DNV·GL

Certificate No:
TAD00000S1

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Marine Riser Equipment

with type designation(s)
- 21" QTR3500 Drilling Riser (incl. C&K-, Booster- and Hydraulic lines)

- 21-1/4" QTR3500 Drilling Riser (incl. C&K-, Booster- and Hydraulic lines)

- 21" Pup Joint (incl. C&K-, Booster- and Hydraulic lines)

Issued to
MHWirth AS
KRISTIANSAND S, Norway

is found to comply with
DNVGL-OS-E101 – Drilling plant, Edition July 2015
DNVGL-SI-0166 – Verification for compliance with Norwegian shelf regulations, Edition July 2015

Application :

See next page.

Issued at **Høvik** on **2017-08-10**
This Certificate is valid until **2022-07-09**.
DNV GL local station: **Oslo Drilling Systems**

Approval Engineer: **Axel Janson**

for **DNV GL**

Per Esvall
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

© DNV GL 2014. DNV GL and the Horizon Graphic are trademarks of DNV GL AS.

Reference Standards

[1] API Spec. 16F "Specification for Marine Drilling Riser Equipment", first edition, 2004

[2] API Spec. 16C "Choke and Kill Equipment", second edition, March 2015

[3] API Spec. 16R "Specification for Marine Drilling Riser Couplings", first edition, 1997

[4] DNV-OS-F201 Offshore Standard, Dynamic Risers, October 2010

[5] DNVGL-ST-0378 Standard for offshore and platform lifting appliances, May 2016

[6] ISO 15156 / NACE MR0175 "Materials for use in H2S-containing environments in oil and gas production", first edition, 2001

Product Description

21" and 21-1/4" OD clip drilling riser joints and pup joints, including choke-, kill- and auxiliary lines, clip connectors, guide plates and lifting attachments.

Application/Limitation

Paramenter	Value
Minimum design temperature:	-20 °C / -4 °F
Max. load rating, clip connector:	3500000 lbs / 15569 kN
Max. temp. choke & kill line and main line:	82 °C / 180 °F
Max. temp. auxilliary lines:	57 °F / 135 °F
Corrosion/erosion allowance:	0.05" / 1.27 mm
Service - main pipe, booster and hydr. Lines:	Standard
Service - choke & kill lines:	Sour
Material Resistance Factor (DNV-OS-F201):	1.15
Safety Class Resistance Factor (DNV-OS-F201):	1.04

* No corrosion allowance for hydraulic lines

The following 21" OD main pipe load combinations are covered:

Wall thickness	Rated equivalent tension load at zero differential pressure	Rated working differential pressure, burst, at zero tension	Rated working differential pressure, collapse, at zero tension
0.6250" / 15.9 mm	1840 kips / 8185 kN	2880 psi / 199 bar	806 psi / 56 bar
0.6875" / 17.5 mm	2040 kips / 9074 kN	3230 psi / 223 bar	1084 psi / 75 bar
0.7500" / 19.1 mm	2250 kips / 10009 kN	3575 psi / 246 bar	1408 psi / 97 bar
0.8125" / 20.6 mm	2460 kips / 10943 kN	3875 psi / 267 bar	1713 psi / 118 bar
0.8750" / 22.2 mm	2660 kips / 11832 kN	4230 psi / 292 bar	2106 psi / 145 bar
0.9375" / 23.8 mm	2865 kips / 12744 kN	4585 psi / 316 bar	2522 psi / 174 bar
1.0000" / 25.4 mm	3067 kips / 13643 kN	4950 psi / 341 bar	2952 psi / 204 bar

The following 21 ¼" OD main pipe load combinations are covered:

Wall thickness	Rated equivalent tension load at zero differential pressure	Rated working differential pressure, burst, at zero tension	Rated working differential pressure, collapse, at zero tension
0.8750" / 22.2 mm	2695 kips / 11988 kN	4175 psi / 288 bar	2046 psi / 141 bar
1.0000" / 25.4 mm	3100 kips / 13789 kN	4885 psi / 337 bar	2878 psi / 198 bar

The following choke & kill lines are covered:

Outer diameter	Wall thickness	Rated working pressure	Material
5.000" / 127.0 mm	0.625" / 15.9 mm	10000 psi / 690 bar	AISI 4130M
5.118" / 130.0 mm	0.812" / 20.6 mm	15000 psi / 1034 bar	AISI 4130M
5.875" / 149.2 mm	0.937" / 23.8 mm	15000 psi / 1034 bar	AISI 4130M
6.000" / 152.4 mm	1.000" / 25.4 mm	15000 psi / 1034 bar	AISI 4130M
6.500" / 165.1 mm	1.000" / 25.4 mm	15000 psi / 1034 bar	AISI 4130M
6.750" / 171.5 mm	1.125" / 28.6 mm	15000 psi / 1034 bar	AISI 4130M

The following hydraulic lines are covered:

Outer diameter	Wall thickness	Rated working pressure	Material
2.500" / 63.5 mm	0.250" / 6.4 mm	5000 psi / 345 bar	Duplex
2.875" / 73.0 mm	0.437" / 11.1 mm	5000 psi / 345 bar	Super Duplex
2.875" / 73.0 mm	0.375" / 9.5 mm	5000 psi / 345 bar	Stainless 316L
3.000" / 76.2 mm	0.350" / 8.9 mm	5000 psi / 345 bar	Duplex
3.000" / 76.2 mm	0.250" / 6.4 mm	5000 psi / 345 bar	Duplex
3.500" / 88.9 mm	0.250" / 6.4 mm	5000 psi / 345 bar	Duplex
4.125" / 104.8 mm	0.312" / 7.9 mm	5000 psi / 345 bar	Duplex

The following booster lines are covered:

Outer diameter	Wall thickness	Rated working pressure	Material
4.720" / 119.9 mm	0.360" / 9.1 mm	5000 psi / 345 bar	AISI 4130M
4.720" / 119.9 mm	0.360" / 9.1 mm	5600 psi / 386 bar	AISI 4130M
5.000" / 127.0 mm	0.500" / 12.7 mm	5000 psi / 345 bar	AISI 4130M
5.000" / 127.0 mm	0.500" / 12.7 mm	7500 psi / 517 bar	AISI 4130M
5.500" / 139.7 mm	0.500" / 12.7 mm	7500 psi / 517 bar	AISI 4130M
7.000" / 177.8 mm	0.500" / 12.7 mm	5000 psi / 345 bar	AISI 4130M

Type Approval Documentation

Fabrication and Testing Procedures

- Procedures related to NDT, welding etc. are to be reviewed/approved by the DNV GL local surveyor. Comprehensive material requirements are to be reviewed/approved by the DNV GL local surveyor.

- Charpy impact testing shall be carried out in accordance with DNVGL-OS-E101 Ch.2 Sec.2 at the minimum design temperature of -20 °C / -4 °F.

- Choke & kill, booster and hydraulic lines shall be pressure tested to 1.5 times the maximum working pressure with a holding period of at least 15 minutes, ref API Spec 16F, §9.1.4. Testing of main pipe is not required per API Spec. 16F.

- Load test of the pad eyes shall be carried out with minimum loads according to DNVGL-ST-0378 Standard for offshore and platform lifting appliances, Appendix E. In agreement with DNV GL, the number of pad eyes that are subject to load testing shall be minimum 10 % per batch.

Other Conditions and Comments

- Each riser and pup joint is to be surveyed during fabrication in accordance with the requirements for equipment of Category I as defined in DNV GL Offshore Standard DNVGL-OS-E101 Drilling Plant Ch.3 Sec.3, followed by issuance of Product Certificate Form No. 20.92a. Fabrication records are to be maintained in accordance with DNVGL-OS-E101 Ch.3, Sec.3 §2.

- This design approval is based on the design limitations specified in this certificate. Global riser system analysis is not covered and shall be performed for site specific conditions of the riser system. Global riser analysis is not required for issuing Product Certificates for individual riser joints.

- For combined loading, LRFD or WSD formats may be applied for strength checking.

- Materials for Choke & Kill lines shall meet the requirements of ISO 15156 (NACE MR0175).

- This Type Approval Certificate replaces the previously issued certificate D-5178.

Marking of Product

For traceability the following marking is to be carried out on each product:

- Part number
- Serial number
- Pressure/load rating
- Manufacturer's name and trademark

Certificate Retention Survey

For retention of this Type Approval Certificate, DNV GL AS's representative shall carry out surveys every second year in accordance with DNV GL Type Approval Scheme DNVGL-CP-0338.

END OF CERTIFICATE