

Reaction to fire testing of Multilayer pouch filled with Phase Change Material savE®HS22 Single Burning Item test according to EN 13823:2020

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1. PRODUCT IDENTIFICATION

Multilayer pouch filled with Phase Change Material savE@HS22, further referred to as 'the product'.

2. ABSTRACT

Determination of the reaction to fire properties of the product, when exposed to the thermal attack by a **Single Burning Item** according to EN 13823, with the objective to obtain the reaction to fire classification according to EN 13501-1.

3. DETAILS OF THE PRODUCT TESTED

3.1 INTENDED APPLICATION

The product will be used as suspended ceiling tiles.

3.2 MANUFACTURER/IMPORTER

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3.3 PRODUCT DESCRIPTION

According to the sponsor the product sample is composed of:

- 8-celled multilayer pouches filled with Phase Change Material of ref. savE@HS22 of total dimensions: 30x60cm, average thickness ~2 cm, and total weight approx. 2 kg;
 - Pouch: Multilayer [REDACTED] composite of total thickness of approx. 118-135 µm [REDACTED], the layers are built up as follows:
 - [REDACTED];
 - [REDACTED];
 - [REDACTED];
 - [REDACTED];
- The pouches are painted using three colours (red, black and white), with a usage of approx. 2.4-2.5 g/m².
- Filling: Hydrated salt savE@HS22, [REDACTED] solution with a melting point of 22 °C. [REDACTED]; each cell is filled with approx. 250 g salt diluted in water which results in a water concentration of max. 30%.

The product has a total thickness of ~20 mm, and a mass per unit area of approx. 11.1 kg/m².

4. DETAILS OF THE EXAMINATION

4.1 SAMPLES

Sampling procedure	The samples were submitted by the sponsor. The specimens were prepared by Efectis.
Age	At the time of receipt: no information received.
Date of receipt	September 30 th , 2022

4.2 SPECIMENS

Substrate used	Calcium silicate board - 12 mm, non-combustible (class A1/A2 according to EN 13238).
Specimen preparation	As the pouches are of dimension 30x60cm vertical and horizontal joints present on the short and long wings. See photographs of the SBI test at the end of the report.

4.3 CONDITIONING

Prior to the examinations, the specimens were conditioned over a period of two weeks minimum at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) % according to § 4.1 of EN 13238.

4.4 EXAMINATION

Method of mounting and fixing	The pouches have been knitted on the substrate and tested without an air gap.
Exposed side to flames	The painted frontside of the product is exposed to flames during the performance of the test.
Harmonised Product Standard	At the time of examination of the product, the sponsor was not aware of a related existing Harmonised Product Standard.
Assessment	In the end use situation the product is loosely laid on ceiling tiles. The pouches have been knitted to the substrate in order to be able to test them vertically. This is deemed to be representative or more critical than the end use situation.
Number of tests	A total of three Single Burning Item tests, were carried out, all in accordance with EN 13823:2020.
Date of examination:	October 19 th 2022
Location of examination	Efectis Nederland BV, Bleiswijk, The Netherlands

The results are given in Table 1.

Table 1: Single Burning Item classification parameter results

Test parameter	Test number	1	2	3	Classification parameter
FIGRA _{0.2 MJ}	[W/s]	0	23	4	9
FIGRA _{0.4 MJ}	[W/s]	0	23	4	9
THR _{600s}	[MJ]	0.3	1.6	0.4	0.8
LFS	{Yes, No}	No	No	No	No
SMOGRA	[m ² /s ²]	0.0	0.0	0.0	0.0
TSP _{600s}	[m ²]	0	0	0	0
Flaming droplets/particles					
Flaming ≤ 10 s	{Yes, No}	No	No	No	No
Flaming > 10 s	{Yes, No}	No	No	No	No

- FIGRA Fire growth rate: The maximum of the quotient of heat release rate from the burning specimen and the time of its occurrence, determined during the full test period, using a THR-threshold of 0.2 MJ or 0.4 MJ and a HRR_{av}-threshold of 3 kW.
- THR_{600s} Total heat release from the burning specimen during the first 600s of exposure to the main burner flames.
- LFS Lateral flame spread over the long specimen wing.
- SMOGRA Smoke growth rate: The maximum of the quotient of smoke production rate from the burning specimen and the time of its occurrence (multiplied by 10.000), determined during the full test period, using the TSP-threshold of 6 m² and the SPR_{av}-threshold of 0.1 m²/s.
- TSP_{600s} Total smoke production from the burning specimen during the first 600s of exposure to the main burner flames.

Observations of physical behaviour of the test specimen: during the test the pouches open up and the liquid floatd down, no flaming particles have been observed.

5. CONCLUSIONS

A formal classification is to be assessed in accordance with EN 13501-1, "Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests".

Graphs of Rate of Heat Release (HRR_{av}(t)), Rate of Smoke Production (SPR_{av}(t)), Total Heat release (THR(t)), Total Smoke Production (TSP(t)), FIGRA_{0.2 MJ}, FIGRA_{0.4 MJ} and SMOGRA, are presented hereafter followed by some photographs of the test setup and test results.

Remarks:

The test 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.

Regarding the estimated precision of the test method, the following information is given in Annex B of EN 13823.

Table B.2 — Average relative standard deviations

	FIGRA _{0.2 MJ}	FIGRA _{0.4 MJ}	THR _{600 s}	SMOGRA	TSP _{600 s}
Average (s_r /m)	14 %	15 %	11 %	15 %	18 %
Average (s_R /m)	23 %	25 %	21 %	40 %	44 %



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APPENDIX: CHARTS

Chart 1	Rate of Heat Release ($HRR_{av}(t)$) [kW]
Chart 2	Rate of Smoke Production ($SPR_{av}(t)$) [m^2/s]
Chart 3	Total Heat release ($THR(t)$) [MJ]
Chart 4	Total Smoke Production ($TSP(t)$) [m^2]
Chart 5	$FIGRA_{0.2 MJ}$ [W/s]
Chart 6	$FIGRA_{0.4 MJ}$ [W/s]
Chart 7	SMOGRA [m^2/s^2]

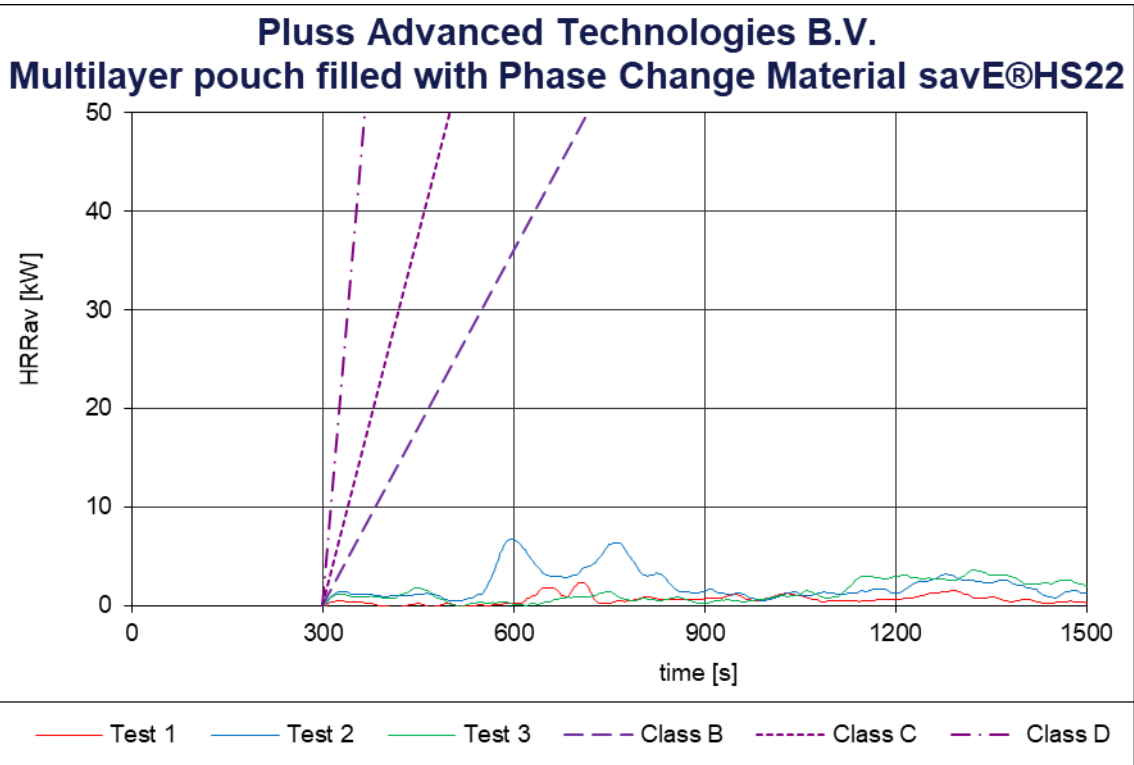


Chart 1: Rate of Heat Release ($HRR_{av}(t)$) [kW]

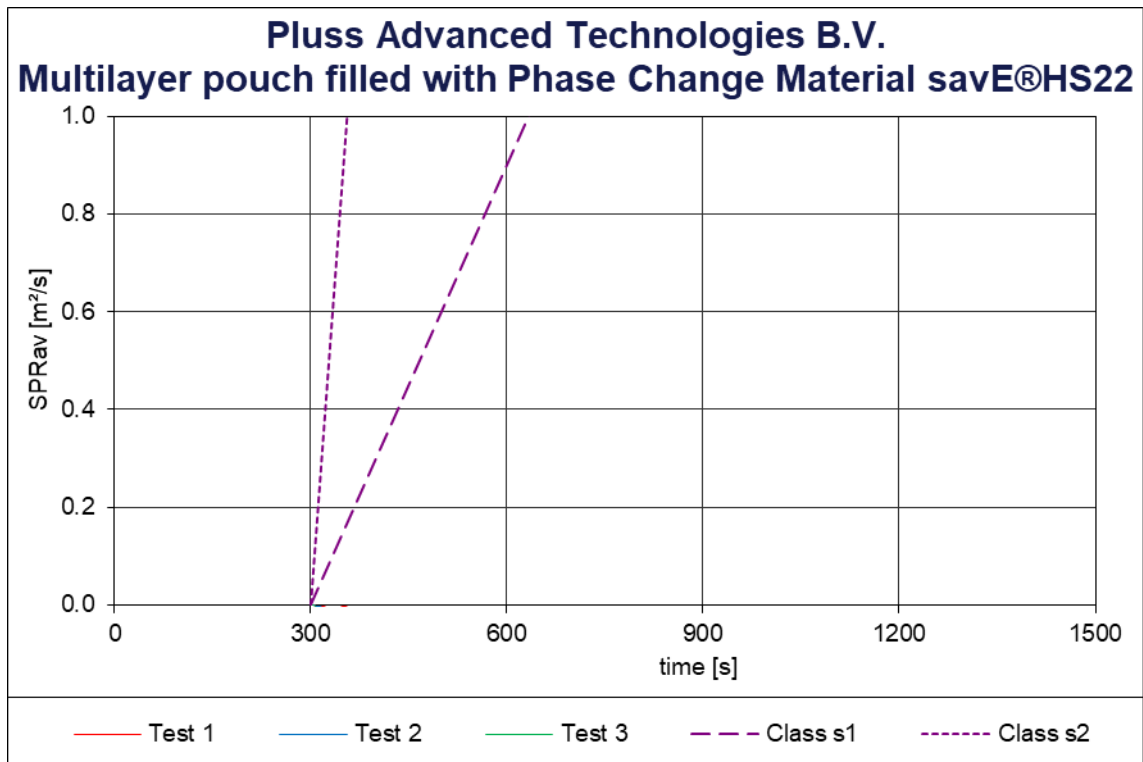


Chart 2: Rate of Smoke Production ($SPR_{av}(t)$) [m^2/s]

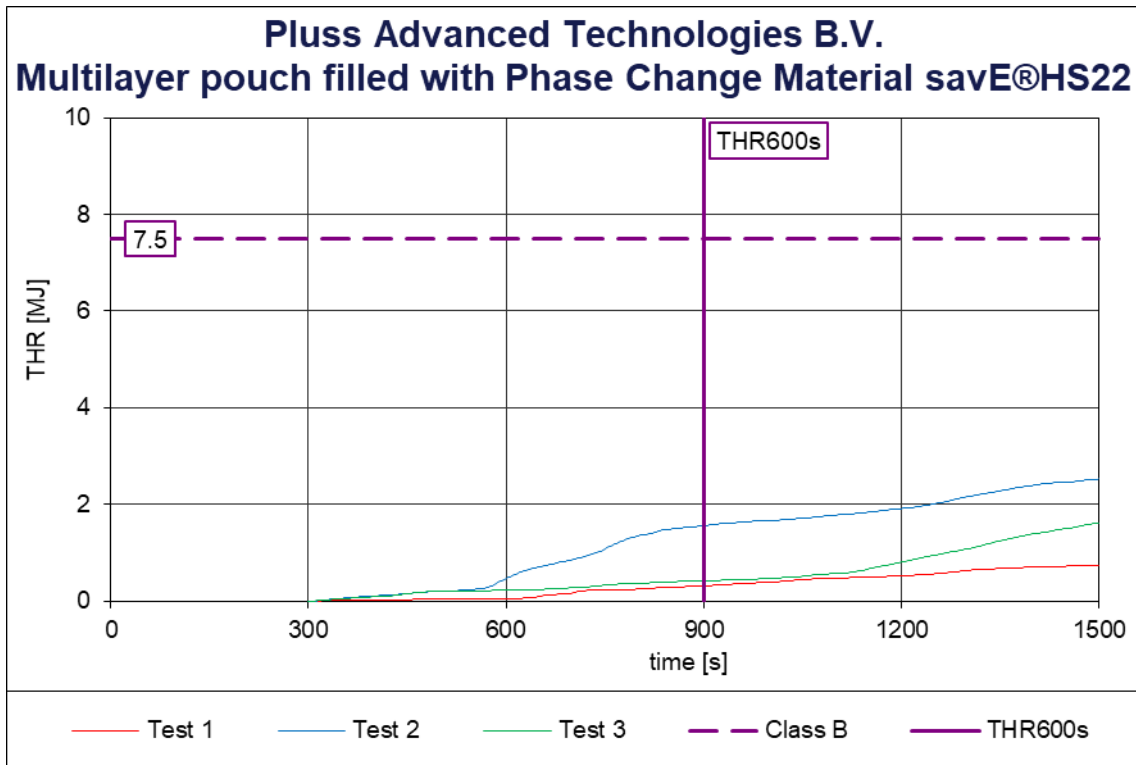


Chart 3: Total Heat release (THR(t)) [MJ]

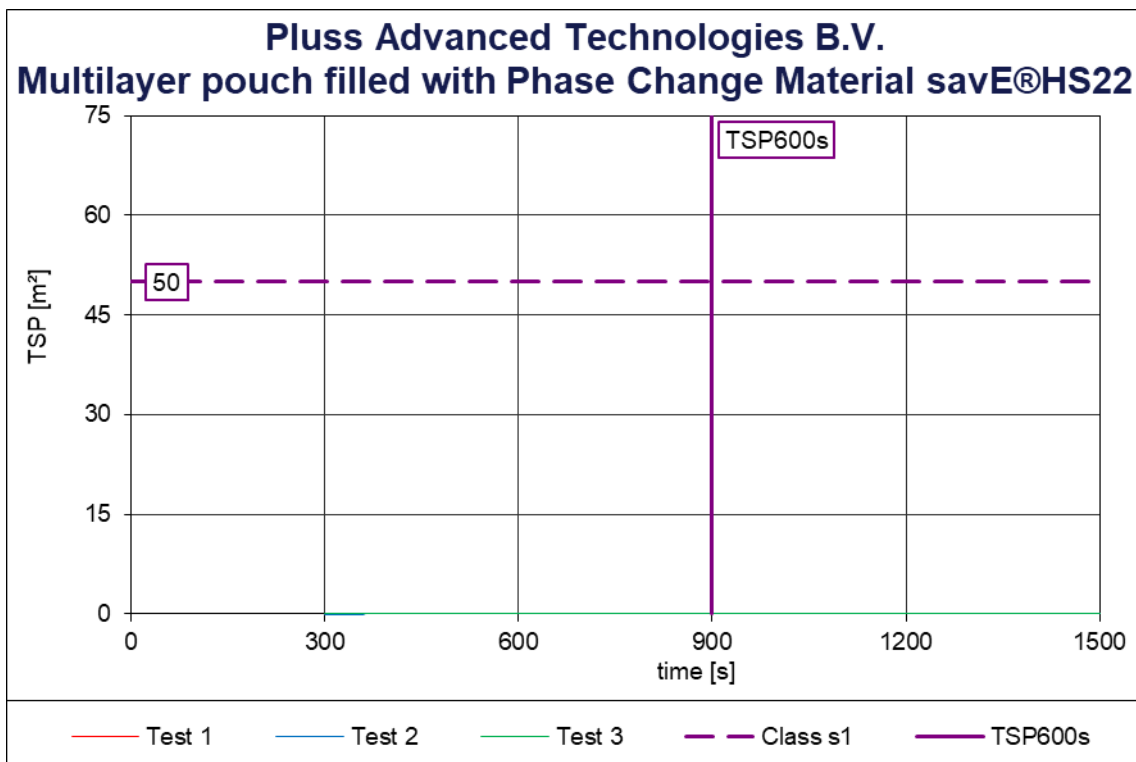
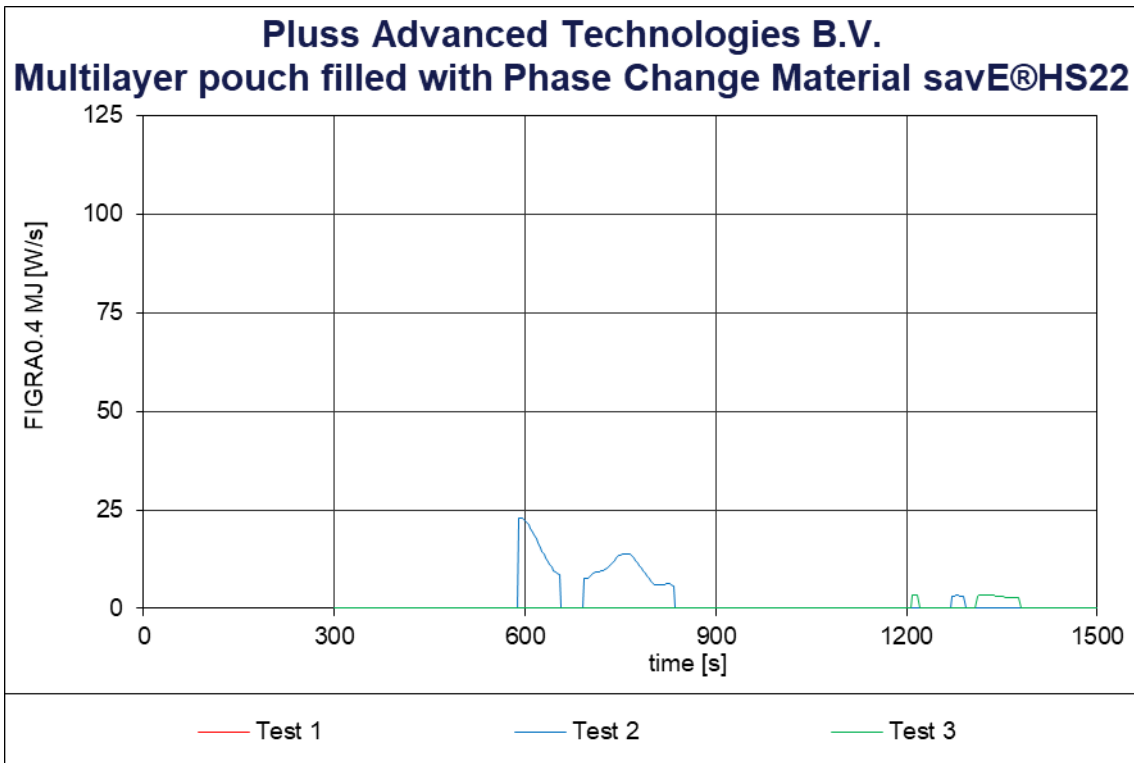
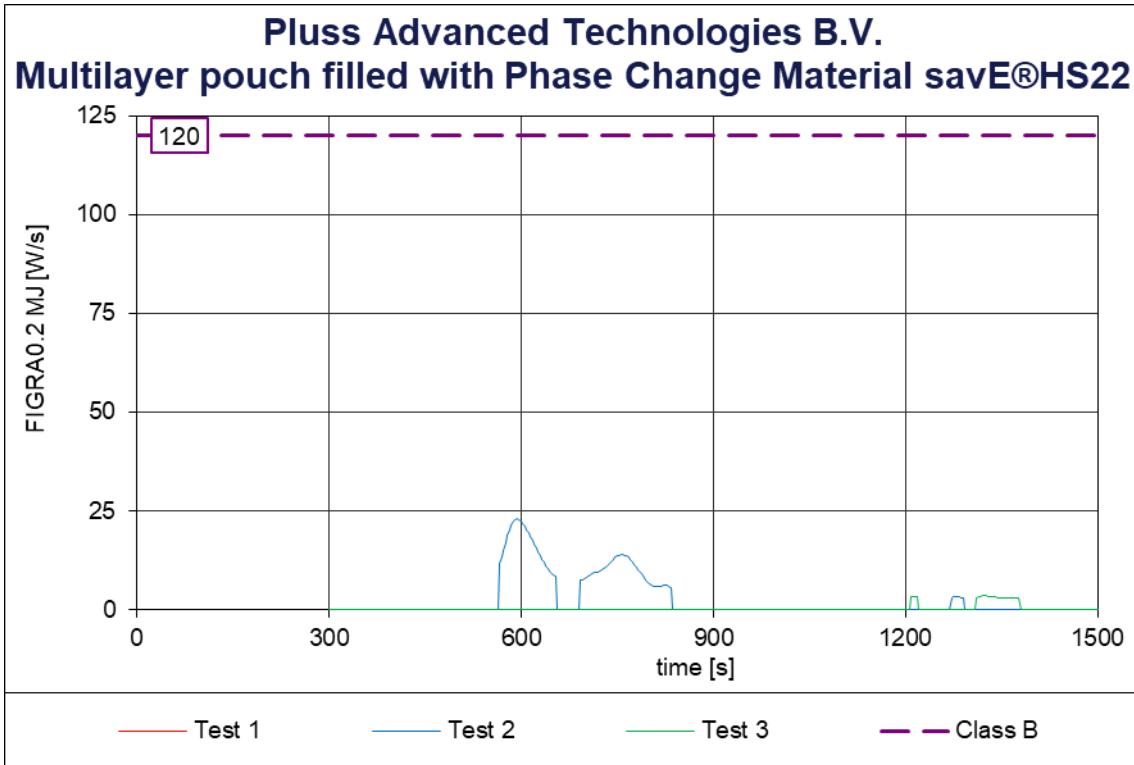


Chart 4: Total Smoke Production (TSP(t)) [m²]



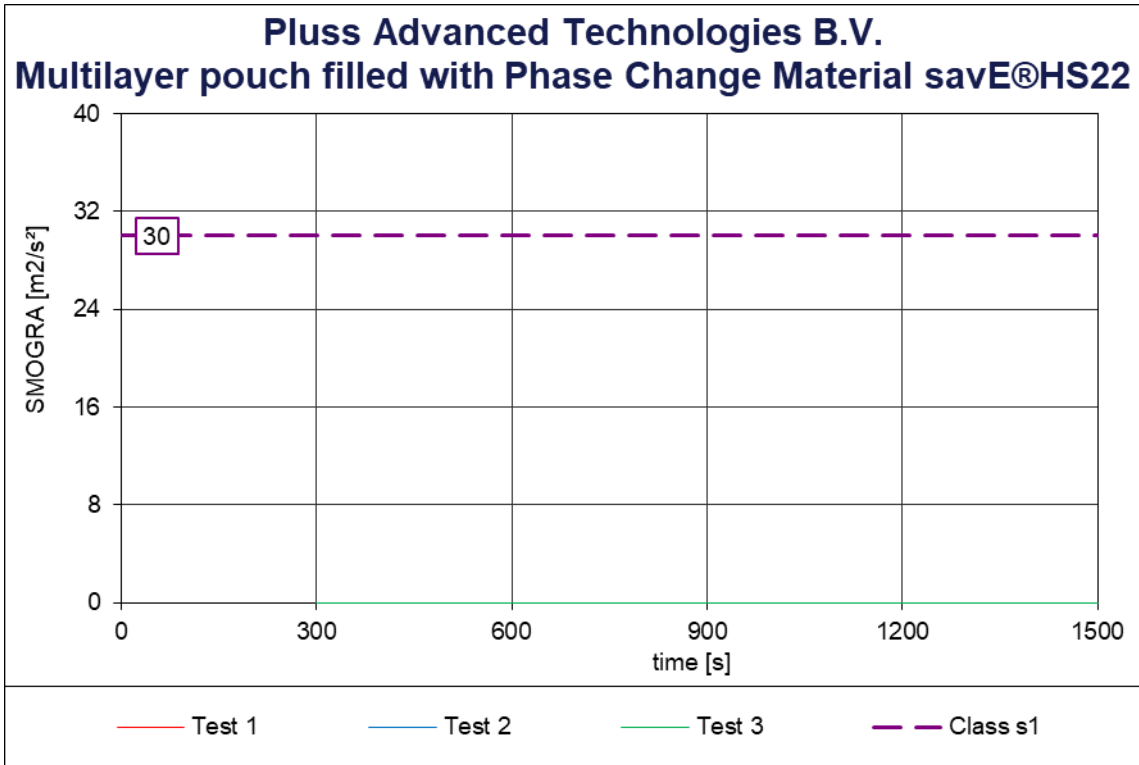


Chart 7: SMOGRA [m²/s²]

APPENDIX: PHOTOGRAPHS



Photographs 1 and 2: Specimen prior to testing



Photographs 3 and 4: Specimen after testing