

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Marine Riser Equipment**with type designation(s)
Intermediate-4 FlexJoint

Issued to

Oil States Industries Inc.
ARLINGTON, TX, USA

is found to comply with

DNVGL-OS-E101 – Drilling facilities, Edition January 2018**DNVGL-SI-0166 – Verification for compliance with Norwegian shelf regulations, Edition July 2018****Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL when accompanied with a DNV GL Product Certificate (PC).**Issued at **Houston, TX** on **2019-09-12**This Certificate is valid until **2024-09-11**.for **DNV GL**DNV GL local station: **Houston, Approval CMC**Approval Engineer: **Mark Miser**

Christian Nilsen
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.



Product description

The Intermediate-4 FlexJoint Assembly is a marine drilling riser equipment that permits relative angular displacement of the drilling riser system elements without excessive bending stresses.

The following design codes/standards were used as references:

- [1] API 16F, 'Specification for Marine Drilling Riser Equipment' 2nd Edition
- [2] ASME Boiler & Pressure Vessel Code, Section VIII, Division 2, 2010, "Rules for Construction of Pressure Vessels"

Application/Limitation

<u>Design Parameter</u>	<u>Value</u>	<u>(Equivalent)</u>
Minimum Design Temperature	: -4°F	(-20 °C)
Maximum Design Temperature	: 180 °F	(82 °C)
Rated Load (Axial Tensile Capacity)	: 4,000,000 lbf	(17,792.9 kN)
Rated Working Pressure	: 3,000 psi	(20.7 MPa)
Maximum Combined Loading Condition #1	: 3,000 psi pressure : 1,000,000 lbf tensile load : ±20° Flex Angle	(20.7 MPa) (4448.2 kN)
Maximum Combined Loading Condition #2	: 500 psi pressure : 3,000,000 lbf tensile load : ±20° Flex Angle	(3.45 MPa) (13,344.7 kN)
Maximum Combined Loading Condition #3	: 0 psi pressure : 3,500,000 lbf tensile load : ±20° Flex Angle	(0 MPa) (15,568.8 kN)
Maximum Combined Loading Condition #4	: 0 psi pressure : 4,000,000 lbf tensile load : ±15° Flex Angle	(0 MPa) (17,792.9 kN)
Maximum Combined Loading Condition #5	: 0 psi pressure : 2,000,000 lbf compression load : ±0° Flex Angle	(0 MPa) (8,896.4 kN)
Hydrostatic Test Loading Condition	: 4,500 psi pressure : 0 lbf tension : ±0° Flex Angle	(31.0 MPa) (0 kN)
Maximum Flex Angle	: ±20° (angle is from generatrix to right cone axis)	
System; Equipment; Service	: Well Control System; Marine Riser Equipment; H ₂ S (Sour)	

Design Limitation Note : Customer supplied Riser Couplings shall be provided with DNV GL supporting documentation conforming to DNVGL-OS-E101 for Category I Equipment, and may reduce the indicated design limitations.

Type Approval documentation

Tests carried out

Factory Acceptance Test in accordance with OSI SP2F-00-001, Rev. F, 2010

1. This product is to be pressure tested in accordance with normative reference API 16F §8.5.2.
2. Type testing, as required by normative reference API 16F, §8.5.1 and documented by SP1E-22-349 Rev. B, was found to acceptable.
3. Procedures related to testing, welding, NDT, traceability, etc are to be reviewed/approved by DNV GL's local surveyor.

Marking of product



Job Id: **262.1-015350-2**
Certificate No: **TAD000014H**

Product marking shall:

1. Be reviewed and approved by DNV GL's local surveyor,
2. Identify and differentiate each production unit,
3. Establish traceability to product design and fabrication documentation,
4. Be in accordance with API Specification 16F §8.6.

Periodical assessment

For retention of the Type Approval, DNV GL's surveyor shall perform a survey every second year in accordance with DNV GL Type Approval Scheme DNVGL-CP-0338.

END OF CERTIFICATE