ADVANTAGE LINE ENDTRUCK

PARTS & MAINTENANCE MANUAL

10200 JACKSBORO HWY.,FORT WORTH,TEXAS 76135
PH: (817) 237-7700 FAX: (817) 237-2777
WEBSITE: WWW.ACEWORLDCOMPANIES.COM

REGISTERED ISO 9001 COMPANY

It is important that all persons operating or servicing this equipment be familiar with the instructions & information contained in this manual for their own safety & protection as well as for other workers and equipment.

ADVANTAGE LINE ENDTRUCK

TOP RUNNING & UNDERHUNG

FIXED AXLES

PARTS & MAINTENANCE MANUAL

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REGISTERED ISO 9001 COMPANY

It is important that all persons operating or servicing this equipment be familiar with the instructions & information contained in this manual for their own safety & protection as well as for other workers and equipment.

UNDER RUNNING ENDTRUCKS DESCRIPTION

ADVANTAGE SERIES:

Ace World Companies designs and manufacturers one size of under running Advantage endtrucks(6") suitable for single beam and double beam under running bridges as well as patented track applications. These under running endtrucks consist of a structural frame, drive wheel I assembly, idler wheel assembly, drive assembly and energy absorbing bumpers and safely drop bars.

The structural frame is made from a 500 Grade B bolted together with yoke plates at the ends and reinforced beam mounting plate located at the center where the user attaches the bridge beam.

The wheel assemblies consist of pairs of single flanged wheels designed following the stringent criteria in the latest CMAA specifications which dictates the width of the running surface versus the allowable wheel load. **Ace World Companies under running single** flanged wheels are designed to run on either standard "S" beams with tapered flanges or wide flange beams with flat flanges. Each truck has one pair of idler wheels and one pair of drive wheels. The drive wheel and idler wheel are identical except the drive wheel has the drive gear cut into the wheel flange. The bearings are supported on machined axles and are adjustable in the field to suit the runway beam flange width. The axle is supported by a compression fit collar welded to the tube frame. This arrangement gives a well balanced support base which prevents the axle from bending or twisting.

The drive assembly consists of a totally enclosed oil bath gear reducer and motor mounted to the drive axle plate via a machined mounting adapter. The drive assembly supports the drive pinion shaft on one end and a machined flange bearing supports the drive pinion shaft on the other end. This arrangement assures pinion and gear alignment without needing to adjust or shim anything..

NOTE:

Motors and gear reducers are covered in the end section of this manual. Please refer to the appropriate motor/reducer section for the type drive provided.

UNDER RUNNING ENDTRUCKS INSTALLATION

ADVANTAGE SERIES:

The wheel assemblies can be removed while the crane is on the runway. To accomplish removal of either the drive wheel assembly or an idler wheel assembly, follow the steps below:

1) Move the empty trolley hoist to the opposite end of bridge.

> **WARNING!**
> **Disconnect and lock out the power source feeding the crane mainline or other power source. Injury or death to personnel will result if this precaution is not followed.**

2) If a drive wheel assembly is being removed, first remove the drive assembly by removing the bolt at the end of the pinion drive shaft. Then remove the four bolts holding the drive assembly to the endtruck frame. Be careful, at this point, the drive will rotate freely on the pinion shaft. Carefully slide the drive off the pinion shaft and secure. Disconnect the wires to the drive if no sure way of securing the drive after it is removed from the pinion shaft is found and lower drive to the ground.

3) Remove the bolts holding the bearing capsule to the frame. Carefully while supporting the pinion shaft weight, pull the bearing capsule from the truck frame. The pinion shaft can now be lowered to the ground.

The above two steps do not need to be done if an idler wheel is being removed.

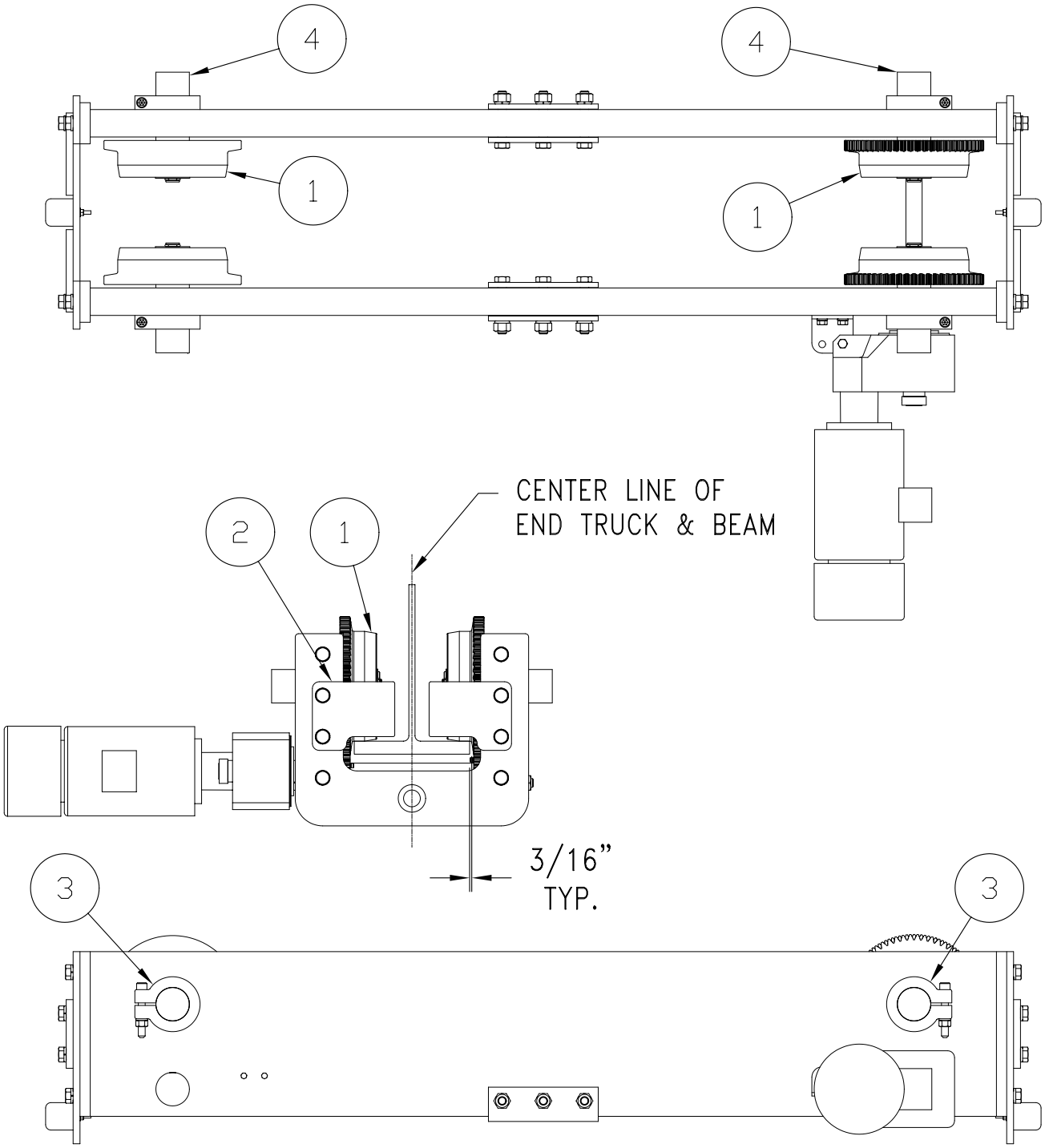
4) Remove the safety drop bar in front of the wheel assembly to be removed.

5) Using a suitable jack, jack up the end of the endtruck to take any dead weight from the wheel. The wheel should spin freely on the axle.

6) Remove the bolts holding the axle keeper plate to the frame. With the keeper or suitable wrench handle, turn the axle to back the axle out of the threaded truck frame. As the wheel contacts the inside of the truck frame, reach inside the frame and hold into the wheel while the axle is completely backed out of the frame. The wheel can now be removed out the front of the truck.

> **WARNING!**
> **The wheel is not retained to the axle. Be careful while turning the axle out of the frame that the wheel does not come off the axle and fall to the ground.**

USB
Under Running End Truck Installation Guide



ADVANTAGE
UNDER RUNNING END TRUCK
INSTALLATION GUIDE

(WITH THE END TRUCK ON THE GROUND OR IN AN ACCESSIBLE LOCATION)

1. Begin by removing all end truck wheels (ref. Balloon 1) by sliding them off the end of their shafts.

2. Remove all drop lugs (ref. Balloon 2). (Drop lug fasteners are 5/8" hex head bolts).

3. Loosen all axle keeper fasteners (ref. Balloon 3) and remove all axles (ref. Balloon 4) from the end truck. (Axle keeper fasteners are 1/2" socket head cap screws).

   (THE END TRUCK IS NOW READY FOR POSITIONING BELOW THE RUNWAY BEAM)

4. Raise the end truck into place below the runway beam.
   NOTE: The centerline of the end truck **must** be in line with the centerline of the beam.

5. Replace all but one drop lug on each end truck. Tighten all 5/8" hex head bolts to 125 FT-LBS torque.

6. Roll or lower **one** wheel into place in the corner of the end truck with a missing drop lug. Replace one axle in the end truck, with the wheel in place, so that the shoulder of the axle is flush up against the wheel bearing. Replace the drop lug for that corner of the end truck and tighten both 5/8" hex head bolts to 125 FT-LBS torque.

7. Remove **one** drop lug from the corner of the end truck with a missing wheel.

8. Repeat STEPS 6 & 7 until all wheels have been replaced.

9. With the end truck centered on the runway beam, position all wheels, by adjusting the axle, so that on each side there is approximately a 3/16" gap between the wheel flange and the edge of the beam.

10. Once the wheels are positioned properly, tighten all axle keeper 1/2" socket head cap screws to 100-125 FT-LBS torque.

11. Finally, loosen the screws on the drive pinion torque lock bushings (ref. Balloon 5) and position all pinions so that the outside faces of the pinions are aligned with the outside faces of the drive wheel. After positioning, tighten all torque lock bushing screws (alternating screws in clockwise fashion every couple turns) to lock pinions onto shaft.

12. Lubricate gear wheels and pinions. (See page 4 for Lubricant Details)

UNDER RUNNING ENDTRUCKS REMOVAL

ADVANTAGE SERIES:

The wheel assemblies can be removed while the crane is on the runway. To accomplish removal of the idler wheel assembly, steps 2 and 3 are not necessary.

1. Move the empty trolley hoist to the opposite end of the bridge.

WARNING!
Disconnect and lock out the power source feeding the crane mainline or other power source. Injury or death to personnel will result if this precaution is not followed.

Jack Shaft Removal:

2. If a drive wheel assembly is being removed, first remove the drive assembly by removing the split collar at the end of the pinion drive shaft. Remove the bolt connecting the torque arm to the structure. At this point the drive can rotate freely on the pinion shaft. Carefully slide the drive off the pinion shaft and secure. Drive can be lowered if wires are disconnected. Mark wires for re-assembly.
3. Remove Split collar on side without drive shaft. Loosen QD bushing so that pinion gears slide loosely on shaft. Slide the pinion shaft out and secure or lower to the floor. Be careful that loose hardware (bearings, QD bushings, etc.) does not fall. Secure hardware with drive pinion.

Wheel Removal:

4. Remove the drop bar in front of the wheel assembly which will be removed.
5. Using a suitable jack, jack up the end of the end truck to take any dead weight from the wheel. The wheel should spin freely on the axle.
6. Remove the retaining ring at the end of the axle (closest to girder.)
7. Loosen Split Collar bolt. Shaft should move freely in the axial direction. Slide the wheel out. It might be necessary to slide out the axle so that the wheel can be removed.
8. If axle is being replaced, remove it as well.

REPAIR OF THE WHEEL ASSEMBLY

Repair of the wheel assemblies is limited to replacement of the components. Inspect the wheel gear and running surface of the wheels for wear. If the bearings need to be replaced, they must be replaced in pairs. Remember, the wheel bearings are sealed and can not be lubricated by the user. The bearings are put into the wheels with a light press fit and held secure by a snap ring; inspect the drive pinions for wear. While the unit is disassembled, it is a good time to clean the old grease from the pinions and wheel gear and re-grease.

Installation of the under running wheel assemblies follows the reverse of the removal outlined above.

ASSEMBLY OF ENDTRUCK:

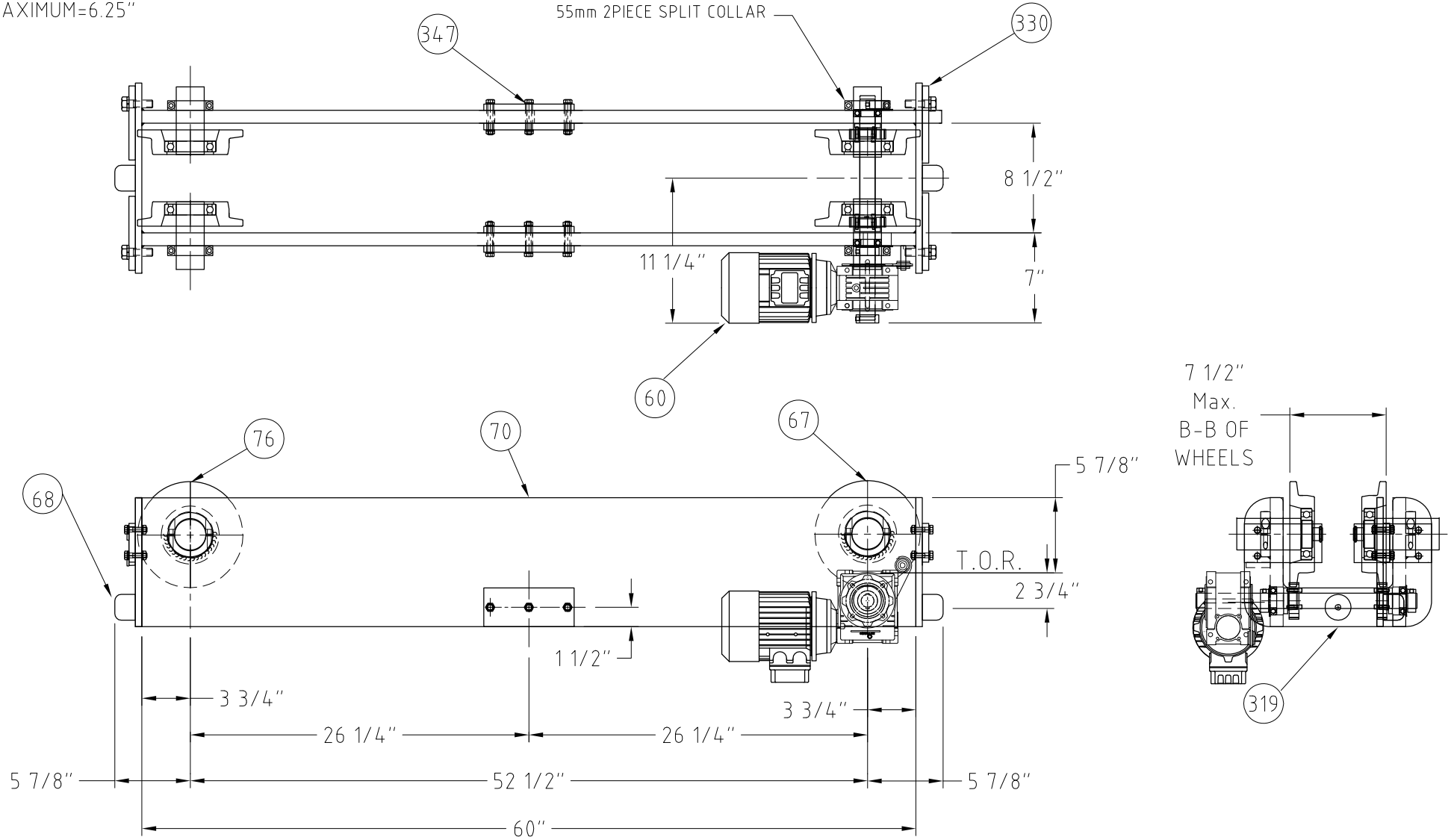
WARNING!

Be sure the crane power source is still locked out. Failure to insure this will result in injury or death to personnel.

1. Clean the inner race of the bearings and apply a thin film of oil. With the truck frame still jacked up, put the wheel and bearing assembly back into the end of the truck frame and align with the axle hole.
2. Clean the truck frame axle and axle hole. Apply a thin film of oil or grease to the axle and axle hole.
3. Install snap ring that will be between the wheel and the truck frame.
4. Insert axle into frame. You might have to slide the axle until the snap ring makes contact with the frame.
5. Slide wheel assembly onto axle and secure with retaining ring.
6. Once all wheels have been installed, adjust the wheel locations to allow 1/8" clearance between the wheel flange and the beam flange.
7. Make sure the wheels are centered by measuring the distance from the axle to the structure.
8. Re-install the safety drop bar and tighten the bolts.
9. Re-install the pinion drive shaft if removed. Engage the pinions with the wheel gears. Install the bearing capsule and bearing and tighten the bolts. Be sure the pinion drive shaft is pushed fully into the bearing capsule. Be sure the pinions align with the wheel gear and adjust if required by loosening the set screws and sliding the pinions so they are centered to the wheel gears. Check the pinion shaft key for the drive assembly.
10. Install the split collar on the end of the pinion shaft and secure. Recheck alignment of the pinions with the wheel gears and adjust if required. There should be some backlash between the pinions and wheel gears.
11. Remove the jack and lower the truck and wheel assembly to the runway beam. Again check all the alignment and bolt tightness

12. Restore power to the crane and test operation fully before listing a load or putting the crane back into operation.

NOTE: BEAM FLANGE WIDTH
MINIMUM=3.25"
MAXIMUM=6.25"



SHOWN RIGHT HAND

REV.	DATE	DESCRIPTION
1	6/26/09	CHANGED MOTOR POSITION

CUSTOMER:

PO NUMBER:

☐ QTY. ( ) ENDTRUCK(S).
☐ QTY. ( ) PAIR(S): ASSEMBLE ONE ENDTRUCK AS SHOWN & ONE OPPOSITE HAND PER PAIR.

APPROVED _____ ☐
NOT APPROVED _____ ☐
APPROVED AS NOTED _____ ☐
BY: _____
DATE: _____

ace World Companies
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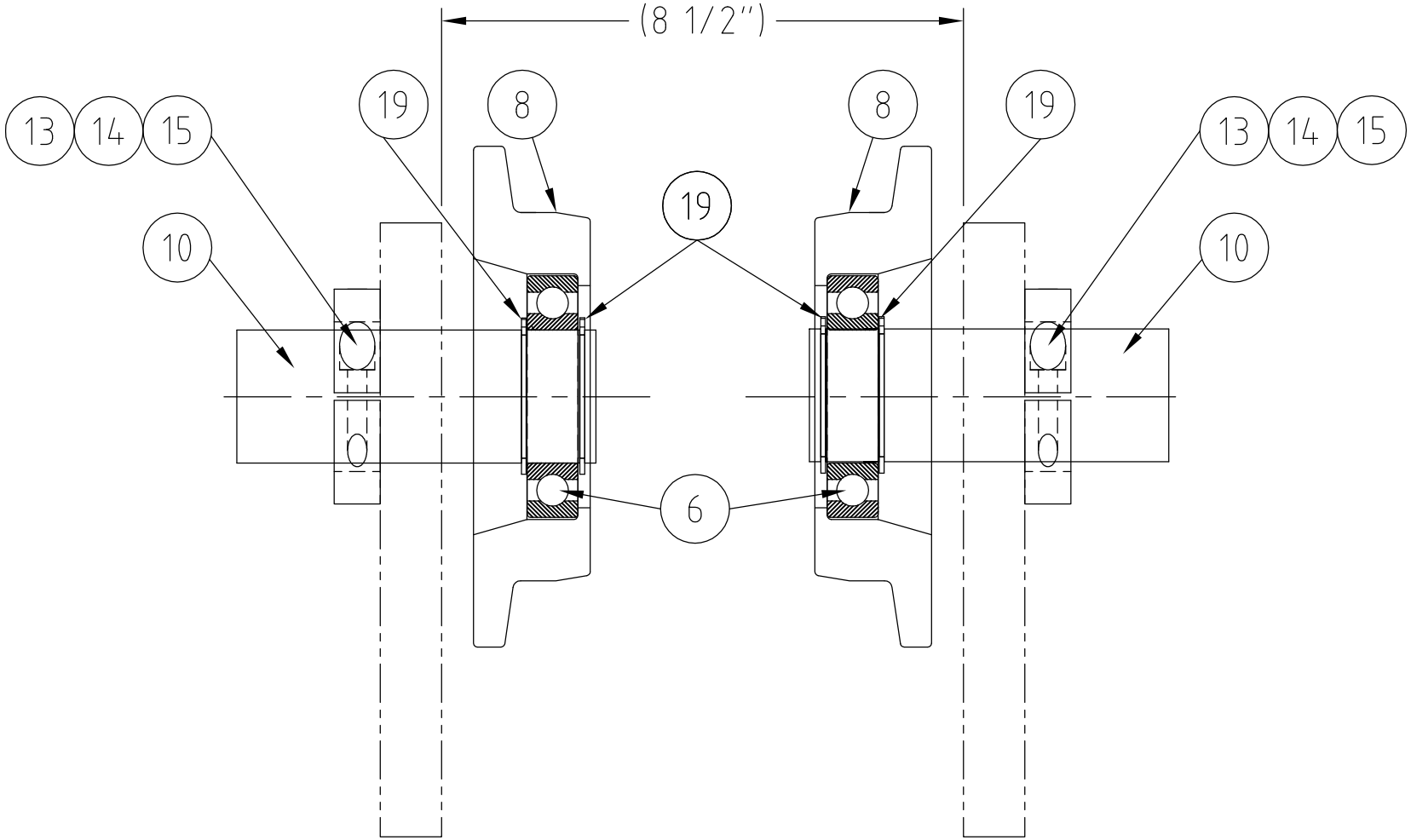
DRAWN BY:	CHECKED BY:	APR.:	DATE:	QTY:	ITEM:
GHR			5/30/08		69

DRAWING TITLE
AU52500, 100 FPM, 2 @ 1/2 HP
6" DIA. WHL, 52.5" W.B., 12,000 AWL

SCALE: NTS
FILE:
PART NO. 100002-0000
JOB NO.



ITEM	QTY.	DESCRIPTION	WEIGHT	P/N	LENGTH
19	4	RETAINING RING,EXT SHAFT DIA 2-1/8"		107202	
15	4	NUT, 5/16"-24		106318	
14	4	LOCKWASHER, 5/16"		100610	
13	4	CAP SCREW, 5/16"-24		106317	7/8"
10	2	AXLE, 6" & 8" DIA. UH WHEELS		100002-0810	
8	2	IDLER WHEEL, 6" DIA. SINGLE FLANGE		100002-0940	
6	2	BEARING, 6211-2RS1		103523	

REV.	DATE	DESCRIPTION
1	05/03/07	SEE DCN 05.03.2007.2

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DRAWN BY: GHR | CHECKED BY: | APR.:

DRAWING TITLE

6" DIA. - IDLER ,AV, U.H.
IDLER WHEEL ASSY, 1"X10" FLAT BAR

DATE: 03/14/07 | QTY: | ITEM: 76

SCALE: NTS

FILE:

PART NO. 100002-0760 | JOB NO.

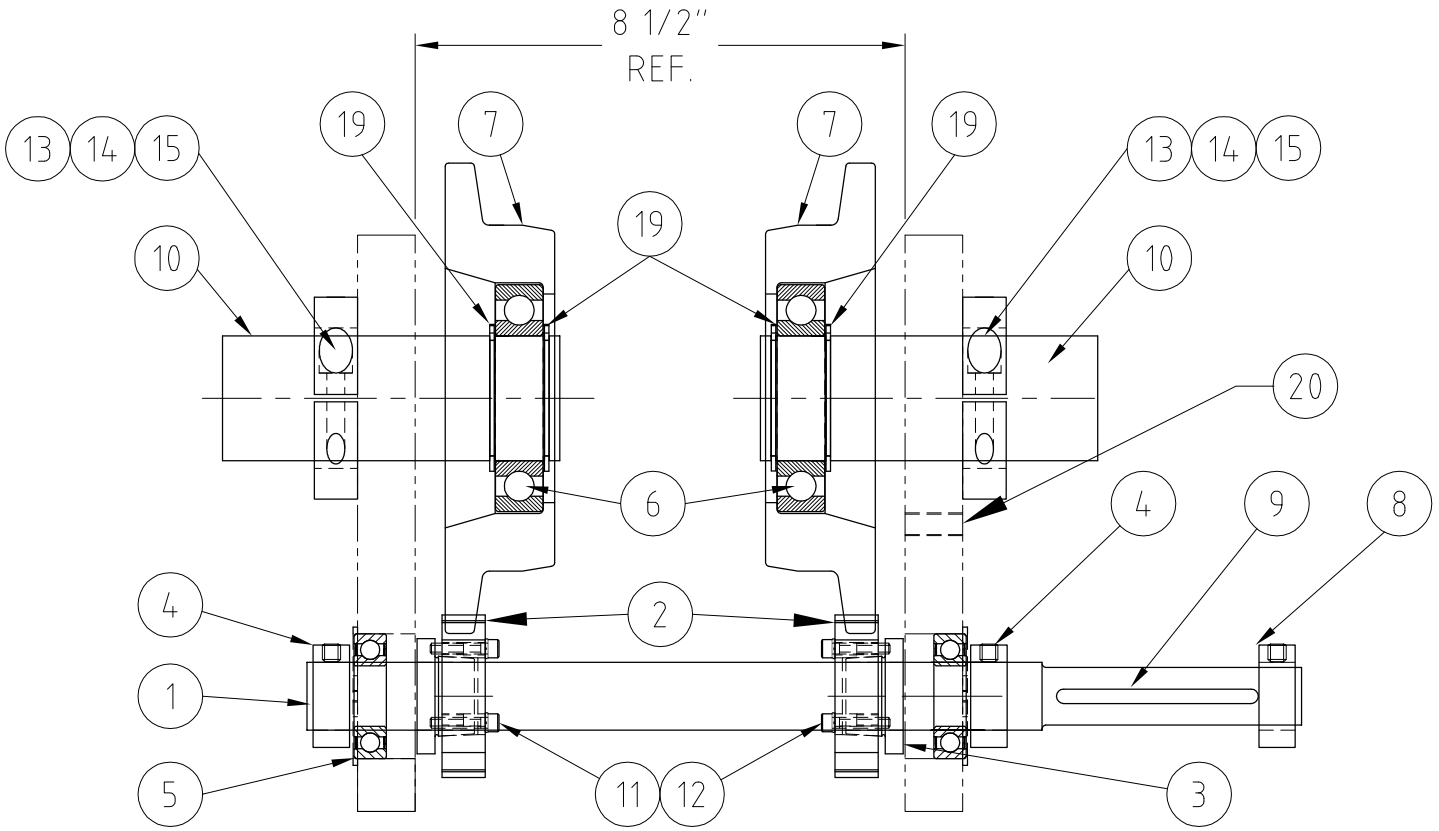
TOLERANCES
UNLESS OTHERWISE SPECIFIED

METRIC	ENGLISH
.X ±.5mm	.X ±.05
.XX ±.10mm	.XX ±.015
.XXX ±.01mm	.XXX ±.005
	.XXXX ±.0005

ANGULAR ± 0° 30'
LINEAR FRACTIONAL ± 1/16"
HOLES FRACTIONAL ± 1/32"

HEAT TREATMENT
Rockwell ±4
Brinell ±15

FGE10.01 Rev. 1 1/14/99



ITEM	QTY.	DESCRIPTION	WEIGHT	P/N	LENGTH
20	1	T-ARM MOUNTING HOLE 3/8-16, FOR BOLT,LOCK WASHER,NUT		100401	2 1/2"
19	4	RETAINING RING,EXT SHAFT DIA 2-1/8"		107202	
15	4	NUT,5/16"-24		106318	
14	4	LOCKWASHER, 5/16"		100610	
13	4	CAP SCREW, 5/16"-24		106317	7/8"
12	6	LOCKWASHER, #10		105117	
11	6	CAP SCREW, #10-24		105116	1 1/4"
10	2	55mm AXLE, 6" DIA. AA WHEELS		100002-0810	
9	1	KEY, 1/4" SQ		106316	3 1/2"
8	1	SHAFT COLLAR, 25MM HALF		106319	
7	2	DRIVE WHEEL, AA 6" DIA. SINGLE FLANGE		100002-0780	
6	2	BEARING, 6211-2RS1		103523	
5	2	BEARING, 6006-2RS1, w/ SNAP RING		104677	
4	2	SHAFT COLLAR, 30mm w/ SET SCREW		105112	
3	2	QD BUSHING, SIZE JA, (30mm w/o KEY)		105111	
2	2	PINION, 6" WHEELS (for QD bushing)		105139	
1	1	JACK SHAFT (30mm), 6" DIA. UH		100002-1440	17-1/4"

REV.	DATE	DESCRIPTION
1	05/03/07	SEE DCN 05.03.2007.2

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DRAWN BY: GHR | CHECKED BY: | APR.:

DRAWING TITLE

6" DIA. -DRIVE, AV,U.H.
DRIVE WHEEL ASSY, 1"X10" FLAT BAR

DATE: 03/14/07
SCALE: NTS
FILE:
PART NO. 100002-0670
QTY:
ITEM: 67
JOB NO.

TOLERANCES
UNLESS OTHERWISE SPECIFIED

METRIC	ENGLISH
.X ±.5mm	.X ±.05
.XX ±.10mm	.XX ±.015
.XXX ±.01mm	.XXX ±.005
	.XXXX ±.0005

ANGULAR ± 0° 30'
LINEAR FRACTIONAL ± 1/16"
HOLES FRACTIONAL ± 1/32"

HEAT TREATMENT
Rockwell ±4
Brinell ±15

TOP RUNNING FIXED AXLE ENDTRUCKS DESCRIPTION

Ace World Companies designs and manufactures 6", Advantage fixed axle top running endtrucks suitable for light duty single & double girder cranes. These fixed axle top running tube endtrucks consist of a structural tube frame, drive wheel assembly, idler wheel assembly, energy absorbing bumpers, rail sweeps and drive assembly.

The structural tube frame is made from ASTM A500 Grade B tubing with internal diaphragms welded inside the tube just behind each wheel assembly. The endtruck tube is completely welded before the bored holes for the fixed axles are machined on a horizontal boring mill. This process insures parallel axle alignment.

The wheel assemblies consist of identical alloy steel machined drive and idler wheels with the only difference being the width of one flange on the drive wheel where the wheel gear is cut into the flange. Each wheel is fitted with two sealed deep groove ball bearings designed to provide the required bearing life as specified in CMAA standards. The bearings are supported by machined alloy axles fitted through the bored axle holes in the tube. Retaining Rings on the axle keep the wheel centered in the tube.

The drive assembly consists of a worm gear.

NOTE

Motors and gear reducers are covered in the end section of this manual. Please refer to the appropriate motor/reducer section for the type drive provided.

TOP RUNNING FIXED AXLE ENDTRUCKS WHEEL ASSEMBLY REMOVAL

The wheel assemblies can be removed while the crane is on the runway. To accomplish removal of either the drive wheel assembly or an idler wheel assembly, follow the steps below:

1) Move the empty trolley hoist to the opposite end of the bridge.

WARNING!

Disconnect and lock out the power source feeding the crane main-line or other power source. Injury or death to personnel will result if this precaution is not followed.

2) If a drive wheel assembly is being removed, first remove the drive assembly by removing the four bolts holding the drive assembly to the truck tube. Be careful, at this point, the drive is very heavy. Slowly pull the drive assembly away from the truck frame and secure it. If the drive cannot be secured on the Rail, disconnect (and label) all wires and lower the drive assembly to the ground.

3) Using a suitable jack, jack up the end of the truck behind the wheel being removed just enough so the wheel will spin freely on the axle.

4) Remove the bolts holding the keeper plate to the truck frame.

5) With a hammer and block of wood, drive the axle through the wheel assembly towards the outside of the span. Once the axel has been driven through the first tube wall, it will be ready for removal

6) Pull the axle free of the truck frame. Jack the truck frame higher so the wheel can be slid out the bottom of the truck frame.

TOP RUNNING FIXED AXLE ENDTRUCKS WHEEL INSTALLATION

WARNING!

Be sure the crane power source is still locked out. Failure to insure this will result in injury or death to personnel.

1) Clean all components. Clean the inner race of the bearings and apply a thin film of oil. With the truck frame still jacked up, put the wheel and bearing assembly back into the end of the truck frame and align with the axle hole.

2) Clean the truck frame axle holes and apply a thin coat of grease.

3) Lower the truck frame so the wheel bearings inner bore aligns with the axle holes.

   Slide the axle into the wheel and secure the Assembly using the Retaining Rings.

4) Install the axle from the outside of span, starting with the end with the keeper plate slot. The keeper plate slot should be flush with the truck frame.

5) Reinstall the keeper plate and bolts and tighten.

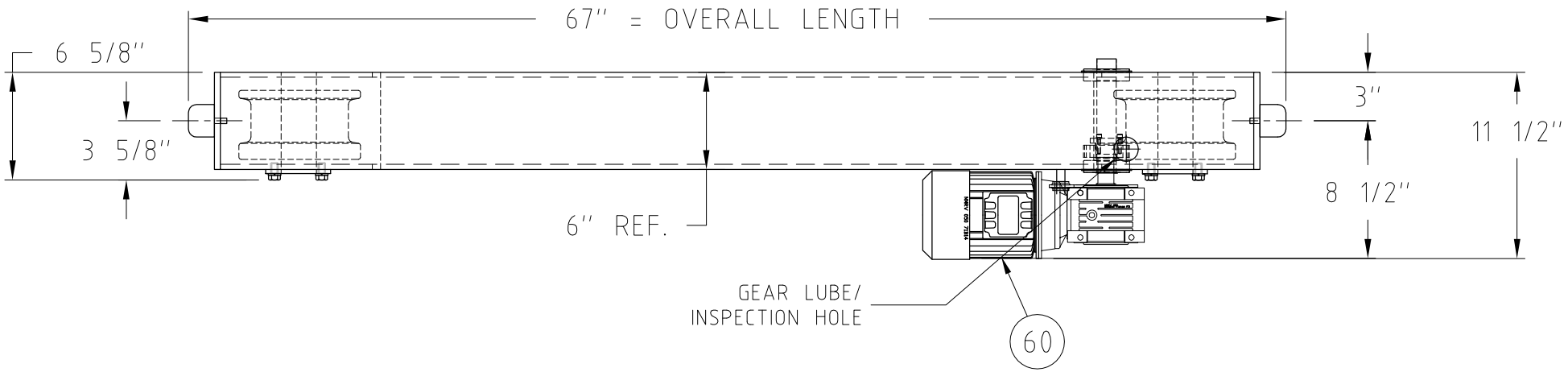
6) Check the drive pinion for wear and replace if required. Reinstall the drive assembly insuring the pinion engages with the wheel gear. Install and tighten the drive assembly bolts. Rewire the motor if the wires were removed.

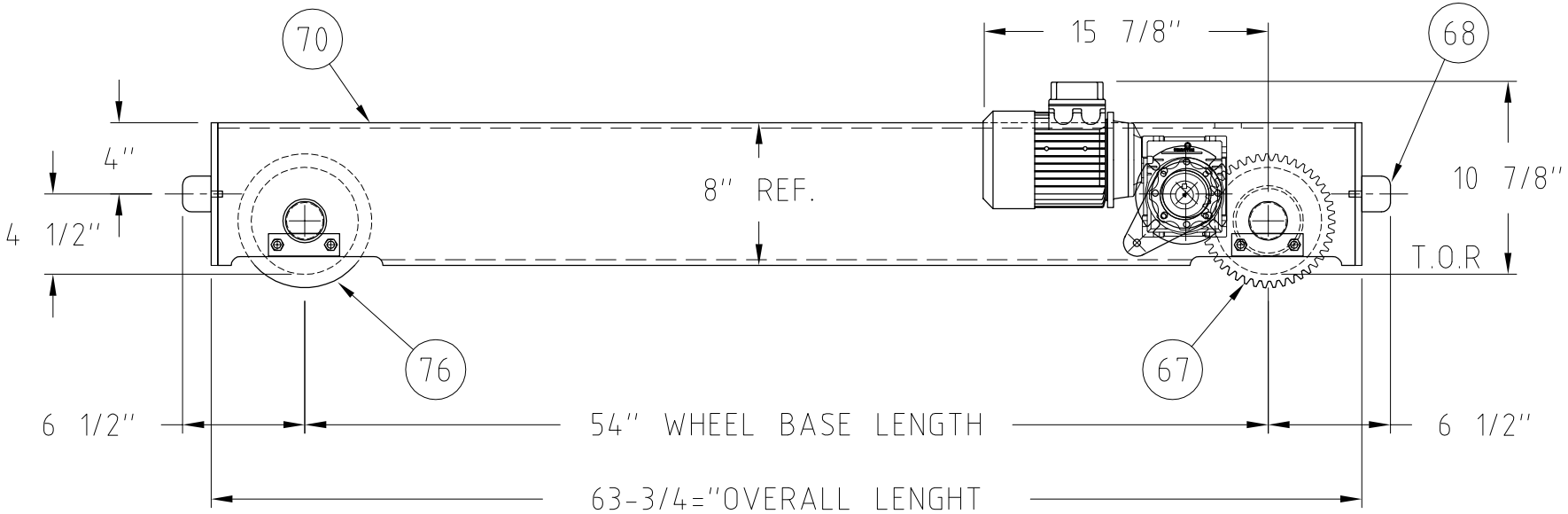
7) Lower the truck frame so the wheel contacts the rail. Remove the jack and wheel chocks.

8) Be sure lubrication has been applied to the pinion & gear on wheel. Inspect the alignment of the pinion and wheel gear through the inspection hole on top of the truck frame. Adjust pinion location if required. This is accomplished by removing the drive assembly and adjusting location of pinion on the motor shaft.

9) Restore power to the crane and test operation fully before lifting a load or putting crane back into operation.

SHOWN IN RIGHT HAND SIDE





REV.	DATE	DESCRIPTION

CUSTOMER:	PO NUMBER:

☐ QTY. ( ) ENDTRUCK(S).
☐ QTY. ( ) PAIR(S): ASSEMBLE ONE ENDTRUCK AS SHOWN & ONE OPPOSITE HAND PER PAIR.

APPROVED ☐
NOT APPROVED ☐
APPROVED AS NOTED ☐
BY: _____
DATE: _____

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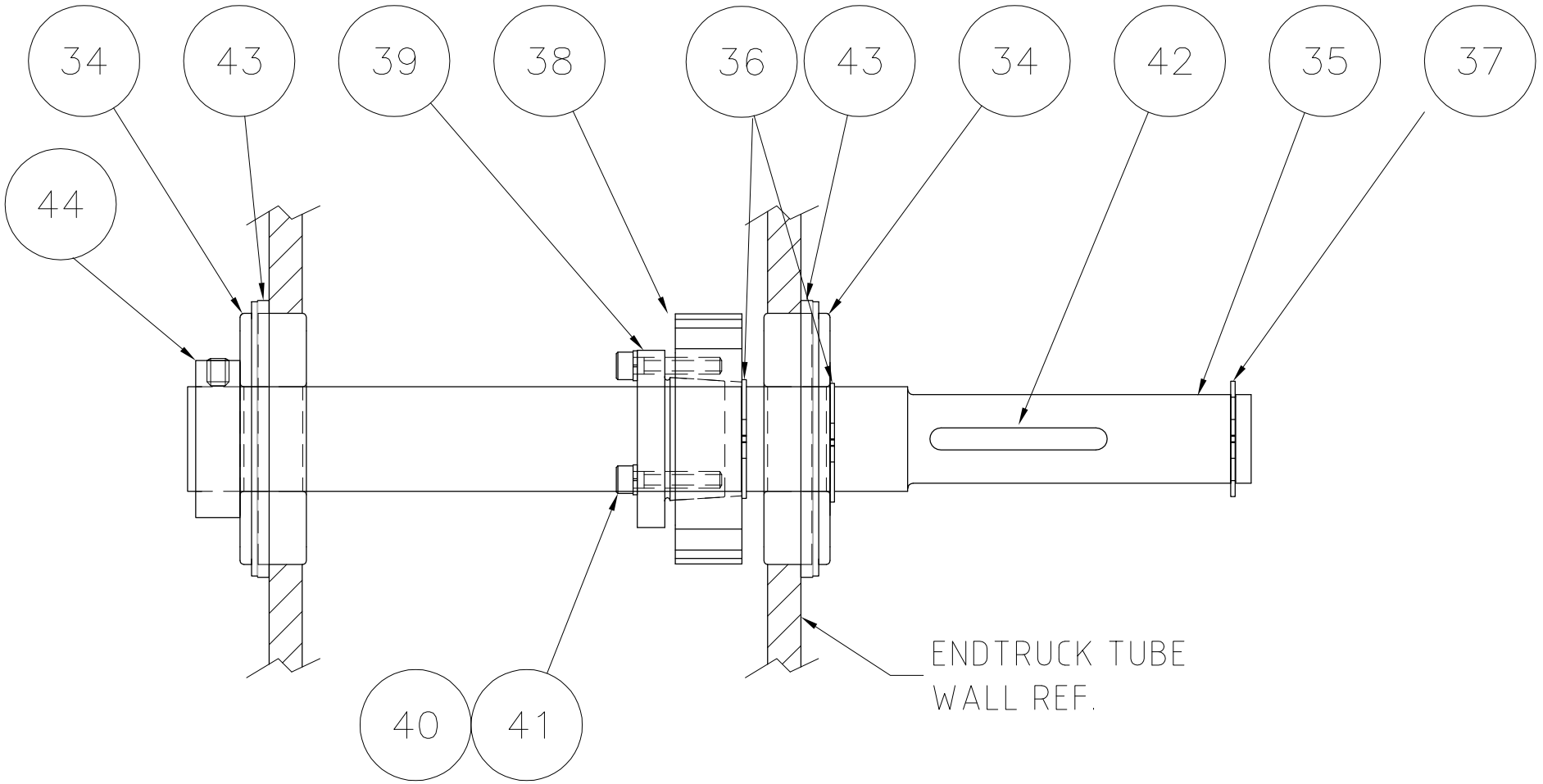
ACEWORLDCOMPANIES.COM

DRAWN BY:	CHECKED BY:	APR.:	DATE:	QTY:	ITEM:
GHR			03/10/08		69

DRAWING TITLE
ADVANTAGE TR , 100 FPM, 2 @ .5 HP
6" DIA. WHL., FIXED AXLE,54" W.B.

SCALE:	FILE:	PART NO.	JOB NO.
NTS	200222-0000	200222-0000	



ITEM	QTY.	DESCRIPTION	WEIGHT	P/N	LENGTH
44	1	Collar,Clamp,One Piece,1.18" Bore		105112-00	
43	2	Spacer Ring,F/6306 Brg.,10ga.		105295-00	
42	1	KEY, 8mm x 5mm		103528-00	3"
41	3	LOCKWASHER, #10		105117-00	
40	3	CAP SCREW, #10-24		105116-00	1 1/4"
39	1	QD BUSHING		105111-00	
38	1	PINION, 15 TOOTH, for QD BUSHING		105139-0000	
37	1	SNAP RING, EXTERNAL, SH100		104463-00	
36	2	SNAP RING, EXTERNAL, SH118		104945-00	
35	1	Shaft,Drive,Mtv NMRV50, Fixed Axle		100281-0000	12"
34	2	BEARING, DBL. SEALED w/SNAP RING		105239-00	

REV.	DATE	DESCRIPTION

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DRAWING TITLE

MTV NMRV50, FIXED AXLE DRIVE PINION AND SHAFT ASSEMBLY

DATE: 03/15/08
SCALE: NTS
FILE: 100282-0000
PART NO. 100282-0000
JOB NO.
QTY:
ITEM: 144

TOLERANCES
UNLESS OTHERWISE SPECIFIED

METRIC	ENGLISH
.X ±.5mm	.X ±.05
.XX ±.10mm	.XX ±.015
.XXX ±.01mm	.XXX ±.005
	.XXXX ±.0005

ANGULAR ± 0° 30'
LINEAR FRACTIONAL ± 1/16"
HOLES FRACTIONAL ± 1/32"

HEAT TREATMENT
Rockwell ±4
Brinell ±15

FGE10.01 Rev. 1 1/14/99

TOLERANCES
UNLESS OTHERWISE SPECIFIED

METRIC	ENGLISH
.X ±.5mm	.X ±.05
.XX ±.10mm	.XX ±.015
.XXX ±.01mm	.XXX ±.005
	.XXXX ±.0005

ANGULAR ± 0° 30'
LINEAR FRACTIONAL ± 1/16"
HOLES FRACTIONAL ± 1/32"

HEAT TREATMENT
Rockwell ±4
Brinell ±15

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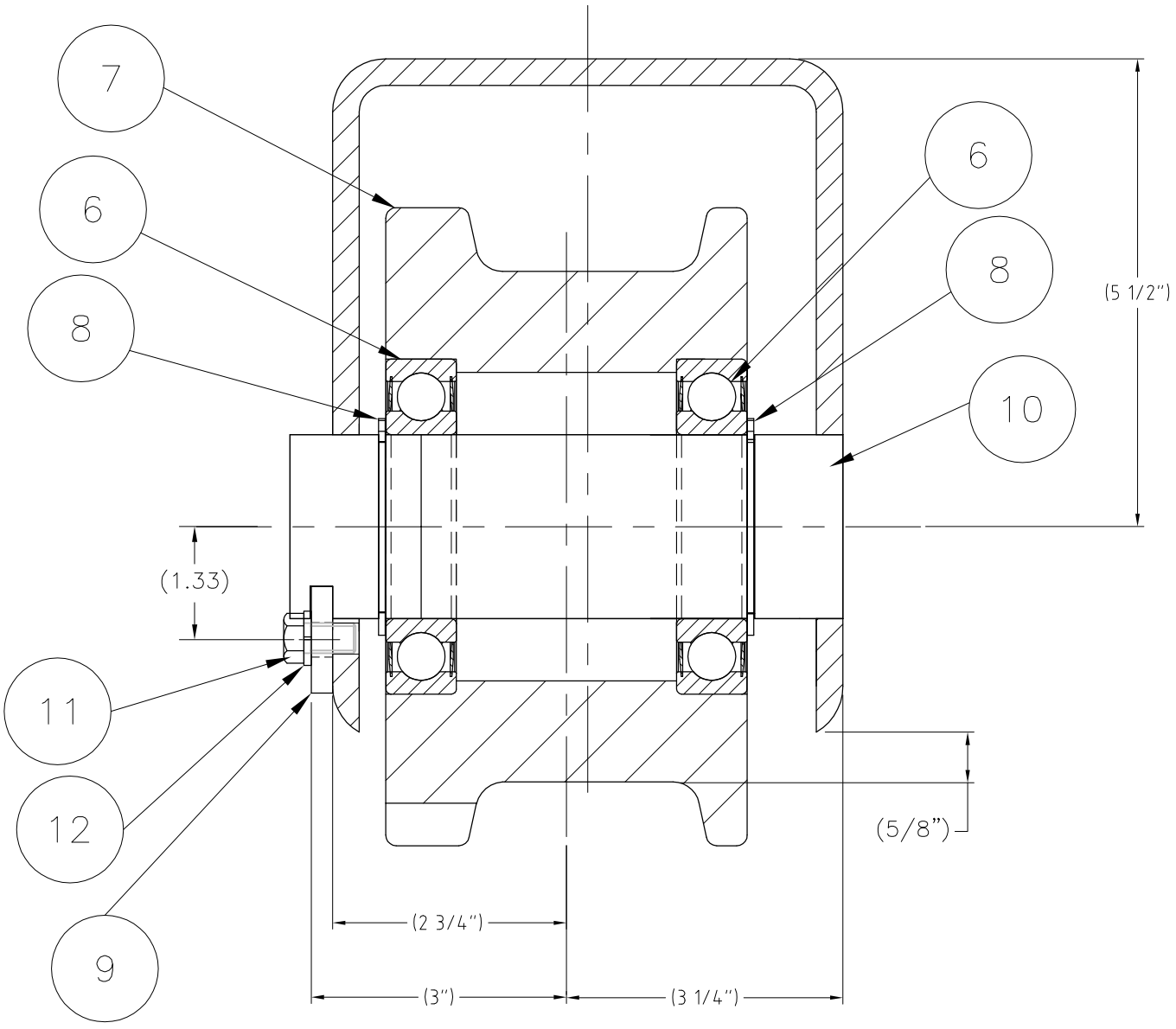

ITEM	QTY.	DESCRIPTION	WEIGHT	P/N:	LENGTH
12	4	LOCKWASHER, 3/8"		100611-00	
11	4	HEX BOLT, 3/8"-16		100110-00	3/4"
10	1	AXLE		100000-0790	6.50"
9	2	AXLE KEEPER		100000-0410	4"
8	2	RETAINING RING,EXT SHAFT DIA 2-1/8"		107202-00	
7	1	IDLER WHEEL, 6"DIA. x 4 3/4" WIDE, 325 BHN		100000-0780	
6	2	BEARING, 6211-2RS1		103523-00	

REV.	DATE	DESCRIPTION

ace World Companies
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FORT WORTH, TX 76135
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ACEWORLDCOMPANIES.COM

DRAWN BY: GHR | CHECKED BY: | APR.:
DATE: 03/15/08
SCALE: NTS
MACOLA 100000-0670
PART NO. 100000-0670
QTY:
ITEM: 67
JOB NO.

DRAWING TITLE
6"DIA. x 4 1/4" - FIXED AXLE DRIVE WHEEL ASSY (325 BHN) - 8x6 TUBE

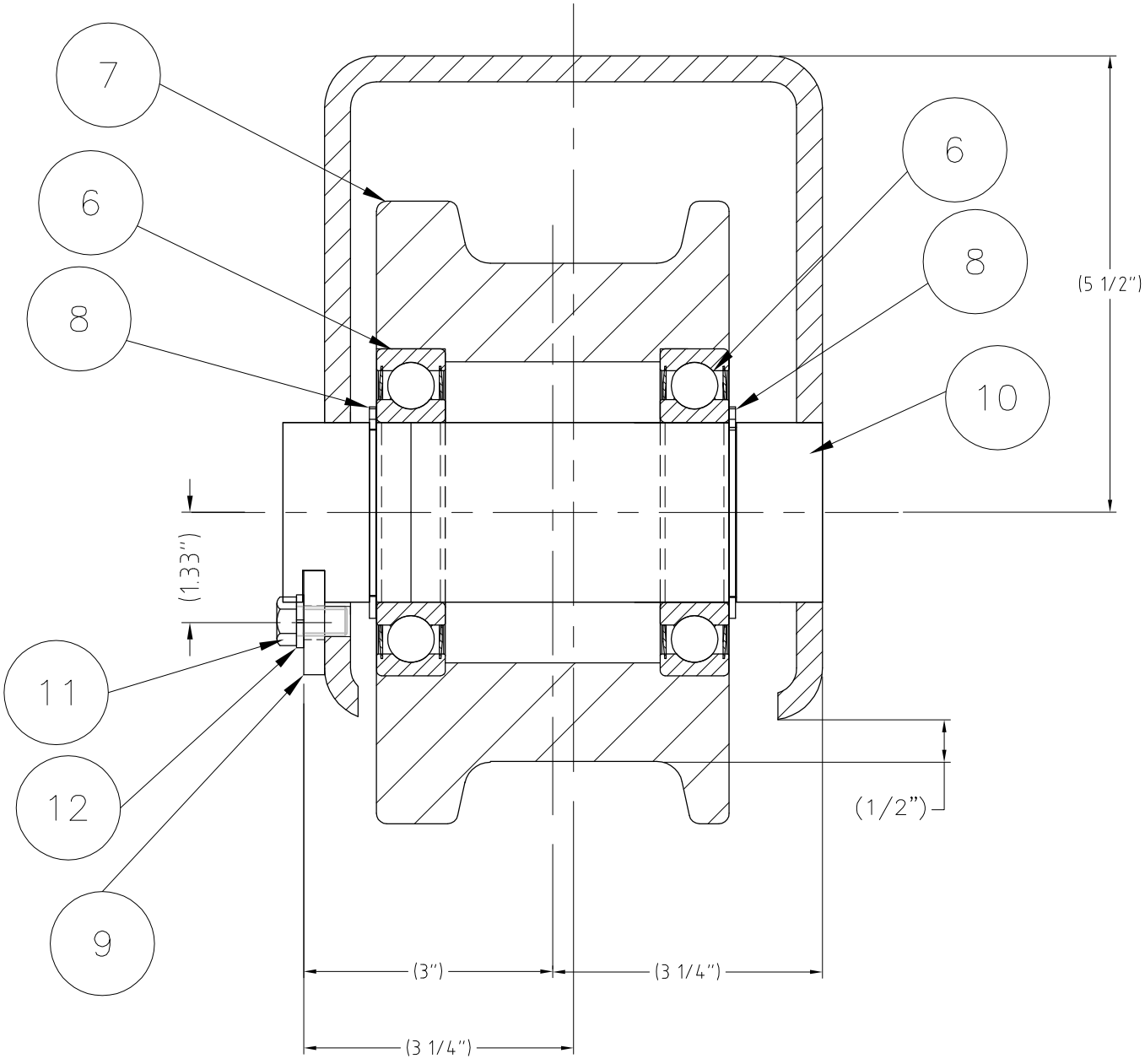
TOLERANCES
UNLESS OTHERWISE SPECIFIED

METRIC	ENGLISH
.X ±.5mm	.X ±.05
.XX ±.10mm	.XX ±.015
.XXX ±.01mm	.XXX ±.005
	.XXXX ±.0005

ANGULAR ± 0° 30'
LINEAR FRACTIONAL ± 1/16"
HOLES FRACTIONAL ± 1/32"

HEAT TREATMENT
Rockwell ±4
Brinell ±15

FGE10.01 Rev. 1 1/14/99



ITEM	QTY.	DESCRIPTION	WEIGHT	P/N:	LENGTH
12	4	LOCKWASHER, 3/8"		100611	
11	4	HEX BOLT, 3/8"-16		100110	3/4"
10	1	AXLE		100000-0810	6-1/2"
9	2	AXLE KEEPER		100000-0410	4"
8	2	RETAINING RING,EXT SHAFT DIA 2-1/8"		107202	
7	1	IDLER WHEEL, 6"DIA. x 4 3/4" WIDE, 325 BHN		100000-0940	
6	2	BEARING, 6211-2RS1		103523	

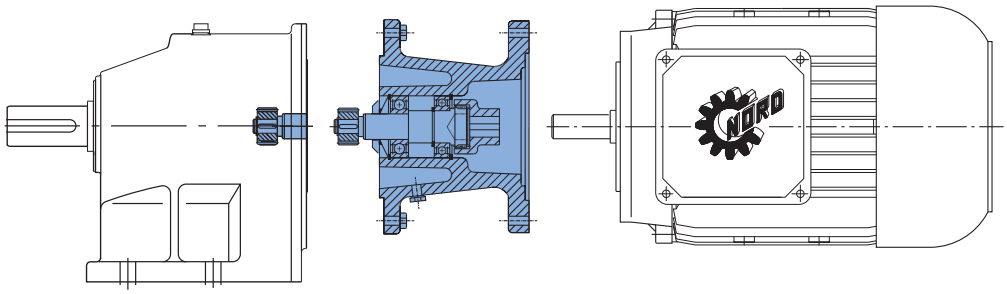
REV.	DATE	DESCRIPTION

ace World Companies
10200 JACKSBORO HWY.
FORT WORTH, TX 76135
PHONE 817.237.7700
FAX 817.237.2777
ACEWORLDCOMPANIES.COM

DRAWN BY: GHR | CHECKED BY: | APR.:
DATE: 03/12/07
SCALE: NTS
FILE: 100000-0760
QTY:
ITEM: 76
PART NO. 100000-0760
JOB NO.

DRAWING TITLE
6"DIA. x 4 1/4" - FIXED AXLE IDLER WHEEL ASSY (325 BHN) - 8x6 TUBE

NEMA/IEC INPUT ADAPTERS & THEIR COUPLINGS



⚠ WARNING ⚠

LOCK OUT POWER before any maintenance is performed. Make absolutely sure that no voltage is applied while work is being done on the gearbox or input.

NEMA/ IEC Motor Adapters

Motor adapters allow for easy installation and removal of industry standard motors. Motor adapters consist of a coupling and an adapter housing that connects the motor to the gear reducer.

NORD Gear supplies a coupling that is to be mounted on the motor shaft. It is important that the coupling is properly positioned.

- For NEMA Input Adapters, follow the Motor Installation Instructions on pages 3-4.
- For IEC Input Adapters, the supplied coupling will mount directly against the motor shaft shoulder. No locating measurements need to be taken.

⚠ NOTE ⚠

Some of the larger IEC inputs will have a coupling spacer included to help locate the coupling. Slide the spacer against the motor shaft shoulder, slide the coupling against the spacer and tighten set screw(s).

⚠ NOTE ⚠

For the larger motor adapters (IEC160 / N250TC and larger), an Automatic Lubricator is supplied. This will need to be activated at the time of startup. For operation and activation instructions, refer to user manual U45200.

NEMA/IEC Motor Weight Limits

When mounting a motor to a NORD NEMA C-face motor adapter it is important to consider the motor's weight. Following is a table that includes the maximum motor weight the NEMA adapter can support. If the motor exceeds the listed weight is must be externally supported. When a C-face mounted motor is externally supported care must be taken to ensure that the support system does not impose additional pre-loads on the NEMA motor adapter.

NEMA Motor Weight Limit

Motor FRAME	56C	143TC	145TC	182TC	184TC	210TC
Max Weight [lb]	66	88	110	130	175	220
Motor FRAME	**250TC**	**280TC**	**324TC**	**326TC**	**365TC**	
Max Weight [lb]	440	550	770	1100	1540	

IEC Motor Weight Limit

Motor FRAME	63	71	80	90	100	112
Max Weight [lb]	55	66	88	110	130	175
Motor FRAME	**132**	**160**	**180**	**200**	**225**	**250**
Max Weight [lb]	220	440	550	770	1100	1540

Couplings

Couplings are made with tough abrasion resistant materials, which resist most chemicals and petroleum products. They are electrically isolated (prevent metal to metal contact) and require no lubrication or maintenance. Depending upon the size of the C-face input, NORD provides either a gear or a jaw type coupling.

NORD supplies three different types of couplings depending on the size of input: "J" style, "M" style and "Jaw" style coupling. Following are instructions on how to properly mount each type of coupling onto the motor.

NEMA/IEC INPUT ADAPTERS & THEIR COUPLINGS

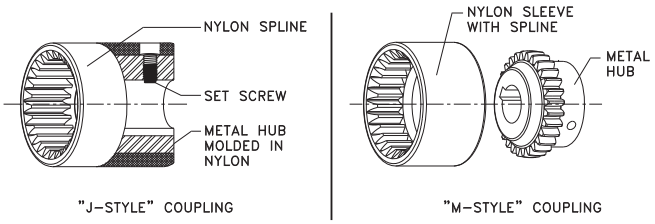
Couplings for the NEMA and IEC Adapters

Depending on the size of the input adapter to the gearbox, NORD Gear supplies two styles of couplings - BoWex® (gear tooth) and Rotex® (jaw) couplings.

BoWex® Couplings

NORD C-face adapter input shafts have a machined spline on the end. NORD incorporates two styles of BoWex® couplings, the "J" and "M" styles. The "J" style is a one-piece coupling with a metal hub and nylon spline. The "M" style is a two-piece coupling – the metal hub and a nylon sleeve. Nylon and steel components allow them to operate in high ambient temperatures without lubrication or maintenance.

- Nylon sleeves resist dirt, moisture, most chemicals and petroleum products
- No lubrication required
- Operating Conditions: -22°F - 212°F (-30°C - 100°C)
- Higher temperature coupling sleeve available up to 250°F (120°C)
- Special bore available



BoWex® Couplings Mechanical Ratings "J" Style

Coupling Type	Available Bore Sizes	Cont. / Peak Torque	Input
J14	11 mm,14 mm 5/8 in	10/20 Nm 89/117 lb-in	IEC 63, 71 NEMA 56C
J24	19 mm, 24 mm 5/8 in, 7/8 in	20/40 Nm 117/354 lb-in	IEC 80, 90 NEMA 56C, 140TC
J28	28 mm 1-1/8 in	45-90 Nm 399/797 lb-in	IEC 100-112 NEMA 180TC

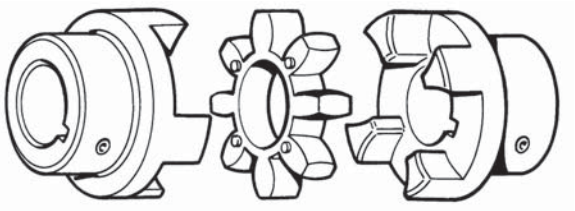
BoWex® Couplings Mechanical Ratings "M" Style

Coupling Type	Available Bore Sizes	Cont. / Peak Torque	Input
M14, M24, M28	Same as "J" Style	Same as "J" Style	Same as "J" Style
M38	38 mm 1-1/8 in, 1-3/8 in	80/160 Nm 708/1,416 lb-in	IEC 132 NEMA 180TC, 210TC
M42	42 mm 1-5/8 in	100/200 Nm 885/1,770 lb-in	IEC 160 NEMA 250TC
M48	48 mm 1-7/8 in	140/280 Nm 1,240/2,478 lb-in	IEC 180 NEMA 280TC

Rotex® Couplings

The cast iron jaw type couplings have an integral urethane "spider" that provides smooth transmission of the motor torque. A set screw on the coupling prohibits axial movement along the motor shaft.

- Excellent shock and vibration dampening
- Excellent resistance to oils and most chemicals
- No metal-to-metal contact
- Operating Conditions: -22°F - 195°F (-30°C - 90°C)
- Higher temperature material (Hytrel) spider available up to 230°F (110°C)
- Low temperature materials available upon request
- Special bores available



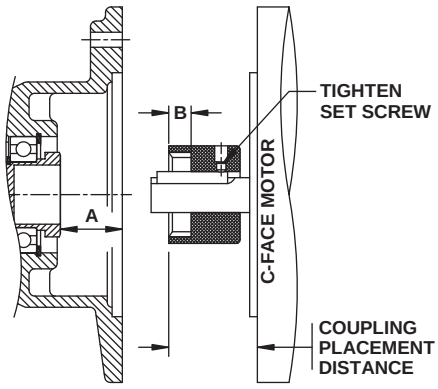
BoWex® Couplings Mechanical Ratings "J" Style

Coupling Type	Available Bore Sizes	Cont. / Peak Torque	Input	Spider
R19	14 mm 19 mm	17/34 NM 150/300 lb-in	SEK/SEP 100	Urethane 98 Shore A Hardness Color: Red
R24	19 mm 24 mm	60/120 Nm 530/1,060 lb-in	SEK/SEP 100 SEK/SEP 130	
R28	32 mm 38 mm	95/190 Nm 840/1,680 lb-in	SEK/SEP 65 SEK/SEP 215	Urethane 92 Shore A Hardness Color: Yellow
R38	1.89" (48 mm) Max Bore	190/382 Nm 1,680/3,380 lb-in	-	
R42	2.44" (62 mm) Max Bore	310/620 Nm 2,740/5,480 lb-in	-	
R48	42, 48 mm 1-5/8, 1 7/8 in	310/620 Nm 2,740/5,480 lb-in	IEC 160, 180 NEMA 250T NEMA 280T SEK/SEP 300 SEK/SEP 215	
R65	60 mm 2-1/8, 2-3/8 in	625/1,250 Nm 5,530/11,060 lb-in	IEC 225 NEMA 320T NEMA 360T	
R90	65, 75, 80 mm 2-1/8, 2-3/8 in	2,400/4,800 Nm 24,240/42,480 lb-in	IEC 250, 280 IEC 315 NEMA 360TC NEMA 400TS NEMA 440TS	

NEMA/IEC INPUT ADAPTERS & THEIR COUPLINGS

"J" Style Coupling NEMA C-face Motor Installation

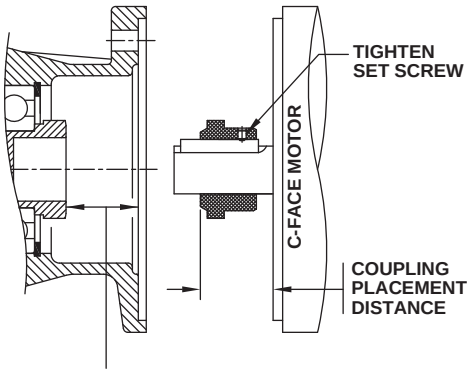
1. Measure the distance from the face of the input adapter to the face of the splined shaft and record that measurement as A in the equation below.
2. Measure depth of coupling engagement zone and record the measurement as "B" in the equation below.
3. Add "A" + "B" and subtract 0.08" (~2mm) from the distance. This needs to be done so that the coupling will not be preloaded after installation!
4. Use that measurement to locate the coupling from the face of the motor onto the shaft.
5. Once in place, tighten the set screw to lock the coupling in place. It is recommended that the key is staked or bonded (Loctite) in place to prohibit the key from vibrating out.
6. Mount the motor onto the input adapter with customer supplied bolts. Make sure that the coupling from the adapter and the motor engage securely. Use lock washers or Loctite to prohibit bolts from becoming loose from vibration.



MEASURED DISTANCES A + B		SUBTRACT DISTANCE	COUPLING PLACEMENT DISTANCE
___ +	___	- 0.080" (2mm) =	_____

"M" Style Coupling NEMA C-face Motor Installation

1 Measure the distance from the face of the input adapter to the face of the splined shaft & record that measurement.
2. Subtract 0.31" (~8mm) from the distance. This needs to be done so that the coupling will not be preloaded after installation!
3. Use that measurement to locate the coupling from the face of the motor onto the shaft.
4. Once in place, tighten the set screw to lock the coupling in place. It is recommended that the key is staked or bonded (Loctite) in place to prohibit the key from vibrating out.
5. Mount the motor onto the input adapter with customer supplied bolts. Make sure that the coupling from the adapter and the motor engage securely. Use lock washers or Loctite to prohibit bolts from becoming loose from vibration.



MEASURED DISTANCE	SUBTRACT DISTANCE	COUPLING PLACEMENT DISTANCE
_____	- 0.310" (8mm) =	_____

"Jaw" Style Coupling NEMA C-face Installation

1. Measure the distance from the face of the input adapter to the face of the coupling as shown and record that measurement.

2. Subtract the "X" dimension from the measured distance. This needs to be done so that the coupling will not be preloaded after installation!

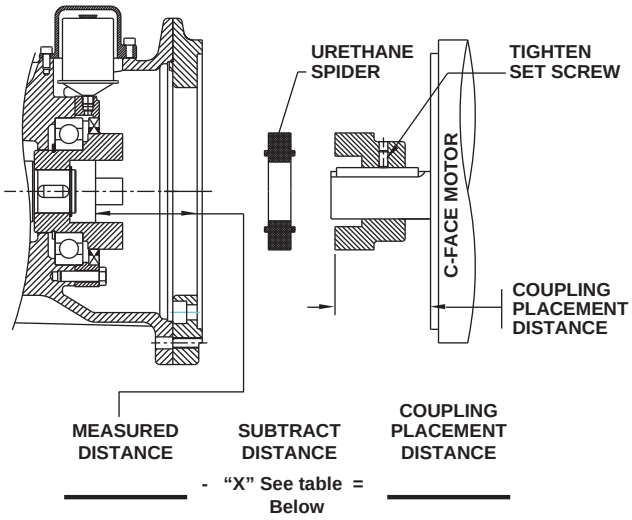
3. Use that measurement to locate the coupling from the face of the motor onto the shaft.

4. The metal portion of the coupling should be heated up prior to assembly, generally 250°F to 300°F (120°C to 150°C).

⚠ *WARNING* ⚠
DO NOT HEAT THE URETHANE SPIDER.

5. Once in place, tighten the setscrew to lock coupling in place. Let the coupling cool down before placing the spider into the jaws. It is recommended that the key is staked or bonded (Loctite) in place to prohibit the key from vibrating out.

6. Mount the motor onto the input adapter with customer supplied bolts. Make sure that the coupling from the adapter and the motor engage securely. Use lock washers or Loctite to prohibit bolts from becoming loose from vibration.

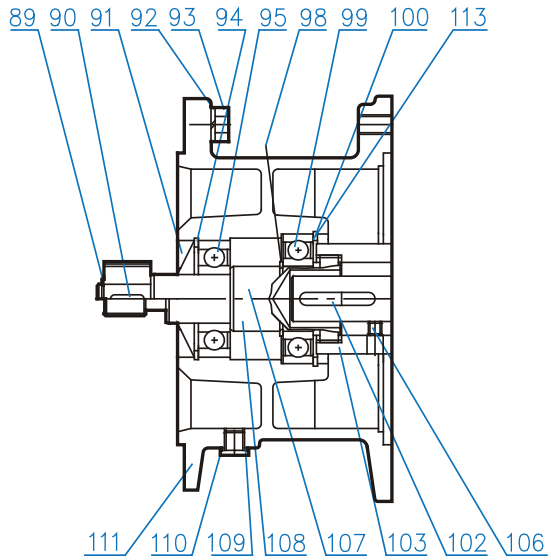


Coupling Size	"X" (Subtract this value from measured distance)
R14	0.06" (1.5 mm)
R19 & R24	0.08" (2.0 mm)
R28	0.10" (2.5 mm)
R38 & 42	0.12" (3.0 mm)
R48	0.14" (3.5 mm)
R65	0.18" (4.5 mm)
R90	0.22" (5.5 mm)

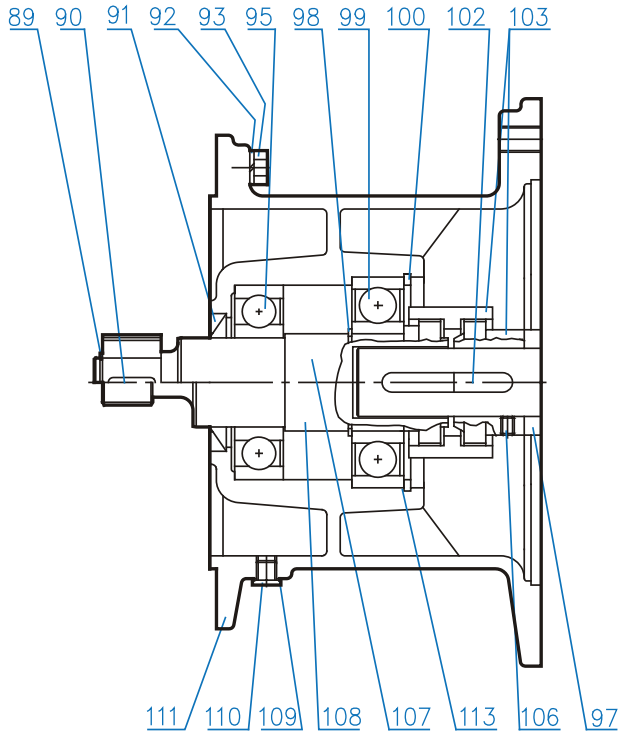
NEMA/IEC INPUT ADAPTERS & THEIR COUPLINGS

NEMA/IEC Parts List for UNICASE Gearboxes

NEMA 56C - 180TC



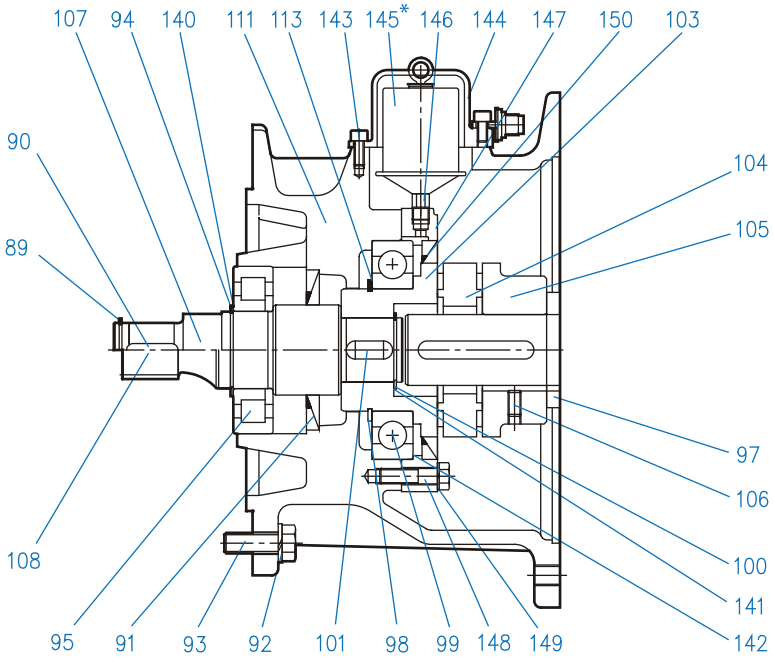
NEMA 180TC - 280TC



89	Circlip
90	Key
91	Shaft Seal
92	Washer
93	Hexagon Screw
94	Circlip
95	Clutch Shaft Bearing
97	Space
98	Circlip
99	Clutch Shaft Bearing
100	Circlip
101	Key
102	Key
103	Coupling
104	Coupling
105	Coupling
106	Set Screw
107	Clutch Shaft
108	Clutch Pinion Shaft
109	Seal
110	Oil-Plug
111	NEMA / IEC Adapter
112	Oil Flinger
113	Shim
140	Shim
141	Shim
142	Shim
143	Socket Head Screw
144	Cover
145	Automatic Lubricator*
146	Adapter
147	Bearing Cover
148	Hexagon Screw
149	Washer
150	Shaft Seal

* Please see U45250 for automatic lubricator Instructions.

NEMA 250TC - 400TC
IEC 160 - IEC 315

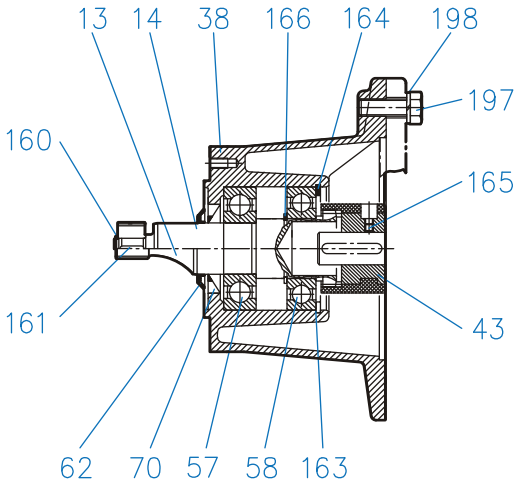


NORD Gear Limited
Toll Free in Canada: 800.668.4378

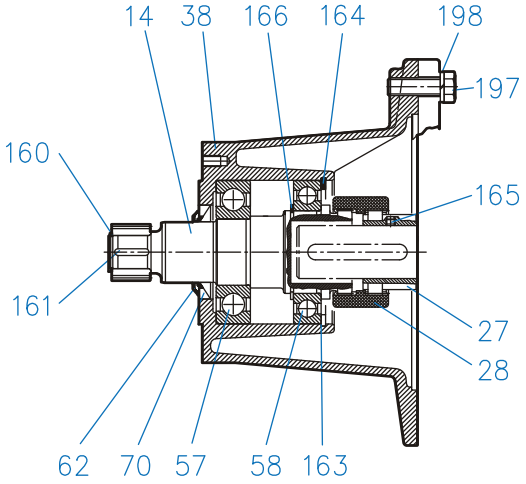
NORD Gear Corporation
Toll Free in the United States: 888.314.6673

NEMA/IEC Parts List for Nordbloc Gearboxes

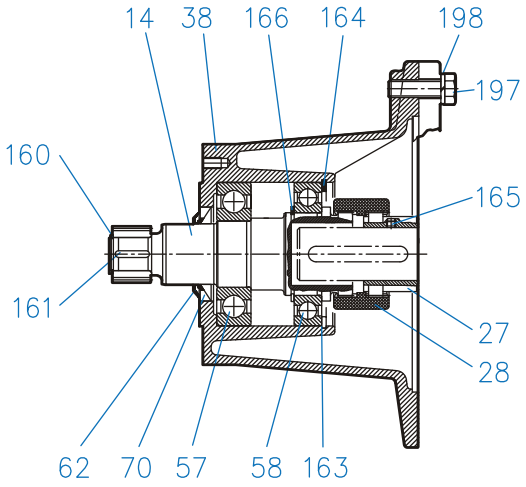
NEMA 56C - 180TC
IEC 63 - IEC 112



NEMA 210TC - 280TC
IEC 132-IEC 180



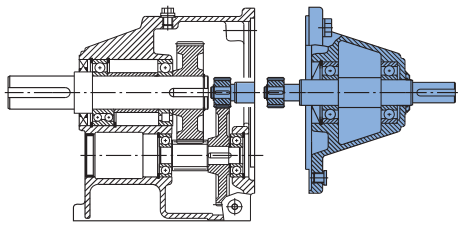
IEC 200



13	Clutch Pinion Shaft
14	Clutch Shaft
26	Coupling
27	Coupling
28	Coupling
38	IEC Adapter
43	Coupling
57	Clutch Shaft Bearing
58	Clutch Shaft Bearing
62	Oil Flinger
70	Shaft Seal
101	Key
160	Snap Ring
161	Key
163	Shim
164	Snap Ring
165	Set Screw
166	Snap Ring
197	Bolt
198	Spring Washer

1. Solid Input Shaft (W)

The shaft will be inch or metric, depending on how the unit was ordered. Measure and verify the shaft before mounting anything on the shaft. Below are the tolerances used for the solid shafts.



2. Solid shaft diameter tolerance

Reducer input shaft extensions have a diameter tolerance as specified in **Table 1**.

Table 1: Solid Shaft Diameter Tolerance

Above ø (in)	To & Including ø (in)	Tolerance (in)
0.375	1.750	+0.0000 / -0.0005
1.750	2.750	+0.0000 / -0.0010

Above ø (mm)	To & Including ø (mm)	Tolerance (mm)	ISO 286-2 Fit Class
10	18	+0.012 / +0.001	k6
18	30	+0.015 / +0.002	k6
30	50	+0.018 / +0.002	k6
50	70	+0.030 / +0.011	m6

3. Fitting drive elements onto the reducer solid shaft

Solid input shaft extensions are provided with a drill and tap feature as indicated in Table 2. When installing drive elements such as coupling hubs, pulleys, sprockets, or gears, NORD recommends using the threaded hole in the end of the shaft, along with a suitable assembly device fitted into the threaded hole.

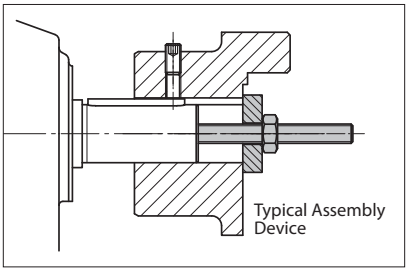


Table 2: Solid Input Shaft End - Threaded Holes

Above ø (in)	To & Including ø (in)	Tap size & Depth (in)
0.375	0.500	10-24 x 0.43 in
0.500	0.875	1/4-20 x 0.59 in
0.875	0.938	5/16-18 x 0.71 in
0.938	1.100	3/8-16 x 0.87 in
1.100	1.300	1/2-13 x 1.10 in
1.300	1.875	5/8-11 x 1.42 in
1.875	2.750	3/4-10 x 1.73 in

Above ø (mm)	To & Including ø (mm)	Tap Size & Depth (mm)
10	13	M4 x 10 mm
13	16	M5 x 12.5 mm
16	21	M6 x 16 mm
21	24	M8 x 19 mm
24	30	M10 x 22 mm
30	38	M12 x 28 mm
38	50	M16 x 36 mm
50	70	M20 x 42 mm

STOP *HARMFUL SITUATION* STOP

DO NOT DRIVE or **HAMMER** the coupling hub, pulley, sprocket, or gear into place. An endwise blow to the reducer shaft can generate damaging axial forces and cause damage to the reducer housing, bearings or internal components.

⚠ *WARNING* ⚠

To avoid serious injury the user must provide suitable safety guards for all rotating shafts and shaft components such as couplings, chain drives, belt drives, etc. All guarding must adhere to local regulations and safety standards.

4. Installing interference-fit hubs to the reducer shaft

Prior to installing any interference-fit hubs to the reducer shaft, consult with the manufacturer to determine proper assembly and fit. Interference-fits usually require heating the coupling, sprocket or gear hub, per the manufacturer's recommendations. Coupling hub installation typically follows ANSI/AGMA 9002-A86. Always make sure the reducer shaft seals are protected from the heat source. Apply uniform heat to the drive element hub to prevent distortion. NORD does not recommend heating the drive element hub beyond 212°F to 275°F (100°C to 135° C).

⚠ *WARNING* ⚠

When using heat to mount a drive element hub, do not use open flame in a combustible atmosphere or near flammable materials. Use suitable protection to avoid burns or serious injury.

STOP *HARMFUL SITUATION* STOP

When using external chain or belt drives, make sure the reducer is sized so that the shaft and bearings have adequate capacity. To avoid unnecessary bearing loads and additional shaft deflection, mount all power take-off devices (sprockets, pulleys, etc.) so that the applied load center is as close to the gear housing as possible and check component alignment and tension of any belts or chains per the manufacturer's recommendation. Do not over tighten the belts or chains.

5. Coupling installation

The performance and life of any coupling depends upon how well it is installed. Coupling hubs are typically mounted flush with the shaft ends, unless specifically ordered for overhung mounting. Shaft couplings should be installed according to the coupling manufacturer's recommendations for gap, angular and parallel alignment. To help obtain critical shaft alignment coupling hubs may be installed to the machine shafts prior to final shimming or tightening of the foundation bolts. Proper coupling alignment allows for thermal and mechanical shaft movement during operation and ensures that only torque (no radial load) is transmitted between the mating shafts.

Coupling gap and angular alignment

The shaft gap must be sufficient to accommodate any anticipated thermal or mechanical axial movement. When setting the coupling gap, insert a spacer or shim stock equal to the required spacing or gap between the coupling hub faces. Measure the clearance using feeler gauges at 90-degree intervals, to verify the angular alignment.

Parallel (or offset) alignment

Mount a dial indicator to one coupling hub, and rotate this hub, sweeping the outside diameter of the other hub. The parallel or offset misalignment is equal to one-half of the total indicator reading. Another method is to rest a straight edge squarely on the outside diameter of the hubs at 90° intervals and measure any gaps with feeler gauges. The maximum gap measurement is the parallel or offset misalignment.

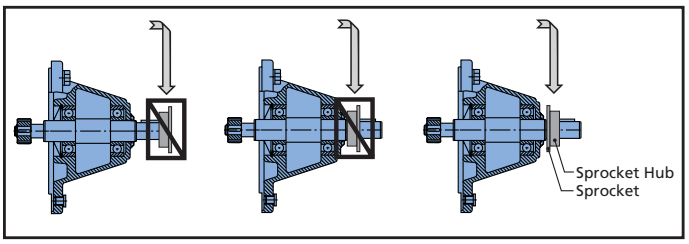
Check alignment

After both angular and parallel alignments are within specified limits, tighten all foundation bolts securely and re-check critical alignment. If any of the specified limits for alignment are exceeded, realign the coupling.

6. Installing sheaves (pulleys), sprockets and gears

To avoid unnecessary bearing loads and additional shaft deflection, mount all power take-off devices (sprockets, pulleys, gears, etc.) so that the applied load center is as close to the gear housing as possible, as shown in **Figure 2**.

Figure 2: Pully or Sprocket Mounting



Align the driver sheave or sprocket with the driven sheave or sprocket by placing a straight-edge length-wise across the face of the sheaves or sprockets. Alignment of bushed sheaves and sprockets should be checked only after bushings have been tightened. Check horizontal shaft alignment by placing one leg of a square or a level vertically against the face of the sheave or sprocket.

Always check component alignment and tension any belts or chains per the manufacturer's recommendation. The ideal belt or chain tension allows proper wrap of the driver and driven wheels, while maintaining the lowest possible tension of the belts or chain, so that no slipping occurs under load conditions. Check belt or chain tension frequently over the first 24 to 48 hours of operation.

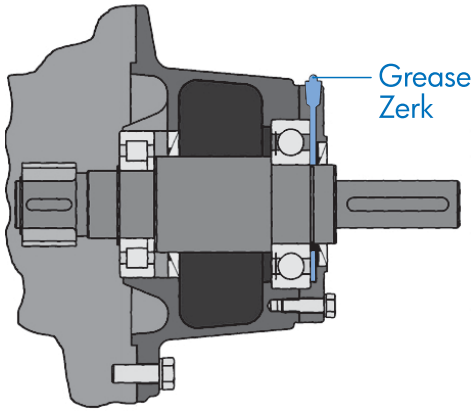
STOP *HARMFUL SITUATION* STOP

When using external chain or belt drives, make sure the reducer is sized so that the shaft and bearings have adequate capacity. To avoid unnecessary bearing loads and additional shaft deflection, mount all power take-off devices (sprockets, pulleys, etc.) so that the applied load center is as close the gear housing as possible and check component alignment and tension of any belts or chains per the manufacturer's recommendation. Do not over tension the belts or chains.

7. Service Guidelines for W-Shaft Input with Grease Fitting

On some solid shaft input (Type W) gear units, the outer roller bearing needs to be re-greased at regular service intervals. This is necessary for double-stage gearboxes sizes SK62 or SK6282 and larger, and triple-stage gearboxes from size SK73, SK7382 or SK9072.1 and larger.

To lubricate the bearing of the input shaft, approximately 0.75 to 1.0 ounces (20-25 grams) grease should be added by the grease fitting approximately after every 2,500 hours of service or at least every 6 months. The W-shaft input is factory assembled with the proper amount and type of grease. The type of grease supplied depends upon the type of oil specified at time of order.



Standard Bearing Grease Options

Reducer Oil Type	Grease Type/Thickener	NLGI Grade	Ambient Temperature Range	Manufacturer Brand/Type
Mineral	Standard (Li-Complex)	NLGI 2	-30 to 60°C (-22 to 140°F)	Mobil Grease XHP222
Synthetic	High Temp (Polyurea)	NLGI 2	-25 to 80°C (-13 to 176°F)	Mobil Polyrex EP 2
Food-Grade	Food-Grade (AL-Complex)	NLGI 2	-25 to 40°C (-13 to 104°F)	Mobil Grease FM222

STOP *HARMFUL SITUATION* STOP

Grease compatibility depends upon the type of thickener or soap complex used, the base oil type suspended within the thickener, and the type of additives used. The user should check with the lubrication supplier before making substitutions in brand and type in order to assure compatibility and to avoid causing damage to the extended bearing.

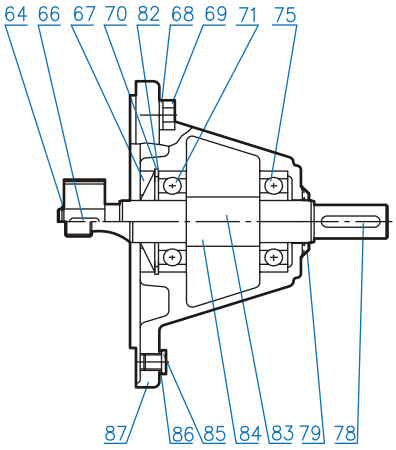
W-Type Input Parts List for UNICASE Gearboxes

SK 02 - SK 52
SK 03 - SK 63

SK 0182NB - SK 6382

SK 02040 - SK 42125
SK 13050 - SK 43125

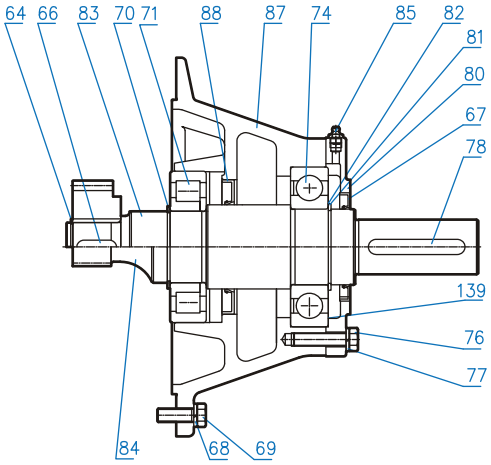
SK 9012.1 - SK 9052.1
SK 9013.1 - SK 9053.1



SK 62 - SK 72
SK 73 - SK 93

SK 6282 - SK 7282
SK 7382 - SK 9382

SK 9062

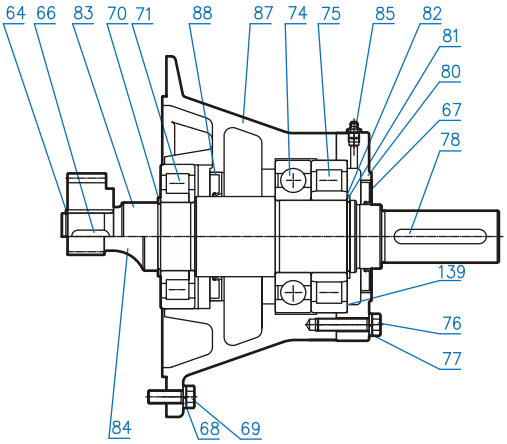


64	Circlip
66	Key
67	Shaft Seal
68	Washer
69	Hexagon Screw
70	Circlip
71	Input Shaft Bearing
74	Ball Bearing
75	Input Shaft Bearing
76	Washer
77	Hexagon Screw
78	Key
79	Oil Flinger
80	Bearing Cover
81	Circlip
82	Shim
83	Input Shaft, Plain
84	Input Shaft, Gearcut
85	Drain Plug
86	Seal
87	Input Bearing Housing
88	Shaft Seal (Oil Flinger)
139	Shim

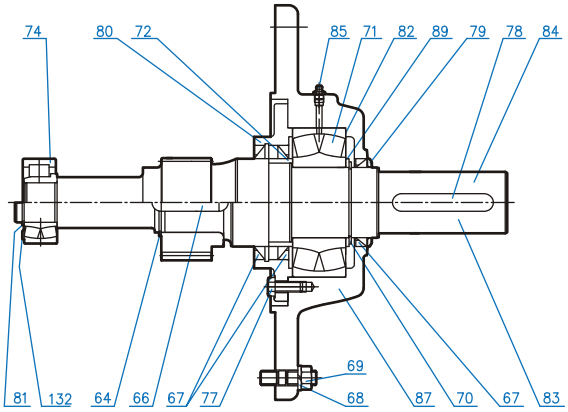
SK 82 - SK 102
SK 103

SK 8282 - SK 9282

SK 9082 - SK 9092



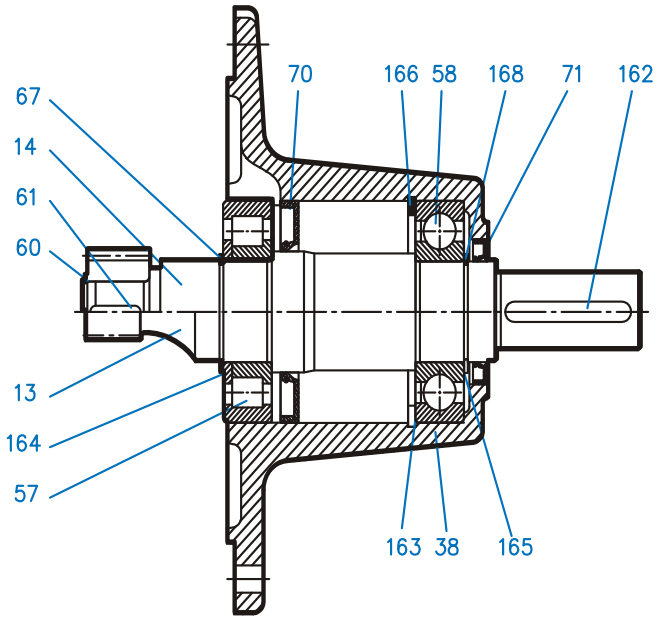
SK 10282 - SK 12382



SOLID INPUT SHAFT (W)

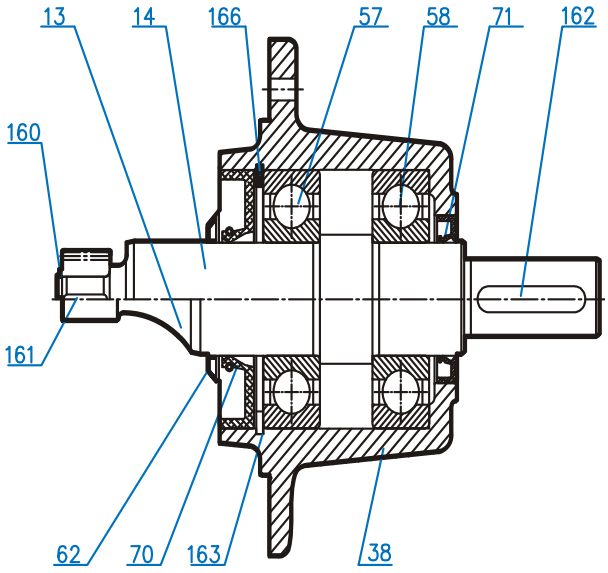
W-Type Inputs for Parts List for Nordbloc / 92 Bevel Gearboxes

SK172 - SK673
SK92072 - SK92372



13	Pinion Shaft
14	InputShaft
38	IEC Adapter
57	Bearing
58	Bearing
62	Oil Flinger
70	Shaft Seal
71	Shaft Seal
160	Snap Ring
161	Key
162	Key
163	Shim
164	Snap Ring
165	Set Screw
166	Snap Ring
167	Snap Ring
168	Snap Ring

SK772 - SK973
SK92672 - SK92772



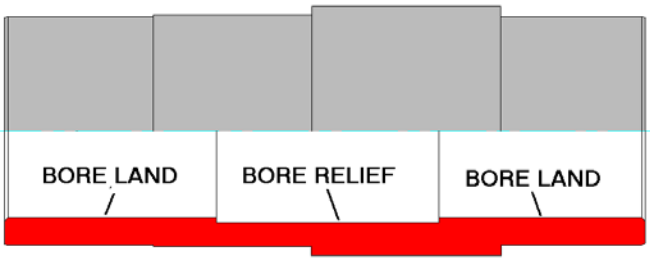
Hollow Keyed Shaft & Fixing Element Installation and Maintenance Instructions

BIM 1002

USA

CDN

Retain These Safety Instructions For Future Use



CAUTION:

For hollow bore reducers designed to use rectangular keys, the mating solid shaft must be made to mating rectangular dimensions. Otherwise the supplied keys will not fit properly. **Not doing so may cause the hollow shaft or the key to fail**.

CAUTION:

Key(s) must engage the full land length at each end of the hollow bore shaft. **Not doing so may cause the hollow shaft or the key to fail**.

Basic Design

Nord uses a tight tolerance ISO 286 class H7 for its hollow bore shafts. And, recommends a close fit of mating components to prevent excessive free play that might lead to failure. Straightness, roundness, and diameter tolerance variations of both shafts combined with the low clearance between would make installation difficult without special design features to compensate.
A relief area is cut in the center section of the hollow bore. In most cases, Nord furnishes 2 short keys instead of a single long key. The bore relief and break of the keys are done as design features to ease assembly of the solid shaft. If a key supplied by others is used, it must engage the full land length at each end of the hollow bore shaft.

Assembly

Before assembly, lubricate the hollow bore lands and the solid (male) shaft diameter with anti-seize compound (preferred), assembly paste or at a minimum, use a #2 grease. Anti-seize compounds are available from many manufacturers such as Loctite, Kluber, etc. This will aid installation of the reducer. But more importantly, the lubricant will aid removal should it be required at a later date.
After installation, a bead of silicone or grease around both ends of the hollow bore and solid shaft intersections will help prevent moisture from wicking down the shaft and corroding the two together.

Design of Mating Connection

Tolerance of Customer shaft with keyseat (in)	
0.625 – 1.500	+0.0000 / -0.0020
1.525 – 2.500	+0.0000 / -0.0030
2.625 – 7.000	+0.0000 / -0.0040

Shaft finish to be 125μ inches or smoother

Key Dimensions

Most keyed sizes use standard square keys and some units use rectangular keys (refer to the catalog for details). If the reducer shaft uses a rectangular key the mating, solid (male) shaft must be made to rectangular key dimensions. For dimensions of the mating male shaft keyway, see ANSI B17.1 or a general engineering text such as the *"Machinery's Handbook*". The male shaft should be made with a Class 2, transitional fit (slightly loose to slightly tight). If the key fit is tight at assembly it may require hand fitting of the keys (i.e. light filing of the key sides).
Keys in the female shaft are designed to be a low clearance. This is to allow for easier assembly with the mating male shaft, without allowing too much clearance that may work loose during use.

Preventing Axial Movement

Due to the slight oscillations inherent in any rotating shaft, Nord offers an optional "fixing element kit. This is a method to prevent the reducer from "walking out" of position. The kit includes all of the necessary parts to secure the shaft by using a tapped hole in the end of the mating male shaft. Refer to Nord's Constant Speeds catalog for dimensions in the fixing element section.

NORD Gear Corporation
National Customer Service Toll Free 888-314-6673
www.nord.com

NORD Gear Limited
Toll Free in Canada 800-668-4378

WEST
1121 Railroad Street
Building 101
Corona, CA 92882
Phone 951-279-2600
Fax 888-408-6673

MIDWEST
PO Box 367
800 Nord Drive
Waunakee, WI 53597
Phone 608-849-7300
Fax 800-373-6673

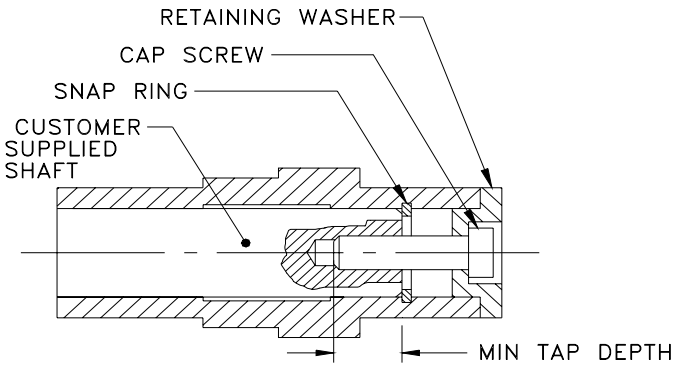
SOUTH
100 Forsyth Hall Dr.
Building 100B
Charlotte, NC 28273
Phone 704-529-1255
Fax 888-259-6673

CANADA
41 West Drive
Brampton, Ontario L6T 4A1
Phone 905-796-3606
Fax 905-796-8130

Optional Fixing Element Kit

The fixing element kit is used to prevent axial movement of the reducer during operation. A bolt and special washer tension the solid (male) shaft against a snap ring inside the hollow bore or a shoulder on the male shaft at the entry end of the bore. A plastic cover (not available with all sizes) seals the fixing element bolt. A bead of silicon, or grease applied between the hollow shaft end and the retaining washer will help prevent moisture wicking down the shaft and corroding the shafts together.

Kits are designed to fit multiple of bore sizes and may contain more than one bolt and/or snap ring. Use most appropriate parts and discard remaining components. Only one bolt, snap ring, retaining washer, and plastic cover are required per reducer. See Table for allowable thrust load ratings on the snap rings.



Bolt Tightening

If the “Customer Supplied Solid Shaft” is pulled up against the “Snap Ring” as shown in the figure above, then the shaft retaining screw labeled “Cap Screw” should be tightened lightly snug. The screw should also be secured with a thread-locking compound to prevent the screw from backing out. Be careful not to over tighten the retaining “Cap Screw” or the snap ring may be pulled out of its seating groove.

If the “Customer Supplied Solid Shaft” is shouldered and pulled up against the end of the hollow shaft and not the “Snap Ring,” then the shaft retaining “Cap Screw” should be tightened to standard torque as recommended by bolt manufacturers based on the bolt grade and materials.

CAUTION:

Maximum Edge Break on the solid (male) shaft must not exceed the value shown, otherwise the thrust capacity of the snap ring will reduced.

Shaft Bore inch	Max. Thrust on Snap Ring † lbs [N]	Bolt Size	Max. Edge Break on Solid Shaft †	
			Radius inch	Chamfer Inch
5/8	710 [3,158]	10 - 32	0.027	0.021
3/4	1,460 [6,494]	1/4 - 20	0.032	0.025
13/16	3,700 [16,458]	1/4 - 20	0.047	0.036
1	2,800 [12,455]	3/8 - 16	0.042	0.034
1-1/4	3,900 [17,348]	7/16 - 14	0.047	0.036
1-3/16	3700 [16458]	7/16 - 14	0.047	0.036
1-3/8	5050 [22463]	5/8 - 11	0.048	0.038
1-7/16	5500 [24465]	5/8 - 11	0.048	0.038
1-1/2	6000 [26689]	5/8 - 11	0.048	0.038
1-5/8	6900 [30693]	5/8 - 11	0.064	0.05
1-3/4	8050 [35808]	5/8 - 11	0.064	0.05
1-13/16	8450 [37587]	5/8 - 11	0.064	0.05
1-15/16	9700 [43148]	5/8 - 11	0.064	0.05
2	10300 [45816]	5/8 - 11	0.064	0.05
2-1/16	10850 [48263]	5/8 - 11	0.078	0.062
2-3/8	14300 [63609]	3/4 - 10	0.078	0.062
2-7/16	14900 [66278]	3/4 - 10	0.078	0.062
2-3/4	19200 [85405]	3/4 - 10	0.092	0.074
2-15/16	19500 [86740]	3/4 - 10	0.092	0.074
3-3/16	25000 [111205]	3/4 - 10	0.104	0.083
3-1/4	27000 [120101]	3/4 - 10	0.104	0.083
3-15/16	39300 [174814]	7/8 - 9	0.124	0.099
4	40700 [181042]	7/8 - 9	0.128	0.102
4-1/16	41000 [182376]	7/8 - 9	0.128	0.102
4-3/8	44600 [198390]	7/8 - 9	0.154	0.123
4-3/4	49000 [217962]	7/8 - 9	0.154	0.123

† Maximum edge break must be equal or less than shown.

MOTOR MOUNT PLATFORM (MK)

Motor Mount Platform (MK)

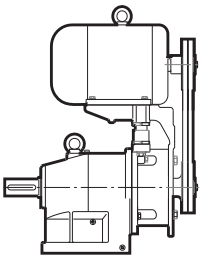
For proper installation of the belt drive, consult the manufacturer. NORD MK motor mounts are adjustable in two ways. Slotted holes are provided at the input cylinder for the initial height adjustment. There are two fine adjustments at the yoke to increase/decrease tension. Two spanner head wrenches will be needed to tighten/loosen the fine adjustments. The four bolts holding the motor platform to the input cylinder must be loosened in order to use the fine adjustments.

The motor mounting platform has tapped holes to accept the foot pattern of the standard footed NEMA or IEC motor. All MK mounting input shaft diameters are metric.

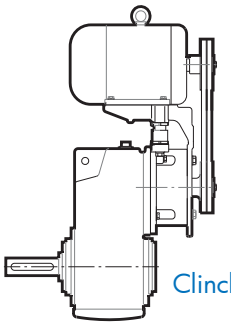
Align the sheaves or sprockets square and parallel by placing a straight edge across their faces. Alignment of bushed sheaves and sprockets should be checked after bushings have been tightened. Check horizontal shaft alignment by placing a level vertically against the face of the sheave or sprocket. Adjust belt or chain tension per the manufacturer's specified procedure. After a period of operation, recheck alignment and adjust as required.

HARMFUL SITUATION

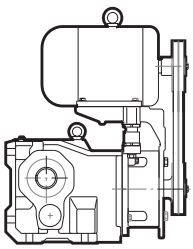
When using external chain or belt drives, make sure the reducer is sized so that the shaft and bearings have adequate capacity. To avoid unnecessary bearing loads and additional shaft deflection, mount all power take-off devices (sprockets, pulleys, etc.) so that the applied load center is as close to the gear housing as possible and check component alignment and tension of any belts or chains per the manufacturer's recommendation. Do not over tighten the belts or chains.



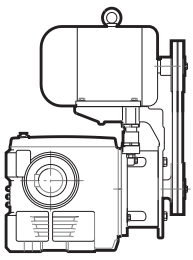
In-Line Unit



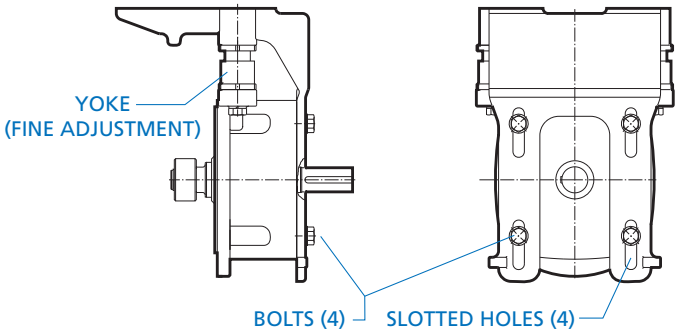
Clincher™ Unit



Bevel Unit



Worm Unit



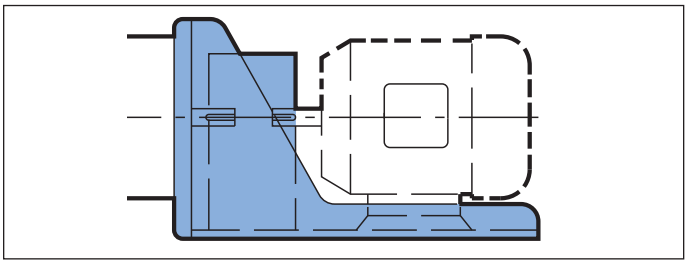
WARNING

NORD Gear does not furnish the safety guards for the belt drive. It is the responsibility of the customer to install a safety guard to conform to OSHA standards.

NORD Gear Limited
Toll Free in Canada: 800.668.4378

NORD Gear Corporation
Toll Free in the United States: 888.314.6673

Sugar Scoop



Each scoop bracket includes the coupling for the motor and the coupling guard.

- NORD's standard supplied coupling is the jaw-type coupling with elastomeric spider element.
- The reducer-side (driven) coupling hub is mounted by NORD.
- The motor-side (driver) coupling hub must be mounted by the party responsible for supplying or mounting the motor.
- The supplied coupling guard must be mounted after coupling installation.

Coupling Mounting Instructions

1. Make sure that the motor shaft is clean and free of burrs or defects.
2. Check the motor shaft, coupling hub bores, key and key seat dimensions to make sure they are the proper dimensions.
3. Mount the coupling onto the motor by placing the coupling so that the inside face is flush with the end of the motor shaft and tightening the set screws to hold it in place (Figure 1).

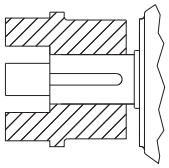


Figure 1. Place coupling flush with end of motor shaft and tighten setscrew.

IMPORTANT NOTE

Heating the coupling hub slightly, up to 176°F (80°C) will help facilitate installation onto the motor shaft.

WARNING

Wear appropriate safety gloves to handle the heated coupling hubs to avoid serious burns or injury.

HARMFUL SITUATION

DO NOT DRIVE or HAMMER coupling hubs into place. An endwise blow to the reducer or motor shaft can generate damaging axial forces and cause damage to the reducer or motor housing, bearings, or internal components.

4. Let the coupling cool down before mounting the spider into the jaws. The spider should not be under axial compression when installed.
5. Place the motor onto the scoop and engage the couplings together. The scoop has slotted holes to help accommodate axial alignment. Secure the motor to the scoop bracket but do not completely tighten the fasteners.

IMPORTANT NOTE

Before tightening the motor to the scoop bracket, the alignment of the coupling must be checked. Shimming of the motor feet may be needed to properly align the couplings. Careful coupling alignment extends the life of not only the coupling but all the components of the drive train.

6. Check the parallel alignment by placing a straight edge or level across the two coupling hubs, and measure the maximum offset at various points around the circumference of the coupling, without rotating the coupling. The maximum parallel alignment should not exceed 0.015 inches (4 mm).
7. Check the angular alignment of the coupling without rotating the hubs. The maximum angular displacement should not exceed 1.0°.
8. After both angular and parallel alignment is within specified limits, tighten all motor mounting hardware to the appropriate torque specification.
9. Re-check the critical alignment and repeat steps 6 and 7 if needed.
10. Mount the coupling guard to the scoop.

WARNING

It is the customer responsibility to properly guard the rotating shaft and coupling connection and make sure the system meets all local safety regulations.

IMPORTANT NOTE

After a period of operation, it is suggested that the system be checked to make sure coupling alignment is being maintained.

1. Importance of the operating instructions

These operating instructions are intended to provide general information and safety guidelines. It is the responsibility of the buyer, machine builder, installer and user of the NORD product to make sure that all the proper safetynotes and operating instructions have been reviewed and understood. If the contents of this instruction or any applicable operating instructions are not understood, please consult NORD.

⚠ *WARNING* ⚠

Electric motors, gearmotors, electrical brakes, variable frequency drives, and gear reducers contain potentially dangerous high-voltage, rotating-components and surfaces that may become hot during operation. All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians.

2. Inspect incoming freight

Before accepting shipment from the freight company, thoroughly inspect the NORD equipment for any shipping and handling damage. If any goods called for in the bill of lading or express receipt are damaged, or if the quantity is short, do not accept until the freight express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight carrier or express agent at once, and request a formal review of your claim.

Claims for loss or damage in shipment must not be deducted from the NORD invoice, nor should payment of the NORD invoice be withheld awaiting adjustment of such claims, as the carrier guarantees safe delivery. NORD will try to assist in collecting claims for loss or damage during shipment; however, this willingness on our part does not remove the transportation company's responsibility in reimbursing you for collection of claims or replacement of material.

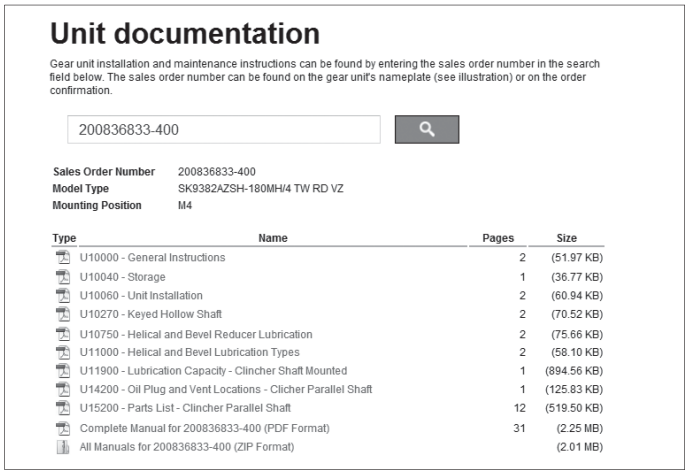
3. Obtaining detailed operating instructions

One can receive the detailed installation and maintenance instructions by entering a serial number (or NORD order number) at the appropriate location on the NORD web site.

i. Record the serial number from your gearmotor, gear reducer, or motor nameplate, or record the serial number found on your order confirmation.

ii. Go to **www.nord.com/docs** to download the appropriate operating instructions.

EXAMPLE: www.nord.com/docs



Unit documentation

Gear unit installation and maintenance instructions can be found by entering the sales order number in the search field below. The sales order number can be found on the gear unit's nameplate (see illustration) or on the order confirmation.

200836833-400

Sales Order Number	200836833-400
Model Type	SK9382AZSH-180MH/4 TW RD VZ
Mounting Position	M4

Type	Name	Pages	Size
	U10000 - General Instructions	2	(51.97 KB)
	U10040 - Storage	1	(36.77 KB)
	U10060 - Unit Installation	2	(60.94 KB)
	U10270 - Keyed Hollow Shaft	2	(70.52 KB)
	U10750 - Helical and Bevel Reducer Lubrication	2	(75.66 KB)
	U11000 - Helical and Bevel Lubrication Types	2	(58.10 KB)
	U11900 - Lubrication Capacity - Clincher Shaft Mounted	1	(894.56 KB)
	U14200 - Oil Plug and Vent Locations - Clicher Parallel Shaft	1	(125.83 KB)
	U15200 - Parts List - Clincher Parallel Shaft	12	(519.50 KB)
	Complete Manual for 200836833-400 (PDF Format)	31	(2.25 MB)
	All Manuals for 200836833-400 (ZIP Format)		(2.01 MB)

4. Intended use

NORD is a supplier of electric motors, gearmotors, reducers, electromechanical brakes, mechanical variators, and electrical variable frequency drives that are intended for commercial installations on larger systems and machines.

⚠ *WARNING* ⚠

NORD does not accept any liability for damage or injury caused by:

- Inappropriate use, operation or adaptation of the drive system.
- Unauthorized removal of housing covers, safety and inspection covers, guarding, etc.
- Unauthorized modifications to the drive system.
- Improper servicing or repair work on the drive system.
- Damage caused during shipment or transportation.
- Disregard of the important Safety Notes or Operating Instructions.

5. Notes concerning warranty and liability

All units are supplied according to the terms described in our standard "Conditions of Sale." The unit limited warranty is also defined in our "Conditions of Sale" and is located in the back of our product catalogs as well as the back of your order invoice.

All NORD Safety Notes and all related NORD Operating instructions shall be considered up-to-date at the time in which they were compiled by the buyer, machine builder, installer or user. NORD reserves the right to incorporate technical modifications and information updates to any safety/operating instructions that are within the scope of providing additional knowledge or clarification, communicating design changes, or product enhancements. Information updates may include any NORD product, or subsequent products purchased and supplied by NORD; No specific claims can be derived from the information or illustrations and descriptions contained in the safety notes or related operating instructions.

⚠ *WARNING* ⚠

NORD assumes no liability for personal injury, equipment damage or malfunctions resulting from failure to comply with any installation safety notes. The applicable national, regional, and local work regulations and safety requirements must also be complied with. Failure to comply with any safety notes or regulations may result in serious injury, damage to property, or even death.

6. Checklist for installation and operation

- ☑ Verify that the purchased NORD product has been supplied with the expected accessories & options. Check the received goods and packing slip to make sure items are properly received.
- ☑ Make sure that you have all of the required Operating Instructions for your NORD electric motor, gearmotor, reducer, electromechanical brake, mechanical variable speed drives, or electrical variable frequency drives.
- ☑ Consult NORD if you feel you are missing any documentation or if you have questions.

SAFETY NOTES

1. Safety & information symbols

All work including transportation, storage, installation, electrical connection, commissioning, servicing, maintenance and repair must be performed **only by qualified specialists or personnel**. It is recommended that repairs to NORD Products are carried out by the NORD Service Department. Instructions related to operational safety will be emphasized as shown.

Symbol	Meaning
⚠	**General Warning or Hazard -** Severe risk or danger of personal injury or death by working around dangerously high electrical voltage or moving machinery. Proper safety precautions must be taken.
STOP	**Possible Harmful Situation -** Care must be taken to avoid the possibility of damaging the drive unit, driven machine, or the environment.
ℹ	**Important Note -** Useful note or tip to help assure trouble-free operation.
♻	**Material Disposal Note -** Important note concerning suggested material disposal.

2. Safety warnings

⚠ GENERAL WARNINGS ⚠

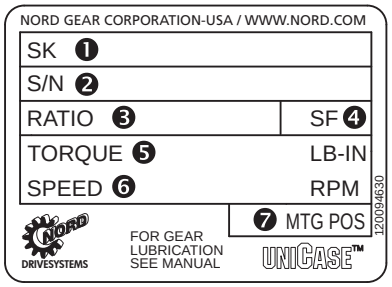
- All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians. All applicable national, regional, and local work regulations and safety requirements must also be complied with. **NORD assumes no liability for personal injury, accidental death, or equipment damage and malfunctions resulting from failure to comply with installation or operating instructions, safety notes, or any work regulations and laws!**
- Gear unit installation and maintenance work may only be performed when no power is available to the prime mover or motor. Electric motors, electrical brakes, and variable frequency drives, contain potentially dangerous high-voltage. Prior to installation or maintenance, shut down the power at the circuit breaker or power switch. **While working on the drive, make sure the power from the prime mover is isolated or secured on "lock-out" to prevent accidental start-up and to safeguard against injury!**
- Surfaces of motors and gear units may become hot during operation or shortly after start-up. In some instances additional protection against accidental contact may be necessary. **Use caution to avoid burns or serious injury!**

3. Observe published performance range & nameplate data

STOP HARMFUL SITUATION STOP

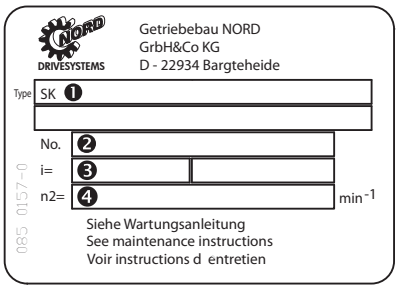
Observe the data on all reducer nameplates and verify published ratings for the NORD item/s in question. Do not operate any NORD equipment outside the published performance range. Failure to comply may result in damage to the drive unit, driven machine, or the environment.

U.S. Nameplate



❶ Model/Type
❷ Serial Number
❸ Gear Ratio
❹ Service Factor
❺ Torque Rating
❻ Output Speed RPM
❼ Mounting Position

European Nameplate



❶ Model/Type
❷ Serial Number
❸ Gear Ratio
❹ Speed

4. Transportation and handling

Make sure that all eyebolts and lifting lugs are tight and lift only at designed points. Protect the mounting surface from possible damage during transportation.

⚠ WARNING ⚠

Do not attach other machinery or loads to the NORD assembly, since the supplied lifting bolts are not designed for this purpose.

If the gearmotor or assembly is equipped with two suspension eye bolts, then both locations should be used for transportation and placement of the unit; in this case the tension force of the slings must not exceed a 45° angle.

In some instances it may be appropriate to use additional lifting straps or slings in order to assure safe transportation of the assembly. Always use sufficiently rated handling equipment and ensure that adequate safety measures are taken to protect personnel from injury during transportation. Once the NORD assembly is properly installed, remove the transportation fixtures.

7. DISPOSAL

MATERIAL DISPOSAL

Properly dispose of all used gear units and internal parts in accordance with all local regulations. In particular, all lubricants must be properly collected and disposed.

For confirmation of specific materials used in a specific reducer or gearmotor assembly, please consult NORD with the appropriate unit identification or serial number.

Components	Material
Gear wheels, shafts, rolling bearings, parallel keys, snap rings, spacers, shims, etc.	Steel
Gear housing and housing components	Cast iron or Aluminum (depending on type and size)
Worm gears	Bronze alloy
Radial seals, sealing caps, and rubber components	Elastomers with some steel
Coupling components	Plastic or Elastomer with Steel
Housing gaskets and flat oil seals	Asbestos-free sealing or gasket material (various types used)
Gear Oil	Mineral, SHC-Synthetic or PG-Synthetic (can vary)

STORAGE & COMMISSIONING

1. Storage

IMPORTANT NOTE

For storage periods longer than 9 months, or for storage in less than desirable conditions, please consult NORD for recommendations.

Storage for up to 9 months is possible, so long as the following conditions are observed:

- Store the gear unit in its actual mounting position in accordance with the specified oil fill-level, in a clean and dry temperature controlled area. Avoid temperature fluctuations within the range of 0°C and 40°C (32°F to 104°F) and avoid relative humidity conditions in excess of 60%.
- Protect all exposed or unpainted shaft and flange surfaces with an anti-corrosion agent or grease.
- Store in a location free from shock and vibration, to avoid false brinelling of bearing elements and raceways.
- Whenever possible, rotate the shafts periodically, by hand if necessary, to help prevent brinelling (bearing damage) and to help keep the shaft seals pliable.
- Avoid direct exposure to the sun or UV light and aggressive or corrosive materials in the environment (ozone, gases, solvents, acids, caustic solutions, salts, radioactivity, etc.

2. Commissioning

Prior to gear unit start-up, complete the following:

- Check the lubricant and be sure the gear unit is filled with the proper oil type, to the proper level, as determined by the mounting position.

IMPORTANT NOTE

Some smaller gear units are supplied as maintenance free/ lubricated for life gear units. Oil level may not be checked on some of these units.

- Check the condition of all shaft seals and all assembled flange gasket areas. If any change is detected in the shape, color, hardness or permeability, or if any leaks are detected, the corresponding shaft seals and/or gaskets must be replaced.
- Remove all anti-corrosive metal protectant from otherwise bare metal surfaces. Follow product manufacturers directions and warnings during surface protection removal.
- Check the resistance of all motor and brake windings to verify the integrity of the winding insulation and inspect all terminal box openings and wire connection areas to verify that all components are dry and free of corrosion.

3. Long-Term Storage

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

- Store the gear unit in its actual mounting position in accordance with the specified oil fill-level, in a clean and dry temperature controlled area. Avoid temperature fluctuations within the range of 0°C and 40°C (32°F to 104°F) and avoid relative humidity conditions in excess of 60%.
- Fill the reducer full with oil that is compatible with the product normally used or recommended during service.
- Apply grease to all unpainted or unprotected shafts, bores, keyways, flange surfaces, tapped holes, and to the exterior of all oil seals.
- Store in a location free from shock and vibration, to avoid false brinelling of bearing elements and raceways.
- Once every few months rotate the input shaft approximately 10-20 revolutions to redistribute the weight of gears and shafts and to prevent brinnelling of the bearings and drying of the seal track.
- Avoid direct exposure to the sun or UV light and aggressive or corrosive materials in the environment (ozone, gases, solvents, acids, caustic solutions, salts, radioactivity, etc.)

4. Commissioning After Long-Term Storage

- Remove all anti-corrosive metal protectant from otherwise bare metal surfaces. Follow product manufacturers directions and warnings during surface protection removal.
- Drain the reducer and refill it with the proper type and amount of lubricant.
- Observe start-up and initial operation to make sure there are no seal or gasket leaks, or unusual sounds, vibration or heat rise during operation.
- Check the resistance of all motor and brake windings to verify the integrity of the winding insulation and inspect all terminal box openings and wire connection areas to verify that all components are dry and free of corrosion.

UNIT INSTALLATION

1. Installation site

Drives must be properly installed if they are to produce the rated torque. Improper installation may lead to oil leaks, reduced life, or even catastrophic failure. NORD gear drives and motors are intended to be installed at a suitable mounting site under the following conditions:

- Unimpeded airflow to and around the units.
- Accessibility to oil drain, level and breather plugs.
- On brakemotors, allow adequate space for removing the fan guard and replacing and adjusting the brake.
- Mounting surfaces must be flat, torsionally rigid, and dampened against vibration.
- Unless special measures are taken, the immediate vicinity around the gear drive or motor should not be exposed to any aggressive or corrosive substances, contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity, etc.

2. Mounting position

Reducer mounting position charts illustrate the standard mounting positions for horizontal and vertical mounting. All gear units are assembled with the oil fill-level, oil-drain and vent plugs installed in their proper locations, **according to the customer-specified mounting position**. For mounting orientations other than shown consult NORD Gear.

STOP *HARMFUL SITUATION* STOP

The gear reducer may not receive proper lubrication if the unit is not mounted in the position for which it is designed. Observe the mounting position designated on the reducer nameplate, or specified in the order acknowledgement. Consult NORD prior to changing mounting position in the field. While it is often possible to simply relocate the oil fill-level and vent locations, and adjust the oil fill amount, in some cases, different mounting positions may lend themselves to different internal construction features.

3. Reducer mounting

- The support foundation must be straight, level and flat. Whether the gear unit is foot-mounted or flange-mounted, NORD recommends that the straightness and flatness of the customer-supplied support foundation follow **Table 1**.
- The gear unit must be properly aligned with the driven shaft of the machine in order to prevent additional stress or load forces from being imposed upon the gear unit.
- To facilitate oil drainage it may be desirable to elevate the gear box foundation above the surrounding support structure.
- All bolting surfaces must be clean and free from contamination and corrosion.

Table 1: Recommended Straightness and Flatness of Customer-Supplied Support Foundation

Above (in)	To & Including (in)	General Tolerance on Straigtness & Flatness ISO 2768-2, Tolerance Class K
0.00	0.39	+/- 0.002 in
0.39	1.18	+/- 0.004 in
1.18	3.9	+/- 0.008 in
3.9	11.8	+/- 0.016 in
11.8	39	+/- 0.024 in
39	118	+/- 0.031 in

Above (mm)	To & Including (mm)	General Tolerance on Straigtness & Flatness ISO 2768-2, Tolerance Class K
0	10	+/- 0.05 mm
10	30	+/- 0.1 mm
30	100	+/- 0.2 mm
100	300	+/- 0.4 mm
300	1000	+/- 0.6 mm
1000	3000	+/- 0.8 mm

Straightness: Based upon the length of the corresponding line.

Flatness: Based upon the longer lateral surface or the diameter of the circular surface.

STOP *HARMFUL SITUATION* STOP

The responsibility for the design and construction of the support foundation is with the user. The foundation must be adequate to withstand normal operating loads and possible overloads while maintaining alignment to attached system components under such loads. ***Motors and drive components mounted on prefabricated base plates can become misaligned during shipment. Always check alignment after installation.***

4. Steel foundation

An engineered structural steel foundation should be designed to provide adequate rigidity and prevent loads from distorting the housing or causing misalignment of internal gears and shafts. When foot-mounting the gear reducer, a base plate or sole plate with suitable thickness (generally equal or greater than the thickness of the drive feet) should be securely bolted to steel supports and extend under the entire gear drive assembly. When flange-mounting the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear unit or gear motor.

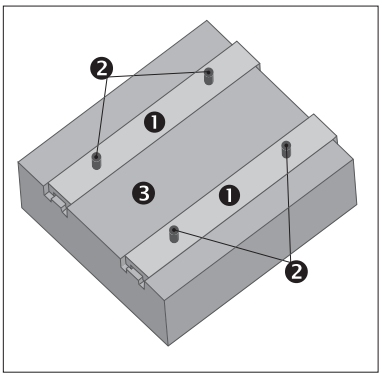
STOP *HARMFUL SITUATION* STOP

Do not weld on the gear unit or use the gear unit as an earth or ground connection for any welding procedure as this may cause permanent damage to the bearings and gears.

5. Concrete foundation

If a concrete foundation is used, allow the concrete to set firmly before bolting down the gear drive. Grout structural steel mounting pads and bolts of sufficient size into the concrete, to adequately distribute the load stress onto the concrete foundation.

Figure 1: Concrete Foundation



❶ Grouted Structural Steel Mounting Pads
❷ Mounting Bolts
❸ Concrete Foundation

6. Bolt connections for footed & flange mounted units

NORD footed reducers and flange-mount reducers (with B5 flange) have clearance designed into the mounting holes to allow for some minor adjustments in alignment. Bolt size, strength and quantity should be verified to insure proper torque reaction capacity whatever the mounting arrangement. Tightening torque for gear reducer mounting bolts, and recommended fastener grades, are provided in Table 2.

Table 2A: Tightening Torque for Inch Reducer Mounting Bolts

Thread Size	Grade SAE 5 / ASTM A449		Grade SAE 8	
(in)	(lb-ft)	(Nm)	(lb-ft)	(Nm)
1/4-20	7.1	9.6	10.0	13.6
5/16-18	16	21	22	30
3/8-16	28	37	39	53
1/2-13	69	93	98	132
5/8-11	138	188	195	264
3/4-10	247	334	348	472
7/8-9	396	537	558	757
1-8	592	802	833	1,130
1 1/8-7	-	-	1,233	1,672
1 1/4-7	-	-	1,717	2,327
1 3/8-6	-	-	2,267	3,073
1 1/2-6	-	-	2,983	4,045
1 3/4-5	-	-	4,458	6,045

- Calculated tightening torques are based a conventional 60°, clean and dry (un-lubricated) thread, with thread-friction and head-friction equal to 0.15.
- When using inch-fasteners, NORD recommends a minimum Grade SAE 5 (ASTM A-449) for sizes up to 1-8 UNC, and Grade SAE 8 for all larger sizes.

Table 2B: Tightening Torque for Metric Reducer Mounting Bolts

Above	ISO Grade 8.8		ISO Grade 10.9		ISO Grade 12.9	
(mm)	(lb-ft)	(Nm)	(lb-ft)	(Nm)	(lb-ft)	(Nm)
M4	2.4	3.2	3.5	4.7	4.1	5.5
M5	4.7	6.4	6.9	9.3	8.1	11
M6	8	11	12	16	14	19
M8	20	27	29	39	34	46
M10	39	53	58	78	67	91
M12	68	92	100	135	110	155
M14	107	145	159	215	180	250
M16	170	230	247	335	290	390
M18	240	325	343	465	400	540
M20	339	460	487	660	570	770
M22	465	630	664	900	770	1,050
M24	583	790	848	1,150	960	1,300
M27	848	1,150	1,217	1,650	1,440	1,950
M30	1,180	1,600	1,660	2,250	1,950	2,650
M36	2,050	2,780	2,884	3,910	3,470	4,710
M42	3,297	4,470	4,639	6,290	5,560	7,540
M48	4,940	6,700	7,010	9,500	8,260	11,200

- Calculated tightening torques are based on a conventional 60°, clean and dry (un-lubricated) thread, with thread-friction and head-friction equal to 0.15.
- When using metric-fasteners, NORD recommends a minimum ISO Grade 8.8 bolt.

7. Mounting the prime mover

When the motor is not flange mounted or integrally mounted to the gearbox, it is important to properly secure and align the gear drive with respect to the driven machine before attempting to align the prime mover or motor.

A. After the main gear drive is properly aligned and bolted in place, align the prime mover with respect to the reducer input shaft.

B. Use shims under the feet of the prime mover as needed, and secure in place with the proper mounting bolts. Dowel pins may be field-installed to help prevent misalignment and ensure proper realignment if removed for service.

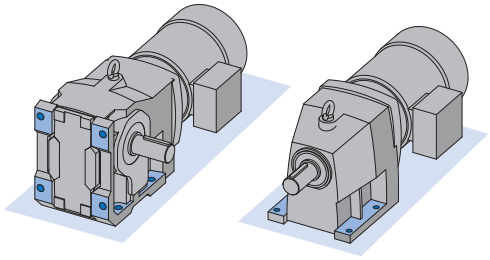
IMPORTANT NOTE

When using a high speed coupling connection between the prime mover and the reducer, check alignment per the coupling manufacturers recommendations. If the coupling is misaligned, the reducer alignment or shimming is incorrect. Re-align the gear reducer and re-check the high-speed coupling alignment before re-aligning the motor.

REDUCER MOUNTING
FOOTED & FLANGE MOUNT GEAR UNITS

1. Foot-mounted reducers

When installing the foot-mounted gear unit, observe the flatness specifications and bolt tightening torque guidelines provided in U10060 and make sure the mating mounting surface and reducer feet are clean and free of debris. Use of shims under the feet of the gear unit may be required in order to align the output shaft to the driven equipment. Make sure that all feet are supported so that the housing will not distort when it is bolted down. Improper shimming will cause mis-alignment and may reduce the life of the gear unit or cause component failure. Dowel pins may be field-installed to help prevent misalignment and ensure proper realignment if removed for service.



IMPORTANT NOTE

Gear units may be subjected to radial loads or side pull, caused by external chain drives or belt drives. In these instances it is recommended that the mounting base be designed with a slide-plate adjustment to accommodate extra slack in the chain or the belt after the feet are loosened. When using an external chain or belt drive, make sure the reducer is sized so that the shaft and bearings have adequate capacity.

2. Flange-mounted reducers (with B5 flange)

When using the B5 flange to mount the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear reducer or gearmotor. On the B5 mounting flange NORD provides a pilot register or and the flange pilot tolerance as listed per Table 1. When the mating hole is designed with the proper fit, the flange pilot tenon provides a means of accurately positioning the reducer while the hold-down bolts are properly secured; once the reducer is secured, the tenon helps prevent movement of the reducer and it helps locate the center of the reducer output shaft.

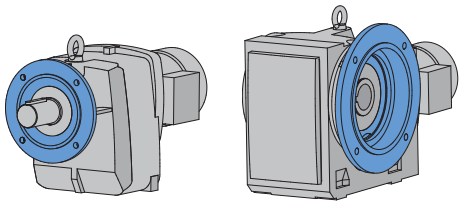


Table : Flange Pilot Tolerance

Above ø (in)	To & Including ø (in)	Tolerance (in)	ISO 286-2 Fit Class
1.969	3.150	+0.0005 / -0.0003	j6
3.150	4.724	+0.0005 / -0.0004	j6
4.724	7.087	+0.0006 / -0.0004	j6
7.087	9.055	+0.0000 / -0.0005	h6
9.055	9.843	+0.0000 / -0.0011	h6
9.843	12.402	+0.0000 / -0.0013	h6
12.402	15.748	+0.0000 / -0.0014	h6
15.748	19.685	+0.0000 / -0.0016	h6

Above ø (mm)	To & Including ø (mm)	Tolerance (mm)	ISO 286-2 Fit Class
50	80	+0.012 / -0.007	j6
80	120	+0.013 / -0.009	j6
120	180	+0.014 / -0.011	j6
180	230	+0.000 / -0.013	h6
230	250	+0.000 / -0.029	h6
250	315	+0.000 / -0.032	h6
315	400	+0.000 / -0.036	h6
400	500	+0.000 / -0.040	h6

When installing the flange mounted gear unit, observe the flatness specifications and bolt tightening torque guidelines provided in U10060. Make sure the mating mounting surface and reducer flange are clean and free of debris. Use a straight edge or parallel bar to check for high spots on the mating mounting surface and remove any raised material around the mounting holes.

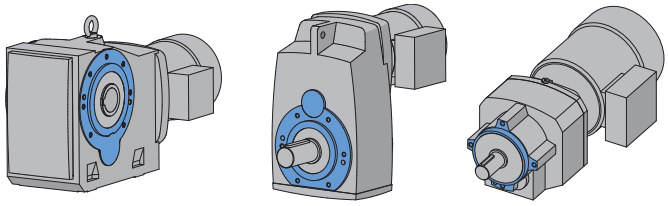
Set the gear unit into place and tighten the bolts until they are snug. Before final bolt-tightening check for any material gaps between the mating surfaces and if shimming is required, use “U” shaped shims at least 2 times the width of the bolt. Avoid over shimming a very irregular surface as this will make it very difficult to achieve proper alignment.

IMPORTANT NOTE

For heavy shock applications, it is advisable to field-install dowel pins through the mounting flange connection (in addition to the mounting bolts). This will help control flange movement or flange rotation and relieve the mounting bolts from this additional stress.

3. Flange-mounted reducers (with B14 flange)

When using the B14 flange to mount the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear reducer or gearmotor. When properly installed, the output flange of the reducer housing is designed to enable the permissible torques and radial forces to be reliably transmitted by the bolt connections.



IMPORTANT NOTE

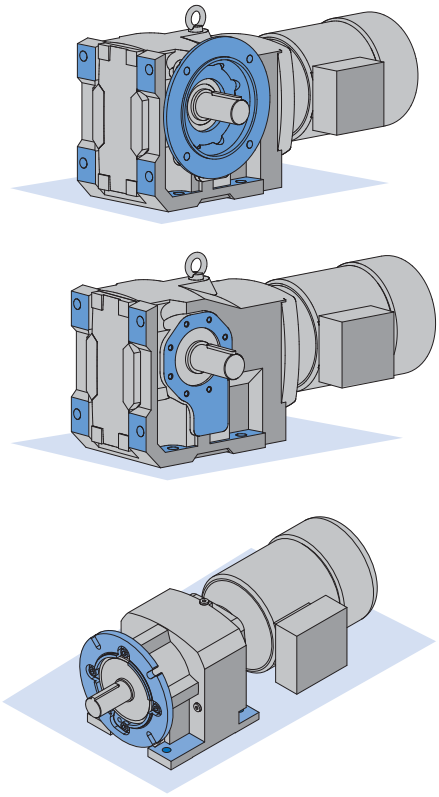
When using the B14 flange-face for mounting, if dowel pin holes are provided in addition to the threaded holes, then it is advisable to also use the proper dowel pins, to help control flange movement or flange rotation and relieve the mounting bolts from this additional stress This is especially important for heavy shock applications.

4. Foot & flange reducer housings

Some gear reducer housings are available with a foot and an output flange. Units with a foot and a B5 Flange are designated with the suffix XF after the primary model number and units with a B14 face-flange are designated with the suffix XZ after the primary model number. When a gear unit is provided with both a foot and a flange, the foot is consider the primary mounting surface. The flange is generally considered to be the secondary mounting option and it is intended that this surface be used for auxiliary add on elements that place minimal load stress on the reducer housing.

HARMFUL SITUATION

To prevent overstress on the main gear unit housing, never tighten the reducer mounting feet and the mounting flange against one-another. Auxiliary add-on elements that are mounted to the reducer flange, must not transmit excessive force, torque or vibration to the main gear housing.

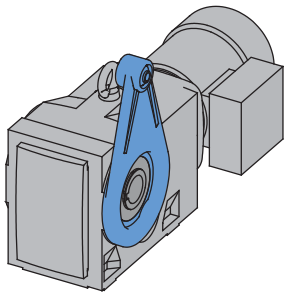


RIGHT-ANGLE SHAFT-MOUNT WITH TORQUE ARM (D)

1. Torque arm (D)

The preferred method of installing a shaft-mounted reducer is to support the weight of the gear unit or gearmotor assembly from the driven solid machine shaft. A torque arm is required in order to restrain the gearbox, react the load torque, and keep the gear unit from spinning around the shaft.

Table 1 (Page 2) provides a list of Torque-Arm (D) part numbers available based upon reducer series and type. The torque-arm is a tear-drop shaped bracket that is mounted to the B14 flange-face of the reducer. Each torque-arm bracket is supplied with a resilient rubber bushing located at the fastening hole-end of the bracket.



IMPORTANT NOTE

The side of the reducer that the torque arm is mounted on, and the angular position can be specified at time of order. Consult the appropriate NORD catalog for specific Torque Arm (D) mounting options and ordering guidelines.

2. Purpose of the built-in resilient rubber bushing

The resilient rubber bushing installed into the fastening hole end of the torque-arm helps isolate and absorb all the load forces present in the system and increase the reducer's service life by reducing cumulative torsional shock loads.

- The primary load force acts in the direction of driven shaft rotation, reacts the load torque of the reducer, and prevents the gearbox from spinning on the shaft.
- Additional forces present themselves in the direction opposite of the shaft rotation, due to the typical slight out-of-round condition present in the machine shaft. This condition is the reason most shaft mounted-reducers have a slight shaft-wobble, which is normal.

HARMFUL SITUATION

Always make sure that the Torque Arm (D) has the resilient rubber bushing installed into the fastening hole end of the torque arm. Failure to do so will not properly cushion the reducer and can result in excessive binding, bearing stress, and damage to the reducer.

3. Machine support

The user must supply a suitably strong and rigid mating machine support that provides load bearing capacity on both sides of the torque-arm bracket.

WARNING

It is the responsibility of the machine builder to design a support bracket of adequate strength and rigidity, and supply an appropriate tightening bolt assembly. Failure to do so may result in injury caused from a damaged or broken torque-reaction assembly.

4. Installation of the right-angle reducer with torque arm (D)

A. Make sure the Torque-Arm (D) is mounted in the correct position on the reducer.
   - The torque-arm can be repositioned on the as-received unit by removing the fixing screws, re-position the torque-arm in the correct location, and re-securing the fixing screws to the proper tightening torque, as indicated in Table 2 (Page 2).
   - If the torque-arm was shipped loose, position the torque-arm in the correct location on the gear unit, and secure the torque-arm with the proper fixing screws & tightening torque, as indicated in Table 2 (Page 2).

B. Install the right-angle hollow bore reducer onto the machine shaft. Line up the hole in the reducer's torque-arm with the hole in the machine's support bracket and temporarily hold the reducer in place

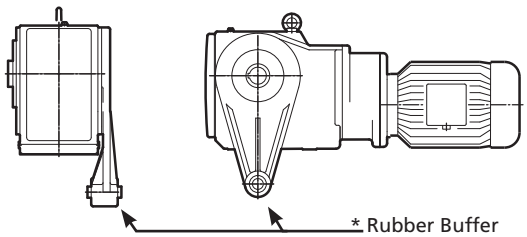
C. Properly secure the gear unit assembly to the driven shaft in an axial direction.

D. Place the fastening bolt through the rigid machine support bracket and reducer torque-arm. Then apply a thread locking compound to the end of the fixing bolt and loosely secure the nut onto the end of the bolt.

E. Tighten the fixing bolt to the proper tightening torque as indicated in Table 2 (Page 2).

RIGHT-ANGLE SHAFT-MOUNT WITH TORQUE ARM (D)

Table 1 - Torque Arm (D) with rubber buffer



- For all 90.1 Series Helical-Bevel gear units, NORD also offers a bottom mount Torque Arm (K). See User Manual U10620.
- For the large 90.1 Series Helical-Bevel gear units sizes: SK9082.1, SK9086.1, SK9092.1, and SK9096.1, please use the Torque Arm (K).
- A metric fixing bolt is preferred for fastening the Torque-Arm(D) to the machine support bracket.

Series	Type	Torque Arm Assembly P/N	Rubber Buffer* P/N	Reducer Mounting Screws	Mounting Screw P/N	Fastening Hole in [mm]	Fastening Bolt Size
92 Series Helical- Bevel	SK92172AZD	69290600	29602505	(Qty 8) M6 X 16 SHCS	22106165	0.41 [10.5]	M10
	SK92372AZD	69390600	29602505	(Qty 8) M8 X 25 SHCS	22108250	0.41 [10.5]	M10
	SK92672AZD	69390600	29602505	(Qty 8) M8 X 25 SHCS	22108250	0.41 [10.5]	M10
	SK92772AZD	69590600	29603605	(Qty 8) M8 X 25 SHCS	22108250	0.65 [16.5]	M16
90.1 Series Helical-Bevel	SK9012.1AZD/SK9013.1AZD	61090600	29602505	(Qty 7) M8 X 20 SHCS	22108205	0.41 [10.5]	M10
	SK9016.1AZD/SK9017.1AZD	61090600	29602505	(Qty 7) M8 X 20 SHCS	22108205	0.41 [10.5]	M10
	SK9022.1AZD/SK9023.1AZD	68290600	29603605	(Qty 7) M8 X 25 SHCS	22108250	0.65 [16.5]	M16
	SK9032.1AZD/SK9033.1AZD	68390600	29603605	(Qty 7) M10 X 30 SHCS	22110305	0.65 [16.5]	M16
	SK9042.1AZD/SK9043.1AZD	68490600	29605205	(Qty 7) M12 X 35 SHCS	22112350	0.98 [25]	M24
	SK9052.1AZD/SK9053.1AZD	68590600	29605205	(Qty 7) M12 X 35 SHCS	22112350	0.98 [25]	M24
	SK9072.1AZD	68690600	29605205	(Qty 7) M16 X 45 SHCS	22116450	0.98 [25]	M24
Helical-Worm	SK02040AZD	60190600	29602505	(Qty 4) M6 X 20 SHCS	22106205	0.41 [10.5]	M10
	SK02050AZD/SK13050AZD	60290600	29602505	(Qty 4) M8 X 20 SHCS	22108205	0.41 [10.5]	M10
	SK12063AZD/SK13063AZD	61090600	29602505	(Qty 7) M8 X 22 SHCS	22108220	0.41 [10.5]	M10
	SK12080AZD/SK13080AZD	61290600	29602505	(Qty 7) M10 X 25 SHCS	22110255	0.41 [10.5]	M10
	SK32100AZD/SK33100AZD	63290600	29603605	(Qty 7) M12 X 30 SHCS	22112300	0.65 [16.5]	M16
	SK42125AZD/SK43125AZD	64290600	29603605	(Qty 7) M12 X 30 SHCS	22112300	0.65 [16.5]	M16
MINICASE® Worm	1SM31AZD	60390600	29602505	(Qty 4) M6 X 20 SHCS	22106205	0.41 [10.5]	M10
	1SM40AZD/2SM40AZD	60490600	29602505	(Qty 4) M8 X 20 SHCS	22008206	0.41 [10.5]	M10
	1SM50AZD/2SM50AZD	60490600	29602505	(Qty 4) M8 X 20 SHCS	22008206	0.41 [10.5]	M10
	1SM63AZD/2SM63AZD	60690600	29602505	(Qty 4) M8 X 20 SHCS	22008206	0.41 [10.5]	M10
FLEXBLOC™ Worm	SK1SI31AZD	60393900	29602505	(Qty 4) M6 X 16 SHCS	22106160	0.41 [10.5]	M10
	SK1SI40AZD	60493900	29602505	(Qty 4) M8 X 22 SHCS	22108220	0.41 [10.5]	M10
	SK1SI50AZD	60593900	29602505	(Qty 4) M8 X 22 SHCS	22108220	0.41 [10.5]	M10
	SK1SI63AZD	60693900	29602505	(Qty 4) M10 X 25 SHCS	22110250	0.41 [10.5]	M10
	SK1SI75AZD	60793900	29602505	(Qty 4) M12 X 30 SHCS	22112300	0.41 [10.5]	M10

Thread Size	Tightening Torque					
	ISO Grade 8.8			ISO Grade 10.9		
(mm)	(lb-in)	(lb-ft)	(N-m)	(lb-in)	(lb-ft)	(Nm)
M6	97	8	11	142	12	16
M8	239	20	27	345	29	39
M10	469	39	53	690	58	78
M12	814	68	92	1,195	100	135
M16	2,036	170	230	2,965	247	335
M20	4,071	339	460	5,841	487	660
M24	6,992	583	790	10,178	848	1,150

FLEXBLOC™ (SI SERIES) WORM GEAR LUBRICATION GUIDELINES

1. Importance of Proper Lubrication

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective "fluid boundary" between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

2. Factory Oil-Filled / Maintence-Free

NORD modular worm gear units are inherently maintence-free, factory oil filled, and supplied with a high-quality, long-life, synthetic oil which is intend to be suitable for the life of the gear unit.

FLEXBLOC™ SI worm gear units are filled at time of assembly to a universal oil fill, allowing for many mounting position possibilities. See user manual U13300.

3. Standard oil type

FLEXBLOC™ worm gear reducers are oil-filled as follows:

- FLEXBLOC™ inch hollow-bore modules are factory-filled with an ISO VG220 food grade synthetic polyglycol lubricant (suitable for NSF-H1 incidental contact).
- FLEXBLOC™ metric hollow-bore modules are factory filled with an ISO VG220 polyglycol lubricant (unless special ordered).

See user manual U11060 for FLEXBLOC™ (SI) worm lubrication types and options.

STOP *HARMFUL SITUATION* **STOP**

In worm gears avoid using extreme pressure (EP) gear oils containing sulfur-phosphorous chemistries; these additives can react adversely with bronze worm gears, and accelerate wear.

4. Efficiency

It is important to consider the following, when ordering worm gears.

- Worm gears reach their peak rated efficiency, after they undergo a natural run-in process (up to 25 hours operating time at maximum rated load). Catalog published power and torque figures are based upon the rated efficiency after the run-in is complete.
- Worm gears have naturally lower startup efficiencies compared to operating efficiencies. As input speed increases the enhanced hydrodynamic effects of the oil result in less tooth friction and increased worm gear efficiency.

IMPORTANT NOTE

Worm gear reducers applied in cold temperature service, may require increased motor power for the following reasons:

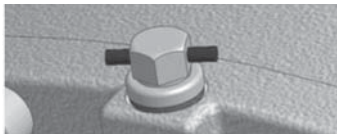
- Lower operating temperatures, cause lubrication viscosity to increase in both the gearbox and in the moving areas of the driven machine.
- Worm-gears have naturally lower start-up efficiencies compared to operating efficiencies.
- In extreme cases, one might need to consider increasing the motor power and lowering the oil viscosity

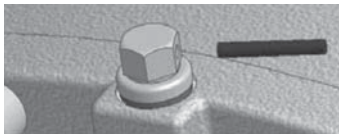
5. Optional Vent Kits

FLEXBLOC™ (SI) worm gear units are designed to operate sealed or vented. As a standard the modular worm gear units are factory oil filled and supplied with oil plugs in the housing, making vent plugs optional. See user manual U14800 for vent locations.

NORD can supply an AUTOVENT™ or an open vent with each gear unit size. If a vent is desired the type must be specified at the time of order. Reducer vents are sealed with a transportation plug that must be removed prior to gear unit start-up.

Type	Installation	Part Number
AUTOVENT™	Factory or Field site	220080561
Open Vent	Factory	22008004 (vent) 25308121 (gasket)
Open Vent	Field site	60693500 (No Transportation Plug)





WARNING

To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start-up.

6. AUTOVENT™

The AUTOVENT™ helps prevent bearing and gear damage by behaving like a check valve to block the entry of foreign material (water, dust, corrosives, etc.). The breather opens at approximately 2-3 psi during operation and closes tightly as the gearbox cools. This option is perfect for humid conditions and wash-down environments, helping to maintain proper oil cleanliness, while reducing foaming and oxidation.

7. Open Vent

A typical gearbox industry open vent option can also be supplied by NORD. This option allows free exchange of air and does not build-up any back pressure inside the gear unit. This option is ideal for many operating conditions where the geared product is used in relatively clean and moisture-free environment.

FLEXBLOC™ (SI SERIES) WORM GEAR LUBRICATION GUIDELINES

8. When to Use a Sealed or a Vented Unit

There are many conditions that should be considered when deciding whether to use a sealed or vented unit.

1. If the duty cycle is intermittent, the run times are short, and any build-up of internal pressure or temperature is relatively low, the sealed unit option may be used.
2. If running continuous and under moderate to high load conditions, worm gears can generate higher operating temperatures and a build-up of internal pressure. In these instances a vent is strongly recommended. Consult NORD if operation at high load conditions is required.
3. If running continuous at 4-pole electric motor speeds (1800 rpm at 60 Hz) or higher, then a vent option is usually recommended. Consult NORD if operation at higher speeds is required.
4. Radial shaft seals produce a hydrodynamic pumping action to help push lubricant back into the gear unit, causing a small amount of ingested air and a small pressure increase (1-2 psi) that does not normally require a reducer vent; however when combined with continuous operation under high load (Condition 2), additional operating pressures will result and a vent should be used.
5. When the environment is contaminated with water, dirt, or other objects that may be ingested into the breather, increased wear of bearings, gearing, and lubrication breakdown can result. In these instances the sealed option or an AUTOVENT™ should be considered.

9. Maximum Oil Sump Temperature Limit

To prevent reducer overheating, the reducer's maximum oil-sump temperature limit must not be exceeded for prolonged periods of operation.

Oil Type	Maximum Oil Temperature Limit	
	NORD	AGMA 9005-D94
Synthetic	105°C (220°F)	107°C (225°F)

IMPORTANT NOTE

Use caution when specifying gear reducers for high temperature service. If there is concern about exceeding the allowable safe operating temperatures, please consult NORD to discuss alternatives.

10. Oil Viscosity

The viscosity rating determines the operating oil's resistance to shear under load conditions. Some important viscosity considerations include the following:

- Lightly loaded gears require lower viscosity oils than highly loaded gears.
- Lower viscosity will provide thin oil film, lower friction, higher mechanical efficiency, and better heat removal conditions.
- Higher viscosity will provide thicker oil film, and better resistance to sliding wear, scuffing wear, and galling at high pressure.
- Higher operating temperatures will cause a reduction in viscosity and lower operating temperatures, cause an increase in viscosity or a thickening of the oil.

The standard oil-fill is considered acceptable for most applications. In certain situations an oil viscosity change may be beneficial.

- If the gear unit is exposed to frequent high load conditions. A higher viscosity oil will have a higher film thickness offering better overall resistance to oil shear, sliding wear and scuffing wear in gears and roller element bearings.
- An oil viscosity correction or lubrication change may improve the overall performance when operating the gear unit at very low or high ambient temperature conditions.

IMPORTANT NOTE

The user should consult with their primary lubrication supplier before considering changes in oil type or viscosity.

11. Viscosity Index

Viscosity index helps quantify the rate of oil viscosity change with respect to temperature changes. Oils with a reasonably high viscosity index tend to be more stable in a changing temperature environment. The ability of an oil to maintain a small viscosity differential over the operating range of the gearbox provides a more consistent lubricating film and better wear performance.

Synthetic oils typically have a higher viscosity index than mineral oils and polyglycol oils tend to have an exceptionally high viscosity index compared to other synthetic oils like polyalphaolefin or ester based products.

FLEXBLOC™ (SI SERIES) WORM GEAR LUBRICATION TYPES

Lubrication Tables – FLEXBLOC™ (SI Series) Worm Gear Units

Standard Oil Lubricants

NORD uses a semi automated assembly process to produce the FLEXBLOC™ gear unit assemblies. During this process the gear units are factory filled in accordance with the following table.

ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Unit Type
VG220	FG-PG	-25 to 40°C (-13 to 104°F)	Klübersynth UH1 6-220	Inch
	PG	-25 to 40°C (-13 to 104°F)	Klübersynth GH 6-220	Metric

Please consult with NORD prior to considering any optional lubricants for the FLEXBLOC™ gear unit.

IMPORTANT NOTES

- Observe the general lubrication guidelines in User Manual U10800.
- Ambient temperature range is a guideline only. The allowed operating temperature range for the gear unit is dependent upon assembly components used, their individual temperature limits, and the actual operating conditions.
- The selected oil type and viscosity is considered appropriate for most applications utilizing the specified NORD gear unit type. Different oil types or viscosity grades may be recommended if the gear unit is exposed to frequent high load conditions or operating under extreme low or high ambient temperature conditions.
- To prevent reducer overheating, observe the maximum operating oil temperature limits:
  Synthetic oil: 105 °C (225 °F).
- Consult NORD for recommendations in the following instances:
  √ The gear unit is exposed to frequent high load conditions.
  √ Ambient temperature conditions exceed 40 °C (104 °F) or approach 0 °C (32 °F) or lower.
  √ Fluid grease is being considered or specified for lubricating the gear unit.
  √ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service.

Oil Formulation Codes

PAO - Synthetic Polyalphaolefin Oil
PG - Synthetic Polyglycol Oil
FG-PAO - Food-Grade, Synthetic Poyalphaolefin Oil
FG-PG - Food-Grade, Synthetic Polyglycol Oil

WARNING

- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not to mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral or polyaolpha-olefin (PAO) oils.

FLEXBLOC™ WORM REDUCER LUBRICATION TYPES

Oil Cross-reference Chart

ISO Viscosity	Oil Type	Ambient Temperature Range	Mobil	Shell	Castrol	FUCHS	KLÜBER LUBRICATION
VG 100	PAO	-35 to 25°C (-31 to 77°F)	Mobil SHC627	N/A	N/A	N/A	Klübersynth GEM 4-100N
	PG	-25 to 25°C (-13 to 77°F)	Mobil Glygoyle 100	N/A	N/A	N/A	Klübersynth GH 6-100
	FG-PAO	-35 to 25°C (-31 to 77°F)	Mobil SHC Cibus 100	N/A	N/A	N/A	Klüberoil 4 UH 1-100N
	FG-PG	-25 to 25°C (-13 to 77°F)	Mobil Glygoyle 100	N/A	N/A	N/A	Klübersynth UH1 6-100
VG150	PAO	-35 to 25°C (-31 to 77°F)	Mobil SHC629	Omala RL 150	Alphasyn T150	N/A	Klübersynth GEM 4-150N
	PG	-25 to 25°C (-13 to 77°F)	Mobil Glygoyle 150	Tivela S150	Alphasyn PG150	Renolin PG150	Klübersynth GH 6-150
	FG-PAO	-15 to 25°C (5 to 77°F)	Mobil SHC Cibus 150	N/A	N/A	Cassida GL150	Klüberoil 4 UH 1-150N
	FG-PG	-25 to 25°C (-13 to 77°F)	Mobil Glygoyle 150	N/A	N/A	N/A	Klübersynth UH1 6-150
VG220	PAO	-15 to 40°C (5 to 104°F)	Mobil SHC630	Omala RL220	Alphasyn T220	N/A	Klübersynth GEM 4-220N
	PG	-25 to 40°C (-13 to 104°F)	Mobil Glygoyle 220	Tivela S220	Alphasyn PG220	Renolin PG220	Klübersynth GH 6-220
	FG-PAO	-25 to 40°C (-13 to 104°F)	Mobil SHC Cibus 220	N/A	N/A	Cassida GL220	Klüberoil 4 UH 1-220N
	FG-PG	-25 to 40°C (-13 to 104°F)	Mobil Glygoyle 220	N/A	N/A	Cassida WG220	Klübersynth UH1 6-220
VG460	PAO	0 to 40°C (32 to 104°F)	Mobil SHC 634	Omala RL460	Alphasyn T460	N/A	Klübersynth GEM 4-460N
	PG	0 to 40°C (32 to 104°F)	Mobil Glygoyle 460	Tivela S460	Alphasyn PG460	N/A	Klübersynth GH 6-460
	FG-PAO	0 to 40°C (32 to 104°F)	Mobil SHC Cibus 460	N/A	N/A	Cassida GL460	Klüberoil 4 UH 1-460N
	FG-PG	0 to 40°C (32 to 104°F)	Mobil Glygoyle 460	N/A	N/A	Cassida WG460	Klübersynth UH1 6-460
VG680	PAO	0 to 40°C (32 to 104°F)	Mobil SHC636	Omala RL680	N/A	N/A	Klübersynth GEM 4-680N
	PG	0 to 40°C (32 to 104°F)	Mobil Glygoyle 680	Tivela S680	N/A	N/A	Klübersynth GH 6-680
	FG-PAO	0 to 40°C (32 to 104°F)	N/A	N/A	N/A	Cassida GL680	Klüberoil 4 UH1-680N
	FG-PG	0 to 40°C (32 to 104°F)	Mobil Glygoyle 680	N/A	N/A	Cassida WG680	Klübersynth UH1 6-680

Low-end service temperature limit may vary for a specific lubricant; Please also see the important notes on Page 1.

FLEXBLOC™ (SI SERIES) WORM GEAR OIL FILL QUANTITIES

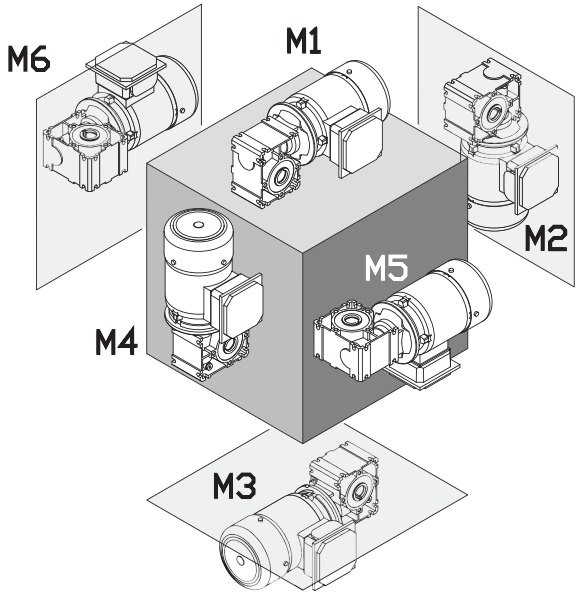
FLEXBLOC™ (SI Series) Lubrication

NORD FLEXBLOC™ (SI Series) worm gear reducers are inherently maintence free, factory oil filled, and supplied with a high quality, long life synthetic gear oil intended to be suitable for the life of the product. For lubrication types see User Manual U11060.

NORD FLEXBLOC™ (SI Series) worm gear reducers are equipped with oil plugs. Venting the gear unit is optional as discussed in User Manual U14800.

Related User Manuals

U10810 FLEXBLOC™ (SI Series) Worm – Lubrication Guidelines
U11060 FLEXBLOC™ (SI Series) Worm – Lubrication Types
U14800 FLEXBLOC™ (SI Series) Worm – Oil Plug Locations



FLEXBLOC™ (SI Series) Gear Reducer Oil Fill - Universal Housing

Type	M1		M2		M3		M4		M5		M6	
	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml	oz	ml
SK 1SI31	1.0	30	1.0	30	1.0	30	1.0	30	1.0	30	1.0	30
SK 1SI40	1.9	55	1.9	55	1.9	55	1.9	55	1.9	55	1.9	55
SK 1SI50	3.2	95	3.2	95	3.2	95	3.2	95	3.2	95	3.2	95
SK 1SI63	6.1	180	6.1	180	6.1	180	6.1	180	6.1	180	6.1	180
SK 1SI75	12.2	360	12.2	360	12.2	360	12.2	360	12.2	360	12.2	360

Oil Fill is universal and independent of mounting position.

FLEXBLOC™ (SI SERIES) WORM GEAR OIL PLUG & VENT LOCATIONS

Vent locations

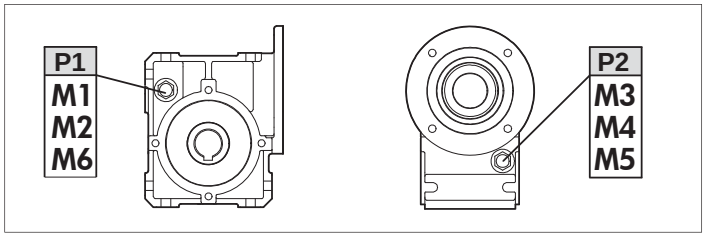
FLEXBLOC™ (SI SERIES) reducers are fitted with oil plugs to allow for optional venting of the gear unit. NORD can supply either an AUTOVENT™ (valve-type) vent or an open vent. Vent options are available for most gear unit sizes and positions as indicated by the table below. For more complete details on vent options and when to consider reducer venting, see user manual U10810.

Vent Compatability by Unit Size & Mounting Position

	M1	M2	M3	M4	M5	M6
SMI/SMID 31	-	x	x	x	-	x
SMI/SMID 40	-	x	x	x	-	x
SMI/SMID 50	x	x	x	x	-	x
SMI/SMID 63	x	x	x	x	x	x
SMI/SMID 75	x	x	x	x	-	x

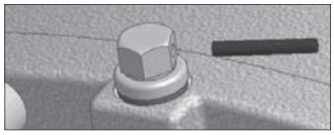
Continuous Input speed ≤ 1800 rpm

Optional Vent Locations



Vent Kit Part Numbers

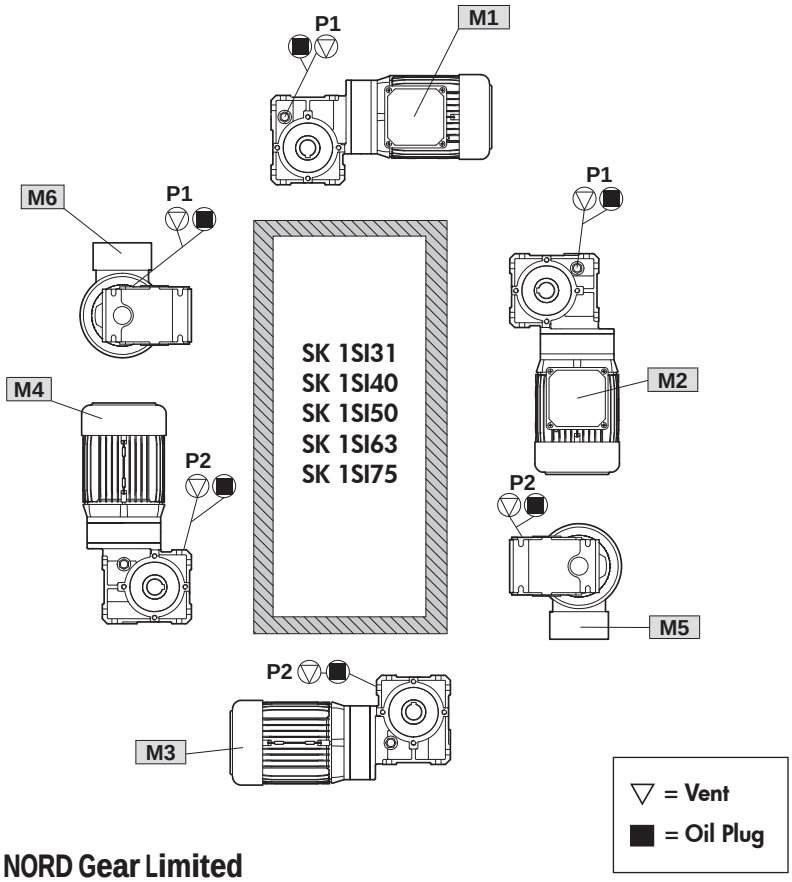
Type	Installation	Part Number
AUTOVENT	Factory	220080561
Open Vent	Factory	22008004 (vent) 25308121 (gasket)
Open Vent	Field site	60693500 (No Transportation Plug)



⚠ WARNING ⚠

To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start-up.

FLEXBLOC™ (SI Series) Universal Housing



NORD Gear Limited
Toll Free in Canada: 800.668.4378

NORD Gear Corporation
Toll Free in the United States: 888.314.6673

Troubleshooting

This section identifies some of the most common issues involved with NORD Gear speed reducers , and provides recommendations to assist you in defining and answering your questions as you work with our products. You may also contact our Engineering/Application departments if your questions are not answered in the table below.

Problem With the Reducer		Possible Causes	Suggested Remedy
Runs Hot	Overloading	Load exceeds the capacity of the reducer	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce the load.
	Improper lubrication	Insufficient lubrication	Check lubricant level and adjust up to recommended levels
		Excessive lubrication	Check lubricant level and adjust down to recommended levels.
		Wrong lubrication	Flush out and refill with correct lubricant as recommended
Runs Noisy	Loose foundation bolts	Weak mounting structure	Inspect mounting of reducer. Tighten loose bolts and/or reinforce mounting and structure.
		Loose hold down bolts	Tighten bolts
	Failure of bearings	May be due to lack of lubricant	Replace bearing. Clean and flush reducer and fill with recommended lubricant.
		Overload	Check rated capacity of reducer.
	Insufficient lubricant	Level of lubricant in reducer not properly maintained.	Check lubricant level and adjust to factory recommended level.
Output shaft does not turn	Internal parts are broken or missing	Overloading of reducer can cause damage	Replace broken parts. Check rated capacity of reducer.
		Key missing or sheared off on input shaft.	Replace key.
		Coupling loose or disconnected	Properly allign reducer and coupling. Tighten coupling.
Oil Leakage	Worn seals	Caused by dirt or grit entering seal.	Replace seals. Autovent may be clogged. Replace or clean.
	Unit runs hot or leaks	Overfilled reducer	Check lubricant level and adjust to recommended level.
		Vent clogged.	Clean or replace, being sure to prevent any dirt from falling into the reducer.
	Incorrect fill level	Improper mounting position, such as wall or ceiling mount of horizontal reducer.	Check mounting position on the name tag & verify with mounting chart in manual.

MOTORS - AC INDUCTION, SINGLE & POLYPHASE

1. Overview

This user manual applies to NORD Motor products and it provides general information for motor operation, installation, maintenance, inspection, repair, and trouble shooting, which is relevant to most of the motor products shipped by NORD. Information and instructions provided in this manual, safety and commissioning information and all other manuals applicable to any items supplied by NORD must be observed.

This instruction manual is not intended to include comprehensive details and information related to all possible design variations or accessories options available with NORD motors. If there is any uncertainty about specific procedures, instructions or motor details, then please refer these questions to NORD for additional information or clarification.

Before installing, operating, or performing maintenance on any electrical motor become familiar with the following:

- The detailed operating instructions and wiring diagrams.
- All applicable national, local and system-specific regulations, codes and practices.
- The national / regional regulations governing safety and accident prevention.
- The proper use of any tools, transportation or hoisting equipment, and safety equipment needed to complete the installation.
- To avoid serious injury or possible damage to the equipment or machine, compliance with all safety and information notes is mandatory!

⚠ *WARNING* ⚠

All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians. All applicable national, regional, and local work regulations and safety requirements must also be complied with. NORD assumes no liability for personal injury, accidental death, or equipment damage and malfunctions resulting from failure to comply with installation or operating instructions, safety notes, or any work regulations and laws!

⚠ *WARNING* ⚠

To avoid electrocution, injury or death, make certain the motor is properly grounded, completely de-energized and brought to a no-voltage condition prior to working on any electrical connections.

2. Motor Types

NORD AC electric induction motors described in this manual generally include the following types:

- Single speed or two-speed design.
- Three phase alternating current or single phase design.
- Enclosure types: TEFC, TENV, and TEBC.

3. Enclosure Types

Totally enclosed fan cooled (TEFC).

TEFC motor designs rely on fan that is mounted on the motor's rotor shaft so the cooling capacity can vary based upon the motor's operating speed.

Totally enclosed, non-ventilated (TENV)

The TENV motor designs rely purely on convection cooling and they have no fan. Often TENV designs are labeled for intermittent or periodic duty or at a lower power rating than is typical for the given motor frame size.

Totally enclosed, blower cooled (TEBC)

The TEBC design uses separate blower or ventilator fan, with its own low wattage motor and a separate power supply, to provide continuous airflow and cooling. The blower can be used to extend the speed range of the motor and allow extreme slow speed operation without causing a concern for overheating. Blower data is provided in Table 6, page 11.

4. Voltage and Frequency Variation

Voltage and frequency variations are based upon the assumption that the nameplate horsepower will not be exceeded and that the motor temperature may increase. Standard allowable deviations are based upon the type of motor labeling.

NEMA and CSA Labeled Motors

Variations are based upon the nominal utilization voltage, and not the service (supply) voltage as per ANSI C84.1.

Service Voltages	Utilization Voltages
120V, 208V, 240V, 480V, 600V	115V, 200V, 230V, 460V, 575V

- Voltage variation at rated frequency = ±10%.
- Frequency variations at rated voltage = ±5%.
- Combined voltage/frequency variation = ±5%.

CE Labeled Motors

Per IEC 60038, allowable service voltage variations on in the current system, compared to the previous system, are as indicated.

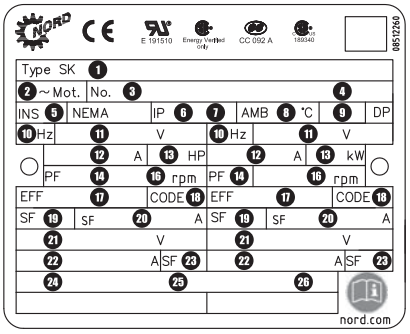
Previous Service Voltages	Current Service Voltages
220V, 380V, 660V	230V, 400V, 690V +6/-10%
240V, 415V	230V, 400V +10/-6%

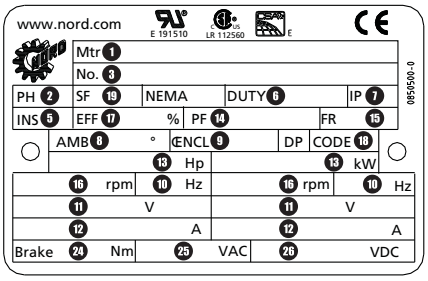
- Per EN 60034-1 a ±5% voltage variation and a ±2% frequency variation can be tolerated.
- The allowed variations are based upon the voltage (or voltage range) indicated on the motor nameplate.

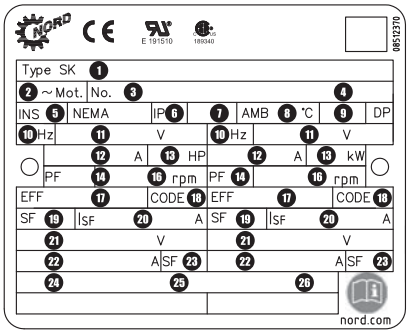
MOTORS - AC INDUCTION, SINGLE & POLYPHASE

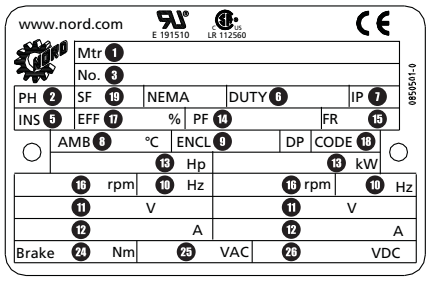
5. Motor Nameplate Information

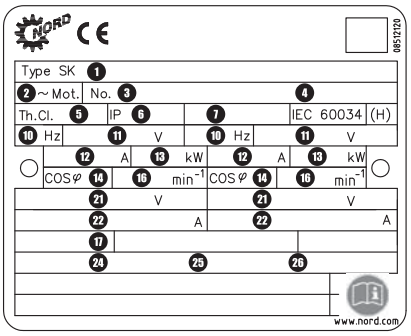
The motor nameplate and the display of technical information may vary slightly depending upon the global standard/s that the motor conforms to and the efficiency level. Please reference the examples below.











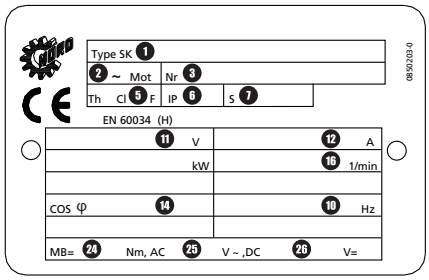


Table 1. Nameplate Data

Field	Definition
1	Model / Type
2	Number of Phases
3	Order Number
4	Serial Number
5	Insulation Class
6	IP (Ingress Protection) Enclosure Rating
7	Duty Cycle
8	Ambient Temperature Rating (°C)
9	Enclosure Type
10	Motor Frequency (Hz)
11	Voltage Rating (V)
12	Current Rating (A)
13	Rated Power (HP or kW)

Field	Definition
14	Power Factor
15	Motor Frame Size
16	Full Load Speed (rpm or 1/min^2)
17	Efficiency
18	NEMA Code Letter
19	Service Factor
20	Current Rating (If Service Factor ≥ 1.15)
21	Operating Voltage Rage (A)
22	Current Rating at Operating Voltage Range (A)
23	Service Factor at Operating Voltage Range (A)
24	Brake Rating (Nm)
25	Brake Supply Voltage (VAC)
26	Brake Coil Voltage (VDC)

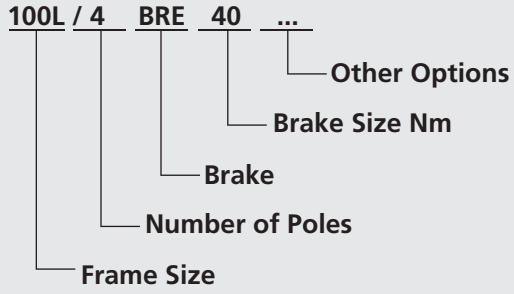
6. Motor Options And Nomenclature

NORD offers many options for its motors. The option code will be shown in the motor nomenclature. Below are commonly used options.

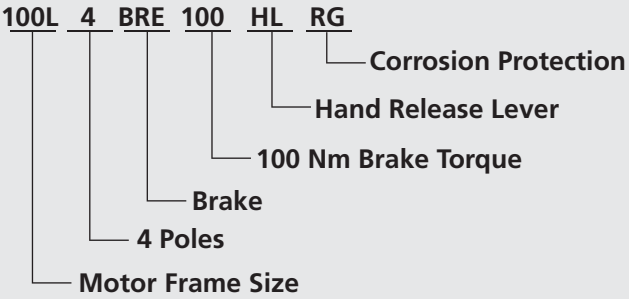
Code	Description
AICM	Additional Internal Insulation Coating Applied
BRE	With Brake
EAR	Single Phase, Start Cap/Run Cap
ECR	Single Phase, Start Cap/Run Cap Increased SF
EHB	Single Phase, Run Capacitor Only
EP	Epoxy Dipped Windings
F	Blower Cooling Fan - 3ph & 1ph
FC	Blower Cooling Fan - 1ph
FHL	Brake – Lockable Manual Release
H	Energy Efficient
HL	Brake – Manual Hand Release
IG	Incremental Encoder
IP66	IP66 Environmental Protection
IR	Brake – Current Sensing Relay
KB	Condensation Holes - Removable Plugs
KD	Condensation Holes - Open
MIK	Brake – Microswitch
MS	Power Plug Connector

Code	Description
OL	TENV Motor – Without Fan / With Cover
OL/H	TENV Motor - Without Fan & Cover
P	Premium Efficient Motors
RD	Canopy Cover
RDD	Double Canopy Cover
RG	Brake – Corrosion Protected
RLS	Backstop
SH	Motor Space Heater
SR	Brake – Dust Protected
TF	Thermistor
TW	Thermostat
VN	10:1 Constant Torque Rated Motor
VR	5:1 Constant Torque Rated Motor
VW	20:1 Constant Torque Rated Motor
VZ-F	1000+:1 Constant Torque Rated Motor
WE	2nd Motor Shaft End
WU	High Slip Rotor
Z	High Inertia Motor Fan

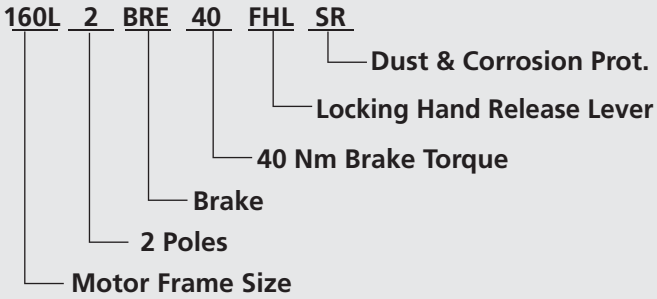
Motor Nomenclature



Ordering Examples



100 Frame Motor with 4 poles, Brake, 100 Nm with a hand release lever, corrosion protected brake, and a current sensing relay.



63 Frame Energy efficient motor with 4 poles, Brake, 40 Nm with a locking hand release lever and dust & corrosion protection.

7. Application Conditions

Standard NORD motors are designed to operate in dusty or moist environments and have anti-fungal, thermal class F insulation.

- Enclosure Protection Rating = IP55 (minimum).
- Maximum Installation Height = 3300 ft (1000 m).
- Ambient Temperature = -4 to 104°F (-20 to 40 °C).
- Tropical-proof, Thermal Class F insulation.

The protection level and maximum ambient temperature are stated on the motor nameplate.

IMPORTANT NOTE

NORD can provide motors for an expanded range of applications and service conditions including higher protection levels, extreme ambient conditions and, higher altitudes.

WARNING

Consult NORD for recommendations if motors are operated under extreme loading conditions, exposed to high inertia loads, or need to operate under unusually high cycling conditions with high starting and stopping frequency.

WARNING

Special design and assembly considerations are needed if NORD motors are subject to any of the following conditions:

- Outdoor installation with motor in a vertical position.
- Direct contact with aggressive or corrosive materials (acids, bases, salts, certain gases, etc.).
- Exposure to extreme high or low temperatures, high relative humidity, condensation moisture or very wet environments.
- Subject to extreme material build-up on the unit (dirt, dust, sand, etc.).
- Hazardous Locations (risk of fire or explosion).

8. Transportation

During transportation observe the following:

- Make sure that all eyebolts and lifting lugs are tight and firmly against their supporting surface.
- Use all the lifting eyes that are intentionally supplied with the motor.
- Lift only at designed points.
- Protect the mounting surface from possible damage during transportation.
- Always use sufficiently rated handling equipment, lift mechanisms and lifting straps.
- With heavier objects or unbalanced loads, it may be appropriate to use more than one lifting point or an additional strap or sling to assure safe transportation of the assembly. This is especially true of assembled gearmotors and motorized reducers.
- Once the NORD motor or assembly is properly installed, remove the transportation fixtures completely or make certain they are properly re-secured and tightened.

WARNING

Transportation – Use of Lifting Devices

To avoid death, serious injury or equipment damage…

- Hoisting lugs or lifting eyes attached to the motor are designed for the weight of the motor only! Do not attach any additional loads!
- The motor must only be transported and lifted using the lifting eyes, in a position that is appropriate for its type of construction. Otherwise, it could fall over or slip in the lifting tackle.
- During suspended transport, two straps must be able to carry the entire load weight safely.
- When required use additional, suitable means of support for transportation, installation or removal.
- Always secure the support equipment to prevent it from slipping.

9. Storage

If the motor is not in service, store it according to the following conditions:

- Store the motor in a clean, dry, dirt-free, vibration free area.
- Storage temperatures of 10°C (50°F) to 50°C (120°F) must be maintained.
- Relative humidity must not exceed 60%.
- If vibration in the area exceeds 0.002 inch (0.05 mm) at 60 hertz, then vibration isolation pads are suggested to prevent brinelling of the bearings.
- Treat the unprotected shaft end and mating flange surfaces with a corrosion inhibitor that can be cleaned off prior to commissioning.
- Before placing the motor into service, visually inspect the motor exterior for evidence of deterioration during storage. Turn the motor shaft by hand to make sure the shaft turns freely.
- Motor space heaters, when provided, are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional. Remove motor from the storage container when the heater is energized.
- If the motor needs to be stored for extended periods, or if it is stored in less than favorable conditions, it is recommend that the winding insulation resistance be checked prior to commissioning (page 7).
- Even if stored in favorable conditions, the antifriction motor bearings and motor shaft seals may need to be replaced if the storage period is more than 4 years.

10. Safety Considerations

When installing, servicing or replacing electric motors it is important to be working in a “voltage-free” state. Observe the following safety rules.

Five Safety Rules

1. Disconnect the system. Disconnect the auxiliary circuits (brakes, space heaters, etc.).
2. Prevent reconnection (follow safe lock-out/tag-out practices).
3. Make sure that the equipment is at zero voltage.
4. Make certain the equipment is properly grounded and short-circuited.
5. Cover or isolate nearby components that are still electrically live.

To energize the system, apply the measures in reverse order.

Qualified Personnel

All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians.

For the purpose of this documentation, a qualified personnel is taken to mean a person or people who fulfill the following requirements:

- Through appropriate training and experience, they are able to recognize and avoid risks and potential dangers in their particular field of activity.
- They have been instructed to carry out work on the machine by the appropriate person responsible.
- They are responsible for knowing and complying with all applicable national, regional, and local work regulations and safety requirements.

10. Safety Considerations Ctd.

General Warnings and Cautions

⚠ *WARNING* ⚠

To avoid electrocution, injury or death, make certain all electrical devices (motors, brakes, variable frequency drives, etc.) are properly grounded, completely de-energized, and brought to a no-voltage condition prior to working on any electrical connections. Remember that most of these devices carry potentially dangerous energy levels for a period of time after power is removed. Always follow proper lock-out/tag-out procedures.

⚠ *WARNING* ⚠

Electrical machines contain dangerous voltage levels, electrically live parts, rotating surfaces and hot surfaces. To prevent injury, death or possible equipment damage always observe the following:

- Keep all safety covers and guards in place during operation. Remove and replace covers in compliance with the applicable safety regulations.
- Allow the machine to cool down before starting any work on it.
- Operate the machines properly.
- Perform regular maintenance on the machine.
- Secure and guard free-standing shaft extensions.

⚠ *WARNING* ⚠

Electrically Live Parts

Electrical machines contain electrically live parts. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

⚠ *WARNING* ⚠

Rotating Parts

Electrical machines contain dangerous rotating parts. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

⚠ *WARNING* ⚠

Hot Surfaces

Electrical machines have hot surfaces. Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly. Allow the machine to cool down before starting any work on it.

⚠ *WARNING* ⚠

Maintain Proper Cooling

Operating the motor without the intended cooling fan may cause overheating and result in very hot surfaces, personal injury and material damage. Never commission a motor intended to be fan cooled when it is missing the shaft-driven fan or external blower assembly.

⚠ *WARNING* ⚠

Condensation Drain Holes (Optional)

Inserting objects into the condensation drain holes can damage the winding and can result in death, serious injury and damage to property!

- Before opening sealed drain holes, make sure the motor is in a no-voltage condition. Close the condensation drain holes before re-commissioning.
- Exercise caution around drain holes that are intended to be left open, especially when the motor is energized.

STOP *HARMFUL SITUATION* STOP

Before start-up check the following:

- All electrical connections are secure, well grounded and properly made.
- The motor is rotating in the correct direction (when de-coupled from the driven load).
- There are no temperature-sensitive parts (cables etc.), in contact with motor enclosure.
- Condensation drain holes are always located at the lowest point of the motor.

11. Checking the Insulation

Before putting the motor into operation for the first time, after a lengthy period of storage or standstill (approx. 6 months), the insulation resistance of the winding should be checked.

⚠ WARNING ⚠

During and directly after measurement the motor connection terminals carry hazardous voltages.

A. Control

The insulation resistance of new, cleaned, or repaired motor windings against the grounded housing and against one another should be > 200 Mega-Ohms.

B. Measurement

Using a Mega-Ohm meter apply a DC voltage of 500 VDC to the motor winding for a period of 60 seconds and record the winding insulation resistance compared to ground.

- The 500 VDC test voltage is applicable to low voltage motors up to 1000 VAC.
- When performing this test the temperature of the windings should be 25°C ± 15°C (77°F ± 27°F).

C. Verification

- If the insulation resistance of the winding is less than 50 Mega-Ohms, the cause may be moisture. The windings should be dried and the test should be repeated.
- After any lengthy period of operation the insulation resistance may drop. So long as the measured value does not fall below the critical value of 50 Mega-Ohm, the motor may continue to be operated.
- If the measured value falls below the critical 50 Mega-Ohm level, the cause must be established and the windings or winding sections must be cleaned, dried, repaired, or replaced as needed.

12. Bearing Lubrication

NORD motor frame sizes 63 up to and including 225 are normally supplied with internally grease lubricated bearings and require no lubrication during normal operation.

NORD motor frame sizes 250 and larger are supplied with grease fittings for re-greasing the motor bearings.

IMPORTANT NOTE

Motors with grease fittings are normally supplied with a label indicating the grease type used, the suggested re-lubrication interval, and the amount of new grease to be applied. General bearing maintence guidelines are listed in Table 3.

Typical motor bearing grease is an NLGI No. 2 consistency, high grade product with a polyurea base thickener, synthetic or blended mineral/synthetic oil, and stabilizing agents to protect against heat and oxidation.

Table 3 – Motor Bearing Maintence Guidelines

Frame Size	Power	Poles	Re-greasing Interval
63-225	0.16-60 HP (0.12-45 kW)	All	Maintence Free
250 to 280	75-125 HP (55-75 kW)	2	4000 h
		4 to 8	8000 h
315	150-250 HP (132-200 kW)	2	3000 h
		4 to 8	6000 h

STOP HARMFUL SITUATION STOP

When re-greasing motor bearings do not to mix different greases without verifying the compatibility with a reputable grease lubrication supplier. Mixing incompatible products can lead to bearing failure.

13. Mechanical Installation

Integral motors, NEMA C-face motors, and IEC flange mounted motors must be rigidly secured to their mating connection surface using all fastening screws tightened to the proper bolt torque. It is good practice to apply a medium strength thread- locking agent (Loctite® 242) to the mounting screws.

Foot mounted motors must be securely installed to a rigid and level foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. All mounting hole locations must be utilized. Tighten all hold down screws or bolts to the proper bolt torque.

STOP HARMFUL SITUATION STOP

Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Accurate alignment and proper balancing of output devices (couplings, belts, pulleys, etc.) is required to assure quite, low vibration, trouble free operation. When the motor is directly coupled to a gear drive or a driven machine make sure that the motor shaft and driven machine shaft are aligned with one another axially.

STOP HARMFUL SITUATION STOP

Inaccurate alignment may lead to bearing damage, excessive vibrations and shaft breakage.

IMPORTANT NOTE

For motor replacement guidelines see section 20 on page 15 and section 21 on page 16.

14. Electrical Connections

⚠ WARNING ⚠

To avoid electrocution, injury or death, make certain all electrical devices (motors, brakes, variable frequency drives, etc.) are properly grounded, completely de-energized, and brought to a no-voltage condition prior to working on any electrical connections. Remember that most of these devices potentially dangerous energy levels for a period of time after power is removed. Always follow proper lock-out/tag-out procedures.

IMPORTANT NOTE

External motor brakes have their own connection requirements as indicated in the appropriate brake instruction manuals.

⚠ WARNING ⚠

If the motor has an integral brake, make certain there is no load connected to the driven equipment before releasing the brake. Otherwise serious injury, death, or damage to the equipment may result.

- The supply voltage and frequency must agree with the motor nameplate data.
- Always feed the connecting leads into the terminal box using appropriate mating cable glands. The mating connection cables and cable glands should be suitable for temperatures ≥ 194°F (90°C).
- Provide the ends of the connecting leads and ground lead with cable lugs or curved ring eyelets before connecting them to the terminal board.
- Make certain that the wiring connections and arrangement of the terminal board jumpers conform to the appropriate wiring diagram as provided in the motor terminal box and/or page 9 of this manual.
- Tighten the terminal board screw connections on the on the main terminal board per the table below.

Table 4 – Tightening Torque: Terminal Board and Grounding Screws

Thread Size	Nut Size [mm]	Tightening Torque [lb-ft]	Tightening Torque [N-m]
M4	7	0.6-0.9	0.8-1.2
M5	8	1.3-1.8	1.8-2.5
M6	10	2.0-3.0	2.7-4
M8	13	4.0-5.9	5.5-8
M10	17	6.6-9.6	9-13
M12	19	11.8-14.8	16-20

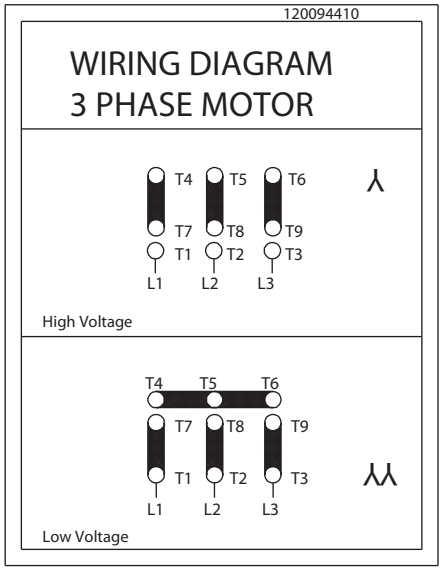
- Upon final assembly, the terminal box cover must be sealed so that it is dust-tight and water-tight.

Table 5 – Tightening Torque: Terminal Box Cover Screws

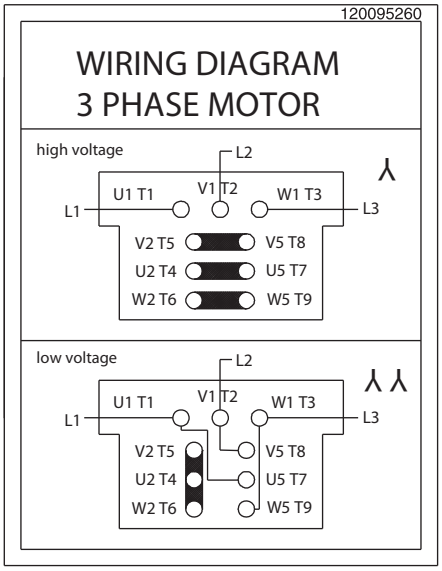
Thread Size	Tightening Torque [lb-ft]	Tightening Torque [N-m]
M4	0.6-0.9	0.8-1.2
M5	0.9-1.3	1.2-1.8
M6	1.1-1.8	1.5-2.5
M8	2.2-3.7	3.0-5.0

15. Wiring Diagrams

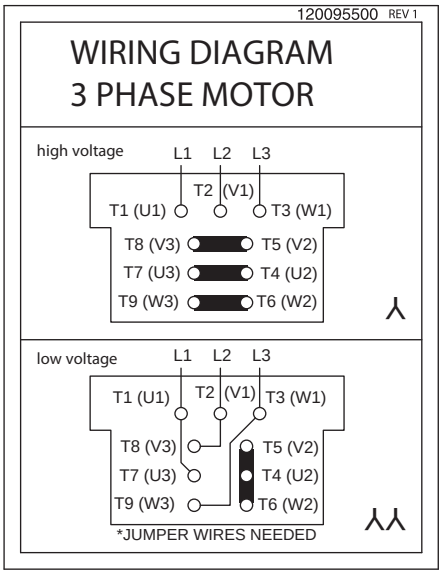
Frames 63-132
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø |



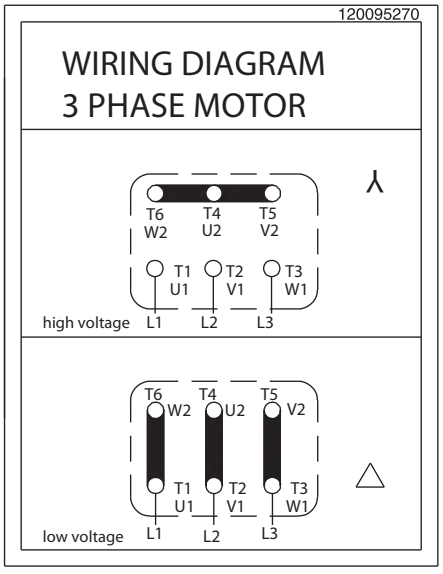
Frames 160 +
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø |



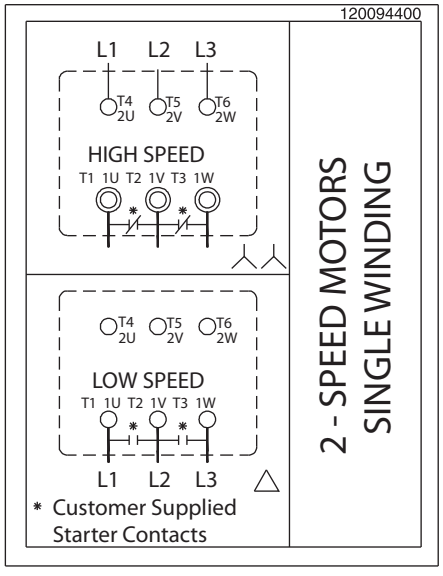
Frames 160 +
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø |



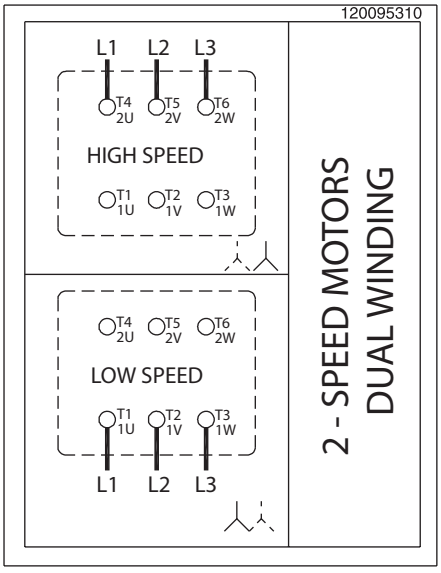
460 / 800V, 60Hz, 3Ø | 230 / 400V, 50Hz, 3Ø
208 / 360V, 60Hz, 3Ø | 400 / 690V, 50Hz, 3Ø
332 / 575V, 60Hz, 3Ø |



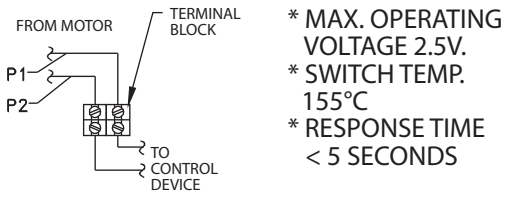
2 - SPEED MOTORS
SINGLE WINDING (4-2 & 8-4 POLE)



2 - SPEED MOTORS
DUAL WINDING (8-2 POLE)



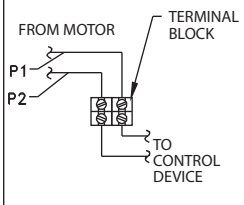
15. Wiring Diagrams Ctd.



* MAX. OPERATING VOLTAGE 2.5V.
* SWITCH TEMP. 155°C
* RESPONSE TIME < 5 SECONDS

THERMISTOR
"TF" OPTION

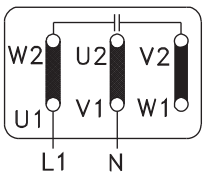
120095240



* NC (NORMALLY CLOSED)
* CONTACTS RATED 1.6A AT 2.50 VAC
* 6-500 VAC WORKING RANGE
* AUTOMATIC RESET AT 30 ± 15°C TEMP. DROP

THERMISTATS
"TW" OPTION

120095230



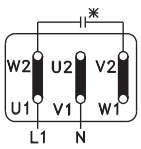
1 PHASE
115V*
50/60 Hz

* CAPACITOR IS SUPPLIED

BLOWER COOLING FAN
"FC" OPTION

120095450

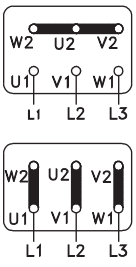
OPTION "F" 1 PH



230V
50 / 60 Hz

* CAPACITOR IS SUPPLIED

OPTION "F" 3 PH

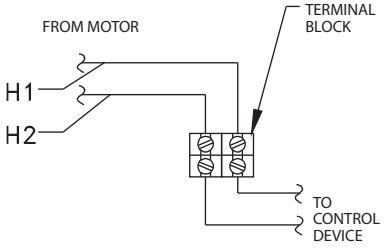


380-575V
50 / 60 Hz

220-332V
50 / 60 Hz

BLOWER COOLING FAN
"F" OPTION

120095250



SPACE HEATER
"SH" OPTION

120095220

16. Motor Accessories

Blower Cooling Fan (Option F & FC)

- Connection Diagram Shown on page 10
- Option FC is 1-phase, 115V
- Option F has capability of 1 phase by connecting a supplied capacitor

Option F – 3ph & 1ph 220-575V 50/60Hz

Motor Frame	60Hz Ratings			50Hz Ratings		
	Voltage [V]	Current [A]	Power [W]	Voltage [V]	Current [A]	Power [W]
Single phase connection - ⊥ (Delta)						
63	230 – 277	0.11	38	230 – 277	0.10	27
71	230 – 277	0.12	41	230 – 277	0.10	28
80	230 – 277	0.13	44	230 – 277	0.11	29
90	230 – 277	0.25	88	230 – 277	0.26	72
100	230 – 277	0.28	88	230 – 277	0.26	70
112	230 – 277	0.31	107	230 – 277	0.26	73
132	230 – 277	0.27	89	230 – 277	0.29	82
160 - 225	230 – 277	0.41	140	230 – 277	0.45	128
Three phase low-voltage connection - (Delta)						
63	220 – 332	0.08	23	220 – 290	0.10	27
71	220 – 332	0.08	24	220 – 290	0.10	30
80	220 – 332	0.08	25	220 – 290	0.01	29
90	220 – 332	0.21	64	220 – 290	0.28	86
100	220 – 332	0.21	66	220 – 290	0.27	86
112	220 – 332	0.23	70	220 – 290	0.27	85
132	220 – 332	0.25	74	220 – 290	0.32	96
160 - 225	220 – 322	0.49	165	220 – 290	0.52	155
Three phase high-voltage connection - (Y)						
63	380 – 575	0.04	23	380 – 500	0.05	29
71	380 – 575	0.04	25	380 – 500	0.05	30
80	380 – 575	0.04	26	380 – 500	0.05	29
90	380 – 575	0.12	62	380 – 500	0.16	82
100	380 – 575	0.12	66	380 – 500	0.16	83
112	380 – 575	0.13	70	380 – 500	0.16	82
132	380 – 575	0.14	75	380 – 500	0.18	96
160 - 225	380 – 575	0.28	165	380 – 500	0.29	155

Option FC – 115V 50/60Hz 1ph

Motor Frame	60Hz Ratings			50Hz Ratings		
	Voltage [V]	Current [A]	Power [W]	Voltage [V]	Current [A]	Power [W]
Single Phase Connection - ⊥ (Delta)						
63	100 – 135	0.23	42	100 – 135	0.30	42
71	100 – 135	0.23	47	100 – 135	0.30	44
80	100 – 135	0.27	57	100 – 135	0.30	43
90	100 – 135	0.46	102	100 – 135	0.57	78
100	100 – 135	0.53	105	100 – 135	0.54	78
112	100 – 135	0.60	115	100 – 135	0.55	80

Table 6 – Option F & FC

16. Motor Accessories Ctd.

Thermostats (Option TW and Option 2TW)

Standard connection	Series connected, one per phase
Contact	NC (Normally Closed)/ Auto Re-setting
Response Temperature (Option TW)	311 °F (155 °C) Shut-Off Device
Response Temperature (Option 2TW)	311 °F (155 °C) Shut-Off Device + 266°F (130 °C) Alarm Device
Nominal Current	1.6 Amp at 250 V
Resistance	< 50 mΩ
Switch Rebound	< 1ms
Insulation Rating	2000 VAC
Cycles	10,000 max
Lead Identification (inside terminal box)	P1 and P2 or TB1 and TB2 / 2TB1 and 2TB2

Motor thermostats or bi-metallic switches can be wired directly into the control circuit without a separate control module or tripping device. Thermostats operate on a relatively high control voltage so they are much less sensitive to voltage interference from the main power supply. Often one can run thermostat leads and motor power leads next to each other when using the appropriate shielded cable. The installer is responsible to wire the thermostats into the motor control circuit. The leads may be labeled in a variety of ways as indicated.

Thermistors (Option TF)

Standard Connection	Three devices, series connected, one per phase
Type	Positive temperature coefficient (PTC)
Transition Temperature	150°C±5 °C
Resistance	20… 500Ω (below transition) > 4 kΩ (above transition)
Reed Current	< 1mA
Max Voltage	30V
Lead Identification (inside terminal box)	P1 and P2 or TP1 and TP2

With a separate control module or tripping device (ex. Kirwan INT69) thermistors are used to sense motor overload/ over temperature conditions by converting the critical operating temperature limit into large internal resistance change. Due to their small size, heat sink construction, and high change in resistance value, minor resistance variations caused by relatively long lead runs can be tolerated. This feature also allows for one controller to be used for several temperature sensing locations. Many variable frequency drives come with on-board thermistor inputs. NORD does not supply the thermistor control module.

⚠ WARNING ⚠

Thermostats and Thermistors will automatically reset.

⚠ WARNING ⚠

All wiring must be completed by qualified personal and adhere to all local codes.

Space Heaters (Option SH)

- Connection Diagram shown on Page 9
- Space Heaters are mounted directly on the motor winding
- The leads are brought into the terminal box and labeled H1 and H2
- They require a separate voltage supply and must not be energized when the motor is energized
- The heaters will keep the winding of the motor approximately 5°C above the surrounding ambient

Table 5. Space Heater Data

Frame Size	Wattage	Voltages	Heater Strips/MTR
63 & 71	18W	110V	1
		230V	
		460V	
80	25W	110V	1
		230V	
		460V	
90 – 112	50W	110V	2
		230V	
		460V	
132-180	100W	110V	2
		230V	
		460V	
200 & 225	120W	110V	2
		230V	
		460V	

Encoder (Option IG)

- Most standard encoders will be enclosed inside the fan cover
- Incremental, Quadrature, Differential, Marker Channel
- IP66 Protection
- IG1 = 1024PPR, IG2 = 2048PPR, IG4 = 4096PPR
- TTL/RS422, HTL/Push-Pull, Line Driver.
- 5V or 10-30V available.
- Absolute encoders also available.
- Seperate encoder wiring instructions are provided by NORD.

17. Inspection

Inspect the motor after every 500 operating hours.

⚠ *WARNING* ⚠

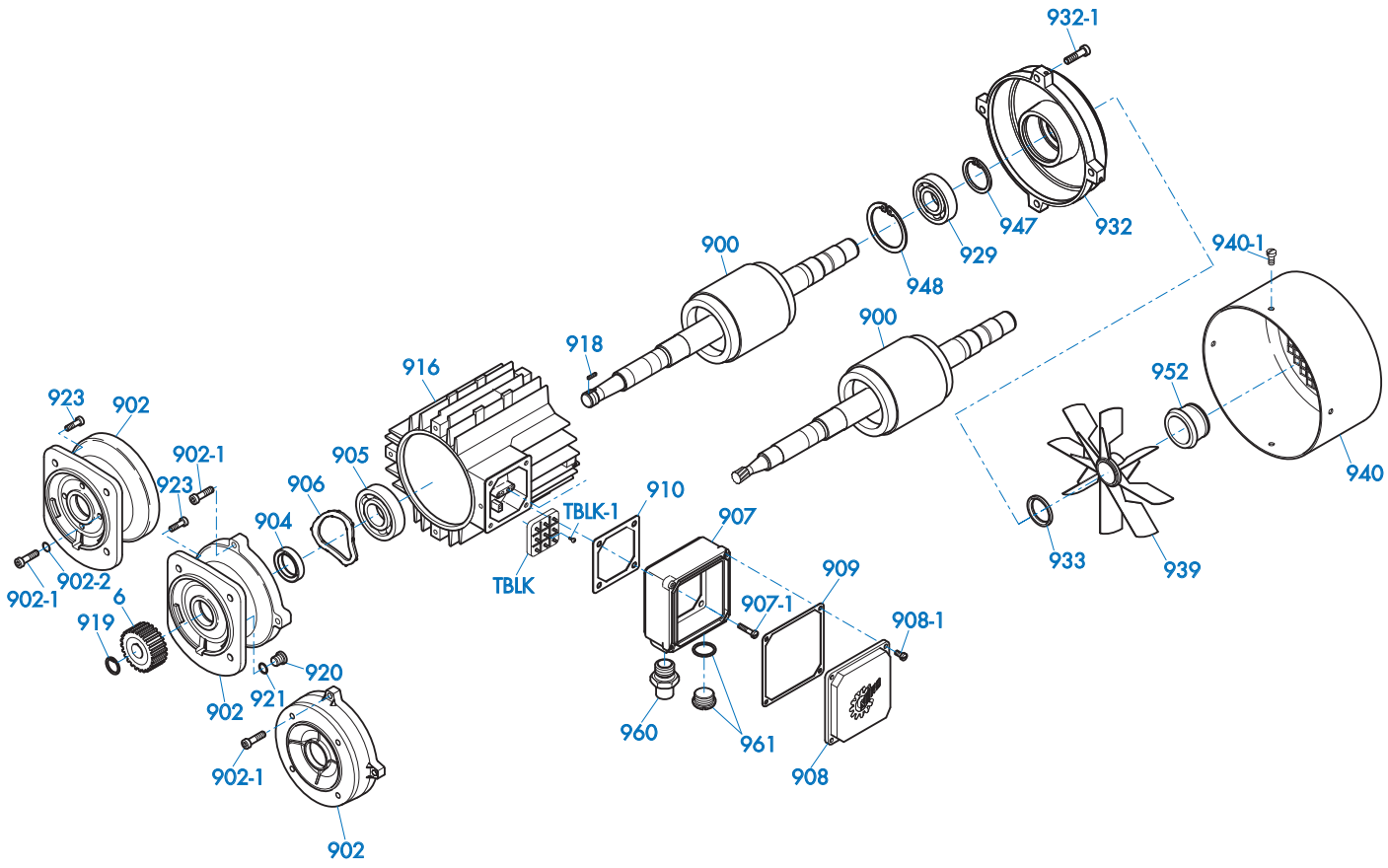
If it is necessary to clean the motor exterior, do not use shop air. Shop air can force contaminents into the motor and may cause parts damage or result in blowing debris causing injury.

Table 8 - Inspection Guidelines

Inspect	Check	Action
Motor Exterior	Check the external surfaces for contamination. Accumulation of dirt and fibrous deposits must be removed.	Clean the motor external surfaces using clean, lint-free cloths.
		Clean deposits from between cooling fins using a vacuum cleaner and a stiff-bristled nylon brush.
	Check the external surfaces for oil film and greasy deposits.	Clean the oil film and greasy deposits from the motor surface using clean, lint-free cloths.
		If necessary, moisten the cloth with an approved non-flammable, residue-free solvent. Do not pour solvent on the motor.
	Check for evidence of damage or overheating.	If the motor has physical damage, replace the motor.
Motor Mountings	Make sure the mounting hardware is secure.	If the mounting hardware is not secure, check the motor/gearbox alignment, and tighten the mounting hardware.
Motor Electrical Connections	Check that all electrical connections are secure.	If the electrical connections are not secure, tighten them.
	Check the electrical connections for evidence of arcing.	Loose electrical connections can cause arcing, which is evident by discoloration and charring. If you find evidence of arcing, replace the damaged connections.
Insulation Resistance	Using an ohmmeter, check and record the resistance of motor winding insulation.	Compare the current resistance reading to previous readings. If the resistance drops significantly, perform an internal inspection for insulation damage or deterioration.
Motor Brake	On motors that have a brake, use a feeler gauge to check the air gap in between the brake pad and the rotor according to the appropriate user manual.	If the air gap exceeds the maximum allowed for that brake configuration provided in the manual, adjust the air gap or replace the brake pad according to user manual U35000.

18. Parts List

If you are ordering a part, provide the model and order number (table 1, page 2) of your motor. This will determine the specific part number you need.



Part Number	Part Description	Qty per Assembly
6	Input Pinion	1
900	Rotor Assembly	1
902	A-Endbell	1
902-1	Screw	4
902-2	Dubo Seal	4
904	Oil Seal	1
905	Bearing	1
906	Preload Spring	1
907	Terminal Box Frame	1
907-1	Screw	4
908	Terminal Box Cover	1
908-1	Screw	4
909	Gasket - Terminal Box Frame	1
910	Gasket - Terminal Box Cover	1
916	Stator	1
918	Key	1
919	Retaining Ring	1
920	Oil Plug	1

Part Number	Part Description	Qty per Assembly
921	Gasket	1
923	Screw	4
929	Bearing	1
932	B-Endbell	1
932-1	Screw	4
933	Oil Seal	1
939	Fan	1
940	Fan Cover	1
940-1	Screw	4
947	Retaining Ring	1
948	Retaining Ring	1
952	Fan Clip	1
960	NPT Thread Adapter	1
961	Plug (includes O-ring)	1
TBLK	Terminal Block	1
TBLK-1	Screw, Terminal Block Mounting	2
	Jumper Bar (not illustrated)	AR

19. Repair

Reference the parts list drawing on page 14 for clarification.

A. Disassemble the motor according to the general exploded view in PARTS INFORMATION. Disassemble only as far as necessary to replace the failed parts.

B. Whenever the motor is disassembled, clean all dust and contamination from the motor interior using a vacuum cleaner and a soft-bristled nylon brush.

C. The following parts must be replaced if they are removed:

- Oil seal (904), Oil seal (933)
- Gasket (909), Gasket (910), Gasket (921)
- Gasket on plug (961) • Self-locking screws (907-1, 908-1, 923, 932-1, 940-1)
- Dubo Seals (902-2)

D. If the following parts are removed, inspect them, and replace them if they are deformed or damaged:

- Retaining ring (919), Retaining ring (947), Retaining ring (948)
- Fan clip (952)

20. Removing and Replacing Integral Motors

Reference the parts list on Page 14 for clarification.

A. Disconnect the power to the electric motor. Make certain the motor is properly grounded, de-energized and secured with a lock-out/tag-out device.

B. Drain the oil from the mating gearbox, or rotate the motor/gearbox assembly so that the motor is up, to prevent oil from spilling from the gearbox when the motor is removed.

C. Support the motor and prepare it for removal. Steady the motor and support it. For larger motors, use of mechanical lifting or support devices to may be appropriate.

D. Remove the fastening screws that hold the motor to the reducer input.

IMPORTANT NOTE

Most integral motor installations have mounting bolts accessible from the motor exterior. If the bolts are not clearly visible, unbolt the input flange from the gearbox. Remove the bolts securing the motor to the reducer input flange, and discard the old DUBO sealing rings that were under the screw heads.

E. Maintain motor shaft alignment and move the motor directly away from its mounting surface until the motor shaft and mating input gear clear both the internal gear mesh and reducer input.

F. Remove and discard the old flange gasket.

G. Clean the gasket faces on the motor and gearbox, making sure no cleaning debris enters the gearbox.

H. Check the replacement motor to make sure the motor flange, motor shaft, and motor pinion are identical to the motor that was removed.

I. Place a new gasket between the gearbox and new motor.

J. Position the motor on the gearbox, making sure the input pinion meshes with the input gear. Rotate the motor as necessary to align the bolt holes and seat the motor flange. Make sure the gasket remains properly aligned and seated

K. Apply a medium strength thread locking compound to the bolt threads. Install the bolts and tighten them to the appropriate torque.

IMPORTANT NOTE

If the motor/gearbox installation uses an input flange, first mount the input flange to the motor using the four mounting bolts and NEW DUBO sealing rings under the head of each fastening screw. Make sure the fastening screws are clean and apply new thread sealant if necessary.

L. Check the gearbox oil level in accordance with the appropriate User Manual/s. If necessary fill or add oil to the gearbox.

HARMFUL SITUATION

Do not mix different types of oil!

M. Re-establish the electrical connection to the motor.

N. Observe the subsequent start-up closely to make certain the equipment is operating properly and there are no seal or gasket leaks.

21. Removing and Replacing NEMA C-Face or IEC Fange-Mounted Motors

For further clarification of these instructions, reference the parts list on Page 14 of this manual.

A. Disconnect the power to the electric motor. Make certain the motor is properly grounded, de-energized and secured with a lock-out/tag-out device.

B. Support the motor and prepare it for removal. Steady the motor and support it. For larger motors, use of mechanical lifting or support devices to may be appropriate.

C. Remove the fastening screws that hold the motor to the C-face or IEC mounting flange.

D. Maintain motor shaft alignment, and move the motor directly away from its mounting surface until the motor shaft and mating coupling clear the mounting flange surface of the driven equipment.

E. Measure and record the proper placement of the motor shaft coupling prior to removing it from the old motor.

F. Make sure the new motor shaft, key and key slot are free of all nicks, burrs, and lubrication or grease.

G. Install the new shaft key on the new motor. If the shaft key is not captured or if an open-ended key slot is utilized it is good practice to secure the key into the key slot with a medium strength thread locking agent or alternatively one may stake the key in place.

H. Re-install the coupling on the new motor shaft, making sure the placement of the coupling is in the same location as it was on the old motor (See Step E).

I. Clean all old gasket material, sealants, contamination, and corrosion from the flange surface on the driven equipment.

J. If the motor is utilized in a wet or wash down environment apply a sealing gasket or gasket eliminating compound to the mating flange surface, as would seem most appropriate for the application.

K. Support the new motor and mount it flush against the mating flange surface of the driven equipment.

L. Apply a medium strength thread locking agent to the bolt threads.

M. Install the bolts and tighten them to the appropriate torque.

N. Re-establish the electrical connection to the motor.

O. Observe the subsequent start-up closely to make certain the equipment is operating properly.

22. Testing

IMPORTANT NOTE

NORD electric motors do not require periodic testing. However, if a motor is removed from its installation, NORD recommends that the motor be checked according to the following static and dynamic testing procedures before it is reinstalled. Finding a condition that will require future repair before the motor is reinstalled decreases the overall maintenance time.

This section provides general test information and functional checks for the types of motors covered by this manual. Read and understand the tests and checks before performing them on your motor.

Record and date all measurements taken.

If the motor fails any of the test procedures provided below, use the troubleshooting guide to determine the motor problem.

Static Testing

A. The motor can only be static tested if it is disconnected from the component it drives and securely mounted on a fixture or mounting plate. These tests are usually conducted when a motor has been removed for any reason other than failure

B. Turn the motor shaft slowly by hand. Feel and listen for evidence of a failed bearing, which is indicated by a rough feel as the shaft rotates, and by noise.

C. Check for smooth rotation, with no evidence of binding or catching. If the shaft does not rotate smoothly, or binds or catches, the bearings are worn or failing, lack lubrication, or are contaminated.

D. Check the motor shaft for side play by applying pressure at right angles to the shaft in several places around the circumference. If the shaft moves perceptibly, the front bearing may be worn.

Dynamic Testing

A. Find the motor voltage and rated load current values as listed on the motor nameplate.

B. Using a volt-ohmmeter, verify that the motor power supply is in the correct range.

C. Run the motor with no load. As the motor is operating, listen for unusual motor noise and check for excessive vibration. Vibration and motor noise are indications of bearing contamination, lack of lubrication, damage, or failure.

D. Use an ammeter to measure the no-load current. Record the no-load current for comparison with previous readings, and for reference during future testing.

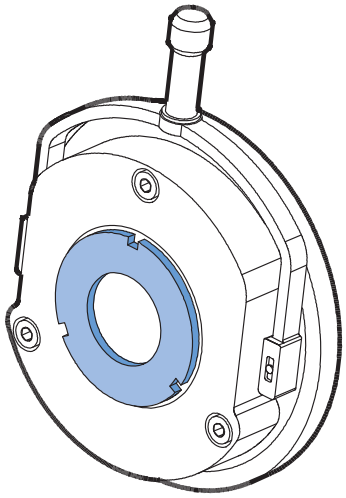
E. If the motor passes the no-load test, operate the motor at rated load and check and record the current.

F. Check the motor operating temperature at rated load. If the motor operates at a higher than normal temperature, the motor may be damaged, overloaded or failing.

23. Troubleshooting

Fault	Likely Cause	Corrective Action
Motor fails to start.	• Motor is mis-wired • Brake is may not be releasing. • Fan guard damaged and contacting fan. • Motor protection device has tripped or does not switch • 1-Ph Capacitor or start switch has failed.	• Verify and correct motor wiring. • Troubleshoot brake per User Manual U35000. • Replace damaged fan guard. • Check motor protection device for correct setting and correct error. • Discharge capacitor and use a volt-ohm meter to check the capacitor for an open circuit - replace if needed. Inspect switch and connections. Replace if contacts look burned or pitted.
Fuses blow or motor protection faults immediately.	• Short circuit in line. • Lines connected incorrectly. • Fuse or circuit breaker tripped. • Motor is overloaded or equipment jammed. • Stator is shorted or went to ground.	• Rectify short circuit. • Check circuit diagram and make corrections. • Replace fuse or circuit breaker. • Make sure load is free. Verify motor amp draw compared to nameplate rating. • A damaged or blown stator will show a burn mark. Stator must be repaired or replaced.
Motor hums and has high current consumption	• Brake may not be releasing. • Rotor may be rubbing stator. • Defective or incorrect stator winding.	• Troubleshoot brake per User Manual U35000. • Send motor to a repair specialist.
Severe speed loss under load or excessive acceleration time.	• Overload. • Excessive voltage drop. • Damaged or failing motor bearings. • Damaged or worn gear unit. • 1-Ph Capacitor or start switch has failed.	• Check load conditions and make certain system is unobstructed. Reduce load or consider a larger motor. • Verify service voltage is within specification. Check if nearby equipment is affecting incoming power. Make sure connection harness and wiring is adequate. • Replace motor bearings. • Replace or repair damaged gear unit. • See instructions under "Motor fails to start".
Motor runs the incorrect direction.	• Incorrect wiring.	• Rewire motor according to system schematic and/or switch two incoming motor phases.
Motor heats up excessively or thermal overload protection trips	• Overload. • Ambient temperature is too high. • Inadequate cooling. • Operation is outside the allowed duty cycle. • Motor protection device may be defective. • Excessive supply voltage. • System short or damaged stator.	• Make sure load is free. Verify motor amp draw compared to nameplate rating. Reduce load or consider a larger motor. • Do not operate above the rated conditions. • Correct cooling air supply. Open and clear cooling air passages. Retrofit with forced ventilator fan if needed. • Adjust operating duty cycle or contact a specialist to select a suitable motor or drive. • Replace motor protection device. • Adapt motor supply voltage. • Check for loose, cut or damaged wires. Check stator winding for defects or burn damage.
Excessive Noise or Vibration	• Motor bearings contaminated or damaged. • Excessive motor shaft end play. • Misaligned or imbalanced load.	• Test motor by itself. If bearings are bad noise may be heard or roughness detected. Replace bearings. Add lubrication if bearings have grease fittings. • Check shaft endplay with motor and system power disconnected. If shaft movement is excessive replace motor shaft bearings. • Check all mating shaft connections for proper alignment and correct all imbalanced load conditions.
1 Ph Start Capacitor Failures	• Motor is not coming up to speed quickly enough. • Motor is being cycled frequently • Start switch is defective or damaged.	• Verify motor size to load conditions. Motor should come up to speed in no more than 2-3 seconds. • Verify duty cycle and consult specialist for recommendations. • Replace start switch.
1 Ph Run Capacitor Failures	• Possible power surge to motor caused by transient voltage or lightening. • Excessive ambient temperature.	• Install proper surge protection. • Verify ambient conditions do not exceed nameplate value.

MOTOR BRAKES INSTALLATION & MAINTENANCE



General Instructions

This manual describes general operating and maintenance guidelines for a majority of brake products shipped by NORD Gear. This instruction manual is not intended to include a comprehensive listing of all details or procedures required for installation, operation and maintenance.

Brakes covered in this manual are manufactured by PRECIMA. Please feel free to contact NORD with any questions about the supplied brake components.

Safety Notice

Only qualified personnel should attempt installation, operation and maintenance of NORD brakes. Read this manual in its entirety before operating, commissioning, servicing, or assembling the motor brake. If you have a question about a procedure or are uncertain about any detail, seek clarification and DO NOT PROCEED!

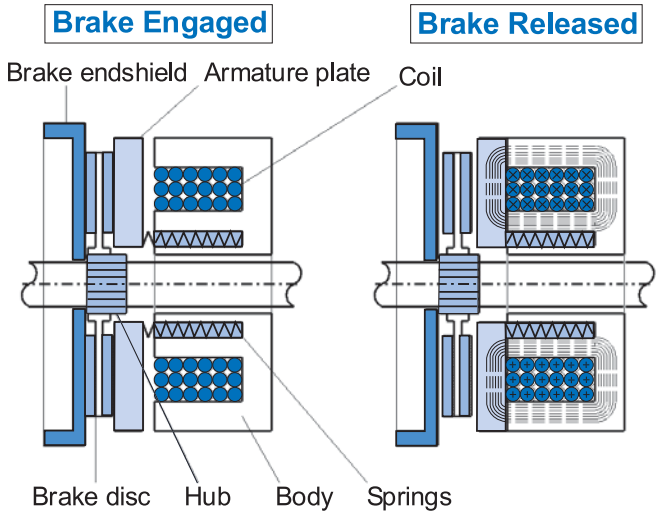
⚠ WARNING ⚠

- This equipment contains high electrical voltage. Remove and lockout all power from the electric motor and brake before any work is completed on the brake.
- The user is responsible for conforming to all national and local electrical and safety codes. Wiring practices, proper grounding, disconnects, and over current protection, are of particular importance.
- Make certain the load is supported when servicing the brake. Removing power from the brake or removing the brake from the motor will release the load, which may cause severe injury or death.
- Failure to follow proper procedures and precautions may result in severe bodily injury or death.

Motor Brake

The standard NORD motor brake is “spring-set”. When power is removed and the brake is de-energized (power-off), the brake springs exert a force against the armature plate in turn preventing the brake rotor (or brake disc) from rotating. When the brake coil is energized (power-on), a magnetic field builds and pulls the armature plate across the air gap to the brake casing, which releases the brake rotor and allows the motor shaft to rotate.

Figure 1: Basic Brake Operation



NORD brakes are DC voltage brakes and in most instances are supplied with a motor mounted brake rectifier for easy connections to AC power. AC power is taken directly from the power line or from the terminal block of the motor and converted to DC by the supplied rectifier.

IMPORTANT NOTE

If the motor is connected to a frequency inverter, soft start, or is a two-speed motor, the AC power must be supplied to the brake rectifier separately from the motor power.

- Each NORD motor frame size has a number of brake sizes available, with different torque capacities.
- Brake torque adjustments are possible by changing the brake spring combinations. In addition, brake sizes from 5-40 Nm (3.7-30 lb-ft) are typically supplied with an additional spanner-nut adjustment on the back of the brake.
- NORD brakes provide a high degree of safety because when power is removed the brake will automatically set to hold the load.
- The brake rotor or brake disc is environmentally safe and asbestos-free.
- The connection between the rectifier and the brake coil is completed at the factory and the brake air-gap is factory-set but can be adjusted in the event of wear.

Brake Selection

As indicated in the NORD catalog, each NORD motor can be supplied with a number of brake torque sizes.

NORD relies on the equipment builder to specify appropriate brake sizing for their application, while giving consideration to the following:

- For most applications, we advise sizing the brake to 1.5 - 2 times the motor rated torque.
- For vertical applications, it may be advisable to size the brake size up to 3 times the motor rated torque.
- For some applications, it may be necessary to specify a reduced brake torque setting to prevent excessive peak load conditions developed at the reducer output.
- On travel drive applications, excessive brake torque may lead to wheel skid; in addition on crane applications excess hoist-cable swing can result.

⚠ CAUTIONS ⚠

- **Brake torque -** The brake torque is measured with a mean friction radius of the brake pad surface with a circumferential speed of 1m/sec (197 fpm).
- **Brake torque tolerance -** For different applications and operating conditions, brake torque can vary from +40/-20% compared to the rated brake torque.
- **Hoisting (lifting/lowering) applications -** must have the brake wired for fast response (DC-switching)
- **Initial operation & wear-in period -** In new condition, the brake will have a reduced torque of up to 30%. In order to achieve full rated brake torque, a short run-in period is required. The run in time will vary depending on system loads.
- **The brake rotor or brake pad -** must be protected against foreign matter, oil and grease. Contaminants of this type can greatly influence wear and reduce breaking torque.

Brake Torque Adjustment

Brake torque adjustments are possible by changing the brake spring combinations or by removing springs (Table 1).

In addition, brake sizes from 5-40 Nm (3.7-30 lb-ft) are typically supplied with a threaded adjustment nut or spanner nut to allow for additional fine torque adjustments of the brake. The braking torque can be adjusted by unscrewing the spanner nut a number of turns or "clicks" with a spanner wrench (Table 2).

Table 1a: Brake Torque Reduction - Spring Removal

"Brake Size"	7 Springs		5 Springs		3 Springs	
	[Nm]	[lb-ft]	[Nm]	[lb-ft]	[Nm]	[lb-ft]
BRE 5	5	3.7	3.5	2.6	2	1.5
BRE10	10	7.4	7	5.2	4	3.0
BRE20	20	14.8	14	10.3	8	5.9
BRE40	40	29.5	28	20.7	17	12.5
BRE60	60	44.3	43	31.7	26	19.2
BRE100	100	73.8	70	51.6	42	31.0
BRE150	150	111	107	78.9	65	47.9

On brake sizes 5-150 Nm (3.7-111 lb-ft) full brake torque is achieved with all (7) springs. The brake springs are placed in such a manner where there are (3) inner and (4) outer springs. When adjusting the brake torque, start by removing the outer springs at opposite corners to prevent uneven brake wear.

Table 1b: Brake Torque Reduction - Spring Removal

"Brake Size"	8 Springs		6 Springs		4 Springs	
	[Nm]	[lb-ft]	[Nm]	[lb-ft]	[Nm]	[lb-ft]
BRE250	250	184	187	138	125	92
BRE400	400	295	300	221	200	148
BRE800	800	590	600	443	400	295
BRE1200	1200	885	900	664	600	443

On brake sizes 250-1200 Nm (184-885 lb-ft) full brake torque is achieved with all (8) springs. The brake springs are placed in such a manner where there are (4) inner and (4) outer springs. When adjusting the brake torque, start by removing the outer springs at opposite corners to prevent uneven brake wear.

Table 2: Spanner Nut Adjustment

"Brake Size"	Torque Reduction*		Max. Turns	Minimum Torque✹	
	[Nm]	[lb-ft]		[Nm]	[lb-ft]
BRE 5	0.2	0.15	6	0.8	0.59
BRE10	0.2	0.15	12	1.6	1.18
BRE20	0.3	0.22	12	4.4	3.25
BRE40	1	0.74	9	8.0	5.90

✹ **With the minimum number of springs and maximum number of turns to the spanner nut.**

* **Per each turn of the spanner nut**

Brake sizes from 5-40 Nm (3.7-30 lb-ft) are typically supplied with a threaded adjustment nut or spanner nut. Additional fine torque adjustment can be made by unscrewing the spanner nut a number of turns or "clicks" with a spanner wrench.

Brake Control Rectifiers

NORD brake control rectifiers convert AC voltage to DC voltage. Rectifiers are used because most applications require AC voltage to power the motor, but DC power is required to power the brake and DC power is not typically available.

NORD brakemotors typically include the rectifier located inside the terminal box. NORD rectifiers can be powered by the motor terminal block, or by a separate power source.

Rectifier Advantages

- Individual power source for each brake.
- Compact size, mounted inside the terminal box.
- Multiple types, voltage options and release/engagement modes available.
- Mountable in a separate control cabinet.
- Integral protection against voltage spikes.

Table 3: Rectifier Types and Ratings

Type	Part No.	Input Volt. VAC ± 10%	Rated Output Current (40°C)	(75°C)
GVE20L Full-Wave	19141000 (Black)	110-275	1.5 ADC	1.0 ADC
GHE40L Half-Wave	19141010 (Yellow)	200-480	1.0 ADC	0.5 ADC
GHE50L Half-Wave	19141020 (Grey)	200-575	1.0 ADC	0.5 ADC
PMG500 Push-Hybrid	19140200 (Black)	200-500	4.0 ADC	2.8 ADC

Full-wave rectifier:
The DC output voltage is 90% of the applied input AC voltage.

Half-wave rectifier:
The DC output voltage is 45% of the applied input AC voltage.

PMG 500 Push-Hybrid rectifier:

- The PMG500 push-hybrid rectifier is designed to switch from an initial full-wave mode to a final half-wave mode.
- The PMG 500 rectifier can be powered from the motor terminal block or from its own power source.

IMPORTANT NOTE

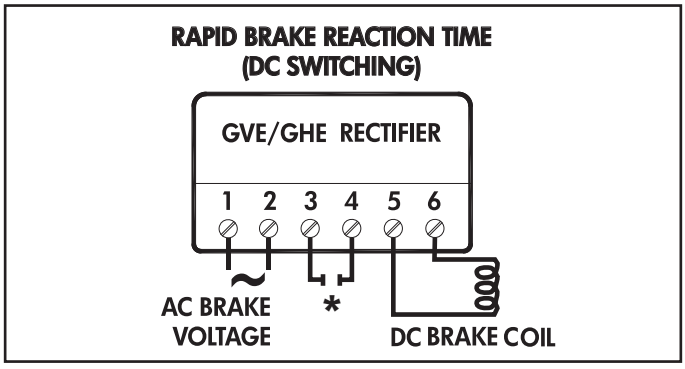
The PMG500 rectifier is required when utilizing the larger 800 Nm (590 lb-ft) - and 1200 Nm (885 lb-ft) twin-rotor brakes. In order to prevent rapid wear, NORD recommends using the PMG500 rectifier to "overexcite" the brake during its release. The brake coil should be sized utilizing the PMG rectifier like a half-wave rectifier.

Brake Switching Options

The rectifiers discussed in this manual can be wired for either switching the AC power source (input) or the DC voltage supply (output).

- Wiring the DC switching gives the fastest reaction (de-energize/ brake engagement/stopping) time.
- If AC switching is used, the source power can be attached to the motor brake terminals. Tapping into the motor terminals gives the slowest de-energize time (stopping), due to the collapsing time of the motor magnetic field.

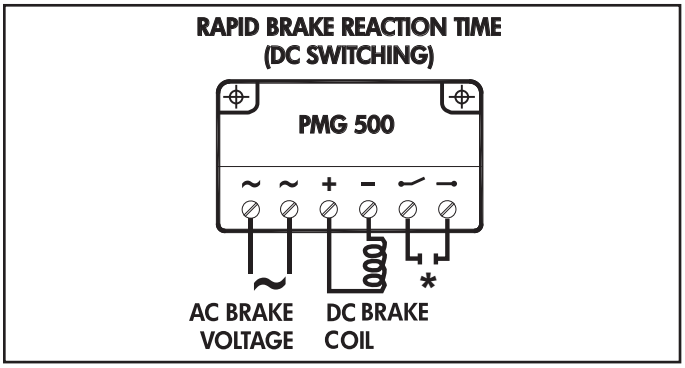
Figure 2: GVE20L, GHE40L, and GHE50L Rectifiers



Terminals 1 & 2	-	Brake system connection to AC supply voltage
Terminals 3 & 4	-	Installed Jumper for AC switching or Switch contact (as shown) for DC switching
Terminals 5 & 6	-	DC Voltage Connection to the brake coil

*** The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.**

Figure 3: PMG 500 Push-Hybrid Rectifier



Terminals ~ & ~	-	Brake system connection to AC supply voltage
Terminals + & -	-	DC Voltage Connection to the brake coil
Terminals ⌐ & →	-	Installed Jumper for AC switching or Switch contact (as shown) for DC switching

*** The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.**

MOTOR BRAKES INSTALLATION & MAINTENANCE

BRAKE SIZE: BRE 5 **BRAKE TORQUE: 5 Nm (3.7 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19010212	-	-	-	-	22	24	0.92	26.0
19010912	230	0.09	115	0.19	22	105	0.21	500
19011902	400	0.05	200	0.11	22	180	0.12	1475
19011912	460	0.05	230	0.10	22	205	0.11	1900
19012212	500	0.04	250	0.08	21	225	0.09	2450
19012512	575	0.04	-	-	22	250	0.09	2850

BRAKE SIZE: BRE20 **BRAKE TORQUE: 20 Nm (15 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19030222	-	-	-	-	34	24	1.42	16.9
19030922	230	0.18	115	0.35	41	105	0.39	270
19031922	400	0.09	200	0.17	34	180	0.19	950
19031932	460	0.07	230	0.13	30	205	0.15	1391
19032222	500	0.07	250	0.15	36	225	0.16	1391
19032522	575	0.06	-	-	35	250	0.14	1780

BRAKE SIZE: BRE 60 **BRAKE TORQUE: 60 Nm (44 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19050252	-	-	-	-	52	24	2.18	11.0
19050952	230	0.27	115	0.54	63	105	0.60	174
19051902	400	0.13	200	0.27	54	180	0.30	602
19051952	460	0.12	230	0.25	57	205	0.28	740
19052252	500	0.10	250	0.20	50	225	0.22	1004
19052552	575	0.09	-	-	48	250	0.19	1300

BRAKE SIZE: BRE 150 **BRAKE TORQUE: 150 Nm (110 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19070252	-	-	-	-	77	24	3.20	7.5
19070952	230	0.39	115	0.79	92	105	0.88	120
19071902	400	0.18	200	0.36	73	180	0.40	445
19071952	460	0.15	230	0.31	70	205	0.34	600
19072252	500	0.15	250	0.30	76	225	0.34	670
19072552	575	0.14	-	-	76	250	0.30	825

BRAKE SIZE: BRE 400 **BRAKE TORQUE: 400 Nm (295 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19092252	-	-	-	-	144	24	6.00	4.0
19092952	230	0.62	115	1.24	145	105	1.38	76
19093902	400	0.35	200	0.70	141	180	0.78	230
19093952	460	0.31	230	0.62	140	205	0.68	300
19093962	500	0.29	250	0.57	143	225	0.63	355
19093972	575	0.26	-	-	142	250	0.57	440

BRAKE SIZE: BRE 1200 **BRAKE TORQUE: 1200 Nm (885 lb-ft) max. ❷**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19099802	230	0.62	-	-	145	105	1.38	76
19099902	400	0.27	-	-	108	180	0.60	300
19099902	460	0.31	-	-	140	205	0.68	300

BRAKE SIZE: BRE 10 **BRAKE TORQUE: 10 Nm (7.4 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19020222	-	-	-	-	28	24	1.17	20.6
19020922	230	0.14	115	0.28	33	105	0.32	332
19021902	400	0.07	200	0.15	29	180	0.16	1100
19021922	460	0.06	230	0.11	26	205	0.13	1620
19022222	500	0.06	250	0.12	30	225	0.13	1700
19022522	575	0.05	-	-	27	250	0.11	2323

BRAKE SIZE: BRE40 **BRAKE TORQUE: 40 Nm (30 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19040232	-	-	-	-	41	24	1.69	14.2
19040932	230	0.21	115	0.42	49	105	0.46	226
19041902	400	0.11	200	0.22	45	180	0.25	723
19041922	460	0.11	230	0.22	50	205	0.24	840
19042232	500	0.09	250	0.18	44	225	0.20	1150
19042532	575	0.08	-	-	44	250	0.18	1425

BRAKE SIZE: BRE 100 **BRAKE TORQUE: 100 Nm (74 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19060252	-	-	-	-	80	24	3.33	7.2
19060952	230	0.39	115	0.79	92	105	0.88	120
19061902	400	0.21	200	0.42	83	180	0.46	390
19061952	460	0.20	230	0.40	91	205	0.44	464
19062252	500	0.16	250	0.32	79	225	0.35	643
19062552	575	0.14	-	-	79	250	0.31	795

BRAKE SIZE: BRE 250 **BRAKE TORQUE: 250 Nm (185 lb-ft) max.**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19080252	-	-	-	-	99	24	4.14	5.8
19080952	230	0.51	115	1.03	120	105	1.14	92
19081902	400	0.27	200	0.54	108	180	0.60	300
19081952	460	0.24	230	0.49	111	205	0.54	380
19082252	500	0.20	250	0.40	100	225	0.44	507
19081962	575	0.17	-	-	95	250	0.38	655

BRAKE SIZE: BRE 800 **BRAKE TORQUE: 800 Nm (590 lb-ft) max. ❶**

NORD Brake P/N	Half-Wave [V_{AC}]	Half-Wave [A_{AC}]	Full-Wave [V_{AC}]	Full-Wave [A_{AC}]	P_C [W]	V_C [V_{DC}]	I_C [A_{DC}]	R_C [Ω]
19094252	-	-	-	-	144	24	6.00	4.0
19094952	230	0.62	-	-	145	105	1.38	76
19095902	400	0.27	-	-	108	180	0.60	300
19095902	460	0.31	-	-	140	205	0.68	300
19095962	500	0.29	-	-	143	225	0.63	355

IMPORTANT NOTE

The PMG500 rectifier is required when utilizing the larger 800 Nm (590 lb-ft) - and 1200 Nm (885 lb-ft) twin-rotor brakes. In order to prevent rapid wear, NORD recommends using the PMG500 rectifier to "overexcite" the brake during its release. The brake coil should be sized utilizing the PMG rectifier like a half-wave rectifier.

Half-Wave [V_{AC}] = AC supply voltage with half-wave rectifier

Half-Wave [A_{AC}] = AC supply current to half-wave rectifier

Full-Wave [V_{AC}] = DC supply voltage with full-wave rectifier

Full-Wave [A_{AC}] = AC supply current to full-wave rectifier

Pc [W] = Power to brake coil

Vc [V_{DC}] = DC brake coil voltage (range -30% to +10%)

Ic [A_{DC}] = DC current top brake coil

Rc [V] = Brake coil resistance (±5%)

❶ When used as a stopping brake, evaluation of brake work is essential.

❷ Designed as a holding brake or emergency stop brake only.

Brake coil data based upon ambient conditions of 20°C (68°F).

General Maintenance

Brake Air Gap

In order to obtain optimal brake performance and maximum brake life, it is necessary to periodically check and reset the brake air gap. As the brake rotor wears and decreases in thickness, the air gap will increase. If the air gap is too large, the brake coil may not have enough magnetic force to pull the metal armature disc across the gap and the brake will drag.

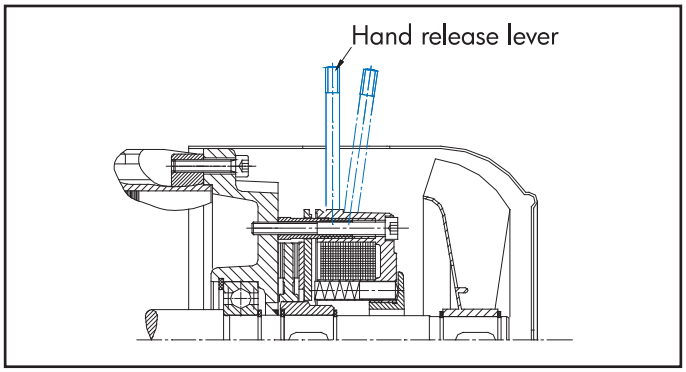
IMPORTANT NOTE

When a complete brake motor is supplied by NORD, the air gap is already set at the factory. If the brake is ordered as a part, the air gap must be set in the field. All brake air gap adjustments must be made with the brake assembled onto the motor and power off (brake engaged).

Hand Release Lever (HL)

It is common to supply the NORD brake with a hand release lever assembly. The hand release lever allows the brake to be manually released without requiring that the brake be energized with voltage. The lever has a spring return that allows the brake to be hand released and returned automatically to its set position. The handle of the hand release lever can be unscrewed for easy removal.

Figure 4

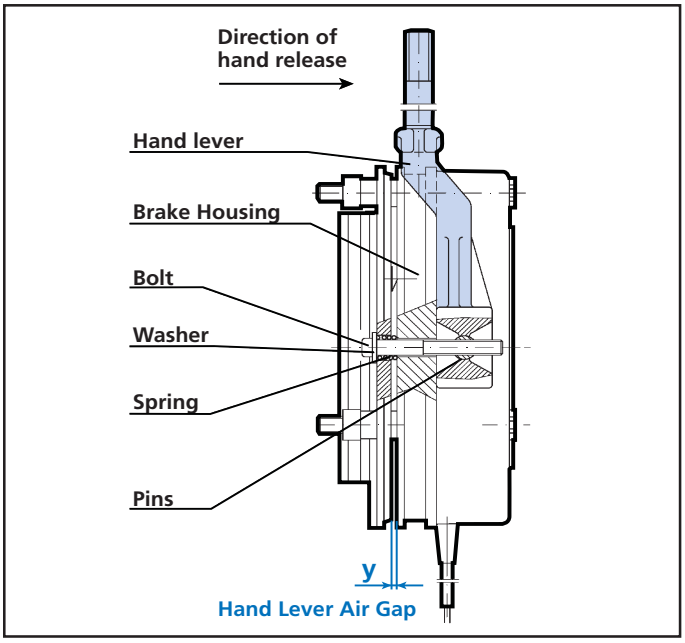


IMPORTANT NOTE

When a brake motor with hand-lever is supplied by NORD, both the hand lever air gap and brake air gap are set at the factory. When ordered as parts, proper hand-lever and air gap adjustments must be made in the field. Hand-lever adjustments must always be made prior to assembling the brake to the motor. All brake air gap adjustments must be made with the brake assembled to the motor and the power off (brake engaged).

Brake Hand-Lever Installation and Adjustment

Figure 5



1. Place the hand-lever over the brake housing (as shown) and align the pins.
2. Screw the bolts with washer and spring into the pins.
3. Using a feeler gage, adjust the hand-lever air gap per Table 5.

Table 5: Hand-Lever Air Gap Setting

Brake Size	Dimension "y" ❶ [mm]	[in]	Brake Size	Dimension "y" ❶ [mm]	[in]
BRE 5	1	0.040	BRE 100	1.2	0.047
BRE 10	1	0.040	BRE 150	1.2	0.047
BRE 20	1	0.040	BRE 250	1.5	0.059
BRE 40	1	0.040	BRE 400	1.5	0.059
BRE 60	1	0.040	BRE 800	1.5	0.059
			BRE 1200	1.5	0.059

❶ Tolerance: + 0.008 in [+ 0.2 mm]

IMPORTANT NOTE

When setting the hand-lever gap or dimension "y" the magnetic brake coil housing and the anchor plate must be kept uniform all around.

WARNING

- To assure proper assembly and proper functioning of the brake, the hand-lever must be assembled to the brake, and the hand-lever air gap must be adjusted, before the brake is assembled to the motor.
- Once adjusted properly, the hand-lever air gap setting should not be altered, even when readjusting the air gap setting.

Setting the Brake Air Gap

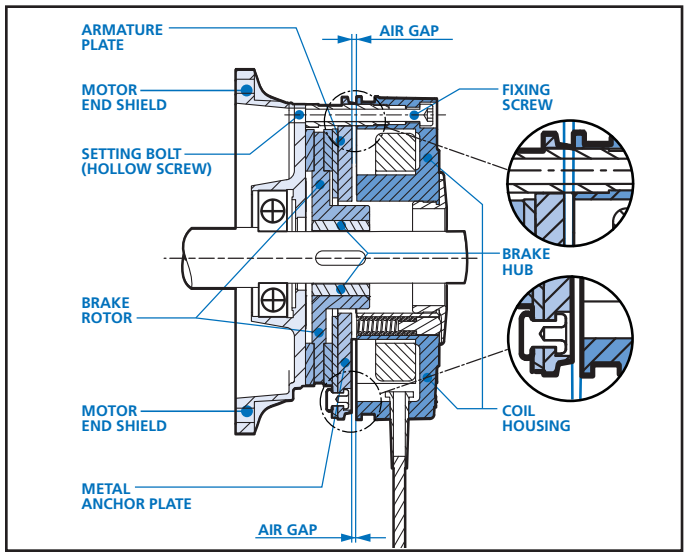
NORD spring-loaded brakes are virtually maintenance free. However, the air-gap of the brake rotor or brake disc must be periodically checked and adjusted. If necessary, the worn brake rotor must be replaced. Table 6 serves as guide to check and set the brake air gap as needed.

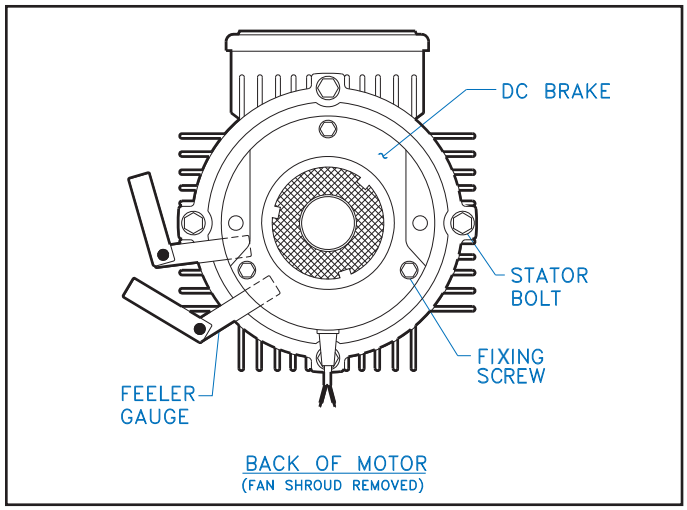
IMPORTANT NOTE

When a complete brake motor is supplied by NORD, the air gap is already set at the factory. If the brake is ordered as a part, the air gap must be set in the field. All brake air gap adjustments must be made with the brake assembled to the motor and the power off (brake engaged).

The brake air gap is checked by placing a feeler gage between metal anchor plate and the brake coil housing as shown in Figure 6. This procedure is identical even for the larger BRE800 and BRE1200 twin rotor brakes.

Figure 6 – Setting the Brake Air Gap





Procedure

1. Loosen the fixing screws that attach the brake to the motor's end-shield by approximately half a turn.
2. If required, the brake assembly may be loosened slightly from the motor's end shield by turning the threaded setting bolts (hollow screws) that surround the fixing screws, counter clockwise, into the brake coil housing.
3. Depending upon whether or not the air gap needs to be decreased or increased, turn the fixing screws accordingly until the desired nominal air gap (Table 6) is reached, as measured using the appropriate feeler gauge.
   - Turning the fixing screws clockwise allows the brake coil housing to be moved towards the anchor plate and reduces the air gap.
   - Turning the fixing screws counter-clockwise allows the brake coil housing to be moved away from the anchor plate and increases the air gap.
4. If the setting bolts (hollow screws) were adjusted as suggested in Step 2, re-secure the brake coil housing firmly against the motor's end shield by turning the setting bolts (hollow screws) clockwise, out of the brake coil housing.
5. Tighten the fixing screws to the appropriate torque.
6. Re-check and measure the air gap in multiple locations to check for appropriate spacing. Repeat the steps as needed until the desired air gap spacing is uniform and consistent all the way around the brake.

Table 6: Brake Air Gap Settings

Brake Size	Fixing Screw Tightening Torque		Nominal Air Gap Setting ❶		Maximum Air Gap ❷	
	[lb-ft]	[Nm]	[in]	[mm]	[in]	[mm]
BRE 5	2.2	3	0.008	0.2	0.024	0.6
BRE10	4.4	6	0.008	0.2	0.028	0.7
BRE20	7.4	10	0.012	0.3	0.031	0.8
BRE40	7.4	10	0.012	0.3	0.035	0.9
BRE60	18	25	0.012	0.3	0.039	1.0
BRE100 ❸	18	25	0.016	0.4	0.043	1.1
BRE150 ❸	18	25	0.016	0.4	0.043	1.1
BRE250	37	50	0.020	0.5	0.047	1.2
BRE400	37	50	0.020	0.5	0.047	1.2
BRE800	37	50	0.028	0.7	0.047	1.2
BRE1200	37	50	0.028	0.7	0.047	1.2

❶ **Tolerance: + 0.004 in [+ 0.1 mm]**

❷ **Brake air gap must be re-adjusted before the stated value.**

❸ **When using the stainless steel friction plate (RG) increase the nominal air gap to 0.6 mm (0.024 in.).**

Brake Rotor (Brake Disc) Wear Assessment

Periodically the brake rotor or brake disc must also be checked for wear. If the brake rotors wear approaches the minimum allowed thickness, then the part should be replaced. Use Table 7 to determine whether or not the brake rotor requires replacement.

Table 7: Brake Rotor Thickness

Brake Size	Nominal Brake Rotor Thickness ❶		Minimum Brake Rotor Thickness ❷	
	[in]	[mm]	[in]	[mm]
BRE 5	0.295	7.5	0.177	4.5
BRE10	0.335	8.5	0.217	5.5
BRE20	0.406	10.3	0.295	7.5
BRE40	0.492	12.5	0.374	9.5
BRE60	0.571	14.5	0.453	11.5
BRE100	0.630	16	0.492	12.5
BRE150	0.709	18	0.571	14.5
BRE250	0.787	20	0.650	16.5
BRE400	0.787	20	0.650	16.5
BRE800	0.787	20	0.650	16.5
BRE1200	0.866	22	0.689	17.5

❶ As new condition.

❷ Worn condition - brake rotor replacement is required!

Brake Pad Replacement (reference to parts list on page 8)

When the brake pad is worn the pad should be replaced to maintain proper brake operation and ensure safety.

Required Tools

- Phillips head screw drivers (fan shroud removal)
- External snap ring pliers (fan and brake hub removal).
- Large flat head screw driver or small pry bar (fan removal)
- Metric T-handle wrenches and open-end wrenches.

Procedure

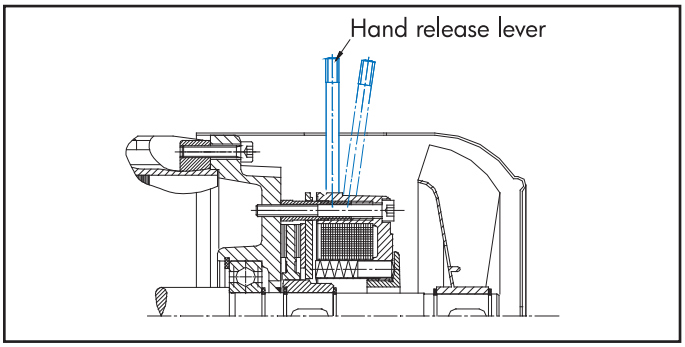
1. Remove the fixing screws (946) securing the fan cover (940) to the motor end-shield (932). If the brake has a hand release (937), the lever arm should be removed by unscrewing it.
2. Remove the fan cover (940) and note the position of the hand release slot if applicable.
3. Remove the snap ring holding the cooling fan (939) and carefully remove the cooling fan (939), key and second snap ring (997).
4. If the brake is equipped with a dust boot (992), remove it.
5. Remove the socket head cap screws holding the brake coil (936) to the motor end-shield (932).
6. Remove the brake coil (936), noting the hand release (937) and power cable locations.
7. Slide the brake rotor (993) off the brake hub (938) which is secured to the motor shaft.
8. Clean the brake, install the new brake rotor pad and reassemble the brake in reverse order of the steps outlined.

Optional Brake Accessories

NORD can supply a variety of brake options and accessories, of which some of the most common are noted below.

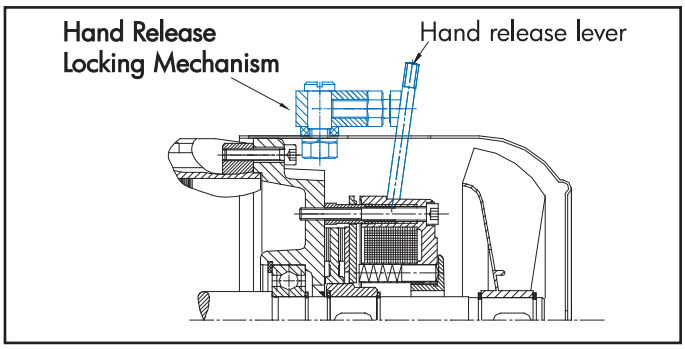
Hand Release Lever (HL)

The hand release lever allows the brake to be manually released without requiring that the brake be energized with voltage. The lever has a spring return that allows the brake to be hand released and returned automatically to its set position. The handle of the hand release lever can be unscrewed for easy removal.



Locking Hand Release Lever (FHL)

This option allows the brake to be manually released and locked off without requiring voltage to the brake. The lock mechanism prevents the spring from returning the brake to a closed state without manual action by the user. The hand release lever can be unscrewed for easy removal.



Corrosion Protected Brake (RG)

The brake is fitted with a stainless steel brake plate to provide additional corrosion protection in severe and wet environments.

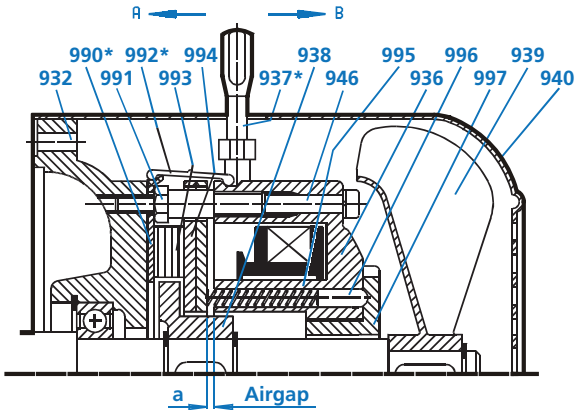
Dust & Corrosion Protected Brake (SR)

A rubber-sealing boot is installed on the brake to provide additional protection in dusty environments. This feature includes the stainless steel brake plate (RG).

IP66 Brake (IP66)

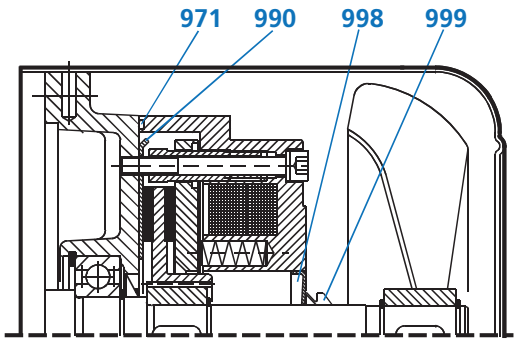
NORD can also provide an IP66 brake option designed for a bigger degree of protection against severe environments.

Parts List - Precima Brakes



Normal Design, Enclosure IP55 with following options:

RG – Stainless Steel Disc (Item 990)
SR – Dust Boot-includes Option RG (Item 992)
HL – Hand Release (Item 937)



Optional Brake with optional IP66 enclosure

932 Non-drive end shield
936 Brake coil
937 Manual brake lever – optional
938 Brake hub
939 Fan
940 Fan cover
946 Fixing screw
971 O-ring - optional
990 Friction plate - optional
991 Setting bolt
992 Dust protection ring
993 Brake rotor
994 Armature plate
995 Spring
996 Pressure plate adjustment**
997 Adjustable ring **
998 Bushing/seal - optional
999 V-ring - optional

*** Only for brakes that are 5 Nm to 40 Nm***

Table 8: Spare Parts

Brake Size	NORD Motor Frame	Brake Rotor [Item 993]	Brake Hub [Item 938]	Brake Hub Bore / (Style)	Hand Release (HL) [Item 937]	Stainless Disc (RG) [Item 990]	Dust Boot (SR) [Item 992]
BRE5	63/71/80	19120042	19100112	15 mm (hex)	19150042	19130042	19110042
BRE10	63/71	19120082	19100212	15 mm (hex)	19150082	19130082	19110082
BRE10	80/90	19120082	19100222	20 mm (hex)	19150082	19130082	19110082
BRE20	80/90/112	19120162	19100322	20 mm (hex)	19150162	19130162	19110162
BRE20	100	19120162	19100332	25 mm (hex)	19150162	19130162	19110162
BRE40	90/100	19120322	19100452	25 mm (spline)	19150322	19130322	19110402
BRE40	112	19120402	19100442	30 mm (hex)	19150322	19130322	19110402
BRE60	100	19120602	19100532	25 mm (spline)	19150602	19130602	19110602
BRE60	112	19120602	19100542	30 mm (spline)	19150602	19130602	19110602
BRE60	132	19120602	19100552	35 mm (spline)	19150602	19130602	19110602
BRE100	132/160	19120802	19100652	35 mm (spline)	19150802	19130802	19110802
BRE150	132	19121502	19100752	35 mm (spline)	19151502	19131502	19111502
BRE150	160/180	19121502	19100772	45 mm (spline)	19151502	19131502	19111502
BRE250	160/180	19122402	19100872	45 mm (spline)	19152402	19132500	19112502
BRE250	200	19122402	19100882	50 mm (spline)	19152402	19132500	19112502
BRE400	200/225	19124002	19100912	60 mm (spline)	19154003	10114020	19114002

IMPORTANT NOTES

- For brake coil part numbers, listed by brake size and coil voltage, please see page 4.
- The large BRE 800 and BRE 1200 twin rotor brakes are supplied to NORD pre-assembled and complete. For parts list details and spare parts information please contact NORD.

Brake Times & Electrical Selection

Brake timing performance is critical in selecting the optimal brake system. NORD brakes can provide exceptional performance in terms of the release (start) times and engagement (stop) times. Use the following guidelines in order to select the correct brake control components and connections.

1) Determine if the brake needs to be wired directly from the motor terminal block or powered by a separate power source.

- If you are using a frequency inverter, soft-start or a two speed motor you will need to supply the rectifier from a separate power source.

- If the motor is powered direct across-the-line the rectifier power can be supplied from the motor's terminal block.

2) What type of performance do I need?

- Is the standard brake performance OK?

- Is a higher performance required for fast brake release or very fast brake stopping?

Selection Suggestions

When Fast Stopping is Recommended

Any applications that require quick stops and positive action at stand-still

Recommended Applications

- conveyors and inclined conveyors
- hoists and lifts
- bulk material handling equipment (bucket elevators, idler conveyor's).

⚠ *CAUTION* ⚠

- **Hoisting (lifting/lowering) applications** - must have the brake wired for fast response.

When Fast-Release is Recommended (Overexcitation)

Fast Release is recommended in any application that is very high-cycling with frequent starts and stops. These applications require the brake to release very-quickly in order to avoid excessive heat build-up in the AC motor and brake coil.

Recommended Applications

- Index conveyors
- Diverters
- Storage and retrieval crane systems

Power Source	Brake Release (start)	Brake engagement (stop)	Braking Method *	Rectifier
Motor Terminal Block	Standard	Standard (AC switching)	10	GVE/GHE/GUE
	Standard	Fast (DC switching)	15	GVE/GHE/GUE
	❶ Fast (Overexcitation)	Standard (AC switching)	30	PMG 500
	❶ Fast (Overexcitation)	Fast (DC switching)	35	PMG 500
Separate Power Source	Standard	Standard (AC switching)	20	GVE/GHE/GUE
	Standard	Fast (DC switching)	25	GVE/GHE/GUE
	❶ Fast (Overexcitation)	Standard (AC switching)	45	PMG 500
	❶ Fast (Overexcitation)	Fast (DC switching)	50	PMG 500

*** Braking methods referenced in connection diagrams on pages 11-15.**

❶ Please see important note below:

IMPORTANT NOTE

The PMG500 rectifier is required when utilizing the larger 800 Nm (590 lb-ft) - and 1200 Nm (885 lb-ft) twin-rotor brakes. In order to prevent rapid wear, NORD recommends using the PMG500 rectifier to "overexcite" the brake during its release. The brake coil should be sized utilizing the PMG rectifier like a half-wave rectifier.

3) What is the AC brake supply voltage?

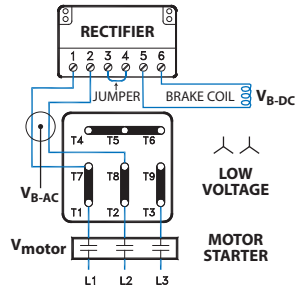
The table below determines the rectifier and DC brake voltage required, based on the AC supply voltage & braking method.

AC Brake Supply Voltage (VAC)	Braking Method	Rectifier Model Type	DC Brake Voltage (VDC)	Rectifier Part Number
115 (105-120)	20	GVE20L	105	19141000
	25	GVE20L	105	19141000
208 (200-208)	10	GVE20L	180	19141000
	15	GVE20L	180	19141000
	20	GVE20L	180	19141000
	25	GVE20L	180	19141000
230 (220-240)	10	GVE20L	205	19141000
	10	GHE40L	105	19141010
	15	GVE20L	205	19141000
	15	GHE40L	105	19141010
	20	GVE20L	205	19141000
	20	GHE40L	105	19141010
	25	GVE20L	205	19141000
	25	GHE40L	105	19141010
	30	PMG 500	105	19140200
	35	PMG 500	105	19140200
	45	PMG 500	105	19140200
	50	PMG 500	105	19140200
400 (380-415)	10	GHE40L	180	19141010
	15	GHE40L	180	19141010
	20	GHE40L	180	19141010
	25	GHE40L	180	19141010
	30	PMG 500	180	19140200
	35	PMG 500	180	19140200
	45	PMG 500	180	19140200
	50	PMG 500	180	19140200
460 (440-480)	10	GHE40L	205	19141010
	15	GHE40L	205	19141010
	20	GHE40L	205	19141010
	25	GHE40L	205	19141010
	30	PMG 500	205	19140200
	35	PMG 500	205	19140200
	45	PMG 500	205	19140200
	50	PMG 500	205	19140200
500	10	GHE50L	225	19141020
	15	GHE50L	225	19141020
	20	GHE50L	225	19141020
	25	GHE50L	225	19141020
575 (550-600)	10	GHE50L	250	19141020
	15	GHE50L	250	19141020
	20	GHE50L	250	19141020
	25	GHE50L	250	19141020

Specify Rectifier Model Type _____ And DC Brake Voltage _____

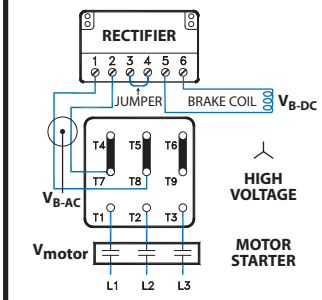
Typical Connection Diagrams

BR101A — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — NORMAL STOPPING (AC-SWITCHING) — 10



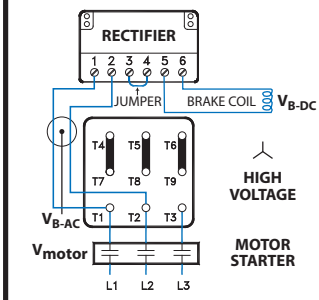
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208-230YY/460Y	GVE20	208 VAC	230 VAC	205 VDC
230YY/460Y	GVE20	230 VAC	230 VAC	205 VDC

BR101B — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — NORMAL STOPPING (AC-SWITCHING) — 10



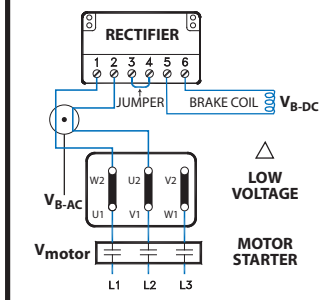
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	GVE20	460 VAC	230 VAC	205 VDC

GP101C — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — NORMAL STOPPING (AC-SWITCHING) — 10



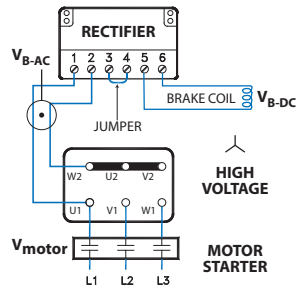
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	GHE40	460 VAC	460 VAC	205 VDC

BR601A — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — NORMAL STOPPING (AC-SWITCHING) — 10



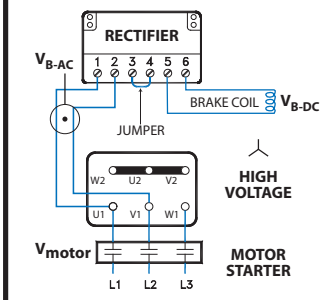
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208Δ/360Y	GVE20	208 VAC	208 VAC	180 VDC
230Δ/400Y	GVE20	230 VAC	230 VAC	205 VDC
400Δ/690Y	GHE40	400 VAC	400 VAC	180 VDC
460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC

BR601B — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — NORMAL STOPPING (AC-SWITCHING) — 10



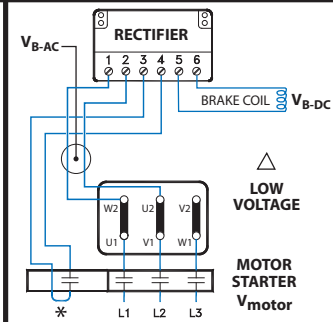
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230Δ/400Y	GVE20	400 VAC	230 VAC	205 VDC

BR601C — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — NORMAL STOPPING (AC-SWITCHING) — 10



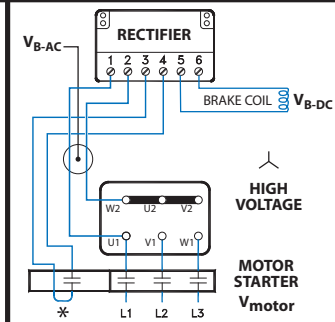
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
332Δ/575Y	GHE50	575 VAC	575 VAC	250 VDC

BR603A — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — FAST STOPPING (DC-SWITCHING) — 15



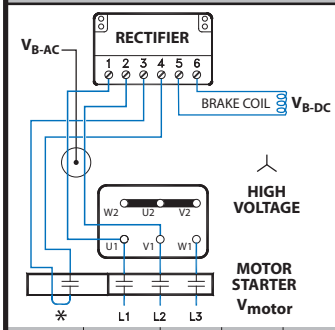
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208Δ/360Y	GVE20	208 VAC	208 VAC	180 VDC
230Δ/400Y	GVE20	230 VAC	230 VAC	205 VDC
400Δ/690Y	GHE40	400 VAC	400 VAC	180 VDC
460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC

BR603B — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — FAST STOPPING (DC-SWITCHING) — 15



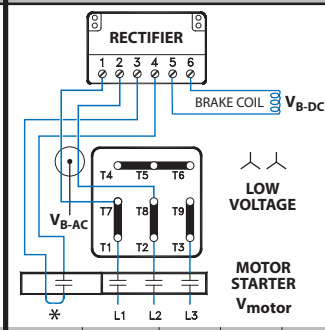
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230Δ/400Y	GVE20	400 VAC	230 VAC	105 VDC

BR603C — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — FAST STOPPING (DC-SWITCHING) — 15



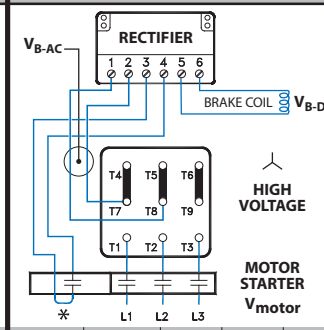
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
332Δ/575Y	GHE50	575 VAC	575 VAC	250 VDC

BR103A — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — FAST STOPPING (DC-SWITCHING) — 15



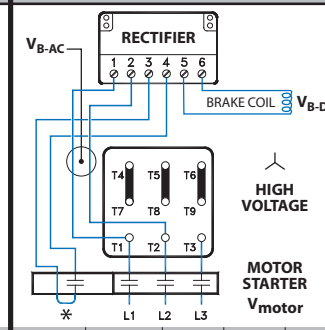
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	GVE20	208 VAC	230 VAC	205 VDC

BR103B — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — FAST STOPPING (DC-SWITCHING) — 15



MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	GVE20	460 VAC	230 VAC	205 VDC

BR103C — POWERED FROM MOTOR TERMINAL BLOCK — STANDARD RELEASE — FAST STOPPING (DC-SWITCHING) — 15



MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	GHE40	460 VAC	460 VAC	205 VDC

* The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

= Braking Method

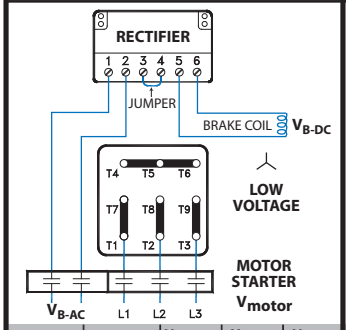
MOTOR BRAKES INSTALLATION & MAINTENANCE

Typical Connection Diagrams

BR102A

SEPERATE POWER SOURCE
STANDARD RELEASE
NORMAL STOPPING (AC-SWITCHING)

20

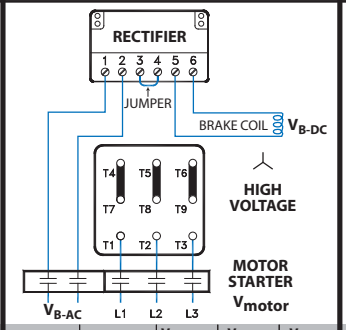


MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208-230YY/460Y	GVE20	208 VAC	230 VAC	205 VDC
230YY/460Y	GVE20	230 VAC	230 VAC	205 VDC

BR102B

SEPERATE POWER SOURCE
STANDARD RELEASE
NORMAL STOPPING (AC-SWITCHING)

20

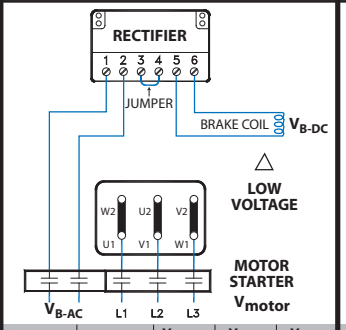


MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	GHE40	460 VAC	460 VAC	205 VDC

BR602A

SEPERATE POWER SOURCE
STANDARD RELEASE
NORMAL STOPPING (AC-SWITCHING)

20

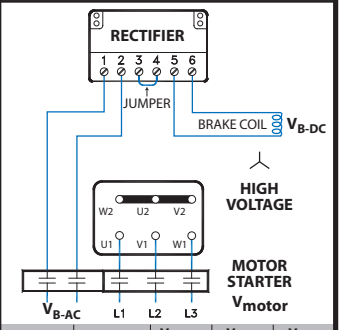


MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208Δ/360Y	GVE20	208 VAC	208 VAC	180 VDC
230Δ/400Y	GVE20	230 VAC	230 VAC	205 VDC
400Δ/690Y	GHE40	400 VAC	400 VAC	180 VDC
460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC

BR602B

SEPERATE POWER SOURCE
STANDARD RELEASE
NORMAL STOPPING (AC-SWITCHING)

20

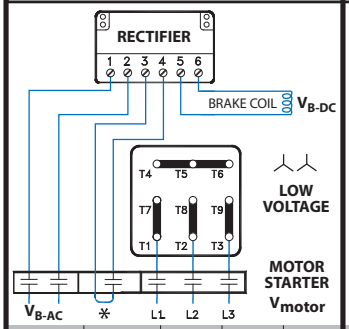


MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230Δ/400Y	GHE40	400 VAC	400 VAC	180 VDC
332Δ/575Y	GHE50	575 VAC	575 VAC	250 VDC

BR104A

SEPERATE POWER SOURCE
STANDARD RELEASE
FAST STOPPING (DC-SWITCHING)

25

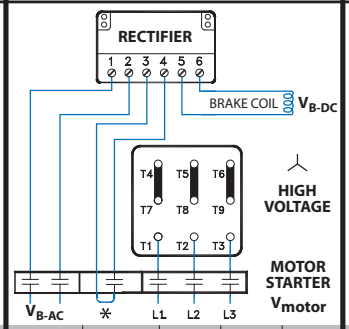


MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208-230YY/460Y	GVE20	208 VAC	230 VAC	205 VDC
230YY/460Y	GVE20	230 VAC	230 VAC	205 VDC

BR104B

SEPERATE POWER SOURCE
STANDARD RELEASE
FAST STOPPING (DC-SWITCHING)

25

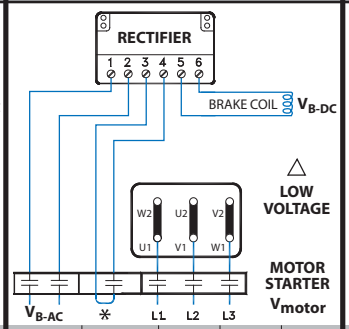


MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	GHE40	460 VAC	460 VAC	205 VDC

BR604A

SEPERATE POWER SOURCE
STANDARD RELEASE
FAST STOPPING (DC-SWITCHING)

25

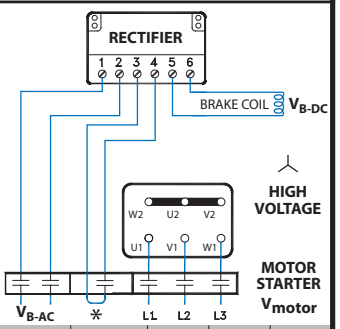


MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208Δ/360Y	GHE20	208 VAC	208 VAC	105 VDC
230Δ/400Y	GHE20	230 VAC	230 VAC	105 VDC
400Δ/690Y	GHE40	400 VAC	400 VAC	180 VDC
460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC

BR604B

SEPERATE POWER SOURCE
STANDARD RELEASE
FAST STOPPING (DC-SWITCHING)

25



MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230Δ/400Y	GHE20	400 VAC	230 VAC	105 VDC
332Δ/575Y	GHE40	575 VAC	332 VAC	180 VDC

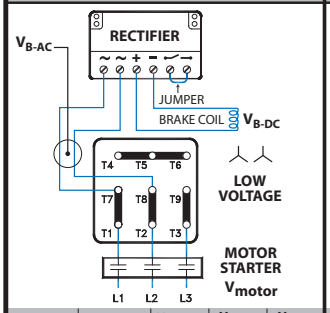
✻ The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

= Braking Method

MOTOR BRAKES INSTALLATION & MAINTENANCE

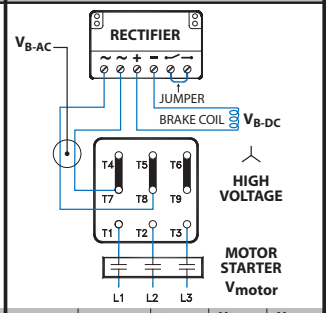
Typical Connection Diagrams

PMG101A — POWERED FROM MOTOR TERMINAL BLOCK — 30
FAST-RELEASE (OVER EXCITATION)
NORMAL STOPPING (AC-SWITCHING)



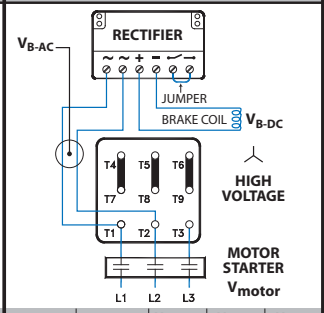
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230YY/460Y	PMG500	230 VAC	230 VAC	105 VDC

PMG101B — POWERED FROM MOTOR TERMINAL BLOCK — 30
FAST-RELEASE (OVER EXCITATION)
NORMAL STOPPING (AC-SWITCHING)



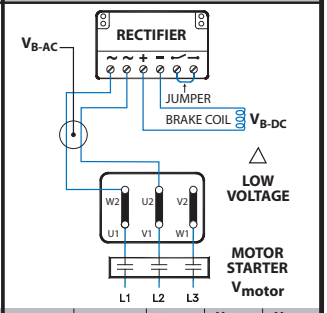
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230YY/460Y	PMG500	460 VAC	230 VAC	105 VDC

PMG101C — POWERED FROM MOTOR TERMINAL BLOCK — 30
FAST-RELEASE (OVER EXCITATION)
NORMAL STOPPING (AC-SWITCHING)



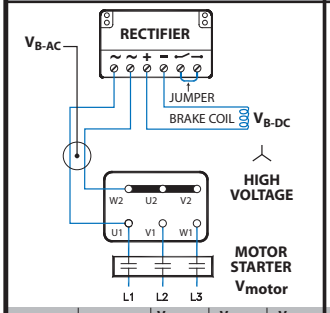
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230YY/460Y	PMG500	460 VAC	460 VAC	205 VDC

PMG101D — POWERED FROM MOTOR TERMINAL BLOCK — 30
FAST-RELEASE (OVER EXCITATION)
NORMAL STOPPING (AC-SWITCHING)



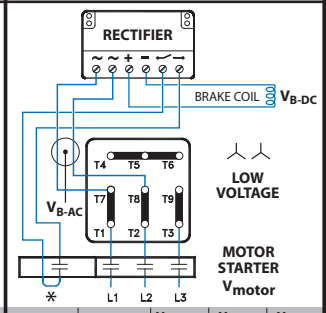
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
208Δ/360Y	PMG500	208 VAC	208 VAC	105 VDC
230Δ/400Y	PMG500	230 VAC	230 VAC	105 VDC
400Δ/690Y	PMG500	400 VAC	400 VAC	180 VDC
460Δ/Y	PMG500	460 VAC	460 VAC	205 VDC

PMG101E — POWERED FROM MOTOR TERMINAL BLOCK — 30
FAST-RELEASE (OVER EXCITATION)
NORMAL STOPPING (AC-SWITCHING)



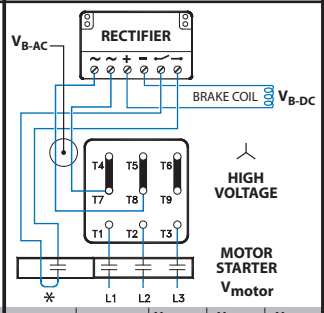
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230Δ/400Y	PMG500	400 VAC	230 VAC	105 VDC

PMG102A — POWERED FROM MOTOR TERMINAL BLOCK — 35
FAST-RELEASE (OVER EXCITATION)
FAST STOPPING (DC-SWITCHING)



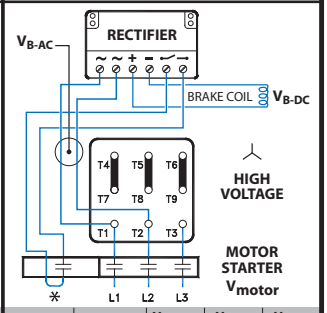
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230YY/460Y	PMG500	230 VAC	230 VAC	105 VDC

PMG102B — POWERED FROM MOTOR TERMINAL BLOCK — 35
FAST-RELEASE (OVER EXCITATION)
FAST STOPPING (DC-SWITCHING)



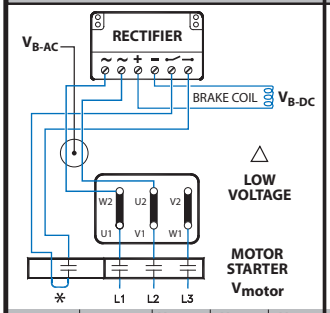
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230YY/460Y	PMG500	460 VAC	230 VAC	105 VDC

PMG102C — POWERED FROM MOTOR TERMINAL BLOCK — 35
FAST-RELEASE (OVER EXCITATION)
FAST STOPPING (DC-SWITCHING)



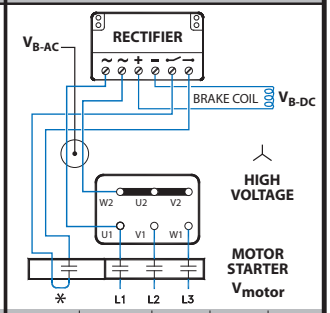
MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230YY/460Y	PMG500	460 VAC	460 VAC	205 VDC

PMG102D — POWERED FROM MOTOR TERMINAL BLOCK — 35
FAST-RELEASE (OVER EXCITATION)
FAST STOPPING (DC-SWITCHING)



MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
208Δ/360Y	PMG500	208 VAC	208 VAC	105 VDC
230Δ/400Y	PMG500	230 VAC	230 VAC	105 VDC
400Δ/690Y	PMG500	400 VAC	400 VAC	180 VDC
460Δ/Y	PMG500	460 VAC	460 VAC	205 VDC

PMG102E — POWERED FROM MOTOR TERMINAL BLOCK — 35
FAST-RELEASE (OVER EXCITATION)
FAST STOPPING (DC-SWITCHING)



MOTOR	RECTIFIER	V_{motor}	$V_{B\text{-}AC}$	$V_{B\text{-}DC}$
230Δ/400Y	PMG500	400 VAC	230 VAC	105 VDC

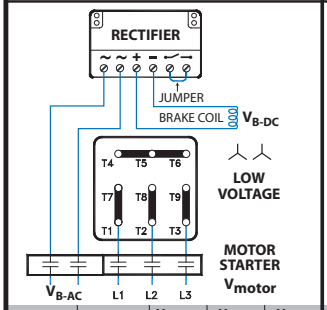
✻ The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

= Braking Method

MOTOR BRAKES INSTALLATION & MAINTENANCE

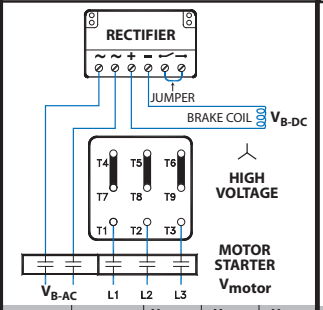
Typical Connection Diagrams

PMG104A — 45 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), NORMAL STOPPING (AC-SWITCHING)



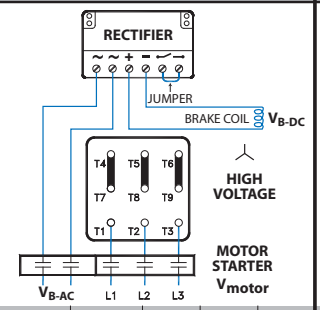
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	PMG500	230 VAC	230 VAC	105 VDC

PMG104B — 45 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), NORMAL STOPPING (AC-SWITCHING)



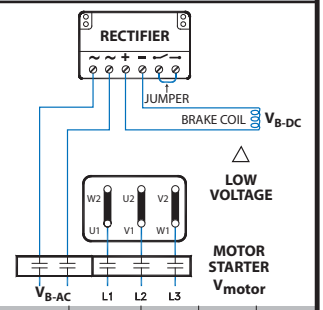
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	PMG500	460 VAC	230 VAC	105 VDC

PMG104C — 45 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), NORMAL STOPPING (AC-SWITCHING)



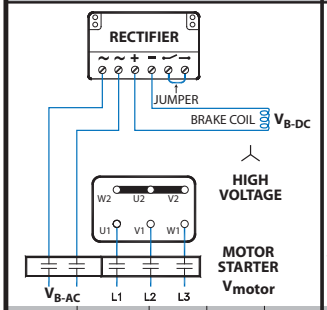
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	PMG500	460 VAC	460 VAC	205 VDC

PMG104D — 45 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), NORMAL STOPPING (AC-SWITCHING)



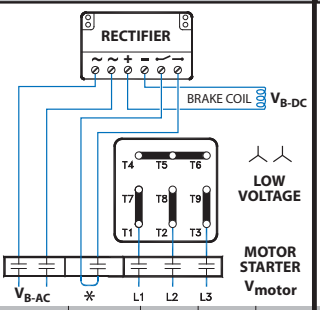
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208Δ/360Y	PMG500	208 VAC	208 VAC	105 VDC
230Δ/400Y	PMG500	230 VAC	230 VAC	105 VDC
400Δ/690Y	PMG500	400 VAC	400 VAC	180 VDC
460Δ/Y	PMG500	460 VAC	460 VAC	205 VDC

PMG104E — 45 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), NORMAL STOPPING (AC-SWITCHING)



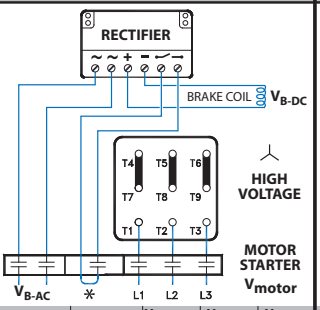
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230Δ/400Y	PMG500	400 VAC	230 VAC	105 VDC

PMG105A — 50 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), FAST STOPPING (DC-SWITCHING)



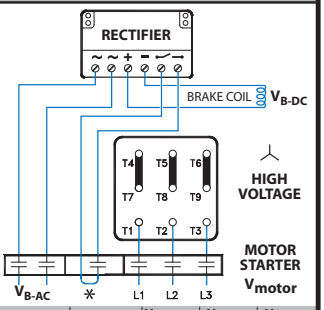
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	PMG500	230 VAC	230 VAC	105 VDC

PMG105B — 50 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), FAST STOPPING (DC-SWITCHING)



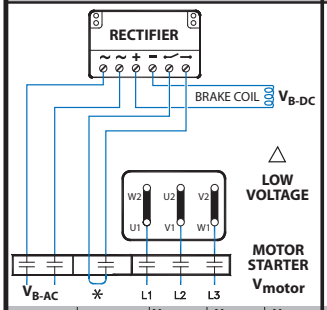
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	PMG500	460 VAC	230 VAC	105 VDC

PMG105C — 50 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), FAST STOPPING (DC-SWITCHING)



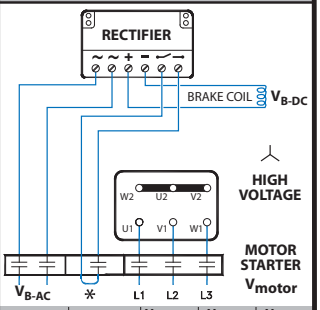
MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230YY/460Y	PMG500	460 VAC	460 VAC	205 VDC

PMG105D — 50 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), FAST STOPPING (DC-SWITCHING)



MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
208Δ/360Y	PMG500	208 VAC	208 VAC	105 VDC
230Δ/400Y	PMG500	230 VAC	230 VAC	105 VDC
400Δ/690Y	PMG500	400 VAC	400 VAC	180 VDC
460Δ/Y	PMG500	460 VAC	460 VAC	205 VDC

PMG105E — 50 — SEPERATE POWER SOURCE, FAST-RELEASE (OVER EXCITATION), FAST STOPPING (DC-SWITCHING)



MOTOR	RECTIFIER	V_{motor}	V_{B-AC}	V_{B-DC}
230Δ/400Y	PMG500	400 VAC	230 VAC	105 VDC

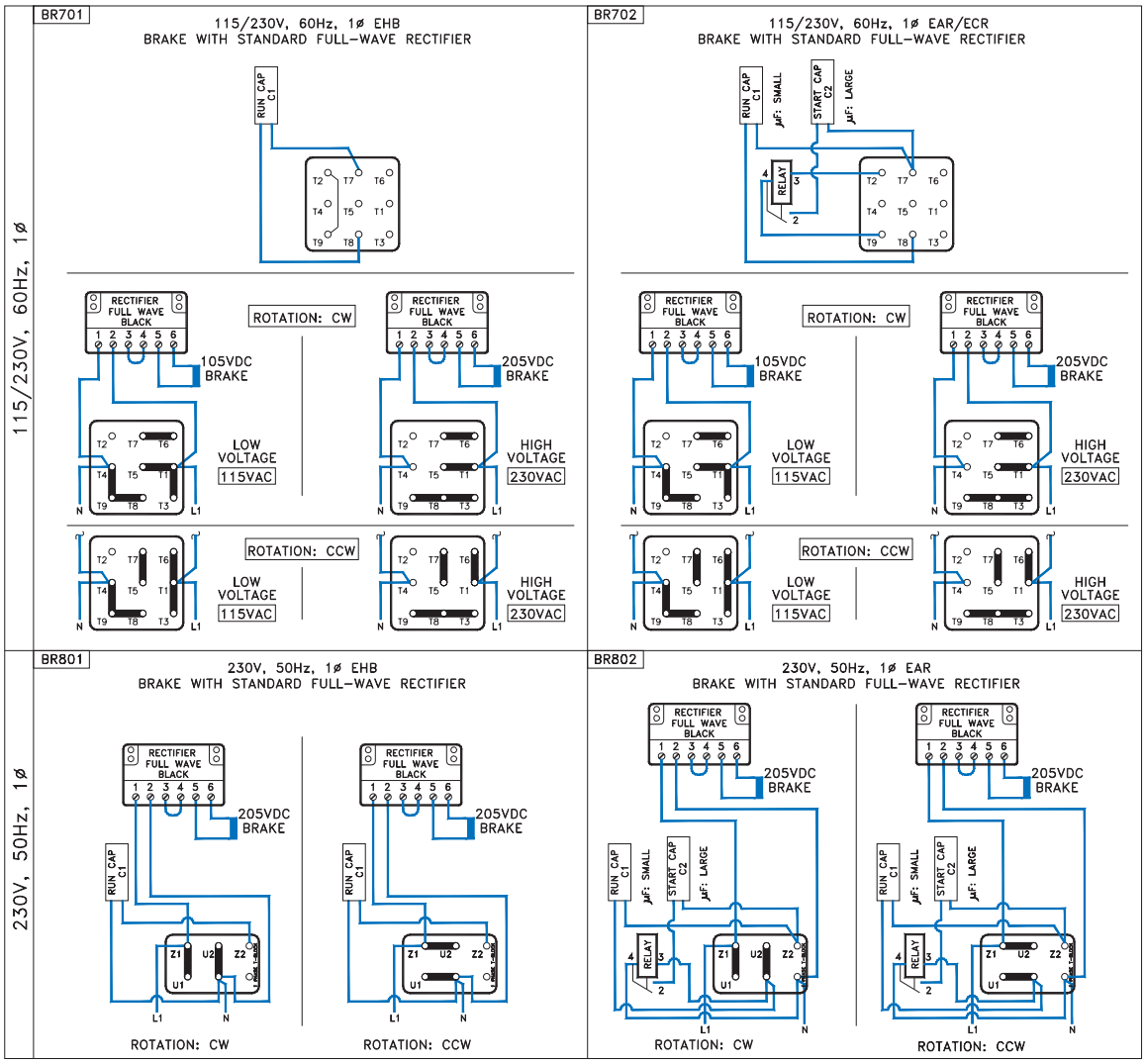
✻ The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

= Braking Method

NORD Gear Limited
Toll Free in Canada: 800.668.4378

NORD Gear Corporation
Toll Free in the United States: 888.314.6673

Typical Connection Diagrams - Single Phase Motors



Troubleshooting Information

Troubleshooting	Cause	Remedy
Brake doesn't release	Air gap too large	Check air gap and adjust
	Brake not recieving electrical power	Check electrical connection
	Failed rectifier	Replace rectifier
	Brake is getting too warm	Use fast response (FR) rectifier
	Voltage to brake coil too small	Check connection voltageof brake coil
	Rectifier supply voltage from inverter	Rectifier voltage must be from seperate source. (Inverter output voltage varies)
Brake release is delayed	Air gap too large	Check air gap and adjust
	Voltage to brake coil too small	Check connection voltage of brake coil
Brake does not engage	Voltage to coil too large	Check connection voltages of brake windings
	Hand release is adjusted incorrectly	Adjust to correct air gap
	Anchor plate mechanically blocked	Remove mechanical blockage
Brake engagement is delayed	Voltage to coil too large	Check connection voltage of brake windings
	Brake is switched to AC side	Use DC switching