

# Equivalences between standards

	Standards			
	NF	EN	IEC	
<b>FIRE RESISTANCE</b>				
Circuit integrity			60331-1	Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0.6/1.0 kV and with an overall diameter exceeding 20 mm
			60331-2	Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0.6/1.0 kV and with an overall diameter not exceeding 20 mm
			60331-3	Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0.6/1.0 kV tested in a metal enclosure
			60331-11	Apparatus - Fire alone at a flame temperature of at least 750 °C
			60331-21	Procedures and requirements - Cables of rated voltage up to and including 0.6/1.0 kV
			60331-23 60331-25	Procedures and requirements - Electric data cables Procedures and requirements - Optical fibre cables
CR1 test	C 32-070			Tests for classification of conductors and cables with respect to their fire behaviour
Test on small conductors	C 32-076	50200		Method of test for resistance to fire of unprotected small cables for use in emergency circuits
Test on large conductors	C 32-077	50362		Method of test for resistance to fire of larger unprotected power and control cables for use in emergency circuits
<b>FLAME PROPAGATION</b>				
<b>Cable alone:</b>				
Vertical flame	C 32-078-1-1	60332-1-1	60332-1-1	Test for a vertical flame propagation for a single insulated wire or cable - Apparatus
	C 32-078-1-2	60332-1-2	60332-1-2	Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame
	C 32-078-1-3	60332-1-3	60332-1-3	Test for vertical flame propagation for a single insulated wire or cable - Procedure for determination of flaming droplets/particles
C2 test	C 32-070			Tests for classification of conductors and cables with respect to their fire behaviour
Vertical flame on small conductor	C 32-078-2-1	60332-2-1	60332-2-1	Test for vertical flame propagation for a single small insulated wire or cable - Apparatus
	C 32-078-2-2	60332-2-2	60332-2-2	Test for vertical flame propagation for a single small insulated wire or cable - Procedure for diffusion flame
<b>Bunched cable:</b>				
	C 32-078-3-10	60332-3-10	60332-3-10	Test for vertical flame spread of vertically-mounted bunched wires or cables - Apparatus
	C 32-078-3-21	60332-3-21	60332-3-21	Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A F/R
	C 32-078-3-22	60332-3-22	60332-3-22	Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A
	C 32-078-3-23	60332-3-23	60332-3-23	Test for vertical flame spread of vertically-mounted bunched wires or cables - Category B
	C 32-078-3-24	60332-3-24	60332-3-24	Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C
	C 32-078-3-25	60332-3-25	60332-3-25	Test for vertical flame spread of vertically-mounted bunched wires or cables - Category D
<b>FIRE PROPAGATION</b>				
C1 test	C 32-070			Tests to classify conductors and cables according to their fire behaviour - C1 test
<b>SMOKE DENSITY</b>				
	C 32-073-1	61034-1	61034-1	Test apparatus
	C 32-073-2	61034-2	61034-2	Test procedure and requirements
	X 10-702-1			Determination of the opacity of the fumes in an atmosphere without air renewal - Apparatus
	X 10-702-2			Determination of the opacity of the fumes in an atmosphere without air renewal - Test method
<b>COMBUSTION GASES</b>				
	C 32-074-1	60754-1	60754-1	Determination of halogen acid gas content
	C 32-074-2	60754-2	60754-2	Determination of acidity (by pH measurement) and conductivity
	X 70-100			Analysis of pyrolysis and combustion gases - Tubular furnace method
	X 70-101			Analysis of pyrolysis and combustion gases - Smoke chamber method
	C 20-453			Conventional determination of smoke corrosiveness
	C 20-454			Analysis and titrations of gases evolved during pyrolysis or combustion of materials used in electrotechnical systems

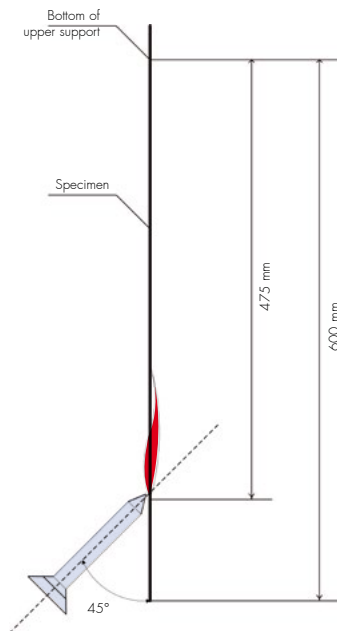
## Description of some tests

### Test: Vertical flame spread on insulated cable as per IEC 60332-1-2 - Test C2 as per NF C 32-070

Length of specimen: 600 mm.  
Burner characteristics: as per IEC 60322-1-1  
Properties of flame: 1 kW.  
Position of specimen: vertical  
Flame position: 45° from the vertical axis of the specimen and 475 mm from the bottom of the lower support.  
Flame application time: see table below.

#### Acceptance criteria:

- The cable must be self-extinguishing.
- The carbonised zone must not be within 50 mm of the bottom of the upper support.
- The carbonised zone must not be more than 540 mm from the bottom of the upper support.



Outer diameter of specimen  
mm

Flame application time  
s

$D \leq 25$	60
$25 < D \leq 50$	120
$50 < D \leq 75$	240
$D > 75$	480

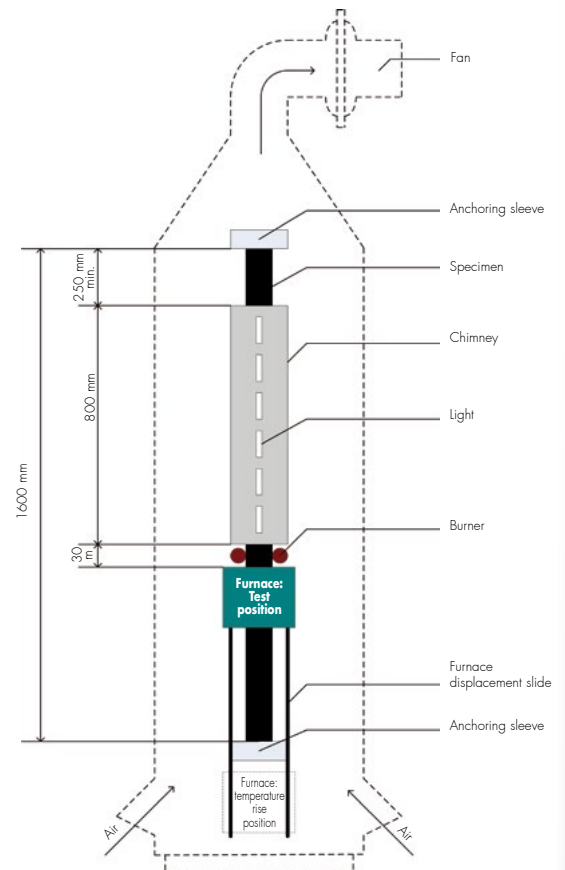
Note: When non-circular cables are tested (e.g. flat cables), the circumference is measured and used to calculate an equivalent diameter as if the cable was circular.

### Test: Fire propagation - C1 test as per NF C 32-070

Length of specimen: 1600 mm.  
Number of sections per specimen: according to cable diameter  
Properties of flame: 1 kW.  
Position of specimen: vertical  
Test temperature: 800 °C.  
Duration: 30 min.

#### Acceptance criteria:

- The part of the specimen beyond the upper end of the chimney must present no traces of combustion.



## EUROCLASSES

**The new European reaction-to-fire classification<sup>(1)</sup> for cables as per the Construction Products Regulation (CPR): "EUROCLASSES"**

Faced with all fire risks, in 2006 the European Union decided to include cables in the Construction Products Directive (CPD). A classification of fire reaction characteristics of cables was published in the Official Journal of the European Union on 27 October 2006 to endorse this decision. These Euroclasses relate to both power and communication cables, in all types of building - residential, commercial and industrial. The new classification represents significant progress for the safety of people and property, as it considers the overall performance of cables in a fire.

### MORE ACCURATE CLASSIFICATION

Table 52A in standard NF C 15-100 currently lists the conductors and cables commonly used in an electrical installation. The table indicates especially the fire reaction characteristics for each cable (C1, C2 or C3). This French classification is set out by the Order of 21 July 1994 which, apart from the classes, lays down the certificate of compliance of the fire performance of electric conductors and cables. It is going to be replaced gradually by the European classification that will have seven classes: A, B1, B2, C, D, E and F, A is the most demanding level.

The public authorities must adapt the French regulations to the European requirements and amend the Order of 21 July 1994 to apply this new classification in France. The regulations on different types of building will then be reviewed to clarify the application of the Euroclasses. The Euroclasses will take time to become applicable. The tests on cables in terms of their fire performance must first be harmonised at European level. Several standards have therefore been prepared:

- Standard EN 50399, which defines the new test methods that supplement certain methods already in existence.
- Standard EN 13501-6, which translates the Euroclass classification. This is at the final voting stage in the relevant Technical Committee of the CEN.
- The "harmonised products" standard EN 50575, which sets out the essential requirements for the assessment and declaration of performance, the initial tests, the monitoring and the marking of products.

Once all these standards have been published and the public authorities have notified the European Commission about which bodies are approved for product certification, the certified products will then gradually appear in the marketplace bearing the CE markings and the statement of the Euroclass achieved. The French classification and the Euroclasses will operate side-by-side for a certain period. Subsequently, the CE markings and performance declarations will be mandatory.

EUROCLASS	CLASSIFICATION CRITERIA	ADDITIONAL CRITERIA
A <sup>ca</sup>	Fire load	
B1 <sup>ca</sup>	Heat release + Vertical spread in bunched cables + Flame spread	Smoke emissions (s1, s1a, s1b, s2, s3)
B2 <sup>ca</sup>		Flaming droplets (d0, d1, d2)
C <sup>ca</sup>		Acidity (a1, a2, a3)
D <sup>ca</sup>		
E <sup>ca</sup>	Flame spread	
F <sup>ca</sup>		

### EUROCLASS CLASSIFICATION CRITERIA

#### Fire load

Aca = Non-combustible (glass, silica, etc.)  
B1ca = Combustible non-flammable  
B2ca = Combustible low flammability  
Cca = Combustible low flammability  
Dca = Combustible moderate flammability  
Eca = Combustible high flammability  
Fca = not classified

#### Smoke opacity

(based on quantity and speed of production)  
s1 = small quantity and slow production speed  
s2 = moderate quantity and production speed  
s3 = large quantity and fast production speed  
s1a = results in better light transmittance than s1b

#### Flaming droplets and debris

d0: no debris  
d1: no debris that burns for more than ten seconds  
d2: debris that burns for more than ten seconds

#### Acidity and conductivity

a1: low conductivity and low acidity of solubilised combustion gases  
a2: relatively low conductivity and low acidity of solubilised combustion gases  
a3: high conductivity and acidity of solubilised combustion gases

(1) Caution, the reaction to fire relates to the performance of the cable when it is burning. It does not refer to its ability to do its work for a limited time in a fire (the term in this case is resistance to fire).

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