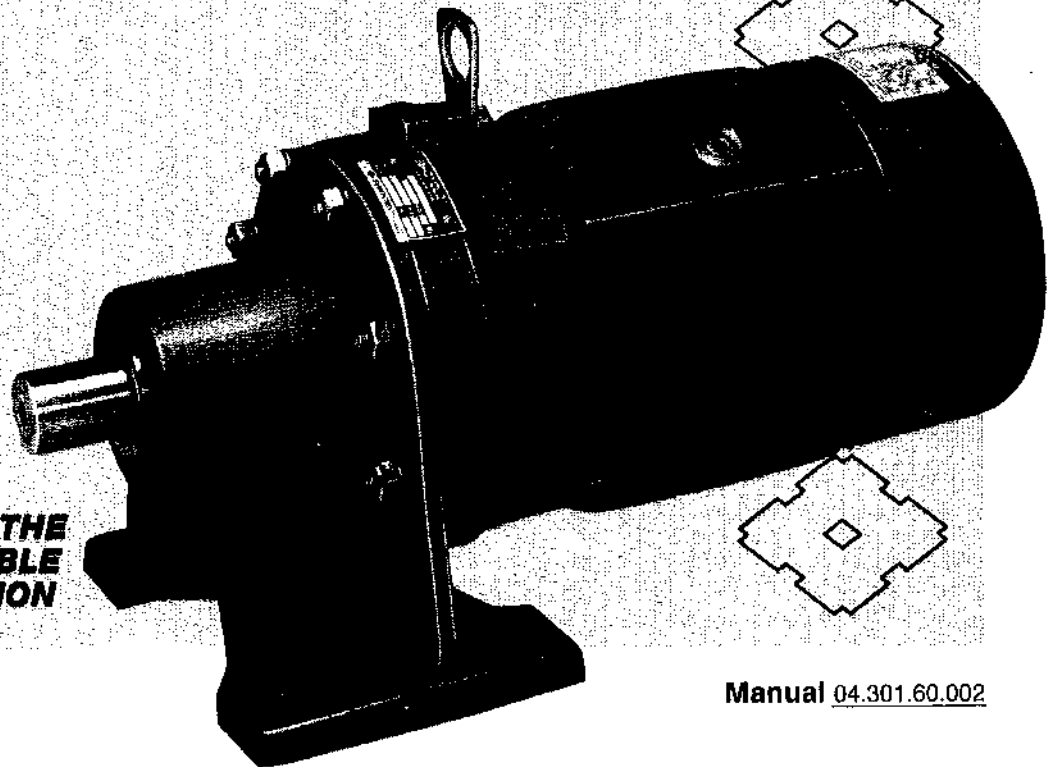


SUMITOMO
MACHINERY CORPORATION OF AMERICA

SM-CYCLO® GEARMOTORS

Operating and Maintenance Manual

3000 Series



**THE
AVAILABLE
SOLUTION**

Manual 04.301.60.002

Index

Mounting of Gearmotor	2	Pre-Start Up Inspection	14
General Construction	3, 4	Wiring Grounding, Insulating Resistance	14
SM-CYCLO® Reducer	5	Preparation and Start-Up	14
Lubrication	5	Bearings, Oil Seals for Motor	15
Grease	5	Designated Grease	15
Designated Grease	6	Intervals and Quantities of Grease	15
Grease Replenishment & Change	6	Grease Replenishment Procedure	15
Quantities of Grease	6	Oil Seals	15
Oil Units	7	Single Lip Type, Slinger Type	15
Forced Lubrication for Vertical Units	7	Bearing and Oil Seal Sizes	16, 17
Types of Lubrication Oils	8	General Information	17
Allowable Oil Viscosities	8	SM-CYCLO Gearmotor	18
Oil Quantities	8	Disassembly/Assembly	18, 19
Oil Change	8	Trouble-Shooting-Reducer	20
Oil Fill Procedures	8	Trouble-Shooting-Motor	21
Oil Level Dimensions	9	Gearmotor Maintenance and Inspection	22
Bearings, Oil Seals & Gaskets	10	Daily/Periodic	
SM-CYCLO Motor	12	Ordering Correct Replacement Parts	22
General Construction	13	Storage and Operation After Storage	23
General Inspection of Motor	14		

Mounting

1. Mounting on Exact Planes

The Horizontal Type oil-lubricated units must be mounted on horizontal surfaces. Where they are mounted on inclined surfaces, some modifications may be necessary. Specify mounting plane inclination at time of ordering.

2. Accurate Alignment

Where the gearmotor is connected to the driven machine through coupling, align the shafts accurately. Where the gearmotor is connected through V pulleys or sprockets, insure that the belts or chains are neither too tight nor too slack.

3. Overhung Load Positions

Overhung loads should be located as close to the bearing as possible. (See the Catalog page 16.)

4. Foundations

Foundations must be rugged enough to withstand shock and stress applied from the load side through the gearmotor.

5. Secure Housing

Where the reduction units are operated under conditions of vibration and/or frequent starts and stops, it

is recommended to secure them on their mounting surfaces by inserting dowel pins into the knock-holes provided on the foot of the casing. This will insure that bending or shearing forces are reduced on the mounting bolts. Pins must be securely inserted, particularly when the units are to be operated under conditions of severe recurrent peak loads.

6. Mounting Accessibility

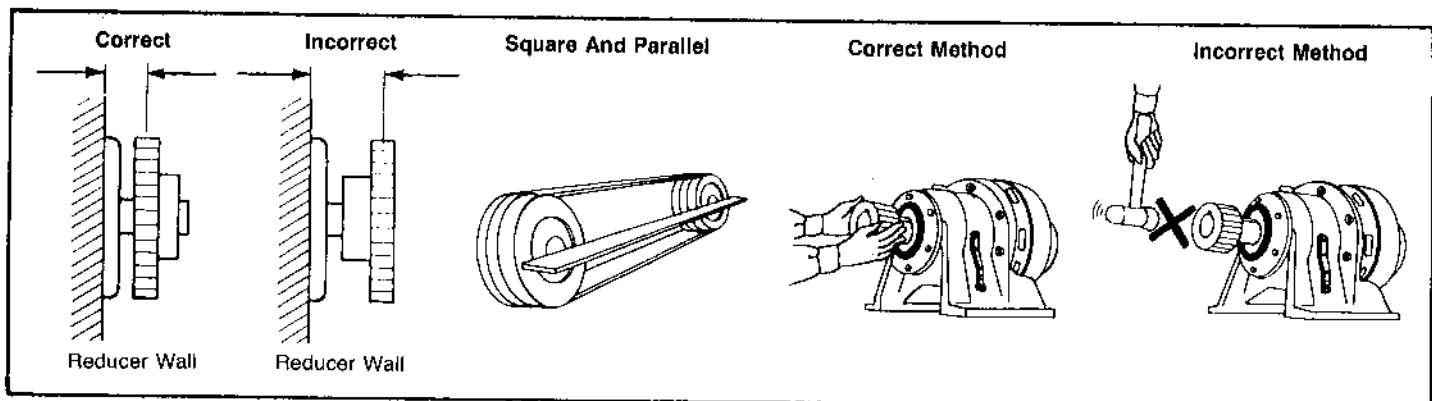
The reduction units must be mounted on places with easy accessibility for lubrication maintenance purposes and ease of inspection.

7. Ventilation

Avoid installation in places where the humidity is high, dust is considerable, or where the gearmotor will be in contact with water or oil. Select a clean, dry location with good ventilation.

8. Installation

Be sure to install and operate SM-CYCLO® speed reducers in compliance with applicable local and national safety codes. Appropriate guards for rotating shafts should be used and are available from local stocks.



General Construction

Fig. 1 Single Reduction (Horizontal Foot Mount)

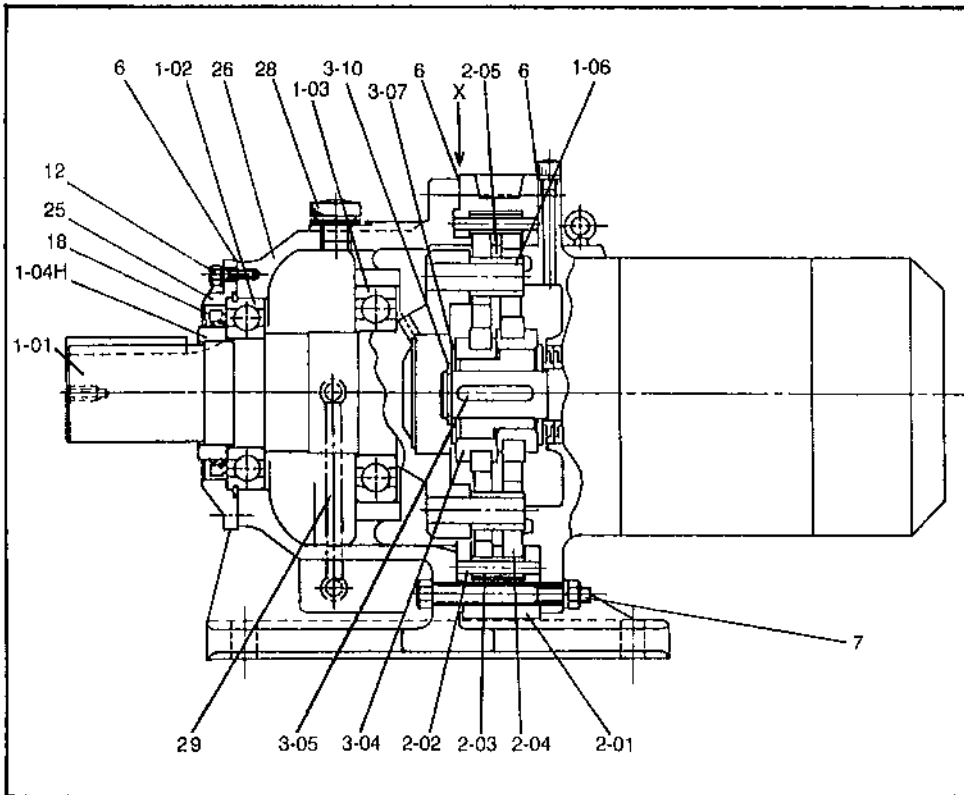


Fig. 2 Single Reduction (Vertical Base Mount)

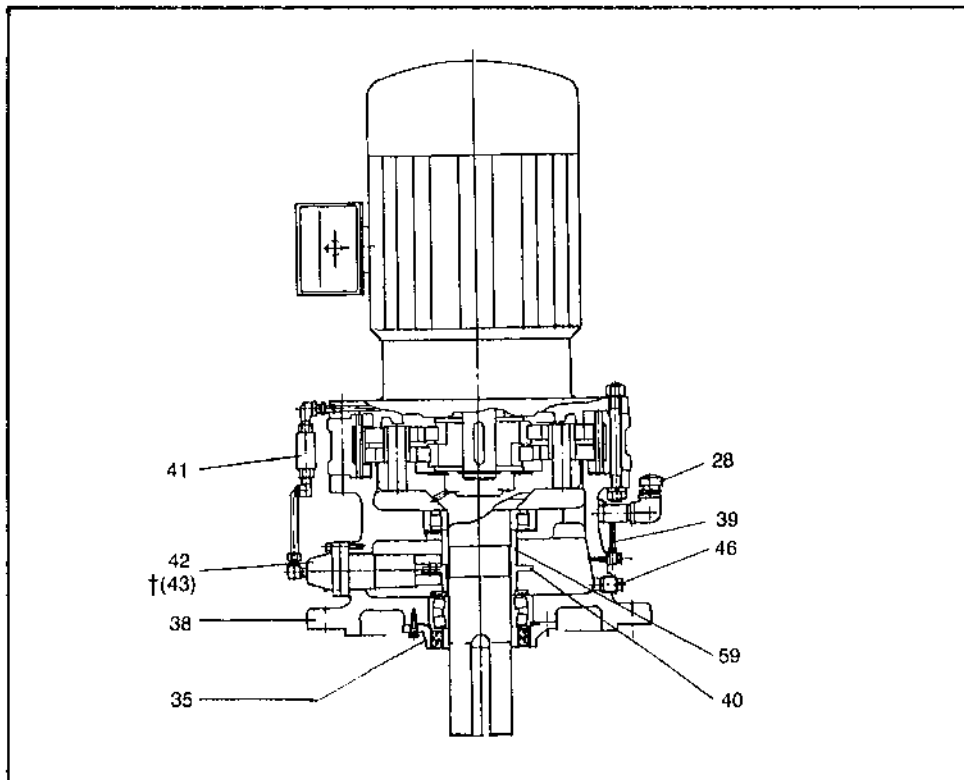


Table 1 Main Parts

Part No.	Part Name
1-01	Slow Speed Shaft w/pins
1-02	Bearing A
1-03	Bearing B
1-04H	Oil Seal Collar—Horizontal
1-06	Slow Speed Shaft Rollers
2-01	Ring Gear Housing
2-02	Ring Gear Pins
2-03	Ring Gear Rollers
2-04	Cyclo Disc
2-05	Spacer Ring
3-04	Eccentric Bearing Assembly
3-05	Eccentric Key
3-06	Balance Weight
3-07	Spacer
3-10	Retaining Ring
5-01	Intermediate Shaft w/Pins
5-02	Bearing F
5-03	Bearing G
5-04	Eccentric Bearing Assembly
6	Gasket Set
7	Casing Nuts & Bolts
12	Bolts For SS Oil Seal Housing
15	Grease Nipple
18	Slow Speed Output Oil Seal
25	Horizontal Oil Seal Housing
26	Horizontal Case
28	Oil Fill Plug
29	Oil Gauge—Horizontal Unit
35	Vertical Oil Seal Housing
38	Vertical Case (Integral V Type)
39	Oil Gauge—Vertical Unit
40	Cam
41	Piping Set & Oil Signal
42	Plunger Pump
43	Positive Displacement Pump
46	Drain Plug
55	Intermediate Cover
57	Eye Bolt
*59	Spacer

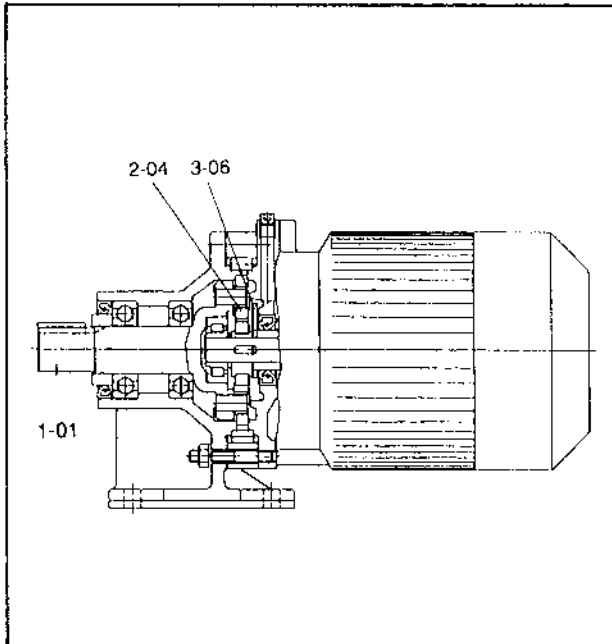
Note: For details of oil seals, bearings or gaskets, refer to pages 10 and 11.

†Refer to Table on Pg. 7 for units which require a positive displacement pump.

*Pt. No. 58 — frame sizes 3195-3275 only.

*Pt. No. 59 — frame sizes 3205-3275 only.

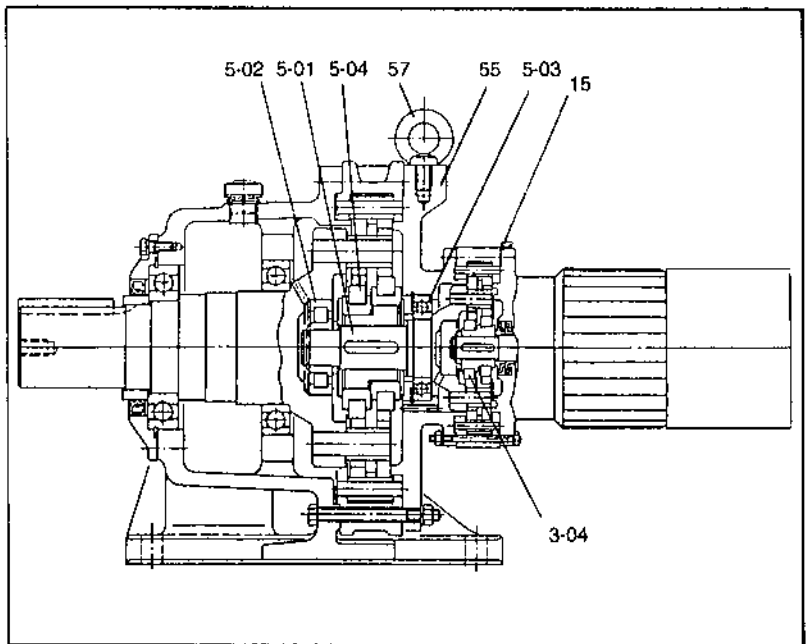
Fig. 3 Speed Reducer/Single Disc Type (Frame Size 3075-3095)



Speed Reducer — Single Disc

SM-CYCLO single reduction, Models No. 3075-3095 employ the use of a single planetary gear (Cycloid Disc) and a balance weight.

Fig. 4 Speed Reducer/Double Reduction



Multiple Reduction Reducers

Multiple reduction SM-CYCLO Reducers are a combination of standard reduction mechanism assemblies connected using an intermediate shaft (Part No. 5-01) and intermediate cover (Part No. 55) between them.

Table 2 Frame Sizes and Ratio Combination Of Double Reduction Models

Frame Size Combination

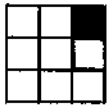
Frame Size	Second Stage	First Stage
3097/08	3097	3085
3105/08	3105	3085
3115/09	3115	3095
3145/10	3145	3105
3155/09	3155	3095
3165/11	3165	3115
3175/11	3175	3115
3185/14	3185	3145
3190/11	3190	3115
3195/11	3195	3115
3195/14	3195	3145

Reduction Ratio Combination

Frame Size	Second Stage	First Stage
3205/11	3205	3115
3205/14	3205	3145
3215/14	3215	3145
3215/16	3215	3165
3225/14	3225	3145
3225/17	3225	3175
3235/16	3235	3165
3235/18	3235	3185
3245/16	3245	3165
3245/18	3245	3185
3255/17	3255	3175
3255/19	3255	3195
3265/19	3265	3195
3275/19	3275	3195

Total Ratio	Second Stage Ratio	First Stage Ratio
102	17	6
121	11	11
165	15	11
174	29	6
187	17	11
210	35	6
231	21	11
258	43	6
289	17	17
319	29	11
354	59	6
385	35	11
473	43	11
493	29	17
522	87	6
595	35	17
649	59	11
731	43	17
841	29	29

Total Ratio	Second Stage Ratio	First Stage Ratio
957	87	11
1003	59	17
1015	35	29
1225	35	35
1247	43	29
1479	87	17
1505	43	35
1711	59	29
1849	43	43
2065	59	35
2523	87	29
2537	59	43
3045	87	35
3481	59	59
3741	87	43
5133	87	59
7569	87	87



Lubrication

SM-CYCLO® reducers, frame sizes 3075 through 3115 are grease-lubricated. Sizes 3140 through 3275 are normally oil-lubricated. Double reduction units may be grease or oil-lubricated, depending on size, ratio, and/or application.

Grease Lubrication

Single Reduction Models—Table 3

Frame Size	3075	3085	3090 3095 3097	3100 3105 310H	3110 3115 311H
Horizontal Shaft	Grease (MAINTENANCE FREE)				
Vertical Shaft	Grease (MAINTENANCE FREE)				

For the single reduction units, frame sizes 3075-3115 (maintenance-free type), NLGI No. 2 is designated. NLGI No. 2 is also designated for grease-lubricated multi-reduction units.

Grease-lubricated models are filled with grease before shipment to customer and are ready for use.

Double Reduction Models—Table 4

Frame Size	3075/07 thru 3155/09	3165/11	3175/11	3185/14	3190/11 3195/11 3195/14	3205/11 3205/14	3215/14 3215/16	3225/14 3225/17	3235/16 3235/18	3245/16 3245/18	3255/17 3255/19	3265/19	3275/19
Horizontal													
VERTICAL	< Ratio > 102 ~ 493												
	522 ~ 841												
	957 ~ 1015												
	1225 ~ 2523	Grease Lubricated Models											
	2537 ~ 3045												
	3045 ~ 7569												

Oil Lubricated Models

Triple Reduction Models—Table 5

Horizontal Shaft	Frame Size of The 1st Reduction Stage: 3105 or Smaller	Grease Lubricated (NLGI Grade 2)
Vertical Shaft	Frame Sizes: 3075/07/07 3265/19/14	Grease Lubricated (NLGI Grade 2)
	Frame Sizes: 3275/19/11 3275/19/14	Depending On The Operating Condition Consult Factory

Note: Tables above are for operation at standard input speed. If the input speed differs from the standard, please consult factory.

Designated Greases—Table 6

For additional information please refer to Engineering Sheet No. 336.03.00

Ambient Temperature F° (C°)	Single Reduction (Maintenance Free)	Double Reduction
-5 ~ 122 (-15 ~ 50)	NLGI No. 2	NLGI No. 2

Grease Replenishment And Change Interval—Table 7

Model	Condition	Interval	
Single Reduction (Maintenance Free Type)	Replenishment	NOT REQUIRED	
	*Overhaul	Every 20,000 Hours Or Every 4 ~ 5 Years	
Double Reduction	Replenishment	Less Than 10 Hours Per Day Operation	Every 3 ~ 6 Month
		10 ~ 24 Hours Per Day	Every 500 ~ 1000 Hours
	Change	Speed Reduction Mechanism, High Speed Shaft Bearings (Speed Reducer Type)	Every 2 ~ 3 years
		Slow Speed Shaft Bearings	Every 3 ~ 5 Years

*Overhauling consists of disassembling the unit, replacing the seals and gaskets, cleaning the internal parts, and then repacking the unit with designated grease.

Note 1: Frame sizes 3075-311H are maintenance free units. Grease replenishment and change not being necessary. Where longer life of the drive is expected or if relubricating is preferred before recommended period of time, refer to Tables 6, 7 and 8.

Quantities Of Grease (Ounces)—Table 8

Frame Size	3075	3085	3090 3095 3097	3100 3105 310H	3110 3115 311H
Speed Reduction Mechanism	.7	.7	2.1	3.5	8.5
Slow Speed Shaft Bearings	.4	.9	2.3	3.9	4.9

Frame Size	3097/08	3105/08	3115/09	3145/10	3155/09	3165/11	3175/11	3185/14	3190/11 3195/11	3195/14	3205/11
Speed Reduction Mechanism (First Stage)	0.7	0.7	2.1	2.3	1.4	5.3		15.9	5.3	15.9	5.6
Speed Reduction Mechanism (Second Stage)	2.1	3.5	8.5	15.9	15.9	26.5	35.3	38.8	52.9		52.9
Slow Speed Shaft Bearing (Second Stage)	2.3	3.9	4.9	10.6	10.6	10.6	17.6	21.2	24.7		24.7

Frame Size	3205/14	3215/14	3215/16	3225/14	3225/17	3235/16	3235/18	3245/16	3245/18	3255/17	3255/19	3265/19
Speed Reduction Mechanism (First Stage)	15.9		26.5	15.9	35.3	26.5	38.8	26.5	38.8	35.3	52.9	
Speed Reduction Mechanism (Second Stage)	52.9	70.5		88.2		141.0		158.7		211.6		282.2
Slow Speed Shaft Bearing (Second Stage)	24.7	28.2		31.7		35.3		38.8		42.3		45.9

Note 1: Replenish grease to the reduction mechanism 1/3 to 1/2 of quantities for the first reduction stage described in Table 8 in accordance with replenishment interval recommended in Table 7.

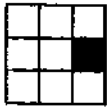
Note 2: When the unit is disassembled for overhauling, refill with grease in quantities indicated in Table 8. Or alternatively, 80% of the space around reduction mechanism and slow speed shaft bearings of single reduction units and 50% around reduction mechanism of both first and second stage of double reduction units.

Slightly larger quantities may be supplied to lower reduction ratio units, and somewhat smaller quantities for high reduction ratio units.

Apply grease liberally to the central part (i.e., around the eccentric bearings) of the mechanism. Apply grease to both the slow speed and high speed shaft bearings as you would do to ordinary bearings at time of re-assembly.

Note 3: If excessive grease is added, agitation heating of the grease will raise the operating temperature of the unit. Avoid excessive greasing, however, as the reverse case, when the grease is insufficient it will raise the operating temperature due to the breakdown of the lubrication films on the eccentric bearing.

If a rise in the operating temperature is found supply grease immediately.



Oil Lubrication

SM-CYCLO® reducers sizes 3140 through 3275 are normally oil-lubricated. Double reduction units may be grease or oil-lubricated, depending on size, ratio, and/or application.

Oil-lubricated models are shipped without oil. Units must be filled with recommended oil prior to start-up.

Single Reduction Models — Table 9

Frame Size	3140 3145	3155 315H	3160 3165 316H	3170 3175	3180 3185	3190 3195	3205	3215	3225	3235	3245	3255	3265	3275
Horizontal Shaft	Oil Bath													
Vertical Shaft	Oil Bath			Forced-oil Lubrication										

Double Reduction Models—Table 10

Frame Size	3165/11	3175/11	3185/14	3190/11 3195/11 3195/14	3205/11 3205/14	3215/14 3215/16	3225/14 3225/17	3235/16 3235/18	3245/16 3245/18	3255/17 3255/19	3265/19	3275/19
Horizontal	Oil Bath											
VERTICAL SHAFT	< Ratio > 102 ~ 493	Forced-Oil Lubrication										
	522 ~ 841											
	957 ~ 1015											
	1225 ~ 2523											
	2537 ~ 3045											
	3045 ~ 7569											
	Grease Lubricated Models											

Triple Reduction Models—Table 11

Horizontal	Frame Size Of The 1st Reduction Stage: 3115 Or Larger	Oil Bath Lub. (Refer to Table 12)
Vertical	Frame Size: 3275/19/11 and 3275/19/14	Depending On the Operating Condition Consult Factory

Note: Tables above are for operation at standard input speed. If the input speed differs from the standard, please consult factory.

Forced Lubrication For Vertical Units

Plunger Pump Type

Small Size Pump				Large Size Pump			
Frame Size	Ratio	Frame Size	Ratio				
3160 3170 3180 3190 3165 316H 3175 3185 3195	All	3205 3215 3225 3235 3245 3255 3265	All				
3165/11 thru 3195/14	All	3205/11-3265/19	All				

Positive Displacement Type Pump

SM-CYCLO Reducer		Positive Displacement Pump
Frame Size	Reduction Ratio	
3275	All	TOP-216HAVB-3
3275/19	All	TOP-204HAVB-3

1-1 Plunger Lubrication

The plunger pump (Part No. 42) is automatically operated by a cam (Part No. 40) fitted on the slow speed shaft (Part No. 1-01). The number of pumping cam teeth required is in direct relation to the reduction ratio and frame size. For input speeds other than standard, consult factory.

1-2 Positive Displacement Pump Lubrication

Forced oil lubrication is accomplished by using a positive displacement pump and motor which requires an additional electric power source. It is recommended that the main motor be interlocked with the pump motor to avoid misoperation. The pump must be started 30 seconds or longer before the main motor is operated.

Type Of Lubrication Oil—Table 12

Mild EP Oil is used for the lubrication of SM-CYCLO® Reducers, Models 3140 and larger.

For additional information please refer to Lubrication Specification Sheet No. 03.301.63.002

Ambient Temperature	14°F ~ 32°F (-10°C ~ 0°C)	32°F ~ 95°F (0°C ~ 35°C)	95°F ~ 122°F (35°C ~ 50°C)
Viscosity @ 40°C (104°F) cSt.	41.4 ~ 74.8	90 ~ 165	198 ~ 506
ISO Viscosity Grade	46 ~ 68	100 ~ 150	220 ~ 460
AGMA Viscosity Grade	2EP	3EP 4EP	5EP ~ 7EP
Viscosity @ 100°F (38°C) SSU	214 ~ 389	468 ~ 871	1047 ~ 2719
SAE Grade (Crankcase Oils)	20 W	30 40	50

Allowable Viscosity Of Oil—Table 13

Minimum Allowable Viscosity To Maintain Adequate Lubricating Oil-film		80 SUS During Operation
Maximum Allowable Viscosity To Allow Easy Starting	Oil Bath	20,000 SUS At Operation Start
	Forced-Oil Lubrication	10,000 SUS At Operation Start

Oil Quantities (Gallons) — Table 14

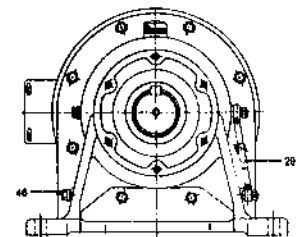
Single Reduction	Frame Size	3140 3145 314H 3155 315H	3160 3165 316H	3170 3175	3180 3185	3190 3195	3205	3215	3225	3235	3245	3255	3265	3275
	Horizontal	0.2	0.4	0.5	0.6	1.1	1.5	2.3	2.6	4.0	4.2	5.6	7.7	14.8
	Vertical	0.3	0.3	0.5	0.5	0.7	1.5	2.0	2.6	3.2	4.0	11.1	13.5	(15.9)

Double Reduction	Frame Size	3165/11	3175/11	3185/14	3190/11 3195/11 3195/14	3205/11 3205/14	3215/14 3215/16	3225/14 3225/17	3235/16 3235/18	3245/16 3245/18	3255/17 3255/19	3265/19	3275/19
	Horizontal	0.4	0.6	0.9	1.6	1.6	2.7	2.9	4.5	4.8	6.1	8.5	18.5
	Vertical	0.3	0.5	0.5	0.7	2.9	3.7	4.8	6.1	7.7	11.1	13.5	(15.9)

The above quantities shown in parentheses are for the forced-oil lubricated models with a positive displacement pump.

Oil Change—Table 15

Oil Change Interval		Operation Condition
Initial Oil Change	After 500 Hours of Primary Operation	Under Every Condition
Subsequent Oil Change	Every 6 Months	Less Than 10 Hours/Day Operation
	Every 2,500 Hours	10 ~ 24 Hours/Day Operation
	Every 1 ~ 3 Months	High Ambient Temperature, High Humidities Or Atmosphere Of Active Gas

Fig. 5**Oil Fill Procedure**

Fill the reducer with recommended oil through the filler plug before start-up. The oil levels must be to the upper red line on the oil level gauge while the unit is not operated, and above the lower red line during operation. If too much oil is supplied, the temperature will rise due to the churning heat of the oil; or, oil will leak across the high speed shaft oil seal.

Oil Level Gauge

When it becomes difficult to check the oil level due to the discoloration of the vinyl hose, the gauge must be replaced. The standard vinyl oil gauge shall be used at ambient temperature: -4°F to 100°F. Where the

reducer is used at ambient temperatures greater than 100°F (+40°C) or less than -4°F (-20°C), a glass gauge set or a dipstick is recommended.

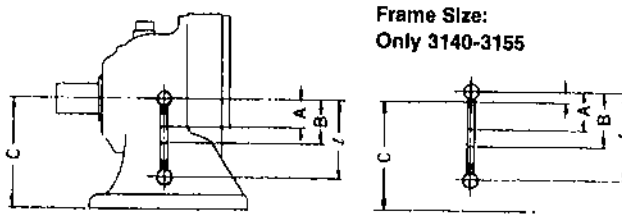
Note 1: When draining oil, remove drain plug (Part No. 46) or lower side plug of the oil level gauge. See fig. 5.

Note 2: Before filling vertical base type unit with lubrication oil, remove the vent plug (Part No. 14. See picture on pg. 3). After filling, apply teflon sealing tape to threads of the vent plug prior to installation.

Note 3: The oil level gauge can be attached on either side of the casing on horizontal units. Locate on whichever side is more convenient to check oil level. (The oil level gauge is normally attached on the right when viewed from slow speed shaft end.)

Oil Level Dimensions

Foot Mount Horizontal Type
Fig. 6



Frame Size:
Only 3140-3155

Table 16 Oil Level Dimensions (Inches)

Frame Size	A	B	C	ℓ
3140-3145, 314H	1.38	2.18	5.91	4.66
3155, 315H	1.38	2.18	5.91	4.66
3160-3165, 316H	1.57	2.75	6.30	3.70
3165/11	1.18	1.78	6.30	3.70
3170-3175	1.97	3.34	7.87	4.96
3175/11	1.18	1.78	7.87	4.96
3180-3185	2.18	3.93	8.66	5.91
3185/14	1.38	2.18	8.66	5.91
3190-3195	2.25	3.25	9.84	6.61
3190/11-3195/11	1.18	1.78	9.84	6.61
3195/14	1.38	2.18	9.84	6.61
3205	2.12	3.18	9.84	5.47
3205/11	1.25	1.93	9.84	5.47
3205/14	1.25	2.13	9.84	5.47
3215	2.05	3.03	10.43	6.03
3215/14	1.18	1.97	10.43	6.03
3215/16	1.57	2.75	10.43	6.03
3225	2.25	3.43	11.03	6.50
3225/14	1.25	2.05	11.03	6.50
3225/17	1.85	3.43	11.03	6.50
3235	2.48	3.47	11.81	7.17
3235/16	1.57	2.75	11.81	7.17
3235/18	1.97	3.35	11.81	7.17
3245	2.76	3.78	13.19	7.76
3245/16	1.65	2.72	13.19	7.76
3245/18	2.00	3.35	13.19	7.76
3255	3.18	4.17	14.76	8.47
3255/17	1.97	3.35	14.76	8.47
3255/19	2.25	3.22	14.76	8.47
3265	3.22	4.22	15.75	9.49
3265/19	2.28	3.25	15.75	9.49
3275	3.35	4.53	21.25	11.22
3275/19	2.75	4.33	21.25	11.22

Base Mount Vertical Type
Frame Size: 3140-315H
Fig. 7

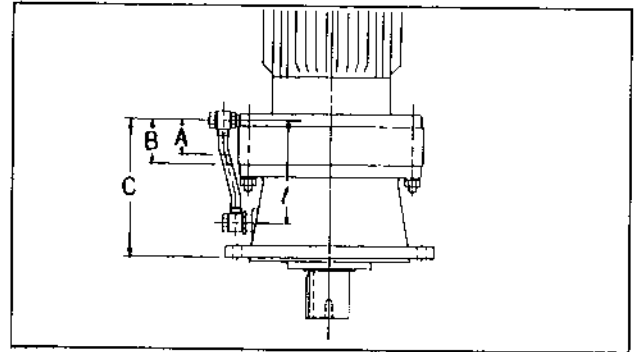


Table 17 Base Mount Vertical Type
Oil Level Dimensions (Inches)
Frame Size: 3140-315H

Frame Size	A	B	C	ℓ
3140-315H	1.85	2.72	7.46	5.78

Base Mount Vertical Type
Frame Size: 3160-3275
Fig. 8

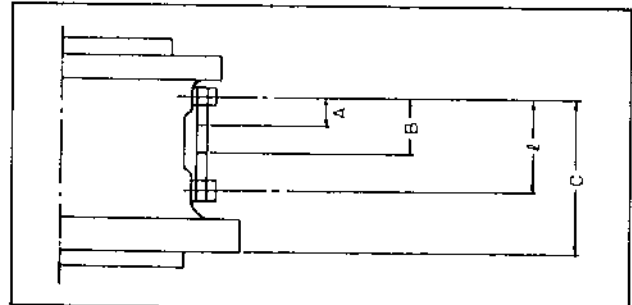


Table 18 Base Mount Vertical Type
Oil Level Dimensions (Inches)
Frame Size: 3160-3275

Frame Size	A	B	C	ℓ
3160-3165, 316H	1.03	1.42	4.68	2.71
3170-3175	1.69	2.48	6.03	3.78
3180-3185	1.93	2.71	6.73	4.25
3180-3195	2.09	3.27	7.87	5.47
3205	1.46	2.04	7.09	3.54
3215	1.46	2.04	7.09	3.54
3225	1.46	2.04	7.87	3.54
3235	1.46	2.04	7.72	3.54
3245	1.46	2.04	8.01	3.54
3255	1.46	2.04	8.64	3.54
3265	1.46	2.04	9.61	3.54
3275	1.97	2.75	13.38	5.50

REDUCER

Bearings, Oil Seals, Gaskets

Fig. 9

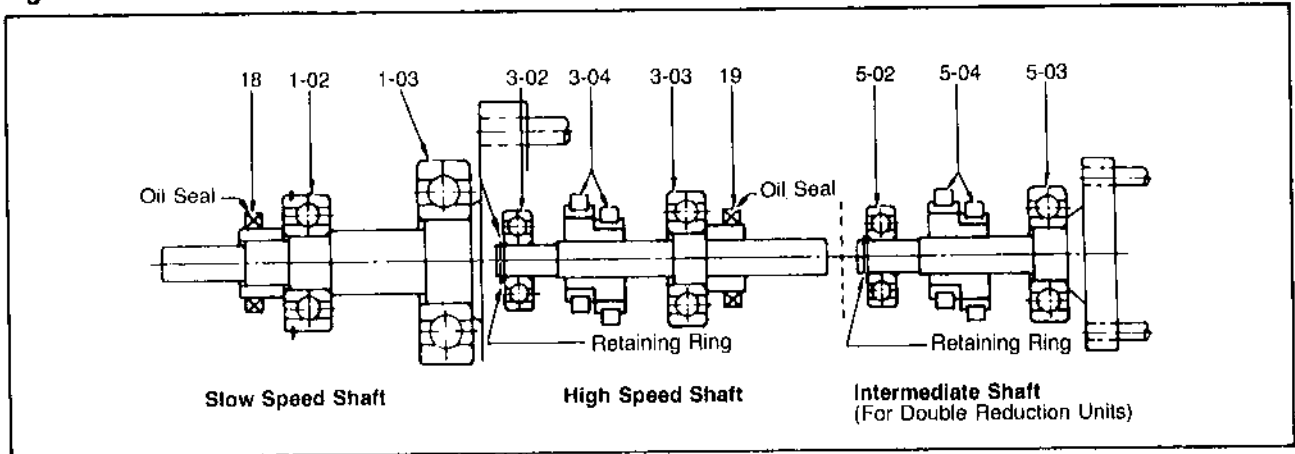


Table 19 Single Reduction Units

Frame Size	BEARING					OIL SEAL					
	SLOW SPEED SHAFT		MOTOR SHAFT			SLOW SPEED SHAFT					
	Part No. 1-02	Part No. 1-03	Part No. 3-02	Part No. 3-04		Part No. 1B					
	Number	Number	Number	Number	Qty	*Type	Dimension	Qty			
							H Type	V Type			
3075	6202Z	6203	6201	18UZ5208	1	D	20/35x7	1	1		
3085	6204Z	6909	6301	19UZ5208	1	D	30/47x8	1	1		
3090/5/7	6206Z	6011Z	NJ302RS5HZ	Refer to Table 21	1	D	45/62x9	1	1		
3100/5	6306Z	6011Z	6302			D	50/72x12	1	1		
310H	6306Z	16011	6302			D	50/72x12	1	2		
3110/5, 311H	6308Z	6013	6304			D	65/90x13	1	1		
3140/5	6211NR	6213	6305			D	65/88x12	1	2		
3155, 315H	22211BNR	6213	NJ305			D	65/88x12	1	2		
3160/5	6213NR	6215	NJ307			D	85/110x13	1	2		
316H	3TM 6213NR	6215	6307R			D	85/110x13	1	2		
3170/5	6216NXR	6218	NJ406			60UZ587	2	D	95/130x15	1	2
3180/5	6218NR	6220	NJ407			65UZ588	2	D	110/145x15	1	2
3190/5	6221NR	6026	NJ408	85UZ589	2	D	120/155x16	1	2		
3205	22220 BNRC2	6222C2	NJ310EV3	E-85UZ 5220	2	D	120/155x16	1	2		
3215	23022 BNRC2	6224CZ	NJ311EV1	E-95UZ 5221	2	D	130/160x14	1	2		
3225	23024 BNRC2	NUP226CZ	NJ312EV2	E-100UZ 5222	2	D	145/175x14	1	2		
3235	23026 BNRC2	NUP228CZ	NJ313EV3	E-105UZ 5223	2	D	160/190x16	1	2		
3245	23028 BNRC2	NUP230CZ	NJ314EV5	E-125UZ 5224	2	D	170/200x16	1	2		
3255	23032 BNRC2	NUP234CZ	NJ316EV1	140UZ 5225	2	D	190/225x16	1	2		
3265	23032 BNRC2	NUP236CZ	NJ317EV1	140UZ 5226	2	D	200/240x20	1	2		
3275	23136 BNXR	6340	NJ417	180UZ 593	2	D	230/270x20	1	2		

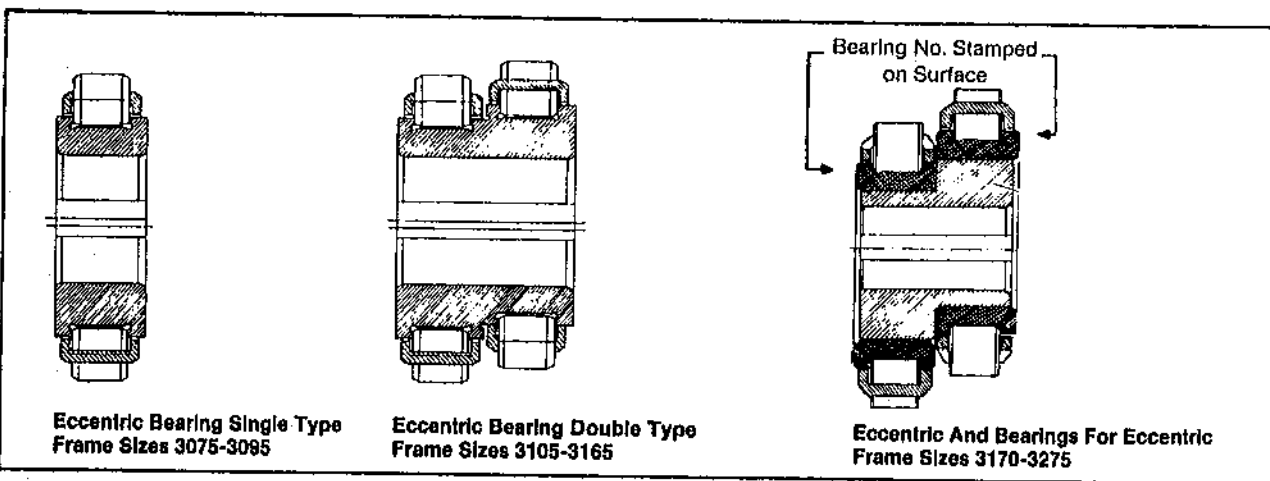
*D: Double lip (dust proof and seal lip) type.

Table 20 Double Reduction Units Intermediate Shaft Parts

Frame Size	BEARINGS			
	Part No. 5-02	Part No. 5-04		Part No. 5-03
	Number	Number	Q'ty	Number
3075/07	6201	19UZS208	1	6909
3085/07	6301	19UZS208	1	6909
3105/08	6302	Refer to Table 21	1	6007
3115/08	6304			6205
3145/10	6305			6206
3155/09	6305			6206
3165/11	6307R			6208
3175/11	6406	60UZS87V	2	6208
3185/14	6407	65UZS88V	2	6213
3190/11-3195/11	6408	85UZS89V	2	6210
3915/14	6408	85UZS89V	2	6213

Note 1: Required quantity of bearings (Part No. 1-02, 1-03, 3-02, 3-03, 5-02, 5-03) for each unit is one.

Fig. 10



DELETE

Frame Size	BEARINGS			
	Part No. 5-02	Part No. 5-04		Part No. 5-03
	Number	Number	Q'ty	Number
3205/11	NJ310EV3	E-85UZS220	2	6210
3205/14	NJ310EV3	E-85UZS220	2	6310
3215/14-3215/18	NJ311EV1	E-95UZS221	2	6311
3225/14-3225/17	NJ312EV2	E-100UZS222	2	6313
3235/16-3235/18	NJ313EV3	E-105UZS223	2	6314
3245/16	NJ314EV5	E-125UZS224	2	6315
3245/18	NJ314EV5	E-125UZS224	2	6316
3255/17-3255/19	NJ316EV1	140UZS225	2	6318
3265/19	NJ317EV1	140UZS226	2	6320
3275/19	NJ417	180UZS93	2	6420CS90

Note 2: On Table 15, Bearing for eccentric (Part No. 5-04) suffixed with "V" such as 60UZS87V is roller bearing without retainer.

DELETE

Table 21 Identification No. of Eccentric Bearing

Frame Size	3090 3095 3097	3100 3105 310H 3105/08	3110 3115 311H 3115/09	3140 3145 314H 3145/10	3155 3155/09	315H	3160 3165 3165/11	316H
Part No.	3-04							
Ratio	3-04							
6	15UZE20908T2	15UZ21006T2	22UZ2110608T2	25UZ28506-11T2	—	26UZ28506-11T2S	35UZ2860608T2	35UZ2860608T2S
8	15UZE20908-15T2	15UZ21008-15T2	22UZ2110608T2	25UZ28506-11T2	—	25UZ28506-11T2S	35UZ2860608T2	35UZ2860608T2S
11	15UZE20908-15T2	15UZ21008-15T2	22UZ2111115T2	25UZ28506-11T2	—	25UZ28506-11T2S	35UZ28611-16T2	35UZ28611-15T2S
13	15UZE20908-15T2	15UZ21008-15T2	22UZ2111317T2	25UZ28513-17T2	25UZ28513-17T2	25UZ28513-17T2S	35UZ28611-15T2	35UZ28611-15T2S
15	16UZE20908-15T2	15UZ21008-15T2	22UZ2111115T2	25UZ28513-17T2	25UZ28513-17T2	26UZ28513-17T2S	35UZ28611-15T2	35UZ28611-15T2S
17	16UZE20917T2	15UZ21017T2	22UZ2111317T2	25UZ28513-17T2	—	25UZ28513-17T2S	35UZ28617-25T2	—
21	16UZE20921T2	16UZ21021T2	22UZ21121T2	25UZ28521/25 417T2	25UZ2852125/ 417T2	25UZ2852125/ 417T2S	35UZ28617-25T2	35UZ28617-25T2S
25	16UZE2092529T2	15UZ2102529T2	22UZ2112529T2	25UZ2852125/ 417T2	—	25UZ2852125/ 417T2S	35UZ28617-25T2	35UZ28617-25T2S
29	15UZE2092529T2	15UZ2102529T2	22UZ2112529T2	25UZ2852935T2	—	25UZ2852935T2S	35UZ2862935T2	—
35	15UZE20935T2	16UZ21035T2	22UZ21135T2	25UZ2852935T2	25UZ2852935T2	—	35UZ2862935T2	—
43	15UZE20943T2	15UZ21043T2	22UZ21143T2	25UZ28543-59T2	—	25UZ28543-59T2S	35UZ2864351T2	35UZ2864351T2S
51	15UZE20951/ 814359T2	15UZ21051/ 824359T2	22UZ2115159T2	25UZ28543-59T2	25UZ28543-59T2	—	35UZ2864351T2	35UZ2864351T2S
59	16UZE20959T2	15UZ21059T2	22UZ2115159T2	25UZ28543-59T2	25UZ28543-59T2	—	35UZ28659T2	—
71	15UZE20971/ 8187T2	15UZ21071/ 8287T2	22UZ2117187T2	25UZ2857187T2	—	25UZ2857187T2S	35UZ28671/ 659T2	35UZ28671/ 659T2
87	15UZE20987T2	15UZ21087T2	22UZ2117187T2	25UZ2857187T2	25UZ2857187T2	—	35UZ28687T2	—
119	15UZE209119T2	15UZ210119T2	—	—	—	—	—	—

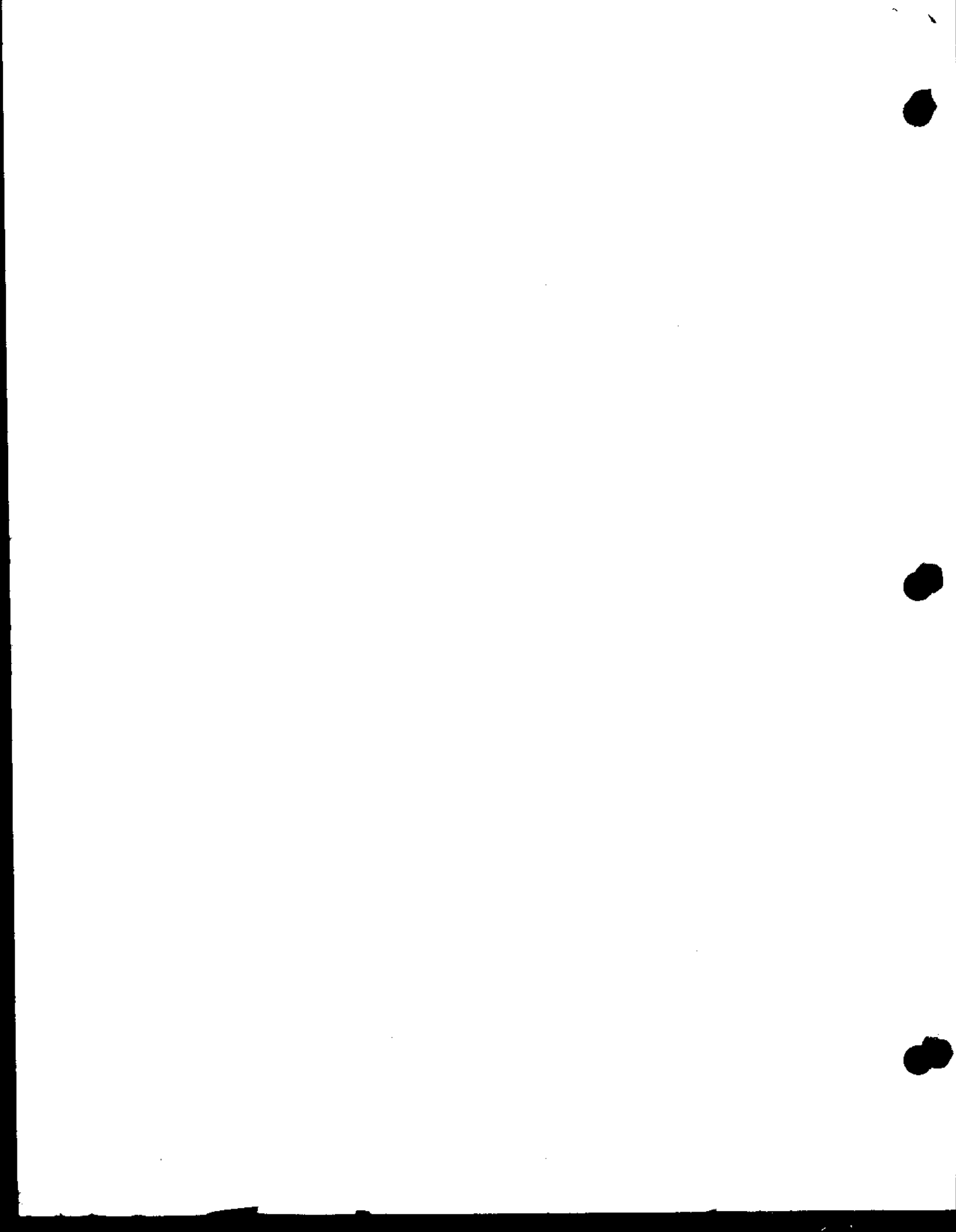


Table 20 Double Reduction Units Intermediate Shaft Parts

Frame Size	BEARINGS			
	Part No. 5-02	Part No. 5-04		Part No. 5-03
	Number	Number	Q'ty	Number
3075/07	6201	19UZS208	1	6909
3085/07	6301	19UZS208	1	6909
3105/08	6302	Refer to Table 21	1	6007
3115/09	6304			6205
3145/10	6305			6206
3155/09	6305			6206
3165/11	NJ307G1			6208
3175/11	NJ406G1	60UZS87V	2	6208
3185/14	NJ407G1	65UZS88V	2	6213
3190/11-3195/11	NJ408G1	85UZS89V	2	6210
3915/14	NJ408G1	85UZS89V	2	6213

Note 1: Required quantity of bearings (Part No. 1-02, 1-03, 3-02, 3-03, 5-02, 5-03) for each unit is one.

Frame Size	BEARINGS			
	Part No. 5-02	Part No. 5-04		Part No. 5-03
	Number	Number	Q'ty	Number
3205/11	NJ310EV3	E-85UZS220	2	6210
3205/14	NJ310EV3	E-85UZS220	2	6310
3215/14-3215/16	NJ311EV1	E-95UZS221	2	6311
3225/14-3225/17	NJ312EV2	E-100UZS222	2	6313
3235/16-3235/18	NJ313EV3	E-105UZS223	2	6314
3245/16	NJ314EV5	E-125UZS224	2	6315
3245/18	NJ314EV5	E-125UZS224	2	6316
3255/17-3255/19	NJ316EV1	140UZS225	2	6318
3265/19	NJ317EV1	140UZS226	2	6320
3275/19	NJ417	180UZS93	2	6420CS30

Note 2: On Table 15, Bearing for eccentric (Part No. 5-04) suffixed with "V" such as 60UZS87V is roller bearing without retainer.

Fig. 10

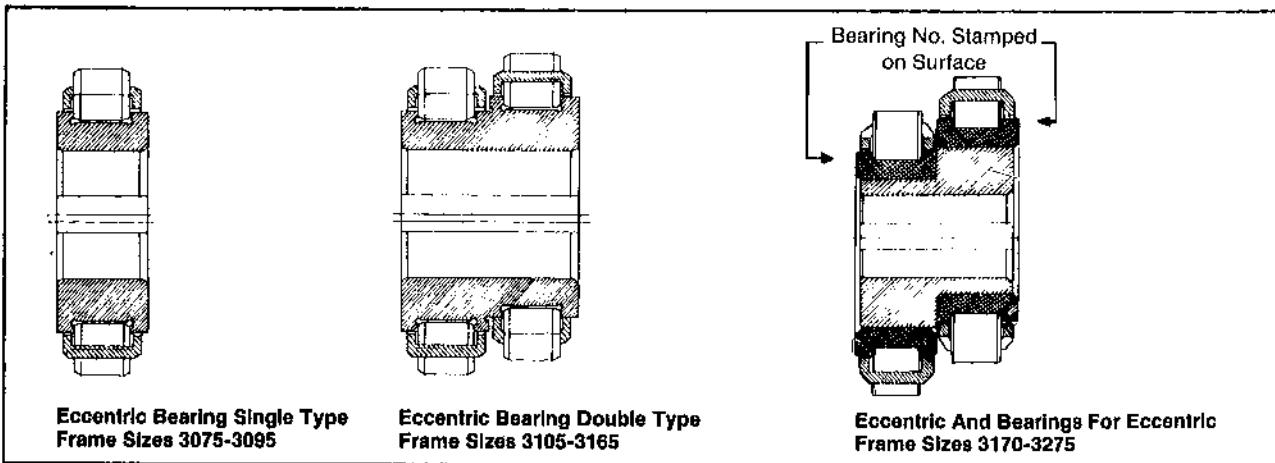


Table 21 Identification No. of Eccentric Bearing

Frame Size	3090 3095 3097	3100 3105 310H 3105/08	3110 3115 311H 3115/09	3140 3145 314H 3145/10	3155 3155/09	315H	3160 3165 3165/11	316H
Ratio	3-04							
6	15UZE20906T2	15UZ21006T2	22UZ2110608T2	25UZ8506-11T2	—	25UZ8506-11T2S	35UZ860608T2	35UZ860608T2S
8	15UZE2098-15T2	15UZZ1008-15T2	22UZ2110608T2	25UZ8506-11T2	—	25UZ8506-11T2S	35UZ860608T2	35UZ860608T2S
11	15UZE2098-15T2	15UZZ1008-15T2	22UZ2111115T2	25UZ8506-11T2	—	25UZ8506-11T2S	35UZ8611-15T2	35UZ8611-15T2S
13	15UZF2098-15T2	15UZZ1008-15T2	22UZ2111317T2	25UZ8513-17T2	25UZ8513-17T2	25UZ8513-17T2S	35UZ28611-15T2	35UZ8611-15T2S
15	15UZE2098-15T2	15UZZ1008-15T2	22UZ2111115T2	25UZ8513-17T2	25UZ8513-17T2	25UZ8513-17T2S	35UZ8611-15T2	35UZ8611-15T2S
17	15UZE20917T2	15UZ21017T2	22UZ2111317T2	25UZ8513-17T2	—	25UZ8513-17T2S	35UZ8617-25T2	—
21	15UZE20921T2	15UZ21021T2	22UZ21121T2	25UZ8521/25 417T2	25UZ852125/ 417T2	25UZ852125/ 417T2S	35UZ86617-25T2	35UZ8617-25T2S
25	15UZE2092529T2	15UZ2102529T2	22UZ2112529T2	25UZ852125/ 417T2	—	25UZ852125/ 417T2S	35UZ8617-25T2	35UZ8617-25T2S
29	15UZE2092529T2	15UZ2102529T2	22UZ2112529T2	25UZ852935T2	—	25UZ852935T2S	35UZ862935T2	—
35	15UZE2035T2	15UZ21035T2	22UZ21135T2	25UZ2852935T2	25UZ852935T2	—	35UZ862935T2	—
43	15UZE20943T2	15UZZ1043T2	22UZ21143T2	25UZ8543-59T2	—	25UZ8543-59T2S	35UZ864351T2	35UZ864351T2S
51	15UZE20951/ 814359T2	15UZZ1051/ 824359T2	22UZ2115159T2	25UZ8543-59T2	25UZ8543-59T2	—	35UZ864351T2	35UZ864351T2S
59	15UZE20959T2	15UZZ1059T2	22UZ2115159T2	25UZ8543-59T2	25UZ8543-59T2	—	35UZ8659T2	—
71	15UZE20971 818772	15UZZ1071/ 828772	22UZ2117187T2	25UZ857187T2	—	25UZ857187T2S	35UZ8671/ 659T2	35UZ8671/ 659T2
87	15UZE20987T2	15UZZ1087T2	22UZ2117187T2	25UZ857187T2	25UZ857187T2	—	35UZ8687T2	—
119	15UZE209119T2	15UZZ10119T2	—	—	—	—	—	—

Electric Motor and Brake Motors

Sumitomo Heavy Industries Electrical Division has been manufacturing its various types of motors since 1913. The motor used with the SM-Cyclo® Gearmotor has been manufactured since 1969 with well over 3 million having been shipped throughout the world.



General Construction of Motor

Fig. 11 Motor construction

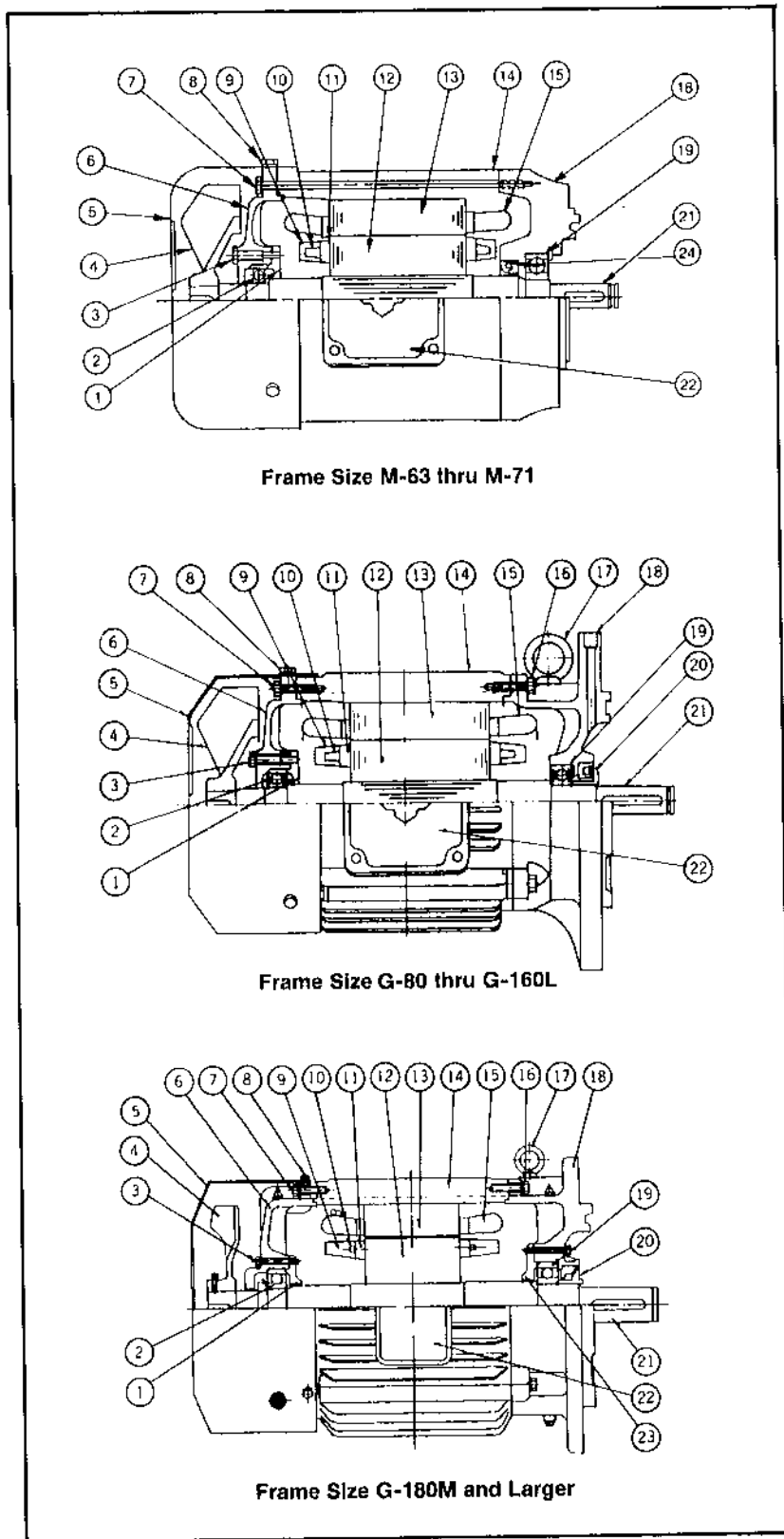


Table 22 Main Parts
Parts No. Parts Name

1	Bearing Cover
2	Bearing
3	Bolt
4	Fan
5	Fan Cover
6	End Bracket
7	Bolt
8	Bolt
9	Internal Fan
10	Hub
11	Short Circuit Ring
12	Rotor Core
13	Stationary Core
14	Stator Frame
15	Stator Winding
16	Bolt
17	Eye Bolt
18	Cyclo Flange Bracket
19	Bearing
20	Slinger
21	Motor Shaft
22	Conduit Box
23	Bearing Cover
24	Oil Seal

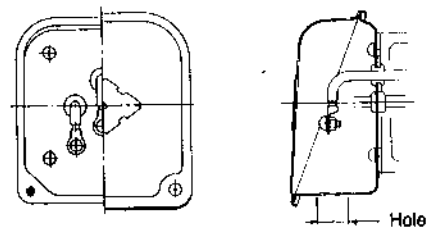


Fig. 12 Conduit Box-Standard Type

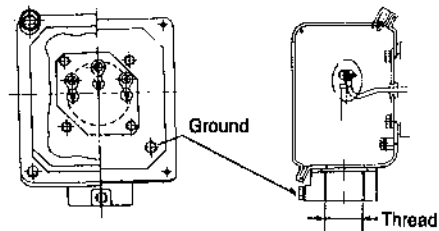


Fig. 13 Weather-Proof Type



General Inspection of Motor

The following items should be verified when the motor is delivered:

1. Check the nameplate horsepower rating (H.P.), number of poles (P), type, voltage (volt) and frequency (Hz).
2. Rotate the motor shaft by hand to check for binding.
3. Check the motor's overall appearance for possible shipping damage.

Pre-Start Up Inspection

Check the following prior to start-up:

1. **Wiring:** Prior to wiring refer to the name plate affixed to the motor portion of the gearmotor. Check power supply, interconnects, relays protective starting devices, [i.e. Star (Wye) delta—if reduced voltage starting is required], space heaters, thermal sensors and other accessories.
2. **Grounding: Caution:** The motor frame and conduit box must be properly grounded so as to avoid electrical shock.
3. **Insulation Resistance:** Stator winding measurements are to be made at the motor terminals. Stator windings of less than 600 volts are to be measured with a 500 volts megger.

Insulation resistance will vary depending on winding temperature, moisture, cleanliness, duration of usage, and test voltage and charging period.

Other factors which will affect insulation resistance are: output rating, voltage, insulation class and RPM.

Although it is difficult to decide a minimum value applicable to each and every case, for simplicity the following may be used as a guide:

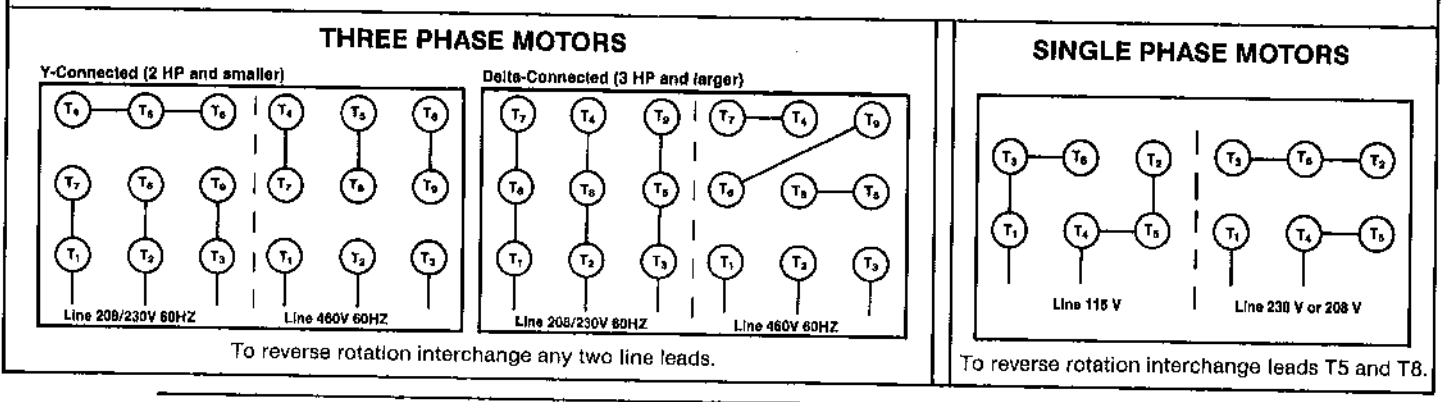
- 1 megohms for less than 600 volts

If the measured insulation resistance is less than indicated above, the cause may be due to moisture. The resistance can therefore be increased by subjecting wire to heat, hot air, vacuum, current (short circuit current, low voltage—no load current, or direct current).

If the megohm reading cannot be recovered by drying—consult factory.

Fig. 14 Typical Wiring Diagrams

Illustrated below are the wiring diagrams for our standard motor, for additional information please refer to motor name plate.



Preparation and Start-up

Prior to start-up, please check the following under no load:

1. The driven load and the SM-Cyclo gearmotor are properly secured prior to operation.
2. The motor bearings are grease packed when shipped from our factory, however, if the motor is operated after long term storage, you must replenish the grease in the open type bearing only. Please refer to page 15, Table 24 for correct quantity.
3. Check the direction of rotation. If a reverse direction is required, simply reverse any two power leads.
4. Check the voltage supply and current (line and phase) to verify balancing for a 3 phase power source.
5. When power is supplied to the motor and the starting is abnormally long, starting is not completed, or any abnormal sound is heard—immediately shut off the power and consult factory.
6. Measure the current draw. The current measured at full load should not exceed the nameplate rating.



Bearings, Oil Seals for Motor

Non-Contact Shield Type Ball Bearings

These bearings do not require grease replenishment, however, it is recommended that they be replaced once every three years when operated under normal conditions, and once every year when severe duty exists.

Open Type Ball or Roller Bearing

For interval of grease replenishment, quantities of grease and the type of grease for the open type bearing refer to tables 23 and 24.

Table 23 Type of Grease for Open Type Bearings

Class of Insulation	Grease
B	Shell Alvania No. 2
H, F	Shell Darina No. 2

Table 24 Interval and Quantity of Grease Replenishment

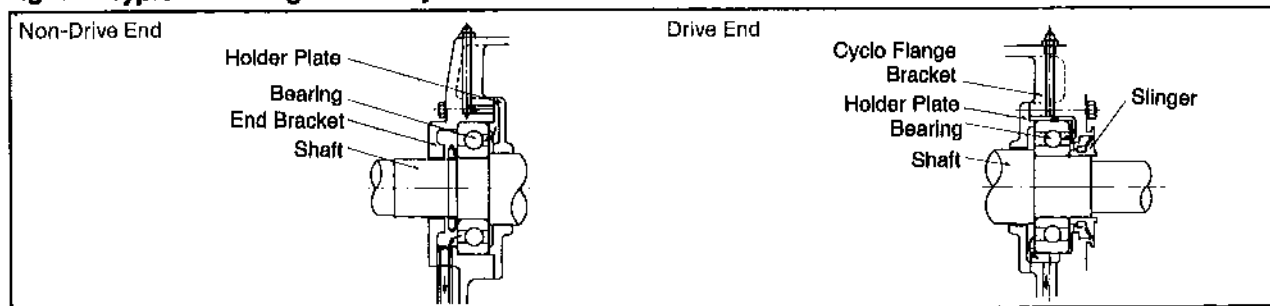
Bearing Size	Replenishment Qty (oz)	Initial Qty (oz)	Interval of Replenishment (HR)		
			900 rpm	1200 rpm	1800 rpm
6314	1.4	7.1	7000	5000	2500
6315	1.6	8.1	6500	4500	2500
6316	1.8	9.2	6500	4500	2500
6317	1.9	10	6000	4000	2000
6318	2.1	12	5500	4000	2000
6319	2.3	14	5500	3500	1500
6320	2.5	16	5000	3500	1500
6321	2.6	18	5000	3000	1500
6322	2.8	19	4500	3000	1000
6324	3.5	25	4000	2500	1000
6412	1.4	7.1	7000	5000	3000
6413	1.6	8.1	6500	4500	2500
6414	1.9	10	6500	4500	2500
NU314	1.4	4.2	3500	2500	—
NU315	1.6	5.3	3000	2000	—
NU316	1.8	7.1	3000	2000	—
NU317	1.9	8.8	3000	2000	—
NU318	2.1	10	2500	2000	—
NU319	2.3	12	2500	1500	—
NU320	2.5	14	2500	1500	—
NU321	2.6	16	2500	1500	—
NU322	2.8	18	2000	1500	—
NU324	3.5	23	2000	1000	—

Grease Replenishment Procedure

The gearmotor must be running with the drain plug removed. Using a grease gun, inject a quantity of grease until some grease is purged from the drain. Plug the drain approximately 10 minutes after start of operation.

Note: Excess grease replenishment may cause overheating or leakage. A lack of grease will cause premature failure.

Fig. 15 Typical Bearing Assembly



Oil Seal

The reducer and the motor of the SM-CYCLO® Gear motor are integrally assembled. In grease lubricated units, a single lip seal is installed between the motor section and reducer section as shown in figure 16. On oil lubricated units a slinger type oil seal is used—figure 17.

Fig. 16 Single Lip Type: Grease Lubed Units

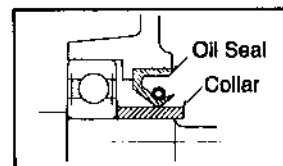
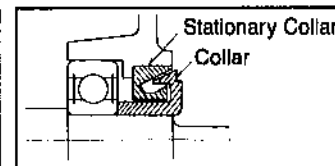


Fig. 17 Slinger Type: Oil Lubed Units



Note: For oil seal replacement sizes see table 25.

MOTOR

Bearings and Oil Seals

Table 25 Bearings and Oil Seals Sizes†

MOTOR FRAME NO.	MOTOR		CYCLO FRAME SIZE	BEARING		OIL SLINGER SIZE*	OIL SEAL SIZE**
	HP	RPM		NON-DRIVE END	DRIVE END		
M-63S	1/8	1800	3075	6202ZZ	6203ZZ	—	S22357
			3085	6202ZZ	6203ZZ	—	S22357
			3090/95/97	6202ZZ	6204ZZ	—	S26428
M-63	1/4	1800	3075	6202ZZ	6203ZZ	—	S22357
			3085	6202ZZ	6203ZZ	—	S22357
	3090/95/97		6202ZZ	6204ZZ	—	S26428	
	3100/05		6202ZZ	6204ZZ	—	S26428	
M-71	1/2	1800	3085	6202ZZ	6203ZZ	—	S22357
			3090/95/97	6202ZZ	6204ZZ	—	S26428
			3100/05	6202ZZ	6204ZZ	—	S26428
			3110/15	6202ZZ	6205ZZ	—	S35558
G-80S G-80	3/4	1800	3090/95/97	6203ZZ	6303ZZ	—	S25458
			3100/05	6203ZZ	6303ZZ	—	S25458
	3110/15		6203ZZ	6205ZZ	—	S35558	
	3140/45 3150/55		6203ZZ	6206ZZ	RSA306219	(MHS406212)	
G-90S G-90L	1 1/2	1800	3095/97	6205ZZ	6303ZZ	—	S25458
			3100/05/0H	6205ZZ	6303ZZ	—	S25458
	3110/15/1H		6205ZZ	6305ZZ	—	S35558	
	3140/45 3150/55/5H		6205ZZ	6206ZZ	RSA306219	(MHS406212)	
	3160/65		6205ZZ	6307ZZ	RSA356819	(MHS456812)	
G-100L	3	1800	310H	6205ZZ	6303ZZ	—	S25458
			3110/15/1H	6205ZZ	6305ZZ	—	S35558
			3140/45 3150/55/5H	6205ZZ	6206ZZ	RSA306219	(MHS406212)
			3160/65/6H	6205ZZ	6307ZZ	RSA356819	(MHS456812)
G-112M	5	1800	3110/15/1H	6206ZZ	6305ZZ	—	S35558
			3140/45 3150/55/5H	6206ZZ	6206ZZ	RSA306219	(MHS406212)
			3160/65/6H	6206ZZ	6307ZZ	RSA356819	(MHS456812)
			3170/75	6206ZZ	6308ZZ	RSA408023	(MHS508014)
			3180/85	6206ZZ	6309ZZ	RSA458521	(MHS558514)
G-132S	7 1/2	1800	311H	6307ZZ	6306ZZ	—	S35558
			3140/45 3150/55/5H	6307ZZ	6306ZZ	RSA306219	(MHS406212)
			3160/65/6H	6307ZZ	6307ZZ	RSA356819	(MHS456812)
			3170/75	6307ZZ	6309ZZ	RSA458521	(MHS558514)
			3180/85	6307ZZ	6310ZZ	509022	(MHS609014)
			3190/95	6307ZZ	6311ZZ	559524	(MHS659514)
G-132M	10	1800	3140/45 3150/55/5H	6307ZZ	6308ZZ	RSA306219	(MHS406212)
			3160/65/6H	6307ZZ	6307ZZ	RSA356819	(MHS456812)
			3170/75	6307ZZ	6309ZZ	RSA458521	(MHS558514)
			3180/85	6307ZZ	6310ZZ	509022	MHS609014
			3190/95	6307ZZ	6311ZZ	559524	(MHS659514)

†For 6 pole motors not shown, please consult factory.



MOTOR FRAME NO.	MOTOR		CYCLO FRAME SIZE	BEARING		OIL SLINGER SIZE*	OIL SEAL SIZE**
	HP	RPM		NON-DRIVE END	DRIVE END		
G-160M	15	1800	315H	6309ZZ	6308ZZ	RSA306219	(MHS406212)
			3160/65/6H	6309ZZ	6308ZZ	RSA356819	(MHS456812)
			3170/75	6309ZZ	6309ZZ	RSA458521	(MHS558514)
	10	1200	3180/85	6309ZZ	6311ZZ	559524	(MHS659514)
			3190/95	6309ZZ	6311ZZ	559524	(MHS659514)
			3200/05	6309ZZ	6312ZZ	509022	(MHS609014)
			3215	6309ZZ	6313ZZ	559524	(MHS659514)
G-160L	20	1800	315H	6309ZZ	6306ZZ	RSA306219	(MHS406212)
			3160/65/6H	6309ZZ	6308ZZ	RSA356819	(MHS456812)
			3170/75	6309ZZ	6309ZZ	RSA458521	(MHS558514)
	15	1200	3180/85	6309ZZ	6311ZZ	559524	(MHS659514)
			3190/95	6309ZZ	6311ZZ	559524	(MHS659514)
			3205	6309ZZ	6312ZZ	509022	(MHS609014)
			3215	6309ZZ	6313ZZ	RSA6511529	(MHS659514)
G-180M	25	1800	3165/6H	6312ZZ	6308ZZ	RSA356189	(MHS456812)
			3175	6312ZZ	6309ZZ	RSA458521	(MHS558514)
			3180/85	6312ZZ	6311ZZ	559524	(MHS659514)
	30	1200	3190/95	6312ZZ	6313ZZ	6511529	(MHS8011515)
			3205	6312ZZ	6312ZZ	509022	(MHS609014)
			3215	6312ZZ	6313ZZ	559524	(MHS659514)
			3225	6312ZZ	6314ZZ	6010026	(MHS7510013)
			3235	6312ZZ	NU314G1	6511529	(MHS8011515)
F-180L	40	1800	3190/95	6312ZZ	6313ZZ	6511529	(MHS8011515)
			3205	6312ZZ	6312ZZ	509022	(MHS609014)
			3215	6312ZZ	6313ZZ	559524	(MHS659514)
			3225	6312ZZ	6314ZZ	6010020	(MHS7510013)
	25	1200	3235	6312ZZ	NU314G1	6511529	(MHS8011515)
3245			6312ZZ	NU315G1	7013029	(MHS10513013)	
F-200L	50	1800	3205	6312ZZ	6312ZZ	509022	(MHS609014)
			3215	6312ZZ	6313ZZ	559524	(MHS659514)
			3225	6312ZZ	6314ZZ	6010026	(MHS7510013)
	40	1200	3235	6312ZZ	NU314G1	6511529	(MHS8011515)
			3245	6312ZZ	NU315G1	7013029	(MHS10513013)
			3255	6312ZZ	NU317G1	8514030	(MHS11014014)
			3265	6312ZZ	NU318G1	9015038	(MHS12015014)
			3215	6314ZZ	6313ZZ	559524	(MHS659514)
F-225S	75	1800	3225	6314ZZ	6314ZZ	6010026	(MHS7510013)
			3235	6314ZZ	NU314G1	6511529	(MHS8011515)
			3245	6314ZZ	NU315G1	7013029	(MHS10513013)
	60	1200	3255	6314ZZ	NU317G1	8514030	(MHS11014014)
			3265	6314ZZ	NU318G1	9015038	(MHS12015014)
			3235	6314ZZ	NU314G1	DT218WW	(MHS8011515)
F-250S	75	1200	3245	6314ZZ	NU315G1	CD4-3160	(MHS10513013)
			3255	6314ZZ	NU317G1	8014030	(MHS110014014)

Oil slinger is used on oil lubricated cyclo gearmotors.

**Oil seal is used on grease lubricated cyclo gearmotors. Where oil lubrication is standard, oil seal is shown in ().



Disassembly/Assembly of Gearmotor

Disassembly:

SM-CYCLO® Gearmotors are designed to provide maximum ease in disassembly and reassembly they require no special maintenance skills.

The following procedures and precautions are recommended at time of disassembly and assembly:

- Work should be performed in a dust-free, humidity-free area.
- Use of a soft or plastic hammer is recommended.
- Care should be taken not to damage parts, i.e. coil, bearings, seals, etc.
- Inspect all components and replace as necessary.
- Be extremely careful in handling of bearings.

1. Remove the complete SM-CYCLO® Gearmotor from the driven machine.
2. Place the gearmotor vertically with the output shaft upward.
3. Remove the through bolts from the motor flange, ring gear housing, and lift the slow speed side, thus separating the unit into two parts so that the inner mechanism can be removed (Fig. 18-23).
4. If the unit will not separate easily, gently drive a wedge at the line X...X shown in Fig. 1 on page 3 (if in so doing a burr is produced, be sure to remove it before reassembly).
5. To lift the slow speed side, attach an eyebolt to the tapped hole on the end of the slow speed shaft and use a hoist or chain block (Fig. 18).
6. Take out the slow speed shaft rollers, item 1-06, page 3 (Fig. 19). Check the slow speed shaft pins (1-01) to see whether any rollers have adhered to them.

7. The top cycloid disc (2-04) on the slow speed side can be easily lifted out with both hands (Fig. 20).

8. Remove the spacer ring (2-05).

9. The eccentric bearing assembly (3-04) can be removed from the motor shaft after taking out the retaining ring (3-10), or the bearings (3-02), figures 21, 22.

Note, in certain sizes, the eccentric bearings are roller bearings without a retainer. Remove rollers of the top disc and the second disc on the motor side before removing the eccentric.

10. Take out the second disc located on the motor side.

11. Remove the ring gear housing (2-01) from the motor.

12. The slow speed shaft (1-01) with its bearings is removed from the casing (26) as follows: (a) Remove the slow speed end cap (25). (b) With a wooden or hard rubber mallet, rap the inner end of the slow speed shaft to expose the retaining ring* from the outer raceway of the bearing. (c) Remove the retaining ring. (d) Rap the outer end of the slow speed shaft with a wooden or hard rubber mallet, and remove it from the casing.

13. The cycloid disc is made from bearing steel and is heat treated, while the spacer ring is cast iron. Take care not to strike them together while handling.

*Note 1: Retaining ring is part of bearing A. (See Part 1-02)

2: If motor is in need of repair, please send to any authorized EASA shop.

Assembly

SM-CYCLO® Gearmotors are reassembled by reversing the disassembly procedure. Care must be taken to exclude dust or foreign matter from the moving parts, and to see that gaskets are properly placed to make the assembly oil-tight.

Following are some helpful points to remember when assembling SM-CYCLO® Gearmotors.

1. Set the ring gear housing and insert the ring gear pins and rollers; then test-rotate the pins and rollers by hand. (Apply grease liberally to the ring gear pins and rollers before they are inserted in grease lubricated SM-CYCLO® Gearmotors).
2. Cycloid discs are a matched pair each carrying the same number which is stamped on one side of each disc.
3. Set the cycloid disc with the stamped number face up as shown in figure 23.

4. Insert the end plate (35) and then insert the eccentric with bearings by rapping with a wooden or hard rubber mallet (Fig. 22).

5. Insert the other end plate and the inner bearing raceway. Secure them with the retaining ring (Fig. 21).

6. Set the spacer ring in place.

7. Insert top disc in such a way that the mark is 180° opposed to the marking of the bottom disc (Fig. 20).

8. Insert slow speed shaft rollers (Fig. 19).

9. Put the slow speed shaft pins into the rollers (Fig. 18). The above instructions are for eccentric bearings with retainer. Following are the instructions suggested for roller bearings without retainer:

a. First insert the eccentric with inner raceways of bearings by rapping with a wooden or hard rubber mallet.

Fig. 18

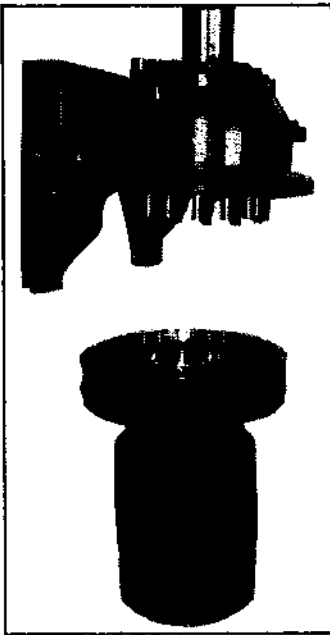


Fig. 19



Fig. 22



Fig. 20



Fig. 21

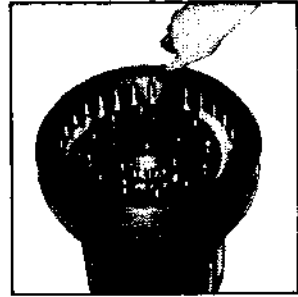
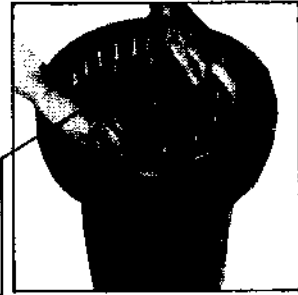


Fig. 23



Note: Insert second disc with number facing slow speed side, exactly 180° opposed to number on first disc.

Note: Set disc with number facing slow speed side.

b. Apply grease to the raceway of the eccentric on the disc. Fix the rollers and set disc in place.

c. Insert the spacer ring and set second disc in such a way that mark is 180° opposed, to mark of bottom disc.

Eccentric Bearing Replacement Precautions

The eccentric bearings are specially designed for installation on SM-CYCLO® Reducers. They are special roller bearings without outer raceways (refer to the list of bearings on page 11).

It is necessary to insert replacement bearings with numbered surfaces of the inner raceways facing outward. Note that the wrong insertion of the bearings (i.e., insertion of bearings with numbered surfaces inside) causes trouble.

Disassembly and Assembly of Sizes 3085-3097 SM-CYCLO® Reducers

Small sizes 3085-3095 are of a single disc system, so they differ in construction from larger sizes in the following ways:

1. A balance weight is provided in lieu of the two-disc system. Refer to figure 24.
2. The balance weight must be positioned exactly 180° as opposed to that of the eccentric.
3. There are no end plates on either side of the eccentric. In all other respects, 1805-1815 have exactly the same construction as the larger sizes. Follow the instructions given under "Disassembly and Assembly".

Disassembly Of Output Side (3085-311H)

1. With casing supported, tap output shaft until it is disengaged from casing.
2. Remove bearing "A" by using pulling tool.
3. Replace all bearings, gaskets and seals when reassembling. (Page number 10 & 11).

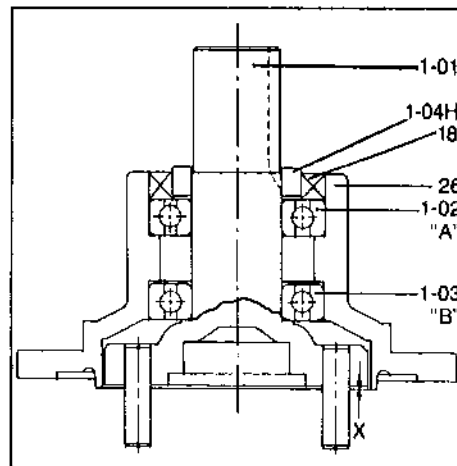
Assembly Of Output Side (3085-311H)

1. Assemble the "B" Bearing (Part No. 1-03) on the slow speed shaft (Part No. 1-01). Heating of "B" Bearing is recommended for easier assembly.

Note: Do not exceed temperature of 200°F.

2. Assemble the casing (Part No. 26) over the slow speed shaft (Part No. 1-01).
3. Carefully tap bearing "A" (Part No. 1-02) onto the slow speed shaft (Part No. 1-01) until the bearing is flush with the shoulder of the casing.
4. Place the collar (Part No. 1-04H) onto the slow speed shaft (Part No. 1-01). Heating the collar is recommended for easier assembly.
5. Insert the oil seal (Part No. 18), lip in, into the casing (Part No. 26).

Fig. 24

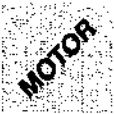


REDUCER

SM-CYCLO® Reducer Trouble-Shooting and Repair

This trouble shooting guide is to help you identify and overcome common problems of reducers. If you have a problem not listed below, please consult factory at Teterboro.

PROBLEM WITH THE REDUCER		POSSIBLE CAUSES	SUGGESTED REMEDY
Runs Hot	Overloading	Load exceeds the capacity of the reducer.	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce load.
	Improper Lubrication	Insufficient lubrication.	Check lubricant level and adjust up to recommended levels.
		Excessive lubrication.	Check lubricant level and adjust down to recommended level.
		Wrong lubricant.	Flush out and refill with correct lubricant as recommended.
Vibration or Noise	Loose Foundation Bolts	Weak mounting structure.	Inspect mounting of reducer. Tighten loose bolts and/or reinforce mounting & structure.
		Loose hold down bolts.	Tighten bolts.
	Worn Disc	Overloading unit may result in damage to disc.	Disassemble and replace disc. Re-check rated capacity of reducer.
	Failure of Bearings	May be due to lack of lubricant.	Replace bearing. Clean and flush reducer and fill with recommended lubricant.
		Overload.	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce load.
	Insufficient Lubricant	Level of lubricant in the reducer not properly maintained.	Check lubricant level and adjust to factory-recommended level.
	Damaged Pins & Rollers	Overloading of reducer.	Disassemble and replace ring gear pins and rollers. Check load on reducer.
Output Shaft Does Not Turn	Motor Shaft Broken	Overloading of reducer can cause damage.	Replace broken shaft. Check rated capacity of reducer.
		Key missing or sheared off on input shaft.	Replace key.
	Eccentric Bearing Broken	Lack of lubricant.	Replace eccentric bearing. Flush and refill with recommended lubricant.
	Motor Doesn't Turn	Motor	Refer to page 21
Oil Leakage	Worn Seals	Caused by dirt or grit entering seal.	Replace seals. Breather filter may be clogged. Replace or clean filter.
	Leakage Into Motor	Overfilled reducer.	Check lubricant level and adjust to recommended level.
		Vent clogged.	Clean or replace element, being sure to prevent any dirt from falling into the reducer.
		Improper mounting position, such as wall or ceiling mount of horizontal reducer.	Mount horizontally or rework reducer to wall or ceiling mount.



SM-CYCLO® Motor Trouble-Shooting and Repair

Problem With The Motor		Possible Causes	Suggested Remedy	
Load is disconnected but motor doesn't rotate	Makes a groaning sound	Faulty switch contact	Adjust the contact	
		Blown fuse	Replace	
		One phase wire of the power supply open	Replace	
		Stator coil open	Repair by a specialist	
		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	Check the power source with a voltmeter	
	Doesn't make any noise	Stator coil open	Repair by a specialist	
Outside the motor Power failure Open connection wire Faulty switch contact Faulty starter contact		Contact the power company Check the source wiring Adjust the contact		
Rotates with the load disconnected, but:	Rotates in the wrong direction	Connection error	Change any two of the three phase source	
	Fuse blows	Shorted lead wire	Replace	
	Speed doesn't increase	Faulty starter contact	Adjust	
	Groans	Overcurrent/ Overheating	Rotor and stator touching	Repair by a specialist
		Over-current	One phase of stator coil shorted	Replace the stator winding
	Makes a high-pitched metallic noise	Faulty bearing	Replace the bearing	
Rotates when the load is disconnected but when the load is connected it:	Switch overheated	Insufficient switch capacity	Replace with one having the rated capacity	
		Overload	Drop to the rated load	
	Fuse blows	Insufficient fuse capacity	Replace with one having the rated capacity	
	Overheats	Overload	Drop to the rated load	
		Voltage drop	Consult with the power company	
	Speed suddenly drops	Voltage drop	Consult with the power company	
		Overload	Drop to the rated load	
	Stops	Bearing damaged by overheat	Replace the bearing	



Maintenance and Inspection

To insure long life and trouble-free operation, periodic inspection and maintenance of your gearmotor is recommended.

Daily Inspection:

1. Check for loose nuts and bolts.
2. Check for cooling fan air obstruction.
3. Listen for abnormal sounds.
4. Check for abnormal temperature and vibration carefully placing hand on unit (caution: be extremely careful when making direct contact with the unit to avoid burns from abnormal temperatures).
5. Visually check the oil level gauge on the vertical unit, forced-lubricated type. Check lubrication flow by viewing pressure gauge (Part No. 41), whose faulty operation is caused by a lack of lubrication oil, damage to the plunger pump (Part No. 42) or the positive displacement pump (Part No. 43) or the clogging of pipes, etc. In case of faulty operation, stop and inspect the unit immediately.

6. A temperature rise of approximately 105°F above ambient on the surface of the ring gear housing (Part No. 2-01) is allowable if the temperature fluctuation is small. If temperature rises rapidly from stable condition, add the recommended oil or grease (Tables 6 & 12). A rapid temperature rise may be caused from a lack of lubrication. If after lubricating unit, the problem persists, stop operation and consult factory.

7. When abnormal sound is heard from inside the unit, stop operation and inspect the unit.

8. If the lubrication oil leaks, replace the damaged or worn part with new one. (Refer to Part No. 1-04H, Page 3).

Periodic Inspection:

1. Replenish grease in the motor bearings; for quantities, refer to Table 24, Page 15.
2. Check installation resistance in accordance with instructions as shown on Page 14, Note 3.

Ordering Correct Replacement Units Or Parts

The SM-CYCLO® Gearmotor is fully standardized to offer maximum part interchangeability among models of the same frame size. However there are many frame sizes, models, and types in the production range of SM-CYCLO®. Therefore to get correct replacement units or parts, proper information to identify the speed reducer in question is essential. The name plate provides this identifying data which is secured to the body of the drive.

By reading the name plate, please give the full description, being sure to include the *SERIAL NUMBER* and *MODEL NUMBER*, to our distributors. Our production records will supply us with all the necessary information so as to provide you with the correct unit or parts if such information is provided.

Name Plate on SM-CYCLO® Gearmotor

SM-CYCLO™		MEMBER OF	
CHESAPEAKE, VIRGINIA		SUMITOMO	
MODEL	<input type="text"/>		
MOTOR H.P.	<input type="text"/>	CLASS	<input type="text"/>
OUTPUT R.P.M.	<input type="text"/>	RATIO	<input type="text"/>
SERIAL NO.	<input type="text"/>	DATE	<input type="text"/>
A-5600 SUMITOMO		MACHINERY CORP. OF AMERICA	

Storage and Operation After Storage

Storage 6 Months–1 Year

Oil-Lubricated

1. Fill unit(s) with 20% of the recommended quantity as shown in Table 14, Page 8 with a rust preventative oil (NP20 or equivalent) or a circulating oil (Shell VSI No. 100 or equivalent).
2. At approximately 3 months interval, change oil as described in No. 1.

Grease-Lubricated

Grease lubricated models do not require any special attention during storage. (Inspect unit before operation.)

Note: For both the Oil-Lubricated and Grease-Lubricated models, if units are to be stored for a period exceeding 1 year, consult factory.

Operation After Storage of 6 Months–1 Year

Oil-Lubricated

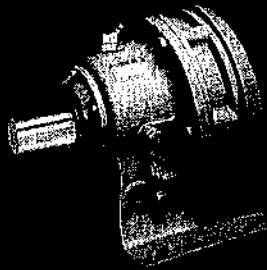
1. Completely drain the rust preventive, or circulating oil from unit.
2. Flush unit with the recommended operating oil as shown in Table 12.
3. After flushing, fill the unit to the proper oil level with the recommended lubricating oil.

Grease-Lubricated

Add ½ of the recommended quantity of new grease as shown in Table 8.

Note: Before operation of units stored for periods greater than 1 year, consult factory.

SM-CYCLO



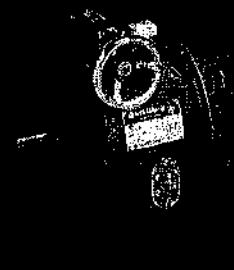
SPEED REDUCER

SM-CYCLO



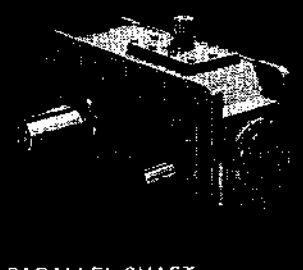
GEARMOTOR

SM-BEIER DRIVE



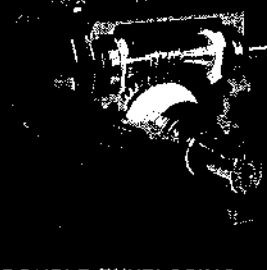
ADJUSTABLE SPEED
VISCIOUS TRACTION

PARAMAX 7



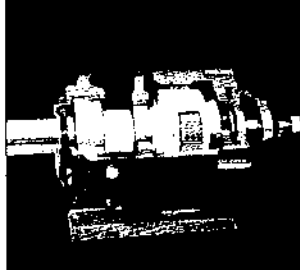
PARALLEL SHAFT
& RIGHT ANGLE REDUCERS

SM-HEDCON



DOUBLE-ENVELOPING
WORM GEAR REDUCER

SM-COMPOWER



PLANETARY GEAR REDUCER

SUMITOMO THE DRIVING FORCE IN POWER TRANSMISSION

If you specify or buy gear boxes, Sumitomo Machinery Corp. of America is "The Available Solution." We manufacture the "SM-Cyclo" line of fine cycloidal reducers and gearmotors, able to withstand shock loads to 500% of their ratings, and we warrant them for two full years.

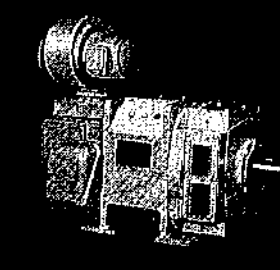
We also ship in 48 hours, if needed, without a premium delivery charge. If you need gear boxes (Cyclo - Parallel - Right Angle - Worm) from 1/8 HP through 7,000 HP, or have a variable speed application problem, call us ... we're "The Available Solution," and we're everywhere in North America ... and the world.

SM-BEISTER DRIVE



ADJUSTABLE SPEED
DRY TRACTION

DC MOTORS



SUMITOMO MACHINERY CORP. OF AMERICA

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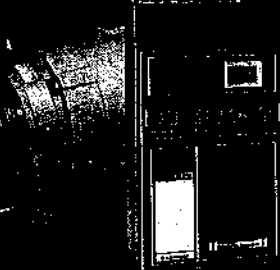


SMAC-PAC AF-500



AC INVERTER

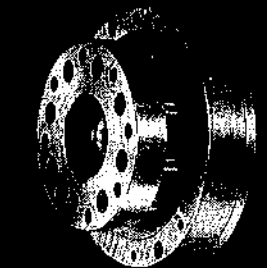
DRIVE-PAC



DC SCR DRIVE

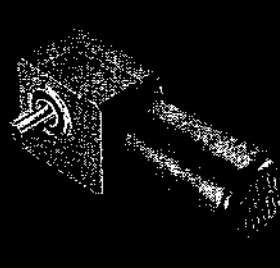
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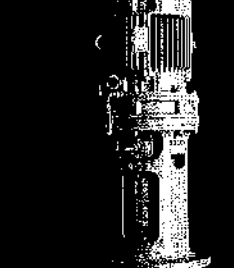
GEARING FOR ROBOTICS

SM-HyPEX



HYPOID RIGHT ANGLE
GEARMOTOR

SM-CYCLO GEARMOTOR



VERTICAL
MOUNT

SM-CYCLO GEARMOTOR



TORQUE
LIMITER