Certificate No:
TAD00001FV

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Hoisting, Rotation and Pipehandling Equipment

with type designation(s)
Gearbox for DDM 1000 2M, Gearbox for DDM 1000 2M ENH, Gearbox for DDM 1000 2M ENH ID105

Issued to
MHWirth GmbH
Erkelenz, Nordrhein-Westfalen, Germany

is found to comply with
DNV-OS-E101 – Drilling facilities, Edition July 2021

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2022-03-16**
This Certificate is valid until **2027-03-15**.
DNV local station: **Essen**

Approval Engineer: **Thomas Henrik Tranesen**

for **DNV**

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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

DDM 1000 2M - derrick drilling machine (top drive system).
Swivel assembly consisting of gearbox/swivel housing, main shaft with thrust nut designed to transfer axial load, torque and internal pressure through the shaft.

Design codes and standards

API Specification 8C, Specification for drilling and production hoisting equipment, Apr.2012
API Spec.7-1, Specification for rotary drill stem elements, 2006, reaffirmed 2021
API Spec.7-2, Threading and gauging of rotary shouldered connections, 2017, addendum 2020
API RP 7G, Recommended practice for drill stem design and operating limits, reaffirmed 2015
DNV-RP-C203, Fatigue design of offshore steel structures, 2019, amended 2020
FEM 1.001, Rules for design of hoisting appliances, 1998
Eurocode 3, Part 1-1, Design of steel structures, general rules
Eurocode 3, Part 1-8, Design of steel structures, design of joints

Application/Limitation

Gearbox DDM 1000 2M (main shaft ref. dwg B0079266, inner ø90mm)

Design parameter	Value	Equivalent/comment
Min design temperature	-20ºC	
Hoisting via link hanger (tripping)	1000shT	8896kN
Load rating at drilling (*):		
- max make-up torque 118kNm	810shT	7217kN
- max make-up torque 130kNm	684shT	6085kN
Load rating in rotary-shouldered connection (**)	576shT	5125kN
Max pressure rating	7500psi	517bar
API bearing load rating at n = 100rpm	784shT	6980kN
Max rotation speed	250rpm	
Max drilling torque	128kNm	94400 lb-ft
Break-out torque against gearlock	135kNm	99570 lb-ft

* - drill stem load. Can be accompanied by max torques and max pressure
** - load other than drill stem load (ref. API Spec.8C §4.3.8.3). No torque and no pressure allowed.

Gearbox DDM 1000 2M ENH (main shaft ref. dwg B0079262, inner ø80mm)

Design parameter	Value	Equivalent/comment
Min design temperature	-20ºC	
Hoisting via link hanger (tripping)	1000shT	8896kN
Load rating at drilling (*)	1000shT	8896kN
Load rating in rotary-shouldered connection (**)	827shT	7357kN
Max pressure rating	7500psi	517bar
API bearing load rating at n = 100rpm	784shT	6980kN
Max rotation speed	250rpm	
Max drilling torque	128kNm	94400 lb-ft
Max make-up torque	130kNm	95882.lb-ft
Break-out torque against gearlock	135kNm	99570 lb-ft

* - drill stem load. Can be accompanied by max torques and max pressure
** - load other than drill stem load (ref. API Spec.8C §4.3.8.3). No torque and no pressure allowed.

Gearbox DDM 1000 2M Enhanced ID105 (main shaft ref. dwg B0092928, inner ø105mm)

Design parameter	Value	Equivalent/comment
Min design temperature	-20ºC	
Hoisting via link hanger (tripping)	1000shT	8896kN
Load rating at drilling (*)	1000shT	8896kN
Load rating in rotary-shouldered connection (**)	658shT	5854kN
Max pressure rating	7500psi	517bar
API bearing load rating at n = 100rpm	784shT	6980kN
Max rotation speed	250rpm	
Max drilling torque	128kNm	94400 lb-ft
Max make-up torque	130kNm	95882.lb-ft
Break-out torque against gearlock	135kNm	99570 lb-ft

* - drill stem load. Can be accompanied by max torques and max pressure
** - load other than drill stem load (ref. API Spec.8C §4.3.8.3). No torque and no pressure allowed.

Product Specification Level (ref. API Spec.8C), all abovementioned products: PSL 1

Type Approval documentation

Tests to be carried out

Test Procedures:

- Functional testing shall be performed in accordance with DNV-OS-E101 Ch.2 Sec.8 §3.5 and be witnessed by DNV surveyor.
- Charpy Impact testing shall be conducted according to API 8C §6.3 and DNV-OS-E101 Ch.2 Sec.2.
- Pressure testing of mud circuit shall be performed in accordance with API Spec.8C §8.7, §9.9 and DNV-OS-E101 Ch.2 Sec.8 §3.3.

NDE Procedures:

- Non-destructive examination methods, extent, and acceptance criteria according to DNV-OS-E101 Ch.2 Sec.8 §3.

Welding Procedures:

- Qualification of welding procedures and qualification of welders shall be in accordance with DNV-OS-E101 Ch.2 Sec.8 §2.

Other conditions and comments

- The electrical system is not part of this Type Approval and shall be certified separately.
- This Type Approval is only valid for the accelerations and load spectrum specified in the calculations provided by the manufacturer, or for less demanding accelerations and load spectrums.
- Risk analysis evaluation of the complete DDM (top drive) system is not a subject of this Type Approval.
- This document may be used as part of the documentation required to comply with European Union (EU) Directives referenced in PSA's Acts, regulations and provisions for the petroleum activities. It should however be noted that the scope covered by this document does not necessarily cover all aspects required to issue the EU Declaration of Conformity and to affix the CE-mark. It is the manufacturer's/operator's responsibility to ensure compliance with relevant EU Directives.
- Each product is to be surveyed during fabrication in accordance with the requirements for equipment of Category I as defined in DNV's Offshore Standard DNV-OS-E101, followed by issuance of Product Certificate. If the intended installation is DNV classed, then this automatically means DNV product certificate. Fabrication records are to be maintained in accordance with DNV-OS-E101 Ch.3 Sec.3.

Marking of product

For traceability, marking of each product shall be carried out in accordance with API Spec.8C §10. The marking shall include the following:

- Part No.
- Serial No.
- Rated Load capacity

- Manufacturers Name or Mark
- Product Specification Level (PSL)

Periodical assessment

For retention of the Type Approval, DNV's representative shall carry out biennial Product Audits in accordance with DNV-CP-0338.

END OF CERTIFICATE