

Particulars of Design

Manufacturer:	National Oilwell Varco Norway A/S
Location:	Kristiansand S, NORWAY
Purchase order no:	Utility Handling Tool
Installation:	Statoil Cat J No.1 – SHI Koje Shipyard Hull no. 7117
Id No:	D33750
Archive no:	37602409, Electronic
Regulatory body:	PSA Norway

This is to verify that the design of:

G9816 - Utility Handling Tool

has been reviewed and found to comply with:

- [1] DNV GL's Offshore Standard DNV-OS-E101 "Drilling Plant", October 2009,
- [2] DNV GL's Offshore Service Specification DNV-OSS-201 "Verification for Compliance with Norwegian Shelf Regulations", October 2013. Sec.7 DRILL(N)

The verification is based on the following

A. Design codes/standards used as references

FEM Rules for the design of hoisting appliances, 3rd edition 1998.
Eurocode 3, Design of steel structures, April 2006

B. Design limitations

Design Parameter	Value	(equivalent)
Safe working load, SWL:		
Hook	1200kg	
Gripper head	500kg	
Minimum design temperature	-20°C	
Maximum design temperature	+45°C	
Area classification	Zone 1	
FEM appliance classification	A2 (Q2+U2)	
Design lifetime	20 years	
Horizontal outreach	746 to 7406mm	
Slew angle:		
Boom	±180°	
Head	±180°	
Tilt angle:		
inner arm	64°	
outer arm	123°	
head (up)	+93°	
head (down)	-105°	
Gripper head tubular capacity	2 5/8" to 10"	
Guide head tubular size	2 7/8" to 30"	
Max slew speed	0.6 rpm	
Max telescope speed	0.1 m/s	
Max tilt speed	3°/sec	
Max telescope push/pull force	40kN	
Slew torque, drive / break	50 / 70 kNm	
Dynamic factor	1.15	
Hydraulic pressure	207 bar	
Hydraulic flow	180 l/min	
Power consumption	100W	

Environmental loads at elevation DF+2900mm:

Condition	Accelerations		Wind [m/s]
	Horizontal a_H [m/s ²]	Vertical a_V [m/s ²]	
Still water	0.00	0.00	0
Operation of the Utility Handling Tool	1.96	1.96	20.0
Survival	7.35	3.94	70.5
Accidental heel	4.45	-1.07	0.0

Accelerations are total accelerations including the gravity component of roll and pitch angles.

C. Design Specifications

<u>Drwg./Doc. No.</u>	<u>Rev.</u>	<u>Title</u>
G9816-D1327-G0001	5	GA, 317 UHT
G9816-D1327-G0002	4	GA, 317 UHT
D1327-A0002	4	AD, UHT, bottom foundation
D1327-A0003	2	AD, UHT, King
D1327-A0004	1	AD, UHT, Middle boom
D1327-A0005	3	AD, UHT, Telescopic boom
D1327-A0006	6	AD, UHT, Grip head
D1327-A0007	2	AD, UHT, Grip head dies
D1327-A0008	2	AD, UHT, Guide head
D1327-A0009	0	AD, UHT, Control panel
D1327-A0012	2	AD, UHT
D1327-A0016	0	AD, UHT, Expansion Cylinder
D1327-00001	4	DD, UHT, Installation flange
D1327-00002	7	DD, UHT, Bottom Foundation
D1327-00003	6	DD, UHT, Bottom boom
D1327-00004	4	DD, UHT, Middle boom
D1327-00005	6	DD, UHT, Telescopic boom, outer box
D1327-00006	6	DD, UHT, Telescopic boom, middle box
D1327-00007	9	DD, UHT, Telescopic boom, inner box
D1327-00009	6	DD, UHT, Head frame
D1327-00010	8	DD, UHT, Jaws
D1327-00011	6	DD, UHT, Link arm
D1327-00012	5	DD, UHT, Link arm – center
D1327-00014	2	DD, UHT, Pin Ø30x264mm
D1327-00015	8	DD, UHT, Jaws
D1327-00017	4	DD, UHT, Die keeper end
D1327-00019	1	DD, UHT, Pin Ø70x328mm
D1327-00020	1	DD, UHT, Pin Ø70x480
D1327-00022	2	DD, UHT, Pin Ø60x280mm
D1327-00027	1	DD, UHT, Slide Plate
D1327-00029	0	DD, UHT, Flange bushing
D1327-00037	6	DD, UHT, Link arm
D1327-00044	1	DD, UHT, End cover plate
D1327-00051	2	DD, UHT, Top foundation
D1327-00053	3	DD, UHT, Pin Ø30/Ø35x227,5mm
D1327-00067	1	DD, UHT, Pin Ø60x284mm
D1327-00068	2	DD, UHT, Pin Ø70x389mm
D1327-00070	1	DD, UHT, Wire guide
D1327-00073	0	DD, UHT, Position Transmitter Arm
D1327-00079	3	DD, UHT, Die frame lock plate
D1327-00083	0	DD, UHT, Shim plate
D1327-00113	0	DD, UHT, Claw
G9816-D1327-H0001	5	FD, 317 UHT
G9816-D1327-H0002	6	FD, 317 UHT
G9816-D1327-H0003	7	FD, 317 UHT
G9816-D1327-H0004	7	FD, 317 UHT
G9816-D1327-E0001	4	BD instrument, 317 UHT
G9816-D1327-E0100	2	TD, 317 UHT
G9816-D1327-E0101	2	TD, 317 UHT,
G9816-D1327-E0200	4	LD, 317 UHT power distribution, 317 UHT
G9816-D1327-E0201	3	LD, PLC configuration, 317 UHT
G9816-D1327-E0202	4	LD, Base unit / ESD config, 317 UHT
G9816-D1327-E0203	4	LD, AI, 317 UHT

G9816-D1327-E0204	2	LD, DO, 317 UHT
G9816-D1327-E0205	2	LD, AO, 317 UHT
G9816-D1327-E0206	1	LD, Counter, 317 UHT
G9816-D1327-E0300	2	LD, 317E1-IB010, 317 UHT
G9816-D1327-E0301	1	LD, -JB001, 317 UHT
G9816-D1327-E0302	1	LD, -JB002, 317 UHT
G9816-D1327-E0303	1	LD, -JB003, 317 UHT
G9816-D1327-E0304	1	LD, -JB004, 317 UHT
G9816-D1327-E0305	0	LD, -JB005, 317 UHT
G9816-D1327-E0306	0	LD, -JB006, 317 UHT
G9816-D1327-E0307	0	LD, -JB007, 317 UHT

D. Calculations

Doc. No.	Rev.	Title
G9816-Z-RD-008	0	Utility Handling Tool

E. Material Specifications

Components	Material	Minimum Yield Strength	Charpy
Main steel (see drawings for details)	S355	355 MPa *	35 J at -20°C
	EN 1.4418- QT900	750 MPa	42 J at -20°C
Structural bolts (as per drawing)	Gr. 8.8	640 MPa	27 J at -20°C
	Gr 10.9	900 MPa	
	Gr 12.9	1080 MPa	

* For all thicknesses

F. Fabrication Procedures

Test Procedures:

- 1- Charpy testing of the materials shall be carried out in accordance to DNV-OS-E101 Ch.2 Sec.2 B at or below minimum design temperature.
- 2- Pressure testing of the hydraulic system/components shall be tested in accordance to DNV-OS-E101 Ch.2 Sec.7 D200.

NDE Procedures:

- 3- Non-destructive examination shall be carried out in accordance to DNV-OS-E101 Ch.2 Sec.7 C.

Welding Procedures:

- 4- Qualifications of welding procedures and qualification of welders shall be in accordance to DNV-OS-E101 Ch.2 Sec.7 B.

G. Correspondences

Reference	"Subject" / Content	Date
J-5819 (IN)	"FW: D33750 - G9816 - Missing drawings" / Submission of additional drawings	2016-08-25
J-5979 (IN)	RE: D33750 - G9816 - Fatigue and Cylinder / Slew bearing capacities Clarification of fatigue capacity and capacity of slew bearing	2016-10-06

H. Comments

- 2456 (PE) The following Hydraulic cylinders shall be delivered with Product Certificates. The minimum required capacities are as follow:
- Inner Boom tilt Cylinders (per cylinder)
Min allowable / holding compression capacity 196.5 kN / 242 kN
 - Telescope tilt cylinder (per cylinder):
Min allowable / holding compression capacity 188 kN / 217.5 kN
 - Telescope cylinder:
Min allowable / holding compression capacity 44.2 kN / 61.3 kN
Min allowable / holding tension capacity 41.9 kN / 54.2 kN
- 2499 (PE) The Cylinder of the head claw shall be delivered with a DNV GL product. The minimum capacities are as follow:
- Working / Holding compression force: 197 kN
- 2457 (PE) Guide cylinders - position H01 on drawing number D1327-A0008 - shall be delivered with at least Manufacturer's Work Certificate
- 2458 (PE) The slew drive shown on drawing number D1327-A0002 revision 4 (model WD-H-0373) shall be delivered with a DNV GL product certificate.
- 2459 (PE) The Rotobox shall be delivered with a DNV GL product certificate.
For the minimum required capacity, see Appendix A08.6 and Appendix A09.3
- 2460 (PE) Bolts for connections to the slewing ring (dwg D1327-A0002) shall be delivered with 3.1 certificates.
- 2461 (PE) Other structural bolts shall as a minimum be delivered with 2.2 certificates.
- 2462 (PE) For Ex components with EX certificates with certificate number that is ending with a "U" or "X" where measures to obtain compliance with the special conditions given in the certificate are required, shall be documented and demonstrated to local DNV GL surveyor.
- 2463 (PE) EX documentation for this system is assumed to be submitted in a common complete package to the yard. EX documentation is also to be provided and presented to the DNV GL surveyor at site. It is assumed that the electrical equipment installed is certified for the relevant/correct zone.
- 2464 (PE) Overload testing at 1.25×SWL (hook load) shall be carried out after installation in accordance to DNV-OS-E101 Ch.2 Sec.7 D300. Considerations shall be made to requirements as specified in D304.
- 2465 (PE) Gripper head holding capacity shall be verified through testing at 2xSWL in accordance to DNV-OS-E101 Ch.2 Sec.5 F104.
- 2466 (PE) Testing of the equipment, as specified above, shall be carried out according to received FAT program, and witnessed as relevant by attending DNV GL surveyor. Additional tests might be required.
- 2467 (PE) Functional testing after installation shall be carried out in accordance to DNV-OS-E101 Ch.2 Sec.7 D400. Gripper head functionality with SWL shall be properly addressed in testing. All safety functions shall be included.

Høvik, 2016-10-11

for DNV GL



Digitally Signed By: Aker, Alf Henry
Location: DNV GL Høvik, Norway
Signing Date: 14/10/2016, on behalf of

Esvall, Per
Head of Section
MOANO376



Digitally Signed By: Junalik, Bruno
Location: DNV GL Høvik, Norway
Signing Date: 2016-10-11

Junalik, Bruno
Senior Engineer

Verified by: Ola E. Ruud

Distribution:

Orig: **National Oilwell Varco Norway A/S**, att.: Administrator NOVADM [Fax:+47 38 19 26 04]

CC: DNV GL Kristiansand