Julio Lorenzo

Hydraulic Drifter
HD 8035

Operating Manual
Spares List

EURODRILL GmbH
Gewerbeg. Friedrichsthal
Saßmicker Hammer 26
D-57462 Olpe/Germany

Hydraulic Drifter

Type:	HD 8035
Drifter No.:	054
Year of Constr.:	12 / 1997
Customer:	SUTEVAR S.L., 28850 Torrejon de Ardoz (Madrid) Spain
Weight:	850 kg without base plate
Op. Pressure:	Rotary Head 200 bar Percussion Mechanism 160...180 bar

Address: EURODRILL GmbH
Gewerbegebiet Friedrichsthal
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Data and information in this manual may be changed without prior notice.

Descriptions and pictures are only of general nature and may be modified in the course of technical development.

In case of doubt, the German text version shall prevail.

Although compiled with all due care, this manual may contain errors.

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1. Declaration of Conformity

EC - Declaration of Conformity
as defined by machinery 89/392/EEC, Annex II A

Herewith we declare that the

type of construction of: Hydraulic Drifter

type: HD 8035

EURODRILL serial No.: 054

in the supplied execution complies with the following provisions:

Relevant EC-Directive: EC machinery directive (89/392/EEC)

Applied harmonized standards, in particular:

DIN EN 292 Part 1 Safety of machinery
Basis concepts, general principles for design;
Part 1: Basic terminology, methodology

DIN EN 292 Part 2 Safety of machinery
Basis concepts, general principles for design;
Part 2: Technical principles and specifications

DIN EN 791 drilling machines
Safety

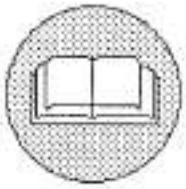
This declaration looses its validity upon an modification not agreed with EURODRILL.

Date / Manufacturer - Signature: 16.12.1997

Position of signer: General Manager

2. Notes

3. Preface



All personnel involved in operating and / or maintaining the Drifter type HD 8035 must first **read** and **understand** the manual, prior to attempting operation, or performing maintenance on the Drifter.

Non-authorized or untrained personnel must **not** under **any** circumstances attempt to operate and repair the machine.

SAFETY FIRST must **always** be the primary consideration of all personnel while operating or maintaining the Drifter, under normal, and especially in unusual conditions.

Since the Safety Precautions listed on the following pages cannot cover every possible situation, everyone is expected to exercise good judgement, foresight and common sense, while operating or working with, on or near the Drifter.

All information concerning your personal safety are written in a different type.

The signs CAUTION and PLEASE NOTE are to be defined as follows:

CAUTION

This word is used to point out that inadequate or non-compliance with operating manuals working instructions etc., will substantially damage property or cause severe personal injury which could be fatal.

PLEASE NOTE

PLEASE NOTE is used to make people aware of installations and gives hints for operation and maintenance which are important, but not hazard related.
It generally indicates an **OPERATIONAL AID.**

3. Preface

This manual contains details of:

- Important Safety Instructions
- Operating Instructions for the Drifter type HD 8035
- Maintenance Instructions for the Drifter type HD 8035
- Trouble-Shooting Guide

The Operating Manual describes application and operating instructions for the Drifter on-site. Be sure to keep the manual with the carrier rig.

Special attention is drawn to Safety Instructions.
They are detailed at the beginning of the Operating Manual and repeated in relevant sections.

Remember, YOU are the one who is responsible for your own personal safety.
This manual is only a general guide. It does not relieve you of your responsibility to use foresight, exercise caution and common sense and always comply with safety at work regulations and procedures.

All Safety Precautions detailed in this manual meet current Stipulations of the European Community.
Beyond this additional national instructions are considered.

The Contractor (User) of the Drifter is obliged to amend Safety Regulations to fully meet specific local and / or national stipulations of the Country the equipment is used in.

Only use original EURODRILL spare-parts to secure a safe operation.

Please refer to page 14 about warranty conditions for EURODRILL's Hydraulic Drifter.

4. Safety Precautions

Do not attempt to operate the Hydraulic Drill unless you are fully familiar with all of the rigs, gauges, controls, functions and operational sequences. Refer to the rig manufacturers operating manual for the detailed instructions. Failure to comply could result in physical injury or even death.

While operating the drill rig in Germany the user is obliged to fully meet specific national stipulations as defined by the German Association of Civil Engineers.

Always wear an approved hard hat, safety shoes, safety glasses, nose mask and hearing protection, when near a drill in operation.

Keep hands, arms, legs and clothing away from all moving parts, Failure to comply could result in physical injury or even death.

Rotary Heads, Drifters, shank adapters, couplings, drill steels, casings, bits and crowns are, or may get hot during operation. Do not touch these parts with your bare hands. Wear gloves to protect your hands when you are handling any of the above components. A severe burn may result if these parts are touched with bare hands.

Nitrogen is the only gas used to charge accumulators on r
ers of the HD-series. Never use oxygen to charge the ac
tors. Ignition of any oxygen and oil mixture may produce
plosion, which could severely injure personnel in the area.

Make sure that accumulators are always in perfect condition. Check regularly and thoroughly that 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.

Be sure to always bleed accumulators prior to any attempt at disassembly. Failure to comply may cause severe injury or even death.

4. Safety Precautions

Keep all hose connections tight. A loose hose connection will result in leak and bad performance and may also cause the hose to come off and whiplash, injuring operator or others.

Dangers may occur in particular under following working conditions:

a) transport to and from job-site;
b) assembly and dismantling at job-site;
c) while drilling and maintenance at job-site;
d) moving between different positions at job-site;
e) out of operation at job-site;
f) storage at factory area, at job-site;

Danger area		Working conditions					
		a	b	c	d	e	f
1	overturning, slipping of the drill rig	x	x	x	x	x	
2	leakage of oil, fuel, coolant and hydraulic fluid	x	x	x	x	x	x
3	unintended fall down of drilling equipment	x	x	x	x		
4	ejection of cuttings			x	x		
5	drop in of hydraulic- and air-pressure	x	x	x	x	x	
6	mechanic failure or misfunction of components		x	x	x	x	
7	exposed movable parts		x	x	x		
8	contact with cold and hot components		x	x	x		
9	jerking ropes and hoses		x	x	x		
10	high-pressure fluids, gases		x	x	x	x	
11	excessive vibrations transferred to persons			x			
12	excessive noise		x	x	x		
13	complicated working conditions						
13.1	weather (rain, storm, ice...)	x	x	x	x	x	
13.2	subsoil (mud, sand ...)	x	x	x	x		
14	harmful concentrates of dust and toxic gases			x	x		
15	dangers while mounting and dismantling of mast		x				
16	dangers while mounting and dismantling of Rotary Head and Hydraulic Drifter		x				
17	fire	x	x	x	x	x	
18	insufficient lightning	x	x	x	x		
19	persons falling down from higher positions		x	x	x	x	x

4. Safety Precautions

4.1 Before starting work

Carry out a visual check. All hoses, pipes and fixing screws / bolts must be checked each day before starting work for wear and to ensure they have not come loose.

4.2 While operating the Hydraulic Drifter

Only approved hydraulic oils should be used. All mineral hydraulic oils recommended by the carrier manufacturer are suitable for Drifter operation. Use of other hydraulic oils is subject to approval.
Only use hydraulic oils with sufficient viscosity. In summer and in countries with a tropical climate, the minimum requirement is a hydraulic oil of type HLP 68.
Do not start up the drifter at temperatures below minus 20 °C while the hydraulic oil is still cold, as this could cause damage to the seals in the Hydraulic Drifter.
Observe the carrier manufacturer's instructions.

4.3 During maintenance and repair work

The shank adapter must be lubricated regularly every two hours during operation with the percussion mechanism running.

4.4 Check the screw connections

For the first 50 operating hours all screw connections on the Hydraulic Drifter must be checked daily, and thereafter once a week. Loose connections should be tightened without exceeding the prescribed tightening torque.

4.5 Check the oil-filter

The return line to the hydraulic system must be fitted with an oil filter with a mesh no greater than 50 micrometers and equipped with a magnetic separator.

Clean the oil filter regularly. On new Hydraulic Drifters, the oil filter should be cleaned for the first time after 50 operating hours and thereafter regularly every 500 operating hours.

5. Personal Safety Equipment

Regardless of which drilling method is being used, make sure that all personnel involved in the operation wear Personal Safety Equipment at all times.
Personal Safety Equipment consists of:

approved Hard Hat

Safety Boots

Working Gloves **

Hearing Protection

Respiratory Protection *

Safety Glasses *

* especially on applications creating dust or when using Compressed Air for Flushing Purposes!

** not operator

6. Warranty Conditions

EURODRILL will provide a warranty on all parts for a period of 6 months (3 months for multiple-shift operations) after take-over, however no longer than 12 months after delivery.

Deliveries are subject to the General Terms of Sale and Delivery of EURODRILL.

Spare parts have a warranty of 3 months, but at least until expiry of the original warranty period for components in question.

Any variations in the warranty conditions are laid down in the individual purchase contract / dealership agreement and require prior written confirmation by EURODRILL.

EURODRILL do not accept liability for damages resulting from:

- inadequate maintenance
- improper use of the equipment
- faulty operation
- use of wrong lubricants
- damage caused by the use of non-EURODRILL spares
- damage caused to carrier rig and other equipment by improper use of the Drifter

The following components and wear parts are not covered by warranty:

- shank adapters
- circlips
- bushings
- all seals and gaskets

PLEASE NOTE

EURODRILL reserve the right to modify the equipment without prior notice.

7. Technical Data HD 8035

Percussion Mechanism		
Piston-stroke adjustment	HD 8035 A	hydraulically controlled
Piston-stoke adjustment	HD 8035 M	manually controlled
Capacity	Q_S (l/min)	70...100
Operating Pressure	p (bar)	160...200
No. of blows	f (min^{-1})	1500...2100
Single blow energy	W_E	600...900
Starting pressure	p (bar)	60...95

Rotary Head	standard motor			2-speed motor		
	1 motor	2 motors	3 motors	1 motor	2 motors	3 motors
RPM n (min^{-1}) at 150 l/min	45	30	15	90	60	30
Op. Pressure p (bar)	200	200	200	200	200	200
Torque Mt (daNm)	1135	2270	3405	565	1130	1695

shank adapter standard H112 / H90 optional

weight app. 750 kg

8. Conditions of application, transport and storage

Operating conditions

The EURODRILL Hydraulic Drifter is an attachment tool suitable for use in conjunction with the hydraulic-powered carriers.

Applications

Drilling work in the mining and rock products industries.

Transporting and storing

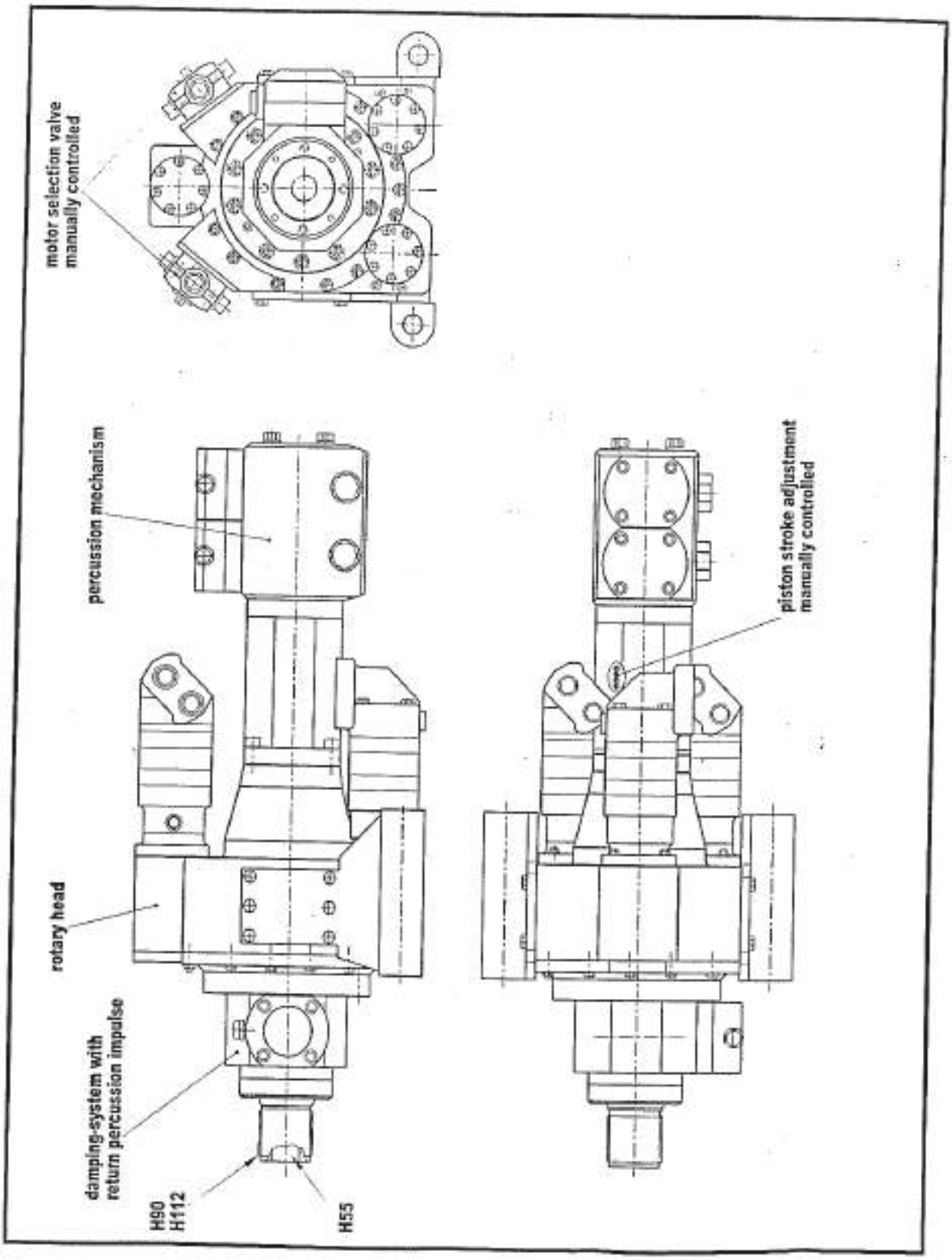
The Hydraulic Drifter is supplied without mounting plate but filled with the requisite operating media such as oil, grease etc. (the accumulator is ready charged with gas).

The location of the bore holes required on the slide to allow drifter mounting is shown at page 18.

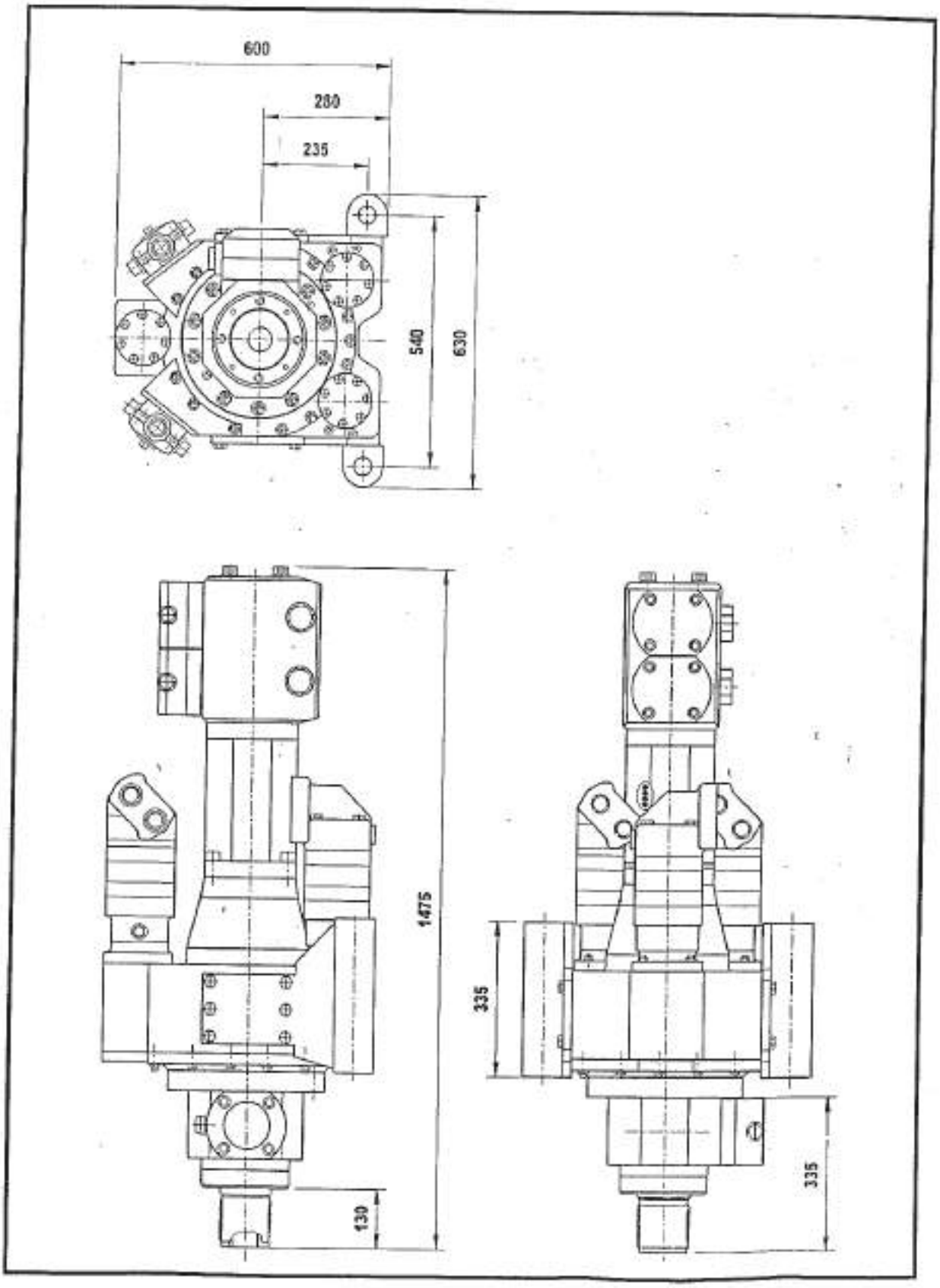
The Hydraulic Drifter should be stored in a roof-covered area so as to avoid weather damage.

To this end, the transport packaging provided by the manufacturer should not be removed until shortly before mounting on the carrier.

9. Main Components



10. Main Dimensions



11. Mounting the Hydraulic Drifter

Be sure to check that the hydraulic lines supply- and return flow for the Rotary Head and the Percussion Mechanism show no restrictions and are adequately filtered.

Non-compliance may result in lack of performance and/or cause major damage to the unit. Refer to section „Connection Diagram" for details and explanatory notes.

At least one helper is required to assist the operator in mounting the Drifter. Be sure to agree on definite hand-signals before attempting to mount the equipment.

A crane or lifting device of adequate hoisting capacity is required to lift the Drifter onto the drill mast.

The drill mast of your rig must be in horizontal position, with the upper mast end resting on the transport bracket.
Use the feed control valve to place the drifter reception slide centrally between the mast/boom connection and the transport bracket.

Attach and secure lifting tackle to shank adapter (striker bar) and upper section of the percussion mechanism.
Align the crane centrally above the Drifter to prevent swaying of the load during lifting. Be sure to check that helpers are at a safe distance and slowly raise the Drifter off the ground.

Lift Drifter above the reception slide on the drill mast and lower onto base plate.
The helper must guide the Drifter to ensure perfect alignment onto the base plate or into brackets.

CAUTION

Great care must be taken to ensure that fingers are not trapped or squashed during this procedure. Never attempt to lift and align the Drifter manually.

Once the Drifter is aligned and securely placed onto the base plate or into brackets, insert retaining bolts and secure them with pins. Always use all bolts and securing devices provided.

CAUTION

Never activate the drill feed while helpers are standing close, or are handling the mast.

11. Mounting the Hydraulic Drifter

Remove lifting tackle and connect hydraulic lines according to the diagram on page 42. Drained oil and other lubricants must always be collected in suitable containers and disposed of in accordance with ANTI-POLLUTION REGULATIONS.
Activate rotary control lever to check direction of rotation. Refer to the carrier rig manufacturers manual for Safety Instructions of the drill rig. The carrier rig manufacturers instructions for operation apply also to the Drifter

12. Operation

PLEASE NOTE

Hydraulic Drifters having been shipped by air arrive with accumulators uncharged. Please refer to section „Accumulators" on page 24 !

CAUTION

Hydraulic Drifters, shank adapters and drill string components can get very hot during operation. Do not touch these items with bare hands. Protect your hands with gloves if you have to handle these components. Non-compliance may result in severe burns!

12.1 Prior to daily start-up

Complete visual inspection of all hydraulic lines, hoses, fittings, setting screws and bolts for wear and tightness.

Retighten and/or replace as required.

After the initial start-up and during the running-in period (approx. 50 hours) these checks should be carried out at shorter intervals.

12.2 During operation

Use only recommended hydraulic fluid. All mineral-based hydraulic oils recommended by the manufacturer of the carrier rig are suitable for operation of the Drifter.
The use of other, non-recommended hydraulic oils is allowed only after consultation with, and written permission by the manufacturer of the carrier rig.
Be sure to use only oil of adequate viscosity. The minimum requirement for summer months and application in tropical climate is for oil of HLP 68 standard.
Do not start up the Drifter at temperatures below minus 20 °C while the hydraulic oil is still cold, as this could cause damage to the seals in the Hydraulic Drifter.

12.3 Maintenance and repair work

The shank adapter must be lubricated regularly with the percussion mechanism running.

12. Operation

12.4 Checking screw connections

The screw connections on percussive tools such as Hydraulic Drifters are subjected to particularly high stresses.
All screw connections on the Drifter must be checked daily for the first 50 operating hours and thereafter once a week. Loose connections should be tightened without exceeding the specified tightening torque.

12.5 Checking the oil-filter

The return line to the hydraulic system must be fitted with an oil filter with a mesh no greater than 50 micrometers and equipped with a magnetic separator.

Clean the oil filter regularly. A new oil filter should be cleaned for the first time after 50 operating hours, and checked thereafter every 500 operating hours.

PLEASE NOTE

When attaching any accessory to the shank adapter (striker bar), it is important that the shank adapter and the mating part are clean and free of grease. This is because you do not want these parts to unscrew during backward rotation, while separating casing joints. Should this occur, it may be necessary to use a small amount of "Loctite", or a similar thread compound to secure this connection.

PLEASE NOTE

The P-line of the Drifters Percussion Mechanism must be equipped with a type-tested pressure-limiting valve to protect the Drifters accumulator. Please refer to the Connection Diagram on page 42 for further details.

13. Piston-stroke adjustment feature

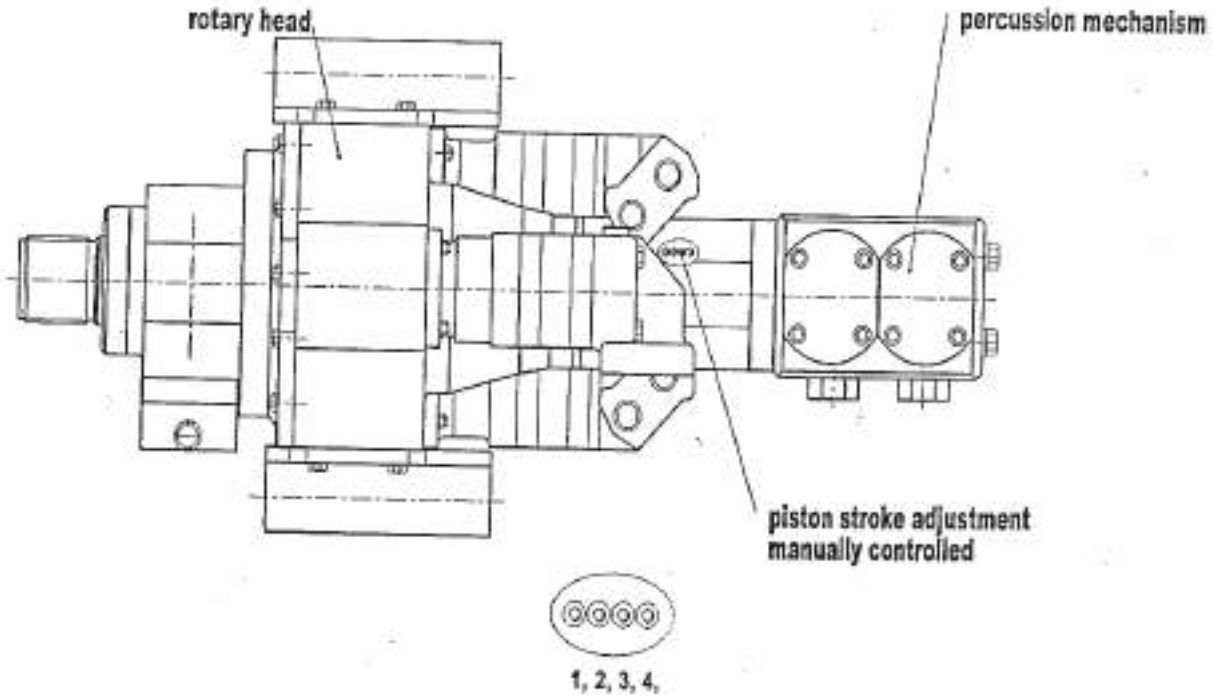
Hydraulic Drifters of the HD-Series are equipped with a piston-stroke adjustment feature.

This device controls piston-stroke - and therewith percussion energy - and ensures optimum penetration in differing soil conditions.

Parameters to be considered are:

a) drilling method used
b) ground conditions and changes
c) available feed pressure

Please consult your EURODRILL Representative for details on how to optimize the piston-stroke adjustment feature for your rig and site.



stroke [mm]	1	2	3	4
21	K	L	L	K
33	L	K	L	K
45	L	L	K	K
57	L	L	L	K

K > M6 x 10 screw
L > M6 x 20 screw

14. Accumulator

EURODRILL Hydraulic Drifters of the HD Series are equipped with accumulators. These are fitted on the Percussion Mechanism control head and on the Rotary Head as a damping feature.

The damping feature is designed to absorb blank-firing (e.g. when drilling in cavities and hollows), and to protect the Rotary Head during operation using reverse percussion (e.g. applying percussion while pulling the drill string).

PLEASE NOTE

The reverse-percussion feature is intended for intermittent (max. 20% /min) use only..

Excessive use of this feature will cause damage to the Drifter, which will not be regarded as valid warranty entitlement.

Charging Pressures

Damping Mechanism	= 80 bar (N)	
Percussion Mechanism	blow energy	= 65 bar (N)
	R-line	= 8 bar (N)
(N) Nitrogen Purity	= 99.8 %	

CAUTION

Be sure to ONLY use NITROGEN to charge accumulators. Use of ANY other gasses - Danger of EXPLOSION!

Operating and servicing accumulators on EURODRILL Hydraulic Drifters of the HD Series

14.1 Checking the charge level:

- Unscrew and remove accumulator plug screw
- Slightly loosen valve screw and screw accumulator filling- and testing device onto accumulator
- Open valve screw. This will also open the accumulator valve. Gas enters the chamber and charging pressure is indicated on the pressure gauge.
- A check valve prevents escaping of gas.

14. Accumulator

14.2 Reducing charge pressure

- Slightly open valve screw to let the nitrogen escape.

14.3 Augmenting charge pressure

PLEASE NOTE

A pressure-limiting valve must be used if the pressure in the nitrogen bottle is higher than the max. permissible operating pressure of the accumulator.

- Use a connection hose to attach the accumulator filling- and testing device to the nitrogen bottle.
- Open valve on nitrogen bottle and valve on the filling device and let nitrogen slowly enter the accumulators chamber.
- Close valve on nitrogen bottle and check charging pressure on pressure gauge.
- Repeat procedure until the required pressure charge is reached
- Close and tighten the valve screw. This will also close the accumulator valve.
- Wait for approx. 5 minutes - pressure and temperature adjustment - and recheck the charging level. Adjust if necessary.
- Unscrew and remove filling and testing device and retighten accumulator valve screw securely.
- Check accumulator seal with soapy water.
- Replace and tighten accumulator plug screw.

PLEASE NOTE

Hydraulic oil detected in the accumulator during inspection and maintenance operations indicates that the diaphragm is damaged.

EURODRILL recommend a complete accumulator change.

14. Accumulator

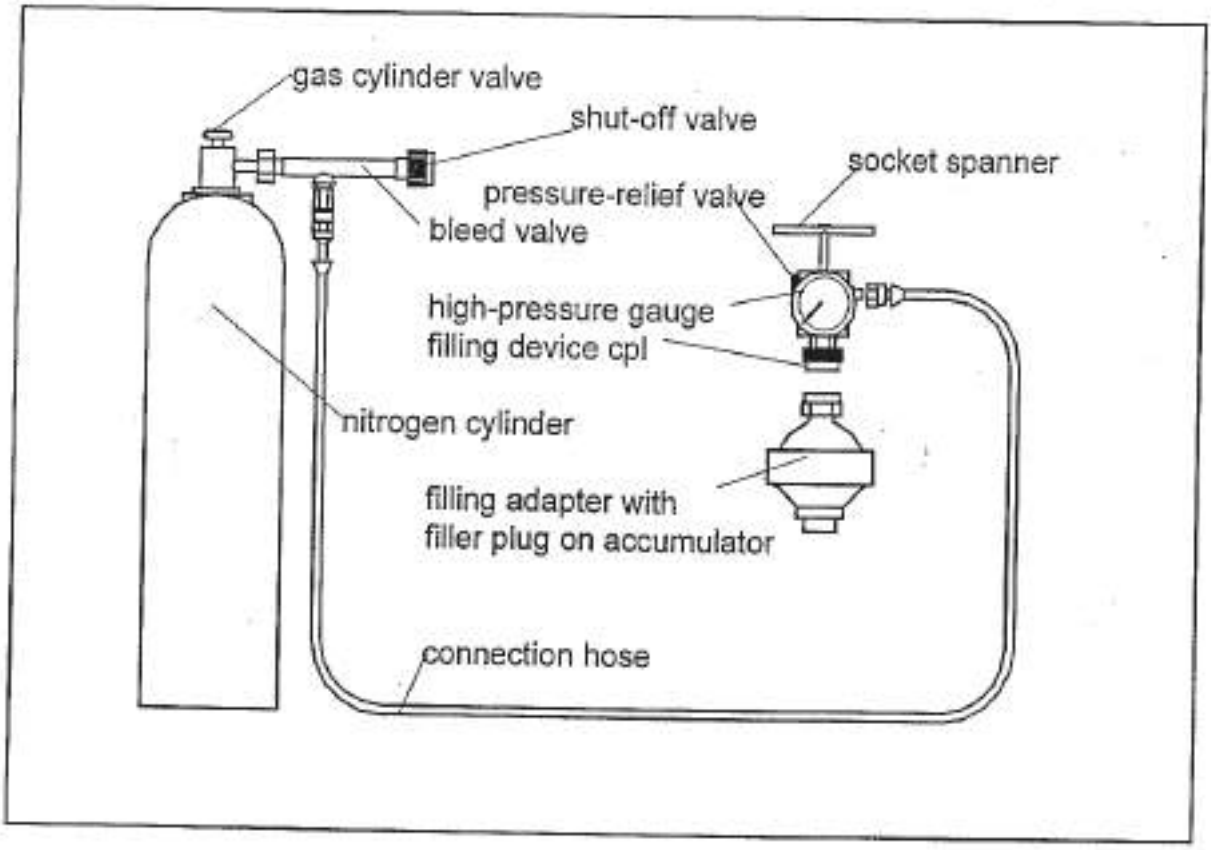
- If jerking has been observed in the high-pressure line during Drifter operation, the filling pressure must be checked.

14.4 Use of the filling- and testing device

For filling the accumulator of:

damping percussion mechanism	= 80 bar (N)	
	blow energy	= 65 bar (N)
	R-line	= 8 bar (N)

14.5 Design



The filling- and testing device consists of:

- high-pressure hose (3 m) with taping pipe for connection to German nitrogen cylinders (green color). (right-hand thread W 24,32 x 1/14 '')
- valve body with manometer 0..250 bar and 0..3500 lbs / inch^2. (on common scale.)
- reverse-percussion valve and nut for accumulator connection thread M 28 x 1,5.

The taping pipe for German nitrogen cylinders, which is connected to the high-pressure hose can be substituted by an adapter for foreign nitrogen cylinders.

The valve body, which is attached to the high-pressure hose, must be tightened via a connecting piece (inner thread M 28 x 1,5) with the gas-sided threaded connection piece of the accumulator (o-ring-sealing !).

The driver of the filling- and testing device is operated with a commercial torque wrench. (1/2" - square head, indication area > 30 Nm).

14.6 Application

14.6.1 Before filling the accumulator

The gas-sided outside thread (M28 x 1,5) of the accumulator and its front, on which the o-ring of the filling- and testing device is positioned, must be cleaned carefully.

14.6.2 Attaching the filling device to the nitrogen cylinder and to the accumulator

Connect the pressure relief valve to the nitrogen cylinder.

Push the filling device onto the filling adapter of the cap and screw tight. To this end, the filling screw must be in lower and the socket spanner in upper position.

Attach the connecting hose to the pressure relief valve and the filling device.

Close the bleed valve on the filling device.

Close the shut-off valve on the pressure-relief valve.

Using the socket spanner, screw out the filler plug as far as it will go.

14.7 Filling the accumulator

Open the gas cylinder valve slowly.

Slowly open the shut-off valve on the pressure-relief valve until the required filling pressure can be read on the pressure gauge of the filling device.

Once the prescribed filling pressure has been reached, close the shut-off valve.

Wait for a temperature balance in accumulator.

If the pressure gauge now shows that the pressure is too high, reduce pressure using the bleed valve.

If the pressure is too low, top up with gas.

When the pressure reading for the accumulator is correct, tighten the filler plug firmly using the socket spanner.

Close the gas cylinder valve.
Relieve the pressure on the connecting hose using the bleed valve and remove the filling device.

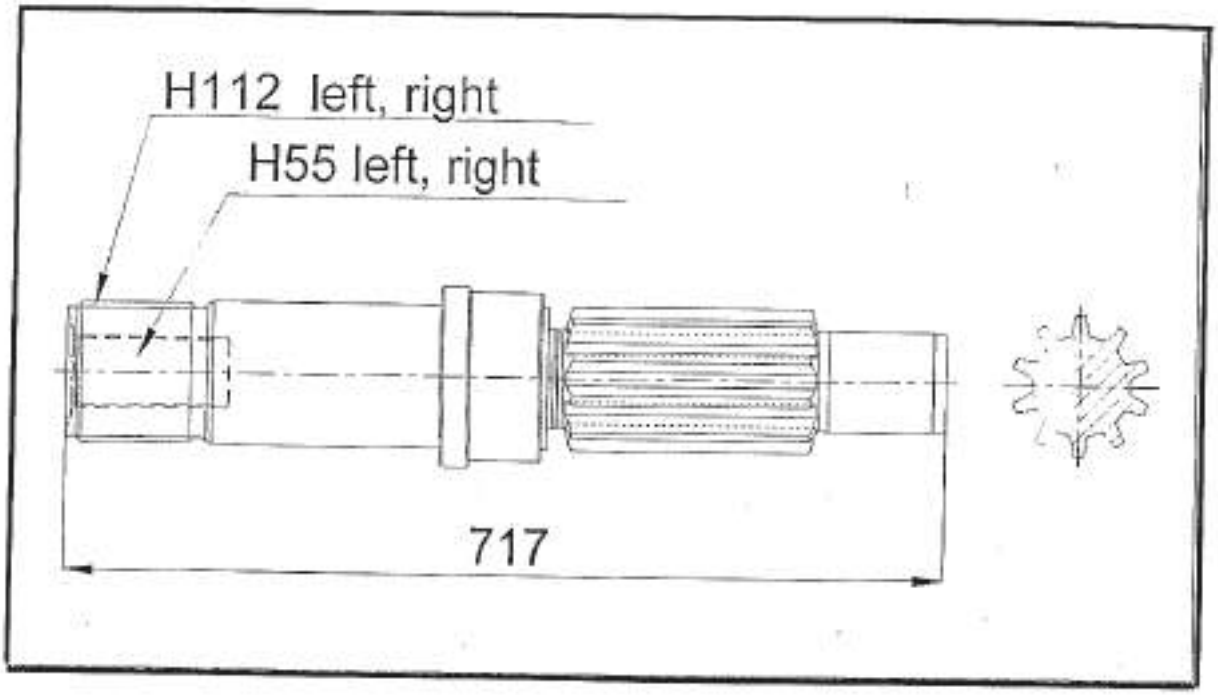
Check the accumulator is airtight using a soap solution.

Seal the filling adapter of the accumulator using the protective cap.

PLEASE NOTE

Now tighten the indicator plug by using a torque wrench. (30 ± 10 Nm).

15. Shank Adapters



Shank Adapters can be replaced by the operator on-site.

- remove the retaining nuts from the damping mechanism
- pull-off the entire damping section over the threaded end of the shank adapter
- pull the shank adapter out of the Rotary Mechanism
- insert the new shank adapter
- replace the damping section
- replace and tighten the retaining nuts

- **PLEASE NOTE**

Be sure to always use Original EURODRILL shank adapters. Damage resulting from non-compliance will not be considered as valid warranty entitlement.

16. Reverse-Percussion Feature

The reverse-percussion feature on Hydraulic Drifters of the HD series has been subject to substantial improvement.

This major innovation assures the constant presence of an oil film in the damping mechanism and not only, as with standard type drifters, when hydraulic pressure is applied to the Percussion Mechanism.

The damping mechanism and reverse percussion feature greatly reduces the risks and dangers inherent in blank-firing and wear of shank adapters, piston, cylinder and control head.

PLEASE NOTE

Reverse Percussion must only be used as an intermittent aid.
A continuous operation of the percussion mechanism while pulling the drill string may result in severe damages.

While pulling let the percussion mechanism run just for a **short time** to loosen the drill string and continue **without** percussion.

17. Operating Media

The following media are required to run the Hydraulic Drifter:

17.1 Hydraulic Oil

A hydraulic oil with a viscosity > 68 cSt must be used at 40°C
A hydraulic oil with a viscosity > 8,8 cSt must be used at 100°C

PLEASE NOTE

Hydraulic oil must never be exposed to temperatures exceeding 80 °C.

Synthetic Oils and biologically degradable Hydraulic Oils

Synthetic and biologically degradable hydraulic fluids can be used after consultation with, and written permission from EURODRILL.

PLEASE NOTE

Only approved hydraulic oils should be used. All hydraulic oils recommended by the carrier manufacturer are suitable for Hydraulic Drifter operation. Use of other hydraulic fluids is subject to approval.

Check the oil filter!

Compare to page 33/34 !

17.2 Grease

EURODRILL recommend for lubrication of the drill sleeve at the prescribed intervals:

Manufacturer	Product
K.S. Paul	P.B.C. TP.492

Above mentioned grease is suitable for working temperatures from -30°C to +160°C for continuous and to - 260°C for discontinuous application and as „ANTI-WEAR MEDIA" up to 1200°C. For representatives and agencies of K. S. Paul refer to appendix.

17. Operating Media

17.3 Gas

Only gas meeting the following conditions may be used to fill the accumulator

CAUTION

Normal nitrogen
99.8% pure

Ensure that no other gas (e.g. air, oxygen) is used for this purpose. **Risk of explosion!**

18. Repairs and maintenance

Service, maintenance and repair operations should be carried out only in a suitable equipped workshop.

Repairs of hydraulic components require utmost cleanliness. Never expose open hydraulic components to operations creating dust.

Non-compliance will cause major damage to the unit.

18.1 Hydraulic Lines

Hydraulic lines from control spools to the Drifter and from the Drifter to the tank must be without restrictions and reductions in diameter.

For the Rotary Mechanism of your Drifter type HD 8035 this means:

P-line to motors	DN20 = 25S
R-line from motors	DN20 = 25S
Filtration R-line	= 25 µm

For the Percussion Mechanism of your Drifter type HD 8035 this means:

P-line to motors	DN20 = 25S
Filtration P-line	= 15 µm
R-line	DN20 = 25S
Filtration R-line	= 25µm

PLEASE NOTE

Back-up pressure in the R-line must not exceed 3 bar.

18.2 Filter

Recommendation of EURODRILL

R-line filters:

ARGO type P2. 1217 -12K
Argo No. 1725004

18. Repairs and Maintenance

P-line filter - percussion:

Pall Filter HC 9600 consisting of:

1 X HC 9600 FDP 8H
1 X HC 9600 FDT 8H

PLEASE NOTE

Always use filters with magnetic separator and contamination indicator.

Be sure to check the filter for contamination at least once during every shift.

Excessive contamination increases flow restriction. The filter must be cleaned and / or replaced immediately.

For the initial running-in period (1st week of operation) EURODRILL recommend a start-up filter of 10 µm.

The filter manufacturers data regarding flow capacity should exceed the actual flow by approx. 200 %.

18.3 Seals

EURODRILL recommend that the entire seal kit be renewed when replacing damaged seals.

PLEASE NOTE

Be sure to note direction of installation when replacing seals.

Avoid wedging and jamming of components. Misalignment of components during reassembly will cause seals to shear.

19. Working in extreme temperatures

19.1 Working in high outside temperatures

When using mineral fluids, the oil temperature must be checked constantly to ensure it does not exceed 80 °C. If higher temperatures are measured in the tank, an oil cooler must be fitted.
Use only hydraulic oils with adequate viscosity. In summer and in countries with a tropical climate, the minimum requirement is a hydraulic oil of type HLP 68.

When using other fluids, the temperature limits specified by the carrier manufacturer must be monitored closely. Again, it may be necessary to fit a cooler.

19.2 Working in low outside temperatures

PLEASE NOTE

At temperatures lower than minus 20 °C, the Hydraulic Drifter should not be put into operation until the hydraulic oil has been warmed up.

At temperatures minus 20 °C, the hydraulic oil must be warmed up before-hand.

Observe the carrier manufacturer's regulations for low-temperature operation.

20. Care and maintenance of the Hydraulic Drifter

In order to ensure top performance, it is important that the operator carries out maintenance work on the Hydraulic Drifter and the hydraulic system at the prescribed intervals.

CAUTION

Always observe the relevant safety regulations when carrying out maintenance work.
Switch off the carrier before starting assembly/dismantling work so as to ensure that the hydraulic system is depressurized.

20.1 Before starting work

Check hydraulic lines!

A visual check must be made on all lines (hoses and pipes) from the pump to the Hydraulic Drifter and back to the tank.

What to do in case of...

Loose screw connections and hose clamps must be retighten.
Damaged pipes and/or hoses must be replaced by trained personnel.

20.2 Lubricating the shank adapter

The shank adapters must be lubricated every 2 hours using a grease gun.
For grease recommendation refer to page 31.

20.3 Observing the accumulator

If the previously slack pressure line to the Hydraulic Drifter starts to jerk violently, there is a problem with the accumulator. Shut down the Hydraulic Drifter immediately and have the accumulator repaired by a specialist.

Whenever a pressurized vessel is repaired and pressure-bearing parts are replaced, the vessel must be examined by a specialist before being put back to use.
Accumulators are subject to the regulations valid in the country of use.
(Federal law gazette 1980,§9;aAbs.2).

Outside of the Federal Republic of Germany accumulators are subject to the regulations valid in the country of use.

20. Care and maintenance of the Hydraulic Drifter

At the latest every 5 years, high-pressure accumulators must be subjected to a routine inspection to ensure that they still comply with the regulations governing pressurized vessels in the country of use.

20.4 Checking the impact face of the piston for dents

Each time the shank adapter is changed, and at the latest once a month, the impact face of the piston must be examined for dents or flaking.

Remove the shank adapter and shine a torch on the impact face of the piston.
If dents greater than 1mm or flaking are detected, the Hydraulic Drifter must be kept out of service until the damaged component has been replaced.
If necessary, notify EURODRILL's after-sales service.

20.5 Routine weekly maintenance checks

Check all screw connections are still tight and hose connections are not leaking.
Check shank adapter and drill sleeve.

20.6 Checking and cleaning the hydraulic oil-filter

A new oil-filter should be cleaned for the first time after 50 operating hours, and checked thereafter every 500 operating hours.

20.7 Maintenance intervals

Lubrication, maintenance and service intervals Hydraulic Drifters HD Series	Interval in operating hours (oh)			
	8	40	100	500
Lubricate Rotary Mechanism	•			
Check all hose fittings for tightness		•		
Check Percussion Mech. and control head			•	
Renew seals				•

PLEASE NOTE: Loss of warranty if service intervals are not complied with!

20. Care and maintenance of the Hydraulic Drifter

20.8 Checking screw connections

The screw connections on percussive tools such as a Hydraulic Drifter are subjected to particularly high stresses.

All screw connections on the Hydraulic Drifter must be checked daily for the first 50 operating hours and thereafter once a week.
Loose connections should be tightened without exceeding the specified tightening torque.

21. Troubleshooting

Hydraulic Drifter does not work		
Cause	**Remedy**	**to be carried out by**
Screw fittings defective or by-pass activated	Check fittings open by-pass	Operator
Control slide valve in control head stuck	Open control head and activate valve manually	Operator
Piston seizure	Relieve hydraulic pressure. Dismantle percussion mechanism and inspect piston. Minor scratches can be repolished using emery cloth grade 600.	Qualified personnel in suitably equipped workshop.

Insufficient Penetration		
Cause	**Remedy**	**to be carried out by**
Worn pump	Use flow-/pressure meter to test pump. Repair or replace.	Qualified personnel in suitably equipped workshop.
Pressure-limiting valve defective	Use flow-/pressure meter to valve characteristics. Dismantle valve, clean, repair or replace.	Qualified personnel in suitably equipped workshop.
Excessive back-pressure in R-line of Percussion Mechanism	Test pressure on T-section of Percussion Mechanism R-line. If back-pressure exceeds 3 bar, check filters, fittings and hose diameter.	Qualified personnel in suitably equipped workshop.
Accumulator defective; Hoses vibrating	Repair or replace accumulator	Qualified personnel in suitably equipped workshop.
Insufficient flushing	Air-flush: check compressor Water-flush: Check pump	Operator
insufficient bailing annulus	Check drill string configuration	Operator
Worn bit	Resharpen or replace	Operator
Drifter blank firing	Adjust feed pressure	Operator
Misalignment of drill string components	Check alignment of shank adapter, drill string and centralizer. Readjust as required.	Operator

21. Troubleshooting

Oil leakage		
Cause	**Remedy**	**to be carried out by**
Hose fittings defective or loose	Check fittings retighten or replace	Operator

Excessive wear to drill rod guide and drill sleeve		
Cause	**Remedy**	**to be carried out by**
Diameter of drill rod guide too large	Replace guide bush	workshop
Drifter knocks against drill rod guide	Incorrect usage	workshop
Drilling in jarring blow range	Correct contact pressure for drill rod	Operator
Drill rod guide and hammer out of alignment	Align components	Operator

PLEASE NOTE

No other single factor effects the Drifters performance as regularly as your choice of drill string configuration (bits, crowns, casing and drill steels) **and** adequate flushing (air, water or a combination of both) for your specific application.

Please do not hesitate to consult your **EURODRILL Representative** for advise and assistance in selecting the right tools for your job.

22. Servicing the Hydraulic Drifter

A complete service must be carried out after every 15,000 meters of drilling, or at the latest every 6 months. The following points must be observed:

PLEASE NOTE

Once the Hydraulic Drifter has been removed from the drill slide and cleaned on the outside, it should be dismantled completely in a suitably-equipped workshop.
As a guide to dismantling, the spare parts list supplied with the Hydraulic Drifter has an exploded drawing on which all individual components are shown. (Please refer to page

22.1 Dismantling of the Rotary Head and the Percussion Mechanism

Dismantling of the Rotary Mechanism and the Percussion Mechanism must be carried out by a suitably-equipped workshop, personnel trained by EURODRILL or by EURODRILL after-sales service staff.

22.2 Inspecting the accumulator

CAUTION

Repairs and inspections may only be carried out by persons who have been suitably trained by EURODRILLS after-sales service staff.

Unauthorized adjustments or repairs to the accumulator will result in the loss of all warranty.

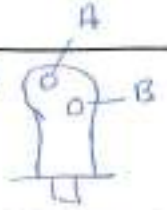
The accumulator must only be filled with nitrogen!
The nitrogen cylinder is green

Make sure no other gas (e.g. air or oxygen) is allowed into the accumulator. **Caution:** risk of explosion!

The max. filling pressure (200 bar) must not be exceeded.

23. Connection Diagram

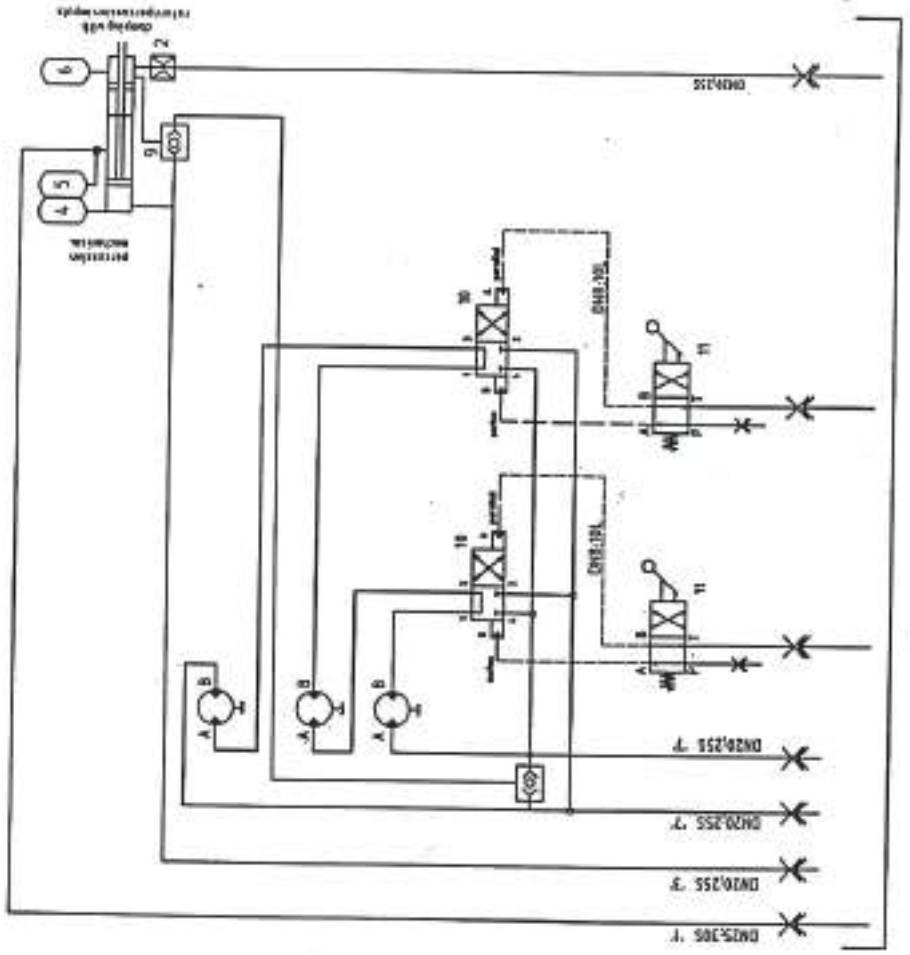
MOTORES CHAR-LYN
(A) Siempre cumbe.



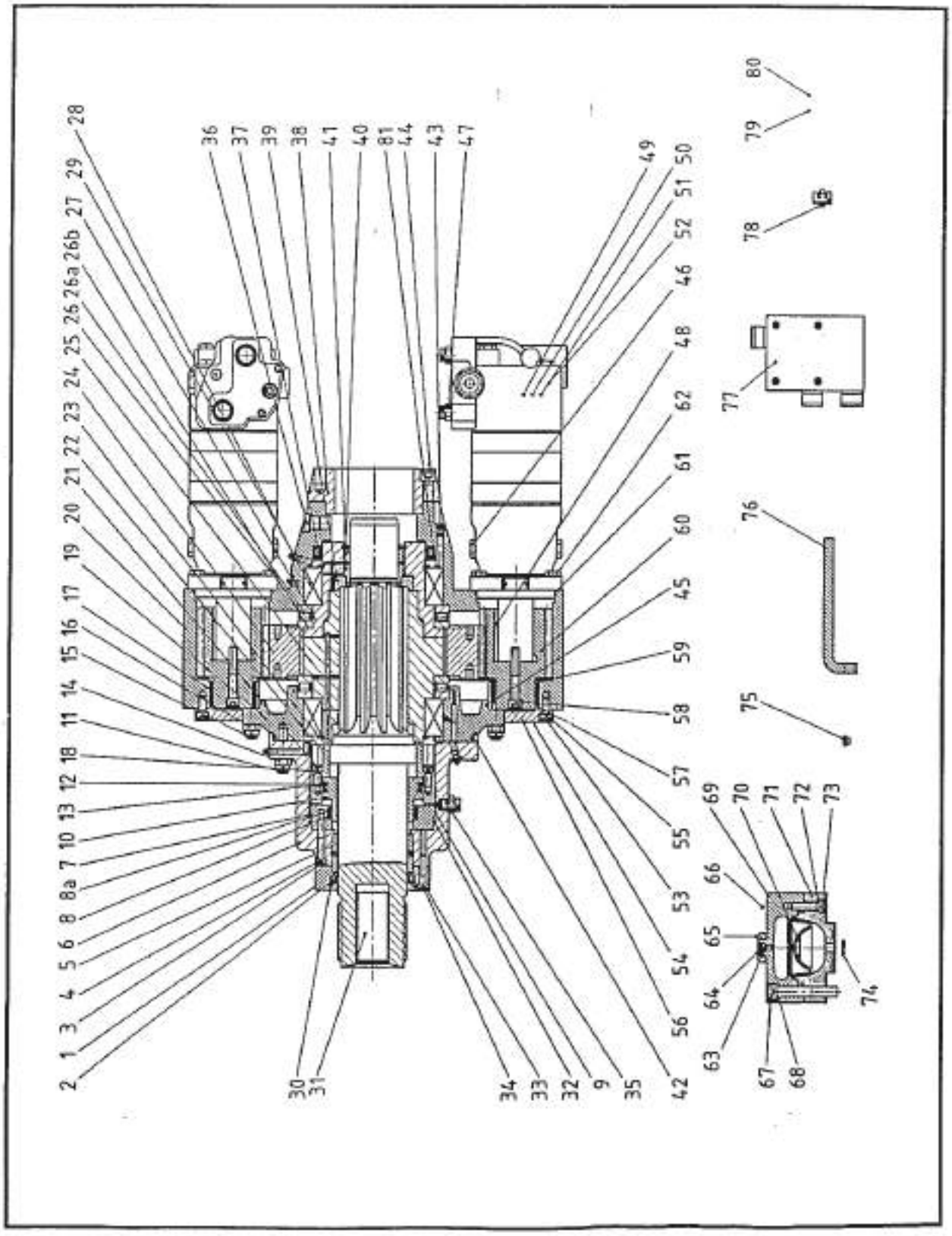
1. R-Line DN20;25S
max. perm. back pressure p=3 bar
2. nozzle 0,5 mm
3. P - Line (percussion)
DN 20; 30S
p=160-180 bar,Q=90-110 l/min
4. air operated accumulator (P-Line)
prestressing pressure p=65 bar
5. air operated accumulator (R-Line)
prestressing pressure p=6 bar
6. air operated accumulator (damping)
Vorspanndruck p=80 bar
7. rotary direction left / right
p=200 bar max.
Q=150 l/min max.
8. hydraulic motors
9. bullet shuttle valve
10. motor selection valve hydr.
series / parallel
11. motor selection valve pilot line
p=systempressure see # Nr.7

Cleanliness Requirements
ISO 4406 18/13

Viscosity
by operating temperature
20-43 cSt



24. Exploded Drawing Rotary Head



25. Ersatzteilliste Drehantrieb
Spares List Rotary Mechanism
Liste des pièces détachées Commande de rotation complète

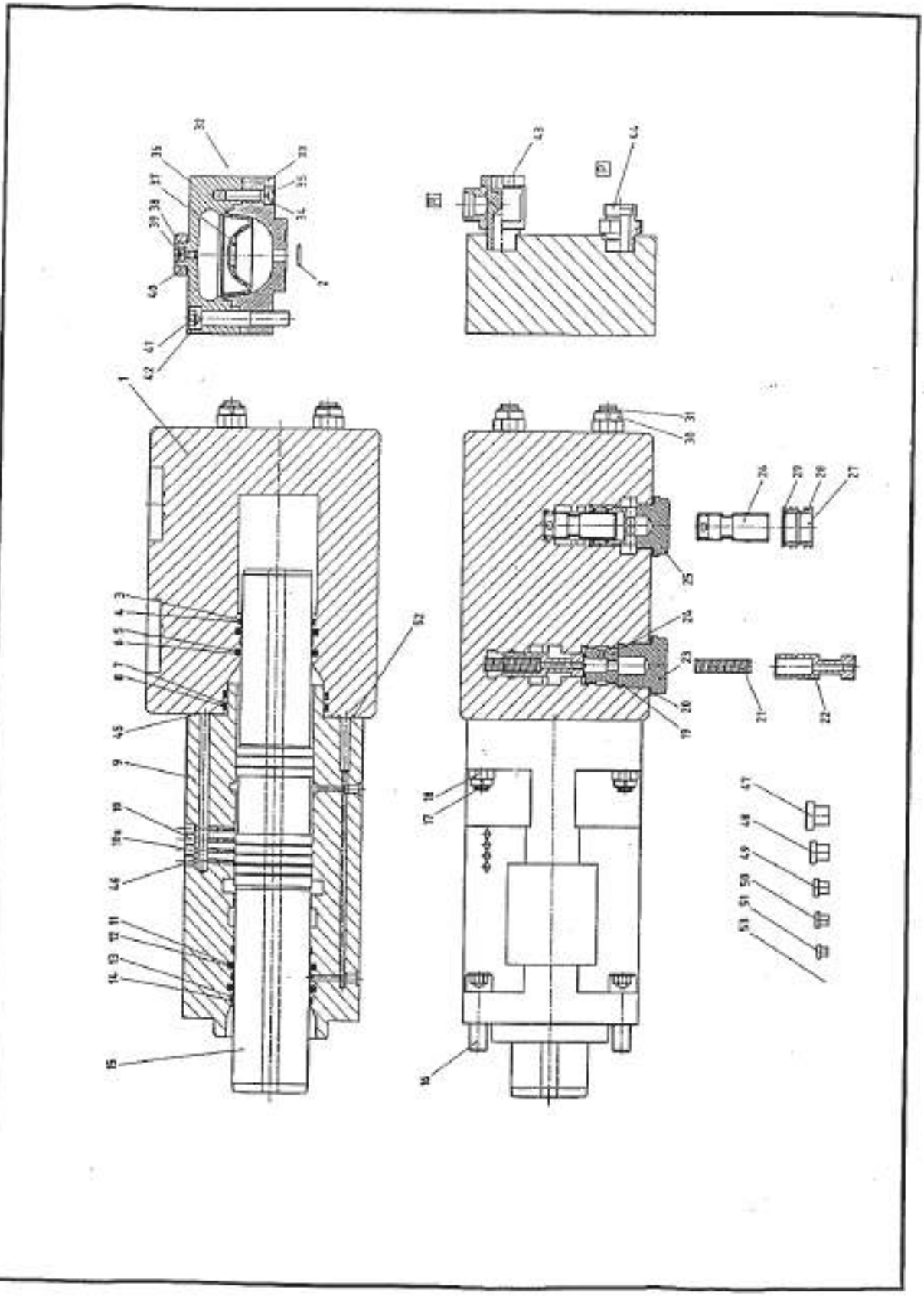
Pos.	Qty.	Part-No.	Bezeichnung	Description	Désignation de la pièce
000	1		Getriebe kpl.	rotary head compl.	Méchanisme de frappe compl.
001	1	68035011	Haltedeckel	cover	Couvercle de retenue
002	1	040142-4	Radial-Wellendichtring	simmerring	Garniture
003	5	050186-1	Zylinderschraube	screw	Vis
004	5	050049-2	Federring innen	spring-loaded washer	Bague élastique intérieure
005	1	68016011	Lagerring (vorne)	bearing ring	Bague de roulement
006	1	68035012	Dämpfungsflansch	housing flange	Bride-tampon
007	1	68035009	Druckbuchse (außen)	pressure bushing (outside)	Douille de pression
008	2	040231-3	Turcon Stepseal	turcon stepseal	Joint Turcon Stepseal
008a	2	040232-1	O-Ring punktiert	o-ring	Anneau-O
009	3	040174-1	O-Ring	o-ring	Anneau-O
010	1	68035010	Druckbuchse (innen)	pressure bushing (inner)	Douille de pression
011	17	050153-4	Stiftschraube	threaded pin	Tige filetée
012	2	040065-3	O-Ring punktiert	o-ring	Anneau-O
013	2	040065-3	Turcon Stepseal	turcon stepseal	Joint Turcon Stepseal
014	17	050032-3	Mutter selbstsichernd	nut selflocking	Ecrou indesserables
015	10	050153-4	Stiftschraube	threaded pin	Tige filetée
016	11	050032-3	Mutter selbstsichernd	nut selflocking	Ecrou indesserables
017	3	060049	Nadellager	needle bearing	Roulement à aiguilles
018	20	050049-2	Federring innen	spring-loaded washer	Bague élastique intérieure
019	1	68020106	Gehäusedeckel	housing cover	Couvercle de carter

Pos.	Qty.	Part-No.	Bezeichnung	Description	Désignation de la pièce
020	1	68035001	Gehäuse	housing	Carter d'engrenages
021	20	050010-1	Zylinderschraube	screw	Vis
022	1	68020105	Haltering für Dämpfung	cover	Bague de retenue
023	2	040002-6	Seegering	circlip	Circlip
024	1	68035004	Zahnrad	gear	Roue dentée
025	1	68035005	Laufbuchse	bushing	Douille de pression
026	2	060033-1	Axial-Zylinderrollenlager Teil K	axial cylinder roller bearing part K	Roulement á rouleaux cyl./part K
026a	2	060033-2	Axial-Zylinderrollenlager Teil GS	axial cylinder roller bearing part GS	Roulement á rouleaux cyl./part GS
026b	2	060033-1	Axial-Zylinderrollenlager Teil WS	axial cylinder roller bearing part W	Roulement á rouleaux cyl./part WS
027	1	68016014	Druckbuchse (hinten)	pressure bushing - rear	Douille de pression arrière
028	2	060019	Wälzlager	rolling bearing	Palier à roulement
029	13	050052-7	Schmiernippel	lubricating nipple	Graisseur
030	1	050089-8	Innen-Sicherungsring	snap ring (inner)	Circlip intérieure
031	1	58020110-1	Einsteckende H112 / H55 rechts	shank adapter H112 / H55 right	Emmanchement H112/H55 droit
031a	1	58020110-2	Einsteckende H112 re / H55 li	shank adapter H112 ri / H55 le	Emmanchement H112 dr / H55 ga
031b	1	58020110-3	Einsteckende H112 li / H55 re	shank adapter H112 le / H55 ri	Emmanchement H112 ga / H55 dr
031c	1	58020110-4	Einsteckende H112 / H55 links	shank adapter H112 / H55 left	Emmanchement H112/H55 gauche
032	4	040173-1	O-Ring	o-ring	Anneau-O
033	5	050049-2	Federring innen	spring-loaded washer	Bague élastique intérieure
034	5	050187-1	Zylinderschraube	screw	Vis
035	1	030213	Gerade Einschraubverschraubung	screwing	Vissage
036	2	030185	Verschlußstopfen (Stahl)	plug	bouchon
037	1	040160-4	Radial-Wellendichtring	simmerring	Garniture d'arbre radiale
038	1	68020101	Zwischenflansch	flange	Bride
039	1	68035007	Druckring (hinten)	pressure ring (inner)	Bague de pression arrière
040	1	050188-8	Innen-Sicherungsring	snap ring (inner)	Circlip intérieure

Pos.	Qty.	Part-No.	Bezeichnung	Description	Désignation de la pièce
041	1	68035008	Lagerring	roller ring	Anneau de palier
042	1	040135-1	O-Ring	o-ring	Anneau-O
043	2	050156-4	Gewindestift mit i-skt.	threaded pin	Tige filetée
044	8	050157-1	Zylinderschraube	screw	Vis
045	1	040233-1	O-Ring	o-ring	Anneau-O
046	3	030254	Gerade Einschraubverschraubung	screwing	Vissage
047	6	030255	Gerade Einschraubverschraubung	screwing	Vissage
048	3	68016038	Paßfeder	adapter	Ressort d'ajustage
049	3	020051	Hydraulik-Motor Typ A Standard	motor type A standard	Moteur hydraulique A standard
050	3	020139	Hydraulik-Motor Typ A 2-Stufen	motor type A 2-speed	Moteur hydraulique A double
051	3	020120	Hydraulik-Motor Typ B Standard	motor type B standard	Moteur hydraulique B standard
052	3	020140	Hydraulik-Motor Typ B 2-Stufen	motor type B 2-speed	Moteur hydraulique B double
053	15	050189-1	Zylinderschraube	screw	Vis
054	1	63500036	kleiner Gehäusedeckel, links	cover	Couvercle (petit), gauge
055	15	050015-2	Federring innen	spring-loaded washer	Bague élastique intérieure
056	2	63500036	kleiner Gehäusedeckel, rechts	cover	Couvercle (petit), droit en haut
057	3	040234-1	O-Ring	o-ring	Anneau-O
058	3	050155-1	Schraube	screw	Vis
059	3	040235-6	Sprengring	circlip	Circlip
060	3	68035003	Antriebsritzel	pinion	pignon
061	3	040030-1	O-Ring	o-ring	Anneau-O
062	12	050142-1	Zylinderschraube	screw	Vis
063	2	040083-5	U-Seal	u-seal	Joint en U
064	2	050166-1	Zylinderschraube	screw	Vis
065	2	54580031	Verschlußkappe	locking cap	Écrou obturateur
066	2	010042	Druckspeicher kpl.	Accumulator cpl.	Accumulator complet

Pos.	Qty.	Part-No.	Bezeichnung	Description	Désignation de la pièce
067	8	050190-1	Zylinderschraube	screw	Vis
068	8	050017-2	Federring	spring-loaded washer	Bague élastique intérieure
069	2	58035109	Druckspeicherdeckel	accumulator cover	Couvercle d'accumulator
070	2	040055-8	Membrane	diaphragm	Membrane
071	2	58035108	Druckspeicherschale	accumulator bassin	Coquille d'accumulator
072	24	050015-2	Federring	spring-loaded washer	Bague élastique intérieure
073	24	050127-1	Zylinderschraube	screw	Vis
074	2	040123-1	O-Ring	o-ring	Anneau-O
075	4	030009	Verschlußschraube	plug	bouchon
076	2	020121	Konsole	bracket	Console
077	1	070163	Hydraulik-Steuerblock	motor selection valve	Sélecteur de circuit
078	1	030199	Verschraubung (Düse)	screwing	Raccord
079	1	040215-8	Dichtsatz kpl.	set of seals cpl.	Pochette de joints cpl.
080	1	030273-2	Schlauchsatz (hydraulisch)	hydraulic houses and fittings kit	Jeu compl. Flexibles, Raccords
081	1	040236-6	Sprengring	circlip	Circlip

26. Exploded Drawing Percussion Mechanism



27. Ersatzteilliste Schlagwerk
Spares List Percussion Mechanism
Liste de pièces détachées Mécanisme de frappe complet

Pos.	Qty.	Part-No.	Bezeichnung	Description	Désignation de la pièce
000	1	58035001	Schlagwerk kpl.	Percussion Mechanism cpl.	Mécanisme de frappe cpl.
001	1	58035134	Steuerkopf	control head	Tête de commande
002	2	040123-1	O-Ring	o-ring	Anneau-O
003	1	040076-1	O-Ring, pkt.	o-ring	Anneau-O
004	1	040077-2	Turcon Excluder	turcon excluder	Joint Turcon Excluder
005	2	040078-1	O-Ring, pkt.	o-ring	Anneau-O
006	2	040079-3	Turcon Stepseal	turcon stepseal	Joint Turcon Stepseal
007	2	040080-8	Quadring	seal	Joint à gaz
008	2	040180-8	Stützring, spiralförmig	back-up ring	Bague d'appui spiralée
009	1	58020104	Zylinder	cylinder	Cylindre
010	3	50103-1	Zylinderschraube	screw	Vis
010a	1	50185-1	Zylinderschraube	screw	Vis
011	2	040082-1	O-Ring, pkt.	o-ring	Anneau-O
012	2	040181-3	Turcon Stepseal	turcon stepseal	Joint Turcon Stepseal
013	1	040023-1	O-Ring, pkt.	o-ring	Anneau-O
014	1	040022-2	Turcon Excluder	turcon excluder	Joint Turcon Excluder
015	1	58035005	Kolben	piston	Piston
016	4	050081-1	Zylinderschraube	screw	Vis
017	4	050179-4	Gewindestift	threaded pin	Tige filetée
018	4	050031-3	Mutter selbstsichernd	nut selflocking	Ecrou indesserables

Pos.	Qty.	Part-No.	Bezeichnung	Description	Désignation de la pièce
019	1	040176-1	O-Ring	o-ring	Anneau-O
020	2	040179-5	U-Seal	u-seal	Joint en U
021	1	050160-8	Feder, Vorsteuerung	spring-pilot control valve	Ressort pour unité de pilotage
022	1	58035004	Speicherschieber	control slide valve	Poussoir de pilotage
023	1	58020131	Verschlußschraube	screw	Vis
024	1	58035003	Distanzbuchse	bushing	Douille d'ecartement
025	1	58035001	Verschlußschraube	screw	Vis
026	1	58035002	Hauptsteuerschieber	control slide valve (principal)	Poussoir de pilotage principal
027	1	54580059	Hauptsteuerbuchse	control bushing	Douille de pilotage
028	2	040164-1	O-Ring	o-ring	Anneau-O
029	1	040046-1	O-Ring	o-ring	Anneau-O
030	4	050031-3	Mutter selbstsichernd	nut selflocking	Ecrou indesserables
031	4	58035100	Gewindestange	threaded bar	
032	2	010042	Druckspeicher kpl.	accumulator cpl.	Accumulator complet
033	2	58035108	Speicherschale	accumulator bassin	Coquille d'accumulateur
034	24	050045-1	Zylinderschraube	screw	Vis
035	24	050015-2	Federring	spring-loaded washer	Bague élastique intérieure
036	2	58035109	Speicherdeckel	accumulator cover	Couvercle d'accumulator
037	2	040055-8	Membrane	diaphragm	Membrane
038	2	040083-5	U-Seal	u-seal	Joint en U
039	24	050080-1	Zylinderschraube	screw	Vis
040	2	54580031	Verschlußdeckel	cover	Couvercle à ressort
041	8	050062-1	Zylinderschraube	screw	Vis
042	8	050017-2	Federring	spring-loaded washer	Bague élastique intérieure
043	1	030210	Verschraubung	screwing	Vissage
044	1	030262	Verschraubung	screwing	Vissage

Pos.	Qty.	Part-No.	Bezeichnung	Description	Désignation de la pièce
045	2	040099-1	O-Ring	o-ring	Anneau-O
046	4	040159-5	U-Seal	u-seal	Joint en U
047	6	030011	Verschlußschraube	indicator plug	Vis de Fermeture
048	6	030089	Verschlußschraube	indicator plug	Vis de Fermeture
049	2	030251	Verschlußschraube	indicator plug	Vis de Fermeture
050	1	030260	Verschlußschraube	indicator plug	Vis de Fermeture
051	13	030009	Verschlußschraube	indicator plug	Vis de Fermeture
052	1	040096-1	O-Ring	o-ring	Anneau-O
053	1	040166-8	Dichtsatz Juego entero Pe	set of seals cpl.	Pochette de joints cpl.

28. Conversion Tables

	Metre	Kilometre	Inch	Foot	Yard	Mile
	1	0,001	39,37	3,3808	1,0936	0,00016
	1000	1	39370	3280,8	1093,6	0,6214
	0,0254	----	1	0,0833	0,0278	---
	0,3048	0,0003	12	1	0,3333	0,0002
	0,9144	0,0009	36	3	1	0,0006
Length	1609,3	1,6903	63360	5280	1780	1
	Cubic Metre	Litre	Cubic Inch	Cubic Foot	Imp. Gallon	U.S. Gallon
	1	1000	61024	35,315	219,97	264,17
	0,001	1	61,024	0,0353	0,22	0,2642
	----	0,0164	1	0,0006	0,0036	0,0043
	0,0283	28,317	1728	1	6,2288	7,4805
	0,0045	4,546	277,42	0,1605	1	1,2009
Volume	0,0038	3,7853	231	0,1337	0,8327	1
	Gram	Kilogram	Ton	Carat	Ounce	Pound
	1	0,001	----	5	0,0353	0,002
	1000	1	0,001	5000	35,247	2,2046
	10^6	1000	1	----	35274	-2204,6
	0,2	0,0002	----	1	0,007	0,0004
	28,349	0,0283	----	141,75	1	0,0625
Weight	453,59	0,4536	0,0005	2268	16	1
	KN/m²	bar	atm.	kgf/cm²	lbf/in²	ft.w.g.
	1	0,01	0,0099	0,0102	0,1450	0,3346
	100	1	0,9869	1,0197	14,504	33,457
	101,32	1,01,32	0,9869	1,0332	14,696	33,901
	98,066	0,9807	0,9678	1	14,223	32,810
	6,8948	0,0689	0,068	0,0703	1	2,3068
Pressure	2,9889	0,0299	0,0295	0,0305	0,4335	1

29. Deviation

1 cm / metre = 0,57°	1,0° = 1,75 cm / metre
2 cm / metre = 1,15°	1,5° = 2,62 cm / metre
3 cm / metre = 1,72°	2,0° = 3,49 cm / metre
4 cm / metre = 2,29°	2,5° = 4,37 cm / metre
5 cm / metre = 2,86°	3,0° = 5,24 cm / metre
6 cm / metre = 3,43°	3,5° = 6,12 cm / metre
7 cm / metre = 4,00°	4,0° = 6,99 cm / metre
8 cm / metre = 4,57°	4,5° = 7,87 cm / metre
9 cm / metre = 5,14°	5,0° = 8,75 cm / metre

30. Appendix

Lubricant - List of suppliers

K. S. PAUL GMBH - 40233 DÜSSELDORF

Ronsdorfer Str. 53
40233 Dûsseldorf
Ruf (0211)370394/95
Telex 8588293

Representatives and agencys of K. S. PAUL

CONDOR S.A.P.A.
BARTOLOME MITRE 559,
BUENOS AIRES,
ARGENTINA

AUSTRIA - SEE GERMANY

ELBE S. A.
POSTBUS 76
1080 BRUSSELS,
BELGIUM

VANGUARD LTDA.,
AVE. HEROES DEL ACRE 1454, CASILLA 4390,
LA PAZ, BOLIVIA.

TIRRENO - IND.COM. DE PROD. QUIM. LTDA.,
CAIXA POSTAL 278,
DIADEMA 09900,
SAO PAULO,
BRAZIL

BRUNEI - SEE SINGAPORE

HALPEN ENGINEERING (I978) LTD.,
14, ELROSE AVENUE,
WESTON, ONTARIO M9M 2H6,
CANADA

IMPERIAL OIL
AMENGUAL 247,
SANTIAGO,
CHILE

30. Appendix

Lubricant - List of suppliers

HONGKONG UNITED DOCKYARDS LTD.,
HUNG HOM
HONG KONG
CHINA

J. HARTMANN
VESTERBROGADE 55B1
1620 COPENHAGEN V.
DENMARK

VERDEJA COMERCIAL & C0. C. por A.,
APARTADO No. 1047,
SANTO DOMINGO,
DOMINICAN REPUBLIC

CI-AR-CI CHEMICALS C0. (DUBAI),
P.0. BOX 3214,
DUBAI

MAXIMO JARA CUEVA,
P. 0. BOX 585,
GUAYAQUIL,
ECUADOR

LA CASA DEL REPUESTO PASCUAL MERLOS C0.,
25. AVENIDA SUR Y 4A, CALLE PONIENTE,
SAN SALVADOR,
EL SALVADOR

BERNER OSAKEYHTI0,
P.B. 15,
SF-00131 HELSINKI 13,
FINLAND

K. S. PAUL-FRANCE S.A.R.L.,
129, RUE DE LA POMPE,
75116 PARIS
FRANCE

K. S. PAUL G.M.B.H.
RONSDORFER STRASSE 53
40233 DUESSELDORF
GERMANY

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Lubricant - List of suppliers

FLAME HELLAS LTD.,
14, SKOUZE,
PIRAEUS,
GREECE

ORION-REPRESENTACIONES INTERNACIONALES,
5A, CALLE 3-21, ZONA 9 ,
AP. POSTAL 919,
GUATEMALA CITY,
GUATEMALA

MOLY-PAUL HOLLAND B. V.
POSTBUS 22,
2665 ZG BLEISWIJK,
HOLLAND

H. J. LEACH & C0.,
LUBRICANT DEPT.
P. 0. BOX 899, ASIAN BLDG.,
R. KAMANI MARG, BALLARD ESTATE,
BOMBAY 400 038,
INDIA

MURPHY ENGINEERS LTD.,
JOHN F. KENNEDY AVENUE,
JOHN F. KENNEDY ESTATE,
NAAS ROAD , DUBLIN I 2 .
IRELAND

S. SCHLESINGER,
23, SOKOLOW STREET,
TEL-AVIV,
ISRAEL.

ME.PA.C0. S.R.L.,
VIA G. LEOPARDI N. 2/4,
57100 LIVORNO,
ITALY

DAISHIN TRADING C0. , LTD. ,
FUJI BUILDING 2 - 4- 4 ,
SHIBA DAIMON , MINATO-KU ,
TOKYO 105,
JAPAN

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Lubricant - List of suppliers

MALAYSIA - SEE SINGAPORE

W. MICALLEF,
HEMLOCK,
DITCH STREET, off HOMPESCH ROAD,
FGURA,
MALTA

SWIFT CONSOLIDATED (N.Z.) LTD.,
5th FLOOR, MOTOR TRADE HOUSE,
KENT TERRACE, WELLINGTON 1,
G.P.O. BOX 1002,
NEW ZEALAND

KJEMI-SERVICES A. S.,
N. 3143 KJOEPMANNSKJAER,
NORWAY

COPISA,
CIA. QUIMICA INDUSTRIAL DEL PACIFICO S.A.,
AVE. ARGENTINA 5064,
LIMA,
PERU

VECOM PORTUGAL S.A.R.L.,
RUA DOS LUSIADOS 18-3,
LISBON 3,
PORTUGAL.

AL-NASR TRADING ORGANISATION,
P.O. BOX 28,
DOHA,
QATAR

ABLE & RIDWAY SUPPLY (PTE) LTD.,
23, SAM LEONG ROAD,
SINGAPORE 8

CERA S. A., (PTY) LTD.,
P.O. BOX 5196,
BOKSBURG NORTH,
TRANSVAAL 1461,
SOUTH AFRICA

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Lubricant - List of suppliers

SOUTH KOREA - SEE JAPAN

VECOM ESPANOLA S.A.,
SERRANO 139,
MADRID 6,
SPAIN

and

VECOM ESPANOLA S. A.,
CORRT. PORTUGALETA A ORTUELLA KM 2,500,
ORTUELLA (VIZCAYA),
SPAIN

ESANCO IMPORT AB.,
HJARNEGATAN 10,
112 29 STOCKHOLM,
SWEDEN

SWITZERLAND - SEE GERMANY

CHAUTONG TRADING C0. LTD.,
No. 7-2, SEC. 1,
CHUNG HWA ROAD,
TAIPEI 100,
TAIWAN

EMPIRE INTERNATIONAL LTD., PARTNERSHIP
G.P.0. BOX 1355,
3497/9, CHIENGMAI ROAD,
BANGKOK 6,
THAILAND

GRULLERO KARDESLER,
HALEFI,
ANTONYO GRULLERO VE ORTAGI KILLECTIF SIRKETI,
YEMENICILER CADDESI 55,
KARAKOY,
ISTANBUL,
TURKEY

URUGUAY - SEE ARGENTINA

30. Appendix

Lubricant - List of suppliers

URUGUAY - SEE ARGENTINA

STAHL SPECIALTY CO.,
KINGSVILLE,
MISSOURI 64061,
UNITED STATES OF AMERICA

GLEASON & CIA., S.A.,
APARTADO (P.O. BOX) 2432,
VENEZUELA.

BULGARIA/RUMANIA:-

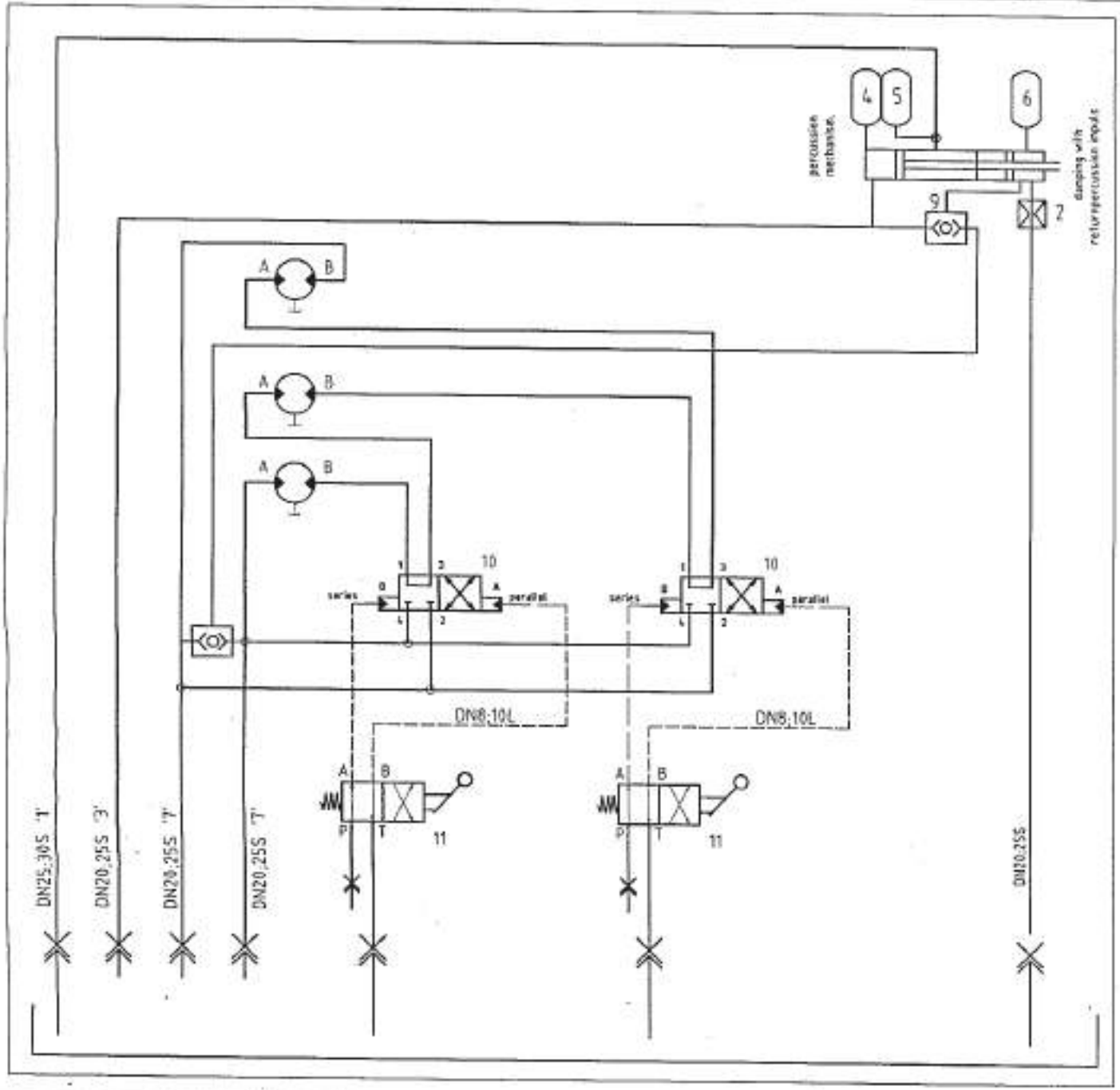
INDUSTRIAL LUBRICANTS A. G.,
POSTFACH 44,
CH-8702 ZOLLIKON,
SWITZERLAND

All other countries are supplied from K. S. Paul Products Ltd. London or from K. S. Paul GmbH, Duesseldorf.

Zeich.Nr.: 7 8035 003
Datum: 04.07.97 Bz

Hydraulic Connection HD8035

GmbH



1. R-Line DN20;25S
   max. perm. back pressure p=3 bar
2. nozzle 0,5 mm
3. P – Line (percussion)
   DN 20; 30S
   p=160-180 bar; Q=90-100 l/min
4. air operated accumulator (P-Line)
   prestressing pressure p=65 bar
5. air operated accumulator (R-Line)
   prestressing pressure p=8 bar
6. air operated accumulator (damping)
   Vorspanndruck p=80 bar
7. rotary direction left / right
   p=200 bar max.
   Q=150 l/min max.
8. hydraulic motors
9. bullet shuttle valve
10. motor selection valve hydr.
    series / parallel
11. motor selection valve pilot line
    p=systempressure see # Nr.7

Cleanliness Requirements
ISO 4406 18/13

Viscosity
by operating temperature
20-43 cSt