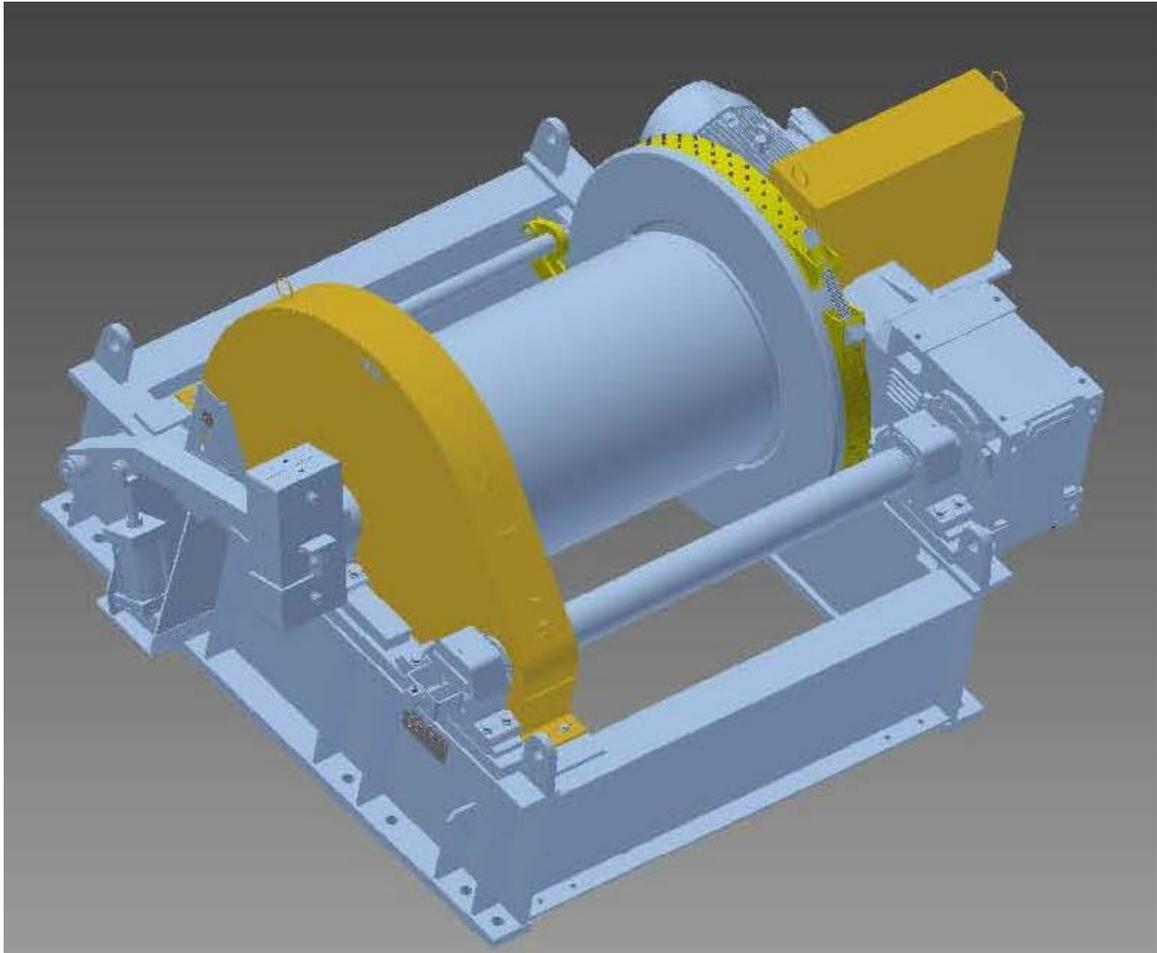




Owner's Manual



Model GP200-1-40EVFD WINCH

Serial Number 13-9007-1

TIMBERLAND EQUIPMENT LIMITED

Timberland Revision: 0

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1 Introduction

1.1 Foreword

This manual is to assist the operator in becoming familiar with the features of this equipment, and thereby becoming proficient in the operation and periodic maintenance procedures. This manual is provided with pertinent safety information, detailed operating, service, and installation instructions, as well as equipment data.

Keep this manual accessible and have all operation and maintenance personnel read it periodically. If this manual has been lost or becomes illegible and cannot be read, request a replacement manual from Timberland Equipment Limited.

If you require any servicing details, do not hesitate to call Timberland Equipment Limited's service department.

Timberland Equipment Limited will herein be referred to as Timberland.



WARNING

QUALIFIED OPERATORS ONLY- Study operator's manual. Injury or death can result from untrained operation.



WARNING

Misuse of this equipment can result in personal injury and property damage. Operating and maintenance instructions have been provided by Timberland Equipment Limited to the purchaser. Operators must be familiar with the instructions. Timberland recommends and can provide operation and maintenance training.



IMPORTANT NOTE

Where applicable, throughout this text, "Safety Alert" symbols have been used to indicate important safety measures. Read carefully, understand, and follow these instructions to prevent hazardous situations that could lead to risk of personal injury.

1.2 Model and Serial Number Record

In order to identify your machine and its components correctly, please record the model and serial numbers below and refer to them when ordering service parts from Timberland.

Customer: SNC Lavalin Inc.
Work Order(s): 9007, 9008
Equipment Serial(s): 13-9007-1, 13-9008-1
Date Shipped: February, 2014

Component: _____
Model No: _____
Serial No: _____

2 Warranty

TIMBERLAND warrants that it will repair F.O.B. its factory or furnish without charge F.O.B. its factory a similar part to replace any material in its machinery. Proved to the satisfaction of TIMBERLAND, all parts claimed defective shall be returned properly identified to TIMBERLAND's factory charges prepaid. TIMBERLAND will warrant all defects in workmanship for the period of twelve (12) months after said machinery is put into operation or eighteen (18) months after date of shipment from its plant, whichever expires first.

This Warranty to repair applies only to new and unused machinery, which, after shipment from the factory of TIMBERLAND, has not been altered, changed, repaired or treated in any manner whatsoever unless such alteration, change, repair or treatment has been previously authorized in writing by TIMBERLAND or has been performed by the authorized service representative of TIMBERLAND.

This Warranty to repair is the only Warranty either express, implied, or statutory, upon which the said machinery is sold; the company's liability in connection with this transaction is expressly limited to the repair or replacement of defective parts, all other damages and warranties, statutory or otherwise, being hereby expressly waived by the Purchaser.

Component parts and equipment not manufactured by TIMBERLAND are warranted only to the extent they are warranted by the supplier to TIMBERLAND. TIMBERLAND will use reputable suppliers.

TIMBERLAND shall not be liable for any incidental or consequential damages for breach of any warranty and the Purchaser's sole remedy for breach of any warranty or for any negligence of TIMBERLAND shall be as set forth herein.

TIMBERLAND makes no warranty that the machinery shall be merchantable or fit for any particular purpose nor does it make any other warranty, express or implied except as is expressly set forth herein. TIMBERLAND warrants that the machinery will conform to the description on the face hereof, that it will convey good title thereto; that such goods will be delivered free from any lawful security interest or other lien or encumbrance unknown to the purchaser except as otherwise expressly provided herein.

No representative of TIMBERLAND has authority to change this Warranty or this contract in any manner whatsoever and no attempt to repair or promise to repair or improve the machinery covered by this contract by any representative of TIMBERLAND shall waive any consideration of the contract or change or extend this Warranty in any manner whatsoever.

MODEL: GP200-1-40EVFD

APPROVED BY: 
JORDAN TRACHSEL – GENERAL SALES MANAGER

SERIAL #: 13-9007-1

DATED: February, 2014

3 Safety Rules

3.1 General

Should there be any information or instruction in this manual that are not in compliance with local laws and regulations in force in the country or region where this equipment is operated, the local laws and regulations must take precedence.

Timberland's basic policy is to produce products that are safe and reliable. However, even when using well engineered equipment, there will always remain an element of risk in heavy-duty equipment operation. Therefore, study the following safety measures carefully and apply them on the job.

As the operator and/or maintainer ensure that you become familiar with all occupational safety regulations pertaining to this type of machinery as well as all safety instructions pertaining to this equipment. Observe the instructions provided in this manual and on all hazard information labels on the machine.



WHEN THIS SIGN APPEARS IN THESE PAGES, IT INDICATES WHERE SPECIAL ATTENTION SHOULD BE PAID TO THE INSTRUCTIONS GIVEN, SINCE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT MAY OCCUR IF THE INSTRUCTIONS ARE NOT FOLLOWED.



DANGER indicates an imminently hazardous situation which if not avoided will result in serious injury or death.



WARNING indicates a potentially hazardous situation which if not avoided could result in death or serious injury.



CAUTION indicates a potentially hazardous situation which if not avoided may result in minor or moderate injury.

3.2 General Safety Precautions

1. The new owner, and all authorized operators must become familiar with the equipment and all operating and maintenance procedures, and be sure each day that the equipment is in safe operating condition including all guards and safety devices in place, before allowing it to be operated. Only fully trained and qualified personnel shall operate equipment.
2. Comply with the instructions in this manual and worksite regulations for the installation, operation, and maintenance of this equipment. Know the capabilities and limitations of the equipment and learn the most efficient operating techniques.
3. This equipment must be installed, operated and maintained in accordance with prevailing requirements of the local enforcing authorities.
4. Do not modify the equipment in any way, or failure of equipment and harm to personnel could result.
5. Keep a comprehensive and complete first aid kit in an easily accessible place.
6. Keep floors, steps and running boards, if applicable, clean and free from oil, ice, mud and loose objects.

3.3 General Operating Safety Precautions

1. Adhere strictly to ALL regulations at the work site pertaining to the operation of this equipment.
2. Only fully trained operators shall operate this equipment.
3. It is the responsibility of the owner to ensure the equipment is safely and properly installed and secured before running.
4. Check lubrication before use.
5. Operate the equipment only when physically fit and not under the influence of alcohol or drugs.
6. Prior to commencing work after a repair, check all equipment controls and ensure that the machine responds correctly.
7. Test that ALL emergency stop functions are operating properly.
8. Use recommended safety devices, i.e. gloves, safety boots, hard hats, goggles and ear protection, and wear protective clothing when and where required.
9. Before starting the equipment, make certain that controls are in neutral and brakes are applied.
10. For vertical lift applications, ensure brake hold prior to making complete lift by lifting load a short distance and releasing control.
11. Keep your head, hands, feet and loose clothing away from any moving parts of the equipment.
12. Ensure all personnel are clear of working equipment and use only approved communication practices.
13. Do not lift loads with personnel underneath. Do not walk or work under a load or in line of force of any load and do not allow others to do so either.
14. Do not exceed the load rating of the winch or any other component in the system or failure of the equipment could result. Recommended performance ratings are outlined in the specifications section of this manual.
15. Do not use damaged or malfunctioning equipment or failure of the equipment could result.
16. Do not leave a load suspended.
17. Equipment must be isolated when left unattended, to prevent unauthorized use. Misuse can result in personal injury and property damage.

3.4 General Servicing Safety Precautions

1. Adhere strictly to ALL regulations at the work site pertaining to the operation of this equipment.
2. Only qualified and trained, skilled technicians should perform service or repairs on this equipment.
3. Before performing maintenance or repair work on any equipment, consult the section of this manual on servicing and follow the recommended procedures.
4. When servicing or repairing the equipment, shut down the equipment unless it is required to be running for adjustment purposes. Do not service equipment with any load. Electrical panels, where applicable, should have power removed and breakers locked out. Follow applicable on-site safety regulations.
5. Always use the proper tools for the job. Repair or replace any broken or damaged tools, including lifting equipment, immediately.
6. Keep your head, hands, feet and loose clothing away from power-driven parts.
7. Pressure can be maintained in the hydraulic or pneumatic circuits, where applicable, long after the power source and pump have been shut down. Relieve ALL trapped pressures before performing any service work to the pneumatic or hydraulic components.
8. When troubleshooting a hydraulic system for leaks, where applicable, use a piece of cardboard or other material as detector - rather than your hand. Pressurized air or hydraulic fluid escaping from a faulty component can cause serious injury.
9. Do not change the pressure setting of ANY fixed setting hydraulic component, if applicable.
The pressure (air) setting for the brake must match what is specified.
10. Use CAUTION when draining hot fluids from a machine. Splashing hot fluid can cause serious burns.
11. If dismantling any part of the equipment, be sure that all machined parts and faces are thoroughly cleaned and free of any foreign matter before re-assembly. Take care that the matching parts fit exactly and are not marred or soiled. Positive alignment is dependent on accurate fitting. Be sure spigots are pulled together evenly.
12. Inspect the equipment regularly for signs of damage, unusual wear, fluid leaks or faulty operation.
13. Replacement parts must be specified and/or manufactured by TIMBERLAND only.

3.5 Fire Prevention

Fires can create severe emergencies where both human life and property may be lost. Even when confined, a fire may cause very expensive damage to your equipment. Fire can strike at any time, not only when the equipment is used, but also when left unattended between work shifts, and nobody is around to fight it.

When working in a confined environment, it is difficult to prevent combustible material from collecting in tight corners of the equipment. This material, in itself, may not cause a fire; however, when mixed with fuel, oil or grease in a hot and confined place, it can become a fire hazard.

To reduce the chances for a fire to break out, follow the preventative instructions listed below:

1. Inspect the machine regularly for potential fire hazards and make ANY necessary repairs immediately.
2. Always ensure that excess grease and oil accumulation, including spillage, are cleaned up immediately.
3. Use only nonflammable cleaning agents for cleaning the machine or ANY machine component.
4. Store oily rags and other combustible materials in a fireproof location.
5. Before performing repair work such as welding, the area surrounding the repair location must be clean and clear of debris, and a fire extinguisher positioned close by.
6. Maintain a charged fire extinguisher on or near the equipment at ALL times. KNOW HOW TO USE IT!

3.6 Grounding Equipment and Methods (where applicable)

Grounding equipment and methods information is covered in the following publications:

TECHNICAL REPORT - TYPE 2 (I.E.C. TR61911)
Installation of Distribution Conductors
(Stringing Equipment and Accessory Items)
TECHNICAL REPORT - TYPE 2 (I.E.C. TR1328)
Installation of Transmission Line Conductors and Earthwires
(Stringing Equipment and Accessory Items)

The above publications are available through the following organization:

INTERNATIONAL ELECTROTECHNICAL COMMISSION
3, RUE DE VAREMBE, PO BOX 131,
CH-1211 GENEVA 20, SWITZERLAND
PHONE: +41 22 919 0211
FAX: +41 22 919 0300
E-MAIL: inmail@iec.ch
WEBSITE: <http://www.iec.ch>

S-1241A

3.7 Decals

Your Equipment was shipped from the factory with safety and operator decals pre-installed.

Should any of these decals be missing, the proper operation and / or maintenance of the unit could be hindered, which may result in personal injury and / or property damage.

If any of these decals are missing, please contact us for a replacement. Refer to the decal list drawing included in the “Equipment Drawing” sections of this manual.

Order the decal(s) by stating decal number, description, and quantity.

TIMBERLAND EQUIPMENT LIMITED

P.O. Box 490

Woodstock, Ontario

N4S 7Z2

Attention – Service Manager

T: (International Code 1) 1-519-537-6262

E: service@tewinch.com

www.timberland.on.ca

4 Specifications

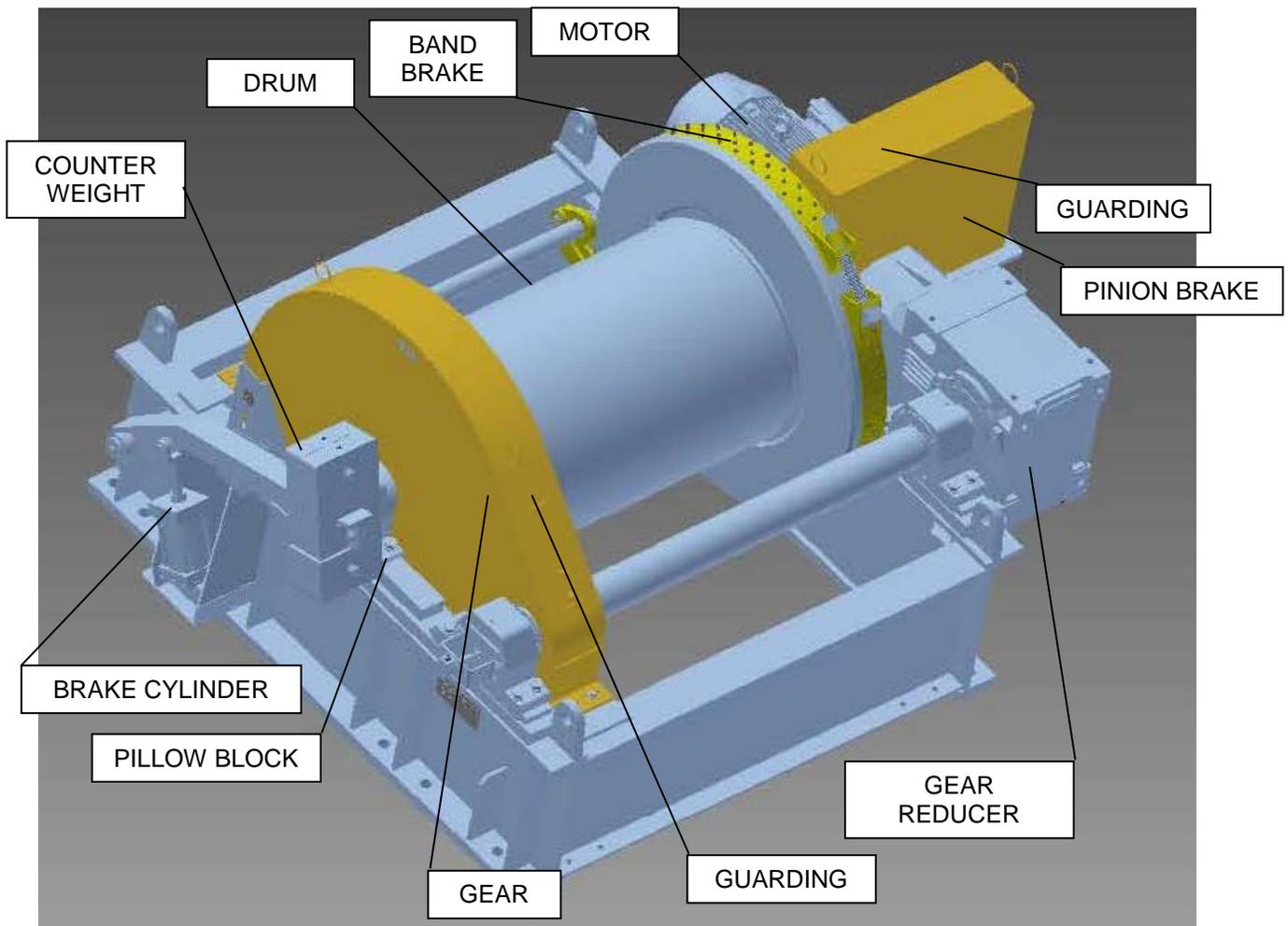
4.1 Introduction

To obtain the best performance from your Timberland manufactured equipment, it is important that the machine functions and the operating procedures are well understood. Read this section (and the manual in its entirety) carefully and use as a reference until complete proficiency is achieved.

4.2 Equipment Description

This specification describes a Timberland GP200-1-40EVFD Winch.

The GP200-1-40EVFD is a single plain faced drum used for handling materials only. The electric motor powers a gear reducer to rotate the drum.



4.3 Equipment Rating

LAYER	LINEPULL (LBS)	LINESPEED (FPM)	CAPACITY (FT)
1	23,871	41.9	370
2	22,424	44.6	764
3	21,143	47.3	1,182
4	20,000	50.0	1,624

Winch is rated for use with 1 inch diameter wire rope only.



WARNING

These values are a maximum and must not be exceeded.



WARNING

Do NOT operate winch under load if there are over four layers on the drum.



WARNING

THIS HOIST IS TO BE USED FOR MATERIAL ONLY; IT IS NOT TO BE USED FOR HOISTING OR LOWERING PERSONNEL UNDER ANY CIRCUMSTANCES.



WARNING

Always leave three dead wraps of rope on the drum during operation.

5 Installation

5.1 Equipment Installation



It is the responsibility of the owner to ensure that the equipment is safely and properly installed and secured before operating.



WARNING

Ensure that the winch base makes full contact with the mounting base. Any gaps must be removed using shimming materials inserted with the equipment in a relaxed state (not torqued down). Failure to do so could result in premature failure of winch components.

Refer to the following drawings provided in this manual for equipment footprint and base reaction loads.

30-00139-000 GA – GP200-1-40EVFD

1. The winch must be installed on a level, flat, stable mounting surface that is capable of handling the loads imposed by the equipment within allowable stresses and without deflection. Refer to drawing 30-00139-000 for winch loading.
2. Only use the lifting points shown as indicated for handling. Ensure that no other points on the winch are used to lift the unit. View the “Lifting Methods” section for detailed instructions.
3. The foundation must be match drilled to the hoist foundation to ensure that the bolt holes are aligned. Do not drill the foundation holes until the hoist has been set in place and is level within 1/16”. Ensure that the hoist is positioned so that the rope entry/exit is as prescribed for the application. (i.e. no interferences and fleeting angles optimized)
4. Mounting considerations are imperative to minimize machinery stress and maintain proper alignment.
5. Shim and grout the winch mounting points as necessary to ensure a matching face to the winch base. The hoist must sit level to ensure proper gear contact with a backlash of 0.030 – 0.040. Shim the base under the bolt holes as required ensuring proper alignment.
6. All mounting holes on the base must be used and the bolts must be properly torqued.
Quantity: 30, Size: 1 1/4”-4NC, Grade: Gr.8 Torque Value: Lubricated & torqued to 400 ft-lbs.
7. Inspect the connection and the integrity of the electrical cables. For electrical cables inside cabinets, inspection must be conducted by qualified personnel only.
8. Ensure that all fluids are verified at the correct levels (Gearbox Fluids). In addition ensure that all grease points are properly greased.
9. Perform any required paint touch ups as required.
10. Check rope clamp torque value of 200 ft-lbs.

5.2 Equipment Commissioning



It is the responsibility of the owner to ensure that the equipment is safely and properly set up and commissioned before operating.

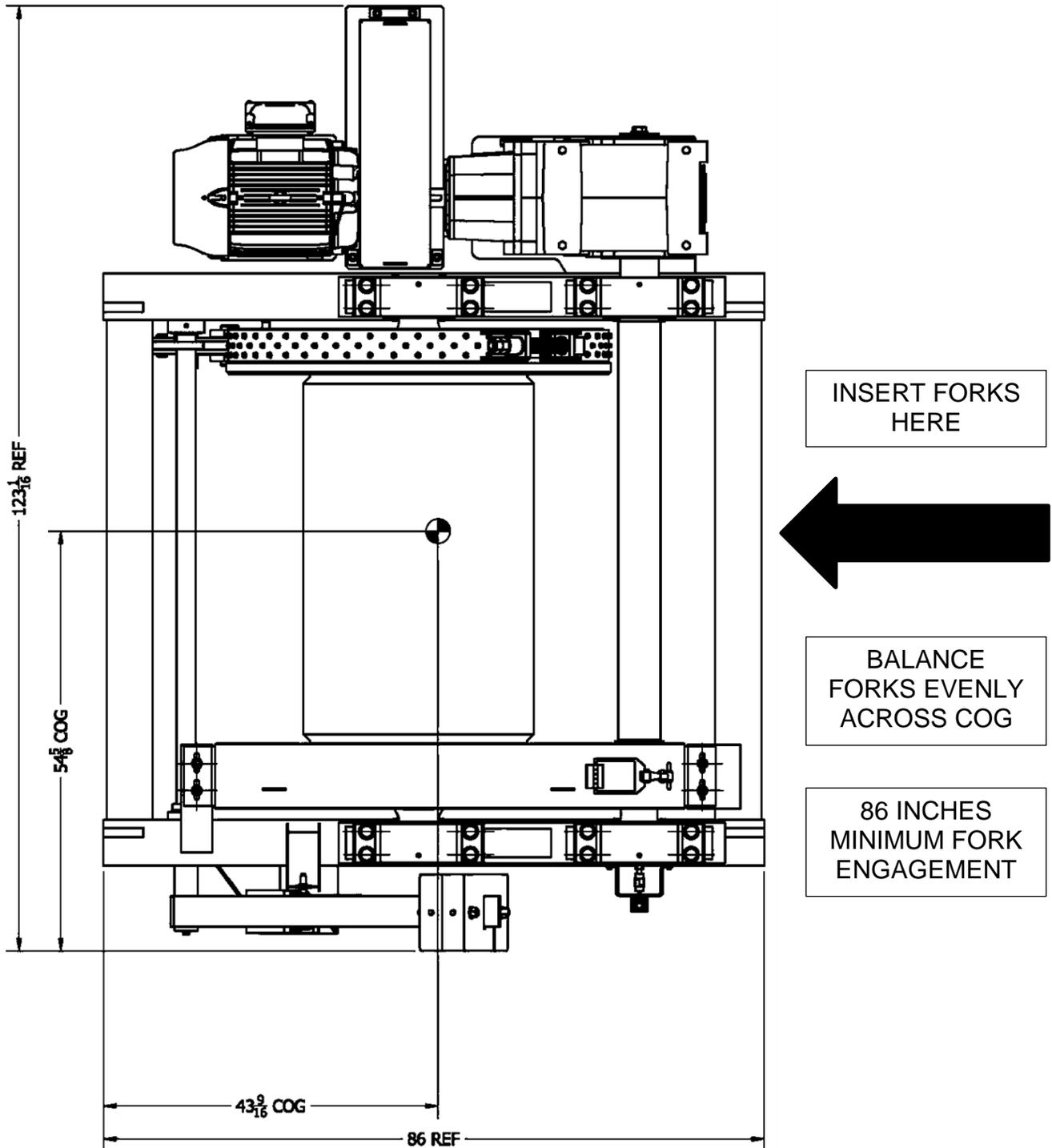
1. Inspect the connection and the integrity of the electrical cables. For electrical cables inside cabinets, inspection must be conducted by qualified personnel only.
2. Ensure that the gearbox oil is verified at the correct levels. In addition ensure that all grease points are properly greased.
3. Operate the equipment to ensure all controls function correctly.

5.3 Lifting Methods

The GP200-1-40EVFD is equipped to be lifted by either of the following two methods.

1. A four point lift using the lugs built into the frame; or
2. Via a fork truck (minimum fork engagement is 86 inches).

The fork truck must be correctly oriented for safe lifting. View below image for specifications.



6 Operation

6.1 Control Panel Functions

6.1.1 Main Disconnect Panel

DEVICE	DESCRIPTION
EMERGENCY STOP - push button	PUSHED IN - Disconnects the safety relay and engages all brakes PULLED OUT - Restores normal operating functionality
MAIN DISCONNECT - switch	OFF - Removes power from the system ON - Reconnects the system to the power
POWER ON - light	Illuminated (green) indicates control panel is operational

6.1.2 Operator Control Console

DEVICE	DESCRIPTION
EMERGENCY STOP - push button	PUSHED IN - Removes power from the controls and engages both sets of brakes PULLED OUT - Return power to controls
FAULT - light	Illuminated (red) indicates the system is not operational and troubleshooting is required (see HMI screen for errors)
FAULT RESET - button	Acts as power reset button Once fault has been manually corrected, pressing fault reset button resets safety relay and reconnects control console to the power
HMI Display Screen	Allows for various option selection ie. High and low speed line speed (low and high linepull respectfully)
DIRECTIONAL CONTROL LEVER	NEUTRAL - No movement of the drum PAYOUT - Pays rope off of the drum PULL IN - Pulls rope onto the drum
BRAKE TEST - switch	NORMAL - Brake operates normally MOTOR - Activates the motor brake test BAND - Activates the band brake
SYSTEM LOCKOUT - key switch	OFF - Removes power from controls ON - Activates the controls (connecting power)

6.2 Equipment Operation



WARNING

Review the safety, specifications, and installation sections of this manual prior to startup of the equipment.



WARNING

Hoist must not be operated if either of the braking systems are not functioning properly.



WARNING

Do not exceed 2000 psi at HPU any time while operating this equipment.



WARNING

The holding power of the brakes and proper functioning of all machine controls must be verified before the hoist is put into service to ensure safe and correct operation.

6.2.1 Starting the Hoist Unit (Normal Operation)

6.2.1.1 Main Control Panel



WARNING

Do not restart the unit until the reason for the shutdown is clearly understood and corrected.

1. To turn on the main power, turn the **panel disconnect** switch clockwise, the light will turn green when the main panel **power** is on.
2. Reset the **emergency stop** push button. The **emergency stop** push button will shut down all output functions from the controls and both sets of brakes will apply.

6.2.1.2 Operator Control Console

1. Ensure the Main Control Panel is ready as outlined in 6.2.1.1. When the console panel has power, the **HMI display screen** will light up.
2. Ensure the **system lockout** key is inserted and the switch is turned to the right (clockwise) position. If such is not the case, the system will be locked out and all control functions inoperable.
3. Reset the **emergency stop** push button.
4. Check the **fault** light. If illuminated red, check the HMI display to determine the fault.
5. Press the **fault reset** button once the **fault** issue has been resolved.
6. Use the **directional control lever** to operate the winch. Push the **directional control lever** away from operator to payout rope (travel downward). Pull the **directional control lever** towards operator to pull in rope (travel upwards). Return the **directional control lever** back to the center (neutral) position to stop the hoist.

6.2.2 Stopping the Hoist

1. Return the **directional control lever** to the neutral (center) position.
2. Brakes will apply automatically.

6.2.3 Paying Out

1. Turn power on by turning the **panel disconnect** to the “**on**” position.
2. Reset the **emergency stop** buttons.
3. Ensure that the general **fault** indicators are not illuminated on the control console. Troubleshoot as necessary and press the **fault reset** button once corrected.
4. Pay out rope from the equipment by moving the **directional control lever** slowly to pay out (the further away from neutral the **directional control lever** is moved, the faster payout speed will be).
5. Slow the hoist prior to stopping by moving **directional control lever** smoothly and slowly toward neutral.
6. Stop by moving the **directional control lever** on the control console to neutral.
7. Press the **emergency stop** button and return the **panel disconnect** to the “**off**” position.

6.2.4 Pulling In Rope

1. Turn power on by turning the **panel disconnect** to the “**on**” position.
2. Reset the **emergency stop**.
3. Ensure that the general **fault** indicators are not illuminated on the control console. Troubleshoot as necessary and press the **fault reset** button once corrected.
4. Pull in rope by moving the **directional control lever** on the hoist control console slowly to pull in (the further away from neutral the faster the pull in speed).
5. Slow the hoist prior to stopping by moving **directional control lever** smoothly and slowly toward neutral.
6. Stop by moving the **directional control lever** on the control console to neutral.
7. Press the **emergency stop** button and return the **panel disconnect** to the “**off**” position.

6.2.5 Limit Checks



NOTICE

The limit checks must be performed under no load.

6.2.5.1 Check Upper Over Travel Limits

1. Start the conveyance up the shaft.
2. It must trip upper limit and the hoist will stop immediately.
3. Follow the travel limit back away procedure as described previously.

6.2.5.2 Check Lower Over Travel Limits

1. Start the conveyance down the shaft.
2. It must trip lower limit and the hoist will stop immediately.
3. Follow the travel limit back away procedure as described previously.

6.2.5.3 Over Speed Shutdown

The over speed shutdown is normally set approximately 10% above the speed of hoist, but may be governed by applicable Safety Codes if set at anything other than 10%.

6.2.6 Brake Test



WARNING

The hoist must not be operated if either (or both) of the braking systems are not functioning properly.



NOTICE

Brake tests must be performed prior to each shift.

6.2.6.1 Band Brake Test

1. From the **HMI display screen** activate the **band brake test**.
2. The **band brake** green light on the **HMI display screen** indicates that the band brake is now activated.
3. Move the **directional control lever** to the payout position.
4. Watch the "**motor current (a)**" on the **HMI display screen** rise to approximately 44.5 Amperes. This simulates that the band brake is able to hold at least 120% of the hoist's rated torque.
5. The drum must not turn. If the drum turns the band brake needs to be serviced.
6. Return the **directional control lever** to the neutral position.
7. From the **HMI display screen**, press the "**cancel brake test**" push button.

6.2.6.2 Drive Brake Test

8. From the **HMI display screen** activate the **drive brake test**.
9. The **drive brake** green light on the **HMI display screen** indicates that the drive brake is now activated.
10. Move the **directional control lever** to the payout position.
11. Watch the "**motor current (a)**" on the **HMI display screen** rise to approximately 44.5 Amperes. This simulates that the drive brake is able to hold at least 120% of the hoist's rated torque.
12. The drum must not turn. If the drum turns the drive brake needs to be serviced.
13. Return the **directional control lever** to the neutral position.
14. From the **HMI display screen**, press the "**cancel brake test**" push button.

6.3 HMI Operations

Display

1. **Motor status** (“on”/ “off”) indicates whether the motors are running (“on”) or off.
2. **Band brake status** (“on”/ “off”) indicates whether the band brakes are applied (“on”) or released.
3. **Drive brake status** (“on”/ “off”) indicates whether the drive brake is applied (“on”) or released.
4. **Line speed** indicates current line speed in feet per minute.
5. **Rope distance** indicates current rope distance in feet.
6. **Oil pressure** indicates current oil pressure in psi at inlet of motor.
7. **Oil temperature** indicates current oil temperature in degrees Celsius at hydraulic reservoir.
8. **Hour meter** keeps count of the hours that the e-motor has run.

Warning/Fault

1. **Band brake fault** indicates that the brake will not release.
2. **Drive brake fault** indicates that the brake will not release.
3. **Device fault** indicates that a device (instrument) has become faulty.
4. **High oil temperature** indicates that the oil temperature is too high at the reservoir.
5. **Over speed** indicates that the winch speed is too high.
6. **Over travel** indicates that the winch has travelled too far.
7. **Low oil level** indicates low oil level in reservoir.
8. **Safety relay de-energized** indicates whether or not the safety relay is active.

6.3.1 HMI Operator Screens

Figure 1: Start-Up Screen (opening menu)



Description:

Upon connecting power to the operator console, the **HMI display** will turned on to this screen
Note: The **panel disconnect** switch must be turned clockwise to the “on” position.
The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

Shutdown fault reset required: Illuminates when a fault has occurred and **fault reset** must be pressed.
Main: Selecting will direct the HMI display to the Main Operation Screen (**Figure 3**).
Maintenance: Selecting will direct the HMI display to the Maintenance Screen (**Figure 4**).
PLC I/O status: Selecting will direct the HMI display to the Analog Input Screen (**Figure 7**).
Alarm status: Selecting will direct the HMI display to the Alarm Screen (**Figure 10**).

Figure 2: Warning Alert Screen



Description:

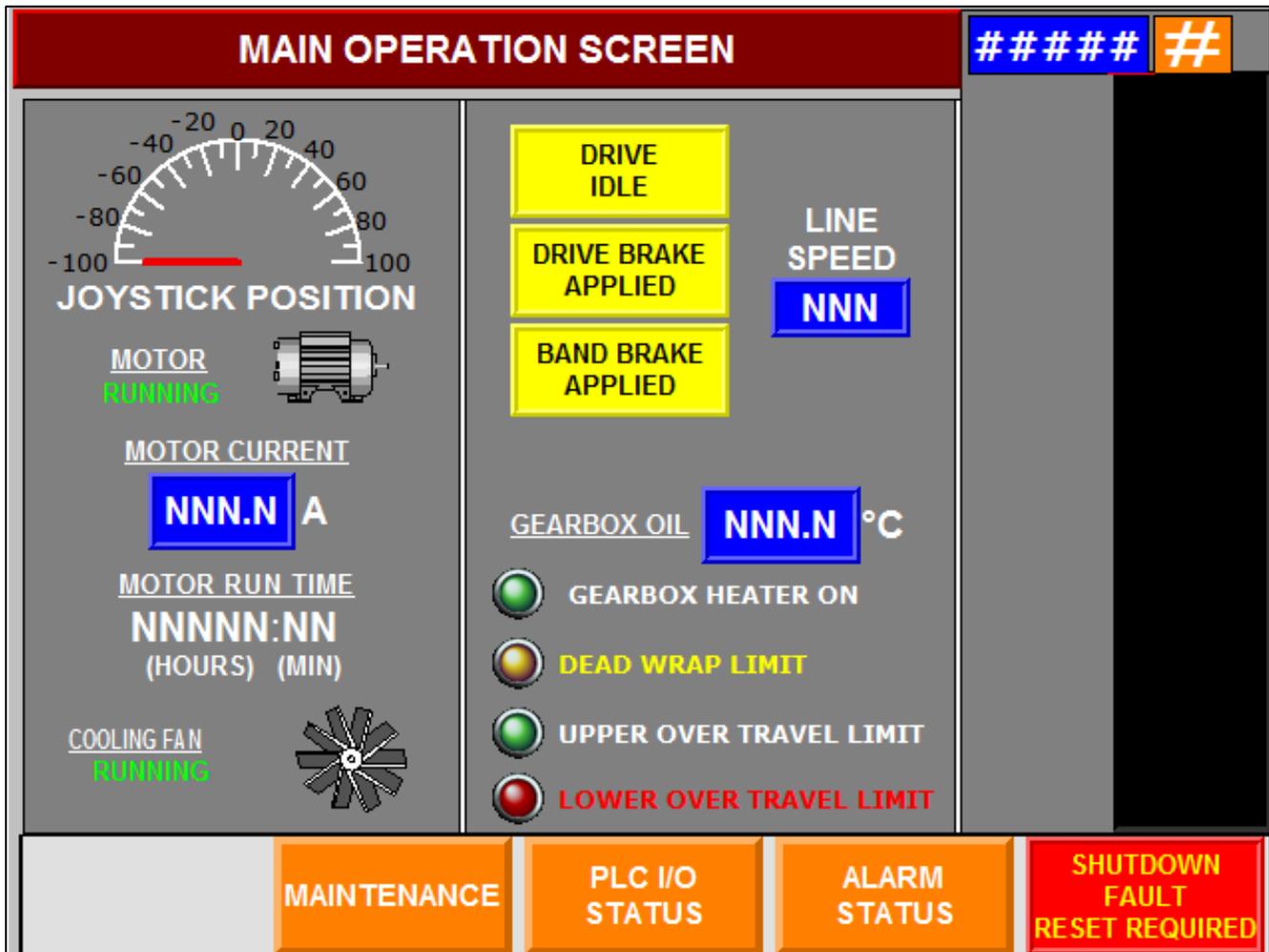
Upon selecting “*maintenance*”, this screen will appear on the *HMI display*.
The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

Back to main: Selecting will direct the HMI display to the Main Operation Screen (*Figure 3*).

Acknowledge (...): Read instructions outlined on the *HMI display* and ensure all warnings are heeded.
Selecting will direct the *HMI display* to the Maintenance and Diagnostics Screen (*Figure 4*).

Figure 3: Main Operation Screen



Description:

Upon selecting “main”, this screen will appear on the *HMI display*. The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

- Shutdown fault reset required:** Illuminates when a fault has occurred and **fault reset** must be pressed.
- Maintenance:** Selecting will direct the HMI display to the Maintenance Screen (*Figure 4*)
- PLC I/O status:** Selecting will direct the HMI display to the Analog Input Screen (*Figure 7*).
- Alarm status:** Selecting will direct the HMI display to the Alarm Screen (*Figure 10*).

Left Section of Display:**Joystick position:**

- A negative number indicates the **directional control lever** is in payout position.
- A positive number indicates the **directional control lever** is in pull in position.

Motor:

Running (changes): Displays the status of the motor.

- When the indicator is green, the motor is running.
- When the indicator is red, the motor is not running (reads **stopped**).

Motor current: the current of the motor will be displayed in AMPS where **NNN.N** is shown.

Motor run time:

NNNN:NN: The total run time of the motor will be displayed in (HOURS: MINUTES) here.

Cooling Fan:

Running (changes): Displays the status of the fan.

- When the indicator is green, the fan system is running.
- When the indicator is red, the fan system is not running (**stopped**).
- When the indicator is white, the fan system is disconnected (**no comm**).

Middle Section of Display:

Drive idle (changes): Displays the status of the motor drive.

Yellow button indicates the drive is idling

Drive brake applied (changes): Displays the status of the drive brake.

Yellow button indicates the drive brake is applied.

Band brake applied (changes): Displays the status of the band brake.

Yellow button indicates the band brake is applied.

Line speed: The speed of the line will be displayed in FPM where **NNN** is shown.

Gearbox oil: The temperature will be displayed in degrees Celsius where **NNN.N** is shown.

Gearbox heater on (changes):

Green indicates the gearbox heater is running.

Dead wrap limit:

Yellow indicates the dead wrap limit for the winch has been reached.

Upper over travel limit and **lower over travel limit:**

Red indicates the corresponding over travel limit is activated.

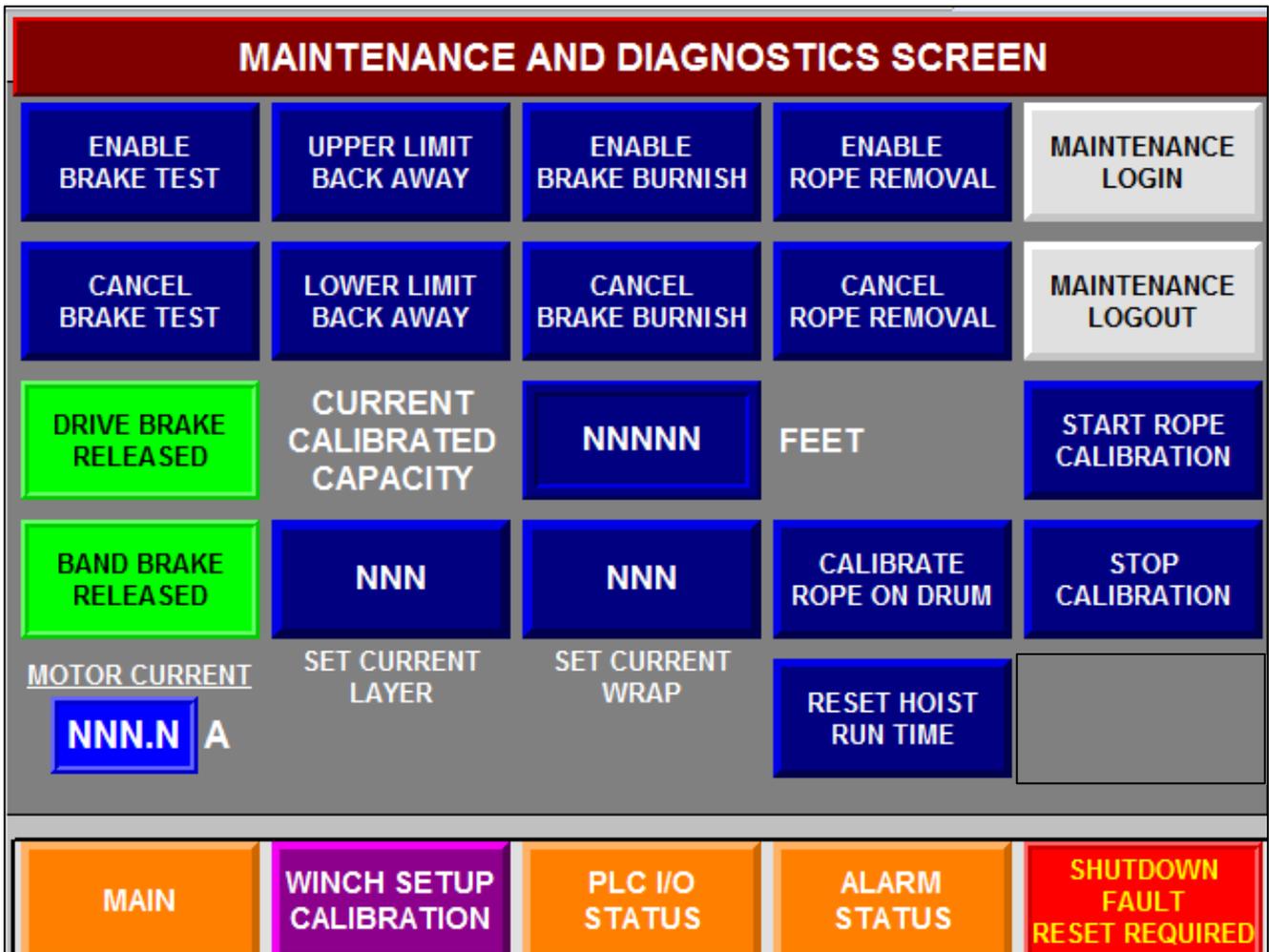
Right Section of Display:

####. The line depth (in text) is displayed here.

#. The rope layer number is displayed here.

The dark bar displays the conveyance position in the shaft relative to the collar and shaft bottom.

Figure 4: Maintenance Screen



Description:

Upon selecting “*maintenance*”, this screen will appear on the **HMI display**. The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

- Shutdown fault reset required:** Illuminates when a fault has occurred and **fault reset** must be pressed.
- Main:** Selecting will direct the HMI display to the Main Operation Screen (**Figure 3**).
- Winch setup calibration:** Selecting will direct the HMI display to the Calibration Screen (**Figure 5**).
- PLC I/O status:** Selecting will direct the HMI display to the Analog Input Screen (**Figure 7**).
- Alarm status:** Selecting will direct the HMI display to the Alarm Screen (**Figure 10**).

Enable brake test: Selecting this button enables the brake test function.

Cancel brake test: Selecting this button cancels the brake test function.

Upper limit back away: Selecting this button allows line to be lowered after reaching upper limit.

Lower limit back away: Selecting this button allows line to be raised after reaching lower limit.

Enable brake burnish: Selecting this button enables the brake burnish function.

Cancel brake burnish: Selecting this button cancels the brake burnish function.

Enable rope removal: Selecting this button enables the rope removal function.

Cancel rope removal: Selecting this button cancels the rope removal function.

Maintenance login: Selecting will permit access for inputting data for rope calibration..

Maintenance logout: Selecting will close the calibration mode access.

Drive brake released (changes):

Green button indicates the drive brake is released.

Band brake released (changes):

Green button indicates the band brake is released.

Current calibrated capacity:

Feet: The length of rope on the drum will be displayed in feet where **NNNNN** is shown.

Set current layer: The rope layer number will be displayed where **NNN** is shown.

Set current wrap: The rope wrap number will be displayed where **NNN** is shown.

Calibrate rope on drum: Selecting will calibrate the length of rope on the drum (must login first).

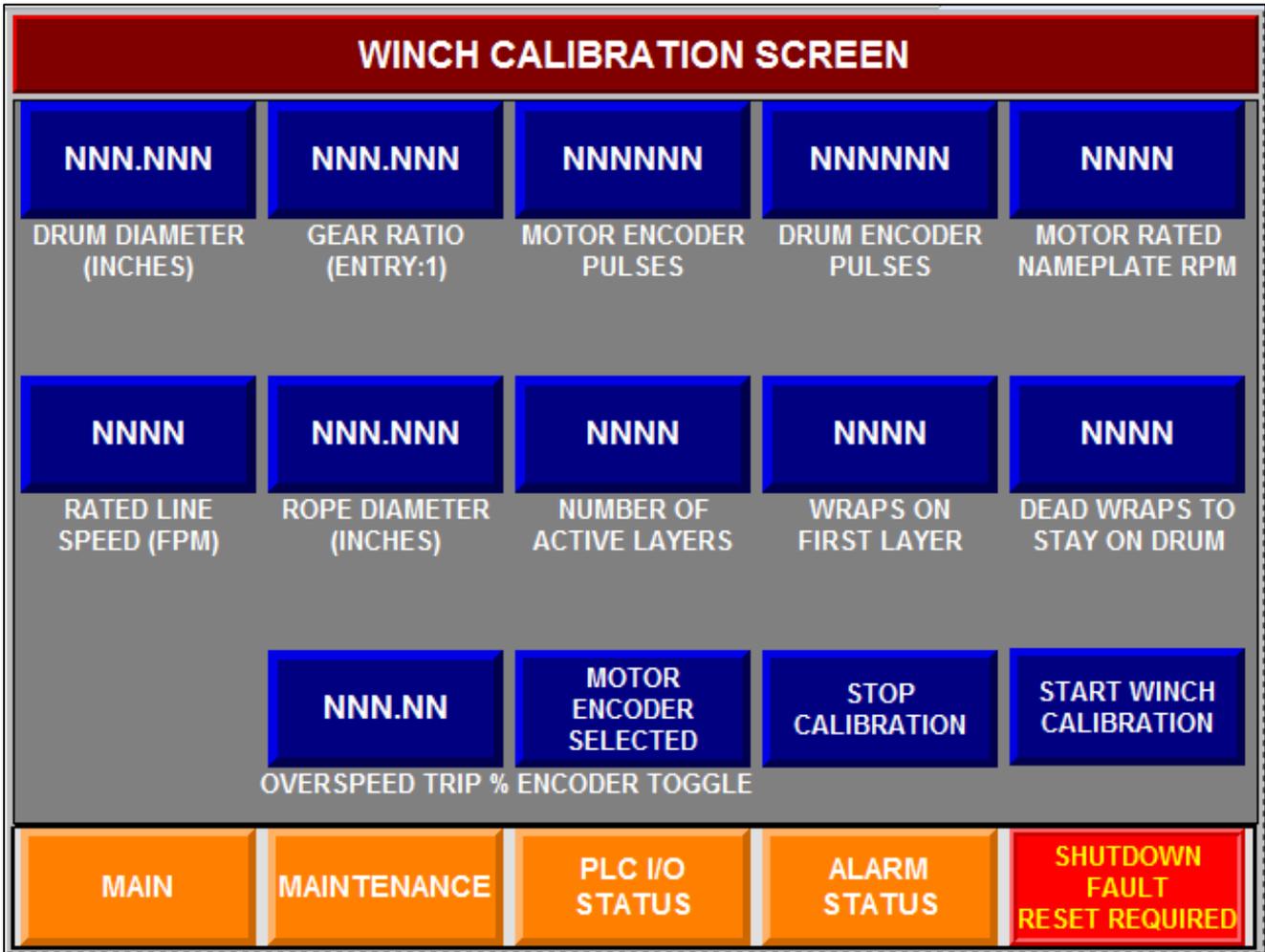
Start rope calibration: Selecting this button starts the rope calibration.

Stop calibration: Selecting this button cancels the rope calibration.

Motor current: The current of the motor will be displayed in AMPS where **NNN.N** is shown.

Reset hoist run time: Selecting will reset the runtime clock back to 0 hours: 0 minutes.

Figure 5: Calibration Screen



Description:

Upon selecting “**winch setup calibration**” from the Maintenance and Diagnostics Screen (**Figure 4**), the **HMI display** will show this screen. The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

- Shutdown fault reset required:** Illuminates when a fault has occurred and **fault reset** must be pressed.
- Main:** Selecting will direct the HMI display to the Main Operation Screen (**Figure 3**).
- Maintenance:** Selecting will direct the HMI display to the Maintenance Screen (**Figure 4**).
- PLC I/O status:** Selecting will direct the HMI display to the Analog Input Screen (**Figure 7**).
- Alarm status:** Selecting will direct the HMI display to the Alarm Screen (**Figure 10**).

Drum diameter: The diameter of the drum will be displayed in inches where **NNN.NNN** is shown.

Gear ratio: The ratio of the gears will be displayed where **NNN.NNN** is shown..

Motor encoder pulses: The rate of pulses will be displayed where **NNNNN** is shown.

Drum encoder pulses: The rate of pulses will be displayed where **NNNNN** is shown.

Rated line speed: The speed of the line will be displayed in FPM where **NNNN** is shown.

Rope diameter: The diameter of the rope will be displayed in inches where **NNN.NNN** is shown.

Active layers: The number of active layers will be displayed where **NNNN** is shown.

Wraps on first layer: The number of wraps on the first layer will be displayed where **NNNN** is shown.

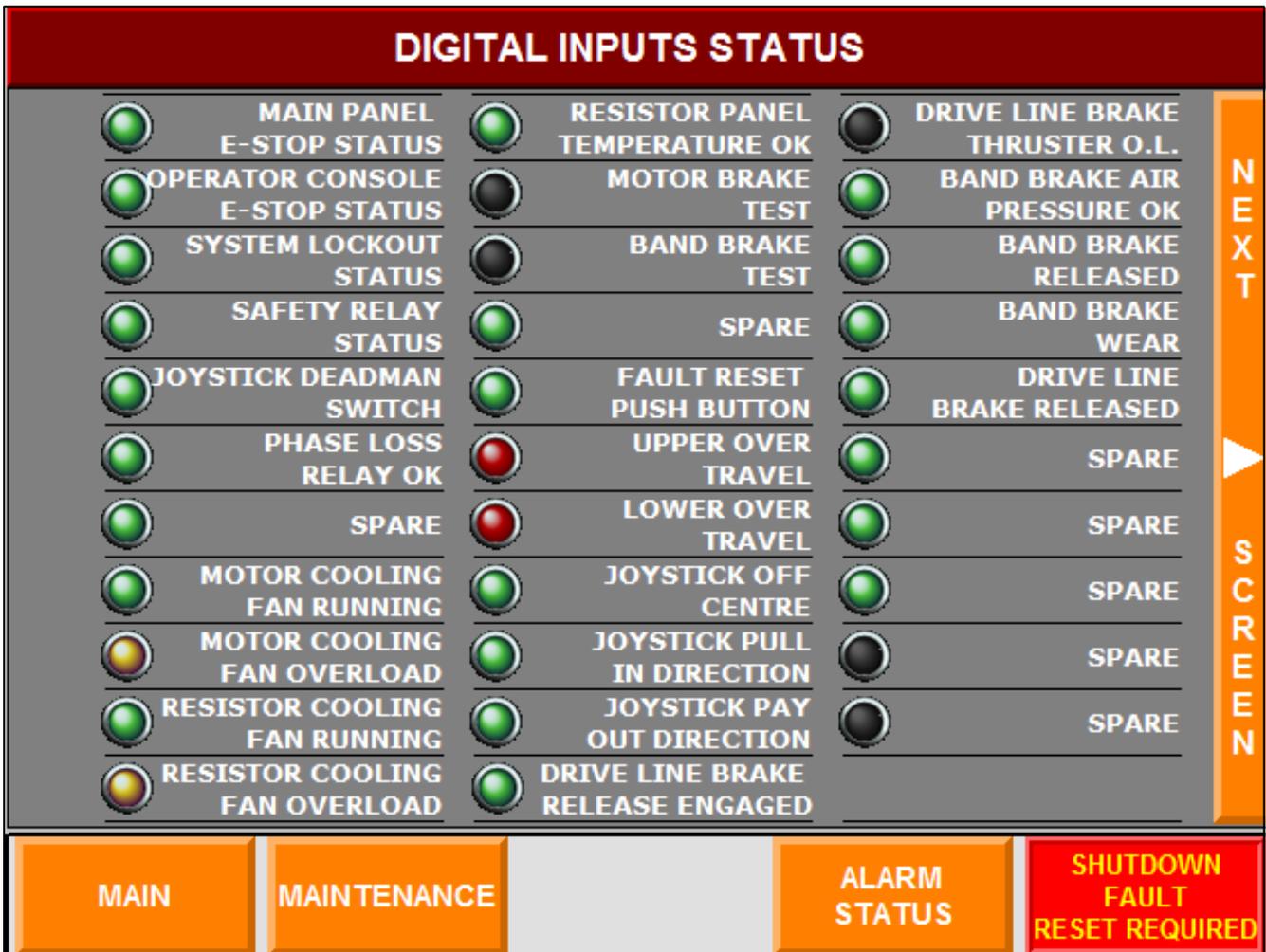
Overspeed trip %: The percentage of the normal speed that when reached above said normal speed. will activate the overspeed trip. The percentage will be displayed where **NNN.NN** is shown.

Motor encoder selected (changes): Selecting will toggle through the different available encoders:

Stop calibration: Selecting this button cancels the winch calibration.

Start winch calibration: Selecting this button starts the winch calibration.

Figure 6: Digital Input Screen



Description:

Upon selecting “**PLC I/O status**”, this screen will appear on the **HMI display**.
 Or upon selecting “**prev screen**” from the Analog Input Screen (**Figure 7**), the **HMI display** will be directed to this screen.

The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

Shutdown fault reset required: Illuminates when a fault has occurred and **fault reset** must be pressed.

Main: Selecting will direct the HMI display to the Main Operation Screen (**Figure 3**).

Maintenance: Selecting will direct the HMI display to the Maintenance Screen (**Figure 4**)

Alarm status: Selecting will direct the HMI display to the Alarm Screen (**Figure 10**).

Next Screen: Selecting will direct the HMI display to the next status screen (**Figure 7**).

Main panel E-stop and Operator console E-stop:

- When indicator is red, the emergency stop button is pressed (power removed).
- When indicator is green, the emergency stop button is disengaged.

System lockout status:

- When indicator is off, the system lockout key is in the lockout position.
- When indicator is green, the system lockout key is in the system enable position.

Safety relay status:

- When indicator is green, the safety relay is engages (system ready to operate).
- When indicator is off, the safety relay output status is disengaged (fault has occurred).

Joystick deadman switch:

- When indicator is red, the joystick deadman switch is activated.
- When indicator is green, the system is ready to operate.

Phase loss relay ok:

- When indicator is red, a fault has been detected.
- When indicator is green, the phase loss relay is ready to operate.

Spare: Extra features may be added to the program, but currently, the spare, can be ignored.

Motor cooling fan running and Resistor cooling fan running:

Green indicates the cooler fan is running.

Motor cooling fan overload and Resistor cooling fan overload:

Red indicates the corresponding fan motor has experienced an overload.

Resistor panel temperature ok:

Green indicates the temperature of the resistor panel is in operating range.

Motor brake test and Band brake test:

Illuminated indicator represents that the corresponding brake test is activated.

Fault reset push button:

Illuminated indicator represents that the fault reset push button is activated.

Upper over travel and lower over travel:

- When indicator is green, corresponding over travel limit is not activated.
- When indicator is red, corresponding over travel limit is activated.

Joystick off center:

- When the indicator is off, the directional control lever is not in neutral.
- When the indicator is green, the directional control lever is in neutral.

Joystick payout direction and Joystick pull in direction:

When indicator is green, the directional control lever is in the stated position.

Drive line brake release engaged:

- When the indicator is off, the drive brake is applied.
- When the indicator is green, the drive brake is released.

Drive line brake thruster O.L.:

Illuminated indicator represents that the drive brake has been overloaded.

Band brake air pressure ok:

Illuminated indicator represents that the band brake air pressure is in operating range.

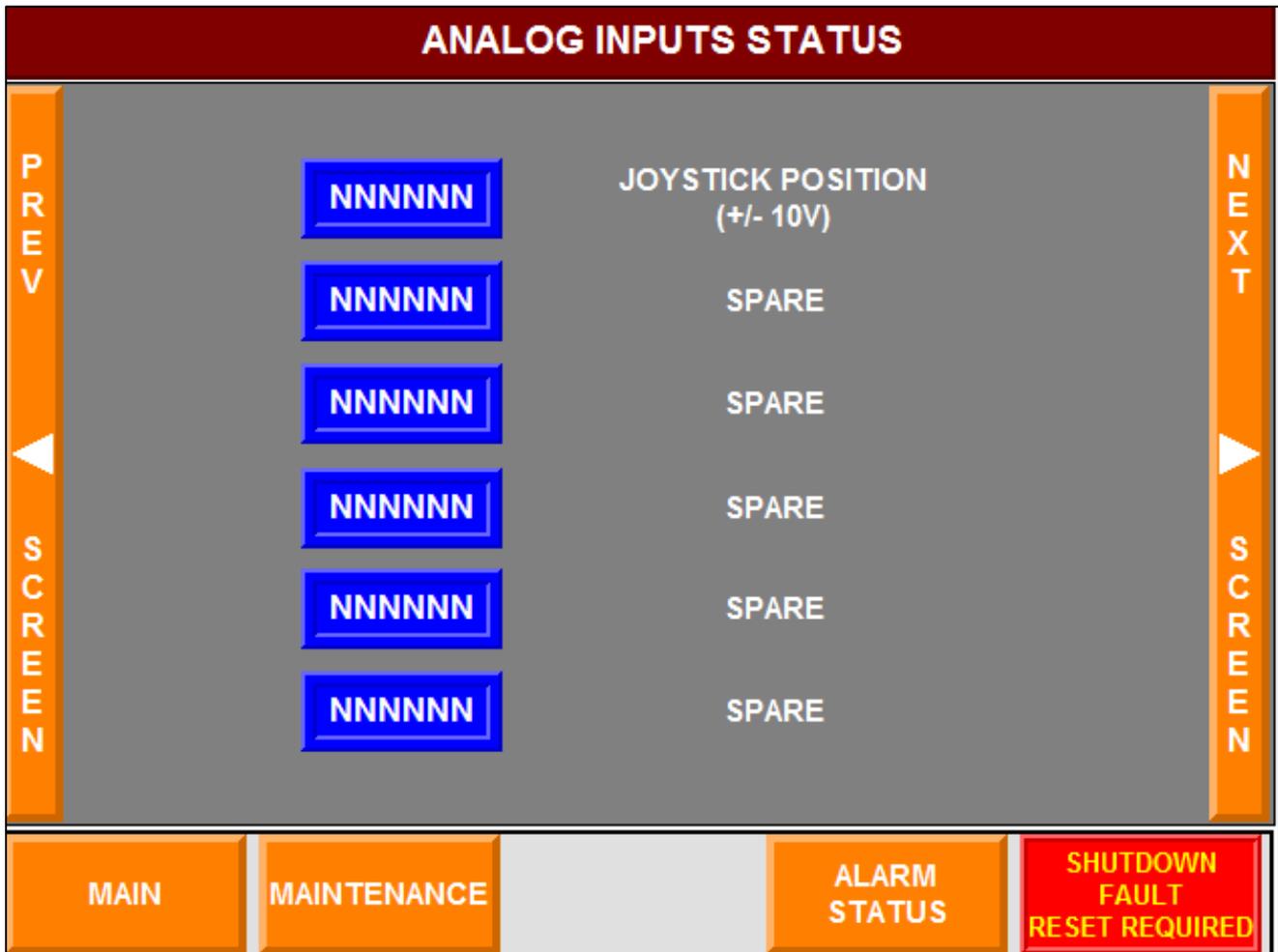
Band brake released and Drive line brake released:

- When the indicator is off, the drive brake is applied.
- When the indicator is green, the drive brake is released.

Band brake wear:

- When the indicator is yellow or red, the band brake pad is worn and should be replaced.
- When the indicator is green, the corresponding brake pad is ready to operate.

Figure 7: Analog Input Screen



Description:

Upon selecting “*next screen*” from the Digital Input Screen (**Figure 6**), this screen will be displayed. Or upon selecting “*prev screen*” from the Digital Output Screen (**Figure 8**), the **HMI display** will be directed to this screen.

The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

Shutdown fault reset required: Illuminates when a fault has occurred and **fault reset** must be pressed.

Main: Selecting will direct the HMI display to the Main Operation Screen (**Figure 3**).

Maintenance: Selecting will direct the HMI display to the Maintenance Screen (**Figure 4**)

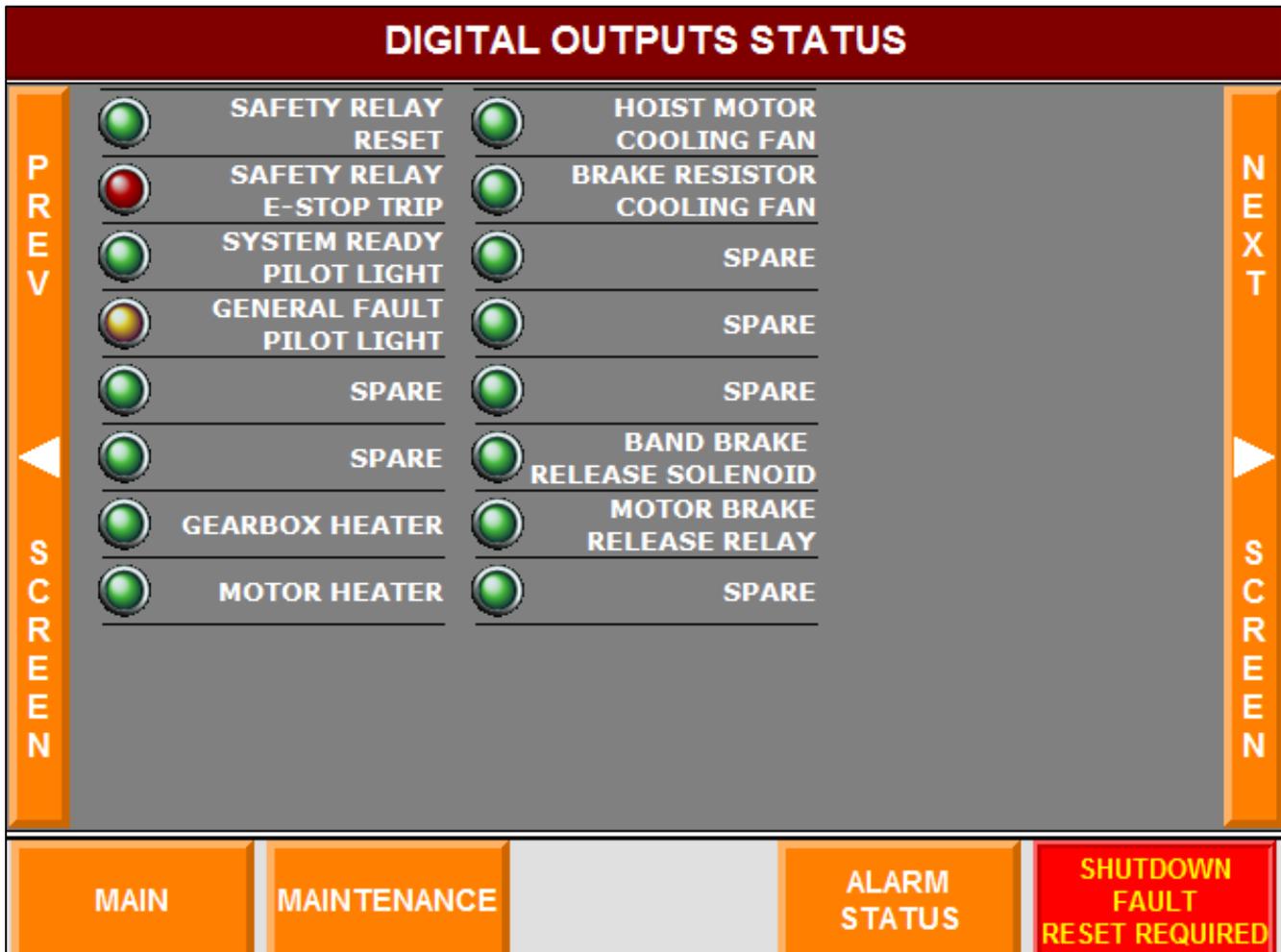
Alarm status: Selecting will direct the HMI display to the Alarm Screen (**Figure 10**).

Prev Screen: Selecting will direct the HMI display to the previous status screen (**Figure 6**).

Next Screen: Selecting will direct the HMI display to the next status screen (**Figure 8**).

Joystick position: The degree off of neutral will be displayed ($\pm 10V$) where **NNNNNN** is shown.

Figure 8: Digital Output Screen



Description:

Upon selecting “**next screen**” from the Analog Input Screen (**Figure 7**), this screen will be displayed. Or upon selecting “**prev screen**” from the RTD Module Screen (**Figure 9**), the **HMI display** will be directed to this screen. The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

- Shutdown fault reset required:** Illuminates when a fault has occurred and **fault reset** must be pressed.
- Main:** Selecting will direct the HMI display to the Main Operation Screen (**Figure 3**).
- Maintenance:** Selecting will direct the HMI display to the Maintenance Screen (**Figure 4**).
- Alarm status:** Selecting will direct the HMI display to the Alarm Screen (**Figure 10**).
- Prev Screen:** Selecting will direct the HMI display to the previous status screen (**Figure 7**).
- Next Screen:** Selecting will direct the HMI display to the next digital status screen (**Figure 9**).

Safety relay reset:

Green indicates the safety relay is energized (engaged).

Safety relay E-stop trip:

Green indicates the safety relay is disconnected (E-stop tripped).

System ready pilot light:

Green indicates no fault conditions are present (system is ready to operate).

General fault pilot light:

Red indicates a fault condition is active (HMI will display fault details). Green indicates no faults.

Spare: Extra features may be added to the program, but currently, the spare, can be ignored.

Gearbox heater:

Green indicates the gearbox heater contactor is engages (heater is on).

Motor heater:

Green indicates the motor heater contactor is engages (heater is on).

Hoist motor cooling fan:

Green indicates the motor cooling fan is engages (fan is on).

Brake resistor cooling fan:

Green indicates the brake resistor cooling fan is engages (fan is on).

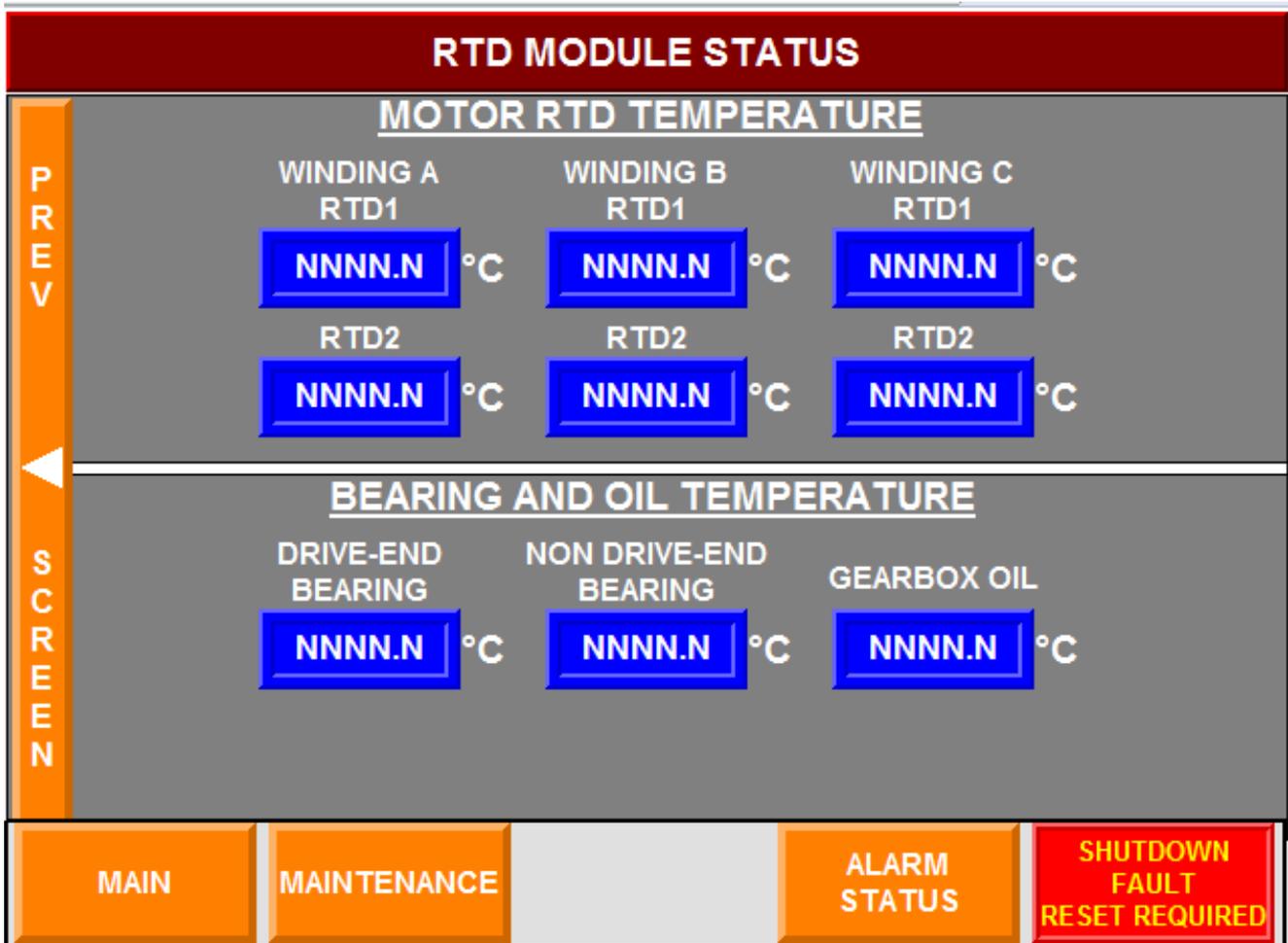
Band brake release solenoid:

Green indicates the band brake is released and ready to operate.

Motor brake release relay:

Green indicates the motor brake is released and ready to operate.

Figure 9: RTD Module Screen



Description:

Upon selecting “**next screen**” from the Digital Output Screen (**Figure 8**), the **HMI display** will be directed to this screen.

The various displays, selectors and indicators of this screen are described below.

Primary Functions of Display:

Shutdown fault reset required: Illuminates when a fault has occurred and fault reset must be pressed.

Main: Selecting will direct the HMI display to the Main Operation Screen (**Figure 3**).

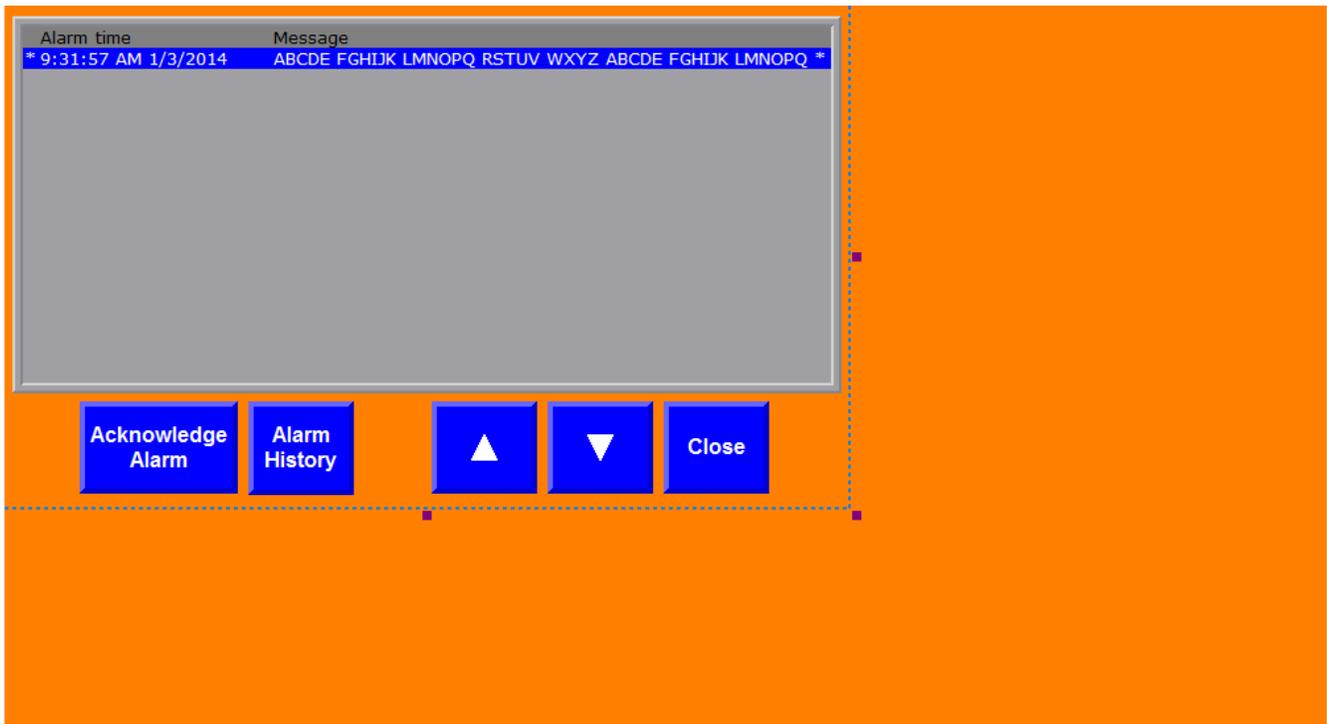
Maintenance: Selecting will direct the HMI display to the Maintenance Screen (**Figure 4**)

Alarm status: Selecting will direct the HMI display to the Alarm Screen (**Figure 10**).

Prev Screen: Selecting will direct the HMI display to the previous status screen (**Figure 8**).

NNNN.N: The temperature of the corresponding RTD module in degrees Celsius will be displayed here.

Figure 10: Alarm Screen



Description:

Upon selecting “**alarm status**”, this screen will appear on the **HMI display**.
The various displays, selectors and indicators of this screen are described below.

Functions of Display:

Acknowledge alarm: Selecting will clear alarm from active alarm screen (above).
Alarm will still be shown on the Alarm History Screen (**Figure 11**).

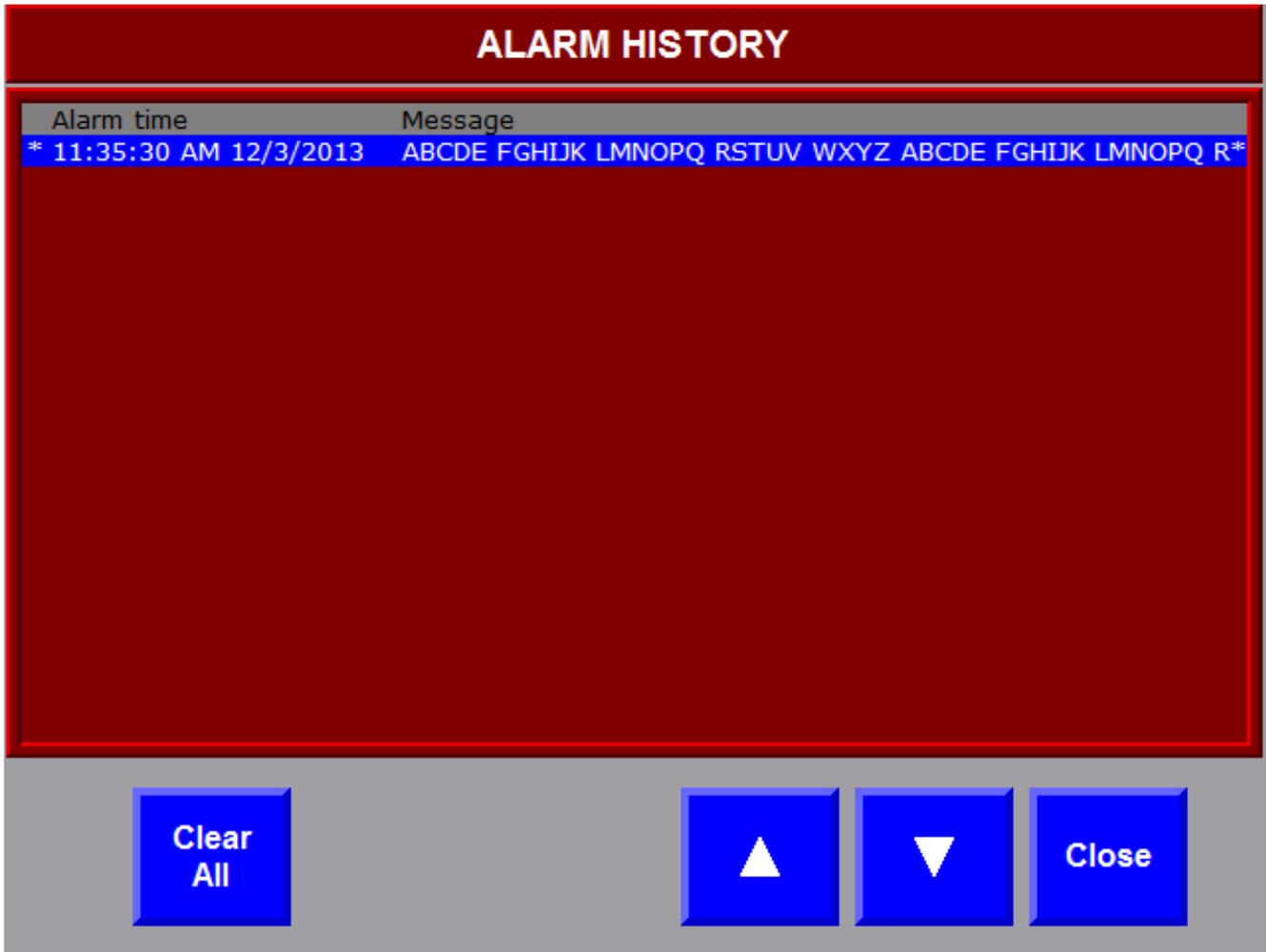
Alarm history: Selecting will direct the HMI display to the Alarm History Screen (**Figure 11**).

Upwards arrow: This will highlight the alarm directly above the previously highlighted.

Downwards arrow: This will highlight the alarm directly below the previously highlighted.

Close: Selecting will direct the HMI display to the Start-Up Screen (**Figure 11**).

Figure 11: Alarm History Screen



Description:

Upon selecting “**alarm history**” from the “**alarm screen**” (**Figure 10**), the **HMI display** will appear as so. The various displays, selectors and indicators of this screen are described below.

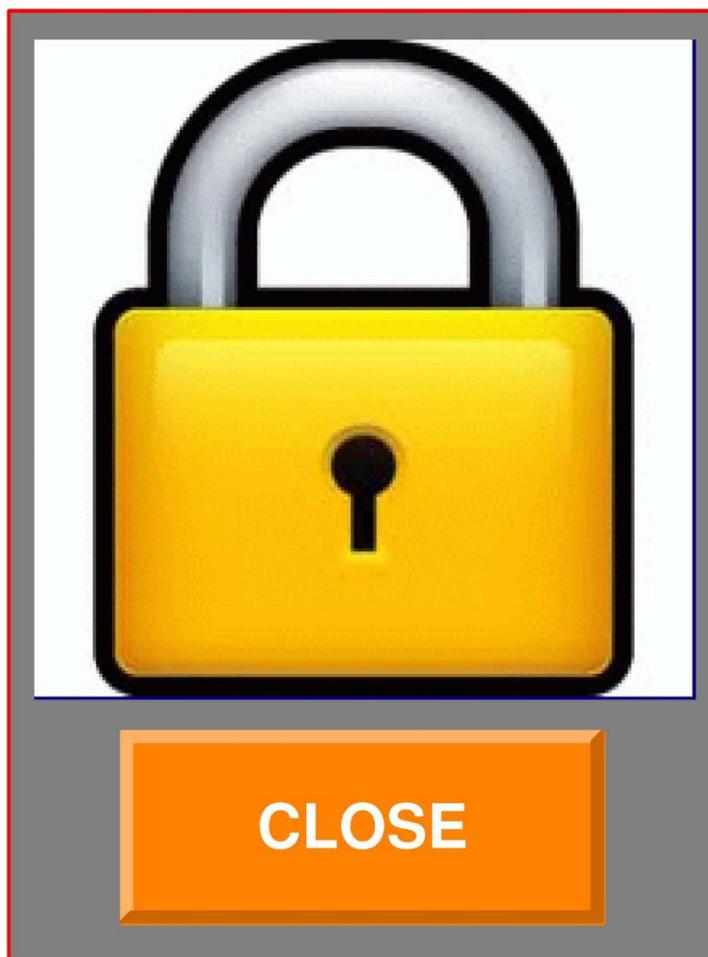
Functions of Display:

Clear all: Selecting will erase all alarms listed in the alarm history (top part of the screen).

Upwards arrow: This will highlight the alarm directly above the previously highlighted.

Downwards arrow: This will highlight the alarm directly below the previously highlighted.

Close: Selecting will direct the HMI display to the Alarm Screen (**Figure 1**).

Figure 12: Lockout Screen**Description:**

Upon locking out the system using the **system lockout** key switch, this screen will appear. The **close** option will not appear until the **system lockout** key switch is turned to the "on" position. Selecting the **close** option will return the **HMI screen** to its normal function.

7 Servicing

7.1 Maintenance Schedule

The following schedule is to be carried out by qualified personnel using proper lubricants to suit environmental and operating conditions.



NOTE:

These are suggested minimum recommendations only. Specific situations may require a different lubrication schedule. Increase frequency as necessary.

SERVICE INTERVAL	HOURS	DAILY	WEEKLY	150	500	1000	2000
	MONTHS			1	3	6	12
DESCRIPTIONS (3)							
BEARINGS		-	-	L	-	-	O
BUSHINGS		-	-	L	-	-	-
REELSHAFT BUSHINGS		L	-	-	-	-	-
PIVOT POINTS		-	X	L	-	-	-
CHAIN DRIVES		-	-	-	-	O	-
COUPLINGS		-	-	-	-	-	X
BOLTED CONNECTIONS		X	-	-	-	-	-
HYDRAULIC PLUMBING		X	-	-	-	-	-
HYDRAULIC RESERVOIR		X	-	-	R	-	-
HYDRAULIC FILTERS (2)		-	-	-	-	X	-
HYDRAULIC HOSES		-	-	-	-	-	-
MISC. COMPONENTS (1)		-	L	-	-	-	-
OPEN GEARS				X		L	

LEGEND	
R	REPLACE
L	LUBRICATE
X	INSPECT & CORRECT
O	CLEAN & LUBRICATE
F	FLUSH & CHANGE

NOTE:

1. Items such as engines, pumps, motors, reducers, brakes, etc. on your equipment to be serviced according to the manufacturer's maintenance schedule (See Outside Vendor Literature)
2. Hydraulic Filter part numbers and descriptions can be found in the hydraulic schematic, if applicable.
3. Certain items may not be a part of your machine and DO NOT apply.

7.2 Maintenance Procedures



DANGER

Ensure main power source has been disconnected and locked out before completing any repairs on the equipment.

Periodic inspection of the unit according to a regular schedule will establish the normal state of the unit for personnel associated with its operation and maintenance and provide a set of consistent conditions, which will tend to highlight any occurrence of a potentially hazardous malfunction.

On a daily basis walk around the equipment and look closely for any indication of the following:

1. Loose threaded connectors.
2. Metal fatigue or excessive corrosion.
3. Abraded hose surfaces.
4. Air or hydraulic fluid leakage.
5. Possible obstruction of moving parts – especially in the drive train.

To ensure proper operation and long life of your TIMBERLAND EQUIPMENT LIMITED products, use only good quality lubricants and maintain a regular maintenance schedule as recommended by TIMBERLAND EQUIPMENT LIMITED and our component suppliers.

Prior to start-up of new TIMBERLAND EQUIPMENT LIMITED products, ALL fluid levels are to be checked to ensure correct operating levels. ALL lubrication and maintenance points are to be inspected and lubricated as illustrated on the 'Lubrication and Maintenance Instructions' sheets in this section of the manual.

While TIMBERLAND EQUIPMENT LIMITED recommends specific intervals, they are intended as a minimum general guide for the maintenance of the equipment. Some job conditions and/or locations may dictate more frequent service intervals than have been recommended.

Refer to the 'Lubrication Data Sheets' by lubrication code for lubricants, their SAE grades and temperature ranges. You will notice that in some instances several types of lubricants have been coded with the same 'Lubrication Code Number'. In most cases, the lubricant will be of several different qualities; therefore the user may select the quality as well as the SAE grade most suitable for the application, conditions and ambient operating temperature range.

7.3 Lubrication

LUBRICATION BRAND	LUBRICATION INFORMATION	ISO GRADES	REF. PART No.	APPLICATION
HYDRAULIC OIL (PETRO CANADA)	HYDREX AW 68	68	5010765	HYDRAULIC TANK
GREASE (PETRO CANADA)	GENERAL PURPOSE MOLY EP2	NLGI GRADE 2	5010766	BEARINGS - PLAIN OR ANTI-FRICTION, AMBIENT TEMP, JOB APPLICATION, AND CONDITIONS WILL DETERMINE MOST SUITABLE GREASE TO BE USED.
GEAR LUBRICANT	SELECT SUITABLE GEAR LUBRICANT FOR AMBIENT TEMP RANGE.	—————	—————	OPEN GEARS
DYNA GEAR EXTRA	OPEN GEAR LUBE WINTER -40°C TO 40°C	—————	511321	—————
OIL	SELECT OIL MOST SUITABLE FOR APPLICATION AND AMBIENT TEMP RANGE.	—————	—————	ROLLER CHAINS, OPEN AND OIL BATH
SPRAY LUBRICANTS	SELECT OIL MOST SUITABLE FOR APPLICATION	—————	—————	PIVOT PINS, CONNECTION PINS, THREADED CONNECTIONS
GEAR OILS	SELECT GEAR OIL AS RECOMMENDED BY MANUFACTURER'S LITERATURE.	—————	—————	GEAR REDUCERS - REFER TO MANUFACTURER'S LITERATURE FOR RECOMMENDED OILS AND GRADES.
RUST-BAN 392	SOLVENT CUTBACK RUST PREVENTATIVE (NOT SUITABLE FOR INDOOR USE) AFTER APPLICATION BY SPRAYBRUSH, OR BY DRIPPING, LET THE SOLVENT EVAPORATE, LEAVING A PROTECTIVE COATING. COATING DRYING TIMES WILL VARY WITH APPLICATION CONDITIONS. LEAVES A THIN FILM. RUST- BAN 392 CONTAINS WATER DISPLACING AGENT AND A FINGERPRINT NEUTRALIZER. RUST-BAN 392 HAS A POUR POINT OF -40°C (-40°F).	—————	—————	LONG TERM STORAGE OF EQUIPMENT.

LUBRICATION BRAND	LUBRICATION INFORMATION	ISO GRADES	REF. PART No.	APPLICATION
RUST-BAN 343	OIL TYPE: 'RUST-BAN 343', WHICH HAS THE VISCOSITY OF AN SAE 10 MOTOR OIL, CAN BE USED TO CIRCULATE THROUGH THE INTERIOR OF A HYDRAULIC SYSTEMS, GEAR BOX OR ENGINE. AFTER DRAINING, THE INTERNAL SURFACES ARE PROTECTED AGAINST RUST BY THE OILY MOISTURE REPELLANT FILM THAT REMAINS. OTHER USES INCLUDE OIL LUBRICATED BEARINGS, DELICATE INSTRUMENTS AND CUTTER BARS. POUR POINT OF 0°C (32°F).	_____	_____	_____

8 List of Attachments

8.1 Attachments 1 – Equipment Drawings

Decal List	D001758
General Assembly	30-00139-000
Sub-frame Assembly	30-00139-054
Electrical Schematic	7002078
Controls Layout	7002090

8.2 Attachments 2 – Component Parts & Service Detail

Reducer	5010771
Motor	5010752
Motor Brake	5010781

8.1

Attachments 1

Equipment Drawings

REV	DATE	CHANGE NUMBER	AMENDMENTS	BY	APPD

19	D597001		PAYOUT PULLIN GRADIENT		1
18	D597000		GP 200 WEIGHT: 32,200 LBS		1
17	D596996		PANEL DISCONNECT		1
16	D593302		LUBRICATE WITH OPEN GEAR LUBRICANT		1
15	D596982		RATING: GP200-1-40EVFD		1
14	D590566		LIFTING LUG		4
13	D596979		EP-2 GREASE (LH)		4
12	D596978		EP-2 GREASE (RH)		4
11	D596367		GEAR OIL - EP150		1
10	D596744		NOTICE: THE OPERATOR IS RESP...		1
9	D590472		CAUTION: POWER FED FROM...		2
8	D596515		WARNING: DO NOT OPERATE W/O GUARDS		2
7	D590053		WARNING: KEEP CLEAR OF UNGUARDED MOVING		2
6	D594393		WARNING: KEEP CLEAR ROPE UNDER TENSION		2
5	D593006		WARNING: KEEP CLEAR OF THIS EQUIP...		2
4	D592727		WARNING: KEEP AWAY FROM ALL MOVING...		4
3	D595835		WARNING: QUALIFIED OPERATORS ONLY		2
2	D590030		WARNING: MISUSE OF THIS EQUIPMENT...		2
1	D590025		MADE IN CANADA		1

ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY
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UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE INCHES
DIMENSIONS IN [] ARE MM
-TOLERANCES-

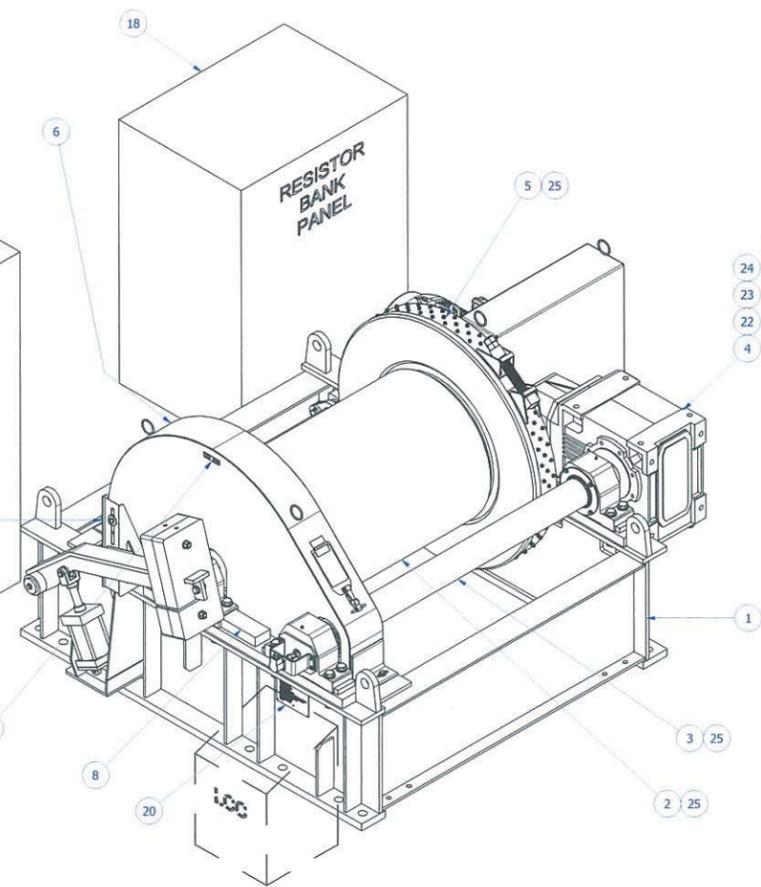
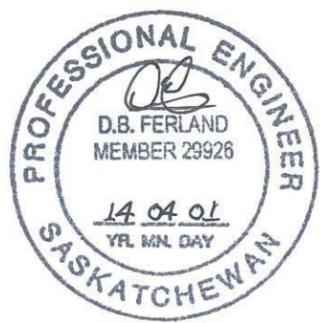
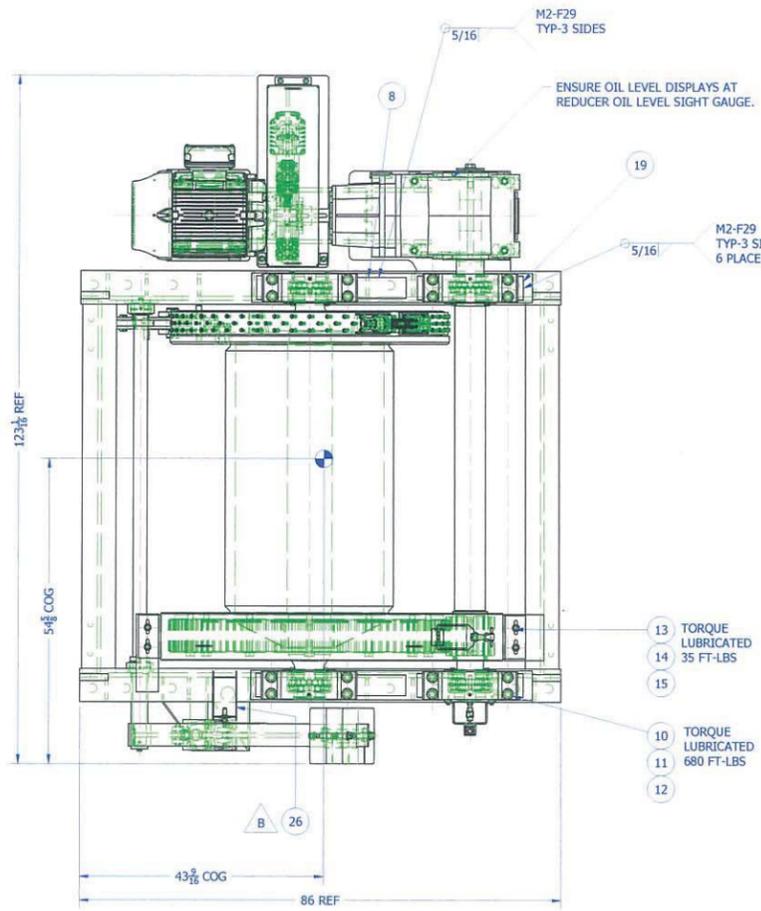
- A) ANGULAR ± 1/2°
- B) DECIMAL (ONE) .X ± .06
- (TWO) .XX ± .02
- (THREE) .XXX ± .01
- C) FRACTIONAL
- 1. GENERAL ± 1/32
- 2. SAWING, FLAME CUTTING, SHEARING & BREAKING ± 1/16
- 3. WELDING ± 1/8



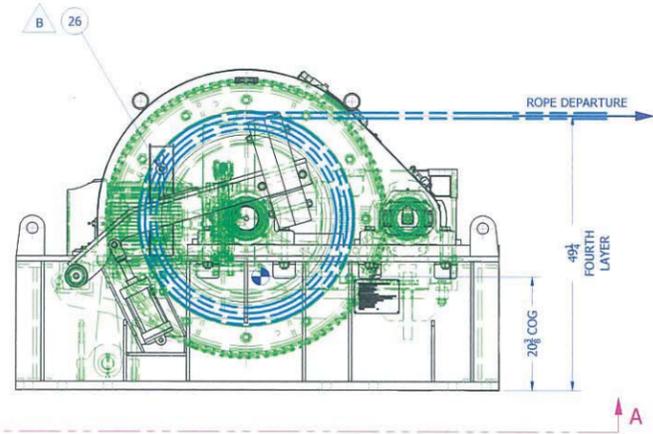
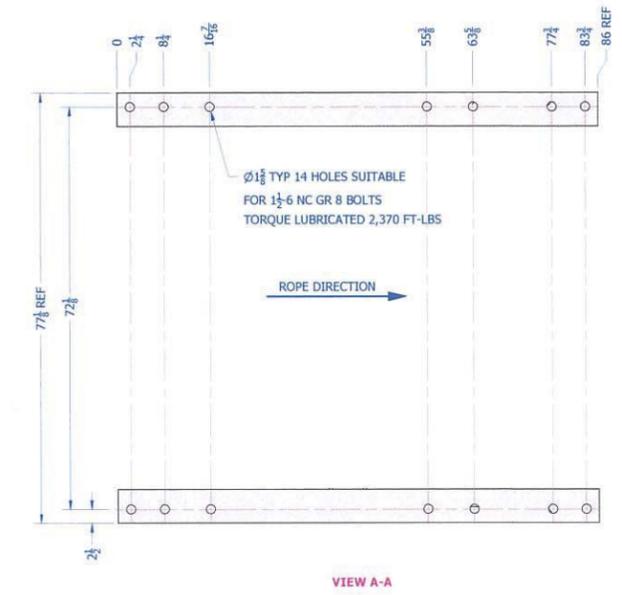
TIMBERLAND EQUIPMENT LIMITED

Woodstock, Ontario, Canada

MATL CERT	N/R	TITLE	DECAL LIST-GP200		
MATL TEST	N/R	NEXT ASSEMBLY	F001373	DERIVED FROM	D001788
WELD TEST	N/R	FIRST USED DN WD	9007	SHEET	1 OF 1
EST LBS	N/A	DRAWN SJC	CHECKED	APPROVED	D001758
ACT LBS	N/A	DATE	16DEC13	SCALE	
					REV

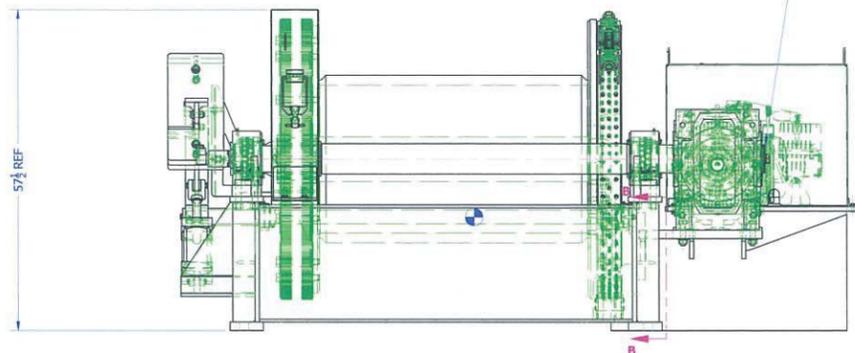


ITEM	PART NUMBER	OPER	DESCRIPTION	MATERIAL	UNIT QTY
1	30-00139-001		FRAME-ASSY-GP200		1
2	30-00139-003		DRUM ASSY-GP200		1
3	30-00139-007		INTERMEDIATE SHAFT ASSY-GP200		1
4	30-00139-012		DRIVE ASSY/MACH- GP200		1
5	30-00139-043		BAND BRAKE ASSY-GP200		1
6	30-00139-050		GEAR GUARD ASSY-GP200		1
7	125043	1	1 LG - 5 DIA ROUND	C1020 HR	0.08FT
8	101151	2	R 2 PL 8 3/4 X 3 3/4	A633 Gr.C	0.46SF
9	101131	1	R 1 1/2 PL 1 1/2 X 12	A633 Gr.C	0.13SF
10	271627		HHCS 1-8NC X 7 LG	GR8	16
11	180011		HEX NUT- 1-8NC	GR8	16
12	181011		FLAT WASHER- 1 HARDENED	STL	33
13		FI	HHCS 1/2-13NC X 1 1/2 LG	GR5	4
14		FI	LOCKWASHER- 1/2	STL	4
15		FI	FLAT WASHER- 1/2	STL	4
16	271610		HHCS 1-8NC X 2 1/2 LG	GR8	1
17	7002090		PANEL LAYOUT ASSY GP200-1-40EVFD		1
18	5010940	1	VFD BRAKE RESISTOR		REF
19	110011	6	4 1/4 LG - 1 SQUARE	A36	2.13FT
20	30-00139-252		SERIAL TAG		1
21	5011005		TAG-OPERATING DIRECTION		1
22	5011006		EQUIPMENT TAG-MOTOR-GP200		1
23	5011007		EQUIPMENT TAG-REDUCER-GP200		1
24	537472		GEAR OIL, EP150		1
25	5010766		GREASE-GP MOLY EP2		1
26	30-00139-059		SENSOR ASSY- BRAKE RELEASED		1



SHEAR REACTION
 20,000 LBS [89 kN] @ WORKING LINEPULL
 30,000 LBS [133 kN] @ BRAKE HOLDING (1.5 X WORKING)
 100,000 LBS [445 kN] @ 5X WORKING

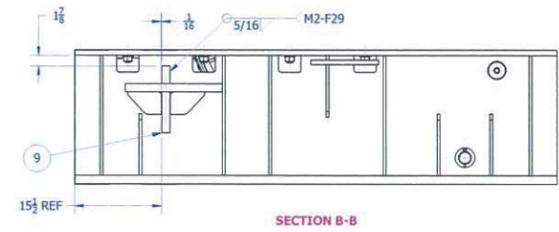
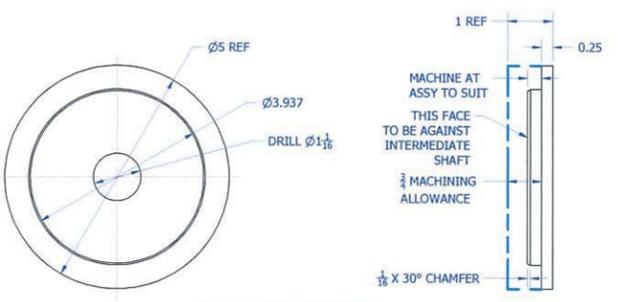
MOMENT REACTION
 985,000 IN-LBS [111 kN.m] @ WORKING LINEPULL
 1,477,500 IN-LBS [167 kN.m] @ BRAKE HOLDING (1.5X WORKING)
 4,925,000 LBS [556 kN.m] @ 5X WORKING



WINCH PERFORMANCE:
 - LINEPULL: 20,000 LBS [89 kN].
 - RATED BRAKE HOLD: 30,000 LBS [133 kN].
 - BRAKES COMPRISED OF TWO AUTOMATIC INDEPENDENT SYSTEMS:
 i) SPRING-APPLIED ELECTRICALLY RELEASED DRIVELINE BRAKE RATED AT 150% LINEPULL.
 ii) COUNTER-WEIGHT APPLIED PNEUMATIC RELEASED BAND BRAKE ACTING DIRECTLY ON WINCH DRUM FLANGE RATED AT 150% LINEPULL.
 - LINESPEED: 50 FPM ON TOP LAYER.
 - NUMBER OF WORKING LAYERS: 4.
 - RATED CAPACITY: 1500 FT WORKING + 10 DEAD WRAPS OF 1 IN WIRE ROPE.
 - ESTIMATED WEIGHT WITHOUT ROPE: 18,000 LBS [8165 KG].
 - AMBIENT TEMPERATURE: -30°C TO +40°C.
 - DEPARTURE ANGLE FROM HORIZONTAL: 0° +/- 5°.

PAINT:
 - EQUIPMENT TO BE PREPPED AND PAINTED ACCORDING TO CUSTOMER SPECIFICATION NO. 000B7001EF REV. 09 SECTION 6.10 SYSTEM 9 - EQUIPMENT - CORROSIVE CONDITIONS - OPERATING TEMPERATURE 90°C MAXIMUM.
 - COLOUR: GUARDING TO BE SAFETY YELLOW; ALL OTHER PARTS TO BE LIGHT BLUE AS DEFINED IN CUSTOMER SPECIFICATION.

TESTING:
 - ACCORDING TO FACTORY ACCEPTANCE TEST (FAT) PROCEDURE. MINIMUM TESTING:
 i) FULL SPEED, NO LOAD FUNCTION TEST; BOTH DIRECTIONS.
 ii) BRAKES TESTED AT 100% LINEPULL = 20,000 LBS [89 kN].
 - EQUIPMENT SHALL BE WEIGHED AFTER FINAL ASSEMBLY AND REPORTED TO ENGINEERING.



NOTE:
 - NO BRASS, COPPER OR ALUMINUM COMPONENTS
 - ENCLOSURES ARE TO BE NEMA 4X, 316 SS
 - PANEL/LCC LOCATION TBD

DRAWING SIZE: D
 PROJECT NAME: PROJECT VAULT
 PROJECT NUMBER: 334562
 PURCHASE ORDER NUMBER: 334562-P05-4M-7192
 EQUIPMENT TAG NUMBER: 41722
 EQUIPMENT: 20,000 LBS WINCH
 VDRL CODE: G.2

AS BUILT



REV	DATE	ECN	AMENDMENTS	BY	APPD
D	27-Jan-14		WAS NOTED AS '65000 LBS WINCH'; PANELS/LCC WERE SHOWN AT WINCH FRAME; WT ESTIMATE AND COG NO LONGER INCLUDE PANELS OR LCC; AS BUILT WT ADDED.	CNK	
C	11-Nov-13		UPDATED AS PER CUSTOMERS REQUEST	SJC	DF
B	19-Jun-13	12430	IT#20 WAS 600150; REV'D IT#21; ADDED IT#26	CNK	PLK
A	07-Jun-13	12391	LCC RELOCATED TO SUIT FOUNDATION/SUB-FRAME; PULL DIRECTION MODIFIED PER CLIENT INFORMATION; RATED BRAKING WAS SHOWN AS 3X LINEPULL; COG UPDATED; MACHINING DETAIL FOR UPDATED ITEM 7 ADDED	CNK	PLK

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DIMENSIONS IN [] ARE MM -TOLERANCES-

MATERIAL	QTY	UNIT	DESCRIPTION
ANGULAR	1	12"	
SECTIONAL	1	24"	
GENERAL	1	24"	
FRACTIONAL	1	24"	
GENERAL	1	24"	
SAWING, FLAME CUTTING, SHEARING & BREAKING	1	24"	
WELDING	1	24"	

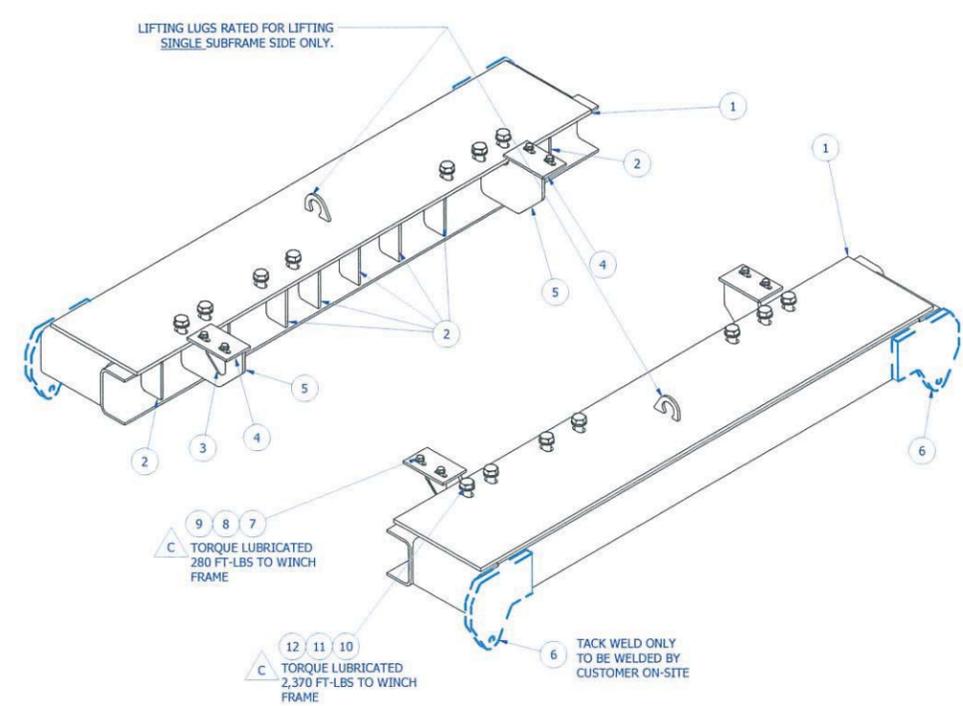
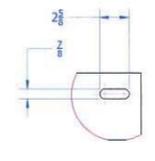
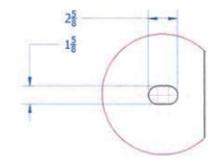
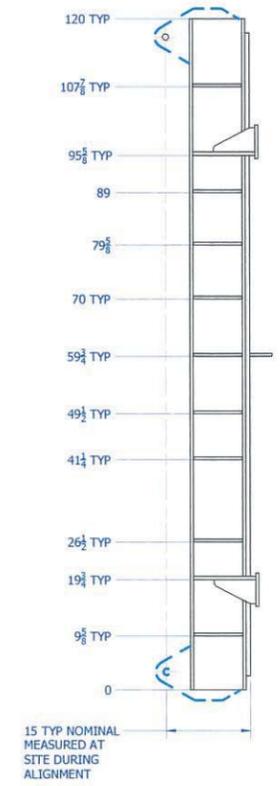
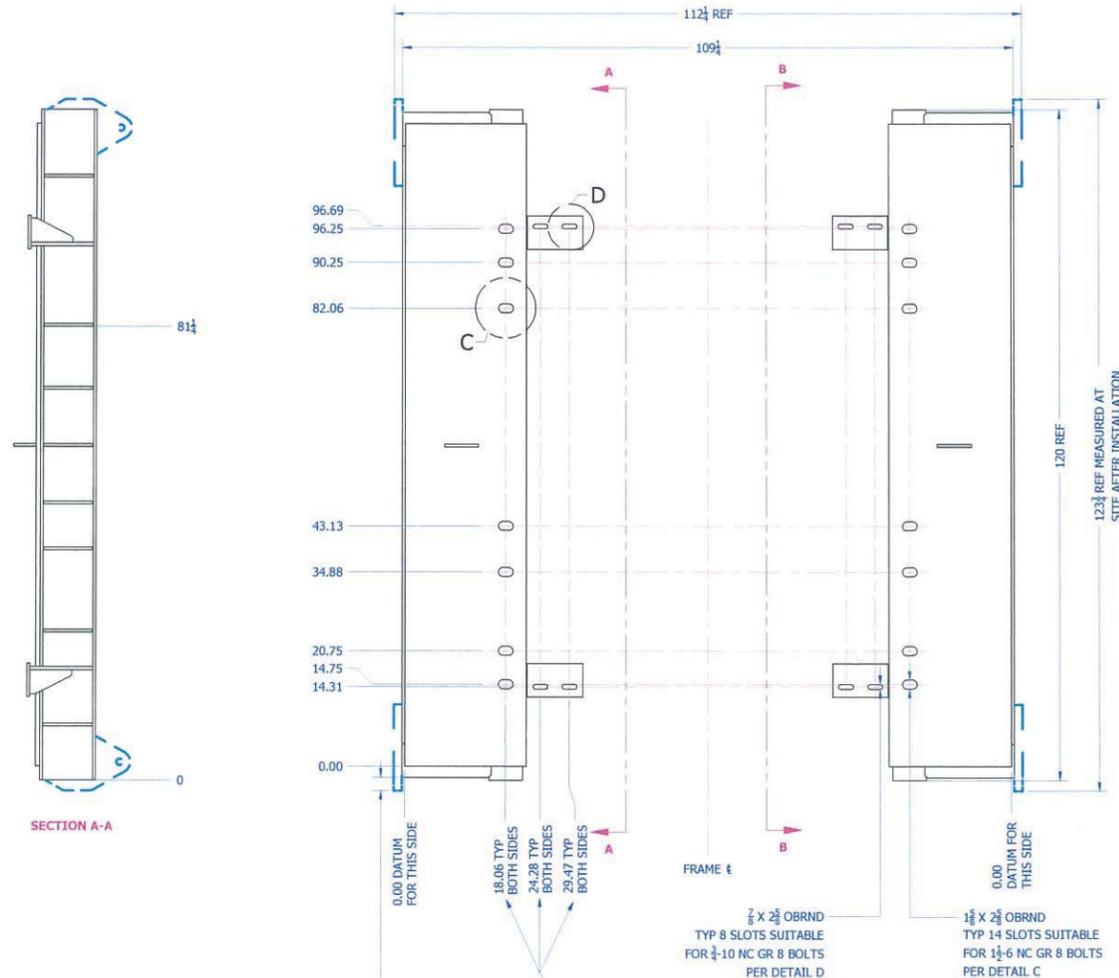
TIMBERLAND EQUIPMENT LIMITED
 Woodstock, Ontario, Canada

GA-GP200-1-40EVFD

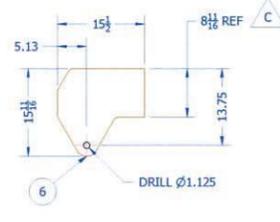
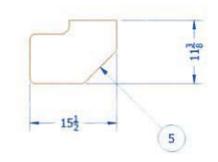
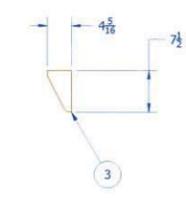
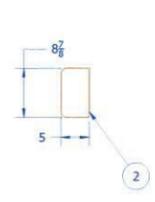
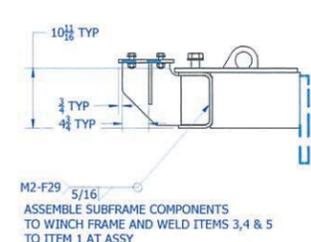
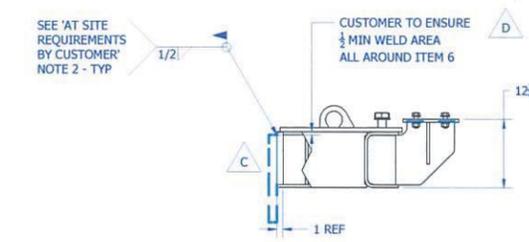
DATE: 24-May-13 SCALE: 1/16

30-00139-000 D

ITEM	PART NUMBER	OPER	DESCRIPTION	MATERIAL	UNIT QTY
1	30-00139-028		SUBFRAME SUB ASSY-GP200		2
2	101051	17	P 1/2 PL 5 X 8 7/8	A633 Gr.C	5.245F
3	101051	4	P 1/2 PL 4 5/16 X 7 1/2	A633 Gr.C	0.905F
4	101051	4	R 1/2 PL 6 X 9 15/16	A633 Gr.C	1.665F
5	101061	4	P 5/8 PL 15 1/2 X 11 3/8	A633 Gr.C	4.905F
6	101131	4	P 1 1/2 PL 15 1/2 X 15 11/16	A633 Gr.C	6.755F
7	270709		HHCS 3/4-10NC X 2 1/4 LG	GR8	8
8	181009		FLAT WASHER- 3/4 HARDENED	STL	16
9	180009		HEX NUT- 3/4-10NC	GR8	8
10	271720		HHCS 1 1/2-6NC X 5 LG	GR8	14
11	181016		FLAT WASHER- 1 1/2 HARDENED	STL	28
12	180119		HEX NUT- 1-1/2-6NC	GR8	14



CUSTOMER TO ENSURE THIS DIMENSION IS 2 1/2 ± .01 BEFORE WELDING TYP 4 PLACES



NOTES:

- ITEM 6 TO BE TACK-WELDED ON ONLY.
- UNLESS OTHERWISE NOTED; WELD ALL JOINTS PER M2-F29 WITH ALL-AROUND 5/16 FILLET WELD.
- LIFTING LUGS ON SUBFRAME ARE RATED FOR LIFTING SUBFRAME ONLY AS TWO SEPARATE PIECES AND CANNOT BE USED FOR LIFTING ADDITIONAL PARTS.

PAINT:

EQUIPMENT TO BE PREPPED AND PAINTED ACCORDING TO CUSTOMER SPECIFICATION NO. 000B7001EF REV. 09 SECTION 6.10 SYSTEM 9 - EQUIPMENT - CORROSIVE CONDITIONS - OPERATING TEMPERATURE 90°C MAXIMUM. COLOUR TO BE LIGHT BLUE AS DEFINED IN CUSTOMER SPECIFICATION.

AT SITE REQUIREMENTS BY CUSTOMER:

- CUSTOMER TO APPLY CHOCKFAST AT SITE TO WINCH BASE FOR SUB-FRAME TO WINCH INTERFACE.
- AFTER PREVIOUS NOTE IS FOLLOWED, CUSTOMER TO ALIGN ITEMS 6 WITH FOUNDATION BRACKET HOLES THEN WELD AND PAINT AS NOTED; WELD TO BE IN ACCORDANCE WITH CUSTOMER SPECIFICATION NO. 000B7004EF REV 01 SECTION 4.6 'MATERIALS' SUBSECTION 'WELDING MATERIALS'. WELDER MUST BE CERTIFIED TO PERFORM REQUIRED WELDS.
- FOR TIE-DOWN TO CUSTOMER FOUNDATION: LOADING ANALYSIS MUST BE PERFORMED BY CUSTOMER AND MUST BE APPROVED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF SASKATCHEWAN. CUSTOMER IS WHOLLY RESPONSIBLE FOR TIE-DOWN TO CUSTOMER FOUNDATION INCLUSIVE OF MATERIAL AND METHOD IF NOT OTHERWISE SPECIFIED ON THIS DRAWING.
- APPLY TOUCH UP PAINT AS NEEDED PER PAINT PROCEDURE SPECIFICATION NO. 000B7001EF REV. 09 SECTION 6.10 SYSTEM 9 - EQUIPMENT - CORROSIVE CONDITIONS - OPERATING TEMPERATURE 90°C MAXIMUM (LIGHT BLUE).

DRAWING SIZE: D
PROJECT NAME: PROJECT VAULT
PROJECT NUMBER: 334562
PURCHASE ORDER NUMBER:
334562-P05-4M-7192
EQUIPMENT TAG NUMBER: 41722
EQUIPMENT: 20000 LBS WINCH
VDRL CODE: G.2



REV	DATE	ECN	AMENDMENTS	BY	APPD
D	11-Apr-14		ADJUSTED NOTES FOR CLARITY.	PMV	DF
C	27-Jan-14	13043	ADDED REF DIMENSIONS; ADDED BREAK-OUT TO SHOW WELD STRUCTURE FOR SITE WELD; ADDED ITS 7 THRU 12 INC	CNK	DF
B	23-Dec-13		UPDATED PAINT NOTE, ADDED EQUIPMENT DESCRIPTION	SJC	PLK
A	14-Dec-13		AT SITE NOTE SPECIFIED SUB-FRAME TO FOUNDATION INTERFACE	CNK	CNK

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN () ARE MM -TOLERANCES-		TITLE		SUBFRAME ASSY/MACH-GP200	
A) ANGULAR	N/R	DATE	07-Jul-13	SCALE	1/16
B) DECIMAL	N/R	TEST		APPROVED	GRH
C) FRACTIONAL	N/R	DATE		SCALE	
1) GENERAL	N/R	DATE		SCALE	
2) SAWING, FLAME CUTTING, SHEARING & BREAKING	N/R	DATE		SCALE	
3) WELDING	N/R	DATE		SCALE	



REV	DATE	ECN	AMENDMENTS	BY	APPD
D	11-Apr-14		ADJUSTED NOTES FOR CLARITY.	PMV	DF
C	27-Jan-14	13043	ADDED REF DIMENSIONS; ADDED BREAK-OUT TO SHOW WELD STRUCTURE FOR SITE WELD; ADDED ITS 7 THRU 12 INC	CNK	DF
B	23-Dec-13		UPDATED PAINT NOTE, ADDED EQUIPMENT DESCRIPTION	SJC	PLK
A	14-Dec-13		AT SITE NOTE SPECIFIED SUB-FRAME TO FOUNDATION INTERFACE	CNK	CNK

LEGEND	
XXXX TB-01	MAIN PANEL TERMINAL
XXXX TB-02	WINCH TERMINAL/LOCATION
XXXX TB-03	OPERATOR'S CONSOLE TERMINAL/LOCATION
—————	INTERNAL PANEL WIRING
- - - - -	INTERCONNECTING/MACHINE WIRING
+	CONNECTION
2190	CONTINUES TO OR FROM LINE
PIN# ⊙	PIN CONNECTOR
XX	BILL OF MATERIAL ITEM#

CONDUCTOR COLOUR AND SIZE

WIRE TYPE :R90, RW90, T90 NYLON OR GREATER		
CIRCUIT TYPE	COLOUR	MINIMUM SIZE
24VDC(+)	BLUE	16 AWG
24VDC(-)	BLUE/WHITE STRIPE	16 AWG
EARTH	GREEN/YELLOW STRIPE	AS REQUIRED
120VAC	RED	14 AWG
NEUTRAL	WHITE	14 AWG
SAFETY E-STOP	YELLOW	16 AWG
SAFETY RESET	YELLOW	16 AWG
POWER	BLACK	PER AMPERAGE

AREA CLASSIFICATION NOTES

WINCH TO BE INSTALLED AT A POTASH MINE. HIGHLY CORROSIVE DUST IS PRESENT.

DRAWING SIZE: C
 PROJECT NAME: PROJECT VAULT
 PROJECT NUMBER: 334562
 PURCHASE ORDER NUMBER:
 334562-P05-4M-7192
 EQUIPMENT TAG NUMBER: 41722
 VDRL CODE: E.6
 20K LBS WINCH

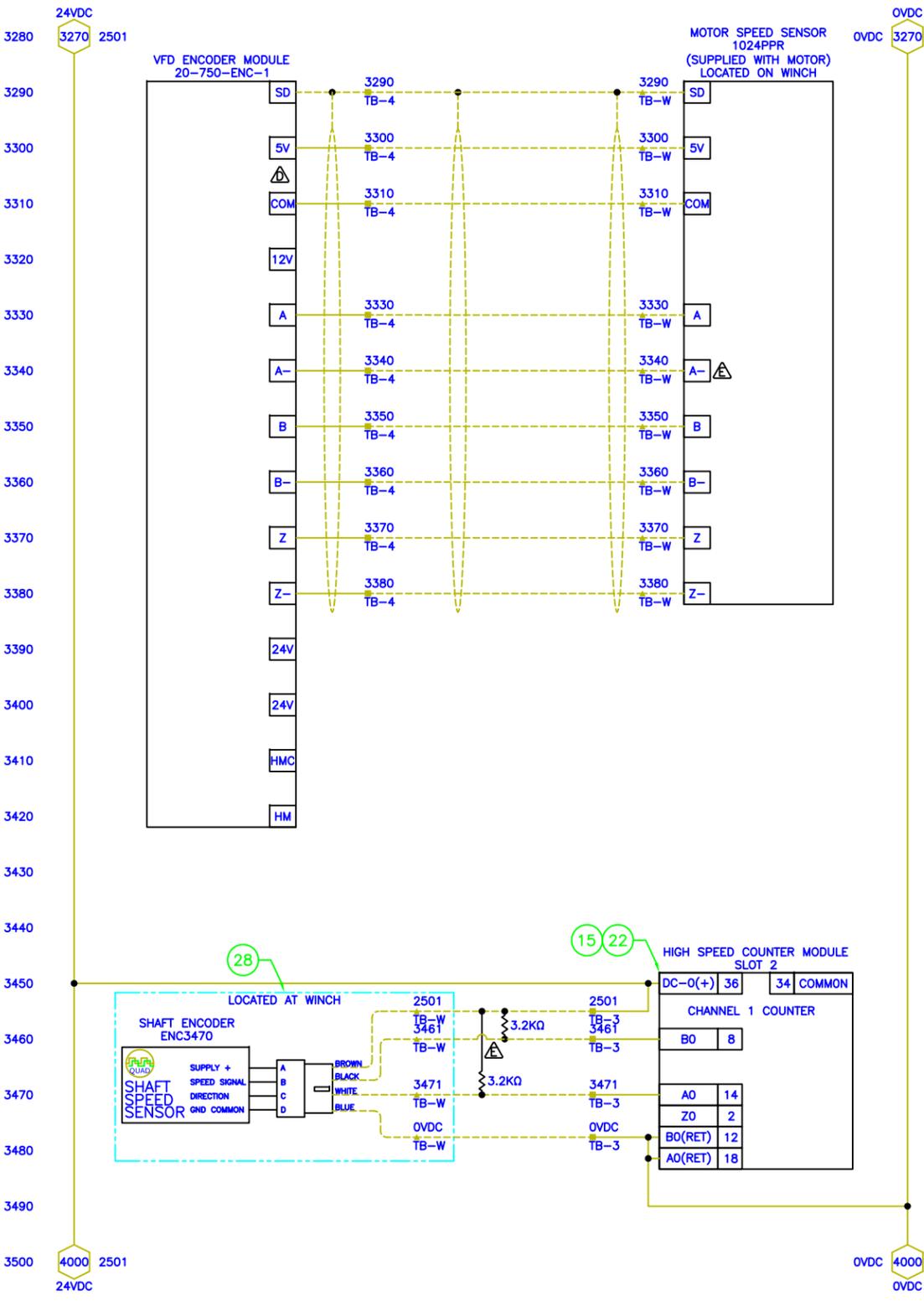
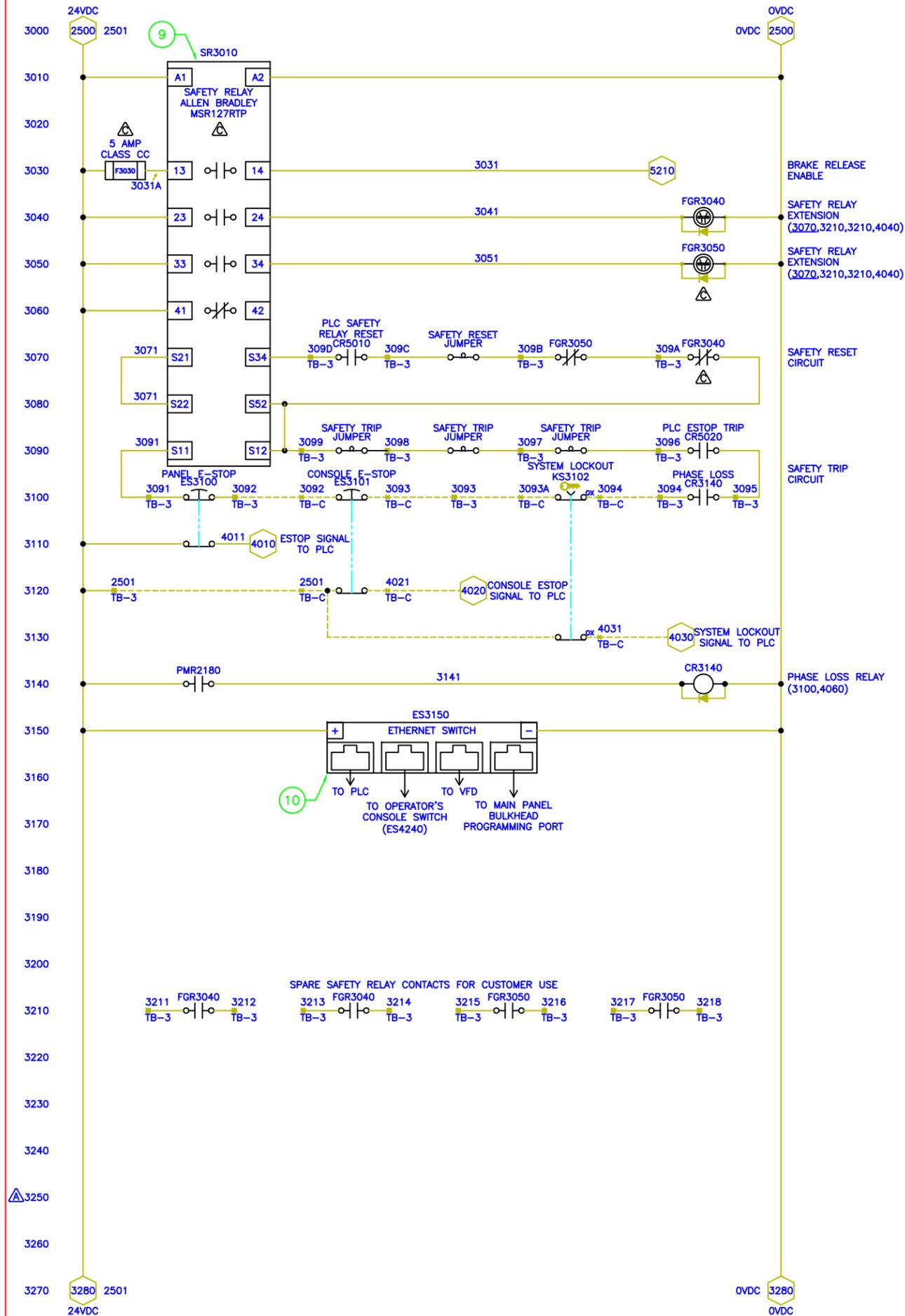


REV	DATE	CHANGE NUMBER	AMENDMENTS	BY	APPD
A	21MAY13	12318	RELEASED FOR PRODUCTION, REM. ITEM 4, CONTACTOR AND QUICK CONNECTS	AJP	GRH
B	03JUL13	12455	ADDED ITEM 30	AJP	GRH
C	02OCT13	12687	REVISED SAFETY RELAY WIRING	AJP	DJH
D	22NOV13		REM. ITEM 7, BAND REL. SW. WAS PRESSURE, CHANGED ENCODER WIRING	AJP	DJH
E	27DEC13		AS BUILT - ENCODER WIRING CHANGES	AJP	DJH

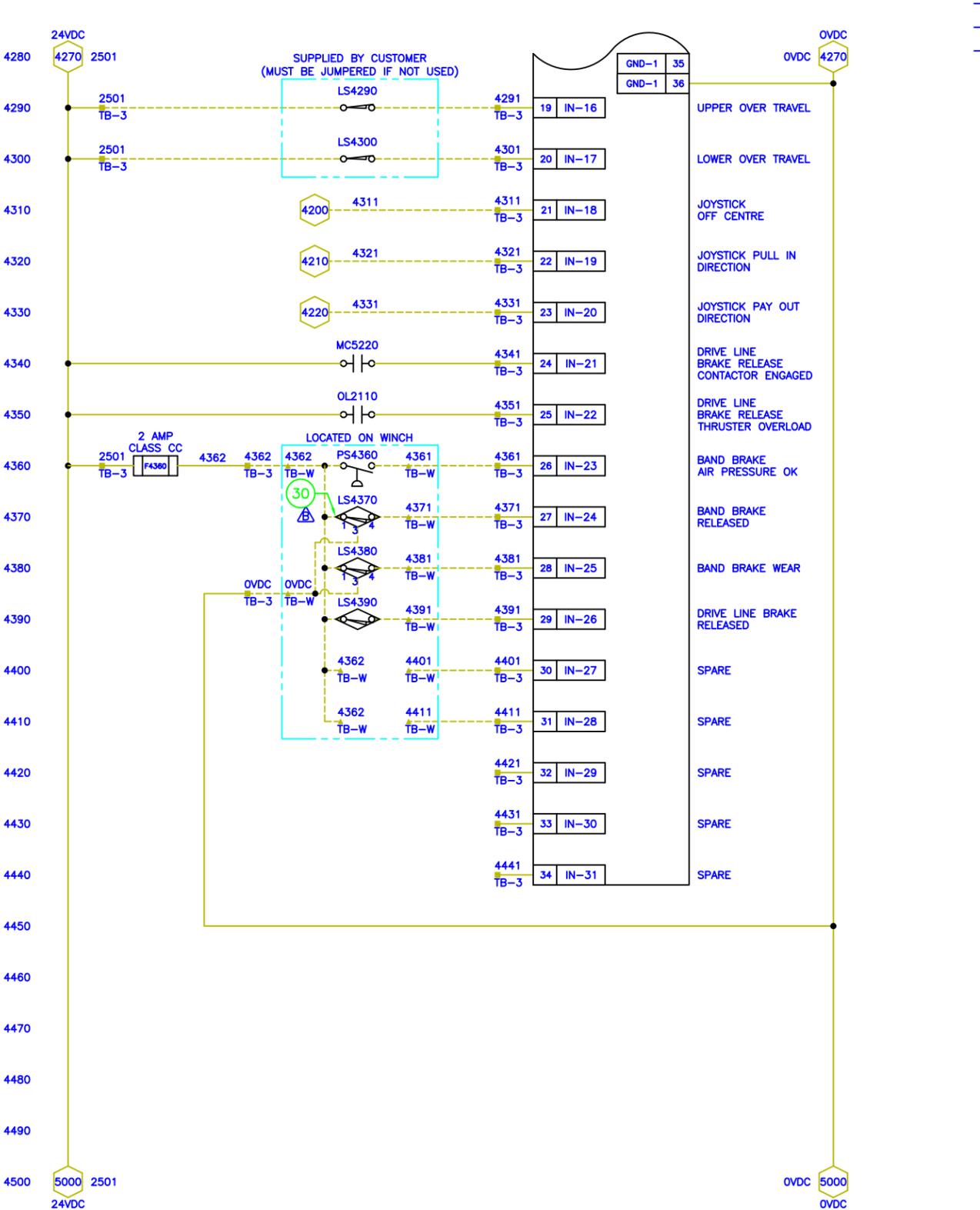
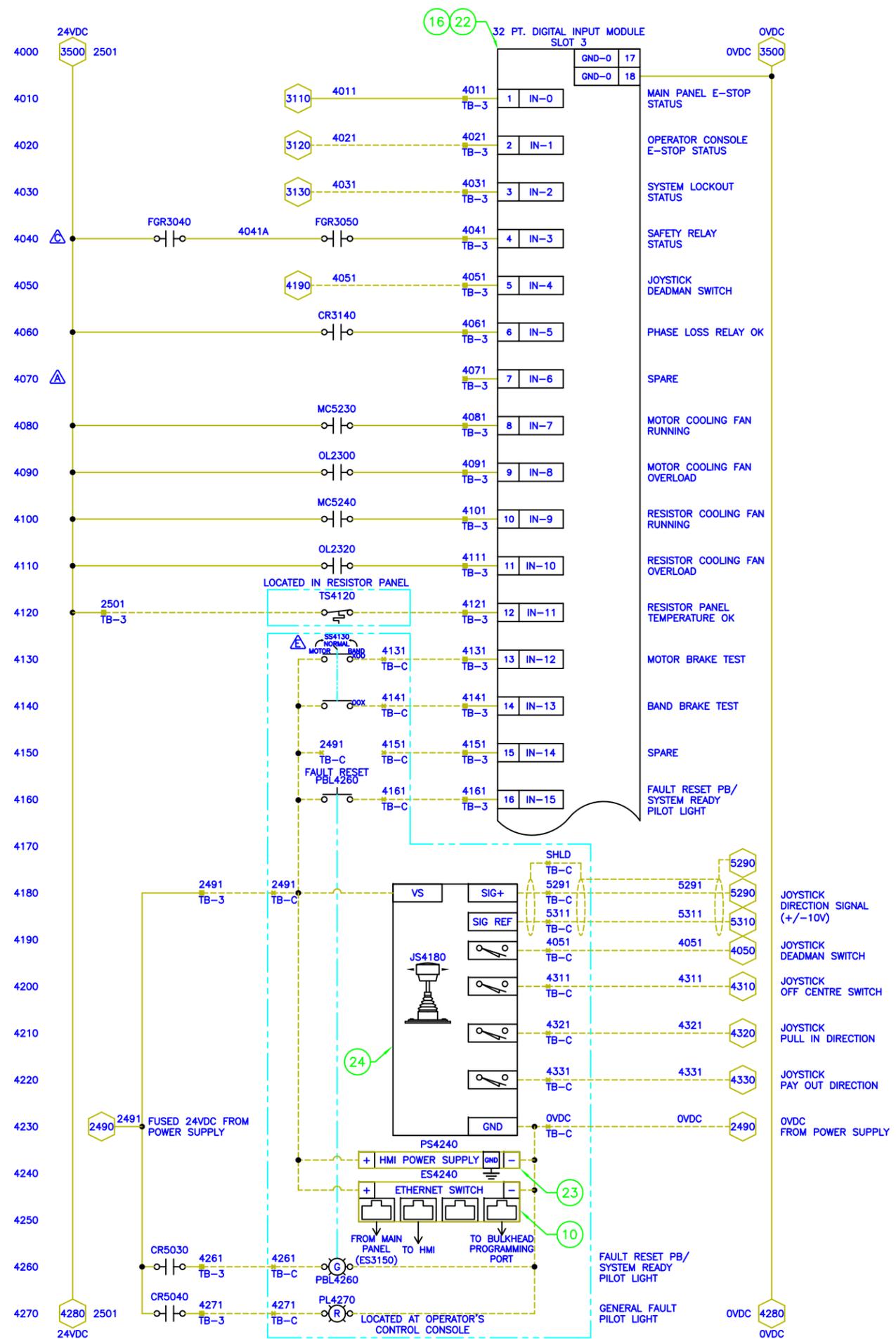
30	5011044	1	PROXIMITY SWITCH 10-30VDC 18MM PLUG NO		REF
29					
28	549103	1	ROTARY PULSE GENERATOR		REF
27	5010781	1	BRAKE-DRUM-575/3/60 THRUSTER		REF
26	5010752	1	MOTOR-EVFD-40HP 1800RPM 575/3/60		REF
25	5008519	1	DIRECT IMMERSION RTD 1/2 NPT		REF
24	5010937	1	JOYSTICK, BI-DIR +-10V 24VDC SR TRIGGER		REF
23	5010736	1	PANELVIEW PLUS 1000		REF
22	5010822	2	CONTROL LOGIX RTB, 36-PIN SPRING CLAMP		REF
21	5010821	4	CONTROL LOGIX RTB, 20-PIN SPRING CLAMP		REF
20	5010733	2	CONTROL LOGIX SLOT FILLER MODULE		REF
19	5010730	2	CONTROL LOGIX ANALOG RTD MODULE		REF
18	5009704	1	CONTROL LOGIX 6PT ANALOG INPUT		REF
17	5007566	1	CONTROL LOGIX 16PT DIGITAL OUTPUT		REF
16	5008005	1	CONTROL LOGIX 32PT DIGITAL INPUT		REF
15	5008007	1	CONTROL LOGIX HIGH SPEED COUNTER		REF
14	5008460	1	CONTROL LOGIX ETHERNET/IP BRIDGE MODULE		REF
13	5010729	1	CONTROL LOGIX CPU 1756-L62		REF
12	5007565	1	CONTROL LOGIX CHASSIS POWER SUPPLY		REF
11	5008009	1	CONTROL LOGIX 10 SLOT CHASSIS		REF
10	5010754	2	5-PORT ETHERNET SWITCH		REF
9	5008029	1	SAFETY RELAY ALLEN BRADLEY		REF
8	5010746	1	MAIN PANEL POWER SUPPLY 120VAC-24VDC		REF
7	5010916	0	CURRENT TRANSDUCER 100A TO 4-20MA		REF
6	5010940	1	VFD BRAKE RESISTOR - 21 OHM 45KW NEMA 3R		REF
5	5010813	1	LINE REACTOR - OPEN, 55AMPS, 0.85MH		REF
4	5009261	0	MODULE - SAFE TORQUE OFF - PF750		REF
3	5009260	1	MODULE - INCREMENTAL ENCODER - PF750		REF
2	5010860	1	NEMA 1 KIT- PF750 FRAME 5		REF
1	5010815	1	VFD, PF755 - 50HP ND, 40HP HD, 600 VAC		REF
ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES-		TIMBERLAND EQUIPMENT LIMITED Woodstock, Ontario, Canada		
A) ANGULAR ± 1/2°	B) DECIMAL (ONE) X ± .06 (TWO) .XX ± .02 (THREE) .XXX ± .01			TITLE ELECTRICAL SCHEMATIC - GP200-1-40EVFD
C) FRACTIONAL 1. GENERAL ± 1/32	2. SAWING, FLAME CUTTING, SHEARING & BREAKING ± 1/16	3. WELDING ± 1/8	MATL CERT N/R NEXT ASSEMBLY 7002090 DERIVED FROM 7001770A WELD TEST N/R FIRST USED DN WD 9007 SHEET 1 OF 6 EST LBS N/A DRAWN AJP DATE 28MAR13 CHECKED DJH APPROVED GRH SCALE 1/1 7002078 REV E	

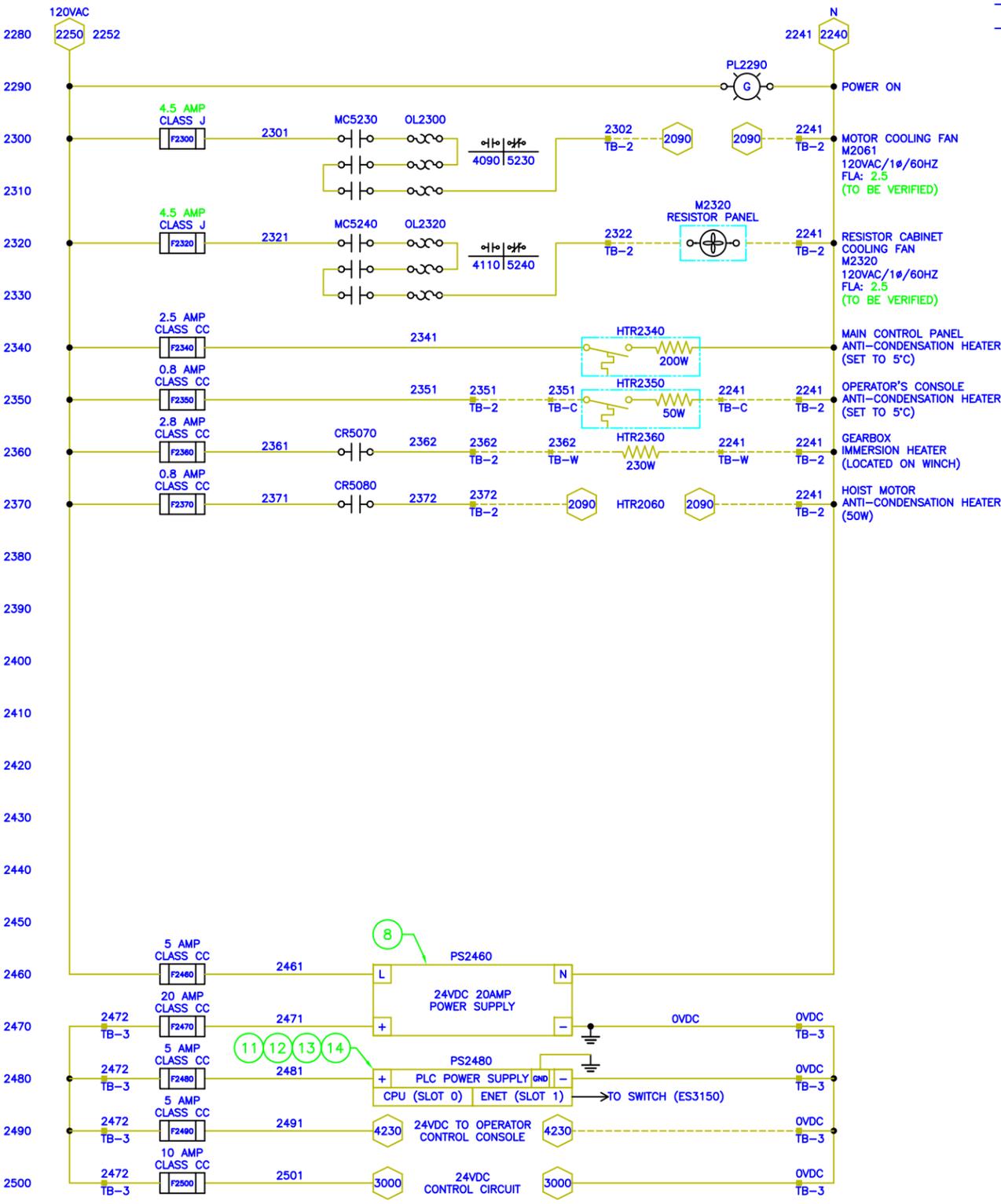
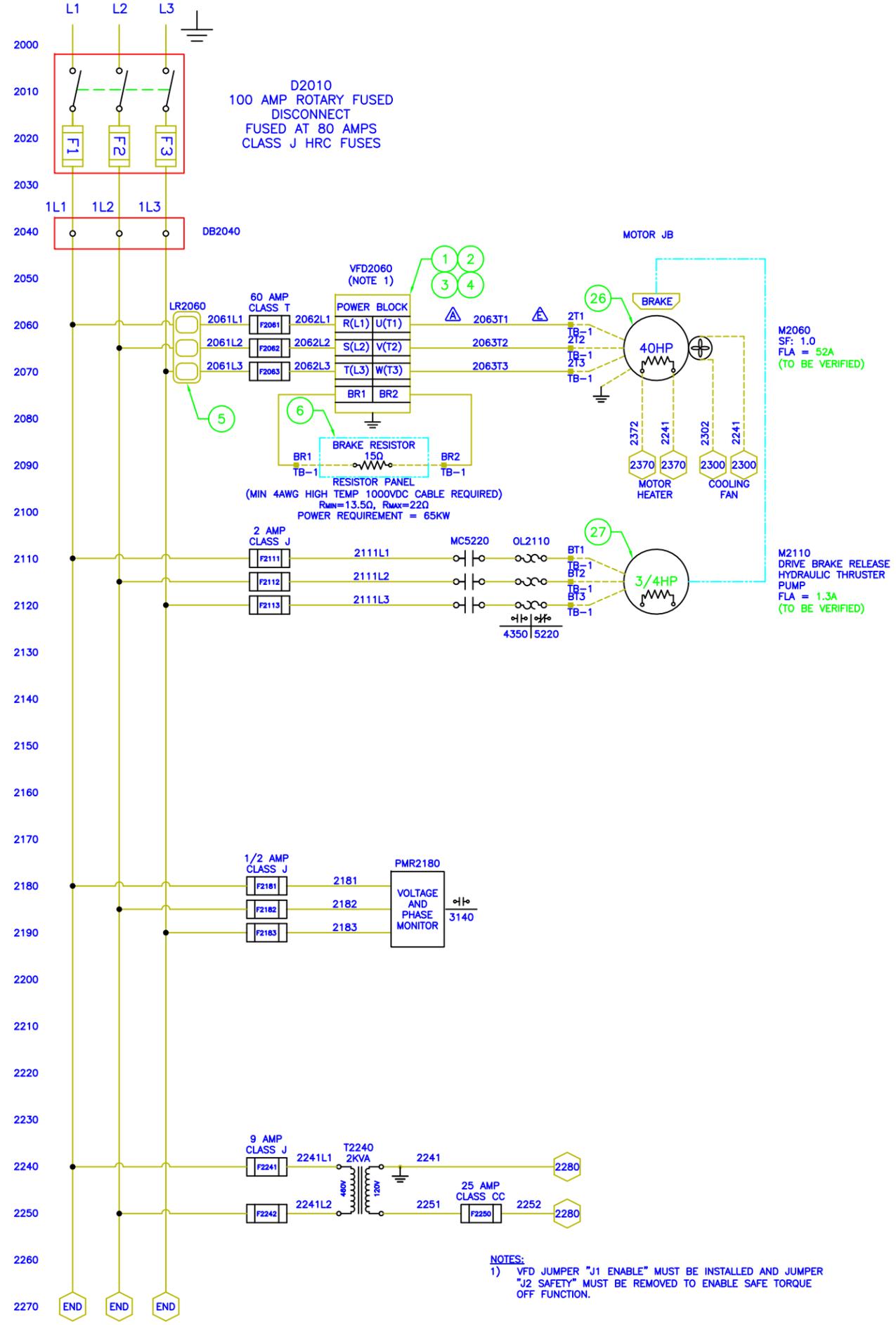


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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES-					
A) ANGULAR			± 1/2°		
B) DECIMAL (ONE)			± .06		
			(TVD) .XX		
			(THREE) .XXX		
C) FRACTIONAL			± 1/32		
1. GENERAL			± 1/32		
2. SAWING, FLAME CUTTING, SHEARING & BREAKING			± 1/16		
3. WELDING			± 1/8		
MATERIAL		TITLE		UNIT QTY	
N/R		ELECTRICAL SCHEMATIC - GP200-1-40EVD			
N/R		NEXT ASSEMBLY 7002090		DERIVED FROM 7001770A	
N/R		FIRST USED ON WD 9007		SHEET 3 OF 6	
EST LBS	N/A	DRAWN AJP	CHECKED DJH	APPROVED GRH	
ACT LBS	N/A	DATE 28MAR13	SCALE 1/1		
				7002078	REV E



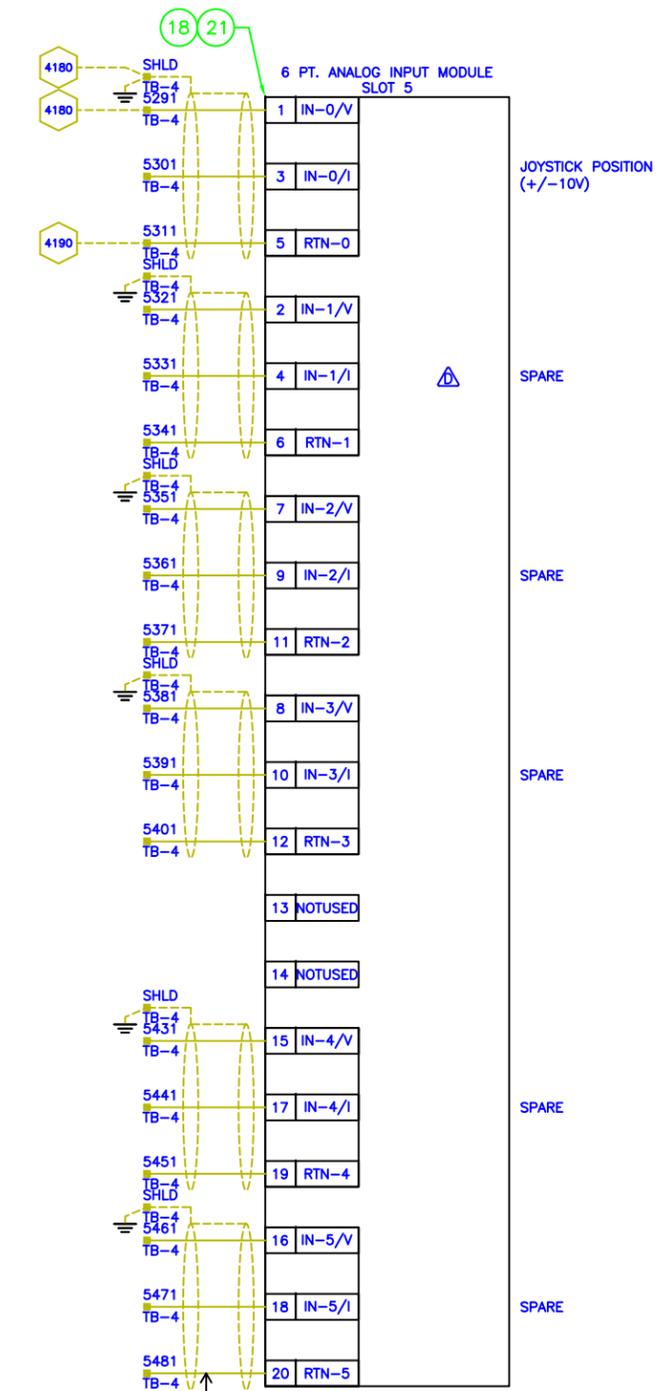
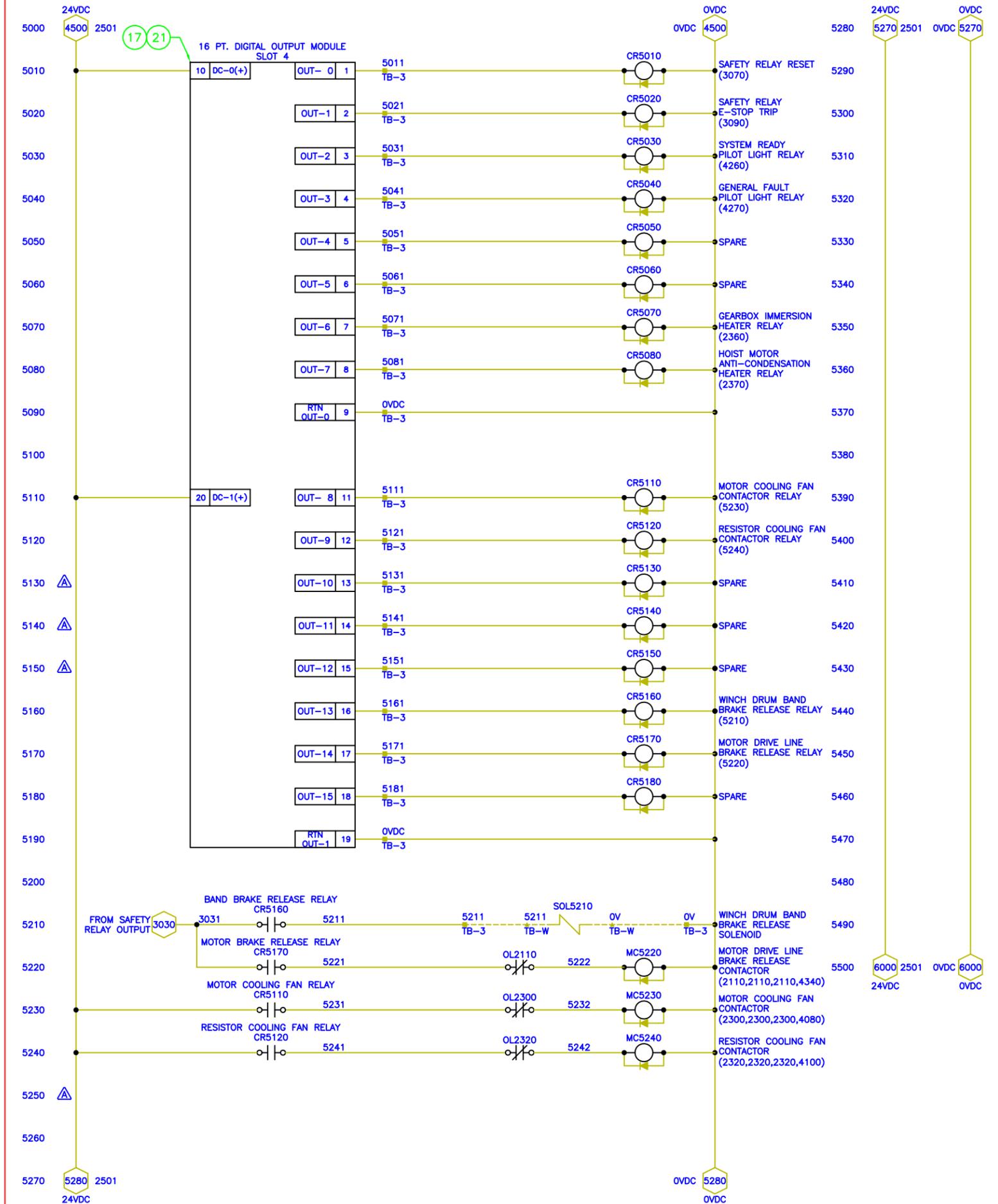
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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES-					
A) ANGULAR		± 1/2"			
B) DECIMAL	(ONE) .X	± .06			
	(TWO) .XX	± .02			
	(THREE) .XXX	± .01			
C) FRACTIONAL		± 1/32			
1. GENERAL		± 1/32			
2. SAWING, FLAME CUTTING, SHEARING & BREAKING		± 1/16			
3. WELDING		± 1/8			
			TIMBERLAND EQUIPMENT LIMITED Woodstock, Ontario, Canada		
MATL CERT N/R MATL TEST N/R WELD TEST N/R EST LBS N/A ACT LBS N/A			TITLE ELECTRICAL SCHEMATIC - GP200-1-40EVFD NEXT ASSEMBLY 7002090 FIRST USED DN WD 9007 DRAWN AJP DATE 28MAR13 CHECKED DJH SCALE 1/1 APPROVED GRH SHEET 4 OF 6 7002078		
					REV E

CUSTOMER SUPPLY
575VAC/3Ø/60HZ



NOTES:
1) VFD JUMPER "J1 ENABLE" MUST BE INSTALLED AND JUMPER "J2 SAFETY" MUST BE REMOVED TO ENABLE SAFE TORQUE OFF FUNCTION.

ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY
<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES-</p> <p>A) ANGULAR ± 1/2° B) DECIMAL (ONE) X ± .06 (TWO) .XX ± .02 (THREE) .XXX ± .01</p> <p>C) FRACTIONAL 1. GENERAL ± 1/32 2. SAWING, FLAME CUTTING, SHEARING & BREAKING ± 1/16 3. WELDING ± 1/8</p>					
<p>TIMBERLAND EQUIPMENT LIMITED Woodstock, Ontario, Canada</p>			<p>TITLE ELECTRICAL SCHEMATIC - GP200-1-40EVD</p>		
<p>MATL CERT N/R</p>			<p>NEXT ASSEMBLY 7002090</p>		
<p>MATL TEST N/R</p>			<p>DERIVED FROM 7001770A</p>		
<p>WELD TEST N/R</p>			<p>FIRST USED ON WD 9007</p>		
<p>EST LBS N/A</p>			<p>DRAWN AJP CHECKED DJH APPROVED GRH</p>		
<p>ACT LBS N/A</p>			<p>DATE 28MAR13 SCALE 1/1</p>		
<p>7002078</p>					<p>REV E</p>



ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY
<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES-</p> <p>A) ANGULAR ± 1/2° B) DECIMAL (ONE) X ± .06 (TWO) .XX ± .02 (THREE) .XXX ± .01</p> <p>C) FRACTIONAL ± 1/32 1. GENERAL ± 1/16 2. SAWING, FLAME CUTTING, SHEARING & BREAKING ± 1/16 3. WELDING ± 1/8</p>					
<p>TITLE ELECTRICAL SCHEMATIC - GP200-1-40EVFD</p>			<p>TIMBERLAND EQUIPMENT LIMITED Woodstock, Ontario, Canada</p>		
MATERIAL TEST N/R		NEXT ASSEMBLY 7002090		DERIVED FROM 7001770A	
WELD TEST N/R		FIRST USED ON WD 9007		SHEET 5 OF 6	
EST LBS N/A		DRAWN AJP		CHECKED DJH	
ACT LBS N/A		DATE 28MAR13		APPROVED GRH	
				7002078	
				REV E	

A	21MAY13	12318	RELEASED FOR PRODUCTION, REM. ITEM 4, CONTACTOR AND QUICK CONNECTS	AJP	GRH
B	03JUL13	12454	SPECIFIED ELECTRICAL ENCLOSURES AS 316SS, ADD ITEM 30	AJP	GRH
C	23SEP13	12666	SPECIFIED GLANDS, ETC. AS 316SS	AJP	DJH
D	13NOV13	12811	TEMPORARY INTERCONNECTION WIRING AT TEL	DJH	GRH

APPLICATION

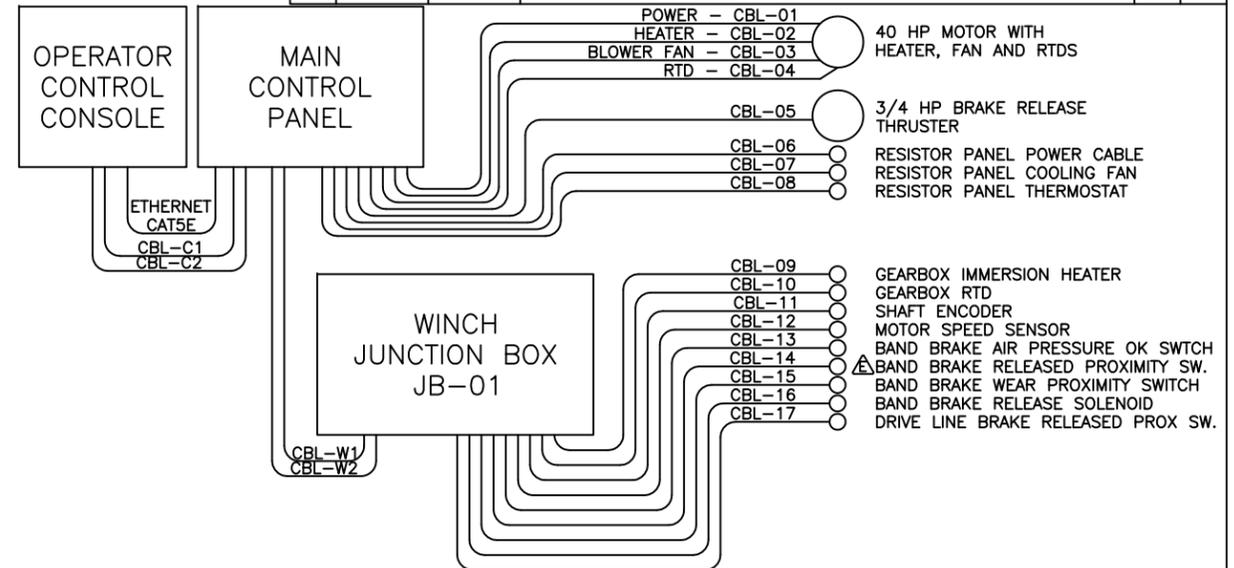
- GENERAL PURPOSE ROPE HANDLING WINCH
- TO BE USED FOR THE INITIAL INSTALLATION OF MINING ROPES, INSTALLATION AND REMOVAL OF BAILS AND GENERAL MAINTENANCE IN THE HEADFARME AND COLLAR AREA OF THE MINING SHAFT
- WINCH WILL BE STATIONED EITHER INDOORS OR OUTDOORS, TO BE MOVABLE BY FORKLIFT.

SPECIFICATIONS

- PANEL DESIGN AND BUILD SHALL BE PER TEL ELECTRICAL SCHEMATIC 7002078.
- THE CONNECTION OF CABLES SHALL ALWAYS BE BOTTOM ENTRY.
- STANDARDS TO BE MET: UL, CSA, CANADIAN ELECTRICAL CODE.
- PANELS ARE TO BE 316SS, NEMA 4X RATED, WITH APPROPRIATELY RATED 316SS GLANDS, FITTINGS, ETC.
- PANEL SHALL BE SUITABLE FOR OPERATION ON A SYSTEM CAPABLE OF DELIVERING 65,000 SYMMETRICAL RMS AMPERES IN A FAULT CONDITION.
- PANEL SHALL BE BUILT TO MAINTAIN INTERNAL "TOUCH SAFE" STATUS. ALL DISCONNECT/CONTACTOR LUGS AND DISTRIBUTION BLOCKS SHALL BE SHROUDED, AND ALL FUSE HOLDERS SHALL BE OF DEADFRONT DESIGN (MERSEN USCC SERIES OR EQUIVALENT).
- EARTHING CONNECTION SHALL BE AVAILABLE ACROSS THE BOTTOM OF THE PANEL BACKPLANE FOR BONDING (GROUND BAR).
- PILOT LIGHTS AND PUSH BUTTON COLOURS SHALL BE IN ACCORDANCE WITH THE CSA REQUIREMENTS.
- ALL CONTROL CABLES WILL ENTER THE ENCLOSURE THROUGH RATED BULKHEADS IN THE BOTTOM OF THE ENCLOSURE.
- ALL TERMINAL BLOCKS FOR SIGNAL, CONTROL, E-STOP STRINGS SHALL BE CAGE CLAMP TYPE.
- 20% SPARE TERMINAL BLOCKS SHALL BE PROVIDED.
- TERMINAL BLOCK SECTION SHALL BE IDENTIFIED WITH THE IDENTIFIER INDICATED ON THE DRAWINGS.
- TERMINALS SHALL BE GROUPED ON THE DIN RAIL BY POTENTIAL TO FACILITATE WIRE SEPARATION. WITHIN EACH POTENTIAL GROUP, TERMINALS SHALL BE INSTALLED IN NUMERICAL ORDER. CABLE SHIELD DRAIN TERMINALS SHALL BE INSTALLED ADJACENT TO THE TERMINALS UPON WHICH THEIR CABLE'S CONDUCTORS TERMINATE.
- VOLTAGE SUPPLY DISTRIBUTION TERMINALS (120VAC/N, 24VDC/0VDC) SHALL BE GROUPED BY POTENTIAL, AND TERMINALS OF LIKE POTENTIAL CONNECTED VIA A COMMONING BUS ACROSS THE TERMINALS. THESE SUPPLY GROUPS SHALL BE INDIVIDUALLY SUPPLIED WITH 20% SPARE CAPACITY, OR THE CAPACITY TO CONNECT FOUR ADDITIONAL WIRES, WHICHEVER IS GREATER.
- WIRES SHALL BE ROUTED IN DUCTS, AND ROUTED TO MAINTAIN SEPARATION OF UNLIKE VOLTAGES WHERE FEASIBLE. DUCTS SHALL BE FILLED NO MORE THAN 40% BY CALCULATED CROSS-SECTIONAL AREA.
- WIRES SHALL BE TERMINATED WITH FERRULES, AND A WIRE MARKER APPLIED TO EACH END. WIRE MARKERS SHALL BE HEAT SHRINK OR SELF-LAMINATING TYPE. WIRE NUMBERS SHALL MATCH TERMINAL NUMBERS SHOWN.
- WHERE NECESSARY TO ROUTE WIRING EXTERNAL TO DUCTS, WIRES SHALL BE NEATLY BUNDLED AND RUN IN PARALLEL/PERPENDICULAR PATHS.
- THE INCOMING SUPPLY SHALL BE PROVIDED WITH AN HRC CLASS FUSIBLE MAIN ISOLATOR WITH PAD LOCKABLE YELLOW AND RED HANDLE. THE DISCONNECT IS TO BE MOUNTED ON THE BACK PANEL, WITH THE HANDLE MOUNTED ON THE DOOR.
- ALL FORCE GUIDED RELAYS SHALL BE POSITIVE TYPE OMRON, ALLEN BRADLEY OR EQUIVALENT.
- ALL FIELD DEVICES SHALL BE WIRED WITH SOW TYPE 600V CABLING SUITABLE FOR -30 TO 40 DEGREES CELSIUS, AND SHALL BE APPROVED FOR THE AREA OF INSTALLATION.
- NO SUBSTITUTIONS WILL BE PERMITTED WITHOUT PREVIOUS AUTHORIZATION FROM TIMBERLAND OR IT'S AGENTS.
- ENGRAVED LAMICOID LABELS SHALL BE SUPPLIED FOR ALL COMPONENTS INSIDE AND OUTSIDE OF PANEL.
- JUMPERS TO BE INSTALLED ON TERMINALS AS REQUIRED.
- CABLE CONNECTORS REMOVED - NO LONGER APPLICABLE. Δ
- CABLE CONNECTORS REMOVED - NO LONGER APPLICABLE. Δ
- ALL SPARE PINS ON CABLE CONNECTORS ARE TO BE TERMINATED FOR FULL CONTINUITY TO REMOTE PANELS FOR FUTURE USE WITHOUT CABLE DISASSEMBLY.
- VENDOR TO SUPPLY PIN OUT DETAILS AND WIRING DIAGRAM OF MULTI PIN CONNECTORS.
- MOTOR STARTERS ARE TO BE NEMA TYPE.
- PANEL BUILDER WILL SUPPLY ALL MATERIALS AND COMPONENTS EXCEPT FREE-ISSUE PARTS.
- VENDOR WILL BE RESPONSIBLE FOR ALL ASPECTS OF THE ELECTRICAL INSTALLATION, INCLUDING BUT NOT LIMITED TO:
 - MOUNTING OF ENCLOSURES
 - DRILLING AND TAPPING OF HOLES
 - ROUTING AND SECURING OF CABLES OR CONDUITS
 - LAYOUT AND DRILLING OR PUNCHING HOLES IN ALL ENCLOSURES
 - FASTENERS FOR CONDUITS OR CABLES AND CABLE BUNDLING (TYE-RAPS)
- PANEL BUILDER WILL ENSURE THAT PANEL DOES NOT EXCEED RECOMMENDED SIZE, WHERE STATED, AND WILL FIT MECHANICAL FOOTPRINT.
- ALL PUSH BUTTONS AND OPERATORS SHALL BE SUITABLE FOR THE APPLICATION.
- ALL MAIN POWER CABLES FROM MAIN DISCONNECT TO STARTERS AND MOTORS SHALL BE 1KV INSULATION RATING, XLPE, RW-90 ARMORED TECK TYPE.
- VENDOR HAS FREEDOM OF SELECTION OF OTHER NON FREE-ISSUE COMPONENTS, HOWEVER THEY WILL REQUIRE APPROVAL AND MUST COMPLY WITH ALL APPLICABLE CODES AND SPECIFICATIONS.
- ETHERNET CABLES SHALL BE RATED FOR HARD USAGE CAT5E OR BETTER.

MACHINE WIRING NOTES

- ALL SKID WIRING SHALL BE SUITABLE FOR OUTDOOR USE, MUD AND UV RESISTANT.
- CABLES SHALL BE ROUTED PARALLEL AND PERPENDICULAR TO EQUIPMENT FEATURES, BENDING AT SMOOTH 45° OR 90° ANGLES, WITH PROPER CONSIDERATION TO BENDING RADIUS.
- CABLES SHALL BE FASTENED AT INTERVALS APPROPRIATE TO ENSURE A NEAT APPEARANCE AND ELIMINATE SAG OR THE POSSIBILITY OF ENTANGLEMENT IN MOVING PARTS.
- IF A CABLE IS REQUIRED TO ENTER AND PIECE OF EQUIPMENT FROM ANY DIRECTION OTHER THAN BELOW, A DRIP LOOP SHALL BE PROVIDED TO ENSURE NO WATER CAN POOL AT THE ENTRY GLAND.
- ALL INTERCONNECTION CABLES TO BE SUPPLIED BY PANEL VENDOR.
- WHERE SHOWN, SHIELDED CABLES SHALL BE USED. INDIVIDUALLY SHIELDED PAIRS/TRIADS WITHIN LARGER CABLES ARE ACCEPTABLE.
- CABLE CONNECTORS REMOVED - NO LONGER APPLICABLE. Δ



SCOPE

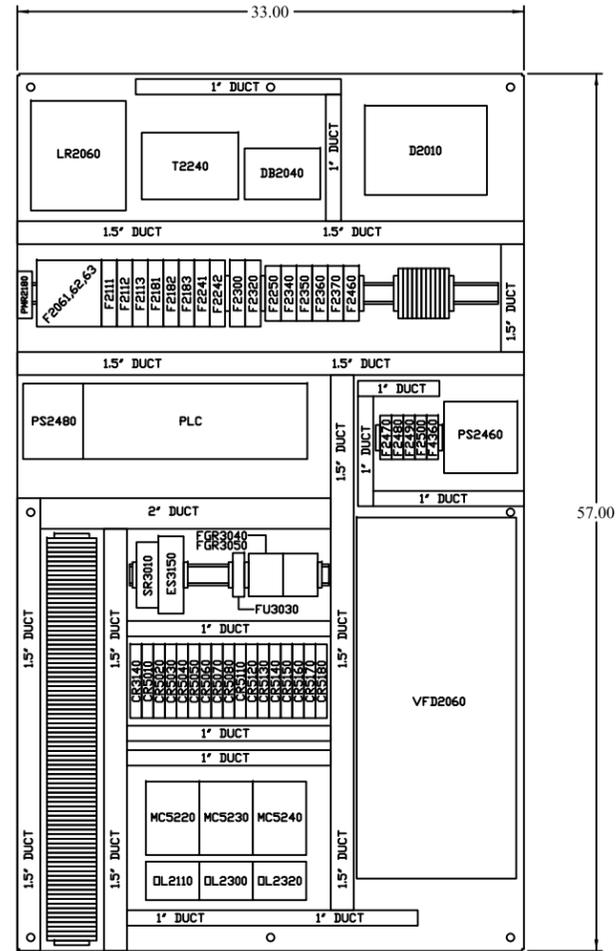
- 1) MAIN CONTROL PANEL (QTY 1)**
 - ALL COMPONENTS NOT FREE ISSUED BY TIMBERLAND
 - INSTALLATION/WIRING OF FREE-ISSUED COMPONENTS
 - WIRE DUCTS AND WIRING
 - TERMINAL BLOCKS AND DIN RAILS
 - GROUND LUGS
- 2) OPERATOR'S CONTROL CONSOLE (QTY 1)**
 - ALL COMPONENTS NOT FREE ISSUED BY TIMBERLAND
 - INSTALLATION/WIRING OF FREE-ISSUED COMPONENTS
 - WIRE DUCTS AND WIRING
 - TERMINAL BLOCKS AND DIN RAILS
 - GROUND LUGS
- 3) WINCH JUNCTION BOX (QTY 1)**
 - TERMINAL BLOCKS AND DIN RAILS
 - GROUND LUGS
- 4) INTERCONNECTION CABLING**
 - VENDOR SHALL SUPPLY ALL INTERCONNECTING WIRING FOR BOTH TEMPORARY AND PERMANENT WIRING INSTALLATIONS.
- 5) DOCUMENTATION**
 - VENDOR SHALL SUPPLY ALL PANEL LAYOUT DRAWINGS INCLUDING BILL OF MATERIAL. BILL OF MATERIAL SHALL BE SUPPLIED IN BOTH CAD AND EXCEL FORMAT.
- 6) INSTALLATION AT TIMBERLAND**
 - TEMPORARY INTERCONNECTING CABLES AND CONNECTORS
 - WIRING TO ALL MOTORS AND MOTOR ACCESSORIES
 - WIRING ALL COMPONENTS TO PANELS AS SHOWN
 - WIRING OF ALL DEVICES MOUNTED ON WINCH TO WINCH JUNCTION BOX
 - GROUNDING OF ENTIRE SYSTEM

DRAWING SIZE: C
 PROJECT NAME: PROJECT VAULT
 PROJECT NUMBER: 334562
 PURCHASE ORDER NUMBER: 334562--P05--4M--7192
 EQUIPMENT TAG NUMBER: 41722
 VDRL CODE: U.5
 20K LBS WINCH

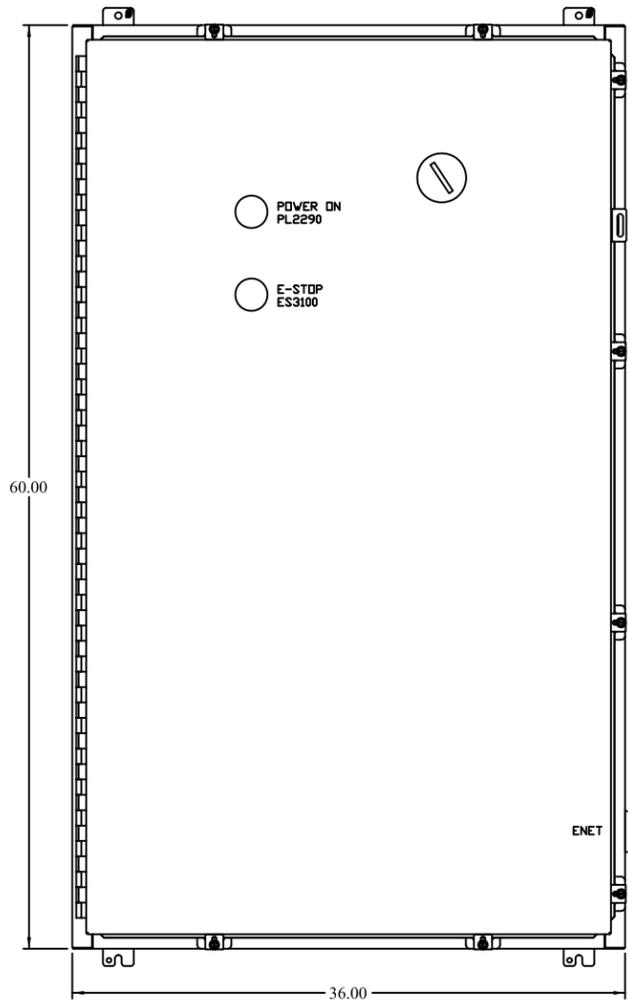


30	5011044		PROXIMITY SWITCH 10-30VDC 18MM PLUG NO		1
29	7002078		ELECTRICAL SCHEMATIC - GP200-1-40EVFD		REF
28	549103		ROTARY PULSE GENERATOR		1
27	5010781		BRAKE-DRUM-575/3/60 THRUSTER		REF
26	5010752		MOTOR-EVFD-40HP 1800RPM 575/3/60		REF
25	5008519		DIRECT IMMERSION RTD 1/2 NPT		1
24	5010937		JOYSTICK, BI-DIR +-10V 24VDC SR TRIGGER		1
23	5010736		PANELVIEW PLUS 1000		1
22	5010822		CONTROL LOGIX RTB, 36-PIN SPRING CLAMP		2
21	5010821		CONTROL LOGIX RTB, 20-PIN SPRING CLAMP		4
20	5010733		CONTROL LOGIX SLOT FILLER MODULE		2
19	5010730		CONTROL LOGIX ANALOG RTD MODULE		2
18	5009704		CONTROL LOGIX 6PT ANALOG INPUT		1
17	5007566		CONTROL LOGIX 16PT DIGITAL OUTPUT		1
16	5008005		CONTROL LOGIX 32PT DIGITAL INPUT		1
15	5008007		CONTROL LOGIX HIGH SPEED COUNTER		1
14	5008460		CONTROL LOGIX ETHERNET/IP BRIDGE MODULE		1
13	5010729		CONTROL LOGIX CPU 1756-L62		1
12	5007565		CONTROL LOGIX CHASSIS POWER SUPPLY		1
11	5008009		CONTROL LOGIX 10 SLOT CHASSIS		1
10	5010754		5-PORT ETHERNET SWITCH		2
9	5008029		SAFETY RELAY ALLEN BRADLEY		1
8	5010746		MAIN PANEL POWER SUPPLY 120VAC-24VDC		1
7	5010916		CURRENT TRANSDUCER 100A TO 4-20MA		0
6	5010940		VFD BRAKE RESISTOR - 21 OHM 45KW NEMA 3R		1
5	5010813		LINE REACTOR - OPEN, 55AMPS, 0.85MH		1
4	5009261		MODULE - SAFE TORQUE OFF - PF750		0
3	5009260		MODULE - INCREMENTAL ENCODER - PF750		1
2	5010860		NEMA 1 KIT- PF750 FRAME 5		1
1	5010815		VFD, PF755 - 50HP ND, 40HP HD, 600 VAC		1

ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY
<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES-</p> <p>A) ANGULAR ± 1/2° B) DECIMAL (ONE) X ± .06 (TWO) XX ± .02 (THREE) XXX ± .01</p> <p>C) FRACTIONAL 1. GENERAL ± 1/32 2. SAWING, FLAME CUTTING, SHEARING & BREAKING ± 1/16 3. WELDING ± 1/8</p>					
<p>TIMBERLAND EQUIPMENT LIMITED Woodstock, Ontario, Canada</p>			<p>TITLE PANEL LAYOUT ASSY GP200-1-40EVFD</p> <p>NEXT ASSEMBLY 30-00139-000 DERIVED FROM 7002074</p> <p>FIRST USED 9007 SHEET 1 OF 4</p> <p>DATE 15APR13 SCALE 1/1</p> <p>7002090</p> <p>REV E</p>		

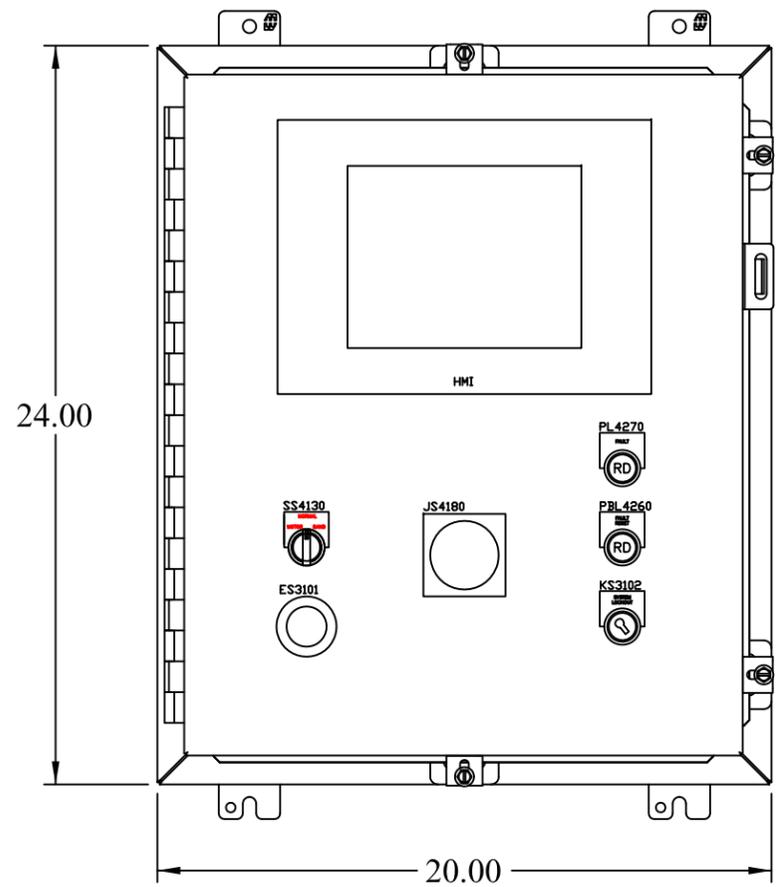
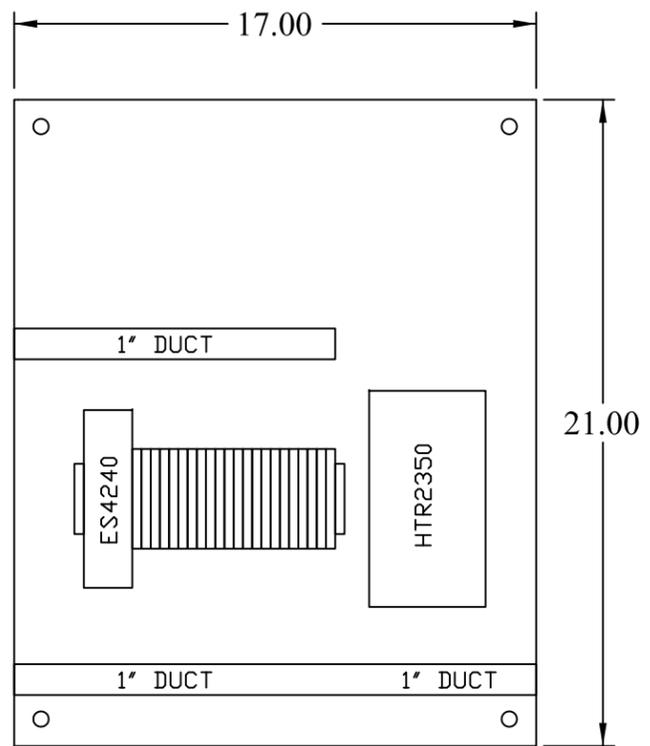


INNER VIEW



FRONT VIEW

ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY
<small>This print is the property of Timberland Equipment Limited. It is loaned with the express agreement that the drawing and the information contained therein are the property of Timberland Equipment Limited and will not be reproduced, copied or otherwise disposed of directly or indirectly, and will not be used in whole or in part to assist in making or to furnish any information for making drawings, prints or other reproductions thereof, or for the making of apparatus or parts thereof except upon written permission of Timberland Equipment Limited. The acceptance of the print will be construed as an acceptance of the foregoing agreement.</small>					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES- A) ANGULAR ± 1/2° B) DECIMAL (ONE) .X ± .06 (TWO) .XX ± .02 (THREE) .XXX ± .01 C) FRACTIONAL ± 1/32 1. GENERAL ± 1/32 2. SAWING, FLAME CUTTING, SHEARING & BREAKING ± 1/16 3. WELDING ± 1/8			 TIMBERLAND EQUIPMENT LIMITED Woodstock, Ontario, Canada		
MATL CERT N/R MATL TEST N/R WELD TEST N/R EST LBS N/A ACT LBS N/A			TITLE PANEL LAYOUT ASSY GP200-1-40EVFD NEXT ASSEMBLY 30-00139-000 FIRST USED ON WD 9007 DRAWN AJP DATE 15APR13		DERIVED FROM 7002074 SHEET 3 OF 4 APPROVED GRH SCALE 1/8
				7002090	REV E



ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY
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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES DIMENSIONS IN [] ARE MM -TOLERANCES- A) ANGULAR ± 1/2° B) DECIMAL (ONE) .X ± .06 (TWO) .XX ± .02 (THREE) .XXX ± .01 C) FRACTIONAL 1. GENERAL ± 1/32 2. SAWING, FLAME CUTTING, SHEARING & BREAKING ± 1/16 3. WELDING ± 1/8			 TIMBERLAND EQUIPMENT LIMITED Woodstock, Ontario, Canada		
MATL CERT N/R MATL TEST N/R WELD TEST N/R EST LBS N/A ACT LBS N/A			TITLE PANEL LAYOUT ASSY GP200-1-40EVD NEXT ASSEMBLY 30-00139-000 DERIVED FROM 7002074 FIRST USED DN WD 9007 SHEET 4 OF 4 DRAWN AJP CHECKED DJH APPROVED GRH DATE 15APR13 SCALE 1/4		
				7002090	REV E

8.2

Attachments 2

Component Parts & Service Detail

8.2

Attachments 2

5010771 – Reducer

INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS

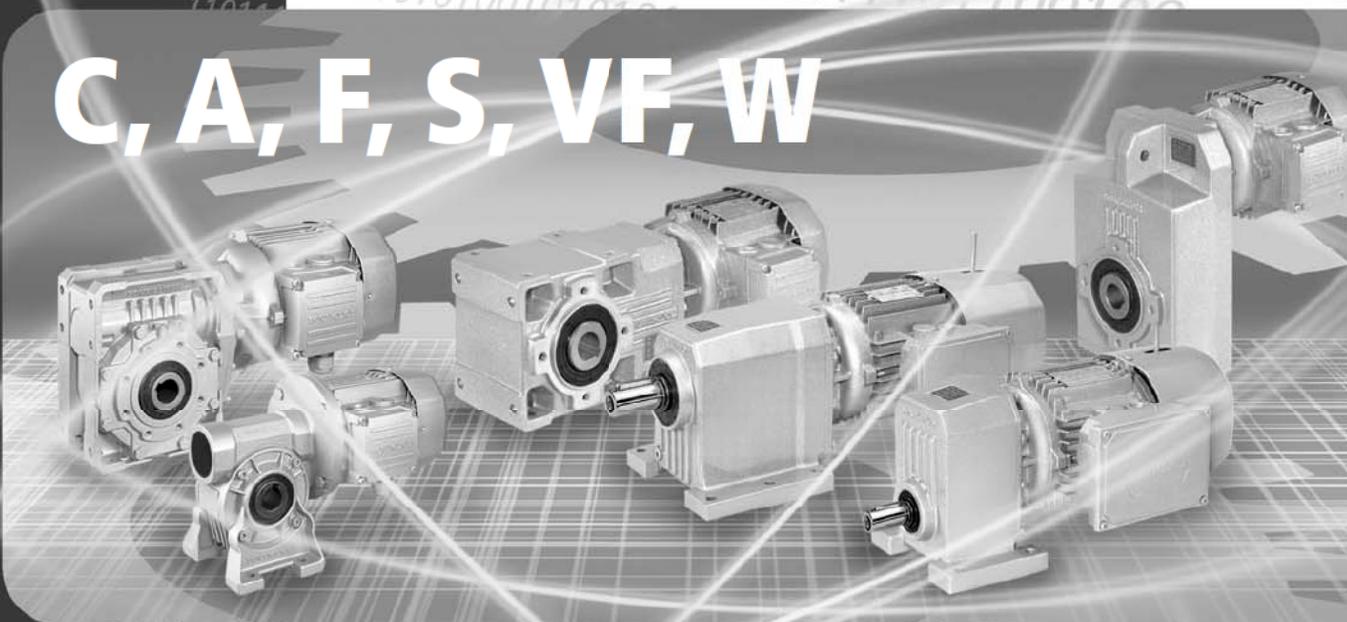


BONFIGLIOLI
RIDUTTORI

Installation, use and service manual



C, A, F, S, VF, W



BONFIGLIOLI



INSTALLATION, USE AND SERVICE MANUAL

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Revisions

Refer to page 50 for the catalogue revision index. Visit www.bonfiglioli.com to search for catalogues with up-to-date revisions.



1.0 - GENERAL INFORMATION

1.1 - PURPOSE OF THE MANUAL

This manual has been compiled by the Manufacturer to provide information on the safe transport, handling, installation, maintenance, repair, disassembly and dismantling of the gear units.

All purchasing and design criteria is provided in the Sales Catalogue. Apart from adhering to established engineering practices, the information given in this manual must be carefully read and applied rigorously.

The information regarding the electric motor that can be found matching the speed reducer is supplied with the owner's manual relevant to the specific electric motor.

Failure to adhere to the information provided herein may result in risk to personal health and safety, and may incur economic damages.

This information, provided in the original language (Italian) of the Manufacturer, may also be made available in other languages to meet legal and/or commercial requirements.

The documentation must be stored by a person with the correct authority and must always be made available for consultation.

In case of loss or damage, replacement documentation must be requested directly from the Manufacturer, quoting the code of this manual.

The manual reflects the state of the art at the time of commercialisation of the gear unit.

The Manufacturer reserves the right to modify, supplement and improve the manual, without the present publication being for that reason considered inadequate.

Particularly significant sections of the manual and important specifications are highlighted by symbols whose meanings are given below.

SYMBOLS:



DANGER - WARNING

This symbol indicates situations of serious danger which, if ignored, may result in serious risks to the health and safety of personnel.



CAUTION - ATTENTION

This symbol indicates the need to adopt specific precautions to avoid risks to the health and safety of personnel and possible economic damages.



IMPORTANT

This symbol indicates important technical information.



The instructions indicated on a yellow background next to these symbols refer exclusively to equipment conforming to the "ATEX" Directive 94/9/EC.

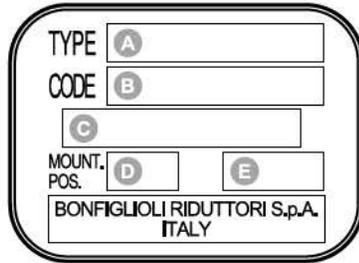
The operations highlighted by these symbols must be carried out by qualified professionals specially trained in the safety requirements for zones characterised by potentially explosive atmospheres.

Failure to observe these instructions may result in serious risks to personal and environmental safety

1.2 - EQUIPMENT IDENTIFICATION

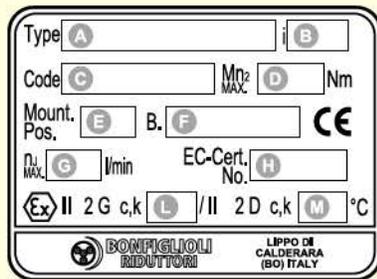
The gear unit bears the following nameplate. The nameplate bears all references and indispensable safety instructions. The gear unit's identifying code is explained in the Sales Catalogue. If the gear unit is supplied complete with electric motor (gearing motor), all information regarding the motor itself is supplied in the motor manual.

Nameplate data



- A** Gear unit type.
- B** Product code.
- C** Month / Year of manufacture.
- D** Mounting position.
- E** Gear ratio.

Nameplate for ATEX-specified gear units:



- A** Gear unit type.
- B** Gear ratio.
- C** Product code.
- D** Transmissible torque at $n_1=1400$ rpm [Nm].
- E** Mounting position.
- F** Month / Year of manufacture.
- G** Maximum drive speed.
- H** Certification Nr.
- L** Temperature class, or maximum surface temperature.
- M** Maximum surface temperature.



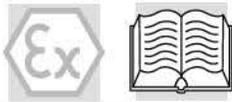
CE - ExMark

- Environmental limits (ambient temperature range between -20°C and $+40^{\circ}\text{C}$).
- Maximum surface temperature: temperature class **T4** for 2G and **130°C** for 2D. Some types of gear unit, shown in the catalogue, are exceptions to this rule and are marked temperature class **T3** for 2G or **160°C** for 2G and 2D.
- Certifying agency with whom the technical file has been deposited.

Readability of the nameplate

The nameplate and the information thereon must be readable at all times and consequently cleaned from time to time.

Should the nameplate wear and/or become damaged so as to affect its readability or that of even one of the items of information thereon, the User must request a new nameplate from the Manufacturer, quoting the information given in this manual, and replace the old one.



1.3 - GLOSSARY AND TERMINOLOGY

Some of the frequently occurring terms used in this manual are described below so as to unequivocally define their meaning.

Routine maintenance: the set of operations required for maintaining the functionality and efficiency of the gear unit. These operations are usually scheduled by the Manufacturer, who defines the qualifications required and tasks in question.

Non-routine maintenance: the set of operations required for maintaining the functionality and efficiency of the gear unit. These operations are not scheduled by the Manufacturer and must be done by an expert maintenance technician.

Expert maintenance technician: an authorised technician selected by means of having the qualifications, skills and mechanical and electrical training to do repairs and non-routine maintenance work on the gear unit.

Overhaul: an overhaul consists in the replacement of bearings and/or other mechanical components which have worn to such an extent as to compromise the operation of the gear unit. The overhaul also includes verification of the condition of all gear unit components (keys, seals, gaskets, vents, etc.). If any such components are damaged they must be replaced and the reason for the damage identified.

1.4 - REQUESTING TECHNICAL ASSISTANCE

For any technical service needs, contact the Manufacturer's sales network, quoting the information on the unit's nameplate, the approximate hours of service and the type of defect.

1.5 - MANUFACTURER'S LIABILITY

The Manufacturer declines all liability for cases of:

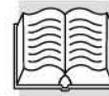
- use of the gear unit in violation of local laws on safety and accident prevention at work.
- incorrect installation, disregard or incorrect application of the instructions provided in this manual.
- incorrect or defective power supply (gearmotors).
- modifications or tampering.
- work done on the unit by unqualified or unsuitable persons.

The safety of the gear unit also depends on scrupulous observance of the instructions given in this manual, in particular:

- always operate the unit within its operating limits.
- diligently observe the routine maintenance schedule.
- only authorise trained operators to inspect and service the unit.
- use only original spare parts.



- the configurations given in the gear unit catalogue are the only ones permitted.
- do not attempt to use the unit contrary to the instructions supplied.
- the instructions given in this manual do not substitute but summarise the provisions of applicable safety legislation.



2.0 - TECHNICAL INFORMATION

2.1 - GEAR UNIT DESCRIPTION

The gear unit has been designed and constructed for integration, if required, driven by an electric motor, into an assembly of interlocking parts or mechanisms as part of a specific application.

Depending on the requirements of the application, the gear unit can be supplied in a variety of executions and configurations. It is capable of satisfying a range of specific requirements in the mechanical, chemical, agricultural and food industries, etc.

BONFIGLIOLI RIDUTTORI supplies a range of accessories and optionals to make their products as versatile as possible. For further technical information and descriptions, refer to the Sales Catalogue.

The User is responsible for using the products recommended for installation and maintenance of BONFIGLIOLI gear units in an appropriate manner and in accordance with instructions.

 	<p>SAFETY SPECIFICATIONS FOR ATEX SPECIFIED GEAR UNITS</p> <ul style="list-style-type: none">• use of synthetic lubricants only (oil and grease)• VITON[®] seal rings• thread locker on all external bolts• vent caps with anti-intrusion valve• double oil seals on series C gear units, and oil seals with dust traps on all other types• components and products operable at above the maximum rated operating temperature• no metal moving parts external to the gear unit• no plastic parts capable of building up electrostatic charge• irreversible temperature indicator supplied along with each unit• for installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme of all surfaces and recesses to avoid a build up of dust of more than 5 mm in depth• to prevent dust build-ups in difficult to access areas, the units are equipped with a variety of seals in proximity to the couplings of moving parts, mounting flanges and external threaded holes.
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2.2 - CONFORMITY TO STANDARDS

All gear units or gearmotors (when supplied complete with electric motor) are designed in compliance with the provisions of all applicable Essential Health and Safety Requirements, "Machinery Directive" 98/37/EC and, if requested, can be supplied complete with Manufacturer's Declaration – Annex IIB as provided by said directive.

The electric motors of all BONFIGLIOLI RIDUTTORI gearmotors conform to the provisions of Low Voltage Directive 73/23/EEC and Electromagnetic Compatibility Directive 89/336/EEC.

 	<p>Furthermore, if specified for use in potentially explosive atmospheres, the gear units are designed and constructed to conform with the Essential Health and Safety Requirements (EHSR) of Annex II of ATEX Directive 94/9/EC and conform to the following classification:</p> <ul style="list-style-type: none">• Equipment group: II.• Class: Gas 2G – Dust 2D.• Zone: Gas 1 – Dust 21.• Maximum surface temperature: temperature class T4 for 2G and 130°C for 2D. <p>Some types of gear units, given in the catalogue, are exceptions to this rule and are marked temperature class T3 for 2G or 160°C for 2G and 2D.</p>
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2.3 - OPERATING LIMITS AND CONDITIONS



Modification of the gearbox configuration or mounting position is only permitted if previously authorised by the BONFIGLIOLI RIDUTTORI technical service.



Failure to obtain said authorisation voids the ATEX certification.

Ambient conditions

- Operation of gear units is permitted at ambient temperatures between -20°C and $+40^{\circ}\text{C}$.
However, for temperatures between -20°C and -10°C unit may only start up after it has been progressively and evenly pre-heated, or otherwise initially operated unloaded.
Load may then be connected to the output shaft when the gear unit has reached the temperature of -10°C , or higher.
- Do not use the gear unit, if not explicitly intended for the purpose, in a potentially explosive atmosphere or where the use of explosion-proof equipment is specified.



The nameplate data on the maximum surface temperature, refer to measurements made in normal ambient and installation conditions. Even minimal variations to said conditions (e.g. smaller mounting cabinet) could have a significant impact on the build up of heat.



Lighting

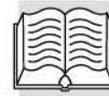


If the unit is to be serviced in a poorly lit area, use additional lamps and ensure that the work is done in compliance with applicable safety legislation.

Noise - Vibration

During operational testing at the Manufacturer's premises, the acoustic pressure measured under full load at a distance of 1 m from the unit and 1.6 m above ground level without vibration was less than 85 dB(A).

The vibrations produced by the gear unit do not constitute a health risk for personnel. Excessive vibration may be the result of a fault and should be immediately reported and eliminated.



3.0 - SAFETY INFORMATION

3.1 - SAFETY STANDARDS

- Carefully read the instructions given in this manual and those posted directly on the gear unit, especially those regarding safety.
- Persons charged with working on the gear unit at any time in its service life must be trained specifically for the purpose with special abilities and experience in this area as well as being equipped with the appropriate tools and individual safety equipment (as per Legislative Decree 626/94). Failure to meet these requirements constitutes a risk to personal health and safety.
- Use the gear unit only for the applications envisaged by the Manufacturer. Improper use can result in risks to personal health and safety and economic damages.



The applications defined by the Manufacturer are those industrial applications for which the gear unit has been developed.

- Keep the gear unit at its maximum efficiency by following the routine maintenance schedule. Good maintenance enables the unit to operate at maximum performance over a long service life in compliance with safety regulations.
- When working on the unit in areas which are difficult to access or hazardous, ensure that adequate safety precautions have been taken for the operator and others in compliance with the provisions of law on health and safety at work.
- All maintenance, inspection and repairs must only be done by an expert maintenance technician fully familiar with the attendant hazards. It is, therefore, essential to implement operating procedures which address potential hazards and their prevention for the entire machine. The expert maintenance technician must always work with extreme caution in full compliance with applicable safety standards.

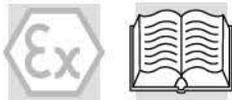


If the gear unit is to be serviced in a potentially explosive atmosphere, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning.



Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc.).

- During operation wear only the apparel and safety equipment indicated in the User instructions provided by the Manufacturer or laid down by applicable laws on safety at work.
- Replace worn components with original spare parts. Use the lubricants (oil and grease) recommended by the Manufacturer.
- Do not dump polluting materials into the environment. Dispose of all such materials as stipulated by applicable legislation.
- After replacing lubricants clean the gear unit's surfaces and the walk-on surfaces around the work area.



4.0 - HANDLING AND TRANSPORT

4.1 - PACKAGING

The standard packaging, when supplied and unless otherwise agreed, is not proofed against rainfall and is intended for shipping by ground and not sea, and for environments which are under cover and not humid.

The material can be stored in suitable conditions for a period of two years under cover at a temperature between $-15\text{ }^{\circ}\text{C}$ and $+50\text{ }^{\circ}\text{C}$ at a relative humidity not in excess of 80%. Storage in all other conditions requires specific packaging.

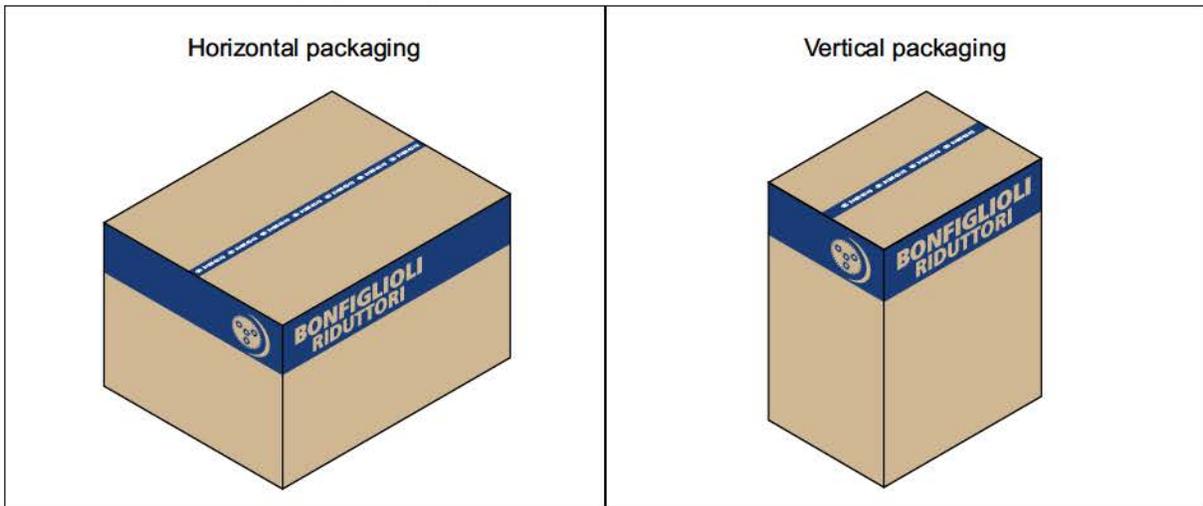
In order to facilitate handling, heavy packages can be loaded on pallets.

The most frequent types of packaging are shown in the figures below.

- Wooden crate for miscellaneous products shipped by sea.



- Carton pallet packaging for single products and kits.



On receipt of the gear unit, check that the delivery item corresponds to the purchase order and that it is not damaged or faulty in any way. Refer any nonconformity to your BONFIGLIOLI RIDOTTORI dealer.

Dispose of packaging materials as laid down by the provisions of law.



4.2 - HANDLING INSTRUCTIONS

Handle packages as per the Manufacturer's instructions and those marked on the packages themselves. Since the weight and shape of packages may make manual handling unfeasible, special equipment must be used to avoid damage and injury. Persons authorised for this purpose must be trained and experienced in the work in question to safeguard his safety and that of all other persons involved.



The person authorised to handle the product must take all necessary precautions to safeguard his safety and that of all other persons involved.

4.2.1 - Moving packages

- Prepare a suitable, delimited area with a level floor or surface for unloading the packages.
- Prepare the equipment required for handling the package. The lifting and handling equipment used (e.g. crane or lift truck) must have adequate capacity for the weight and size of the load, taking into account its attachment points and centre of gravity. If required, this information is indicated on the package itself. Harness heavy packages with chains, belts and steel ropes after checking that they are capable of sustaining the weight of the load, which is generally specified.
- When handling the load keep it level to avoid instability and/or tipping.

4.2.2 - Moving the equipment



All the following operations must be done with due care and caution and without sudden movements.

- Identify the attachment points for lifting the gear unit. Refer to Annex 4 of this manual for this information.
- Prepare the gear unit for lifting by attaching straps, hooks, shackles etc. to its attachment points, or alternatively, use a pallet for moving the load. If using a crane, first lift the gear unit vertically out of its packaging.
- If using a lift truck or pallet truck, remove the packaging and fit the truck's forks at the indicated positions.
- First lift the load very slowly to check that it is stable.
- Move the gear unit to the unloading area and lower it gently into position, taking care not to cause sudden oscillations while moving it.



If the gear unit is coupled to an electric motor, do not use the eyebolts on the motor for lifting the entire load, unless this is expressly indicated.



4.3 - STORAGE

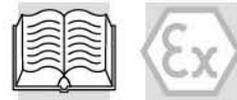
Some recommendations for storing the gear unit are indicated below.

1. Do not store the unit in excessively humid conditions or where it is exposed to the weather (do not store outdoors).
2. Do not place the gear unit directly on the ground.
3. Place the gear unit on a stable base and make sure that it is not subjected to accidental displacement.
4. Store the packaged gear unit (if allowed) in accordance with the instructions on the packaging itself.

If the gear unit is stored for more than 6 months, the following **additional** precautions must be taken:

5. Cover all machined external surfaces with a rustproofing product such as Shell Ensis or equivalent product with similar properties and application range.
6. Fill the unit with lubricating oil.

 	<p>SAFETY PRECAUTIONS to be taken when returning the gear unit to service after storage.</p> <p>The output shafts and external surfaces must be thoroughly cleaned of all rustproofing product, contaminants and other impurities (use a standard commercial solvent). Do this outside any explosion hazard area.</p> <p>The solvent must not touch the seal rings as this can damage them and render them ineffective.</p> <p>If the oil or protective material used during storage is not compatible with the synthetic oil used during the machine's operation, the interior of the unit must be thoroughly cleaned before filling with the operating oil.</p> <p>The service life of bearing grease is reduced if the unit is stored for more than 1 year. The bearing grease must be synthetic.</p>
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5.0 - INSTALLATION

5.1 - INSTALLING THE GEAR UNIT



The entire installation process must be planned based on the general design of the machine. The person authorised to do the work must, if necessary, implement a safety plan to safeguard all persons directly involved and rigorously apply all applicable legislation.

If a gearmotor is going to be installed, please consult the owner's manual of the electric motor on beforehand.

1. Thoroughly clean all packaging materials and protective product residue from the gear unit. Pay particular attention to the coupling surfaces.
2. Check that the data on the nameplate corresponds to that which is specified on the order.
3. Ensure that the structure to which the gear unit is to be mounted is sufficiently robust and rigid to support its weight and operating stresses.
4. Check that the machine on which the gear unit is to be installed is switched off and cannot be accidentally switched on again.
5. Check that all coupling surfaces are flat.
6. Check that the shaft/shaft or shaft/bore are perfectly aligned for coupling.
7. Fit suitable guards to protect against the external moving parts of the gear unit.
8. If the work environment is corrosive for the gear unit or any of its parts, take the special precautions required for aggressive environments. In this case, contact the BONFIGLIOLI RIDUTTORI sales service.
9. We recommend applying a protective paste to all couplings between the gear unit/motor and other parts (Klüberpaste 46 MR 401 or equivalent product with similar properties and application range) to ensure optimal coupling and protection against fretting corrosion.
10. To ensure effective coupling, the driven shafts should be machined to the tolerances given in tables (A16), (A17), (A18), (A19), (A20) and (A21) in Annex 3 of this Manual.
11. In case of installation outdoors and when fitted with an electric motor, protect the latter from direct sunlight and the weather by means of guards or a casing. Also make sure that the assembly is properly ventilated.

Now proceed with the installation as follows:

1. Place the gear unit in the vicinity of the installation area.
2. Mount the gear unit and secure it to the structure at the points provided. The gear unit should be secured to the structure through all mounting points on the mount specified (feet or flange).
3. Locate the closed plug used for transportation (usually red) and replace it with the vented plug provided.
4. Tighten down the mounting bolts and check that the oil plugs are screwed down to the torque given in table (A0).



(A0)

Bolt size	Tightening torque [Nm] +5% /-10%	
	Bolt class	
	8.8	10.9
M4	3	3.8
M5	5.9	8.0
M6	10.3	13.0
M8	25.5	32
M10	50	64
M12	87.3	110
M14	138.3	180
M16	210.9	275
M18	306	390
M20	432	540
M22	592	720
M24	744	930
M27	1100	1400
M30	1500	1850

Cap/vent thread	Pitch	Tightening torque [Nm]
1/8"	28	5
1/4"	19	7
3/8"	19	7
1/2"	14	14
3/4"	14	14
1"	11	25

5. Charge the gear unit with oil or top it up with reference to the method in which gear units of the type covered by this manual are filled in the factory. The standard charge of synthetic life-time lubricant is as follows:

(A1)

C 05	C 11	C 21	C 31	C 35	C 41	C 51	C 61	C 70	C 80	C 90	C 100
A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55	A 60	A 70	A 80	A 90
F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	F 90			
S 10	S 20	S 30	S 40	S 50							
VF 27	VF 30	VF 44	VF 49	VF 130	VF 150	VF 185	VF 210	VF 250			
W 63	W 75	W 86	W 110								

 Life-time lubrication.

 Life-time lubrication with ATEX-specified unit only.



Helical in-line gear units C 11, C 21 and C 31 are not equipped with service plugs for direct oil level checks.

Bevel helical gear units A 10, A 20 and A 30 are not equipped with service plugs for direct oil level checks in mounting positions B6 and B7 only.

For these types of gear units, refer to Annex 1 of this Manual.

Before installing, check the unit as follows:

1. Place the gear unit in the mounting position indicated for the gear unit in question in Annex 1. Wait 10 minutes for the oil level to stabilise inside the gear unit's casing.
2. Insert a dipstick through the hole shown in drawing (S4) or (S5) and measure the distance between the oil level and the exterior of the casing. This value must be compared with the **values in mm** given in Annex 1, tables (A7) and (A8), depending on the mounting position for the gear unit in question.
3. If the measurement gives a higher value than that prescribed, top up the oil to the correct level as indicated in the catalogue.

For all other types of gear unit the oil level must be checked via the oil plug (spill type) using the tool (out of scope for supply) described in Annex 1.

For the first charge and subsequent top ups, only use the recommended oils.



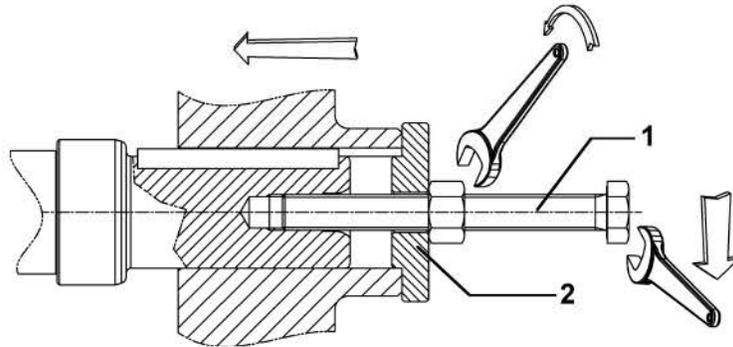
Installation of gear units classified under Directive 94/9/EC

- Category 2D gear units must be installed in compliance with the provisions of standards EN 1127-1 and EN 50281-1-2. The installer must, therefore, be fully informed and trained for this application.
- The installation technician must be aware of the ATEX class of the installation area, as well as the risks associated with the presence of a potentially explosive atmosphere, with particular attention to explosion and fire hazards, and thereby adopt the necessary safety precautions.
- All maintenance, assembly and disassembly work must be done **outside the explosion hazard area** by trained personnel.
- Check that all accessory components (cables, joints, cable glands, cooling units, etc.) comply with the Essential Health and Safety Requirements of the ATEX directives. Handle them with extreme care to avoid altering their characteristics.
- Remove the bolts sealing the threaded holes if provided for securing the gear unit. Do not damage the coupling surfaces.
- When assembling gear units with a torque arm, make sure that during operation, the metal parts which move relative to each other do not come into contact. If necessary, insert non-metal anti-friction elements in compliance with Directive 94/9/EC.
- Do not connect any object with electrical resistance greater than $10^9 \Omega$ to the product.
- Install guards to prevent the hazardous accumulation of dust and liquids on the seals of the solid shafts and to protect them mechanically.
- In case of installation of the gearmotor in a vertically downward orientation, the electric motor must be equipped with a drip cover.
- The output shaft and any pulleys or other transmission components must be perfectly aligned.
- Only install the gear unit in the motor execution and mounting position specified on the order. Shaft-mounted gear units can be installed with a tolerance relative to the theoretical plane of installation of $\pm 5^\circ$.
- If the gear unit is supplied without lubricant it must be installed as such and only filled with lubricant thereafter.
- Secure the gear unit to a flat, vibration-free surface capable of bearing the torsional stresses it produces in operation. Make sure not to deform the contact surfaces, mounting feet and/or flanges by overtightening the bolts.
- Use bolts of quality no lower than 8.8 for mounting the gear unit, and for heavy-duty installations use 10.9 bolts. For the tightening torque refer to table (A0). To prevent bolts from unscrewing, apply a thin film of Loctite 510, or equivalent, on threads of all bolts used to assemble the gear unit onto the structure and/or to the electric motor.
- Make sure that the radial/thrust loads and operating torques do not exceed those specified for the unit.
- The vent caps and oil level caps must be easy to access for inspection.
- Clean the gear unit thoroughly after installation.

5.1.1 - Gear units with solid output shaft

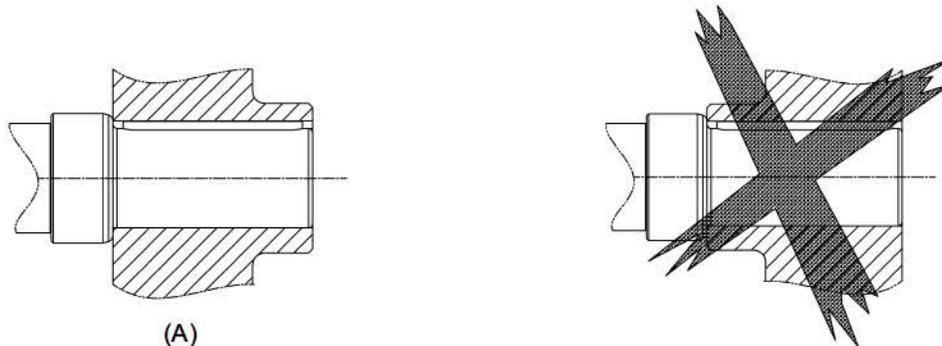


For mounting external parts do not use hammers or other tools which might damage the gear unit's shafts or bearings. Instead, proceed as indicated in the diagram below:



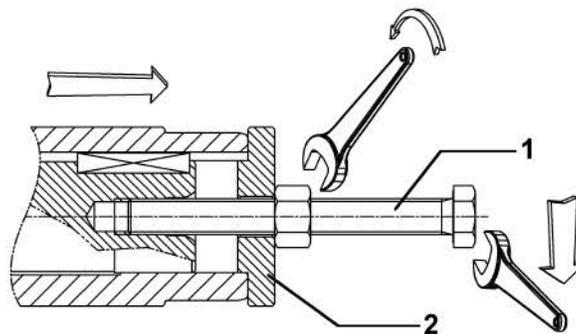
Bolt (1) and spacer (2) are to be supplied by customer.

To minimise the loads on the shaft bearings, when mounting transmission elements with asymmetrical hubs, the preferred layout is shown in diagram (A) below:



5.1.2 - Gear units with hollow output shaft

To facilitate mounting hollow shaft gear units onto the machine's driven shaft, proceed as indicated in the diagram below. Also refer to Annex 3 of this Manual for dimension information on customer's shaft.



The bolt (1) and spacer (2) are to be supplied by customer.



5.1.3 - Gear units with shrink disk

Series A and F gear units may be specified with a shrink disk for coupling onto the driven shaft. When installing a unit of this type, proceed as follows:

1. Loosen the locking bolts gradually and in sequence and remove the entire shrink disk.
2. Clean and carefully degrease the coupling surface between the gear unit's output shaft and the customer shaft.



Do not use molybdenum bisulphide or any other grease which would affect the friction coefficient of the coupling surfaces and reduce the performance of the shrink disk.

3. Fit the gear unit onto the machine sliding its output shaft onto the driven shaft.
4. Fit the shrink disk to the gear unit shaft.
5. Fully tighten down the shrink disk bolts gradually following a circular sequence using a torque wrench. This operation usually must be repeated several times to reach the tightening torque **Mt** specified in the table below:

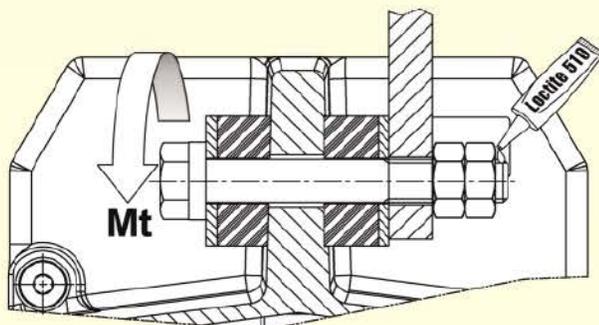
(A2)

		A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55	A 60	A 70	A 80	A 90
	Mt [Nm]	14,5	14,5	14,5	14,5	14,5	14,5	35	35	35	35	69	69
		F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	F 90			
	Mt [Nm]	8,5	14,5	14,5	14,5	14,5	35	35	69	69			

5.1.4 - Shaft mounted gear units series F

Anchoring the torque arm

Use the original vibration-damping kit to ensure optimal operation of the assembly, as it is specifically designed and constructed, along with the gear unit, for operation in explosion hazard areas. Failure to use the original accessory on gear units classified under 94/9/EC voids the ATEX certification.



	Mt [Nm]
F 10	10
F 20	10
F 30	20
F 40	20
F 50	50
F 60	50

The torque arm shown in the diagram is to be supplied by customer.



5.2 - INSTALLING AN IEC-STANDARD FLANGED MOTOR

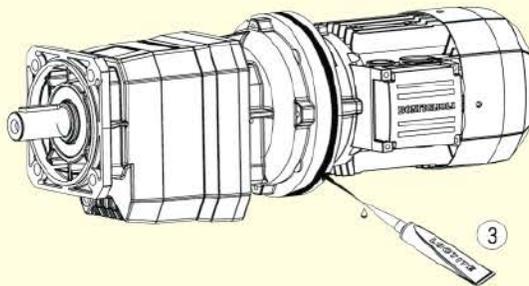
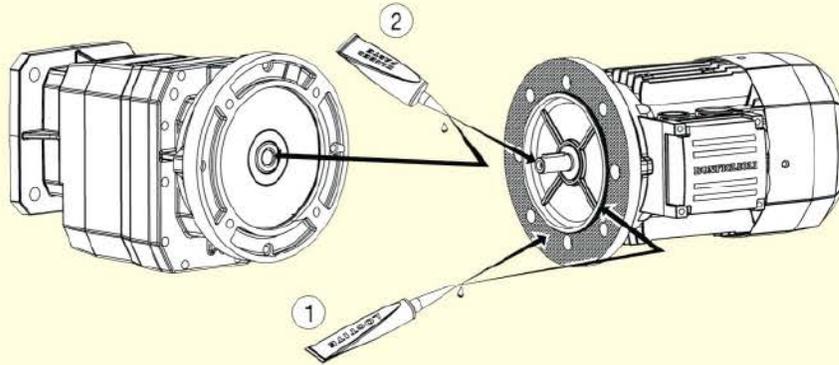
Further to all the precautions indicated above, when installing a IEC-flange mount electric motor the following precautions must also be observed:

- Do not force the coupling and do not use inappropriate tools during assembly. Take care not to damage the flat and/or cylindrical coupling surfaces.
- Do not force the shaft with large radial and/or thrust loads.
- To facilitate assembly, use a lubricating synthetic oil paste such as Klüberpaste 46 MR 401 or equivalent product with similar properties and application range.
- Tighten down all motor/gear unit mounting bolts to their prescribed torque. For the tightening torques, refer to table (A0).

When the gear unit is mounted to an IEC electric motor, proceed as follows:

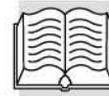
- Apply a layer of sealant (Loctite 510 or equivalent product with similar properties and application range) to the motor/gear unit mounting flanges, spigot and frontal coupling surfaces as shown in diagram (S1).

(S1)



- 1 - Apply "Loctite 510" to both the flange surface and spigot.
- 2 - Apply "Klüberpaste 46MR401" to the input shaft bore and motor shaft.
- 3 - Use "Loctite 5366" to seal the area of contact between the gear unit and motor, taking care to fill in any gaps between the two flanges (e.g. disassembly slots).

- After mounting the motor, apply a layer of sealant (Loctite 5366 or equivalent product with similar properties and application range) around the edges of the flanges so as to close any gaps between their surfaces.
- If the gearbox is of the flanged type, the User must take similar precautions to prevent dust deposits forming in the gaps between the flanges or in the vicinity of the couplings.



6.0 - TESTING THE GEAR UNIT

The gear unit has been factory tested by the Manufacturer.

Before starting the unit, check that:

- The machine incorporating the gear unit complies with the provisions of the "Machinery Directive" 98/37/EC and any other applicable safety legislation.
- The gear unit's mounting position in the installation corresponds to that prescribed and indicated on the nameplate.
- The electrical power supply and control systems are suitable and operational as stipulated in standard EN 60204-1, and grounded as per standard EN 50014.
- The motor power supply corresponds to that prescribed and is within $\pm 5\%$ of the rated value.
- The oil level is as prescribed and that there are no leaks from the caps or gaskets.
- The unit does not run noisily or with excessive vibration.

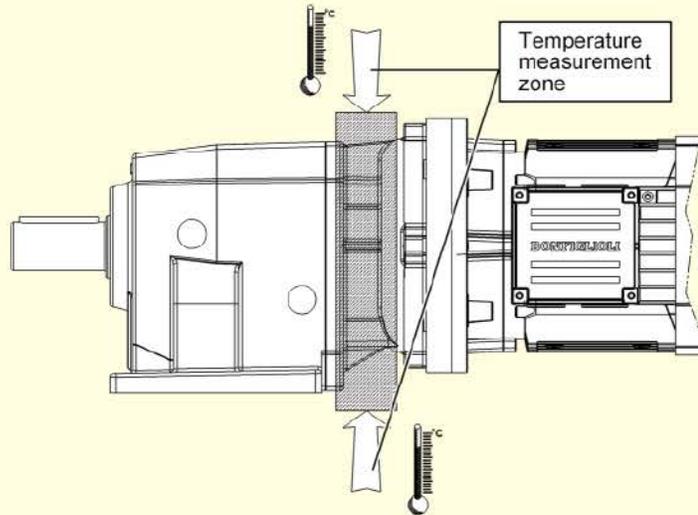
 	<p>Before starting up the unit, check and ensure that:</p> <ul style="list-style-type: none">• Assembly is not carried out in a potentially explosive atmosphere (oil, acid, gas, vapour or radiation) and that there is no dust deposits thicker than 5 mm on the gear unit.• During service the gear unit is sufficiently ventilated and that it is not subject to radiation from external heat sources.• During service the cooling air does not exceed 40 °C.• The oil level, drain and vent plugs are all easily accessible.• All accessories of any type mounted onto the gear unit are ATEX compliant.• Gear units with hollow shafts, with or without shrink disk, have been correctly mounted.• The gear unit is thoroughly cleaned after installation.• All guards installed to prevent accidental contact between operators and the gear unit's moving parts or seals, are effective.
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Measuring the gear unit's surface temperature

- The gear unit's maximum surface temperature depends on the motor speed, gear ratio and motor execution and must never exceed 130 °C (160 °C if so specified on the nameplate).
- The nameplate specifications regarding the maximum surface temperature, refer to measurements made in normal ambient and installation conditions. Even minimal variations to said conditions (e.g. smaller mounting cabinet) could have a significant impact on the build up of heat.
- When commissioning the gear unit, the surface temperature must be measured in the same operating conditions as for the final application.
The surface temperature must be measured at the coupling between the gear unit and motor, and at the points which are most shielded from the motor's fan cooling.

(S2)



IMPORTANT:

The maximum surface temperature is reached after 3 hours' operation at full load. The temperature measured in these conditions must not differ (ΔT) from the ambient temperature by more than the following values:

(A3)

	ΔT [°C]
C 11...C 61	75
A 10...A 60	75
F 10...F 60	75
VF 44, VF 49	75
W 63...W 86	75
W 110	90

Should the temperature differential exceed these values, stop the gear unit at once and contact the BONFIGLIOLI RIDUTTORI technical service.

- If the temperature differential is within the above values, wait for the gear unit to cool down and then install the temperature indicator supplied with the gear unit at the point of maximum temperature.

Example:



- At the same time, check for excessive running noise and vibration.



 	<ul style="list-style-type: none">• Provided all the above checks have been passed and that all other instructions in this manual have been strictly observed, an electric motor with ATEX rating equal or greater than that of the gear unit may be installed, thus forming a gearmotor which itself complies with the provisions of Directive 94/9/EC. <p>If, on the other hand, the installation of the motor to the gear unit requires actions other than those prescribed in this Manual and/or one or more of the manual's prescriptions has not been satisfied, the User shall be responsible for analysing the risks attendant on this particular motor/gear unit combination. The risk analysis is in any case mandatory if the motor is driven through an inverter.</p> <p>Only in this way, and subject to certification by the assembler, shall the assembly, including the gear unit itself, be compliant with the requirements of Directive 94/9/EC.</p>
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7.0 - USING THE EQUIPMENT

Before putting the gear unit into service, the User must ensure that the plant in which it is installed complies with all applicable directives, especially those regarding health and safety at work.



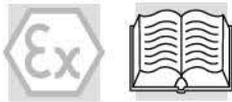
The gear unit may not be used in areas and environments:

- with highly corrosive and/or abrasive vapours, smoke or dust
- in direct contact with loose food products.



Danger zones and exposed persons:

The danger zone of the gear unit is the protrusion of the shaft which constitutes a hazard for exposed persons in direct contact with it (crushing, cutting, trapping). In particular, when the gear unit is operating in automatic mode and in an accessible area, the shaft must be protected by a guard.



8.0 - MAINTENANCE



Maintenance and replacement work must be done by expert maintenance technicians trained in the observance of applicable laws on health and safety at work and the special ambient problems attendant on the installation.



Before doing any work on the unit, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning (due to suspended loads or similar external factors).

Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc.).

- Before doing any maintenance work, activate all safety equipment and, if necessary, inform persons working in the vicinity. In particular, mark off the area around the unit and prevent access to any equipment which, if activated, might be the cause of unexpected health and safety hazards.
- Replace worn components with original spare parts only.
- Use the lubricants (oil and grease) recommended by the Manufacturer.
- When working on the gear unit always replace gaskets and seals with new original ones.
- If a bearing requires replacement, it is good practice to also replace the other bearing supporting the same shaft.
- We recommend replacing the lubricating oil after all maintenance work.

The above instructions are aimed at ensuring efficient and safe operation of the gear unit.

The Manufacturer declines all liability for injury and damage to components due to the use of non-original spare parts and non-routine work which modifies the safety requirements without the express prior authorisation of the Manufacturer.

Refer to the specific spare parts catalogue when ordering spare parts for the gear unit.



Do not dump polluting liquids, worn parts and maintenance waste into the environment. Dispose of all such materials as stipulated by applicable legislation.



- Observe the routine inspection and maintenance schedule to ensure suitable operating conditions and the effective explosion protection of the unit.
- Always apply fresh Loctite 510 paste or equivalent product with similar properties and application range to all disassembled threads.
- Before servicing or repairing internal components, allow the gear unit to cool down completely before opening the casing so as to avoid burns from parts which are still hot.
- Make sure, on completion of maintenance work, that all safety measures and equipment have been applied and reset.
- Clean the gear unit thoroughly after maintenance work and repairs.
- On completion of maintenance work, tighten all vent, filler and level plugs to their specified torque (table A0).
- On completion of any maintenance work, all seals must be refitted and sealed as prescribed. On gear units with double seal rings, the cavity between the two rings must be packed with synthetic grease (Fluorocarbon gel 880 ITP or equivalent product with similar properties and application range) before assembly.
- Regardless of the type of gear unit, whenever a seal ring is replaced its lips should be smeared with a thin layer of grease (Fluorocarbon gel 880 ITP or equivalent product with similar properties and application range) before assembly.
- Use only original spare parts for repairs.



8.1 - ROUTINE MAINTENANCE



Keep the gear unit at its maximum efficiency by following the routine maintenance schedule specified by the Manufacturer.

Good maintenance enables the unit to operate at its maximum performance over a long service life in compliance with safety regulations.

Frequency	Component	Type of work	Operation
1000 h	External seals and gaskets	Check oil level Check for leaks by eye	Maintain or replace components as required
3000 h	For gear units with torque arm: polymer bushings	Check for cracks/ageing	Replace if no longer fully effective
5000 h	Gear unit seals and gaskets	Inspect carefully for wear/ageing of external seals.	Replace if aged/worn

Depending on the temperature reached by the lubricant, it should be replaced at the intervals indicated in table (A4) below:

(A4)

Oil temperature t [°C]	Hours
$t < 65$	25000
$65 \leq t < 80$	15000
$80 \leq t \leq 95$	12500

For installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme for all surfaces and recesses to avoid build up of dust more than 5 mm in depth.

Every 1000 h of operation or after 6 months:

- Measure the surface temperature of the coupling between the gear unit and motor, at the points most shielded from the motor's fan cooling. The maximum temperature must not differ (ΔT) from the ambient temperature by more than the following values, nor may this differential be exceeded during operation.



(A3)

	ΔT [°C]
C 11...C 61	75
A 10...A 60	75
F 10...F 60	75
VF 44, VF 49	75
W 63...W 86	75
W 110	90



Check the condition of the temperature indicator previously installed on the gear unit during commissioning.

Example:



Limit temperature exceeded



Limit temperature NOT exceeded

Also check that the temperature is not excessive around the gear unit's bearings.

- Check the oil levels with reference to the tables and diagrams given in Annexes 1 and 2.
- Check that there are no signs of lubricant leaks near to the gear unit.
- **If any anomalies are found, identify their cause, repair the unit accordingly and top up the lubricant before putting the gear unit back into service.**

Every 3000 h of operation:

- For gear units with torque arm, check that the polymer bushings are not aged or damaged. If they are at all compromised, replace with original spare parts.

Every 5000 h of operation:

- Change the synthetic oil and bearing grease if the gear unit is not life-time lubricated.
- Replace all externally accessible seal rings unless this has already been done as a result of problems occurring before the scheduled maintenance deadline.



Every 5000 h of operation at rated torque:

(The minimum overhaul interval indicated here may increase considerably depending on actual conditions of service; see table (A5)).

- Overhaul the gear unit, unless this has already been done as a result of problems occurring before the specified deadline.

(An overhaul involves the replacement of bearings and/or other mechanical components which have worn to such an extent as to compromise the operation of the gear unit).

(A5)

$\frac{M_{n2}}{M_{r2}}$	Interval hours
1.0	5000
1.25	10000
1.5	17000
1.75	27000
2.0	40000

M_{n2} = nominal torque at output shaft

M_{r2} = required torque at output shaft



8.2 - LUBRICANTS

Before putting the gear unit into service, check the oil level. This must be done with the gear unit in the mounting position in which it will be used in the application. If necessary, if or top up the lubricant to the filling mark on the level cap which may be transparent or of the spill type.



Life-time lubricated gear units which are not subject to external contamination do not normally require periodic lubricant changes.



Do not mix oils of different nature or specifications and check that the oil is highly resistant to foaming and is EP rated.

If the same type of oil as that already in use is not available, drain the gear unit completely and flush its interior thoroughly with a light solvent before refilling with a new lubricant.

8.3 - OIL CHANGE

1. Place an adequate container under the drain plug.
2. Remove the filler and drain plugs and allow the oil to drain out.



The oil will drain better if it is warm.

3. Wait for a few minutes until all the oil has drained out, then screw the drain plug back on with a new gasket.
4. Fill the gear unit with the new oil (in its actual mounting position) to the centre of the level plug.
5. Tighten down the filler plug after fitting a new gasket.



The gear unit may be supplied with or without lubricant, as specified by the User. The quantity of oil to be filled is specified in the Sales Catalogue. This specification is, however, approximate, and reference must always be made to the centre of the level plug, the placement of which depends on the mounting position specified in the order.

Lubricants, solvents and detergents are toxic/harmful to health:



- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they can be fatal if swallowed.

Handle them with care using suitable individual safety equipment. Do not dump into the environment and dispose of in compliance with applicable legislation.



If a leak is found, identify the cause of the fault, repair it and refill with lubricant before operating the gear unit.



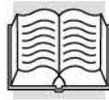
8.4 - RECOMMENDED/PERMITTED OILS

	OILS AND GREASES COMPATIBLE with ATEX-certified gear units
	<p>Greases:</p> <ul style="list-style-type: none">• Klüber Asonic GHY 72 (for bearings)• Shell TVX Compound B (for greased gear trains)• Shell Tivela GL 00 (alternative for greased gear trains)• Klüberpaste 46 MR 401 (to facilitate coupling of cylindrical parts)• ITP Fluorocarbon gel 880 (for greasing contact seals) <p>Oils (as alternatives to Shell Tivela Oil S 320):</p> <ul style="list-style-type: none">• Shell: Tivela Oil SC320• Aral: Degol GS 320• IP: Telium Oil VSF 320 (o Agip)• Klüber: Klübersynth GH 6 320• Total: Carter SY 320• Mobil: Glygoyle HE 320



		C	S	F	A		VF	VF R	VF_L	VF-EP	V		VR
		11...100	10...50	10...90	05...60	70...90	W	WR	W_L	W-EP	0.25-0.5	1...10	0.25...10
	Tivela S 220												
	Tivela S 320												
	Tivela S 460												
	Donax TX												
	Donax TA												
	Cassida Fluid WG 460	F	F	F	F	F	F	F		F			
	Cassida Fluid HF 46										F	F	
	Tivela GL 00								G				G
	Blasia S 220												
	Blasia S 320												
	Spartan EP 220												
	Spartan EP 320												
	Klübersynth GH 6 220												
	Klübersynth GH 6 320												
	Klübersynth UH1 6-460	F	F	F	F	F	F	F		F			
	Glygoyle 320												
	Glygoyle 460												
	Mobilgear SHC XMP 220												
	Mobilgear SHC XMP 320												
	Mobil SHC 630												
	Mobil SHC 632												
	Glygoyle 460 UH1	F	F	F	F	F	F	F		F			
	Alphasyn PG 220												
	Alphasyn PG 320												
	Carter SY 220												
	Carter SY 320												
	Carter SY 460												
	Nevastane SY 460	F	F	F	F	F	F	F		F			
	Degol GS 220												
	Degol GS 320												
	Degol PAS 220												
	Synlube CLP 220												
	Synlube CLP 320												
	Renoling PG 220												
	Renoling PG 320												

G = Grease Recommended
F = Food grade Permitted



8.5 - CHECKING EFFICIENCY

- Remove dust deposits from the gear unit and motor casings.
- Check that noise at constant load does not vary. Excessive vibration or noise can indicate wear of the gear train or failure of a bearing.
- Check the power absorption and voltage against the nominal values given on the motor's nameplate.
- Check the wear of linings on the brake motor (if used) and, if necessary, adjust the gap.
- Check for lubricant leaks from the gaskets/seals, caps and casings.
- Check all bolted couplings for wear, deformation or corrosion and tighten them down fully without over-tightening.

8.6 - CLEANING

Clean all dust and process waste off the gear unit. Do not use solvents or other products which are incompatible with the construction material and do not direct high-pressure jets of water at the gear unit.

8.7 - PAINT COATING

In the factory, the cast-iron casing of the gear unit is magnetised and sprayed with polyester heat-setting resin which is then baked on. Aluminium casings are not paint coated.

Table (A6) shows in colour the types and gear frame sizes of gear units which are generally painted.

(A6)

C 05	C 11	C 21	C 31	C 35	C 41	C 51	C 61	C 70	C 80	C 90	C 100
A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55	A 60	A 70	A 80	A 90
F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	F 90			
S 10	S 20	S 30	S 40	S 50							
VF 27	VF 30	VF 44	VF 49	VF 130	VF 150	VF 185	VF 210	VF 250			
W 63	W 75	W 86	W 110								



If the gear unit is to be painted, tape the nameplate and seal rings to prevent contact with solvent.



9.0 - REPLACING PARTS



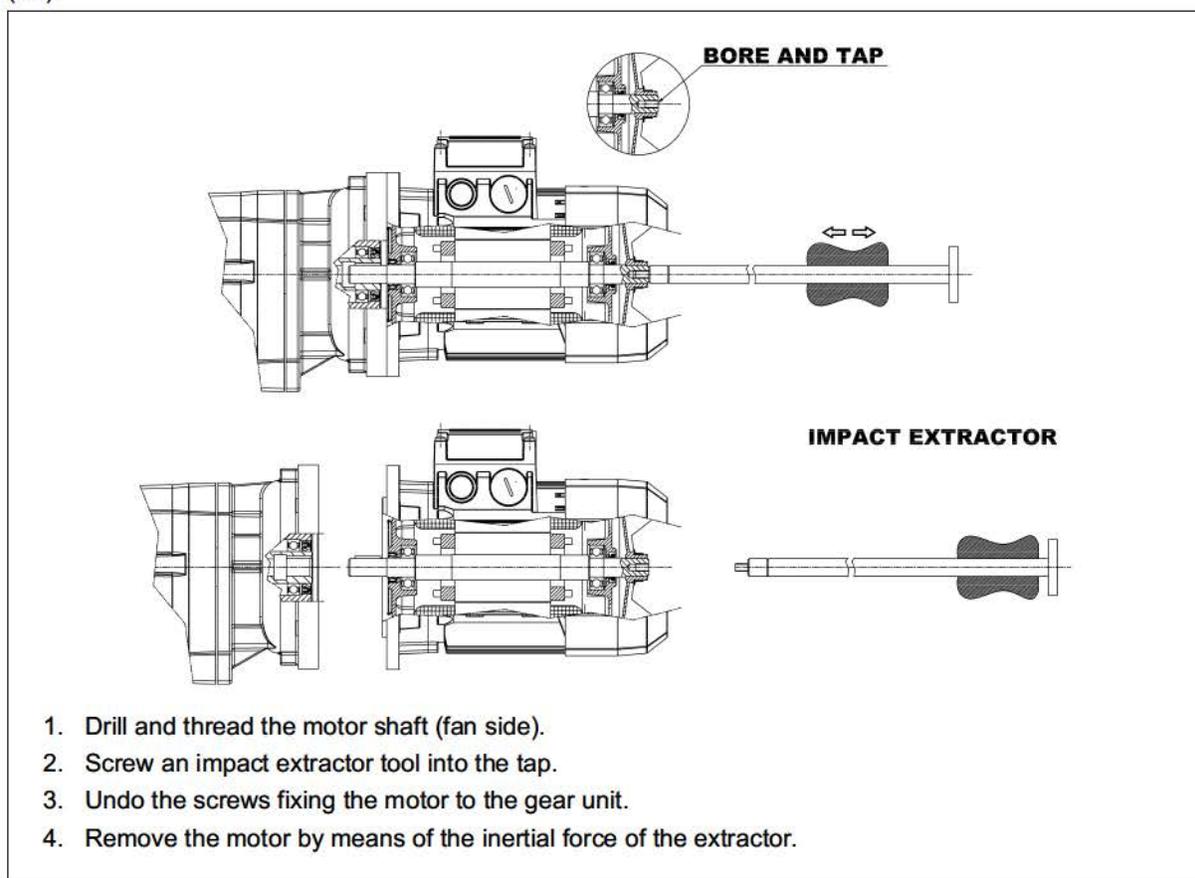
- Do not hesitate to replace parts and/or components if they are not able to guarantee safe and reliable operation.
- Never improvise repairs.
- The use of non-original spare parts not only voids the warranty but can compromise gear unit operation.

9.1 - TAKING APART OF THE IEC-STANDARD FLANGED MOTOR

If, during operation, the coupling area of the motor and gear unit has not rusted significantly, it should be possible to remove the motor without applying excessive force.

If, on the other hand, it proves difficult to remove the motor, do not use screwdrivers or levers to apply force as this can damage the flanges and coupling surfaces, but proceed as indicated below.

(S3)



9.2 - SCRAPPING THE GEAR UNIT

This must only be done by operators trained in the observance of applicable laws on health and safety at work.

Do not dump non-biodegradable products, lubricants and non-ferrous materials (rubber, PVC, resins, etc.) into the environment. Dispose of all such materials as stipulated by applicable environmental protection legislation.



Do not attempt to re-use parts or components which appear to be in good condition after they have been checked and/or replaced by qualified personnel and declared unsuitable for use.



10.0 - TROUBLESHOOTING

The following information is intended to serve as an aid in identifying and correcting defects and faults. In some cases, such problems may be caused by the plant or machine onto which the gear unit is assembled, and hence, the cause and eventual solution can be found in the Manufacturer's technical documentation for the machine/plant in question.

PROBLEM	CAUSE	SOLUTION
Bearing temperature too high	Oil level too low	Top up oil level
	Oil too old	Replace oil
	Defective bearings	Contact authorised workshop
Operating temperature too high	Oil level too high	Check oil level
	Oil too old	Replace oil
	Impurities in oil	Replace oil
Abnormal running noise	Gears damaged	Contact authorised workshop
	Bearing axial backlash too high	Contact authorised workshop
	Bearings defective or worn	Contact authorised workshop
	Service load too high	Correct service load to nominal values given in Sales Catalogue
	Impurities in oil	Replace oil
Abnormal noise at gear unit mounting	Mounting bolts loose	Tighten down to specified torque
	Mounting bolts worn	Replace bolts
Oil leaks	Oil level too high	Check oil level
	Casing/coupling seals inadequate	Contact authorised workshop
	Gaskets worn	Contact authorised workshop
Gear unit does not run or runs with difficulty	Oil viscosity too high	Replace oil (see table of recommended lubricants)
	Oil level too high	Check oil level
	Service load too high	Redesign drive for actual service load
Output shaft does not turn with motor running	Gears damaged	Contact authorised workshop



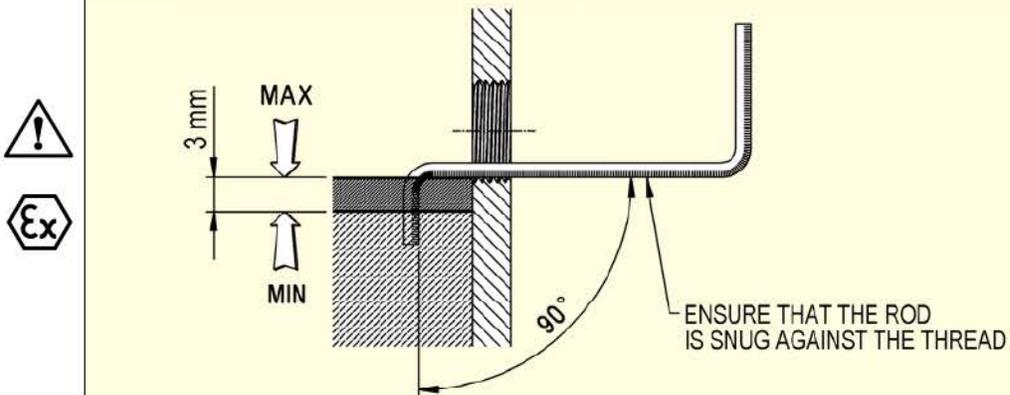
ANNEX 1 - CHECKING OIL LEVEL ON ATEX-SPECIFIED GEAR UNITS

Gear units are normally supplied with a yellow oil level plug of the spill type.

To check the oil level, first identify the yellow level plug.

Remove the plug and insert a bar of the right size for the hole and of the shape shown in the figure below.

If the level is more than 3 mm below the overflow level, top up and check the reason for the drop in oil level.

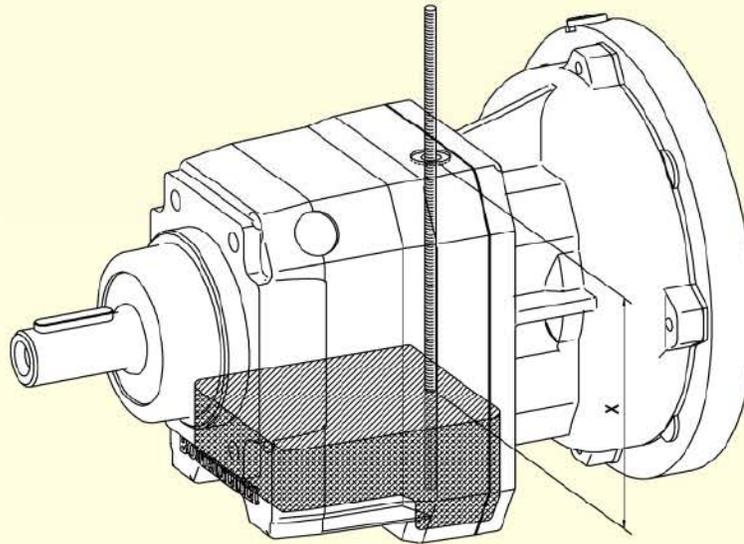


Helical in-line gear units C11, C21 and C31 (all mounting positions) and bevel helical gear units A10, A20 and A30 in mounting positions B6 and B7 only do not feature a level plug. The oil level must therefore be checked, not as described above, but via a hole provided for the purpose in the manner described hereafter.



Helical in-line gear units C 11, C 21, C 31

(S4)



(A7)



	P						F						U-UF					
	B3	B6	B7	B8	V5	V6	B5	B51	B53	B52	V1	V3	B5	B51	B53	B52	V1	V3
C 11 2_ P63-P71	70	70	70	70	70	45	70	70	70	70	60	30	70	70	70	70	60	30
C 11 2_ P80...P112	75	75	75	75	75	45	75	75	75	75	70	30	75	75	75	75	70	30
C 21 2_ P63-P71, HS	70	70	70	70	70	40	70	70	70	70	45	70	70	70	70	70	70	45
C 21 2_ P80...P112	75	75	75	75	75	40	75	75	75	75	45	75	75	75	75	75	75	45
C 21 3_ P63-P71	50	50	50	50	50	30	50	50	50	50	30	50	50	50	50	50	50	30
C 21 3_ P80...P112	55	55	55	55	55	30	55	55	55	55	30	55	55	55	55	55	55	30
C 31 2_ P63...P112, HS	65	65	65	65	60	60	65	65	65	65	55	55	65	65	65	65	55	55
C 31 3_ P63...P112	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55

Values in the table are given in mm.

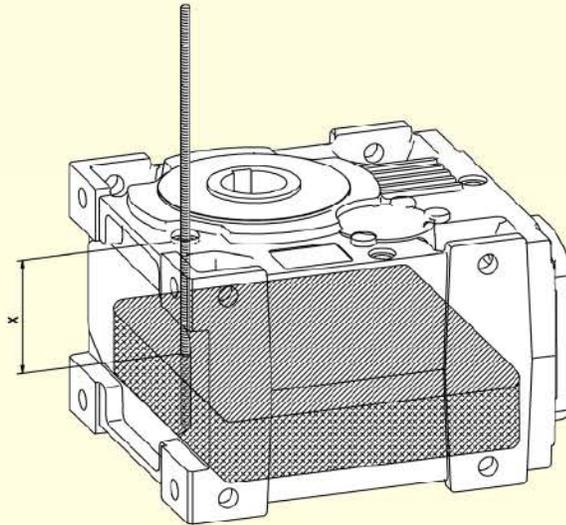
To check the oil level, proceed as follows:

1. Place the gear unit in the mounting position as shown in diagram (S4).
2. Insert a dipstick through the yellow service cap (on top of the gear unit) until it touches the floor of the casing. Mark the level of the upper surface of the casing on the dipstick in this position.
3. Extract the dipstick and measure the distance X shown in diagram (S4) above.
4. The value X must be **less than** the value given in table (A7).



Bevel helical gear units A 10, A 20 and A 30 - Mounting positions B6 and B7 

(S5)



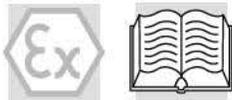
(A8)

	B6	B7
A 10_ P63...P112	30	30
A 20_ P63...P112, HS	25	25
A 30_ P63...P112, HS	30	30

Values in the table are given in mm

To check the oil level, proceed as follows:

1. Place the gear unit in the mounting position as shown in diagram (S5).
2. Insert a dipstick through the yellow service cap (on top of the gear unit) until it touches the floor of the casing. Mark the level of the upper surface of the casing on the dipstick in this position.
3. Extract the dipstick and measure the distance **X** shown in diagram (S5) above.
4. The value **X** must be **less than** the value given in table (A8).



ANNEX 2 - LUBRICANT FILL QUANTITY

Helical in-line gear units, series C:

(A9)

																		
	P						F						U - UF					
	B3	B6	B7	B8	V5	V6	B5	B51	B53	B52	V1	V3	B5	B51	B53	B52	V1	V3
C 05 2	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	-	-
C 11 2	0.45	0.45	0.45	0.45	0.50	0.60	0.40	0.40	0.50	0.50	0.50	0.60	0.40	0.40	0.50	0.50	0.50	0.60
C 21 2	0.80	0.80	0.80	0.80	0.85	1.1	0.75	0.75	0.75	0.75	0.80	1.0	0.75	0.75	0.75	0.75	0.80	1.0
C 21 3	1.2	1.2	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.2	1.3	1.4
C 31 2	1.4	1.4	1.4	1.4	1.5	1.5	1.3	1.3	1.3	1.3	1.5	1.5	1.3	1.3	1.3	1.3	1.5	1.5
C 31 3	1.6	1.6	1.6	1.6	1.8	1.8	1.6	1.6	1.6	1.6	1.8	1.8	1.6	1.6	1.6	1.6	1.8	1.8
C 35 2	1.6	1.5	1.5	1.3	2.1	2.4	-	-	-	-	-	-	1.6	1.5	1.5	1.3	2.1	2.4
C 35 3	1.5	1.4	1.5	1.3	2.0	2.3	-	-	-	-	-	-	1.5	1.4	1.5	1.3	2.0	2.3
C 35 4	2.3	2.1	2.3	2.1	2.7	3.1	-	-	-	-	-	-	2.3	2.1	2.3	2.1	2.7	3.1
C 41 2	2.2	2.0	2.1	1.9	2.7	3.4	-	-	-	-	-	-	2.2	2.0	2.1	1.9	2.7	3.4
C 41 3	2.1	1.9	2.1	1.9	2.6	3.2	-	-	-	-	-	-	2.1	1.9	2.1	1.9	2.6	3.2
C 41 4	2.8	2.6	2.8	2.6	3.5	3.9	-	-	-	-	-	-	2.8	2.6	2.8	2.6	3.5	3.9
C 51 2	3.1	3.0	3.1	3.0	4.3	5.0	-	-	-	-	-	-	3.1	3.0	3.1	3.0	4.3	5.0
C 51 3	3.0	2.8	3.1	3.0	4.1	4.9	-	-	-	-	-	-	3.0	2.8	3.1	3.0	4.1	4.9
C 51 4	4.3	4.1	4.4	4.2	5.4	6.1	-	-	-	-	-	-	4.3	4.1	4.4	4.2	5.4	6.1
C 61 2	4.2	4.0	4.2	4.1	6.0	6.7	-	-	-	-	-	-	4.2	4.0	4.2	4.1	6.0	6.7
C 61 3	4.2	4.0	4.2	4.1	6.0	6.7	-	-	-	-	-	-	4.2	4.0	4.2	4.1	6.0	6.7
C 61 4	6.1	5.9	6.1	6.0	7.9	8.6	-	-	-	-	-	-	6.1	5.9	6.1	6.0	7.9	8.6
C 70 2	6.5	8.5	8.5	7.5	11	7.5	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 70 3	6.5	8.5	8.5	7.5	11	7.5	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 70 4	6.5	8.5	8.5	7.5	11	8.0	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 80 2	11	14	14	13	18	13	11	14	14	13	18	13	-	-	-	-	-	-
C 80 3	11	14	14	13	18	13	11	14	14	13	18	13	-	-	-	-	-	-
C 80 4	11	14	14	13	18	13	11	14	14	13	18	13	-	-	-	-	-	-
C 90 2	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 90 3	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 90 4	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 100 2	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-
C 100 3	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-
C 100 4	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-

 Life-time lubricated gear units.

 Life-time lubricated gear units only in combination with ATEX variants.

 Lubricant is not factory filled.



Bevel helical gear units, series A:

(A10)

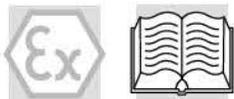
						
	B3	B6	B7	B8	VA	VB
A 05 2	0.50	0.50	0.50	0.50	0.50	0.50
A 10 2	1.4	1.4	1.4	1.4	1.4	1.4
A 20 2	2.3	2.3	2.3	2.3	2.3	2.3
A 20 3	2.6	2.6	2.6	2.6	2.6	2.6
A 30 2	3.2	3.2	3.2	3.2	3.2	3.2
A 30 3	3.6	3.6	3.6	3.6	3.6	3.6
A 35 2	2.8	3.2	3.2	3.2	3.9	2.7
A 35 3	3.5	3.8	3.8	3.6	4.9	3.3
A 41 2	3.8	3.1	3.0	4.0	5.3	3.3
A 41 3	4.6	3.9	3.8	4.8	6.1	4.0
A 50 2	4.9	8.1	4.7	8.4	11	9.2
A 50 3	5.1	8.1	4.7	8.4	11	9.2
A 50 4	6.3	8.2	5.3	8.3	13	9.1
A 55 2	3.2	6.2	6.1	7.0	8.5	8.0
A 55 3	3.8	6.8	6.5	7.7	9.2	8.2
A 55 4	5.2	9.2	9.0	8.8	10.6	8.7
A 60 2	6.8	8.1	12	15	18	15
A 60 3	6.8	8.1	12	15	18	15
A 60 4	7.2	11	7.4	16	19	14
A 70 3	10	14	10	15	20	14
A 70 4	13	14	10	15	23	14
A 80 3	15	22	15	26	35	22
A 80 4	20	22	15	26	39	22
A 90 3	31	35	37	44	66	39
A 90 4	41	35	37	44	73	39

						
	B3	B6	B7	B8	VA	VB
A 10 2	0.80	see Annex 1	see Annex 1	1.2	1.2	1.1
A 20 2	1.2			1.7	1.8	1.5
A 20 3	1.5			1.7	2.4	1.6
A 30 2	1.8			2.3	2.6	2.1
A 30 3	2.3			2.4	3.5	2.3
A 41 2	4.0	4.1	4.1	4.7	5.2	4.4
A 41 3	4.0	4.0	4.0	4.7	6.1	3.9
A 50 2	4.9	8.1	4.7	8.4	11	9.2
A 50 3	5.1	8.1	4.7	8.4	11	9.2
A 50 4	6.3	8.2	5.3	8.3	13	9.1
A 60 2	6.8	8.1	12	15	18	15
A 60 3	6.8	8.1	12	15	18	15
A 60 4	7.2	11	7.4	16	19	14



 Life-time lubricated gear units.

 Lubricant is not factory filled.



Shaft-mounted gear units, series F:

(A12)

	 []					
	H1	H2	H3	H4	H5	H6
F 10 2	0.95	0.95	0.95	0.95	0.95	0.95
F 20 2	1.4	1.4	1.4	1.4	1.4	1.4
F 20 3	1.8	1.8	1.8	1.8	1.8	1.8
F 30 2	2.6	2.1	1.5	2.1	2.9	2.1
F 30 3	2.6	2.1	1.5	2.1	2.9	2.1
F 30 4	2.9	2.4	1.7	2.4	3.2	2.4
F 40 2	5.0	3.9	4.0	3.1	5.1	4.0
F 40 3	5.0	3.9	4.0	3.1	5.1	4.0
F 40 4	5.3	4.3	4.3	3.3	5.5	4.4
F 50 2	9.2	6.7	7.6	4.7	9.2	6.7
F 50 3	9.2	6.7	7.6	4.7	9.2	6.7
F 50 4	9.7	7.4	8.1	5.1	9.9	7.4
F 60 3	14	10	7.4	10	14	10
F 60 4	15	12	8.0	11	15	11
F 70 3	23	20	9.7	16	24	19
F 70 4	23	20	9.7	16	27	19
F 80 3	40	34	16	29	42	31
F 80 4	40	34	16	29	48	31
F 90 3	71	59	32	49	76	55
F 90 4	71	59	32	49	86	55

(A13)



	 []					
	H1	H2	H3	H4	H5	H6
F 10 2	1.2	1.3	0.70	0.80	0.80	1.1
F 20 2	2.0	1.7	0.90	1.3	1.2	1.7
F 20 3	2.3	1.8	1.2	1.5	1.8	1.8
F 30 2	2.6	2.6	1.5	1.7	2.5	2.6
F 30 3	2.5	2.5	1.5	1.6	2.4	2.5
F 30 4	3.0	2.7	1.9	2.0	3.3	2.7
F 40 2	5.5	4.4	4.5	3.6	5.6	4.9
F 40 3	5.5	4.4	4.5	3.6	5.6	4.9
F 40 4	5.3	4.3	4.3	3.3	5.5	4.4
F 50 2	9.7	7.2	8.1	5.2	9.7	7.6
F 50 3	9.7	7.2	8.1	5.2	9.7	7.6
F 50 4	9.7	7.4	8.1	5.1	9.9	7.4
F 60 3	14	11	7.9	11	15	11
F 60 4	15	12	8.0	11	15	11

 Life-time lubricated gear units.

 Lubricant is not factory filled.



Worm gear units, series VF:

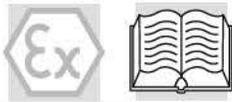
(A14)

			 [1]					
			B3	B6	B7	B8	V5	V6
VF 27	N - A - V - F	HS - P(IEC)	0.025	0.025	0.025	0.025	0.025	0.025
VF 30	N - A - V - F - P	HS - P(IEC)	0.045	0.045	0.045	0.045	0.045	0.045
VF 44	N - A - V - F - FA - P	HS - P(IEC)	0.075	0.075	0.075	0.075	0.075	0.075
VFR 44	N - A - V - F - FA - P	P(IEC)	0.050	0.050	0.050	0.050	0.050	0.050
VF 49	N - A - V - F - FA - P	HS - P(IEC)	0.12	0.12	0.12	0.12	0.12	0.12
VFR 49	N - A - V - F - FA - P	HS - P(IEC)	0.065	0.065	0.065	0.065	0.065	0.065
VF 130	N	HS - P(IEC)	2.3	2.5	2.5	3.0	3.2	3.4
VFR 130	N	HS - P(IEC)	0.70	0.50	0.50	0.40	0.40	0.50
VF 130	V	HS - P(IEC)	3.4	2.5	2.5	3.1	3.0	2.5
VFR 130	V	HS - P(IEC)	0.50	0.50	0.50	0.40	0.40	0.70
VF 130	A - F - FC - FR - P	HS	3.9	2.5	2.5	2.3	3.3	3.3
VF 130	A - F - FC - FR - P	P(IEC)	3.0	2.5	2.5	2.3	3.3	3.3
VFR 130	A - F - FC - FR - P	HS - P(IEC)	0.40	0.50	0.50	0.70	0.40	0.50
VF 150	N	HS - P(IEC)	3.0	3.5	3.5	4.3	3.8	4.0
VFR 150	N	HS - P(IEC)	1.0	0.80	0.80	0.60	0.40	1.0
VF 150	V	HS - P(IEC)	4.0	3.5	3.5	3.6	4.3	3.0
VFR 150	V	HS - P(IEC)	1.0	0.80	0.80	0.40	0.60	1.0
VF 150	A - F - FC - FR - P	HS	4.5	3.5	3.5	3.0	3.9	3.9
VF 150	A - F - FC - FR - P	P(IEC)	4.3	3.5	3.5	3.0	3.9	3.9
VFR 150	A - F - FC - FR - P	HS - P(IEC)	0.60	0.80	0.80	1.0	0.40	1.0
VF 185	N	HS - P(IEC)	5.0	5.5	5.5	7.8	6.6	6.8
VFR 185	N	HS - P(IEC)	1.0	0.80	0.80	0.60	0.40	1.0
VF 185	V	HS - P(IEC)	6.8	5.5	5.5	6.4	7.8	5.4
VFR 185	V	HS - P(IEC)	1.0	0.80	0.80	0.40	0.60	1.0
VF 185	A - F - FC - FR - P	HS	9.6	5.5	5.5	5.0	6.7	6.7
VF 185	A - F - FC - FR - P	P(IEC)	7.8	5.5	5.5	5.0	6.7	6.7
VFR 185	A - F - FC - FR - P	HS - P(IEC)	0.60	0.80	0.80	1.0	0.40	1.0
VF 210	N	HS - P(IEC)	7.5	9.5	9.5	7.3	9.2	9.0
VFR 210	N	HS - P(IEC)	1.3	1.1	1.1	0.80	0.70	1.3
VF 210	V	HS - P(IEC)	8.9	9.5	9.5	7.3	11	8.0
VFR 210	V	HS - P(IEC)	1.3	1.1	1.1	0.60	0.90	1.3
VF 210	A - F - FC - FR - P	HS	15	9.5	9.5	7.5	9.4	8.9
VF 210	A - F - FC - FR - P	P(IEC)	11	9.5	9.5	7.5	9.4	8.9
VFR 210	A - F - FC - FR - P	HS - P(IEC)	0.80	1.1	1.1	1.3	0.70	1.3
VF 250	N	HS - P(IEC)	11	17	17	11	17	17
VFR 250	N	HS - P(IEC)	1.3	1.1	1.1	0.80	0.70	1.3
VF 250	V	HS - P(IEC)	17	17	17	11	23	11
VFR 250	V	HS - P(IEC)	1.3	1.1	1.1	0.60	0.90	1.3
VF 250	A - F - FC - FR - P	HS	28	17	17	11	18	17
VF 250	A - F - FC - FR - P	P(IEC)	23	17	17	11	18	17
VFR 250	A - F - FC - FR - P	HS - P(IEC)	0.80	1.1	1.1	1.3	0.70	1.3

VF permanent lubrication.

VFR permanent lubrication.

For VFR units the lubricant charge refers only to the additional helical reduction.



Worm gear units, series W:

(A15)

				[1]						
				B3	B6	B7	B8	V5	V6	R
W 63	i = 7, 10, 12, 15			0.31	0.31	0.31	0.31	0.31	0.31	0.15
	i = 19, 24, 30, 38, 45, 64, 80, 100			0.38	0.38	0.38	0.38	0.38	0.38	
W 75	i = 7, 10, 15			0.48	0.48	0.48	0.48	0.48	0.48	0.25
	i = 30, 40			0.52	0.52	0.52	0.52	0.52	0.52	
	i = 20, 25, 50, 60, 80, 100			0.56	0.56	0.56	0.56	0.56	0.56	
W 86	i = 7, 10, 15			0.64	0.64	0.64	0.64	0.64	0.64	0.25
	i = 30			0.73	0.73	0.73	0.73	0.73	0.73	
	i = 20, 23, 40, 46, 56, 64, 80, 100			0.90	0.90	0.90	0.90	0.90	0.90	
				B3	B6	B7	B8	V5	V6	R
W 110	P80...P132	-	-	1.5	1.7	1.7	1.9	1.7	1.6	0.40
	-	M2 – M3	-	1.5	1.7	1.7	1.9	1.7	1.6	
	-	-	7 ≤ i ≤ 15	1.5	1.7	1.7	1.9	1.7	1.6	
	-	-	20 ≤ i ≤ 100	2.7	1.7	1.7	1.9	1.7	1.6	

Life-time lubricated gear units.

Life-time lubricated gear units only in combination with ATEX variants.

Lubricant is not factory filled.

Single-stage helical gear units, series S:

(A16)

	[1]											
	P						F					
	B3	B6	B7	B8	V5	V6	B5	B51	B52	B53	V1	V3
S 10 1	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
S 20 1	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
S 30 1	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
S 40 1	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
S 50 1	1.7	2.2	2.2	3.0	3.0	2.0	1.7	1.7	1.7	1.7	3.0	2.0

Life-time lubricated gear units.

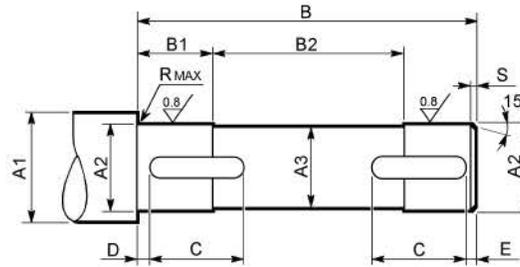
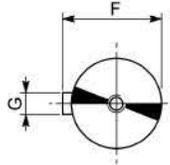
Lubricant is not factory filled.



ANNEX 3 - CUSTOMER'S SHAFT

Series A

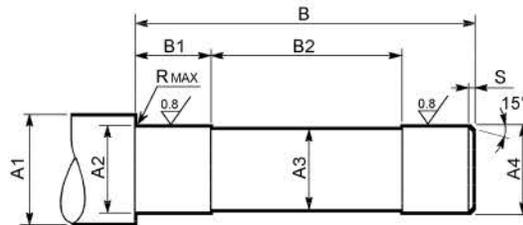
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(A17)

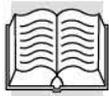
	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	
A 05	≥ 30	25 h7	24	102	21	62	20	2	2	28	8 h9	0.5	1.5	8x7x20 A
A 10	≥ 35	30 h7	29	118	16	87	20	2	2	33	8 h9	0.5	1.5	8x7x20 A
	≥ 30	25 h7	24	118	16	87	20	2	2	28	8 h9	0.5	1.5	8x7x20 A
A 20	≥ 42	35 h7	34	138	20	98	20	2	2	38	10 h9	0.5	1.5	10x8x20 A
	≥ 35	30 h7	29	138	20	98	25	2	2	33	8 h9	0.5	1.5	8x7x25 A
A 30	≥ 47	40 h7	39	158	23	112	30	2	2	43	12 h9	0.5	1.5	12x8x30 A
	≥ 42	35 h7	34	158	23	112	30	2	2	38	10 h9	0.5	1.5	10x8x30 A
A 35	≥ 47	40 h7	39	175	33	109	40	2	2	43	10 h9	1	1.5	12x8x40 A
	≥ 42	35 h7	34	175	33	109	40	2	2	38	10 h9	1	1.5	10x8x40 A
A 41	≥ 52	45 h7	44	184	28	128	45	2.5	2.5	49.5	14 h9	1	2	14x9x45 A
	≥ 47	40 h7	39	184	28	128	50	2.5	2.5	43	12 h9	1	2	12x8x50 A
A 50	≥ 63	55 h7	54	226	37.5	151	55	2.5	2.5	59	16 h9	1	2	16x10x55 A
	≥ 57	50 h7	49	226	37.5	151	65	2.5	2.5	53.5	14 h9	1	2	14x9x65 A
A 55	≥ 70	60 h7	59	226	37.5	151	65	2.5	2.5	59	16 h9	2	2	18x11x65 A
	≥ 60	50 h7	49	226	37.5	151	75	2.5	2.5	53.5	14 h9	2	2	14x9x75 A
A 60	≥ 78	70 h7	69	248	48	152	70	2.5	2.5	74.5	20 h9	2.5	2	20x12x70 A
	≥ 68	60 h7	59	248	48	152	80	2.5	2.5	64	18 h9	2.5	2	18x11x80 A
A 70	≥ 89	80 h7	79	303	58	187	90	3	3	85	22 h9	2.5	2.5	22x14x90 A
	≥ 78	70 h7	69	303	58	187	110	3	3	74.5	20 h9	2.5	2.5	20x12x110 A
A 80	≥ 99	90 h7	89	358	78	202	120	3	3	95	25 h9	2.5	2.5	25x14x120 A
	≥ 89	80 h7	79	358	78	202	130	3	3	85	22 h9	2.5	2.5	22x14x130 A
A 90	≥ 111	100 h7	99	408	78	252	160	3	3	106	28 h9	2.5	2.5	28x16x160 A
	≥ 99	90 h7	89	408	78	252	190	3	3	95	25 h9	2.5	2.5	25x14x190 A

US

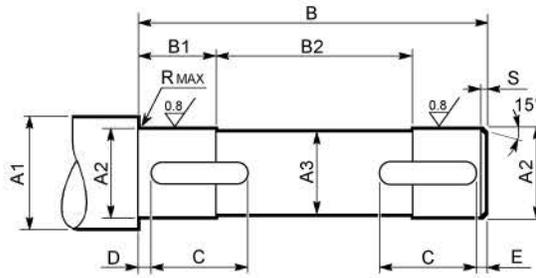
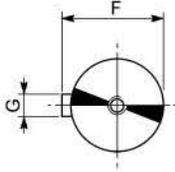
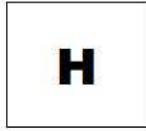


(A18)

	A1	A2	A3	A4	B	B1	B2	R	S
A 10	≥ 42	32 h7	29	30 h6	147.5	34	77.5	0.5	1.5
A 20	≥ 48	37 h7	34	35 h6	170	40	89	0.5	1.5
A 30	≥ 54	42 h7	39	40 h6	191.5	48	95.5	0.5	1.5
A 35	≥ 54	42 h7	39	40 h6	208.5	48	112.5	0.5	1.5
A 41	≥ 60	47 h7	44	45 h6	222	53	117	1	2
A 50	≥ 72	57 h7	54	55 g6	264	46	156	1	2
A 55	≥ 72	62 h7	59	60 g6	266	46	158	2.5	2
A 60	≥ 90	72 h7	69	70 g6	293	48	178	2.5	2.5
A 70	≥ 104	82 h7	79	80 g6	352.5	90	172.5	2.5	2.5
A 80	≥ 114	92 h7	89	90 g6	416	100	216	2.5	2.5
A 90	≥ 126	102 h7	99	100 g6	469	78	321	2.5	2.5

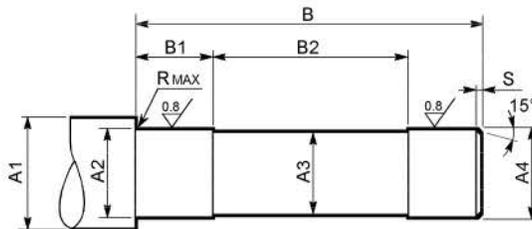


Series F



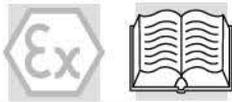
(A19)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	 UNI 6604
F 10	≥ 35	30 h7	29	79	15.5	48	20	2	2	33	8 h9	0.5	1.5	8x7x20 A
	≥ 30	25 h7	24	79	15.5	48	20	2	2	28	8 h9	0.5	1.5	8x7x20 A
F 20	≥ 42	35 h7	34	99	18	63	22	2	2	38	10 h9	0.5	1.5	10x8x22 A
	≥ 35	30 h7	29	99	18	63	22	2	2	33	8 h9	0.5	1.5	8x7x22 A
F 30	≥ 47	40 h7	39	104	28	48	30	2	2	43	12 h9	0.5	1.5	12x8x30 A
	≥ 42	35 h7	34	104	28	48	30	2	2	38	10 h9	0.5	1.5	10x8x30 A
F 40	≥ 52	45 h7	44	118	27.5	63	45	2.5	2.5	49.5	14 h9	1	2.0	14x9x45 A
	≥ 47	40 h7	39	118	27.5	63	45	2.5	2.5	43	12 h9	1	2.0	12x8x45 A
F 50	≥ 63	55 h7	54	139	33	73	50	2.5	2.5	59	16 h9	1	2.0	16x10x50 A
	≥ 57	50 h7	49	139	33	73	50	2.5	2.5	53.5	14 h9	1	2.0	14x9x50 A
F 60	≥ 78	70 h7	69	180	38	104	70	2.5	2.5	74.5	20 h9	1	2.0	20x12x70 A
	≥ 68	60 h7	59	180	38	104	70	2.5	2.5	64	18 h9	1	2.0	18x11x70 A
F 70	≥ 89	80 h7	79	229	58	113	75	3	3	85	22 h9	2.5	2.5	22x14x75 A
	≥ 78	70 h7	69	229	58	113	75	3	3	74.5	20 h9	2.5	2.5	20x12x75 A
F 80	≥ 99	90 h7	89	272	78	116	100	3	3	95	25 h9	2.5	2.5	25x14x100 A
	≥ 89	80 h7	79	272	78	116	100	3	3	85	22 h9	2.5	2.5	22x14x100 A
F 90	≥ 111	100 h7	99	333	87.5	158	110	3	3	106	28 h9	2.5	2.5	28x16x110 A
	≥ 99	90 h7	89	333	87.5	158	110	3	3	95	25 h9	2.5	2.5	25x14x110 A



(A20)

	A1	A2	A3	A4	B	B1	B2	R	S
F 10	≥ 36	27 h7	24	25 h6	138	34	70	0.5	1.5
F 20	≥ 42	32 h7	29	30 h6	160	38	84	0.5	1.5
F 30	≥ 50	38 h7	35	36 h6	155	40	73	1	2
F 40	≥ 58	44 h7	41	42 h6	177	46.5	82	1	2
F 50	≥ 68	54 h7	51	52 g6	201	48	91	1	2
F 60	≥ 84	67 h7	64	65 g6	248	53	133	1.5	2
F 70	≥ 104	82 h7	79	80 g6	308	78	140	2.5	2.5
F 80	≥ 114	92 h7	89	90 g6	365	88	177	2.5	2.5
F 90	≥ 126	102 h7	99	100 g6	429.5	98	221.5	2.5	2.5



ANNEX 4 - LIFTING



When lifting, use accessories such as eyebolts, snap hooks, screw clamps, straps, ropes, hooks etc. which are certified and adequate for the load.

The weight of the product to be lifted is given in the Sales Catalogue.

The method of attachment for the products covered by this Manual are detailed below according to the various product series, sizes and configurations.

The most suitable type of solution for safely lifting and handling each is indicated below.

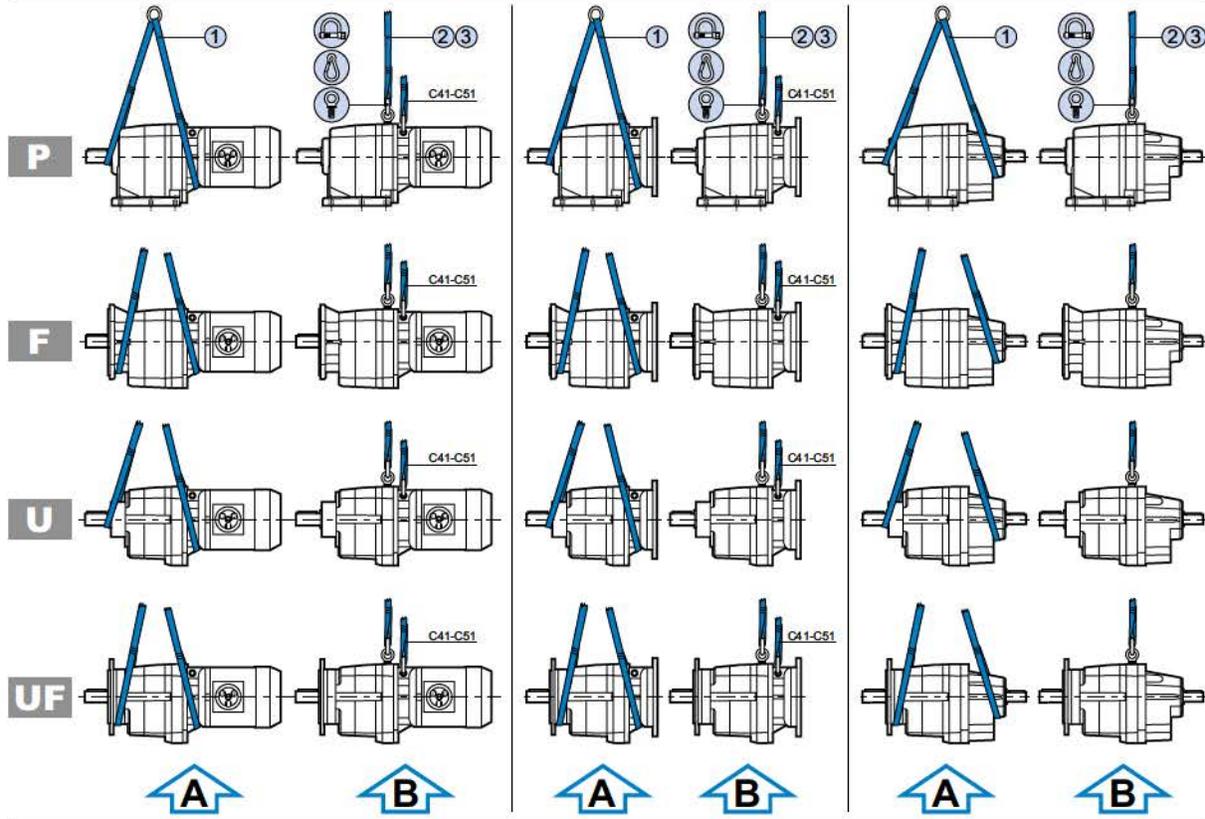
Symbols:

Lifting method	Manual	Through mechanical equipment	
Simbol	M	A	B
Approximate weight	≤ 15 Kg	> 15 Kg	
Instruction	—	Recommended method for positioning	Recommended method for handling and positioning
Warning	—	The load may be unstable	The load may sway or oscillate.
Solution	—	Slide the lifting ring to align it with the load's centre of gravity as shown in the diagrams below Lock the ropes under the ring with a cable clamp or similar device so as to prevent them sliding, and lift the load Observe all precautions regarding the handling of loads	Stabilise the moving load by hand. Observe all precautions regarding the handling of loads

The load must not be allowed to sway or oscillate by more than 15° in any direction when being lifted. If the oscillation exceeds this limit, stop and repeat the lifting operation as instructed.



Series C

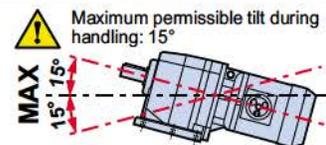


	M05	M1	M2	M3	M4	M5		
C 05	M		—	—	—	—	—	—
C 11	M		A		—	—	M	M
C 21	M		A		—	—	M	M
C 31	M	A			—	—	M	M
C 35	A			—	—	A	A	
C 41	A - B				—	A - B	A - B	
C 51	—	A - B			—	A - B	A - B	
C 61	—	A - B			A	A - B	A - B	
C 70	—	A - B			A	A - B	A - B	
C 80	—	A - B			A	A - B	A - B	
C 90	—	A - B			A	A - B	A - B	
C 100	—	A - B			A	A - B	A - B	

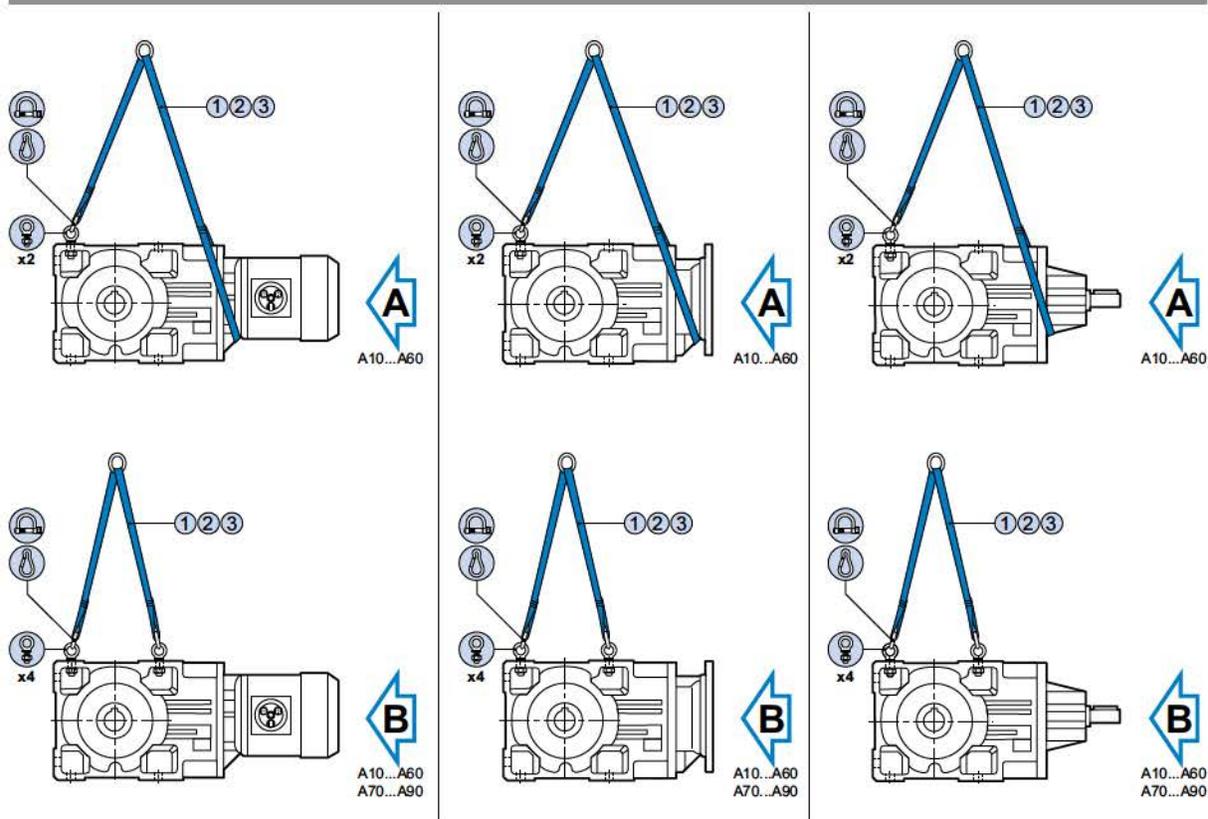
- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

- Screw clamp (use with harness)
- Snap hook (use with rope)
- Eyebolt (already fitted to gear units C50...C100)

- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B



Series A



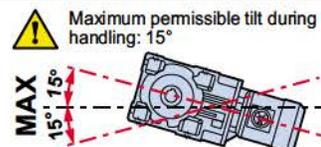
	M05	M1	M2	M3	M4	M5	IEC	
A 05	M	A	—	—	—	—	M	—
A 10	M	A	—	—	—	—	M	M
A 20	A - B				—	—	M (P63...P90)	M
A 30	A				—	—	A - B (P100...P112)	A
A 35	A				—	—	A	A
A 41	A - B				—	—	A - B	A - B
A 50	—	A - B			—	—	A - B	A - B
A 55	—	A - B				—	A - B	A - B
A 60	—	B			—	—	A - B	A - B
A 70	—	B			—	—	B	B
A 80	—	B			—	—	B	B
A 90	—	B			—	—	B	B

Recommended:
solution A for positioning; solution B for positioning and handling.

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

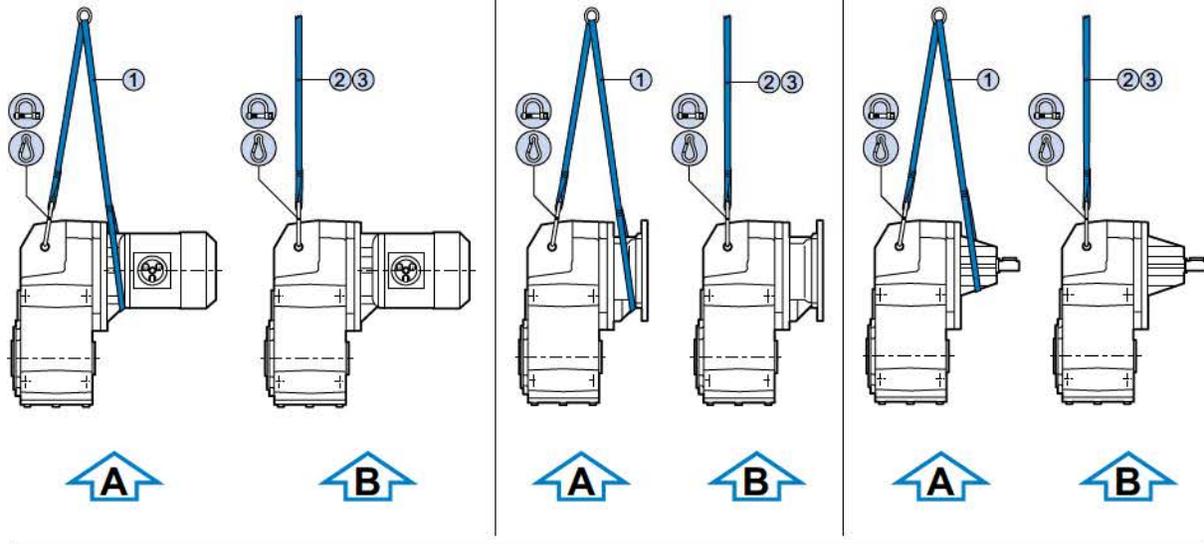
- Screw clamp (use with harness)
- Snap hook (use with rope)
- Eyebolt

- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B





Series F



								
	M05	M1	M2	M3	M4	M5		
F 10	M		A - B		—	—	M	M
F 20	A - B				—	—	M (P63...P90)	M
							A - B (P100...P112)	
F 30	A				—	—	A	A
F 40	A - B				—	—	A - B	A - B
F 50	—	A - B				—	A - B	A - B
F 60	—	A - B				—	A - B	A - B
F 70	—	A - B				—	A - B	A - B
F 80	—	A - B				—	A - B	A - B
F 90	—	A - B				—	A - B	A - B

Recommended:
solution A for positioning; solution B for positioning and handling.

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

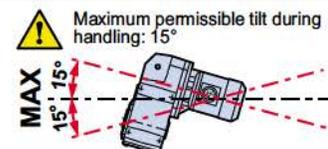
 Screw clamp (use with harness)

 Snap hook (use with rope)

M Lift manually (weight ≤ 15 kg)

A Lift as per diagram A

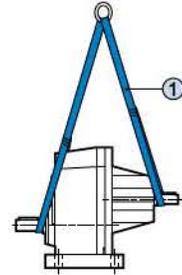
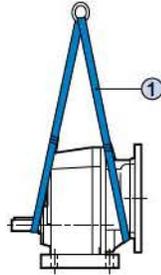
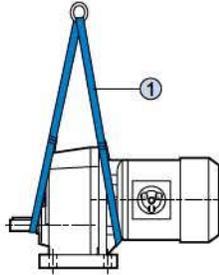
B Lift as per diagram B



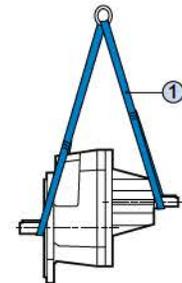
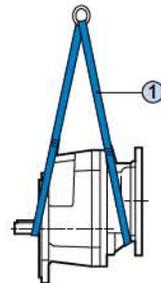
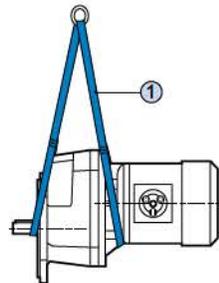


Series S

P



F



							
	M05	M1	M2	M3	M4		
S 10 1	M		A		—	M	M
S 20 1	M		A		—	M	M
S 30 1	M		A		—	M	M
S 40 1			A			A	A
S 50 1			A			A	A

Recommended:
solution A for positioning.

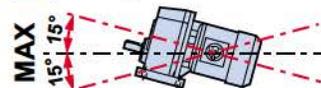
① Ring harness

M Lift manually
(weight ≤ 15 kg)

A Lift as per diagram A

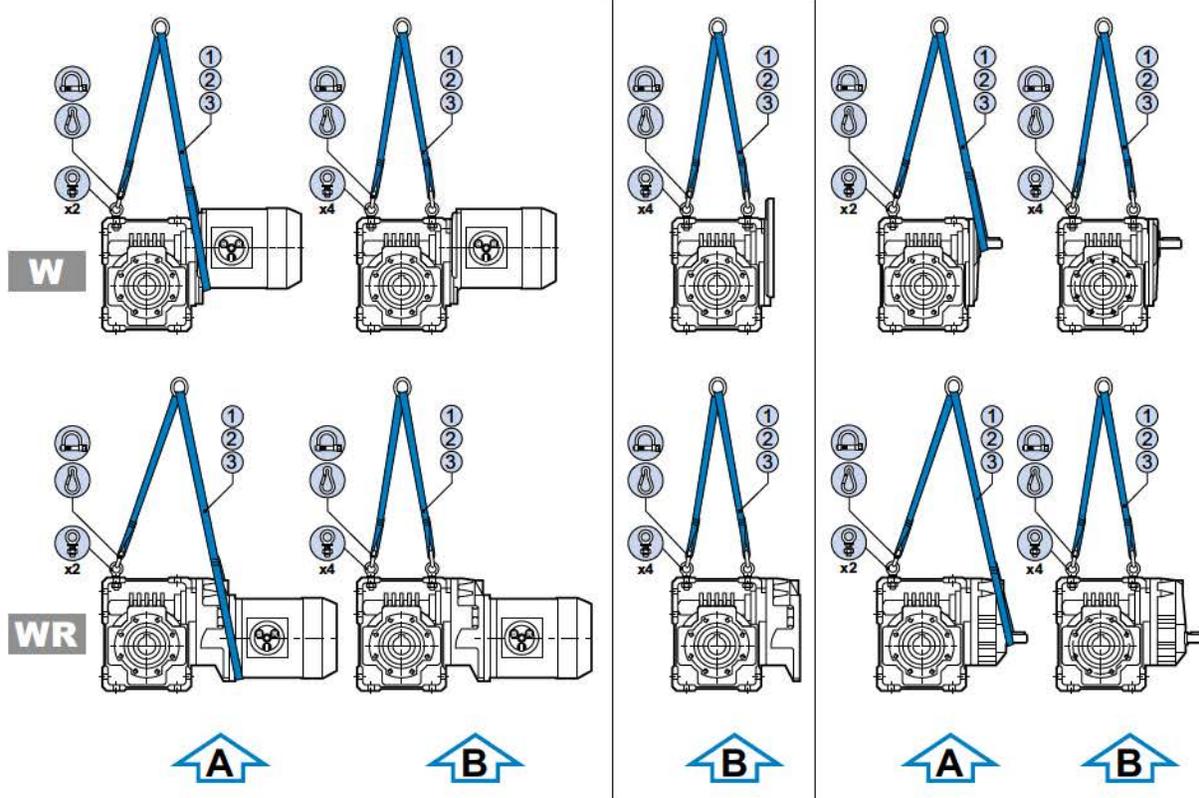


Maximum permissible tilt during handling: 15°





Series W



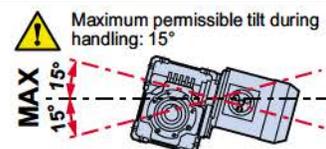
			 IEC	
W 63	WR 63	M	M	M
W 75	WR 75	A - B	M	M
W 86	WR 86	A - B	M	M
W 110	WR 110	A - B	B	A - B

Recommended:
solution A for positioning; solution B for positioning and handling.

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

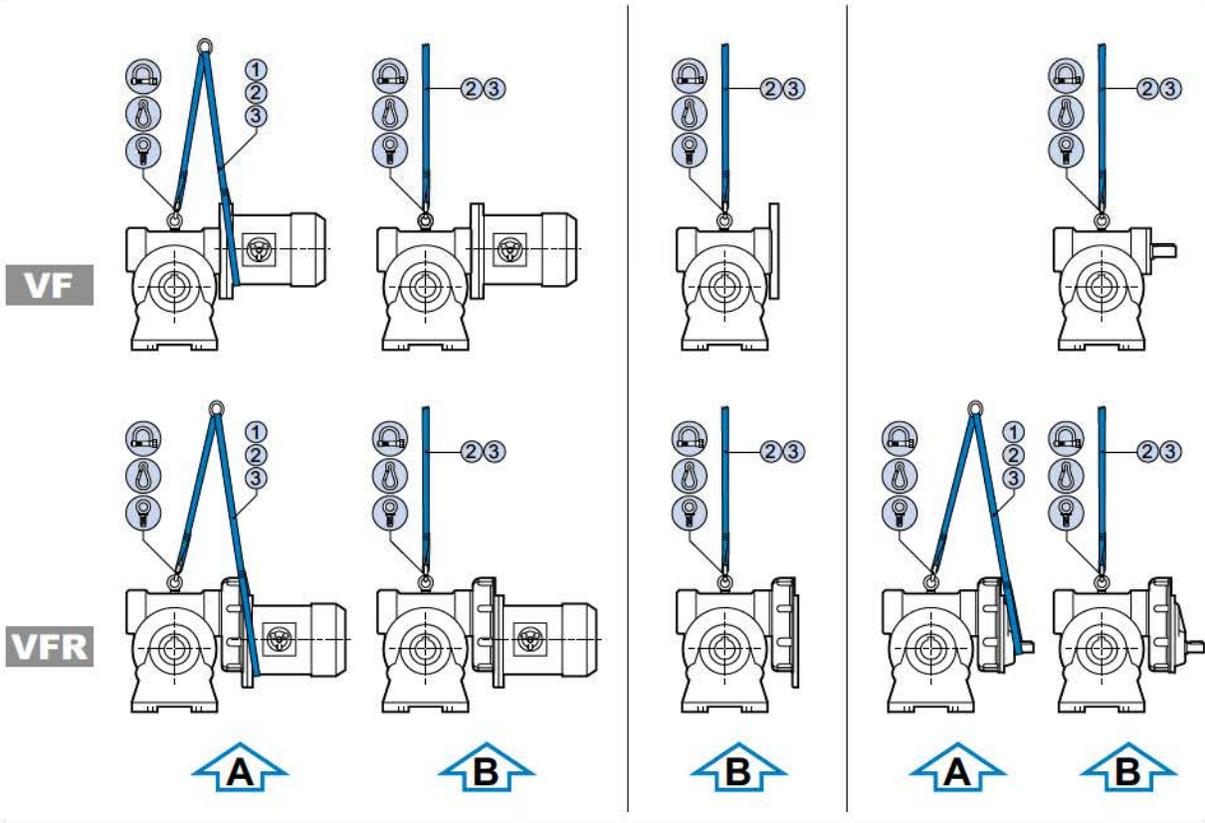
-  Screw clamp (use with harness)
-  Snap hook (use with rope)
-  Eyebolt

- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B





Series VF



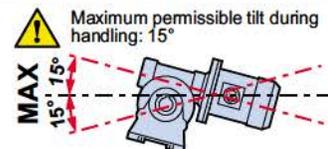
VF 30	M		
VF 44 VFR 44			
VF 49 VFR 49			
VF 130 VFR 130	A - B	A - B	A - B
VF 150 VFR 150			
VF 185 VFR 185			
VF 210 VFR 210			
VF 250 VFR 250			

Recommended:
solution A for positioning; solution B for positioning and handling.

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

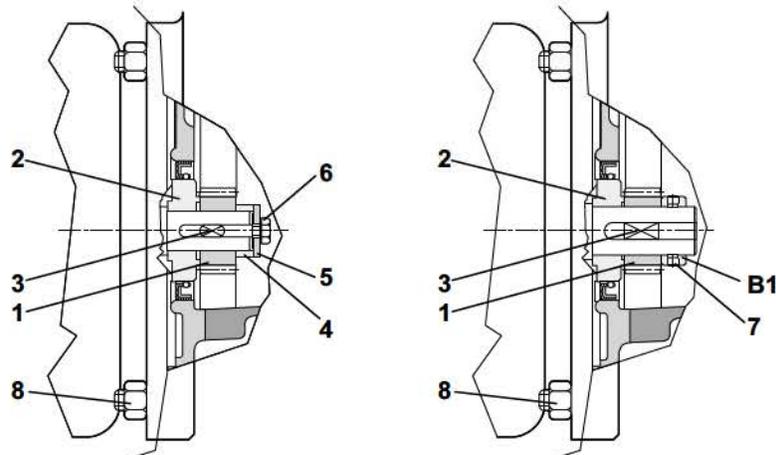
- Screw clamp (use with harness)
- Snap hook (use with rope)
- Eyebolt (already fitted to gear units VF130...VF250)

- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B





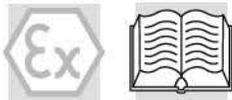
ANNEX 5 - INSTALLING THE MOTOR ON TYPE VFR WORM GEAR UNITS



- 1) Thoroughly clean and degrease the motor shaft and pinion (1) and bushing (2) coupling surfaces.
- 2) Check the motor shaft tolerance meets the following specifications:

Shaft diameter - \varnothing [mm]	Tolerance
11 - 28	j6
38 - 48	k6

- 3) Preheat the bushing (2) and pinion (1) to 80-100 °C.
- 4) Quickly fit, the bushing (2), key (3) and pinion (1), in succession, to the motor shaft.
When fitting the bushing (2), ensure that the chamfered side is facing the operator.
To facilitate mounting, lightly press on the parts being fitted (e.g. with a tubular drift). Make sure that the reaction force in this case is supported at the opposite end of the shaft, and not by the fan cover.
After this procedure the pinion (1) should be snug against the bushing (2).
- 5) Lock the assembly with the spacer (4) and washer (5) by tightening down the bolt (6) or, for configurations which have this option, fit the stop bushing (B1) and tighten down the two grub screws (7) while holding it snug against the pinion (1); see figure on the right.
- 6) Lubricate the seal ring lips with a film of grease.
- 7) For type VFR 49 units, which are lubricated for life and, hence, do not have a service plug, fill with the quantity of lubricant specified in the corresponding chapter of the catalogue dealing with lubrication of VFR units.
- 8) Hold the motor firmly and, holding it in alignment, mount it to the flange of the additional helical reduction casing. Take the greatest care to avoid denting the pinion or gear wheel teeth.
- 9) With the motor and gear unit flanges in contact, fully tighten down the mounting bolts (8) gradually and in a cross-wise pattern.
- 10) For units VFR 110 to VFR 250 the lubricant must be changed periodically.
The lubricant charge (fil) for these gear units is given in the VF catalogue. Check that the correct level has been reached via the sight glass, with the gear unit in its specified mounting position. Top up as necessary.



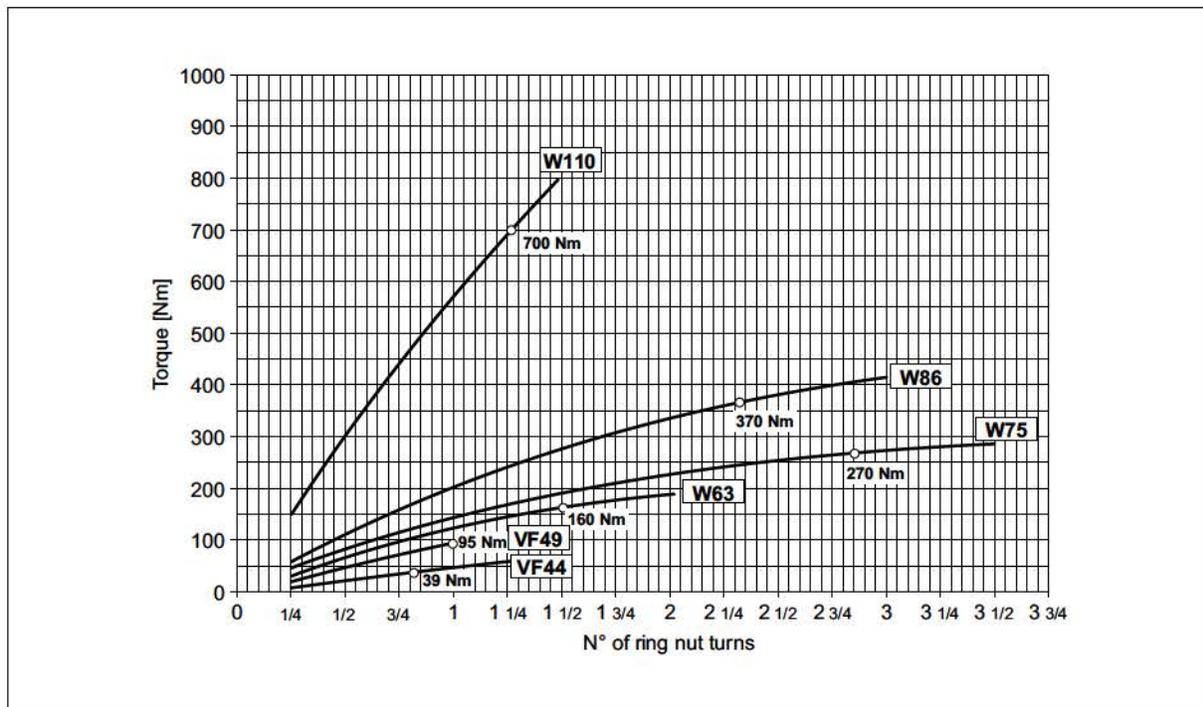
ANNEX 6 - CALIBRATING THE TORQUE LIMITER SLIP TORQUE

The torque limiter is an optional device available for worm gear units of the following types: VF 44L, VF 49L, W 63L, W 75L, W 86L and W 110L.

The device is factory calibrated to a slip torque which coincides with the nominal torque Mn_2 [$n_1=1400$] for the gear unit in question.

This is achieved as follows. The same operations, with exclusion of step (2), allow the User to calibrate the limiter to a torque different to that set in the factory.

1. The calibration ring nut is screwed in until the disk springs are loaded to the point that they cannot be turned freely by hand.
2. A centre punch is used to make two corresponding reference marks at the same angular position on the ring nut and the protruding section of the output shaft. This reference position is the starting point from which all further turns of the ring nut are counted, and thus, the torque calibration is measured.
3. The ring nut is now screwed in by the fractions of a turn which correspond to the nominal torque Mn_2 for the gear unit in question. The reference in this case is given by the diagram below, which is also to be used for any new settings required over time.







INDEX OF REVISIONS (R)

R4

12
15

25
26

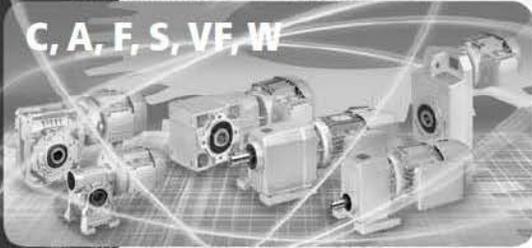
Addition of new sizes A 05, A 35 and A 55.

33
37

42

INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS

C, A, F, S, VF, W



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8.2

Attachments 2

5010752 – Motor



INSTALLATION AND
MAINTENANCE INSTRUCTIONS
FOR THREE PHASE
INDUCTION MOTORS

Frames 143T - 449T



18060 -109 Ave Edmonton, AB T5S 2K2
Phone: 800-661-4023 780-444-8933 Fax: 888-873-8964

RECEIVING

1. Check nameplate data.
2. Check whether any damage has occurred during transportation.
3. After removal of shaft clamp, turn shaft by hand to check that it turns freely.
4. If motor is to be reshipped (alone or installed to another piece of equipment) the shaft must again be clamped to prevent axial movement.

Note: Remove the bearing clamp before turning the shaft on 284T-449TZ frame motors.

WARNING

THE FOLLOWING SAFETY PRECAUTIONS MUST BE OBSERVED:

1. Electric rotating machinery and high voltage can cause serious or fatal injury if improperly installed, operated or maintained. Responsible personnel should be familiarized with NEMA MG2; Safety Standards for Construction and Guide Selection. Installation and Use of Electric Motors and Generators; National Electric Code and all local safety requirements.
2. When servicing, all power sources to the motor and to the accessory devices should be de-energized and disconnected and all rotating parts should be at standstill.
3. Lifting means, when supplied, are intended for lifting the motor only. When two lifting devices are supplied with the motor a dual chain must be used.
4. Suitable protection must be used when working near machinery with high noise levels.
5. Safeguard or protective devices must not be by-passed or rendered inoperative.
6. The frame of this machine must be grounded in accordance with the National Electric Code and applicable local codes.
7. A suitable enclosure should be provided to prevent access to the motor by other than authorized personnel. Extra caution should be observed around motors that are automatically or have automatic re-setting relays as they may restart unexpectedly.
8. Shaft key must be fully captive or removed before motor is started.
9. Provide proper safeguards for personnel against possible failure of motor-mounted brake, particularly on applications involving overhauling loads.
10. Explosion proof motors are constructed to comply with the label service procedure manual, repair of these motors must be made by TECO-Westinghouse Motor Company or U/L listed service center in order to maintain U/L listing.

LOCATION

1. Drip-proof motors are intended for use where atmosphere is relatively clean, dry, well ventilated and non-corrosive.
2. Totally enclosed motors may be installed where dirt, moisture, or dust are present and in outdoor locations.
3. Explosion-proof motors are built for use in hazardous locations as indicated by Underwriters label on the motor.
4. Chemical duty enclosed motors are designed for installation in high corrosion or excessive moisture locations.

Note: in all cases, no surrounding structure should obstruct normal flow or ventilating air through or over the motor.

MOUNTING

1. Mount motor securely on a firm, flat base. All ball bearing normal thrust motors up to and including 256T frame size may be side-wall or ceiling mounted; all others check nearest TECO-Westinghouse office for mounting recommendations.
2. Align motor accurately, using a flexible coupling if possible. For drive recommendations, consult with drive or equipment manufacturer, or TECO-Westinghouse.
3. Mounting bolts must be carefully tightened to prevent changes in alignment and possible damage to the equipment. The recommended tightening torque s for medium carbon steel bolts, identified by three radial lines at 120 degrees on the head, are:

Bolt Size	Recommended Torque (Ft-lb.)	
	Minimum	Maximum
2/8	25	37
1/2	60	90
5/8	120	180
3/4	210	320

4. V-belts Sheave Pitch Diameters should not be less than those shown in Table 1 (NEMA recommended values)
5. Tighten belts only enough to prevent slippage. Belt speed should not exceed 5000 ft. per min.

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number					V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	Horsepower at				Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
	Synchronous Speed, RPM							
3600	1800	1200	900					
143T	1.5	1	.75	.5	2.2	4.25	2.2	2.25
145T	2-3	1.5-2	1	.75	2.4	4.25	2.4	2.25
182T	3	3	1.5	1	2.4	5.25	2.4	2.75
182T	5				2.6	5.25	2.4	2.75
184T			2	1.5	2.4	5.25	2.4	2.75
184T	5				2.6	5.25	2.4	2.75
184T	7.5	5			3.0	5.25	3.0	2.75
213T	7.5-10	7.5	3	2	3.0	6.5	3.0	3.375
215T	10		5	3	3.0	6.5	3.0	3.375
215T	15	10			3.8	6.5	3.8	3.375
254T	15		7.5	5	3.8	7.75	3.8	4
254T	20	15			4.4	7.75	4.4	4
256T	20-25		10	7.5	4.4	7.75	4.4	4
256T		20			4.6	7.75	4.4	4
284T			15	10	4.6	9	4.4	4.625
284T		25			5.0	9	4.4	4.625
286T		30	20	15	5.4	9	5.2	4.625

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number					V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	Horsepower at				Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
	Synchronous Speed, RPM							
3600	1800	1200	900					
324T		40	25	20	6.0	10.25	6.0	5.25
326T		50	30	25	6.8	10.25	6.8	5.25
364T			40	30	6.8	11.5	6.8	5
364T		60			7.4	11.5	7.4	5.785
365T			50	40	8.2	11.5	8.2	5.785
365T		75			9.0	11.5	8.6	5.785
404T			60		9.0	14.25	8.0	7.25
404T				50	9.0	14.25	8.4	7.25
404T		100			10.0	14.25	8.6	7.25
405T			75	60	10.0	14.25	10.0	7.25
405T		100			10.0	14.25	8.6	7.25
405T		125			11.5	14.25	10.5	7.25
444T			100		11.0	16.75	10.0	8.5
444T				75	10.5	16.75	9.5	8.5
444T		125			11.0	16.75	9.5	8.5
444T		150				16.75	10.5	8.5
445T			125		12.5	16.75	12.0	8.5
445T				100	12.5	16.75	12.0	8.5
445T		150				16.75	10.5	8.5

*Max. Sheave width = 2(N-W) - .25

**Max Sheave width = N-W

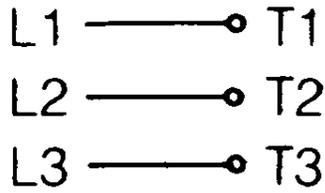
***Sheave ratios greater than 5:1 and center-to-center distance less than the diameter of the large sheave should be referred to TECO-Westinghouse.

POWER SUPPLY & CONNECTIONS

1. Wiring of motor and control, overload protection and grounding should be in accordance with National Electrical Code and all local safety requirements.
2. Nameplate voltage and frequency should agree with power supply. Motor will operate satisfactorily on line voltage within -10% of nameplate voltage; or frequency with -5% and with a combined variation not to exceed -10%. 230-volt motors can be used on 208-volt network systems, but with slightly modified performance characteristics as shown on the nameplate.
3. Dual voltage and single voltage motors can be connected for the desired voltage by following connection diagram shown on the nameplate or inside of the conduit box.
4. All Explosion Proof motors have Temperature Limiting Devices in the motor enclosure to prevent excessive external surface temperature of the motor in accordance with U/L standards. Terminals of thermal protectors (P1 & P2) should be connected to the motor control equipment, according to the connection diagram inside of the conduit box.
5. Standard connection diagram for three phase, not thermally protected, dual rotation motors are shown in diagrams A through E.

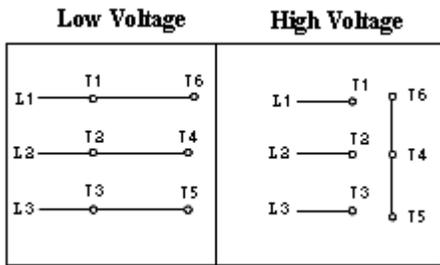
(Note: To change rotation, Interchange any two line leads)

A. 3 Lead, Single Voltage

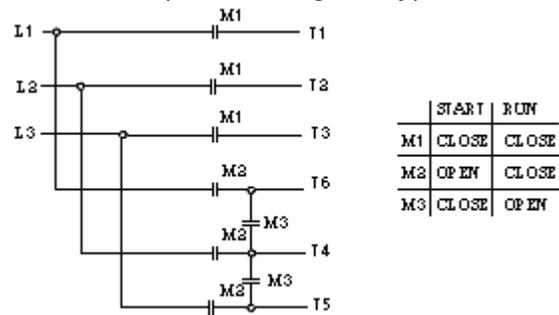


B. 6 Lead, Dual Voltage & Voltage Ratio 1 to 3

B-1 Across the Line Start & Run

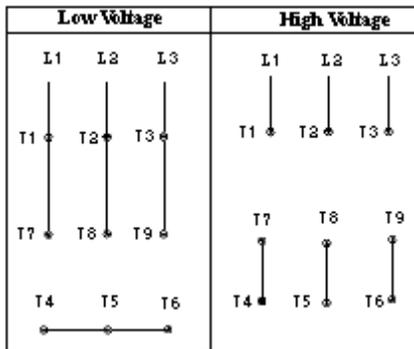


B-2 Wye Start & Delta Run
(Low Voltage only)

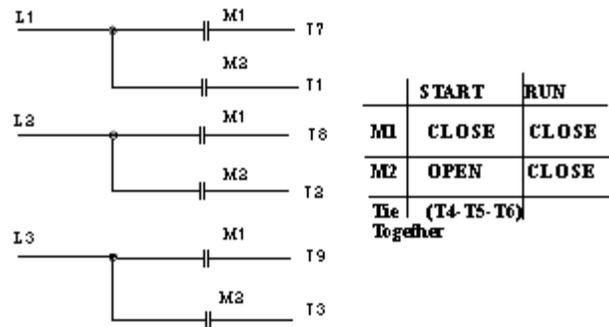


C. 9 Leads; Dual Voltage & Voltage Ratio 1 to 2, Wye Connected

C-1 Across the Line Start & Run

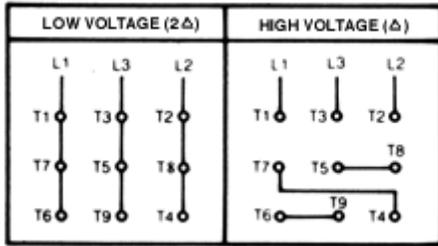


C-2 Part Winding Start
(Low Voltage only)

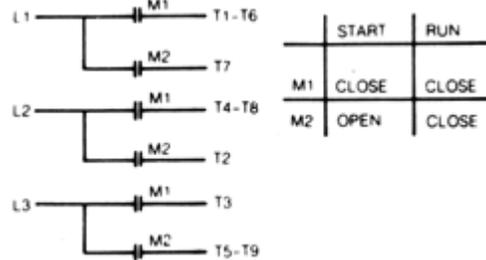


D. 9 Leads; Dual Voltage & Voltage Ratio 1 to 2, Delta Connected

D-1 Across the Line Start & Run

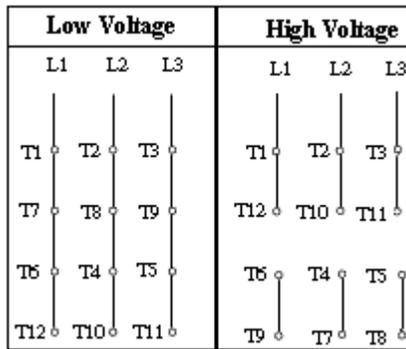


D-2 Part Winding Start (Low Voltage only)

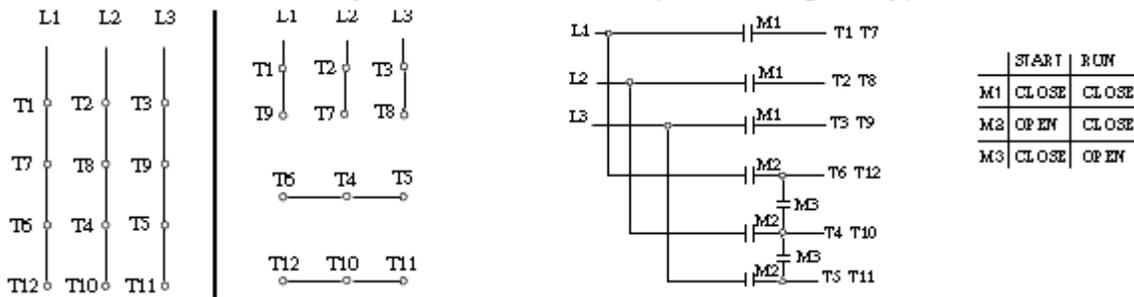


E. 12 Leads, Dual Voltage

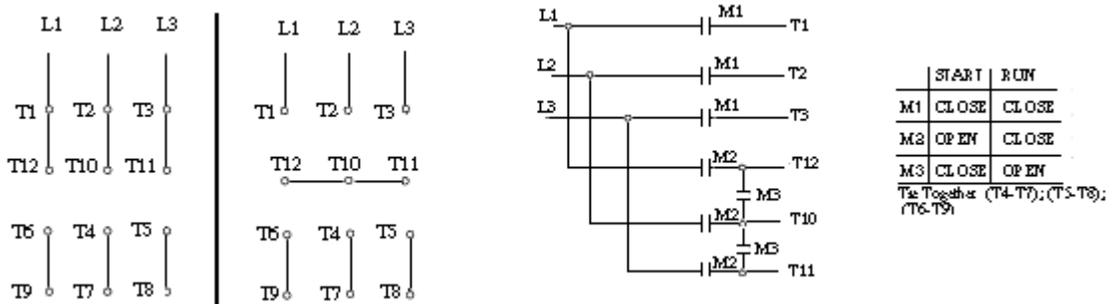
E-1 Across the Line Start & Run



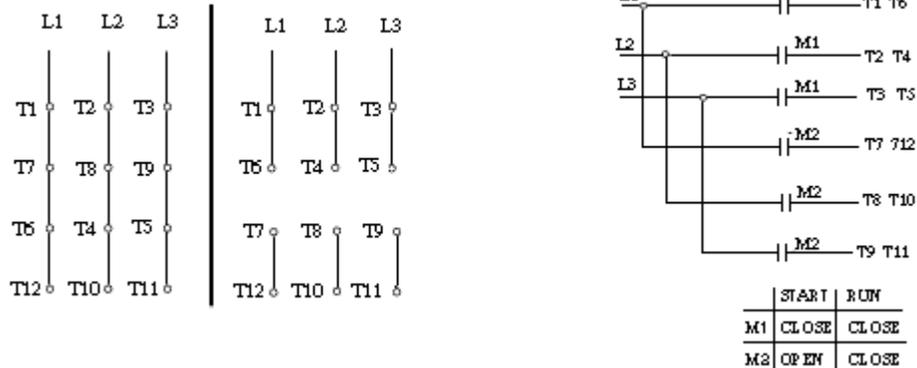
E-2-1 Wye Start & Delta Run (Low Voltage only)



E-2-2 Wye Start & Delta Run (High Voltage only)



E-3 Part Winding Start (Low Voltage only)



*Important: For Part Winding Start, M2 contactor should be closed within two (2) seconds after M1 contactor is closed.
Only 4 pole and above (e.g., 6P, 8P) motors are satisfactory for Part Winding Start at low voltage.

START UP

1. Disconnect load and start motor. Check direction of rotation. If rotation must be changed, ALLOW THE MOTOR TO STOP COMPLETELY. Interchange any two leads of a three-phase motor.
2. Connect load. The motor should start quickly and run smoothly. If no, shut power off at once. Recheck the assembly including all connections before restarting.
3. If excessive vibration is noted, check for loose mounting bolts too flexible motor support structure or transmitted vibration from adjacent machinery. Periodic vibration checks should be made; foundations often settle.
4. Operate under load for short period of time and check operating current against nameplate.

TESTING

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megohmmeter. Depending on the length and conditions of storage it may be necessary to regrease or change rusted bearings.

If the resistance is lower than one megohm the windings should be dried in one of the following two ways:

1. Bake in oven at temperatures not exceeding 194°F until insulation resistance becomes constant.
2. With rotor locked, apply low voltage and gradually increase the current through windings until temperature measured with a thermometer reaches 194°F. Do not exceed this temperature.

MAINTENANCE

INSPECTION

Inspect motor at regular intervals. Keep motor clean and ventilation openings clear.

LUBRICATION

1. Frame 143T-256T: Double shielded and pre-lubricated ball-bearing motors without grease fittings and don't need relubrication, except on MAX-E1^m and MAX-E2^m products which have regreasable features.
2. Frames 280TS, 320-449TZ(TS): Motors having grease fittings and grease discharge devices at brackets. Motors are shipped with grease for initial running. It is necessary to relubricate anti-friction bearing motors periodically, depending on size and type of service. See Table 2 to provide maximum bearing life. Excessive or too frequent lubrication may damage the motor.

TABLE 2

Horsepower	Standard Conditions	Severe Conditions	Extreme Conditions
1 Thru 30 Hp, 1800 rpm and below	7 years	3 years	180 days
40 Thru 75 Hp, 1800 rpm and below	210 days	70 days	30 days
100 Thru 150 Hp, 1800 rpm and below	90 days	30 days	15 days
1 Thru 20 Hp, 3600 rpm	5 years	2 years	90 days
25 Thru 75 Hp, 3600 rpm	180 days	60 days	30 days
100 Thru 150 Hp, 3600 rpm	90 days	30 days	15 days

Note:

- A. Standard conditions: 8 hours operation per day, normal or light loading, clear and 40°C ambient conditions.
 - B. Severe conditions: 24-hour operation per day or light shock loading, vibration or in dirty or dusty conditions.
 - C. Extreme conditions: With heavy shock loading or vibration or dusty conditions.
 - D. For double shielded bearings, above data (lubrication frequency) means that the bearing must be replaced.
3. Be sure fittings are clean and free from dirt. Using a low-pressure grease gun, pump in the recommended grease until new grease appears at grease discharge hole.
 4. Use the ALVANIA R3 grease or equivalent lithium based grease unless special grease is specified on the nameplate.
 5. If relubrication is to be performed with the motor running, stay clear of rotating parts. After regreasing, allow the motor to run for ten to thirty minutes.

RENEWAL PARTS

1. Use only genuine TECO-Westinghouse renewal parts or as recommended by TECO-Westinghouse Motor Company.
2. When you order renewal parts please specify complete information to TECO-Westinghouse office/agent such as type, frame no., poles, horsepower, voltage, series no., quantity, etc.

**FOR FURTHER INFORMATION PLEASE CONTACT
TECO-WESTINGHOUSE MOTORS (CANADA) INC.**

8.2

Attachments 2

5010781 – Motor Brake

Johnson industries / elevantja

□ **Western Office**
6500 Dennett Place
Delta BC
Canada V4G 1N4
Tel: 604 940 4555
Fax: 604 940 4565
www.jbrakes.com

☒ **Eastern Office**
108 Skyway Avenue
Toronto ON
Canada M9W 4Y9
Tel: 416 213 9991
Fax: 416 213 9992
www.brakes.ca

□ **European Office**
Bath Road
Bridgwater Somerset
England TA6 4YQ
Tel: 01278 456 411
Fax: 01278 429 949
www.elevantja.com

USER'S MANUAL

JDL Thruster Drum Brake

CUSTOMER

**Timberland Equipment Ltd.
459 Industrial Avenue
Woodstock, ON N4S 7Z2
Canada**

P.O. # 0060567-00

JOB NUMBER 619101

**SERIAL # JDL250-EJ023/5-619101-1
MODEL # JDL250-EJ023/5**

SPECIFICATIONS

**Torque Max: 240 Lb-Ft or 325 Nm
Linings: Organic, 0.42, Bonded
Working Stroke: 35 mm
Full Release: 50 mm**

 **Western Office**
6500 Dennett Place
Delta BC
Canada V4G 1N4
Tel: 604 940 4555
Fax: 604 940 4565
www.jbrakes.com

 **Eastern Office**
108 Skyway Avenue
Toronto ON
Canada M9W 4Y9
Tel: 416 213 9991
Fax: 416 213 9992
www.brakes.ca

 **European Office**
Bath Road
Bridgwater Somerset
England TA6 4YQ
Tel: 01278 456 411
Fax: 01278 429 949
www.elevantja.com

INTRODUCTION

Thank you for choosing a new Johnson JDL/SMLB shoe brake with an electro-hydraulic thruster.

Before installing your new JDL/SMLB shoe brake it is necessary to read this manual.

Not reading this manual could cause a malfunction with your new JDL/SMLB shoe brake.

The Manufacturer is exempt from any Civil or Penal liability for damages ascribable to unskilled default and non-observance of the instructions of this manual.

All comments and suggestions are welcomed and will be used in order to improve this document.

Our technical department is at your full disposal for any information about the new JDL/SMLB shoe brakes.

Please do not hesitate to contact us if you require any further information.

Sincerely yours.



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01 - GENERAL INFORMATION

The new JDL/SMLB shoe brakes are a fail safe design manufactured according to DIN 15435 standards, that is to say that they are spring applied and electro-hydraulically released by the means of the Thrustor.

The new JDL/SMLB shoe brakes are the result of experience in the manufacturing of industrial brakes since 1915. They have the following standard features:

- Electrohydraulic Thrustor (230/400VAC/ 50Hz, IP65, F) (HYD)
- Aluminum brake shoes with steel bushings (CD)
- Asbestos free linings with friction coefficient $\mu = 0.42$ (42)
- Standard stainless steel pins (SS)
- Self lubricating bushings on main pins (AU)
- Galvanized tie rods, screws, nuts and small items (ZN)
- Epoxy paint (colour light grey RAL 7001)
- Square-shaped spring tube with new universal braking torque plate (with transparent film for repainting is necessary) i.e. unique for each brake diameter independently of the thrustor used.
- Steel levers and base
- Automatic lining wear adjustment.

The new JDL/SMLB shoe brakes can be fitted with the following optional items :

- Extra - wide brake shoes (CL)
- Lubricators on main pins (GR)
- Open position microswitch (FIA)
- Lining wear microswitch (FIC)
- Manual release and locking systems (HAN)
- Supporting spheres for vertical brake axis (ORZ)

All JDL/SMLB shoe brakes are statically tested before dispatch.

All Johnson EJ Thrustors are tested before dispatch, during the test of the Johnson shoe brake,



01.01 - PACKING OF THE NEW JDL SHOE BRAKES

The JDL/SMLB shoe brakes are always delivered carefully packed.

The type of packing depends on the type of transport, the distance, the net weight and the Customer's choices.

We normally use pallets with film for transport by land, wooden cases with tar paper for sea freight and normal wooden cases for air freight.

01.02 - HANDLING OF THE NEW JDL SHOE BRAKES

During the handling of the new JDL/SMLB shoe brakes any kind of impact must be avoided, especially to the base, the Johnson EJ Thrustor, the main spring set and the upper tie rod.

Should damage occur to any of the above mentioned components it is necessary to check carefully the JDL/SMLB shoe brake and to replace the damaged component.

WARNING!

Failure to inspect and replace any damaged component could cause malfunction and result in an accident.

01.03 - DRAWINGS OF THE NEW JDL/SMLB SHOE BRAKES

Please refer to the certified print at the back of this manual for dimensional details.

The enclosed drawings show the brakes in the 'NV' version with automatic lining wear adjustment and with no other optional item; they show the minimum and maximum braking torque, the total weight and the product code.

The enclosed drawings can also be sent by E-mail or saved on CD in 'pdf', 'dwg' or 'dxf' formats.



01.04 - IDENTIFICATION OF THE NEW JDL/SMLB SHOE BRAKES

SHOE BRAKE'S SERIAL NUMBER PLATE

All the new JDL/SMLB shoe brakes have an aluminum serial number plate fixed to the upper left lever.

The following data is printed on the serial number plate:

- Type and diameter (in millimeters) of JDL/SMLB shoe brakes in the 'brake type' square (JDL/SMLB 160, 200, 250, 315, 400 or 500)
- Serial number and year of manufacture in the 'Serial Nr./year' square
- Weight of the JDL/SMLB shoe brake in the 'mass (kg)' square
- 'X' in the 'AU' square for self lubricating bushings on the main pins.
- 'X' in the 'ZN' square for galvanized pins, tie rods, screws, nuts and small items.
- 'X' in the 'CD' square for brake shoes to DIN 15435 standard or,
- 'X' in the 'CL' square extra wide brake shoes.
- 'X' in the 'PS' square for standard pins or,
- 'X' in the 'SS' square for stainless steel pins.
- 'X' in the 'GR' , 'FIA' , 'FIC' , 'HAN' , 'EPO' squares if these optional items are fitted

THRUSTOR NAME PLATES

For a complete identification of the new JDL shoe brakes it is also necessary to read the Johnson EJ Thrustor's name plate.

The Johnson EJ Thrustor's name plate is fixed on the vertical upper part of the Thrustor. To correctly identify the brake model is necessary to read:

- Model of EJ Thrustor in the 'Thrustor type' square (EJ .023 , 030 , 050 , 080 , 121 , 120 , 301/06 or 301/12)
- Codes 'IS' , 'LI' , 'LO' if those items are fitted
- Voltage and frequency



		Brake type	CE
Serial Nr./Year		Braking Torque SEE BR. TORQUE PLATE	Mass (kg)
Shoes CD <input type="checkbox"/>	CL <input type="checkbox"/>	Pins PS <input type="checkbox"/>	SS <input type="checkbox"/>
Bushes AU <input type="checkbox"/>			
Lubricators GR <input type="checkbox"/>	Switch FIA <input type="checkbox"/>	Wear Indic FIC <input type="checkbox"/>	
Locking HAN <input type="checkbox"/>	Paint EPO <input type="checkbox"/>	Zinc Plate ZN <input type="checkbox"/>	

		Thruster type	CE
Serial Nr./Year		Lifting force	Stroke
		N	mm
		kg	
kW		Hz	min ⁻¹
Cos φ			
IP 65	CL F TROP	Serv S1-S3	c/h 2000
△ V	A	∩ V	A

MOTOR 3 ~ IEC34/1

DRGS 1 & 2 SERIAL NUMBER PLATES

In case the name plates are missing, the JDL/SMLB shoe brake can be identified knowing the following data :

- Diameter of the brake drum
- Width of the brake shoes
- With or without Automatic lining wear adjustment
- Dimension 'A' of the Thruster, that is to say the distance between the centers of upper pin and lower pin

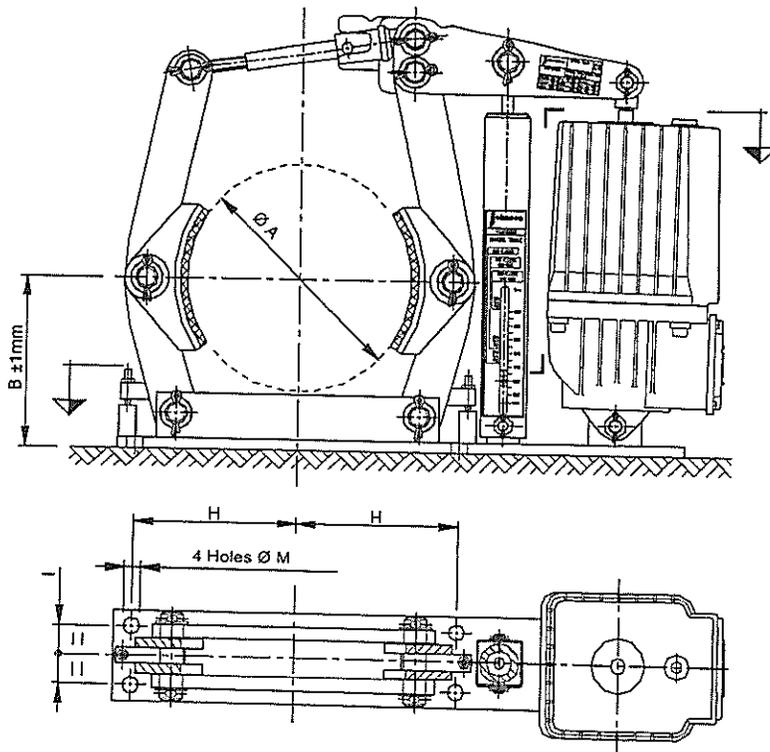


02 - INSTALLATION OF THE NEW JDL/SMLB SHOE BRAKES

For correct installation and operation it is necessary to prepare a level surface on which the base of the JDL/SMLB shoe brakes can be mounted.

The level surface must be parallel to the brake axis and must be manufactured according to following dimensions A, B, H and I

The four holes which are necessary for fixing the JDL/SMLB shoe brake to the level surface must be made according to the following dimensions H, I, and M.
(See drawing No. 3 below)



DRG 3 BRAKE INSTALLATION



TABLE OF DIMENSIONS

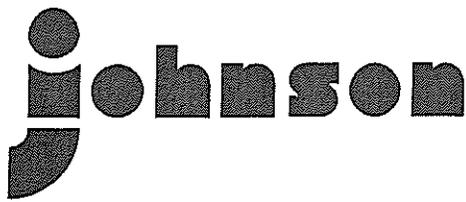
AISE STANDARD (imperial dimensions)							
MODEL	Dia A	Height B	Length H	Width I	Hole M	Bolt Dia	Bolt Torque
SMLB6	6.00	4.750	4.00	3.00	• 7/16	• 3/8	5/15 ft-lbs
SMLB8	8.00	7.000	3.25	5.75	• 11/16	• 5/8	15/75 ft-lbs
SMLB10	10.00	8.375	4.00	6.25	• 11/16	• 5/8	25/75 ft-lbs
SMLB13	13.00	9.875	5.75	9.00	• 13/16	• 3/4	55/130 ft-lbs
SMLB16	16.00	12.125	7.50	10.75	• 1-1/16	• 1	65/190 ft-lbs
SMLB19	19.00	13.250	9.25	13.00	• 1-1/16	• 1	105/190 ft-lbs
DIN 15435 STANDARD (metric dimensions)							
JDL160	160	130	120	55	12	M10	6/17 Nm
JDL200	200	160	145	55	14	M12	9/30 Nm
JDL250	250	190	180	65	18	M16	16/76 Nm
JDL315	315	230	220	80	18	M16	29/76 Nm
JDL400	400	280	270	100	22	M20	50/148 Nm
JDL500	500	340	325	130	22	M20	81/148 Nm

Once the level surface has been manufactured according to dimensions A, B, H, I, and M it is possible to install the brake.

The JDL/SMLB shoe brakes are supplied ready for installation, with the thruster full of oil and the main spring set to the minimum value of braking torque or as shown on the certified print.

Start the installation by removing the cotter pins from the lower pin of the brake arm opposite to the thruster and pulling this pivot pin out.

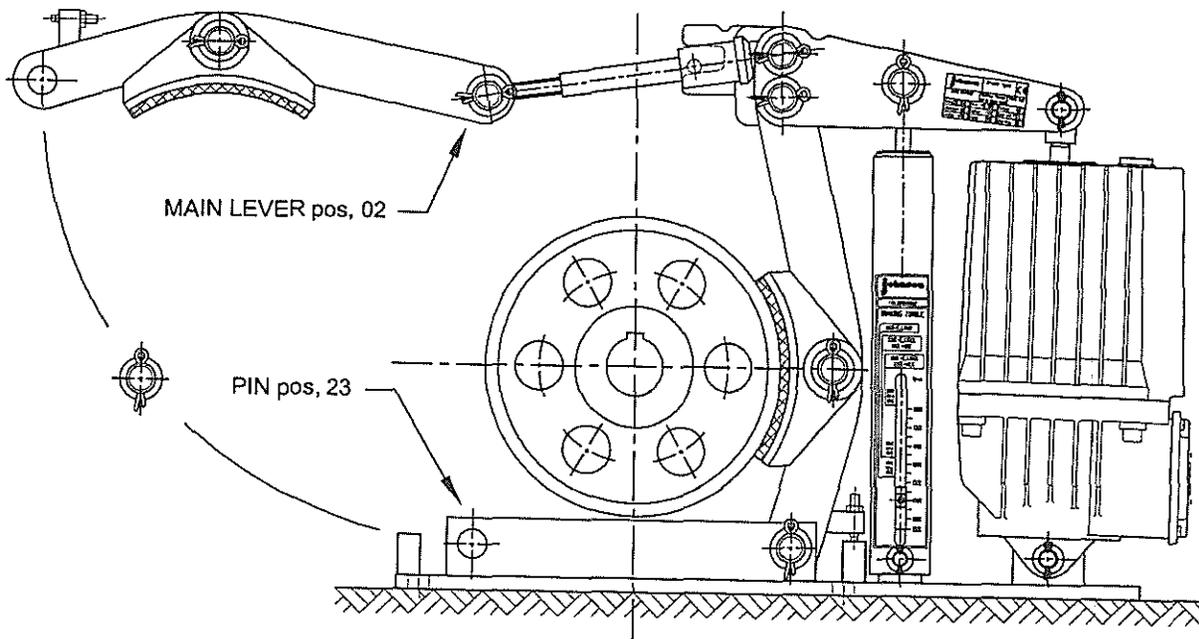
After removing this pin, the brake arm opposite to the Thruster can be lifted up to clear



the brake drum by rotating it on its upper pin which is fixed to the upper tie rod.

With the lever arm lifted out of the way the brake can be slid under the drum so that the brake shoe which is closest to the thruster is placed against the brake drum and the base of the brake is positioned under the brake drum so that it can be fixed to the level surface. Refer to drawing no. 4 for an illustration.

With the brake in position the pivot pin and cotter pins must be reinstalled. **After all these operations the brake must be in the same condition as before installation.**



DRG 4 REMOVAL OF ARM

The base of the JDL/SMLB shoe brake must be fixed to the level surface by means of four bolts in the mounting holes of the base itself and in the corresponding holes of the level surface according to dimensions H, I and M. Ensure that the mounting bolts are tightened to a value within the range shown in the table above.

The length of the bolts depend on the thickness of the level surface, on the thickness of the base.



The four bolts must be fastened with self locking nuts or into tapped holes for securing the JDL/SMLB shoe brake to the level surface.

02.01 - ELECTRICAL CONNECTION OF THE NEW SHOE BRAKES

After installing the JDL/SMLB brake by following the instructions of section 02 of this manual it is necessary to make the electrical connection to the Johnson EJ Thrustor.

If not specified at time of purchase, the Johnson EJ Thrustors are supplied with a three phase electric motor 230/400V, 50 Hz. These thrustors have class F windings and have an IP65 rated enclosure. The direction of rotation is unimportant.

All the data of the electric thruster motor are printed on the name plate fixed that is on the vertical upper part of the Thrustor itself.

In the table below is the electrical data of the 230/400 V, 50 Hz and 265/460 V, 60 Hz Johnson EJ Thrustors:

Table 2.51
230/400V - 50 Hz

Thrustor	kW	Volt Δ	Amps Δ	Volt Y	Amps Y	rpm	Cos. Φ
EJ .023/05	0,160	230	0,69	400	0,40	2790	0,76
EJ .030/05	0,195	230	0,85	400	0,49	2770	0,78
EJ .050/06	0,210	230	1,00	400	0,58	2880	0,65
EJ .080/06	0,320	230	1,31	400	0,76	2770	0,78
EJ .121/06	0,320	230	1,64	400	0,95	2790	0,71
EJ .201/06	0,450	230	1,87	400	1,08	2780	0,76
EJ .301/06	0,560	230	2,20	400	1,30	2760	0,78



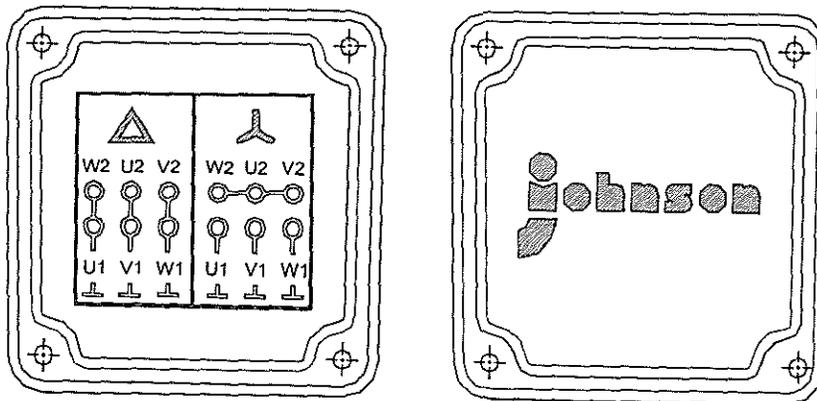
Table 2.61
265/460V - 60 Hz

Thruster	kW	Volt Δ	Amps Δ	Volt Y	Amps Y	rpm	Cos. Φ
EJ .023/05	0,160	265	0,60	460	0,35	3348	0,76
EJ .030/05	0,195	265	0,74	460	0,43	3324	0,78
EJ .050/06	0,210	265	0,87	460	0,50	3456	0,65
EJ .080/06	0,320	265	1.14	460	0.66	3324	0,78
EJ .121/06	0,320	265	1.42	460	0.83	3348	0,71
EJ .201/06	0,450	265	1.62	460	0.94	3336	0,76
EJ .301/06	0,560	265	1.91	460	1.13	3312	0,78

Electrical data for other voltages are available upon request.

To make the electrical connection it is necessary to remove the terminal box cover by removing the four cover screws.

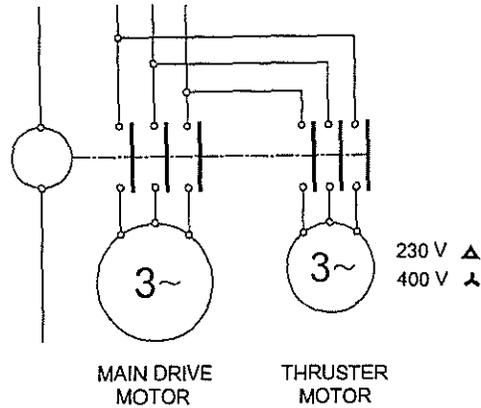
The Thruster can be either star or delta connected as shown in the diagram below depending on the voltage of the available power supply. The termination instructions for the electrical connection can be found inside the terminal box cover.



DRG 5 TERMINAL BOX COVER

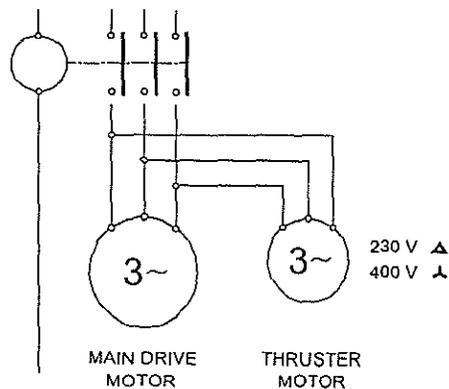


The Thruster's motor must be connected to the machine's main motor as per the following electrical scheme.



DRG 6 SUGGESTED WIRING DIAGRAM

It is not recommended to make a direct connection with the machine's main motor as shown below especially with high power motors. The such a connection can delay the brake reaction time due to the possibility that the remnant magnetism and the persistent movement of the motor's rotor can cause residual current that can exert an influence on the Thruster motor.



DRG 7 NOT RECOMMENDED WIRING DIAGRAM



02.02 - BEDDING OF LININGS

Bedding is required of new brake linings as they generally do not conform to the shape of the drum. It is essentially sanding of the linings such that their curvature matches that of the drum and lining surface irregularities are eliminated. Conformity allows for good contact between the brake's friction surfaces and the friction path, giving the required braking torques.

Materials Required:

- Adhesive-backed sandpaper (120 grit)
- Dust mask
- Protective eye wear
- 0.002" feeler gauge
- Non-oil based solvent cleaner

Procedure:

Note: All item numbers pertain to the parts list at the back of the manual

1. Jumper out brake release limit switch 'FIA'.
2. Prepare sandpaper. Cut to width and circumference of drum.
3. Open brakes:
 - i. Remove self-adjuster fork (Item 36), if equipped.
 - ii. Rotate tie rod (Item 06/07) at the nut such that the brake opens as wide as possible.
4. Adhere sandpaper to drum, ensuring grit is facing out. Entire surface of drum should be covered in sandpaper.
5. Close brakes:
 - i. Rotate tie rod (Item 06/07) at the nut such that the brake closes.
 - ii. Stop when there is clearance of 1 mm between each shoe and the sandpaper, while brake is released.
6. Bed the linings. This can be done in two ways, depending on the presence of a hand-release:
 - i. With Hand Release:
 - (1) Engage drive at 5% speed or less (100 RPM max.)
 - (2) Use lever to lightly apply the brakes
 - (3) Adjust pressure applied to brakes as required to improve bedding.
 - ii. Without Hand Release:
 - (1) Minimize brake torque by rotating nut at top of main spring rod such that the index reads the minimum value on the scale.
 - (2) Disable thruster electrically or by removing the thruster top pin (Item



- 29) to apply the brakes.
- (3) Engage drive at 5% speed or less (100 RPM max.)
- (4) Adjust brake torque if required to improve bedding.

NOTE:

Be sure to wear protective eye wear and dust mask during bedding process as a large amount of dust is created.

7. Periodically check conformity between lining and drum surface.
 - i. Stop drive.
 - ii. Attempt to slide feeler gauge in between the lining and drum. Do so at several positions on both sides of both shoes.
 - iii. If the gauge fits between the surfaces at all, the surfaces are not yet conformed. Revert to step 6.
 - iv. If the gauge cannot fit between the surfaces at any point, the surfaces are conformed. Proceed to step 8.
8. Open brakes, as outlined in step 3(ii).
9. Remove sandpaper from drum surface. Clean drum surface with non-oil based solvent cleaner.
10. Close brakes:
 - i. Rotate tie rod (Item 06/07) at the nut such that the brake closes.
 - ii. Set brake shoe opening stroke as indicated in the manual.
 - iii. Re-attach self-adjuster fork (Item 36) to the brake.
 - iv. Set brake torque as described in the manual.
11. Remove limit switch jumper.

02.03 - ADJUSTMENT OF THRUSTER STROKE AND BRAKE SHOE GAP

After installing the brake following the instructions of section 02 of this manual and after making the Thrustor's electrical connection following the instructions of section 02.01 of this manual it is necessary to adjust the brake shoe gap and thruster working stroke.

With the brake in the closed position the upper tie rod must be rotated until the thruster is totally open.

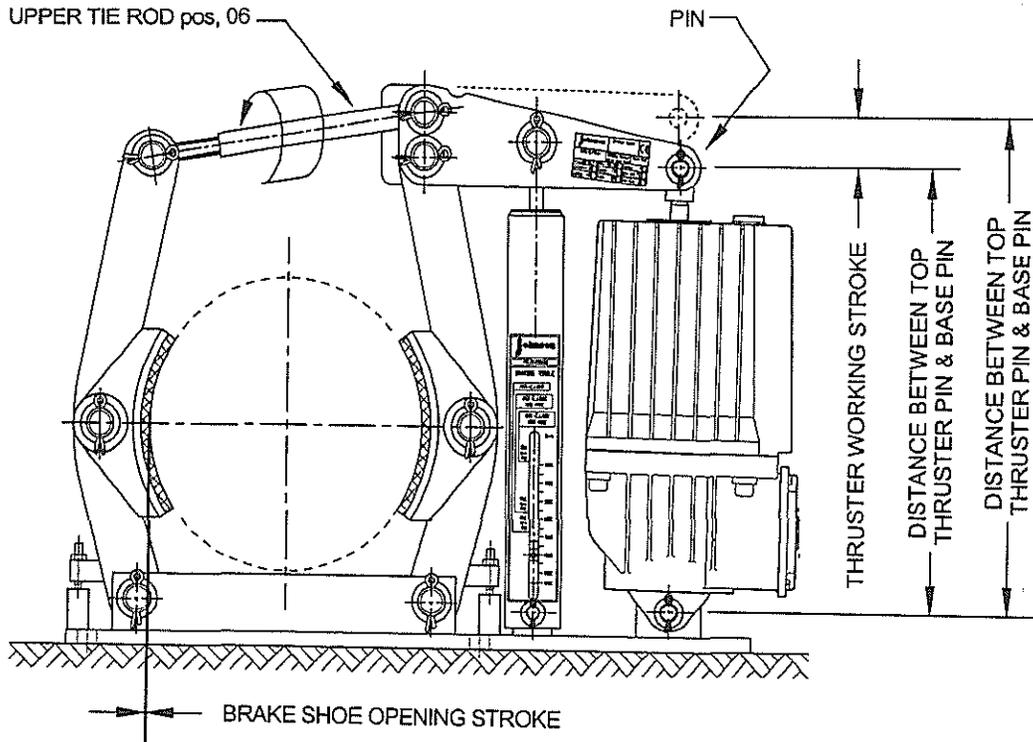
To verify that the thruster is at maximum extension it is necessary to measure the distance between the thruster top pin and the thruster base pin.

Then the upper tie rod must be rotated in opposite direction until the Thrustor's top hinge pin goes down in a measure equal to the 'Thrustor's stroke' of the following table.



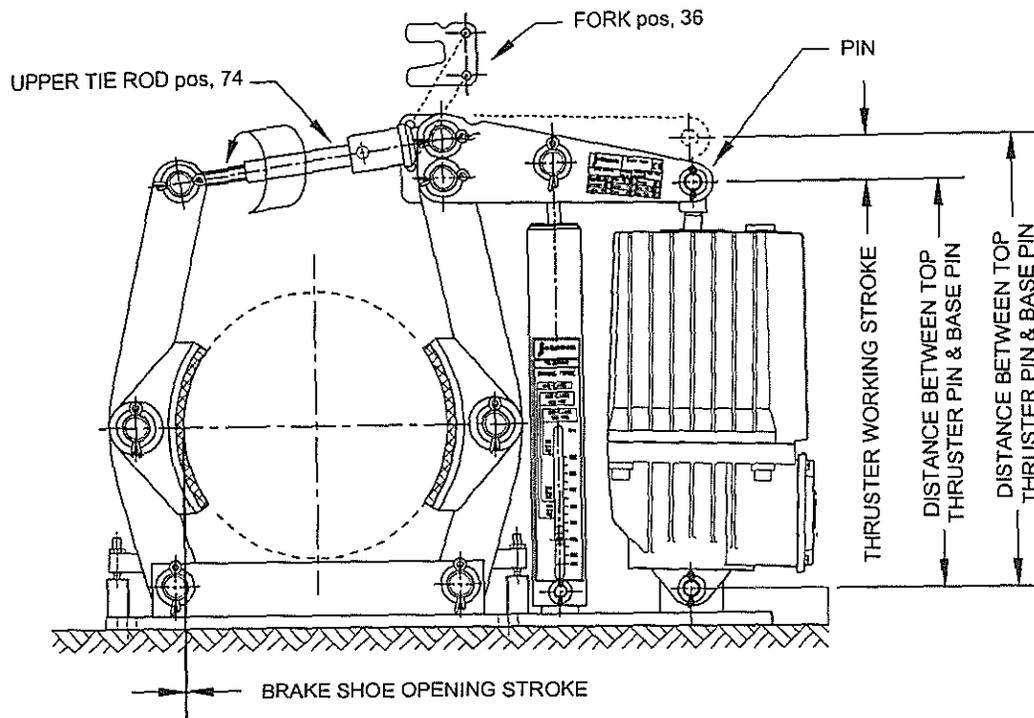
TABLE 3

Brake Diameter	160mm	200mm	250mm	315mm	400mm	500mm
Thrustor Stroke	20mm	20mm	25mm	25mm	35mm	35mm



DRG 8 ADJUSTMENT OF MANUALLY ADJUSTED BRAKE

For JDL/SMLB brakes in 'NV' version with automatic lining wear adjustment, it is necessary to temporarily remove the 'NV' self adjuster fork to allow rotation of the upper tie rod. After adjusting the thruster working stroke the self adjuster fork must be put back in its original position, otherwise the automatic lining wear adjustment will be disengaged.



DRG 9 ADJUSTMENT OF AUTOMATICALLY ADJUSTED BRAKE

By adjusting the thruster stroke in the above manner the value of the brake shoe gap or running clearance will be correct to DIN 15435 standard, as listed in the following table. The values listed in the table is the total air gap between linings and the brake drum for both shoes.

Brake Diameter	160mm Not at DIN standard	200mm	250mm	315mm	400mm	500mm
Running clearance	0,80mm	1,00mm	1,25mm	1,25mm	1,60mm	1,60mm

Brakes of 'NV' version with automatic lining wear adjustment the brake shoe gap and thruster stroke is kept constant as the linings wear.

The brakes of 'N' version without automatic lining wear adjustment the brake shoe gap increases directly with the decrease in pad thickness as the linings wear. To maintain the thruster working stroke within limits it is necessary to rotate the shoe brake's upper tie rod for adjusting the thruster stroke as per the above mentioned table.



DANGER!

Failure to compensate for pad wear by maintaining the thruster stroke will result in excessive stroke and sudden loss of braking torque.

02.04 - ADJUSTING OF THE BRAKING TORQUE

After following instructions of sections 02, 02.01 and 02.02 of this manual it is necessary to adjust the braking torque of the brake.

The adjustment of the braking torque must be made with a closed brake and with the brake shoes set on the brake drum and the thruster stroke set as in Table 3.

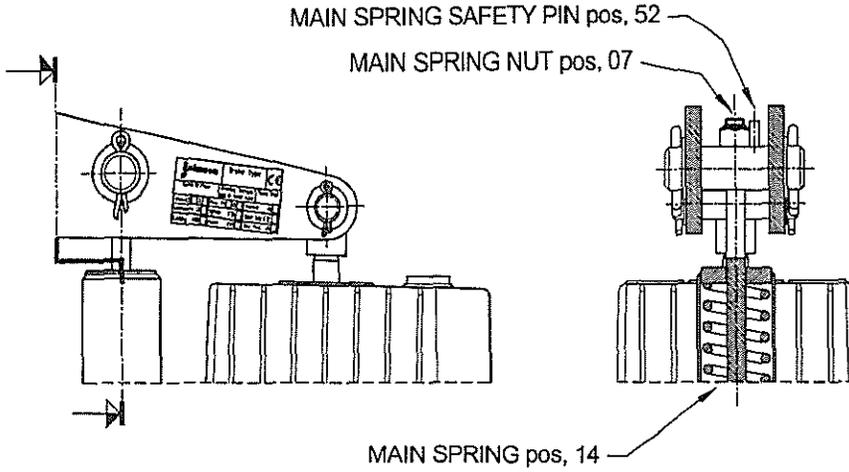
The braking torque is increased by clockwise rotation of the nut fixed at the top of the main spring rod thereby compressing the brake's main spring. The torque setting is read off of the index on the spring tube. Read the value corresponding to the bottom of the flat washer that sits under the main spring.

Ensure that the adjustment nut safety pin is installed once the braking torque is adjusted to prevent loss of torque setting.

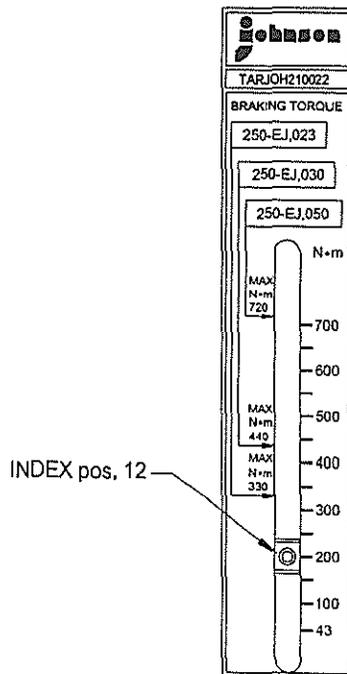
As it is possible to see in the drawing no. 11 below, the braking torque plate shows more than one value of maximum braking torque. The maximum torque depends on the thruster fitted on the brake.

More precisely, the braking torque plate of the Johnson JDL/SMLB brake shows two maximum values of braking torque for the 160 mm diameter brake and three maximum values of braking torque for the brakes from diameter 200mm to 500mm included.

For example, the maximum braking torque of the Johnson JDL/SMLB brake of diameter 250mm is 330 Nm with Johnson Thrustor type EJ 023/50, 440Nm with Thrustor type EJ 030/05 and 720Nm with Thrustor type EJ 050/06.



DRG 10 ADJUSTMENT OF BRAKING TORQUE



DRG 11 TYPICAL BRAKING TORQUE PLATE



For this reason it is necessary to know the size of installed EJ Thrustor for the maximum braking torque.

In case the desired braking torque is not known by the user or by the manufacturer it is recommended to set the brake at its maximum braking torque and to decrease the braking torque to achieve the required stopping times or distances to suite the particular application. For holding brakes the torque should be set and tested to hold a minimum 125% of the safe working load.

Brakes in 'NV' version with automatic lining wear adjustment the braking torque is kept constant as the linings wear.

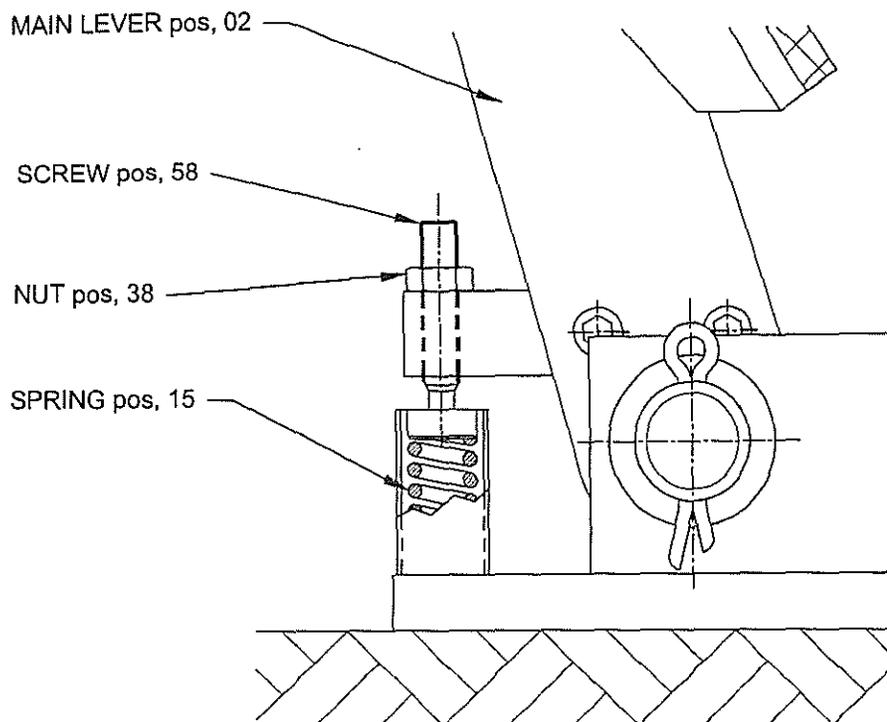
Brakes in 'N' version without automatic lining wear adjustment the braking torque decreases in a measure which is directly proportional to the lining wear and to the increase of the brake shoe gap so it is imperative to periodically adjust the brake's upper tie rod to maintain the thruster stroke.

02.05 - ADJUSTMENT OF BALANCING SCREWS

After following instructions of sections 02 of this manual it is necessary to adjust the brake arms bias screws to equalize the running clearance at the shoes.

With the brake in the open position the bias screws must be adjusted until the two brake arms equally open and the running clearance between each shoe and the drum is equal. Refer to the diagram below .

Once this last operation is made, the brake is ready for operation. However it should be noted that rated torque is not achieved until the linings are fully bedded.



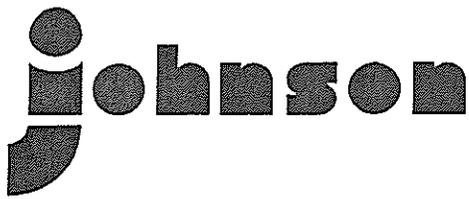
DRG 12 MAIN LEVER BALANCING ADJUSTMENT

03 - OPTIONAL ITEMS FOR NEW JOHNSON SHOE BRAKES

As written in section 01 of this manual, the brakes can be fitted with the following optional items described in the following sections:

- | | |
|--|-------|
| 12. Extra-wide brake shoes | (CL) |
| 13. Lubricators on main pins | (GR) |
| 14. Open Position microswitch | (FIA) |
| 15. Lining wear microswitch | (FIC) |
| 16. Manual release and locking system | (HAN) |
| 17. Supporting spheres for vertical brake axis | (ORZ) |

In case other optional items not included in our standard range are needed we will be



glad to consider their manufacturing as per Customer's requirement.

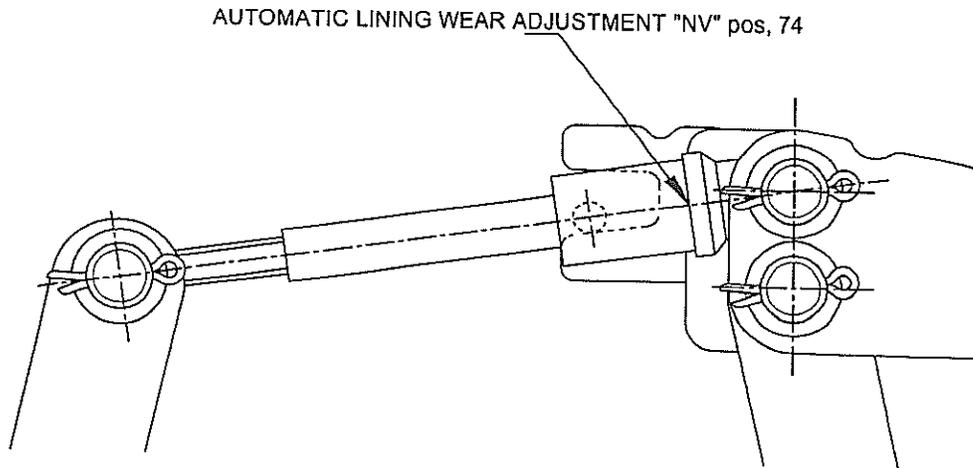
03.01 - AUTOMATIC LINING WEAR ADJUSTMENT (NV)

The brakes with automatic lining wear adjustment are identified by the 'NV' code.

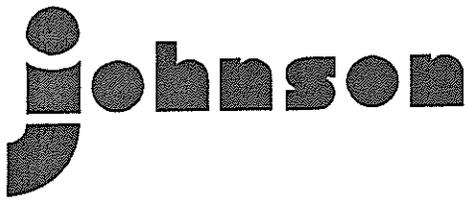
The automatic lining wear adjustment is an optional item which is considered very useful in any case and especially for all the Johnson JDL/SMLB brakes used for main hoist drive, auxiliary hoist drive, boom hoist drive, grab opening and closing.

The Automatic lining wear adjustment can be offered in any case for any JDL/SMLB brake because, as already written in sections 02.02 and 02.03 of this manual, it keeps constant braking torque and thrustor stroke during lining wear.

The function of the automatic lining wear adjustment is to adjust automatically the upper tie rod during lining wear.



DRG 13 AUTOMATIC LINING WEAR ADJUSTMENT "NV"



03.02 - EXTRA-WIDE BRAKE SHOES (CL)

The JDL/SMLB brakes with extra-wide brake shoes are identified by the 'CL' code.

The extra-wide brake shoes are 1,5 times wider than the DIN standard brake shoes, and are suggested for all JDL/SMLB brakes for dynamic duty.

The extra-wide brake shoes are offered because they allow a better dissipation of thermal energy and a longer pad life.

The extra-wide brake shoes must be used with extra-wide brake drums.

The DIN standard brake shoes are called 'RF2' while the extra-wide brake shoes are called 'RF4'.

The width of 'RF2' and 'RF4' brake shoes are listed in the following table:

Brake Diameter	160mm	200mm	250mm	315mm	400mm	500mm
RF2 shoe width	55mm	70mm	90mm	110mm	140mm	180mm
RF4 shoe width	85mm	105mm	135mm	165mm	210mm	270mm

03.03 - STAINLESS STEEL PINS (SS)

Stainless steel pins are standard on the Johnson JDL/SMLB range of brakes and are identified by the 'SS' code on the brake name plate.

03.04 - LUBRICATORS ON MAIN PINS

The brakes with lubricators on main pins are identified by the 'GR' code.

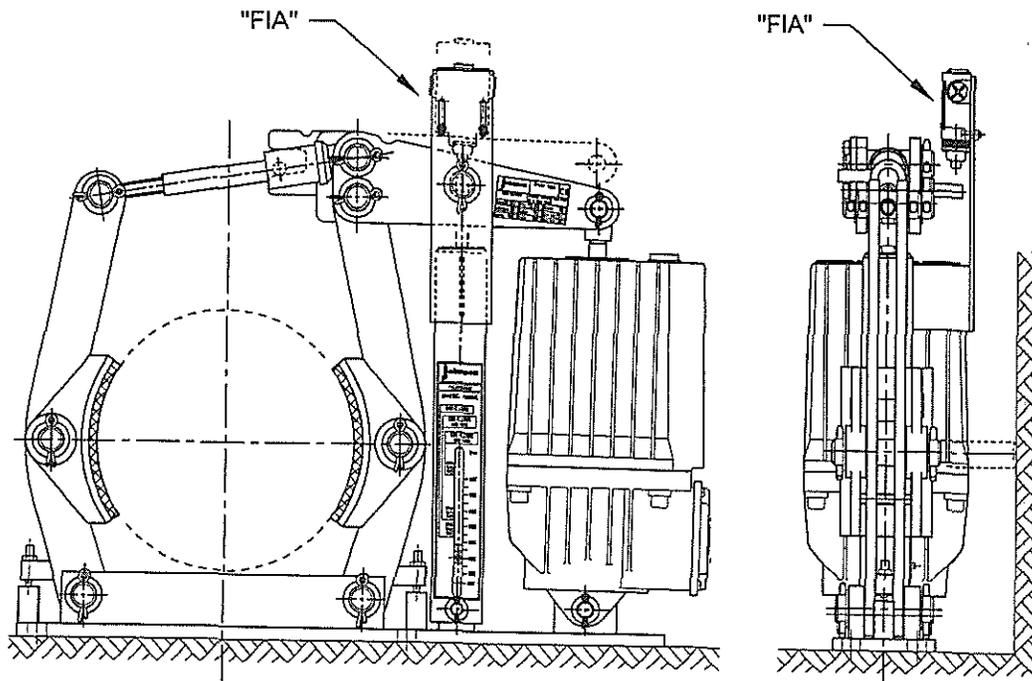
The lubricators on main pins are an optional item which is suggested for all shoe brakes which are installed outdoors or in marine and humid environments.

The JDL/SMLB brakes with lubricators on main pins can be periodically lubricated by using an ESSO (EXXON) Beacon 2 grease. The lubrication points are Tecalemit UNI 7662 button head grease fittings.

03.05 - OPEN POSITION MICROSWITCH (FIA)

The JDL/SMLB brakes with open position (brake released) indicating microswitch are identified by the 'FIA' code.

The open position microswitch is an optional item which is recommended to be used as a drive motor interlock to prevent the accidental operation of the machine's main motor when the brake is set.



DRG 14 OPEN POSITION MICROSWITCH "FIA"

The release indicating limit switch has the following specifications:

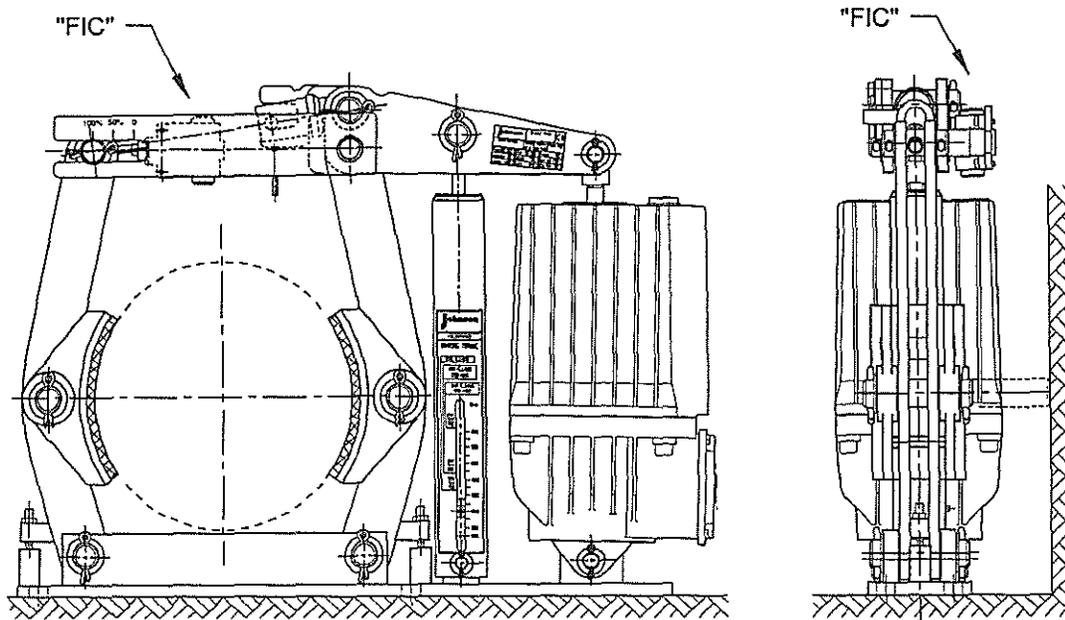
'FIA' RELEASE SWITCH SPECIFICATIONS

Contact type:	2 pole, snap action	
Contact ratings:	120VAC / 0.5A	(AC-15 / NEMA A300 duty)
	24VDC / 0.4A	(DC-13 / NEMA Q300 duty)
Ambient Temperature:	-25°C - +70°C	
Degree of Protection:	IP66	
Cable Gland:	M20x1.5	

03.06 - LINING WEAR MICROSWITCH (FIC)

The JDL/SMLB brakes with lining wear microswitch are identified by the 'FIC' code.

The lining wear microswitch is an optional item which is used to indicate when the linings have worn down to the minimum allowable thickness. In other words the switch indicates when the linings need replacing. The wear switch is the same type as the 'FIA' release indicating switch.



DRG 16 LINING WEAR MICROSWITCH "FIC"

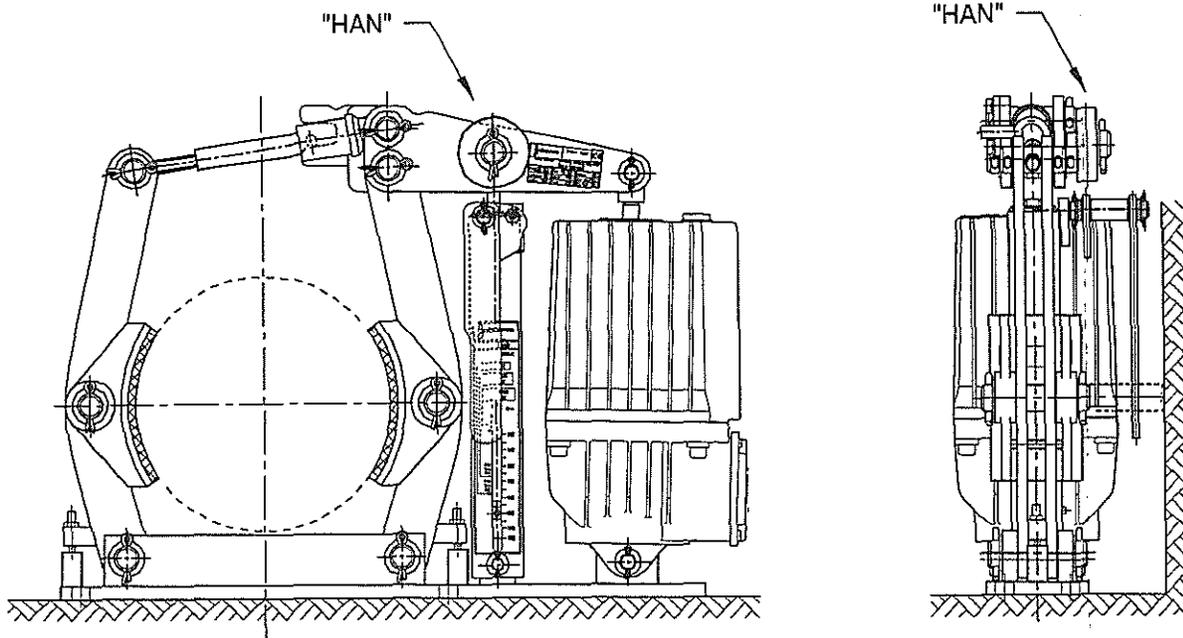
03.07 - MANUAL RELEASE AND LOCKING SYSTEM (HAN)

The JDL/SMLB brakes with manual release and locking system are identified by the 'HAN' code.

The manual release and locking system is an optional item which is suggested for maintenance purposes or for manually opening the brake in case of power failure.



The system is comprised of a lever that hangs down off of the spring tube with a cam which can be turned 90° to the horizontal position thereby opening the brake. The hand release is latching to keep the brake in the open position. Should the hand release lever be inadvertently left in the released position the lever will drop or disengage when the thruster is energized.



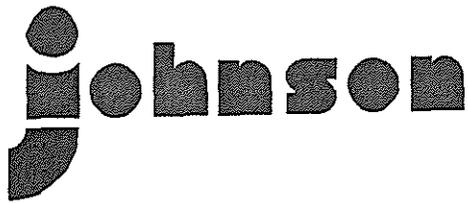
DRG 18 MANUAL OPENING & LOCKING SYSTEM "HAN"

03.09 - SUPPORTING SPHERES FOR VERTICAL BRAKE AXIS (ORZ)

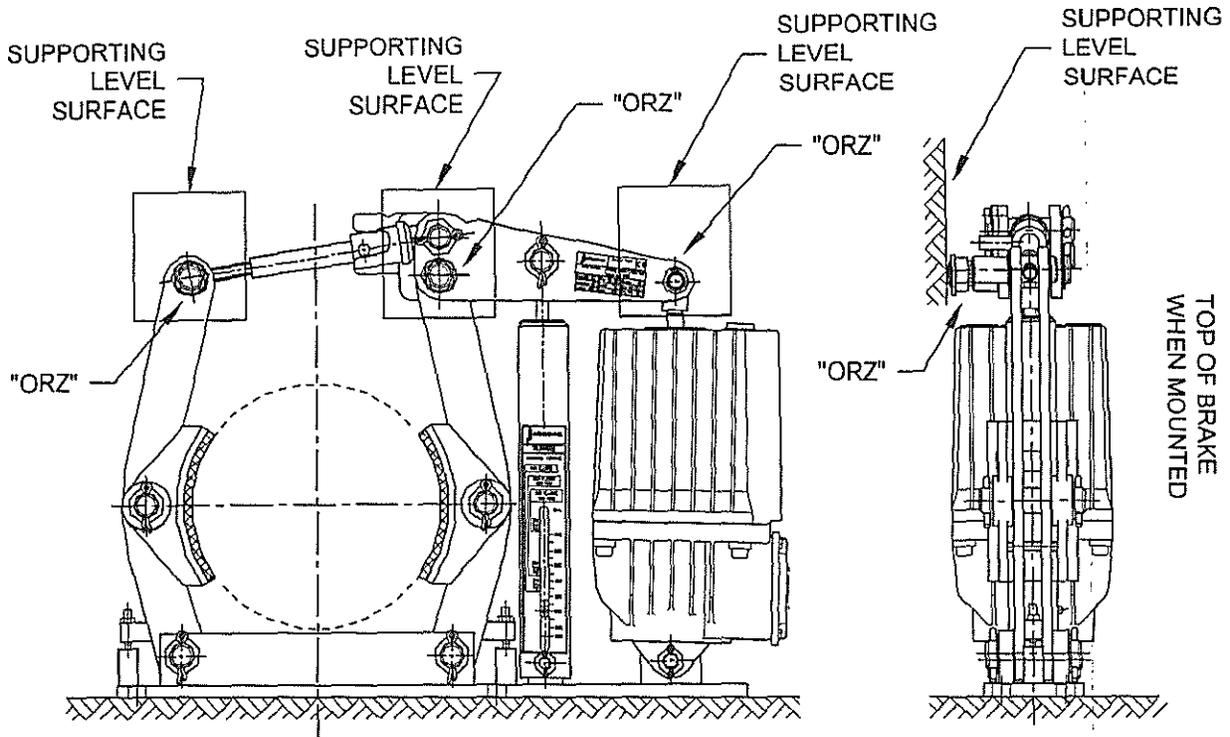
The Johnson shoe brakes with supporting spheres for a vertical brake axis are identified by the 'ORZ' code.

The supporting spheres for vertical brake axis are an optional item which is necessary for any Johnson shoe brake which is installed in horizontal position, that is to say with vertical brake axis.

The spheres support the Johnson shoe brake and they must roll on a horizontal level



surface under the brake itself.



DRG 19 SUPPORT AREAS FOR VERTICAL BRAKE "ORZ"

04 - MAINTENANCE OF THE NEW JOHNSON SHOE BRAKES

To ensure safe and reliable operation of the brake and a longer service life proper maintenance procedures also have to be followed as well as proper installation of the brake.

For maintenance of the new brake it is necessary to have the suggested original spare parts listed in section 05 of this manual.

04.01 - REPLACEMENT OF WORN BRAKE SHOES

All the brake shoes of the new brakes are made in aluminum with steel bushings and with bonded asbestos free linings.

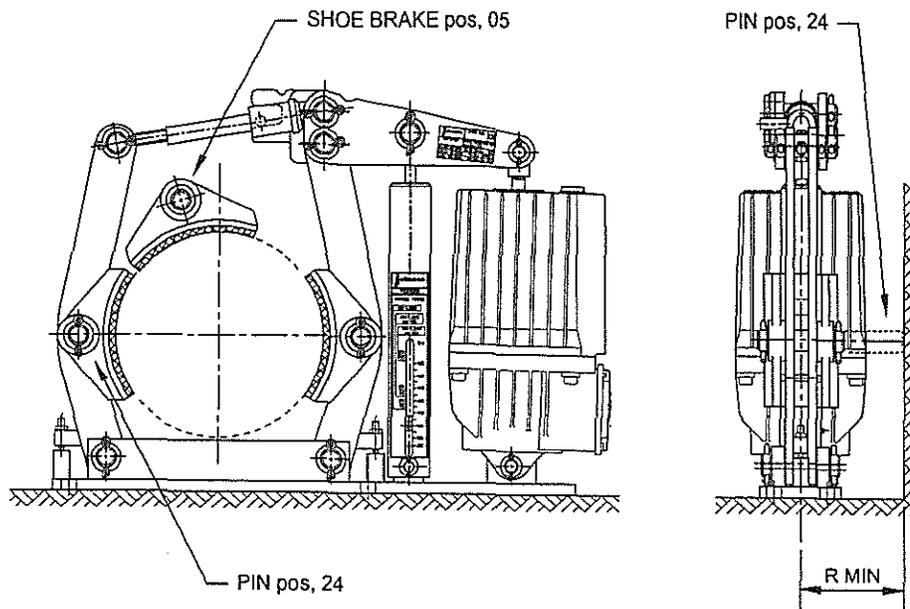


The lining is obviously subject to wear depending of the type of service of the brake and also the type of environment. It is necessary to periodically inspect the condition of the linings in order to be able to replace the brake shoes before the linings are totally worn.

If the linings are not checked periodically, it is possible that the brake shoes can come in direct contact with the brake drum surface and damage it even causing a loss of braking torque.

Both DIN standard 'RF2' brake shoes and extra-wide 'RF4' brake shoes can be easily replaced without disassembling the brake.

Before removing shoes the thruster must be adjusted to the bottom of its stroke. For replacing the worn brake shoes it is necessary to remove the two cotter pins from the shoe pins and to remove the shoe pins themselves in order to separate them from the lever. Once the shoe pins are removed the shoes can be rotated upwards on the brake drum, as shown in the following drawing.



DRG 20 REPLACEMENT OF WORN BRAKE SHOES

The 'Rmin' dimension in the above drawing is the minimum distance between the brake's vertical center plane and any side obstruction for extracting the pin which fixes the brake shoe to the brake arms. In the certified drawing attached at the back of the manual this dimension is given for the brake supplied.



The brake shoes with worn lining can be replaced with new brake shoes or be sent back to Johnson Industries Ltd for relining.

The linings are bonded rather than riveted because the bonding system used creates a superior cohesion between lining and shoe than what is obtained with rivets.

In case the relining of the brake shoes is made by the user or by user's suppliers we do not recommend using rivets for fixing the linings.

We recommend to use only original Johnson brake shoes or Johnson brake shoes relined by the brake manufacturer.

CAUTION

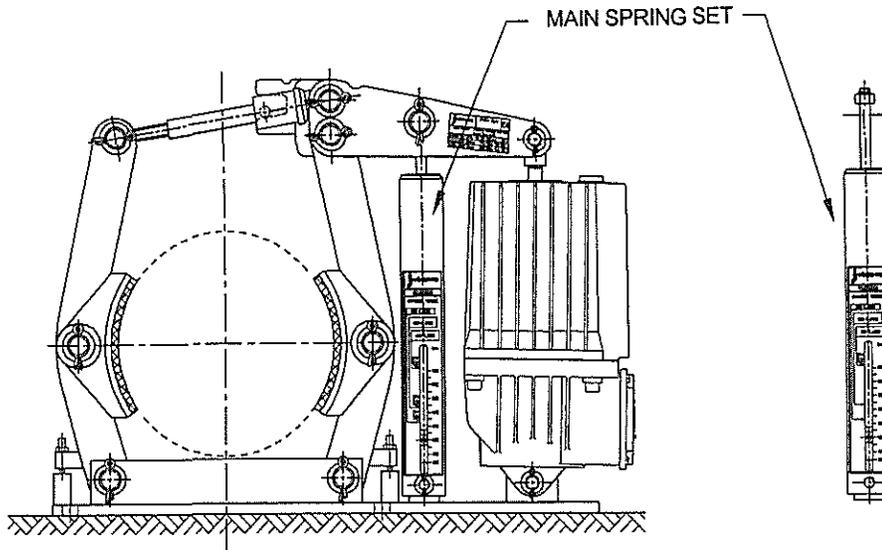
New brake shoes or linings must be properly bedded to develop rated torque.

04.02 - REPLACEMENT OF THE MAIN SPRING SET

The purpose of the main spring set is to provide the force on the shoes that produces the braking torque. Replacement of these springs is suggested only in the event that it is damaged or insufficient for any reason. Consultation with Johnson Industries is strongly recommended for these cases.

Whatever the reason for replacement, the entire main spring set must be replaced, that is to say that it must be replaced as an assembly with a new original spring set supplied already assembled and complete of every component.

Incorrect assembling or replacement would create a malfunctioning of the main spring which could prevent the brake from applying.



DRG 21 REPLACEMENT OF MAIN SPRING SET

04.03 - EJ THRUSTOR OIL CHANGE

The thruster oil must be changed every 1000 hours of operation or every 12 months, whichever comes first.

After unscrewing the thrusters' upper cap it is necessary to completely empty the oil from the thruster itself and to flush it using the same type of oil used for refilling. At least three flushings must be carried out : the first one with 60% of the quantity specified for filling, the second and third with 30%.

Do not to use the same oil used for flushing for the final filling, or even that used for the first filling for the second and third flushing unless the oil is filtered properly after every flushing.

The type of oil finally used needs not necessarily to be the same as that used for the previous filling; however, it must have the same technical characteristics.

All Johnson EJ thrusters are delivered with ESSO (EXXON) Invarol EP .22 oil



Oil must be poured always in the upper hole of the thrustor.

Due to the air bubble that forms in the lower parts, it is necessary to carry out filling in at least three phases, pouring in the quantity of oil indicated in the table below.

After pouring in the quantity show for the first phase, tighten the cap with a low torque, turn the thrustor upside down and in that position, pull out the piston by hand and push it back in again at least three times.

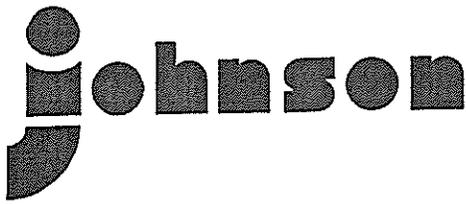
Slowly bring the thrustor back into a vertical position, then proceed with the second filling (2nd phase), once again turning the thrustor upside down as in the first phase, then complete the filling (3rd phase) again turning the thrustor upside down.

Once filling has been completed, the oil level, measured from the cap's support plane, must be equal to the value indicated in the table in the 'level' column.

Remember that if the level is too low, it may mean that the thrustor cannot operate properly if installed in horizontal position.

The cap must be tightened with a tightening torque of 25 Nm.

EJ THRUSTOR	1 ST Phase Litres	2 ND Phase Litres	3 RD Phase Litres	Total ± 3% Litres	Level mm
EJ 023/05	1.500	0.150	0.100	1.750	17
EJ 030/05	2.000	0.500	0.200	2.700	20
EJ 050/06 & 080/06	4.400	0.550	0.200	5.150	22
EJ 050/12 & 080/12	6.700	0.600	0.200	7.500	23
EJ 121/06 & 201/06	6.900	0.700	0.200	7.800	28
EJ 301/06	6.900	0.700	0.200	7.800	27
EJ 121/12 & 201/12	6.800	0.700	0.200	7.700	28
EJ 301/12	6.800	0.700	0.200	7.700	27



When the thruster is fitted with optional internal spring (IS) and/or with optional lifting and lowering valves (LI-LO), the volumes of oil must be reduced depending on the volume of the relative optional items.

The following table shows the quantities of oil that must be subtracted from those indicated above, bearing in mind that the reduction must be made on the quantities of the 1st phase and on the total quantities :

Thruster	Internal Springs (IS) litres	Lifting And Lowering Valves (LI-LO) litres
EJ 023	0.025	0.080
EJ 030	0.045	0.085
EJ 050	0.100	0.160
EJ 080	0.190	0.160
EJ 121	0.250	0.220
EJ201	0.400	0.220
EJ301	0.650	0.220

Calculating the above quantities is the responsibility of the user, but it is an extremely simple matter.

04.04 - OPENING AND CLOSING THRUSTOR

The thruster is basically a maintenance free product.

The only required maintenance is the periodical oil change described in section 04.03 of this manual.

Thrusters must never be disassembled for normal maintenance if they are not malfunctioning. If the thruster is malfunctioning it is suggested to consult the manufacturer for any operation.

In case the thruster had been disassembled for any reason it is absolutely necessary to follow the instructions below for closing the thruster itself, ie for joining the lower motor housing to the upper reservoir.



Before joining the motor housing to the reservoir it is necessary that the contact surfaces of the two components are perfectly clean.

Thus it is necessary to check the gap between the two components, joining them without gasket 36, using screws 69 and tightening them with a tightening torque of 5NM.

The correct gap is between 0.5 and 0.75 mm. A gap larger than 0.75 mm would mean a risk of not ensuring an appropriate pressure on gasket 36 once it has been inserted while a gap smaller than 0.55 mm would result in deforming the internal parts during final tightening. Once this check has been completed, the two components must be separated, prior to final assembly.

Put a band of liquid gasketing to each of the two contact surfaces. The width of the band of gasketing applied must be about 3 - 4 mm. Distribute the gasketing uniformly on both surfaces, making sure that the four holes are surrounded by gasketing. There is no point in applying gasketing to surfaces that are not going to be in contact with gasket 36.

Insert the two plugs 83 in the holes provided in the tank, then to position seals 36 and insert them on the plugs. This operation must be carried out with great care, to prevent the gasket from breaking, as it is quite fragile.

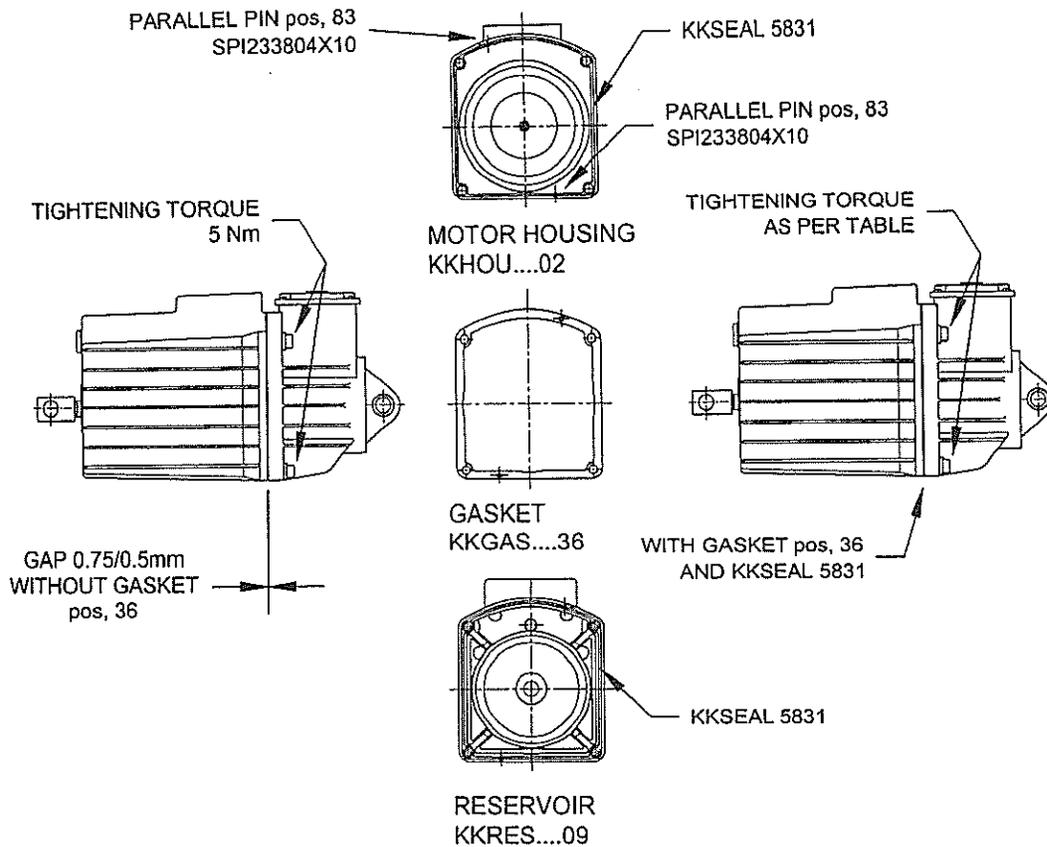
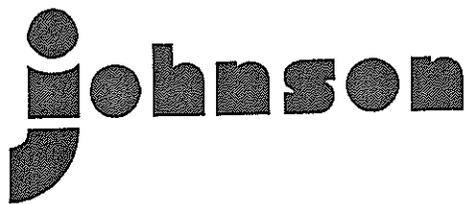
Join the tank and the motor housing , taking care that the two plugs are adequately inserted in the holes of the component concerned.

Insert the four screws 69 after having applied three drops of thread locking to the initial threaded part, and then tighten them without completely joining the two parts.

Tighten the screws in three phases in accordance with the torque values listed below.

Thruster	1 st Phase	2 nd Phase	3 rd Phase
EJ 023 & 030	Screws 1,3,2,4 10Nm	Screws 4,2,3,1 17Nm	Screws 2,4,1,3 25Nm
EJ 050 & 080	Screws 1,3,2,4 12Nm	Screws 4,2,3,1 20Nm	Screws 2,4,1,3 30Nm
EJ 121, 201 & 301	Screws 1,3,2,4 20Nm	Screws 4,2,3,1 35Nm	Screws 2,4,1,3 50Nm

75 minutes after the completion of the above operation, the thruster can be filled, in accordance with the procedures described in section 04.03 of this manual.



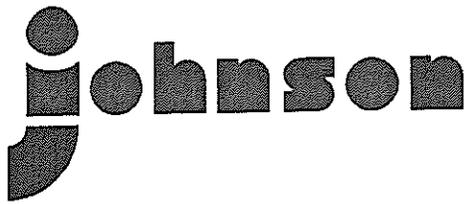
04.05 - REPLACEMENT OF THRUSTOR

Should the thruster need replacing, isolate the power supply and disconnect the cable. Take note of the braking torque the brake has been set to reset the brake to the same value after replacing the thruster.

To remove the thruster the first step is to back off the torque setting to minimum. This is done by temporarily removing the spring pin at the top of the main spring and to rotate the adjusting nut counter clockwise until the torque index on the main spring reaches the minimum value of braking torque indicated.

It is necessary to keep the spring pin because once the braking torque is adjusted it is used to retain the spring setting.

With the spring tension removed it is possible to remove the four cotter pins of the upper and lower thruster pins and to remove the two thruster pins. With the thruster pins



removed the thrustor is free from the brake.

Once the thrustor has been replaced with a new one of the same model, it is necessary to return the brake to its original condition by reversing the above steps.

04.06 - LUBRICATION OF PINS WITH LUBRICATOR (GR)

The brakes with optional lubricated pins (GR) can have the main pivot pins periodically lubricated by injection of grease ESSO (EXXON) Beacon 2 with a proper grease gun for use Tecalemit UNI 7662 type grease fittings.

04.07 - MAINTENANCE NOT PROVIDED FOR IN THIS MANUAL

For any maintenance intervention not provided for in this manual the user is invited to consult the manufacturer or the Dealer to ask for the necessary information and instructions.

05 - SUGGESTED SPARE PARTS FOR THE NEW SHOE BRAKES

As already written in section 04 of this manual, for proper maintenance of the new shoe brakes, it is suggested to have the genuine spare parts listed in this section.

For each brake it is suggested to keep in stock the following genuine spare parts in the below mentioned minimum quantities :

- four 'RF2' brake shoes for 'CD' brakes OR
- four 'RF4' brake shoes for 'CL' brakes
- one 'TIR' upper tie-rod for 'N' brakes OR
- one 'RIP' upper tie-rod for 'NV' brakes
- one 'SPR' main spring set

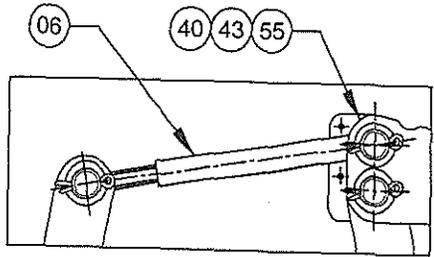
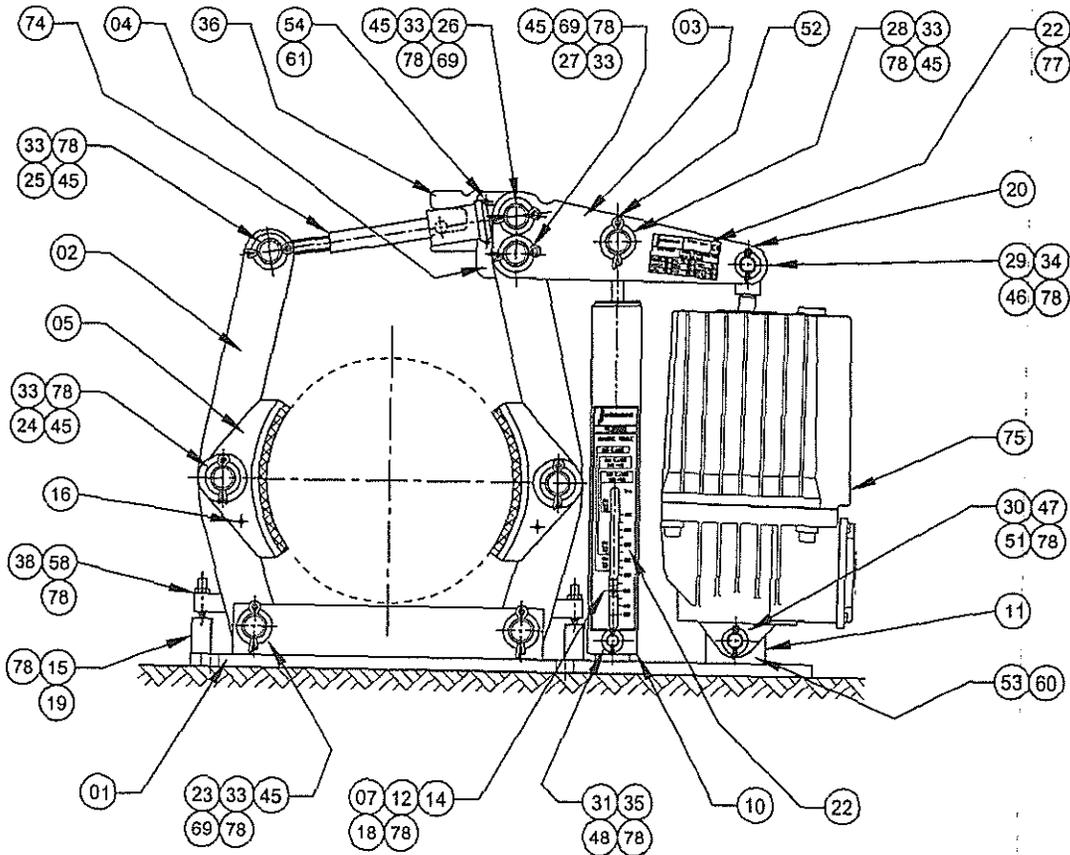
It is suggested to order the spare parts together with the brake in order not to be out of stock when they are necessary.

The availability of the above mentioned strategic spare parts will protect the User from any unforeseen event.

Even if the above mentioned spare parts are normally available, prompt delivery is not assured.

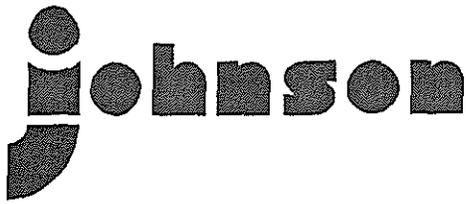
06 - LIST OF COMPONENTS OF THE NEW SHOE BRAKES

Below is a numbered list of the main components of the new shoe brake so that any necessary components can be easily identified.



* = VALID ONLY FOR "N" BRAKES

DRG 24 BRAKE ASSEMBLY



Note that items 6, 40, 43, 54 and 55 are only valid for the 'N' model brake and that items 7, 36, 61 and 74 are only valid for the brake models designated by 'NV'.

07 - ENCLOSED DOCUMENTS

The following documents are the certified print and the bill of materials for the specific brake supplied. The parts list refers to the assembly drawing no. 24 by way of item numbers.

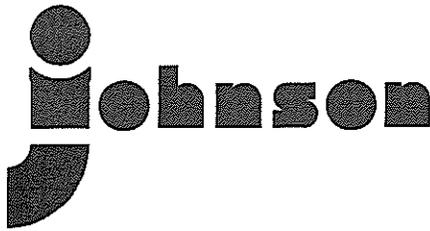
Johnson industries Ltd

108 Skyway Ave Toronto ON Canada M9W 4Y9
 Phone: 416 213 9991 Fax: 416 213 9992
 johnson@jbrakes.com http://www.jbrakes.com

DEALER MANUFACTURES SERVICE MAINTENANCE GUIDE FOR SMLB/JDL THRUSTER DRUM BRAKES

No.	SCHEDULE	DAILY	WEEKLY	MONTHLY	ANNUALLY
1	Visually inspect all parts for gross malfunction or damage	✓			
2	Inspect Shoe Linings for permissible wear		✓		
3	Verify proper supply voltages to switches and thrusters			✓	
4	Inspect Thruster Amperage Draw			✓	
5	Inspect Thruster for Oil Leakage			✓	
6	Check Thruster Oil Level			✓	
7	Change Thruster Oil				✓
8	Visually inspect torque spring and torque setting		✓		
9	Visually inspect brake pins secured with cotters & washers				✓
10	Visually inspect for paint chips				✓
11	Visually inspect corrosion on steel components				✓
12	Tighten Base Bolts				✓
13	Check for missing hardware or components				✓
OPTIONAL ITEMS INSTALLED					
14	Test Function of Switches (Release/Wear/Set/Hand)			✓	
15	Test Function of Hand Release			✓	
16	Test Function of Thruster Lowering Valve			✓	
17	Test Function of Thruster Lifting Valve			✓	
	Check Grease Fittings			✓	
19	Re-grease Lubricated Pins				✓

NOTE: The above schedule is recommended for typical brake usage.
 Extreme usage or conditions need shorter inspection intervals.



JN 619101 - JDL250 BRAKE PARTS LIST

POS	ITEM	PART NO.	POS	ITEM	PART NO.
01	BASE (1X)	JDLDSB250EJ023	35	SPECIAL WASHER (2X)	JDL250W4
02	MAIN LEVER (2X)	JDLML250	36	FORK (1X)	JDL250FRK
03	UPPER LEVER (2X)	JDLL250	38	NUT (2X)	JDL250NT1
04	UPPER LEVER NV (1X)	JDLML250	40	NUT (1X)	JDL250NT2
05	BRAKE SHOE (2X)	JDAS250N3904	43	DISC SPRING (12X)	JDL250DSP
06	TIE ROD (1X)	JDL250TR	45	SPLIT PIN (16X)	JDL250SPN1
07	TIE ROD (1X)	JDL250TRNV	46	SPLIT PIN (2X)	JDL250SPN2
10	SPRING FENDER (1X)	JDL250SF	47	SPLIT PIN (2X)	JDL250SPN3
11	HINGE (1X)	JDL250H	48	SPLIT PIN (2X)	JDL250SPN4
12	BOTTOM (1X)	JDL250BTM	51	SPECIAL WASHER (4X)	JDL250W5
14	MAIN SPRING (1X)	JDLMS250	52	ROLL PIN (1X)	JDL250RP2
15	BIAS SPRING (2X)	JDL250BS	53	LOCTITE (1.5ML)	LOCTITE
16	SHOE HOLDER SPRING (2X)	JDL250SHS	54	SPRING WASHER (2X)	JDL250SW
18	ROLL PIN (2X)	JDL250RP1	55	ROLL PIN (1X)	JDL250RP3
19	DISC (2X)	JDL250D	58	SCREW (2X)	JDL250S1
20	WASHER (X)	JDL250W1	60	SCREW (2X)	JDL250S2
21	DATA PLATE FOR SHOE BRAKES (1X)	JDL-DP	61	SCREW (2X)	JDL250S3
22	BRAKING TORQUE (1X)	JDL-BTQ10	69	SELF LUB. BUSHING (8X)	JDL250SLB1
23	BASE PIN (2X)	JDLP250-SS-BP	70	SELF LUB. BUSHING (2X)	JDL250SLB2
24	SHOE PIN (2X)	JDLP250-SS-SP	74	AUTOMATIC WEAR ADJUSTMENT DEVICE (1X)	JDL250
25	TRUNNION PIN (1X)	JDLP250-SS-TP	75	EJ023/5 THRUSTOR (1X)	EJ02306046060
26	S/A TRUNNION (1X)	JDLP250-SS-ST	77	BOSTIK	_____
27	LEVER PIN (1X)	JDLP250-SS-LP	78	GREASE	_____
28	TOP SPRING PIN (1X)	JDLP250-SS-SPT	OPTIONAL ITEMS (see relevant sections)		
29	THRUSTOR TOP PIN (1X)	JDLP250-SS-TPT	80	BRAKE OPEN SWITCH "FIA" (1X)	JDLW250LS X
30	THRUSTOR BOTTOM PIN (1X)	JDLP250-SS-TPB	81	LINING WEAR SWITCH "FIC" (1X)	JDLW250RW
31	BOTTOM SPRING PIN (1X)	JDLP250-SS-SPE	82	MANUAL OPENING "HAN" (1X)	JDLH250LK
33	SPECIAL WASHER (18X)	JDL250W2	83	SUPPORTING SPHERES FOR VERTICAL BRAKE AXIS "ORZ" (1X)	JDLO250VS
34	SPECIAL WASHER (2X)	JDL250W3	84	SPECIAL	X

