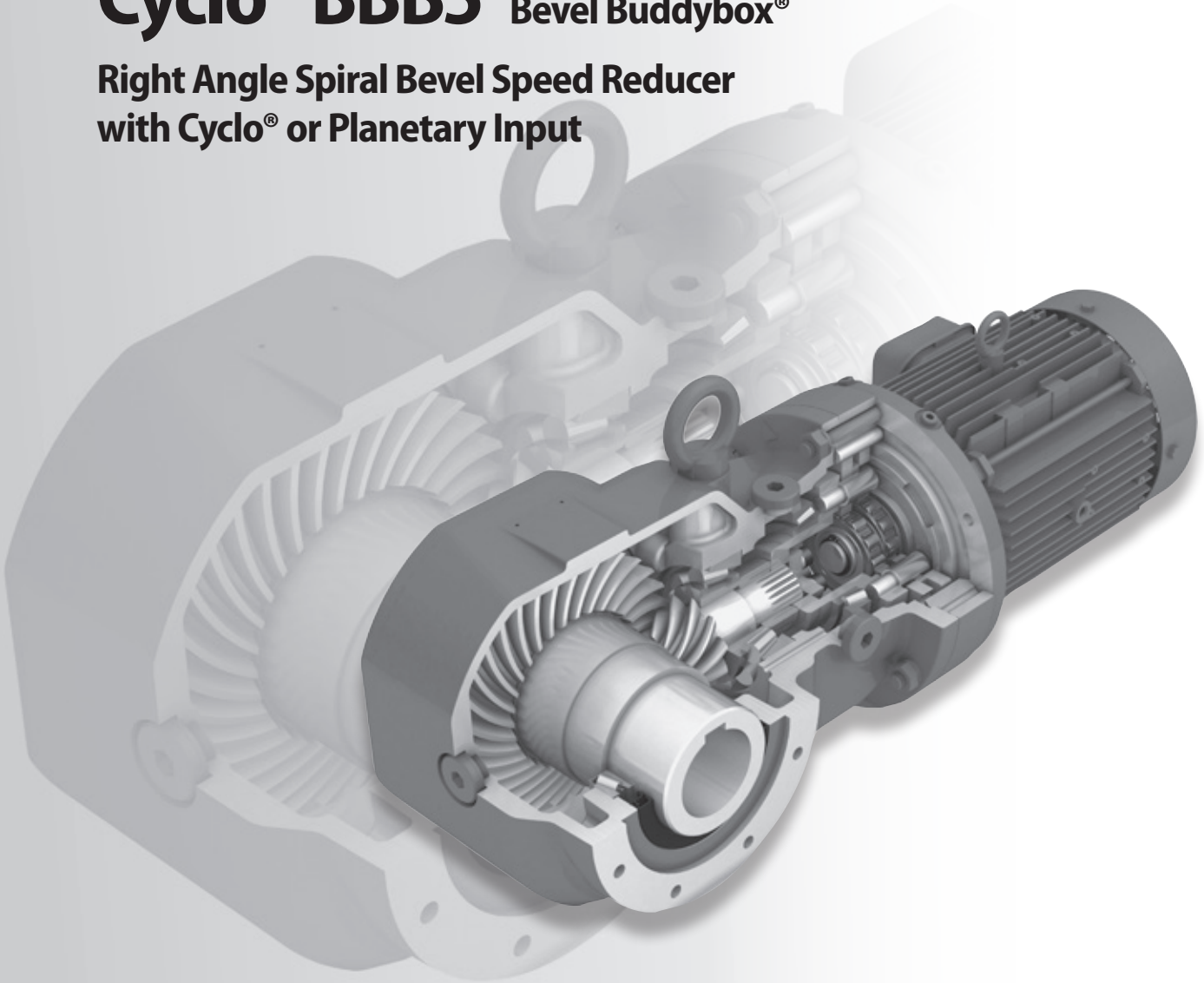


# Cyclo<sup>®</sup> BBB5 Bevel Buddybox<sup>®</sup>

Right Angle Spiral Bevel Speed Reducer  
with Cyclo<sup>®</sup> or Planetary Input



## Operation and Maintenance Manual

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## Important Notes

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### 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® BBB5 operation
- 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 that this manual is easily accessible for reference at the machine location.



- **Only properly trained personal** 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."**



- 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 (Aluminum and/or 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 the order.** Using the incorrect product may cause equipment damage or personal injury.
- **Do not** remove the nameplate from the 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
- notify the shipping company immediately any damage is found. Do not install or operate a damaged unit.
- all bolts and nuts are fully tightened.

Please consult a Sumitomo representative, distributor, or sales office if any defects are found or if there any questions.

## Nameplate Inspection

When contacting Sumitomo’s agent, distributor, or sales office about this product, please be prepared to provide the following information from the reducer/gearmotor nameplate:

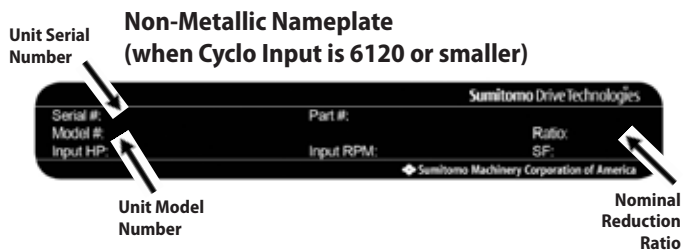
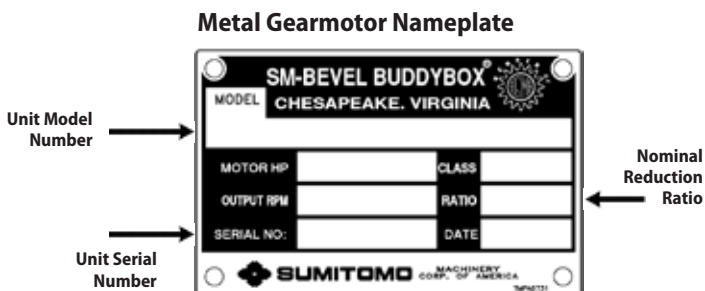
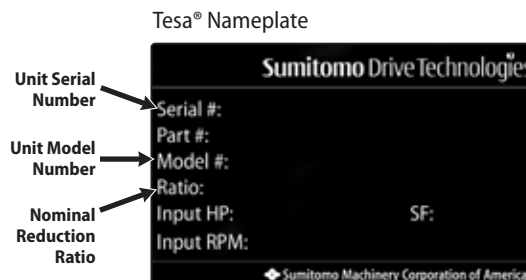
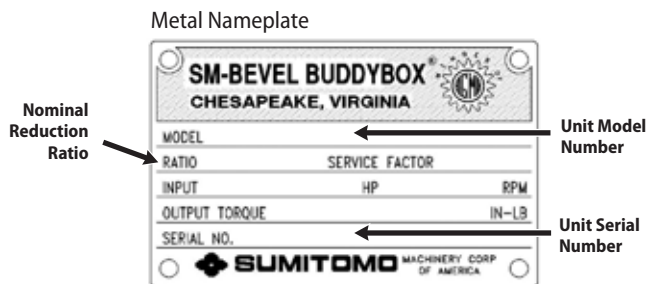
- **reducer or gearmotor model number (nomenclature)**
- **reduction ratio**
- **serial number.**

## 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.

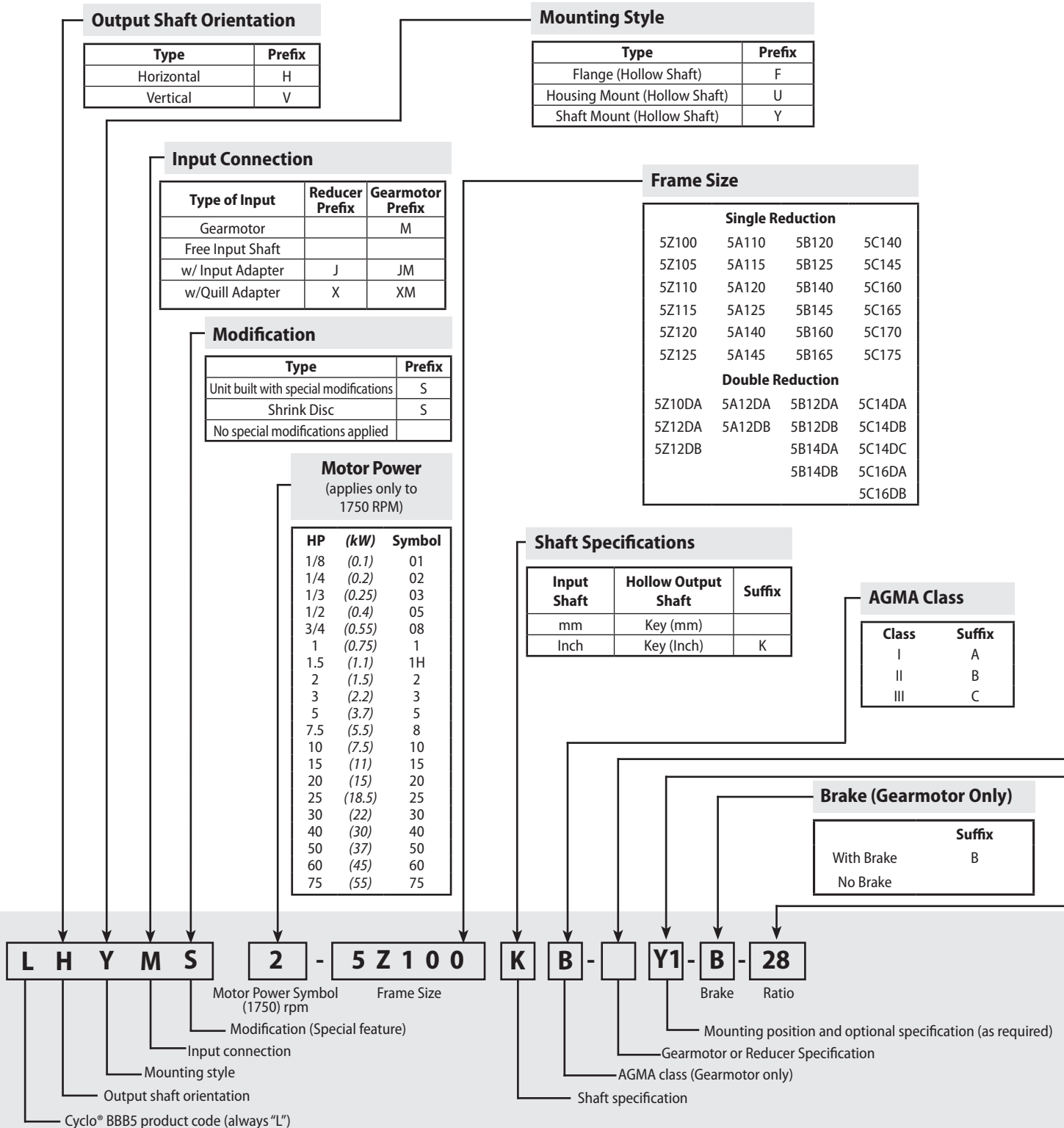
Refer to the Lubrication section in this manual for detailed lubrication information.



# Nomenclature

## Nomenclature

The nomenclature details specific information about Sumitomo products. Verify that the nomenclature of the unit delivered matches the order.



# Nomenclature continued

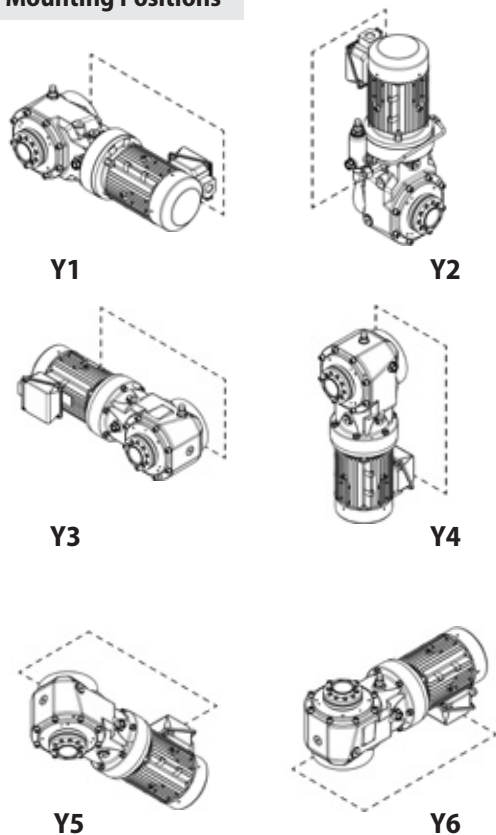
### Gearmotor Specification

Specification	Suffix
Three-Phase Motor	
Single-Phase Motor	<b>SG</b>
AF Motor (Adj. Frequency)	<b>AV</b>
Servo Motor	<b>SV</b>
DC Motor	<b>DV</b>
Torque Limiter	<b>TL</b>
Premium Efficient Three-Phase Motor	<b>EP</b>

### Reducer Specification

Type	Suffix
Standard	
Shovel Base	<b>SB</b>
DC Motor	<b>DV</b>

### Mounting Positions



### Nominal and Exact Ratio

BBB with Planetary Input				BBB with Cyclo Input			
Input Ratio	Nominal Overall Ratio		Exact Ratio	Input Ratio	Nominal Overall Ratio		Exact Ratio
					BBB Frame Size		
3	11	All	5Z10	All	6	21	21.0
			5Z11		7	22	22.4
			5Z12		25	24.5	
			5A11		8	28	28.0
			5A12		35	35.2	
			5B12		39	38.5	
		5B16	13		46	45.5	
		5C16	15		53	52.5	
		5C17	17		60	59.5	
		5A14	21		67	67.2	
		5B14	25		74	73.5	
		5C14	29		80	80.0	
4	13	All	5Z11	All	88	87.5	
			5Z12		102	101.5	
			5A11		112	112.0	
			5A12		123	122.5	
			5B12		151	150.5	
			5B16		179	178.5	
		5C16	59		207	206.5	
		5A14	71		249	248.5	
		5B14	87		305	304.5	
		5C14					
		5Z10			12.99		
		5C17			13.09		
4	14	All	5Z11	All	364	364.0	
			5Z12		424	423.5	
			5A11		501	500.5	
			5A12		578	577.5	
			5B12		683	682.5	
			5B16		809	808.5	
		5A14	273		956	955.5	
		5B14	319		1117	1116.5	
		5C14	377		1320	1319.5	
		5Z10	473		1656	1655.5	
		5C17	559		1957	1956.5	
		5Z10	649		2272	2271.5	
5	16	All	5Z12	All	731	2559	2558.5
			5A12		841	2944	2943.5
			5B12		1003	3511	3510.5
			5Z11		1247	4365	4364.5
			5A11		1479	5177	5176.5
			5A14		1849	6472	6471.5
		5B14	2065		7228	7227.5	
		5C14	2537		8880	8879.5	
		5C17	3045		10658	10657.5	
		5B16					
		5C16					
		5Z10			16.80		
5Z12		17.12					
5A12		17.12					
5B12		17.12					
5Z11		17.38					
5A11		17.38					
5A14		17.50					
5B14		17.50					
5C14		17.50					
5C17		17.68					
5B16		17.68					
5C16		17.78					
5B14		17.78					
5B16		17.78					
5C16		17.78					

### Nomenclature Example: LHYMS2-5Z100-KB-Y1-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
- 5Z100 - Frame Size
- K - 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® BBB5 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. Rustproofing procedures are required.
- Consult Sumitomo when exporting the unit. Rustproofing procedures may be required.

If the Cyclo® BBB5 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® BBB5 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 contact a 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 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

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 – 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 with a torque arm or similar means to limit housing rotation.

**NOTE:** 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 a 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

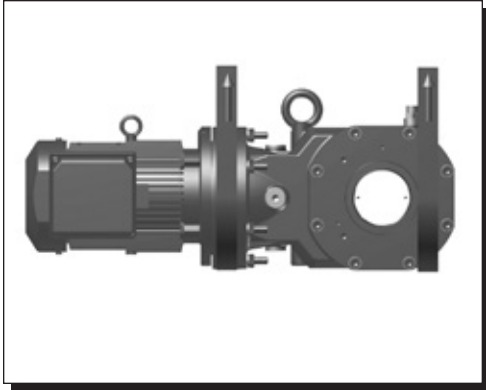


- Before mounting the reducer/gearmotor to the machine, verify the appropriate/desired rotation of the machine. Differences in the rotational direction may cause personal injury and/or equipment damage.
- Before operating the unit, ensure that all safety guards around the rotating components are in-place and secure. Failure to do so may result in personal injury.
- When mounting the reducer or gearmotor to the driven shaft of the machine or conveyor, ensure that the torque arm is properly tensioned, and the bolts securing the torque arm are sufficiently tightened. Failure to follow these precautions may result in personal injury and/or equipment damage.



# Installation onto Driven Shaft

## Keyed Hollow Bore



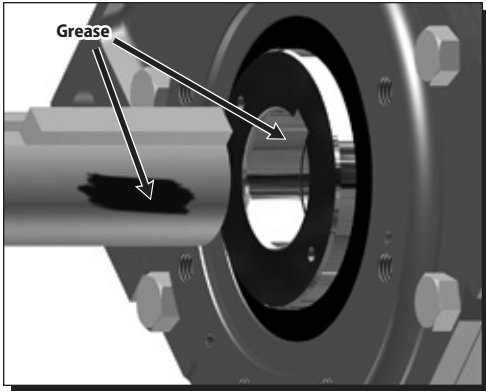
### Keyed Hollow Bore Introduction



**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 of this manual.



**CAUTION:** The Cyclo® BBB5 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**

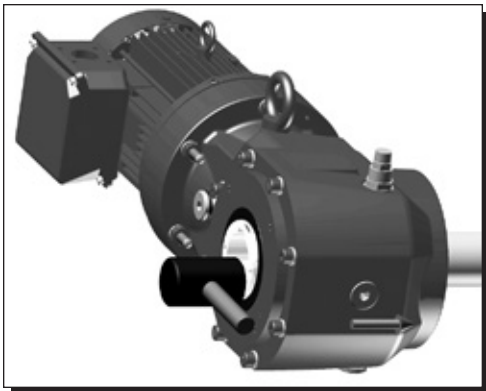
Align the driven shaft with the reducer/gearmotor bore and carefully slide unit onto the driven shaft to desired location.



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

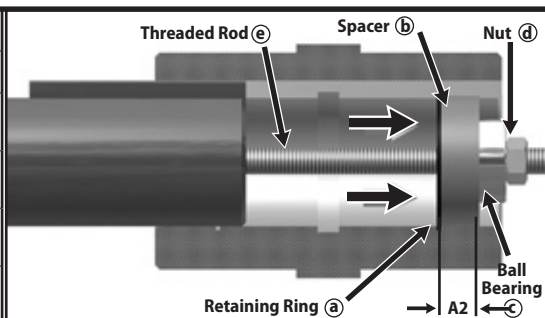
If using a mallet during installation, strike **only** against the unit's steel keyed hollow bore. Do not strike the reducer housing or oil seal, as damage to the bearings, housing, and/or seals may occur.

If the fit is tight, use a jig such as the one shown in Table 1 to ease assembly. **Sumitomo does not supply a mounting jig. This information is provided for reference only.**



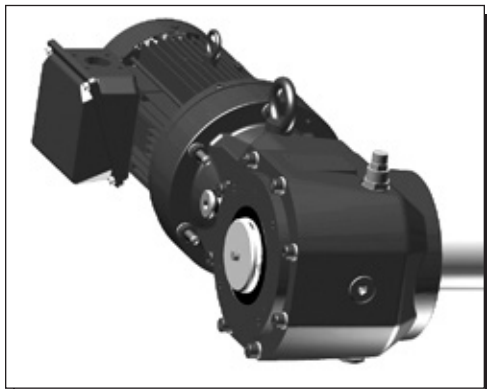
**Table 1. Jig Dimensions (mm)**

Size	a	b	c	d	e
	CC (ISO/JIS)	A2	Bearing	Nut	Threaded Rod
5Z	45	25	51104	M16	M16 x 250
5A	55	25	51104	M16	M16 x 250
5B	65	25	51105	M20	M20 x 300
5C	75	35	51105	M20	M20 x 300



## Installation onto Driven Shaft

### Keyed Hollow Bore, Shrink Disc Type Hollow Bore



#### 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 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® BBB5 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.

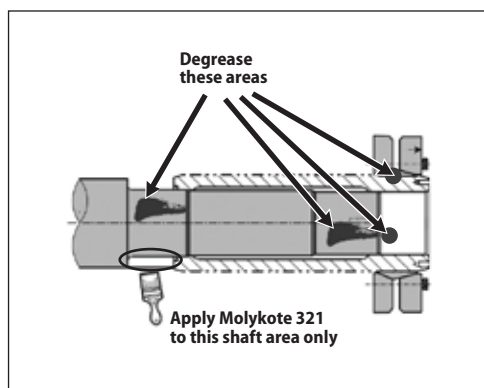
## Bore and Shaft Tolerance Specifications

- Refer to the certified outline drawing or Cyclo® BBB5 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 Driven Shaft



Before placing unit onto driven shaft, **do not apply grease, oil, or anti-seize grease 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.



#### 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.

# Installation onto Driven Shaft

## Shrink Disc Type Hollow Bore



### 2

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



If the fit is tight, strike on the reducer 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 hollow bore. Do not strike the reducer housing or oil seal

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 2. Shrink Disc Bolt Tightening Torques**

Shrink Disc Bolt Tightening Torques				
Size	Model (Typical)	Bolt	Bolt Torque	
			(lb•ft)	(Nm)
5Z	TAS-3071-45x55	8 x M6X25 ISO/JIS grade 10.9	9	(12)
5A	TAS-3071-55x68	10 x M6x25 ISO/JIS grade 10.9	9	(12)
5B	TAS-3071-65x80	7 x M8x30 ISO/JIS grade 12.9	26	(34)
5C	TAS-3071-75x100	12 x M8x35 ISO/JIS grade 12.9	26	(34)

### 3

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

### 4

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, Flange Mount (Banjo) Torque Arm

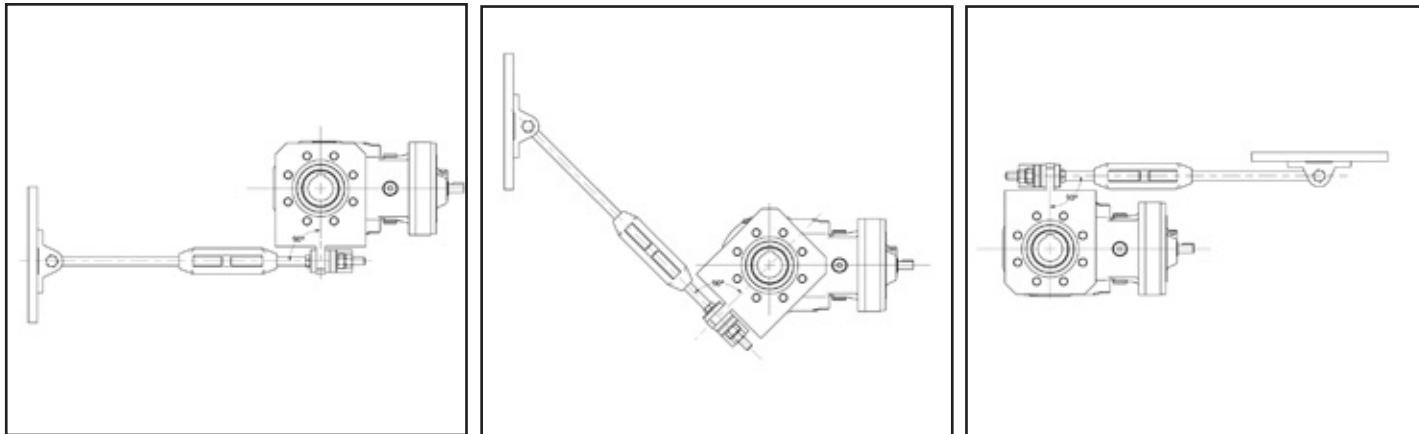
### Torque Arm Introduction

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 a tie-rod or turn buckle type torque arm is used. Turnbuckle or tie-rod type shown below for reference:

Figure 1. Turnbuckle or Tie-Rod Type Schematics



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

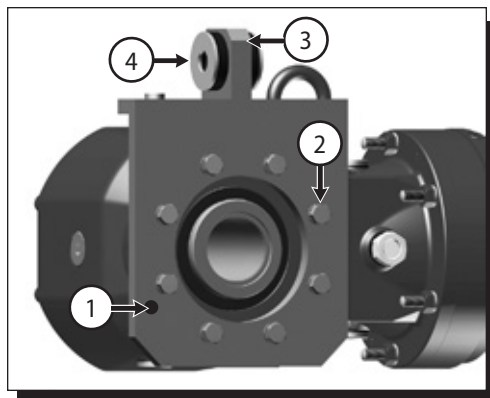
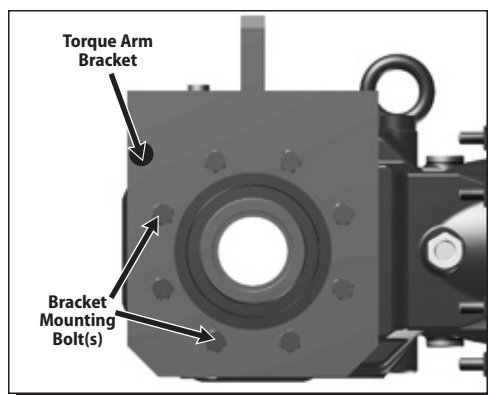


Table 3. Torque Arm Components

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

### Flange Mount (Banjo) Type Torque Arm Installation Procedure



#### 1

Attach the torque arm bracket to the Cyclo® BBB5 using mounting hardware.

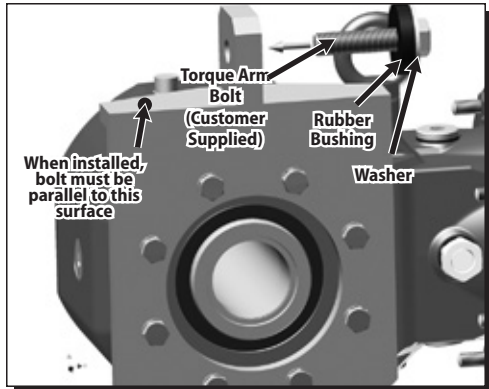
Table 4. Flange Mount (Banjo) Type Torque Arm Bolt Tightening

Unit Size	Bracket Bolt Size <sup>[1]</sup>	Torque	
		lb-ft	(N·m)
5Z	8 x M8	17 – 19	(24 – 26)
5A	8 x M10	34 – 38	(46 – 51)
5B	8 x M12	59 – 65	(80 – 88)
5C	8 x M16	152 – 167	(206 – 227)

Note: [1] Bolt ISO/JIS Class 8.8

# Torque Arm Installation

## Flange Mount (Banjo) Torque Arm



**2**

Place washer and rubber bushing on bolt.

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



Make sure bolt is parallel to Banjo type torque arm side surface when fully installed

**3**

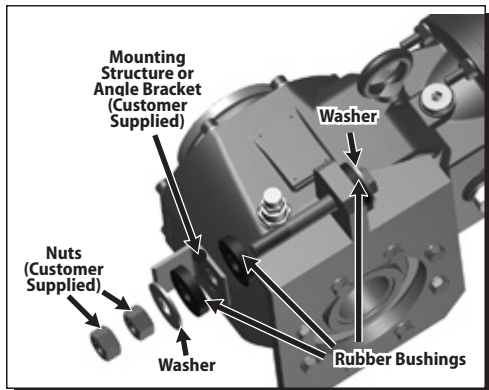
Follow these steps to attach the torque arm to mounting structure or mounting angle bracket (customer supplied):

- Verify that the mounting structure or mounting angle bracket hole is the correct diameter (refer to Table 5).
- Place rubber bushing and mounting angle bracket on bolt.
- Ensure the bolt passes through mounting structure or mounting angle bracket hole.
- Place remaining bushing, washer and two nuts on the bolt.

**Table 5. Flange Mount Torque Arm Bolt Dimensions**

Unit Size	Bracket Tab Bore	Typical Bolt Size <sup>(1)</sup>
5Z	Ø18mm	M16
5A	Ø18mm	M16
5B	Ø22mm	M20
5C	Ø26mm	M24

**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.



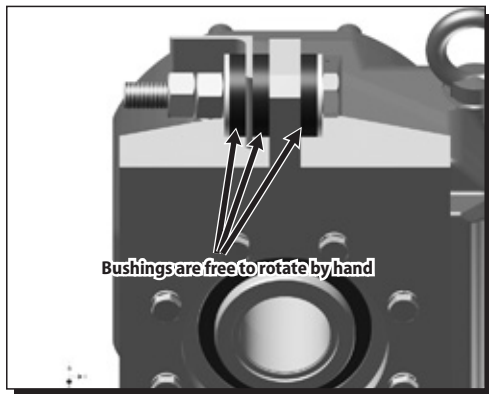
**Do not over-tighten nuts. Tighten to point where rubber bushings can still be hand rotated.**

**4**

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



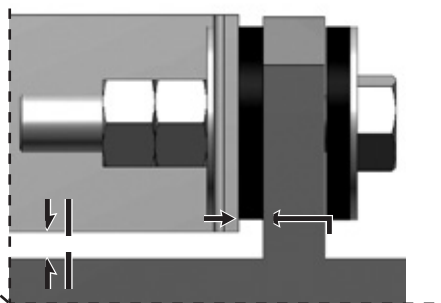
Compressed bushings will not allow the bushings to properly absorb the loads of the shaft mounted gearbox. This can lead to premature failure.



**Mounting Angle Bracket must be secured to the machine structure.**

**5**

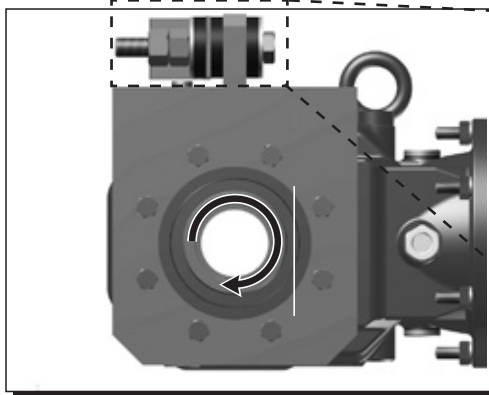
**Confirm the mounting angle bracket does not interfere with the torque arm.** There should be no metal-to-metal contact between the two during a complete revolution of the driven equipment.



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

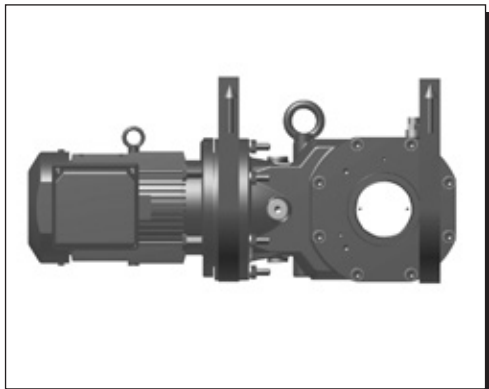


Metal-to-Metal contact between these two components may lead to catastrophic failure of the reducer/gearmotor.



## Removal from Driven Shaft

### Removal of Cyclo® BBB5 with Keyed Hollow Bore



#### Removal of Cyclo® BBB5 with Keyed Hollow Bore



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

**1**

Externally support the Cyclo® BBB5 unit such that all unit weight is removed from the driven shaft.

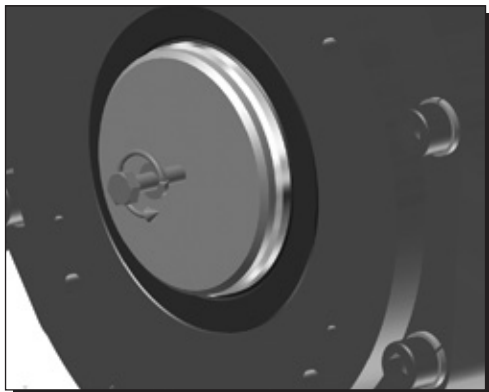


The weight of the Cyclo® BBB5 must be externally supported throughout the entire removal process.

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

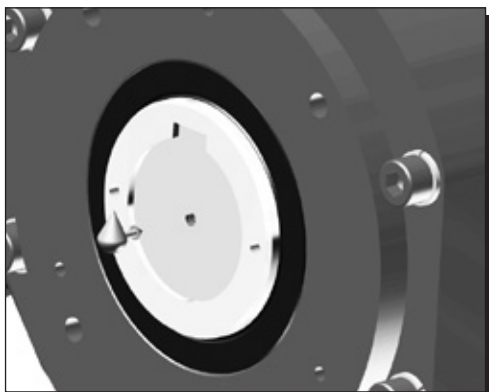
**2**

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



**3**

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.



**4**

Once the penetrant has settled adequately, carefully remove the Cyclo® BBB5 from the driven shaft.

If shaft removal is difficult, a jig such as the one shown in Table 6 may be used to ease the removal process. **Sumitomo does not supply the removal jig. This information is supplied for reference only.**

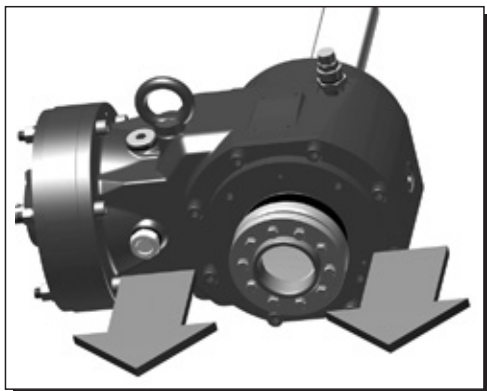
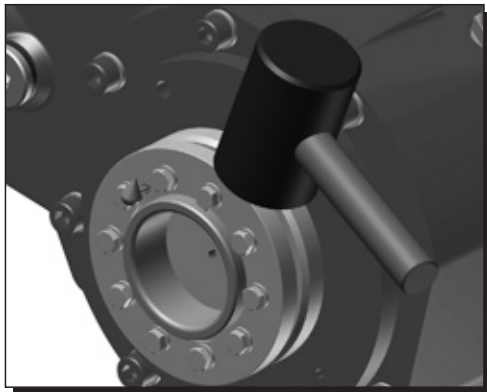
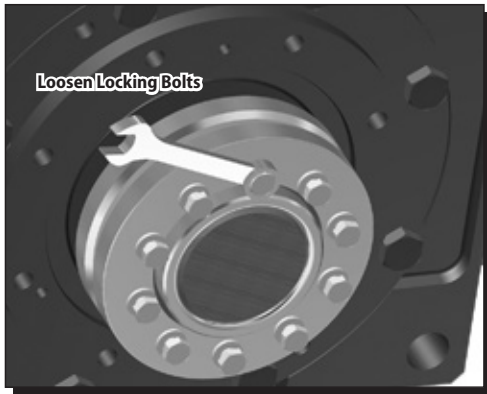


## Removal from Driven Shaft

### Removal of Cyclo® BBB5 with Keyed Hollow Bore, Removal of Cyclo® BBB5 with Shrink Disc

Table 6: Removal Jig Dimensions

Size	a	f	g	h
	CC (ISO/JIS)	A3	BOLT	A8
5Z	45	19	M24×250	5
5A	55	19	M24×250	5
5B	65	19	M24×300	5
5C	75	19	M24×300	5



### Removal of Cyclo® BBB5 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

Externally support the Cyclo® BBB5 unit such that all unit weight is removed from the driven shaft.



The weight of the Cyclo® BBB5 must be externally supported throughout the entire removal process.

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

#### 2

If required, 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 wooden or hard rubber mallet may be required if any fretting corrosion has occurred.

#### 3

Remove the gearbox from the shaft.

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

## Lubrication

### Lubrication Introduction, Lubrication Nomenclature

## Lubrication Introduction



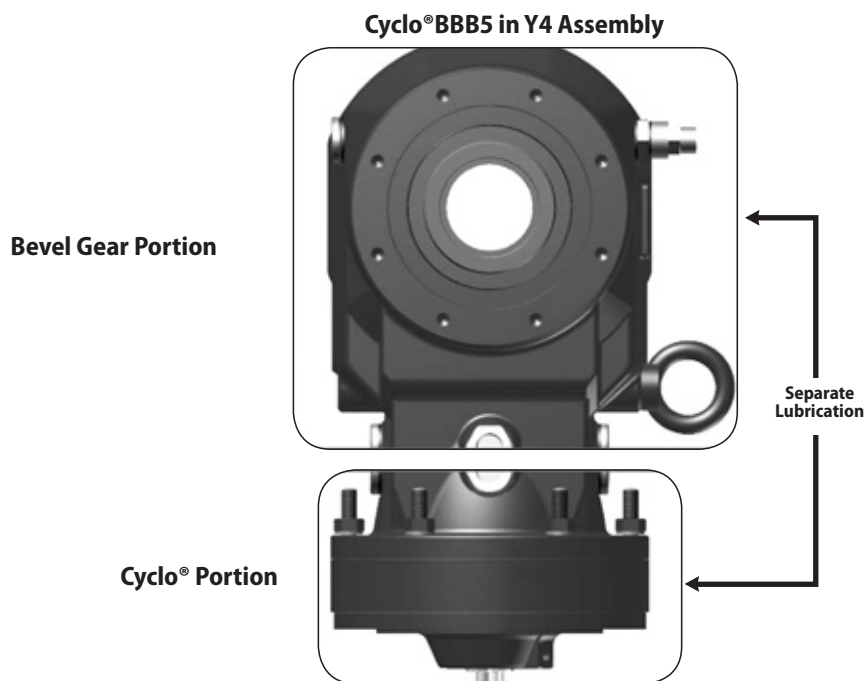
Sumitomo Cyclo® BBB5s are shipped from the factory **without** lubricating oil, unless the customer specified otherwise when the unit was ordered.

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



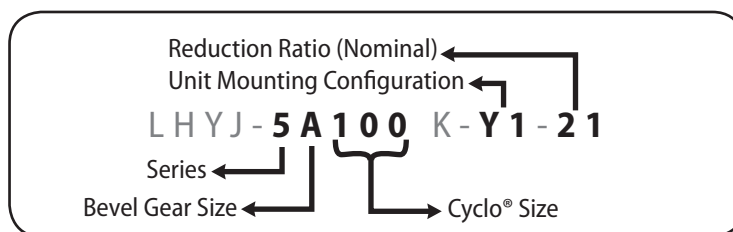
For all Y4 motor down mounting configuration models, the Cyclo® portion is filled at the factory with **grease**. For these units, the Cyclo® portion **does not** need to be filled with lubricant before start-up. The Bevel Gear portion of models built for the Y4 mounting configuration requires filling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

For the Cyclo® BBB5 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 portion 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:





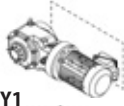
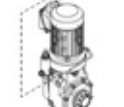
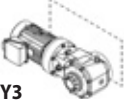

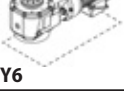
# Lubrication, continued

## Lubrication Method

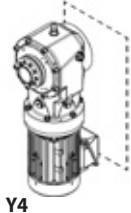
### Lubrication Method

Using the model number and mounting configuration, refer to Tables 7 and 8 to determine the unit's lubrication method.

**Table 7. Lubrication Method for Configurations Y1, Y2, Y3, Y5, Y6**

Mounting Configuration	Unit Size		Lubrication Method	
	Bevel Gear Size	Cyclo® Size		
 <b>Y1</b>  <b>Y2</b>  <b>Y3</b>  <b>Y5</b>  <b>Y6</b>	5Z – 5C	100, 105, 110, 115, 120, 125, 140, 145, 160, 165, 170, 175,  10DA, 12DA, 12DB, 14DA, 14DB, 14DC, 16DA	Complete Unit (Bevel Gear Portion and Cyclo®)	Common Oil Sump

**Table 8. Lubrication Method for Y4 Configuration**

Mounting Configuration	Unit Size		Lubrication Method	
	Bevel Gear Size	Cyclo® Size		
 <b>Y4</b>	5Z – 5A	100, 105, 110, 115, 120, 125, 10DA, 12DA, 12DB	Cyclo® Portion	Maintenance Free Grease <sup>[1]</sup>
			Bevel Gear Portion	Oil
	5A – 5C	140, 145, 160, 165, 170, 175  12DA, 12DB, 14DA, 14DB, 14DC, 16DA	Cyclo® Portion	Grease <sup>[2]</sup>
			Bevel Gear Portion	Oil

**Notes:** [1] Maintenance Free Grease: the input Cyclo® portion is grease lubricated as standard from the factory and usually does not require replacement or replenishment.  
 [2] Grease: the input Cyclo® portion is grease lubricated as standard from the factory. Please refer to Tables 12 and 13 for the proper grease replenishment and change interval.

## Bevel Gear Portion and Cyclo® Portion Lubricants

### Recommended Oils

**Table 9, Recommended Oils**, lists the oils that may be used to lubricate the Bevel Gear portion of the unit. These oils may also be used in the Cyclo® portion if it is oil lubricated.

**Table 9. Recommended Oils**

Ambient Temp. °F (C)	Manufacturer						
	Gulf Oil	Exxon Oil	Mobil Oil	Shell Oil	Caltex Oil	BP Oil	Idemitsu
14° – 41°F (-10° – 5°C)	EP Lubricant HD 68	—	Mobilgear 600 XP 68 (ISO VG 68)	Omala S2 G 68	—	Energol GR-XP 68	Daphne Mechanic Oil 68
32° – 95°F (0° – 35°C)	EP Lubricant HD 100 HD150	Spartan EP 100 EP 150	Mobilgear 600 XP 100, 150 (ISO VG 100, 150)	Omala S2 G 100 150	Meropa 100 150	Energol GR-XP 100 GR-XP 150	Daphne Mechanic Oil 100,150
86° – 122°F (30° – 50°C)	EP Lubricant HD 220 HD 320 HD 460	Spartan EP 220 EP 320 EP 460	Mobilgear 600 XP 220, 320, 460 (ISO VG 220, 320, 460)	Omala S2 G 220 320 460	Meropa 220 320 460	Energol GR-XP 220 GR-XP 320 GR-XP 460	Daphne Mechanic Oil 220,320,460

- Use lubricants with low viscosity for operation during winter or at relatively low temperatures.
- Use a lubricant with a viscosity within the range listed in **Table 10, Recommended Oil Viscosity**.

**Table 10. 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 a 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 11, 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 11. 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.







# Lubrication, continued

## Oil Quantities

### Oil Quantities

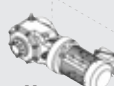




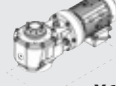
**Table 12. Single Reduction Approximate Oil Quantity**

 Units: U.S. liquid gallon (*liter*) **Note: Output = Bevel Gear Portion Input = Cyclo®**

Bevel Gear Unit Size	Mounting Configuration						
							
				Output	Input		
SZ10	0.21 (0.80)		0.42 (1.58)	0.18 (0.67)	Grease	0.17 (0.66)	0.24 (0.90)
SZ11	0.22 (0.85)		0.44 (1.65)			0.19 (0.71)	0.25 (0.95)
SZ12	0.25 (0.93)		0.47 (1.79)			0.21 (0.79)	0.27 (1.03)
5A11	0.42 (1.59)		0.81 (3.05)	0.22 (0.83)	Grease	0.36 (1.35)	0.49 (1.85)
5A12	0.44 (1.68)		0.85 (3.23)			0.38 (1.44)	0.51 (1.94)
5A14	0.50 (1.90)		0.95 (3.58)			0.44 (1.66)	0.57 (2.16)
5B12	0.70 (2.66)		1.37 (5.17)	0.42 (1.60)	Grease	0.60 (2.29)	0.81 (3.06)
5B14	0.76 (2.86)		1.46 (5.52)			0.66 (2.49)	0.86 (3.26)
5B16	0.88 (3.33)		1.63 (6.17)			0.78 (2.96)	0.99 (3.73)
5C14	1.41 (5.35)		2.84 (10.74)	0.93 (3.53)	Grease	1.33 (5.05)	1.50 (5.66)
5C16	1.61 (6.08)		3.07 (11.62)			1.53 (5.78)	1.69 (6.39)
5C17	1.72 (6.52)		3.20 (12.13)			1.64 (6.22)	1.80 (6.83)

**Table 13. Double Reduction Approximate Oil Quantity**

 Units: U.S. liquid gallon (*liter*) **Note: Output = Bevel Gear Portion Input = Cyclo®**

Bevel Gear Unit Size	Mounting Configuration						
							
				Output	Input		
SZ10DA	0.24 (0.89)		0.42 (1.60)	0.18 (0.70)	Grease	0.24 (0.91)	0.26 (1.00)
SZ12DA	0.24 (0.89)		0.47 (1.78)			0.29 (1.10)	0.29 (1.10)
SZ12DB	0.26 (0.99)		0.47 (1.78)			0.29 (1.11)	0.29 (1.10)
5A12DA	0.44 (1.68)		0.85 (3.23)	0.22 (0.83)	Grease	0.38 (1.44)	0.54 (2.04)
5A12DB	0.47 (1.78)		0.85 (3.23)			0.38 (1.44)	0.54 (2.04)
5B12DA	0.70 (2.66)		1.37 (5.17)			0.42 (1.60)	Grease
5B12DB	0.73 (2.76)		1.39 (5.27)	0.68 (2.59)	0.89 (3.36)		
5B14DA	0.76 (2.86)		1.46 (5.52)	0.68 (2.59)	0.89 (3.36)		
5B14DB	0.78 (2.96)		1.46 (5.52)	0.93 (3.53)	Grease	1.33 (5.05)	1.50 (5.66)
5C14DA	1.44 (5.45)		2.86 (10.84)			1.36 (5.15)	1.50 (5.66)
5C14DB	1.44 (5.45)		2.86 (10.84)			1.36 (5.15)	1.52 (5.76)
5C14DC	1.44 (5.45)		2.89 (10.94)	0.93 (3.53)	Grease	1.55 (5.88)	1.71 (6.49)
5C16DA	1.61 (6.08)		3.07 (11.62)			1.58 (5.98)	1.71 (6.49)
5C16DB	1.63 (6.18)		3.1 (11.72)				

## Oil Supply Procedure



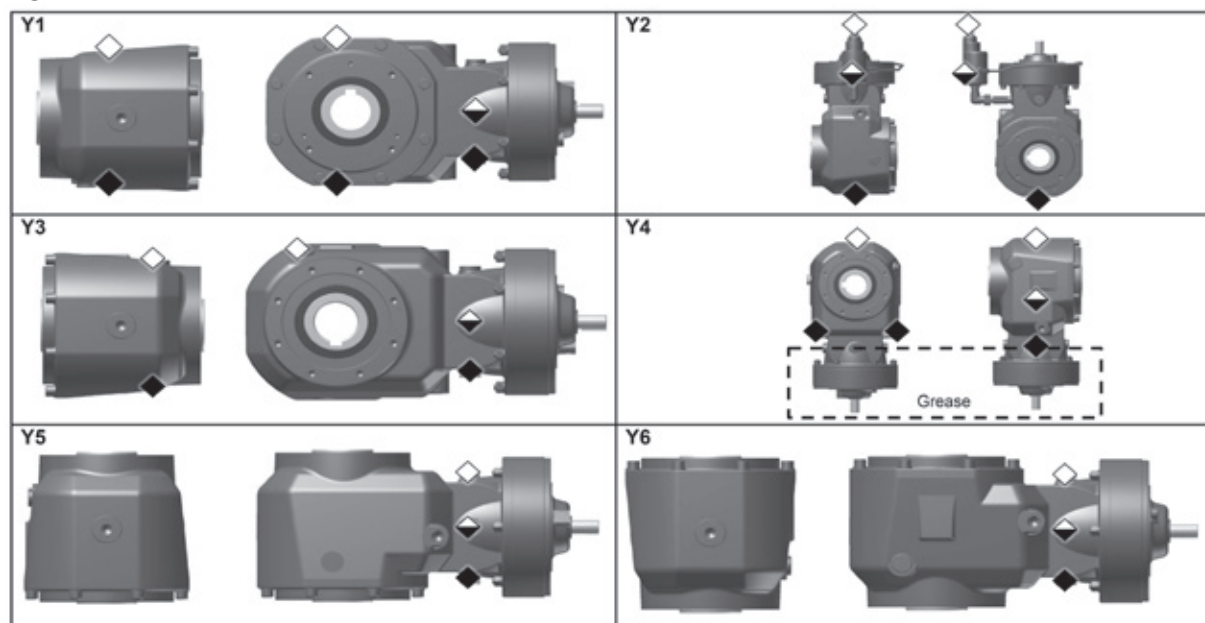
- Always stop the unit before adding oil
- Oil level may drop during operating, depending on the oil viscosity, temperature and direction of rotation. Additional oil is not necessary. Check the oil level when the unit is stopped to ensure that it has the correct amount of oil.
- It may take some time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

1. Remove the oil fill plug; refer to Figure 2 for location.
2. Slowly add oil while checking the level through the oil gauge.
3. After the oil has settled, make sure the level is midway between the high and low marks on the oil gauge.
4. Insert the oil fill plug after wrapping it with sealing compound or tape.

**Table 14. 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 158°F (70°C)

**Figure 2. Oil Fill/Drain Locations**



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

## Oil Discharge Procedure

1. Remove the drain plug to discharge oil; refer to Figure 2 for location.
2. Properly discard or recycle lubricant according to applicable regulations.
3. Replace the drain plug after wrapping it with sealing compound or tape.

# Lubrication, continued

## Grease Quantities

### Grease Quantities




- Grease quantities listed in this section are for the Cyclo® portion of the reducer/gearmotor.
- The Bevel Gear portion is always oil lubricated unless otherwise specified at time of order entry.
- Refer to the Oil Quantities section, Tables 12 and 13, for Bevel Gear portion oil quantities.
- Installing grease into Bevel Gear portion will result in damage to the unit

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


**Table 15 . Single Reduction Approximate Grease Quantity**

Units: ounce (*gram*)

Unit Size	Unit Lubrication Portion	Lube Quantity  Y4 only
5Z10	Cyclo®	4.24 (120)
5Z11		6.71 (190)
5Z12		8.83 (250)
5A11		6.71 (190)
5A12		8.83 (250)
5A14		15.89 (450)
5B120		8.83 (250)
5B140		15.89 (450)
5B160		26.48 (750)
5C140		15.89 (450)
5C160		26.48 (750)
5C170		35.3 (1000)

**Table 16. Double Reduction Approximate Grease Quantity**

Units: ounce (*gram*)

Unit Size	Cyclo® Stage	Lube Quantity  Y4 only
5Z10DA	First (Input)	0.88 (25)
	Second	4.24 (120)
5Z12DA	First (Input)	0.88 (25)
	Second	8.83 (250)
5Z12DB	First (Input)	2.12 (60)
	Second	8.83 (250)
5A12DA	First (Input)	0.88 (25)
	Second	8.83 (250)
5A12DB	First (Input)	2.12 (60)
	Second	8.83 (250)
5B12DA	First (Input)	0.88 (25)
	Second	8.83 (250)
5B12DB	First (Input)	2.12 (60)
	Second	8.83 (250)
5B14DA	First (Input)	0.88 (25)
	Second	15.9 (450)
5B14DB	First (Input)	2.12 (60)
	Second	15.9 (450)
5C14DA	First (Input)	0.88 (25)
	Second	15.9 (450)
5C14DB	First (Input)	2.12 (60)
	Second	15.9 (450)
5C14DC	First (Input)	4.24 (120)
	Second	15.9 (450)
5C16DA	First (Input)	2.12 (60)
	Second	26.5 (750)

## Grease Replenishment and Draining Procedures, 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 air pressure and possible seal damage.
- Do not add more grease than the amount shown in Table 15 and 16. Adding too much grease may cause the grease temperature to rise, or force the grease to leak into the motor.

Follow the lubrication providers 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.

**Table 17. 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 18. 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 15 & 16 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 15 and 16.
- Adding too much grease may cause the grease temperature to rise or force the grease to leak into the motor.



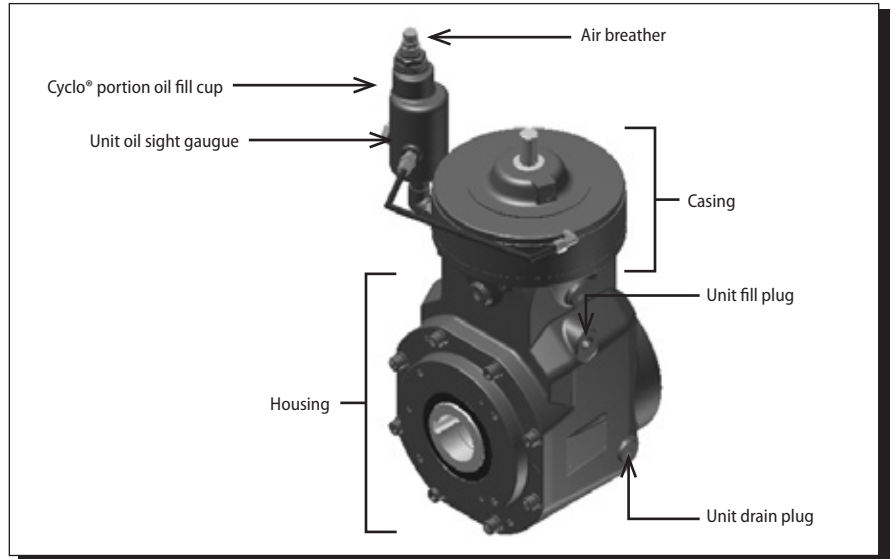
- Consider implementing a lube analysis program to ensure lubricant continues to operate at peak performance.
- Follow the lubrication providers analysis recommendations to ensure reducer performance.
- Always consult factory and warehouses for overhaul of gearmotors and reducers. Experience is necessary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

# Y2 Oil Fill & Drain Procedures

## Oil Fill Process

### Affected Unit Sizes

This document is intended for all Cyclo® Bevel Buddybox® (BBB) 5 series units built in the Y2 mounting (motor up) configuration. Images contained within the document show a single reduction input stage, however the process remains the same for double and triple reduction product offerings.



### Oil Fill Process

CAUTIONARY NOTE:



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



#### 1

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



#### 2

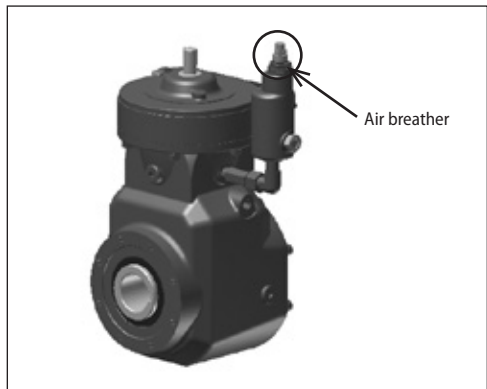
Fill the bevel portion with the appropriate type and grade of oil.

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

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

## Y2 Oil Fill &amp; Drain Procedures, continued

## Oil Fill Process

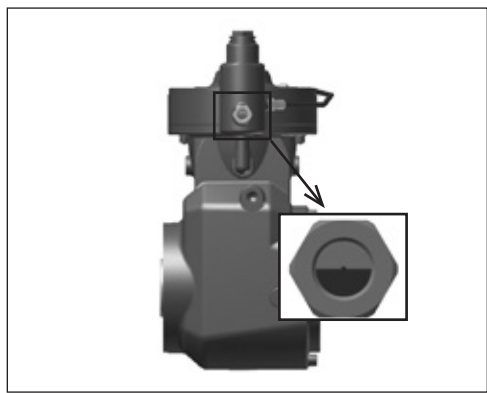
**3**

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

**4**

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

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

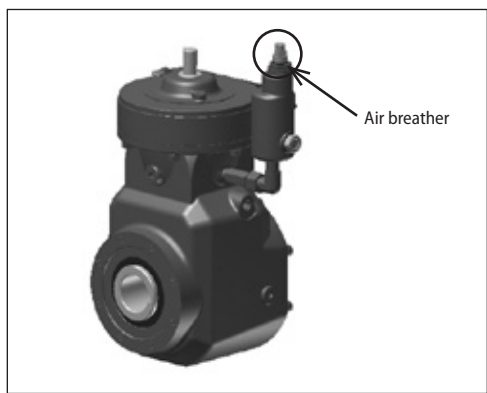
**5**

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



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

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

**6**

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



# Y2 Oil Fill & Drain Procedures, continued

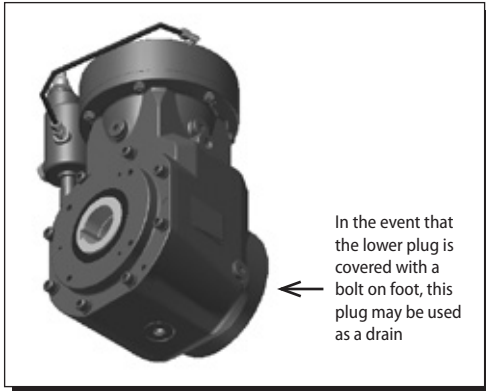
## Oil Drain Process

### Oil Drain Process

CAUTIONARY NOTE:



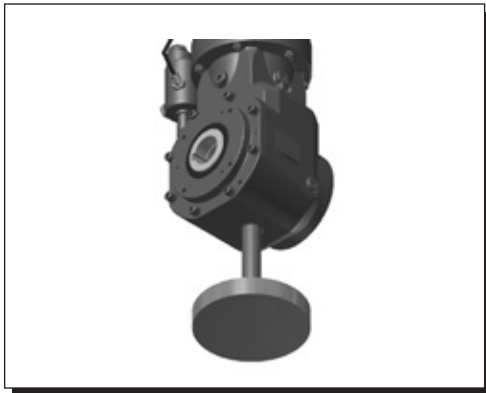
- Exercise extreme caution when draining the lubricating oil from the Cyclo® Bevel Buddybox® as it may be hot.
- Follow all corporate, local, state and federal government regulations in disposing of the used lubricating oil.



#### 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 19.

**Table 19. Plug sizes and tightening torque values**

Plug Sizes		Torque Value		
Unit Size	Housing*	Size	lb-in	N·m
5Z	1/2	1/2	13:1	17.8
5A	1/2	3/4	22:1	30.0
5B	6x 1/2	1	30.4	41.2
	1x 1			
5C	6x 1/2			
	1x 1			

\* 5 series is a monoblock and does not have separate casing.

## Y2 Oil Fill &amp; Drain Procedures, continued

## Oil Drain Process

Table 20. BBB5 Y2 Single Reduction Oil Quantity\*

Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
5Z10	0.42	1.58
5Z11	0.44	1.65
5Z12	0.47	1.79
5A11	0.81	3.05
5A12	0.85	3.23
5A14	0.95	3.58

Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
5B12	1.37	5.17
5B14	1.46	5.52
5B16	1.63	6.17
5C14	2.84	10.7
5C16	3.07	11.6
5C17	3.20	12.1

Table 21. BBB5 Y2 Single Reduction Oil Quantity\*

Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
5Z10DA	0.18	0.68
5Z12DA	0.18	0.70
5Z12DB	0.18	0.70
5A12DA	0.22	0.83
5A12DB	0.22	0.83
5B12DA	0.42	1.60
5B12DB	0.42	1.60

Bevel Gear Unit Size	Y2 Configuration Oil Quantity	
	gallon	liter
5B14DA	0.42	1.60
5B14DB	0.42	1.60
5C14DA	0.93	3.53
5C14DB	0.93	3.53
5C14DC	0.93	3.53
5C16DA	0.93	3.53
5C16DB	0.93	3.53

\* All oil quantities are estimates

# Motor Wiring

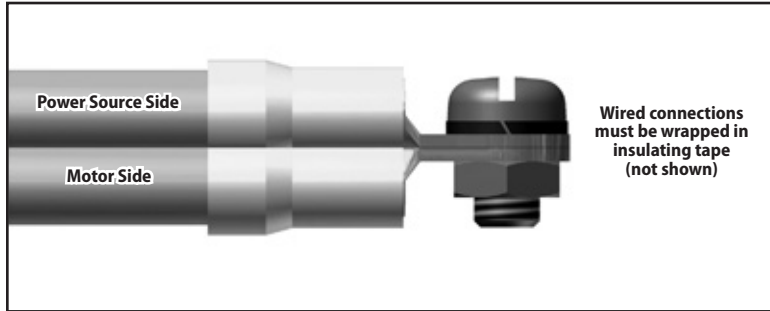
## Wiring Guidelines

### 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 the following table:

**Table 22. 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 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	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	DELTA	DELTA	DELTA	DELTA	DELTA
2 (1.5) x 4					
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

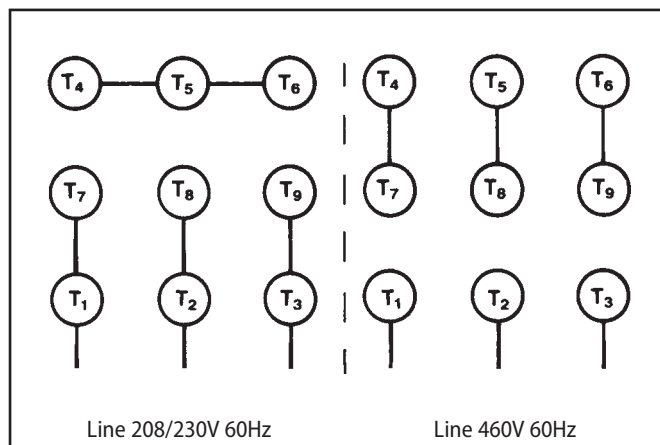


Figure 5. Three-Phase DELTA connection Motor

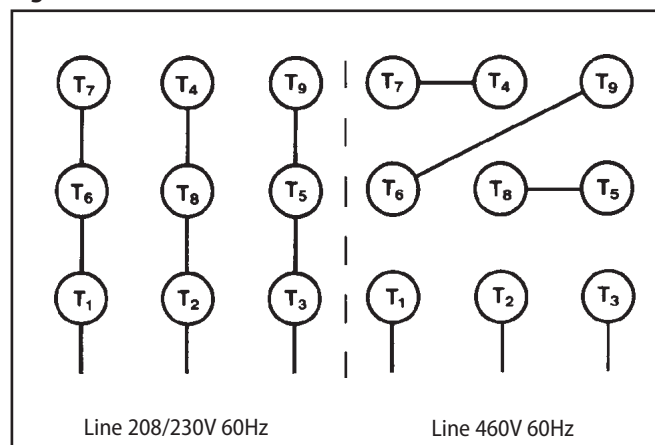


Figure 6. Three-Phase Motor, 575V, 60Hz

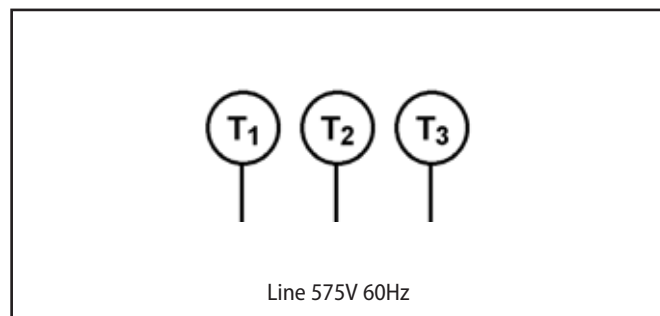
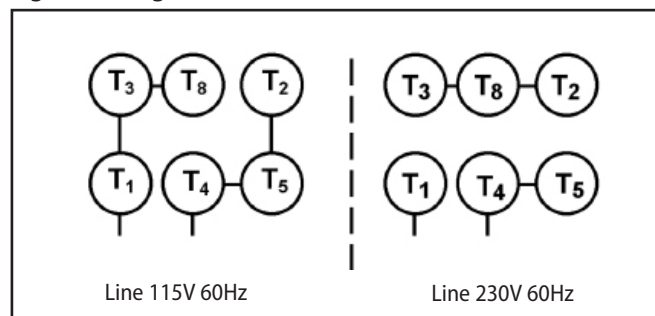


Figure 7. Single-Phase Motor, 115/230V, 60Hz



# 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	380V, 50Hz Three Phase	WYE-Start DELTA-Run
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		

### 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.

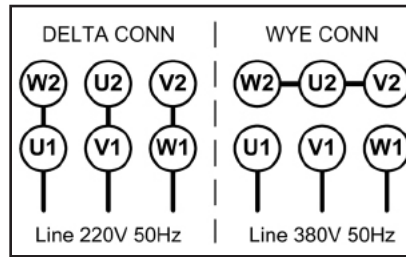
**1**

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

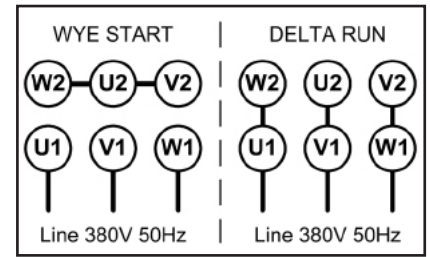
**2**

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**



## Brake Wiring

### Varistor Selection

For wiring of Fast Brake Action, Sumitomo recommends the use of a Varistor (VR). Refer to Table 40 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

## 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 these methods:

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

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

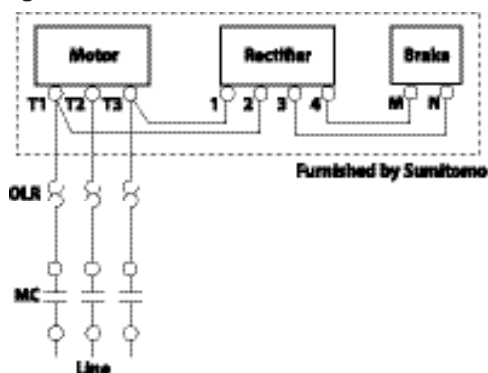


Figure 11. Fast Brake Action, 230V

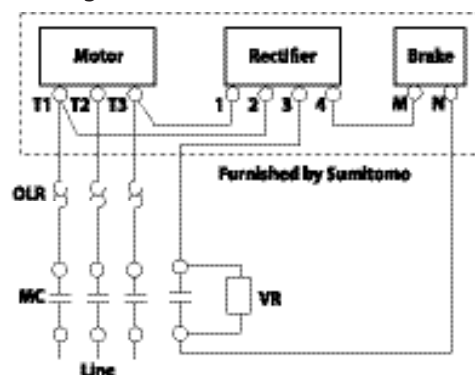


Figure 12. Normal Brake Action, 460V

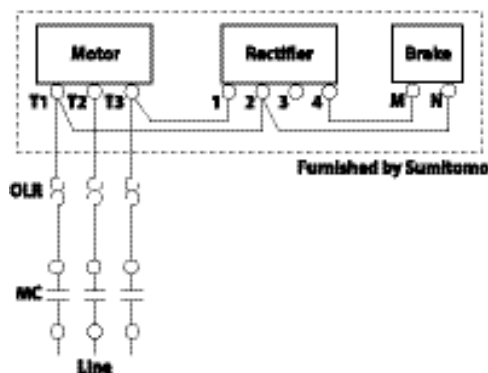
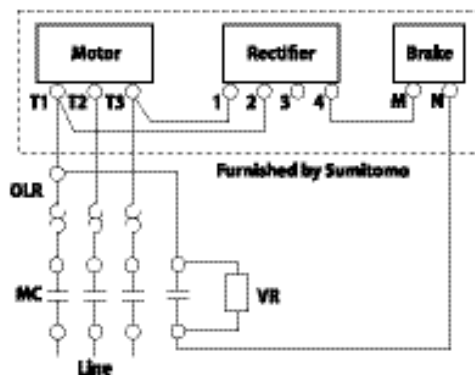


Figure 13. Fast Brake Action 460V, 575V



- MC: Electromagnetic Relay
- MCB: Magnetic Circuit Breaker
- OLR: Overload or Thermal Relay
- VR: Varistor (protective device)<sup>[1]</sup>

Note: [1] Refer to Varistor Specifications Table

# 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 these methods:

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

Figure 14. Normal Brake Action, 230V

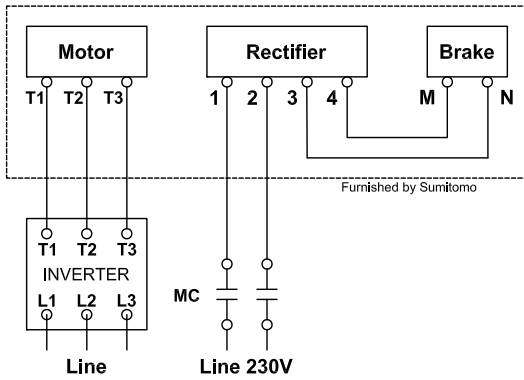


Figure 15. Fast Brake Action, 230V Brake

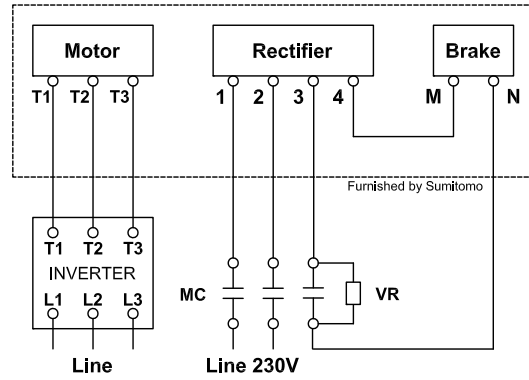


Figure 16. Normal Brake Action, 460V, 575V Brake

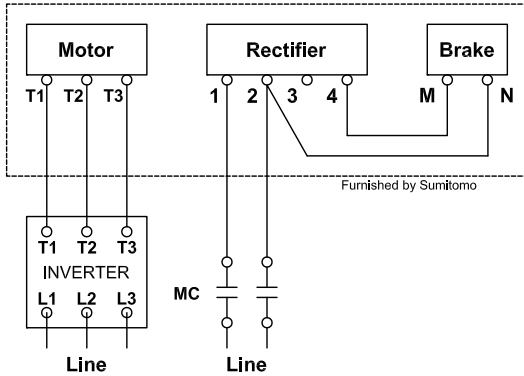
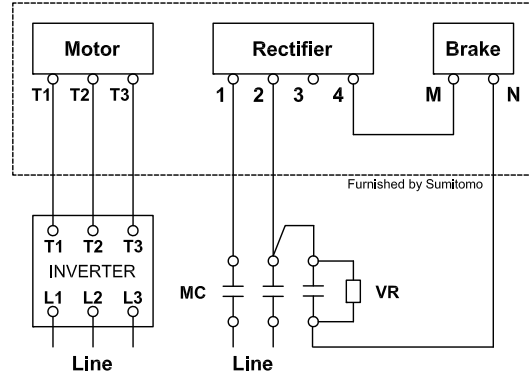


Figure 17. Fast Brake Action 460V, 575V Brake



#### Models FB-20/FB-30

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

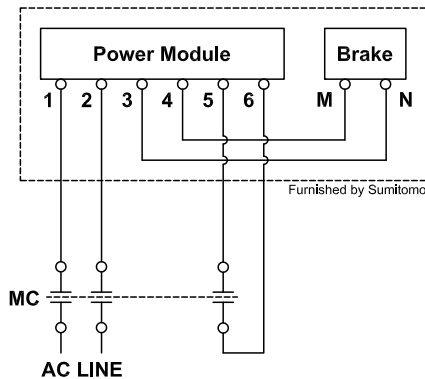
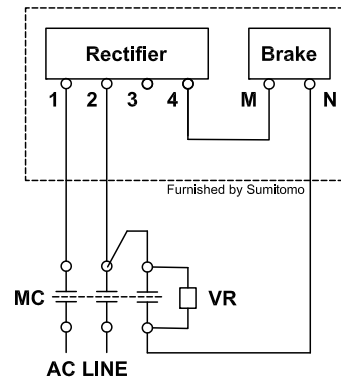


Figure 19. FB-20 and FB-30 Brake Wiring, 575VAC



- MC: Electromagnetic Relay
- MCB: Magnetic Circuit Breaker
- OLR: Overload or Thermal Relay
- VR: Varistor (protective device)<sup>[1]</sup>

Note: [1] Refer to Varistor Specifications Table

## CE Motor Brake Wiring

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

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

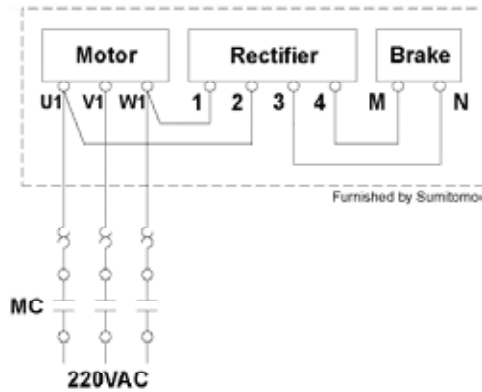


Figure 21. Fast Brake Action, 220V Motor 220V Brake

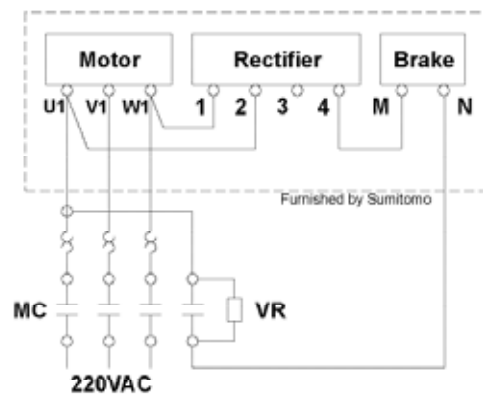


Figure 22. Normal Brake Action, 380V Motor, 220V Brake, Tapped

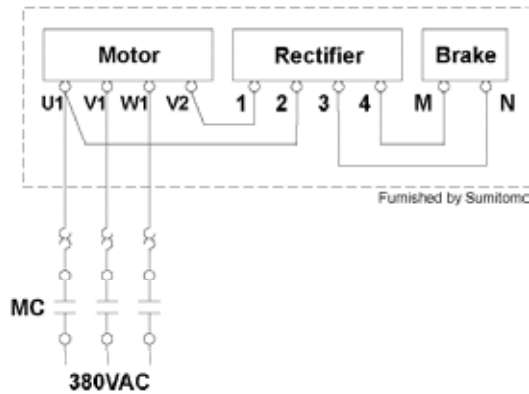


Figure 23. Fast Brake Action, 380V Motor, 220V Brake, Tapped

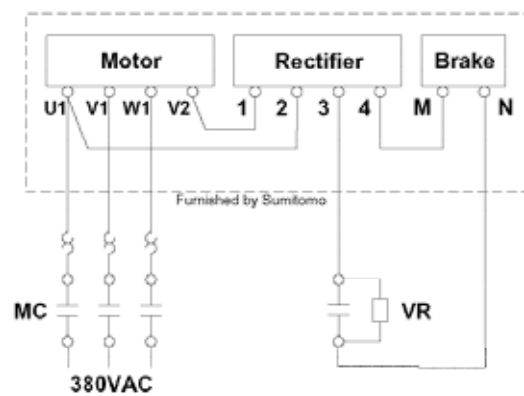


Figure 24. Normal Brake Action. 380V Motor. 220V Brake. Separated

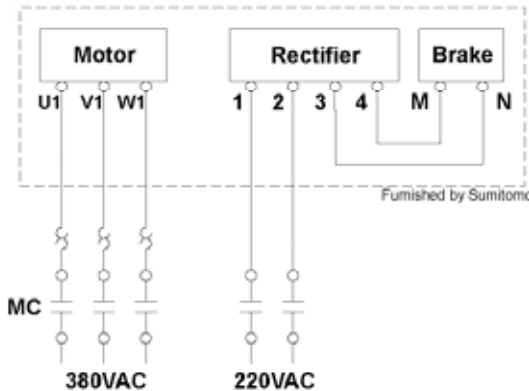
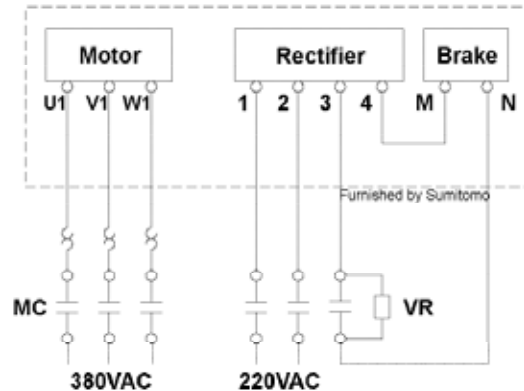


Figure 25. Fast Brake Action, 380V Motor, 220V Brake, Separated



- MC: Electromagnetic Relay
- MCB: Magnetic Circuit Breaker
- OLR: Overload or Thermal Relay
- VR: Varistor (protective device)<sup>[1]</sup>

Note: [1] Refer to Varistor Specifications Table



# 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

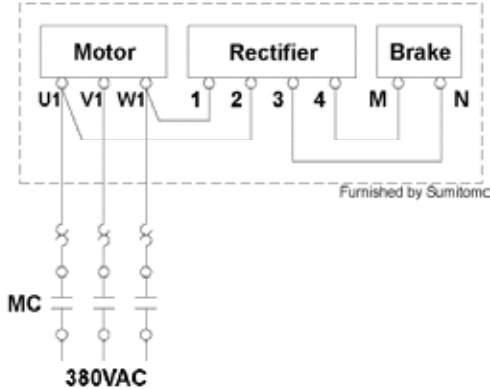
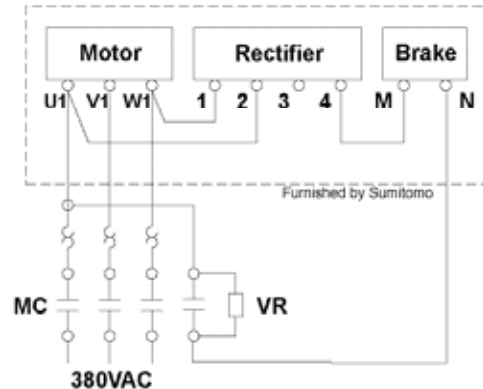


Figure 27. Fast Brake Action, 380V Motor, 380V Brake



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

Figure 28. Normal Brake Action

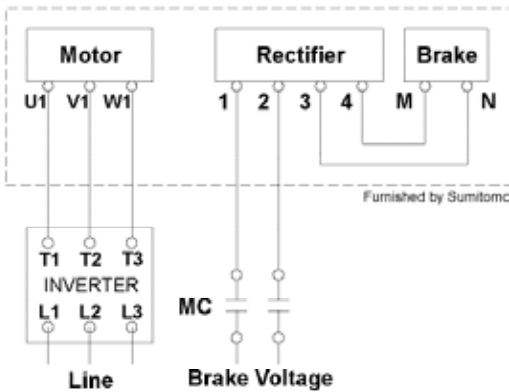
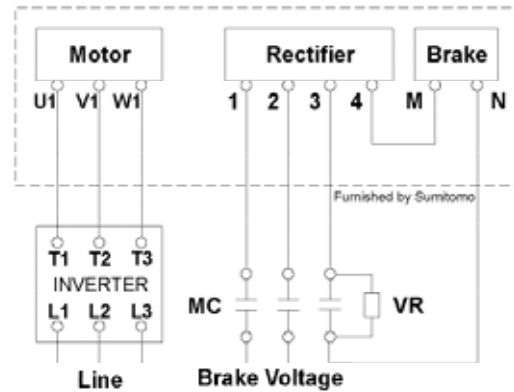


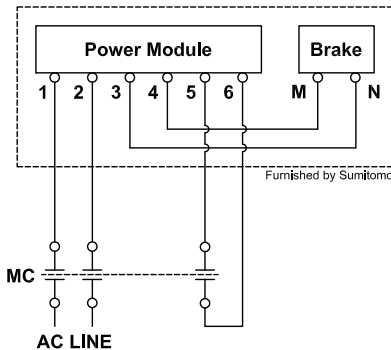
Figure 29. Fast Brake Action



## CE Motor Brake Wiring

### Models FB-20/FB-30

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



- MC: Electromagnetic Relay
- MCB: Magnetic Circuit Breaker
- OLR: Overload or Thermal Relay
- VR: Varistor (protective device)<sup>(1)</sup>

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			
1 (0.75) x 4	FB-1D/FB-1E		
1.5 (1.1) x 4			
2 (1.5) x 4	FB-2D/FB-1HE/FB-2E		
3 (2.2) x 4			
4 (3) x 4	FB-3D/FB-3E		
5 (3.7) x 4			
7.5 (5.5) x 4	FB-8B/FB-8E	380V, 50Hz	380V, 50Hz
10 (7.5) x 4			
15 (11) x 4			

Note: [1] Refer to Varistor Specifications Table

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				

# Parts

## Cyclo® BBB5 Reducer

Figure 31. Cyclo® BBB5 Reducer Parts

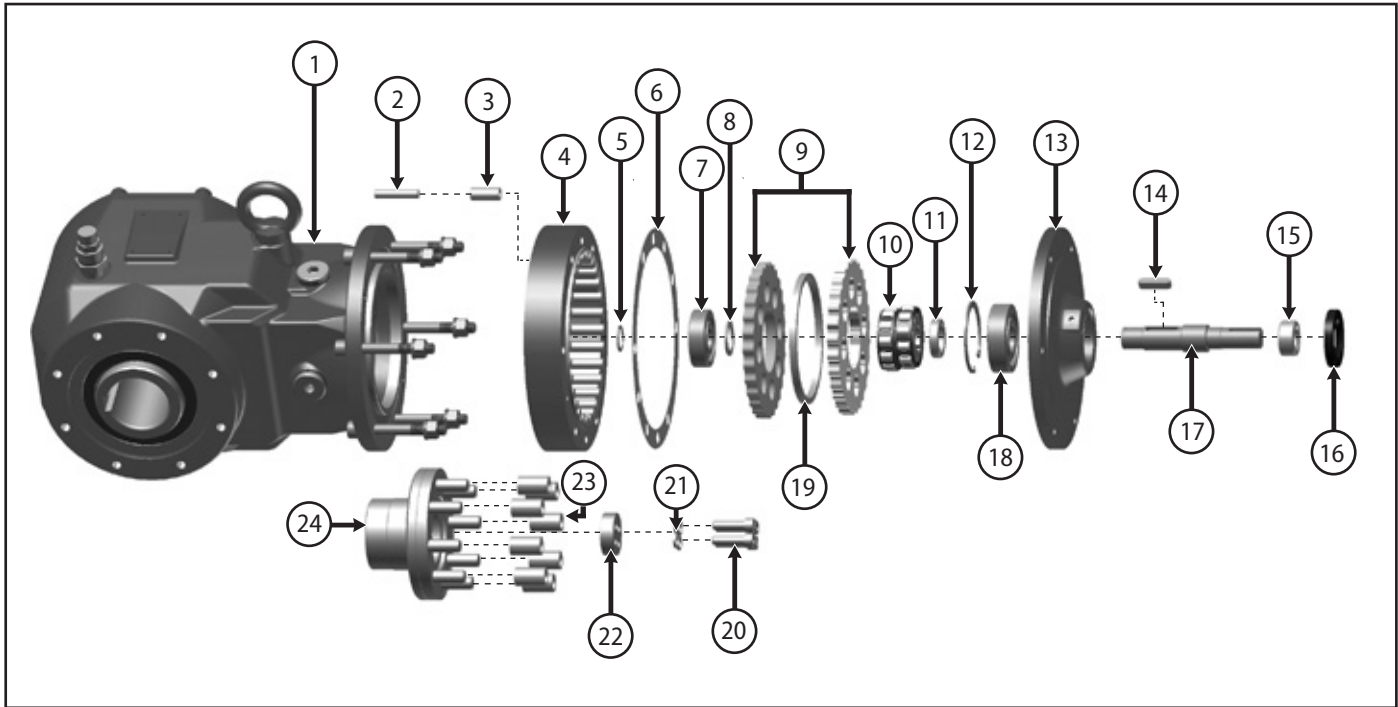


Table 30. Cyclo® BBB5 Reducer Parts

Number	Description
1	BBB5 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	Snap Ring

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	High Speed Shaft B Bearing
19	Cycloid Disc Spacer
20	Retaining Bolts
21	Lock Washers
22	End Plate
23	Pin Carrier Rollers
24	Pin Carrier

## Cyclo® Planetary Reduction Component Parts

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

Figure 32. Cyclo® Planetary Reduction Component

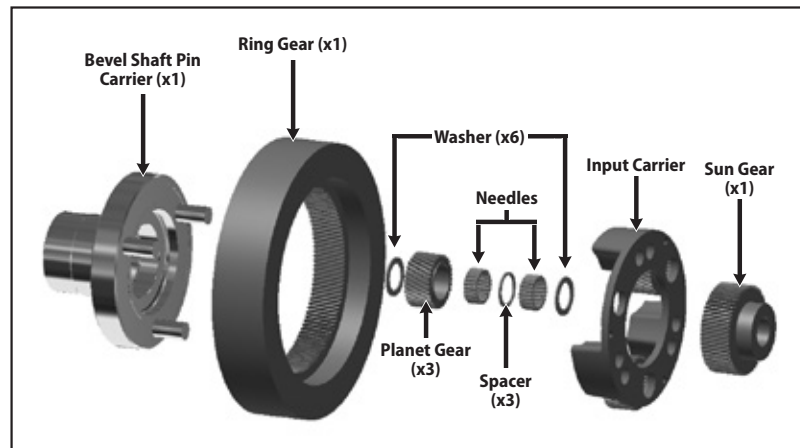


Table 31. Cyclo® Planetary Reduction Component Part Numbers (Ratios 11 - 18:1)

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
5Z100, 5Z105 5A100, 5A105	11	3:1	931SD610-003G	AN8911G	AN8303G	AN8910G	-	AW5434G	-	-	CK320LG (for 5Z) BL515LG (for 5A)
	13, 14	4:1	931SD610-004G	AN8870G	AN8871G	AN8869G					
	16, 18	5:1	931SD610-005G	AN8305G	AN8306G	AN8304G					
5A110 5A115	11	3:1	931BB612-003G	See Note <sup>[1]</sup>							
	13, 14	4:1	931BB612-004G								
	16, 18	5:1	931BB612-005G								
5Z120, 5Z125 5A120, 5A125 5B120, 5B125	11	3:1	931BB612-003G	AP8712G	CJ584LG	AP8711G	AX2806G	AX2543G	AX2761G	CJ244LG	CK322LG (for 5Z) CJ701LG (for 5A) CJ703LG (for 5B)
	13, 14	4:1	931BB612-004G	AP8706G	CJ554LG	AP8705G					
	16, 18	5:1	931BB612-005G	AP8714G	CJ585LG	AP8713G					
5A140, 5A145 5B140, 5B145 5C140, 5C145	11	3:1	931BB614-003G	AP8717G	CJ586LG	AP8716G	AX2807G	AX2763G	AX2544G	CJ588LG	CJ702LG (for 5A) CJ704LG (for 5B) CJ706LG (for 5C)
	13, 14	4:1	931BB614-004G	AP8708G	CJ555LG	AP8707G					
	16, 18	5:1	931BB614-005G	AP8719G	CJ587LG	AP8718G					
5B160, 5B165 5C160, 5C165	11	3:1	931BB616-003G	AP8721G	CJ589LG	AP8720G	AX2808G	AX2555G	AX2554G	CJ591LG	CJ705LG (for 5B) CJ707LG (for 5C)
	13, 14	4:1	931BB616-004G	AP8710G	CJ556LG	AP8709G					
	16, 18	5:1	931BB616-005G	AP8726G	CJ590LG	AP8722G					
5C170 5C175	11	3:1	931BB617-003G	AP9278G	CJ993LG	AP9277G	AX3077G	AX3061G	AX3060G	CJ996LG	CJ938LG (for 5C)
	13, 14	4:1	931BB617-004G	AP9280G	CJ994LG	AP9279G					
	16, 18	5:1	931BB617-005G	AP9282G	CJ995LG	AP9281G					

Notes: [1] Consult Factory

**Parts**, continued

Cyclo® Reduction Component Parts

**Cyclo® BBB5 Reduction Component Part Numbers (Ratios ≥ 19:1)**

Figure 33. Cyclo® BBB5 Reduction Components - 5Z100 thru 5C175

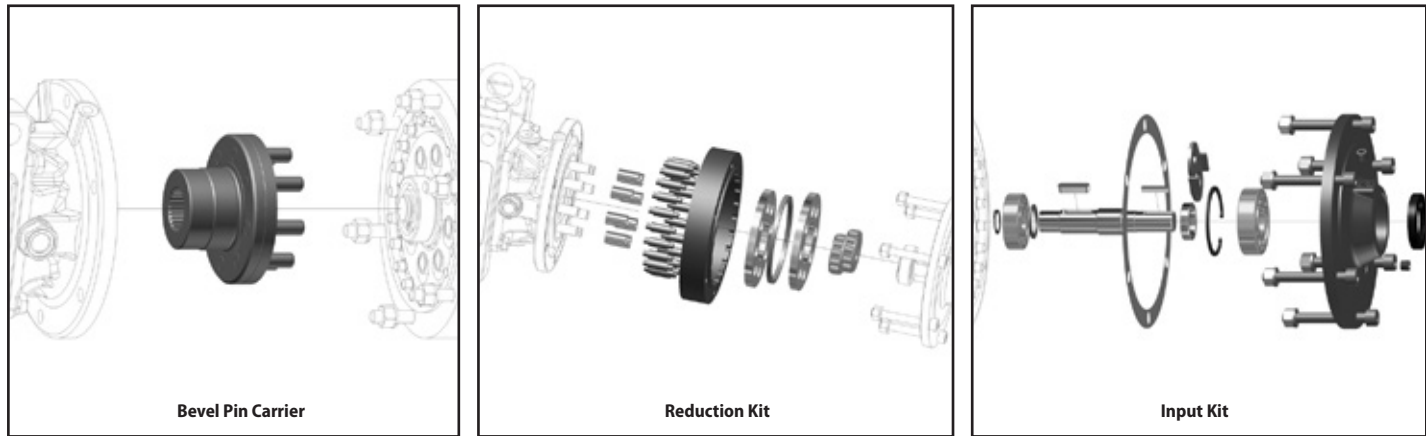


Table 32. Cyclo® Reduction Component Part Numbers (Ratios ≥ 19:1)

Unit Size	Reduction Ratio		Part Numbers		
	Overall	Cyclo®	Input Kit	Reduction Kit	Bevel Pin Carrier
5Z100	19, 21	6	D78622	D78675	BL514LG
	22, 25	7		See Note <sup>(1)</sup>	
	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	87	D78689			
364	104	See Note <sup>(1)</sup>			
364, 417	119	See Note <sup>(1)</sup>			
≥ 424	≥ 121	See Note <sup>(1)</sup>			

Unit Size	Reduction Ratio		Part Numbers			
	Overall	Cyclo®	Input Kit	Reduction Kit	5A12 Bevel Pin Carrier	5B12 Bevel Pin Carrier
5A120	19, 21	6	D78623	D78690	CJ691LG	CJ693LG
	22, 25	7		See Note <sup>(1)</sup>		
	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 <sup>(1)</sup>				
364, 417	119	See Note <sup>(1)</sup>				
≥ 424	≥ 121	See Note <sup>(1)</sup>				

Notes: [1] Consult Factory

Cyclo® Reduction Component Parts

Table 33. Cyclo® Reduction Component Part Numbers (Ratios ≥ 19:1), continued

Unit Size	Reduction Ratio		Part Numbers		
	Overall	Cyclo®	Input Kit	Reduction Kit	Bevel Pin Carrier
5Z100	19, 21	6	D78504	D78520	CJ690LG
	22, 25	7		See Note <sup>[1]</sup>	
	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		D78532	
	278, 305	87		D78534	
364	104	See Note <sup>[1]</sup>			
364, 417	119	See Note <sup>[1]</sup>			
≥ 424	≥ 121	See Note <sup>[1]</sup>			

Unit Size	Reduction Ratio		Part Numbers				
	Overall	Cyclo®	Input Kit	Reduction Kit	5A14 Bevel Pin Carrier	5B14 Bevel Pin Carrier	5C14 Bevel Pin Carrier
5A140	19, 21	6	D78624	D78535	CJ692LG	CJ694LG	CJ696LG
	22, 25	7		See Note <sup>[1]</sup>			
	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	87		D78549			
364	104	See Note <sup>[1]</sup>					
364, 417	119	See Note <sup>[1]</sup>					
≥ 424	≥ 121	See Note <sup>[1]</sup>					

Unit Size	Reduction Ratio		Part Numbers			
	Overall	Cyclo®	Input Kit	Reduction Kit	5B16 Bevel Pin Carrier	5C16 Bevel Pin Carrier
5B160	19, 21	6	D78625	D78720	CJ695LG	
	22, 25	7		See Note <sup>[1]</sup>		
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				

Unit Size	Reduction Ratio		Part Numbers		
	Overall	Cyclo®	Input Kit	Reduction Kit	Bevel Pin Carrier
5C170	19, 21	6	D78624	D78535	CJ698LG
	22, 25	7		See Note <sup>[1]</sup>	
	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	87		D78748	
364	104	See Note <sup>[1]</sup>			
364, 417	119	See Note <sup>[1]</sup>			
≥ 424	≥ 121	See Note <sup>[1]</sup>			

Notes: [1] Consult Factory

## Bearing and Oil Seals

Figure 34. Cyclo® BBB5 Bearings and Oil Seals

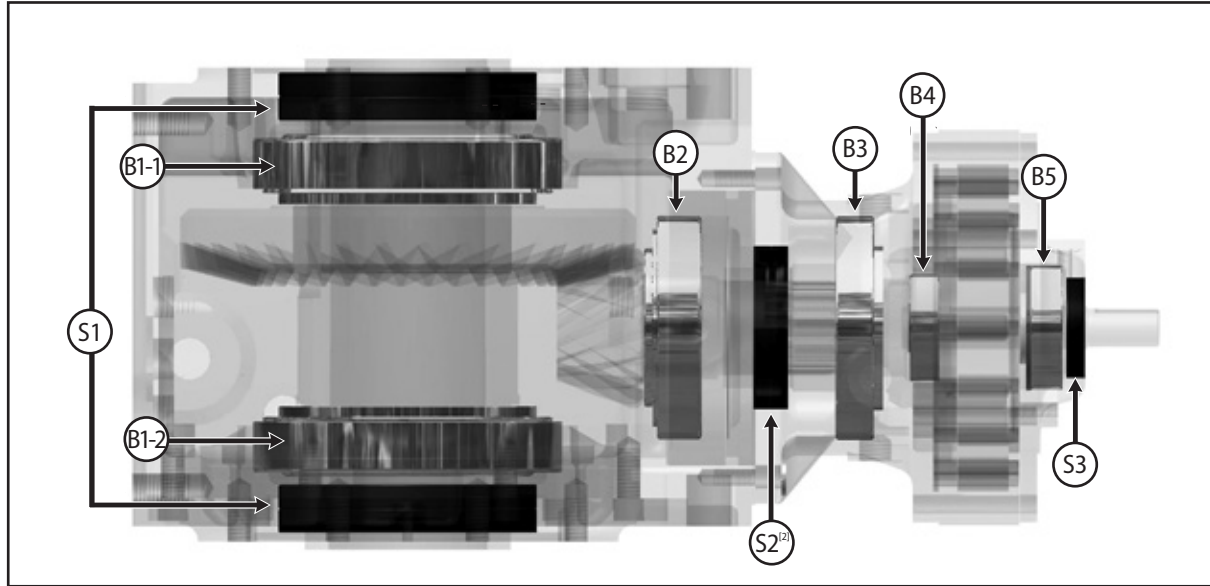


Table 34. Cyclo® BBB5 Reducer Bearings and Oil Seals

Unit Size	Bearings						Oil Seals <sup>[1]</sup>		
	B1-1	B1-2	B2	B3	B4	B5	S1	S2 <sup>[2]</sup>	S3
5Z100 5Z105	6214	6213	32307	32011	6302RSH2	6302Z	D 65 x 120 x 13	S 50 x 68 x 9	S 20 x 35 x 7
5Z110 5Z115				D 32 x 52 x 8					
5Z120 5Z125				32013	6304	6305Z			D 38 x 58 x 11
5A110 5A115				32016	32916	32308			32011
5A120 5A125	32013	6304	6305Z				D 32 x 52 x 8		
5A140 5A145	30215	6305R	6306				D 38 x 58 x 11		
5B120 5B125	32020	32018	32310				32013	6304	6305Z
5B140 5B145				30215	6305R	6306	D 38 x 58 x 11		
5B160 5B165				30217	6307R	6308	D 55 x 78 x 12		
5C140 5C145				32022	32020	32312	30215	6305R	6306
5C160 5C165	30217	6307R	6308				D 55 x 78 x 12		
5C170	30220	6406	6407				D 62 x 82 x 12		
5C175									

Notes: [1] D = Double Lip Seal. S = Single Lip Seal. Seal Dimensions are in mm.  
 [2] for "Y4" assembly only.

## 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® BBB5 Bevel Gearing Tooth Count

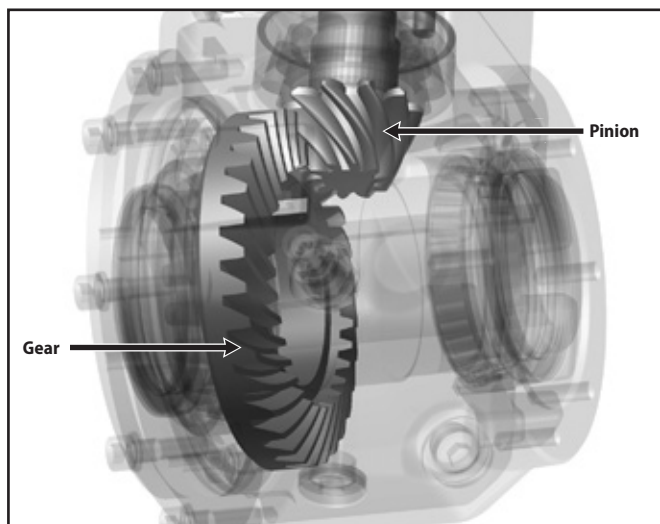


Table 35. Cyclo® BBB5 Ratios

Cyclo® BBB5 Nominal Ratio	Bevel Ratio	Cyclo® Input Ratio
11	3.5	3 <sup>(1)</sup>
13	3.2	4 <sup>(1)</sup>
14	3.5	4 <sup>(1)</sup>
16	3.2	5 <sup>(1)</sup>
18	3.5	5 <sup>(1)</sup>
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

Notes: [1] Planetary Input

Cyclo® BBB5 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® BBB5 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® BBB5 nominal ratio and corresponding bevel ratio from Table 36. Then reference Table 37 to identify the actual number of bevel gear and pinion teeth.

Table 36. Bevel Tooth Count and Part Numbers

Bevel Ratio	Number of Teeth		Bevel Gear Set Part Number			
	Pinion	Gear	5A10, 5A11, 5Z12, 5A14	5B12, 5B14, 5B16	5B12, 5B14, 5B16	5C14, 5C16, 5C17
3.2	10	32	CJ570LG/CJ560LG	CJ561LG/CJ571LG	CJ562LG/CJ572LG	CJ562LG/CJ572LG
3.5	10	35	998BBB-2A---G	998BBB-2B---G	998BBB-2C---G	998BBB-2C---G



## 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. Contact Sumitomo repair centers for replacement information.

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 personal 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® BBB5 from the driven shaft by following the instructions outlined in the Removal From Driven Shaft section of this manual.

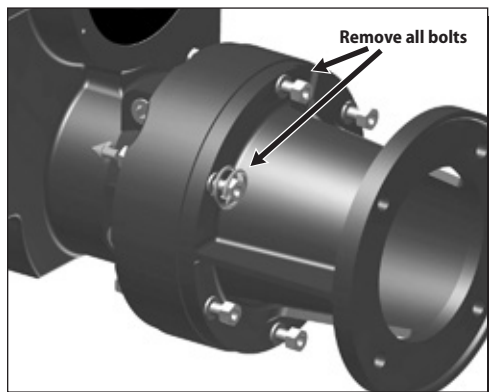


**3**

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.

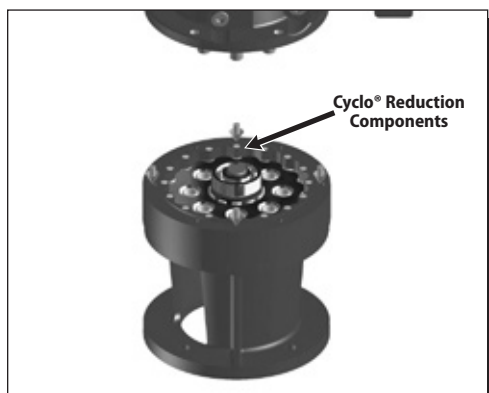
Cyclo® Portion Disassembly/Assembly, *continued*

## Disassembly Procedure



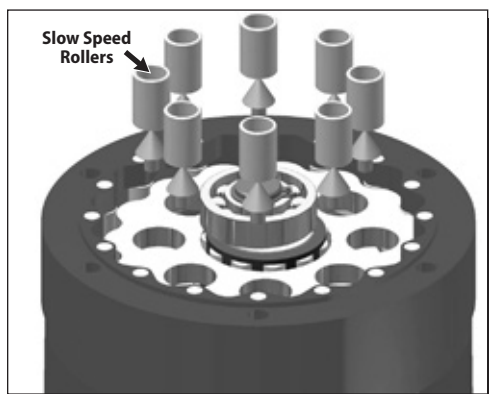
4

While continuing to externally support the entire Cyclo® BBB5 unit, remove each of the bolts from the Cyclo® ring gear housing (shown in horizontal position for clarity).



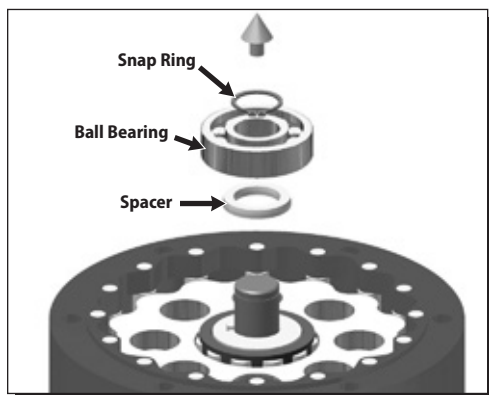
5

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.

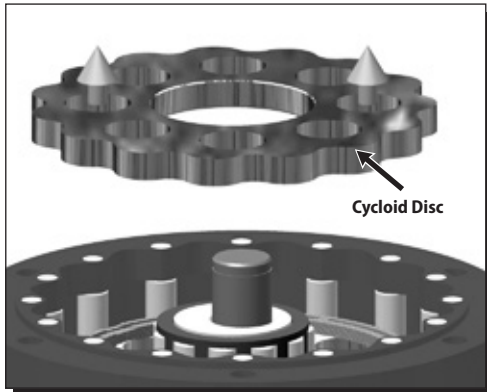


7

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

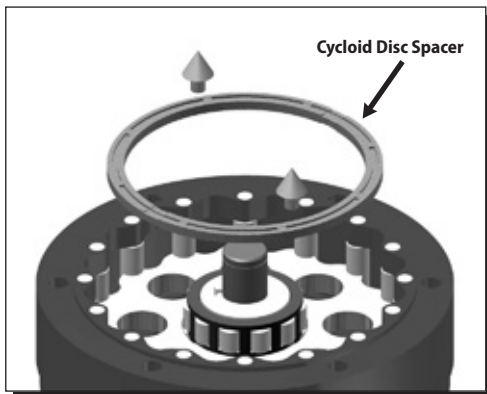
## Cyclo® Portion Disassembly/Assembly, continued

### Disassembly Procedure



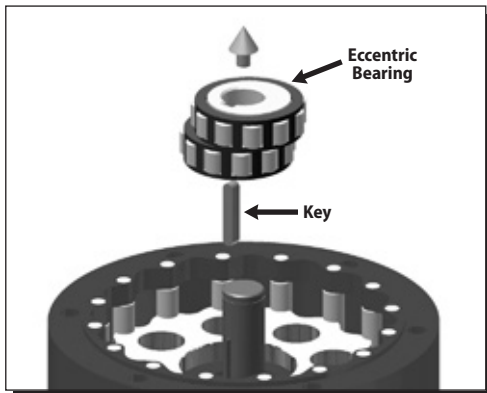
**8**

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



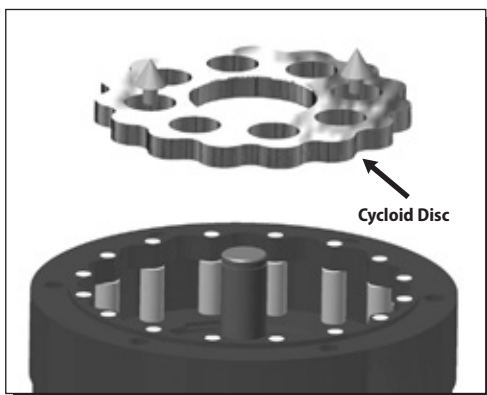
**9**

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



**10**

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

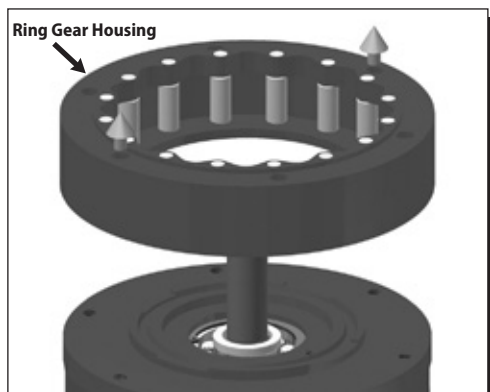


**11**

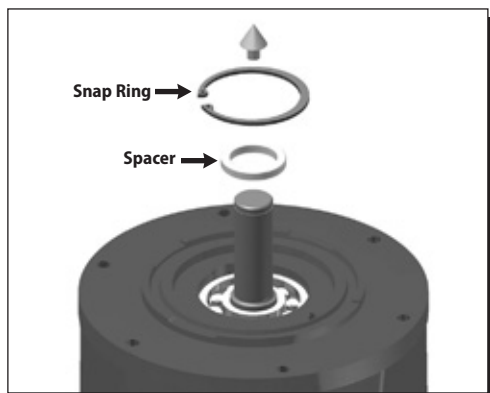
Using both hands, carefully remove the remaining **Cycloid disc**.

## Cyclo® Portion Disassembly/Assembly, *continued*

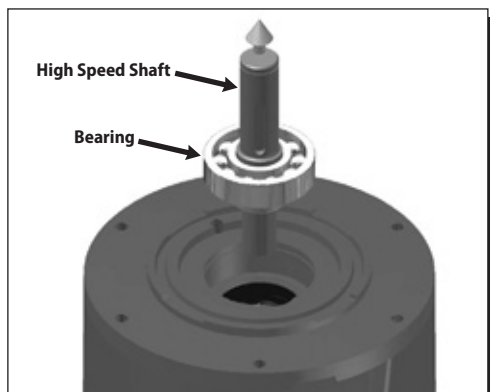
### Disassembly Procedure

**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**.

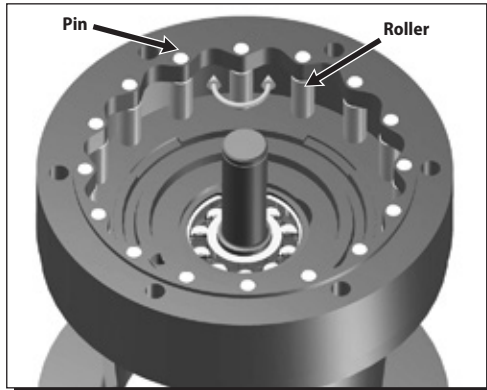
## Cyclo® Portion Disassembly/Assembly, continued

### 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:**



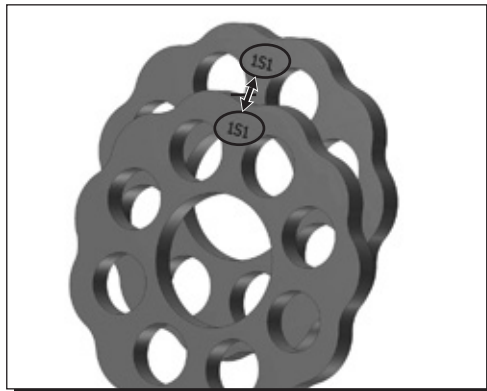
**1**

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® BBB5 is grease lubricated, liberally apply grease to the ring gear pins and rollers before they are inserted into the ring gear housing.



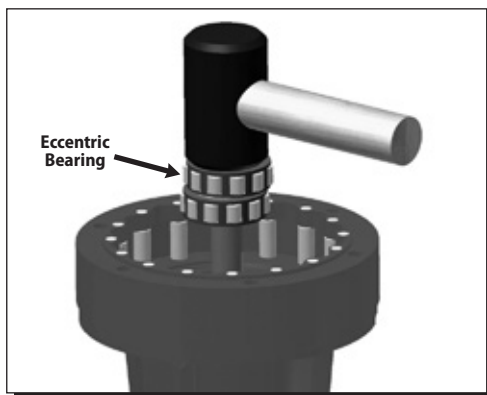
**If the Cyclo® portion of the Cyclo® BBB5 unit is oil lubricated – do not add any grease during the reassembly process.**



**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.

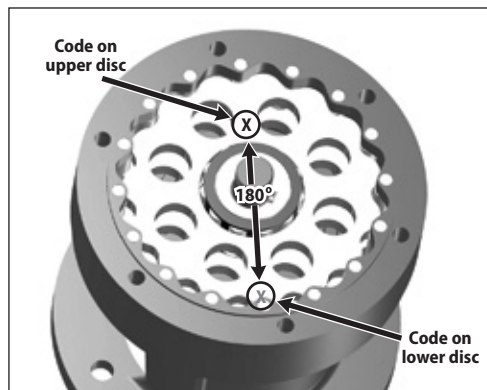


**3**

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**.

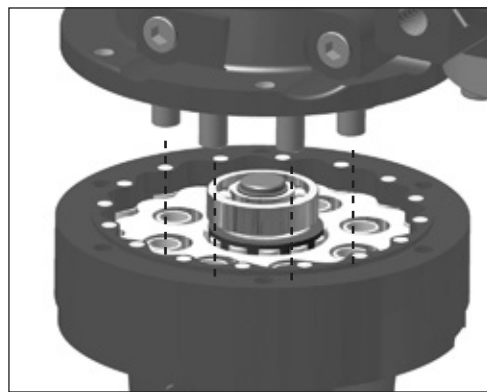


## 5

If the Cyclo® portion of the Cyclo® BBB5 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® BBB5 unit is oil lubricated – do not add any grease during the reassembly process.**



## 6

When reassembling the Cyclo® BBB5 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 in reducers and motors. If a problem with the reducer and/or the motor is not listed below, please consult the factory for assistance.

Problem with the Reducer		Possible Causes	Suggested Remedy
<b>Runs Hot</b>	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
<b>Vibration or Noise</b>	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
<b>Output Shaft/Hub does not turn</b>	Motor shaft broken	Load exceeds capacity of reducer or repetitive shock loading	Replace broken shaft and 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
<b>Oil Leakage</b>	Worn seals	Caused by dirt or grit entering the seal area	Replace the oil seals
	Leakage into motor	Reducer has been overfilled with 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 it's designed mounting angle

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

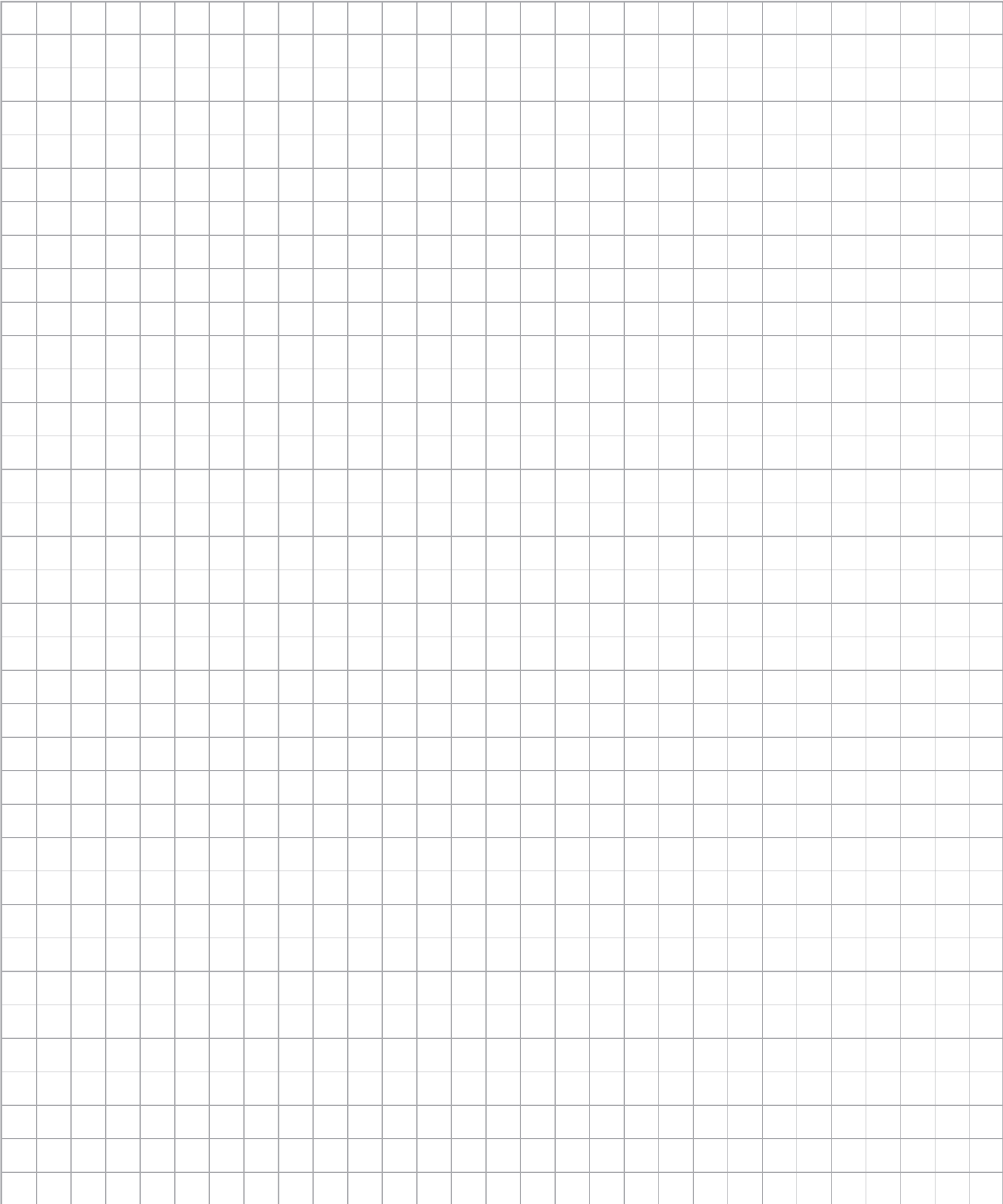
This troubleshooting guide provides assistance in identifying and overcoming common problems in reducers and motors. If a problem with the reducer and/or the motor is not listed below, please consult the factory for assistance.

Problem with the Motor		Possible Causes	Suggested Remedy
<b>Load is disconnected but motor does not rotate</b>	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 single phase	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	
<b>Rotates with the load disconnected but:</b>	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
<b>Rotates when the load is disconnected but when the load is connected:</b>	Switch overheats	Insufficient switch capacity	Replace with switch having the rated capacity
		Overload	Decrease load to the rated Value
	Fuse blows	Insufficient fuse capacity	Replace with fuse having the rated capacity
	Overheats	Overload	Decrease load to rated value
		Voltage drop	Consult with local power company
	Speed suddenly drops	Voltage drop	Consult with local power company
		Overload	Decrease load to rated value
	Stops	Bearing damaged by overheating	Replace the bearings



# Notes

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