Certificate No:
**TAP00002T2**

# TYPE APPROVAL CERTIFICATE

## This is to certify:

**That the Pipe Flange, Welded Connection**

with type designation(s)
**FAD compact flange**

Issued to
## FAD Flange Acciaio & Derivati SpA
**Cambiago, MI, Italy**

is found to comply with
**DNV standard DNV-ST-F101 – Submarine pipeline systems**
**DNV recommended practice DNV-RP-F112 – Duplex stainless steel – design against hydrogen induced stress cracking**

## Application :

**Product(s) approved by this certificate is/are accepted for submarine pipelines designed according to DNV-ST-F101.**
**Temperature range: Temperature Design Range is equal to -40°C to 250°C (material dependant).**
**Max. working press.: CL150 to CL2500 & 10000Psi to 20000 (see the DNV report 2016516, Rev. 0).**

Issued at **Høvik** on **2023-10-19**
This Certificate is valid until **2028-10-18** .
DNV local unit: **Milan Verification**

for **DNV**

Approval Engineer: **Gaetano Ricci**

**Bartlomiej Zygmunt Kolosowski**
**Head of Section**

## Product description

The FAD flanges (as described in designer's manual referenced in the type approval documents) have been designed according to DNV-ST-F101 ed. 2021 and DNV-RP-F112 ed. 2019 (*)

*(*) Please refer to the DNV verification report 2016516, Rev. 0, section 4, for the exhaustive list of reference codes and standards.*

### Size and pressure class

| Pressure Class | Pressure Rating | Size (from) | Size (to) |
|---|---|---|---|
| 150 | 20.0 | ½" | 48" |
| 300 | 51.7 | ½" | 48" |
| 600 | 103.4 | ½" | 48" |
| 900 | 155.2 | ½" | 48" |
| 1500 | 258.6 | ½" | 48" |
| 2500 | 431.0 | ½" | 24" |
| 10 000 (Psi) | 690.0 | 2" | 16" |
| 15 000 (Psi) | 1035.0 | 2" | 16" |
| 20 000 (Psi) | 1380.0 | 2" | 16" |

### Materials

| Component | Material |
|---|---|
| Flange Body | ASTM A694 Grade F52 |
| Flange Body | ASTM A694 Grade F56 |
| Flange Body | ASTM A694 Grade F60 |
| Flange Body | ASTM A694 Grade F65 |
| Flange Body | ASTM A182 Grade F22 |
| Flange Body | ASTM A350 Grade LF2 |
| Flange Body | ASTM A182 Grade F51 |
| Flange Body | ASTM A182 Grade F53 |
| Flange Body | ASTM A182 Grade F55 |
| Bolt | ASTM A193 Grade B7 |
| Bolt | ASTM A320 Grade L7 |
| Bolt | ASTM A193 Grade B16 |
| Bolt | ASTM A193 Grade B7M |
| Bolt | ASTM A320 Grade L7M |
| Bolt | ASTM A320 Grade L43 |
| Seal Ring | Alloy 316 – Austenitic stainless steel (*) |
| Seal Ring | 360LT – Carbon Steel |
| Seal Ring | Alloy 625 – Nickel base alloy |
| Seal Ring | Alloy 825 – Nickel base alloy |

(*) Applicable for low pressure classes

**Manufacturing location**
FAD Flange Acciaio & Derivati SpA, Via Boneschi, 1  20040 Cambiago, Italy.

## Application

The products approved by this certificate is/are qualified for use on pressure systems both subsea and topsides and are in accordance with the appropriate referenced standards listed below:

| | |
|---|---|
| 1 | DNV-ST-F101 ed. 2021 *Submarine pipeline systems* |
| 2 | DNV-RP-F112 ed. 2019 *Duplex stainless-steel design against hydrogen induced stress cracking* |
| 3 | NORSOK L-005 ed 2006 *Compact Flanged Connections* |
| 4 | ISO 27509 ed 2013 *Petroleum and natural gas industries — Compact flanged connections with IX seal ring* |

## Limitations and additional recommendations

1. The Type Approval covers the application of FAD flanges for use in submarine pipeline systems designed according to DNV-ST-F101 standard.
2. The use of FAD flanges in riser systems needs to be evaluated case-by-case with project specific assessment and calculations.
3. Compact Flanges design is generally governed by NORSOK L-005 and ISO 27509 standards. For this project, revision 2006 of NORSOK L-005 and revision 2013 of ISO 27509 are considered.
4. The Fad SW Flange (swivel ring + hub) design can be stated as Compact Flange (as defined by NORSOK L-005) **compatible** but not Compact Flange design according to NORSOK L-005. To be able to name SW flange as a compact flange type and not only compatible with, **on project specific conditions** the static behaviour needs to be proven for critical tolerance combinations and the range of sizes, pressure classes, wall thicknesses and up to the max. allowable load level (67% utilization). This shall be done based on guidance of NORSOK L-005 revision from 2023.
5. Duplex stainless-steel material shall be compliant with DNV-RP-F112 requirements. For use subsea, it is a type approved condition that the flange needs to follow Category 2 assessment as well as the thermal gradient for the flange section which reflects **project specific conditions** need to be considered.
6. Fatigue evaluation shall be conducted based on **project specific conditions**.
7. Minimum design temperature shall be in accordance with ASME Sec.II-D & maximum design temperature 250°C.
8. Flanges shall be properly protected against corrosion. In sour service NACE requirements shall be fulfilled and documented. Austenitic stainless-steel grades 304, 304L, 316 and 316L shall not be considered seawater resistant.
9. CRA overlay is acceptable. The capacity calculations shall take this into account as appropriate.
10. With respect to the scope of NORSOK L-005 2006 revision the following considerations applies:
    a. The code only specifies design with IX seal ring type and is only for topside use. Other seal rings are not covered by the code. For use subsea, it is a type approved condition that based on project specific conditions, the seal contact pressure shall as a minimum be 2 times the incidental pressure as required by ISO 13628-7 Appendix H. In addition, the flange connection shall be in a static condition during the operational phase as per NORSOK L-005 requirements.
    b. The code maximum pressure class is 2500. For use in higher pressure classes as outlined by this Type Approval, it is a type approved condition that based on project specific conditions the flange shall follow the general utilization requirements from NORSOK L-005. In addition, the flange connection shall be in a static condition during the operational phase as per NORSOK L-005 requirements and the seal ring design shall comply with item a) above.
    c. Flanges of swivel type are not covered by the code. For use subsea, it is a type approved condition that the design confirms a static behaviour for the worst combination of geometric tolerances, the maximum design loads, and load combinations based on project specific conditions. In addition, the seal ring design shall comply with item a) above as well as the flange connection shall be in a static condition during the operational phase as per NORSOK L-005 requirements.

## Type Approval documentation

Please refer to the DNV verification report 2016516, Rev. 0, section 3.1.

For traceability to this type approval the flanges are to be marked with:
- Manufacturer's name or trade mark
- Class
- Material identification
- Size

The scope of the Periodical assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.
Periodical assessments (for Certificate Retention / Certificate Renewal) shall be performed according to DNV-SE-0284.
This certificate is only valid if required Periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com.

## Documentation

Documentation for each compact flange size and pressure rating that shall be available at the manufacturer:

- Design premises;
- Description;
- Assembly drawing with parts list;
- Calculations;
- Machine drawings;
- Materials specifications;
- Pipeline exposure from the plug and pressure stress calculations;
- Inspection and test plan;
- Test reports containing compliance with test procedures.

## Revision Record

- First issue dated 2023-Oct-19.

END OF CERTIFICATE