

Headquarters & Manufacturing

◆ Sumitomo Machinery Corporation of America

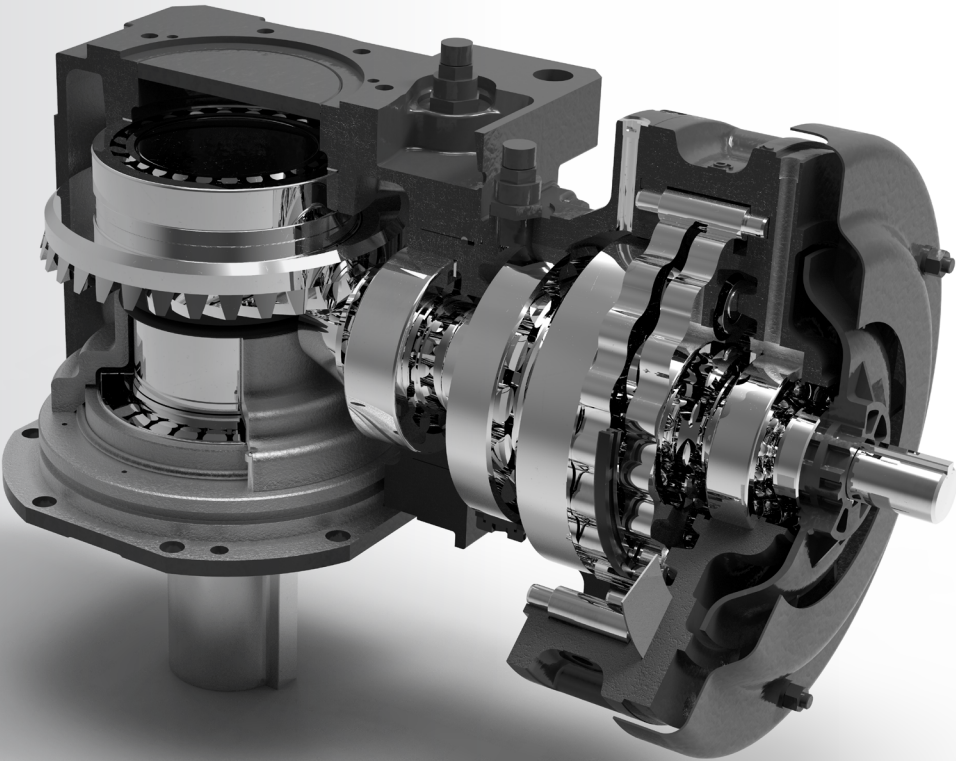
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Cyclo® BBB4 Bevel Buddybox®
Mixer Drive Right Angle Spiral Bevel Gearbox
with Cyclo Reducer Input & Leak-Free Drywell System



**Operation and
Maintenance
Manual**

World Headquarters

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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

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.**

Metal Reducer Nameplate

SM-BEVEL BUDDYBOX® CHESAPEAKE, VIRGINIA		
MODEL	← Unit Model Number	
RATIO	SERVICE FACTOR	
INPUT	HP	RPM
OUTPUT TORQUE	IN-LB	
SERIAL NO.	← Unit Serial Number	
SUMITOMO MACHINERY CORP. OF AMERICA		

Nominal Reduction Ratio →

Metal Gearmotor Nameplate

SM-BEVEL BUDDYBOX® CHESAPEAKE, VIRGINIA		
← Unit Model Number		
MOTOR HP	CLASS	
OUTPUT RPM	RATIO	← Nominal Reduction Ratio
SERIAL NO.	DATE	
SUMITOMO MACHINERY CORP. OF AMERICA		

Unit 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. In case shipped with oil, please follow installation procedure.
- **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.

**Non-Metallic Nameplate
(when Cyclo input is 613 or larger)**

Sumitomo Drive Technologies		
Unit Serial Number →	Serial #:	
	Part #:	
Unit Model Number →	Model #:	
	Ratio:	
Nominal Reduction Ratio →	Motor HP:	Class:
	Output RPM:	
Sumitomo Machinery Corporation of America		

**Non-Metallic Nameplate
(when Cyclo Input is 6120 or smaller)**

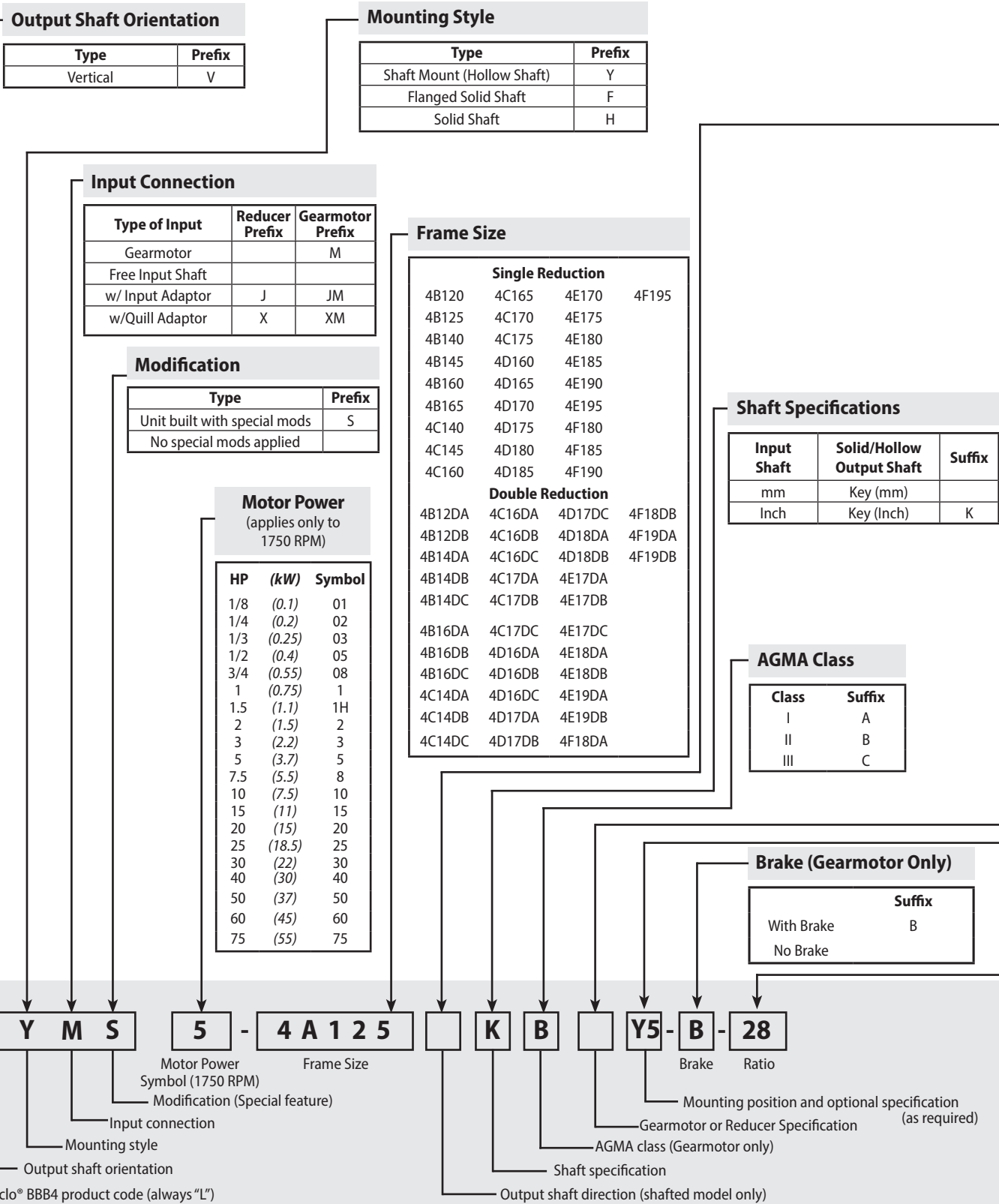
Sumitomo Drive Technologies		
Unit Serial Number →	Serial #:	Part #:
	Model #:	
Unit Model Number →	Input HP:	Ratio: SF:
	Input RPM:	
	Sumitomo Machinery Corporation of America	

Nominal Reduction Ratio →

Nomenclature

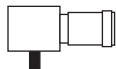

Nomenclature

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



Nomenclature, continued

Output Shaft Direction (shafted model only)

Projects to Left Side	L	
Projects to Both Left/Right Sides	T	

Gearmotor Specification

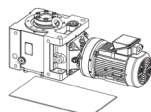
Specification	Suffix
Three-Phase Motor	
Torque Limiter	TL

Reducer Specification

Type	Suffix
Standard	
Baseplate	BP
Shovel Base	SB

Mounting Positions

Y5



Nomenclature Example:

LVYMS-5-4A125-KBY5-B-28**L** - Cyclo® Bevel Buddybox**V** - Vertical**Y** - Shaft Mount (Hollow Shaft)**M** - Gearmotor**S** - Special Modifications**5** - 5 HP (3.7kW), 1750 RPM**4A125** - Frame Size**K** - Inch Shaft Specification**B** - AGMA Class**Y5** - Mounting Position**B** - Brake (gearmotor only)**28** - Ratio

Nominal and Exact Ratio

BBB with Planetary Input				
Nominal Ratio		Frame	Exact	
Input	Overall	Size	Ratio	
3	11	4B14	10.89	
		4B16	10.85	
		4C16		
		4D16		
		4D17		
		4E17	10.50	
		4E18		
		4F18		
4E19	10.82			
4F19				
4	13	4B14	12.45	
		4B16	12.80	
		4C16		
		4D16		
		4D17	13.09	
		4E17		
		4E18		
		4F18		
		4E19	13.01	
		4F19		
		4	4B14	14.16
			4B16	14.00
	4C16			
	4D16			
	4D17		14.32	
	4E17			
	4E18			
	4F18			
	4E19	14.23		
	4F19			
5	16	4B14	16.00	
		4B16	16.26	
		4C16		
		4D16		
		4D17	16.17	
		4E17		
		4E18	15.63	
		4F18		
		4E19	15.47	
		4F19		
		18	4B14	17.50
			4B16	17.78
	4C16			
	4D16			
	4D17		17.68	
	4E17			
	4E18		17.10	
	4F18			
	4E19	16.92		
	4F19			

BBB with Cyclo Input			
Single Reduction			
Nominal Ratio		Frame	Exact
Input	Overall	Size	Ratio
6	21	All	21.0
7	22		22.4
	25		24.5
8	28		28.0
11	35		35.2
	39		38.5
13	46		45.5
15	53		52.5
17	60		59.5
21	67		67.2
	74		73.5
25	80		80.0
	88		87.5
29	102		101.5
35	112		112.0
	123	122.5	
43	151	150.5	
51	179	178.5	
59	207	206.5	
71	249	248.5	
87	305	304.5	
119	417	4A10	416.5

Double Reduction			
Nominal Ratio		Frame	Exact
Input	Overall	Size	Ratio
104	364	All	364.0
121	424		423.5
143	501		500.5
165	578		577.5
195	683		682.5
231	809		808.5
273	956		955.5
319	1117		1116.5
377	1320		1319.5
473	1656		1655.5
559	1957		1956.5
649	2272		2271.5
731	2559		2558.5
841	2944		2943.5
1003	3511		3510.5
1247	4365		4364.5
1479	5177		5176.5
1849	6472		6471.5
2065	7228		7227.5
2537	8880		8879.5
3045	10658		10657.5
3481	12184		12183.5
4437	15530		15529.5
5133	17966		17965.5
6177	21620		21619.5
7569	26492		26491.5

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.
- In case a unit supplied with oil lubrication filling by Sumitomo, **do not lift and turn upside down** or excessive inclination to prevent oil leakage.

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.

Standard Installation Location

Ambient Temperature Range ... 14° - 104°F (-10° - 40°C)

Ambient Humidity 85% or less

Ambient Conditions 14°F minimum

Altitude 3,280 feet (1,000 m) or less

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

Location Indoor/Outdoor— 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, Mixer Drive to be vertical upright, shaft downward. 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 vertical upright**.

In case a unit shipped with oil filled by Sumitomo, carefully handle angle of unit because drywell device will be inside gearbox and which should not be flooded by oil. If customer has to fill oil, it should be after installation completed and until the level is fixed.

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). If customer has to fill oil, it should be after installation completed and until the level is fixed.

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.
- Taper Grip Busing, Easy Grip, and shrink disc are not for use in applications where thrust load is transmitted to the reducer. Friction locking devices are only for use where the mixing shaft is supported by a thrust bearing.

Installation onto Driven Shaft

Keyed Hollow Bore

Keyed Hollow Bore Installation



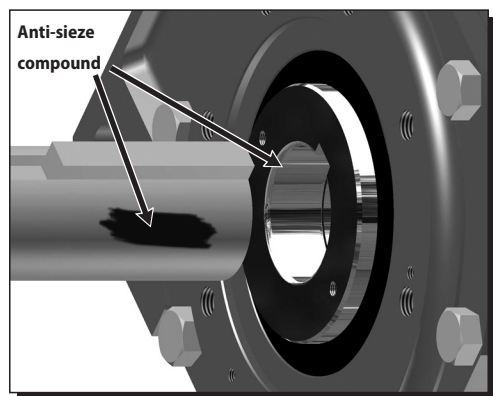
Do not operate unit until the torque arm has been attached to the unit and fixed to a rigid structure. The torque arm prevents counter-rotation during unit operation. Refer to torque arm Installation section in this manual for instructions.



CAUTION: The Cyclo® BBB4 must be externally supported prior to insertion of driven shaft into hollow bore. In case a unit shipped with oil lubrication or a condition after oil filled, carefully handle installation angle. Keep shaft vertical and install driven shaft because drywell cover will be inside gearbox and which should not be flooded by oil.

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

(Images shown for standard BBB in horizontal orientation and for Mixer drive with drywell the orientation is vertical)

1

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

2

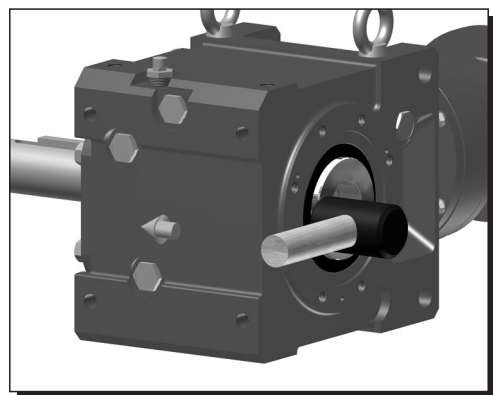
Align the driven shaft with the reducer/gearmotor bore and carefully slide unit onto the driven shaft to the desired location.



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. **Sumitomo does not supply a mounting jig. This information is provided for reference only.**

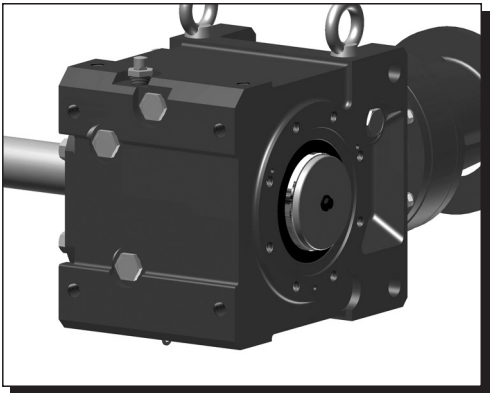
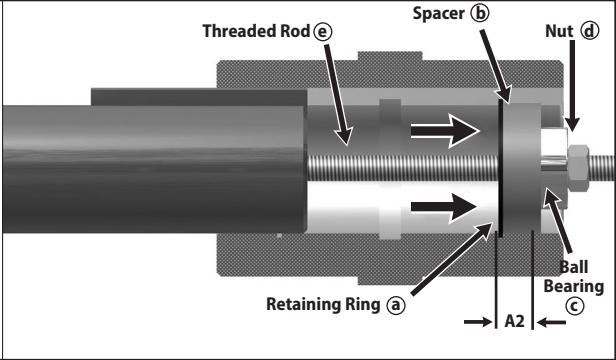


Installation onto Driven Shaft, continued

Keyed Hollow Bore, Shrink Disc Type Hollow Bore

Table 1. 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

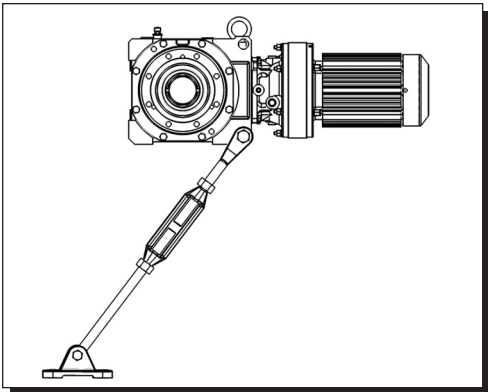
Once driven shaft has been completely inserted into the unit's keyed hollow bore, secure the shaft in place using a keeper plate as shown to the left, or some other means of securing the unit to the driven shaft.



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

Torque Arm Installation

Torque Arm Introduction, Turnbuckle Type Torque Arm



Torque Arm Introduction

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



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

Turnbuckle Type Torque Arm Parts

Figure 1. Turnbuckle Rod Type Torque Arm Parts

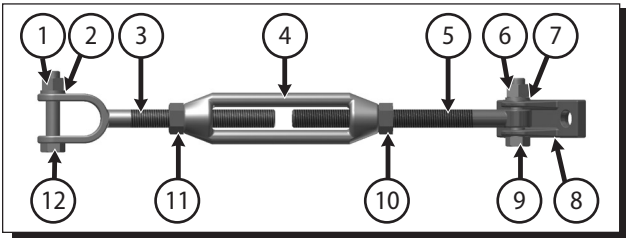
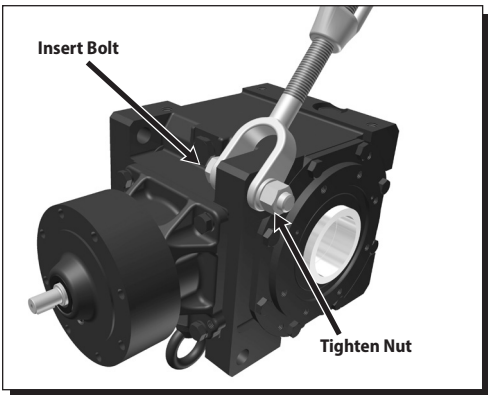


Table 2. Turnbuckle Type Torque Arm Parts

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



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

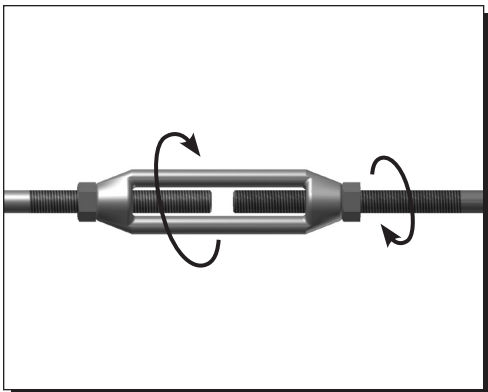
Table 3. Bolt Tightening Torques

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		

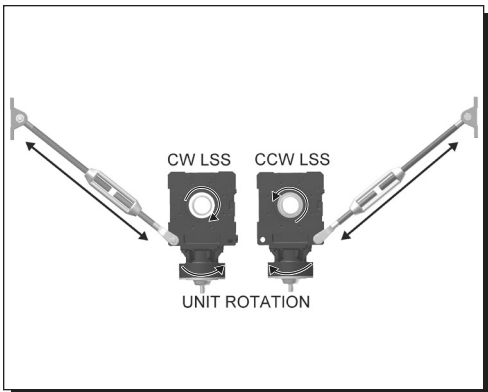
Note: [1] Bolt Class equal to ISO/JIS Class 8.8

Torque Arm Installation, continued

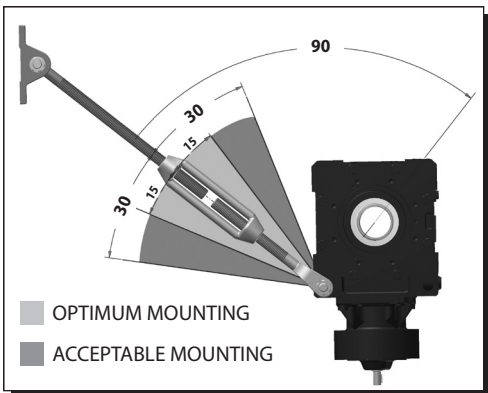
Turnbuckle Type Torque Arm



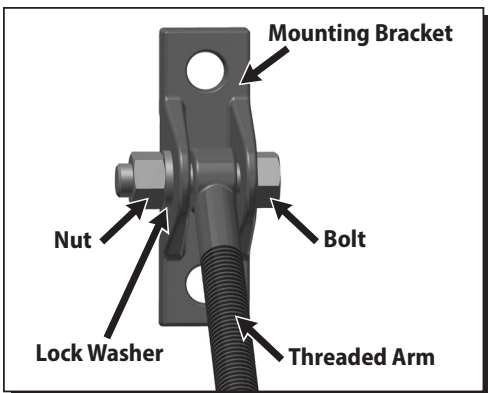
- 2**
- Install the turnbuckle onto the threaded extension rod (gearbox side) and then threaded arm (foundation side) to the turnbuckle
- If the assembly was supplied with hex nuts to secure the turnbuckle, install the nuts loosely, ensuring the left hand nut is used on the threaded arm, prior to installing 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.



- 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.

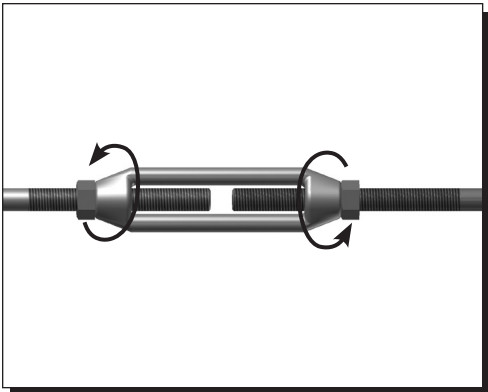
Table 4. Bolt Tightening Torques

Unit Size	Bolt Size ^[1]	ft·lb _i	(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

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 5. Nut Tightening Torques

Unit Size	Nut Size ⁽¹⁾	ft·lb _f	(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		

Tie Rod Type Torque Arm Parts

Figure 1. Tie Rod Type Torque Arm Parts

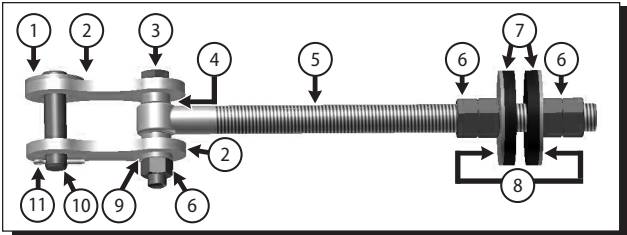
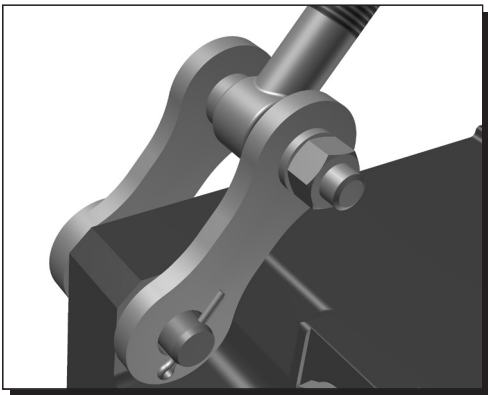


Table 6. Tie Rod Type Torque Arm Parts

Item Number	Description	Item Number	Description
1	Flat Washer	7	Rubber Bushings
2	(2) Mounting Brckts or (1) Clevis	8	Washers
3	Hex Bolt	9	Lock Washer
4	Spacer	10	Clevis Pin
5	Threaded Arm	11	Cotter Pin
6	Hex Nut		



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.

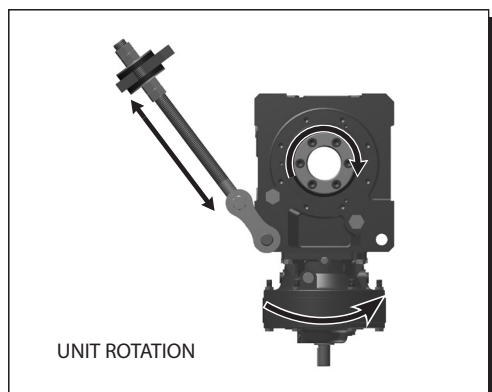
Table 7. Bolt Tightening Torques

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

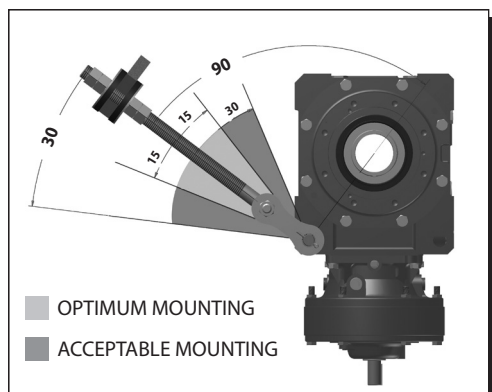
Tie Rod Type Torque Arm



2

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

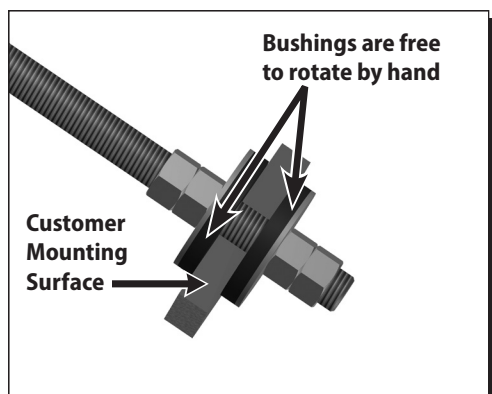
Consider installing two torque arms for reversing applications to allow torque arm to be in tension for each direction of rotation.



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.

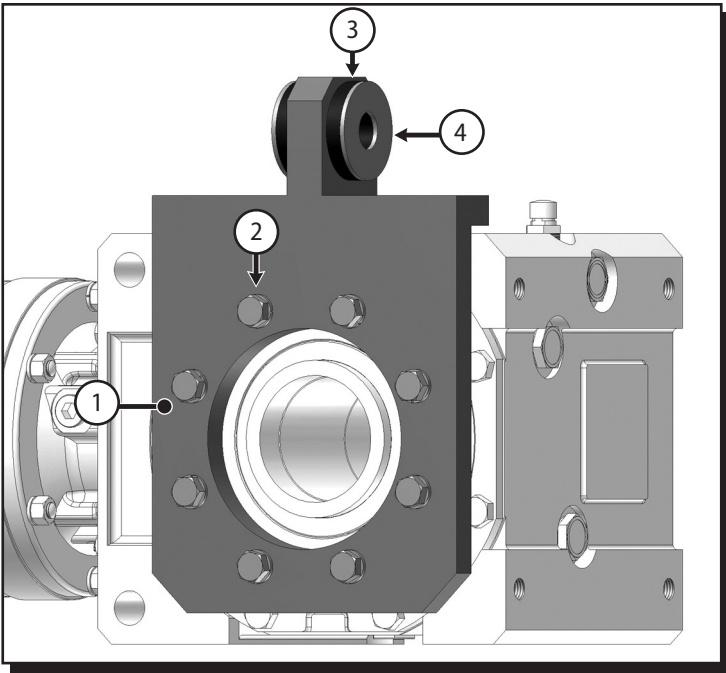


Before starting unit, verify the following:

- 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

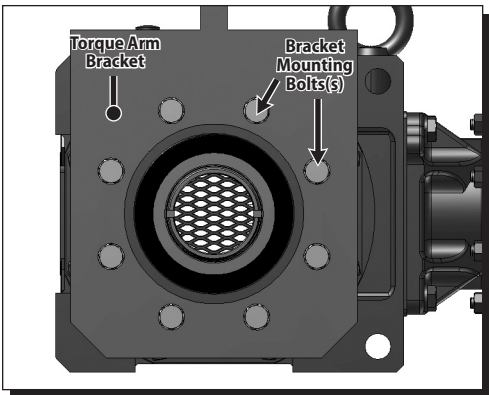
Flange Mount (Banjo) Type Torque Arm



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

Table 8. 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 9. 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

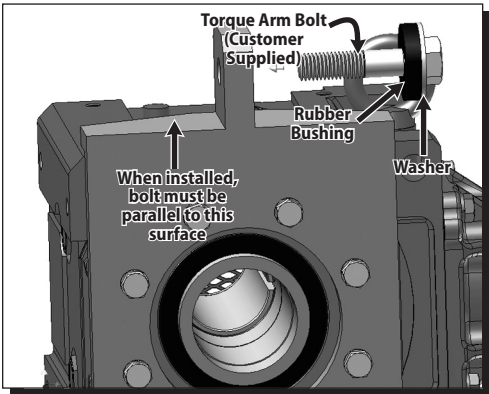
2

Place washer and rubber bushing on bolt.

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

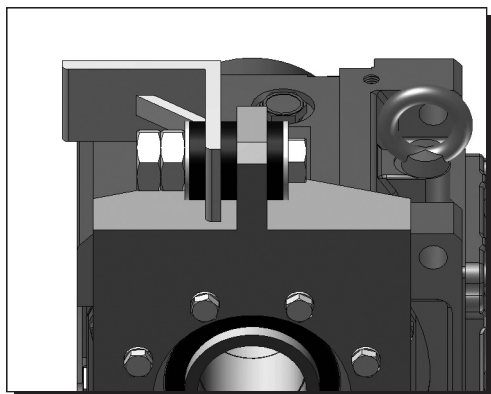
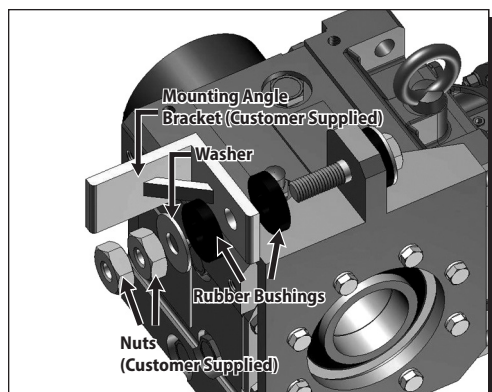


Make sure bolt is parallel to Flange Mount (Banjo) Type Torque Arm surface when fully installed.



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 10. 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.

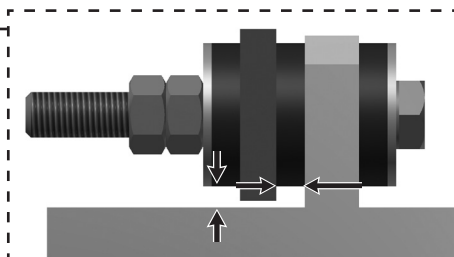
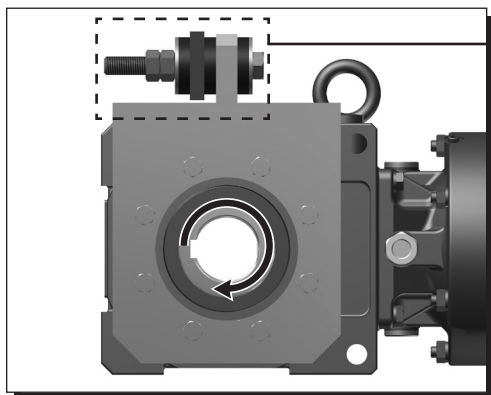
4

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.

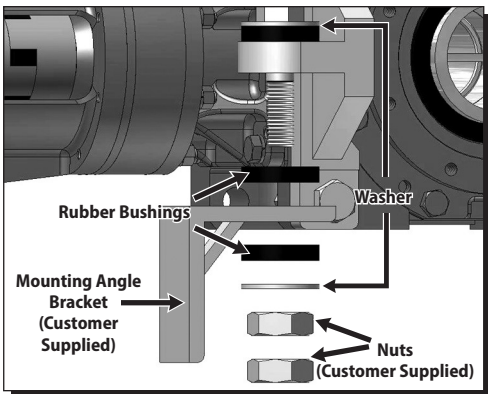
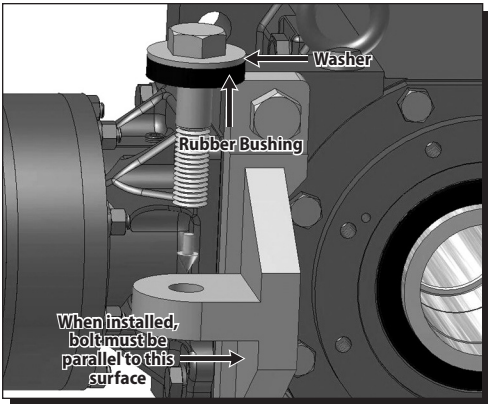
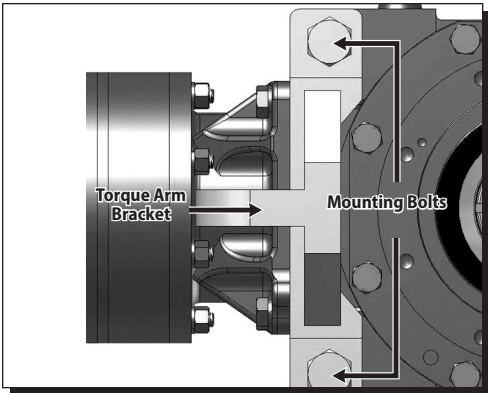
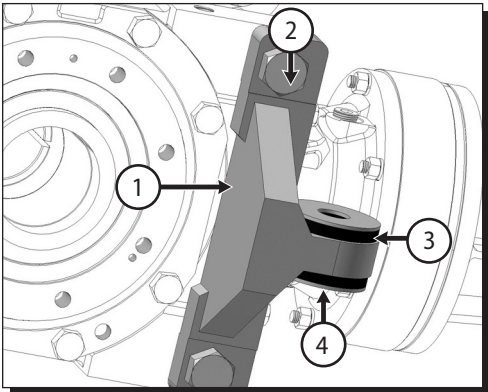
There should be no metal-to-metal contact between the two during a complete revolution of the driven equipment.



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 11. 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 12. 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 13.



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 13. 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.

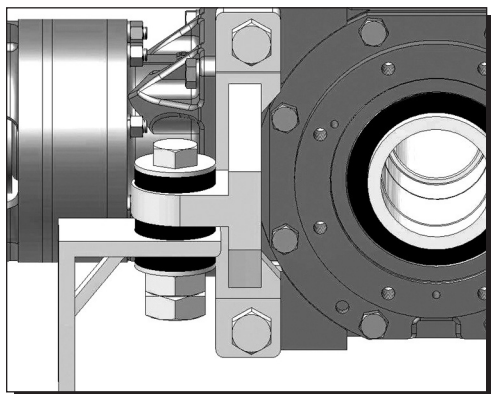
4

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.



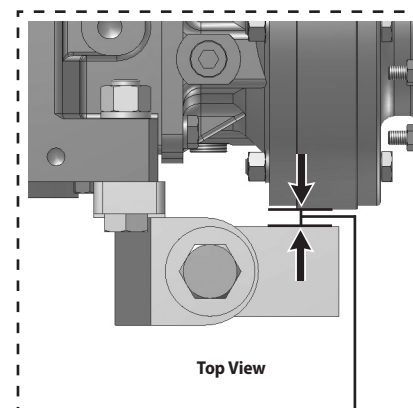
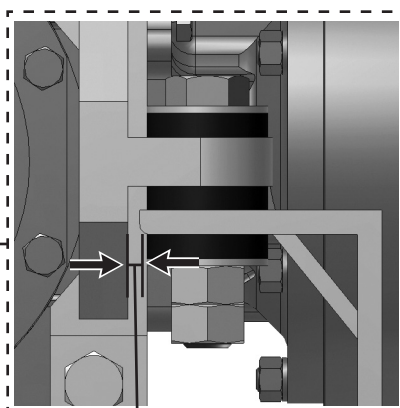
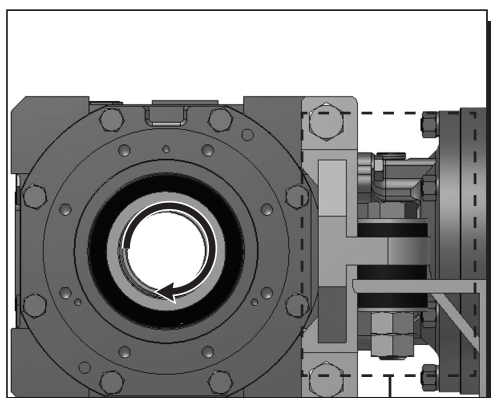
5

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.



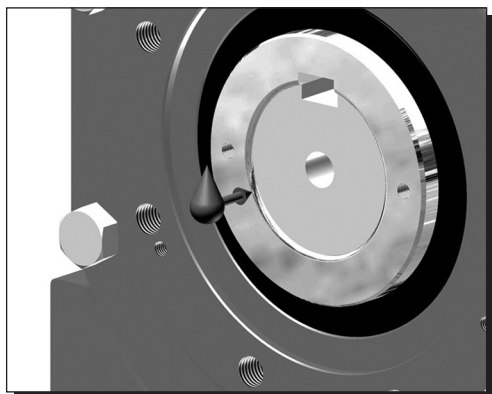
Metal-to-Metal contact between these two components may lead to catastrophic failure of the reducer/ gearmotor.



Top View

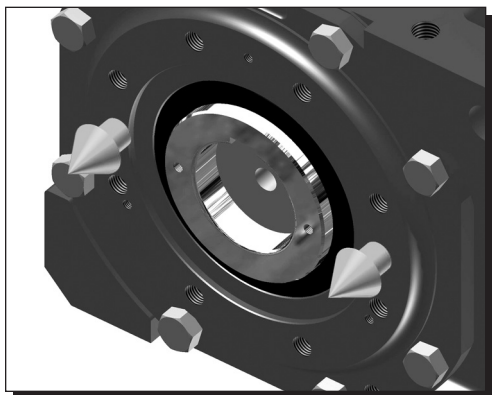
Removal from Driven Shaft

Removal of Cyclo® BBB4 with Shrink Disc



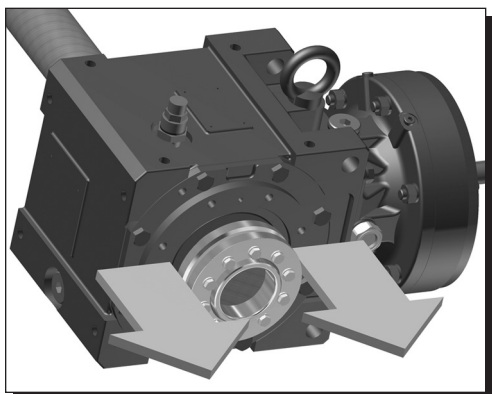
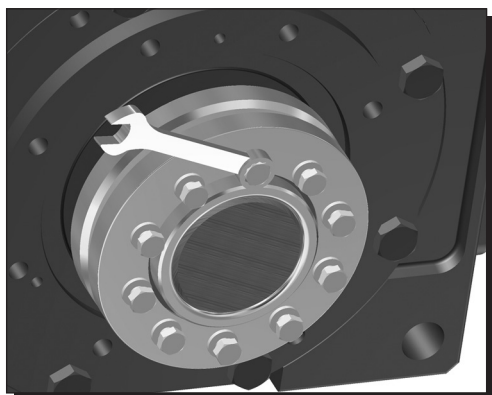
2

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



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

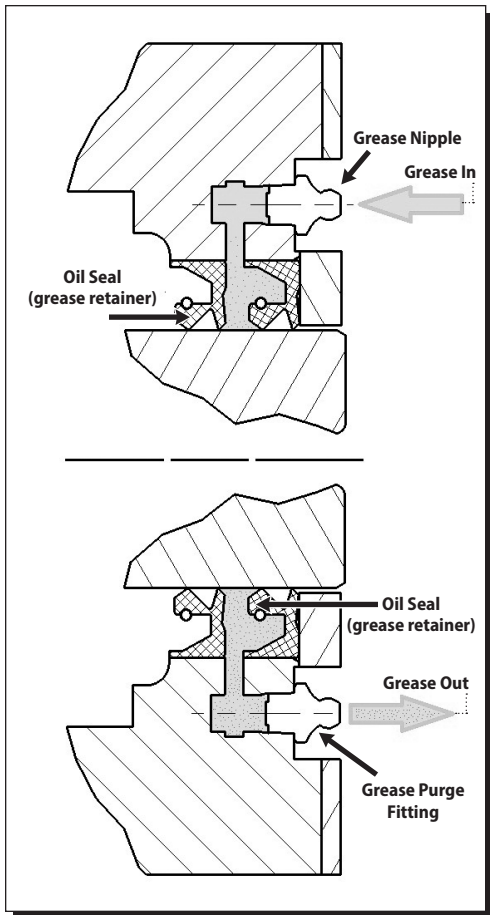
Remove the gearbox from the shaft.

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 case the unit ordered as Mixer Drive. 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 14. 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 15. Recommended NLGI#2 Mineral Greases

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

Lubrication, continued

Taconite Seal Lubrication Procedure, continued

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

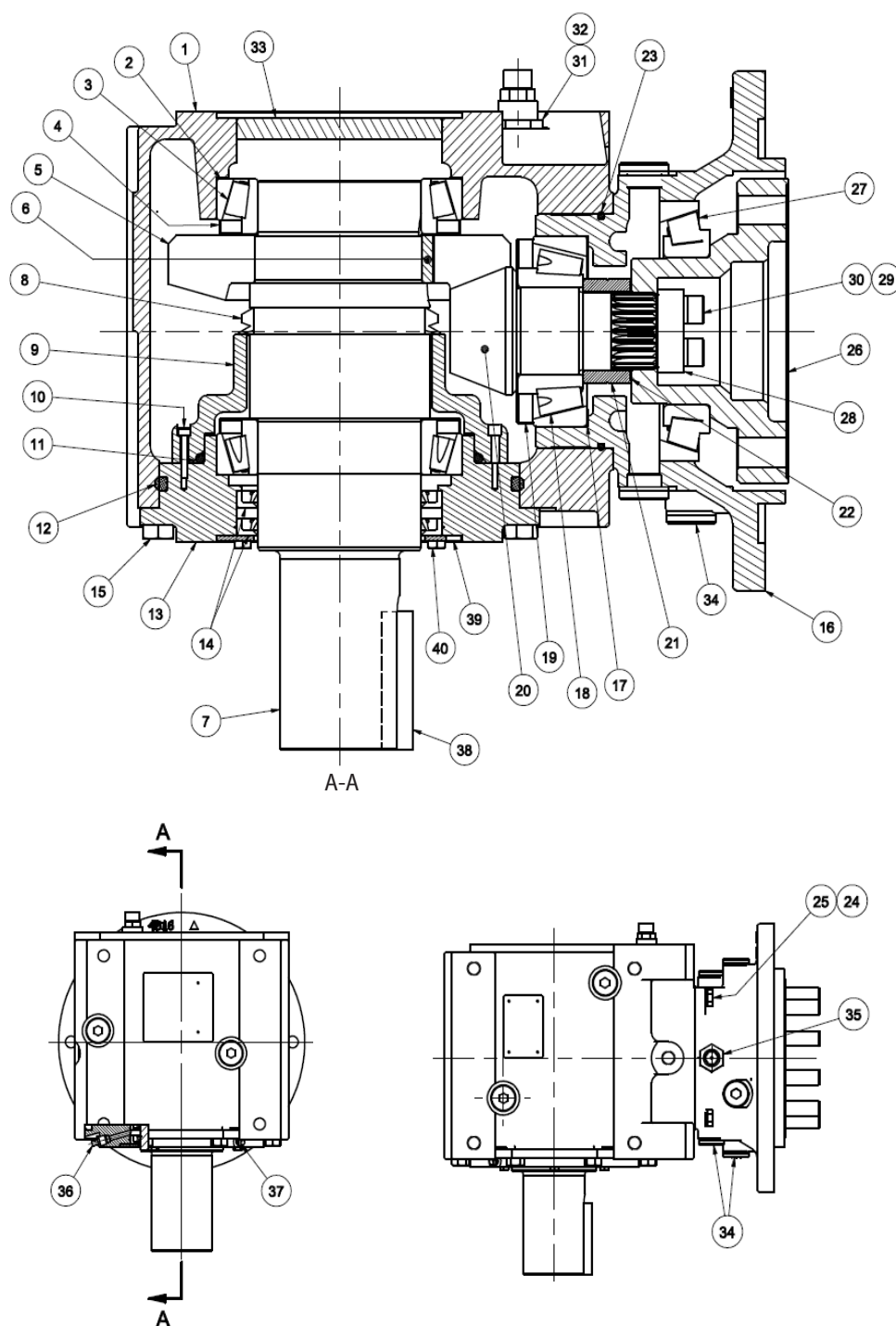
Lubrication, continued

Notes

Lubrication Introduction, Mixer Drive Drywell Structure

Refer below the structure of Mixer Drive Drywell located inside Cyclo®BBB4 gearbox or geared motor which functioning to prevent lubrication leakage to outside.

Because of structure, the gearbox installation must be handled with vertical shaft down condition especially when lubrication oil supplied with the unit or install after oil filled.



40	HEX HEAD BOLT
39	SEAL COVER
38	KEY
37	GREASE RELIEF
36	GREASE FITTING
35	OIL GAUGE
34	PLUG
33	SEAL CAP
32	AIR BREATHER
31	BUSH
30	SOCKET HEAD SCREW
29	LOCK WASHER
28	END PLATE
27	BEARING
26	PIN CARRIER
25	HEX HEAD BOLT
24	SPRING WASHER
23	O-RING
22	SHIM
21	SPACER
20	BEVEL PINION SHAFT
19	NILOS RING
18	BEARING
17	SHIM
16	FLANGED CASING
15	HEX HEAD BOLT
14	OIL SEAL
13	OUTPUT SHAFT COVER
12	O-RING
11	O-RING
10	SOCKET HEAD SCREW
9	DRYWELL
8	V-RING
7	SOLID SHAFT
6	KEY
5	BEVEL GEAR
4	NILOS RING
3	BEARING
2	SHIM
1	CASING
ITEM	DESCRIPTION

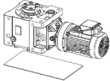
Lubrication, continued

Lubrication Method

Lubrication Method

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

Table 16. Lubrication Method for Configuration for Mixer Drive Cyclo® BBB4 Series with Drywell

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

Bevel Gear Portion and Cyclo® Portion Lubricants

Recommended Oils

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

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 17. Recommended Oils

°F	14	32	50	68	86	104	122
°C	-10	0	10	20	30	40	50
ISO VG (Ambient Temperature)							
		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 18. Recommended Oil Viscosity

Minimum allowable viscosity	15 cSt (mm^2/s) or more at operating temperature	Viscosity that ensures oil film strength adequate for load transmission.
Maximum allowable viscosity	4300 cSt (mm^2/s) 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.

Lubrication, continued

Oil Quantities

Be sure to check the oil level with the oil gauge. The following listed oil quantities are approximate.

Oil Quantities

Table 19. Single Reduction Approximate Oil Quantity with Mixer Drywell

Units: US liquid gallon (*liter*)

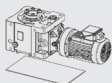
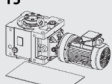
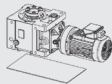
Bevel Gear Unit Size	Mounting Configuration
	Y5 
4B12	0.88 (3.34)
4B14	0.94 (3.54)
4B16	1.05 (3.97)
4C14	1.40 (5.30)
4C16	1.52 (5.74)
4C17	1.62 (6.12)
4D16	2.56 (9.69)
4D17	2.64 (10.0)
4D18	2.72 (10.3)
4E17	3.46 (13.1)
4E18	3.49 (13.2)
4E19	3.75 (14.2)
4F18	4.89 (18.5)
4F19	5.10 (19.3)

Table 20. Double Reduction Approximate Oil Quantity with Mixer Drywell

Units: US liquid gallon (*liter*)

Bevel Gear Unit Size	Mounting Configuration
	Y5 
4B12DA	0.89 (3.37)
4B12DB	0.90 (3.41)
4B14DA	0.94 (3.57)
4B14DB	0.95 (3.61)
4B14DC	0.97 (3.66)
4C14DA	1.41 (5.33)
4C14DB	1.42 (5.37)
4C14DC	1.43 (5.42)
4C16DA	1.53 (5.81)
4C16DB	1.55 (5.86)
4C17DA	1.64 (6.19)
4C17DB	1.67 (6.32)
4C17DC	1.70 (6.42)
4D16DA	2.58 (9.76)
4D16DB	2.59 (9.81)
4D16DC	2.59 (9.82)

Bevel Gear Unit Size	Mounting Configuration
	Y5 
4D17DA	2.59 (9.81)
4D17DB	2.69 (10.2)
4D17DC	2.72 (10.3)
4D18DA	2.77 (10.5)
4D18DB	3.01 (11.4)
4E17DA	3.46 (13.1)
4E17DB	3.49 (13.2)
4E17DC	3.51 (13.3)
4E18DA	3.51 (13.3)
4E18DB	3.75 (14.2)
4E19DA	4.23 (16)
4E19DB	4.28 (16.2)
4F18DA	4.91 (18.6)
4F18DB	5.15 (19.5)
4F19DA	5.57 (21.1)
4F19DB	5.63 (21.3)

Lubrication, continued

Oil Fill and Drain Procedures

Oil Fill Procedure



- Always stop the unit before adding oil . Overfill may cause oil leaking issue.
- 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.

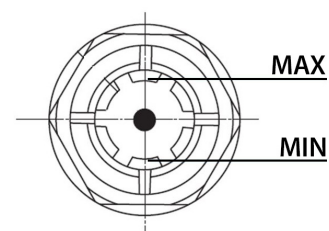
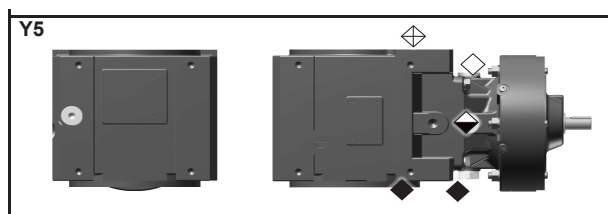


Table 21. Oil Change Intervals

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. 5000 hrs operation or 1 year, whichever comes first.	When case oil temperature is 158° F (70° C) or higher When case oil temperature is lower than 158° F (70° C)
When Unit Supplied with Mobil SHC Gear Hi-Shock 150 Oil	First Change	1000 hrs operation or 6 months, whichever comes first.	All
	Second change and thereafter	5000 hrs operation or 1 year, whichever comes first. 10000 hrs operation or 2 year, whichever comes first.	When case oil temperature is 158° F (70° C) or higher 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

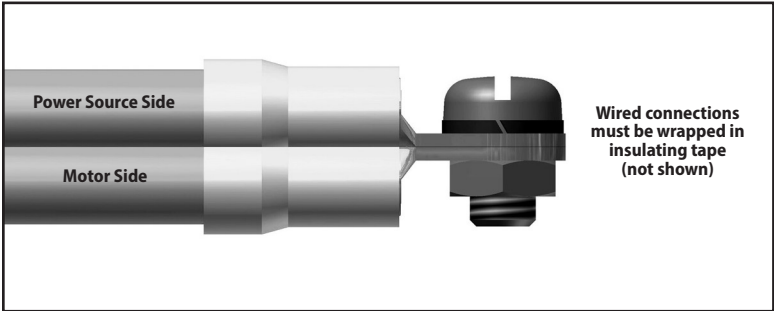
Oil Drain Procedure

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.

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



- 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.

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 22. Insulation Resistance

Mega-Ohm	Insulation Resistance
500V	1 M (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 Wiring, continued

Motor Protection, Motor Wiring Method

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 23. 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					WYE
2 (1.5) x 4					
3 (2.2) x 4					
5 (3.7) x 4					
7.5 (5.5) x 4	DELTA	DELTA	DELTA	DELTA	
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

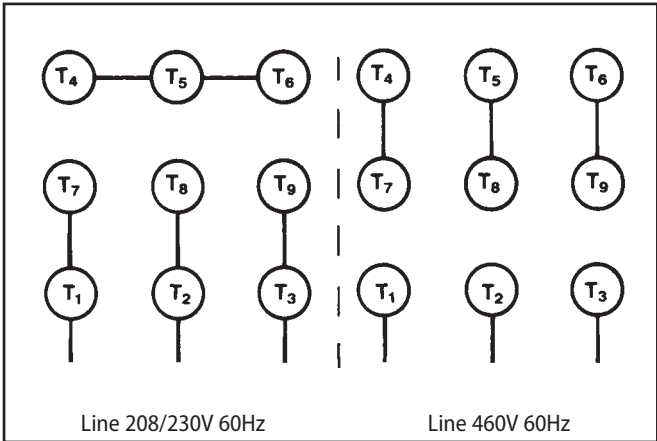


Figure 5. Three-Phase DELTA connection Motor

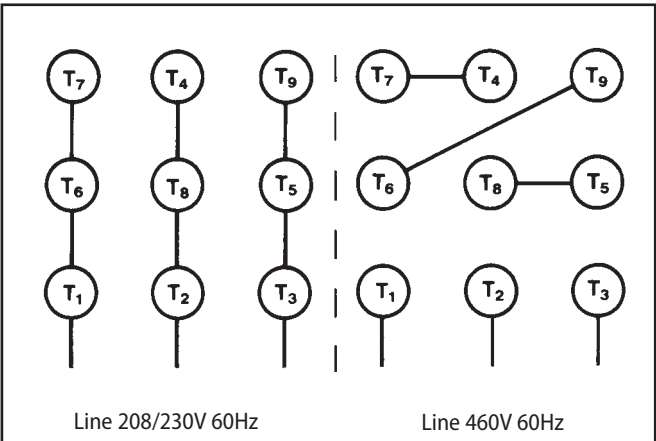


Figure 6. Three-Phase Motor, 575V, 60Hz

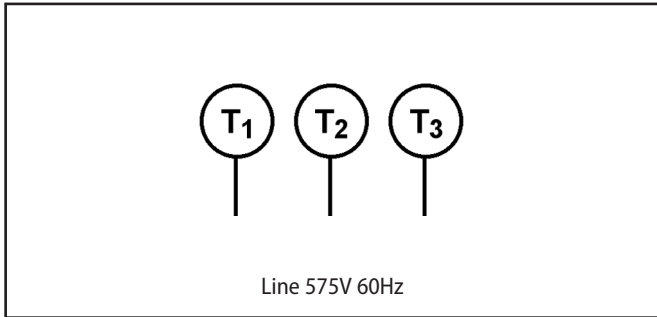
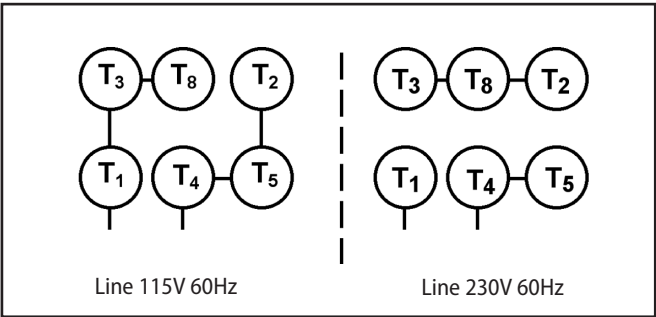


Figure 7. Single-Phase Motor, 115/230V, 60Hz



Motor Wiring, continued

Motor Wiring Method, Brake Wiring

CE Motors

Table 24. 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		
3 (2.2) x 4		
4 (3.0) x 4		
5 (3.7) x 4		
7.5 (5.5) x 4	380V, 50Hz Three Phase	WYE-Start DELTA-Run
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		

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

Figure 8. DELTA-WYE Connection Motor

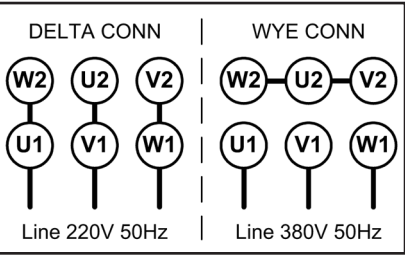
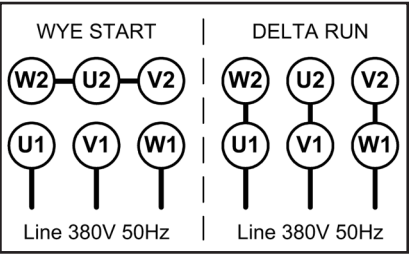


Figure 9. WYE-DELTA Start Connection Motor



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 25. 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, continued

U.S. Standard and CSA Approved Motor Brake Wiring

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

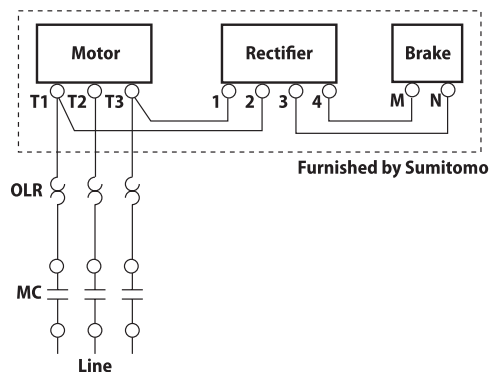


Figure 11. Fast Brake Action, 230V

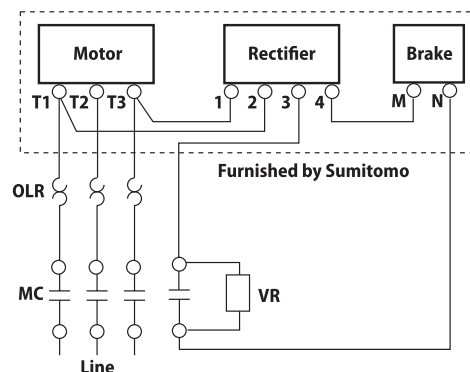


Figure 12. Normal Brake Action, 460V

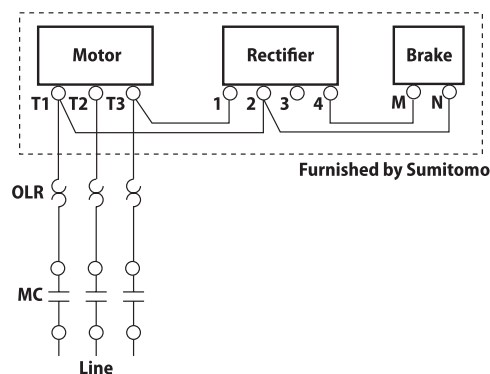
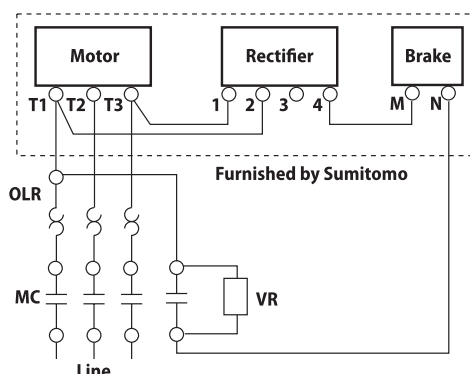


Figure 13. Fast Brake Action, 460V, 575V



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

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

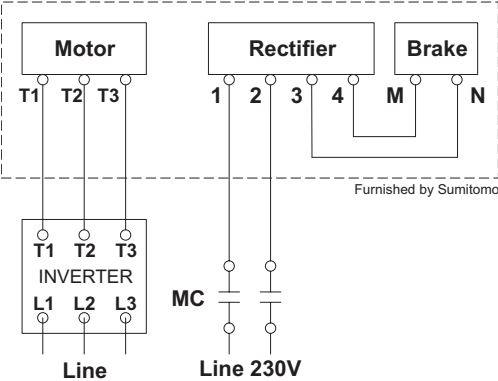


Figure 15. Fast Brake Action, 230V Brake

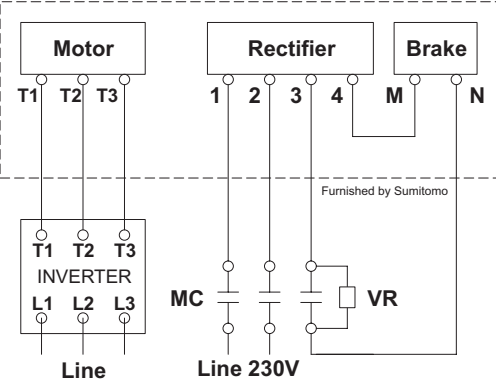


Figure 16. Normal Brake Action, 460V, 575V Brake

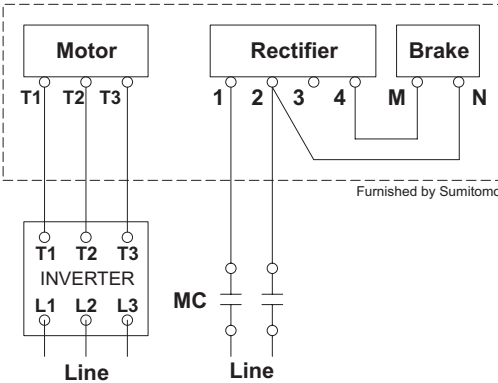
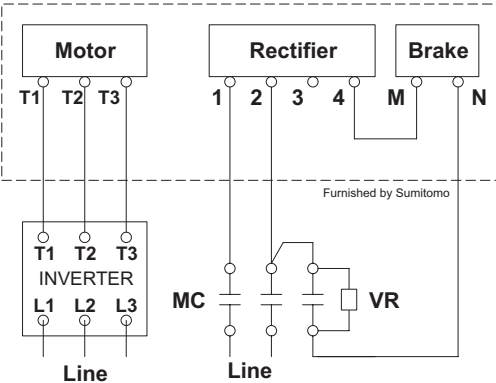
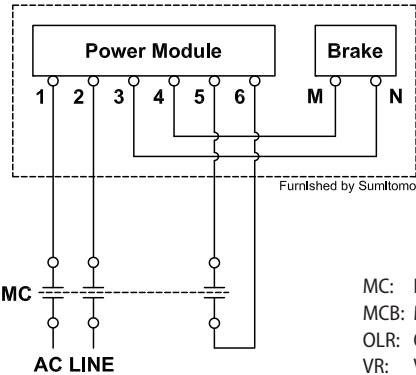


Figure 17. Fast Brake Action, 460V, 575V Brake



Models FB-20 / FB-30

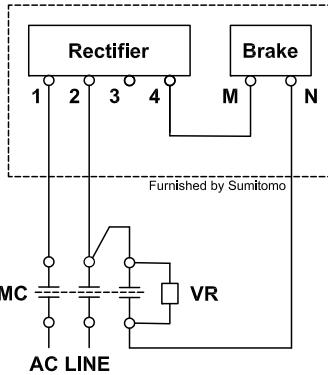
Figure 18. FB-20 and FB-30 Brake Wiring, 480VAC or less



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



Motor Wiring, continued

CE Motor Brake Wiring

CE Motor Brake Wiring

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

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

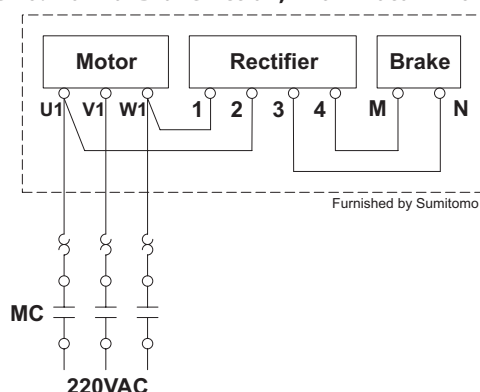


Figure 21. Fast Brake Action, 220V Motor 220V Brake

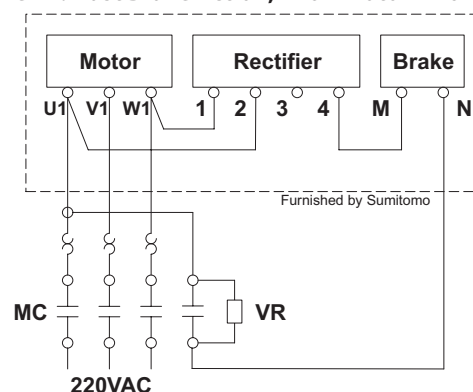


Figure 22. Normal Brake Action, 380V Motor, 220V Brake, Tapped

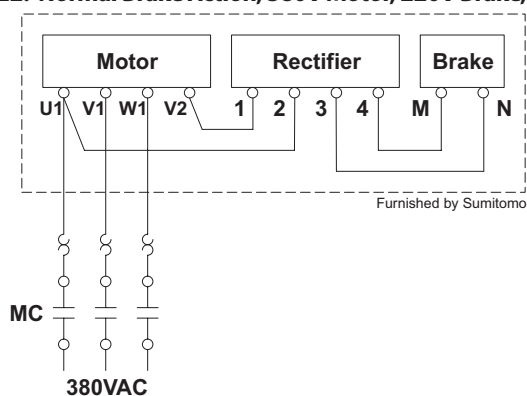


Figure 23. Fast Brake Action, 380V Motor, 220V Brake, Tapped

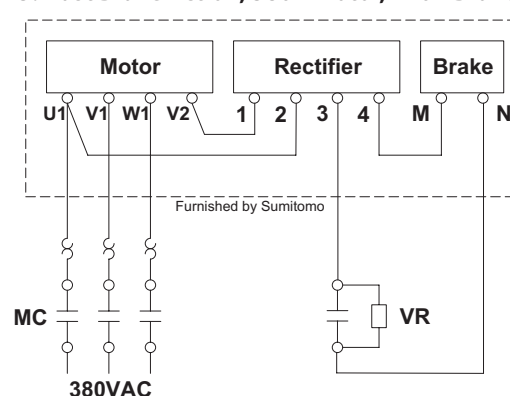


Figure 24. Normal Brake Action, 380V Motor, 220V Brake, Separated

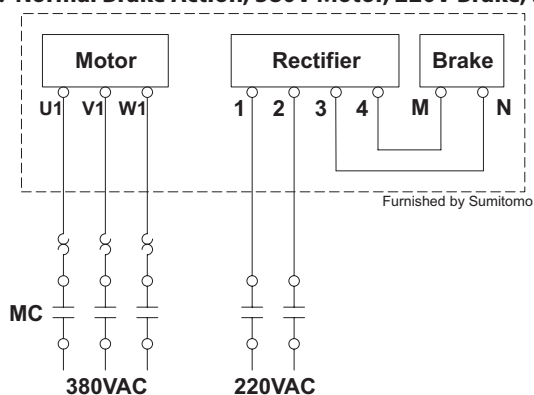
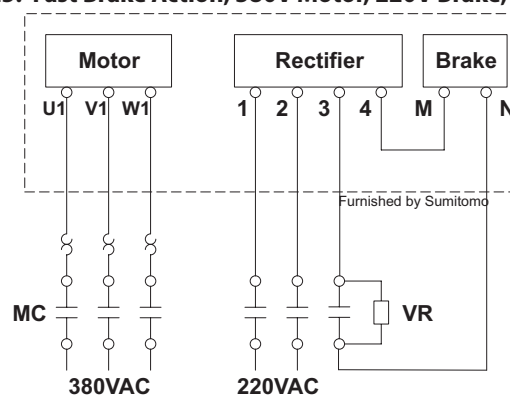


Figure 25. Fast Brake Action, 380V Motor, 220V Brake, Separated



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

Note: [1] Refer to Varistor Specifications Table

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

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

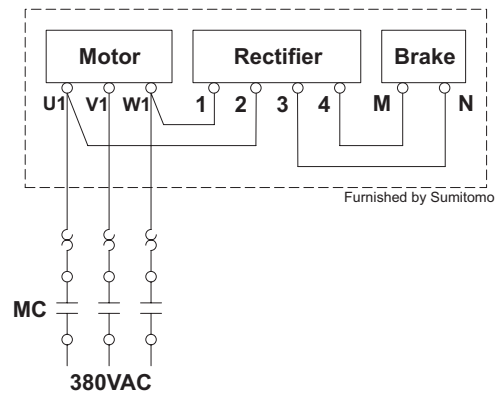
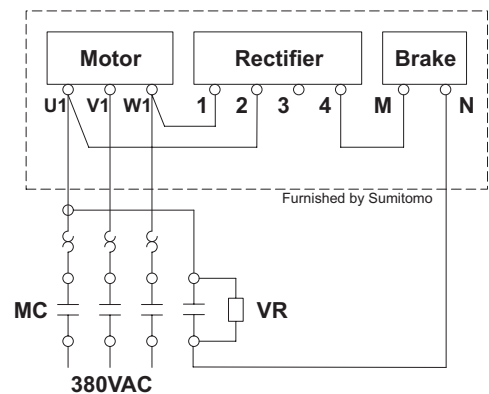


Figure 27. Fast Brake Action, 380V Motor, 380V Brake



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

Figure 28. Normal Brake Action

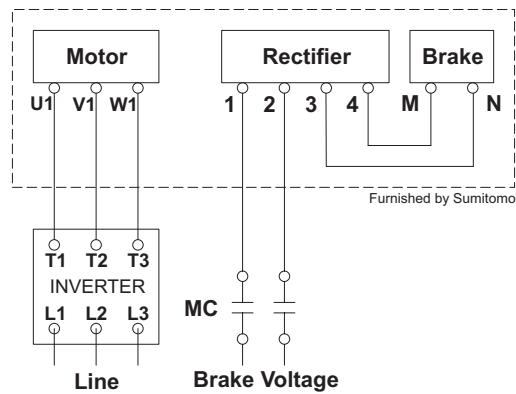
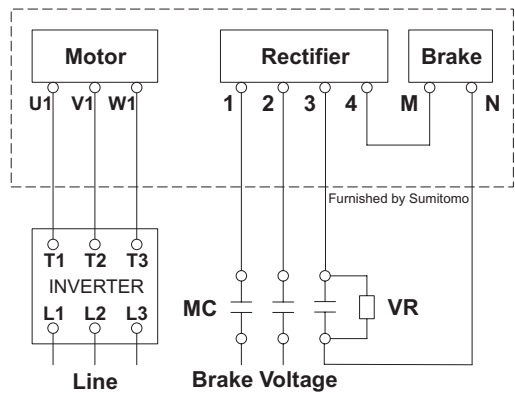


Figure 29. Fast Brake Action



CE Motor Brake Wiring

Models FB-20 / FB-30

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

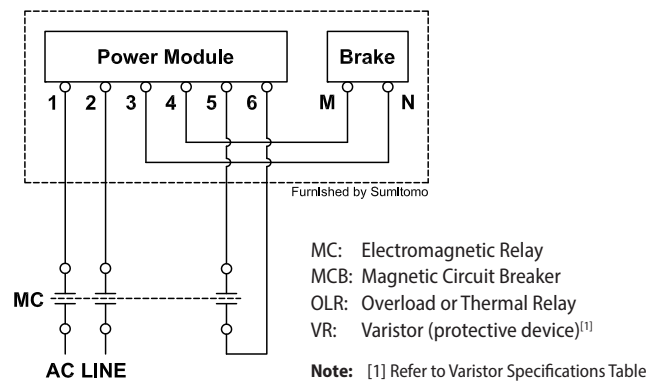


Table 26. Standard CE Motor, Motor / Brake Voltage Table

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 27. 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 28. 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	Consult Factory	Consult Factory	05F-4FB2	MP985WW-01
FB-10B, 10B1, 10E	10 (7.5) x 4			15F-4FB1	EW397WW-01
FB-15B, 15B1, 15E	15 (11) x 4				

Table 29. 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

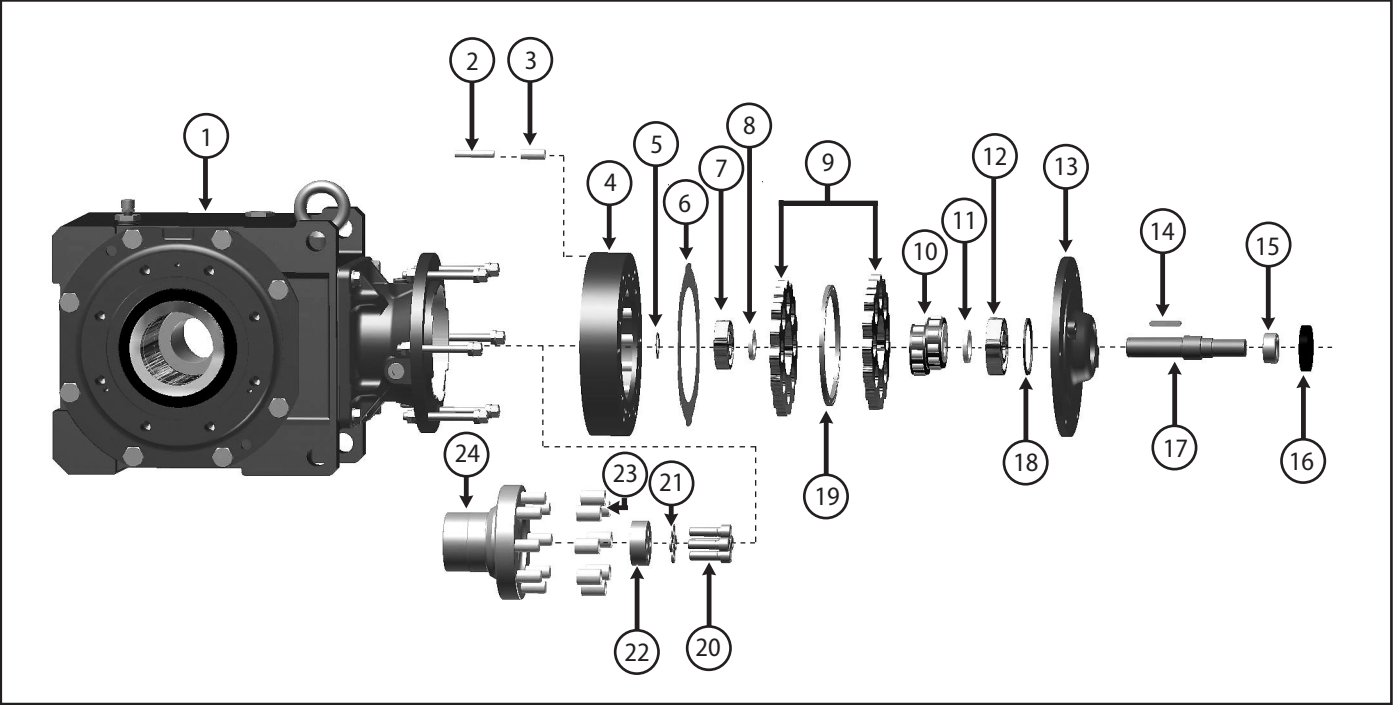


Table 30. Cyclo® BBB4 Reducer Parts

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

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

Parts, continued

Cyclo® Planetary Reduction Component Parts

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

Figure 32. Cyclo® Planetary Reduction Component

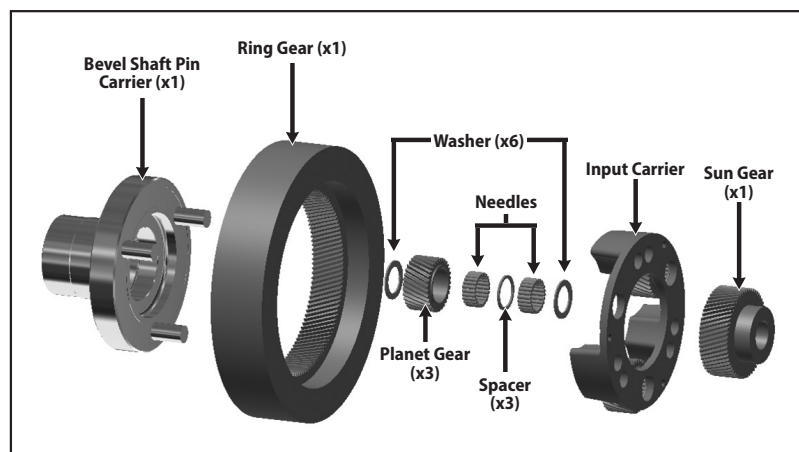
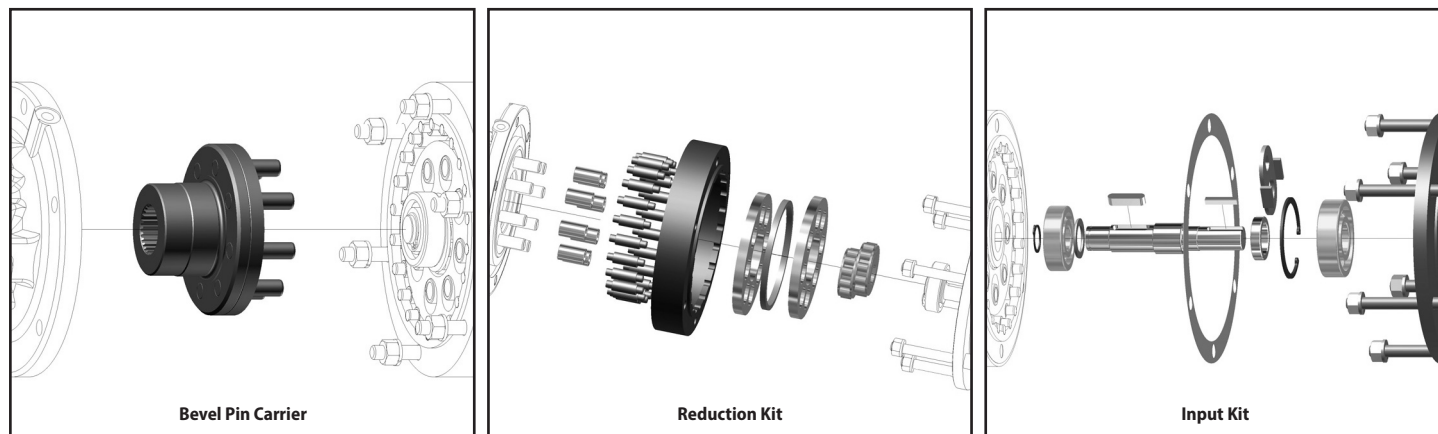


Table 31. Cyclo® Planetary Reduction Component Part Numbers (Ratios 11 - 18:1)

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
4B120, 4B125	11	3:1	931BB612-003G	AP8712G	CJ584LG	AP8711G	AX2806G-3	AX2543G	AX2761G	CJ244LG	CJ701LG (for 4A) CJ703LG (for 4B)
	13, 14	4:1	931BB612-004G	AP8706G	CJ554LG	AP8705G					
	16, 18	5:1	931BB612-005G	AP8714G	CJ585LG	AP8713G					
4B140, 4B145 4C140, 4C145	11	3:1	931BB614-003G	AP8717G	CJ586LG	AP8716G	AX2807G-3	AX2763G	AX2544G	CJ588LG	CJ702LG (for 4A) CJ704LG (for 4B) CJ706LG (for 4C)
	13, 14	4:1	931BB614-004G	AP8708G	CJ555LG	AP8707G					
	16, 18	5:1	931BB614-005G	AP8719G	CJ587LG	AP8718G					
4B160, 4B165 4C160, 4C165	11	3:1	931BB616-003G	AP8721G	CJ589LG	AP8720G	AX2808G-3	AX2555G	AX2554G	CJ591LG	CJ705LG (for 4B) CJ707LG (for 4C)
	13, 14	4:1	931BB616-004G	AP8710G	CJ556LG	AP8709G					
	16, 18	5:1	931BB616-005G	AP8726G	CJ590LG	AP8722G					
4C170, 4C175 4D170, 4D175 4E170, 4E175	11	3:1	931BB617-003G	AP9278G	CJ993LG	AP9277G	AX3077G-3	AX3061G	AX3060G	CJ996LG	CJ938LG (for 4C) CK009LG (for 4D, 4E)
	13, 14	4:1	931BB617-004G	AP9280G	CJ994LG	AP9279G					
	16, 18	5:1	931BB617-005G	AP9282G	CJ995LG	AP9281G					
4D180, 4D185 4E180, 4E185 4F180, 4F185	11	3:1	931BB618-003G	AP9285G	CJ997LG	AP9284G	AX3077G-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® BBB4 Reduction Component Part Numbers (Ratios $\geq 19:1$)

Figure 33. Cyclo® BBB4 Reduction Components - thru 4F195



Parts, continued

Cyclo® Reduction Component Parts

Table 32. 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
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⁾		

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo®	Input Kit	Reduction Kit	4A14 Bevel Pin Carrier	4B14 Bevel Pin Carrier	4C14 Bevel Pin Carrier
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	4C17 Bevel Pin Carrier	4D17, 4E17 Bevel Pin Carrier
4C170 4C175 4D170 4D175 4E170 4E175	19, 21	6	D78626	D78735	CJ698LG	CJ700LG
	22, 25	7		See Note ⁽¹⁾		
	26, 28	8		D78794		
	35, 39	11		D78736		
	42, 46	13		D78737		
	48, 53	15		D78738		
	54, 60	17		D78739		
	67, 74	21		D78740		
	80, 88	25		D78741		
	93, 102	29		D78742		
	112, 123	35		D78743		
	138, 151	43		D78744		
	163, 179	51		D78745		
	189, 207	59		D78746		
	227, 249	71		D78747		
	278, 305	89		D78748		
	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	CK012LG		CK016LG
	42, 46	13		D78750			
	48, 53	15		D78751			
	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			

Unit Size	Reduction Ratio		Part Numbers			
	Overall	Cyclo®	Input Kit	Reduction Kit	4E19 Bevel Pin Carrier	4F19 Bevel Pin Carrier
4E190 4E195 4F190 4F195	19, 21	6	D78628	See Note ⁽¹⁾	CJ956LG	CJ931LG
	22, 25	7		See Note ⁽¹⁾		
	26, 28	8		See Note ⁽¹⁾		
	35, 39	11		D78763		
	42, 46	13		D78763		
	48, 53	15		D78764		
	54, 60	17		D78765		
	67, 74	21		D78766		
	80, 88	25		D78767		
	93, 102	29		D78768		
	112, 123	35		D78769		
	138, 151	43		D78770		
	163, 179	51		D78771		
	189, 207	59		D78772		
	227, 249	71		D78773		
	278, 305	87		D78774		

Note: [1] Consult Factory

Bearings and Oil Seals

Figure 33. Cyclo® BBB4 Bearings and Oil Seals

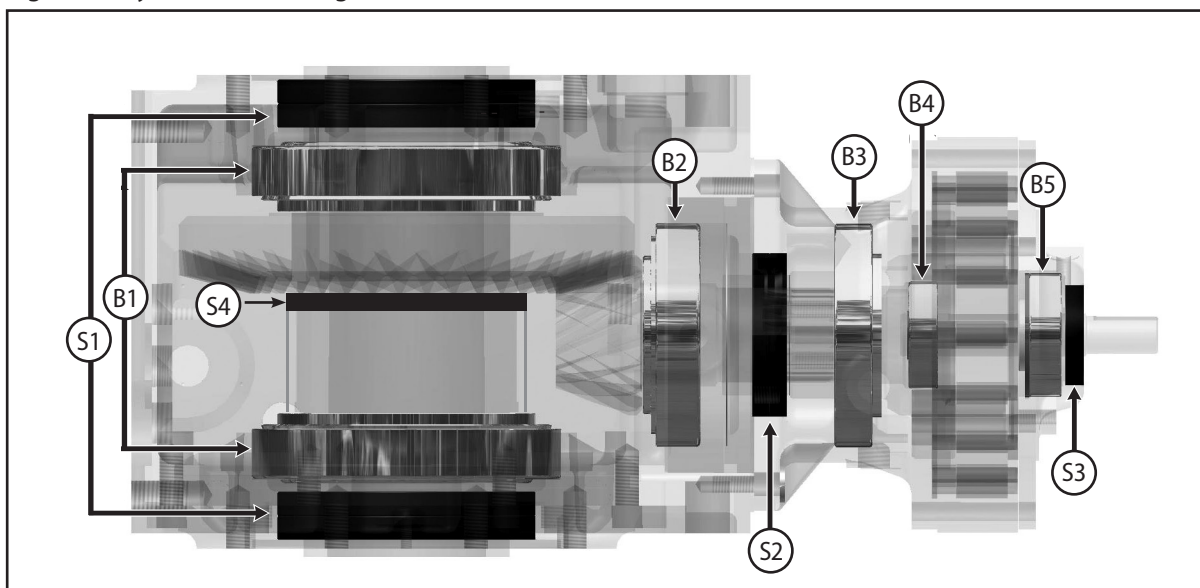


Table 34. Cyclo® BBB4 Reducer Bearings and Oil Seals

Unit Size	Bearings					Oil Seals ^[1]			
	B1	B2	B3	B4	B5	S1 ^[2]	S2 ^[3]	S3	S4 ^[4]
4B120 4B125	32020	32310	32013	6304	6305Z	D 100 x 125 x 13	S 60 x 75 x 9	D 32 x 52 x 8	VS-110
4B140 4B145			30215	6305R	6306			D 38 x 58 x 11	
4B160 4B165			30217	6307R	6308			D 55 x 78 x 12	
4C140 4C145	32024	32312	30215	6305R	6306	D 120 x 150 x 14	S 70 x 95 x 13	D 38 x 58 x 11	VS-130
4C160 4C165			30217	6307R	6308			D 55 x 78 x 12	
4C170 4C175			30220	6406	6407			D 60 x 82 x 12	
4D160 4D165	32028	32314	30217	6307R	6308	D 140 x 170 x 14	S 90 x 115 x 13	D 55 x 78 x 12	VS-160
4D170 4D175			30220	6406	6407			D 62 x 82 x 12	
4D180 4D185			30222	6407	6409			D 65 x 88 x 12	
4E170 4E175	32032	32315	30220	6406	6407	D 160 x 190 x 16	S 90 x 115 x 13	D 62 x 82 x 12	VS-180
4E180 4E185			30222	6407	6409			D 65 x 88 x 12	
4E190 4E195			30226	6408	6411			S 70 x 88 x 10	
4F180 4F185	32036	32319	30226	6407	6409	D 180 x 210 x 16	S 140 x 170 x 14	D 65 x 88 x 12	VS-190
4F190 4F195			30230	6408	6411			S 70 x 88 x 10	

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

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

[3] Only when BBB portion and Cyclo(R) portion are specified different lubrication. (optional)

[4] [4] Only when BBB Mixer Drive with drywell structure, v-ring on drywell device and material recommended FKM.

Parts, continued

Bevel Gearing Parts and Tooth Count

Bevel Gearing Parts and Tooth Count

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

Figure 35. Cyclo® BBB4 Bevel Gearing Tooth Count

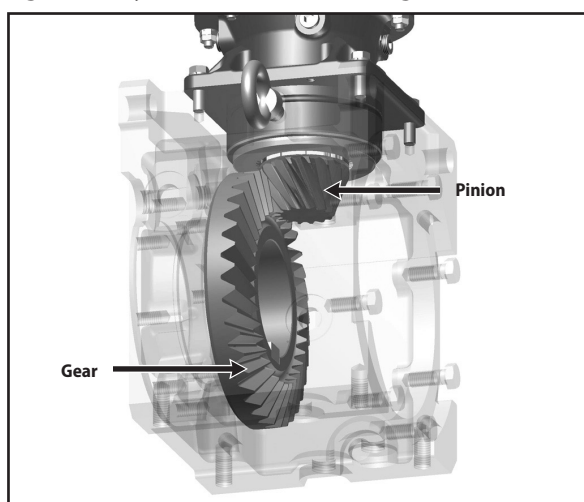


Table 35. Cyclo® BBB4 Ratios

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

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

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

To determine the bevel tooth count, identify the Cyclo® BBB4 nominal ratio and corresponding bevel ratio from Table 49. Then reference Table 45 to identify the actual number of bevel gear and pinion teeth.

Table 36. Bevel Tooth Count and Part Numbers

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

Cyclo® Portion Disassembly/Assembly

Disassembly Procedure

Disassembly/Assembly

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

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



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

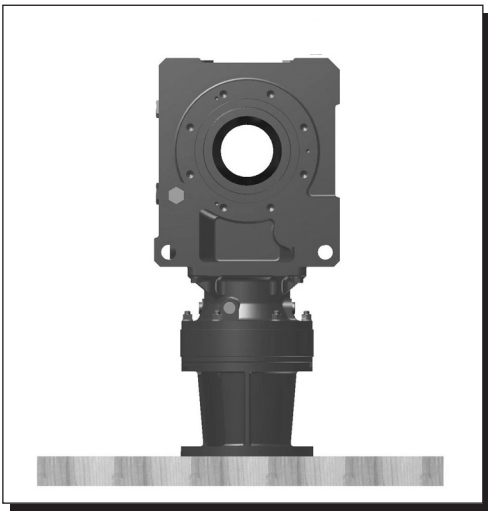
Cyclo® Portion – General Disassembly

1

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

2

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

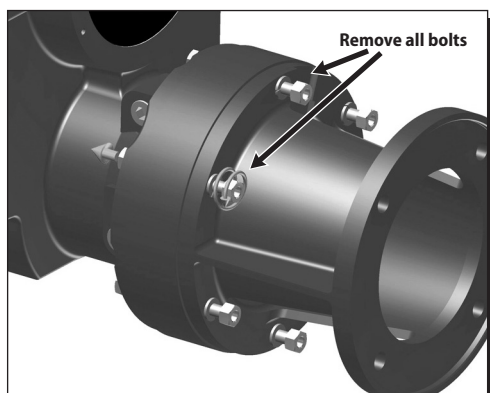


3

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.

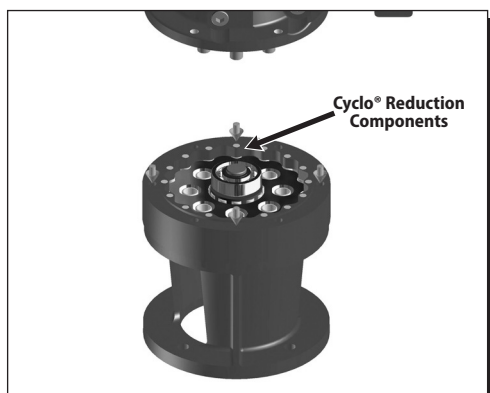
Cyclo® Portion Disassembly/Assembly, continued

Disassembly Procedure



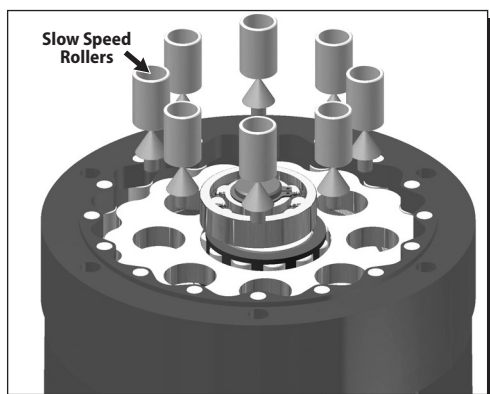
4

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).



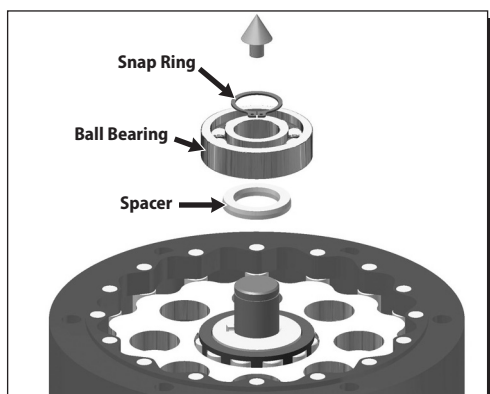
5

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.

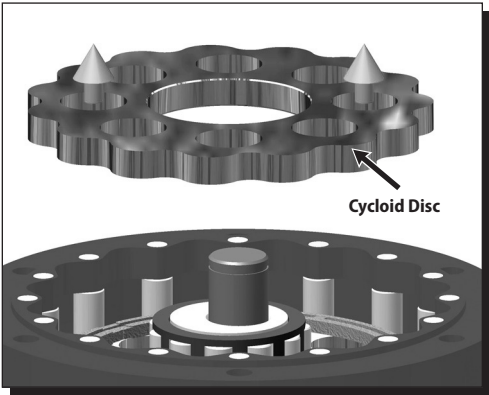


7

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

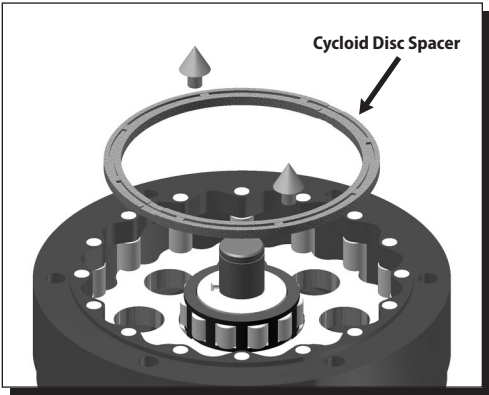
Cyclo® Portion Disassembly/Assembly, continued

Disassembly Procedure



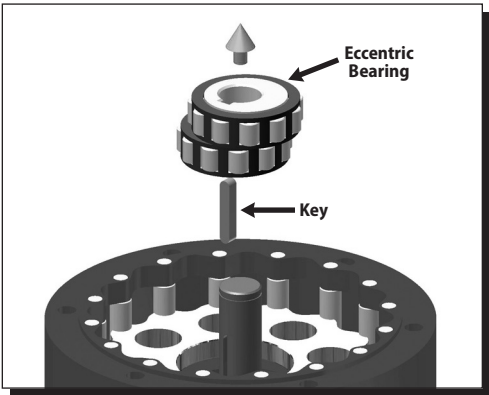
8

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



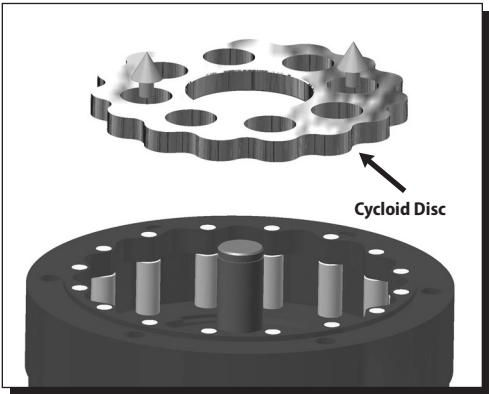
9

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



10

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

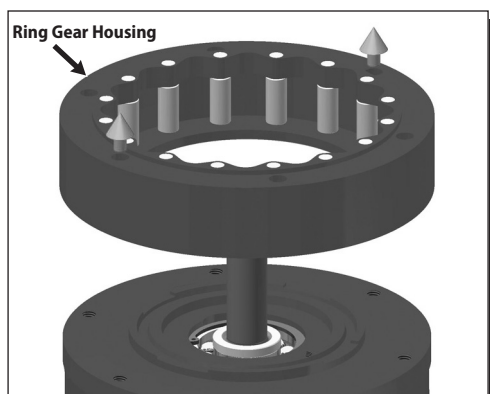


11

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

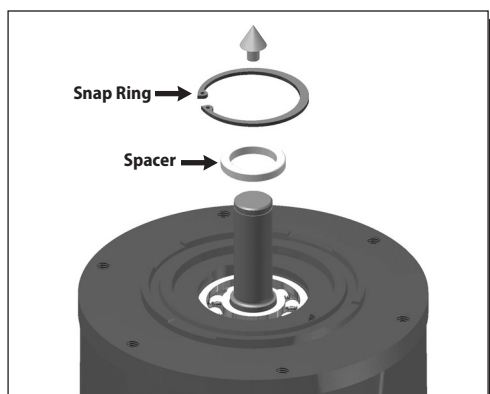
Cyclo® Portion Disassembly/Assembly, continued

Disassembly Procedure



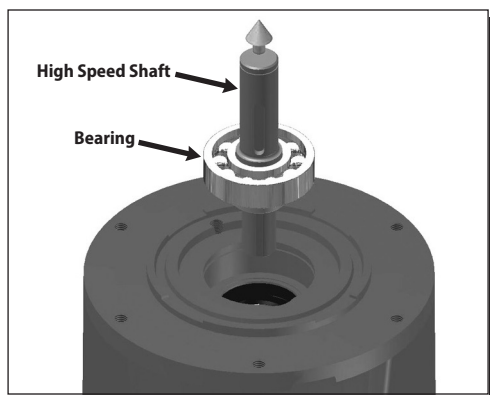
12

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**.

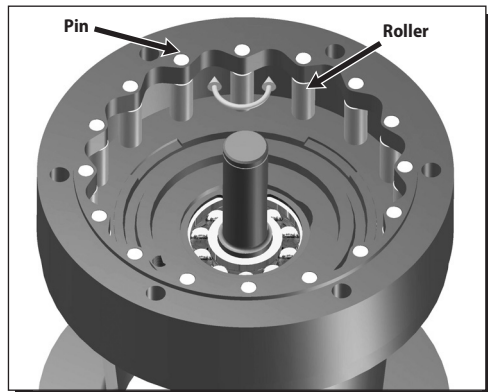
Cyclo® Portion Disassembly/Assembly, continued

Reassembly Procedure

Cyclo® Portion – General Reassembly

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

Remember these important notes when assembling the Cyclo® reducer:



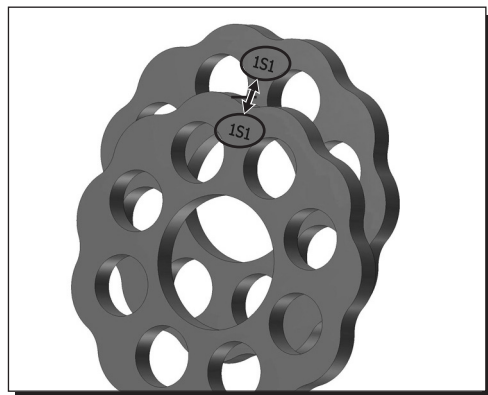
1

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

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



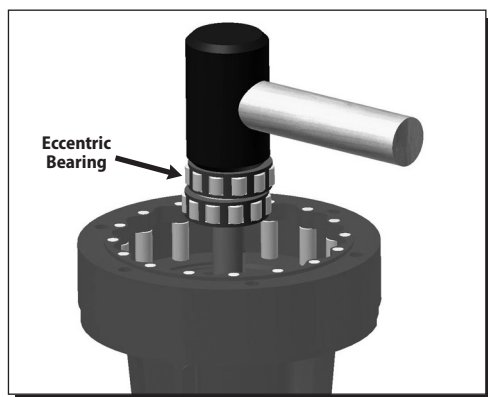
If the Cyclo® portion of the Cyclo® BBB4 unit is oil lubricated – do not add any grease during the reassembly process.



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.

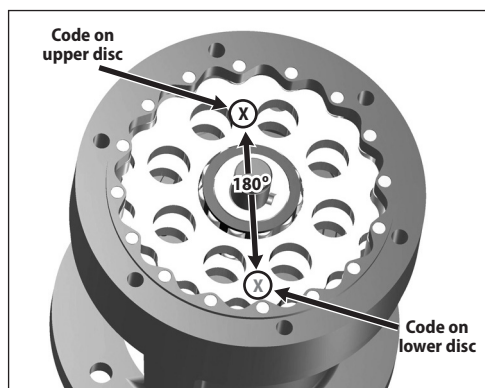


3

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

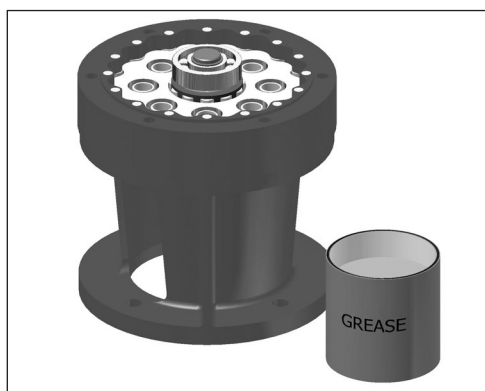
Cyclo® Portion Disassembly/Assembly, continued

Reassembly Procedure



4

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

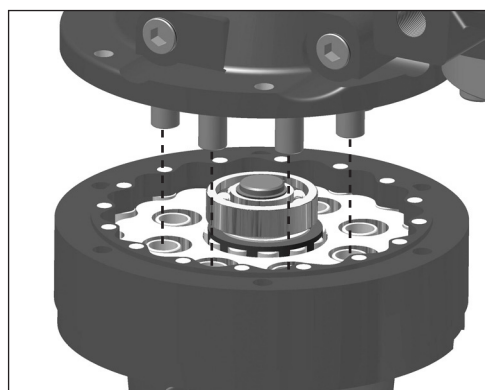


5

If the Cyclo® portion of the 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.



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**.

Troubleshooting

Reducer Troubleshooting

Reducer Troubleshooting

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

Reducer Troubleshooting

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

Troubleshooting, continued**Motor Troubleshooting****Motor Troubleshooting**

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