



NABRICO

DF-1 N Electric Winch Owner's Manual

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NABRICO

DF-1-N ELECTRIC MANUAL WINCH

Owner's Manual

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SAFETY INFORMATION

CAUTION

Prior to installing and operating the winch, please read this manual thoroughly and carefully. Keep this manual and all other instructions accessible at all times.

The Occupational Safety and Health Act of 1970 states that it is the employer's responsibility to provide a workplace free of hazard. To this end, all equipment should be installed, operated and maintained in compliance with applicable trade, industrial, federal, state and local regulations. It is the equipment owner's responsibility to obtain copies of these regulations and to determine the suitability of the equipment for the equipment owner's intended use.

Although this manual will help you become familiar with the basic operation of the winch, it is by no means a substitute for proper training by your company in the safe use of winches, barge rigging and other marine equipment. This manual suggests methods of operation, but ultimately, the owners and operators of the equipment are responsible for determining whether a particular method of operation is safe and appropriate for the equipment being operated. Only individuals trained in the proper use of winches, barge rigging and other marine equipment should operate these winches.

The typical operating environment of barge and towboat winches often includes very high forces, and the potential hazards associated with these high forces should not be underestimated. Improper installation or incorrect or unsafe use could result in injury or death to persons or cause equipment failure or damage.

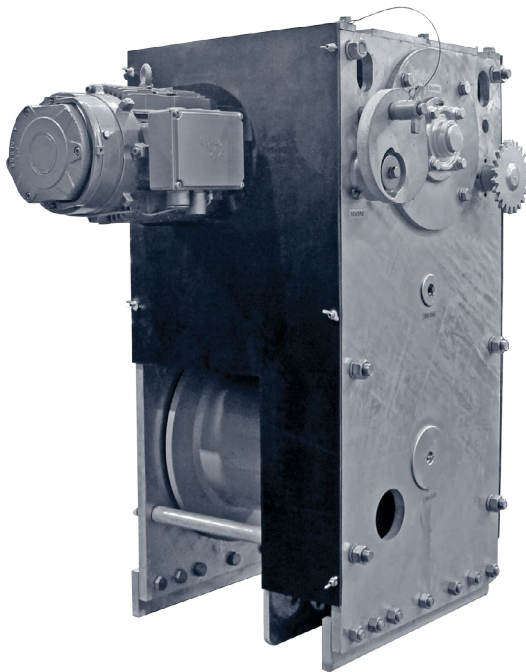
Recommended Information for Safe Operation:

CAUTION

- Check lubrication before use.
- Do not apply tension to the winch unless there are 5 complete wraps of rope on the drum.
- Do not operate the equipment unless you have a firm stance on a non-slippery surface.
- Do not wrap the wire rope around the load. This will damage the wire rope and could cause the load to escape. Rigging connectors are strongly recommended to secure the wire rope to the load.
- Keep fingers, loose clothing and any foreign objects away while operating the equipment.
- Do not divert attention away while operating the equipment. Stay alert to the possibility of accidents and try to prevent them from happening.
- Always remain to the side of the equipment while in operation.
- Never operate the equipment from the front or when bystanders are in front of it.
- Operators and bystanders should stay clear of any load and the wire rope while the equipment is operating.
- Avoid shock loads by starting and stopping the equipment smoothly. Shock loads can over load the equipment which may cause damage.
- Under no circumstances should any equipment be used to move, raise or lower a person(s) or equipment.
- Do not exceed a 15 minute duty cycle for the winch. To do so may result in equipment damage or failure.

<h3><u>NOTICE</u></h3>
<p>Inspect the equipment carefully at least once a month for loose fasteners, worn gears and pawls, cracked welds and other damaged parts. If any worn, cracked or damaged parts are found, stop use immediately and remove equipment from service until all appropriate repairs are completely made.</p>

1.1 GENERAL INFORMATION



DF-1 N ELECTRIC WINCH Features & Specifications

- Salt water package standard on all power winches.
- Hot-dipped galvanized.
- Stainless or silicon bronze fasteners.
- 3-ply conveyor belt covers (damage and corrosion resistant).
- 3-tooth locking dog with large release and fail-safe disc brake.
- NEMA motor design with helical-bevel gearbox.
- Heaviest winch in its class.
- Variable frequency drive option available. Amp draw limits, variable speeds, and motor protection.
- Made as one model adjustable to true right or left hand models for use in pairs.
- Over 100 fewer parts than other electric winches (no chain or sprockets).
- 30 Ton - 5 HP motor standard.
- 40 Ton - 7.5 HP motor standard.
- 65 Ton - 10 HP motor standard.

MODEL	HOLDING DOG & OR BRAKE	LINE PULL		LINE SPEED 1ST LAYER (FPM)	DRUM CAPACITIES (FT)				WEIGHT (LBS)
		@ RATED AMPS	@ MOTOR STALL		1/2"	5/8"	3/4"	1"	
DF-I-30	30 TONS	7,495	23,234	21	361	228	138	66	1700
DF-I-40	40 TONS	10,140	30,420	23	-	287	180	100	1800
DF-I-65	65 TONS	24,310	77,791	13	-	572	325	200	3200

1.2 INSTALLATION OF EQUIPMENT

NOTICE

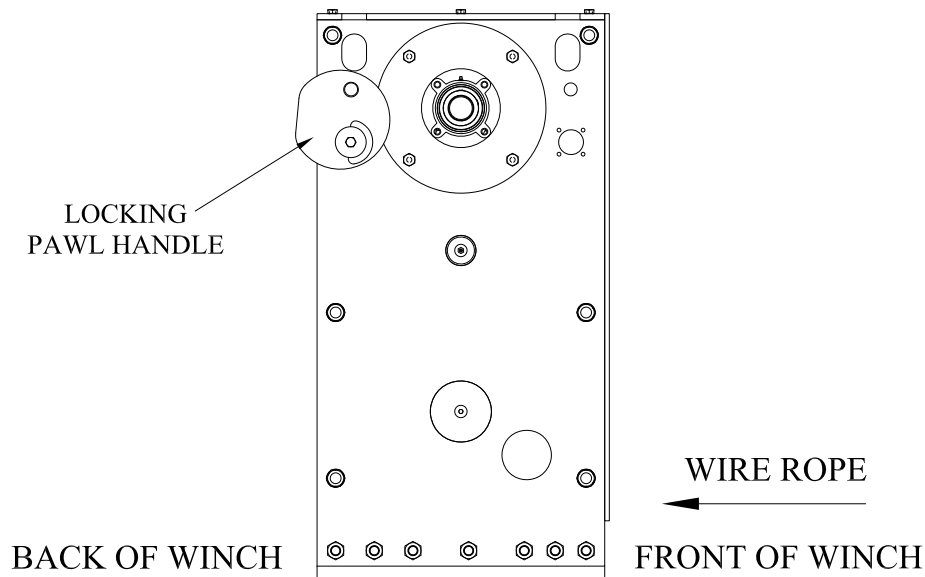
It is the responsibility of the customer, not the winch manufacturer, to properly locate and install the winch with regard to the safety of those operating the machinery.

CAUTION

Install the equipment in an area where there is ample room to operate the unit without the operator becoming entangled in the cable, lines, chains, winch mechanisms or other nearby equipment.

- 1.2.1** All winches must be installed on a flat, rigid and non-slippery surface. Deck and structure must be strong enough to withstand the weight and holding capacity of the winch and ultimate capacity of the wire, and the forces likely to occur during operation. A qualified professional should inspect or design the foundation to insure that it will provide adequate support.
- 1.2.2** Locate the winch in a suitable area free of traffic and obstacles. The winch should also be visible during entire operation. Keep in mind that the winch needs to be accessible for proper lubrication, maintenance and operation.
- 1.2.3** Mounting direction must be in line with the desired direction of cable pull. The front of the winch must face in the direction from which the cable is reeled (see fig. #1). When the unit is powered up the drum should rotate so that it reels cable onto the bottom of the drum from the front of the winch.

FIGURE #1 - MOUNTING POSITION



- 1.2.4 Maintain a fleet angle no greater than 1-1/2 degrees from winch drum to lead sheave (see appendix 1). The proper fleet angle helps to minimize wire rope damage by assisting the wire rope to wind uniformly onto the drum.
- 1.2.5 Using sufficient tack welds, secure the base bars to the deck or doubler plate. This will prevent the winch from becoming misaligned from heat distortion during the application of the seal weld.
- 1.2.6 Next apply a seal weld to the mounting fixture to permanently secure it to the deck. The seal weld will prevent corrosion from occurring between the mounting fixture and mounting surface.
- 1.2.7 Inspect the winch immediately following installation. This inspection will give a good starting record of the winch condition so that future inspections can be compared.

<u>CAUTION</u>

Remember that the weld has to be strong enough to withstand loads equal to or greater than the capacity of the winch and ultimate capacity of the wire.
--

1.3 ELECTRIC POWER CONNECTION

CAUTION

All electrical work must be performed by a licensed electrician. Failure to do so could result in electric shock or poor equipment operation.
--

- 1.3.1 All winches have been factory tested prior to shipment to insure proper operation.
- 1.3.2 All winches have been factory wired to accommodate power supplies as specified by the customer.
- 1.3.3 Make certain that equipment is grounded before electrical power is connected.
- 1.3.4 Refer to Appendix B.1 for typical connection between motor and control box.
- 1.3.5 Ensure that the correct power supply agrees with the motor rating before connecting power to the winch. Do not operate the winch until proper power is supplied to the motor.
- 1.3.6 Before operation of the winch, remove the plastic plug from the gearbox breather.
- 1.3.7 Test connections by operating the winch. The rotation of the drum must agree with the labels of the control device, and the motor must stop when the control is released. The drum must reel the wire rope onto the bottom of the winch drum when the "IN" button is depressed.

1.4 INSTALLATION OF WIRE ROPE

- 1.4.1 To install wire rope, rotate the drum of the winch so that the U-bolt nuts are easily accessed through the round cut out located on the side of the winch (see fig. 2a).
- 1.4.2 Using a standard socket wrench with an extension, loosen the nuts.
- 1.4.3 If installing wire rope on a new winch, remove and discard the u-bolt spacer pipe. If replacing worn out wire rope, remove the wire rope from the U-bolt and dispose of properly.

CAUTION

Remember to always wear the proper protective equipment when handling the wire rope.

- 1.4.4 Rotate the U-bolt so it is at the bottom of the winch and insert the new wire rope end under the winch drum and through the U-bolt from the front of the winch so that approximately 3 to 4 inches extend through the U-bolt.

NOTICE

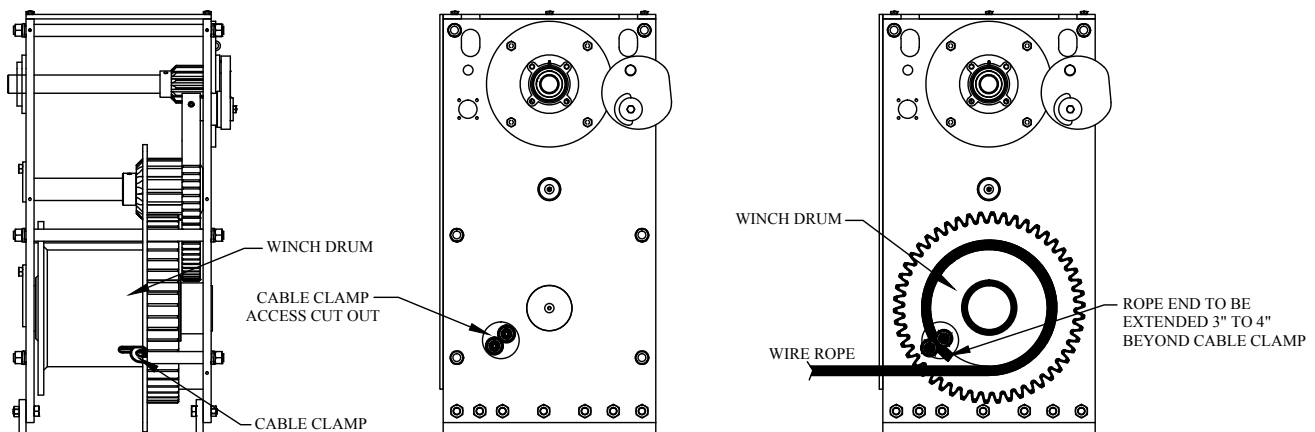
Breaking strength of new wire rope should be a least 3 times greater than the largest load placed on the winch. This minimum value may be greater depending on type of load and the method of moving the load.

- 1.4.5 Tighten the U-bolt nuts evenly to secure the wire rope to the winch drum. The U-bolt will act as a vise keeping the wire rope in place as the rest of the rope is reeled onto the winch.

CAUTION

The U-bolt nuts must be retightened periodically to insure that the wire rope end is held in place snugly against the drum flange. Over time and usage the rope will “crush” down at the U-bolt creating the possibility that the rope end will escape.

FIGURE #2 - INSTALLING THE WIRE ROPE



A) LOCATING THE CABLE CLAMP

B) INSTALLING THE WIRE ROPE

- 1.4.6 Tighten the U-bolt nuts evenly to secure the wire rope to the winch drum. The U-bolt will act as a vise keeping the wire rope in place as the rest of the rope is reeled onto the winch.
- 1.4.7 Wind the wire rope onto the drum by operating the winch. Maintain tension on the wire rope to insure that the first coil lays snugly against the drum flange and each successive coil is snug against the previous coil. Make sure that the wire rope is being reeled in from the bottom on the winch drum.
- 1.4.8 Continue wrapping the wire rope until there are at least 5 complete wraps on the winch drum. These wraps serve as an anchor and must remain on the drum at all times.

WARNING

In order for the winch to attain its full holding capacity, 5 complete wraps of the wire rope must be on the winch drum at all times. Also, make sure the rope is installed securely to the drum. A poorly secured wire rope could come loose from its anchor and allow the load to escape.

NOTICE

Drum capacity depends on how tightly and evenly the wire rope is wound on the drum. Actual drum capacities are usually 25% to 30% less than values given in performance tables when the wire rope is loosely wound and overlapping. Also, line speed will increase with each additional layer of wire rope that is wound onto the drum.

2.1 OPERATING THE WINCH

2.1.1 Powered Operation

- 2.1.1.1** To reel the wire rope onto the winch drum, depress and hold the “IN” button located on the control box or remote operator station. Make certain that the locking pawl is disengaged by rotating the locking pawl handle to the up position and inserting the T handle locking pin to secure in place (see fig. #3a).
- 2.1.1.2** Observe the wire rope as it winds onto the winch drum. If it becomes loose, uneven or overlapped, stop the operation and rewind before continuing. Continued operation with undesirable wire rope lay can damage the rope and shorten its life.
- 2.1.1.3** To reel the wire rope off the winch drum, depress and hold the “OUT” button located on the control box or remote operator station. Some tension should be kept on the wire rope during unreeling to minimize rope fouling on the drum.

CAUTION

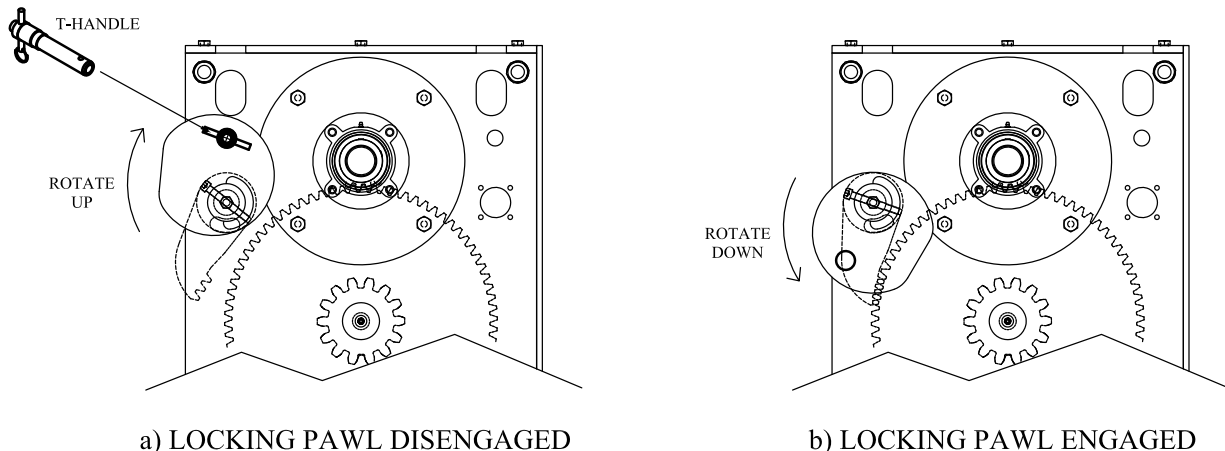
Length of winch operation should not exceed the 15 minute duty cycle rating.

NOTICE

Breaking in the winch occurs during the first 30 to 60 minutes. During break-in, mating surfaces become polished and clearances increase. This is desirable for efficient operation of the bearings and gears.

- 2.1.1.4** To stop the wire rope, release the “IN” or “OUT” button; this will automatically engage the electric brake located on the winch motor. As with any electric brake, there is a slight delay (approx. 0.03 seconds) between the “IN” or “OUT” button release and brake set.
- 2.1.1.5** After the winch is stopped and the brake is set, the locking pawl handle can be rotated down so the locking pawl is free to engage thus dogging the winch down (see fig. #3b).

FIGURE #3 - LOCKING PAWL DISENGAGE/ENGAGE



2.1.2 Emergency Operation

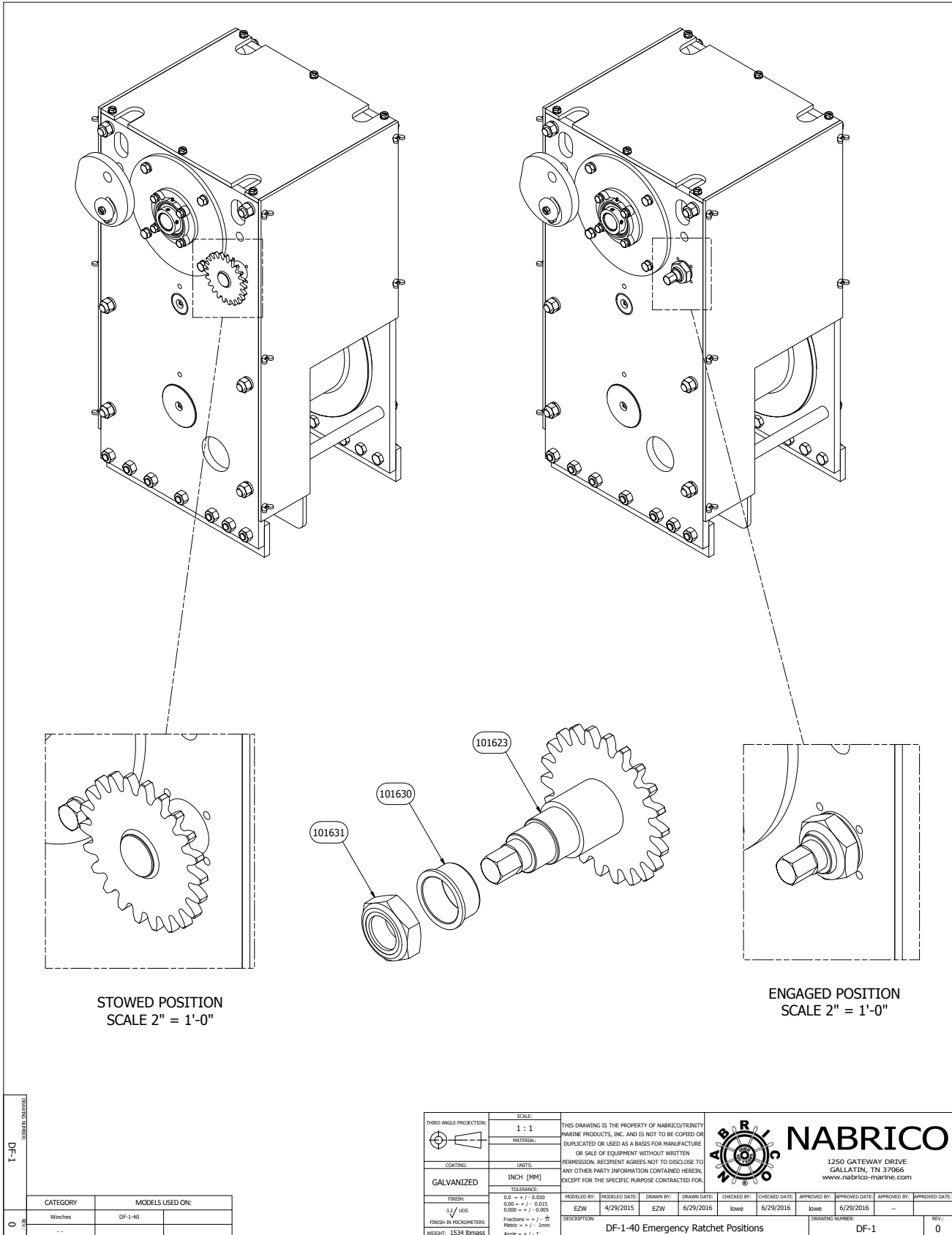
WARNING

Manual operation of an electric winch while under load is extremely dangerous and should only be performed in emergency situations. The extreme high tensions that are common in winch applications should not be underestimated.


To reduce the potential of electric shock, lock out and tag out procedures should be followed before initiating any type of manual operation of the winch

- 2.1.2.1 In case of power failure, disconnect all power sources supplied to the winch.
- 2.1.2.2 Rotate the locking pawl handle down so the locking pawl is free to engage thus dogging the winch down (see fig. 3b).
- 2.1.2.3 Make sure safety precautions have been taken to secure the load and keep unnecessary personnel away from the winch while operating in manual mode.
- 2.1.2.4 Remove the rubber cover from the front of the winch.
- 2.1.2.5 Remove the Hex Jam Lock Nut (see fig. 4) from the Emergency Ratchet Add-on.
 - 2.1.2.5.1 DF-1-30 Emergency Ratchet P/N 101622
 - 2.1.2.5.2 DF-1-40 Emergency Ratchet P/N 101620
 - 2.1.2.5.3 DF-1-65 Emergency Ratchet P/N 101621
- 2.1.2.6 Remove the Shaft Assembly (see fig. 4) from the Stowed Position and reinstall inside the winch with the hex part of the shaft protruding through the winch.
- 2.1.2.7 Replace the Hex Jam Lock Nut on the outside of the winch in the Engaged Position.
- 2.1.2.8 Disengage the motor brake by turning the lever located on the outside of the brake 90 degrees. The locking pawl should now be holding the load applied to the winch.
- 2.1.2.9 While maintaining control of the brake release lever and manual crank, rotate the locking pawl handle up relieving the locking dog engagement (see fig. 3a). The winch should now be ready to be operated manually. It is recommended to have more than one person to operate the winch in manual mode.
- 2.1.2.10 Using a 15/16" ratchet, rotate the Emergency Ratchet Add-on until the tension on the wire rope reaches the desired level.
- 2.1.2.11 Once tensioning has been achieved, the locking pawl should be reengaged dogging the load down.
- 2.1.2.12 After all loads have been removed from the winch, remove the Emergency Ratchet Add-on and store in the Stowed Position.

FIGURE #4 - EMERGENCY OPERATION



DF-1	0	CATEGORY	Winches	MODELS USED ON:	DF-1-40
	0				

THIRD ANGLE PROJECTION:	SCALE: 1 : 1	THIS DRAWING IS THE PROPERTY OF NABRICO/TRINITY MARINE PRODUCTS, INC. AND IS NOT TO BE COPIED OR DUPLICATED OR USED AS A BASIS FOR MANUFACTURE OR SALE OF EQUIPMENT WITHOUT WRITTEN PERMISSION. RECIPIENT AGREES NOT TO DISCLOSE TO ANY OTHER PARTY INFORMATION CONTAINED HEREIN, EXCEPT FOR THE SPECIFIC PURPOSE CONTRACTED FOR.									
COATING: GALVANIZED	UNITS: INCH [MM]	 NABRICO 1250 GATEWAY DRIVE GALLATIN, TN 37066 www.nabrico-marine.com									
FINISH: 32/100	TOLERANCE:										
FINISH IN MICROMETERS	0.0 = +/- 0.030 0.000 = +/- 0.015 0.000 = +/- 0.005	MODELED BY: EZW	MODELED DATE: 4/29/2015	DRAWN BY: EZW	DRAWN DATE: 6/29/2016	CHECKED BY: lowe	CHECKED DATE: 6/29/2016	APPROVED BY: lowe	APPROVED DATE: 6/29/2016	DESIGNING NUMBER: DF-1	REV: 0
WEIGHT: 1534 lb/mass	0.000 = +/- 0.005 Metric = +/- .1mm Angle = +/- .5°	DESCRIPTION: DF-1-40 Emergency Ratchet Positions									

3.1 EQUIPMENT INSPECTION

NOTICE

An inspection program should be started as soon as any equipment is put into service. A qualified person should be appointed the responsibility of regularly inspecting the equipment. Written records of inspections are recommended by the manufacturer.

3.1.1 Frequent Inspection

- 3.1.1.1** Visually inspect the equipment before each use. Check the equipment for cracks, bending, wear, rust, corrosion and any other damage. If any problems are discovered, stop use immediately and remove the equipment from service until all appropriate repairs are completely performed.
- 3.1.1.2** **ENSURE THAT EQUIPMENT IS PROPERLY LUBRICATED.** Check the gearbox for signs of leakage and make sure it is filled with the proper lubricant.
- 3.1.1.3** Check to ensure that the foundation is in good condition. Make sure that mounting fasteners and other hardware are tightened securely.
- 3.1.1.4** Check electrical wiring and connections for wear, cuts, corrosion and other damage.
- 3.1.1.5** Ensure that the wire rope is installed correctly and anchored securely to the drum. Also, check to make sure the wire rope is in good condition.
- 3.1.1.6** While equipment is running, listen for unusual noises and look for signs of damage. Visually inspect the wire rope to ensure that it winds evenly onto the drum. Make sure the winch responds properly to control device(s) and that the brake operates correctly.

3.1.2 Periodic Inspection

- 3.1.2.1** Periodic inspections should occur whenever equipment is returned to service from storage, every six months in service, more frequently if an inspection discovers any damage or poor operation or in any case where the winch may have been over loaded or operationally abused.
- 3.1.2.2** Visually inspect the equipment checking the finish for wear, flaking or other damage as listed in the frequent inspection plan. Disassembly is recommended in order to properly inspect individual components.
- 3.1.2.3** Check the gearbox oil for dirt, metal particles, water and other signs of contamination by draining a small amount into a clean container.
- 3.1.2.4** Ensure that the gearbox is properly lubricated and replenish if necessary to restore the proper level.
- 3.1.2.5** Check the winch drum by moving it with your hands. Check for excessive movement that may be the result of worn or loose gears, bearings or shafts. Some play is normal while excessive play may be the result of overloading.

- 3.1.2.6 Disconnect power and thoroughly inspect electrical equipment for signs of wear, cuts, corroded connections, moisture, burn marks and other damage.
- 3.1.2.7 Check the power supply at the motor to ensure that it is consistent with the motor rating.

3.1.3 Wire Rope Inspection

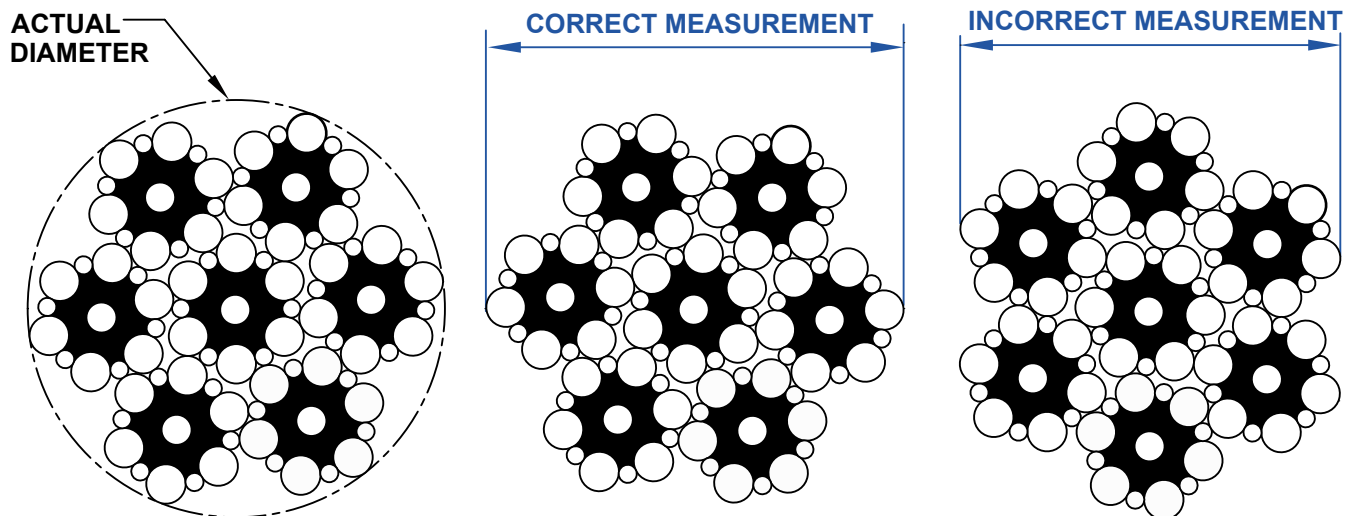
- 3.1.3.1 Wire rope inspection should be conducted according to the manufacturer's recommendations or accepted industry standards.

CAUTION

Remember to always wear the proper protective equipment when handling the wire rope.

- 3.1.3.2 Inspect the entire length of wire cable for bent or crushed areas, broken or cut wires, corrosion and other damage. If any defect or damage is found the cable must be replaced.
- 3.1.3.3 Inspect end connections and fittings for corrosion, kinking, crushing or other damage. If any corrosion or damage is found the cable must be replaced.
- 3.1.3.4 Check the wire rope diameter for signs of decreased area (see fig. 5). Diameter decrease may be signs of wear and internal degradation in the wire rope. Generally, wire ropes are manufactured larger than nominal diameter. When placed in service for the first time, diameter can reduce slightly. Minimum diameter specifications can be obtained from the rope manufacturer.

FIGURE #5 - WIRE ROPE DIAMETER



THE WIRE ROPE MUST BE REPLACED IF THE DIAMETER MEASURES LESS THAN THE MINIMUM DIAMETER GIVEN BY THE ROPE MANUFACTURER

EXAMPLE - A $\frac{3}{4}$ " WIRE ROPE HAS A MINIMUM DIAMETER OF $\frac{45}{64}$ " (0.7031")

3.2 EQUIPMENT LUBRICATION

WARNING

Lubricate the spur gears before each operation, and periodically during operation. Failure to lubricate the gears will cause damage or deformation of gear teeth.
--

- 3.2.1** All grease fittings should be lubricated using NABRICO's suggested lubricants or similar (See Appendix 2).
- 3.2.2** Drive shaft and drum shaft grease fittings should be lubricated at least once a month under normal conditions and at least once a day under adverse conditions. Lubricate while gears are rotating slowly.
- 3.2.3** Drive gear teeth should be coated at least once a month. Application with an aerosol can is recommended for uniform coverage. Graphite or other dry type lubricant should be used instead of gear grease when the winch is subjected to large amounts of foreign material such as coal dust. Always keep gear teeth as free of foreign material as possible.

3.3 CLEANING AND STORAGE

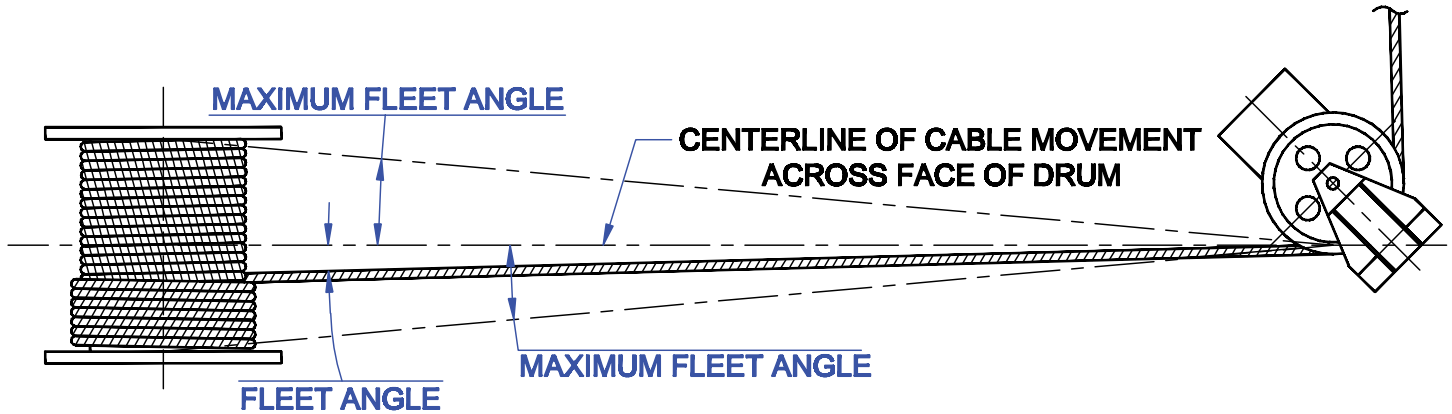
3.3.1 Cleaning the Equipment

- 3.3.1.1** The equipment should be regularly cleaned to remove dirt and to help prevent rust and corrosion.
- 3.3.1.2** When cleaning, be sure to leave a light film of oil on all surfaces to protect them against the elements of nature. Wipe off excessive amounts of oil to avoid the accumulation of dirt.
- 3.3.1.3** Remove all unnecessary objects from the area surrounding the equipment to prevent hazardous situations from occurring.

3.3.2 Storing the Equipment

- 3.3.2.1** Lubricate the equipment as necessary to help prevent rust and corrosion during storage. Add a rust preventive for long term storage.
- 3.3.2.2** Seal the equipment in plastic, if possible, to help prevent rust, corrosion and other damage.
- 3.3.2.3** Store the equipment upright in a cool clean place away from corrosive chemicals and moisture.
- 3.3.2.4** Rotate the drum periodically to keep bearing and gear surfaces from becoming lacquered.

A.1 FLEET ANGLE



Fleet Angle:

In order to insure proper wrapping on the drum and no undue wear of the wire rope, the fleet angle should be kept as small as practical. This is important to consider during the planning of a winch installation. Sheaves and drums should be placed so that the fleet angle will be equal on each side of the centerline of rope travel.

For a smooth drum a maximum fleet angle of 1-1/2 degrees is recommended. When the drum is grooved to suit the wire rope, the fleet angle should not exceed 2 degrees.

Example: Fleet Angle Calculation for 36" Chain Drive Barge Moving Winch

36" Chain Drive Moving Winch

$a=18''$

$b=x$ (distance to be determined)

$A^\circ=1.5^\circ$ (minimum for a smooth drum)

$\tan A = a/b$

$\tan 1.5^\circ = 18''/x$

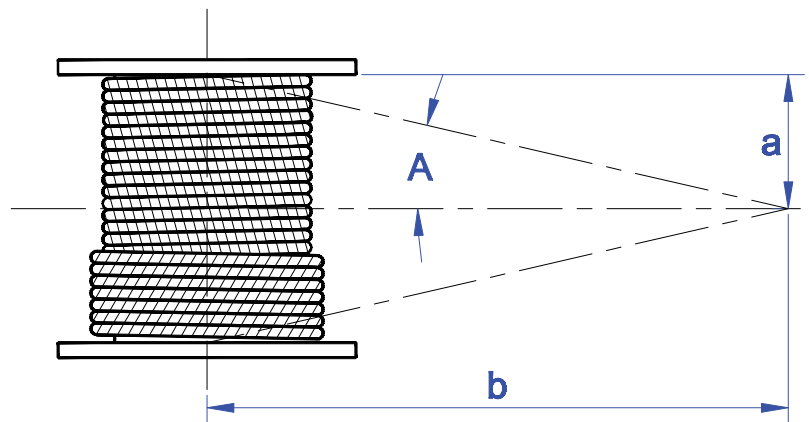
$.02619 = 18''/x$

$x = 18''/.02619$

$x \sim 688''$ (rounded up to next whole number)

$x \sim 688'' / 12$ (convert to feet)

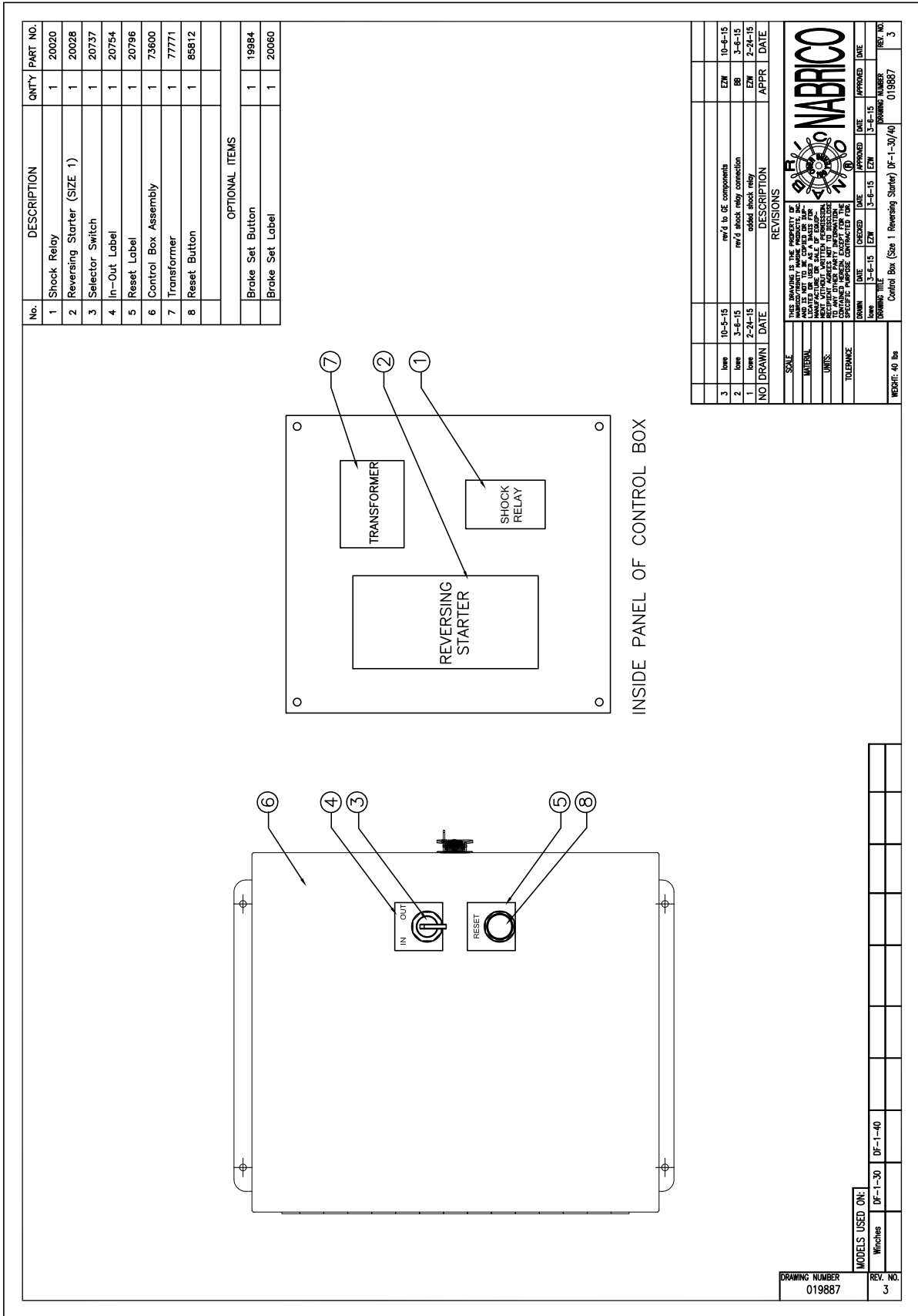
$x \sim 58'$

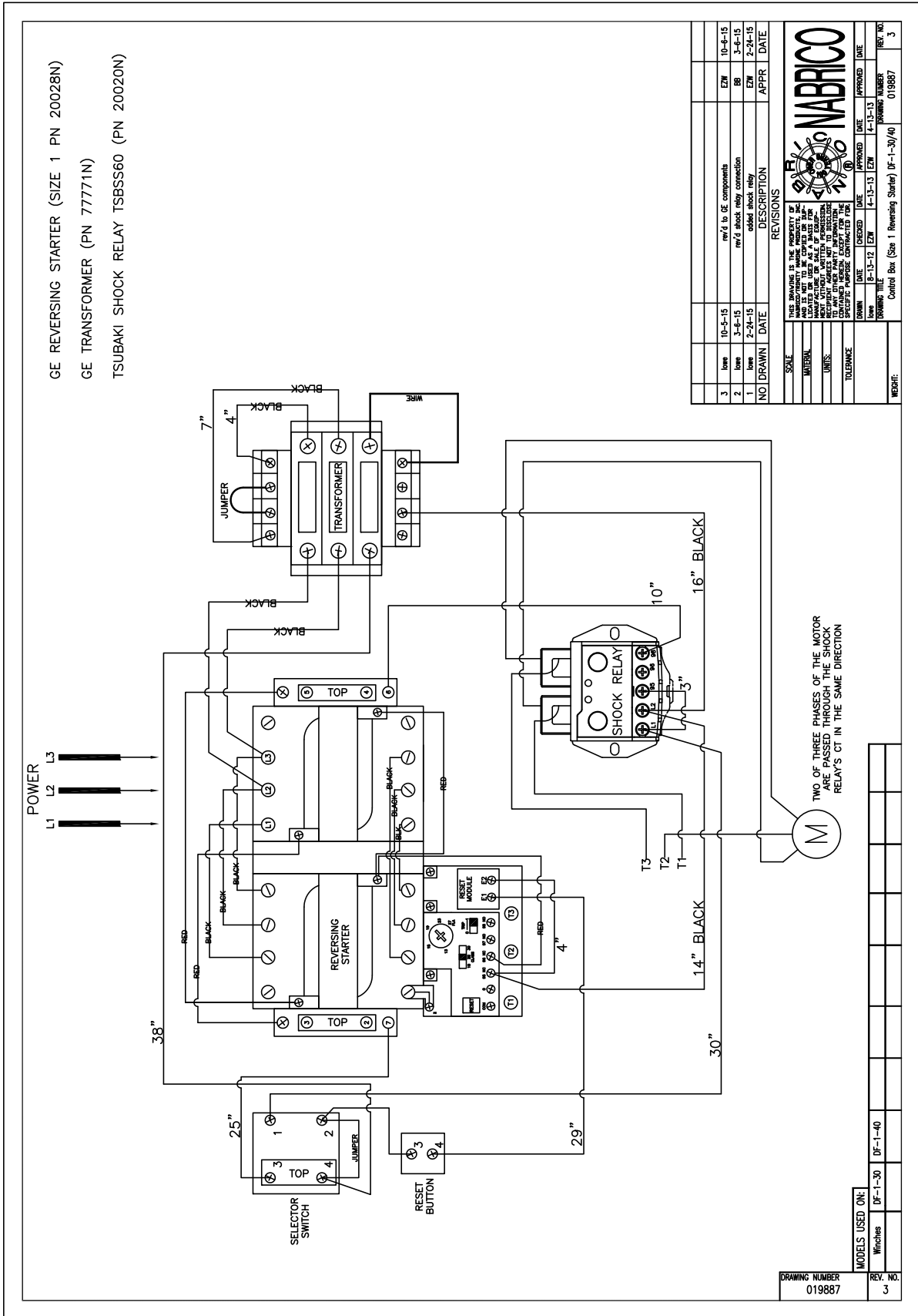


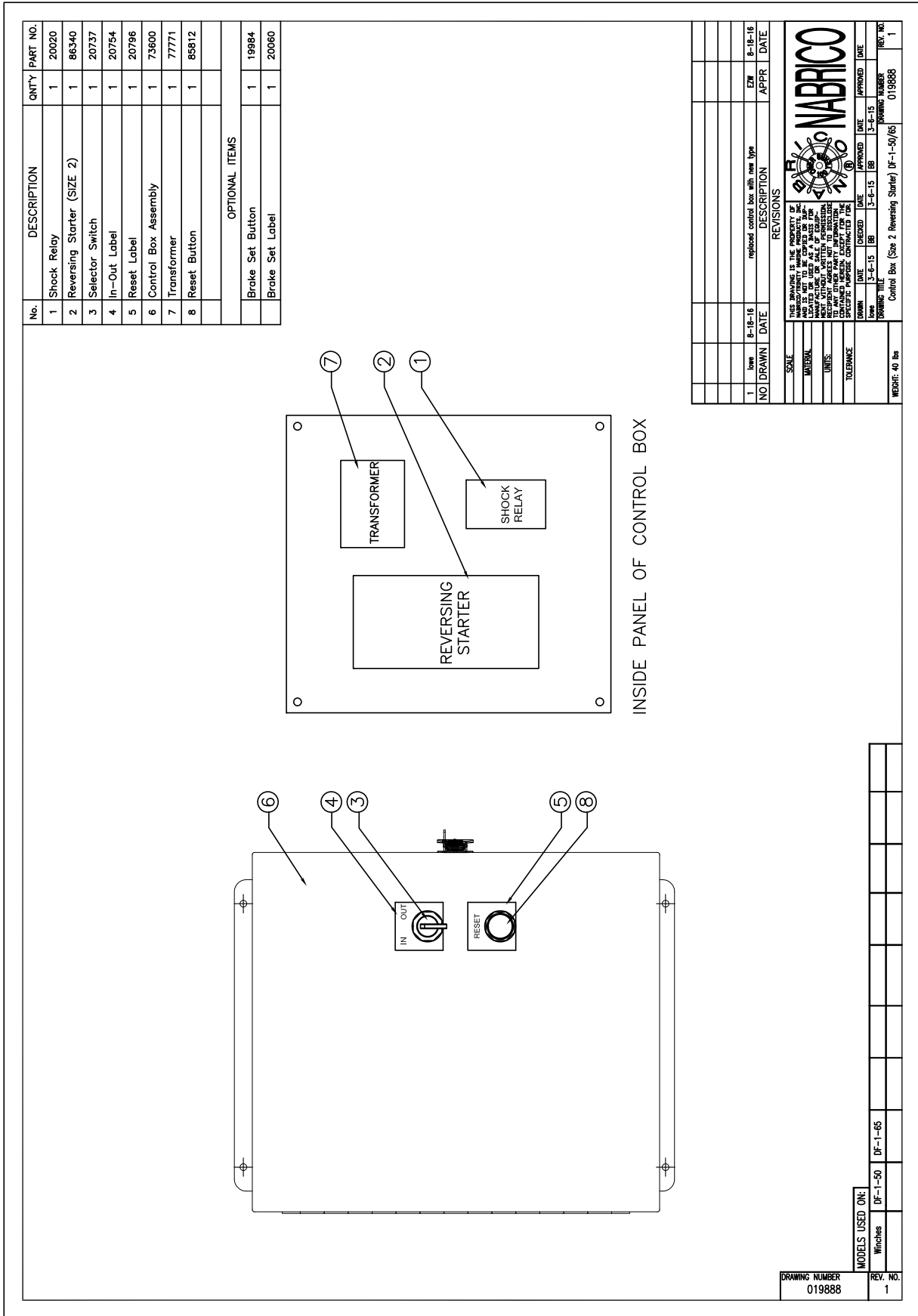
A.2 EQUIPMENT LUBRICATION

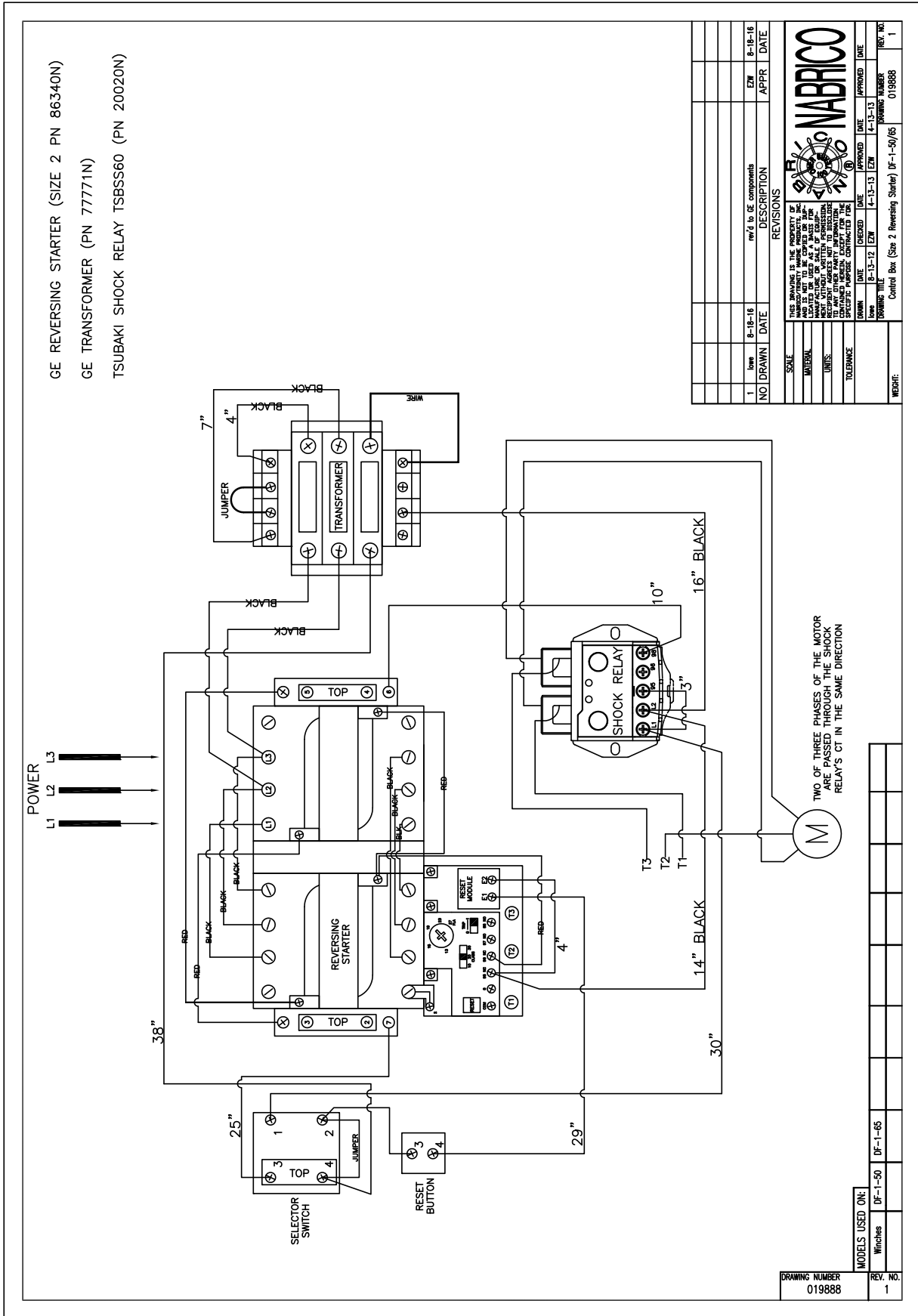
RECOMMENDED LUBRICANT FOR USE WITH NABRICO DECK MACHINERY	
HYDRAULIC OIL (OPEN LOOP)	ENVIROLOGIC 3032
SPUR, HELICAL GEARS	ENDURATEX EP220
ALL WORM GEARS	ENDURATEX EP 220
OPEN GEARING (SPRAY CAN)	EUREKA FLUID FILM SPRAY
	MOBILTAC E
	LUBRIPLATE OPEN GEAR SHEILDING
GREASE FITTINGS	PEERLESS LLG #2
PRESERVATIVE TREATMENT	MOBILARMA 524
SUMITOMO, NORD AND SEW GEARBOXES	USE MANUFACTURER'S RECOMMENDATIONS
SLEWING BEARINGS / DF-559 WINCH	AQUA SHIELD
<p>Note: Lubricant manufacturers shown are not exclusive recommendations. Consult your lubricant source for more detailed information about oil selection.</p>	

B.1 TYPICAL CONTROL BOX INFORMATION











EHFSA05.0601-4

SHOCK RELAY TSBSA Series INSTRUCTION MANUAL



WARNING

1. Make sure you read this instruction manual thoroughly before installing, wiring, operation and inspecting this SHOCK RELAY.
2. Please make sure that this instruction manual accompanies the SHOCK RELAY to the end user.
3. Product specification are subject to change for improvement without notice.
4. Disconnect power. Always lock out power switch before installing, removing, or servicing unit. Comply with Occupational Safety and Health Standards 1910. 147 "The Control of Hazardous Energy (Lock Out/Tag Out)."
5. Install in proper enclosure in accordance with NEMA 250-1991 "Enclosures for Electrical Equipment (1000Volts Maximum)" and NFPA496 1993 edition "Purged and Pressurized Enclosures for Electrical Equipment, 1993 Edition." When revisions of these standards are published, the updated edition shall apply.
6. Guards must be provided on all power transmission and conveyor applications in accordance with provisions of ASME B15.1-1996 "Safety Standards for Conveyors and Related Equipment, or other applicable standards. When revision of these standards are published, the updated edition shall apply.



CAUTION

- If danger is expected from your application, take the necessary steps to ensure that it operates safely.
- If your Tsubaki Emerson product does not operate normally, take care to ensure that dangerous operating conditions do not occur.
- Wear suitable clothing and protective equipment (safety glasses, gloves, safety shoes, etc.)
- Keep your work place tidy and safe to prevent accidents.

TSUBAKI E&M CO.

2013.12. 1

1. Preface

Thank you for purchasing the Shock Relay TSBSA series.

This instruction manual describes everything from installation to adjustment.

Be sure to read this manual carefully before using your Shock Relay.

When delivering a device containing the Shock Relay, be sure that this instruction manual is included.

2. TSBSA and TSB2CT Model identification

• Shock relay

TSB SA 05

		Current Range:	
	Series: SS series	<u>05</u>	<u>0.5 - 5 A</u>
		<u>10</u>	<u>1 - 10A</u>
Model: Shock Relay		<u>30</u>	<u>3 - 30 A</u>
		<u>60</u>	<u>5 - 60 A</u>

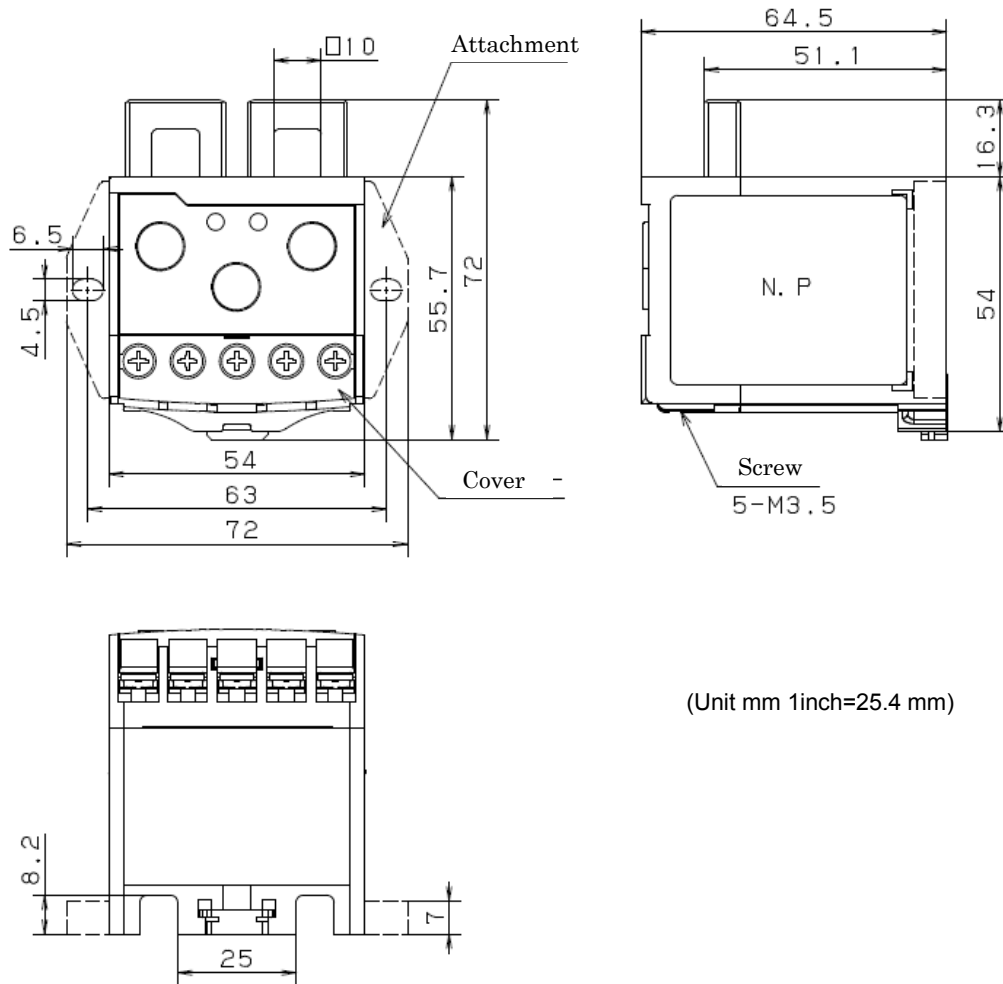
• External 2-phase CT

TSB 2CT 100

		Rated primary current:	<u>100</u>	<u>100A</u>
			<u>200</u>	<u>200A</u>
	Series: 2-phase CT		<u>300</u>	<u>300A</u>
Model: Shock Relay				

3. Dimensions

• Shock relay



(Unit mm 1inch=25.4 mm)

4. Specifications

Series		TSB SA	
Current Setting * ¹	Type	Range	
	05	0.5 - 5A	
	10	1 - 10A	
	30	3 - 30A	
	60	5 - 60A	
Time Setting * ¹	Starting Trip Delay	Start Time	0.2 - 10s
	Trip Time	Shock Time	0.2 - 5s
Accuracy	Current	±10% (full scale)	
Control Power Supply	100~240VAC, 50/60Hz * ²		
Rated Voltage	600VAC, 50/60Hz		
Current Sensing	2 Integral Current Transformer		
Output Relay	Mode	1-SPDT(1-C)	
	Rating	3A / 250VAC, Resistive	
	Minimum applicable load * ³	DC10V, 10mA	
	Status	Normally De-Energized	
Expected Output Relay Life	Mechanical	10,000,000 Operations	
	Electrical	100,000 Operations	
Display	Monitor(MON,green), Over Current(OC,red)		
Reset	Auto Reset after 1s		
Ambient Environment	Temperature	Operating	-20 - +60°C (-4 - +158 F)
		Storage	-30 - +70°C (-22 - +176 F)
	Humidity	45 - 85% RH without Condensation	
Insulation	Between casing and circuit	Over 10MΩ with 500 VDC Megger	
Dielectric Strength	Between casing and circuit	AC 2000V, 5mA, 60Hz, 1min	
	Between contacts	AC 1000V, 5mA, 60Hz, 1min	
	Between circuits	AC 2000V, 5mA, 60Hz, 1min	
Power Consumption	115VAC	2.70 VA(0.35W)	
	230VAC	11.00 VA(1.2W)	
Material	Case	Upper:PA6, Bottom:PA66	
	Terminal cover	PA6	
Mounting	35mm DIN rail or Panel		
Dimension(WxHxD /Including Integral CT Windows)	54x60x65mm		
Weight	Less than 200g (0.445LBS) without External CT		

*1 Current and time setting ranges can be set within the warranty range, but not the upper or lower level of setting volume.

*2 When Shock Relay Is used with Inverter, the output frequency of Inverter should be from 30Hz to 60Hz.

*3 When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure. As for the input to PLC, it is commended to drive the relay coil for minute current by relay signal of Shock Relay at first, then input this relay contact to PLC.

5. Installation

1. Environmental specifications

Install the Shock Relay in the following environment.

- Temperature: -20 to $+60^{\circ}\text{C}$ not in direct sunlight.
- Humidity: 45~85% relative humidity without condensation and freezing.
- Place: Indoors, no water splash.
- Atmosphere: Free from dust, corrosion gas, and oil mist.
- Height: 2000m or less above sea level.
- Vibration: 5.9m/s^2 and under.

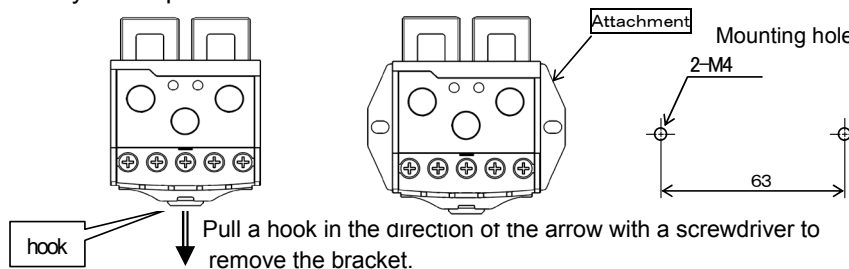
2. Installation to the panel

(1) Installation with DIN rail

While pulling the hook of Shock Relay to the arrow direction, install Shock Relay to 35mm DIN rail. When removal, put the hook to the arrow direction with flathead screwdriver.

(2) Installation with screw

Put the plate for installation at the both side of Shock Relay, and install Shock Relay to the panel



3. Installation to the DIN rail

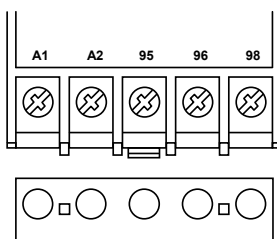
- (1) Pull the hook on the Shock Relay in the direction of the arrow to remove the mounting bracket.
- (2) Install the Shock Relay to the DIN rail.

6. Wiring

- (1) Connect 90–250VAC power source to the terminal A1, A2.
 - Never connect the output of an inverter or a servo driver to terminals A1-A2. Install an insulation transformer between the power line and terminals A1-A2 of the SHOCK RELAY when harmonic noise is included in the power line.
- (2) Check and correct the following items before turning the power on.
 - a. Is there any misconnection?
 - b. Have you forgotten to complete any connections?
 - c. Are there any abnormal conditions such as a short-circuit or ground fault?

	WARNING	ELECTRICAL SHOCK AND BURN Do not operate without the ground wire connected.
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7. Terminal Function



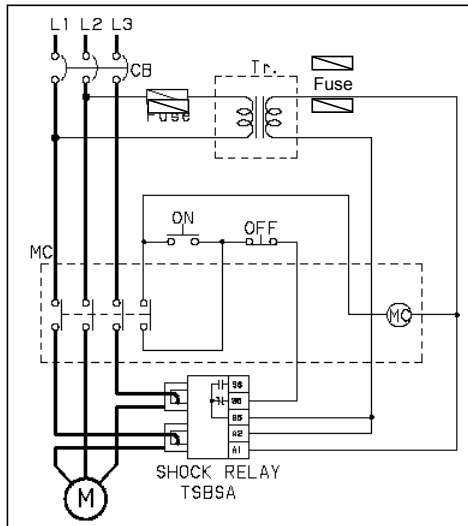
Terminal	Function	Contents.
A1	Power Supply	100 – 240VAC commercial power supply is wired
A2		
95	Output Relay	Common
96		Normally close (Tripped: open)
98		Normally open (Tripped: close)

8. Current Transformer

Select the number of wires passing through the CT (Current Transformer) by using the following table for best performance. When two motor leads pass through the CT, the current sensed by the CT is twice the motor current flowing through the motor lead.

AC 200 ~ 230 Volt Motor				AC 400 ~ 460 Volt Motor			
Motor Capacity (kW)	Motor Capacity (Hp)	TSBSS TYPE	Wires passing through CT	Motor Capacity (kW)	Motor Capacity (Hp)	TSBSS TYPE	Wires passing through CT
0.1	1/8	TSBSA05	4	—	—	—	—
0.2	1/4	TSBSA05	3	0.2	1/4	TSBSA05	4
0.4	1/2	TSBSA05	2	0.4	1/2	TSBSA05	3
0.75	1	TSBSA05	1	0.75	1	TSBSA05	2
1.5	2	TSBSA10	1	1.5	2	TSBSA05	1
2.2	3	TSBSA10	1	2.2	3	TSBSA05	1
3.7	5	TSBSA30	1	3.7	5	TSBSA10	1
5.5	7-1/2	TSBSA30	1	5.5	7-1/2	TSBSA30	1
7.5	10	TSBSA60	1	7.5	10	TSBSA30	1
11	15	TSBSA60	1	11	15	TSBSA30	1
—	—	—	—	15	20	TSBSA60	1
—	—	—	—	18.5	25	TSBSA60	1
—	—	—	—	22	30	TSBSA60	1

Basic wiring diagram



M : THREE-PHASE MOTOR

MC : Magnetic contactor

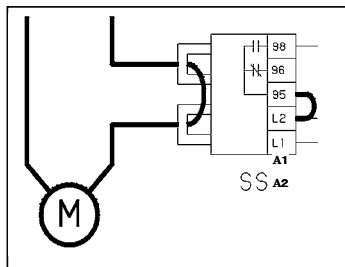
ON : Start switch

OFF : Stop switch

Fuse : Fuse

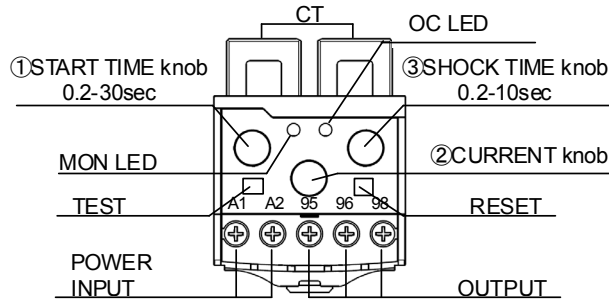
Tr : Transformer

1. A transformer may be required, depending on the voltage of Motor (i.e. over 250VAC)
2. Output relay is normally de-energized. When Shock Relay trips, the contacts change state.
3. Two of three phases of the motor are passed through the Shock Relay's CT in the same direction.
4. A fire might be happened as there is no protection circuit in main circuit.
5. Please select a fuse capacity depending upon capacity of a contactor MC to be connected.



M: SINGLE-PHASE MOTOR

10. construction



Description

Two of three phases of the motor current are monitored by integral current transformers (External current transformers are required for current more than 60 Amps). The internal solid state circuitry compares the monitored motor (or load) currents with the preset current level.

When motor current exceeds the preset trip current level, the "OC" LED illuminates and indicates that an overload has been detected.

The relay will trip after the preset trip time (SHOCK TIME) and the "OC" LED remains illuminated indicating an overload trip has occurred.

When the motor currents decrease, the relay reverts after one second.

If the motor current drops back down below the preset current level before the preset trip time delay has elapsed, Shock Relay will return to normal condition.

MON lamp (green) shows monitor condition.

It is turned on under the normal monitor condition, and the relay turns off the lights while it is outputted.

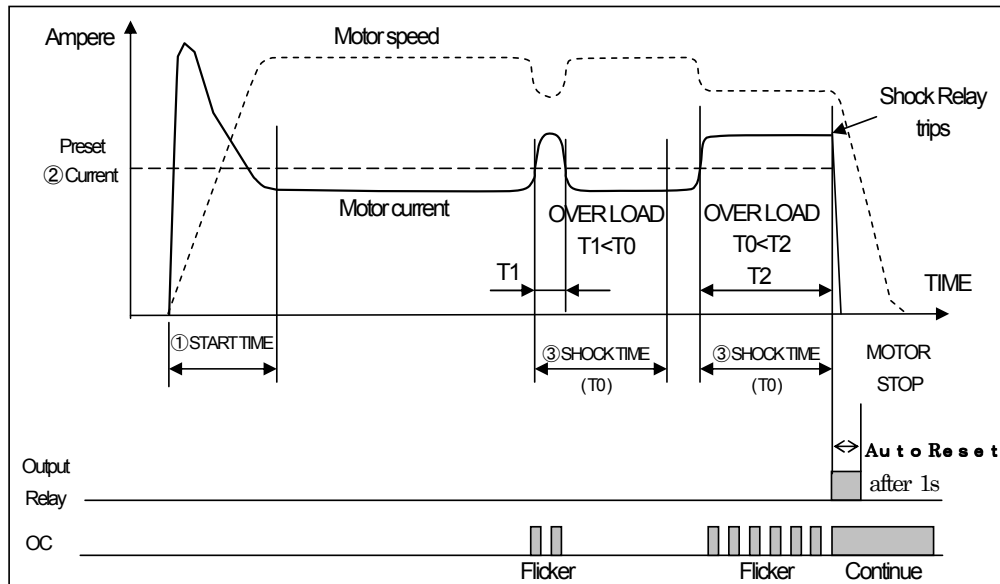
With the visual aid of the "OC" LED flashing when motor current becomes 100% of the preset current actual load current can be determined without aid of an ammeter.

The TEST button provides the means of testing service-worthiness and integrity.

Since the Shock Relay has definite time characteristics, the start trip delay may be adjusted with a minimum setting of 0.2 through a maximum of 10 seconds.

The trip time adjustment range is from 0.2 through 5 seconds. The relay may be used as an electronic shear-pin by setting the SHOCK TIME to minimum.

If the Shock Relay trips, always investigate to determine the cause and correct prior to restarting.



11. Set up

- 1) When installing, set the start delay timer (START TIME knob) to the known motor run-up time or the maximum if the time is not known.
- 2) Set the trip delay timer (SHOCK TIME knob) to the desired trip time.
- 3) Set the load current (CURRENT knob) at the rated full load or the desired value.
- 4) With connections made and control power on, depress the TEST button and hold.
Verify that the red LED illuminates and the internal relay should switch contacts after the sum of start time and shock time.
- 5) Start the equipment and notice the run-up time, then slowly turn the CURRENT knob counter clock-wise until the LED flashes, This indicates 100% of the load current.
Set the CURRENT knob to the desired trip setting. A setting of 110% of the running current is commonly used.
- 6) Reset the START TIME knob to match the normal run-up time.
- 7) Periodic testing by using the TEST button is suggested to ensure the full protection through preventive maintenance.

12. Troubleshooting

Symptom	Check	Result	Treatment
"MON" lamp isn't turned on.	Check the operation power supply wiring. (between terminals A1 and A2)	Incorrect wiring.	Wire correctly
	Measure the voltage of the operation power supply with a tester. (between terminals A1 and A2)	Not between 100~240VAC. Between 100~240VAC.	Set the voltage between 100 ~240VAC. Repair or replace.
Just after starting, the relay begins operating.	Check the value of START TIME.	Short	Set a longer.
		Long (It is obvious that relay is operating within the set time).	Repair or replace.
The relay output does not operate.	Examine the Current level setting.	The Current level setting is inappropriate.	Set to suitable level.
	Examine the SHOCK TIME setting.	Long.	Set a shorter.

13. Maintenance and testing

During performance of any maintenance or testing, be sure to go the following.

- (1) To prevent a fire hazard, keep the surrounding area clean and create a safe environment.
- (2) When performing tests on the Shock Relay mounting or connections, be sure that the power supply is disconnected, that the instrument is completely stopped, and that "MON" lamp isn't turned on. Also, make sure that the power supply cannot be accidentally reconnected.
- (3) Observe the guidelines listed in the Labor Safety and Health Regulation.

14. Daily check and periodic check

- (1) Confirm that there is no looseness in the installation of the Shock Relay and current transformer. Check the wiring connections every six months.
- (2) Regularly check the function of the output relay, terminal 95-96, terminal 97-98, by pressing the TEST button.
- (3) A typical life time of electrolytic capacitor mounted in the SHOCK RELAY is about 10 years at an average ambient temperature of 30°C, but this lifetime may vary with a different ambient environment and with the operating period when power is supplied. We recommend you to exchange the Shock Relay for a new one before trouble occurs.

15. Point for safe use

- (1) Take measures beforehand to prevent danger when using a TSUBAKI product.
- (2) If our product begins to operate improperly, be sure to take measures to prevent a dangerous situation from arising.

16. Guarantee.

1 Range of guarantee

With regard to any troubles happened to our products, replacement or repair of such troubled parts will be provided for free of charge during the effective period of guarantee, provided that installation and maintenance/management of said products have been performed properly pursuant to the description of this instruction manual and said products have been used under the condition described in the brochures or agreed separately through mutual consultations. The content of guarantee is limited only to the Shock Relay itself delivered to you and the judgment thereof will be made by our selection because such judgment pertaining to the range of guarantee is often complex.

2 Guarantee period

The guarantee period shall be either 18 months after shipment from our factory or 12 months after starting operation, whichever is shorter. Any and all inspection/repair undertaken by us after the above guarantee period has passed will be charged. Should questions arise, please do not hesitate to contact us or the dealer from whom you purchased.

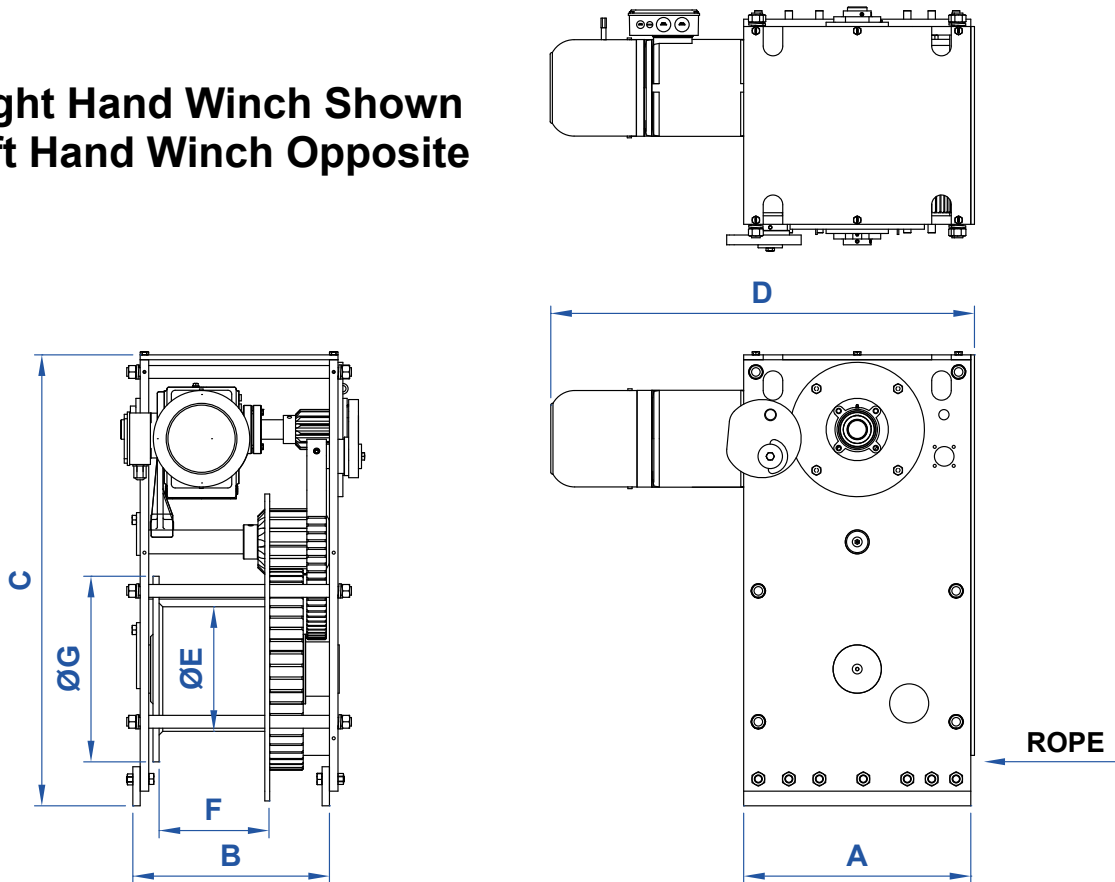
3 Miscellaneous

- (1) Any matters described in this instruction manual are subject to change without notice.
- (2) We have tried our best in preparing the contents of this instruction manual. Should any mistake or oversight be found, we will be more than happy if you would advice us of them.

C.1 DIMENSIONAL (SHAFT MOUNTED)

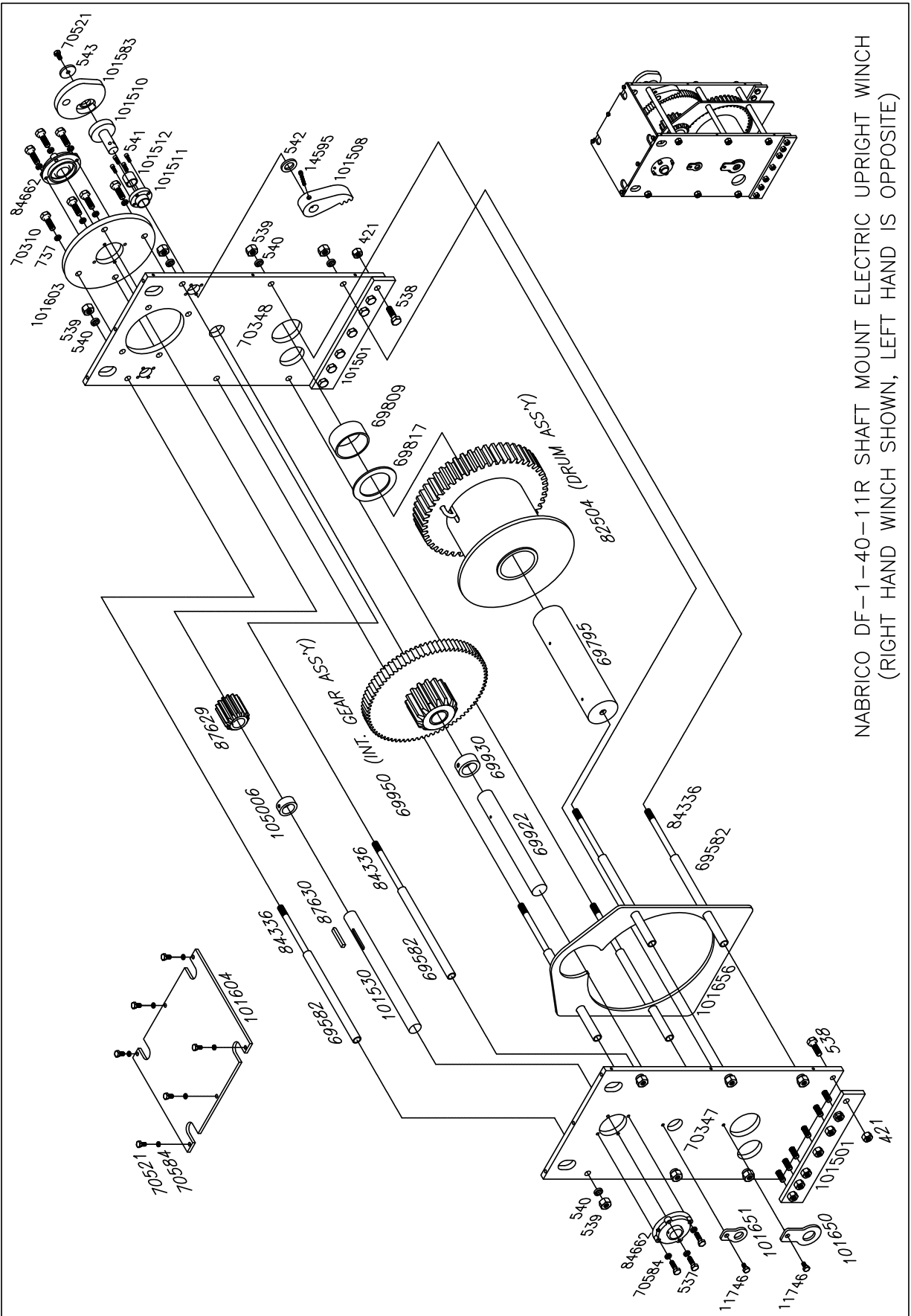


**Right Hand Winch Shown
Left Hand Winch Opposite**



MODEL	A	B	C	D	ØE	F	ØG
DF-1-30	22"	19-3/8"	39"	36"	10-3/4"	11-1/4"	16"
DF-1-40	23-1/4"	20-1/8"	46-1/8"	43-3/8"	12-3/4"	11-1/4"	19"
DF-1-65	30"	23-1/8"	55-1/2"	45-5/8"	14"	10-5/8"	24"

C.2 PARTS BREAKDOWN (SHAFT MOUNTED)



NABRICO DF-1-40-11R SHAFT MOUNT ELECTRIC UPRIGHT WINCH
(RIGHT HAND WINCH SHOWN, LEFT HAND IS OPPOSITE)

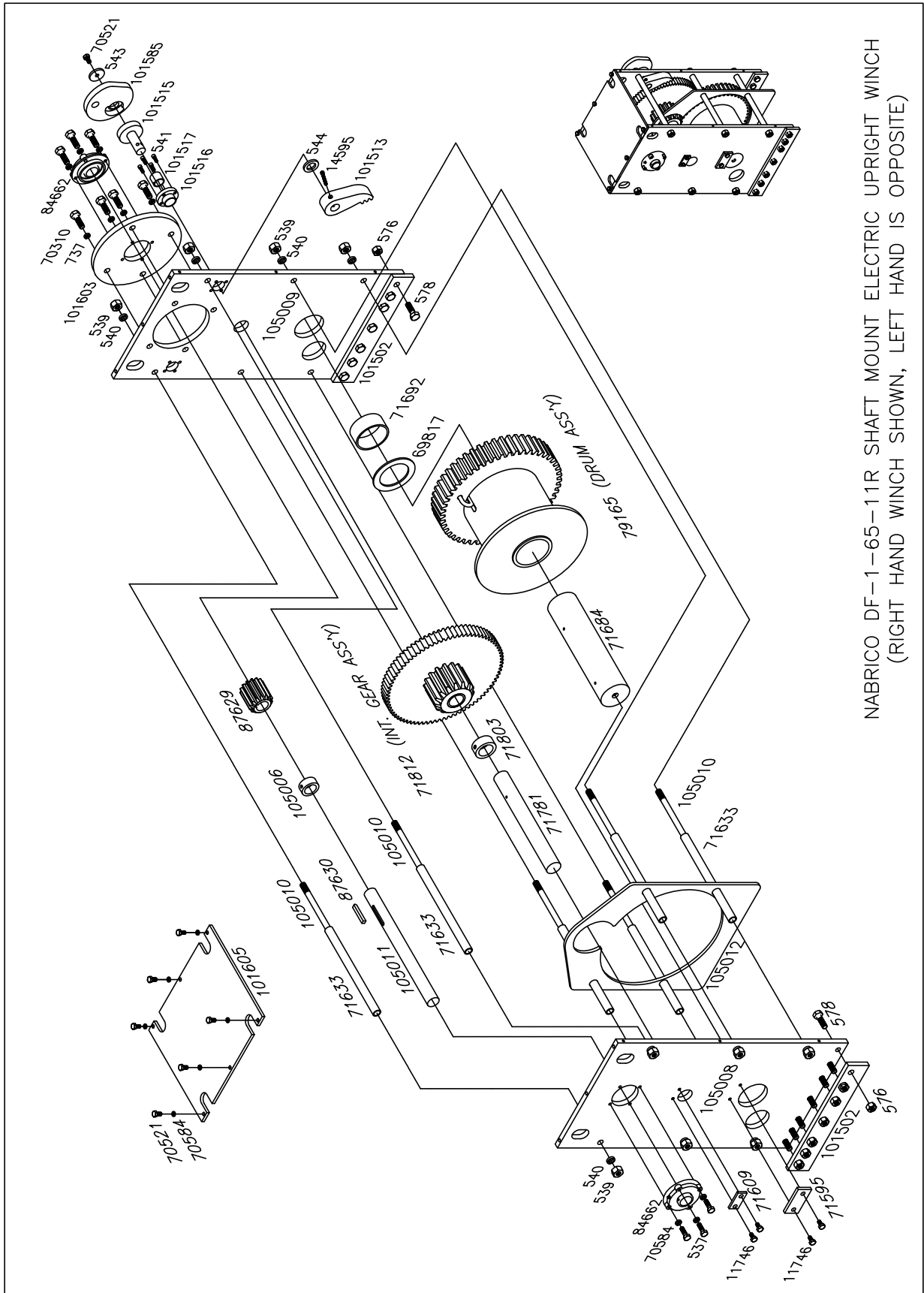
DF-1-40-N Electric Winch Parts List		
Winch Parts		
Part Description	Qty	Part #'s
Cover Plate (shaft mount bearing cut-out)	1	396
Pipe Separator	6	69582
Drum Shaft	1	69795
Drum Pipe Spacer	1	69809
Drum Washer	1	69817
Intermediate Shaft	1	69922
Intermediate Shaft Collar	1	69930
Intermediate Gear Assembly (Hardened)	1	69950
Side Plate (keeper side)	1	70347
Side Plate (locking pawl side)	1	70348
Drum Assembly (Hardened)	1	82504
Pipe Separator Rod (SS)	6	84336
Drive Pinion	1	87629
Key (drive pinion) 1/2" SQ x 4-1/4"	1	87630
Locking Dog Handle (15" Length)	1	93732
Base Bar	2	101501
Locking Pawl	1	101508
Locking Pawl Post	1	101510
Locking Pawl Sleeve	1	101511
Top Plate	1	101604
Keeper Plate (BIG)	1	101650
Keeper Plate (small)	1	101651
Cable Guard Plate	1	101656

Motor and Components		
Part Description	Qty	Part #'s
Lock Washer 5/8" (SS)	4	737
Hex Head Bolt 5/8" x 2" (SS)	4	70311
NORD-HB-7.5HP-17.08-M1	1	84982

DF-1-40-N Electric Winch Parts List		
Fasteners and Etc.		
Part Description	Qty	Part #'s
Hex Head Bolt 3/4-10 NC x 1-1/2" (SS)	1	282
Washer 13/16" ID x 2-3/4" OD x 1/8" thk	1	397
Hex Nut 3/4" (SS)	14	421
Hex Head Bolt 1/2" x 2" (SS)	4	537
Hex Head Bolt 3/4" x 2-1/2" (SS)	14	538
Hex Nut 7/8" (SS)	12	539
Lock Washer 7/8" (SS)	12	540
Socket Head Cap Screw 3/8" x 1" (SS)	4	541
Locking Pawl Washer	1	542
Washer 9/16" ID x 2-1/2" OD (SS)	1	543
Lock Washer 3/4" (SS)	1	729
Hex Head Bolt 5/8" x 1"	2	11746
Socket Head Cap Screw 3/8" x 3" (SS)	1	14595
Hex Head Bolt 1/2" x 1" (SS)	6	70521
Lock Washer 1/2" (SS)	9	70584

Bushings and Bearings		
Part Description	Qty	Part #'s
Intermediate Gear Bushing	1	69973
Drum Gear Bushing	1	82511
Locking Pawl Sleeve Bushing	1	101512

Miscellaneous Components		
Part Description	Qty	Part #'s
Cover Mounting Stud 3/8" x 1-1/2"	10	549
Brass Wing Nut 3/8"	10	550
Protective Rubber Cover	2	80243
U-Bolt with Fasteners (1" Dia. Wire)	1	82570
T-Handle (locking pawl handle)	1	101580



NABRICO DF-1-65-11R SHAFT MOUNT ELECTRIC UPRIGHT WINCH
(RIGHT HAND WINCH SHOWN, LEFT HAND IS OPPOSITE)

DF-1-65-11-N Electric Winch Parts List		
Winch Parts		
Part Description	Qty	Part #'s
Drum Washer	1	69817
Keeper Plate (BIG)	2	71595
Keeper Plate (small)	2	71609
Pipe Separator	6	71633
Drum Shaft	1	71684
Drum Pipe Spacer	1	71692
Intermediate Shaft	1	71781
Intermediate Shaft Collar	1	71803
Intermediate Gear Assembly	1	71812
Drum Assembly	1	79165
Drive Pinion	1	87629
Key (drive pinion) 1/2" SQ x 4-1/4"	1	87630
Base Bar	2	101502
Locking Pawl	1	101513
Locking Pawl Post	1	101515
Locking Pawl Sleeve	1	101516
Locking Pawl Handle (Left Hand Winch)	1	101584
Locking Pawl Handle (Right Hand Winch)	1	101585
Cover Plate (side mount motor cut-out)	1	101603
Top Plate	1	101605
Drive Shaft Collar	1	105006
Side Plate (keeper side)	1	105008
Side Plate (locking pawl side)	1	105009
Pipe Separator Rod (SS)	6	105010
Drive Shaft Collar	1	105011
Cable Guard Plate	1	105012

Motor and Components		
Part Description	Qty	Part #'s
Nord Gearmotor 10 hp, 230/460V, 60 HZ, 27.91 ratio	1	

DF-1-65-11-N Electric Winch Parts List		
Fasteners and Etc.		
Part Description	Qty	Part #'s
Hex Head Bolt 1/2" x 2" (SS)	8	537
Hex Nut 7/8" (SS)	6	539
Lock Washer 7/8" (SS)	6	540
Socket Head Cap Screw 3/8" x 1" (SS)	4	541
Locking Pawl Washer	3	544
Washer 9/16" ID x 2-1/2" OD (SS)	1	543
Hex Nut 1" (SS)	14	576
Hex Head Bolt 1" x 3" (SS)	14	578
Lock Washer 5/8" (SS)	4	737
Hex Head Bolt 5/8" x 1"	8	11746
Socket Head Cap Screw 3/8" x 3" (SS)	1	14595
Hex Head Bolt 5/8" x 1-3/4" (SS)	4	70310
Hex Head Bolt 1/2" x 1" (SS)	7	70521
Lock Washer 1/2" (SS)	14	70584

Bushings and Bearings		
Part Description	Qty	Part #'s
Drum Gear Bushing	1	71676
Intermediate Gear Bushing	1	71854
Ball Bearing	2	84662
Locking Pawl Sleeve Bushing	1	101517

Miscellaneous Components		
Part Description	Qty	Part #'s
Cover Mounting Stud 3/8" x 1-1/2"	10	549
Brass Wing Nut 3/8"	10	550
U-Bolt with Fasteners (1" Dia. Wire)	1	72001
Protective Rubber Cover	2	80228
T-Handle (locking pawl handle)	1	101580

D.1 GEARMOTOR TECHNICAL INFORMATION (SHAFT MOUNTED)



GENERAL INSTRUCTIONS



RETAIN FOR FUTURE USE

U10000 - 1 of 2

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 safety notes 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.

Sales Order Number: 200836833-400
 Model Type: SK9382AZSH-180MH4 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	(75.96 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 - Clincher Parallel Shaft	1	(125.83 KB)
📄	U15200 - Parts List - Clincher Parallel Shaft	12	(619.50 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.



GENERAL INSTRUCTIONS



RETAIN FOR FUTURE USE

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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.

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.

WARNING
<p>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.</p>



SAFETY NOTES



RETAIN FOR FUTURE USE

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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.
	Possible Harmful Situation - Care must be taken to avoid the possibility of damaging the drive unit, driven machine, or the environment.
	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	
<ul style="list-style-type: none"> 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

HARMFUL SITUATION	
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

NORD GEAR CORPORATION-USA / WWW.NORD.COM

SK ①

S/N ②

RATIO ③ SF ④

TORQUE ⑤ LB-IN

SPEED ⑥ RPM

⑦ MTG POS

FOR GEAR LUBRICATION SEE MANUAL UNICASE™

- ① Model/Type
- ② Serial Number
- ③ Gear Ratio
- ④ Service Factor
- ⑤ Torque Rating
- ⑥ Output Speed RPM
- ⑦ Mounting Position

European Nameplate

Getriebebau NORD
GrbH&Co KG
D - 22934 Bargteheide

Type SK ①

No. ②

i= ③

n2= ④ min⁻¹

Siehe Wartungsanleitung
See maintenance instructions
Voir instructions d'entretien

- ① Model/Type
- ② Serial Number
- ③ Gear Ratio
- ④ 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.



HELICAL & BEVEL REDUCER LUBRICATION



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RETAIN FOR FUTURE USE

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.

Most NORD reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position.

2. Standard oil type

The following tables indicate the standard oil fill type used. Please see user manual U11000 for more specific information and for optional helical and bevel gear lubricants:

Serviceable Gear Units	
Helical In-line	Standard Oil Fill: ISO VG 220, Mineral Oil
Clincher Parallel-Shaft	
Right-Angle Bevel	
NORDBLOC® Series In-line	
NORDBLOC®.1 Series In-line	
Standard Series In-line	

IMPORTANT NOTE

For shipping purposes, the following large Clincher™ gear units are supplied without oil:

- Clincher™ Sizes SK11282, SK11382 and SK12382

Maintenance-free / Lubricated For Life Gear Units	
Clincher™ sizes SK0182NB, SK0282NB & SK1382NB	Standard Oil Fill: ISO VG220 SHC/PAO Synthetic Oil
NORDBLOC® Sizes SK172, SK272, SK371F, SK372, SK373, SK320	

IMPORTANT NOTE

Maintenance-free units are supplied as sealed units with no vent-plug. Consult NORD prior to ordering if interested in ordering any of the above sizes as serviceable gear units.

IMPORTANT NOTE

Consult the sticker adjacent to the fill plug to determine the type of lubricant installed at the factory. Some units have special lubricants designed to operate in certain environments or intended to extend the service life or service temperature range of the lubricant. If in doubt about which lubricant is needed for a certain application, please contact NORD Gear.

3. Lubrication replacement

If the gear unit is filled with mineral oil, the lubricant should be replaced at least after every 10,000 operating hours or after every two years. If the gear unit is filled with synthetic oil, the lubricant should be replaced at least after every 20,000 operating hours or after every four years. Often gear reducers are exposed to extreme ambient conditions, hostile environments, wet conditions, or dirty and dusty operating areas. Especially in these situations, it is important to establish a condition-based oil service interval.

4. Oil viscosity

Viscosity, or the oil's resistance to shear under load, is often considered the single most important property of any gear oil.

- Often one will consider making a viscosity correction to the oil to improve the performance when operating the gear unit at low temperature or high temperature.
- In cases of extreme load conditions, gear pairs and antifriction bearings may be more susceptible to sliding or scuffing wear. In these operating conditions, it may also be beneficial to consider an increased lubrication viscosity and/or a lubrication with improved antiwear additive packages.

IMPORTANT NOTE

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

5. 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 (up to 3 hours continuous operation depending upon reducer size).

Oil Type	Maximum Oil Temperature Limit	
	NORD	AGMA 9005-D94
Mineral	80-85°C (176-185°F)	95°C (203°F)
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.

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HELICAL & BEVEL REDUCER LUBRICATION



RETAIN FOR FUTURE USE

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6. The importance of routine oil analysis

Routine oil analysis, sound lubrication practices, and good tracking of oil performance trends will help establish proper lubrication maintenance and change-out intervals. To maximize equipment reliability, NORD Gear generally recommends a condition-based lubrication maintenance program. One may take exceptions to this general recommendation on sealed-for-life or maintenance-free gear units or smaller and less costly gear units. In these instances, the replacement cost of the gear unit is often small compared to the costs associated with this type of oil analysis program.

STOP	HARMFUL SITUATION	STOP
<p>NORD suggests replacing the gear oil if oil analysis indicates any of the following:</p> <ul style="list-style-type: none"> • Viscosity has changed by approximately 10% or more. • Debris particles (silicon, dust, dirt or sand) exceed 25 ppm. • Iron content exceeds 150-200 ppm. • Water content is greater than 0.05% (500 ppm). • The total acid number (TAN) tests indicate a significant level of oxidative break-down of the oil, and a critical reduction in performance; If the TAN number measured changes by more than 5% over the new oil, then an oil change would be recommended. 		

7. Mounting position and oil fill quantity

All NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. *For additional information, please see the separate mounting position diagrams and the corresponding oil fill quantity tables for the specified gear unit.*

The gearbox nametag will indicate the mounting position that was provided. *For mounting orientations other than shown in the mounting position charts, please consult NORD Gear.*

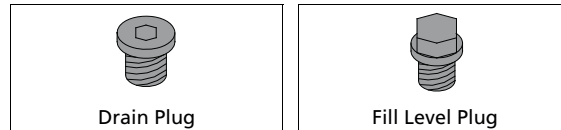
STOP	HARMFUL SITUATION	STOP
<p>Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil-level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.</p>		

8. Oil plug locations

All gear units are assembled with the oil fill-level, oil-drain and vent plugs installed in their proper locations, according to the specified mounting position. All standard plugs are metric and utilize sealing gaskets between the head of the plug and the reducer housing.

9. Drain and fill-level plugs

All reducer drain plugs are metric socket head cap screws. For easier identification, it is NORD's standard practice to provide a hex-head screw for the fill-level plug. For ease of draining the used oil from the gear reducer, use the socket head screw located at the lowest part of the gearbox.

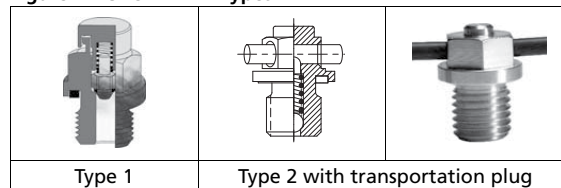


10. Vent plug locations

Reducer venting allows for air pressure differences that occur during operation, between the inner space of the reducer and the atmosphere, while ensuring leak-free operation. The AUTOVENT™ is standard for all vented gear units, unless otherwise noted.

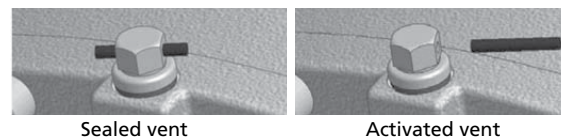
AUTOVENT™ - The AUTOVENT™ helps prevent bearing and gear damage by behaving like a check valve to block the entry of foreign material (water, dust, corrosives, etc.). The breather opens at approximately 2-3 psi during operation and closes tightly as the gearbox cools. This option is perfect for humid conditions and wash-down environments, helping to maintain proper oil cleanliness, and reducing foaming and oxidation. NORD may choose to offer one of two style options as shown in Figure 1. The Type 2 AUTOVENT™ comes closed upon delivery with a transportation sealing plug (see Warning).

Figure 1 AUTOVENT™ Types



Open Vent - An optional open vent can be supplied by NORD. The open vent comes closed upon delivery with a transportation sealing plug (see Warning).

⚠	WARNING	⚠
<p>To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start up.</p>		



Filtered Vent - NORD may offer an optional filtered vent, which allows gases to permeate, but does not allow dust and debris to pass through the vent.



HELICAL & BEVEL REDUCER LUBRICATION TYPES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

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Lubrication Tables – Helical and Bevel Gear Units

Standard Oil Lubricants

ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
VG220	MIN-EP	0 to 40°C (32 to 104°F)	Mobilgear 600XP220	◆●
	PAO	-35 to 60°C (-31 to 140°F)	Mobil SHC630	◆②
	FG	-5 to 40°C (23 to 104°F)	Fuchs FM220	◆

Optional Oil Lubricants

ISO Viscosity	Oil Type	Ambient Temperature Range	Manufacturer Brand/Type	Notes
VG460	PAO	-35 to 80°C (-31 to 176°F)	Mobil SHC 634	-
	FG-PAO	-35 to 80°C (-31 to 176°F)	Mobil SHC Cibus 460	-
VG220	FG-PAO	-35 to 60°C (-31 to 140°F)	Mobil SHC Cibus 220	-
VG150	PAO	-35 to 25°C (-31 to 77°F)	Mobil SHC629	-

Grease Options (applied to greased bearings and seal cavities)

NLGI Grade	Grease Type/Thickener	Ambient Temperature Range	Manufacturer Brand/Type	Notes
NLGI 2	Standard (Li-Complex)	-30 to 60°C (-22 to 140°F)	Mobil Grease XHP222	◆●
	High Temp (Polyurea)	-40 to 80°C (-40 to 176°F)	Mobil / Polyrex EP 2	◆②
	Food-Grade (Polyurea)	-30 to 40°C (-22 to 104°F)	Mobil SHC Polyrex 222	◆

◆ Stocked Lubricants

● Standard product on serviceable gear units

② Standard product on maintenance free gear units

	IMPORTANT NOTES	
<ul style="list-style-type: none"> • The "Ambient Temperature" is intended to be an operation guideline based upon the typical properties of all the lubricant. The viscosity and other properties of the lubricant change based upon load, speed, ambient conditions, and reducer operating temperatures. The user should consult with their lubrication supplier & NORD gear before considering changes in oil type or viscosity. • To prevent reducer overheating, observe the maximum operating oil temperature limits: Mineral Oil: 80-85 °C (176 – 180 °F). Synthetic Oil: 105 °C (225 °F). • In the following instances, please consult NORD for specific recommendations: <ul style="list-style-type: none"> √ Gear units will operate in high ambient temperature conditions exceeding 40 °C (104 °F). √ Gear units will operate in cold ambient temperature conditions approaching 0 °C (32 °F) or lower. √ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service. √ Fluid grease is required for lubricating the gear unit. • Observe the general lubrication guidelines outlined in user manual U10750. 		

Oil Formulation Codes

- MIN-EP - Mineral Oil with EP Additive
- PAO-EP - Synthetic Polyalphaolefin Oil with EP Additive
- PAO - Synthetic Polyalphaolefin Oil
- PG - Synthetic Polyglycol Oil
- FG - Food-Grade Oil
- FG-PAO - Food-Grade, Synthetic Polyalphaolefin Oil
- FG-PG - Food-Grade, Synthetic Polyglycol Oil

Lubrication Notes

- 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 oil or polyalphaolefin (PAO) synthetic oil.

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HELICAL & BEVEL REDUCER LUBRICATION TYPES



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Oil Cross-reference Chart

ISO Viscosity	Oil Type	Ambient Temperature Range	Mobil	Shell	Castrol	FUCHS	KLÜBER LUBRICATION
VG150	MIN-EP	0 to 25°C (32 to 77°F)	Mobilgear 600XP150	Omala 150	Alpha SP150	Renolin EP150	Klüberoil GEM 1-150N
	PAO-EP	-30 to 25 °C (-22 to 77 °F)	Mobilgear SHC150	Omala HD 150	Alphasyn EP150	Gearmaster SYN150/NA	Klübersynth EG 4-150
	PAO	-30 to 25°C (-22 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	0 to 25°C (32 to 77°F)	Mobil DTE FM 150	N/A	N/A	N/A	N/A
	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	MIN-EP	0 to 40°C (32 to 104°)	Mobilgear 600XP220	Omala 220	Alpha SP220	Renolin EP220	Klüberoil GEM 1-220N
	PAO-EP	-30 to 60 °C (-22 to 140 °F)	Mobilgear SHC220	Omala HD220	Alphasyn EP220	Gearmaster SYN220/NA	Klübersynth EG 4-220
	PAO	-30 to 60°C (-22 to 140°F)	Mobil SHC630	Omala RL220	Alphasyn T220	N/A	Klübersynth GEM 4-220N
	PG	-25 to 60°C (-13 to 140°F)	Mobil Glygoyle 220	Tivela S220	Alphasyn PG220	Renolin PG220	Klübersynth GH 6-220
	FG	0 to 40°C (32 to 104°F)	Mobil DTE FM 220	N/A	N/A	Fuchs FM220	N/A
	FG-PAO	-25 to 60°C (-13 to 140°F)	Mobil SHC Cibus 220	N/A	N/A	Cassida GL220	Klüberoil 4 UH 1-220N
	FG-PG	-25 to 60°C (-13 to 140°F)	Mobil Glygoyle 220	N/A	N/A	Cassida WG220	Klübersynth UH1 6-220
VG460	MIN-EP	0 to 40°C (32 to 104°F)	Mobilgear 600XP460	Omala 460	Alpha SP460	Renolin EP460	Klüberoil GEM 1-460N
	PAO-EP	-20 to 80°C (-4 to 176°F)	Mobilgear SHC460	Omala HD460	Alphasyn EP460	Gearmaster SYN460/NA	Klübersynth EG 4-460
	PAO	-20 to 80°C (-4 to 176°F)	Mobil SHC 634	Omala RL460	Alphasyn T460	N/A	Klübersynth GEM 4-460N
	PG	-20 to 80°C (-4 to 176°F)	Mobil Glygoyle 460	Tivela S460	Alphasyn PG460	N/A	Klübersynth GH 6-460
	FG	0 to 40°C (32 to 104°F)	Mobil DTE FM460	N/A	N/A	Fuchs FM460	N/A
	FG-PAO	-20 to 80°C (-4 to 176°F)	Mobil SHC Cibus 460	N/A	N/A	Cassida GL460	Klüberoil 4 UH 1-460N
	FG-PG	-20 to 80°C (-4 to 176°F)	Mobil Glygoyle 460	N/A	N/A	Cassida WG460	Klübersynth UH1 6-460

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

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90.1 HELICAL-BEVEL FLANGED OIL FILL QUANTITIES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

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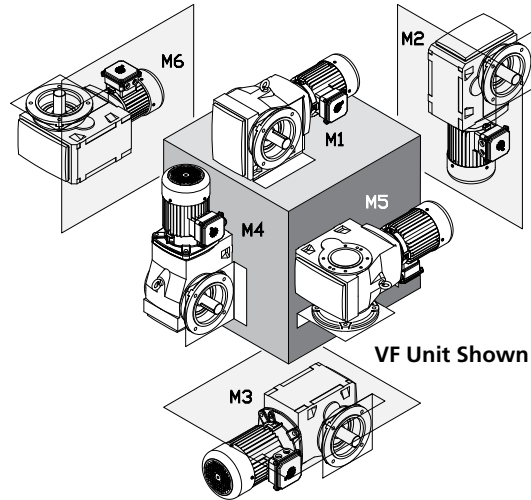
90.1 Helical-bevel flanged lubrication

Unless otherwise noted below, the following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

STOP HARMFUL SITUATION STOP

Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



Type	M1		M2		M3		M4		M5		M6	
	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters
SK 9012.1	1.06	1.00	2.01	1.90	2.01	1.90	2.32	2.20	1.27	1.20	1.80	1.70
SK 9013.1	1.53	1.45	2.43	2.30	2.22	2.10	2.96	2.80	1.11	1.05	1.90	1.80
SK 9016.1	1.06	1.00	2.01	1.90	2.01	1.90	2.32	2.20	1.27	1.20	1.80	1.70
SK 9017.1	1.53	1.45	2.43	2.30	2.22	2.10	2.96	2.80	1.11	1.05	1.90	1.80
SK 9022.1	1.69	1.60	3.70	3.50	3.70	3.50	4.44	4.20	2.43	2.30	2.96	2.80
SK 9023.1	2.43	2.30	3.70	3.50	4.02	3.80	5.60	5.30	2.32	2.20	3.59	3.40
SK 9032.1	2.22	2.10	5.07	4.80	6.76	6.40	7.50	7.10	3.49	3.30	5.39	5.10
SK 9033.1	3.91	3.70	6.02	5.70	7.08	6.70	9.09	8.60	3.80	3.60	5.60	5.30
SK 9042.1	4.76	4.50	10.6	10.0	10.6	10.0	12.2	11.5	6.87	6.50	8.66	8.20
SK 9043.1	6.87	6.50	11.1	10.5	12.6	11.9	15.5	14.7	7.08	6.70	9.83	9.30
SK 9052.1	7.93	7.50	17.4	16.5	21.1	20.0	24.8	23.5	12.2	11.5	19.0	18.0
SK 9053.1	13.7	13.0	19.0	18.0	22.7	21.5	28.0	26.5	13.7	13.0	18.0	17.0
SK 9062.1	12.7	12.0	29.1	27.5	34.9	33.0	40.7	38.5	20.1	19.0	27.5	26.0
SK 9072.1	12.7	12.0	29.1	27.5	34.9	33.0	40.7	38.5	20.1	19.0	27.5	26.0
SK 9082.1	22.2	21.0	57.0	54.0	70.0	66.0	85.0	80.0	40.2	38.0	55.0	52.0
SK 9086.1	38.0	36.0	82.0	78.0	96.0	91.0	113	107	56.0	53.0	80.0	76.0
SK 9092.1	42.3	40.0	137	130	163	154	185	175	87.0	82.0	96.0	91.0
SK 9096.1	85.0	80.0	198	187	204	193	272	257	119	113	165	156

Oil Levels shown apply to base models and gear units ending in AZ, AF, VZ, & VF.

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90.1 HELICAL-BEVEL OIL PLUG & VENT LOCATIONS



DRIVESYSTEMS

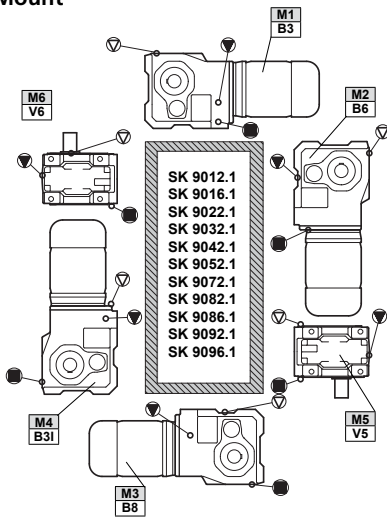
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U14400 - 1 of 1

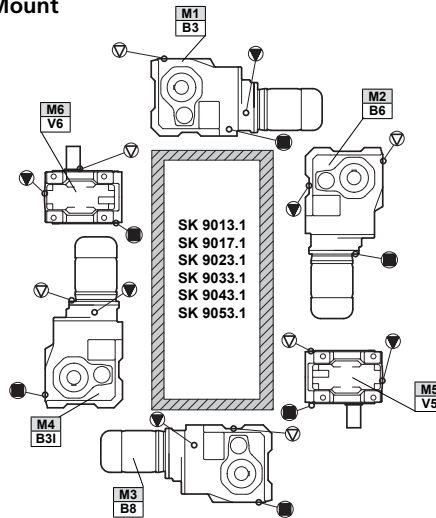
Oil plug connections

Prior to commissioning the reducer, check the oil-fill level using the reducer's oil-level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole. *For mounting orientations other than shown please consult NORD Gear. New plug locations may be required.*

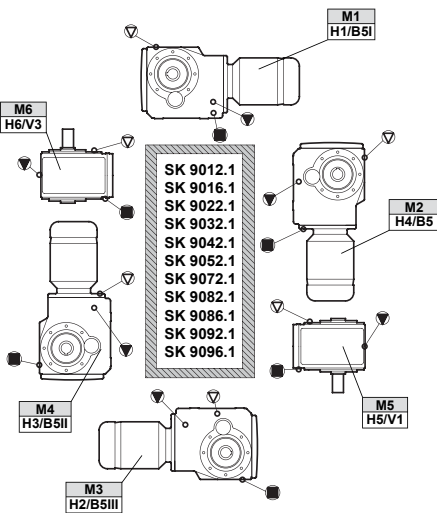
Foot Mount



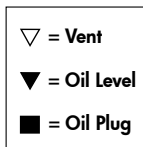
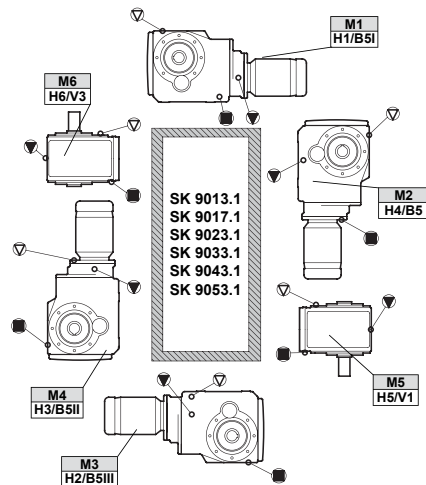
Foot Mount



Shaft/Flange Mount



Shaft/Flange Mount



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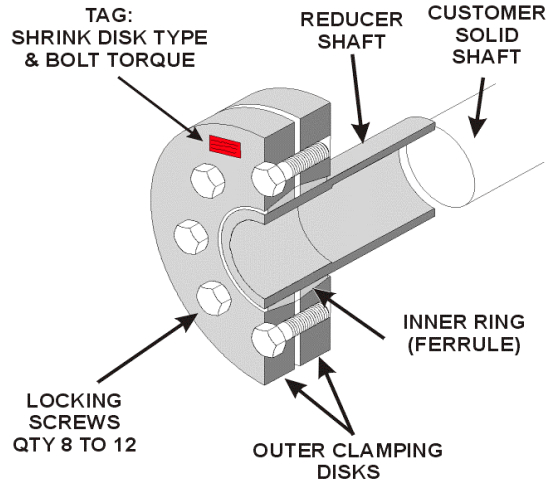


Hollow Shrink Disc Shaft Installation and Maintenance Instructions

BIM 1001



Retain These Safety Instructions For Future Use



Installation Instructions:

1. Mating shaft tolerances are normally tighter for shrink discs due to the gripping forces needed. Customer shaft diameter has to be machined according to ISO h6 or f6 tolerances (f6 easier to machine but lower gripping forces as shown in catalog). Refer to Table 1 for h6 and f6 tolerances for customer shafts.
2. Remove transportation spacers (if provided) located between outer collars. Do not take the unit apart.
3. Lightly tighten locking screws until most play between outer collars and the conical inner ring (ferrule) is eliminated. You must be able to easily turn the ferrule with your fingers.
4. Lightly lubricate the bore of the ferrule, with grease, for easier mounting onto outside diameter of the reducer hollow shaft.
5. Slide the shrink-disc onto hollow shaft.
6. Wipe the reducer bore and the mating solid shaft clean of any lubricants and dirt. Only use solvent if the parts feel oily to the touch after wiping with a clean rag.
7. Slide the reducer onto the solid shaft until it is about half way through.
8. Lubricate the remaining portion of the solid shaft with a #2 grease, where it will be inserted into the hollow shaft.
9. Tighten the locking screws in a circular pattern. Refer to Table 2 for tightening torques. Initially, tighten locking screws finger tight to position outer collars. Then tighten 1/4

to 1/2 turn at a time until specified tightening torque (per table) is reached.

10. Continue tightening each bolt at rated torque until no further rotation is seen. This assures the shrink disc is fully seated.

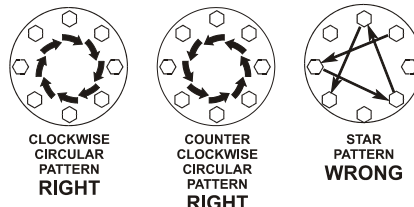
Warning:

The surface area between the hollow shaft and the solid shaft must be free of lubricant or the connection may slip in service.

Warning:

Always tighten in a circular pattern. Never tighten bolts in a star pattern or connection may slip in service.

BOLT TIGHTENING PATTERN



Customer shaft diameter tolerance with Shrink Disc fit h6

Metric (mm)

- $\leq \varnothing 18 = +0.000/-0.011$
- $> \varnothing 18 \leq \varnothing 30 = +0.000/-0.013$
- $> \varnothing 30 \leq \varnothing 50 = +0.000/-0.016$

- $> \varnothing 50 \leq \varnothing 80 = +0.000/-0.019$
- $> \varnothing 80 \leq \varnothing 120 = +0.000/-0.022$
- $> \varnothing 120 \leq \varnothing 180 = +0.000/-0.025$

Inch

- $\leq \varnothing 0.750 = +0.0000/-0.0004$
- $> \varnothing 0.750 \leq \varnothing 1.125 = +0.0000/-0.0005$
- $> \varnothing 1.125 \leq \varnothing 2.000 = +0.0000/-0.0006$
- $> \varnothing 2.000 \leq \varnothing 3.000 = +0.0000/-0.0007$
- $> \varnothing 3.000 \leq \varnothing 4.750 = +0.0000/-0.0008$
- $> \varnothing 4.750 \leq \varnothing 7.000 = +0.0000/-0.0010$

Shaft finish to be 125 micro inches or smoother.

Customer shaft diameter tolerance with Shrink Disc fit f6 (looser fit)

Metric (mm)

- $\leq \varnothing 18 = -0.016/-0.024$
- $> \varnothing 18 \leq \varnothing 30 = -0.020/-0.029$
- $> \varnothing 30 \leq \varnothing 50 = -0.025/-0.036$
- $> \varnothing 50 \leq \varnothing 80 = -0.030/-0.043$
- $> \varnothing 80 \leq \varnothing 120 = -0.036/-0.051$
- $> \varnothing 120 \leq \varnothing 180 = -0.043/-0.061$

Inch

- $\leq \varnothing 0.750 = -0.0006/-0.0011$
- $> \varnothing 0.750 \leq \varnothing 1.125 = -0.0008/-0.0013$
- $> \varnothing 1.125 \leq \varnothing 2.000 = -0.0010/-0.0016$
- $> \varnothing 2.000 \leq \varnothing 3.000 = -0.0012/-0.0019$
- $> \varnothing 3.000 \leq \varnothing 4.750 = -0.0014/-0.0023$
- $> \varnothing 4.750 \leq \varnothing 7.000 = -0.0017/-0.0027$

Shaft finish to be 125 micro inches or smoother

Tightening Torques for Locking Screws

Shrink Disk Type	Bore Size Inches (mm)	Locking Screws (Bolts)		
		Qty	Size	Torque in-lbs (Nm)
SNxx/35V	0.9375 – 1.000 (24 - 26)	8	M5X25	60 (7)
SNxx/40V	1.125 - 1.250 (28 - 32)	8	M6X35	110 (12)
SNxx/46V	1.3125 - 1.4375 (34 - 36)	10	M6X35	110 (12)
SNxx/55V	1.5625 - 1.75 (40 - 45)	8	M8X40	270 (30)
SNxx/62V	1.875 - 2.0625 (48 - 52)	10	M8X40	270 (30)
SNxx/76V	2.1875 - 2.5625 (55 - 65)	10	M10X50	520 (59)
SNxx/90V	2.5625 - 2.9375 (65 - 75)	10	M12X70	885 (100)
SNxx/108V	2.9375 - 3.375 (75 - 85)	12	M12X70	885 (100)
SNxx/128V	3.750 - 4.125 (95 - 105)	8	M16X70	2,210 (250)
SNxx/138V	4.125 - 4.500 (105 - 115)	8	M16X70	2,210 (250)
SNxx/158V	4.500 - 5.125 (115 - 130)	12	M16X80	2,210 (250)
SNxx/185V	5.3125 - 5.875 (135 - 150)	12	M16X80	2,210 (250)
SNxx/210V	6.250 (160)	12	M16X80	4,340 (490)
SNxx/230V	6.3125 - 7.500 (160 - 190)	12	M20X100	4,340 (490)

Maintenance

Shrink disks are maintenance free.

Removal

- Loosen locking screws in circular pattern as they were tightened, by approximately 1/4 to 1/2 turn at a time until finger tight. Do not remove locking screws completely.
- Loosen the outer collars from the tapered inner ring. This may require tapping the bolts with a soft faced hammer or prying lightly between the outer collars.
- Remove hollow-shaft reducer from solid shaft.

Preparation for Re-Use:

- Disassemble and thoroughly clean all parts. Wire brush to remove any excessive rust or dirt.
- Lubricate the taper of the outer collars and of the inner ring with Molycote G-Rapid plus (product of Dow Corning) or equivalent.
- Grease screw threads and head contact area with multipurpose grease.

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Fax 888-259-6673

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



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



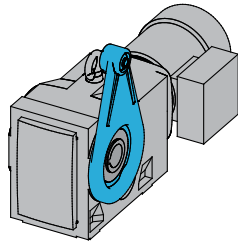
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1. Torque arm (D)

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.

The Torque-Arm (D) bracket is mounted to either side of the right-angle gear unit using mounting screws that thread into the B14 flange-face of the reducer. The anchor hole of the torque-arm bracket is supplied with a resilient rubber bushing.



i	IMPORTANT NOTE	i
<p>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.</p>		

2. Purpose of the built-in resilient rubber bushing

The resilient rubber bushing installed into the anchor 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.

STOP	HARMFUL SITUATION	STOP
<p>Always make sure that the Torque Arm (D) has the resilient rubber bushing installed into the anchor 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.</p>		

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	!
<p>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.</p>		

4. Installation of a right-angle reducer with torque arm

A. Make sure the Torque-Arm (D) is mounted in the correct position on the reducer. Assembled screw heads should always sit flush with the torque arm.

- To reposition the torque-arm, remove the mounting screws, relocate the torque-arm, and reassemble the mounting screws as noted above.
- If the torque-arm was shipped loose, position the torque-arm in the correct location on the gear unit, and secure the torque-arm as noted above.

i	IMPORTANT NOTES	i
<ul style="list-style-type: none"> • Torque arm mounting screws should be secured with a thread locking product (ex. Loctite® 242 or Loxeal® 54-03) and tightened per the table on page 2. • Assembled screw heads should always sit flush with the torque arm. • The support bracket should provide support on both sides of the torque arm or be in the form of a U-shape. • Do not force the torque-arm. The torque arm must remain at a right angle to the gear unit. • If mounting holes do not align properly the machine support may need to be moved. 		

B. Install the right-angle hollow bore reducer onto the machine shaft. Then 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. Apply a thread locking compound such as Loctite® 242 or Loxeal® 54-03 to the end of the anchor bolt that is used to secure the torque arm in place.

D. Place the anchor bolt through the support bracket and the reducer torque-arm. Attach the mating nut to the bolt and tighten the assembly until snug. At least one bolt diameter should protrude from the nut after assembly.

!	WARNING	!
<p>Do not force misalignment of the torque-arm. The torque arm must remain at a right angle to the gear unit or excessive load may be placed on the reducer shaft and bearings.</p>		

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

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TROUBLESHOOTING



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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 align 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.

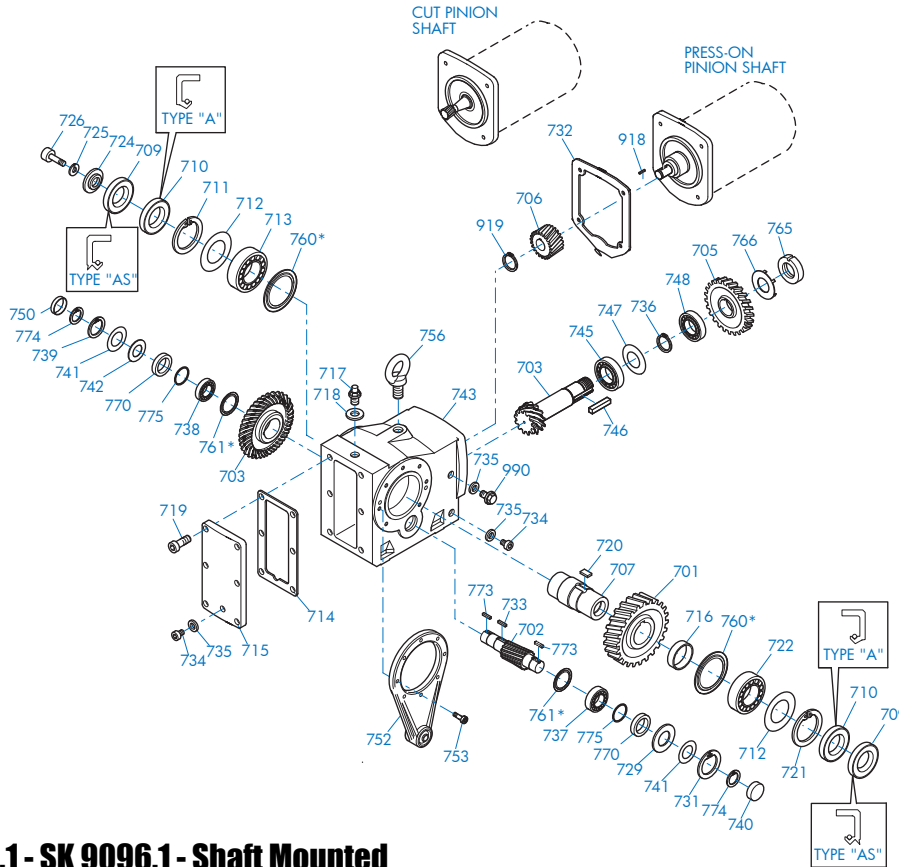


90.1 HELICAL-BEVEL PARTS LIST DRAWINGS



RETAIN FOR FUTURE USE

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SK 9012.1 - SK 9096.1 - Shaft Mounted

701 Gear	724 Retaining Washer	748 Anti-Friction Bearing
702 Pinion Shaft	725 Lock Washer	750 Bore Plug
703 Bevel Gearset	726 Bolt	752 Torque Arm
705 Gear	729 Thrust Washer	753 Bolt
706 Pinion	731 Snap Ring	756 Flanged Eye Bolt
707 Output Shaft	732 Gasket	760 Nilos Ring*
709 Oil Seal	733 Key	761 Nilos Ring*
710 Oil Seal	734 Oil plug	765 Slotted Round Nut
711 Snap Ring	735 Gasket	766 Tab Lock Washer
712 Shim	736 Snap Ring	770 Backstop (If Equipped)
713 Anti-Friction Bearing	737 Anti-Friction Bearing	773 Key (w/Backstop)
714 Gasket	738 Anti-Friction Bearing	774 Snap Ring
715 Inspection Cover	739 Snap Ring	(w/Backstop)
716 Spacer	740 Bore Plug	775 Thrust Washer
717 Vent Plug	741 Shim	(w/Backstop)
718 Gasket	742 Thrust Washer	918 Key
719 Bolt	743 Gearcase	919 Snap Ring
720 Key	745 Anti-Friction Bearing	990 Oil Level Plug
721 Snap Ring	746 Key	
722 Anti-Friction Bearing	747 Shim	

* Conditionally used part

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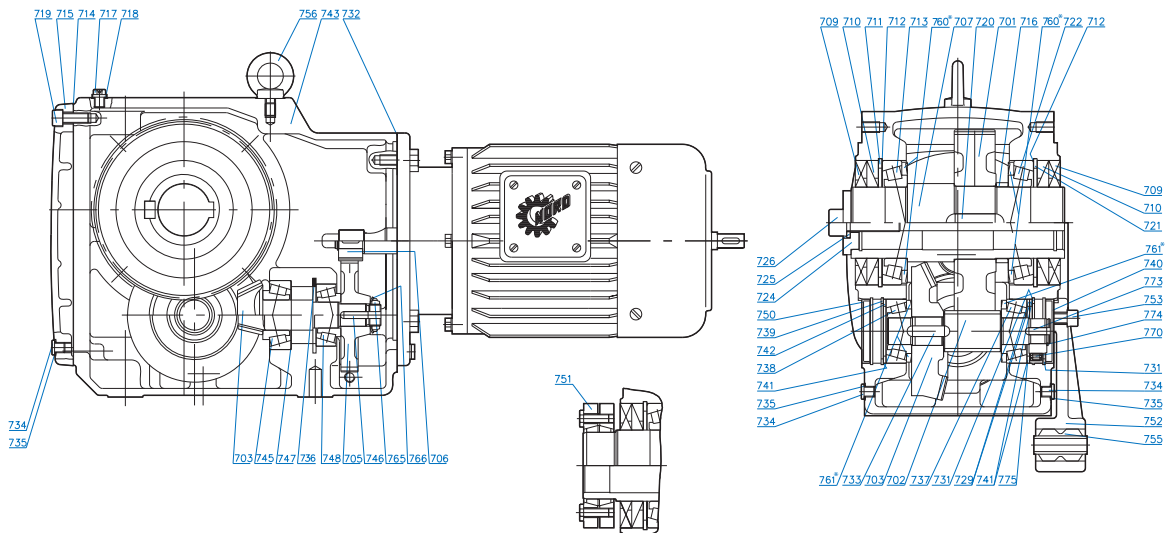


90.1 HELICAL-BEVEL PARTS LIST DRAWINGS



RETAIN FOR FUTURE USE

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SK 9012.1 - SK 9096.1 - Shaft Mounted

701 Gear	722 Anti-Friction Bearing	746 Key
702 Pinion Shaft	724 Washer	747 Shim
703 Bevel Gearset	725 Lock Washer	748 Anti-Friction Bearing
705 Gear	726 Bolt	750 Bore Plug
706 Pinion	729 Thrust Washer	751 Shrink Disc
707 Output Shaft	731 Snap Ring	752 Torque Arm
709 Oil Seal	732 Gasket	753 Bolt
710 Oil Seal	733 Key	755 Rubber Buffer
711 Snap Ring	734 Oil plug	756 Flanged Eye Bolt
712 Shim	735 Gasket	760 Nilos Ring*
713 Anti-Friction Bearing	736 Snap Ring	761 Nilos Ring*
714 Gasket	737 Anti-Friction Bearing	765 Slotted Round Nut
715 Inspection Cover	738 Anti-Friction Bearing	766 Tab Lock Washer
716 Spacer	739 Snap Ring	770 Backstop*
717 Vent Plug	740 Bore Plug	773 Key (w/Backstop)
718 Seal	741 Shim	774 Snap Ring
719 Bolt	742 Thrust Washer	(w/Backstop)
720 Key	743 Gearcase	775 Thrust Washer
721 Snap Ring	745 Anti-Friction Bearing	(w/Backstop)

* Conditionally used part

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MOTORS - AC INDUCTION, SINGLE & POLYPHASE

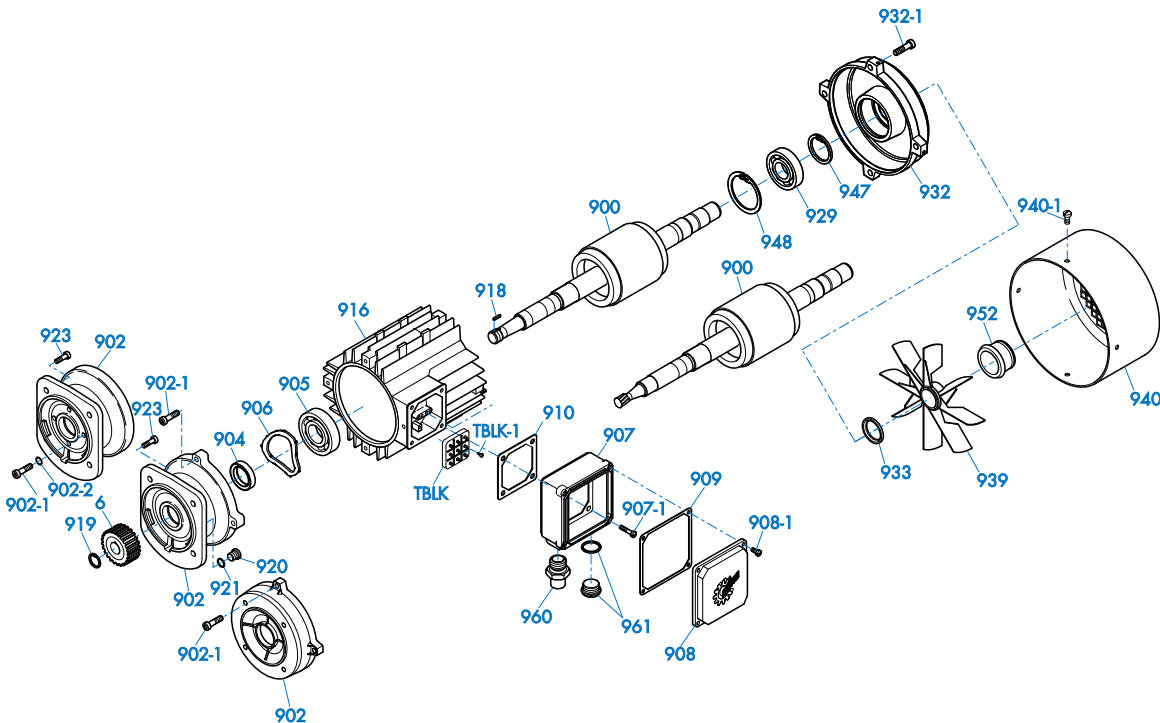


RETAIN FOR FUTURE USE

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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

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MOTORS - AC INDUCTION, SINGLE & POLYPHASE

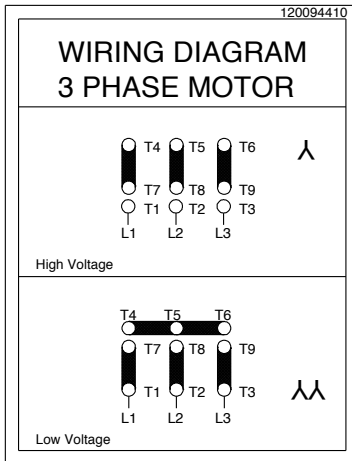


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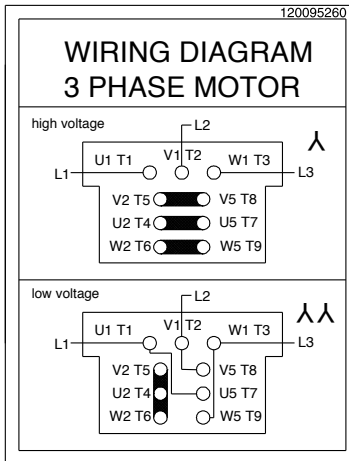
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15. Wiring Diagrams

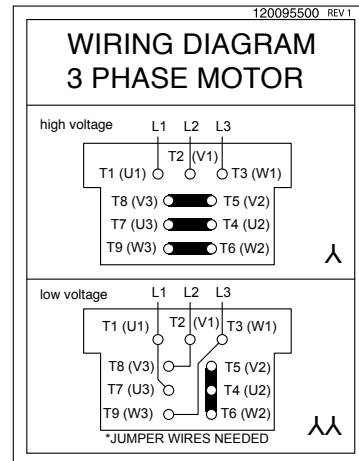
NORD Frames 63-225
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø



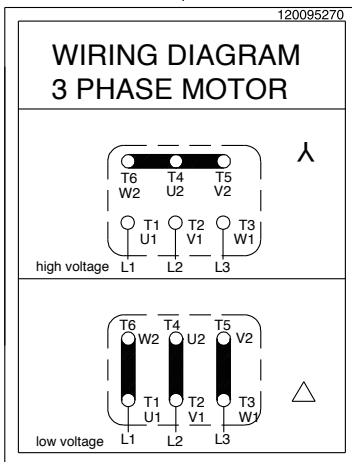
NORD mfg by Siemens - Frames 200 +
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø



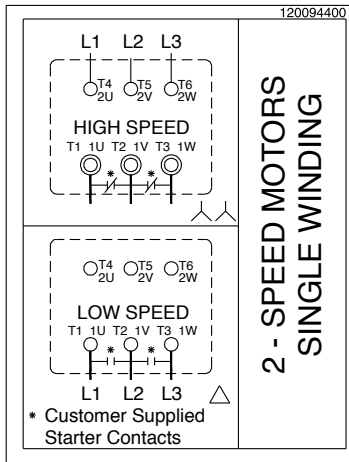
NORD mfg by Siemens - Frames 200 +
230 / 460V, 60Hz, 3Ø | 200 / 400V, 50Hz, 3Ø
190 / 380V, 60Hz, 3Ø



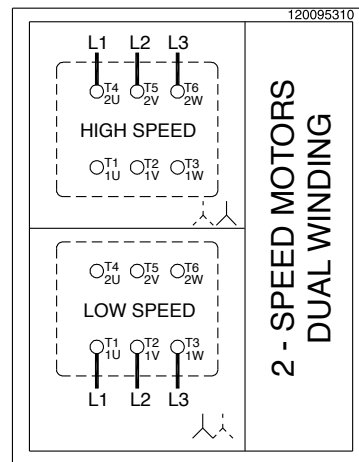
NORD Frames 63 - 225
460 / 800V, 60Hz, 3Ø | 230 / 400V, 50Hz, 3Ø
208 / 360V, 60Hz, 3Ø | 400 / 690V, 50Hz, 3Ø
332 / 575V, 60Hz, 3Ø



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



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





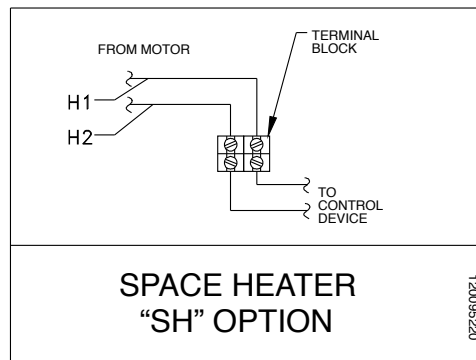
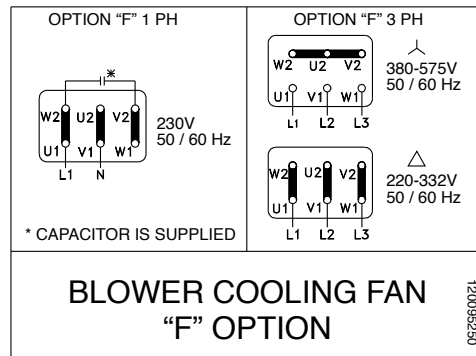
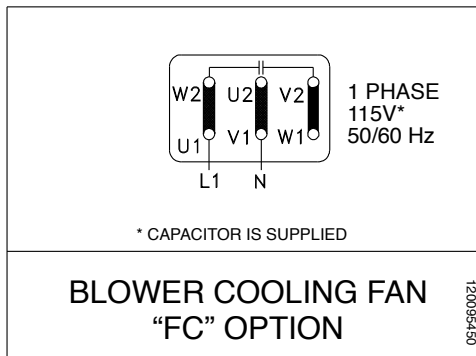
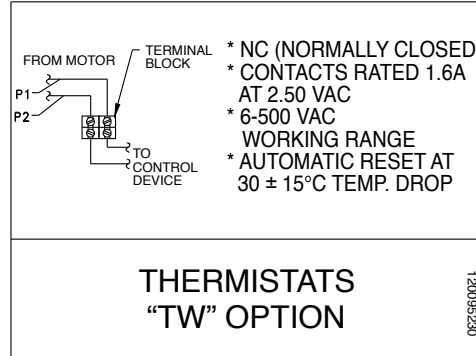
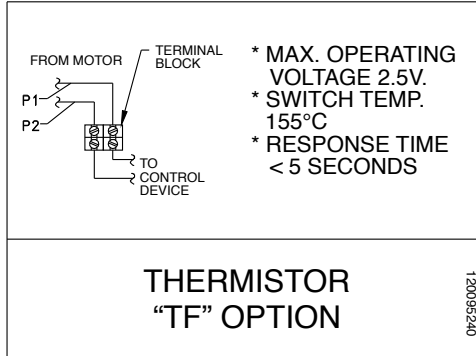
MOTORS - AC INDUCTION, SINGLE & POLYPHASE



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15. Wiring Diagrams Ctd.



E.1 NORD BRAKE TECHNICAL INFORMATION

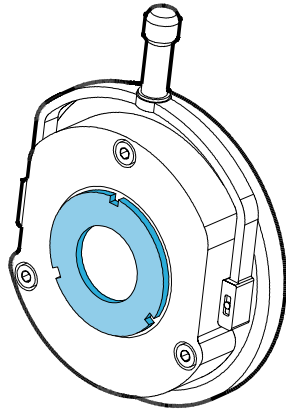


MOTOR BRAKES INSTALLATION & MAINTENANCE



RETAIN FOR FUTURE USE

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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

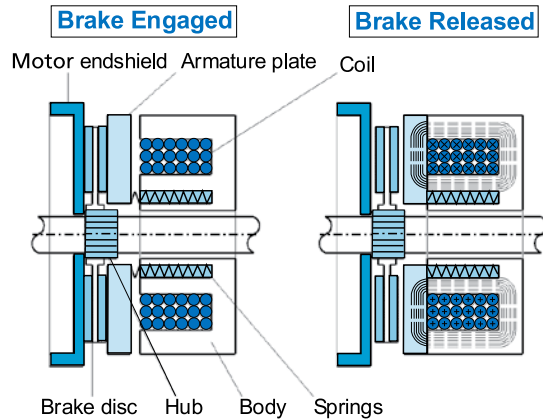
Only qualified personnel should attempt installation, operation and maintenance of NORD brakes. Read this manual in its entirety before operating, commissioning, servicing, or assembling the motor brake. If you have a question about a procedure or are uncertain about any detail, seek clarification and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

WARNING
<ul style="list-style-type: none"> 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.

Brake Operation

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
<p>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.</p>

Advantages

- 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.

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MOTOR BRAKES INSTALLATION & MAINTENANCE



DRIVESYSTEMS

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General Selection Considerations

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.



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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 brake motors typically include the rectifier located inside the terminal box.

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.

Model	Type	Part No.	Color	Input Voltage $V_{AC} \pm 10\%$	Rated Current A_{DC}	
					(40°C)	(75°C)
GVE20L	Full-wave	19141000	Black	110-275	1.5	1.0
GVE20V	Full-wave	19141030	Black	110-275	1.5	1.0
GHE40L	Half-wave	19141010	Yellow	200-480	2.0	1.0
GHE40V	Half-wave	19141040	Yellow	200-480	2.0	1.0
GHE50L	Half-wave	19141020	Gray	200-575	2.0	1.0
GHE50V	Half-wave	19141050	Gray	200-575	2.0	1.0
GUE40V	Dual-wave	19140300	Black	230-460	0.7	0.5
PMG500	Push-Hybrid	19140200	Black	200-500	4.0	2.8

Rectifier electronics are sealed for moisture-protection; electronics on models ending with the suffix "V" are resin-encapsulated to provide added protection if water should get into the motor terminal box.

Rectifier Types

Full-wave rectifier [GVE]:

A rectifier in which both the positive and negative half-cycles of the AC input signal are rectified to produce a uni-directional DC current supply to the load or the brake. The output voltage is 90% of the input voltage ($V_{DC} = 0.90 \times V_{AC}$).

Half-wave rectifier [GHE]:

A rectifier in which only alternate half-cycles of the AC input signal are rectified to produce a uni-directional DC current supply to the load or the brake. The output voltage is 45% of the input voltage ($V_{DC} = 0.45 \times V_{AC}$).

Dual Wave Rectifier [GUE]

A rectifier that can be wired as either a full-wave rectifier or a half-wave rectifier depending upon how it is connected to the AC input signal.

IMPORTANT NOTE

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

Rectifier Types [Ctd.]

PMG 500 Push-Hybrid rectifier [PMG]:

A fast-acting or push-hybrid brake rectifier provides an initial "push" in the form of a timed full-wave brake-release function, which is then followed by a continuous half-wave brake-holding function. There are two ways to apply these rectifiers as follows:

- "Overexcitation" of the brake coil provides faster brake release or improved cycling capacity. The DC voltage of the brake coil is determined based upon using a half-wave rectifier. The output voltage is 45% of the input voltage ($V_{DC} = 0.45 \times V_{AC}$).
- "Reducer-Power Holding" of the brake coil maintains the brake in a released state by using only 25% of the power needed for the initial brake release. This results in very fast brake stopping. The DC voltage of the brake coil is determined based upon using a full-wave rectifier. The output voltage is 90% of the input voltage. ($V_{DC} = 0.90 \times V_{AC}$).

NORD offers additional fast-acting rectifiers besides the PMG 500. For additional details please reference User Manual U35100 – Fast Acting Brake Rectifiers.

IMPORTANT NOTE

In order to prevent rapid wear, the PMG 500 rectifier is required when utilizing the larger 800 Nm (590 lb-ft) and 1200 Nm (885 lb-ft) twin-rotor brakes. The PMG 500 rectifier is wired to "overexcite" the brake during its initial release.

Brake Switching Options

The rectifiers discussed in this manual can be wired to allow brake switching at either the AC power source (input) or the DC power source (output).

- AC switching allows the brake rectifier to be powered directly from the motor's terminal block with no additional wiring. However, this provides a slower brake stopping time due to the additional time needed to de-energize or collapse the motor's magnetic field.
- DC switching directly interrupts the current flow in the DC circuit of the brake rectifier. This method of brake switching guarantees faster brake stopping or brake engagement times.

WARNING

When the moving system undergoes a change in height (such as in a lift or incline conveyor application) or if the system tends to speed up or overhaul during normal operation, then DC-switching of the brake is required in order to prevent excessive load movement, drift or falling loads during stopping.



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Figure 2.1: GVE/GHE Dimensions

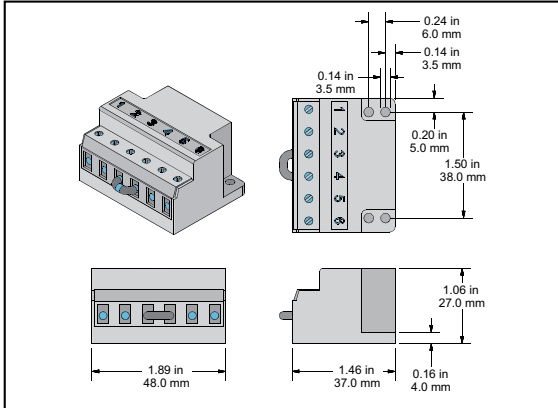


Figure 3.1: GUE Dimensions

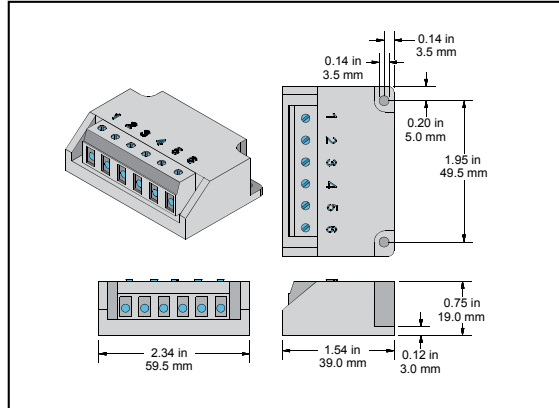


Figure 2.2: GVE/GHE Braking Methods

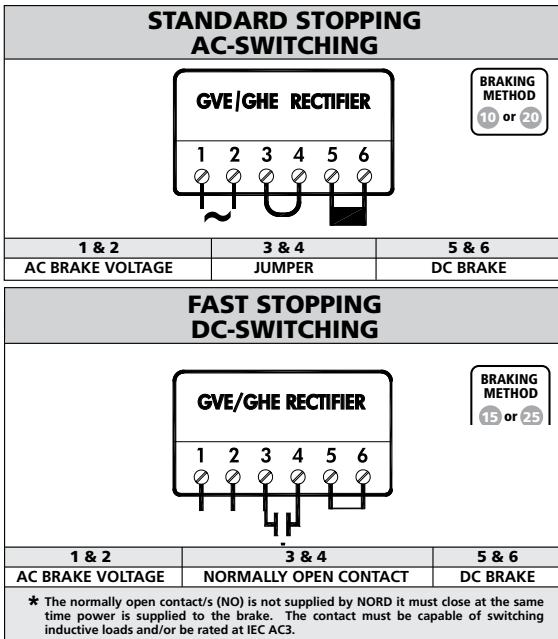
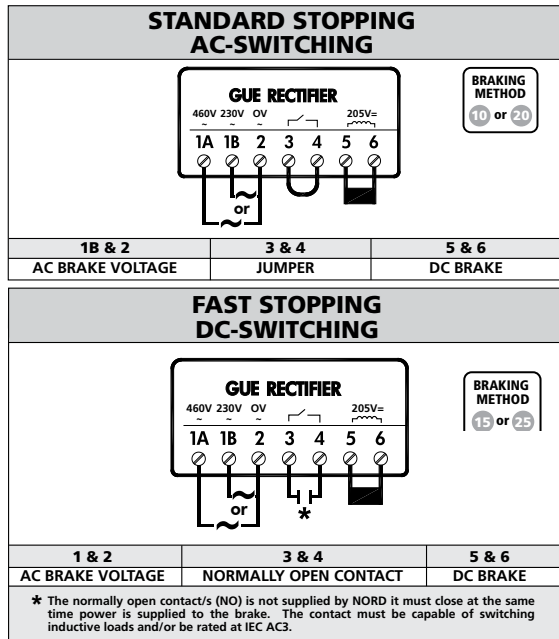


Figure 3.2: GVE/GHE Braking Methods



Braking Method	Break Release (Start)	Brake Engage (Stop)	Power Source
10	Standard	Standard (AC-Switching)	Motor terminals
15	Standard	Fast (DC-switching)	Motor terminals
20	Standard	Standard (AC-Switching)	Separate power
25	Standard	Fast (DC-switching)	Separate power

Braking Method	Break Release (Start)	Brake Engage (Stop)	Power Source
10	Standard	Standard (AC-Switching)	Motor terminals
15	Standard	Fast (DC-switching)	Motor terminals
20	Standard	Standard (AC-Switching)	Separate power
25	Standard	Fast (DC-switching)	Separate power

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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.

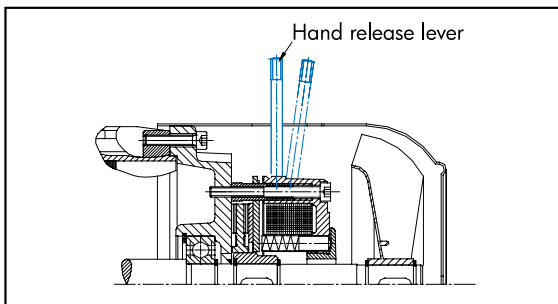
IMPORTANT NOTE

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 5

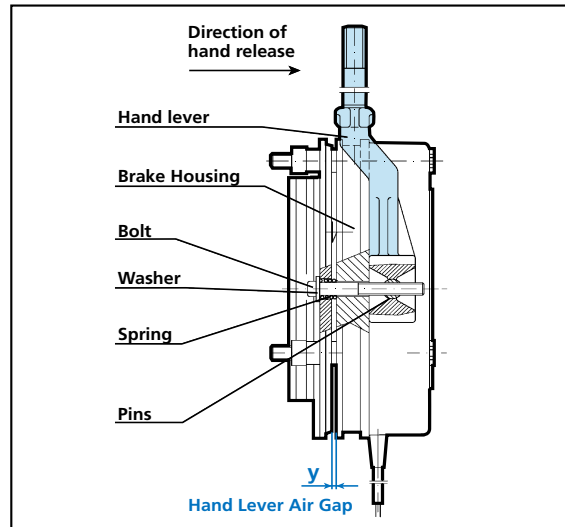


IMPORTANT NOTE

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 6



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" Ⓢ		Brake Size	Dimension "y" Ⓢ	
	[mm]	[in]		[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

Ⓢ 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.



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Setting the Brake Air Gap

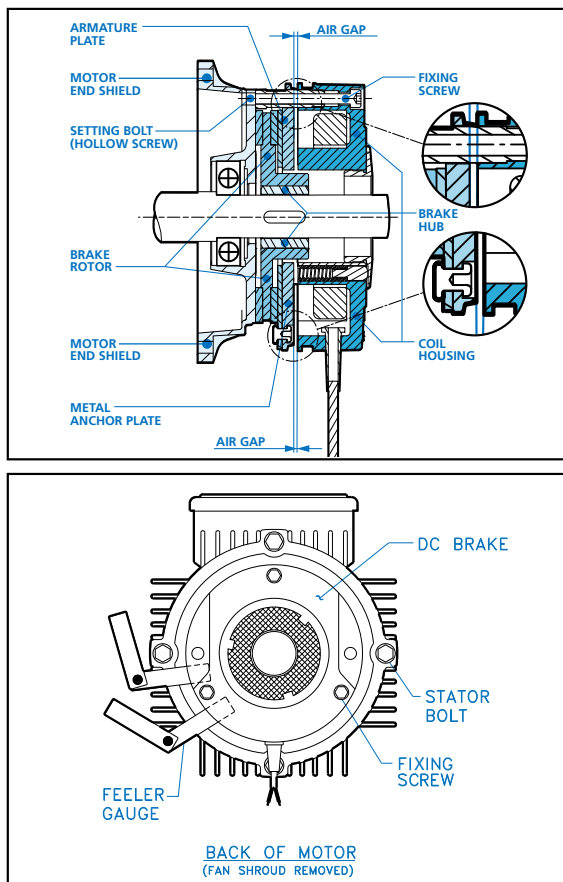
NORD spring-loaded brakes are virtually maintenance free. However, the air-gap of the brake rotor or brake disc must be periodically checked and adjusted. If necessary, the worn brake rotor must be replaced. Table 6 serves as guide to check and set the brake air gap as needed.

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 7 – 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. The brake assembly may be further loosened by turning the setting bolts or hollow screws counter-clockwise into the brake coil housing.

2. The desired nominal air-gap for each brake size is displayed in Table 6. In the course of making adjustments, the air gap measurement must be checked in several places using a feeler gauge. The feeler gauge should be positioned between the armature plate and the brake coil housing as indicated in Figure 7.

3. Decreasing or Increasing the air gap can be accomplished per the following instructions:

Decreasing the Air Gap – To decrease the air gap, turn the setting bolts or hollow screws counter-clockwise while securing the fixing screws; alternatively, turn the fixing screws clockwise while securing the setting bolts or hollow-screws.

Increasing the Air Gap – To increase the air gap, turn the setting bolts or hollow screws clockwise while securing the fixing screws; alternatively, turn the fixing screws counter-clockwise, while securing the setting bolts or hollow screws.

4. Re-tighten the fixing screws to the proper torque as indicated in Table 6.

5. Re-check the air gap in several places and repeat Steps 1-5 as needed until the 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 ①		Maximum Air Gap ②	
	[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 ③	18	25	0.016	0.4	0.043	1.1
BRE150 ③	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

- ① Tolerance: + 0.004 in [+ 0.1 mm]
- ② Brake air gap must be re-adjusted before the stated value.
- ③ When using the stainless steel friction plate (RG) increase the nominal air gap to 0.6 mm (0.024 in.).

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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.

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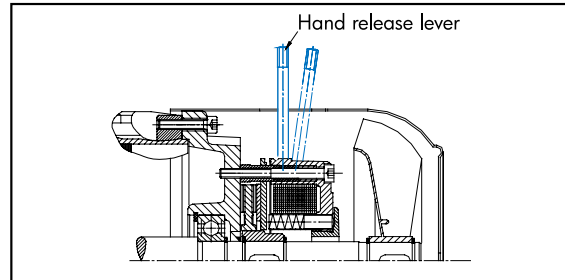
Optional Brake Accessories

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.

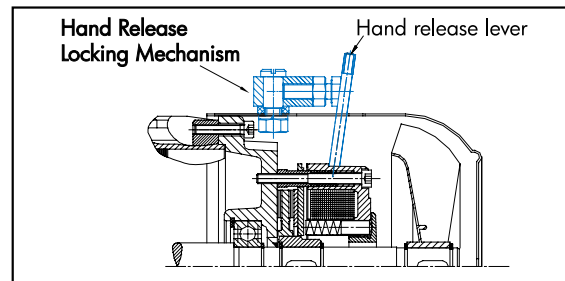
Figure 8



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.

Figure 9



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.

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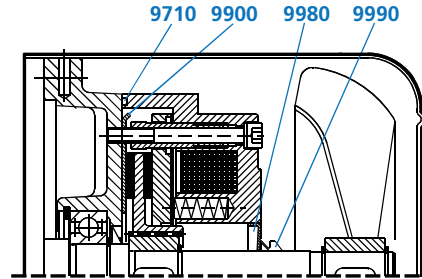
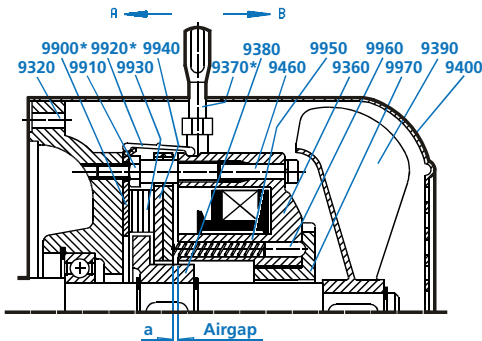


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Parts List - Precima Brakes



Normal Design, Enclosure IP55 with following options:

- RG – Stainless Steel Disc (Item 9900)
- SR – Dust Boot-includes Option RG (Item 9920)
- HL – Hand Release (Item 9370)

Optional Brake with optional IP66 enclosure

- 9320 Non-drive end shield
- 9360 Brake coil
- 9370 Manual brake lever – optional
- 9380 Brake hub
- 9390 Fan
- 9400 Fan cover
- 9460 Fixing screw

- 9710 O-ring - optional
- 9900 Friction plate - optional
- 9910 Setting bolt
- 9920 Dust protection ring
- 9930 Brake rotor
- 9940 Armature plate
- 9950 Spring

- 9960 Pressure plate adjustment**
- 9970 Adjustable ring **
- 9980 Bushing/seal - optional
- 9990 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 9930]	Brake Hub [Item 9380]	Brake Hub Bore / (Style)	Hand Release (HL) [Item 9370]	Stainless Disc (RG) [Item 9900]	Dust Boot (SR) [Item 9920]
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.

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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?
- 3) Determine the brake supply voltage and check the rectifier compatibility using the table on page 10?

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	
<ul style="list-style-type: none"> • 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
	ⓘ Fast (Overexcitation)	Standard (AC switching)	30	PMG 500
	ⓘ 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
	ⓘ Fast (Overexcitation)	Standard (AC switching)	45	PMG 500
	ⓘ Fast (Overexcitation)	Fast (DC switching)	50	PMG 500

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

ⓘ Please see important note below:

	IMPORTANT NOTE	
<p>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.</p>		



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Typical Connection Diagrams

BR101A		BR101B		BR101C		BR601A			
POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING)			
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}
208/230m/460v	GVE20	208 VAC	230 VAC	205 VDC	230m/460v	GVE20	208 VAC	230 VAC	205 VDC
230m/460v	GVE20	230 VAC	230 VAC	205 VDC	230m/460v	GVE40	460 VAC	230 VAC	105 VDC
230m/460v	GHE40	230 VAC	230 VAC	105 VDC					
POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING)			
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}
230Δ/400v	GVE20	400 VAC	230 VAC	205 VDC	332Δ/575v	GHE50	575 VAC	575 VAC	250 VDC
					208Δ/360v	GVE20	208 VAC	208 VAC	180 VDC
					230Δ/400v	GVE20	230 VAC	230 VAC	205 VDC
					400Δ/690v	GHE40	400 VAC	400 VAC	180 VDC
					460Δ/y	GHE40	460 VAC	460 VAC	205 VDC
POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING)		POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING)			
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}
332Δ/575v	GHE50	575 VAC	575 VAC	250 VDC	208/230m/460v	GVE20	208 VAC	230 VAC	205 VDC
					230m/460v	GVE20	230 VAC	230 VAC	205 VDC
					230m/460v	GHE40	230 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

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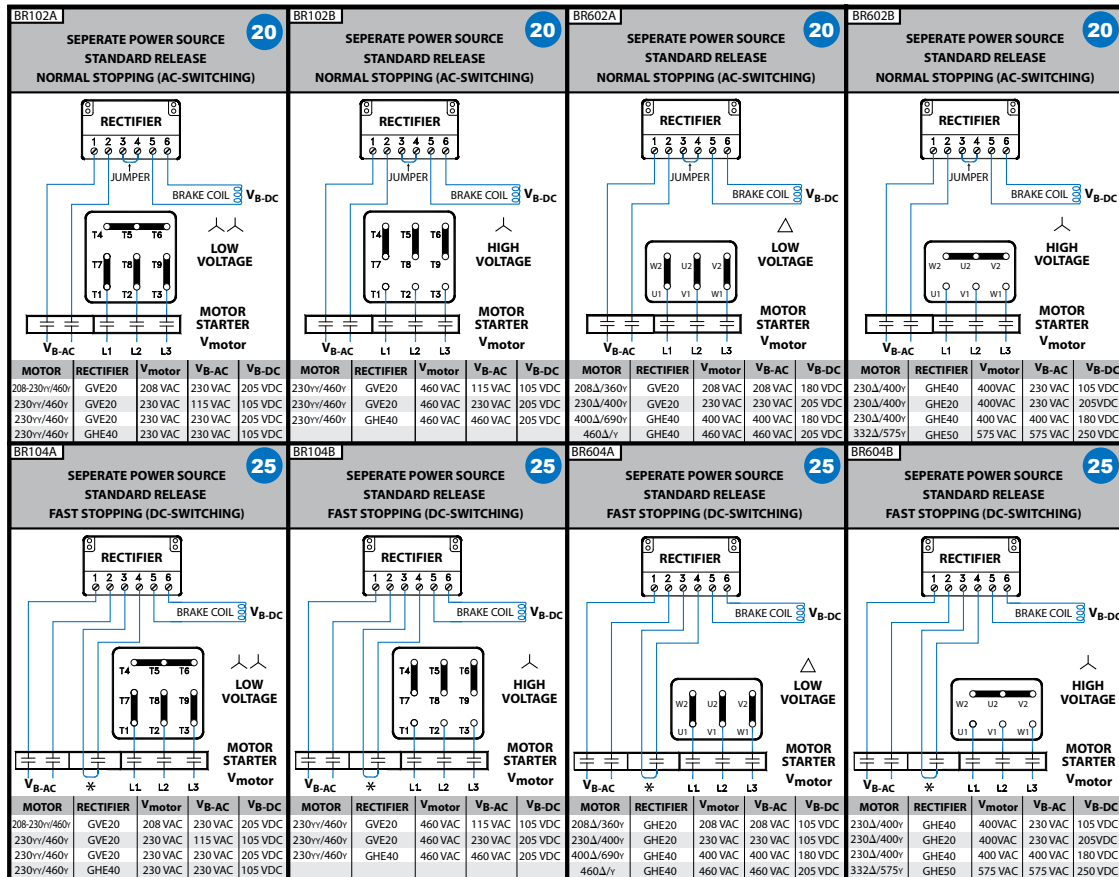
MOTOR BRAKES INSTALLATION & MAINTENANCE



RETAIN FOR FUTURE USE

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Typical Connection Diagrams



* 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

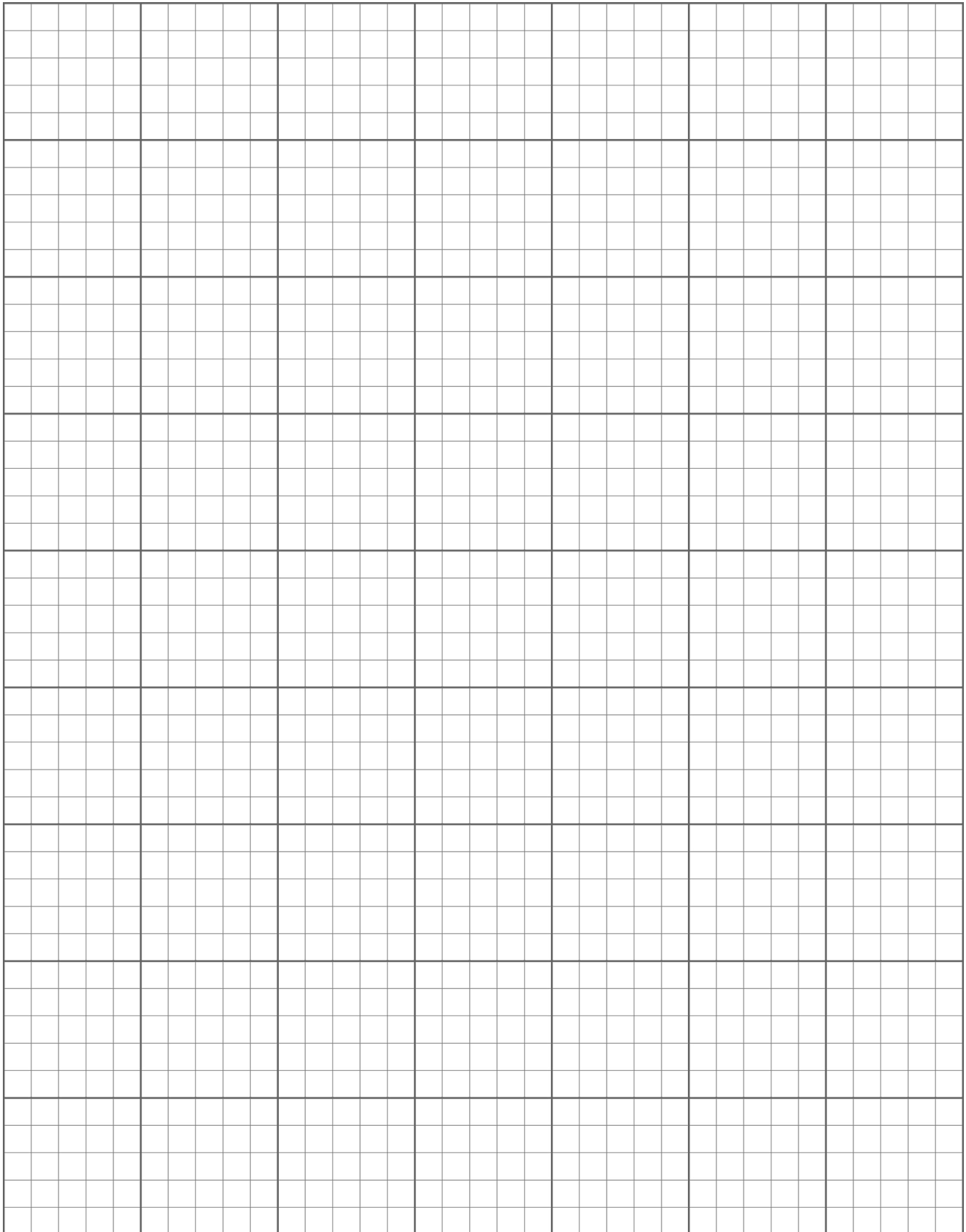


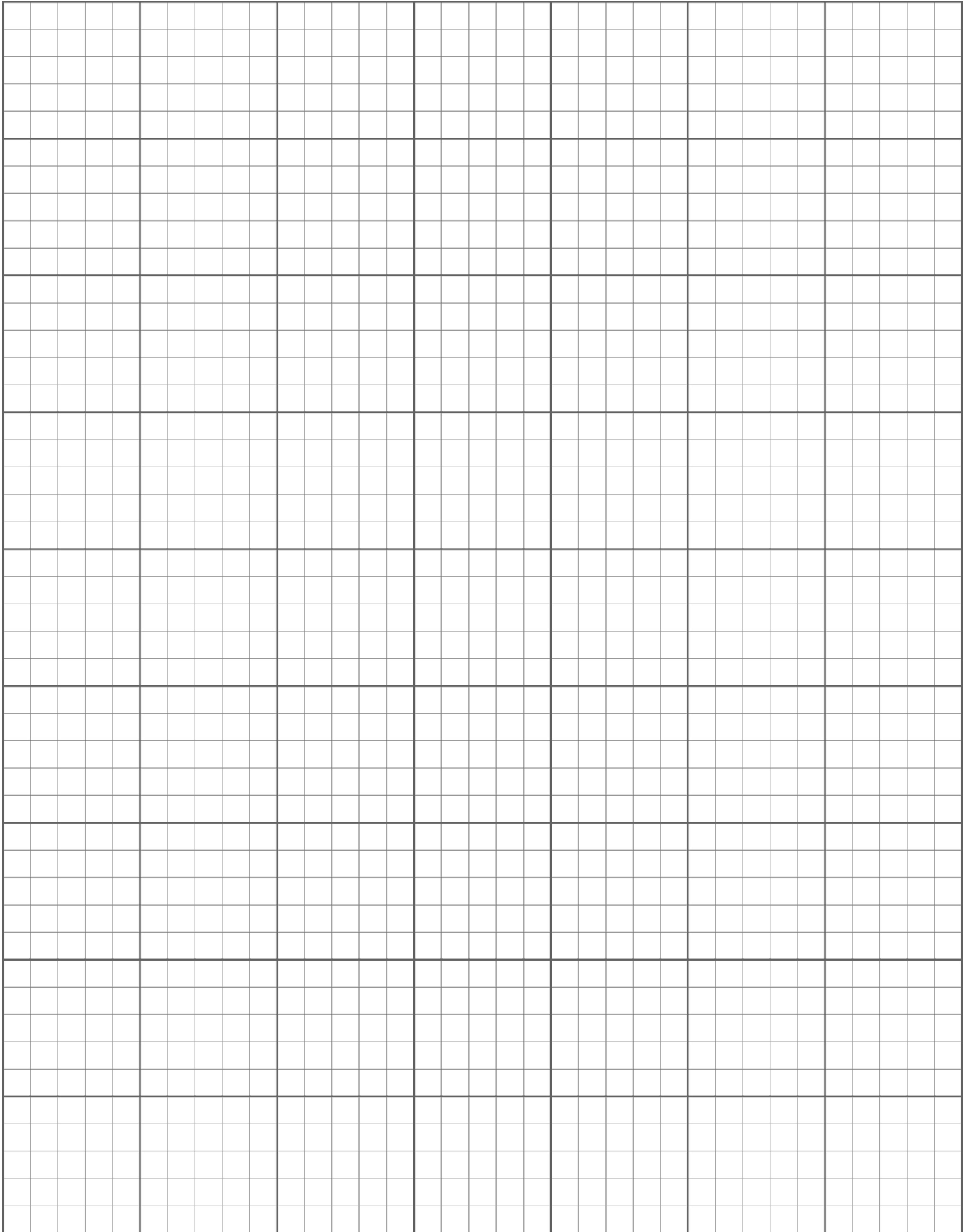
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Troubleshooting Information

Troubleshooting	Cause	Remedy
Brake doesn't release	Air gap too large	Check air gap and adjust
	Brake not receiving 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 voltage of brake coil
	Rectifier supply voltage from inverter	Rectifier voltage must be from separate 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





PRODUCT WARRANTY

NABRICO warrants that all NABRICO products shall be free from defects in material and workmanship during the Warranty Period (as herein defined); provided, however that NABRICO's warranty hereunder shall not apply to any equipment, material, or component that is not manufactured by NABRICO, and NABRICO makes no expressed or implied warranty that any such equipment, material, or component is free from manufacturer or supplier defects. To the extent permitted, NABRICO agrees to transfer and assign to a Buyer or End User any warranties extended by the manufacturer or supplier of such equipment, material or components. NABRICO shall have no obligation or responsibility to repair or replace any defective NABRICO product if a notice of defect is not reported in writing to NABRICO within 180 days from the date of shipment of any NABRICO Winch Products and 90 days from the date of shipment of any other NABRICO Products (such 180 day and 90 day periods are hereinafter referred to as "Warranty Period").

In the event Buyer or End User timely notifies NABRICO in writing of any claim of defect covered by this warranty, NABRICO shall correct the nonconforming work by making repairs or replacements, at NABRICO's option and at NABRICO's expense, if NABRICO's examination shall disclose to its satisfaction that all or a portion of the NABRICO Product is defective. However, this warranty is conditional upon compliance by the Buyer or End User with the loading, use, and handling in accordance with good commercial practices of the trade, and NABRICO shall not be responsible for defects caused by misloading, overheating, improper cleaning, misapplication, physical abuse or from normal wear and tear. This warranty is void where any NABRICO Product has been altered or repaired by anyone other than NABRICO or its authorized agent.

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Usage Warnings. All NABRICO Products must be correctly sized, properly located, and installed to serve their intended functions and it is the responsibility of Buyer or End User to insure such action is taken. Please note and consider the following warnings: Improper installation can result in failure of a NABRICO Product. NABRICO Products that have failed because of overloads, or which have been dislodged from foundations, or have fractures and/or deformations should be repaired or replaced immediately. Loads to bits must be applied to the posts between the base and the midpoint in a horizontal or downward direction. Properly placed chocks will prevent line chafing. Kevels should be installed horizontally on foundation bases of sufficient size, and forces to kevels must be direct to the trunk and not the horns. Horns will fail when exposed to direct loads. And, NABRICO Products are not designed for use to lift a vessel.

Dimensions. All dimensions shown in this catalog are in feet and inches. Weights are in English pounds. Capacities are in short tons of 2,000 pounds. Please note that dimensions and weights are nominal and are subject to standard variations. Maximum test pressure on hatches, doors, and enclosures is 2 PSI unless advised in writing by NABRICO of a higher allowance. Product details and specifications are subject to change without notice.

NABRICO



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WINCHES

ELECTRIC
HYDRAULIC
MANUAL

HATCHES

WATERTIGHT
TWIST LOCK
QUICK ACTING

BITTS

DOUBLE BITT
SINGLE BITT
THRU-DECK BITT

CAPSTANS

HYDRAULIC
ELECTRIC
CUSTOMIZABLE

DOORS

6 DOG MANUAL
QUICK ACTING
4 DOG MANUAL

KEVELS

KEVEL CHOCK
KEVEL
THRU-DECK KEVEL

SIGNS

WARNING
CUT-OFF
OIL POLLUTION

CHOCKS

CAST STEEL
BUTTON
ROLLER BUTTON

BARGE CRANES

ELECTRIC OPERATION
MANUAL OPERATION

OIL TANKS

300 GALLON
600 GALLON
CUSTOM SIZES

OCEAN DOMES

MILD STEEL
STAINLESS STEEL

SUCTION BELLMOUTHS

6" SIZE
8" SIZE
10" SIZE