

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Pipe Couplings

with type designation(s)
HX Seal Ring

Issued to

TPConnectors AS
Drammen, Norway

is found to comply with

DNVGL-OS-E101 – Drilling facilities, Edition January 2018
DNVGL-OS-E201 – Oil and gas processing systems, Edition July 2018

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Issued at **Høvik** on **2020-02-26**

This Certificate is valid until **2025-02-25**.

for **DNV GL**

DNV GL local station: **Oslo Mooring, Diving & Offshore Equipment**

Approval Engineer: **Chenyu Sun**

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Inger-Helene Hals
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 seal ring has a symmetrical cross-section with an upper and a lower groove and also a "waist" formed by the outer handling groove and an identical groove on the inside which is beneficial to prevent misalignment and makes the ring more flexible. Also, the seal ring contact stress pattern and the reaction forces are symmetrical.

HX seals have four seal lips, all self-energized. The inner lips are pressure-assisted from external pressure and the outer lips are pressure-assisted from internal pressure.

Application/Limitation

The TPCConnectors HX Seal ring may be used in riser connector and process piping with Maximum design pressure 10000 PSI (690 bar) and design temperature range -20° C to 250°C.

This Type Approval covers following sizes:

Design codes/standards used as references

Asme B31.3 /ASME VIII Div.2

ISO 13628-7

API Specification 17D/

API Specification 6A

Sizes:

Ref: Designers Manual TPC Compact Flange – HX seal ring dimensions

0.5", 0.75", 1", 1.5", 2", 2.5", 3", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 22", 24", 26", 28", 30", 32", 34", 36", 38", 40", 42", 44", 46" and 48".

0.5", 0.75", 1", 1.5", 2", 2.5", 3", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 22", 24", 26", 28", 30", 32", 34", 36", 38", 40", 42", 44", 46" and 48".

0.5", 0.75", 1", 1.5", 2", 2.5", 3", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 22", 24" and 26".

Materials:

The materials of the TPCConnectors seal ring are listed in the Technical Report TPC HX Rev.3 Chapter 3.3. The allowable seal ring material at allowable pressure class is shown in table 3.2 in the Technical Report TPC HX Rev.3 Chapter 3.4.

Seal ring Material	SMYS @ 20°C [MPa]	UTS @ 20°C [MPa]
ASTM A182 F51	448.2	620.5
17-4PH H1150M	517.1	792.9
17-4PH-H1150D	725.0	860.0
Alloy 625	413.7	827.4
Alloy 718	800.0	1030.0
Alloy 725	800.0	1030.0
AISI 4140	515.0	690.0

Type Approval documentation

Drw. No.	Rev.	Title
TPC17-TR0005	0	Qualification Status – TPC Compact Flanges
0.5in - TPC17-DM0094	0	HX15
0.75in - TPC16-DM0219	0	HX20
1in - TPC17-DM0095	0	HX25
1.5in - TPC17-DM0096	0	HX40
2in - TPC16-DM0412	1	HX50
2.5in - TPC17-DM0097	0	HX65
3in - TPC17-DM0035	1	HX80
4in - TPC16-DM0149	0	HX100
5in - TPC16-DM0218	0	HX125
6in - TPC16-DM0150	1	HX150
8in - TPC16-DM0389	0	HX200
10in - TPC17-DM0098	0	HX250
12in - TPC16-DM0313	2	HX300

Job Id: **262.1-032470-1**
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14in - TPC16-DM0216	0	HX350
20in - TPC16-DM0217	0	HX500
22in - TPC17-DM0099	0	HX550
24in - TPC16-DM0312	0	HX600
26in - TPC16-DM0384	0	HX650
28in - TPC17-DM0100	0	HX700
30in - TPC17-DM0101	0	HX750
32in - TPC16-DM0151	0	HX800
34in - TPC17-DM0102	0	HX850
36in - TPC17-DM0103	0	HX900
38in - TPC17-DM0104	0	HX950
40in - TPC17-DM0105	0	HX1000
42in - TPC16-DM0263	0	HX1050
44in - TPC17-DM0106	0	HX1100
46in - TPC17-DM0107	0	HX1150
48in - TPC17-DM0108	0	HX1200
TPC19-TR0041	3	HX seal ring-qualification Test Records Report HX300
TPC19-TR0047	1	HX seal ring-qualification Test Records Report HX25
TPC19-TR0042	2	HX seal ring-qualification Test Records Report HX550
		Type Approval application for seal rings
	3	Technical Report TPC HX
TPC19-TR0018	A	Procedure for qualification testing of HX seal rings
TPC18-TR0030	0	Designers Manual - TPC Compact Flange - HX seal ring dimensions
		Seals for TPC Compact Flanges

Tests carried out

For the HX Seal Ring size 1", 12" and 22"

- Low pressure assembly verification test with Nitrogen
- 200 pressure cycles Hydro-test to 10000psi(690bar)
- 50 pressure cycles hyperbaric-test to 10000psi (690bar) with 300 bar external pressure
- High pressure gas-test to 10000psi(690bar) submerged in water
- PR2 Temperature cycles test, 3 cycles (-29°C to +121°C)

Marking of product

For traceability to this type approval, the seal rings should at least be marked with:

- Manufacturer's name or trade mark.
- Type number identification
- Size
- Any additional marking at the manufacturer's discretion