Certificate Number: 19ABD11035 Rev. 0
BV Job no.: 19ABD10753504

Certificate of Type Approval

This is to certify that the design methodology and the manufacturing processes for the product identified below was found to be in compliance with the stated Regulations and Standards

Product:	Optima Subsea Clamp Connector
Manufactured by:	Freudenberg Oil & Gas Technologies Christchurch Road Baglan Ind. Park Port Talbot SA12 7BZ
Specified regulations and standards:	API Specification 6A: 21st Edition: 2018 ASME BPVC.VIII-1: 2019 ASME BPVC.VIII-2: 2019 NACE MR0175: 2015 / BS EN ISO 15156: 2015

We further certify that the manufacturer's arrangements for consistently manufacturing the product in accordance with the approved type have been assessed and found to be satisfactory.

This Type Approval Certificate is valid until: 14/11/2023

Issued by:	Author: James Stephen Position: Design Verification Engineer	Approved by: Hamish Tait Position: Technical Manager
Bureau Veritas UK Limited Craigshaw Business Park Craigshaw Road AB12 3AR Aberdeen	Signature	Signature
	Date: 01/10/2019	Date: 01/10/19

Certificate Revision History

Revision	Reason for Revision
0	Initial Issue

Schedule of Approval

1 Product Description:

The Optima Subsea Clamp Connector is a metal to metal sealing connector with enhanced misalignment capability, allowing quick ROV flowline connection.

Standard Size Range: 2''; 3''; 4''; 5''; 6''; 8''; 10''; 12''; 14''; 16''; 18''; 20''; 22''; 24''; 26''; 28''; 30''; 32''; 34'' & 36''

2 Application/Limitations:

Field of application: Offshore Subsea Operations

Temperature Range: Material Dependent

Maximum Working Pressure: Temperature, Material and Connector Size Dependent

Notes:

1. Pressure rating must be based on materials and temperature, and leadscrew and link pin materials shall be compatible with hub/clamp material. Materials shall be in line with section 4 of this certificate.
2. Maximum working pressure of the Optima Subsea Clamp Connector shall be based on materials specified in section 4 and size range specified in section 1.

Service Type: Optima Clamp Connector is to be suitable to be used in both standard and sour service conditions (material classes AA, BB, CC, DD, EE, FF & HH) as per API 6A: 21st Edition: 2018, and therefore materials shall satisfy the requirements of NACE MR0175: 2015 / BS EN ISO 15156: 2015.

Optima Subsea Clamp Connector shall be assembled and tested in accordance with manufacturer's instructions.

Production Survey Requirements: Fabrication and quality control shall be in accordance with the requirements of the design standards listed on page 1 of this certificate.

The design methodology for the Optima Subsea Clamp Connector has been assessed through review of Optima Subsea Connector Calculation template VI-PT-13-142 – No. 02 and was found to meet the requirements of the design standards listed on page 1 of this certificate.

In case of changes in design, design methodology or manufacturing procedures of the Optima Subsea Clamp Connector, the present certificate would de facto lose its validity.

3 *Design Calculations, Design Methodology, Drawings, Documentation and Specifications:*

OC-DLD Rev. 0	Optima Calculations Dimension Location Drawing
VI-PT-13-138 Rev. 1	Duoseal Dimensions GA Drawing
VI-PT-13-142 – No.02	Optima Subsea Connector Calculations

4 *Material Specifications:*

The following materials are considered as applicable to the Optima Subsea Clamp Connector. Other recognised industry material grades may also be considered acceptable, if used in conjunction with the standards specified on page 1 of this certificate.

Specific customer requirements such as corrosion testing, impact testing, chemical analysis, deviation (from standard specifications) and special mechanical requirements shall be by agreement with Freudenberg Oil & Gas Technologies (FOGT) and are outside the scope of this Type Approval.

The following table shows standard material selection for the Optima Connector:

	Hub	**Clamp**	**Leadscrew & Link Pin**	**Duoseal**	**Trunnion**
Material Type	A694-F65	AISI-4140	Alloy 725	Alloy 725	CuproNickel Bronze
FOGT Material Specification	H163 Rev. E	C232 Rev. G	R622 Rev. C	R622 Rev. C	H652 Rev. E

Alternative materials may be used providing they are suitable for the specified size and performance criteria, and are in accordance with the standards specified on page 1 of this certificate. The following table shows alternative materials identified by FOGT for each component:

	Hub	**Clamp**	**Leadscrew & Link Pin**	**Duoseal**	**Trunnion**
Material Type	A182-F22 (MOD)	AISI-4130	AISI-4140 (MOD)	630 SS	Alloy 725
	A182-F51	A182-F22 (MOD)	Alloy 625	AISI-4140	Alloy 625
	A182-F55	A350-LF2 (MOD)	A193-B7 (MOD)	AISI-4130	AISI-4140 (MOD)
	Alloy 625	316L SS	CuproNickel Bronze	Alloy 718	A193-B7 (MOD)
	Alloy 725	-	-	-	-
	Alloy 718	-	-	-	-
	AISI-4130 (MOD)	-	-	-	-
	A694-F65 (MOD)	-	-	-	-

Notes:

1. FOGT shall ensure the compatibility of the hub material with the pipeline material.
2. Duoseal seating surface to be inlaid with Alloy 625, unless the hub is manufactured from suitable corrosion resistant alloy material.

3. FOGT shall notify Bureau Veritas of any material changes not falling under the above tables in Section 4.

5 Fabrication/Testing Procedures:

Bureau Veritas conducted an initial audit in line with ISO 9001: 2015 to assess the quality management system (QMS) arrangements, and practices in place for Optima Subsea Clamp Connectors at Freudenberg Oil & Gas Technologies. The audit was carried out on 2nd – 4th April 2019 and is detailed in Type Approval Audit Report No. BV-TYP-2019-01 Rev. 02.

As a result of the Type Approval Audit, it was concluded by the Auditor that Freudenberg Oil & Gas Technologies have adequate systems in place which are in compliance with the specified regulations and standards and Bureau Veritas Type Approval Procedure (M&ODW-019 Rev. 04).
Note: For certificate retention refer to Section 7 of this Certificate of Type Approval.

6 Marking of Product:

Product marking shall comply with the requirements of the applicable standards as listed in page 1 and relevant material specification(s) as detailed in section 4 of this certificate.

7 Certificate Retention:

The Type Approval is valid only if the certificate retention process is followed by the approval of manufacturer's quality management system (QMS) with annual surveillance by Bureau Veritas.

8 Documentation to accompany each product:

- Design Documents
- Detailed Engineering Drawings
- Calculation Report
- Specific Torque Values / Installation Procedure
- Operating Manual
- Manufacturing Record Book (MRB)*

* Note: The MRB shall be in accordance with the requirements of Section 15 of API Specification 6A: 21st Edition: 2018.

9 Comments:

9.1 This Certificate of Type Approval is considered to contribute towards a Duty Holder's obligation for the verification of the equipment's design under the requirements of the following regulations:

- SI-913 (1996) The Offshore Installations and Wells (Design and Construction, etc.) Regulations
- SI-2306 (1998) The Provision and Use of Work Equipment Regulations (PUWER)

9.2 Freudenberg Oil & Gas Technologies shall demonstrate all relevant documents including design reports and calculations on a case-by-case basis for each project specific product. Design reports shall also document limitations stated in section 2 of this Certificate of Type Approval.

9.3 This Type Approval certifies that the design methodology and the manufacturing processes for the Approved Type were found to be in compliance with the stated regulations and standards.
When in-service this product shall be subject to Verification and Examination and comply with the applicable shelf state requirements.

End of certificate