CMG-1T CALIBRATION SHEET

WORKS ORDER:	12802	DATE:	07-Mar-2013
SERIAL NUMBER:	T1075	TESTED BY:	S. Goddard

	Velocity Output V/m/s (Differential)	Mass Position Output (Acceleration output) $V/m/s^2$	Feedback Coil Constant $Amp/m/s^2$
VERTICAL	2 x 1490	2070	0.01371
NORTH/SOUTH	2 x 1485	1457	0.01457
EAST/WEST	2 x 1491	1413	0.01413

Power Consumption: 60mA @ +12V input
Calibration Resistor: 51000

NOTE: A factor of 2 x must be used when the sensor outputs are used differentially (also known as push-pull or balanced output). Under no conditions should the negative outputs be connected to the signal ground. A separate signal ground pin is provided.

POLES AND ZEROS TABLE

WORKS ORDER NUMBER: 12802

SENSOR SERIAL NO: T1075

Velocity response output, Vertical Sensor:

POLES (HZ)	ZEROS HZ
$-1.964 \times 10^{-3} \pm j1.964 \times 10^{-3}$	0
-30.0529±j31.1211	0
-41.2564±j114.535	

Normalizing factor at 1 Hz: A = 27.7×10^{6}

Sensor Sensitivity: See Calibration Sheet.

Velocity response output, Horizontal Sensors:

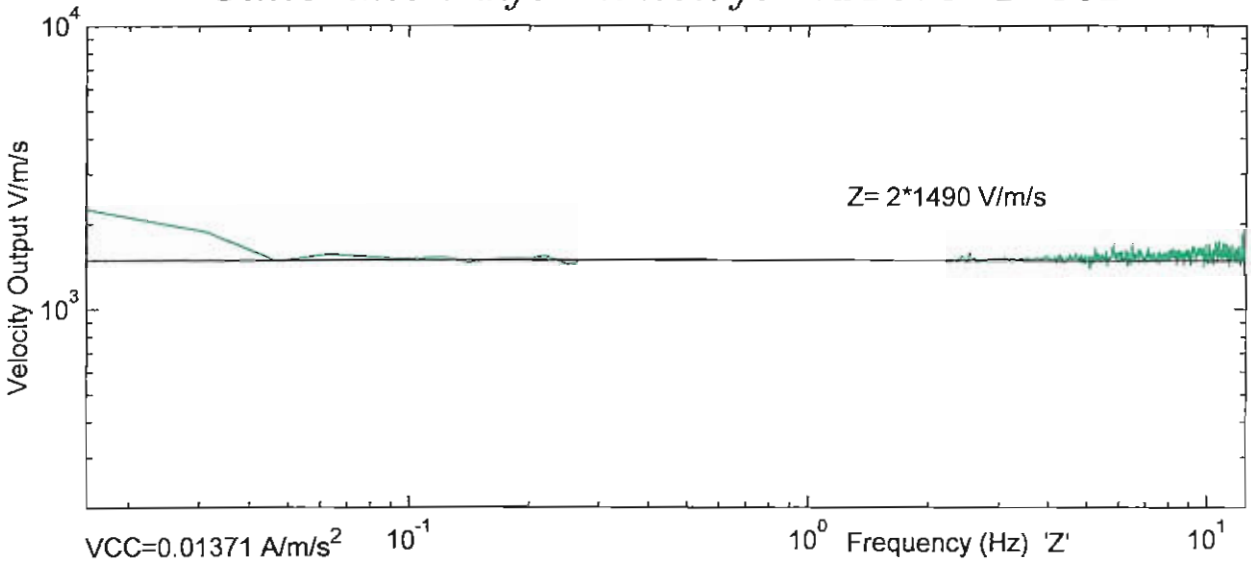
POLES (HZ)	ZEROS (HZ)
$-1.964 \times 10^{-3} \pm j1.964 \times 10^{-3}$	0
-30.0529±j31.1211	0
-41.2564±j114.535	

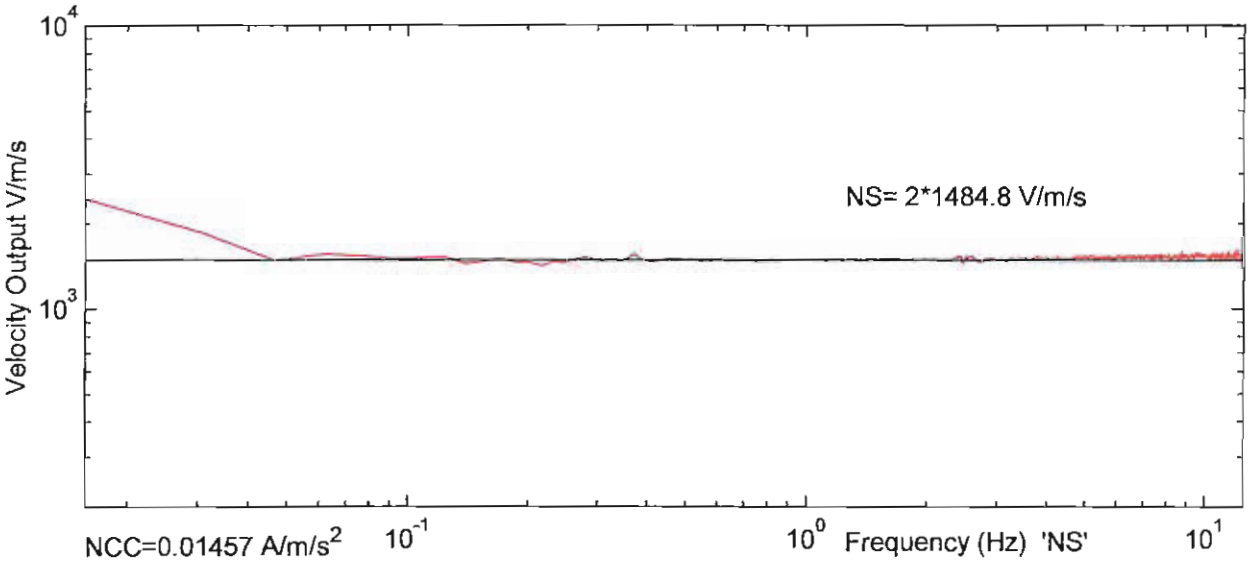
Normalizing factor at 1 Hz: A = 27.7×10^{6}

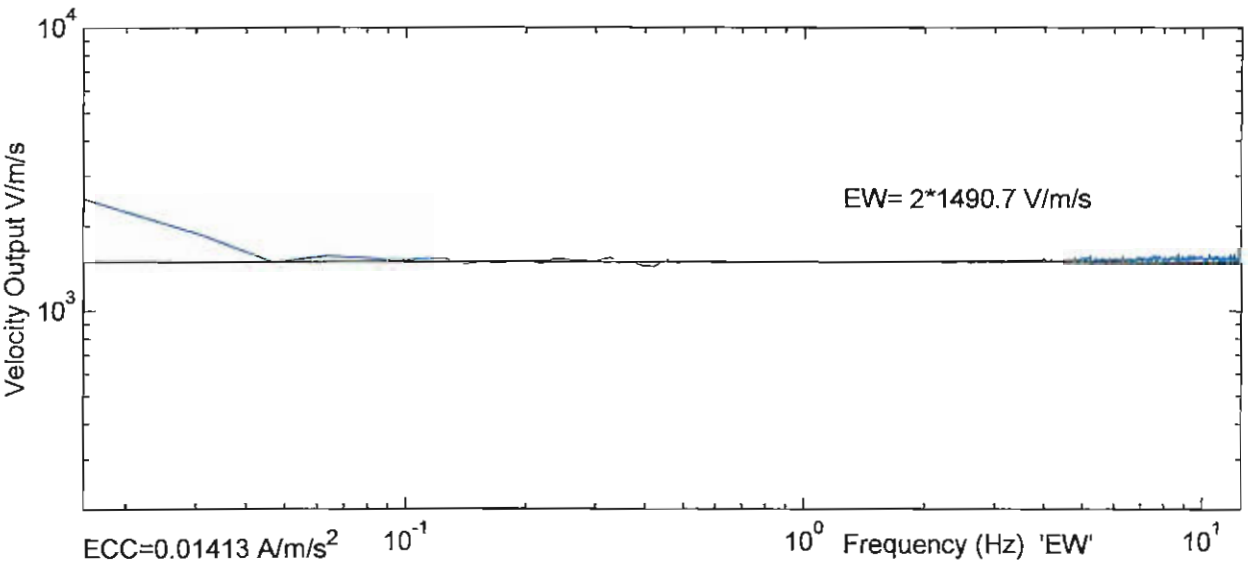
Sensor Sensitivity: See Calibration Sheet.

NOTE: The above poles and zeros apply to the vertical and the horizontal sensors and are given in units of Hz. To convert to Radian/sec multiply each pole or zero with 2π. The normalizing factor A should also be recalculated.

Calibration Information for :T1075 12802



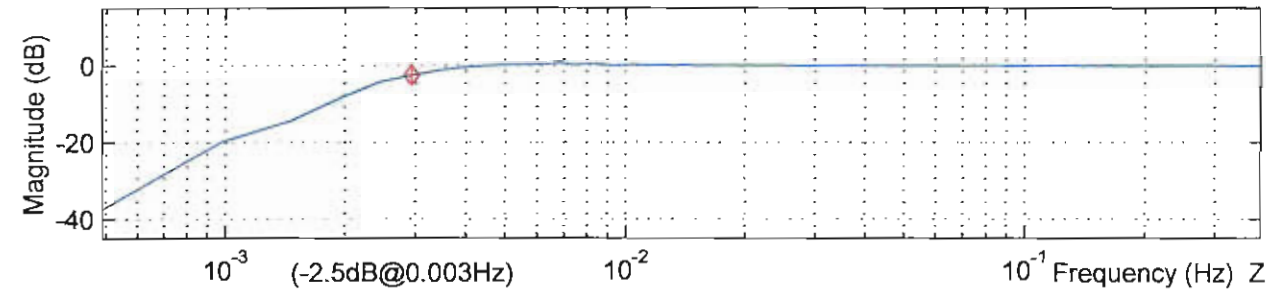


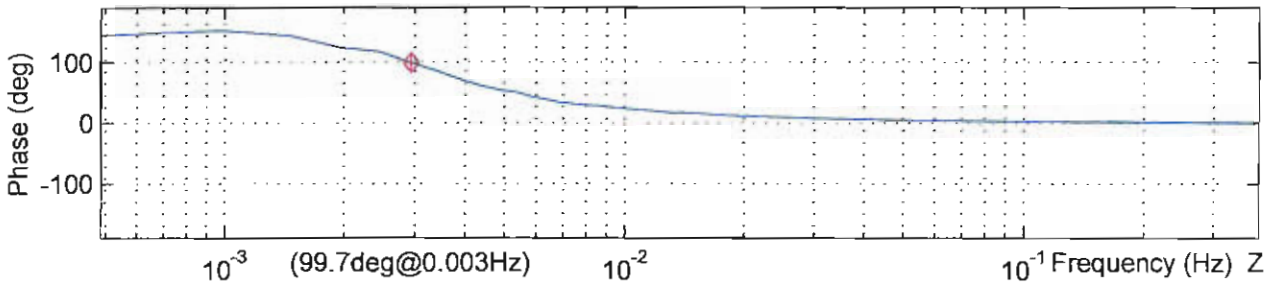


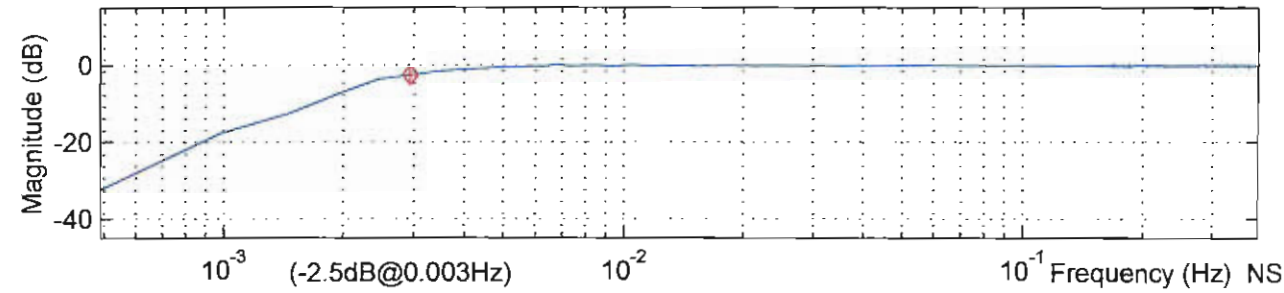
RCal =51000 Ohms

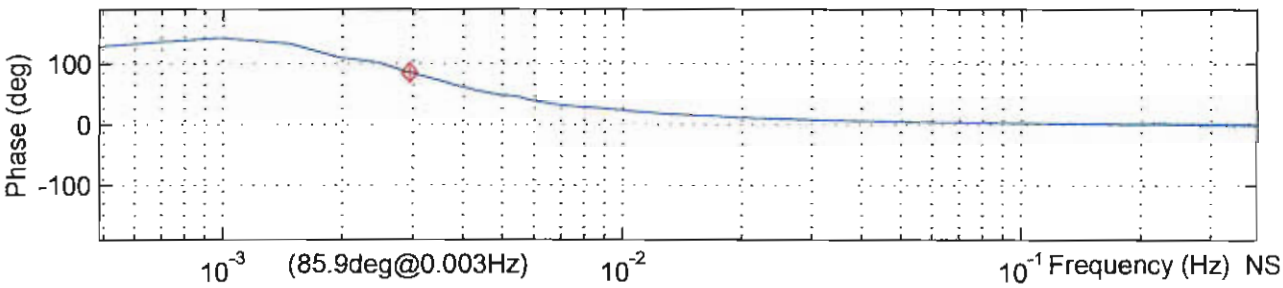
07-Mar-2013

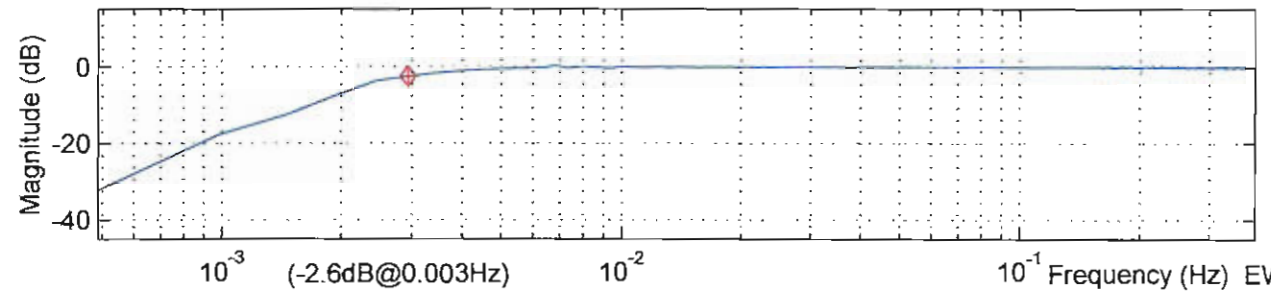
Normalized Frequency Response for :T1075, 12802

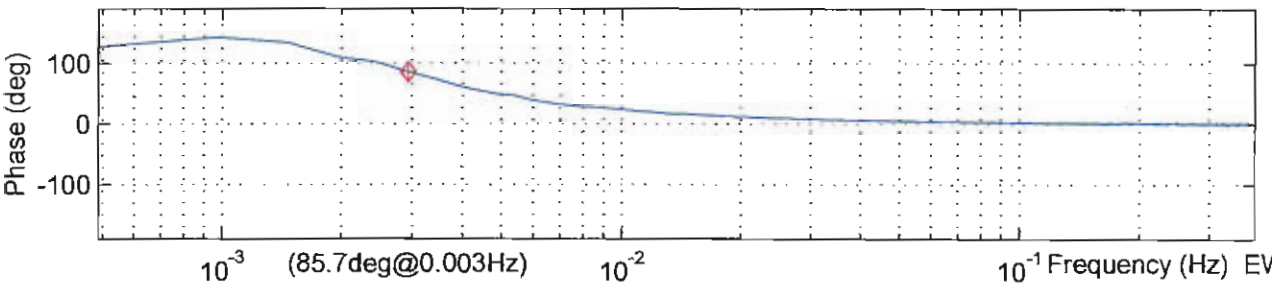












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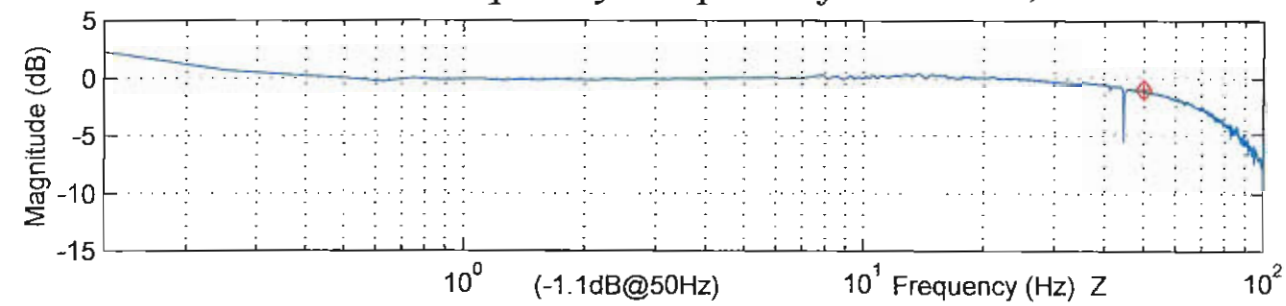
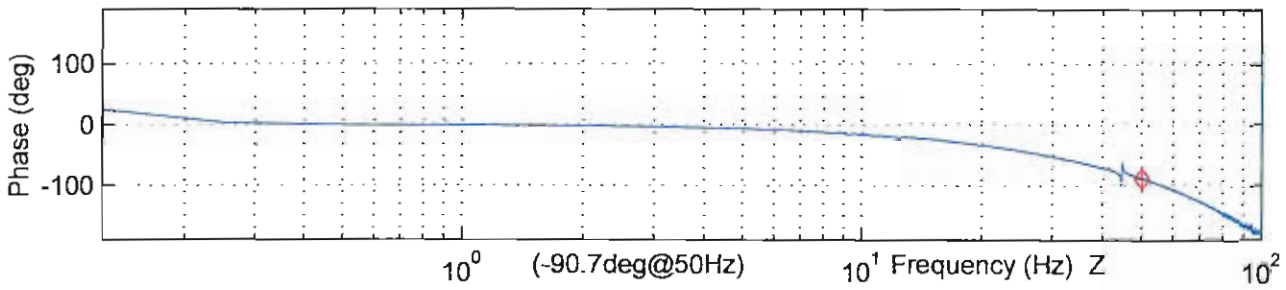
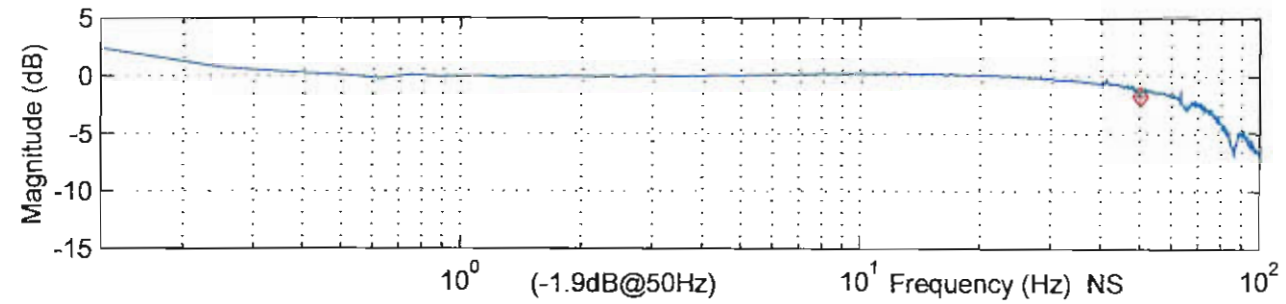
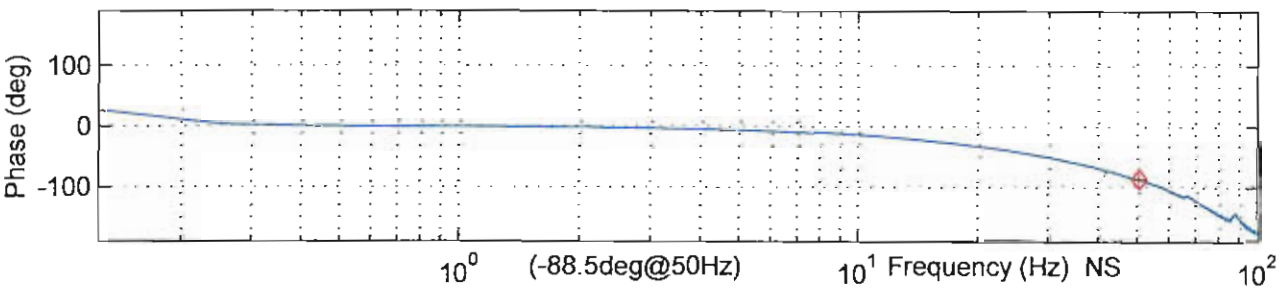
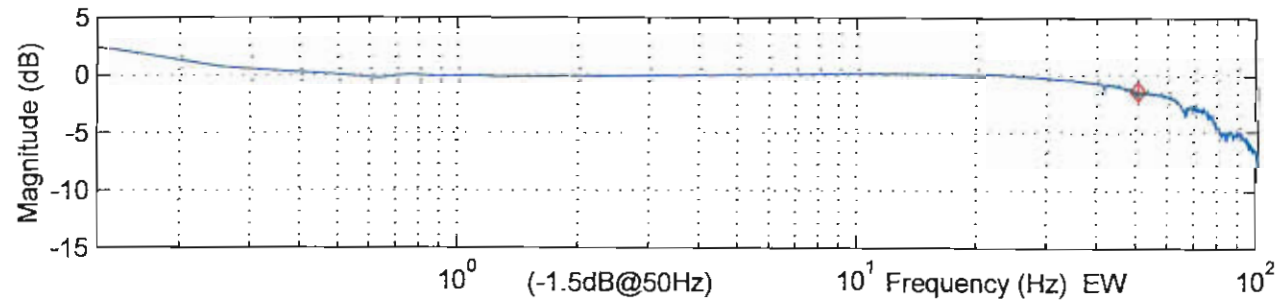
Normalized Frequency Response for :T1075, 12802

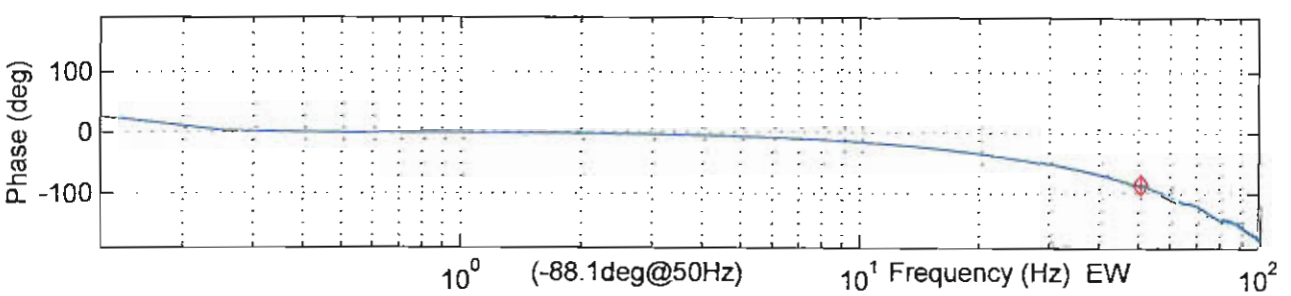












07-Mar-2013

GURALP SYSTEMS

GURALP SYSTEMS LIMITED, 3 MIDAS HOUSE, CALLEVA PARK,
ALDERMASTON, READING, RG7 8EA, UK.
TELEPHONE: +44 118 9819056 FAX: +44 118 9819943
sales@guralp.com

CMG-5T/TD/U Instrument Quality Certificate

This certificate identifies the tests and inspection carried out.

Sensor Serial Number.	TSCP1
	Pass
Sensor Noise Coherence.	
Frequency response. Document attached.	✓
Calibration. Document attached.	✓
Cable Lengths & Ancillaries as per customer order?	

Final Quality Approval. [signature]

On behalf of Guralp Systems. Date 20/2/14

CMG-5T ABSOLUTE CALIBRATION
(ACCELERATION OUTPUTS)

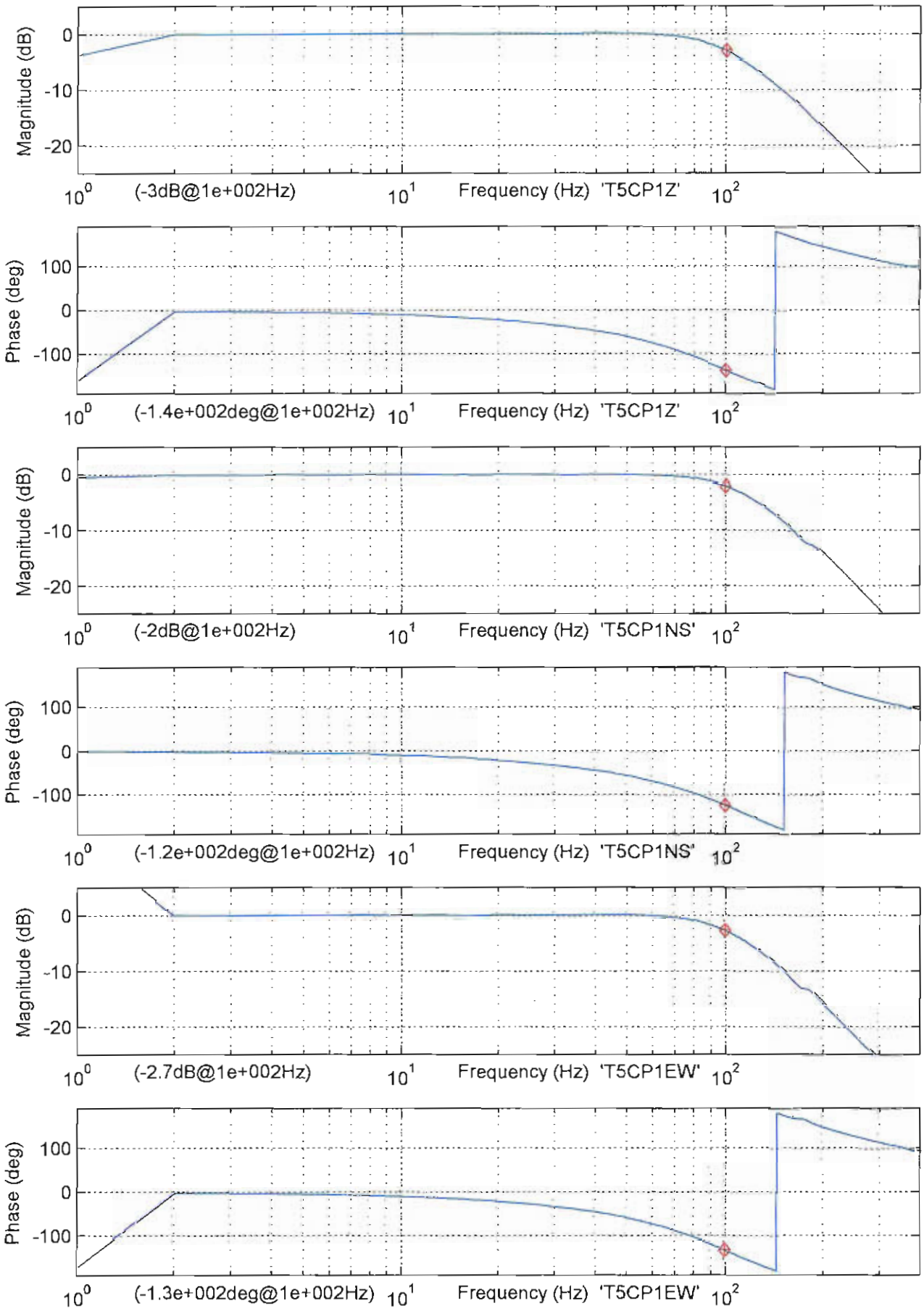
WORKS ORDER:	12802	DATE:	26/02/2013
SERIAL NUMBER:	T5CP1	TESTED BY:	SH
		OUTPUT at 1g	5 volts

	Acceleration Response $V/m/s^2$
VERTICAL	2 x 0.509
NORTH/SOUTH	2 x 0.509
EAST/WEST	2 x 0.510

Vertical component equivalent acceleration from calibration signal of:	1 Volt = $0.982 m/s^2$
North/South component equivalent acceleration from calibration signal of:	1 Volt = $0.982 m/s^2$
East/West component equivalent acceleration from calibration signal of:	1 Volt = $0.980 m/s^2$
Calibration enable signal polarity:	Active Low
Typical Current Consumption:	
This sensor operates from:	10 to 36 Volts

NOTE: A factor of 2 x must be used when the sensor outputs are used differentially (also known as push-pull or balanced output). Under no conditions should the negative outputs be connected to the signal ground. A separate signal ground pin is provided.

Frequency Response for :T5CP1 'WO12982'



HIGH TECH, INC.

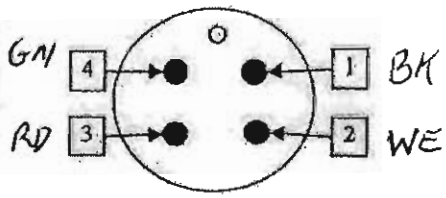
21120 Johnson Road
Long Beach, MS 39560

Tel. (228) 868-6632
Fax (228) 868-6645
hightechinc@att.net

299/1/57 Hydrophone Information 03/04/13
Model# HTI-90-U/Diff
Connector: Subconn IL-4-M & DLSA-M

Connector Pinout

Pin 1	+12VDC
Pin 2	12VDC Return / Signal Gnd
Pin 3	Signal + Output
Pin 4	Signal - Output



Test Data

Serial Number	Hydrophone Sensitivity dB re: 1V/uPa	Current mA
299463	-174.8	2.22
299464	-174.1	2.23
299465	-173.9	2.21
299466	-174.2	2.24
299467	-174.0	2.22
299468	-174.5	2.23
299469	-174.4	2.2
299470	-174.6	2.22
AVG	**-174.3**	**2.22**
VAR	**0.1**	**0.00**
STD	**0.3**	**0.01**
MAX	**-173.9**	**2.24**
MIN	**-174.8**	**2.20**
DIF	**0.9**	**0.04**

5m cable

Sensitivity was measured using the comparison method
Reference hydrophone = 999901
Measurements traceable to USRD Newport, RI

Hydrophones listed on this page:
- Leaked less than 0.1uA @ 27VDC after 1hr @ 100PSI hydrostatic pressure
- Passed shield integrity test
- Have the same Polarity Response

BSS 2/28/13

Voltage	12VDC
Preamp Mode	Voltage
Source Capacitor	800pF
Termination Resistor	-

Expected Gain	12dB
Response High (-3dB)	20kHz
Response Low (-3dB)	2Hz

	Gain (dB)								
Preamp#	2Hz	5Hz	50Hz	100Hz	1KHz	5KHz	10KHz	20KHz	30KHz
1	9.62	11.83	12.42	12.42	12.42	12.42	12.43	12.44	12.47
2	9.60	11.83	12.43	12.44	12.44	12.44	12.44	12.46	12.49
3	9.55	11.81	12.42	12.42	12.42	12.42	12.43	12.44	12.47
4	9.57	11.80	12.42	12.43	12.43	12.43	12.43	12.45	12.48
5	9.58	11.83	12.42	12.42	12.42	12.42	12.43	12.44	12.47
6	9.54	11.84	12.41	12.42	12.42	12.42	12.42	12.44	12.47
7	9.57	11.83	12.43	12.43	12.43	12.43	12.44	12.45	12.48
8	9.68	11.84	12.41	12.42	12.42	12.42	12.42	12.44	12.47
AVG	9.59	11.82	12.42	12.43	12.43	12.43	12.43	12.45	12.47
VAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
MAX	9.68	11.84	12.43	12.44	12.44	12.44	12.44	12.46	12.49
MIN	9.54	11.80	12.41	12.42	12.42	12.42	12.42	12.44	12.47
DIF	0.14	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02

	Phase (deg)								
Preamp#	2Hz	5Hz	50Hz	100Hz	1KHz	5KHz	10KHz	20KHz	30KHz
1		-159.7	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
2		-159.5	-177.8	-179.0	179.9	178.9	177.8	175.6	173.4
3		-159.9	-177.9	-179.0	179.8	178.9	177.8	175.5	173.4
4		-159.7	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
5		-159.7	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
6		-159.6	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
7		-159.4	-177.8	-179.0	179.9	178.9	177.8	175.6	173.4
8		-159.9	-177.9	-179.0	179.9	178.9	177.8	175.5	173.4
AVG		-159.7	-177.9	-179.0	179.8	178.9	177.8	175.6	173.4
VAR		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STD		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAX		-159.4	-177.8	-179.0	179.9	178.9	177.8	175.6	173.4
MIN		-159.9	-177.9	-179.0	179.8	178.9	177.8	175.5	173.4
DIF		0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DM24 CALIBRATION

WORKS ORDER:12802 **DIGITISER SERIAL NUMBER:**A4275

SYSTEM ID:4275 CPLD:A0.E1
UNIT ID:VEL2, ACC2 BOOTLOADER:MK3BOOT302.IMG
OUTPUT DATA FORMAT:GCF DSP SOFTWARE:DSP1090.BIN
BAUD RATE: 115200 SYSTEM: DMNET107b14.IMG

VELOCITY CHANNELS

Channel:	VEL2Z2	Vertical	3.223 µV/Count
	VEL2N2	North/South	3.227 µV/Count
	VEL2E2	East/West	3.221 µV/Count
	ACC2Z2	Vertical	3.239 µV/Count
	ACC2N2	North/South	3.217 µV/Count
	ACC2E2	East/West	3.226 µV/Count

MASS POSITION CHANNELS

Sample Rate: 4 samples/sec (Default)

Channel:	VEL2M8	Vertical	291.67 µV/Count
	VEL2M9	North/South	291.07 µV/Count
	VEL2MA	East/West	291.84 µV/Count

CAL SIGNAL MONITOR

VEL2X2/ VEL2C2 3.216 µV/Count

GPS RECEIVER

PWM: 8000 Counts
At Temperature Reading: 23°C

POWER CONSUMPTION

Digitiser Power Consumption	80mA @ 12v
GPS Power Consumption	28mA @ 12v

AUXILIARY CHANNELS

Sample Rate: 4 samples/sec (Default)

Channel:		
	VEL2MB	291.78 μV/Count
	VEL2MC	291.29 μV/Count
	VEL2MD	291.27 μV/Count
	VEL2ME	291.40 μV/Count
	VEL2MF	292.31 μV/Count

National
Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

National Oceanography Centre
University of Southampton Waterfront Campus
European Way, Southampton SO14 3ZH
United Kingdom

Pressure Test Lab +44 (0) 23 8059 6309
http://noc.ac.uk

Date: 18/12/13

Purchase Order; 30082

HYDROSTATIC TEST REPORT

Company: Guralp Systems Limited

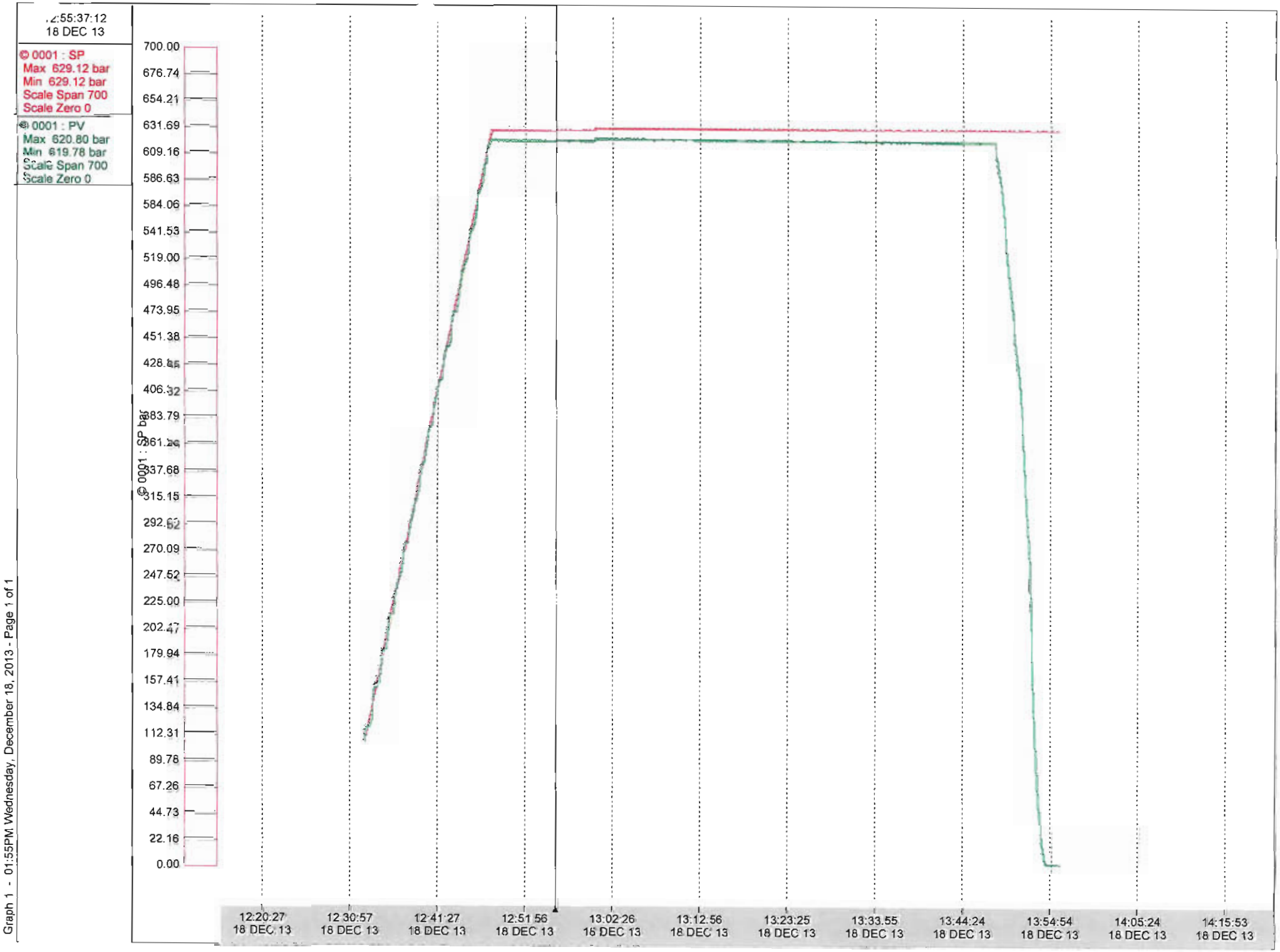
Address: 3 Midas House
Calleva Park
Aldermaston
Reading
RG7 8EA

Equipment: 1 x ITOBS Sphere
Serial No; 58328-00003

Schedule: 620 bar hold for 1 hour.

Comments: No visual signs of leaks or damage.

Andy Staszkiewicz
023 8059 6309


12:55:37:12
18 DEC 13
0001 : SP
Max 629.12 bar
Min 629.12 bar
Scale Span 700
Scale Zero 0
0001 : PV
Max 620.80 bar
Min 619.78 bar
Scale Span 700
Scale Zero 0
700.00
676.74
654.21
631.69
609.16
586.63
584.06
541.53
519.00
496.48
473.95
451.38
428.85
406.32
383.79
361.26
337.68
315.15
292.62
270.09
247.52
225.00
202.47
179.94
157.41
134.84
112.31
89.78
67.26
44.73
22.16
0.00
0001 : SP bar
12:20:27 18 DEC 13
12:30:57 18 DEC 13
12:41:27 18 DEC 13
12:51:56 18 DEC 13
13:02:26 18 DEC 13
13:12:56 18 DEC 13
13:23:25 18 DEC 13
13:33:55 18 DEC 13
13:44:24 18 DEC 13
13:54:54 18 DEC 13
14:05:24 18 DEC 13
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