HydroCaL

Garwood Paperboard

New Jersey

Cavitation Air Flotation System
CAF®-320
Serial # HCAF2141A0898
Aerator # HAA1135G0998
HAA1136G0998
HAA1137G0998

Operation and Maintenance Manual

August 1998

TABLE OF CONTENTS

W A R N I N G

The HydroCal Flotation System involves chemical processes as well as mechanical and electrical parts.

- Electrical repairs, alterations or adjustments should be carried out only by a qualified electrician.

- Mechanical repairs, alterations or adjustments should be carried out only by a qualified mechanic or fitter.

- Handling and use of chemicals should be carried out in strict accordance with the chemical manufacturer's instruction, bearing in mind all necessary safety precautions.

- No electrical or mechanical repairs, alterations, adjustments or servicing should be carried out when the equipment is in operation.

- When carrying out alterations, repairs, adjustments or servicing to the equipment, the main electrical supply to all equipment must be switched off.

- All guards, protectors or safety devices must be securely in place prior to and during equipment operation.

- All plant operators must be suitably trained with respect to the correct operation of all the equipment and must be familiar with the operating, maintenance and safety instructions.

- No loose garments should be worn during plant operation by operators or other personnel moving close to the equipment and any materials capable of coming into contact with moving parts should be removed.

- All normal safety precautions relevant to the operation and maintenance of electrical and mechanical equipment should be strictly adhered to.

- Suitable tools must be used for all repairs and maintenance.

- Where heavy objects are to be lifted or moved, a suitable number of personnel should be used or suitable lifting equipment employed.

- All electrical and mechanical equipment must be inspected at regular and suitable intervals to ensure its operating safety.

- All alterations, servicing, operating, adjusting and repairing must be carried out in strict accordance with the manufacturer's or supplier's instructions and in accordance with all the local, state or national laws and regulations applying.

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Users assume full responsibility for determining the appropriate application of any product, method or suggestion, and for adopting such precautions against damage to property or injury to persons as are necessary or advisable under the circumstances of use. NO WARRANTY OF FITNESS OF A PARTICULAR PURPOSE IS MADE. No statement contained in HydroCal, Inc., technical data sheets is to be construed to constitute the permission, recommendation or encouragement of any use of application that may infringe any patents now or hereafter in existence.

SECTION ONE

INSTALLATION

I. GENERAL GUIDELINES:

Since every application and installation will vary greatly, the following installation instructions are only general guidelines. Local building codes and electrical codes should be adhered to.

The HydroCal Flotation cell should be **installed on a sound, level foundation or structure** suitable for the weight of the Unit including hydraulic loading.

The unit must be level in both directions for efficient operation.

All plumbing connections should be sealed. All electrical piping and wiring work should be to code and installed by a qualified electrician.

Wastewater to be treated can be gravity fed or pumped to the unit; pumping is the preferred method to ensure the most consistent flow. Effluent discharge can either be by gravity or pump.

When Customer or other has completed installation and the unit is ready for start-up, HydroCal, Inc. should be notified. A qualified technician will then visit the site, inspect the unit, and perform the start-up and commissioning.

Caution: **Do not start up the Aerator in a dry condition**;
Seals in the Unit require cooling by liquid.

SECTION TWO

START-UP

I. PREPARATION FOR START-UP:

A. Check aerators to see that everything is secure and that no objects are lying on the bottom of the aeration chamber, i.e. pipe fittings, hand tools.

B. Check that nothing is in the way of the scraper mechanism - i.e. nothing on the beach.

C. Check that nothing is obstructing the auger. **(Auger is optional equipment)**

D. Adjust torque limiter (see section eight).

E. Fill main tank with wastewater.

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II. START-UP PROCEDURE:

Caution:

Check each motor for voltage hook-up
Check rotation of each motor.
Jog each motor individually.

- The aerator motor fan should be turning in a clockwise direction. (Do not run dry!)

- The scraper motor direction depends on mounting position of gearbox. Check that this direction is correct.

III. LIQUID LEVEL ADJUSTMENT

To set the HydroCal Float for proper liquid level:

A. Adjust the weir plate located at the discharge end of the unit. The weir plate is held in place by four bolts.

B. Adjust plate until liquid (not sludge) in main tank reaches center of metal beach. At this point, scraper paddles should be approximately one inch into liquid, provided that the flow rate is consistent.

C. Tighten bolts on weir plate.

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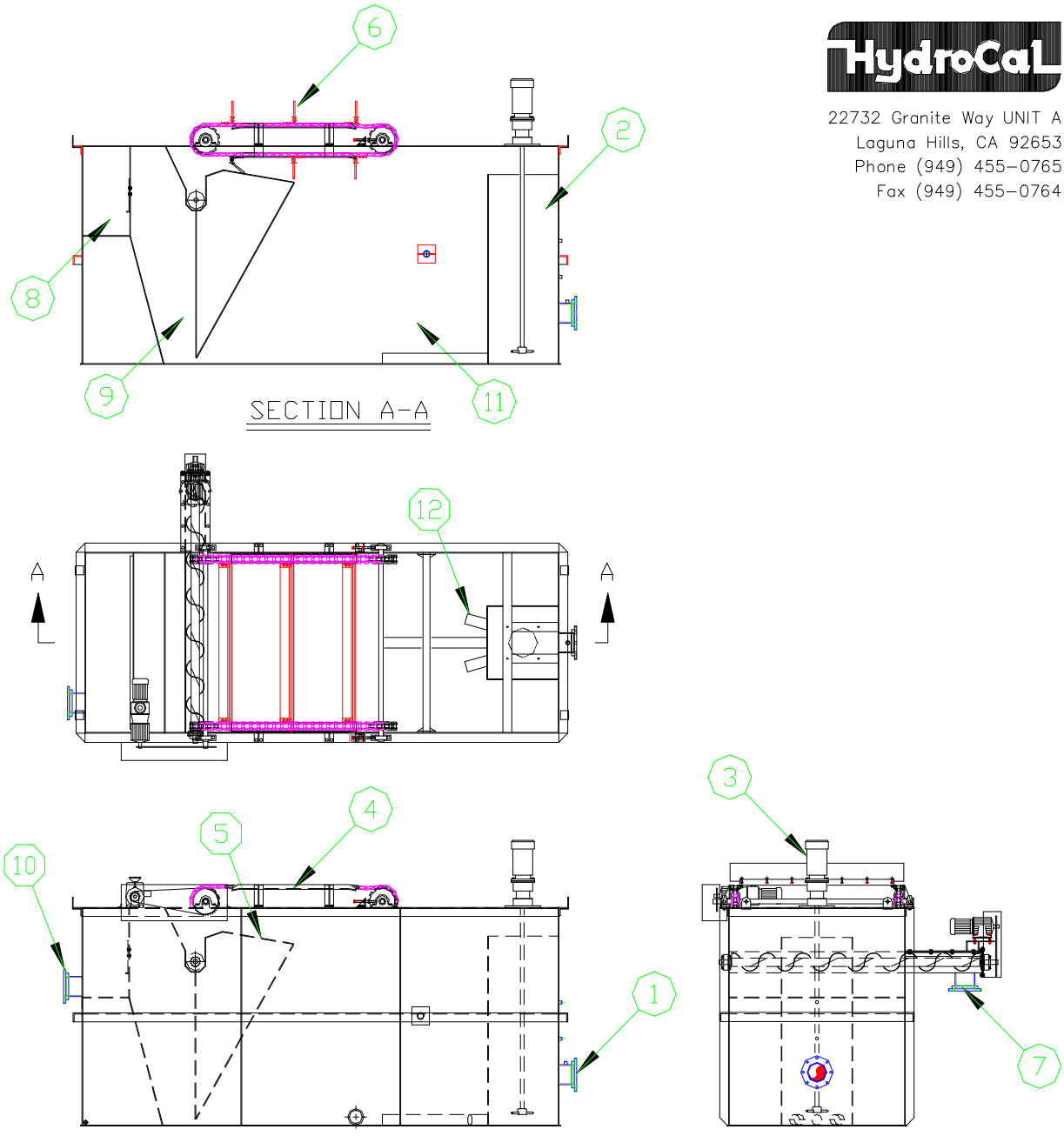


CAF Flotation Cell Diagram

LARGE MODELS

1. INLET
2. AERATION CHAMBER
3. PATENTED AERATOR
4. SCRAPER CHAIN GUIDES
5. BEACH
6. SCRAPER MECHANISM
7. AUGER DISCHARGE
8. WEIR DISCHARGE CHAMBER
9. WEIR CHAMBER
10. OUTLET CONNECTION
11. MAIN TANK
12. RECYCLE PIPE

L:/EQUIPMENT/Manuals/CAF Floctation Cell Diagram/940252-Large CAF Modals

NOTE: The auger is an optional piece of equipment.

SECTION THREE

SERVICE

I. AERATOR:

A. AERATOR REMOVAL:

There is a hook eye on the aerator body.

1. Unscrew the four bolts from aerator base plate.

2. Hook chain to hook eye.

3. As aerator weighs approximately 300 pounds, remove by mechanical hoist or forklift.

B. REPLACEMENT OF SEALS:

1. Loosen bottom SS (Stainless Steel) lock nuts, which are located above the impeller (aerator head).

2. Unscrew aerator head. To do this, remove the 6mm X 75mm SS bolt, nut and lock washer located on bottom of aerator head.

3. Remove the two SS lock nuts. The bottom section of the mechanical seal will then slip out.

4. In order to remove the top section of the mechanical seal, remove the housing from this upper section which is attached to the main body of the aerator by four Hex head bolts. Unscrew Hex head bolts. Slip off housing which contains the top half of the mechanical seal.

5. Press out tops half of mechanical seal - Note position of seal.

6. To replace seal, reverse this procedure.

Be sure that mechanical seal surfaces are clean and free of oil or grease.

C. REPLACEMENT OF BOTTOM BEARING:

1. Remove aerator head, lock nuts, mechanical seal and housing. See “Replace Seals” procedure.

2. Remove bearing housing by unscrewing top four (4) Hex head bolts. Bearing housing will then slip off.
3. Remove bearing from housing.

4. Replace with new bearing - #6307 2RS or equal.

5. To reassemble aerator, reverse procedure.

D. REPLACEMENT OF AERATOR HEAD:

1. Loosen bottom SS lock nuts located at the top of aerator head (impeller).

2. Remove the 6-mm X 75 mm SS bolt located on the bottom of the aerator head.

3. Unscrew aerator head from shaft counterclockwise.

4. Replace with new head.

5. To reassemble, reverse procedure.

E. REPLACEMENT OF TOP BEARING:

1. Remove aerator motor by unscrewing four nuts.

2. Inside the main housing is a half coupling. Remove this by unscrewing the setscrew. Half coupling will then slip off shaft.

3. Remove motor mount.

4. Remove bearing retaining ring located on the top of bearing.

5. Next, remove bearing housing.

6. Slip bearing out of housing.

7. Replace with 6307 2RS or equal.

8. To reassemble, reverse procedure.

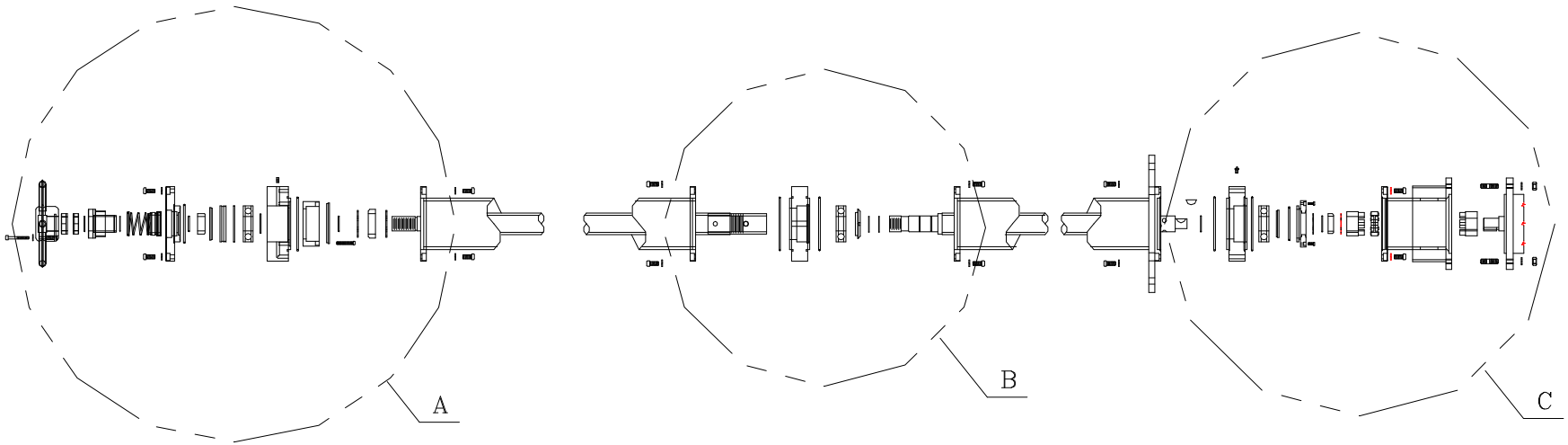
F. REPLACEMENT OF SHAFT:

If shaft is damaged, call HydroCal, Inc., or your local representative.

G. REPLACEMENT OF AERATOR MOTOR:

1. Unscrew four nuts.

2. Motor can now be removed from aerator either for service or replacement.



GENERAL NOTES

UNLESS OTHERWISE SPECIFIED

JOB NO.	P.O. NO.		
APPROVALS		DATE	
DRAWN BY M.NERREN		10/20/92	
MATERIAL SPEC.	CHECKED BY		
PAINT	ISSUED BY		

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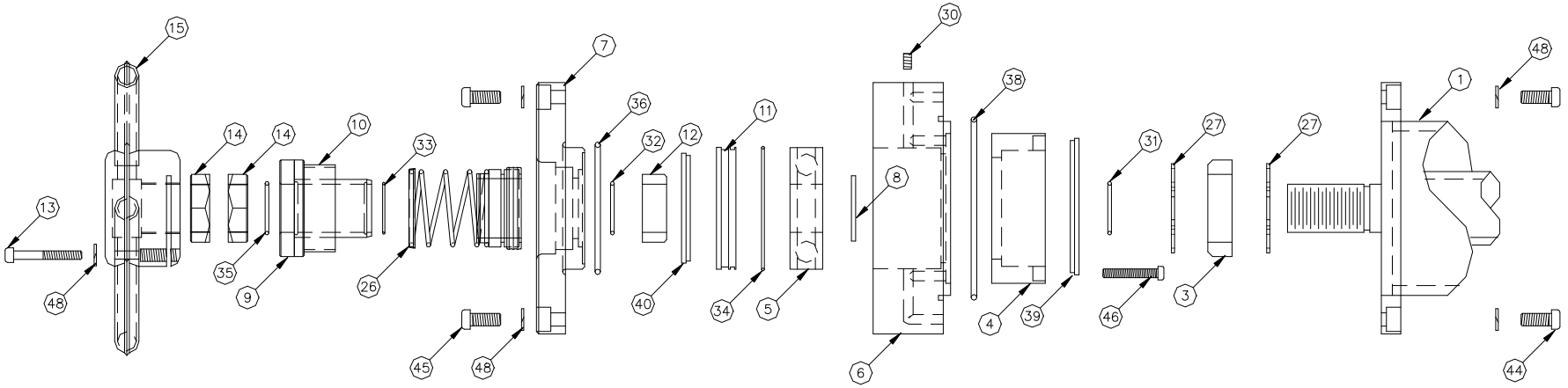
PROJECT: AERATOR

SHEET TITLE:

DRAWING NO.	SCALE	REV.
920328	NONE	A

SHEET 1 OF 6



DETAIL –A

GENERAL NOTES

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PROJECT: AERATOR

SHEET TITLE:

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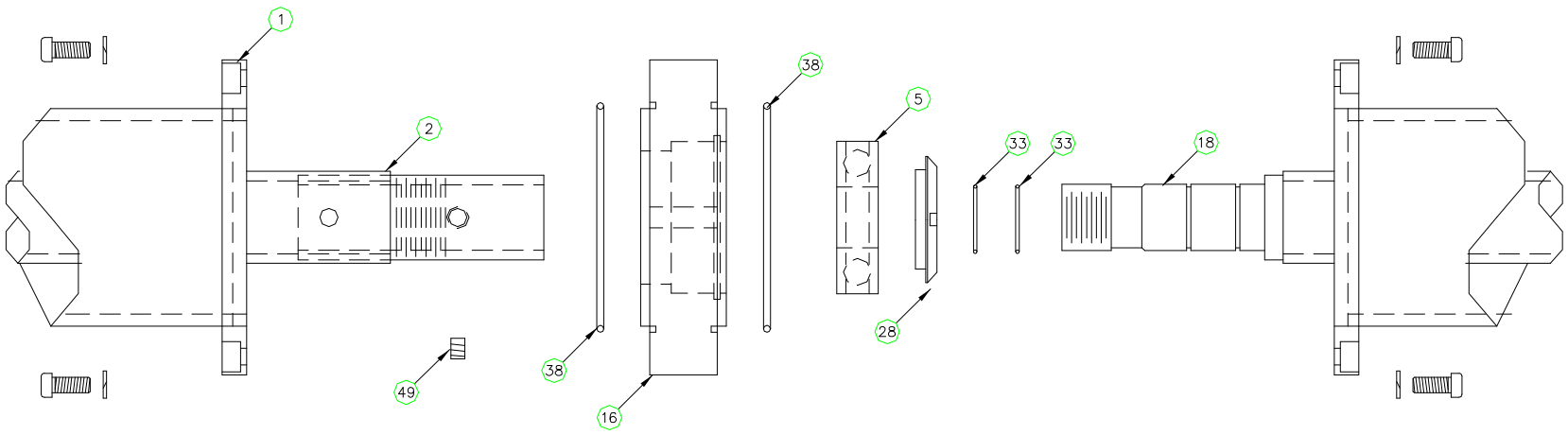
SHEET 2 OF 6



DETAIL -B

GENERAL NOTES
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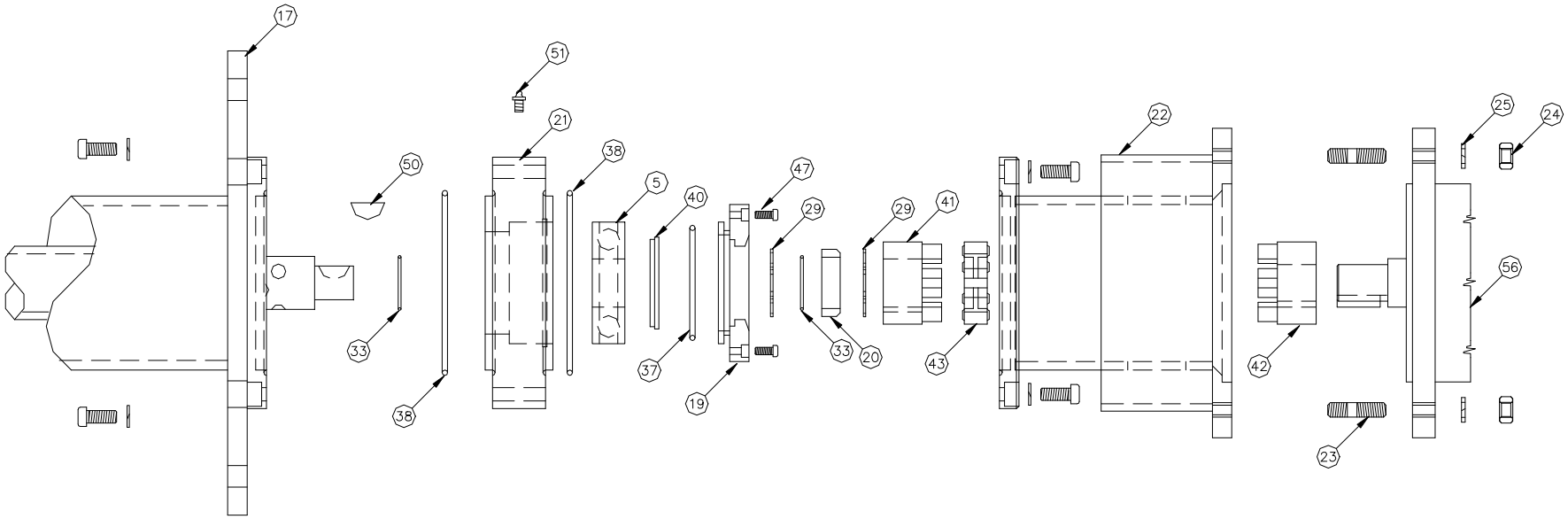
PROJECT: AERATOR
SHEET TITLE:
DRAWING NO. 920328
SCALE: NONE
REV. A
SHEET 3 OF 6



DETAIL –C

GENERAL NOTES
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PROJECT: AERATOR
SHEET TITLE:
DRAWING NO. 920328 | SCALE NONE | REV. A
SHEET 4 OF 6

AERATOR PART LIST

QTY. REQD	HYDROCAL PART OR IDENTIFYING NO.	VENDOR PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL/SPECIFICATION	PART NO.
1	A1LST		Lower Support Tube		1
1	A2LAS		Lower Air Shaft		2
1	A3GRR		Lower Grease Retainer Seal Ring		3
1	A4GSR		Grease Seal Retainer		4
3	A5BRG		Bearing	SKF	5
1	A6LBH		Lower Bearing Housing		6
1	A7MSR		Mechanical Seal Retainer		7
1	A8PS		Plastic Spacer		8
1	A9SS		Seal Sleave		9
1	A10SK		Seal Sleave Skirt		10
1	A11LSR		Lower Grease Seal Retainer		11
1	A12LGR		Lower Grease Retainer Seal Ring		12
1	AP13LS		Impeller Lockscrew		13
2	A14LKN		Locknut (Impeller & Seal Sleave)		14
1	A15IMP		Impeller		15
1	A16CBH		Center Bearing Housing		16
1	A17UST		Upper Support Tube		17
1	A18UAS		Upper Air Shaft		18
1	A19USR		Upper Grease Seal Retainer		19
1	A20UGR		Upper Grease Retainer Seal Ring		20
1	A21UGR		Upper Bearing Housing		21
1	A22MM		Motor Mount		22
4	A23MMS		Motor Mount Stud		23
4	A24MMN		Motor Mount Nut		24
4	A25MLW		Motor Mount Lockwasher 10mm		25
1	A26MS		Mechanical Seal		26
2	A27LRR		Lower Seal Ring Retaining Ring		27
1	A16CBR		Center Bearing Retaining Ring		28
2	AP29URR		Upper Seal Ring Retaining Ring		29
1	AP30PPG		Pipe Plug		30
1	AP31OR		"O"–Ring ARP 031	ARP 301	31
1	AP32OR		"O"–Ring ARP 024	ARP 024	32
5	AP33OR		"O"–Ring ARP 026	ARP 026	33
1	AP34OR		"O"–Ring ARP 041	ARP 041	34

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SHEET NO. 5 OF 6

DWG.NO. 920328 REV A

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AERATOR PART LIST

QTY. REQD	HYDROCAL PART OR IDENTIFYING NO.	VENDOR PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL/SPECIFICATION	PART NO.
1	AP350R		"O"–Ring ARP 124	ARP 124	35
1	AP360R		"O"–Ring ARP 235	ARP 235	36
1	AP370R		"O"–Ring ARP 233	ARP 233	37
5	AP380R		"O"–Ring ARP 246	ARP 246	38
1	AP39LAS		Lower Air Shaft Seal		39
2	AP40GRS		Lower & Upper Grease Retaining Seal		40
1	AP41SCH		Air Shaft Coupling Half		41
1	AP42MCH		Motor Coupling Half		42
1	AP43CS		Coupling Spider		43
24	AP44STS		Support Tube Screw M8x20	M8 x 20	44
4	AP45SRS		Seal Retainer Screw M8x25	M8 x 25	45
4	AP46LRS		Lower Retainer Screw M6x40	M6 x 40	46
4	AP47URS		Upper Retainer Screw 10–32x5/8	10–32x5/8	47
25	AP48LKW		Lockwasher 8mm	M8	48
1	AP49SS		Air Shaft Setscrew		49
1	AP50WK		Air Shaft Woodruff key	# 607	50
1	AP51GF		Grease Fitting		51
1	AM52MTR		Motor – 3hp	DFT100LS4CW	52
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DWG.NO. 920328 REV A

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2 METER AERATOR PRE-ASSEMBLED PARTS LIST

PART NO.	HYDROCAL PART OR	NOMENCLATURE OR DESCRIPTION	UNIT PRICE	QTY RECD
1	A9SSA Consisting of parts: a9ss, a10sk, ap330r, ap35or	Seal Sleeve Assembly	278.98	1
2	A4GRA Consisting of parts: a4gsr, ap40grs	Grease Seal Retainer (low air shaft)	192.30	1
3	A11LRA Consisting of parts: a11lsr, ap40grs	Grease Seal Retainer (lower) Assembly	126.30	1
4	15IMPA Consisting of parts: a15imp, ap13ls, ap48lkw	Impeller Assembly	834.46	1
5	A19URA Consisting of parts: a19usr, ap40grs	Grease Seal Retainer (upper) Assembly	148.30	1
6	AP3138ORA Consisting of parts: ap31or, ap32or, ap33or (5), ap34or, ap35or, ap36or, ap37or, ap38or (5)	Complete Seat of O-Rings	21.70	1

II. SCRAPER MECHANISM:

A. SCRAPER COMPONENTS:

1. Two shafts
2. Four polymer sprockets
3. Four pillow block bearings
4. Two pillow block bearing adjusters
5. Polymeric chain
6. Rubber paddles
7. Gear motor
8. Gear drive sprockets
9. Gear drive chain
10. Chain guard
11. Torque-Limiter

B. REPLACEMENT OF PILLOW BLOCK BEARINGS:

1. There are two sets of bearings. One set is permanent, the other is adjustable. Loosen adjustable bearings by loosening the two bolts, which clamp bearing to top surface of HydroCal Flotation unit. Release tension on the chains by adjusting the tensioning screws counter-clockwise until shaft and sprockets become loose.
2. Unscrew setscrews, which clamp bearing to shaft.
3. Remove two bearing bolts completely, faulty bearing can now be removed.
4. Remove bearing block from shaft.
5. Replace with new bearing.
6. To reassemble, reverse procedure.

C. REPLACEMENT OF POLYMERIC SPROCKETS:

1. Remove bearing, by following procedure for removing pillow block bearing.

2. Break the linkage on the chain by removing the linkage pin. Pin is pressed into position. Chain is split and free from sprocket.

3. Unscrew two setscrews that are mounted in the hub of sprocket. These set screws clamp sprocket to shaft.

4. Slip sprocket off shaft.

5. Replace with new sprocket.

6. To reassemble, reverse procedures.

D. REPLACEMENT OF CHAIN:

1. See procedure for replacing pillow block bearing, step one.

2. Replace broken part of chain.

3. Reconnect chain by reversing procedure.

E. REPLACEMENT OF PADDLE:

Paddles are fabricated from SS and heavy duty 3 ply rubber.

1. Unscrew two SS nuts and bolts, which are attached at each end of the paddle assembly. This enables the paddle assembly to be removed from the operating position for adjustment or replacement.

2. To replace paddle, remove SS bolts, which attach SS plates and rubber together.

3. Install new rubber.

4. To reassemble, reverse procedure, using new SS bolts and self-locking nuts. (Aircraft nylon insert type.)

F. REPLACEMENT OF DRIVE MOTOR AND DRIVE CHAIN:

1. Isolate power source.

2. Remove chain guard.

3. Loosen the four bolts, which attach the gear motor to the main tank body. (Motor will slide forward).

4. Slide motor forward, which will release the tension from the drive chain to the motor.

5. Remove the drive chain by removing the quick release linkage.

6. Unscrew the four bolts completely.

7. Motor can be removed for servicing or replacement, or drive chain can be replaced.

8. To replace motor or chain, reverse procedure.

G. INSTALLATION OF TORQUE LIMITER:

WARNING: To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

CAUTION: Friction discs must be kept clean and free of oil or moisture at all times to obtain proper functioning of the Torque Limiter. Do not use washers under heads of tension screws.

NOTE: Refer to the drawing on page 21 when a number in parenthesis is used.

1. Back off tension screws (28) at least three turns.

2. Loosen setscrew (26) nine full turns. (Size 25 six full turns.) Remove nut (24).

3. Remove one pressure plate (18) and one friction disc (20). Place bushing (22) on hub (12).

4. Slide center member (sprocket, sheave, etc.) on bushing (22).
   NOTE: Bore finish must not exceed 125 micro-inch and both sides of center member, where contacted by discs (20), must be ground parallel (65 to 125 micro-inch) and must be clean and free of oil or moisture.

5. Replace friction disc (20) and pressure plate (18) with ground side of plate against friction disc.

6. Replace nut (24) and tighten finger tight.

7. Tighten setscrew (26) in nearest spline notch.

8. Tighten tension screws (28) alternately and evenly until heads bottom on nut 24. This provides maximum torque setting. For less torque proceed with the following directions.

ADJUSTMENT OF TORQUE LIMITER:

1. Back off tension screws (28) at least three turns.

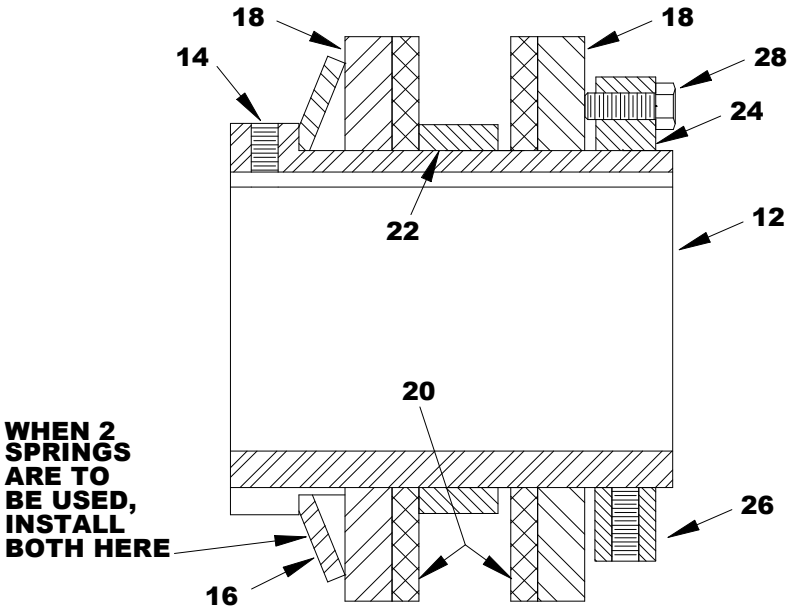
2. Loosen adjusting nut setscrew (26) at least nine turns.

3. Reset adjusting nut (24) (Turn clockwise for more torque or counterclockwise for less. Do not tighten adjusting nut beyond finger tight.)

4. Tighten adjusting nut screw (26) in nearest spline notch. (Do not tighten so screw on threads of nub.)

5. Tighten tension screws (28) alternately and evenly until heads bottom. Do not use washers under heads of these screws.

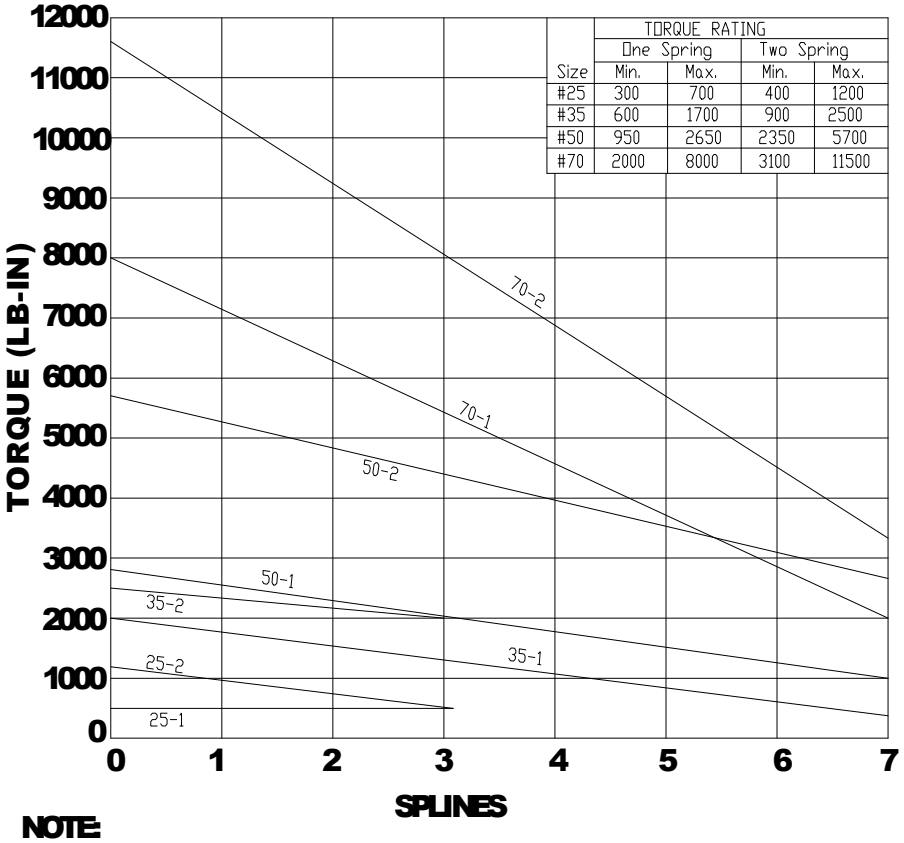
6. Check alignment of drive. If necessary, loosen hub setscrew (14) and shift hub (12) on shaft.



Refer-erence	No Req'd.	Name of Part	Part Numbers Size 25	Size 35	Size 50	Size 70
12	1	*Hub Assembly	.....	.....	.....	.....
14	1	▲Hub Set Screw	.....	.....	.....	.....
16	♦	Conical Spring	096039	096041	096042	096043
14	2	Pressure Plate	391371	391375	391379	391383
12	1	●Friction Disc	096065	096066	096067	096068
22	♦	Bushing 1/8" long	096050	096055	096062	.....
		Bushing 1/4" long	096051	096056	096063	096070
		Bushing 3/8" long	.....	096067	096064	096071
		Bushing 1/2" long	.....	.....	.....	096072
24	1	Ajusting Nut Assembly	.....	.....	.....	.....
			391372	391376	391380	391384
26	1	▲Ajusting Nut	.....	.....	.....	.....
		Set Screw	.....	.....	.....	.....
28	3	▲Tension screw	391373	391377	391381	391385

♦ As Reuired.
▲ Included in preceding assembly.
* Specify bore.
● Sold in packs of 2 only

TORQUE-TAMER CLUTCH CALIBRATION



Size	TORQUE RATING One Spring Min.	One Spring Max.	Two Spring Min.	Two Spring Max.
#25	300	700	400	1200
#35	600	1700	900	2500
#50	950	2650	2350	5700
#70	2000	8000	3100	11500

NOTE:

Graph indicates approximate rated torque vs number of splines adjusting nut is backed off from finger tight.

Numbers on calibration lines indicate TORQUE-TAMER model and quantity of compression springs. Example: 35-2 is a model 35 TORQUE-TAMER with 2 springs.

III. AUGER: (Optional Equipment)

Auger is supported at each side of the main body of the tank by two flange bearings.

A. REPLACEMENT OF BEARINGS:

1. To remove worn bearings, unscrew four bolts and set screw. Flange bearing will slide off auger shaft.

2. To replace, reverse procedure.

B. REPLACEMENT OF SCREW AUGER:

1. Isolate power source.

2. Remove chain guard.

3. Loosen four bolts on drive motor, which will lower the motor.

4. Remove drive chain by removing quick release linkage.

5. Move drive sprocket from auger drive shaft by unscrewing the set screws found in the hub of the sprocket.

6. Slip sprocket off shaft and remove key.

7. Remove the two bearings found on either side of the screw by unscrewing the four bolts in each bearing.

8. On the discharge side of the auger, remove the faceplate by removing the bolts and nuts and sliding it off the shaft.

9. Auger can now be removed from its operating position.

10. To reassemble, reverse procedure.

IV. WEIR PLATE:

A. ADJUSTMENT OF WEIR PLATE:

Adjustable weir plate is attached to the main weir section at the discharge end of the float. It is held in position by four SS bolts found on either end of the plate.

1. To adjust; slacken bolts and make necessary adjustments.

2. To replace; remove bolts nuts and washers. Plate can now be removed.

3. To reassemble; reverse procedure.

SECTION FOUR

MAINTENANCE

I. WEEKLY MAINTENANCE:

A. Check bearings for noise and vibration.

B. Lubricate metal chain only.

II. MONTHLY MAINTENANCE:

A. Lubricate bearings - DO NOT OVER LUBRICATE

B. Aerator Lubrication:

1. Only requires lubrication when bearings are replaced.

III. ANNUAL MAINTENANCE

A. Remove aerator from CAF unit and inspect for internal and or external wear or damage.

1. Take notes to compare with future annual inspections.

B. Breakdown lower bearing housing and replace bearing, grease seals, O-rings and mechanical seal. See section three (service) for procedure.

NOTE: If unusual vibration or noise is coming from the aerator, the bearings and impeller should be checked. If in good order, HydroCal or local Representative should be notified.

SECTION FIVE

TROUBLE SHOOTING

I. AERATOR:

A. Switch unit off at power source.

B. Check breakers to see if they are tripped out. If they continue tripping, shut off unit and ascertain why.

C. Check to see that impeller is turning freely.

If none of the above solves the problem, contact plant or qualified electrician to check system.

II. SCRAPER AND/OR AUGER:

A. Switch unit off at power source.

B. Check for jams binding or misalignment.

C. Check for broken chain.

D. Check bearings.

SECTION SIX

PREVENTATIVE MAINTENANCE

Any equipment is only as good as the quality of Preventative Maintenance applied to maximize the life expectancy of the equipment. HydroCal takes great pride and pleasure in utilizing the finest components available in the industry to date. With minor care, cleaning, and proper lubrication schedules, the life of the equipment can be extended considerably.

While the following is a combination of recommendations, your particular installation site should develop its own schedule based upon productivity, usage, man-hour allocations, etc.

For the purposes of this recommended Preventative Maintenance, please refer to the attached parts layout drawing on page 24-25, which is in exploded for illustrative purposes. Please refer to your specific CAF Manual for your particular equipment.. We will address the unit in four (4) basic sections and describe recommendations accordingly per section:

I. AERATOR

(Items 13 & 15 on Reference Layout Drawing - page 24-25)

Warning: Never run the aerator dry! The aerator must be connected to the HydroCal CAF unit and submersed in water. Running the aerator dry will cause significant damage to the internal components of this device.

Warning: Disconnect all power at the control panel by switching off three-phase power before removing aerator for inspection or repairs.

Caution: Aerator weighs approximately 300 pounds. Suggested removal by a hydraulic hoist, a chain fall or a forklift. There is a hook eye on the aerator body. If done by hand, at least four people should be on hand to safely lift and remove the aerator from the unit.

Refer to HydroCal CAF Operation & Maintenance Manual pages 4 & 5 and on the following addendum's listing part diagrams and locations.

1. Disconnect the power.
2. Unscrew the four bolts from the aerator base.
3. Disconnect wiring from the motor junction box.

4. Lift aerator from mounts and remove to a location, which will permit complete access to the shaft, motor, impeller, etc.

5. Inspect impeller for wear. Replace the impeller if there are any signs or wear to the tubes. Note: The impellers are stainless steel and are covered with a black epoxy coating when new. This coating will wear during use. The inspection should be that the tubes are intact and no pinholes or erosion has occurred to the impeller body.
6. Shaft should spin with minimal effort by hand. If extremely hard to turn by hand or will not turn by hand at all, refer to Section Three parts B through G in the HydroCal CAF Operation & Maintenance Manual pages 4-5.
7. Motor lubrication based upon usage. Please review the attached SKF lubrication schedule to determine your specific needs (SKF pages 26-30)
8. Reverse the above procedure to reinstall the aerator to the unit.

Caution: Never operate the aerator without the unit being reconnected to the HydroCal CAF Unit and being submersed in water. Running the aerator dry will cause significant damage to the internal components of this device.

II. SCRAPER ASSEMBLY

(Items 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12 & 14 on Reference Layout Drawing - page 24-25)

Warning: Disconnect all power at the control panel by switching off the three-phase power before removing any components such as the chain, paddle blades, bearings, or sprockets.

Caution: When working on the blades, they are heavy and should be supported to prevent injury or accidental damage to the chain, hanger block assemblies, rails, rail guides, etc.

This area of the unit works best when clean and free of debris. Build up of foreign material can impede the operation of the chain and sprockets and cause unnecessary wear on the blade inserts.

Refer to HydroCal CAF Operation & Maintenance Manual pages 13-17.

1. Lubricate pillow block bearings as required. Please refer to the SKF lubrication schedule to determine your specific intervals. (SKF pages 26-30)
2. Inspect the chain for wear marks, uneven wear, and scrape marks or gouges. Clean excess debris as prescribed by your facility-engineering department, i.e.: pressure wash down, brushing, etc.:
   a) Chain adjustment may be necessary. Chain adjusters are provided (Item 14 on drawing). Caution should be taken to avoid over tightening as well. Smooth, even movement with the adjusters rarely being over half way is optimal setting.
   b) The chain can be turned over for additional life, but care should be taken to insure the wide part of the chain is the leading edge as the chain rotates over the guide rail facing the rail from the auger (discharge) end.
   c) Inspect the rails for alignment. The ends should be even and square to the chain with a slight tilt down on the insides facing the chain. Any sharp edges, burrs, cuts or dents should be fixed immediately to prevent additional chain wear.
   d) Inspect the Teflon wear guides. They should be smooth and at least 3/16” thick particularly at the leading edge.

e) Inspect the teeth on the sprockets. If the teeth are becoming rounded, they should be replaced.
f) Inspect the hangers for the paddles for looseness and wear. Replace if necessary.
g) Inspect rubber paddles for wear, especially unevenness, as the paddles travel over the surface area (beach plate) that the paddles come in contact with at the end of the unit facing the auger (discharge) end. Adjust the paddles so the paddle comes in contact with the water approximately 1/4 inch deep. The paddles are designed to be adjusted if required.
h) Lubricate the metallic drive chain and sprocket assembly as determined by your facilities engineering department. SKF pages 26-30 will help determine the frequency. Inspect for wear, and replace if required.

III. AUGER (Optional Equipment)

(Items 19, 20, 21 & 22 on Reference Layout Drawing - page 24-25)

Warning: Disconnect all power at the control panel by switching off the three-phase power before working on the auger, motor or bearings in this area.

Caution: If replacing the bearings, the auger is very heavy and will require more than one individual to complete this task. Inspect auger to insure auger blades are free from sharp edges, nicks or dents depending on your process to guard against possible injury.

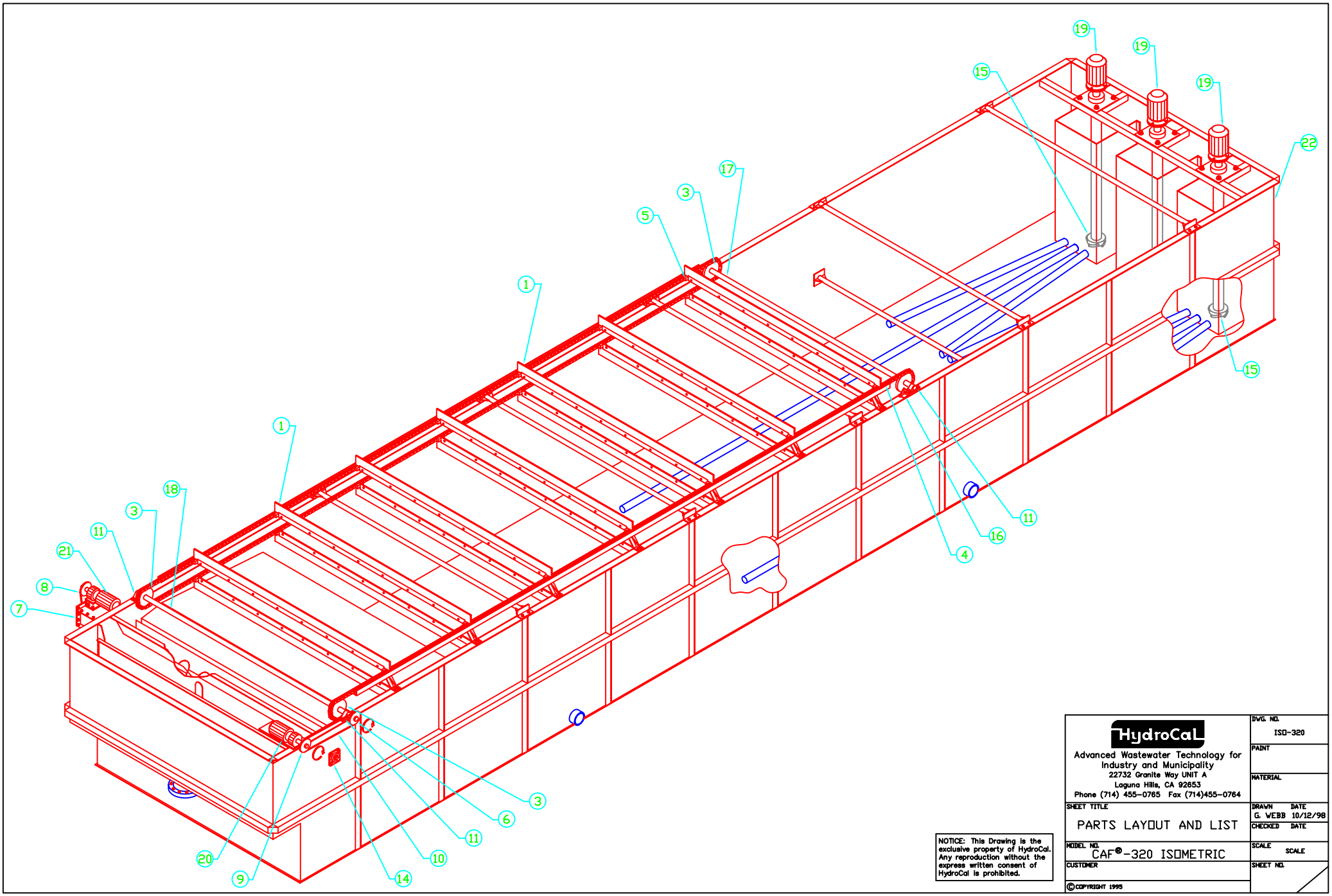
Refer to HydroCal CAF Operation & Maintenance Manual page 18-19.

a) Inspect flange bearings. Lubricate as determined by usage rate (SKF pages 26-30). Inspect for leakage. Replace if necessary.
b) Lubricate metallic drive chain mechanism as determined by your facility usage (SKF pages 26-30).

IV. TANK

The stainless steel units generally only require clean out as determined by your facility usage. Debris will accumulate on the bottom and occasionally will have to be cleaned out requiring the entire unit to be drained. Clean out procedures again must be determined by your facility to determine if brushing, power washing, or other method of cleaning is acceptable to your use.

Coated units should be inspected for damage to the painted surface. Touch up should be done to any and all surfaces showing deterioration and especially rust colored marks. Touch up paint is available through HydroCal if needed.



NOTICE: This Drawing is the exclusive property of HydroCal. Any reproduction without the express written consent of HydroCal is prohibited.

HydroCaL
Advanced Wastewater Technology for Industry and Municipality
22732 Granite Way UNIT A
Laguna Hills, CA 92653
Phone (714) 455-0765 Fax (714)455-0764

DWG. NO.	ISO-320
PAINT	
MATERIAL	
SHEET TITLE	PARTS LAYOUT AND LIST
DRAWN / DATE	G. WEBB 10/12/98
CHECKED / DATE	
MODEL NO.	CAF®-320 ISOMETRIC
SCALE	SCALE
CUSTOMER	
SHEET NO.	

BILL OF MATERIAL (CAF-320)

No.	tem Number	Description	Material	Qty.
1	HY06RP320	Rubber Paddle Inserts	Rubber 3035mm x 178mm x 13mm	14
2	HY105HW320	Stainless Steel Hardware		1
3	HY179PS25-400	Plastic Sprocket	Plastic Sprocket w/ 40mm bore w/keyway & set screw	4
4	HY180RC25-400-1-1	Polymeric Chain		119
5	HY183DH25-400	Delrin Hanger Blocks Assembly	Delrin	28
6	HY188SP25-400	Scraper Sprocket	Mild Steel Sprocket 40mm Bore	1
7	HY192AS25-400	Auger Sprocket	Mild Steel Sprocket 40mm Bore	1
8	HY198AMS250-400	Auger Motor Sprocket	Mild Steel Sprocket 30mm Bore	1
9	HY196SMS25-400	Scraper Motor Sprocket	Mild Steel Sprocket 30mm Bore	1
10	HY199C25-400	Roller Chain	Mild Steel Roller Chain	10
11	HY201BR25-400	Pillow Block Bearing 40mm	Cast Iron	4
12	HY202CL25-400	Chain Connecting Link	Mild Steel 60RIV Connecting Link	2
13	HY203□L25-400	Chain □ffset Link	Mild Steel 60RIV □ffset Link	2
14	HY205BR10-400	Flange Bearing 40mm	Cast Iron	2
15	HY2MANS25-400	2 Meter Aerator New Style	Aerator with Motor	3
16	HY37CA20-400	Chain Adjusters	1 Set (left hand & right hand), Stainless Steel	1
17	HY48SS320	Scraper Shaft	Stainless Steel 40mm dia x 3175mm with 12mm keyway	1
18	HY49SS320	Scraper Shaft	Stainless Steel 40mm dia x 3277mm with 12 keyway	1
19	HY55AM25-400	Aerator Motor	Motor 1500 RPM, torque 110 lbs-in., 220/380 volts, 50Hz	3
20	HY61SD175-400	Scraper Drive Unit	Drive Unit 2.5-12.5 RPM, 220/380 volts, 50Hz	1
21	HY65AD225-320	Auger Drive Unit	Drive Unit 29 RPM, 220/380 volts, 50 Hz	1
22	HY68NP5-400	Hydrocal CAF Nameplate	Cast Iron	1
22	HYCAFWS320	Wear Strip Set	Polyethylene	1

GREASE SPECIFICATIONS

Grease Lubrication

Grease can be used to lubricate ball bearings under normal operating conditions in the majority of applications.

Grease has the advantage over oil that it is more easily retained in the bearing arrangement, particularly where shafts are inclined or vertical, and it also contributes to sealing the arrangement against contaminants, moisture or water.

Excessive amounts of grease will cause the operating temperature within the bearing to rise rapidly, particularly when running at high speeds. As a general rule, when starting up only the bearing should be completely filled, while the free space in the housing should be partly filled with grease. Before operating at full speed, the excess grease in the bearing must be allowed to settle or escape during a running-in period. At the end of the running-in period the operating temperature will drop considerably indicating that the grease has been distributed in the bearing arrangement.

However, where bearings are to operate at very low speeds and good protection against contamination and corrosion is required, it is advisable to fill the housing completely with grease.

SKF greases

The SKF range of lubricating greases for rolling bearings comprises many types of grease and covers virtually all application requirements. These greases have been developed based on the latest information regarding rolling bearing lubrication and have been thoroughly tested both in the laboratory and in the field. Their quality is continuously monitored by SKF.

The most important technical specifications on SKF greases are given in Table 1 – Part 1: Technical Specifications (see following pages) together with a quick selection guide Table 1 – Part 2: Characteristics (see following pages).

Further information on SKF greases can be found in the online catalogue at http://www.mapro.skf.com.

For a more detailed selection of the appropriate grease for a specific bearing type and application, use the Internet based SKF grease selection program "LubeSelect". This program can be found at http://www.aptitudexchange.com/ax/index.jsp.

Table 1: HydroCal greases – technical specifications and characteristics
Part 1: Technical specifications

Designation	Description	NLGI class	Thickener/ Base oil	Base oil Viscosity at		Temperature limits	
				40°C	100°C	LTL[1)]	HTPL[2)]
-	-	-	-	Mm^2/s		°C	
LGMT 2	All purpose industrial and automotive	2	Lithium soap / mineral oil	110	11	-30	+120
LGMT 3	All purpose industrial and automotive	2	Lithium soap / mineral oil	120	12	-30	+120
LGEP 2	Extreme pressure, high load	2	Lithium soap / mineral oil	200	16	-20	+110
LGLT 2	Low load and temperature high speed	2	Lithium soap/ diester oil	15	3,7	-55	+100
LGHP 2	High performance and high temperature	2	Di-urea / Mineral oil	96	10,5	-40	+150
LGFP 2	Food compatible	2	Aluminium complex / Medical white oil	130	7,3	-20	+110
LGGB 2	Biodegradable and low toxicity	2	Lithium-calcium soap/ Ester oil	110	13	-40	+120
LGLC 2	Low temperature and high speed	2	Calcium complex soap/ Ester-mineral oil	24	4,7	-40	+120
LGWA 2	Wide temperature range	2	Lithium complex soap/ Mineral oil	185	15	-30	+140 peaks: +220
LGHB 2	High viscosity and high temperature	2	Calcium sulphonate Complex/mineral oil	450	26,5	-20	+150 peaks: +200
LGET 2	Extreme temperature	2	PTFE/synthetic/ Fluorinated polyether	400	38	-40	+260
LGEM 2	High viscosity with solid lubricants	2	Lithium soap/ Mineral oil	500	32	-20	+120
LGEV 2	Extreme high viscosity with solid lubricants	2	Lithium-calcium soap/ Mineral oil	1,000	58	-10	+120
LGWM 1	Extreme pressure, low temperature	1	Lithium soap/ Mineral oil	200	16	-30	+110

1) LTL: low teperature limit
2) HTPL: high temperature performance limit

Table 1: HydroCal greases – technical specifications and characteristics
Part 2: Characteristics

Designation	High Temp. Above +120o C	Low Temp.	Very high speed	Very low speed or oscillations	Low torque, low friction	Severe vibrations	Heavy loads	Rust inhibiting properties	Water resistance
LGMT 2			o	-	+	+	o	+	+
LGMT 3			o	-	o	+	o	o	+
LGEP 2			o	o	-	+	+	+	+
LGLT 2		+	+	-	+	-	-	o	o
LGHP 2	+	o	+	-	o	-	o	+	+
LGFP 2			o	-	o	o		+	+
LGGB 2		o	o	o	o	+	+	o	+
LGLC 2		+	+	-	+	-	o	+	+
LGWA 2	+		o	o	o	+	+	+	+
LGHB 2	+		o	+	-	+	+	+	+
LGET 2	Contact the SKF application engineering service								
LGEM 2			-	+	-	+	+	+	+
LGEV 2		-	-	+	-	+	+	+	+
LGWM 1		-	o	o	o	-	+	+	+

Symbols: + Recommended
o Suitable
- Not suitable

Where no symbol is indicated the relevant grease may be used – however, it is not recommended.
For further information, please contact HydroCal application engineering service.

Single row deep groove ball bearings

Sealed bearings

The most popular sizes of deep groove ball bearings are also produced in sealed versions with shields or contact seals on one or both sides. Details regarding the suitability of the different seals for various operating conditions will be found in table 1. Sealed bearings in the wide 622, 623 and 630 series are particularly suitable for long maintenance-free service. In addition, ICOS™ bearing units with integrated radial shaft seals are available for higher sealing requirements.
The bearings with shields or seals on both sides are lubricated for life and are maintenance-free. They should not be washed nor heated to temperatures above 80 °C. Depending on the series and size, deep groove ball bearings are supplied charged with one of three standard greases:

- LT10 grease for bearings in the 8 and 9 Diameter Series up to and including 30 mm outside diameter,
- MT47 grease for bearings in the 8 and 9 Diameter Series above 30 mm up to and including 62 mm outside diameter and for bearings in the 0, 1, 2 and 3 Diameter Series up to and including 62 mm outside diameter,
- MT33 grease for all bearings above 62 mm outside diameter.

Characteristics of the above standard greases are listed in table 2. The designation for a standard grease is not identified in the bearing designation. The quantity of grease fills some 25 to 35 % of the free space in the bearing. To special order, other grease filling grades are available. Also on request, special grease fills can be supplied (table 2):

- high temperature grease GJN for bearings up to 62 mm outside diameter
- high temperature grease HT22 for bearings above 62 mm outside diameter
- low temperature grease LT20
- wide temperature range grease GWB
- wide temperature range and silent running grease LHT23

Table 1: Seal selection guidelines

Requirement	Shields	Low-friction Seals		Contact Seals	
	Z	RSL	RZ	RSH	RS1
Low friction	+++	++	+++	o	o
High speeds	+++	+++	+++	o	o
Grease retention	o	+++	+	+++	++
Dust exclusion	o	++	+	+++	+++
Water exclusion					
- static	-	o	-	+++	++
- dynamic	-	o	-	+	+
- high pressure	-	o	-	+++	o

Symbols: +++ excellent ++ very good + good o fair – not recommended

Table 2: SKF grease filling for sealed deep groove ball bearings

Technical specifications	Standard greases			Special greases				
	LT10	MT47	MT33	GJN	HT22	LT20	GWB	LHT23
Thickener	Lithium soap	Lithium soap	Lithium soap	Polyurea soap	Lithium complex soap	Lithium soap	Polyurea soap	Lithium soap
Base oil type	Diester oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Diester oil	Ester oil	Ester oil
NLGI consistency class	2	2	3	2	3	2	2 - 3	2
Operating temperature, °C	-50 to +90	-30 to +110	-30 to +120	-30 to +150	-20 to +140	-55 to +110	-40 to +160	-50 to +140
Base oil viscosity, mm^2/s								
at 40 °C	12	70	74	115	110	15	70	26
at 100 °C	3,3	7,3	8,5	12,2	13	3,7	9,4	5,1

SECTION SEVEN

CAF Assembly Breakdown
See Pages 29-30

Equipment Data Sheet

EQUIPMENT DATA SHEET

COMPANY **Garwood Paperboard**
MODEL CAF®-320SS
SERIAL NO. HCAF2141A0898
MFG. DATE August 1998

HydroCal Sales Office:
22732 Granite Way, Suite A
Laguna Hills, CA 92653 USA
Phone: 949-455-0765
Fax: 949-455-0764

ITEM	SPECIFICATIONS	PART #	SERIAL #
Flotation Unit	Flow Rate: 1410 gpm / 88 lps	CAF-320	HCAF2141A0898
Aerator	Size: 2 Meter Aerator	HY2MANS25-400	HAA1135G0998 HAA1136G0998 HAA1137G0998
Aerator Motor	RPM: 1800 Volts: 575 Cycle/Hz: 60 Phase: 3 Hp: 3 Flange: 200mm Shaft: IEC Paint Specs: GFI-CA39	HY54AM25-400	N/A
Scraper Drive	RPM: 2.4 -12 Volts: 460 Cycle/Hz: 60 Phase: 3 Hp: 0.75 Ratio: 176.88 Shaft: 1.25” Paint Specs: GFI-CA39	HY60SD175-400	N/A

SECTION EIGHT

Aerator Motor

(DFT100LS4C-KS)

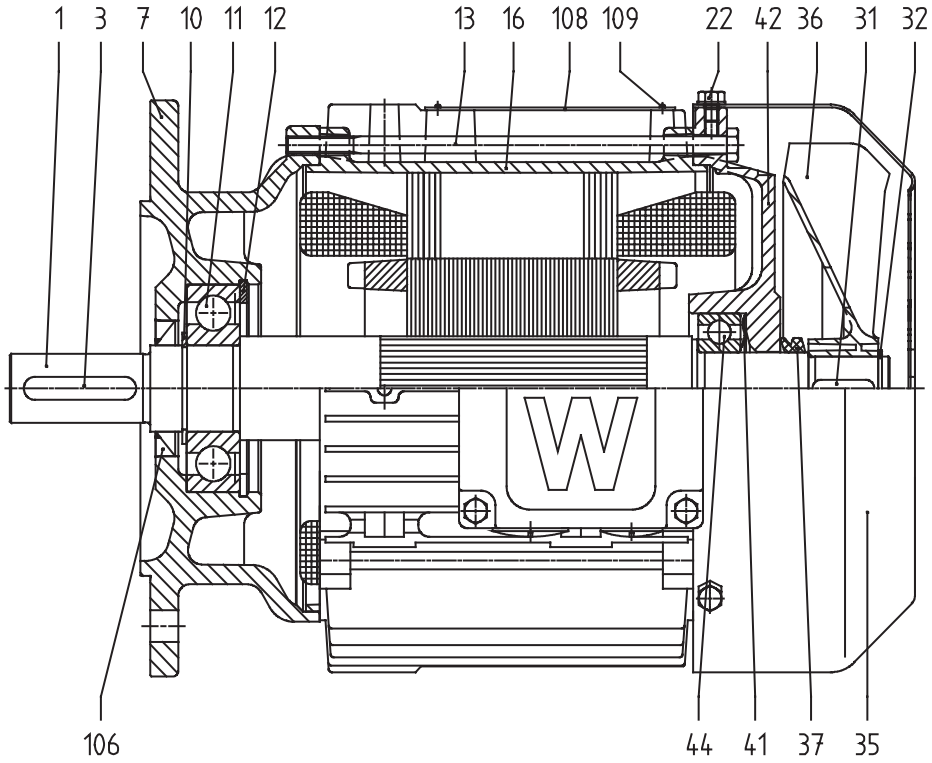
Motor
(S)DFT90L & S; (S)DFT100L & LS

PARTS LIST

08 308 778 US

DFT90: ① 160mm Flange Dia. and for mounting to Varigear® VU/VZ11
② 200mm Flange Dia. and for mounting to Varigear® VU/VZ2-21
③ 250mm Flange Dia. and for mounting to Varigear® VU/VZ3

DFT100: ④ 200mm Flange Dia. and for mounting to Varigear® VU/VZ21
⑤ 250mm Flange Dia. and for mounting to Varigear® VU/VZ3-31



When ordering parts, please supply nameplate data with serial number or S.O. number, model number, description of part and part number. Rotors and stators are stamped with a part number.

For terminal box parts, refer to respective parts list. Shaded items denote recommended spare parts.

Item	Part Name	Description	Part No	Qty
1	Rotor	DFT90L4	136 759 5	1
1	Rotor	DFT90S4	136 760 9	1
1	Rotor	SDFT90L6/2	183 870 9	1
1	Rotor	SDFT90L8/2	183 871 7	1
1	Rotor	SDFT90S6/2	183 868 7	1
1	Rotor	SDFT90S8/2	183 869 5	1
1	Rotor	DFT100L4	135 369 1	1
1	Rotor	DFT100LS4	135 477 9	1
1	Rotor	SDFT100L6/2	183 878 4	1
1	Rotor	SDFT100L8/2	183 879 2	1
1	Rotor	SDFT100LS6/2	183 876 8	1
1	Rotor	SDFT100LS8/2	183 877 6	1
3	Key DFT90	A8x7x40mm	010 022 6	1
3	Key DFT100	A8x7x50mm	010 023 4	1
7	Flange ①	DFT90	180 801 X	1
7	Flange ②	DFT90	136 780 3	1
7	Flange ③		135 182 6	1
7	Flange ④	DFT100	136 684 X	1
7	Flange ⑤	DFT100	136 700 5	1

Item	Part Name	Description	Part No	Qty
10	Retaining Ring	30x1.5mm External	011 462 6	1
11	Ball Bearing	6306-2RS-J-C3	017 163 8	1
12	Retaining Ring	72x2.5mm Internal	010 322 5	1
13	Hex Head Screw DFT90	M6x155mm	011 870 2	4
13	Hex Head Screw DFT100	M6x205mm	011 871 0	4
16	Stator Complete			1
22	Hex Head Screw	M5x7mm	013 630 1	4
31	Key	A6x6x22mm	010 013 7	1
32	Retaining Ring	22x1.2mm External	010 272 5	1
35	Fan Guard		135 198 2	1
36	Fan		135 482 5	1
37	V-Ring	V25	011 769 2	1
41	Spring Washer	42x51x0.5mm	011 590 8	1
42	B-Side Endshield		135 192 3	1
44	Ball Bearing	6205-2RS-J-C3	017 167 0	1
106	Oil Seal	A30x47x7mm-No Spring	011 196 1	1
108	Nameplate			1
109	Cheese Head Nail	2x4mm	010 764 6	2

Motors and Brakemotors

Type BM (G) Brakes

OPERATING INSTRUCTIONS

09 793 77 US

General

Every SEW-Eurodrive motor is thoroughly tested, checked, and properly packed prior to shipment. However, please check immediately upon arrival for shortage of parts or transit damage. Note the damage or shortage on the freight bill of lading and file a claim with the carrier. Also, notify SEW-Eurodrive of the shortage or damage.

Installation

For motors mounted integrally to a gear unit, please refer to the Operating Instructions for Gearmotors and Gear Reducers for proper installation of the drive. The drive installation site should be selected to ensure:

- Ambient temperatures below 40°C (104°F).
- Unimpeded flow of air to the motor and variable speed units.
- Accessibility to gear unit, oil plugs.
- Adequate space for the removal of the brakemotor fanguard for brake adjustment and maintenance.

The drive unit should be mounted on a flat, vibration damping, and torsionally rigid structure. The flatness tolerance of the supporting surface should not exceed:

For motor size 180 and smaller — 0.004 inch
For motor size above 180 — 0.008 inch

Do not hammer on the shafts to install couplings, sheaves, etc. Hammering can cause brinelling of the bearings and a reduction in bearing life. We recommend heating the components to approximately 175°F and sliding them on. This will reduce possible damage to the bearings. In addition, there is a metric tapped hole in the center of the motor shaft that can be utilized with a tool to press on or remove the coupling, sheaves, etc.

The motor shaft diameters are metric and have tolerances as listed in the SEW-Eurodrive catalogs. Shaft couplings should be properly aligned to prevent vibration, coupling wear and premature failure of the shaft bearings.

Maximum Parallel Offset — 0.003 inch
Maximum Angular Offset — 0.030°

To prevent the output shaft and bearings from being subjected to excessive loads, the maximum overhung loads, as shown in SEW-Eurodrive catalogs, should not be exceeded. Please consult our engineering department if the load may exceed the recommended figure given or where there are combined radial and axial loads. In such cases, the exact operating conditions must be stated including speed, direction of rotation, position, magnitude and direction of the external radial and axial loads being applied.

Long Term Storage

If the motor must be stored for a long period of time without operating, the motor must be stored in a dry, protected area, and in the mounting position indicated on the unit nameplate. In order to ensure that the motor has not been damaged by moisture after a prolonged storage, the insulation resistance should be checked. An insulation tester with a measurement voltage of at least 500V (e.g. magneto generator) should be used for this purpose. The insulation resistance is sufficient if it has an ohmic value of at least 1000 x V_N (e.g. at V_N = 230VAC: $R_{insul} \geq 230000$ ohms = 0.23M ohms). If the measured value is smaller, the motor should be dried before use (for example, with hot air up to a maximum of 90°C or by resistance heating with an auxiliary AC voltage of 10% of V_N via an isolating transformer). Care should be taken to ensure that the motor is heated with not more than 20% of its rated current and that the rise in temperature is not more than 90°C. The drying procedure can be stopped when the insulation resistance has reached 500000 = 0.5M ohms.

Severe Duty Units

Severe Duty Units are indicated with the letters "-KS" at the end of the motor type on the motor nameplate. Severe Duty units include drain holes in the motor end bells and conduit box at the lowest points allowing condensation to drain out of the motor.

CAUTION!

The drain holes are installed for the mounting position listed on the gearbox nameplate. Installing a unit in a mounting position other than what is shown on the nameplate will reposition the condensation drain holes. As a result, the drain holes may not be located at the lowest point and may not allow water to drain. This can cause premature drive failure.

Electrical Connection

The motor must be installed and connected by a qualified electrician who is knowledgeable with the NEC article 430 and local regulations. He must make sure that the voltage and frequency of the electrical supply correspond with the data stamped on the motor nameplate before connecting the motor in accordance with the wiring diagram, which can be found in the terminal box. For brake connections, see the following pages.

At installation the electrician must make sure that the terminal block jumpers are positioned correctly and that all electrical connections including the ground connection are secure. In order to effectively protect the motor from overloads, appropriate motor protection must be provided. Fuses do not always provide adequate motor protection. For motors which are required to operate with a very high start-stop frequency, the overload heater type motor protection is insufficient. It is advisable in such applications to provide the motor with temperature sensors (thermistors) in the windings. Monitor the thermistors by means of an external trip device. In this way, the motor will be fully protected against practically all possible overloads.

When using motors outdoors or in washdown applications the cable entries into the terminal box must be directed downward to prevent water from entering the conduit box. The unused cable entries must be closed off properly.

Lubrication and Maintenance

WARNING! Always ensure equipment is secure and electrical power is off before removing or performing maintenance on the drive assembly. The motor bearings are sealed and the grease content is adequate for the life of the bearing.

SEW EURODRIVE

SOUTHEAST MANUFACTURING & ASSEMBLY CENTER
1295 Spartanburg Highway/Lyman SC 29365
(864) 439-7537 Fax: (864) 439-7830

SOUTHWEST ASSEMBLY CENTER
3950 Platinum Way/Dallas TX 75237
(214) 330-4824 Fax: (214) 330-4724

MIDWEST ASSEMBLY CENTER
2001 West Main Street/Troy OH 45373
(937) 335-0036 Fax: (937) 332-0038

EAST COAST ASSEMBLY CENTER
200 High Hill Road/Bridgeport NJ 08014
(856) 467-2277 Fax: (856) 845-3179

WEST COAST ASSEMBLY CENTER
30599 San Antonio Road/Hayward CA 94544
(510) 487-3560 Fax: (510) 487-6381

Brake Coil Resistance

Motor Frame		DT71-80	DT80	DT90-100	DT100	DV112-132S	DV132M-160M	DV160L-225
Brake Size		BM(G)05	BM(G)1	BM(G)2	BM(G)4	BM(G)8	BM15	BM30/31/32/62
Brake Torque (lb-ft)		0.89 - 3.7	4.4 - 7.4	3.7 - 14.8	17.7 - 29.5	7.00 - 55.3	18.4 - 110.6	36.9 - 442.5
BRAKE VOLTAGE		$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$
AC (to rectifier V_B)	DC	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$
—	24	4.4 13.4	3.9 12.1	3.4 10.2	2.7 8.2	1.4 7.5	0.8 5.0	0.67 5.0
105-116	48	17.6 53.4	15.6 48.1	13.6 40.5	10.9 32.7	5.7 29.8	3.1 20.1	2.2 16.8
186-207	80	55.6 169	49.5 152	42.9 128	34.5 103	17.9 94.2	9.8 63.5	7.1 53.0
208-233	96	70.0 213	62.3 192	54.0 161	43.4 130	22.5 119	12.4 80.0	8.9 66.7
330-369	147	176 534	157 481	136 405	109 327	56.5 298	31.1 201	22.3 168
370-414	167	221 672	197 606	171 510	137 411	71.2 375	39.2 253	28.1 211
415-464	185	279 846	248 762	215 643	173 518	89.6 472	49.3 318	35.4 266
465-522	208	351 1066	312 960	271 809	218 652	113 594	62.1 401	44.6 334

Voltage AC - The voltage shown is the nameplate AC brake voltage supplied to the brake rectifier.

DC - The voltage shown is the effective DC voltage required by the brake coil. The measured voltage from the rectifier will be 10-20% lower than that shown.

Brake Coil Resistance - values must be measured with the brake coil disconnected from the rectifier.

R_B - Accelerator coil resistance in Ω, measured from the red to the white brake coil wire at 20º C.

R_T - Fractional coil resistance in Ω, measured from the white to the blue brake coil wire at 20º C.

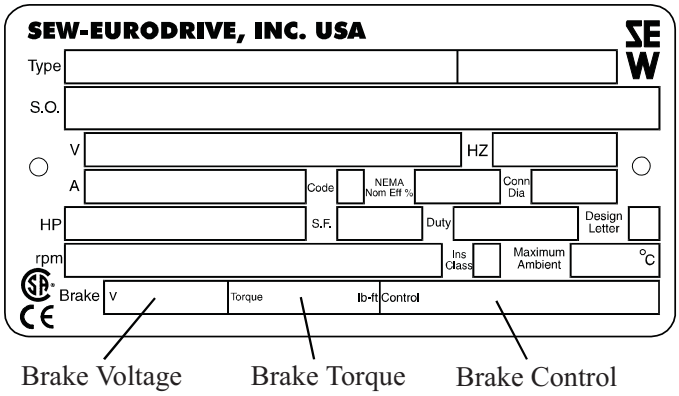
Brake Connection (AC Voltage)

SEW-Eurodrive motor brakes can be connected in a number of different ways. In order to connect the brake for each application, it is important to refer to the data on the motor nameplate that describes the brake system. The brake fields are: brake voltage, brake torque and brake control.

This operating instruction covers AC brake voltages with the following brake control components. If the brake voltage is DC, or if the brake control components differ from those listed below, an additional operating instruction must be consulted for connection information.

SEW-Eurodrive fail-safe mechanical brakes are DC controlled. Standardly, a brake rectifier (halfwave) is provided to convert the AC line voltage to the DC voltage required to drive the brake. 24VDC brakes do not include a rectifier. When voltage (V_B) is applied to the brake, it will release. When voltage (V_B) is removed from the brake, it will set. The brake rectifier can be wired either for normal brake reaction time (setting, stopping) or fast brake reaction time. The fast brake reaction will set the brake more quickly which will provide a shorter and more repeatable stopping distance. There are two basic types of brake rectifiers, BG and BGE. The BG brake rectifier is standard on motor sizes DT71 - DT100. The BGE rectifier is standard on motor sizes DV112 - DV225. The BGE rectifier can be ordered with motor sizes DT71 - DT100 and will provide faster brake release times allowing the motor to cycle more frequently.

Brake Control (Rectifier)	Part Number
BG1.5	825 384 6
BG3.0	825 386 2
BGE1.5	825 385 4
BGE3.0	825 387 0

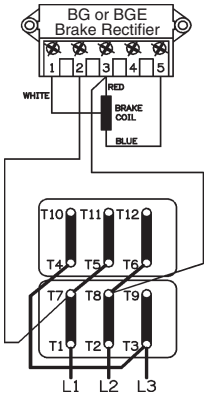


The wiring diagrams for brake connections are located on the inside of the motor conduit box lid. The brake will release and allow the motor to rotate when the nameplate AC brake voltage V_B is supplied to the brake rectifier terminals. There are certain cases where the brake rectifier can receive its voltage from the motor's terminal block, meaning that when power is applied to the motor it will simultaneously release the brake and start the motor. See page 3 for this description.

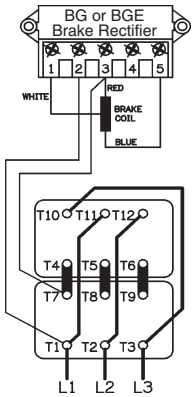
Brake Voltage Supplied from the Motor

There are specific instances when the brake voltage can be tapped from the motor's terminal block. The advantage of brake systems wired in this way is when power is applied to the motor, the brake releases, (requiring no additional brake supply power wiring). The brake can be wired to the motor terminal block under the following conditions: a single speed motor; the motor is started and run across the line (i.e., no inverter or electronic soft start). The connections shown on this page are for normal brake reaction time. For rapid brake reaction time, incorporate the contact as shown on the brake diagram located on the inside of the motor conduit box lid.

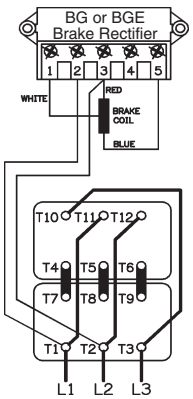
Brake Motor Connection
Single Speed Dual Voltage - ΔΔ/Δ
Connection Diagram DT72
Example Motor Voltages:
230ΔΔ/460Δ Volts - 60 Hz



Motor wired for low voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 230V
Brake voltage 230V

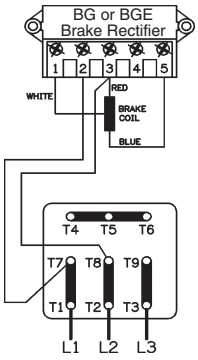


Motor wired for high voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 230V

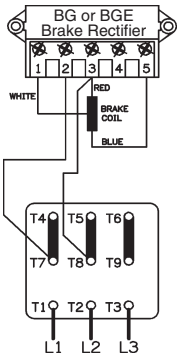


Motor wired for high voltage.
Brake voltage matches high motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 460V

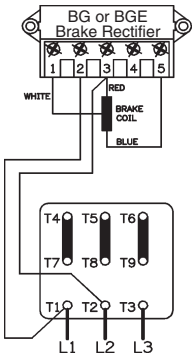
Brake Motor Connection
Single Speed Dual Voltage - YY/Y
Connection Diagram DT79
Example Motor Voltages:
230YY/460Y Volts - 60 Hz
200YY/400Y Volts - 50 Hz



Motor wired for low voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 230V
Brake voltage 230V

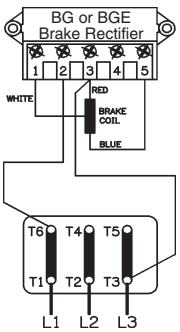


Motor wired for high voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 230V

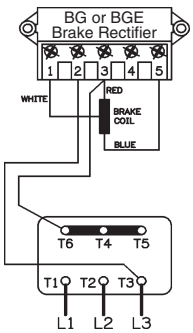


Motor wired for high voltage.
Brake voltage matches high motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 460V

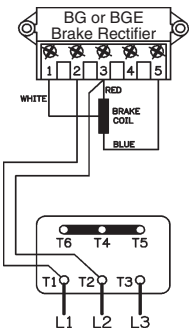
Brake Motor Connection
Single Speed Dual Voltage - Δ/Y
Connection Diagram DT13
Examples Motor Voltages:
200Δ/346Y Volts - 60 Hz
330Δ/575Y Volts - 60 Hz
220Δ/380Y Volts - 50 Hz



Motor wired for low voltage.
Brake voltage matches low motor voltage
Example: 200/346V Motor
Motor wired 200V
Brake voltage 200V



Motor wired for high voltage.
Brake voltage matches low motor voltage.
Example: 220/380V Motor
Motor wired 380V
Brake voltage 220V



Motor wired for high voltage.
Brake voltage matches high motor voltage.
Example: 220/380V Motor
Motor wired 380V
Brake voltage 380V

Re-adjusting the Brake Air Gap

A properly adjusted brake air gap is critical for correct operation. The following table indicates the required air gap measurement.

Motor Size	Brake Size	Air Gap
DT71 - DT100	BM(G)05 - BM(G)4	0.010"-0.024" (0.25-0.6 mm)
DV112 - DV225	BM(G)8 - BM31	0.012"-0.047" (0.3-1.2 mm)
DV180-DV225	BM32-BM62 Double Disc	0.016"-0.047" (0.4-1.2 mm)

Prolonged use of the brake will wear the brake disc lining. This wear increases the air gap. When the air gap approaches its maximum value, the brake must be re-adjusted. To re-adjust the brake, follow the procedure below.

1. Remove the fan cover (14), fan snapring, fan (17), rubber seal (2), and any accessories at the fan end.
2. Insert a feeler gauge between the brake coil body (21) and the stationary disc (22), tighten the adjusting nuts (19) until the minimum value for the air gap is reached equally around the brake. With motor size 160L and up (brakes BM30 to BM62) first screw the threaded bushings (24) into the endshield. After setting the air gap, lock the bushings (24) against the coil body.
3. Ensure a play of 0.06" to 0.08" (1.5 to 2 mm) in the releasing arm. See "THE HAND RELEASE MECHANISM."

Replacement of the Brake Disc (26)

Extended operation of the brake may wear the brake disc (26) beyond acceptable limits. The thickness of the brake disc can be measured to determine if this has occurred.

Motor Size	Brake Size	Min. Disc (26) Thickness
DT71 - DT100	BM05 - BM4	0.354" (9mm)
DV112 - DV225	BM8 - BM62	0.394" (10mm)

If the brake disc (26) is worn below the measurement given, it must be replaced. If the thickness is greater than the specification above, the brake disc is still usable and the brake can be re-adjusted.

The Hand Release Mechanism

Most of our brakes are supplied with a hand-operated release lever. This allows opening of the brake without applying power, allowing for adjustments on the driven machinery.

There are two brake release mechanisms available:

The "BMHR" (4) type requires a lever to be inserted into the release arm. To open the brake, pull the lever away from the motor. It will re-engage automatically, once the lever is released. The lever, when not used, is attached to the motor's cooling fins with clamps.

The screw-type "BMHF" (5) arrangement requires a hexagon key which, when turned clockwise, opens the brake.

Since the stationary disc (22) will move away from the coil body during the brake's operation, it is vital that there is free play (floating clearance) on the release arm of 0.060"-0.080" (1.5-2.0 mm). The springs (11) should be placed between the arm (7) and the nuts (12) to eliminate noise.

The brake release mechanism is not used to change the brake's torque setting. There must always be clearance on the lever.

Troubleshooting

Fault: Motor does not run

1. Check the motor and brake wiring for damage and proper connection.
2. At the motor, measure the line voltage, line current and motor resistance of all three phases.
3. If all three phases read a similar current value the following conditions may exist:
   - The motor may be blocked by either an excessive external load, or problems in the reducer or the brake. In both cases, the motor should draw locked rotor (in-rush) current. Consult SEW-Eurodrive catalogs for these values. Release the brake mechanically, reset the air gap if needed, or disconnect the load from the output shaft.
   - If the brake is at fault electrically see #4 below.
   - If the current differs significantly from the rated locked rotor current, the motor is either an incorrect voltage, or it is jumpered for the wrong voltage.
4. If the brake can be released mechanically, but does not respond to voltage, check the brake for electrical problems.
   - Make sure the wiring is according to the instructions. Pay special attention to the brake voltage.
   - Energize the brake circuit and measure the AC voltage on the rectifier terminals 2 and 3 (BG/BGE rectifiers). The measured voltage should correspond to the nameplate inscription: "Brake V."
   - Measure the DC voltage across terminals 3 and 5 of the brake rectifier which should be about 35% to 45% of the previously measured AC voltage.
   - If there is no fault found to this point, measure the resistance of the brake coils. Disconnect the coil from the rectifier for this measurement. See the table on Page 2 for the brake coil resistance values.
   - Measure the resistance of each brake coil lead to the brake coil body. This test should show an open circuit. If a short is found, the brake coil is damaged.

If the results of all these checks (electrical connection, mechanical checks and adjustments, and electrical tests) indicate that the brake should work, then the most likely cause of the brake's failure to release is a damaged brake rectifier.

Fault: Brake stopping time is too slow

If the brake has been operating well for some time and a gradual increase in stopping time has occurred, the release arm may have come in contact with the coil body. Verify that the brake release arm end play is correct, and check for excessive brake disc wear, (see previous instructions).

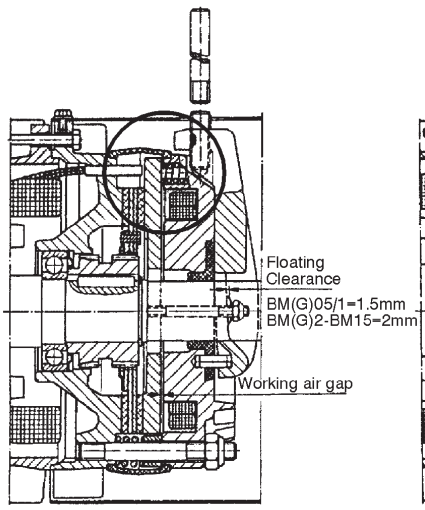
If the brake has been in operation for some time, and the stopping has become erratic, dust accumulation around the stationary disc guides may be the cause. Remove the brake's rubber sealing collar and clean with an air hose.

If the application is new, check the brake's wiring and air gap. If the brake is not wired for fast response, then changing the brake wiring to fast response will decrease the stopping time. Vertical motion and indexing applications may also require the fast response connection. Increasing the brake's torque may remedy the situation, but will also increase stress on the transmission.

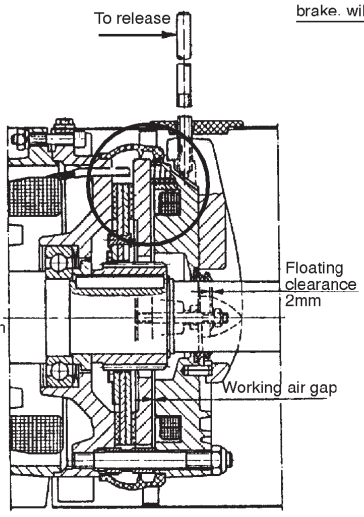
On applications requiring excessive brake work, the lining's surface may become glazed due to extreme heat. The application of a BGE rectifier will improve this situation dramatically. BGE rectifiers are standard equipment on motors size DV 112 - DV225, but optional on the smaller sizes DT71-DT100. Contact SEW-Eurodrive for more information.

BM(G) Brake Cross Section and Exploded Views

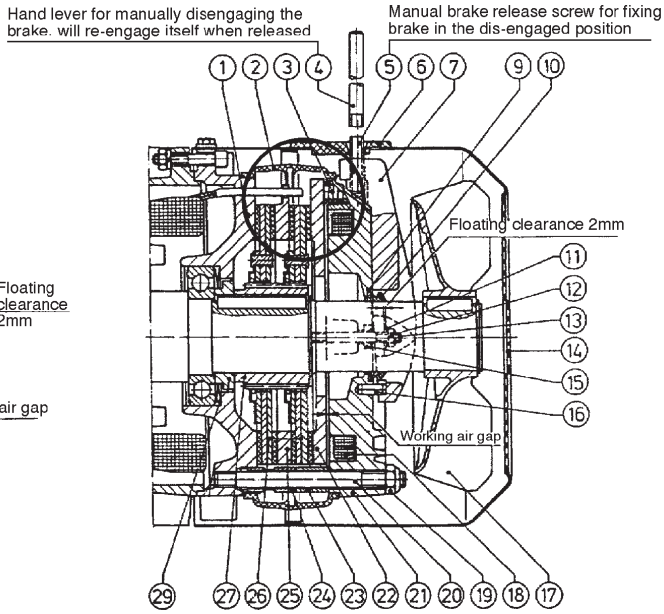
BM(G) 05 - BM 15

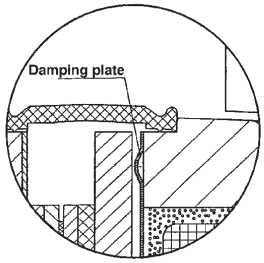


BM 30/31



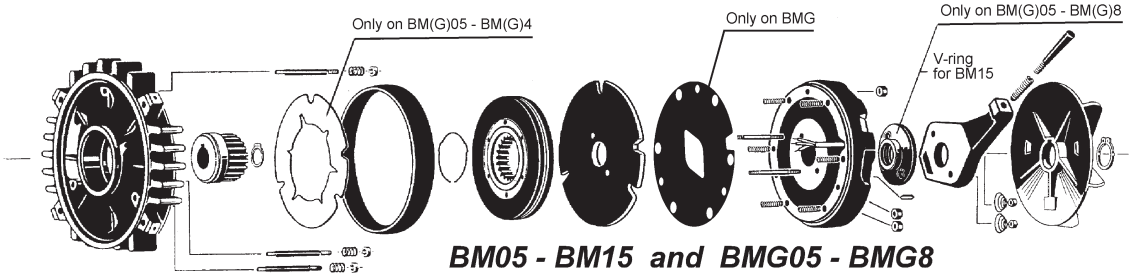
BM 32/62





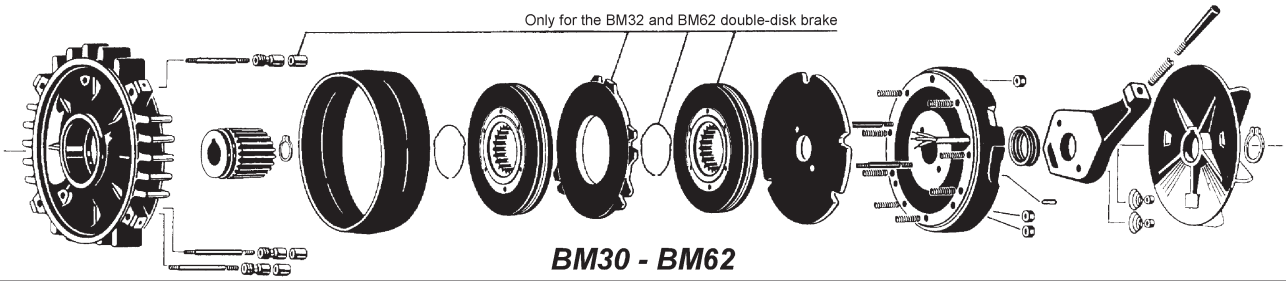
(1) Brake end shield
(2) Rubber sealing collar
(3) Braking springs
(4) Hand release lever
(5) Releasing screw
(6) Closing plate
(7) Release arm
(9) Sealing ring
(10) V-ring
(11) Conical spring
(12) Release
(13) Stud
(14) Fanguard
(15) Grommet
(16) Dowel pin
(17) Fan
(18) N/A
(19) Brake adjustment nut
(20) Retaining stud
(21) Brake coil body
(22) Stationary disc
(23) Pressure ring
(24) Setting sleeve
(25) Dual brake pad stationary disc
(26) Brake disc complete
(27) Carrier
(29) Cup Spring

Exploded view of the BM and BMG single-disk brake (motor sizes 71-160M)



BM05 - BM15 and BMG05 - BMG8

Exploded view of the BM single-disk and double-disk brake (motor sizes 160L-225)



BM30 - BM62

Troubleshooting Chart

PROBLEM	CAUSE	REMEDY
Motor Overheats (Check temperature with instrumentation)	Motor not connected for proper supply voltage	Check connection diagram on conduit box cover and correct the wiring.
	Supply voltage varies outside the allowable tolerance causing an undervoltage or overvoltage condition.	Assure correct supply voltage.
	Insufficient cooling air volume due to: a. Low frequency operation on variable frequency drive. b. Obstructed air flow.	Increase air flow: a. Continuous running auxiliary fan. b. Ensure unobstructed air flow.
	Ambient temperature is too high.	Ensure cool air gets to the motor. Ducting may be required.
	Overload at rated voltage. Unit will draw current in excess of nameplate rating and run below rated speed.	Select a larger unit.
	Motor's allowable duty cycle is exceeded (too many starts per hour required).	The problem may or may not be solved with a larger motor. Contact SEW-Eurodrive.
	Single phasing due to break or loose connection in supply line or blown fuse.	Repair supply lines. Replace fuses.
Motor does not run.	Blown fuse.	Determine and correct cause of failure and replace fuse.
	Motor protection device activated.	Reset protective device. Identify and correct cause for device activation.
	Motor protection device faulty or will not reset.	Check protection device for faults.
Motor will not start or starts sluggishly.	Motor not connnected for proper voltage.	Check connection diagram in conduit box cover and correct the wiring.
	Large voltage and/or frequency fluctuation at starting.	Ensure stable power supply.
For reduced voltage starting, motor will not start in Star Connection but will start in Delta connection.	Insufficient torque in Star Connection.	Start motor directly in Delta Connection if possible. Otherwise use a larger motor.
	Faulty contact in Star/Delta starter.	Correct fault condition.
Motor hums and draws high current.	Faulty or defective winding.	Have motor repaired by qualified service shop.
	Rotor dragging.	
Fuses blow or motor overcurrent protection trips immediately.	Short circuit in power supply conductors or in the motor.	Correct the fault condition.
	Motor has ground fault or winding to winding short circuit.	Have motor repaired by qualified service shop.
	Motor improperly connected.	Check connection diagram in conduit box cover and correct the wiring.
Motor runs in wrong direction.	Motor supply leads misconnected.	Switch two supply leads.

Note: If, after proceeding through the Troubleshooting Chart, the motor is found to be defective, contact your nearest SEW-Eurodrive Assembly Center for warranty assistance or replacement parts.

Motor Connection Diagrams

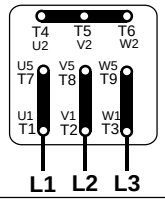
Dual-Voltage Motors
(single-speed)

Frame Size	Low Voltage	High Voltage
DT71 thru DV180	230V - 60Hz	460V - 60Hz
	200V - 50Hz	400V - 50Hz

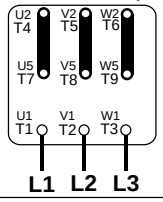
SEW-Eurodrive, Inc. USA — 10939/P000004

Single-Speed / Dual-Voltage — Connection Diagram **DT79**

Low Voltage ΥΥ (See Motor Nameplate)



High Voltage Υ (See Motor Nameplate)

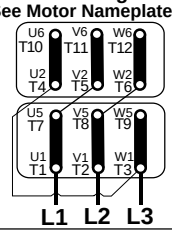


Frame Size	Low Voltage	High Voltage
DV200 thru DV225	230V - 60Hz	460V - 60Hz

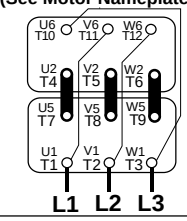
SEW-Eurodrive, Inc. USA — 10936/P000007

Single-Speed / Dual-Voltage — Connection Diagram **DT72**

Low Voltage ΔΔ (See Motor Nameplate)



High Voltage Δ (See Motor Nameplate)

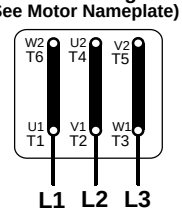


Frame Size	Low Voltage	High Voltage
DT71 thru DV225	200V - 50Hz	346V - 50Hz
	208V - 60Hz	360V - 60Hz
	220V - 50Hz	380V - 50Hz
	230V - 50Hz	400V - 50Hz
	240V - 50Hz	415V - 50Hz
	330V - 60Hz	575V - 60Hz

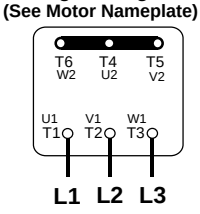
SEW-Eurodrive, Inc. USA — 1093/9P000001

Single-Speed / Dual-Voltage — Connection Diagram **DT13**

Low Voltage Δ (See Motor Nameplate)



High Voltage Υ (See Motor Nameplate)



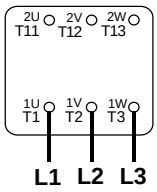
Single-Voltage Motors
(two-speed)

Frame Size: DT71 thru DV225

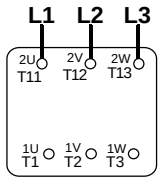
SEW-Eurodrive, Inc. USA — 10939/P000011

Two-Speed / Two-Winding — Connection Diagram **DT43**

Low Speed Υ (See Motor Nameplate)



High Speed Υ (See Motor Nameplate)

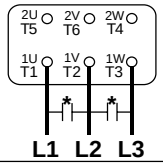


Frame Size: DT71 thru DV132S

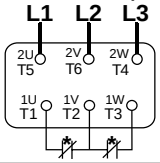
SEW-Eurodrive, Inc. USA — 1093/9P000009

Two-Speed / Single-Winding — Connection Diagram **DT33**

Low Speed Δ (See Motor Nameplate)



High Speed ΥΥ (See Motor Nameplate)



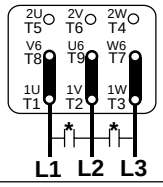
***Customer Supplied Motor Starter Contacts**

Frame Size: DV132M thru DV225

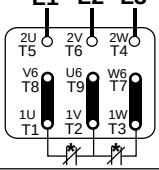
SEW-Eurodrive, Inc. USA — 1093/9P000010

Two-Speed / Single-Winding — Connection Diagram **DT53**

Low Speed Δ (See Motor Nameplate)



High Speed ΥΥ (See Motor Nameplate)

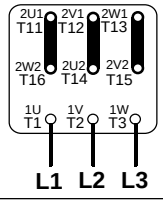


***Customer Supplied Motor Starter Contacts**

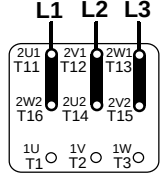
SEW-Eurodrive, Inc. USA — 0997/P000022

Two-Speed / Two-Winding — Connection Diagram **DT48**

Low Speed Υ (See Motor Nameplate)



High Speed Δ (See Motor Nameplate)



SECTION NINE

Scraper Drive

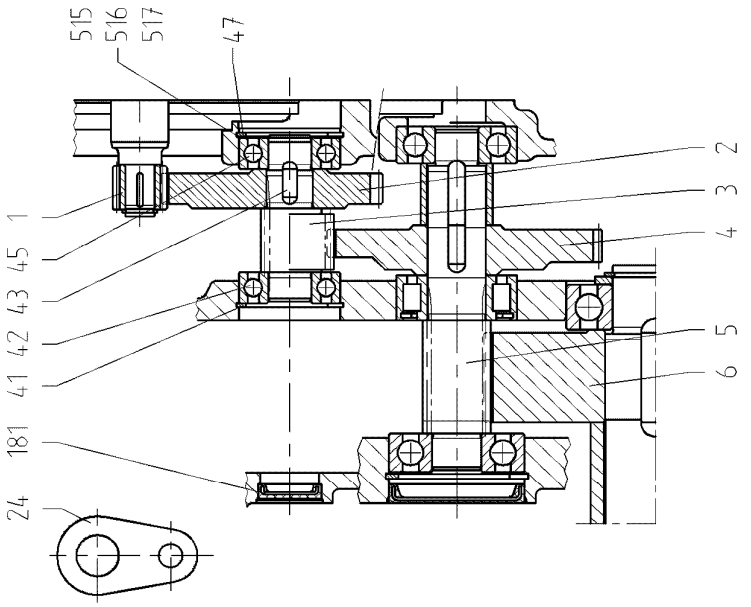
(R57D16BDT71D4-KS)

Parts List

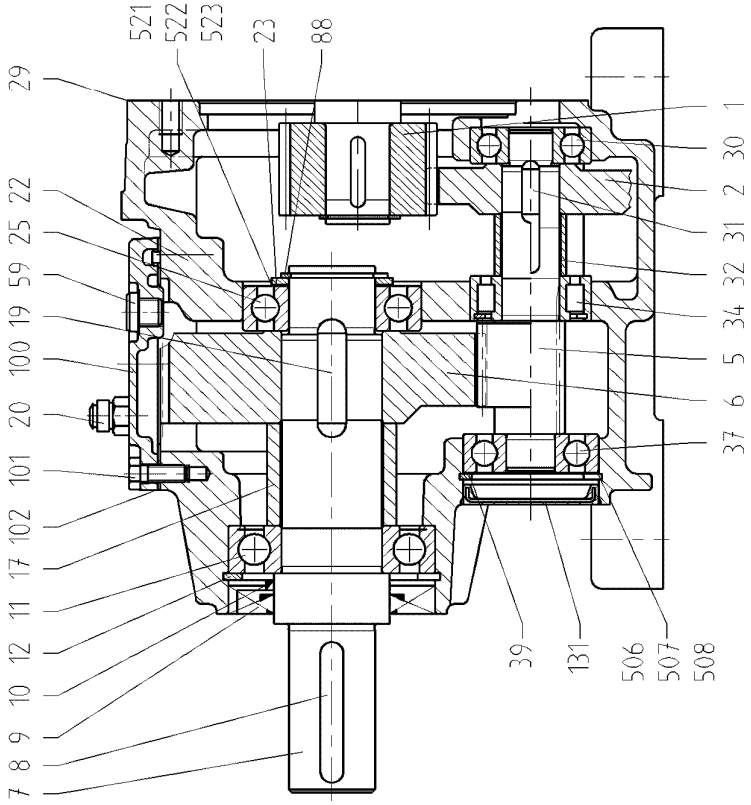
Helical gear unit
R57

01 261 05 97

3-stage



2-stage



When ordering spare parts always quote nameplate data with serial number and designation with part number!
Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted on the drive end. For parts see appropriate parts list.

No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
1	Pinion			*	1
2	Wheel			*	1
3	Pinion shaft			*	1
4	Wheel			*	1
5	Pinion shaft			*	1
6	Wheel			*	1
7	Output shaft		Ø 35x70 mm	06413447	1
7	Output shaft	stainless; ASEPTICplus	Ø 35x70 mm	00452564	1
7	Output Shaft (inch)		Ø 1,375x2,67 in.	06413455	1
8	Key		DIN6885 A10x8x56-C45K	00100293	1
8	Key	stainless; ASEPTICplus	DIN6885 A10x8x56-Niro	13228218	1
8	Key (inch)		W4190 5/16x5/16x1-13/16 IN.	08069239	1
9	Oil seal		W4560 BA-SF40x72x10/6-NBR	0017758X	1
9	Oil seal	optional oil seal in Vitonoptional oil seal in FKM (Viton); ATEX model according to category II2G, II2D, II3G, II3D; ASEPTICplus	W4561 BA-SF40x72x10/6-FKM	00176133	1
10	Oil seal	Double sealing; ATEX model according to category II2G, II2D, II3G, II3D; ASEPTICplus	W4562 B1-SF 40x66x8/10-FKM	00174343	1
11	Deep groove ball bearing		DIN625 6207-Z-J	00112879	1
12	Circlip		DIN472 72x2,5	00103225	1
17	Spacer tube		Ø36xØ45x36,5 mm	06413463	1
19	Key		DIN6885 B10x8x32-55HRC	00100579	1
20	Breather valve		W4087 M10x1-MS	00130303	1
20	Breather valve	stainless; ASEPTICplus	W4087 M10x1-NIRO	00136239	1
22	Gear Housing			06413412	1
23	Supporting ring		DIN988 S30x42x2,5-FST	00103489	1
24	Eyebolt			01644122	1
25	Deep groove ball bearing		DIN625 6206-J	00104892	1
29	Adhesive and sealing compound			09102558	X)
30	Deep groove ball bearing		DIN625 6302-J	00105066	1
31	Key	2-stage	DIN6885 B6x6x16-55HRC	00116017	1
31	Key	3-stage	DIN6885 B6x6x14-55HRC	00116149	1
32	Spacer tube		Ø20,6xØ25x22 mm	06433421	1
34	Cylindrical roller bearing		F55357501.01 NUPT INA	13241281	1
37	Deep groove ball bearing		DIN625 6303-J	00105074	1
39	Circlip		DIN472 47x1,75	00103187	1
41	Circlip		DIN472 35x1,5	00103144	1
42	Deep groove ball bearing		DIN625 6202-J	0010485X	1
43	Key		DIN6885 B5x5x10-55HRC	00114839	1
45	Deep groove ball bearing		DIN625 6202-J	0010485X	1
47	Circlip		DIN472 35x1,5	00103144	1
59	Screw plug		W4085 M10x1-ST-A2L	0011426X	5
88	Circlip		DIN471 30x1,5	00102776	1
100	Gearcase cover			06432093	1
101	Hex head screw		ISO4017 M6x16-8.8	00101052	6
102	Gasket			06435041	1
131	Closing cap		W4300 47x7	00124974	1
181	Closing cap		W4300 37x10	00106895	1
506	Shim		DIN988 37x47x0,1-ST	0010373X	X)
507	Shim		DIN988 37x47x0,3-ST	00103977	X)

* Gearing parts have embossed part numbers. These must always be quoted!
X) if required
When ordering spare parts always quote nameplate data with serial number and designation with part number!
Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted on the drive end. For parts see appropriate parts list.

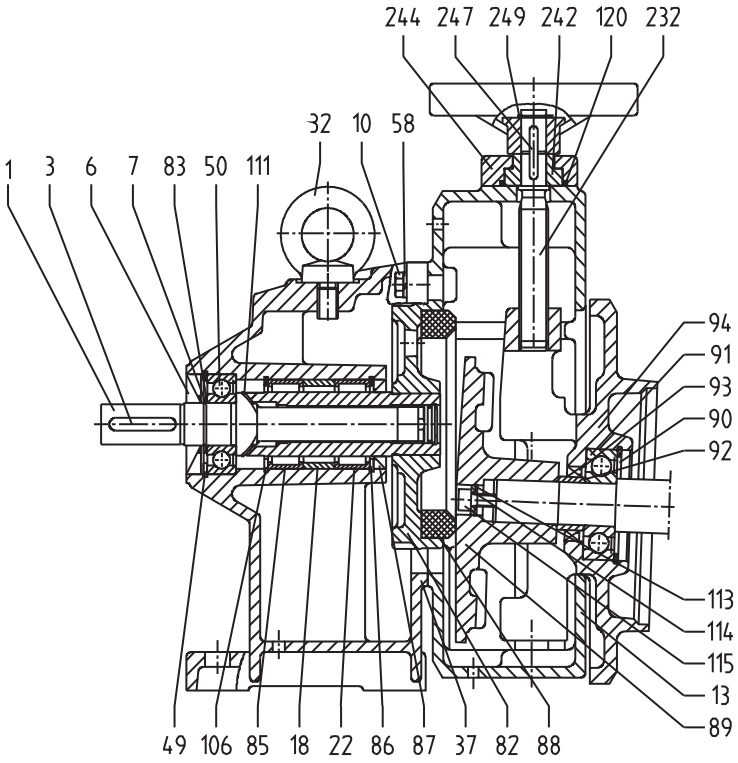
No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
508	Shim		DIN988 37x47x0,5-ST	00123404	X)
515	Shim		DIN988 25x35x0,1-ST	00103691	X)
516	Shim		DIN988 25x35x0,3-ST	00103934	X)
517	Shim		DIN988 25x35x0,5-ST	00104167	X)
521	Shim		DIN988 30x42x0,1-ST	00103853	X)
522	Shim		DIN988 30x42x0,3-ST	00104094	X)
523	Shim		DIN988 30x42x0,5-ST	00123455	X)

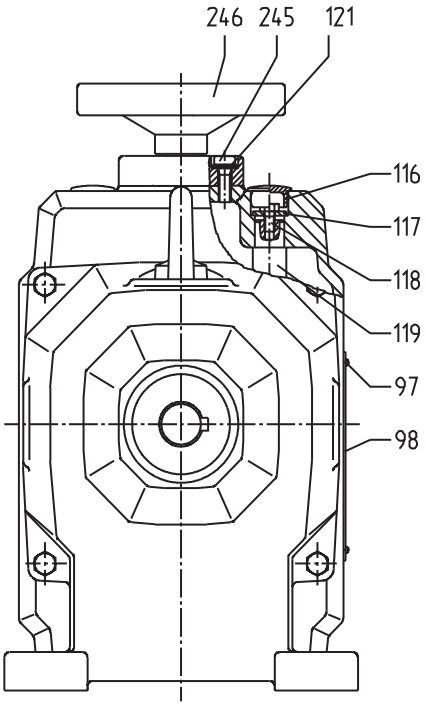
X) if required
When ordering spare parts always quote nameplate data with serial number and designation with part number!
Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted on the drive end. For parts see appropriate parts list.

Variable Speed Unit VARIMOT® D16

PARTS LIST

15 251 293 US





When ordering parts, please supply nameplate data with serial number or S.O. number, model number, description of part and part number.
X - As required

Shaded items denote recommended spare parts.
Ⓑ - Option B - Severe Duty Feature.

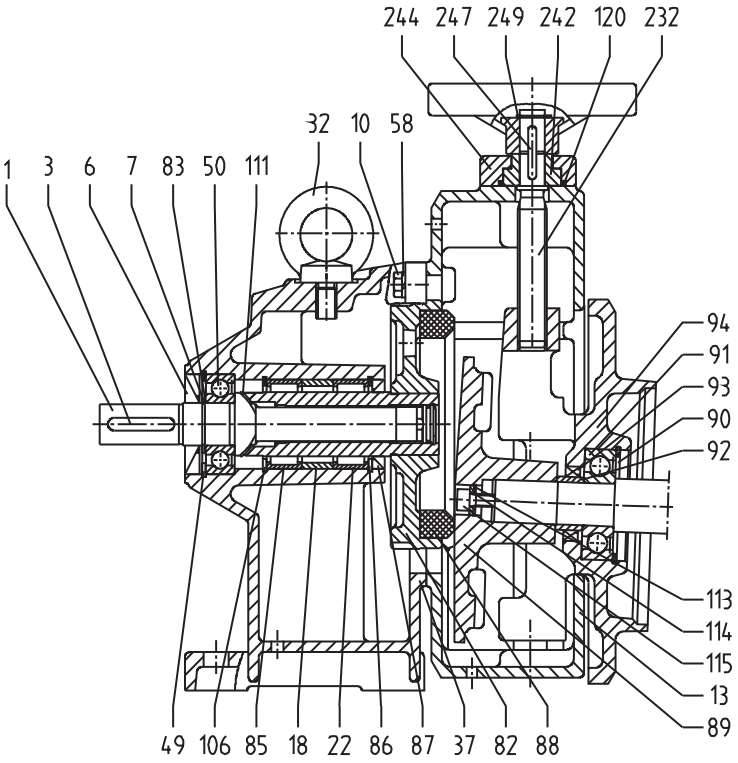
Item	Part Name	Description	Part No	Qty
1	Output Shaft Complete	19mm Diameter	154 002 5	1
1	Output Shaft Complete	0.750 in. Diameter	154 003 3	1
3	Key 19mm Dia. Shaft	A6x6x32mm	010 015 3	1
3	Key 0.750 in. Dia. Shaft	3/16x3/16x1-1/16 in.	806 920 4	1
6	Oil Seal	A20x47x7mm-No Spring	011 190 2	1
7	Retaining Ring	20x1.2mm External	010 271 7	1
10	Hex Head Screw	M6x20mm	010 107 9	4
13	Mounting Plate		150 762 1	1
18	Spacer		150 570 X	1
22	Needle Roller Bearing	RNA4905	010 582 1	1
32	Eyebolt	M10mm	010 229 6	1
37	Housing		150 547 5	1
49	Retaining Ring	47x1.75mm Internal	010 318 7	1

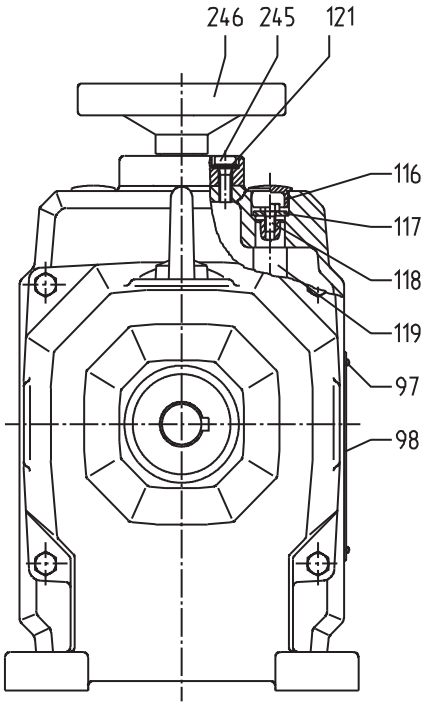
Item	Part Name	Description	Part No	Qty
50	Ball Bearing	6204-2Z	010 498 1	1
58	Lockwasher	B6mm	010 990 8	4
82	Hollowshaft Complete	With Friction Ring	154 030 0	1
82	Hollowshaft Complete	Without Friction Ring	154 026 2	1
83	Shim	20x28x0.5mm	010 415 9	1
85	Needle Roller Bearing	RNA4905	010 582 1	1
86	Retaining Ring	42x1.75mm Internal	010 317 9	1
87	Oil Seal	A30x42x5.7mm	010 616 X	1
88	Friction Ring		150 755 9	1
89	Driving Cone		150 768 0	1
89	Driving Cone Ⓑ	Chrome Plated	150 814 8	1
90	Retaining Ring	52x2mm Internal	010 319 5	1
91	Ball Bearing	6304-2RS-J	806 986 7	1

Variable Speed Unit VARIMOT® D16

PARTS LIST

15 251 293 US





When ordering parts, please supply nameplate data with serial number or S.O. number, model number, description of part and part number.
X - As required

Shaded items denote recommended spare parts.
Ⓑ - Option B - Severe Duty Feature.

Item	Part Name	Description	Part No	Qty
92	Wear Sleeve		150 822 9	1
93	Oil Seal	AS25x35x7mm	010 654 2	1
94	Motor Mounting Plate	DT71-80 Frame Motor	154 042 4	1
97	Cheese Head Nail	2x4mm	010 764 6	2
98	Scale		150 122 4	1
106	Retaining Ring	42x1.75mm Internal	010 317 9	1
111	Cam Washer		150 425 8	1
113	Retaining Ring	14x1mm Internal	011 451 0	1
114	Disc	6.4x13.8x2mm	013 961 0	1
115	Socket Head Screw	M6x25mm	010 134 6	1
116	Closing Plug	18.5mm	011 375 1	2
117	Disc	5.3x17.8x2mm	013 960 2	2
118	Hex Head Screw	M5x16mm	010 104 4	2

Item	Part Name	Description	Part No	Qty
119	Guide Pillar		150 796 6	2
119	Guide Pillar Ⓑ		150 788 5	2
120	O-Ring	27x2.5mm	017 644 3	1
121	Washer	B6.4mm	010 236 9	2
232	Spindle		150 585 8	1
242	Sleeve		150 525 4	1
244	Plate		150 580 7	1
245	Socket Head Screw	M6x16mm	010 156 7	2
246	Handwheel	100x12mm	010 747 6	1
246	Handwheel-HS Complete	100x12mm	150 841 5	1
247	Key	A4x4x25mm	013 529 1	1
249	Retaining Ring	12x1mm External	010 265 2	1

VARIMOT®

OPERATING INSTRUCTIONS

15 756 16A US

General

These operating instructions are intended to help you install and operate the drive. For trouble free service, proper installation and operation are essential. Additionally, these instructions contain important recommendations on maintenance.

Before shipment every SEW-Eurodrive gear unit is thoroughly tested, checked, and properly packed. However, please check the drive immediately upon arrival for shortage or transit damage. Note the damage or shortage on the freight bill of lading and file a claim with the carrier. Additionally, notify SEW-Eurodrive of the shortage or damage.

Installation

VARIMOT® units may be foot mounted, flange mounted or attached to a gear unit. The drive installation site should be selected to ensure:

- Ambient temperature below 40°C (104°F).
- Unimpeded flow of air to the motor and variable speed unit.
- Accessibility to the drain, level and breather plugs.
- Adequate space for removal of brakemotor fanguard for brake adjustment and maintenance.

The drive unit should be mounted on a flat, vibration damping, and torsionally rigid structure. Careful alignment is critical. Mounting to an uneven surface will cause housing distortion. The flatness tolerance of the supporting surface should not exceed 0.004 inch.

Installation of Couplings, Sprockets, Sheaves, Etc.

Do not hammer on the shafts. Hammering can cause brinelling of the bearings and a reduction in bearing life.

We recommend heating the components to approximately 175°F and sliding them on. This will reduce possible damage to the bearings.

The VARIMOT® shaft diameters have tolerance of +.0000″ -.0005″. Tolerance for metric shafts are listed in SEW-Eurodrive catalogs.

Shaft couplings should be properly aligned to prevent vibration, coupling wear and premature failure of the shaft bearings.

Maximum Parallel Offset	0.003 inch
Maximum Angular Offset	0.030°

To prevent the output shaft and bearings from being subjected to excessive loads, the maximum overhung load, as shown in SEW-Eurodrive catalogs, should not be exceeded. Please consult our engineering department if the load may exceed the recommended figure given or where there are combined radial and axial loads. In such cases, the exact operating conditions must be stated including speed, direction of rotation, position, magnitude, and direction of the external radial and axial loads being applied.

Severe Duty Units

Severe Duty units include drain holes in the traction housing at the lowest points allowing condensation to drain out of the variable speed housings.

CAUTION!

The drain holes are installed for the mounting position listed on the nameplate. Installing a unit in a mounting position other than what is shown on the nameplate will reposition the condensation drain holes. As a result, the drain holes may not be located at the lowest point and may not allow water to drain. This can cause premature drive failure.

Operation

VARIMOT®'s are shipped with the speed setting adjusted for minimum output rpm. For manually controlled units, the speed is increased by turning the handwheel (sprocket, spindle, etc.) counter-clockwise. The VARIMOT® is supplied with permanent stops at minimum and maximum speeds. Relative speed may be determined by referring to the speed scale on the side of the unit.

For Electric Remote Control units, see electrical connections and speed stop setting on pages 3 and 4.

Please refer also to the motors' operating instructions.

Maintenance and Lubrication

CAUTION! Always ensure equipment is secure and electrical power is off before removing or performing maintenance on the drive assembly. VARIMOT® variable speed units are largely maintenance-free. The VARIMOT® drive case itself does not require oil since it is a dry traction drive. However, for units which are flange mounted to a gear reducer, there is an oil plug located in the VARIMOT® flange. Depending on the drive mounting position, this plug may be used as a breather or oil level plug for the reducer. This plug does not connect to the VARIMOT® housing. Refer to the Operating Instructions for Gear Reducers for proper gearcase oil level.

The traction ring wear can be checked by the torsional play on the output shaft. If the torsional play is approximately 45°, the traction ring needs to be replaced. In the case of gear reducer fitted with variable speed drive, the torsional play can be checked at the motor fan. For this purpose the drive unit should be set at 80% speed (the pointer on the scale should be at 80). If there is torsional play of 45° on the fan, the traction ring needs to be replaced.

SEW EURODRIVE

SOUTHEAST MANUFACTURING & ASSEMBLY CENTER
1295 Old Spartanburg Highway/Lyman SC 29365
(864) 439-7537 Fax: (864) 439-7830

SOUTHWEST ASSEMBLY CENTER
3950 Platinum Way/Dallas TX 75237
(214) 330-4824 Fax: (214) 330-4724

MIDWEST ASSEMBLY CENTER
2001 West Main Street/Troy OH 45373
(937) 335-0036 Fax: (937) 222-4104

EAST COAST ASSEMBLY CENTER
200 High Hill Road/Bridgeport NJ 08014
(856) 467-2277 Fax: (856) 845-3179

WEST COAST ASSEMBLY CENTER
30599 San Antonio Road/Hayward CA 94544
(510) 487-3560 Fax: (510) 487-6381

To replace the traction ring:

- Remove four (4) hex head screws - [2].
- Split the traction housings.
- Mark the traction ring/hollowshaft assembly so the cam lobes at the end of the shaft assembly can later be engaged at the same place.
- Remove the complete hollowshaft [9] from the housing [8].
- Carefully pry out the friction ring from the hollowshaft.
- Place new friction ring on a clean, even surface.
- Center the hollowshaft over the friction ring shoulder.
- Press the hollowshaft and friction ring together.
- Before assembling the housing, clean the driving cone surface [6] so it is completely free from oil and grease.

When the traction ring is checked or replaced, perform the following regreasing of the bearings and cam lobes:

- Remove the hollowshaft assembly [9] if it is still in the housing [8].
- Regrease the needle roller bearings [7] with Molilux EP2 or equivalent. When regreasing, do not overfill cavity. Too much grease generates an excessive amount of heat.
- Grease the cam lobes [11] with Lubriplate grease GR-132 or bearing grease.

If the cam lobes are worn excessively (approximately 0.04in/1mm) and cannot function properly by sliding over each other, replace both the hollowshaft, output shaft and cam washer.

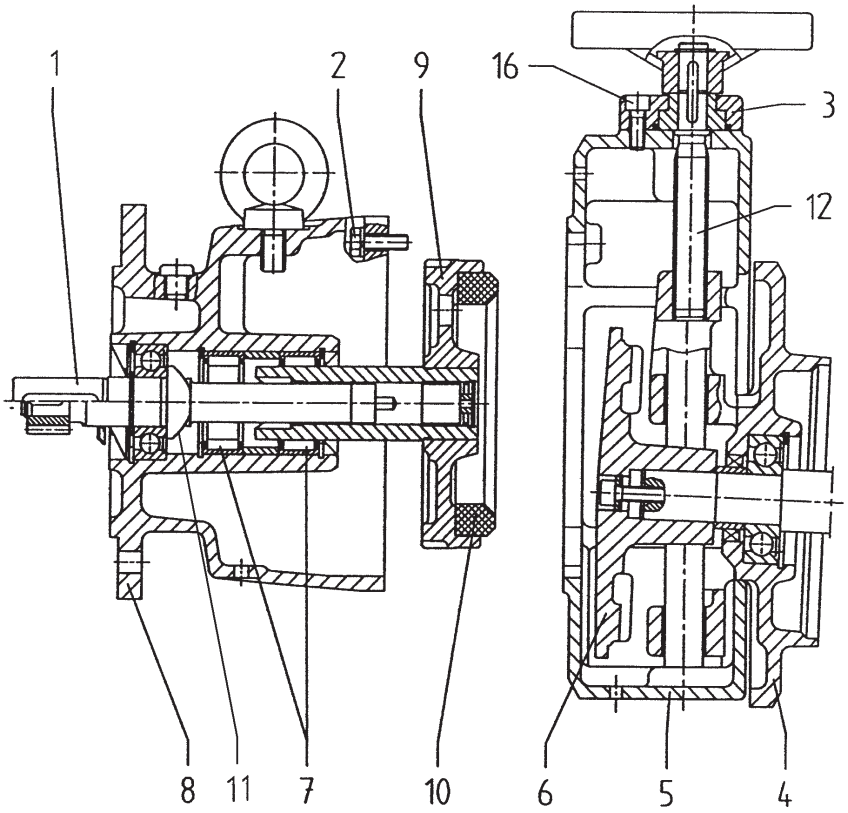
Periodically, the threaded speed adjusting spindle [12] should be relubricated with a suitable grease such as Never-Seez®.

Grease-packed bearings should be cleaned and regreased every 10,000 hours with Mobilux EP2 or equivalent. Care must be taken that only 1/3 of the free volume of the bearing space is filled with grease in order to avoid overheating of the bearing.

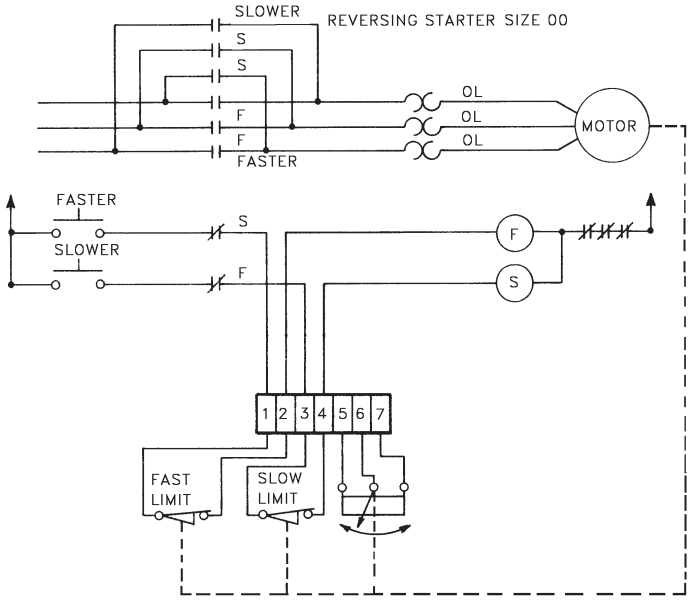
Check coupling alignment, chain or belt tension and mounting bolt torque periodically.

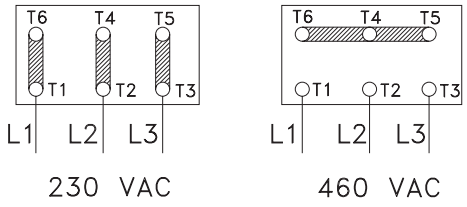
To ensure adequate cooling, deposits of dirt and dust on the surfaces of the units must be removed at frequent intervals. Particular attention should be paid to the motor by removing all deposits from between the motor cooling fins and also from the air intake on the fan guard.

1 Input shaft
2 Hex head screw
3 Plate
4 Motor mounting plate
5 Mounting plate
6 Driving cone
7 Needle roller bearing
8 Housing
9 Hollow shaft
10 Friction ring
11 Cam lobe
12 Speed adjusting spindle
16 Socket head screw



Wiring Diagram for 3 Phase Remote Speed Control Motors - Option EF





MOTOR TERMINAL CONNECTIONS

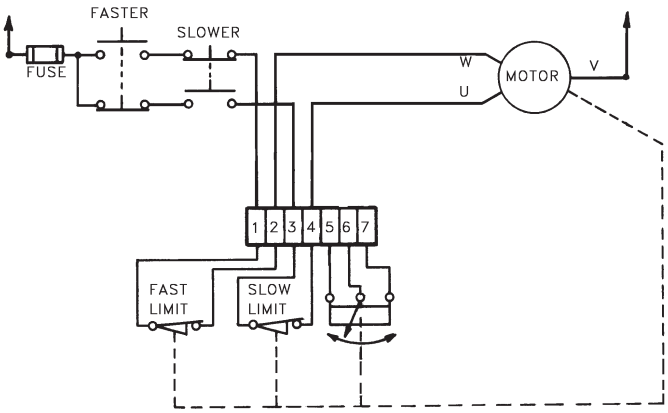
EF Motor Current for VARIMOT® Sizes:
D/DF 16 - 26 @ 230V/460V: 0.4A/0.2A
D/DF36 - 46 @ 230V/460V: 0.55A/0.32A

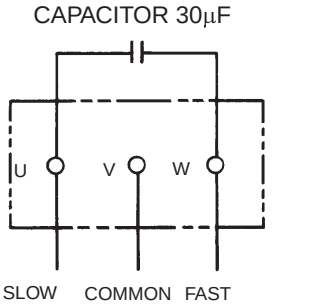
The speed control motor is rated for 15% ED (cyclic duration factor) and a maximum starting frequency of 20 per hour.

NOTE:

Pushbutton and motor starter are not supplied by SEW-Eurodrive.
See page 4 for adjusting the limit switches.

Wiring Diagram for Single Phase Remote Speed Control Motors - Option EF





MOTOR TERMINAL CONNECTION

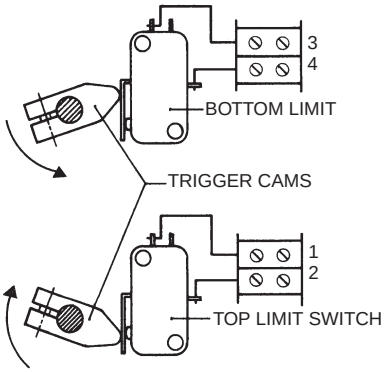
Motor Current for all VARIMOT®
Sizes @ 115V: 2.1 Amps

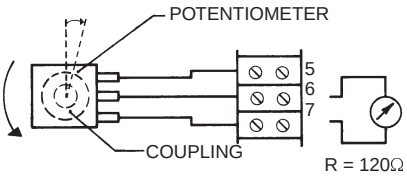
NOTE:

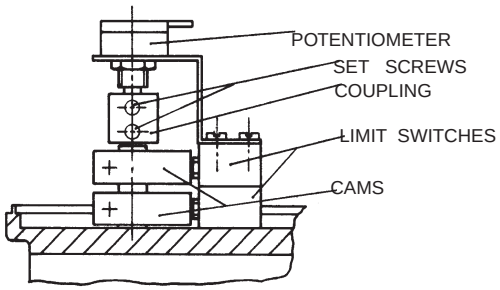
Fuse and pushbuttons are not supplied by SEW-Eurodrive.
See page 4 for adjusting the limit switches

The speed control motor is rated for 15% ED (cyclic duration factor) and a maximum starting frequency of 20 per hour.

Setting of the Speed Range Limits - Option EF







The Limit Switches and Potentiometers are factory preset for maximum speed range. To modify the speed range, the limit switches may be field adjusted. The switches and potentiometers are located under the cover of the speed control motor.

Limit Switch Adjusting Instructions:

1. Remove cover.
2. Run the Speed Control Motor to obtain the maximum drive output speed.
3. Rotate the CAM for the Top Limit Switch clockwise until it trips the Limit Switch. Tighten the locking screw.
4. Run the Speed Control Motor to obtain the minimum drive output speed.
5. Rotate the CAM for the Bottom Limit Switch counter-clockwise until it trips the Limit Switch. Tighten the locking screw.

Potentiometer Adjusting Instructions (used for closed loop system control):

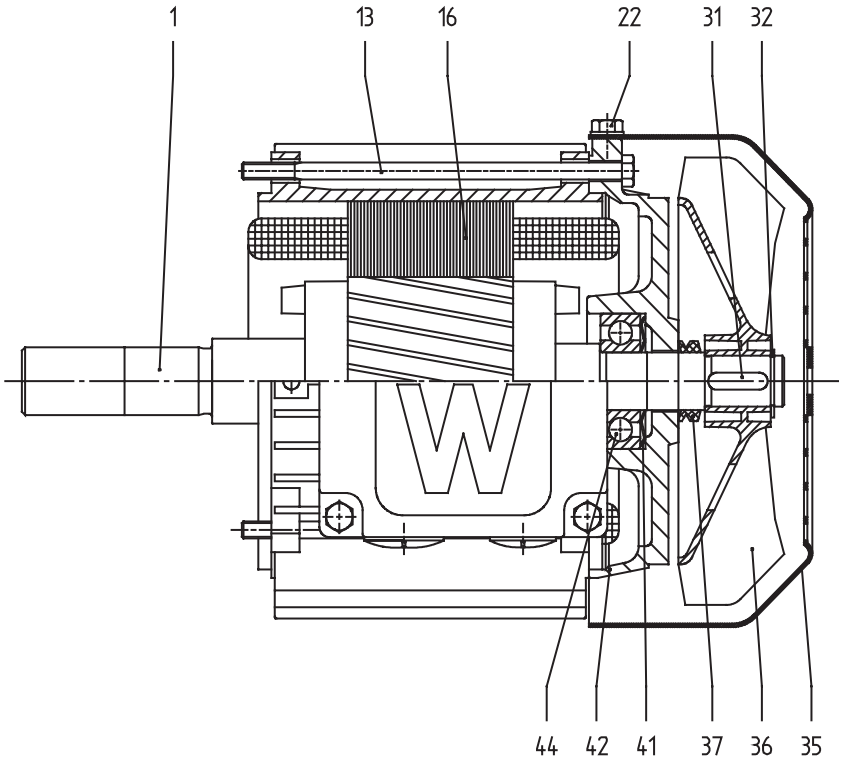
1. Turn the potentiometer counter-clockwise until it runs against the stop (Variable Speed Unit must be at minimum speed). Turn the potentiometer approximately 15° clockwise. Between terminals 6 & 7 there must be a resistance of 120 ohms.
2. Tighten the coupling set screws.

Motor

DT71D; DT80K & N
For VARIMOT® D16

PARTS LIST

08 408 494 US



When ordering parts, please supply nameplate data with serial number or S.O. number, model number, description of part and part number. Rotors and stators are stamped with a part number.

For terminal box parts, refer to respective parts list. Shaded items denote recommended spare parts.

Item	Part Name	Description	Part No	Qty
1	Rotor	DT71D4	184 516 0	1
1	Rotor	DT71D6	184 517 9	1
1	Rotor	DT80K4	184 518 7	1
1	Rotor	DT80N4	184 462 8	1
1	Rotor	DT80K6	184 519 5	1
1	Rotor	DT80N6	184 520 9	1
13	Hex Head Screw DT71	M5x115mm	011 868 0	4
13	Hex Head Screw DT80	M5x165mm	011 869 9	4
16	Stator Complete			1

Item	Part Name	Description	Part No	Qty
22	Hex Head Screw	M5x7mm	013 630 1	4
31	Key	A5x5x18mm	010 006 4	1
32	Retaining Ring	15x1mm External	010 267 9	1
35	Fan Guard		135 059 5	1
36	Fan		135 599 6	1
37	V-Ring	V16	011 768 4	1
41	Spring Washer	33x39.1x0.5mm	011 589 4	1
42	B-Side Endshield		135 092 7	1
44	Ball Bearing	6203-2RS-J-C3	017 166 2	1

Motors and Brakemotors

Type BM (G) Brakes

OPERATING INSTRUCTIONS

09 793 77 US

General

Every SEW-Eurodrive motor is thoroughly tested, checked, and properly packed prior to shipment. However, please check immediately upon arrival for shortage of parts or transit damage. Note the damage or shortage on the freight bill of lading and file a claim with the carrier. Also, notify SEW-Eurodrive of the shortage or damage.

Installation

For motors mounted integrally to a gear unit, please refer to the Operating Instructions for Gearmotors and Gear Reducers for proper installation of the drive. The drive installation site should be selected to ensure:

- Ambient temperatures below 40°C (104°F).
- Unimpeded flow of air to the motor and variable speed units.
- Accessibility to gear unit, oil plugs.
- Adequate space for the removal of the brakemotor fanguard for brake adjustment and maintenance.

The drive unit should be mounted on a flat, vibration damping, and torsionally rigid structure. The flatness tolerance of the supporting surface should not exceed:

For motor size 180 and smaller — 0.004 inch
For motor size above 180 — 0.008 inch

Do not hammer on the shafts to install couplings, sheaves, etc. Hammering can cause brinelling of the bearings and a reduction in bearing life. We recommend heating the components to approximately 175°F and sliding them on. This will reduce possible damage to the bearings. In addition, there is a metric tapped hole in the center of the motor shaft that can be utilized with a tool to press on or remove the coupling, sheaves, etc.

The motor shaft diameters are metric and have tolerances as listed in the SEW-Eurodrive catalogs. Shaft couplings should be properly aligned to prevent vibration, coupling wear and premature failure of the shaft bearings.

Maximum Parallel Offset — 0.003 inch
Maximum Angular Offset — 0.030°

To prevent the output shaft and bearings from being subjected to excessive loads, the maximum overhung loads, as shown in SEW-Eurodrive catalogs, should not be exceeded. Please consult our engineering department if the load may exceed the recommended figure given or where there are combined radial and axial loads. In such cases, the exact operating conditions must be stated including speed, direction of rotation, position, magnitude and direction of the external radial and axial loads being applied.

Long Term Storage

If the motor must be stored for a long period of time without operating, the motor must be stored in a dry, protected area, and in the mounting position indicated on the unit nameplate. In order to ensure that the motor has not been damaged by moisture after a prolonged storage, the insulation resistance should be checked. An insulation tester with a measurement voltage of at least 500V (e.g. magneto generator) should be used for this purpose. The insulation resistance is sufficient if it has an ohmic value of at least 1000 x V_N (e.g. at V_N = 230VAC: $R_{insul} \geq 230000$ ohms = 0.23M ohms). If the measured value is smaller, the motor should be dried before use (for example, with hot air up to a maximum of 90°C or by resistance heating with an auxiliary AC voltage of 10% of V_N via an isolating transformer). Care should be taken to ensure that the motor is heated with not more than 20% of its rated current and that the rise in temperature is not more than 90°C. The drying procedure can be stopped when the insulation resistance has reached 500000 = 0.5M ohms.

Severe Duty Units

Severe Duty Units are indicated with the letters "-KS" at the end of the motor type on the motor nameplate. Severe Duty units include drain holes in the motor end bells and conduit box at the lowest points allowing condensation to drain out of the motor.

CAUTION!

The drain holes are installed for the mounting position listed on the gearbox nameplate. Installing a unit in a mounting position other than what is shown on the nameplate will reposition the condensation drain holes. As a result, the drain holes may not be located at the lowest point and may not allow water to drain. This can cause premature drive failure.

Electrical Connection

The motor must be installed and connected by a qualified electrician who is knowledgeable with the NEC article 430 and local regulations. He must make sure that the voltage and frequency of the electrical supply correspond with the data stamped on the motor nameplate before connecting the motor in accordance with the wiring diagram, which can be found in the terminal box. For brake connections, see the following pages.

At installation the electrician must make sure that the terminal block jumpers are positioned correctly and that all electrical connections including the ground connection are secure. In order to effectively protect the motor from overloads, appropriate motor protection must be provided. Fuses do not always provide adequate motor protection. For motors which are required to operate with a very high start-stop frequency, the overload heater type motor protection is insufficient. It is advisable in such applications to provide the motor with temperature sensors (thermistors) in the windings. Monitor the thermistors by means of an external trip device. In this way, the motor will be fully protected against practically all possible overloads.

When using motors outdoors or in washdown applications the cable entries into the terminal box must be directed downward to prevent water from entering the conduit box. The unused cable entries must be closed off properly.

Lubrication and Maintenance

WARNING! Always ensure equipment is secure and electrical power is off before removing or performing maintenance on the drive assembly. The motor bearings are sealed and the grease content is adequate for the life of the bearing.

SEW EURODRIVE

SOUTHEAST MANUFACTURING & ASSEMBLY CENTER
1295 Spartanburg Highway/Lyman SC 29365
(864) 439-7537 Fax: (864) 439-7830

SOUTHWEST ASSEMBLY CENTER
3950 Platinum Way/Dallas TX 75237
(214) 330-4824 Fax: (214) 330-4724

MIDWEST ASSEMBLY CENTER
2001 West Main Street/Troy OH 45373
(937) 335-0036 Fax: (937) 332-0038

EAST COAST ASSEMBLY CENTER
200 High Hill Road/Bridgeport NJ 08014
(856) 467-2277 Fax: (856) 845-3179

WEST COAST ASSEMBLY CENTER
30599 San Antonio Road/Hayward CA 94544
(510) 487-3560 Fax: (510) 487-6381

Brake Coil Resistance

Motor Frame		DT71-80	DT80	DT90-100	DT100	DV112-132S	DV132M-160M	DV160L-225
Brake Size		BM(G)05	BM(G)1	BM(G)2	BM(G)4	BM(G)8	BM15	BM30/31/32/62
Brake Torque (lb-ft)		0.89 - 3.7	4.4 - 7.4	3.7 - 14.8	17.7 - 29.5	7.00 - 55.3	18.4 - 110.6	36.9 - 442.5
BRAKE VOLTAGE		$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$	$R_B(\Omega)$
AC (to rectifier V_B)	DC	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$	$R_T(\Omega)$
—	24	4.4 13.4	3.9 12.1	3.4 10.2	2.7 8.2	1.4 7.5	0.8 5.0	0.67 5.0
105-116	48	17.6 53.4	15.6 48.1	13.6 40.5	10.9 32.7	5.7 29.8	3.1 20.1	2.2 16.8
186-207	80	55.6 169	49.5 152	42.9 128	34.5 103	17.9 94.2	9.8 63.5	7.1 53.0
208-233	96	70.0 213	62.3 192	54.0 161	43.4 130	22.5 119	12.4 80.0	8.9 66.7
330-369	147	176 534	157 481	136 405	109 327	56.5 298	31.1 201	22.3 168
370-414	167	221 672	197 606	171 510	137 411	71.2 375	39.2 253	28.1 211
415-464	185	279 846	248 762	215 643	173 518	89.6 472	49.3 318	35.4 266
465-522	208	351 1066	312 960	271 809	218 652	113 594	62.1 401	44.6 334

Voltage AC - The voltage shown is the nameplate AC brake voltage supplied to the brake rectifier.

DC - The voltage shown is the effective DC voltage required by the brake coil. The measured voltage from the rectifier will be 10-20% lower than that shown.

Brake Coil Resistance - values must be measured with the brake coil disconnected from the rectifier.

R_B - Accelerator coil resistance in Ω, measured from the red to the white brake coil wire at 20º C.

R_T - Fractional coil resistance in Ω, measured from the white to the blue brake coil wire at 20º C.

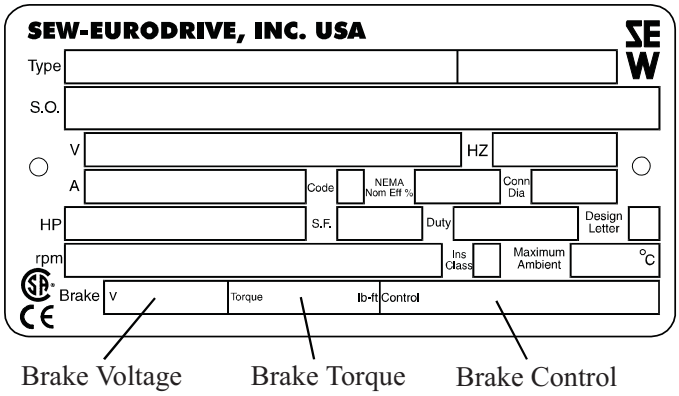
Brake Connection (AC Voltage)

SEW-Eurodrive motor brakes can be connected in a number of different ways. In order to connect the brake for each application, it is important to refer to the data on the motor nameplate that describes the brake system. The brake fields are: brake voltage, brake torque and brake control.

This operating instruction covers AC brake voltages with the following brake control components. If the brake voltage is DC, or if the brake control components differ from those listed below, an additional operating instruction must be consulted for connection information.

SEW-Eurodrive fail-safe mechanical brakes are DC controlled. Standardly, a brake rectifier (halfwave) is provided to convert the AC line voltage to the DC voltage required to drive the brake. 24VDC brakes do not include a rectifier. When voltage (V_B) is applied to the brake, it will release. When voltage (V_B) is removed from the brake, it will set. The brake rectifier can be wired either for normal brake reaction time (setting, stopping) or fast brake reaction time. The fast brake reaction will set the brake more quickly which will provide a shorter and more repeatable stopping distance. There are two basic types of brake rectifiers, BG and BGE. The BG brake rectifier is standard on motor sizes DT71 - DT100. The BGE rectifier is standard on motor sizes DV112 - DV225. The BGE rectifier can be ordered with motor sizes DT71 - DT100 and will provide faster brake release times allowing the motor to cycle more frequently.

Brake Control (Rectifier)	Part Number
BG1.5	825 384 6
BG3.0	825 386 2
BGE1.5	825 385 4
BGE3.0	825 387 0

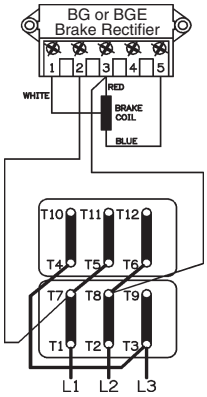


The wiring diagrams for brake connections are located on the inside of the motor conduit box lid. The brake will release and allow the motor to rotate when the nameplate AC brake voltage V_B is supplied to the brake rectifier terminals. There are certain cases where the brake rectifier can receive its voltage from the motor's terminal block, meaning that when power is applied to the motor it will simultaneously release the brake and start the motor. See page 3 for this description.

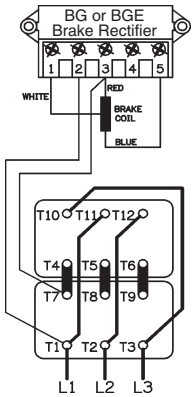
Brake Voltage Supplied from the Motor

There are specific instances when the brake voltage can be tapped from the motor's terminal block. The advantage of brake systems wired in this way is when power is applied to the motor, the brake releases, (requiring no additional brake supply power wiring). The brake can be wired to the motor terminal block under the following conditions: a single speed motor; the motor is started and run across the line (i.e., no inverter or electronic soft start). The connections shown on this page are for normal brake reaction time. For rapid brake reaction time, incorporate the contact as shown on the brake diagram located on the inside of the motor conduit box lid.

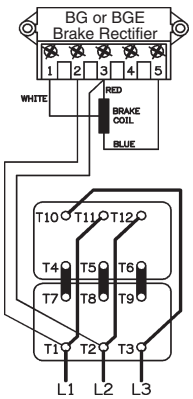
Brake Motor Connection
Single Speed Dual Voltage - ΔΔ/Δ
Connection Diagram DT72
Example Motor Voltages:
230ΔΔ/460Δ Volts - 60 Hz



Motor wired for low voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 230V
Brake voltage 230V

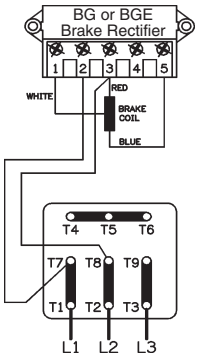


Motor wired for high voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 230V

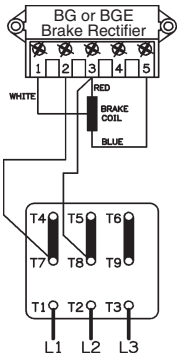


Motor wired for high voltage.
Brake voltage matches high motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 460V

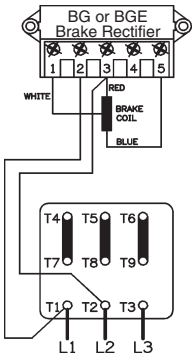
Brake Motor Connection
Single Speed Dual Voltage - YY/Y
Connection Diagram DT79
Example Motor Voltages:
230YY/460Y Volts - 60 Hz
200YY/400Y Volts - 50 Hz



Motor wired for low voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 230V
Brake voltage 230V

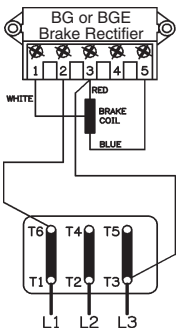


Motor wired for high voltage.
Brake voltage matches low motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 230V

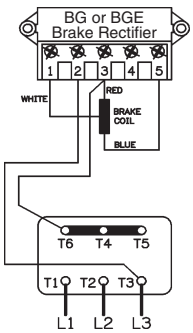


Motor wired for high voltage.
Brake voltage matches high motor voltage.
Example: 230/460V Motor
Motor wired 460V
Brake voltage 460V

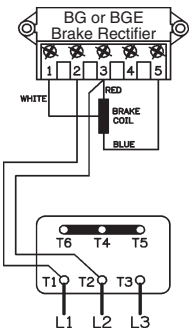
Brake Motor Connection
Single Speed Dual Voltage - Δ/Y
Connection Diagram DT13
Examples Motor Voltages:
200Δ/346Y Volts - 60 Hz
330Δ/575Y Volts - 60 Hz
220Δ/380Y Volts - 50 Hz



Motor wired for low voltage.
Brake voltage matches low motor voltage
Example: 200/346V Motor
Motor wired 200V
Brake voltage 200V



Motor wired for high voltage.
Brake voltage matches low motor voltage.
Example: 220/380V Motor
Motor wired 380V
Brake voltage 220V



Motor wired for high voltage.
Brake voltage matches high motor voltage.
Example: 220/380V Motor
Motor wired 380V
Brake voltage 380V

Re-adjusting the Brake Air Gap

A properly adjusted brake air gap is critical for correct operation. The following table indicates the required air gap measurement.

Motor Size	Brake Size	Air Gap
DT71 - DT100	BM(G)05 - BM(G)4	0.010"-0.024" (0.25-0.6 mm)
DV112 - DV225	BM(G)8 - BM31	0.012"-0.047" (0.3-1.2 mm)
DV180-DV225	BM32-BM62 Double Disc	0.016"-0.047" (0.4-1.2 mm)

Prolonged use of the brake will wear the brake disc lining. This wear increases the air gap. When the air gap approaches its maximum value, the brake must be re-adjusted. To re-adjust the brake, follow the procedure below.

1. Remove the fan cover (14), fan snapring, fan (17), rubber seal (2), and any accessories at the fan end.
2. Insert a feeler gauge between the brake coil body (21) and the stationary disc (22), tighten the adjusting nuts (19) until the minimum value for the air gap is reached equally around the brake. With motor size 160L and up (brakes BM30 to BM62) first screw the threaded bushings (24) into the endshield. After setting the air gap, lock the bushings (24) against the coil body.
3. Ensure a play of 0.06" to 0.08" (1.5 to 2 mm) in the releasing arm. See "THE HAND RELEASE MECHANISM."

Replacement of the Brake Disc (26)

Extended operation of the brake may wear the brake disc (26) beyond acceptable limits. The thickness of the brake disc can be measured to determine if this has occurred.

Motor Size	Brake Size	Min. Disc (26) Thickness
DT71 - DT100	BM05 - BM4	0.354" (9mm)
DV112 - DV225	BM8 - BM62	0.394" (10mm)

If the brake disc (26) is worn below the measurement given, it must be replaced. If the thickness is greater than the specification above, the brake disc is still usable and the brake can be re-adjusted.

The Hand Release Mechanism

Most of our brakes are supplied with a hand-operated release lever. This allows opening of the brake without applying power, allowing for adjustments on the driven machinery.

There are two brake release mechanisms available:

The "BMHR" (4) type requires a lever to be inserted into the release arm. To open the brake, pull the lever away from the motor. It will re-engage automatically, once the lever is released. The lever, when not used, is attached to the motor's cooling fins with clamps.

The screw-type "BMHF" (5) arrangement requires a hexagon key which, when turned clockwise, opens the brake.

Since the stationary disc (22) will move away from the coil body during the brake's operation, it is vital that there is free play (floating clearance) on the release arm of 0.060"-0.080" (1.5-2.0 mm). The springs (11) should be placed between the arm (7) and the nuts (12) to eliminate noise.

The brake release mechanism is not used to change the brake's torque setting. There must always be clearance on the lever.

Troubleshooting

Fault: Motor does not run

1. Check the motor and brake wiring for damage and proper connection.
2. At the motor, measure the line voltage, line current and motor resistance of all three phases.
3. If all three phases read a similar current value the following conditions may exist:
   - The motor may be blocked by either an excessive external load, or problems in the reducer or the brake. In both cases, the motor should draw locked rotor (in-rush) current. Consult SEW-Eurodrive catalogs for these values. Release the brake mechanically, reset the air gap if needed, or disconnect the load from the output shaft.
   - If the brake is at fault electrically see #4 below.
   - If the current differs significantly from the rated locked rotor current, the motor is either an incorrect voltage, or it is jumpered for the wrong voltage.
4. If the brake can be released mechanically, but does not respond to voltage, check the brake for electrical problems.
   - Make sure the wiring is according to the instructions. Pay special attention to the brake voltage.
   - Energize the brake circuit and measure the AC voltage on the rectifier terminals 2 and 3 (BG/BGE rectifiers). The measured voltage should correspond to the nameplate inscription: "Brake V."
   - Measure the DC voltage across terminals 3 and 5 of the brake rectifier which should be about 35% to 45% of the previously measured AC voltage.
   - If there is no fault found to this point, measure the resistance of the brake coils. Disconnect the coil from the rectifier for this measurement. See the table on Page 2 for the brake coil resistance values.
   - Measure the resistance of each brake coil lead to the brake coil body. This test should show an open circuit. If a short is found, the brake coil is damaged.

If the results of all these checks (electrical connection, mechanical checks and adjustments, and electrical tests) indicate that the brake should work, then the most likely cause of the brake's failure to release is a damaged brake rectifier.

Fault: Brake stopping time is too slow

If the brake has been operating well for some time and a gradual increase in stopping time has occurred, the release arm may have come in contact with the coil body. Verify that the brake release arm end play is correct, and check for excessive brake disc wear, (see previous instructions).

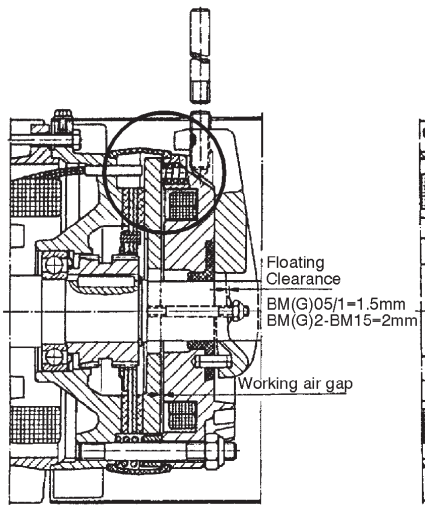
If the brake has been in operation for some time, and the stopping has become erratic, dust accumulation around the stationary disc guides may be the cause. Remove the brake's rubber sealing collar and clean with an air hose.

If the application is new, check the brake's wiring and air gap. If the brake is not wired for fast response, then changing the brake wiring to fast response will decrease the stopping time. Vertical motion and indexing applications may also require the fast response connection. Increasing the brake's torque may remedy the situation, but will also increase stress on the transmission.

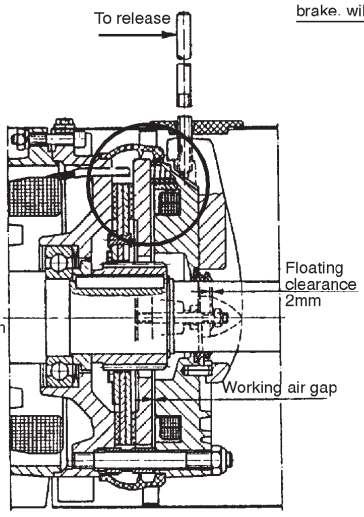
On applications requiring excessive brake work, the lining's surface may become glazed due to extreme heat. The application of a BGE rectifier will improve this situation dramatically. BGE rectifiers are standard equipment on motors size DV 112 - DV225, but optional on the smaller sizes DT71-DT100. Contact SEW-Eurodrive for more information.

BM(G) Brake Cross Section and Exploded Views

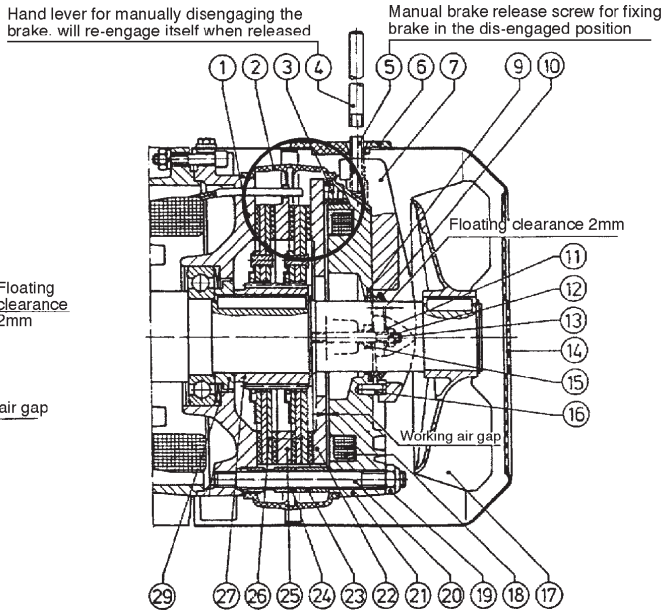
BM(G) 05 - BM 15

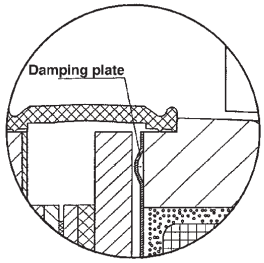


BM 30/31



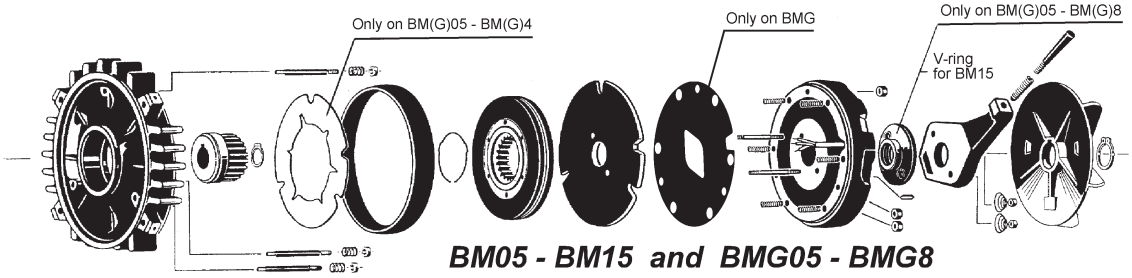
BM 32/62





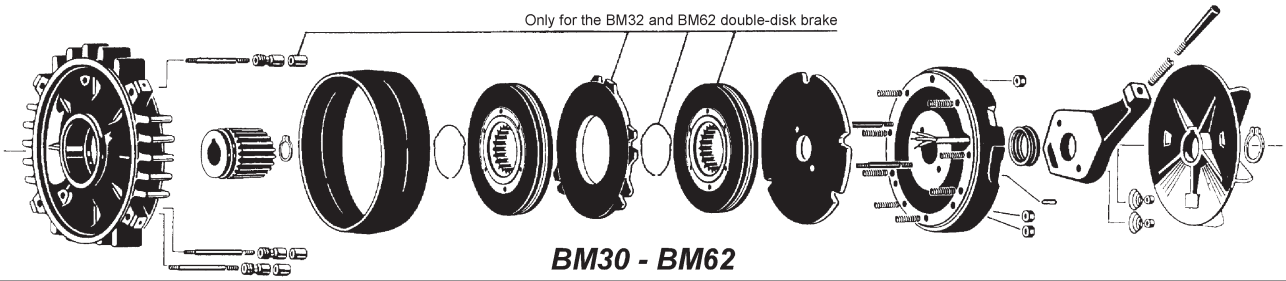
(1) Brake end shield
(2) Rubber sealing collar
(3) Braking springs
(4) Hand release lever
(5) Releasing screw
(6) Closing plate
(7) Release arm
(9) Sealing ring
(10) V-ring
(11) Conical spring
(12) Release
(13) Stud
(14) Fanguard
(15) Grommet
(16) Dowel pin
(17) Fan
(18) N/A
(19) Brake adjustment nut
(20) Retaining stud
(21) Brake coil body
(22) Stationary disc
(23) Pressure ring
(24) Setting sleeve
(25) Dual brake pad stationary disc
(26) Brake disc complete
(27) Carrier
(29) Cup Spring

Exploded view of the BM and BMG single-disk brake (motor sizes 71-160M)



BM05 - BM15 and BMG05 - BMG8

Exploded view of the BM single-disk and double-disk brake (motor sizes 160L-225)



BM30 - BM62

Troubleshooting Chart

PROBLEM	CAUSE	REMEDY
Motor Overheats (Check temperature with instrumentation)	Motor not connected for proper supply voltage	Check connection diagram on conduit box cover and correct the wiring.
	Supply voltage varies outside the allowable tolerance causing an undervoltage or overvoltage condition.	Assure correct supply voltage.
	Insufficient cooling air volume due to: a. Low frequency operation on variable frequency drive. b. Obstructed air flow.	Increase air flow: a. Continuous running auxiliary fan. b. Ensure unobstructed air flow.
	Ambient temperature is too high.	Ensure cool air gets to the motor. Ducting may be required.
	Overload at rated voltage. Unit will draw current in excess of nameplate rating and run below rated speed.	Select a larger unit.
	Motor's allowable duty cycle is exceeded (too many starts per hour required).	The problem may or may not be solved with a larger motor. Contact SEW-Eurodrive.
	Single phasing due to break or loose connection in supply line or blown fuse.	Repair supply lines. Replace fuses.
Motor does not run.	Blown fuse.	Determine and correct cause of failure and replace fuse.
	Motor protection device activated.	Reset protective device. Identify and correct cause for device activation.
	Motor protection device faulty or will not reset.	Check protection device for faults.
Motor will not start or starts sluggishly.	Motor not connnected for proper voltage.	Check connection diagram in conduit box cover and correct the wiring.
	Large voltage and/or frequency fluctuation at starting.	Ensure stable power supply.
For reduced voltage starting, motor will not start in Star Connection but will start in Delta connection.	Insufficient torque in Star Connection.	Start motor directly in Delta Connection if possible. Otherwise use a larger motor.
	Faulty contact in Star/Delta starter.	Correct fault condition.
Motor hums and draws high current.	Faulty or defective winding.	Have motor repaired by qualified service shop.
	Rotor dragging.	
Fuses blow or motor overcurrent protection trips immediately.	Short circuit in power supply conductors or in the motor.	Correct the fault condition.
	Motor has ground fault or winding to winding short circuit.	Have motor repaired by qualified service shop.
	Motor improperly connected.	Check connection diagram in conduit box cover and correct the wiring.
Motor runs in wrong direction.	Motor supply leads misconnected.	Switch two supply leads.

Note: If, after proceeding through the Troubleshooting Chart, the motor is found to be defective, contact your nearest SEW-Eurodrive Assembly Center for warranty assistance or replacement parts.

Each gear unit is supplied from the factory with the correct grade and quantity of lubricant for the specified mounting position. The following lubricants are supplied from our North American Facilities. Under special circumstances such as high or low ambient temperatures optional oils should be used.

Standard Oil

USA			
Gear Units	**Type**	**Manufacturer**	**Ambient Temperature °C**
R..17 – 167	Mobilgear 630 [M]	Mobil Oil Corp.	0 to +40
CANADA			
R..17	Tribol 800/220 [S]	Shell Oil Co.	0 to +40
R..27 – 167	Omala 220 [M]	Shell Oil Co.	0 to +40

[M]Mineral Oil
[S] Synthetic Oil

Optional Oil

USA			
Gear Units	**Type**	**Manufacturer**	**Ambient Temperature °C**
R..17 – 167	Mobilgear 629 [M]	Mobil Oil Corp.	-15 to +25
R..17 – 167	Mobil SHC630 [S]		-40 to +40
R..17 – 167	Mobil SHC629 [S]		-30 to +50
CANADA			
R..27 – 167	Omala RL220 [S]	Shell Oil Co.	-30 to +80

[M]Mineral Oil
[S] Synthetic Oil

For ball and roller bearings of gear units the following greases are recommended:

Mineral Grease

Type	Manufacturer	Ambient Temperature °C
Mobilux EP2	Mobil Oil Corp.	-20 to +40
Alvania Grease R3	Shell Oil Co.	-30 to +60

Synthetic Grease

Type	Manufacturer	Ambient Temperature °C
Mobiltemp SHC 32	Mobil Oil Corp.	-45 to +60

Lubricant table

	6) °C -50 0 +50 +100	DIN (ISO)	ISO, NLGI	Mobil®	Shell	Klüber	Aral	BP	Tribol	Texaco	Optimol	Fuchs
R...	Standard -10 +40	CLP(CC)	VG 220	Mobilgear 630	Shell Omala 220	Klüberoil GEM 1-220	Aral Degol BG 220	BP Energol GR-XP220	Tribol 1100/220	Meropa 220	Optigear BM 220	Renolin CLP220
	-25 +80	CLPPG	VG 220	Mobil Glygolyle 30	Shell Tivela WB	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP220	Tribol 800/220	Synlube CLP220	Optiflex A 220	
K...(HK...)	4) -40 +80	CLPHC	VG 220	Mobil SHC 630	Shell Omala 220 HD	Klübersynth EG 4-220	Aral Degol PAS 220		Tribol 1510/220	Pinnacle EP220	Optigear Synthetic A 220	Renolin Unisyn CLP220
	4) -40 +40		VG 150	Mobil SHC 629		Klübersynth EG 4-150				Pinnacle EP150		
	-20 +25	CLP(CC)	VG 150 VG 100	Mobilgear 627	Shell Omala 100	Klüberoil GEM 1-150	Aral Degol BG 100	BP Energol GR-XP100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP150
F...	-30 +10	HLP(HM)	VG 68-46 VG 32	Mobil D.T.E. 13M	Shell Tellus T 32	Klüberoil GEM 1-68	Aral Degol BG 46		Tribol 1100/68	Rando EP Ashless 46	Optigear 32	Renolin B 46 HVI
	4) -40 +10	CLPHC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46		
	4) -40 -20	HLP(HM)	VG 22 VG 15	Mobil D.T.E. 11M	Shell Tellus T 15	Isoflex MT 30 ROT		BP Energol HLP-HM 10		Rando HDZ 15		
S...(HS...)	Standard 0 +40	CLP(CC)	VG 680	Mobilgear 636	Shell Omala 680	Klüberoil GEM 1-680	Aral Degol BG 680	BP Energol GR-XP680	Tribol 1100/680	Meropa 680	Optigear BM 680	Renolin CLP680
	-20 +60	CLPPG	VG 680 1)	Mobil Glygoyle HE 680		Klübersynth GH 6-680		BP Enersyn SG-XP680	Tribol 800/680	Synlube CLP680		
	4) -30 +80	CLPHC	VG 460	Mobil SHC 634	Shell Omala 460 HD	Klübersynth EG 4-460				Pinnacle EP460		
	4) -40 +10		VG 150	Mobil SHC 629		Klübersynth EG 4-150				Pinnacle EP150		
	-20 +10	CLP(CC) HLP(HM)	VG 150 VG 100	Mobilgear 627	Shell Omala 100	Klüberoil GEM 1-150	Aral Degol BG 100	BP Energol GR-XP100	Tribol 1100/100	Meropa 100	Optigear BM 100	Renolin CLP150
	-25 +20	CLPPG	VG 220 1)	Mobil Glygoyle 30		Klübersynth GH 6-220			Tribol 800/220	Synlube CLP220	Optiflex A 220	
	4) -40 0	CLPHC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46		
R..., K...(HK...), F..., S...(HS...)	4) -30 +40	HCE 7)	VG 460		Shell Cassida Fluid GL460	Klüberoil 4UH1-460	Aral Eural Gear 460				Optileb GT 460	
	-20 +40	E 8)	VG 460			Klüberbio CA2-460	Aral Degol BAB 460				Optisynt BS 460	
W...(HW...)	Standard -20 +40	SEW PG	VG 460 2)			Klüber SEW HT-460-5						
	4) -40 +10	API GL5	SAE 75W90 (~VG 100)	Mobilube SHC 75 W90-LS								
	-20 +40	CLPPG 7)	VG 460 3)			Klübersynth UH1 6-460						
R32 R302	-25 +60	DIN 51 818 5)	00	Glygoyle Grease 00	Shell Tivela Compound A	Klübersynth GE 46-1200				Multifak 6833 EP00		
	Standard -15 +40		000 - 0	Mobilux EP004	Shell Alvania GL00		Aralub MFL00	BP Energrease LS-EP00		Multifak EP000	Longtime PD 00	Renolin SF 7 - 041

The lubricant table above shows the permitted lubricants for SEW gear units. Please note the following key to the lubricant table.

Key to the lubricant table

CLP = Mineral oil
CLP PG = Polyglycol (W gear units, conforms to USDA-H1)
CLP HC = Synthetic hydrocarbons
E = Ester oil (water pollution danger category WGK 1)
HCE = Synthetic hydrocarbons + ester oil (USDA - H1 certification)
HLP = Hydraulic oil
= Synthetic lubricant (= synthetic-based anti-friction bearing grease)
= Mineral lubricant (= mineral-based anti-friction bearing grease)

1) Helical-worm gear units with PG oil: Please contact SEW
2) Special lubricant for Spiroplan® gear units only
3) Recommendation: Select SEW $f_B \geq 1.2$
4) Note critical starting behavior at low temperatures!
5) Low-viscosity grease
6) Ambient temperature
7) Lubricant for the food processing industry
8) Biodegradable oil (lubricant for use in agriculture, forestry and water resources)