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Kempe U3-9BQ-H00 Hydraulic Diamond Drill O & M Manual and Parts List

Title	Date	By	Sign	Approved	Sign
Kempe U3-9BQ-H00 Hydraulic Diamond Drill O & M Manual and Parts List	**17.6.09**	**I Omand**		**D Huddy**	
Revision	Date	By	Sign	Approved	Sign
HUD Design Original					

U3-9BQ Hydraulic Diamond Drill Specifications

Rating	500 m ex (horizontal). BQ and BX
Spindle speed	0 - 550 rpm, infinitely variable
Weight drill	135 kg
Weight Rod Puller	22kg
Motor	Hydraulic
Power Pack	45kW electric motor with variable displacement hydraulic pump.
Oil tank Capacity	250 litres
Controls	Free standing console incorporating controls for drilling, rod pulling and pushing, with 4m hose from controls to the drill-head
Operating pressure	21MPa
Feed screw	ID suitable for E, A, AQ, B or BQ rods
Feedscrew run	850 mm
Chuck	3 jaw for E, A, AQ, B or BQ rods
Drill	Totally enclosed unit containing all moving parts including the motor. The brackets on the main housing are designed for either left hand (R/H) or right hand (L/H) mounting.
Feed gears	The machine is equipped with 4 feed gears, with available selection as follows:

Revolutions per inch advance

ratio 22/56	ratio 23/60	**Standard Config ratio 25/65**
180	139	**158**
330	210	**256**
530	276	**360**
736	325	**446**
1360	410	620

In all cases the same feed gears are used. One set of input gears is changed to give different feed ranges.

Feed gear change	Interlock system. Neutral / reverse position located between each gear. Holding the handwheel while in neutral will reverse the feed screw.
Saddle plate	Double-ended saddle plate to take two rod pullers if necessary.
Mounting	Clamps fit 114mm (4 ½“) OD single bar.

Angle of drilling	Designed to drill through 360˚.
Rod puller	Hydraulic rod puller with inter connecting hoses
Puller mechanism	Non-slip double-ended ball type with turrets on either side to facilitate pushing or pulling. Available for E, A, AQ, B, or BQ rods

1. Safety Precautions For Operating Pneumatic Drills.

The safety precautions listed below are intended to alert the operators and maintenance personnel to the possible physical dangers inherent in the various phases of operating and maintaining equipment of this kind.

All operators and maintenance personnel must read and thoroughly understand this manual before attempting to operate or perform maintenance on the product. In all situations "SAFETY FIRST" must be primary consideration of all personnel while operating or maintaining the drill. Since these safety precautions cannot cover every possible situation, good judgment and common sense must be applied while operating, servicing or working near the product.

1. During operation of the drill, Safety Shoes, Safety Glasses, Ear Protection and Safety Helmut must be worn.

2. Exposure to excessive noise can lead to hearing deficiency. Appropriate Ear Protection must always be worn.

3. Distraction increases the danger of accidents occurring.

4. Only on actual operation of the drill, should the operating handle be touched

5. When working with the drill, sure and firm footing is necessary.

6. The drill should be positioned as near to the face as possible.

7. The drill should never be put into operation if it is lying on the ground or if it is not held securely in working position.

8. Compressed air is dangerous! Never point a connected compressed air hose at co-workers or yourself. Avoid the habit of blowing your clothes free of dust with compressed air.

9. Be sure that all hose connections are tight and sealed. A loose hose not only causes loss of air: danger exists that it comes completely off the DRILL, whips around injuring the operators and others in the area. Secure hoses with safety cables or ropes to prevent danger of injury in case a hose is broken.

10. Never disconnect a pressurized air hose: First shut off air at the compressor port, then bleed the line and tool.

11. Do not operate the machine with loose clothing as it can easily be picked up by the feed screw.

12. When loosening the chuck be sure there is no back pressure in the rod string and never stand behind the drill rods, always stand to the side when adding a new rod.

13. Ensure that no cables, pipes and the like are in area of the drill operation (Power, Instrumentation, Gas, Water, Telephone, or any other).

14. In case a cleaning solvent is used for cleaning drill parts, make sure that this meets the current safety and health regulations and that it is used in a well-ventilated area. In addition the current regulations of disposal are to be respected.

15. If there is any possibility of drilling into high pressure water HUD recommend the use of our safety rigging. (See Drill Rig - Safety stand Assembly on page 27).

2. U3-9BQ Hydraulic Drill Machine Specifications

The U3-9BQ-H00 Hydraulic machine is identical to the U3-9BQ air machine with the exception of the air motor section. This has been replaced by a dummy liner and rotor.

A hydraulic fixed displacement motor drives directly onto the rotor shaft via a nylex coupling. A hydraulic operated rod puller replaces the air operated puller.

Detailed specifications:

1) Power pack

Electric motor	45kw – 1450 rpm foot and flange mounted flameproof or standard
Pump	100 lt/min - pressure set to 21 MPa
Return filter	capacity 300 lts/min at 20 micron
Suction filter	capacity 300 lts/min at 60 micron

2) Control valve

U3-9BH standard	two bank valve to control a) Rotation b) Rod pulling cylinder
U3-9BH	three bank valve to control heavy duty frame a) Rotation b) Rod pulling cylinder c) Rod gripper box
Hoses	High pressure hydraulic inter-connecting hoses.

3) U3-9BH machine:

Thrust	positive screw thread advance via 4 speed selector
Rotation	fixed displacement motor. Speed variation obtained by changing motors (400 – 1500 rpm)

Chuck	manual three jaw
Rod pulling Cylinder	50mm dia
Puller Mechanism	double ball type for pushing and pulling OD rods
Jigger clamp std	114mm (4 ½“) jigger clamp which enables the machine to drill 360˚ horizontal or vertical.
Heavy duty frame	fitted with double jigger clamps for increase stability on deep holes. Also fitted with two hydraulic rod puller cylinders and hydraulic rod gripper.

3. General maintenance and lubrication

All gears and moving parts in the machine are grease lubricated on assembly using a multi purpose EP2 high temperature bearing grease. If a grease that is not to the above specifications is used the following problems may occur.

- if the grease through continued use loses its viscosity it will leak out of the front & rear cover felt seals causing a messy problem on the working site and leaving gears and bearings not properly lubricated.
- if the grease used is too viscous then gears and bearings cut a path into the grease and will remain un-lubricated.
- if the grease used is too sticky the gears and bearings require excessive drive power causing poor performance.
- if the grease is not sticky enough the centrifugal force throws the grease off the gears leaving them un-lubricated.

The above noted problems relate to our past experience and we recommend the use of the correctly specified grease.

Grease nipples are provided in strategic but visible positions and we recommend that all nipples be greased at the commencement of a shift with the above specified grease.

Feed screw lubrication: We recommend regular cleaning with paraffin and oiling with light oil for optimum feedscrew and feednut life.

Stripping and Assembly Instructions:

To strip the machine completely:-

- loosen screw (9a). Remove retainer 19 and key 18. Then remove hand wheel 18 (l/h thread)
- front and rear covers will then come off easily
- remove (9b) by hand
- remove retainer (4) and nut (52)
- use a gear puller to remove gear (6)

- use an end plate puller screw onto end plate (48) and remove same. Gear (50) will come off in same operation
- use a gear puller to remove gear(s) (15). Gear/s (35) come out by hand
- use circlip pliers to remove retainer (8a)
- use feed nut and drive sleeve draw-bolt to remove parts 7, 8, 12a, etc , and the whole feednut and drive sleeve assembly. Note: before pulling the latter parts remove the key (14) with screwdriver or pliers
- the rotor (44) may then be tapped out using a soft hammer
- remaining end plate (42) and liner (46) are then tapped out with hammer and long pin punch

To re-assemble:-

- All re-usable parts are to be washed in paraffin or petrol, lubricated with grease and refitted. No feeler gauges or shims are necessary
- Examine rotor housing liner and replace if worn or corrugated
- Replace rotor blades if worn or chipped.
- Replace bearings irrespective of condition.
- Re-assemble in the reverse order to above
- most fitting procedures outline special recommended tools

Special Fitting Precautions: Make sure that all spacers are fitted into the machine as shown in this parts manual, in the feed nut assembly.

Motor Bearings: Use only HUD supplied Kempe bearing retainers, as they are specially ground circlips.

Feed Gear Fitting: When fitting feed gears into the machine, they must be placed in numerical feed sequence with the finest feed towards the rear end plate. i.e. 158 → 256 → 360 → 446. Then the 446 gear must be closest to the rear end plate and the 158 gear closest to the rear cover. It is essential to only use HUD supplied Kempe gears in mating sets.

Routine Maintenance checks – Hydraulic Machines:

Daily checks:

1 Grease all nipples
2 Clean feed screw and grease lightly
3 Check oil level of hydraulic tank.
4 Clean the balls in the rod puller mechanism

Weekly checks:

1 Strip and clean chuck and check jaws for excessive wear
2 Check general condition of machine and rectify where necessary.
3 Check power pack and machine for oil leaks and tighten where necessary.

Monthly checks:

1 Replace oil filters on power pack
2 Check all above items.

The power pack is preset before leaving the factory. In the event of pressure or flow decrease, contact HUD to rectify. Incorrect setting can damage the hydraulic components

4. Operating Instructions For U3 Series Hydraulic Drills.

The Kempe U3 series of hydraulic diamond drills are primarily underground machines designed for prospect drilling or any other type of drilling including grout holes.

The machine is to be securely mounted on a 114mm (4 ½") dia bar. It is l/h or r/h mounting and can drill through 360.

It is important to lubricate all grease nipples at the commencement of the shift. The machine may now be run at an infinitely variable speed, which is regulated by means of a valve on the air line. It is very important to check whether the oil mist lubricator is working by placing ones hand into the exhaust air stream. If a few oil droplets have deposited on ones hand then all is well. This procedure is to be repeated as often as may be convenient during the shift.

A handle is provided at the rear of the machine to change the rate of feed. This gear changing is to be done only when the machine is running very slowly (and not under pressure) or when it is stationary using the hand wheel to assist in locating the correct gear. No force is to be applied. When reversing the feed screw, place the feed lever into neutral, hold the hand wheel and start the machine slowly. The screw will now run back at high speed. **It is important to first loosen the chuck before placing the feed handle into neutral.**

Rigging: The machine is mounted on a double jack bar and should be anchored to the face with a turn buckle or chain. (This helps to combat "offline" drilling).

Care must be taken that all bolts are properly tightened and that the rig is secure.

Machine mounting: The machine is equipped with bar clamp and can be rigged onto horse rigs or mounting bars. The machine is capable of causing considerable thrust during drilling and the mounting rig must be properly secured to withstand this thrust. If there is any doubt use chains and turnbuckles to secure the rig. Precautions must be taken to prevent the mounting rig from twisting causing off-line drilling.

Machine operation: The chuck speed is dependent on the hydraulic motor and oil flow. The forward feed speed is dependent on the engaged feed gear and the drill operator develops a feel for this situation. The hardness of the formation, cutting ability of the bit, etc, all have a bearing on the speed and penetration rate and only past experience dictates the required circumstances. The required feed is selected by means of the shifter handle. (choice of 4). For reversing, the shifter handle is placed in the neutral position, the handwheel held by hand and the hydraulic motor motivated. The feed screw will then reverse revolving right handed.

Caution: Do not reverse the feed screw at excessive speed and do not ram the chuck into the front cover.

Before drilling commences:

- Lubricate the machine
- Check the hydraulic oil level in the power pack reservoir (via the sight glass)

- Check all hydraulic hoses, couplings and fittings are clean, and that there are no signs of any signs of oil leaks
- Check there is a return flow of water
- Check machine is safely and securely mounted – see below

Drilling:

A handle is provided at the rear of the machine to change the rate of Feed. This gear changing is to be done only when the machine is running very slowly (and not under pressure) or when it is stationary using the hand wheel to assist in locating the correct gear. No force is to be applied. When reversing the Feed Screw, place the Feed Lever into neutral, hold the hand wheel and start the machine slowly. The screw will now run back at high speed. It is important to first loosen the Chuck before placing the Feed handle into neutral.

- Select the gear you require and then open the hydraulic valve slowly until the crown actually starts cutting
- then gradually increase power until the rod string is rotating vibration free
- to change gear, stop the machine and select the required gear and start off slowly.
- at the end of the feed screw run, close off the hydraulic valve, loosen the chuck and reverse the machine
- next tighten the chuck and start the machine slowly
- when the core-barrel has been filled or a blockage has occurred, turn of the water, remove the rod that is in the feedscrew, open the machine by loosening the saddle plate eye bolt, then extract the rods with the rod puller
- **remember,** rod grease or any other additive must be used to lubricate the rod string

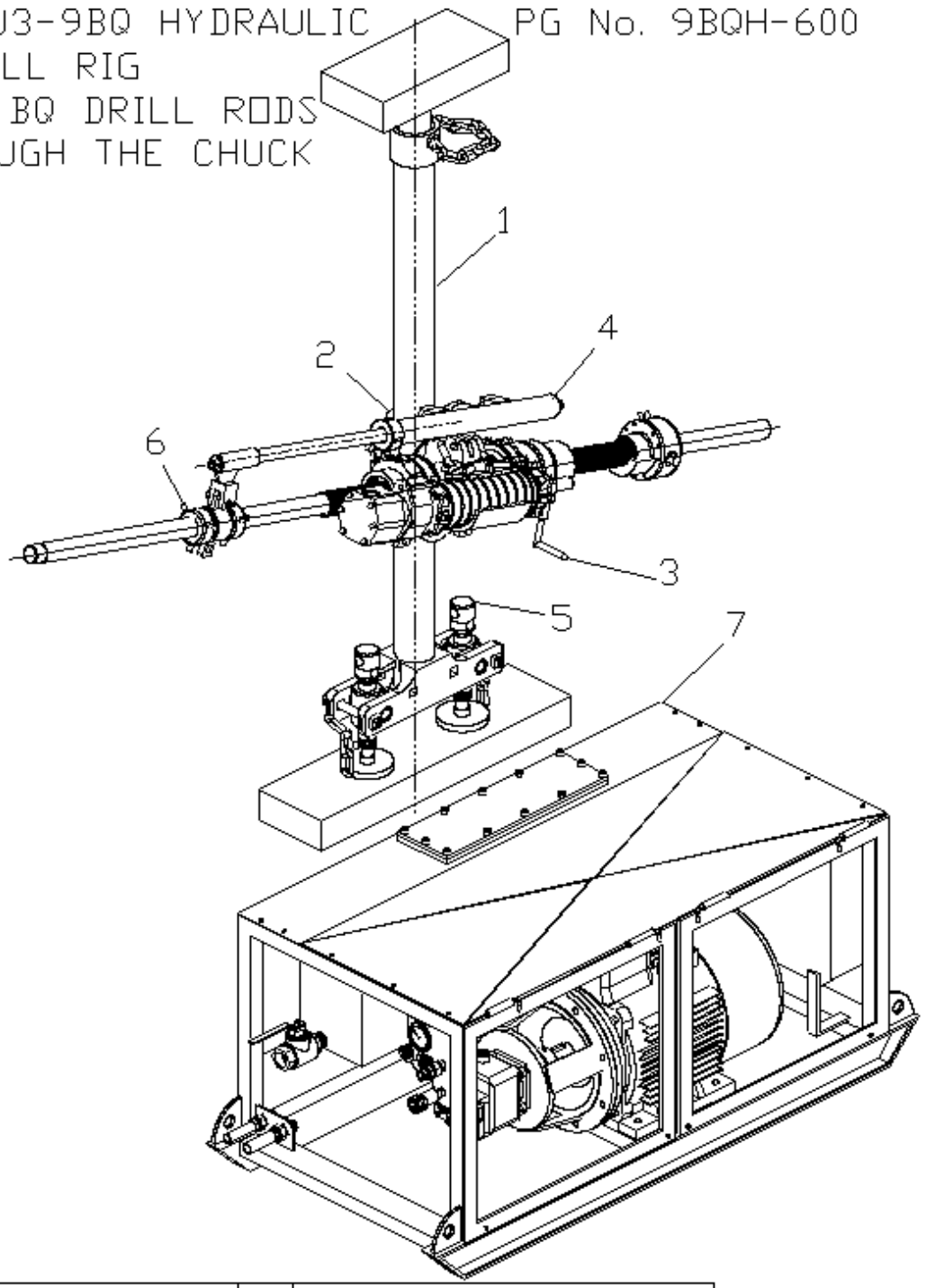
Notes: before attempting to place the machine into neutral, loosen the chuck to relieve built up thrust back pressure.

To re-engage feed, move the handwheel slightly to and fro allowing the shifter key to engage into the rotor feed gear.

Special note: once drilling has commenced the torsion and thrust will retain the feed gear key firmly in position and under no circumstances may the feed be changed during drilling. The feed may only be changed when the machine is stationary and the chuck has been loosened.

STD U3-9BQ HYDRAULIC - DRILL RIG
E TO BQ DRILL RODS
-THROUGH THE CHUCK

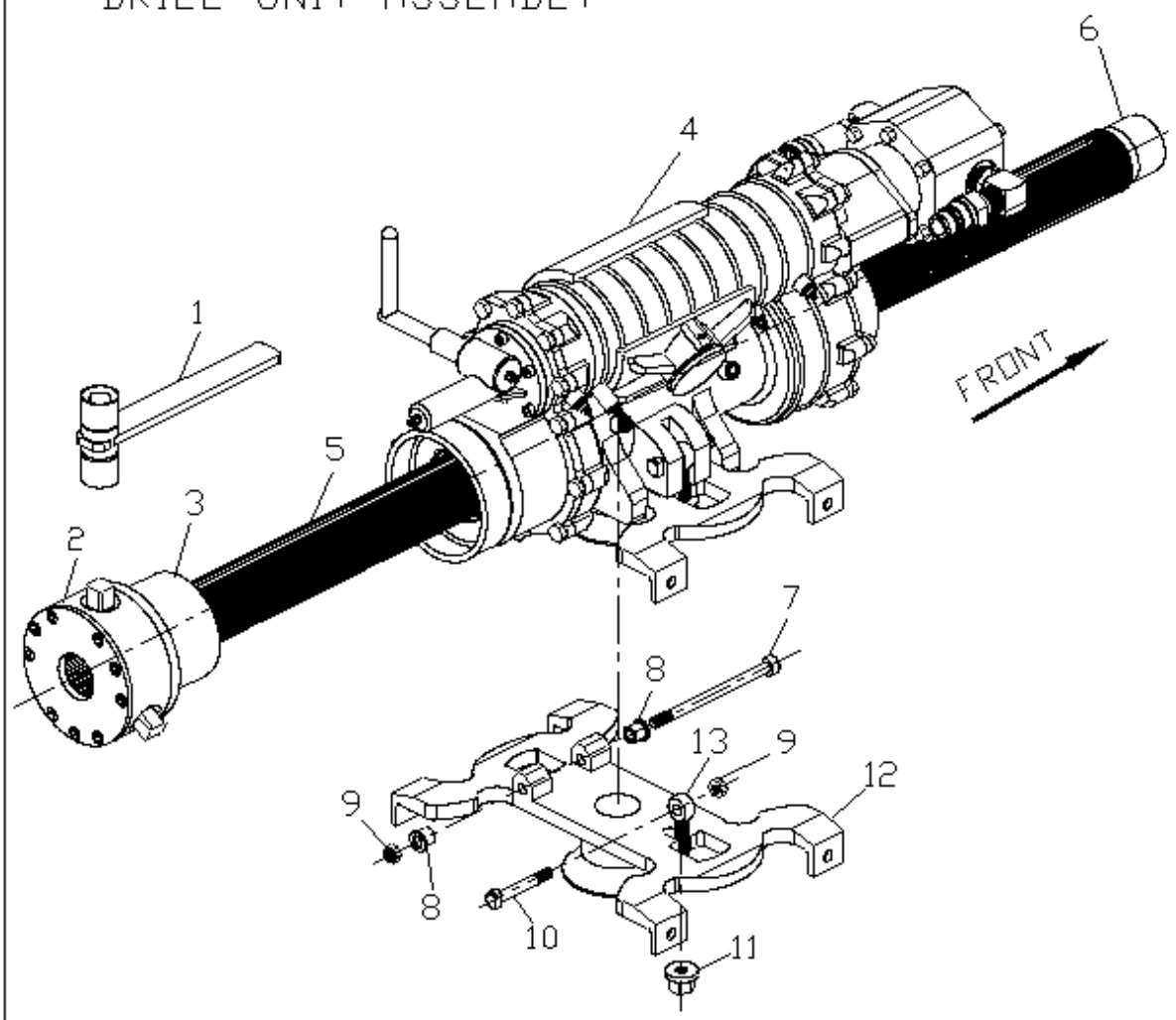
PG No. 9BQH-600



IT	DESCRIPTION	QTY	PAGE No
0	DRILL RIG COMPLETE	1	9BH-600
1	TELESCOPIC POLE ASSEMBLY	1	U3-6-TP
2	POLE CLAMP ASSEMBLY	1	U3-6-PC
3	DRILL UNIT ASSEMBLY	1	U3-9BH-00
4	STANDARD HYD. ROD PULLER	1	U3-9-305
5	DOUBLE JACK ASSEMBLY	1	U3-6-130
6	BALL ROD PULLER ASSEMBLY	1	U3-6-72-*
7	HYDRAULIC POWER PACK	1	K6-HP-00
8			

U3-9BQ HYDRAULICC DRILL
DRILL UNIT ASSEMBLY

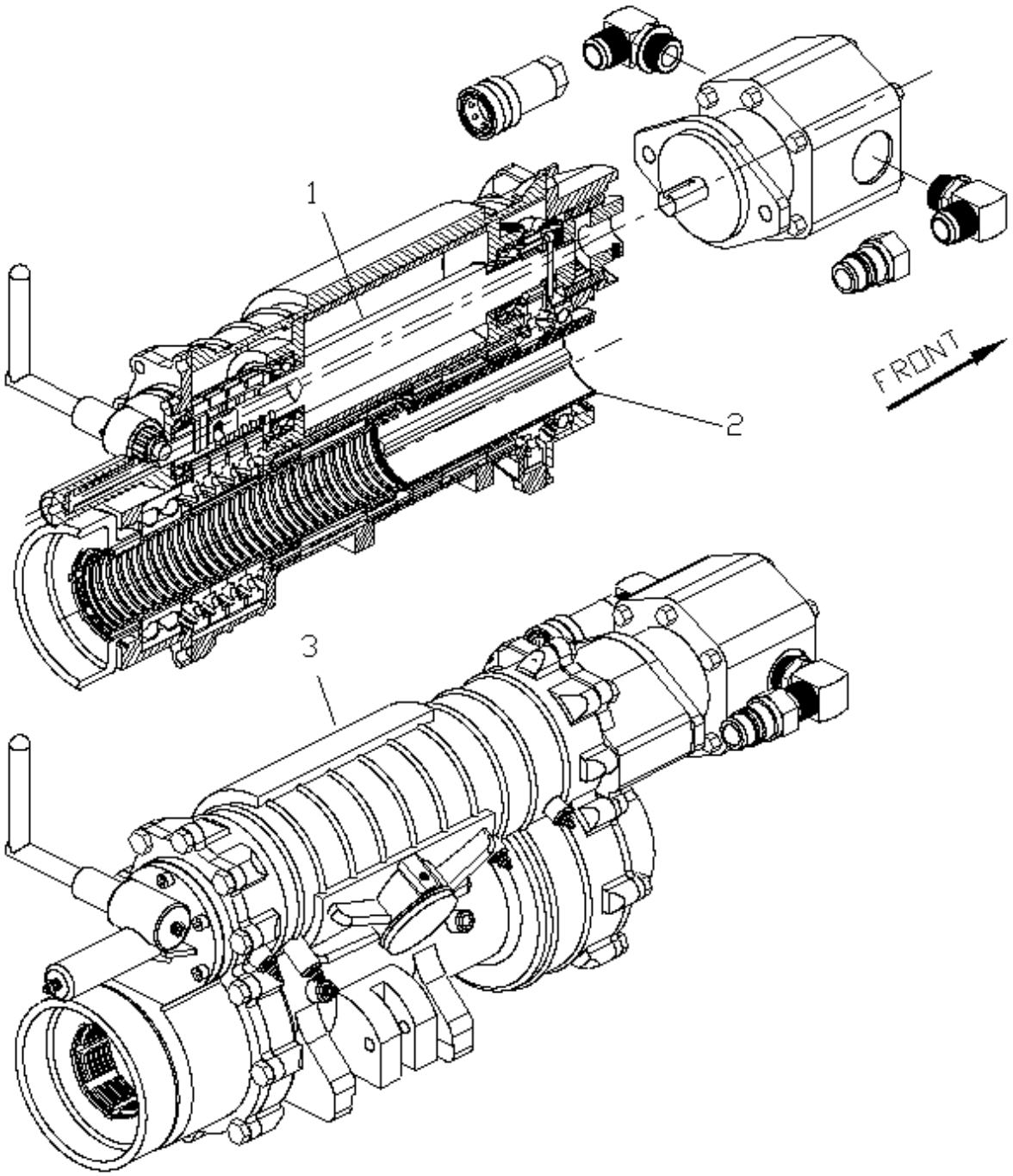
PG No. 9BQH DU



IT	DESCRIPTION	QTY	PART No.	PAGE No.
0	DRILL UNIT COMPLETE	1	U3-9BQ-H00	
1	CHUCK SPANNER	1	U3-6-106	
2	CHUCK (STATE SIZE)	1	U3-6BQ-107	6BQN CHK
3	RUBBER BUFFER	1	U3-6BQ-227	
4	DRILL HEAD	1	U3-9BQ-00	9BQP DH
5	FEEDSCREW LEFT HAND	1	U3-6BQ-98 LH	
6	ROD STABALIZING FERRULE (STATE SIZE)	1	U3-6BQ-98B	
7	HINGE BOLT LONG	1	U3-6-57	
8	MAIN HOUSING BUSH	2	U3-6-10-BUSH	
9	HINGE BOLT NUT	2	U3-6-57A	
10	HINGE BOLT SHORT	1	U3-6-57S	
11	EYE BOLT NUT	1	U3-6-56	
12	SADDLE PLATE	1	U3-6-54	U3 JCSP
13	EYE BOLT	1	U3-6-55	

U3-9BQ HYDRAULICC DRILL
DRILL HEAD ASSEMBLY

PG No. 9BQH DH

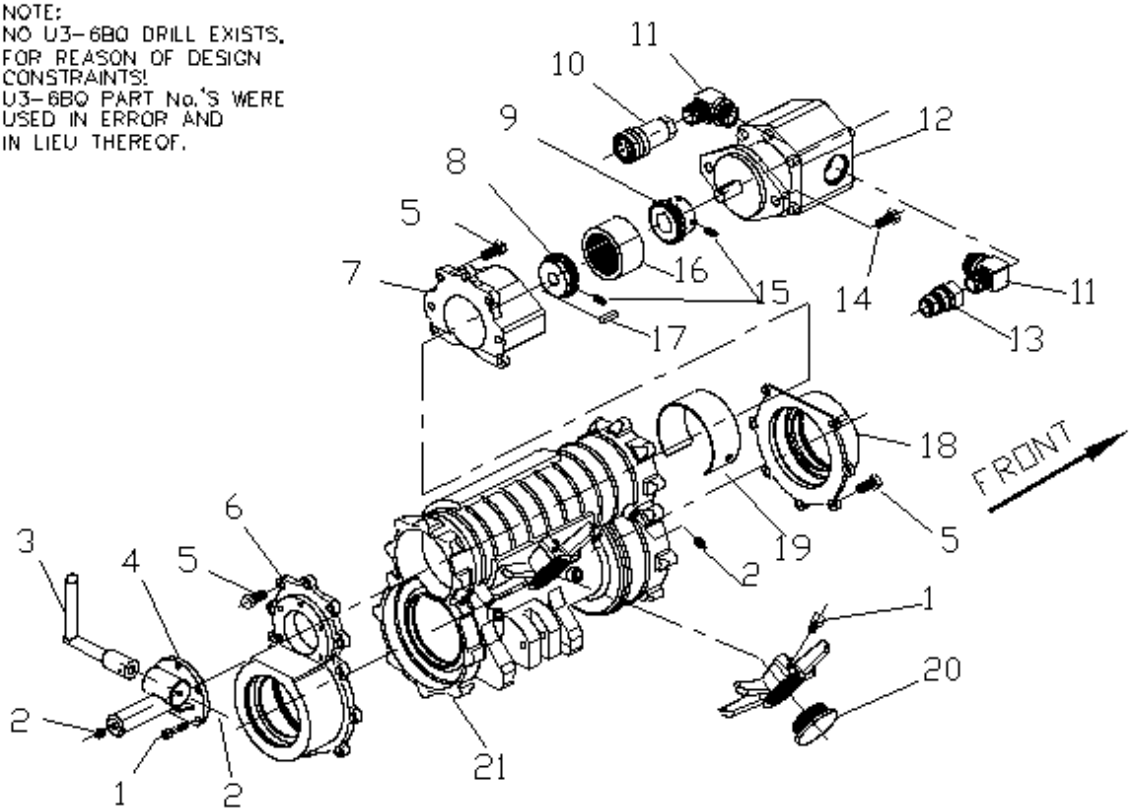


IT	DESCRIPTION	QTY	PAGE No.
0	DRILL HEAD	1	
1	MOTOR AND SHIFTER ASSEMBLY	1	9BQH-MS
2	DRIVE SLEEVE AND FEED NUT ASSEMBLY	1	9BQH-DSFN
3	HOUSING ASSEMBLY	1	9BQH-HSE

U3-9BQ HYDRAULIC DRILL HOUSING - ASSEMBLY

PG No. 9BQH HSE

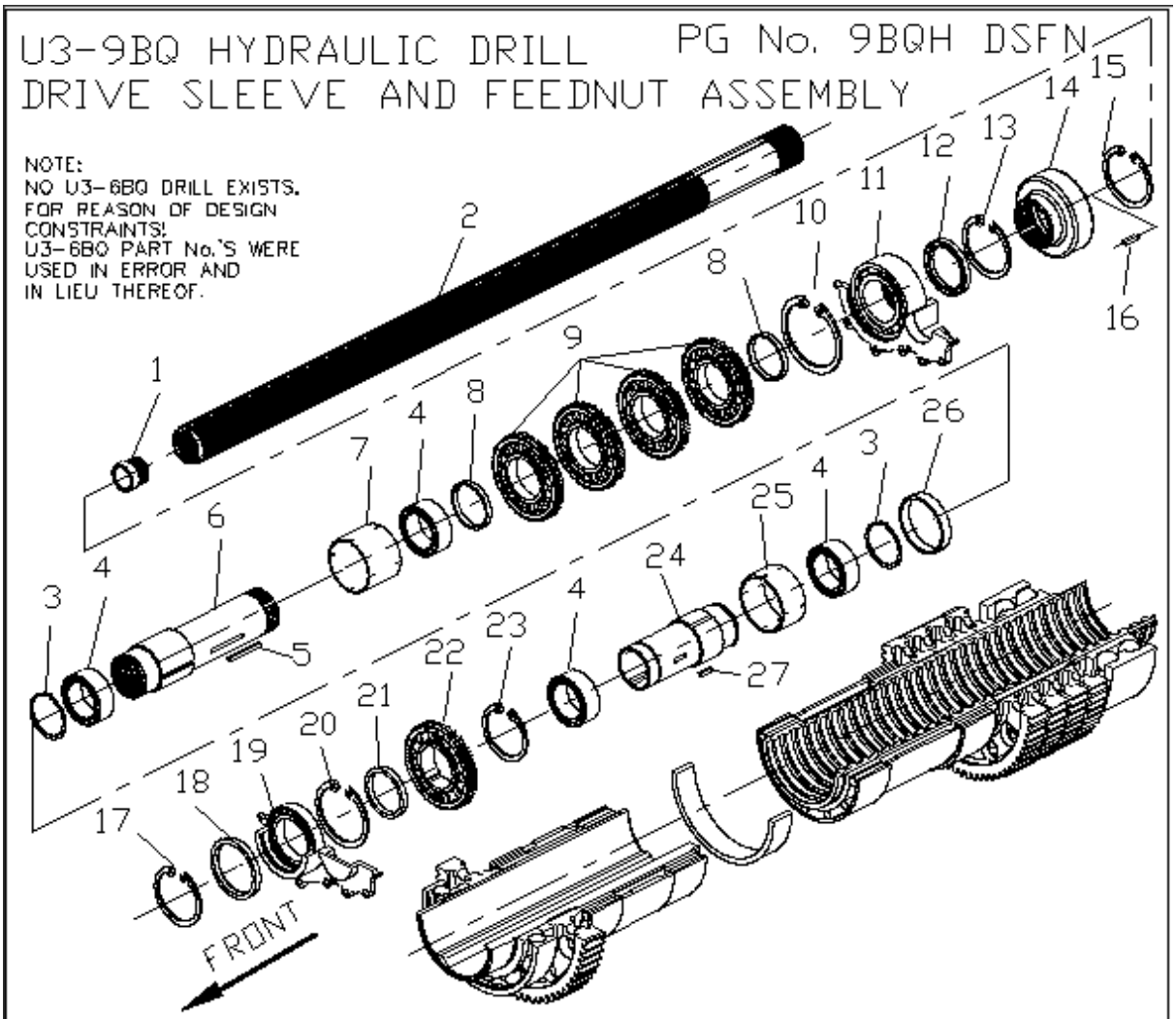
NOTE:
NO U3-6BQ DRILL EXISTS.
FOR REASON OF DESIGN CONSTRAINTS!
U3-6BQ PART No.'S WERE USED IN ERROR AND IN LIEU THEREOF.



IT	DESCRIPTION	QTY	PART No.
1	SOC HD CAP SCREW	7	U3-6-32
2	GREASE NIPPLE	8	U3-6-100
3	SHIFTER HANDLE	1	U3-6-29M
4	SHIFTER PINION HOUSING	1	U3-6B-24M
5	COVER HEX CAP SCREW	25	U3-6BQ-9A
6	REAR COVER	1	U3-6BQ-11
7	HYD MOTOR ADAPTOR PLATE	1	U3-6BH-10B
8	ROTOR GEAR COUPLING	1	U3-6B-201
9	MOTOR GEAR COUPLING	1	U3-6B-203
10	QUICK COUPLER - BODY	1	U4-HP-22
11	ELBOW	2	U3-6B-207
12	HYDRAULIC MOTOR	1	U3-6B-204
13	QUICK COUPLER - NIPPLE	1	U4-HP-23
14	HEX CAP SCREW	2	U3-6B-??
15	GRUB SCREW	2	U3-6B-205
16	GEAR COUPLING SLEEVE	1	U4-45-36
17	KEY	1	U3-6B-200
18	HYD. FRONT COVER	1	U3-6BQ-9BH
19	FRONT COVER END PLATE SPACER	1	U3-6-9B
20	NUT - AIR INLET COVER	1	U3-6H-10B
21	HOUSING	1	U3-9BQ-1D
22			

U3-9BQ HYDRAULIC DRILL PG No. 9BQH DSFN
DRIVE SLEEVE AND FEEDNUT ASSEMBLY

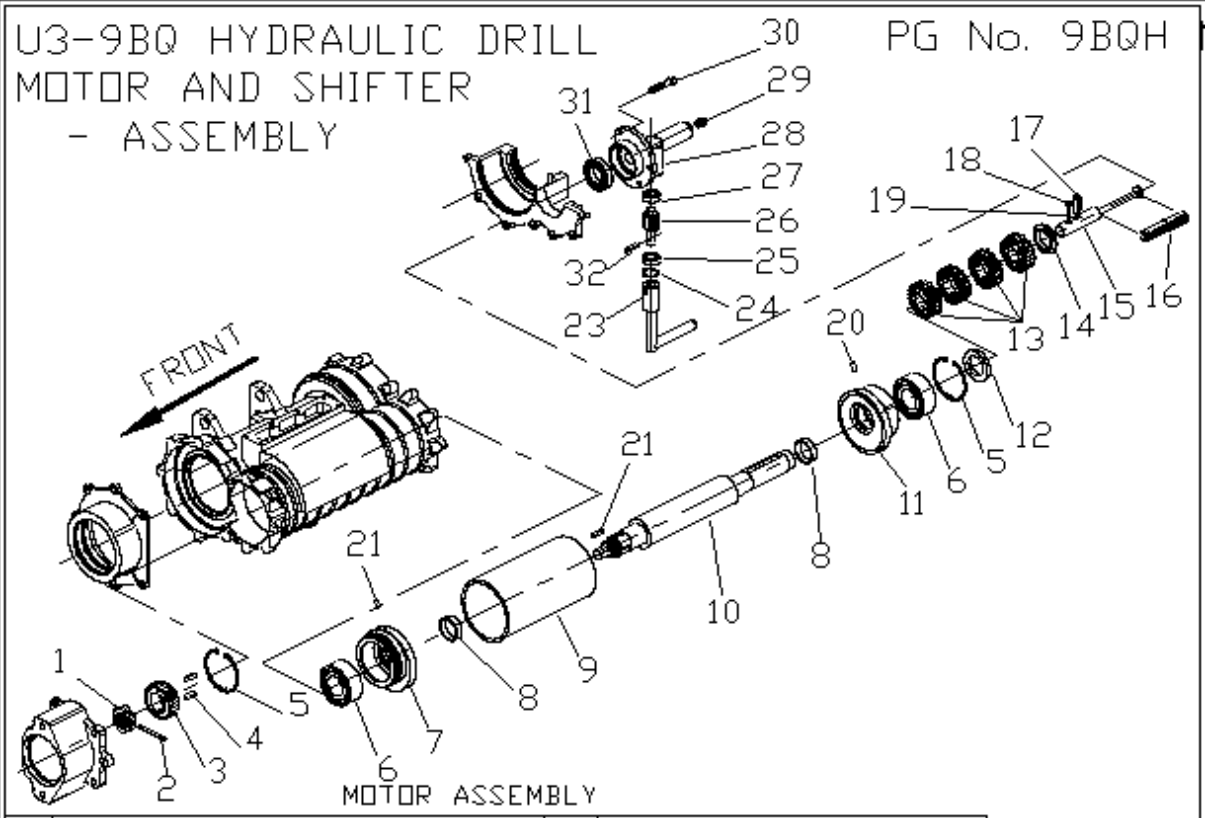
NOTE:
NO U3-6BQ DRILL EXISTS.
FOR REASON OF DESIGN CONSTRAINTS!
U3-6BQ PART No.'S WERE USED IN ERROR AND IN LIEU THEREOF.



IT	DESCRIPTION	QTY	PART No.
1	ROD STABILIZING FERRULE - STATE SIZE	1	U3-6BQ-96B
2	SCREW-FEED	1	U3-6BQ-96
3	CIRCLIP - DRIVE SLEEVE	2	U3-6BQ-7D
4	NEEDLE ROLLER BRG	4	U3-6BQ-7B
5	KEY-FEED GEAR	1	U3-6B-5
6	NUT-FEED	1	U3-9BQ-12
7	SPACER-REAR	1	U3-9BQ-12C
8	SPACER-MAIN BRG.	2	U3-6BQ-13
9	GEAR-FEED	4	U3-6BQ-15-446/360/256/158
10	REAR COVER BRG CIRCLIP	1	U3-6BQ-8
11	REAR COVER BRG	1	U3-6BQ-12B
12	REAR COVER OIL SEAL	1	U3-6BQ-1
13	RETAINER - REAR COVER SEAL	1	U3-6BQ-23
14	WHEEL-HAND	1	U3-6BQ-20
15	RETAINER - HAND WHEEL	1	U3-6BQ-19
16	KEY-HAND WHEEL	1	U3-6BQ-18
17	FRONT BRG CIRCLIP	1	U3-6BQ-17A
18	FRONT COVER OIL SEAL	1	U3-6BQ-1
19	FRONT COVER BRG	1	U3-6BQ-17
20	FRONT BRG RETAINER CIRCLIP	1	U3-6BQ-8A
21	SPACER-DRIVE GEAR	1	U3-6BQ-17B
22	GEAR-DRIVE	1	U3-6BQ-6
23	BEARING RETAINER	1	U3-6BQ-4
24	SLEEVE-DRIVE	1	U3-6BQ-7
25	SPACER-FRONT	1	U3-6BQ-7C
26	SPACER-CENTER	1	U3-6BQ-8B
27	KEY-DRIVE GEAR	3	U3-6B-5

U3-9BQ HYDRAULIC DRILL MOTOR AND SHIFTER - ASSEMBLY

PG No. 9BQH

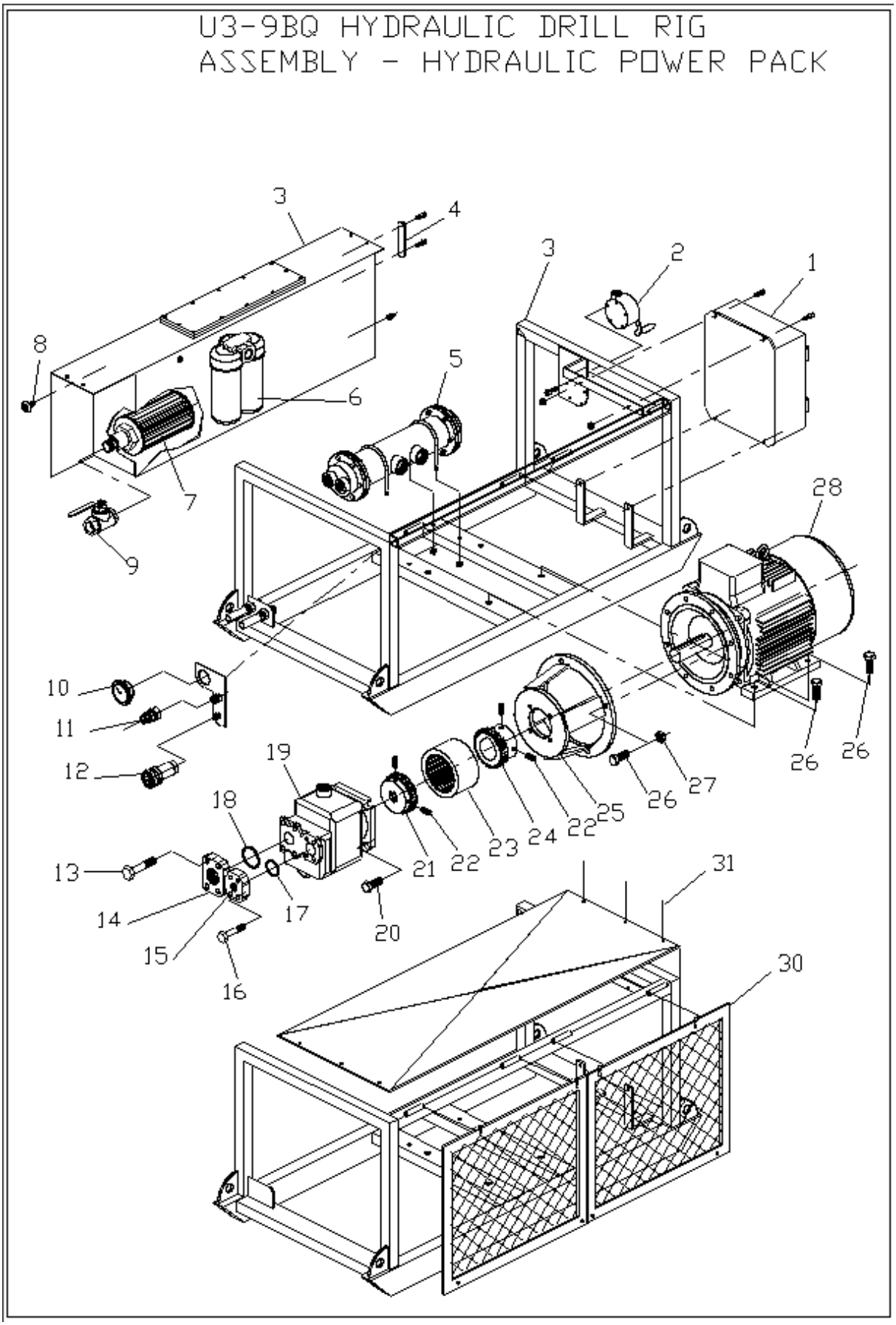


MOTOR ASSEMBLY

IT	DESCRIPTION	QTY	PART No.
1	ROTOR PINION NUT	1	U3-6-52H
2	ROTOR PINION NUT COTTER PIN	1	U3-6-53
3	ROTOR PINION (SEE SPECIFICATIONS)	1	U3-6BQ-6
4	PINION KEY	2	U3-6-51
5	END PLATE BEARING RETAINER	2	U3-6-41A
6	END PLATE BEARING	2	U3-6-41
7	FRONT END PLATE	1	U3-6-48
8	ROTOR BEARING SPACER	2	U3-6-43
9	DUMMY LINER	1	U3-9-46H
10	DUMMY ROTOR SHAFT	1	U3-9-44H
11	REAR END PLATE	1	U3-6-42
12	FEED GEAR SPACER	1	U3-6-40
13	ROTOR FEED GEARS (SEE SPECIFICATION)	4	U3-6-35
14	SPACER	1	U3-6-34
15	SHIFTER SPINDLE	1	U3-6-36
16	SHIFTER RACK	1	U3-6-36A
17	FEED GEAR KEY	1	U3-6-37
18	SHIFTER BALL	1	U3-6-39
19	SHIFTER SPRING	1	U3-6-38
20	END PLATE DOWEL	2	U3-6-42A
21	ROTOT GEAR COUPLING KEY	1	U3-9-200

SHIFTER HOUSING ASSEMBLY

23	SHIFTER PINION HANDLE	1	U3-6-29M
24	SHIFTER PINION RETAINER	1	U3-628M
25	PINION BEARING	1	U3-6-26M
26	SHIFTER PINION	1	U3-6-25M
27	PINION BEARING(SEALED)	1	U3-6-27M
28	SHIFTER HOUSING	1	U3-6B-24M
29	GREASE NIPPLE	1	U3-6-100
30	SHIFTER HOUSING CAP SCREW	5	U3-6-32
31	SHIFTER HOUSING BEARING	1	U3-6-33
32	SEL-LOK PIN	1	U3-6-30M


U3-9BQ HYDRAULIC DRILL RIG
ASSEMBLY - HYDRAULIC POWER PACK
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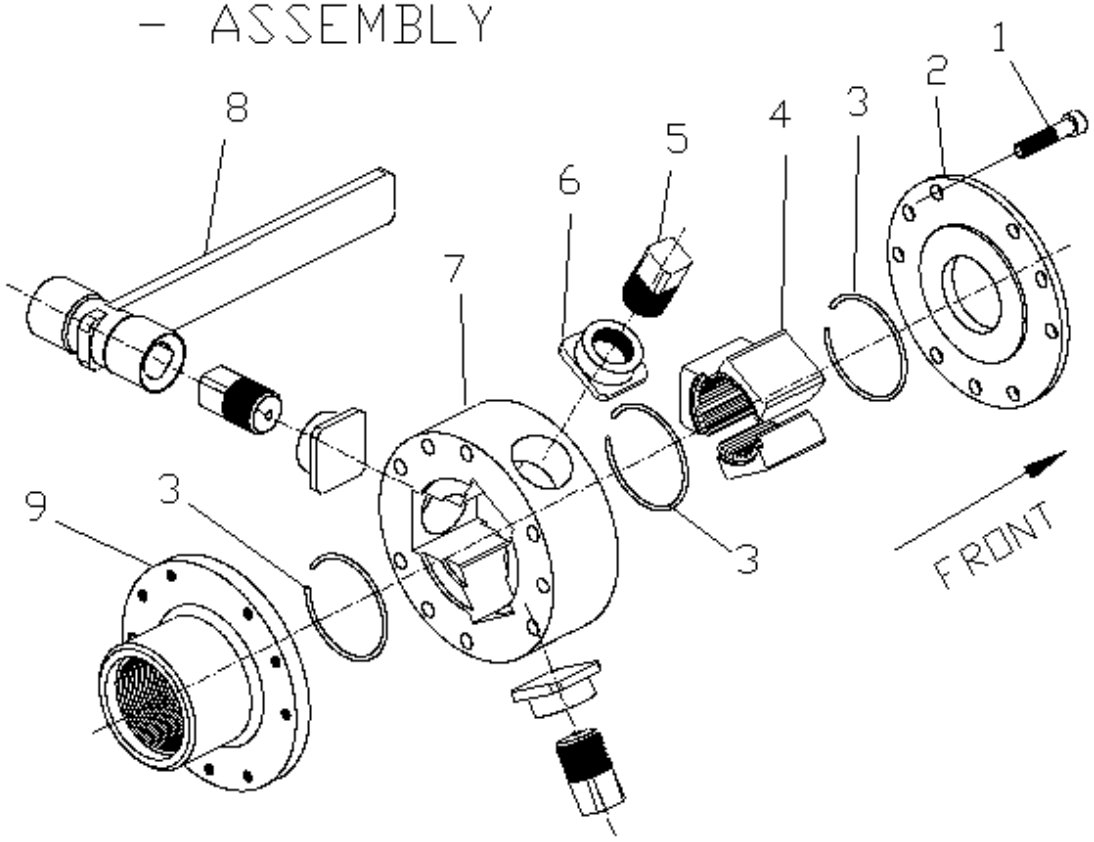
U3-9BQ HYDRAULIC DRILL RIG
ASSEMBLY - POWER PACK
PARTS LIST

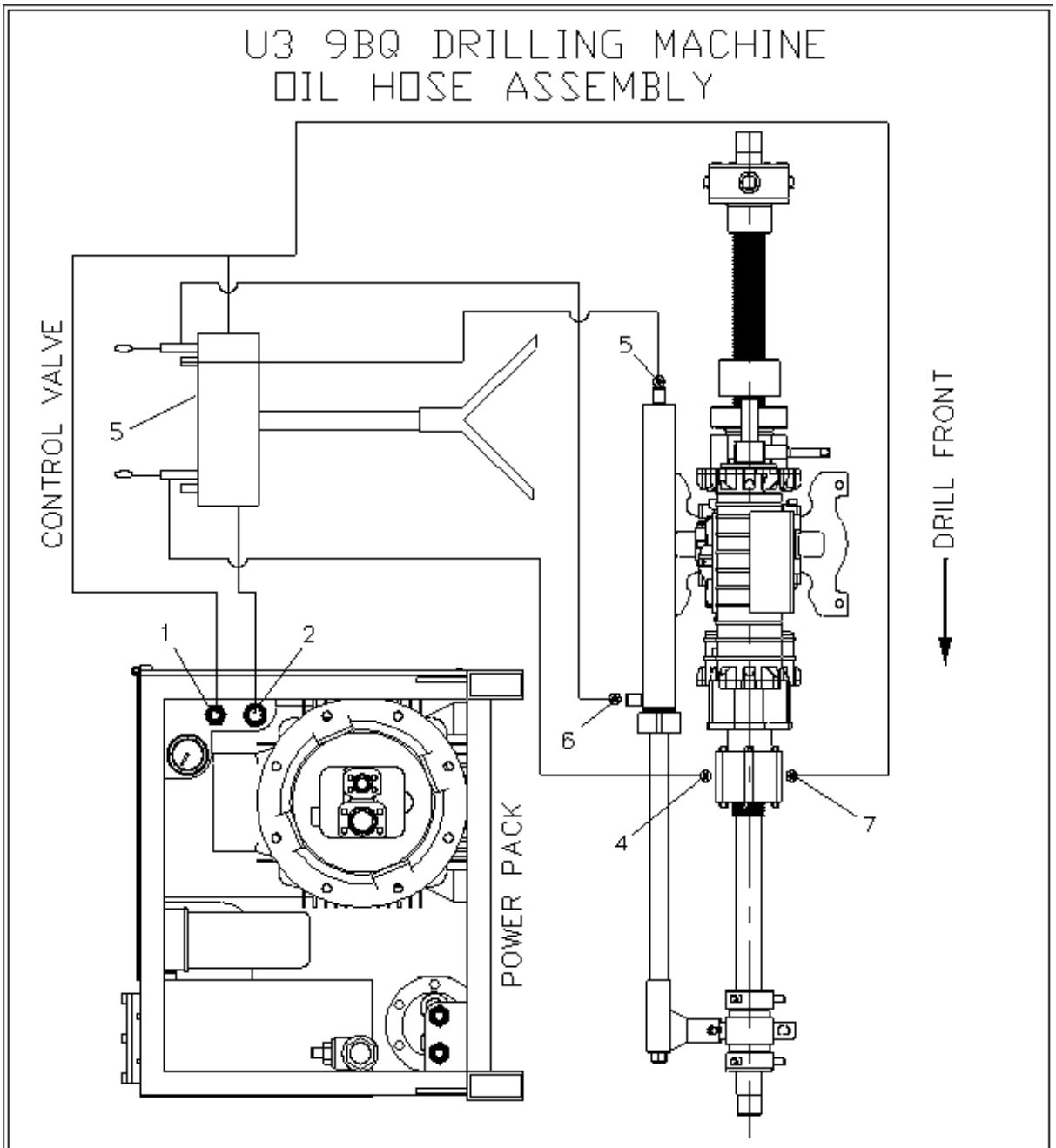
IT	DESCRIPTION	QTY	PART No
0	POWER PACK COMPLETE	1	U3-HP-00
1	ELECTRICAL SWITCH GEAR	1	U3-HP-34
2	OIL FILLING HAND PUMP	1	U4-HP-31
3	TANK & FRAME ASSEMBLY	1	U3-HP-01 U3-HP-07
4	OIL LEVEL & TEMP GAUGE	1	U4-HP-32
5	OIL COOLER	1	U3-HP-?
6	RETURN FILTER ELEMENT	2	U3-HP-25E
7	SUCTION STRAINER	1	U3-HP-35E
8	TANK BREATHER	1	U4-HP-26
9	OIL CLOSE VALVE	1	U3-HP-??
10	PRESSURE GAUGE 0-25 MPa	1	U4-HP-24
11	QUICK COUPLER 1" NIPPLE	1	U4-HP-23
12	QUICK COUPLER 3/4" BODY	1	U4-HP-22
13	FLANGE BOLT	4	U3-HP-00
14	PUMP FLANGE SUCTION	1	U3-HP-15B
15	PUMP FLANGE PRESSURE	1	U3-HP-15A
16	PUMP FLANGE BOLT	4	U3-HP-
17	FLANGE PRESSURE O - RING	1	U3-HP-
18	FLANGE SUCTION O - RING	1	U3-HP-
19	HYDRAULIC PUMP	1	U4-HP-15
20	PUMP FLANGE BOLT	4	U3-HP-
21	PUMP COUPLING	1	U3-HP-14 ??
22	GRUB SCREW	4	U3-HP-
23	DRIVE COUPLING	1	U4-HP-12
24	MOTOR COUPLING	1	U4-HP-13
25	BELL HOUSING	1	U3-HP-11
26	MOUNTING BOLT	8	U3-HP-
27	MOUNTING BOLT NUT	8	U3-HP-
28	45kW ELECTRIC MOTOR	1	U3-HP-10
29	SCREW - TOP COVER	6	U3-HP-B1
28	COVER - FRONT INSPECTION	2	U3-HP-??

PG No. BQP CHK

U3-6BQ PNEUMATIC CHUCK - ASSEMBLY

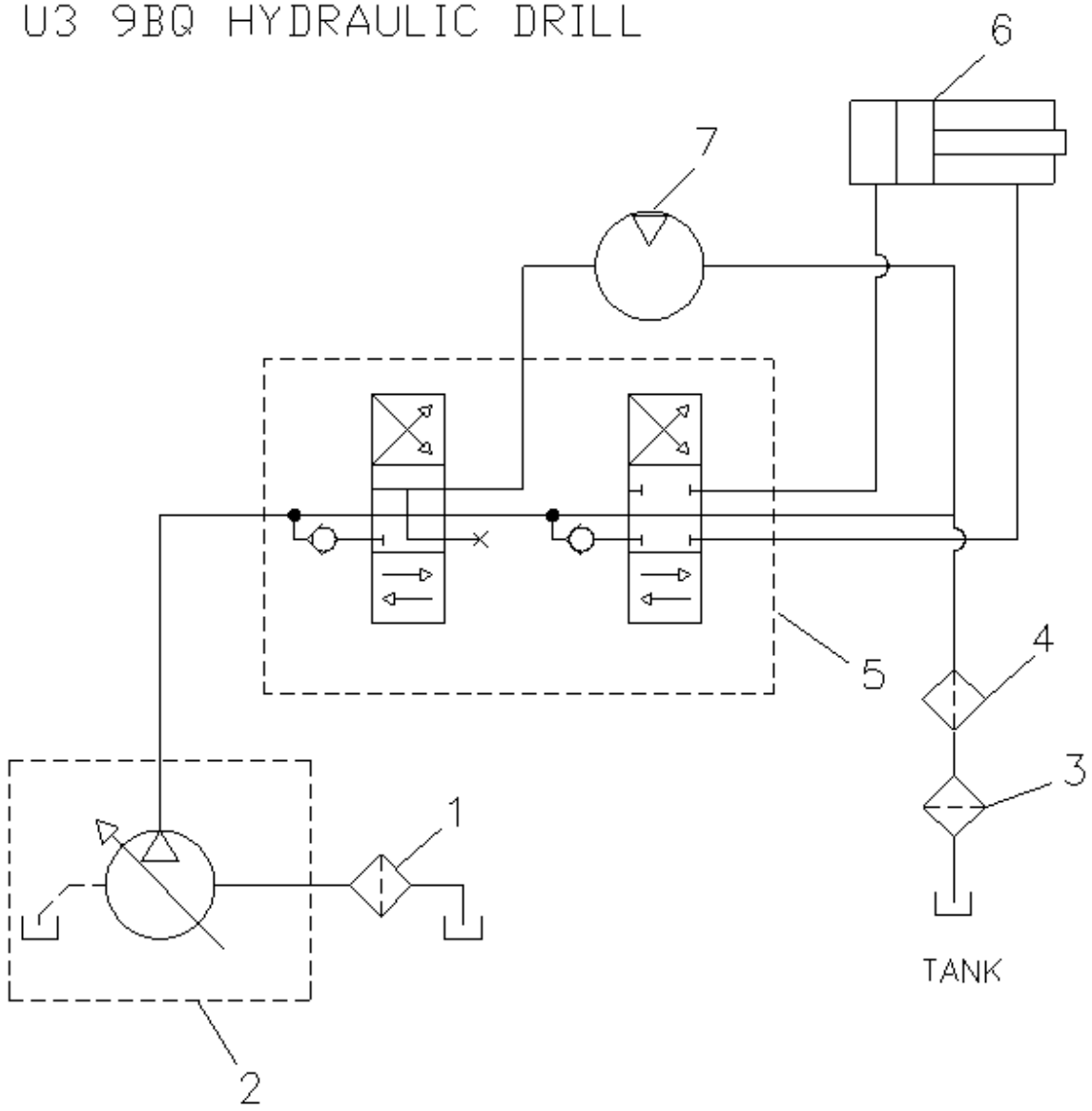


IT	DESCRIPTION	QTY	PART No
0	CHUCK COMPLETE	1	U3-6BQ-107
1	CHUCK BOLTS	9	U3-6-97
2	CHUCK FRONT COVER (STATE SIZE)	1	U3-6BQ-98
3	CHUCK JAW SPREADER	2	U3-6BQ-102
4	CHUCK JAWS (STATE SIZE)	3	U3-6-99
5	CHUCK SCREWS	3	U3-6-100
6	CHUCK SCREW INSERTS	3	U3-6-101
7	CHUCK BODY	1	U3-6BQ-103
8	CHUCK SPANNER	1	U3-6-106
9	CHUCK FLANGE	1	U3-6BQ-105 LH



ITEM	DESCRIPTION	PART No.	QTY.
0	HYDRAULIC HOSE COMPLETE	U3-S-00	1 SET
1	PUMP RETURN HOSE	U4-S-1R28	1
2	PUMP PRESSURE HOSE	U4-S-34R28	1
3	CONTROL VALVE	U3-DC-202	1
4	MOTOR PRESSURE HOSE	U3-DC-203	1
5	ROD PULLER HOSE	U3-DC-204	1
6	ROD PULLER HOSE	U3-DC-204	1
7	MOTOR RETURN HOSE	U3-DC-205	1

SCHEMATIC OIL FLOW DIAGRAM
U3 9BQ HYDRAULIC DRILL

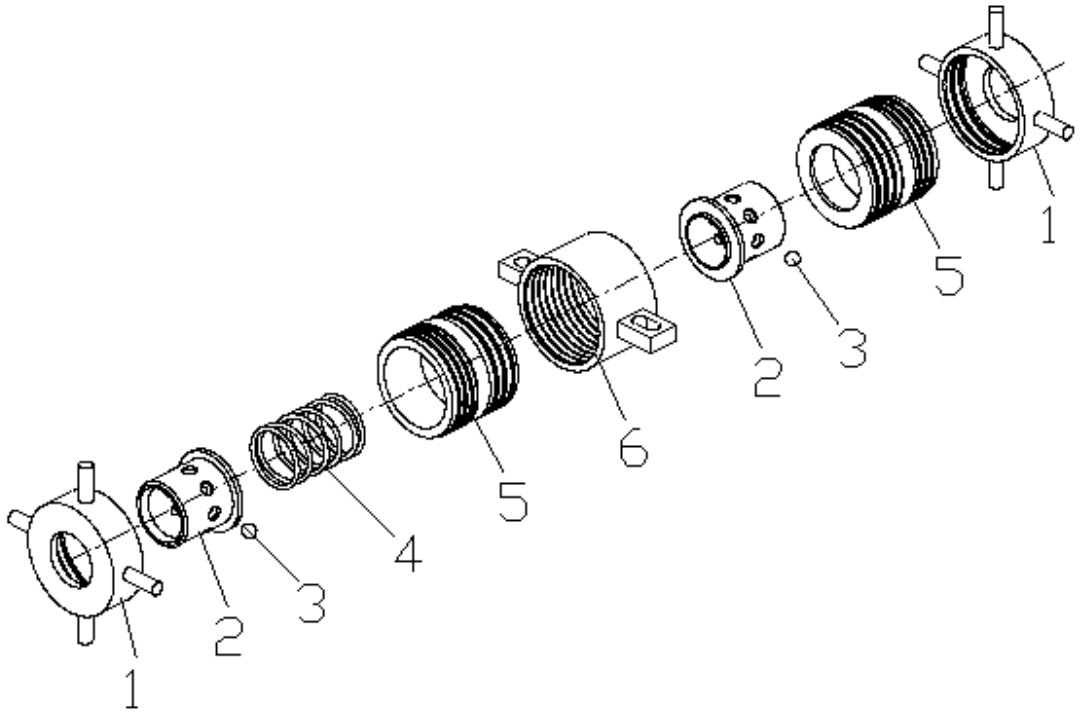


U3 9BQ HYDRAULIC DRILL

IT	DESCRIPTION	QTY	PART NO.
1	SUCTION FILTER ELEMENT	1	
2	MAIN HYDRAULIC PUMP	1	
3	RETURN FILTER – (ELEMENT)	1	
4	OIL COOLER	1	
5	2 BANK VALVE	1	
6	HYDRAULIC ROD PULLER	1	
7	HYDRAULIC MOTOR	1	

PG No. U3-6-71

BALL ROD PULLER ASSEMBLY
U3-6-71 (B-BW-BQ)

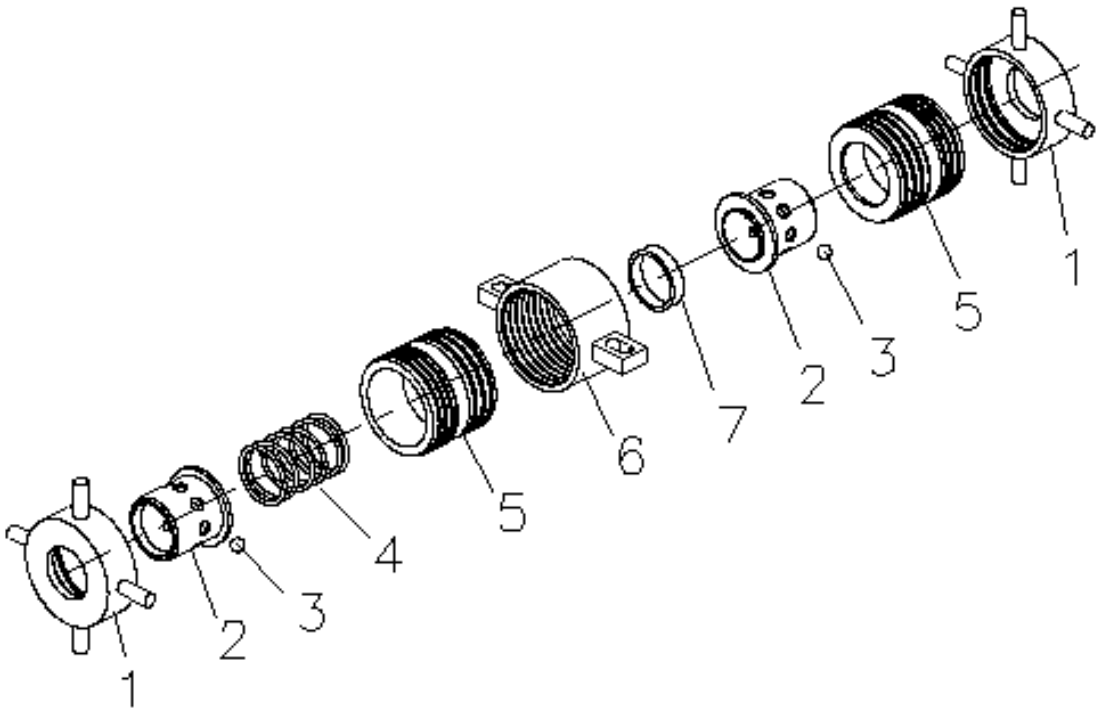


(*) = STATE DRILL ROD SIZE

ITEM	DESCRIPTION	PART No.	QTY.
00	ROD PULLER COMPLETE	U3-6-72-(*)	1
01	NUT	U3-6-72-(*)	2
02	CASE	U3-6-74-(*)	2
03	12 STEEL BALL	U3-6-74A-(*)	16
04	SPRING	U3-6-76-(*)	1
05	BODY	U3-6-73-(*)	2
06	FLANGE	U3-6-75-(*)	1

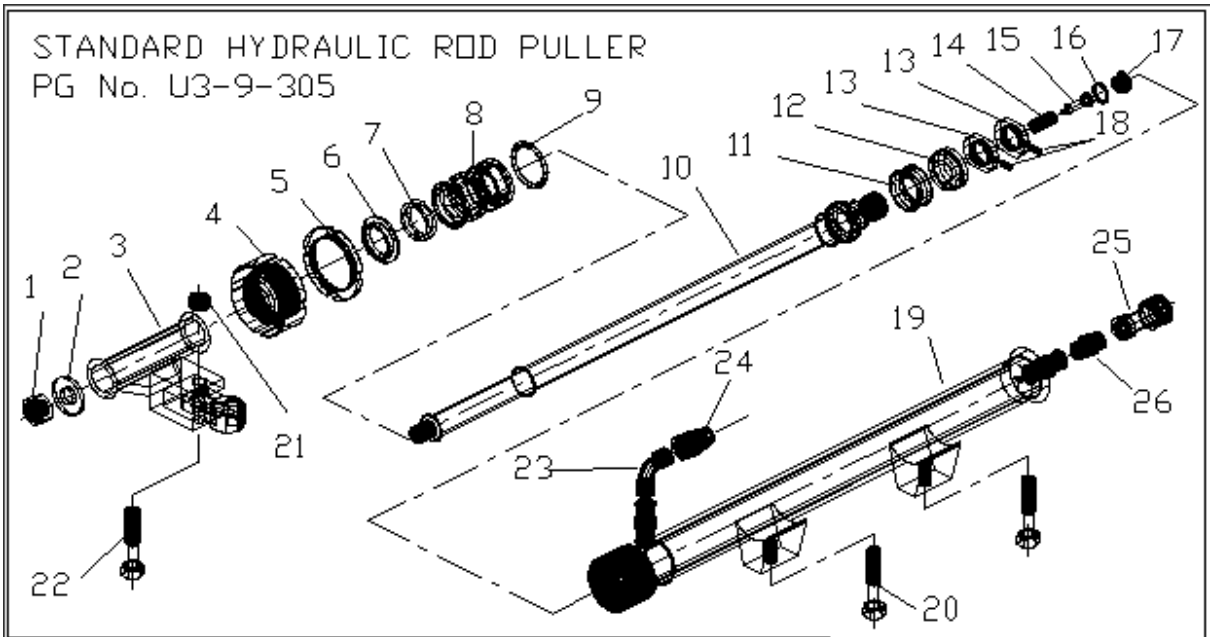
PG No. U3-6-71

BALL ROD PULLER ASSEMBLY
U3-6-71 (A-AW-E-EW)

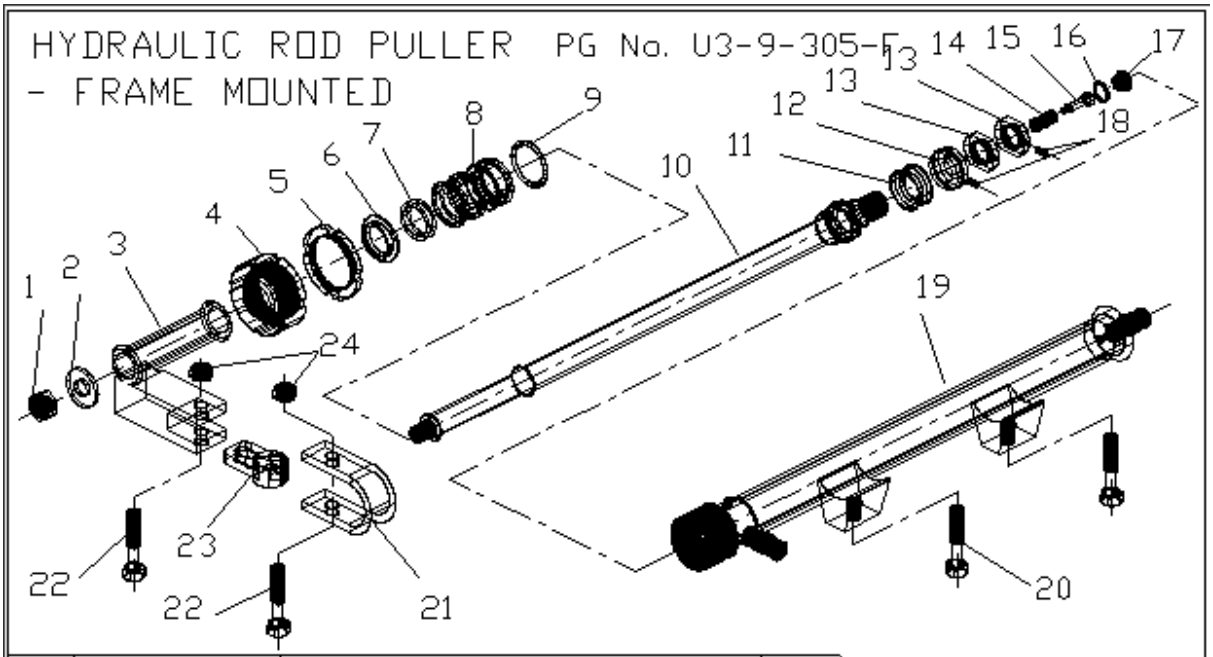


(*) = STATE DRILL ROD SIZE

ITEM	DESCRIPTION	PART No.	QTY.
00	ROD PULLER COMPLETE	U3-6-72-(*)	1
01	NUT	U3-6-72-(*)	2
02	CASE	U3-6-74-(*)	2
03	STEEL BALL	U3-6-74A-(*)	16
04	SPRING	U3-6-76-(*)	1
05	BODY	U3-6-73-(*)	2
06	FLANGE	U3-6-75-(*)	1
07	FLANGE	U3-6-75A-(*)	1



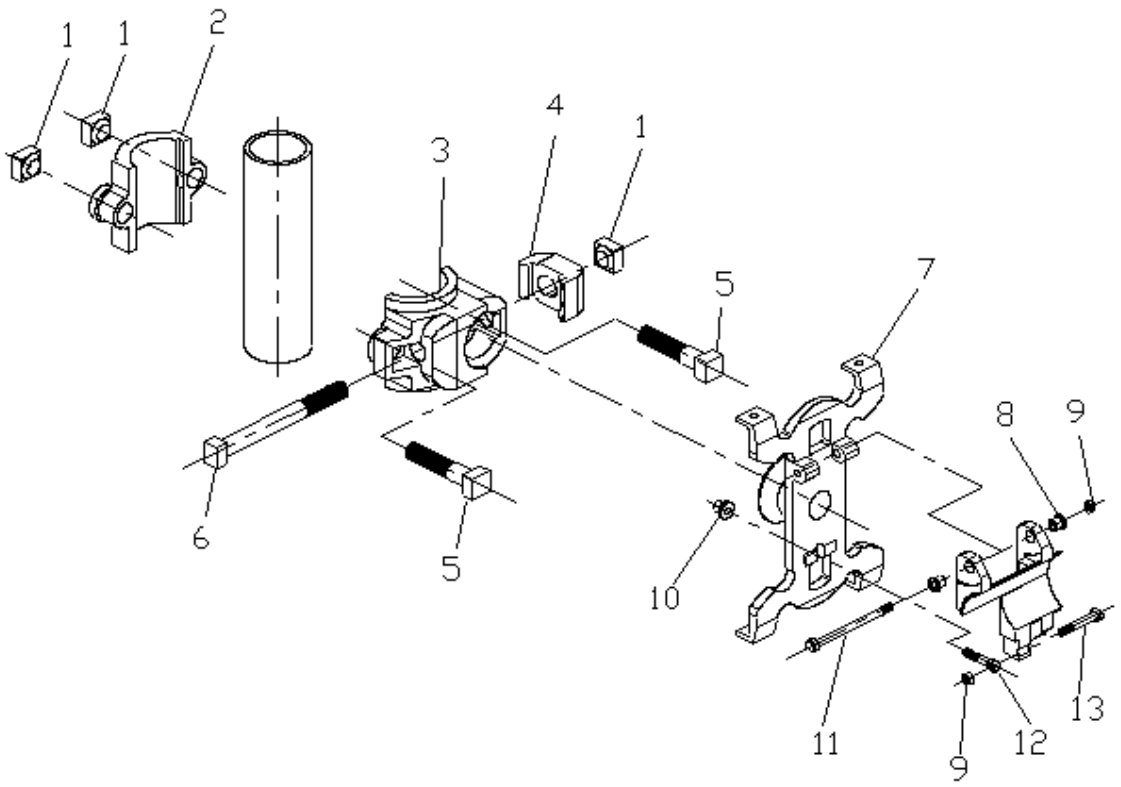
ITEM	PART No.	DESCRIPTION	QTY.
1	U3-9-305	STD HYD. ROD PULLER COMPLETE	
1	U3-9-218	NUT - FORK LOCK	1
2	U3-9-217	SPACER - FORK	1
3	U3-6-216	FORK - ROD PULLER	1
4	U3-9-214	CAP - FRONT	1
5	U3-9-213	NUT - CYL CAP LOCK	1
6	U3-9-215	CAP - BRONZE BUSH	1
7	U3-9-219	SEAL - ROD	1
8	U3-9-221	BUSH - CYL	1
9	U3-9-220	O-RING	1
10	U3-9-222	ROD - PISTON	1
11	U4-50-45	SEAL - PISTON	1
12	U3-9-224	PISTON SEAL - BACK UP WASHER	1
13	U3-9-211	NUT - CYL ROD LOCK	2
14	A1606-00	SPRING - CUSHION VALVE	1
15	A1602-00	VALVE - CUSHION	1
16	A1601-00	WASHER - GUIDE BUSH LOCK	1
17	A1603-00	BUSH -CUSHION VALVE GUIDE	1
18	9353	SCREW - SOCKET SET	2
19	U3-9-212	HOUSING - CYL	1
20	U3-9-228	BOLTS - ROD PULLER MTG	2
21	U3-6-77A	NUT	1
22	U3-6-77	BOLT	1
23	U3-9-230	90° HYDRAULIC ELBOW	1
24	U4-HP-20	FEMALE QUICK COUPLER	1
25	U4-HP-21	MALE QUICK COUPLER	1
26	U3-9-231	HYDRAULIC NIPPLE	1



ITEM	PART No.	DESCRIPTION	QTY.
1	U3-9-305-F	HYD ROD PULLER (FRAME MTG)	
1	U3-9-218	NUT - FORK LOCK	1
2	U3-9-217	SPACER - FORK	1
3	U3-6B-302	FORK - ROD PULLER	1
4	U3-9-214	CAP - FRONT	1
5	U3-9-213	NUT - CYL CAP LOCK	1
6	U3-9-215	CAP - SEAL	1
7	U3-9-219	SEAL - ROD	1
8	U3-9-221	BUSH - CYL	1
9	U3-9-220	O-RING	1
10	U3-9-222	ROD - PISTON	1
11	U4-50-45	SEAL - PISTON	1
12	U3-9-224	PLATE - PISTON SEAL	1
13	U3-9-211	NUT - CYL ROD LOCK	2
14	A1606-00	SPRING - CUSHION VALVE	1
15	A1602-00	VALVE - CUSHION	1
16	A1601-00	WASHER - GUIDE BUSH LOCK	1
17	A1603-00	BUSH -CUSHION VALVE GUIDE	1
18	9353	SCREW - SOCKET SET	2
19	U3-9-212	HOUSING - CYL	1
20	U3-9-228	BOLTS - ROD PULLER MTG	2
21	U3-6-71-PC	PULLER DOG CLAMP	2
22	U3-6-77	BOLT	2
23	U3-6-71-PD	PULLER DOG CAM	1
24	U3-6-77A	NUT	2

PG No. U3 JCSP

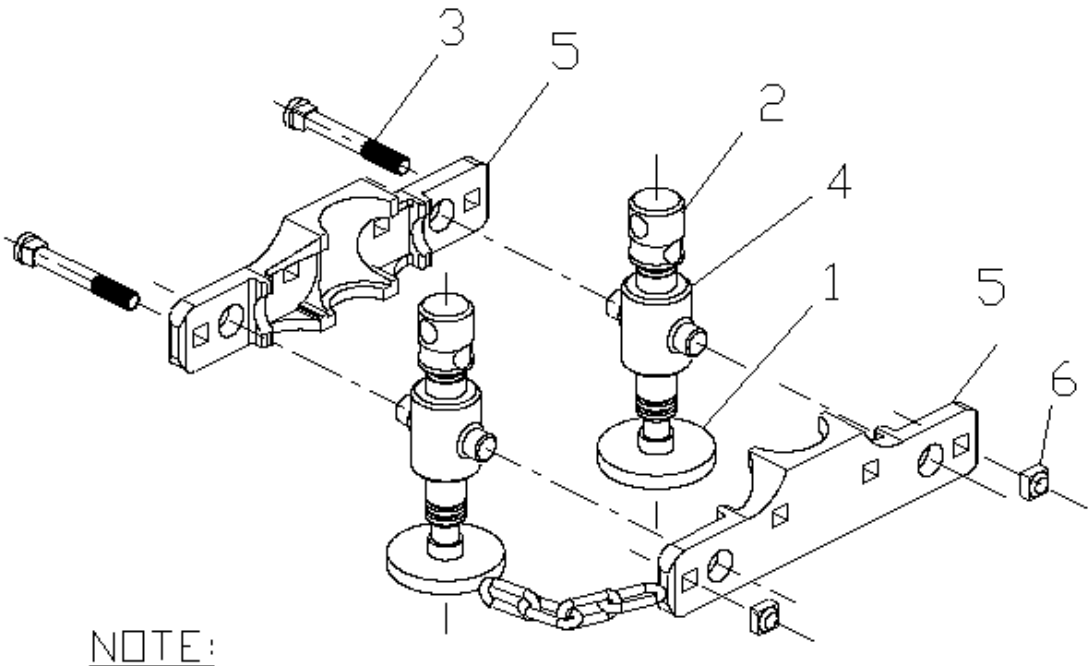
JIGGER CLAMP AND SADDLE PLATE - ASSEMBLY



IT	DESCRIPTION	QTY	PART No.
0	JIGGER CLAMP ASSEMBLY	1	U3-6-130
1	JIGGER CLAMP BOLT - NUT	3	U3-6-151
2	JIGGER CLAMP - BASE	1	U3-6-147
3	JIGGER CLAMP BODY	1	U3-6-146
4	JIGGER CLAMP SIDE - CLAMP	1	U3-6-149
5	JIGGER CLAMP BOLT - SHORT	2	U3-6-150
6	JIGGER CLAMP BOLT - LONG	1	U3-6-148
7	SADDLE PLATE ASSEMBLY	1	U3-6-54
8	MAIN HOUSING BUSH	2	U3-6-1D-BUSH
9	HINGE BOLT NUT	2	U3-6-57A
10	EYE BOLT NUT	1	U3-6-56
11	HINGE BOLT LONG	1	U3-6-57
12	EYE BOLT	1	U3-6-55
13	HINGE BOLT SHORT	1	U3-6-57S

PG No. U3-6-130

DOUBLE JACK ASSEMBLY

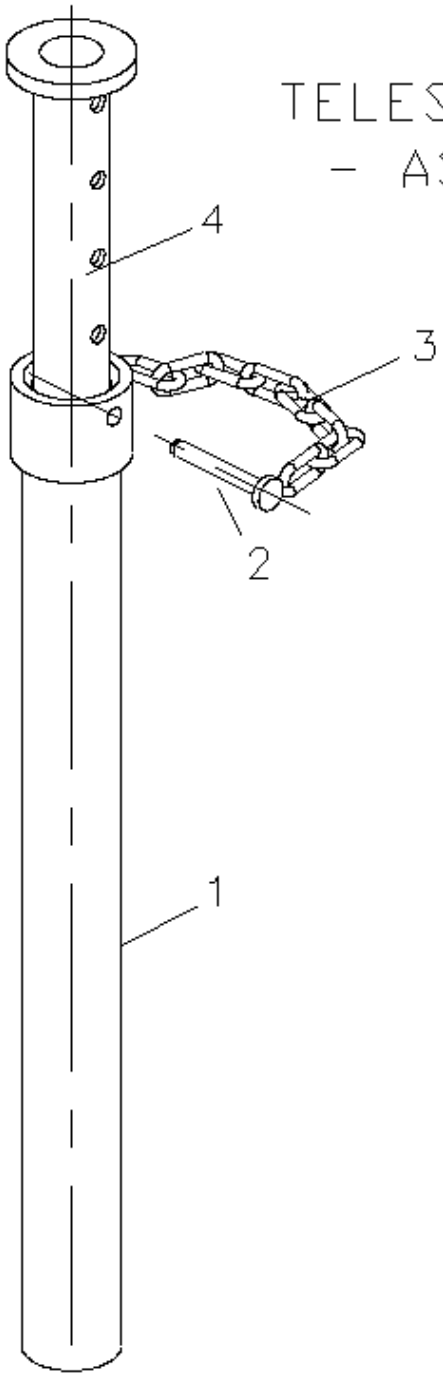


NOTE:
ITEM 1 AND ITEM 5
TO BE ATTACHED TO
EACH OTHER WITH CHAINS
(WELDED)

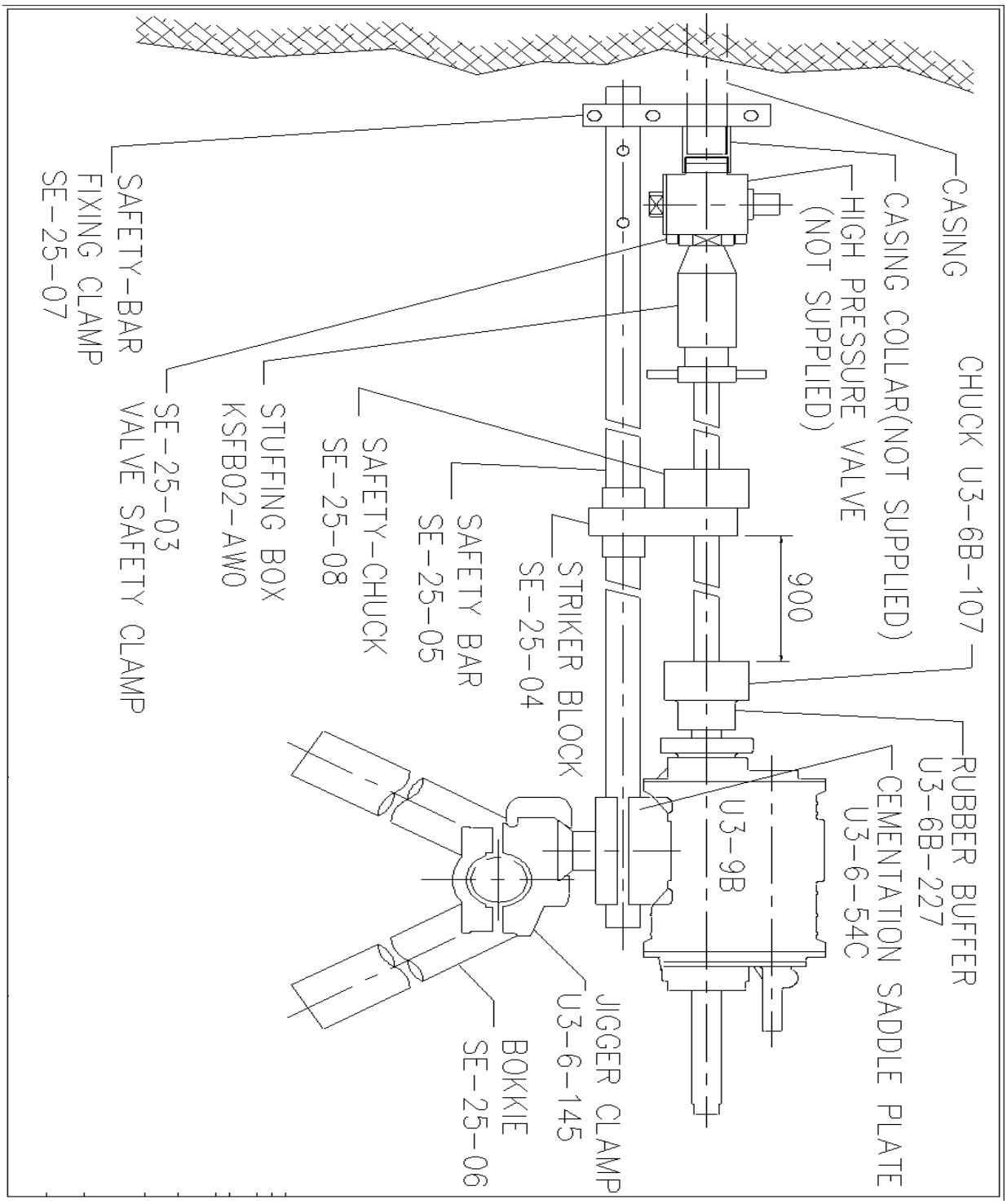
IT	DESCRIPTION	QTY	PART NO.
0	DOUBLE JACK COMPLETE	1	U3-6-130
1	FOOT	2	U3-6-132A
2	SCREW	2	U3-6-131
3	STRAPPING BOLT	2	U3-6-137
4	NUT	2	U3-6-138
5	SIDE PLATE	2	U3-6-132
6	NUT	2	U3-6-137A

PG No. U3-6-TP

TELESCOPIC POLE - ASSEMBLY



IT	DESCRIPTION	QTY	PART NO
00	TELESCOPIC POLE COMPLETE	1	U3-6-TP
1	OUTER TUBE	1	U3-6-127-01
2	PIN	1	U3-6-127-04
3	1/8"X200 LG. LONG LINK CHAIN	1	
4	INNER TUBE	1	U3-6-127-02


CASING
CHUCK U3-6B-107
CASING COLLAR(NOT SUPPLIED)
HIGH PRESSURE VALVE (NOT SUPPLIED)
900
SAFETY-BAR FIXING CLAMP SE-25-07
SE-25-03 VALVE SAFETY CLAMP
STUFFING BOX KSFB02-AWO
SAFETY-CHUCK SE-25-08
SAFETY BAR SE-25-05
STRIKER BLOCK SE-25-04
RUBBER BUFFER U3-6B-227
CEMENTATION SADDLE PLATE U3-6-54C
U3-9B
JIGGER CLAMP U3-6-145
BOKKIE SE-25-06