EGOLF TC1
**N460rev**

# SUMMARY REPORT FOR ROUND-ROBIN EN ISO 1716

## PURPOSE OF THE ROUND-ROBIN

During the EGOLF meetings in Boras, Sweden in April 2007 and in Prague, Czech Republic in October 2007, EGOLF TC 1 decided that a round robin exercise should be performed among the EGOLF members. It was decided that the round robin should be carried out on the determination of the heat of combustion test method described in the European standard EN ISO 1716: 2002.
The aims of the round robin exercise were as follows:
- confirmation of EGOLF laboratories being able to perform the EN ISO 1716 test in a proper way
- information about the reproducibility and repeatability found in the exercise
- indication of the variability in equipment, procedures and tools

The round robin exercise was organised by the EGOLF members MPA BAU HANNOVER and MPA NRW.

## SCOPE OF THE ROUND-ROBIN

### TIME FRAME

The Round Robin was performed from 2008 until 2009.

### NUMBER OF PARTICIPANTS

The following 35 laboratories participated.

| **Country** | **Lab** |
|---|---|
| Austria | IBS |
| Belgium | warringtonfiregent |
| Czech Republic | PAVUS |
| Denmark | DBI |
| Finland | VTT |
| France | CSTB |
| France | LNE |
| Germany | BAM |
| Germany | MFPA Leipzig |
| Germany | MPA BAU HANNOVER |
| Germany | MPA Braunschweig |
| Germany | MPA NRW |
| Germany | MPA Stuttgart |
| Germany | Prüfinstitut Hoch |
| Germany | TU München - HFM |
| Hungary | EMI |
| Italy | CSI |
| Italy | LAPI |
| Italy | LSF |
| Latvia | MEKA |
| Lithuania | FRC |
| Norway | SINTEF NBL |

| | |
|---|---|
| Poland | ITB |
| Portugal | LNEC |
| Slovenia | ZAG |
| Spain | AFITI |
| Spain | AITEX |
| Spain | Applus - LGAI |
| Spain | Leitat |
| Spain | Gaiker |
| Sweden | SP |
| Switzerland | Swiss Safety Institut |
| UK | BRE Global |
| UK | Exova Warringtonfire |
| USA | FM APPROVALS |

### TEST SPECIMEN

The first sample for the round robin exercise was a copolyamide in powder form. This material was selected because it is homogeneous, and no special preparation of the samples is necessary. Furthermore, the product is having a PCS-value ≥ 30 MJ/kg, and therefore no combustion aid is necessary for the tests.
The second material was a mineral wool with a nominal density of 15 kg/m³. The PCS-value should be between 1,5 MJ/kg and 2,0 MJ/kg.
The third material was a black glass tissue with a nominal area weight of 60 g/m². The PCS-value should be between 3,0 MJ/kg and 4,0 MJ/kg.

### TEST METHOD

The following information on the test procedure was given to the participants before the test:
The round robin exercise with Material 1 is divided in two parts (Procedure 1 and Procedure 2).
Make only three determinations of the PCS value according EN ISO 1716 even if the criteria in table 1 of this standard are not fulfilled.
Procedure 1 (individual procedure of your lab):
Take one digital photo of the specimen before the test, which characterizes for all three single PCS determinations.
Perform the test according to EN ISO 1716 as you usually would do in your laboratory.
Take three digital photos (one of each single PCS determination) of the specimens after the test.
Procedure 2 (for all labs the same procedure):
Take 0.5 g of Material 1
Do not mill the material more.
Do not use any auxiliary combustion aid.
Make three determinations of PCS value according to EN ISO 1716.
Take three digital photos (one of each single PCS determination) of the specimens after the test.
For the tests of Material 2 and 3 the labs should use Procedure 1.

## TEST RESULTS

### DATA PROCESSING

The data were analysed according to ISO 5725-2:1994/Cor 1:2002 “Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method.

### SUMMARY OF TEST RESULTS

**General**
All in all 35 labs participated in this round robin exercise, but the number of labs changed dependant on the different material used. In the first round 32 labs carried out the tests with Material 1 Procedure 1 and 2. After this 34 labs determined the gross heat of combustion of Material 2 and Material 3 in a second round. An EGOLF training course in testing according to EN ISO 1716 was attended by 27 of the 35 labs listed on the actual EGOLF website.

**Equipment of the labs**
The 35 participating labs used different types of calorimeter, produced by different manufacturers. The working methods were adiabatic, isoperibolic or isothermal.
Due to the test results of this round robin exercise there was no significant influence of the equipment of the labs. Also the used combustion aids like benzoic acid, paraffin oil, PE-bag etc. didn't lead to different test results.

**Outliers and stragglers**
The number of outliers and strugglers due to the between-laboratory consistency is less than the number due to the within-laboratory consistency. Reasons for the outliers and stragglers of the test results of some labs couldn't be found in the test reports of the labs. Also the photos taken of the test materials before and after the tests show no significant deviations from the given test procedure.

**Results in dependence of attending an EGOLF training course**
The result of this round robin exercise is based on a satisfied handling of the test procedure, trained in special courses organised by EGOLF. But the results also show that an EGOLF training course is not a guarantee for a correct test result. In the between-laboratory consistency there were 6 labs identified as outliers. 5 labs of them were attending an EGOLF training course, 1 was not. In the within-laboratory consistency there were 9 labs identified as outliers. 8 labs of them were attending an EGOLF training course, 1 was not. Therefore the listing on the EGOLF webside is not a guarantee. It is important that only the person of the lab, who was attending the EGOLF training course, should carry out the tests. At least the informations of the course are handed to these persons. Furthermore a repeat of the training course should take place in a fixed frequency.

**Results compared to values in Annex B of EN ISO 1716**
All statistical values from the EGOLF round robin exercise are clearly less than the maximum values of the Standard EN ISO 1716 Annex B Table B.2. This shows that the labs can carry out this reaction to fire test in a very proper way.

**Results compared to classification criteria in EN 13501-1**
Material 1 (copolyamide) is used as a part (thickness ≤ 1 mm) of an external non-substantial component of non-homogeneous products (e. g. glueing glass tissues on mineral wool boards). No lab met the requirement of Class A1 (PCS ≤ 2,0 MJ/kg) according to EN 13501-1 Table 1 footnote b. Using footnote c of EN 13501-1 Table 1 all labs met the requirement of Class A1 (PCS ≤ 2,0 MJ/m²), if the area weight is limited, dependant on the other parts the external non-substantial components.
Material 2 (mineral wool) is used as a homogeneous product or a substantial component of a nonhomogeneous product. From 29 labs of the statistical analysis met
- 25 labs the requirement of Class A1 (PCS ≤ 2,0 MJ/kg),
- 3 labs only the requirement of Class A2 (PCS ≤ 3,0 MJ/kg) and
- 1 lab neither Class A1 nor Class A2.

Material 3 (glass tissue) is used as a part (thickness ≤ 1 mm) of an external non-substantial component of non-homogeneous products. No lab met the requirement of Class A1 (PCS ≤ 2,0 MJ/kg) according to EN 13501-1 Table 1 footnote b, but using footnote c of EN 13501-1 Table 1 all labs met the requirement of Class A1 (PCS ≤ 2,0 MJ/m²), if the nominal area weight of 60 g/m² of the glass tissue is taking into consideration.

## ASSESSMENT OF THE OUTCOME OF THE ROUND-ROBIN

The analysis of the tests results of this round robin exercise shows that
- most of the participating labs are able to perform the EN ISO 1716 test in a very proper way.
- the repeatability and reproducibility standard deviations for the PCS values are lower than the values

reported in the standard EN ISO 1716 Annex B Table B.2.
- there is no significant influence caused by the equipment, test procedure or tools of the labs.