



Certificate no.:
TAP000035J

TYPE APPROVAL CERTIFICATE

This is to certify:

that the **Pipeline Repair Connector**

with type designation(s)
YC-28IN-CONNECTOR-001

issued to

Langfang Yongchun Industrial Product Co., Ltd.
He Bei, China

is found to comply with

DNV standard DNV-ST-F101 – Submarine pipeline systems

DNV recommended practice DNV-RP-F113 – Pipeline subsea repair

Application:

For use as pipeline repair connector for the replacement of damaged/corroded carbon steel subsea pipeline sections within the following main design envelope:

Pipeline Size: 28"

Maximum Water Depth: 400 m

Design Pressure: 26 MPa

Temperature Range: 0°C - 40°C

Content: Water and seawater

Further limitations and conditions are detailed in this certificate and in the referenced documents.

Design to follow approved design documentation and test procedures given in the reference documents.

Issued at **Høvik** on **2026-03-12**

This Certificate is valid until **2031-03-11**.

for **DNV**

DNV local unit: **Shanghai Verification**

Approval Engineer: **Zhongqiang Zhou**

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

Pipeline Connector

Type: YC-28IN-CONNECTOR-001

The repair connector, YC-28IN-CONNECTOR-001, can be used for:

- 28-inch subsea pipelines
- with 3mm overlay weld at flange seal face
- diver installed
- for water/seawater service

The connector mainly consists of:

- connection sleeve, the body housing the whole connection with the pipeline to be repaired
- sealing device, installed at the connection sleeve and activated when the seals are squeezed
- locking device, a mechanism using Wedge With Grip Teeth to grip the outer diameter of the pipeline to achieve rapid locking.

The product is further detailed in [1].

Application/Limitation

This Type Approval Certificate (TAC) testifies that the methodology of the presented design documentation meets the requirements given in the specified codes and DNV's engineering judgement.

The Yongchun Pipeline Connector:

- is used for replacement of damaged sections of 28-inch carbon steel subsea pipelines with/without corrosion allowance, up to 26 MPa design pressure, water depth up to 400 m, temperature range 0°C-40°C.
- can be installed and sealed on carbon steel pipelines, able to restore full structural integrity of the pipeline
- is designed for water/seawater service
- for pipelines with corrosion allowance, acceptable structural integrity shall be documented considering corroded condition
- is able to be subsea back seal tested after installation.

Extension of the design envelope (e.g. pressure, content, temperature, size) can be done on a case-by-case basis. Upon successful completion of a case specific study or project, this Type Approval will be updated accordingly. This Type Approval covers the design methodology only. Activities related to manufacturing are not covered by this certificate but can be covered by DNV product certification. A DNV Product Certificate can be based on this Type Approval, provided that DNV has been involved in the manufacturing activities as detailed in DNV-SE-0499 "Certification of Pipeline Components" with the requirements as specified in either DNV-ST-F101 "Submarine Pipeline Systems" or DNV-RP-0034 "Steel forgings for subsea applications - technical requirements".

Design standards

The governing design standards for the repair connector are:

1. DNV-ST-F101 "Submarine Pipeline Systems" - providing general requirements related to design, fabrication, installation, commissioning and operation for the pipeline system.
2. DNV-RP-F113 "Subsea Pipeline Repair", which is harmonized with the requirements given in DNV-ST-F101, covering local pipe wall utilization from connector interference loads, functional requirements related to gripping capacity and sealing performance.
3. DNV-SE-0284 "Type Approval Scheme – Oil and Gas, specifying the process, conditions and requirements for issuing the DNV Type Approval Certificate.

Type Approval documentation

The DNV TAC is based on the reference documents specified below:

#	DOC.NO / UID	REV	TITLE
[1]	SD-SPC-SP-SPST-0001 ¹⁾	B3	Product Performance Specification Document
[2]	DD-SPC-SP-SPST-0001	B4	Material Specification (A694F65)
[3]	DD-SPC-SP-SPST-0002	B4	Material Specification (4140)
[4]	DD-SPC-SP-SPST-0003	B3	Material specification (A320 L7)
[5]	DD-SPC-SP-SPST-0004 ²⁾	B1	Material specification (FKM seal ring)
[6]	SD-CAL-SP-SPST-0001 ³⁾	1	28"1500LB Mechanical Connector FEA Report
[7]	SD-CAL-SP-SPST-0002	B2	28"1500LB Mechanical Connector Fatigue Analysis Report
[8]	SD-DWG-SP-SPST-001	B2	General Assembly Drawing 28"1500LB Mechanical Connector
[9]	SD-DOP-SP-SPST-0001	0	Test Outline
[10]	MC-001-TA-20251217	20251217	Type Approval Test Report for TYPE "A"

- ¹⁾ The product performance specification states applicable medium: petroleum, gas and water. Only water/seawater has been confirmed by DNV. Temperature range started as -29°C – 121°C. Only range 0°C – 40°C confirmed by DNV. Corrosion resistance is mentioned in the specification, but DNV has not been involved in review of corrosion protection design, and this is not covered by the TAC.
- ²⁾ Service life and fluid composition: It is noted that the sealing material is qualified for more than 40 years in sea water service at 25°C. For temperature service above 40°C and other fluids (including specified amounts of H₂S) further documentation is needed.
- ³⁾ The Weld Neck Flange connection (flanges and bolts) is not covered by the TAC and needs to be assessed on a case-by-case basis.

Documentation

Documentation for the 28-inch repair connector that shall be available at the manufacturer:

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

Conditions

1. The use of the connector in riser- and topside applications are not covered by this TAC.
2. Each connector shall be subjected to hydrostatic pressure test prior to operation (i.e., strength test). The test pressure shall be specified by the relevant design code, typically 1.43 times the pipeline incidental pressure. Seal test pressure, as defined in the design manual, is to be applied via external ports to the cavity between the test- and the primary sealing elements. The back-seal test pressure shall be minimum 1.1 times the pipeline incidental pressure. Verification of the seal integrity shall be performed after installation either by annulus seal test or pipeline system test.
3. Extension of the connector design envelope (e.g., temperature, content, size) can be done on a case-by-case basis. Upon successful completion of a case specific study or project, this TAC will be updated accordingly.
4. External loads to be evaluated on a project specific basis.
5. The cathodic protection of the connector is not covered by this TAC and should be evaluated based on each specific application.
6. The TAC is limited to permanent works condition (installation and retrieval is not covered)
7. Seals need to be changed if connector is re-used.
8. This Type Approval covers the design methodology only. Activities related to manufacturing/ fabrication are not covered by this certificate but can be covered by DNV product certification.
9. For the Connector Weld Neck Flange, structural design of the flange, bolts and pup piece must be evaluated on a case-by-case basis.

Tests carried out

The functional performance of the structural repair connector is in accordance with the test procedure in [9] documented through the qualification tests reported in [10].

The following tests were performed for DNV to issue a TAC for the 28-inch repair connector:

Type test program:

- Non-pressure Tensile Test (@5590 kN)
- Non-pressure Compression Test (@5590 kN)
- Torque Test (@545 kNm)
- Strength Test (@1.43 x design pressure)
- Locking Test
- Bending Moment Fatigue Test (824.7 kNm for 100 cycles)
- Temperature Fatigue Test (2680 kN for 100 cycles, equivalent to 30 degrees temperature difference)
- Bending Moment Test (@824.7 kNm)
- Fire Resistance Test (@824.7 kNm & 760°C~982°C; @19.6 MPa & 760°C~982°C)
- Post-test Visual and Dimensional Inspection

Marking of product

- For traceability to this Type Approval, the final products are to be marked with:
- Manufacturer's name and trademark
- Type designation
- Serial/ Part No.
- Nominal internal and external pressure
- Maximum and minimum working temperature.

Periodical assessment

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>.

Product Certificate

Each connector shall be subject to DNV witness during manufacturing and FAT according to DNV-SE-0499, as well as check of the actual documentation corresponding to the type approval documentation as listed above. This forms the basis for the 'Product Certificate' issued by DNV, including marking of the product.

Revision Record

- First issue dated 2026-03-12

END OF CERTIFICATE