



CABLE TESTING FACILITY

**Comprehensive &
Rigorous Test Facility for
Cables & Subsea Devices**

DEVELOPMENT & ENGINEERING SERVICES

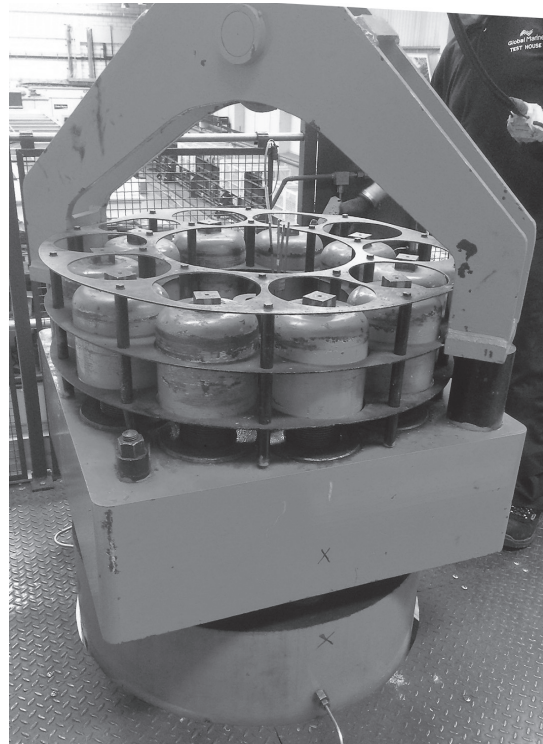
Global Marine's Lloyds Registered and UKAS accredited test facility is capable of performing various rigorous tests, simulating deployment, installation and recovery, as well as whole of life service tests related to submarine cable and submarine plant.

Each test is designed to provide the customer with useful and practical results pertaining to a marine environment capability. The facility is unique in being able to provide a complete range of cable and joint/repeater qualification tests, all under one roof. The facility's highly skilled team combines vast experience of years of submarine cable and joint testing, with state of the art resources and expertise.

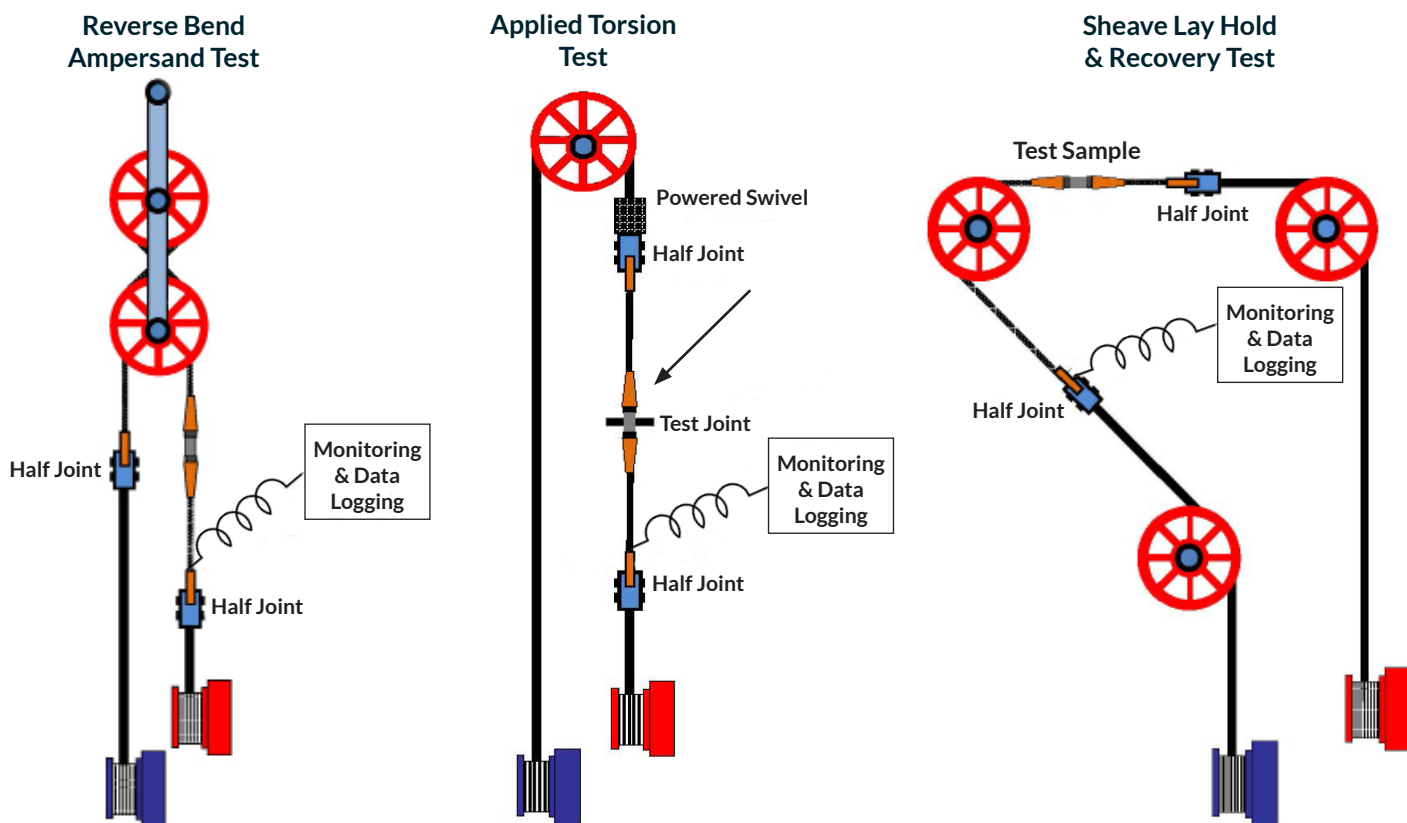
INDUSTRY STANDARDS

Global Marine's approach offers customers an industry recognised standard of service, utilising ISO9001 and 17025 document and project management principles, as well as efficient and cost effective testing for a multitude of submersible products. In addition, there is the ability to monitor operational parameters of products during testing and to accurately simulate various operational conditions, providing a very realistic testing environment.

The range of tests include, but are not limited to, tensile testing, high pressure testing, high voltage testing and a wide range of simulated operational tests. These tests are designed to replicate the conditions that are likely to be faced by the submersible products throughout their service life.



Top of the 16" Diameter Pressure Vessel



GM0149V1

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TESTING CAPABILITY TO MULTIPLE INDUSTRY STANDARDS

We work within a range of industry recognised standards which are as follows:

Testing Regime - Industry Standards Requirements Coverage							
TEST TYPE	Cigre	Electra		UJQTS	ITU-T	Other	Equipment
	623	171	189	200	G.976		
TENSILE TEST WITH OR WITHOUT SWIVEL	*5.5 *6.10	*2.3		*3.6 *3.7	*8.2.2.1 *8.2.5.2 *8.2.2.2	ISO13628-5 10.2.2 ISO13628-11 9.6.3	Tensile Machines Inside Rig
TENSILE TEST: PULL TO FAILURE				*3.9 *4.16	*8.2.2.3		
FATIGUE - IN LINE CYCLING TEST	5.6 *6.7			*3.8	*8.2.2.4	ISO13628-5 10.2.5 ISO13628-11 9.7.3	
SHEAVE - TENSILE BEND	*5.2 *5.5 6.2 *6.5	*2.2	4.8.3	*3.6 *3.4	*8.2.2.5		Winches & Sheaves Outside Rig
SHEAVE TEST REVERSE BEND				*3.2			
TENSILE TEST WITH TWIST APPLIED				*3.3 *3.5			
HANDLING TEST CRANE	*6.8						Crane
PRESSURE TEST	*5.3 *5.4			*4.2	*8.2.1.4	IEC60794-1-22	Pressure Vessel
TEMPERATURE					8.2.1.3		
HIGH VOLTAGE TEST				4.3	8.2.4.3		Electrical Testing
INSULATION INTEGRITY TEST				*4.5	*8.2.4.4		
DC RESISTANCE TEST				*4.10, *4.14			

Note * These tests are UKAS accredited

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DEVELOPMENT & ENGINEERING SERVICE

Global Marine's Development & Engineering Service provides a unique design testing and qualification service for subsea cable jointing technology and subsea (cable related) devices.



7" Diameter, 5m Long Pressel Vessel

QUALIFICATION PROGRAMMES

Typical qualification programmes for cables, joints, repeaters and subsea devices comprises of:

Phase 1 - Review

Determination/review of cable characteristics. This includes a detailed dissection of cable component parts and material testing in the case of a cable qualification, and a detailed review of the form, function and engineering aspects of the subsea device or cable. Numerical models are completed for the cable or subsea device allowing us to understand the conditions it will see during installation and recovery activities. These are used to establish appropriate design specifications and subsequent testing regimes.

Phase Review 2 - Pre-Engineering

Thorough engineering trials to verify component design. Detailed manufacturing piece part and tool drawings. Full assembly documentation.

Phase Review 3 - Pre-Qualification

Representative sample construction. Qualification of cable interconnections to approved standards by the Test House. This section includes extensive practical testing using our unique testing facilities.

Phase Review 4 - Post Qualification

Technology transfer to Jointer Training School, final document review and sign off, and issuing of qualification certificates.

Phase Review 5 - Final Acceptance

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TEST COMPLETED

The tests are performed to the requested standards and a Qualification Test Report is generated. Cable related devices undergo the following specifically to investigate the behaviour of the devices during installation and maintenance activities.

TEST TYPE	NOTES
Tensile Test With or Without Swivel	Purpose: Simulates the load on the cable/joint during cable installation/deployment and cable recovery. The new line load is set with the accepted uncertainty. Load and optical performance continuously measured
Fatigue- In-Line Cycling Test	Purpose: Simulates the dynamic loads on the cable/joint when the vessel is holding on station. The load(s) are set with the accepted uncertainty. Load and optical performance continuously measured
Sheave - Tensile Bend	Purpose: Simulates the cable/joint passing over the sheave for cable installation/deployment and cable recovery. The load is set with the accepted uncertainty. The sheave diameter is fixed, load and optical performance continuously measured
Sheave Test - Reverse Bend	Purpose: Simulates the process of cable tanking. The load is set with the accepted uncertainty. The sheave diameter is fixed, load and optical performance continuously measured.
Tensile Test With Twist Applied	Purpose: To understand the safety margin above max operating tension. The load is set including the a half the expanded uncertainty measurement of the equipment used. Load is continuously measured
Pressure Test	Purpose: Simulates the cable/joint at operational depth. The pressure is set with the accepted uncertainty. Pressure and optical performance continuously measured
Tensile Test: Pull to Failure	Purpose: To understand the safety margin above max operating tension. The load is set including the a half the expanded uncertainty measurement of the equipment used. Load is continuously measured.
Handling Test (Crane)	Purpose: To test the cables at the noted minimum bend radius. Lift to a height to achieve the minimum bending radius of the cable, optical performance can be continuously measured
High Voltage Test	Purpose: Test for the cable/joint system life. The load is set with the accepted uncertainty. Load continuously measured
Insulation Integrity Test	Purpose: Test for the cable/joint system life. The load is set with the accepted uncertainty. The resulting value is recorded
DC Resistance Test	Purpose: Test for the cable/joint system operation. The load is set with the accepted uncertainty. The resulting value is recorded



Tensile Machine

EQUIPMENT

The integrated test facility provides a diverse range of tests for the cable and hydrospace industry. Our skilled staff are on hand to provide help and advice on the range of tests available. The facility has ISO9001 accreditation with further ISO17025 UKAS accreditation, for specific tests, and issues a report with each sample detailing the tests carried out. Equipment used in the Test House is calibrated annually in accordance with UKAS recommendations.

Our facility consists of the following key test equipment:

1. TENSILE MACHINE (INDOOR)

- › 300/1000kN tensile machine – maximum sample length 35m
- › Controllable by load or position feedback
- › Loads may be constant, ramp or cyclic waveform
- › Maximum position 1828mm using 300kN ram
- › Maximum position 3048mm using 1000kN ram
- › Hydraulic power swivel providing torque up to 5000Nm

2. ROUND-THE-SHEAVE EQUIPMENT (OUTDOOR)

This specialised equipment simulates shipboard cable laying or recovery operation. Loads of up to 300kN can be achieved with cable sample tests at one of the following angles:

- › 45, 90, 135 or 180 plus
- › Other diameters can be produced to customer specific requirements
- › Hydraulic Power Swivel – capable of providing controlled rotation/torque at loads of up to 300kN

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3.07 Diameter Sheave

SHEAVE LIST

SHEAVE NUMBER	CIRCUMFERENCE (M)	DIAMETER (M)
8	1.42	0.44
12	1.74	0.55
11	1.74	0.55
14	4.10	1.31
RTS 5	7.66	2.44
RTS 6	5.94	1.89
RTS 7	5.94	1.89
13	6.31	2.0
2	6.35	2.0
9	9.65	3.07
10	9.65	3.07
4	9.65	3.07
20	9.58	3.05
3	13.88	4.42
15	27.99	7
1	16.77	5.34
20x	15.87	5.05

3. PRESSURE VESSEL

Water pressure is obviously a key concern for submarine devices. Our facility offers a complete ocean depth simulation facility with a range of pressure vessels. The pressure medium is inhibited water and destructive collapse is possible, provided the collapse volume is limited.

The sizes and ratings are:

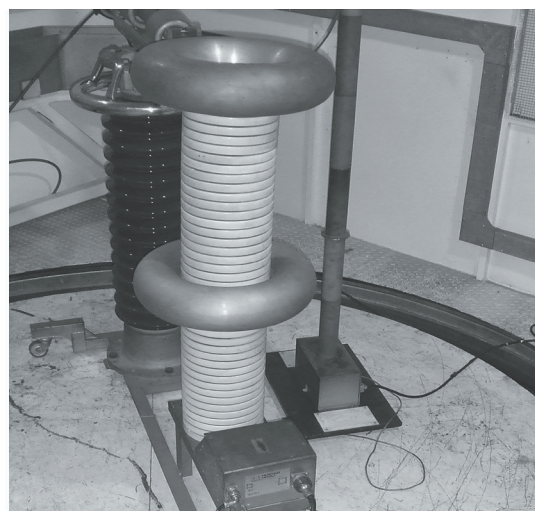
VESSEL REFERENCE NUMBER	PRESSURE RATING		INTERNAL DIAMETER		INTERNAL LENGTH	
	Mpa	Psi	mm	In	mm	ft
1 (16 inch)	93	13500	406	16"	3500	11.5
2 (13 inch)	93	13500	330	13"	3500	11.5
3 (2 metre)	108	15664	100	4"	1800	6.0
4 (5 metre)	100	14505	180	7"	5000	16.4

4. HIGH VOLTAGE ROOM

Any device requiring power subsea is likely to operate at high voltage. This brings challenges of insulation breakdown which must be investigated. Our High Voltage Room provides all needed facilities and equipment to fully investigate the immediate and long term effects of high voltage on a device. Water bath or dry tests at up to 50kV DC or 100kV AC and 100kV containerised test unit.

5. OPTICAL MEASUREMENTS

The optical path loss of test samples can be monitored during any tests carried out within the facility. Optical measurements can be carried out at both 1300 and 1550nm. Measurements available include standard path loss, OTDR and optical strain. Items in the table are calibrated annually.



Inside HV Chamber

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