WITNESS TESTING OF LABORATORY PROCEDURES

Prepared for:

SSP FITTINGS CORP.

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Test Protocol
Witness Testing Report

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Program Description

OnSpeX will 3rd-party monitor and report results of SSP Fittings Laboratory testing of Duolok instrumentation fitting product samples to assure compliance to British Standard 4368, to publish a report of those test results, and provide an assessment as to compliance with the stated requirements.

Test Protocol: British Standard 4368, Compression Couplings for Tubes, Part 4, 1984; Specification for type test requirements.

Purpose: To determine compliance of SSP Duolok Instrumentation fittings with **British Standard BS 4368, Part 4** test procedure.

Test Locations: All tests were performed at the Tech Center Laboratory of SSP FITTINGS in Twinsburg, OH, USA.

Test Methods: All fittings were assembled in accordance with SSP published instructions.
All tests were performed in accordance with BS 4368*, as follows: Sizes under test include Duolok ¼' ½", ¾" and 1" diameters (sizes 4, 8, 12 and 16); Metric sizes are proportional in design to inch in every respect and are included in sizes 6mm through 25mm.

BS 4368 Standard Performance Tests: 7.2 Hydraulic proof test*, 7.3 Minimum hydraulic burst test*, 7.4 Dismantling and reassembly test, 7.5 Minimum static gas pressure (vacuum) test, 7.6 Maximum static gas pressure test, and 7.7 Hydraulic impulse and vibration test.

Test Detailed Data: Detailed test configurations and data are recorded in a separate Excel file: ITR-897-00-, available by request.

*In certain tests, water was substituted for mineral oil as the test medium.

Executive Summary

OnSpeX has verified that SSP Duolok Instrumentation fitting sizes 4 through 16 comply with BS 4368 (metric sizes 6mm through 25mm are proportional in design to inch sizes and are included in the test group). OnSpeX has verified that SSP Fittings calibration lab procedures meet accepted industry standards. The test procedures used by the SSP Tech Center Laboratory followed the instructions set forth in BS 4368.

The conditions observed during testing are contained in this report.

OnSpeX™
Consumer Product Evaluation

TABLE OF CONTENTS

Samples:			
Manufacturer	Model/SKU	Quantity	Description
SSP Fittings Corporation	sizes ¼", ½", ¾" 1"	50 fittings of each size group.	Instrumentation Tube Fittings

Description of test samples

This procedure defines the approach for testing the performance characteristics of tube fittings manufactured by SSP FITTINGS CORP. These fittings mechanically attach tubing, creating a deformation in the tubing, which results in a seal and restrained joint between the tubing and the fitting. These tests shall be performed in a laboratory environment that will simulate shop and field conditions.

Scope

Standard Referenced: British Standard 4368 part 4: 1984
Refer to section 1.

Definition

Standard Referenced: British Standard 4368 part 4: 1984
Refer to section 2.

Test Temperatures

Standard Referenced: British Standard 4368 part 4: 1984
Refer to section 3.

Test Fluid

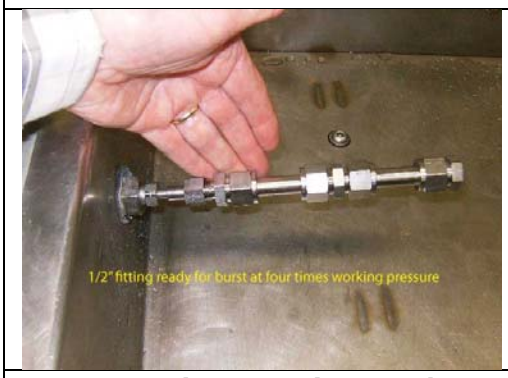
Standard Referenced: British Standard 4368 part 4: 1984
In the Hydraulic Proof Test and Minimum Hydraulic Burst Pressure Test, water was substituted for the mineral oil listed in BS 4368. For the Hydraulic Impulse testing, Shell Rotella-T SAE 5W40 synthetic oil was substituted for the mineral oil listed in BS 4368.
Please reference ASTM F 1387-99 (2005), Standard Specification for Performance Piping and Tubing Mechanically Attached Fittings; section 7.6.3 reads "Unless otherwise specified, the test fluids used in the testing of MAF shall include those fluids specified within the test. **Water and other fluids** such as SAE Grade 10W, MIL-H-5606, MIL-L-7808, or MIL-H-83282 **may be used without affecting the validity of the test."** (**emphasis added**).

Apparatus
Standard Referenced: British Standard 4368 part 4: 1984 Refer to section 5.

Selection and Preparation of Specimens	
Standard Referenced: British Standard 4368 part 4: 1984 Refer to section 6.	
	Number of Specimens
SSP Fittings Co	50 fittings of each size group

Test Procedures
Standard Referenced: British Standard 4368 part 4: 1984 Refer to section 7 and the following subsections: 7.1 through 7.7.

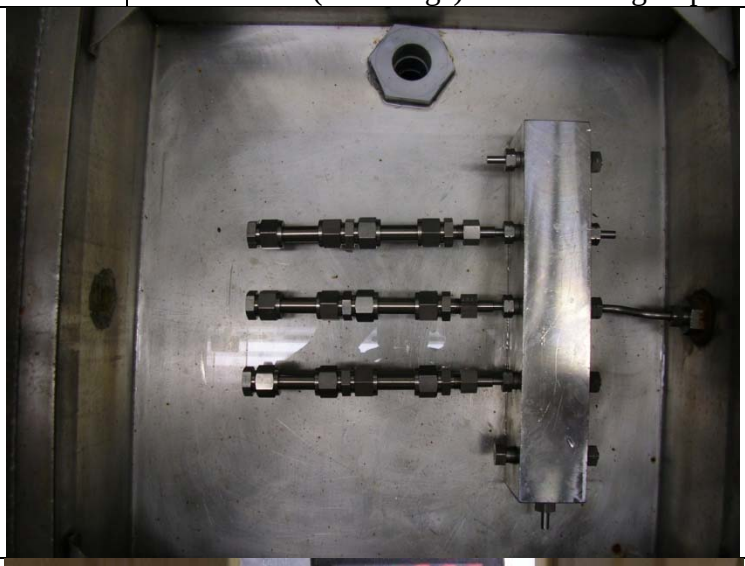
Hydraulic Proof Test		
Standard Referenced: British Standard 4368 part 4: 1984 Refer to sections 7.2.1 and 7.2.2.		
	Number of Specimens	Pass/Fail
SSP Fittings Co	50 fittings of each size group	Pass
Comments: All assemblies under test are subject to this test at 1.5 times working pressure for five minutes. Water was substituted for the mineral oil listed in BS 4368.		

Minimum Hydraulic Burst Pressure Test		
Standard Referenced: British Standard 4368 part 4: 1984 Refer to section 7.3		
	Number of Specimens	Pass/Fail
SSP Fittings Co	3 assemblies (12 fittings) of each size group	Pass
		
Comments: Choose an adequate tube gauge to ensure that test assemblies do not fail by premature bursting. Do not reuse these samples for other tests. Water was substituted for the mineral oil listed in BS 4368.		

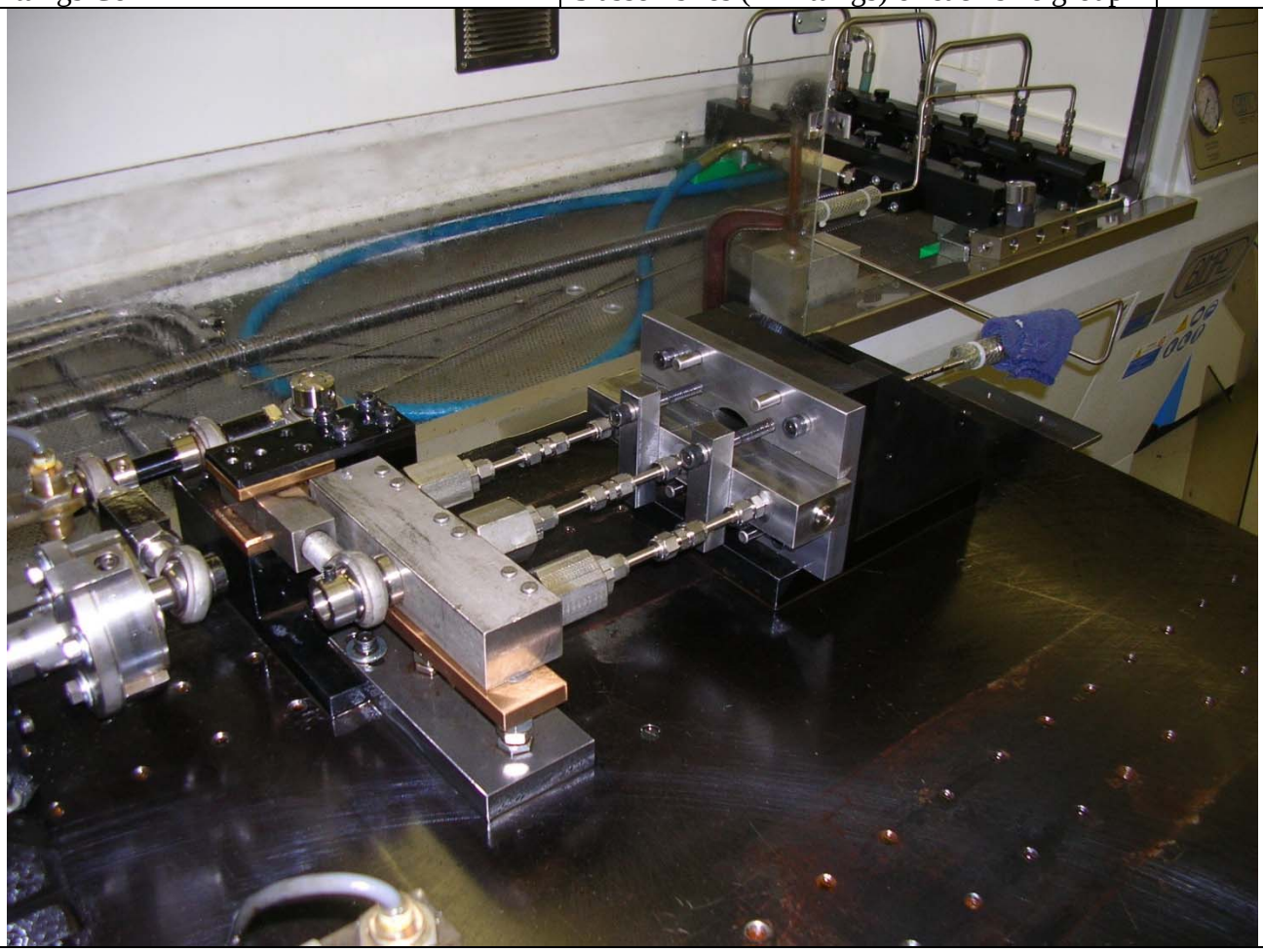
Dismantling and Reassembly Test		
Standard Referenced: British Standard 4368 part 4: 1984 Refer to section 7.4		
	Number of Specimens	Pass/Fail
SSP Fittings Co	2 fittings of each size group	Pass
Comments: Remake the fittings ten times. The fittings will then be retested to section 7.2.		

Minimum Static Gas Pressure (Vacuum) test		
Standard Referenced: British Standard 4368 part 4: 1984 Refer to section 7.5		
	Number of Specimens	Pass/Fail
SSP Fittings Co	3 assemblies (12 fittings) of each size group	Pass

Comments: Subject test samples to negative 700 millibars for 15 minutes. Failure will be a rise in pressure of 30 millibars within 15 minutes.

Maximum Static Gas Pressure test		
Standard Referenced: British Standard 4368 part 4: 1984 .		
SSP Fittings Co	Number of Specimens	Pass/Fail
	3 assemblies (12 fittings) of each size group	Pass
		
		
Comments: The samples must withstand 70 Bar for 5 minutes without leaking.		

Hydraulic Impulse and Vibration Test		
Standard Referenced: British Standard 4368 part 4: 1984 Refer to sections 5.4.1 through 5.4.11		
	Number of Specimens	Pass/Fail
SSP Fittings Co	3 assemblies (12 fittings) of each size group	Pass



Comments: The samples must withstand planar vibration at the required stress levels of each size fitting for 20MM cycles, with simultaneous pressure impulse of 133% of working pressure for 0.5MM cycles without leaking.
Shell Rotella-T SAE 5W40 synthetic oil was substituted for the mineral oil listed in BS 4368.