Operation and Maintenance Manual

Screw Conveyor – Dodge Drive

Screw Conveyor Parts, LLC
PO Box 470187, Fort Worth, TX 76147
3321 Suffolk Drive Building 102, Fort Worth, TX 76133
(682) 231-1228 GetHelp@ScrewConveyorParts.Com
www.ScrewConveyorParts.com

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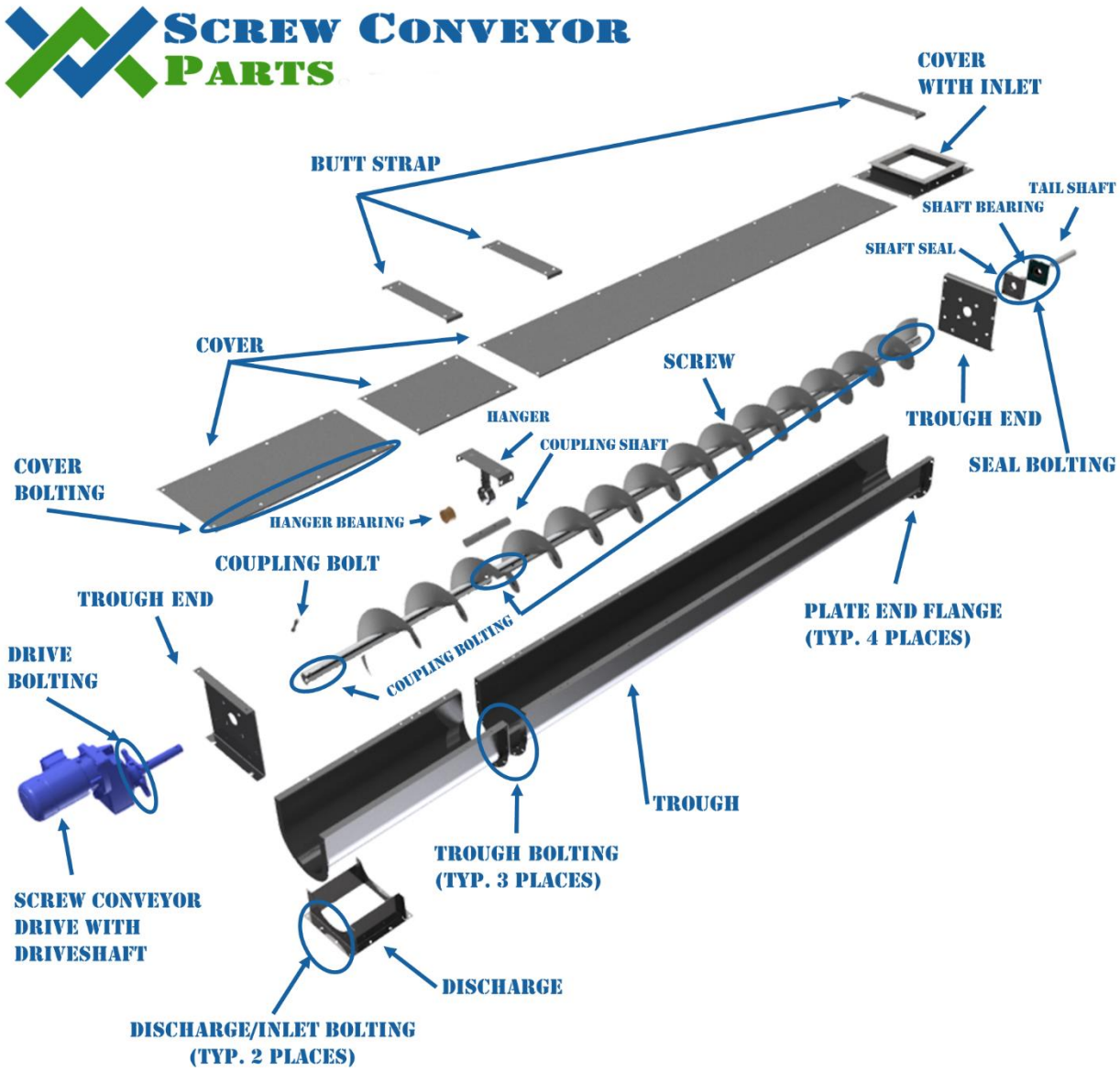
SCP Screw Conveyor Assembly Model



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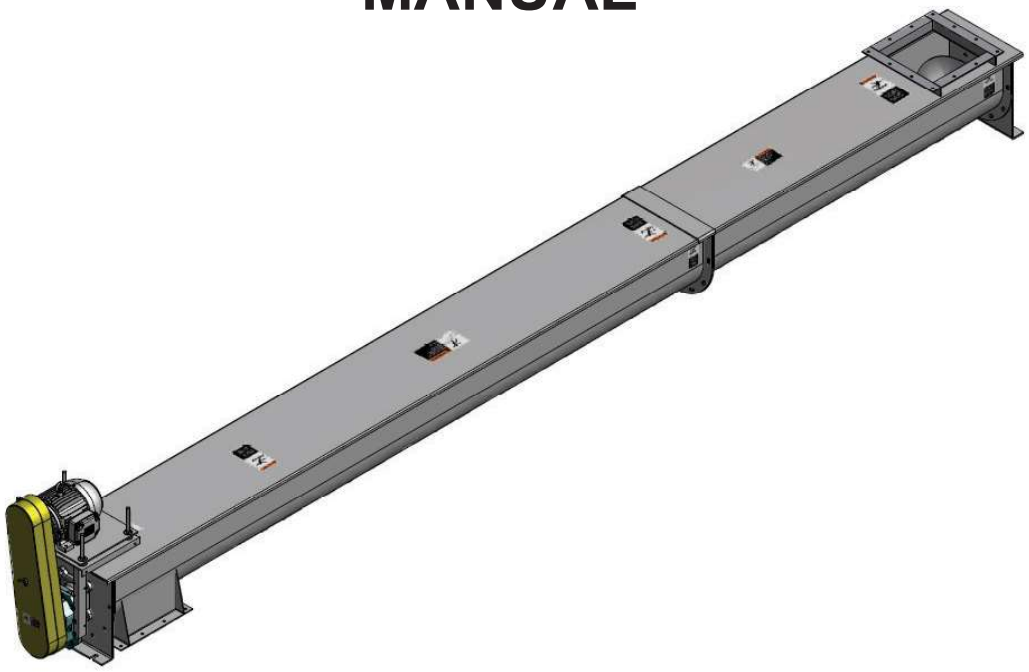
(Approved March 2018)

SCREW CONVEYOR SAFETY OPERATION AND MAINTENANCE MANUAL



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Conveyor Equipment Manufacturers Association
5672 Strand Ct., Suite 2
Naples, Florida 34110-3314
www.cemanet.org

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INTRODUCTION

The *Engineering Conference Screw Conveyor Committee* of CEMA (Conveyor Equipment Manufacturers Association) was assigned the task of bringing together, under one cover, the accumulated experience of many individuals and their companies in an effort to provide a common basis for the safety, operation and maintenance of screw conveyors.

The **Screw Conveyor Safety Operation and Maintenance Manual** contains instructions for the safe installation, operation and maintenance of screw conveyors. The reliability and service life depend on the proper care taken while installing and preparing the equipment for its intended use.

Read **ALL** instructions in this manual and manufacturer's manuals **BEFORE** installing, operating and maintaining the equipment.

Screw conveyor safety begins with a plan that considers every possible danger and potential hazard. Operation and maintenance personnel must be thoroughly trained in safe operating procedures, recognition of possible hazards, and maintenance of a safe area around screw conveyors.

CEMA has a comprehensive safety program that includes:

- Warning and Safety Reminder for Screw Conveyors, Drag Conveyors and Bucket Elevators - (CEMA Document: SC2018-01)
- CEMA Safety Label Brochure - (CEMA Document: 201)
- CEMA Safety Label Placement Guidelines:
  - Screw Conveyor - (CEMA Document: SC-2)
  - Vertical Screw Conveyor - (CEMA Document: SC-3)
- Screw Conveyor Safety Poster - (CEMA Screw Conveyor Safety Poster)
- Screw Conveyor, Drag Conveyor and Bucket Elevator Safety DVD - (CEMA Document: AV6) This DVD describes key safety practices that personnel must follow when operating and maintaining screw conveyors, drag conveyors and bucket elevators.

Screw conveyor accidents can be avoided by implementation and enforcement of an in-plant safety program. A number of safety precautions are included in this manual. Carefully study and follow the safety precautions. Remember - accidents are usually caused by negligence or carelessness.

SCREW, DRAG, AND BUCKET ELEVATOR CONVEYORS

APPROVED FOR DISTRIBUTION BY THE SCREW CONVEYOR SECTION OF THE
CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION (CEMA)
CEMA Document: SC 2018-01, Rev. SC 2004-01
March 2018

It is the responsibility of the contractor, installer, owner and user to install, maintain and operate the conveyor, components and, conveyor assemblies in such a manner as to comply with the Occupational Safety and Health Act and with all state and local laws and ordinances and the American National Standards Institute (ANSI) B20.1 Safety Code.

Paragraph 5.16 of ANSI B20.1 addresses risk assessment and risk reduction. Risk assessment and related risk reduction should be performed by the owner and user at each phase of a conveyor or conveyor system's life cycle. Examples of risk assessment processes can be found in the following:

1. CEMA Technical Report 2015-01
2. ASSE Z590.3 (American Society of Safety Engineers)
3. MIL-STD-882 (U.S. Military Standard)

In order to avoid an unsafe or hazardous condition, the assemblies or parts must be installed and operated in accordance with the following minimum provisions.

1. Conveyors shall not be operated unless all covers and/or guards for the conveyor and drive unit are in place. If the conveyor is to be opened for inspection cleaning, maintenance or observation, the electric power to the motor driving the conveyor must be LOCKED OUT in such a manner that the conveyor cannot be restarted by anyone; however remote from the area, until conveyor cover or guards and drive guards have been properly replaced.

2. If the conveyor must have an open housing as a condition of its use and application, the entire conveyor is then to be guarded by a railing or fence in accordance with ANSI standard B20.1.(Request current edition and addenda)

3. Feed openings for shovel, front loaders or other manual or mechanical equipment shall be constructed in such a way that the conveyor opening is covered by a grating. If the nature of the material is such that a grating cannot be used, then the exposed section of the conveyor is to be guarded by a railing or fence and there shall be a warning sign posted.

4. Do not attempt any maintenance or repairs of the conveyor until power has been LOCKED OUT.

5. Always operate conveyor in accordance with these instructions and those contained on the caution labels affixed to the equipment.

6. Do not place hands, feet, or any part of your body, in the conveyor.

7. Never walk on conveyor covers, grating or guards.

8. Do not use conveyor for any purpose other than that for which it was intended.

9. Do not poke or prod material into the conveyor with a bar or stick inserted through the openings.

10. Keep area around conveyor drive and control station free of debris and obstacles.

11. Eliminate all sources of stored energy (materials or devices that could cause conveyor components to move without power applied) before opening the conveyor

12. Do not attempt to clear a jammed conveyor until power has been LOCKED OUT.

13. Do not attempt field modification of conveyor or components.

14. Conveyors are not normally manufactured or designed to handle materials that are hazardous to personnel. These materials which are hazardous include those that are explosive, flammable, toxic or otherwise dangerous to personnel. Conveyors may be designed to handle these materials. Conveyors are not manufactured or designed to comply with local, state or federal codes for unfired pressure vessels. If hazardous materials are to be conveyed or if the conveyor is to be subjected to internal or external pressure, manufacturer should be consulted prior to any modifications.

CEMA insists that disconnecting and locking out the power to the motor driving the unit provides the only real protection against injury. Secondary safety devices are available; however, the decision as to their need and the type required must be made by the owner-assembler as we have no information regarding plant wiring, plant environment, the interlocking of the screw conveyor with other equipment, extent of plant automation, etc. Other devices should not be used as a substitute for locking out the power prior to removing guards or covers. We caution that use of the secondary devices may cause employees to develop a false sense of security and fail to lock out power before removing covers or guards. This could result in a serious injury should the secondary device fail or malfunction.

There are many kinds of electrical devices for interlocking of conveyors and conveyor systems such that if one conveyor in a system or process is stopped other equipment feeding it, or following it can also be automatically stopped.

Electrical controls, machinery guards, railings, walkways, arrangement of installation, training of personnel, etc., are necessary ingredients for a safe working place. It is the responsibility of the contractor, installer, owner and user to supplement the materials and services furnished with these necessary items to make the conveyor installation comply with the law and accepted standards.

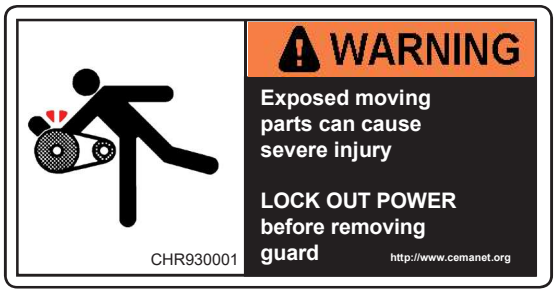
Conveyor inlet and discharge openings are designed to connect to other equipment or machinery so that the flow of material into and out of the conveyor is completely enclosed.

One or more warning labels should be visible on conveyor housings, conveyor covers and elevator housings. If the labels attached to the equipment become illegible, please order replacement warning labels from the OEM or CEMA.

The Conveyor Equipment Manufacturers Association (CEMA) has produced an audio-visual presentation entitled "Safe Operation of Screw Conveyors, Drag Conveyors, and Bucket Elevators." CEMA encourages acquisition and use of this source of safety information to supplement your safety program.

SEE NEXT PAGE FOR SAFETY LABELS

The CEMA safety labels shown below should be used on screw conveyors, drag conveyors, and bucket elevators. Safety labels should be placed on inlets, discharges, troughs, covers, inspection doors & drive guards. See CEMA Safety Label Placement Guidelines on CEMA Website: www.cemanet.org



PROMINENTLY DISPLAY THESE SAFETY LABELS ON INSTALLED EQUIPMENT

SEE PREVIOUS PAGE FOR SAFETY REMINDERS

Note: Labels alone do not substitute for a thorough in-plant safety training program centered on the hazards associated with operating your installed equipment.

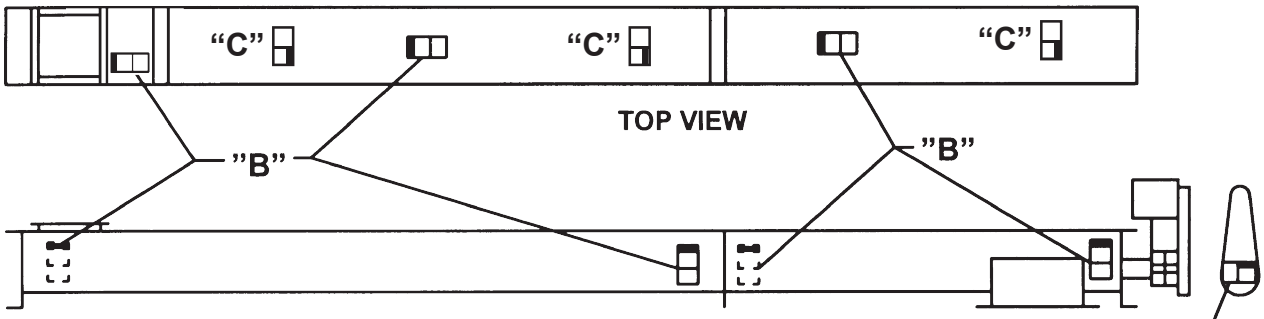
Contact CEMA or Your Equipment Manufacturer for Replacement Labels

CONVEYOR EQUIPMENT MANUFACTURERS ASSOCIATION
5624 Strand Ct., Suite 2., Naples, Florida 34110-3314
239-514-3441
www.cemanet.org / www.cemastore.com

CEMA Safety Screw Conveyor Parts ent Guidelines

Product: Bulk Handling Equipment

Equipment: Screw Conveyor - SC-2



SIDE VIEW

"B"

To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation.

"A"

"C"

To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards

NEAR SIDE

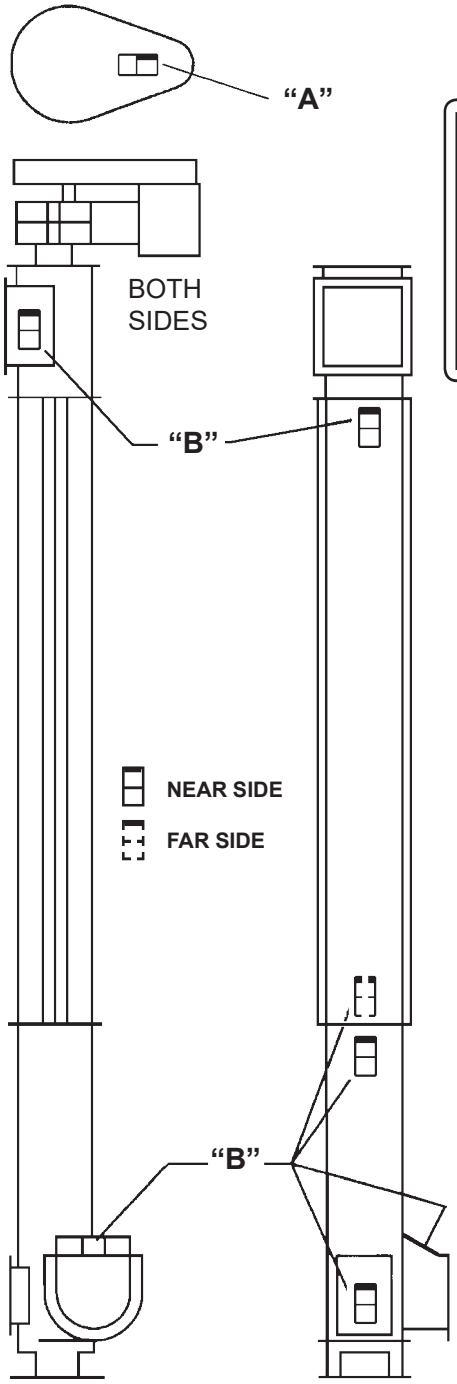
FAR SIDE

USE LABEL "A" ON BELT GUARD
USE LABEL "B" ON ENDS OF TROUGH, MIDDLE OF COVERS AND AT INLET OPENING.
USE LABEL "C: ON TOP OF COVERS

Product: Bulk Handling Equipment

Equipment: Vertical Screw Conveyor - SC-3

USE LABEL "A" ON BELT GUARD
USE LABEL "B" ON ENDS OF TROUGH,
ON INTAKE INSPECTION DOOR, AND BOTH SIDES OF DISCHARGE SPOUT



"A"

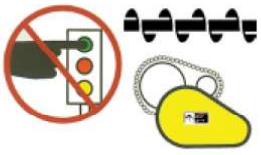
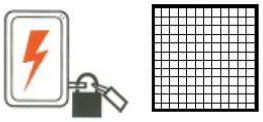
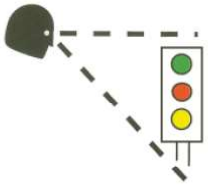
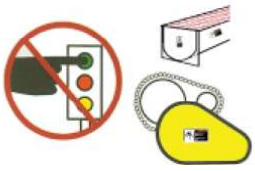
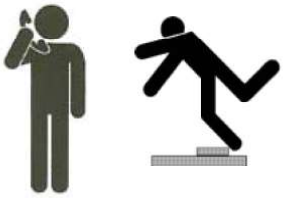
To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards

"B"

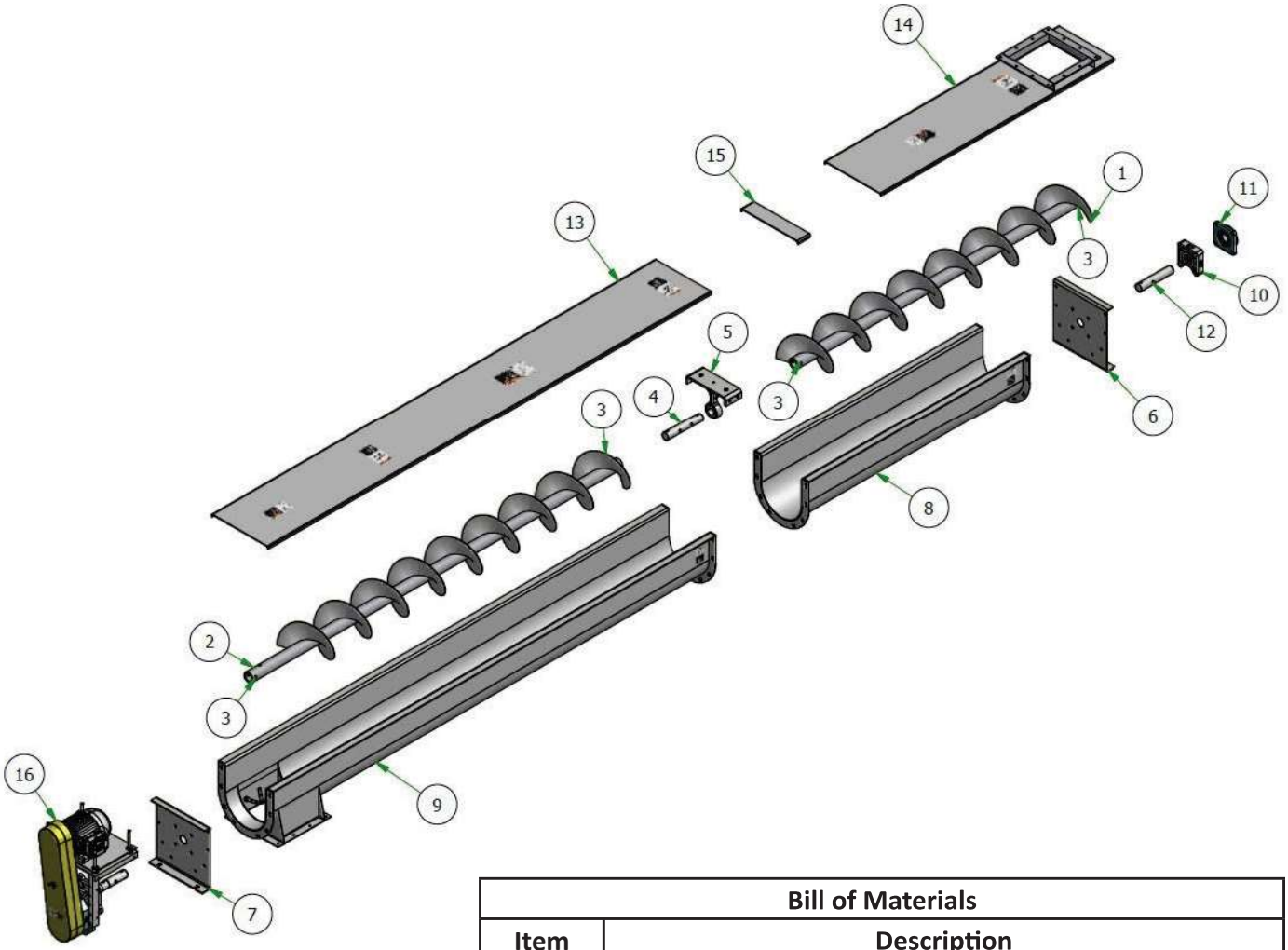
To be placed on inlets and discharges, troughs, covers, and inspection doors of screw conveyors to provide warning against exposed moving parts while in operation.

SC-3

Screw Conveyors

 Do Not Climb, Sit, Stand or Walk, On Conveyor At Any Time	 Do Not Perform Maintenance on Conveyor Until Electrical, Air, Hydraulic and Gravity Energy Sources Have Been Locked Out and Blocked	 Operate Equipment Only With All Approved Covers and Guards in Place
 LOCK OUT ALL Power and Block Gravity Loads Before Servicing	 Ensure That All Personnel Are Clear of Equipment Before Starting	 Allow Only Authorized And Trained Personnel To Operate or Maintain Conveyors and Accessories
 Keep Clothing, Body Parts, and Hair Away from Conveyors	 Clean Up Spillage Near Moving Parts ONLY When the Power Is Locked Out **AND** Guards Are In Place	 DO NOT Modify Conveyor or Controls
 Ensure That All Controls are Visible and Accessible	 Operate Equipment Only With All Approved Covers, Guards, and Safety Labels In Place	 Report All Unsafe Conditions

POST IN PROMINENT AREA



Bill of Materials	
Item	**Description**
1	Screw
2	Screw with Bare Pipe at Discharge
3	Coupling Bolts (Not Shown)
4	Coupling Shaft
5	Hanger with Bearing
6	Tail End Trough End
7	Trough End for Screw Conveyor Drive
8	Trough End for Screw Conveyor Drive
9	Trough with Discharge Spout
10	Seal
11	Bearing
12	Tail Shaft
13	Flanged Cover
14	Flanged Cover with Inlet
15	Buttstrap
16	Screw Conveyor Drive Unit with Motor Mount, V-Belt

RECEIVING

1. Screw conveyors may be ordered as individual components with all the assembly operations performed in the field, or assembled completely by the manufacturer, with drawings and bill of materials.
2. Immediately upon receipt all items in the shipment should be checked against shipping papers for shortages and inspected for damage.
3. Items to be inspected include troughs, screws, covers and drive units.
4. DO NOT ATTEMPT TO INSTALL DAMAGED COMPONENTS OR ASSEMBLIES.

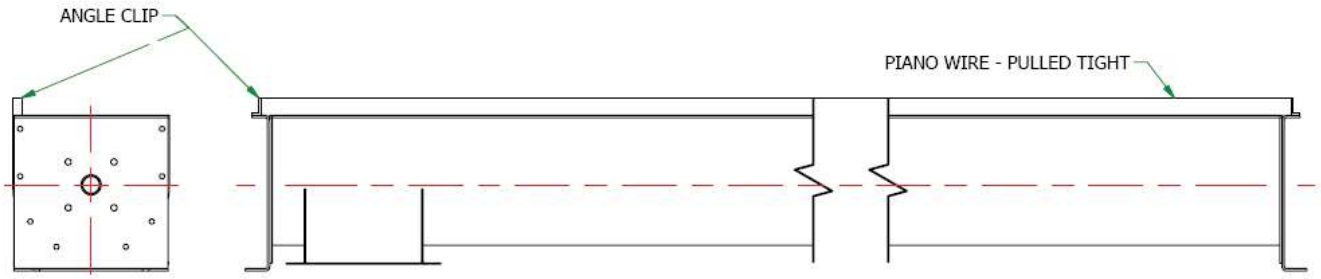
LIFTING AND MOVING

1. Extreme care must be taken to prevent damage when moving assembled conveyors or components.
2. Spreader bars with slings are the recommended support method for lifting.
3. Unsupported span should be no greater than 12'.
4. NEVER LIFT A CONVEYOR WITH ONLY ONE SUPPORT POINT.
5. Unusually heavy items such as drives or gates shall be considered when choosing support points because of load balance and their bending effect.
6. Shop assembled conveyors are typically match marked and shipped in the longest sections for practical shipment.

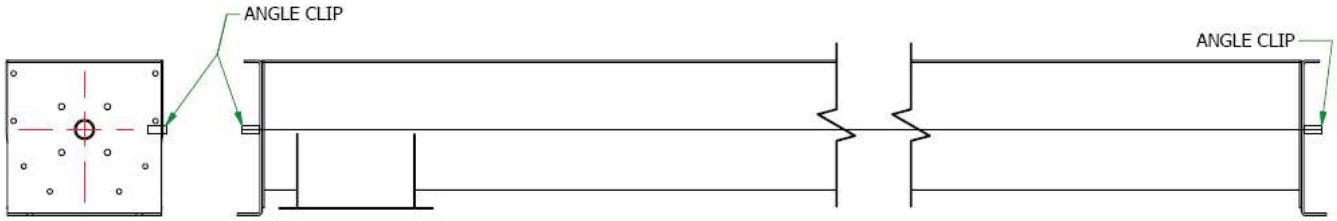
ASSEMBLY

1. The mounting surface for supporting the conveyor must be level and true.
2. Screw conveyor troughs must be assembled straight and true with no distortion.
3. Place troughs in proper sequence with discharge spout properly located.
4. Connect the joints loosely. DO NOT TIGHTEN BOLTS.
5. Assemble each trough end to proper end of conveyor.
6. Attach piano wire full length of conveyor at centerline. Make sure piano wire is pulled tight. Refer to *Figure 1* at the end of this section.
7. Tighten trough flange bolts keeping the trough assembly true to piano wire. Alignment must be checked in both horizontal and vertical directions. Maximum deviation in either direction at any point along the length of the conveyor is 1/8". Torque bolts to proper torque rating per Chart A.
8. Anchor trough assembly to mounting surface. Make sure entire length of trough is straight and true. CEMA recommends supporting trough assemblies every 10' to 12'. Saddles and feet may be required.
9. Mount drive or thrust unit on correct trough end. Drive or thrust units are normally located at discharge end of conveyor. Make sure drive or thrust unit is centered in seal and trough end openings. Torque bolts to proper torque rating per Chart A.
10. Place the first screw section in the trough starting at the drive or thrust end. Install screw so end lugs are opposite carrying side of flight.
11. Insert screw onto drive shaft and install coupling bolts. DO NOT TIGHTEN COUPLING BOLTS.
12. Insert coupling shaft into opposite end of screw and install coupling bolts. DO NOT TIGHTEN COUPLING BOLTS.
13. Pull screw section away from drive or thrust unit to seat thrust connection.
14. Insert hanger onto coupling shaft.
15. Raise hanger and screw section until hanger top bar is flush with top of trough. Make sure correct clearance exist between outside diameter of screw and inside of trough. Match mark and drill troughs to mount hanger assembly. Insert hanger assembly bolts and hand tighten.
16. Assemble screw sections, couplings and hangers until all are installed by repeating steps 10 through 15. Install screw sections so flighting is 180 degrees from end of flighting of previous screw section.
17. Center hanger bearings between screw sections. Torque hanger assembly bolts to proper torque rating per Chart A.
18. Assemble seal and bearing to opposite trough end. Make sure end shaft is centered in seal and trough end openings. Torque bolts to proper torque rating per Chart A.

19. Insert end shaft thrc ...OT TIGHTEN COUPLING BOLTS.
20. Rotate entire screw assembly to check alignment and adjust hanger assemblies as required.
21. Torque ALL coupling bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide** (Chart A) to eliminate over tightening of coupling bolts.
22. Adjust seals as required.
23. Remove all debris from conveyor.
24. Install covers in proper sequence starting at inlet end and attach with provided fasteners.
25. Lubricate drive and all bearings in accordance with manufacturer's instructions. DRIVES GENERALLY SHIPPED WITHOUT OIL.
26. MAKE SURE ALL CEMA SAFETY LABELS ARE IN PROPER LOCATIONS.



CEMA COMMONLY USED PIANO WIRE SETUP
PIANO WIRE ATTACHED TO TOP OF CONVEYOR ON SIDE



OPTIONAL PIANO WIRE SETUP
PIANO WIRE ATTACHED TO CENTERLINE OF CONVEYOR ON SIDE

Figure 1 - Piano Wire Setup Diagrams

Proper equipment alignment is critical to successful long-term operation. Alignment must be checked in both horizontal and vertical directions. Maximum deviation in either direction is 1/8". Please refer to the manufacturer's Operations and Maintenance Manual for additional information.

BEFORE INITIAL START-UP

1. LOCKOUT/TAGOUT ALL POWER.
2. Lubricate all bearings in accordance with manufacturer's instructions.
3. Lubricate all gear reducers in accordance with manufacturer's instructions. Gear reducers are normally shipped without lubrication.
4. Check conveyor to ensure all tools and foreign materials have been removed.
5. Turn drive unit by hand to check for alignment and obstructions.
6. Check conveyor to ensure all covers, guards and safety devices are installed and operating properly.
7. Attach gates to inlet and discharge chutes, where applicable.

INITIAL START-UP (WITHOUT MATERIAL)

1. Reenergize power to conveyor.
2. Start conveyor momentarily to check for proper conveyor rotation. If conveyor rotation is NOT correct, quickly shutdown and have qualified electrician change wiring.
3. Operate conveyor without material for several hours as a break in period. Observe for excessive bearing temperature, unusual noise or drive misalignment. If these conditions occur refer to Troubleshooting Section of this document.
4. Stop the conveyor and LOCKOUT/TAGOUT ALL POWER.
5. Remove covers and check tightness of coupling bolts. Torque bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide** (Chart A) to eliminate over tightening of coupling bolts. Replace covers.
6. Check all assembly and mounting bolts. Torque bolts to proper torque rating.
7. Check conveyor discharge. Discharge must be clear to ensure that material flow out of conveyor will not be impeded.

INITIAL START-UP (WITH MATERIAL)

1. Reenergize power to conveyor.
2. Start conveyor and operate without material for several minutes.
3. Feed material gradually until design capacity is reached.
4. DO NOT EXCEED CONVEYOR SPEED, CAPACITY AND MATERIAL DENSITY.
5. Start and stop conveyor several times. Operate conveyor for several hours with material.
6. Check motor amperage when conveying at design capacity and compare to full load amperage of motor. Problems may exist if amperage is excessive. Check voltage to ensure that it is within normal operating limits.
7. Stop the conveyor and LOCKOUT/TAGOUT ALL POWER.
8. Remove covers and check tightness of coupling bolts. Torque bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide** (Chart A) to eliminate over tightening of coupling bolts.
9. Check hanger bearings and realign if necessary.
10. Replace covers.
11. Check all assembly and mounting bolts. Torque bolts to proper torque rating per Chart A.

Practice good housekeeping. Keep area around conveyor clean and free of obstacles to provide easy access and to avoid interference with the function of the conveyor.

Establish routine periodic inspection of the entire conveyor to ensure continuous maximum operating performance. LOCKOUT/TAGOUT ALL POWER BEFORE INSPECTION OF CONVEYORS. Periodic inspections should be made of the following:

- Bearings – Check for proper lubrication. Lubricate all bearings in accordance with manufacturer's instructions. Check hanger bearings for proper alignment and excessive wear. Replace hanger bearings when wear exceeds 1/8".
- Gear Reducers – Check for proper lubrication. Lubricate all gear reducers in accordance with manufacturer's instructions.
- Drives – Check for wear on belts and proper tension. Check for lubrication on chains and proper tension. Replace belts or chains as necessary.
- Screws – Check for damage, excessive wear and material buildup. Replace screw sections as necessary.
- Troughs – Check for damage, excessive wear and material buildup. Check trough alignment using piano wire as described in Installation Section of this document. Replace trough sections as necessary.
- Shafts – Check for bolt hole elongation and wear. Check for run-out. Replace shafts when wear exceeds 1/8".
- Seals – Check for leakage. Adjust seal or replace packing as necessary.
- Coupling Bolts – Check for wear. Replace worn coupling bolts as necessary. It is recommended to replace coupling bolts and lock nuts when replacing screw sections. Torque ALL coupling bolts to proper torque rating. Over tightening of coupling bolts could result in failure in tension. CEMA recommends tightening coupling bolts to 75% of the values given in the **Bolt Torque Guide** (Chart A) to eliminate over tightening of coupling bolts.
- Assembly Bolts – Check for tightness. Torque ALL assembly bolts to proper torque rating per Chart A.
- Guards – Check for clearance and bolt tightness. Check oil level on oil-tight guards.

REPLACING SCREW CONVEYOR COMPONENTS

1. LOCKOUT/TAGOUT ALL POWER
2. Removal of a screw section must proceed from the end opposite the drive or thrust unit.
3. Remove trough end, screw sections, coupling shafts and hangers until the damaged screw section is reached and removed.
4. Reassemble conveyor components in accordance with the Installation Section of this document.

NOTE: Quick disconnect screws can be removed at intermediate locations without first removing adjacent sections.

EMERGENCY SHUTDOWN

An emergency shutdown may be necessary to clear obstructions or to replace damaged or worn components.

1. LOCKOUT/TAGOUT ALL POWER.
2. Remove all covers.
3. Remove all obstructions and product from conveyor.
4. Inspect all components for damage or wear. Check conveyor components in accordance with the Maintenance Section of this document.
5. Replace all damaged or worn components. Replace conveyor components in accordance with the Installation Section of this document.
6. Turn drive unit by hand to check for alignment and obstructions.
7. Replace all covers and guards.
8. Restart conveyor in accordance with the Operation Section of this document.

EXTENDED SHUTDOWN

An extended shutdown may be necessary if the conveyor is not in operation for a long period of time.

1. Operate conveyor until all product is removed.
2. LOCKOUT/TAGOUT ALL POWER.
3. Remove all covers.
4. Remove all obstructions and product from conveyor.
5. Inspect all components for damage or wear. Check conveyor components in accordance with the Maintenance Section of this document.
6. Replace all damaged or worn components. Replace conveyor components in accordance with the Installation Section of this document.
7. Lubricate drive and all bearings in accordance with manufacturer's instructions.
8. Coat all exposed metal surfaces with rust preventative.
9. Rotate screws by hand every week. Screws may sag and permanently deform if not rotated.

NOTE: When operation is to resume, restart conveyor in accordance with the Operation Section of this document.

STORAGE

1. Protect conveyor from weather, moisture and extreme temperatures. DO NOT use coverings that promote condensation.
2. Coat all exposed metal surfaces with rust preventative.
3. Rotate screws by hand every week. Screws may sag and permanently deform if not rotated.

NOTE: When operation is to resume, restart conveyor in accordance with the Operation Section of this document.

PROBLEM	CAUSE	REMEDY
1. ACCELERATED FLIGHT WEAR	FLIGHT THICKNESS TOO LIGHT	INCREASE FLIGHT THICKNESS. USE ABRASION RESISTANT MATERIALS OR HARDFACING.
	RPM TOO HIGH OR TROUGH LOADING TOO HIGH	REDUCE SPEED. CONSULT ANSI/ CEMA 350 BOOK TO DETERMINE RECOMMENDED SPEED AND TROUGH LOADING.
2. HANGER BEARING FAILURE	INCORRECT ALIGNMENT	REALIGN TROUGH ASSEMBLY AND HANGERS IN ACCORDANCE WITH ASSEMBLY SECTION OF THIS DOCUMENT.
	IMPROPER SPEED AND TROUGH LOADING	CONSULT ANSI/CEMA 350 BOOK TO DETERMINE RECOMMENDED SPEED AND TROUGH LOADING.
	IMPROPER HANGER BEARING MATERIAL	CONSULT ANSI/CEMA 350 BOOK TO DETERMINE RECOMMENDED BEARING MATERIAL.
	EXCESSIVE BEARING WEAR	REPLACE HANGER BEARING.
3. PREMATURE TROUGH FAILURE	TROUGH THICKNESS TOO LIGHT	INCREASE TROUGH THICKNESS. USE ABRASION RESISTANT MATERIAL. CONSULT ANSI/CEMA No. 350 TO DETERMINE RECOMMENDED TROUGH THICKNESS.
	SCREW DEFLECTION	CONSULT ANSI/CEMA No. 350 TO DETERMINE PROPER PIPE SIZE AND SCREW LENGTH.
	BENT SCREW	STRAIGHTEN OR REPLACE SCREW.
4. SHAFT HOLE ELONGATION	INSUFFICIENT NUMBER OF COUPLING BOLTS	INCREASE NUMBER OF COUPLING BOLTS.
	CONVEYOR SUBJECT TO FREQUENT STOP/ START	CEASE FREQUENT STOP/START. INCREASE BEARING CAPACITY OF SHAFT AND/OR INCREASE NUMBER OF COUPLING BOLTS.
	FREQUENT OVERLOADS	
5. DRIVE SHAFT BREAKAGE	EXCESSIVE TORQUE	CONSULT ANSI/CEMA No. 350 TO DETERMINE PROPER TORQUE RATING.
6. MOTOR OVERLOAD	MOTOR UNDERSIZED	CONSULT ANSI/CEMA STANDARD No. 350 TO DETERMINE PROPER HORSEPOWER REQUIREMENTS.
	UPSET LOADING CONDITION	EMPTY TROUGH, CONTROL FEED AND OPERATE UNDER DESIGN SPECIFICATIONS.

SECTI ... inued

PROBLEM	CAUSE	REMEDY
7. TROUGH END BEARING FAILURE	BEARING CONTAMINATION	UPGRADE OR REPLACE SEAL. CHANGE TO OUTBOARD BEARING.
	INSUFFICIENT LUBRICATION	LUBRICATE IN ACCORDANCE WITH MAINTENANCE SECTION OF THIS DOCUMENT.
	IMPROPER SHAFT RUNOUT	CHECK SCREW STRAIGHTNESS AND REPLACE AS NECESSARY.
8. COUPLING SHAFT BREAKAGE	EXCESSIVE TORQUE	CONSULT ANSI/CEMA No. 350 TO DETERMINE PROPER TORQUE RATING.
	INCORRECT ALIGNMENT	REALIGN TROUGH ASSEMBLY AND HANGERS IN ACCORDANCE WITH ASSEMBLY SECTION OF THIS DOCUMENT.
	EXCESSIVE SHAFT WEAR	REPLACE COUPLING SHAFT.

GENERAL BOLT TIGHTENING TORQUE (ft-lbs)

Bolt Diameter (in)	Threads Per (in) (UNC)	SAE 2	SAE 5	SAE 8	18-8 & 316 Stainless Steel
1/4	20	5	9	12	6
5/16	18	11	18	25	11
3/8	16	18	31	44	20
7/16	14	28	49	69	29
1/2	13	44	73	105	40
9/16	12	63	108	149	52
5/8	11	96	147	212	86
3/4	10	158	252	351	115
7/8	9	219	389	552	180
1	8	316	589	784	240

All bolted applications should be evaluated to determine optimum tightening torque.
K factor in the formula below is considered an estimate.
The most commonly used K factor is 0.20 for plain finished bolts.

Formula: T= K x D x P

- T Target tighten torque (the result of this formula is in-lbs, dividing by 12 yields ft-lbs)
- K Coefficient of friction (nut factor), always an estimation in this formula
- D Bolts nominal diameter (in)
- P Bolt's desired tensile load (in-lbs) (generally 75% of yield strength)

P (lbs) = (75%) Yield Strength * Tensile Stress Area

Bolt Torque Guide is for fasteners used to assemble screw conveyors and does not include coupling bolts. Over tightening of coupling bolts could result in failure in tension.

CEMA recommends tightening coupling bolts to 75% of the values given in the Bolt Torque Guide to eliminate over tightening of coupling bolts

Instruction Manual
Dodge® Torque-Arm™ II Speed Reducers
Ratios 5, 9, 15, 25, and 40:1

TA0107L	**TA3203H**	**TA6307H**	**TA9415H**
TA1107H	**TA4207H**	**TA7315H**	**TA10507H**
TA2115H	**TA5215H**	**TA8407H**	**TA12608H**

These instructions must be read thoroughly before installation or operation. This instruction manual was accurate at the time of printing. Please see **baldor.com** for updated instruction manuals.

Note! The manufacturer of these products, Baldor Electric Company, became ABB Motors and Mechanical Inc. on March 1, 2018. Nameplates, Declaration of Conformity and other collateral material may contain the company name of Baldor Electric Company and the brand names of Baldor-Dodge and Baldor-Reliance until such time as all materials have been updated to reflect our new corporate identity.

WARNING: To ensure the 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.

WARNING: All products over 25 kg (55 lbs) are noted on the shipping package. Proper lifting practices are required for these products.

WARNING: Torque-Arm II product exceeding 13.5 kg (30 lbs) should be lifted using lift-assist equipment rated for the weight of the product. Weight values for all Torque-Arm II products are listing in the Gearing Engineering Catalog. Lifting brackets provided on the Torque-Arm II should be used when connecting to the lift-assist equipment.

WARNING: Depending on operating conditions, sound levels for Torque-Arm II products may exceed 70 dB. Protective measures such as hearing protection may be needed when in close proximity to a Torque-Arm II.

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by ABB nor are the responsibility of ABB. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

INSTALLATION

1. Use lifting bracket to lift reducer.
2. Determine the running positions of the reducer. (See Figure 1). Note that the reducer is supplied with 6 plugs; 4 around the sides for horizontal installations and 1 on each face for vertical installations. These plugs must be arranged relative to the running positions as follows:

Horizontal Installations–Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filter/ventilation plug in shipment and install plug in topmost hole. Of the 2 remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.

Vertical Installations–Install the filter/ventilation plug in the hole provided in the upper face of the reducer housing as installed. If space is restricted on the upper face, install the vent in the highest hole on the side of the reducer per Figure 1. Install a plug in the hole in the bottom face of the reducer. Do not use this hole for the magnetic drain plug. Of the remaining holes on the sides of the reducer, use the plug in the upper housing half for the minimum oil level plug.

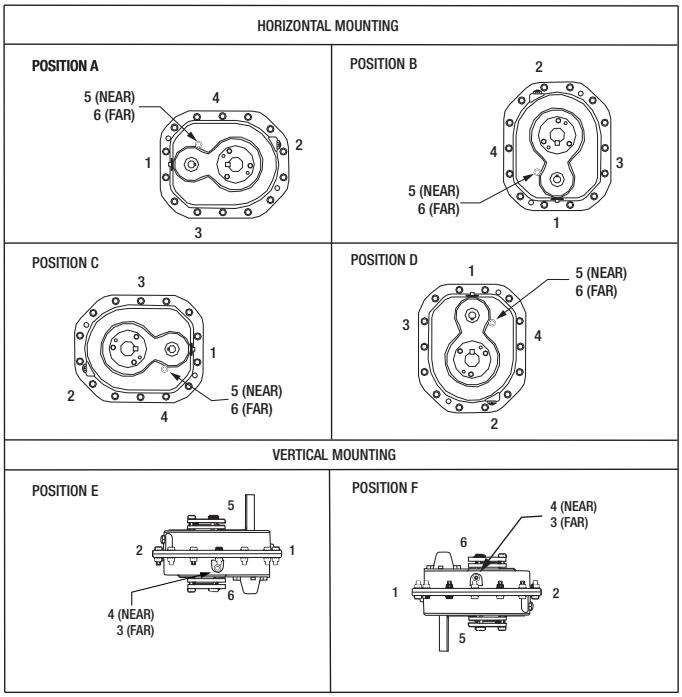


Figure 1 - Mounting Positions

Table 1 - Output Speeds

Output Speeds Above 15 RPM						
Mounting Position	**Vent and Plug Locations**					
	1	**2**	**3**	**4**	**5**	**6**
Position A	Level	Plug	Drain	Vent	Plug	Plug
Position B	Drain	Vent	Level	Plug	Plug	Plug
Position C	Plug	Level	Vent	Drain	Plug	Plug
Position D	Vent	Drain	Level	Plug	Plug	Plug
Position E	Level	Plug	Plug	Drain	Vent	Plug
Position F	Plug	Drain	Level	Plug	Plug	Vent

Output Speeds Above 15 RPM and Below*						
Mounting Position	**Vent and Plug Locations**					
	1	**2**	**3**	**4**	**5**	**6**
Position A	Plug	Level	Drain	Vent	Plug	Plug
Position B	Drain	Vent	Plug	Level	Plug	Plug
Position C	Level	Plug	Vent	Drain	Plug	Plug
Position D	Vent	Drain	Level	Plug	Plug	Plug
Position E	Level	Plug	Plug	Drain	Vent	Plug
Position F	Plug	Drain	Level	Plug	Plug	Vent

* Below 15 RPM output speed, oil level must be adjusted to reach the highest oil level plug. If reducer position is to vary from those shown in Figure 1, either more or less oil may be required. Consult Mechanical Power Transmission Support in Greenville, SC.

The running position of the reducer in a horizontal application is not limited to the four positions shown in Figure 1. However, if running position is over 20° in position "B" & "D" or 5° in position "A" & "C", either way from sketches, the oil level plug cannot be used safely to check the oil level, unless during the checking, the torque arm is disconnected and the reducer is swung to within 5° for position "A" & "C" or 20° for position "B" & "D" of the positions shown in Figure 1. Because of the many possible positions of the reducer, it may be necessary or desirable to make special adaptations using the lubrication filling holes furnished along with other standard pipe fittings, stand pipes and oil level gauges as required.

If mounting the Torque-Arm II reducer on an inclined angle, consult Mechanical Power Transmission Support for proper oil level.

3. Mount reducer on driven shaft as follows:

   For Taper Bushed Reducer: Mount reducer on driven shaft per instruction in Torque-Arm II Bushing Installation section of this manual.
4. Install sheave on input shaft as close to reducer as practical (Figure 2).
5. If not using a Dodge Torque-Arm II motor mount, install motor and V-belt drive so belt will approximately be at right angles to the center line between driven and input shaft (Figure 3). This will permit tightening the V-belt with the torque arm.
6. Install torque arm and adapter plates reusing the reducer bolts. The adapter plates will fit in any position around the input end reducer.
7. Install torque arm fulcrum on a flat and rigid support so that the torque arm will be approximately at right angles to the center line through the driven shaft and the torque arm anchor screw (Figure 4). Make sure that there is sufficient take-up in the turnbuckle for belt tension adjustment when using V-belt drive.

   CAUTION: Unit is shipped without oil. Add proper amount of recommended lubricant before operating. Failure to observe this precaution could result in damage to or destruction of the equipment.
8. Fill gear reducer with recommended lubricant (Table 3).

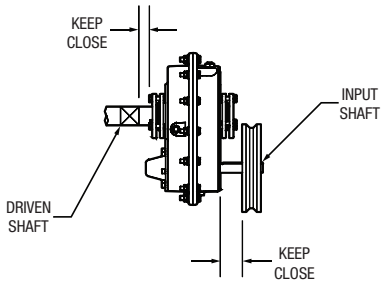


Figure 2 - Reducer and Sheave Installation

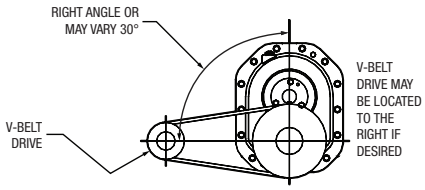


Figure 3 - Angle of V-Drive

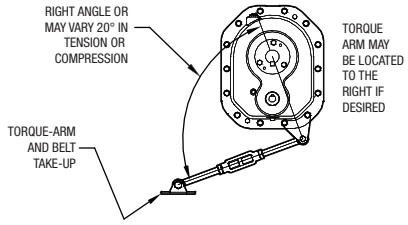


Figure 4 - Angle of Torque-Arm

TORQUE-ARM II BUSHING INSTALLATION

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

The Dodge Torque-Arm II reducer is designed to fit both standard and short length driven shafts. The Standard Taper Bushings series is designed where shaft length is not a concern. The Short Shaft Bushing series is to be used where the driven shaft does not extend through the reducer.

Standard Taper Bushings:

1. One bushing assembly is required to mount the reducer on the driven shaft. An assembly consists of two tapered bushings, bushing screws and washers, two bushing backup plates and retaining rings, and necessary shaft key or keys. The driven shaft must extend through the full length of the reducer. If the driven shaft does not extend through the reducer do not use the standard tapered bushings; instead use the short shaft bushings as described in the Short Shaft Bushings section that follows. The minimum shaft length, as measured from the end of the shaft to the outer edge of the bushing flange (Figure 6), is given in Table 2.
2. Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.
3. Place one bushing, flange end first, onto the driven shaft and position per dimension “A”, as shown in Table 2. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.
4. Insert the output key in the shaft and bushing. For easy of installation, rotate the driven shaft so that the shaft keyseat is at the top position.

PLEASE NOTE – In most cases the keys that are supplied with the bushing kit are NOT square keys, and the orientation of the key is important. Install the key so that it fits snugly in the width of the keyseat. The keys are marked with a part number and some keys are also etched with “THIS SIDE UP” – these markings should be showing on the top of the key when it is installed in the shaft keyseat, see Figure 5 below.

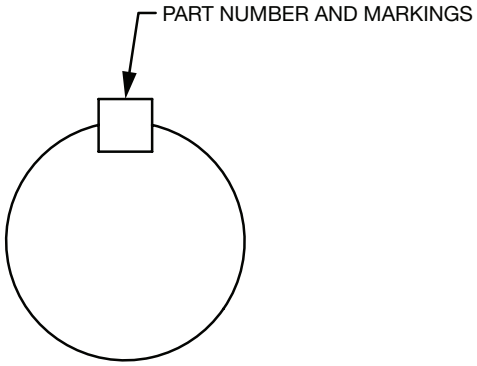


Figure 5- Key Marking

5. Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance “A” from the shaft bearing.
6. Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly. If the reducer must be positioned closer than dimension “A”, place the screws with washers installed, in the unthreaded holes in the bushing before positioning reducer making sure to maintain at least 1/8” between the screw heads and the bearing.
7. Place the second tapered bushing in position on the shaft and align the bushing keyway with the shaft key. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.
8. Alternately and evenly tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 2. Repeat procedure on outer bushing.

Short Shaft Bushings:

1. One bushing assembly is required to mount the reducer on the driven shaft. An assembly consists of one long tapered bushing, one short tapered bushing, one tapered bushing wedge, bushing screws and washers, two bushing backup plates and retaining rings, and necessary shaft key or keys. The driven shaft does not need to extend through the reducer for the short shaft bushing to operate properly. The minimum shaft length, as measured from the end of the shaft to the outer edge of the bushing flange (Figure 5), is given in Table 1.

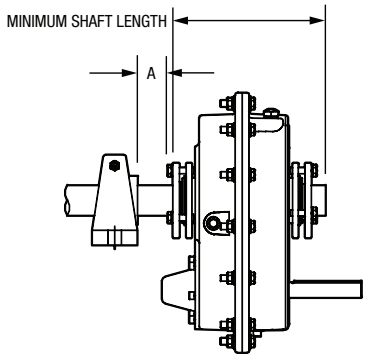


Figure 6 – Minimum Recommended Dimensions

Table 2 – Minimum Mounting Dimensions and Bolt Torques

Minimum Required Shaft Length		
Reducer Size	**Standard Taper Bushing (inch)**	**Short Shaft Bushing (inch)**
TA0107L	6.83	4.32
TA0107L	6.83	4.32
TA1107H	6.95	4.43
TA2115H	7.80	4.80
TA3203H	8.55	5.46
TA4207H	8.94	5.66
TA5215H	10.33	6.35
TA6307H	10.82	6.72
TA7315H	11.87	7.62
TA8407H	12.82	8.10
TA9415H	13.74	8.56
TA10507H	15.46	9.67
TA12608H	18.32	11.60

Bushing Screw Information and Minimum Clearance for Removal			
Reducer Size	**Fastener Size**	**Torque in lb-ft**	**A (inch)**
TA0107L	5/16-18	20-17	1.08
TA1107H	5/16-18	20-17	1.20
TA2115H	3/8-16	20-17	1.20
TA3203H	3/8-16	20-17	1.20
TA4207H	3/8-16	26-23	1.48
TA5215H	1/2-13	77-67	1.81
TA6307H	1/2-13	77-67	1.81
TA7315H	1/2-13	77-67	2.06
TA8407H	1/2-13	77-67	2.06
TA9415H	5/8-11	86-75	2.39
TA10507H	5/8-11	86-75	2.39
TA12608H	5/8-11	86-75	2.39

2. The long bushing is designed to be installed from the side of the reducer opposite the driven equipment as shown in Figure 6. The long bushing when properly installed is designed to capture the end of the customer shaft that does not extend through the reducer. Normally the reducer would be mounted such that the input shaft extends from the side of the reducer opposite the driven equipment however the reducer design allows installation of the reducer to be mounted in the opposite direction.
3. Install the tapered bushing wedge into the hollow bore of the reducer from the same side as the long bushing will be installed. When installing the tapered bushing wedge into the reducer hub, install the flange end first so that the thin taper is pointing outwards towards the long bushing as shown in Figure 7. The wedge is properly installed when it snaps into place in the reducer hub.

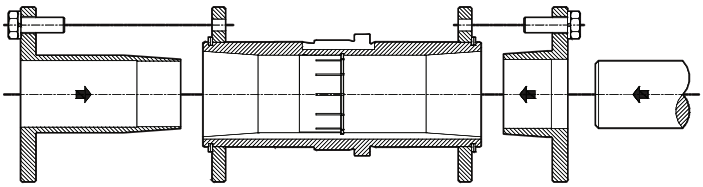


Figure 7 – Short Shaft Bushing and Output Hub Assembly

4. Align the tapered bushing wedge keyway with the reducer hub keyway. The keyway in the wedge is slightly wider than the keyway in the reducer hub allowing for easier installation.
5. Install one bushing backup plate on the end of the hub and secure with the supplied retaining ring. Repeat procedure for other side.
6. Install the short bushing; flange first, on the driven shaft and position per dimension “A”, as shown in Table 3. This will allow the bolts to be threaded into the bushing for future bushing and reducer removal.
7. Insert the output key in the shaft and bushing. For easy of installation, rotate the driven shaft so that the shaft keyseat is at the top position.

PLEASE NOTE – In most cases the keys that are supplied with the bushing kit are NOT square keys, and the orientation of the key is important. Install the key so that it fits snugly in the width of the keyseat. The keys are marked with a part number and some keys are also etched with “THIS SIDE UP” – these markings should be showing on the top of the key when it is installed in the shaft keyseat, see Figure 8 below.

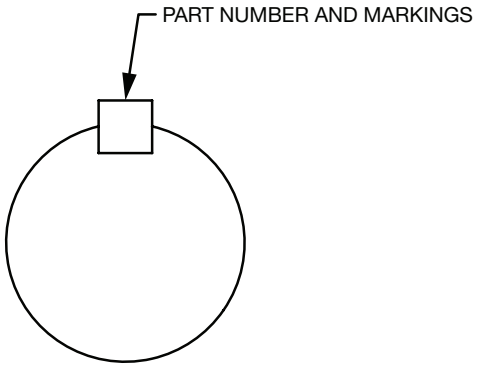


Figure 8- Key Marking

8. Mount the reducer on the driven shaft and align the shaft key with the reducer hub keyway. Maintain the recommended minimum distance “A” from the shaft bearing.
9. Insert the screws, with washers installed, in the unthreaded holes in the bushing flange and align with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing screws. Tighten the screws lightly. If the reducer must be positioned closer than dimension “A”, place the screws with washers installed, in the unthreaded holes in the bushing before positioning reducer making sure to maintain at least 1/8” between the screw heads and the bearing.
10. Place the long bushing in position on the shaft and align the bushing keyway with the shaft key. Use care to locate the long bushing with the tapered bushing wedge installed earlier. Align the unthreaded holes in the bushing with the threaded holes in the bushing backup plate. If necessary, rotate the bushing backup plate to align with the bushing holes. Insert bushing screws, with washers installed in the unthreaded holes in the bushing. Tighten screws lightly.
11. Alternately and evenly tighten the screws in the bushing nearest the equipment to the recommended torque given in Table 1. Repeat procedure on outer bushing.

Bushing Removal for Standard Taper or Short Shaft Bushings:

1. Remove bushing screws.
2. Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the shaft. For ease of tightening screws make sure screw threads and threaded holes in the bushing flanges are clean. If the reducer was positioned closer than the recommended minimum distance “A” as shown in Table 2, loosen the inboard bushing screws until they are clear of the bushing flange by 1/8”. Locate two (2) wedges at 180 degrees between the bushing flange and the bushing backup plate. Drive the wedges alternately and evenly until the bushing is free on the shaft.
3. Remove the outside bushing, the reducer, and then the inboard bushing.

LUBRICATION

NOTE: Because reducer is shipped without oil, it is necessary to add the proper amount of oil before operating reducer. Use a high-grade petroleum base rust and oxidation inhibited (R&O) gear oil (Tables 3 and 4). Follow instructions on reducer warning tags, and in the installation manual.

For average industrial operating conditions, the lubricant should be changed every 2500 hours of operation or every 6 months, whichever occurs first. Drain reducer and flush with kerosene, clean magnetic drain plug and refill to proper level with new lubricant.

CAUTION: Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. Failure to observe this precaution could result in bodily injury.

Under extreme operating conditions, such as rapid rise and fall of temperature, dust, dirt, chemical particles, chemical fumes, or oil sump temperatures above 200°F, the oil should be changed every 1 to 3 months, depending on severity of conditions.

Table 3–Oil Volumes

Approximate Reducer Size		Volume of Oil to Fill Reducer to Oil Level Plug ① ④											
		② Position A		② Position B		② Position C		② Position D		② Position E		② Position F	
		③ Quart	Liter	③ Quart	Liter	③ Quart	Liter	③ Quart	Liter	③ Quart	Liter	③ Quart	Liter
TA0107L	Single	0.7	0.6	0.5	0.5	0.7	0.6	1.4	1.3	1.3	1.2	1.5	1.4
	Double	0.7	0.6	0.5	0.5	0.6	0.6	1.3	1.3	1.2	1.2	1.4	1.3
TA1107H	Single	1.3	1.3	0.7	0.7	0.7	0.6	1.7	1.6	1.5	1.4	1.9	1.8
	Double	1.3	1.3	0.7	0.7	0.6	0.6	1.7	1.6	1.5	1.4	1.9	1.8
TA2115H	Single	2.1	2.0	1.2	1.2	1.1	1.0	2.7	2.5	2.3	2.2	3.1	2.8
	Double	2.1	2.0	1.1	1.1	1.0	1.0	2.6	2.5	2.4	2.3	3.0	2.9
TA3203H	Single	2.8	2.7	1.6	1.6	1.8	1.7	4.1	3.9	3.3	3.1	4.4	4.2
	Double	2.8	2.7	1.5	1.4	1.7	1.6	4.0	3.8	3.4	3.3	4.2	4.0
TA4207H	Single	4.4	4.2	2.6	2.5	2.9	2.8	7.4	7.0	6.3	6.0	7.8	7.3
	Double	4.4	4.2	2.5	2.4	2.8	2.6	7.3	6.9	6.4	6.0	7.5	7.1
TA5215H	Single	7.4	7.0	4.9	4.7	5.8	5.5	13.2	12.5	11.6	11.0	13.1	12.4
	Double	7.4	7.0	4.7	4.4	5.5	5.2	12.9	12.2	11.4	10.8	12.6	11.9
TA6307H	Single	8.8	8.4	5.8	5.5	6.6	6.2	16.1	15.3	13.2	12.5	16.1	15.3
	Double	8.8	8.4	5.5	5.2	6.2	5.9	15.8	15.0	13.9	13.1	15.3	14.5
TA7315H	Single	8.4	8.0	11.8	11.1	13.9	13.2	22.5	21.3	22.1	20.9	25.1	23.7
	Double	8.4	8.0	10.8	10.3	13.2	12.5	22.0	20.9	22.4	21.2	23.1	21.8
TA8407H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	7.7	7.3	11.7	11.1	13.7	12.9	25.1	23.8	24.0	22.7	25.8	24.4
TA9415H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	17.0	16.1	16.8	15.9	18.1	17.1	33.2	31.4	33.2	31.4	38.6	36.5
TA10507H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	38.0	36.0	27.6	26.1	25.8	24.4	53.5	50.6	53.8	50.9	56.1	53.0
TA12608H	Single	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Double	53.0	50.2	41.5	39.3	37.1	35.1	70.7	66.9	72.2	68.3	80.4	76.1

① Oil quantity is approximate. Service with lubricant until oil runs out of oil level hole.
② Refer to Figure 1 for mounting positions.
③ US measure: 1 quart = 32 fluid ounces = .94646 liters.
④ Below 15 RPM output speed, oil level must be adjusted to reach the highest oil level plug. If reducer position is to vary from those shown in Figure 1, either more or less oil may be required. Consult Mechanical Power Transmission Support, Greenville, SC
⑤ Reducers with a 5:1 ratio are single-reduction. All other ratios are double-reduction

Table 4 – Oil Recommendations

Output RPM	ISO Grades For Ambient Temperatures of 50° F to 125° F * (10° C to 51° C)											
	Torque-Arm II Reducer Size											
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H	TA8407H	TA9415H	TA10507H	TA12608H
301 – 400	320	320	320	220	220	220	220	220	220	220	220	220
201 – 300	320	320	320	220	220	220	220	220	220	220	220	220
151 – 200	320	320	320	220	220	220	220	220	220	220	220	220
126 – 150	320	320	320	220	220	220	220	220	220	220	220	220
101 – 125	320	320	320	320	220	220	220	220	220	220	220	220
81 – 100	320	320	320	320	320	220	220	220	220	220	220	220
41 – 80	320	320	320	320	320	220	220	220	220	220	220	220
11 – 40	320	320	320	320	320	320	320	320	320	320	220	220
1 – 10	320	320	320	320	320	320	320	320	320	320	320	320
Output RPM	ISO Grades For Ambient Temperatures of 15° F to 60° F * (-9.4° C to 15° C)											
	Torque-Arm II Reducer Size											
	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H	TA6307H	TA7315H	TA8407H	TA9415H	TA10507H	TA12608H
301 – 400	220	220	220	150	150	150	150	150	150	150	150	150
201 – 300	220	220	220	150	150	150	150	150	150	150	150	150
151 – 200	220	220	220	150	150	150	150	150	150	150	150	150
126 – 150	220	220	220	150	150	150	150	150	150	150	150	150
101 – 125	220	220	220	220	150	150	150	150	150	150	150	150
81 – 100	220	220	220	220	220	150	150	150	150	150	150	150
41 – 80	220	220	220	220	220	150	150	150	150	150	150	150
11 – 40	220	220	220	220	220	220	220	220	220	220	150	150
1 – 10	220	220	220	220	220	220	220	220	220	220	220	220

NOTES:

1. Assumes auxiliary cooling where recommended in the catalog.
2. Pour point of lubricant selected should be at least 10°F lower than expected minimum ambient starting temperature.
3. Extreme pressure (EP) lubricants are not necessary for average operating conditions. When properly selected for specific applications, TORQUE-ARM II backstops are suitable for use with EP lubricants.
4. Special lubricants may be required for food and drug industry applications where contact with the product being manufactured may occur. Consult a lubrication manufacturer's representative for his recommendations.
5. For reducers operating in ambient temperatures between -22°F (-30°C) and 20°F (–6.6°C) use a synthetic hydrocarbon lubricant, 100 ISO grade or AGMA 3 grade (for example, Mobil SHC627). Above 125°F (51°C), consult Mechanical Power Transmission Support, Greenville, SC for lubrication recommendation.
6. Mobil SHC630 Series oil is recommended for high ambient temperatures.

GUIDELINES FOR TORQUE-ARM II REDUCER LONG-TERM STORAGE

During periods of long storage, or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service.

By taking special precautions, problems such as seal leakage and reducer failure due to lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

Preparation:

1. Drain oil from the unit. Add a vapor phase corrosion inhibiting oil (VCI-105 oil by Daubert Chemical Co.) in accordance with Table 5.
2. Seal the unit airtight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.
3. Cover all unpainted exterior parts with a waxy rust preventative compound that will keep oxygen away from the bare metal. (Non-Rust X-110 by Daubert Chemical Co. or equivalent).
4. The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside, or cover the unit with a durable waterproof cover which can keep moisture away.
5. Protect reducer from dust, moisture, and other contaminants by storing the unit in a dry area.
6. In damp environments, the reducer should be packed inside a moisture-proof container or an envelope of polyethylene containing a desiccant material. If the reducer is to be stored outdoors, cover the entire exterior with a rust preventative.

When placing the reducer into service:

1. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.
2. Clean the shaft extensions with petroleum solvents.
3. Assemble the vent plug into the proper hole.
4.

Follow the installation instructions provided in this manual.

Table 5 – Quantities of VCI #105 Oil

Reducer Size	Quantity (Ounces / Milliliter)
TA0107L	1 / 30
TA1107H	1 / 30
TA2115H	1 / 30
TA3203H	1 / 30
TA4207H	1 / 30
TA5215H	2 / 59
TA6307H	2 / 59
TA7315H	3 / 89
TA8407H	3 / 89
TA9415H	4 / 118
TA10507H	6 / 177
TA12608H	8 / 237

VCI #105 and #10 are interchangeable.
VCI #105 is more readily available.

OIL VISCOSITY EQUIVALENCY CHART

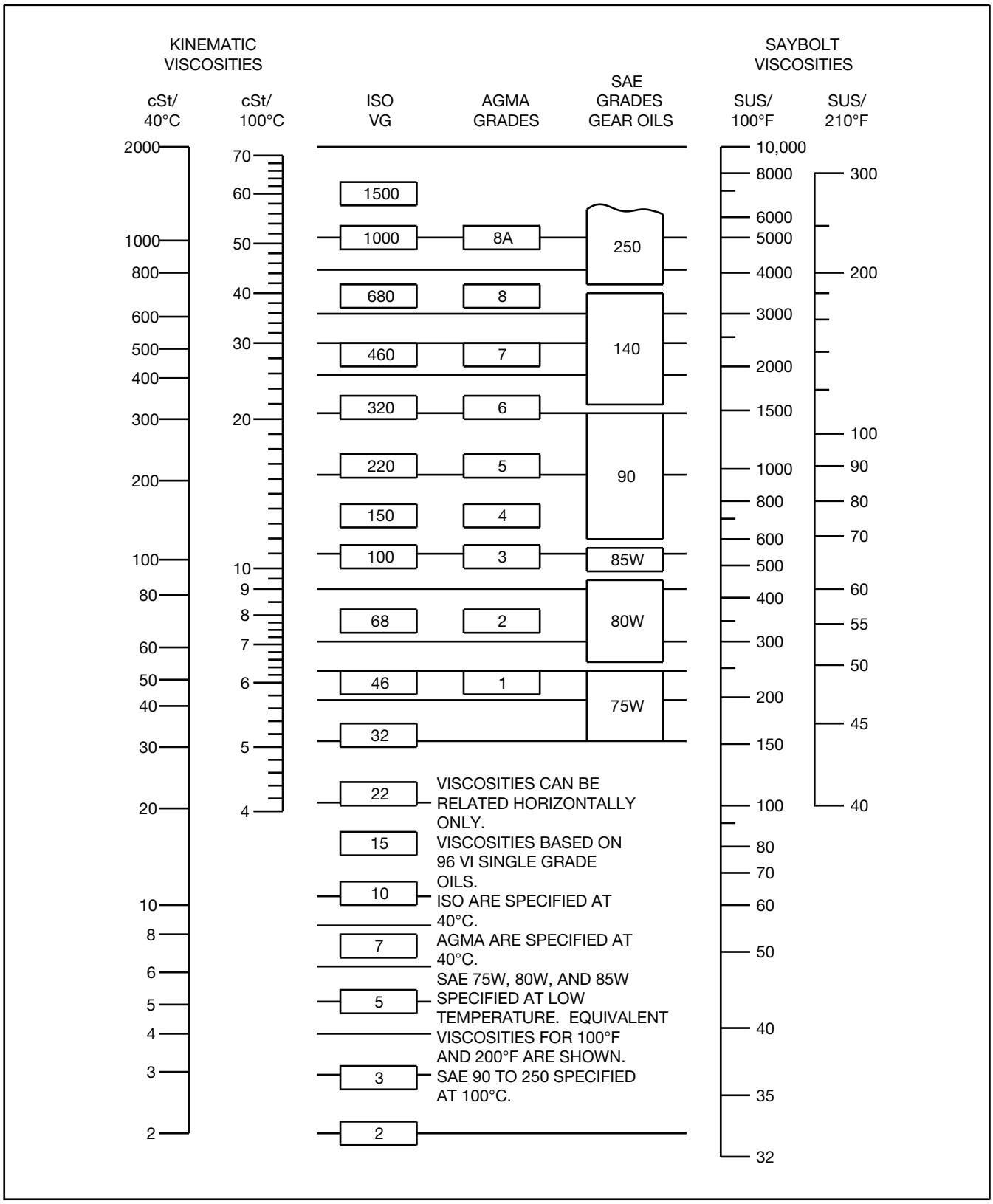


Figure 9 - OIL VISCOSITY EQUIVALENCY CHART

COOLING FAN INSTALLATION

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

Unpack all components and inspect for shipping damage. Do not use any component that has been damaged or modified. Make sure all components are clean and free of any foreign material prior to assembly. Cooling fan assembly is designed to fit onto the input shaft before placement of sheaves or belt guard assembly.

Installation for TA4207CF and TA5215CF:

1. Referring to Figure 10, install tapered bushing (9) into bore of fan blade assembly (2) and loosely install the three set screws provided with fan. Snug set screws but do not tighten at this time.
2. Slide fan assembly onto input shaft and install input shaft key.

   Note: Key is supplied with the TAII reducer. Locate fan blade edge distance "A" (Figure 10) from end of shaft per Table 5. Make sure fan assembly rotates without interference when input shaft is rotated.

3. Alternately tighten the set screws until fan assembly is securely installed on the input shaft.
4. Recheck fan assembly for proper location and clearance. Loosen set screws and repeat steps 2 and 3 above if not properly located.

Installation for TA6307CF through TA12608CF:

1. Referring to Figure 11, install fan guard back plate assembly (1) using the four bolts (4) provided. Note that the screen is mounted towards the reducer. Tighten to recommended torque in Table 8.

   CAUTION: Fan guard screen has sharp edges. Use caution when installing to avoid lacerations.

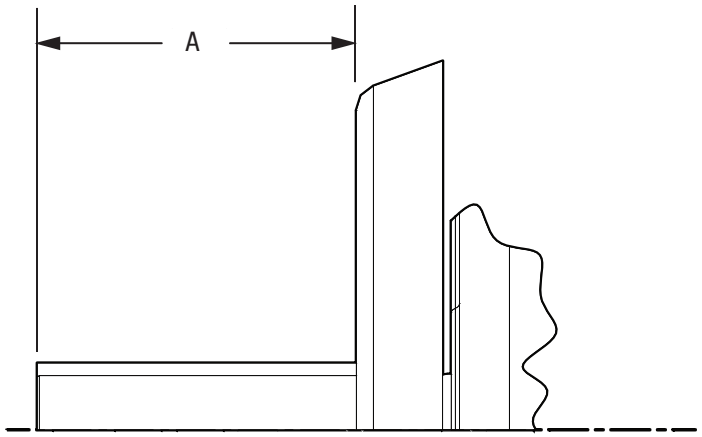
1. Slide fan blade assembly (2) onto input shaft and install key and set screws (5).

   NOTE: Key is supplied with the TAII reducer.

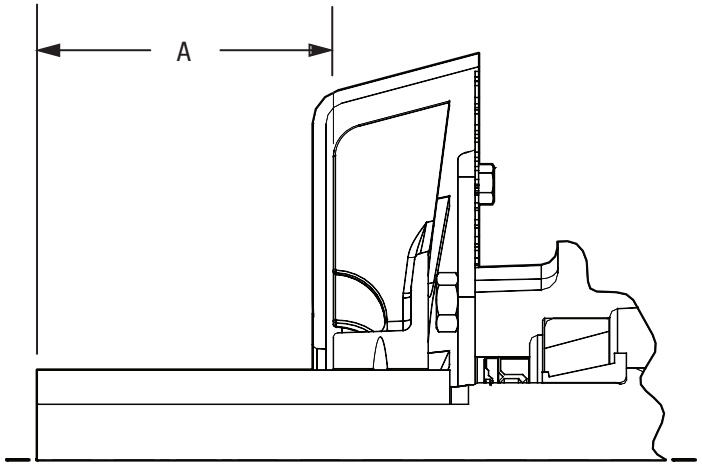
   Position fan blade edge distance "A" (Figure 10) from end of shaft per Table 6. Make sure fan assembly rotates without interference when input shaft is rotated. Tighten the two fan blade set screws (5) securely.
2. Install fan guard cover (3) with four bolts (6), lockwashers (7), and hex nuts (8). Tighten securely.
3. Verify fan blade rotates freely and does not interfere with fan guard back plate (1) or fan guard cover (3). Adjust fan blade if necessary.

Table 6 - Dimensions and Bolt Torque

Reducer Size	Dim."A" inch	Torque (Ft.-Lbs.)
TA4207H	3-3/4	
TA5215H	4-5/8	
TA6307H	4-1/4	33 - 30
TA7315H	4-3/8	33 - 30
TA8407H	5-1/16	33 - 30
TA9415H	6-1/4	33 - 30
TA10507H	6-7/16	33 - 30
TA12608H	6-7/16	33 - 30

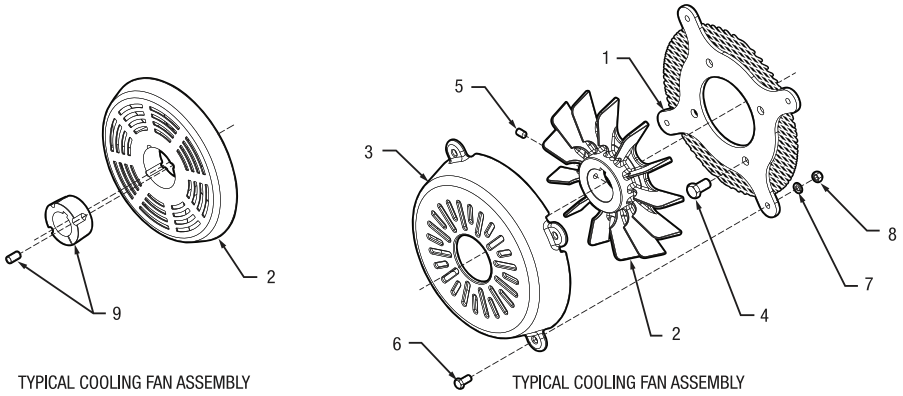


TYPICAL FOR REDUCER SIZES 4 AND 5



TYPICAL FOR REDUCER SIZES 6 - 12

Figure 10 - Fan Blade Placement



TYPICAL COOLING FAN ASSEMBLY FOR REDUCER SIZES 4 AND 5

TYPICAL COOLING FAN ASSEMBLY FOR REDUCER SIZES 6 THROUGH 12

Figure 11 - Parts Identification

Table 7 – Cooling Fan Part Numbers

Description	Ref. Number	Quantity	TA4207	TA5215	TA6307	TA7315	TA8407	TA9415	TA10507	TA12608
Cooling Fan Assembly ①	------	1	904106	905106	906106	907106	907106	909106	910106	912106
Fan Guard Plate Assembly ②	1	1	------	------	906519	906519	906519	909519	909519	912519
Fan Blade ②	2	1	904517	905517	906517	907517	907517	909517	910517	910517
Fan Guard Cover ②	3	1	------	------	906521	906521	906521	909521	909521	909521
Mounting Bolt ②	4	4	------	------	411294	411294	411294	411294	411294	411294
Fan Set Screw ②	5	2	------	------	400086	400086	400086	400086	400086	400086
Cover Bolt ②	6	4	------	------	411390	411390	411390	411390	411390	411390
Lockwasher ②	7	4	------	------	419010	419010	419010	419010	419010	419010
Hex Nut ②	8	4	------	------	407085	407085	407085	407085	407085	407085
Taper Bushing Assembly. ② ③	9	1	117162	117092	------	------	------	------	------	------

① Assembly includes parts listed below marked ②
③ Set screws are included with taper bushing assembly.

BACKSTOPS

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

1. Remove backstop shaft cover and gasket, shown in Figure 10. These parts will not be reused. This cover is directly opposite the extended end of the input shaft.
2. Clean the face of the gearbox to remove any gasket material or contamination from the cover mounting surface. It is important that contamination not get into the gearbox or the backstop during the backstop installation/servicing process.
3. Face reducer looking at the side from which the cover was removed. Determine carefully the desired direction of free rotation. It is important that the direction be correctly determined because to reverse the direction after the backstop is installed, it is necessary to remove the backstop, turn it end-for-end and then reinstall it.
4. Match the arrow on the backstop inner race to the direction of free rotation for the desired shaft. Note that reversing the backstop end-for end changes the direction of the arrow. The shaft will rotate in the same direction as the arrow on the backstop.
5. If the backstop kit has a spacer ring included, install it onto the shaft first, adjacent to the bearing inner ring.
6. Install the backstop inner race and sprag cage assembly onto the shaft. DO NOT remove the cage from the inner race or the shipping strap from the sprag set at this time. Insert the key into the inner race and mating shaft keyway. These parts should slip onto the shaft easily, a light coating of oil may assist in assembly. Do not use a hammer to force the installation, damage can occur to the shaft and/or the backstop. Slide the race against the spacer or the shaft shoulder and install the retaining ring into the groove in the shaft. Only use the supplied key, as it is specifically designed for each backstop.
7. Apply a thin coating of RTV silicone onto the gearbox mating surface for the outer race (same as the cover area). It is important to apply the sealant around the fastener holes to prevent leakage. Do not allow excessive amounts of silicone to enter the gearbox or to be applied to other parts.
8. Install the outer race by gently rotating it opposite the shaft rotation while pressing lightly inwards. Do not force the outer race into position as backstop damage may occur. Once the outer race is well piloted onto the sprag set, remove the shipping strap from the sprag set by cutting it, being careful not to let the outer race back off the sprags. The outer race should slide easily into position with a slight turning motion. A light coating of oil on the race inner diameter may ease installation.
9. Align the fastener holes in the outer race with the mating holes in the gearbox. Use the supplied grade 5 fasteners and lock washers only. Torque the fasteners in an alternating pattern per Table 8.

Table 8 – Backstop Fastener Torque Values

Reducer Size	Fastener Size	Torque in lb-ft
TA0107L	1/4-20	8 – 7
TA1107H	1/4-20	8 – 7
TA2115H	1/4-20	8 – 7
TA3203H	1/4-20	8 – 7
TA4207H	1/4-20	8 – 7
TA5215H	5/16-18	17 – 15
TA6307H	5/16-18	17 – 15
TA7315H	3/8-16	30 – 27
TA8407H	5/16-18	17 – 15
TA9415H	3/8-16	30 – 27
TA10507H	3/8-16	30 – 27
TA12608H	3/8-16	30 – 27

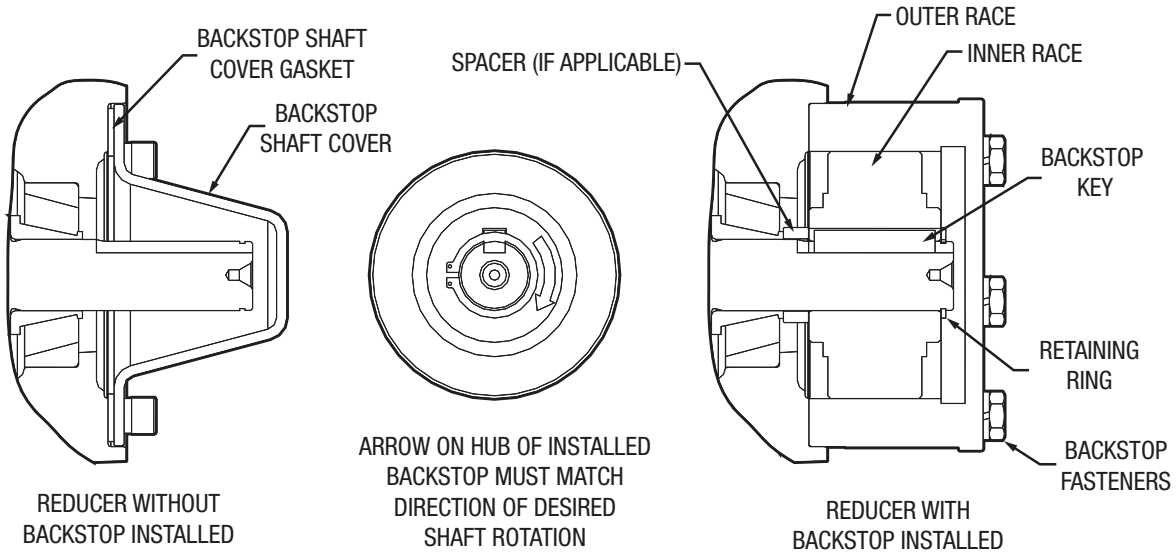


Figure 12 - Backstop Assembly

MOTOR MOUNTS

Motor Mount Assembly:

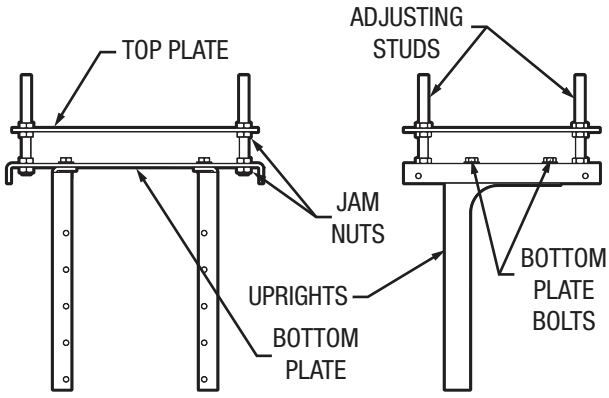


Figure 13 – Motor Mount Components

Refer to Figure 12 for descriptions of component parts. Using the hardware provided, assemble uprights (the angled parts to which the reducer is fastened) to the u-shaped, rectangular bottom plate. Notice that there are eight slots cut into the plate. If the reducer is to be mounted in Positions A or C, as illustrated in Figure 8, assemble the uprights in the outermost slots. If the reducer is to be mounted in Positions B or D, assemble the uprights in the innermost slots. The bottom plate may be mounted with the vertical flanges up or down (as shown in Figure 11). Snug bolts only, do not torque bolts at this time.

Fasten long threaded studs to the four corners of bottom plate using jam nuts, one on each side of the plate. Securely tighten these nuts, as they will not require any further adjustment. Add ne additional jam nut to each stud and thread approximately to the middle of the stud. Assemble top motor plate (the flat rectangular plate with many holes) on top of the jam nuts. Assemble the remaining jam nuts on studs to secure top motor plate. Do not fully tighten these nuts yet.

The motor mount may be installed in any of the four positions (A, B, C or D) and in any of the mounting levels (M1, M2, M3 or M4) shown in Figure 12. Note that the motor mount uprights attach to the input side of the reducer when mounted in either the “B” or “D” positions.

Motor Mount Installation:

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

Remove four or six (as required) housing bolts from the reducer. Place the motor mount in position and reinstall the bolts through the motor mount uprights and reducer housing. Where reducer is shaft mounted in positions A or C, the torque-arm adapter plate must be mounted between the reducer housing and the motor mount upright. Tighten bolts to the torque specified in Table 12.

Mount the motor onto the top plate and bolt securely. Install the motor sheave and reducer sheave as close to the motor and reducer housings as practical. Loosen the bottom plate bolts and slide the motor and mounting plate to accurately align the motor and reducer sheave. Securely tighten the bottom plate bolts. Install the required number of V-belts and tension belts by alternately adjusting the jam nuts on the four adjusting studs provided on the motor mount. Check all bolts to see that they are securely tightened. Verify that the V-belt drive is properly aligned before operating the reducer.

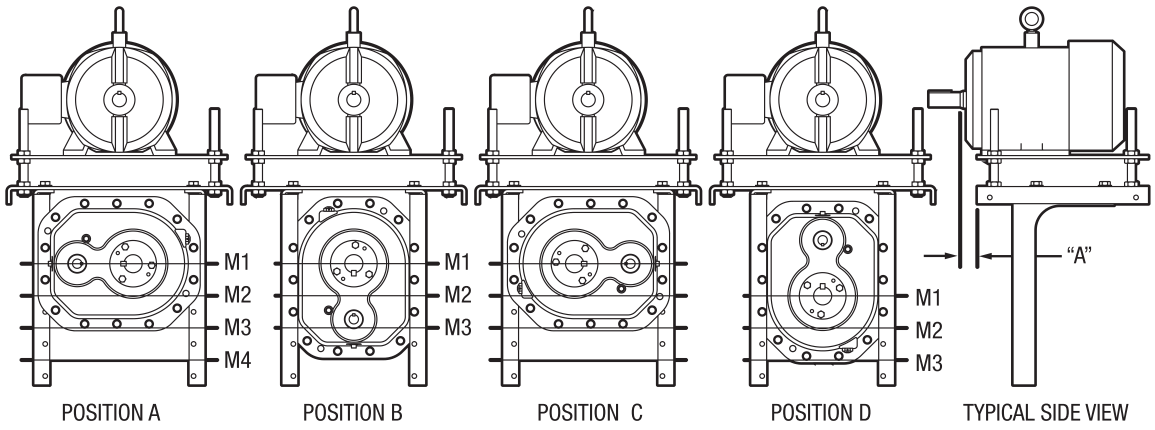


Figure 14 - Motor Mount Positions

Table 9 - V-Drive Center Distances

	Position	Mounting	Motor Frame / Motor Shaft Offset Dimensions "A"						
			56T / A=.78	140T / A=1.22	180T / A=1.37	210T / A=1.55	250T	280T	320T
TA0107L Reducer	A	M1	14.4 – 18.2	14.4 – 18.2	15.4 – 19.2	16.2 – 19.9	----	----	----
		M2	16.8 – 20.5	16.8 – 20.5	17.8 – 21.5	18.5 – 22.3	----	----	----
		M3	19.1 – 22.9	19.1 – 22.9	20.1 – 23.9	20.8 – 24.6	----	----	----
		M4	21.5 – 25.2	21.5 – 25.2	22.5 – 26.2	23.2 – 27.0	----	----	----
	B	M1	17.2 – 21.0	17.2 – 21.0	18.2 – 22.0	19.0 – 22.8	----	----	----
		M2	19.6 – 23.4	19.6 – 23.4	20.6 – 24.4	21.3 – 25.1	----	----	----
		M3	22.0 – 25.8	22.0 – 25.8	23.0 – 26.8	23.7 – 27.5	----	----	----
	C	M1	12.6 – 16.4	12.6 – 16.4	13.6 – 17.4	14.3 – 18.1	----	----	----
		M2	14.9 – 18.7	14.9 – 18.7	15.9 – 19.7	16.7 – 20.4	----	----	----
		M3	17.3 – 21.1	17.3 – 21.1	18.3 – 22.1	19.0 – 22.8	----	----	----
		M4	19.6 – 23.4	19.6 – 23.4	20.6 – 24.4	21.4 – 25.2	----	----	----
	D	M1	11.8 – 15.6	11.8 – 15.6	12.8 – 16.6	13.5 – 17.3	----	----	----
		M2	14.1 – 17.9	14.1 – 17.9	15.1 – 18.9	15.9 – 19.7	----	----	----
		M3	16.5 – 20.3	16.5 – 20.3	17.5 – 21.3	18.3 – 22.1	----	----	----
	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimensions "A"						
			56T / A=.78	140T / A=1.22	180T / A=1.37	210T / A=1.55	250T / A=1.56	280T	320T
TA1107L Reducer	A	M1	13.8 – 17.9	13.8 – 17.9	14.7 – 18.9	15.4 – 19.6	16.4-20.6	----	----
		M2	16.2 – 20.5	16.2 – 20.5	17.2 – 21.4	17.9 – 22.2	18.9-23.2	----	----
		M3	18.8 – 23.0	18.8 – 23.0	19.7 – 24.0	20.5 – 24.7	21.5-25.7	----	----
		M4	21.3 – 25.6	21.3 – 25.6	22.3 – 26.6	23.0 – 27.3	24.0-28.3	----	----
	B	M1	17.7 – 22.0	17.7 – 22.0	18.7 – 23.0	19.5 – 23.8	20.5-24.7	----	
		M2	20.3 – 24.6	20.3 – 24.6	21.3 – 25.6	22.1 – 26.4	23.1-27.4	----	----
		M3	22.9 – 27.2	22.9 – 27.2	23.9 – 28.2	24.6 – 29.0	25.6-30.0	----	----
	C	M1	13.8 – 17.9	13.8 – 17.9	14.7 – 18.9	15.4 – 19.6	16.4-20.6	----	
		M2	16.2 – 20.5	16.2 – 20.5	17.2 – 21.4	17.9 – 22.2	18.9-23.2	----	----
		M3	18.8 – 23.0	18.8 – 23.0	19.7 – 24.0	20.5 – 24.7	21.5-25.7	----	----
		M4	21.3 – 25.6	21.3 – 25.6	22.3 – 26.6	23.0 – 27.3	24.0-28.3	----	----
	D	M1	11.3 – 15.7	11.3 – 15.7	12.3 – 16.7	13.1 – 17.4	14.1-18.4	----	
		M2	13.9 – 18.2	13.9 – 18.2	14.9 – 19.2	15.7 – 20.0	16.7-21.0	----	----
		M3	16.5 – 20.8	16.5 – 20.8	17.5 – 21.8	18.3 – 22.6	19.3-23.	----	----

Table 9 - V-Drive Center Distances

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimensions "A"						
			56T / A=.78	140T / A=1.22	180T / A=1.37	210T / A=1.55	250T / A=1.56	280T	320T
TA2115H Reducer	A	M1	13.6 – 17.2	13.6 – 17.2	14.6 – 18.1	15.3 – 18.9	16.3 – 19.8	----	----
		M2	16.6 – 20.1	16.6 – 20.1	17.5 – 21.1	18.3 – 21.9	19.2 – 22.8	----	----
		M3	19.5 – 23.1	19.5 – 23.1	20.5 – 24.1	21.2 – 24.9	22.2 – 25.9	----	----
		M4	22.5 – 26.2	22.5 – 26.2	23.5 – 27.1	24.2 – 27.9	25.2 – 28.9	----	----
	B	M1	18.5 – 22.2	18.5 – 22.2	19.5 – 23.2	20.3 – 24.0	21.3 – 25.0	----	----
		M2	21.6 – 25.3	21.6 – 25.3	22.6 – 26.3	23.3 – 27.0	24.3 – 28.0	----	----
		M3	24.6 – 28.3	24.6 – 28.3	25.6 – 29.3	26.4 – 30.1	27.4 – 31.1	----	----
	C	M1	13.6 – 17.2	13.6 – 17.2	14.6 – 18.1	15.3 – 18.9	16.3 – 19.8	----	----
		M2	16.6 – 20.1	16.6 – 20.1	17.5 – 21.1	18.3 – 21.9	19.2 – 22.8	----	----
		M3	19.5 – 23.1	19.5 – 23.1	20.5 – 24.1	21.2 – 24.9	22.2 – 25.9	----	----
		M4	22.5 – 26.2	22.5 – 26.2	23.5 – 27.1	24.2 – 27.9	25.2 – 28.9	----	----
	D	M1	10.4 – 14.1	10.4 – 14.1	11.4 – 15.1	12.2 – 15.9	13.2 – 16.9	----	----
		M2	13.5 – 17.2	13.5 – 17.2	14.5 – 18.2	15.3 – 19.0	16.3 – 20.0	----	----
		M3	16.6 – 20.3	16.6 – 20.3	17.6 – 21.3	18.3 – 22.0	22.0 – 23.0	----	----

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			140T / A=1.22	180T / A=1.37	210T / A=1.55	250T / A=1.56	280T / A=1.16	320T	360T
TA3203H Reducer	A	M1	14.6 – 18.4	15.5 – 19.4	16.2 – 20.1	17.2 – 21.1	17.9 – 21.8	----	----
		M2	17.9 – 21.8	18.9 – 22.8	19.6 – 23.5	20.5 – 24.5	21.3 – 25.2	----	----
		M3	21.2 – 25.2	22.2 – 26.2	22.9 – 26.9	23.9 – 27.9	24.7 – 28.6	----	----
		M4	24.6 – 28.6	25.6 – 29.6	26.3 – 30.3	27.3 – 31.3	28.1 – 32.1	----	----
	B	M1	19.8 – 23.9	20.8 – 24.9	21.6 – 25.6	22.6 – 26.6	23.3 – 27.4	----	----
		M2	23.3 – 27.3	24.3 – 28.3	25.0 – 29.1	26.0 – 30.1	26.8 – 30.8	----	----
		M3	26.7 – 30.8	27.7 – 31.8	28.5 – 32.5	29.5 – 33.5	30.2 – 34.3	----	----
	C	M1	13.6 – 17.4	14.5 – 18.4	15.2 – 19.1	16.2 – 20.1	16.9 – 20.8	----	----
		M2	16.9 – 20.8	17.8 – 21.7	18.6 – 22.5	19.5 – 23.5	20.2 – 24.2	----	----
		M3	20.2 – 24.2	21.2 – 25.1	21.9 – 25.9	22.9 – 26.9	23.6 – 27.6	----	----
		M4	23.6 – 27.6	24.6 – 28.5	25.3 – 29.3	26.3 – 30.3	27.0 – 31.0	----	----
	D	M1	10.2 – 14.2	11.2 – 15.2	11.9 – 16.0	12.9 – 17.0	13.7 – 17.7	----	----
		M2	13.6 – 17.7	14.6 – 18.7	15.4 – 19.4	16.4 – 20.4	17.1 – 21.2	----	----
		M3	17.1 – 21.1	18.1 – 22.1	18.8 – 22.9	19.8 – 23.9	20.6 – 24.6	----	----

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			140T / A=1.22	180T / A=1.37	210T / A=1.55	250T / A=1.56	280T / A=1.16	320T / A=.38	360T
TA4207H Reducer	A	M1	17.3 – 21.1	18.3 – 22.1	19.0 – 22.8	19.9 – 23.8	20.6 – 24.5	21.6 – 25.5	----
		M2	21.2 – 25.1	22.2 – 26.1	22.9 – 26.8	23.9 – 27.8	24.6 – 28.6	25.6 – 29.5	----
		M3	25.2 – 29.2	26.2 – 30.2	26.9 – 30.9	27.9 – 31.9	28.7 – 32.6	29.6 – 33.6	----
		M4	29.3 – 33.2	30.2 – 34.2	31.0 – 34.9	32.0 – 35.9	32.7 – 36.7	33.7 – 37.7	----
	B	M1	22.6 – 26.7	23.6 – 27.7	24.4 – 28.4	25.4 – 29.4	26.1 – 30.2	27.1 – 31.2	----
		M2	26.8 – 30.8	27.8 – 31.8	28.5 – 32.5	29.5 – 33.5	30.3 – 34.3	31.3 – 35.3	----
		M3	30.9 – 34.9	31.9 – 35.9	32.6 – 36.7	33.6 – 37.7	34.4 – 38.4	35.4 – 39.4	----
	C	M1	15.4 – 19.2	16.3 – 20.1	17.0 – 20.8	18.0 – 21.8	18.7 – 22.5	19.6 – 23.5	----
		M2	19.3 – 23.1	20.2 – 24.1	20.9 – 24.8	21.9 – 25.8	22.6 – 26.5	23.6 – 27.5	----
		M3	23.2 – 27.2	24.2 – 28.1	24.9 – 28.9	25.9 – 29.9	26.6 – 30.6	27.6 – 31.6	----
		M4	27.3 – 31.2	28.2 – 32.2	29.0 – 32.9	29.9 – 33.9	30.7 – 34.6	31.7 – 35.6	----
	D	M1	12.2 – 16.2	13.2 – 17.2	14.0 – 18.0	15.0 – 19.0	15.7 – 19.7	16.7 – 20.7	----
		M2	16.3 – 20.4	17.3 – 21.4	18.1 – 22.1	19.1 – 23.1	19.8 – 23.9	20.8 – 24.9	----
		M3	20.4 – 24.5	21.4 – 25.5	22.2 – 26.2	23.2 – 27.2	23.9 – 28.0	24.9 – 29.0	----

Table 9 - V-Drive Center Distances

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			180T / A=1.37	210T / A=1.55	250T / A=1.56	280T / A=1.16	320T / A=.38	360T / A=1.01	400T
TA5215H Reducer	A	M1	19.5 – 23.4	20.2 – 24.1	21.1 – 25.1	21.8 – 25.8	22.8 – 26.8	23.8 – 27.8	----
		M2	24.2 – 28.3	25.0 – 29.0	25.9 – 30.0	26.7 – 30.7	27.6 – 31.7	28.6 – 32.7	----
		M3	29.1 – 33.2	29.8 – 33.9	30.8 – 34.9	31.5 – 35.6	32.5 – 36.6	33.5 – 37.6	----
		M4	34.0 – 38.1	34.7 – 38.8	35.7 – 39.8	36.5 – 40.6	37.4 – 41.5	38.4 – 42.5	----
	B	M1	26.2 – 30.3	26.9 – 31.1	27.9 – 32.1	28.7 – 32.8	29.7 – 33.8	30.7 – 34.8	----
		M2	31.2 – 35.3	31.9 – 36.1	32.9 – 37.1	33.7 – 37.8	34.7 – 38.8	35.7 – 39.8	----
		M3	36.2 – 40.3	36.9 – 41.1	37.9 – 42.1	38.7 – 42.8	39.7 – 43.8	40.7 – 44.8	----
	C	M1	16.4 – 20.3	17.1 – 21.0	18.0 – 21.9	18.7 – 22.6	19.7 – 23.6	20.6 – 24.6	----
		M2	21.1 – 25.1	21.8 – 25.8	22.8 – 26.8	23.5 – 27.5	24.4 – 28.5	25.4 – 29.4	----
		M3	25.9 – 29.9	26.6 – 30.7	27.6 – 31.6	28.3 – 32.4	29.3 – 33.4	30.3 – 34.3	----
		M4	30.8 – 34.8	31.5 – 35.6	32.5 – 36.6	32.2 – 37.3	34.2 – 38.3	35.2 – 39.3	----
	D	M1	17.7 – 21.8	18.4 – 22.6	19.4 – 23.6	20.2 – 24.3	21.2 – 25.3	22.2 – 26.3	----
		M2	22.7 – 26.8	23.4 – 27.6	24.4 – 28.6	25.2 – 29.3	26.2 – 30.3	27.2 – 31.3	----
		M3	N/A	N/A	N/A	N/A	N/A	N/A	----

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			180T / A=1.37	210T / A=1.55	250T / A=1.56	280T / A=1.16	320T / A=.38	360T / A=1.01	400T / A=.75
TA6307H Reducer	A	M1	21.2 – 25.0	21.9 – 25.8	22.9 – 26.7	23.6 – 27.4	24.5 – 28.4	25.5 – 29.4	26.5 – 30.4
		M2	26.2 – 30.1	26.9 – 30.8	27.9 – 31.8	28.6 – 32.5	29.6 – 33.5	30.5 – 34.5	31.5 – 35.4
		M3	31.2 – 35.1	32.0 – 35.9	32.9 – 36.9	33.7 – 37.6	34.6 – 38.6	35.6 – 39.6	36.6 – 40.6
		M4	36.3 – 40.3	37.0 – 41.0	38.0 – 42.0	38.8 – 42.7	39.7 – 43.7	40.7 – 44.7	41.7 – 45.7
	B	M1	27.5 – 31.5	28.2 – 32.3	29.2 – 33.3	30.0 – 34.0	31.0 – 35.0	32.0 – 36.0	33.0 – 37.0
		M2	32.7 – 36.7	33.4 – 37.5	34.4 – 38.5	35.2 – 39.2	36.2 – 40.2	37.2 – 41.2	38.2 – 42.2
		M3	37.9 – 41.9	38.6 – 42.7	39.6 – 43.7	40.4 – 44.4	41.4 – 45.4	42.4 – 46.4	43.4 – 47.4
	C	M1	17.9 – 21.6	18.6 – 22.3	19.5 – 23.3	20.2 – 24.0	21.1 – 25.0	22.1 – 25.9	23.0 – 26.9
		M2	22.8 – 26.6	23.5 – 27.3	24.4 – 28.3	25.2 – 29.0	26.1 – 30.0	27.1 – 31.0	28.0 – 32.0
		M3	27.8 – 31.7	28.5 – 32.4	29.5 – 33.4	30.2 – 34.1	31.2 – 35.1	32.1 – 36.1	33.1 – 37.1
		M4	32.8 – 36.8	33.5 – 37.5	34.5 – 38.5	35.3 – 39.2	36.2 – 40.2	37.2 – 41.2	38.2 – 42.2
	D	M1	14.4 – 18.4	15.2 – 19.2	16.1 – 20.2	16.9 – 20.9	17.9 – 21.9	18.9 – 22.9	19.9 – 23.9
		M2	19.6 – 23.6	20.3 – 24.3	21.3 – 25.3	22.1 – 26.1	23.1 – 27.1	24.1 – 28.1	25.1 – 29.1
		M3	24.8 – 28.8	25.5 – 29.5	26.5 – 30.5	27.3 – 31.3	28.3 – 32.3	29.3 – 33.3	30.2 – 34.3

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			210T / A=1.55	250T / A=1.56	280T / A=1.16	320T / A=.38	360T / A=1.01	400T / A=.75	440T
TA7315H Reducer	A	M1	27.4 – 31.4	28.4 – 32.4	29.1 – 33.1	30.1 – 34.1	31.1 – 35.1	32.1 – 36.1	----
		M2	33.3 – 37.3	34.3 – 38.3	35.0 – 39.0	36.0 – 40.0	37.0 – 41.0	38.0 – 42.0	----
		M3	39.2 – 43.2	40.2 – 44.2	41.0 – 45.0	42.0 – 46.0	43.0 – 47.0	44.0 – 48.0	----
		M4	45.2 – 49.2	46.2 – 50.2	46.9 – 50.9	47.9 – 51.9	48.9 – 52.9	49.9 – 53.9	----
	B	M1	30.0 – 34.0	31.0 – 35.0	31.8 – 35.7	32.8 – 36.7	33.7 – 37.7	34.7 – 38.7	----
		M2	36.0 – 40.0	37.0 – 40.9	37.7 – 41.7	38.7 – 42.7	39.7 – 43.7	40.7 – 44.7	----
		M3	41.9 – 45.9	42.9 – 46.9	43.6 – 47.6	44.6 – 48.6	45.6 – 49.6	46.6 – 50.6	----
	C	M1	17.4 – 21.3	18.4 – 22.4	19.1 – 23.0	20.0 – 23.9	21.0 – 24.9	22.0 – 25.9	----
		M2	23.2 – 27.1	24.2 – 28.1	24.9 – 28.8	25.9 – 29.8	26.9 – 30.8	27.8 – 31.8	----
		M3	29.1 – 33.0	30.0 – 34.0	30.8 – 34.7	31.8 – 35.7	32.8 – 36.7	33.7 – 37.7	----
		M4	35.0 – 39.0	36.0 – 39.9	36.7 – 40.7	37.7 – 41.7	38.7 – 42.7	39.7 – 43.7	----
	D	M1	20.5 – 24.4	21.5 – 25.4	22.2 – 26.1	23.2 – 27.1	24.2 – 28.1	25.1 – 29.1	----
		M2	26.4 – 30.3	27.4 – 31.3	28.1 – 32.0	29.1 – 33.0	30.1 – 34.0	31.0 – 35.0	----
		M3	32.3 – 36.3	33.3 – 37.2	34.0 – 38.0	35.0 – 39.0	36.0 – 40.0	37.0 – 41.0	----

Table 9 - V-Drive Center Distances

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			210T / A=1.55	250T / A=1.56	280T / A=1.16	320T / A=.38	360T / A=1.01	400T / A=.75	440T
TA8407H Reducer	A	M1	27.4 – 31.3	28.3 – 32.3	29.1 – 33.0	30.1 – 34.0	31.0 – 35.0	32.0 – 36.0	----
		M2	33.2 – 37.2	34.2 – 38.2	35.0 – 39.0	36.0 – 39.9	37.0 – 40.9	37.9 – 41.9	----
		M3	39.2 – 43.2	40.2 – 44.2	40.9 – 44.9	41.9 – 45.9	42.9 – 46.9	43.9 – 47.9	----
		M4	45.1 – 49.1	46.1 – 50.1	46.9 – 50.9	47.9 – 51.9	48.8 – 52.8	49.8 – 53.8	----
	B	M1	30.2 – 34.2	31.2 – 35.2	32.0 – 35.9	32.9 – 36.9	33.9 – 37.9	34.9 – 38.9	
		M2	36.2 – 40.1	37.1 – 41.1	37.9 – 41.9	38.9 – 42.9	39.9 – 43.9	40.9 – 44.9	----
		M3	42.1 – 46.1	43.1 – 47.1	43.8 – 47.8	44.8 – 48.8	45.8 – 49.8	46.8 – 50.8	----
	C	M1	17.6 – 21.4	18.5 – 22.4	19.2 – 23.1	20.2 – 24.1	21.2 – 25.1	22.1 – 26.0	----
		M2	23.3 – 27.3	24.3 – 28.2	25.0 – 29.0	26.0 – 30.0	27.0 – 30.9	28.0 – 31.9	----
		M3	29.2 – 33.2	30.2 – 34.1	30.9 – 34.9	31.9 – 35.9	32.9 – 36.9	33.9 – 37.8	----
		M4	35.1 – 39.1	36.1 – 40.1	36.8 – 40.8	37.8 – 41.8	38.8 – 42.8	39.8 – 43.8	----
	D	M1	20.3 – 24.2	21.3 – 25.2	22.0 – 25.9	23.0 – 26.9	23.9 – 27.9	24.9 – 28.9	----
		M2	26.1 – 30.1	27.1 – 31.1	27.9 – 31.8	28.8 – 32.8	29.8 – 33.8	30.8 – 34.8	----
		M3	32.1 – 36.0	33.0 – 37.0	33.8 – 37.8	34.8 – 38.8	35.8 – 39.7	36.7 – 40.7	----

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			250T / A=1.56	280T / A=1.16	320T / A=.38	360T / A=1.01	400T / A=.75	440T / A=1.62	440T
TA9415H Reducer	A	M1	N/A	N/A	N/A	N/A	N/A	N/A	----
		M2	N/A	N/A	N/A	N/A	N/A	N/A	----
		M3	N/A	N/A	N/A	N/A	N/A	N/A	----
		M4	N/A	N/A	N/A	N/A	N/A	N/A	----
	B	M1	35.5 – 39.2	36.2 – 40.0	37.2 – 41.0	38.2 – 42.0	39.2 – 43.0	40.2 – 44.0	----
		M2	40.5 – 44.2	41.2 – 45.0	42.2 – 46.0	43.2 – 47.0	44.2 – 47.9	45.2 – 48.9	----
		M3	N/A	N/A	N/A	N/A	N/A	N/A	----
	C	M1	N/A	N/A	N/A	N/A	N/A	N/A	----
		M2	N/A	N/A	N/A	N/A	N/A	N/A	----
		M3	N/A	N/A	N/A	N/A	N/A	N/A	----
		M4	N/A	N/A	N/A	N/A	N/A	N/A	----
	D	M1	21.3 – 25.0	22.0 – 25.7	23.0 – 26.7	24.0 – 27.7	25.0 – 28.7	25.9 – 29.7	----
		M2	26.2 – 29.9	26.9 – 30.6	27.9 – 31.6	28.9 – 32.6	29.9 – 33.6	30.9 – 34.6	----
		M3	N/A	N/A	N/A	N/A	N/A	N/A	----

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			250T / A=1.56	280T / A=1.16	320T / A=.38	360T / A=1.01	400T / A=.75	440T / A=1.62	
TA10507H Reducer	A	M1	N/A	N/A	N/A	N/A	N/A	N/A	
		M2	N/A	N/A	N/A	N/A	N/A	N/A	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	
		M4	N/A	N/A	N/A	N/A	N/A	N/A	
	B	M1	46.7 – 50.5	47.5 – 51.2	48.5 – 52.2	49.5 – 53.2	50.5 – 54.2	51.5 – 55.2	
		M2	52.1 – 55.9	52.8 – 56.6	53.8 – 57.6	54.8 – 58.6	55.8 – 59.6	56.8 – 60.6	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	
	C	M1	N/A	N/A	N/A	N/A	N/A	N/A	
		M2	N/A	N/A	N/A	N/A	N/A	N/A	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	
		M4	N/A	N/A	N/A	N/A	N/A	N/A	
	D	M1	17.7 – 21.4	18.4 – 22.2	19.4 – 23.2	20.4 – 24.2	21.4 – 25.2	22.4 – 26.2	
		M2	23.0 – 26.8	23.8 – 27.5	24.8 – 28.5	25.8 –29.5	26.8 – 30.5	27.8 – 31.5	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	

Table 9 - V-Drive Center Distances

	Position	Mounting.	Motor Frame / Motor Shaft Offset Dimension "A"						
			250T / A=1.56	280T / A=1.16	320T / A=.38	360T / A=1.01	400T / A=.75	440T / A=1.62	
TA12608H Reducer	A	M1	N/A	N/A	N/A	N/A	N/A	N/A	
		M2	N/A	N/A	N/A	N/A	N/A	N/A	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	
		M4	N/A	N/A	N/A	N/A	N/A	N/A	
	B	M1	48.9 – 52.7	49.7 – 53.5	50.7 – 54.5	51.7 – 55.5	52.7 – 56.5	53.7 – 57.5	
		M2	54.5 – 58.3	55.3 – 59.1	56.3 – 60.1	57.3 – 61.1	58.3 – 62.1	59.3 – 63.1	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	
	C	M1	N/A	N/A	N/A	N/A	N/A	N/A	
		M2	N/A	N/A	N/A	N/A	N/A	N/A	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	
		M4	N/A	N/A	N/A	N/A	N/A	N/A	
	D	M1	22.0 – 25.8	22.8 – 26.6	23.8 – 27.6	24.8 – 28.6	25.8 – 29.6	26.8 – 30.6	
		M2	N/A	N/A	N/A	N/A	N/A	N/A	
		M3	N/A	N/A	N/A	N/A	N/A	N/A	

TORQUE-ARM II BELT GUARD INSTALLATION

Two different belt guards are available for the Torque-Arm II speed reducer. One belt guard assembly is designed for mounting in position "B" and the other belt guard assembly is designed for mounting in position "C" as shown in Figure 14. It is important that the mounting position of the Torque-Arm II motor mount be determined prior to purchase of the belt guard as these two guards do not interchange and will be attached to the motor mount uprights.

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

WARNING: Ensure that all guards are properly installed before proceeding. Exercise extreme care to avoid contacting rotating parts. Failure to observe these precautions could result in bodily injury.

Vertical Installation (Position B):

1. Move belt guard and hardware from box and verify all parts are available. The belt guard assembly consists of one back cover, one front cover, two brackets, and necessary hardware.
2. Using the hardware provided, assemble the two brackets to the back cover as shown in Figure 16. Note that the brackets are mounted so that the angles of the brackets are mounted to the inside. Do not fully tighten these bolts.
3. Position back cover over the motor shaft and reducer input shaft. The long slot in the back cover fits over the motor shaft.
4. Align the back cover assembly to the Torque-Arm II motor mount and attach using four cap screws, washers, and nuts. Securely tighten the brackets to the motor mount and back cover.
5. Install motor and reducer sheaves. Install belts and adjust accordingly.
6. Position and install the front cover onto the back cover. **Note: The front cover is designed with an extended lip at the top of the cover and installs over the top of the back cover.**
7. Secure the front cover with four cap screws and washers.
8. Check machine for proper operation.

Horizontal Installation (Position C):

1. Remove belt guard and hardware from box and verify all parts are available. The belt guard assembly consists of one back cover, one front cover, two brackets, and necessary hardware.
2. Using the hardware provided, assemble the two brackets to the back cover as shown in Figure 17. Note that the brackets are mounted so that the angles of the brackets are mounted in the same direction. Do not fully tighten these bolts.
3. Position back cover over the motor shaft and reducer input shaft. The long slot in the back cover fits over the motor shaft.
4. Align the back cover assembly to the Torque-Arm II motor mount and attach using four cap screws, washers, and nuts. Securely tighten the brackets to the motor mount and back cover.
5. Install motor and reducer sheaves. Install belts and adjust accordingly.
6. Position and install the front cover onto the back cover. **Note: The front cover is designed with an extended lip at the top of the cover and installs over the top of the back cover. Close cover and secure with two cap screws and washers.**
1. Secure the front cover with four cap screws and washers.
2. Check machine for proper operation.

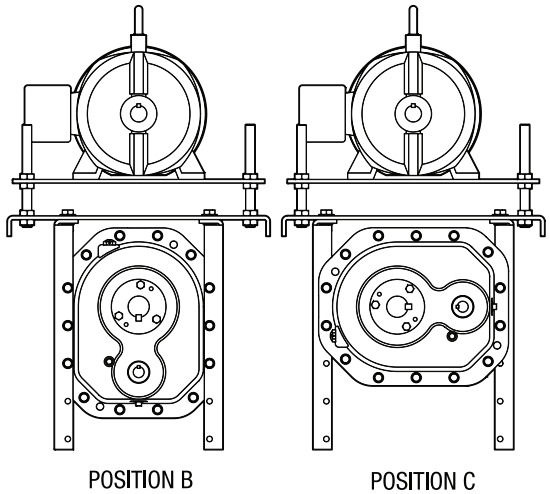


Figure 15 – Belt Guard Mounting Positions

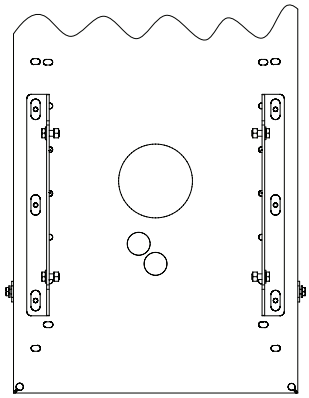


Figure 16 - Mounting Brackets in Position B

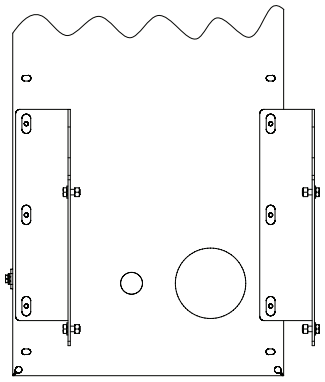


Figure 17 – Mounting Brackets in Position C

SCREW CONVEYOR ADAPTER ASSEMBLY

1. Install seals (408) into adapter housing as shown in Figure 18. If the optional packing adapter is to be used, install only one seal in the small end of the adapter. Use extreme care when installing seals to avoid damage to the seals. Press or tap seals into place by applying pressure only on the outer edge of the seal. Make sure seals are install evenly and are not tilted.
2. If using the optional packing adapter, install the two studs (413), retaining ring (412), and two nuts (414). Thread the nuts onto the studs about 4-5 threads. Install the three braided type seals (415) in a circular direction into the adapter cavity. Shoulder the braided seals against the adjustable retaining ring (412). To aid in installation of the driveshaft in step 7, the braided seals can be flattened out slightly with a soft hammer prior to installation. When installing the braided seals offset the joints from each other.
3. Lightly tap the large washer (407) into the counterbore on the large end of the adapter to seal the braided material installed in Step 2 or the seal installed in Step 1.
4. Place reducer on blocks so that it lays flat with the input shaft down.
5. Position screw conveyor adapter (400) on the reducer output hub so that the small end (end with four drilled holes) rests on reducer. The approximate 1/8” piloting projection should locate in the output seal bore next to the auxiliary seal. Adapter projection should not touch the face of the gear case casting.
6. Place four adapter screws (409) and lock washers (410) through the adapter and thread into the reducer. Tighten the four cap screws (409) to the torque specified in Table 9.
7. Turn reducer onto its side. Use caution not to damage either type seals and install drive shaft through the adapter housing into the reducer. Line up the keyway in the drive shaft with the keyway in the reducer hub bore. Slide or gently tap key into reducer through the input shaft side of the output hub.
8. Install the retaining ring (411) into the screw conveyor wedge (402). Making sure the drive shaft is fully seated into the reducer, slide the wedge onto drive shaft.
9. Install keeper plate (401), drive shaft cap screw (404), and lockwasher (405). Torque to specifications in Table 12.

DRIVE SHAFT REMOVAL

To remove the driveshaft from the reducer the following steps are required.

1. Remove the drive shaft retaining bolt (404) and lock washer (405), the keeper plate (401), and the retaining ring (411).
2. Referring to Table 10, install the correct size hex head set screw into the end of the drive shaft until flush. Note TA6307H and TA7315H does not require a set screw.
3. Position the keeper plate (401) flush against the end of the drive shaft and with the small end facing out. Next install the retaining ring (411). When properly installed, the retaining ring holds the keeper plate (401) in place.
4. Screw removal bolt(s) into the keeper plate (401) and tighten until the drive shaft wedge (402) is dislodged. Once the drive shaft wedge (402) is dislodged, pull the assembly free from the reducer. If installed, remove the hex head set screw from the end of the drive shaft. The drive shaft can now be easily removed from the reducer by pulling the drive shaft straight out of the reducer.

Note: The removal bolt is not the same bolt as the retaining bolt. Refer to Table 10 for the correct bolt to be used for removal.

Table 10 – Removal Hardware

Reducer Size	Removal Bolt	Hex Head Set Screw
TA0107L	3/4-10 x 2	5/8-11 x 3/4
TA1107H	3/4-10 x 2	5/8-11 x 3/4
TA2115H	3/4-10 x 2	5/8-11 x 3/4
TA3203H	7/8-9 x 2	3/4-10 x 3/4
TA4207H	7/8-9 x 2	3/4-10 x 3/4
TA5215H	7/8-9 x 2	3/4-10 x 3/4
TA6307H	3/8-16 x 2 (4 required)	N/A
TA7315H	½-13 x 2 (4 required)	N/A

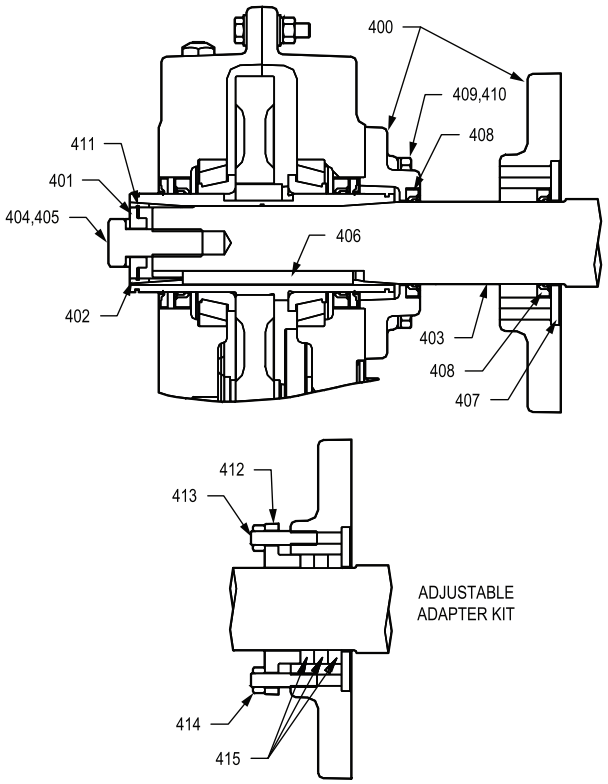


Figure 18 – Screw Conveyor Adapter Assembly

REPLACEMENT OF PARTS

NOTE: Using tools normally found in a maintenance department, a Dodge Torque-Arm II speed reducer can be disassembled and reassembled by careful attention to the instructions following.

Cleanliness is very important to prevent the introduction of dirt into the bearings and other parts of the reducer. A tank of clean solvent, an arbor press, and equipment for heating bearings and gears (for shrinking these parts on shafts) should be available.

The oil seals are contact lip seals. Considerable care should be used during disassembly and reassembly to avoid damage to the surface on which the seals rub.

The keyseat in the input shaft, as well as any sharp edges on the output hub should be covered with tape or paper before disassembly or reassembly. Also, be careful to remove any burrs or nicks on surfaces of the input shaft or output hub before disassembly or reassembly.

Ordering Parts: When ordering parts for reducer, specify reducer size number, reducer model number, part name, part number, and quantity.

It is strongly recommended that, when a pinion or gear is replaced, the mating pinion or gear is replaced also. If the large gear on the output hub must be replaced, it is recommended that an output hub assembly consisting of a gear assembled on a hub be ordered to ensure undamaged surfaces on the output hub where the output seals rub. However, if it is desired to use the old output hub, press the gear and bearing off and examine the rubbing surface under the oil seal carefully for possible scratching or other damage resulting from the pressing operation. To prevent oil leakage at the shaft oil seals, the smooth surface of the output hub must not be damaged.

If any parts must be pressed from a shaft or from the output hub, this should be done before ordering parts to make sure that none of the bearings or other parts are damaged in removal. Do not press against rollers or cage of any bearing.

Because old shaft oil seals may be damaged in disassembly, it is advisable to order replacements for these parts.

Removing Reducer from Shaft:

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

Taper Bushed:

1. Disconnect and remove belt guard, v-drive, and motor mount as required. Disconnect torque arm rod from reducer adapter.
2. Remove bushing screws.
3. Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the shaft. For ease of tightening screws, make sure screw threads and threaded holes in bushing flanges are clean. A tap can be used to clean out the threads. Use caution to use the proper size tap to prevent damage to the threads.
4. Remove the outside bushing, the reducer, and then the inboard bushing.

Disassembly:

1. Drain all oil from the reducer.
2. Position the reducer on its side and remove all housing bolts. Drive dowel pins from housing. Using the three pry slots around the periphery of the flange, gently separate the housing halves. Open housing evenly to prevent damage to the parts inside.
3. Lift input shaft, all gear assemblies, and bearing assemblies from housing.
4. Remove seals from housing.
5. Remove bearings from shafts and hubs. Be careful not to scratch or damage any assembly or seal area during bearing removal. The hub assembly can be disassembled for gear replacement but if scratching or grooving occurs on the hub, seal leakage will occur and the hub will need to be replaced.

Reassembly:

1. **Output Hub Assembly:** Heat gear to 325°F to 350°F to shrink onto hub. Heat bearings to 270°F to 290°F to shrink onto hub. Any injury to the hub surfaces where the oil seals rub will cause leakage, making it necessary to use a new hub.
2. **Countershaft Assembly:** Shaft and pinion are integral. Press gear and bearings on shaft. Press against inner race (not cage or rollers) of bearings.
3. **Input Shaft Assembly:** Shaft and pinion are integral. Press bearings on shaft. Press against inner race (not cage or rollers) of bearings.
4. Drive the two dowel pins into place in the right-hand housing half.
5. Place R.H. housing half on blocks to allow for protruding end of output hub.
6. Install bearing cups in right-hand housing half, making sure they are properly seated. The output hub assembly has one bearing pressed against the gear and the other bearing pressed against a shoulder on the hub. For double reduction reducers, install the output hub assembly so that the end where the bearing is pressed against the gear is up. For single reduction reducers, install the output hub assembly so that the end where the bearing is pressed against the gear is down.
7. Mesh output hub gear and small countershaft gear together and set in place in housing. Set input shaft assembly in place in the housing. Make sure bearing rollers (cones) are properly seated in their cups. Set bearing cups for left-hand housing half in place on their rollers.
8. Making sure both housing halves are clean, set left-hand housing half into position and tap with a soft hammer (rawhide, not lead hammer) until housing bolts can be used to draw housing halves together. Make sure reducer shafts do not bind while tightening housing bolts.
9. Rotate the input shaft and seat all bearings with a soft hammer. Using a magnetic base and indicator, measure and record the end play of the input shaft, countershaft, and output hub. Remove left housing half and shim behind the bearing cup as required to achieve the correct bearing end play or preload per Table 8. Repeat this process and check end play until proper end play is obtained. Note that the output shaft is preloaded. After end play is determined, add the correct shim thickness to the end play reading to obtain the correct preload.

10. Remove left housing half and clean housing flange surfaces on both halves, making sure not to nick or scratch flange face. Place a 1/8" bead of Dow RTV732 sealant or equivalent on flange face (make sure RTV is placed around bolt holes and inside of flange face). Place left housing half into position and tap with a soft hammer (rawhide, not lead hammer) until housing bolts can be used to draw housing halves together. Torque housing bolts per torque values listed in Table 12.
11. Install input seal, output seals, and auxiliary seals. Extreme care should be used when installing seals to avoid damage due to contact with sharp edges on the input shaft or output hub. The possibility of damage and consequent oil leakage can be decreased by covering all sharp edges with tape prior to seal installation. Lightly coat the seal lips with Mobilith AW2 All-Purpose grease or equivalent. Seals should be pressed or tapped with a soft hammer evenly into place in the reducer housing, applying pressure only on the outer edge of the seals. A slight oil leakage at the seals may be evident during initial running, but should disappear unless seals have been damaged.
12. Install bushing backup plates and snap rings on Taper Bushed reducers or hub collars on straight bore reducers.

Table 11 - Bearing Adjustment Tolerances

Reducer Size	Bearing Endplay Values		
	Input	Countershaft	Output
TA0107L	.002-.004 Loose	.0005-.003 Loose	.002-.004 Preload
TA1107H	.002-.004 Loose	.0005-.003 Loose	.002-.004 Preload
TA2115H	.002-.004 Loose	.0005-.003 Loose	.002-.004 Preload
TA3203H	.002-.004 Loose	.0005-.003 Loose	.002-.004 Preload
TA4207H	.002-.004 Loose	.0005-.003 Loose	.002-.004 Preload
TA5215H	.002-.004 Loose	.0005-.003 Loose	.003-.005 Preload
TA6307H	.002-.004 Loose	.0005-.003 Loose	.006-.008 Preload
TA7315H	.002-.004 Loose	.0005-.003 Loose	.006-.008 Preload
TA8407H	.002-.004 Loose	.0005-.003 Loose	.004-.006 Preload
TA9415H	.002-.004 Loose	.0005-.003 Loose	.004-.006 Preload
TA10507H	.002-.004 Loose	.0005-.003 Loose	.006-.008 Preload
TA12608H	.002-.004 Loose	.0005-.003 Loose	.006-.008 Preload

Table 12 - Recommended Bolt Torque Values

Housing Bolt Recommended Torque Values		
Reducer Size	Fastener Size	Torque in Ft..-Lbs.
TA0107L	5/16-18	17 – 15
TA1107H	5/16-18	17 – 15
TA2115H	3/8-16	30 – 27
TA3203H	3/8-16	30 – 27
TA4207H	1/2-13	75 – 70
TA5215H	1/2-13	75 – 70
TA6307H	1/2-13	75 – 70
TA7315H	5/8-11	90 – 82
TA8407H	5/8-11	90 – 82
TA9415H	5/8-11	90 – 82
TA10507H	¾-10	148 – 138
TA12608H	¾-10	148 – 138

Table 12 - Recommended Bolt Torque Values

Backstop Cover Bolt Recommended Torque Values		
Reducer Size	Fastener Size	Torque in Ft.-Lbs.
TA0107L	1/4-20	8 – 7
TA1107H	1/4-20	8 – 7
TA2115H	1/4-20	8 – 7
TA3203H	1/4-20	8 – 7
TA4207H	1/4-20	8 – 7
TA5215H	5/16-18	17 – 15
TA6307H	5/16-18	17 – 15
TA7315H	3/8-16	30 – 27
TA8407H	5/16-18	17 – 15
TA9415H	3/8-16	30 – 27
TA10507H	3/8-16	30 – 27
TA12608H	3/8-16	30 – 27
Screw Conveyor Adapter Bolt Recommended Torque Values		
Reducer Size	Fastener Size	Torque in Ft.-Lbs.
TA0107L	3/8-16	30 – 27
TA1107H	3/8-16	30 – 27
TA2115H	7/16-14	50 – 45
TA3203H	1/2-13	75 – 70
TA4207H	1/2-13	75 – 70
TA5215H	5/8-11	90 – 82
TA6307H	¾-10	148 – 138
TA7315H	¾-10	148 – 138
Screw Conveyor Drive Shaft Retainer Bolt Recommended Torque Values		
Reducer Size	Fastener Size	Torque in Ft.-Lbs.
TA0107L	5/8-11	90 – 82
TA1107H	5/8-11	90 – 82
TA2115H	5/8-11	90 – 82
TA3203H	3/4-10	148 – 138
TA4207H	3/4-10	148 – 138
TA5215H	3/4-10	148 – 138
TA6307H	1-8	210 –190
TA7315H	1-8	210 – 190

Table 13 – Part Numbers for Replacement Bearings, Single and Double Reduction Reducers

Reducer Size	Output Hub Bearing – LH and RH Sides Part Number
TA0107L	900250/900251
TA1107H	901250/901251
TA2115H	403003/402003
TA3203H	903252/402268
TA4207H	403016/402193
TA5215H	403140/402050
TA6307H	906250/906251
TA7315H	403105/402147
TA8407H	403105/402147
TA9415H	403110/402160
TA10507H	910250/910251
TA12608H	912250/912251
Reducer Size	**Countershaft Bearing – LH Side Part Number**
TA0107L	304833/304740
TA1107H	403165/402265
TA2115H	304836/411626-05-B
TA3203H	403101/402271
TA4207H	304809/304710
TA5215H	403005/402001
TA6307H	403026/906257
TA7315H	403159/907260
TA8407H	411626-06-BE/411626-05-BM
TA9415H	403036/304701
TA10507H	403087/402023
TA12608H	402233/912253

Table 13 – Part Numbers for Replacement Bearings, Single and Double Reduction Reducers

Reducer Size	Countershaft Bearing – Backstop (RH) Side Part Number
TA0107L	304833/304740
TA1107H	403165/402265
TA2115H	304836/411626-05-B
TA3203H	403101/402271
TA4207H	304809/304710
TA5215H	403005/402001
TA6307H	403026/906257
TA7315H	403159/907260
TA8407H	411626-06-BE/908253
TA9415H	403036/304701
TA10507H	403087/402023
TA12608H	402233/912253

Note:
LH is input side of reducer, and RH is backstop or output side of reducer. Bearing part numbers refer to Cup/Cone combinations, respectively, and apply to all ratios unless otherwise specified. For actual reducer ratios, refer to Table 12.

Table 13 – Part Numbers for Replacement Bearings, Single and Double Reduction Reducers (Continued.)

Reducer Size	Ratio	Input Shaft Bearing – LH Side Part Number
TA0107L	5:1	403166/402284
	9:1	
	15:1	
	25:1	
	40:1	
TA1107H	5:1	402169/402294
	9:1	
	15:1	
	25:1	
	40:1	
TA2115H	5:1	403094/304753
	9:1	
	15:1	
	25:1	
	40:1	403094/304707
TA3203H	5:1	304809/411626-05-K
	9:1	
	15:1	
	25:1	
	40:1	403101/402271
TA4207H	5:1	304809/411626-05-K
	9:1	
	15:1	
	25:1	
	40:1	
TA5215H	5:1	403005/402001
	9:1	
	15:1	
	25:1	403005/304717
	40:1	

Table 13 – Part Numbers for Replacement Bearings, Single and Double Reduction Reducers (Continued.)

Reducer Size	Ratio	Input Shaft Bearing – LH Side Part Number
TA6307H	5:1	403026/906260
	9:1	
	15:1	
	25:1	
	40:1	
TA7315H	5:1	304802/402041
	9:1	
	15:1	
	25:1	
	40:1	
TA8407H	15:1	908259/908260
	25:1	
	40:1	
TA9415H	15:1	403036/304701
	25:1	
	40:1	
TA10507H	15:1	402231/402232
	25:1	
	40:1	
TA12608H	15:1	402231/402232
	25:1	
	40:1	
TA0107L	5:1	403165/402265
	9:1	
	15:1	
	25:1	
	40:1	
TA1107H	5:1	403063/402108
	9:1	
	15:1	
	25:1	
	40:1	403094/304753
TA2115H	5:1	403094/304707
	9:1	
	15:1	
	25:1	403094/304707
	40:1	304809/411626-05-K
TA3203H	5:1	403101/402271
	9:1	
	15:1	
	25:1	403101/402271
	40:1	304809/411626-05-K
TA4207H	5:1	904256/904257
	9:1	
	15:1	
	25:1	
	40:1	904256/904258
TA5215H	5:1	403005/402001
	9:1	
	15:1	
	25:1	403005/304717
	40:1	403005/411626-05-V

Table 13 – Part Numbers for Replacement Bearings, Single and Double Reduction Reducers (Continued.)

Reducer Size	Ratio	Input Shaft Bearing – LH Side Part Number
TA6307H	5:1	403026/906260
	9:1	
	15:1	
	25:1	403026/906257
	40:1	
TA7315H	5:1	403159/907260
	9:1	
	15:1	
	25:1	
	40:1	403159/402054
TA8407H	15:1	908256/908257
	25:1	
	40:1	304804/908258
TA9415H	15:1	411626-06-BE/411626-05-BM
	25:1	
	40:1	304804/908258
TA10507H	15:1	411626-06-BE/411626-05-BM
	25:1	
	40:1	304804/908258
TA12608H	15:1	403036/304701
	25:1	
	40:1	403036/912258

Table 14 – Replacement Parts Kit Numbers

Reducer Size	Ratio	Seal Kit ①	Output Hub Assembly ②	Countershaft Assembly ③	Bearing Kit ④	Shim Kit
TA0107L	5:1	900126	900120	---	900128	900180
	9:1			900122	900129	
	15:1			900123		
	25:1			900124		
	40:1			900125		
TA1107H	5:1	901126	901120	---	901128	901180
	9:1			901122	901129	
	15:1			901123		
	25:1			901124		
	40:1			901125		
TA2115H	5:1	902126	902120	---	902128	902180
	9:1			902122	902129	
	15:1			902123		
	25:1			902124		
	40:1	902127		901125	902130	
TA3203H	5:1	903126	903120	---	903128	903180
	9:1			903122	903129	
	15:1			903123		
	25:1			903124		
	40:1	903127		903125	903130	
TA4207H	5:1	904126	904120	---	904128	904180
	9:1			904122	904129	
	15:1			904123		
	25:1			904124		
	40:1			904125	904130	

Table 14 – Replacement Parts Kit Numbers

Reducer Size	Ratio	Seal Kit ①	Output Hub Assembly ②	Countershaft Assembly ③	Bearing Kit ④	Shim Kit
TA5215H	5:1	905126	905120	---	905128	905180
	9:1			905122	905129	
	15:1			905123		
	25:1			905124	905130	
	40:1			905125	905131	
TA6307H	5:1	906126	906120	---	906128	906180
	9:1			906122	906129	
	15:1			906123		
	25:1			906124	906130	
	40:1			906125		
TA7315H	5:1	907126	907120	---	907128	907180
	9:1			907122	907129	
	15:1			907123		
	25:1			907124		
	40:1			907125	907130	
TA8407H	15:1	908126	908120	908123	908129	908180
	25:1			908124		
	40:1			908125	908130	
TA9415H	15:1	909126	909120	909123	909129	909180
	25:1			909124		
	40:1			909125	909130	
TA10507H	15:1	910126	910120	910123	910129	910180
	25:1			910124		
	40:1			910125	910130	
TA12608H	15:1	912126	912120	912123	912129	912180
	25:1			912124		
	40:1			919125	912130	

① Seal Kit consists of Input Seal, Output Seals, and Backstop Cover Gasket② Output Hub Assembly consists of Output Hub, Output Gear and Gear Key.

③ Countershaft Assembly consists of Countershaft Pinion, Countershaft Gear and Gear Key.

④ Bearing Kit consists of LH and RH Output Bearing Cup/Cone, LH and RH Countershaft Bearing Cup/Cone (double reduction only) and LH and RH Input Bearing Cup/Cone.

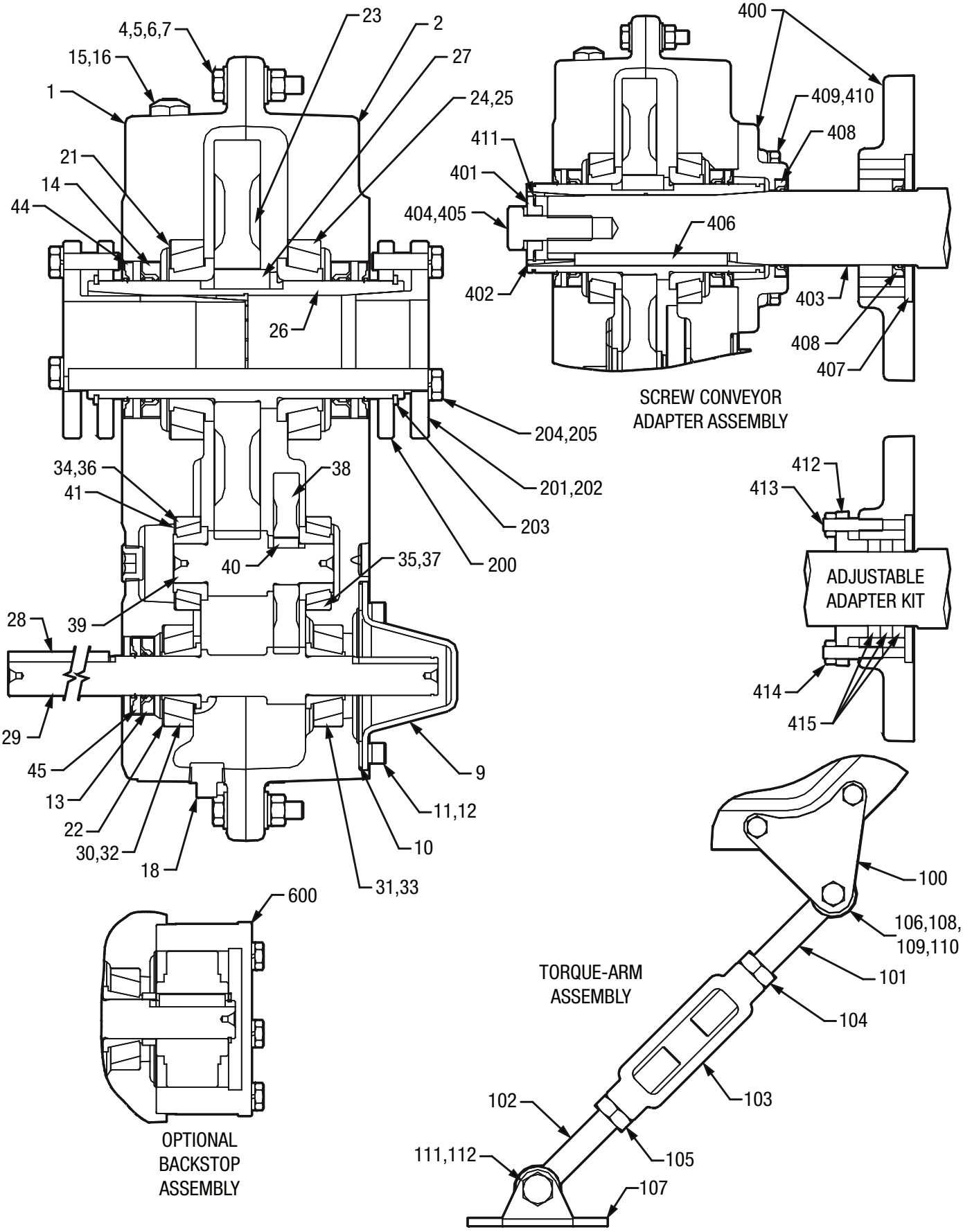


Figure 19 - Parts for TA0107L through TA12608H Taper Bushed Double Reduction Reducers

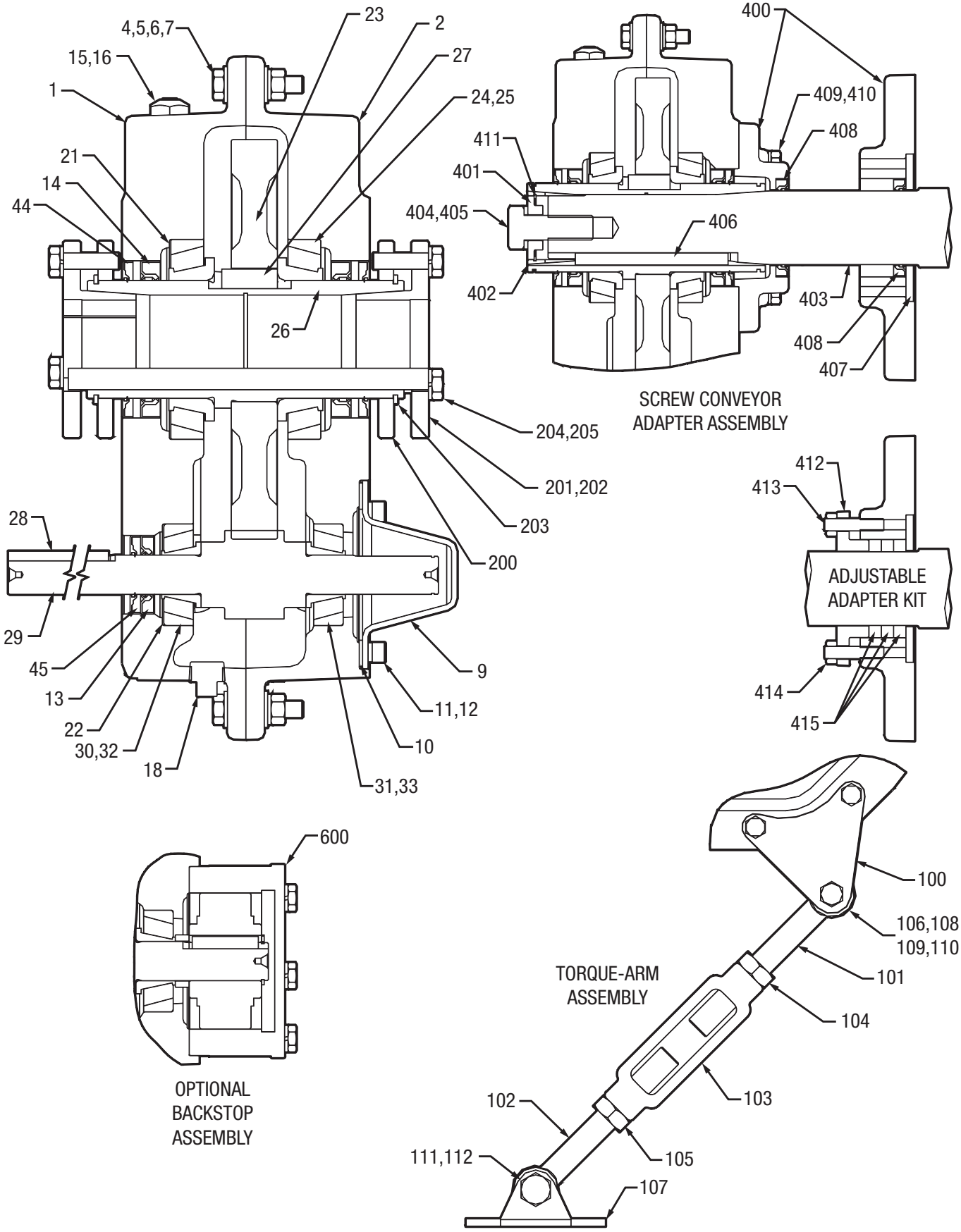


Figure 20 - Parts for TA0107L through TA7315H Taper Bushed Single Reduction Reducers

Table 15 - Parts for TA0107L through TA5215H Taper Bushed and Single Reduction Reducers

Ref.	Description		Quantity	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H
1	Housing-LH		1	900202A	901202A	902202	903202	904202	905202
2	Housing-RH		1	900203	901203	902203	903203	904203	905203
①	RTV Sealant, Tube		1	915112-80-H	915112-80-H	915112-80-H	915112-80-H	915112-80-H	915112-80-H
4	Housing Bolt		14	032018012BJ	032018012BJ	411412	411412	411460	411460
5	Flat Washer		28	900241	900241	902241	902241	904241	904241
6	Nut		14	407085	407085	407087	407087	407091	407091
7	Lockwasher		14	419010	419010	419011	419011	419013	419013
8 ①	Dowel Pin		2	901248	901248	304624	901248	304624	304624
9	Backstop Shaft Cover		1	901279P	901279P	901279P	903279P	904279P	905279P
10	Backstop Cover Gasket		1	901280	901280	901280	903280	904280	905280
11	Backstop Cover Screw		6 ②	417038	417038	417038	417038	417038	417074
12	Lockwasher		6 ②	419045	419045	419045	419045	419045	419046
13	Input Oil Seal	5:1, 9:1, 15:1 ③ 25:1 Ratio ③ 40:1 Ratio ③	1 1 1	276173 276173 276173	276173 276173 276173	276285 276285 276173	276280 276280 242281	A73108 A73108 A73108	905266 905266 905266
14	Output Oil Seal		2	900286	901286	902286	A73109	904286	905286
15	Air Vent		1	900287	900287	900287	900287	904287	904287
16	Bushing		1	N/A	N/A	N/A	N/A	430079	430079
17 ①	Oil Plug		4	430031	430031	430031	430031	430035	430035
18	Magnetic Oil Plug		1	430060	430060	430060	430060	430064	430064
21	Output Bearing Shim-As Required	.015" Shim .007" Shim .005" Shim		900263 900265 900264	901263 901265 901264	902263 902265 902264	903263 903265 903264	904263 904265 904264	905263 905265 905264
22	Input Bearing Shim-As Required	.015" Shim .007" Shim .005" Shim		900271 900273 900272	901271 901273 901272	902271 902273 902272	903267 903269 903268	903267 903269 903268	905271 905273 905272
23	Output Gear		1	900208	901208	902208	903208	904208	905208
24	Output Bearing Cup		2	900250	901250	403003	903252	403016	403140
25	Output Bearing Cone		2	900251	901251	402003	402268	402193	402050
26	Output Hub		1	900230	901230	902230	903230	904230	905230
27	Output Gear Key		1	900275	901275	901275	903275	904275	905275
28	Input Pinion Key	5:1, 9:1, 15:1, 25:1 Ratio ③ 40:1 Ratio ③	1 1	443634 443634	443634 443634	902277 902277	903277 903298	904277 904277	905277 905277
29	Input Pinion	5:1 Ratio ③ 9:1 Ratio ③ 15:1 Ratio ③ 25:1 Ratio ③ 40:1 Ratio ③	1 1 1 1 1	900222A 900221A 900220A 900219A 900218A	901222A 901221A 901220A 901219A 901218A	902222 902221 902220 902219 902218	903222 903221 903220 903219 903218	904222 904221 904220 904219 904218	905222 905221 905220 905219 905218
30	Input Bearing Cup-LH	5:1 Ratio ③ 9:1 Ratio ③ 15:1 Ratio ③ 25:1 Ratio ③ 40:1 Ratio ③	1 1 1 1 1	403166 403166 403166 403166 403166	402169 402169 402169 402169 402169	403094 403094 403094 403094 403094	304809 304809 304809 304809 403101	304809 304809 304809 304809 304809	403005 403005 403005 403005 403005
31	Input Bearing Cup-RH	5:1 Ratio ③ 9:1 Ratio ③ 15:1 Ratio ③ 25:1 Ratio ③ 40:1 Ratio ③	1 1 1 1 1	403165 403165 403165 403165 403165	403063 403063 403063 403063 403063	403094 403094 403094 403094 403094	403101 403101 403101 403101 403101	904256 904256 904256 904256 904256	403005 403005 403005 403005 403005
32	Input Bearing Cone-LH	5:1 Ratio ③ 9:1 Ratio ③ 15:1 Ratio ③ 25:1 Ratio ③ 40:1 Ratio ③	1 1 1 1 1	402284 402284 402284 402284 402284	402294 402294 402294 402294 402294	304753 304753 304753 304753 304707	411626-05-K 411626-05-K 411626-05-K 411626-05-K 402271	411626-05-K 411626-05-K 411626-05-K 411626-05-K 411626-05-K	402001 402001 402001 304717 304717
33	Input Bearing Cone-RH	5:1 Ratio ③ 9:1 Ratio ③ 15:1 Ratio ③ 25:1 Ratio ③ 40:1 Ratio ③	1 1 1 1 1	402265 402265 402265 402265 402265	402108 402108 402108 402108 402108	304707 304707 304707 304707 304707	402271 402271 402271 402271 402271	904257 904257 904257 904257 904258	402001 402001 402001 402001 411626-05-V
34	Countershaft Bearing Cup-LH		1	304833	403165	304836	403101	304809	403005
35	Countershaft Bearing Cup-RH		1	304833	403165	304836	403101	304809	403005
36	Countershaft Bearing Cone-LH		1	304740	402265	411626-05-B	402271	304710	402001
37	Countershaft Bearing Cone-RH		1	304740	402265	411626-05-B	402271	304710	402001
38	First Stage Gear	9:1 Ratio ③ 15:1 Ratio ③ 25:1 Ratio ③ 40:1 Ratio ③	1 1 1 1	900217 900215 900213 900211	901217 901215 901213 901211	902217 902215 902213 902211	903217 903215 903213 903211	904217 904215 904213 904211	905217 905215 905213 905211
39	Countershaft Pinion		1	900209	901209	902209	903209	904209	905209

Table 15 - Parts for TA0107L through TA5215H Taper Bushed and Single Reduction Reducers

Ref.	Description		Quantity	TA0107L	TA1107H	TA2115H	TA3203H	TA4207H	TA5215H
40	First Stage Gear Key		1	900276	901276	902276	903276	904276	905276
41	Countershaft Bearing Shim-As Required	.015" Shim .007" Shim .005" Shim		900271 900273 900278	901271A 901273A 901272A	901271 901273 901272	903267 903269 903268	903267 903269 903268	905271 905272 905273
44	Auxiliary Output Seal		2	900236	901236	902236	903236	904236	905236
45	Auxiliary Input Seal	5:1, 9:1, 15:1, 25:1 Ratio ③ 40:1 Ratio ③	1 1	442023 442023	442023 442023	902238 442023	903238 N/A	904238 904238	905238 905238
100	⑤Torque-Arm Adapter Bracket		2	900500P	901500P	902500P	903500P	904500P	905500P
	Torque-Arm Rod Kit ④		1	964263	964263	A73091	A73091	964268	964268
101	⑤ Torque-Arm Rod End ⑥		1	A73092	A73092	A73087	A73087	A73146	A73146
102	⑤ Torque-Arm Extension ⑥		1	A73085	A73092	A73088	A73088	A73092	A73092
103	⑤ Torque-Arm Turnbuckle ⑥		1	A73086	A73086	A73089	A73089	A73148	A73148
104	⑤ RH Nut ⑥		1	407122	407122	407095	407095	033102022AB	033102022AB
105	⑤ LH Nut ⑥		1	A73261	A73261	407244	407244	A73263	A73263
106	Torque-Arm Bushing		1	242243	242243	243243	243243	245243	245243
107	Torque-Arm Fulcrum		1	241249	241249	243249	243249	246249	246249
108	Torque-Arm Bolt		1	411412	411412	411437	411437	411460	411460
109	Torque-Arm Lockwasher		1	419011	419011	419012	419012	419013	419013
110	Torque-Arm Nut		1	407087	407087	407089	407089	407091	407091
111	Torque-Arm Bolt		1	411456	411456	032018016EJ	032018016EJ	032018016EJ	032018016EJ
112	Torque-Arm Nut		1	407091	407091	407093	407093	407093	407093
113	Lockwasher		1	N/A	N/A	N/A	N/A	N/A	N/A
200	Bushing Back-Up Plate		2	241266	901301	243308	903301	904301	905301
203	Retaining Ring		2	421111	901304	421109	903304	421107	421055
204	Bushing Cap Screw		6	411405	411390	902306	032018010CJ	032018010CJ	411456
205	Bushing Lockwasher		6	419010	419010	419011	419011	419011	419013
	④ Adapter & Hardware Kit		1	900070	901070	902070	903070	904070	905070
400	⑤ Screw Conveyor Adapter		1	900401	901401	902401	903401	904401	905401
401	⑤ Screw Conveyor Keeper Plate		1	900402	901402	902402	903402	904402	905402
402	⑤ Screw Conveyor Wedge		1	900403	901403	902403	903403	904403	905403
403	Screw Conveyor Drive Shaft	1-1/2" Shaft 1-1/2" Shaft, Stainless Steel 2" Shaft 2" Shaft, Stainless Steel 2-7/16" Shaft 2-7/16" Shaft, Stainless Steel 3" Shaft 3" Shaft, Stainless Steel 3-7/16" Shaft 3-7/16" Shaft, Stainless Steel	1 1 1 1 1 1 1 1 1 1	900072 900080 900073 900081 900074 900082 900075 900083 N/A N/A	901072 901080 901073 901081 901074 901082 901075 901083 N/A N/A	902072 902080 902073 902081 902074 902082 902075 902083 902076 902084	N/A N/A 903073 903081 903074 903082 903075 903083 903076 903084	N/A N/A 904073 904081 904074 904082 904075 904083 904073 904084	N/A N/A 9050732 905081 905074 905082 905075 905083 905076 905084
404	⑤ Retaining Bolt		1	411549	411549	411549	411551	411551	411551
405	⑤ Lockwasher		1	034017018AB	034017018AB	034017018AB	034017020AB	034017020AB	034017020AB
406	⑤ Drive Shaft Key		1	900405	901405	902405	903405	904405	905405
407	⑤ Drive Shaft Washer		1	900404	901404	902404	903404	904404	905404
408	⑤ Seal		2	900411	901411	902411	353085	904411	905411
409	⑤ Bolt		4	032018012CJ	032018012CJ	411435	411456	411456	411483
410	⑤ Lockwasher		4	419011	419011	419012	419013	419013	034017018AB
411	⑤ Retaining Ring		1	900446	901446	902446	903446	904446	905446
412	Adjustable Packing Retainer		1	900413	901413	902413	903413	904413	905413
413	Adjustable Packing Gland Stud		2	400404	400404	400404	400404	400404	400404
414	Adjustable Packing Gland Nut		2	407202	407202	407202	407202	407202	407202
415	Sealing Rings		3	900416	901416	902416	903416	904416	905416
600	Backstop Assembly	5:1, 9:1, 15:1, 25:1 Ratio ③	1	901102	901102	902102	903102	904102	905102
		40:1 Ratio ③	1	901102	901102	902102	903102	904103	905103

NOTES:
① Not shown on drawing.
② 8 required on TA5215H
③ See Table 14 for actual ratio
④ Includes parts listed immediately below marked ⑤
⑤ Makes up assembly under which it is listed marked ④
⑥ Zinc plated as of 2016.

Table 16 - Parts for TA6307H through TA12608H Taper Bushed and Single Reduction Reducers

Ref.	Description		Quantity	TA6307H	TA7315H	TA8407H	TA9415H	TA10507	TA12608
1	Housing-LH		1	906202	907202	908202	909202	910202	912202
2	Housing-RH		1	906203	907203	908203	909203	910203	912203
①	RTV Sealant, Tube		1	415112-80-H	415112-80-H	415112-80-H	415112-80-H	415112-80-H	415112-80-H
4	Housing Bolt		14 ③	411460	411488	411488	411488	411494	411494
5	Flat Washer		28 ④	904241	907241	907241	907241	910241	910241
6	Nut		14 ③	407091	407093	407093	407093	407095	407095
7	Lockwasher		14 ③	419013	419014	419014	419014	034017020AB	034017020AB
8	Dowel Pin		2	304624	304624	304624	304624	304624	304624
9	Backstop Shaft Cover		1	906279P	907279P	908279P	907279P	910279P	912279P
10	Backstop Cover Gasket		1	906280	907280	908280	907280	910280	912280
11	Backstop Cover Screw		6 ②	417074	907281	417074	907281	907281	907281
12	Lockwasher		6 ②	419046	419047	419046	419047	419047	419047
13	Input Oil Seal	5:1, 9:1 ⑥	1	901286	907266	N/A	N/A	N/A	N/A
		15:1 ⑥	1	901286	907266	907266	907266	902286	902286
		25:1 Ratio ⑥	1	901286	907266	907266	907266	902286	902286
		40:1 Ratio ⑥	1	901286	907266	907266	907266	902286	902286
14	Output Oil Seal		2	906286	907286	907286	909286	910286	912286
15	Air Vent		1	904287	904287	904287	904287	904287	904287
16	Bushing		1	430079	430079	430079	430079	430079	430079
17	Oil Plug		4	430035	430035	430035	430035	430035	430035
18	Magnetic Oil Plug		1	430064	430064	430064	430064	430064	430064
21	Output Bearing Shim-As Required	.015" Shim		906263	907263	907263	909263	910263	912263
		.007" Shim		906265	907265	907265	909265	910265	912265
		.005" Shim		906264	907264	907264	909264	910264	912264
22	Input Bearing Shim-As Required	.015" Shim		906271	907271	903263	909267	910267	910267
		.007" Shim		906273	907273	903265	909269	910269	910269
		.005" Shim		906272	907272	903264	909268	910268	910268
23	Output Gear		1	906208	907208	908208	909208	910208	912208
24	Output Bearing Cup		2	906250	403105	403105	403110	910250	912250
25	Output Bearing Cone		2	906251	402147	402147	402160	910251	912251
26	Output Hub		1	906230	907230	908230	909230	910230	912230
27	Output Gear Key		1 ⑤	906275	907275	908275	909275	910275	912275
28	Input Pinion Key	5:1, 9:1 ⑥	1	906277	907277	N/A	N/A	N/A	N/A
		15:1, 25:1 Ratio ⑥	1	906277	907277	908277	909277	909277	909277
		40:1 Ratio ⑥	1	906277	907277	908277	909277	909277	909277
29	Input Pinion	5:1 Ratio ⑥	1	906222	907222	N/A	N/A	N/A	N/A
		9:1 Ratio ⑥	1	906221	907221	N/A	N/A	N/A	N/A
		15:1 Ratio ⑥	1	906220	907220	908220	909220	910220	912220
		25:1 Ratio ⑥	1	906219	907219	908219	909219	910219	912219
		40:1 Ratio ⑥	1	906218	907218	908218	909218	910218	912218
30	Input Bearing Cup-LH	5:1 Ratio ⑥	1	403026	304802	N/A	N/A	N/A	N/A
		9:1 Ratio ⑥	1	403026	304802	N/A	N/A	N/A	N/A
		15:1 Ratio ⑥	1	403026	304802	908259	403036	402231	402231
		25:1 Ratio ⑥	1	403026	304802	908259	403036	402231	402231
		40:1 Ratio ⑥	1	403026	304802	908259	403036	402231	402231
31	Input Bearing Cup-RH	5:1 Ratio ⑥	1	403026	403159	N/A	N/A	N/A	N/A
		9:1 Ratio ⑥	1	403026	403159	N/A	N/A	N/A	N/A
		15:1 Ratio ⑥	1	403026	403159	908256	411626-06-BE	411626-06-BE	403036
		25:1 Ratio ⑥	1	403026	403159	908256	411626-06-BE	411626-06-BE	403036
		40:1 Ratio ⑥	1	403026	403159	304804	304804	304804	403036
32	Input Bearing Cone-LH	5:1 Ratio ⑥	1	906260	402041	N/A	N/A	N/A	N/A
		9:1 Ratio ⑥	1	906260	402041	N/A	N/A	N/A	N/A
		15:1 Ratio ⑥	1	906260	402041	908260	304701	402232	402232
		25:1 Ratio ⑥	1	906260	402041	908260	304701	402232	402232
		40:1 Ratio ⑥	1	906260	402041	908260	304701	402232	402232
33	Input Bearing Cone-RH	5:1 Ratio ⑥	1	906260	907260	N/A	N/A	N/A	N/A
		9:1 Ratio ⑥	1	906260	907260	N/A	N/A	N/A	N/A
		15:1 Ratio ⑥	1	906260	907260	908257	411626-05-BM	411626-05-BM	304701
		25:1 Ratio ⑥	1	906257	907260	908257	411626-05-BM	411626-05-BM	304701
		40:1 Ratio ⑥	1	906257	402054	908258	908258	908258	912258
34	Counter-Shaft Bearing Cup-LH		1	403026	403159	411626-06-BE	403036	403087	402233
35	Counter-Shaft Bearing Cup-RH		1	403026	403159	411626-06-BE	403036	403087	402233
36	Counter-Shaft Bearing Cone-LH		1	906257	907260	411626-05-BM	304701	402023	912253
37	Counter-Shaft Bearing Cone-RH		1	906257	907260	908253	304701	402023	912253

Table 16 - Parts for TA6307H through TA12608H Taper Bushed and Single Reduction Reducers

Ref.	Description		Quantity	TA6307H	TA7315H	TA8407H	TA9415H	TA10507	TA12608
38	First Stage Gear	9:1 Ratio ⑥	1	906217	907217	N/A	N/A	N/A	N/A
		15:1 Ratio ⑥	1	906215	907215	908215	909215	910215	912215
		25:1 Ratio ⑥	1	906213	907213	908213	909213	910213	912213
		40:1 Ratio ⑥	1	906211	907211	908211	909211	910211	912211
39	Counter-Shaft Pinion		1	906209	907209	908209	909209	910209	912209
40	First Stage Gear Key		1	906276	907276	908276	909276	910276	912276
41	Countershaft Bearing Shim-As Required	.015” Shim		906271	906271	908267	909267	904263	912267
		.007” Shim		906273	906273	908269	909269	909265	912269
		.005” Shim		906272	906272	908268	909268	904264	912268
44	Auxiliary Output Seal		2	906236	907236	907236	909236	910236	912236
45	Auxiliary Input Seal	5:1, 9:1 Ratio ⑥	1	901236	907238	N/A	N/A	N/A	N/A
		15:1, 25:1 Ratio ⑥	1	901236	907238	907238	907238	902236	902236
		40:1 Ratio ⑥	1	901236	907238	907238	907238	902236	902236
100	Torque-Arm Adapter Bracket		2	906500P	907500P	907500P	909500P	910500P	912500P
	Torque-Arm Rod Kit ⑦		1	964269	964275	964275	965682	965682	965683
101	⑧ Torque-Arm Rod End ⑩		1	A73269	A73101	A73101	964278	964278	964284
102	⑧ Torque-Arm Extension ⑩		1	A73265	963479	963479	964280	964280	964286
103	⑧ Torque-Arm Turnbuckle ⑩		1	A73267	A73102	A73102	964279	964279	964285
104	⑧ RH Nut ⑩		1	A73268	407103	407103	407107	407107	964290
105	⑧ LH Nut ⑩		1	A73266	A73270	A73270	965051	965051	964289
106	Torque-Arm Bushing		1	247244	271046	271046	272046	272046	272187
107	Torque-Arm Fulcrum		1	247248	271054	271054	272054	272054	272154
108	Torque-Arm Bolt		1	411489	411510	411510	411520	411520	411527
109	Torque-Arm Lockwasher		1	034017018AB	419020	419020	419024	419024	419025
110	Torque-Arm Nut		1	407093	407099	407099	407104	407104	407108
111	Torque-Arm Bolt		1	411489	411516	411516	419524	411524	411528
112	Torque-Arm Nut		1	407093	407099	407099	407104	407104	407108
113	Lockwasher		1	034017018AB	419020	419020	419024	419024	419025
200	Bushing Back-Up Plate		2	906301	272037	908301	909301	910301	912301
203	Retaining Ring		2	906304	421098	908304	909304	910304	912304
204	Bushing Cap Screw		6 ⑨	411456	411457	411457	032018016EJ	032018016EJ	032018016EJ
205	Bushing Lockwasher		6 ⑨	419013	419013	419013	032018016EJ	032018016EJ	032018016EJ
400	Screw Conveyor Adapter		1	906401	907401	N/A	N/A	N/A	N/A
401	Screw Conveyor Keeper Plate		1	906402	907402	N/A	N/A	N/A	N/A
402	Screw Conveyor Wedge		1	906403	907403	N/A	N/A	N/A	N/A
403	Screw Conveyor Drive Shaft	2-7/16” Shaft	1	906074	907074	N/A	N/A	N/A	N/A
		2-7/16” Shaft, Stainless Steel	1	906082	907082	N/A	N/A	N/A	N/A
		3” Shaft	1	906075	907075	N/A	N/A	N/A	N/A
		3” Shaft, Stainless Steel	1	906083	907083	N/A	N/A	N/A	N/A
		3-7/16” Shaft	1	906076	907076	N/A	N/A	N/A	N/A
		3-7/16” Shaft, Stainless Steel	1	906084	907084	N/A	N/A	N/A	N/A
404	Retaining Bolt		1	966138	966138	N/A	N/A	N/A	N/A
405	Lockwasher		1	419020	419020	N/A	N/A	N/A	N/A
406	Drive Shaft Key		1	906405	907405	N/A	N/A	N/A	N/A
407	Drive Shaft Washer		1	906404	907404	N/A	N/A	N/A	N/A
408	Seal		2	906411	907411	N/A	N/A	N/A	N/A
409	Bolt		4	411983	411493	N/A	N/A	N/A	N/A
410	Lockwasher		4	034017020AB	034017020AB	N/A	N/A	N/A	N/A
411	Retaining Ring		1	906446	907446	N/A	N/A	N/A	N/A
412	Adjustable Packing Retainer		1	906413	907413	N/A	N/A	N/A	N/A
413	Adjustable Packing Gland Stud		2	400404	400404	N/A	N/A	N/A	N/A
414	Adjustable Packing Gland Nut		2	407202	407202	N/A	N/A	N/A	N/A
415	Sealing Rings		3	906416	907416	N/A	N/A	N/A	N/A
600	Backstop Assembly	5:1, 9:1 ⑥	1	906102	907102	N/A	N/A	N/A	N/A
		15:1 Ratio ⑥	1	906102	907102	908102	909102	910102	912102
		25:1 Ratio ⑥	1	906103	907102	908102	909102	910102	912102
		40:1 Ratio ⑥	1	906103	907103	908103	907103	910103	912103

NOTES:
① Not shown on drawing.
② 8 required on TA6307H, TA7315H, TA8407H and TA9415H; 12 required on TA10507H and TA12608H.
③ 18 required on TA9415H; 20 required on T10507H; 22 required on TA12608H
④ 36 required on TA9415H; 40 required on TA10507H; 44 required on TA12608H
⑤ 2 required on TA7315H, TA8407H, TA9415H, and TA10507H
⑥ See Table 14 for actual ratio.
⑦ Includes parts listed immediately below marked ⑧.
⑧ Makes up assembly under which it is listed marked ⑦
⑨ 8 required on TA12608H
⑩ Zinc plated as of 2016

Table 17 - Actual Ratios

Reducer Size	Nominal Ratios				
	5:1	9:1	15:1	25:1	40:1
TA0107L	5.200	9.000	14.928	25.091	30.942
TA1107H	5.000	8.990	14.912	25.064	30.909
TA2115H	5.200	9.103	15.619	25.067	33.333
TA3203H	4.913	9.234	15.067	24.954	32.451
TA4207H	5.000	9.231	15.000	25.125	39.107
TA5215H	5.105	9.183	14.923	24.996	38.907
TA6307H	4.944	9.215	15.451	24.868	38.319
TA7315H	5.188	9.716	14.914	24.837	39.656
TA8407H	N/A	N/A	15.120	24.965	39.667
TA9415H	N/A	N/A	15.103	25.435	39.406
TA10507H	N/A	N/A	15.092	25.184	39.676
TA12608H	N/A	N/A	14.788	25.025	38.188

Supplemental Instructions For the Installation, Operation and Maintenance of ATEX Approved Torque-Arm II Shaft Mount Reducers (Zone 1) Sizes TA0107 – TA12608

PREFACE

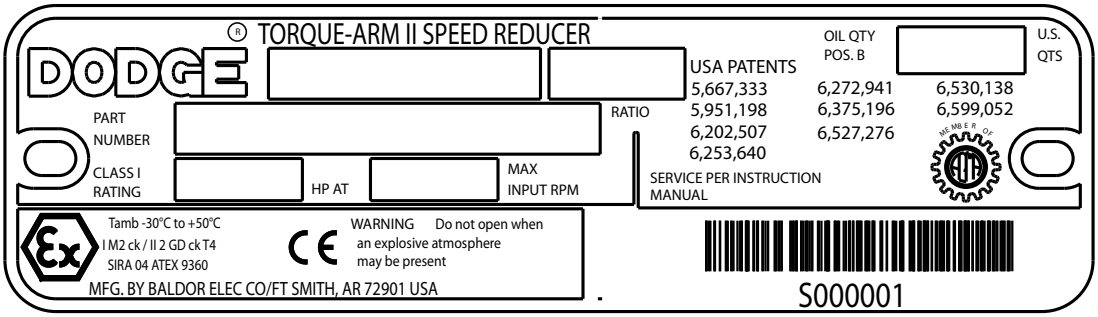
The products described in this manual are manufactured by Baldor Electric Company, Fort Smith, AR USA.

This manual is intended to provide basic information on the safe operation and maintenance of ATEX approved Torque-Arm II shaft mount reducers. These instructions do not cover all details or variations in equipment nor provide every possible contingency or hazard to be met in connection with installation, operation, and maintenance. Should further information be desired or should particular problems arise which are not covered in the manual, the matter should be referred to your local Baldor Electric Company representative.

The reducer was manufactured under the guidelines of the ATEX directive 94/9/EC.

Torque-Arm II reducers are suitable for ATEX Category 2 and M2, Group II and I, for gas and dust environments and are also suitable for ATEX Category 3 for all gas or dust environments with ignition temperatures higher than T4 - 135°C.

Typical reducer marking is contained on a certification plate similar to the following:



ATTENTION - HAZARDOUS AREA USE

For Hazardous Area Use the following potential ignition hazards have been identified:

Impact to outer enclosure
Heat generation
Contact of rotating parts with stationery parts

The installation should be in accordance with the conditions in the following sections.

The reducer is designed to operate with a surface temperature at or below 200°F. Failure to operate the reducer properly can cause this maximum surface temperature to be exceeded. If applied in a Division 1 or Zone 1 environment this excessive temperature may cause ignition of hazardous materials.

The use of supplemental cooling devices such as a shaft-mounted cooling fan or heat exchanger may be required to ensure operating temperature below 200°F if indicated by catalog selection tables or if the reducer is operated at ambient temperatures above 80°F. Proper use of supplemental cooling, if provided, and avoidance of undesirable operating conditions is required.

ABNORMAL CONDITIONS

Operating the reducer under any of the following conditions can cause higher than normal operating temperatures:
reducer load exceeding nameplate ratings
ambient temperatures above nameplate rating
inadequate cooling
operation above maximum nameplate speed
insufficient amount or improper type of lubricant

ADDITIONAL INSTRUCTIONS FOR SAFE INSTALLATION AND USE

- Do not open reducer when an explosive atmosphere may be present.
- All rotating parts should be guarded to prevent contact with foreign objects which could result in sparks and ignition.
- The reducer should be periodically inspected for proper oil level, signs of oil leakage, and dust or dirt buildup that would impede heat dissipation.
- Follow lubrication instructions and service schedule in this manual. Use gear lubricant with flash point temperature 300°F or higher.
- Increasing levels of vibration and noise could indicate the need for repair or replacement of the reducer, including replacement of bearings.
- Electrical sparks are a source of ignition. To reduce this risk, proper electrical bonding and grounding are recommended. Under standard operating conditions, the reducer is electrically bonded to the driven equipment through the output shaft connection.

BALDOR
A MEMBER OF THE ABB GROUP

EU Declaration of Conformity

The undersigned, representing the following supplier and authorised representative:-

Baldor Electric Company
5711 R. S. Boreham, Jr. Street
Fort Smith, Arkansas 72901
USA

ABB Automation Products GmbH
Oberhausener Straße 33
40472 Ratingen, Germany

This declaration is issued under the sole responsibility of the manufacturer.
herewith declare that the Products

Product identification (brand and catalogue number/part number):

MTA Range of Reduction Gearboxes (Ex)
Sizes MTA2115H,MTA3203H,MTA4207H,MTA5215H,MTA6307H,MTA7315H, MTA8407H
I M2 c k
II 2GD c k T4
Tamb –30°C to +50°C (c-face clamp collar and c-face 3 piece coupling inputs)
Tamb –30°C to +45°C (separate input)

Sira 12ATEX6164X

are in conformity with the provisions of the following EC Directive(s) when installed in accordance with the installation instructions contained in the product documentation:

2014/34/EU	*ATEX*

and that the standards and/or technical specifications referenced below have been applied:

EN 13463-1:2009	*Non - Electrical Equipment For Potentially Explosive Atmospheres -Method And Requirements*
EN13463-5:2011	*Non-Electrical Equipment Intended For Use In Potentially Explosive Atmospheres - Part 5: Protection by constructional Safety 'c'*
EN13463-8:2008	*Non-Electrical Equipment Intended For Use In Potentially Explosive Atmospheres - Part 8: Protection by liquid immersion 'k'*

Notified Body:
Sira Certification Services Ltd -0518
Unit 6
Hawarden Industrial Park
Hawarden
DEESIDE
CH5 3US
Certificate: SIRA 12ATEX6164

Supplier:	*Authorised representative:*
Signature	***Signature***
Evans Massey	i.V. M. Klein
Name: L. Evans Massey	*Name:* Michael Klein
Position: Manager Standards and Certification	*Position:* Regional Sales and Marketing Manager Central Europe
Date: 14 August 2018	*Date:* 14 August 2018

ABB Motors and Mechanical Inc.
5711 R. S. Boreham Jr. Street
Fort Smith, AR 72901
Ph: 1.479.646.4711

Mechanical Power Transmission Support
Ph: 1.864.297.4800

new.abb.com/mechanical-power-transmission
baldor.com

MN1601 (Replaces 499314)

09/18 Litho 25,000

1601-0918

INSTALLATION, OPERATION AND MAINTENANCE MANUAL OF ELECTRIC MOTORS

This manual provides information about WEG induction motors fitted with squirrel cage, permanent magnet or hybrid rotors, low, medium and high voltage, in frame sizes IEC 56 to 630 and NEMA 42 to 9606/10.
The motor lines indicated below have additional information that can be checked in their respective manuals:

- Smoke Extraction Motors;
- Electromagnetic Brake Motors;
- Hazardous Area Motors.

These motors meet the following standards, if applicable:

- NBR 17094-1: Máquinas Elétricas Girantes - Motores de Indução - Parte 1: trifásicos.
- NBR 17094-2: Máquinas Elétricas Girantes - Motores de Indução - Parte 2: monofásicos.
- IEC 60034-1: Rotating Electrical Machines - Part 1: Rating and Performance.
- NEMA MG 1: Motors and Generators.
- CSA C 22.2 N°100: Motors and Generators.
- UL 1004-1: Rotating Electrical Machines - General Requirements.

If you have any questions regarding this manual please contact your local WEG branch, contact details can be found at www.weg.net.

TABLE OF C

1. TERMINC

Balancing: the procedure by which the mass distribution of a rotor is checked and, if necessary, adjusted to ensure that the residual unbalance or the vibration of the journals and/or forces on the bearings at a frequency corresponding to service speed are within specified limits in International Standards.
[ISO 1925:2001, definition 4.1]

Balance quality grade: indicates the peak velocity amplitude of vibration, given in mm/s, of a rotor running free-in-space and it is the product of a specific unbalance and the angular velocity of the rotor at maximum operating speed.

Grounded Part: metallic part connected to the grounding system.

Live Part: conductor or conductive part intended to be energized in normal operation, including a neutral conductor.

Authorized personnel: employee who has formal approval of the company.

Qualified personnel: employee who meets the following conditions simultaneously:
- Receives training under the guidance and responsibility of a qualified and authorized professional;
- Works under the responsibility of a qualified and approved professional.

Note*: The qualification is only valid for the company that trained the employee in the conditions set out by the authorized and qualified professional responsible for training.*

2. INITIAL RECC

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. Therefore, it is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.
Also the applicable procedures and relevant standards of the country where the machine will be installed must be considered.
Noncompliance with the recommended procedures in this manual and other references on the WEG website may cause severe personal injuries and/or substantial property damage and may void the product warranty.

For practical reasons, it is not possible to include in this Manual detailed information that covers all construction variables nor covering all possible assembly, operation or maintenance alternatives.
This Manual contains only the required information that allows qualified and trained personnel to carry out their services. The product images are shown for illustrative purpose only.

For *Smoke Extraction Motors*, please refer to the additional instruction manual 50026367 available on the website www.weg.net.

For brake motors, please refer to the information contained in WEG 50021973 brake motor manual available on the website www.weg.net.

For information about permissible radial and axial shaft loads, please check the product technical catalogue.

The user is responsible for the correct definition of the installation environment and application characteristics.

During the warranty period, all repair, overhaul and reclamation services must be carried out by WEG authorized Service Centers to maintain validity of the warranty.

2.1. WARNING SYMBOL

Warning about safety and warranty.

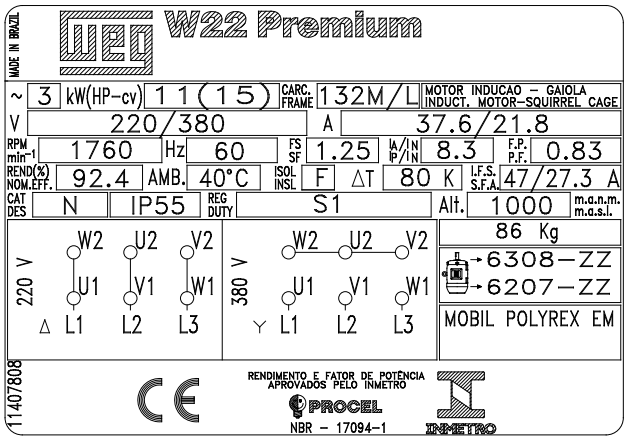
2.2. RECEIVING INSPECTION

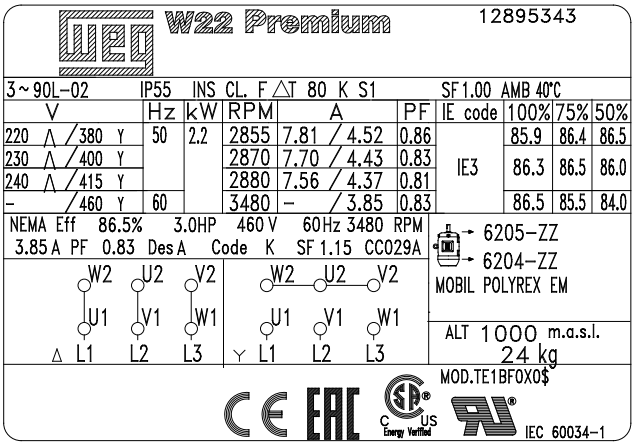
All motors are tested during the manufacturing process.
The motor must be checked when received for any damage that may have occurred during the transportation. All damages must be reported in writing to the transportation company, to the insurance company and to WEG. Failure to comply with such procedures will void the product warranty.
You must inspect the product:
- Check if nameplate data complies with the purchase order;
- Remove the shaft locking device (if any) and rotate the shaft by hand to ensure that it rotates freely;
- Check that the motor has not been exposed to excessive dust and moisture during the transportation.

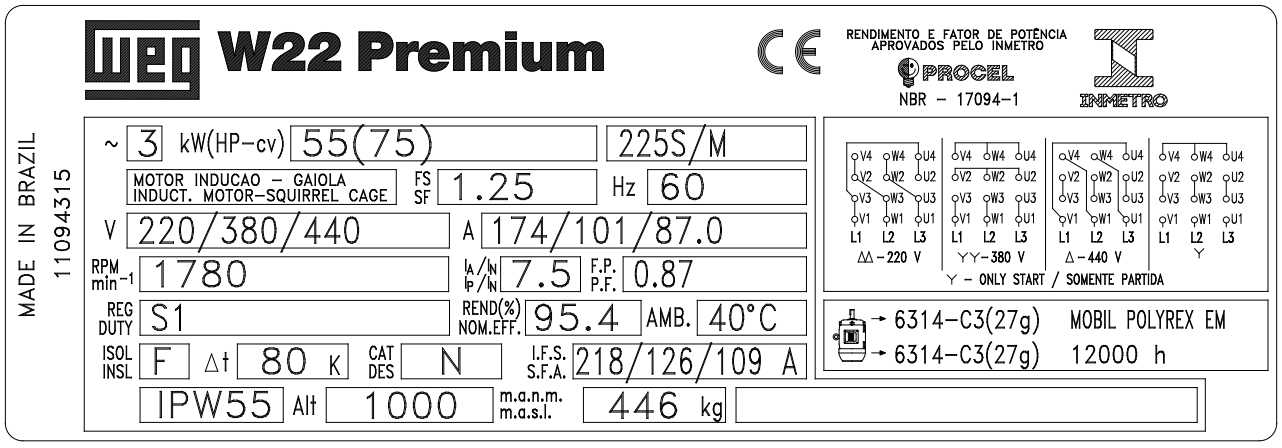
Do not remove the protective grease from the shaft, or the plugs from the cable entries. These protections must remain in place until the installation has been completed.

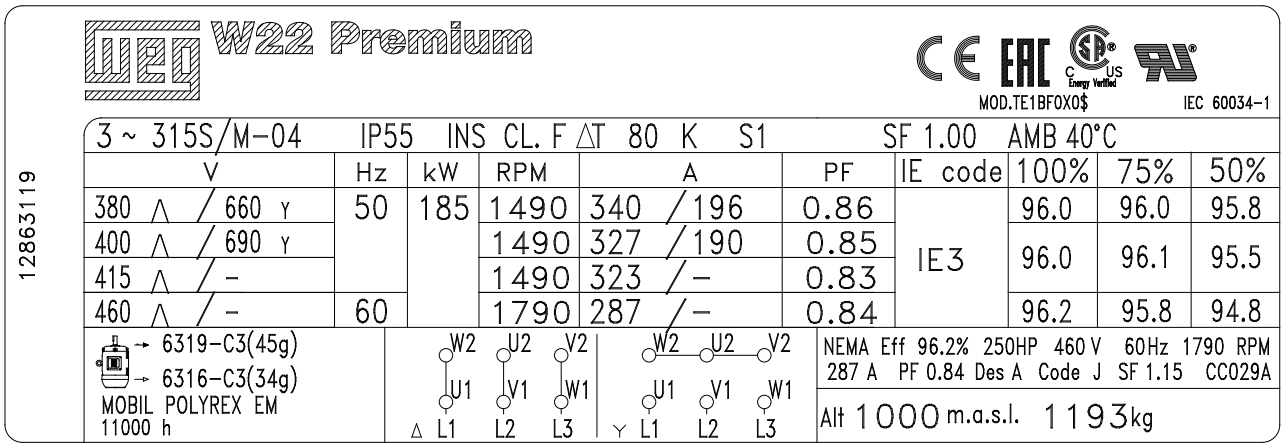
2.3. NAMEPLATE

The nameplate contains information that describes the construction characteristics and the performance of the motor. Figure 2.1 and Figure 2.2 show nameplate layout examples.









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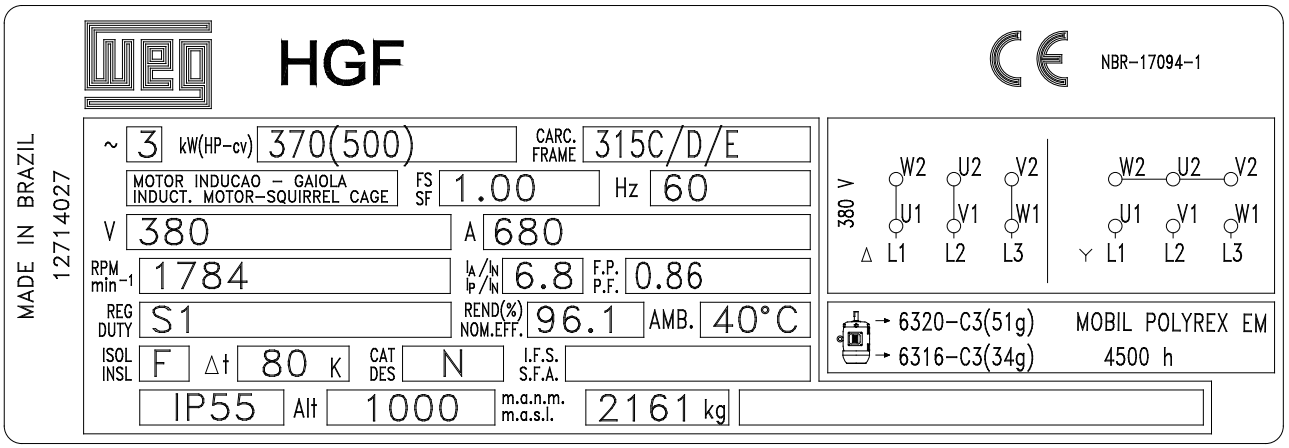
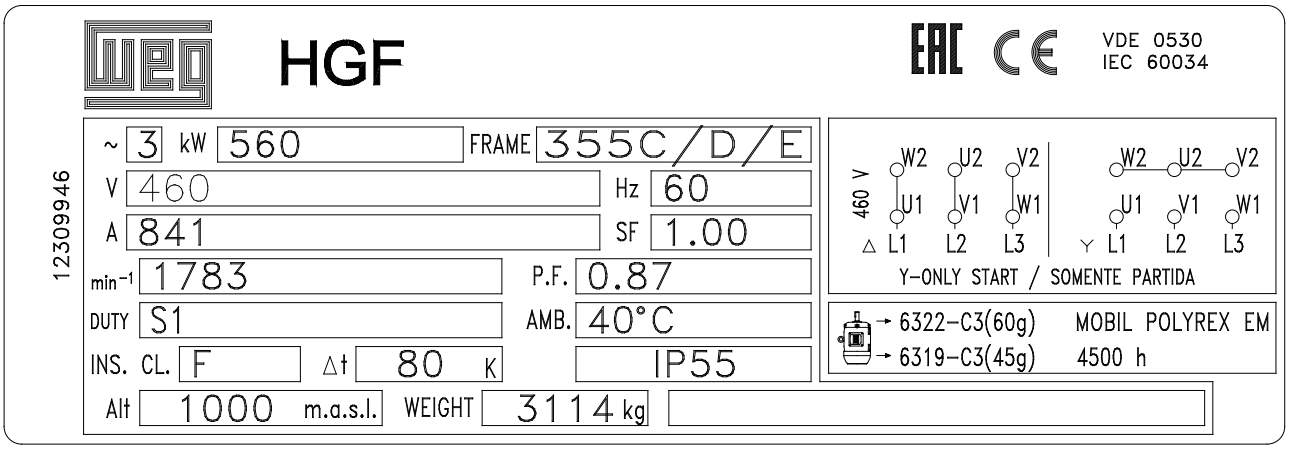




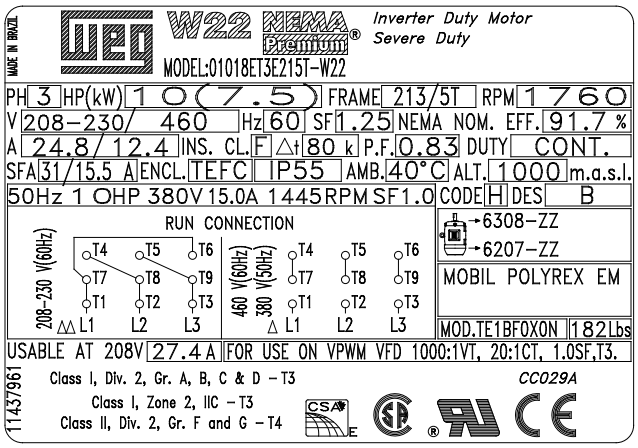
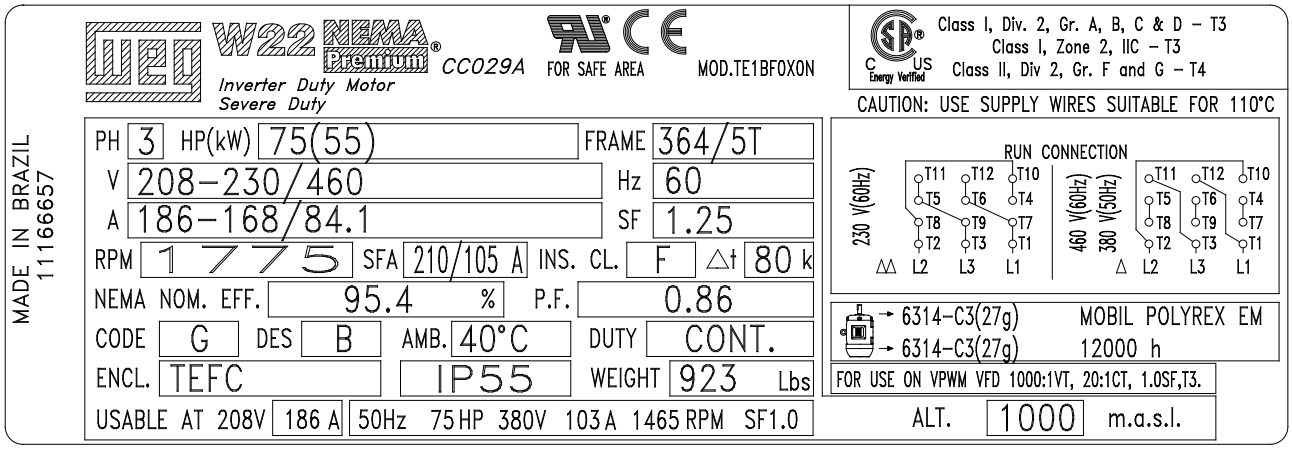


Figure 2.1 - *IEC motor nameplate*



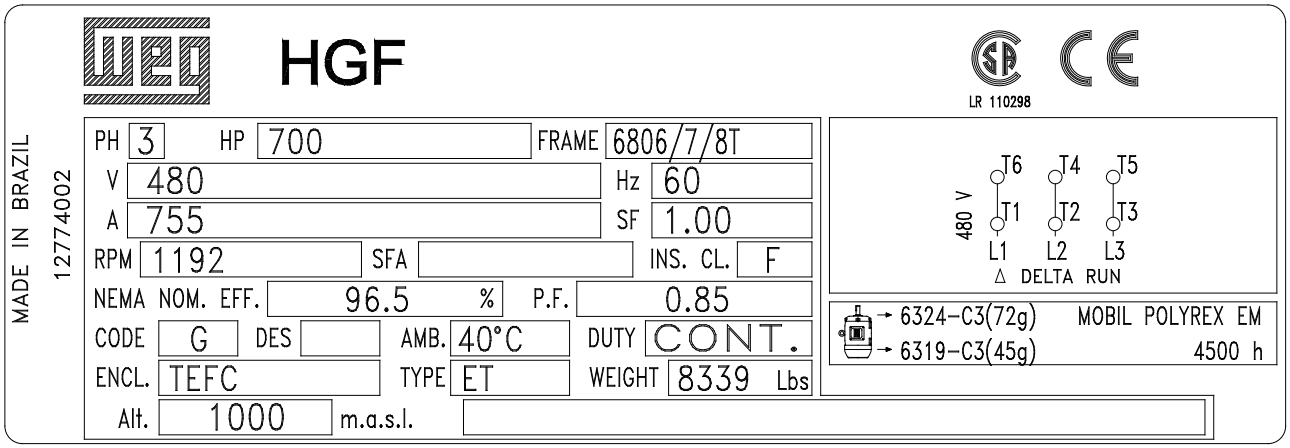


Figure 2.2 - *NEMA motor nameplate*

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3. SAFETY INST

The motor must be disconnected from the power supply and be completely stopped before conducting any installation or maintenance procedures. Additional measures should be taken to avoid accidental motor starting.

Professionals working with electrical installations, either in the assembly, operation or maintenance, should use proper tools and be instructed on the application of standards and safety requirements, including the use of Personal Protective Equipment (PPE) that must be carefully observed in order to reduce risk of personal injury during these services.

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. It is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.

Always follow the safety, installation, maintenance and inspection instructions in accordance with the applicable standards in each country.

4. HANDLIN

Individually packaged motors should never be lifted by the shaft or by the packaging. They must be lifted only by means of the eyebolts, when supplied. Use always suitable lifting devices to lift the motor. Eyebolts on the frame are designed for lifting the machine weight only as indicated on the motor nameplate. Motors supplied on pallets must be lifted by the pallet base with lifting devices fully supporting the motor weight.

The package should never be dropped. Handle it carefully to avoid bearing damage.

Eyebolts provided on the frame are designed for lifting the machine only. Do not use these eyebolts for lifting the motor with coupled equipment such as bases, pulleys, pumps, reducers, etc..

Never use damaged, bent or cracked eyebolts. Always check the eyebolt condition before lifting the motor.

Eyebolts mounted on components, such as on end shields, forced ventilation kits, etc. must be used for lifting these components only. Do not use them for lifting the complete machine set.

Handle the motor carefully without sudden impacts to avoid bearing damage and prevent excessive mechanical stresses on the eyebolts resulting in its rupture.

To move or transport motors with cylindrical roller bearings or angular contact ball bearings, use always the shaft locking device provided with the motor.
All HGF motors, regardless of bearing type, must be transported with shaft locking device fitted.
Vertical mounted motors with oil-lubricated bearings must be transported in the vertical position. If necessary to move or transport the motor in the horizontal position, install the shaft locking device on both sides (drive end and non-drive end) of the motor.

4.1. LIFTING

Before lifting the motor ensure that all eyebolts are tightened properly and the eyebolt shoulders are in contact with the base to be lifted, as shown in Figure 4.1. Figure 4.2 shows an incorrect tightening of the eyebolt.
Ensure that lifting machine has the required lifting capacity for the weight indicated on the motor nameplate.

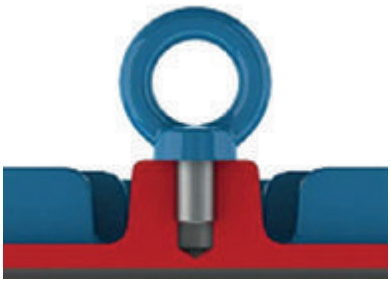

Figure 4.1 *- Correct tightening of the eyebolt*

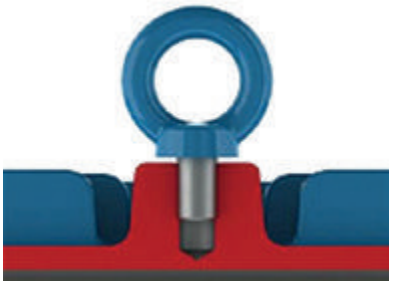

Figure 4.2 *- Incorrect tightening of the eyebolt*

The center-of-gravity may change depending on motor design and accessories. During the lifting procedures the maximum allowed angle of inclination should never be exceeded as specified below.

4.1.1. Horizontal motors with one eyebolt

For horizontal motors fitted with only one eyebolt, the maximum allowed angle-of-inclination during the lifting process should not exceed 30º in relation to the vertical axis, as shown in Figure 4.3.

Figure 4.3 *- Maximum allowed angle-of-inclination for motor with one eyebolt*

4.1.2. Horizontal moto

When motors are fitted with two or more eyebolts, all supplied eyebolts must be used simultaneously for the lifting procedure.

There are two possible eyebolt arrangements (vertical and inclined), as shown below:

- For motors with vertical lifting eyebolts, as shown in Figure 4.4, the maximum allowed lifting angle should not exceed 45° in relation to the vertical axis. We recommend to use a spreader beam for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface;

Figure 4.4 *- Maximum resulting angle for motors with two or more lifting eyebolts*

- For HGF, W40 and W50 motors, as shown in Figure 4.5, the maximum resulting angle should not exceed 30° in relation to the vertical axis;

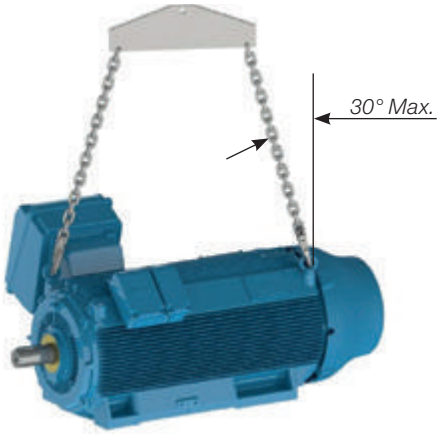

Figure 4.5 *- Maximum resulting angle for horizontal HGF, W40 and W50 motors*

- For motors fitted with inclined eyebolts, as shown in Figure 4.6, the use of a spreader beam is required for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 4.6 *- Use of a spreader beam for lifting*

4.1.3. Vertical m

For vertical mounted motors, as shown in Figure 4.7, the use of a spreader beam is required for maintaining the lifting element (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 4.7 *- Lifting of vertical mounted motors*

Always use the eyebolts mounted on the top side of the motor, diametrically opposite, considering the mounting position. See Figure 4.8.

Figure 4.8 *- Lifting of HGF and W50 motors.*

4.1.3.1. Procedures to place W22 motors in the vertical position

For safety reasons during the transport, vertical mounted Motors are usually packed and supplied in horizontal position.
To place W22 motors fitted with eyebolts (see Figure 4.6), to the vertical position, proceed as follows:

1. Ensure that the eyebolts are tightened properly, as shown in Figure 4.1;
2. Remove the motor from the packaging, using the top mounted eyebolts, as shown in Figure 4.9;

Figure 4.9 *- Removing the motor from the packaging*

3. Install a second pair o

Figure 4.10 *- Installation of the second pair of eyebolts*

4. Reduce the load on the first pair of eyebolts to start the motor rotation, as shown in Figure 4.11. This procedure must be carried out slowly and carefully.

Figure 4.11 *- End result: motor placed in vertical position*

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.1.3.2. Procedures to place HGF and W50 motors in the vertical position

HGF motors are fitted with eight lifting points: four at drive end and four at non-drive end. W50 motors are fitted with nine lifting points: four at drive end, one in the central part and four at non-drive end. The motors are usually transported in horizontal position, however for the installation they must be placed in the vertical position.
To place an these motors in the vertical position, proceed as follows:

1. Lift the motor by using the four lateral eyebolts and two hoists, see Figure 4.12;

Figure 4.12 *- Lifting of HGF and W50 motors with two hoists*

2. Lower the hoist ... end until the motor reaches its equilibrium, see Figure 4.13;

Figure 4.13 *- Placing HGF and W50 motors in vertical position*

3. Remove the hoist hooks from the drive end eyebolts and rotate the motor 180° to fix the removed hooks into the two eyebolts at the motor non-drive end, see Figure 4.14;

Figure 4.14 *- Lifting HGF and W50 motors by the eyebolts at the non-drive end*

4. Fix the removed hoist hooks in the other two eyebolts at the non-drive end and lift the motor until the vertical position is reached, see Figure 4.15.

Figure 4.15 *- HGF and W50 motors in the vertical position*

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.2 Procedures to place W22 vertical mount motors in horizontal position

To place W22 vertical mount motor in horizontal position, proceed as follows:

1. Ensure that all eyebolt

2. Install the first pair of eyebolts and lift the motor as shown in Figure 4.16;

Figure 4.16 - *Install the first pair of eyebolts*

3. Install the second pair of eyebolts, as shown in Figure 4.17;

Figure 4.17 - *Install the second pair of eyebolts*

4. Reduce the load on the first pair of eyebolts for rotating the motor, as shown in Figure 4.18. This procedure must be carried out slowly and carefully;

Figure 4.18 - *Motor is being rotated to horizontal position*

5. Remove the first pair of eyebolts, as shown in Figure 4.19.

Figure 4.19 - *Final result: motor placed in horizontal position*

5. STORAGE

If the motor is not installed immediately, it must be stored in a dry and clean environment, with relative humidity not exceeding 60%, with an ambient temperature between 5 ºC and 40 ºC, without sudden temperature changes, free of dust, vibrations, gases or corrosive agents. The motor must be stored in horizontal position, unless specifically designed for vertical operation, without placing objects on it. Do not remove the protection grease from shaft end to prevent rust.

If the motor are fitted with space heaters, they must always be turned on during the storage period or when the installed motor is out of operation. Space heaters will prevent water condensation inside the motor and keep the winding insulation resistance within acceptable levels. Store the motor in such position that the condensed water can be easily drained. If fitted, remove pulleys or couplings from the shaft end (more information are given on item 6).

The space heaters should never be energized when the motor is in operation.

5.1. EXPOSED MACHINED SURFACES

All exposed machined surfaces (like shaft end and flange) are factory-protected with temporary rust inhibitor. A protective film must be reapplied periodically (at least every six months), or when it has been removed and/or damaged.

5.2. STORAGE

The stacking height of the motor packaging during the storage period should not exceed 5 m, always considering the criteria indicated in Table 5.1:

Table 5.1 *- Max. recommended stacking height*

Packaging type	Frame sizes	Maximum stacking quantity
Cardboard box	IEC 63 to 132 NEMA 143 to 215	Indicated on the top side of the cardboard box
Wood crate	IEC 63 to 315 NEMA 48 to 504/5	06
	IEC 355 NEMA 586/7 and 588/9	03
	W40 / W50 / HGF IEC 315 to 630 W40 / W50 / HGF NEMA 5000 to 9600	Indicated on the packaging

Notes:
1) Never stack larger packaging onto smaller packaging;
2) Align the packaging correctly (see Figure 5.1 and Figure 5.2);

Figure 5.1 *- Correct stacking*

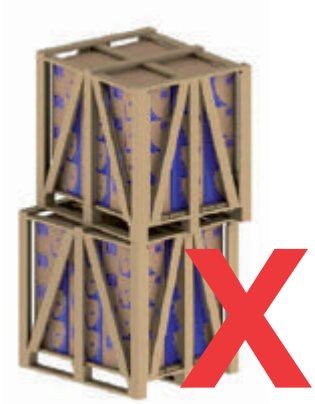

Figure 5.2 *- Incorrect stacking*

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3) The feet of the crates above *n the steel tape or without support (Figure 5.4);*

Figure 5.3 - Correct stacking

Figure 5.4 - Incorrect stacking

4) When stacking smaller crates onto longer crates, always ensure that suitable wooden supports are provided to withstand the weight (see Figure 5.5). This condition usually occurs with motor packaging above IEC 225S/M (NEMA 364/5T) frame sizes.

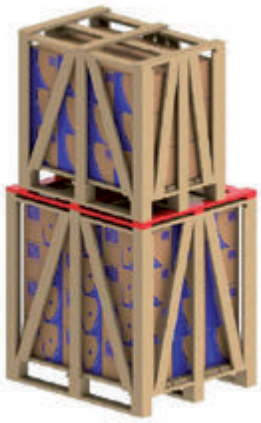


***Figure 5.5** - Use of additional battens for stacking*

5.3 BEARINGS

5.3.1 Grease lubricated bearings

We recommend rotating the motor shaft at least once a month (by hand, at least five revolutions, stopping the shaft at a different position from the original one). If the motor is fitted with shaft locking device, remove it before rotating the shaft and install it again before performing any handling procedure. Vertical motors may be stored in the vertical or in horizontal position. If motors with open bearings are stored longer than six months, the bearings must be relubricated according to item 8.2 before commissioning of the motor.
If the motor is stored for longer than 2 years, the bearings must be replaced or removed, washed, inspected and relubricated according to item 8.2.

5.3.2 Oil lubricated bearings

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the center of the sight glass.
During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions, thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.
If the motor is stored for a period equal or longer than the oil change interval, the oil must be replaced according to Item 8.2, before starting the operation. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to Item 8.2. The oil of vertical mounted motors is removed to prevent oils leaks during the transport. After receiving the motor the bearings must be lubricated.

5.3.3 Oil Mist lut

The motor must be stored in horizontal position. Lubricate the bearings with ISO VG 68 mineral oil in the amount indicated in the Table 5.2 (this is also valid for bearings with equivalent dimensions). After filling with oil, rotate the shaft by hand, at least five revolutions)
During the storage period, remove the shaft locking device (if any) and rotate the shaft by hand every week, at least five revolutions, stopping it at a different position from the original one. Reinstall the shaft locking device every time the motor has to be moved. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to item 8.2.

Table 5.2 - *Amount of oil per bearing*

Bearing size	Amount of oil (ml)	Bearing size	Amount of oil (ml)
6201	15	6309	65
6202	15	6311	90
6203	15	6312	105
6204	25	6314	150
6205	25	6315	200
6206	35	6316	250
6207	35	6317	300
6208	40	6319	350
6209	40	6320	400
6211	45	6322	550
6212	50	6324	600
6307	45	6326	650
6308	55	6328	700

The oil must always be removed when the motor has to be handled. If the oil mist system is not operating after installation, fill the bearings with oil to prevent bearing rusting. During the storage period, rotate the shaft by hand, at least five revolutions, stopping it at a different position from the original one. Before starting the motor, all bearing protection oil must be drained from the bearing and the oil mist system must be switched ON.

5.3.4 Sleeve bearing

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the middle of the sight glass. During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions, and at 30 rpm, thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.
If the motor is stored for a period equal or longer than the oil change interval, the oil must be replaced, according to Item 8.2, before starting the operation.

If the motor is stored for a period longer than the oil change interval, or if it is not possible to rotate the motor shaft by hand, the oil must be drained and a corrosion protection and dehumidifiers must be applied.

5.4. INSULATION RESISTANCE

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.

5.4.1. Insulation resistance measurement

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.


The insulation resistance must be measured in a safe environment.

The insulation resistance ... old state and disconnected from the power supply.

To prevent the risk of an electrical shock, ground the terminals before and after each measurement. Ground the capacitor (if any) to ensure that it is fully discharged before the measurement is taken.

It is recommended to insulate and test each phase separately. This procedure allows the comparison of the insulation resistance between each phase. During the test of one phase, the other phases must be grounded. The test of all phases simultaneously evaluates the insulation resistance to ground only but does not evaluate the insulation resistance between the phases.
The power supply cables, switches, capacitors and other external devices connected to the motor may considerably influence the insulation resistance measurement. Thus all external devices must be disconnected and grounded during the insulation resistance measurement.
Measure the insulation resistance one minute after the voltage has been applied to the winding. The applied voltage should be as shown in Table 5.3.

Table 5.3 *- Voltage for the insulation resistance*

Winding rated voltage (V)	Testing voltage for measuring the insulation resistance (V)
< 1000	500
1000 - 2500	500 - 1000
2501 - 5000	1000 - 2500
5001 - 12000	2500 - 5000
> 12000	5000 - 10000

The reading of the insulation resistance must be corrected to 40 °C as shown in the Table 5.4.

Table 5.4 *- Correction factor for the insulation resistance corrected to 40 °C*

Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C	Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C
10	0.125	30	0.500
11	0.134	31	0.536
12	0.144	32	0.574
13	0.154	33	0.616
14	0.165	34	0.660
15	0.177	35	0.707
16	0.189	36	0.758
17	0.203	37	0.812
18	0.218	38	0.871
19	0.233	39	0.933
20	0.250	40	1.000
21	0.268	41	1.072
22	0.287	42	1.149
23	0.308	43	1.231
24	0.330	44	1.320
25	0.354	45	1.414
26	0.379	46	1.516
27	0.406	47	1.625
28	0.435	48	1.741
29	0.467	49	1.866
30	0.500	50	2.000

The motor insulati th the values indicated in Table 5.5 (corrected to 40 °C):

Table 5.5 *- Evaluation of the insulation system*

Limit value for rated voltage up to 1.1 kV (MΩ)	Limit value for rated voltage above 1.1 kV (MΩ)	Situation
Up to 5	Up to 100	Dangerous. The motor can not be operated in this condition
5 to 100	100 to 500	Regular
100 to 500	Higher than 500	Good
Higher than 500	Higher than 1000	Excellent

The values indicated in the table should be considered only as reference values. It is advisable to log all measured values to provide a quick and easy overview on the machine insulation resistance.
If the insulation resistance is low, moisture may be present in the stator windings. In this case the motor should be removed and transported to a WEG authorized Service Center for proper evaluation and repair (This service is not covered by the warranty). To improve the insulation resistance through the drying process, see section 8.4.

6. INSTALLATIO

The insulation resistance must be measured in a safe environment.

Check some aspects before proceeding with the installation:

1. Insulation resistance: must be within the acceptable limits. See item 5.4.
2. Bearings:
   If the motor is installed without running immediately, proceed as described in item 5.3.
3. Operating conditions of the start capacitors: If single-phase motors are stored for a period of over two years, it is recommended to change the start capacitors before motor starting since they lose their operating characteristics.
4. Terminal box:
   a. the inside of the terminal box must be clean and dry;
   b. the contacts must be correctly connected and corrosion free. See 6.9 and 6.10;
   c. the cable entries must be correctly sealed and the terminal box cover properly mounted in order to ensure the degree of protection indicated on the motor nameplate.
5. Cooling: the cooling fins, air inlet and outlet openings must be clean and unobstructed. The distance between the air inlet openings and the wall should not be shorter than ¼ (one quarter) of the diameter of the air inlet. Ensure sufficient space to perform the cleaning services. See item 7.
6. Coupling: remove the shaft locking device (where fitted) and the corrosion protection grease from the shaft end and flange just before installing the motor. See item 6.4.
7. Drain hole: the motor must always be positioned so the drain hole is at the lowest position (If there is any indication arrow on the drain, the drain must be so installed that the arrow points downwards).
   Motors supplied with rubber drain plugs leave the factory in the closed position and must be opened periodically to allow the exit of condensed water. For environments with high water condensation levels and motor with degree of protection IP55, the drain plugs can be mounted in open position (see Figure 6.1).
   For motors with degree of protection IP56, IP65 or IP66, the drain plugs must remain at closed position (see Figure 6.1), being opened only during the motor maintenance procedures.
   The drain system of motors with Oil Mist lubrication system must be connected to a specific collection system (see Figure 6.12).

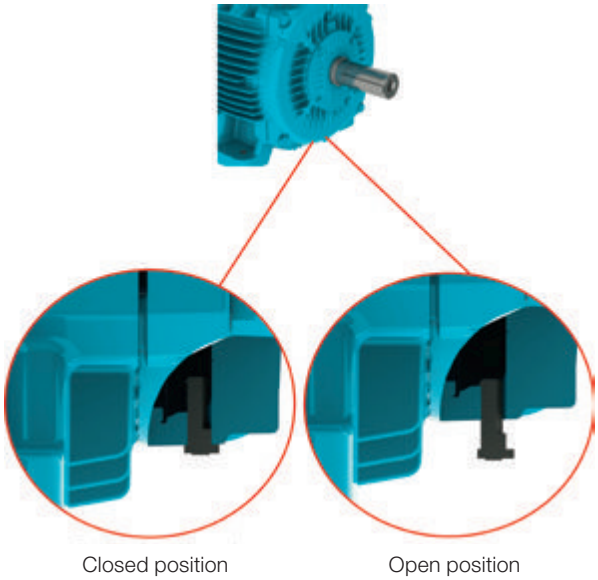


Figure 6.1 *- Detail of the rubber drain plug mounted in closed and open position*

8.Additional recon

a. Check the direction of motor rotation, starting the motor at no-load before coupling it to the load;
b. Vertical mounted motors with shaft end down must be fitted with drip cover to protect them from liquids or solids that may drop onto the motors;
c. Vertical mounted motors with shaft end up should be fitted with water slinger ring to prevent water ingress inside the motor.
d. The fixing elements mounted in the threaded through holes in the motor enclosure (for example, the flange) must be properly sealed.

Remove or fix the shaft key before starting the motor.

Changes on the motor construction (features), such as installation of extended grease fittings or modification of the lubrication system, installation of accessories at alternative locations, etc., can be carried out only after prior written consent from WEG.

6.1. FOUNDATIONS

The foundation is the structure, structural element, natural or prepared base, designed to withstand the stresses produced by the installed equipment, ensuring safe and stable performance during operation. The foundation design should consider the adjacent structures to avoid the influences of other installed equipment and no vibration is transferred through the structure

The foundation must be flat and its selection and design must consider the following characteristics:

a) The features of the machine to be installed on the foundation, the driven loads, application, maximum allowed deformations and vibration levels (for instance, motors with reduced vibration levels, foot flatness, flange concentricity, axial and radial loads, etc. lower than the values specified for standard motors).

b) Adjacent buildings, conservation status, maximum applied load estimation, type of foundation and fixation and vibrations transmitted by theses constructions.

If the motor is supplied with leveling/alignment bolts, this must be considered in the base design.

Please consider for the foundation dimensioning all stresses that are generated during the operation of the driven load.
The user is responsible for the foundation designing and construction.

The foundation stresses can be calculated by using the following equations (see Figure 6.2):

$$F_1 = 0,5 * g * m - (4 * T_b / A)$$
$$F_2 = 0,5 * g * m + (4 * T_b / A)$$

Where:

F_1 and F_2 = lateral stresses (N);
g = gravitational acceleration (9,8 m/s^2);
m = motor weight (kg);
T_b = breakdown torque (Nm);
A = distance between centerlines of mounting holes in feet or base of the machine (end view) (m).

The motors may be mou

- Concrete bases: are most used for large-size motors (see Figure 6.2);
- Metallic bases: are generally used for small-size motors (see Figure 6.3).

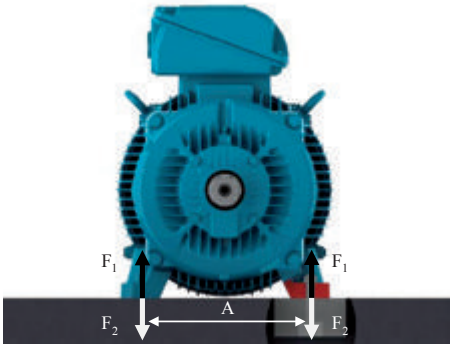


Figure 6.2 *- Motor installed on concrete base*

Figure 6.3 *- Motor installed on metallic base*

The metallic and concrete bases may be fitted with sliding system. These types of foundations are generally used where the power transmission is achieved by belts and pulleys. This power transmission system is easier to assemble/disassemble and allows the belt tension adjustment. Other important aspect of this foundation type is the location of the base locking screws that must be diagonally opposite. The rail nearest the drive pulley is placed in such a way that the positioning bolt is between the motor and the driven machine. The other rail must be placed with the bolt on the opposite side (diagonally opposite), as shown in Figure 6.4 .

To facilitate assembly, the bases may have the following features:

- Shoulders and/or recesses;
- Anchor bolts with loose plates;
- Bolts cast in the concrete;
- Leveling screws;
- Positioning screws;
- Steel & cast iron blocks, plates with flat surfaces.

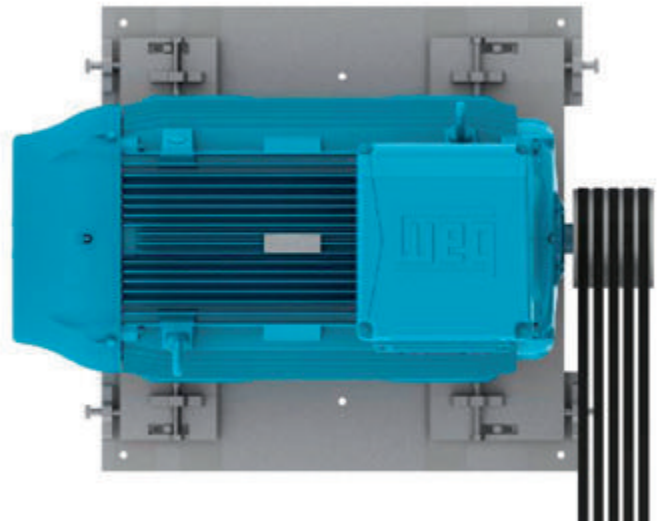


Figure 6.4 *- Motor installed on sliding base*

After completing the installation, it is recommended that all exposed machined surfaces are coated with suitable rust inhibitor.

Footless motors supplied with transportation devices, according to Figure 6.5, must have their devices removed before starting the motor installation.

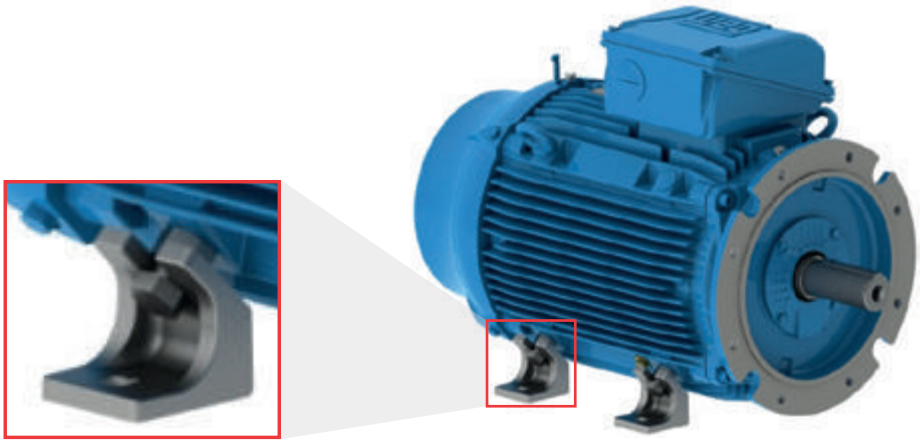


Figure 6.5 *- Detail of the transportation devices for footless motors*

6.2.1. Foot mounted motors

The drawings of the mounting hole dimensions for NEMA or IEC motors can be checked in the respective technical catalogue.
The motor must be correctly aligned and leveled with the driven machine. Incorrect alignment and leveling may result in bearing damage, generate excessive vibration and even shaft distortion/breakage.
For more details, see section 6.3 and 6.6. The thread engagement length of the mounting bolt should be at least 1.5 times the bolt diameter. This thread engagement length should be evaluated in more severe applications and increased accordingly.
Figure 6.6 shows the mounting system of a foot mounted motor indicating the minimum required thread engagement length.

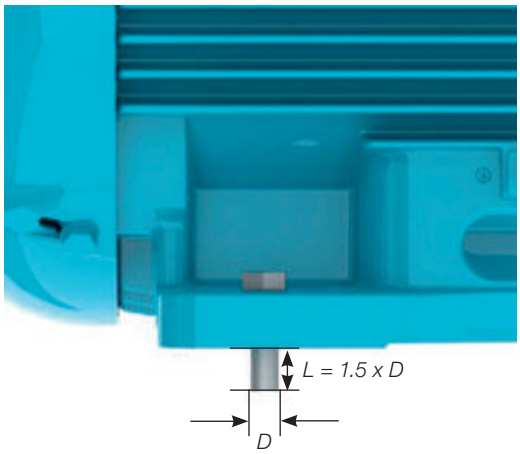


Figure 6.6 *- Mounting system of a foot mounted motor*

6.2.2. Flange mounted motors

The drawings of the flange mounting dimensions, IEC and NEMA flanges, can be checked in the technical catalogue.
The coupling of the driven equipment to the motor flange must be properly dimensioned to ensure the required concentricity of the assembly.
Depending on the flange type, the mounting can be performed from the motor to the driven equipment flange (flange FF (IEC) or D (NEMA)) or from the driven equipment flange to the motor (flange C (DIN or NEMA)).
For the mounting process from the driven equipment flange to the motor, you must consider the bolt length, flange thickness and the thread depth of the motor flange.

If the motor flange has tapped through-holes, the length of the mounting bolts must not exceed the tapped through-hole length of the motor flange, thus preventing damage to the winding head.

For flange mounting the times the bolt diameter. In severe applications, longer thread engagement length may be required.
In severe applications or if large motors are flange mounted, a foot or pad mounting may be required in addition to the flange mounting (Figure 6.7). The motor must never be supported on its cooling fins.

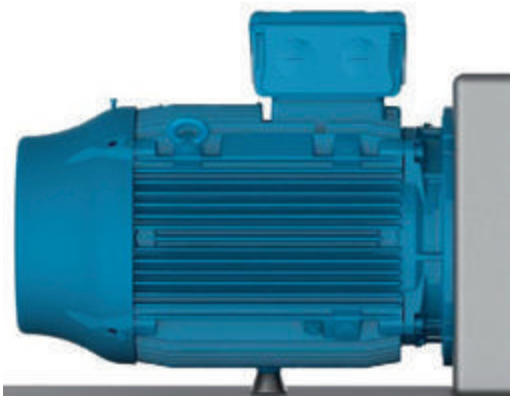


Figure 6.7 *- Mounting method of flange mounted motors with frame base support*

Note*:*
When liquid (for example oil) is likely to come into contact with the shaft seal, please contact your local WEG representative.

6.2.3. Pad mounted motors

Typically, this method of mounting is used in axial fans. The motor is fixed by tapped holes in the frame. The dimensions of these tapped holes can be checked in the respective product catalogue. The selection of the motor mounting rods/bolts must consider the dimensions of the fan case, the installation base and the thread depth in the motor frame.
The mounting rods and the fan case wall must be sufficiently stiff to prevent the transmission of excessive vibration to the machine set (motor & fan). Figure 6.8 shows the pad mounting system.

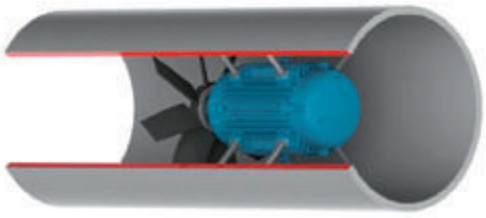


Figure 6.8 *- Mounting of the motor inside the cooling duct*

6.3. BALANCING

Unbalanced machines generate vibration which can result in damage to the motor. WEG motors are dynamically balanced with “half key” and without load (uncoupled). Special balancing quality level must be stated in the Purchase Order.

The transmission elements, such as pulleys, couplings, etc., must balanced with “half key” before they are mounted on the motor shaft.

The balance quality grade meets the applicable standards for each product line.

The maximum balancing deviation must be recorded in the installation report.

6.4. COUPLINGS

Couplings are used to transmit the torque from the motor shaft to the shaft of the driven machine. The following aspects must be considered when couplings are installed:
- Use proper tools for coupling assembly & disassembly to avoid damages to the motor and bearings;
- Whenever possible, use flexible couplings, since they can absorb eventual residual misalignments during the machine operation;
- The maximum loads and speed limits informed in the coupling and motor manufacturer catalogues cannot be exceeded;
- Level and align the motor as specified in sections 6.5 and 6.6, respectively.

Remove or [illegible] order to prevent accidents.

6.4.1. Direct coupling

Direct coupling is characterized when the Motor shaft is directly coupled to the shaft of the driven machine without transmission elements. Whenever possible, use direct coupling due to lower cost, less space required for installation and more safety against accidents.

Do not use roller bearings for direct coupling, unless sufficient radial load is expected.

6.4.2. Gearbox coupling

Gearbox coupling is typically used where speed reduction is required.
Make sure that shafts are perfectly aligned and strictly parallel (in case of straight spur gears) and in the right meshing angle (in case of bevel and helical gears).

6.4.3. Pulley and belt coupling

Pulleys and belts are used when speed increase or reduction between motor shaft and driven load is required.

Excessive belt tension will damage the bearings and cause unexpected accidents such as breakage of the motor shaft.

6.4.4. Coupling of sleeve bearing motors

Motors designed with sleeve bearings must be operated with direct coupling to the driven machine or a gearbox. Pulley and belts can not be applied for sleeve bearing motors.

Motors designed with sleeve bearings have 3 (three) marks on the shaft end. The center mark is the indication of the magnetic center and the 2 (two) outside marks indicate the allowed limits of the rotor axial movement, as shown in Figure 6.9.
The motor must be so coupled that during operation the arrow on the frame is placed over the central mark indicating the rotor magnetic center. During start-up, or even during operation, the rotor may freely move between the two outside marks when the driven machine exerts an axial load on the motor shaft. However, under no circumstance, the motor can operate continuously with axial forces on the bearing.

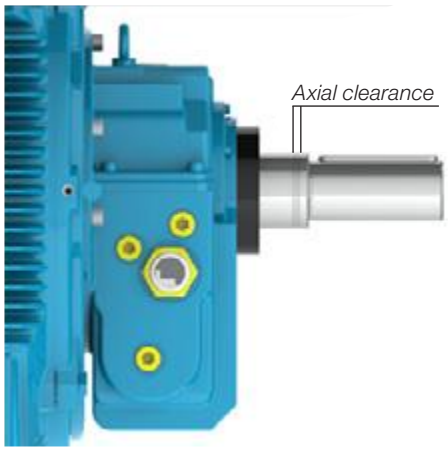


Figure 6.9 *- Axial clearance of motor designed with sleeve bearing*

For coupling evaluation consider the maximum axial bearing clearance as shown in Table 6.1.
The axial clearance of the driven machine and coupling influence the maximum bearing clearance.

Table 6.1 *- Clearance used for sleeve bearings*

Bearing size	Total axial clearance (mm)
9*	3 + 3 = 6
11*	4 + 4 = 8
14*	5 + 5 =10
18	7,5 + 7,5 = 15

** For Motors in accordance with API 541, the total axial clearance is 12.7 mm*

The sleeve bearings used by WEG were not designed to support axial load continuously.
Under no circumstance must the motor be operated continuously at its axial clearance limits.

6.5. LEVELING

The motor must be leveled to correct any deviations in flatness arising from the manufacturing process and the material structure rearrangement. The leveling can be carried out by a leveling screw fixed on the motor foot or on the flange or by means of thin compensation shims. After the leveling process, the leveling height between the motor mounting base and the motor cannot exceed 0.1 mm.
If a metallic base is used to level the height of the motor shaft end and the shaft end of the driven machine, level only the metallic base relating to the concrete base.

Record the maximum leveling deviations in the installation report.

6.6. ALIGNMENT

The correct alignment between the motor and the driven machine is one of the most important variables that extends the useful service life of the motor. Incorrect coupling alignment generates high loads and vibrations reducing the useful life of the bearings and even resulting in shaft breakages. Figure 6.10 illustrates the misalignment between the motor and the driven machine.

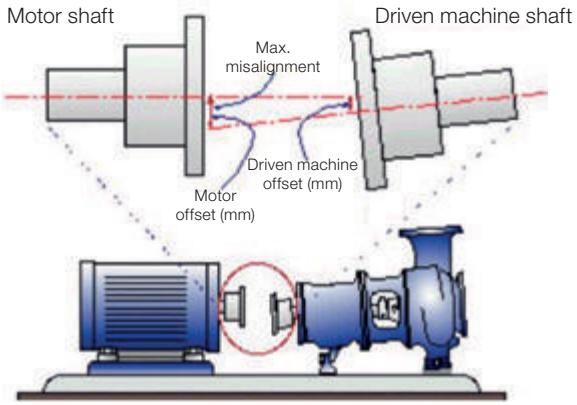
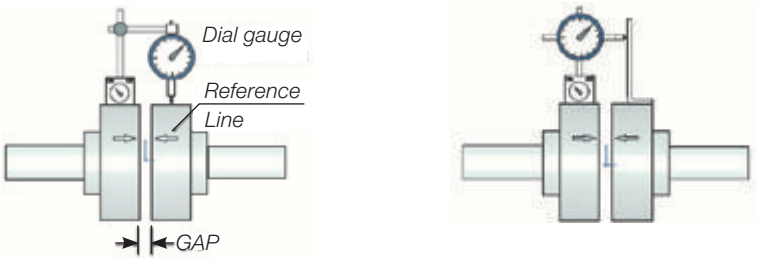


Figure 6.10 *- Typical misalignment condition*

Alignment procedures must be carried out using suitable tools and devices, such as dial gauge, laser alignment instruments, etc.. The motor shaft must be aligned axially and radially with the driven machine shaft.

The maximum allowed eccentricity for a complete shaft turn should not exceed 0.03 mm, when alignment is made with dial gauges, as shown in Figure 6.11. Ensure a gap between couplings to compensate the thermal expansion between the shafts as specified by the coupling manufacturer.



Parallel alignment *Angular alignment*

Figure 6.11 *- Alignment with dial gauge*

If alignment is mac nendations provided by the laser instrument manufacturer.
The alignment should be checked at ambient temperature with machine at operating temperature.

The coupling alignment must be checked periodically.

Pulley and belt couplings must be so aligned that the driver pulley center lies in the same plane of the driven pulley center and the motor shaft and the shaft of the driven machine are perfectly parallel.
After completing the alignment procedures, ensure that mounting devices do not change the motor and machine alignment and leveling resulting into machine damage during operation.

It is recommended to record the maximum alignment deviation in the Installation Report.

6.7. CONNECTION OF OIL LUBRICATED OR OIL MIST LUBRICATED MOTORS

When oil lubricated or oil mist lubricated motors are installed, connect the existing lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12. The lubrication system must ensure continuous oil flow through the bearings as specified by the manufacturer of the installed lubrication system.

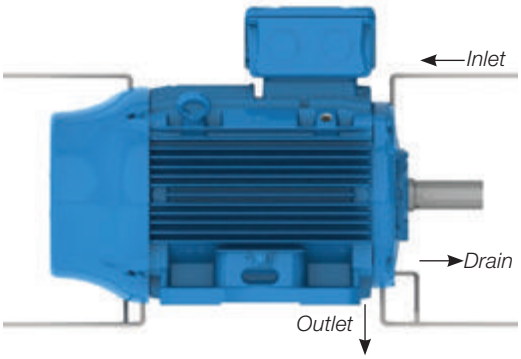


Figure 6.12 *- Oil supply and drain system of oil lubricated or oil mist lubricated motors*

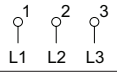
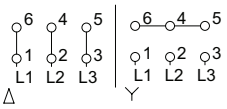
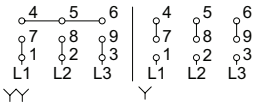
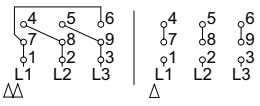
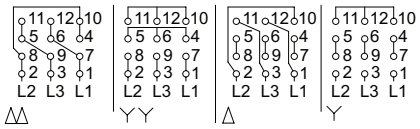
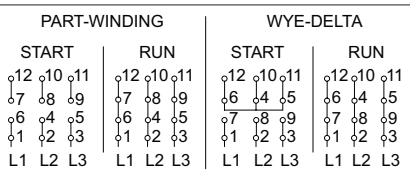
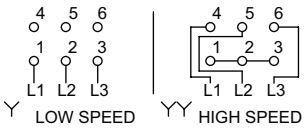
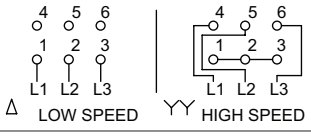
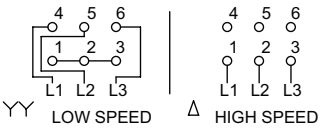
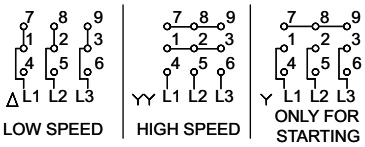
6.8. CONNECTION OF THE COOLING WATER SYSTEM

When water cooled motors are installed, connect the water inlet and outlet tubes to ensure proper motor cooling. According to item 7.2, ensure correct cooling water flow rate and water temperature in the motor cooling system.

6.9. ELECTRICAL CONNECTION

Consider the rated motor current, service factor, starting current, environmental and installation conditions, maximum voltage drop, etc. to select appropriate power supply cables and switching and protection devices. All motors must be installed with overload protection systems. Three-phase motors should be fitted with phase fault protection systems.

Before connecting the motor, check if the power supply voltage and the frequency comply with the motor nameplate data. All wiring must be made according to the connection diagram on the motor nameplate. Please consider the connection diagrams in the Table 6.2 as reference value.
To prevent accidents, check if motor has been solidly grounded in accordance with the applicable standards.

Configuration	Quantity of leads	Type of connection	Connection diagram
Single speed	3	-	
	6	Δ - Y	
	9	YY - Y	
		ΔΔ - Δ	
	12	ΔΔ - YY - Δ - Y	
		Δ - PWS Part-winding start	
Double speed Dahlander	6	YY - Y Variable Torque	
		Δ - YY Constant Torque	
		YY - Δ Constant Output	
	9	Δ - Y - YY	
Double speed Double winding	6	-	

Equivalent table for lead identification													
Lead identification on the wiring diagram		1	2	3	4	5	6	7	8	9	10	11	12
Single speed	NEMA MG 1 Part 2	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	IEC 60034-8	U1	V1	W1	U2	V2	W2	U3	V3	W3	U4	V4	W4
	JIS (JEC 2137) - up to 6 terminals	U	V	W	X	Y	Z						
	JIS (JEC 2137) - above 6 terminals	U1	V1	W1	U2	V2	W2	U5	V5	W5	U6	V6	W6
Double speed (Dahlander / Double winding)	NEMA MG 1 Part 2[1)]	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W
	IEC 60034-8	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W
	JIS (JEC 2137)	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W

1) NEMA MG 1 Part 2 defines T1 to T12 for two or more winding, however WEG adopts 1U to 4W.

WARNING - Local standards have priority on the definition of the connection standards.

The connections presented below are a reference for the connection of the customer's power cables on low voltage motors with terminal block. The terminal blocks presented below are the standard for each product line, however variations may occur.
It is recommended the use of terminals made of electrolytic copper or brass, similar to the terminals used on the motors cables.

W21 and W22

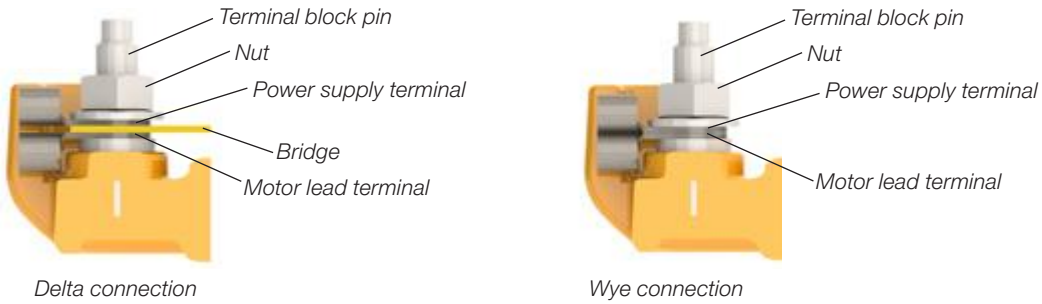


Figure 6.13 *- Connetion for W21 and W22 motors with terminal block*

W50 and HGF

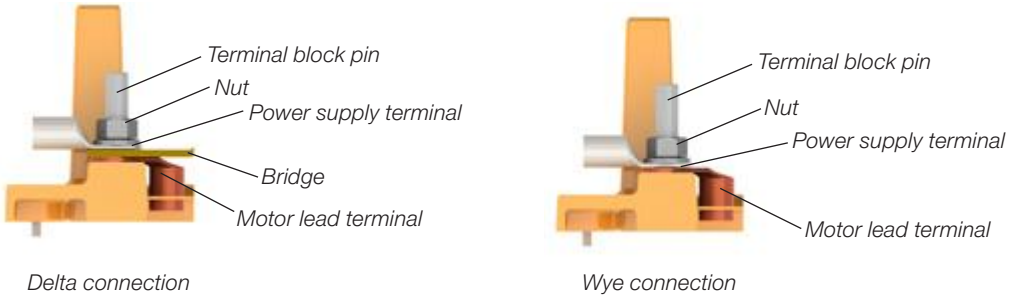


Figure 6.14 *- Connetion for W50 and HGF motors with terminal block*

If motors are supplied without terminal blocks, insulate the cable terminals with suitable insulation material that meets the power supply voltage and the insulation class indicated on the motor nameplate.

Ensure correct tightening torque for the power cable and grounding connections as specified in Table 8.11

The clearance distance (see Figure 6.15) between non-insulated live parts with each other and between grounded parts must be as indicated in Table 6.3.

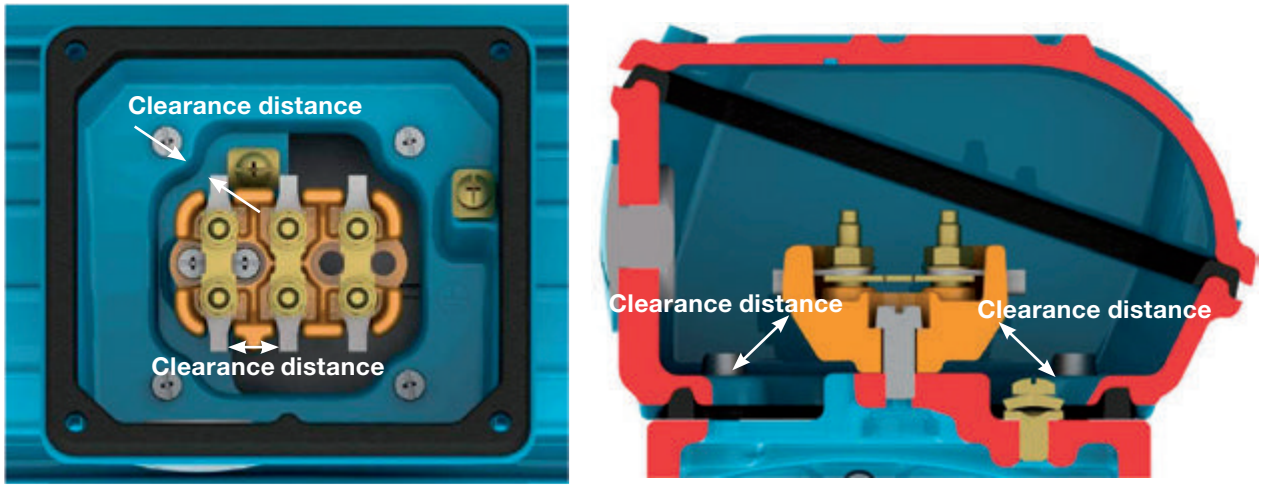


Figure 6.15 *- Clearance distance representation*

Table 6.3 *- Minimum clearance distance (mm) x supply voltage*

Voltage	Minimum clearance distance (mm)
U ≤ 440 V	4
440 < U ≤ 690 V	5.5
690 < U ≤ 1000 V	8
1000 < U ≤ 6900 V	45
6900 < U ≤ 11000 V	70
11000 < U ≤ 16500 V	105

Even when the motor is off, dangerous voltages may be present inside the terminal box used for the space heater supply or winding energization when the winding is used as heating element.
Motor capacitors will hold a charge even after the power has been cut off. Do not touch the capacitors and/or motor terminals, before discharging the capacitors completely.

After the motor connection has been completed, ensure that no tool or foreign body has been left inside the terminal box.

Take the required measures in order to ensure the degree of protection indicated on the motor nameplate:
- unused cable inlet holes in the terminal boxes must be properly closed with blanking plugs;
- components supplied loose (for example, terminal boxes mounted separately) must be properly closed and sealed.
The cable inlets used for power supply and control must be fitted with components (for example, cable-glands and conduits) that meet the applicable standards and regulations in each country.

If the motor is fitted with accessories, such as brakes and forced cooling systems, these devices must be connected to the power supply according to the information provided on their nameplates and with special care as indicated above.

All protection devices, including overcurrent protection, must be set according to the rated machine conditions. These protection devices must protect the machine against short circuit, phase fault or locked rotor condition. The motor protection devices must be set according to the applicable standards.

Check the direction of rotation of the motor shaft. If there is no limitation for the use of unidirectional fans, the shaft rotation direction can be changed by reversing any two of the phase connections. For single-phase motor, check the connection diagram indicated on the motor nameplate.

6.10. CONNECTION OF THE THERMAL PROTECTION DEVICES

If the motor is supplied with temperature monitoring devices, such as, thermostat, thermistors, automatic thermal protectors, Pt-100 (RTD), etc., they must be connected to the corresponding control devices as specified on the accessory nameplates. The non-compliance with this procedure may void the product warranty and cause serious material damages.

Do not apply test voltage above 2.5 V on thermistors and current above 1 mA on RTDs (Pt-100) according to IEC 60751 standard.

Figure 6.16 and Figure 6.17 show the connection diagram of the bimetal thermal protector (thermostats) and thermistors, respectively.

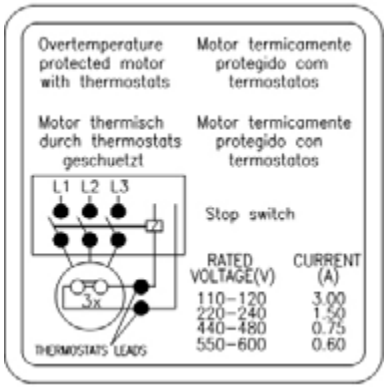


Figure 6.16 *- Connection of the bimetal thermal protectors (thermostats)*

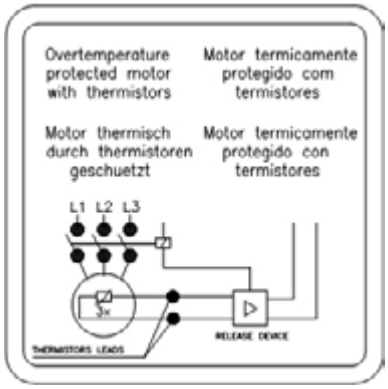


Figure 6.17 *- Thermistor connection*

The alarm temperature limits and thermal protection shutdowns can be defined according to the application; however these temperature limits can not exceed the values in Table 6.4.

Table 6.4 *- Maximum activation temperature of the thermal protections*

Component	Insulation class	Maximum temperature of the protection setting (°C)	
		Alarm	Tripping
Winding	B	-	130
	F	130	155
	H	155	180
Bearing	All	110	120

Notes:
1) The number and type of the installed protection devices are stated on the accessory nameplate of the motor.
2) If the motor is supplied with calibrated resistance, (for example, Pt-100), the motor protection system must be set according to the operating temperatures indicated in Table 6.4.

6.11. RESISTANCE TEMPERATURE DETECTORS (PT-100)

The thermocouples Pt-100 are made of materials, whose resistance depends on the temperature variation, intrinsic property of some materials (usually platinum, nickel or copper), calibrated resistance. Its operation is based on the principle that the electric resistance of a metallic conductor varies linearly with the temperature, thus allowing a continuous monitoring of the motor warm-up through the controller display ensuring a high level of precision and answer stability. These devices are widely used for measuring temperatures in various industry sectors.
In general these devices are used in installations where precise temperature control is required, for example, in installation for irregular or intermittent duty.
The same detector may be used for alarm and tripping purposes.

Table 6.5 and Figure 6.18 show the equivalence between the Pt-100 resistance and the temperature.

Table 6.5 *- Equivalence between the Pt-100 resistance and the temperature*

°C	Ω	°C	Ω	°C	Ω	°C	Ω	°C	Ω
-29	88.617	17	106.627	63	124.390	109	141.908	155	159.180
-28	89.011	18	107.016	64	124.774	110	142.286	156	159.553
-27	89.405	19	107.404	65	125.157	111	142.664	157	159.926
-26	89.799	20	107.793	66	125.540	112	143.042	158	160.298
-25	90.193	21	108.181	67	125.923	113	143.420	159	160.671
-24	90.587	22	108.570	68	126.306	114	143.797	160	161.043
-23	90.980	23	108.958	69	126.689	115	144.175	161	161.415
-22	91.374	24	109.346	70	127.072	116	144.552	162	161.787
-21	91.767	25	109.734	71	127.454	117	144.930	163	162.159
-20	92.160	26	110.122	72	127.837	118	145.307	164	162.531
-19	92.553	27	110.509	73	128.219	119	145.684	165	162.903
-18	92.946	28	110.897	74	128.602	120	146.061	166	163.274
-17	93.339	29	111.284	75	128.984	121	146.438	167	163.646
-16	93.732	30	111.672	76	129.366	122	146.814	168	164.017
-15	94.125	31	112.059	77	129.748	123	147.191	169	164.388
-14	94.517	32	112.446	78	130.130	124	147.567	170	164.760
-13	94.910	33	112.833	79	130.511	125	147.944	171	165.131
-12	95.302	34	113.220	80	130.893	126	148.320	172	165.501
-11	95.694	35	113.607	81	131.274	127	148.696	173	165.872
-10	96.086	36	113.994	82	131.656	128	149.072	174	166.243
-9	96.478	37	114.380	83	132.037	129	149.448	175	166.613
-8	96.870	38	114.767	84	132.418	130	149.824	176	166.984
-7	97.262	39	115.153	85	132.799	131	150.199	177	167.354
-6	97.653	40	115.539	86	133.180	132	150.575	178	167.724
-5	98.045	41	115.925	87	133.561	133	150.950	179	168.095
-4	98.436	42	116.311	88	133.941	134	151.326	180	168.465
-3	98.827	43	116.697	89	134.322	135	151.701	181	168.834
-2	99.218	44	117.083	90	134.702	136	152.076	182	169.204
-1	99.609	45	117.469	91	135.083	137	152.451	183	169.574
0	100.000	46	117.854	92	135.463	138	152.826	184	169.943
1	100.391	47	118.240	93	135.843	139	153.200	185	170.313
2	100.781	48	118.625	94	136.223	140	153.575	186	170.682
3	101.172	49	119.010	95	136.603	141	153.950	187	171.051
4	101.562	50	119.395	96	136.982	142	154.324	188	171.420
5	101.953	51	119.780	97	137.362	143	154.698	189	171.789
6	102.343	52	120.165	98	137.741	144	155.072	190	172.158
7	102.733	53	120.550	99	138.121	145	155.446	191	172.527
8	103.123	54	120.934	100	138.500	146	155.820	192	172.895
9	103.513	55	121.319	101	138.879	147	156.194	193	173.264
10	103.902	56	121.703	102	139.258	148	156.568	194	173.632
11	104.292	57	122.087	103	139.637	149	156.941	195	174.000
12	104.681	58	122.471	104	140.016	150	157.315	196	174.368
13	105.071	59	122.855	105	140.395	151	157.688	197	174.736
14	105.460	60	123.239	106	140.773	152	158.061	198	175.104
15	105.849	61	123.623	107	141.152	153	158.435	199	175.472
16	106.238	62	124.007	108	141.530	154	158.808	200	175.840

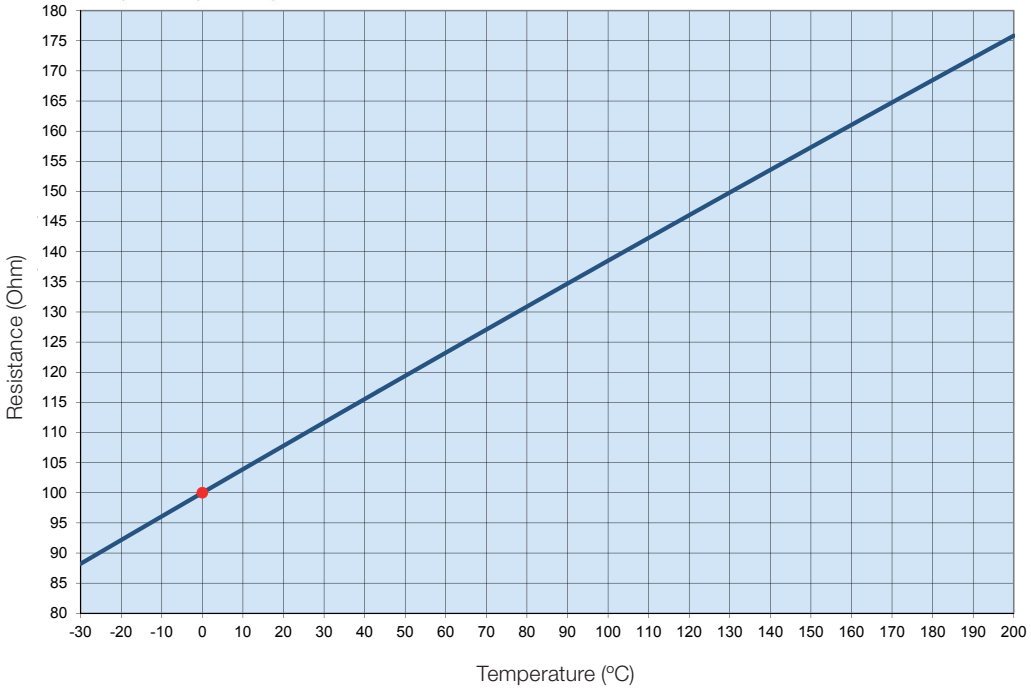


Figure 6.18 *- Ohmic resistance of the Pt-100 x temperature*

6.12. CONNECTION OF THE SPACE HEATERS

Before switching ON the space heaters, check if the space heaters connection have been made according to the connection diagram shown on the space heater nameplate. For motors supplied with dual voltage space heaters (110-127/220-240 V), see Figure 6.19.

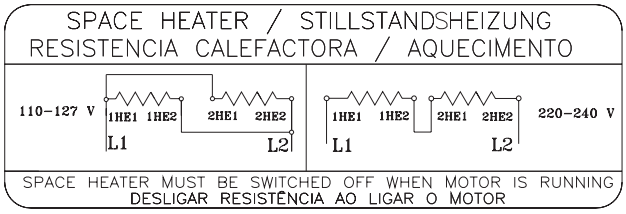


Figure 6.19 *- Dual voltage space heater connection*

The space heaters should never be energized when the motor is in operation.

ENGLISH

6.13. STARTING METH

Whenever possible, the motor starting must be Direct On Line (DOL) at rated voltage. This is the most simple and feasible starting method. However, it must only be applied when the starting current does not affect the power supply. Please consider the local electric utility regulations when installing a motor.
High inrush current may result in:
a) high voltage drop in the power supply line creating unacceptable line disturbance on the distribution system;
b) requiring oversized protection system (cables and contactor) increasing the installation costs.

If DOL starting is not allowed due to the reasons mentioned above, an indirect starting method compatible with the load and motor voltage to reduce the starting current may be used.
If reduced voltage starters are used for starting, the motor starting torque will also be reduced.

Table 6.6 shows the possible indirect starting methods that can be used depending on the number of the motor leads.

Table 6.6 *- Starting method x number of motor leads*

Number of leads	Possible starting methods
3 leads	Autotransformer Soft-starter
6 leads	Star-Delta Autotransformer Soft-starter
9 leads	Series/Parallel Part winding Autotransformer Soft-starter
12 leads	Star-Delta Series/Parallel Part winding Autotransformer Soft-starter

Table 6.7 shows examples of possible indirect starting methods to be used according to the voltage indicated on the motor nameplate and the power supply voltage.

Table 6.7 *- Starting methods x voltage*

Nameplate voltage	Operating voltage	Star-delta	Autotransformer starting	Starting by series/ parallel switch	Part-winding starting	Starting by Soft-starter
220/380 V	220 V 380 V	YES NO	YES YES	NO NO	NO NO	YES YES
220/440 V	220 V 440 V	NO NO	YES YES	YES NO	YES NO	YES YES
230/460 V	230 V 460 V	NO NO	YES YES	YES NO	YES NO	YES YES
380/660 V	380 V	YES	YES	NO	NO	YES
220/380/440 V	220 V 380 V 440 V	YES NO YES	YES YES YES	YES YES NO	YES YES NO	YES YES YES

The WQuattro line motors must be started direct on-line (DOL) or driven by a frequency inverter in scalar mode.

The operation with frequency inverter must be stated in the Purchase Order since this drive type may require some changes of the motor design.

Wmagnet Motors must only be driven by WEG frequency inverter.

The frequency inverter used to drive motors up to 690 V must be fitted with Pulse With Modulation (PWM) with vector control.

When a motor is driven by a frequency inverter at lower frequencies than the rated frequency, you must reduce the motor torque to prevent motor overheating. The torque reduction (derating torque) can be found in the item 6.4 of the "Technical Guidelines for Induction Motors driven by PWM Frequency inverters" available on the site www.weg.net.

If the motor is operated above the rated frequency, please note:
- That the motor must be operated at constant output;
- That the motor can supply max. 95% of its rated output;
- Do not exceed the maximum speed and please consider:
  - max. operating frequency stated on the additional nameplate;
  - mechanical speed limitation of the motor.

Information on the selection of the power cables between the frequency inverter and the motor can be found in the item 6.4 of the "Technical Guidelines for Induction Motors driven by PWM Frequency inverters" available at www.weg.net.

6.14.1. Use of dV/dt filter

6.14.1.1. Motor with enameled round wire

Motors designed for rated voltages up to 690 V, when driven by frequency inverter, do not require the use of dV/dT filters, provided that following criteria are considered.

Criteria for the selection of motors with round enameled wire when driven by frequency inverter				
Motor rated votage [1]	**Peak voltage at the motor terminals (max)**	**dV/dt inverter output (max)**	**Inverter Rise Time [2] (min.)**	**MTBP [2] Time between pulses (min)**
Vnom < 460 V	≤ 1600 V	≤ 5200 V/µs	≥ 0,1 µs	≥ 6 µs
460 ≤ Vnom < 575 V	≤ 2000 V	≤ 6500 V/µs		
575 ≤ Vnom ≤ 1000 V	≤ 2400 V	≤ 7800 V/µs		

***Notes**:*
1. For the application of dual voltage motors, example 380/660 V, consider the lower voltage (380 V).
2. Information supplied by the inverter manufacturer.

6.14.1.2. Motor with prewound coils

Motors with prewound coils (medium and high voltage motors regardless of frame sizes, and low voltage motors from IEC 500 / NEMA 800 frame on), designed for the use with frequency inverters, do not require the use of filters, provided they comply with the criteria in Table 6.8.

***Table 6.8** - Criteria to be considered when using motor with prewound coils to be drive by frequency inverters*

Motor rated voltage	**Type of modulation**	**Turn to turn insulation (phase-phase)**		**Phase-ground insulation**	
		Peak voltage at the motor terminals	**dV/dt at the motor terminals**	**Peak voltage at the motor terminals**	**dV/dt at the motor terminals**
690 < Vnom ≤ 4160 V	Sinusoidal	≤ 5900 V	≤ 500 V/µs	≤ 3400 V	≤ 500 V/µs
	PWM	≤ 9300 V	≤ 2700 V/µs	≤ 5400 V	≤ 2700 V/µs
4160 < Vnom ≤ 6600 V	Sinusoidal	≤ 9300 V	≤ 500 V/µs	≤ 5400 V	≤ 500 V/µs
	PWM	≤ 14000 V	≤ 1500 V/µs	≤ 8000 V	≤ 1500 V/µs

6.14.2. Bearing insulat

Only the motors in IEC frame size 400 (NEMA 680) and larger are supplied, as standard, with insulated bearing. If motor must be driven by frequency inverter, insulate the bearing according to Table 6.9.

Table 6.9 *- Recommendation on the bearing insulation for inverter driven motors*

Frame size	Recommendation
IEC 315 and 355 NEMA 445/7 to L5810/11	■ Insulated bearing/end shield ■ Grounding between shaft and frame by grounding brush
IEC 400 and larger NEMA 680 and larger	■ Insulated NDE bearing ■ Grounding between shaft and frame by grounding brush

When motors are supplied with shaft grounding system, monitor the grounding brush constantly during its operation and, when it reaches the end of its useful life, it must be replaced by another brush with the same specification.

6.14.3. Switching frequency

The minimum inverter switching frequency must not be lower than 2.5 kHz and should not exceed 5 kHz.

The non-compliance with the criteria and recommendations indicated in this manual may void the product warranty.

6.14.4. Mechanical speed limitation

Table 6.10 shows the maximum speeds allowed for motors driven by frequency inverter.

Table 6.10 *- Maximum motor speed (in rpm)*

Frame size		DE-bearing	Maximum speed for standard motors
IEC	NEMA		
63-90	143/5	6201 6202 6203 6204 6205	10400
100	-	6206	8800
112	182/4	6207	7600
		6307	6800
132	213/5	6308	6000
160	254/6	6309	5300
180	284/6	6311	4400
200	324/6	6312	4200
225-630	364/5-9610	6314	3600
		6315	3600
		6316	3200
		6319	3000
		6218	3600
		6220	3600
		6320	2200
		6322	1900
		6324	1800
		6328	1800
		6330	1800
		6224	1800
		6228	1800

Note:
To select the maximum allowed motor speed, consider the motor torque derating curve.

For more information on the application of frequency inverters, contact WEG or check the “Technical Guidelines for Induction Motors driven by PWM Frequency inverters” available at www.weg.net.

7.1. INITIAL START-UP

After finishing the installation procedures and before starting the motor for the first time or after a long period without operation, the following items must be checked:

- If the nameplate data (voltage, current, connection diagram, degree of protection, cooling system, service factor, etc.) meet the application requirements;
- If the machine set (motor + driven machine) has been mounted and aligned correctly;
- If the motor driving system ensures that the motor speed does not exceed the max. allowed speed indicated in Table 6.10;
- Measure the winding insulation resistance, making sure it complies with the specified values in item 5.4;
- Check the motor rotation direction;
- Inspect the motor terminal box for damage and ensure that it is clean and dry and all contacts are rust-free, the seals are in perfect operating conditions and all unused threaded holes are properly closed thus ensuring the degree of protection indicated on the motor nameplate;
- Check if the motor wiring connections, including grounding and auxiliary equipment connection, have been carried out properly and are in accordance with the recommendations in item 6.9;
- Check the operating conditions of the installed auxiliary devices (brake, encoder, thermal protection device, forced cooling system, etc.);
- Check bearing operating conditions. If the motors are stored and/or installed for more than two years without running, it is recommended to change the bearings, or to remove, wash, inspect and relubricate them before the motor is started. If the motor is stored and/or installed according to the recommendations described in item 5.3, lubricate the bearings as described in item 8.2. For the bearing condition evaluation, it is recommended to use of the vibration analysis techniques: Envelope Analysis or Demodulation Analysis.
- For roller bearing motors with oil lubrication, ensure:
  - The oil level should be in the center of the sight glass (see Figure 8.1 and 8.2);
  - That if the motor is stored for a period equal or longer than the oil change interval, the oil must be changed before starting the motor.
- When motors are fitted with sleeve bearings, ensure:
  - Correct oil level for the sleeve bearing. The oil level should be in the center of the sight glass (see Figure 8.3);
  - That the motor is not started or operated with axial or radial loads;
  - That if the motor is stored for a period equal or longer than the oil change interval, the oil must be changed before starting the motor.
- Inspect the capacitor operating condition, if any. If motors are installed for more than two years, but were never commissioned, it is recommended to change the start capacitors since they lose their operating characteristics;
- Ensure that the air inlet and outlet opening are not blocked. The minimum clearance to the nearest wall (L) should be at least ¼ of the fan cover diameter (D), see Figure 7.1. The intake air temperature must be at ambient temperature.

***Figure 7.1**- Minimum clearance to the wall*

Table 7.1 - Minimum distance between the fan cover and wall

Frame size		Distance between the fan cover and the wall (L)	
IEC	NEMA	mm	inches
63	-	25	0.96
71	-	26	1.02
80	-	30	1.18
90	143/5	33	1.30
100	-	36	1.43
112	182/4	41	1.61
132	213/5	50	1.98
160	254/6	65	2.56
180	284/6	68	2.66
200	324/6	78	3.08
225 250	364/5 404/5	85	3.35
280	444/5 445/7 447/9	108	4.23
315	L447/9 504/5 5006/7/8 5009/10/11	122	4.80
355	586/7 588/9 5807/8/9 5810/11/12	136	5.35
400	6806/7/8 6809/10/11	147	5.79
450	7006/10	159	6.26
500	8006/10	171	6.73
560	8806/10	185	7.28
630	9606/10	200	7.87

- Ensure correct water flow rate and water temperature when water cooled motors are used. See item 7.2;
- Ensure that all rotating parts, such as pulleys, couplings, external fans, shaft, etc. are protected against accidental contact.

Other tests and inspections not included in the manual may be required, depending on the specific installation, application and/or motor characteristics.

After all previous inspections have been carried out, proceed as follows to start the motor:

- Start the motor on no-load (if possible) and check the motor direction of rotation. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions;
- Ensure the motor starts smoothly. If any abnormal operating condition is noticed, switch off the motor, check the assembly system and connections before the motor is started again;
- If excessive vibrations are noticed, check if the motor mounting bolts are well tightened or if the vibrations are not generated and transmitted from adjacent installed equipment. Check the motor vibration periodically and ensure that the vibration limits are as specified in item 7.2.1;
- Start the motor at rated load during a short time and compare the operating current with the rated current indicated on the nameplate;
- Continue to measure the following motor variables until thermal equilibrium is reached: current, voltage, bearing and motor frame temperature, vibration and noise levels;
- Record the measured current and voltage values on the Installation Report for future comparisons.

As induction motors have high inrush currents during start-up, the acceleration of high inertia load requires an extended starting time to reach full speed resulting in fast motor temperature rise. Successive starts within short intervals will result in winding temperature increases and can lead to physical insulation damage reducing the useful life of the insulation system. If the duty cycle S1 / CONT. is specified on the motor nameplate, this means that the motor has been designed for:

- Two successive starts: first start from cold condition, i. e., the motor windings are at room temperature and the second start immediately after the motor stops;
- One start from hot condition, i. e., the motor windings are at rated temperature.

The Troubleshooting Chart in section 10 provides a basic list of unusual cases that may occur during motor operation with the respective corrective actions.

7.2. OPERATING

Unless otherwise stated in the Purchase Order, electric motors are designed and built to be operated at altitudes up to 1000 meters above sea level and in a temperature range from -20 °C to +40 °C. Any deviation from the normal condition of motor operation must be stated on the motor nameplate. Some components must be changed if the ambient temperature is different from the specified one. Please contact WEG to check the required special features.

For operating temperatures and altitudes differing from those above, the factors indicated in Table 7.2 must be applied to the nominal motor power rating in order to determine the derated available output (Pmax = Pnom x correction factor).

Table 7.2 - *Correction factors for altitude and ambient temperature*

T (°C)	Altitude (m)								
	1000	1500	2000	2500	3000	3500	4000	4500	5000
10							0.97	0.92	0.88
15						0.98	0.94	0.90	0.86
20					1.00	0.95	0.91	0.87	0.83
25				1.00	0.95	0.93	0.89	0.85	0.81
30			1.00	0.96	0.92	0.90	0.86	0.82	0.78
35		1.00	0.95	0.93	0.90	0.88	0.84	0.80	0.75
40	1.00	0.97	0.94	0.90	0.86	0.82	0.80	0.76	0.71
45	0.95	0.92	0.90	0.88	0.85	0.81	0.78	0.74	0.69
50	0.92	0.90	0.87	0.85	0.82	0.80	0.77	0.72	0.67
55	0.88	0.85	0.83	0.81	0.78	0.76	0.73	0.70	0.65
60	0.83	0.82	0.80	0.77	0.75	0.73	0.70	0.67	0.62
65	0.79	0.76	0.74	0.72	0.70	0.68	0.66	0.62	0.58
70	0.74	0.71	0.69	0.67	0.66	0.64	0.62	0.58	0.53
75	0.70	0.68	0.66	0.64	0.62	0.60	0.58	0.53	0.49
80	0.65	0.64	0.62	0.60	0.58	0.56	0.55	0.48	0.44

Motors installed inside enclosures (cubicles) must be ensured an air renewal rate in the order of one cubic meter per second for each 100 kW installed power or fraction of installed power. Totally Enclosed Air Over motors - TEAO (fan and exhaust / smoke extraction) are supplied without cooling fan and the manufacturer of the driven machine is responsible for sufficient motor cooling. If no minimum required air speed between motor fins is indicated on the motor nameplate, ensure the air speed indicated in the table 7.3 is provided. The values shown in Table 7.3 are valid for 60 Hz motors. To obtain the minimum air speed for 50 Hz motors, multiply the values in the table by 0.83.

Table 7.3 *- Minimum required air speed between motor fins (metres/second)*

Frame		Poles			
IEC	**NEMA**	**2**	**4**	**6**	**8**
63 to 90	143/5	13	7	5	4
100 to 132	182/4 to 213/5	18	12	8	6
160 to 200	254/6 to 324/6	20	15	10	7
225 to 280	364/5 to 444/5	22	20	15	12
315 to 450	445/7 to 7008/9	25	25	20	15

The voltage and frequency variations may affect the performance characteristics and the electromagnetic compatibility of the motor. The power supply variations should not exceed the values specified in the applicable standards. Examples:

- ABNT NBR 17094 - Parts 1 and 2. The motor has been designed to supply the rated torque for a combined variation in voltage and frequency:
  - Zone A: ±5% of the rated voltage and ±2% of the rated frequency;
  - Zone B: ±10% of the rated voltage and +3% -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods.

- IEC 60034-1. The motor has been designed to supply the rated torque for combined variation in voltage and frequency:
  - Zone A: ±5% of the rated voltage and ±2% of the rated frequency;
  - Zone B: ±10% of the rated voltage and +3% -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods. For multivoltage motors (example 380-415/660 V), a ±5% voltage variation from the rated voltage is allowed.

- NEMA MG 1 Part 12. 7 ariations:
  - ±10% of the rated voltage, with rated frequency;
  - ±5% of the rated frequency, with rated voltage;
  - A combined variation in voltage and frequency of ±10%, provided the frequency variation does not exceed ±5%.

If the motor is cooled by ambient air, clean the air inlet and outlet openings and cooling fins at regular intervals to ensure a free airflow over the frame surface. The hot air should never be returned to the motor. The cooling air must be at room temperature limited to the temperature range indicated on the motor nameplate (if no room temperature is specified, please consider a temperature range between -20 °C and +40 °C).

Table 7.4 shows the minimum required water flow for water cooled motors considering the different frame sizes and the maximum allowed temperature rise of the cooling water after circulating through the motor. The inlet water temperature should not exceed 40 °C.

Table 7.4 *- Minimum required water flow and the maximum allowed temperature rise of the cooling water after circulating through the motor*

Frame size		Flow rate (litres/minute)	Maximum allowed water temperature rise (°C)
IEC	NEMA		
180	284/6	12	5
200	324/6	12	5
225	364/5	12	5
250	404/5	12	5
280	444/5 445/7 447/9	15	6
315	504/5	16	6
355	586/7 588/9	25	6

Motors fitted with oil mist lubrication systems can be operated continuously for a maximum of one hour after the failure of the oil pumping system.

Considering the sun's heat increases the operating temperature, externally mounted motors should always be protected from direct sunlight exposure.

Each and every deviation from the normal operating condition (tripping of the thermal protection, noise and vibration level increase, temperature and current rise) should be investigated and corrected by WEG Authorized Service Centers.

Motors fitted with cylindrical roller bearings require a minimum radial load to ensure a normal operation. For information regarding the radial preload, please contact WEG.

7.2.1.Limits of vibration

The vibration severity is the maximum vibration value measured at all positions and in all directions as recommended in the standard IEC 60034-14. Table 7.5 specifies the limits of the maximum vibrations magnitudes according to standard IEC 60034-14 for shaft heights IEC 56 to 400, for vibrations grades A and B. The vibration severity limits in Table 7.5 are given as RMS values (Root Mean Square values or effective values) of the vibration speed in mm/s measured in free suspension condition.

Table 7.5 *- Recommended limits for the vibration severity according to standard IEC 60034-14*

Shaft height [mm]	56 ≤ H ≤ 132	132 ≤ H ≤ 280	H > 280
Vibration grade	Vibration severity on elastic base [mm/s RMS]		
A	1.6	2.2	2.8
B	0.7	1.1	1.8

Notes:

1 - The values in Table 7.5 are valid for measurements carried out with decoupled machines (without load) operated at rated voltage and frequency.

2 - The values in Table 7.5 are valid regardless of the direction of rotation of the machine.

3 - The values in Table 7.5 are not applicable to single-phase motors, three-phase motors powered by a single-phase system or to machines mounted in situ or coupled with inertia flywheels or to loads.

According to NEMA MG 1, the allowed vibration limit for standard motors is 0.15 in/s (peak vibration in in/s).

Note:

For the load operation condition, the use of the standard ISO 10816-3 is recommended for evaluating the motor vibration limits. In the load condition the motor vibration will be influenced by several factors, such as, type of the coupled load, condition of the motor fixation, alignment condition under load, structure or base vibration due to other equipments, etc..

8. MAINTEN

The purpose of the maintenance is to extend the useful life of the equipment. The non-compliance with one of these previous items can cause unexpected machine failures.

If motors with cylindrical roller or angular contact bearings are to be transported during the maintenance procedures, the shaft locking device must always be fitted. All HGF motors, regardless of the bearing type, must always be transported with the shaft locking device fitted.

All repairs, disassembly and assembly related services must be carried out only by qualified and well-trained personnel by using proper tools and techniques. Make sure that the machine has stopped and it is disconnected from the power supply, including the accessory devices (space heater, brake, etc.), before any servicing is undertaken.
The company does not assume any responsibility or liability for repair services or maintenance operations executed by non-authorized Service Centers or by non qualified service personnel. The company shall have no obligation or liability whatsoever to the buyer for any indirect, special, consequential or incidental loss or damage caused or arising from the company's proven negligence

8.1. GENERAL INSPECTION

The inspection intervals depend on the motor type, application and installation conditions. Proceed as follows during inspection:

- Visually inspect the motor and coupling. Check if abnormal noises, vibrations, excessive heating, wear signs, misalignment or damaged parts are noticed. Replace the damaged parts as required;
- Measure the insulation resistance according to the item 5.4;
- Clean the motor enclosure. Remove oil spills and dust accumulation from the motor frame surface to ensure a better heat transfer to the surrounding ambient;
- Check cooling fan condition and clean the air inlet & outlet openings to ensure a free air flow over the motor;
- Investigate the actual condition of the seals and replace them, if required;
- Drain the condensed water from inside the motor. After draining, reinstall the drain plugs to ensure the degree of protection as indicated on the motor nameplate. The motor must always be positioned so the drain hole is at the lowest position (see item 6);
- Check the connections of the power supply cables, ensuring the correct clearance distance between live and grounded parts, as specified in Table 6.3;
- Check if the tightening torque of the bolted connections and mounting bolts meets the tightening torque specified in Table 8.11;
- Check the status of the cable passages, the cable gland seals and the seals inside the terminal box and replace them, if required;
- Check the bearing operating conditions. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions, like motor temperature rise. Check the oil level, the lube oil condition and compare the workings hours with the informed life time;
- Record and file all changes performed on the motor.

Do not reuse damaged or worn parts. Damaged or worn parts must be replaced by parts supplied by the manufacturer and must be installed as if they were the original parts.

8.2. LUBRICATION

Proper lubrication plays a vital role in the motor performance. Only use the grease or oil types, amounts and lubrication intervals recommended for the bearings. This information is available on the motor nameplate and the lubrication procedures must be carried out according to the type of lubricant (oil or grease).
When the motor is fitted with thermal protection devices for bearing temperature control, consider the operating temperature limits shown in Table 6.4.
The maximum operating temperature of motors used in special applications may differ from those shown in Table 6.4. The grease and oil disposal should be made in compliance with applicable laws in each country.

Please contact WEG when motors are to be installed in special environments or used for special applications.

8.2.1. Grease lubricate

Excess grease causes bearing overheating, resulting in bearing failure.

The lubrication intervals specified in Table 8.1, Table 8.2, Table 8.3, Table 8.4, Table 8.5, Table 8.6, Table 8.7 and Table 8.8 consider an absolute temperature on the bearing of 70 °C (up to frame size IEC 200 / NEMA 324/6) and 85 °C (for frame size IEC 225 / NEMA 364/5 and above), the motor running at rated speed, a motor mounted in horizontal position and greased with Mobil Polyrex EM grease. Any variation of the parameters listed above must be evaluated.

Table 8.1 *- Lubrication intervals for ball bearings*

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)					
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)	
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
90	143/5	2	6205	4	-	-	20000	20000	25000	25000
		4								
		6								
		8								
100	-	2	6206	5	-	-	20000	20000	25000	25000
		4								
		6								
		8								
112	182/4	2	6207/ 6307	9	-	-	20000	20000	25000	25000
		4								
		6								
		8								
132	213/5	2	6308	11	-	-	20000	18400	25000	23200
		4					20000	20000	25000	25000
		6								
		8								
160	254/6	2	6309	13	20000	20000	18100	15700	22000	20000
		4					20000	20000	25000	25000
		6								
		8								
180	284/6	2	6311	18	20000	20000	13700	11500	17000	14000
		4					20000	20000	25000	25000
		6								
		8								
200	324/6	2	6312	21	20000	20000	11900	9800	15000	12000
		4					20000	20000	25000	25000
		6								
		8								
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	2	6314	27	18000	14400	4500	3600	5000	4000
		4			20000	20000	11600	9700	14000	12000
		6					16400	14200	20000	17000
		8					19700	17300	24000	20000
		2	6316	34	14000	*Upon request	3500	*Upon request	4000	*Upon request
		4			20000	20000	10400	8500	13000	10000
		6					14900	12800	18000	16000
		8					18700	15900	20000	20000
		2	6319	45	*Upon request					
		4			20000	20000	9000	7000	11000	8000
		6					13000	11000	16000	13000
		8					17400	14000	20000	17000
		4	6322	60	20000	20000	7200	5100	9000	6000
		6					10800	9200	13000	11000
		8					15100	11800	19000	14000

ENGLISH

Frame		Poles	Bearing designation	Amount of grease (g)	LUBRICATION INTERVALS (hours)					
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)	
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
160	254/6	2	NU309	13	20000	19600	13300	9800	16000	12000
		4				20000	20000	20000	25000	25000
		6								
		8								
180	284/6	2	NU311	18	18400	12800	9200	6400	11000	8000
		4			20000	20000	20000	19100	25000	25000
		6						20000		
		8								
200	324/6	2	NU312	21	15200	10200	7600	5100	9000	6000
		4			20000	20000	20000	17200	25000	21000
		6						20000		25000
		8								
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	4	NU314	27	17800	14200	8900	7100	11000	9000
		6			20000	20000	13100	11000	16000	13000
		8					16900	15100	20000	19000
		4	NU316	34	15200	12000	7600	6000	9000	7000
		6			20000	19000	11600	9500	14000	12000
		8				20000	15500	13800	19000	17000
		4	NU319	45	12000	9400	6000	4700	7000	5000
		6			19600	15200	9800	7600	12000	9000
		8			20000	20000	13700	12200	17000	15000
		4	NU322	60	8800	6600	4400	3300	5000	4000
		6			15600	11800	7800	5900	9000	7000
		8			20000	20000	11500	10700	14000	13000

Table 8.3 - Lubrication intervals for ball bearings - HGF line

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	6314	27	3100	2100
		4 - 8	6320	50	4500	4500
			6316	34	4500	4500
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T	2	6314	27	3100	2100
		4 - 8	6322	60	4500	4500
			6319	45	4500	4500
400L/A/B and 400 C/D/E	6806/7/8T and 6809/10/11T	2	6315	30	2700	1800
		4 - 8	6324	72	4500	4500
			6319	45	4500	4500
450	7006/10	2	6220	31	2500	1400
		4	6328	93	4500	3300
			6322	60	4500	4500
		6 - 8	6328	93	4500	4500
			6322	60	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 - 8	6330	104	4500	4500
			6324	72	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 - 8	6330	104	4500	4500
			6324	72	4500	4500
560	8806/10	4 - 8	*Upon request			
630	9606/10	4 - 8				

ENGLISH

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8 and 5009/10/11	4	NU320	50	4300	2900
		6 - 8			4500	4500
355L/A/B and 355C/D/E	5807/8/9 and 5810/11/12	4	NU322	60	3500	2200
		6 - 8			4500	4500
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11	4	NU324	72	2900	1800
		6 - 8			4500	4500
450	7006/10	4	NU328	93	2000	1400
		6			4500	3200
		8			4500	4500
500	8006/10	4	NU330	104	1700	1000
		6			4100	2900
		8			4500	4500
560	8806/10	4	NU228 + 6228	75	2600	1600
		6 - 8		106	4500	4500
630	9606/10	4	NU232 + 6232	92	1800	1000
		6		120	4300	3100
		8		140	4500	4500

Tabela 8.5 *- Lubrication intervals for ball bearings - W50 line*

	Frame		Poles	D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	N.D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Ball bearings	315 H/G	5009/10	2	6314	27	4500	3500	6314	27	4500	3500
			4 - 8	6320	50		4500	6316	34		4500
	355 J/H	5809/10	2	6314	27		3500	6314	27		3500
			4 - 8	6322	60		4500	6319	45		4500
	400 L/K and 400 J/H	6806/07 and 6808/09	2	6218	24	3800	2500	6218	24	3800	1800
			4 - 8	6324	72	4500	4500	6319	45	4500	4500
	450 L/K and 450 J/H	7006/07 and 7008/09	2	6220	31	3000	2000	6220	31	3000	2000
			4	6328	93	4500	3300	6322	60	4500	4500
			6 - 8				4500				
Vertical mounting Ball bearings	315 H/G	5009/10	2	7314	27	2500	1700	6314	27	2500	1700
			4	6320	50	4200	3200	6316	34	4500	4500
			6 - 8			4500	4500				
	355 J/H	5809/10	2	7314	27	2500	1700	6314	27	2500	1700
			4	6322	60	3600	2700	6319	45	4500	3600
			6 - 8			4500	4500				4500
	400 L/K and 400 J/H	6806/07 and 6808/09	2	7218	24	2000	1300	6218	24	2000	1300
			4	7324	72	3200	2300	6319	45	4500	3600
			6			4500	4300				4500
			8				4500				
	450 L/K and 450 J/H	7006/07 and 7008/09	2	7220	31	1500	1000	6220	31	1500	1000
			4	7328	93	2400	1700	6322	60	3500	2700
			6			4100	3500			4500	4500
			8			4500	4500				

Tabela 8.6 *- Lubrication intervals for cylindrical roller bearings - W50 line*

	Frame		Poles	D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	N.D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Roller bearings	315 H/G	5009/10	4	NU320	50	4300	2900	6316	34	4500	4500
			6 -8			4500	4500				
	355 J/H	5809/10	4	NU322	60	3500	2200	6319	45		
			6 - 8			4500	4500				
	400 L/K and 400 J/H	6806/07 and 6808/09	4	NU324	72	2900	1800				
			6 - 8			4500	4500				
	450 L/K and 450 J/H	7006/07 and 7008/09	4	NU328	93	2000	1400	6322	60		
			6			4500	3200				
			8				4500				

	Frame		Poles	D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	N.D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Ball bearings	315G/F	5010/11	2	6314	27	4500	4500	6314	27	4500	4500
			4 - 8	6319	45	4500	4500	6314	27	4500	4500
	355 J/H	L5010/11	2	6218	24	4500	4500	6218	24	4500	4500
			4 – 8	6224	43	4500	4500	6218	24	4500	4500
	400 J/H	L5810/11	2	6220	31	4500	3800	6220	31	4500	3800
			4 – 8	6228	52	4500	4500	6220	31	4500	4500
	450 K/J	L6808/09	2	6220	31	4500	3800	6220	31	4500	3800
			4 – 8	6228	52	4500	4500	6220	31	4500	4500

Tabela 8.8 *- Lubrication intervals for cylindrical roller bearings - W40 line*

	Frame		Poles	D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	N.D.E. Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Roller bearings	315G/F	5010/11	4 - 8	NU319	45	4500	4500	6314	27	4500	4500
	355 J/H	L5010/11	4 – 8	NU224	43	4500	4500	6218	24	4500	4500
	400 J/H	L5810/11	4 – 8	NU228	52	4500	3300	6220	31	4500	4500
	450 K/J	L6808/09	4 – 8	NU228	52	4500	3300	6220	31	4500	4500

For each increment of 15 °C above the bearing temperature, the relubrication intervals given in the Table must be halved. The relubrication interval of motors designed by the manufacturer for mounting in horizontal position, but installed in vertical position (with WEG authorization), must be halved.
For special applications, such as: high and low temperatures, aggressive environments, driven by frequency inverter (VFD - frequency inverter), etc., please contact WEG about the required amount of grease and the relubrication intervals.

8.2.1.1. Motor without grease fitting

Motors without grease fittings must be lubricated in accordance with the existing Maintenance Plan. Motor disassembly must be carried out as specified in Item 8.3. If motors are fitted with shielded bearings (for example, ZZ, DDU, 2RS, VV), these bearings must be replaced at the end of the grease service life.

8.2.1.2. Motor with grease fitting

To lubricate the bearings with the motor stopped, proceed as follows:
- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Lift grease inlet protection;
- Remove the grease outlet plug;
- Pump in approximately half of the total grease indicated on the motor nameplate and run the motor for about 1 (one) minute at rated speed;
- Switch-off the motor and pump in the remaining grease;
- Lower again the grease inlet protection and reinstall the grease outlet protection.

To grease the motor while running, proceed as follows:
- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Pump the total grease indicated on the motor nameplate;
- Lower again the grease inlet protection.


For lubrication, use only manual grease gun.

If Motors are provided with a spring device for grease removal, the grease excess must be removed by pulling the rod and cleaning the spring until the spring does not remove more grease.

8.2.1.3. Compatibility of the Mobil Polyrex EM grease with other greases

The Mobil Polyrex EM grease has a polyurea thickener and a mineral oil and it is not compatible with other greases.
If you need another type of grease, contact WEG.
It is not recommended to mix different types of greases. In such a case, clean the bearings and lubrication channels before applying new grease.
The used grease must have in its formulation corrosion and oxidation inhibitors.

8.2.2. Oil lubricated bearings

To change the oil of oil lubricated motor proceed as follows:
- Switch-off the motor;
- Remove threaded oil drain plug;
- Open the valve and drain the oil;
- Close the drain valve again;
- Reinstall the threaded oil drain plug;
- Fill-up with the type and amount of oil as specified on the nameplate;
- Check oil level. The oil level is OK when the lubricant can be viewed approximately in the center of the sight glass;
- Reinstall oil inlet plug;
- Check for oil leaks and ensure that all not used threaded plugs are closed with plugs.

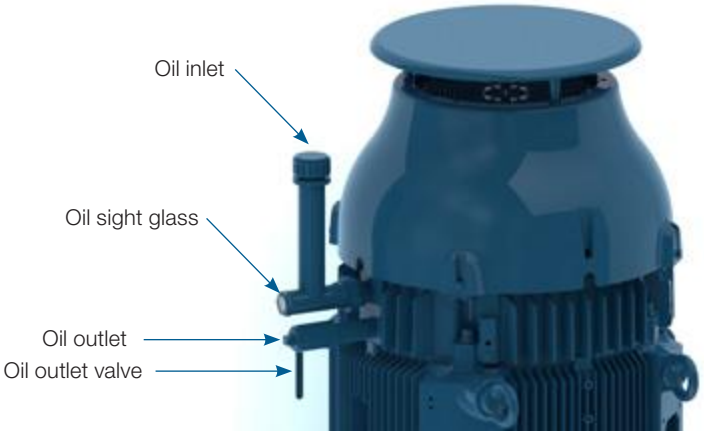


Figure 8.1 *- Oil lubricated bearing - vertical mounting*

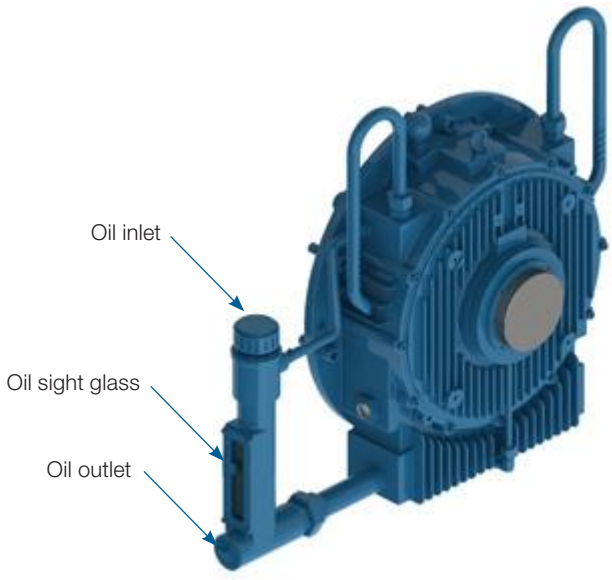


Figure 8.2 *- Oil lubricated bearing - horizontal mounting*

The bearing lubric r changes in the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and must be kept in the center of the sight glass.
Please contact WEG, when oils with different viscosities should be used.

***Note**:*
The HGF vertical mounted motors with high axial thrust are supplied with grease lubricated DE-bearings and with oil lubricated NDE-bearings. The DE-bearings must be lubricated according to recommendations in item 8.2.1. Table 8.9 specifies the oil type and the amount of oil required for this motor lubrication.

***Table 8.9** - Oil properties for HGF vertical mounted motors with high axial thrust*

Mounting - high axial thrust	Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
	IEC	NEMA						
	315L/A/B e 315C/D/E	5006/7/8T e 5009/10/11T	4 - 8	29320	20	8000	FUCHS Renolin DTA 40 / Mobil SHC 629	ISO VG150 mineral oil with antifoam and antioxidant additives
	355L/A/B e 355C/D/E	5807/8/9T e 5810/11/12T	4 - 8	29320	26			
	400L/A/B e 400C/D/E	6806/7/8T e 6809/10/11T	4 - 8	29320	37			
	450	7006/10	4 - 8	29320	45			

8.2.3. Oil mist lubricated bearings

Check the service conditions of the seals and if replacement is required use only original components. Clean the seal components before assembly (bearing caps, end shields, etc.).
Apply joint sealant between the bearing caps and end shields. The joint sealant must be compatible with the used lubricating oil. Connect the oil lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12.

8.2.4. Sleeve bearings

The lubricating oil of sleeve bearings must be changed at the intervals specified in Table 8.10. To replace the oil, proceed as follows:
- NDE-bearing: remove the protection plate from the fan cover;
- Drain the oil through the drain hole located at the bottom of the bearing (see Figure 8.3);
- Close the oil drain hole;
- Remove the oil inlet plug;
- Fill the sleeve bearing with the specified oil and with the amount of oil specified in;
- Check the oil level and ensure it is kept close to the center of the sight glass;
- Install the oil inlet plug;
- Check for oil leaks.

***Figure 8.3** - Sleeve bearing*

Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
IEC	NEMA						
315	5000	2	9-80	2.8	8000	FUCHS Renolin DTA 10	ISO VG32 mineral oil with antifoam and antioxidant additives
355	5800						
400	6800						
450	7000						
315	5000	4 - 8	9-90	2.8	8000	FUCHS Renolin DTA 15	ISO VG46 mineral oil with antifoam and antioxidant additives
355	5800		9-100				
400	6800		11-110	4.7			
450	7000		11-125				
500	8000						

The lubricating oil must be replaced as specified on the nameplate or whenever changes on the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and kept in the center of the sight glass.
Please contact WEG, when oils with different viscosities are to be used.

8.3. MOTOR ASSEMBLY AND DISASSEMBLY

All repair services on motors should be always performed by qualified personnel and in accordance with the applicable laws and regulations in each country. Always use proper tools and devices for motor disassembly and assembly.

Disassembly and assembly services can be carried out only after the motor has been disconnected from the power supply and is completely stopped.

Dangerous voltages may be present at the motor terminals inside the terminal box since capacitors can retain electrical charge for long periods of time even when they are not connected directly to a power source or when space heaters are connected to the motor or when the motor windings are used as space heaters. Dangerous voltages may be present at the motor terminals when they are driven by frequency inverter even when they are completely stopped.

Record the installation conditions such as terminal connection diagram, alignment / leveling conditions before starting the disassembly procedures. These records should be considered for later assembly.

Disassemble the motor carefully without causing scratches on machined surfaces or damaging the threads.

Assemble the motor on a flat surface ensuring a good support base. Footless motors must be fixed/locked on the base to prevent accidents.

Handle the motor carefully to not damage the insulated components such as windings, insulated rolling bearings, power cables etc..

Seal elements, such as joint seals and bearing seals should always be replaced when wear or damage is noticed.
Motors with degree of protection higher than IP55 are supplied with joint and screw seal Loctite 5923 (Henkel) Clean the components and apply a new coat of Loctite 5923 on the surfaces before assembly.

For the W50 and HGF motor lines provided with axial fans, the motor and the axial fan have different markings for indicating the direction of rotation for prevent incorrect assembly.
The axial fan must be assembled so that the indicative arrow for direction of rotation is always visible, viewing the non-drive end side. The marking indicated on the axial fan blade, CW for clockwise direction of rotation or CCW for counterclockwise direction of rotation, indicates the direction of rotation of the motor viewing the drive end side.

8.3.1. Terminal b

Proceed as follows to remove the terminal box cover and to disconnect/connect the power supply cables and the cables of the accessory devices:

- Ensure that during the screw removal the terminal box cover does not damage the components installed inside the terminal box;
- If the terminal box cover is fitted with lifting eyebolt, lift the terminal box cover always by its lift eyebolt;
- If motors are supplied with terminal blocks, ensure the correct tightening torque on the motor terminals as specified in Table 8.11;
- Ensure that the cables do not contact sharp edges;
- Ensure that the original IP degree of protection is not changed and is maintained as indicate on the motor nameplate. The power supply cables and the control cables must always be fitted with components (cable glands, conduits) that meet the applicable standards and regulations of each country;
- Ensure that the pressure relief device is in perfect operating condition, if provided. The seals in the terminal box must be in perfect condition for reuse and must be reinstalled correctly to ensure the specified degree of protection;
- Ensure the correct tightening torque for the securing bolts of the terminal box cover as specified in Table 8.11.

Table 8.11 *- Tightening torque for the securing bolts [Nm]*

Screw type and seal	M4	M5	M6	M8	M10	M12	M14	M16	M20
Hex bolt/hex socket bolt (rigid joint)	-	3,5 to 5	6 to 9	14 to 20	28 to 40	45 to 70	75 to 110	115 to 170	230 to 330
Combined slotted screw (rigid joint)	1,5 to 3	3 to 5	5 to 10	10 to 18	-	-	-	-	-
Hex bolt/hex socket bolt (flexible joint)	-	3 to 5	4 to 8	8 to 15	18 to 30	25 to 40	30 to 45	35 to 50	-
Combined slotted screw (flexible joint)	-	3 to 5	4 to 8	8 to 15	-	-	-	-	-
Terminal blocks	1 to 1,5	2 to 4 1)	4 to 6,5	6,5 to 9	10 to 18	15,5 to 30	-	30 to 50	-
Grounding terminals	1,5 to 3	3 to 5	5 to 10	10 to 18	28 to 40	45 to 70	-	115 to 170	

Note: 1) For 12-pin terminal block, apply the minimum torque of 1.5 Nm and maximum torque of 2.5 Nm.

8.4. DRYING THE STATOR WINDING INSULATION

Dismantle the motor completely. Remove the end shields, the rotor with the shaft, the fan cover, the fan and the terminal box before the wound stator with the frame is transferred to the oven for the drying process. Place the wound stator in the oven heated to max. 120 °C for two hours. For larger motors a longer drying time may be required. After the drying process has been concluded, allow the stator to cool to room temperature. Measure the insulation resistance again as described in item 5.4. Repeat the stator drying process if the required insulation resistance does not meet the values specified in Table 5.3. If the insulation resistance does not improve despite several drying processes, evaluate the causes of the insulation resistance drop carefully and an eventual replacement of the motor winding may be required. If in doubt contact WEG.

To prevent electrical shock, discharge the motor terminals immediately before, and after each measurement. If the motor is equipped with capacitors, these must be discharged before beginning any repair.

8.5. SPARE PARTS

When ordering spare parts, always provide complete motor designation, indicating the motor type, the code number and the serial number, which are stated on the motor nameplate.

Spare parts must always be purchased from WEG authorized Service Centers. The use of non-original spare parts can cause motor failure, performance drop and void the product warranty.

The spare parts must be stored in a clean, dry and properly ventilated room, with relative air humidity not exceeding 60%, with ambient temperature between 5 °C and 40 °C, free of dust, vibrations, gases, corrosive smokes and at constant temperature. The spare parts must be stored in their normal mounting position without placing other components onto them.

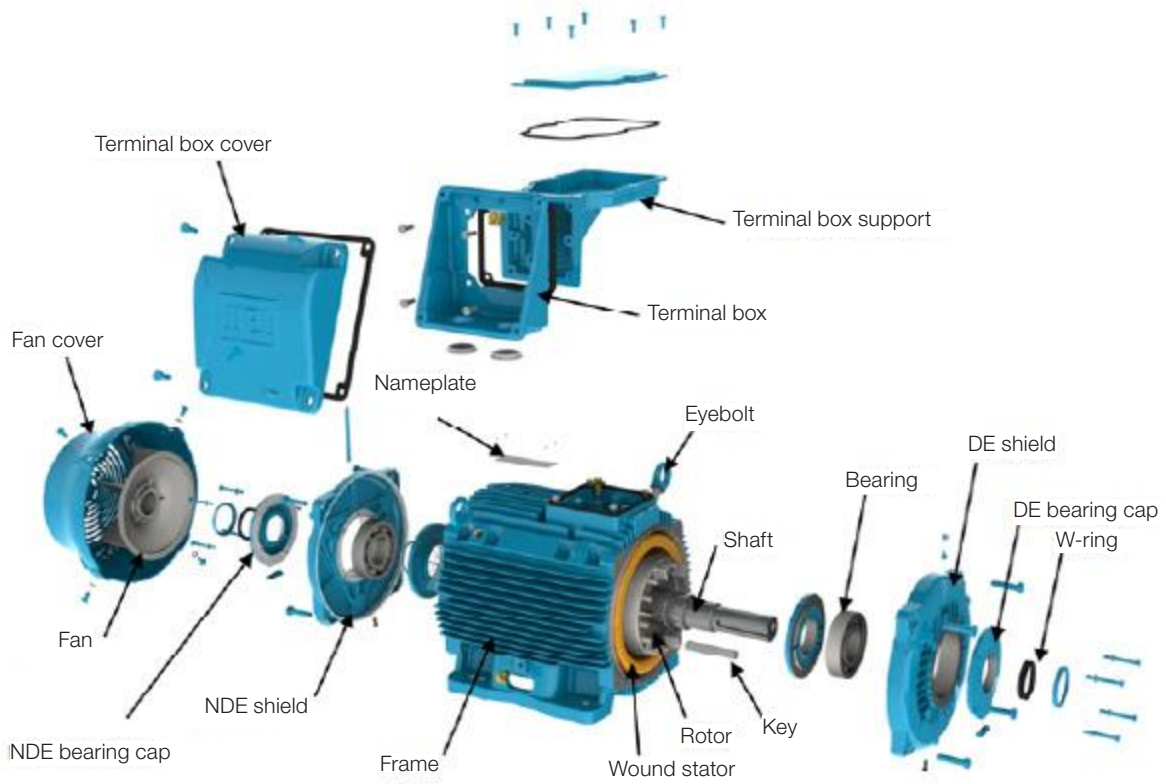


Figure 8.4 *- Exploded view of the components of a W22 motor*

9. ENVIRON

9.1. PACKAGING

WEG electric motors are supplied in cardboard, plastic or wooden packaging. These materials can be recycled and must be disposed according to the applicable laws and regulations in each country. All wood used in the packaging of WEG motors come from the company reforestation program and is not submitted to any chemical conservation treatment.

9.2. PRODUCT

Electric motors consist mainly of ferrous metals (steel plates and cast iron), non ferrous metals (copper and aluminum) and plastic materials.

In general, electric motors have relatively long service live. However when they must be discarded, WEG recommends to dismantle the motor, sort the different materials and send them for recycling.

No-recyclable materials should be disposed of at industrial landfills according to the applicable environmental laws and regulations in each country, or co-processed in cement kilns or incinerated.

The recycling service providers, the disposal in industrial landfills, the waste co-processing or the incineration process must be properly authorized by the state environment agency to carry out these activities.

10. TROUBLESH

This troubleshooting chart provides a basic list of problems that may occur during motor operation, possible causes and recommended corrective actions. In case of doubts, please contact WEG Service Center.

Problem	Possible cause	Corrective action
Motor does not start, neither coupled nor decoupled	Power cables are interrupted	Check the control panel and the motor power supply cables
	Blown fuses	Replace blown fuses
	Wrong motor connection	Correct the motor connection according to connection diagram
	Locked rotor	Check motor shaft to ensure that it rotates freely
The motor starts at no-load, but fails when load is applied. It starts very slowly and does not reach the rated speed	Load toque is too high during start-up	Do not start the motor on load
	Too high voltage drop in the power cables	Check the installation dimensioning (transformer, cable cross section, relays, circuit breakers, etc.)
Abnormal/excessive noise	Defective transmission component or defective driven machine	Check the transmission force, the coupling and the alignment
	Misaligned / unleveled base	Align / level the motor with the driven machine
	Unbalanced components or unbalanced driven machine	Balance the machine set again
	Different balancing methods used for motor and coupling balancing (halve key, full key)	Balance the motor again
	Wrong motor direction of rotation	Reverse the direction of rotation
	Loose bolts	Retighten the bolts
	Foundation resonance	Check the foundation design
	Damaged bearings	Replace the bearings
Motor overheating	Insufficient cooling	Clean air inlet and outlet and cooling fins
		Check the minimum required distance between the fan cover and nearest walls. See item 7
		Check air temperature at inlet
	Overload	Measure motor current, evaluate motor application and if required, reduce the load
	Number of starts per hour is too high or the load inertia moment is too high	Reduce the number of starts per hour
	Power supply voltage too high	Check the motor power supply voltage. Power supply voltage must not exceed the tolerance specified in item 7.2
	Power supply voltage too low	Check the motor power supply voltage and the voltage drop. Power supply voltage must not exceed the tolerance specified in item 7.2
	Interrupted power supply	Check the connection of the power cables
	Voltage unbalance at the motor terminals	Check for blown fuses, wrong commands, voltage unbalance in the power line, phase fault or interrupted power cables
	Direction of rotation is not compatible with the unidirectional fan	Check if the direction of rotation matches the rotation arrow indicated on end shield
Bearing overheating	Excessive grease/oil	Clean the bearing and lubricate it according to the provided recommendations
	Grease/oil aging	
	The used grease/oil does not matches the specified one	
	Lack of grease/oil	Lubricate the bearing according to the provided recommendations
	Excessive axial or radial forces due to the belt tension	Reduce the belt tension
		Reduce the load applied to the motor

SCP MASTER SEAL SCREW CONVEYOR SHAFT SEAL

SCP MASTER SEAL DESCRIPTION

Screw Conveyor Shaft Seal, SCP Master Seal, Stainless Steel (316SS) Cover Plates, UHMW Body, Teflon Rotor Cups, Silicon Elastomer.

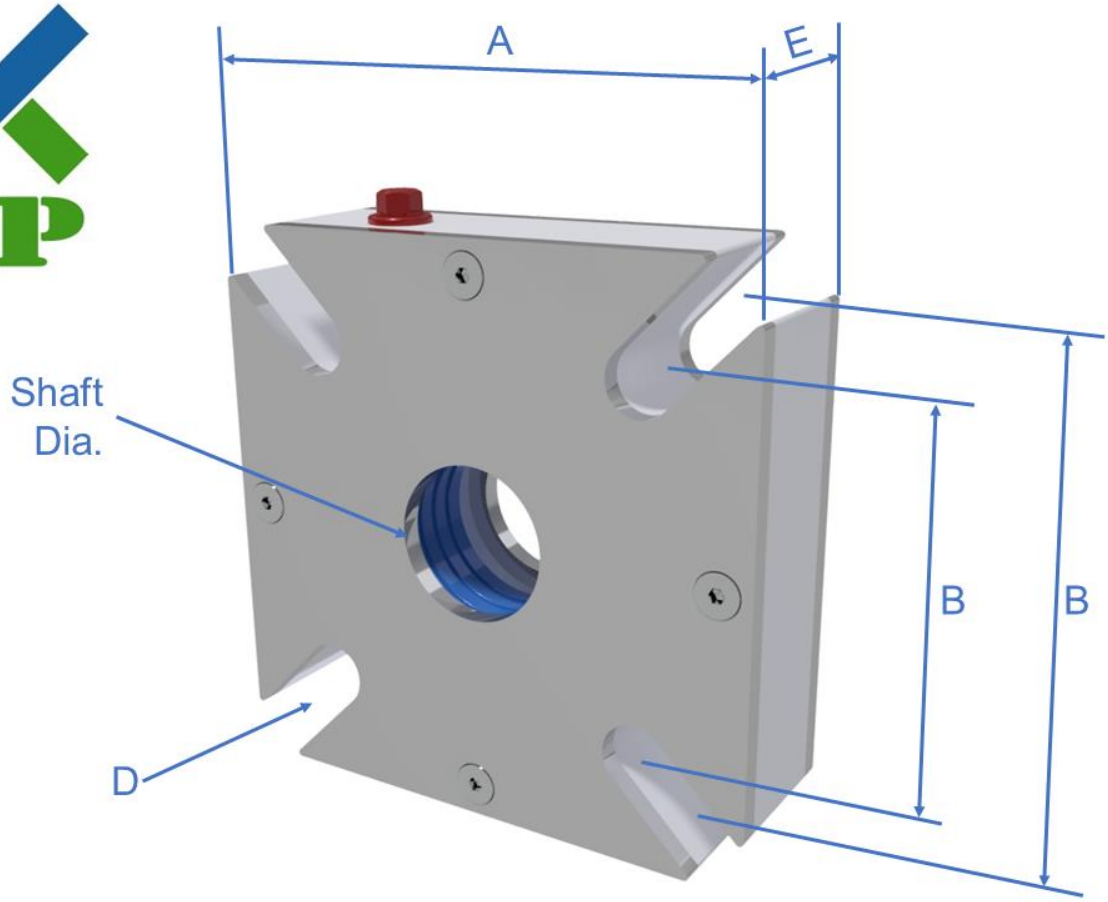
ADVANTAGES OF THE SCP MASTER SEAL:

1. This is a fully mechanical screw conveyor shaft seal with Teflon rotors cups sealing against 316SS face plates. This sealing mechanism eliminates the traditional Teflon rope against the conveyor shaft leading to premature seal and shaft failure.
2. Optional air purge keeps the sealing surfaces clean of contaminants and increases screw conveyor shaft seal life, even in the most abrasive products such as sand, coal dust, minerals and metal recyclables.
3. This mechanical screw conveyor shaft seal takes the place of traditional waste pack and plate seals meaning a superb sealing option is available without the need for costly upgrades to existing and new-build screw conveyors.

4. With a housing made of 316 Stainless Steel and UHMW, this seal is well suited for any environment and will usually outlast the conveyor it is attached to.
5. This seal is completely rebuildable without needing to be removed from the shaft. Over time abrasive products can take their toll on any seal so easy to install rebuild kits are available and can be installed in as little as 30m.

Screw Conveyor Parts, LLC
PO Box 470187, Fort Worth, TX 76147
(682) 231-1228 GetHelp@ScrewConveyorParts.Com
www.ScrewConveyorParts.com

6. Affordability – For a few hundred bucs over the cost of a waste pack seal, these seals will pay for them selves over and over.



Shaft Dia.	A (SQ.)	B – Min (SQ.)	B – Max (SQ.)	D (Bolts)	E
1 1/2”	5 3/8”	4”	4 1/8”	1/2”	1 5/8”
2”	6 1/2”	4 3/8”	5 1/8”	5/8”	1 5/8”
2 7/16”	7 3/8”	5 3/8”	5 5/8”	5/8”	1 5/8”
3”	7 3/4”	6”	6”	3/4”	1 5/8”
3 7/16”	9 1/4”	6 3/4”	7”	3/4”	1 5/8”

Dimensionally the same as a std Waste Pack Seal

Screw Conveyor Parts, LLC
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www.ScrewConveyorParts.com

INSTALLATION INSTRUCTIONS

1. The Seal is shipped in its final assembled configuration.
2. Loosen spring tension ring two 360* turns via the adjustment port.
3. Slide seal along shaft and position seal at vessel end wall. If resistance is present, lubricate with dissipating solution, (eg) soapy water.
4. Test perpendicularity with square, seal must be square to the shaft within 1/16".
5. Secure seal with mounting bolts using torque wrench at 20-25 foot pounds of torque. DO NOT OVER TIGHTEN.
6. Once seal is secured in position, retighten spring tension ring the two 360* turns, or three finger tight. DO NOT OVER TIGHTEN.
7. Install air purge gauge at either of the two ports, set the purge pressure at 5-10 psi above any internal vessel pressure. Purge should be detectable at the lip of the 316SS mounting plate, if no purge detected, increase the purge pressure or loosen the spring tension ring, at ¼ turn increments. Use clean dry air, or silicone based grease.
8. If any product leakage is detected, adjust the spring tension ring, at ¼ turn increments, or increase air purge.
9. Test Seal for any heat at the outboard endplate, if heat is present loosen spring tension ring and check perpendicularity of seal to shaft.

Routine checks of seal is suggested, as the rotor assembly will seat itself upon operation. This will be evidenced by a slight flaking of the Teflon rotor cup. The spring tension ring should be adjusted at ¼ turn increments. This will compress the silicone elastomer slightly causing it to spread laterally, maintaining correct pressure / tension between the stationary and rotating faces.

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Screw Conveyor Parts, LLC (SCP) Terms and Conditions of Sale

DEFINITIONS: "SCP" shall refer to the Screw Conveyor Parts, LLC. "Customer" shall refer to the legal entity whom paid for, is using, is going to use, or who will at any time have procession of portion or whole of the parts, equipment and services supplier by Screw Conveyor Parts, LLC. "Equipment" shall refer to all parts, pieces, equipment, components and any other items or services sold through or by Screw Conveyor Parts, LLC. "Supplier" shall refer to and legal entity who supplies any parts, pieces, equipment, components and any other items or services sold through or by Screw Conveyor Parts, LLC

TERMS OF PAYMENT: All invoices are due and payable in Tarrant County, Texas. All credit sales are due in full within thirty (30) days from the date of invoice, unless otherwise agreed to in writing or stated in the invoice. No discount is allowed for earlier payment unless authorized by SCP in writing. Accounts past due shall accrue interest at the highest rate allowed by applicable law.

LIMITED WARRANTY: Equipment sold by SCP and manufactured by others is not warranted in any way by SCP and carries only the manufacturer's warranty, if any. SCP MAKES NO OTHER WARRANTY OF ANY KIND AND HEREBY DISCLAIMS ALL WARRANTIES EXCEPT THE LIMITED WARRANTY HEREBY STATED, BOTH EXPRESS AND IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. All warranty claims must be submitted to SCP within ten (10) days of discovery of defects or shall be deemed waived, without prior approval in writing.

LIMITATIONS OF LIABILITY: It is expressly understood that SCP's liability is limited to that of the original manufacturer's warranty as described above. SCP SHALL NOT BE LIABLE, UPON WARRANTIES OR OTHERWISE, FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES FOR ANY DAMAGES ARISING FROM THE USE OF EQUIPMENT. Thus, SCP is not liable for any other expense, loss or damage including, but not limited to loss of profits, production, increased cost of operation, spoilage arising in connection with the sale or use of, or inability to use the purchased equipment or products for any reason, except as herein provided.

JURISDICTION AND VENUE: It is expressly understood that this sale of products or equipment was negotiated, executed, consummated and is otherwise performable in Tarrant County, Texas, and shall be governed, construed and interpreted as to validity, enforcement and in all other respects in accordance with the laws of the State of Texas, and the laws of the United States of America, as applicable. SCP has its principal place of business in Tarrant County, Texas, which county shall be the proper place of venue to enforce payment or performance. Purchasers irrevocably agree that any legal proceeding arising out of or in connection with this sale shall be brought in the state courts of Tarrant County, Texas, or the United States District Court for the judicial district in which Tarrant County is located.

SAFETY DEVICES: SCP will supply only such safety devices as are specified in writing by the customer. Any additional safety measures or devices which may be required by law, or which the customer wishes to add, are to be furnished by the customer or, at the customer's written request, the safety devices will be furnished by SCP at additional cost to the customer. The aforementioned safety devices include, but are not limited to; interlocks, limit switches, overflow relief switches, shear pins, emergency stop switches, emergency stop pull cables and point-of-operation switches.

User Training: Customer agrees that it assumes sole responsibility and liability for training of its employees, contractors, agents, and other end users in the safe operation of the SCP sold equipment. Customer agrees that it has not retained nor paid SCP to provide safety training, operational training, or best-practices advice or input regarding the operation of any SCP sold equipment, or the types of safety devices best suited for the customer's usage of the purchased equipment. Customer acknowledges that it has superior information and control over the manner in which the SCP sold equipment will be incorporated as a component part into customer's processes, and that the customer is in a superior position to specify appropriate safety devices and to design safety training protocols to conform to equipment usage. Customer releases, indemnifies, and holds harmless SCP, or any of its suppliers, for any claims related to the safe operations of its equipment.

Indemnity: Customer agrees to defend, indemnify and hold harmless SCP for any liability arising out of any injuries, damage, or casualty loss of any kind whatsoever experienced by customer, its employees, contractors, or assigns arising out of or involving in any way customer's utilization or operation of SCP sold equipment or any component part thereof. Such defense and indemnity obligation includes any and all claims arising out of any allegation of SCP's own alleged negligence or any alleged manufacturing, design, or warning defect or deficiency asserted against SCP, or its suppliers.

Arbitration: Customer agrees that any claim or dispute of any kind whatsoever arising out of the terms of the sale and purchase of SCP's sold equipment, any injuries, damage, or loss associated therewith, or any claim asserted on behalf of customer, its employees, agents, or assigns arising out of the operation or utilization thereof will be resolved solely through mandatory binding arbitration as the parties' exclusive remedy.

SAFETY WARNING LABELS: All equipment sold by SCP has warning labels affixed in many easily seen locations. Additional safety stickers are available upon request from the Conveyor Equipment Manufacturer's Association (CEMA – www.cemanet.org). Please refer to CEMA Safety Program, along with Warning and Safety Reminders for Screw, Drag and Bucket Elevator Conveyors, CEMA Safety Label Placement Guide and CEMA Safety Labels documents for further information. SCP's suppliers will supply standard safety warning labels as recommended by CEMA or equivalent industry standards. Customer acknowledges that it has superior information regarding the manner in which the SCP sold equipment will be incorporated into customer's manufacturing processes, and the skill level and language abilities of customer's employees who may interface with the equipment. Customer agrees that it is solely responsible for any additional safety signage, warnings, or other safety requirements particular to its employees or utilization of the SCP sold equipment, and customer hereby releases, indemnifies, and holds harmless SCP and its suppliers for any liabilities arising out of same.

CONTRACTS: All contracts are made and accepted in Fort Worth, Texas, and are not valid until written and signed acknowledgement from SCP. It is the intent and purpose of SCP to surrender title to the sold equipment when final payment is made, including shipping charges. Possession may be given before final payment is due, and to protect SCP against default in payment or in the event of an execution or attachment is levied on the customer's property, it is hereby expressly agreed:

(A) The title and right of possession to the sold equipment shall remain with SCP until full and final payment is made, including shipping charges;

(B) No part of the sold equipment shall be considered a fixture or incorporated into the realty by virtue of its attachment to real estate and any part may be separated from such real estate for the purpose of re-possession by SCP or by its agents in the event of a default by purchaser;

(C) SCP shall have the right to elect a claim of mechanic's lien against the property upon which this material is situated and waive its rights to re-possess under Paragraphs (A) and (B) above any time before expiration of the time fixed by law for filing a mechanic's lien;

(D) Acceptance or acknowledgement of any order, quotation or contract is with the express understanding that a "no lien agreement" has not been filed.

DELIVERY: Delivery or shipment lead times or dates represent only the best estimate of the time required to complete the work and ship the material from the SPC supplier or office. All orders are accepted with the understanding that shipping dates are approximate and subject to change because of, but not limited to factory conditions, fires, strikes, material shortages, civil or military authority, mandatory priority and/or other causes beyond the knowledge or control of SCP.

CANCELLATION: Orders received by SCP are not subject to cancellation and no cancellations will be accepted except upon terms that will INDEMNIFY SCP against loss. Accepted order cancellations will include a 15% charge and/or charges for any work performed prior to written notification, whichever is greater.

SHIPPING: All orders are made F.O.B. Fort Worth, Texas, or the location of the supplier unless otherwise indicated. All shipping charges are subject to a minimum 15% mark-up. SCP responsibility ceases when delivery has been made to the transportation company. All equipment shall be checked for damage immediately upon arrival by the customer. If there are shortages or evidence of damage upon delivery, the customer should insist on the transportation agent making notations on the shipping documents before signing the receipt. SCP will cooperate with customers, when desired, in obtaining adjustments from the transportation company due to loss or damage. If assistance is required of SCP, written notification must be received from the customer by SCP within 24 hours of receipt of the equipment and have been documented on the transportation company's receipt. Do not attempt to install damaged component equipment. Claims for errors or shortages existing prior to delivery of the equipment to the carrier will be considered only when made known to SCP within 24 hours of receipt of equipment.

RETURNED GOODS: No material will be accepted for return unless such return is first authorized in writing by SCP. Accepted returns will include a 15% charge plus any restocking fees accessed to SCP. Customer will pay all shipping charges to return the equipment.

SPECIAL TAXES: Any federal, state or city sales tax or other manufacturers' or processors' tax, if any when assessed, will be added to the invoice.

PAINTING: SCP sold equipment will be shipped with one coat of standard shop paint to all outside accessible unfinished surfaces, and a protective coat to all machine-finished surfaces. This coating is meant to prevent major corrosion. This coating is not cosmetic and minor scratches, scuffs, surface rust and wear are to be expected. This coating is not meant to be protective for any period beyond the shipping process. This protective coating is not covered under any warranty hereby stated, both express or implied.