

DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE

TEST SPECIFICATION

Customer Specification



Report No. 0755

GLOBAL MARINE SYSTEMS LIMITED
TEST FACILITY – TECHNICAL REPORT

Cortland Fibron

RM0011 R.O.V Umbilical

**THIS SAMPLE
CONFORMED TO
THE TEST
SPECIFICATION
REQUIREMENTS**

Test Facility
Global Marine Systems Limited
1 Winsford Way
Boreham Interchange
Chelmsford
Essex CM2 5PD

DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

CONTENTS

1. FLOW CHART & INTRODUCTION
2. CUSTOMER'S DOCUMENTS
3. TEST DETAILS
4. TEST RESULTS
5. CALIBRATION DETAILS

DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

SECTION 1 - FLOW CHART & INTRODUCTION**FLOW CHART**

The sample was subjected to the following tests:-

Specification No.	CFBX W08695	Issue 00	Section
			3.2 Load/ Elongation
			3.3 Rotation
			3.4 Cycle Reeling Test

INTRODUCTION

The samples were tested in accordance with Specification No. CFBX W08695 Issue 00.

DOCUMENT COMPILED AND
REVIEWED BY G.KARDOS



DATE 27/03/08

AUTHORISED FOR RELEASE BY
ENGINEERING MANAGER C BEECH



DATE 23/04/08

DOCUMENT

Sample No. CSQ 0616

Document Issue No 1

Start Date: 27.02.2008

Global Marine Systems Limited - Test Facility

Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

SECTION 2**CUSTOMER'S DOCUMENTS**

TEST DATA DOCUMENT

SAMPLE No	CSQ0616	REVISION :	2	PROJECT CODE:	VKKA073
PROJECT	CORTLAND FIBRON				
CABLE	RM0011 R.O.V. Umbilical		CABLE No		

OPTICAL MONITORING	YES	NUMBER OF FIBRES	TBD
--------------------	-----	------------------	-----

BUILD DOCUMENT REF	N/A	ISS		ISS		ISS	
ASSEMBLY PARTS REF:	N/A	ISS		ISS		ISS	

TEST PROGRAMME	CFBX WO8695	ISSUE NO.	00
----------------	-------------	-----------	----

BUILD COMMENTS

Samples to be terminated with potted sockets and electrical and optical monitor loops connected

SAMPLE 1

3.2 LOAD/ELONGATION	increase to 60kN reduce to 0 for 10 complete cycles. 0 to 90kN in 10kN steps. Increase to failure	Pre-test Electrical continuity	
		TIME v LOAD, RAM POSITION	
		Post-test Electrical continuity	
		PASS	FAIL

SAMPLE 2

3.3 ROTATION	Sample to be tested horizontally with swivel. Increase to 60kN and then released to zero.	Pre-test Electrical continuity	
		TIME v LOAD, ROTATION	
		Post-test Electrical continuity	
		PASS	FAIL

SAMPLE 3

3.4 CYCLE REELING TEST	10,000 passes around Ø0.45 metre sheave at 60kN. Sample to travel 0.75 metres for each pass.	Pre-test Electrical continuity	
		TIME v LOAD	
		Post-test Electrical continuity	
		PASS	FAIL

TEST COMMENTS

PREPARED BY	C. BEECH	AUTHORISED		DATE	29/01/08
-------------	----------	------------	--	------	----------

HISTORY OF CHANGE

1	INITIAL ISSUE	29/01/08
---	---------------	----------

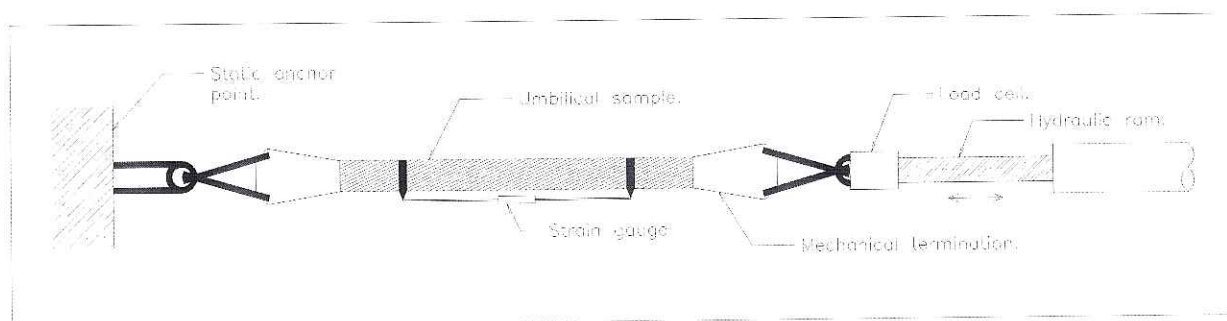
3.2 LOAD/ELONGATION TEST

Appropriate mechanical terminations, representative of those used in service (e.g. Wirelock potted socket) shall be installed on each end of a suitable length of umbilical sample.

The sample shall be installed in a tensile test rig, generally as depicted below, of rating greater than the. A means of monitoring umbilical load (e.g. load cell) shall be in line with the sample.

All electrical conductors shall be "daisy-chained" in series and connected to an electrical continuity monitor.

All optical fibres (excepting the 1 off multi-mode fibre) shall be "daisy-chained" in series and connected to a suitable optical light source & power meter or OTDR. The output of this may be data-logged if possible, otherwise manual recording will be sufficient. Initial attenuation value shall be recorded.



Increase the load on the umbilical at a steady rate to 60 kN (SWL) monitoring load vs. elongation, then release load to minimum tension. This process shall be repeated a minimum of ten times or until the load vs. elongation curve approximates well to linear.

The load be increased to 90 kN in 10 kN increments. Cable diameter (at centre of sample), elongation, optical attenuation and electrical continuity shall be measured and recorded at each increment.

The load will then, without measurement of cable diameter, elongation, optical attenuation and electrical continuity, be steadily increased until sample breakage occurs. Peak load prior to break shall be recorded.

Acceptance criteria:

- 1) No significant change in optical attenuation up to 90 kN load.
- 2) No loss of electrical continuity up to 90 kN load.
- 3) MBL in excess of 180 kN.

APPROVED		WITNESSED	
TEST ENGINEER	TEST RESPONSIBLE		

3.3 ROTATION

Appropriate mechanical terminations, representative of those used in service (e.g. resin potted socket) shall be installed on each end of a suitable length of umbilical sample.

The sample shall be suspended vertically. A load of 60 kN will then be applied to the lower end of the sample and released a minimum of 10 times.

Pointers or some form of rotation gauge shall be installed on the sample. A load of 60 kN shall again be applied to the sample and rotation measured.

Note: an alternative method of assessing umbilical rotation may be considered if preferred.

Acceptance criteria:

- 1) Rotation less than 1° per metre @ 60 kN load.

APPROVED		WITNESSED	
TEST ENGINEER	TEST RESPONSIBLE		

3.4 CYCLIC REELING TEST

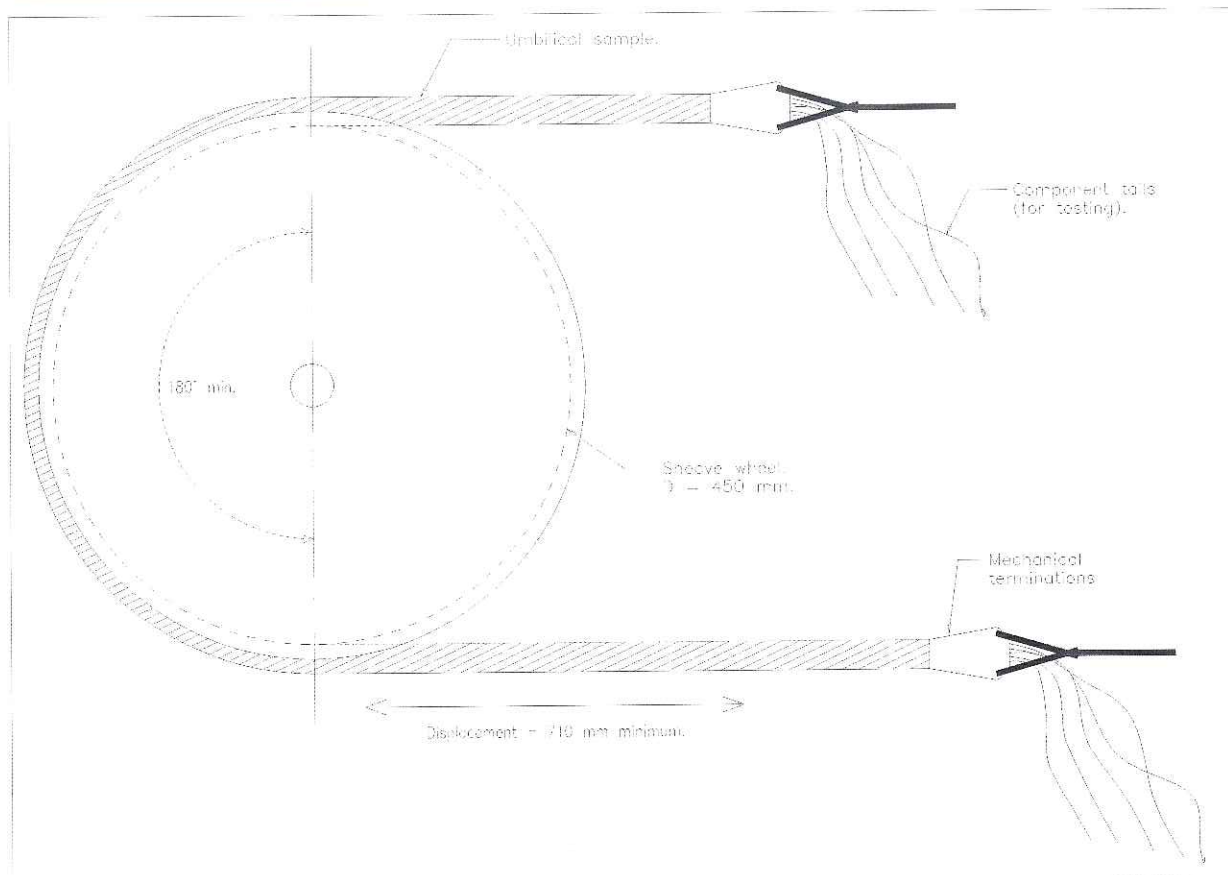
Appropriate mechanical terminations, representative of those used in service (e.g. Wirelock potted socket) shall be installed on each end of a suitable length of umbilical sample.

The sample shall be installed in a test rig, generally as depicted below. The tensile rating of the rig shall be greater than 60 kN. A means of monitoring umbilical load (e.g. load cell) shall be in line with the sample.

All electrical conductors shall be "daisy-chained" in series and connected to an electrical continuity monitor.

All optical fibres (excepting the 1 off multi-mode fibre) shall be "daisy-chained" in series and connected to a suitable optical light source & power meter or OTDR. The output of this may be data-logged if possible, otherwise manual recording will be sufficient. Initial attenuation value shall be recorded.

TEST DATA DOCUMENT



60 kN load shall be applied to the sample. The umbilical shall then be subjected to 5,000 reeling cycles under tension. A cycle is defined as two complete displacements, one in each direction.

Upon completion of 5,000 cycles, the sample shall be removed from the test rig and the insulation resistance of all cores measured.

Acceptance criteria:

- 1) No significant change in optical attenuation after 5,000 cycles.
- 2) No loss of electrical continuity after 5,000 cycles.
- 3) Insulation resistance as follows:
 - 0.22 mm² (x 4): 1,000 MΩ.km minimum @ 1.0 kV_{dc}.
 - 4.0 mm² (x 5): 1,000 MΩ.km minimum @ 5.0 kV_{dc}.

APPROVED		WITNESSED	
TEST ENGINEER	TEST RESPONSIBLE		

DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

SECTION 3 - TEST DETAILS

Specification No. CFBX W08695

Section 3.2**Load/ Elongation****EQUIPMENT DETAILS:****Optical**

PERKIN ELMER STRAIN MEASURING EQUIPMENT
WAVELENGTH 1550nm
Number Of Fibres In Circuit: 6

Serial No. 1305
Limits ± 2 dB, $\pm 2\%$
Excursive Loss Limit 0.6 dB
Residual Loss Limit 0.3 dB

OTHER EQUIPMENT:

1 MN Tensile Machine
300 kN Ram

Serial No. Mar 91654

Parameters Monitored: Load, Ram Position, Continuity & Optical Loss.

START DATE – 08/03/08**METHOD:**

- a. Install the cable sample in the 1MN tensile machine using the 300kN ram.
- b. Apply a nominal load to measure the sample length.

TEST1:

FOR RECORDING PURPOSES "THE TEST" SHALL BE DEEMED TO START AND FINISH TEN MINUTES BEYOND THE ACTUAL OPERATION.

- c. Apply a tensile load of **7kN** to the cable sample.
- d. Increase load to **60kN** and cycle 10 times between these loads.
- e. Reduce load to zero.

TEST 2:

- f. Apply a nominal load to measure the sample length.
- g. Increased the load in 10kN steps to 90kN hold the for 2 min
- h. At a ramp rate of 10kN per minute apply an increasing tensile load until sample failure occurs.
Note the failure occurs 140.0kN

Next Test – Rotation

DEVIATION FROM THE ABOVE METHOD CAN ONLY BE PERMITTED WITH THE WRITTEN APPROVAL OF THE PROJECT MANAGER. NON COMPLIANCE WITH REASONS MUST BE DETAILED OVERLEAF. HE MUST ALSO BE NOTIFIED OF ANY ABNORMAL RESULTS OR FAILURES ON COMPLETION OF THE TEST.

TEST SCHEDULE APPROVED

C Beech
Global Marine Systems Limited

TESTS PERFORMED AS PER SPECIFICATION

 Initial

DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

SECTION 3 - TEST DETAILS

Specification No. CFBX W08695

Section 3.3

Rotation

EQUIPMENT DETAILS:**Optical**

PERKIN ELMER STRAIN MEASURING EQUIPMENT

WAVELENGTH 1550nm

Number Of Fibres In Circuit: 6

Serial No. 1305

Limits ± 2 dB, $\pm 2\%$

Excursive Loss Limit 0.6 dB

Residual Loss Limit 0.3 dB

OTHER EQUIPMENT:

1 MN Tensile Machine

300 kN Ram

Serial No. Mar 91654

Parameters Monitored: Load, Rotation, Continuity & Optical Loss.

START DATE – 27/02/08

METHOD:

- a. Install the cable sample in the 1MN tensile machine using the 300kN ram.
- b. Apply a nominal load to measure the sample length.

TEST1:

FOR RECORDING PURPOSES "THE TEST" SHALL BE DEEMED TO START AND FINISH TEN MINUTES BEYOND THE ACTUAL OPERATION.

- c. Apply a tensile load of **7kN** to the cable sample.
- d. Increase load to **60kN** then reduce to zero and cycle 10 times between these loads.

Next Test – Cycle Reeling Test

DEVIATION FROM THE ABOVE METHOD CAN ONLY BE PERMITTED WITH THE WRITTEN APPROVAL OF THE PROJECT MANAGER. NON COMPLIANCE WITH REASONS MUST BE DETAILED OVERLEAF. HE MUST ALSO BE NOTIFIED OF ANY ABNORMAL RESULTS OR FAILURES ON COMPLETION OF THE TEST.

TEST SCHEDULE APPROVED

TESTS PERFORMED AS PER SPECIFICATION

C Beech
Global Marine Systems Limited


..... Initial

DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

SECTION 3 - TEST DETAILS

Specification No. CFBX W08695

Section 3.4**Cyclic Reeling Test****EQUIPMENT DETAILS:****Optical**

PERKIN ELMER STRAIN MEASURING EQUIPMENT
WAVELENGTH 1550nm
Number Of Fibres In Circuit: 6

Serial No. 1305
Limits ± 2 dB, $\pm 2\%$
Excursive Loss Limit 0.6 dB
Residual Loss Limit 0.3 dB

Other Equipment

RTS Winches

Serial Nos MAR91652 & MAR91653

Parameters Monitored: Load, Continuity and Optical

START DATE – 09/03/2008

METHOD:

- a. Install the cable sample around the ampersand facility
- b. A sketch of the test set up is shown in figure 1.

TEST1:

FOR RECORDING PURPOSES "THE TEST" SHALL BE DEEMED TO START AND FINISH TEN MINUTES BEYOND THE ACTUAL OPERATION.

- c. Apply a tensile load of **60kN** to the cable sample.
- d. Operate the winch controls to pull the cable, around the Ø0.45m sheave. Stop the winches when the cable end is approximately 0.75 metres from the sheave. Reverse the direction of pull and haul the cable back to the original start position, stop the winches.
- e. Repeat the above procedure a further 4,999 times to complete 5,000 cycles giving a total of 10,000 passes.

Next Test – Returned to Customer

DEVIATION FROM THE ABOVE METHOD CAN ONLY BE PERMITTED WITH THE WRITTEN APPROVAL OF THE PROJECT MANAGER. NON COMPLIANCE WITH REASONS MUST BE DETAILED OVERLEAF. HE MUST ALSO BE NOTIFIED OF ANY ABNORMAL RESULTS OR FAILURES ON COMPLETION OF THE TEST.

TEST SCHEDULE APPROVED

TESTS PERFORMED AS PER SPECIFICATION

C Beech
Global Marine Systems Limited

 Initial

DOCUMENT

Sample No. CSQ 0616

Document Issue No 1

Start Date: 27.02.2008

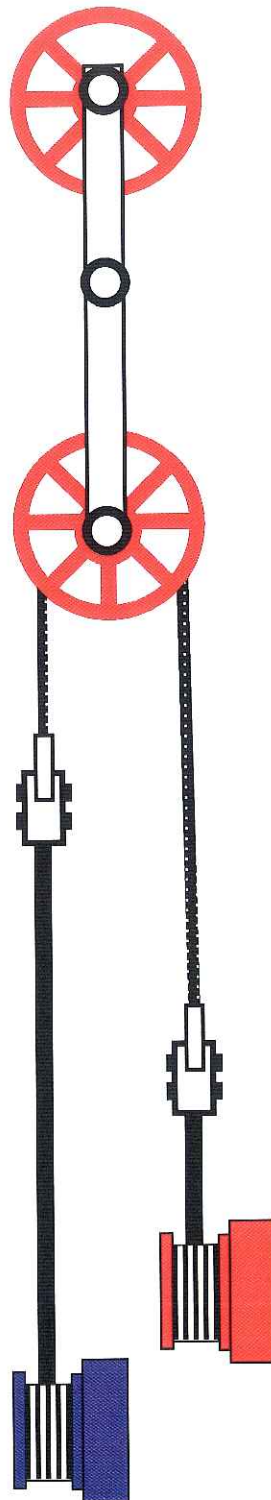
Global Marine Systems Limited - Test Facility

Customer: Cortland Fibron

IN CONFIDENCE

TEST SPECIFICATION

Customer Specification



***Figure 1
Cyclic Reeling Test***

DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

SECTION 4 - TEST RESULTS

<u>Specification No.</u>	<u>CFBX W08695 Issue 00</u>	<u>Section 3.2</u>	<u>Load/ Elongation</u>
Graph 1 shows	Load plotted against time. Continuity plotted against time Ram Position plotted against time Optical loss plotted against time		
<u>Specification No.</u>	<u>CFBX W08695 Issue 00</u>	<u>Section 3.3</u>	<u>Rotation</u>
Graph 2 shows	Load plotted against time. Continuity plotted against time Optical loss plotted against time Rotation plotted against time		
<u>Specification No.</u>	<u>CFBX W08695 Issue 00</u>	<u>Section 3.4</u>	<u>Cyclic Reeling Test</u>
Graph 3 shows	Load plotted against time. Continuity plotted against time Optical loss plotted against time		
Graph 4 shows	Load plotted against time. Continuity plotted against time Optical loss plotted against time		
Graph 5 shows	Load plotted against time. Continuity plotted against time Optical loss plotted against time		
Graph 6 shows	Load plotted against time. Continuity plotted against time		
Graph 7 shows	Load plotted against time. Continuity plotted against time		
Graph 8 shows	Load plotted against time. Continuity plotted against time		
Graph 9 shows	Load plotted against time. Continuity plotted against time		
Graph 10 shows	Load plotted against time. Continuity plotted against time		
Graph 11 shows	Load plotted against time. Continuity plotted against time		
Graph 12 shows	Load plotted against time. Continuity plotted against time		
Graph 13 shows	Load plotted against time. Continuity plotted against time		

CONCLUSION

The above samples have performed to the specification CFBX W08695 issue 00. On the cycle reeling test optics were loss after 2834 passes and electrical continuity was at approximately 9180 Passes.

CSQ 0616 08/03/08

GRAPH 1



25kN / Div

Ref

Before Scan

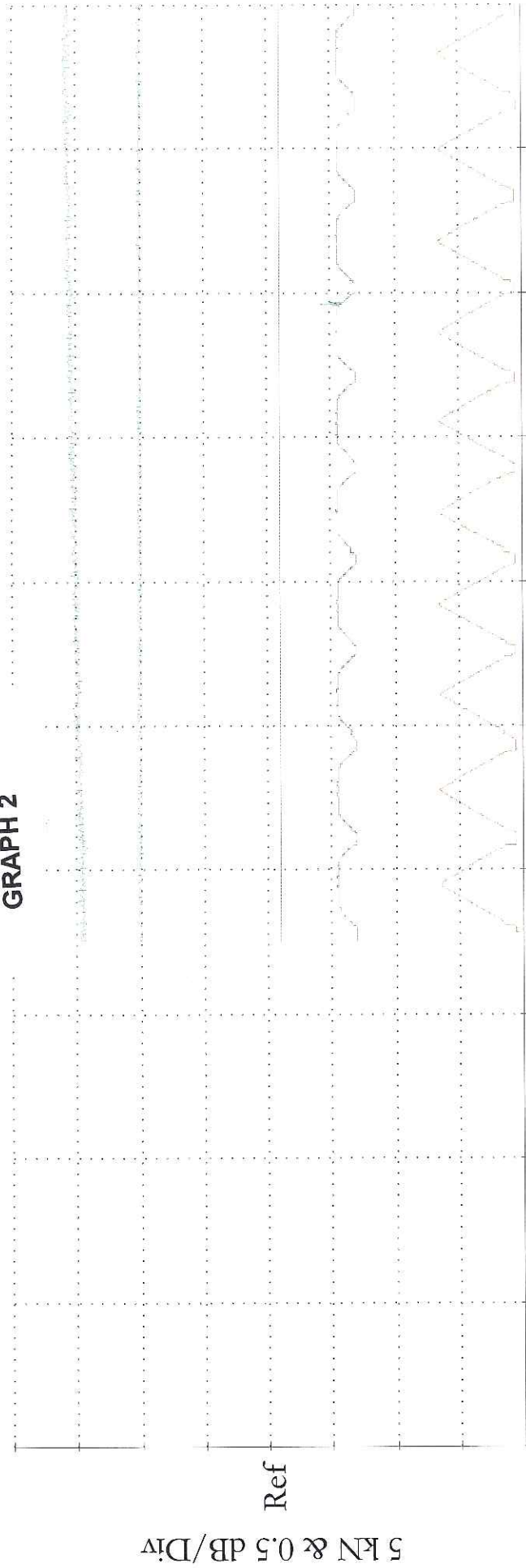
Time/Div: 10:00min

15:56:07.989

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>50kN x Units/div	1.000000	4.000000	On	Off
2 <912>Continuity	5.000000	-6.000000	Off	Off
3 <906>(400)0.5dBxUnits/div	1.000000	-1.800000	Off	Off
4 <907>(400)E0.5%xUnits/div	1.000000	-0.900000	Off	Off
5 <910>Pos0.25m x Units/div	1.000000	2.800000	Off	Off
Time/Div 10:00min				
y2:(Off)		t2:(Off)		
y1:(900)	2.812905	t1:(900)	15:55:22.070	
Delta y		Delta t		

CSQ 0616 CORTLAND 27/2/08

GRAPH 2



Before Scan

Time/Div: 20:00min

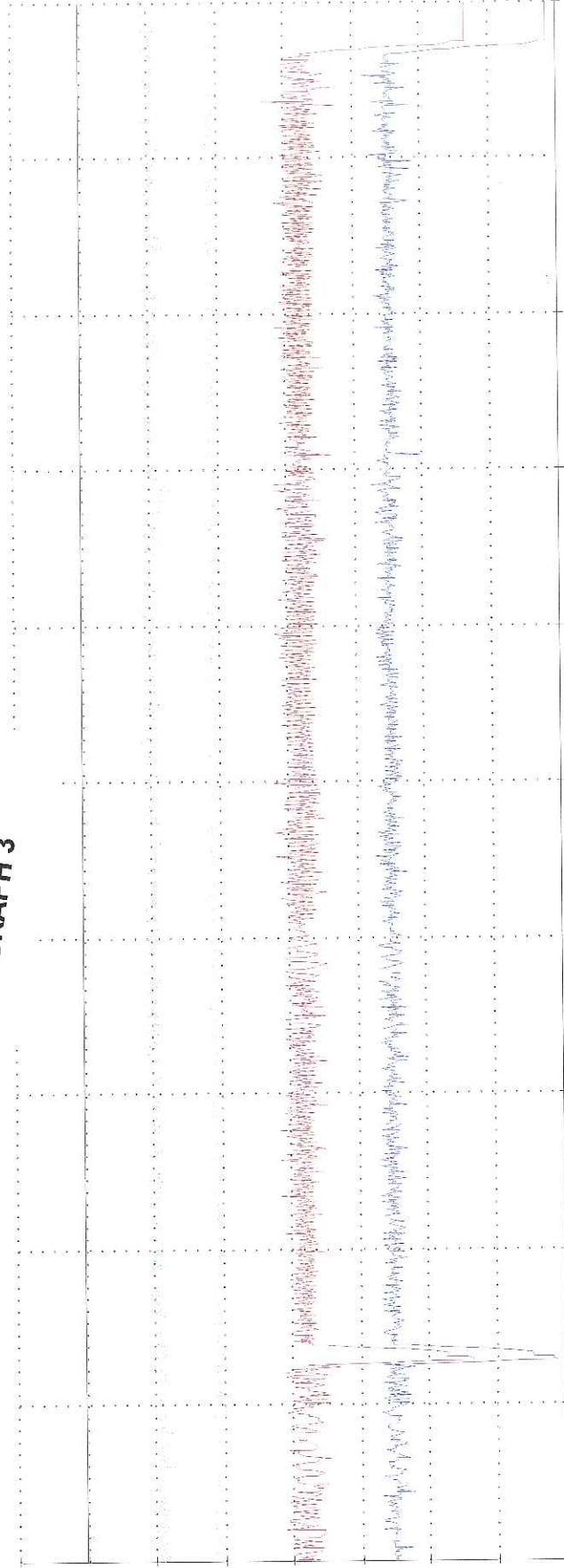
15:00:24.430

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>50kN x Units/div	1.000000	3.900000	Off	Off
2 <906>(400)0.5dBxUnits/div	1.000000	-2.900000	Off	Off
3 <907>(400)E0.5%Units/div	1.000000	-2.000000	Off	Off
4 <912>Continuity	1.000000	0.200000	Off	Off
5 <909>360 deg x Units/div	0.200000	0.000000	Off	Off

Time/Div 20:00min	y2:(Off)	t2:(Off)
	y1:(Off)	t1:(Off)
	Delta y	Delta t

CSQ 616 Cortland 09/03/08

GRAPH 3



25kN/div
Ref

10:07:41.559

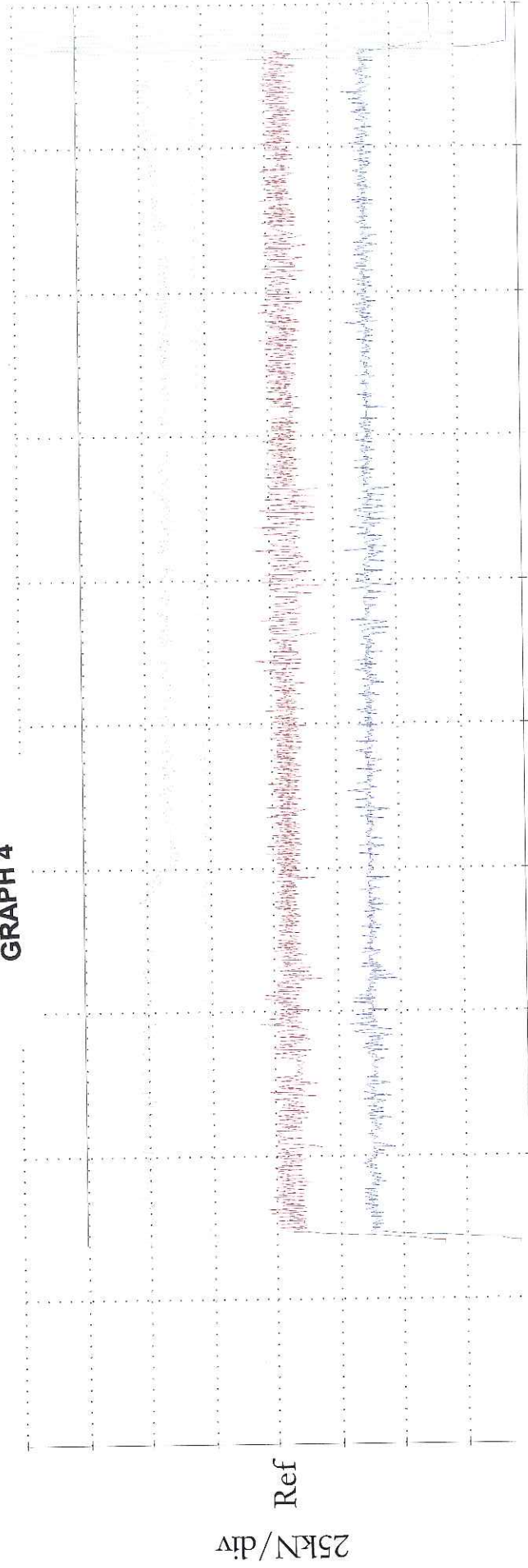
Time/Div: 20:00min

13:27:41.559

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
4 <905>(400)ED 5% x Units/div	1.000000	-1.000000	Off	Off
5 <904>(400)0.5dB x Units/div	1.000000	-1.800000	Off	Off
Time/Div 20:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

CSQ 616 Cortland 09/03/08

GRAPH 4



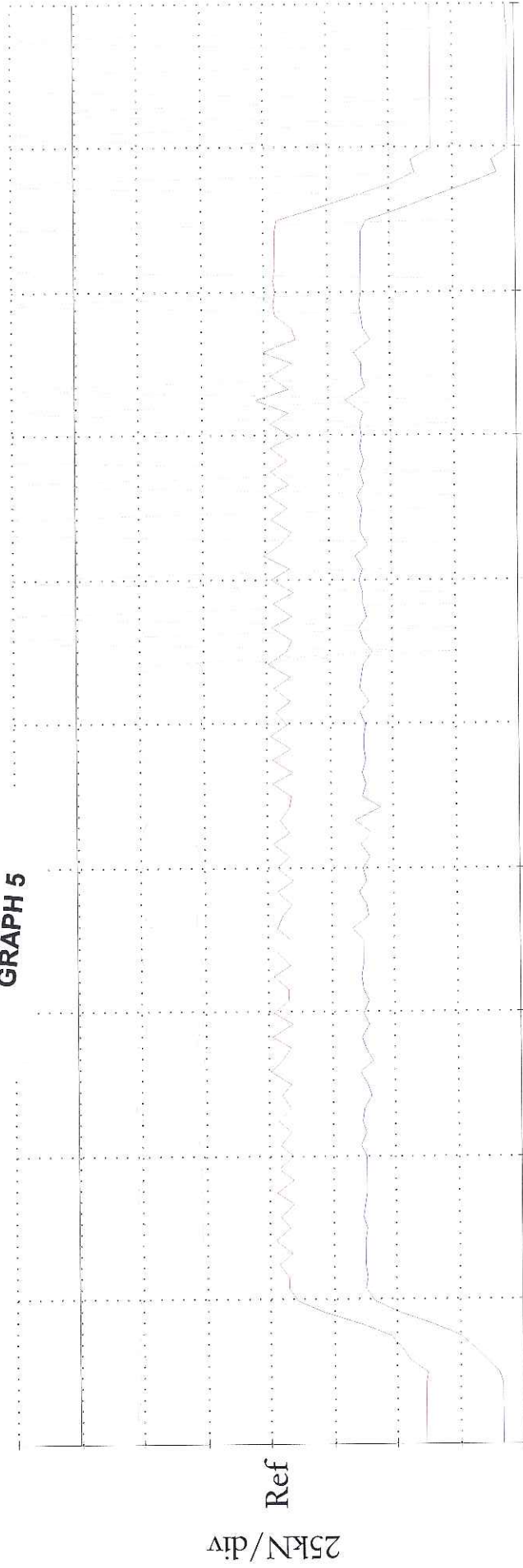
10:31:23.187

Time/Div: 20:00min

Before Scan

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R,50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B,50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
4 <905>(400)E0 5% x Units/div	1.000000	-1.000000	Off	Off
5 <904>(400)0.5dB x Units/div	1.000000	-2.000000	Off	Off
Time/Div 20:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

GRAPH 5



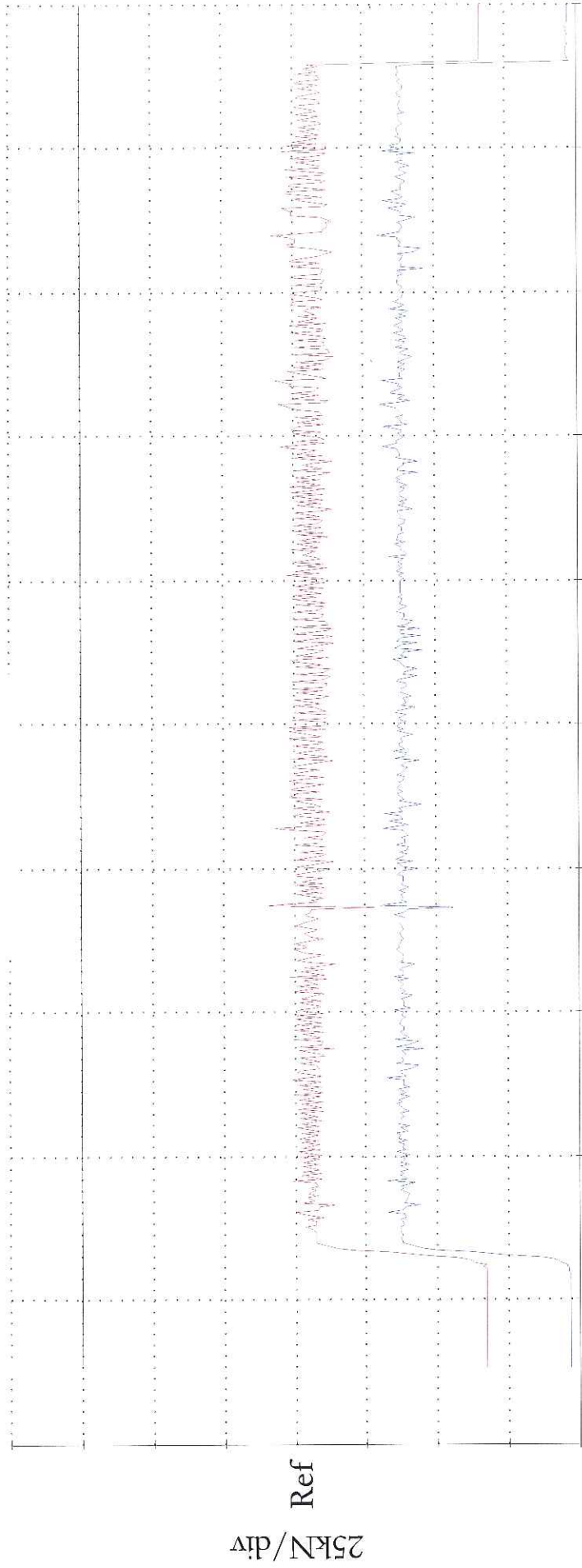
07:46:34.655

Time/Div: 02:00min

08:06:34.655

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
4 <905>(400)E0.5%Units/div	1.000000	-1.000000	Off	Off
5 <904>(400)0.5dBxUnits/div	1.000000	-2.000000	Off	Off
Time/Div 02:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

GRAPH 6



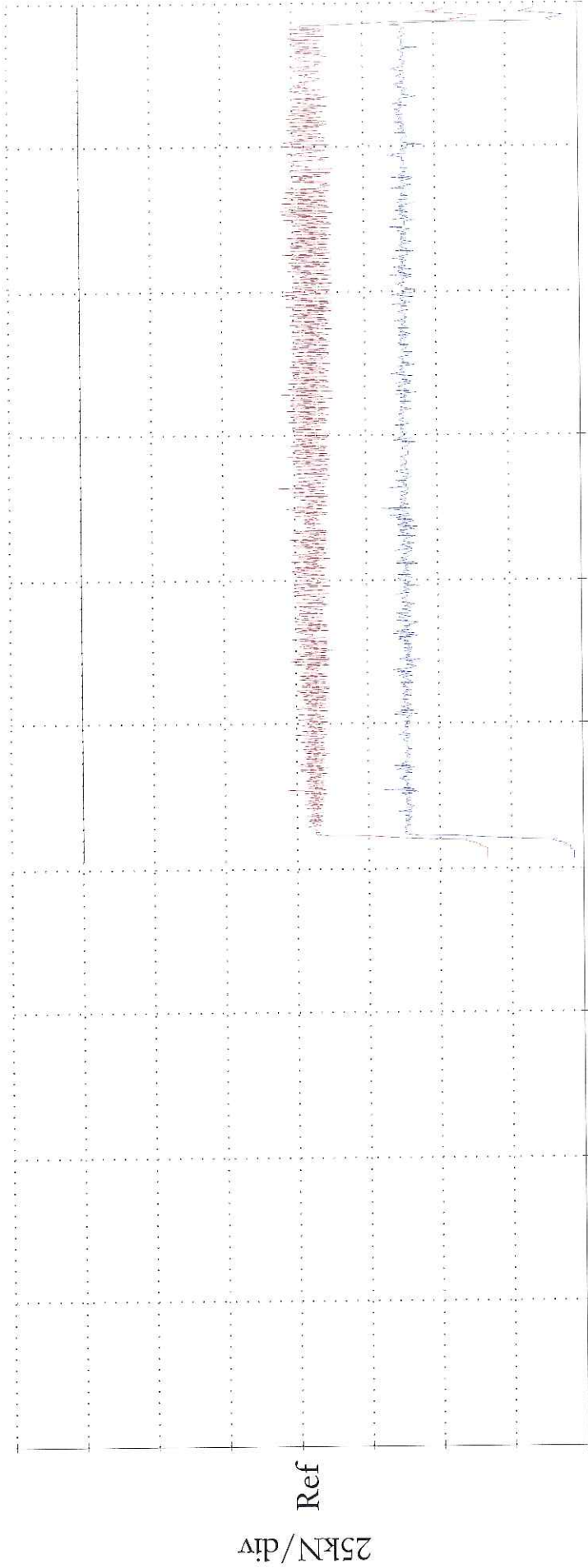
Before Scan

Time/Div: 10:00min

13:27:58.458

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
Time/Div 10:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

GRAPH 7



Before Scan

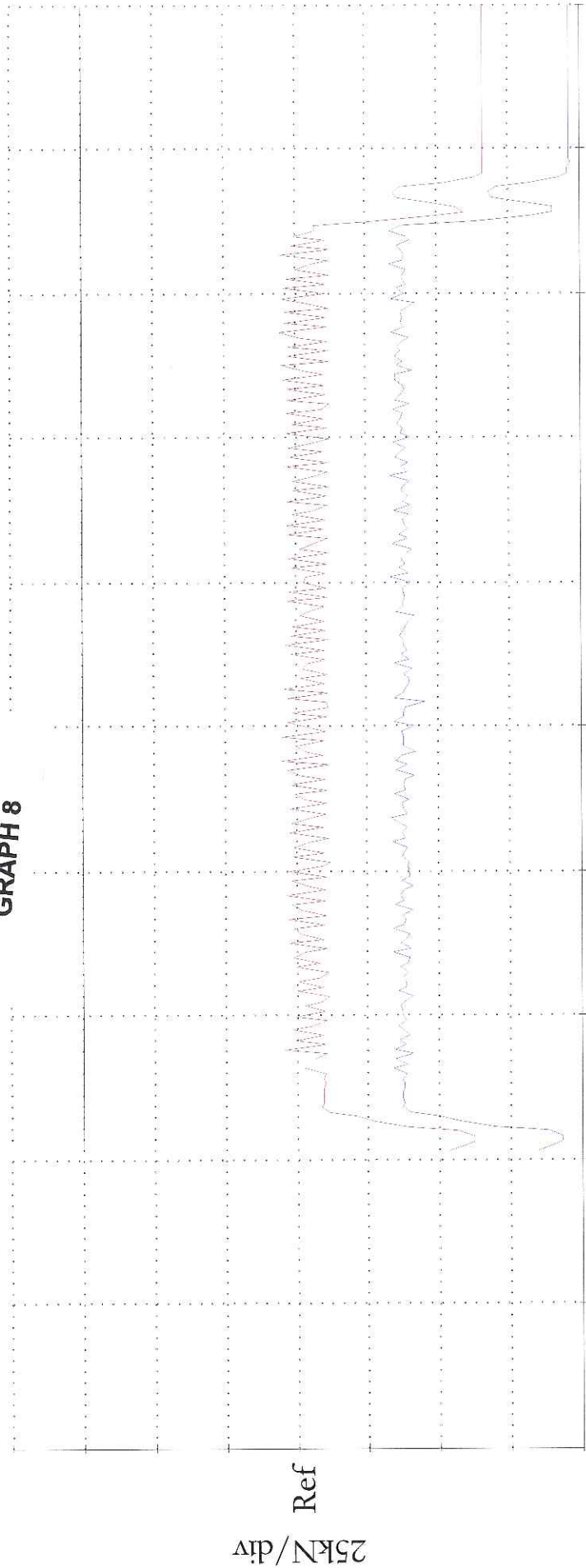
Time/Div: 20:00min

10:12:19.203

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
Time/Div 20:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

CSQ 616 Cortland 09/03/08

GRAPH 8



Before Scan

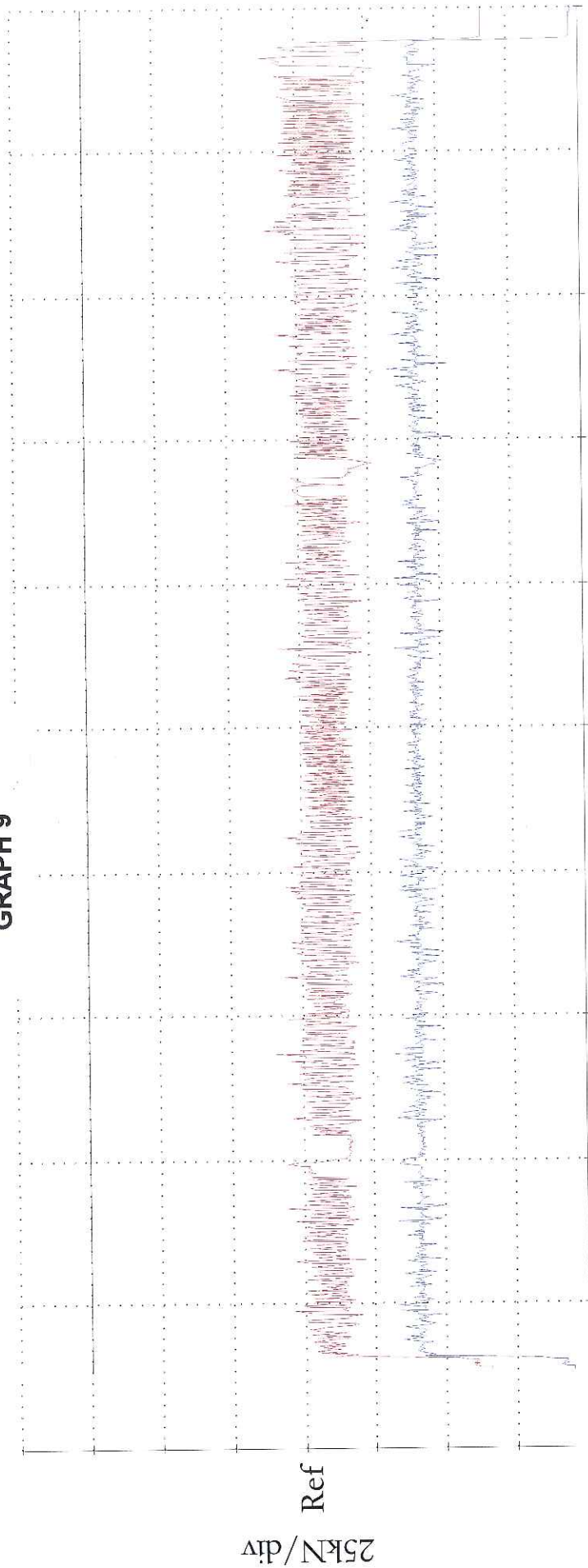
Time/Div: 05:00min

10:53:26.838

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
Time/Div 05:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

CSQ 616 Cortland 09/03/08

GRAPH 9

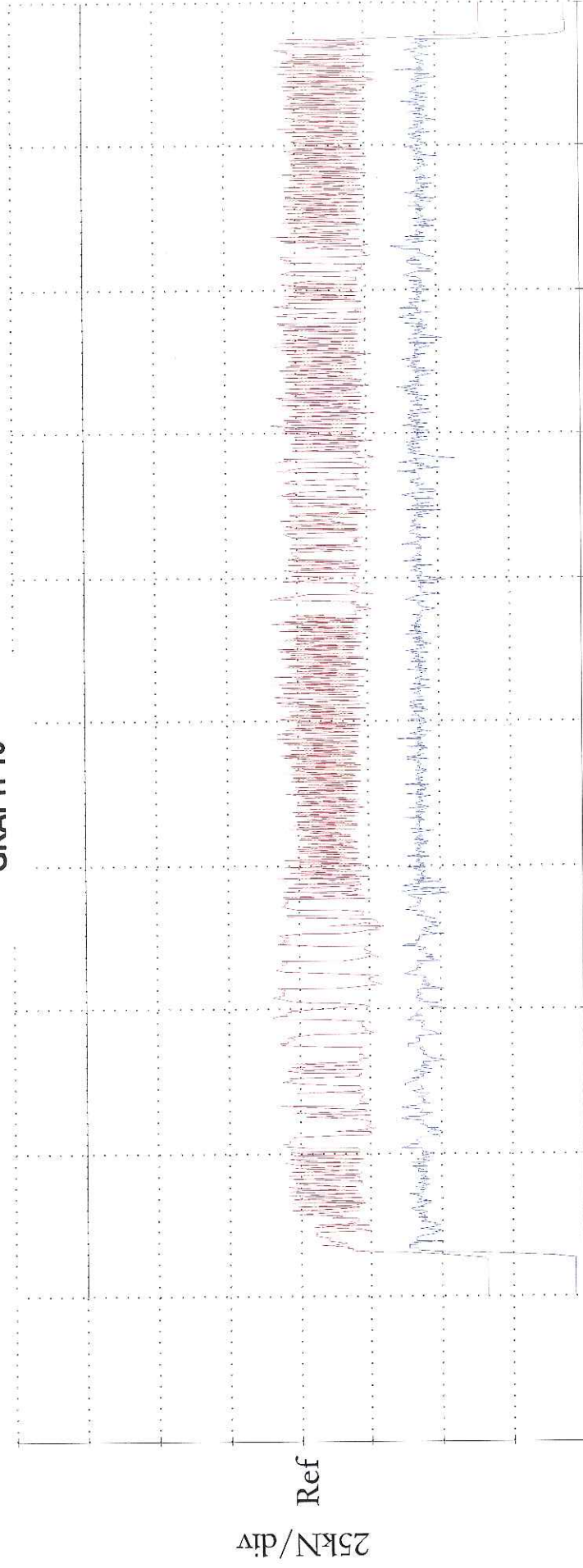


Before Scan Time/Div: 20:00min 10:44:33.943

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
Time/Div 20:00min				
y2:(Off)		t2:(Off)		
y1:(Off)		t1:(Off)		
Delta y		Delta t		

CSQ 616 Cortland 09/03/08

GRAPH 10



Before Scan

Time/Div: 20:00min

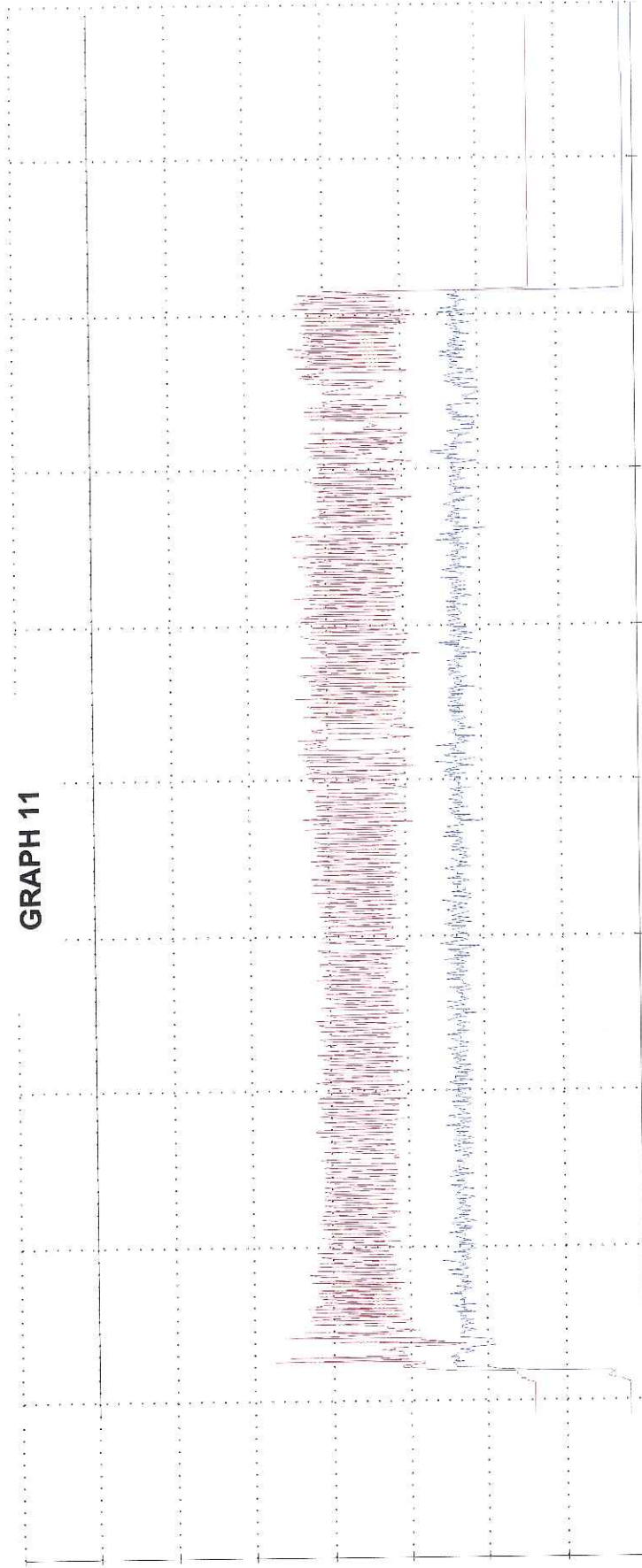
15:05:58.742

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off

Time/Div 20:00min	y2:(Off)	t2:(Off)
	y1:(Off)	t1:(Off)
	Delta y	Delta t

GRAPH 11

25kN/div
Ref



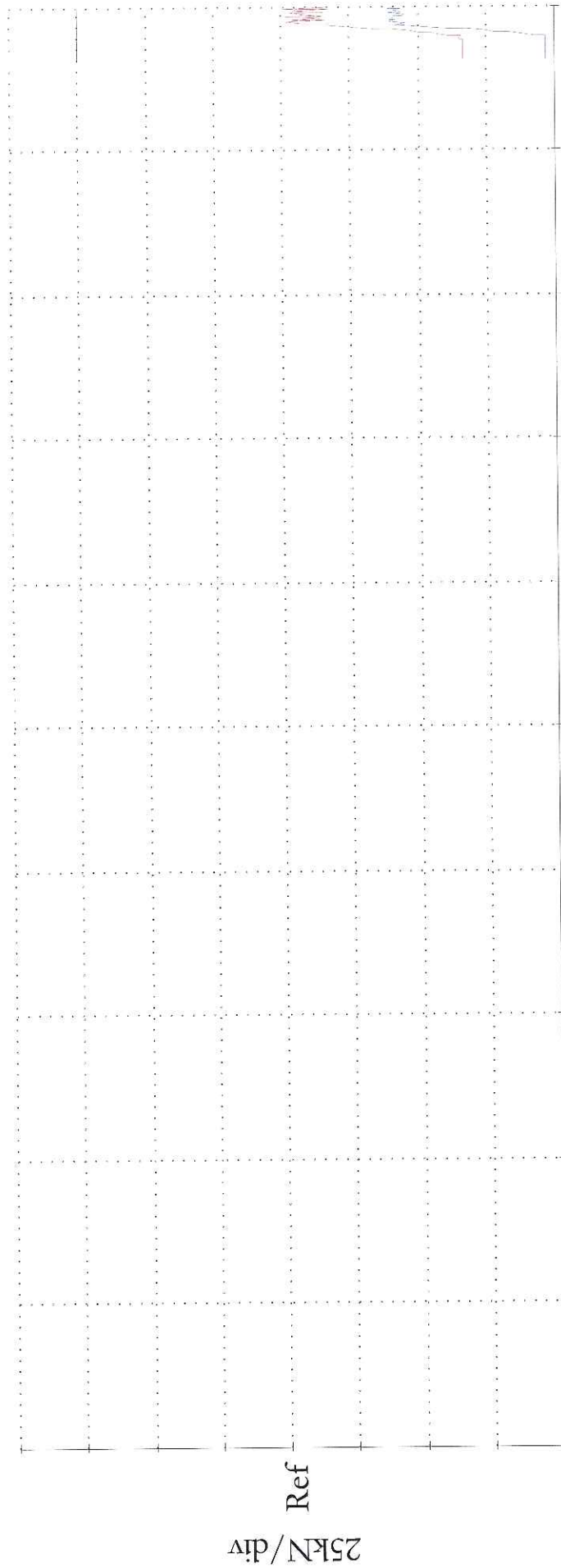
Before Scan

Time/Div: 20:00min

10:30:02.628

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R, 50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B, 50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
Time/Div 20:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

GRAPH 12



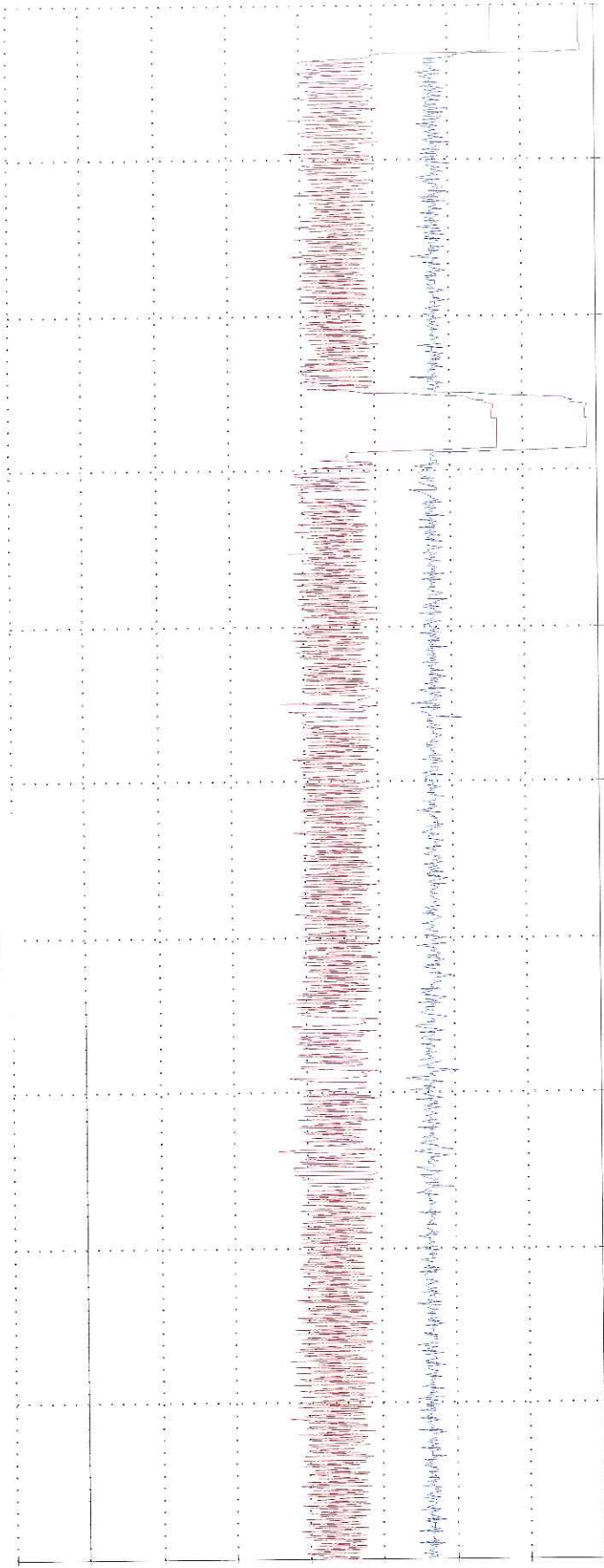
Before Scan

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R.50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B.50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
Time/Div 20:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

CSQ 616 Cortland 09/03/08

GRAPH 13

25kN/div
 Ref



10:40:40.320 14:00:40.320
 Time/Div: 20:00min

Channel Name	Units/Div	Reference	Marker: 1	Marker: 2
1 <900>R, 50kN x Units/div	0.500000	1.350000	Off	Off
2 <901>B, 50kN x Units/div	0.500000	1.950000	Off	Off
3 <915>Continuity Ohms	1E+008	-3E+008	Off	Off
Time/Div 20:00min	y2:(Off)	t2:(Off)		
	y1:(Off)	t1:(Off)		
	Delta y	Delta t		

CERTIFICATE OF CALIBRATION

ISSUED BY: **SERCAL MATERIALS TESTING MACHINES SERVICES LTD - REDDITCH**

DATE OF ISSUE: **13 August 2007**

SERIAL NUMBER: **28211**



0375

SERCAL

MATERIALS TESTING MACHINES SERVICES LTD

The Rubicon Centre
Broad Ground Road
Lakeside, Redditch
B98 8YP England

Telephone : +44 (0)1527 514015

Facsimile : +44 (0)1527 514016

E-mail : sercal@btinternet.com

Web Site : www.sercal-mtms.com

Page 1 of 3 Pages

APPROVED SIGNATORY

JIM SWANN

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

MACHINE DESCRIPTION: **300kN Integrated Systems Horizontal Tensile**

TYPE REFERENCE: **RTS Rig**

SERIAL NUMBER: **MAR 91653 / Blue Winch**

MEASURING SYSTEM DESCRIPTION: **4 strain gauged shear pin load cells with a single range digital display**

DATE OF CALIBRATION: **9 August 2007**

AMBIENT TEMPERATURE: **20°C**

LOCATION: **Integrated Test Facility – Outdoor Cable Test Area - RTS**

REPORT:

This testing machine has been verified to the procedures of: BS EN ISO 7500-1 tension testing machines - Verification and calibration of the force measuring system.

MEASUREMENTS:

The measured results show the testing machine satisfies the requirements of BS EN ISO 7500-1 in respect to the relevant error of accuracy, repeatability, zero and resolution (see table 2 of the specification) as follows:

No adjustments were made prior to verification.

Range Description	Mode	Maximum Force	Minimum Force	Class	Resolution @ 0 Force
300kN	Tension	300kN	30kN	2	0.1kN

Certified

The reported expanded uncertainty is based on a standard uncertainty, multiplies by a coverage factor $k=2$, proving a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standard, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

SERCAL MATERIALS TESTING MACHINES SERVICES LTD

UKAS ACCREDITED CALIBRATION LABORATORY No. 0375

13 August 2007

SERIAL NUMBER
28211

Page 2 of 3

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

MACHINE SETTING-UP PROCEDURE:

To recommendations of the Manufacturer with the calibration figures set as follows:

Load Cell	Cal Figure Actual	Zero Error	Cal Figure Calculated
1	57.55	-2.15	59.70
2	55.93	-3.71	59.64
3	56.56	+3.14	53.42
4	64.16	+6.08	58.08

CALIBRATION PROCEDURE:

Accessories:

Description	Type	Serial Number	Status
Straininstall Shear Pin Load Cell	459	27033 (1)	Calibrated
Straininstall Shear Pin Load Cell	459	27036 (2)	Calibrated
Straininstall Shear Pin Load Cell	3405	54205 (3)	Calibrated
Straininstall Shear Pin Load Cell	459	27032 (4)	Calibrated

(With reference to Clause 6.4.5 of the Standard)

The verification was completed using the constant indicated method of verification over a series of measurements taken at five test forces at approximately equal intervals over each scale range.

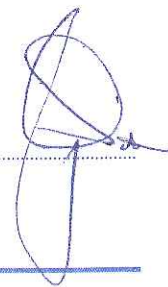
Additional static test forces below 20% of the scale maximum, in compliance with Clause 6.4.5 of the Standard, were taken down to a limit of compliance or the lower limit of verification.

TABLE OF MEASURED RESULTS:

Range Description Force Indicated (kN)	Tension	
	Average Actual Applied Force (kN)	Relative Uncertainty of Mean (%)
300kN range:		
15	14.95	0.78
30	30.55	0.47
45	45.72	0.44
60	60.87	0.41
120	120.81	0.41
180	180.84	0.41
240	240.38	0.39
300	300.42	0.39

NB. A negative Mean Error shows the machine's indicator to lag the true force applied.

Certified



CERTIFICATE OF CALIBRATION

SERCAL MATERIALS TESTING MACHINES SERVICES LTD

UKAS ACCREDITED CALIBRATION LABORATORY No. 0375

13 August 2007

SERIAL NUMBER
28211

Page 3 of 3

ISSUED TO: GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD

INFORMATIVE NOTES:

Intervals between Verifications:

(With reference to Clause 9 of the Standard)

The time between two verifications depend upon the type of testing machine, the standard of maintenance and the amount of use. Unless otherwise specified it is recommended that the verification be carried out at intervals not exceeding twelve months. The machine shall in any case be verified if it is moved to a new location, necessitating dismantling or subject to major repairs or adjustments.

FORCE-PROVING INSTRUMENTS USED:

Description	Serial Number	Certificate Number	Date Verified	Class	Average Temperature
Load Cell	600/3U	0478 / E07010354/1	06.02.2007	1	20°C

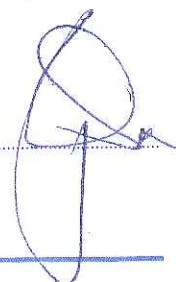
Alignment of the force-proving instruments satisfied Clause 6.4.1 of the Standard with reference to ISO 376.

(With reference to BS EN ISO 7500-1 Clause 6.1)

The verification equipment used is in accordance with ISO 376. The class of the verification equipment was equal to or superior to the class determined for the testing machine.

NB. The expiry date of certificates of calibration used for the force-proving instruments recorded above is, 26 months for load cells and 5 years for masses.

Certified



CERTIFICATE OF CALIBRATION

ISSUED BY: **SERCAL MATERIALS TESTING MACHINES SERVICES LTD - REDDITCH**

DATE OF ISSUE: **13 August 2007**

SERIAL NUMBER: **28210**



0375

SERCAL

MATERIALS TESTING MACHINES SERVICES LTD

The Rubicon Centre
Broad Ground Road
Lakeside, Redditch
B98 8YP England

Telephone : +44 (0)1527 514015

Facsimile : +44 (0)1527 514016

E-mail : sercal@btinternet.com

Web Site : www.sercal-mtms.com

Page 1 of 3 Pages

APPROVED SIGNATORY

JIM SWANN

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

MACHINE DESCRIPTION: **300kN Integrated Systems Horizontal Tensile**

TYPE REFERENCE: **RTS Rig**

SERIAL NUMBER: **MAR 91652 / Red Winch**

MEASURING SYSTEM DESCRIPTION: **4 strain gauged shear pin load cells with a single range digital display**

DATE OF CALIBRATION: **8 August 2007**

AMBIENT TEMPERATURE: **21°C**

LOCATION: **Integrated Test Facility – Outdoor Cable Test Area - RTS**

REPORT:

This testing machine has been verified to the procedures of: BS EN ISO 7500-1 tension testing machines - Verification and calibration of the force measuring system.

MEASUREMENTS:

The measured results show the testing machine satisfies the requirements of BS EN ISO 7500-1 in respect to the relevant error of accuracy, repeatability, zero and resolution (see table 2 of the specification) as follows:

No adjustments were made prior to verification.

Range Description	Mode	Maximum Force	Minimum Force	Class	Resolution @ 0 Force
300kN	Tension	300kN	60kN	3	0.1kN

Certified

The reported expanded uncertainty is based on a standard uncertainty, multiplies by a coverage factor $k=2$, proving a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standard, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

SERCAL MATERIALS TESTING MACHINES SERVICES LTD

UKAS ACCREDITED CALIBRATION LABORATORY No. 0375

13 August 2007

SERIAL NUMBER
28210

Page 2 of 3

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

MACHINE SETTING-UP PROCEDURE:

To recommendations of the Manufacturer with the calibration figures set as follows:

Load Cell	Cal Figure Actual	Zero Error	Cal Figure Calculated
1	56.78	-0.49	57.27
2	50.63	-2.26	52.89
3	57.94	-0.41	58.35
4	55.95	+1.66	54.29

CALIBRATION PROCEDURE:

Accessories:

Description	Type	Serial Number	Status
Straininstall Shear Pin Load Cell	459	27034 (1)	Calibrated
Straininstall Shear Pin Load Cell	3405	49037 (2)	Calibrated
Straininstall Shear Pin Load Cell	459	27035 (3)	Calibrated
Straininstall Shear Pin Load Cell	3405	49038 (4)	Calibrated

(With reference to Clause 6.4.5 of the Standard)

The verification was completed using the constant indicated method of verification over a series of measurements taken at five test forces at approximately equal intervals over each scale range.

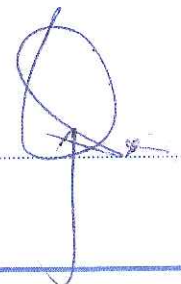
Additional static test forces below 20% of the scale maximum, in compliance with Clause 6.4.5 of the Standard, were taken down to a limit of compliance or the lower limit of verification.

TABLE OF MEASURED RESULTS:

Range Description Force Indicated (kN)	Tension	
	Average Actual Applied Force (kN)	Relative Uncertainty of Mean (%)
300kN range:		
15	13.95	0.79
30	28.84	0.76
45	43.56	0.45
60	58.42	0.47
120	117.99	0.43
180	180.65	0.43
240	242.44	0.39
300	304.80	0.39

NB. A negative Mean Error shows the machine's indicator to lag the true force applied.

Certified



CERTIFICATE OF CALIBRATION

SERCAL MATERIALS TESTING MACHINES SERVICES LTD

UKAS ACCREDITED CALIBRATION LABORATORY No. 0375

13 August 2007

SERIAL NUMBER
28210

Page 3 of 3

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

INFORMATIVE NOTES:

Intervals between Verifications:

(With reference to Clause 9 of the Standard)

The time between two verifications depend upon the type of testing machine, the standard of maintenance and the amount of use. Unless otherwise specified it is recommended that the verification be carried out at intervals not exceeding twelve months. The machine shall in any case be verified if it is moved to a new location, necessitating dismantling or subject to major repairs or adjustments.

FORCE-PROVING INSTRUMENTS USED:

Description	Serial Number	Certificate Number	Date Verified	Class	Average Temperature
Load Cell	600/3U	0478 / E07010354/1	06.02.2007	1	21°C

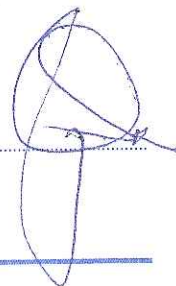
Alignment of the force-proving instruments satisfied Clause 6.4.1 of the Standard with reference to ISO 376.

(With reference to BS EN ISO 7500-1 Clause 6.1)

The verification equipment used is in accordance with ISO 376. The class of the verification equipment was equal to or superior to the class determined for the testing machine.

NB. The expiry date of certificates of calibration used for the force-proving instruments recorded above is, 26 months for load cells and 5 years for masses.

Certified



The following Instrument and Options have been calibrated to the manufacturers published specifications.

MODEL No : SPL400

SERIAL No : 1305

CERTIFICATE No : 1305/2008

OPTION	DESCRIPTION	CONDITION	DATE OF CAL	NEXT CAL DUE
CD409/ST	STRAIN	A	10/01/2008	JA ~ 2009
CD409/A	ATTENUATION	A	10/01/2008	JA ~ 2009
	LENGTH	A	10/01/2008	JA ~ 2009

CONDITION :

A : All measurements were within specification - No adjustment was made.

B : All measurements were within specification - Minor adjustments were made to optimise results.

C : Not all measurements were within specification - See comments below.

R : A repair was carried out - See comments below.

COMMENTS :**CALIBRATION EQUIPMENT USED :**

CD313: 960207

Attenuator: JE012813

Frequency Counter: 131554

Calibration for the above instruments is traceable to the UK National Physical Laboratories unless otherwise indicated.

For PE.fiberoptics :



Print Name :

...ADRIAN EVANS.....

Position :

...OPERATIONS DIRECTOR.....

Date :

10/01/2008

CERTIFICATE OF CALIBRATION

ISSUED BY: **SERCAL MATERIALS TESTING MACHINES SERVICES LTD - REDDITCH**

DATE OF ISSUE: **13 August 2007**

SERIAL NUMBER: **28213**



0375

SERCAL

MATERIALS TESTING MACHINES SERVICES LTD

The Rubicon Centre
Broad Ground Road
Lakeside, Redditch
B98 8YP England

Telephone : +44 (0)1527 514015

Facsimile : +44 (0)1527 514016

E-mail : sercal@btinternet.com

Web Site : www.sercal-mtms.com

Page 1 of 3 Pages

APPROVED SIGNATORY

JIM SWANN

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

MACHINE DESCRIPTION: **300kN Integrated Systems Horizontal Tensile**

TYPE REFERENCE: **Cable Test**

SERIAL NUMBER: **MAR 91655**

MEASURING SYSTEM DESCRIPTION: **Single range digital display**

DATE OF CALIBRATION: **7 August 2007**

AMBIENT TEMPERATURE: **22°C**

LOCATION: **Integrated Test Facility**

REPORT:

This testing machine has been verified to the procedures of: BS EN ISO 7500-1 tension testing machines - Verification and calibration of the force measuring system.

MEASUREMENTS:

The measured results show the testing machine satisfies the requirements of BS EN ISO 7500-1 in respect to the relevant error of accuracy, repeatability, zero and resolution (see table 2 of the specification) as follows:

No adjustments were made prior to verification.

Range Description	Mode	Maximum Force	Minimum Force	Class	Resolution @ 0 Force
300kN	Tension	300kN	20kN	1	0.1kN

Certified

The reported expanded uncertainty is based on a standard uncertainty, multiplies by a coverage factor $k=2$, proving a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standard, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

SERCAL MATERIALS TESTING MACHINES SERVICES LTD

UKAS ACCREDITED CALIBRATION LABORATORY No. 0375

13 August 2007

SERIAL NUMBER
28213

Page 2 of 3

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

MACHINE SETTING-UP PROCEDURE:

To recommendations of the Manufacturer with the calibration figure set as follows:

kN range	295.2	With the calibration resistor connected to the red and white test points.
----------	-------	---

CALIBRATION PROCEDURE:

Accessories:

Description	Type	Serial Number	Status
75 000lbf Strainert Load Cell	FL25U	07278-1	Calibrated

(With reference to Clause 6.4.5 of the Standard)

The verification was completed using the constant indicated method of verification over a series of measurements taken at five test forces at approximately equal intervals over each scale range.

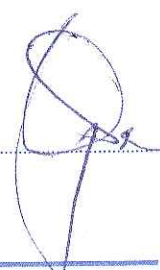
Additional static test forces below 20% of the scale maximum, in compliance with Clause 6.4.5 of the Standard, were taken down to a limit of compliance or the lower limit of verification.

TABLE OF MEASURED RESULTS:

Range Description Force Indicated (kN)	Tension	
	Average Actual Applied Force (kN)	Relative Uncertainty of Mean (%)
300kN range:		
20	19.98	0.50
30	30.02	0.44
45	45.06	0.41
60	60.09	0.40
120	119.87	0.39
180	180.01	0.39
240	240.17	0.39
300	300.07	0.39

NB. A negative Mean Error shows the machine's indicator to lag the true force applied.

Certified



CERTIFICATE OF CALIBRATION

SERCAL MATERIALS TESTING MACHINES SERVICES LTD

UKAS ACCREDITED CALIBRATION LABORATORY No. 0375

13 August 2007

SERIAL NUMBER
28213

Page 3 of 3

ISSUED TO: **GLOBAL MARINE SYSTEMS LIMITED - CHELMSFORD - CM2 5PD**

INFORMATIVE NOTES:

Intervals between Verifications:

(With reference to Clause 9 of the Standard)

The time between two verifications depend upon the type of testing machine, the standard of maintenance and the amount of use. Unless otherwise specified it is recommended that the verification be carried out at intervals not exceeding twelve months. The machine shall in any case be verified if it is moved to a new location, necessitating dismantling or subject to major repairs or adjustments.

FORCE-PROVING INSTRUMENTS USED:

Description	Serial Number	Certificate Number	Date Verified	Class	Average Temperature
Load Cell	600/3U	0478 / E07010354/1	06.02.2007	1	22°C

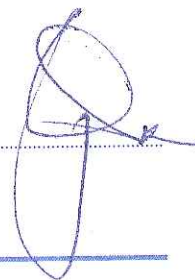
Alignment of the force-proving instruments satisfied Clause 6.4.1 of the Standard with reference to ISO 376.

(With reference to BS EN ISO 7500-1 Clause 6.1)

The verification equipment used is in accordance with ISO 376. The class of the verification equipment was equal to or superior to the class determined for the testing machine.

NB. The expiry date of certificates of calibration used for the force-proving instruments recorded above is, 26 months for load cells and 5 years for masses.

Certified



DOCUMENT

Sample No. CSQ 0616
Document Issue No 1
Start Date: 27.02.2008
Global Marine Systems Limited - Test Facility
Customer: Cortland Fibron

IN CONFIDENCE**TEST SPECIFICATION**

Customer Specification

SECTION 5 - CALIBRATION DETAILS

Equipment	Type	Serial No.	Calibration Date
Blue Winch	Colt – 585	MAR 91653	08.08.07
Red Winch	Colt – 586	MAR 91652	08.08.07
Perkin Elmer Strain Measuring Equipment	SPL 400	1305	10/01/2008
1 MN Tensile Rig 300 kN RAM	Cable Test	MAR 91655	07.08.07

The above items are calibrated annually.