Certificate No:
**TAD00001FU**

# TYPE APPROVAL CERTIFICATE

## This is to certify:

**That the Valve**

with type designation(s)
**Top Drive Valve (Packard NQ-334)**

Issued to
## Packard International
**Conroe, TX, USA**

is found to comply with
**DNV-OS-E101 – Drilling facilities, Edition July 2021**
**DNV statutory interpretations DNV-SI-0166 – Verification for compliance with Norwegian shelf regulations, Edition July 2021**

## Application :

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

Issued at **Houston** on **2022-02-14**
This Certificate is valid until **2027-02-13**.
DNV local station: **Certification & Inspection Services**

Approval Engineer: **Parna Deljo**

for **DNV**

**Mark Miser**
**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

The Packard NEXGEN NQ Valve is a ball valve designed to be operated manually or automatically through the movement of the stem in a 90-degree motion between the open and closed positions to allow/restrict the passage of mud through the valve.

## Reference Standards

- API Spec 7-1, *Specification for Rotary Drill Stem Elements*, 1st Edition.
- API 8C, Drilling and Production Hoisting Equipment (PSL 1 and PSL 2), 5th Edition.
- NACE MR0175/ISO 15156, *Petroleum and Natural Gas Industries Material for Use in H2S- Containing Environments in Oil and Gas Production*, 2nd Edition.

## Application/Limitation

The following table indicates the design limits of the valve excluding the end connections. End connections have been excluded from this design assessment. The design limits of the valve including end connections are the lesser of the indicated design limits and the end connection design limits.

Larger OD NQ-334 Valves with the same ID, internal dimensions, internal components, and material specified by the Type Approval documentation are covered by this TAC due to conservative change (e.g., a larger OD), provided with the verified design limits below are applied.

| Parameter | Value | (Equivalent) |
|---|---|---|
| Maximum Working Pressure (MWP) | : 15,000 psi | (103.4 MPa) |
| Maximum Internal Shell Pressure | : 22,500 psi | (155.1 MPa) |
| Minimum Design Temperature | : -4˚F | (-10˚C) |
| Maximum Design Temperature | : 194˚F | (90˚C) |
| Sealing System Temperature Range | : -4 ˚F to 194 ˚F | (-10˚C to 90˚C) |
| API 7-1 Service Class | : Class 1 & 2 | |
| API 7-1 Supplement | : $H_2S$ | |
| Maximum Torsional Load for End Connection | : See End Connection Specification[1] | |
| System | : BOP Systems; Blowout prevention equipment | |
| Equipment | : Valves in drill string | |
| *NQ 3-3/4 in ID Single Stem Valve Body* | | |
| **For 8 ½ ≤ OD < 9 Body** | | |
| Maximum Tensile Capacity (120K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 2,185,499 lbs | (9,721.6 kN) |
| Maximum Tensile Capacity (130K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 2,552,441 lbs | (11,353.8 kN) |
| Maximum Tensile Capacity (140K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 2,895,544 lbs | (12,880.0 kN) |
| **For 9 ≤ OD < 9 ½ Body** | | |
| Maximum Tensile Capacity (120K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 3,062,367 lbs | (13,622.1 kN) |
| Maximum Tensile Capacity (130K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 3,453,631 lbs | (15,362.5 kN) |
| Maximum Tensile Capacity (140K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 3,834,086 lbs | (17,054.9 kN) |
| **For 9 ½ ≤ OD < 10 Body** | | |
| Maximum Tensile Capacity (120K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 3,901,376 lbs | (17,354.2 kN) |
| Maximum Tensile Capacity (130K Body):[2] at Maximum Working Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 4,357,283 lbs | (19,382.2 kN) |
| Maximum Tensile Capacity (140K Body):[2] | : 4,796,199 lbs | (21,334.6 kN) |

| Parameter | Value | (Equivalent) |
|---|---|---|
| at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | | |
| **For OD ≥ 10 Body** | | |
| Maximum Tensile Capacity (120K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 4,783,538 lbs | (21,278.2 kN) |
| Maximum Tensile Capacity (130K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 5,299,375 lbs | (23,572.8 kN) |
| Maximum Tensile Capacity (140K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 5,805,454 lbs | (25,824.0 kN) |
| *NUQ 3-3/4 in ID Dual and Quad Stem Hole Valve Body* | | |
| **For 8 ½ ≤ OD < 9 Body** | | |
| Maximum Tensile Capacity (140K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 2,840,810 lbs | (12,636.6 kN) |
| **For 9 ≤ OD < 9 ½ Body** | | |
| Maximum Tensile Capacity (140K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 3,660,441 lbs | (16,282.5 kN) |
| **For 9 ½ ≤ OD < 10 Body** | | |
| Maximum Tensile Capacity (140K Body):[2] at Maximum Internal Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 4,528,353 lbs | (20,143.1 kN) |
| **For OD ≥ 10 Body** | | |
| Maximum Tensile Capacity (140K Body):[2] at Maximum Working Pressure and 100,000 ft-lbf maximum Drilling Torque Capacity | : 5,438,319 lbs | (24,191.0 kN) |

*Note 1: End connections are proprietary designs and have been excluded from this design assessment. The claimed rating of end connections has not been evaluated by DNV for conformance to any applicable codes.*

*Note 2: All operating conditions for the product shall be within the limits specified in the Combined Loading Curves reported by the manufacturer in the design package listed under "Calculation." Capacities may be further limited by end connections.*

## Type Approval documentation

## Tests carried out

| Doc No. | Date | Title |
|---|---|---|
| NMQ-812334-07AC2 | 2021-10-26 | Class 2 Verification Report |

## Marking of product

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

1. Serial No.
2. Manufacturer's name or trademark
3. Marking as specified in API 7-1

## Periodical assessment

Periodical assessments for type approvals will be required after two years (+/- 90 days) and after three-and-a-half years (+/- 90 days) in accordance with DNV-CP-0338, Section 4.

## Other conditions/comments

1. Procedures related to testing, welding, NDT, and other quality control requirements are to be reviewed/approved by DNV's local surveyor.
2. When DNV product Certification is required, each product is to be surveyed during fabrication in accordance with the requirements for Category I equipment as defined in DNV's Offshore Standard DNVGL-OS-E101.
3. DNV ref.: A1148126-1

END OF CERTIFICATE