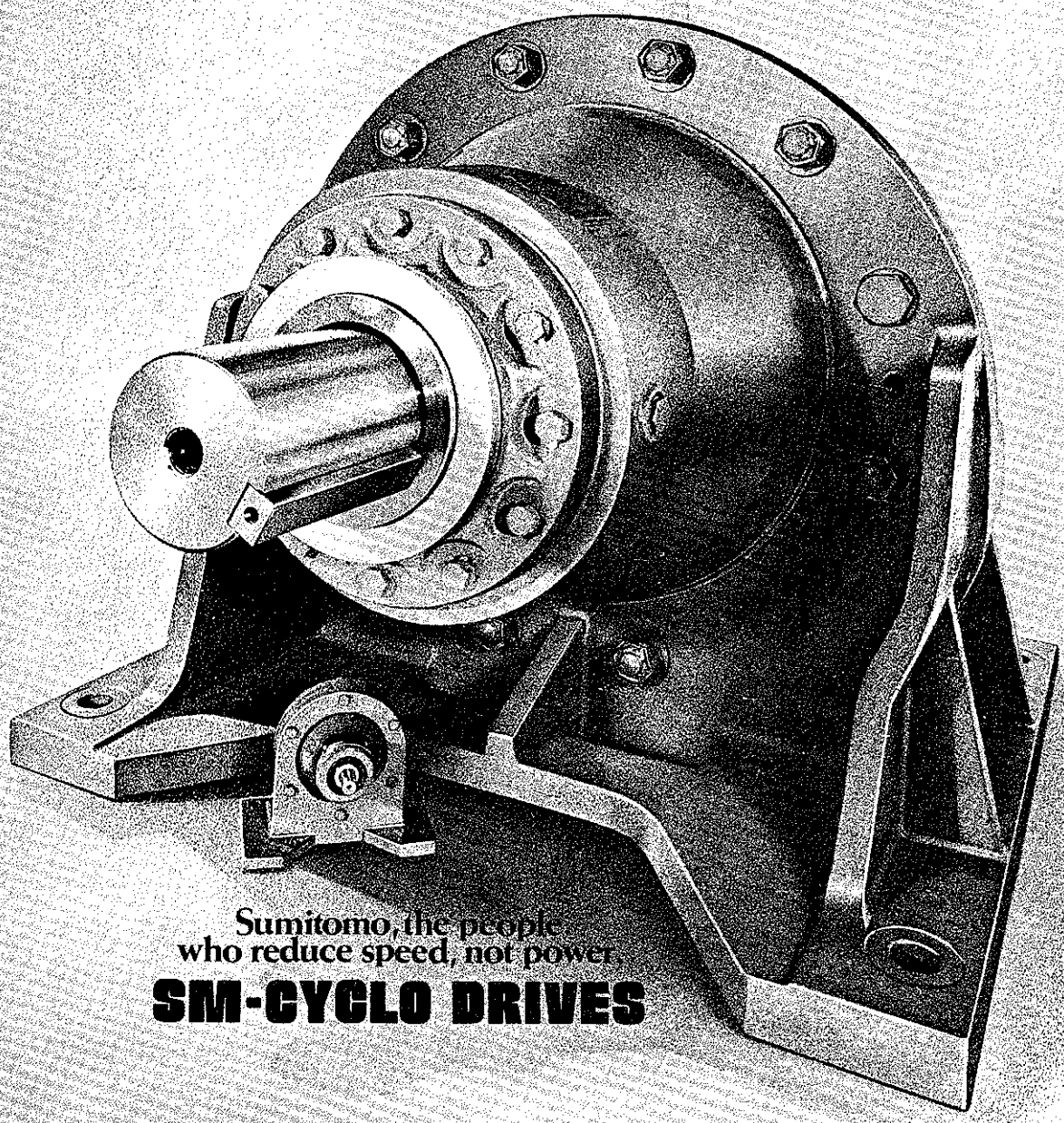
Operating & Maintenance Manual for SM-Cyclo Drive.

A/AX Series



Sumitomo, the people who reduce speed, not power

SM-CYCLO DRIVES

INDEX

GENERAL DESCRIPTION

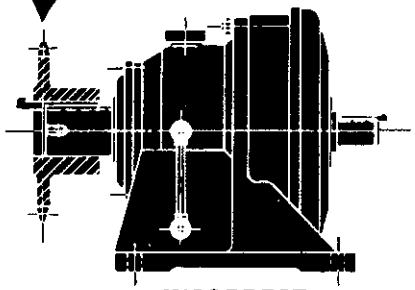
Separate Reducer

The separate reducer units have no motor adaptor, and are driven with couplings, pulleys, sprockets, or gears, etc., on their high speed shafts.

Motorized Type marked "J"

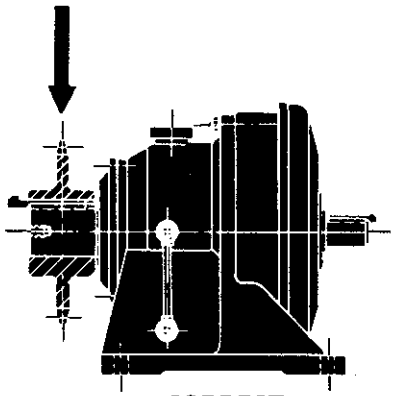
Motorized reducer with motor adaptor units bearing the letter "J" in their model numbers have NEMA "C" face adaptors and couplings on their high speed side.

RADIAL LOAD



INCORRECT

RADIAL LOAD



CORRECT

SM-CYCLO DRIVE HORIZONTAL TYPE

MOUNTING

The Horizontal Type units must be mounted on horizontal beds. Where they are mounted on inclined surfaces, some variations are necessary. Specify mounting plane at time of ordering.

Where the reducer is connected to the motor and the driven machine through couplings, align the shafts accurately, and insure, by means of V-pulleys or sprockets, that belts or chains are neither too tight nor too slack. Loads should be concentrated as close to the bearing as possible and never beyond the mid-point of the shaft projection. The reduction units above size no. 57-AX/A must be fixed on their beds by inserting pins into the knock-holes provided on the foot of casing. This will insure that bending or shearing forces are not applied to the mounting bolts. Pins must be securely inserted, particularly when the units are to operate under conditions of severe recurrent peak loads.

The reduction units must be mounted in places easily accessible for the supply, change, and level control of lubricating oil. Be sure that wholly covered reducers are properly ventilated.

LUBRICATION

Except for models 53-AX/A and smaller and some multiple reduction units that are grease lubricated, all SM-CYCLO DRIVES are oil lubricated.

Oil Lubrication

Kinds of Oils

1) By referring to the Standard Viscosities Table on page 4, select high quality lubricants as motor oil (which exhibit good oiliness, great film strength, oxidation & corrosion resistance and freedom from foaming), high grade industrial gear oil, or their equivalents.
2) The appropriate viscosities of these lubricants range from SAE 20 to 40 at ambient temperatures between 30 and 100° F; the optimum winter (30--70°F) viscosity being SAE 20 (AGMA No. 2), and the optimum summer (70--100° F) being SAE 40 (AGMA No. 4).
3) Where the ambient temperature varies widely, the use of a higher viscosity index lubricant (for less viscosity variation due to temperature change) or multigrade motor oil (SAE 5W-20, 10W-30, 20W-40 and other grades above 100 in. V.I.) is suggested.
4) Where the reduction units are used at ambient temperatures higher than 100°F, exceptionally high-purity, highly oxidation-resistant R & O type oil is necessary. At high temperatures, oil deteriorates quickly and it is necessary to change oil more frequently than the normal periods specified later in this manual.
5) Where the reduction units are used at ambient temperatures lower than 30° F, it may be difficult to start them if ordinary oil is used; it is therefore necessary to select oil whose pour point is lower than the ambient temperature by at least 10--20° F.
   Oil viscosity is also important at low temperatures. If viscosities are too high, it is hard to start the reduction units, and their efficiencies drop during operation. The lubricant viscosity that allows easy starting of SM-CYCLO DRIVES is 20,000 SUS (Saybolt Universal Seconds).
6) Where your reduction units are to be used at ambient temperatures lower than-20°F, please specify the operating conditions at time of ordering.
7) SM-CYCLO DRIVES have gear components whose contact are of a rolling nature; they require no extreme pressure oil in their common applications.
   The use of mild EP type industrial gear oil is suggested when the reduction units assume service under especially severe load conditions involving many starts and stops. Mild EP type oil is also recommended for large sizes 62-A & 63-A

Oiling Procedure

SM-CYCLO DRIVES are shipped dry (without lubricating oil). The casing should be filled to the upper red line on the oil gauge through the filler plug (25) at the top of the casing on the slow speed side before starting the unit (see page 11).

Oil Level Control

Take care that the oil level is not above the upper red line on the oil gauge while the units are not operating, and not below the lower red line during operation.
If too much oil is supplied the churning loss of oil will increase and the temperature will rise. Excess oil can be drained by removing the plug at the bottom of the oil gauge. The approximate quantities of lubricants by frame size are given below.

Mounting of Oil Gauge

The oil gauge can be mounted on either the right or the left side of the casing. Mount it on a prominent side, normally on the right side, as viewed from the slow speed shaft.

Table 1 STANDARD VISCOSITY TABLE SAE NO. & AGMA NO.

AMBIENT TEMPERATURE °F	STANDARD VISCOSITY (SUS)		SAE NO. (MOTOR OIL)	AGMA NO.
	0°F	210°F		
−20~0	~12,000	>39	5W 10W	— —
0~30	6,000~48,000	>40	10W 20W	— 1,2
30~100	—	45~85	20 30 40	1,2 3 4
100~140	—	85~110	50	5
140~180	—	110~130	—	6

Table 2 QUANTITIES OF OIL (single reduction units)

FRAME SIZE	54-AX/A	56-AX/A	57-AX/A	58-AX/A	59-AX/A	60-AX/A	61-AX/A	62-AX/A	63-AX/A
GALLON	0.15	0.25	0.3	0.5	0.6	1.0	1.5	5.0	10

Table 3 QUANTITIES OF OIL (double reduction units)

FRAME SIZE	563-AX/A	573-AX/A	584-AX/A	593-AX/A	596-AX/A	606-AX/A	617-AX/A	628-AX/A	639-AX/A
GALLON	0.4	0.6	0.9	1.2	0.9	2.5	3.5	8.0	14.0

Grease Lubrication

SM-CYCLO DRIVES of the grease lubricated type are greased before shipment to the customer, and are ready for use. Grease lubrication portion includes the speed reduction mechanism, slow speed shaft bearings and high speed shaft bearings.

Kinds of Greases

1) Sizes 53-Y and smaller are grease lubricated.
   Usually lithium grease No. 2 (NLGI consistency, 265--295) is used in sealed form.
2) Normally, SM-CYCLO DRIVES 54Y and larger are oil lubricated. If grease lubrication is absolutely necessary, specify at time of inquiry. In this case, the use of lithium grease No. 2 having good stability, long service, great film strength, and excellent resistance to heat and cold (5 ° F to 250 ° F) is suggested.
3) For service under special operating conditions — such as extremely high or low, or widely changing ambient temperatures, lithium grease, diester grease, or other greases may be sealed in the units according to the respective operating conditions.
4) Mixtures of different soap base greases vary in properties such as dropping point, consistency and leakiness. For this reason

avoid using mixtures of different greases. When standard grease types do not meet your requirements, consult your grease manufacturer.

Grease Supply to Speed Reduction Mechanism

1) When the speed reduction mechanism is disassembled, re-grease in accordance with the quantities given in table 4 below. Under normal conditions the reducer is approximately half filled with grease. Slightly larger quantities are used for lower reduction ratio units, and somewhat smaller quantities for higher reduction ratio units. Grease to the central part (i. e. around the eccentric bearings) of the mechanism liberally.
2) When operating the reducers under 10 hour/day conditions, additional grease should be added every 3--6 months. When operating 24 hours/day continuously, add grease every 500--1000 hours. For larger sizes, supply grease more frequently. The appropriate quantities of grease to be supplied when re-greasing is one-third to one-half of the values described in the table below. For better lubrication, supply grease while unit is running.
3) A grease nipple is provided on the top of the high speed end shield to facilitate re-greasing.
4) If excessive grease is added, agitation heating of the grease will raise the operating temperature of the unit.
5) Grease shortage will cause the lubricant films on the eccentric bearings to break down, thereby causing a bearing failure. If a rise in the operating temperature is found, supply grease immediately.

Slow speed shaft and high speed shaft bearings.

Apply grease to these bearings as you would to ordinary bearings at time of assembly. That is, the bearing case approximately one-fourth full utilizing the same grease as applied in speed reduction mechanism. No additional grease is necessary.

Table 4 QUANTITIES OF GREASE (single reduction units)

FRAME SIZE	49-AX/A	51-AX/A	52-AX/A	53-AX/A	54-AX/A	56-AX/A	57-AX/A	58-AX/A	59-AX/A	60-AX/A	61-AX/A	62-AX/A
POUND	1/20	1/6	1/4	1/2	1	1-2/3	2-1/5	2-2/5	3-1/3	5-1/2	10	18

SM-CYCLO DRIVE 54Y thru the 62Y are normally oil lubricated. However, all reducers can be grease lubricated depending on the application. Please consult the factory for additional information.

MAINTENANCE

Oil Change

The first oil change is made after 500 hours of operation. Subsequent oil changes are made after 2,500 hours of long (10–24 H/D) continuous operation or after six months of short (less than 10 H/D) intermittent operation. Oil should be changed after 1--3 months of operation at especially high ambient temperatures, relative humidities and in the atmosphere of active gas.

Before restarting reduction units that have been out of operation for long periods, be sure to change oil.

Oil is drained by removing the plug at the bottom of the oil gauge. Procedure for adding new oil is described on page 4.

Grease Change

For long life and trouble-free operation, it is recommended that the speed reduction mechanism and high speed shaft bearings be overhauled periodically -- once every 1--2 years — the slow speed shaft bearings once every 2--4 years. At this time repack with new grease. Where the reduction units have been out of operation for long periods (at least over one year), the grease may have deteriorated. Disassemble the units and renew the grease. If it is impossible to disassemble, supply fresh grease liberally with a grease gun and start operation.

DISASSEMBLY

(Refer to page 8 & 9)

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

1) Remove the complete SM-CYCLO DRIVE 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 completely.
3) Remove the cooling fan cover and fan from those Speed Reducer types (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 8--12).
   Note: If the reducer is motorized (K-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. 2 on page 8 (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. 7).
6) Take out the slow speed shaft rollers, item 15, page 8 (Fig 8). Check the slow speed shaft pins (13), to see whether any rollers have adhered to them.
7) The top cycloid disc (11) on the slow speed side can be easily lifted out with both hands (Fig. 9).
8) Remove the spacer ring (23).
9) The eccentric (34) can be removed from the high speed shaft (41) after taking out the retaining ring (17) and the inner bearing raceway (Figs. 10, 11). 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 (21).
12) The slow speed shaft (31) with its bearings is removed from the casing (22) as follows: (a) Remove the slow speed end cap (24). (b) With a wooden or hard rubber mallet, rap the inner end of the slow speed shaft to expose the retaining ring (16) 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 (41) with bearings is removed from the high speed end shield (45) by rapping the shaft end after first taking off the retaining ring (18) (Refer to Figs. 2,3).
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.

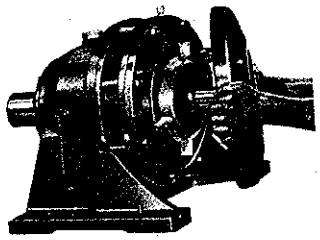


Fig. 6

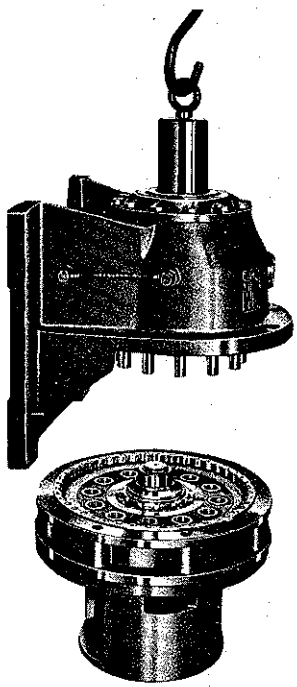


Fig. 7

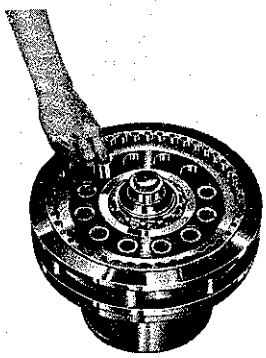


Fig. 8

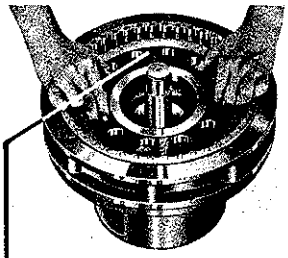


Fig. 12

NOTE. Set disc with number facing slow speed side.

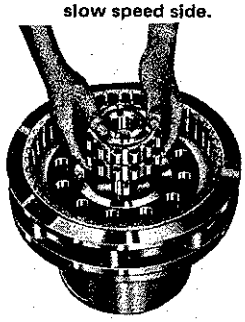


Fig. 11

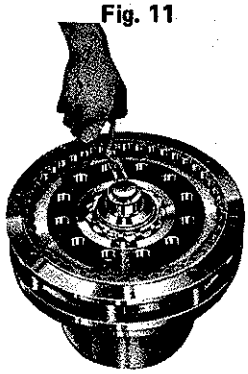


Fig. 10

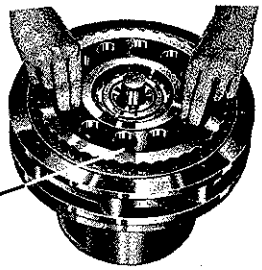


Fig. 9

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

REASSEMBLY

SM-CYCLO DRIVES 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 DRIVES:

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 DRIVES).
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 12.
4) Insert the end plate (35) and then insert the eccentric with bearings by rapping with a wooden or hard rubber mallet (Fig. 11).
5) Insert the other end plate and the inner bearing raceway. Secure them with the retaining ring (Fig. 10).
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. 9).**
8) Insert slow speed shaft rollers (Fig. 8).
9) Put the slow speed shaft pins into the rollers (Fig. 7).

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.
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 DRIVES. They are special roller bearings without outer raceways (refer to the list of bearings on page 10).

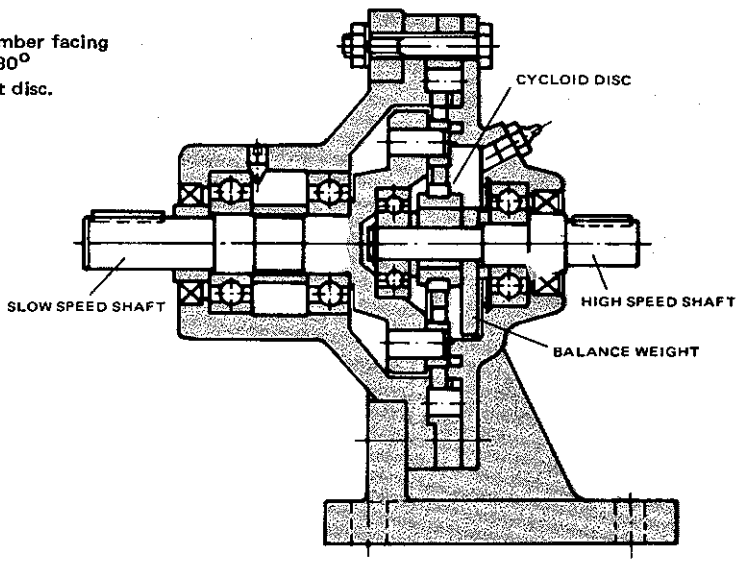
It is necessary to insert replacement bearings with numbered surfaces of the inner raceways facing outward. Note that the wrong insertion of the bearings (i.e., insertion of bearings with numbered surfaces inside) causes trouble.

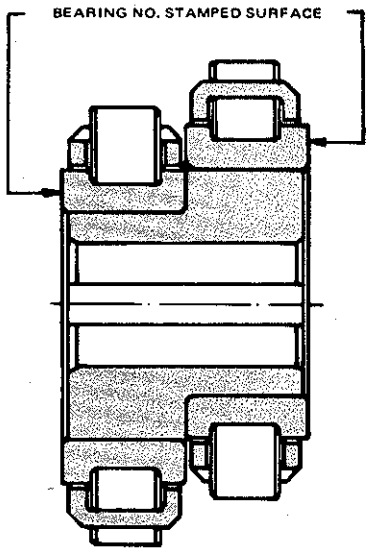
Disassembly and Reassembly of Size No. 49AX/A and 51AX/A SM-CYCLO DRIVES

Small sizes 49AX/A and 51AX/A 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° opposed to that of the eccentric.
3) There are no end plates on either side of the eccentric.
4) The cycloid discs for 51AX/A and 52AX/A are identical so either may be used.

In all other respects, 49AX/A and 51AX/A have exactly the same construction as the larger sizes. Follow the instructions given under "Disassembly and Reassembly".





OPERATING NOTES

Temperature Rise

Where the temperature rise registered outside the ring gear housing (21) is higher than 90° F, or where abnormal sound is heard from inside the reducer, stop operation, and disassemble and inspect the unit.

Possible Causes and Repairs:

a) Abnormally high temperature may be caused by improper lubrication of the eccentric bearings. Lubricate them properly.

b) Abnormal sounds frequently are an indication of damage to the speed reduction mechanism.

Oil Leakage

a) All SM-CYCLO DRIVES are so assembled that they are oil-tight. Synthetic rubber oil seals are used for the high speed and slow speed shafts while chemical-soaked gaskets are compressed between end shield and the ring gear housing, between the ring gear housing and the casing, and between the slow speed end cap and the casing.
When disassembling or removing the reduction units, take care not to damage the gaskets. Where they cannot be reused, replace them in kind or apply non-drying packing chemicals to ordinary gaskets (thickness 0.012 in.).

b) If oil leaks from the oil seal portion of

Table 5 MAIN PARTS LIST

11	Cycloid disc	22	Casing	42	Collar (high speed)
12	Ring gear pin	23	Spacer ring	43	Spacer
13	Slow speed shaft pin	24	Slow speed end cap	44	Spacer
14	Ring gear roller	25	Filler plug	45	High speed end shield
15	Slow speed shaft roller	31	Slow speed shaft	46	Cooling fan
16	Retaining ring	33	Collar (slow speed)	47	Fan cover
17	Retaining ring	34	Eccentric	48	Adaptor
18	Retaining ring	35	End Plate		
21	Ring gear housing	41	High speed shaft		

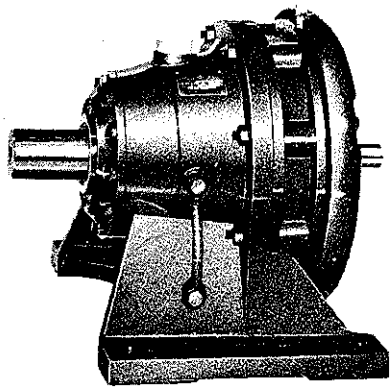


Fig. 1

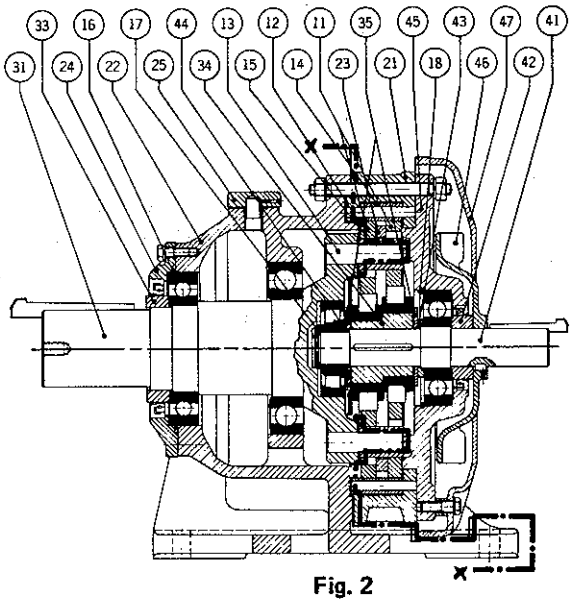


Fig. 2

the slow speed end cap (24), inspect the collar surface and the oil seal lip.

If the collar surface is damaged, renew the collar. If the oil seal is faulty, renew the oil seal.

Sufficiently lubricate the seal lip (with grease or oil for example) and insert the oil seal into the shaft, taking care the seal lip is not damaged.

c) Oil seals used in standard SM-CYCLO DRIVES are made from nitrile rubber so that they can be used at temperatures between – 10° F and 250° F. If the operating ambient temperatures are lower than 0°F or higher than 180° F, the use of silicone rubber oil seals is suggested. Silicone rubber tears easily, so special attention must be paid to the insertion of silicone rubber oil seals.

d) In dusty places, use oil seals with a dust proof lip with which SM-CYCLO DRIVES are equipped. For perfect dust proofness, fill the clearance between the dust proof lip and oil seal lip with grease.

Oil Gauge

Special oil-resistant vinyl hose is used for the oil gauge. If it becomes difficult to see the oil level through the oil gauge, renew the vinyl hose. Vinyl hose can be used at temperatures between 0° F and 180° F. Where the oil gauge is used beyond this temperature range, use a glass tube, so called, "L" type oil guage.

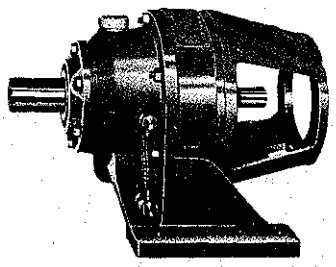


Fig. 4

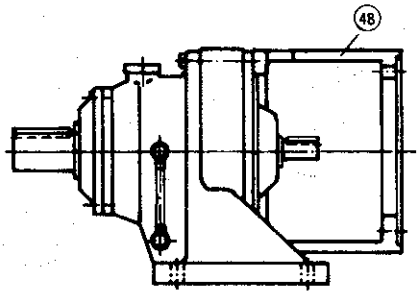


Fig. 5

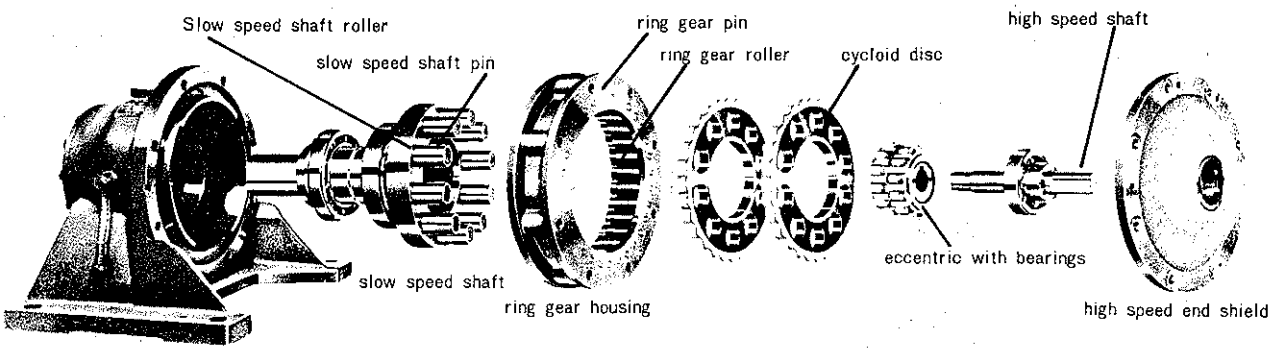


Fig. 3

BEARINGS, OIL SEALS, RETAINING RINGS

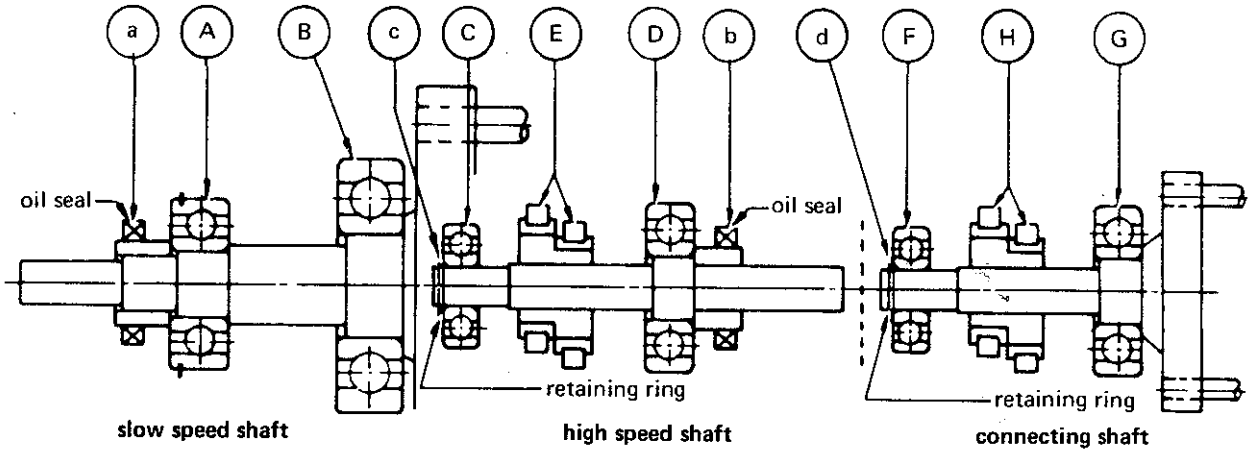


Table 6

single reduction units

FRAME SIZE	BEARING NUMBER					OIL SEAL		RETAIN. RING (c) SHAFT DIA.
	SLOW SPEED SIDE		HIGH SPEED SIDE			a	b	
	A	B	C	E†	D			
49-AX/A	6202	6202	629	R-0406	6201*	21326	—	—
51-AX/A	6204	6204	6301	UZ-204BG$_1$	6302	26428	20357	15/32
52-AX/A	6206	6206	6201	UZ-204BG$_1$	6302	38508	20357	15/32
53-AX/A	6208	6208	6204	SEE TABLE #1 BELOW	6305	507010	32528	13/32
54-AX/A	6211NR	6213	6305		6306	658812	385811	21/32
56-AX/A	6213NR	6215	NJ307		6308	8511013	557812	1
57-AX/A	6216NXR	6218	NJ406	UZ-312BG$_1$	6407	9513015	608212	1-3/16
58-AX/A	6218NR	6220	NJ407	UZ-313BG$_1$	6409	11014515	658812	1-3/8
59-AX/A	6221NR	6026	NJ408	UZ-217BG$_1$	6411	12015516	8511013	1-9/16
60-AX/A	23122BNR	6222	NJ409	UZ-222BG$_1$	6412	14017014	8511013	1-25/32
61-AX/A	23124BNR	6224	NJ410	UZ-228BG$_1$	6415	14519016	9513015	1-31/32
62-AX/A	23128BNR	6232	NJ414	UZ-328BG$_1$	6420CS	18021016	13016014	2-3/4
63-AX/A	23136BNR	6340	NJ417	UZ-336BG$_1$	6426CS	23027020	16019016	3-11/32

* 6201Z only — 1 piece 6201 only — 1 piece

† Bearing numbers, for eccentric bearings (E) & (H), ending in G_1, are retainer type roller bearings. Those ending in V are roller bearings without retainers.

double reduction units — connecting parts

FRAME SIZE	BEARING NUMBER			RETAIN. RING (d) SHAFT DIA.
	F	H	G	
499-AX/A	629	R0406	6201	—
519-AX/A	6301	UZ-204G$_1$	6202	15/32
529-AX/A	6201	UZ-204G$_1$	6202	15/32
539-AX/A	6302	UZ-206BG$_1$	6204	13/32
531-AX/A	6302	UZ-206G$_1$	6204	13/32
541-AX/A	6403	UZ-307BG$_1$	6204	21/32
542-AX/A	6403	UZ-307BG$_1$	6206	21/32
561-AX/A	NJ405	UZ-309BG$_1$	6205	1
563-AX/A	NJ307	NOTE 4	6208	1
573-AX/A	NJ406	UZ312V	6208	1-3/16
584-AX/A	NJ407	UZ-313V	6213	1-3/8
593-AX/A	NJ408	UZ-217V	6210	1-9/16
596-AX/A	NJ408	UZ-217V	6215	1-9/16
606-AX/A	NJ409	UZ-222V	6215	1-25/32
617-AX/A	NJ410	UZ-228V	6218	1-31/32
628-AX/A	NJ414	UZ-328G$_1$	6220	2-3/4
639-AX/A	NJ417	UZ-336G$_1$	6420	3-11/32

Table 1

Cyclo Drive Frame size	Ratio	No. of Eccentric Bearing
53	11	22UZ311
	17	22UZ317
	29	22UZ329
	35	22UZ335
	43	22UZ343
	59	22UZ359
54	11	25UZ411
	17	25UZ417
	29	25UZ429
	35	25UZ435
	43	25UZ443
	59	25UZ459
	87	25UZ487
56	11	35UZ611
	17	35UZ617
	29	35UZ62935
	35	35UZ62935
	43	35UZ643
	59	35UZ659
	87	35UZ687

GENERAL NOTES

1) When replacing high speed shaft bearing use motor bearings or equivalents.
2) Oil seals (a) & (b) are double lip i.e. with dust proof lip and oil seal lip.
3) Vertical reducers 54-A-63-A have two double lip seals on the output shaft.
4) See Table 1 — Frame Size 56.

OIL LEVEL INDICATING DIMENSIONS

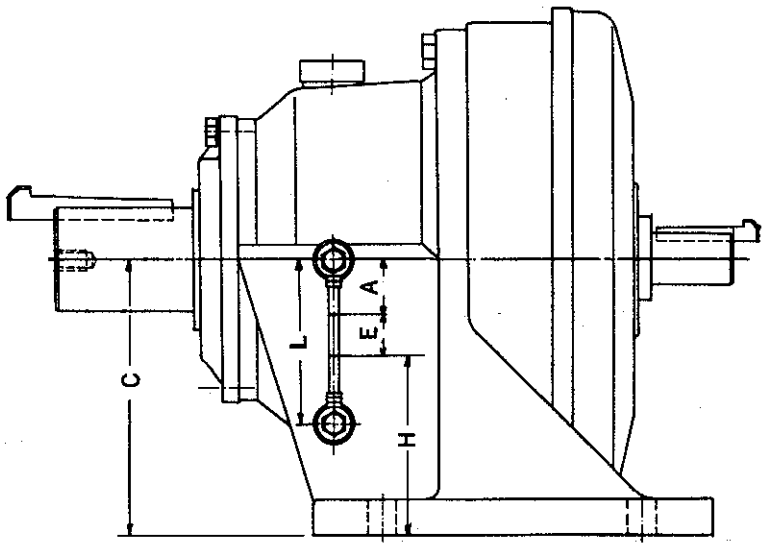


Table 7

SINGLE REDUCTION						DOUBLE REDUCTION					
FRAME SIZE	C	L	A	E	H*	FRAME SIZE	C	L	A	E	H*
V-54AX/A		5.9	0.85	0.40							
H-54AX/A	5.90	4.0	1.40	0.80	3.74						
H-56AX/A	6.29	3.7	1.60	1.20	3.54	H-563AX/A	6.29	3.7	1.20	0.60	4.54
H-57AX/A	7.87	4.95	1.95	1.40	4.54	H-573AX/A	7.87	4.95	1.20	0.60	6.10
H-58AX/A	8.66	5.9	2.15	1.75	4.73	H-584AX/A	8.66	5.9	1.40	0.80	6.50
H-59AX/A	9.84	10.6	2.75	1.60	5.51	H-594AX/A	9.84	10.6	1.40	0.80	7.68
						H-596AX/A	9.84	10.6	1.60	1.20	7.10
H-60AX/A	11.41	13.4	2.75	0.79	7.87	H-606AX/A	11.41	13.4	1.60	1.20	8.66
H-61AX/A	12.79	15.6	2.95	1.05	8.79	H-617AX/A	12.79	15.6	1.95	1.40	9.45
H-62AX/A	16.53	10.7	4.35	1.00	11.2	H-628AX/A	16.53	10.7	2.15	1.75	12.6
H-63AX/A	21.26	11.2	6.70	1.20	13.4	H-639AX/A	21.26	11.2	2.75	1.60	16.8

*H referencial dimension

GENERAL NOTES

1) "L" indicates total length of oil gauge.
2) Diameter of vinyl hose. 54AX/A – 61AX/A (including double reduction units) 1/4" / 7/16". 62AX/A & 63AX/A (including double reduction units) 15/32" / 3/4".
3) Mount, with the 1-groove cap at the upside and the 2-groove cap at the downside.

VERTICAL TYPE SM-CYCLO DRIVE

CONSTRUCTION

Vertical SM-CYCLO DRIVES have the same internal construction as horizontal type units, except that vertical models 56AX/A and larger are equipped with an oil pump, as illustrated.

(Small units 49AX/A-53AX/A are grease lubricated and the 54AX/A employs oil-bath lubrication). As the plunger of the oil pump (52) is pushed by the cam (19), which turns with the slow speed shaft (31), the oil in the casing (22) flows through the piping (54) to the speed reduction mechanism. Here the oil is atomized and the condensate returns to the oil tank at the bottom. The pump is actuated automatically with the rotation of the slow speed shaft. An oil signal (53) is provided at the midpoint of the piping (54) to allow visual checking of the oil being circulated.

Sizes 61AX/A and 62AX/A are equipped with two oil pumps.

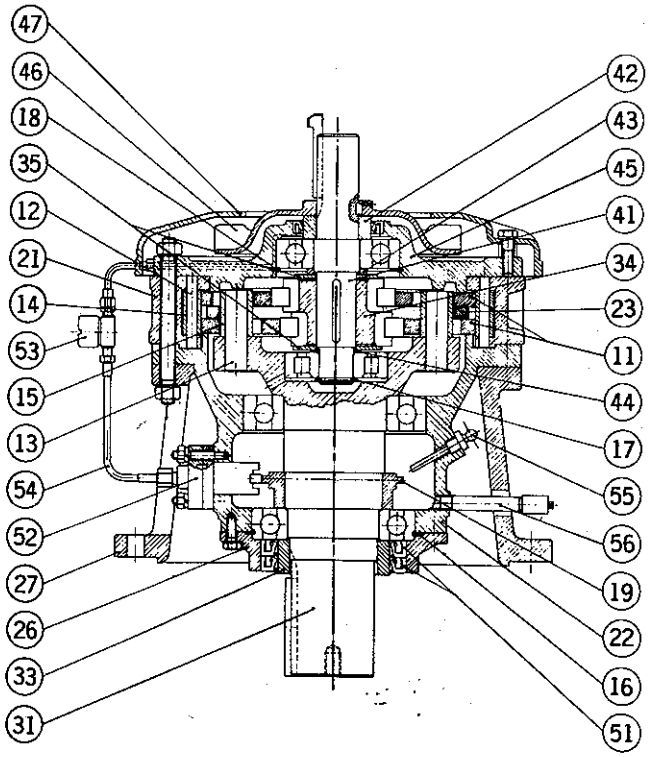
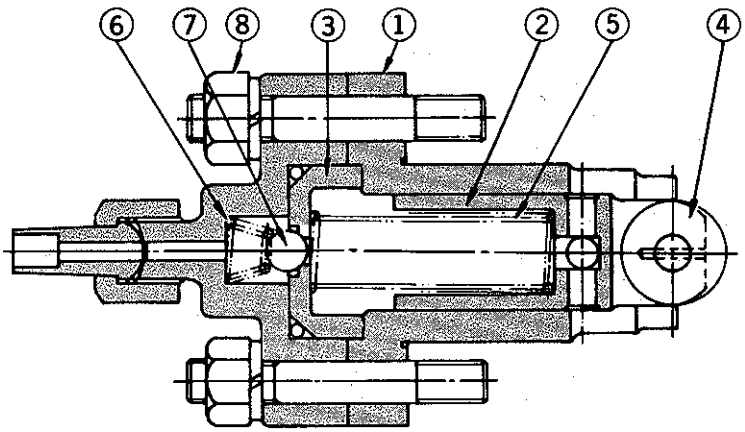


Table 8 MAIN PARTS LIST

11	Cycloid disc	23	Spacer ring	44	Spacer
12	Ring gear pin	26	Gland	45	High speed end shield
13	Slow speed shaft pin	27	Base	46	Cooling fan
14	Ring gear roller	31	Slow speed shaft	47	Fan cover
15	Slow speed shaft roller	32	Spacer	48	Adaptor
16	Retaining ring	33	Collar (slow speed)	51	Oil seal
17	Retaining ring	34	Eccentric	52	Oil pump
18	Retaining ring	35	End plate	53	Oil signal
19	Cam	41	High speed shaft	54	Piping
21	Ring gear housing	42	Collar (high speed)	55	Oil gauge
22	Casing	43	Spacer	56	Drain plug

PLUNGER OIL PUMP SECTIONAL DRAWING



LUBRICATION

Vertical SM-CYCLO DRIVES are oil or grease lubricated.

Oil Lubrication

a) Forced Lubrication (for units 56AX/A and larger)

The use of high-grade lubricants will assure longer machine life and freedom from repairs. Contaminated lubricant in the oil pump will obstruct oil circulation. To add new oil, first remove the air breather and the oil gauge from the casing, then add correct amount of oil. (see table 9). The reducer must be operated with the oil level above the groove on the level gauge.

b) Oil Bath Lubrication (54AX/A only)

Fill the casing to the upper red line on the oil gauge. During normal operation the oil level must be maintained above the lower red line. Table 9 indicates the correct amount of oil required for the various frame sizes.

Grease Lubrication (49AX/A – 53AX/A)

Small units 49AX/A – 53AX/A are grease lubricated. For proper grease selection, lubrication, change, etc., follow the instructions given for Horizontal Type units.

Table 9 QUANTITIES OF OIL (single reduction units)

FRAME SIZE	54-AX/A	56-AX/A	57-AX/A	58-AX/A	59-AX/A	60-AX/A	61-AX/A	62-AX/A	63-AX/A
GALLON	0.25	0.2	0.3	0.4	0.7	0.9	1.3	4.0	9.0

Table 10 MAIN PARTS LIST

NO.	PART	NO.	PART
1	Pump cylinder	5	Spring
2	Plunger	6	Valve Spring
3	Valve seat	7	Steel ball (1/4 in. dia.)
4	Roller	8	Setting bolts & nuts

MAINTENANCE

For lubricant or grease change, please follow the instructions for the Horizontal Type units.

DISASSEMBLY AND REASSEMBLY

Vertical SM-CYCLO DRIVES are disassembled in the same manner as Horizontal Type units. When disassembling and reassembling, take particular care of the oil pump and the piping.

OPERATING NOTES

Oil Pump

The oil pump is the life of every vertical speed reducer. If oil circulation stops, the speed reduction mechanism can be severely damaged. Visual observation of proper oil circulation may be made by viewing oil movement through the oil signal which serves as an oil flow gauge. If loss of circulation is noted, STOP operation immediately for inspection of pump.

Lubrication

Grease lubricated SM-CYCLO DRIVES are supplied, lubricated and ready for use. Those using the oil lubrication system are supplied without lubricant and it is necessary to fill them with the correct amount before starting operation.

5V & 5VJ BEARING SIZES AND SPANS

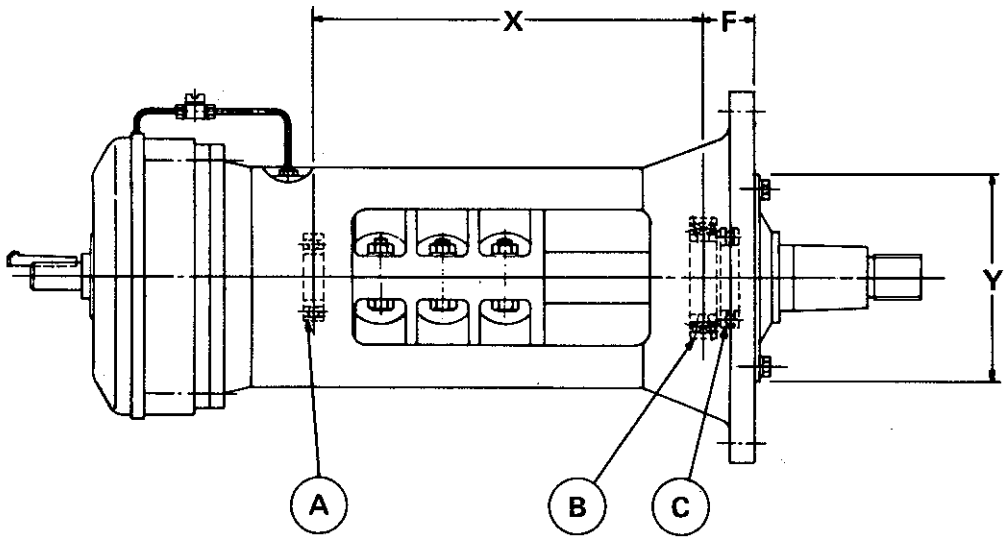


Table 12

FRAME SIZE	DISTANCE BETWEEN BEARINGS X	Y	F	BEARINGS		
				A	B	C
52-AX/A	7-5/32	5-1/2	1-23/32	6206	1306	51106
53-AX/A	8-7/8	5-7/8	7/8	6211	1611*	–
54-AX/A	11	7	1-5/16	6213NR	1613*	–
56-AX/A	11	8-1/4	2-15/32	6213NR	1313	51113
57-AX/A	15-13/32	8-21/32	2-3/8	6216NR	1314	51114
58-AX/A	18-5/16	10-13/32	2-19/32	6218NR	1317	51116
59AX/A	24-11/16	11	2-19/32	6221NR	1319	51120

* with adaptor

SM-CYCLO DRIVES and BEIER VARIATORS

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