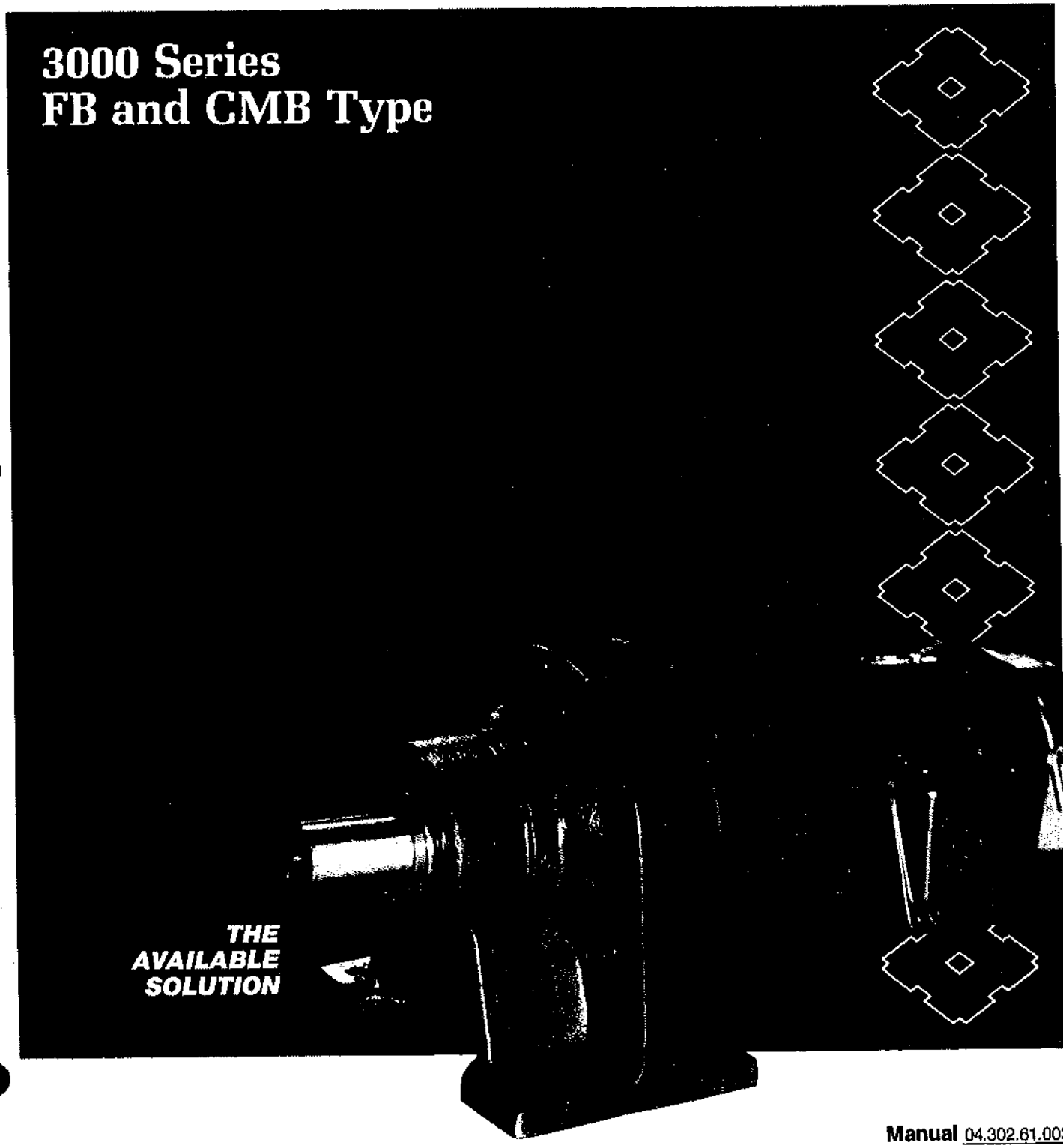
SUMITOMO
MACHINERY CORPORATION OF AMERICA

SM-CYCLO® BRAKEMOTOR
Operating and Maintenance Manual

3000 Series
FB and CMB Type

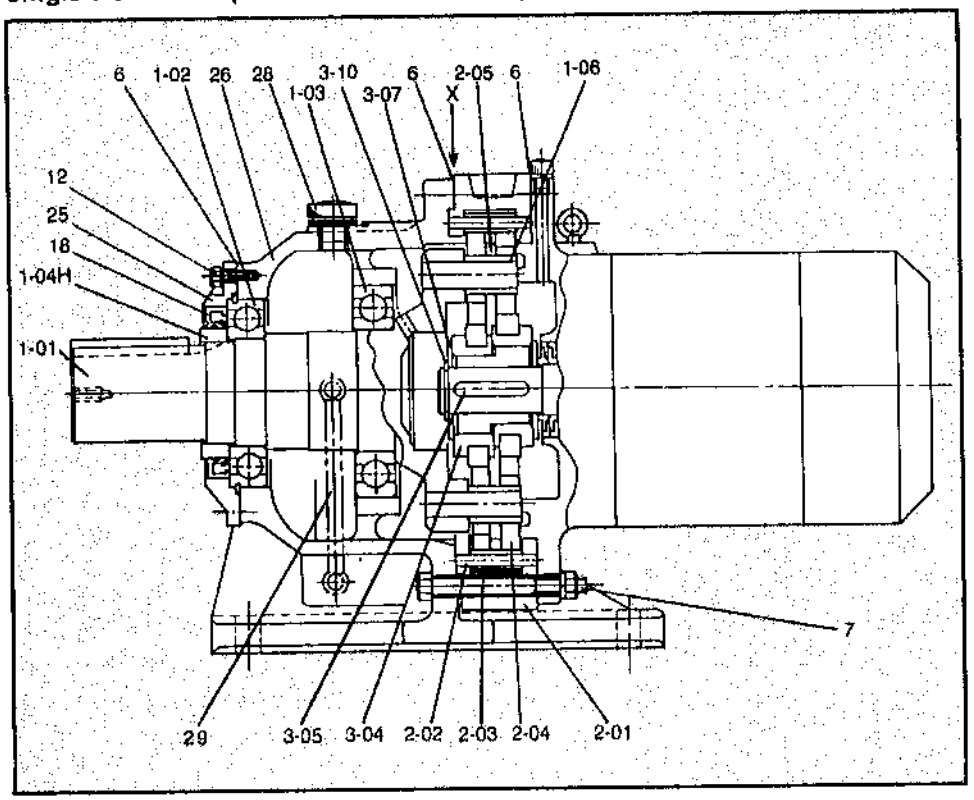


Manual 04.302.61.003

TABLE OF CONTENTS

GENERAL CONSTRUCTION

Single Reduction (Horizontal Foot Mount)



Single Reduction (Vertical Base Mount)

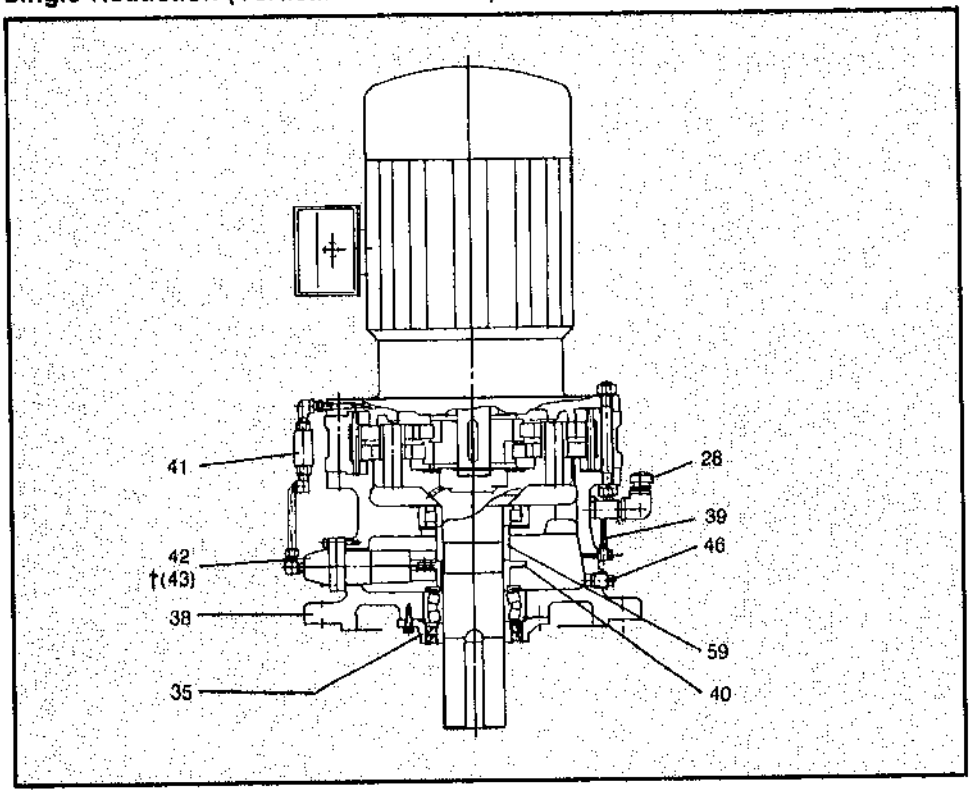


Table 1 Main Parts

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.

INTRODUCTION

SM-CYCLO FB and CMB series brakemotors were developed to be mechanically rugged in design, electrically reliable and efficient in operation.

This manual has been written to provide you all the necessary information so as to insure long, trouble-free service.

Please note that the information in this manual specifically pertains to the brake portion of the brake-gearmotor. For information on the basic gearmotor, please refer to the SM-CYCLO 3000 Series Gearmotor Operating and Maintenance Manual.

1. STANDARD BRAKEMOTOR SPECIFICATIONS

TABLE 1

BRAKE TYPE	MOTOR HP	STD. BRAKE TORQUE FT. LB.	BRAKE COIL	ENCLOSURE TYPE	BRAKE DELAY TIME (SEC.)	
					NORMAL ACTION	FAST ACTION
FB — 01	1/8	0.72	DC ENERGIZED TYPE (BUILT-IN RECTIFIER WITHIN TERMINAL BOX	TOTALLY ENCLOSED NON-VENTILATED	0.15 — 0.2	0.025 — 0.03
FB — 02	1/4	1.4		TOTALLY ENCLOSED FAN COOLED		0.015 — 0.02
FB — 05	1/2	2.9				0.01 — 0.015
FB — 1	3/4	5.8			0.2 — 0.3	0.01 — 0.02
	1	5.8				
FB — 2	1.5	11			0.3 — 0.4	0.02 — 0.03
FB — 2	2	11				
FB — 3	3	16				
FB — 5	5	27				
FB — 8	7.5	40			0.6 — 0.7	0.04 — 0-.05
CMB — 10	10	36			230 V 0.6 ~ 0.8 460 V 0.4 ~ 0.5	0.1 ~ 0.15
CMB — 15	15	54				
CMB — 20	20	72				

Notes: 1) Continuous time rating for both the brake and motor.
2) Indoor types can be installed in any orientation for use.

2. MODELS FB-01, -02, AND -05

2-1 Construction and Operating Principles

a) Construction

Fig. 1 illustrates the construction of the brake incorporated. The brake comprises an integral sub-assembly composed of a stationary core (1), solenoid coil (14), stud bolt (2) and retaining pin (11). The armature plate (13) is kept from rotating by the retaining pin (11) but will move along the motor shaft by electromagnetic attraction and the tension of the actuating spring (3). The plate (12) is always pressed against the gap adjusting nut (6) by the tension of the auxiliary spring (4). The brake lining (5) is fit to the boss (7) which is secured to the motor shaft with a key. The solenoid coil (14) is energized via a rectifier provided within the terminal box.

b) Operating Principles

The brake incorporated is a (fail safe type) spring actuated type brake, which will release brake mechanism when its solenoid coil is energized and will work when the coil is de-energized.

When power is applied to the unit, the solenoid coil and the electric motor are energized and the coil attracts the armature plate (13) against the retaining force of the actuating spring (3). As a result, the brake lining is disengaged, and the motorshaft begins to rotate.

When the power is disconnected, the solenoid coil and the motor are de-energized. This causes the actuating spring to actuate the armature plate (13), which in turn presses the brake lining against the plate (12) and brings the motor to a quick stop.

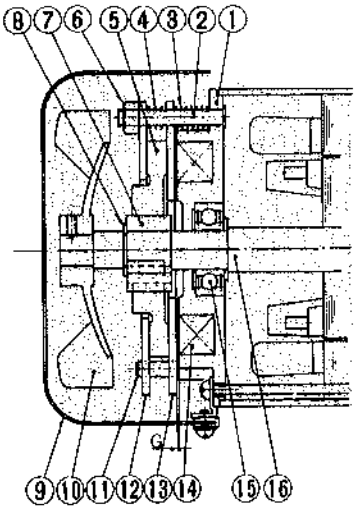


Fig. 1

Part No.	Part name
1	Stationary core
2	Stud bolt
3	Actuating spring
4	Auxiliary spring
5	Brake lining
6	Gap adjusting nut
7	Boss
8	Shaft retaining C-ring
9	Fan cover
10	Fan (not provided for 1/8 HP type)
11	Retaining pin
12	Plate
13	Armature plate
14	Solenoid coil
15	Ball bearing
16	Motor shaft

2-2 Inspection, Adjustment and Maintenance

a) Inspection

Check the following points at regular intervals:

1) The unit is operating normally.
2) The brake lining is not worn excessively (or gap G is normal).
3) No screws in the unit are loose.

b) Gap inspection and adjustment

The brake lining will wear after it is in extended service. From time to time, check for gap G. Should the gap become too large, the magnetic coil may fail to actuate the armature plate and thereby prevent the brake from working properly.

Gap inspection procedure

1) Remove fan cover (9).
2) Insert a feeler gage into the gap between stationary core (1) and armature plate (13), and measure the gap. If the measured value is close to the allowable limit given in Table 2, adjust the gap by using the procedure below.

Table 2. Brake gap size

Brake type	Gap value G (in)	
	Spec. value	Allowable limit
FB — 01 FB — 02 FB — 05	.008 ~ .010	.020

Gap adjustment procedure

If the brake lining is so heavily worn that gap should be adjusted, proceed as follows:

1) Remove fan cover (9).
2) Insert a feeler gage into the gap between stationary core (1) and armature plate (13), and turn gap adjusting nut (6) located at the tip of each stud bolt (2) clockwise. The three adjusting nuts should be adjusted until the gaps at three circumferential points are equal in width and fall within the specification range given in Table 2.
3) Check for brake performance by turning the power to the unit on/off a few times. If no abnormality is found, apply a thread locking compound to gap adjusting nuts (6).
4) Replace fan cover (9).

c) Brake lining replacement

If the brake lining has been worn to the thickness limit given in Table 3, replace it with a new one by using the following procedure:

1) Remove fan cover (9).
2) Remove fan (10).
3) Remove all the three gap adjusting nuts (6).
4) Remove plate (12) and take out brake lining (5).
5) Fit new lining onto boss (7). Check to see that the lining moves along the boss smoothly.

Table 3. Braking lining size

Brake type	Brake lining dimension	Initial thickness	Allowable thickness limit
		t_o (in)	t_o (in)
FB — 01 FB — 02 FB — 05	t_o	.28	.22

6) After completion of the brake assembly, check for gap G. If the gap size is out of the specification range, adjust the gap adjusting nuts until the gap falls within the range.
7) After completion of gap adjustment, replace fan (10). Apply thread locking compound to the fan set bolt. Check for any abnormal brake operation by turning the power to the unit on and off a few times. If no abnormalities are detected, apply thread locking compound to the gap adjusting nuts (6).
8) Replace fan cover (9).

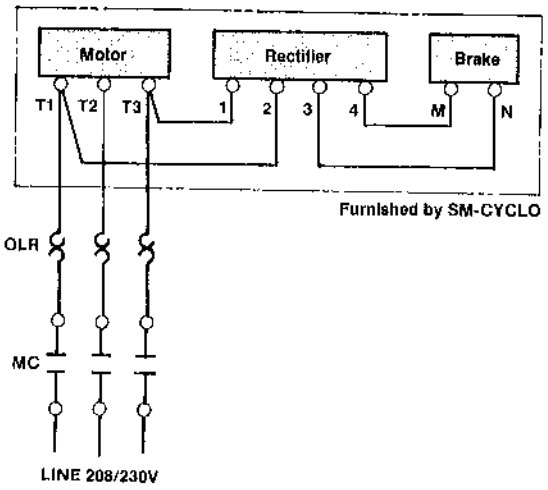
2. MODELS FB-01, -02, AND -05 (cont.)

2.3 Wiring Connection (This applies also to Models FB-1 through -8)

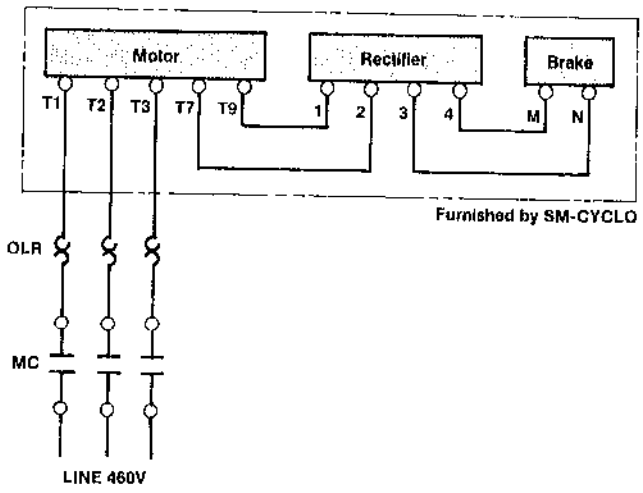
a) Normal braking action

Fig. 2-a shows the wiring diagram for the normal braking circuitry.

Fig. 2a Normal Brake Action
(1) Low Voltage



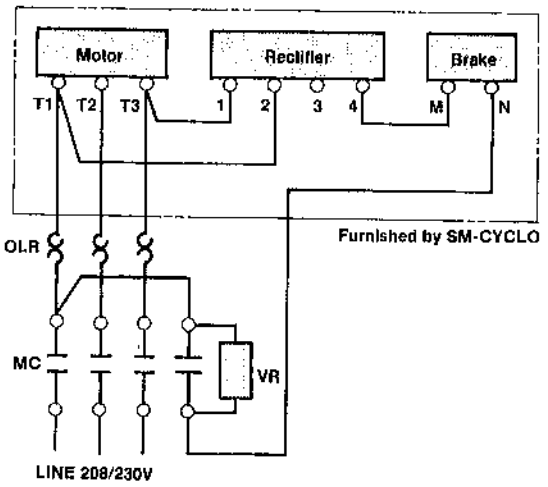
(2) High Voltage



b) Fast braking action

Fig. 2-b shows the wiring diagram for the fast braking circuitry.

Fig. 2b Fast Brake Action
(1) Low Voltage



(2) High Voltage

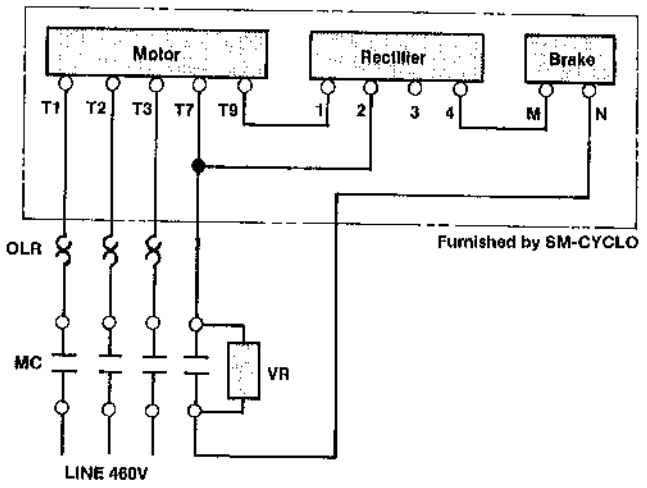


Table 4. Varistor (VR) Specifications

Brake power supply		200 ~ 230V	380V ~ 460 V
Rating voltage		AC260V ~ AC300V	AC510V
Varistor voltage		430V ~ 470V	820V
Allowable power	FB-01, 02, 05	0.2 watts or more	0.4 watts or more
	FB-1	0.4 watts or more	0.6 watts or more
	FB-2, 3, 5	0.6 watts or more	1.5 watts or more
	FB-8, 10	1 watt or more	1.5 watts or more

NOTE: For single voltage brakemotor 208V, 230V, 460V, 575V, or other special voltages please refer to the motor mounted connection diagram or refer to factory.

MC: Electromagnetic contractor
OLR: Overload or thermal relay
VR: Varistor (protective device)

2-4 Troubleshooting

The brake assembly is normal when it meets the following criteria:

a) The motor begins to run immediately after the start switch is pressed to ON.
b) No abnormal sounds are heard from the unit in operation.
c) The motor stops running within 0.5 seconds after the power to the unit is switched off.

Should any abnormalities be found, take adequate corrective action as soon as possible, by referring to Table 5 below.

Table 5. Quick Troubleshooting Guide (Applicable also to FB-1 through -10)

Problem	Possible Cause	Corrective Action
Brake fails to function normally.	Improper adjustment after reassembly.	Adjust again.
Brake slips.	Not in the fast action mode.	Change to the fast mode (Fig. 2-b).
	Foreign matter entrapped in brake lining part. Oil on lining surface	Remove foreign matter and take preventive action. Wipe lining surface with dry cloth.
	Worn brake lining.	Adjust brake gap or replace lining with a new one.
	Uneven brake gap.	Adjust evenly.
	Excessive load.	Decrease load or use larger brake frame size.
Motor won't run.	Faulty electric circuit.	Check circuit.
	Blown fuse.	Replace fuse.
	Three-phase power supply acting as singte phase.	Measure power supply voltage and check for defective circuit.
	Protective device in action.	Eliminate cause and reset.
	Broken motor winding.	Repair or replace at factory.
	Rust on brake friction surface.	Clean brake (lining).
	Adjusting nuts overtightened during gap adjustment.	Adjust brake gap again.
	Burned bearing.	Replace.
	Overload.	Check and troubleshoot load and safety device.
Abnormal noise.	Foreign material inside the brake motor.	Check inside and remove.
	Damaged bearing.	Replace.
	Worn brake lining.	Adjust brake gap or replace lining.
	Burned solenoid coil.	Replace.
	Damaged rectifier.	Replace.
Trouble under loaded condition.	Voltage drop.	Raise voltage to rated level.
	Overload.	Reduce the load or oversize the brakemotor.
	Improper protective device adjustment.	Adjust protective device.

3. MODEL FB-1A

3.1 Construction and Operating Principles

a) Construction

Fig. 3 Illustrates the construction of the brake incorporated. The restraining bolt (7) fastens the fixed plate (15), noise shield plate (16), brake shoe (17), gap adjusting sleeves (5) and spacer (4) onto the stationary core (1). The armature plate (18) is kept from rotation by the restraining bolt (7) but moves axially by electromagnetic attraction and the tension of the pressure spring (19). The brake lining (8) is fitted to the hub (10) which is secured to the motor shaft with a key. The solenoid coil (20) is energized via a rectifier provided within the terminal box.

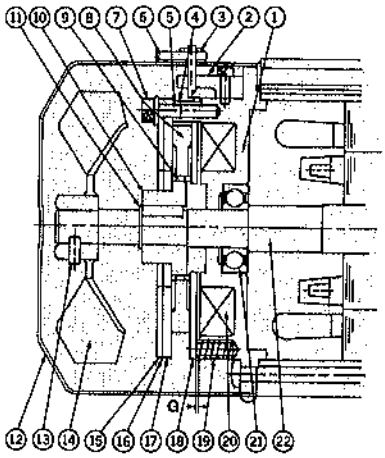


Fig. 3

Part No.	Part name	Part No.	Part name
1	Stationary Core	12	Fan Cover
2	Brake Release Support	13	Fan Set Pin
		14	Fan
3	Shifting Pin	15	Fixed Plate
4	Spacer	16	Noise Shield
5	GAP Adjusting Sleeve	17	Brake Shoe
		18	Armature Plate
6	Brake Release Lever	19	Pressure Spring
7	Restraining Bolt	20	Solenoid Coil
8	Brake Lining	21	Fan Side Motor Bearing
9	Leaf Spring		
10	Hub	22	Motor Shaft
11	Retaining Ring		

b) Operating Principles

The brake incorporated is a (fail safe type) spring actuated type brake, which will release the brake mechanism when its solenoid coil is energized and will engage when the coil is de-energized.

When power is applied to the unit, the solenoid coil and the electric motor will be energized, and the energized coil attracts the armature plate (18) against the tension of the pressure spring (19). As a result, the brake lining (8) will be disengaged, and the motor begins to run.

When the power is disconnected, the solenoid coil and the electric motor is de-energized. This causes the pressure spring (19) to actuate the armature plate (18) which in turn presses the brake lining (8) against the brake shoe (17) and brings the motor to a quick stop.

3-2 Wiring Connection

The wiring connection for model FB-1 units is the same as that for models FB-01, 02 and -05. Refer to Section 2-2.

3-3 Inspection, Adjustment and Maintenance

a) Inspection

Check the following points at regular intervals:

1) The unit is operating normally.
2) The brake lining is not worn excessively (or gap G is normal).
3) No screws in the unit are loose.

b)Manual brake release procedure.

To manually release the brake with power to the unit off, use the brake release mechanism as follows:

FB-1 thru FB-8 brakemotors are equipped with a one touch release mechanism. To disengage brake, pull up brake release lever and push forward towards reducer portion. If lever is released brake will re-engage.

c) Gap Inspection and adjustment

The model FB-1 unit may be able to withstand 2 million braking operations without adjustment. However, should it be operated frequently or under a load with large inertial mass from a long time, excessive brake lining wear might occur. From time to time, check for gap G (Fig. 3). Should gap G be too large, the solenoid coil may fail to move the armature plate and hence cannot release the brake.

Gap Inspection procedure

1) Remove fan cover (12).
2) Insert a gap gage into the gap between stationary core (1) and armature plate (18), and measure the size of the gap. Adjustment is needed if the measured value is close to the allowable limit given in Table 6. Gap measurement should be made at three appropriate circumferential points.

Table 6. Brake gap size

Brake type	Gap value G (in)	
	Spec. value	Allowable limit
FB — 1A	.006 ~ .010	.020

Gap adjustment procedure

If the brake lining is so heavily worn that gap adjustment is necessary, proceed as follows:

1) Remove fan cover (12). Measure the gap size to confirm the deviation from the specified value. The minimum adjustable deviation is .008 in.
2) Loosen set pin (13) and remove fan (14).
3) Slightly loosen restraining bolt (7), remove parts (4), (5), (7), (15), (16), and (17) together. Make certain that (7) has not been removed.
4) The thickness of one gap adjusting sleeve (5), is .008 in. Decrease the number of the sleeves in use according to the degree of the wear. Reassemble parts (4), (5), (7), (15), (16) and (17) as a set.

5) After reassembly, check for gap G. If the gap size is still too large, adjust the number of the sleeves again.
6) After completion of gap adjustment, check for brake performance by turning system power on and off a few times.
7) Replace fan (14), set pin (13) and cover (12).

(d) Brake lining replacement

When the brake lining has been worn to such a degree that its thickness has reached the allowable limit shown in Table 7, or when sleeve adjustment is no longer an effective means of gap adjustment, replace the brake lining with a new one as follows:

1) Remove fan cover (12), measure gap G. Remove set pin (13) and fan (14).
2) Slightly loosen restraining bolt (7), then remove parts (4), (5), (7), (15), (16) and (17) as a set.
3) Take out brake lining (8) and measure its thickness. During removal of the lining, care should be taken not to let leaf spring (9) come off.
4) Install a new brake lining with its smaller step side (.024 in.) toward you. Then, check to ensure that the lining moves along the boss smoothly. Care should also be taken to ensure that leaf spring (9) is not damaged nor comes off during the installation of the lining.

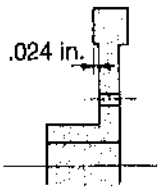


Fig. 5

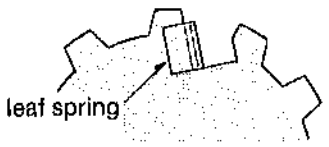


Fig. 6

5) Replace the gap adjusting sleeves removed during gap adjustment. Then, reinstall parts (4), (5), (7), (15), (16) and (17) as a set.
6) Measure gap G. Readjust if gap is out of spec. value.
7) Check for brake performance by turning system power on and off a few times.

   If no abnormalities are detected, replace fan (14), set pin (13) and cover (12).

Table 7. Brake lining size

Brake type	Brake lining dimension	Initial thickness	Allowable thickness limit
		t_o (in)	t_a (in)
FB — 1		.327	.287

3-4 Troubleshooting

The brake is normal when it meets the following criteria:
a) The motor begins to run immediately after the start switch is pressed to ON.
b) No abnormal sounds are heard from the unit in operation.
c) The motor stops running within about 0.5 seconds after power to the unit is switched off.

Should any abnormality be found, take adequate corrective action as soon as possible, by referring to Table 8 below.

Table 8. Quick Troubleshooting Guide (See also table 5)

Problem		Possible Cause	Corrective Action
Brake fails to function normally	Won't work.	Release lever still in engagement.	Disengage or reset release lever.
	Slips (longer braking time)		
Motor won't run.		Gap is too narrow.	Readjust the number of sleeves.
Abnormal noise.		• Hub leaf spring is off. • Damaged leaf spring.	Replace with correct spring.

4. MODELS FB- 2A, -3A, -5A, AND -8A

4-1 Construction and Operating Principles

a) Construction

Figs. 7 and 8 illustrate the construction of the brake incorporated. Among the brake parts, a stationary core, solenoid coil, and stud bolt constitute an integral sub-assembly unit. The armature plate is kept from rotating by the stud bolt but moves axially by electromagnetic attraction and the tension of the spring.

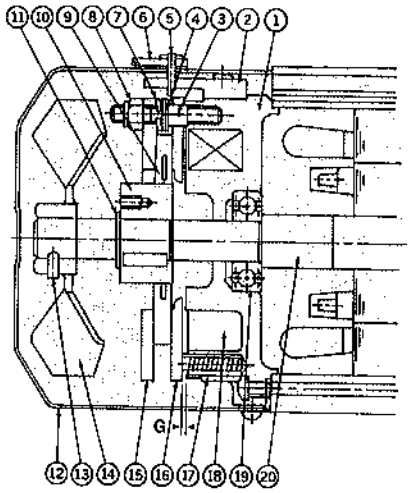


Fig. 7 FB-2A and -3A

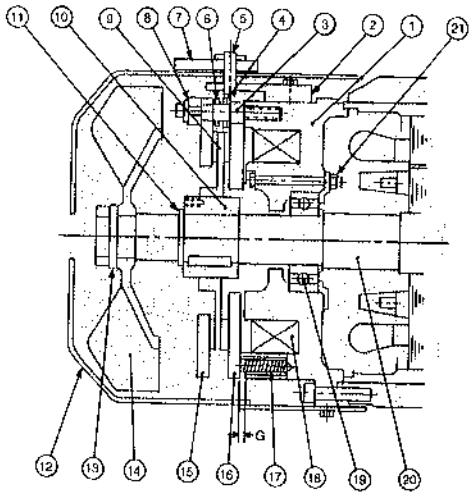


Fig. 8 FB-5A, and -8A

Part No.	Part name	Part No.	Part name
1	Stationary core	11	Retaining Ring
2	Brake Release Support	12	Fan Cover
		13	Fan Set Screw or Pin
3	Stud Bolt	14	Fan
4	GAP Adjusting Sleeve	15	Brake Shoe
		16	Armature Plate
5	Shifting Pin	17	Pressure Spring
6	Brake Release Lever	18	Solenoid Coil
7	Spring Washer	19	Fan Side Motor Bearing
8	Nut		
9	Brake Lining	20	Motor Shaft
10	Hub	21	Bearing Cover

The adjusting sleeve and spring washer hold the brake shoe against the nut at all times. The brake lining is fit to the hub, which is secured to the motor shaft with a key. The solenoid coil is energized via a rectifier provided within the terminal box.

b) Operating Principles

The brake incorporated is a (fail safe type) spring actuated type brake, which will release the brake mechanism when its solenoid coil is energized and will engage when the coil is de-energized.

When power is applied to the unit, the solenoid coil and the electric motor will be energized, and the energized coil attracts the armature plate against the tension of the pressure spring. As a result, the brake lining is disengaged, and the motor begins to run. When the power is disconnected, the coil and the motor will be de-energized. This causes the spring to actuate the armature plate, which in turn presses the brake lining against the brake shoe and brings the motor to a quick stop.

4-2 Wiring Connection

The wiring connection for models FB-2A, -3A, -5A and -8A is the same as that for models FB-01, -02 and -05. Refer to Section 2.2.

4-3 Inspection, Adjustment and Maintenance

a) Inspection

Check the following points at regular intervals:

1) The unit is operating normally.
2) The brake lining is not worn excessively (or gap G is normal).
3) All the mounting screws are securely tightened.

b) Manual brake release procedure

To manually release the brake with power to the unit off, use the brake release mechanism as follows:

FB-1A thru FB-8A brakemotors are equipped with a one touch release mechanism. To disengage brake, pull up brake release lever and push forward towards reducer portion. If lever is released brake will re-engage.

c) Gap inspection and adjustment

The brake lining will wear after the unit has been used for a long period of time. It is necessary to check the brake for gap G from time to time (Figs. 7 and 8). Should the gap G become too large, the solenoid coil may fail to move the armature plate and hence cannot release the brake, resulting in the unit remaining in a continuously braked condition.

Gap inspection procedure

1) Remove fan cover.
2) Insert a gap gage into the gap between stationary core and armature plate, and measure the size of the gap. Adjustment may be needed if the measured value is close to the allowable limit given in Table 9. Gap measurement should be made at three appropriate circumferential points.

Table 9. Brake gap size

Brake type	Gap value G (in)	
	Spec. value	Allowable limit
FB — 2A, 3A	.018 ~ .020	.035
FB — 5A	.024 ~ .026	.043
FB — 8A	.026 ~ .028	.055

Gap adjustment procedure

If the brake lining is so heavily worn that gap adjustment is required, proceed as follows:

1) Remove fan cover.
2) Insert a gap gage into the gap between stationary core and armature plate, and rotate the nut at the tip of stud bolt clockwise until appropriate gap size is reached. Should gap be too large for this adjustment, decrease the number of adjusting sleeves in use. The three nuts should be evenly adjusted by turns until the gaps at the three circumferential points are equal in width and fall within the specification range shown in Table 9.
3) Check for brake performance by turning system power on and off a few times.
4) Replace fan cover.

d) Brake lining replacement

If the thickness of the brake lining has been worn to the allowable limit shown in Table 10, replace it with a new one as follows:

1) Remove fan cover.
2) For models FB-2A, -3A and -5A, remove fan set pin. For models FB-8A, remove fan by loosening fan set screw.
3) Remove all three nuts.
4) Remove brake shoe and take out brake lining.
5) Fit a new brake lining onto hub, check to ensure that the lining moves along the hub smoothly. For models FB-5A through -8A, care should be taken not to fit the lining inside out.
6) After completion of brake assembly, measure gap G. If the gap is out of the specification range, adjust by rotating gap adjusting nut.
7) Check for brake performance by turning system power on and off a few times.
   If no abnormalities are detected, replace fan, set pin or fan set screw and fan cover into position.

Table 10. Braking lining size

Brake type	Brake lining dimension	Initial thickness	Allowable thickness limit
		t_o (in)	t_o (in)
FB — 2A, 3A		.315	.236
FB — 5		.433	.276
FB — 8		.472	.315

4-4 Troubleshooting

The brake is normal when it meets the following criteria:

a) The motor begins to run immediately after the start switch is pressed to ON.
b) No abnormal sounds are heard from the unit in operation.
c) The motor stops running within about 1 second after power to the unit is switched off.

Should any abnormality be found, take adequate corrective action as soon as possible, by referring to Table 11 below.

Table 11. Quick Troubleshooting Guide (See also Table 5)

Problem		Possible Cause	Corrective Action
Not adjustable to specified gap size.		Excessively worn brake lining	Decrease the number of adjusting sleeves.
Brake fails to function normally	Won't work.	Release lever still in action.	Disengage or re-adjust release lever.
	Slips (longer braking time)		
Motor won't run.		Gap too wide due to loose nut.	Replace nut with a new one.

5. MODELS CMB-10, -15 AND -20

5-1 Construction and Operating Principles

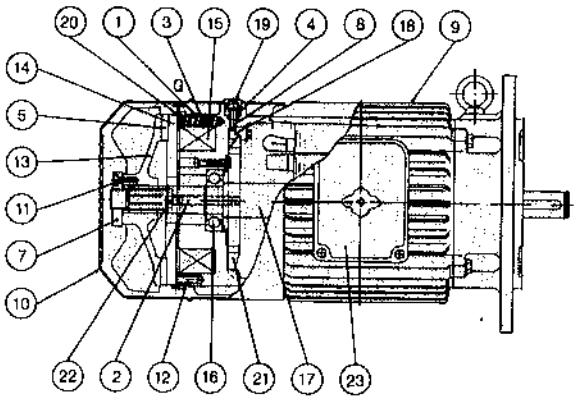


Fig. 9

Part No.	Part name	Part No.	Part name
1	Stationary Core	13	Brake Wheel
2	Restraining Bolt	14	Armature Plate
3	Pressure Spring	15	Solenoid Coil
4	Auxiliary Spring	16	Bearing
5	Brake Lining	17	Motor Shaft
7	Restraining Nut	18	Roller
8	Adjusting Bolt (Not Supplied)	19	Plug
		20	Dust Proof Seal
9	Motor	21	Shifting Plate
10	Fan Cover	22	Nut
11	Bolt	23	Conduit Box
12	Pin		

a) Construction

Each brake consists of a solenoid coil (15), armature plate (14), and brake lining (5). The armature plate (14) is free to move axially along the motor shaft (17) but is restrained from rotation by a pin (12). A pressure spring (3) forces the armature plate (14) against the brake wheel (13) which is fixed to the motor shaft (17). The restraining nut (7) restrains the brake wheel against axial motion when braking.

A threaded stud passes through the armature plate (14) and stationary core (1), threading into the shifting plate (21). A nut (22) is installed on one end of the stud.

The brake includes an air gap adjustment mechanism which consists of a roller (18), adjusting bolt (8), auxiliary spring (4), and shifting plate (21).

b) Operating Principles

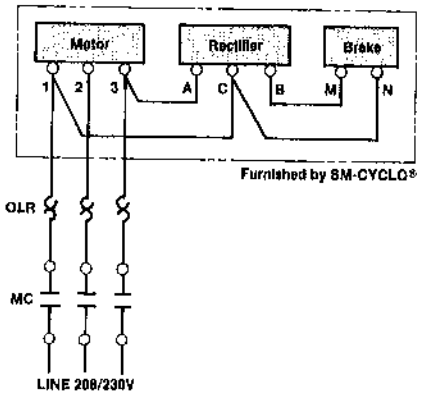
When power is applied the current flows through the solenoid coil, an electromagnetic force attracts the armature plate — overcomes spring forces — the brake disengages and the motor shaft begins to rotate.

When the power is removed, the current flow through the solenoid coil stops and the electromagnetic force decays. The spring (3) force now moves the armature plate (14) towards the brake wheel (13) pressing the brake lining (5) against the brake wheel and the motor shaft quickly comes to a stop.

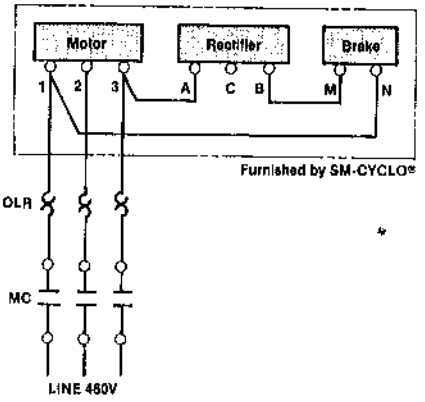
5-2 Wiring Connection

NOTE: For single voltage brakemotor 208V, 230V, 460V, 575V, or other special voltages please refer to the motor mounted connection diagram or refer to the factory.

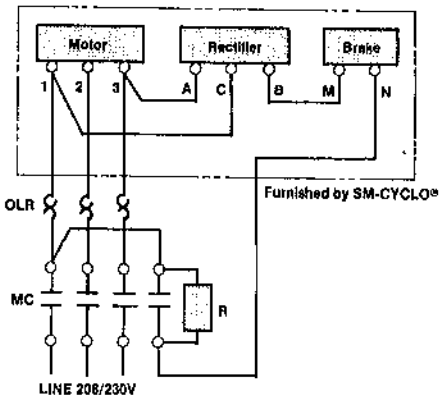
Normal Brake Action
(1) Low Voltage 200 ~ 230V



(2) High Voltage 400 ~ 460V

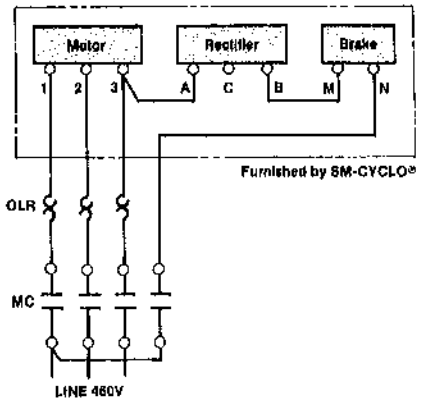


Fast Brake Action
(1) Low Voltage 200 ~ 230V



OLR: Overload Relay or Thermal Relay
MC: Electromagnetic Contactor
R: Resistor (2 watt, 200~300Ω)

(2) High Voltage 400 ~ 460



5-3 Adjustment and Maintenance

a) Brake Lining Inspection

If the brake has been in operation for a long period of time and then starts to operate improperly, check the brake lining for wear. Under normal use the lining will wear after approximately 200,000 engagements.

b) Inspection of Air Gap "G"

The air gap "G" will increase as the brake lining wears. It must not exceed .050 inches, or difficulty may be experienced. To check the air gap, proceed as follows.

a) remove the plug (19), cover (10) and the dust proof seal (20).
b) insert a feeler gage between the stationary core and the armature plate. If air gap exceeds .050 inches, adjust the gap as follows.

c) Adjustment of Air Gap "G"

a) remove the two bolts (2) using a socket head wrench.
b) install an M8 thread by 30mm long brake adjusting bolt at position #8 figure 9.
c) turn the brake adjusting bolt (8) clockwise until the brake is completely released.
d) tighten the restraining nut (7) until the lining (5) just about contacts the brake wheel.
e) remove the brake adjusting bolt installed in step d above. Air Gap "G" should now measure 0.030 inches or less.

DANGER — Failure to remove the brake adjusting bolt will result in an inoperative brake.

f) install bolts (2) and tighten.
g) install dust proof seal (20), cover (10), and plug (19).
h) test brakemotor a few times to insure proper operation.

5-4 Troubleshooting

The brake is normal when it meets the following criteria:
a) The motor begins to run immediately after the start switch is pressed to ON.
b) No abnormal sounds are heard from the unit in operation.
c) The motor stops running within approx. 1.5 seconds after the power to the unit is switched off. Should any abnormality be found, take adequate corrective action as soon as possible, by referring to Table 12 below.

Table 12. Quick Troubleshooting Guide (For Models CMB-10 through -20)

Problem	Possible Cause	Corrective Action
Brake inoperative	Brake lining excessively worn	Inspect according to par 5-3-b
	Improperly serviced after assembly	Reservice
Motor does not rotate when power is applied	Air gap G excessively increased	Adjust gap G according to par 5-3-c
	Electromagnetic coil opened	Repair it at service shop
	Recitifier damaged	Replace it
	Wiring failure	Wire correctly
	Voltage drop	Contact SUMITOMO
	Retaining nut overtightened in serving	Readjust
	Spring overtensioned	Pressure spring correctly.
Long braking time	Fast action circuit not used	Change to fast action (refer to par 5-2)
	Air gap G excessive, friction disc comes in contact with nut	Adjust gap G according to par 5-3-c
	Insufficient brake torque	Adjust spring compression
Brake cannot operate continuously due to reset mechanism	Restraining nut overtightened	Readjust according to par. 5-3-c
	Motor protection device improperly adjusted	Reset bolt

FORMULA AND CONVERSION REFERENCE TABLES

TORQUE

$$T = \frac{63025 \times HP}{rpm}$$

T = Torque inch lbs.
HP = Horsepower transmitted
rpm = Revolutions per minute

HORSEPOWER

$$HP = \frac{T \times rpm}{63025}$$

VELOCITY

a.) ANGULAR

$$\omega = 2\pi \times r \times rpm$$

b.) LINEAR

$$V = 2\pi \times r \times rpm$$

V = Linear velocity (ft./min.)
R = Radius (feet)
rpm = Revolutions per minute
ω = Angular velocity (radians per minute)

ANGULAR ACCELERATION

$$\Theta = \frac{2\pi \times N}{60t}$$

Θ = Angular Acceleration (radians/sec/sec)
N = Angular velocity (rpm)
t = Time in sec. required to accelerate from rest
J = Moment of inertia (lb. ft./ft. of system) Motor and load
N_M = Motor speed (rpm)
T_M = Motor torque (lb. ft.)
T_L = Load torque (lb. ft.)

ACCELERATION TIME

$$tacc = \frac{J}{308} \times \frac{N_M}{T_M - T_L}$$

CONVERSION IN UNIT SYSTEMS

a) Length

	ft (foot)	in (inch)	m (meter)	mm (millimeter)
1 ft. =	1	12	0.3048	304.8
1 in. =	0.0833	1	0.0254	25.40
1m =	3.281	39.370	1	1,000
1mm =	0.0033	0.0394	0.001	1

b) weight

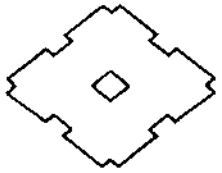
	lb (pound)	oz (ounce)	kg (kilogram)	g (gram
1 lb =	1	16	0.4536	453.6
1 oz =	0.0625	1	0.0284	28.35
1 kg =	2.205	35.27	1	1,000
1 g =	0.0022	0.0353	0.001	1

c) Torque

	ft-lb (foot pound)	in-lb (inch pound)	kgm (kilogram meter)
1 ft lb. =	1	12	0.1383
1 in lb. =	0.0833	1	0.0115
1 kgm =	7.233	86.8	1

d) Power

	HP (British horsepower)	PS (horsepower Metric)	KW (kilowatt)	kgm/s
1 HP =	1	1.014	0.7455	76.04
1 PS =	0.9863	1	0.7355	75
1 KW =	1.341	1.360	1	102.0



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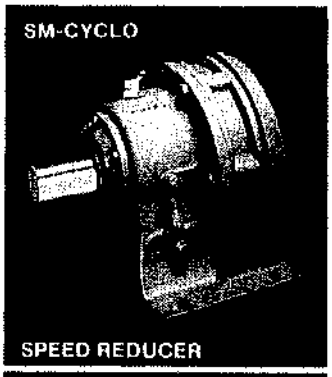

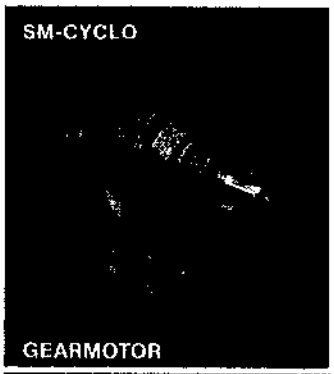

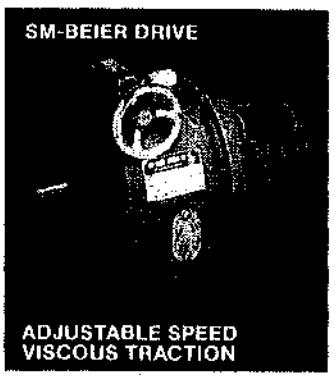

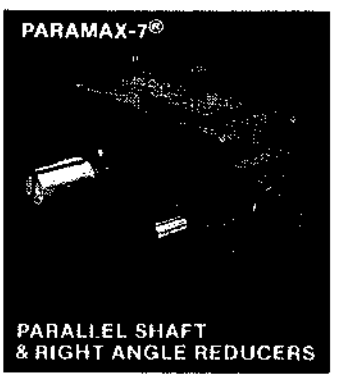

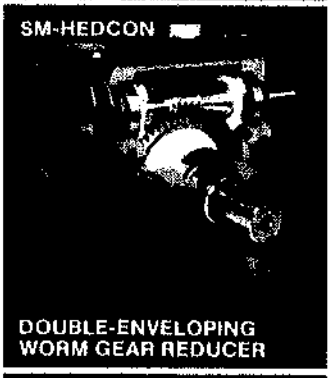

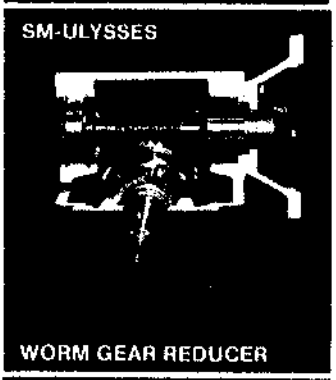

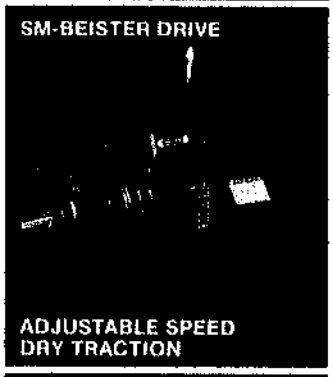

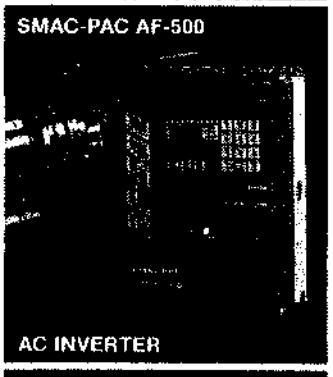

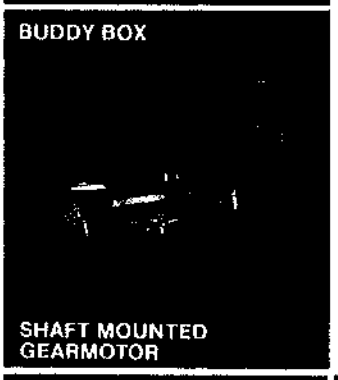

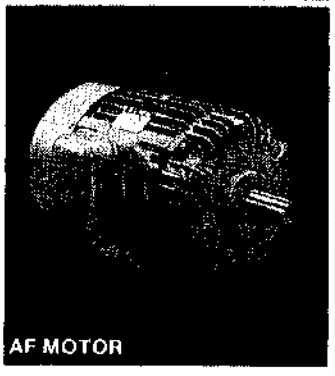

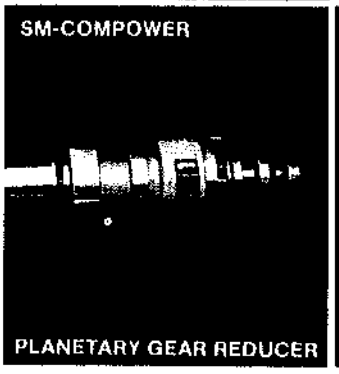

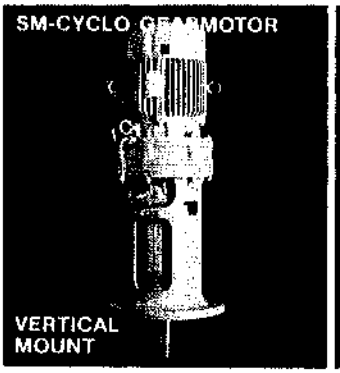

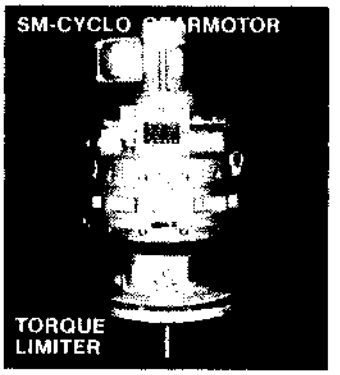

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