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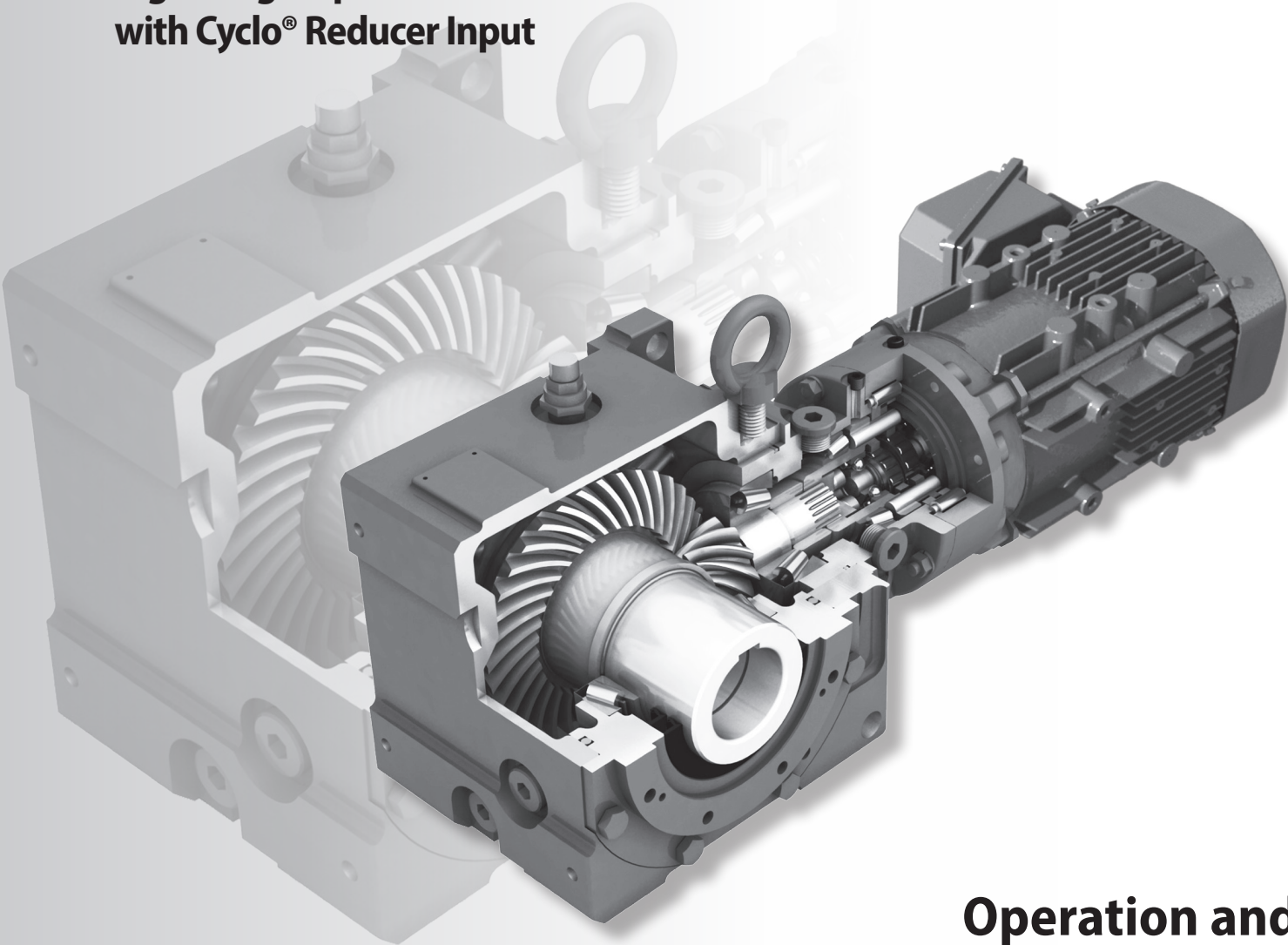
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Sumitomo Drive Technologies

Cyclo® BBB4 Bevel BuddyBox®

Right Angle Spiral Bevel Gearbox
with Cyclo® Reducer Input



www.sumitomodrive.com/BBB4

Operation and Maintenance Manual

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Important Notes

Safety Symbols

These safety symbols appear throughout this manual to indicate important warnings:



DANGER: Incorrect handling of the unit and/or failure to follow the instructions may cause physical damage, serious personal injury, and/or death.



CAUTION: Incorrect handling of the unit and/or failure to follow the instructions may cause physical damage and/or personal injury.

Safety Precautions

- Review and adhere to the instructions in this manual to ensure:
- trouble-free Cyclo® BBB4 operation
 - your rights to make a warranty claim.

Read this manual and all accompanying documents thoroughly before use. Understand the machine, information on safety, and all precautions for correct operation. Sumitomo recommends making this manual easily accessible for reference at the machine location.



- **Only properly trained personnel** should transport, install, align, wire, inspect, operate, and maintain the unit.
- When the unit is to be used in a system for transport of human beings, a secondary safety device should be installed to guard against accidents that may result in injury, death, or damage to the system.
- When the unit is to be used for an elevator, install a safety device on the elevator side to prevent it from falling; otherwise, serious injury, death, or damage to the elevator may result.



- CAUTION:**
- Operate the unit only within its design and performance specifications; otherwise, injury or damage to the system may occur.
 - Keep hands and all foreign objects from the internal moving parts of the unit; otherwise, injury or damage to the system may occur.
 - Take damaged units off-line immediately and do not resume operation until properly repaired.
 - Modifications or alterations of any kind to the unit will void the warranty and all subsequent claims.
 - Do not remove the rating plate.

Disposal

Please refer to local, state, and federal regulations governing disposal of:

Steel Scrap:

- Housing (Ductile and Gray Cast Iron)
- Gears
- Shafts
- Bearings

Lubricants:

- Gear Oil
- Grease

Delivery

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.

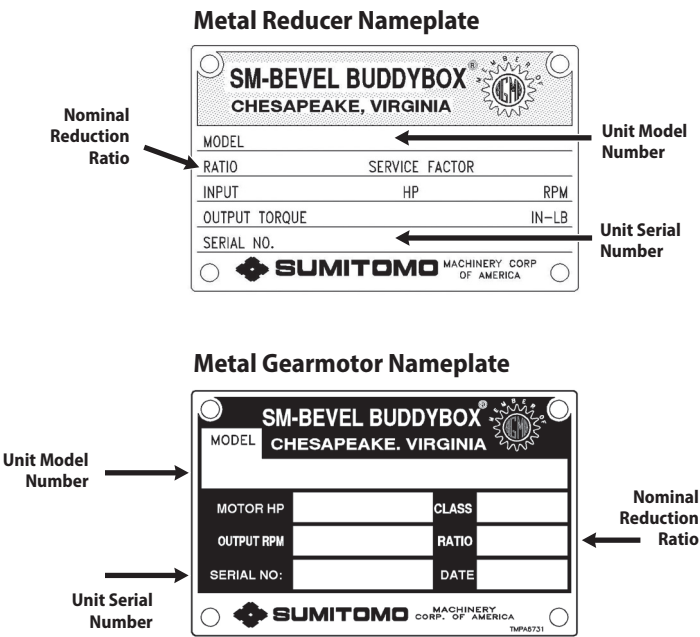
- Upon receipt of the reducer/gearmotor, verify that:
- the model number on the unit nameplate matches the purchase order
 - the unit was not damaged during shipping
 - all bolts and nuts are fully tightened.

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.**

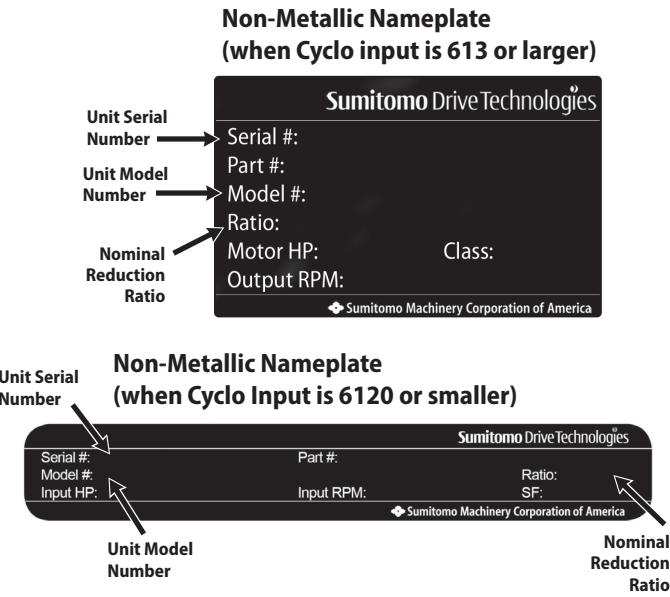


Lubrication Inspection



- **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.

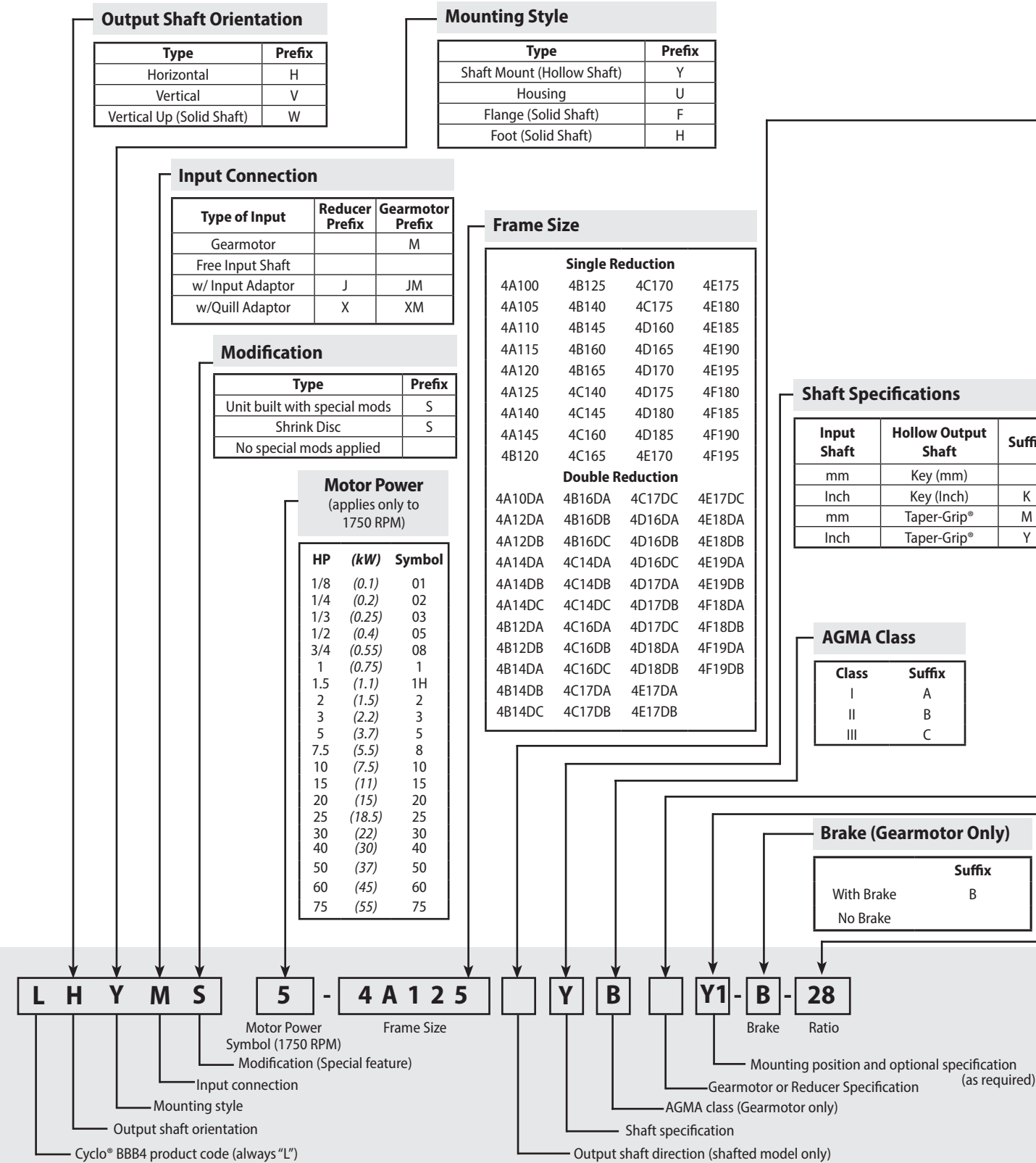
Refer to the lubrication section in this manual for detailed lubrication information.



Nomenclature

Nomenclature

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



Nomenclature, continued

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	6	21			All	21.0
		4A12		7	22	22.4			
		4A14	10.89	8	25	24.5			
		4B16		11	35	28.0			
		4C16	10.85	11	39	35.2			
		4D16		13	46	38.5			
		4D17	15	53	45.5				
		4E17	17	60	52.5				
		4E18	10.50	21	67	59.5			
		4F18		21	74	67.2			
		4E19	10.82	25	80	73.5			
		4F19		25	88	80.0			
4	13	4A10	12.99	29	102	87.5			
		4A12	12.80	35	112	101.5			
		4A14	12.95	43	123	112.0			
		4B14		51	151	122.5			
		4B16	12.80	59	179	150.5			
		4C16		71	207	178.5			
		4D16	87	249	206.5				
		4D17	13.09	87	305	248.5			
		4E17		119	417	304.5			
		4E18	13.01	4A10	416.5				
		4F18							
		4E19	14.21						
	4F19								
	14	4A10	14.00						
		4A14	14.16						
		4B14							
		4B16	14.00						
		4C16							
		4D16	14.32						
		4D17							
		4E17	14.23						
		4E18							
		4F18	14.23						
		4F19							
		5	16	4A10	15.36	319	1117	1116.5	
	4A12			15.65	377	1320	1319.5		
	4A14			16.00	473	1656	1655.5		
	4B14				559	1957	1956.5		
	4B16			16.26	649	2272	2271.5		
	4C16				731	2559	2558.5		
	4D16			16.17	841	2944	2943.5		
	4D17				1003	3511	3510.5		
	4E17			15.63	1247	4365	4364.5		
	4E18				1479	5177	5176.5		
	4F18			15.47	1849	6472	6471.5		
	4F19				2065	7228	7227.5		
18	4A10		16.80	2537	8880	8879.5			
	4A12		17.12	3045	10658	10657.5			
	4A14		17.50	3481	12184	12183.5			
	4B14			4437	15530	15529.5			
	4B16		17.78	5133	17966	17965.5			
	4C16			6177	21620	21619.5			
	4D16		17.68	7569	26492	26491.5			
	4D17								
	4E17		17.10						
	4E18								
	4F18		16.92						
	4F19								

Nomenclature Example:
LHYMS-5-4A125-YBY1-B-28

L - Cyclo® Bevel Buddybox

H - Horizontal

Y - Shaft Mount (Hollow Shaft)

M - Gearmotor

S - Special Modifications

5 - 5 HP (3.7kW), 1750 RPM

4A125 - Frame Size

Y - Inch Shaft Specification

B - AGMA Class

Y1 - Mounting Position

B - Brake (gearmotor only)

28 - Ratio

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 Cyclo® 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 Cyclo® 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, Shell VSI Circulating Oil #32 or NP-20 [JIS] equivalent rust preventative is already sprayed into the Cyclo® 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 a suitable NP-19 [JIS] petroleum base corrosion preventative such as Black Bear Par-Al-Ketone, Houghton Rust Veto 342, Daphne Ever Coat No.1 or equivalent.

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.

Transporting

- **Do not** stand directly under a unit suspended by a lifting mechanism. Injury or death may occur if the unit is dropped.
- **Before lifting the unit**, determine its weight (refer to catalog, packing list, etc.) and ensure that the moving equipment will support the unit’s weight.
- **Never hoist or move a unit that exceeds the moving equipment’s rated capacity** or else personal injury and/or equipment damage may occur.
- **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.

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 ... 14° - 104°F (-10° - 40°C)
Ambient Humidity.....85% or less
Ambient Conditions..... 14°F minimum
Altitude3,280 feet (1,000 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.

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

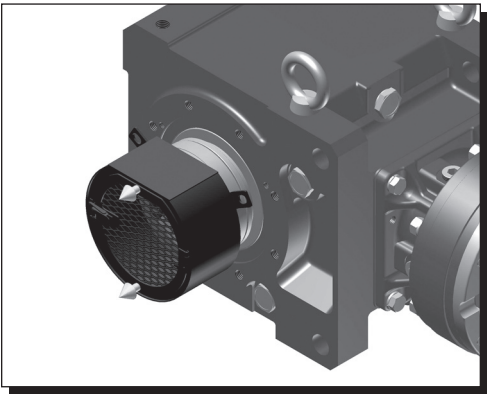
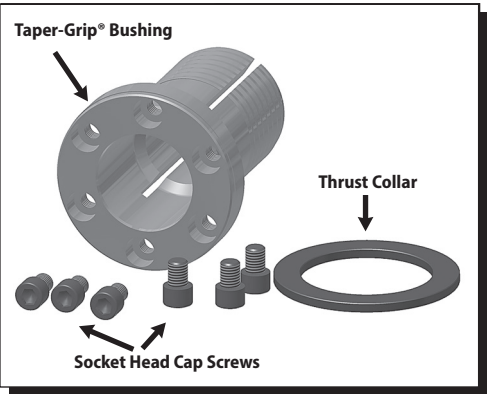
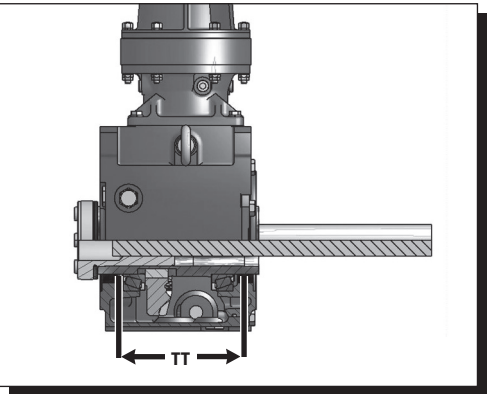
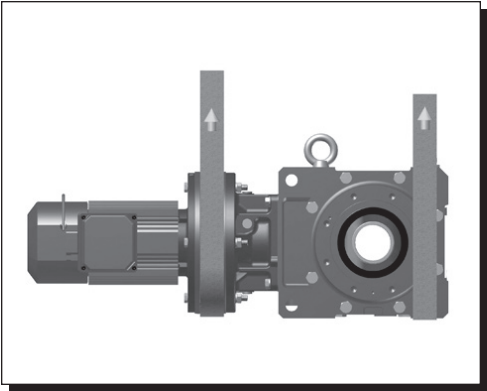
For applications with severe vibration and/or frequent starts and stops, Sumitomo recommends the use of high-strength mounting bolts of Grade 8.8 (or greater).

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 Cyclo® 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 Cyclo® 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 (in)		Tolerance (in)	
1-3/16 – 1-15/16		+0 / -0.0015	
2 – 3-1/8		+0 / -0.0018	
3-3/16 – 4-11/16		+0 / -0.0021	
4-3/4 – 6-1/2		+0 / -0.0025	

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

BBB		TGB		TGB XL	
Size	TT (mm)	TT (in)	TT (mm)	TT (in)	
4A	209	8.23	110	4.33	
4B	243	9.57	120	4.72	
4C	280	11.02	150	5.91	
4D	327	12.87	170	6.69	
4E	360	14.17	190	7.48	
4F	412	16.22	-	-	

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

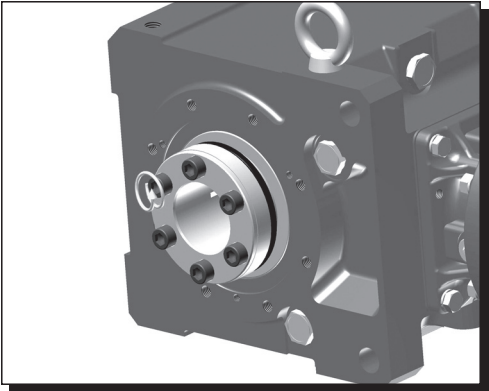
Taper-Grip® Bushing Installation onto Driven Shaft

1

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

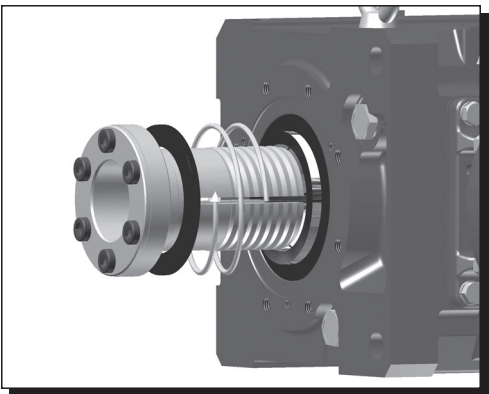
Installation onto Driven Shaft, continued

Taper-Grip® Bushing



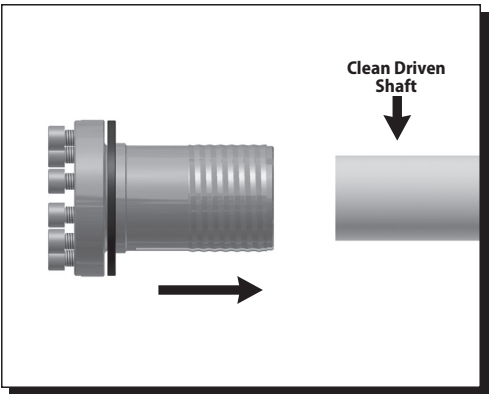
2

Loosen **socket head cap screws**.



3

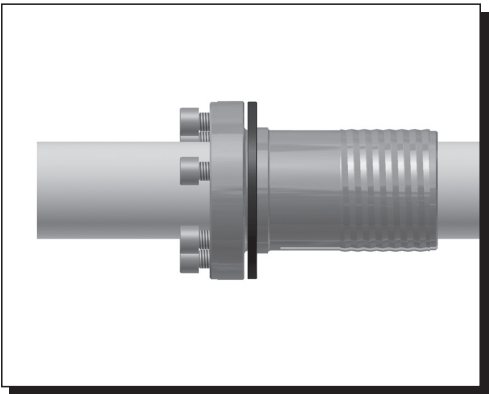
Remove (unscrew) Taper-Grip® bushing from the unit.



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.



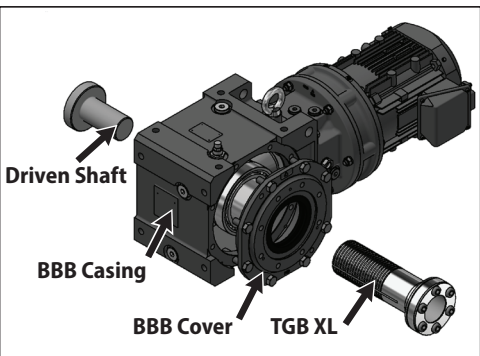
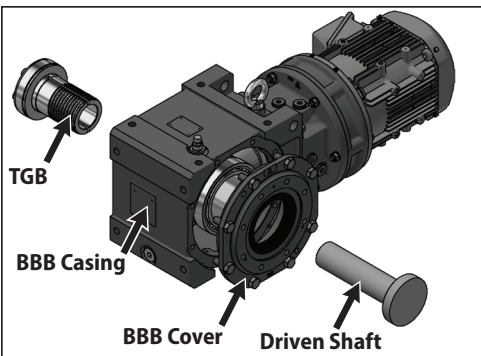
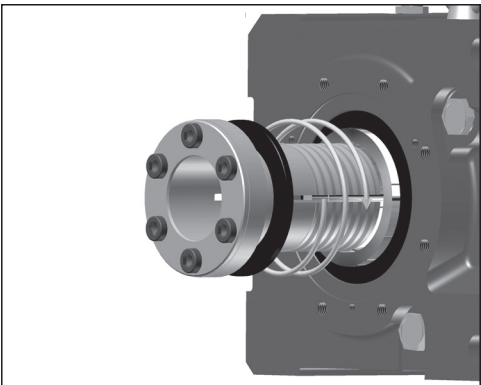
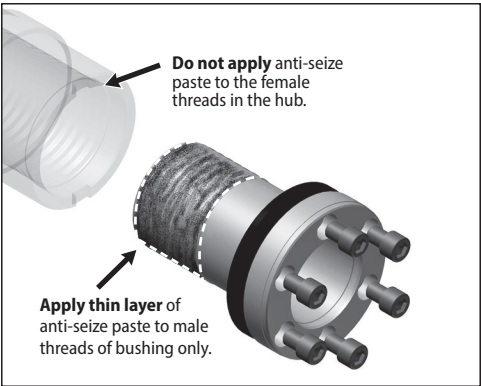
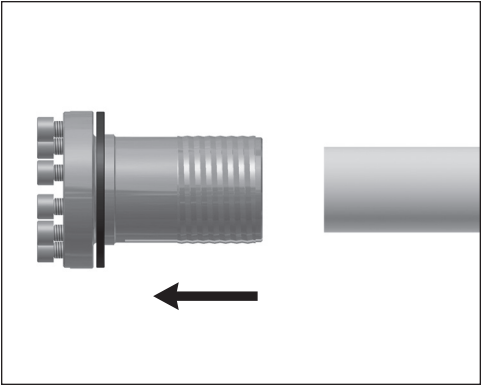
5

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

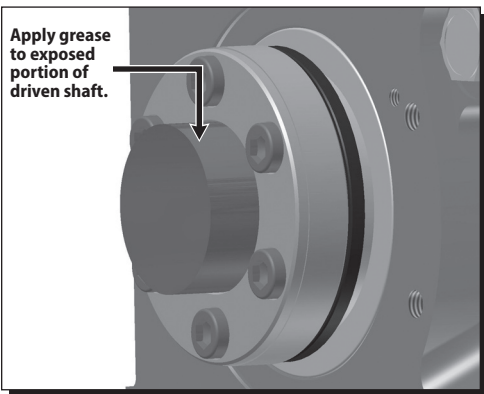
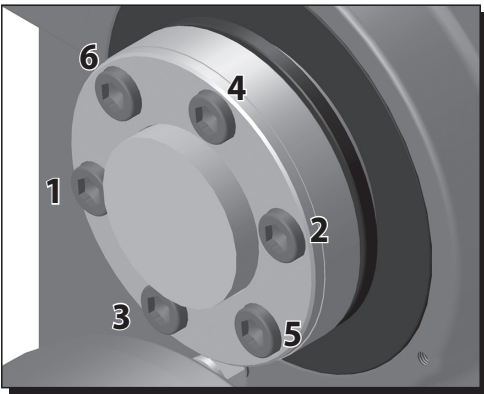
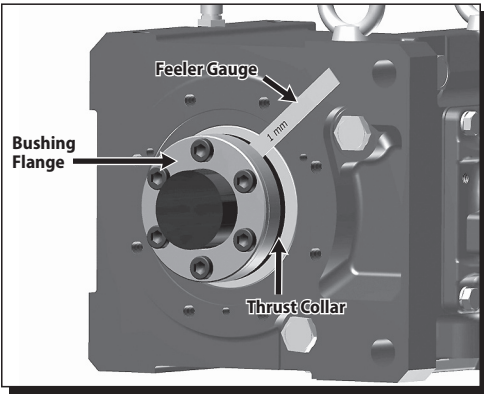
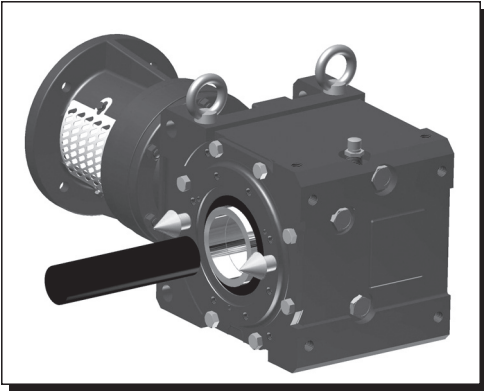
Taper-Grip® Bushing



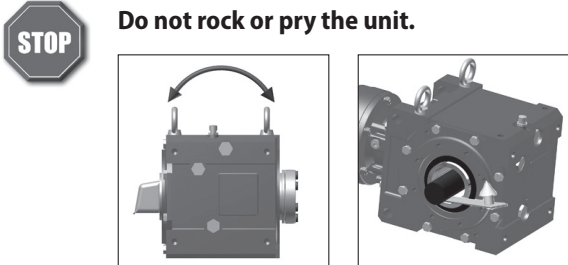
NOTE: BBB Casing and Cover are shown disassembled for reference only. Cover should not be removed in order to install either TGB or TGB XL. Disassembling the reducer/gearmotor may result in void warranty.

Installation onto Driven Shaft, continued

Taper-Grip® Bushing



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



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

Cyclo® BBB4 Size	Screw Qty x Size	Screw Torque	
		lb-ft	(N·m)
4A	6 x M12	56	(75)
4B	6 x M12	104	(140)
4C	6 x M16	185	(250)
4D	6 x M16	223	(300)
4E	8 x M16	223	(300)
4F	10 x M16	223	(300)

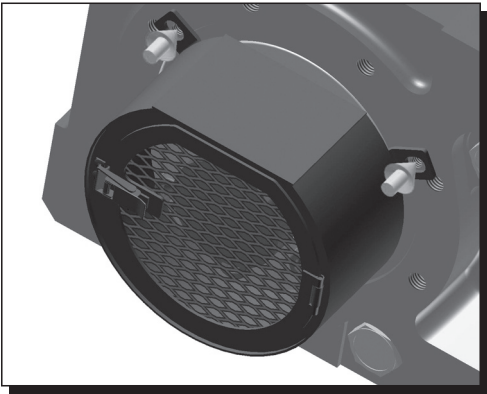
12 In order to prevent corrosion, apply grease to the exposed portion of the driven shaft.

- 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 After the reducer has been running for 20 to 30 hours, re-torque the screws to the values in Table 2. Screw torques should be subsequently checked at normal service intervals (i.e. every 6 months).

Installation onto Driven Shaft, continued

Taper-Grip® Bushing, Keyed Hollow Bore



14

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.

Keyed Hollow Bore Installation

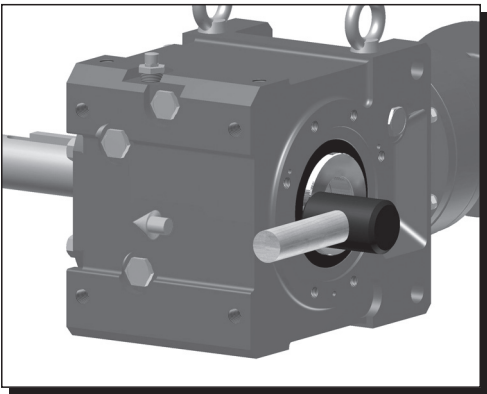
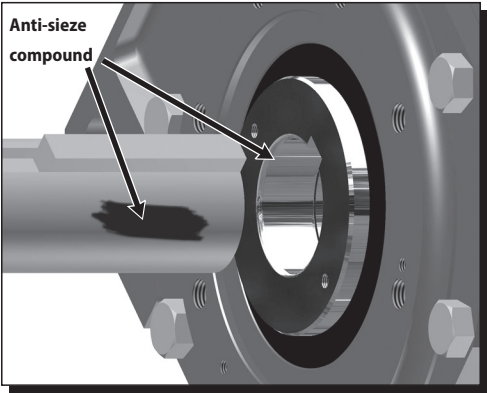


Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm Installation section in this manual for instructions.

CAUTION: The Cyclo® 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 conforms to JIS H8.
- If application involves high shock loading and/or large radial loads, a shaft tolerance of JIS js6 or JIS 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.

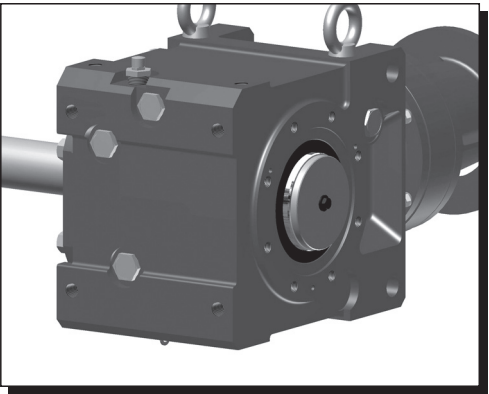
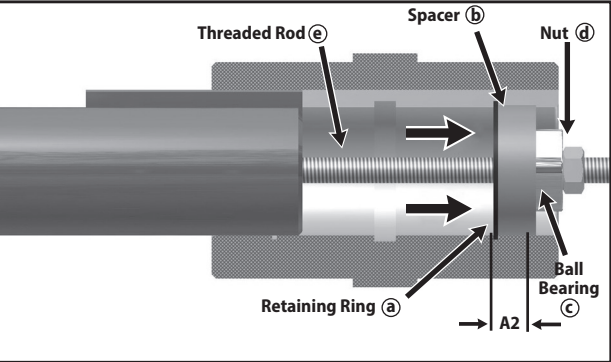
Note: If the fit is tight, use a jig such as the one shown in Table 3 to ease assembly. **Sumitomo does not supply a mounting jig. This information is provided for reference only.**

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	55	25	51104	M16	M16 x 250
4B	65	25	51105	M20	M20 x 300
4C	75	25	51105	M20	M20 x 300
4D	85	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.



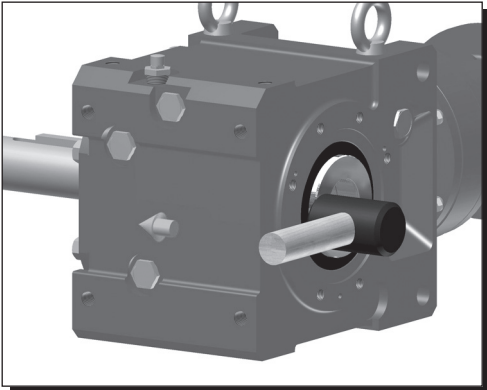
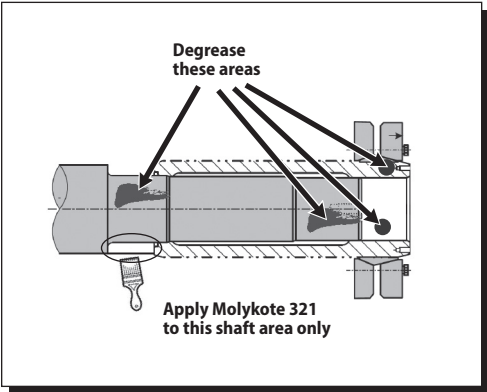
CAUTION: The Cyclo® BBB4 must be externally supported prior to insertion of driven shaft into hollow bore. External support **MUST** be maintained until all shrink disc socket head cap screws have been tightened to the appropriate operational torque.

Bore and Shaft Tolerance Specifications

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

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.

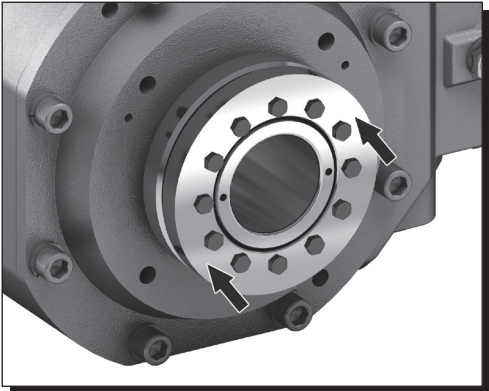
- 2**
- Align the driven shaft with the bore of reducer/gearmotor bore and carefully slide unit onto the driven shaft to the desired location.
- If the fit is tight, strike on the reducer hollow bore with a mallet to assist in the assembly.

 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.

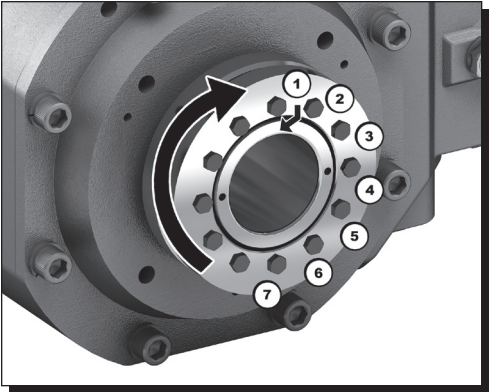
If the fit is tight, use a jig such as the one shown in the Keyed Hollow Bore Installation section to ease assembly. **Sumitomo does not supply a mounting jig. This information is provided for reference only.**

Table 4. Shrink Disc Bolt Tightening Torques

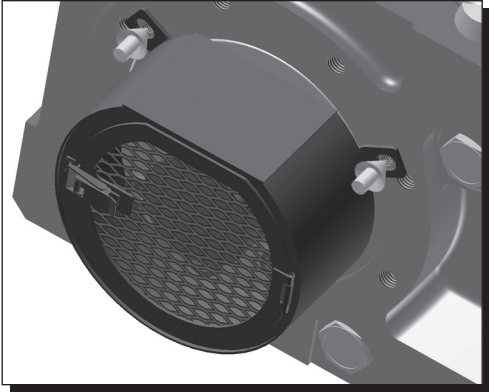
Size	Model (Typical)	Bolt	Bolt Torque	
			lb-ft	(N•m)
4A	TAS-3071-55x68	10 x M6x25 ISO/JIS grade 10.9	9	(12)
4B	TAS-3071-65x80	7 x M8x30 ISO/JIS grade 12.9	26	(34)
4C	TAS-3071-75x100	12 x M8x35 ISO/JIS grade 12.9	26	(34)
4D	TAS-3071-85x110	9 x M10x40 ISO/JIS grade 12.9	51	(68)
4E	TAS-3071-100x140	10 x M12x45 ISO/JIS grade 12.9	87	(118)
4F	TAS-3071-120x165	8 x M16x55 ISO/JIS grade 12.9	214	(290)



- 3**
- Set the (untightened) shrink disc on the reducer shaft.



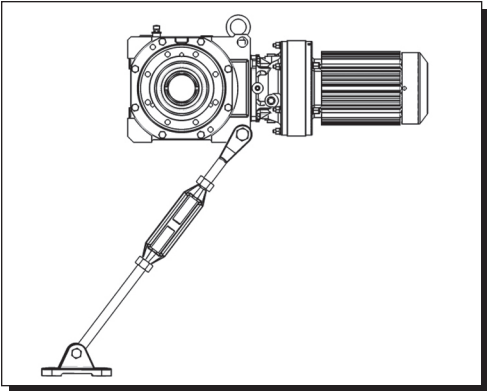
- 4**
- Tighten Bolts to the correct torque value.
- For 3-piece design shrink disc, make sure that both plates are parallel when tightening bolts.
 - After confirming that the shrink disc is set correctly, tighten the bolts uniformly, in a clockwise pattern while keeping both plates parallel (**not** 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



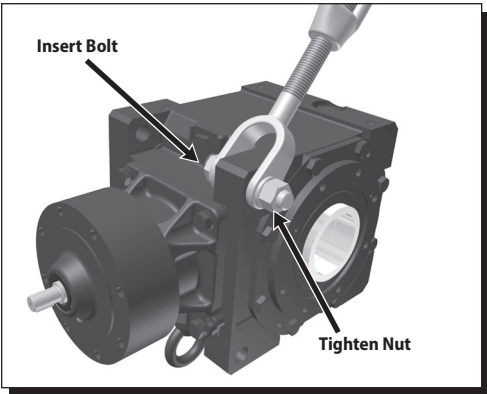
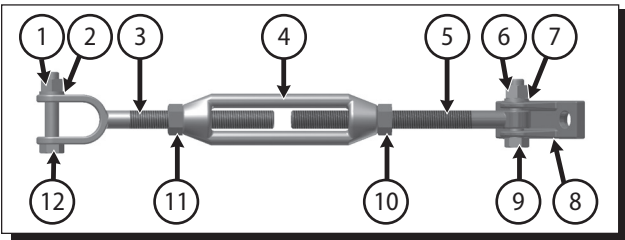
Torque Arm Introduction

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.

Figure 1. Turnbuckle Rod Type Torque Arm Parts



1

Attach the torque arm threaded extension rod to the bevel housing, as shown in Figure 1, 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.

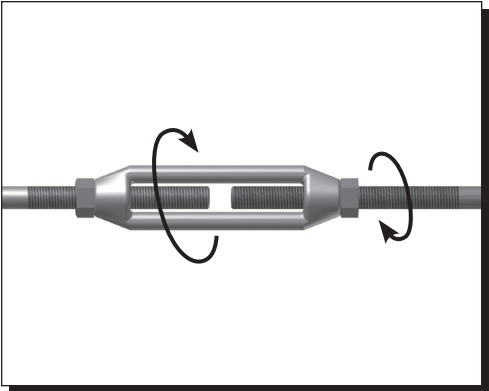
Table 6. Bolt Tightening Torques

Unit Size	Bolt Size ^[1]	ft•lb _f	(N•m)
A	M16 x 75	152 – 167	(206 – 227)
B	M20 x 100	290 – 319	(392 – 431)
C	M24 x 105	507 – 558	(686 – 755)
D	M24 x 125	507 – 558	(686 – 755)
E	M24 x 125	507 – 558	(686 – 755)
F	Consult Factory		

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

Torque Arm Installation, continued

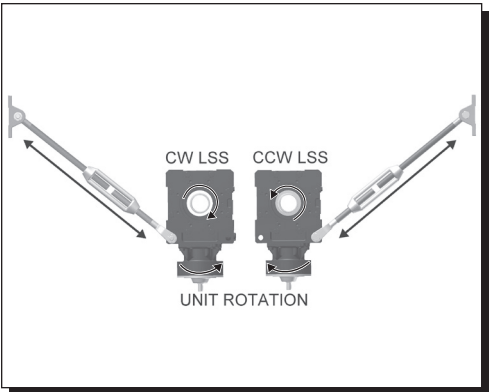
Turnbuckle Type Torque Arm



2

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

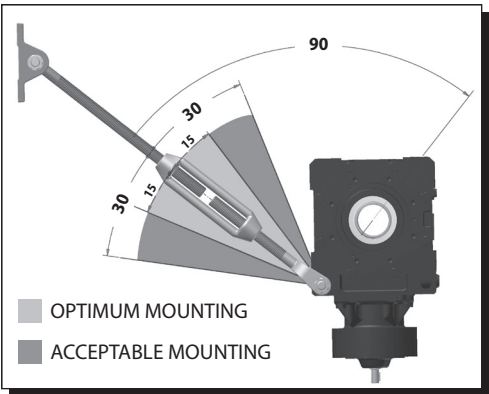
If the assembly was supplied with hex nuts to secure the turnbuckle, install the nuts loosely, ensuring the left hand nut is used on the threaded arm, prior to installing the turnbuckle and threaded arm



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

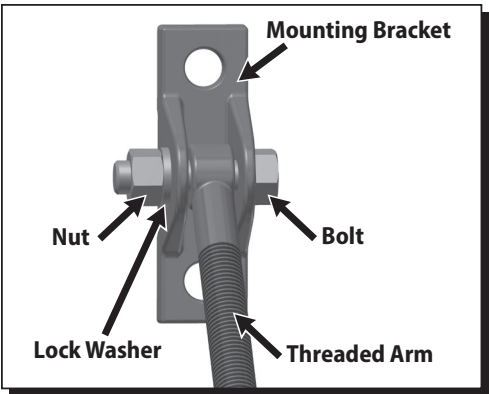
Unit Size	Bolt Size ^[1]	ft•lb _f	(N•m)
A	M16 x 65	152 – 167	(206 – 227)
B	M16 x 80	152 – 167	(206 – 227)
C	M16 x 80	152 – 167	(206 – 227)
D	M16 x 80	152 – 167	(206 – 227)
E	M16 x 80	152 – 167	(206 – 227)
F	Consult Factory		

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

5

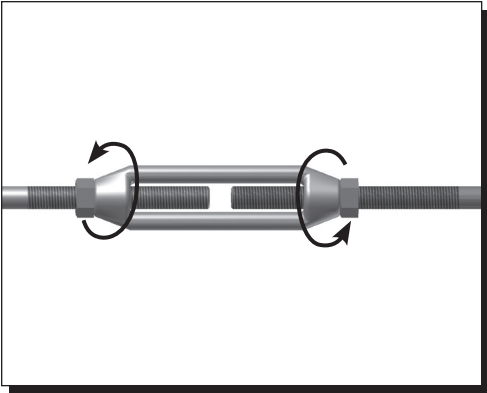
Assemble the threaded arm to the fulcrum mounting bracket, as shown. Some adjustment of the turnbuckle may be required to lengthen or shorten the overall length. Secure it with the appropriate nut, bolt and lockwasher.

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



Torque Arm Installation, continued

Turnbuckle Type Torque Arm, Tie Rod Type Torque Arm

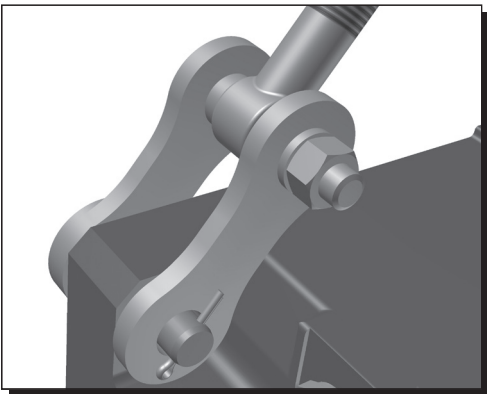
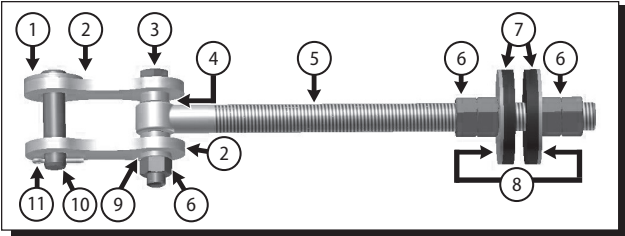


6
If turnbuckle hex nuts were supplied, secure the turnbuckle position by adjusting the previously installed turnbuckle nuts.

Table 8. Nut Tightening Torques

Unit Size	Nut Size ^[1]	ft·lb _t	(N·m)
A	M20	290 – 319	(392 – 431)
B	M24	507 – 558	(686 – 755)
C	M24	507 – 558	(686 – 755)
D	M24	507 – 558	(686 – 755)
E	M24	507 – 558	(686 – 755)
F	Consult Factory		

Figure 1. Tie Rod Type Torque Arm Parts



1
Assemble the torque arm mounting brackets or wishbone clevis to the threaded arm, as shown in Figure 1 and attach the torque arm assembly to the bevel housing, at the housing corner eyelet, using the pin and cotter pin.

Tighten mounting bolts according to the values listed in this table:

- Insert the clevis pin through the brackets and housing eyelet.
- Insert the cotter pin into clevis pin and secure assembly.

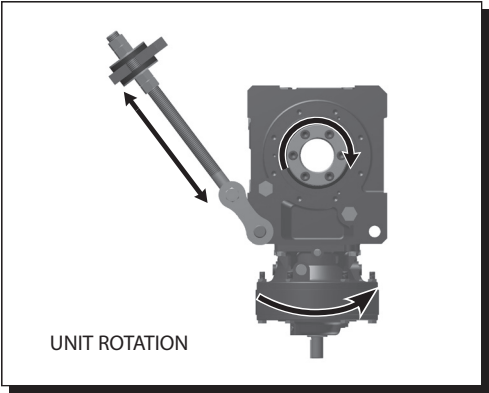
Table 10. Bolt Tightening Torques

BBB4 Size	Bracket Bolt Size ^[1]	Torque	
		lb·ft	(N·m)
4A	2 x M16	152 – 167	(206 – 227)
4B	2 x M20	290 – 319	(392 – 431)
4C	2 x M24	507 – 558	(686 – 755)
4D	2 x M24	507 – 558	(686 – 755)
4E	2 x M24	507 – 558	(686 – 755)
4F	Consult Factory		

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

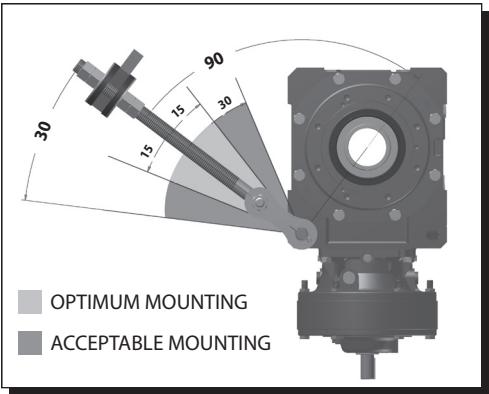
Torque Arm Installation, continued

Tie Rod Type Torque Arm



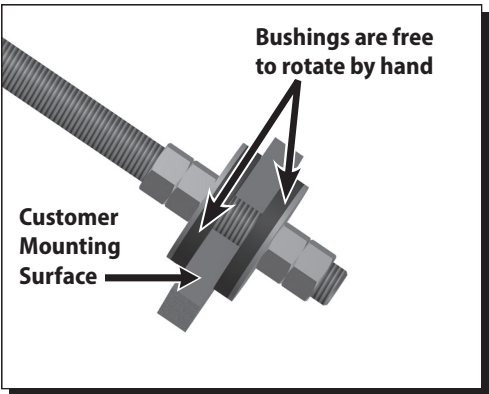
2
Position the torque arm so it will be in tension during unit operation.

Consider installing two torque arms for reversing applications to allow torque arm to be in tension for each direction of rotation.



3
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.

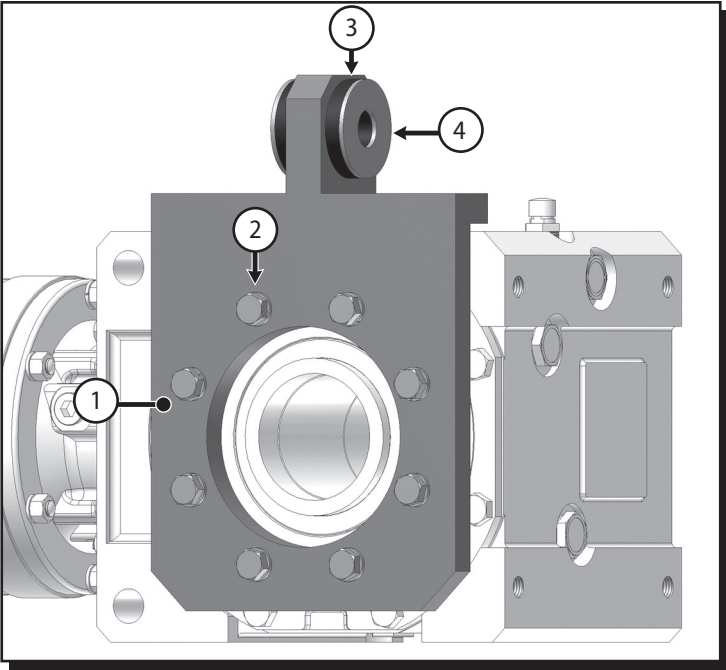


4
After inserting the torque rod into the mounting surface, carefully tighten nuts on either side of torque rod.

- ⚠ Do **not** over tighten nuts. Tighten to point where rubber bushings can still be hand rotated when the unit is turned off.
- 🛑 Before starting unit, verify the following:
 - The torque arm will be in tension when the unit is in operation.
 - The torque arm is aligned with the reducer housing.
 - The torque arm is perpendicular to the axis of the output / driven shaft.
 - The threaded arm is not touching the reducer housing.

Torque Arm Installation, continued

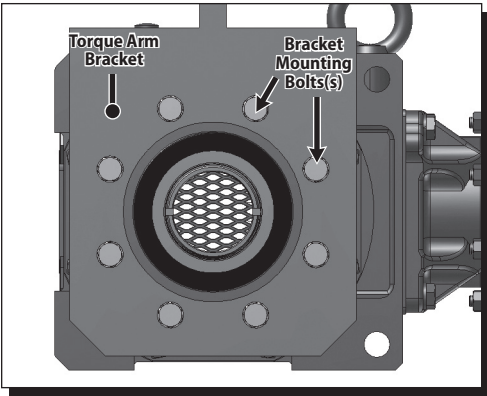
Flange Mount (Banjo) Type Torque Arm



Sumitomo Supplied Components of Flange Mount (Banjo) Type Torque Arm

Table 11. Flange Mount (Banjo) Type Torque Arm Components

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



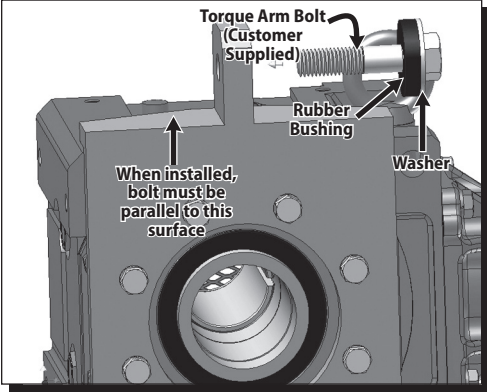
Flange Mount (Banjo) Type Torque Arm Installation Procedure

1 Attach the Flange Mount (Banjo) Torque Arm Bracket to the Cyclo® BBB4 using mounting hardware.

Table 12. Flange Mount (Banjo) Torque Arm Bolt Tightening

Torques Unit Size	Bracket Bolt Size ^[1]	Torque	
		lb-ft	(N·m)
4A	8 x M10	34 – 38	(46 – 51)
4B	8 x M12	59 – 65	(80 – 88)
4C	8 x M16	152 – 167	(206 – 227)
4D,4E	8 x M20	290 – 319	(392 – 431)
4F	8 x M24	507 – 558	(686 – 755)

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



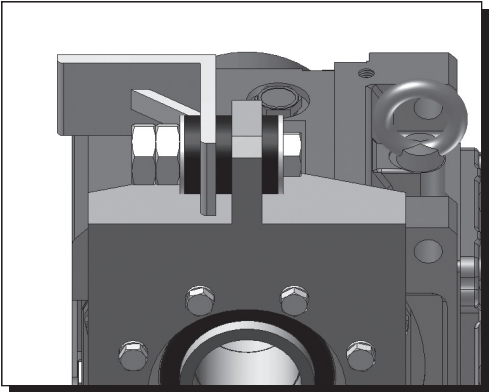
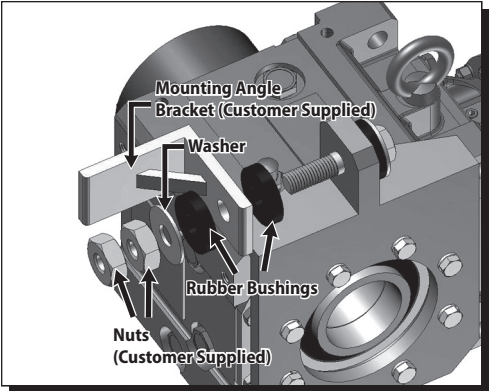
2 Place washer and rubber bushing on bolt.

Insert torque arm bolt (supplied by customer) through mounting tab on Banjo torque arm.

⚠ Make sure bolt is parallel to Flange Mount (Banjo) Type Torque Arm surface when fully installed.

Torque Arm Installation, continued

Flange Mount (Banjo) Type Torque Arm



3 Follow these steps to attach the customer supplied mounting bracket.

- Place rubber bushing and mounting angle bracket on bolt.
- Verify that the mounting angle bracket hole is the correct diameter (see Table 13 in Step 1).
- 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.

Table 13. Flange Mount (Banjo)Torque Arm Bolt Dimensions

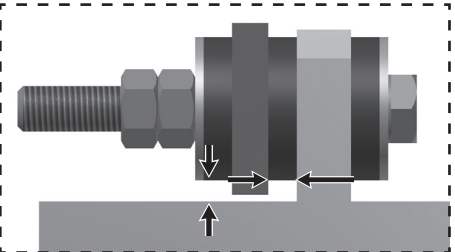
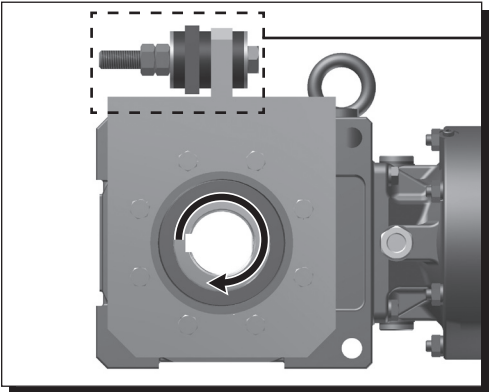
Unit Size	Bracket Tab Bore	Typical Bolt Size ^[1]
4A	Ø18mm	M16
4B	Ø18mm	M16
4C	Ø22mm	M20
4D	Ø26mm	M24
4E	Ø33mm	M30
4F	Ø39mm	M36

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.



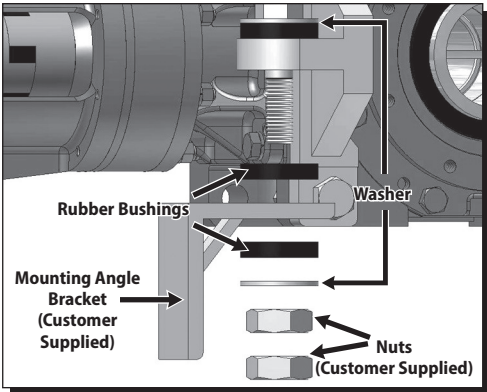
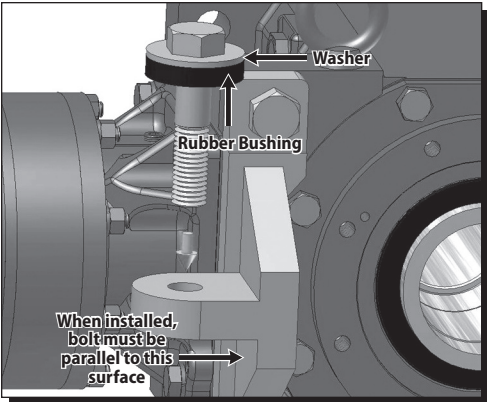
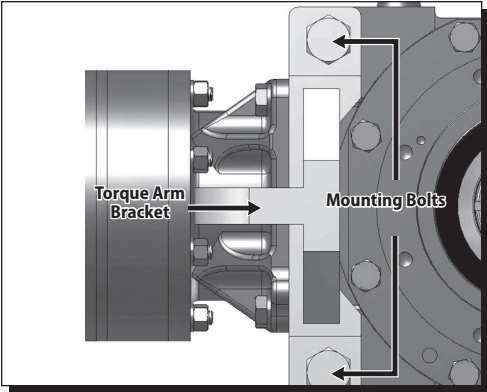
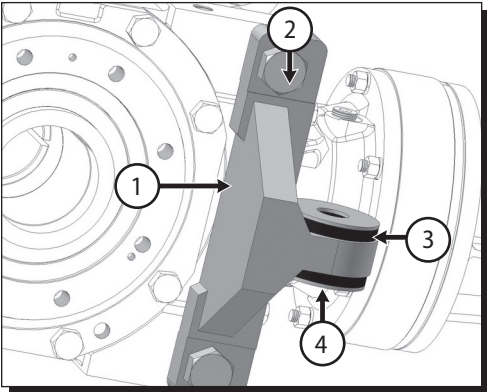
During full rotation of driven shaft, there must be no metal-to-metal contact between mounting angle bracket and torque arm.

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.

Torque Arm Installation, continued

T-Type Torque Arm



T-Type Torque Arm

Sumitomo Supplied Components for T-Type Torque Arm

Table 14. 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 Cyclo® BBB4 using the supplied mounting hardware.

Tighten mounting bolts according to the values listed in Table 15:

Table 15. T-Bracket Bolt Torques

BBB4 Size	Bracket Bolt Size ^[1]	Torque	
		lb·ft	(N·m)
4A	2 x M16	152 – 167	(206 – 227)
4B	2 x M20	290 – 319	(392 – 431)
4C	2 x M24	507 – 558	(686 – 755)
4D	2 x M30	1014 – 1115	(1373 – 1510)
4E	2 x M30	1014 – 1115	(1373 – 1510)
4F	2 x M36	1844 – 2213	(2500 – 3000)

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 16.

 **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 16. T-Type Bolt Dimensions

Unit Size	Bracket Tab Bore	Typical Bolt Size ^[1]
4A	Ø18mm	M16
4B	Ø22mm	M20
4C	Ø26mm	M24
4D	Ø33mm	M30
4E	Ø33mm	M30
4F	Ø39mm	M36

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.

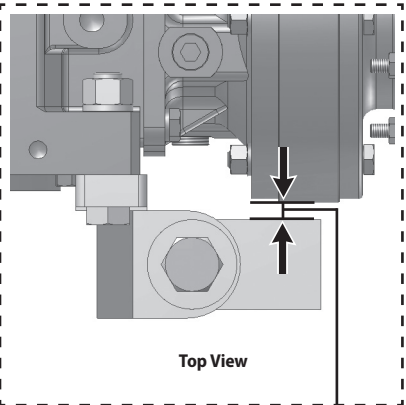
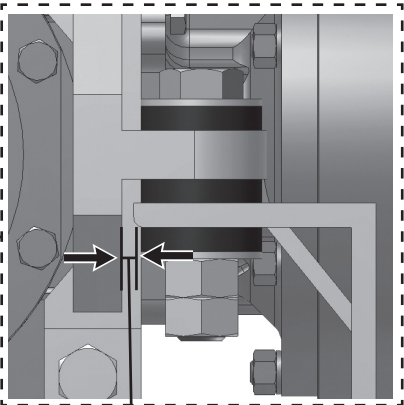
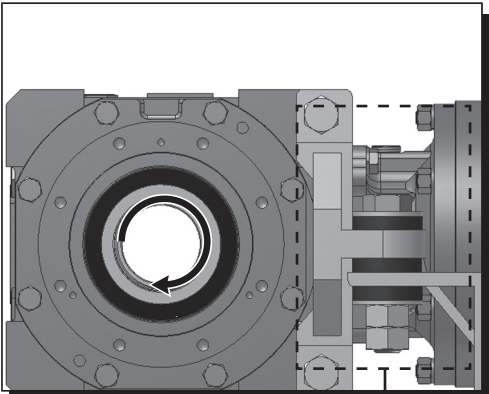
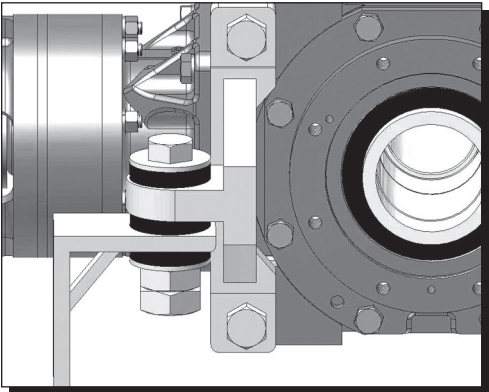
 Compressed bushings will not allow the bushings to properly absorb the loads of the shaft mounted gearbox. This can lead to premature failure.

Mounting angle bracket must be secured to the machine structure.

5

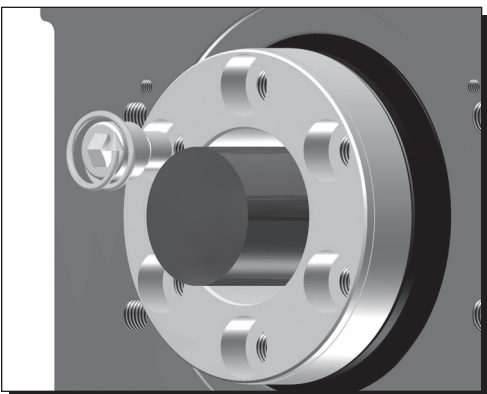
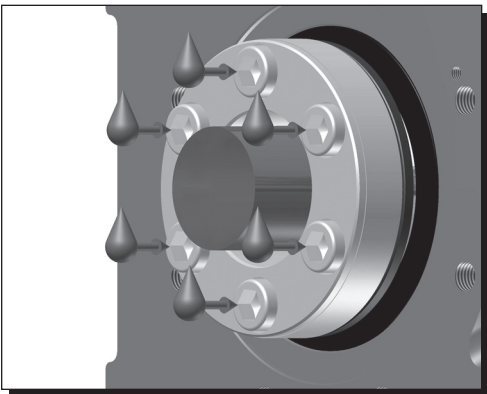
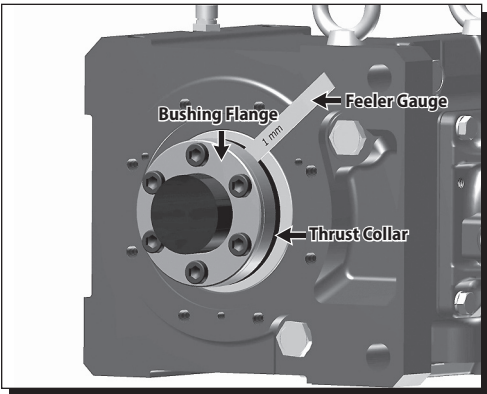
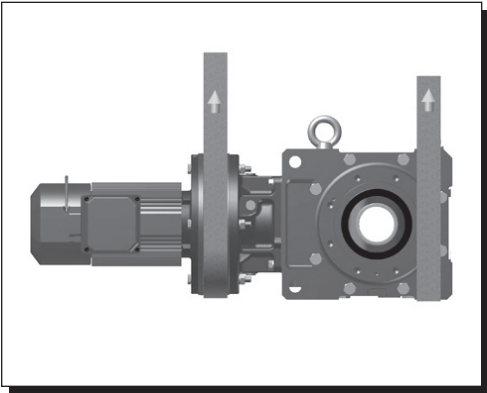
Confirm the mounting angle bracket does not interfere with the torque arm. There should be no metal-to-metal contact between the two during a complete revolution of the driven equipment.

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



Removal from Driven Shaft

Removal of Cyclo® BBB4 with Taper-Grip® Bushing



Removal of Cyclo® BBB4 with Taper-Grip® Bushing

- STOP

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 Cyclo® BBB4 unit such that all unit weight is removed from the driven shaft.
- !

The weight of the Cyclo® 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

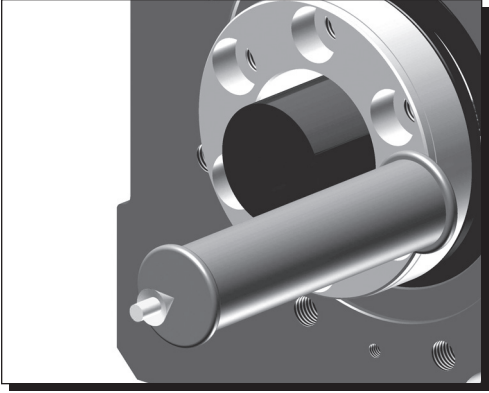
Apply a liquid-penetrant onto each of the Taper-Grip® bushing socket-head cap screws. Allow time for the penetrant to settle into the threads of the screws.

- 4

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

Removal from Driven Shaft, continued

Removal of Cyclo® BBB4 with Keyed Hollow Bore



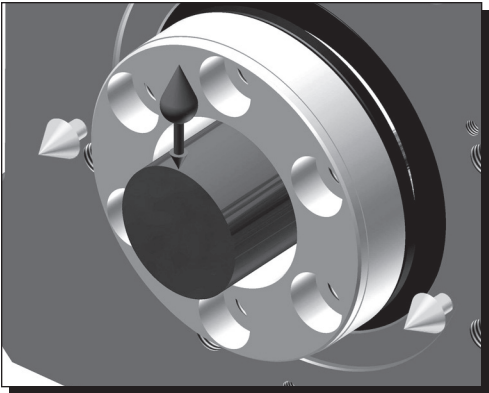
- 5

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 17 may be used to ease the removal process. **Sumitomo does not supply the removal jig . This information is supplied for reference only.**

Table 17. 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 Cyclo® 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 Cyclo® BBB4 with Keyed Hollow Bore

- STOP

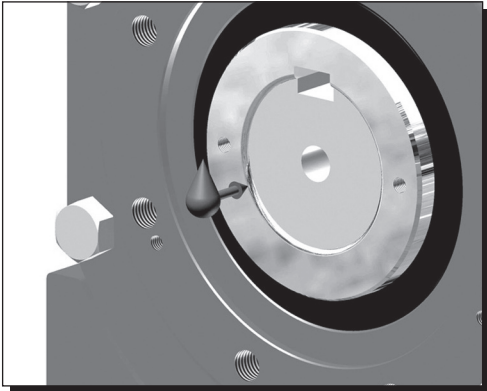
Before starting unit removal process, ensure that electrical power to unit has been safely locked out and that electrical connections to the unit have been disconnected.

- 1

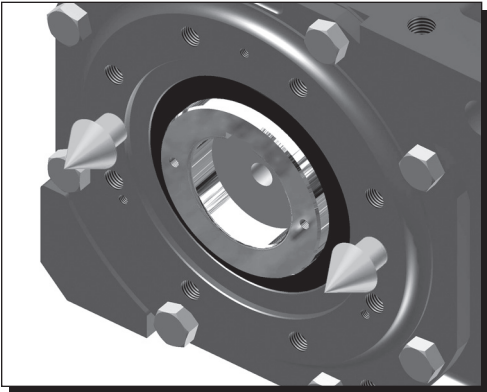
Remove safety cover and the shaft-retaining device from the driven shaft.

Removal from Driven Shaft, continued

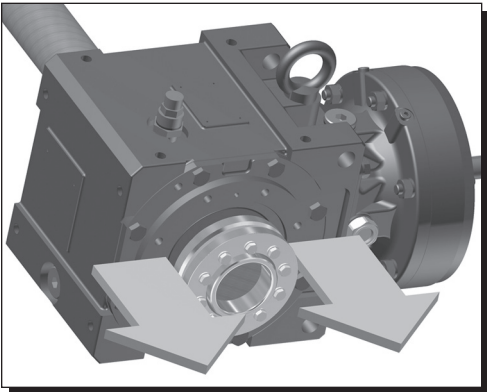
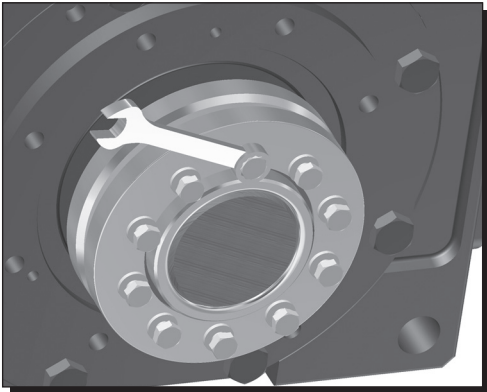
Removal of Cyclo® BBB4 with Shrink Disc



- 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 Cyclo® BBB4 from the driven shaft.



Removal of Cyclo® BBB4 with Shrink Disc

STOP 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.

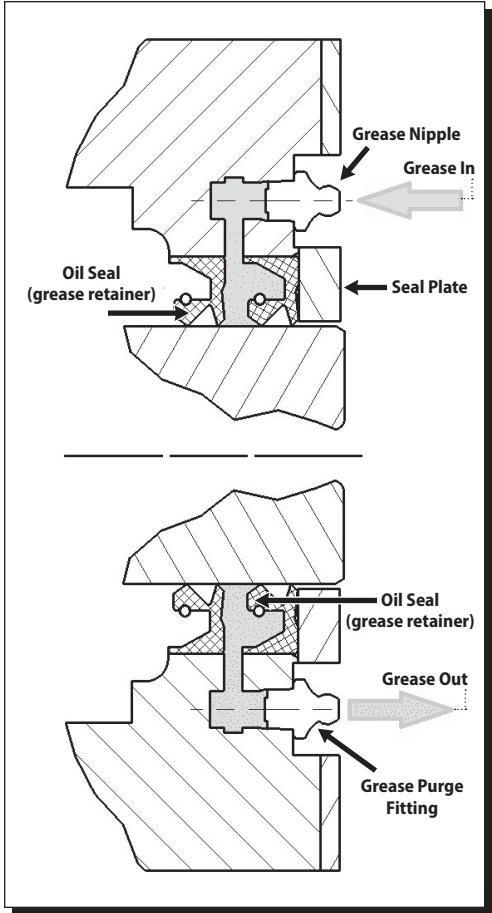
- 2
- Remove the gearbox from the shaft.

If shaft removal is difficult, a jig such as the one shown in the Removal of Cyclo® 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

Figure 1. 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 1 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:

- a. Unless otherwise specified, the Taconite output seals are each packed with NLGI #2 EP mineral grease prior to unit shipment from the factory location.
- b. **Grease does not need to be added to the seals prior to unit start-up.**
- c. Add grease to the seals according to the guidelines indicated in Table 18. Refer to Table 19 for recommended greases.

Table 18. 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 19. 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	Gadus S2 V220 2	Multis EP2
Food Grade					FM EP2					

- 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.

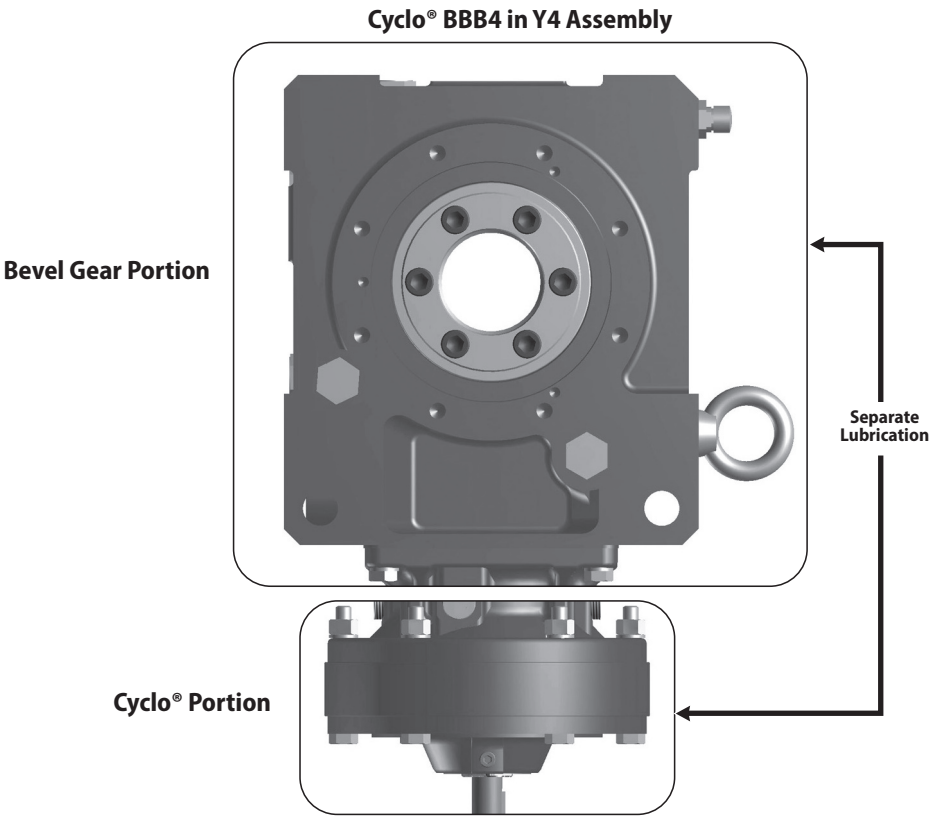
Lubrication Introduction

STOP Sumitomo Cyclo® BBB4s 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.

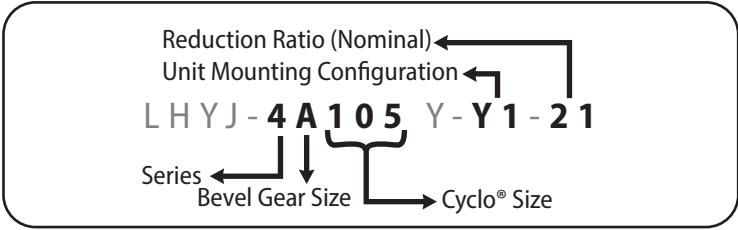
For all Y4 motor down mounting configuration models, the Cyclo® portion is filled at the factory with **grease**. For these units, the Cyclo® portion **does not** need to be filled with lubricant before start-up. The Bevel Gear portion of models built for the Y4 mounting configuration requires filling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

For the Cyclo® 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 20, 21a, and 21b to determine the unit’s lubrication method.

Table 20. Lubrication Method for Configurations Y1, Y3, Y5, Y6

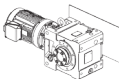
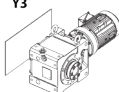
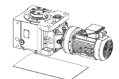
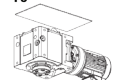
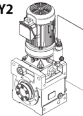
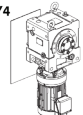
Mounting Configuration	Unit Size		Lubrication Method	
	Bevel Gear Size	Cyclo® Size		
Y1 	4A - 4F	100, 105, 110, 115, 120, 125, 140, 145, 160, 165, 170, 175, 180, 185, 190, 195	Complete Unit (Bevel Gear Portion and Cyclo® Portion)	Common Oil Sump
Y3 				
Y5 				
Y6 				

Table 21a. Lubrication Method for Y2 Configuration

Mounting Configuration	Unit Size		Lubrication Method	
	Bevel Gear Size	Cyclo® Size		
	4A-4F	100, 105, 110, 115, 120, 125, 140, 145, 160, 165, 170, 175, 180, 185, 190, 195	Complete Unit (Bevel Gear Portion and Cyclo® Portion)	Common Oil Sump
		10DA, 12DA, 12DB	Cyclo® Portion	Maintenance Free Grease ^[1]
			Bevel Gear Portion	Oil

Mounting Configuration	Unit Size		Lubrication Method	
	Bevel Gear Size	Cyclo® Size		
	4A-4F	100, 105, 110, 115, 120, 125	Cyclo® Portion	Maintenance Free Grease ^[1]
			Bevel Gear Portion	Oil
		140, 145, 160, 165, 170, 175, 180, 185, 190, 195	Cyclo® Portion	Grease ^[2]

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 27, 28 and 29 for the proper grease replenishment and change interval.

Lubrication, continued

Recommended Lubricants

Bevel Gear Portion and Cyclo® Portion Lubricants

Recommended Oils

Table 22, 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.

ExxonMobil:	Spartan EP	Shell Oil:	Omala S2 G	Kluber:	Kluberoil GEM1
ExxonMobil:	Mobilgear 600XP	Caltex:	Meropa	Idemitsu Oil:	Daphane Mechanic
ExxonMobil:	Mobil SHC Gear Hi-Shock 150	Castrol:	Alpha SP	BP Oil:	Energol GR-XP
Food Grade Oil:	Klübersynth UH1 6-460	Gulf Oil:	EP Lubricant HD	Total:	Carter EP

Table 22. Recommended Oils

° F	14	32	50	68	86	104	122
° C	-10	0	10	20	30	40	50
ISO VG							
		68 (14 °F to 41 °F)					
			100/150 (32 °F to 95 °F)				
					220/320/460 (86 °F to 122 °F)		

- Use lubricants with low viscosity for operation during winter or at relatively low temperatures.
- Use lubricant with a viscosity within the range listed in **Table 23, Recommended Oil Viscosity**.

Table 23. Recommended Oil Viscosity

Minimum allowable viscosity	15 cSt (<i>mm²/s</i>) or more at operating temperature	Viscosity that ensures oil film strength adequate for load transmission.
Maximum allowable viscosity	4300 cSt (<i>mm²/s</i>) max.	Viscosity that permits start-up of Buddybox®

- Consult local distributor, nearest authorized agent or Sumitomo directly when the unit will be operated in ambient temperatures other than 14° – 104°F (-10° – 40°C). Special unit modifications may be necessary.

Cyclo® Portion Approved Greases

Table 24, 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 24. Cyclo® Portion Approved Greases

Ambient Temp. °F (C)	Overall Reduction Ratio	All Unit Sizes
14° – 122°F (-10° – 50°C)	11:1 through 18:1	Shell Gadus S2 V220 NLGI 00
	19:1 and higher	ExxonMobil Unirex N2 grease

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

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 filler plug', and 'Oil fill air vent' as referenced in Figure 2.
2. Slowly add oil while checking the level through the oil gauge.
3. After the oil has settled, make sure **the level is visible** in the oil gauge.
4. Re-install 'Oil filler plug', and 'Oil fill air vent' after wrapping it with sealing compound or tape.

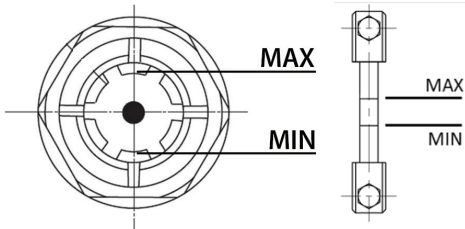
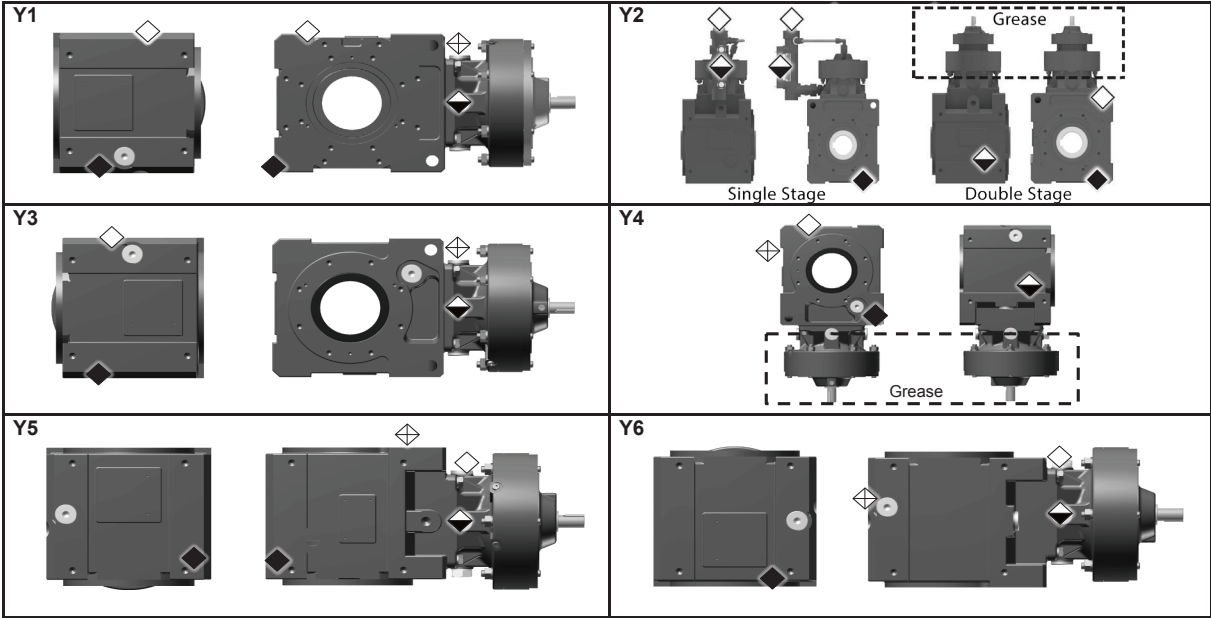


Table 27. Oil Change Intervals

Task	Change interval		Conditions of use
Supply of Oil	At installation		All
Oil Change	First Change	500 hrs operation or 6 months, whichever comes first.	All
	Second change and thereafter	2500 hrs operation or 6 months, whichever comes first.	When case oil temperature is 158° F (70° C) or higher
		5000 hrs operation or 1 year, whichever comes first.	When case oil temperature is lower than 158° F (70° C)

Note: Units supplied with Mobil SHC Gear Hi-Shock 150 may double the oil change intervals.

Figure 2. Oil Fill/Drain Locations



◇=Oil filler plug ◆=Oil level (Oil gauge) ◆=Oil drain plug ◇=Oil fill air vent

Oil Discharge Procedure

1. Remove the drain plug as shown in Figure 2, 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.

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 25 & 26. 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 & Y2 double reduction** units is grease lubricated at the factory. Additional grease is not required before initial start-up. All assemblies other than **Y4 & Y2** have oil lubricated Cyclo® portions. The following tables are provided for user rebuild or refurbishment reference.

Table 28. Single Reduction Approximate Grease Quantity

Units: ounce (*gram*)

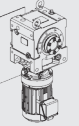
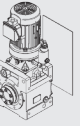
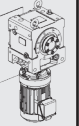
Unit Size	Unit Lubrication Portion	Lube Quantity oz. (<i>gram</i>)
		Y4  only
4A100/105	Cyclo®	4.24 (120)
4A110/115		6.71 (190)
4A120/125		8.83 (250)
4A140/145		15.89 (450)
4B120/125		8.83 (250)
4B140/145		15.89 (450)
4B160/165		26.48 (750)
4C140/145		15.89 (450)
4C160/165		26.48 (750)
4C170/175		35.3 (1000)
4D160/165		26.48 (750)
4D170/175		35.3 (1000)
4E170/175		35.3 (1000)
4F180/185		38.8 (1100)
4F190/195		52.9 (1500)

Table 29. Double Reduction Approximate Grease Quantity

Units: ounce (*gram*)

Unit Size	Cyclo® Stage	Lube Quantity oz. (<i>gram</i>)
		Y2  & Y4 
4A10DA	First (Input)	0.88 (25)
	Second	4.24 (120)
4A12DA	First (Input)	0.88 (25)
	Second	8.83 (250)
4A12DB	First (Input)	2.12 (60)
	Second	8.83 (250)
4B12DA	First (Input)	0.88 (25)
	Second	8.83 (250)
4B12DB	First (Input)	2.12 (60)
	Second	8.83 (250)
4B14DA	First (Input)	0.88 (25)
	Second	15.86 (450)
4B14DB	First (Input)	2.12 (60)
	Second	15.86 (450)
4C14DA	First (Input)	0.88 (25)
	Second	15.86 (450)
4C14DB	First (Input)	2.12 (60)
	Second	15.86 (450)
4C14DC	First (Input)	4.24 (120)
	Second	15.86 (450)
4C16DA	First (Input)	2.12 (60)
	Second	26.48 (750)
4C16DB	First (Input)	4.24 (120)
	Second	26.48 (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 28 and 29. 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 30. 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 31. 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 28 & 29 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 28 and 29.
- Adding too much grease may cause the grease temperature to rise or force the grease to leak into the motor.

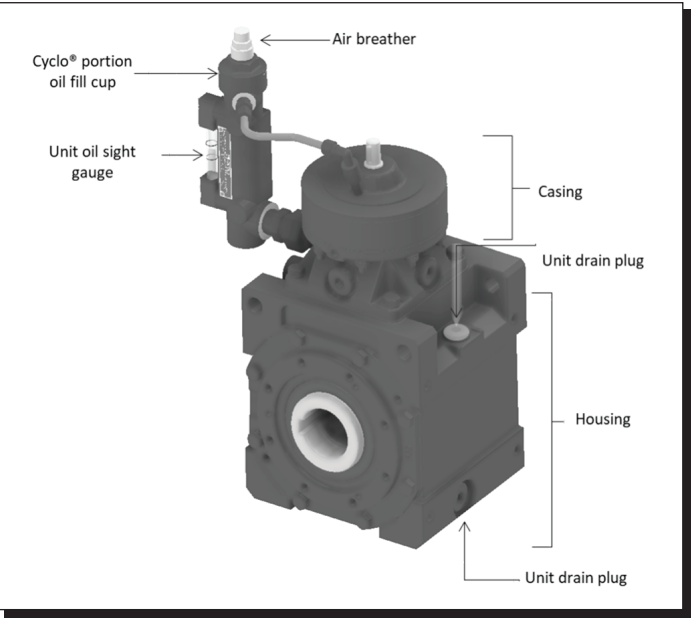
- Consider implementing a lube analysis program to ensure lubricant continues to operate at peak performance.
- Follow your lubrication providers analysis recommendations to ensure reducer performance.
- Always consult factory and warehouses for overhaul of gearmotors and reducers. Experience is necessary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

Y2 Oil Fill & Drain Procedures

Oil Fill Process

Affected Unit Sizes

This document is intended for all Cyclo® Bevel Buddybox® (BBB) 4 series units built in the Y2 mounting (motor up) configuration.

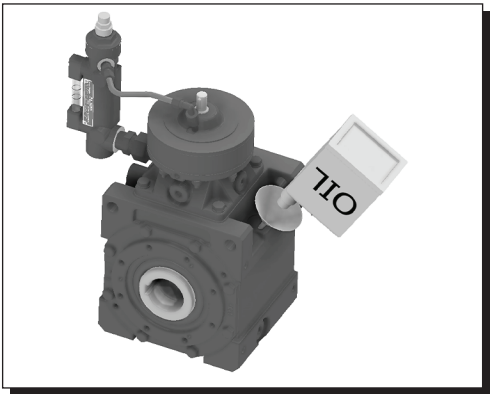
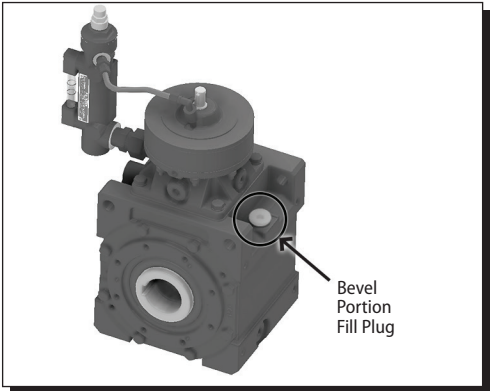


Oil Fill Process

CAUTIONARY NOTE:

- Use only those lubricating oils approved by Sumitomo Drive Technologies for use in the Cyclo® 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.

Single Reduction



- 1

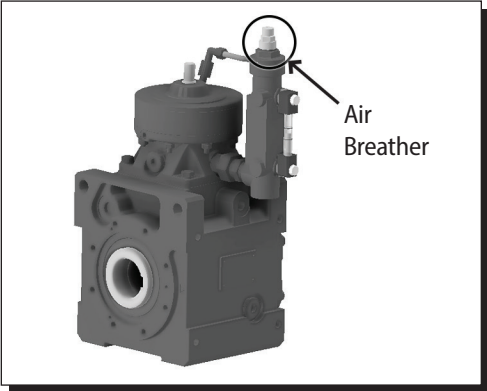
Identify the bevel portion oil fill plug on the bevel gear housing. Carefully remove the plug and put aside for reinsertion after oil fill is complete.
- 2

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

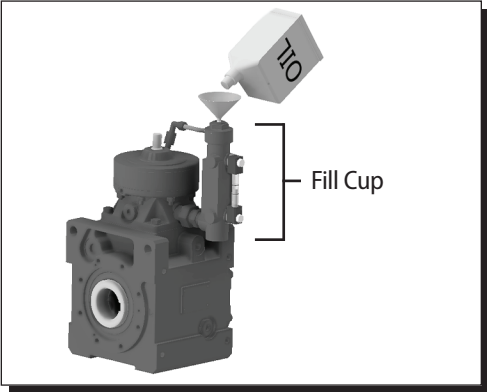
The bevel portion is considered full when the oil level reaches the oil fill port.

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

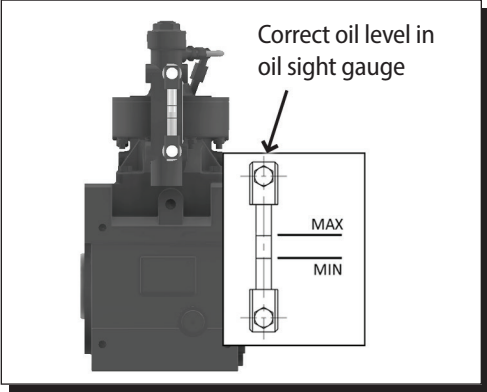
Oil Fill Process



3
Carefully remove the unit Air Breather assembly and put aside for reinsertion after oil fill process is complete.

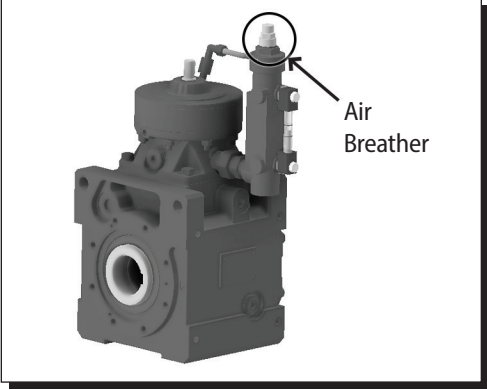


4
Slowly fill the Cyclo® (input) portion with the correct type and grade of oil as used in STEP #2 of this process.
NOTE: The oil fill cup may immediately become full during the process. In such an event, stop the fill process and allow the oil to drain from the cup into the reducer.



5
The input portion is considered full when the oil level stabilizes in the middle of the oil sight gauge.

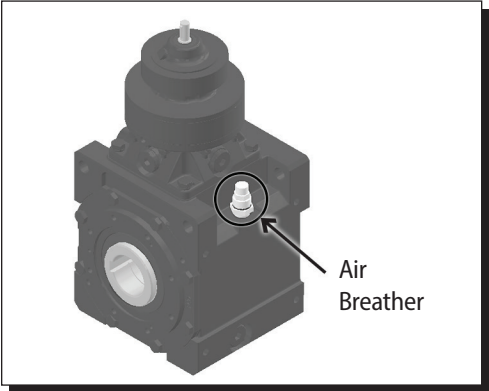
 Check gauge carefully. Oil film from fill procedure can distort view.
Be sure to check the oil level after a few minutes of operation. Stop equipment and check gauge as shown in step 5. Adjust oil level as required.



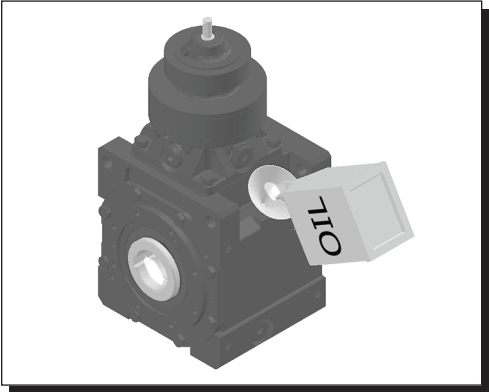
6
Once the input portion of the unit is filled to the correct level with lubricant, carefully reinsert the air breather assembly into the oil fill cup.

Oil Fill Process

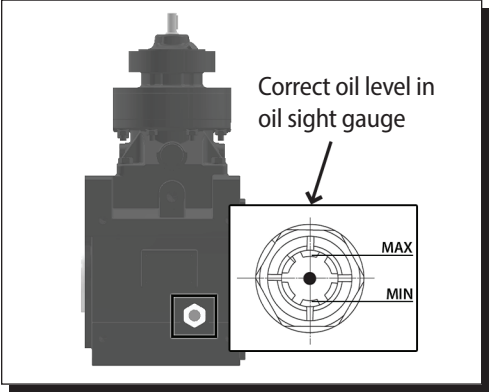
Double Reduction



1
Carefully remove the unit Air Breather assembly and put aside for reinsertion after oil fill process is complete.

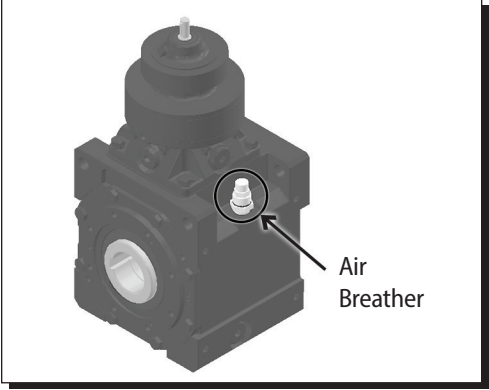


2
Fill the bevel portion with the appropriate type and grade of oil.



3
The output 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.



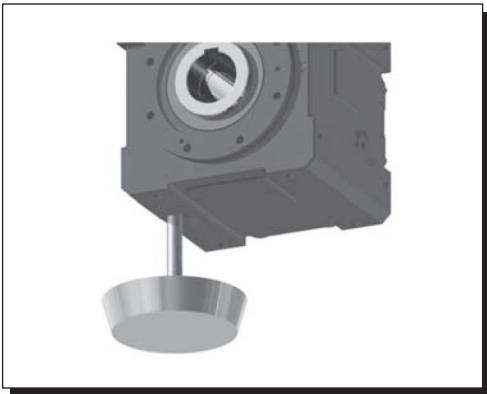
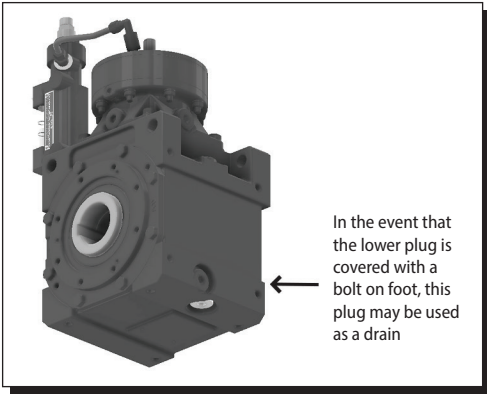
4
Once the output portion of the unit is filled to the correct level with lubricant, carefully reinsert the air breather assembly into the oil fill cup.

Oil Drain Process

CAUTIONARY NOTE:



- Exercise extreme caution when draining the lubricating oil from the Cyclo® 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 32.

Table 32. Plug sizes and tightening torque values

Plug Sizes			Torque Value		
Unit Size	Housing	Casing	Size	lb-in	N•m
4A	1/2	1/2	1/2	13.1	17.8
4B	1/2	1/2	3/4	22.1	30.0
4C	3/4	1/2	1	30.4	41.2
4D	3/4	1/2			
4E	3/4	1/2			
4F	3/4	1/2			

Table 33. BBB4 Y2 Single Reduction Oil Quantity*

Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
4A10	0.86	3.26
4A11	0.89	3.36
4A12	0.93	3.51
4A14	1.08	4.11
4B12	1.74	6.61
4B14	1.93	7.31
4B16	2.06	7.80
4C14	3.01	11.4
4C16	3.17	12.0

Table 34. BBB4 Y2 Double Reduction Oil Quantity*

Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
4A10DA	0.26	1.00
4A12DA	0.26	1.00
4A12DB	0.26	1.00
4B12DA	0.53	2.00
4B12DB	0.53	2.00
4B14DA	0.53	2.00
4B14DB	0.53	2.00
4C14DA	0.92	3.50
4C14DB	0.92	3.50
4C14DC	0.92	3.50

* All oil quantities are estimates

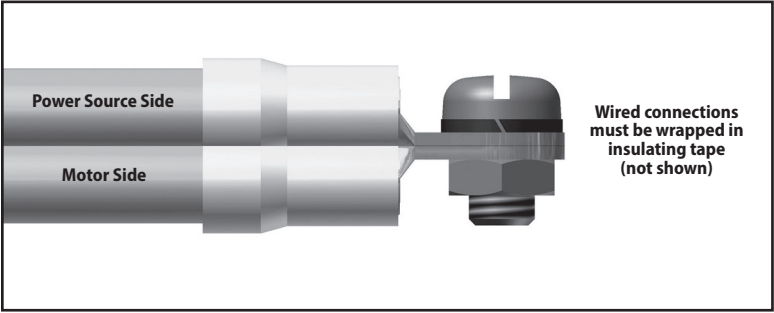
Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
4C17	3.37	12.8
4D16	5.31	20.1
4D17	5.48	20.8
4D18	5.62	21.3
4E17	7.67	29.1
4E18	7.76	29.4
4E19	8.10	30.7
4F18	10.5	39.7
4F19	10.8	40.9

Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
4C16DA	0.92	3.50
4C16DB	0.92	3.50
4C17DA	0.92	3.50
4D16DA	1.32	5.00
4D16DB	1.32	5.00
4D17DB	1.32	5.00
4D17DC	1.32	5.00
4E17DA	1.93	7.30
4E17DB	1.93	7.30
4E17DC	1.93	7.30

Wiring Guidelines

This section details wiring for standard Sumitomo three-phase motors and brakemotors. If using a motor manufactured by a company other than Sumitomo, please refer to that manufacturer’s instruction manual for wiring, operating and maintenance details. When wiring motors into the power supply, Sumitomo recommends the use of terminal rings to facilitate the connection:

Figure 3. Terminal Ring Wiring Connection



- STOP

 - Do not handle the unit when cables are live. Be sure to turn-off the power; otherwise electric shock may result.
 - Connect the power cables to the unit according to the connection diagram shown inside the terminal box or in the maintenance manual; otherwise electric shock or fire may result.
 - Correctly ground the grounding bolt; otherwise electric shock may result.
 - Keep all wiring and electrical parts dry and moisture free.
 - Follow local electrical codes and regulations when wiring; otherwise burning, electrical shock, injury and/or fire may result.
 - The motor is not equipped with an overload device. Sumitomo strongly recommends that another protective device (i.e.: ground fault interrupters, etc.), in addition to an overload device, be installed in order to prevent burning, electric shock, personal injury and/or fire.
 - For single phase motors, exercise caution so as to not damage the vinyl cover of the starting capacitor, otherwise shock may result.
 - For brakemotors, do not electrify a brake coil continuously when the motor is stopped otherwise the brake coil may burn and fire may result.
- !

 - For brakemotors, install the rectifier where the temperature is less than 140°F (60°C)
 - Long wires cause the voltage to drop. Select cables with appropriate diameter so that the voltage drop will be less than 2%.
 - After wiring the motor, check that the terminal box mounting bolts are tight.

Measuring Insulation Resistance

When measuring insulation resistance, disconnect the motor from the control panel. Check the motor separately.

- STOP

Never touch the terminals when measuring insulation resistance otherwise electrical shock may occur.

Measure the insulation resistance before wiring. Insulation resistance varies according to the motor voltage, insulation type, coil temperature, humidity, length of operation, test electrification time, etc.

Under most conditions, the insulation resistance exceeds the value shown in this table:

Table 35. Insulation Resistance

Mega-Ohm	Insulation Resistance
500V	1M (Ω)

A drop in resistance may be attributed to poor insulation. In such case, do not turn on the power. Contact the nearest Sumitomo representative, distributor, or sales office.

Motor Protection

- !

 - Use a molded case circuit breaker for protection against short circuit.
 - Use an overload protection device that protects the unit against voltage surges.

U.S. Standard Motors
Motor Wiring Method

- !

 - For additional information please refer to the motor name plate.
 - Due to changes in design features, this diagram may not always agree with that on the motor.
 - In such cases, connection diagram found inside the conduit box of the motor should be used.

1
Based on motor power, determine if motor is **WYE** or **DELTA** type

2
Wire the motor to the power source using the correct connection type:

Table 36. Typical 230/460V, Three-Phase Wiring Configuration by Motor Type

Motor HP (kW) x P	Standard		AF-Motor		EP.NA-Motor
	Non CSA	CSA	Non CSA	CSA	UL/CSA/CE
1/8 (0.1) x 4	WYE	WYE	WYE	WYE	
1/4 (0.2) x 4					
1/3 (0.25) x 4					
1/2 (0.4) x 4					
3/4 (0.55) x 4					
1 (0.75) x 4					
1.5 (1.1) x 4					
2 (1.5) x 4	DELTA	DELTA	DELTA	DELTA	DELTA
3 (2.2) x 4					
5 (3.7) x 4					
7.5 (5.5) x 4					
10 (7.5) x 4					
15 (11) x 4					
20 (15) x 4					
25 (18.5) x 4			—	—	
30 (22) x 4					
40 (30) x 4					
50 (37) x 4					
60 (60) x 4					
75 (56) x 4					

Figure 4. Three-Phase WYE Connection Motor

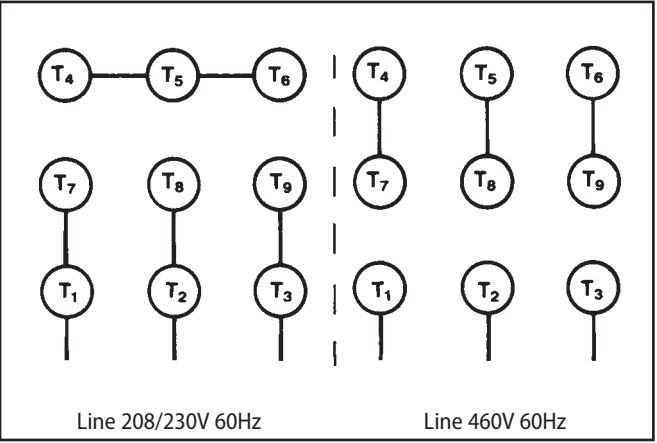


Figure 5. Three-Phase DELTA connection Motor

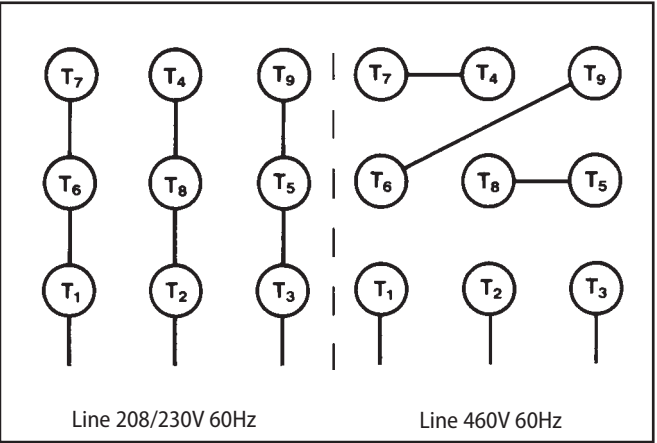


Figure 6. Three-Phase Motor, 575V, 60Hz

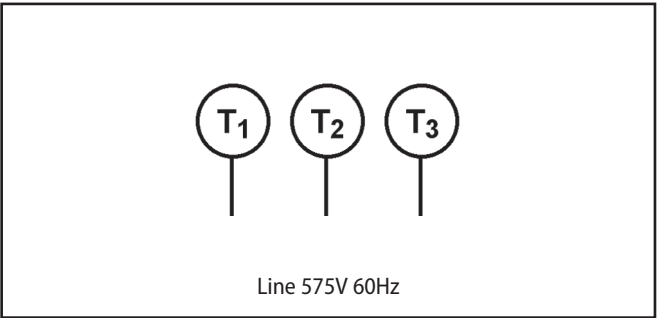
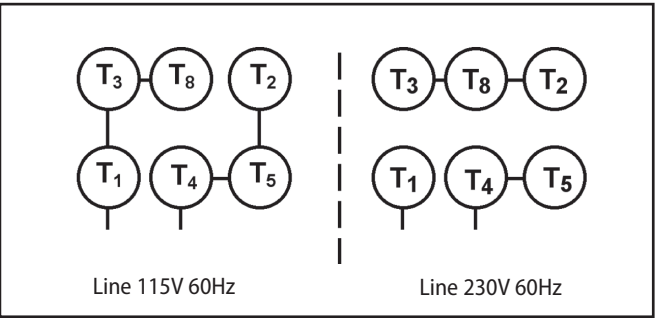


Figure 7. Single-Phase Motor, 115/230V, 60Hz



CE Motors

Table 37. Typical 220/380V, Three-Phase Wiring Configuration by Motor Type

Motor HP (kW) x P	Voltage Configuration	Wiring Configuration
1/8 (0.1) x 4	220/380V, 50Hz Three Phase	DELTA-WYE
1/4 (0.2) x 4		
1/3 (0.25) x 4		
1/2 (0.4) x 4		
3/4 (0.55) x 4		
1 (0.75) x 4		
1.5 (1.1) x 4		
2 (1.5) x 4	380V, 50Hz Three Phase	WYE-Start DELTA-Run
3 (2.2) x 4		
4 (3.0) x 4		
5 (3.7) x 4		
7.5 (5.5) x 4		
10 (7.5) x 4		
15 (11) x 4		
20 (15) x 4		
25 (18.5) x 4		
30 (22) x 4		
40 (30) x 4		

Brake Wiring

Varistor Selection

For wiring of Fast Brake Action, Sumitomo recommends the use of a Varistor (VR). Refer to Table 38 to assist in the selection of the appropriately sized Varistor.

Table 38. Varistor Specifications Table

Operating Voltage		190 - 230V	380-460V	575V
Varistor Rated Voltage Varistor Voltage		AC260-300V 430-470V	AC510V 820V	AC604V 1000V
Rated Watts	FB01A, 02A FB-05A FB-1D, 1E FB-2D, 3D, 1HE, 2E, 3E FB-5B, 8B, 5E, 8E FB10B, 15B, 10B1, 15B1, 10E, 15E	Over 0.4W Over 0.4W Over 0.6W Over 1.5W Over 1.5W Over 1.5W Over 1.5W	Over 0.4W Over 0.4W Over 0.6W Over 1.5W Over 1.5W Over 1.5W Over 1.5W	Over 0.4W Over 0.4W Over 0.6W Over 1.5W Over 1.5W Over 1.5W Over 1.5W
	FB-20, 30			Over 1.5W

Motor Wiring Method



- For additional information please refer to the motor name plate.
- Due to changes in design features, this diagram may not always agree with that on the motor.
- In such cases, connection diagram found inside the conduit box of the motor should be used.

1

Based on motor power, determine if motor is **WYE** or **DELTA** type.

2

Wire the motor to the power source using the correct connection type:

Figure 8. DELTA-WYE Connection Motor

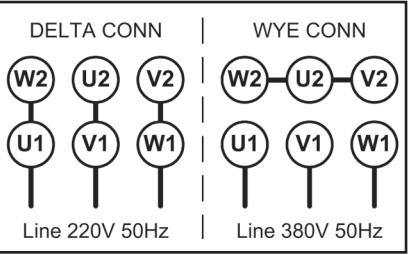
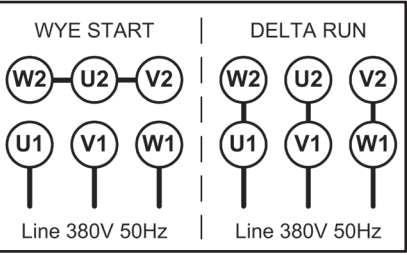


Figure 9. WYE-DELTA Start Connection Motor



U.S. Standard and CSA Approved Motor Brake Wiring

The brake portion (if supplied) of the motor may be wired using one of the following methods

Models FB-01A through FB-15B/FB-15E

Figure 10. Normal Brake Action, 230V, 575V

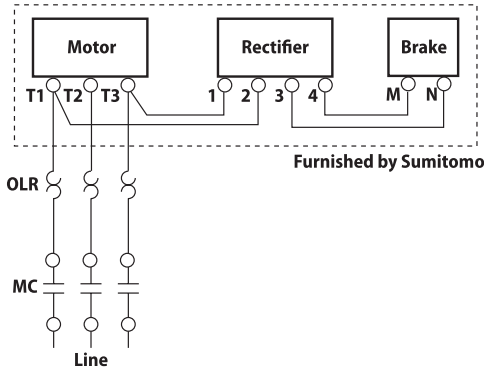


Figure 11. Fast Brake Action, 230V

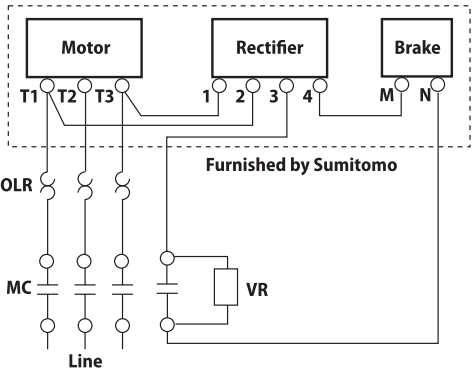


Figure 12. Normal Brake Action, 460V

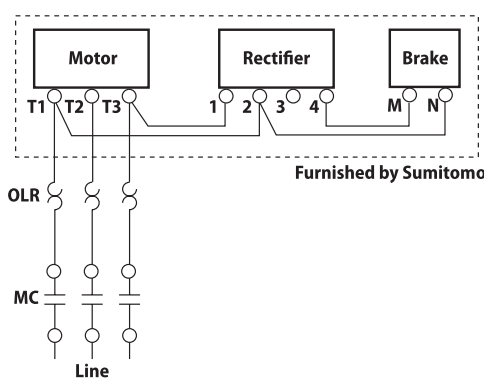
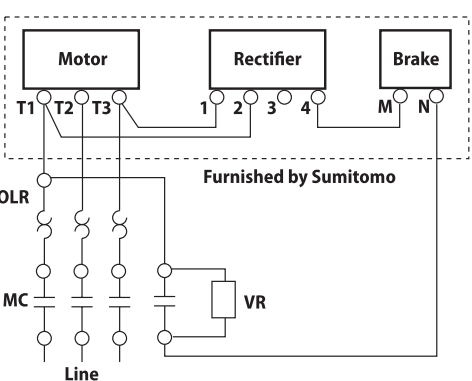


Figure 13. Fast Brake Action, 460V, 575V



MC: Electromagnetic Relay
MCB: Magnetic Circuit Breaker
OLR: Overload or Thermal Relay
VR: Varistor (protective device)^[1]

Note: [1] Refer to Varistor Specifications Table

U.S. Standard and CSA Approved Motor Brake Wiring

The brake portion (if supplied) of the motor may be wired using one of the following methods

Models FB-01A through FB-15B/FB-15E with Inverter

Figure 14. Normal Brake Action, 230V

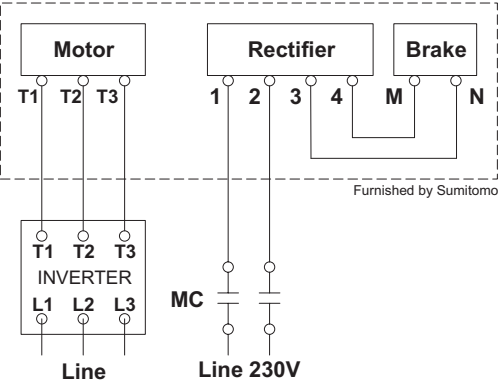


Figure 15. Fast Brake Action, 230V Brake

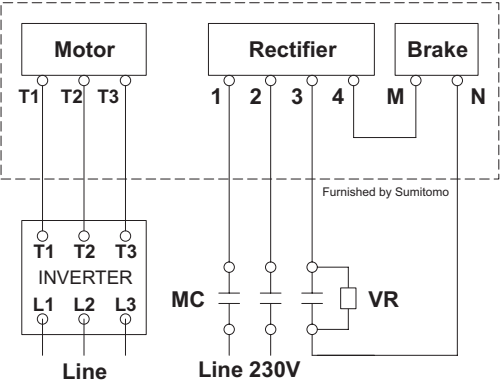


Figure 16. Normal Brake Action, 460V, 575V Brake

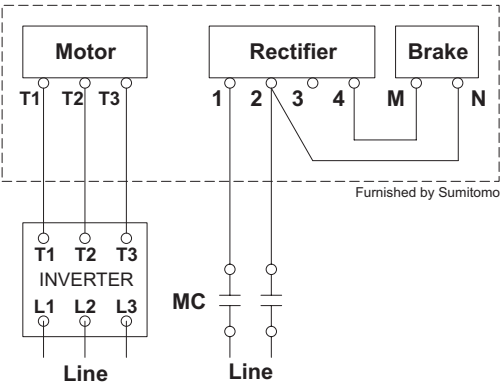
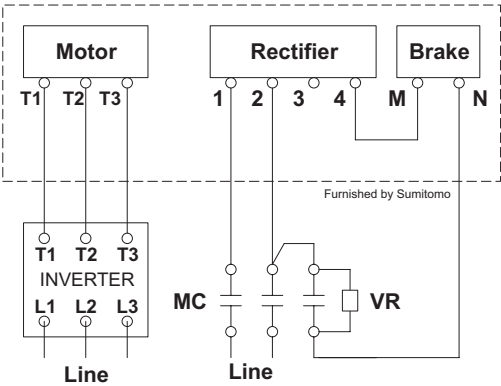
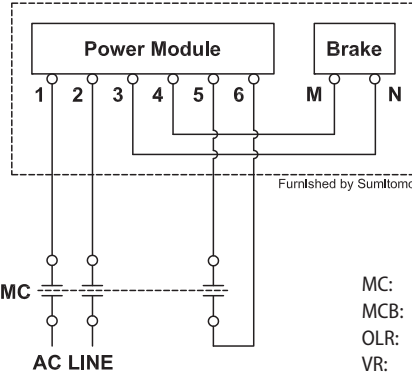


Figure 17. Fast Brake Action, 460V, 575V Brake



Models FB-20 / FB-30

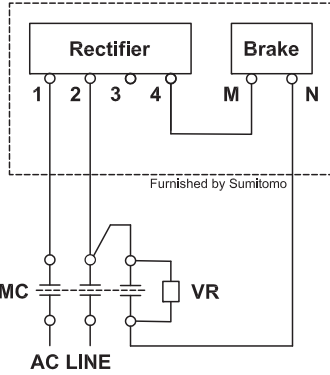
Figure 18. FB-20 and FB-30 Brake Wiring, 480VAC or less



MC: Electromagnetic Relay
MCB: Magnetic Circuit Breaker
OLR: Overload or Thermal Relay
VR: Varistor (protective device)^[1]

Note: [1] Refer to Varistor Specifications Table

Figure 19. FB-20 and FB-30 Brake Wiring, 575VAC



CE Motor Brake Wiring

Models FB-01A through FB-5B/FB-5E, 220/380V, 50Hz

Figure 20. Normal Brake Action, 220V Motor 220V Brake

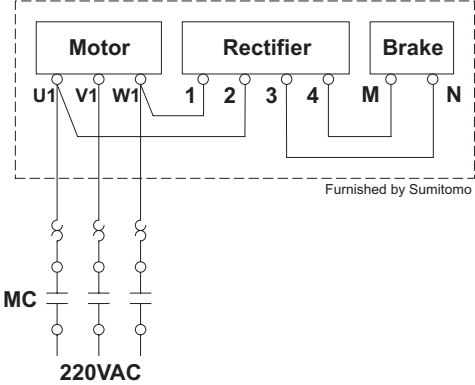


Figure 21. Fast Brake Action, 220V Motor 220V Brake

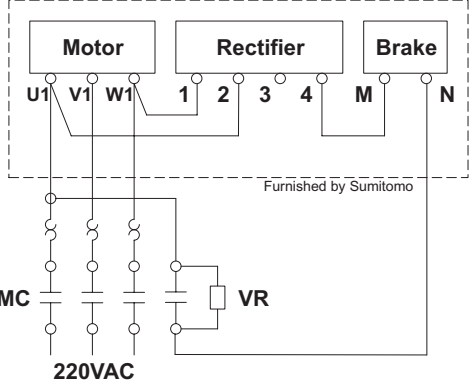


Figure 22. Normal Brake Action, 380V Motor, 220V Brake, Tapped

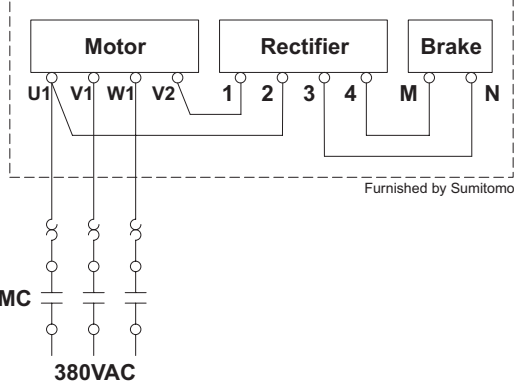


Figure 23. Fast Brake Action, 380V Motor, 220V Brake, Tapped

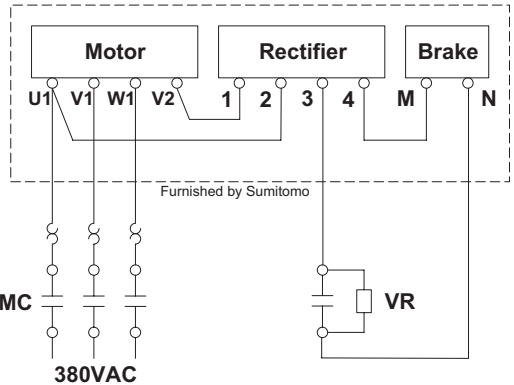
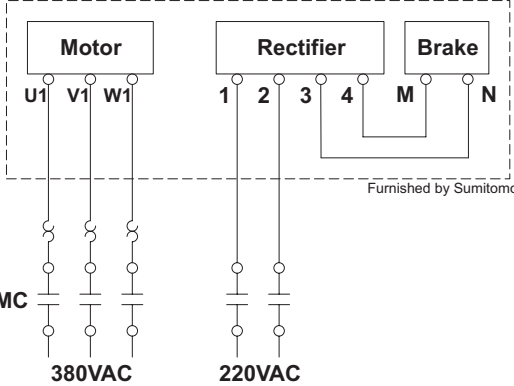


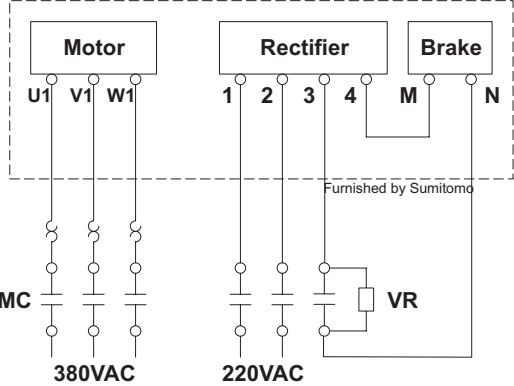
Figure 24. Normal Brake Action, 380V Motor, 220V Brake, Separated



MC: Electromagnetic Relay
MCB: Magnetic Circuit Breaker
OLR: Overload or Thermal Relay
VR: Varistor (protective device)^[1]

Note: [1] Refer to Varistor Specifications Table

Figure 25. Fast Brake Action, 380V Motor, 220V Brake, Separated



Motor Wiring, continued

CE Motor Brake Wiring

Models FB-8B/FB-8E through FB-15B/FB-5E

Figure 26. Normal Brake Action, 380V Motor, 380V Brake

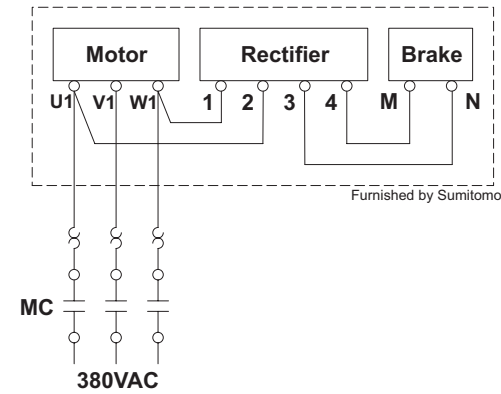
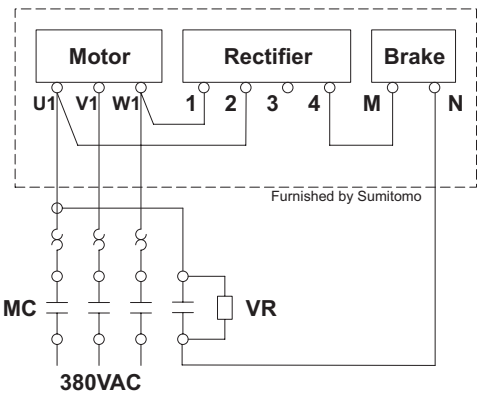


Figure 27. Fast Brake Action, 380V Motor, 380V Brake



CE Motors Models FB-01A through FB-15B/FB-15E with Inverter

Figure 28. Normal Brake Action

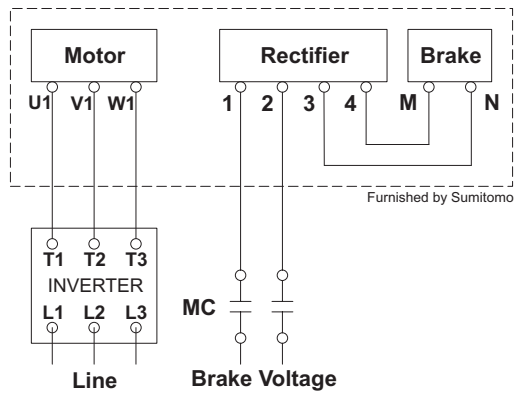
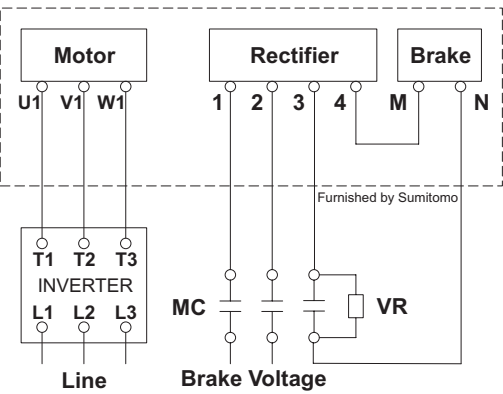


Figure 29. Fast Brake Action



CE Motor Brake Wiring

Models FB-20 / FB-30

Figure 30. FB-20 and FB-30 Brake Wiring, 480VAC or less

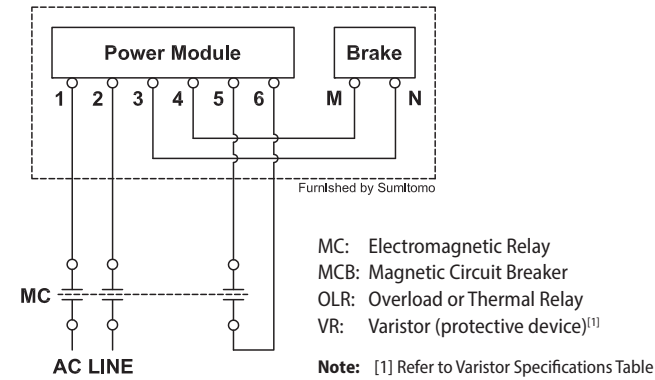


Table 26. Standard CE Motor, Motor / Brake Voltage Table

HP (kW) x P	Brake Model	Motor Voltage	Brake Voltage
1/8 (0.1) x 4	FB-01A	220/380V, 50Hz	220V, 50Hz
1/4 (0.2) x 4	FB-02A		
1/3 (0.25) x 4			
1/2 (0.4) x 4	FB-05A		
3/4 (0.55) x 4	FB-1D/FB-1E		
1 (0.75) x 4			
1.5 (1.1) x 4	FB-2D/FB-1HE/FB-2E		
2 (1.5) x 4			
3 (2.2) x 4	FB-3D/FB-3E		
4 (3) x 4	FB-5B/FB-4E/FB-5E		
5 (3.7) x 4			
7.5 (5.5) x 4	FB-8B/FB-8E	380V, 50Hz	380V, 50Hz
10 (7.5) x 4	FB-10B/FB-10E		
15 (11) x 4	FB-15B/FB-15E		

Motor Wiring, continued

Brake Rectifiers and Power Modules

Brake Rectifiers and Power Modules

Table 40. Standard Brake Rectifiers

Brake Type	Motor HP (kW) x P	230V/460V Rectifier		575V Rectifier	
		Model Number	Part Number	Model Number	Part Number
FB-01A	1/8 (0.1) x 4	25FW-4FB3	EW107WW-01	10F-6FB3	EW104WW-01
FB-02A	1/4 (0.2) x 4 1/3 (0.25) x 4				
FB-05A	1/2 (0.4) x 4				
FB-1D, 1E	3/4 (0.55) x 4 1 (0.75) x 4				
FB-2D, 1HE, 2E	1.5 (1.1) x 4 2 (1.5) x 4				
FB-3D, 3E	3 (2.2) x 4				
FB-5B, 5E	5 (3.7) x 4				
FB-8B, 8E	7.5 (5.5) x 4				
FB-10B, 10B1, 10E	10 (7.5) x 4				
FB-15B, 15B1, 15E	15 (11) x 4				
FB-20	20 (15) x 4				
FB-30	25 (18.5) x 4 30 (22) x 4 40 (30) x 4				

Table 41. Brake Rectifiers for CE Motors

Brake Type	Motor HP (kW) x P	220V Rectifier		380V Rectifier	
		Model Number	Part Number	Model Number	Part Number
FB-01A	1/8 (0.1) x 4	10F-2FB2	MP983WW-01	Consult Factory	Consult Factory
FB-02A	1/4 (0.2) x 4 1/3 (0.25) x 4				
FB-05A	1/2 (0.4) x 4				
FB-1D, 1E	3/4 (0.55) x 4 1 (0.75) x 4				
FB-2D, 1HE, 2E	1.5 (1.1) x 4 2 (1.5) x 4				
FB-3D, 3E	3 (2.2) x 4				
FB-5B, 4E, 5E	4 (3.0) x 4 5 (3.7) x 4				
FB-8B, 8E	7.5 (5.5) x 4				
FB-10B, 10B1, 10E	10 (7.5) x 4				
FB-15B, 15B1, 15E	15 (11) x 4				
		Consult Factory	Consult Factory	05F-4FB2	MP985WW-01
				15F-4FB1	EW397WW-01

Table 42. Brake Power Modules

Brake Type	Motor HP (kW) x P	170 ~ 300VAC Module		380 ~ 480VAC Module	
		Model Number	Part Number	Model Number	Part Number
FB-20	20 (15) x 4	13SR-2	ES075WW-01	10SR-4	MQ003WW-01
FB-30	25 (18.5) x 4				
	30 (22) x 4				
	40 (30) x 4				

Figure 31. Cyclo® BBB4 Reducer Parts

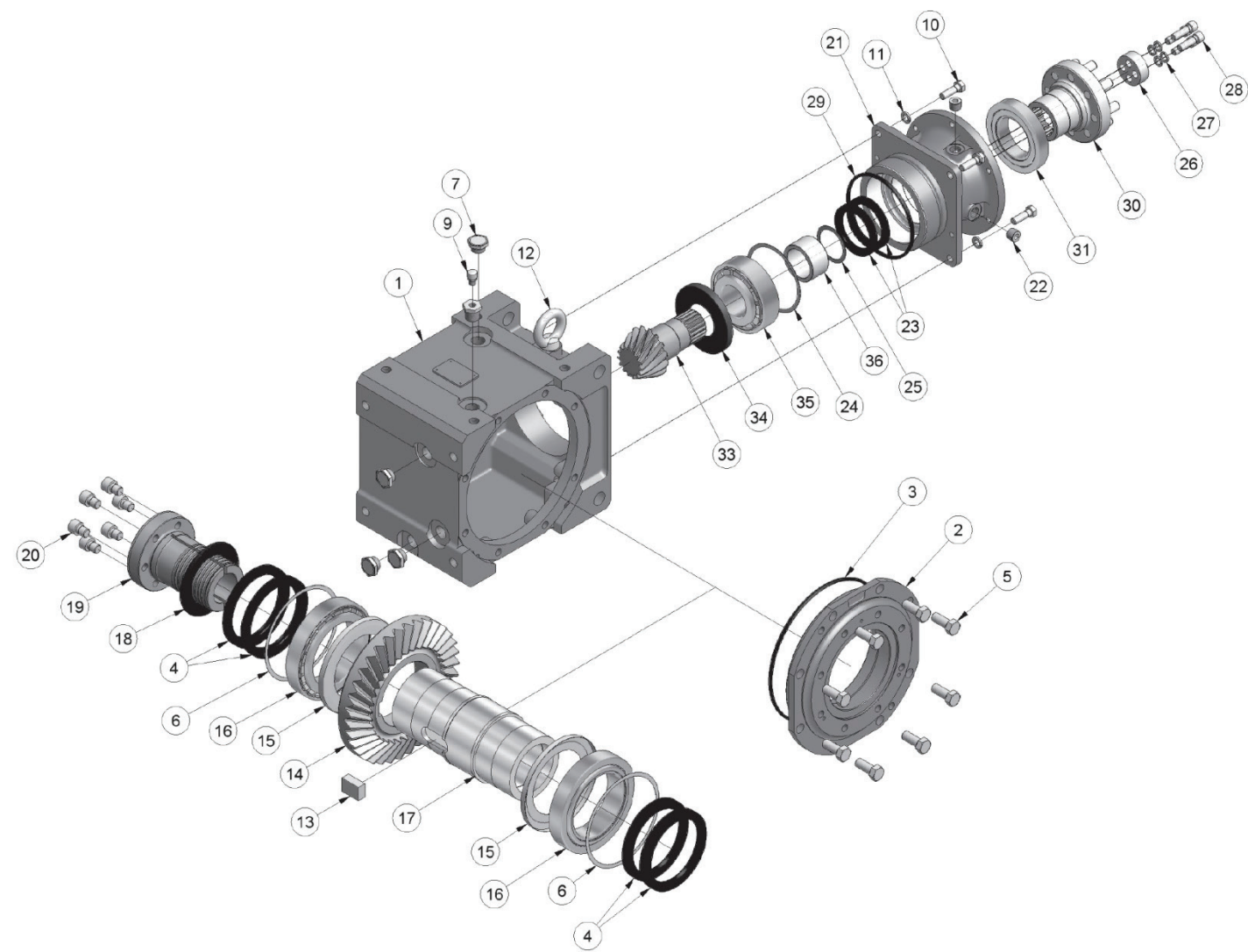


Table 43. Cyclo® BBB4 Reducer Parts

Item No.	Description	QTY	Model					
			A	B	C	D	E	F
0	Complete Output Assy. [1]	1	2190	2740	3652	6242	8052	17796
1	Gear Housing Only	1	1448	1862	2342	4406	5022	8900
2	Output Cover	1	406	474	698	1124	1228	1842
3	O-Ring	1	12	12	32	52	56	74
4	Oil Seal	4	58	72	102	126	136	318
5	Hex Head Bolt	8	16	16	16	22	22	36
6, 24, 25	Shim Set	Set	104	106	182	212	238	398
7	Plug	8	16	16	26	26	26	34
8	Bushing	1	10	10	12	12	12	24
9	Air Vent	1	24	24	24	24	24	36
10	Hex Head Bolt	4	26	26	26	26	26	38
11	Spring Washer	4	16	16	16	16	16	24
12	Eye Bolt	1	16	16	26	26	38	62
13	Key	1	48	58	58	76	118	198
14, 33	Bevel Gear & Pinion Shaft	Set	908	1202	2044	3548	4436	9604
15	Nilos Ring	2	58	74	86	112	198	230
16	Tapered Roller Bearing	2	186	186	420	660	994	1470
17	Taper-Grip® Output Hub	1	858	990	1560	2434	3128	4360
18, 19, 20	Taper-Grip® Bushing Assembly [2]	Set	256	318	446	540	690	1008
21	Flanged Casing	1	584	740	1234	1594	1640	1700
22	Hex Socket Plug	Set	18	18	28	28	28	36
23	Oil Seal (grease lube only)	2	12	16	36	48	48	48
24, 25	Shim	See Item #6						
26	End Plate	1	58	58	62	70	74	88
27	Lock Washer	4	12	12	16	22	22	26
28	Hex. Soc. Hd. Cap Screw	4	16	16	16	22	22	26
29	O-Ring	1	18	18	18	26	36	56
30	Pin Carrier	1	528	912	1218	1244	1250	1250
31	Tapered Roller Bearing	1	206	206	212	212	212	212
33	Bevel Pinion Shaft	See Item #14						
34	Nilos Ring	1	36	44	48	76	76	76
35	Tapered Roller Bearing	1	50	218	302	302	302	302
36	Collar or Spacer	1	136	136	138	168	168	168
	Standard Safety Cover	1	126	150	174	204	222	342
	Hinged Safety Cover	1	258	258	276	292	342	476

Note:
[1] TGB style or standard keyed hollow bores. Consult Factory (C/F) for other sizes or styles.
[2] Standard bushing sizes only, special bore sizes will be subject to bushing rework adder.

Cyclo® Planetary Reduction Component Parts

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

Figure 32. Cyclo® Planetary Reduction Component

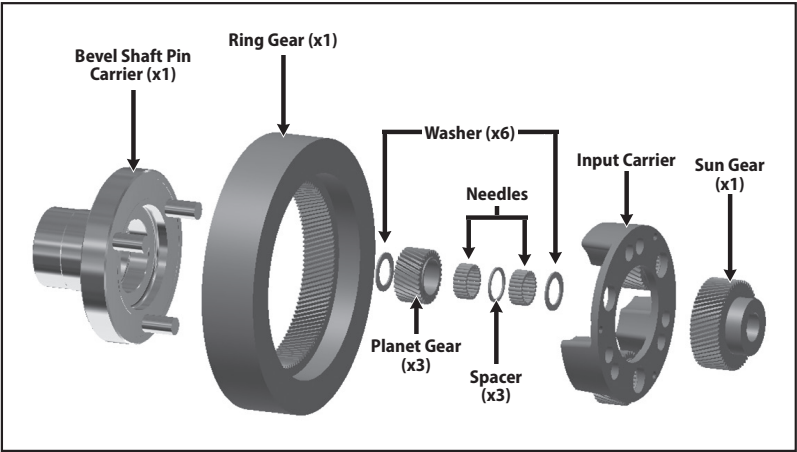


Table 44. Cyclo® Planetary Reduction Component Part Numbers (Ratios 11 - 18:1)

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					
	11	3:1	931BB612-003G	AP8712G	CJ584LG	AP8711G	AX2806G-3	AX2543G	AX2761G	CJ244LG	CJ701LG (for 4A) CJ703LG (for 4B)
4A120, 4A125 4B120, 4B125	13, 14	4:1	931BB612-004G	AP8706G	CJ554LG	AP8705G					
	16, 18	5:1	931BB612-005G	AP8714G	CJ585LG	AP8713G					
	11	3:1	931BB614-003G	AP8717G	CJ586LG	AP8716G	AX2807G-3	AX2763G	AX2544G	CJ588LG	CJ702LG (for 4A) CJ704LG (for 4B) CJ706LG (for 4C)
4A140, 4A145 4B140, 4B145 4C140, 4C145	13, 14	4:1	931BB614-004G	AP8708G	CJ555LG	AP8707G					
	16, 18	5:1	931BB614-005G	AP8719G	CJ587LG	AP8718G					
	11	3:1	931BB616-003G	AP8721G	CJ589LG	AP8720G	AX2808G-3	AX2555G	AX2554G	CJ591LG	CJ705LG (for 4B) CJ707LG (for 4C)
4B160, 4B165 4C160, 4C165	13, 14	4:1	931BB616-004G	AP8710G	CJ556LG	AP8709G					
	16, 18	5:1	931BB616-005G	AP8726G	CJ590LG	AP8722G					
	11	3:1	931BB617-003G	AP9278G	CJ993LG	AP9277G	AX3077G-3	AX3061G	AX3060G	CJ996LG	CJ938LG (for 4C) CK009LG (for 4D, 4E)
4C170, 4C175 4D170, 4D175 4E170, 4E175	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-3	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-3	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)

Cyclo® Reduction Component Parts

Cyclo® BBB4 Reduction Component Part Numbers (Ratios≥ 19:1)

Figure 34. Cyclo® BBB4 Reduction Components - 4A100 thru 4F195

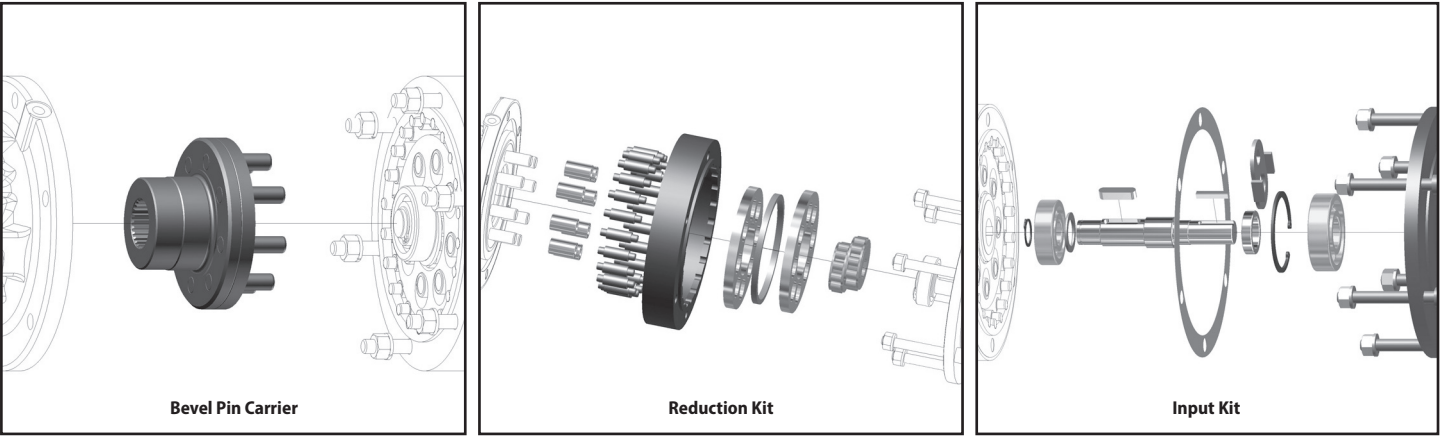


Table 45. Cyclo® BBB4 Reduction Component Part Numbers (Ratios ≥ 19:1)

Unit Size	Reduction Ratio		Part Numbers		
	Overall	Cyclo®	Input Kit	Reduction Kit	Bevel Pin Carrier
4A100 4A105	19, 21	6	D78622	D78675	BL514LG
	22, 25	7		See Note ^[1]	
	26, 28	8		D78676	
	35, 39	11		D78677	
	42, 46	13		D78678	
	48, 53	15		D78679	
	54, 60	17		D78680	
	67, 74	21		D78681	
	80, 88	25		D78682	
	93, 102	29		D78683	
	112, 123	35		D78684	
	138, 151	43		D78685	
	163, 179	51		D78686	
	189, 207	59		D78687	
	227, 249	71		D78688	
	278, 305	89		D78689	
	364	104		See Note ^[1]	
	364, 417	119		See Note ^[1]	
	≥ 424	≥ 121		See Note ^[1]	
4A110 4A115	19, 21	6	D78504	D78520	CJ690LG
	22, 25	7		See Note ^[1]	
	26, 28	8		D78521	
	35, 39	11		D78522	
	42, 46	13		D78523	
	48, 53	15		D78524	
	54, 60	17		D78525	
	67, 74	21		D78526	
	80, 88	25		D78527	
	93, 102	29		D78528	
	112, 123	35		D78529	
	138, 151	43		D78530	
	163, 179	51		D78531	
	189, 207	59		D78532	
	227, 249	71		D78533	
	278, 305	87		D78534	
	364	104		See Note ^[1]	
	364, 417	119		See Note ^[1]	
	≥ 424	≥ 121		See Note ^[1]	

Note: [1] Consult Factory

Parts, continued

Cyclo® Reduction Component Parts

Table 46. Cyclo® BBB4 Reduction Components Part Numbers (Ratios >19:1), continued

Unit Size	Reduction Ratio		Part Numbers			
	Overall	Cyclo®	Input Kit	Reduction Kit	4A12 Bevel Pin Carrier	4B12 Bevel Pin Carrier
4A120 4A125 4B120 4B125	19, 21	6	D78623	D78690	CJ691LG	CJ693LG
	22, 25	7		See Note ^[1]		
	26, 28	8		D78691		
	35, 39	11		D78692		
	42, 46	13		D78693		
	48, 53	15		D78694		
	54, 60	17		D78695		
	67, 74	21		D78696		
	80, 88	25		D78697		
	93, 102	29		D78698		
	112, 123	35		D78699		
	138, 151	43		D78700		
	163, 179	51		D78701		
	189, 207	59		D78702		
	227, 249	71		D78703		
	278, 305	89		D78704		
	364	104		See Note ^[1]		
	364, 417	119		See Note ^[1]		
	> 424	> 121		See Note ^[1]		
4A140 4A145 4B140 4B145 4C140 4C145	19, 21	6	D78623	D78535	CJ692LG	CJ694LG CJ696LG
	22, 25	7		See Note ^[1]		
	26, 28	8		D78536		
	35, 39	11		D78537		
	42, 46	13		D78538		
	48, 53	15		D78539		
	54, 60	17		D78540		
	67, 74	21		D78541		
	80, 88	25		D78542		
	93, 102	29		D78543		
	112, 123	35		D78544		
	138, 151	43		D78545		
	163, 179	51		D78546		
	189, 207	59		D78547		
	227, 249	71		D78548		
	278, 305	89		D78549		
	364	104		See Note ^[1]		
	364, 417	119		See Note ^[1]		
	> 424	> 121		See Note ^[1]		

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo®	Input Kit	Reduction Kit	4B16 Bevel Pin Carrier	4C16 Bevel Pin Carrier	4D16 Bevel Pin Carrier
4B160 4B165 4C160 4C165 4D160 4D165	19, 21	6	D78625	D78720	CJ695LG	CJ697LG	CJ699LG
	22, 25	7		See Note ^[1]			
	26, 28	8		D78721			
	35, 39	11		D78722			
	42, 46	13		D78723			
	48, 53	15		D78724			
	54, 60	17		D78725			
	67, 74	21		D78726			
	80, 88	25		D78727			
	93, 102	29		D78728			
	112, 123	35		D78729			
	138, 151	43		D78730			
	163, 179	51		D78731			
	189, 207	59		D78732			
	227, 249	71		D78733			
	278, 305	89		D78734			
	364	104		See Note ^[1]			
	364, 417	119		See Note ^[1]			
	> 424	> 121		See Note ^[1]			

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo®	Input Kit	Reduction Kit	4D18 Bevel Pin Carrier	4E18 Bevel Pin Carrier	4F18 Bevel Pin Carrier
4D180 4D185 4E180 4E185 4F180 4F185	19, 21	6	D78627	See Note ^[1]	CJ655LG		CJ657LG
	22, 25	7		See Note ^[1]			
	26, 28	8		See Note ^[1]			
	35, 39	11		D78749			
	42, 46	13		D78750			
	48, 53	15		D78751	CK012LG	CK016LG	
	54, 60	17		D78752			
	67, 74	21		D78753			
	80, 88	25		D78754			
	93, 102	29		D78755			
	112, 123	35		D78756			
	138, 151	43		D78757			
	163, 179	51		D78758			
	189, 207	59		D78759			
	227, 249	71		D78760			
	278, 305	87		D78761			

Note: [1] Consult Factory

Parts, continued

Bearings and Oil Seals

Bearings and Oil Seals

Figure 34. Cyclo® BBB4 Bearings and Oil Seals

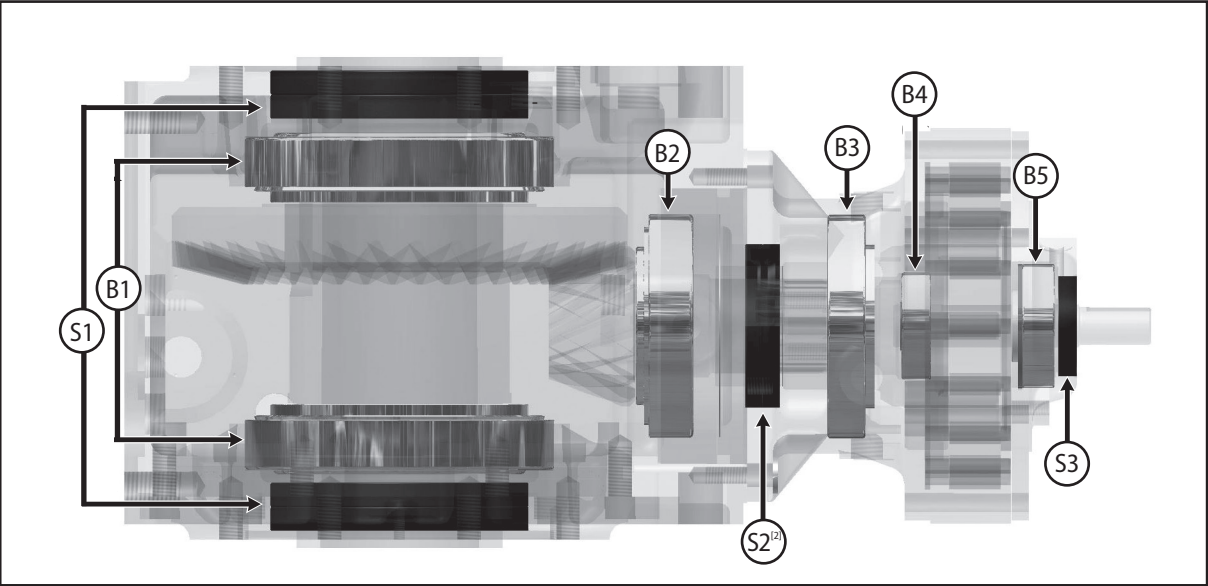


Table 47. Cyclo® BBB4 Reducer Bearings and Oil Seals

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
4B120 4B125 4B140 4B145 4B160 4B165			32013	6304	6305Z			D 32 x 52 x 8
4C140 4C145 4C160 4C165			32015	6305R	6306			D 38 x 58 x 11
4D160 4D165 4D170 4D175 4D180 4D185			32013	6304	6305Z			D 32 x 52 x 8
4E170 4E175 4E180 4E185			32015	6305R	6306			D 38 x 58 x 11
4F180 4F185 4F190 4F195			32017	6307R	6308			D 55 x 78 x 12
4G190 4G195 4G200 4G205 4G210 4G215 4G220 4G225 4G230 4G235 4G240 4G245 4G250 4G255 4G260 4G265 4G270 4G275 4G280 4G285 4G290 4G295 4G300 4G305 4G310 4G315 4G320 4G325 4G330 4G335 4G340 4G345 4G350 4G355 4G360 4G365 4G370 4G375 4G380 4G385 4G390 4G395 4G400 4G405 4G410 4G415 4G420 4G425 4G430 4G435 4G440 4G445 4G450 4G455 4G460 4G465 4G470 4G475 4G480 4G485 4G490 4G495 4G500 4G505 4G510 4G515 4G520 4G525 4G530 4G535 4G540 4G545 4G550 4G555 4G560 4G565 4G570 4G575 4G580 4G585 4G590 4G595 4G600 4G605 4G610 4G615 4G620 4G625 4G630 4G635 4G640 4G645 4G650 4G655 4G660 4G665 4G670 4G675 4G680 4G685 4G690 4G695 4G700 4G705 4G710 4G715 4G720 4G725 4G730 4G735 4G740 4G745 4G750 4G755 4G760 4G765 4G770 4G775 4G780 4G785 4G790 4G795 4G800 4G805 4G810 4G815 4G820 4G825 4G830 4G835 4G840 4G845 4G850 4G855 4G860 4G865 4G870 4G875 4G880 4G885 4G890 4G895 4G900 4G905 4G910 4G915 4G920 4G925 4G930 4G935 4G940 4G945 4G950 4G955 4G960 4G965 4G970 4G975 4G980 4G985 4G990 4G995 4G1000	32024	32312	30215	6305R	6306	D 120 x 150 x 14	S 70 x 95 x 13	D 38 x 58 x 11
4H200 4H205 4H210 4H215 4H220 4H225 4H230 4H235 4H240 4H245 4H250 4H255 4H260 4H265 4H270 4H275 4H280 4H285 4H290 4H295 4H300 4H305 4H310 4H315 4H320 4H325 4H330 4H335 4H340 4H345 4H350 4H355 4H360 4H365 4H370 4H375 4H380 4H385 4H390 4H395 4H400 4H405 4H410 4H415 4H420 4H425 4H430 4H435 4H440 4H445 4H450 4H455 4H460 4H465 4H470 4H475 4H480 4H485 4H490 4H495 4H500 4H505 4H510 4H515 4H520 4H525 4H530 4H535 4H540 4H545 4H550 4H555 4H560 4H565 4H570 4H575 4H580 4H585 4H590 4H595 4H600 4H605 4H610 4H615 4H620 4H625 4H630 4H635 4H640 4H645 4H650 4H655 4H660 4H665 4H670 4H675 4H680 4H685 4H690 4H695 4H700 4H705 4H710 4H715 4H720 4H725 4H730 4H735 4H740 4H745 4H750 4H755 4H760 4H765 4H770 4H775 4H780 4H785 4H790 4H795 4H800 4H805 4H810 4H815 4H820 4H825 4H830 4H835 4H840 4H845 4H850 4H855 4H860 4H865 4H870 4H875 4H880 4H885 4H890 4H895 4H900 4H905 4H910 4H915 4H920 4H925 4H930 4H935 4H940 4H945 4H950 4H955 4H960 4H965 4H970 4H975 4H980 4H985 4H990 4H995 4H1000			30217	6307R	6308			D 55 x 78 x 12
4I200 4I205 4I210 4I215 4I220 4I225 4I230 4I235 4I240 4I245 4I250 4I255 4I260 4I265 4I270 4I275 4I280 4I285 4I290 4I295 4I300 4I305 4I310 4I315 4I320 4I325 4I330 4I335 4I340 4I345 4I350 4I355 4I360 4I365 4I370 4I375 4I380 4I385 4I390 4I395 4I400 4I405 4I410 4I415 4I420 4I425 4I430 4I435 4I440 4I445 4I450 4I455 4I460 4I465 4I470 4I475 4I480 4I485 4I490 4I495 4I500 4I505 4I510 4I515 4I520 4I525 4I530 4I535 4I540 4I545 4I550 4I555 4I560 4I565 4I570 4I575 4I580 4I585 4I590 4I595 4I600 4I605 4I610 4I615 4I620 4I625 4I630 4I635 4I640 4I645 4I650 4I655 4I660 4I665 4I670 4I675 4I680 4I685 4I690 4I695 4I700 4I705 4I710 4I715 4I720 4I725 4I730 4I735 4I740 4I745 4I750 4I755 4I760 4I765 4I770 4I775 4I780 4I785 4I790 4I795 4I800 4I805 4I810 4I815 4I820 4I825 4I830 4I835 4I840 4I845 4I850 4I855 4I860 4I865 4I870 4I875 4I880 4I885 4I890 4I895 4I900 4I905 4I910 4I915 4I920 4I925 4I930 4I935 4I940 4I945 4I950 4I955 4I960 4I965 4I970 4I975 4I980 4I985 4I990 4I995 4I1000			30220	6406	6407			D 60 x 82 x 12
4J200 4J205 4J210 4J215 4J220 4J225 4J230 4J235 4J240 4J245 4J250 4J255 4J260 4J265 4J270 4J275 4J280 4J285 4J290 4J295 4J300 4J305 4J310 4J315 4J320 4J325 4J330 4J335 4J340 4J345 4J350 4J355 4J360 4J365 4J370 4J375 4J380 4J385 4J390 4J395 4J400 4J405 4J410 4J415 4J420 4J425 4J430 4J435 4J440 4J445 4J450 4J455 4J460 4J465 4J470 4J475 4J480 4J485 4J490 4J495 4J500 4J505 4J510 4J515 4J520 4J525 4J530 4J535 4J540 4J545 4J550 4J555 4J560 4J565 4J570 4J575 4J580 4J585 4J590 4J595 4J600 4J605 4J610 4J615 4J620 4J625 4J630 4J635 4J640 4J645 4J650 4J655 4J660 4J665 4J670 4J675 4J680 4J685 4J690 4J695 4J700 4J705 4J710 4J715 4J720 4J725 4J730 4J735 4J740 4J745 4J750 4J755 4J760 4J765 4J770 4J775 4J780 4J785 4J790 4J795 4J800 4J805 4J810 4J815 4J820 4J825 4J830 4J835 4J840 4J845 4J850 4J855 4J860 4J865 4J870 4J875 4J880 4J885 4J890 4J895 4J900 4J905 4J910 4J915 4J920 4J925 4J930 4J935 4J940 4J945 4J950 4J955 4J960 4J965 4J970 4J975 4J980 4J985 4J990 4J995 4J1000	30217	6307R	6308	D 140 x 170 x 14	S 90 x 115 x 13	D 55 x 78 x 12		
4K200 4K205 4K210 4K215 4K220 4K225 4K230 4K235 4K240 4K245 4K250 4K255 4K260 4K265 4K270 4K275 4K280 4K285 4K290 4K295 4K300 4K305 4K310 4K315 4K320 4K325 4K330 4K335 4K340 4K345 4K350 4K355 4K360 4K365 4K370 4K375 4K380 4K385 4K390 4K395 4K400 4K405 4K410 4K415 4K420 4K425 4K430 4K435 4K440 4K445 4K450 4K455 4K460 4K465 4K470 4K475 4K480 4K485 4K490 4K495 4K500 4K505 4K510 4K515 4K520 4K525 4K530 4K535 4K540 4K545 4K550 4K555 4K560 4K565 4K570 4K575 4K580 4K585 4K590 4K595 4K600 4K605 4K610 4K615 4K620 4K625 4K630 4K635 4K640 4K645 4K650 4K655 4K660 4K665 4K670 4K675 4K680 4K685 4K690 4K695 4K700 4K705 4K710 4K715 4K720 4K725 4K730 4K735 4K740 4K745 4K750 4K755 4K760 4K765 4K770 4K775 4K780 4K785 4K790 4K795 4K800 4K805 4K810 4K815 4K820 4K825 4K830 4K835 4K840 4K845 4K850 4K855 4K860 4K865 4K870 4K875 4K880 4K885 4K890 4K895 4K900 4K905 4K910 4K915 4K920 4K925 4K930 4K935 4K940 4K945 4K950 4K955 4K960 4K965 4K970 4K975 4K980 4K985 4K990 4K995 4K1000	30220	6406	6407			D 62 x 82 x 12		
4L200 4L205 4L210 4L215 4L220 4L225 4L230 4L235 4L240 4L245 4L250 4L255 4L260 4L265 4L270 4L275 4L280 4L285 4L290 4L295 4L300 4L305 4L310 4L315 4L320 4L325 4L330 4L335 4L340 4L345 4L350 4L355 4L360 4L365 4L370 4L375 4L380 4L385 4L390 4L395 4L400 4L405 4L410 4L415 4L420 4L425 4L430 4L435 4L440 4L445 4L450 4L455 4L460 4L465 4L470 4L475 4L480 4L485 4L490 4L495 4L500 4L505 4L510 4L515 4L520 4L525 4L530 4L535 4L540 4L545 4L550 4L555 4L560 4L565 4L570 4L575 4L580 4L585 4L590 4L595 4L600 4L605 4L610 4L615 4L620 4L625 4L630 4L635 4L640 4L645 4L650 4L655 4L660 4L665 4L670 4L675 4L680 4L685 4L690 4L695 4L700 4L705 4L710 4L715 4L720 4L725 4L730 4L735 4L740 4L745 4L750 4L755 4L760 4L765 4L770 4L775 4L780 4L785 4L790 4L795 4L800 4L805 4L810 4L815 4L820 4L825 4L830 4L835 4L840 4L845 4L850 4L855 4L860 4L865 4L870 4L875 4L880 4L885 4L890 4L895 4L900 4L905 4L910 4L915 4L920 4L925 4L930 4L935 4L940 4L945 4L950 4L955 4L960 4L965 4L970 4L975 4L980 4L985 4L990 4L995 4L1000	30222	6407	6409			D 65 x 88 x 12		
4M200 4M205 4M210 4M215 4M220 4M225 4M230 4M235 4M240 4M245 4M250 4M255 4M260 4M265 4M270 4M275 4M280 4M285 4M290 4M295 4M300 4M305 4M310 4M315 4M320 4M325 4M330 4M335 4M340 4M345 4M350 4M355 4M360 4M365 4M370 4M375 4M380 4M385 4M390 4M395 4M400 4M405 4M410 4M415 4M420 4M425 4M430 4M435 4M440 4M445 4M450 4M455 4M460 4M465 4M470 4M475 4M480 4M485 4M490 4M495 4M500 4M505 4M510 4M515 4M520 4M525 4M530 4M535 4M540 4M545 4M550 4M555 4M560 4M565 4M570 4M575 4M580 4M585 4M590 4M595 4M600 4M605 4M610 4M615 4M620 4M625 4M630 4M635 4M640 4M645 4M650 4M655 4M660 4M665 4M670 4M675 4M680 4M685 4M690 4M695 4M700 4M705 4M710 4M715 4M720 4M725 4M730 4M735 4M740 4M745 4M750 4M755 4M760 4M765 4M770 4M775 4M780 4M785 4M790 4M795 4M800 4M805 4M810 4M815 4M820 4M825 4M830 4M835 4M840 4M845 4M850 4M855 4M860 4M865 4M870 4M875 4M880 4M885 4M890 4M895 4M900 4M905 4M910 4M915 4M920 4M925 4M930 4M935 4M940 4M945 4M950 4M955 4M960 4M965 4M970 4M975 4M980 4M985 4M990 4M995 4M1000	30220	6406	6407	D 160 x 190 x 16	S 90 x 115 x 13	D 62 x 82 x 12		
4N200 4N205 4N210 4N215 4N220 4N225 4N230 4N235 4N240 4N245 4N250 4N255 4N260 4N265 4N270 4N275 4N280 4N285 4N290 4N295 4N300 4N305 4N310 4N315 4N320 4N325 4N330 4N335 4N340 4N345 4N350 4N355 4N360 4N365 4N370 4N375 4N380 4N385 4N390 4N395 4N400 4N405 4N410 4N415 4N420 4N425 4N430 4N435 4N440 4N445 4N450 4N455 4N460 4N465 4N470 4N475 4N480 4N485 4N490 4N495 4N500 4N505 4N510 4N515 4N520 4N525 4N530 4N535 4N540 4N545 4N550 4N555 4N560 4N565 4N570 4N575 4N580 4N585 4N590 4N595 4N600 4N605 4N610 4N615 4N620 4N625 4N630 4N635 4N640 4N645 4N650 4N655 4N660 4N665 4N670 4N675 4N680 4N685 4N690 4N695 4N700 4N705 4N710 4N715 4N720 4N725 4N730 4N735 4N740 4N745 4N750 4N755 4N760 4N765 4N770 4N775 4N780 4N785 4N790 4N795 4N800 4N805 4N810 4N815 4N820 4N825 4N830 4N835 4N840 4N845 4N850 4N855 4N860 4N865 4N870 4N875 4N880 4N885 4N890 4N895 4N900 4N905 4N910 4N915 4N920 4N925 4N930 4N935 4N940 4N945 4N950 4N955 4N960 4N965 4N970 4N975 4N980 4N985 4N990 4N995 4N1000	30222	6407	6409			D 65 x 88 x 12		
4O200 4O205 4O210 4O215 4O220 4O225 4O230 4O235 4O240 4O245 4O250 4O255 4O260 4O265 4O270 4O275 4O280 4O285 4O290 4O295 4O300 4O305 4O310 4O315 4O320 4O325 4O330 4O335 4O340 4O345 4O350 4O355 4O360 4O365 4O370 4O375 4O380 4O385 4O390 4O395 4O400 4O405 4O410 4O415 4O420 4O425 4O430 4O435 4O440 4O445 4O450 4O455 4O460 4O465 4O470 4O475 4O480 4O485 4O490 4O495 4O500 4O505 4O510 4O515 4O520 4O525 4O530 4O535 4O540 4O545 4O550 4O555 4O560 4O565 4O570 4O575 4O580 4O585 4O590 4O595 4O600 4O605 4O610 4O615 4O620 4O625 4O630 4O635 4O640 4O645 4O650 4O655 4O660 4O665 4O670 4O675 4O680 4O685 4O690 4O695 4O700 4O705 4O710 4O715 4O720 4O725 4O730 4O735 4O740 4O745 4O750 4O755 4O760 4O765 4O770 4O775 4O780 4O785 4O790 4O795 4O800 4O805 4O810 4O815 4O820 4O825 4O830 4O835 4O840 4O845 4O850 4O855 4O860 4O865 4O870 4O875 4O880 4O885 4O890 4O895 4O900 4O905 4O910 4O915 4O920 4O925 4O930 4O935 4O940 4O945 4O950 4O955 4O960 4O965 4O970 4O975 4O980 4O985 4O990 4O995 4O1000	30226	6408	6411			D 70 x 88 x 10		
4P200 4P205 4P210 4P215 4P220 4P225 4P230 4P235 4P240 4P245 4P250 4P255 4P260 4P265 4P270 4P275 4P280 4P285 4P290 4P295 4P300 4P305 4P310 4P315 4P320 4P325 4P330 4P335 4P340 4P345 4P350 4P355 4P360 4P365 4P370 4P375 4P380 4P385 4P390 4P395 4P400 4P405 4P410 4P415 4P420 4P425 4P430 4P435 4P440 4P445 4P450 4P455 4P460 4P465 4P470 4P475 4P480 4P485 4P490 4P495 4P500 4P505 4P510 4P515 4P520 4P525 4P530 4P535 4P540 4P545 4P550 4P555 4P560 4P565 4P570 4P575 4P580 4P585 4P590 4P595 4P600 4P605 4P610 4P615 4P620 4P625 4P630 4P635 4P640 4P645 4P650 4P655 4P660 4P665 4P670 4P675 4P680 4P685 4P690 4P695 4P700 4P705 4P710 4P715 4P720 4P725 4P730 4P735 4P740 4P745 4P750 4P755 4P760 4P765 4P770 4P775 4P780 4P785 4P790 4P795 4P800 4P805 4P810 4P815								

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.

Figure 35. Cyclo® BBB4 Bevel Gearing Tooth Count

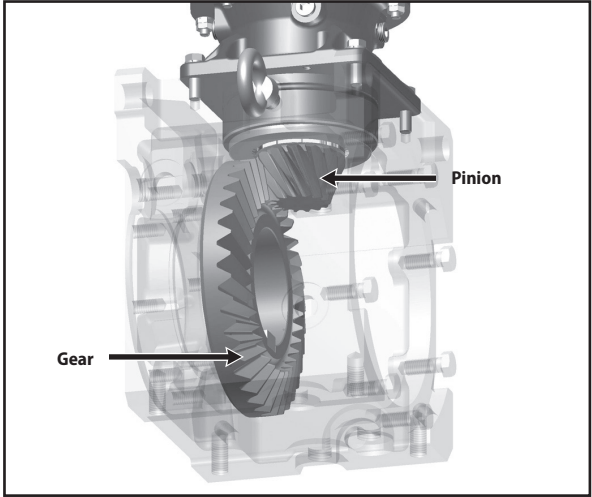


Table 48. Cyclo® BBB4 Ratios

Cyclo® 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

To determine the bevel tooth count, identify the Cyclo® BBB4 nominal ratio and corresponding bevel ratio from Table 48. Then reference Table 49 to identify the actual number of bevel gear and pinion teeth.

Table 49. 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

Components, Assembly Instructions

Screw Conveyor Components

Figure 36. Cyclo® BBB4 Screw Conveyor Components

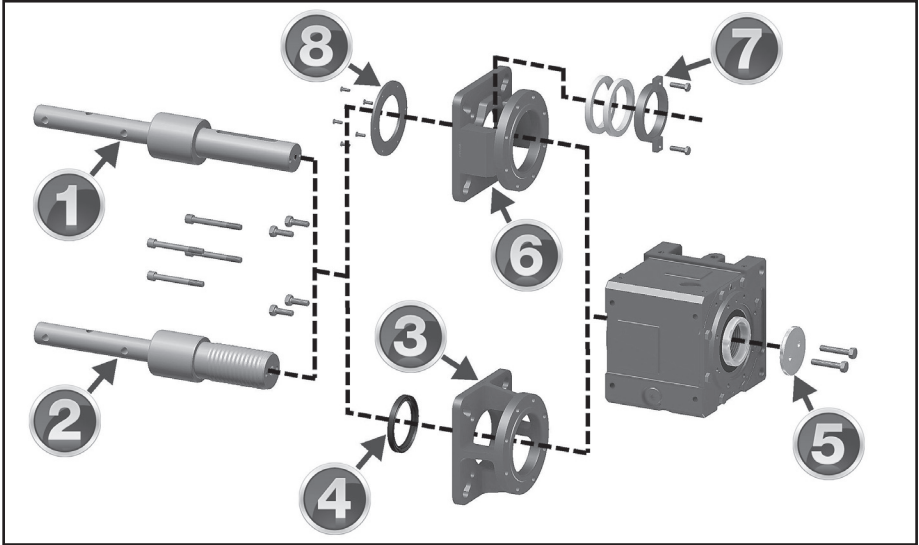
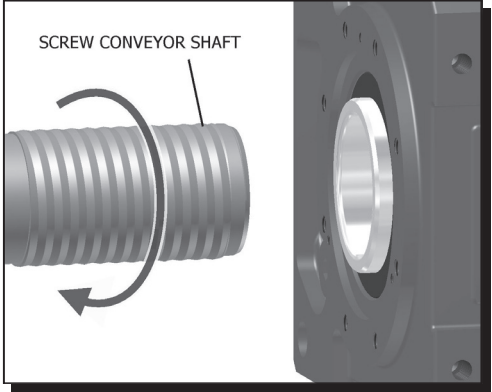


Table 50. Typical Cyclo® BBB4 Screw Conveyor Components

Item Number	Description
1	Screw Conveyor Shaft for KHB
2	Screw Conveyor Shaft for TGB
3	Cast Screw Conveyor Adapter
4	Shaft Seal
5	Shaft Retaining Plate
6	Fabricated Screw Conveyor Adaptor
7	Optional Braided Cord Packing Seal
8	Optional Gland Cover Plate

Screw Conveyor Assembly Instructions

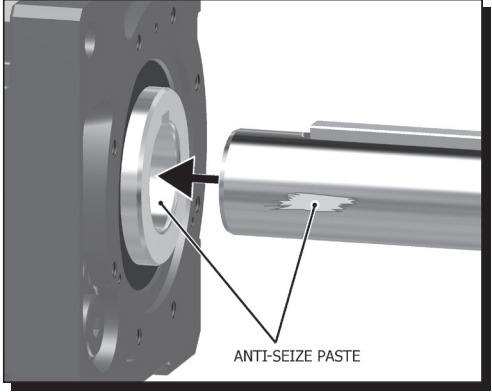
Tapered Grip Bushing Type



- 1
- Insert the **screw conveyor shaft** completely into the Cyclo® BBB4 **output hub**.

Tapered Grip Bushing Type – Screw the threaded end into the BBB unit.

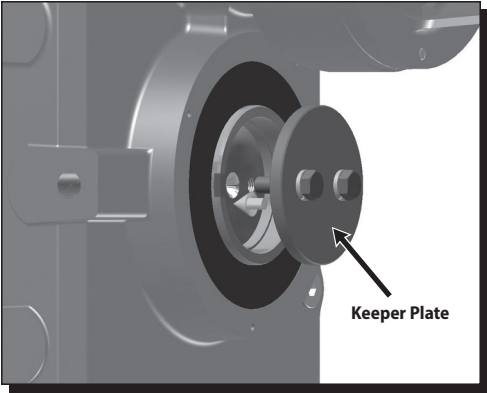
Keyed Type



Keyed Type – Apply anti-seize paste to the driven shaft, install key into shaft keyway, align the key and hollow shaft keyway and carefully slide the shaft into the BBB unit

Screw Conveyor Options, continued

Assembly Instructions

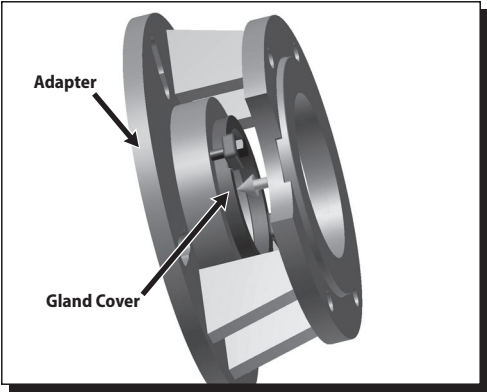


2

Secure the screw conveyor shaft in place using the **keeper plate** with the supplied hardware.

Table 51. Bolt Tightening Torques

Unit Size	Shaft Retaining Bolts	
	Qty. x Bolt Size	Bolt Torque (ft·lbs)
4A	2 x M10	33
4B	2 x M10	33
4C	2 x M12	59
4D	2 x M16	146
4E	2 x M16	146



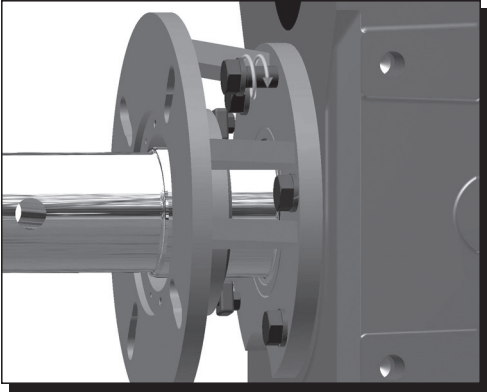
3

If braided cord is supplied, place the **gland cover** into the screw conveyor adapter and secure it in place with the supplied hardware.

Cover not required with the use of a lipped seal.

Table 52. Bolt Tightening Torques

Unit Size	Gland Cover Bolts	
	Qty. x Bolt Size	Bolt Torque (ft·lbs)
4A	2 x M8	15
4B		
4C		
4D		
4E		



4

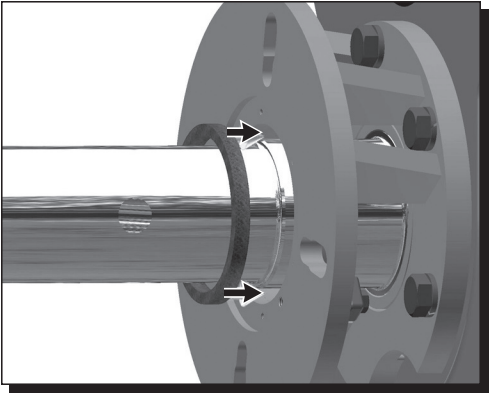
Carefully slide the screw conveyor adapter over the shaft and position it against the corresponding threaded holes in the Cyclo® BBB4 housing. Use the included hardware to secure the adapter to the housing.

Table 53. Bolt Tightening Torques

Unit Size	Cast Adapter/Housing Bolts		Fabricated Adapter/Housing Bolts	
	Qty. x Bolt Size	Bolt Torque (ft·lbs)	Qty. x Bolt Size	Bolt Torque (ft·lbs)
4A	8 x M10 (HH)	47	4 x M10 (HH) 4 x M10 (SHCS)	47 57
4B	8 x M12 (HH)	83	4 x M12 (HH) 4 x M12 (SHCS)	83 100
4C	8 x M16 (HH)	202	4 x M16 (HH) 4 x M16 (SHCS)	202 247
4D	8 x M20 (HH)	401	4 x M20 (HH) 4 x M20 (SHCS)	401 285
4E	8 x M20 (HH)	401	8 x M20 (HH)	401

Screw Conveyor Options, continued

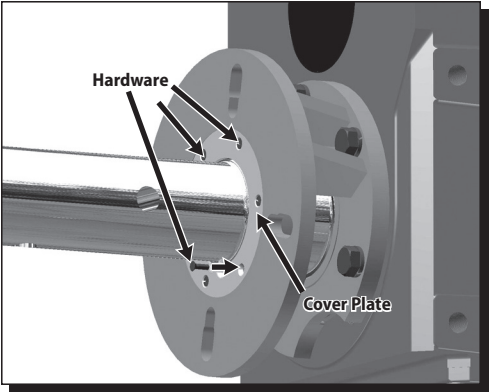
Assembly Instructions



5

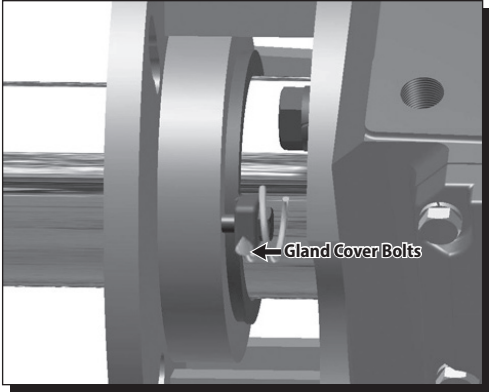
If supplied, carefully insert the application appropriate **sealing material** into the bore of the screw conveyor adapter.

- To seal the output portion of the screw conveyor adapter, Sumitomo provides two different options for each screw conveyor kit:
 - High-Performance Braided Cord: recommended for use if the conveyed material is abrasive.
 - Double-Lip, Nitrile Oil Seal: recommended for use if conveyed material is a nonabrasive liquid.
- Sumitomo **does not** recommend the use of both sealing options at the same time.



6

If using the **braided cord seal**, carefully slide the **cover plate** over the screw conveyor shaft and place it against the screw conveyor adapter. Secure the cover plate using the supplied hardware.



7

If using the **braided cord seal**, tighten the **gland cover bolts** to achieve sufficient sealing on the screw conveyor shaft.

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.

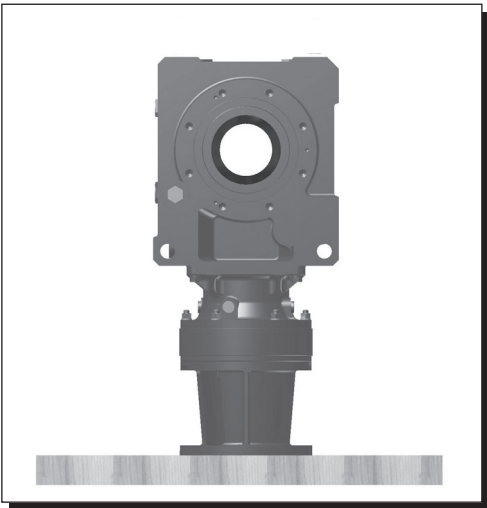


Cyclo® repairs should be conducted by experienced personnel to prevent damage to components or persons.

Cyclo® Portion – General Disassembly

1
Before starting the disassembly process, Sumitomo recommends draining and properly disposing of all lubrication.

2
Carefully remove the entire Cyclo® BBB4 from the driven shaft by following the instructions outlined in the Removal From Driven Shaft section of this manual.

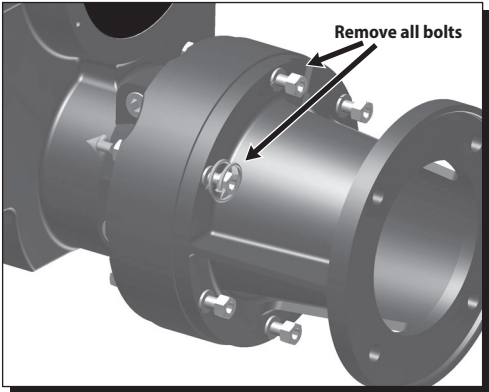


3
While carefully supporting the entire unit, place the unit on a level work surface so that the high speed portion (Cyclo® portion) is facing down.

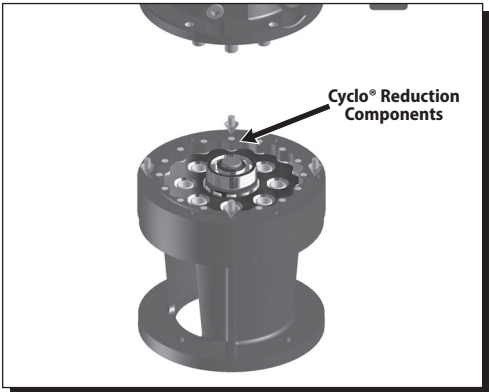
Cyclo® Portion Disassembly/Assembly, continued

Disassembly Procedure

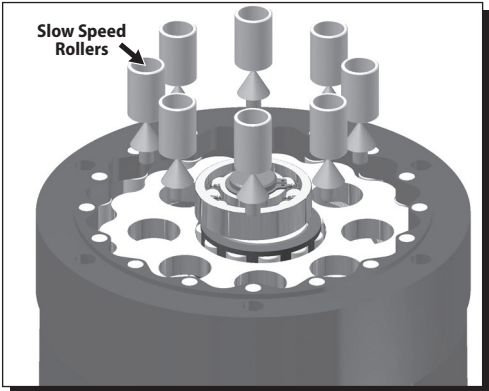
4
While continuing to externally support the entire Cyclo® BBB4 unit, remove each of the bolts from the Cyclo® ring gear housing (shown in horizontal position for clarity).



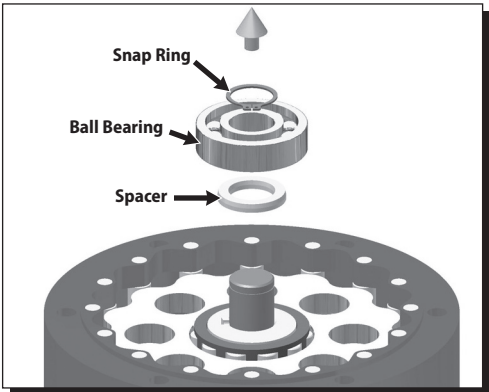
5
Carefully separate the **bevel gear housing assembly** from the Cyclo® portion to gain access to the **Cyclo® reduction components**.



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.

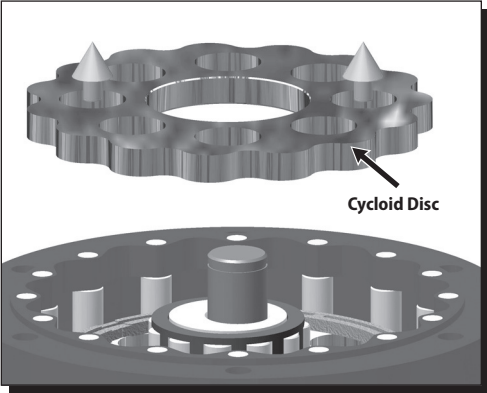


7
Remove the **snap ring**, the **ball bearing** and the **spacer** from the high speed shaft.

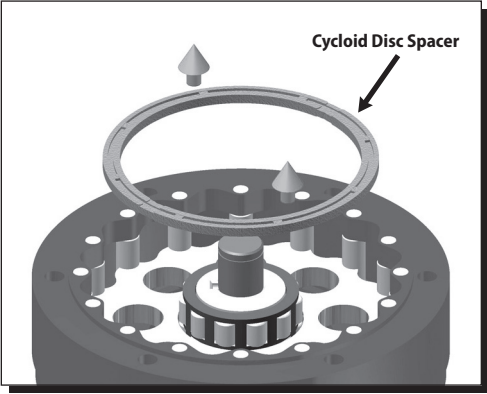


Cyclo® Portion Disassembly/Assembly, continued

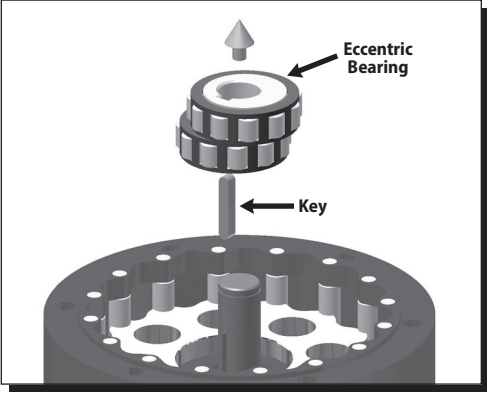
Disassembly Procedure



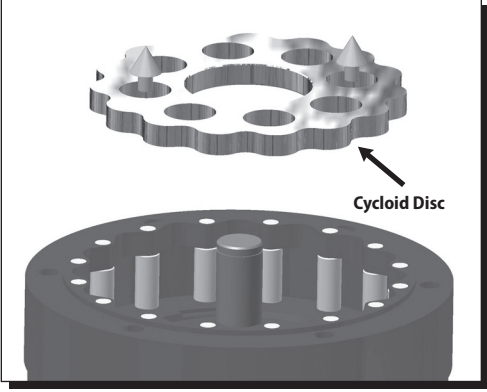
- 8
- Using both hands, carefully remove the top **Cycloid disc**.



- 9
- For Cyclo® units supplied with a **spacer**, remove the **Cycloidal disc spacer**.



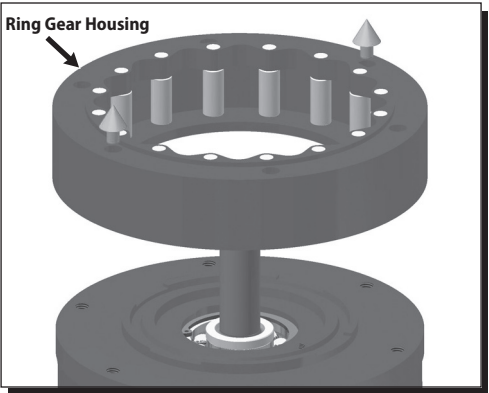
- 10
- Remove the **eccentric bearing** from the high speed shaft.



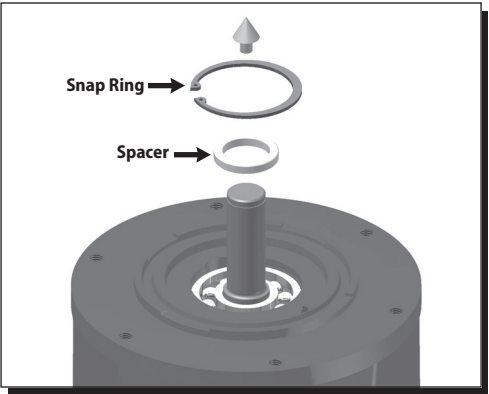
- 11
- Using both hands, carefully remove the remaining **Cycloid disc**.

Cyclo® Portion Disassembly/Assembly, continued

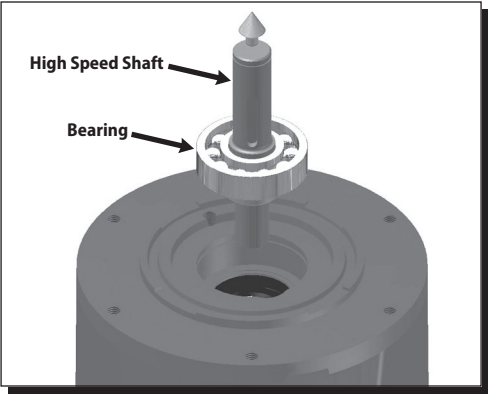
Disassembly Procedure



- 12
- Remove the **ring gear housing**



- 13
- Remove the **spacer** and the **snap** ring from the **high speed end shield**.



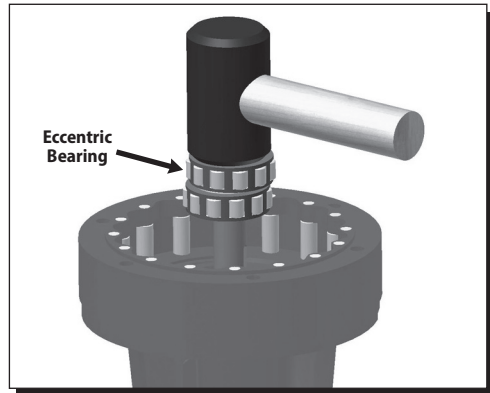
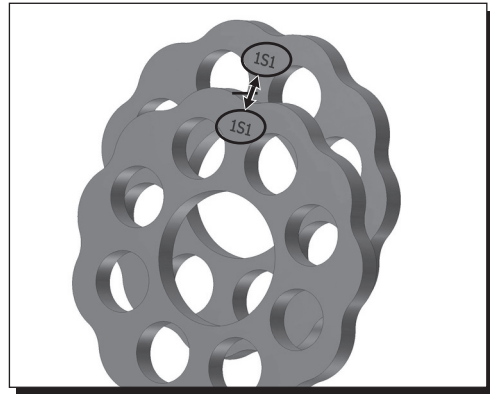
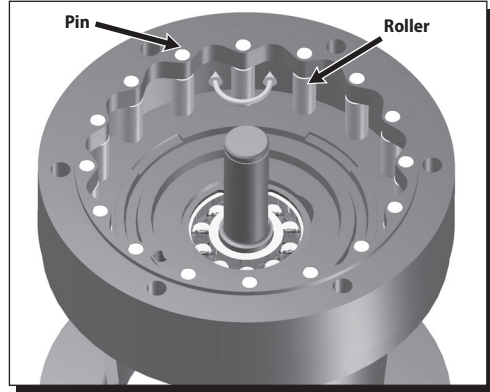
- 14
- Remove the **high speed shaft**, along with its associated bearing, from the **high speed end shield**.

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

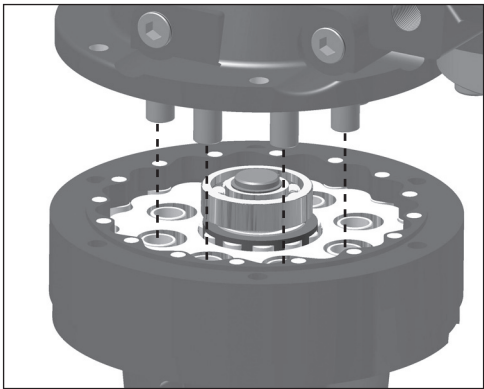
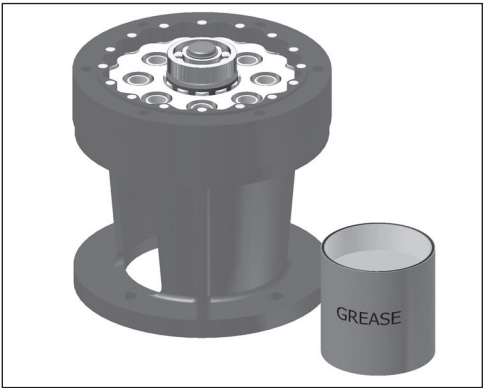
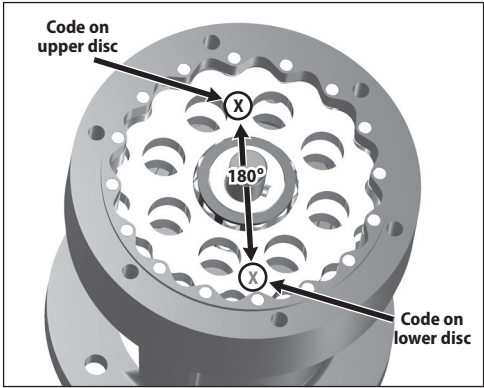
STOP If the Cyclo® portion of the Cyclo® BBB4 unit is oil lubricated – do not add any grease during the reassembly process.

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.

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 Cyclo® 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.

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

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

Quill Bushing

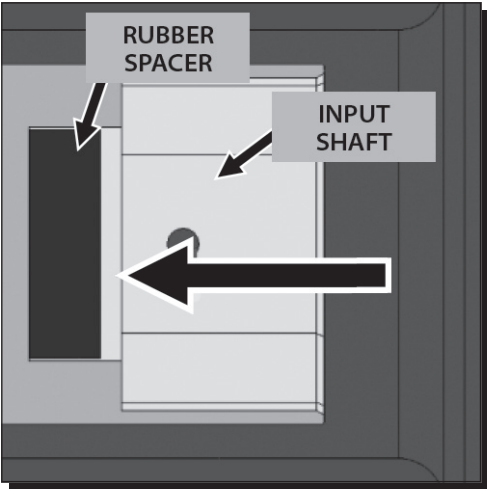
Installation Procedure

Quill bushing installation is described by steps 1-4.
Motor installation is described by steps 5-8.

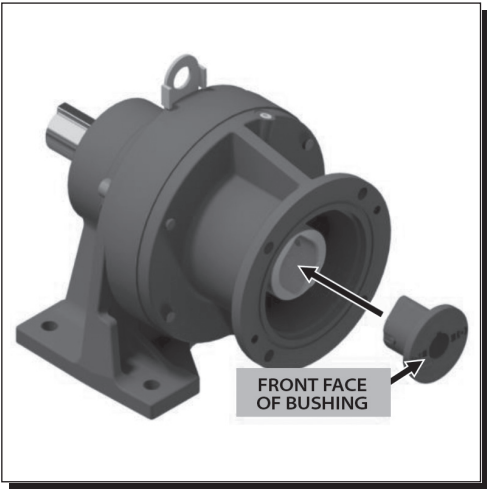


Before beginning, check the part number and bore size on the bushing to make sure it matches the motor.

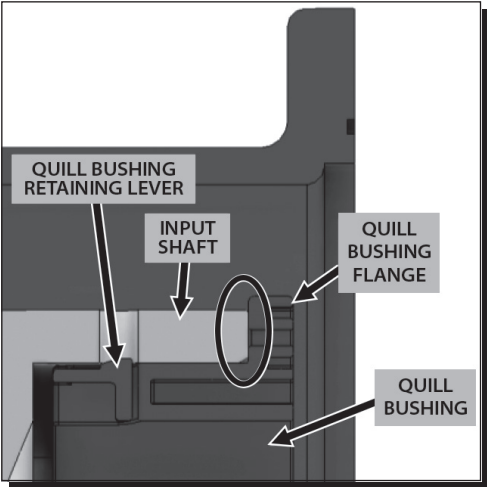
Quill Bushing



- 1**
This step ONLY applies to the installation of quill bushing CMMR8527-C210. For all other bushings, start from step 2.
- Insert the rubber spacer (CRPK6634-2) all the way into the deepest visible bore of the input shaft.

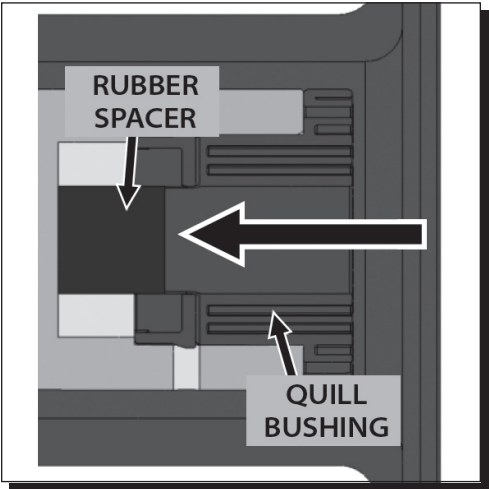


- 2**
- Align the quill bushing with the matching opening in the input shaft.
- Fully insert the bushing into the shaft, firmly tapping the front face of bushing with a rubber mallet if necessary.
- Ensure the bushing is straight before tapping with a mallet.

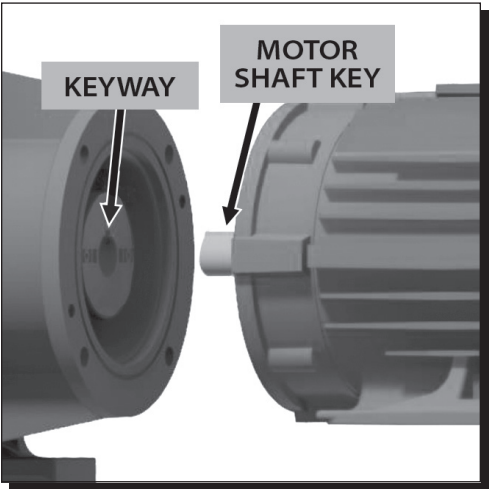


- 3**
- Using a feeler gauge, confirm that the quill bushing flange fully contacts the front face of the input shaft.
- This ensures that the “quill bushing retaining levers” are captured in the two corresponding holes in the input shaft.

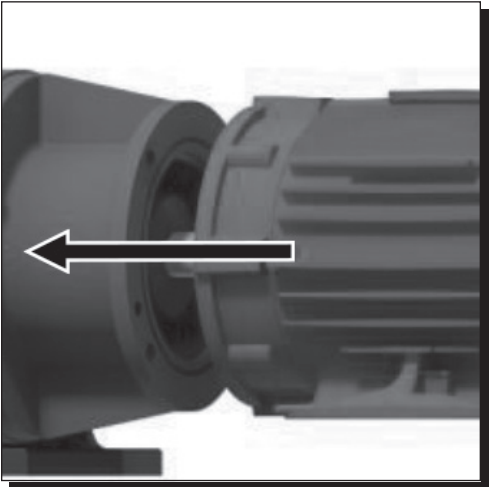
Quill Bushing



- 4**
This step ONLY applies to the installation of quill bushing CMMR8527-B180 when used for a 612 Cyclo, and the installation of quill bushing CMMR8527-C180. For all other bushings, skip to step 5.
- Insert the rubber spacer (CRPK6634-1 for CMMR8527-B180 or CRPK6634-3 for CMMR8527-C180) all the way into the bore of the quill bushing.

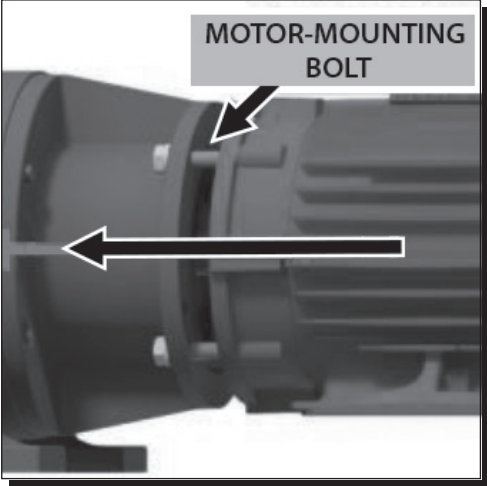


- 5**
- Use a crane or hoist to support the motor if necessary. Line up the motor shaft with the quill bushing bore, ensuring that the key and keyway are aligned.



- 6**
- Insert the motor shaft into the quill bushing bore by hand and get it started.
- Check the alignment of the motor shaft and quill bushing and then try to fully insert the motor shaft by hand.
- If successful, proceed directly to step 8. If not, then continue to step 7.

Quill Bushing



- 7** Use the four motor-mounting bolts to pull the motor fully in.
- Bolts with a longer length may be required to initially reach the tapped holes in the motor to accomplish this.

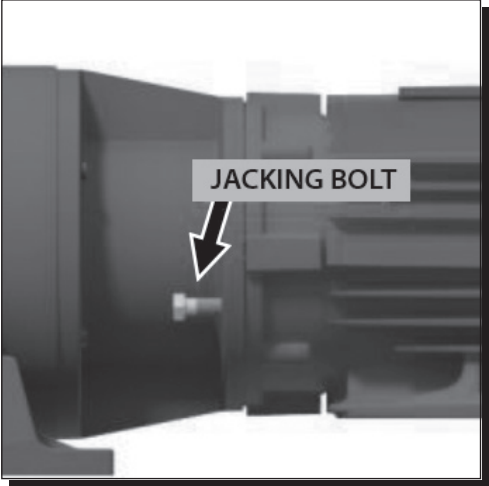


- 8** Torque the four motor-mounting bolts to the prescribed tightening torque.
- If the necessary tightening torque is unknown, the following values can be used for reference (assuming Grade 5 bolts):
- 3/8-16 Bolts (56C-145TC): 28 ft-lb
1/2-13 Bolts (182TC-256TC): 68 ft-lb

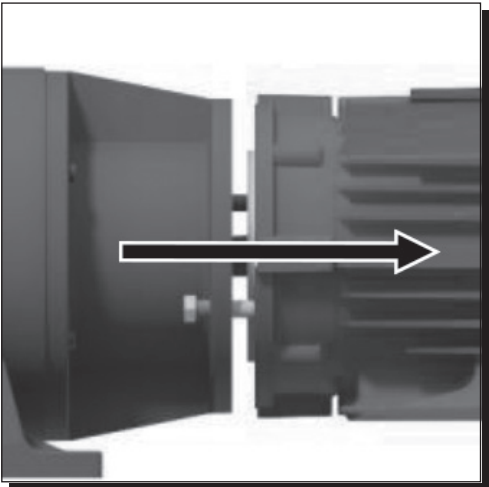
Removal Procedure

Motor removal is described by steps 1-3.
Quill bushing removal is described by steps 4-6.

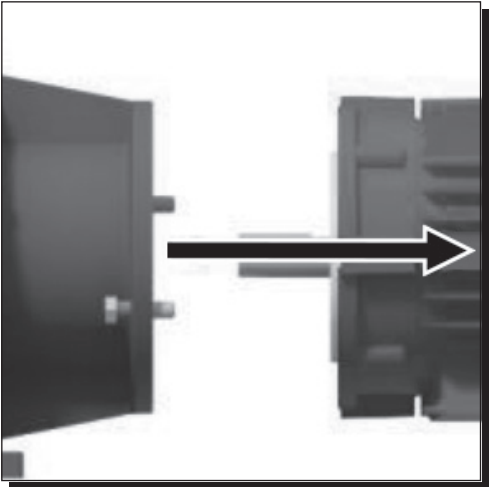
Quill Bushing



- 1** Support the motor with a crane or hoist if needed.
- Unscrew the four motor mounting bolts and thread two of them into the jacking bolt tapped holes in the quill adapter, to use as jacking bolts.

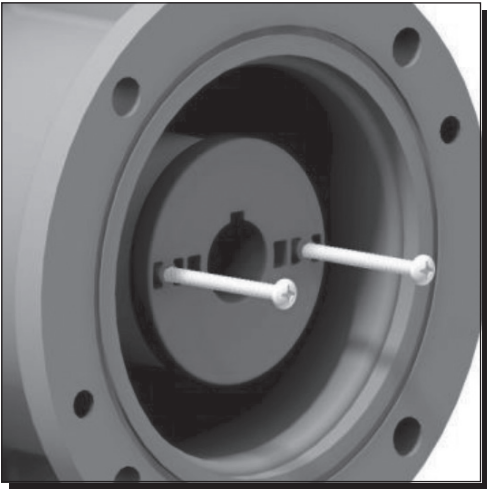


- 2** Turn the two jacking bolts to separate the motor from the Cyclo unit.



- 3** Fully remove the motor, using prybars and/or longer jacking bolts if needed.
- The quill bushing may remain on the motor shaft and come out with the motor.
- If so, then remove the bushing from the motor shaft with a bearing puller and proceed to step 6.
- If it remains in the input shaft, continue to step 4.

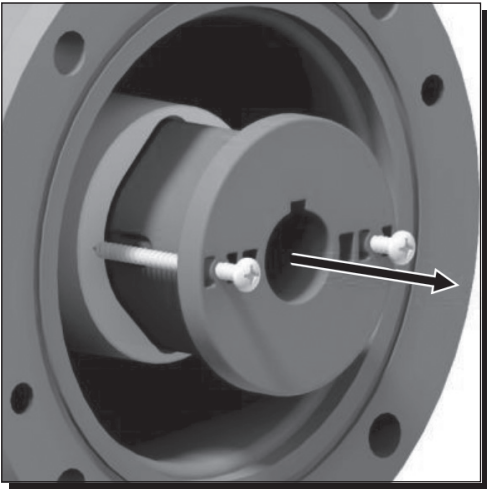
Quill Bushing



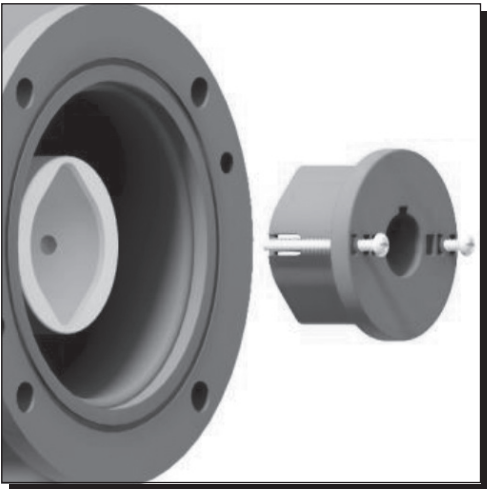
4
Insert two #8 screws into the holes on the front face of the quill bushing and screw them in until they contact the front face of the input shaft.

The preferred style of screw is ASME B18.6.3 Sheet Metal Screw (Type A), with a minimum length based on the bushing part number as follows:

- CMMR8527-A###: 1"
- CMMR8527-B###: 1.75"
- CMMR8527-C###: 2.5"



5
Turn the screws to extract the bushing from the input shaft.



6
Discard the quill bushing. It is not recommended to reuse the bushing.

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

Notes

[illegible]