

Determination of the reaction to fire performance of the product Clay-wood shaving thermal insulation

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Order ref.	e-mail / 26.11.2021 / Eero Tuominen
Contact person	Eurofins Expert Services Oy Terhi Nyman Kivimiehentie 4 FI-02150 Espoo, Finland TerhiNyman@eurofins.fi
Product	The customer gave the following information about the product: Product name: Clay-wood shaving thermal insulation Manufacturer: ECOSAFE 2 –project Product description: Clay-wood shaving, Wood shaving with water and clay powder. Product recipe: <ul style="list-style-type: none">• Wood shaving (EHTA Eriste paali, 20 kg) 2 parts,• Water 1 part,• Clay powder (clay content of a loam 40-60%) Tiileri,• mixed and dried. Thickness of insulation: 180 mm Nominal density of insulation: 100...150 kg/m ³ More detailed information about product: "Tuotetiedot ECOSAFE JA ECOSAFE2 hankkeissa tutkituista materiaaleista", Tampereen yliopisto 2022
Sample	The sample of the product was chosen test specimens was made by the customer. Date of delivery: 22 December 2021 Manufacturing dates: April to June 2021 Type of the sample: Clay-wood shaving in bags
Date of test	22, 23 and 28 February 2022

- Test method** EN 13823:2020, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item.*
- The descriptions of the method and classification criteria are presented in Appendix 1.
- Test specimens** The test specimens were made by Eurofins Expert Services Oy.
- Clay-wood shaving filled in metal screen frames in required density (1500 mm x 1000 mm x 180 mm) or (1500 mm x 500 mm x 180 mm) Thickness of sample: 180 mm
- The test specimens have made as described in EN 15101-1:2014+A1:2019, *Thermal insulation products for buildings. In-situ formed loose fill cellulose (LFCI) products. Part 1: Specification for the products before installation.* (out of scope of accreditation)
- The test specimens (long wing 1,0 m x 1,5 m and short wing 0,5 m x 1,5 m) with a thickness of 180 mm were fixed to substrate using metal screen frame. The substrate and the backing boards were wood fibre boards with a nominal thickness of $(12 \pm 1,2)$ mm and a nominal density of (≥ 240) kg/m³, E.
- The photographs of the test specimen are presented in Appendix 2.
- The test specimens were conditioned prior to the test to a constant mass at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %.

Test results

The test results are shown in Tables 1 and 2. The heat release and smoke production graphs are presented in Appendices 3, 4, 5, 6 and 7.

Table 1. Test results, product with 100 kg/m³ density.

Property	Test 1	Test 4	Test 5	Mean
FIGRA _{0,2MJ} (W/s)	471,3	464,5	479,4	471,7
FIGRA _{0,4MJ} (W/s)	471,3	464,5	479,4	471,7
THR _{600s} (MJ)	14,8	11,6	12	12,8
LFS EDGE OF SPECIMEN	No	No	No	-
SMOGRA (m ² /s ²)	12,2	18	16,7	15,6
TSP _{600s} (m ²)	137,2	161,5	190,9	163,2
Flaming droplets / particles within 600 s	No	No	No	-

Table 2. Test results, product with 125 kg/m³ and 150 kg/m³ density.

Property	Test 2	Test 3
Density (kg/m ³)	125	150
FIGRA _{0,2MJ} (W/s)	501,9	482,4
FIGRA _{0,4MJ} (W/s)	501,9	482,4
THR _{600s} (MJ)	11,8	10,6
LFS EDGE OF SPECIMEN	No	No
SMOGRA (m ² /s ²)	10,1	10,8
TSP _{600s} (m ²)	108	106,5
Flaming droplets / particles within 600 s	No	No

Note

The results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

Eurofins Expert Services Oy is a notified body 0809 concerning the Construction Products Regulation (CPR).

Espoo, 9 June 2023

Taru Huokuniemi
Senior Expert

APPENDICES

Appendix 1, Description of the test method and requirements
Appendix 2, Photographs of the test specimen
Appendix 3, Heat release and smoke production in Test 1 by graphs
Appendix 4, Heat release and smoke production in Test 2 by graphs
Appendix 5, Heat release and smoke production in Test 3 by graphs
Appendix 6, Heat release and smoke production in Test 4 by graphs
Appendix 7, Heat release and smoke production in Test 5 by graphs

DISTRIBUTION

Customer, electronically approved

DESCRIPTION OF THE TEST METHOD

EN 13823:2020 *Reaction to fire tests for building products. Building products excluding floorings exposed to the thermal attack by a single burning item.*

Specimens

The corner specimen consists of two wings (495 ± 5) mm × (1500 ± 5) mm and (1000 ± 5) mm × (1500 ± 5) mm. If the thickness of the product is more than 200 mm, the thickness is reduced to (200 +0/-10) mm. The specimens shall be attached as in practice. At least three tests are carried out on the product. If the product has orientational effect and the product standard does not specify the orientation which has to be tested, one specimen of the product shall be tested once in both directions. The test shall be completed with two tests in the direction with worse results (all parameters shall be worse).

The specimens are conditioned prior to the tests in a room with a temperature of (23 ± 2) °C and relative humidity (50 ± 5) %.

Test procedure

The test specimen wings are fixed cornerwise in the specimen holder of the test apparatus. A propane gas burner with a thermal output of 30 kW is placed in the corner formed by the test specimens. The specimens and the burner are located under a hood in an enclosure. During the test the combustion gases are collected through the hood into a duct where their temperature, smoke density, oxygen and carbon dioxide contents as well as the flow-induced pressure difference are measured every 3 seconds. The behaviour of the specimens is observed during the test through windows in the walls of the enclosure. The following factors required for classification are determined from the measured data: **FIGRA** (Fire Growth Rate), **THR_{600s}** (Total Heat Release within the first 600 s of the test), **SMOGRA** (SMOke Growth RAte), **TSP_{600s}** (Total Smoke Production within the first 600 s of the test). **LFS** (Lateral Flame Spread) and the formation of flaming droplets and particles are observed, too. The duration of the test is 21 min.

CLASSIFICATION CRITERIA

The classification criteria are given in the classification standard EN 13501-1:2018, *Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests.*

The classification criteria concerning this method are given below. (The classification is not only based on the results of this test method.)

Class A2	FIGRA ≤ 120 W/s	and	LFS < edge of specimen	and	THR ₆₀₀ ≤ 7,5 MJ
Class B	FIGRA ≤ 120 W/s	and	LFS < edge of specimen	and	THR ₆₀₀ ≤ 7,5 MJ
Class C	FIGRA ≤ 250 W/s	and	LFS < edge of specimen	and	THR ₆₀₀ ≤ 15 MJ
Class D	FIGRA ≤ 750 W/s				
Smoke production s1	SMOGRA ≤ 30 m ² /s ²	and	TSP ≤ 50 m ²		
Smoke production s2	SMOGRA ≤ 180 m ² /s ²	and	TSP ≤ 200 m ²		
Smoke production s3	not s1 or s2				
Flaming droplets/particles d0	no flaming droplets/particles within 600 s				
Flaming droplets/particles d1	no flaming droplets/particles persisting longer than 10 s within 600 s				
Flaming droplets/particles d2	not d0 or d1				

3.12.2020



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Photographs of the test specimen

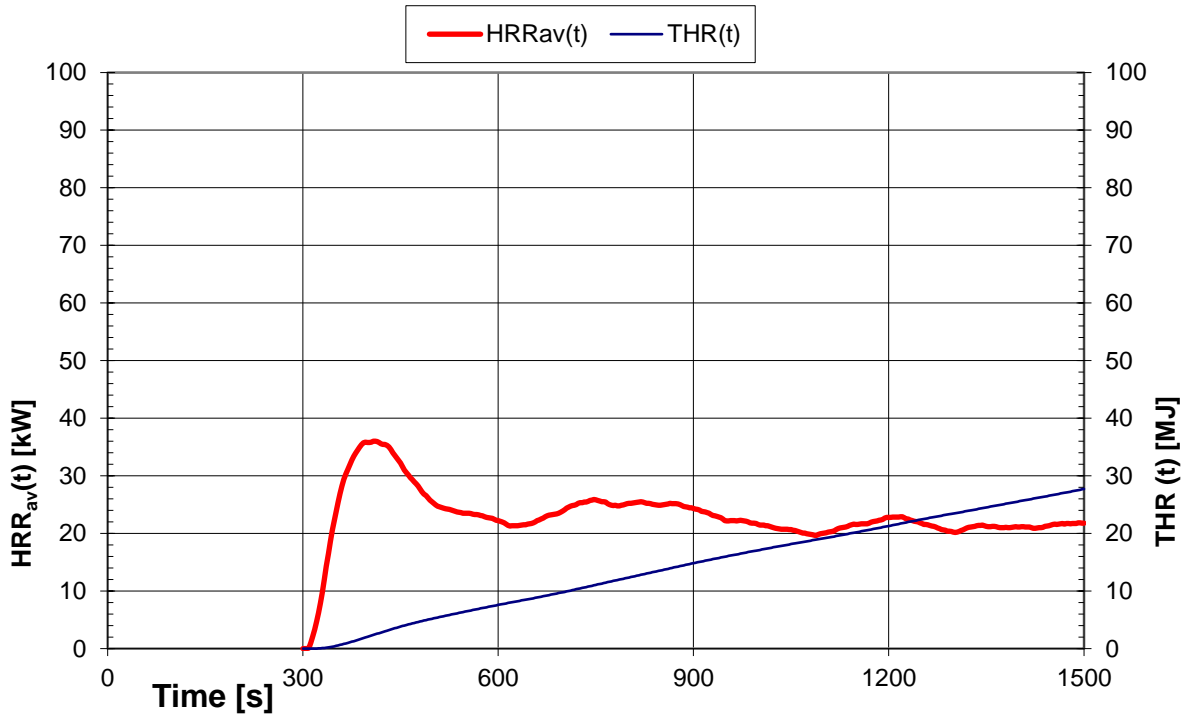


A total view of the exposed surface of the long wing in test 3.

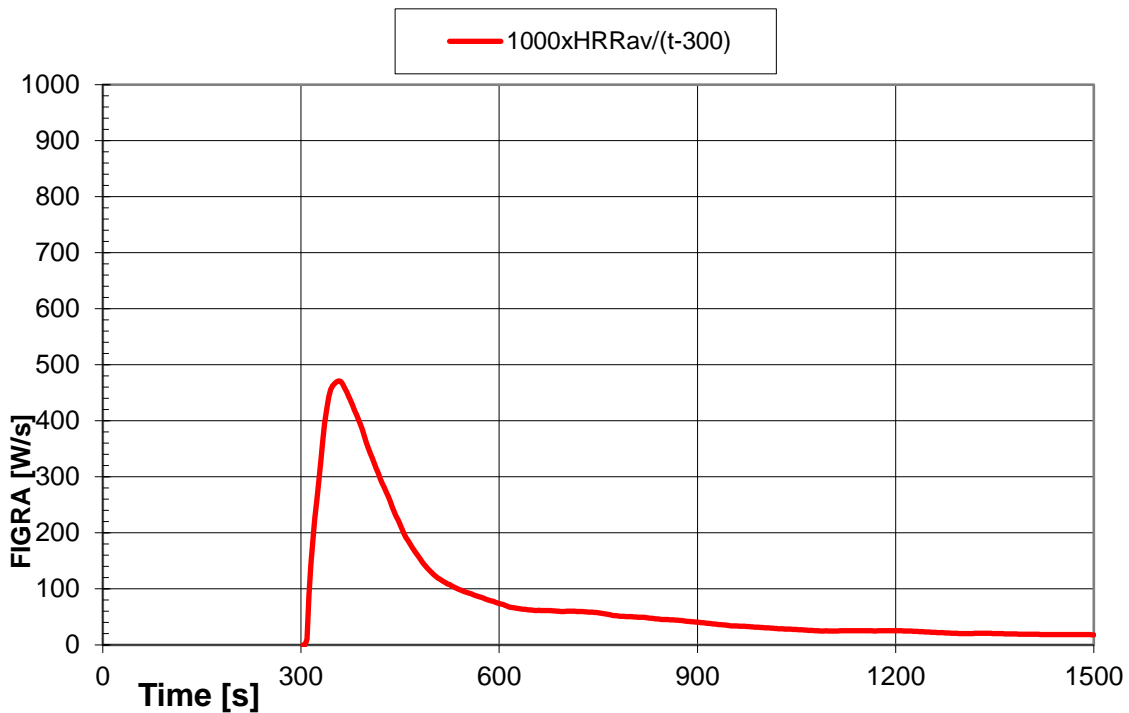


A close up of the vertical outer edge of the long wing in test 3.

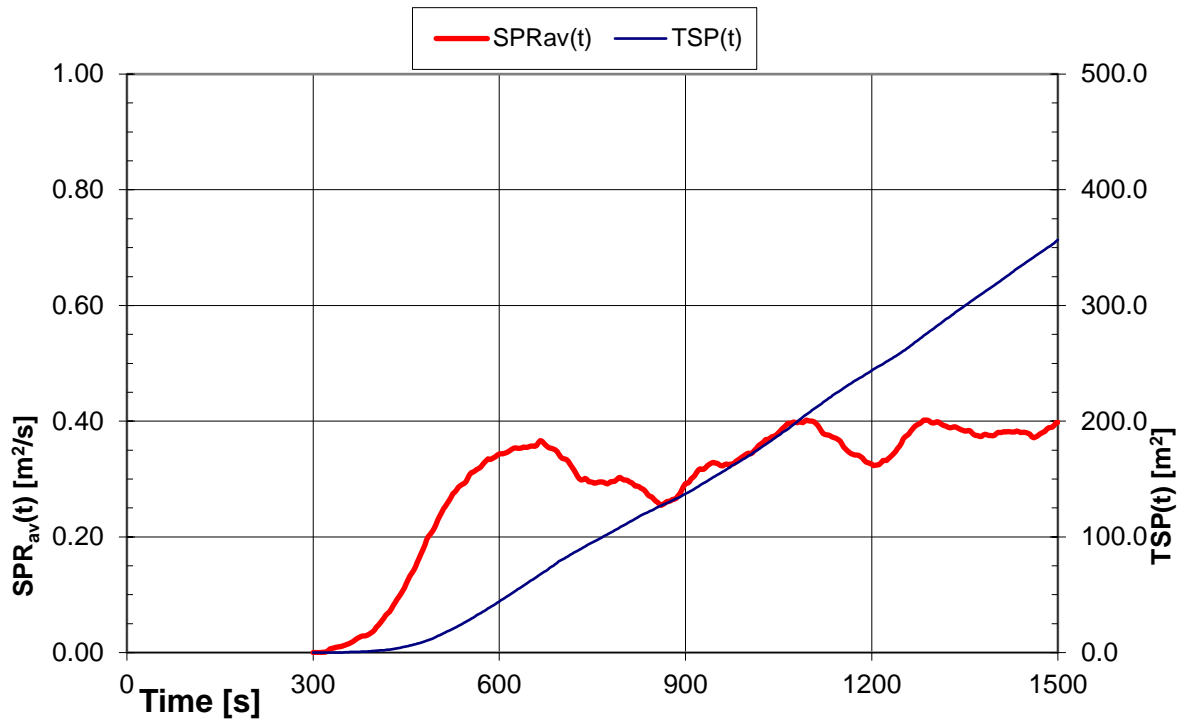
Heat release and smoke production in Test 1 by graphs



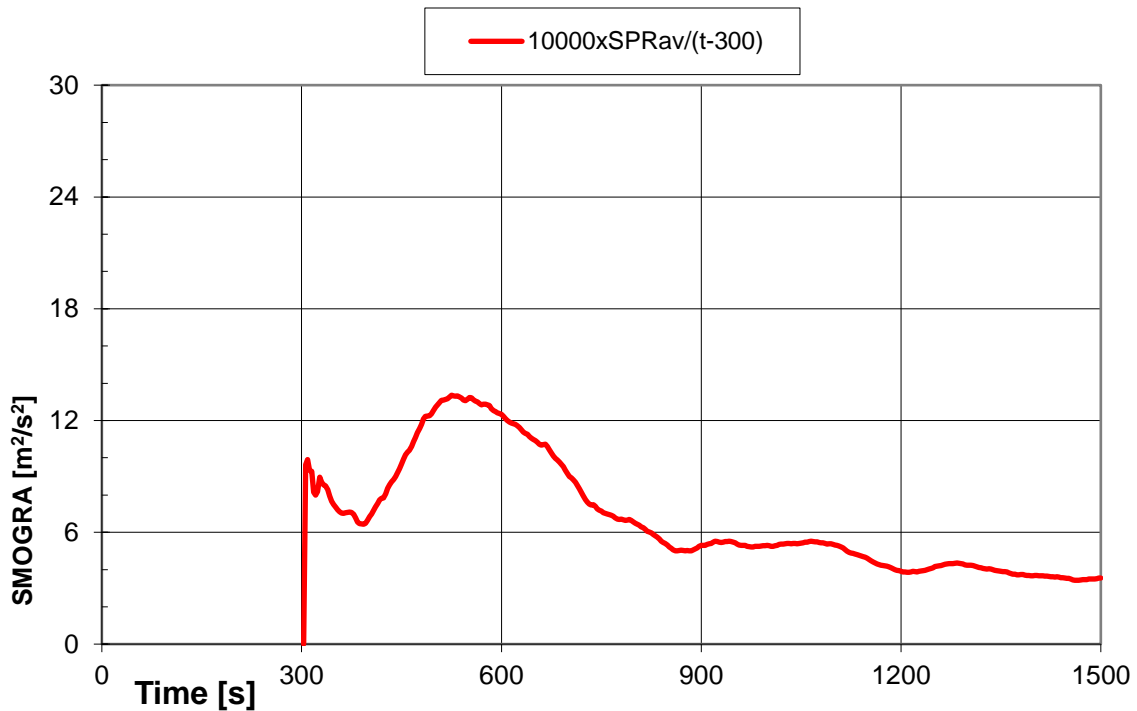
Graph 1. Average heat release rate HRR_{av}(t) and total heat release THR(t).



Graph 2. Fire growth rate index FIGRA is calculated as $1000 \times HRR_{av} / (t - 300)$.

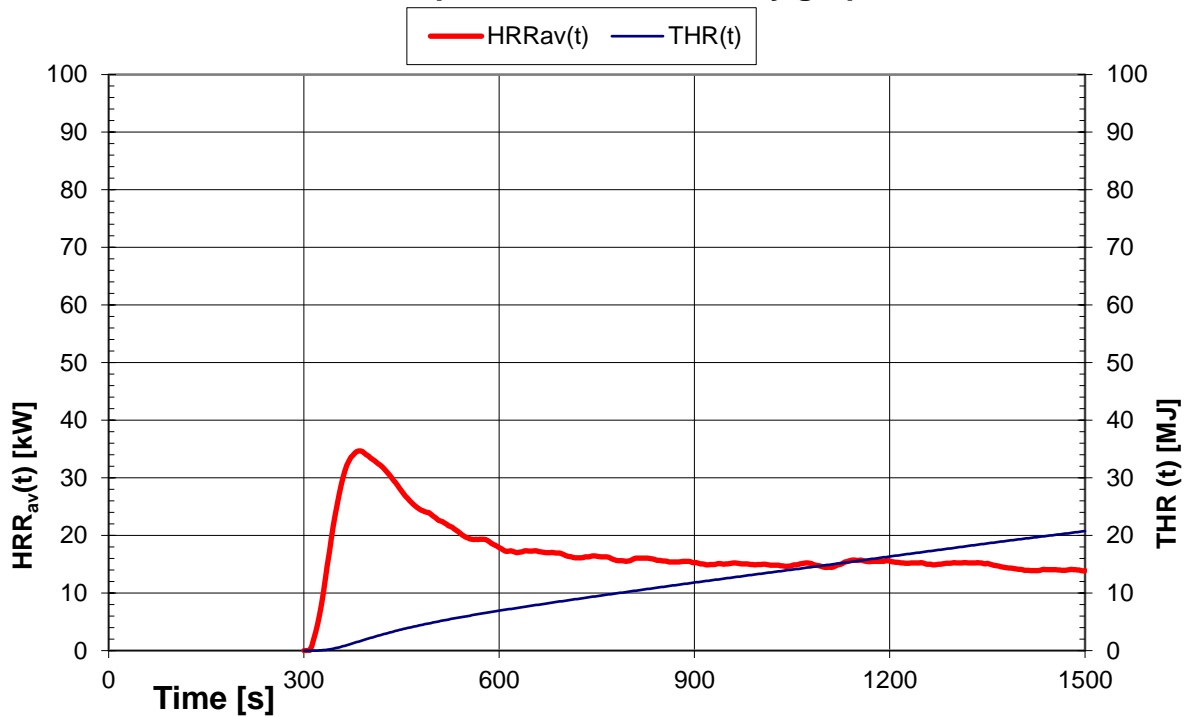


Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production $TSP(t)$.

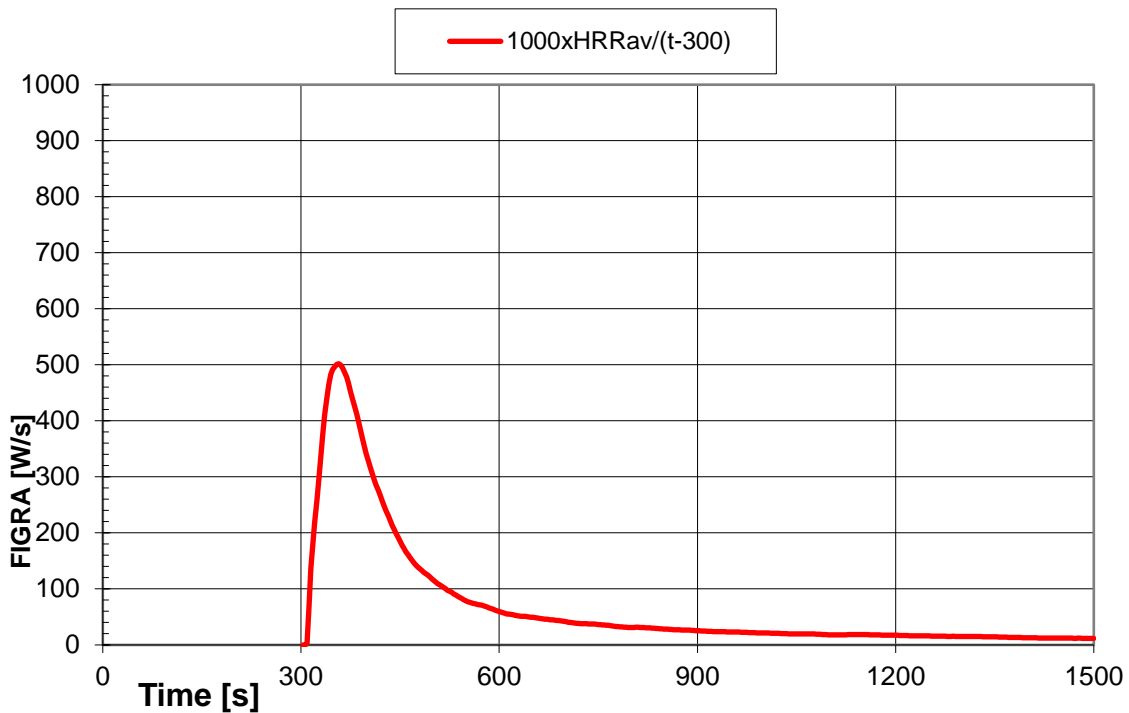


Graph 4. Smoke growth rate index SMOGRA is calculated as $10000 \times SPR_{av} / (t - 300)$.

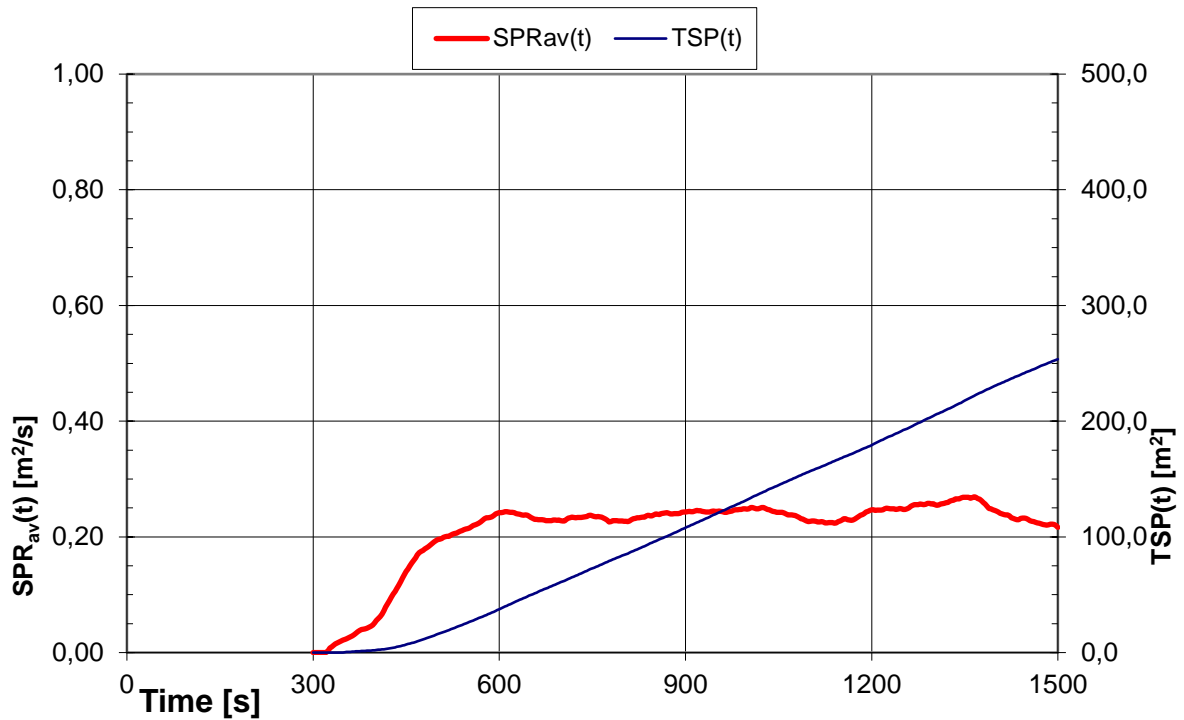
Heat release and smoke production in Test 2 by graphs



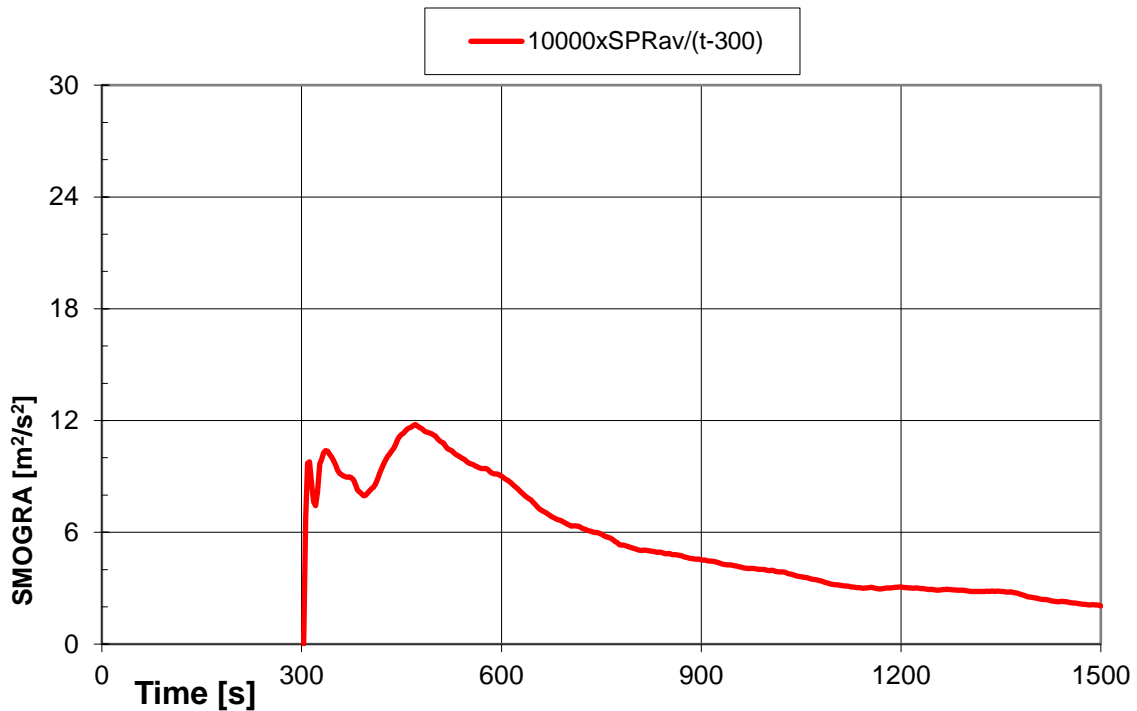
Graph 1. Average heat release rate HRR_{av}(t) and total heat release THR(t).



Graph 2. Fire growth rate index FIGRA is calculated as $1000 \times HRR_{av} / (t - 300)$.

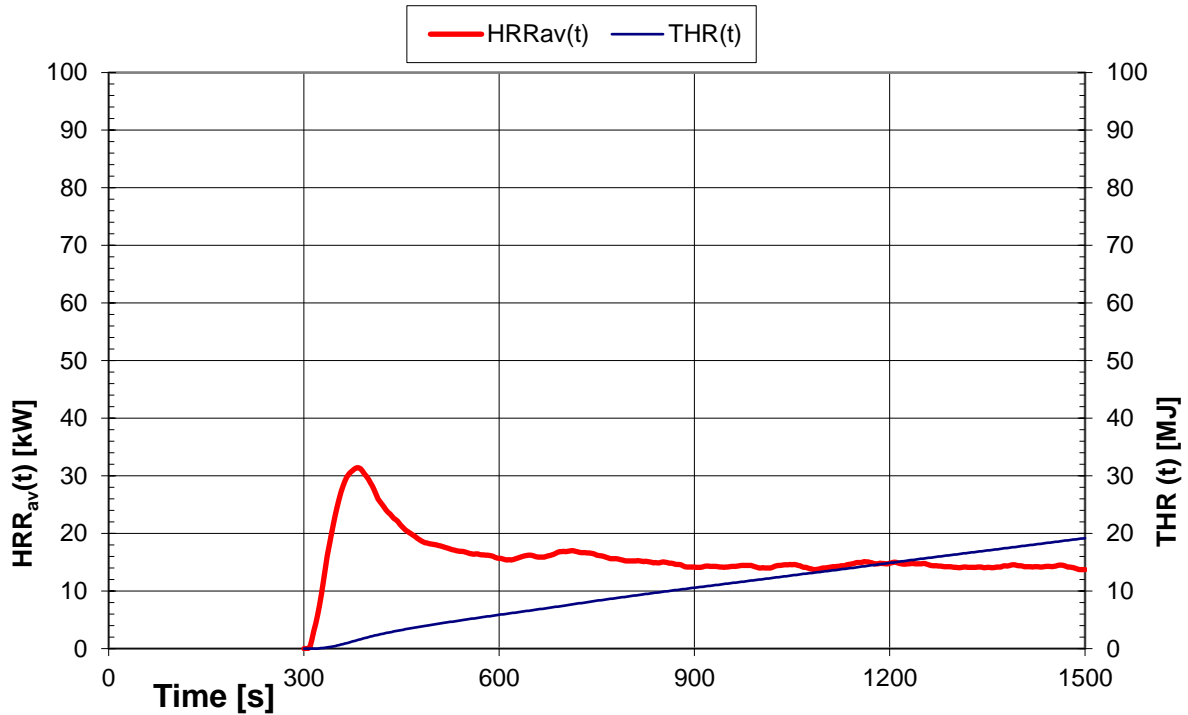


Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production $TSP(t)$.

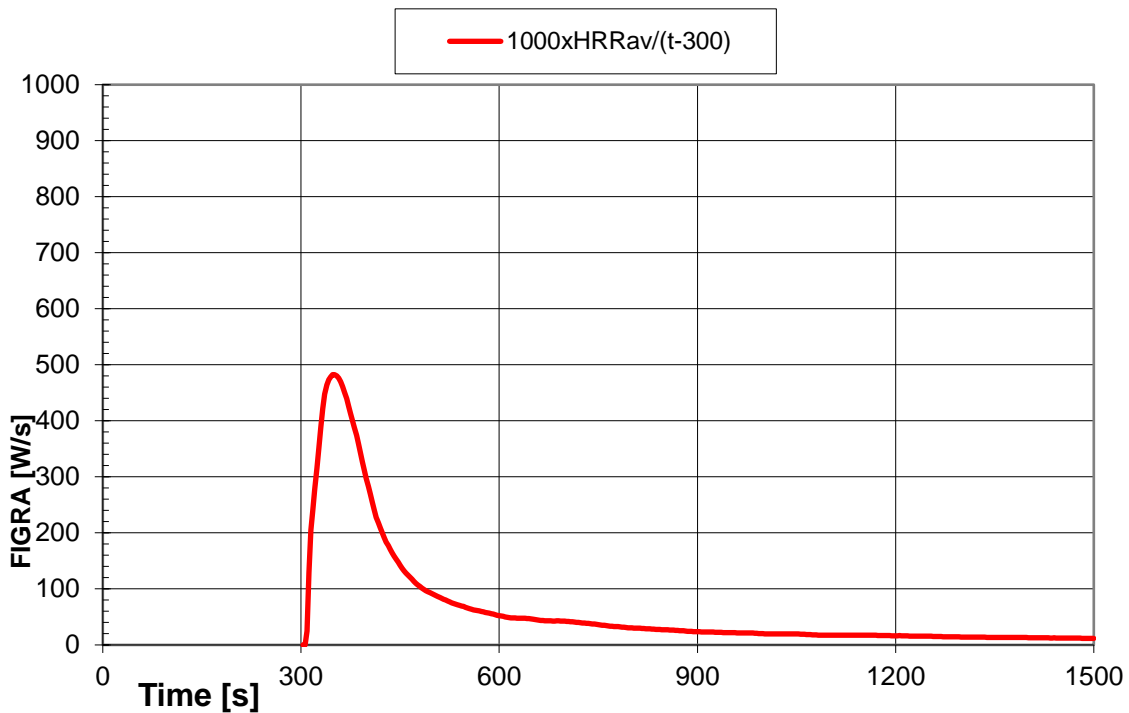


Graph 4. Smoke growth rate index SMOGRA is calculated as $10000 \times SPR_{av} / (t - 300)$.

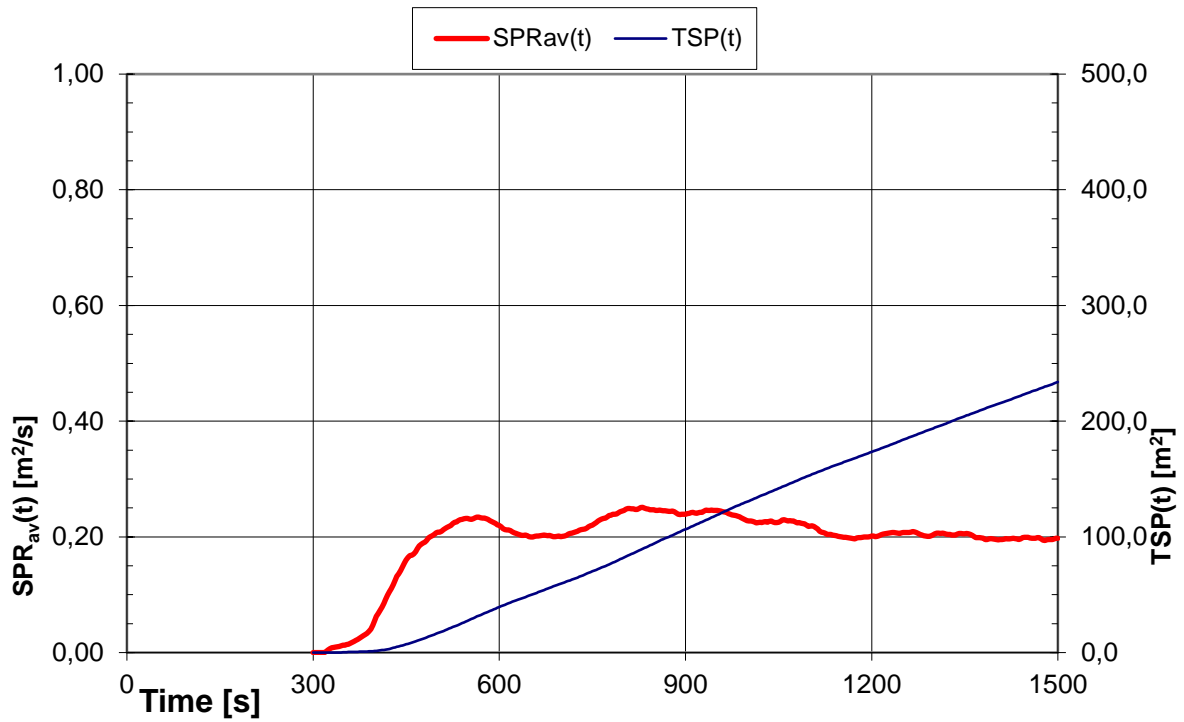
Heat release and smoke production in Test 3 by graphs



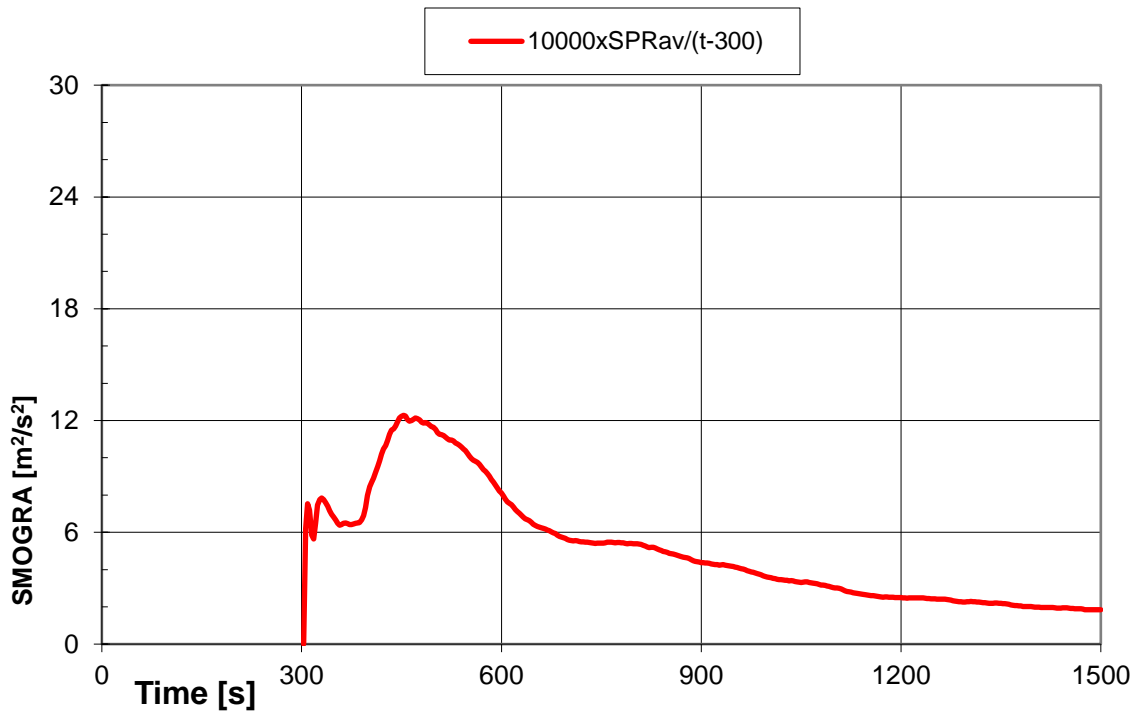
Graph 1. Average heat release rate HRR_{av}(t) and total heat release THR(t).



Graph 2. Fire growth rate index FIGRA is calculated as $1000 \times HRR_{av} / (t - 300)$.

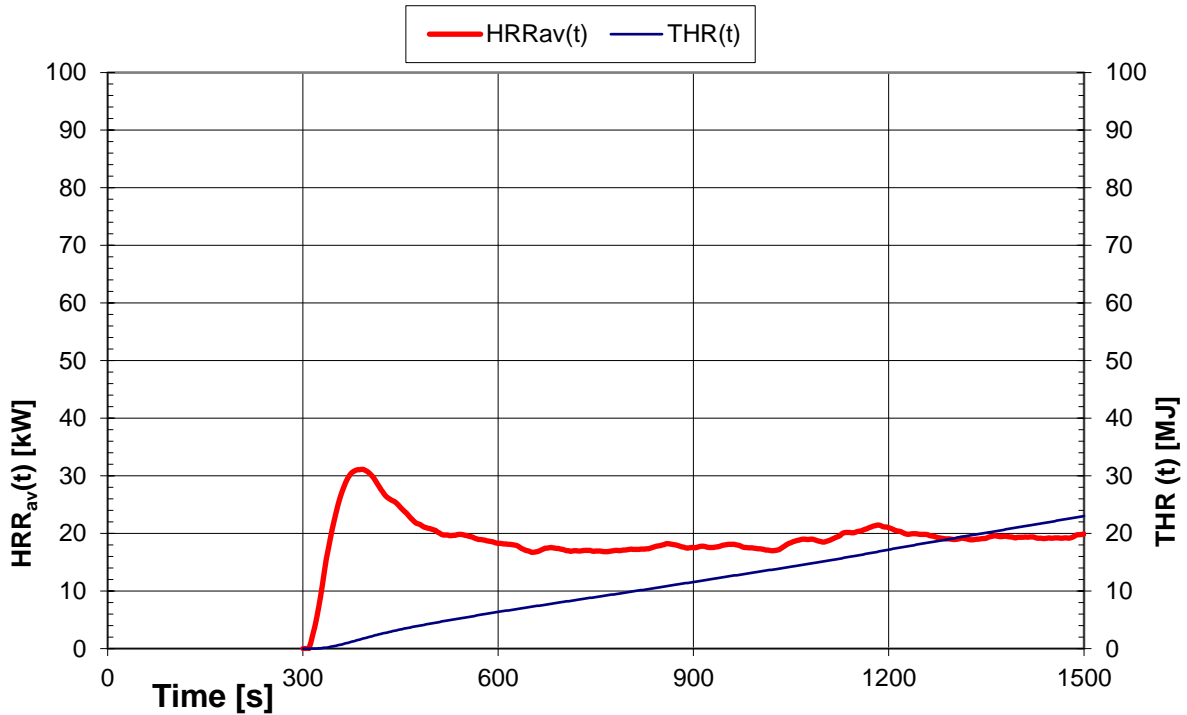


Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production $TSP(t)$.

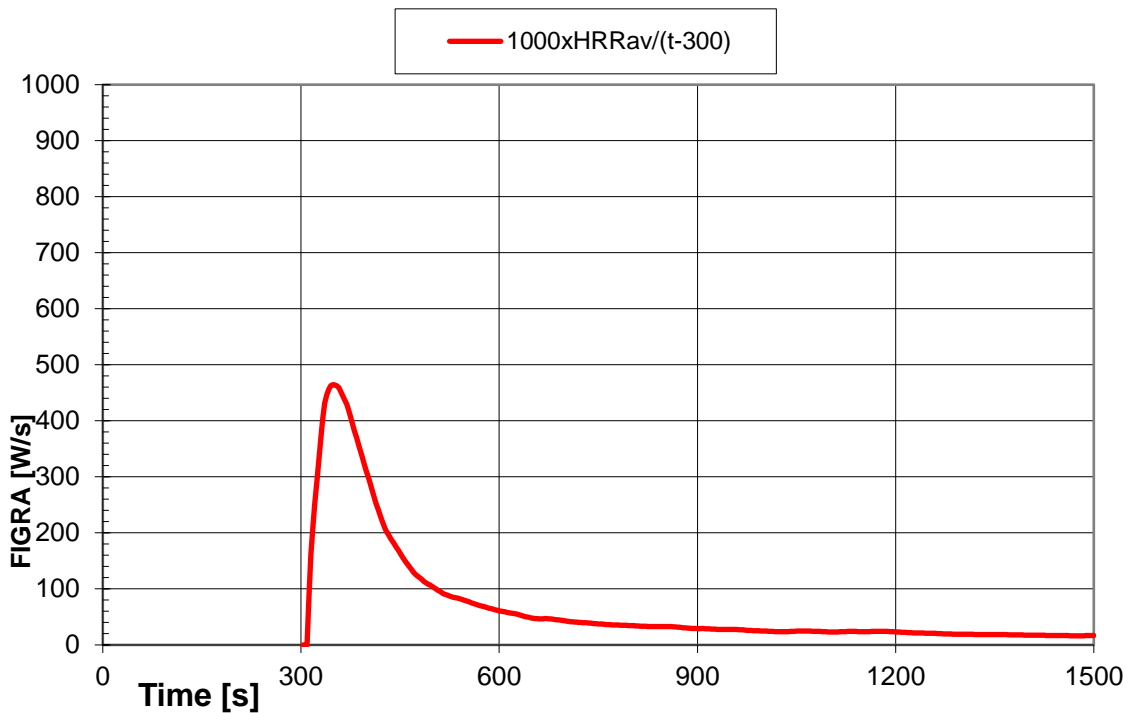


Graph 4. Smoke growth rate index SMOGRA is calculated as $10000 \times SPR_{av} / (t - 300)$.

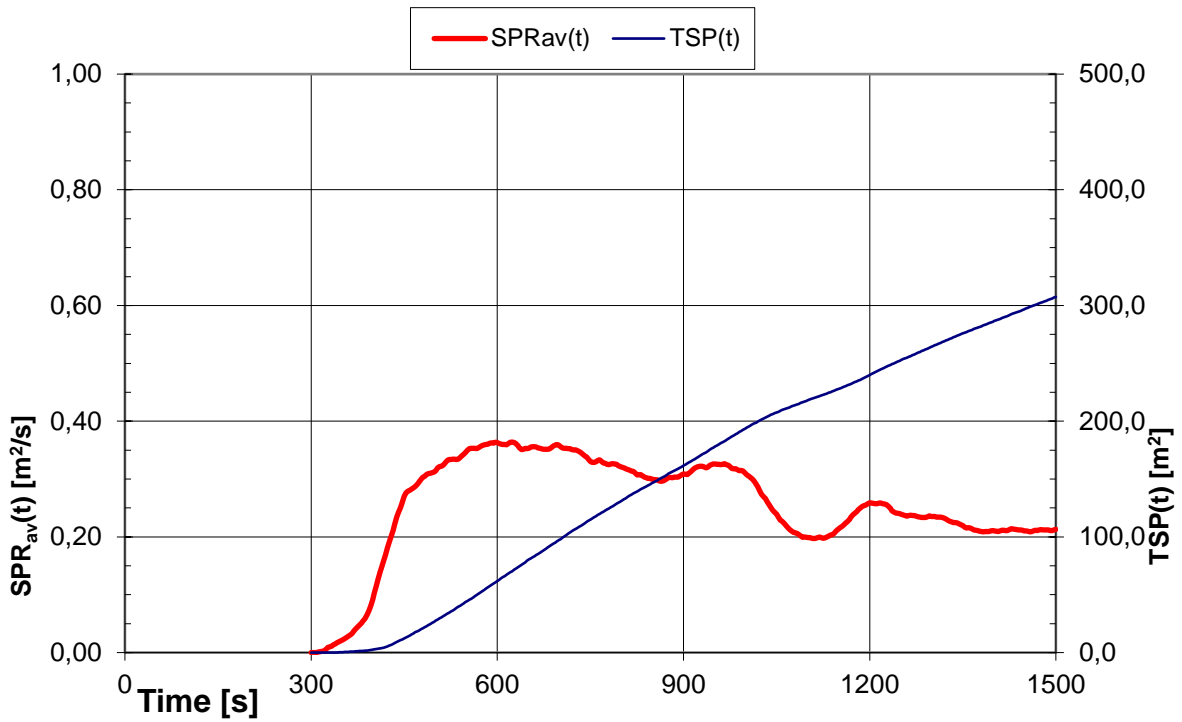
Heat release and smoke production in Test 4 by graphs



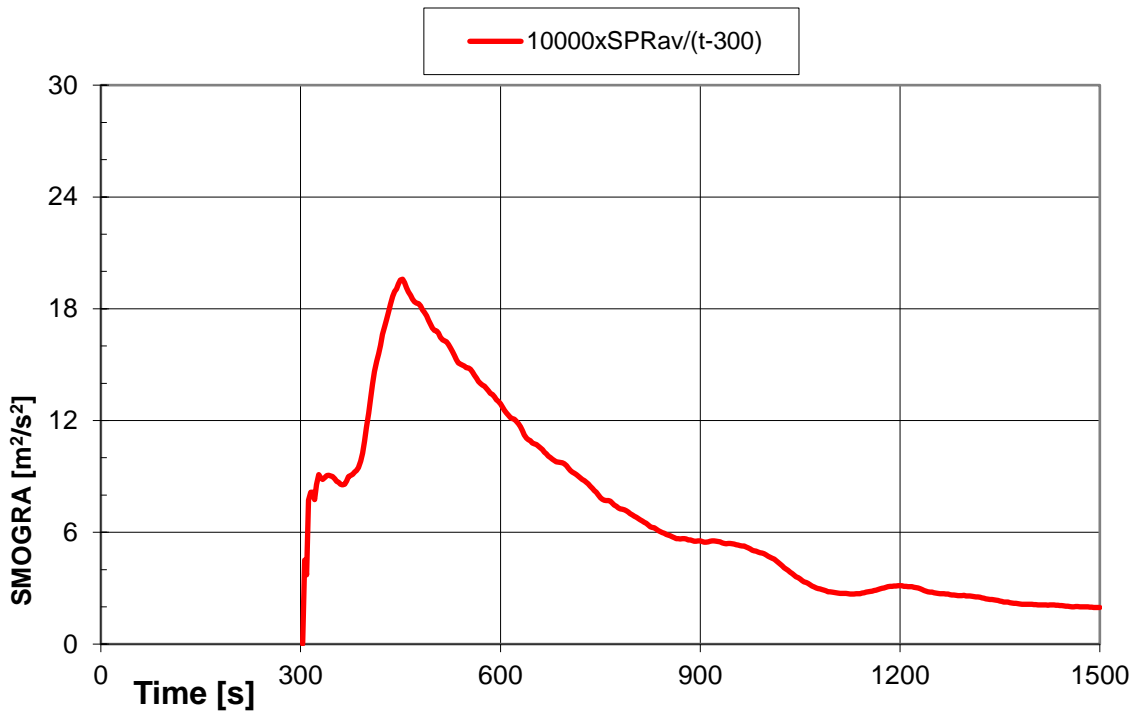
Graph 1. Average heat release rate HRR_{av}(t) and total heat release THR(t).



Graph 2. Fire growth rate index FIGRA is calculated as $1000 \times HRR_{av} / (t - 300)$.

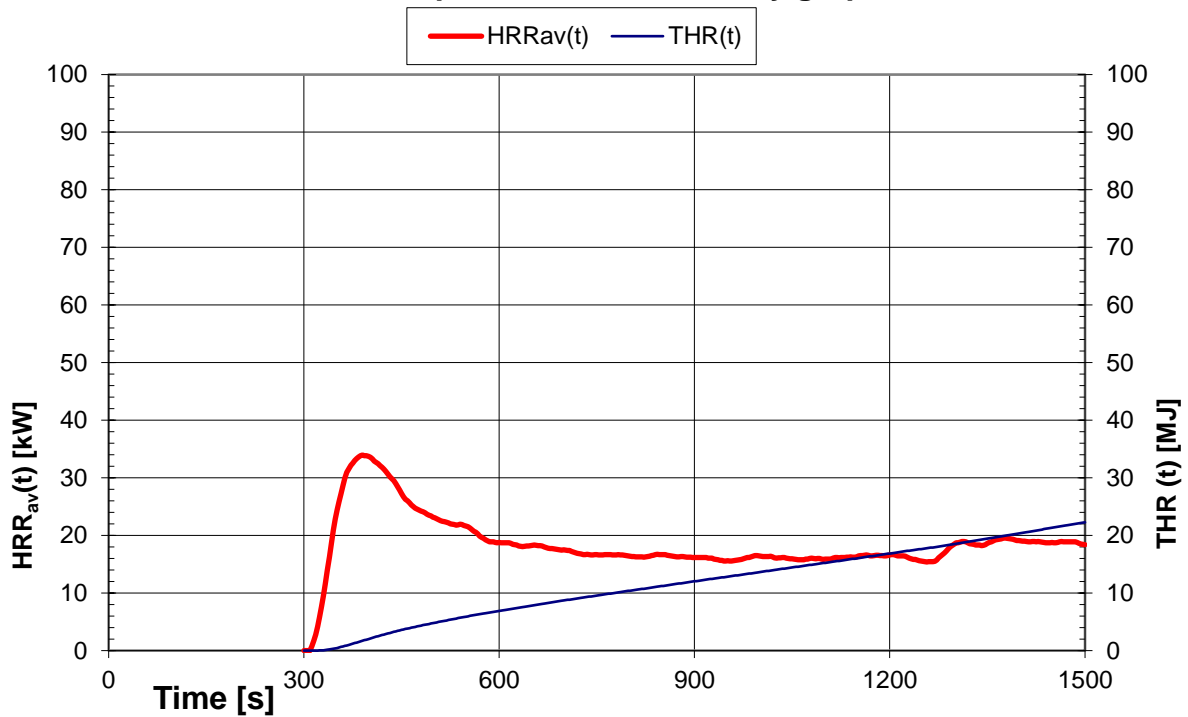


Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production $TSP(t)$.

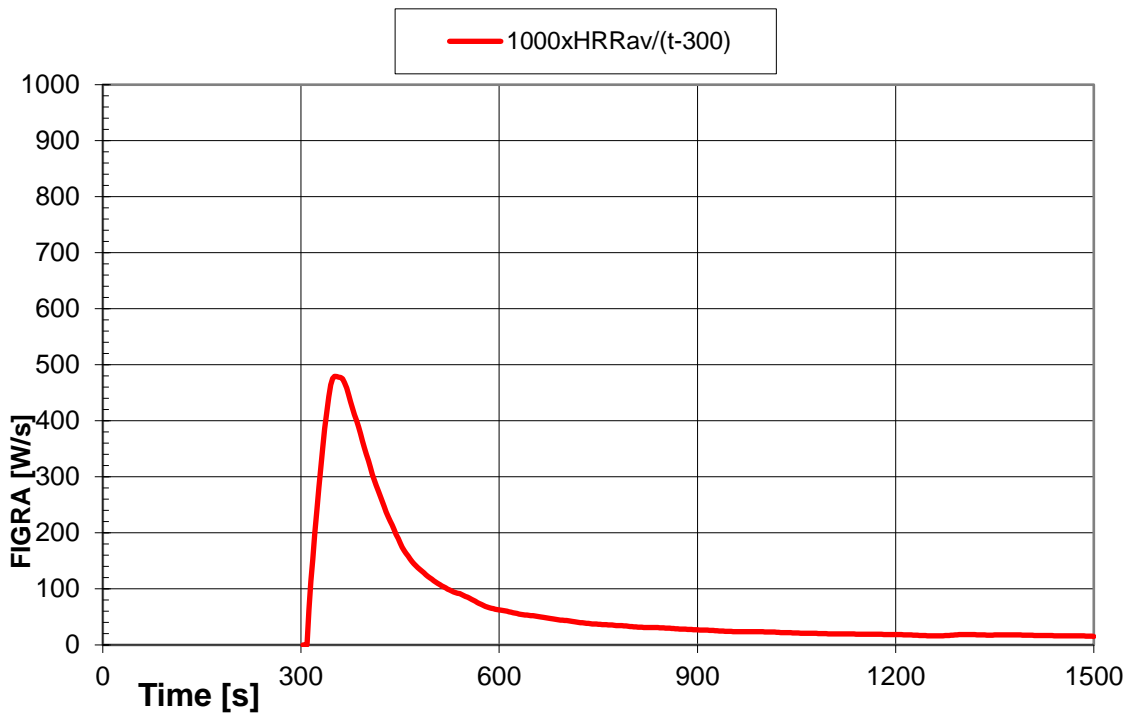


Graph 4. Smoke growth rate index SMOGRA is calculated as $10000 \times SPR_{av} / (t - 300)$.

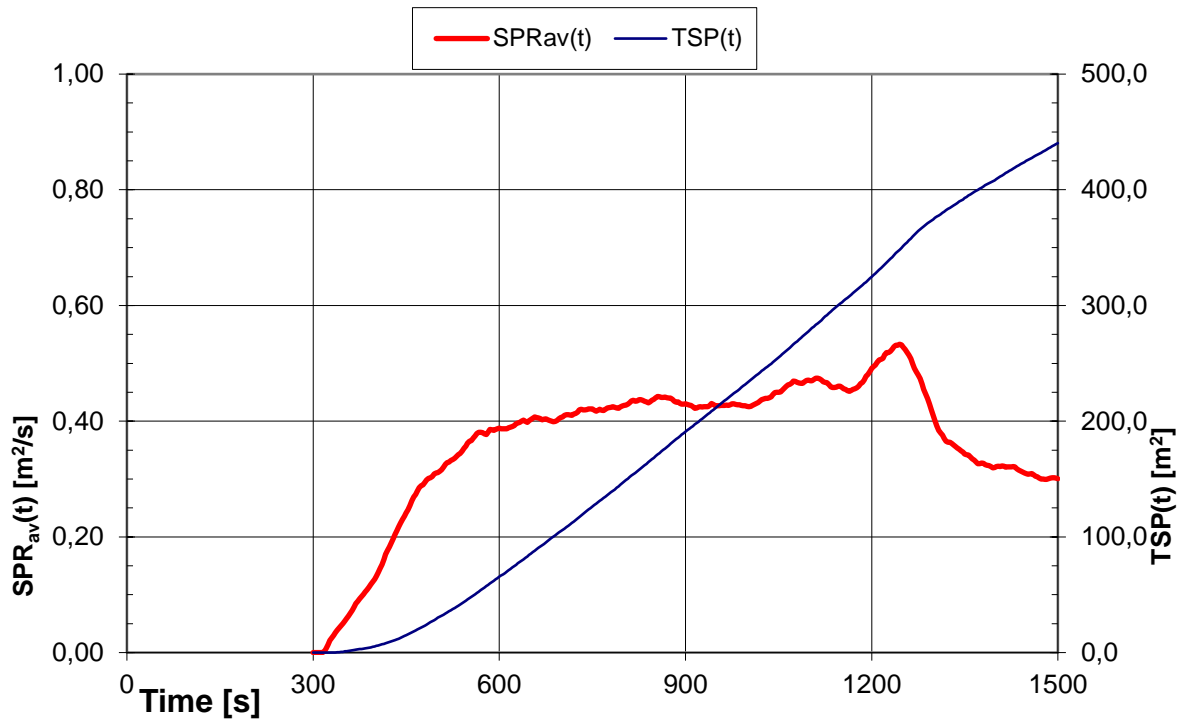
Heat release and smoke production in Test 5 by graphs



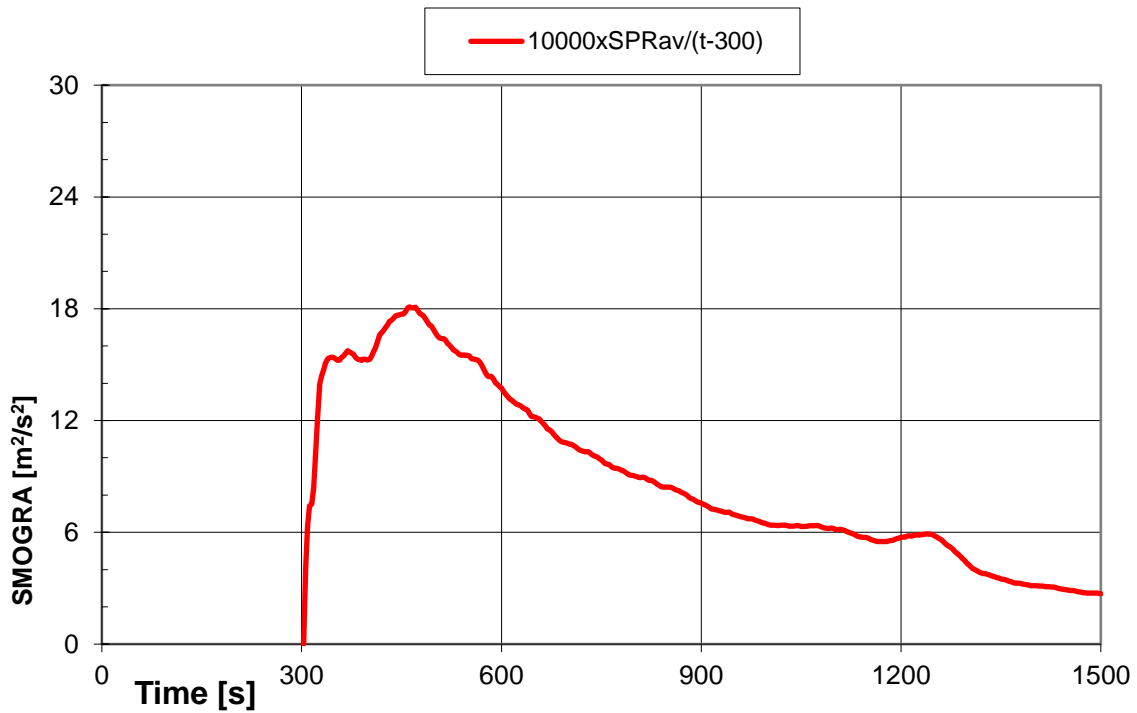
Graph 1. Average heat release rate HRR_{av}(t) and total heat release THR(t).



Graph 2. Fire growth rate index FIGRA is calculated as $1000 \times HRR_{av} / (t - 300)$.



Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production $TSP(t)$.



Graph 4. Smoke growth rate index SMOGRA is calculated as $10000 \times SPR_{av} / (t - 300)$.