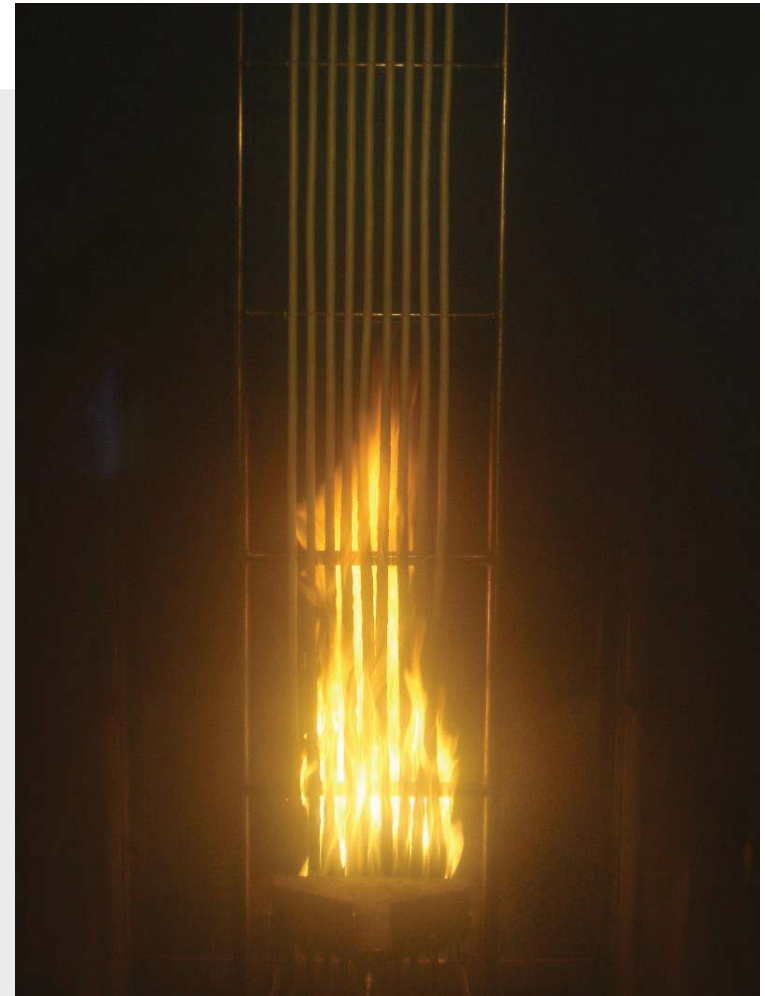


## Testing of Cables and Cords within the scope of CPR

### Fire Tests

#### Testing standards:

- EN 50399
- EN 60332-1-2
- EN 61034-2
- EN 50267-2-3



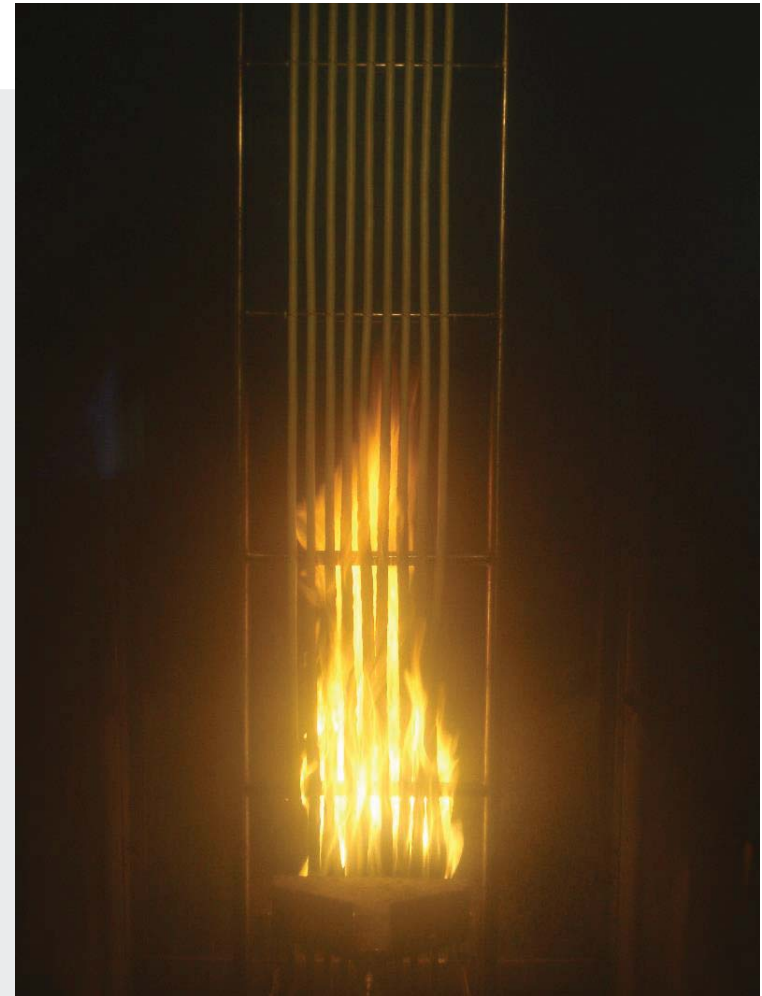
## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 50399

*Common test methods for cables under fire conditions -  
Heat release and smoke production measurement  
on cables during flame spread test -  
Test apparatus, procedures, results*

- **Determination of fire class**
- **Additional classification *flaming droplets / particles***



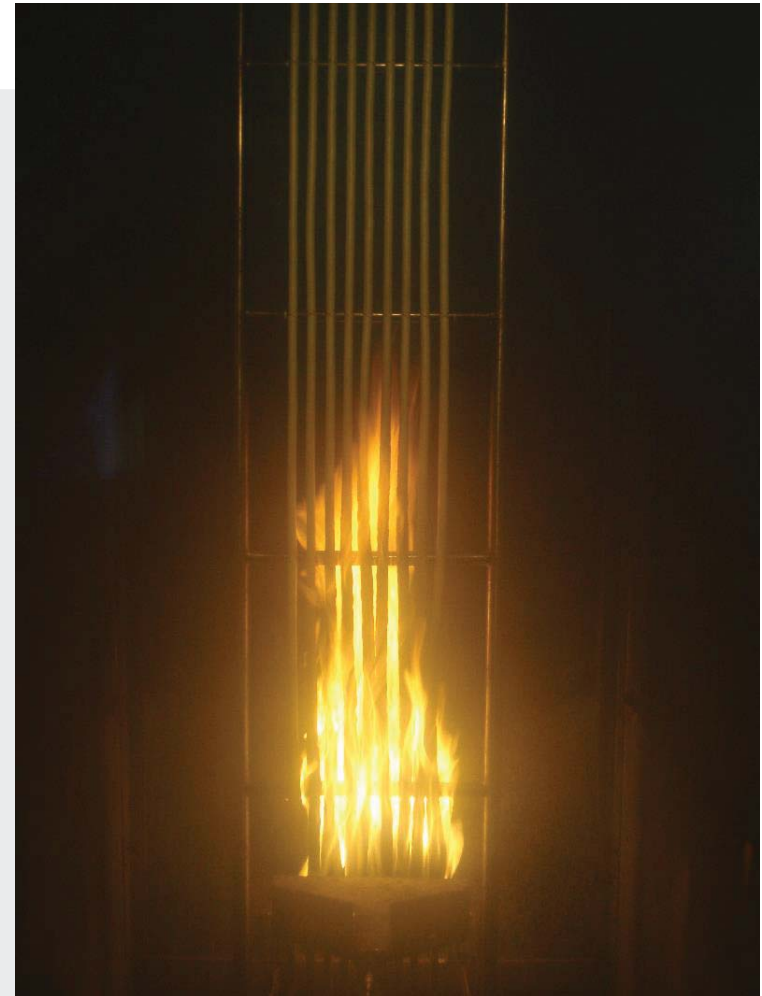
## Testing of Cables and Cords within the scope of CPR

### Fire Tests

#### EN 50399

#### General test procedure

- Several cable samples, fixed side by side on a cable ladder, are exposed to fire in a fire chamber
- The developing exhaust gases are analyzed regarding temperature and oxygen / carbon dioxide content, which gives information about the heat release
- A light beam in the exhaust pipe gives information about the smoke density
- The occurrence of flaming droplets is checked during the flame impingement
- Fire test with 20.5 kW or 30.0 kW power
- Flame impingement: 20 minutes



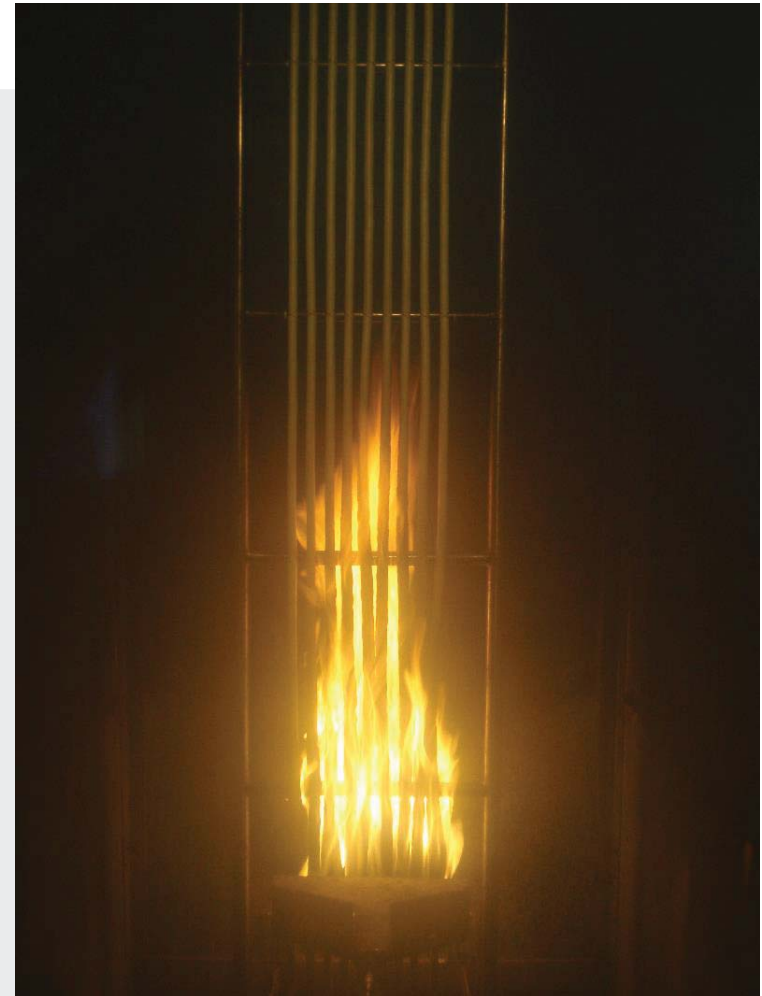
## Testing of Cables and Cords within the scope of CPR

### Fire Tests

#### EN 50399

##### ■ Measuring parameters:

- FS: Flame Spread
- Peak HRR: Max. Heat Release Rate
- Peak SPR: Max. Smoke Production Rate
- THR1200s: Total Heat Release value during flame impingement
- TSP1200: Total Smoke Production value during flame impingement
- FIGRA: FIGRA-Index
- The occurrence of flaming droplets and their duration of burning



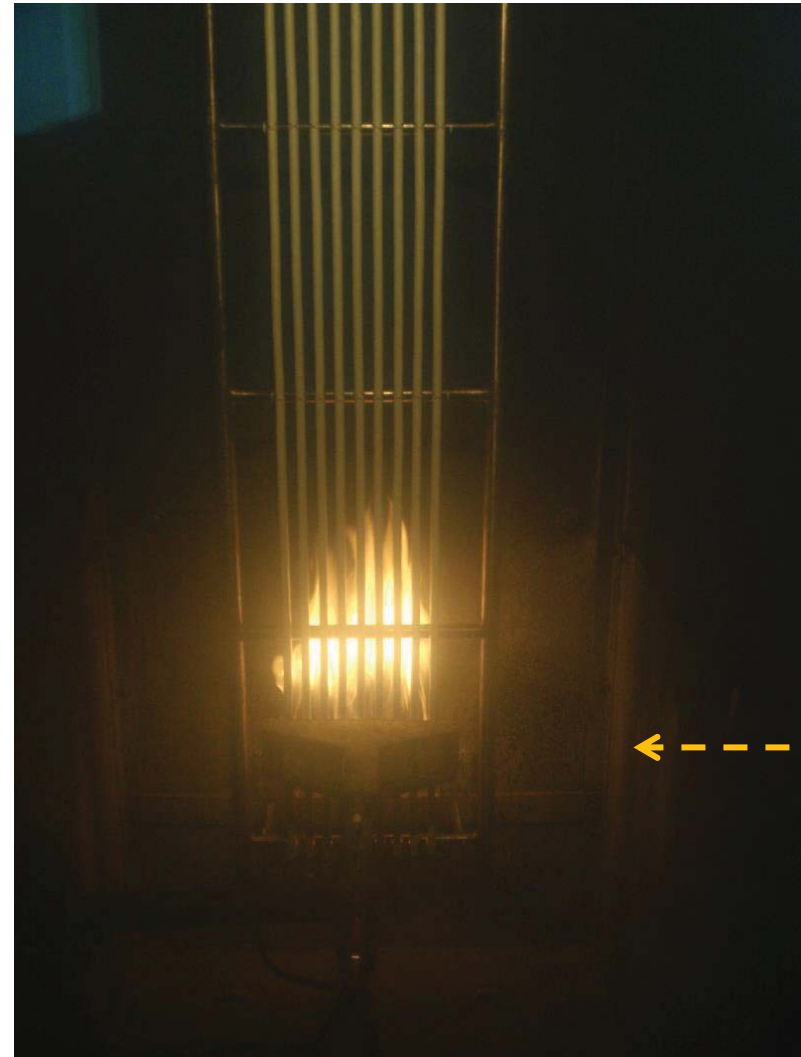
## Testing of Cables and Cords within the scope of CPR



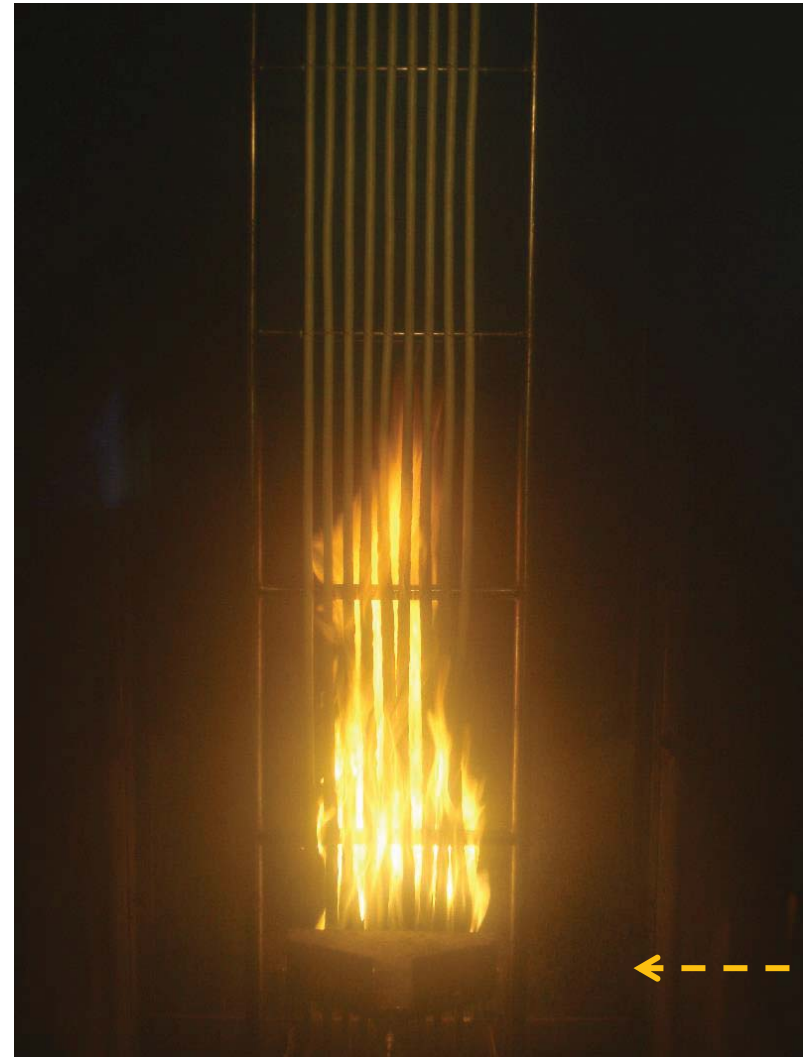
## Testing of Cables and Cords within the scope of CPR



## Testing of Cables and Cords within the scope of CPR

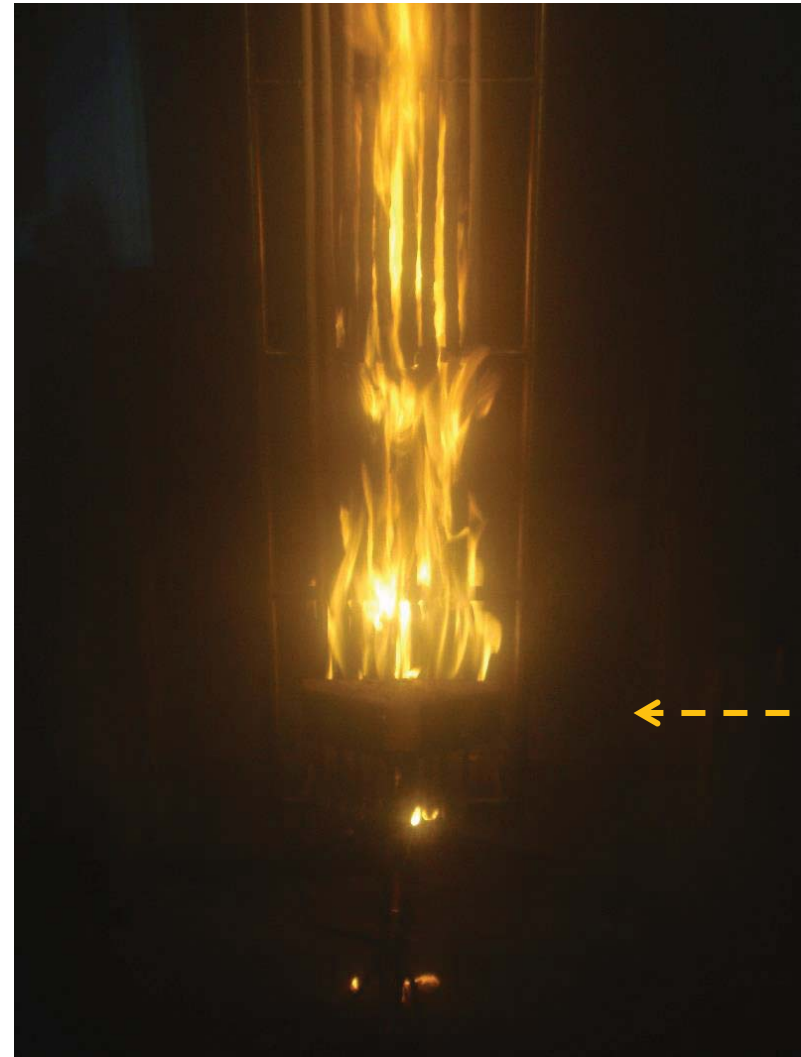


## Testing of Cables and Cords within the scope of CPR

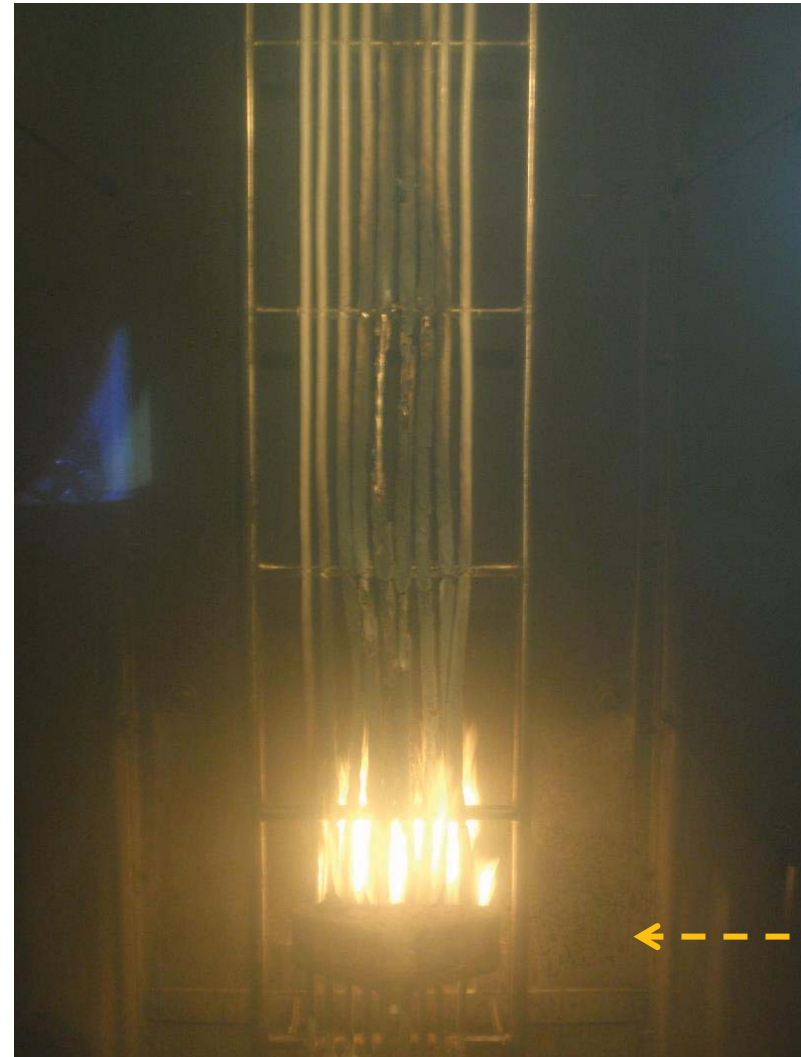




## Testing of Cables and Cords within the scope of CPR



## Testing of Cables and Cords within the scope of CPR



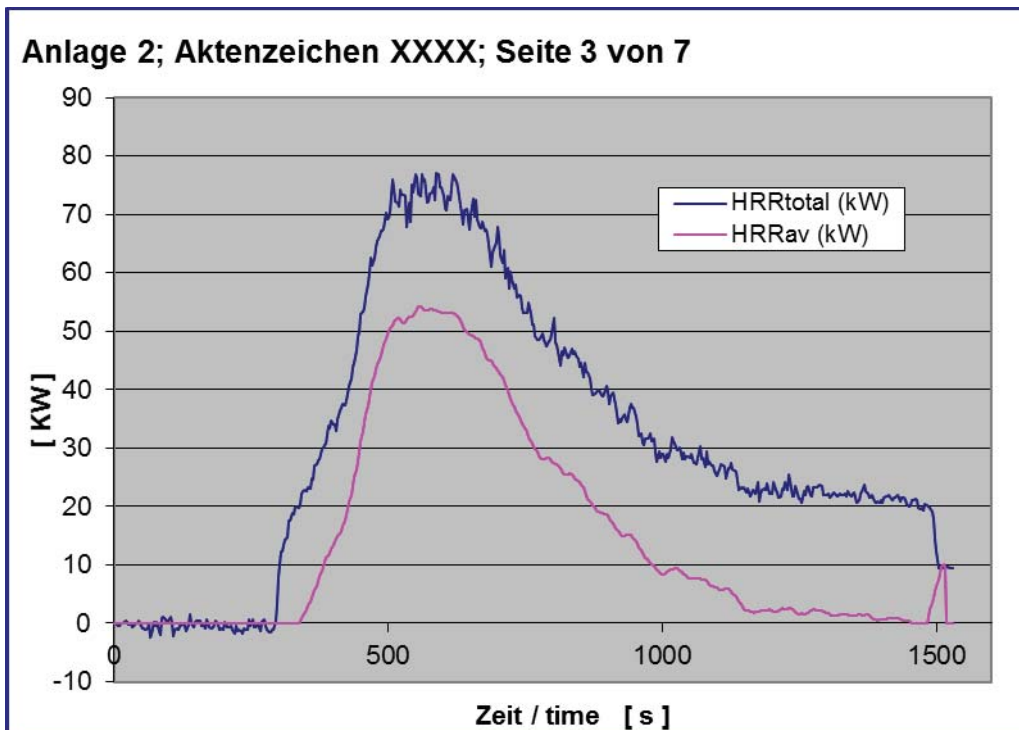
## Testing of Cables and Cords within the scope of CPR



# Testing of Cables and Cords...

Report (exemplary extract)

<b>Testreport EN 50399</b>		Anlage 2 Seite 1 von 7	
Aktenzeichen /File ref.:	XXXX		
Datum / Date of test:	XXXX		
Prüfer / Operator:	XXXX		
Firma /Manufacturer:	XXXX		
Fertigungstätte /Place of manufacture:	XXXX		
Typ /Type:	XXXX		
Aufdruck / Trademark:	XXXX		
Beschreibung / Description	XXXX		
Größe /Quantity:	Wert /Value:		
	Soll:	Ist:	
Anzahl der montierten Muster /Number of cables mounted:	14	14	[St]
Vorlaufzeit /Time propane burner ignited:	300	300	[s]
Brenndauer /Time propane burner extinguished:	1200	1200	[s]
Test Ende /Test end time:	1530 ± 10	1533	[s]
Brennerleistung / Heat output of the burner:	20,5	20,5	[kW]
THRta <sub>1200</sub> /Total heat released <sub>1200</sub> :		22,3	[MJ]
TSPta <sub>1200</sub> /Total smoke production <sub>1200</sub> :		84,4	[m <sup>3</sup> ]
Spitze HRR ohne Brenner /Peak HRR ex burner:		54,2	[kW]
Zeit bei Spitze HRR / Time to peak HRR:		558	[s]
Spitze SPRav /Peak SPRav:		0,28	[m <sup>3</sup> /s]
Zeit bei Spitze SPRav / Time to peak SPRav:		768	[s]
FIGRA max:		250,0	[W/s]
t FIGRA:		495	[s]



## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 60332-1-2

*Tests on electric and optical fibre cables under fire conditions –*

*Part 1-2: Test for vertical flame propagation for a single insulated wire or cable –*

*Procedure for 1 kW pre-mixed flame*

**→ Determination of fire class**



## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 60332-1-2

General test procedure

- A cable sample (length 60cm) is fixed in a draught-free chamber.
- A burner with a 1 kW-flame is applied to the sample at an angle of 45°
- Flame impingement: 1-8 minutes, depending on cable diameter
- Measuring parameter:
  - H: charring length



## Testing of Cables and Cords within the scope of CPR

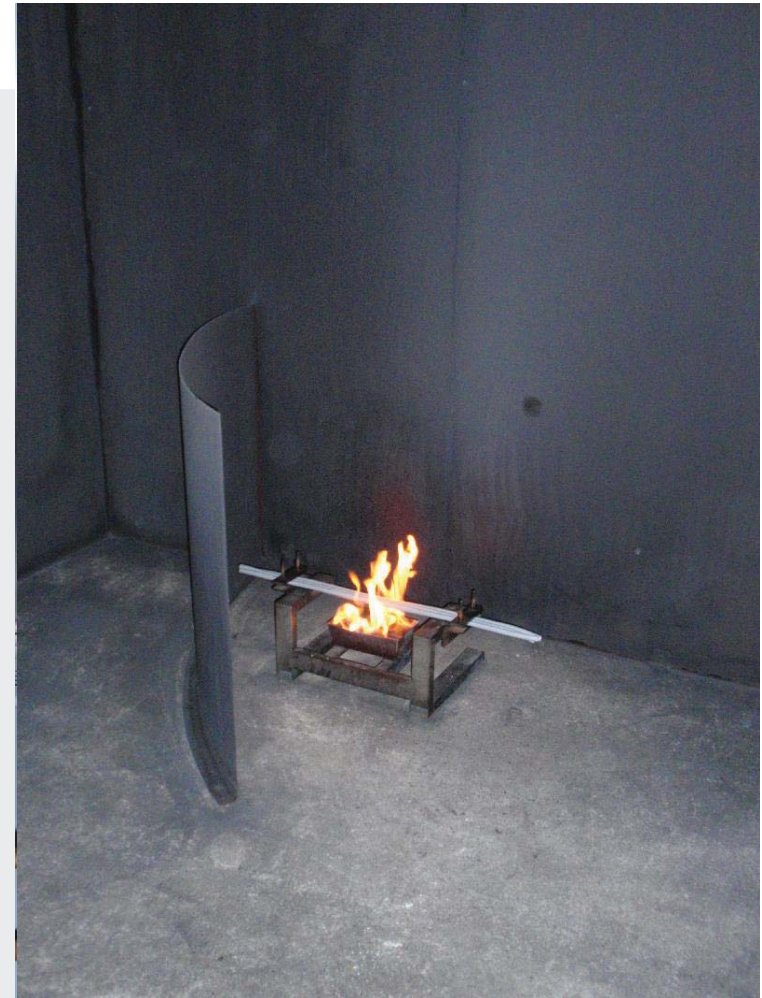
### Fire Tests

EN 61034-2

*Measurement of smoke density of cables burning under defined conditions –*

*Part 2: Test procedure and requirements*

→ **Additional classification *smoke production***



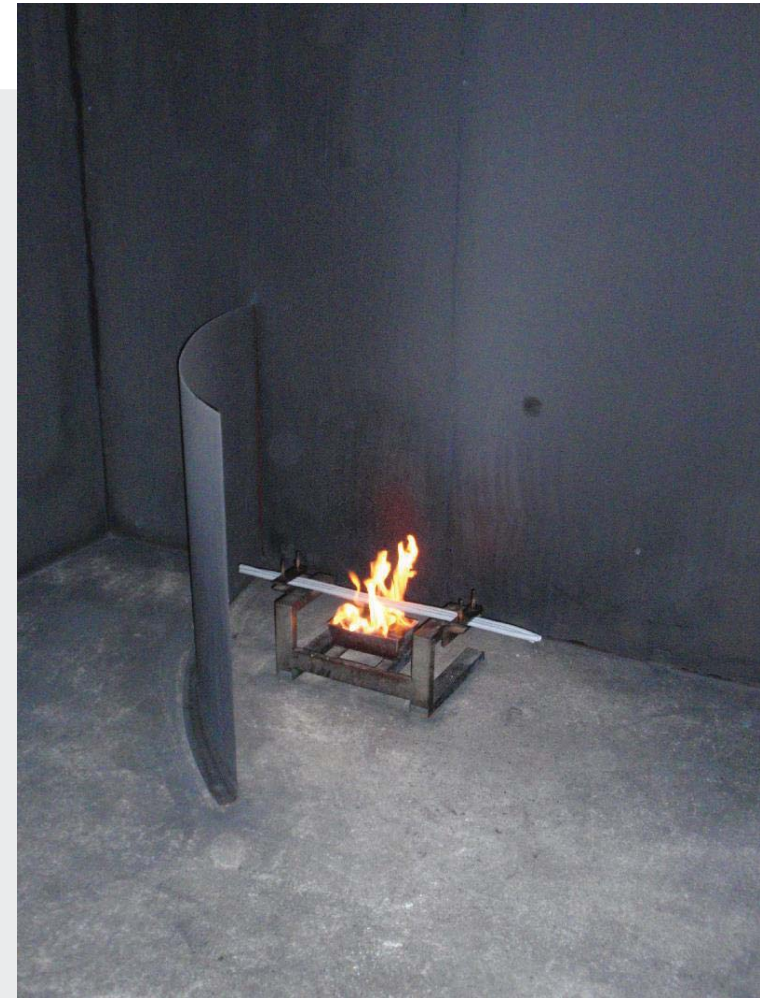
## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 61034-2

General test procedure

- Cable samples (length 100cm) are fixed in a special 3x3x3 m<sup>3</sup> cube-type chamber above a fire bowl with burning alcohol
- A light source is fixed on one side of the chamber
- On the opposite side, the light intensity is measured
- Measuring parameter:
  - Reduction of light intensity [in %], caused by developing smoke in the chamber





## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 50267-2-3

*Common test methods for cables under fire conditions –*

*Tests on gases evolved during combustion  
of materials from cables –*

*Part 2-3: Procedures – Determination of degree  
of acidity of gases for cables by determination  
of the weighted average of pH and conductivity*

→ **Additional classification acidity**

In future replaced by:

EN 60754-2

with no significant difference regarding test procedure



## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 50267-2-3

General test procedure

- One gram of the cable material to be tested is put in a furnace at  $\geq 935^{\circ}\text{C}$
- The developing exhaust gases are washed
- The liquid is analyzed concerning conductivity and pH value
- Measuring parameter:
  - Conductivity
  - pH value



# Testing of Cables and Cords within the scope of CPR

## Fire Tests

Fire class		FIPEC <sub>20</sub> Scenario 2 (30 kW-Flamme)	FIPEC <sub>20</sub> Scenario 1 (20,5 kW-Flamme)	EN 60332-1-2	EN 61034-2	EN 50267-2-3
A <sub>Ca</sub>			Minor relevance			
B1 <sub>Ca</sub>	FS ≤ 1,75 m THR <sub>1200s</sub> ≤ 10 MJ Peak HRR ≤ 20 kW FIGRA ≤ 120 W/s			H ≤ 425 mm		
B2 <sub>Ca</sub>		FS ≤ 1,5 m THR <sub>1200s</sub> ≤ 15 MJ Peak HRR ≤ 30 kW FIGRA ≤ 150 W/s		H ≤ 425 mm		
C <sub>Ca</sub>		FS ≤ 2,0 m THR <sub>1200s</sub> ≤ 30 MJ Peak HRR ≤ 60 kW FIGRA ≤ 300 W/s		H ≤ 425 mm		
D <sub>Ca</sub>		THR <sub>1200s</sub> ≤ 70 MJ Peak HRR ≤ 400 kW FIGRA ≤ 1300 W/s		H ≤ 425 mm		
E <sub>Ca</sub>				H ≤ 425 mm		
F <sub>Ca</sub>	No performance determined					

## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 13501-6 defines additional classifications

- Additional classification *smoke production* (s1, s1a, s1b, s2, s3)
  - Requirements from test according to EN 50399
  - Additional requirements from smoke density test according to EN 61034-2

<b>Zusatzklassifizierung RAUCHENTWICKLUNG (nur für Brandklassen B1<sub>Ca</sub>, B2<sub>Ca</sub>, C<sub>Ca</sub>, D<sub>Ca</sub>)</b>					
	FIPEC <sub>20</sub> Scenario 2 (30 kW-Flamme)	FIPEC <sub>20</sub> Scenario 1 (20,5 kW-Flamme)	EN 60332-1-2	EN 61034-2	EN 50267-2-3
s1	TSP <sub>1200</sub> ≤ 50 m <sup>2</sup> Peak SPR ≤ 0,25 m <sup>2</sup> /s				
s1a	TSP <sub>1200</sub> ≤ 50 m <sup>2</sup> Peak SPR ≤ 0,25 m <sup>2</sup> /s			Transmittance ≥ 80%	
s1b	TSP <sub>1200</sub> ≤ 50 m <sup>2</sup> Peak SPR ≤ 0,25 m <sup>2</sup> /s			Transmittance ≥ 60% < 80%	
s2	TSP <sub>1200</sub> ≤ 400 m <sup>2</sup> Peak SPR ≤ 1,5 m <sup>2</sup> /s				
s3	NICHT s1 / s2 bzw. keine Leistungsangabe				
Anmerkungen: Die Ergebnisse müssen aus dem jeweiligen FIPEC20 - Versuch stammen					

## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 13501-6 defines additional classifications

- Additional classification *flaming droplets / particles* (d0, d1, d2)
  - Requirements from test according to EN 50399

<b>Zusatzklassifizierung BRENNENDES ABTROPFEN / ABFALLEN (nur für Brandklassen B1<sub>Ca</sub>, B2<sub>Ca</sub>, C<sub>Ca</sub>, D<sub>ca</sub>)</b>					
	FIPEC <sub>20</sub> Scenario 2 (30 kW-Flamme)	FIPEC <sub>20</sub> Scenario 1 (20,5 kW-Flamme)	EN 60332-1-2	EN 61034-2	EN 50267-2-3
d0	kein brennendes Abtropfen / Abfallen innerhalb 1200 s				
d1	kein brennendes Abtropfen / Abfallen innerhalb 1200 s, die länger als 10s bestehen				
d2	NICHT d1 / d2 bzw. keine Leistungsangabe				
Anmerkungen: Die Ergebnisse müssen aus dem jeweiligen FIPEC20 - Versuch stammen					

## Testing of Cables and Cords within the scope of CPR

### Fire Tests

EN 13501-6 defines additional classifications

- Additional classification *acidity* (a1, a2, a3)
  - Requirements from test according to EN 50267-2-3
  - Material test!

Zusatzklassifizierung AZIDITÄT (nur für Brandklassen B1 <sub>Ca</sub> , B2 <sub>Ca</sub> , C <sub>Ca</sub> , D <sub>Ca</sub> )					
	FIPEC <sub>20</sub> Scenario 2 (30 kW-Flamme)	FIPEC <sub>20</sub> Scenario 1 (20,5 kW-Flamme)	EN 60332-1-2	EN 61034-2	EN 50267-2-3
a1					Leitfähigkeit < 2,5 µS/mm pH > 4,3
a2					Leitfähigkeit < 10 µS/mm pH > 4,3
a3	NICHT a1 / a2 bzw. keine Leistungsangabe				
keine Angabe	keine Überprüfung durchgeführt				