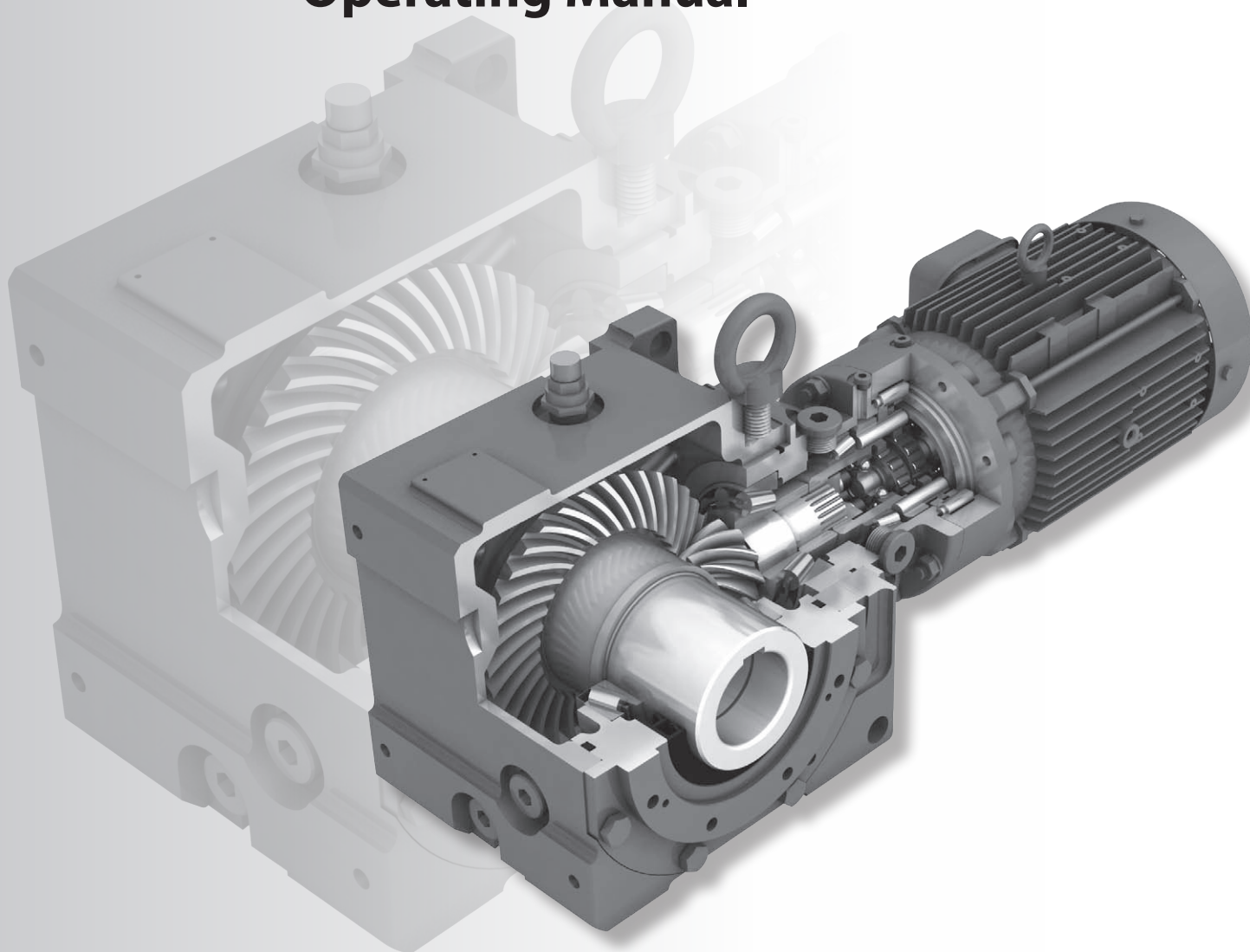


Bevel Buddybox 4

Gear and Gearmotor

Operating Manual



Nr. 991301
01/2016

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Important Notes

General Notes

Please make sure that you heed the safety notes in this documentation.



Electrical hazards

Using the machine incorrectly may lead to bodily injury, serious injuries and/or life-threatening situations.



Hazard

Using the machine incorrectly may lead to bodily injury, serious injuries and/or life-threatening situations.



Dangerous situation

Slight injury may result.



Harmful situation

Damage to the drive or the environment could be caused.



Helpful information



Disposal

Please obey the regulations in force.



Important information on ATEX explosion protection

Spare parts

Only use original spare parts. Any guarantee lapses should unauthorised spare parts be used.

Important Notes

Safety notes



Before working on the machine (assembling, operating, maintaining, inspecting etc.), please read these operating instructions through carefully so that you know exactly how to operate the gearbox properly, you know the safety regulations to be applied and the warnings to be heeded. Keep these instructions near by the machine so that you can refer to them at any time if necessary.



Transport, installation, lubrication, operation, maintenance and inspections should only be carried out by properly trained technicians, otherwise injury or damage to the machine may result.

Keep hands and all foreign objects away from the internal moving parts of the unit, otherwise injury or damage to the machine may occur.



The gearbox unit must be put out of action and disconnected from the power supply for maintenance and assembly work.

The unit must only be used for the intended purpose, otherwise there is the risk of injury or damage to the machine.

Safety instructions for use in an ATEX area



Explosive gas mixtures or dust concentrations combined with hot, live and moving parts on the gears may cause serious or fatal injuries.

Installing, connecting, commissioning and maintaining and repairing the gearbox and additional electrical equipment must only be carried out by a qualified professional, taking account of

- these instructions
- the warning and instruction plates on the gearbox
- any other development documents and connection diagrams relating to the drive
- the plant-specific conditions and requirements
- the national and regional standards and regulations in force (explosion protection, safety, accident protection).

The gears are designed for industrial plants and must only be used in accordance with the information in the technical documentation from Sumitomo and the data on the model plate. They comply with the standards and regulations in force and meet the requirements of Directive 94/9EG.

A drive motor connected to the gearbox must only be started up after ensuring that the measures set out in the section Motor Installation have been carried out before installation.

A motor connected to the gearbox may only be operated on the frequency inverter if the information on the gearbox rating plate is obeyed.

Notes on transport



The consignment must be checked immediately after receipt for any transport damage. The carrier must be notified of this immediately. If it must be assumed that transport damage will restrict proper operation then the unit must not be started up.



Only prescribed slings of the correct size that can be hooked into the existing eyebolts or can be put round the flange connections must be used. The screwed in eyebolts are only designed for the weight of the drive. No additional loads must be suspended.

Do not allow the unit to drop or fall while moving. Always use the eye bolts attached to the gear housing (and on motor if supplied) when moving the unit. After securing the unit to the machine, remove the moving hooks/straps from the eyebolts.

Important Notes



Make sure that when fitting the gearbox there is no explosive atmosphere, oils, acids, gases, vapours or radiation. Check whether the ambient temperature is within the range of application in accordance with section Installation Notes.

Ensure that there is enough ventilation to the gear and there is no external heat source (e. g. from couplings). The cooling air must not exceed a temperature of 40°C.

Check that the configuration matches the configuration specified on the gear's model plate.

Please note: The design may only be changed after prior consultation with Sumitomo, otherwise the ATEX approval will lapse.

Please check that all drive parts to be installed are ATEX approved.



With gears with adapters, make sure that the data given on the gear's model plate is not exceeded

With mains operated motors:


Check that the data given on the gear and motor model plates matches the environmental conditions of the installation location.

Check list for ATEX approved gears before commissioning

You must check whether the following data on the gear model plate agrees with the permissible explosive area on site:



- Equipment group
- Ex category
- Ex zone
- Temperature class
- Maximum surface temperature

Sumitomo Drive Technologies	
◆ Sumitomo (SHI) Cyclo Drive Germany GmbH	
TYPE	CE
i	S.F.I
P ₁	kW
n ₁	1/min
SERIAL NO:	
○  ○	211527 ○

ATEX ID

ATEX classification

Tests before commissioning in Ex area



- Does the data on the gear box's rating plate correspond to the permissible explosive area on site?
- Is the drive undamaged? (Check for any transport or storage damage).
- Is there an explosive atmosphere (oils, acids, gases, vapours, radiation, etc.)?
- Does the design correspond to the information on the model plate? Attention: If the design has not been changed by Sumitomo, the ATEX approval will lapse.
- Is an unrestricted supply of cooling air guaranteed? Is any hot exhaust air being drawn in from other equipment? The cooling air must not exceed a temperature of 40 °C.
- Are all drive parts ATEX-approved?

If possible, the gear box is to be started without load. If it runs quietly and without any odd noises, the gearbox is attached to the driven machine.

Measure the surface temperature after about 3 hours. Maximum permissible difference from ambient temperature: 55 K. At a value of >55 K stop the drive immediately and contact Sumitomo.

With frequency inverter operated gear motors:

Check that the gear motor can be operated by a frequency inverter. The frequency inverter's parameters must be set to prevent overloading of the gear box (see gear box model plate).

Important Notes

Inspection Upon Delivery



- In order to avoid injury, **ensure that the unit is in a stable position** before unpacking.
- **Verify that the unit received matches your order.** Using the incorrect product may cause equipment damage or personal injury.
- **Do not** remove the nameplate from the unit.

Upon delivery, inspect the unit for damage that may have occurred during shipment. Notify the shipping company immediately if you find any damage. **Do not** install or operate a damaged unit.

Upon receipt of the reducer/gearmotor, verify that:

- the model number on the unit nameplate matches the purchase order
- the unit was not damaged during shipping
- all bolts and nuts are fully tightened.

Please consult your Sumitomo agent, distributor, or sales office if you find any defects or if you have any questions.

Nameplate Inspection

When contacting Sumitomo about this product, please be prepared to provide the following information from the reducer/ gearmotor nameplate:

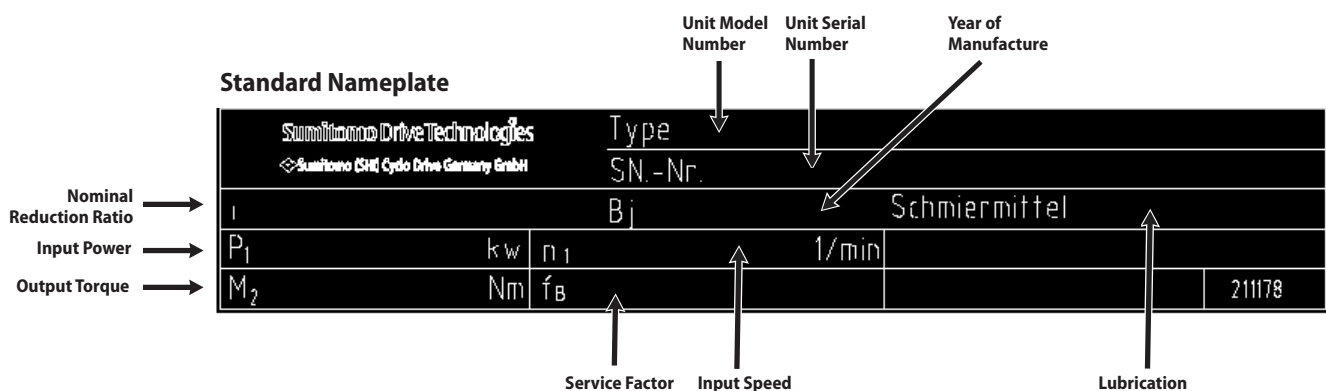
- **reducer or gearmotor model number (nomenclature)**
- **reduction ratio**
- **serial number.**

Lubrication Inspection



- **Oil lubricated units are shipped without oil, unless the customer specified otherwise when the unit was ordered.** Always fill the unit with the correct type and quantity of lubricant prior to operation.
- **Certain models must be filled with lubricant in two separate locations,** the Bevel Gear portion (output) and the input portion.

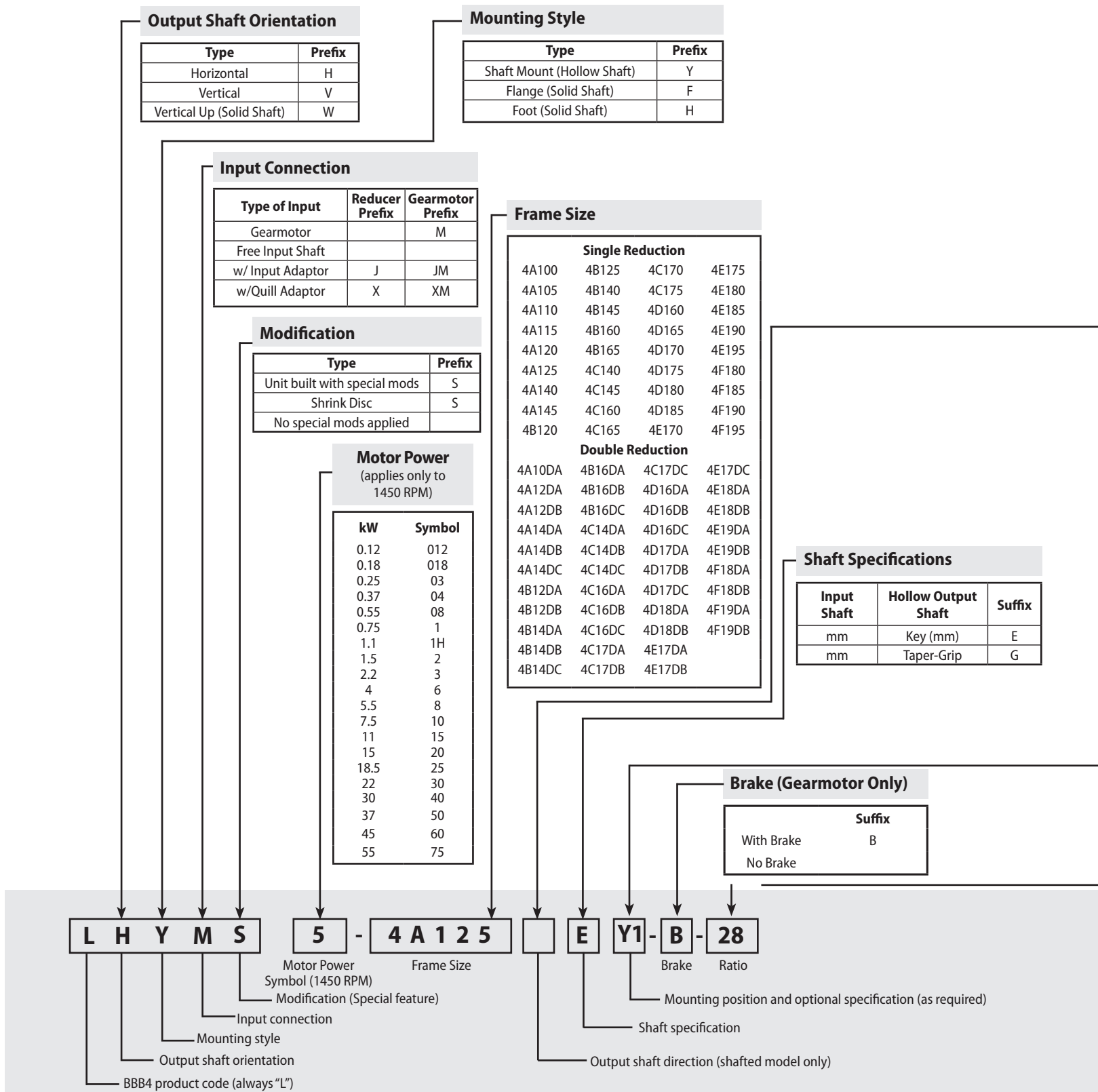
Refer to the lubrication section in this manual for detailed lubrication information.



Nomenclature

Nomenclature

Our nomenclature details specific information about our products. Verify that the nomenclature of the unit delivered matches your order.

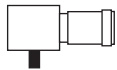


Nomenclature, continued

Output Shaft Direction (shafted model only)

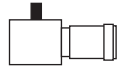
Projects to Left Side

L



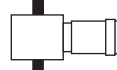
Projects to Right Side

R



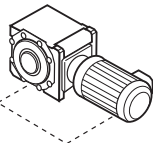
Projects to Both Left/Right Sides

T

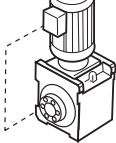


Mounting Positions

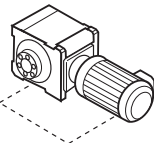
Y1



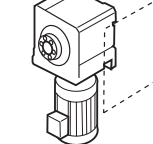
Y2



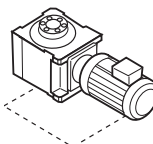
Y3



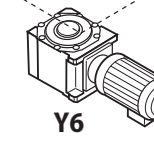
Y4



Y5



Y6

Nomenclature Example:
LHYMS-6-4A125-EY1-B-28

L - Bevel Buddybox
H - Horizontal
Y - Shaft Mount (Hollow Shaft)
M - Gearmotor
S - Special Modifications
6 - 4 kW Motor, 1450 RPM

4A125 - Frame Size
E - Metric Shaft Specification
Y1 - Mounting Position
B - Brake (gearmotor only)
28 - Ratio

Nominal and Exact Ratio

BBB with Planetary Input				BBB with Cyclo Input				
Nominal Ratio		Frame Size	Exact Ratio	Single Reduction				
Input	Overall			Nominal Ratio		Frame Size	Exact Ratio	
3	11	4A10	10.50	Input	Overall			All
		4A12		6	21	21.0		
		4A14		7	22	22.4		
		4B14	10.89		25	24.5		
		4B16		8	28	28.0		
		4C16		11	35	35.2		
		4D16	10.85		39	38.5		
		4D17		13	46	45.5		
		4E17		15	53	52.5		
		4E18	10.50		60	59.5		
		4F18		17	67	67.2		
		4E19		21	74	73.5		
4	13	4F19	10.82		80	All	80.0	
		4A10		25	88		87.5	
		4A12		29	102		101.5	
		4A14	12.95		112		112.0	
		4B14		35	123		122.5	
		4B16		43	151		150.5	
		4C16	12.80	51	179		178.5	
		4D16		59	207		206.5	
		4D17		71	249		248.5	
		4E17	13.09	87	305		304.5	
		4E18		119	417		416.5	
		4E19						
	14	4F19	13.01			All		
		4A10						
		4A12						
		4A14	14.16					
		4B14						
		4B16						
		4C16	14.00					
		4D16						
		4D17						
		4E17	14.32					
		4E18						
		4F18						
4E19	14.23							
4F19								
5	16	4A10	15.36			All		
		4A12	15.65					
		4A14	16.00					
		4B14						
		4B16						
		4C16	16.26					
		4D16						
		4D17						
		4E17	16.17					
		4E18						
		4F18						
		4E19	15.63					
	4F19							
	18	4A10	16.80			All		
		4A12	17.12					
		4A14	17.50					
		4B14						
		4B16						
		4C16	17.78					
		4D16						
		4D17						
		4E17	17.68					
		4E18						
4F18								
4E19		17.10						
4F19								

Storing and Transporting

Storage Location

- Store the unit in a clean, dry area.
- **Do not** store outdoors or in an area with high humidity, dust, sudden temperature changes, or corrosive gases.

Generally, the BBB4 gearbox is to be stored indoors, in an ordinary factory or a warehouse. The unit should be sealed, wrapped in plastic and additionally packed with desiccant. Desiccant should be replaced periodically to keep the inside of the box dry. Use of color changing desiccant will aid in identifying when desiccant should be changed.

Storage Period

- **Do not** store the unit for longer than 3 months without following long-term storage procedures recommended by Sumitomo.
- Consult Sumitomo when storing the unit for more than 3 months. Rust proofing procedures are required.
- Consult Sumitomo when exporting the unit. Rust proofing procedures may be required.

If the BBB4 gearbox will be inactive for a long period of time, long-term storage preparation is required to prevent rust or other degradation to the gearbox.

LONG-TERM STORAGE SPECIFIED WITH ORDER:

If long-term storage is specified at the time of order entry, Castrol Alpha oil MW-100 or equivalent rust preventative is already sprayed into the BBB4 reducer and the air vent is replaced with a sealing plug before shipping the reducer from Sumitomo factory. External machined surfaces are coated with Valvoline Tectyl 846/K19 or equivalent. These brands are subject to change without notice.

Consult Sumitomo for Long Term Storage procedures:

- Storage without factory preparations
- Ongoing maintenance during storage period

Operation After Storage

Before operating the unit after an extended storage period, flush unit of rust preventative and ensure that non-metal parts, i.e., oil seals, o-rings, air breather, have not deteriorated. Non-metal parts may deteriorate easily from exposure to ambient conditions (i.e., extreme temperatures, UV rays). Replace deteriorated parts with new before unit start-up.

After starting the unit, verify that there is no abnormal noise, vibration, and/or temperature rise. Immediately stop the unit and call your local distributor, Original Equipment Manufacturer or Sumitomo directly if you observe any abnormality.

Installation Notes

Installation Precautions



- Do not use the reducer/gearmotor for specifications other than those shown on the nameplate or in the manufacturing specification documents. Personal injury and/or equipment damage may occur.
- Do not place combustible material on or around the unit; fire may occur.
- Do not place any objects around the unit that will prohibit proper ventilation. Inadequate ventilation may lead to high unit temperature and/or fire.
- Do not step on or hang from the unit. Excessive weight may cause component breakage leading to personal injury and/or equipment damage.
- Do not touch the shaft, keyway, or motor fan with bare hands; injury may occur.
- For applications in which lubricant leaks could adversely affect operations (i.e., package handling, food processing), place an oil pan below the unit to protect against contamination that may occur if oil seals become damaged or worn.
- Do not remove the eye-bolt from the motor. Should the eye-bolt need to be removed for any reason, install a replacement bolt in the tapped hole to prevent water from entering the motor.

Installation Location

Ambient Temperature Range-10° ... +40° C

Ambient Humidity.....85% or less

Altitude1,000 m or less

AtmosphereThe location should not contain corrosive gas, explosive gas, or steam. The location should be free of dust and well ventilated.

LocationIndoor – free of dust and water

Consult Sumitomo when the unit will operate in conditions other than those specified above. Special unit modifications may be required.

Units manufactured according to customer specified application requirements (i.e. outdoor modifications, high-temperature modifications) are designed to operate within the specified environment.

Install the unit so inspection and/or maintenance procedures may be easily performed. Install all units that are not shaft mounted on a sufficiently rigid base.

Torque arm clearance with machine structure is required to allow for machine shaft run out. Refer to the Torque Arm Installation section in this manual for additional information.

Conditions for installing in an ATEX area



Ambient temperature: -10° ... +40° C

Maximum self-heating at nominal rating: 60 K

Installation height < = 1000 m

Maximum drive speed: 1500 min-1

Short term maximum load: 200 % of the rated load torque

500 % shock overload is not permitted.

Installation Angle

Mount the unit in the specified position for which it was ordered. Confirm the mounting position from the gearbox nameplate.

Consult your local distributor, Original Equipment Manufacturer or Sumitomo directly if the mounting angle is to be **other than horizontal or vertical**.

Severe Loading Conditions

For applications with severe vibration and/or frequent starts and stops, Sumitomo recommends the use of high-strength mounting bolts of Grade 8.8 (or greater).

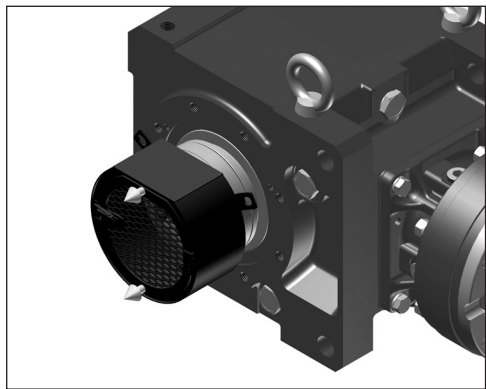
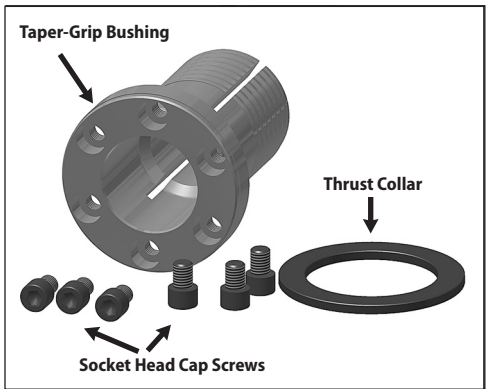
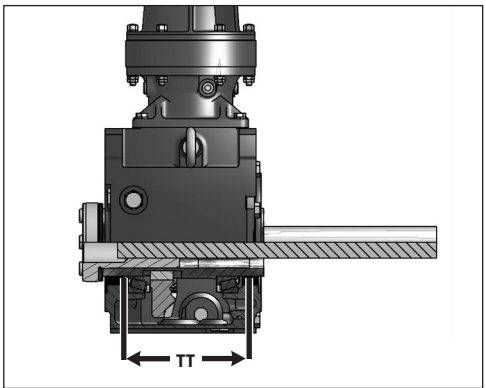
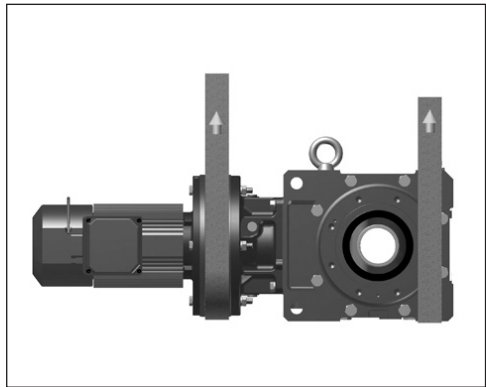
Installation onto the Driven Machine



- Before coupling the reducer/gearmotor to the machine, verify the appropriate/desired rotation of the machine. Differences in the rotational direction may cause personal injury and/or equipment damage.
- Before operating the unit, ensure that all safety guards around the rotating components are in-place and secure. Failure to do so may result in personal injury.
- When joining the reducer or gearmotor to the load, ensure that the center alignment, belt tension, and/or parallelism of the coupling device are within the coupling manufacturer's established recommendations. For applications with a belt, ensure that the belt is properly tensioned to the manufacturer's specification, and the bolts securing the pulley and couplings are sufficiently tightened. Failure to follow these precautions may result in personal injury and/or equipment damage.

Installation onto Driven Shaft

Taper-Grip Bushing



Taper-Grip Bushing Introduction

The keyless Taper-Grip bushing system provides a simple and reliable shaft attachment for Sumitomo speed reducers and gearmotors. This system allows bi-directional shaft rotation operation with a powerful, slip-free grip. To assure peak performance of your equipment, please read, understand and follow these installation instructions.



Prior to installation of the BBB4 onto the driven shaft, ensure that the shaft length meets or exceeds the minimum shaft engagement value “TT” detailed in Table 1.

Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm installation section in this manual for instructions.



CAUTION: The BBB4 must be externally supported prior to insertion of driven shaft into bushing. External support **MUST** be maintained until all bushing socket head cap screws have been tightened to the appropriate operational torque.

Components of Taper-Grip Bushing

As shown in the figure on the left, the Taper-Grip bushing includes the **bushing**, **thrust collar**, and **socket head cap screws**.

Table 1. Driven Shaft Tolerance ^[1] and Minimum Shaft Engagement (TT)

Shaft Diameter mm	Tolerance μm
30 - 50	+0 / -39
50 - 80	+0 / -46
80 - 120	+0 / -54
120 - 180	+0 / -63

Note: [1] Based on ISO/JIS/DIN h8

BBB4 Size	TT mm
4A	208
4B	242
4C	279
4D	326
4E	359
4F	412

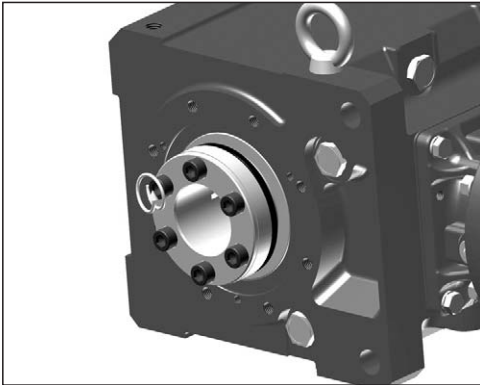
Taper-Grip Bushing Installation onto Driven Shaft

1

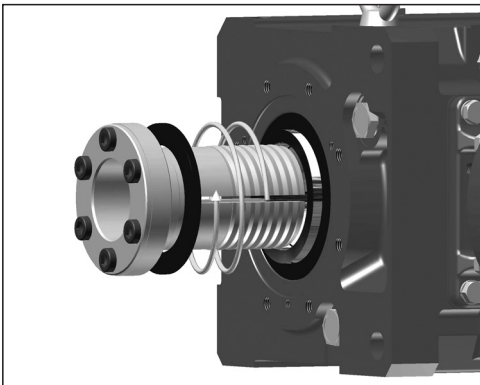
Remove **bushing cover** if unit was supplied with one.

Installation onto Driven Shaft, continued

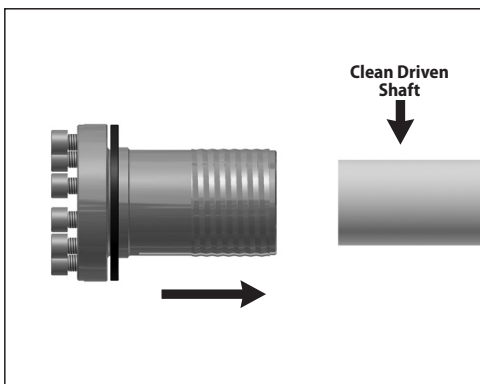
Taper-Grip Bushing

**2**

Loosen **socket head cap screws**.

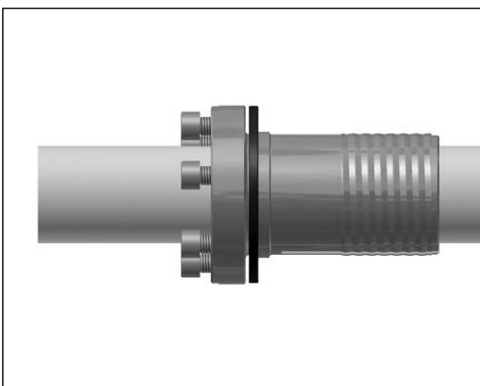
**3**

Remove (unscrew) Taper-Grip bushing from the unit.

**4**

Clean all **grease, oil** and/or **anti-seize paste** from the driven shaft. Failure to do so could result in damage to shaft.

Slide Taper-Grip bushing onto driven shaft.

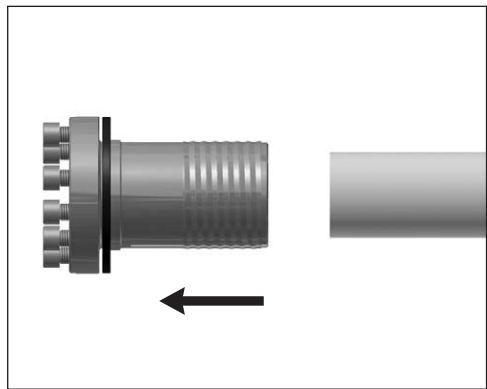
**5**

Inspect and test Taper-Grip bushing on shaft.

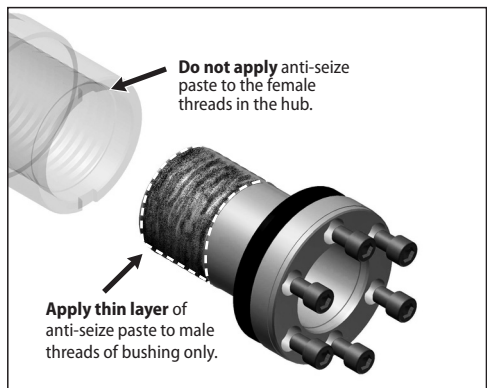
- Check shaft for burrs, corrosion, or warpage. Repair or replace shaft as necessary.
- Slide bushing back and forth along shaft, checking for surface irregularities and fit.
- Verify bushing is sized correctly for the shaft diameter.

Installation onto Driven Shaft, continued

Taper-Grip Bushing

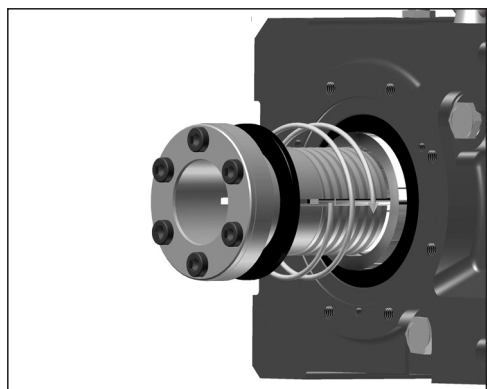


6
Remove Taper-Grip bushing from driven shaft.



7
Apply a thin layer of anti-seize paste to the male threads of the Taper-Grip bushing only.

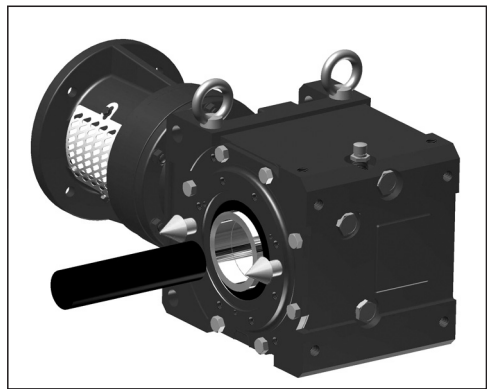
STOP Ensure that the anti-seize paste does not enter the Taper-Grip bushing bore.
Do not apply anti-seize paste to the female threads in the hub.



8
Screw Taper-Grip bushing into BBB4 leaving approximately 1 mm gap between the bushing flange and thrust collar.

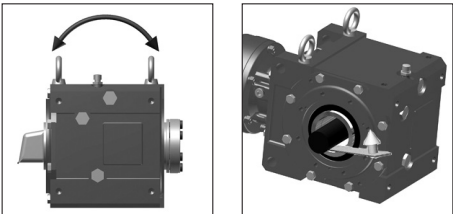
STOP Do not apply grease, oil, or anti-seize paste to the driven shaft or the bushing bore before placing the unit onto driven shaft. Use of these friction-minimizing products will adversely affect the ability of the unit to transmit torque.

STOP **CAUTION:** The BBB4 must be externally supported prior to insertion of driven shaft into bushing. External support **MUST** be maintained until all bushing socket head cap screws have been tightened to the appropriate operational torque.



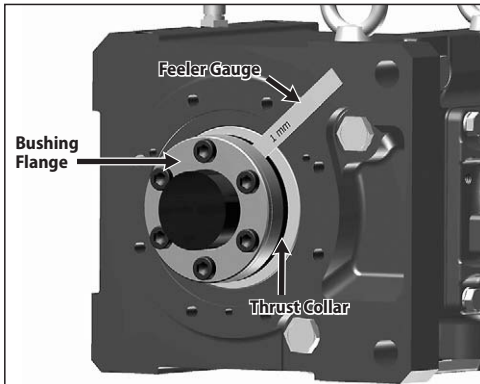
9
Mount or slide the **BBB4** onto the driven shaft to the desired location.

STOP Do not rock or pry the unit.



Installation onto Driven Shaft, continued

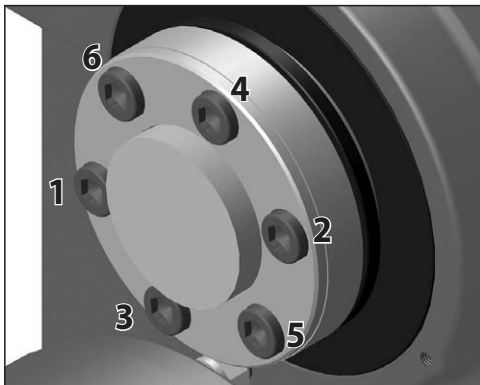
Taper-Grip Bushing



10

Screw Bolts into Taper-Grip bushing.

- Lightly oil threads of each bolt before inserting.
- Finger tighten each bolt to secure in place.
- Be sure to **maintain the 1 mm** (approximate) **gap** between the **thrust collar** and the **bushing flange**.



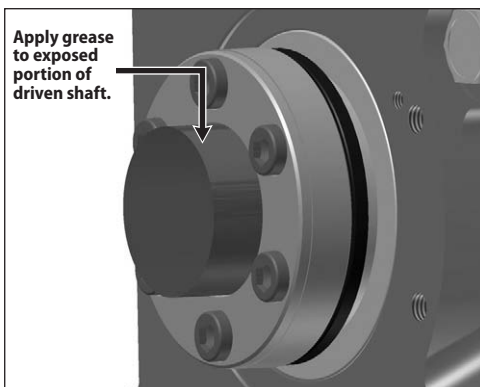
11

Tighten bushing bolts to the correct torque value.

- Following a star pattern, use a torque wrench to **gradually tighten each socket head cap screw in 20% increments**.
- Refer to **Table 2, Taper-Grip Bushing Bolt Tightening Torques**, for the correct operational screw torques.

Table 2. Taper-Grip Bushing Bolt Tightening Torques

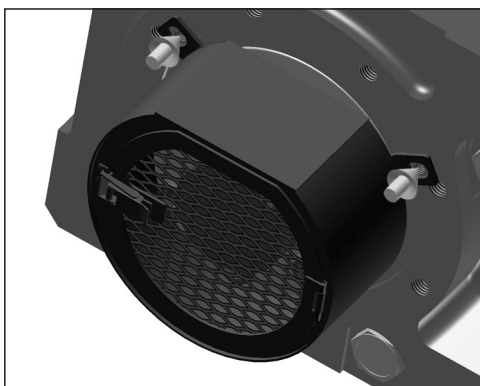
BBB4 Size	Screw Qty x Size	Screw Torque
		N·m
4A	6 x M12	75
4B	6 x M12	140
4C	6 x M16	250
4D	6 x M16	300
4E	8 x M16	300
4F	10 x M16	300



12

In order to prevent corrosion, apply grease to the exposed portion of the driven shaft.

- **After installing and tightening** the bushing bolts with a torque wrench, **apply grease or an anti-corrosion product** to the exposed portion of the shaft.



13

For units that include a bushing safety cover, reinstall the guard over the Taper-Grip bushing.



Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm Installation section in this manual for instructions.

Installation onto Driven Shaft, continued

Keyed Hollow Bore

Keyed Hollow Bore Installation

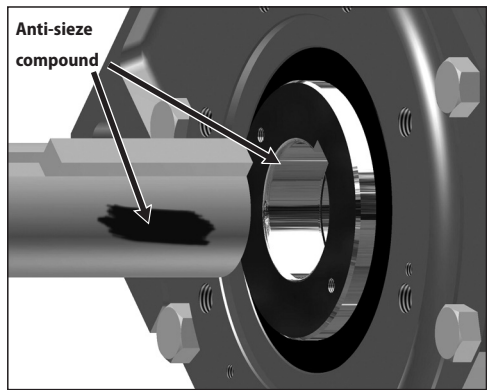


Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm Installation section in this manual for instructions.

CAUTION: The BBB4 must be externally supported prior to insertion of driven shaft into hollow bore.

Bore and Shaft Tolerance Specifications

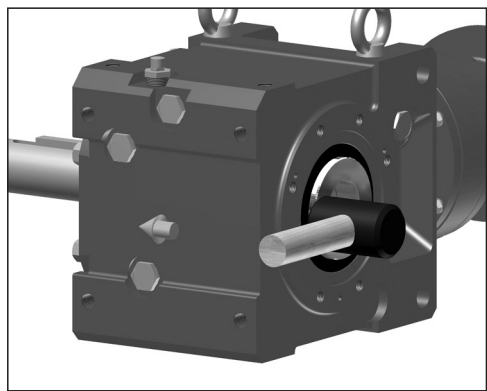
- Unless otherwise specified, the tolerance of the Hollow Shaft Bore tolerance H8.
- If application involves high shock loading and/or large radial loads, a shaft tolerance of js6 or k6 is recommended.



Keyed Hollow Bore Installation onto Driven Shaft

1

Apply anti seize compound to the driven shaft surface and inside the reducer keyed hollow bore.



2

Align the driven shaft with the reducer/gearmotor bore and carefully slide unit onto the driven shaft to the desired location.



If the fit is tight, strike on the keyed hollow bore with a wooden or hard rubber mallet to assist in the assembly.

If using a mallet during installation, strike **only** against the unit's steel keyed hollow bore. Do not strike the reducer housing or oil seal as damage to the bearings, housing and/or seals may occur.

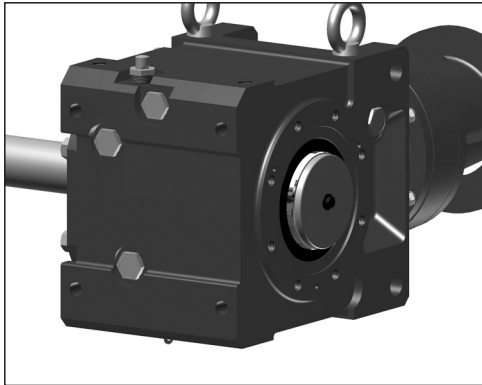
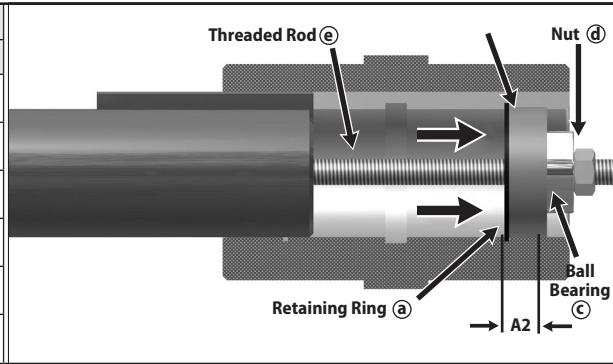
Note: If the fit is tight, use a jig such as the one shown in Table 3 to ease assembly. **Sumitomo does not supply a mounting jig. This information is provided for reference only.**

Installation onto Driven Shaft, continued

Keyed Hollow Bore, Shrink Disc Type Hollow Bore

Table 3. Jig Dimensions (mm)

Size	a	b	c	d	e
	CC (ISO/JIS)	A2	Bearing	Nut	Threaded Rod
4A	40	25	51104	M16	M16 x 250
4B	60	25	51105	M20	M20 x 300
4C	70	25	51105	M20	M20 x 300
4D	90	35	51107	M24	M24 x 400
4E	100	35	51107	M24	M24 x 400
4F	120	46	51109	M30	M30 x 450



3

Once driven shaft has been completely inserted into the unit's keyed hollow bore, secure the shaft in place using a keeper plate as shown to the left, or some other means of securing the unit to the driven shaft.



Do not operate unit until the torque arm has been attached. Refer to the Torque Arm Installation section in this manual for instructions.

Shrink Disc Type Mounting Introduction

The **keyless Shrink Disc** provides a reliable commodity shaft attachment for Sumitomo speed reducers and gearmotors. This system allows bi-directional shaft rotation operation with a powerful, slip-free grip.

To assure peak performance of your equipment, please read, understand and follow these installation instructions.



Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm Installation section in this manual for instructions.

CAUTION: The BBB4 must be externally supported prior to insertion of driven shaft into hollow bore. External support **MUST** be maintained until all shrink disc socket head cap screws have been tightened to the appropriate operational torque.


Bore and Shaft Tolerance Specifications

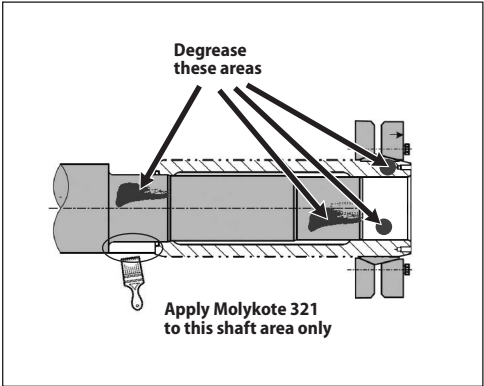
- Refer to the certified outline drawing or BBB4 Catalog for recommended machine shaft dimensions.
- Unless otherwise specified, the tolerance of the Shrink Disc Bore H8.
- If application involves high shock loading and/or large radial loads, a shaft tolerance of js6 or k6 is recommended.

Installation onto Driven Shaft, continued

Shrink Disc Type Hollow Bore

Shrink Disc Type Hollow Bore Installation onto Shaft

 Before placing unit onto driven shaft, **do not apply grease, oil, or anti-seize paste to the entire driven shaft or to the bore of the shrink disc.** Use of these friction-minimizing products will adversely affect the ability of the unit to transmit torque. Never tighten locking screws before shaft installation. Inner ring may become permanently contracted even at low tightening torques.



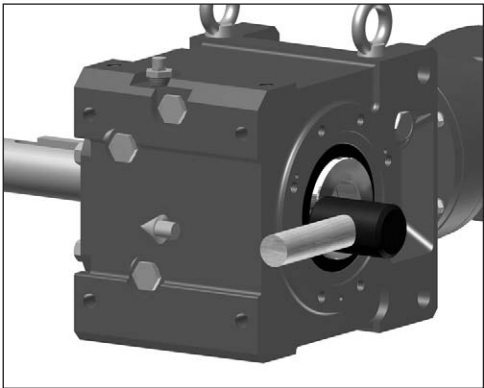
1

Clean and degrease contact surfaces; reducer shaft and bore, and the machine driven shaft.

Apply Molykote 321 or an equivalent dry film lubricant to the driven shaft shoulder opposite from the shrink disc.



Do Not apply any friction minimizing compound to the driven shaft at or near the shrink disc.



2

Align the driven shaft with the bore of reducer/gearmotor bore and carefully slide unit onto the driven shaft to the desired location.

• If the fit is tight, strike on the reducer hollow bore with a mallet to assist in the assembly.



If using a mallet during installation, strike **only** against the unit's steel hollow bore. **Do not** strike the reducer housing or oil seal, as damage to the bearings, housing, and/or seals may occur.

If the fit is tight, use a jig such as the one shown in the Keyed Hollow Bore Installation section to ease assembly. **Sumitomo does not supply a mounting jig. This information is provided for reference only.**

Table 4. Shrink Disc Bolt Tightening Torques

Size	Model (Typical)	Bolt	Bolt Torque
			N·m
4A	TAS-3071-55x68	10 x M6x25 ISO/JIS grade 10.9	12
4B	TAS-3081-65x80	7 x M8x30 ISO/JIS grade 12.9	34
4C	TAS-3081-75x100	12 x M8x35 ISO/JIS grade 12.9	34
4D	TAS-3093-85x110	12 x M10x45 ISO/JIS grade 12.9	68
4E	TAS-3081-100x140	10 x M12x45 ISO/JIS grade 12.9	118
4F	TAS-3071-120x165	8 x M16x55 ISO/JIS grade 12.9	290

Installation onto Driven Shaft, continued

Shrink Disc Type Hollow Bore



3

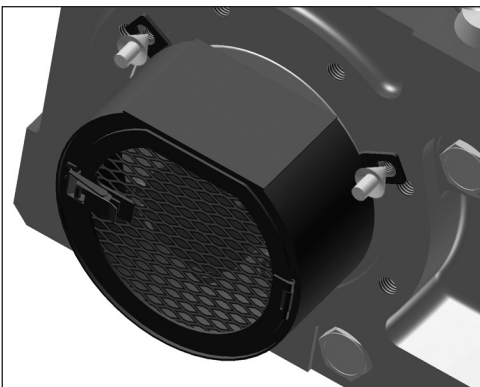
- Set the (untightened) shrink disc on the reducer shaft.



4

Tighten Bolts to the correct torque value.

- For 3-piece design shrink disc, make sure that both plates are parallel when tightening bolts.
- After confirming that the shrink disc is set correctly, tighten the bolts uniformly, in a clockwise pattern while keeping both plates parallel (**not** diagonally or 'star' pattern).
- It is recommended to tighten respective bolts by 30 degrees each time – until the specified torque is reached.



5

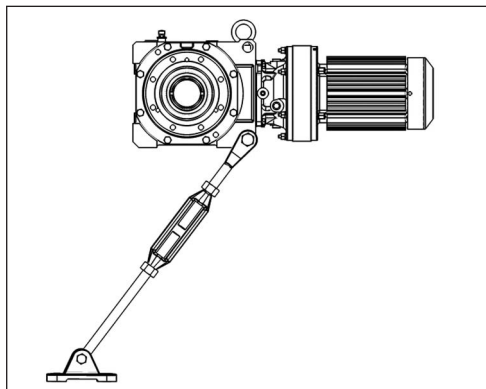
For units with a safety cover, install the guard over the **shrink disc**.



Do not operate unit until the torque arm has been attached. Refer to the Torque Arm Installation section in this manual for instructions.


Torque Arm Installation

Torque Arm Introduction, Turnbuckle Type Torque Arm



Torque Arm Introduction

A **torque arm** is a device used to prevent counter-rotation of the shaft mounted reducer/gearmotor during operation.

 The torque arm **must** be mounted in **tension** when torque arm mounting point is greater than 6 inches (150mm) from machine mounting point or, tie-rod or turn buckle type torque arm is used.

Turnbuckle Type Torque Arm Parts

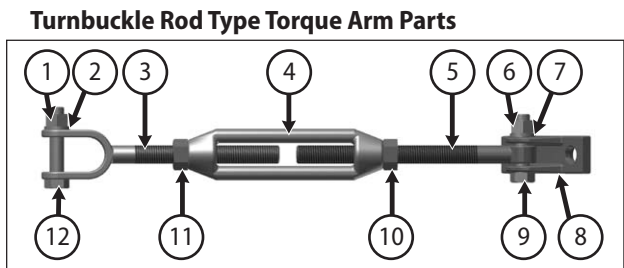
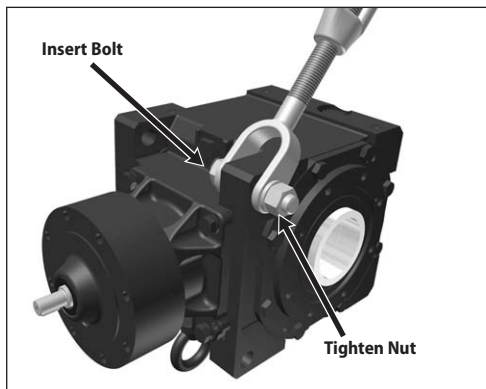


Table 5. Turnbuckle Type Torque Arm Parts

Item Number	Description	Item Number	Description
1	Hex Nut	7	Locke Washer
2	Lock Washer	8	Fulcrum Mounting Bracket
3	Threaded Extension Rod	9	Hex Bolt
4	Turnbuckle	10	Locking Nut (if supplied)
5	Threaded Arm	11	Locking Nut (if supplied)
6	Hex Bolt	12	Hex Bolt



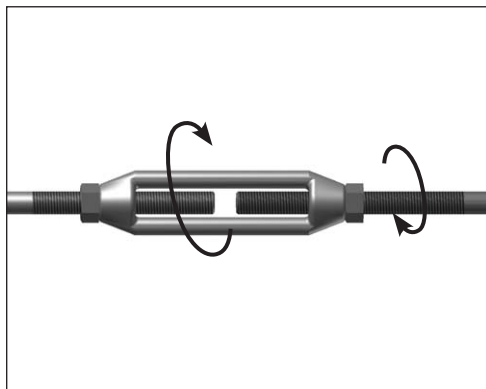
1
Attach the torque arm threaded extension rod to the bevel housing, as shown in the Figure, at the housing corner eyelet, using the appropriate nut, bolt and lockwasher.

- Insert the bolt through the brackets, torque arm sleeve (if supplied) and reducer housing eyelet.
- Place the lockwasher on the bolt and secure with nut.

Table 6. Bolt Tightening Torques

Unit Size	Bolt Size ^[1]	N·m
A	M16 x 75	206 – 227
B	M20 x 100	392 – 431
C	M24 x 105	686 – 755
D	M24 x 125	686 – 755
E	M24 x 125	686 – 755
F	Consult Factory	

Note: [1] Bolt Class equal to ISO/JIS Class 8.8

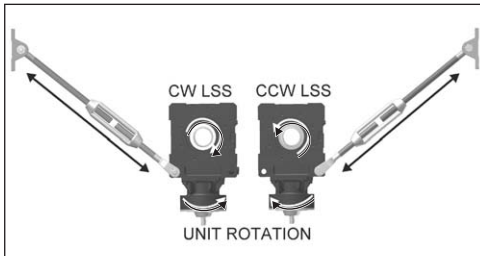


2
Install the turnbuckle onto the threaded extension rod (gearbox side) and then threaded arm (foundation side) to the turnbuckle

If the assembly was supplied with hex nuts to secure the turnbuckle, install the nuts loosely, ensuring the left hand nut is used on the threaded arm, prior to installing the turnbuckle and threaded arm

Torque Arm Installation, continued

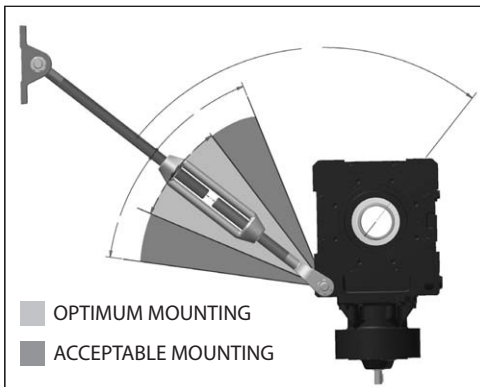
Turnbuckle Type Torque Arm



3

Position the torque arm so it will be in tension during unit operation and mount the fulcrum mounting bracket to suitable structure or foundation. Consider installing two torque arms for reversing applications to allow torque arm to be in tension for each direction of rotation.

Mounting hardware for fulcrum mounting bracket are NOT supplied by Sumitomo.



4

Position the torque arm as close as possible to 90° relative to the unit output bore / driven equipment shaft.

Sumitomo does not recommend combining torque arm assemblies to achieve a greater overall length.

Table 7. Bolt Tightening Torques

Unit Size	Bolt Size ^[1]	N·m
A	M16 x 65	206 – 227
B	M16 x 80	206 – 227
C	M16 x 80	206 – 227
D	M16 x 80	206 – 227
E	M16 x 80	206 – 227
F	Consult Factory	

Note: [1] Bolt Class equal to ISO/JIS Class 8.8

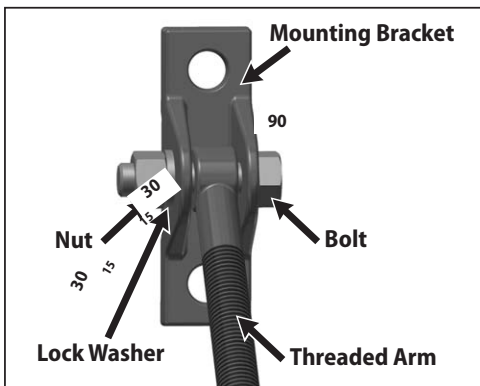
5

Assemble the threaded arm to the fulcrum mounting bracket, as shown.

Some adjustment of the turnbuckle may be required to lengthen or shorten the overall length.

Secure it with the appropriate nut, bolt and lockwasher.

- Insert the bolt through the brackets and threaded arm eyelet.
- Place the lockwasher on the bolt and secure with nut.

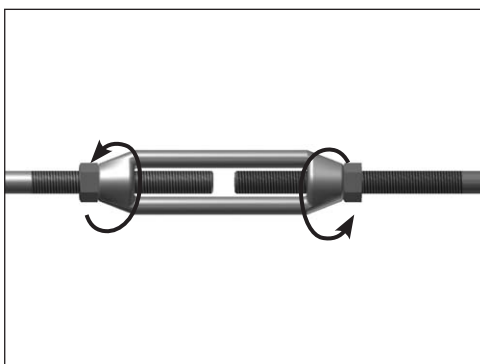


6

If turnbuckle hex nuts were supplied, secure the turnbuckle position by adjusting the previously installed turnbuckle nuts.

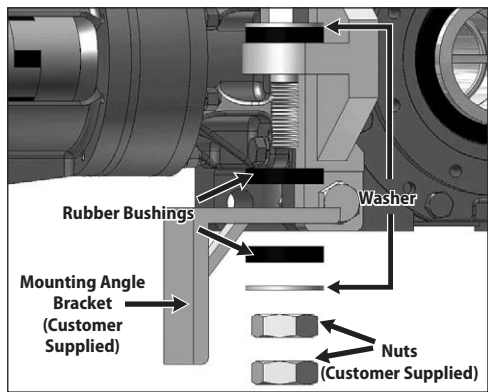
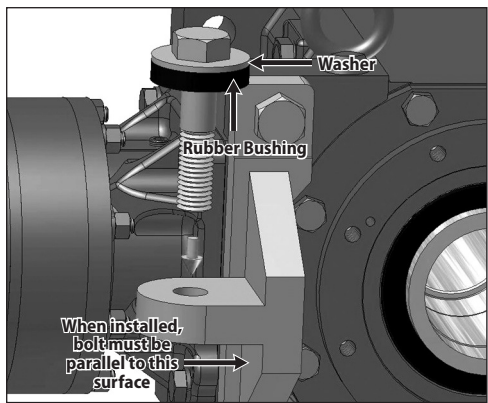
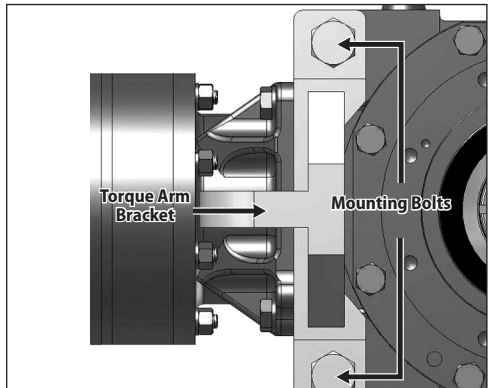
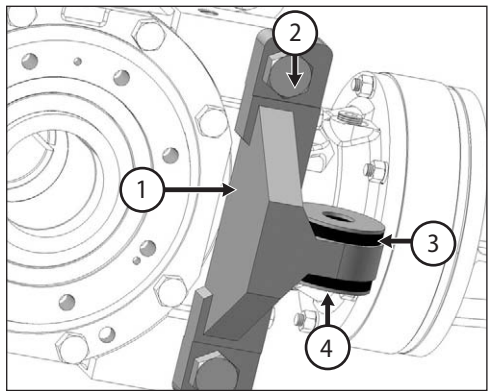
Table 8. Nut Tightening Torques

Unit Size	Nut Size ^[1]	N·m
A	M20	392 – 431
B	M24	686 – 755
C	M24	686 – 755
D	M24	686 – 755
E	M24	686 – 755
F	Consult Factory	



Torque Arm Installation, continued

T-Type Torque Arm



T-Type Torque Arm

Sumitomo Supplied Components for T-Type Torque Arm

Table 9. T-Type Torque Arm Components

Item Number	Description
1	Torque Arm Bracket
2	Bracket Hardware
3	Rubber Bushing (qty 3)
4	Washer (qty 2)

T-Type Torque Arm Installation Procedure

1

Attach the T-Type Torque Arm Bracket to the BBB4 using the supplied mounting hardware.

Tighten mounting bolts according to the values listed in Table 10:

Table 10. T-Bracket Bolt Torques

BBB4 Size	Bracket Bolt Size ^[1]	Torque
		N·m
4A	2 x M16	206 – 227
4B	2 x M20	392 – 431
4C	2 x M24	686 – 755
4D	2 x M30	1373 – 1510
4E	2 x M30	1373 – 1510
4F	T-Type Not Available	

Note: [1] Bolt class equal to ISO/JIS Class 8.8

2

Place washer and rubber bushing on bolt.

Insert torque arm bolt (supplied by customer) through torque arm mounting tab. T-Type bolt sizes listed in Table 11.

 **Make sure bolt is parallel to T-Type Torque Arm side when fully installed.**

3

Follow these steps to attach the mounting angle bracket:

- Place rubber bushing and mounting angle bracket on bolt.
- Verify that the mounting angle bracket hole is the correct diameter for customer supplied bolt.
- Place remaining bushing, washer and two nuts on the bolt.

 **Do not over-tighten nuts. Tighten to point where rubber bushings can still be hand rotated.**

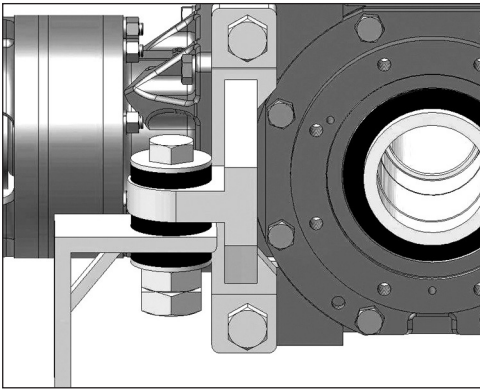
Torque Arm Installation, continued

T-Type Torque Arm

Table 11. T-Type Bolt Dimensions

Unit Size	Bracket Tab Bore	Typical Bolt Size ^[1]
4A	Ø18mm	M16
4B	Ø18mm	M16
4C	Ø22mm	M20
4D	Ø26mm	M24
4E	Ø33mm	M30

Note: [1] Bolt class should be greater or equal to ISO/JIS Class 8.8. Application with multiple start/stops and/or shock loading should use ISO/JIS 10.9 at a minimum.



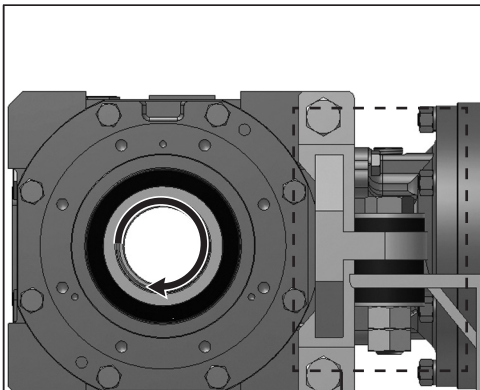
4

Confirm that the **rubber bushings** can still be rotated by hand. This indicates the bushing has not been over tightened.



Compressed bushings will not allow the bushings to properly absorb the loads of the shaft mounted gearbox. This can lead to premature failure.

Mounting angle bracket must be secured to the machine structure.



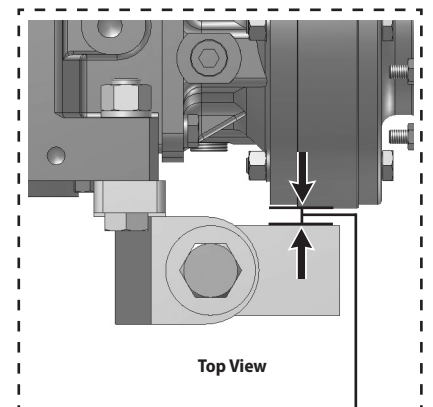
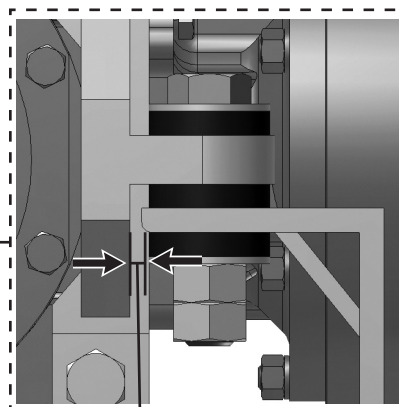
5

Confirm the mounting angle bracket does not interfere with the torque arm.

There should be no metal-to-metal contact between the two during a complete revolution of the driven equipment.



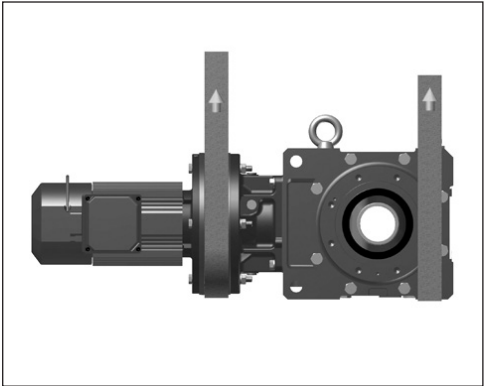
Metal-to-Metal contact between these two components may lead to catastrophic failure of the reducer/ gearmotor.



Top View

Removal from Driven Shaft

Removal of BBB4 with Taper-Grip Bushing



Removal of BBB4 with Taper-Grip Bushing



Before starting unit removal process, ensure that electrical power to unit has been safely locked out and that electrical connections to the unit have been disconnected.

1

Externally support the BBB4 unit such that all unit weight is removed from the driven shaft.

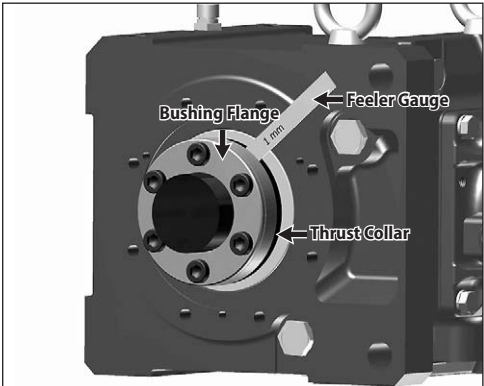


The weight of the BBB4 must be externally supported throughout the entire removal process.

Do not raise the unit too high. Shaft binding may occur.

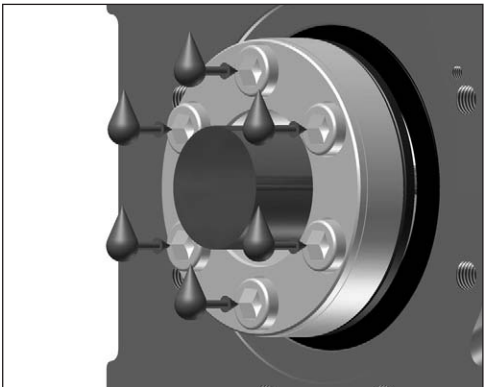
2

Remove safety guard from unit. Inspect the Taper-Grip bushing to ensure that a gap exists between the thrust collar and the bushing flange.



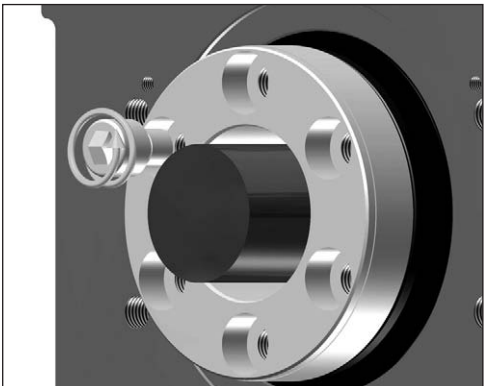
3

Apply a liquid-penetrant onto each of the Taper-Grip bushing socket-head cap screws. Allow time for the penetrant to settle into the threads of the screws.



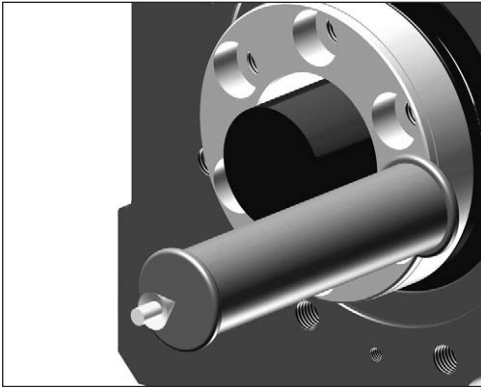
4

After the penetrant has settled, remove the socket head cap screws one at a time.



Removal from Driven Shaft, continued

Removal of BBB4 with Keyed Hollow Bore



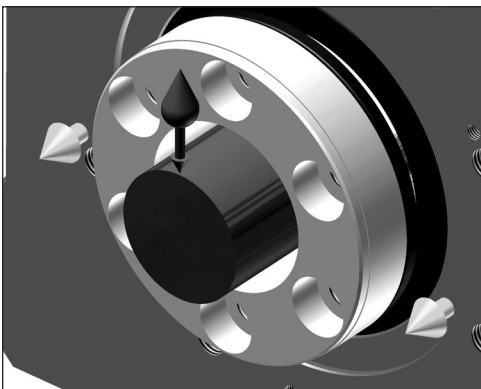
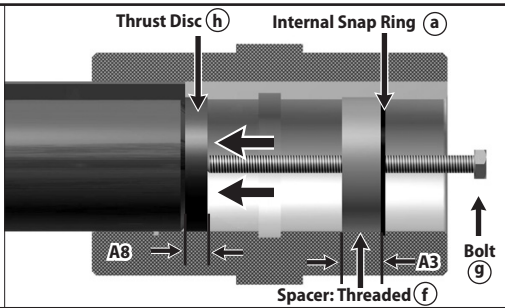
5

Place a soft-metal (i.e. brass) bar against the flange of the Taper-Grip bushing and carefully strike end of bar with a hammer to release the bushing.

If shaft removal is difficult, a jig such as the one shown in Table 12 may be used to ease the removal process. **Sumitomo does not supply the removal jig .**
This information is supplied for reference only.

Table 12. Removal Jig Dimensions

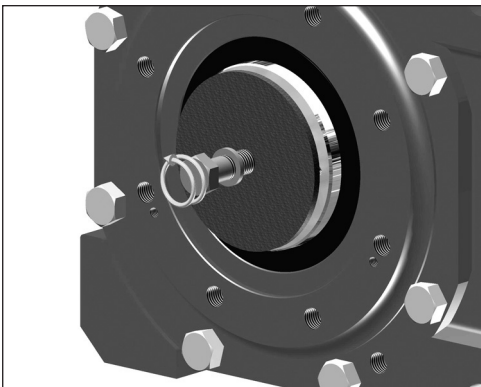
Size	a	f	g	h
	CC (ISO/JIS)	A3	BOLT	A8
4A	55	19	M24x250	6
4B	65	19	M24x300	6
4C	75	19	M24x300	5
4D	85	24	M30x400	5
4E	100	19	M30x400	5
4F	120	30	M36x450	7



6

Apply a liquid penetrant to the shaft where it contacts the bushing. Allow time for the liquid to settle between the shaft and the bushing wall. Once the penetrant has settled adequately, carefully remove the BBB4 from the driven shaft.

If the Taper-Grip bushing releases but the unit cannot be removed from the driven shaft, a puller may need to be applied to the bushing flange to pull the unit free from the shaft.



Removal of BBB4 with Keyed Hollow Bore



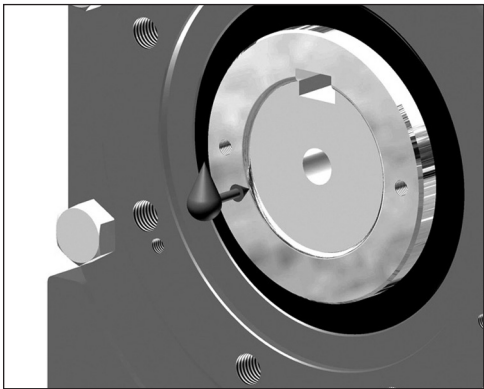
Before starting unit removal process, ensure that electrical power to unit has been safely locked out and that electrical connections to the unit have been disconnected.

1

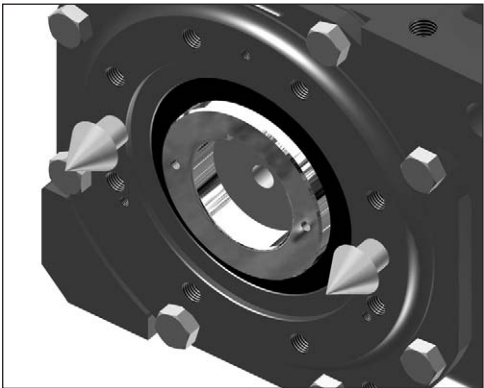
Remove safety cover and the shaft-retaining device from the driven shaft.

Removal from Driven Shaft, continued

Removal of BBB4 with Shrink Disc




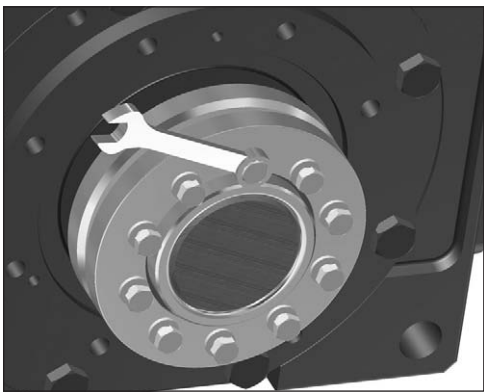
- 2
- Apply a liquid penetrant to the shaft where it contacts the keyed hollow bore. Allow time for the liquid to penetrate between the shaft and the wall of the keyed hollow bore.



- 3
- Once the penetrant has settled adequately, carefully remove the BBB4 from the driven shaft.

Removal of BBB4 with Shrink Disc

-  Before starting unit removal process, ensure that electrical power to unit has been safely locked out and that electrical connections to the unit have been disconnected.

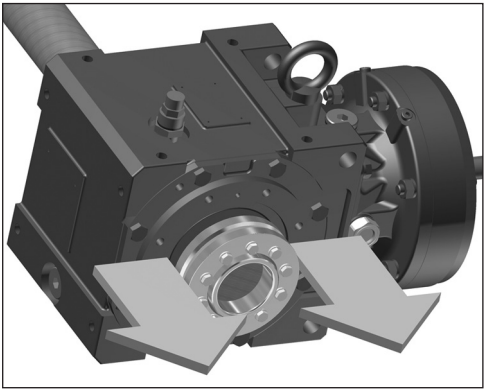


- 1
- Remove the safety cover and apply liquid penetrant to the shrink disc bolts and shaft/bore allowing adequate time for proper penetration.

Loosen the locking bolts on the shrink disc.

Complete bolt removal should not be required.

Tapping the shrink disc flanges with a rubber dead blow hammer may be required if any fretting corrosion has occurred.



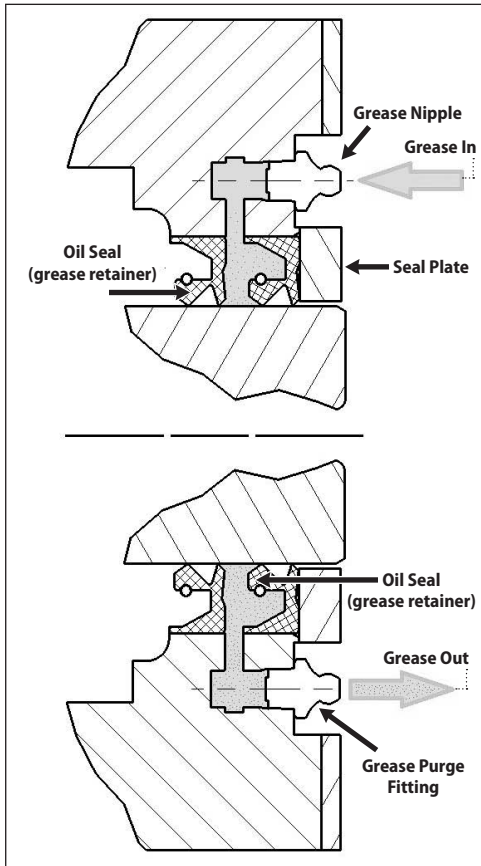
- 2
- Remove the gearbox from the shaft.

If shaft removal is difficult, a jig such as the one shown in the Removal of BBB4 with Taper-Grip Bushing section may be used to ease the removal process. **Sumitomo does not supply the removal jig. This information is supplied for reference only.**

Lubrication

Taconite Seal Lubrication Procedure

Taconite Seal Assembly



1. Introduction

Taconite seals may be used in high dust operating environments. They use a grease purging system to prevent outside contaminants from entering the speed reducer/gearmotor. Figure to the left details the Taconite Seal assembly as utilized in the 4-Series Bevel Buddybox.

2. Procedure

Please follow these instructions to maintain lubrication of the Taconite Seal system:

- Unless otherwise specified, the Taconite output seals are each packed with NLGI #2 EP mineral grease prior to unit shipment from the factory location.
- Grease does not need to be added to the seals prior to unit start-up.**
- Add grease to the seals according to the guidelines indicated in Table 13. Refer to Table 14 for recommended greases.

Table 13. Lubrication Cycle

Output Shaft RPM	Hours of Operation
>200	5,000

Please note that a highly contaminated environment may require a more frequent lubrication cycle.

Table 14. Recommended NLGI#2 Mineral Greases

Grease	BP	Castrol			Chevron/Texaco		Exxon/Mobil		Shell	Total
Mineral	Ener-Grease LS EP2	Spheerol AP3	Olista Longtime 3EP	Tribol 3020/1000-2	Duralith Grease EP2	Multifak Grease EP2	Beacon EP2	Mobilux EP2	Alvania EP2	Multis EP2
Food Grade					FM EP2					

Lubrication, continued

Taconite Seal Lubrication Procedure, continued

- d. If the unit will not be operated for a period greater than 6 months, apply a thin layer of grease to the outside surface of the seals to prevent dry-out. Before starting the unit, check the seals' integrity and replace if required. If seal replacement is required, purge and add grease to the newly installed seals prior to unit operation.
- e. Units may be equipped with either a spring loaded grease relief fitting, or a plug in the grease purge port.
 - If your unit has a plug, begin by removing the plug.
 - While rotating the reducer shafts to ensure even grease distribution, **slowly** add grease until new grease begins to come out of the grease purge port. **NOTE: Rotate shafts by hand in this process. Exercise caution in rotating shaft in order to avoid injury.**
 - Wipe away excess grease and reinstall plug if necessary.

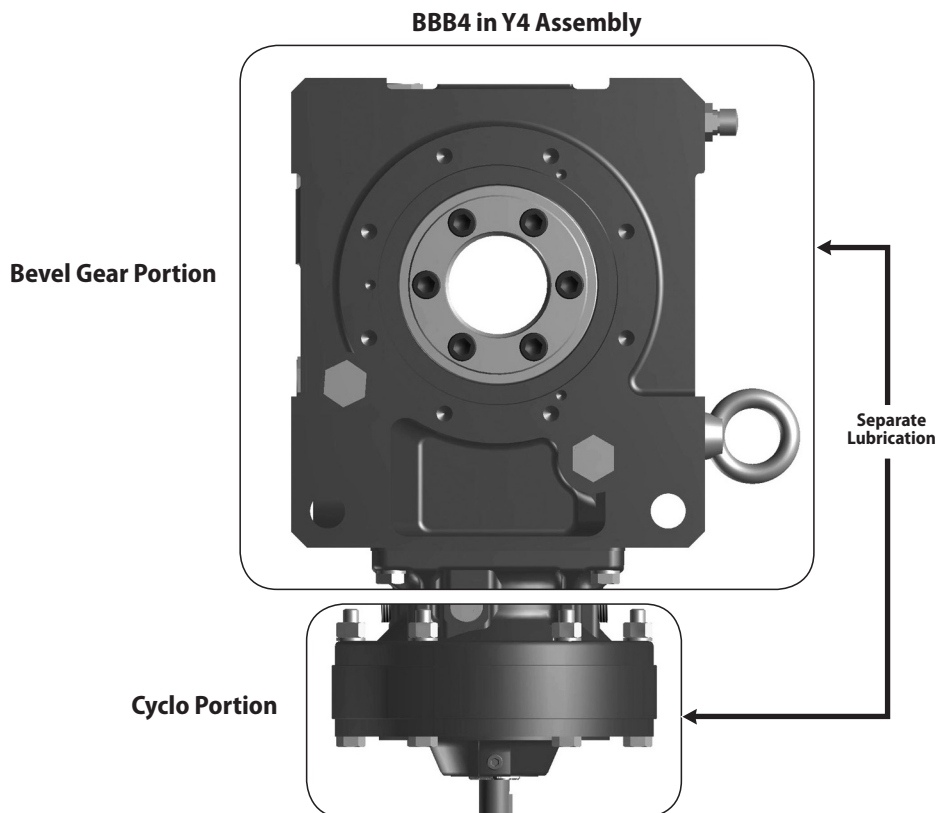
Lubrication, continued**Lubrication Introduction, Lubrication Nomenclature****Lubrication Introduction**

Sumitomo BBB4 units are shipped from the factory **without** lubricating oil, unless the customer specified otherwise when the unit was ordered.

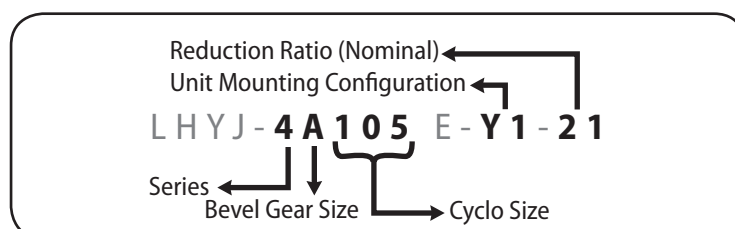
The unit must contain the correct type and amount of lubrication before operating.

For all Y4 motor down mounting configuration models, the Cyclo portion is filled at the factory with **grease**. For these units, the Cyclo portion **does not** need to be filled with lubricant before start-up. The Bevel Gear portion of models built for the Y4 mounting configuration requires filling with gear oil before start-up. Refer to the Lubrication Method section for details.

For the BBB4 built for the Y4 mounting configuration, the Cyclo and the bevel gear portions **must** be filled with lubricant separately and maintained separately. Lubricant **does not** flow from one section to the other.

**Lubrication Nomenclature**

Refer to the **Model** portion of the unit's nameplate to determine the unit size, reduction ratio, and mounting configuration:



Lubrication, continued

Lubrication Method

Lubrication Method

Using the model number and mounting configuration, refer to Tables 15 and 16 to determine the unit’s lubrication method.

Table 15. Lubrication Method for Configurations Y1, Y2, Y3, Y5, Y6







Mounting Configuration	Unit Size		Lubrication Method	
	Bevel Gear Size	Cyclo Size		
<div> Y1</div> <div> Y2</div> <div> Y3</div> <div> Y5</div> <div> Y6</div>	4A - 4F	100, 105, 110, 115, 120, 125, 140, 145 160, 165, 170, 175, 180, 185, 190, 195 10DA, 12DA, 12DB, 14DA, 14DB, 14DC, 16DA, 16DB, 17DA, 17DB, 17DC	Complete Unit (Bevel Gear Portion and Cyclo Portion)	Common Oil Sump

Table 16. Lubrication Method for Y4 Configuration

Mounting Configuration	Unit Size		Lubrication Method	
	Bevel Gear Size	Cyclo Size		
<div> Y4</div>	4A-4F	100, 105, 110, 115, 120, 125	Cyclo Portion	Maintenance Free Grease ^[1]
		10DA, 12DA, 12DB	Bevel Gear Portion	Oil
		140, 145, 160, 165, 170, 175 180, 185, 190, 195	Cyclo Portion	Grease ^[2]
		14DA, 14DB, 14DC, 16DA, 16DB, 17DA, 17DB, 17DC, 18DA, 18DB, 19DA, 19DB	Bevel Gear Portion	Oil

Notes: [1] Maintenance Free Grease: the input Cyclo portion is grease lubricated as standard from the factory and usually does not require replacement or replenishment.
[2] Grease: the input Cyclo portion is grease lubricated as standard from the factory. Please refer to Tables 22 and 23 for the proper grease replenishment and change interval.

Lubrication, continued**Recommended Lubricants****Bevel Gear Portion and Cyclo Portion Lubricants****Recommended Oils**

Table 17, Recommended Oils, lists the oils that may be used to lubricate the Bevel Gear portion of the unit. These oils may also be used in the Cyclo portion if it is oil lubricated.

Table 17. Recommended Oils.

Manufacturer	Type of oil	Manufacturer	Type of oil
AVIA	Gear RSX	MOBIL	Mobilgear 600XP
CASTROL	Alpha EP	SHELL	Omala
DEA	Falcon CLP	TOTAL	Carter EP / XEP
KLÜBER	Klüberoil GEM1		

- Use lubricants with low viscosity for operation during winter or at relatively low temperatures.
- Use a lubricant with a viscosity within the range listed in **Table 18, Recommended Oil Viscosity**.

Table 18. Recommended Oil Viscosity

lubricant as per DIN 57517 part 3	possible operating temperatures °C						
	ambient temperature °C						
	-20°C	0°	+20°	+40°	+60°	+80°	+100°
CLP 68							
CLP 100							
CLP 150							
CLP 220							
CLP 320							

- Consult local distributor, nearest authorized agent or Sumitomo directly when the unit will be operated in ambient temperatures other than -10° – 40°C. Special unit modifications may be necessary.

Cyclo Portion Approved Greases

Table 19, Cyclo Portion Approved Greases, lists the greases that may be used to lubricate the Cyclo portion if grease is the specified lubrication method (refer to the Lubrication Method section for details).

Table 19. Cyclo Portion Approved Greases

Ambient Temp. °C	Overall Reduction Ratio	All Unit Sizes
-10° – 50 °C	11:1 through 18:1	Shell Gadus S2 V220 00
	19:1 and higher	Esso Unirex N2

Cyclo portions have unique operating characteristics that require specific lubricant properties. Please consult Sumitomo if alternate lubricants are required.

Lubrication, continued

Oil Quantities

Oil Quantities

Table 20. Single Reduction Approximate Oil Quantity

 Units: Liter **Note: Output** = Bevel Gear Portion **Input** = Cyclo Portion

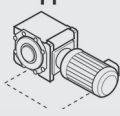
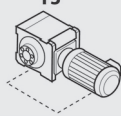
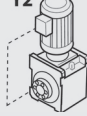
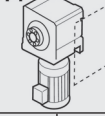
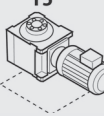
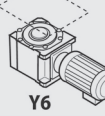
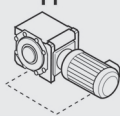
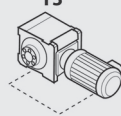
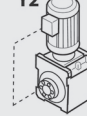
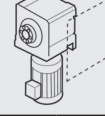
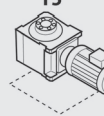
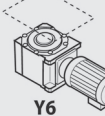
Bevel Gear Unit Size	Mounting Configuration					
	Y1	Y3	Y2	Y4	Y5	Y6
						
				Output	Input	
4A10	1.62		3.17	1.13	Grease	1.36
4A11	1.66		3.26			1.40
4A12	1.71		3.35			1.45
4A14	1.91		3.77			1.65
4B12	3.29		6.50	1.72	Grease	3.34
4B14	3.49		6.97			3.54
4B16	3.92		7.61			3.97
4C14	5.52		11.1			5.30
4C16	5.96		11.8	2.72	Grease	5.74
4C17	6.34		12.5			6.12
4D16	10.1		19.9			9.69
4D17	10.4		20.5			10.0
4D18	10.7		21.0	4.61	Grease	10.3
4E17	14.6		28.8			13.1
4E18	14.7		29.1			13.2
4E19	15.7		30.4			14.2
4F18	20.0		39.4	7.28	Grease	18.5
4F19	20.8		40.6			19.3

Table 21. Double Reduction Approximate Oil Quantity

 Units: Liter **Note: Output** = Bevel Gear Portion **Input** = Cyclo Portion

Bevel Gear Unit Size	Mounting Configuration					
	Y1	Y3	Y2	Y4	Y5	Y6
						
				Output	Input	
4A10DA	1.65		3.20	1.13	Grease	1.39
4A12DA	1.74		3.38			1.48
4A12DB	1.78		3.43			1.52
4B12DA	3.32		6.53			3.37
4B12DB	3.36		6.57	1.72	Grease	3.41
4B14DA	3.52		7.00			3.57
4B14DB	3.56		7.04			3.61
4C14DA	5.55		11.2			5.33
4C14DB	5.59		11.2	2.72	Grease	5.37
4C14DC	5.64		11.3			5.42
4C16DA	6.03		11.8			5.81
4C16DB	6.08		11.9			5.86
4C17DA	6.41		12.6			6.19
4D16DA	10.1		20.0	4.61	Grease	9.76
4D16DB	10.2		20.0			9.81
4D17DB	10.5		20.6			10.2
4D17DC	10.7		20.7			10.3
4E17DA	14.6		28.8	6.26	Grease	13.1
4E17DB	14.7		28.9			13.2
4E17DC	14.8		29.0			13.3

Lubrication, continued**Oil Supply and Discharge Procedures****Oil Supply Procedure**

- Always stop the unit before adding oil
- Oil level may drop during operation, depending on the oil viscosity, temperature and direction of rotation. Additional oil is not necessary. Check the oil level when the unit is stopped to ensure that it has the correct amount of oil.
- It may take some time for the oil to settle when the oil viscosity is high. Be careful not to add too much oil.
- There may be two different oil fill locations for some combinations; refer to oil fill/ drain locations figure for details.
- Consider implementing an oil analysis program to ensure lubricant continues to operate at peak performance. Follow your lubrication provider's oil analysis recommendations to ensure reducer performance.
- Always consult factory and warehouses for overhaul of gearmotors and reducers. Familiarity with Cyclo products is necessary for proper overhaul.

1. Remove the oil fill plug, as referenced in the Figures below.
2. Slowly add oil while checking the level through the oil gauge.
3. After the oil has settled, make sure the level is midway between the high and low marks on the oil gauge.
4. Insert the oil fill plug after wrapping it with sealing compound or tape.

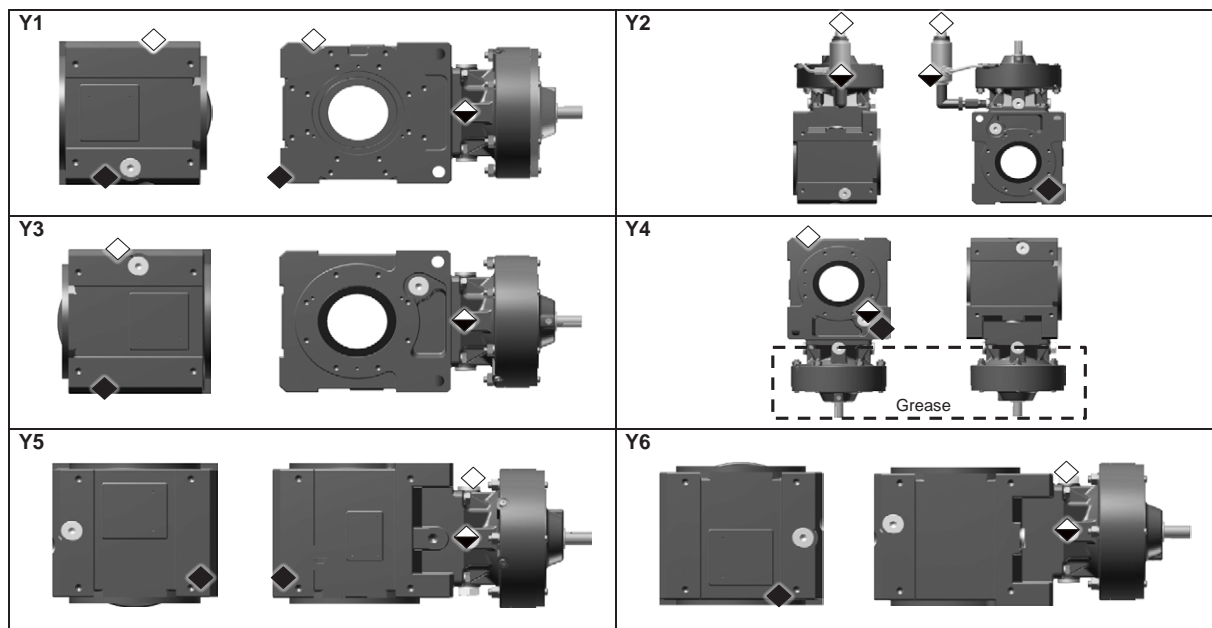
Oil change Intervals

Oil level must be checked every 5,000 hours. If the oil is contaminated, burned or waxed, change the oil immediately, and flush the gear if necessary. The oil level can be checked by the oil level control device.

Under normal operating conditions oil should be changed every 10,000 hours or after 2 years at the latest. A shorter oil change (every 3,000 or 5,000 hours) will increase the gear lifetime.

We recommend to change the oil after the first 500 hours of operation.

The recommendations above do not apply to abnormal operating conditions, i.e., high temperature, high humidity or corrosive environments. If any of these situations exist, the lubricant may have to be changed more frequently.

Oil Fill/Drain Locations

◇=Oil filler plug ◈=Oil level (Oil gauge) ◆=Oil drain plug

Oil Discharge Procedure

1. Remove the drain plug as shown in the Figures above, to discharge oil.
2. Properly discard or recycle lubricant according to applicable regulations.
3. Replace the drain plug after wrapping it with sealing compound or tape.

Lubrication, continued

Grease Quantities

Grease Quantities



- Grease quantities listed in this section are for the Cyclo portion of the reducer/gearmotor.
- The Bevel portion is always oil lubricated unless otherwise specified at time of order entry.
- Refer to the Oil Quantities section, Tables 20 & 21. for Bevel portion oil quantities.
- Installing grease into Bevel Gear portion will result in damage to the unit.

The Cyclo (input) portion of **only Y4 double reduction** units is grease lubricated at the factory. Additional grease is not required before initial start-up. All assemblies other than Y4 have oil lubricated Cyclo portions. The following tables are provided for user rebuild or refurbishment reference.

Table 22. Single Reduction Approximate Grease Quantity

Units: gram

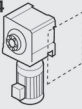
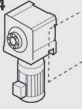
Unit Size	Unit Lubrication Portion	Lube Quantity gram
		 Y4 only
4A100/105	Cyclo	120
4A110/115		190
4A120/125		250
4A140/145		450
4B120/125		250
4B140/145		450
4B160/165		750
4C140/145		450
4C160/165		750
4C170/175		1000
4D160/165		750
4D170/175		1000
4E170/175		1000
4F180/185		1100
4F190/195		1500

Table 23. Double Reduction Approximate Grease Quantity

Units: gram

Unit Size	Cyclo Stage	Lube Quantity gram
		 Y4 only
4A10DA	First (Input)	25
	Second	120
4A12DA	First (Input)	25
	Second	250
4A12DB	First (Input)	60
	Second	250
4B12DA	First (Input)	25
	Second	250
4B12DB	First (Input)	60
	Second	250
4B14DA	First (Input)	25
	Second	450
4B14DB	First (Input)	60
	Second	450
4C14DA	First (Input)	25
	Second	450
4C14DB	First (Input)	60
	Second	450
4C14DC	First (Input)	120
	Second	450
4C16DA	First (Input)	60
	Second	750
4C16DB	First (Input)	120
	Second	750

Lubrication, *continued***Grease Replenishment and Draining Procedure, Grease Replacement****Grease Replenishment and Draining Procedure****Procedure for adding grease to grease-lubrication models (excluding maintenance-free models)**

1. Remove the grease discharge plug from the outside cover.
2. Add grease with a grease gun from the grease nipple in the inside cover section or motor connection cover.
3. Insert the grease discharge plug.



Add grease while manually rotating the input shaft to ensure proper, uniform circulation.

Add grease slowly, to prevent internal pressure and possible seal damage.

Do not add more grease than the amount shown in Table 22 and 23. Adding too much grease may cause the grease temperature to rise, or force the grease to leak into the motor.

Always consult factory and warehouses for overhaul of gearmotors and reducers. Familiarity with Cyclo products is necessary for proper overhaul.

Table 24. Grease Replenishment Intervals

Hours of operation	Replenishment interval	Remarks
10 hr. max./day	3 - 6 months	Shorten the supply interval when the operating conditions are severe or the frame size is large
10 - 24 hr. max./day	500 - 1000 hours	

Table 25. Grease Replacement Intervals

Change Interval	Remarks
Every 20,000 hrs or 3-5 years	Shorten the supply interval when the operating conditions are severe or the frame size is large

Grease Replacement

- Maintenance free units may be safely operated for an extended time because it is sealed with maintenance free grease. Tables 22 & 23 are provided for generalized reference.



- Adequate care should be taken to ensure the lubricant continues to meet the specified lubrication characteristics.

- If refurbishment or rebuild is required, do not add more grease than the amount shown in Tables 22 and 23.
- Adding too much grease may cause the grease temperature to rise or force the grease to leak into the motor.



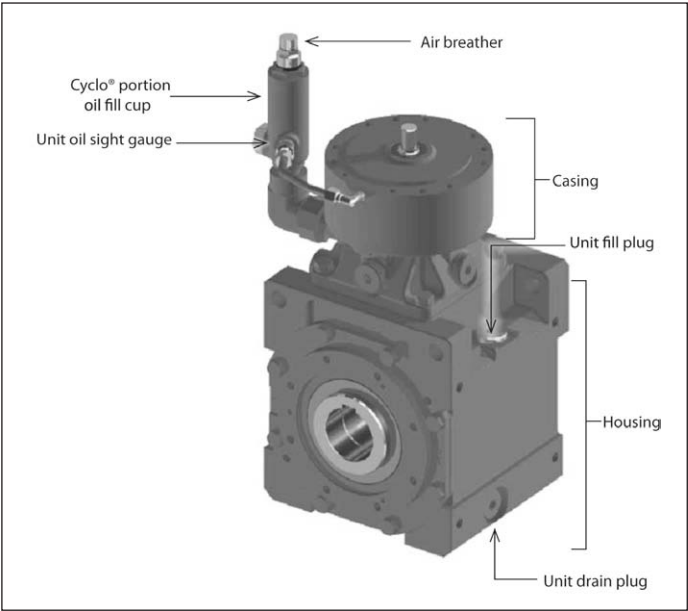
- Consider implementing a lube analysis program to ensure lubricant continues to operate at peak performance.
- Follow your lubrication providers analysis recommendations to ensure reducer performance.
- Always consult factory and warehouses for overhaul of gearmotors and reducers. Experience is necessary for proper overhaul.

Y2 Oil Fill & Drain Procedures

Oil Fill Process

Affected Unit Sizes

This document is intended for all Bevel Buddybox (BBB) 4 series units built in the Y2 mounting (motor up) configuration. Images contained within the document show a single reduction input stage, however the process remains the same for double and triple reduction product offerings.

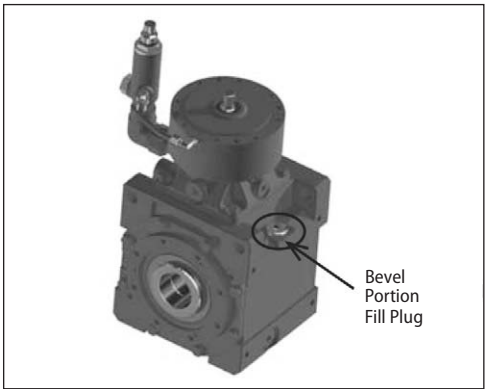


Oil Fill Process

CAUTIONARY NOTE:



- Use only those lubricating oils approved by Sumitomo Drive Technologies for use in the Bevel Buddybox.
- Use the appropriate grade of lubricating oil based on ambient operating conditions of the application.
- Refer to the Sumitomo product catalog and/or Operating & Maintenance manual for a list of Sumitomo approved lubricating oils.
- Prior to beginning the fill process, ensure the Unit Drain Plug is in place and adequately tightened.



1

Identify the bevel portion oil fill plug on the bevel gear housing. Carefully remove the plug and put aside for reinsertion after oil fill is complete.



2

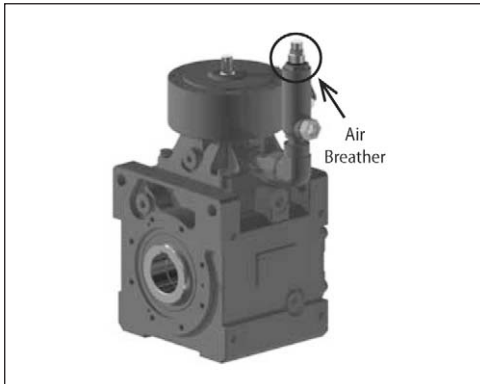
Fill the bevel portion with the appropriate type and grade of oil.

The bevel portion is considered full when the oil level reaches the oil fill port.

Once fill is complete, re-install and tighten the oil plug into the fill port

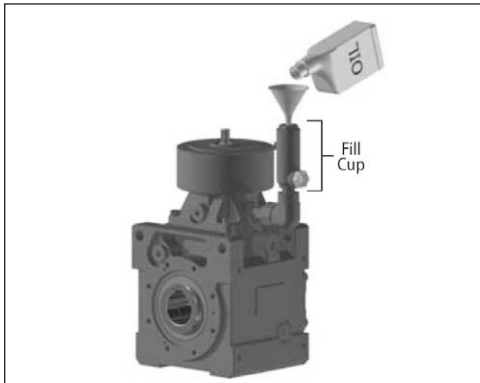
Y2 Oil Fill & Drain Procedures, continued

Oil Fill Process



3

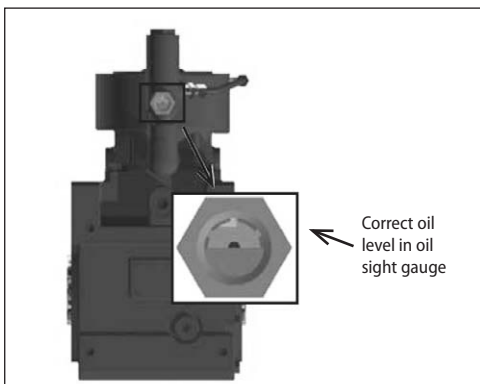
Carefully remove the unit Air Breather assembly and put aside for reinsertion after oil fill process is complete.



4

Slowly fill the Cyclo (input) portion with the correct type and grade of oil as used in STEP #2 of this process.

NOTE: The oil fill cup may immediately become full during the process. In such an event, stop the fill process and allow the oil to drain from the cup into the reducer.



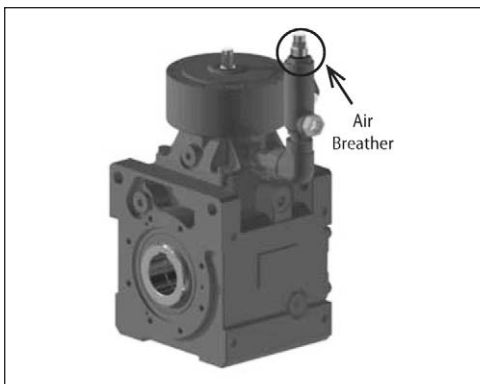
5

The input portion is considered full when the oil level stabilizes in the middle of the oil sight gauge.

Check gauge carefully. Oil film from fill procedure can distort view.



Be sure to check the oil level after a few minutes of operation. Stop equipment and check gauge as shown in step 5. Adjust oil level as required.



6

Once the input portion of the unit is filled to the correct level with lubricant, carefully reinsert the air breather assembly into the oil fill cup.

Y2 Oil Fill & Drain Procedures, continued

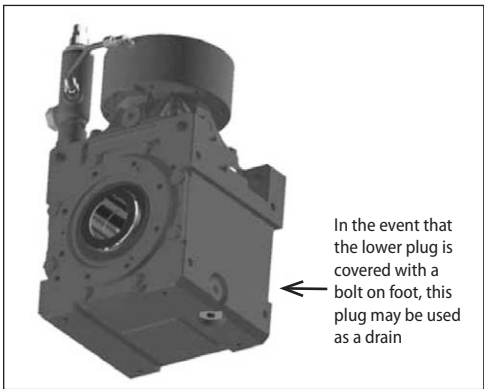
Oil Drain Process

Oil Drain Process

CAUTIONARY NOTE:



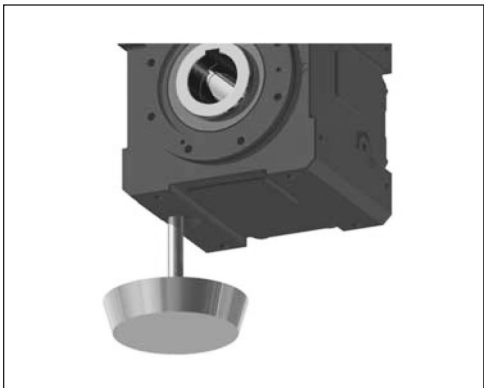
- Exercise extreme caution when draining the lubricating oil from the Bevel Buddybox as it may be hot.
- Follow all corporate, local, state and federal government regulations in disposing of the used lubricating oil.



1

Identify the bevel portion oil drain plug on the bevel gear housing.

Carefully remove the plug and put aside for reinsertion after oil fill is complete.



2

Carefully remove the unit air breather assembly and put aside for reinsertion after oil fill process is complete.

Allow used oil to freely flow into an approved lubricant container.

Once the unit is completely drained of oil, reinstall the drain plug and tighten.

Refer to torque tightening values in Table 26.

Table 26. Plug sizes and tightening torque values

Plug Sizes		
Unit Size	Housing	Casing
4A	1/2	1/2
4B	1/2	1/2
4C	3/4	1/2
4D	3/4	1/2
4E	3/4	1/2
4F	3/4	1/2

Torque Value	
Size	N•m
1/2	17.8
3/4	30.0
1	41.2

Motor installation

Electrical installation

Safety notes



Installation, connection and commissioning work as well as maintenance and repairs must only be carried out by qualified experts.

Before any work starts on the motor or the gear motor but particularly before covers are taken off active parts, the motor must be disconnected as prescribed.

The 5 safety rules as set out in DIN VDE 0105 must be obeyed.

These electric motors comply with the standards and regulations in force and meet the requirements of the Low Voltage Directive 2014/35/EG.



The installation is subject to all regulations in force and must be done by qualified personnel.

Area of application



The motors are completely sealed and air-cooled. Standard protection type: IP 55 with IP 44 brake.

Ambient temperature: -10°C to +40°C

Installation height: < 1000 m

The coil is designed to be in insulation class F (150 °C). If operated properly the temperatures on the motor surface may reach more than 100 °C. Do not touch. Temperature-sensitive parts must not be fixed on or rest against it.



When connecting motors via brackets or an IEC flange, a suitable IP65 seal must be provided. The customer is responsible for fitting this seal.



The ventilation openings in the fan hood must not be blocked.

For sufficient cooling, the distance between the hood and the wall must not fall below the FB measurement. FA is the minimum distance required to remove the fan hood.

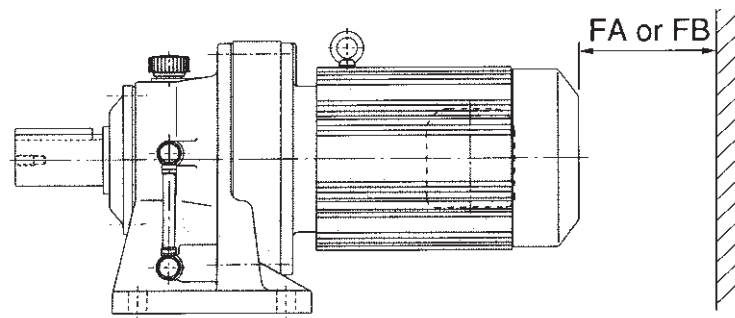


Table 27. Cooling and removing distances for fan hood

Standard motor										
Motor size	63-71	80	90	100	112-132S	132M-160M	160L	180M	180L	220
FB (mm)	20	20	20	20	20	25	30	30	30	30
FA (mm)	48	49	52	56	60	75	130	155	170	230
Brake motor										
Motor size	63-71	80	90	100	112-132S	132M-160M	160L	180M	180L	220
FB (mm)	20	20	20	20	25	25	30	30	30	30
FA (mm)	61	93	115	121	132	170	220	367	370	445

Motor installation, continued

Electrical installation



Table 28. Conduit threat sizes

Frame	Conduit threat	Frame	Conduit threat
63-71	1 x M16 x 1,5 1 x M25 x 1,5	180	2 x M 40 x 1,5
80-132S	2x M25 x 1,5	200-225	2 x M50 x 1,5
132M-160	2 x M32 x 1,5	250	2 x M63 x 1,5

Cable glands must comply at least with the motor protection class specified on the model plate.

Unused cable glands must be closed depending on the type of motor protection. Existing plugs must be tightened firmly.



Please refer to the rating plate and these operating instructions as well as the current catalogue for technical data and information on the permissible operating conditions. You will find information on special versions on your order confirmation. If anything is unclear, we urgently recommend you to contact the factory or your sales centre giving the model description and the serial number.

Sumitomo (SHI) Cyclo Drive Germany GmbH									
3 PHASE INDUCTION MOTOR									
TYPE		P		kW		S1		CONT	
Hz									
V		Δ		Y				Y	
A									
1/min									
cos									
IP	AMB	°C	IEC/EN 60034		MG1-12		SF 1,15		
INS. CLASS	EFF 2	NEMA	nom. eff.	%	DESIGN	CODE			
Brake	VAC		A		Nm		IP		
SN -Nr					FACTORY				

Motor 0.12 - 4.0 kW

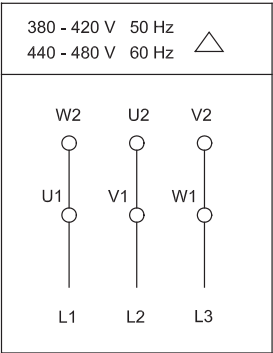
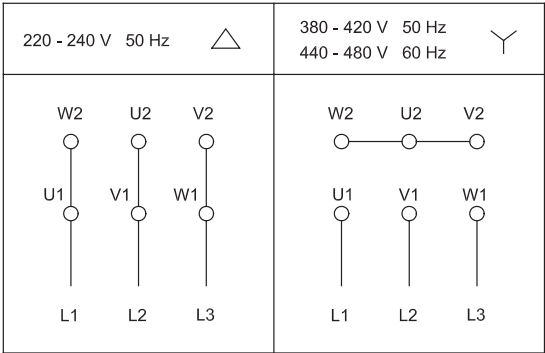
Sumitomo (SHI) Cyclo Drive Germany GmbH									
3 PHASE INDUCTION MOTOR									
TYPE		P		kW		S1		CONT	
Hz									
V				Δ				Δ	
A									
1/min									
cos									
IP	AMB	°C	IEC/EN 60034		MG1-12		SF 1,15		
INS. CLASS	EFF	NEMA	nom. eff.	%	DESIGN	CODE			
Brake	VAC		A		Nm		IP		
SN -Nr					FACTORY				

Motor 5.5 - 55 kW

Connect the protective earthing conductor to this terminal.



A circuit diagram is located in the terminal box. The motors can be connected to the terminal board depending on the connection voltage as follows:



The rated voltage range as set out in EN 60 034-1 applies to the specified voltages with a ± 5 % voltage or ± 2 % frequency deviation.

The following tightening torques apply to the threaded bolts on the terminal board:

Table 29. Tightening torques

Screw thread:	Permissible tightening torque in Nm
M4	1.2
M5	2.5
M6	4.0
M8	7.5

Motor installation, continued

Brake motors

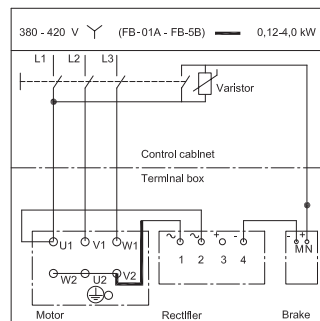
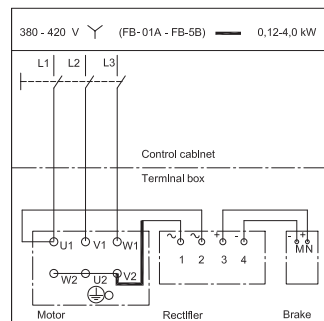
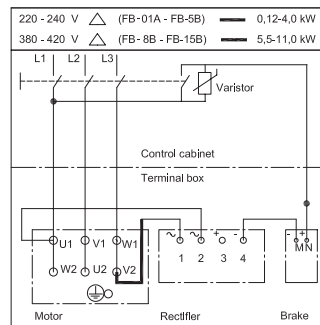
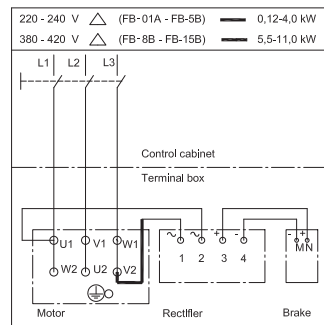
Brake motors



The brake motors are connected in accordance with the following circuit diagrams:

Standard brake

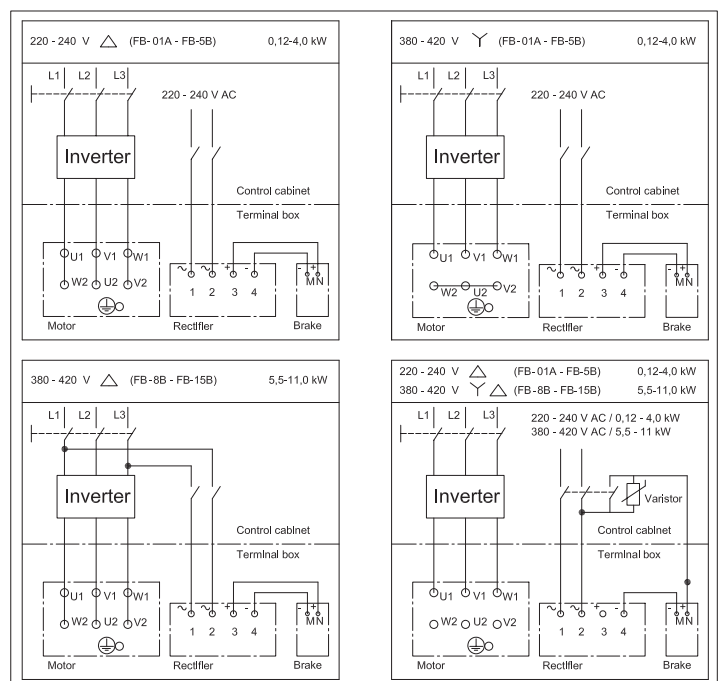
Rapid action brake



The brake control voltage is noted on the rating plate.

If the stop position of the application is not reached on starting up, this may not have anything to do with the brake torque.

For motors driven by an inverter, the brake must be supplied separately, as shown below:



Motor installation, continued

Brake motors

If only the alternating current is switched off, the braking times as set out in the table below apply.

Table 30. Technical data for motor brakes

P1 [kWxP]	Type	Brake torque [Nm]	Optional max. torque [Nm]	Brake reaction time		Brake motor inertia [10 ⁻⁴ kg m ²]	Brake energy [10 ⁶ J]	Brake power	
				standard [sec]	fast [sec]			230 V 50 Hz	400 V 50 Hz
0.12 x 4	FB-01A	1.0	1.3	0.15 - 0.2	0.015 - 0.02	3.50	120	0,1	0,04
0.18 x 4	FB-02A	2.0	2.7	0.15 - 0.2	0.015 - 0.02	5.50	120	0,1	0,05
0.25 x 4	FB-02A	2.0	2.7	0.15 - 0.2	0.015 - 0.02	5.50	120	0,1	0,05
0.37 x 4	FB-05A	4.0	5.4	0.1 - 0.15	0.01 - 0.015	6.75	120	0,1	0,05
0.55 x 4	FB-1D	7.5	10	0.2 - 0.3	0.01 - 0.02	11.1	330	0,1	0,1
0.75 x 4	FB-1D	7.5	10	0.2 - 0.3	0.01 - 0.02	13.0	330	0,1	0,1
1.1 x 4	FB-2D	15	20	0.2 - 0.3	0.01 - 0.02	20.8	380	0,3	0,1
1.5 x 4	FB-2D	15	20	0.2 - 0.3	0.01 - 0.02	23.5	380	0,3	0,1
2.2 x 4	FB-3D	22	30	0.3 - 0.4	0.01 - 0.02	37.3	450	0,3	0,1
3.0 x 4	FB-5B	37	50	0.4 - 0.5	0.01 - 0.02	81	2350	0,6	0,3
4.0 x 4	FB-5B	37	50	0.4 - 0.5	0.01 - 0.02	96	2350	0,6	0,3
5.5 x 4	FB-8B	55	74	0.3 - 0.4	0.01 - 0.02	125	2350	-	0,3
7.5 x 4	FB-10B	75	100	0.7 - 0.8	0.03 - 0.04	303	3430	-	0,4
11 x 4	FB-15B	110	110	0.5 - 0.6	0.03 - 0.04	410	3430	-	0,4
15 x 4	FB-20	150	220	1.7 - 1.8	0.03 - 0.06	1070	10100	-	0,5
18.5 x 4	FB-30	190	220	1.4 - 1.5	0.03 - 0.06	2430	10100	-	0,5
22 x 4	FB-30	220	220	1.4 - 1.5	0.03 - 0.06	2430	10100	-	0,5
30 x 4	FB-30	200	200	1.4 - 1.5	0.03 - 0.06	2620	10100	-	0,5

If the direct current circuit is cut off after the rectifier, the brake is applied up to 10 times faster. This is particularly important for lifting devices.



To ensure that the brake (connected to the DC side) is applied quickly, a separate cable must be run to an external contact. The contact must be protected by a Varistor (see Table 31).

Table 31. Varistor voltage range

Motor voltage			AC 200-240V	AC 380 - 460V
Corresponding Varistor range			AC 260-AC 300V	AC 510V
Varistor voltage			430 - 470V	820V
Corresponding Varistor output	Type of brakes	FB-01A, 02A, 05A	> 0.2 W	> 0.4 W
		FB-1B, 1D	> 0.4 W	> 0.6W
		FB-2B, 3B, 2D, 3D	> 0.6W	> 1.5 W
		FB-5B, 8B	> 0.6W	> 1.5 W
		FB-10B, 15B	> 1.0 W	> 1.5 W

Motor installation, continued

Checking for brake wear

Checking for brake wear

The brake is normally assembled as shown in the picture below.

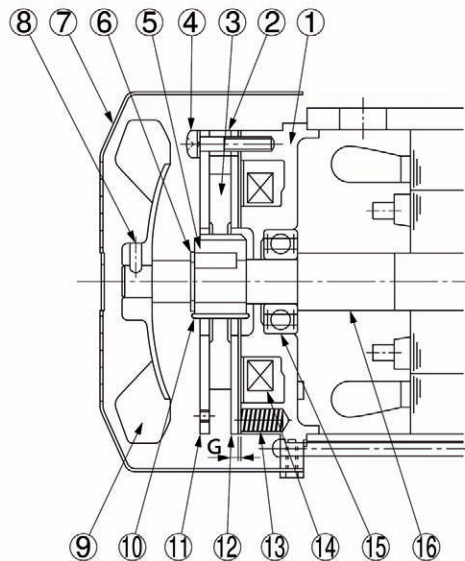


Table 32. Brake parts

Part no Teil Nr.	Part name	Name des Teils
1	Stator packet	Statorpaket
2	Spacer	Abstimmring
3	Brake lining	Bremsbelag
4	Assembling bolt	Screw
5	Boss	Nabe
6	Shaft retaining C-ring	Lock washer
7	Cover	Abdeckung
8	Fan set bolt	Sicherungsschraube
9	Fan (Not provided for FB-01A1 and FB-01A)	Lüfter
10	Leaf spring	Blattfeder
11	Brake disk	Bremsscheibe
12	Armature plate	Ankerscheibe
13	Spring	Feder
14	Electromagnetic coil	Magnetspule
15	Ball bearing	Kugellager
16	Motor shaft	Motorwelle

The following air gaps apply to the FB brakes:

Table 33. Air gaps

Type of brake	Air gap G (mm)	
	Nominal dimensions	Limit
FB-01A FB-02A FB-05A	0.2~0.35	0.5
FB-1B, 1D FB-2B, 2D	0.3~0.4	0.6
FB-3B, 3D		0.7
FB-5B FB-8B	0.4~0.5	1.0
FB-10B FB-15B	0.4~0.5	1.2
FB-20 FB-30	0.6~0.7	1.5

If the air gap limit is exceeded it can be adjusted as set out in the table below.

Table 34. Brake lining limits

Type of brakes	Thickness of brake lining	Thickness limit
		x (mm)
FB 01A FB-02A FB-05A		one-off adjustment
FB-1B, 1D		6.0
FB-2B, 2D		7.2
FB-3B, 3D		8.0
FB-5B, 8B		6
FB-10B, 15B		7
FB-20, 30		12

Motor installation, continued



The air gap must be checked at at least three positions (each offset to 120°).

If the adjustment is repeated the thickness of the brake lining must be checked.



Brakes are safety-related components.

Brake liners and friction discs are not sold as separate parts.

Brakes are only available as a complete set.

Converter operation



When operating the motors on the frequency converter the converter manufacturer's EMC notes must be observed. Appropriate suppression measures must be taken. Metal shielded cables and cable glands should be provided.

The motor's torque depends on the respective converter.

With brake motors the brake's rectifier must be fitted with a separate, sinusoid voltage.

The motor must be protected from excessive overheating by cold conductors, thermo contacts and/ or by external fans.

Motor protection



Motor protection switches (overload protection) must be set to the current value specified on the rating plate depending on the voltage.

Thermo contacts are normally designed as openers.

The resistance of cold conductors (PTC's) at 20 °C is not significant. The value may vary between 60 Ω and a maximum of 750 Ω.

External fans



The voltage and wiring of the external fan are different depending on the type of fan.

The external fan has a separate terminal box.

Information on the voltage, frequency and wiring of the external fan is in this terminal box. These are different depending on the size.



ATTENTION : Depending on the controls, the external fan may operate even if the motor is not turning.

Some external fans can only be operated in single phase.

Other fan motors can be operated both in single phase in a Steinmetz circuit and also in triphase.

3 phase motor: In a star circuit or a triangular circuit, depending on the voltage as in the section "Electrical connection".

Commissioning the input drive



Ensure that all safety instructions have been explicitly obeyed once more.

Mains power conditions and the information on the rating plate must be the same. There is additional information in the motor terminal box for additional equipment, such as standstill heating.

The cross section of the connection cables must be adapted to the motor currents.

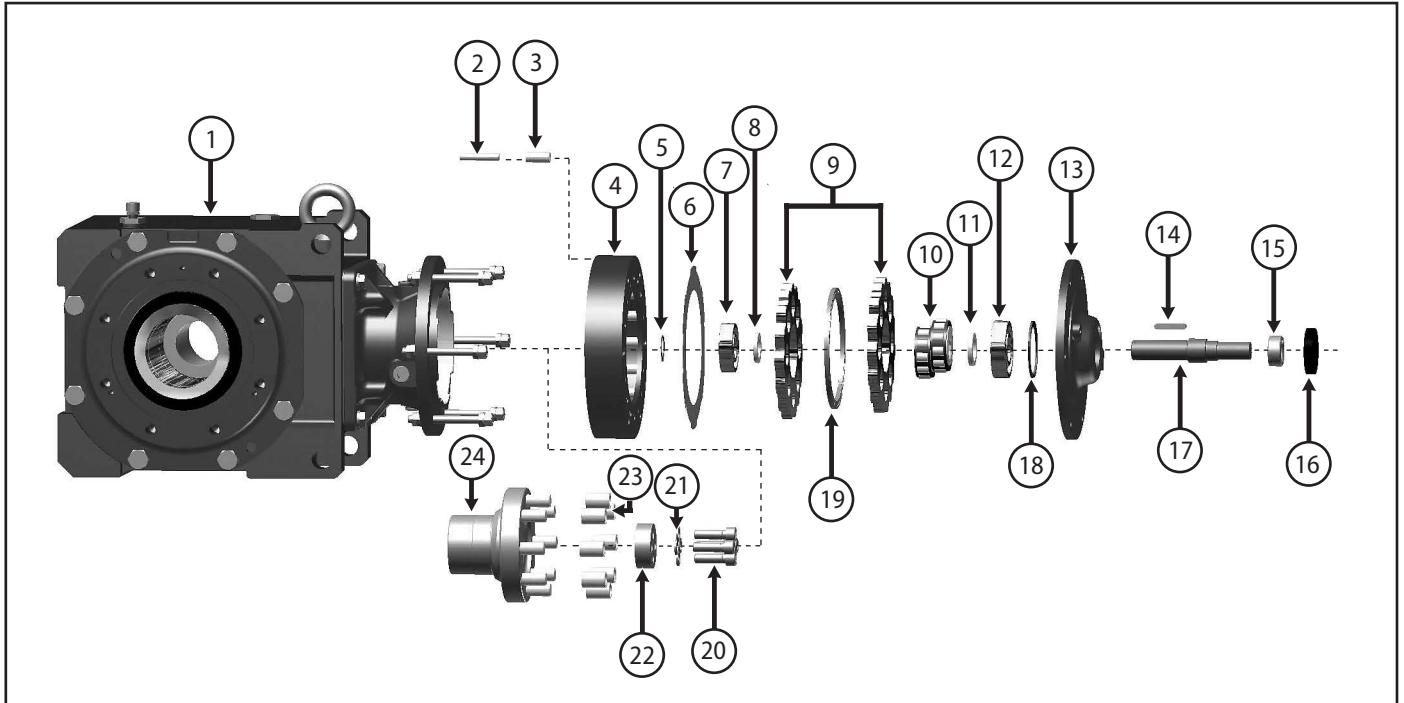
The installation is subject to all regulations in force and must be done by qualified personnel.



Before starting the gear motor, ensure that all safety regulations have been obeyed, the machine has been installed and aligned properly, all fastenings and earth connections have been tightened properly, the auxiliary and additional devices are working properly and have been connected properly and that the feather key on any second shaft end key cannot be flung out.



If possible, the gear box is to be started without load. If it runs quietly and without any odd noises, the motor is attached to the driven machine. On starting up it is advisable to look at the currents being used when the motor is connected to its driven machine so that potential overloads and asymmetries on the mains side can be detected immediately.

Parts**BBB4 Reducer****BBB4 Reducer Parts****Table 35. BBB4 Reducer Parts**

Number	Description
1	BBB4 Gear Assembly
2	Cyclo Ring Gear Housing Pins
3	Cyclo Ring Gear Housing Rollers
4	Cyclo Ring Gear Housing
5	Snap Ring
6	Gasket Set
7	High Speed Shaft A Bearing
8	Spacer
9	Cycloid Discs
10	Cyclo Eccentric Cam Assembly
11	Spacer
12	High Speed Shaft B Bearing

Number	Description
13	Cyclo High-Speed End Shield
14	Eccentric Key
15	High Speed Shaft Oil Seal Collar
16	High Speed Shaft Oil Seal
17	High Speed Shaft
18	Snap Ring
19	Cycloid Disc Spacer
20	Retaining Bolts
21	Lock Washers
22	End Plate
23	Pin Carrier Rollers
24	Pin Carrier

Parts, continued

Cyclo Planetary Reduction Component Parts

Cyclo Planetary Reduction Component Parts (Cyclo Ratios 11 - 18:1)

Cyclo Planetary Reduction Component

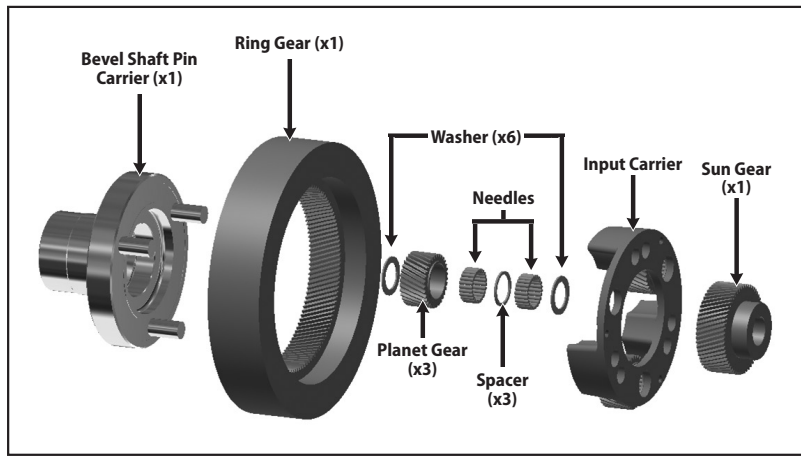
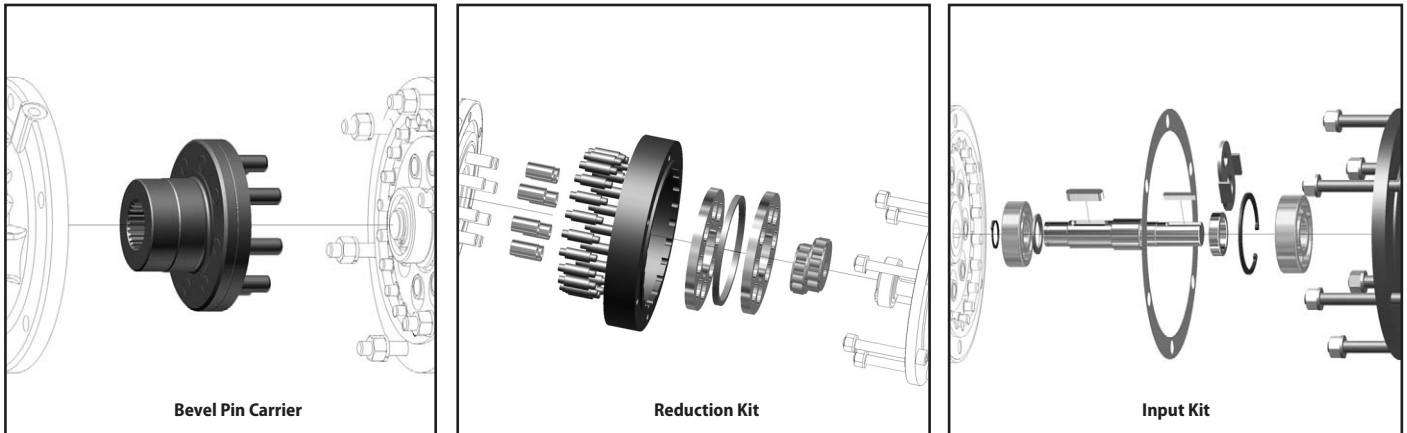


Table 36. Cyclo Planetary Reduction Component Part Numbers (Ratios 11 - 18:1)

Unit Size	Reduction Ratio (nominal)		Cyclo Planetary Reduction Part Numbers								
	Overall	Cyclo Planetary	Reduction Block Set (gears & bearings)	Planet Gear	Ring Gear	Sun Gear	Needles	Spacer	Washer	Input Carrier	Bevel Shaft Pin Carrier
4A100 4A105	11	3:1	931SD610-003G	AN8911G	AN8303G	AN8910G	-	AW5434G	-	-	BL515LG
	13, 14	4:1	931SD610-004G	AN8870G	AN8871G	AN8869G					
	16, 18	5:1	931SD610-005G	AN8305G	AN8306G	AN8304G					
4A120, 4A125 4B120, 4B125	11	3:1	931BB612-003G	AP8712G	CJ584LG	AP8711G	AX2806G	AX2543G	AX2761G	CJ244LG	CJ701LG (for 4A) CJ703LG (for 4B)
	13, 14	4:1	931BB612-004G	AP8706G	CJ554LG	AP8705G					
	16, 18	5:1	931BB612-005G	AP8714G	CJ585LG	AP8713G					
4A140, 4A145 4B140, 4B145 4C140, 4C145	11	3:1	931BB614-003G	AP8717G	CJ586LG	AP8716G	AX2807G	AX2763G	AX2544G	CJ588LG	CJ702LG (for 4A) CJ704LG (for 4B) CJ706LG (for 4C)
	13, 14	4:1	931BB614-004G	AP8708G	CJ555LG	AP8707G					
	16, 18	5:1	931BB614-005G	AP8719G	CJ587LG	AP8718G					
4B160, 4B165 4C160, 4C165	11	3:1	931BB616-003G	AP8721G	CJ589LG	AP8720G	AX2808G	AX2555G	AX2554G	CJ591LG	CJ705LG (for 4B) CJ707LG (for 4C)
	13, 14	4:1	931BB616-004G	AP8710G	CJ556LG	AP8709G					
	16, 18	5:1	931BB616-005G	AP8726G	CJ590LG	AP8722G					
4C170, 4C175 4D170, 4D175 4E170, 4E175	11	3:1	931BB617-003G	AP9278G	CJ993LG	AP9277G	AX3077G	AX3061G	AX3060G	CJ996LG	CJ938LG (for 4C) CK009LG (for 4D, 4E)
	13, 14	4:1	931BB617-004G	AP9280G	CJ994LG	AP9279G					
	16, 18	5:1	931BB617-005G	AP9282G	CJ995LG	AP9281G					
4D180, 4D185 4E180, 4E185 4F180, 4F185	11	3:1	931BB618-003G	AP9285G	CJ997LG	AP9284G	AX3077G	AX3061G	AX3060G	CK001LG	CJ961LG (for 4D, 4E) CJ965LG (for 4F)
	13, 14	4:1	931BB618-004G	AP9287G		AP9286G				CK002LG	CJ960LG (for 4D, 4E) CJ966LG (for 4F)
	16, 18	5:1	931BB618-005G	AP9289G		AP9288G				CK003LG	CJ959LG (for 4D, 4E) CJ967LG (for 4F)
4E190, 4E195 4F190, 4F195	11	3:1	931BB619-003G	AP9292G	CK004LG	AP9291G	AX3077G	AX3061G	AX3060G	CK007LG	CJ962LG (for 4E) CJ968LG (for 4F)
	13, 14	4:1	931BB619-004G	AP9294G		AP9293G				CK006LG	CJ963LG (for 4E) CJ969LG (for 4F)
	16, 18	5:1	931BB619-005G	AP9296G		AP9295G				CK008LG	CJ964LG (for 4E) CJ970LG (for 4F)

Note: [1] Consult Factory [2] 18:1 ONLY

Parts, continued**Cyclo Reduction Component Parts****BBB4 Reduction Component Part Numbers (Ratios $\geq 19:1$)****BBB4 Reduction Components - 4A100 thru 4F195****Table 37. BBB4 Reduction Component Part Numbers (Ratios $\geq 19:1$)**

Unit Size	Reduction Ratio		Part Numbers		
	Overall	Cyclo	Input Kit	Reduction Kit	Bevel Pin Carrier
4A100 4A105	19, 21	6	930HY610- EOLG	931SD610-006G	BL514LG
	22, 25	7		See Note ^[1]	
	26, 28	8		931SD610-008G	
	35, 39	11		931SD610-011G	
	42, 46	13		931SD610-013G	
	48, 53	15		931SD610-015G	
	54, 60	17		931SD610-017G	
	67, 74	21		931SD610-021G	
	80, 88	25		931SD610-025G	
	93, 102	29		931SD610-029G	
	112, 123	35		931SD610-035G	
	138, 151	43		931SD610-043G	
	163, 179	51		931SD610-051G	
	189, 207	59		931SD610-059G	
	227, 249	71		931SD610-071G	
	278, 305	89		931SD610-087G	
	364, 417	119		931SD610-119G	

Unit Size	Reduction Ratio		Part Numbers		
	Overall	Cyclo	Input Kit	Reduction Kit	Bevel Pin Carrier
4A110 4A115	19, 21	6	930HY611- EOLG	931SD611-006G	BL514LG
	22, 25	7		See Note ^[1]	
	26, 28	8		931SD611-008G	
	35, 39	11		931SD611-011G	
	42, 46	13		931SD611-013G	
	48, 53	15		931SD611-015G	
	54, 60	17		931SD611-017G	
	67, 74	21		931SD611-021G	
	80, 88	25		931SD611-025G	
	93, 102	29		931SD611-029G	
	112, 123	35		931SD611-035G	
	138, 151	43		931SD611-043G	
	163, 179	51		931SD611-051G	
	189, 207	59		931SD611-059G	
	227, 249	71		931SD611-071G	
	278, 305	89		931SD611-087G	
	364, 417	119		931SD611-119G	

Note: [1] Consult Factory

Parts, continued

Cyclo Reduction Component Parts

Table 38. BBB4 Reduction Components Part Numbers (Ratios >19:1), continued

Unit Size	Reduction Ratio		Part Numbers			
	Overall	Cyclo	Input Kit	Reduction Kit	4A12	4B12
					Bevel Pin Carrier	
4A120 4A125 4B120 4B125	19, 21	6	930HY612- EOLG	931SD612-006G	CJ691LG	CJ693LG
	22, 25	7		931SD612-007G		
	26, 28	8		931SD612-008G		
	35, 39	11		931SD612-011G		
	42, 46	13		931SD612-013G		
	48, 53	15		931SD612-015G		
	54, 60	17		931SD612-017G		
	67, 74	21		931SD612-021G		
	80, 88	25		931SD612-025G		
	93, 102	29		931SD612-029G		
	112, 123	35		931SD612-035G		
	138, 151	43		931SD612-043G		
	163, 179	51		931SD612-051G		
	189, 207	59		931SD612-059G		
	227, 249	71		931SD612-071G		
	278, 305	87		931SD612-087G		
	364, 417	119		931SD612-119G		

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo	Input Kit	Reduction Kit	4A14	4B14	4C14
					Bevel Pin Carrier		
4A140 4A145 4B140 4B145 4C140 4C145	19, 21	6	930HS614- EBBG	931SD614-006G	CJ692LG	CJ694LG	CJ696LG
	22, 25	7		931SD614-007G			
	26, 28	8		931SD614-008G			
	35, 39	11		931SD614-011G			
	42, 46	13		931SD614-013G			
	48, 53	15		931SD614-015G			
	54, 60	17		931SD614-017G			
	67, 74	21		931SD614-021G			
	80, 88	25		931SD614-025G			
	93, 102	29		931SD614-029G			
	112, 123	35		931SD614-035G			
	138, 151	43		931SD614-043G			
	163, 179	51		931SD614-051G			
	189, 207	59		931SD614-059G			
	227, 249	71		931SD614-071G			
	278, 305	87		931SD614-087G			
	364, 417	119		931SD614-119G			

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo	Input Kit	Reduction Kit	4B16	4C16	4D16
					Bevel Pin Carrier		
4B160 4B165 4C160 4C165 4D160 4C165" 163, 179 189, 207 227, 249 278, 305 364, 417	19, 21	6	930HY616- JBBG	931SD616-006G	CJ695LG	CJ697LG	CJ699LG
	22, 25	7		931SD616-007G			
	26, 28	8		931SD616-008G			
	35, 39	11		931SD616-011G			
	42, 46	13		931SD616-013G			
	48, 53	15		931SD616-015G			
	54, 60	17		931SD616-017G			
	67, 74	21		931SD616-021G			
	80, 88	25		931SD616-025G			
	93, 102	29		931SD616-029G			
	112, 123	35		931SD616-035G			
	138, 151	43		931SD616-043G			
	163, 179	51		931SD616-051G			
	189, 207	59		931SD616-059G			
	227, 249	71		931SD616-071G			
	278, 305	87		931SD616-087G			
	364, 417	119		931SD616-119G			

Unit Size	Reduction Ratio		Part Numbers			
	Overall	Cyclo	Input Kit	Reduction Kit	4C17	4D17, 4E17
					Bevel Pin Carrier	
4C170 4C175 4D170 4D175 4E170 4E175" 163, 179 189, 207 227, 249 278, 305 364, 417	19, 21	6	930HY617- JBBG	931SD617-006G	CJ698LG	CJ700LG
	22, 25	7		931SD617-007G		
	26, 28	8		931SD617-008G		
	35, 39	11		931SD617-011G		
	42, 46	13		931SD617-013G		
	48, 53	15		931SD617-015G		
	54, 60	17		931SD617-017G		
	67, 74	21		931SD617-021G		
	80, 88	25		931SD617-025G		
	93, 102	29		931SD617-029G		
	112, 123	35		931SD617-035G		
	138, 151	43		931SD617-043G		
	163, 179	51		931SD617-051G		
	189, 207	59		931SD617-059G		
	227, 249	71		931SD617-071G		
	278, 305	87		931SD617-087G		
	364, 417	119		931SD617-119G		

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo	Input Kit	Reduction Kit	4D18	4E18	4F18
					Bevel Pin Carrier		
4D180 4D185 4E180 4E185 4F180 4F185"	19, 21	6	930HY618- JBBG	931SD618-006G	CJ955LG		CJ957LG
	22, 25	7		931SD618-007G			
	26, 28	8		931SD618-008G			
	35, 39	11		931SD618-011G	CK012LG		CK016LG
	42, 46	13		931SD618-013G			
	48, 53	15		931SD618-015G			
	54, 60	17		931SD618-017G			
	67, 74	21		931SD618-021G			
	80, 88	25		931SD618-025G			
	93, 102	29		931SD618-029G			
	112, 123	35		931SD618-035G			
	138, 151	43		931SD618-043G			
	163, 179	51		931SD618-051G			
	189, 207	59		931SD618-059G			
	227, 249	71		931SD618-071G			
	278, 305	87		931SD618-087G			
	364, 417	119		931SD618-119G			

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo	Input Kit	Reduction Kit	4E19	4F19	
					Bevel Pin Carrier		
4E190 4E195 4F190 4F195"	19, 21	6	930HY619- JBBG	931SD619-006G	CJ956LG	CJ931LG	
	22, 25	7		931SD619-007G			
	26, 28	8		931SD619-008G			
	35, 39	11		931SD619-011G			
	42, 46	13		931SD619-013G			
	48, 53	15		931SD619-015G			
	54, 60	17		931SD619-017G			
	67, 74	21		931SD619-021G			
	80, 88	25		931SD619-025G			
	93, 102	29		931SD619-029G			
	112, 123	35		931SD619-035G			
	138, 151	43		931SD619-043G			
	163, 179	51		931SD619-051G			
	189, 207	59		931SD619-059G			
	227, 249	71		931SD619-071G			
	278, 305	87		931SD619-087G			
	364, 417	119		931SD619-119G			

Parts, continued

Bearings and Oil Seals

Bearings and Oil Seals

BBB4 Bearings and Oil Seals

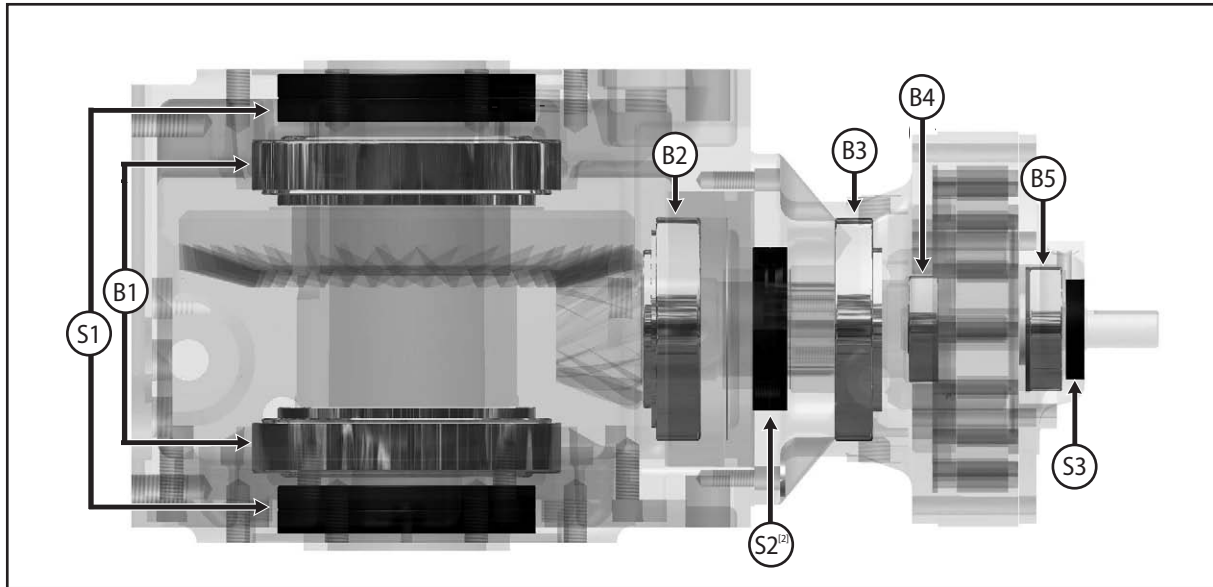


Table 39. BBB4 Reducer Bearings and Oil Seals

Unit Size	Bearings					Oil Seals ^[1]		
	B1	B2	B3	B4	B5	S1 ^[2]	S2 ^[3]	S3
4A100 4A105 4A110 4A115 4A120 4A125 4A140 4A145	32017	32308	32011	6302RSH2	6302Z	D 85 x 110 x 13	S 50 x 68 x 9	S 20 x 35 x 7
			32013	6304	6305Z			D 32 x 52 x 8
			30215	6305R	6306			D 38 x 58 x 11
4B120 4B125 4B140 4B145 4B160 4B165			32013	6304	6305Z			D 32 x 52 x 8
			30215	6305R	6306			D 38 x 58 x 11
			30217	6307R	6308			D 55 x 78 x 12
4C140 4C145 4C160 4C165 4C170 4C175			30215	6305R	6306			D 38 x 58 x 11
			30217	6307R	6308			D 55 x 78 x 12
4D160 4D165 4D170 4D175 4D180 4D185	32024	32312	30220	6406	6407	D 120 x 150 x 14	S 70 x 95 x 13	D 62 x 82 x 12
			30217	6307R	6308			D 55 x 78 x 12
			30220	6406	6407			D 62 x 82 x 12
			30222	6407	6409			D 65 x 88 x 12
4E170 4E175 4E180 4E185 4E190 4E195			30220	6406	6407			D 62 x 82 x 12
			30222	6407	6409			D 65 x 88 x 12
4F180 4F185 4F190 4F195	32028	32314	30226	6408	6411	D 160 x 190 x 16	S 90 x 115 x 13	S 70 x 88 x 10
			30226	6407	6409			D 65 x 88 x 12
			30230	6408	6411			S 70 x 88 x 10

Notes: [1] D = Double Lip Seal. S = Single Lip Seal. Seal Dimensions are in mm.

[2] A total of 4 seals are needed - two on top and two on bottom

[3] for "Y4" assembly and grease lubricated units only

Parts, continued

Bevel Gearing Parts and Tooth Count

Bevel Gearing Parts and Tooth Count

Bevel gear and pinions are sold in sets only. Individual components are not available for purchase. The information below regarding tooth count of the bevel gearset is provided for vibration analysis purposes.

BBB4 Bevel Gearing Tooth Count

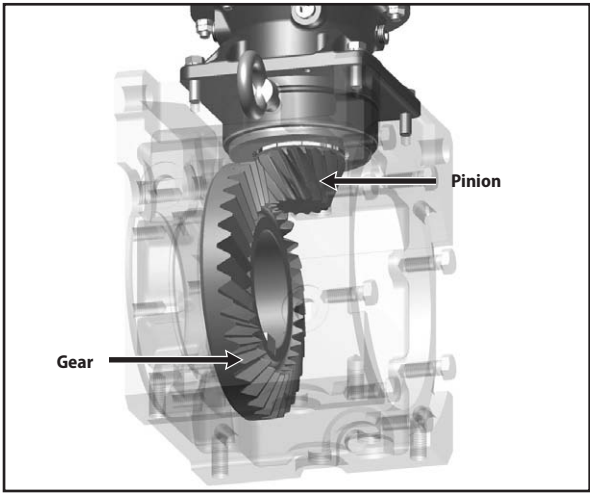


Table 40. BBB4 Ratios

BBB4 Nominal Ratio	Bevel Ratio	Cyclo Input Ratio
11	3.5	3 ^[1]
13	3.2	4 ^[1]
14	3.5	4 ^[1]
16	3.2	5 ^[1]
18	3.5	5 ^[1]
19	3.2	6
21	3.5	6
22	3.2	7
25	3.5	7
26	3.2	8
28	3.5	8
35	3.2	11
39	3.5	11
42	3.2	13
46	3.5	13
48	3.2	15
53	3.5	15
54	3.2	17
60	3.5	17
67	3.2	21
74	3.5	21

Note: [1] Planetary Input

BBB4 Nominal Ratio	Bevel Ratio	Cyclo Input Ratio
80	3.2	25
88	3.5	25
93	3.2	29
102	3.5	29
112	3.2	35
123	3.5	35
138	3.2	43
151	3.5	43
163	3.2	51
179	3.5	51
189	3.2	59
207	3.5	59
227	3.2	71
249	3.5	71
278	3.2	87
305	3.5	87
364	3.5	104
417	3.5	119
424	3.5	121
501	3.5	143
578	3.5	165
683	3.5	195

BBB4 Nominal Ratio	Bevel Ratio	Cyclo Input Ratio
809	3.5	231
956	3.5	273
1117	3.5	319
1320	3.5	377
1656	3.5	473
1957	3.5	559
2272	3.5	649
2559	3.5	731
2944	3.5	841
3511	3.5	1003
4365	3.5	1247
5177	3.5	1479
6472	3.5	1849
7228	3.5	2065
8880	3.5	2537
10658	3.5	3045
12184	3.5	3481
15530	3.5	4437
17966	3.5	5133
21620	3.5	6177
26492	3.5	7569

To determine the bevel tooth count, identify the BBB4 nominal ratio and corresponding bevel ratio from Table 36. Then reference Table 37 to identify the actual number of bevel gear and pinion teeth.

Table 41. Bevel Tooth Count and Part Numbers

Bevel Ratio	Number of Teeth		Bevel Gear Set Part Number						
	Pinion	Gear	4A10, 4A11 4A12, 4A14	4B12, 4B14, 4B16	4C14, 4C16, 4C17	4D16	4D17, 4D18	4E17, 4E18, 4E19	4F18, 4F19
3.2	10	32	998BBB-4A--BG	998BBB-4B--BG	998BBB-4C--BG	998BBB-4D16BG	998BBB-4D17BG	998BBB-4E--BG	998BBB-4F--BG
3.5	10	35	998BBB-2A---G	998BBB-2B---G	998BBB-2C---G	998BBB-2D---G	998BBB-2D17-G	998BBB-2E---G	998BBB-4F--AG

Cyclo Portion Disassembly/Assembly

Disassembly Procedure

Disassembly/Assembly

The Bevel Gear portion is designed for lower speeds and therefore has lower operating cycles when compared to the Cyclo input assembly, therefore in most cases does not require rebuilding. Always consult our specialized factory and warehouses for overhaul of gearmotors and reducers. Experience is necessary for proper overhaul.

The Cyclo portion has significantly higher operating cycles than the Bevel Gear portion, rebuild and repair is a convenient way to extend the useful life of your gearbox.



Cyclo repairs should be conducted by experienced personnel to prevent damage to components or persons.

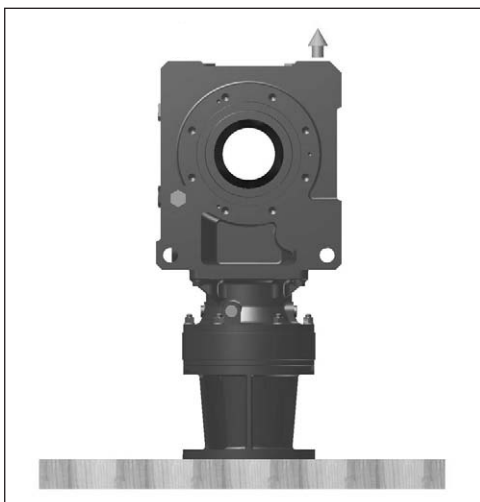
Cyclo Portion – General Disassembly

1

Before starting the disassembly process, Sumitomo recommends draining and properly disposing of all lubrication.

2

Carefully remove the entire BBB4 from the driven shaft by following the instructions outlined in the Removal From Driven Shaft section of this manual.

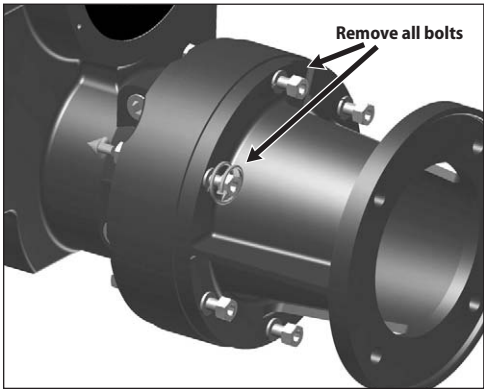


3

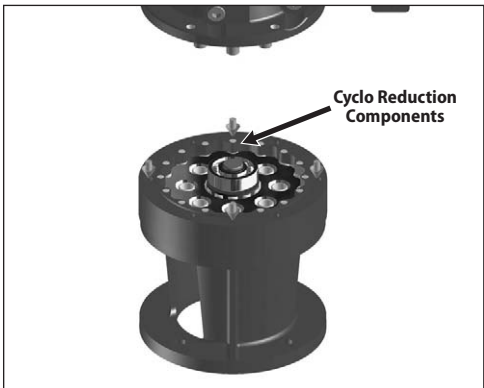
While carefully supporting the entire unit, place the unit on a level work surface so that the high speed portion (Cyclo portion) is facing down.

Cyclo Portion Disassembly/Assembly, continued

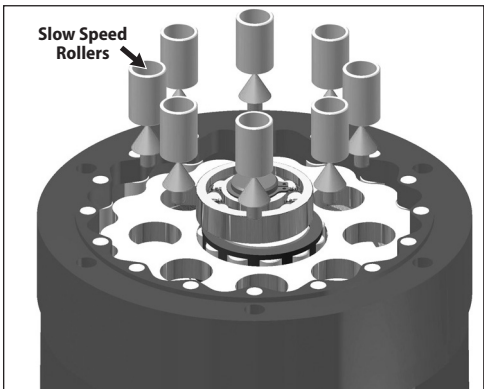
Disassembly Procedure



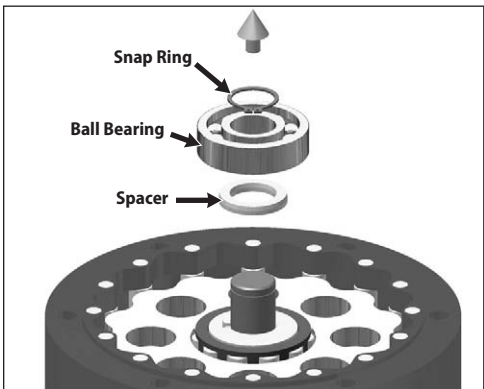
- 4** While continuing to externally support the entire BBB4 unit, remove each of the bolts from the Cyclo ring gear housing (shown in horizontal position for clarity).



- 5** Carefully separate the **bevel gear housing assembly** from the Cyclo portion to gain access to the **Cyclo reduction components**.



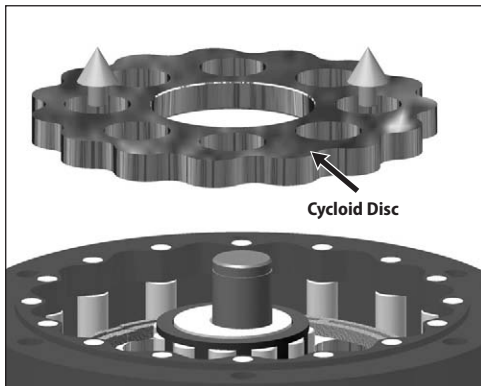
- 6** Remove the **slow speed rollers**. Additionally, check the pins on the pin carrier to see if any of the rollers have adhered to them.



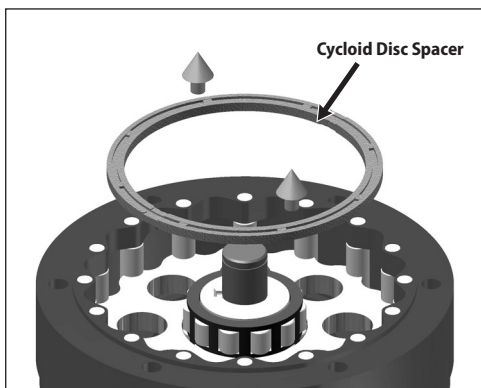
- 7** Remove the **snap ring**, the **ball bearing** and the **spacer** from the high speed shaft.

Cyclo Portion Disassembly/Assembly, continued

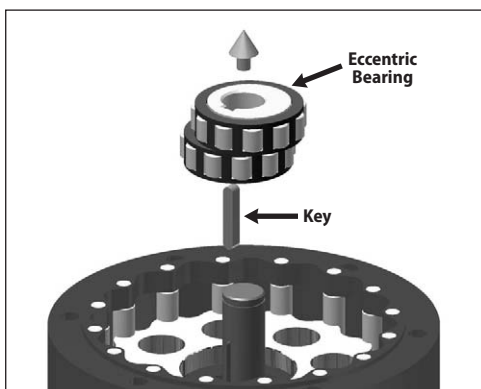
Disassembly Procedure

**8**

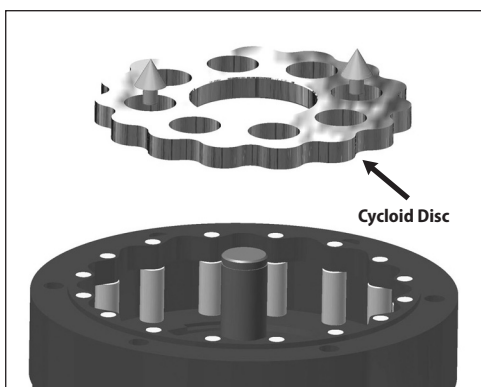
Using both hands, carefully remove the top **Cycloid disc**.

**9**

For Cyclo units supplied with a **spacer**, remove the **Cycloidal disc spacer**.

**10**

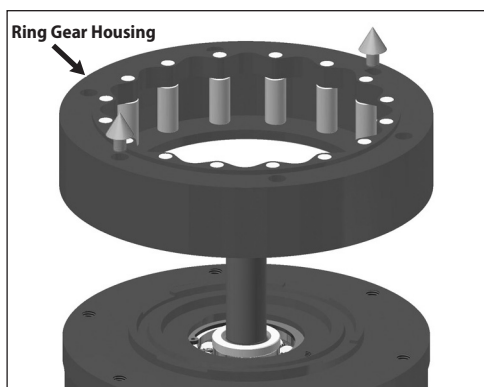
Remove the **eccentric bearing** from the high speed shaft.

**11**

Using both hands, carefully remove the remaining **Cycloid disc**.

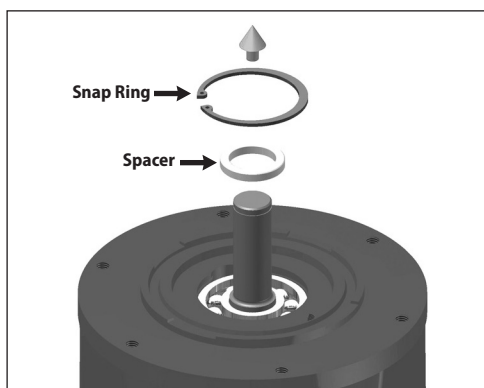
Cyclo Portion Disassembly/Assembly, continued

Disassembly Procedure



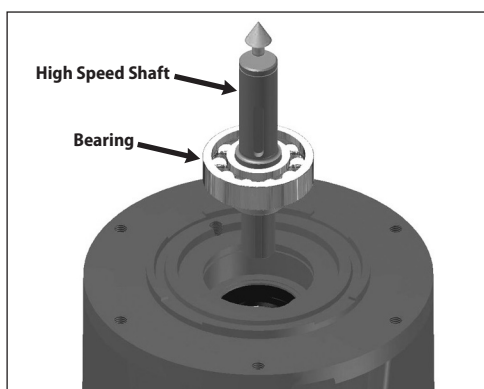
12

Remove the **ring gear housing**



13

Remove the **spacer** and the **snap** ring from the **high speed end shield**.



14

Remove the **high speed shaft**, along with its associated bearing, from the **high speed end shield**.

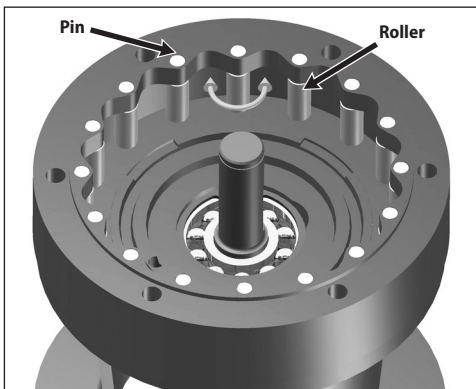
Cyclo Portion Disassembly/Assembly, continued

Reassembly Procedure

Cyclo Portion – General Reassembly

The Cyclo portion of the speed reducer may be reassembled by reversing the disassembly procedure. All parts must be returned to the original order from which they were removed during disassembly. Take care to keep the moving reduction components free of dust or foreign material, and properly align all gaskets in order to keep the assembly oil tight/leak free.

Remember these important notes when assembling the Cyclo reducer:



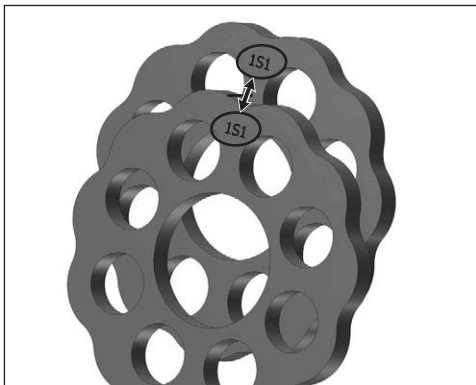
1

Place the **ring gear housing** on the Cyclo **high speed end shield** (or the motor flange) and insert the ring gear housing **pins** and **rollers** (if they had been removed during the disassembly process). Rotate each of the pins and rollers by hand to assure that they freely move/rotate.

If the Cyclo portion of the BBB4 is grease lubricated, liberally apply grease to the ring gear pins and rollers before they are inserted into the ring gear housing.



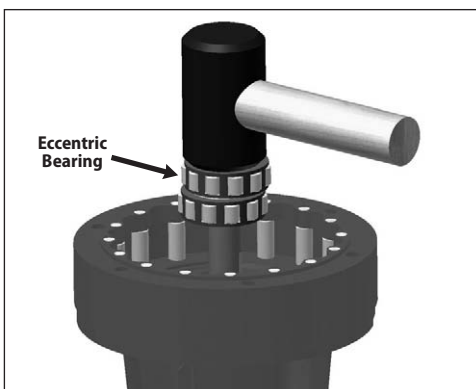
If the Cyclo portion of the BBB4 unit is oil lubricated – do not add any grease during the reassembly process.



2

Cycloid discs are a matched pair, both discs have the same code etched on one side.

When inserting these discs into the ring gear housing, be sure that the etched number is facing up.

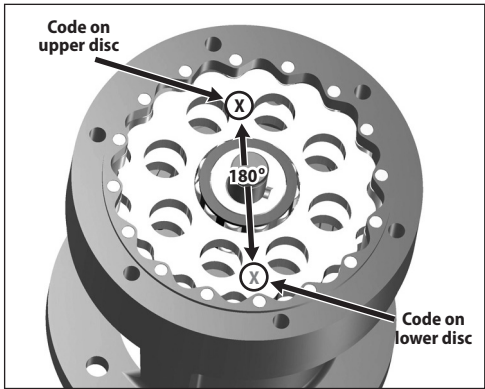


3

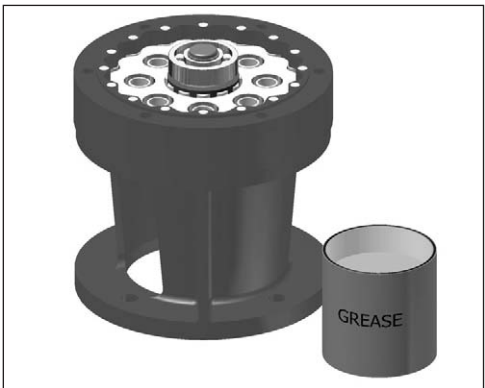
When reinserting the **eccentric bearing assembly**, use only a wooden or hard rubber mallet to tap it into place.

Cyclo Portion Disassembly/Assembly, continued

Reassembly Procedure



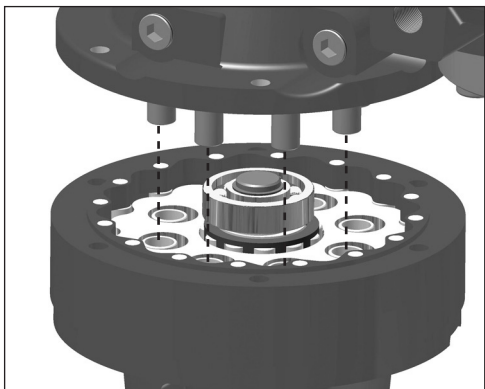
- 4
- Insert the **top Cycloid disc** so that the code engraved on its surface is 180° opposed to the corresponding etched code on the **lower Cycloid disc**.



- 5
- If the Cyclo portion of the BBB4 unit is grease lubricated, refill the reduction components with the amount specified in Grease Quantities section of this manual; **or**, fill to 80% of the space around the reduction mechanism and bearings of single reduction units, and 50% of the space around the reduction mechanism of both the first and second stage of double reduction units.



If the Cyclo portion of the BBB4 unit is oil lubricated – do not add any grease during the reassembly process.



- 6
- When reassembling the BBB4 gear housing onto the Cyclo reduction stage, ensure that the **carrier pins** are inserted and aligned with the corresponding bores of the **rollers**.

Troubleshooting

Reducer Troubleshooting

Reducer Troubleshooting

This troubleshooting guide provides assistance in identifying and overcoming common problems with reducers and motors. If a problem with the reducer and/or the motor is not listed below, please consult the factory for assistance.

Reducer Troubleshooting

Problem with the Reducer		Possible Causes	Suggested Remedy
Runs Hot	Overloading	Load exceeds capacity of the reducer	Check the rated capacity of the reducer, replace with unit of sufficient capacity or reduce the load
	Improper lubrication	Insufficient lubricant	Check lubricant level and increase to recommended level
		Excessive lubricant	Check lubricant level and reduce to recommended level
		Incorrect lubricant	Flush old lubricant from the unit and refill with correct recommended lubricant
Vibration or Noise	Loose foundation bolts	Weak mounting structure	Inspect mounting of reducer. Tighten loose bolts and/or reinforce mounting & structure
		Loose hold-down bolts	Tighten bolts
	Worn disc and/or bevel gearing	Load exceeds capacity of reducer	If bevel gearset is damaged, contact the factory. If Cycloid discs are damaged, disassemble the Cyclo portion and replace discs. Re-check the rated capacity of the unit
	Bearing failure	Insufficient lubricant	If output bearings are damaged, contact the factory If bearings in Cyclo portion are damaged, replace the affected bearings. Clean & flush the reducer and fill with the correct type and quantity of lubricant
		Load exceeds capacity of reducer	Check the rated capacity of the reducer. Replace with unit of sufficient capacity or reduce the driven load
	Insufficient lubricant	Insufficient lubricant	Check lubricant level and adjust to recommended level
	Damaged Cyclo pins and rollers	Load exceeds capacity of reducer	Disassemble Cyclo portion of reducer and replace ring gear housing pins and rollers. Check load on reducer
Output Shaft/Hub does not turn	Motor shaft broken	Load exceeds capacity of reducer or repetitive shock loading	Replace broken shaft. Check rated capacity of reducer
	Key missing or sheared off on input shaft		Replace key
	Eccentric bearing broken	Insufficient lubricant	Replace the Eccentric Bearing in the Cyclo portion. Flush and refill the unit with the recommended lubricant
	Motor does not turn	Motor	Refer to the "Motor" portion of this Troubleshooting guide
Oil Leakage	Worn seals	Caused by dirt or grit entering the seal area	Replace the oil seals
	Leakage into motor	Excessive lubricant	Check the lubricant level and adjust to the recommended level
		Air breather clogged	Clean or replace element, being sure to prevent any dirt from falling into the reducer
		Improper mounting position, such as other than designed mounting angle	Mount the unit in its designed mounting angle

Troubleshooting, continued

Motor Troubleshooting

Motor Troubleshooting

Problem with the Motor		Possible Causes	Suggested Remedy
Load is disconnected but motor does not rotate	Makes a "groaning" sound	Faulty switch contact	Adjust the contact
		Blown fuse	Replace fuse
		One phase wire of the power supply open	Rewire connection
		Stator coil open	Repair by rewinding or replacing the stator assembly
		Stator and rotor touching due to bearing housing wear	Replace the bearing and bracket
	Starts in either direction when turned by hand	Three-phase is operating as singlephase	Consult the power source with a voltmeter
	Doesn't make any noise	Stator coil open	Repair by rewinding or replacing stator assembly
		External power failure	Contact the local power company.
		Open connection wire Faulty Switch contact Faulty Starter contact	Check the source wiring Adjust the contacts
Rotates with the load disconnected but:	Rotates in the wrong direction	Connection error	Change any two of the three-phase source connections
	Fuse blows	Shorted lead wire	Replace fuse and rewire short
	Speed does not increase	Faulty starter contact	Replace or adjust starter contact
	Makes a "groaning" sound	Overcurrent/Overheating due to Rotor and Stator touching	Repair by rewinding or replacing stator assembly
		Overcurrent due to one phase of Stator Coil shorted	Replace the stator winding
	Makes a highpitched "metallic" noise	Faulty bearing	Replace the bearing
Rotates when the load is disconnected but when the load is connected:	Switch overheats	Insufficient switch capacity	Replace with switch having the rated capacity
		Overload	Decrease load to the rated value
	Fuse blows	Insufficient fuse capacity	Replace with fuse having the rated capacity
	Overheats	Overload	Decrease load to rated value
		Voltage drop	Consult with local power company
	Speed suddenly drops	Voltage drop	Consult with local power company
		Overload	Decrease load to rated value
	Stops	Bearing damaged by overheating	Replace the bearings

Notes

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Notes

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