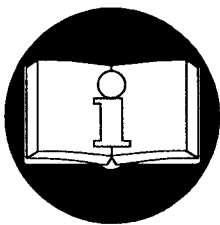


**PARTS AND MAINTENANCE MANUAL**  
for  
**LIFTSTAR AIR WINCHES**  
**LS1500R SERIES**



**READ THIS MANUAL BEFORE USING THESE PRODUCTS.** This manual contains important maintenance information. Make this manual available to all persons responsible for the maintenance of these products.

**⚠ WARNING**

**Do not use this hoist for lifting, supporting, or transporting people or lifting or supporting loads over people.**

**Always operate, inspect and maintain this hoist in accordance with European Security Rules and any other applicable safety codes and regulations.**

**Refer all communications to the nearest Ingersoll-Rand/SAMI/A Material Handling Office or Distributor.**

# CONTENTS

<b>Safety Information</b>	
Danger, Warning, Caution and Notice	3
Safety Summary	3
Safe Operating Instructions	4
Warning Label	4
<b>Specifications</b>	
Performance Graph	5
How to Order	5
<b>Description</b>	
Description of Operation	6
<b>Installation</b>	
Mounting	6
Wire Rope	6
Air Supply	7
Motor	7
Initial Operating Checks	8
<b>Operation</b>	
Winch Control	9
<b>Lubrication</b>	
Wire Rope	9
Reduction Gear Assembly	9
Drum Bushings	9
Seals and Bearings	9
<b>Inspection</b>	
Records and Reports	9
Frequent Inspection	9
Periodic Inspection	10
Winches not in Regular Use	10
<b>Troubleshooting</b>	
Troubleshooting Chart	11
<b>Maintenance</b>	
Maintenance Intervals	12
General Disassembly	13
Disassembly Instructions	13
Winch Disassembly	13
Lever Control Valve disassembly	14
Air Control Valve disassembly - Optional Europ Version	14
Air Gear Motor disassembly	14
Pendant Control disassembly	14
Pendant Control emergency stop disassembly	14
Shut-off valve disassembly	15
Emergency stop valve disassembly	15
Cleaning, Inspection and Repair	15
Assembly Instructions	15
Winch Assembly	15
Lever Control Assembly	16
Air Gear Motor Assembly	17
Pendant Control Assembly	17
Pendant Control with emergency stop Assembly	17
Pendant Control Adjustment	17
Accessories	18
Testing	18
<b>Parts</b>	
Winch Assembly Drawing	20
Winch Assembly Parts List	21
Air Gear Motor Assembly Drawing	22
Air Gear Motor Assembly Parts List	23
Lever Control Valve Assembly and Parts List	24
Control Valve Assembly Drawing and Parts List	25
Control Valve Assembly Drawing and Parts List	26
PHS2 Remote Control Assembly Drawing and Parts List	27
PHS2U Remote Control with Emergency Stop Assembly Drawing and Parts List	28
Shut-off Valve Assembly Drawing and Parts List	29
Emergency Stop Valve Assembly Drawing and Parts List	30
Torque Limitor Assembly Drawing and Parts List	31
Drum Guard Assembly and Parts List	32
<b>Parts Ordering Information</b>	
Warranty	33
Office Location	34

## SAFETY INFORMATION

This manual provides important information for all personnel involved with the safe installation, operation and proper maintenance of this product. Even if you feel you are familiar with this or similar equipment, you should read and understand this manual before operating the product.

### Danger, Warning, Caution and Notice

Throughout this manual there are steps and procedures which, if not followed, may result in injury. The following signal words are used to identify the level of potential hazard.

#### DANGER

presence of a hazard which *will* cause *severe* injury, death, or substantial property damage if the warning is ignored.

#### WARNING

presence of a hazard which *can* cause *severe* injury, death, or substantial property damage if the warning is ignored.

#### CAUTION

presence of a hazard which *will* or *can* cause *minor* injury or property damage if the warning is ignored.

#### NOTICE

Notice is used to notify people of installation, operation, or maintenance information which is important but not hazard-related.

### Safety Summary

#### WARNING

- Do not use this winch for lifting, supporting, or transporting people or supporting loads over people.
- The supporting structures and load-attaching devices used in conjunction with this winch must provide an adequate safety factor to handle the rated load, plus the weight of the winch and attached equipment. This is the customer's responsibility. If in doubt, consult a qualified registered engineer.

The National Safety Council, Accident Prevention Manual for Industrial Operations, Eighth Edition and other recognized safety sources make a common point.

Employees who work near cranes or assist in hooking on or arranging a load should be instructed to keep out from under the load. From a safety standpoint, one factor is paramount: conduct all lifting operations in such a manner that if there were an equipment failure, no personnel would be injured. This means keep out from under a raised load and keep out of the line of force of any load.

INGERSOLL-RAND Material Handling winches are manufactured in accordance with the latest ASME B30.7 standards.

The Occupational Safety and Health Act of 1970, generally places the burden of compliance with the owner/employer, not the manufacturer. Many OSHA requirements are not concerned or connected with the manufactured product but are, rather, connected with the final installation. It is the owner's responsibility and user's responsibility to determine the suitability of a product for any particular use. It is recommended that all applicable industry, trade association, federal, state and local regulations be checked. Read all operating instructions and warnings before operation.

**Rigging** : It is the responsibility of the operator to exercise caution, use common sense and be familiar with proper rigging techniques. See ASME B30.9 for rigging information, American National Standards Institute, 1430 Broadway, New York, NY 10018.

#### NOTICE

- Using other than genuine INGENSOLL-RAND Material Handling parts will void the warranty.

## SAFE OPERATING INSTRUCTIONS

The following warnings and operating instructions have been adapted in part from American National (Safety) Standard ANSI B30.7 and are intended to avoid unsafe operating practices which might lead to injury or property damage.


INGERSOLL-RAND recognizes that most companies who use winches have a safety program in force in their plants. In the event that some conflict exists between a rule set forth in this publication and a similar rule already set by an individual company, the more stringent of the two should take precedence.

Safe Operating Instructions are provided to make an operator aware of dangerous practices to avoid and are not necessarily limited to the following list. Refer to specific sections in the manual for additional safety information.

1. Only allow personnel trained in safety and operation to operate and maintain a winch.
2. Only operate a winch if you are physically fit to do so.
3. When a "DO NOT OPERATE" sign is placed on the winch, do not operate the winch until the sign has been removed by designated personnel.
4. Before each shift, check the winch for wear or damage.
5. Never lift a load greater than the rated capacity of the winch. See warning labels attached to winch.
6. Keep hands, clothing, etc., clear of moving parts.
7. Never place your hand in the throat area of a hook or in the vicinity of the wire rope as it spools onto the drum.
8. Always rig loads properly and carefully.
9. Be certain the load is properly seated in the saddle of the hook. Do not tiplod the hook as this leads to spreading and eventual failure of the hook.
10. Do not "side pull" or "yard".
11. Make sure everyone is clear of the load path. Do not lift a load over people.
12. Never use the winch for lifting or lowering people and never allow anyone to stand on a suspended load.
13. Ease the slack out of the wire rope when starting a lift. Do not jerk the load.
14. Do not swing a suspended load.
15. Never suspend a load for an extended period of time.
16. Never leave a suspended load unattended.
17. Pay attention to the load at all times when operating the winch.
18. After use, properly secure winch and all loads.
19. The operator must maintain an unobstructed view of the load at all times.
20. Never use the winch wire rope as a sling.

## WARNING LABEL

Each winch is supplied from the factory with the warning tag shown. If the tag is not attached to your unit, order a new tag and install it. See the parts list for the part number. Read and obey all warnings and other safety information attached to this winch. Tag may not be shown actual size.

 **WARNING**

**Failure to follow these warnings may result in death, severe injury or property damage:**

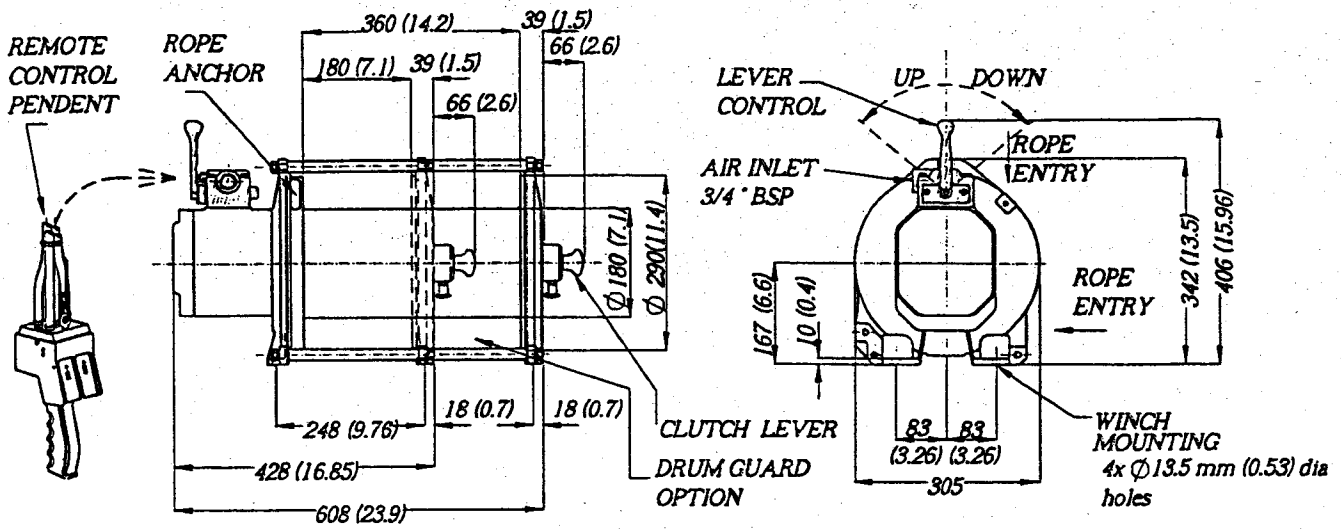
- Do not operate this winch before reading operation and maintenance manual.
- Do not lift people or loads over people.
- Do not lift more than rated loads.
- Do not allow less than three wraps of wire rope to remain on drum at all times.
- Do not operate a damaged or malfunctioning winch.
- Do not remove or obscure warning labels.

Read the latest edition of ASME B30.7. Comply with other federal, state and local rules.

P/N: 71060529/8  
for winches

**INGERSOLL-RAND**  
MATERIAL HANDLING

# SPECIFICATIONS

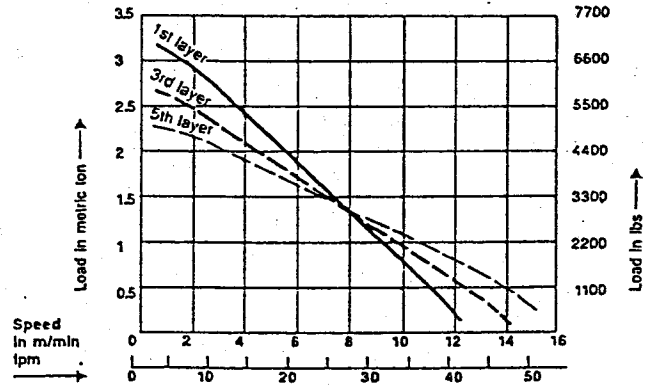


--- SHORT DRUM MODEL

(Dwg. D6310029 A)

- Air Pressure : 90 psig (6.3 bar)
- Air Flow : 124 scfm (3.5 cu.m/min)
- Drum Size :
  - Barrel dia. 7-3/32 in. (180 mm)
  - Flange dia. 11-13/32 in. (290 mm)
  - Length Between Flanges : 14-3/16 in. (360 mm)
- Long drum model
  - Length Between Flanges : 7-1/16 in. (180 mm)
- Short drum model
- Drum Wire Rope Storage Capacity :
  - 3/8 in. (10 mm) wire rope : 398 ft. (121 m)
  - Long drum model
  - 3/8 in. (10 mm) wire rope : 191 ft. (58 m)
  - Short drum model
- Line Pull Hoisting :
  - Maximum full drum line pull 3,300 lbs (1500 kg)
  - (5:1 safety factor)
- Line Pull Pulling :
  - Maximum pulling capacity at 1st layer 5,250 lbs (2400 kg)
  - (3.5:1 safety factor)
- Line Speed :
  - Maximum speed with no load 49 fpm (15 m/min)
  - with 3,300lbs (1500 kg)-23 fpm (7 m/min) at 3rd layer.
  - with 5,250lbs (2400 kg)-13 fpm (4 m/min) at 1st layer.
- Winch Weight :
  - Without wire rope 155 lbs (70.5 kg) : Long drum model
  - Without wire rope 132 lbs (60 kg) : Short drum model

Performance at 90 psi - 1/4 in. wire rope



(Dwg. D6310014)

# HOW TO ORDER

**Example :** FG 1500L-PH4M-CN

3300 lbs capacity, with 4 m of control pendent, and drum guard.

Séries	Ratings	Drum	Control	Pendent Hose Length	Clutch	Option
FG	1500	L	PH	4M	CN	GP

FG	L = Long drum No letter = Short drum	No letter = Lever throttle on winch X M = Specify length PH = Remote control pendent handle (aluminium) PHR = Brass pendent handle	2M = 2 meters (sid.) in meters	fitted	CN = Clutch as standard	G = Drum Guard P = Marine paint Z = Sand blast, and primer
	1500=1500 kg					

## DESCRIPTION

The FG 1500/CN is an air powered planetary winch designed for lifting applications. The winch utilizes a multi-disc brake which is automatically applied if there is a lack of air pressure. The output from the externally mounted air gear motor is transmitted through a first stage reduction gear and shaft to the planetary reduction. The planetary reduction drives a ring gear which is

connected to the wire rope drum through the output shaft. The brake is spring applied and released by pilot air pressure when the winch is operated. In the event of a loss of air pressure the brake automatically applies. The FG 1500/-CN is equipped with a manually operated free wheel clutch. The free wheel clutch permits unloaded wire rope to be pulled from the drum by hand.

## INSTALLATION

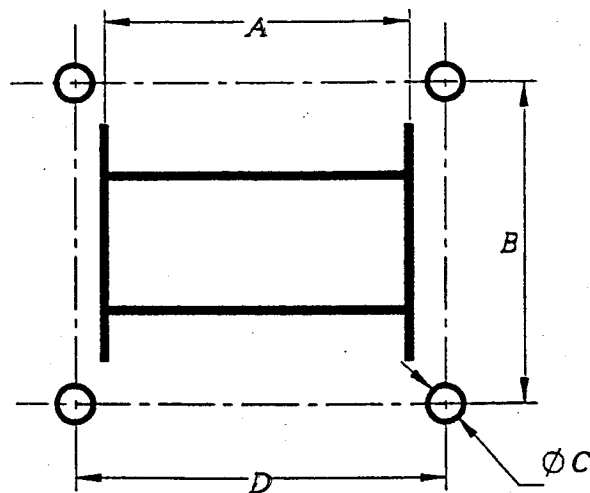
Prior to installing the winch, carefully inspect it for possible shipping damage.

### ⚠ CAUTION

- Owners and users are advised to examine specific, local or other regulations, including American National Standards Institute and/or OSHA Regulations which may apply to a particular type of use of this product before installing or putting winch to use.

### Mounting

1. If winch is to be mounted in one position be sure the mounting surface is even and of sufficient strength to handle the rated load and prevent possible binding of the winch.
2. Make sure the mounting surface is flat to within 1/32 inch (0.8 mm). Shim if necessary.
3. Mounting bolts must be 1/2 in. (10 mm) diameter, Grade 8 or better. Use self-locking nuts or nuts with lockwashers.
4. Tighten mounting bolts evenly and torque to 30 lb.ft. (40N-m) dry. If the fasteners are plated, lubricated or a thread locking is used torque to 23 lb.ft. (31N-m).



(Dwg. D6310019)

5. Maintain a fleet angle between the sheave and winch of no more than 1-1/2 degrees. For every inch of drum length, the lead sheave must be at least 1.6 feet (0.5 m) from the drum.
6. Do not weld to any part of the winch.

### Bolt Hole Dimensions

	with long drum	with short drum
"A"	14-3/16 in. (360 mm)	7-1/16 in. (180 mm)
"B"	6-17/32 in. (166 mm)	6-17/32 in. (166 mm)
"C"	17/32 in. (13.5 mm)	17/32 in. (13.5 mm)
"D"	16.85 in. (428 mm)	9.76 in. (248 mm)

### Wire rope

### ⚠ CAUTION

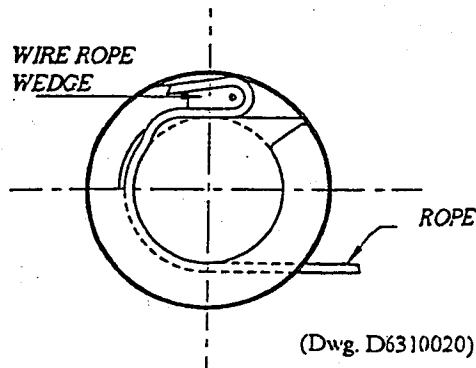
- Maintain at least 3 wraps of wire rope on the drum at all times.
- Install the wire rope to come off the drum in an underwind position as indicated on the direction of rotation tag.

### Wire Rope Selection

Consult a reputable wire rope manufacturer or distributor for assistance in selecting the appropriate type and size of wire rope and, where necessary, a protective coating. Use a wire rope which provides an adequate safety factor to handle the actual working load and meets all applicable industry, trade association, state and local regulations. When considering wire rope requirements the actual working load must include not only the static or dead load but also loads resulting from acceleration, retardation and shock load. Consideration must also be given to the size of the winch wire rope drum, sheaves and method of reeving. Wire rope diameter for lifting or lowering 3/8 in. (10mm). Maximum wire rope diameter is limited by the wire rope anchor.

### Installing Wire Rope

1. Cut wire rope to length in accordance with the wire rope manufacturer's instructions.
2. Feed the end of the wire rope into the smaller anchor hole in the wire rope drum and pull through approximately one foot (0.3 m) of wire rope.
3. Tuck the end of the wire rope back into the wire rope anchor pocket forming a loop in the wire rope.
4. Insert the wire rope anchor and pull the wire rope through the slot tightening the wire rope around the wire rope anchor.



(Dwg. D6310020)

- Make sure the first wrap of wire rope is flush against the drum flange.
5. Pull the wire rope anchor into position in the drum anchor pocket.

#### Wire Rope Spooling

To compensate for uneven spooling and decrease in line pull capacity as the drum fills up, use as short a wire rope as practical. To rewind wire rope apply tension to eliminate slack. This helps achieve level winding and tight spooling.

#### Safe Wire Rope Handling Procedures

1. Always use gloves when handling wire rope.
2. Never use wire rope which is frayed or kinked.
3. Never use wire rope as a sling.
4. Always ensure wire rope is correctly spooled and first layer is tight.

#### Rigging

Make sure all wire rope blocks, tackle and fastenings have sufficient safety margin to handle the required load. Do not allow wire rope to contact sharp edges or make sharp bends which will cause damage to wire rope, use a sheave. Refer to wire rope manufacturer's handbook for proper sizing, use and care of wire rope.

#### Safe Installation Procedures

1. Do not use wire rope as a ground for welding.
2. Do not attach a welding electrode to winch or wire rope.
3. Never run the wire rope over a sharp edge. Use a correctly sized sheave.
4. When a lead sheave is used, it must be aligned with the center of the drum. The diameter of the lead sheave must be at least 18 times the diameter of the wire rope.
5. Always maintain at least three full wraps of wire rope on the drum.

#### Air supply

The air supply must be clean and free from moisture.

#### Air Lines

The inside diameter of the winch air supply lines should not have be smaller than 3/4 in. (19 mm) for flexible lines and 5/8 in. (17 mm) for connectors. Before making final connections, all air supply lines should be purged before connecting to system inlet.

Supply lines should be as short and straight as installation conditions will permit. Long transmission lines and excessive use of fittings, elbows, tees, globe valves, etc, cause a reduction in pressure due to restrictions and surface friction in the lines.

#### Air Line lubricator

Always use an line lubricator with these motors. Use a lubricator having an inlet and outlet at least as large as the inlet on the motor. Install the lubricator in the air line just ahead of the motor.

### NOTICE

- Lubricator should be located no more than 10 ft. (3m) from the motor.

The air line lubricator should be replenished daily and set to provide 2 to 3 drops per minute of SAE 30W oil (minimum viscosity 135 Cst at 104° F (40°C)). Winches are delivered with the gear box filled with oil.

#### Motor

For optimum performance and maximum durability of parts, operate air motor at 90 psi at 70 scfm (6.3 bar/630 kpa at 3.5 cu.m/min) air pressure and volume. The winch should be installed as near as possible to the compressor or air receiver.

#### Initial Operating Checks

Winches are tested for proper operation prior to leaving the factory. Before the winch is placed into service the following initial operating checks should be performed.

1. When first running the motor some light oil should be injected into the inlet connection to allow good lubrication.
2. When first operation the winch it is recommended that the motor be driven slowly in both directions for a few minutes.

For winches that have been in storage for a period of more than one month the following start-up procedure is recommended.

1. Pour a small amount of gasoline fluid in the motor inlet port.
2. Operate the motor for 10 seconds to flush out any impurities.
3. Pour small amount of oil in the motor air inlet port.
4. Operate the motor for an additional 2 to 3 seconds. The winch is now ready to work.

## OPERATION

The four most important aspects of winch operation are :

1. Follow all safety instructions when operating the winch.
2. Allow only people trained in safety and the operation of this winch to operate the winch.
3. Subject each winch to a regular inspection and maintenance procedure.
4. Be aware of the winch capacity and weight of load at all times.

### WARNING

- The FG 1500/CN Winch is not designed or suitable for lifting, lowering or moving persons. Never lift loads over people.

#### Winch Control

The winch spring loaded manual control throttle is mounted to the air motor.

When viewed from the air motor end move the control throttle handle to the right (clockwise) to pay out wire rope. When viewed from the air motor end move the control throttle handle to the left (counterclockwise) to haul in wire rope. To ensure smooth operation of the winch sudden movements of control valve should be avoided.

#### Remote Pilot Pendant Throttle (optional)

The pendant control throttle is equipped with two separate levers for winch operation. Pilot pressure from the pendant throttle activates the winch control valve. Direction of drum rotation is controlled by whichever lever is depressed.

### CAUTION

- To avoid damage to the rigging, the structure supporting the rigging and the winch, do not "two-block" the end of the wire rope.

#### Free Wheel Clutch

To disengage the free wheel clutch pull out the spring loaded plunger until it clears the groove in the handle shaft. Maintain a hold on the plunger knob and pull out the free wheel clutch handle. Release the spring loaded plunger so it locks back into the shaft groove. Gently pull and push on the free wheel clutch handle to check plunger is engaged.

### WARNING

- Never disengage clutch with a load on the wire rope.
- Winch controls must be in the neutral position before operating the free wheel clutch.

To engage the free wheel clutch pull out the spring loaded plunger until it clears the groove in the handle shaft. Maintain a hold on the plunger knob and push in the free wheel clutch handle. Release the spring loaded plunger so it locks back into the shaft groove. Gently pull and push on the free wheel clutch handle to check plunger is engaged. It may be necessary to rotate the drum slowly by hand to allow the clutch drive shaft to engage.



## LUBRICATION

### Wire Rope

Refer the wire rope manufacturer's recommendations. At a minimum observe the following :

1. Clean with a brush or steam if there is dirt, rock dust or other foreign material on the surface of the wire rope.

### CAUTION

- Do not use an acid-based solvent or other cleaning fluid.
2. Apply a wire rope lubricant or SAE 30W oil.
  3. Brush, drip or spray lubricant weekly, or more frequently, depending on severity of service.

### Reduction Gear Assembly

Winches are delivered with the gear box filled with oil. Replace the oil in the reduction housing at least once every year. If the winch is used at a normal frequency, the oil in the reduction housing is suitable for one years operation without changing. However, when the winch is used at a high frequency, the oil may need to be changed on a more frequent basis.

To ensure correct performance, highest efficiency and long life, it is essential that the lubricating oil be maintained at the correct level. The recommended grade of oil must be used at all times since the use of unsuitable oil may result in excessive temperature rise, loss of efficiency and possible damage of the gears.

The reduction gear assembly is filled and shipped with SAE 80W90 oil having a kinematic viscosity of 145 mm<sup>2</sup>/s at 40°C (104°F) from the factory. Use only high quality lubricants in the reduction gear assembly such as high grade EP type oil or the equivalent. Fill the reduction gear assembly until the oil is level with the working rim. Oil capacity : 0.13 gall (0.5 Ltrs)

Below 32°F (0°C) SAE 50W EP4  
32° to 80°F (0° to 27°C) SAE 90 EP4  
Above 80°F (27°C) SAE 140 EP4

### Drum Bushings

Lubricate grease fittings monthly with 2 or 3 pumps of a grease gun. Rotate the drum slowly as grease is being applied. For temperatures -20° to 50°F (-29° to 10°C) use a multipurpose lithium-based EP1 grease. For temperatures 30° to 120°F (-1° to 49°C) use a multipurpose lithium-based EP2 grease.

### Seals and Bearings

If winch is disassembled, clean all parts thoroughly and coat bearings and seals with clean grease. Use sufficient grease to provide a good protective coat.

### Free Wheel Clutch

If winch is disassembled, apply a light coating of grease to the plunger and clutch handle shaft.

### Storage

For exchange winches or winches that will not be operated for extended periods pour a small amount oil into the motor inlet port or supply line. Operate the motor for 2 to 4 seconds to lubricate the motor parts then plug the air inlet port

## INSPECTION

There are two types of inspection, the frequent inspection performed by the operator while using the winch and periodic inspections performed by personnel trained in the operation and maintenance of this winch. Careful inspection on a regular basis will reveal potentially dangerous conditions while still in the early stages, allowing corrective action to be taken before the condition becomes dangerous.

Any deficiency revealed through inspection must be reported to an appointed person. A determination must be made as to whether a deficiency constitutes a safety hazard before resuming operation of the winch.

### Records and Reports

Some form of inspection record must be maintained for each winch, listing all points requiring periodic inspection. A written report should be made monthly on the condition of the critical parts of each winch. These reports should be dated, signed by the person who performed the inspection, and kept on file where they are readily available for review.

### Frequent Inspection

On a winch in continuous service, frequent inspection should be made at the beginning of each shift. In addition, visual inspections should be conducted during regular service for any damage or evidence of malfunction.

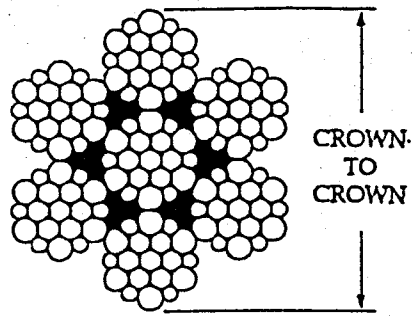
1. OPERATION. Check for visual or abnormal noises which could indicate a defect. Do not operate a winch unless the wire rope feeds onto the winch drum smoothly. If wire rope binds or jumps, clean and lubricate the wire rope. If problem persists, replace the wire rope. Do not operate the winch until all defects have been corrected.
2. AIR SYSTEM. Check air lines, valves and other components for leakage. Repair if necessary.
3. WIRE ROPE. Wire rope is a consumable item which must be replaced when worn. The following list is a guide to the accepted standards by which wire rope must be judged and is not presented as a substitute for an experienced inspector.
  - a. Damage, such as bird cages, kinking, core protrusion, crushing, heat damage, and main strand displacement.
  - b. Corrosion and nicking.
  - c. Wear of crown wires. Replace at 1/3 wear of any crown wire.
  - d. Broken wires or strands, particularly at connections. Replacement is necessary if one wire is broken at a connection ; six wires broken within one lay ; three wires broken in one strand within one lay.
  - e. Lubrication. Replace wire rope if any doubt exists as to wire rope serviceability.
4. WIRE ROPE REEVING. Check reeving and ensure wire rope is properly secured to the drum.
5. CONTROLS. See that controls function properly and control handle returns to neutral center when released.

## Periodic Inspection

According to ASME B30.7, frequency of periodic inspection depends on the severity of usage : NORMAL : yearly ; HEAVY : semi-annually ; SEVERE : quarterly. Disassembly may be required for HEAVY or SEVERE usage. Keep accumulative records of periodic inspections to provide a basis for continuing evaluation. Inspect all the items in a frequent inspection plus the following :

1. **FASTENERS.** Check, capscrew, nuts, pins and other fasteners on winch and air system. Replace if missing and tighten or secure if loose.
2. **ALL COMPONENTS.** Inspect for wear, damage, distortion, deformation and cleanliness. If external evidence indicates the need, disassemble. Check gears, shafts, bearings, springs and covers. Replace worn or damaged parts. Clean, lubricate and reassemble.
3. **DRUM AND SHEAVES.** Check for damage or excessive wear. Replace if necessary.
4. **BRAKE.** Perform functional load test on winch. Check ability of the brake to hold rated load.
5. **LABELS AND TAGS.** Check for presence and legibility. Replace if necessary.
6. **WIRE ROPE.** Besides the items in a frequent inspection, inspect for the following.
  - a. Build-up of dirt and corrosion. Clean if necessary.
  - b. Loose or damaged end connection. Replace if loose or damaged.
  - c. Check wire rope anchor is secure.
  - d. Changes in the size of the wire rope diameter. Periodically measure the diameter of the wire rope from crown-to-crown throughout the life of the wire rope. The actual diameter should be recorded when the wire rope is under equivalent loading and in the

same operating section. If the actual diameter of the wire rope has decreased more than 1/64 in. (0.4 mm) a thorough examination of the wire rope should be conducted by an experienced inspector to determine the suitability of the wire rope to remain in service. (ref. Dwg. D6310012)



(Dwg. D6310012)

7. **FOUNDATION.** Check for the continued ability to handle the imposed loads.

## Winches Not in Regular Use

A winch which has been idle for a period of one month or more, but less than six months, shall be given an inspection conforming with the requirements of "Frequent Inspection" before being placed into service.

A winch which has been idle for a period of over six months shall be given a complete inspection conforming with the requirements of "Periodic Inspection". Standby winches shall be inspected at least semi-annually in accordance with the requirements of "Frequent Inspection". If abnormal operating conditions apply, winches may require a more frequent inspection.

## TROUBLESHOOTING

This section provides the information necessary for troubleshooting this winch. The troubleshooting guide provides a general outline of problems which could be experienced with normal use of this winch. It lists the symptom, the possible cause, and the possible remedy for the trouble being experienced.

SYMPTOM	CAUSE	REMEDY
Winch will not operate.	No air supply to winch. Winch is overload.	Check connections and hoses in air supply line. Reduce load to within rated capacity.
Load continues to move when winch is stopped.	Brake is slipping. Winch is overloaded.	Check brake friction discs and springs. See "MAINTENANCE" section. Reduce load to within rated capacity.
Winch will not lift load or does not lift rated capacity.	Winch is overloaded. Motor may be damaged. Brake is not releasing. Insufficient air supply.	Reduce load to within rated capacity. Inspect motor. See "MAINTENANCE" section. Check brake release pilot hole is not restricted. Check seals on brake piston are not damaged. Check air supply pressure and volume.
Oil leaks from drum bushing area.	Reduction assembly is leaking.	Disassemble winch and inspect reduction assembly seals.
Low power.	Low air pressure at the inlet Worn or damaged motor gears. Improper lubrication or dirt building up in the motor. Winch binds during operation.	Check air pressure at the inlet while winch is running. Inspect motor. See "MAINTENANCE" section. Lubricate as instructed in "LUBRICATION" section. If this does not help, flush the motor as instructed in the "INSTALLATION" section. Check winch mounting surface is flat and does not distort during winch operation.
Motor does not operate smoothly.	Worn or broken rotor bearings.	Examine each bearing. Install new bearings as necessary.

## ⚠ WARNING

- Never perform maintenance on the winch while it is supporting a load.
- Before performing maintenance, tag controls:  
**DANGER - DO NOT OPERATE - EQUIPMENT BEING REPAIRED.**
- Only allow service personnel trained in safety and maintenance on this winch to perform maintenance.
- After performing any maintenance on the winch, test winch to 125% of its rated capacity before returning to service. Testing to more than 125% of rated capacity may be required to comply with standards outside the USA.
- Shut off air system and depressurize air lines before performing any maintenance.
- Do not use Trichloroethylene to clean parts.

### Maintenance Intervals

The Maintenance Interval chart is based on intermittent operation of the winch eight hours each day, five days per week. If winch operation exceeds eight hours per day, or use is under HEAVY or SEVERE conditions, more frequent maintenance should be performed. Refer to 'Periodic Inspection' in the "INSPECTION" section for interval guidance.

INTERVAL	MAINTENANCE
Start of each shift  (Operator or Maintenance Personnel)	Make a thorough visual inspection of the winch for damage. Do not operate the winch if damaged.
	Operate the winch at low RPM in both directions. Winch must operate smoothly without sticking, binding or abnormal noises. Check the operation of the brake.
Yearly  (Maintenance Personnel)	Inspect the brake disc. Clean or replace parts as required.
	Inspect the winch gearing, shafts and bearings for wear and damage. Repair or replace as necessary.
	Check all the supporting members, including the foundation, fasteners, nuts, sheaves and rigging, etc. for indications of damage or wear. Repair or replace as required.

### Motor Removal (Ref. Dwg. D6310041)

Use the following procedure to remove the motor.

1. Disconnect and tag the air lines.
2. Position several blocks of wood on the work bench and stand the winch in a vertical position with the motor end up. Make sure the weight of the winch does not rest on the free wheel handle (65) or cause damage to the free wheel parts
3. Remove the four capscrews (113) and lockwashers (114) which connect the air motor to the front end cover (30) and remove the motor assembly.

### Brake

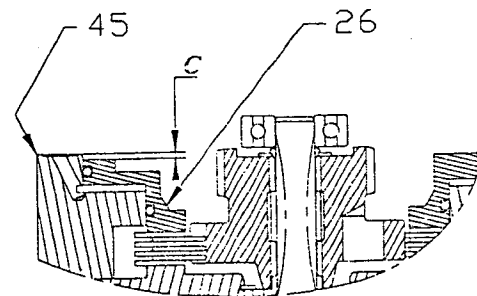
It is recommended that the brake assembly be removed for maintenance and inspection once each year.

### Adjustment

No brake adjustment is required.

### Inspection

If brake slippage occurs during tests prior to placing winch in service or during normal use of the winch, following the winch disassembly procedure until number 14.3 and check dimension « C » from the brake piston (26) to the gear box (45) as shown in Dwg. D6310032. If this dimension is greater than 0,12 in. (3 mm), the brake discs (21 and 22) must be replaced by following the winch disassembly procedure.



(Dwg. D6310032)

## General Disassembly Procedures

The following instructions provide the necessary information to disassemble, inspect, repair, and assemble the winch. Refer to the winch assembly drawing provided in the Parts Section.

If a winch is being completely disassembled for any reason, follow the order of the topics as they are presented.

It is recommended that all maintenance work on the winch be performed on a bench in a clean dust free area. In the process of disassembling the winch, observe the following :

1. Never disassemble the winch any further than is necessary to accomplish the needed repair. A good part can be damaged during the course of disassembly.
2. Never use excessive force when removing parts. Tapping gently around the perimeter of a cover or housing with a soft hammer, for example, is sufficient to break the seal.
3. Do not heat a part with a flame to free it for removal, unless the part being heated is already worn or damaged beyond repair and no additional damage will occur to other parts.

In general, the winch is designed to permit easy disassembly and assembly. The use of heat or excessive force should not be required.

4. Keep the work area as clean as practical, to prevent dirt and other foreign matter from getting into bearings or other moving parts.
5. All seals and 'O' rings should be discarded once they have been removed. New seals and 'O' rings should be used when assembling the winch.
6. When grasping a part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
7. Do not remove any part which is press fit in or on a subassembly unless the removal of that part is necessary for repairs or replacement.
8. When removing ball bearings from shafts, it is best to use a bearing puller. When removing bearings from housings, drive out the bearing with a sleeve slightly smaller than the outside diameter of the bearing. The end of the sleeve or pipe which contacts the bearing must be square. Protect bearings from dirt by keeping them wrapped in clean cloths

## Disassembly Instructions

### Winch Disassembly (ref.Dwg.D6310041)

1. Disconnect and tag the air lines.
2. Remove winch from its mounting and set in a clean work area on a sturdy work bench.
3. Position several blocks of wood on the work bench and stand the winch in a vertical position with the motor end down.
4. Remove the nuts (2) and lock washers (3).

5. Remove the rear end-cover (55).
  - 5.1. Extract the exhaust washers (60) and the rings (59).
  - 5.2. Pull bearing (58) from rear end cover (55)
6. Clutch control disassembly (PS SERIES)
  - 6.1. Unscrew the handle (65) and pull the plunger (61) to remove clutch axle (66), clutch (72) and the spring (69).
  - 6.2. If necessary remove retainer rings (62 and 63) to remove clutch (72) and bearing (71) from clutch axle (66)
  - 6.3. Remove screws (67), washer (68), plunger body (70) and the plunger (61)
7. Remove the drum (56) from the winch.
  - 7.1. Remove the spacer (64). Only for PS series.
  - 7.2. Remove the drum bushings (38) from the drum (56) if they require replacement.
8. Remove the oil drain plug (6) and return the winch to drain the oil from the gear casing.
9. Remove the four screws which secure the motor (29) to the front end cover (30) and pull off the motor straightaway from the winch. For disassembly of the motor and the valve, follow the corresponding procedure.
10. Remove the gasket (31) and the 'O'ring (27) and drain the oil from the brake through the front end cover bore.
11. Remove the three nuts (2) and lock washers (3) and remove the three tie rod spacers (4).
12. Remove the output shaft (5) from the gearbox and brake assembly.
13. Disassembly of the front end-cover (30).
  - 13.1. Remove the screws (34).
  - 13.2. Remove the front end cover (30).
  - 13.3. Remove the retainer ring (32).
  - 13.4. Remove the oil seal (35).

## NOTICE

- The oil has been installed with loctite ® 460 on the backside of the seal.

14. Disassembly of the brake piston.
  - 14.1. Remove the O'ring (25) and the gasket (33).
  - 14.2. Remove the springs (41).
  - 14.3. Remove the bearing (36).
  - 14.4. Extract the brake piston (26) by using low pressure compressed air in brake release port.
15. Disassembly of the gear box
  - 15.1. Remove screws (47) and lock washers (48).
  - 15.2. Extract the gear box cover by using jacking screws in the two M4 threaded holes.
  - 15.3. Press out the output shaft (5) and the output annular gear (50).
  - 15.4. Remove the bearings (51 and 53), oil seal (52) and the O'ring (9).
  - 15.5. Remove the bearing (10), spring washer (49) and the output annular gear (50).
  - 15.6. Remove the satellite support assembly.
  - 15.7. Push out the satellite axles (11).
  - 15.8. Remove the planet gear (15), bearing studs (12) and stop rings (13).

- 15.9. Remove the needle bearings (14) and the spacers (16).
- 15.10. Disassembly of the fixed annular gear (19), friction discs (21) and steel discs (22) :
  - compress the 'O'ring (20) by using the special tool M6313400.
  - remove the retainer ring (17).
  - push out the fixed annular gear (19).
  - remove the 'O'ring (9).
  - remove the pins (39).
  - remove the 'O'ring (20).
  - remove the friction discs (21) and steel discs (22).
- 15.11. Disassembly of the shaft spindle (18).
  - remove the retainer ring (37).
  - remove the gear wheel (43).
  - push out the shaft spindle (18).
- 15.12. Remove the retainer ring (40).
- 15.13. Remove the bearing (44).

#### Lever Control Valve Disassembly

(ref. Dwg. D6310006 or D6310035)

1. Remove screws (130) and lock washers (131).
2. Remove the lever control valve assembly from the motor.
3. Tap out the pin (128).
4. Extract the control lever (121).
5. Remove screws (127) to remove stop (129).
6. Remove the return spring (124).
7. Pull out the rotary valve (126).

### NOTICE

- Localise the mounting position of the rotary valve in the valve housing.
8. Remove the 'O'ring (125) from the rotary valve (126) if necessary.

#### Valve Disassembly Optional Remote Control

(ref. Dwg. D6310026)

1. Remove screws (143).
2. Remove the valve assembly from the motor.
3. Remove the cover (144) from the valve body (150).
4. Remove screws (141) and lock washers (142).
5. Remove the end caps (147) and the rear stops (148).
6. Remove the slide valves (149) and return spring (145).
  - 6.1. Remove the quad rings (151).
7. Remove the quad rings (146) from the valve body.

### NOTICE

- The cover (4) has been installed with Loctite® instajoint No 574.

#### Air Gear Motor Disassembly

(Ref. Dwg. D6310005)

Refer to control valve disassembly sections to remove lever or pendant control valve from motor

1. Remove the screws (81) and lock washers (82).
2. Remove the motor housing (112).
3. Remove the 'O'ring (110).
4. Remove the gasket (95).
5. Remove screws (109).
6. Remove the motor cover (84).
  - remove the 'O'rings (89) and pin (83).
  - remove the exhaust washer (87) and the plug (88).
  - remove the needle bearings (85 and 91) if they have to be changed.
7. Immobilise the motor rotors with a pin between the teeth and remove nuts (101 and 106).
8. Remove the motor rotors (93 and 94).
  - remove the shaft segment (86) and the internal ring.
9. Remove the screw (104) and the washer (103).
10. Remove ball bearings (100 and 107).
11. Remove the spacer (92).
12. Remove the stopper (108), the spring (102) and the rear stop (105).

#### "PHS2" Pendant Control Disassembly

(Ref. Dwg. D5790002)

1. Disconnect all hoses from winch motor.
2. Remove the fittings (161) and the lifting eye (170).
3. Remove the retainer ring (162).
4. Pull out rear covers (164) with the 'O' rings (163).
5. Remove the springs (165).
6. Remove the "slide valve assemblies" (166) with the quad rings (167).
7. Remove the springs (168).
8. Remove the valve cone assemblies (169).
9. Remove the setscrews (174).
10. Tap out pin (171) to remove the levers (173).

#### "PHS2U" Pendant Control with Emergency Stop Disassembly

(Ref. Dwg. D5790003)

Refer to PHS2 control disassembly to begin PHS2U disassembly

11. Remove emergency stop button (179).
12. Remove the setscrews (175).
13. Remove the spools (178).
14. Pull on the shuttle valve stop (180) with ball (176).
15. Remove the 'O' rings (181) from shuttle valve stop and spool (178).

### Shut-off Valve Disassembly

(Ref. Dwg. D6170004)

1. Remove the screw (202).
2. Remove the cover (201) with the spring (203).
3. Remove the 'O' ring (204) from the cover (201).
4. Remove the cover (213) and the 'O' ring (215).
5. Remove the diaphragm (211).
6. Immobilise the valve cone (214) by its hole with a rod in one of two orifices of the body (209) and remove the screw (208).
7. Remove the valve cone (205,214) with joints (206) and distance ring (210) with the washer (207).

### Emergency Stop Valve Disassembly

(Ref. Dwg. D6170003)

Refer to air control valve disassembly to begin disassembly

8. Remove emergency stop button (179).
9. Remove the setscrews (175).
10. Remove the spools (178).
11. Pull on the shuttle valve stop (180) with ball (176).
12. Remove the 'O' ring (181) from shuttle valve stop (180) and spool (176).

### Cleaning, Inspection and Repair

Use the following procedures to clean, inspect, and repair the components of the winch.

- A bearing that appears loose or does not rotate smoothly must be replaced. Failure to observe this precaution will result in bearing and/or winch component damage.

Clean all winch component parts in solvent (except for the brake friction disc). The use of a stiff bristle brush will facilitate the removal of accumulated dirt and sediments in the drum and reduction assembly. If drum bushings have been removed it may be necessary to carefully scrape old Loctite® from the drum bushing bore. Dry each part using low pressure, filtered compressed air. Clean the brake friction disc using a wire brush or emery cloth. Do not wash the brake friction disc in liquid. If the brake friction discs are oil soaked, they must be replaced.

#### Inspection

All disassembled parts should be inspected to determine their fitness for continued use. Pay particular attention to the following:

1. Inspect all gears for worn, cracked, or broken teeth.
2. Inspect all bushings for wear, scoring or galling.
3. Inspect all bearings for play, distorted races, pitting and roller or ball wear or damage. Inspect bearings for freedom of freedom
4. Inspect shafts for ridges caused by wear. If ridges caused by wear are apparent on shafts, replace the shaft. Inspect all surfaces on which oil seal lips seat. These surfaces must be very smooth to prevent damage to the seal lip.

5. Inspect all threaded items and replace those having damaged threads.
6. Inspect all remaining parts for evidence of damage. Replace or repair any part which is in questionable condition. The cost of the part is often minor in comparison with the cost of redoing the job.
7. Smooth out all nicks, burrs, or galled spots on shafts, bores, pins or bushings. Examine all gear teeth carefully, and remove nicks or burrs.
8. Polish the edges of all shaft shoulders to remove small nicks which may have been caused during handling.
9. Remove all nicks and burrs caused by lockwashers.
10. Replace all gaskets, oil seals, and O'rings any time the winch is disassembled for repair.
11. Inspect drum bushings (47) for wear, if thickness is less than 0.039 in. (1 mm), replace drum bushings.
12. Inspect brake discs (21 and 22) for wear, if thickness less than 0.354 in. (9 mm), replace them.

#### Repair

Actual repairs are limited to the removal of small burrs and other minor surface imperfections from gears and shafts. Use a fine stone or emery cloth for this work. Do not use steel wool.

1. Worn or damaged parts must be replaced. Refer to the applicable Parts Listing for specific replacement parts information.
2. Inspect all remaining parts for evidence of damage. Replace or repair any part which is in questionable condition. The cost of the part is often minor in comparison with the cost of redoing the job.
3. Smooth out all nicks, burrs, or galled spots on shafts, bores, pins, or bushings.
4. Examine all gear teeth carefully, and remove nicks or burrs.
5. Polish the edges of all shaft shoulders to remove small nicks which may have been caused during handling.
6. Remove all nicks and burrs caused by lockwashers.
7. Replace all gaskets, oil seals, and 'O' rings removed during winch disassembly.

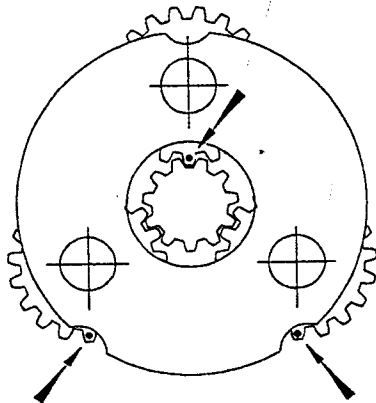
### Assembly Instructions

#### Winch Assembly

(Ref. Dwg. D6310041)

1. Gear box assembly.
  - 1.1. Assembly of the shaft spindle (18)
    - Install bearing (44) with the retainer ring (40)
    - Put the shaft spindle (18) in the bearing (4). Install the gear wheel (43) with the retainer ring (37)
  - 1.2. Assembly of the fixed annular gear (19).
    - Install the friction disc (21) and steel disc (22) in the gear box (45).
    - Install the 'O' ring (20) and the pin (39).
    - Install the 'O' ring (9) in the fixed annular gear (19), install this ass'y in the gear box (45) and secure with the retainer ring (17).

- 1.3. Install the needle bearings (14) and the spacer (16) in the planet (15).
- 1.4. Install the three planet ass'y, bearing studs (12) and stop rings (13) in the planet support (46).
- 1.5. Install the planet axle (11) and the bearing (10).
- 1.6. Install the planet support assembly.
- 1.7. After assembly of planet support (46) with the fixed annular gear (19) and the shaft spindle (18), check for good indexing of planet gears and repeat the above operation if necessary.



(Dwg.D6310013)

**CAUTION**

• For correct assembly of planet gears, each planet gear must be positioned with the timing mark as shown on drawing D6310013.

- 1.8. Install the spring washer (49) and the output annular gear (50).
- 1.9. Assembly of the box cover
  - Install the oil seal (52) and the bearing (51 and 53).
  - Install the output shaft (5) with the retainer ring (54) in the gear box cover.
  - Install the 'O' ring (9).
  - Install the gear box cover ass'y and secure with screws (47) and washers (48).
2. Assembly of the brake piston
  - 2.1. Install the brake piston with the 'O' rings (23 and 25).
  - 2.2. Install bearing (36), spring (41) and gasket (33).
3. Assembly of the front end cover.
  - 3.1. Clean the mounting front end cover (30) bore and apply a bead of Loctite No.460 on the backside of the oil seal (35). Install the oil seal.
  - 3.2. Install the retainer ring (32).
  - 3.3. Install the front end cover (30) and secure with screws (34).
4. Install the three tie rod spacer (4) with the nuts (2) and the washer (3).

5. Fill up the brake with oil.
6. Install the gasket (31) and the 'O' ring (27).
7. Install the motor ass'y and secure with the four screws.
8. Position the winch vertically with the motor end down.
9. Fill up the gear box with oil SAE 80W90
  - kinematics viscosity 145 mm<sup>2</sup>/s at 40°C(104°F)
  - capacity of gear box : 0.13 gall (0.5 Litres)
10. Drum assembly
  - 10.1. Scrape old Loctite from the drum bushing bore and apply a bead of Loctite N°406 on the smooth face of drum bushings (38).
  - 10.2. Install drum bushing in drum bushing bore by taking care to adjust the gaps of the drum bushing to 3.9 ins (100mm) do not allow any clearance between drum bushings and drum.
  - 10.3. Lubricate drum bushings with grease.
  - 10.4. Install the drum on the gear box assembly.
  - 10.5. Lift out the drum to check for good positioning of drum bushing
11. Clutch control assembly (PS SERIES)
  - 11.1. Install plunger body (70) and plunger (61) on the rear end cover (55) and secure with screw (67) and washer (68).
  - 11.2. Install bearing (71) on clutch axle (66) with retainer ring (65) and install the clutch (72) with the retainer ring (62).
  - 11.3. Pull the plunger (61) to introduce the clutch axle with the spring (69) into the plunger body (70) and install the handle (65).
12. Assembly of the rear end cover (55).
  - 12.1. Install bearing (58) on the rear cover.
  - 12.2. Install exhaust washers (69) with ring (59).
13. Install spacer (64) on the output shaft (PS SERIES). Install the rear end cover Ass'y on the three tie rod (4) and secure with lock washers (3) and nuts (2).

**Lever Control Valve Assembly**  
(Ref. Dwg.D6310006 or D6310035)

1. Lubricate and install 'O' ring (125) on rotary valve (126).
2. Lubricate and carefully install rotary valve in valve housing (122).
3. Lubricate and install spring (124) on rotary valve. Ensure pin (123) is installed in valve housing (122).
4. Install stop (129). Apply a small amount of Loctite® 243 to threads of screws (127) and install.
5. Install control handle (121) on rotary valve and align pin hole. Install pin (128) to secure control handle.



### Air Gear Motor Assembly

(Ref. Dwg. D6310005)

1. Install the stop (105), spring (102) and stopper (108).
2. Install the spacer (92).
3. Install the bearing (100 and 107) and secure with the screw (104) and washer (103).
4. Install the internal ring of the bearing (85) on the rotor motor (84) and secure with the retainer ring (86).
5. Install the motors rotors with a pin between the teeth and secure with the nuts (101 and 106).
6. Install the pin (83), the needle bearing (85 and 91), the 'O' ring (89), the exhaust washer (87) and the plug (88) in the motor cover.
7. Install the motor ass'y on the motor cover with the screws (109)
8. Install the 'O' ring (110) and the gasket (95) in the motor housing (112).
9. Install the motor ass'y in the motor housing (112) and secure with the screws (81 and 82).

### NOTICE

- To correctly assemble the exhaust washer, spacers, valve and spring, carefully follow instructions:

- Take the motor body and put it in the same position as mounting on the winch and view from the backside of the motor body, stopper, spring, valve and the spacer must be mounted in the left bore. Check for good functioning of the valve.
- The exhaust washer must be mounted on the same side as the valve in the right bore.
- Before assembly lubricate bearing with grade 2 grease.
- Install ball bearings so markings on bearing remain visible.
- After assembly of the air motor, it must turn smoothly in both direction.
- The screws (104 and 109) the nuts (101 and 106) must be secured with Loctite® 243, secure the nuts with a centre punch.

### 'PHS2'' Pendant Control Assembly

(Ref. Dwg. D5790002)

1. Install lever (173) in pendant handle (172) with pin (171). Stake pin in pendant handle at both ends to secure.
2. Install setcrews (174).
3. Check that 'O' ring is undamaged and securely crimped in valve. Install valve assemblies (169).
4. Install springs (168).
5. Check that 'O' ring is undamaged and securely crimped in spool. Install quad ring (167) and spools (166).
6. Install springs (165).
7. Lubricate and install 'O' ring (163) on rear cover (164). Install rear cover in pendant handle.
8. Install retainer rings (162).

### 'PHS2U'' Pendant Control with Emergency Stop Assembly

(Ref. Dwg. D5790003)

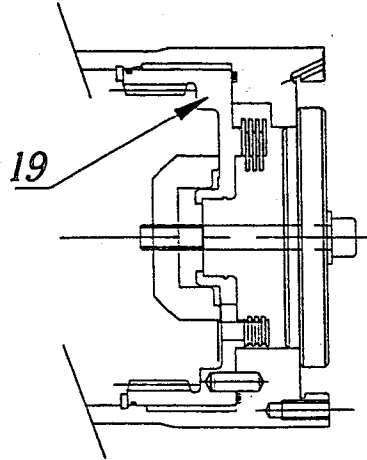
Refer to PHS2 control assembly to begin PHS2U assembly.

9. Install 'O' ring (181) on shuttle valve stop (180) and spool (178).
10. Install that shuttle valve stop (180) with ball (176), those spools (178) in pendant handle (172) and secure with setscrew (175).
11. Install the emergency stop bottom (179).
12. Install the eyebolt (170) and fitting (161).

### Pendant Control Adjustment.

1. Connect the inlet of the pendant to 100 psi (7 bar) air supply.
2. Connect a manometer at the outlet of the lever to be adjusted.
3. Apply a small amount of Loctite® No. 243 on the adjustment setscrew (174).
4. Tighten the adjustment setscrew to obtain a pressure of 15 psi (1 bar) without action the lever.
5. Release the adjustment setscrew by a half turn (pressure must fall to zero).
6. Push the lever. Check that pressure reaches 93 +/- 7 psi (6.5 +/- 0.5 bar). Check that there is no leak at the exhaust.
7. Release the lever, exhaust must occur and result in rapid pressure reduction.
8. Repeat operations "6 and 7" from 2 to 3 times.
9. Disconnect the manometer. Check to ensure that there are no leaks when the lever is not activated.
10. Repeat the operations from 2 to 9 with each lever.

Tooling installation M6313400  
(Dwg.D6310031)



**TEST**

**Testing**

**Operational Tests**

Prior to initial use, all new, altered or repaired winches shall be tested to ensure proper operation.

1. Operate winch in both directions with no load.
2. Check operation of free wheel and brake.
3. Check operation of limit switches and other safety devices when provided.
4. Check all winch mounting bolts are secure.

**Load test**

Prior to initial use, all new, extensively repaired, or altered winches shall be load tested by or under the direction of a person trained in the operation and service of this winch and a written report furnished confirming the rating of the winch.

- For air winches LS series.

The minimum load test for European countries are according to the chart below. If not found below you should use the tests recommended by the FEM.

The dynamic test shall be carried out with an overload coefficient  $\rho_1 = 1,2$  i.e. with a load equal to 120% of the safe working load. All motions shall be carefully operated in turn, without checking speeds of temperature rises in the motors.

the static test shall be carried out with an overload coefficient  $\rho_2 = 1,4$  i.e. with a load equal to 140% of the safe working load. The test must be carried out under still conditions and consists in hoisting the safe working load to a small distance above the ground and then adding the required surplus without shock.

- For air winches PS series.

The dynamic test shall be carried out with the nominal line pull.

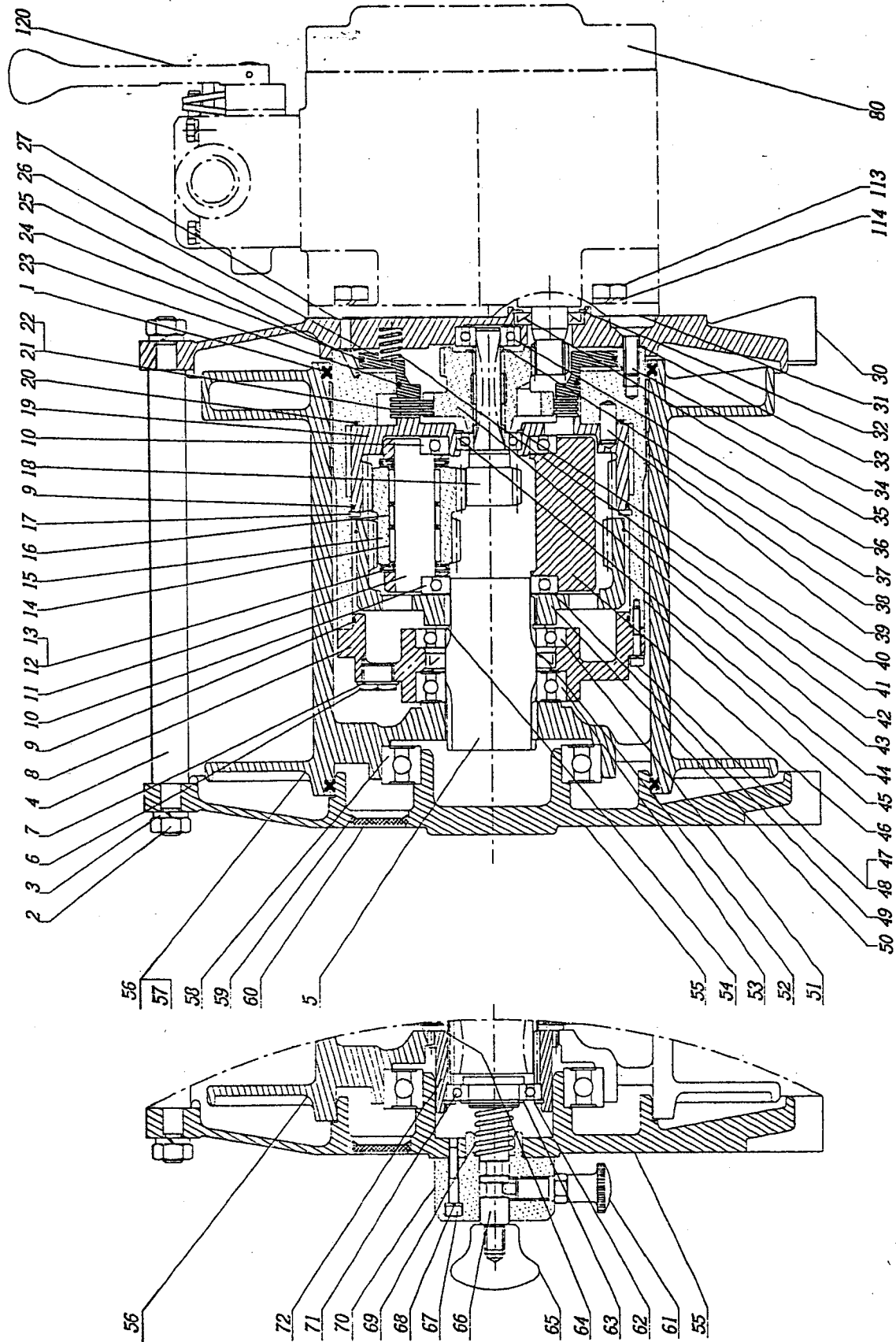
The static test shall be carried out with an overload coefficient  $\rho_2 = 1,4$  i.e. with a load equal to 140% of the safe working load.



**NOTES**



# WINCH ASSEMBLY DRAWING



(Dwg. D6310041)

## WINCH ASSEMBLY PART LIST

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
1	Quad-Ring	2	5823-1029
2	Nut	6	4300-0211
3	Lock washer	6	4520-0010
4	Tie rod spacer (short drum) Tie rod spacer (long drum)	3	9631-0008 9631-0052
5	Output shaft	1	9631-0026
* 6	Plug	2	6511-9732
7	Copper joint	2	5840-3431
8	Gear box cover	1	9631-0005
* 9	O' ring	2	5823-1129
10	Bearing	2	5080-0008
11	Planet axle	3	9620-0060
12	Bearing stub	6	5605-3520
13	Stop ring	6	5731-9832
14	Needle bearing	6	5650-2620
15	Planet Gear	3	9620-0075
16	Spacer	3	9619-0024
* 17	Retainer ring	1	4784-7832
18	Shaft spindle	1	9631-0094
19	Fixed annular gear	1	9631-0096
* 20	O' ring	1	5822-1829
21	Friction disc	4	6305-9932
22	Steel disc	3	6306-0032
* 23	O' ring	1	5823-0929
* 24	O' ring	1	5821-2829
* 25	O' ring	1	5821-2529
26	Brake piston	1	9631-0093
* 27	O' ring	1	5822-6629
30	Front end cover	1	9631-0091
* 31	Gasket	1	9631-0118
32	Retainer Ring	1	4770-3035
* 33	Gasket	1	9631-0097

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
34	Screw	6	4110-2203
* 35	Oil seal	1	5802-0030
36	Bearing	1	5010-0001
* 37	Retainer ring	1	4770-0015
38	Bushing	3	9631-0014
39	Pin	5	4600-0416
* 40	Retainer ring	1	4770-3032
41	Spring	11	6916-5532
* 42	O' ring	1	5820-7129
43	Gear wheel	1	9631-0095
44	Bearing	1	5000-0002
45	Gear box	1	9631-0092
46	Satellite support	1	9620-0010
47	Screw	6	4131-1106
48	Lock washer	6	4520-0004
49	Spring washer	1	6917-2132
50	Output annular gear	1	9620-0031
51	Bearing	1	5080-0009
* 52	Oil seal	1	3801-2130
53	Bearing	1	5005-0009
54	Retainer Ring	1	4770-0045
55	Rear End Cover	1	9631-0003
56	Short Drum (180mm) Long Drum (360mm)	1 1	9631-0001 9631-0050
57	Wire rope wedge	1	9631-0023
58	Bearing	1	5005-0014
* 59	Ring	9	4780-0639
* 60	Exhaust washer	9	6760-0303
80	Air gear motor	1	-
113	screw	4	4100-0201
114	lock Washer	4	4520-0006
120	Air control valve	1	-

### Winches with clutch control

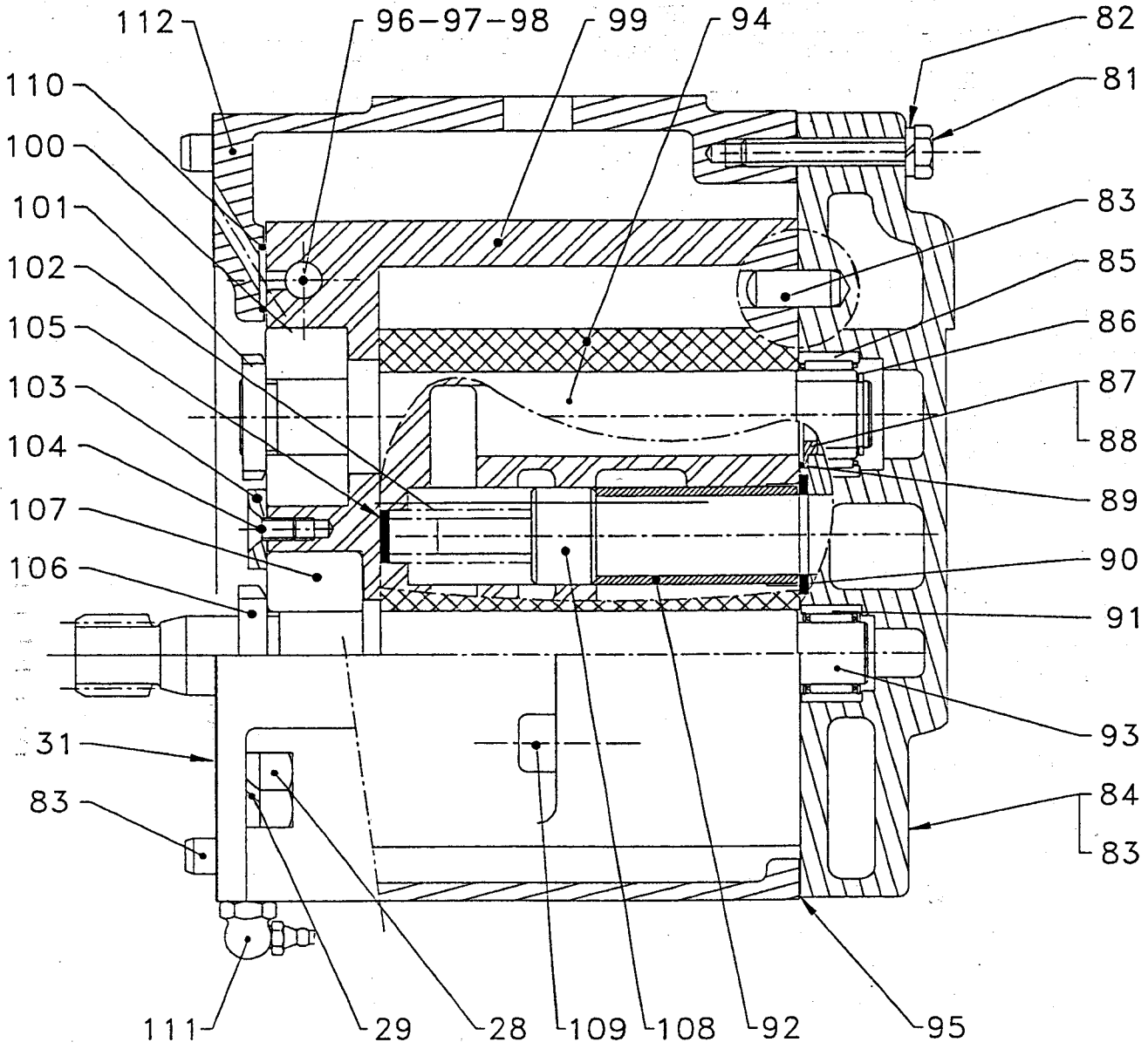
Substitute or add the following parts on winch with clutch control

55	Rear End Cover	1	9631-0027
56	Short Drum (180mm) Long Drum (360mm)	1	9631-0028 9631-0051
61	Plunger	1	6628-8132
62	Retainer Ring	1	4770-3047
63	Retainer Ring	1	4770-0025
64	Spacer	1	9631-0007
65	Handle	1	6956-6232

66	Clutch Axle (Short drum) Clutch Axle (long drum)	1	9631-0037 9631-0053
67	Screw	3	4130-7906
68	Washer	3	4520-0005
69	Spring	1	6918-8932
70	Body	1	9618-0060
71	Bearing	1	5080-0005
72	Clutch	1	9631-0029

\* Recommended spare

# AIR GEAR MOTOR ASSEMBLY DRAWING



(Dwg. D6310005)

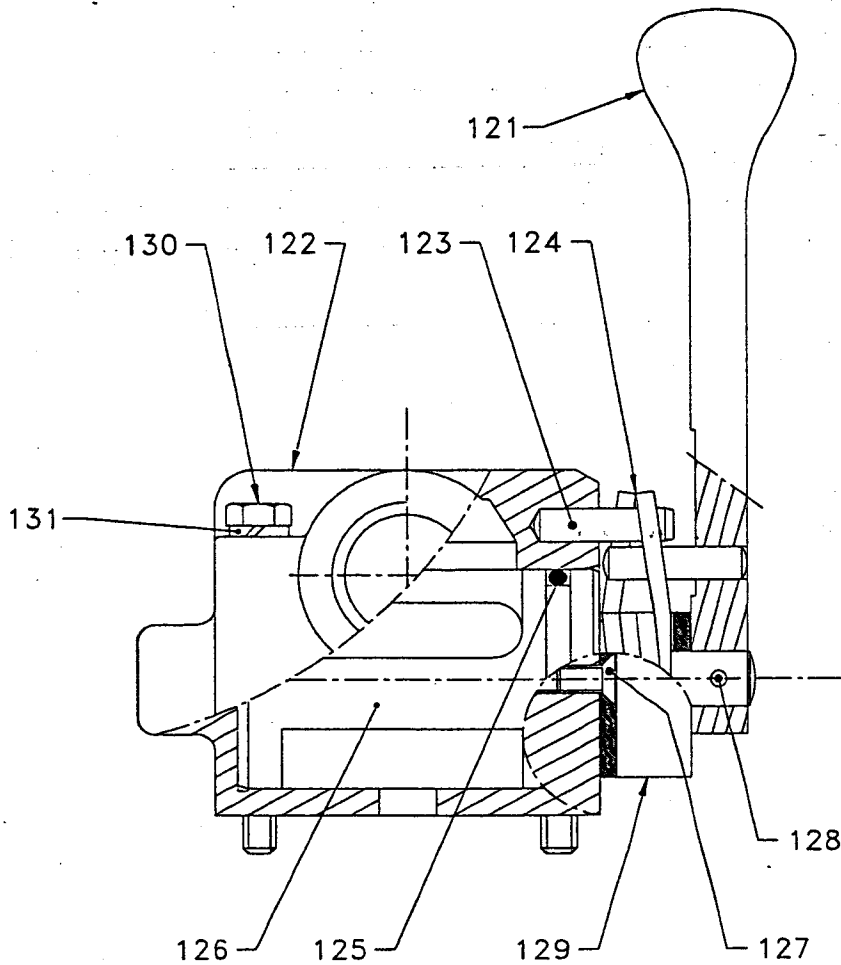


## AIR GEAR MOTOR ASSEMBLY PART LIST

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
31	Gasket	1	9631-0118
80	Motor Ass'y (incl's item 31 & item 81 through 114)		7631-0077
81	Screw	5	4101-9001
82	Lock washer	7	4520-0006
83	Pin	4	4600-0416
84	Motor cover	1	9631-0042
85	Bearing	1	5646-2813
• 86	Shaft segment	1	4783-6732
87	Exhaust washer	1	9620-0045
88	Plug	1	9631-0049
• 89	O' ring	2	5822-5929
90	Rear stop	2	9620-0069
91	Bearing	1	5649-2213
92	Spacer	1	9631-0018
93	Motor rotor	1	9620-0093
94	Repulsion rotor	1	9620-0026
• 95	Gasket	1	9631-0045
96	Selector stop	1	9609-0223
• 97	Ball	1	6940-1625
• 98	O' ring	1	5821-2229
99	Motor housing (incl's item 96, 97 and 98)	1	9620-0008
100	Bearing	1	5060-0003
• 101	Nut	1	5700-0003
102	Spring	1	6914-3932
103	Washer	1	9631-0054
104	Screw	1	4110-3403
105	Rear stop	1	9412-0030
• 106	Nut	1	5700-0004
107	Bearing	1	5060-0004
108	Stopper	1	9631-0017
109	Screw	4	4130-2206
• 110	O' ring	1	5822-1729
111	Greasing nipple	1	6710-2227
112	Motor housing	1	9631-0078
113	Screw	4	4100-0201
114	Lock Washer	4	4520-0006

• Recommended Spare

# LEVER CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST

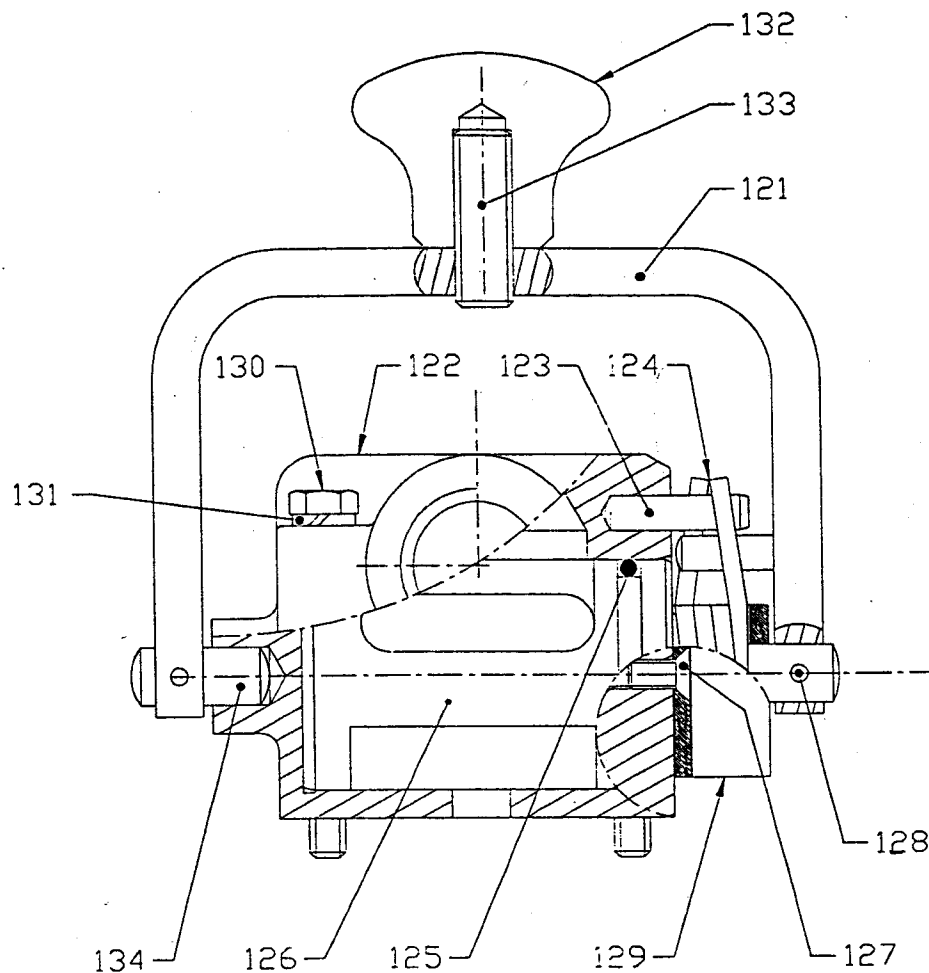


(Dwg. D6310006)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
120	Control Valve Ass'y (incl's item 121 through 131)	1	7631-0081
121	Control lever	1	9618-0031
122	Valve housing	1	9631-0021
123	Pin	2	4600-1216
124	Return spring	1	9618-0035
• 125	O ring	1	5821-0229
• 126	Rotary valve	1	9631-0022
127	Screw	2	4110-3403
128	Pin	1	4650-7220
129	Stop	1	9618-0034
130	Screw HM	4	4101-6601
131	Lock washer	4	4520-0006

• Recommended Spare

# CONTROL VALVE ASSEMBLY DRAWING AND PARTS LIST

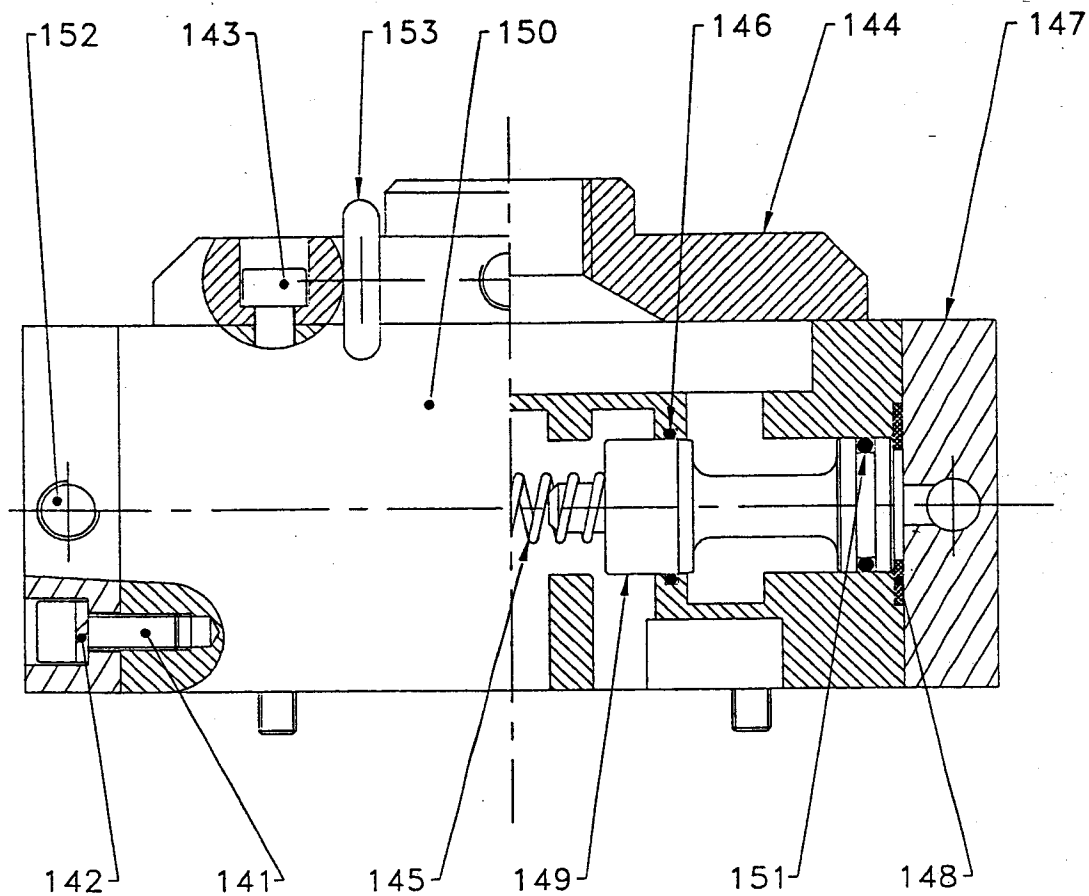


(Dwg. D6310035)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
119	Control Valve Ass'y (incl's item 121 through 134)	1	-
121	Control lever	1	9631-0056
122	Valve housing	1	9631-0058
123	Pin	2	4600-1216
124	Return spring	1	9618-0035
• 125	O-ring	1	5821-0229
• 126	Rotary valve	1	9631-0022
127	Screw	2	4110-3403
128	Pin	2	4650-7220
129	Stop	1	9618-0034
130	Screw HM	4	4101-6601
131	Lock washer	4	4520-0006
132	Handle	1	6956-6232
133	Setscrew	1	4200-1507
134	Axle	1	9631-0057

• Recommended Spare

# OPTIONAL VALVE ASSEMBLY DRAWING AND PARTS LIST

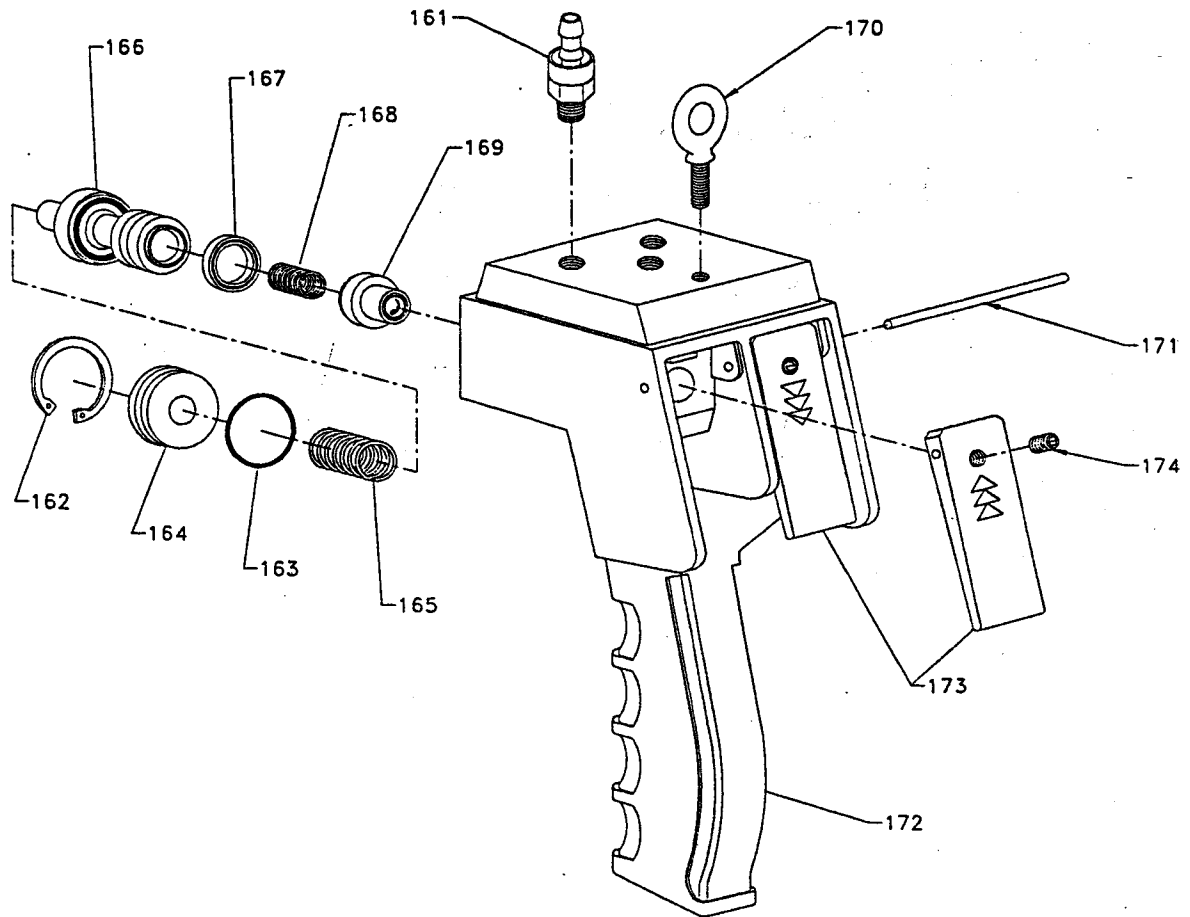


(Dwg. D6310026)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
140	Pendant Control Valve Ass'y (incl's item 141 through 153)	1	7617-0010
141	Screw	8	4130-0206
142	Lock washer	8	4520-0006
143	Screw	4	4130-5906
144	Cover	1	9617-0050
145	Return spring	1	9412-0289
• 146	Quad ring	2	5823-2429
147	End cap	2	9617-0049
148	Read stop	2	9412-0031
149	Slide valve	2	9617-0047
150	Valve body	1	9617-0046
• 151	Quad ring	2	5822-9029
152	Fitting	3	6165-2632
153	Lifting Eye	1	6422-2332

• Recommended Spare

# REMOTE CONTROL PENDANT ASSEMBLY DRAWING AND PARTS LIST

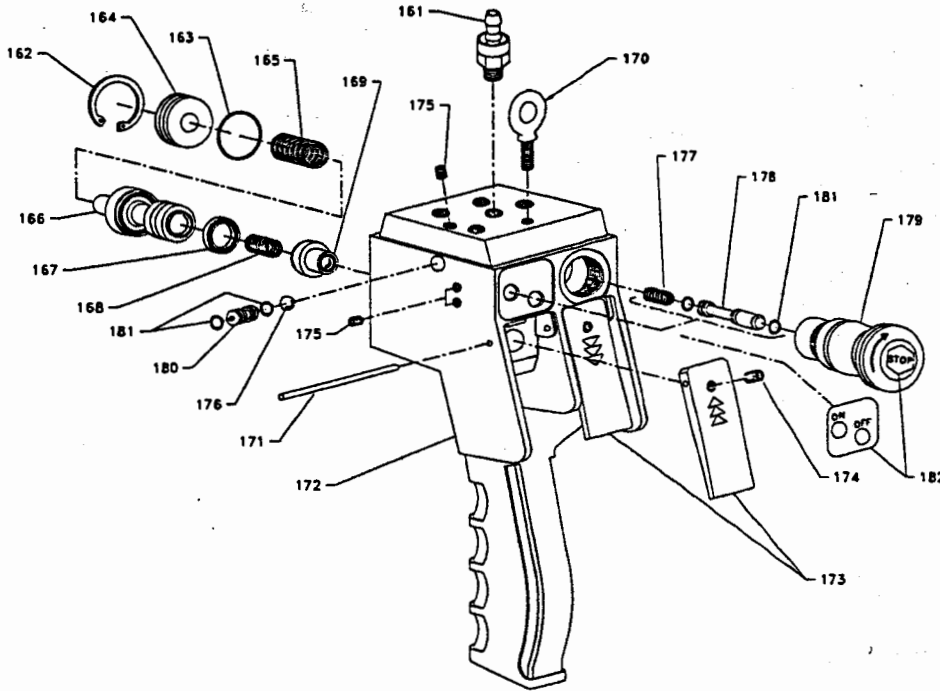


(Dwg.D5790002)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
160	Pendant Control Valve Ass'y (incl's item 161 through 174)	1	7579-0038
161	Fitting	3	6165-2632
162	Retainer Ring	2	4770-3028
• 163	O' Ring	2	5820-3729
164	Rear Cover	2	9579-0037
165	Spring	2	6915-8732
166	Spool (with 'O'Ring crimped)	2	9579-0035
• 167	Quad-ring	2	5823-0229
168	Spring	2	6915-8632
169	Valve Ass'y (with 'O'Ring crimped)	2	9579-0036
170	Lifting Eye	1	6422-2332
• 171	Pin	1	9579-0040
172	Pendant Handle	1	9579-0034
173	Lever	2	9579-0038
174	Setscrew	2	4200-7807

• Recommended Spare

# REMOTE CONTROL PENDANT ASSEMBLY DRAWING AND PARTS LIST

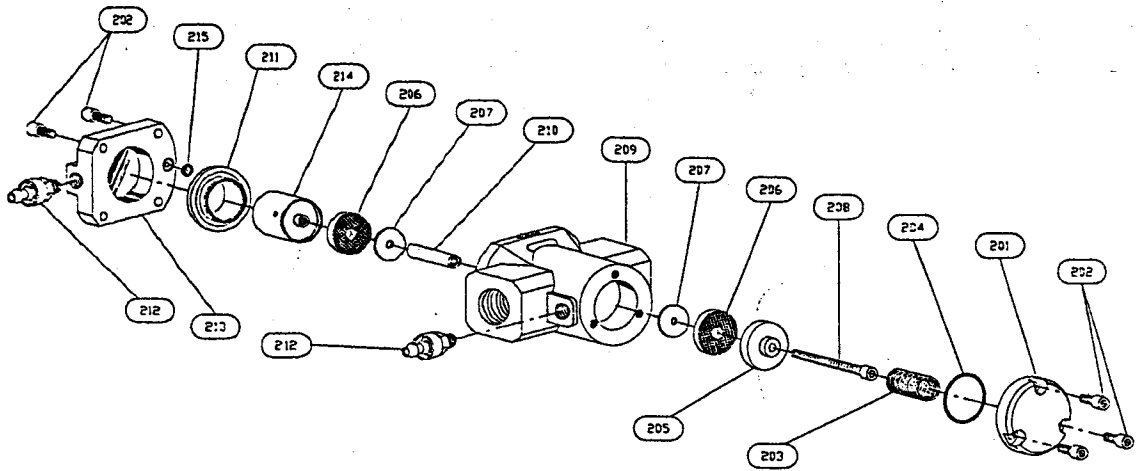


(Dwg. D5790003)

ITEM NO.	DESCRIPTION OF PART	TOTAL QTY	PART NO.
161	Fitting	3	6165-2632
162	Retainer Ring	2	4770-3028
* 163	O' Ring	2	5820-1729
164	Rear Cover	2	9579-0037
165	Spring	2	6915-8732
166	Spool (with 'O'Ring crimped)	2	9579-0035
* 167	Quad-ring	2	5823-0229
168	Spring	2	6915-8632
169	Valve Ass'y (with 'O'Ring crimped)	2	9579-0036
170	Lifting Eye	1	6422-2332
* 171	Pin	1	9579-0040
172	Pendant Handle	1	9579-0095
173	Lever	2	9579-0038
174	Setscrew	2	4200-7807
175	Setscrew	3	4200-8307
176	Ball	1	6940-1625
177	Spring	3	6911-3941
178	Spool	3	9579-0085
179	Emergency stop button	1	6859-8632
180	Shuttle Valve Stop	1	9579-0098
* 181	O' Ring	8	5820-9229
182	Label kit	1	9579-0099
183	Pendant control with emergency stop ass'y (incl's item 161 through 182)	1	7579-0071

\* Recommended Spare

# SHUT-OFF VALVE ASSEMBLY DRAWING AND PARTS LIST

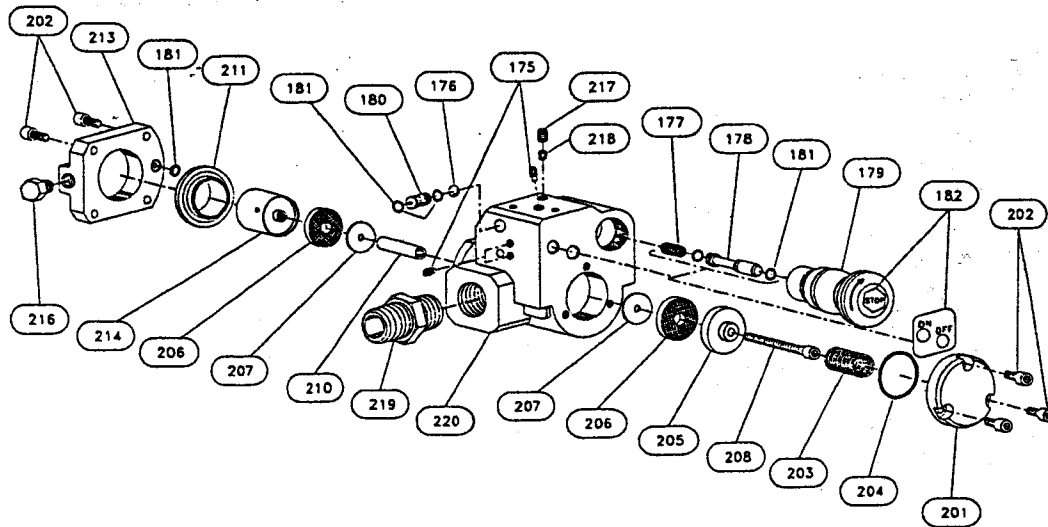


(Dwg.D6170004)

ITEM NO	DESIGNATION OF PART	QTY TOTAL	PART NUMBER
200	Shut-off Valve Assembly (incl's item 201 through 215)	1	7617-0016
201	Cover	1	9617-0059
202	Screw	7	4130-6706
203	Spring	1	6915-8732
• 204	O Ring	1	5821-4829
205	Valve Cone	1	9617-0053
• 206	Joint	2	9617-0056
207	Washer	2	4570-0005
208	Screw	1	4130-8206
209	Body	1	9617-0061
210	Distance Ring	1	9617-0055
• 211	Diaphragm	1	6771-6341
212	Fitting	2	6165-2632
213	Cover	1	9617-0052
214	Valve Cone	1	9617-0054
• 215	O Ring	1	5820-9229

• Recommended Spare.

# EMERGENCY STOP VALVE ASSEMBLY DRAWING AND PARTS LIST



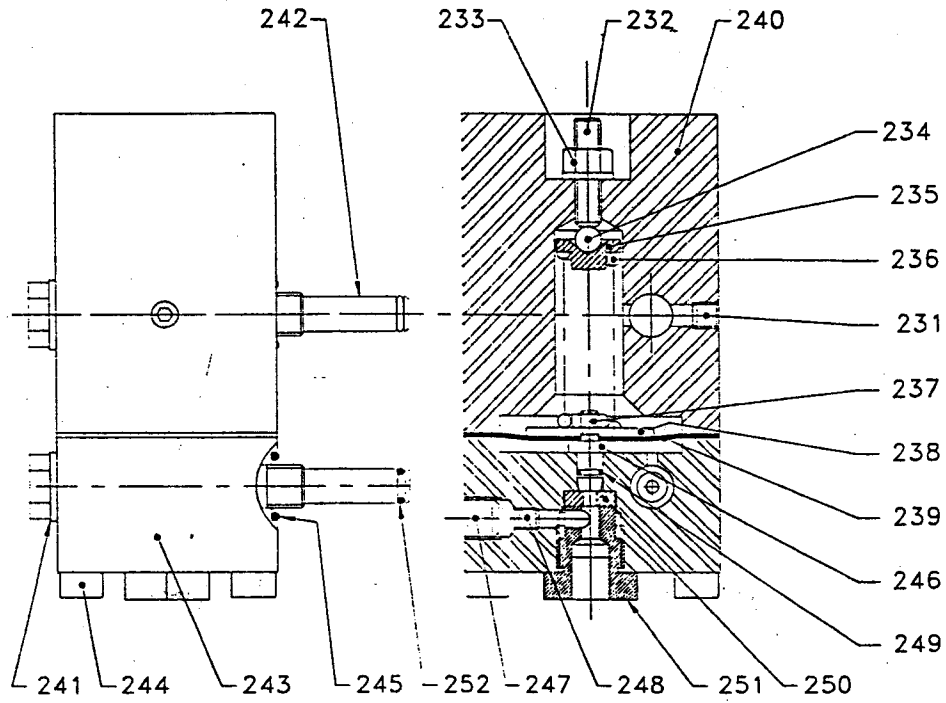
(Dwg.D6170003)

ITEM NO	DESIGNATION OF PART	QTY TOTAL	PART NUMBER
175	Setscrew	3	4200-8207
176	Ball	1	6940-1625
177	Spring	3	6911-3941
178	Spool	3	9579-0085
179	Emergency Stop Bottom	1	6859-8632
180	Shuttle Valve Stop	1	9579-0098
• 181	O' Ring	9	5820-9229
182	Label Kit	1	9579-0099
201	Cover	1	9617-0059
202	Screw	7	4130-6706
203	Spring	1	6915-8732
• 204	O' Ring	1	5821-4829
205	Valve Cone	1	9617-0053
• 206	Joint	2	9617-0056
207	Washer	2	4570-0005
208	Screw	1	4130-8206
210	Distance Ring	1	9617-0055
211	Diaphragm	1	6771-6341
213	Cover	1	9617-0052
214	Valve Cone	1	9617-0054
216	Plug	1	6510-7741
217	Setscrew	1	4200-7407
218	Nozzle	1	9617-0071
219	Nipple	1	6133-0732
220	Body	1	9617-0068
221	Emergency stop Valve Assembly (incl's item 175 through 220)	1	7617-0018

• Recommended Spare.



# TORQUE LIMITOR ASSEMBLY DRAWING AND PARTS LIST

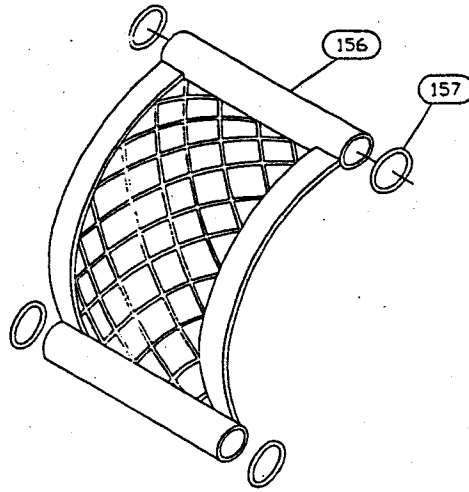


(Dwg.D6360005)

ITEM NO	DESIGNATION OF PART	QTY TOTAL	PART NUMBER
230	Torque limiter Ass'y	1	7636-0005
231	Screw	1	4200-7407
232	Screw	1	4200-1607
233	Nut	1	4300-7811
234	Ball	1	6940-0125
235	Spring Seat	1	9636-0023
• 236	Spring	1	6915-9432
237	Nut	1	4300-1111
238	Washer	1	9636-0019
• 239	Diaphragm	1	9636-0020
240	Cover	1	9636-0015
• 241	Ustir-Ring	2	5840-9731
242	Screw	2	9636-0022
243	Body	1	9636-0016
244	Screw	4	4131-4906
• 245	O'Ring	2	5821-0729
246	Valve	1	9636-0017
247	Plug	1	6517-2032
248	Nozzle	1	9617-0071
• 249	O'Ring	1	5822-2329
250	Joint	1	9636-0021
251	Screw	1	9636-0018
• 252	O'Ring	2	5820-9229

• Recommended Spare.

## DRUM GUARD ASSEMBLY DRAWING AND PART LIST



(Dwg. D6310052)

ITEM NO	DESIGNATION OF PART	QTY TOTAL	PART NUMBER	
			SHORT DRUM	LONG DRUM
155	Drum Guard Ass'y (Incl's item 156 and 157)	1	7631-0009	7631-0010
156	Drum Guard	1	9631-0038	9631-0065
157	'O' Ring	4	5821-1529	5822-0929

### PARTS ORDERING INFORMATION

The use of other than genuine **Ingersoll-Rand** Material Handling replacement parts may adversely affect the safe operation of this product.

For your convenience and future reference it is recommended that the following information be recorded.

Winch Model Number: \_\_\_\_\_

Winch Serial Number: \_\_\_\_\_

Date Purchased: \_\_\_\_\_

When ordering replacement parts, please specify the following:

1. Complete model number and serial number as it appears on the nameplate.
2. Part number(s) and part description(s) as shown in this manual.
3. Quantity required.

The nameplate is located on the winch rear cover.

#### Return Goods Policy

**Ingersoll-Rand** will not accept any returned goods for warranty or service work unless prior arrangements have been made and written authorization has been provided from the location where the goods were purchased.

#### NOTICE

• Continuing improvement and advancement of design may cause changes to this winch which are not included in this manual. Manuals are periodically revised to incorporate changes. Always check the manual edition number on the front cover for the latest issue.

#### Disposal

When the life of the winch has expired, it is recommended that the winch be disassembled, degreased and parts separated as to materials so that they may be recycled.

For additional information contact:  
**Ingersoll-Rand Material Handling**  
 510 Hester Drive  
 P.O. Box 618  
 White House, TN 37188  
 Phone: (615) 672-0321  
 Fax: (615) 672-0801

## LIMITED WARRANTY

**Ingersoll-Rand Company (I-R)** warrants to the original user its Hoists and Winches (Products) to be free of defects in material and workmanship for a period of one year from the date of purchase. **I-R** will repair, without cost, any Product found to be defective, including parts and labor charges, or at its option, will replace such Products or refund the purchase price less a reasonable allowance for depreciation, in exchange for the Product. Repairs or replacements are warranted for the remainder of the original warranty period.

If any Product proves defective within its original one year warranty period, it should be returned to any Authorized Hoist and Winch Service Distributor, transportation prepaid with proof of purchase or warranty card.

This warranty does not apply to Products which **I-R** has determined to have been misused or abused, improperly maintained by the user, or where the malfunction or defect can be attributed to the use of non-genuine **I-R** parts.

**I-R** makes no other warranty, and all implied warranties including any warranty of merchantability or fitness for a particular purpose are limited to the duration of the expressed warranty period as set forth above. **I-R's** maximum liability is limited to the purchase price of the Product and in no event shall **I-R** be liable for any consequential, indirect, incidental, or special damages of any nature rising from the sale or use of the Product, whether based on contract, tort, or otherwise.

Note: Some states do not allow limitations on incidental or consequential damages or how long an implied warranty lasts so that the above limitations may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

## IMPORTANT NOTICE

It is our policy to promote safe delivery of all orders.

This shipment has been thoroughly checked, packed and inspected before leaving our plant and receipt for it in good condition has been received from the carrier. Any loss or damage which occurs to this shipment while enroute is not due to any action or conduct of the manufacturer.

### Visible Loss or Damage

If any of the goods called for on the bill of lading or express receipt are damaged or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt.

### Concealed Loss or Damage

When a shipment has been delivered to you in apparent good condition, but upon opening the crate or container, loss or damage has taken place while in transit, notify the carrier's agent immediately.

### Damage Claims

You must file claims for damage with the carrier. It is the transportation company's responsibility to reimburse you for repair or replacement of goods damaged in shipment. Claims for loss or damage in shipment must not be deducted from the **Ingersoll-Rand** invoice, nor should payment of **Ingersoll-Rand** invoice be withheld awaiting adjustment of such claims as the carrier guarantees safe delivery.

You may return products damaged in shipment to us for repair, which services will be for your account and form your basis for claim against the carrier.

## United States Office Locations

### For Order Entry, Order Status and Technical Support

**Ingersoll-Rand  
Distribution Center**  
P.O. Box 618  
510 Hester Drive  
White House, TN 37188  
Phone: (615) 672-0321  
Fax: (615) 672-0801

**Web Site at:**  
[www.ingersoll-rand.com](http://www.ingersoll-rand.com)

### Regional Sales Offices

**Chicago, IL**  
888 Industrial Drive  
Elmhurst, IL 60126  
Phone: (630) 530-3800  
Fax: (630) 530-3891

**Detroit, MI**  
23192 Commerce Drive  
Farmington Hills, MI 48335  
Phone: (248) 476-6677  
Fax: (248) 476-6670

**Houston, TX**  
450 Gears Road  
Suite 210  
Houston, TX 77067-4516  
Phone: (281) 872-6800  
Fax: (281) 872-6807

**Los Angeles, CA**  
11909 E. Telegraph Road  
Santa Fe Springs, CA  
90670-0525  
Phone: (562) 948-4189  
Fax: (562) 948-1828

**Philadelphia, PA**  
P.O. Box 425  
900 E. 8th Ave., Suite 103  
King of Prussia, PA 19406  
Phone: (610) 337-5930  
Fax: (610) 337-5912

## International Office Locations

Offices and distributors in principal cities throughout the world. Contact the nearest **Ingersoll-Rand** office for the name and address of the distributor in your country or write/fax to:

**Ingersoll-Rand  
Distribution Center**  
P.O. Box 618  
510 Hester Drive  
White House, TN 37188  
Phone: (615) 672-0321  
Fax: (615) 672-0801

**Canada  
National Sales Office  
Regional Warehouse  
Toronto, Ontario**  
51 Worcester Road  
Rexdale, Ontario  
M9W 4K2  
Phone: (416) 213-4500  
Fax: (416) 213-4510  
**Order Desk**  
Fax: (416) 213-4506

### Regional Sales Offices

**Edmonton, Alberta**  
1430 Weber Center  
5555 Calgary Trail N.W.  
Edmonton, Alberta  
T6H 2PG  
Phone: (403) 438-5039  
Fax: (403) 437-3145

**Montreal, Quebec**  
3501 St. Charles Blvd.  
Kirkland, Quebec  
H9H 4S3  
Phone: (514) 695-9040  
Fax: (514) 695-0963

**British Columbia**  
1200 Cliveden Avenue  
Delta, B.C.  
V3M 6G4  
Phone: (604) 523-0803  
Fax: (604) 523-0801

### Latin America Operations Ingersoll-Rand Production Equipment Group

730 N.W. 107 Avenue  
Suite 300, Miami, FL, USA  
33172-3107  
Phone: (305) 559-0500  
Fax: (305) 222-0864

### Europe, Middle East and Africa

**Ingersoll-Rand  
Material Handling  
Douai Operations**  
111, avenue Roger Salengro  
59450 Sin Le Noble, France  
Phone: (33) 3-27-93-08-08  
Fax: (33) 3-27-93-08-00

### Asia Pacific Operations

**Ingersoll-Rand**  
Suite 1201-3 12/F  
Central Plaza  
18 Harbour Road  
Wanchai, Hong Kong  
Phone: (852) 9794 1673  
Fax: (852) 9794 1673

### Russia

**Ingersoll-Rand**  
Kuznetsky Most 21/5  
Entrance 3  
Moscow, Russia 103895  
Phone: 7 501 923 9134  
Fax: 7 501 924 4625