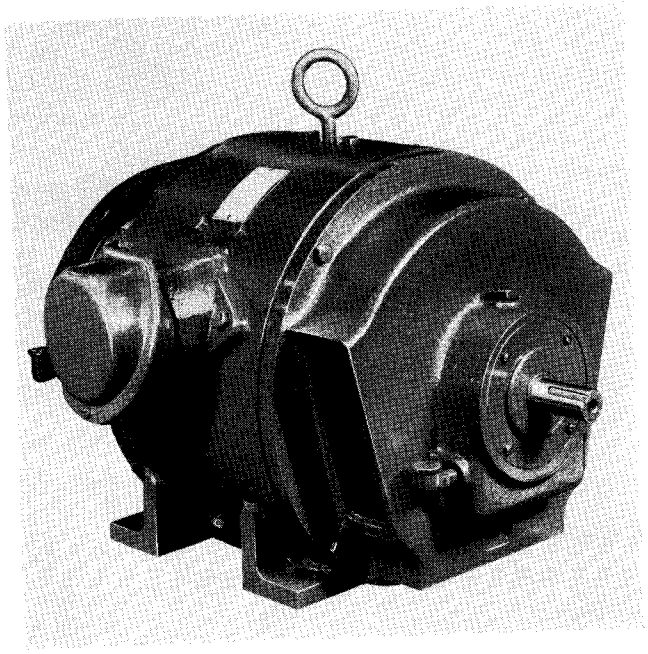
INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

DIRECT-CURRENT *Life-Line* MOTORS AND GENERATORS

TYPE SK, 5 TO 30 HP, 3 TO 25 KW

(Frames 254 Through 365 with Sleeve Bearings)



LIFE-LINE Type SK Motors and Generators in NEMA frame sizes 254 through 365 are direct-current machines designed for a wide variety of constant and variable speeds, plus constant and variable voltage applications. The armature is completely encased in a rolled steel frame. Cast iron end brackets offer special support to the sleeve bearings.

Warranty. The Corporation in connection with apparatus sold agrees to correct any defect or defects in workmanship or material which may develop under proper or normal use during the period of one year from the date of shipment, by repair or by replacement f.o.b. factory of the defective part or parts, and such correction shall constitute a fulfillment of all the Corporation's liabilities in respect to said apparatus, unless otherwise stated in the quotation.

Any defects that may develop should be referred to the nearest Westinghouse Sales Office for complete servicing information.

RECEIVING

Unpack the machine and make certain that it was not damaged during shipment. Turn the shaft by hand to see that it turns freely.

Check to see that the nameplate data agrees with the voltage of the power supply provided for the machine.

The shaft extension is coated with a slushing compound to prevent rusting during shipment and storage. This slushing compound may be removed by wiping with any petroleum solvent, such as benzine, gasoline, turpentine, Stoddard solvent, etc. See precautions under "Maintenance" page 4, for use of these solvents.

INSTALLATION

Mounting. Locate the machine in a place that is clean, dry and well-ventilated. If protecting shields or guards are used, they must not obstruct the free flow of air around the machine. The external air temperature should not exceed 40 degrees C or 104 degrees F.

Fasten to a rigid foundation using bolts or screws of the largest size permitted by the drilling in the mounting feet. The machine must rest evenly on all mounting pads.

For wall or ceiling mounting, the brackets must be turned exactly 90 or 180 degrees to keep the oil reservoir below the shaft and to maintain the neutral position of the brushes. This should preferably be done before the machine leaves the factory, however, if necessary it can be done afterwards. For wall mounting, the connection of the leads to the rocker ring must be interchanged to keep the polarity and direction of the current in the windings the same. For ceiling mounting, the leads to the rocker ring are not to be changed.

Method of Drive. Any of the following drive methods may be used depending on the particular application:

1. ***Flat Belt Drive.*** Mount the machine on the slide rails or bedplate, which allows for adjusting the belt tension.

Mount the pulley on the machine so that the

inner face of the pulley is in line with the shoulder on the shaft extension.

Use a belt wide enough to carry the load without excessive tension. Wide, single ply belts are preferable to double ply belts due to the lower bearing pressures that result.

The smallest pulley should not be less in diameter than that recommended by the belt manufacturer for the belt used, and in no case less in diameter than indicated in Table No. 1.

Align the pulleys so that the belt runs true, and tighten the belt just enough to prevent slippage. Where the pulleys are not of approximately the same diameter, the distance between shaft centers should be greater than twice the diameter of the larger pulley. For short center distances, an idler pulley or a V-belt drive should be employed.

2. ***V-Belt Drive.*** Mount the machine on the slide rails or bedplate, which allows for adjusting the belt tension.

Mount the sheave on the machine close to the bearing housing allowing sufficient clearance for armature end play.

The smallest sheave should not be less in diameter than that recommended by the belt manufacturer for the belt used, and in no case less in diameter than indicated in Table No. 2.

Sheaves should be carefully aligned. Belt tension should be just sufficient to eliminate excessive sag in the slack of the belt. V-belts do not require as much tension as flat belts.

3. ***Chain Drive.*** Mount the machine on the slide rails or bedplate, which allows for adjusting the chain tension.

Mount the sprocket on the machine close to the bearing housing, allowing sufficient clearance for armature end play, and align the sprockets accurately.

4. ***Gear Drive.*** Mount the machine and driven unit so as to maintain accurate alignment. The gears must mesh accurately to prevent vibration.

Mount the gear on the machine close to the bearing housing to minimize the overhang, allowing sufficient clearance for armature end play.

Dowel the machine to the base.

5. ***Direct Drive.*** The machine shaft and the driven or driving shaft must be carefully aligned.

Dowel the machine to the base.

Note: Pulleys, pinions or coupling halves should have a close sliding fit on the shaft extension and must be securely locked to avoid hammering out in operation. If it is necessary to drive the part into position, it is important, on sleeve bearing machines, that the end of the shaft opposite the extension be backed up so that the force of the blow is not taken in the bearing. Use a pinion puller for removing tight pulleys.

Table No. 1

PULLEY SIZE FOR FLAT BELT DRIVES

FRAME	PULLEY DIMENSIONS	
	MIN. DIAM. (Inches)	MAX. WIDTH (Inches)
254	3½	4½
284	4	5½
324	5	6¾
326 (above 2000 RPM)	5	6¾
326 (2000 RPM and below)	6	7¾
364	6	9¾
365	7	11

Table No. 2

SHEAVE SIZE FOR V-BELT DRIVES

FRAME	SHEAVE DIMENSIONS	
	MIN. PITCH DIAM. (Inches)	MAX. WIDTH (Inches)
254	2¾	4½
284	3	5½
324	3¾	6¾
326	4½	7¾
364	4½	9¾
365	5¼	11

Electrical Connections. Connect the motor and starter by referring to the diagrams furnished with the starter and as given in Diagrams No. 1, 2, 3 and 4 in Fig. 1.

Connect the generator and field rheostat by referring to diagrams furnished with the field rheostat and as given in Diagrams No. 5 and 6 in Fig. 1.

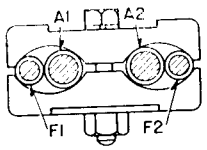
Install all wiring and fusing in accordance with the National Electric Code, and local requirements.

The conduit box on the side of the machine is designed with three conduit knockouts to suit various mounting conditions. Where it is desired to extend conduit from above or one side, remove the four mounting screws, and turn the conduit box 90 degrees or 180 degrees so that the knockout will be in the desired position. The recommended method of connecting the conduit is shown in Fig. 1.

MOTOR CONNECTIONS

(Rotation Facing Commutator End)

DIAGRAM NO. 1. Shunt Wound Motor Without Series Coils

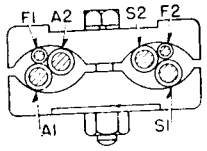


MOTOR TERMINALS

CLOCKWISE ROTATION
Connect A1 and F2 to −line
Connect A2 to starting resistance, then to +line
Connect F1 to +line

COUNTER-CLOCKWISE ROTATION
Connect A2 and F2 to −line
Connect A1 to starting resistance, then to +line
Connect F1 to +line

DIAGRAM NO. 2. Shunt Wound Motor with Series Coils, and Compound Wound

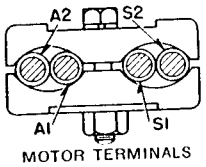


MOTOR TERMINALS

CLOCKWISE ROTATION
Connect S2 and F2 to −line
Connect A1 to S1
Connect A2 to starting resistance, then to +line
Connect F1 to +line

COUNTER-CLOCKWISE ROTATION
Connect S2 and F2 to −line
Connect A2 to S1
Connect A1 to starting resistance, then to +line
Connect F1 to +line

DIAGRAM NO. 3. Series Wound Motor



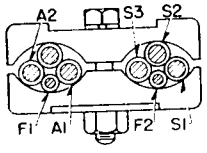
MOTOR TERMINALS

CLOCKWISE ROTATION
Connect S2 to −line
Connect A1 to S1
Connect A2 to starting resistance, then to +line

COUNTER-CLOCKWISE ROTATION
Connect S2 to −line
Connect A2 to S1
Connect A1 to starting resistance, then to +line

DIAGRAM NO. 4. Type SK Elevator Motor, Compound Wound—Classes II and III (See Note below)

(For Class I Motors, Use Diagram No. 1)



MOTOR TERMINALS

CLOCKWISE ROTATION
Connect S2 and F2 to −line
Connect A1 to S1
Connect A2 to starting resistor, then to +line
Connect F1 to +line

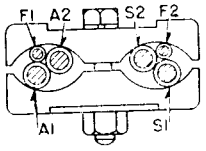
COUNTER-CLOCKWISE ROTATION
Connect S2 and F2 to −line
Connect A2 to S1
Connect A1 to starting resistor, then to +line
Connect F1 to +line

NOTE: Diagram indicates connection for starting, the full series field being in circuit. Under normal running conditions the series field is short circuited. In classes II and III motors, the series field may be cut out in two steps by short-circuiting S2 and S3, then S1 and S3.

GENERATOR CONNECTIONS

(Rotation Facing Commutator End)

DIAGRAM NO. 5. Compound Wound Generator

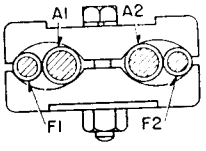


GENERATOR TERMINALS

CLOCKWISE ROTATION
Connect A2 to +line
Connect A1 and F2 to S2
Connect S1 to −line
Connect F1 to field rheostat, then to +line

COUNTER-CLOCKWISE ROTATION
Connect A1 to +line
Connect A2 to F2 to S2
Connect S1 to −line
Connect F1 to field rheostat, then to +line

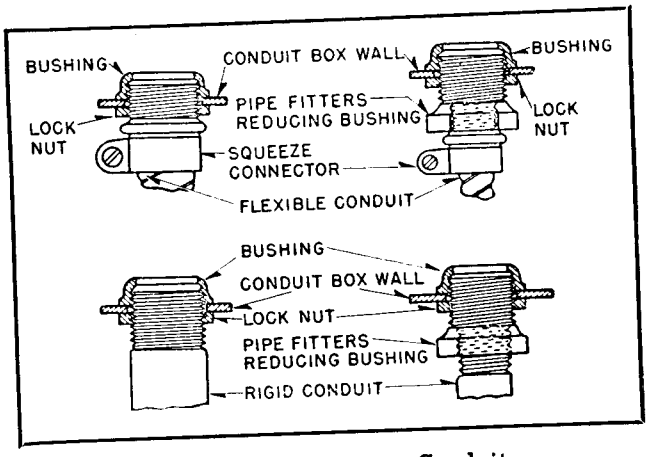
DIAGRAM NO. 6. Shunt Wound Generator



GENERATOR TERMINALS

CLOCKWISE ROTATION
Connect A2 to +line
Connect A1 and F2 to −line
Connect F1 to field rheostat, then to +line

COUNTER-CLOCKWISE ROTATION
Connect A1 to +line
Connect A2 to F2 to −line
Connect F1 to field rheostat, then to +line



Method of Connecting Conduit

FIG. 1. Motor and Generator Connection Diagrams

When the machine is mounted on a bedplate, or on slide rails for belt adjustment, flexible metallic conduit should be used to protect the leads to the machine. In making this connection, a squeeze connector should be used for attaching the flexible conduit to the conduit box. Squeeze connectors may be straight, 45 degrees or 90 degrees.

OPERATION

Motor. Run the motor without load to check the connections, and direction of rotation. To start or stop the motor, refer to the instructions furnished with the starter.

Generator.

Starting. Make certain that all instructions for installing have been complied with and that the connections have been properly made. Then observe the following instructions in the order named.

1. Start each generator with the circuit breaker or the line switch open and all the resistance of the field rheostat in the field circuit.

2. When the generator is up to full speed, adjust the voltage to the proper value by means of the field rheostat.

3. Close the circuit breaker or switch connecting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the generator to the switchboard, and then close any other switches necessary to apply the load.

When starting a generator for parallel operation, the voltage of the generator must be made to agree in direction and strength with that of the bus bars of the generator already in operation; then close the circuit breaker, the equalizer switch and the load switch. The equalizer switch and load switch are sometimes combined in a three-pole switch; if single-pole equalizer switches are used, the generator must not be connected in parallel until the equalizer circuit is complete. On closing the switch connecting the generator to the bus bars, adjust the field rheostat again until the generator takes up its share of the load, as shown by the ammeters.

Failure to generate full voltage may be due to: (1) slow speed; (2) open shunt field circuit, caused by faulty connections, or a burned-out coil or rheostat; (3) open armature or series field circuit; (4) incorrect brush setting; (5) reversed series or shunt coils; (6) poor brush contact due to dirty commutator or brushes sticking in holders; (7) loss of residual magnetism.

Stopping. Reduce the voltage (and consequently the load) of the generator by adjusting the field rheostat and when the load is small, open the circuit breaker and the generator switch, then stop the prime mover, or release clutch.

Important. Generators should be connected shunt wound when used to excite the fields of synchronous motors or generators. If the generator is compound wound, omit the series field winding from the circuit.

Further operating suggestions and construction details will be furnished on request by the nearest Westinghouse Sales Office.

MAINTENANCE

Inspection. Although Life-Line machines require a minimum of attention in service, they should be inspected at regular intervals to guard against excessive (1) dirt, (2) moisture, (3) friction and (4) vibration, which account for 90 percent of all machine failures.

1. ***Guard Against Dirt.*** The insulation and mechanical parts of the machine should be kept clean. Dust that is free from oil or grease may be removed by wiping with a clean, dry cloth, or preferably, by suction. Dust may be blown from inaccessible parts with clean, dry air, using not more than 30 to 50 pounds pressure. Use care to prevent personal injury from the air hose; use goggles to avoid eye injury from flying particles.

When grease or oil is present, wipe with a cloth moistened (but not dripping) with a petroleum solvent of a "safety type" such as Stoddard solvent or similar materials available under various trade names. When a material is difficult to remove, carbon tetrachloride is more effective than petroleum solvents. Wear neoprene gloves to prevent skin irritation when using either petroleum solvents or carbon tetrachloride.

Petroleum solvents are flammable and comparatively nontoxic.

Carbon tetrachloride is nonflammable, but is highly toxic. Suitable ventilation should be provided to avoid breathing vapors. When ventilation is not sufficient to prevent a distinct odor of carbon tetrachloride, a chemical cartridge respirator or gas mask must be used.

2. ***Guard Against Moisture.*** Machines should always be guarded against the accidental intrusion of water from splatter or splashing.

Stand-by units should be run at least once a week to guard against moisture condensation.

Before windings are blown out with air, make sure that water has not condensed in the air line.

3. ***Guard Against Friction.*** Excessive friction or overheating of bearings is usually traced to one of the following causes:

a. Excessive belt tension.

b. Poor alignment causing excessive vibration or binding.

c. Bent shaft.

d. Excessive end or side thrust due to gearing, flexible coupling, etc.

4. ***Guard Against Vibration.*** To avoid failures due to vibration, a few simple checks should be made regularly.

Check for misalignment such as may be caused by foundation settling or heavy floor loading. These may be causing vibration through misalignment.

Check to see if vibration from the driven machine is being transmitted to the motor.

Check for excessive belt or chain tension or the push-apart effect inherent in spur gears.

Check mounting bolts and bracket bolts to be sure they are tight.

Coils. Revarnishing the windings when machines are overhauled will lengthen their life. Suitable varnish may be obtained from the nearest Westinghouse Sales Office.

Brushes. The correct brush position is the same for both directions of rotation. The bracket

is doweled in position before the machine leaves the factory and the brushes should not require further adjustment.

Use only the brushes recommended by Westinghouse. These brushes are recommended on the basis of extensive tests which have proven their reliability for this service. Brushes should have only sufficient clearance in the box to slide easily.

Care of Commutator and Brushes. Keep the commutator clean, wiping it at frequent intervals with a clean canvas cloth free from all lint. The brushes should fit the commutator, making contact over the entire surface.

A commutator that is taking on a polish and shows no signs of wear requires no other attention; but a rough, raw, copper-colored commutator should be smoothed with a piece of sandpaper or sandstone ground to fit and then polished with No. 00 sandpaper. Always lift brushes when polishing commutator and do not replace them until all grit has been removed. Never use emery cloth or emery paper on the commutator.

Bearing Lubrication. When the machine is installed, put a good grade of light dynamo oil* in each bearing housing. The correct level of the oil is one-eighth inch below the top of the combination overflow gauge and filling device. Sleeve bearings should be oiled ***only*** through the combination overflow gauge and filling device. After oiling, close down the cover.

When the machine is first started, feel the bearing housings occasionally to see that the bearings are not overheating.

The frequency of bearing inspection depends on the conditions surrounding the installation, as machines installed in some locations may be more liable to injury than in others. Do not add oil unless the oil level has dropped more than one-eighth inch below the top of the combination overflow gauge and filling device. Do not flood with oil or spill oil over the housing or bracket and the sleeve bearing will not spill oil over the windings.

RENEWAL PARTS

Renewal Parts information may be obtained from the nearest Westinghouse Sales Office. Be sure to give the complete nameplate reading on the machine for positive identification.

**Note: The oil should have a viscosity of from 185 to 212 seconds at 40 degrees C. This is satisfactory for normal temperatures down to 0 (zero) degrees C or 32 degrees F. Special engineering recommendations should be obtained for oil to be used at lower temperatures.*

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