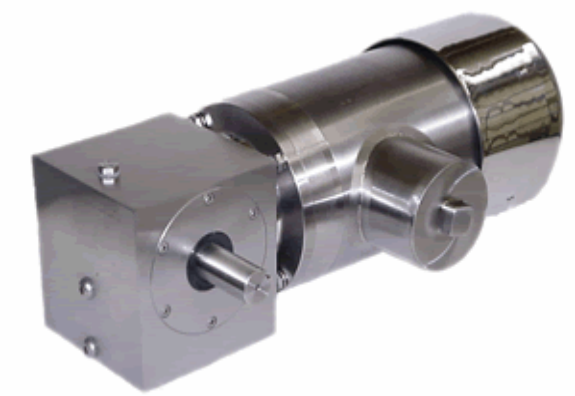
Stainless Motors, Inc.

design innovation ● stainless performance

Gearmotor Operating & Maintenance Manual

Date: 11/01/2011



OPERATING AND MAINTENANCE INSTRUCTIONS FOR MOTORS AND GEARMOTORS

INSTALLATION

Only qualified, trained personnel should install the motor/ gearmotor. Electrical rotating equipment can result in property damage, serious injury or death when improperly installed. Equipment should be installed in accordance with the National Electric Code, local codes and with NEMA MG2.

MOUNTING

Foot mounted motors/gearmotors should be mounted to a rigid foundation to prevent excessive vibration. Flange mounted motors/gearmotors should be properly seated and aligned. Periodically verify that all mounting bolts are firmly tightened.

NOTE: If improper direction of rotation is detrimental to the load, check rotation prior to connecting the motor/gearmotor to the load.

ENVIRONMENT

Stainless motors and gearmotors are suitable for extreme washdown environments such as those in food processing or pharmaceutical manufacturing. They are not intended for submersion service. Outdoor installations in direct, intense sunlight should be carefully reviewed as a precaution to motor overheating.

Installation of Motors

• The motor *must* be grounded in accordance with the National Electrical Code and any local codes.

• Shaft key must be secured before starting motor.

• The motor must match the line voltage, line frequency and be suitably sized for the equipment load.

• Remove all power sources and allow motor to reach standstill prior to servicing.

• Do not bypass or render inoperative safeguard or protective devices.

Installation of Gear Reducers

Most in line and right angle gear reducers are equipped with a vent to equalize pressure inside and outside the gearbox. The vent must be located ABOVE the oil or grease level of the reducer when the reducer is installed. In general, a Stainless Motors, Inc. gear reducer differs from industry norms in that we do not provide locations for vents on all sides of a reducer, as the extra plugs would increase the possibility of leaks and inhibit cleaning. Therefore, we position the oil fill, drain, and vent holes for installation particular to each application.

Keep shafts and vent plugs clean to prevent foreign particles from entering seals or gear case. Inspect all surfaces periodically for oil leaks. Check coupling set screws and reducer

mounting bolts for tightness. Loose fasteners can cause misalignment of the reducer and result in excessive wear of the gearset. Check end-play in shafts - noticeable movement may indicate a service requirement or parts replacement.

WIRING INSTRUCTIONS, Motors/Gearmotors

Connect the motor/gearmotor in accordance with the connection diagram lased on the motor/gearmotor casing. For wiring diagrams refer to pages 18-21.

When the motor is connected to the load and started, it should start quickly and run smoothly. If not, immediately disconnect the motor from the power source and investigate the cause. Verify line voltage (all three legs in a three-phase motor), motor connection matched to line voltage, excessive load, etc.

All three phase Stainless Motors are suitable for use on variable frequency drives and are phase/phase insulated. Consult Stainless Motors, Inc. Engineering if turn-down below 4:1 is expected for extended periods. Thermostats, when supplied, are suitable for control circuits only and must not be connected in series with the motor. Wire lengths of more than 100' between the motor and inverter should be reviewed for potentially damaging high voltage harmonic spikes resulting from inverter/wire/motor combination. In such cases, line reactors or other filtering may be necessary.

TEAO motors (Totally Enclosed Air Over) rely on being placed in an air stream, such as from a large fan for adequate

cooling. It is the customer's responsibility to ensure compatibility of a TEAO motor and its application.

TEBC motors are fitted with a constant speed fan which will provide adequate cooling of the main motor to at least a 10:1 turn-down ratio. This cooling fan is powered by a second independent motor attached to the main motor and requires its own control circuit hardware. Leads for the blower motor are conveniently brought out through the main motor junction box.

TECAC motors (Totally Enclosed Compressed Air Cooled) are compressed air cooled and rely on the customers plant compressed air for proper cooling. They are often fitted with thermostats, thermocouples or both. Refer to the etched nameplate on the motor for the exact configuration supplied.

TEFCAC motors (Totally Enclosed Fan Cooled/ Compressed Air Cooled) are cooled with a combination of compressed air and a standard external fan. They are often fitted with thermostats, thermocouples or both. Refer to the etched nameplate on the motor for the exact configuration supplied.

TELC motors (Totally Enclosed Liquid Cooled) are generally water cooled units with an external water jacket surrounding the motor casing. TELC motors rely on an adequate flow of cooling water for proper operation.

TEOT motors (Totally Enclosed Oil Through) utilize transformer oil, such as Shell DIALA AX, circulating through the motor and an external heat exchanger for proper operation.

It is the customer's responsibility to ensure that adequate and compatible cooling apparatus are employed when utilizing TEAO, TEBC, TECAC, TEFCAC, TELC or TEOT motors. After start-up, it is recommended that the motor current be checked and compared against the nameplate rating.

MAINTENANCE

Motors

Stainless motors are fitted with double sealed "lubed for life" ball bearings. When replacing bearings be sure to select double sealed bearings lubricated with Polyrex EM moisture resistant high temperature grease.

Standard Bearings Sizes

NEMA Frame	Enclosure	Shaft End Bearing	Opposite Shaft End Bearing
48	TENV	6204	6203
48	TEFC	6204	6204
56	TENV	6205	6203
56	TEFC	6205	6204
143T, 145T	TENV	6205	6203
143T, 145T	TEFC	6205	6204
182, 182T	All Types	6206	6205
184, 184T	All Types	6206	6205
213, 213T	All Types	6307	6206
215, 215T	All Types	6307	6206
254T, 256T	All Types	6309	6208
284T, 286T	All Types	6311	6309

*Please contact Stainless Motors for bearing sizes for custom motors.

All stainless motors feature a locked shaft-end bearing which is secured to the endbell with an internal retaining ring. The bearing is locked to the shaft with an external retaining ring. One of the retaining rings MUST be removed before attempting to disassemble the shaft/bearing/endbell assembly. Attempting to press the shaft through the bearing with both retaining rings in place will likely destroy both the shaft and the endbell.

External to the bearings are shaft seals to further protect the bearings and motor windings from the entrance of water or contaminants.

Verify that both endbell O-rings and the four small thru-bolt O-rings are in good, serviceable condition. There must be no visible cracks or tears, and the nitrile must be flexible.

Caution!

Due to the unique construction of our products and to prevent unnecessary damage, we strongly advise repair technicians to contact Stainless Motors, Inc. at (505) 867-0224 for disassembly and rewinding instructions prior to servicing our motors. Our products may also be repaired by a qualified motor rewind shop or may be returned to Stainless Motors, Inc. for a complete rebuild.

MAINTENANCE, Gear Reducers

Planetary In-line Reducers (IL SERIES)

Horizontally mounted planetary reducers are lubricated with

Mobil SHC Cibus 460 food grade synthetic gear oil. In applications where food grade is not required, Mobil SHC 634 may be used in place of the Cibus 460. It is recommended that the oil be changed after the first 100 hours of operation and again after every 2,500 hours of operation, or annually, whichever occurs first. An oil drain port is provided at the six o'clock position, an oil fill port at the twelve o'clock position and a fill level/vent port at the eight o'clock position.

Oil Change Instructions: Remove drain and fill plugs and drain oil. Replace the drain plug and remove the oil level/ vent plug on the side of the reducer. Fill with Mobil SHC Cibus 460 synthetic oil until oil begins to emerge from the oil level port. Replace both the vent/level and fill plugs and tighten firmly.

Vertically mounted planetary reducers are lubricated with Mobil SHC 005 polyrex food grade synthetic grease. The lubrication is considered permanent and no periodic replacement is required. However, when a grease lubricated unit is disassembled for repair or ratio change, the grease should be replaced.

Single Reduction Planetary In-Line Reducers Grease Change Instructions: Disassemble gear reducer. Clean all parts thoroughly to remove as much of the old grease as possible. Install the planetary gearset. Pack the gearset air space volume approximately 30% full with Mobil SHC 005 polyrex food grade synthetic gear grease. In applications where food grade is not required, Mobil SHC 007 may be used. The semi-fluid synthetic grease is required for proper

lubrication at the generally elevated temperatures common to stainless steel housed equipment.

Double Reduction Planetary In-Line Reducers Grease Change Instructions: Please consult factory for instructions and type of grease for this application.

Spiral Bevel Gear Reducers (SB SERIES)

Spiral bevel gear reducers with horizontal output shafts are lubricated with Mobil SHC Cibus 460 food grade synthetic oil. In applications where food grade is not required, Mobil SHC 634 may be used in place of the Cibus 460. It is recommended that the oil be changed after the first 100 hours of operation and again after every 2,500 hours of operation, or annually, whichever occurs first.

Vertically mounted reducers are grease lubricated with Mobil SHC 005 polyrex food grade synthetic grease. Grease lubricated gearboxes generally do not require maintenance of the lubricant, but it should be replaced whenever the reducer is disassembled. Check the factory etched nameplate for the original factory lubrication type.

Oil Change Instructions: Remove drain and fill plugs and drain oil. Replace the drain plug and remove the oil level plug on the side of the reducer. Fill with Mobil SHC Cibus 460 or equivalent synthetic oil until oil begins to emerge from the oil level port. Replace both the oil level and fill plugs and tighten firmly. In applications where food grade is not required, Mobil SHC 634 may be used in place of the Cibus 460.

Grease Change Instructions, Spiral Bevel Gear Reducers: Disassemble the gear reducer. Clean all parts thoroughly to remove as much of the old grease as possible. Reassemble the gearset and verify that the teeth mesh smoothly and have the proper amount of backlash. It is very important that if the output configuration of the gearbox is to be changed that the proper shims are installed on the output shaft to ensure that the gear is properly located and the bearings are under a very slight pre-load. The "MD" or mounting dimension is stamped on each gearset. We have found that it is often necessary to add additional shims to reduce the backlash somewhat from an initial assembly using the stamped "MD" dimension. When it is necessary to do this, add equal shims under both the pinion gear and the output gear.

It is essential that patience and care be used when assembling a spiral bevel gearset to ensure long trouble free and quiet operation.

The proper amount of grease to be added in a spiral bevel reducer is dependent on the installed output shaft orientation. Horizontal output shaft units must have sufficient grease so that the output gear face is completely immersed in the grease at the 6 o'clock position. Under-filling the reducer will lead to poor gear lubrication, higher temperatures, noise and short life. Over-filling the reducer will result in higher temperatures.

Vertical output shaft reducers must be filled with grease so that either the pinion face or the gear face is adequately immersed at some point of its rotation to ensure adequate

grease pick-up for the teeth in mesh. Output shaft bearings should be packed with NGLI #2 bearing grease, such as Polyrex EM.

Spiral Bevel Tubular Gear Reducers (SBT SERIES)

Spiral bevel tubular gear reducers are lubricated with Mobil SHC Cibus 460 food grade synthetic oil. In applications where food grade is not required, Mobil SHC 634 may be used in place of the Cibus 460. It is recommended that the oil be changed after the first 100 hours of operation and again after every 2,500 hours of operation, or annually, whichever occurs first.

Grease lubricated gearboxes generally do not require maintenance of the lubricant, but it should be replaced whenever the reducer is disassembled. Check the factory etched nameplate for the original factory lubrication type.

Oil Change Instructions: Remove drain and fill plugs and drain oil. Replace the drain plug and remove the oil level plug on the side of the reducer. Fill with Mobil SHC Cibus 460 or equivalent synthetic oil until oil begins to emerge from the oil level port. Replace both the oil level and fill plugs and tighten firmly. In applications where food grade is not required, Mobil SHC 634 may be used in place of the Cibus 460. Note: In some applications the oil fill port may be omitted and the coalescing vent is removed to add or refill oil.

Worm Gear Reducers (RA SERIES)

New worm gear reducers require an initial gear set break-in period and will not operate at maximum efficiency during that time. Operating temperatures will be higher, and it is best to run a new worm gear reducer at a reduced load during the initial break-in period.

Worm gear reducers with horizontal output shafts are generally lubricated with Mobil SHC Cibus 460 food grade synthetic gear oil, but may be lubricated with Mobil SHC 005 polyrex synthetic food grade grease. In applications where food grade is not required, Mobil SHC 634 may be used in place of the Cibus 460 or Mobil SHC 007 may be used.

It is recommended that the oil in a worm gear reducer be changed after the first 100 hours of operation and again after every 2,500 hours of operation, or annually, whichever occurs first. See above oil change instructions for periodic oil changes.

Grease lubricated units, lubricated with Mobil SHC 005 polyrex, generally require no periodic grease changes, except in the event of disassembly for repair or gear ratio changes. Longer life will be obtained however, if the grease is periodically changed. Units lubricated with Mobil SHC 005 polyrex or any other food grade grease will require periodic grease changes as the lubricant will degrade over time. Time intervals will depend on the severity of usage, but assume 12 months as a maximum.

Oil Change Instructions: Remove drain and fill plugs and

drain oil. Replace the drain plug and remove the oil level plug on the side of the reducer. Fill with Mobil SHC Cibus 460 synthetic food grade oil until oil begins to emerge from the oil level port. Replace both the oil level and fill plugs and tighten firmly. Mobil SHC 634 may be used if food grade is not required.

Grease Change Instructions, Worm Gear Reducers:
There is no easy way to change the grease in a grease lubricated gearbox! Even in those units fitted with very large drain plugs, it is very difficult to extract the old grease. It is always best to remove one of the output bearing covers and remove the output shaft from the gearbox to facilitate grease change. The grease may then be scooped out and removed from the gearbox. Careful wiping, with clean cloths, of the interior is satisfactory, it is not necessary to absolutely remove 100% of the old grease. It is also not necessary to remove the worm, just clean up the inside as well as possible.

Vertical output shaft reducers must be re-filled with grease so that the grease is level with the centerline of the worm gear. Horizontal output shaft reducers require that the grease is filled to just below the worm. Gear cases are generally fitted with a level port, and in such a case, fill the reducer with grease until it emerges from the level port. The upper output shaft bearing should be packed with an NGLI #2 bearing grease, such as Polyrex EM or 005 for food grade greased units. It is always good procedure to replace the output shaft seals when re-assembling the gear reducer.

All reducers should receive periodic inspection for oil leaks, loose mounting bolts or loose coupling set screws, end-play in shafts, excessive vibration or noise.

Bearing Preload: If it is necessary to replace a worm gear set (always replace both the worm and worm gear) or change the orientation of the output shaft, the worm gear position and bearing preload must be properly set. Shims are located on each side of the worm gear to allow the assembler to adjust the position of the worm gear to be directly centered under the worm. Verify that the worm gear is within .003" of the worm centerline. Adjust as necessary by adding or removing the required shims between the worm gear and output shaft shoulder. Once the gear is properly set, additional shims are used between the worm gear and output shaft bearing collar to take up all clearance and slightly preload the bearings. Proper preload is obtained when slight bearing drag is felt when slowly rotating the output shaft by hand with all bearing cover bolts secured, but without shaft seals installed. Note: the worm shaft must be removed for this test. There must be slight drag with no looseness of the assembly or perpendicular motion (to its axis) of the output shaft possible.

Once the proper output shaft shims have been determined, install the worm shaft. The installation of the worm shaft requires the removal of one output bearing cover, allowing the output shaft/worm gear assembly to drop slightly so that the worm shaft assembly can pass over the worm gear. With the worm shaft assembly installed, reinstall the output shaft bearing cover. Install the worm shaft and output shaft oil seals. Complete the assembly by adding lubricant.

STAINLESS MOTORS, INC. LIMITED WARRANTY

Stainless Motors, Inc. manufactured products are manufactured and sold to industrial distributors, OEMs and significant industrial end-users and are not intended for household, family or personal use. All product specifications, applications or other information provided in Stainless Motors, Inc. sales literature are subject to change without notice, and should be confirmed prior to order placement.

All motors, gearmotors, and gear reducers are warranted against defects in Stainless Motors, Inc. workmanship and materials. The warranty period is one year from the date of shipment from Stainless Motors, Inc. All warranty claims must be received by Stainless Motors, Inc. prior to the expiration of the warranty period.

If a Stainless Motors, Inc. manufactured product is thought to be defective, Stainless Motors, Inc. must be contacted with a full description of the apparent problem with the product. If it is deemed necessary, a Returned Goods Authorization number will be given. The product shall be shipped, freight prepaid, to Stainless Motors, Inc. for evaluation and repair. Stainless Motors, Inc. is not responsible for the removal, shipping, re-installation of the product upon its return to the customer, or any incidental or consequential damages resulting from the defect, removal, re-installation, shipment or otherwise.

Performance problems can be due to a variety of causes not covered by this warranty such as improper maintenance, faulty installation, non-Stainless Motors, Inc. additions or

modification, etc. If the problem is determined not to be due to defect in materials or workmanship, then the customer will be responsible for the cost of any necessary repairs or testing.

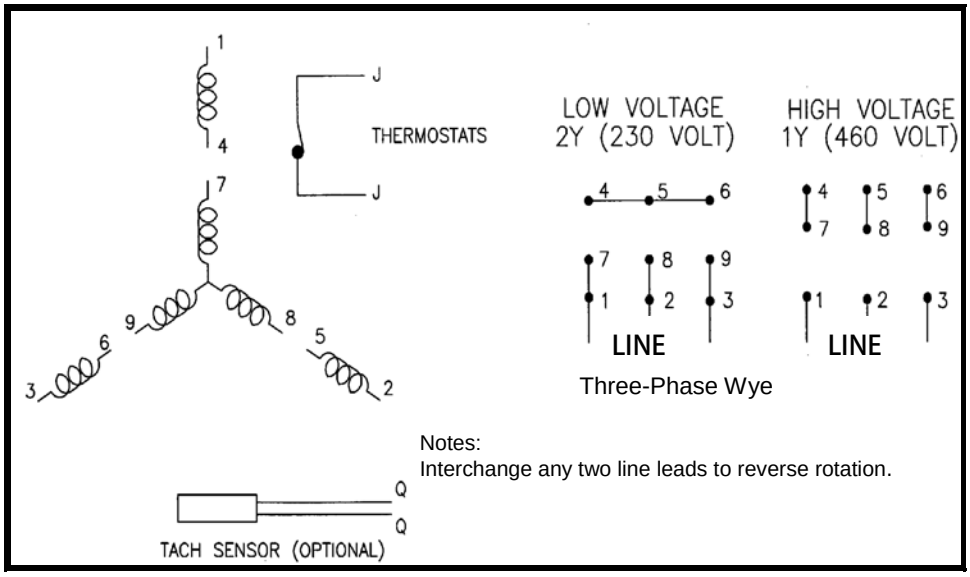
In situations where the customer is unable to ship the product back to the Stainless Motors, Inc. factory, Stainless Motors, Inc., at it's sole discretion, may authorize the valuation and possible repair be accomplished at a qualified EASA repair center.

This limited warranty and service policy represents Stainless Motors, Inc. sole and exclusive warranty obligation wit respect to Stainless Motors, Inc. produced products.

Stainless Motors, Inc.'s responsibility to a customer or any other person shall not exceed Stainless Motors, Inc.'s sales price of the product. Stainless Motors, Inc. disclaims all other expressed or implied warranties, including the implied warranty of fitness for a particular purpose and merchantability. Any disassembly of motors or gear reducers without prior consent from Stainless Motors ,Inc. will void all warranties.

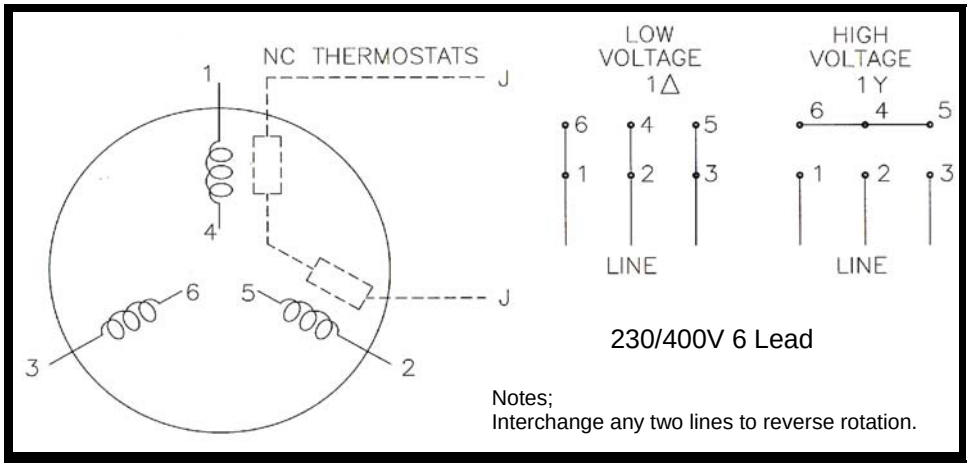
Wiring Diagrams for Single-Phase and Three-Phase Motors

THREE-PHASE MOTORS



Three-Phase Wye

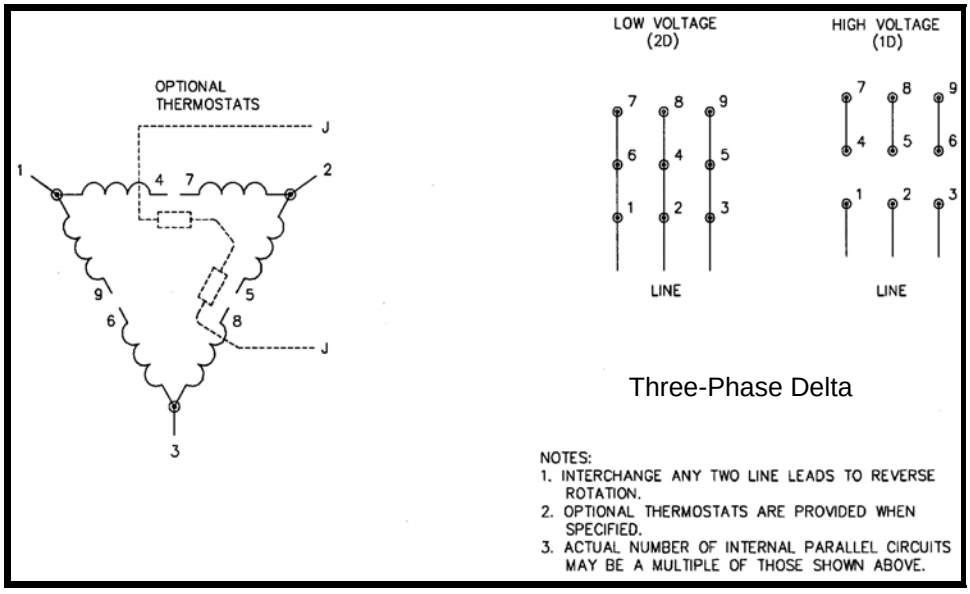
Notes:
Interchange any two line leads to reverse rotation.



230/400V 6 Lead

Notes;
Interchange any two lines to reverse rotation.

THREE-PHASE CONTINUED…

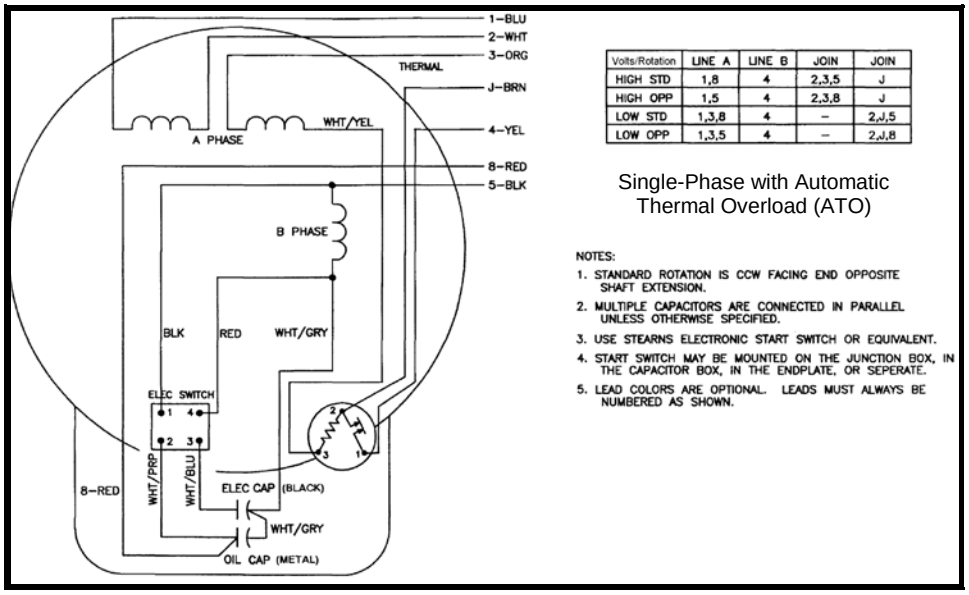


Three-Phase Delta

Please contact Stainless Motors, Inc. if you are unsure of which wiring diagram to refer to for our three-phase motors. Thank you.

(505) 867-0224

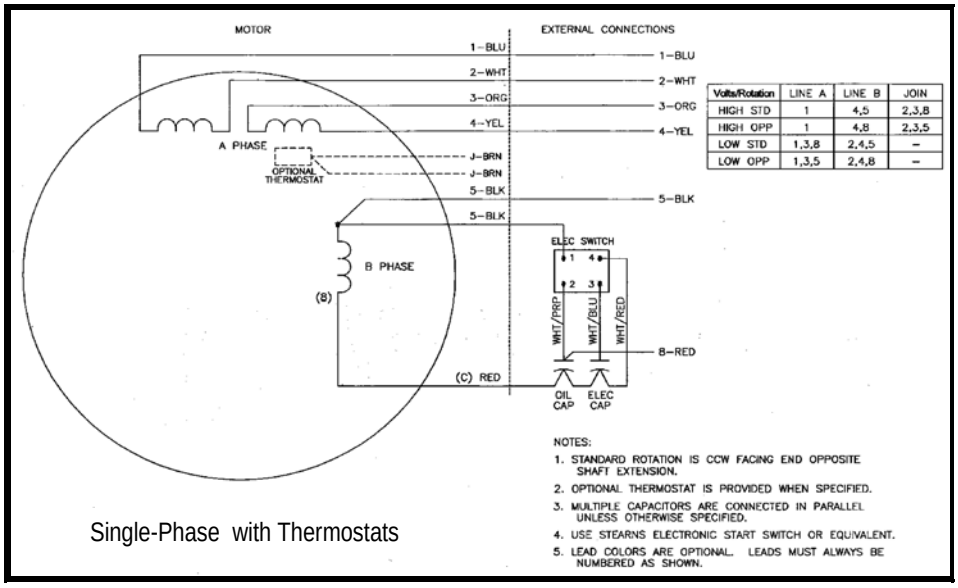
SINGLE-PHASE MOTORS



Volts/Rotation	LINE A	LINE B	JOIN	JOIN
HIGH STD	1,8	4	2,3,5	J
HIGH OPP	1,5	4	2,3,8	J
LOW STD	1,3,8	4	–	2,J,5
LOW OPP	1,3,5	4	–	2,J,8

Single-Phase with Automatic Thermal Overload (ATO)

NOTES:
1. STANDARD ROTATION IS CCW FACING END OPPOSITE SHAFT EXTENSION.
2. MULTIPLE CAPACITORS ARE CONNECTED IN PARALLEL UNLESS OTHERWISE SPECIFIED.
3. USE STEARNS ELECTRONIC START SWITCH OR EQUIVALENT.
4. START SWITCH MAY BE MOUNTED ON THE JUNCTION BOX, IN THE CAPACITOR BOX, IN THE ENDPLATE, OR SEPERATE.
5. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

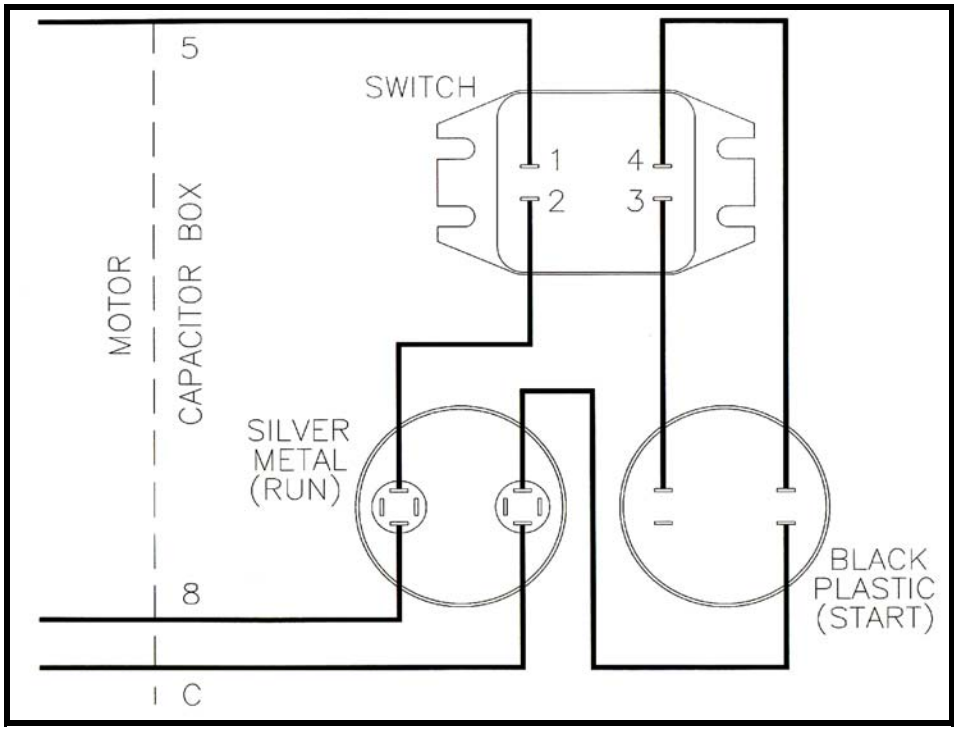


Volts/Rotation	LINE A	LINE B	JOIN
HIGH STD	1	4,5	2,3,8
HIGH OPP	1	4,8	2,3,5
LOW STD	1,3,8	2,4,5	–
LOW OPP	1,3,5	2,4,8	–

Single-Phase with Thermostats

NOTES:
1. STANDARD ROTATION IS CCW FACING END OPPOSITE SHAFT EXTENSION.
2. OPTIONAL THERMOSTAT IS PROVIDED WHEN SPECIFIED.
3. MULTIPLE CAPACITORS ARE CONNECTED IN PARALLEL UNLESS OTHERWISE SPECIFIED.
4. USE STEARNS ELECTRONIC START SWITCH OR EQUIVALENT.
5. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CAPACITOR CONNECTIONS FOR SINGLE-PHASE MOTORS



Please contact Stainless Motors, Inc. if you are unsure of which wiring diagram to refer to for our single-phase motors. Thank you.

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