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ANNEX

Classes of reaction to fire performance

1.1. For the purposes of Tables 1 to 4 the following symbols⁽¹⁾ apply:

- (1) ‘ ΔT ’ — temperature rise;
- (2) ‘ Δm ’ — mass loss;
- (3) ‘ t_f ’ — duration of flaming;
- (4) ‘PCS’ — gross calorific potential;
- (5) ‘LFS’ — lateral flame spread;
- (6) ‘SMOGRA’ — smoke growth rate.

1.2. For the purposes of Tables 1, 2 and 3 the following symbols⁽¹⁾ apply:

- (1) ‘FIGRA’ — fire growth rate;
- (2) ‘THR’ — total heat release;
- (3) ‘TSP’ — total smoke production;
- (4) ‘Fs’ — flame spread.

1.3. For the purposes of Table 4 the following symbols and test parameters apply:

- (1) ‘ HRR_{sm30} , kW’ — heat release rate averaged by a 30-s sliding average;
- (2) ‘ SPR_{sm60} , m^2/s ’ — smoke production rate averaged by a 60-s sliding average;
- (3) ‘Peak HRR,’ — maximum of HRR_{sm30} between test start and end of test, excluded kW contribution from ignition source;
- (4) ‘Peak SPR, m^2/s ’ — maximum of SPR_{sm60} between test start and end of test;
- (5) ‘ THR_{1200} , MJ’ — total heat release (HRR_{sm30}) from test start until end of test, excluded contribution from ignition source;
- (6) ‘ TSP_{1200} , m^2 ’ — total smoke production (HRR_{sm60}) from test start until end of test;
- (7) ‘FIGRA, W/s’ — fire growth rate index defined as the highest value of the quotient between HRR_{sm30} excluding the contribution of ignition source and time. Threshold values $HRR_{sm30} = 3$ kW and $THR = 0,4$ MJ;
- (8) ‘FS’ — flame spread (damaged length);
- (9) ‘H’ — flame spread.

2. For the purposes of Tables 1 to 4 the following definitions apply:

- (1) ‘material’ means a single basic substance or uniformly dispersed mixture of substances;
- (2) ‘homogeneous product’ means a product consisting of a single material, having uniform density and composition throughout the product;
- (3) ‘non-homogeneous product’ means a product that does not satisfy the requirements of a homogeneous product and that is composed of one or more components, substantial and/or non-substantial;
- (4) ‘substantial component’ means a material that constitutes a significant part of a non-homogeneous product; a layer with a mass per unit area $\geq 1,0$ kg/m^2 or a thickness $\geq 1,0$ mm is considered to be a substantial component;

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- (5) ‘non-substantial component’ means a material that does not constitute a significant part of a non-homogeneous product; a layer with a mass per unit area $< 1,0 \text{ kg/m}^2$ and a thickness $< 1,0 \text{ mm}$ is considered to be a non-substantial component;
- (6) ‘internal non-substantial component’ means a non-substantial component that is covered on both sides by at least one substantial component;
- (7) ‘external non-substantial component’ means a non-substantial component that is not covered on one side by a substantial component.

Two or more non-substantial layers that are adjacent to each other, where there are no substantial components in between the layers, shall be considered as one non-substantial component and shall, therefore, be classified in accordance with the criteria for a layer that is a non-substantial component.

TABLE 1

Classes of reaction to fire performance for construction products excluding floorings, linear pipe thermal insulation products, and electric cables

Class	Test method(s)	Classification criteria	Additional classification
A1	EN ISO 1182 ^a ; <i>and</i>	$\Delta T \leq 30 \text{ }^\circ\text{C}$; <i>and</i> $\Delta m \leq 50 \%$; <i>and</i> $t_f = 0$ (i.e. no sustained flaming)	
	EN ISO 1716	$PCS \leq 2,0 \text{ MJkg}^{-1a}$; <i>and</i> $PCS \leq 2,0 \text{ MJkg}^{-1bc}$; <i>and</i> $PCS \leq 1,4 \text{ MJm}^{-2d}$; <i>and</i> $PCS \leq 2,0 \text{ MJkg}^{-1e}$	
A2	EN ISO 1182 ^a ; <i>or</i>	$\Delta T \leq 50 \text{ }^\circ\text{C}$; <i>and</i> $\Delta m \leq 50 \%$; <i>and</i> $t_f \leq 20 \text{ s}$	
	EN ISO 1716; <i>and</i>	$PCS \leq 3,0 \text{ MJkg}^{-1a}$; <i>and</i> $PCS \leq 4,0 \text{ MJm}^{-2b}$; <i>and</i> $PCS \leq 4,0 \text{ MJm}^{-2d}$; <i>and</i> $PCS \leq 3,0 \text{ MJkg}^{-1e}$	
	EN 13823 (SBI)	$FIGRA \leq 120 \text{ W s}^{-1}$; <i>and</i> LFS $<$ edge of specimen; <i>and</i> $THR_{600s} \leq 7,5 \text{ MJ}$	Smoke production ^f ; <i>and</i> Flaming droplets/ particles ^g

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B	EN 13823 (SBI); <i>and</i>	FIGRA $\leq 120 \text{ W s}^{-1}$; <i>and</i> LFS < edge of specimen; <i>and</i> THR _{600s} $\leq 7,5 \text{ MJ}$	Smoke production ^f ; <i>and</i> Flaming droplets/ particles ^g
	EN ISO 11925-2 ⁱ : <i>Exposure = 30 s</i>	Fs $\leq 150 \text{ mm}$ within 60 s	
C	EN 13823 (SBI); <i>and</i>	FIGRA $\leq 250 \text{ W s}^{-1}$; <i>and</i> LFS < edge of specimen; <i>and</i> THR _{600s} $\leq 15 \text{ MJ}$	Smoke production ^f ; <i>and</i> Flaming droplets/ particles ^g
	EN ISO 11925-2 ⁱ : <i>Exposure = 30 s</i>	Fs $\leq 150 \text{ mm}$ within 60 s	
D	EN 13823 (SBI); <i>and</i>	FIGRA $\leq 750 \text{ W s}^{-1}$	Smoke production ^f ; <i>and</i> Flaming droplets/ particles ^g
	EN ISO 11925-2 ⁱ : <i>Exposure = 30 s</i>	Fs $\leq 150 \text{ mm}$ within 60 s	
E	EN ISO 11925-2 ⁱ : <i>Exposure = 15 s</i>	Fs $\leq 150 \text{ mm}$ within 20 s	Flaming droplets/ particles ^h
F	EN ISO 11925-2 ⁱ : <i>Exposure = 15 s</i>	Fs > 150 mm within 20 s	
a	For homogeneous products and substantial components of non-homogeneous products.		
b	For any external non-substantial component of non-homogeneous products.		
c	(2a) Alternatively, any external non-substantial component having a PCS $\leq 2,0 \text{ MJ m}^{-2}$, provided that the product satisfies the following criteria of EN 13823(SBI): FIGRA $\leq 20 \text{ W s}^{-1}$; <i>and</i> LFS < edge of specimen; <i>and</i> THR _{600s} $\leq 4,0 \text{ MJ}$; <i>and</i> s1; <i>and</i> d0.		
d	For any internal non-substantial component of non-homogeneous products.		
e	For the product as a whole.		
f	s1 = SMOGRA $\leq 30 \text{ m}^2 \text{ s}^{-2}$ <i>and</i> TSP _{600s} $\leq 50 \text{ m}^2$; s2 = SMOGRA $\leq 180 \text{ m}^2 \text{ s}^{-2}$ <i>and</i> TSP _{600s} $\leq 200 \text{ m}^2$; s3 = not s1 or s2.		
g	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.		
h	No ignition of the paper = no additional classification; Ignition of the paper = d2 classification.		
i	Under conditions of surface flame attack and, if appropriate to the intended use of the product, edge flame attack.		

TABLE 2

Classes of reaction to fire performance for floorings

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Class	Test method(s)	Classification criteria	Additional classification
A1_{FL}	EN ISO 1182 ^a ; <i>and</i>	$\Delta T \leq 30 \text{ }^\circ\text{C}$; <i>and</i> $\Delta m \leq 50 \%$; <i>and</i> $t_f = 0$ (i.e. no sustained flaming)	
	EN ISO 1716	$PCS \leq 2,0 \text{ MJkg}^{-1a}$; <i>and</i> $PCS \leq 2,0 \text{ MJkg}^{-1b}$; <i>and</i> $PCS \leq 1,4 \text{ MJm}^{-2c}$; <i>and</i> $PCS \leq 2,0 \text{ MJkg}^{-1d}$	
A2_{FL}	EN ISO 1182 ^a ; <i>or</i>	$\Delta T \leq 50 \text{ }^\circ\text{C}$; <i>and</i> $\Delta m \leq 50 \%$; <i>and</i> $t_f \leq 20 \text{ s}$	
	EN ISO 1716; <i>and</i>	$PCS \leq 3,0 \text{ MJkg}^{-1a}$; <i>and</i> $PCS \leq 4,0 \text{ MJm}^{-2b}$; <i>and</i> $PCS \leq 4,0 \text{ MJm}^{-2c}$; <i>and</i> $PCS \leq 3,0 \text{ MJkg}^{-1d}$	
	EN ISO 9239-1 ^e	Critical flux ^f $\geq 8,0 \text{ kWm}^{-2}$	Smoke production ^g
B_{FL}	EN ISO 9239-1 ^e <i>and</i>	Critical flux ^f $\geq 8,0 \text{ kWm}^{-2}$	Smoke production ^g
	EN ISO 11925-2 ^h : <i>Exposure = 15 s</i>	$F_s \leq 150 \text{ mm}$ within 20 s	
C_{FL}	EN ISO 9239-1 ^e <i>and</i>	Critical flux ^f $\geq 4,5 \text{ kWm}^{-2}$	Smoke production ^g
	EN ISO 11925-2 ^h : <i>Exposure = 15 s</i>	$F_s \leq 150 \text{ mm}$ within 20 s	

a For homogeneous products and substantial components of non-homogeneous products.

b For any external non-substantial component of non-homogeneous products.

c For any internal non-substantial component of non-homogeneous products.

d For the product as a whole.

e Test duration = 30 minutes.

f 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 the lower (i.e. the flux corresponding with the furthest extent of spread of flame).

g **s1** = Smoke $\leq 750 \text{ } \%. \text{min}$; **s2** = not s1.

h Under conditions of surface flame attack and, if appropriate to the intended use of the product, edge flame attack.

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D_{FL}	EN ISO 9239-1 ^e <i>and</i>	Critical flux ^f $\geq 3,0$ kWm^{-2}	Smoke production ^g
	EN ISO 11925-2 ^h : <i>Exposure = 15 s</i>	$F_s \leq 150$ mm within 20 s	
E_{FL}	EN ISO 11925-2 ^h : <i>Exposure = 15 s</i>	$F_s \leq 150$ mm within 20 s	
F_{FL}	EN ISO 11925-2 ^h : <i>Exposure = 15 s</i>	$F_s > 150$ mm within 20 s	
a	For homogeneous products and substantial components of non-homogeneous products.		
b	For any external non-substantial component of non-homogeneous products.		
c	For any internal non-substantial component of non-homogeneous products.		
d	For the product as a whole.		
e	Test duration = 30 minutes.		
f	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 the lower (i.e. the flux corresponding with the furthest extent of spread of flame).		
g	s1 = Smoke ≤ 750 %·min; s2 = not s1.		
h	Under conditions of surface flame attack and, if appropriate to the intended use of the product, edge flame attack.		

TABLE 3

Classes of reaction to fire performance for linear pipe insulation products

Class	Test method(s)	Classification criteria	Additional classification
A1_L	EN ISO 1182 ^a ; <i>and</i>	$\Delta T \leq 30$ °C; <i>and</i> $\Delta m \leq 50$ %; <i>and</i> $t_f = 0$ (i.e. no sustained flaming)	
	EN ISO 1716	$PCS \leq 2,0$ MJkg ^{-1a} ; <i>and</i> $PCS \leq 2,0$ MJkg ^{-1b} ; <i>and</i> $PCS \leq 1,4$ MJm ^{-2c} ; <i>and</i>	
a	For homogeneous products and substantial components of non-homogeneous products.		
b	For any external non-substantial component of non-homogeneous products.		
c	For any internal non-substantial component of non-homogeneous products.		
d	For the product as a whole.		
e	s1 = SMOGRA ≤ 105 m ² s ⁻² <i>and</i> TSP _{600s} ≤ 250 m ² ; s2 = SMOGRA ≤ 580 m ² s ⁻² <i>and</i> TSP _{600s} $\leq 1\ 600$ m ² ; s3 = not s1 or s2.		
f	d0 = No flaming droplets/particles in EN13823 (SBI) within 600s; d1 = No flaming droplets/particles persisting longer than 10s in EN13823 (SBI) within 600s; d2 = not d0 or d1; Ignition of the paper in EN ISO 11925-2 results in a d2 classification.		
g	No ignition of the paper = no additional classification; Ignition of the paper = d2 classification.		
h	Under conditions of surface flame attack and, if appropriate to the intended use of the product, edge flame attack.		

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A₂L		$PCS \leq 2,0 \text{ MJkg}^{-1d}$	
	EN ISO 1182 ^a ; <i>or</i>	$\Delta T \leq 50 \text{ }^\circ\text{C}$; <i>and</i> $\Delta m \leq 50 \%$; <i>and</i> t_f $\leq 20 \text{ s}$	
	EN ISO 1716; <i>and</i>	$PCS \leq 3,0 \text{ MJkg}^{-1a}$; <i>and</i> $PCS \leq 4,0 \text{ MJm}^{-2b}$; <i>and</i> $PCS \leq 4,0 \text{ MJm}^{-2c}$; <i>and</i> $PCS \leq 3,0 \text{ MJkg}^{-1d}$	
	EN 13823 (SBI)	$FIGRA \leq 270 \text{ Ws}^{-1}$; <i>and</i> LFS < edge of specimen; <i>and</i> $THR_{600s} \leq 7,5 \text{ MJ}$	Smoke production ^e ; <i>and</i> Flaming droplets/ particles ^f
B_L	EN 13823 (SBI); <i>and</i>	$FIGRA \leq 270 \text{ Ws}^{-1}$; <i>and</i> LFS < edge of specimen; <i>and</i> $THR_{600s} \leq 7,5 \text{ MJ}$	Smoke production ^e ; <i>and</i> Flaming droplets/ particles ^f
	EN ISO 11925-2 ^h : <i>Exposure = 30 s</i>	$F_s \leq 150 \text{ mm}$ within 60 s	
C_L	EN 13823 (SBI); <i>and</i>	$FIGRA \leq 460 \text{ Ws}^{-1}$; <i>and</i> LFS < edge of specimen; <i>and</i> $THR_{600s} \leq 15 \text{ MJ}$	Smoke production ^e ; <i>and</i> Flaming droplets/ particles ^f
	EN ISO 11925-2 ^h : <i>Exposure = 30 s</i>	$F_s \leq 150 \text{ mm}$ within 60 s	
D_L	EN 13823 (SBI); <i>and</i>	$FIGRA \leq 2 \text{ } 100 \text{ Ws}^{-1}$ $THR_{600s} \leq 100 \text{ MJ}$	Smoke production ^e ; <i>and</i>

a For homogeneous products and substantial components of non-homogeneous products.

b For any external non-substantial component of non-homogeneous products.

c For any internal non-substantial component of non-homogeneous products.

d For the product as a whole.

e **s1** = SMOGRA $\leq 105 \text{ m}^2\text{s}^{-2}$ and TSP_{600s} $\leq 250 \text{ m}^2$; **s2** = SMOGRA $\leq 580 \text{ m}^2\text{s}^{-2}$ and TSP_{600s} $\leq 1 \text{ } 600 \text{ m}^2$; **s3** = not s1 or s2.

f **d0** = No flaming droplets/particles in EN13823 (SBI) within 600s; **d1** = No flaming droplets/particles persisting longer than 10s in EN13823 (SBI) within 600s; **d2** = not d0 or d1; Ignition of the paper in EN ISO 11925-2 results in a d2 classification.

g No ignition of the paper = no additional classification; Ignition of the paper = **d2** classification.

h Under conditions of surface flame attack and, if appropriate to the intended use of the product, edge flame attack.

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	EN ISO 11925-2 ^b : <i>Exposure = 30 s</i>	F _s ≤ 150 mm within 60 s	Flaming droplets/ particles ^f
E_L	EN ISO 11925-2 ^b : <i>Exposure = 15 s</i>	F _s ≤ 150 mm within 20 s	Flaming droplets/ particles ^g
F_L	EN ISO 11925-2 ^b : <i>Exposure = 15 s</i>	F _s > 150mm within 20 s	
a	For homogeneous products and substantial components of non-homogeneous products.		
b	For any external non-substantial component of non-homogeneous products.		
c	For any internal non-substantial component of non-homogeneous products.		
d	For the product as a whole.		
e	s1 = SMOGRA ≤ 105 m ² s ⁻² and TSP _{600s} ≤ 250 m ² ; s2 = SMOGRA ≤ 580 m ² s ⁻² and TSP _{600s} ≤ 1 600 m ² ; s3 = not s1 or s2.		
f	d0 = No flaming droplets/particles in EN13823 (SBI) within 600s; d1 = No flaming droplets/particles persisting longer than 10s in EN13823 (SBI) within 600s; d2 = not d0 or d1; Ignition of the paper in EN ISO 11925-2 results in a d2 classification.		
g	No ignition of the paper = no additional classification; Ignition of the paper = d2 classification.		
h	Under conditions of surface flame attack and, if appropriate to the intended use of the product, edge flame attack.		

TABLE 4

Classes of reaction to fire performance for electric cables

Class	Test method(s)	Classification criteria	Additional classification
A_{ca}	EN ISO 1716	PCS ≤ 2,0 MJ/kg ^a	
B1_{ca}	EN 50399 (30 kW flame source) <i>and</i>	FS ≤ 1,75 m <i>and</i> THR _{1200s} ≤ 10 MJ <i>and</i> Peak HRR ≤ 20 kW <i>and</i> FIGRA ≤ 120 W s ⁻¹	Smoke production ^{be} and Flaming droplets/ particles ^c and Acidity (pH and conductivity) ^d
	EN 60332-1-2	H ≤ 425 mm	
B2_{ca}	EN 50399 (20,5 kW flame source) <i>and</i>	FS ≤ 1,5 m; <i>and</i> THR _{1200s} ≤ 15 MJ; <i>and</i>	Smoke production ^{bf} and Flaming droplets/ particles ^c and
a	For the product as a whole, excluding metallic materials, and for any external component (i.e. sheath) of the product.		
b	s1 = TSP ₁₂₀₀ ≤ 50 m ² and Peak SPR ≤ 0,25 m ² /s s1a = s1 and transmittance in accordance with EN 61034-2 ≥ 80 % s1b = s1 and transmittance in accordance with EN 61034-2 ≥ 60 % < 80 % s2 = TSP ₁₂₀₀ ≤ 400 m ² and Peak SPR ≤ 1,5 m ² /s s3 = not s1 or s2		
c	d0 = No flaming droplets/particles within 1 200 s; d1 = No flaming droplets/particles persisting longer than 10 s within 1 200 s; d2 = not d0 or d1 .		
d	EN 60754-2: a1 = conductivity < 2,5 μS/mm <i>and</i> pH > 4,3; a2 = conductivity < 10 μS/mm <i>and</i> pH > 4,3; a3 = not a1 or a2 .		
e	The smoke class declared for class B1 _{ca} cables must originate from the EN 50399 test (30 kW flame source).		
f	The smoke class declared for class B2 _{ca} , C _{ca} , D _{ca} cables must originate from the EN 50399 test (20,5 kW flame source).		

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		Peak HRR \leq 30 kW; <i>and</i> FIGRA \leq 150 W s ⁻¹	Acidity (pH and conductivity) ^d
	EN 60332-1-2	H \leq 425 mm	
C_{ca}	EN 50399 (20,5 kW flame source) <i>and</i>	FS \leq 2,0 m; <i>and</i> THR _{1200s} \leq 30 MJ; <i>and</i> Peak HRR \leq 60 kW; <i>and</i> FIGRA \leq 300 W s ⁻¹	Smoke production ^{bf} and Flaming droplets/particles ^c and Acidity (pH and conductivity) ^d
	EN 60332-1-2	H \leq 425 mm	
D_{ca}	EN 50399 (20,5 kW flame source) <i>and</i>	THR _{1200s} \leq 70 MJ; <i>and</i> Peak HRR \leq 400 kW; <i>and</i> FIGRA \leq 1 300 W s ⁻¹	Smoke production ^{bf} and Flaming droplets/particles ^c and Acidity (pH and conductivity) ^d
	EN 60332-1-2	H \leq 425 mm	
E_{ca}	EN 60332-1-2	H \leq 425 mm	
F_{ca}	EN 60332-1-2	H > 425 mm	
a	For the product as a whole, excluding metallic materials, and for any external component (i.e. sheath) of the product.		
b	s1 = TSP ₁₂₀₀ \leq 50 m ² <i>and</i> Peak SPR \leq 0,25 m ² /s s1a = s1 and transmittance in accordance with EN 61034-2 \geq 80 % s1b = s1 and transmittance in accordance with EN 61034-2 \geq 60 % < 80 % s2 = TSP ₁₂₀₀ \leq 400 m ² <i>and</i> Peak SPR \leq 1,5 m ² /s s3 = not s1 or s2		
c	d0 = No flaming droplets/particles within 1 200 s; d1 = No flaming droplets/particles persisting longer than 10 s within 1 200 s; d2 = not d0 or d1 .		
d	EN 60754-2: a1 = conductivity < 2,5 μ S/mm <i>and</i> pH > 4,3; a2 = conductivity < 10 μ S/mm <i>and</i> pH > 4,3; a3 = not a1 or a2 .		
e	The smoke class declared for class B1 _{ca} cables must originate from the EN 50399 test (30 kW flame source).		
f	The smoke class declared for class B2 _{ca} , C _{ca} , D _{ca} cables must originate from the EN 50399 test (20,5 kW flame source).		

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- (1) The characteristics are defined with respect to the appropriate test method.

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Changes and effects yet to be applied to the whole legislation item and associated provisions

- Signature modified by [S.I. 2019/465 Sch. 3 para. 8](#)