

TYPE APPROVAL CERTIFICATE

Certificate No:
TAP000013J
Rev. No.:

This is to certify:**That the Pipe Couplings**

with type designation(s)
SiRCoS Pipeline Connection System

Issued to

Saipem S.p.A.
Marghera, Italy

is found to comply with
DNVGL-RP-F113 Pipeline Subsea Repair
DNV-OS-F101 Submarine Pipeline Systems
DNVGL-RP-B401 Cathodic Protection Design

Application :

Submarine pipeline connector.

Issued at **Høvik** on 11th Oct. 2017

This Certificate is valid until **2021-12-31**.

DNV GL local station: **Milan**

for **DNV GL**

Approval Engineer: **Dag Øyvind Askheim**

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Afzal Hussain
Head of Section

The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.



Job Id: 262.1-014579-2
Certificate No: TAP000013J
Revision No: -

Product description

SiRCoS Pipeline Connection System is intended for diverless mechanical joining of submarine pipelines. A detailed description is given in the Sonsub document: no 400246-REL-EQ00-T250 Rev. 2 dated 2007-11-08.

Application/Limitation

Application: Pipelines made of steel grades from X60 to X70 with outer diameters from 20" to 48" and with wall thicknesses from 17.4 to 41 mm.

Limitations: The methods to establish the limits for the pipeline forces to be transferred through the connection system and the pressures are specified in documents referred to in the Sonsub document: no 400246-REL-EQ00-T250 Rev. 2 dated 2007-11-08.

Type Approval documentation

A list of documents forming the basis for the Type Approval is specified in the Sonsub document: no 400246-REL-EQ00-T250 Rev. 2 dated 2007-11-08.

Qualification work carried out

The DNV GL engagement in the certification process of the SiRCoS Green Stream pipeline connection system represents the basis for the Type Approval. It started in 2003. DNV GL specialist personnel from DNV GL Høvik in cooperation with DNV GL personnel from DNV GL Milan have performed this work. It includes following up of its development based on the ancient Arcos pipe connection system technology to the final design method. Material tests, small scale tests and full scale tests as well as calibration of numeric analytical models were included. It was focusing in particular on both sealing at the longitudinal weld protrusion and the tension capacity. The final Green Stream functional tests were completed in Trieste during summer 2007.

In 2008 the system was modified to include a new feature regarding the system for ejecting seawater out of connector grooves. This system has been qualified during the Medgaz project:

- System description: "SiRCoS phase 2-Medgaz – Type Approval additional note 1- seawater ejection system" 400375-R-011 (attached).
- Qualification tests: "SiRCoS phase 2-Medgaz – seawater ejection system qualification test report" 400375-R-073 (attached).

The results from numerous tests were used for calibration of the numerical analytical design tools.

Thereby the sealing capacity and the strength capacity of the system with other dimensions than that for the Green Stream could be predicted. This methodology was verified by DNV GL for compliance with DNVGL-RP-F113.

Marking of product

For the traceability to this Type Approval the main parts of the SiRCoS Pipeline Connection System are to be marked with:

- Manufacturers name and trade mark
- Type designation
- Serial no
- Nominal internal and external pressure
- Maximum and minimum working temperature

Periodical assessment

This Type Approval Certificate covers the design and manufacturing methods of SiRCoS Pipeline Connection System within the limitations specified above. A DNV GL Product Certificate for the finished connection systems shall be issued for systems covered by this Type Approval Certificate.

The Product Certificate shall verify both that the design complies with the methods referred to in the Type Approval Certificate and that it has been manufactured according to the specifications referred to. Further shall the Product Certificate be traceable to markings made on the finished product.

END OF CERTIFICATE