

2.A.9. TECHNICAL SPECIFICATION

Client.: HEIDRUN
Rev.: 0

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TOP DRIVE w/RETRACT. DOLLY

1.0 GENERAL DESCRIPTION

The electrically driven DDM (top drive) is designed with a continuous shaft from the mud swivel through the gearbox and pipe handler, with the load hang-off nut at the lower end. A load rating of 650 Short Tons is thereby obtained through the shaft without threaded connections.

The rotary swivel has the housing and bail made of high strength cast steel. The DDM drive shaft is supported from the main swivel bearing, which is of the tapered roller type.

The gearbox has a gear ratio of 1:5,52 through a single reduction gear.

The DC-motors are mounted vertically on the gearbox and the drive end has a hub with a "Flexible Coupling" connecting the motor drive end to the pinion gear. The two pinion gear wheels are supported by radial bearings at the top and the bottom. The air brake is mounted at the top end of the DC motor. Two heat exchangers with air filters are mounted in the cooling air duct. One set for each DC-motor.

The pipe handler is supported under the gearbox and can rotate about the main shaft axis. A swivel coupling allows the pipe handler assembly to receive hydraulic and pneumatic utilities for the different users, such as IBOP actuators, elevator tilt, torque wrench etc.

The pipe handler has adjustable preset positioning with automatic elevator return.

The Maritime Hydraulics' DDM-DC includes features as:

- One piece drive shaft.
- Temperature sensors in swivel and gearbox.
- Flexible coupling between DC motor and pinion gear.
- High capacity cooling system on DC motor.
- Air filters in cooling air duct.
- Pinion gear supported by two bearings.
- Pipe handler can be rotated and has preset return point.
- Two air-flex brakes.
- Load hang-off nut attached to outside threaded lower section of drive shaft.
- Torque wrench dies easily replaceable due to split access functions on torque wrench.
- Torque wrench "attacks" saver sub and pipe tool joint.
- Elevator kept away from rotating drill pipe.
- Torque wrench can be drilled flush to drill floor.
- Gear lock is remote operated.

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DRIVE SYSTEM

The DDM-650-DC has two DC motors (GE make) one on each side of the gearbox. When drilling, maximum torque available is 88000 Nm while drilling between 0 to 163 RPM. The torque is reduced from 88000 Nm to 47480 Nm at max. speed (240 RPM). The torque and speed characteristic can be varied within the described limits.

Each motor has a separate cooling & purge system. This means that if the switch on the SCR is selected to "A"- or "B"-motor, and the flexible coupling between gearbox and the actual motor is disconnected, the DDM can be used with only one motor running.

The DDM has two separate lubrication systems. The swivel has bath lubrication with oil circulation pump, and the gearbox has a forced lubrication system. The forced lubrication system has a pressure switch that gives an alarm signal if the oil pressure drops below 0,5 bar. The lubrication oil pumps is driven by hydraulic motors. A water cooled heat exchanger is used for cooling the swivel lubr. oil.

There are two nozzles of different diameter mounted in the air system. Before drilling can start the DC-motors have to be pre-purged. This means that the fan motors have to run, and the bigger nozzle in the purge control valves has to be open for 10 minutes before it is possible to rotate the DC-motors. After the pre-purging sequence is completed the purging control valve switches from the bigger to the smaller nozzle. This indicates that the pressure in the air ducts has dropped from above 3 mbar to just above 0,8 mbar over pressure. If the purge pressure drops below 0,8 mbar the alarm for low purge pressure will be activated.

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2.0 TECHNICAL SPECIFICATION

2.1 PERFORMANCE DDM 650-DC-2-MOTORS (SHUNT)

$$\text{Gear ratio} = \frac{116}{21} = 1 : 5,52$$

$$\text{Efficiency} = 0,98$$

Continuous drilling torque/speed

Max. continuous drilling torque:

Max. speed at max. continuous torque:

$$\frac{8129 \times 116}{21} \times 0,98 \times 2 = 88000 \text{ Nm (64890 ft. lbs)}$$

Max. speed at max. continuous torque:

$$\frac{900 \times 21}{116} = 163 \text{ RPM}$$

Torque/speed at max. H.P.

Torque at max H.P.:

$$\frac{7736 \times 116 \times 0,98 \times 2}{21} = 83750 \text{ Nm (61760 ft. lbs)}$$

Speed at max. H.P.:

$$\frac{1040 \times 21}{116} = 240 \text{ RPM}$$

Torque at max. speed

Max. speed:

$$\frac{1325 \times 21}{116} = 240 \text{ RPM}$$

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Torque at max. speed:

$$\frac{4386 \times 116 \times 0.98 \times 2}{21} = 47480 \text{ Nm (35010 ft. lbs)}$$

Intermittent drilling torque/speed

Max. torque intermittent:

$$\frac{8936 \times 116 \times 0.98 \times 2}{21} = 97000 \text{ Nm (71500 ft. lbs)}$$

Max. speed at max. intermittent torque:

$$\frac{1080 \times 21}{116} = 195 \text{ RPM}$$

Break-out torque

Max. break-out torque against mechanical gear lock:

120000 Nm (88450 ft. lbs)

Main shaft and gooseneck

Main shaft inside bore: 90 mm dia.

Gooseneck inside bore: 104 mm dia.

Mud pressure (working pressure): 7500 P.S.I. (518 bar)
(for complete mud-line inc. wash pipe).

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2.2 DDM LOAD CAPACITY

All loads in short tons.

- Bail/crossover link : 650 tons
- Swivel and main shaft.
Static load and limited to
1000 cycles : 650 tons
- Elevator link hanger : 650 tons
- Elevator links : 350 tons
- MH elevator : 350 tons
- Rotating load capacity : 450 tons

JARRING:

Caution: The DDM is not designed for jarring with top jar or near surface jarring. When jarring near surface a bumper sub must be installed. This is also recommended when jarring in a deep hole.

After any jarring the DDM/dolly should be inspected.
Ref. API RP 8B specification.

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2.3 PIPE HANDLER PERFORMANCE DATA

Based on hydraulic power 210 bar
and 160 l/min.

- Pipe handler rotation speed,
both directions (adjustable) : 10 - 15 rpm
- Elevator pick-up load
in mousehole : 1 000 kg
- Torque wrench
break-out and make-up
capacity : 100 000 Nm (73 700 ft.lbs)
- The torque wrench
can handle od's : 3 1/2" - 8"
- The torque wrench can be
hoisted up to break-out upper
IBOP and saver sub.
- Rotation torque on elevator : 3650 Nm (2700 ft.lbs)

51/

DOCUMENT NO. : DS-M-DE-050
 ATASHEET : DERRICK WITH ASSOCIATED EQUIPMENT PACKAGE

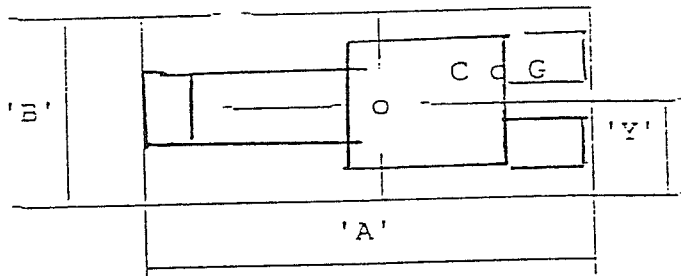
WEIGHT DATA SHEET

Equipment no : 10X1133 Descr. Power swivel assembly
 Vendor (main) : MH Date _____
 Supplier (sub): _____
 No. off (equal items): 1 Location D20

Weight data (Tonnes) of complete unit		Space required for maintenance	Largest item to be removed
	Calculated		
Dry	21,000	(24.129)	N/A
Operating	21,000	24.129	
Lift	21,000		
Test	21,000		

Single largest item removable from skid (size M): Length: 2.6
 Descr. DC-motor Width: 1.5
 Height: 0.9

Size & C o G data
 (Millimetres)

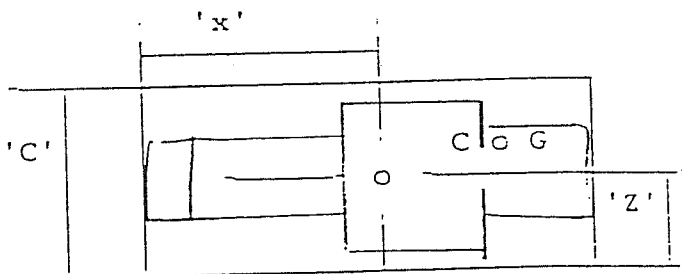


Plan

Overall dimensions

'A' = 7090
 'B' = 2310
 'C' = 1936

C o G



Elevation

Dim	Dry	Oper.
'X'	3930	3930
'Y'	1755	1755
'Z'	1236	1236

Note

1. One data sheet to be completed for each item/skid
2. In order to orientate C o G. Vendor to draw profile of equipment in plan and elevation above