



***Appendix B1, Framework for the activities of Registered Laboratories for conductivity measurements and other characteristics which can be declared (insulation products for buildings)***

**Contents**

	Page
1 Introduction .....	2
2 Requirements and tasks for a registered laboratory .....	3
2.1 Requirements .....	3
2.2 Tasks.....	4
3 Requirements and tasks for a member of the "Thermal Insulation Expert Group" .....	4
3.1 Requirements .....	4
3.2 Tasks.....	4
4 Relationship to SG-19 parties.....	5
5 Financial matters .....	6
5.1 Thermal Insulation Expert group .....	6
5.1.1 Costs to be borne by the "Thermal Insulation Expert Group" .....	6
5.1.2 Financial benefits.....	6
5.2 Registered laboratories.....	6
5.2.1 Costs to be borne by the registered laboratories .....	6
5.2.2 Financial benefits.....	7
Annex 1: Organisation of comparative testing programmes between registered laboratories	
Annex 2: Application form	
Annex 3: Result form	
Annex 4: Example of results of a comparative testing programme set up to establish the European $\lambda_{10}$ level for the "Thermal Insulation Expert Group"	



## 1 Introduction

The role of the registered laboratories is to conduct Initial Testing and Audit Testing for the thermal conductivity as requested by empowered certification bodies, according to EN 13172 and the currently valid KEYMARK Scheme Rules for Thermal Insulation Products.

In order to ensure transparency and fair competition on the open European market, there is a need to obtain a common European level of thermal conductivity at 10°C ("European  $\lambda_{10}$  level").

To ensure conformity with these requirements, registered laboratories shall be designated in accordance with the requirements of these scheme rules. These registered laboratories shall be in agreement with the European conformity requirements for tests as follows:

- For thermal conductivity  $\lambda_{10}$  level, registered laboratories shall be designated in accordance with the requirements of these scheme rules. These registered laboratories shall be in agreement with the European  $\lambda_{10}$  level to within  $\pm 1.5\%$ <sup>1</sup>.
- For other characteristics which can be declared:
  - compression following EN 826 and EN12431,
  - dimensional stability following EN 1604,
  - creeping following EN 1606,
  - tensile strength perpendicular to faces following EN 1607,
  - water absorption following EN 1609 and EN 12089,
  - water vapour permeability following EN 12086
  - bending following EN 12089,
  - shear stress following EN 12090,
  - point load following EN 12430,
  - acoustic following EN 29052-1, EN ISO 354 and EN ISO 11654,
  - air flow resistance EN 29053,


In addition to the registered laboratories, a small expert group, whose members are experts in the field of these test with identified reference equipment (identified reference guarded hot plate equipment, identified traction compression apparatus...), shall be designated so as to define the European  $\lambda_{10}$  level and the European levels of conformity requirements for the other different tests.

The term 'European  $\lambda_{10}$  level' is used for the evaluation of the checks performed in comparative testing where the same test specimens are used by both expert and registered laboratories. It is defined by showing compliance with EN 1946 part 2 and the IRMM 440 reference material.

The term 'European level of conformity requirement' is used for the evaluation of the checks performed in comparative testing where the same test specimens/samples are used by both

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<sup>1</sup> The  $\pm 1.5\%$  shall be obtained when testing the materials EPS and MW in thickness 50 mm and 100 mm. Other deviations might be chosen for other materials or other thickness. This value is subject to evaluation by the "Thermal Insulation Expert Group".

	<b>INSULATION KEYMARK</b> Scheme, Appendix B1	Revision: 2.1 Date: 2019-04-02 Page: 3 of 19
-----------------------------------------------------------------------------------	--------------------------------------------------	----------------------------------------------------

experts and registered laboratories. It is defined by showing compliance with the relevant EN standards and reference material(s).

NOTE 1 The progress of work shall be monitored by the "Thermal Insulation Expert Group" in collaboration with the Notified Bodies group SG-19.

NOTE 2 Within the frame of SG-19, testing laboratories for thermal conductivity, acting as notified bodies, may conduct Type Testing according to the appropriate product standards and the Notified Bodies rules for CE marking.

## 2 Requirements and tasks for a registered laboratory

### 2.1 Requirements

A laboratory shall fulfil the following requirements in order to be designated by the SDG-5 Implementation Group as a registered laboratory:

1. The laboratory shall be accredited against EN ISO 17025 (EA accreditation). In particular, the laboratory shall be able to demonstrate participation in inter-laboratory comparative testing for the relevant test methods<sup>2</sup>.
2. The laboratory shall be notified within the frame of the CPR for insulation products.
3. The laboratory shall have recent experience with test procedures (conditioning, ageing and measuring according to product specifications) according to the specific product standards.
4. For thermal conductivity, the competence of staff and equipment used for testing within the SDG-5 Keymark Scheme shall comply with the requirements of EN 1946-1, 2, and/or 3, and documentary evidence of compliance shall be retained by the laboratory for the purposes of auditing.

For other characteristics:

- compression EN 826 and EN12431,
- dimensional stability EN 1604,
- creeping EN 1606,
- tensile strength perpendicular to faces EN 1607,
- water absorption EN 1609 and EN 12089,
- water vapour permeability EN 12086,
- bending EN12089,
- shear stress EN 12090,
- point load EN 12430,
- acoustic EN 29052-1, EN ISO 354 and EN ISO 11654,
- air flow resistance EN 29053

5. Measurements shall be carried out with registered test equipment for thermal conductivity

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<sup>2</sup> See point 4



6. Results shall be in agreement with the European  $\lambda_{10}$  level to within  $\pm 1.5\%$ <sup>3</sup>. This shall be demonstrated by the laboratory's participation in a programme of comparative testing every third year.

NOTE 1 For thermal conductivity it is recommended that equipment of the guarded hot plate type be used.

NOTE 2 Where a registered laboratory is contracted by a manufacturer to conduct testing for the manufacturer's own factory production control, the acceptance of that registered laboratory to conduct testing for a Certification Body for the INSULATION KEYMARK Scheme will be at the discretion of the Certification Body.

## 2.2 Tasks

1. To participate in comparative testing campaigns between registered laboratories.
2. To participate in other actions of the "Thermal Insulation Expert Group".
3. Accept the periodic audit one per 6 years.

## 3 Requirements and tasks for a member of the "Thermal Insulation Expert Group"

### 3.1 Requirements

In order to be a member of the "Thermal Insulation Expert Group" and the laboratories to which they are contracted shall fulfil all the requirements of Appendix B and the following additional requirements:

1. Members of the "Thermal Insulation Expert Group" must be able to demonstrate experience of testing, involving at least 5 families of insulation materials.
2. Thermal conductivity measurements used for the purpose of the "Thermal Insulation Expert Group" shall be done with an identified reference guarded hot plate equipment.
3. Other characteristics such as compression, dimensional stability, creeping, traction, water absorption, water vapour permeability, bending, shear stress, point load, acoustic, air flow resistance are determined by the laboratory of the expert group laboratory or by subcontracting in another laboratory but under control of the Expert member laboratory.


The number of designated members of the "Thermal Insulation Expert Group" shall optimally be between 6 and 10, dispersed throughout the CEN member countries covering expertise of every type of insulation product.

### 3.2 Tasks

1. To report the outcome of comparative testing on the identified reference equipment for thermal conductivity and on a identified equipment, for other characteristics according to a fixed time schedule.
2. To take part in comparative tests with registered laboratories.
3. To give expert advice on particular issues.

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<sup>3</sup> This value is subject to evaluation by the "Thermal Insulation Expert Group" – see note 1 of page 2.

	INSULATION KEYMARK Scheme, Appendix B1	Revision: 2.1 Date: 2019-04-02 Page: 5 of 19
-----------------------------------------------------------------------------------	-------------------------------------------	----------------------------------------------------

4. To provide reference samples test specimens with measured values, for comparative testing between registered laboratories.
5. To audit registered laboratories.

The European  $\lambda_{10}$  level shall be established with the results from comparative testing using the following materials with a specimen size of at least  $600 \times 600 \text{ mm}^2$ :

- glass fibre board (50 mm and 100 mm thickness).
- EPS (50 and 100 mm thickness - density EPS 30).
- Later on an extension to other materials shall be considered, e.g. low density mineral wool, rigid materials, loose fill material like EPS beads and super insulation materials.

The application form for the comparative testing is given in Annex 2.

The laboratory of a member of the "Thermal Insulation Expert Group" may also be a registered laboratory. In such cases the laboratory shall be able to demonstrate that there are documented procedures in place to ensure that there are no conflict of interest, confidentiality or impartiality between these two roles, and that information is not used to gain unfair business advantage.

#### **4 Relationship to SG-19 parties**

The following figure 1 describes the relationships between the INSULATION KEYMARK Groups and SG-19 parties. Note that some of the parties in this chart may be the same.

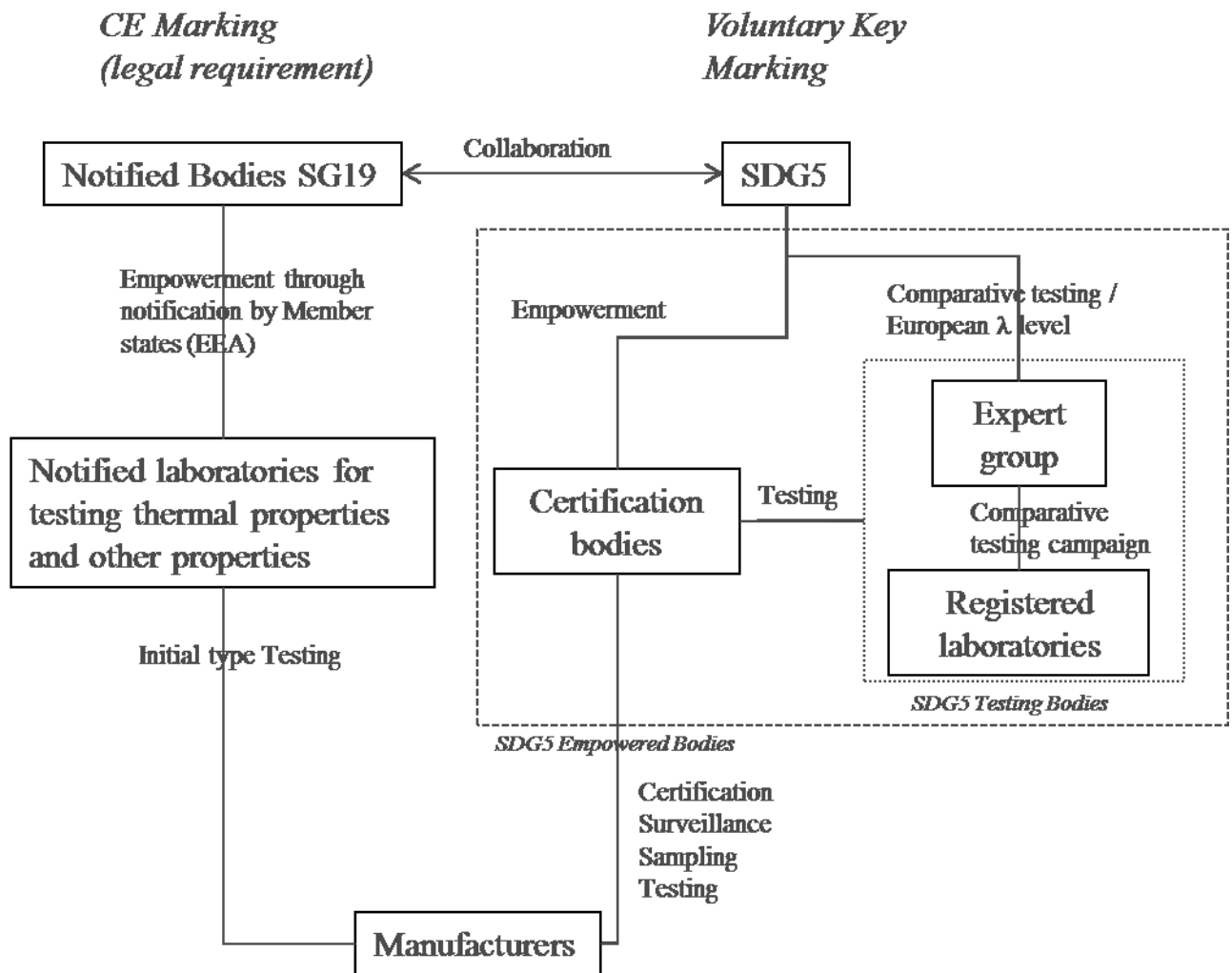


Figure 1: Relationships between parties involved in thermal testing within SG-19 or INSULATION KEYMARK

## 5 Financial matters

### 5.1 Thermal Insulation Expert group

#### 5.1.1 Costs to be borne by the "Thermal Insulation Expert Group"

- Travel / meetings within the "Thermal Insulation Expert Group".


#### 5.1.2 Financial benefits

- Income from performing audits of registered laboratories.

### 5.2 Registered laboratories

#### 5.2.1 Costs to be borne by the registered laboratories

- Auditing by the "Thermal Insulation Expert Group" (initial and periodic assessment).
- Participation in the annual comparative tests.

	INSULATION KEYMARK Scheme, Appendix B1	Revision: 2.1 Date: 2019-04-02 Page: 7 of 19
-----------------------------------------------------------------------------------	-------------------------------------------	----------------------------------------------------

### 5.2.2 Financial benefits

- Payment for testing required by the certification bodies.
- Payment for testing requested by the manufacturers.



## **Annex 1: Organisation of comparative testing programmes between registered laboratories**

### **A1. For thermal conductivity**

In order to ensure that the registered laboratories are within  $\pm 1.5\%$ <sup>4</sup> of the European thermal conductivity level at 10 °C, the laboratories already registered and the laboratories applying for first-time registration<sup>5</sup> shall participate in comparative testing programmes organised by the "Thermal Insulation Expert Group". The comparative testing programmes shall be organised approx. every 3 years in the following way:

#### ***A1.1. Selection of specimens to be used in the comparative testing programme***

Each member of the "Thermal Insulation Expert Group" shall identify an "expert" equipment within their laboratory. This equipment is used to determine the "KEYMARK value" for selected test specimens. The KEYMARK value is determined as the mean value of measurements made using two different "expert" equipment chosen at random. The test specimens may be prepared from different product families for different comparative testing programmes.

#### ***A1.2. Measurements by the registered laboratories***

- The "Thermal Insulation Expert Group" secretariat organises the provision of the test specimens to the laboratories. Each laboratory measures the test specimens and reports to the "Thermal Insulation Expert Group" secretariat.
- Measurements shall be performed on all identified test equipments that the laboratory wishes to be part of the registration.

#### ***A1.3. Outcome of the comparative testing programme:***

The "Thermal Insulation Expert Group" secretariat collects the results and sends a written evaluation of the result to the relevant registered laboratory. The registration of a laboratory is granted (in the case of a laboratory applying for first-time registration) or renewed (in the case of a laboratory already registered) if the laboratory satisfies the general requirements of clause 1 of this document and if the value of the thermal conductivity of each set of test specimens measured by the laboratory lies within  $1.5\%$ <sup>6</sup> of the "KEYMARK value".

### **A2. For other characteristics (if needed).**

#### ***A2.1 Selection of specimens to be used in the comparative testing programme***

The "Thermal Insulation Expert Group" shall identify reference apparatuses of the expert group for the different tests. This equipment is used to determine the "KEYMARK value" for selected test specimens. The test specimens may be prepared from different product families for different tests/comparative testing programmes.

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<sup>4,6</sup> Value subject to evaluation by "Thermal Insulation Expert Group" – see Note 1 of Page 2.

<sup>5</sup> Throughout this annex, we shall refer to both categories as "registered laboratories", for the sake of simplicity.





### ***A2.2 Measurements by the registered laboratories***

- The "Thermal Insulation Expert Group" secretariat organises the provision of the test specimens to the laboratories. Each laboratory measures the test specimens for the relevant test(s) and reports to the "Thermal Insulation Expert Group" secretariat.
- Measurements shall be performed on all identified test equipment that the laboratory wishes to be part of the registration.

### ***A2.3. Outcome of the comparative testing programme***

The "Thermal Insulation Expert Group" secretariat collects the results and sends a written evaluation of the results to the relevant registered laboratory. The registration of a laboratory is granted (in the case of a laboratory applying for first-time registration) or renewed (in the case of a laboratory already registered) if the laboratory satisfies to the general requirements of Section 1 and if the value of the measurement for each test is within the European conformity requirement.



**Annex 2: Application form**

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**Comparative testing for the purpose of establishing the European group of registered laboratories for thermal conductivity measurements**

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This form should be completed and submitted by the laboratories that wish to participate in the comparative testing that will form the basis for the selection of the laboratories that will form the European group of reference laboratories. The measurements shall be made by means of a guarded hot plate or a heat flow meter test equipment.

**1. General information**

***Administrative information:***

Company / Laboratory:

.....

Person responsible for the tests:

.....

Address (location of the laboratory):

.....

Mailing address for samples (if different from above):

.....

Mailing address for letters (if different from above, e.g. P.O. Box):


.....

Tel:

Fax:

E-mail:



	<p style="text-align: center;">INSULATION KEYMARK Scheme, Appendix B1</p>	<p>Revision: 2.1 Date: 2019-04-02 Page: 12 of 19</p>
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Which identified test equipment is intended for use within the CEN European Keymark scheme, and is it documented as in compliance with EN 1946-1, 2 and/or 3?

.....

By means of a IRMM 440 reference material and others?

.....

***Information concerning the test equipment (guarded hot plate or heat flow meter):***

In this section details must be given of the test equipment (guarded hot plate or heat flow meter) that the laboratory wants to use for the tests (add extra photocopied page(s) for more than one piece of test equipment).

Brand and model:

.....

Internal (laboratory) identification number of the test equipment:

.....

Device declared in compliance with which standards?

.....

Is the laboratory accredited according to EN ISO 17025 for testing with this equipment?

If yes, give details (original date of accreditation, most recent audit, etc).

.....

Measurement range:

- thermal conductivity:
  - min:
  - max:
  
- thermal resistance:
  - min:
  - max:
  
- mean temperature:
  - min:
  - max:
  
- specimen thickness:
  - min:
  - max:



- specimen size:
  - min:
  - max:
  
- other?

.....

Declared accuracy of measurement (reference to EN ISO 17025):

.....

NOTE EN 1946-2 only covers part of the uncertainty calculation

Single or double specimen device?

.....

Dimensions of the measurement zone:

.....

Number of points for measuring the surface temperature of the hot side and the cold side (attach a sketch with positions if possible):

.....

Is the measurement of the temperature difference between the hot side and the cold side performed directly or by subtraction of absolute temperatures?

.....

Criteria applied for determining the stabilisation of the thermal conditions:

.....

Thickness measurement principle during  $\lambda$  measurement (number of points, on the edges/entire surface, is the test thickness chosen imposed by the equipment, procedure difference between soft and rigid test specimens, etc.):

.....

### 3. Other characteristics

Test method used?

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....
- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

How many sets of test equipment for the measurement does the laboratory presently use?

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....
- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

Does the laboratory have experience on a regular basis with comparative testing? (If so, give details of the most recent.)

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....
- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

Does the laboratory have experience with the testing of products (conditioning and measuring according to product specification) within different families of insulation materials?

Specify: e.g. MW, FEF, CG, CS, XPS, PUR/PIR, EPS, PEF, PF.

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....

- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

Procedure/standard of conditioning the insulation material

.....

**Information concerning the test equipments:**

In this section details must be given of the test equipment that the laboratory wants to use for the tests (add extra photocopied page(s) for more than one piece of test equipment).

Brand and model:

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....
- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

Internal (laboratory) identification number of the test equipment:

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....
- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

Device declared in compliance with which standards?

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....
- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

Is the laboratory accredited according to EN ISO 17025 for testing with this equipment?

If yes, give details (original date of accreditation, most recent audit, etc).

- traction, compression, shear .....
- creeping .....
- water absorption .....
- water vapor permeability .....
- dimensional stability .....
- air flow resistance .....
- acoustics (for floors) .....
- acoustic absorption index .....

Date:

Signature:



**Annex 3: Result form**

<b>European group of registered laboratories</b>				
<b>Comparative testing for the selection of the registered laboratories</b>				
<b>MEASUREMENT OF THERMAL CONDUCTIVITY</b>				
<i>This form must be filled in and submitted to the Expert secretariat</i>				
<b>Laboratory</b>				
Laboratory name				
Name of staff responsible				
Date of arrival of the sample				
Start date of the measurement				
Finish date of the measurement				
<b>Apparatus details</b>				
Type and identification code/no.				
Size of central metering part				m x m
Size of guard ring				m x m
<b>Specimen details</b>				
Specimen description				
Specimen identity code				
Date of production (when relevant)				
Date of preparation (when relevant)				
Specimen size (length x width)				m
Specimen thickness (EN 823)				m
Pressure plate (size, pressure)			m x m	Pa
Weight				kg
Density				kg/m <sup>3</sup>
<b>Conditioning details</b>				
Conditioning conditions			°C	%HR.
Weight at start of measurement				kg
Weight at finish of measurement				kg
Time at conditioning conditions				days
<b>Measured values</b>				
Stability criteria				
Heat flow direction				
N°	1	2	3	
Surrounding climate				°C
Hot Surface temperature				°C
Cold surface temperature				°C
Specimen area				m <sup>2</sup>
Density of heat flow				W/m <sup>2</sup>
<b>Results</b>				
Time at temperature in apparatus				h
Mean specimen temperature				°C
Surface temperature difference				°C
Thickness during $\lambda$ measurement				m
Density during $\lambda$ measurement				kg/m <sup>3</sup>
<b>Thermal conductivity</b>				
for comparative testing calculations <b>please use 4 significant figures</b> if possible				W/(mK) 4 significant figures

NOTE For products subject to ageing, all relevant data should be provided.



<b>European group of registered laboratories</b> <b>Comparative testing for the selection of the registered laboratories</b> <b>Other characteristics (write which one and relevant std)</b> <i>This form must be filled in and submitted to the Expert secretariat</i>						
<b>Laboratory</b>						
Laboratory name						
Name of staff responsible						
Date of arrival of the sample						
Start date of the measurement						
Finish date of the measurement						
<b>Apparatus details</b>						
Type and identification code/no.						
Method						
<b>Specimen details</b>						
Specimen description						
Specimen identity code						
Date of production (when relevant)						
Date of preparation (when relevant)						
Specimen size (length x width)						m
Specimen thickness (EN 823)						m
Weight						kg
Density						kg/m <sup>3</sup>
<b>Conditioning details</b>						
Conditioning conditions				°C		%HR.
Weight at start of measurement						kg
Weight at finish of measurement						kg
Time at conditioning conditions						days
<b>Measured values</b>						
N°	1	2	3	4	5	unity
<b>Results</b>						

NOTE For products subject to ageing, all relevant data should be provided.

**Annex 4: Example of results of a comparative testing programme set up to establish the European  $\lambda_{10}$  level for the "Thermal Insulation Expert Group"**

Candidate member of the expert group	Material Ia	Material Ib	Material IIa	Material IIb	Mean deviation
A 1	34,6	32,3			-0,2, -0,4
A 2	35,0	32,1			
mean	34,8	32,2			= -0,3
B 1	34,6	32,4			
B 2	34,8	32,2			
mean	34,7	32,3			
C 1	34,8	32,8			
C 2	35,2	32,6			
mean	35,0	32,7			
D 1	35,2	33,3			+0,4, +0,5
D 2	35,6	32,9			= +0,45
mean	35,4	33,1			
etc					
Mean	35,0	32,6			This column is a help for discussion
Corrected	<b>34,8</b>	<b>32,4</b>			

Note: for the purpose of this example, it is assumed that the goal is to reach an agreement on thermal conductivity measurements performed by the members of the expert group on their identified reference equipment within  $\pm 1\%$  for each material.

Test specimens 1 and 2 (comprised of two pieces each) refer to the same specimens tested successively on each identified equipment.

Candidate member of the expert group D: for material Ia the deviation is +1,1 %, for material Ib the deviation is 1,5%; the mean deviation for material I is 1,3 %. D has to improve the quality of his/her measurements to become a member of the expert group. However, his/her laboratory may qualify as a registered laboratory.

The European mean for material Ia shall then be calculated from the values measured by A, B, and C: 34,8 mW/(m.K).

The European mean for material Ib shall then be calculated from the values measured by A, B, and C: 32,4 mW/(m.K).

(Note: a and b refer to two different thickness of material I.)

The test results shall be rounded to the nearest 0,1 mW/(m.K).

NOTE The example is asking for  $\pm 1\%$ , while the provisional value set for registered laboratories is  $\pm 1,5\%$ .