

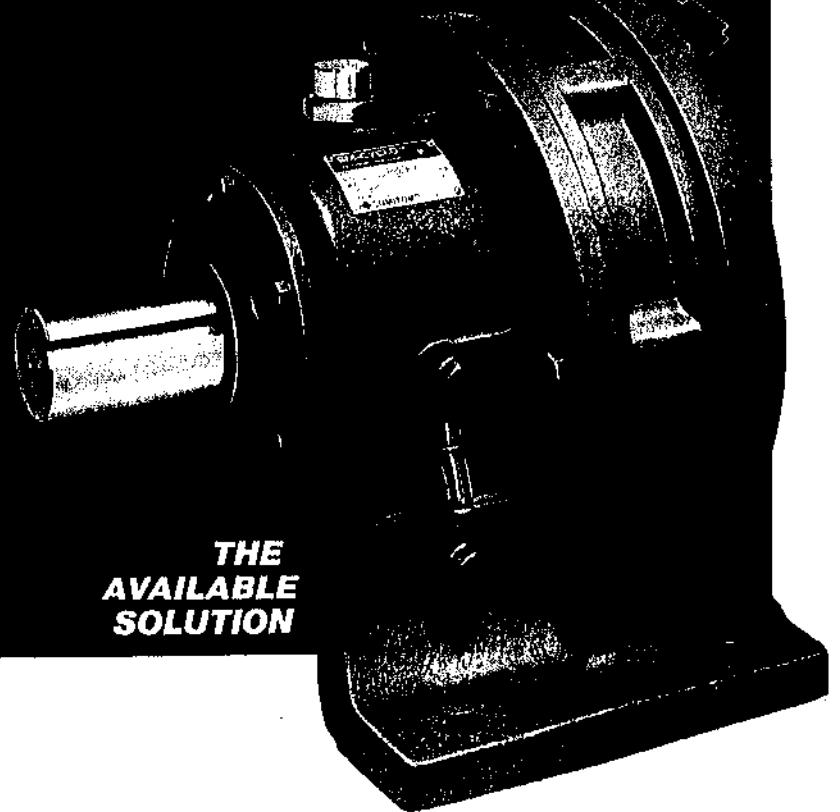
# SUMITOMO

MACHINERY CORPORATION OF AMERICA

## SM-CYCLO<sup>®</sup> DRIVE

### Operating and Maintenance Manual

1000 Series



**THE  
AVAILABLE  
SOLUTION**

# Index

Mounting.....	2	Oil Quantities .....	8
General Construction.....	3, 4	Oil Change.....	8
Lubrication.....	5-9	Oil Fill Procedures .....	8
Grease Units.....	5, 6	Oil Level Dimensions.....	9
Designated Greases.....	6	Bearings, Oil Seals & Gaskets.....	10, 11
Grease Replenishment & Change.....	6	Dissassembly, Assembly.....	12, 13
Quantities Of Grease.....	6	Daily Inspection.....	14
Oil Units.....	7-9	Ordering Correct Replacement Units & Parts.....	14
Forced Lubrication For Vertical Units.....	7	Storage & Operation After Storage.....	14
Types Of Lubricating Oils .....	8	Trouble Shooting.....	15
Allowable Oil Viscosities.....	8		

## NOTE

If the cyclo reducers are driven by D.C. motors, variable frequency A.C. drives, or speeds other than standard catalog input speeds—please consult factory.



## 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 reducer is connected to the motor and the driven machine through couplings, align the shafts accurately. Where the reducer 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 Catalogue page 14.)

### 4. Foundations

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

### 5. Secure Housing

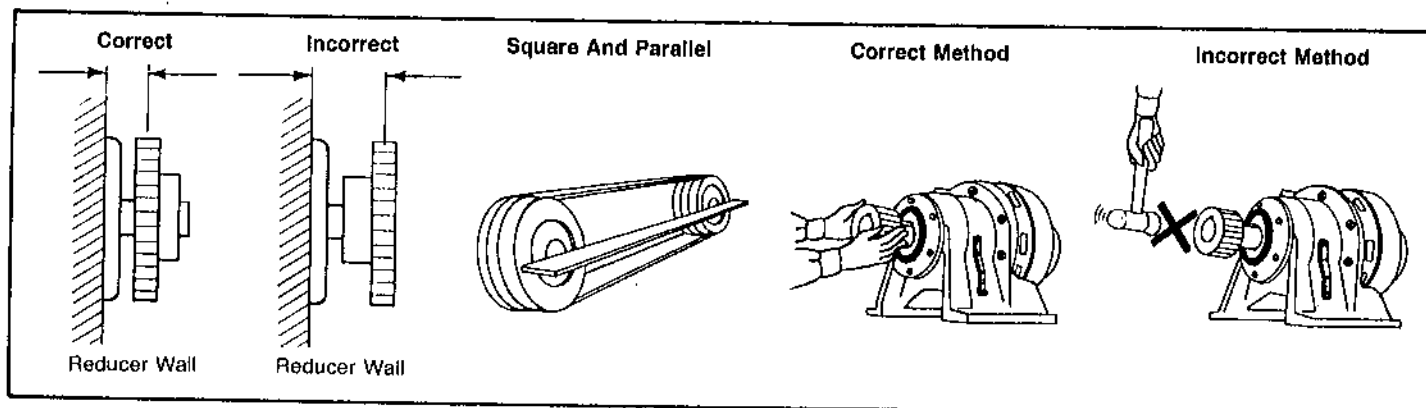
Where the reduction units are operated under conditions of vibration and/or frequent starts and stops, it is recommended to secure them on their mounting surfaces by inserting dowel pins into the knock-holes provided on the foot of the casing. This will insure that bending or shearing forces are reduced 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.

### 7. Ventilation

When the SM-CYCLO Speed Reducer is mounted in a separate enclosure, be sure that adequate ventilation is provided.



# General Construction

Fig. 1 Single Reduction (Horizontal Foot Mount)

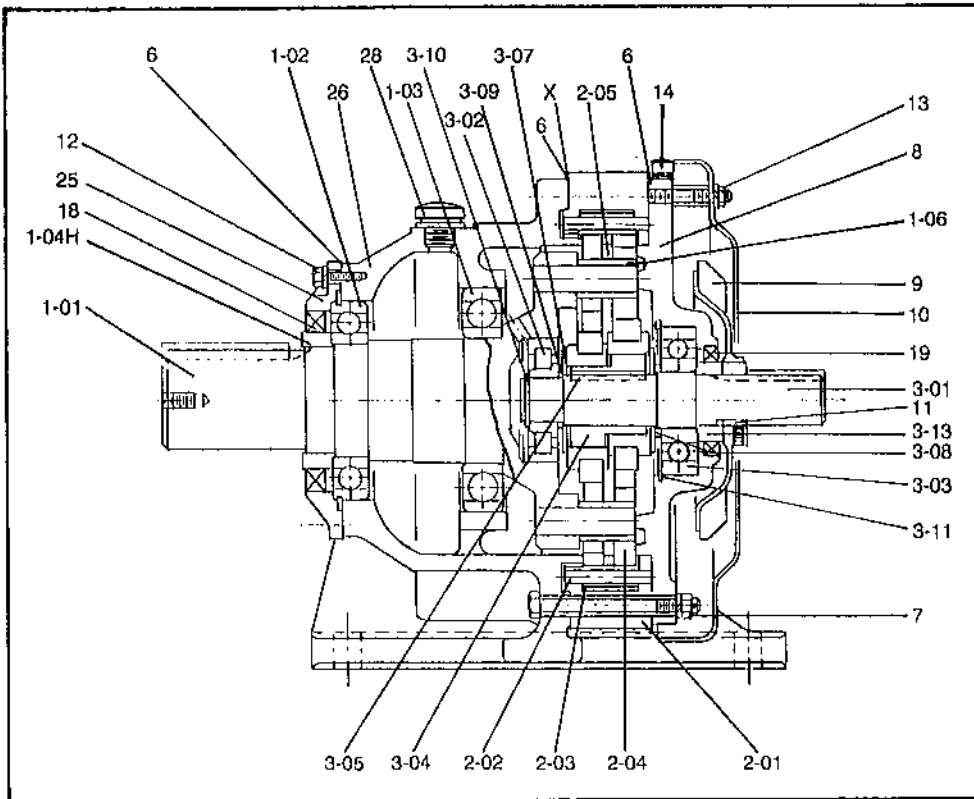
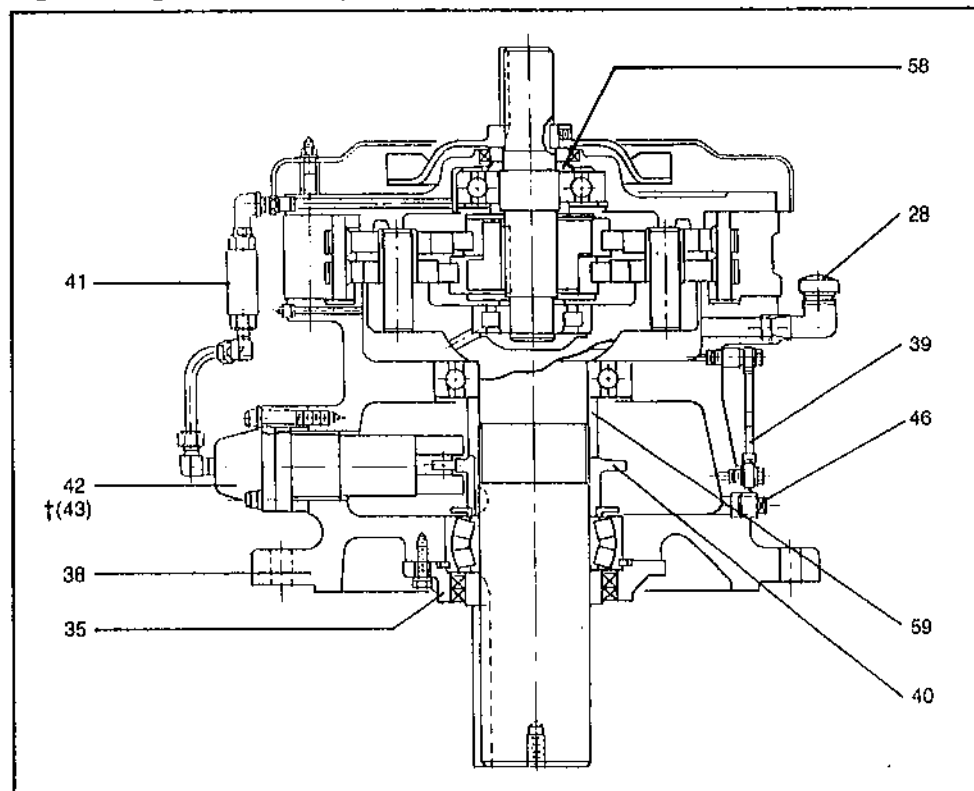


Fig. 2 Single Reduction (Vertical Base Mount)



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

†Model Nos. 1930 and 1935 use a positive displacement pump.

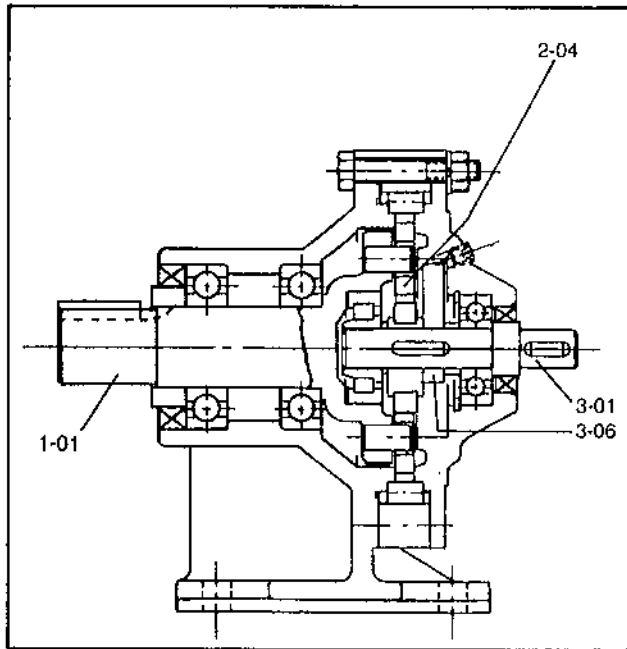
\*Pl. No. 58 — frame sizes 1890-1935 only.

\*Pl. No. 59 — frame sizes 1900-1935 only.

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
3-01	High Speed Shaft
3-02	Bearing C
3-03	Bearing D
3-04	Eccentric Bearing Assembly
3-05	Eccentric Key
3-06	Balance Weight
3-07	Spacer
3-08	Spacer
3-09	Spacer
3-10	Retaining Ring
3-11	Retaining Ring
3-13	Collar
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
8	High Speed End Shield
9	Cooling Fan & Set Screw
10	Fan Cover
11	Fan Key
12	Bolts For SS Oil Seal Housing
13	Bolts, Spacers For Fan Cover
14	Air Vent
15	Grease Nipple
18	Slow Speed Output Oil Seal
19	High Speed Input 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 Point
46	Drain Plug
55	Intermediate Cover
57	Eye Bolt
*58	Oil Slinger
*59	Spacer

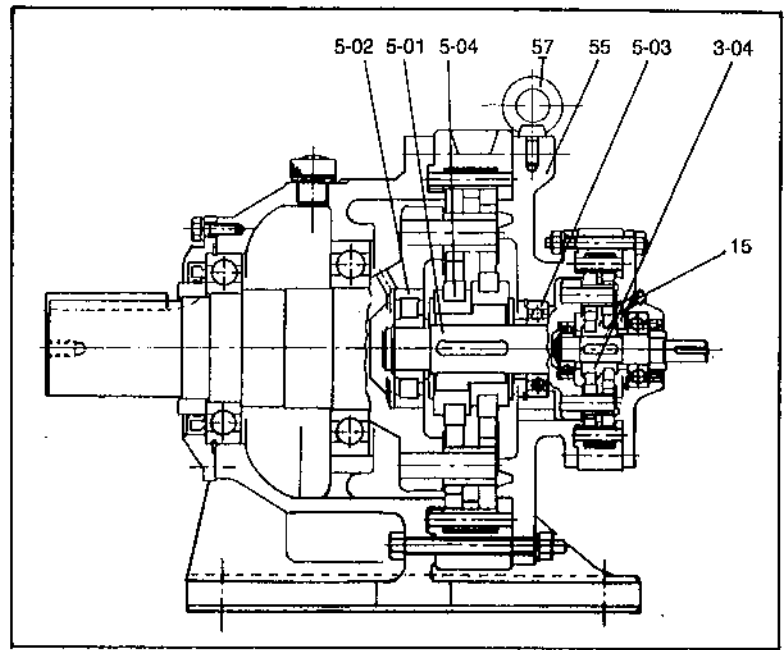
**Fig. 3 Speed Reducer/Single Disc Type (Frame Size 1795-1815)**



**Speed Reducer — Single Disc**

SM-CYCLO single reduction, Models No. 1795-1815 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
17995	1795	1795
18095	1805	1795
18205	1825	1805
18305	1835	1805
18420	1840	1820
18425	1845	1820
18525	1855	1820
18630	1860	1830
18635	1865	1830
18730	1870	1830
18735	1875	1830
18840	1880	1840
18845	1885	1840

Frame Size	Second Stage	First Stage
18930	1890	1830
18935	1895	1830
18945	1895	1840
19040	1900	1840
19045	1905	1840
19060	1905	1860
19160	1910	1860
19165	1915	1860
19170	1915	1870
19280	1920	1880
19285	1925	1880
19390	1930	1890
19395	1935	1890

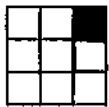
**Reduction Ratio Combination**

Total Ratio	Second Stage Ratio	First Stage Ratio
102	17	6
121	11	11
174	29	6
187	17	11
210	35	6
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

The first and second stage ratio combination for the following models are reversed to the combination shown on the next table.

Frame Size	Ratio
19165, 19285, 19395	595
18095	1247



# Lubrication

SM-CYCLO reducers, frame sizes 1795 through 1835 are grease-lubricated. Sizes 1840 through 1935 are normally oil-lubricated. Double reduction units may be grease or oil-lubricated, depending on size and/or application.

## Grease Lubrication

Single Reduction Models—Table 3

Frame Size	1795 1805 1810 1820 1830 1815 1825 1835
Horizontal Shaft	Grease (MAINTENANCE FREE)
Vertical Shaft	Grease (MAINTENANCE FREE)

For the single reduction units, frame sizes 1795-1835 (maintenance-free type), NGLI No. 2 is designated. NGLI 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	17995-18525	18630 18635	18730 18735	18840 18845	18930 18935	18945	19040 19045	19060	19160 19165	19170	19280 19285	19390 19390
Horizontal												
VERTICAL	<Ratio> 102 ~ 493											
	522 ~ 841											
	957 ~ 1015											
	1225 ~ 2523											
	2537 ~ 3045											
	3481 ~ 7569											

Oil Lubricated Models

Triple Reduction Models—Table 5

Horizontal Shaft	Frame Size of The 1st Reduction Stage: 1825 Or Smaller	Grease Lubricated (NGLI Grade 2)
Vertical Shaft	Frame Sizes: 17995 — 192845	Grease Lubricated (NGLI Grade 2)
	Frame Size: 193935 or Larger	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. 316.03.00

Ambient Temperature F° (C°)	Single Reduction (Maintenance Free)	Double Reduction
-5 ~ 122 (-15 ~ 50)	NGLI No. 2	NGLI 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 1795-1835 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	1795	1805	1810-1815	1820-1825	1830-1835
Speed Reduction Mechanism	.5	1.2	1.4	2.1	7.1
Slow Speed Shaft Bearings	.4	1.1	2.6	2.6	3.9

Frame Size	17995	18095	18205	18305	18420 18425	18525	18630 18635	18730 18735
Speed Reduction Mechanism (First Stage)	.5		1.1		1.9	1.9	5.6	5.6
Speed Reduction Mechanism (Second Stage)	.5	1.1	1.9	5.6	15.9	15.9	26.5	35.3
Slow Speed Shaft Bearing (Second Stage)	.4	1.1	2.6	3.9	10.6	10.6	10.6	17.6

Frame Size	18840 18845	18930 18935	18945	19040 19045	19060	19160 19165	19170	19280 19285
Speed Reduction Mechanism (First Stage)	15.9	5.6	15.9		26.5		35.3	38.8
Speed Reduction Mechanism (Second Stage)	38.8	52.9		88.2		160		285
Slow Speed Shaft Bearing (Second Stage)	21.2	24.7		31.7		35.3		42.3

**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.

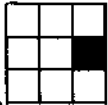
**Note 2:** When the unit is disassembled for overhauling, refill with grease in quantities indicated in Table 8. Or alternatively, 80% of the space around reduction mechanism and slow speed shaft bearings of single reduction units and 50% around reduction mechanism of both first and second stage of 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 the 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 breakage 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 1840 through 1935 are normally oil-lubricated. Double reduction units may be grease or oil-lubricated, depending on size 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	1840 1845	1850 1855	1860 1865	1870 1875	1880 1885	1890 1895	1900 1905	1910 1915	1920 1925	1930 1935
Horizontal Shaft	Oil Bath									
Vertical Shaft	Oil Bath	Forced-oil Lubrication								

**Double Reduction Models—Table 10**

Frame Size	18630 18635	18730 18735	18840 18845	18930 18935	18945	19040 19045	19060	19160 19165	19170	19280 19285	19390 19390	
Horizontal	Oil Bath											
VERTICAL SHAFT	<Ratio> 102 ~ 493	Oil Bath										
	522 ~ 841	Grease Lubricated Models					Forced-Oil Lubrication					
	957 ~ 1015	Grease Lubricated Models					Forced-Oil Lubrication					
	1225 ~ 2523	Grease Lubricated Models					Forced-Oil Lubrication					
	2537 ~ 3045	Grease Lubricated Models					Forced-Oil Lubrication					
	3481 ~ 7569	Grease Lubricated Models					Forced-Oil Lubrication					

**Triple Reduction Models—Table 11**

Horizontal	Frame Size Of The 1st Reduction Stage: 1830 Or Larger	Oil Bath Lub. (Refer to Table 12)
Vertical	Frame Size: 193935 or Larger	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
1860, 1865, 1870, 1875 1880, 1885, 1890, 1895	All	1900, 1905, 1910, 1915	All
18630-18635 ~ 18945	All	1920-1925	43,59,87
		19040-19045 ~ 19280, 19285	All All

### 1-1 Plunger Pump 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.

### Positive Displacement Type Pump

SM-CYCLO Reducer		Positive Displacement Pump
Frame Size	Reduction Ratio	
1920, 1925	11, 17, 29	TOP-216HA
1930, 1935	All	
19390 19395	All	TOP-204HA

### 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 1840 and larger.

For additional information please refer to Engineering Sheet No. 316.02.00

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	6EP 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	1840 1845	1850 1855	1860 1865	1870 1875	1880 1885	1890 1895	1900 1905	1910 1915	1920 1925	1930 1935
	Horizontal	.2	.2	.4	.5	.6	1.1	1.9	3.7	7.9	14.8
	Vertical	.3	.3	.3	.5	.5	.7	2.6	3.7	7.4 (7.6)	(15.9)

Double Reduction	Frame Size	18630 18635	18730 18735	18840 18845	18930 18935	18945	19040 19045	19060	19160 19165	19170	19280 19285	19390 19395
	Horizontal	.4	.6	.9	1.5	1.6	2.6	2.6	4.2	4.2	9.2	18.5
	Vertical	.3	.5	.5	.7	.7	2.6	2.6	3.7	3.7	7.4	(15.9)

The above quantities as shown in parentheses are applied to the forced-oil lubricated models by the 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

**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**

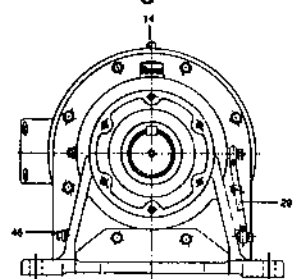
When it becomes difficult to check the oil level due to the discoloration of the vinyl hose, the gauge must be replaced. The standard vinyl oil gauge shall be used at ambient temperature: -4°F to 100°F. Where the

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 air vent plug (Part No. 14). After filling, apply a teflon sealing tape to threads of the air vent prior to installation.

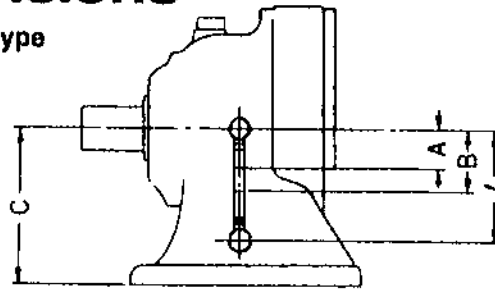
**Note 3:** The oil level gauge can be attached on either side of the casing on horizontal units. Locate on whichever side is more convenient to check oil level. (The oil level gauge is normally attached on the right when viewed from slow speed shaft end.)

**Fig. 5**

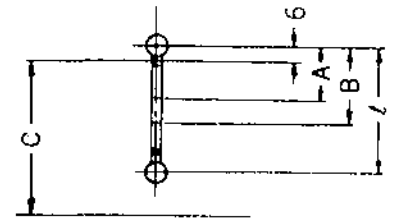


# Oil Level Dimensions

**Foot Mount Horizontal Type**  
Fig. 6



Frame Size: Only 1840-1855

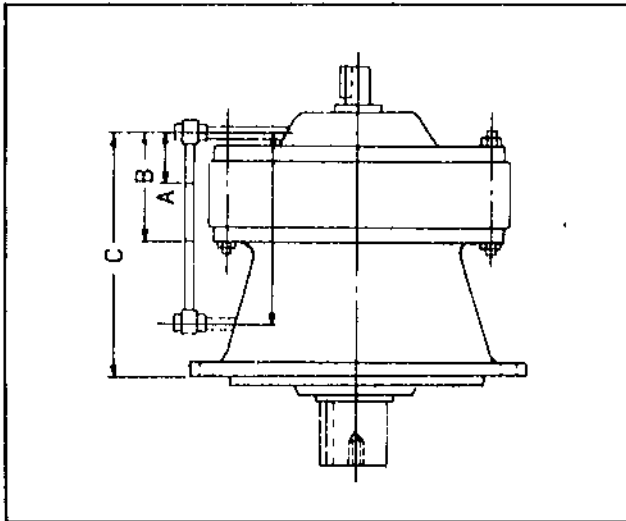


**Table 16 Oil Level Dimensions (Inches)**

Frame Size	A	B	C	ℓ
1840-1845	1 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>16</sub>	5 <sup>29</sup> / <sub>32</sub>	4 <sup>21</sup> / <sub>32</sub>
1850-1855	1 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>16</sub>	5 <sup>29</sup> / <sub>32</sub>	4 <sup>21</sup> / <sub>32</sub>
1860-1865	1 <sup>9</sup> / <sub>32</sub>	2 <sup>3</sup> / <sub>4</sub>	6 <sup>5</sup> / <sub>16</sub>	3 <sup>11</sup> / <sub>16</sub>
18630/18635	1 <sup>3</sup> / <sub>16</sub>	1 <sup>25</sup> / <sub>32</sub>	6 <sup>5</sup> / <sub>16</sub>	3 <sup>11</sup> / <sub>16</sub>
1870-1875	1 <sup>31</sup> / <sub>32</sub>	3 <sup>11</sup> / <sub>32</sub>	7 <sup>7</sup> / <sub>8</sub>	4 <sup>31</sup> / <sub>32</sub>
18730/18735	1 <sup>3</sup> / <sub>16</sub>	1 <sup>25</sup> / <sub>32</sub>	7 <sup>7</sup> / <sub>8</sub>	4 <sup>31</sup> / <sub>32</sub>
1880-1885	2 <sup>3</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	8 <sup>21</sup> / <sub>32</sub>	5 <sup>29</sup> / <sub>32</sub>
18840/18845	1 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>16</sub>	8 <sup>21</sup> / <sub>32</sub>	5 <sup>29</sup> / <sub>32</sub>
1890-1895	2 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	9 <sup>27</sup> / <sub>32</sub>	6 <sup>21</sup> / <sub>32</sub>
18930/18935	1 <sup>3</sup> / <sub>16</sub>	1 <sup>25</sup> / <sub>32</sub>	9 <sup>27</sup> / <sub>32</sub>	6 <sup>21</sup> / <sub>32</sub>
18945	1 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>16</sub>	9 <sup>27</sup> / <sub>32</sub>	6 <sup>21</sup> / <sub>32</sub>

Frame Size	A	B	C	ℓ
1900-1905	2 <sup>3</sup> / <sub>8</sub>	3 <sup>11</sup> / <sub>32</sub>	11 <sup>13</sup> / <sub>32</sub>	6 <sup>13</sup> / <sub>16</sub>
19040/19045	1 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>16</sub>	11 <sup>13</sup> / <sub>32</sub>	6 <sup>13</sup> / <sub>16</sub>
19060	1 <sup>9</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>4</sub>	11 <sup>13</sup> / <sub>32</sub>	6 <sup>13</sup> / <sub>16</sub>
1910-1915	2 <sup>31</sup> / <sub>32</sub>	3 <sup>15</sup> / <sub>16</sub>	12 <sup>13</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>16</sub>
19160/19165	1 <sup>9</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>4</sub>	12 <sup>13</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>16</sub>
19170	1 <sup>31</sup> / <sub>32</sub>	3 <sup>11</sup> / <sub>32</sub>	12 <sup>13</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>16</sub>
1920-1925	2 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	16 <sup>17</sup> / <sub>32</sub>	10 <sup>23</sup> / <sub>32</sub>
19280/19285	2 <sup>3</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	16 <sup>17</sup> / <sub>32</sub>	10 <sup>23</sup> / <sub>32</sub>
1930-1935	3 <sup>11</sup> / <sub>32</sub>	4 <sup>17</sup> / <sub>32</sub>	21 <sup>1</sup> / <sub>4</sub>	11 <sup>7</sup> / <sub>32</sub>
19390/19395	2 <sup>3</sup> / <sub>4</sub>	4 <sup>11</sup> / <sub>32</sub>	21 <sup>1</sup> / <sub>4</sub>	11 <sup>7</sup> / <sub>32</sub>

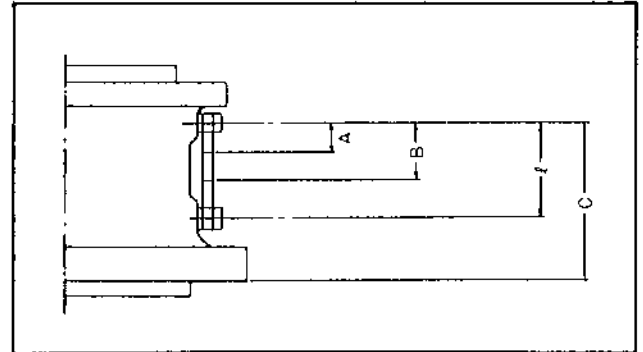
**Base Mount Vertical Type**  
Frame Size: 1840-1855  
Fig. 7



**Table 17 Base Mount Vertical Type**  
**Oil Level Dimensions (Inches)**  
Frame Size: 1840-1855

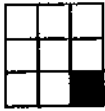
Frame Size	A	B	C	ℓ
V1840-1855	1 <sup>27</sup> / <sub>32</sub>	2 <sup>23</sup> / <sub>32</sub>	7 <sup>15</sup> / <sub>32</sub>	5 <sup>25</sup> / <sub>32</sub>

**Base Mount Vertical Type**  
Frame Size: 1860-1935  
Fig. 8



**Table 18 Base Mount Vertical Type**  
**Oil Level Dimensions (Inches)**  
Frame Size: 1860-1935

Frame Size	A	B	C	ℓ
1860-1865	1 <sup>1</sup> / <sub>32</sub>	1 <sup>7</sup> / <sub>16</sub>	4 <sup>11</sup> / <sub>16</sub>	2 <sup>23</sup> / <sub>32</sub>
1870-1875	1 <sup>11</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>32</sub>	3 <sup>25</sup> / <sub>32</sub>
1880-1885	1 <sup>15</sup> / <sub>16</sub>	2 <sup>23</sup> / <sub>32</sub>	6 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>
1890-1895	2 <sup>3</sup> / <sub>32</sub>	3 <sup>1</sup> / <sub>4</sub>	7 <sup>7</sup> / <sub>8</sub>	5 <sup>15</sup> / <sub>32</sub>
1900-1905	2 <sup>9</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	9	4 <sup>3</sup> / <sub>4</sub>
1910-1915	1 <sup>19</sup> / <sub>32</sub>	2 <sup>3</sup> / <sub>16</sub>	8 <sup>21</sup> / <sub>32</sub>	3 <sup>11</sup> / <sub>16</sub>
1920-1925	2 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>32</sub>	11 <sup>13</sup> / <sub>16</sub>	5 <sup>19</sup> / <sub>32</sub>
1930-1935	1 <sup>31</sup> / <sub>32</sub>	2 <sup>3</sup> / <sub>4</sub>	13 <sup>3</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>



# Bearings, Oil Seals, Gaskets

Fig. 9

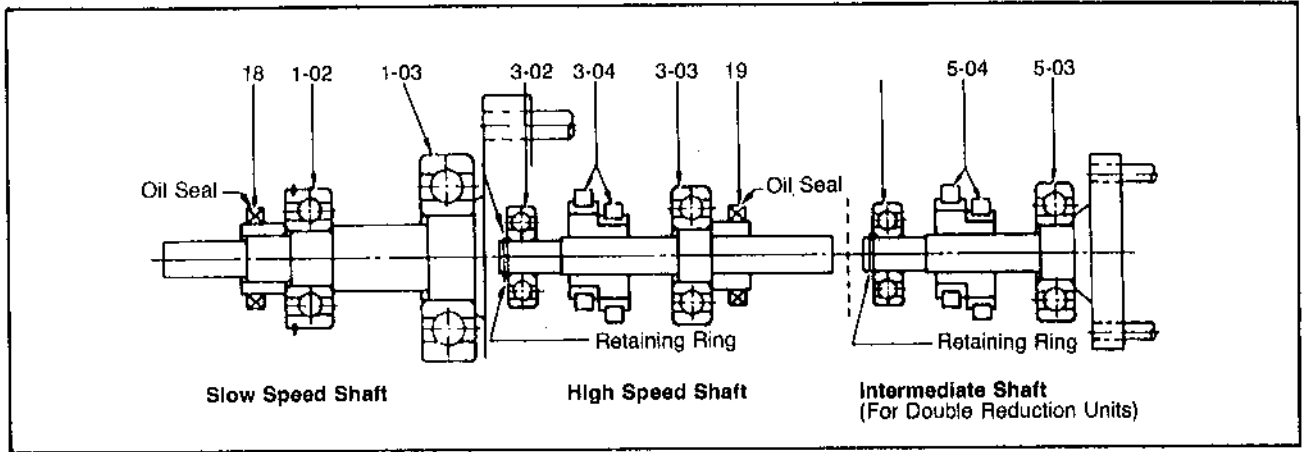


Table 19 Single Reduction Units

Frame Size	BEARING						OIL SEAL							
	SLOW SPEED SHAFT		HIGH SPEED SHAFT				SLOW SPEED SHAFT			HIGH SPEED SHAFT				
	Part No. 1-02	Part No. 1-03	Part No. 3-02		Part No. 3-04		Part No. 18			Part No. 19				
	Number	Number	Number		Number	Q'ty	Number		Q'ty		Type	Dimension	Q'ty	
Speed Reducer	Gear Motor	Type	Dimension	H Type			V Type							
1795	6202Z	6202	6201	6201	19UZS79	1	6201Z	D	20/ 35x 7	1	1	S	16/ 26x 7	1
1805	6204Z	6205	6301	6301	20UZS80	1	6302Z	D	30/ 47x 8	1	1	S	20/ 35x 7	1
1810-1815	6206Z	6206	NKI-15x42x15	NKI-15x42x15	Refer to Table 21	1	6302Z	D	45/ 62x 9	1	1	S	20/ 35x 7	1
1820-1825	6206Z	6206	6302	6302			6302Z	D	45/ 62x 9	1	1	S	20/ 35x 7	1
1830-1835	6208Z	6208	6204	—			6305	D	58/ 80x 9	1	1	D	32/ 52x 8	1
1840-1845	6211NR	6213	6305	—			6306	D	65/ 88x12	1	2	D	38/ 58x11	1
1850-1855	22211BNR	6213	NJ305	—			6306	D	65/ 88x12	1	2	D	38/ 58x11	1
1860-1865	6213NR	6215	NJ307	—			6308	D	85/110x13	1	2	D	55/ 78x12	1
1870-1875	6216NXR	6218	NJ406	—			60UZS87	2	6407	D	95/130x15	1	2	D
1880-1885	6218NR	6220	NJ407	—	65UZS88	2	6409	D	110/145x15	1	2	D	65/ 88x12	1
1890-1895	6221NR	6026	NJ408	—	85UZS89	2	6411	D	120/155x16	1	2	S	70/ 88x10	1
1900-1905	23122BNR	6222	NJ409	—	100UZS90	2	6412	D	140/170x14	1	2	S	80/100x10	1
1910-1915	23124BNR	NJ224EG1	NJ410	—	130UZS91	2	6415	D	145/190x16	1	2	S	95/120x13	1
1920-1925	23128BNR	NJ232EG1	NJ414	—	140UZS92	2	22218BL1	D	180/210x16	1	2	S	110/140x14	1
1930-1935	23136BNR	6340	NJ417	—	180UZS93	2	22222BL1	D	230/270x20	1	2	S	120/150x14	1

Note 1: Type of oil seal on Table 14--D: Double lip (with dust proof and oil seal lip) type. S: Single lip (with oil seal lip only) type.

**Table 20 Double Reduction Units Intermediate Shaft Parts**

Frame Size	BEARING			
	Part No. 5-02	Part No. 5-04		Part No. 5-03
Number	Number	Q'ty	Number	
17995	6201	19UZS79	1	6201
18095	6301	20UZS80	1	6202
18205	6302	Refer to Table 21		6204
18305	6204			6205
18420/18425	6305			6206
18525	6305			6206
18630/18635	NJ307			6208
18730/18735	NJ406	60UZS87V	2	6208
18840/18845	NJ407	65UZS88V	2	6213

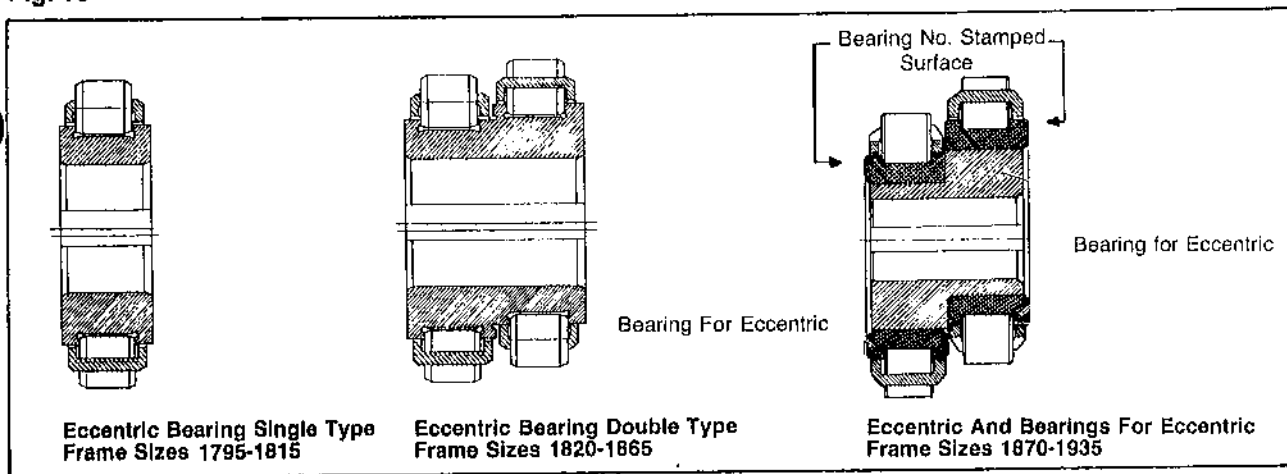
  

Frame Size	BEARING			
	Part No. 5-02	Part No. 5-04		Part No. 5-03
Number	Number	Q'ty	Number	
18930/18935	NJ408	85UZS89V	2	6210
18945	NJ408	85UZS89V	2	6213
19040/19045	NJ409	100UZS90V	2	6213
19060	NJ409	100UZS90V	2	6215
19160/19165	NJ410	130UZS91V	2	6215
19170	NJ410	130UZS91V	2	6218
1928/19285	NJ414	140UZS92	2	6220
19390/19395	NJ417	180UZS93	2	6420

**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.

**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	1810-1815	1820-1825	1830-1835	1840-1845	1850-1855	1860-1865
	—	18205	18305	18420-18425	18525	18630-18635
Part No. R. Ratio	3-04	3-04	3-04	3-04	3-04	3-04
6	15UZE810611	15UZ820611	22UZ830611	25UZ850611	—	35UZ8606
11	15UZE810611	15UZ820611	22UZ830611	25UZ850611	—	35UZ8611
17	15UZE8117	15UZ8217	22UZ831729	25UZ8517	—	35UZ8617
29	15UZE8129	15UZ8229	22UZ831729	25UZ852935	25UZ852935	35UZ862935
35	15UZE8135	15UZ8235	22UZ8335	25UZ852935	25UZ852935	35UZ862935
43	15UZE814359	15UZ824359	22UZ8343	25UZ854359	25UZ854359	35UZ8643
59	15UZE814359	15UZ824359	22UZ8359	25UZ854359	25UZ854359	35UZ8659
87	15UZE8187	15UZ8287	22UZ8387	25UZ8587	25UZ8587	35UZ8687



## Disassembly

SM-CYCLO Reducers are designed to provide maximum ease in disassembling and reassembling . . . they require no special maintenance skills.

1. Remove the complete SM-CYCLO Reducer with adaptor (motorized type) from the driven machine.
2. Remove the plug at the bottom of the oil gauge to drain all oil from the unit.
3. Remove the cooling fan cover and fan from those Speed Reducers (not motorized) equipped with a cooling fan, and stand the unit on a solid base with its high speed shaft side down. Remove the through bolts for the high speed end shield, ring gear housing, and lift the slow speed side, thus separating the unit into two parts so that the inner mechanism can be removed (Figs. 11-16).
 

**Note:** If the reducer is motorized (C-adaptor and coupling) remove the motor and coupling before following the procedure outlined above. As a final step, remove the adaptor and cooling fan.
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. 11).
6. Take out the slow speed shaft rollers, item 1-06 page 3 (Fig. 12). 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. 13).

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

9. The eccentric (3-04) can be removed from the high speed shaft (3-01) after taking out the retaining ring (3-10) and the inner bearing raceway (Fig. 14, 15).

**Note:** In certain sizes, the eccentric bearings are roller bearings without a retainer. Remove bearings of the top disc before proceeding with the next step.

10. Take out the second disc on the high speed side. (Also remove second disc bearings and eccentric with inner bearing raceway if required).

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

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 high speed shaft (3-01) with bearings is removed from the high speed end shield (8) by tapping the shaft end after first taking off the retaining ring (3-11).

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

The above instructions cover complete disassembly. In ordinary cases, however, only the removal of the cycloid discs and the eccentric, and removal of the slow speed shaft from the slow speed end cap is necessary.

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



## Assembly

SM-CYCLO Reducers 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 Reducers.

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 Reducers).
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 16.

4. Insert the end plate (35) and then insert the eccentric with bearings by rapping with a wooden or hard rubber mallet (Fig. 15).

5. Insert the other end plate and the inner bearing raceway. Secure them with the retaining ring (Fig. 14).

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. 13).

8. Insert slow speed shaft rollers (Fig. 12).

9. Put the slow speed shaft pins into the rollers (Fig. 11). 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. 11

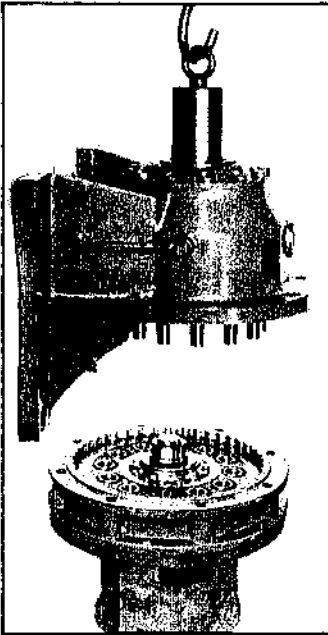


Fig. 12

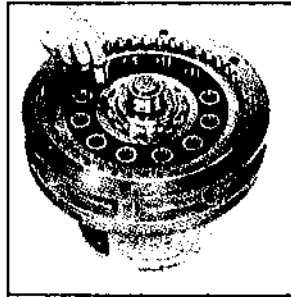


Fig. 13

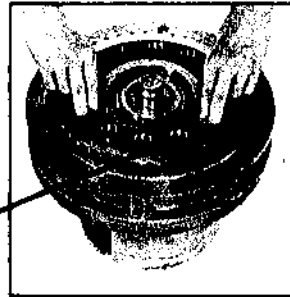


Fig. 14

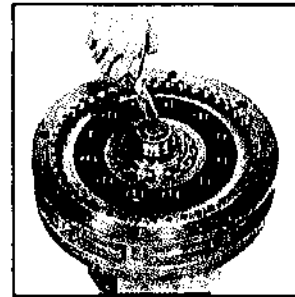


Fig. 15

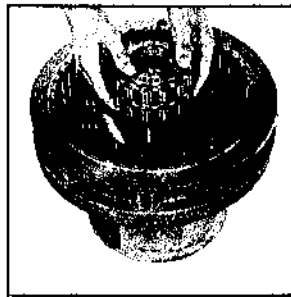
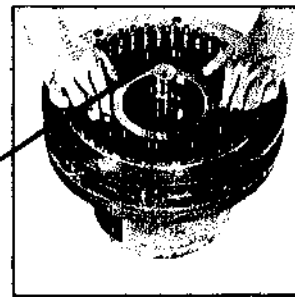


Fig. 16



**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 Reassembly of Sizes 1795-1815 SM-CYCLO Reducers

Small sizes 1795-1815 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 the figure below.
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, 1795-1815 have exactly the same construction as the larger sizes. Follow the instructions given under "Disassembly and Reassembly".

#### Disassembly Of Output Side (1795-1835)

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 (1795-1835)

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), being sure to maintain dimension "X" (fig. 17).

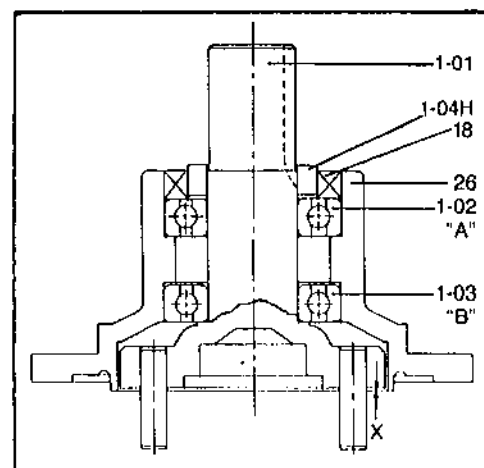
3. Carefully tap bearing "A" (Part No. 1-02) onto the slow speed shaft (Part No. 1-01) until the bearing is flush with the shoulder of the casing.

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.

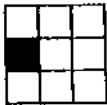
5. Insert the oil seal (Part No. 18), lip in, into the casing (Part No. 26).

**Note:** Measure for dimension "X" preferably in three places to insure proper spacing.

Fig. 17



Dimension "X"		
1795	.030	+ .002 - .000
1805	.112	+ .002 - .000
1810-1815	.030	+ .002 - .001
1820-1825	.030	+ .002 - .000
1830-1835	.026	+ .002 - .000



## Daily Inspection

1. 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.

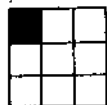
2. A temperature rise of approximately 105°F above ambient on the surface of the ring gear housing (Part No. 2-01) is allowable if the temperature fluctuation is

small. If temperature rises rapidly from a 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.

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

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





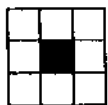
## Ordering Correct Replacement Units Or Parts

The SM-CYCLO 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

<b>SM-CYCLO</b> ®			MEMBER OF 
TETERBORO, NEW JERSEY			
MODEL			
RATIO	SERVICE FACTOR		
INPUT	HP		RPM
OUTPUT TORQUE			IN-LB
SERIAL NO.			
		<b>SUMITOMO</b> MACHINERY CORP. OF AMERICA	



## Storage And Operation After Storage Of SM-CYCLO

### Storage 6 Months-1 Year

#### Oil-Lubricated

1. Completely fill unit(s) with a rust-preventive oil (NP 20 or equivalent) or a circulating oil (Shell VSI No. 100 or equivalent).

2. At approximately 3-month intervals, rotate the input shaft a sufficient number of times to insure all internal components remain coated. (The higher the ratio, the greater the amount of rotations needed for proper lubrication.)

#### 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.