



Material Lab

P.O Box: 114717, Dubai, United Arab Emirates

Tel.: +971 4 3405678

Fax: +971 4 3450677

Email: mld@eim.ae

Website: www.mlab.ae

Test Reports on Physical, Chemical and Thermal Properties of Bronya Classic

Client : Bronya
Address : P.O Box: 299195, SIT Tower, Silicon Oasis, Dubai, U.A.E
Telephone : +971 4 336 3422
Fax : +971 4 336 3422
Lab Project No. : P – 3004
Date : 11-August-2015

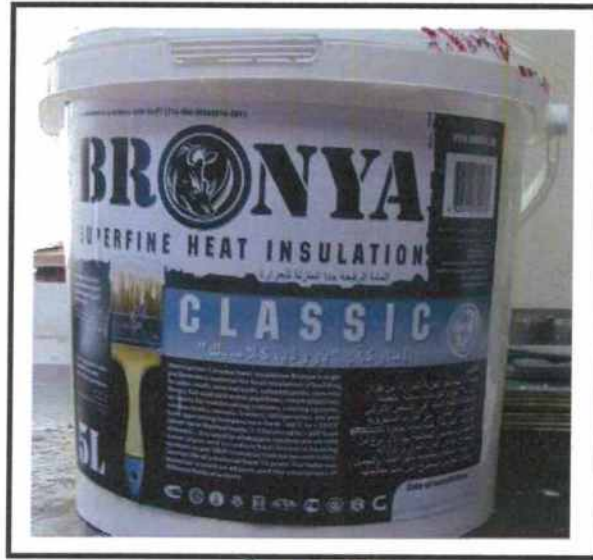




Table of Contents:

- 1: Introduction
- 2: Detailed Test Reports
- 3: Summary of all Test Results
- 4: Technical Data Sheet
- 5: Accreditation Certificates
- 6: Calibration Certificates
- 7: Pictures





1: INTRODUCTION



Certificate Number: SNR 30362926/4/Q



ماتيريال لاب - دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae

Introduction:

Bronya appointed Material Lab for testing of physical, chemical and thermal properties of Bronya Classic. The following tests were conducted as requested by the client:

1. Chemical Resistance
2. Resistance to Water
3. Thermal Conductivity
4. Heat Transmission Reduction
5. Bond Strength on Metal Substrate
6. Pb Content
7. VOC Content

Instrumentation:

In order to conduct the above mentioned tests, the following calibrated instruments were used:

- ICP/OES
- Laser Com
- GC / FID
- Pull Off Tester
- Digital Data Logger
- Humidity Chamber
- Temperature Monitoring System
- Thermocouples



Test Methods:

Following standards were followed for conducting the tests requested by Bronya:

- | | |
|-------------------------------------|----------------|
| 1. Chemical Resistance | ASTM D543 - 95 |
| 2. Resistance to Water | ASTM D543 - 95 |
| 3. Thermal Conductivity | ASTM C518 - 10 |
| 4. Heat Transmission Reduction | MLD-GMS |
| 5. Bond Strength on Metal Substrate | ASTM D4541-95 |
| 6. Pb Content | ICP - OES |
| 7. VOC Content | ASTM-D3960 |





Technical Details (provided by the client):

Technical details of Bronya Classic are provided below:

"Liquid thermal insulation Bronya Classic is a universal basic composition suitable for various applications which has high and stable adhesion to metals and construction materials. Thermal insulation Bronya Classic is a temperature resistant, weather-protective, not vapour-resistant coat which contains rust inhibitors.

Extra-fine insulation Bronya Classic is highly effective for insulation of building sides, roofs, internal walls, window jambs, concrete floors, hot and cold water supply pipelines, steam pipelines, ducting for air conditioning systems, cooling systems, various vessels, tanks, trailers, refrigerators and etc. It is used to avoid condensing on cold water supply pipelines and to decrease heat loss in pursuance of Construction Norms and Regulations (SNiP) in heating systems. **The product is suitable for use in temperatures from -60° to +200° C (up to +260 in peak short-term period). Product service life is up to 15 years."**



Certificate Number: SNR 30362926/4/Q



ماتيريال لاب- دبي، صندوق بريد: 114717 هاتف: +971 4 3405678، فاكس: +971 4 3405677
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: 61831، هاتف: +971 2 5503040، فاكس: +971 2 5503041

Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mid@eim.ae Website: www.mlab.ae



2: DETAILED TEST REPORTS





2.1: CHEMICAL RESISTANCE TEST REPORT



Certificate Number: SNR 30362926/A/Q



ماتيريال لاب- دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677

Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



REPORT ON CHEMICAL RESISTANCE TO SOLVENT OF PAINT INSULATION

Page: 6 of 8

Client : BRONYA
Address : P.O.Box Dubai, U.A.E
Contractor : NP
Consultant : NP
Project Name : NP
Sample Name : Bronya Classic
Sample Size (kg) : 5
Sender's Id : NP
Client Ref No. : Q/SZ/946-B/15
Sampling Date : 25/07/2015
Sampled by : Client
Source of Sample : Client

Report No : 434720 SN 2/3
Lab Project No : P-3004
Lab Sample No : 15-434720/6
Tested by : JD
Date sample received : 25/07/2015
Date test started : 28/07/2015
Date test completed : 10/08/2015
Report Date : 11/08/2015
Specimen Size : 0.6 mm (2 layer coat)
Room testing temp. : 25 °C
Relative humidity : 55%
Immersion Period : 10 days

Test Data:-

Type of Solvent	Visual Observation	
	Before Immersion	After Immersion
Distilled Water	white color smooth thin film specimen	No changes has been observed
Alkali solvent (5% NaOH)	white color smooth thin film specimen	No changes has been observed

Test Method : ASTM D 543-95 Practice A-Immersion Test
Method variation : None
Remarks : None


Authorized Signatory



Result relates only to the item tested.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Certificate Number: SNR 30362926/A/Q



ماتيريال لاب- دبي، صندوق بريد: 114717 هاتف: +971 4 3405678، فاكس: +971 4 3405677
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: 61831، هاتف: +971 2 5503040، فاكس: +971 2 5503041

Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax : + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



2.2: THERMAL CONDUCTIVITY TEST REPORT



Certificate Number: SNR 30362926/4/Q



ماتيريال لاب- دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



REPORT ON THERMAL CONDUCTIVITY OF BRONYA CLASSIC

Page : 1 of 1

Client name : **BRONYA**
Address : P.O.Box Dubai, U.A.E.
Consultant : Not specified
Contractor : Not specified
Project name : Not specified
Project No. : Not specified
Project Location : Not specified

Report No. : **434720 SN 1/1**
Lab. Sample No : **15-434720/1**
Lab. Project No : **P-3004**
Sender's Ref. : **Q/SZ/946-B/15**
Sender's ID. : **NP**

Sample Description : **BRONYA CLASSIC**
Work Size (mm) : 300 x 300 mm
Calibration used : 1450b
Set point upper : 30°C
Set point lower : 40°C
Mean temperature : 35°C
Orientation of Specimen : Horizontal

Source : Client
Sampling Method : Random
Sampling date : 25-Jul-15
Sampled by : Client
Sample brought by : Client
Report Date : **8-Aug-15**
Tested By : JD

DATE SPECIMEN RECEIVED	25-Jul-15
DATE TESTED	04-Aug-15
THICKNESS OF SPECIMEN (mm) UNCOATED	49.727
THICKNESS OF SPECIMEN (mm) COATED	51.079
THICKNESS OF BRONYA CLASSIC (mm)	1.708
TEMPERATURE,RH & TIME AT WHICH SPECIMEN CONDITIONED.	25± 5° C , 60±5 %RH, 48 hr

Lab Sample No.	Sample Description	Thermal Conductance		*Thermal Conductivity		Thermal Conductivity of Bronya Classic
		W/m ² K	BTU/h-ft ² F	W/mK	BTU-in/h-ft ² F	
15-356704/1	Uncoated polystyrene	0.699	0.123	0.03475	0.241	W/mK
15-356704/2	Coated polystyrene	0.702	0.124	0.03587	0.249	0.001
15-356704/3	BRONYA Classic	28.039	4.936	0.04789	0.332	

Test Method : ASTM C518 -10

Remarks : (i) Test witnessed by Client.
(ii) Test specimen preparation conducted by Client.
(iii) This test was conducted by measuring the thermal conductivity of polystyrene foam before and after the coating with Bronya Classic.


Authorized Signatory



Note : * This test accredited by ENAS.

Results relate only to the item tested.
This report shall not be reproduced except in full, without the written approval of the laboratory





ماتيريال لاب
Material Lab



2.4: BOND STRENGTH ON CONCRETE SUBSTRATE TEST REPORT



Certificate Number: SNR 30362926/4/Q



ماتيريال لاب- دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



REPORT ON DETERMINATION OF PULL OFF STRENGTH OF BRONYA CLASSIC

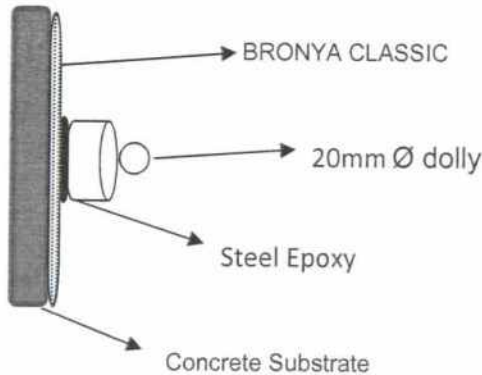
Page 2 of 5

Client : BRONYA
Address : P.O.Box Dubai, U.A.E.
Contractor : NP
Consultant : NP
Project Name : NP
Project No. : NP
Sample Description : BRONYA CLASSIC
Source of sample : Client
Substrate used : Concrete Substrate
Sampled by : Client
Direction of Test : Vertical

Report No : 436708 SN 1/1
Lab Project No : P-3004
Lab. Sample No.: 15-436708/1-3
Type of epoxy used to test: Steel Epoxy
Date test started : 28/07/2015
Date test completed : 04/08/2015
Report Date : 04/08/2015
Sender's No : NP
Tested by : SH

Test Data :

Lab Sample No.	Test Location	Area of Dolly (mm ²)	Maximum Load (N)	Pull Off Strength (N/mm ²)	Failure Mode
15-436708/1	Concrete Substrate	314	320	1.02	Cohesive failure within the BRONYA CLASSIC
15-436708/2		314	305	0.97	
15-436708/3		314	349	1.11	



Test Method : ASTM D 4541-95
Test method variation : Nil
Remarks : Pull off test was carried out using a digital Positest Adhesion Tester.



Results relate only to the item tested.
This report shall not be reproduced except in full without written approval of the laboratory.

Certificate Number: SNR 30362926/4/Q1



ماتيريال لاب- دبي، صندوق بريد: 114717 هاتف: +971 4 3405678، فاكس: +971 4 3405677
ماتيريال لاب جلف لفحص التربة - أبوظبي : صندوق بريد: 61831، هاتف: +971 2 5503040، فاكس: +971 2 5503041
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



2.5: Pb CONTENT TEST REPORT



Certificate Number: SNR 30362926/4/Q



ماتيريال لاب - دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



REPORT ON LEAD CONTENT OF BRONYA CLASSIC

Page: 4 of 5

Client : BRONYA
Address : P.O.Box Dubai, U.A.E
Contractor : NP
Consultant : NP
Project Name : NP
Sample Name : Bronya Classic
Sample Size : NP
Sender's Id : NP
Client Ref No. : Q/SZ/946-B/15
Sampling Date : 23/07/2015
Sampled by : Client
Source of Sample : Client

Report No : 436708 SN 1/1
Lab Project No : P-3004
Lab Sample No : 15-436708/1
Tested by : GK
Date sample received : 25/07/2015
Date test started : 03/08/2015
Date test completed : 04/08/2015
Report Date : 04/08/2015

Test Data:-

PARAMETERS	TEST METHOD	UNIT	DETECTION LIMIT	RESULTS
Lead as (Pb)	ICP-OES	mg/Kg (ppm)	0.01	<0.01

Method variation : None
Remarks : None

Syed N. Rizvi
Authorized Signatory
007 سيد نواز رضوي
Syed N. Rizvi
Manager (OGEC)



Result relates only to the item tested.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Certificate Number: SNR 30362526/A/Q



ماتيريال لاب- دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي : صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax : + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



2.6: VOC CONTENT TEST REPORT



Certificate Number: SNR 30362926/4/Q



ماتيريال لاب- دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي : صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax : + 971 4 3405677

Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



REPORT ON DETERMINATION OF VOLATILE ORGANIC COMPOUNDS OF BRONYA CLASSIC

Page: 5 of 5

Client : BRONYA
Address : P.O.Box Dubai, U.A.E
Contractor : NP
Consultant : NP
Project Name : NP
Sample Name : Bronya Classic
Sample Size : NP
Sender's Id : NP
Client Ref No. : Q/SZ/946-B/15
Sampling Date : 23/07/2015
Sampled by : Client
Source of Sample : Client

Report No : 436708 SN 1/1
Lab Project No : P-3004
Lab Sample No : 15-436708/1
Tested by : GK
Date sample received : 25/07/2015
Date test started : 03/08/2015
Date test completed : 04/08/2015
Report Date : 04/08/2015

Test Results

Test Name	Test Method	UNIT	Detection Limit	Result
Volatile Organic Compounds (VOCs)	ASTM D 3960	ppm	1.0	86.0

Method variation : None
Remarks : None

Syed N. Rizvi
Authorized Signatory



Result relates only to the item tested.
This report shall not be reproduced except in full, without the written approval of the laboratory.

Certificate Number: SNR 30362926/4/Q



ماتيريال لاب - دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



3: SUMMARY OF ALL TESTS





Below is the summary of all tests conducted on Bronya Classic:

Sr. No.	Test Description	Test Method	Unit	Test Result
1	Chemical Resistance	ASTM D543-95	Observation	No change
2	Resistance to Water	ASTM D543-95	Observation	No change
3	Thermal Conductivity	ASTM C518-10	W/mK	0.001
4	Average Bond Strength on Concrete Substrate	ASTM D4541-95	N/mm ²	1.033
5	Pb Content	ICP-OES	ppm	<0.01
6	VOC Content	ASTM D3960	ppm	86.0

Summary of all tests conducted





4: TECHNICAL DATA SHEET



Certificate Number: SNR 30362926/4/Q



ماتيريال لاب- دبي، صندوق بريد: 114717 هاتف: +971 4 3405678، فاكس: +971 4 3405677
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: 61831، هاتف: +971 2 5503040، فاكس: +971 2 5503041
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



5: ACCREDITATION CERTIFICATES



Certificate Number: SNR 30362926/A/Q



ماتيريال لاب- دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١

Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax : + 971 4 3405677

Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041

Email: mid@eim.ae Website: www.mlab.ae



United Arab Emirates

هيئة الإمارات للمواصفات والمقاييس
Emirates Authority For Standardization & Metrology

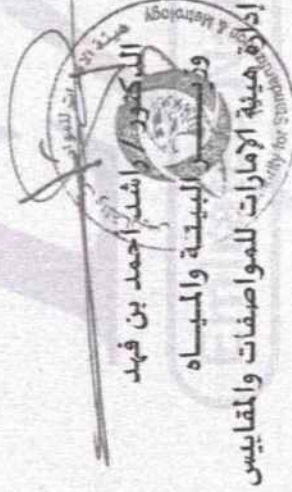


Certificate of Accreditation

ماتيريال لاب (NAL-68) دبي
Material Lab (NAL-68) Dubai, UAE (القوز - دبي - الإمارات العربية المتحدة)

1 حاصل على الاعتماد في مجال "فحص المواد الانشائية وفق الفحوصات المذكورة في وثيقة المجال المرفقة" وفقا للمتطلبات الدولية: ISO/IEC 17025
Accredited according to ISO/IEC 17025 to undertake tests in the field(s) of "Construction material as per attached Test Methods"

تاريخ منح الاعتماد 2014/06/12
تاريخ الانتهاء 2017/06/11



رئيس مجلس إدارة هيئة الإمارات للمواصفات والمقاييس

Accreditation in accordance with the requirements of ISO/IEC 17025:2005 "requirements for testing and calibration laboratories" & the relevant ENAS & ILAC guidelines.
This certificate is invalid without the attached scope of accreditation and shall remain valid until the expiration date above, subject to continuing compliance with the requirements of the accreditation system.

1 وفقا لمتطلبات المواصفة الدولية ISO/IEC 17025:2005 "المتطلبات العامة لكفاءة مختبرات القياس والمعايرة" والأدلة ذات العلاقة الخاصة بالمنظمة الدولية لاعتماد المختبرات ILAC للقيام بالأنشطة الواردة في وثيقة المجال. تعتبر هذه الشهادة صالحة وقابلة للتحديث وإعادة الاصدار حتى تاريخ الانتهاء، المكون اعلاه شريطة استمرار الجهة المذكورة اعلاه في تطبيق متطلبات المواصفات والأدلة سالفة الذكر، وتتعمل الجهة مسؤولة الشهادات الصادرة عنها وتضطلع بمسؤوليات الاعتماد المذكورة في وثيقة المجال المرفقة لمعلومات متابعة لاحقة من قبل نظام الاعتماد الوطني.

هاتف: +971 4 2944434
فاكس: +971 4 2944428

صندوق بريد الإمارات العربية المتحدة
PO.Box 48666, Dubai - United Arab Emirates



هاتف: +971 2 4032700
فاكس: +971 2 6715999
صندوق بريد أبو ظبي - الإمارات العربية المتحدة
PO.Box 2166, Abu Dhabi - United Arab Emirates

ACF 11-21; Rev 1; Issue date 19.03.2014

600-565554
esma.gov.ae



United Arab Emirates

هيئة الإمارات للمواصفات والمقاييس
Emirates Authority For Standardization & Metrology



Accreditation Scope

MATERIAL LAB, Dubai, NAL 068
Testing Lab, Al Quoz, Dubai, UAE

#	Test Material /Matrix	Description of the Test	Tested Method/Standard
---	-----------------------	-------------------------	------------------------

1.	Concrete	Solar Reflective Index	ASTM E 1980
2.		Thermal Conductivity	ASTM C 518
3.	Asphalt	Determination of bitumen content by ignition method	ASTM D 6307
4.		Sieve analysis of extracted aggregates	ASTM D 5444
5.		Marshal properties Voids (VIM, VMA, VFB)	MS-2
6.		Stability flow stiffness	ASTM D 6927
7.		Determination of marshal density	ASTM D 2726
8.		Thickness and density of compacted bituminous mixtures	ASTM D 3549
9.	Cement	Dimensions compressive strength of cement	EN 196 Part 1
10.		Setting time	EN 196 Part 3
11.		Fineness of cement	ASTM C 204

END

Emirates National Accreditation


 Program Manager's signature






**Quality Management System
Certificate of Approval**

This is to certify that the QMS of

MATERIAL LAB

P.O. BOX 114717, DUBAI, U.A.E.

Has been assessed and found to meet the requirements of

ISO 9001:2008

This certificate is valid for the following scope of operations:

OIL & PETROLEUM PRODUCTS TESTING, CONSTRUCTION MATERIAL TESTING, GEO-TECHNICAL INVESTIGATION ENVIRONMENT TESTING, NOISE MONITORING, GLASS TESTING, ACOUSTIC TESTING & FIRE RESISTANCE TESTING

Authorised by:

**Stan Wright
Chief Executive**

Date of Certificate Issue: 22 May 2015

Certificate Valid Until: 21 May 2016

Recertification audit before 21 April 2018. Certified since 22 May 2015.

This certificate is the property of DAS Certification and remains valid subject to satisfactory annual Surveillance audits.

SN Registrars (Holdings) Limited

Registration House, 22b Church Street,
Rushden, Northamptonshire,
NN10 9YT, UK
Tel: +44 (0) 1933 381859
Email: info@snregistrars.com
Web: www.snregistrars.com
Company number: 07659067

Certificate Number: SNR 30362926/4/Q



Member of SN Registrars (Holdings) Ltd

8327



ACCREDITATION CERTIFICATE

LB-008-TEST

Dubai Accreditation Department

has accredited

Material Lab

Dubai- United Arab Emirates

In accordance with the requirements of ISO/ IEC 17025: 2005 to undertake the tests in the fields of:

**Construction Materials Testing
Geotechnical Investigation
Environmental Testing**

For the tasks listed in the attached Scope of Accreditation

This Accreditation is invalid without the attached scope of accreditation and shall remain in force within the validity period printed below, subject to continuing compliance with the requirements of the accreditation program.

Validity of Certificate: from 25- 01- 2015 to 06- 03- 2016

Initial Accreditation Date: 05- 02- 2004


Director, Dubai Accreditation Department



6: CALIBRATION CERTIFICATES

Certificate Number: SNR 30362926/A/Q



ماتيريال لاب- دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677

Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae



Certificate of Calibration

TEMPERATURE LOGGER

SERIAL NO : 150501100

Issue date	Calibration date	Calibration due	Certificate No:	DCML/40847/2015
15.07.2015	13.07.2015	13.07.2016*	Job No:	19758
ISSUED TO:	MATERIAL LAB DUBAI, U.A.E.		ISSUED FOR	Not applicable
Details of equipment under test		Details of working standards used		
Make	CENTER	Equipment	ID No:	Certificate No.
Model :	309	Digital thermometer with PRT	18A-1294	2013085668
Serial No: of readout :	150501100		DCML/T-22	
Sensor used	"K" type thermocouple wire	Environmental conditions		Calibrated by Vahid
Asset No :	DL-31	Temperature °C	Humidity %	
Ranges : in °C	-200 to 1370	22.7	35	
Readability :	0.1°C upto 200°C then 1°C	CONDITION : The EUC is in working order when received		
Location	Danway Lab, Al Quoz Ind. area # 3, Plot # 368-303	for calibration		

Traceability Statement :

All the temperature measurements reported in this certificate are traceable to ITS-90 through the calibration performed by DCL (Lab # LB 014) an accredited lab by DAC.

Calibration method (DCML-T/WI-001):

The sensor of the temperature logger under calibration and two numbers of PRT were immersed in a temperature controlled bath. One PRT is used as the master thermometer and the other as a check standard.

The readings of the EUT and master thermometer were compared to find the error in indication of the EUT.

Deviation : Repeatability test was not done as the EUT records the temperature after certain intervals.

* Note : As per clause 5.10.4.4, of ISO/IEC 17025 : 2005, a calibration certificate shall not contain any recommendation on the calibration interval except where this has been agreed with the customer.

Calibration Results in °C (Channel-T1)

Actual temperature (Average) in °C	Indicated temperature	Error in °C	Uncertainty in ± °C
10.545	10.4	-0.145	0.2
25.640	25.7	0.060	0.2
50.047	49.6	-0.447	0.2
76.691	76.2	-0.491	0.2
101.511	101.1	-0.411	0.2



APPROVED SIGNATORY.....

K. Ravindranath (Manager DCML)

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%. The uncertainties stated in this certificate refer to the values obtained during the verification and make no allowances for any drift.

This certificate may not be reproduced other than in full without the written approval of DCML.

DCML is not responsible for any consequences due to the improper usage of the equipment.

Continuation Sheet
TEMPERATURE LOGGER
SERIAL NO : 150501100

DCML/40847/2015

Calibration Results in °C (Channel-T2)

Actual temperature (Average) in °C	Indicated temperature	Error in °C	Uncertainty in ± °C
10.545	10.8	0.255	0.2
25.637	25.4	-0.237	0.2
50.051	49.7	-0.351	0.2
76.691	76.4	-0.291	0.2
101.509	101.0	-0.509	0.2

Calibration Results in °C (Channel-T3)

Actual temperature (Average) in °C	Indicated temperature	Error in °C	Uncertainty in ± °C
10.553	10.6	0.047	0.2
25.633	25.4	-0.233	0.2
50.047	49.7	-0.347	0.2
76.683	76.1	-0.583	0.2
101.509	101.0	-0.509	0.2

Calibration Results in °C (Channel-T4)

Actual temperature (Average) in °C	Indicated temperature	Error in °C	Uncertainty in ± °C
10.550	10.7	0.150	0.2
25.635	25.7	0.065	0.2
50.050	49.2	-0.850	0.2
76.685	76.4	-0.285	0.2
101.507	101.0	-0.507	0.2

Handwritten mark

CERTIFICATE OF CALIBRATION

Certificate No.	BDH/2014/3771/01	Page	1	of	2
-----------------	------------------	------	---	----	---

NAME & ADDRESS OF THE CUSTOMER

Material Lab
P.O. Box: 114717, Al Quoz, Dubai, United Arab Emirates

DESCRIPTION OF THE UNIT UNDER CALIBRATION

Unit Under Test		Calibration Conditions	
Name of Instrument	Universal Testing Machine	Date of calibration	14/12/2014
Type	Digital	Recommended Due Date	13/12/2015
Make	Tinius Olsen	Temperature	23 ± 5 °C
Model	H25KT	Humidity	50 ± 15 %
Machine Capacity	25 kN	Location	Lab
Sr. No	H25KT-0084	Calibrated by	Gene & Prashant
ID No	-NA-	Condition on receipt	Good
Load cell Capacity	-NA-	Date of receipt	14/12/2014
Load cell Sr. No	-NA-	Mode of calibration	Tension

DETAILS OF MASTER EQUIPMENTS

	Load cell 1	Weights
Capacity	5kN	1 to 200N
ID No.	LC-05	CDW-15
Certificate No	UME G2KV-0042	Z13 13118
Calibration Due Date	17.05.2015	02.12.2015
Traceable To	UME, Turkey	COFRAC

METHODOLOGY

The machine is calibrated using indicated force method. Force is applied from the machine & the true force is measured on the master force measuring instrument. Three series are taken & the relative accuracy & repeatability errors are calculated. For Class A, the tolerances for relative accuracy & repeatability errors are 1%. The referred method is ASTM E4 - 10 & the internal work instructions is WI-44 Iss.No.00 dtd 1.11.14. The calibration is traceable to international standards by calibration at NMI. Uncertainty is calculated as per the ISO 17025 guideline.

VISUAL INSPECTION CHECK LIST FOUND SATISFACTORY

- * Machine is in good working condition
- * Crosshead mechanism permits uniform & smooth variation of force to be verified with sufficient accuracy.
- * M/c structure & gripping systems permit for axial loading.
- * There is no pronounced wear or defects in the guiding elements of the moving crosshead or grips.
- * Flatness of the loading platen is found satisfactory.
- * Machine structure & gripping systems permit for axial loading.
- * Machine is not affected by any other environmental conditions like vibrations electrical supply interferences , effects of corrosion & local temperature variations etc.

Checked By



Gene Palor
(Calibration Engineer)

BDH Laboratories
Calibration Division
P.O. Box: 28637, Dubai - U.A.E.

Approved By



Prashant Aklekar
(Tech. Manager)

DOC NO. BDH/1.1 ISSUE NO. 04 DT. 18.03.2014

Continuation Sheet No. 2

Certificate No. BDH/2014/3771/01	Page 2 of 4
----------------------------------	-------------

CALIBRATION RESULTS

Load cell used	Load N	Std. Rdg.	Observed Readings			Mean	% Rel. Accuracy Error	% Rel. Repeatability Error	% Exp. Uncertainty
			0 °	120 °	240 °				
5kN	200	200.01	200.8	200.9	200.9	200.87	-0.43	0.05	0.30
5kN	800	799.98	800.1	800.0	800.9	800.33	-0.04	0.11	0.30
5kN	1400	1399.85	1400.1	1400.9	1400.9	1400.63	-0.06	0.06	0.30
5kN	2000	1999.62	2000.8	2001.8	2001.3	2001.30	-0.08	0.05	0.30
25kN	2000	1995.5	2000.3	2000.7	2001.2	2000.73	-0.26	0.04	0.30
25kN	8000	7986.1	8000.1	8001.9	8002.0	8001.33	-0.19	0.02	0.30
25kN	10000	9984.1	9998.1	9999.1	9999.8	9999.00	-0.15	0.02	0.30
25kN	15000	14981.1	14997.1	14999.8	14998.2	14998.37	-0.12	0.02	0.30
25kN	20000	19979.6	19993.8	19989.7	19996.4	19993.30	-0.07	0.03	0.30
25kN	25000	24978.5	24999.8	24996.7	24999.0	24998.50	-0.08	0.01	0.30
Residual load			1.7	3.2	1.9	Classification of M/c			ClassA
Range I			20 to 25000 N			Resolution			0.8 kN

25kN - S/N: 0243570 - ID. NO. LC-01

Remarks : The machine has been calibrated by increasing force only & is not adjusted prior to calibration.
The machine was not be checked for eccentricity.

Checked By



Gene Palor
(Calibration Engineer)

BDH Laboratories
Calibration Division
P.O. Box: 28637, Dubai - U.A.E.

Approved By



Prashant Aklekar
(Tech. Manager)

- This report refers to the item calibrated at customers site & the results are valid at the time of and under the conditions of measurement only.
- This report may not be reproduced, except in full without prior permission of BDH Laboratories.
- Any correction in this certificate, invalidates the certificate.
- BDH Laboratories is not liable for any change in calibration data and performance on account of malfunctioning of instrument / equipment covered by this report or due to damage caused to it after issuance of this report.
- Uncertainty of Measurement is at 95 % Confidence level with k=2 & the measurements are traceable to National / International Standards.
- Our calibrated load cells are temperature compensated, so accordingly correction is not required.
- The machine shall in any case be re- calibrated if it is moved to a new location necessitating dismantling or if it is subjected to major repairs or adjustments.

DOC NO. BDH/1.44 ISSUE NO. 00. DT. 01.11.2014



VWR
INTERNATIONAL



BDH LABORATORIES

P.O. Box : 28637, Ground Floor, Al Bindrai Building, 13 St.

Umm Ramool Ind. Area, Al Rashidiya, Dubai, U.A.E

Tel : +971 4 2852211, Fax : +971 4 2863666

E-mail : calibrationsales@bdhme.com, www.bdhcallab.com

Continuation Sheet No. 4

Certificate No.	BDH/2014/3771/01	Page	4	of	4
-----------------	------------------	------	---	----	---

CALIBRATION RESULTS

Load cell used	Load N	Std. Rdg.	Observed Readings			Mean	% Rel. Accuracy Error	% Rel. Repeatability Error	% Exp. Uncertainty
			0 °	120 °	240 °				
Weights	40	39.86	39.7	39.7	39.7	39.70	0.40	0.00	0.30
Weights	160	159.43	158.9	158.9	158.7	158.83	0.37	0.13	0.30
Weights	280	278.99	278.6	278.6	278.6	278.60	0.14	0.00	0.30
Weights	400	398.56	396.4	396.4	396.4	396.40	0.54	0.00	0.30
5kN	400	400.01	403.1	403.2	403.2	403.17	-0.79	0.02	0.30
5kN	1000	999.95	1001.4	1001.6	1002.0	1001.67	-0.17	0.06	0.30
5kN	2000	1999.62	2002.3	2003.1	2004.0	2003.13	-0.18	0.08	0.30
5kN	3000	2999.05	3005.1	3008.6	3009.9	3007.87	-0.29	0.16	0.30
5kN	4000	3998.26	4009.1	4010.1	4011.6	4010.27	-0.30	0.06	0.30
5kN	5000	4997.26	5009.8	5015.6	5018.1	5014.50	-0.34	0.17	0.30
Residual load			0.8	1.7	2.0	Classification of M/c			ClassA
Range I			40 to 5000N			Resolution			0.2 N

5kN - S/N: 180463 - ID. NO. LC-02

Remarks : The machine has been calibrated by increasing force only & is not adjusted prior to calibration.
The machine was not be checked for eccentricity.

Checked By

Gene Palor
(Calibration Engineer)

BDH Laboratories
Calibration Division
P.O. Box: 28637, Dubai - U.A.E.

Approved By

Prashant Akiekar
(Tech. Manager)

- * This report refers to the item calibrated at customers site & the results are valid at the time of and under the conditions of measurement only.
- * This report may not be reproduced, except in full without prior permission of BDH Laboratories.
- * Any correction in this certificate, invalidates the certificate.
- * BDH Laboratories is not liable for any change in calibration data and performance on account of malfunctioning of instrument / equipment covered by this report or due to damage caused to it after issuance of this report.
- * Uncertainty of Measurement is at 95 % Confidence level with k=2 & the measurements are traceable to National / International Standards.
- * Our calibrated load cells are temperature compensated, so accordingly correction is not required.
- * The machine shall in any case be re- calibrated if it is moved to a new location necessitating dismantling or if it is subjected to major repairs or adjustments.

DOC NO.BDH/1.1 ISSUE NO.04 DT.18.03.2014

ص.ب: ٢٨٦٣٧، دبي - ا.ع.م.، الطابق الأرضي، بناية البندري، شارع ١٣، أم رمول المنطقة الصناعية، الراشدية
تليفون: ٢٨٥٢٢١١، فاكس: ٢٨٦٣٦٦٦، +٩٧١، إيميل: calibrationsales@bdhme.com، ويب: www.bdhcallab.com

سجل تجاري رقم: ٦٤٥٩٦٢ والراسمال المدفوع: ٣٠٠ ألف درهم
Commercial Registration No. 645962 and paid up capital AED 300 Thousand.

Continuation Sheet No. 3

Certificate No.	BDH/2014/3771/01	Page	3	of	4
-----------------	------------------	------	---	----	---

CALIBRATION RESULTS

Load cell used	Load N	Std. Rdg.	Observed Readings			Mean	% Rel. Accuracy Error	% Rel. Repeatability Error	% Exp. Uncertainty
			0 °	120 °	240 °				
Weights	20	19.928	19.95	19.95	19.95	19.950	-0.11	0.00	0.30
Weights	80	79.712	79.70	79.70	79.70	79.700	0.02	0.00	0.30
Weights	140	139.498	139.52	139.52	139.52	139.520	-0.02	0.00	0.30
Weights	200	199.279	199.50	199.50	199.50	199.500	-0.11	0.00	0.30
Weights	220	219.207	219.52	219.52	219.52	219.520	-0.14	0.00	0.30
Weights	360	358.70	359.48	359.48	359.48	359.480	-0.22	0.00	0.30
Weights	360	360.01	359.8	359.1	359.2	359.37	0.18	0.19	0.30
Weights	500	500.01	499	499	499	499.2	0.17	0.06	0.30
Residual load			0.06	0.01	0.02	Classification of M/c			ClassA
Range I			20 to 500N			Resolution			0.08
									N

500N - S/N: 176555 - ID. NO. LC-03

Remarks : The machine has been calibrated by increasing force only & is not adjusted prior to calibration.
The machine was not be checked for eccentricity.

Checked By

Gene Palor

Gene Palor
(Calibration Engineer)

BDH Laboratories
Calibration Division
P.O. Box: 28637, Dubai - U.A.E.

Approved By

Prashant Aklekar

Prashant Aklekar
(Tech. Manager)

- * This report refers to the item calibrated at customers site & the results are valid at the time of and under the conditions of measurement only.
- * This report may not be reproduced, except in full without prior permission of BDH Laboratories.
- * Any correction in this certificate, invalidates the certificate.
- * BDH Laboratories is not liable for any change in calibration data and performance on account of malfunctioning of instrument / equipment covered by this report or due to damage caused to it after issuance of this report.
- * Uncertainty of Measurement is at 95 % Confidence level with k=2 & the measurements are traceable to National / International Standards.
- * Our calibrated load cells are temperature compensated, so accordingly correction is not required.
- * The machine shall in any case be re- calibrated if it is moved to a new location necessitating dismantling or if it is subjected to major repairs or adjustments.

DOC NO. BDH/1.44 ISSUE NO.00 DT.01.11.2014



Certificate of Analysis

Certipur® Certified Reference Material

Producer:	Merck KGaA, Frankfurter Str. 250, 64293 Darmstadt, Germany.
Description of CRM:	ICP multi-element standard solution IV
Ord. No.:	1.11355.0100
Lot No.:	HC379062
Composition:	23 elements in HNO ₃ Suprapur® 6.5%
Density:	The density of the standard solution is 1.090 g/cm ³ at 20°C.
Method of Analysis:	Inductively coupled plasma optical emission spectrometry (ICP-OES).
Traceability:	This reference material has been measured applying high precision ICP-OES and is directly traceable to the corresponding NIST SRM® as mentioned on page 2. <i>NIST: National Institute of Standards and Technology, Gaithersburg, USA.</i>
Storage:	Store at +15°C to +25°C tightly closed in the original container.
Application and correct use:	This reference material is intended for use as calibration standard for atomic absorption spectrometry, spectrophotometry and other analytical techniques. Shake well before use and never pipet directly from the original container.
Date of release:	2013/03/11
Minimum shelf life:	2016/03/31

TC-01
Shbin

CERTIFICATE OF CALIBRATION

Date of Issue -	09/02/2015	Certificate No.	BDH/2015/A0035/02	Page 1 of 1
-----------------	------------	-----------------	-------------------	-------------

NAME & ADDRESS OF THE CUSTOMER

MATERIAL LAB
P.O. Box: 114717, Al Quoz, Dubai, United Arab Emirates

DETAILS OF INSTRUMENT UNDER CALIBRATION

UNIT UNDER TEST		CALIBRATION CONDITIONS	
Name of Instrument	Heat Flow Meter	Calibrated On	09/02/2015
Type	Digital	Recommended Due Date	08/02/2016
Make	Lasercomp	Temperature	23±5°C
Model	-NA-	Humidity	50±15%RH
Calibrated Points	30 and 40°C	Location	Chemical Lab
Sr. No.	06120864	Calibrated By	Rafsal / Shbin
ID No.	TC-01	Condition on receipt	Good
Resolution	0.01 °C		

DETAILS OF MASTER EQUIPMENT USED FOR CALIBRATION

Description	Digital Thermometer with RTD Sensor
Sr. No / ID No.	12029291 / 12033601 / 12033604 (DTI-01, MTS-23 & MTS-24)
Calibration Due Date	29.06.2015
Traceability	NIST

CALIBRATION RESULTS

Upper	Set Temperature (°C)	Standard Reading (°C)	UUC Reading (°C)	Deviation (°C)
Center	30.00	30.43	30.03	-0.40
Left	30.00	30.47	30.02	-0.45
Right	30.00	30.46	30.02	-0.44
Back	30.00	30.45	30.03	-0.42
Front	30.00	30.43	30.03	-0.40

Lower	Set Temperature (°C)	Standard Reading (°C)	UUC Reading (°C)	Deviation (°C)
Center	40.00	40.37	40.02	-0.35
Left	40.00	40.42	40.03	-0.39
Right	40.00	40.43	40.03	-0.40
Back	40.00	40.42	40.02	-0.40
Front	40.00	40.42	40.02	-0.40

Mean Temperature = 35.44°C

Checked By

Shbin Joseph Mathew

Shbin Joseph Mathew
(Calibration Engineer)

BDH Laboratories
Calibration Division
P.O. Box: 28637, Dubai - U.A.E.

Approved Signatory

Prashant Aklekar

Prashant Aklekar
(Tech. Manager)

1. This report refers to the item calibrated & valid at the time of and under the conditions of measurement only.
2. This report may not be reproduced, except in full without prior permission of BDH Laboratories.
3. Any correction in this certificate, invalidates the certificate. * The equipment is calibrated in as received condition & not subjected to any repairs.
4. BDH Laboratories is not liable for any change in calibration data or performance specifications on account of malfunctioning of standard instrument / Equipment covered by this report or due to damage caused to it after issuance of this report.

DOC NO. BDH/1.7 ISSUE NO. 01 DT, 09.03.2014

Certificate of Calibration

HUMIDITY CHAMBER

SERIAL NO : 1597

Issue Date : 30.10.2014

Certificate No : DCML/37768/2014

Job No : 18195

FOR:

MATERIAL LAB
DUBAI, U.A.E.

IDENTIFICATION:

Make : OSWORLD
Model : OSC-S-4
Serial No : 1597
Asset No : OI-1
Range : 0 to 100°C
Readability : 0.1°C
Location : Lab, Al Quoz

DATE OF CALIBRATION:

29.10.2014

CALIBRATION DUE ON:

29.10.2015 (See Noe 1)*

BASIS OF CALIBRATION:

DCML-T/WI-002 Based on DKD Guideline DKD-R 5-7

CALIBRATED BY:

Renju Pillai

CALIBRATION TEMPERATURE (AVERAGE) : 22.5°C

REFERENCE EQUIPMENT USED :

Digital thermometer with thermocouple Asset No : DCML/T-01, Calibrated against the thermometer Asset No : DCML/T-22 Calibrated By DCL . Certificate No : DCML/37496/2014

Note 1 :

As per clause 5.10.4.4, of ISO/IEC 17025 : 2005, a calibration certificate shall not contain any recommendation on the calibration interval except where this has been agreed with the customer.

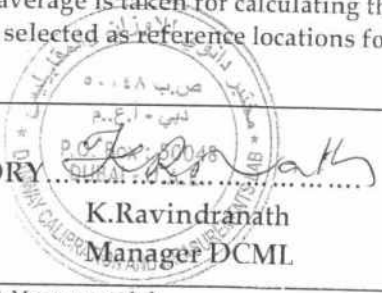
Traceability Statement:

All the temperature measurements reported in this certificate are traceable to ITS-90.

METHOD :

The temperature of the chamber is checked at 5 points inside the volume including the geometric center of the equipment. 10 readings have been taken in a specified time interval and the average is taken for calculating the temperature error at each point. The geometric center of the useful volume is selected as reference locations for determining the spatial inhomogeneity.

APPROVED SIGNATORY


K. Ravindranath
Manager DCML

This certificate may not be reproduced other than in full, without the written approval of Danway Calibration & Measurement Lab

The measurement uncertainties for the temperatures were determined from the uncertainties of the standards, of the measurement procedures applied and of the characteristics of climatic chambers investigated. The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%. The uncertainties stated in this certificate are refer to the values obtained during the verification and make no allowances for due to the continuous use of the equipment.

Continuation Sheet
HUMIDITY CHAMBER
SERIAL NO : 1597

Certificate No :DCML/37768/2014

Measurement Results : (Set Point : 30°C)

Temperaure Sensor Location	Controller Set Point in °C	Measured Temperature at reference Point (average) in °C	Indication of Chamber (Average) in °C	Correction of Indication in °C
Center	30.0	29.43	30.0	-0.57
Back Middle	30.0	29.45	30.0	-0.55
Front Middle	30.0	29.50	30.0	-0.50
Left Middle	30.0	29.49	30.0	-0.51
Right Middle	30.0	29.39	30.0	-0.61

Results for the Charecterization of the Chamber Volume :
Temperature

Controller Set Point in °C	Temporal Instability in °C	Spatial Inhomogeneity in °C	Uncertainty of Incubator calibration
30	0.4	0.07	1.6

Remarks :

The results stated are valid only for the useful volume of the climatic chamber spanned by the measuring locations. All other parts of the chamber volume are considered not to be calibrated

km



Branch : Dubai

Al Quoz Industrial 4, P.O.Box :114810

Tel. : +971 4 3232 751, Fax : +971 4 3232 749

E-mail : dxblab@blcontrol.com

Website : www.blcontrol.com

BETALINK

فرع : دبي

القوز الصناعية ، ص.ب : ١١٤٨١٠

تلفون : +٩٧١ ٤ ٣٢٣٢ ٧٥١ ، فاكس : +٩٧١ ٤ ٣٢٣٢ ٧٤٩

بريد الكتروني : dxblab@blcontrol.com

موقع الانترنت : www.blcontrol.com

CERTIFICATE OF CALIBRATION

Certificate No: 15021182	Date: 08-02-2015	Job No: 2732
Customer: Material Lab		Rev: 00
Address: P.O. Box: 114717, Dubai, United Arab Emirates		Page: 1/2

Equipment Description:	Pull-Off Adhesion Tester		
Manufacturer:	DE FELSKO		
Model:	POSITEST AT-A		
S/No:	AT 05193		
Range:	3.5 Mpa/0~500 Psi		
Readability:	0.01 Mpa/ 1 Psi		
Accuracy:	± 1 % full scale		
Standard:	ASTM C900	Status:	Calibrated

Calibration Date:	08-02-2015	Calibration Due:	07-02-2016
-------------------	------------	------------------	------------

Environmental Conditions			
Temperature:	(23 ± 2) °C	Humidity:	(50 ± 10) % RH

The uncertainty limits quoted refer to the measured values only, with no account being taken of the instruments ability to maintain its calibration.

Reference Equipment Details:			Procedure	WI-086
Description	Serial No.	Make	Model	Traceable Standard
Load Cell	C140-08/AB/0006 C138PN186/AB/0001	MATEST	C140-08 C138PN186	UKAS

Result:

APPLIED Mpa	MEASURED Mpa	ERROR Mpa
0.35	0.322	-0.028
0.70	0.686	-0.014
1.05	1.028	-0.022
1.40	1.378	-0.022
1.75	1.760	0.001
2.10	2.107	0.007
2.45	2.466	0.016

This certificate is issued in accordance with the laboratory accreditation requirement of American National Standard for calibration i.e. ANSI/NCSL Z540-1, General requirements for the competence of calibration laboratories and measuring and test equipment. All measurements recorded in this certificate are traceable back to recognized international standards. The references listed above are subjected to regular verification. This certificate may not be reproduced other than in full except with prior written approval of issuing laboratory. We hereby confirm that the Quality Management System of BETALINK complies with ISO 9001: 2008, ISO 14001:2004, OHSAS 18001:2007, ISO 17020:2012 (ENAS & DAC accreditation) & ISO 17025:2005 (ENAS accreditations).

Doc. No: QF-11/00

Rev: 01



CERTIFICATE OF CALIBRATION

Certificate No: 15021182

Date: 08-02-2015

Job No: 2732

Customer: Material Lab

Rev: 00

Address: P.O. Box: 114717, Dubai, United Arab Emirates

Page: 2/2

APPLIED Mpa	MEASURED Mpa	ERROR Mpa
2.80	2.803	0.003
3.15	3.122	-0.028
3.50	3.485	-0.015

Remarks: Betalink Instrumentation & Calibration Services LLC. here by certify that the above-described " Pull Off Adhesion Tester " tested output & all accessories as per vendor recommended specifications, found to be working satisfactorily.

End of Results

Calibration Engineer: Lab Manager: 

This certificate is issued in accordance with the laboratory accreditation requirement of American National Standard for calibration i.e. ANSI/NC SL Z540-1, General requirements for the competence of calibration laboratories and measuring and test equipment. All measurements recorded in this certificate are traceable back to recognized international standards. The references listed above are subjected to regular verification. This certificate may not be reproduced other than in full except with prior written approval of issuing laboratory. We hereby confirm that the Quality Management System of BETALINK complies with ISO 9001: 2008, ISO 14001:2004, OHSAS 18001:2007, ISO 17020:2012 (ENAS & DAC accreditation) & ISO 17025:2005 (ENAS accreditations).

Doc. No: QF-11/00

Rev: 01

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO. :	REP-212053-01
	ISSUE :	1
	DATE :	27/03/2013
	AUTHOR :	M.M.A.L. Dominicus – van den Acker
	PROJECT :	212053
	PAGE :	page 1 of 12

Calibration report

Second Surface Reference mirror number OMT-212053-01

Direct reflectance at 8° incidence
in the wavelength range 250 nm – 2500 nm.

Visiting address:
High Tech Campus 9
5656AE Eindhoven
The Netherlands

Correspondence:
P.O.Box 775
5600AT Eindhoven
The Netherlands

Tel: +31 40 85 19 260
Fax: +31 40 85 19 269
info@omtsolutions.com
www.omtsolutions.com

Project nr: 212053

Customer:

Material Lab | Abu Dhabi | Dubai

P.O Box 114717 , Dubai - United Arab Emirates

All rights reserved. No part of this document may be reproduced and/or published, stored in a retrieval system of any nature, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the previous written permission of OMT Solutions BV. OMT Solutions BV does not accept any liability for the inaccuracies in this document.

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO.	: REP-212053-01
	ISSUE	: 1
	DATE	: 27/03/2013
	AUTHOR	: M.M.A.L. Dominicus – van den Acker
	PROJ. NO.	: 212053
	PAGE	: page 2 of 12

Content

1.	Introduction.....	3
1.1	Applicable documents	3
1.2	Details	3
2.	Measurements.....	4
2.1	Equipment and conditions.....	4
2.2	Measurement principle	4
2.3	Measurement sequence.....	5
2.4	Calculations	5
3.	Uncertainty analysis.....	6
3.1	Evaluation and Expression of Uncertainty.....	6
3.2	Misalignment	6
3.3	Standard uncertainty in the reflectance	6
3.4	Detector non-linearity	7
3.5	Wavelength uncertainty	8
3.6	Angular uncertainty.....	9
3.7	Uncertainty in the polarization	9
3.8	Sample non-uniformity.....	9
3.9	Combined standard uncertainty	9
3.10	Expanded uncertainty	9
4	Conclusion	10
4.1	Calibration results	10
4.2	Using the calibrated mirror	10
5	Authorization.....	12

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO. :	REP-212053-01
	ISSUE :	1
	DATE :	27/03/2013
	AUTHOR :	M.M.A.L Dominicus – van den Acker
	PROJ. NO. :	212053
	PAGE :	page 3 of 12

1. Introduction

1.1 Applicable documents

- AD1 ORD-212053-05
- AD2 Guide to the Expression of Uncertainty in Measurement, ISBN 92-67-10188-9, 1st Ed. ISO, Geneva, Switzerland (1993).
- AD3 Mielenz, K.D. and Eckerle, K.L., Spectrophotometer at the National Physical Laboratory, J. Res. Of the National Bureau of Standards – A. Physics and Chemistry, Vol. 76A, 1972.
- AD4 Nijnatten, P.A. van, Calibration of neutral density glass filters to produce transmittance standards, 5th ESG Conference "Glass Science and Technology for the 21st Century", Prague, 1999. AD3

1.2 Details

OMT Solutions BV has manufactured a series of second surface reference mirrors for UV/VIS/NIR reflectance. The design of these mirrors is shown in Fig. 2.1 below. The mirror coating is a Metal-dielectric multi-layer design optimised for stability and maximum reflectance in the UV/Vis/NIR range 200 nm – 2,500 nm. The coating is deposited on the back of the protecting front plate that consists of 2 mm ultrapure quartz. A soda-lime glass plate is glued to the back for protection.

Before calibration, the mirror was cleaned with chemically pure isopropyl alcohol. The mirror was calibrated at the angle of incidence of 8°.

- Serial number of the mirror : OMT-212053-01
- Dimensions of the mirror : 50 mm x 50 mm x 5 mm
- Date of the calibration : 4 February 2013
- Calibration performed by : M.M.A.L. Dominicus – van den Acker

This report gives a detailed description of the calibration procedure and evaluation of the calibration uncertainty.

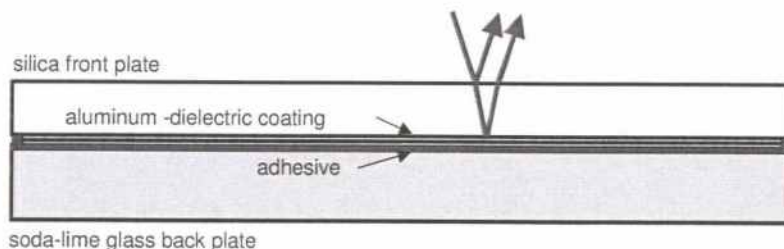


Figure 1.1 Design of the Second Surface Reference mirror issued by OMT solutions BV.

All rights reserved. No part of this document may be reproduced and/or published, stored in a retrieval system of any nature, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the previous written permission of OMT Solutions BV. OMT Solutions BV does not accept any liability for the inaccuracies in this document.

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO.	: REP-212053-01
	ISSUE	: 1
	DATE	: 27/03/2013
	AUTHOR	: M.M.A.L. Dominicus – van den Acker
	PROJ. NO.	: 212053
	PAGE	: page 4 of 12

2. Measurements

2.1 Equipment and conditions

Measurements are performed using a Perkin Elmer Lambda-900 UV/VIS/NIR spectrophotometer equipped with a collection sphere and the L631 200 Directional VW absolute reflectometer.

The following slit program was used:

- 5 nm slit in the wavelength range from 200 nm – 860.6 nm,
- “servo” in the wavelength range from 860.6 nm - 2,500 nm.

The sample temperature during the measurements was 21 ± 1 °C.

2.2 Measurement principle

The measurement principle of the VW absolute reflectance accessory is based on a combination of two measurements (see Fig. 2.1 below). In the so-called V-mode the instrument beam is interacting with three mirrors (M1 - M3). In the so-called W-mode the beam additionally interacts twice with the sample. The ratio of the two scans produces the square of the sample reflectance. This method is an absolute one since a calibrated reference is not needed

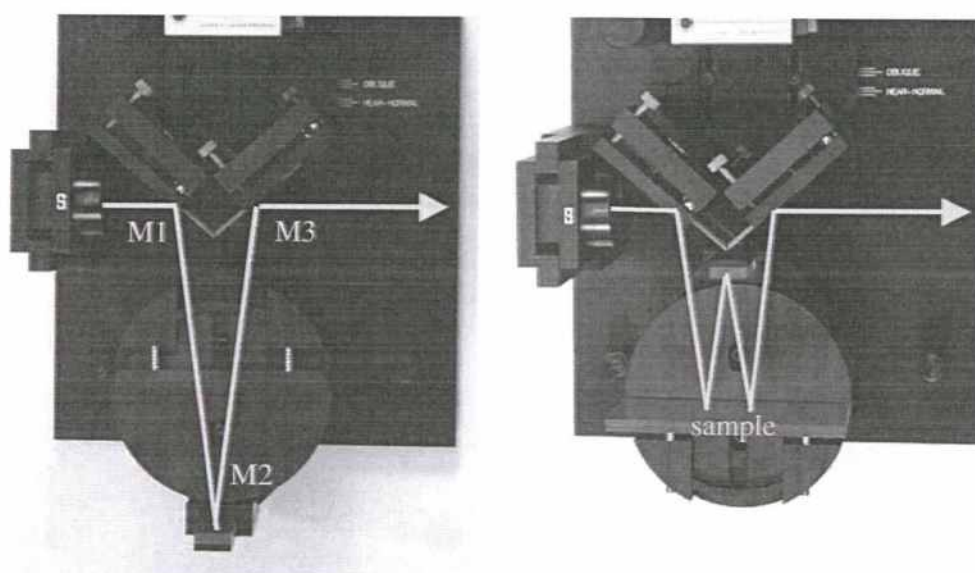


Figure 2.1 Top view of the VW set-up in the V-mode (left) and W-mode (right)

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO. :	REP-212053-01
	ISSUE :	1
	DATE :	27/03/2013
	AUTHOR :	M.M.A.L. Dominicus – van den Acker
	PROJ. NO. :	212053
	PAGE :	page 5 of 12

2.3 Measurement sequence

The following measurement sequence of 12 scans is applied (P and S refers to the polarization state):

1. 0% (stray light) measurement
2. 100% measurement, V-mode
3. sample measurement 1, W-mode
4. sample measurement 2, W-mode
5. 100% measurement, V-mode
6. sample measurement 3, W-mode
7. sample measurement 4 W-mode
8. 100% measurement, V-mode
9. sample measurement 5, W-mode
10. sample measurement 6, W-mode
11. 100% measurement, V-mode
12. 0% (stray light) measurement

Between sample measurements 1 and 2, 3 and 4, and 5 and 6 the sample is removed, repositioned and realigned.

2.4 Calculations

The measurement sequence results in the series $M_{0,1}$, $M_{V,1}$, $M_{W,1}$, $M_{W,2}$, $M_{V,2}$, $M_{W,3}$, $M_{W,4}$, $M_{V,3}$, $M_{W,5}$, $M_{W,6}$, $M_{V,4}$, $M_{0,2}$, from which 6 reflectance values corresponding to each of the W-mode measurements are determined, according to:

$$R_i = \sqrt{\frac{2M_{W,i} - M_{0,1} - M_{0,2}}{M_{V,j} + M_{V,j+1} - M_{0,1} - M_{0,2}}} \quad (1)$$

where $j = 0.5(i + 1)$ for $i = 1, 3, 5$ and $j = 0.5i$ for $i = 2, 4, 6$.

The reflectance of the sample is determined by taking the average of these six values.

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO.	: REP-212053-01
	ISSUE	: 1
	DATE	: 27/03/2013
	AUTHOR	: M.M.A.L. Dominicus – van den Acker
	PROJ. NO.	: 212053
	PAGE	: page 6 of 12

3. Uncertainty analysis

3.1 Evaluation and Expression of Uncertainty

The procedures below are based on AD2.

The following measurement equation is valid for the reflection at near-normal incidence (8°) and given polarisation of an unknown sample:

$$R = \sqrt{f} \cdot \langle R \rangle + \Delta_{NL} + \Delta_{WL} + \Delta_A + \Delta_P + \Delta_{NU} \quad (2)$$

in which

f is a factor that accounts for differences in alignment between V and W mode

$\langle R \rangle$ is the average of the measured reflectance values,

Δ_{NL} is a contribution that accounts for detector non-linearity

Δ_{WL} is a contribution that accounts for a systematic deviation in the wavelength

Δ_A is a contribution that accounts for a systematic deviation in the angle of incidence

Δ_P is a contribution that accounts for a systematic deviation in the polarisation

Δ_{NU} is a contribution that accounts for a systematic deviation due to sample non-uniformity

3.2 Misalignment

The alignment factor f in Eq.(2) has a value of one with a standard uncertainty $u_f < 0.001$ (conservative value based on experience). The uncertainty in the reflectance due to misalignment is proportional to u_f according to

$$u_M = \frac{1}{2} \langle R \rangle^2 u_f \quad (3)$$

3.3 Standard uncertainty in the reflectance

The average reflectance values are estimated from 6 independent observations R_i according to Eq.(1). The standard uncertainty associated with these observations are the estimated standard deviations (of the mean) according to:

$$u_R = 1.11 \cdot \sqrt{\frac{1}{5} \sum_{i=1,3,5} \frac{(R_i - \langle R \rangle)^2}{6}} \quad (4)$$

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO.	: REP-212053-01
	ISSUE	: 1
	DATE	: 27/03/2013
	AUTHOR	: M.M.A.L. Dominicus – van den Acker
	PROJ. NO.	: 212053
	PAGE	: page 7 of 12

In which the factor 1.11 is the Student-t factor for 5 degrees of freedom and a 68.27% confidence level (1 sigma).

3.4 Detector non-linearity

The detector non-linearity produces a systematic uncertainty component that in principle can be corrected (see AD3 and AD4). This requires a thorough investigation of the instrument in use.

Our research (see AD4) has shown that, when a measurement is made with a background correction (values between 0% and 100%), the non-linearity error of the Lambda 900 approximates the function

$$\Delta_{NL} = C(1 - M)M \quad (5)$$

where M is the measurement value (between 0 and 1) and C a constant that is wavelength dependent. According to this equation, the non-linearity error is zero at 0% and 100% and has its maximum at M = 0.5 (50%). The constant C in (6) can be determined using the Double Aperture Method as described in AD4.

If we don't make a non-linearity correction, we chose $\Delta_{NL} = 0$ in equation (3). The standard uncertainty associated with Δ_{NL} is then

$$u_{NL} = \frac{1}{4} C(1 - R)R \quad (6)$$

We can obtain a safe estimate for C by using the limits of the photometric accuracy of the Lambda 900 according to specifications and experience. Using conservative values, we find:

In the UV/Vis range (photometric accuracy = 0.2%) → C = 0.008

In the NIR range (photometric accuracy = 0.3%) → C = 0.012

The factor $\frac{1}{4}$ is a correction for the fact that we measure R^2 and for the coverage factor of 2 that is assumed to be associated with the specified photometric accuracy:

Given the reflectance range in which the VW accessory operates, the non-linearity errors according to these specifications and Eq. (6), follow the curves shown in Fig. 3.1 below.

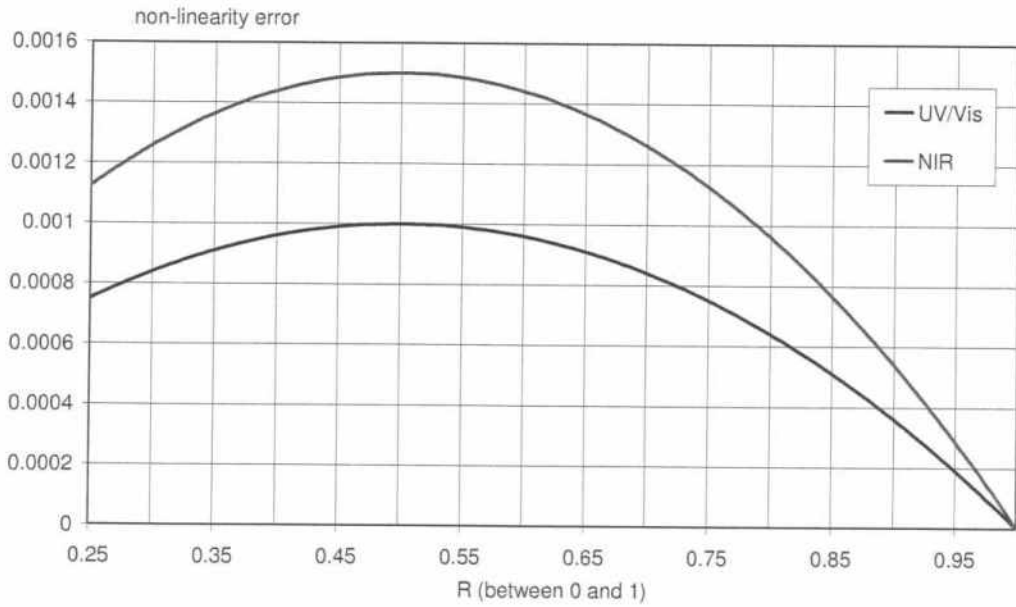


Figure 3.1 Worst-case detector nonlinearity (2 x standard uncertainty)

3.5 Wavelength uncertainty

The correction for a systematic deviation in the wavelength Δ_{wL} is assumed to be zero with a standard uncertainty that can be estimated using wavelength standards.

Unless the measured spectrum is flat, the uncertainty in the wavelength will yield an uncertainty in the ordinate. Taking into account that we measure the square of the reflectance, the standard uncertainty due to this effect is given by:

$$u_{wL} = \frac{1}{2} \left| \frac{\partial R}{\partial \lambda} \right| u_{\lambda} \approx \frac{1}{2} \left| \frac{\Delta R}{\Delta \lambda} \right| u_{\lambda} \quad (7)$$

Typical values for the standard uncertainty in the wavelength scale of the Lambda 900 are:

- In the UV/Vis range → $u_{\lambda} = 0.1 \text{ nm}$
- In the NIR range → $u_{\lambda} = 0.15 \text{ nm}$

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO.	: REP-212053-01
	ISSUE	: 1
	DATE	: 27/03/2013
	AUTHOR	: M.M.A.L. Dominicus – van den Acker
	PROJ. NO.	: 212053
	PAGE	: page 9 of 12

3.6 Angular uncertainty

The standard uncertainty due to the uncertainty in the angle of incidence is assumed to be negligible!

3.7 Uncertainty in the polarization

The calibration has been performed with a Common Beam Depolarizer to scramble the polarization of the beam interacting with the sample. The standard uncertainty due to the residual polarization in the beam is assumed to be negligible!

3.8 Sample non-uniformity

The sample non-uniformity is expressed in a standard uncertainty u_{NU} and is determined from a series of mirrors from the same batch and is set to 0.0007.

3.9 Combined standard uncertainty

The combined standard uncertainty in the measured reflectance is obtained according to

$$u_C = \sqrt{(u_R)^2 + (u_M)^2 + (u_{NL})^2 + (u_{WL})^2 + (u_{NU})^2} \quad (9)$$

3.10 Expanded uncertainty

The expanded uncertainty U provides an interval $R-U$ to $R+U$ about the result R within which the value of R can be asserted with a high level of confidence.

The expanded uncertainty is determined by multiplying the combined standard uncertainty u_C of Eq.(9) with a coverage factor k (for which commonly a value $k=2$ is chosen).

4 Conclusion

4.1 Calibration results

The calibration results of the reflectance standard **OMT-212053-01** which has been calibrated in the wavelength range from 250 nm to 2,500 nm at an angle of incidence of 8° are shown in Figs. 4.1 and 4.2 below. A table of the Reflectance and Expanded Uncertainty (see 3.10) with a coverage factor $k = 2$ is given in the appendix.

4.2 Using the calibrated mirror

The mirror is a primary reflectance standard, mainly intended as a reference mirror in UV/VIS/NIR reflectance measurements. The mirror can be cleaned, by wiping its front surface with a soft tissue and de-mineralised water or isopropyl alcohol.

Reflectance sample: OMT-212053-01, angle of incidence 8°

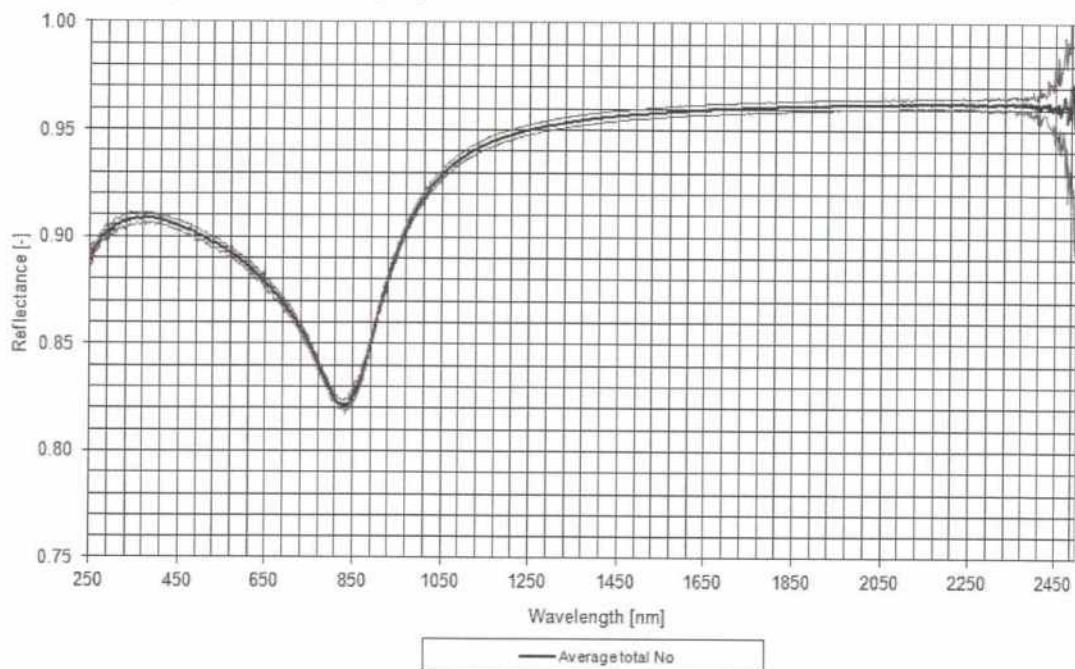


Figure 4.1 Near-normal (8°) Reflectance of the mirror OMT-212053-01

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO. :	REP-212053-01
	ISSUE :	1
	DATE :	27/03/2013
	AUTHOR :	M.M.A.L Dominicus – van den Acker
	PROJ. NO. :	212053
	PAGE :	page 11 of 12

Expanded Uncertainty, coverage factor $k = 2$

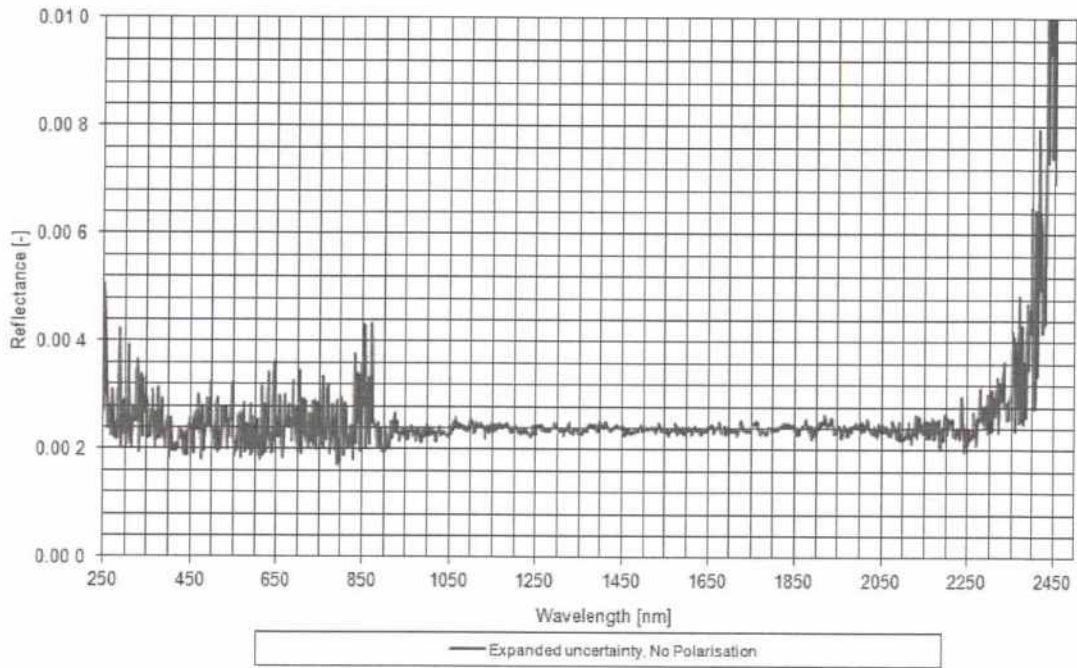



Figure 4.2 Standard uncertainty for mirror OMT-212053-01

All rights reserved. No part of this document may be reproduced and/or published, stored in a retrieval system of any nature, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the previous written permission of OMT Solutions BV. OMT Solutions BV does not accept any liability for the inaccuracies in this document.

OMT Solutions BV <i>Optical Measurements and Testing</i> <i>Materials for optical applications</i> <i>Thin Film Analysis</i>	DOC. NO. :	REP-212053-01
	ISSUE :	1
	DATE :	27/03/2013
	AUTHOR :	M.M.A.L. Dominicus – van den Acker
	PROJ. NO. :	212053
	PAGE :	page 12 of 12

5 Authorization

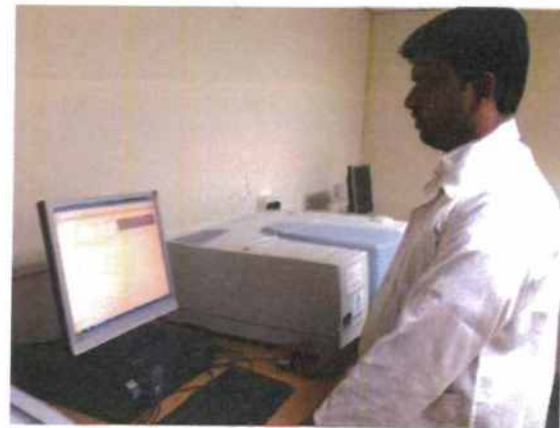
	Name	Signature
Calibration performed by	M.M.A.L. Dominicus – van den Acker	
Authorized by	S.J.M. Timmermans	

All rights reserved. No part of this document may be reproduced and/or published, stored in a retrieval system of any nature, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the previous written permission of OMT Solutions BV. OMT Solutions BV does not accept any liability for the inaccuracies in this document.



7: PICTURES





Certificate Number: SNR 30362926/4/Q



ماتيريال لاب - دبي، صندوق بريد: ١١٤٧١٧ هاتف: +٩٧١ ٤ ٣٤٠٥٦٧٨، فاكس: +٩٧١ ٤ ٣٤٠٥٦٧٧
ماتيريال لاب جلف لفحص التربة - أبوظبي: صندوق بريد: ٦١٨٣١، هاتف: +٩٧١ ٢ ٥٥٠٣٠٤٠، فاكس: +٩٧١ ٢ ٥٥٠٣٠٤١
Material Lab - Dubai, P.O. Box: 114717, Tel. + 971 4 3405678, Fax: + 971 4 3405677
Material Lab Gulf Testing Soil - Abu Dhabi: P.O. Box - 61831, Tel. + 971 2 5503040 Fax: +971 2 5503041
Email: mld@eim.ae Website: www.mlab.ae