



Drilling Riser System

China National Petroleum Corporation



CNPC Baoji Oilfield Machinery Co., Ltd. (BOMCO) has developed new Class-H and Class-E flange-type marine drilling riser unit, Class-E rotation fast-connecting drilling riser unit, Class-E spider, diverter, telescopic joint and no-go sub, etc., with proprietary intellectual property rights and system supporting capacity.



As the main component of riser system, the new flange-type marine drilling riser unit is used to fulfill the function of riser system. The joint, its core fitting, determines the connecting type and efficiency of the riser unit.

Technical Features

- ✔ Both bolts and nuts are connected to the flanges at both ends of the riser joint, not only avoiding the missing of bolts and nuts but also protecting the thread.
- ✔ Patent design of bolts with constant strength can improve the bearing capacity of riser joint and reduce the weight.
- ✔ Rating pre-tightening force of connection bolts prolongs the fatigue life of riser joint's male and female fittings.
- ✔ Ends of choke and kill lines, mud pressurizing lines and hydraulic transmission lines are all in floating socket connection, which can improve marine installation efficiency, ensure possible nonsynchronous deformation between single auxiliary line and main line, and extend the fatigue life of auxiliary lines.

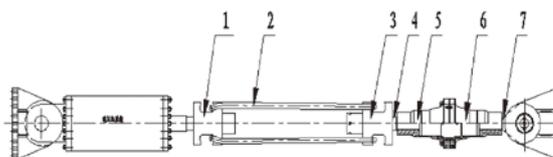
Technical Parameters

Model	DR-E50F	DR-H75F
Rated Load (KN)	8896	15568
Rated length (mm)	15240	22860
Working pressure of main line (MPa)	14	35
Nominal outer diameter (mm)	533.4	533.4
Flange outer diameter (mm)	990	1100

Tensile Test

Tensile test, performed in accordance with the API Spec 16R standard, is used to verify whether the design of key load bearing parts of the marine riser, such as the box, pin and latch segment, meet the requirements of tensile test under the rated load, as well as to validate the correctness of the finite element analysis and calculation method.

- ✔ Max. test load: 20,000KN
- ✔ Max. system pressure: 67MPa
- ✔ Max. turning radius of the tested piece: 1,000mm



Notes: 1-CD10 3/4" 900 Elevator 2-DH900/5500 Lift Ring
3-CD10 3/4" 900 Elevator 4-Lower Adapter
5-Lower Adapter Sleeve Assembly
6-Upper Adapter Sleeve Assembly 7-Upper Adapter

Marine Riser Tensile Test Program

Tensile Force Loading Program List for the Tensile Test of Class E Marine Riser

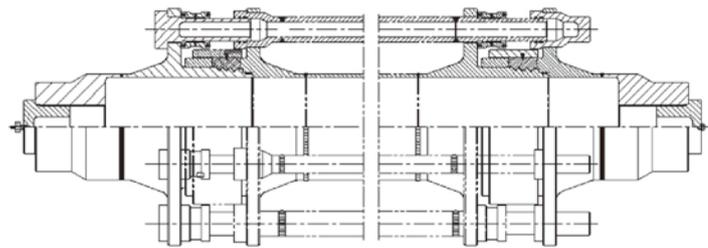
	1	2	3	4	5	6	7	8	9	10
Loading Value (KN)	4500	5000	5500	6000	6500	7000	7500	8000	8500	8896
Holding Time (min)	3	3	3	3	3	3	5	5	5	10

Testing Results

The maximum stress shown at the stress test point is 111.2MPa when maximum test load 8,896KN is reached, and all stress values are less than the allowable yield limit value (392MPa) of the material. In addition, there is no residual deformation.

Pressure Test

Pressure test is conducted as per the standards such as API Spec 16R and API Spec 16C, which includes the strength test and seal test. Strength test is used to verify the pressure integrity and sealing effectiveness of the single joint, choke/kill lines and auxiliary lines of the marine riser, while the seal test is used to verify the sealing effectiveness of the single joint, choke/kill lines and auxiliary lines of the marine riser under the operating pressure.



Assembly Diagram of the Flange Type Marine Riser for Pressure Test

Pressure List for Each Main Part of the Single Joint and Subs of Class E Rotary Marine Riser

Testing Part	Main Body, Marine Riser	Choke/Kill Lines	Mud Pressurizing Line	Hydraulic Line
Strength Test (MPa)	20.69	155.15	51.71	31.03
Seal Test (MPa)	13.79	68.95	34.48	20.69

Testing Results

During the strength test and seal test of the main body and each auxiliary lines of the class E riser nipple, there is no leakage or seepage in the load bearing parts. In pressure holding period, the maximum pressure drop meet the requirement specified in the testing program: pressure change is no more than 3%. The test meets the requirements of the test program, and the provisions specified in Article 8.2 of API SPEC 16R (1997 Ver. 1) and Article 9.3 of API Spec 16C. The test has verified the reliability of the strength and seal design of the marine drilling riser.

Full Scale Fatigue Test

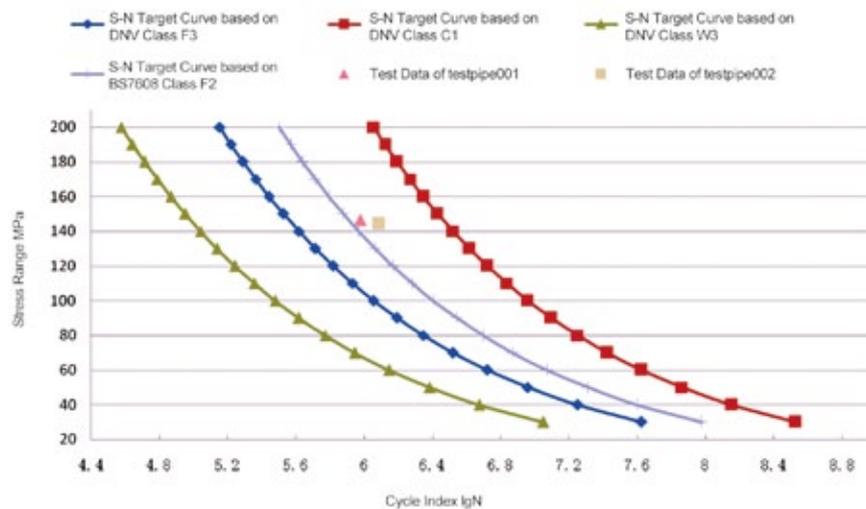
The test, performed in accordance with the DNV C203 and BS 7608 standards, is used to verify the fatigue life of the welds between the joint and pipe body and welds between the pipe bodies, and check whether there is any stress concentration area missed in the design analysis.

- ✔ Testing equipment: Marine riser fatigue test unit
- ✔ Loading frequency: 15-30Hz
- ✔ Water pressure loaded: 0MPa-10MPa
- ✔ Outer dia. range of the test piece: $\Phi 203.2\text{mm}-\Phi 558.8\text{mm}$
- ✔ Max. test piece length: 12m
- ✔ Sampling frequency: 600Hz
- ✔ Test motor: 0Hz-100Hz variable-frequency and variable-speed
- ✔ Dimension of test pit (L×W×H): 18m×3.5m×2.5m



Testing Results

The fatigue life of both test pieces exceeds the target fatigue curve of DNV C203 F3 and BS 7608 F2, and meets the requirements of the test program.



Assembly Diagram of the Flange Type Marine Riser for Pressure Test