

Oxygen Bomb Calorimeter



EN ISO 1182: Reaction to fire tests for building products – Determination of the heat of combustion.

This instrument determines the potential maximum total heat release of a product when completely burning regardless of its end use. The test is relevant to classes A1, A2, A1_n and A2_n. The test specimen of a known mass is burned under standardised conditions, at constant volume in an atmosphere of oxygen, in the bomb calorimeter which is calibrated by combustion of benzoic acid. The calorific value determined under these conditions is calculated on the basis of the measured temperature rise while taking account of heat losses.

The FTT Oxygen Bomb calorimeter consists of:

- Bomb calorimeter with embedded computer control, user-friendly interface, LCD graphics display, high accuracy / resolution PRTs, RS232 interface port for printer and programming
- Oxygen bomb and bucket (calorimeter vessel)
- Thermostatically controlled bath, circulator, cooler, pipette (2L)
- EN ISO 1716 sample preparation device, firing wire & cotton, cigarette making device
- Printer (optional)





Non-Combustibility Apparatus

EN ISO 1182: Reaction to fire tests for building products – Non combustibility test.

This apparatus determines the non-combustibility performance, under specific conditions, of homogenous products and substantial components of non homogeneous building products.

The specimen is subjected to temperatures of 750°C in a vertical tube furnace. The specimen is observed for sustained flaming and temperature rises and furnace thermocouples are used to assess combustibility. The test is relevant to classes A1, A2, A1_{fi} and A2_{fi}.

The FTT non-combustibility apparatus is supplied with

- Special tube furnace
- Instrument unit features a temperature controller; an over-temperature alarm and a power control which control the furnace temperature at 750°C
- 'NonComb' Microsoft Windows analysis software

Why FTT?

FTT has been at the forefront of test instrumentation development in reaction to fire applications for over 20 years and now sets the benchmark in this field of testing. FTT's production and design facility in the UK continues to develop bench-scale instrumentation and large-scale tests for a wide range of regulatory requirements. FTT offers a worldwide sales and technical support service.



Table I - Classes of Reaction to Fire Performance for Construction Products Excluding Floorings

CLASS	TEST METHODS	CLASSIFICATION CRITERIA	ADDITIONAL CLASSIFICATION
A1	EN ISO 1182 ⁽¹⁾ and	$\Delta T \leq 30^{\circ}\text{C}$; and $\Delta m \leq 50\%$; and $t_r = 0$ (i.e. no sustained flaming)	-
	EN ISO 1716	$\text{PCS} \leq 2.0 \text{ MJ/kg}$ ⁽¹⁾ and $\text{PCS} \leq 2.0 \text{ MJ/kg}$ ⁽²⁾ ^(2a) and $\text{PCS} \leq 1.4 \text{ MJ/m}^2$ ⁽³⁾ and $\text{PCS} \leq 2.0 \text{ MJ/kg}$ ⁽⁴⁾	-
A2	EN ISO 1182 ⁽¹⁾ or	$\Delta T \leq 50^{\circ}\text{C}$; and $\Delta m \leq 50\%$; and $t_r \leq 20\text{s}$	-
	EN ISO 1716 and	$\text{PCS} \leq 3.0 \text{ MJ/kg}$ ⁽¹⁾ and $\text{PCS} \leq 4.0 \text{ MJ/m}^2$ ⁽²⁾ ^(2a) and $\text{PCS} \leq 4.0 \text{ MJ/m}^2$ ⁽³⁾ and $\text{PCS} \leq 3.0 \text{ MJ/kg}$ ⁽⁴⁾	-
	EN 13823	$\text{FIGRA} \leq 120 \text{ W/s}$; and $\text{LFS} < \text{edge of specimen}$; and $\text{THR}_{600\text{s}} \leq 7.5 \text{ MJ}$	Smoke production ⁽⁵⁾ and Flaming droplets/particles ⁽⁶⁾
B	EN 13823 and	$\text{FIGRA} \leq 120 \text{ W/s}$; and $\text{LFS} < \text{edge of specimen}$; and $\text{THR}_{600\text{s}} \leq 7.5 \text{ MJ}$	Smoke production ⁽⁵⁾ and Flaming droplets/particles ⁽⁶⁾
	EN ISO 11925-2 Exposure = 30s	$F_s \leq 150\text{mm}$ within 60s	
C	EN 13823	$\text{FIGRA} \leq 250 \text{ W/s}$; and $\text{LFS} < \text{edge of specimen}$; and $\text{THR}_{600\text{s}} \leq 15 \text{ MJ}$	Smoke production ⁽⁵⁾ and Flaming droplets/particles ⁽⁶⁾
	EN ISO 11925-2 ⁽⁸⁾	$F_s \leq 150\text{mm}$ within 60s	
D	EN 13823	$\text{FIGRA} \leq 750 \text{ W/s}$	Smoke production ⁽⁵⁾ and Flaming droplets/particles ⁽⁶⁾
	EN ISO 11925-2 ⁽⁸⁾ Exposure = 30s	$F_s \leq 150\text{mm}$ within 60s	
E	EN ISO 11925-2 ⁽⁸⁾ Exposure = 15s	$F_s \leq 150\text{mm}$ within 20s	Flaming droplets/particles ⁽⁷⁾
F	No performance determined		

⁽¹⁾ For homogenous products and substantial components of non-homogenous products.

⁽²⁾ For any external non-substantial component of non-homogenous products

^(2a) Alternatively, Any external non-substantial component having a $\text{PCS} \leq 2.0 \text{ MJ/m}^3$, provided that the product satisfies the following criteria of EN 13823: $\text{FIGRA} \leq 20 \text{ W/s}$, and $\text{LFS} < \text{edge of specimen}$ and $\text{THR}_{600\text{s}} \leq 4.0 \text{ MJ}$ and s1 and d0

⁽³⁾ For any internal non-substantial component of non-homogenous products

⁽⁴⁾ For the product as a whole

⁽⁵⁾ In the last phase of the development of the test procedure, modifications of the smoke measurement system have been introduced, the effect of which needs further investigation. This may result in a modification of the limit values and/or parameters for the evaluation of the smoke production.

s1 = SMOGRA $\leq 30\text{m}^2/\text{s}^2$ and $\text{TSP}_{600\text{s}} \leq 50\text{m}^2$; s2 = SMOGRA $\leq 180\text{m}^2/\text{s}^2$ and $\text{TSP}_{600\text{s}} \leq 200\text{m}^2$; s3 = not s1 or s2

⁽⁶⁾ d0 = No flaming droplets/particles in EN 13823 (SBI) within 600s;

d1 = No flaming droplets/particles persisting longer than 10s in EN 13823 (SBI) within 600s;

d2 = not d0 or d1;

Ignition of the paper in EN ISO 11925-2 results in a d2 classification

⁽⁷⁾ Pass = no ignition of the paper (no classification); Fail = ignition of the paper (d2 classification)

⁽⁸⁾ Under conditions of surface flame attack and, if appropriate to the end-use application of the product, edge flame attack.

Table 2 - Classes of Reaction to Fire Performance for Floorings

CLASS	TEST METHODS	CLASSIFICATION CRITERIA	ADDITIONAL CLASSIFICATION
A1 _n	EN ISO 1182 ⁽¹⁾ and	$\Delta T \leq 30^{\circ}\text{C}$; and $\Delta m \leq 50\%$; and $t_r = 0$ (i.e. no sustained flaming)	-
	EN ISO 1716	$\text{PCS} \leq 2.0 \text{ MJ/kg}^{(1)}$ and $\text{PCS} \leq 2.0 \text{ MJ/kg}^{(2)}$ and $\text{PCS} \leq 1.4 \text{ MJ/m}^2^{(3)}$ and $\text{PCS} \leq 2.0 \text{ MJ/kg}^{(4)}$	-
A2 _n	EN ISO 1182 ⁽¹⁾ or	$\Delta T \leq 50^{\circ}\text{C}$; and $\Delta m \leq 50\%$; and $t_r \leq 20\text{s}$	-
	EN ISO 1716 and	$\text{PCS} \leq 3.0 \text{ MJ/kg}^{(1)}$ and $\text{PCS} \leq 4.0 \text{ MJ/m}^2^{(2)}$ and $\text{PCS} \leq 4.0 \text{ MJ/m}^2^{(3)}$ and $\text{PCS} \leq 3.0 \text{ MJ/kg}^{(4)}$	-
	EN ISO 9239-1 ⁽⁵⁾	Critical flux ⁽⁶⁾ $\geq 8.0 \text{ kW/m}^2$	Smoke production ⁽⁷⁾
B _n	EN ISO 9239-1 ⁽⁵⁾	Critical flux ⁽⁶⁾ $\geq 8.0 \text{ kW/m}^2$	Smoke production ⁽⁷⁾
	EN ISO 11925-2 ⁽⁸⁾ Exposure = 15s	$F_s \leq 150\text{mm}$ within 20s	
C _n	EN ISO 9239-1 ⁽⁵⁾ and	Critical flux ⁽⁶⁾ $\geq 4.5 \text{ kW/m}^2$	Smoke production ⁽⁷⁾
	EN ISO 11925-2 ⁽⁸⁾ Exposure = 15s	$F_s \leq 150\text{mm}$ within 20s	
D _n	EN ISO 9239-1 ⁽⁵⁾ and	Critical flux ⁽⁶⁾ $\geq 3,0 \text{ kW/m}^2$	Smoke production ⁽⁷⁾
	EN ISO 11925-2 ⁽⁸⁾ Exposure = 15s	$F_s \leq 150\text{mm}$ within 20s	
E _n	EN ISO 11925-2 ⁽⁸⁾ Exposure = 15s	$F_s \leq 150\text{mm}$ within 20s	-
F _n	No performance determined		

⁽¹⁾ For homogeneous products and substantial components of non-homogeneous products

⁽²⁾ For any external non-substantial component of non-homogeneous products

⁽³⁾ For any internal non-substantial component of non-homogeneous products

⁽⁴⁾ For the product as a whole

⁽⁵⁾ Test duration = 30 minutes

⁽⁶⁾ Critical flux is defined as the radiant flux at which the flame extinguishes or the radiant flux after a test period of 30 minutes, whichever is lower (i.e. the flux corresponding with the furthest extent of spread of flame).

⁽⁷⁾ **s1** = Smoke $\leq 750\%.\text{min}$;

s2 = not s1

⁽⁸⁾ Under conditions of surface flame attack and, if appropriate to the end use application of the product, edge flame attack.

Table 3 - Classes of Reaction to Fire Performance for Linear Pipe Thermal Insulation Products

CLASS	TEST METHODS	CLASSIFICATION CRITERIA	ADDITIONAL CLASSIFICATION
A1 _L	EN ISO 1182 ⁽¹⁾ and	$\Delta T \leq 30^{\circ}\text{C}$; and $\Delta m \leq 50\%$; and $t_r = 0$ (i.e. no sustained flaming)	-
	EN ISO 1716	PCS ≤ 2.0 MJ/kg ⁽¹⁾ and PCS ≤ 2.0 MJ/kg ⁽²⁾ and PCS ≤ 1.4 MJ/m ² ⁽³⁾ and PCS ≤ 2.0 MJ/kg ⁽⁴⁾	-
A2 _L	EN ISO 1182 ⁽¹⁾ or	$\Delta T \leq 50^{\circ}\text{C}$; and $\Delta m \leq 50\%$; and $t_r \leq 20\text{s}$	-
	EN ISO 1716 and	PCS ≤ 3.0 MJ/kg ⁽¹⁾ and PCS ≤ 4.0 MJ/m ² ⁽²⁾ and PCS ≤ 4.0 MJ/m ² ⁽³⁾ and PCS ≤ 3.0 MJ/kg ⁽⁴⁾	-
	EN 13823	FIGRA ≤ 270 W/s and LFS < edge of specimen and THR _{600s} ≤ 7.5 MJ	Smoke production ⁽⁵⁾ and Flaming droplets/particles ⁽⁶⁾
B _L	EN 13823 and	FIGRA ≤ 270 W/s and LFS < edge of specimen and THR _{600s} ≤ 7.5 MJ	Smoke production ^(e) and Flaming droplets/particles ^(f)
	EN ISO 11925-2 ⁽⁸⁾ Exposure = 30 s	Fs $\leq 150\text{mm}$ within 60s	
C _L	EN 13823 and	FIGRA ≤ 460 W/s and LFS < edge of specimen and THR _{600s} ≤ 15 MJ	Smoke production ⁽⁵⁾ and Flaming droplets/particles ⁽⁶⁾
	EN ISO 11925-2 ⁽⁸⁾ Exposure = 30 s	Fs $\leq 150\text{mm}$ within 20s	
D _L	EN 13823 and	FIGRA ≤ 2100 W/s THR _{600s} ≤ 100 MJ	Smoke production ⁽⁵⁾ and Flaming droplets/particles ⁽⁶⁾
	EN ISO 11925-2 ⁽⁸⁾ Exposure = 30 s	Fs $\leq 150\text{mm}$ within 60 s	
E _L	EN ISO 11925-2 ⁽⁸⁾ Exposure = 15 s	Fs $\leq 150\text{mm}$ within 20 s	Flaming droplets/particles ⁽⁶⁾
F _L	No performance determined		

⁽¹⁾ For homogeneous products and substantial components of non-homogeneous products

⁽²⁾ For any external non-substantial component of non-homogeneous products.

⁽³⁾ For any internal non-substantial component of non-homogeneous products.

⁽⁴⁾ For the product as a whole

⁽⁵⁾ s1 = SMOGRA ≤ 105 m²/s² and TSP_{600s} ≤ 250 m³; s2 = SMOGRA ≤ 580 m²/s² and TSP_{600s} ≤ 1600 m³;
s3 = not s1 or s2

⁽⁶⁾ d0 = No flaming droplets/particles in EN 13823 within 600 s;

d1 = No flaming droplets/particles persisting longer than 10 s in EN 13823 within 600 s;

d2 = not d0 or d1.

Ignition of the paper in EN ISO 11925-2 results in a d2 classification.

⁽⁷⁾ Pass = no ignition of the paper (no classification);

Fail = ignition of the paper (d2 classification).

⁽⁸⁾ Under conditions of surface flame attack and, if appropriate to the end-use application of the product, edge flame



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