Determination of the reaction to fire performance according to EN 13823:2010

Finnfoam F-29+

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Requested by: Finnfoam Oy

VTT EXPERT SERVICES LTD

Requested by	Finnfoam Oy Satamakatu 5 FI-24100 Salo, Finland
Order	1 August 2011, Asso Erävuoma
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Assignment — **Determination of the reaction to fire performance of a product**

Product

The customer gave the following information about the product:

Name of product: **Finnfoam F-29+**
Manufacturer: Finnfoam Oy
Product description: External thermal insulation composite system with rendering
Insulation board: XPS (Finnfoam F-29), 38 kg/m^3, 20…400 mm
Base plastering: one component cementitious polymer modified mortar, organic content 2,4 %, 0,5…1,5 mm, about 2 kg/dm^3
Reinforcement: glass fibre net, 0,5 mm, about 150 g/m^2
Finishing coat: weber.vetonit Silco Paint, silicone resin based water soluble paint, 0,1…0,3 mm, about 1,5 kg/dm^3
Decorative coat: weber.vetonit Silco Coat, silicone resin based water soluble coating, 1,0…2,0 mm

Sample

Date of delivery: 2 April 2012
Type of sample: test specimens of the product (thickness 170 mm) fixed to substrates without finishing and decorative coats
Separate samples of finishing coat, decorative coat and Sika Monotop 620 sealer were delivered by the customer.
The sample was chosen by the customer.

Date of tests — 13 February 2012

Test specimens

Test specimens were made by the customer at VTT Expert Services Ltd.

Specimens of the product (long wing 1,0 m x 1,5 m and short wing 0,5 m x 1,5 m) were fixed to substrate as follows:

- mechanically with metallic Tulppa z-fastener to plywood substrate (density 450±50 kg/m^3, thickness 9±1 mm, class D-s2,d0)

- mechanically with metallic Tulppa z-fastener and with weber.vetonit RF (renovation fix) to fibre cement substrate (density 1800±200 kg/m^3, thickness 8±2 mm, class A2-s1,d0)

There was a horizontal but joint in the long wing at a height of 500 mm from the bottom edge of the test specimens of the product without finishing and decorative coating and a vertical but joint in the long wing at a distance of 200 mm from the corner line, measured when the wings were mounted ready for testing. Horizontal, vertical and corner joints were levelled and sealed with Sika Monotop 620.

Surface was treated with finishing coat and decorative coat.

There was no cavity between backing board and the test specimen. The backing boards were calcium silicate boards (thickness 12 ± 1 mm, density 870 ± 50 kg/m^3).

The photographs of the test specimens are presented in Appendix 1.

The specimens were conditioned prior to the test to constant mass at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %.

Test methods

EN 13823:2010, "*Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*".

The description of the method and classification criteria is presented in Appendix 2.

Test results

The test results are shown in Table 1 and 2.
The heat release and smoke production are presented by graphs in Appendixes 3, 4, 5 and 6.

Table 1. Test results of the product on fibre cement board.

Quality	Test 1
$FIGRA_{0,2MJ}$ (W/s)	75,3
$FIGRA_{0,4MJ}$ (W/s)	68,5
THR_{600s} (MJ)	2,0
LFS $_{EDGE\ OF\ SPECIMEN}$	No
SMOGRA (m^2/s^2)	0
TSP_{600s} (m^2)	32,6
Flaming droplets/ particles within 600 s	No

Table 2. Test results of the product on plywood board.

Quality	Test 2	Test 3	Test 4	Average
$FIGRA_{0,2MJ}$ (W/s)	81,4	87,0	75,3	81
$FIGRA_{0,4MJ}$ (W/s)	78,6	84,4	73,3	79
THR_{600s} (MJ)	1,9	2,1	1,9	2,0
LFS EDGE OF SPECIMEN	No	No	No	No
SMOGRA (m^2/s^2)	0	0	0	0
TSP_{600s} (m^2)	31,0	29,0	32,5	31
Flaming droplets/ particles within 600 s	No	No	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.

Espoo, 22 May 2012

Tiia Ryynänen
Product Manager

Katja Ruotanen
Expert

APPENDICES

Appendix 1, Photographs of the test specimens
Appendix 2, Description of the test method and requirements
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

DISTRIBUTION

Customer	Original (2)
Archive	Original

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The test results relate only to the sample tested.

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.

DESCRIPTION OF THE METHOD

EN 13823:2010 *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, respectively. If the thickness of the specimens is more than 200 mm, the thickness is reduced to (200 +0/–10) mm. Three tests are carried out on each product.

The specimens are attached to a substrate to which it will be attached in practice using a similar method as used in practice. 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 specimens 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 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 tests are recorded on videotape. The duration of the test is 21 min.

CLASSIFICATION CRITERIA

The classification criteria are given in the classification standard EN 13501-1:2007, "*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.)

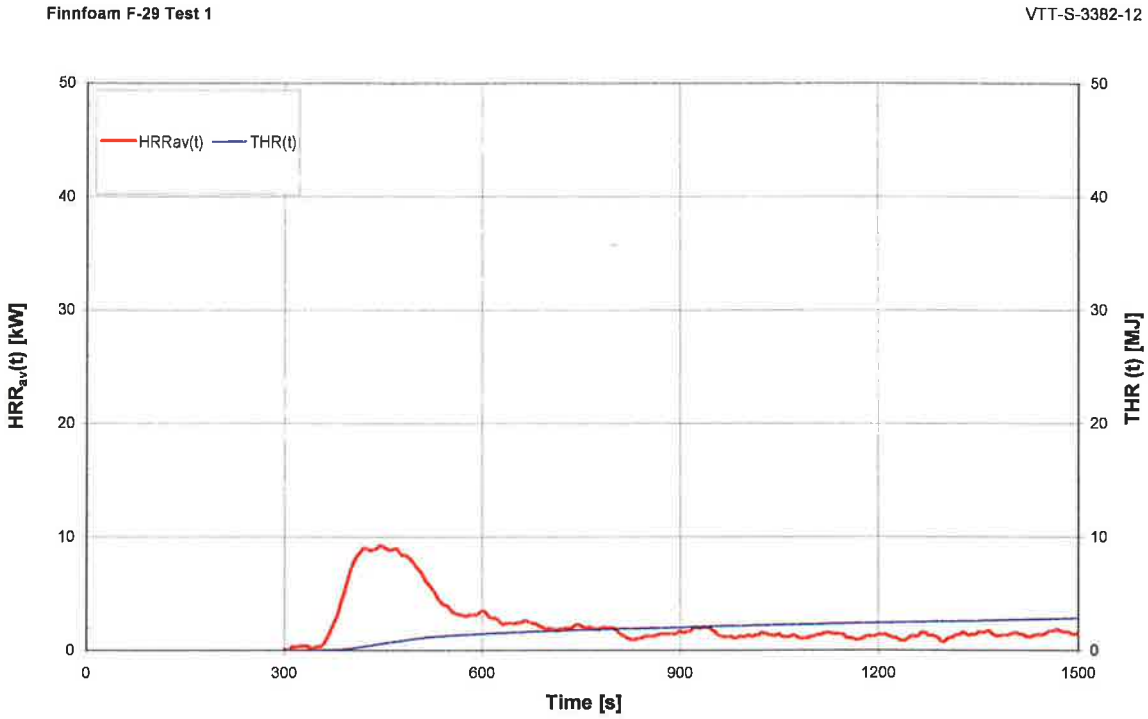
Class A2	FIGRA ≤ 120 W/s	and	LFS < edge of specimen	and	$THR_{600} \leq$ 7,5 MJ
Class B	FIGRA ≤ 120 W/s	and	LFS < edge of specimen	and	$THR_{600} \leq$ 7,5 MJ
Class C	FIGRA ≤ 250 W/s	and	LFS < edge of specimen	and	$THR_{600} \leq$ 15 MJ
Class D	FIGRA ≤ 750 W/s				

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		

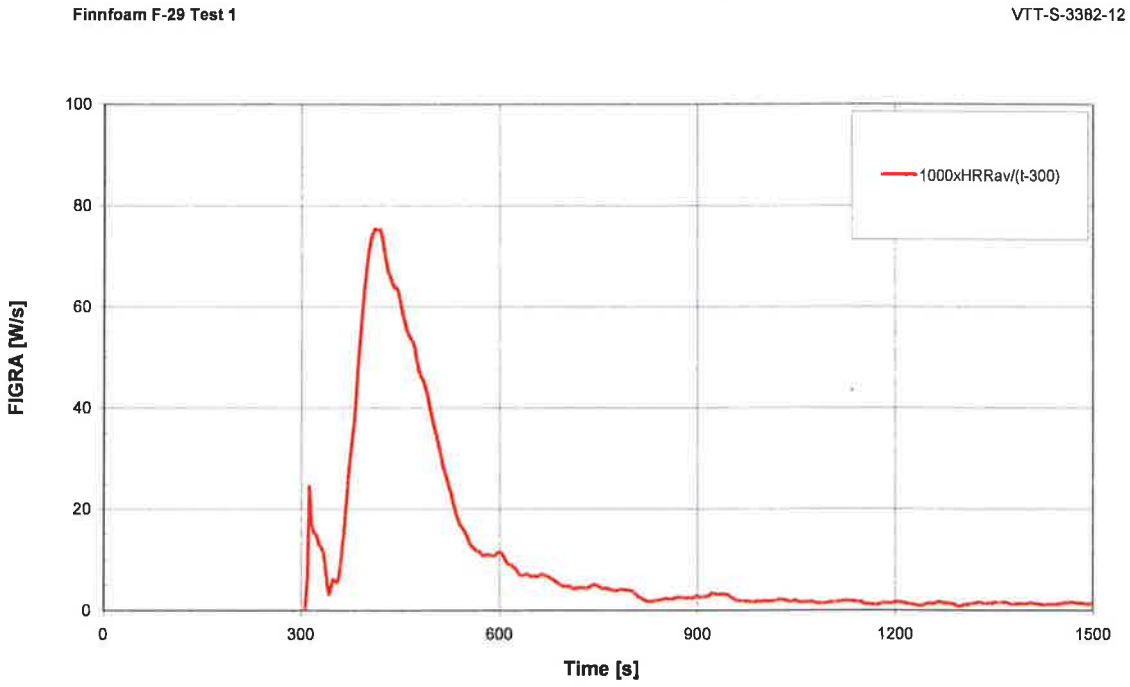
Flaming droplets/particles d0	no flaming droplets/particles within 600 s
Flaming droplets/particles d1	no flaming droplets/particles persisting longer than 10 s within 600 s
Flaming droplets/particles d0	not d0 or d1

20.12.2011

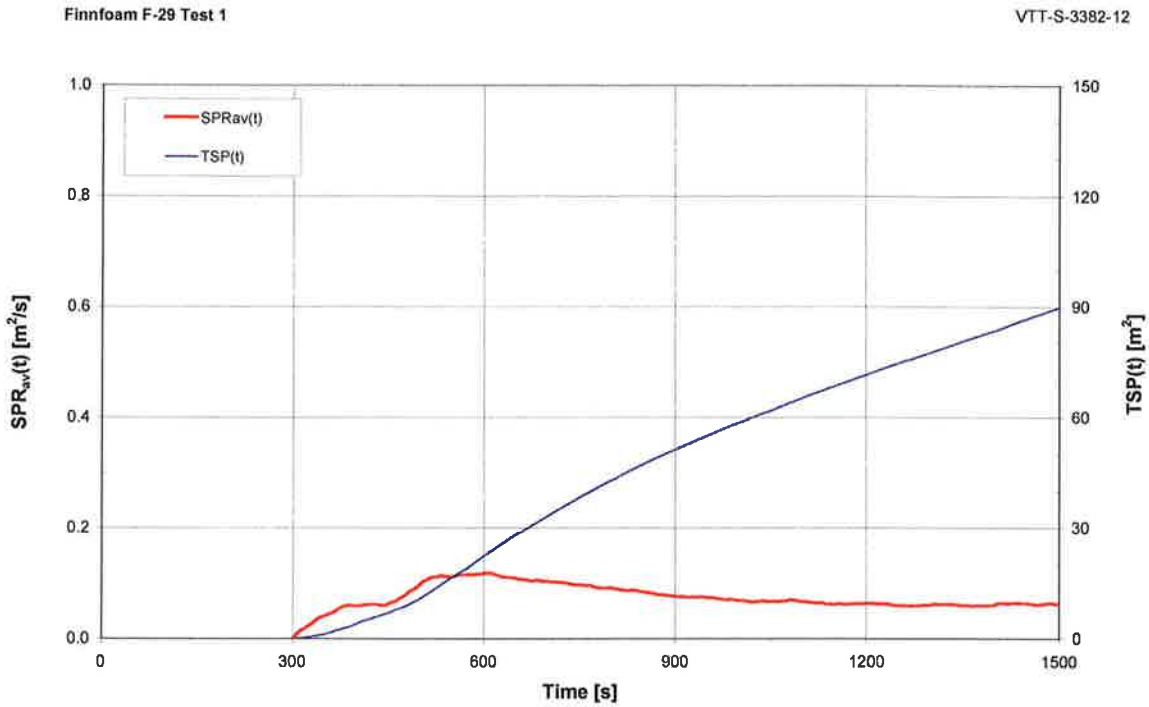
Heat release and smoke production in Test 1 by graphs



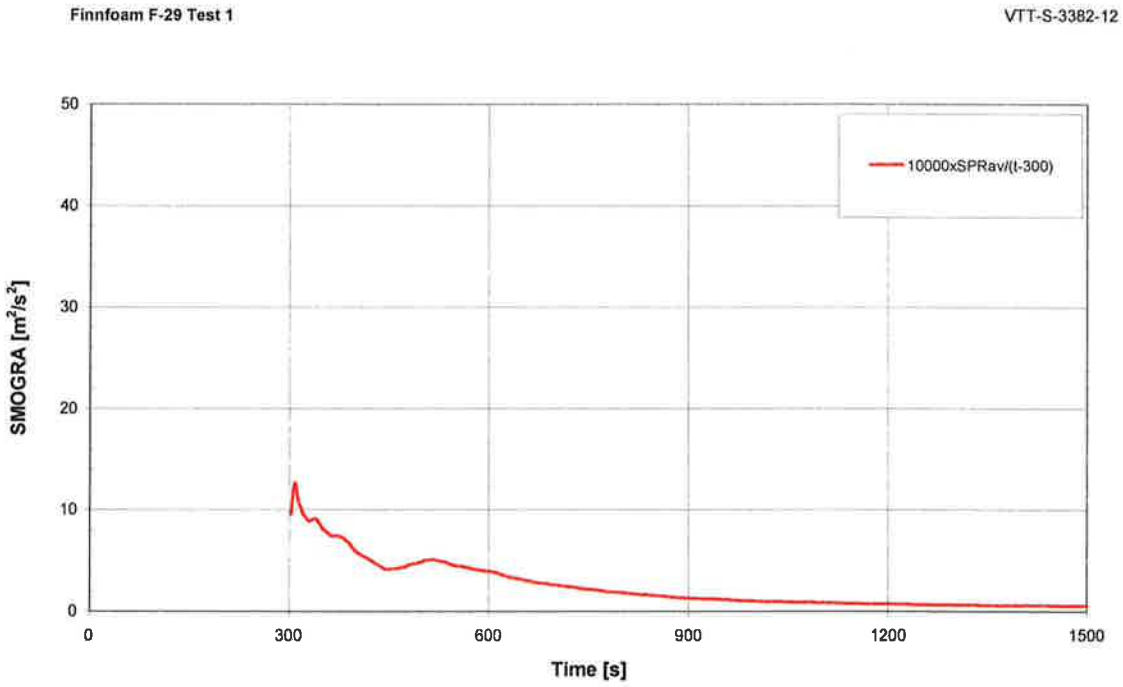
Graph 1. Average heat release rate $HRR_{av}(t)$ and total heat release THR(t).



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

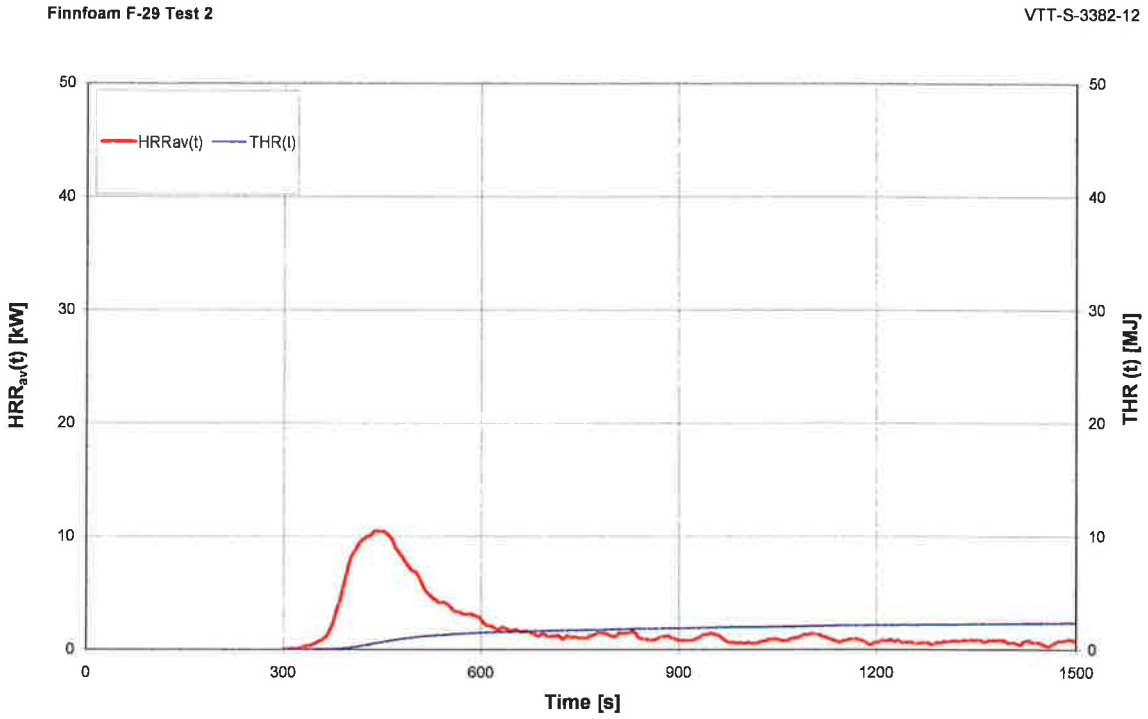


Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production TSP(t).

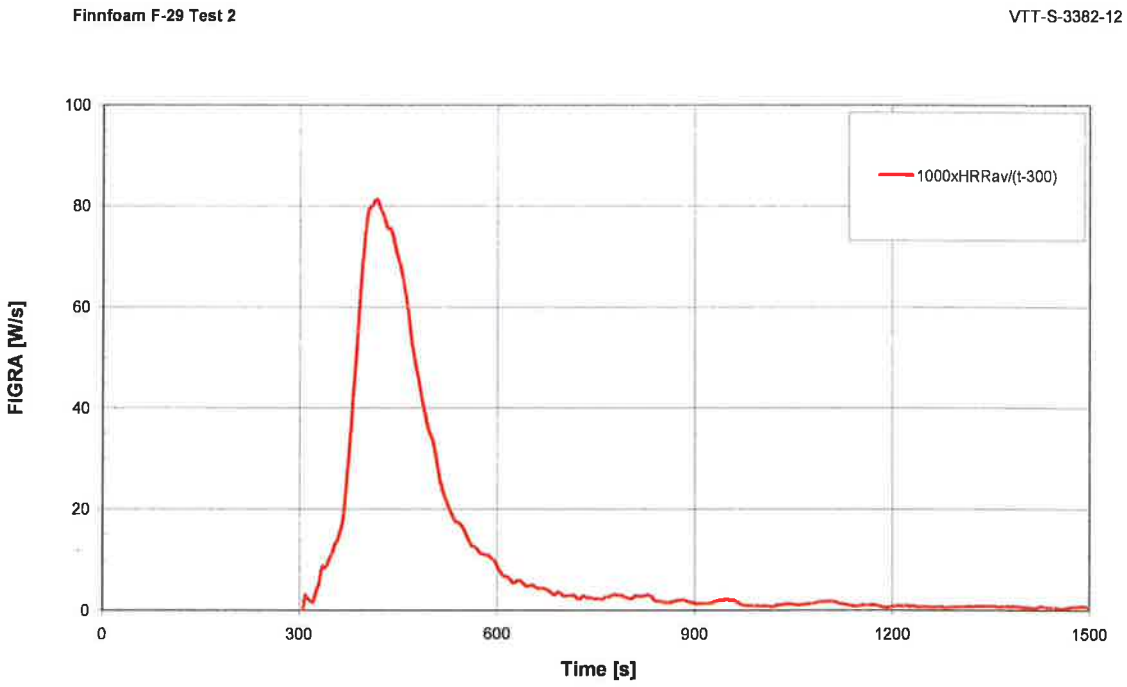


Graph 4. Smoke growth rate index SMOGRA is calculated as $10000xSPR_{av}/(t-300)$.

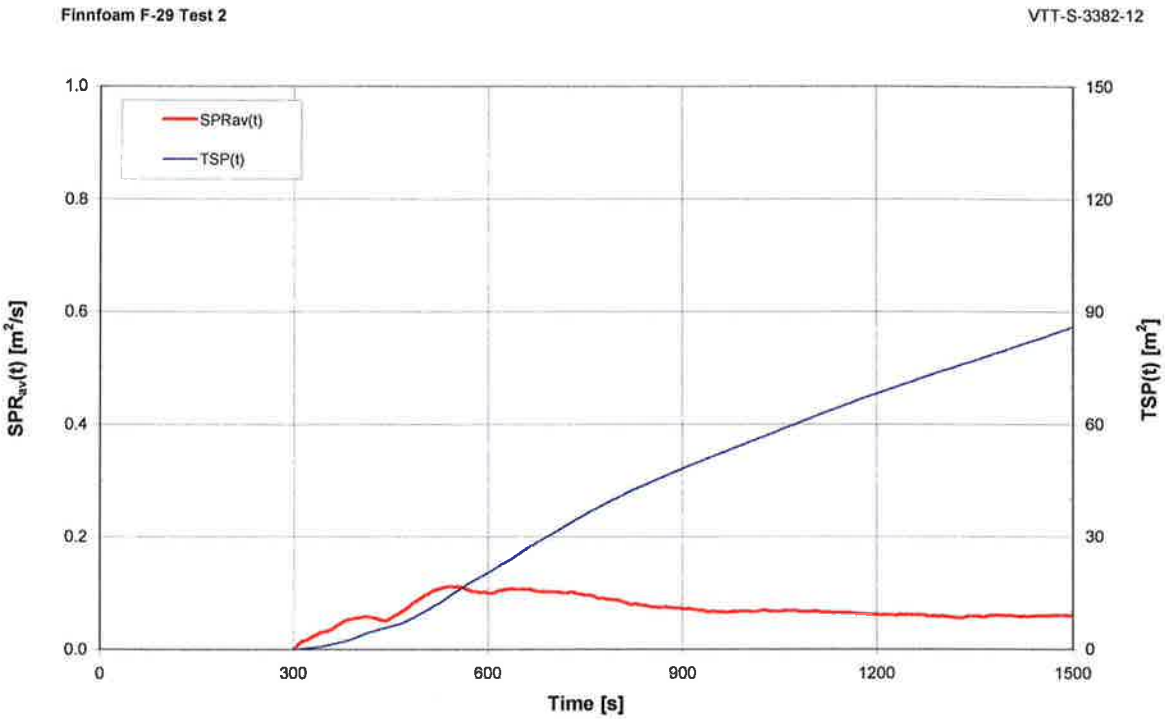
Heat release and smoke production in Test 2 by graphs



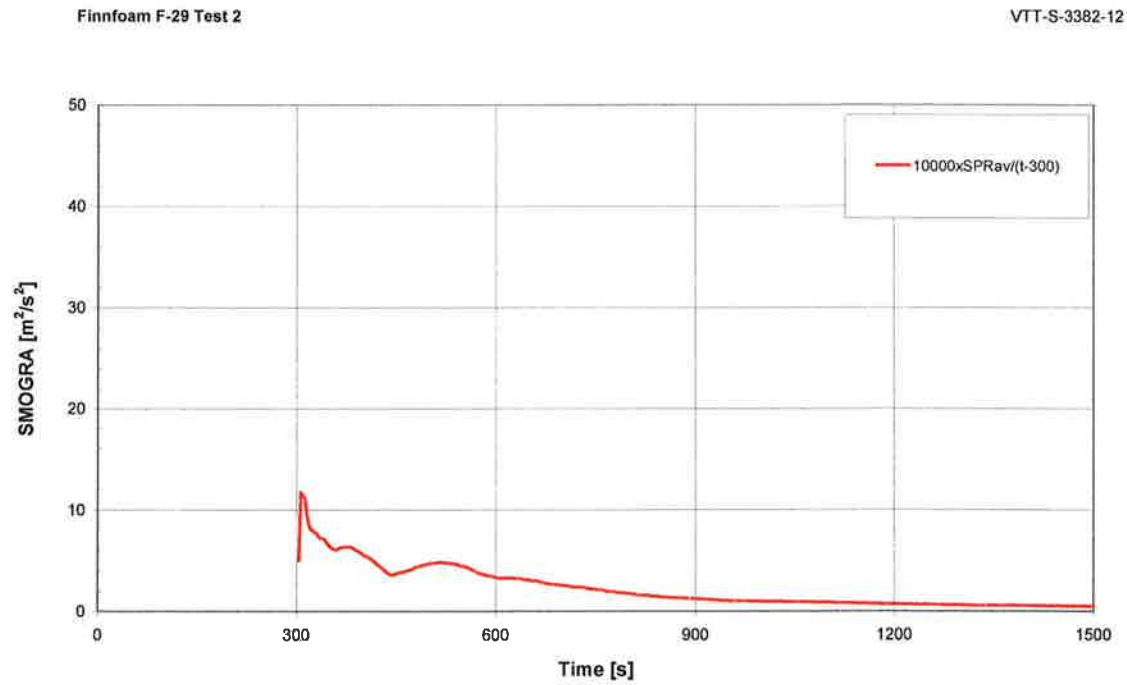
Graph 1. Average heat release rate $HRR_{av}(t)$ and total heat release THR(t).



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

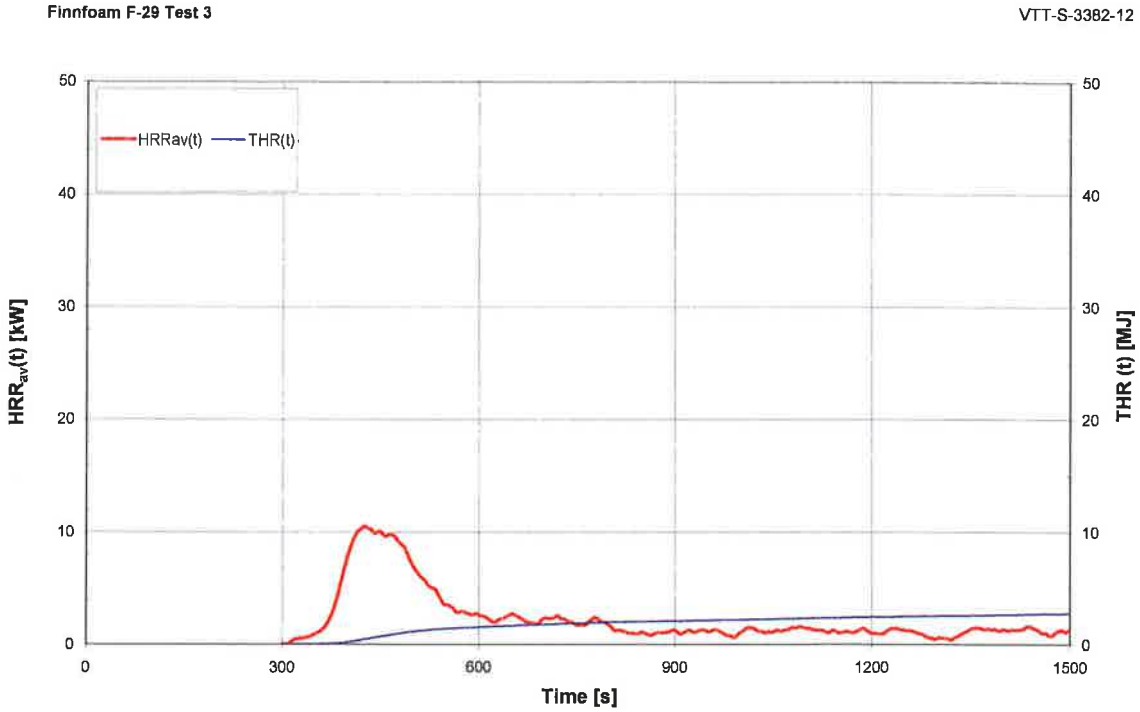


Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production TSP(t).

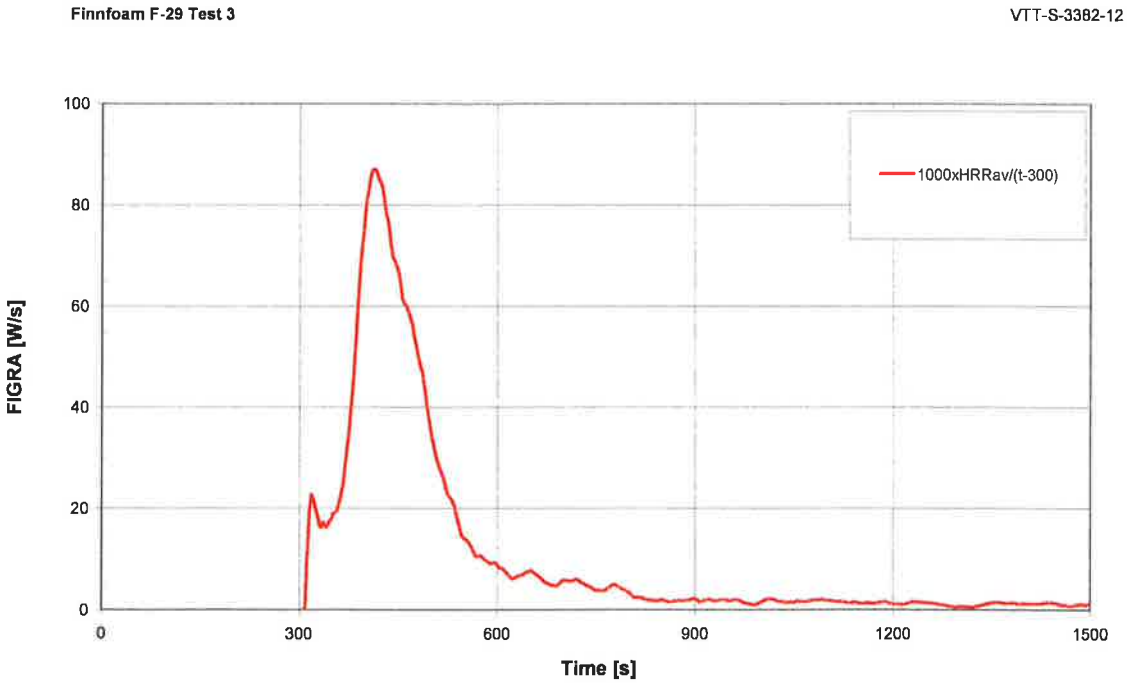


Graph 4. Smoke growth rate index SMOGRA is calculated as $10000xSPR_{av}/(t-300)$.

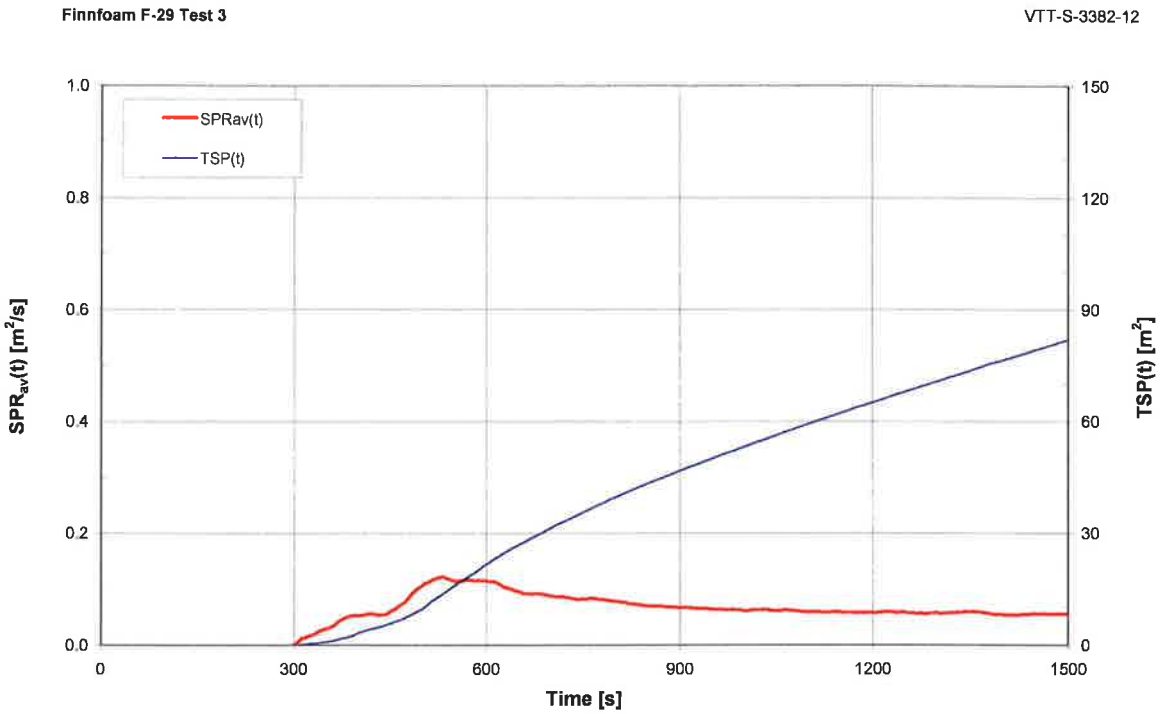
Heat release and smoke production in Test 3 by graphs



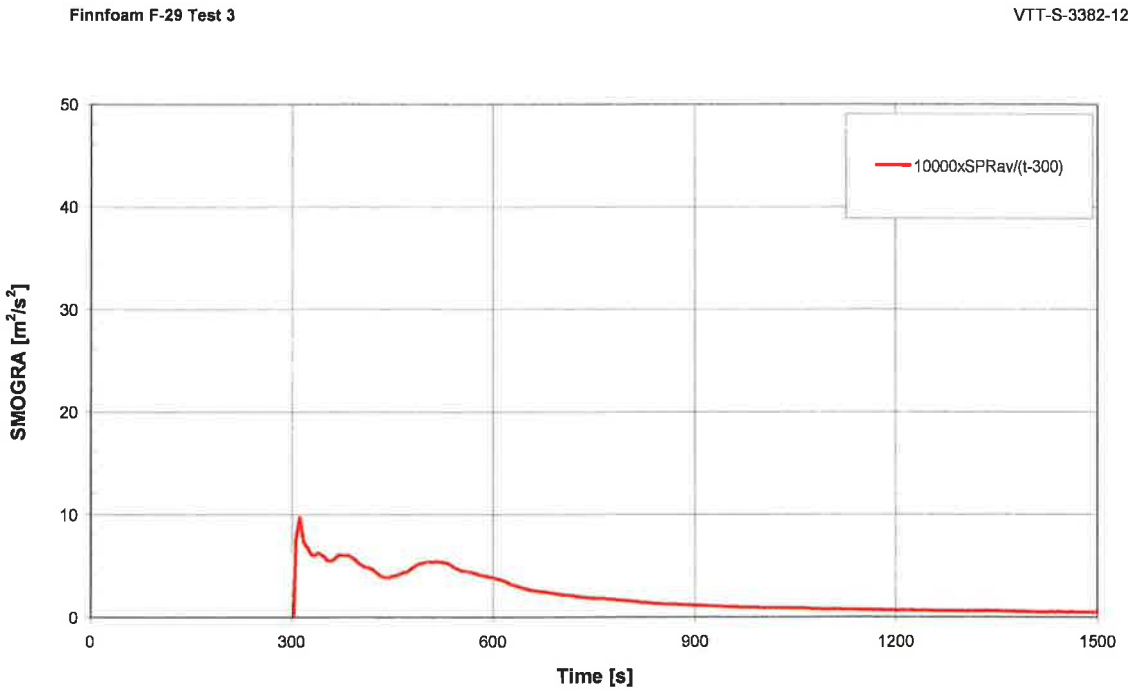
Graph 1. Average heat release rate $HRR_{av}(t)$ and total heat release THR(t).



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

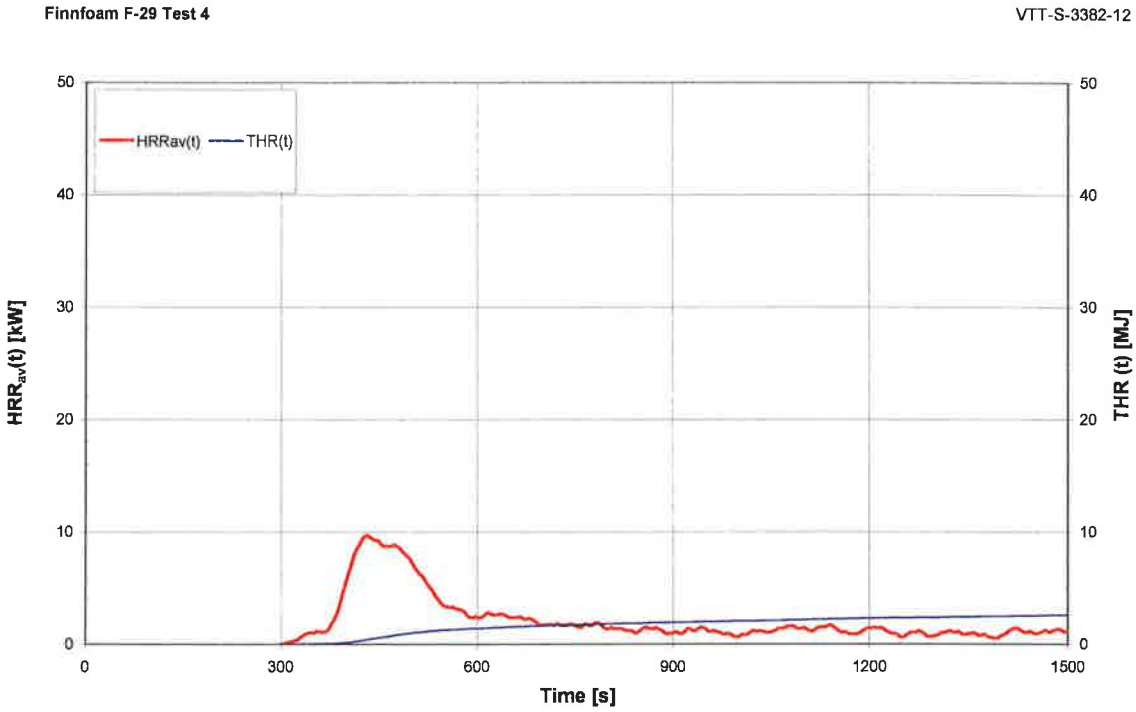


Graph 3. Average smoke production rate $SPR_{av}(t)$ and total smoke production TSP(t).

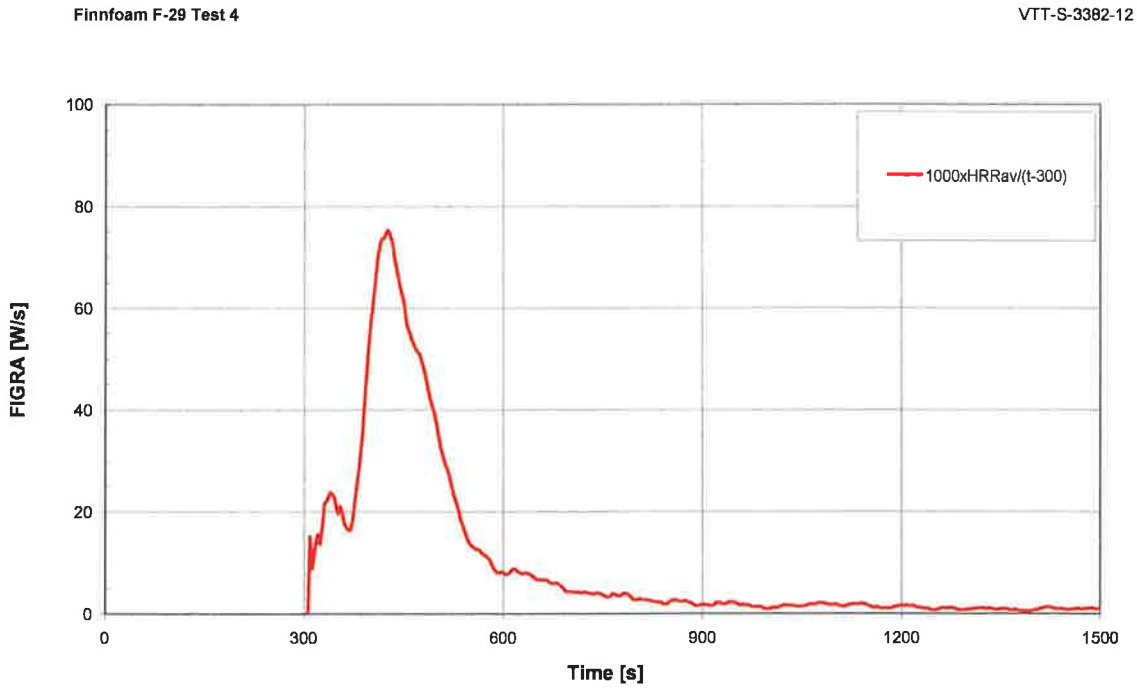


Graph 4. Smoke growth rate index SMOGRA is calculated as $10000xSPR_{av}/(t-300)$.

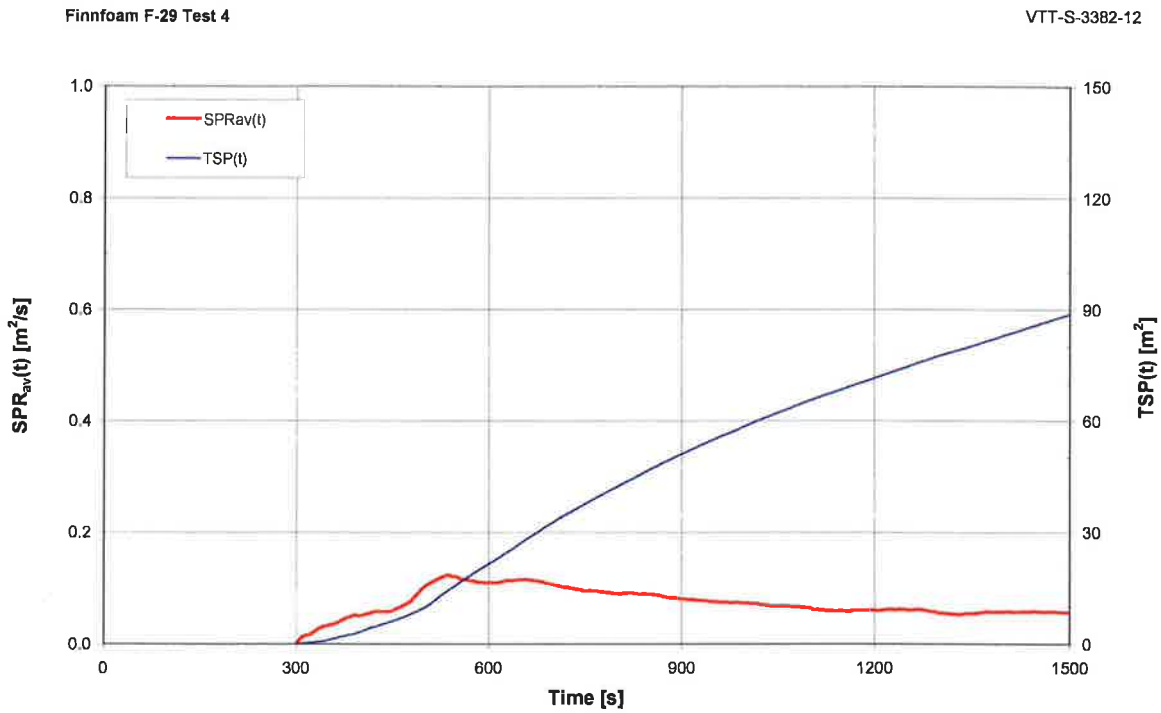
Heat release and smoke production in Test 4 by graphs



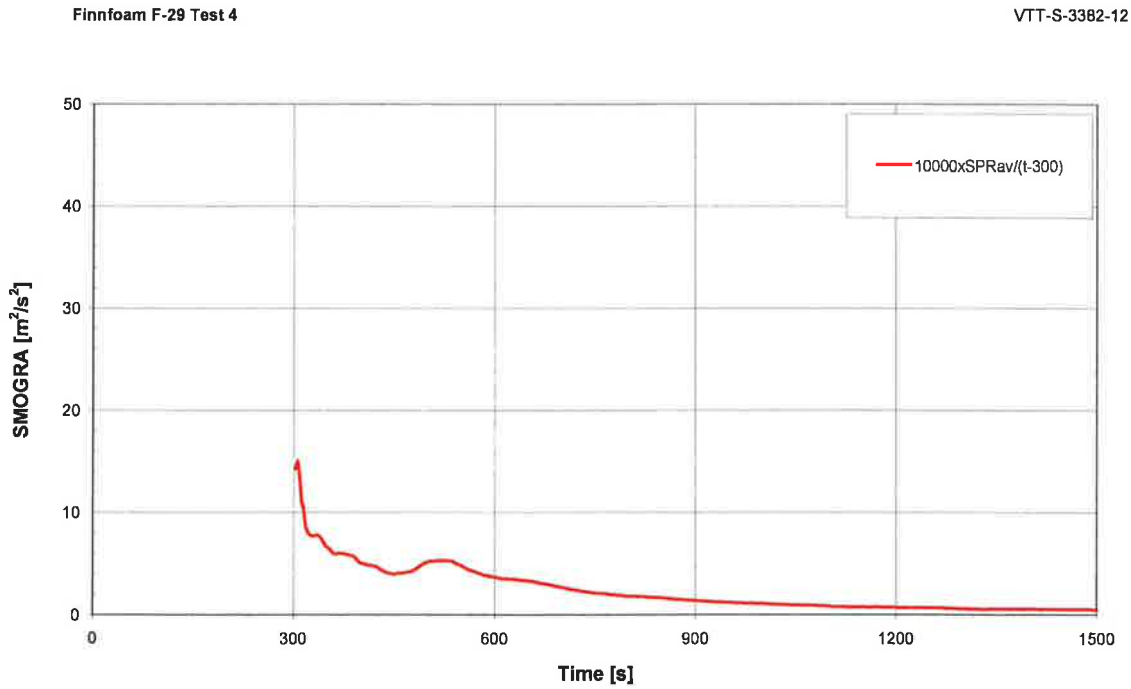
Graph 1. Average heat release rate $HRR_{av}(t)$ and total heat release THR(t).



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



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 $10000xSPR_{av}/(t-300)$.