

Test Item : PETEC WINDSHIELD ADHESIVE 83310 and 83400

Vehicle : Ford Mondeo

Applicant : PETEC Verbindungstechnik GmbH, D-96132 Schlüsselfeld

## **Documentation**

# **Tests Windshield Mounting**

according to

**Federal Motor Vehicle Safety Standard** 

49 CFR 571.212

(FMVSS 212)

This test report is for documentation of measuring results only and shall not be deemed legally binding within the German StVZO/EG-FGV.



Test Item : PETEC WINDSHIELD ADHESIVE 83310 and 83400

Vehicle : Ford Mondeo

Applicant : PETEC Verbindungstechnik GmbH, D-96132 Schlüsselfeld

#### 1. Introduction

This test report describes the test of the windshield retention for motor vehicles during a crash-test.

Upon request of the applicant, TÜV Rheinland Kraftfahrt GmbH has tested PETEC screen bonding products used for the fixation of a windscreen in a vehicle with regard to the FMVSS 212.

The tests were conducted to determine if the screen bonding products meet the requirements specified under item 3. of this test report.

1.1. Name and address of the applicant: PETEC Verbindungstechnik GmbH

Wüstenbuch 26

D-96132 Schlüsselfeld

1.2. Name and address of the manu-

facturer : PETEC Verbindungstechnik GmbH

Wüstenbuch 26

D-96132 Schlüsselfeld

## 2. Description of the test object

Technical description : The tests were performed on a Ford Mondeo 4 door

saloon with twin airbags. The vehicle was soaked prior to the windshield installation and stored 40 min after the installation at an average temperature of 23°C and a relative humidity of 50%. The installation was carried out by 24 Screen Savers Ltd. according to the PETEC installation procedure (see Appendix

2, Appendix 3 and Appendix 4).

Characteristics : Right hand driven vehicle with driver and passenger

airbag system. 50% Hybrid-III Dummy on driver and

passenger side.

Test vehicle : Ford Mondeo 4 door saloon

VIN: WF05XXGBB56P67719

Test weight in test condition including 93% fuel,

nominal fluids and 2 occupants 1.849,5 kg

The vehicle was subjected to a 100% frontal impact by being propelled into a immovable crash block at 48,6 km/h, as per FMVSS 212 Section 5 (≥ 48 km/h).

185XS0225.doc



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The crash test dummies were restrained by means of the vehicle's seat belts and the airbags were

triggered by the impact.

The vehicle was impacted within 1 hour after the

windscreen was fitted.

Specimen description and

part numbers

: PETEC WINDSHIELD ADHESIVE Art.-No. 83310 and 83400 (batch 84675), PETEC Primer (Art.-No. 82410, 82330 and 82430) (on blank metal only and all over the contact area on the glass) & Aktivator (Art.-No. 82230) (Manufacturer documentation see

Appendix 2, Appendix 3 and Appendix 4).

## 3. Test basis and test equipment

#### 3.1. Test basis

Federal Motor Vehicle Safety Standard 49 CFR 571.212 (FMVSS 212) at last amended by 60 FR 13639 – 13649 (1995-03-14)

3.2. Testing device (s),

Crash-test laboratory and climatic chamber of:

HORIBA MIRA Ltd.

Watling Street

Nuneaton

Warwickshire CV10 0TU

**England** 

Used equipment and calibration see Appendix 1

### 4. Description of the test

4.1. Date of the test : 2017-11-30

4.2. Place of the test : Nuneaton, England

4.3. Scope of the test : The objective of the tests was to verify if the test

object is able to guaranty the retention of the vehicle

windshield during a crash.



Test Item : PETEC WINDSHIELD ADHESIVE 83310 and 83400

Vehicle : Ford Mondeo

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#### 5. Test results

## Windshield periphery:

	Right side	2090	mm
Pre test measurement	Left side	2090	mm
	Total	4180	mm
	Right side	2090	mm
Post test measurement	Left side	2090	mm
	Total	4180	mm
Width of molding		38	mm
Temperature of the windshield molding during test		20	°C

Area of retention failures : no failures occurred

Remarks : none

Fotos : see Appendix 1

The test object is able to guaranty the retention of the vehicle windshield during a crash according to FMVSS 212 Section 5.



Test Item : PETEC WINDSHIELD ADHESIVE 83310 and 83400

Vehicle : Ford Mondeo

Applicant : PETEC Verbindungstechnik GmbH, D-96132 Schlüsselfeld

## 6. Appendices

	MIRA test Result report MIRA-1215763 03 Manufacturers documentation PETEC WINDSHIELD ADHESIVE ArtNo. 83310 and 83400	page 1 to 33 page 1 to 3
	(Revision 16.11.2018)	
3.	Manufacturers documentation PRIMER WS	page 1 and 2
	PETEC Primer ArtNo. 82410, 82330 and 82430	
	(Revision 16.11.2018)	

 Manufacturers documentation ACTIVATOR page 1 and 2 Aktivator (Art.-No. 82230) (Revision 23.10.2018)

The test report contains page 1 to 5 and Appendices 1 to 4.

It is only permitted to publish this report formal and in content unchanged and completely including all appendices except with the approval of the testing laboratory TÜV Rheinland Kraftfahrt GmbH, Am Grauen Stein, 51105 Cologne in writing.

Cologne, 2019-01-29 rg

Rudolf Gerlach Technical Expert



## 1215763 03

## **Test Results**

## S9109 Windscreen Retention Test 1 Hour Soak

Customer: Thomas Kügel

PETEC Verbindungstechnik GmbH

Wüstenbuch 26 96132 Schlüsselfeld

Germany

Thomas.Kuegel@petec.de

Contact: William Martin

HORIBA MIRA Ltd

Safety Development Dept

Watling Street Nuneaton Warwickshire

CV10 0TU, UK +44(0)24 7635 5000

Test Date(s): 30 November 2017 Witnesses: Rudolf Gerlach - TUV

Rheinland

Test Objective / Method / Specification No

To assess windscreen bonding product performance according to FMVSS212. Vehicle was soaked at 23°C and 50% relative humidity. The test was conducted 1 hour after the windscreen was fitted. MIRA Test Number S9109.

Specimen Description / Part No(s)

PETEC Glass Bonding Sealant PETEC Scheibenkleber, PETEC Multiaktiv Primer and PETEC Aktivator

Part Description	Part Number	Date Received
PETEC Scheibenkleber	83310 - 83400	27 & 28/11/17
PETEC Multiaktiv Primer	82330 / 82410 / 82430	27 & 28/11/17
PETEC Aktivator	82230	27 & 28/11/17

#### Test vehicle:

Make Ford
Model Mondeo
Drive hand RH Drive

VIN WF05XXGBB56P67719

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:

Not Met

See comments

Prepared By:

Approved By:

UKAS TESTING

William Martin Colin Smith
Crash Test Engineer Head of Crash

Date: 03/12/18

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#### Test Results Detail

The test vehicle was soaked at a 1 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 2.4 Rear 2.2			2.2
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	944.5	554	1498.5
Test Weight (in test condition, including 93% fuel, nominal fluids, instrumentation, ballast and 2 occupants)	994.5	855	1849.5

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)	9 mm left	Complied	
Performance assessment:	LH perimeter 0%	Complied	
(Max 25% detachment on each side of windscreen perimeter)	RH perimeter 0%	Complied	

Test Results: Page 2 of 33

## 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

Test Results : Page 3 of 33 PETEC Verbindungstechnik GmbH

Test Results: Page 4 of 33

# 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

Test Results: Page 6 of 33



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

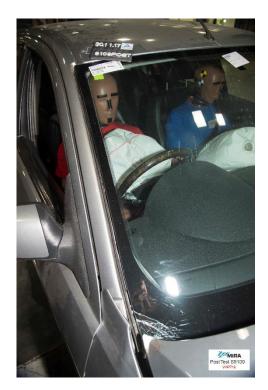


Photo 8
Close front view of RH A-pillar / windscreen RH edge – Post-Test

Test Results: Page 8 of 33



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%ile No 138	N/A	N/A
ATD Identification – RHF HIII 50%ile No 270	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

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Page 1 of 5 Pages

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Mark Pickering – Department Manager Philip Macleod – Supervisor – Instrument Calibration

Dominic Mhandu - Metrologist

Client: Test Operations FG Section: Safety, Crash Off-Board

nstruments

Address: Watling Street Nuneaton

Warwickshire

Client ID:

MIRA ID: Date received: Dallas ID:

Model:

Serial No:

Q38720 to Q38723

17 Jun 2017

Manufacturer: Intercomp 170127-WPC

Description: Weigh Pads 0216MC15008 Calibration Date: 29 Jun 2017 QA4299/C/07 Calibration Procedure: Equipment used: Page 2-5 Measurement Results: Page 2-5 Page 2-5 Measurement Uncertainty:

Used, in good condition Condition of Instrument:

Wilhin 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 Yolis  $\pm$  15 Yolis and 50 Hz  $\pm$ 3.5Hz 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%.

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TC0032b Issue 20

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Issue date: 20 Aug 2017 Cert No: 38724170817



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Mark Pickering - Department Manager

☐ Philip Macleod - Supervisor -② Dominic Mhandu - Metrologist - Instrument Calibration

Client: Test Operations FG Safety, Crash Off-Board Section: Instruments

Watling Street

Nuneaton Warwickshire

Client ID:

MIRA ID: Q38724 to Q38727 Date received: 17 Aug 2017

Condition of Instrument:

Dallas ID:

Test Results: Page 12 of 33

Address:

Manufacturer: Intercomp 170127-WPC Model:

Description: Weigh Pads Serial No: 0216MC15003 Calibration Date: 20 Aug 2017 Calibration Procedure: QA4299/C/C7 Pages 2 to 5 Equipment used: Measurement Results: Pages 2 to 5 Measurement Uncertainty: Pages 2 to 5

Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty Yes Acjusted 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

The instrument was allowed to acclimatise in an environment of  $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and  $50\%\text{RH} \pm 25\%\text{RH}$ , for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts  $\pm$  15 Volts and 50 Hz  $\pm$  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 lavel of confidence of approximately 95%

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TC3032b Issue 20

#### 5m Steel Tape Measure

## CALIBRATION CERTIFICATE

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Mark Pickering – Department Manager Philip Madeoc – Supervisor – Instrument Calibration Dominic Mhandu - Metrologist

mag

Client: Test Operations FG Safety, Crash Off-Board Section:

Instruments Watting Street

Nuneaton

Warwickshire

Q34848 MIRA ID: Date received: 18 Oct 2017 Dallas ID:

Test Results: Page 13 of 33

Address:

Client ID:

Assist Manufacturer: 32G-5019 Model:

Description: 5m Steel Tape Measure

Serial No: **Calibration Date:** 08 Nov 2017 Calibration Procedure: QA3105/C/03

Equipment used: Page 2 Measurement Results: Page 2 Measurement Uncertainty: Page 2

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

The reported values are the result of measurements taken at the time of collibration 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 datas specified.

The instrument was allowed to accumatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 frours before curreneing 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.

certainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of The reported uncertapproximately 85%.

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TO00326 Issue 20

#### **Digital Level**

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Issue date: 18 Jan 2017

Cert No: 33520130117



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Mark Plokering – Head of Instrument Calibration & Repair Philip Macleoc – Supervisor – Instrument Calibration Dominia Mhandu - Metrologist

Client: Section:

Test Operations FG Safety, Crash Off-Board Manufacturer: Model:

Smarttool

Instruments

Address: Watling Street

Nuneaton

Description: Serial No:

Digital Level

Warwickshire

13 Jan 2017

Calibration Date: Calibration Procedure: 18 Jan 2017 QA3129/C/03

Client ID: MIRA ID: Q33520 Equipment used: Measurement Results:

Measurement Uncertainty:

Page 2 Page 2 Page 2

Date received: Dallas ID:

specified.

Condition of Instrument: Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty Adjusted during calibration

Yes No

Repaired prior to or during calibration

No

Within specification on completion, at the points in easured 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

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%RH ± 25%RH, for a minimum of 12 figure before currencing the calibration. The electrical supply within the laboratory is 240 Volts  $\pm$  15 Volts and 50 Hz  $\pm$ 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%.

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1 CU002b Issue 20

#### Stop Watch

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[] Mark Pickering – Head of Instrument Calibration & Repair ⊮ Philip Madeod – Supervisor – Instrument Calibration

Stop Watch

Client: MIRA, Test Operations FG
Section: Vehicle Env & Aero,
Climatic Chamber
Address: Watling Street

Watling Street Nuneaton Warwickshire

Client ID: -MIRA ID: Q38460

Date received: 23 Mar 2015

Test Results: Page 15 of 33

Manufacturer: RS Model: 811-1818

Serial No: - 18 May 2015
Calibration Procedure: QA2113/C/02
Equipment used: Page 2
Measurement Results: Page 2

Measurement Results: Page 2
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

Repaired prior to or during calibration

Within specification on completion, at the points measured subject to the measurement uncertainty

Yes

Description:

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  $\pm$  2°C and 50%RH  $\pm$  25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Volts  $\pm$  15 Volts and 50 Hz  $\pm$  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%.

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TC0032b Issue 17

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Issue date: 16 Dec 2015 Cert No: 34851251115



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Mark Pickering – Head of Instrument Calibration & Repair Philip Madeod – Supervisor – Instrument Calibration Miroslaw Palucki – Netrologist

Client: Mechanical Engineering FG Section: Braking Watling Street Address:

Nuneaton Warwickshire

Client ID: Q34851 MIRA ID: 25 Nov 2015 Date received: Dallas ID:

Manufacturer: RS 699-9259 Model: Digital Stopwatch Description: Serial No: Calibration Date: 16 Dec 2015

Calibration Procedure: CA2113/C/02 Equipment used: Page 2 Measurement Results: Page 2 Page 2 Measurement Uncertainty:

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 Vots  $\pm$  15 Volts and 50 Hz  $\pm$ 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%.

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TC3032b Issue 17

#### **Tyre Pressure Gauge**

## CALIBRATION CERTIFICATE

#### Issued by HORIBA MIRA Ltd

Issue date: 09 Mar 2017 Cert No: 39679100117



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Mark Pickering – Head of Instrument Calibration & Repair Philip Macleod – Supervisor – Instrument Calibration Philip Macleod – Supervisor – I Dominic Mhandu Metrologist

Client: Test Operations FG Section: Safety, Crash Off-Board

Instruments Watling Street

Nuneaton Warw ckshire

Client ID:

Test Results: Page 17 of 33

Address:

MIRA ID: Date received: 10 Jan 2017 Dallas ID:

Q39679

PCL Manufacturer: AFG1H03 Model:

Description: 12 bar Tyre Inflator 141121095 Serial No: Calibration Date: 09 Mar 2017 Calibration Procedure: QA4097/C/03

Equipment used: Page 3 Measurement Results: Page 2 Measurement Uncertainty: Page 2

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 environmenta performance of the instrument. All measurements detailed within this Calibration Certificate relate only to the instrument detailed above on the dates

The instrument was allowed to acclimatise in an environment of 20°C ± 2°C and 50%HH ± 26%HH, for a minimum of 12 rours before commencing the calibration. The electrical supply within the laboratory is 240 Volts  $\pm$  15 Volts and 50 Hz  $\pm$ 0.6Hz 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 12645:1989.



The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 36%.

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TC0032b Issue 20

#### 9 Beam Speed Measurement Laser

## CALIBRATION CERTIFICATE

### Issued by HORIBA MIRA Ltd

Issue date: 19 Apr 2017 Cert No: 08167190417



Page 1 of 5 Pages

Approved Signatory



Watling Street, Nuneaton Warwickshire, CV10 0TU, UK. Telephone: +44 (0)24 7635 5225 Facsimile: +44 (0)24 7635 8225 http://www.horiba.mira.com

- Mark Pickering Head of Instrument Calibration & Repair Philip Macleod Supervisor Instrument Calibration Commic Mhandu Metrologist

Client: Section: Test Operations FC Safety, Crash Off-Board

MIRA

Address:

Instruments Watting Street

Description:

Model:

Manufacturer:

9 Beam Speed

Nuneaton

Serial No:

Measurement Sys

Warwickshire

Calibration Date: Calibration Procedure: 20 Apr 2017 QA2364/C/09

Client ID: MIRA ID: Q08167 Date received: 19 Apr 2017

Condition of Instrument:

Equipment used: Measurement Results: Messurement Uncertainty:

Page 5 Pages 2 to 4 Page 6

Dallas ID:

Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty No Adjusted during calibration Nο 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%.

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TC0032b Issue 20

#### Mobile Speed Measurement Laser

## CALIBRATION CERTIFICATE

### Issued by HORIBA MIRA Ltd

Issue date: 21 Jun 2017 Cert No: 178992503171



Page 1 of 2 Pages

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Mark Pickering – Department Manager Phillip Macteod – Supervisor – Instrument Calibration Dominic Mhandu - Metrologist

Client: Section: Test Operations FG

Safety Crash Off-Board

Instruments

Model:

MIRA TD590

Address: Watting Street Description:

Manufacturer:

Voie Speed Measurement Unit

34 Apr 2017

Cable & Frame

Nuneaton

Warwickshire

Client ID: MIRA ID:

Date received: Dallas ID:

Q17899 to Q17901

25 Mar 2017

Serial No:

Calibration Date: Calibration Procedure:

Equipment used: Measurement Results: Measurement Uncertainty:

QA2517/C/03 Page 2 Page 2

Page 2

Condition of Instrument:

Used, in good condition

Within specification on receipt, at the points measured subject to the measurement uncertainty

Adjusted during calibration

Yes 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 cetailed 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 distort on 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 85%.

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TC3032b Issue 20

#### **Climatic Temperature Probes**

## CERTIFICATE OF CALIBRATION

ISSUED BY: Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017 Date of issue: 5th January 2017

6th January 2017 Certificate Number: 00048454



#### Universal



UNIVERSAL INSTRUMENT SERVICES Ltd.

Unit 69 The Whittle Estate, Cambridge Rose, Whetstone, Leicester LE6 6PA Tel: 0116 275 0123 Fax: 0116 275 0262 Website: www.uiscal.com

Email; sales@uiscal,co.uk

Page 1 of 2 Pages Approved Signatory

J.Bruce

Sustamer: HORIBA MIRA LIMITED

WATLING STREET NUNEATON WARWICKSHIRE

Operator: LKB Our Ref: 361434 Manufacturer: Description: Not Known "T" Thermocouple T-TYP#

Model: Serial No: Asset No:

Q39704 Q39704 263528

Order No: Date Received:

19th December 2016

CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration

YES/NO

#### 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 lost.

#### ACCREDITATIONS

UIS is accredited by UKAS to BS FN 17025:2005 to undortake 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 procetainty evaluation has been carried out in accordance with UKAS requirements.

#### TEST EQUIPMENT USED

Test Results: Page 20 of 33

Asset No.	Description	B. U.S.	
ID3156	Hart 1590 Super-Thermometer II	Certificate No.	Expiry date
ID3051	Tins ey Sld Resistor 25 onms	296385	21/MAR/2017
ID3032	PRT (25 orms)	JKAS 0351304	09//111/2018
ID3289	PRT (25 dams)	UKAS 47039	14/JUL/2017
ID3245	PRT (25 olims)	UKAS 47042	14/4UL/2017
D3245	PRT (25 ohms)	UKAS 47018	12/JUL/2017
D3276	Fluke 1586-2588 Multiplexer	UKAS 47020	12/JUL/2017
	r date 1000-2300 lots liptexer	UKAS 47348	25/FEE/2017

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ISSUED BY: Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017

Date of issue: 5th January 2017 Cortficate Number: 00048455



#### Universal



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Page 1 of 2 Pages Approved Signatory

Bu J.Bruce

Customer: HORIBA MIRA LIMITED

WATLING STREET NUNEATON WARWICKSHIRE

Operator: JKB Our Ref: 331435 Manufacturer: Not Known Description: "T" Thermocouple

Model: T-TYPE Serial No: Q39705 Asset No: Q39705 Order No: 263528

Date Received: 19th December 2016

#### CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration

#### YES/NO

#### ADDITIONAL COMMENTS

#### STABILITY

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

#### **ACCREDITATIONS**

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

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

#### PROCEDURE

UIS procedure CP7 5.3

Test Results: Page 21 of 33

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
IE3156	Hart 1690 Super-Thermometer II	296335	21/MAR/2017
ID3051	Tinsley Std Resistor 25 chms	UKAS 0391304	09/JUL/2018
IC3032	PRT (25 ohms)	UKAS 47039	14/JUL/2017
ID3269	PRT (25 chms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 chms)	UKAS 47018	12/JUL/2017
ID3245	PRT (25 chms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1588-2588 Multiplexer	UKAS 47348	25/FEB/2017

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ISSUED BY: Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017

Date of issue: 5th January 2017 Certficate Number: 00048456



#### Universal



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Website: www.uiscal.com. Email: sales@uiscal.co.uk Page 1 of 2 Pages Approved Signatory

J.Bruce

Gustomen: HORIBA MIRA LIMITED

WATLING STREET

NUNEATON WARWICKSHIRE

Operator: JKR Our Ref: 331438 Manufacturer: Description:

Not Known in Thermocouple

T-TYPE Model: Serial No: Q39706 Asset No: Order No:

Q39706 263528

Date Received: 19th December 2018

#### CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration

#### YES/NO

#### ADDITIONAL COMMENTS

#### STABILITY

The readings given are the results at the time of calibration and do no; carry any implication regarding the long term stability of the unit under test.

#### ACCREDITATIONS

UIS is accredited by UKAS to ES EN 17025;2005 to undertake the calibration presented in this pertificate.

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

#### PROCEDURE

UIS procedure CP7.5.3

#### UNCERTAINTIES

Test Results: Page 22 of 33

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 uncortainty evaluation has been camed 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
ID3032	PBT (25 chms)	UKAS 47039	14/JUL/2017
ID3260	PBT (25 ahms)	UKAS 47042	14/JUL/2017
ID3240	PRT (25 ahrns)	UKAS 47018	12/JUL/2017
103245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
103278	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

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ISSUED BY: Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017

Date of Issue 5th January 2017

Cerlficate Number: 00048457



#### Universal



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Website: www.uiscal.com Email: sales@uiscal.co.uk

Page 1 of 2 Pages Approved Signatory

J.Bruce

Customer: HORIBA MIRA LIMITED

WATLING STREET

NUNEATON WARWICKSHIRE

Operator: JKB

Our Ref: 351437

Manufacturer. Not Known Description: "T" Thermoccupie I-TYPE

Model: Serial No: Q39707

Asset No: Q39707 Order No: 263528

Data Received: 19th December 2016

CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration

YES/NO

#### ADDITIONAL COMMENTS

#### STABILITY

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

#### **ACCREDITATIONS**

UIS is accredited by UKAS to DS EN 17025:2005 to undertake the calibration procented in this certificate.

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

Test Results: Page 23 of 33

Asset No.	Description	Certificate No.	Foot- day
ID3156	Hart 1590 Super-Thermometer II	296385	Expiry date
ID3051	Tinsley Std Resistor 25 ohms	UKAS 0391304	21/MAR/2017
ID3032	PRT (25 chirs)	UKAS 47039	09/JUL/2018
ID3289	PRT (25 phms)		14/JUL/2017
D3240	PRT (25 ohms)	UKAS 47042	14/JUL/2017
ID3245	PRT (25 ohms)	UKAS 47018	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47020	12/JUL/2017
	o so 1560-2aca termiplexet	UKAS 47348	25/FEB/2017

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ISSUED BY: Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017

Date of Issue: 5th January 2017 Certicate Number: 00048450



#### Universal



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Jnit 69 The Whittle Estate, Cambridge Road, Whetstone, Leicester LES 6PA Tel: 0116 275 0123 Fax: 0116 275 0262 Website: www.uiscal.com

≣mail; sales tuiscal.co.uk

Page 1 of 2 Pages. Approved Signatory

Kom J.Bruce

Customer: HORIBA MIRA LIMITED

WATLING STREET NUNEATON

WARWICKSHIRE

Operator: ..KF Our Ref: 361430 Manufacturen Not Known Description: "T" Thermocouple, T-TYPE

Model: Serial No: Asset No;

Q39785 Q39785 263528

Order No: Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration

YES/NO

#### 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

#### ACCREDITATIONS

UIS is accredited by UKAS to BS FN 17026:2005 to undertake the pathration presented in this pertificate.

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

#### PROCEDURE

UIS procedure CP7.5.3

#### UNCERTAINTIES

Test Results: Page 24 of 33

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

#### TEST EQUIPMENT USED

Asset No.	Cescription	Coefficient No.	
ID3156	hart 1590 Super-Thermometer I/	Certificate No.	Expiry date
ID3051	Tinsley Std Hesister 25 chms	296385	21/MAR/2017
ID3032	PRT (25 chms)	UKAS 0391304	09/JUL/2018
103269	PRT (25 chms)	UKAS 47039	14/JUL/2017
ID3240	PR1 (25 ohms)	UKAS 47042	14/JUL/2017
D3245		UKAS 47018	12/JUL/2017
ID3276	PRT (25 ohms)	UKAS 47020	12/JUL/2017
IDOCTO	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

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ISSUED BY: Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017

Date of Issue: 5th January 2017

Certificate Number: 00048453



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Website: www.u scal.com Email: sales@ulscal.co.uk Page 1 of 2 Pages Approved Signatory

J.Bruca

Customer: HORIBA MIRA LIMITED

WATLING STREET

NUNEATON WARWICKSHIRE

Operator: JKB Our Ref: 361433 Manufacturer: Not Known
Description: 'T' Thermo
Model: T-TYPE

'T' Thermocouple T-TYPE Q39786

 Serial No:
 Q39786

 Asset No:
 Q39786

 Order No:
 263528

 Date Received:
 15th December 2016

CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration.

YES/NO

#### 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**

US 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

Test Results: Page 25 of 33

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor x=2, providing a lovel 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
D3156	Hart 1590 Super- hermometer II	298385	21/MAR/2017
ID3051	Tinsley Std Resistor 25 phms	UKAS 0391304	09/JUL/2018
ID3032	PRT (25 ohms)	UKAS 47039	14/JLL/2017
ID3269	PRT (26 ohms)	UKAG 47042	14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
103245	PRT (25 phins)	UKAS 47020	12/JUL/2017
103276	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

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ISSUED BY. Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017

Date of issue: 5th Jenuary 2017

Certificate Number: 00048452



#### Universal



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Whetstone, Leicester LE8 6PA Tel: 0116 275 0123 | Fax: 0116 275 0262

Website: www.uiscal.com Email: sales@uiscal.co.uk hage if of 2 Pages Approved Signatory

J Bruce

Customer: HORIBA MIRA LIMITED

WATUNG STREET NUNEATON

WARWICKSHIRE r: JKB

Operator: JKB Our Ref: 381432 Manufacturer:

Not Known "T" Thermocouple T-TYPE

Description: Model: Serial No:

Q39787 Q39787 Q39787 263528

Asset No: Order No:

Date Received: 19th December 2016

CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration

YES/NO

#### ADDITIONAL COMMENTS

#### STABILITY

The readings given are the results at the time of collistation 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 callbration presented in this certificate.

#### ENVIRONMENT

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

#### PROCEDURE

UIS procedure CP7.5.3

#### UNCERTAINTIES

Test Results: Page 26 of 33

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

#### TEST EQUIPMENT USED

Asset No.	Description	Certificate No.	English days
ID3156	Har, 1590 Super-Thermometer II	298385	Expiry date
ID3051	Tinsley Std Resister 25 phms	UKAS 0391304	21/MAR/2017
ID3032	FRT (25 ohms)	UKAS 47039	09/JUL/2018
ID3259	FRT (25 phms)	UKAS 47042	14/JUL/2017 14/JUL/2017
ID3240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
ID3246	PRT (25 chms)	UKAS 47020	12/JUL/2017
ID3276	Fluke 1586-2588 Multiplexer	UKAS 47348	25/FEB/2017

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ISSUED BY: Universal Instrument Services Ltd.

Date of Calibration: 3rd January 2017.

Date of issue: 5th January 2017 Certificate Number: 00048451



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Whetstone, Leicester LES 6PA Tel: 0116 275 0123 Fax: 5116 275 0262

Website: www.uiscal.com Email: sales@uiscal.co.uk Page 1 of 2 Pages Approved Signatory

Non J.Bruce

Customer: HORIBA MIRA LIMITED

WATLING STREET NUNEATON WARWICKSHIRE

Operator: JKB

Our Ref: 361431 Manufacturer: Description:

Not Known "1" Thermoopuple

Model: Serial No. Asset No: T-TYPE Q39788 Q30788 263528

Order No: Date Received:

19th December 2016

CONDITION OF UNIT UNDER TEST

The Thermocouple was visually inspected prior to calibration

YES/NO

#### ADDITIONAL COMMENTS

### STABILITY

The readings given are the results at the time of pathration 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 17023:2005 to undertake the calibration presented in this certificate

#### ENVIRONMENT

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

#### PROCEDURE

UIS procedure CP7.5.3

#### UNCERTAINTIES

Test Results: Page 27 of 33

The reported expanded uncertainty is based on a standard uncertainty multiplied by a neverage factor s=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
103156	Hart 1590 Super-Thermometer II	296385	21/MAR/2017
103051	Tinsley Std Resistor 25 ohms	UKAS 0391304	09/3012/2018
103032	PRT (25 ohms)	UKAS 47039	14/301/2017
ID3289	PRT (25 phms)	UKAS 47542	14/JUL/2017
103240	PRT (25 ohms)	UKAS 47018	12/JUL/2017
100245	PRT (25 ohms)	UKAS 47020	12/JUL/2017
103276	Fluke 1593-2598 Multiplexer	UKAS 47348	25/F FB/2017

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## **Climatic Humidity Probe**

## 31995

## CERTIFICATE OF CALIBRATION

Issued by

#### ABSOLUTE CALIBRATION LIMITED

DATE OF ISSUE

18 August 2017

CERSIFICATE NUMBER

0426395





#### Absolute Calibration Limited

14 Muzills Estate, Portchester Hampshire, England, PO16 9RD Telephone 023-92321712 Facsimile 023-92210034 Service Facsimilo 023-92327100 www.absolute-cal.ca.uk

Page 1 of 2	Pages
Approved Sig	natory_
a. huna	2111/
M Funnell	Z
S Whittingnam	
D Kingswell	
G Mils	
A Francis	$\Box$

TEMPERATURE/HUMIDITY SENSOR AND ACTIVE ADAPTOR Description:

Manufacturer: ROTRONIC

Type Number: HYGROCLIP & MOK-20-XX-010V-2

Serial Number: 60250059

Customer: HORIBA MIRA LIMITED

WATLING STREET NUNEATON WARW CKSHIRE

Instrument Receipt Date: 02 August 2017

Order Number: 271883 Q31995 Customer Reference:

Laboratory Temperature (20.0 ± 3.0) °C Laboratory Humidity  $(55 \pm 20)$  %th

Calibration Procedure: CP 112 Calibration Engineer \$ Patabendi

18 August 2017 Calibration Date

This Report Contains Recorded results with no adjustments

Pre and post adjustment results

Post repair results

Results recorded at Customer site

This contificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceastilly of measurement to the SI system of units and for to units of measurement realized at the National Physical Laboratory or other recognized national metrology institutes. This certificate may not be reproduced of or than in full, except with the prior written approval of the issuing taboratory.

FM 56/6

HARrist follows 2000 10

Test Results: Page 28 of 33

64116

## CERTIFICATE OF CALIBRATION

lasured by

#### ABSOLUTE CALIBRATION LIMITED

DATE OF ISSUE

18 August 2017

CERTIFICATE NUMBER 0426394





#### **Absolute Calibration Limited**

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Page 1 of 2 Pages Approved Signatory M. F.unash M Formell S Whittingham D Kingswell G Mils A Francis 

Description:	TEMPERATURE/HUMIDITY SENSOR AND ACTIVE ADAPT	OF
Manufacturer:	ROTRONIC	
Type Number:	HYGROCLIP & MOK-20-XX-010V-2	
Serial Number:	60250328	
Customer:	HORIBA MIRA LIMITED WATLING STREET NUNEATON WARWICKSHIRE	
Individual Descript Coto	00 Assessed 2047	
Instrument Receipt Date:	02 August 2017	
Order Number:	271883	
Customer Reference:	Q31996	
Łaccratory 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 regair results	
	Results recorded at Customer site	
provides traceability of measurement to the	th the laboratory accorditation requirements of the United Kingdoor Accorditation Service, it is system of units and for to units of measurement realized at the National Physical entralogy institutes. This continuate may not be reproduced other than in full, except with sometry.  FM 56/6	

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Test Results: Page 29 of 33

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DATE OF ISSUE

19 January 2017

CERTIFICATE NUMBER



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Approved Signa	atory/
n. Juna	elly
M. Funnell	Z
S Whittinghom	- 10
D Kingswell	13
G Mills	10.7
A Francis	

THERMOHYGROMETER PROBE AND ACTIVE ADAPTOR Description:

Manufacturer. ROTRINIC

Type Number: HYGROCLIP & MOK-20-XX-010V-2

Serial Number: 55499255

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

Post repair results

Results recorded at Customer site

Pre and post adjustment results

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Test Results: Page 30 of 33

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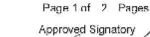
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Service Facsimile 023 92327100

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M.Funnell 5 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: 60250104

Customer: HORIBA MIRA LIMITED

WATLING STREET NUNEATON WARWICKSHIRE

Instrument Receipt Date: 17 January 2017

Order Number: 264315 Customer Reference: Q31998

(20.0 ± 3.0 )°C Laboratory Temperature Laboratory Humidity  $(55 \pm 20)$  %rh CP 112 Calibration Procedure:

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

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FM 56/6

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Test Results: Page 31 of 33

#### 32ch Thermocouple Amplifier

## CALIBRATION CERTIFICATE

#### issued by HORIBA MIRA Ltd

Issue date: 04 Jan 2017 Cert No: 30279191216



Page 1 of 5 Pages

Approved Signatory

National Instru

32ch Thermocouple

SCXI-1102

Amplifier 122578B

04 Jan 2017

Watling Street, Nuneaton Warwickshire, CV10 0TU, UK, Telephone: +44 (0)24 7635 5225 Facsimile: +44 (0)24 7635 8225 http://www.norba-mira.com

Mark Pickering – Head of Instrument Calibration & Repair Philip Macleod – Supervisor – Instrument Calibration

Dominic Mhandu - Metrologist

Client: Test Operations FG Section: Vehicla Env & Aero, Climatic Chamber Address:

Watting Street

Nuneaton Warwickshire

Client ID: MIRA ID:

Date received: Dallas ID:

Test Results: Page 32 of 33

Q30279 19 Dec 2016 Manufacturer: Model:

Description:

Calibration Date: Calibration Procedure: Equipment used: Measurement Results:

Serial No:

QA2656/C/02 Fage 5 Fage 2-5 Measurement Uncertainty: Fage 2-5

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

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 natural detailed above on the dates

The instrument was allowed to additinatise in an environment of 20°C  $\pm$  2°C and 50%RH  $\pm$  25%RH, for a minimum of 12 hours before commencing the calibration. The electrical supply within the laboratory is 240 Vota  $\pm$  15 Votts and 50 Hz  $\pm$ 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-1504200AA

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%.

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TC0032b Issue 20

#### **Climatic Chamber Controller**

## CALIBRATION CERTIFICATE

#### Issued by HORIBA MIRA Ltd



Page 1 cf 3 Pages

Approved Signatory

Watting Street, Nuneaton Warwickshire, CV10 0TU, UK, Telephone: +44 (0)24 7635 5225 Facsimile: +44 (0)24 7635 8225 http://www.heriba-mira.com

|| Mark Pickering - Head of Instrument Calibration & Repair || Phillip Macrace - Supervisor - Instrument Calibration

MIRA

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Page 3

Page 5

05 Jan 2017 QA5032/C/01

Pages 2 & 3

MI003878

Climatic Chamber Controller

|| Dominic Mhandu Metrologist

Client: Test Operations FG
Section: Vehicle Env & Aero,
Climatic Chamber
Address: Watting Street

Client ID:

Test Results: Page 33 of 33

icle Env & Aero, Model: natic Chamber ting Street Description:

Manufacturer:

Nuneaton Serial No:
Warwickshire Calibration Date:
-- Calibration Procedure:
-- Equipment used:
Q34000 Measurement Results:

MIRA ID: Q34000 Measurement Results:
Date received: 05 Jan 2017 Measurement Uncertainty:
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%.

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TC0032b Issue 20



## WINDSHIELD ADHESIVE "SCHEIBENKLEBER" Art.-Nr. 83310 + 83400

is an ambient moisture curing one-component polyurethane sealant. *Passes crash test (FMVSS 212) with security dual air bags after 1 hour.* 

#### **AREAS OF APPLICATIONS:**

can be used to bond windshield and side windows of cars with or without a primer. For other applications, refer to our technical service. Using a primer or not depends of the quality of the substrates (refer to Instructions for use).

#### **TECHNICAL DATA:**

Appearance	Thixotropic paste
Color	Black
Density at 20°C	$1.23 \pm 0.02$
Application temperature	5 to 35 ℃
Skin formation time at 23 °C and 50 % HR	25 to 40 min
Cure time at 23 °C and 50 % HR	> 3.5 mm/24 h
Shore A hardness (internal method IT- 20 after ISO 868 - 3 seconds)	60 to 65
Shearing resistance at 5 h at 23 °C and 50 % HR (FORD SAE J 1529)	> 0.9 MPa (> 130 psi)
Shearing resistance at 7 d at 23 °C	> 3.5 MPa (> 500 psi)
and 50 % HR (Ford SAE J 1529)	
Water and salt spray resistance	Excellent
Specific data	Elongation at break (ISO 37) : > 700 %
	Modulus at break (ISO 37) : approx 7.5 MPa
	Tear strength (ISO 34): approx. 30 N/mm
	Crash test (standard FMVSS 212) with security dual air bags:
	resists after 1 hour at 23 °C and 50 % RH

#### **INSTRUCTIONS FOR USE:**

Substrate preparation:

The substrates must be clean, even, dry and free of dust.

Carefully respect the evaporation times of the solvents.

When using solvents, extinguish all sources of ignition and carefully follow the safety and handling instructions given by the manufacturer.

In case of windshield replacement, it is not necessary to completely remove the old sealant; simply trim it off, leaving a 1 to 2 mm thickness.

There is no compatibility problem applying fresh polyurethane sealant to old polyurethane sealant.

Rub down any rusted area. Clean bare areas of the body before applying the PETEC Primer (Art.-Nr. 82410 / 82330 / 82430). Never clean the old sealant with a solution containing alcohol.



The windshield has to be treated as follows:

#### RAW GLASS:

PETEC instructions: Aktivator (Art.-Nr. 82230) / PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) / Windshield sealant (Art.-Nr. 83310 / 83400).

Clean with Aktivator (Art.-Nr. 82230) according to the WOWO (wipe on/wipe off) method with a clean, dry and lint-free cloth (wipe as soon as the solvent is evaporated, i.e. 30 to 60 seconds after application). As the activator is very sensitive to humidity, the bottle must be closed immediately after use. If it is cloudy, do not use it.

For this application, it is possible to use single-use impregnated wipes (kit containing an impregnated wipe and a dry wipe for WOWO).

Let dry between 10 to 60 minutes after application according to temperature.

In case of excessive drying time, repeat a second time.

Then apply a thin and uniform film of Primer (Art.-Nr. 82410 / 82330 / 82430) with an applicator pad (or a 10 ml tube with single-use foam sponge applicator) in order to form a homogeneous film.

Homogenize the product before application.

Shake until agitator ball is moving. Shake another 30 seconds. Close the bottle immediately after use.

Any contact with humidity will make the primer cure. For this reason, the product must be used within 24 hours after opening the bottle.

Let dry between 15 and 60 minutes according to temperature before application of the sealant.

#### WINDSHIELD WITH CERAMIC FRIT:

PETEC instructions: Cleaning cloth 82111 / Aktivator (Art.-Nr. 82230) / PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) / Windshield sealant (Art.-Nr. 83310 / 83400).

Bonding may be performed with or without primer.

Bonding without PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) must be performed on a windshield with ceramic frit ensuring optimum and uniform opacity to UV and with no silicone residue.

Non compliance with these conditions may cause partial or total loss of adhesion of the sealant on the windshield.

Degrease with Cleaning cloth 82111, abrade with PETEC Multi Cleaner (Art.-Nr. 82100 oder 82200 in order to avoid orange peel effect likely to occur in presence of traces of silicone), degrease a second time with heptane or MEK and respect a drying time of 10 minutes.

Apply Aktivator (Art.-Nr. 82230) according to the method described for raw glass.

Let dry between 10 and 60 minutes before the next step:

- if ceramic frit is sufficiently opaque, application of the sealant;
- if ceramic frit is not sufficiently opaque, application of PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) with an applicator pad (or a 10 ml tube with
- single-use foam sponge applicator) followed by a waiting time of 15 to 60 minutes before application of the sealant.
- ENCAPSULATED WINDSHIELD: degrease if needed with Cleaning cloth 82111 or acetone (do not use alcohol) and respect a 10 minutes drying time, then apply PETEC Primer (Art.-Nr. 82410 / 82330 / 82430)
- WINDSHIELD COATED WITH A PRIMER: degrease with Cleaning cloth 82111 or acetone. After about 10 minutes, apply PETEC Primer (Art.-Nr. 82410 / 82330 / 82430)

For other types of substrates, refer to our technical service.

#### Bonding:

The sealant "Scheibenkleber" can be applied with a hand or pneumatic gun.

The triangle-shaped form of the joint is determined by the nozzle.

If applied in cold weather, store the packagings at about 20°C before use.

The windshield must be applied and pressed before the end of the skinning time.

Do not apply in the presence of cured or non-cured silicones or hybrid sealants (MS, SPUR or STPE).

Do not apply at temperatures lower than 5 °C.

Note: all times described in the above instructions are valuable for a minimum temperature of 15 °C. In case of lower temperatures (between 5 and 15 °C), drying times must be twice longer.



#### Cleaning:

Uncured sealant can be cleaned up with PETEC Multi Cleaner (Art.-Nr. 82100 oder 82200) or acetone. After curing, abrasion is necessary.



Drive-away time for a car: 60 minutes with air bag

#### STORAGE AND SHELF LIFE

12 months in closed original packaging stored in dry premises at a temperature lower than 25 °C. If necessary, gently warm the product before use until it reaches a suitable temperature. Storage at a temperature over 25 °C will decrease the shelf life of the sealant.

#### **PACKAGING**

310 ml aluminium cartridges; 400 and 600 ml sausages Contact us for other packaging options.

Provisional technical data sheet

The technical data contained herein is based on our present knowledge and experience and we cannot be held liable for any errors, inaccuracies, omissions or editorial failings that result from technological changes or research between the date of issue of this document and the date the product is acquired. Before using the product, the user should carry out any necessary tests in order to ensure that the product is suitable for the intended application. Moreover, all users should contact the seller or the manufacturer of the product for additional technical information concerning its use if they think that the information in their possession needs to be clarified in any way, whether for normal use or a specific application of our product. Our guarantee applies within the context of the statutory regulations and provisions in force, current professional standards and in accordance with the stipulations set out in our general sales conditions. The information detailed in the present technical data sheet is given by way of indication and is not exhaustive. The same applies to any information provided verbally by telephone to any prospective or existing customer.



### **PRIMER**

PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) is an isocyanate and solvent-based primer specially developed to improve the adhesion and maximize the bonding of sealants on low surface energy substrates used in the transportation market and more specifically the glass bonding. This all-in-one primer is also compatible with all PETEC polyurethane and hybrid sealants.

#### **AREAS OF APPLICATIONS:**

The surface preparation can be made with the PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) either alone or in combination with the Aktivator (Art.-Nr. 82230) to promote adhesion, improve bond durability and provide optimum protection against UV rays on organic or mineral glass.

PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) is used on glass and silk-screened ceramic frit glass for the bonding of windshield or glass (on cars, trains, buses, trucks and specialty vehicles) as well as on vehicle body frames. It acts as a corrosion inhibitor on metal and can be applied on pinchweld scratches and nicks.

PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) is also recommended in the marine industry (for windshield or porthole bonding) to prime acrylic (PMMA) or polycarbonate windows, fiberglass and polyester.

PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) can also be used as a multipurpose primer on many non-porous substrates used in the transportation market, like aluminium, metals, stainless steel, painted surfaces, ABS, wood and PVC).

For applications other than glass bonding, it is recommended to do preliminary adhesion and compatibility tests - contact our technical service.

#### **TECHNICAL DATA:**

Color	Black
Viscosity	DIN cup Ø4 mm, 100 ml: 11 to 14 s
Density at 20°C	$0.95 \pm 0.05$
Application temperature	+5°C bis +35°C
Specific data	Drying time: 10 to 15 min *

<sup>\*</sup> If the temperature is below 20°C, a longer drying time is recommended.

#### **INSTRUCTIONS FOR USE:**

Substrates preparation:

The substrates to be treated must be clean, dry, free of dust or grease. Contaminated surfaces must be cleaned beforehand with a solvent-based solution with or without the help of an abrasive like PETEC Multi Cleaner (Art.-Nr. 82100 oder 82200). Let evaporate for 5 minutes before next step.

We preconize to treat the glass with the adhesion promoter AKTIVATOR (Art.-Nr. 82230) see the technical data sheet of the product before applying PETEC Primer (Art.-Nr. 82410 / 82330 / 82430).

Note: when using solvents, extinguish all sources of ignition and carefully follow the safety and handling instructions given by the manufacturer.

#### Primer application:

To perfectly homogenize the product, shake thoroughly the bottle until agitator ball is moving, then shake additional 30 seconds. Dip a clean felt tip applicator into the bottle, roll it around the edges of the bottle to squeeze out the excess of product.

PETEC Multiaktiv Primer PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) can also be applied with the 10 ml tube with foam applicator. Shake thoroughly the tube for 10 to 15 seconds in order to re-homogenize the product. Exert a uniform and light pressure to get a homogenous and opaque film.

Hermetically seal the container immediately after use as this product is very sensitive to moisture. Any contact with humidity will make the primer cure.

On the glass: after drying (10 to 15 minutes\* depending on temperature and moisture conditions) apply the sealant within a one hour deadline, proceeding according to instructions of its technical data sheet. If the deadline is not respected or if the film of primer is contaminated (dust, etc.) lightly sand the primed surface, remove the dust and re-prime with PETEC Primer (Art.-Nr. 82410 / 82330 / 82430).



On the vehicle: a surface treatment with PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) is recommended on pinch-weld parts scratched during disassembling of the windscreen as well as on areas where traces of rust are visible. After abrasion followed by a cleaning (solvent), apply PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) with a clean felt tip applicator to stop corrosion. Respect a drying time of 10 to 15 minutes\*.

\* If the temperature is below 20°C, a longer drying time is recommended.

#### Cleaning.

During the few minutes following the application, it is possible to clean with mineral spirits; beyond that time, it is necessary to use a mixture of methylethylketone and toluene or methylethylketone and xylene.

#### I imitations:

Do not use if an increase in viscosity or a cured film on surface are observed.

Do not apply on frozen surfaces.

Do not apply PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) to the existing trimmed polyurethane bead (windshield replacement)

Do not reuse the felt tip applicator.

Do not re-dip the felt tip applicator in the bottle (pollution).

#### **CONSUMPTION**

Consumption is dependent on the nature of the substrates. Count 80 to 100 ml/m<sup>2</sup> on glass.

#### STORAGE AND SHELF LIFE

12 months in original and unopened packaging stored between 5 and 25°C.

PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) should be used during the month following the opening of the bottle. This time is reduced if the packaging

remains opened or is not closed properly, and more so if temperature and humidity are high.

PETEC Primer (Art.-Nr. 82410 / 82330 / 82430) in tube is intended for single use only and should be used quickly after opening.

#### **PACKAGING**

10 ml tubes

Contact us for other packaging options.

#### **SAFETY**

Professional use.

Read the material safety data sheet before use.

Wearing safety glasses and gloves mandatory.

Provisional technical data sheet

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### **AKTIVATOR**

is an organic solvent-based solution specially developed to improve the adhesion of sealants on substrates used in the automotive industry and more specifically the windows bonding.

#### **AREAS OF APPLICATIONS:**

AKTIVATOR (Art.-Nr. 82230) is intended for professional use as an adhesion promoter of polyurethane sealants in windshield replacement with or without the use of a black primer.

AKTIVATOR (Art.-Nr. 82230) can also be used on many non-porous substrates (aluminium, metals, painted surfaces, organic and mineral glass of automotive quality).

It is recommended to check the adhesion and the compatibility of the AKTIVATOR (Art.-Nr. 82230) in the terms of use on the site

For other applications, contact our technical service.

#### **TECHNICAL DATA:**

Appearance	Transparent, colorless, extremely fluid liquid
Density at 20°C	$0.73 \pm 0.02$
Application temperature	5 to 35°C
Specific data	Drying time: 10 minutes *

<sup>\*</sup> If the temperature is below 20°C, this time will be increased.

#### **INSTRUCTIONS FOR USE:**

Substrates preparation:

The substrates to be treated must be clean, dry free of dust or grease.

Contaminated surfaces must be cleaned beforehand with a solvent-based solution.

Let evaporate for 5 minutes before applying AKTIVATOR (Art.-Nr. 82230).

Note: when using solvents, extinguish all sources of ignition and carefully follow the safety and handling instructions given by the manufacturer.

#### Application:

Shake the bottle before use.

Close it immediately after use as this product is very sensitive to moisture.

Do not use if a change of the appearance is observed (presence of particles, cloudy solution, change of color).

AKTIVATOR (Art.-Nr. 82230) can be applied using a felt tip applicator or a lint cloth, in a single pass in order to apply a thin and

uniform layer.

After drying (10 minutes \* depending on temperature and moisture conditions), apply sealant within a one hour deadline following the instructions of its technical datasheet.

Do not apply with a brush, roller or by spraying.

\* If the temperature is below 20°C, this time will be increased.

#### **CONSUMPTION:**



Consumption is dependent on the nature of the substrates.

#### **STORAGE AND SHELF LIFE:**

12 months in the original, hermetically sealed and unopened packaging between 5 and 25°C.

AKTIVATOR (Art.-Nr. 82230) should be used during the month following the opening of the bottle.

This time is reduced if the packaging remains opened or is not closed properly and more so if temperature and humidity are high.

#### **PACKAGING:**

30 ml aluminium bottles. Contact us for other packaging options.

#### **SAFETY:**

Professional use.

Read the material safety data sheet before use.

Wearing gloves mandatory.

Provisional technical data sheet

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