INSTRUCTION MANUAL
For
HYDRAULIC DRIFTER

Model:
MW-80H

Read this Instruction Manual before operating this equipment.

WOLF
METALÚRGICA
Equipamentos Pneumáticos e Hidráulicos

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The Hydraulic Drifter described in this literature is manufactured by WOLF exacting standards.

For maximum utilization and efficiency in operating this equipment, we urge you to thoroughly read the entire contents of this manual before you begin to drill.

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1. INTRODUCTION

This instruction manual contains information for safety, operation, maintenance, service information, troubleshooting for the drifter MW-80H (here-after referred to as drifter).

2. ABBREVIATION LIST

Abbreviation, Symbol or Term	Meaning
A	All- Purpose Grease
C	Celsius (Temperature)
Etc.	Etcetera
Ft.	Feet
F	Fahrenheit (Temperature)
FDO	Final Driver Oil
GO	Gear Oil
HO	Hydraulic Oil
HP	Horsepower
Hr.	Hour
In.	Inches
IM	Instruction Manual
Kg	Kilogram
Kg/cm^2	Kilograms per Square Centimeter
Km	Kilometer
Km/hr	Kilometer per Hour
Kw	Kilowatts
Lb-ft	Pound Feet
L	Liter
L.H.	Left Hand
Max.	Maximum
Min.	Minimum
Mm	Millimeter
MPa	Mega Pascal
Mph	Miles Per Hour
M	Meter
MO	Motor Oil
$M^3/min.$	Cubic Meters per Minute
Nm	Newton Meter
Pt	Pint
Pl	Part List
Psi	Pounds per Square Inch
RDO	Rock Drill Oil
R.H.	Right Hand
SCFM	Standard Cubic Foot Per Minute
Tl	Thread Lubricant
RPM	Revolution Per Minute

3. SAFETY FIRST

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This section contains important information for the Top Hammer MW-80H (here-after referred to as drifter).

Safety First is the primary concern for the protection of both, personnel and the machine during any phase of operation. All personnel must thoroughly understand all safety precautions before operating or doing any maintenance work on the machine.

3.1 Safety Alert Symbol and Signal Words

⚠ This is the Safety Alert Symbol. When you see this symbol on the machine or in this instruction manual, be alert to presence of a hazard.

All Personnel must understand the **DANGER**, **WARNING**, **CAUTION**, and **NOTICE** used throughout the next of this instruction manual. The **DANGER**, **WARNING**, **CAUTION**, and **NOTICE** are defined as follows:

⚠ DANGER

Danger is used to indicate the presence of a hazard, which will cause severe personal injury or death if warning is ignored.

⚠ WARNING

Warning is used to indicate the presence of a hazard which can cause severe injury or death if warning is ignored.

⚠ CAUTION

Caution is used to indicate the presence of a hazard which will or can cause personal 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.

By understanding what **DANGER**, **WARNING**, **CAUTION**, and **NOTICE** mean: and using good judgment and common sense, all personnel can avoid injuring themselves and or damaging the machine.

3.2 Safety Precautions

a) DO NOT ATTEMPT TO OPERATE THE HYDRAULIC DRIFTER UNLESS YOU ARE THOROUGHLY FAMILIAR WITH ALL THE CRAWLER GAUGES, CONTROLS, AND

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FUNCTIONS. REFER TO THE SECTION OF THE CRAWLER INSTRUCTION BOOK FOR DETAILED INSTRUCTIONS. FAILURE TO COMPLY COULD RESULT IN BODILY INJURY.

b) ALWAYS WEAR APPROVED HARD HAT, SAFETY SHOES, SAFETY GLASSES, NOSE MASK AND EAR PROTECTION WHEN NEAR A DRIFTER IN OPERATION.

c) KEEP HANDS, ARMS, LEGS AND CLOTHING AWAY FROM ALL MOVING PARTS. FAILURE TO COMPLY COULD RESULT IN BODILY INJURY.

d) THE DRIFTER, STRIKING BAR, COUPLINGS, DRILL STEELS AND BIT ARE HOT DURING THE DRILLING OPERATION. DO NO TOUCH THESE PARTS WITH YOUR BARE HANDS. WEAR GLOVES TO PROTECT YOUR HANDS WHEN YOU ARE CHANGING BITS OR STEELS. A SEVERE BURN WILL RESULT IF ROTATING PARTS ARE TOUCHED WITH BARE HANDS.

e) KEEP ALL HOSE CONNECTIONS TIGHT. A LOOSE HOSE CONNECTION NOT ONLY CAUSES LEAKS AND POOR PERFORMANCE, BUT MAY ALSO ALLOW THE HOSE TO COME OFF THE DRIFTER, WHIP AROUND, AND INJURE THE OPERATOR OR OTHER PEOPLE IN THE AREA.

f) MAKE SURE THAT THE PARTS-CLEANING SOLVENT IS NON-FLAMMABLE, WILL NOT HARM THE SKIN, MEETS CURRENT SAFETY AND HEALTH STANDARDS, AND IS USED IN WELL VENTILATED AREA.

g) DRY NITROGEN IS THE ONLY GAS PRODUCT TO BE USED TO CHARGE THE DRIFTER ACCUMULATORS. NEVER USE OXIGEN TO CHARGE THE ACCUMULATORS. IGNITION OF AN OXIGEN AND OIL MIXTURE COULD PRODUCE AN EXPLOSION, WHICH COULD SEVERELY INJURE PERSONNEL IN THE AREA.

h) MAKE SURE THE ACCUMULATORS ARE IN GOOD CONDITION. MAKE SURE THE ACCUMULATOR COMPONENTS HAVE NO CRACKS OR SIGNS OF EXCESSIVE WEAR. WHEN PRESSURIZED, A DAMAGED ACCUMULATOR COULD BURST, SCATTERING METAL FRAGMENTS THROUGHOUT THE AREA WHICH COULD SEVERELY INJURE PERSONNEL.

i) BE SURE TO BLEED THE ACCUMULATORS BEFORE ANY ACCUMULATOR DISASSEMBLY IS ATTEMPTED.

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4. INTRODUCTION

This section provides a description and specifications of the Hydraulic Drifter MW-80H (hereafter referred to as drifter).

4.1 DESCRIPTION

The hydraulic drifter is a valved, hydraulically-operated hammer drill that incorporates and integral, independently-controlled, hydraulically-powered rotation motor to rotate the drill steel and bit.

The drifter is capable of drilling 3 to 4 in. (76 to 100mm) diameter holes in all types of rock formations. It is especially suitable for pipeline work, drilling vertical and angle blast holes in quarries, and on any construction jobs where large volume rock excavations are required.

Since the drifter is hydraulic, there are only two moving parts to control hammer action: the piston and the piston valve. The piston provides the impact force which is transmitted to the drill steel. The valve alternately switches pressure from supply to exhaust. This action produces a high frequency reciprocation of 2600 cycles per minute. The piston strikes the striking bar on each forward (power) stroke, thus, transmitting the blow energy through the steel to the bit at 2600 blows per minute.

The hydraulically-powered rotation motor is independently controlled and is designed to provide continuous drill steel rotation-forward or reverse. The motor converts hydraulic fluid to rotation power and transmits the rotation power to the spur gear train housed in the drifter fronthead. The hydraulic rotation motor provides smooth, powerful rotation, especially at low rotation speeds, and assures the operator of positive rotation control under all drilling conditions.

Since hammer action and drill steel rotation are independently controlled, the best combination of individual control of both functions can be selected for the most efficient drilling in a particular formation.

Since the drifter operates on hydraulic fluid power, instead of air, its operation is unaffected by altitude. In addition, there is no noise from air exhaust and no fog buildup in working areas.

The only air requirements for the drifter are: for hole cleaning and fronthead lubrication. The drifter is equipped with a ¾ in. (19mm) outside diameter blower tube which carries hole cleaning air from the inlet connection in the backhead, through the center of the drifter, striking bar, drill steel and bit to the bottom of the hole without contacting any of the internal parts of the drifter.

⚠ CAUTION

THE DRIFTER ACCUMULATORS REQUIRE CHECKING EVERY 250 HOURS OF OPERATION.

The drifter uses two nitrogen-charged diaphragm accumulators to dampen vibrations in the supply and return hoses. The supply line (high pressure) accumulator must be charged to 853 psi (60 kg/cm²). The return line (low pressure) accumulator must be charged to 57 psi

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(4 kg/cm²). An accumulator charging kit is furnished as a standard accessory item with the hydraulic machine.

The drifter is designed with chuck parts to accommodate a 6-splined striking bar. A striking bar is not furnished as standard equipment with the drifter.

4.2 SPECIFICATIONS

Tables below show specifications for the drifter.

	U.S.	Metric
Net Weight ……..…….….....	463 lb.	210 Kg
Overall Length (less striking bar) ……..…….....	40.35 in.	1025 mm
Overall Width …….....	14.17 in.	360 mm
Overall Height …….....	11.61 in.	295 mm
Drill Hammer Hydraulic Operating Pressure …….....	1991 psi	140 kg/cm²
Hammer Blows Per Minute (variable) …….....	2600 bpm	2600 bpm
Diameter of Drill Inlet Hydraulic Hose …….....	¾ in.	19 mm
Diameter of Blower Hose …….....	¾ in.	19 mm
Diameter of Front End Lubrication Hose ……..…….....	3/8 in.	i.5 mm
Supply Accumulator Charge Pressure (Drifter) ……..….....	853 psi	60 kg/cm²
Return Accumulator Charge Pressure (Drifter) …….....	57 psi	4 kg/cm²
Supply Accumulator Charge Pressure (Reverse Percussion)	853 psi	60 kg/cm²
Return Accumulator Charge Pressure (Reverse Percussion)	853 psi	60 kg/cm²

NOTICE: This data based on hydraulic supply of 29.27 gpm (110 liters/min) at 1991 psi (140 kg/cm²) at the inlet.

Rotation Motor Specifications

	U.S.	Metric
Diameter of Hydraulic Hoses (2) ..…….....	½ in.	12.7 mm
Stall Torque at Chuck …….....	427 lb-ft	578 Nm
Rotation Speed at Chuck (Normal Operating Speed)	0 to 150 rpm	
Maximum Chuck Rotation Speed (Free Speed).....	150 rpm	

NOTICE: This data based on hydraulic supply at 11.89 gpm (45 liters/min.) at 1991 psi (140 kg/cm²) at the inlet.

Shipping Information

	U.S.	Metric
Net Weight of Drifter …….....	463 lbs	210 Kg
Shipping Weight ……..…….....	483 lbs	219 Kg

5. REQUIREMENTS

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This section provides air requirements, operating principles, hydraulic requirements, and lubrication requirements of the Hydraulic Drifter MW-80H (hereafter referred to as drifter).

5.1 HYDRAULIC REQUIREMENTS

The hydraulic power required to operate the drifter is divided into two independent functions:

a. **Hammer Operation –** The hydraulic system must be capable of supplying hydraulic fluid to the drifter at a rate of 29.27 gpm (110 liters/min.) at 1991 psi (140 kg/cm²).

b. **Drill Steel Rotation –** The Hydraulic system must be capable of supplying hydraulic fluid to the rotation motor on the drifter at a rate of 11.89 gpm (45 liters/min.) at 1991 psi (140 kg/cm²).

WOLF hydraulic crawler machines are designed to use this hydraulic drifter. Basically, its hydraulic system contains a fluid reservoir, which stores a supply of hydraulic oil; pumps, which develop and deliver the required hydraulic oil pressure and flow to operate the drifter and its rotation motor; filters for removing particulate contamination from the oil supply, control valves to initiate hammer action and control the speed and direction of the rotation motor; and an oil cooper to maintain the entire system at an optimum operating temperature. An arrangement of hoses and fittings carries the oil from the reservoir through the pumps and regulating controls to the drifter and rotation motor and back to the reservoir through the oil cooler.

5.2 LUBRICATION REQUIREMENTS

The Drifter uses an oil mist to provide lubrication to all critical points in the front end of the drifter. A 3/8 in. (9.5 mm) diameter hose, connected to the drifter, carries the oil-laden air from a lubricator (part of drilling machine), to the front end of the drifter. The amount of lubrication provided is controlled by the lubricator located on the drilling machine.

5.3 AIR REQUIREMENTS

The air requirements for the drifter are for front end lubrication and hole cleaning. For normal drilling conditions, a minimum flow of 10 scfm (0.28 m³/min.) at a pressure of 100 psi (7.03 kg/cm²) is required for lubrication and the remaining air for hole cleaning.

5.4 HOSES AND FITTINGS

Only quality hose designed especially for rock drill service should be used. It should be constructed with an outer covering which resists abrasive wear and have a working pressure safety factor of at least 4 to 1 in relation to burst.

Hoses and hose fittings must be in good condition, and the fittings must be kept tight.

The following lists the hoses required to operate the drifter and the diameter of each hose:

a. Inlet Hydraulic Hose - ¾ in, (29 mm) diameter.
b. Return Hydraulic Hose - ¾ in. (19 mm) diameter.
c. Forward Rotation Hydraulic Hose - ½ in. (12.7 mm) diameter.
d. Reverse Rotation Hydraulic Hose - ½ in. (12.7 mm) diameter.
e. Front End Lubrication Hose – 3/8 in. (9.5 mm) diameter.

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5.5 BASIC OPERATING PRINCIPLES

The operation of the drifter is based on two independent basic operating principles: (a) the principle that causes the piston to reciprocate (hammer action) and (b) the principle governing the drill steel rotation.

5.6 DRILL PISTON RECIPROCATION

The drifter is a valved hydraulic drill. The valve cylinder assembly and cylinder liner convert hydraulic fluid pressure into efficient hammer action. The piston within the cylinder liner provides the impact force which is transmitted to the drill steel. The valve alternately switches pressure from supply to exhaust. This action produces a high frequency reciprocating action of 2600 cycles per minute. The piston strikes the striking bar on each forward (power) stroked, and through the striking bar and steel, drives the drill bit into the rock at 2600 blows per minute.

5.7 DRILL STEEL ROTATION

The drifter is designed with an independently-controlled, hydraulic-powered, rotation motor that provides continuous drill steel rotation–forward or reverse.

The motor converts hydraulic fluid to rotation power and transmits the rotation power to a drive gear which is part of the spur gear train housed in the drill fronthead. Thus, as the drive gear is rotated, the meshing chuck gear and mating chuck driver follow the rotation. Splines within the chuck driver mate with those in the striking bar, thereby imparting the rotation through the drill steel to the bit.

5.8 OPERATING CONTROLS

Hammer action, drill steel rotation and feed are controlled separately and each must be regulated for optimum results in the drilling conditions encountered. All operating controls for the drifter are located on the drilling machine console. Refer to the operation section of the drilling machine instruction book for detailed descriptions and instructions covering all operating controls and gauges.

5.9 CHARGING THE DRIFTER ACCUMULATORS

The drifter uses nitrogen accumulators to dampen vibrations in the pressure and return hoses. Before operating the drifter, both accumulators must be charged.

NOTICE

An accumulator charging kit is furnished as a standard accessory item with the drilling machine.

The following **DANGER** Precautions must be observed when charging the drifter accumulators:

⚠ DANGER

DRY NITROGEN IS THE ONLY GAS PRODUCT TO BE USED TO CHARGE THE DRILL ACCUMULATORS. NEVER

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USE OXIGEN TO CHARGE THE ACCUMULATORS. IGNITION OF AN OXIGEN AND OIL MIXTURE IN THE ACCUMULATOR COULD PRODUCE AN EXPLOSION, WHICH COULD SEVERELY INJURE PERSONNEL IN THE AREA.

MAKE SURE THE ACCUMULATORS ARE IN GOOD CONDITION. MAKE SURE THE ACCUMULATOR HOUSING HAS NO CRACKS OR SIGNS OF EXCESSIVE WEAR. A DAMAGED ACCUMULATOR COULD RUPTURE AND SEVERELY INJURE PERSONNEL.

To charge the drifter accumulator, proceed as follows:

a. Using a spanner wrench, remove the protective caps from the accumulator covers on both accumulators.
b. Loosen the accumulator valve slightly (about 1/8 of a turn).
c. Attach the charge valve assembly to the accumulator, turning the assembly hand tight.
d. Connect the nitrogen bottle hose to the charge valve assembly charging port.
e. Make sure the discharge valve on the side of the charging valve assembly is closed. (Turning clockwise closes the valve).
f. Turn the change valve on top of the charging valve assembly counter-clockwise to open the accumulator valve. Open valve three to four turns.

NOTICE

Failure to open the accumulator valve a full three to four turns may result in damage to the seal when the nitrogen bottle valve is opened.

g. Slowly open (turn counter-clockwise) the valve on the nitrogen bottle and allow the pressure to build. Close the valve when the pressure reaches proper setting. If the pressure becomes higher, adjust the pressure by using the discharge valve on the charging valve assembly.
h. Close the accumulator valve by turning the charging valve on the charging valve assembly.
i. Open the discharge valve to release gas in the charging valve assembly and the hose.
j. Remove the nitrogen bottle hose.
k. Remove the charging valve assembly.
l. Tighten the accumulator valve. Torque the valve to 22 lb – ft (30 Nm).
m. Replace the accumulator protective cap.
n. Follow the same procedure to charge the second accumulator. The drifter is then ready for service.

5.10 CONNECTING THE STRIKING BAR

a. Make sure all striking bars and threaded accessories are properly greased.

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NOTICE

It is very important that all threaded accessories be properly lubricated and cared for at all times. Proper lubrication will result in longer part life and will simplify threading and unthreading of all connections. Make sure that all threads are clean and free of dirt and coated with a high pressure grease or equivalent each time they are coupled or stored.

b. Remove the two chuck end cap bolts and nuts.
c. Remove the chuck end cap, cap liner, and o-ring.
d. Make sure the striking bar is equipped with a seal and the lip of that seal is facing the striking bar splines.
e. Coat the striking bar with clean oil and insert the shank end of the striking bar into the chuck.
f. Insert the chuck end cap liner, o-ring and chuck end cap and secure with two chuck end cap bolts and nuts.

5.11 DRILLING PROCEDURES

Detailed operating and drilling instructions are covered in the operation section of the drilling machine instruction book.

5.12 DRILLING TIPS

To ensure maximum operating efficiency, the following suggestions should be observed.

5.13 SUGGESTIONS FOR DRILLERS

a. Never pound on stuck steel. Nothing is accomplished thereby and the drifter and bit may be permanently damaged in the process.
b. Never strike the drifter with tools.
c. Every effort must be made to keep dust and dirt from entering the drifter. Preventing impurities from entering the drifter pays off in improved operation and reduced down-time for repairs.
d. Always be sure the drifter front end parts are well lubricated. Oil must be detected on the striking bar of proper rotation component lubrication. Adjust the oil reservoir so that the striking bar always shows an oil film. Refer to drilling machine instruction manual for time intervals for checking oil reservoir. Keep the lubricator well supplied with oil at all times.
e. Always keep the drifter aligned with the drill steel and hole. This assures straight and true holes that go in fast. Most importantly, this prevents unnecessary wear and damage to the drill.
f. Always use the centralizer to guide the drill steel during the drilling operation.

5.14 DRILL STEEL CARE

a. It is very important that the threads of the drill steel be properly lubricated and cared for at all times. Steels having stripped threads, cracks, or severe galling must not be used. Also, care should be taken while drilling not to bend steel or gall threads due to misuse.

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b. Bent steel produces unnecessary stresses and accelerates wear on all fronthead components. Bent steel and severe thread galling can be avoided if the following steps are taken:
c. Be sure that the steel is bottomed in the striking bar,couplings, and bit.
d. All threads must be in good condition and well greased.
e. Always drill with a sharp bit (no more than 1/8 in. [3.175 mm] flat on carbides). Dull bits cause excessive pounding and unnecessary stresses on all threads and drifter fronthead parts.
f. Approach the rock at reduced feed pressure, position carefully, and collar hole. Once bit is collared in rock, full feed pressure may be applied.
g. Always keep sufficient feed pressure on steel system. Insufficient feed pressure will cause joints to loosen and threads will be damaged.
h. Always maintain alignment between the drifter and the hole.

5.15 BIT CARE

For long bit life, “Drill Steel Care”must also be applied to the bit. In addition, the following steps must also be taken:

a. Never allow the bit to become plugged with loose cuttings. Blow the hole continuously.
b. Never force or broach the bit into a hole.
c. “Rattle”bits from steel using the drifter hammer action with light feed pressure and no rotation. Use a Stillson or Bit wrench to remove the bit. Never strike the bit with a hammer.
d. Bit carbides should never be allowed to flatten any greater than 1/8 in. (3.175 mm) between regrinding intervals.

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6. DISASSEMBLY, INSPECTION AND ASSEMBLY

This section provides information on drifter disassembly, inspection of parts, assembly instructions and lubricant specifications of the Hydraulic Drifter MW-80A (hereafter referred to as drifter).

The drifter must be included in a definite preventive maintenance schedule to assure top performance and long, efficient service life. The operating performance is directly dependent upon the condition in which the working parts and interacting systems are maintained. The following areas must be included in a preventive maintenance "check-list" to assure reliable and consistent drifter operation.

6.1 HYDRAULIC SYSTEM

Clean hydraulic oil is the life-blood of the drifter. Without an adequate supply of clean oil of proper weight at the correct pressure and temperature, the drill cannot operate properly.

a. Make sure the hydraulic oil is kept free of dirt. Check that all filters are properly installed and serviced regularly.
b. Hydraulic oil conforming to the specifications as outlined in the drilling machines instruction manual.
c. Maintain the correct level of hydraulic fluid in the hydraulic oil reservoir to prevent overheating and foaming.
d. Make sure the system heat exchangers or radiator type oil coolers are kept free of dirt.

6.2 HOSES

a. Never allow the hydraulic system hoses to remain uncapped or exposed at any time. Always cap hoses and fittings immediately when disconnecting any part of the hydraulic system.
b. Make sure all hoses are clean before connecting them to any part of the hydraulic system.
c. Make sure all hoses are clean before connecting them to the drifter.
d. Always use the proper size hoses.
e. Make sure all hose connections are tight and all hoses, fittings, and adapters are in top-notch condition.

⚠ DANGER

A LOOSE HOSE CONNECTION NOT ONLY CAUSES LEAKS, BUT THE HOSE MAY COME COMPLETELY OFF THE TOOL, WHIP AROUND AND CAUSE INJURY TO THE OPERATOR.

6.3 DRIFTER

a. Never allow the hose adapters on the drifter to remain uncapped. Dirt contamination of the drifter will cause accelerated wear and drifter failure.
b. Be certain that the striking end of the striking bar is square, flat and free of all sharp edges. The striking bar should be repaired or discarded if cracked, peened, or crowned.

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c. Be sure that the hole in the drill steel is open.
d. Excessively dull bits cause slow drilling and excessive pounding within the drifter. Always change the bit when there is an appreciable drop off in drilling speed, or any noticeable change in the action of the drifter.
e. Be certain that the drifter front end parts are well lubricated. Oil must be detected on the striking bar for proper rotation of lubricating oil provided is controlled by air and oil regulators located at the drilling control console on the drilling machine. Adjust the oil flow so that the striking bar always shows an oil film. Refer to drilling machine instruction manual for time intervals for checking oil reservoir. Keep the lubricator well supplied with oil at all times. Keep the lubricating oil free of dirt.
f. Schedule regular periods for checking front end lubrication. Do not wait for physical evidence of poor lubrication.
g. The drifter fronthead should be taken apart periodically, cleaned, and parts inspected for wear and distortion.
h. Hydraulic seals and o-rings wear during normal operation. Hydraulic oil leakage may be and indication that seals or o-rings need to be replaced.
i. If a drifter is not operating properly, investigate the problem as described in Section 6 covering “Troubleshooting”.

6.4 LUBRICANT SPECIFICATIONS

The Topic outline the lubricants required for the drifter.

6.5 HYDRAULIC OIL

Refer to the instruction manual for the drilling machine for the specifications of the hydraulic oil.

6.6 FRONT END LUBRICATING OIL

CAUTION

KEEP THE ROCK DRILL LUBRICANT CLEAN AND FREE FROM ALL FOREIGN MATTER TO PREVENT TO THE INTERNAL PARTS.

The rock drill oil used in the air line lubricator must be a well refined petroleum lubricating oil. It must be suitably compounded to provide the specified consistency and film strength, and the further compounded to provide the specified steam emulsion number, which is required to provide satisfactory lubricant. Though the composition of the “film strength” additive is not specified, it must be non-corrosive to both steel and bronze,and contain little or no sulphur.

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Table 1. Rock Drill Oil Specifications

Characteristic	Test Procedure	Below 20°F (-7°C)	20°F to 90°F (-7°C to 32°C)	Above 90°F (32°C)
Viscosity:		175 min.		
SUS at 100°F (38°C)	ASTM-D2161	46 min.	450 min.	750 min.
SUS at 210°F (99°C)	ASTM-D2161	37 min.	65min.	85 min.
cST at 104°F (40°C)	ASTM-D445	6 min.	105 min.	160 min.
cST at 212°F (100°C)	ASTM-D445	-10°F	11 min.	16 min.
Pour Point, °F (°C) max.	ASTM-D97	(-23°C)	-10°F	0°F
		370°F	(-23°C)	(-18°C)
Flash Point, °F (°C) min.	ASTM-D92	(188°C)	400°F	450°F
		90	(204°C)	(232°C)
Viscosity Index, min.	ASTM-D2270	1200	90	90
Steam Emulsion No. Min.	ASTM-1935-	Stringy	1200	1200
Consistency	65	2000 lbs	Stringy	Stringy
Falex Load Test lbs (kg)	.....	(907 kg)	2000 lbs	2000 lbs
[min]	ASTM-D2670		(907 kg)	(907 kg)
		30 lbs	30 lbs	30 lbs
Timken E.P. Test lbs (kg) [min]	ASTM-D2782	(14 kg)	(14 kg)	(14 kg)

Table 2. Selection Chart

Typical Operating Conditions	Below 20°F (-7°C)	20°F to90°F (-7°C to 32°C)	Above 90°F (32°C)
100 – 150 psi (7.03 – 10.5 kg/cm²)	Light	Medium	Heavy

6.7 DRILL STEEL THREAD LUBRICANT

It is very important that the threads of all striking bars, drill rods, couplings and bits be properly lubricated and cared for at all times. Proper lubrication will result in longer life and will simplify threading and unthreading drill rod joints.

Use a good molybdenum di-sulphide type thread grease such as.

6.8 MAINTENANCE

To ensure maximum life and top performance of the equipment, it is necessary that the maintenance be made before serious damage occurs. It is important to be cautious when performing any service work. A general knowledge of the system and/or components is important before the removal or disassembly of any components. The following is a list of basic precautions that must always be observed:

a. Never attempt major work on the drifter in the field. The drifter may be in worse condition after major maintenance was tried in the field than before. Send the drifter to the shop.
b. Clean the exterior of the drifter before tearing it down.
c. Use a soft metal, plastic, or wood hammer for driving the heavier exterior parts.
d. Handle parts carefully. Hardened parts might chip or break it drooped on a hard surface.

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e. Clean disassembled parts in a solvent. Probe ports in the backhead, housing, housing liner, drive gear cover, etc. to loosen and remove foreign matter. Place the small parts in a clean container so they will not become lost.

⚠ DANGER

WHEN USING ANY SOLVENT TO CLEAN PARTS, MAKE SURE THAT IT MEETS CURRENT SAFETY AND HEALTH STANDARDS AND THAT IT IS USED IN AN AREA THAT IT IS USED IN AN AREA THAT IS ADEQUATELY VENTILATED.

6.9 DRIFTER DISASSEMBLY

a. Place the drill guide in a horizontal position.
b. Feed the drifter down the guide until it is in the most accessible position.
c. Disconnect, plug, and tag the blower air house, front end lubrication hose, supply and return hydraulic hoses, and forward and reverse rotation hydraulic hoses.
d. Install caps on the hose fittings to prevent dirt from entering the drifter.
e. Remove the nuts and bolts which secure the drifter to the mounting plate, and use a suitable hoist to lift the drifter off the mounting plate.
f. Take the drifter to a clean work area to disassemble it.

⚠ DANGER

THE DRIFTER MUST BE PLACED IN A HORIZONTAL POSITION AND FIXED BY BOLTS ON A WORK BENCH FOR DISASSEMBLY. A DRIFTER POSITIONED VERTICALLY COULD FALL AND CAUSE A SEVERE CRUSHING INJURY TO PERSONNEL.
WHEN USING ANY SOLVENT TO CLEAN PARTS, MAKE SURE THAT IT MEETS CURRENT SAFETY AND HEALTH STANDARDS AND THAT IT IS USED IN AN AREA THAT IS ADEQUATELY VENTILATED.

g. Loosen and remove the two chuck end bolts and nuts.
h. Loosen the four through-bolt nuts.
i. Loosen the twelve bolts which attach the accumulator assemblies to the cylinder.
j. Loosen the backhead gland with an open end wrench. Pull out the backhead gland and blow tube in one piece.

⚠ CAUTION

BE EXTREMELY CAREFUL WHEN REMOVING THE CHUCK END CAP, CHUCK AND STRIKING BAR. THESE PARTS MAY FALL APART AND CAUSE INJURY TO PERSONNEL.

k. Remove the chuck end cap, chuck and striking bar at the same time, being careful not to drop any of the parts.

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l. Unscrew and remove the four through-bolt nuts and pull the four through-bolts out of the drifter.
m. Using a plastic hammer, drive off the chuck end.
n. Pull the chuck driver out of the gear box.
o. Unscrew the four capscrews which hold the hydraulic motor to the gear box.
p. Pull the hydraulic motor out of the gear box .
q. Unscrew the four bolts and remove the cover and o-rings.
r. Use two wooden blocks to support the cylinder so that the backhead (1) can be removed with a plastic hammer.
s. From the chuck end of the drifter, strike the front surface of the piston with a hammer and plastic drift. Drive the piston, valve, valve guide and cylinder back liner out of the cylinder until they can be pulled the rest of the way out by hand.
t. Using both hands, pull the piston, valve, valve guide and cylinder back liner the rest of the way out of the cylinder.
u. Using one of the cover bolts to insert into the gear shaft, pull the gear shaft out of the gear box, Support the idler gear with the other hand so that it will not drop when the gear shaft is pulled out.
v. Separate the gear box from the cylinder with a plastic hammer.
w. Set the gear box on its chuck side. From the backhead side of the gear box, use a hammer and suitable steel bar to drive the drive gear and bearings from the gear box.
x. With the gear box on a suitable fixture (cylinder side down), use a hammer and appropriate drift to drive the front liner out of the gear box.
y. With the gear box on a suitable workbench (cylinder side up), use a hammer and appropriate drift to drive the bushing out of the gear box.
z. Unscrew the twelve bolts which hold the three accumulators to the cylinder and remove the accumulators from the cylinder.

⚠ DANGER

BE SURE TO BLEED THE ACCUMULATORS BEFORE ANY ACCUMULATOR DISASSEMBLY IS ATTEMPTED.

aa. Put the accumulator in a vise and with a spanner wrench remove the cap from the accumulator cover.
bb. Loosen the accumulator valve slightly to bleed the gas from the accumulator.
cc. Unscrew the cover from the accumulator body.
dd. Remove the diaphragm from the accumulator body .
ee. Remove the two seals from the cylinder liner, seals from the back liner and seal wiper ring from the front liner.

NOTICE

Do not remove the cylinder liner unless service is required on the liner.

ff. If necessary to remove the cylinder liner, insert and appropriately sized tool into the cylinder and drive the cylinder liner out with a large hammer or press.

NOTICE

Do not remove any of the bushings unless they require servicing.

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gg. Place the chuck end on an appropriate fixture so that the bushing can be driven out from the chuck side of the chuck end.
hh. Remove the chuck bushing and cap liner if necessary.

6.10 HYDRAULIC ROTATION MOTOR DISASSEMBLY

NOTICE

Clean the exterior of the motor. Cleanliness is extremely important when repairing the hydraulic rotation motor. Work in a clean area.

a. Drain the oil from inside the motor.
b. Place the motor in a vise with the output shaft down.

⚠ CAUTION

CLAMP ACROSS THE MOUNTING FLANGE AREA OF THE BEARING HOUSING. EXCESSIVE CLAMPING PRESSURE WILL CAUSE DISTORTION. WHEN CLAMPING, USE SOME PROTECTIVE DEVICE ON THE VISE, SUCH AS SPECIAL SOFT JAWS OR PIECES OF HARD RUBBER OR BOARD.

c. Unscrew the four bolts and lift the valve housing straight up.

NOTICE

If done carefully, the pins, springs, balance plate and valve will remain on the valve plate.

d. Carefully remove the o-ring from the valve housing.
e. Remove the two pins and springs from the balance plate.
f. Remove the balance plate, valve, and inner and outer face seals.
g. Lift the valve plate away from the geroler.
h. Carefully remove the o-ring from the valve plate.
i. Lift the valve drive out of the geroler.
j. Remove the geroler. Be sure to retain the rollers in the outer ring if they are loose.
k. Pull the drive away from the wear plate.
l. Carefully remove the o-ring from the wear plate.
m. Lift the wear plate away from the bearing housing.
n. Remove the shaft face seal from the wear plate.
o. Remove the o-ring from the bearing housing.

NOTICE

You may need a press to remove the shaft/bearing kit from the bearing housing.

p. Remove the shaft/bearing kit from the bearing housing.
q. Use a small screwdriver to remove the shaft oil seal and dust seal from the bearing housing.

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CAUTION

BE CAREFUL NOT TO DAMAGE THE BORE OF THE BEARING HOUSING.

6.11 INSPECTION OF PARTS

The operating performance of the drifter depends on the condition in which the working parts are maintained. When it is necessary to disassemble the drifter for repairs, all parts should be inspected for wear and damage and replacement parts installed when necessary.

a. Hydraulic Rotation Motor

a) Clean all metal parts in clean solvent and blow dry with air. Do not wipe dry with a cloth or paper towel because lint or other matter can get into the motor and cause damage.
b) Check all matting surfaces. Replace any parts that have scratches or burrs that could cause leakage. Do not use a coarse grit or try to file or grind these parts.
c) Check around the chamfered area of the shaft for burrs, nicks, or sharp edges that damage seals when reassembling.

b. Cylinder

Inspect cylinder bore for scratches, gouges and galling; repair any of these irregularities.

c. Backhead

Inspect the front face (the face that butts up to the cylinder) for scratches and gouges; repair any irregularities.

d. Cylinder Liner, Front Liner, Cylinder Back Liner and Cap Liner.

Inspect the inside diameters of the liners for galling, and seizure marks; repair any irregularities. Replace the liners if necessary.

e. Piston

a) Inspect the striking face of the piston to see if it is chipped. A piston with a chipped striking face must be replaced.
b) Inspect the outside diameter and inside diameter of the piston for galling. Any galling requires replacement of the piston.

f. Gear Box

Inspect the gear box faces for scratches and gouges; repair if necessary.

g. Gear Box Bushing

Inspect the gear box bushing for pitted, scraped, or worn surfaces and replace the bushing if necessary.

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h. Drive Gear

Inspect the front and rear faces of the drive gear for scraping and wear; inspect the drive gear teeth for galling, distortion, or bending; inspect the condition of the spline in the drive gear bore. Replace the drive gear if necessary.

i. Idler Gear

Inspect the front and rear faces of the idler gear for scraping and wear; inspect the idler gear teeth for galling, distortion, or bending; inspect the condition of the idler gear bore. Replace the idler gear if necessary.

j. Chuck Driver

Inspect the front and rear faces to the chuck driver for scraping and wear; inspect the pawl end of the chuck driver for distortion of the pawl. Replace the chuck driver if necessary.

k. Chuck

Inspect the pawl end for distortion and wear; inspect the condition of the spline in the inside bore. Replace the chuck if necessary.

l. Drive Gear Bearings

Inspect the drive gear bearings in the gear box. If the bearings are worn or damaged, use suitable pullers to remove them, then press in new bearings.

m. Idler Gear Bearings

Inspect the idler gear needle bearings in the idler gear. If the bearings are worn or damaged, use a suitable fixture to press out the bearings, then press in new bearings.

n. Chuck End Bushing

Inspect the chuck end bushing for pitted, scraped, or worn surfaces and replace the bushing if necessary.

o. Striking Bar.

a) The striking face of the striking bar must be square, flat, and free for all sharp edges. The striking bar must be discarded if cracked, peened, or crowned.
b) The tapered seating face of the striking bar must be free of cracks and sharp edges. If the face is peened to 1/16 in. (1.59 mm) deep or greater, the striking bar must be discarded.

p. O-rings and Seals.

Inspect all seals and o-rings for nicks, cuts, tears and deformation and replace as necessary. Hydraulic seals and o-rings wear during normal operation. Hydraulic oil leakage may be an indication that seals or o-rings need to be replaced.

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q. Bolts, Capscrews and nuts

Inspect the threads of all bolts, capscrews and nuts; repair as necessary.

6.12 ACCUMULATOR REASSEMBLY

a. Clamp the accumulator body into a vise.
b. Lightly lubricate each diaphragm and insert them in cavities in the accumulator body.

NOTICE

Be sure the lip on the outside edge of the diaphragm is properly seated in the groove in the accumulator body.

c. Install the accumulator covers using a suitable wrench. Torque the covers to 253 lb – ft (343 Nm).
d. Install the seal washers on the accumulator valves. Install the accumulator valves on the accumulator covers.

6.13 HYDRAULIC ROTATION MOTOR REASSEMBLY

⚠ CAUTION

KEEP DIRT ANDOTHER FOREIGN MATERIAL OUT OF THE DRIFTER. DIRT IN THE DRIFTER WILL RESULT IN DAMAGE TO THE PISTON AND OTHER INTERNAL COMPONENTS.

NOTICE

Lubricate all seals (prior to installation) with petroleum jelly. Always use new seals when reassembling the motor.

a. Reassemble in reverse order of disassembly, unless otherwise noted.
b. Alignment studs are extremely helpful when reassembling the motor. They can be shop made to the specifications.

NOTICE

Reassembly involves three steps in the timing of the rotation motor. Timing determines the direction of rotation of the motor output shaft, and thus, the rotation direction of the drill steel and bit. Timing parts include the geroler, valve drive, valve plate, and valve.

c. First Timing Step: Locate the largest pocket in the geroler and mark it on the outside edge of the geroler, proceed as follow:

➔ Install the valve drive in the geroler.
➔ Install the seal in the groove in the valve plate
➔ Align the case drain holes in the geroler and valve plate, and install the valve plate (seal side toward the geroler) against the geroler.

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➔ **Second Timing Step:** Locate the slot opening in the valve plate (7) which is in line with the largest open pocket in the geroler (5).

➔ **Third Timing Step:** Locate any one of the side openings that goes through the bottom face of the valve (8). Line up this side opening with the open slot of the valve plate (7) that is in line with the largest open pocket of the geroler (5). Rotate the valve (8) clockwise until the spline teeth engage.

⚠ CAUTION

INSTALL THE FACE SEALS IN THE POSITION OR THE MOTOR WILL NOT OPERATE PROPERLY. DO NOT FORCE OR BEND THE FACE SEALS. ANY DAMAGE TO THESE SEALS WILL ADVERSELY AFFECT THE OPERATION OF THE MOTOR. MAKE SURE THAT THE SEALS ARE FIRMLY SEATED.

6.14 INSPECTION OF ACCUMULATOR PRESSURES

⚠ CAUTION

THE DRIFTER ACCUMULATORS MUST BE CHECKED EVERY 250 HOURS OF OPERATION TO MAKE SURE THE PRESSURES ARE CORRECT. FOR THE CORRECT ACCUMULATOR PRESSURES AND BELOW FOR THE PROCEDURE FOR CHECKING THESE PRESSURES.

Using the furnished accumulator charging kit, check the accumulator pressures as follows:

a. Using the spanner wrench (furnished with the drifter), remove the protective caps from the accumulator covers on both accumulators.
b. Loosen the accumulator valve slightly (about an 1/8 of a turn).
c. Attach the accumulator valve assembly to the accumulator, turning the assembly hand tight.
d. Check the pressure gauge on the accumulator charging assembly.
e. If the accumulator pressure are incorrect, refer to above topic.

7. TROUBLESHOOTING

Troubleshooting will be accomplished by using the table provided in this section. Table 1 will provide a step by step question and remedy. Using both of these together will solve most common problems.

Table 1. Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Drifter will not start.	1. Could Hydraulic oil or wrong hydraulic oil.	1. Never use hydraulic oil that does not conform to the specifications outlined, Table 1. If ambient temperature is below 32F (0C), drill may be reluctant to start, but it will start if control valve is left in the position for a few minutes
	2. Drifter valve stuck.	2. Check valve for scoring, burrs,

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		or mechanical interference. Repair or replace.
Drifter lacks power (hydraulic supply pressure normally above 1991 psi [140 kg/cm²]).	1. Low hydraulic oil flow.	1. Increase flow setting.
	2. Leaking seals or o-rings	2. Check for tightness of hardware. If necessary, visually inspect seals.
	3. Piston not hitting striking bar at full blow.	3. Check for excessively worn striking bar splines or striking bar seat and replace if necessary. Replace striking bar if shank end is excessively worn.
Through bolt breakage.	1. Uneven tension on nuts or loose nuts.	1. Nuts must be tight and under equal tension. Tighten the nuts gradually and alternately. Apply 325 lb – ft. (441 Nm) of torque to nuts.
No steel rotation or rotation is weak	1. Steel binding in hole	1. Sharpen or replace worn bits. Apply correct amount of down-pressure and keep drill, steel and hole in alignment.
	2. Worn or leaking rotation motor.	2. Repair or replace motor.
	2. Incorrectly assembled chuck/drive gear components or excessively worn components.	3. Check for proper assembly of the chuck/drive gear components and for excessively worn components.
	4. One through bolt broken causing chuck end binding.	4. Replace broken through bolt. Apply 360 lb – ft (488 Nm) of torque to both nuts.
TROUBLE	**PROBABLE CAUSE**	**REMEDY**
Slow drilling speed.	1. Dull bit.	1. Replace bit.
	2. Cuttings not being removed from hole.	2. Increase blow air or water to keep bit working on fresh rock.
	3. Plugged drill steel.	3. Remove drill steel, clean out passages.
	4. Drifter and steel not aligned with hole; steel or bit binding in hole.	4. Check alignment while drilling to prevent binding and to avoid stuck steel.
	5. Worn fronthead components.	5. Check chuck end components and replace if necessary.
	6. Incorrect feed pressure.	6. Adjust feed pressure.
	7. Accumulators not properly charged.	7. Bleed and recharge accumulators.

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Stuck steel.	1. Driving steel after bit is dull or has lost its gauge. 2. Crowding bit in soft formations. 3. Cuttings not being blown from hole. 4. Misalignment of steel with hole causing binding.	1. Don't force a dull bit, sharpen or replace with new bit. 2. Use down-pressure cautiously in soft formations; be certain steel is rotating freely. 3. Use blow air continuously. 4. Keep drill steel, and hole in alignment at all times.
Chipping or breakage of piston.	1. Bad striking bar which is too hard or rounded on end allowing minimum contact with piston striking face. 2. Worn chuck end components which permit striking bar to cock in chuck so that piston strikes shank a glancing blow.	1. Take bad striking bar out of service – one bad striking bar can damage other parts. 2. Replace worn components.

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