1215765 03

Test Results

S9110 Windscreen Retention Test 6 Hour Soak

Customer:	Thomas KÜGEL PETEC Verbindungstechnik GmbH, Wüstenbuch 26, 96132 SCHLÜSSELFELD, GERMANY	Contact:	Paul Moore HORIBA MIRA Ltd Safety Development Dept Watling Street Nuneaton Warwickshire CV10 0TU, UK +44(0)24 7635 5000
Authority:	S84925	Witnesses:	Rudolf Gerlach - TUV Rheinland
Test Date(s)	30 November 2017		

Test Objective / Method / Specification No

To assess PETEC windscreen bonding product performance according to FMVSS212. Vehicle was soaked at 23°C and 50% relative humidity. The test was conducted 6 hours after the windscreen was fitted. MIRA Test Number S9110.

Specimen Description / Part No(s)

PETEC Scheibenkleber (83600), PETEC Multiaktiv Primer (82410), PETEC Aktivator (82230).

Test vehicle:

Make	Ford
Model	Mondeo
Drive hand	RH drive
VIN	WF05XXGBB57C13161

Test Results Summary

Results only relate to items tested. The subject was tested in accordance with the test specification ~~with~~ without deviation. The acceptance criteria of the test specification were:	Met	✓	Not Met		See comments	

Prepared By:

William Martin

Senior Engineer - Crash

Approved By:

Colin Smith

Head of Crash

Date: 29/09/21

UKAS TESTING 1105

Tests marked "Not UKAS Accredited" in this report are not included in the UKAS Accreditation Schedule for this laboratory. Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation

Product Details

Part Description	Part Number	Date Received
Primer	PETEC 82410	27 & 28/11/17
Activator	PETEC 82230	27 & 28/11/17
Sealant	PETEC 83600	27 & 28/11/17

Test Results Detail

The test vehicle was soaked at a 6 hour average temperature of 23˚C and relative humidity 50% after windscreen installation, which was carried out by 24 Screen Savers Ltd. It was then subjected to a 100% frontal impact by being propelled into a rigid crash block at 30mph (48km/h), as described in FMVSS212 Section 5. The ATDs were restrained by the vehicle's standard seat belts and the airbags triggered by the vehicle standard system.

Test Conditions				
Tyre Pressure (bar)	Front	2.1	Rear	2.1
Vehicle modifications	None			
Steering Column	Mid position			
Windows	Down			
Seatbelt Height Adjust	Mid position			
Doors	Unlocked			
Parking Brake	Off			
Ignition	On			
Seat Adjustment - Driver	Mid Fore/Aft – Lowest Height			
Seat adjustment – Passenger	Mid Fore/Aft – Lowest Height			
Restraint system specification	Driver and passenger airbag			

Vehicle mass details	Front (kg)	Rear (kg)	Total (kg)
Unloaded vehicle mass	792	555.5	**1347.5**
Test Weight (in test condition, including 93% fuel, nominal fluids, instrumentation, ballast and 2 occupants)	865	829.5	**1694.5**

Assessment against Legislative Criteria		
Impact Velocity (Target 48.3 +1 / -0 km/h)	48.6 km/h	Complied
Impact Alignment (target <5°. Approx. ± 235mm for 2700mm wheelbase)	45 mm left	Complied
Performance assessment: (Max 25% detachment on each side of windscreen perimeter)	LH perimeter 0%	Complied
	RH perimeter 0%	Complied

Test Equipment

Rigid Barrier with plywood facing

2x Hybrid III 50%ile ATDs (Anthropomorphic Test Devices) – un-instrumented for ballast only

Measurement equipment as listed in Appendix 6

6 high speed digital cameras

Attachments

Appendix 1 - Test Photographs

Appendix 2 - Quality Assurance of Measurements

Appendix 1 Test Photographs

Photo 1
LH General view – Pre-Test

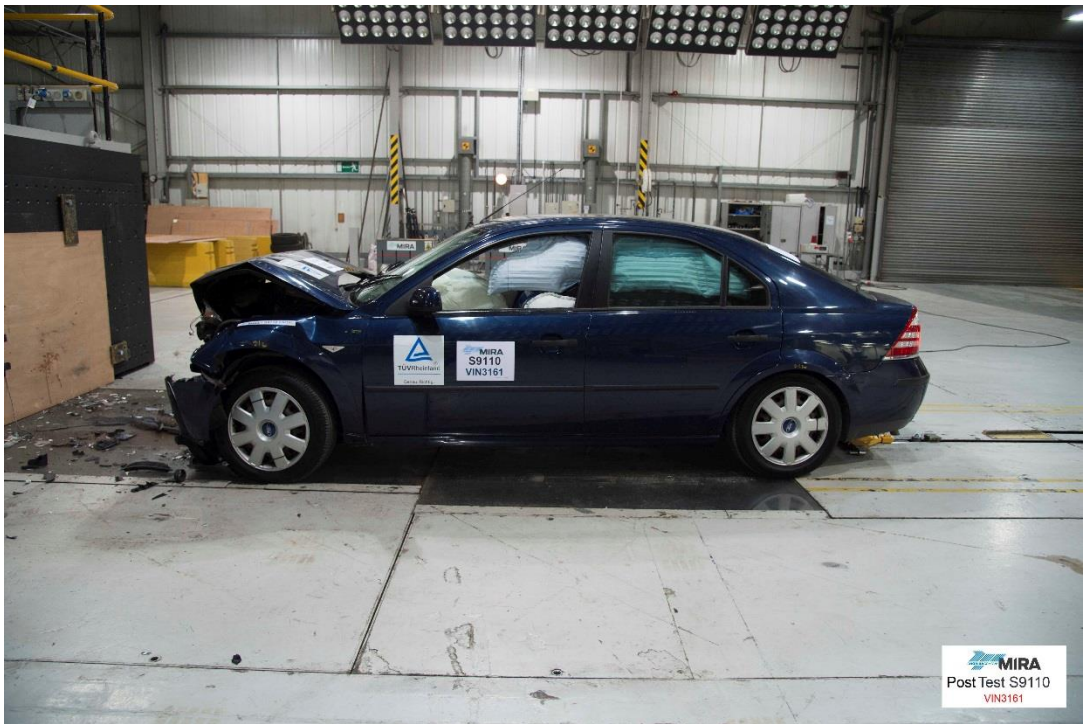

Photo 2
LH General view – Post-Test

Photo 3
Front view – Pre-Test

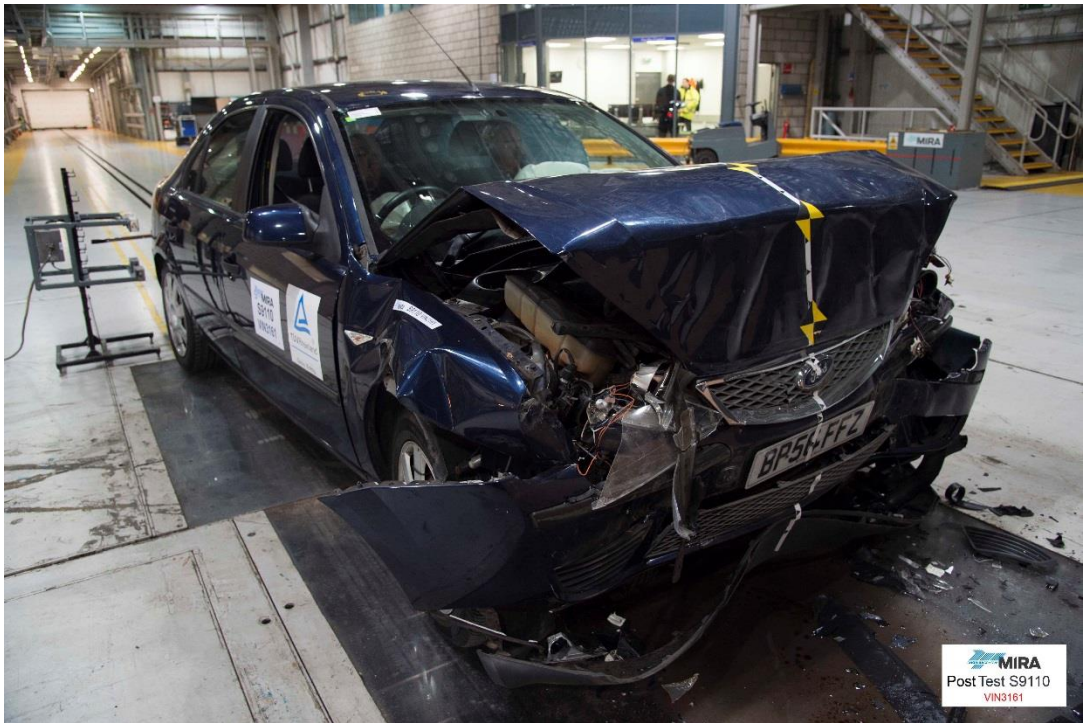

Photo 4
Front view – Post-Test

Photo 5
RH General view – Pre-Test

Photo 6
RH General view – Post-Test

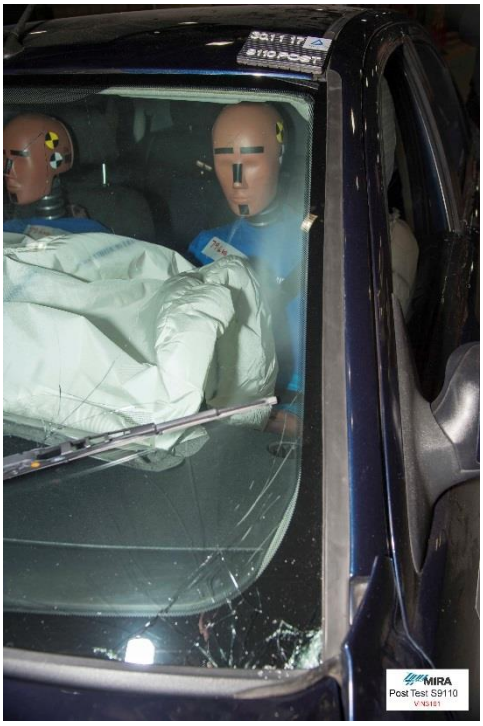

Photo 7
Close front view of LH A-pillar / windscreen LH edge – Post-Test

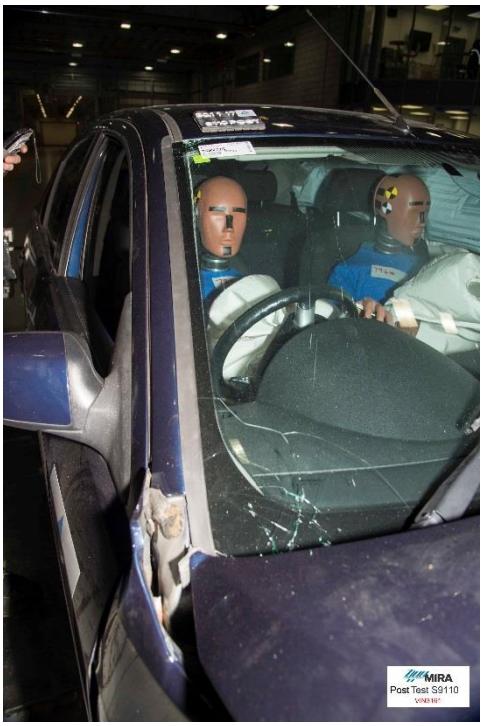

Photo 8
Close front view of RH A-pillar / windscreen RH edge – Post-Test

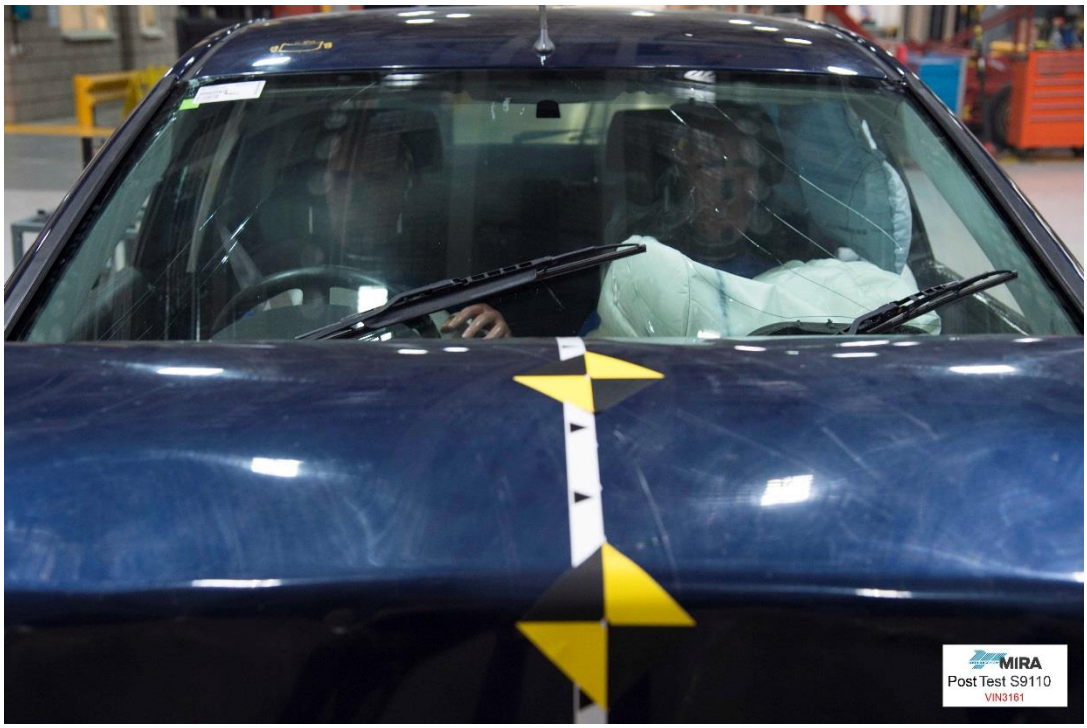

Photo 9
Close front view of header rail / windscreen top edge – Post-Test

Photo 10
Close front view of scuttle / windscreen lower edge – Post-Test

Photo 11
Post-test LHF ATD side view – Post-Test

Photo 12
Post-test RHF ATD side view – Post-Test

Appendix 2 Quality Assurance of Measurements

All instrumentation, high speed images and associated analysis contained in this report conforms to the requirements within SAE J211 July 2007.

The test equipment is checked on a regular schedule to traceable standards in an International Assurance of Measurements (QAM) procedure. Each item of equipment is issued with a QAM number.

The numbers for the equipment used in these tests were:-

Item	QAM number	Cal due date
ATD Identification – LHF HIII 50% No 75	N/A	N/A
ATD Identification – RHF HIII 50% No 138	N/A	N/A
Weigh Scales	38720-23 38724-27	29/06/2018 20/08/2018
5m Steel Tape Measure	34848	07/11/2022
Digital Level	33520	18/01/2018
Stop Watch	34851 38460	15/12/2018 17/05/2018
Tyre Pressure gauge	39679	09/03/2018
Impact Speed Measure (fixed)	8167	26/02/2018
Impact speed measure (mobile)	17921	29/07/2018
Climatic Control Temperature Probe	39704-07, 39785-88	03/01/2018
Climatic Control Humidity Probe	31995-96 31997-98	18/08/2018 19/01/2018
32ch Thermocouple Amplifier	30279	03/01/2018
Climactic Chamber Controller	34000	05/01/2018

Camera ID	View	QAM number	Cal due date
1	F01 LH View – Whole Vehicle	37921	01/08/2018
2	F02 LH View – Front Half of Vehicle	37924	13/07/2018
3	F06 RH View – Whole Vehicle	37938	17/08/2018
4	F07 RH View – Front Half of Vehicle	37922	22/11/2018
5	F14 Overhead View – Whole Vehicle	37919	18/07/2018
6	F11 Front View – Front Half of Vehicle	37917	18/07/2018
7			
8			

Channel Sample Rate: N/A

Weigh Scales

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 29 Jun 2017 **Cert No :** 33720170617

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Approved Signatory

P. Macleod 2

[] Mark Pickering – Department Manager
[✓] Philip Macleod – Supervisor – Instrument Calibration
[] Dominic Mhandu - Metrologist

Client:	Test Operations FG	**Manufacturer:**	Intercomp
Section:	Safety, Crash Off-Board Instruments	**Model:**	170127-WPC
Address:	Watling Street Nuneaton Warwickshire --	**Description:**	Weigh Pads
		Serial No:	0216MC15008
		Calibration Date:	29 Jun 2017
		Calibration Procedure:	QA4299/C/07
Client ID:	--	**Equipment used:**	Page 2-5
MIRA ID:	Q38720 to Q38723	**Measurement Results:**	Page 2-5
Date received:	17 Jun 2017	**Measurement Uncertainty:**	Page 2-5
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

This Instrument was calibrated by comparison with force measurement reference standards using a MIRA procedure. Where the instrument has an electrical output and this has been calibrated, the output has been measured using electrical reference standards.

HORIBA MIRA CALIBRATION

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0032b Issue 20

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 20 Aug 2017 **Cert No :** 38724170817

Approved Signatory

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- Mark Pickering – Department Manager
- Philip Macleod – Supervisor – Instrument Calibration
- Dominic Mbardu - Metrologist

Client:	Test Operations FG	**Manufacturer:**	Intercomp
Section:	Safety, Crash Off-Board Instruments	**Model:**	170127-WPC
Address:	Watling Street Nuneaton Warwickshire --	**Description:** **Serial No:** **Calibration Date:** **Calibration Procedure:**	Weigh Pads 0216MC15003 20 Aug 2017 QA4299/C/07
Client ID:	--	**Equipment used:**	Pages 2 to 5
MIRA ID:	Q38724 to Q38727	**Measurement Results:**	Pages 2 to 5
Date received:	17 Aug 2017	**Measurement Uncertainty:**	Pages 2 to 5
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

This Instrument was calibrated by comparison with force measurement reference standards using a MIRA procedure. Where the instrument has an electrical output and this has been calibrated, the output has been measured using electrical reference standards.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC3032b Issue 20

5m Steel Tape Measure

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 08 Nov 2017 **Cert No :** 34648181017

Page 1 of 2 Pages

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Dominic Mbandu - Metrologist

Client:	Test Operations FG	**Manufacturer:**	Assist
Section:	Safety, Crash Off-Board Instruments	**Model:**	32G-5019
Address:	Watling Street	**Description:**	5m Steel Tape Measure
	Nuneaton	**Serial No:**	--
	Warwickshire	**Calibration Date:**	08 Nov 2017
	--	**Calibration Procedure:**	QA3105/C/03
Client ID:	--	**Equipment used:**	Page 2
MIRA ID:	Q34648	**Measurement Results:**	Page 2
Date received:	18 Oct 2017	**Measurement Uncertainty:**	Page 2
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

This Instrument was calibrated by comparison with length measurement reference standards using a MIRA procedure which incorporates limits based on the tolerances contained in document NIST handbook 44 section 5.52.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0032b Issue 20

Digital Level

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 18 Jan 2017 **Cert No :** 33520130117

Page 1 of 2 Pages

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Philip Maclean – Supervisor – Instrument Calibration
Dominic Mbandu Metrologist

Client:	Test Operations FG	**Manufacturer:**	Smarttool
Section:	Safety, Crash Off-Board Instruments	**Model:**	--
Address:	Watling Street Nuneaton Warwickshire --	**Description:** **Serial No:** **Calibration Date:** **Calibration Procedure:**	Digital Level -- 18 Jan 2017 QA3129/C/03
Client ID:	--	**Equipment used:**	Page 2
MIRA ID:	Q33520	**Measurement Results:**	Page 2
Date received:	13 Jan 2017	**Measurement Uncertainty:**	Page 2
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

Instrument calibrated by comparison with angular reference standards using MIRA Procedure QA3129/C.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TQU002b Issue 20

Stop Watch

CALIBRATION CERTIFICATE

Issued by MIRA Ltd

Issue date: 18 May 2015 **Cert No :** 38460230315

Page 1 of 2 Pages

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[] Philip Macleod – Supervisor – Instrument Calibration

Client:	MIRA, Test Operations FG	**Manufacturer:**	RS
Section:	Vehicle Env & Aero, Climatic Chamber	**Model:**	811-1818
Address:	Watling Street	**Description:**	Stop Watch
	Nuneaton	**Serial No:**	--
	Warwickshire	**Calibration Date:**	18 May 2015
	--	**Calibration Procedure:**	QA2113/C/02
Client ID:	--	**Equipment used:**	Page 2
MIRA ID:	Q38480	**Measurement Results:**	Page 2
Date received:	23 Mar 2015	**Measurement Uncertainty:**	Page 2

Condition of Instrument: New

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0032b Issue 17

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 16 Dec 2015 **Cert No :** 34851251115

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|✓ Philip Macleod – Supervisor – Instrument Calibration
|| Miroslaw Palucki – Metrologist

Client:	Mechanical Engineering FG	**Manufacturer:**	RS
Section:	Braking	**Model:**	699-9259
Address:	Watling Street	**Description:**	Digital Stopwatch
	Nuneaton	**Serial No:**	--
	Warwickshire	**Calibration Date:**	15 Dec 2015
	--	**Calibration Procedure:**	CA2113/C/02
Client ID:	--	**Equipment used:**	Page 2
MIRA ID:	Q54851	**Measurement Results:**	Page 2
Date received:	25 Nov 2015	**Measurement Uncertainty:**	Page 2
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0032b Issue 17

Tyre Pressure Gauge

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 09 Mar 2017 **Cert No :** 39679 00117

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Page 1 of 3 Pages

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[] Dominic Mhandu – Metrologist

Client:	Test Operations FG	**Manufacturer:**	PCL
Section:	Safety, Crash Off-Board Instruments	**Model:**	AFG1H03
Address:	Watling Street	**Description:**	12 bar Tyre Inflator
	Nuneaton	**Serial No:**	141121095
	Warwickshire	**Calibration Date:**	09 Mar 2017
	--	**Calibration Procedure:**	QA4097/C/03
Client ID:	--	**Equipment used:**	Page 3
MIRA ID:	Q39679	**Measurement Results:**	Page 2
Date received:	10 Jan 2017	**Measurement Uncertainty:**	Page 2
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

This Instrument was calibrated by comparison with pressure measurement reference standards using a MIRA procedure which incorporates limits based on the applicable standard, BS EN 12645:1999.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0052b Issue 20

9 Beam Speed Measurement Laser

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 19 Apr 2017 **Cert No :** 0816/190417

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[] Philip Macleod – Supervisor – Instrument Calibration
[] Dominic Mhandu - Metrologist

Client:	Test Operations FC	**Manufacturer:**	MIRA
Section:	Safety, Crash Off-Board Instruments	**Model:**	--
Address:	Watling Street	**Description:**	9 Beam Speed Measurement Sys
	Nuneaton	**Serial No:**	--
	Warwickshire	**Calibration Date:**	20 Apr 2017
	--	**Calibration Procedure:**	QA2361/C/05
Client ID:	--	**Equipment used:**	Page 5
MIRA ID:	Q08167	**Measurement Results:**	Pages 2 to 4
Date received:	19 Apr 2017	**Measurement Uncertainty:**	Page 6
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	No
Adjusted during calibration	No
Repaired prior to or during calibration	Yes
Within specification on completion, at the points measured subject to the measurement uncertainty	No

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

This speed measurement system was calibrated by comparison with distance and time measurement reference standards using a MIRA procedure which incorporates limits based on client requirements detailed in request for service document CR225072012A.

This calibration certificate includes the laser speed measurements taken after repair.

Laser speed set C1 still does not conform to specification.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0032b Issue 20

Mobile Speed Measurement Laser

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 21 Jun 2017 **Cert No :** 17899250317

Approved Signatory

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[✓] Philip Macleod – Supervisor – Instrument Calibration
[] Dominic Mbandu - Metrologist

Client:	Test Operations FG	**Manufacturer:**	MIRA
Section:	Safety Crash Off-Board Instruments	**Model:**	TD590
Address:	Watling Street	**Description:**	Vole Speed Measurement Unit, Cable & Frame
	Nuneaton	**Serial No:**	--
	Warwickshire	**Calibration Date:**	04 Apr 2017
	--	**Calibration Procedure:**	QA2517/C/03
Client ID:	--	**Equipment used:**	Page 2
MIRA ID:	Q17898 to Q17901	**Measurement Results:**	Page 2
Date received:	25 Mar 2017	**Measurement Uncertainty:**	Page 2
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

This instrument was calibrated by comparison with time and displacement measurement reference standards using a MIRA procedure which incorporates limits based on client requirements. These requirements are specified in document CR225072012B.

This certificate includes all component parts list.
This certificate is a replacement for Certificate number 17899250317.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC3032b Issue 20

Climatic Temperature Probes

CERTIFICATE OF CALIBRATION

ISSUED BY: **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of Issue: 6th January 2017 Certificate Number: 00048454

UKAS CALIBRATION 0125

Universal

UNIVERSAL INSTRUMENT SERVICES Ltd.
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Whetstone, Leicester LE8 6PA
Tel: 0116 275 0123 Fax: 0116 275 0282
Website: www.uiscal.com
Email: sales@uiscal.co.uk

Approved Signatory
J.Bruce

Customer: HORIBA MIRA LIMITED
WATLING STREET
NUNEATON
WARWICKSHIRE
Operator: JKB
Our Ref: 361434

Manufacturer: Not Known
Description: "T" Thermocouple
Model: T-TYPE
Serial No: Q39704
Asset No: Q39704
Order No: 263528
Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST
The Thermocouple was visually inspected prior to calibration YES/NO Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate.

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page.

PROCEDURE
UIS procedure CP7.5.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3156	Hart 1590 Super Thermometer II	296385	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0361304	09/NOV/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3269	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3247	PRT (25 ohms)	UKAS 47018	12/JUL/2017
D3245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
D3276	Fluke 1586-2588 Multiplexer	UKAS 47048	25/FEB/2017

CERTIFICATE OF CALIBRATION

ISSUED BY: **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of issue: 5th January 2017 Certificate Number: 00040455

UKAS CALIBRATION 0125

Universal

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Approved Signatory
J.Bruce

Customer:	HORIBA MIRA LIMITED WATLING STREET NUNEATON WARWICKSHIRE	Manufacturer:	Not Known
		Description:	'T' Thermocouple
		Model:	T-TYPE
		Serial No:	Q39705
Operator:	JKB	Asset No:	Q39705
Our Ref:	331435	Order No:	263528
		Date Received:	19th December 2016

CONDITION OF UNIT UNDER TEST — **YES/NO**
The Thermocouple was visually inspected prior to calibration — Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate.

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page.

PROCEDURE
UIS procedure CP7 5.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3156	Hart 1590 Super-Thermometer II	298335	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0361304	09/JUL/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3269	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
ID3245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1568-2588 Multiplexer	UKAS 47348	25/FEB/2017

CERTIFICATE OF CALIBRATION

ISSUED BY: **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of issue: 6th January 2017 Certificate Number: 00046456

UKAS CALIBRATION
0125

Universal

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Approved Signatory
J.Bruce

Customer: HORIBA MIRA LIMITED
WATLING STREET
NUNEATON
WARWICKSHIRE
Operator: JKP
Our Ref: 331436

Manufacturer: Not Known
Description: "T" Thermocouple
Model: T-TYPE
Serial No: Q39706
Asset No: Q39706
Order No: 263528
Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST

	YES/NO
The Thermocouple was visually inspected prior to calibration	Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate.

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page.

PROCEDURE
UIS procedure CP7.5.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3156	Hart 1590 Super-Thermometer II	296385	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0361304	09/JUL/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3250	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
ID3245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

CERTIFICATE OF CALIBRATION

ISSUED BY: **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of Issue: 5th January 2017 Certificate Number: 00048457

UKAS CALIBRATION 0125

Universal

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Approved Signatory
J.Bruce

Customer: HORIBA MIRA LIMITED
WATLING STREET
NUNEATON
WARWICKSHIRE
Operator: JKB
Our Ref: 351437

Manufacturer: Not Known
Description: "T" Thermocouple
Model: T-TYPE
Serial No: 039707
Asset No: 039707
Order No: 263528
Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST

	YES/NO
The Thermocouple was visually inspected prior to calibration	Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate.

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page.

PROCEDURE
UIS procedure CP7.5.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3156	Hart 1590 Super-Thermometer II	296385	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0391304	09/JUL/2018
ID3052	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3239	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47019	12/JUL/2017
ID3245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47343	25/FEB/2017

CERTIFICATE OF CALIBRATION

ISSUED BY: **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of Issue: 5th January 2017 Certificate Number: CC048450

UKAS CALIBRATION
0125

Universal

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Approved Signatory
J.Bruce

Customer: HORIBA MIRA LIMITED
WATLING STREET
NUNEATON
WARWICKSHIRE
Operator: JKB
Our Ref: 361430

Manufacturer: Not Known
Description: "T" Thermocouple
Model: T-TYPE
Serial No: Q39785
Asset No: Q39785
Order No: 283528
Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST

	YES/NO
The Thermocouple was visually inspected prior to calibration	Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate.

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page.

PROCEDURE
UIS procedure CP7.5.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3156	Fluke 1590 Super-Thermometer II	286365	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0381304	09/JUL/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3269	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47014	12/JUL/2017
ID3245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47348	26/FEB/2017

CERTIFICATE OF CALIBRATION

ISSUED BY: **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of Issue: 5th January 2017 Certificate Number: 00049453

UKAS CALIBRATION
0125

Universal

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Email: sales@uiscal.co.uk

Approved Signatory
J.Bruce

Customer:	HORIBA MIRA LIMITED WATLING STREET NUNEATON WARWICKSHIRE	Manufacturer:	Not Known
		Description:	'T' Thermocouple
		Model:	T-TYPE
		Serial No:	Q39786
Operator:	JKB	Asset No:	Q39786
Our Ref:	361433	Order No:	203528
		Date Received:	15th December 2016

CONDITION OF UNIT UNDER TEST

	YES/NO
The Thermocouple was visually inspected prior to calibration	Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate.

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page.

PROCEDURE
UIS procedure CP7.6.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3156	Hart 1590 Super- hermometer II	295385	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0391304	09/JUL/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3269	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
ID3245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

CERTIFICATE OF CALIBRATION

ISSUED BY. **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of issue: 5th January 2017 Certificate Number: U0048452

UKAS CALIBRATION 0125

Universal

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Email: sales@uiscal.co.uk

Approved Signatory
J Bruce

Customer: HORIBA MIRA LIMITED
WATLING STREET
NUNEATON
WARWICKSHIRE
Operator: JKB
Our Ref: 361432

Manufacturer: Not Known
Description: "T" Thermocouple
Model: T-TYPE
Serial No: Q39787
Asset No: Q39787
Order No: 263528
Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST
The Thermocouple was visually inspected prior to calibration — YES/NO: Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate.

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page.

PROCEDURE
UIS procedure CP7.5.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3156	Hart 1590 Super-Thermometer II	295385	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0291304	05/JUL/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3239	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
ID3248	PRT (25 ohms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

CERTIFICATE OF CALIBRATION

ISSUED BY: **Universal Instrument Services Ltd.**

Date of Calibration: 3rd January 2017
Date of Issue: 6th January 2017 Certificate Number: C0048451

UKAS CALIBRATION
0125

Universal

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Approved Signatory
J.Bruce

Customer: HORIBA MIRA LIMITED
WATLING STREET
NUNEATON
WARWICKSHIRE
Operator: JKB
Our Ref: 361431

Manufacturer: Not Known
Description: "T" Thermocouple
Model: T-TYPE
Serial No. Q39788
Asset No: Q39788
Order No: 263528
Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST — **YES/NO**
The Thermocouple was visually inspected prior to calibration — Y

ADDITIONAL COMMENTS

STABILITY
The readings given are the results at the time of calibration and do not carry any implication regarding the long term stability of the unit under test.

ACCREDITATIONS
UIS is accredited by UKAS to BS EN 17025:2005 to undertake the calibration presented in this certificate

ENVIRONMENT
The instrument was calibrated in our laboratory with the ambient conditions stated on the results page

PROCEDURE
UIS procedure CP7.5.3

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

TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	Expiry date
ID3155	Hart 1590 Super-Thermometer II	296385	21/MAR/2017
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0381304	09/JUL/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3239	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
ID3245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

Climatic Humidity Probe

31995 (no

CERTIFICATE OF CALIBRATION

Issued by

ABSOLUTE CALIBRATION LIMITED

DATE OF ISSUE 18 August 2017 CERTIFICATE NUMBER 0426395

UKAS CALIBRATION 0078

Page 1 of 2 Pages

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www.absolute-cal.co.uk

Approved Signatory

M Funnell ☑
S Whittingham ☐
D Kingswell ☐
G Mills ☐
A Francis ☐

Description:	TEMPERATURE/HUMIDITY SENSOR AND ACTIVE ADAPTOR
Manufacturer:	ROTRONIC
Type Number:	HYGROCLIP & MOK-20-XX-010V-2
Serial Number:	60250059
Customer:	HORIBA MIRA LIMITED WATLING STREET NUNEATON WARWICKSHIRE
Instrument Receipt Date:	02 August 2017
Order Number:	271883
Customer Reference:	Q31995
Laboratory Temperature	(20.0 ± 3.0) °C
Laboratory Humidity	(55 ± 20) %rh
Calibration Procedure:	CP 112
Calibration Engineer	S PalaLendi
Calibration Date	18 August 2017
This Report Contains	Recorded results with no adjustments ☑ Pre and post adjustment results ☐ Post repair results ☐ Results recorded at Customer site ☐

CERTIFICATE OF CALIBRATION

Issued by

ABSOLUTE CALIBRATION LIMITED

DATE OF ISSUE 18 August 2017 CERTIFICATE NUMBER 0426394

UKAS CALIBRATION 0078

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Approved Signatory

M Fennell ☐
S Whiffingham ☐
D Kingswell ☐
G Mils ☐
A Francis ☐

Description:	TEMPERATURE/HUMIDITY SENSOR AND ACTIVE ADAPTOR
Manufacturer:	ROTRONIC
Type Number:	HYGROCLIP & MOK-20-XX-010V-2
Serial Number:	60250328
Customer:	HORIBA MIRA LIMITED WATLING STREET NUNEATON WARWICKSHIRE
Instrument Receipt Date:	02 August 2017
Order Number:	271883
Customer Reference:	Q31996
Laboratory Temperature	(20.0 ± 3.0) °C
Laboratory Humidity	(55 ± 20) %rh
Calibration Procedure:	CP 112
Calibration Engineer	S Patabendi
Calibration Date	18 August 2017
This Report Contains	Recorded results with no adjustments ☑ Pre and post adjustment results ☐ Post repair results ☐ Results recorded at Customer site ☐

Q51441 CWO

CERTIFICATE OF CALIBRATION

Issued by

ABSOLUTE CALIBRATION LIMITED

DATE OF ISSUE 19 January 2017 CERTIFICATE NUMBER 0416313

UKAS CALIBRATION 0078

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Approved Signatory

M Funnell ☑
S Whittingham ☐
D Kingswell ☐
G Mills ☐
A Francis ☐

Description:	THERMOHYGROMETER PROBE AND ACTIVE ADAPTOR
Manufacturer:	ROTRINIC
Type Number:	HYGROCLIP & MOK-20-XX-010V-2
Serial Number:	55496255
Customer:	HORIBA MIRA LIMITED WATLING STREET NUNEATON WARWICKSHIRE
Instrument Receipt Date:	17 January 2017
Order Number:	264315
Customer Reference:	Q31997
Laboratory Temperature	(20.0 ± 3.0)°C
Laboratory Humidity	(55 ± 20) %rh
Calibration Procedure:	CP 112
Calibration Engineer	S Patabendi
Calibration Date	19 January 2017
This Report Contains	Recorded results with no adjustments ☑ Pre and post adjustment results ☐ Post repair results ☐ Results recorded at Customer site ☐

Q31998 CW Ø

CERTIFICATE OF CALIBRATION

Issued by

ABSOLUTE CALIBRATION LIMITED

DATE OF ISSUE 19 January 2017 CERTIFICATE NUMBER 0416612

UKAS CALIBRATION 0078

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Approved Signatory
M Funnell ☑
S Whittingham ☐
D Kingswell ☐
G Mills ☐
A Francis ☐

Description:	THERMOHYGROMETER PROBE AND ACTIVE ADAPTOR
Manufacturer:	ROTRONIC
Type Number:	HYGROCLIP & MOK-20-XX-010V-2
Serial Number:	60250104
Customer:	HORIBA MIRA LIMITED WATLING STREET NUNEATON WARWICKSHIRE
Instrument Receipt Date:	17 January 2017
Order Number:	264315
Customer Reference:	Q31998
Laboratory Temperature	(20.0 ± 3.0)°C
Laboratory Humidity	(55 ± 20) %rh
Calibration Procedure:	CP 112
Calibration Engineer	S Patabendi
Calibration Date	19 January 2017
This Report Contains	Recorded results with no adjustments ☑ Pre and post adjustment results ☐ Post repair results ☐ Results recorded at Customer site ☐

FM 8616

32ch Thermocouple Amplifier

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 04 Jan 2017 **Cert No :** 30279191216

Approved Signatory

P. MacLeod

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http://www.horiba-mira.com

[] Mark Pickering – Head of Instrument Calibration & Repair
[✓] Philip Macleod – Supervisor – Instrument Calibration
[] Dominic Mhandu - Metrologist

Client:	Test Operations FG	**Manufacturer:**	National Instru
Section:	Vehicle Env & Aero, Climatic Chambe	**Model:**	SCXI-1102
Address:	Watling Street	**Description:**	32ch Thermocouple Amplifier
	Nuneaton	**Serial No:**	122578B
	Warwickshire	**Calibration Date:**	04 Jan 2017
	--	**Calibration Procedure:**	QA2656/C/02
Client ID:		**Equipment used:**	Page 5
MIRA ID:	Q30279	**Measurement Results:**	Page 2-5
Date received:	19 Dec 2016	**Measurement Uncertainty:**	Page 2-5
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts ± 15 Volts and 50 Hz ± 0.5Hz with a total harmonic distortion of less than 3%.

This instrument was calibrated by comparison with electrical measurement reference standards using a MIRA procedure which incorporates limits based on client requirements. These requirements are specified in document MC-15042009A

EG

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0032b Issue 20

Climatic Chamber Controller

CALIBRATION CERTIFICATE

Issued by HORIBA MIRA Ltd

Issue date: 05 Jan 2017 **Cert No :** 34000050117

Page 1 of 3 Pages

Approved Signatory

P. MacLeod

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|| Mark Pickering – Head of Instrument Calibration & Repair
|| Philip Macleod – Supervisor – Instrument Calibration
|| Dominic Mbandu – Metrologist

Client:	Test Operations FG	**Manufacturer:**	MIRA
Section:	Vehicle Env & Aero, Climatic Chamber	**Model:**	MI003878
Address:	Watling Street	**Description:**	Climatic Chamber Controller
	Nuneaton	**Serial No:**	I01523
	Warwickshire	**Calibration Date:**	05 Jan 2017
	--	**Calibration Procedure:**	QA5032/C/01
Client ID:	--	**Equipment used:**	Page 3
MIRA ID:	Q34000	**Measurement Results:**	Pages 2 & 3
Date received:	05 Jan 2017	**Measurement Uncertainty:**	Page 3
Dallas ID:			

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty	Yes
Adjusted during calibration	No
Repaired prior to or during calibration	No
Within specification on completion, at the points measured subject to the measurement uncertainty	Yes

The reported values are the result of measurements taken at the time of calibration within the environment stated and do not carry any implication regarding the long term stability or environmental performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates specified.

This calibration was performed at the client site.

This instrument was calibrated by comparison with Temperature measurement reference standards using a MIRA procedure which incorporates limits based on client requirements as specified in document CW003032015A.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

TC0032b Issue 20