

**TYPE APPROVAL OF TECHLOK H10”
CLAMP CONNECTOR FOR THE SHEARWATER PROJECT
HIGH PRESSURE/HIGH TEMPERATURE**



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1. PURPOSE

- 1.1 To test a Techlok H10” connector to comply with the design requirements of the Shearwater project.

2. SCOPE

- 2.1 General Requirements
- 2.2 Gas and Hydrotest test the components shown on Fig 1.
- 2.3 Gas test 13600 lb/in² at -50° C
- 2.4 Gas test 13600 lb/in² at 180° C
- 2.5 Gas test 13600 apply maximum bending movement of 93000 ft/lb (126 kNm) at 180° C
- 2.6 Proof test at 29200 lb/in² ambient temperature.

3. WITNESS

All tests witness by MacGregor representative

4. TEST HOUSE

The test were carried out at the independent test house Vaseco, Cheshire

5. EQUIPMENT

Vector test assembly as shown Fig 1.
Vaseco Gas and Hydro test equipment with calibrated data logger

SHEARWATER TEST PROCEDURES AND DESIGN CONDITIONS

6.0 DESIGN CONDITIONS

- 6.1 Design Pressure 13600 lb/in²
- 6.2 Design Temperature 180° C – 50° C
- 6.3 Components to be tested:

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Techlok H10 in 62 mm 32.5W.T. Hub
H10 Clamp
62 size Sealing

6.4 Bending movement

93000 –ft lb (126kNm) see attached sheets for calculations

6.5 Material

Hub: ASTM A182 F55
Clamp: AISI 4140
Sealing: Alloy UNS N06625 PTFE coated

7.0 DETAILED TEST REQUIREMENTS

7.1 Proof test to ASME B31.3 chapter IX Para K304.7.2

Pressurise the Techlok H10 assembly as shown on the attached drawing Fig 1

7.2 The pressure test is based on the following requirements of ASME B31.3 chapter IX Para K304. 7.2

$$2* \text{ design pressure} = 13600 \text{ lb/in}^2 * 2 = \mathbf{27200 \text{ lb/in}^2}$$

- a. Ratio of allowable stress at test temperature to the allowable stress at design temperature

Allowable stress at test temperature 20° C is 2/3 of specified yield
Specified yield from ASTM A182 F55 – 80000 lb/in²

- b. Allowable stress for materials not listed in Section 2 Part D are taken from ASME B31.3 chapter IX Para K302.3.2. (3) (a)
:- 2/3 of yield 80000 lb/in² * 2/3 = 53333 lb/in²

Allowable stress at design temperature 180° C = 79716 lb/in²
(Yield at 180° from Avesta data) * 2/3 = 53144 lb/in²

Therefore 53333/53144 = 1.034 ratio

$$1.034 * 27200 \text{ lb/in}^2 = \mathbf{27296 \text{ lb/in}^2}$$

7.3 Ratio of actual yield to specified yield

Actual yield from test certificate 85260 lb/in²
Specified yield from A182 – F51 = 80000 lb/in²

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85260/80000 = 1.065 ratio

$$1.065 * 27296 \text{ lb/in}^2 = \mathbf{29090 \text{ lb/in}^2} \text{ Proof Test Pressure}$$

8.0 BENDING MOMENT/PRESSURE TEST

- 8.1 The bend test to be carried out at the design pressure of 13600 lb/in² and 180° and the maximum allowable bending moment of 93000 ft/lb (126 kNm).
- 8.2 The test fixture is schematically shown on drawing Fig 1.
- 8.3 The distance between the centre line of the fixture and hydraulic ram – 11.16 ft.
Required bending moment 93000 ft lb/11.16ft = 8333 lb load
- 8.4 The load will be calculated from the hydraulic area of the ram and the hydraulic pressure on the ram.

8.0 SEQUENCE OF TESTS

- 9.1 Low temperature
Connect gas test (nitrogen) equipment and temperature probe to test fixture.
 - a. Test fixture to be cooled to –50° C
 - b. Pressure test fixture to 13600 lb/in²
 - c. Hold for 15 minutes
 - d. Release pressure and return to ambient temperature
- 9.2 High temperature
 - a. Heat test fixture to 180° C
 - b. Pressure test fixture to 13600 lb/in*
 - c. Hold for 15 minutes
 - d. Release pressure
 - e. Maintain test temperature at 180° C
 - f. Pressurise test fixture to 13600 lb/in²
 - g. Apply bending moment of 93000 ft lb
 - h. Hold for 15 minutes
 - i. Release bending moment
 - j. Release pressure return to ambient temperature
- 9.3 Proof Test
 - a. Hydraulically Pressurise test fixture to 29090 lb/in²

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- b. Hold 1 hour
- c. Release pressure, remove test fixture and return to Vector for inspection

10.0 TEST RESULTS

All tests were completed successfully with no recordable leakage
The test were witnessed by MacGregor Inspection

NOTE

- 1. *Tests to be witnessed by 3rd party inspector*
- 2. *Pressure and temperature recorded on a calibrated chart recorder*