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PAVUS, a.s.

AUTHORIZED BODY 216
NOTIFIED BODY 1391
EGOLF MEMBER



FIRE TESTING LABORATORY VESELÍ NAD LUŽNICÍ
Testing Laboratory No. 1026 accredited by ČIA

FIRE RESISTANCE TEST REPORT

No. Pr-14-2.072-En

Issued on 2014-05-14

For product

Fire shutter

**Fire Resistant Loft Ladder KYLF
KYLF01, KYLF09**

Exposed to heat from below

Sponsor: **KEYLITE ROOF WINDOWS Ltd.**
Dellyrolan Industrial Estate, Sandholes Road
Cookstown, Co. Tyrone
BT80 9LU
United Kingdom

Test method:

ČSN EN 1634-1:2009

» Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware -
Part 1: Fire resistance tests for doors, shutters and openable windows «

Test Report contains: 18 pages
(6 text pages + 4 Annexes)

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1 INTRODUCTION

The fire resistance test of fire resistant loft ladder KYLF was performed based on the order of company KEYLITE ROOF WINDOWS Ltd. in Fire Testing Laboratory Veselí nad Lužnicí.

The test was prepared, performed and assessed on the base of following documents:

- [1] ČSN EN 1634-1:2009 Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware – Part 1: Fire resistance tests for doors, shutters and openable windows
- [2] ČSN EN 1363-1:2013 Fire resistance tests
Part 1: General requirements
- [3] Specimen-related technical documentation (delivered by the test sponsor)

For the purposes of this document, the definition given in [1] and [2] together with following abbreviations apply:

ČIA	Český institut pro akreditaci, o.p.s. (Czech Institute for Accreditation)
TC	thermocouple
TM	thermometer (sheathed TC)
PTM	plate thermometer fit with a TM \varnothing 1 mm m
RTC	roving thermocouple
EF	exposed specimen face
UF	unexposed specimen face
ATL	accredited testing laboratory

2 SUBJECT MATTER OF THE TEST

2.1 Specimens in general

For the test, two specimens of fire resistant loft ladder KYLF were manufactured. The smallest (KYLF01) as well as the largest (KYLF09) size of fire resistant loft ladder of the complete product range were tested.

2.2 Specimen description

Specimen No. 1 - KYLF01

- ◆ Internal diameter of shutter: 490 x 900 mm, internal diameter of assembly hole in ceiling construction: 540 x 950 mm;
- ◆ Framebox (shutter frame) made of timber boards 135 x 20 mm, in corners joined by rabbet joints and screwed together using steel corner brackets of 2.0 a 2.5 mm in thickness;
- ◆ The trapdoor (shutter door) situated at the bottom side of frame had following composition:
 - Upper cover board HDF th. 3 mm,
 - Timber peripheral frame th. 30 mm with a pair of inner crossbars, filled up with mineral wool Rockwool Contil 150 AF th. 30 mm,
 - Lower cover board Firax th. 10 mm (Spanolux S.A.);
- ◆ Fire resistant tape Kerafix Flextrem 100 of 2x20 mm in size (Rolf Kuhn GmbH) in the groove round the perimeter of the trapdoor;
- ◆ Sealing TPE S 9609 (Inter Deventer) between the trapdoor and the framebox;
- ◆ A pair of hinges made of steel sheet of 3.0 and 2.5 mm in thickness (Keylite), anchored to trapdoor using 2 pcs of screws 6x25 mm and to the framebox using 2 pcs of screws M6x20 mm and 2 pcs of T-nuts M6x18 mm;
- ◆ A pair of steel arms of 3 mm in thickness (Keylite), anchored to trapdoor using 2 pcs of screws 6x25 mm and to the framebox using 2 pcs of screws M8x40 mm and 2 pcs of dome nuts M8. The arms were keeping the trapdoor closed by steel springs;
- ◆ To the top surface of trapdoor, folding timber ladder of 11 kg in weight was screwed on;

- ◆ The framebox was anchored to the timber frame of loadbearing ceiling construction using 8 pcs of screws 5x70 mm: 3 pcs on both longer sides of shutter and every 1 piece on both shorter sides;
- ◆ Gap between framebox and the timber frame of loadbearing ceiling construction was sealed from below as well as from above using the fire resistant sealant TYTAN.

Specimen No. 2 - KYLF09

- ◆ Internal diameter of shutter: 640 x 1100 mm, internal diameter of assembly hole in ceiling construction: 685 x 1145 mm;
- ◆ Framebox (shutter frame) made of timber boards 135 x 20 mm, in corners joined by rabbet joints and screwed together using steel corner brackets of 2.0 a 2.5 mm in thickness;
- ◆ A trapdoor (shutter door) situated at the bottom side of frame has following composition:
 - Upper cover board HDF th. 3 mm,
 - Timber peripheral frame th. 30 mm with a pair of inner crossbars, filled up with mineral wool Rockwool Contil 150 AF th. 30 mm,
 - Lower cover board Firax th. 10 mm (Spanolux S.A.);
- ◆ Fire resistant tape Kerafix Flextrem 100 of 2x20 mm in size (Rolf Kuhn GmbH) in the groove round the perimeter of the trapdoor;
- ◆ Sealing TPE S 9609 (Inter Deventer) between the trapdoor and the framebox;
- ◆ A pair of hinges made of steel sheet of 3.0 and 2.5 mm in thickness (Keylite), anchored to trapdoor using 2 pcs of screws 6x25 mm and to the framebox using 2 pcs of screws M6x20 mm and 2 pcs of T-nuts M6x18 mm;
- ◆ A pair of hinges made of steel sheet of 3.0 and 2.5 mm in thickness (Keylite), anchored to trapdoor using 2 pcs of screws 6x25 mm and to the framebox using 2 pcs of screws M6x20 mm and 2 pcs of T-nuts M6x18 mm;
- ◆ To the top surface of trapdoor, folding timber ladder of 13 kg in weight was screwed on;
- ◆ The framebox was anchored to the timber frame of loadbearing ceiling construction using 8 pcs of screws 5x70 mm: 3 pcs on both longer sides of shutter and every 1 piece on both shorter sides;
- ◆ Gap between the framebox and the timber frame of loadbearing ceiling construction was sealed from below as well as from above using the fire resistant sealant TYTAN.

The specimens were mounted in construction in the Testing Laboratory on May 5th – 6th, 2014.

Manufacturer of specimen: KEYLITE ROOF WINDOWS Ltd.

Specimen-related documentation is documented in Annex 3.

The Testing Laboratory did not participate in specimen sampling.

3 TEST PERFORMANCE

3.1 General

The fire resistance test was performed according to [1] on horizontal test furnace adjusted to the required test size as per [2].

The specimens were mounted to a rigid wooden frame made of boards 200 x 60 mm simulating installation in ceiling wooden structure. The frame was anchored by screws and plugs into the holes in the ceiling structure made of Ytong panels.

The specimens were exposed to heat from below.

The test was performed on May 7th, 2014.

Sponsor representatives were present at the test.

3.2 Furnace control

The test furnace was heated with a set of oil burners. In-furnace temperature was measured using a PTM and recorded at minute intervals. The measuring joints of PTM were distributed uniformly in a distance of

100 mm from the exposed specimen face. The in-furnace temperature was controlled so that it conforms to the relation according to [2] art. 5.1.1, within the specified limits (see [2] art. 5.1.2):

$$T = 345 \log(8t + 1) + 20$$

where: T (°C) = required in-furnace temperature in time t
t (min) = time since the test beginning.

The test furnace positive pressure was measured using a differential pressure gauge and automatically controlled by a chimney ventilator in the furnace outlet so that the values correspond to the conditions of [2] art. 5.2.1.

3.3 Measuring of specimen

The specimen unexposed surface temperatures were measured using K-type TCs and recorded at minute intervals. The measuring joints of TCs were soldered to the centre of a copper disc of 12 mm in diameter and of 0.2 in thickness and they were covered with a plate of 30 x 30 mm in size and of 2 mm in thickness (see [2] art. 4.5.1.2). TCs were fixed to the specimen surface as per [1] art. 9.1.2.

During the test, the ambient temperature was measured with one TM according to [2] art. 5.6. (see [2] art. 4.5.1.5).

The initial test conditions met the standard values according to [2] art. 10.3.

One RTC was available to measure points where higher temperatures were suspected (see [2] art. 4.5.1.3).

Due to the horizontal position of specimens, no deflection of fire shutter as per [1] art. 9.3. could be measured.

3.4 Conditioning

The specimens were assembled on May 5th – 6th, 2014. The test was performed on may 7th, 2014. During this time, following air humidity and ambient air temperature were measured:

Parameter	Minimum	Maximum
Relative air humidity (%)	49	52
Temperature (°C)	14.3	18.6

4 COURSE OF TEST

Time (min): Observation:

Specimen No. 1

-
- | | |
|-----|--|
| 1. | UF – light escape of smoke through the peripheral gap, stronger smoke escape in the corners of hinged side |
| 4. | UF – diminution of smoke escape |
| 5. | EF – exposed surface turns black and it is burning |
| 10. | UF – light escape of smoke through the shutter frame and the ceiling wooden structure
EF – charred surface has cracked in a cracks network, specimen surface is burning, cracking inside specimen (sub-elements are unsticking) |
| 14. | EF – wide cracks in surface, local exposition of second composition layer |
| 15. | UF – no visible changes |
| 16. | EF – parts of charred bottom layer fall off, exposition of inner partitions and mineral filling of fire shutter |
| 25. | EF – entire bottom layer has burned off, mineral insulation does not fall away |
| 30. | UF – extrusion of intumescent tape through the gap at the hinged side
EF – mineral filling continues to sinter without its parts falling away |
| 35. | UF – surface of top composition layer deflects, some TCs unstick from surface |
| 40. | end of test upon sponsor's agreement after the fire has penetrated the adjacent specimen |
-

Specimen No. 2

-
- | | |
|-----|--|
| 1. | UF – light escape of smoke through the peripheral gap |
| 5. | UF – side of shutter frame turns dark locally from escaping smoke
EF – exposed surface turns black and it is burning |
| 10. | UF – light escape of smoke through the shutter frame and the ceiling wooden structure
EF – charred surface has cracked in a cracks network, specimen surface is burning, cracking inside specimen (sub-elements are unsticking) |
| 14. | EF – wide cracks in surface, local exposition of second composition layer |
| 15. | UF – no visible changes |
| 16. | UF – side of shutter frame as well as the shutter surface turn dark from escaping smoke
EF – parts of charred bottom layer fall off, exposition of inner partitions and mineral filling of fire shutter |
| 25. | EF – entire bottom layer has burned off, mineral insulation does not fall away |
| 30. | UF – extrusion of intumescent tape through the shutter peripheral gap
EF – mineral filling continues to sinter, narrow strips of mineral filling loose at the unrestrained shorter side, mineral insulation does not fall away |
| 35. | UF – surface of top composition layer deflects, raster of transversal rods turns visible on darkening surface |
| 39. | UF – sustained flaming at the hinged shutter side – integrity failure |
| 40. | end of test upon sponsor's agreement |
-

The in-furnace temperatures met the requirements of [2]. Time relations to the measured temperatures are specified in Annex 2.

5 TEST RESULTS

5.1 Limit state attainment criteria

- † **Integrity** (according to [2] art. 11.2). This criterion means the time for which the test specimen continues to maintain its separating function during the test without either:
 - a) causing the ignition of a cotton pad applied according to [2] art. 10.4.5.2; or
 - b) permitting the penetration of a gap gauge as specified in [2] art. 10.4.5.3, assessed visually regarding the horizontal positioning of specimen; or
 - c) sustained flaming.

- † **Insulation** (according to [2] art. 11.3). This criterion means the time for which the test specimen continues to maintain its separating function during the test without developing temperatures on its unexposed surface which either:
 - a) increase the average temperature above the initial average temperature by more than 140 °C; or
 - b) increase the temperature at any location above the initial average temperature by more than 180 °C.

5.2 Listing of test results

Specimen No. 1

Integrity	- cotton pad	39 minutes , no failure
	- sustained flaming	39 minutes , no failure
	- visual assessment of cracks	39 minutes , no failure
Insulation	- average temperature	37 minutes
	- maximum temperature (peripheral zone 100 mm)	38 minutes
	- maximum temperature – additional procedure (peripheral zone 25 mm)	39 minutes , not attained
	- maximum temperature – shutter frame	39 minutes , not attained

Specimen No. 2

Integrity	- cotton pad	38 minutes
	- sustained flaming	38 minutes
	- visual assessment of cracks	39 minutes , no failure
Insulation	- average temperature	38 minutes ¹⁾ , not attained ²⁾
	- maximum temperature (peripheral zone 100 mm)	38 minutes ¹⁾ , not attained ²⁾
	- maximum temperature – additional procedure (peripheral zone 25 mm)	38 minutes ¹⁾ , not attained ²⁾
	- maximum temperature – shutter frame	38 minutes ¹⁾ , not attained ²⁾

1) The performance criteria „insulation“ and „radiation“ shall automatically be assumed not to be satisfied when the „integrity“ criterion ceases to be satisfied whether the specific temperature limits have been exceeded or not.

2) Limit value was not measured for 39 minutes of duration of the test.

5.3 Field of direct application

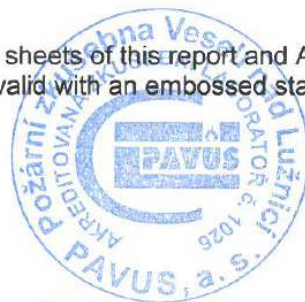
Based on [1] art. 1, the field of direct application of test results is not valid for fire shutters tested in horizontal position.

5.4 Application of test results


The test results refer only to the tested specimen including the way of its mounting into the constructions (see part 2 of this Report).

This report details the method of specimen construction, the test conditions as well as the results obtained when the specific element of construction described herein was tested following the procedure outlined in ČSN EN 1363-1 and ČSN EN 1634-1. Any significant deviation with respect to size, constructional details, load, stresses, edge or end conditions apart of those allowed in the field of direct application is not covered by this report.

The sheets of this report and Annexes are valid with an embossed stamp only



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ANNEX 1: TESTING AND GAUGING DEVICES, MEASUREMENT UNCERTAINTY

Test equipment:	Registration number:
Horizontal furnace (+ equipment for furnace temperature and pressure control)	0007
Furnace pressure probes	0012
Cotton pad frame	0014

Gauging equipment:	Metrological registration number:
Differential pressure gauge AMR DPS	3 09 10
Datalogger ALMEMO 5990-2	3 10 35
PTM – in-furnace temperature (TM K Ø 1 mm)	3 10 52
TC (K) - specimen UF temperature	3 10 31
TM K Ø 3 mm – ambient temperature	3 10 37
Winding tape measure	3 01 05
Stop-watch	3 05 01
Thermohygrograph THZ1int	3 13 05
THERM 2260 + RTC (K)	3 10 06

Metrological relationships of the device are specified in the metrological registration card of the device, which is expressly identified by the metrological registration number of the device.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

Quantity measured			Extended measurement uncertainty
Name	Symbol	Unit	
Time since the test beginning	t	(min)	$3,4 \cdot 10^{-2}$ min, for $t \leq 240$ min
Integrity disruption time		(min)	< 0,5 min
Temperature: TC or K-type PTM + compensation cable (both of the 2 nd tolerance class) + Almemo 5990-2	T	(°C)	< 1,4 °C for $40^{\circ}\text{C} < T \leq 375^{\circ}\text{C}$ < 10 °C for $375^{\circ}\text{C} < T \leq 1000^{\circ}\text{C}$
Ambient-to-in-furnace pressure difference	p	(Pa)	< 2 Pa

The specified extended measurement uncertainties are a product of standard measurement uncertainty and of the extension coefficient $k = 2$, which, for normal distribution, corresponds to the coverage probability of 95 %.

The standard measurement uncertainty has been determined in accordance with the EA-16/02 (EAL R2) and with the GUM document.

ANNEX 2: MEASUREMENT

In-furnace temperature and pressure, ambient temperature

Time t (min)	Temperature (°C)										Dew. d _e (%)		Amb.	Press. 100mm under sp.(Pa)		
	T	74	75	76	77	78	79	80	81	T _s	allow.	act.	Temp.	required	act.	dew.
0	20	20	19	18	18	18	19	18	19	19			17	-		-
5	576	573	602	545	561	590	595	609	645	590	-	-4,6	17	20,0(±5)	18,7	-1,3
10	678	678	675	656	659	672	669	679	700	673	±15	-2,3	17	20,0(±3)	18,7	-1,3
15	739	741	752	735	720	741	723	742	755	738	±12,5	-0,8	17	20,0(±3)	18,4	-1,6
20	781	796	811	782	774	790	774	800	815	793	±10	-0,3	17	20,0(±3)	18,9	-1,1
25	815	810	827	800	799	812	799	824	839	814	±7,5	-0,1	17	20,0(±3)	19,2	-0,8
30	842	840	853	836	825	833	824	848	862	840	±5	0,0	17	20,0(±3)	19,4	-0,6
35	865	865	878	859	855	871	855	876	891	869	±4,6	0,1	17	20,0(±3)	19,7	-0,3
39	881	875	884	868	864	875	863	878	896	875	±4,3	0,1	17	20,0(±3)	19,5	-0,5

Temperatures recorded at minute intervals. In the table, they figure at 5 minute intervals.

T (°C) = average in-furnace temperature defined according to [2] art. 5.1.1: $T = 345 \log_{10} (8t + 1) + 20$

t (min) = time since the test beginning

T_s (°C) = actual in-furnace temperature according to [2] art. 5.1.2

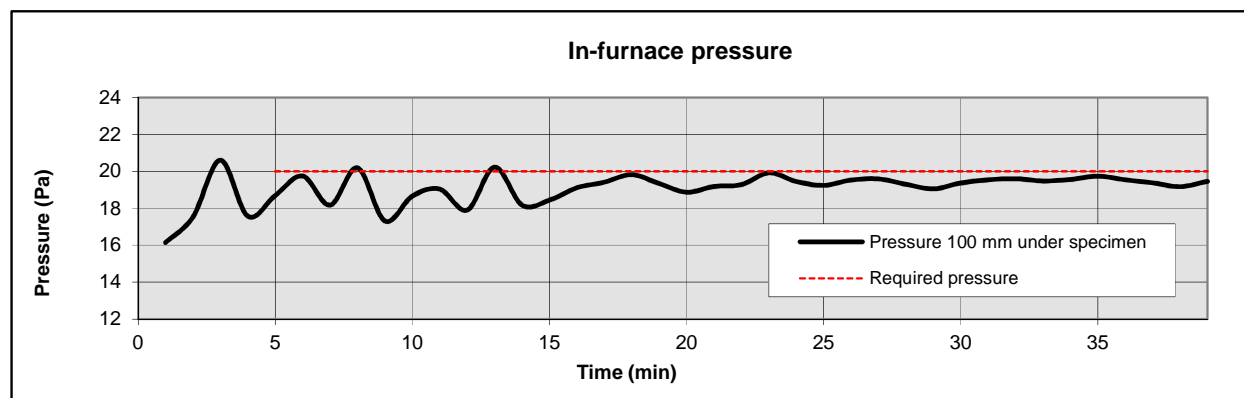
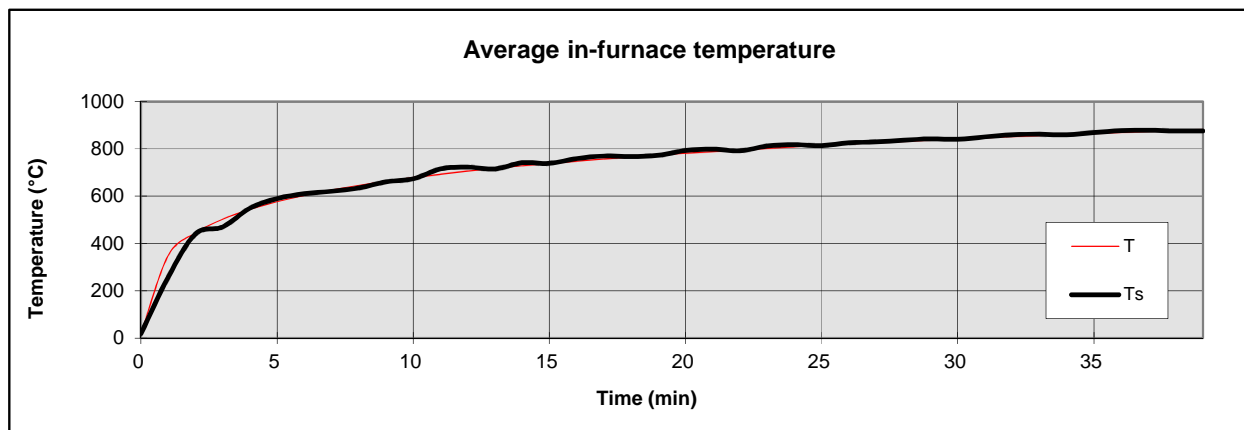
d_e (%) = percentage deviation in the area of the curve of the average in-furnace temperature from the area of the standard temperature curve

- permitted according to [2] art. 5.1.2,

- actual according to [2] art. 5.1.2: $d_e = ((A - A_s)/A_s) * 100$, where

A = area under the actual in-furnace temperature curve

A_s = area under the standard temperature curve



Specimen No. 1 – UF specimen temperature (°C)

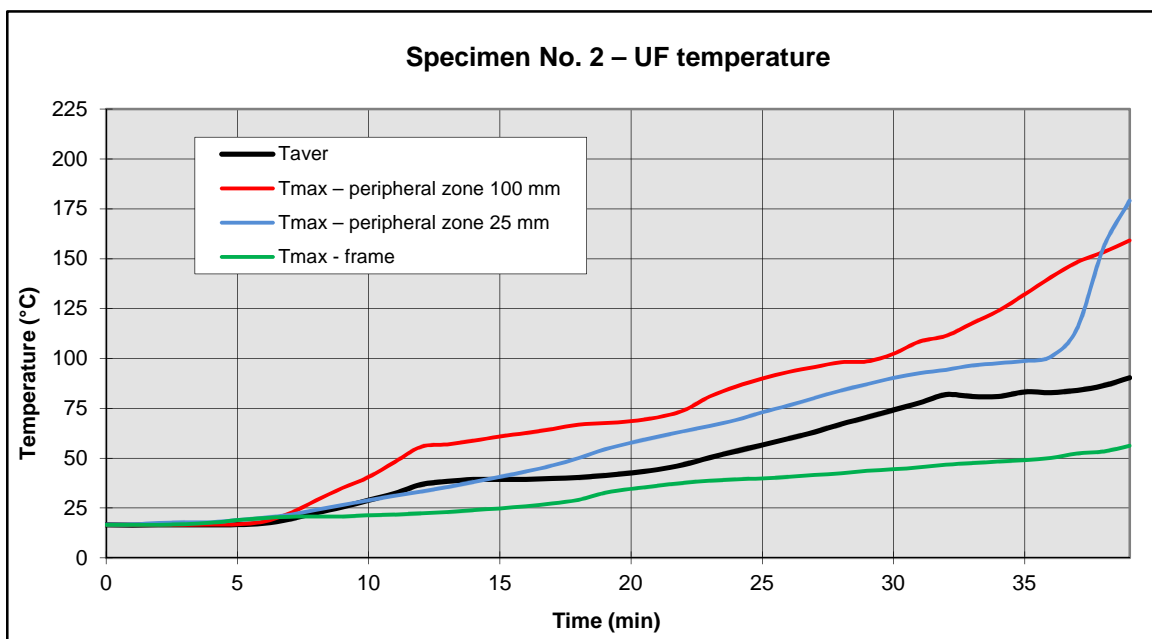
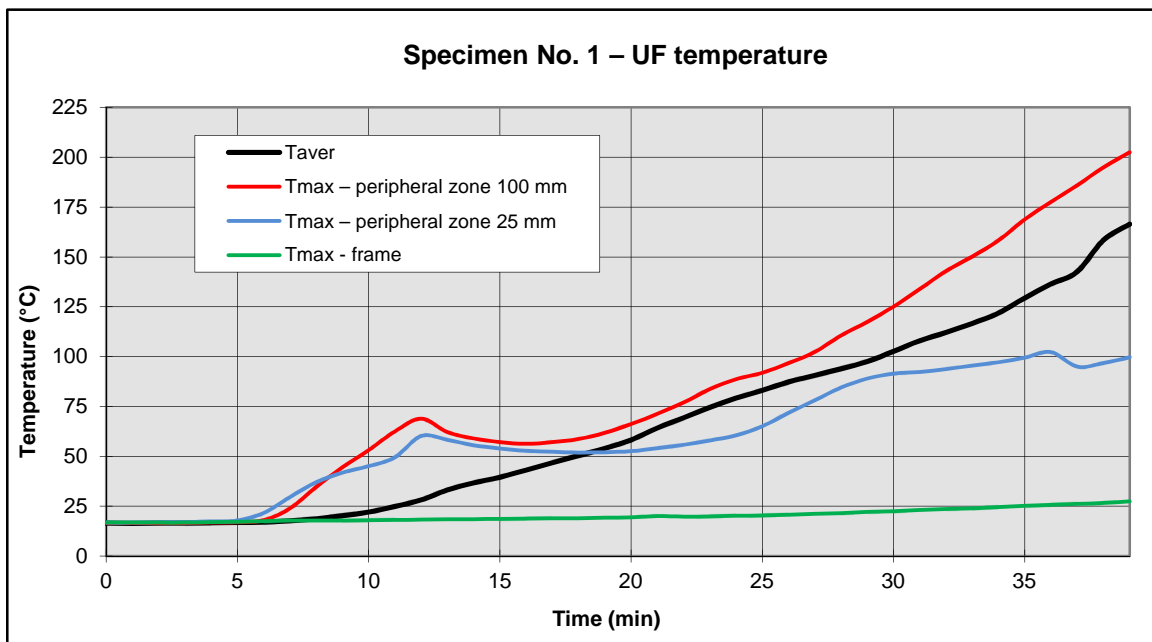
Time (min)	T _{aver} a T _{max}							T _{max} - peripheral zone 100 mm							T _{max} - peripheral zone 25 mm (additional procedure)							T _{max} - shutter frame							
	20	21	22	23	24	T _{aver}	T _{max}	25	26	27	28	29	30	T _{max}	31	32	33	34	35	36	T _{max}	37	38	39	40	41	42	43	T _{max}
0	17	17	17	17	17	17	16	17	17	17	17	16	16	17	17	17	17	17	17	17	17	17	17	16	16	16	16	16	17
5	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	16	16	16	16	16	17
10	23	22	20	27	20	22	53	21	20	19	23	31	53	53	45	22	18	22	21	29	45	17	17	17	17	17	17	17	18
15	43	38	32	54	31	40	57	36	33	30	38	49	57	54	54	31	24	26	32	38	54	17	17	17	17	17	17	17	19
20	59	55	61	64	52	58	62	59	63	57	60	66	66	53	43	36	33	43	46	53	17	17	17	17	17	17	17	17	19
21	67	59	70	70	56	64	66	66	69	64	65	71	71	54	46	38	35	47	49	54	17	17	17	17	17	17	17	17	20
22	73	62	77	74	60	69	69	72	74	70	69	75	77	56	50	41	37	50	53	56	17	17	17	17	17	17	17	17	20
23	80	66	84	80	64	75	73	78	80	77	73	80	84	58	55	44	39	54	56	58	17	17	17	17	17	17	17	17	20
24	86	69	89	85	68	79	77	84	84	83	77	83	89	61	59	47	41	58	60	61	17	17	17	17	17	17	17	17	20
25	91	73	92	89	72	83	80	88	88	88	81	86	92	64	64	49	44	62	65	65	17	17	17	17	17	17	17	17	20
26	94	78	97	92	76	87	83	92	91	93	84	90	97	67	68	52	48	67	72	72	18	17	17	17	17	17	17	17	21
27	97	81	102	94	79	91	85	96	94	96	87	92	102	70	71	54	51	72	78	78	18	17	17	17	17	17	17	17	21
28	97	84	111	97	82	94	87	98	99	99	90	95	111	72	74	56	54	77	85	85	18	17	17	17	17	17	17	17	22
29	100	86	117	100	85	98	88	103	103	102	92	99	117	74	76	58	58	83	89	89	18	17	17	17	17	17	17	17	22
30	106	89	125	105	88	103	89	106	110	109	97	104	125	76	78	60	62	87	92	92	18	17	17	17	17	17	17	17	23
31	114	91	134	112	90	108	89	82	117	116	100	110	134	78	80	63	67	92	92	92	18	17	17	17	17	17	17	17	23
32	113	93	143	119	93	112	90	73	125	123	103	118	143	80	59	66	71	94	93	94	18	17	17	17	17	17	17	17	24
33	118	96	150	121	98	117	94	72	133	131	106	125	150	82	49	69	74	96	93	96	18	17	17	17	17	17	17	17	24
34	126	99	158	*	104	122	100	72	140	140	108	132	158	85	46	73	78	97	94	97	18	17	17	17	17	17	17	17	25
35	134	104	169	*	110	129	107	72	147	148	111	138	169	87	45	77	82	100	94	100	19	17	17	17	17	17	17	17	25
36	141	110	178	*	117	136	114	73	153	155	114	140	178	89	45	64	85	102	94	102	19	17	17	17	17	17	17	17	26
37	147	118	186	*	120	143	116	73	158	163	118	144	186	91	45	51	88	*	95	95	19	17	17	17	17	17	17	17	26
38	154	127	195	*	*	158	122	75	165	172	124	150	195	*	46	*	91	*	97	97	19	17	17	17	17	17	17	17	27
39	162	135	203	*	*	167	129	*	170	179	129	154	203	*	46	*	93	*	100	100	19	17	17	17	17	17	17	17	27

Temperatures were recorded at minute intervals. In the table, they figure at 5 minute intervals maximum. Unsticking of some TCs from surface during the test. The disruption of „insulation“ criterion is highlighted.

Specimen No. 2 – UF specimen temperature (°C)

Time (min)	T _{aver} a T _{max}					T _{max} - peripheral zone 100 mm					T _{max} - peripheral zone 25 mm (additional procedure)					T _{max} - shutter frame												
	50	51	52	53	54	T _{aver}	55	56	57	58	59	60	T _{max}	61	62	63	64	65	66	T _{max}	67	68	69	70	71	72	73	T _{max}
0	16	17	17	17	17	17	16	16	16	16	16	16	17	17	17	17	17	17	17	17	16	16	17	16	16	16	16	17
5	17	17	17	17	17	17	17	17	16	17	17	17	17	18	19	18	17	17	17	19	17	17	17	16	16	19	17	19
10	41	22	32	26	24	29	40	20	20	21	20	20	41	23	29	26	21	21	24	29	18	18	17	16	17	21	18	21
15	55	31	41	36	34	39	61	34	30	43	51	31	61	37	41	41	32	34	40	41	18	18	18	18	17	25	18	25
20	48	38	46	38	44	43	69	63	58	66	60	58	69	48	58	55	43	49	54	58	19	19	19	21	18	35	19	35
21	48	39	49	39	47	44	70	68	64	68	64	64	70	49	61	58	44	53	57	61	19	19	19	21	18	36	19	36
22	50	42	52	40	51	47	74	74	71	72	69	71	74	52	64	60	46	57	60	64	19	19	19	22	18	38	20	38
23	53	45	56	42	55	50	78	81	77	76	74	77	81	54	66	63	48	61	64	66	19	20	20	23	18	39	20	39
24	57	47	61	44	59	54	81	86	82	80	80	84	86	57	69	65	50	66	69	69	20	20	20	24	18	39	20	39
25	59	50	64	46	63	57	84	90	85	84	84	88	90	60	71	67	52	71	73	73	20	21	20	24	18	40	21	40
26	62	54	67	48	68	60	87	93	87	86	88	91	93	63	73	70	55	75	76	76	20	21	20	25	18	41	21	41
27	64	57	70	51	73	63	90	96	90	89	91	93	96	66	76	72	58	78	80	80	20	21	21	25	19	42	22	42
28	68	61	73	55	78	67	92	98	94	91	94	96	98	69	78	76	62	84	84	84	20	22	21	26	19	42	22	42
29	71	65	76	59	83	71	93	99	98	92	95	97	99	72	81	79	65	87	87	87	20	22	22	27	19	44	22	44
30	74	69	78	63	87	74	93	101	102	93	97	101	102	75	83	82	67	90	89	90	21	23	22	27	19	44	23	44
31	77	73	81	67	91	78	94	106	109	95	103	105	109	78	85	86	70	93	91	93	21	23	22	28	20	45	23	45
32	80	78	84	72	94	82	96	111	89	100	110	110	111	82	88	90	72	93	94	94	21	24	23	28	20	47	23	47
33	83	82	88	76	76	81	98	116	68	105	118	116	118	85	91	94	76	*	97	97	21	24	23	29	20	48	24	48
34	84	86	91	80	64	81	102	123	62	111	124	123	124	87	93	97	76	*	98	98	21	25	24	30	21	48	24	48
35	84	90	92	83	67	83	107	130	60	118	132	130	132	90	95	98	79	*	99	99	22	25	24	30	21	49	25	49
36	86	77	94	86	71	83	118	138	58	128	141	137	141	93	65	98	79	*	101	101	22	26	25	31	21	50	26	50
37	87	74	96	87	76	84	126	144	56	137	148	143	148	95	62	99	80	*	115	115	22	27	27	32	22	52	26	52
38	88	79	95	89	80	86	133	148	56	145	153	151	153	97	60	99	82	*	155	155	23	28	28	33	22	53	27	53
39	90	81	98	92	*	90	142	154	57	154	140	159	159	97	60	101	85	*	179	179	23	29	29	33	22	56	29	56

Temperatures were recorded at minute intervals. In the table, they figure at 5 minute intervals maximum. The disruption of „integrity“ criterion is highlighted by dash line. Unsticking of some TCs from surface during the test.

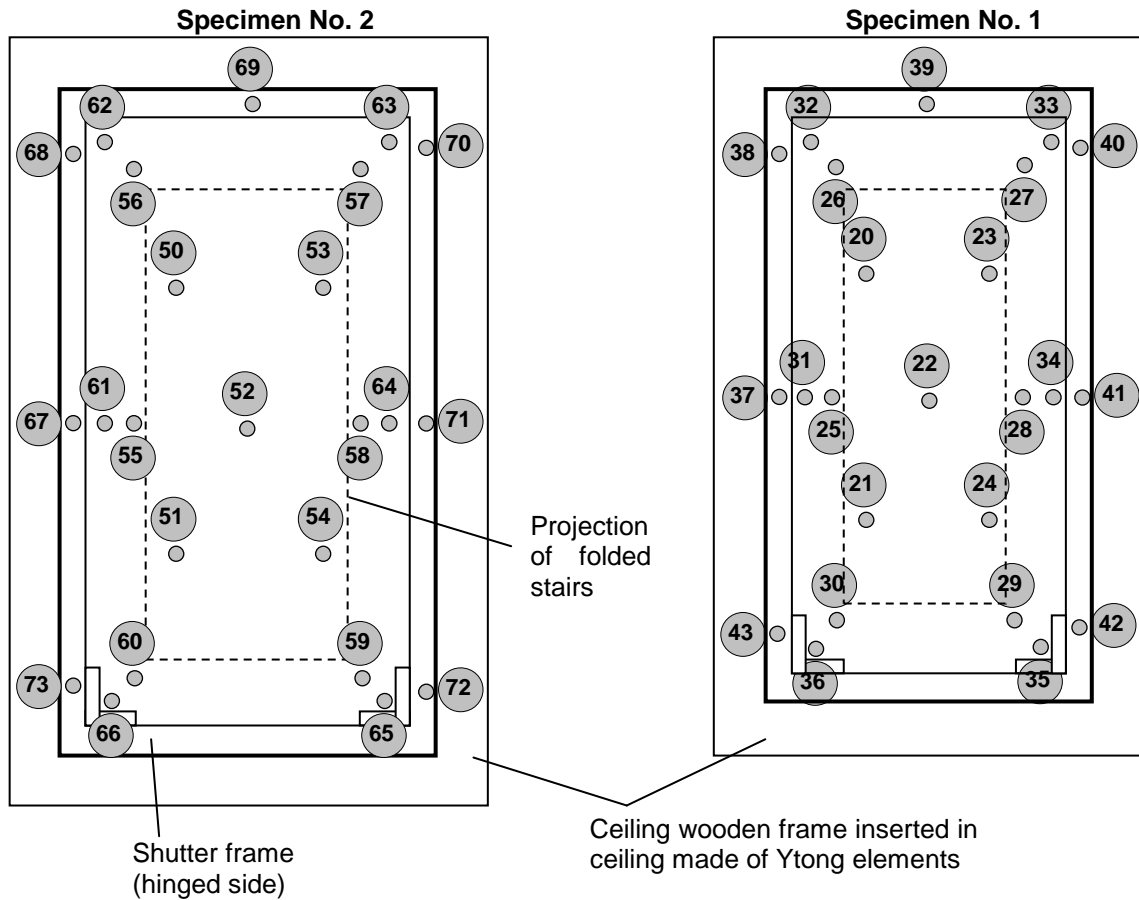


Specimen No. 1 – gaps (mm)

Gap	Position											
	1	2	3	4	5	6	7	8	9	10	11	12
a	4,3	4,3	4,1	3,8	3,9	3,6	3,8	4,6	3,8	2,1	2,0	2,2
b	4,0	4,0	3,8	3,4	3,4	3,2	3,9	4,2	3,8	1,2	1,5	1,3

Specimen No. 2 – gaps (mm)

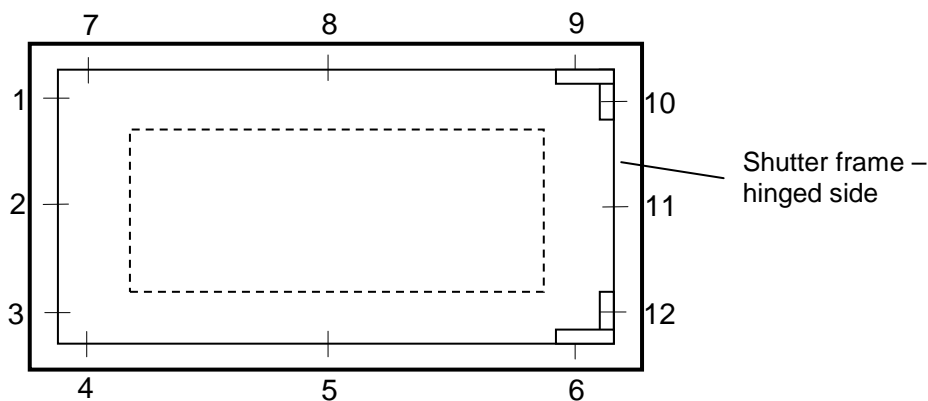
Gap	Position											
	1	2	3	4	5	6	7	8	9	10	11	12
a	3,9	3,2	2,8	5,3	5,1	2,9	3,8	5,0	5,9	2,1	2,5	2,9
b	2,9	2,7	2,6	5,4	5,9	3,9	5,2	5,1	4,6	2,5	2,0	1,0

Layout of TCs on specimen UF

Specimen No. 1

- 20 ÷ 24 - average and maximum UF temperature
- 25 ÷ 30 - maximum UF temperature - peripheral zone 100 mm
- 31 ÷ 36 - maximum UF temperature - peripheral zone 25 mm
- 37 ÷ 43 - maximum UF temperature - shutter frame

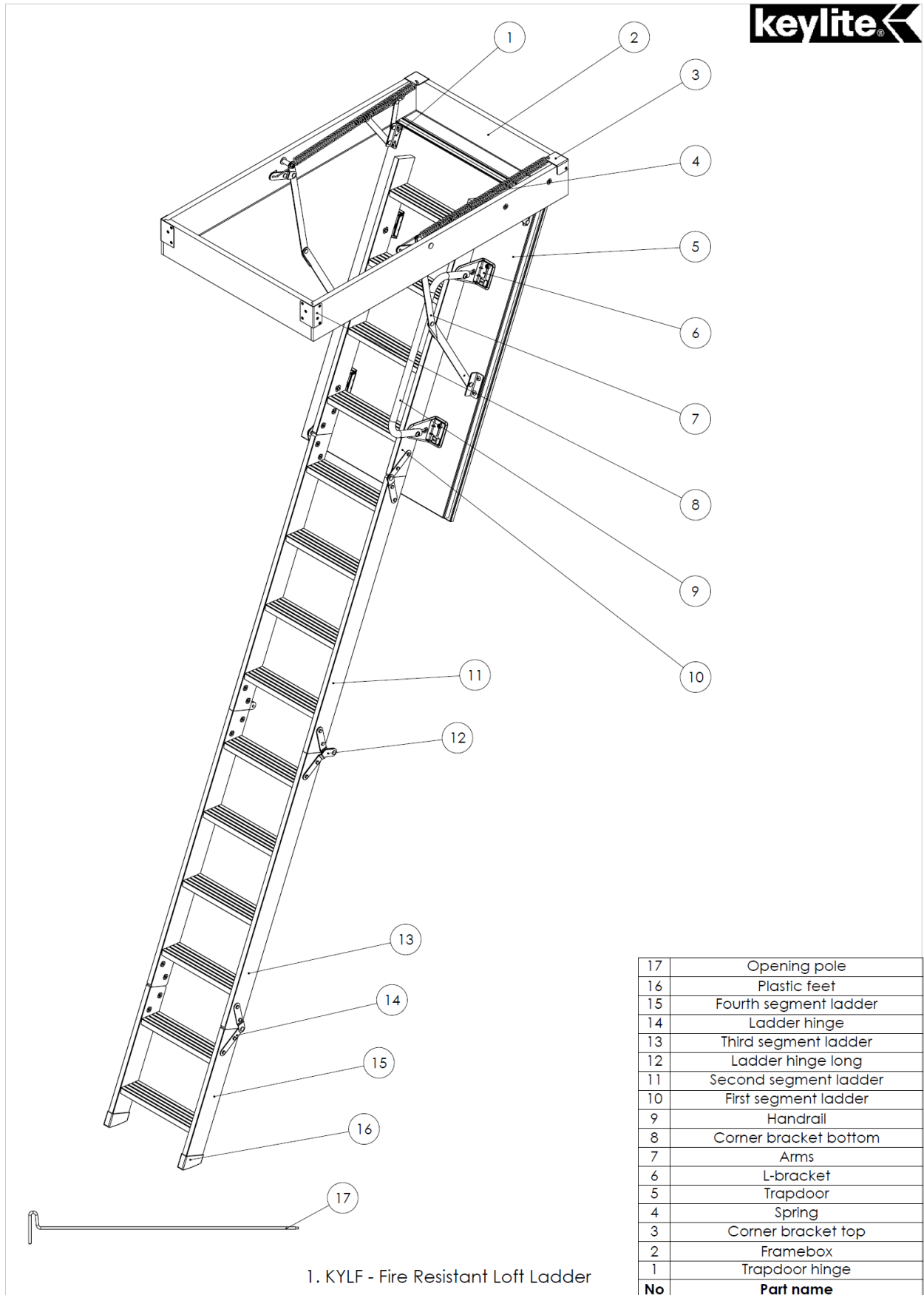
Specimen No. 2

- 50 ÷ 54 - average and maximum UF temperature
- 55 ÷ 60 - maximum UF temperature - peripheral zone 100 mm
- 61 ÷ 66 - maximum UF temperature - peripheral zone 25 mm
- 67 ÷ 73 - maximum UF temperature - shutter frame

Measurement of width of primary gaps


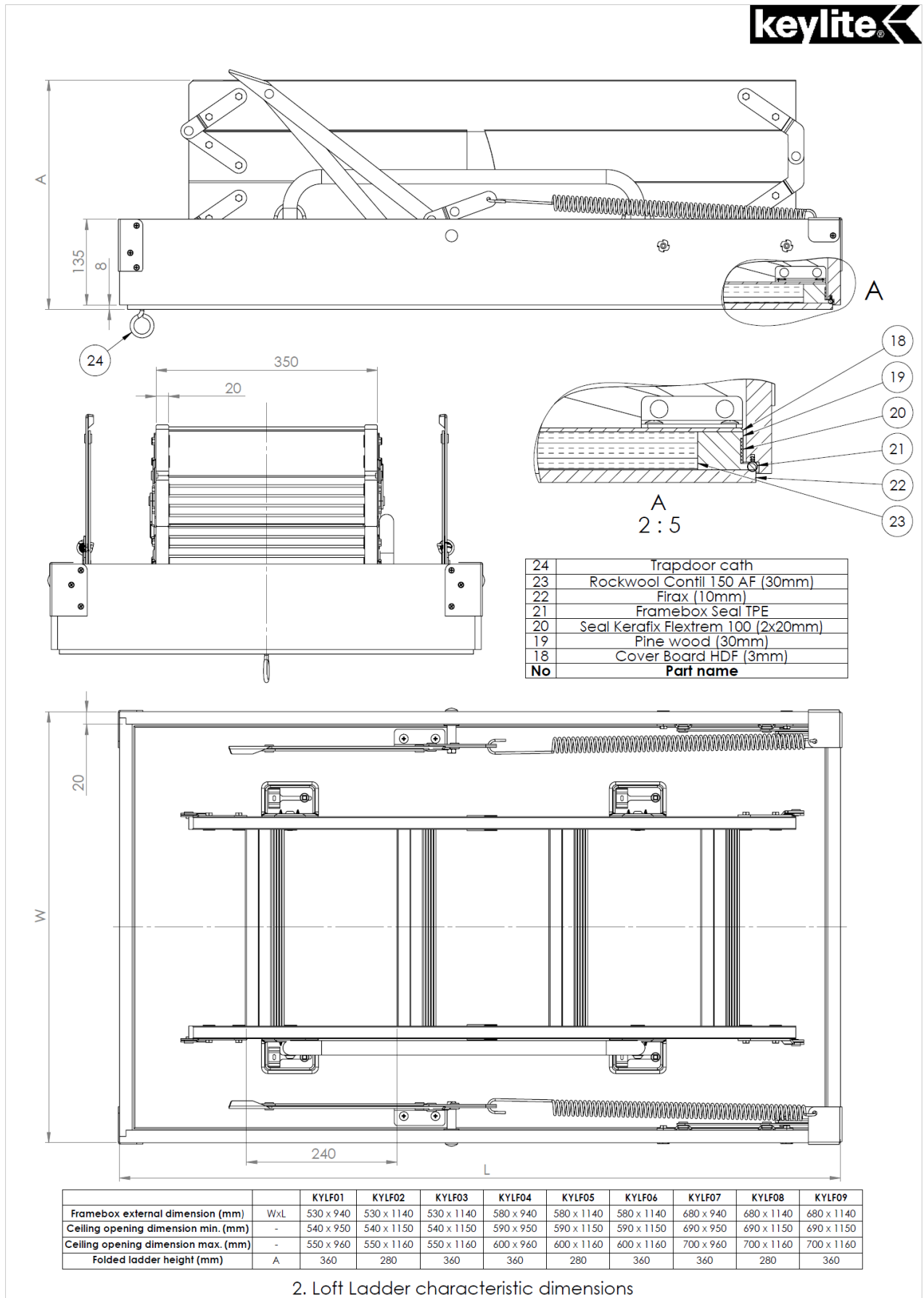
ANNEX 3: DOCUMENTATION

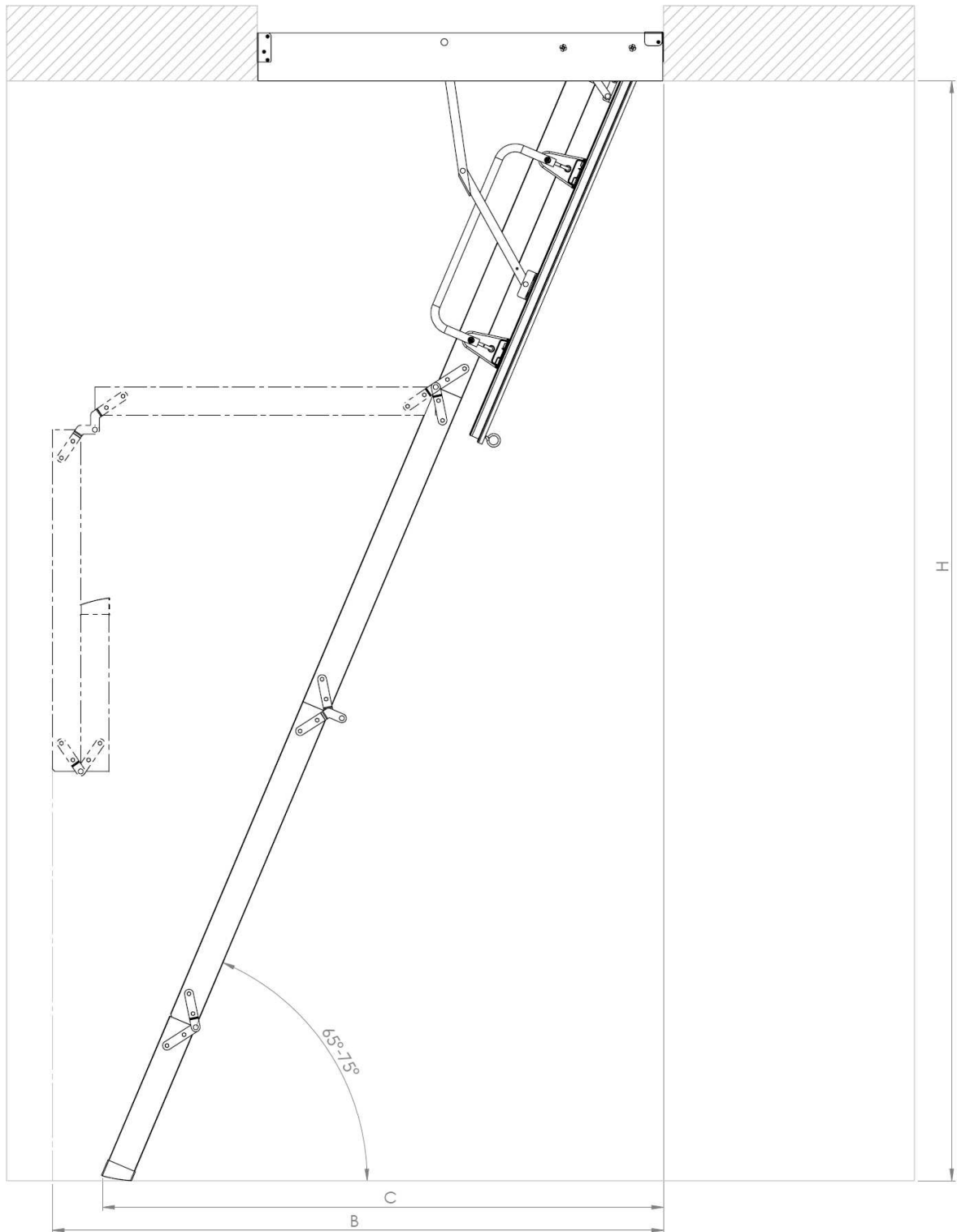
Specimen-related documentation delivered by the test sponsor.



17	Opening pole
16	Plastic feet
15	Fourth segment ladder
14	Ladder hinge
13	Third segment ladder
12	Ladder hinge long
11	Second segment ladder
10	First segment ladder
9	Handrail
8	Corner bracket bottom
7	Arms
6	L-bracket
5	Trapdoor
4	Spring
3	Corner bracket top
2	Framebox
1	Trapdoor hinge
No	Part name

1. KYLF - Fire Resistant Loft Ladder





		KYLF01	KYLF02	KYLF03	KYLF04	KYLF05	KYLF06	KYLF07	KYLF08	KYLF09
Room height (m)	H	2,6-2,8	2,6-2,8	3,0-3,2	2,6-2,8	2,6-2,8	3,0-3,2	2,6-2,8	2,6-2,8	3,0-3,2
Number of ladder segments [units]	-	4	3	4	4	3	4	4	3	4
Swing space (mm)	B	1300-1590	1565-1675	1605-1715	1300-1590	1565-1675	1605-1715	1300-1590	1565-1675	1605-1715
Distance after ladder unfolding (mm)	C	1025-1385	1025-1385	1145-1575	1025-1385	1025-1385	1145-1575	1025-1385	1025-1385	1145-1575

3. Space occupied by Loft Ladder

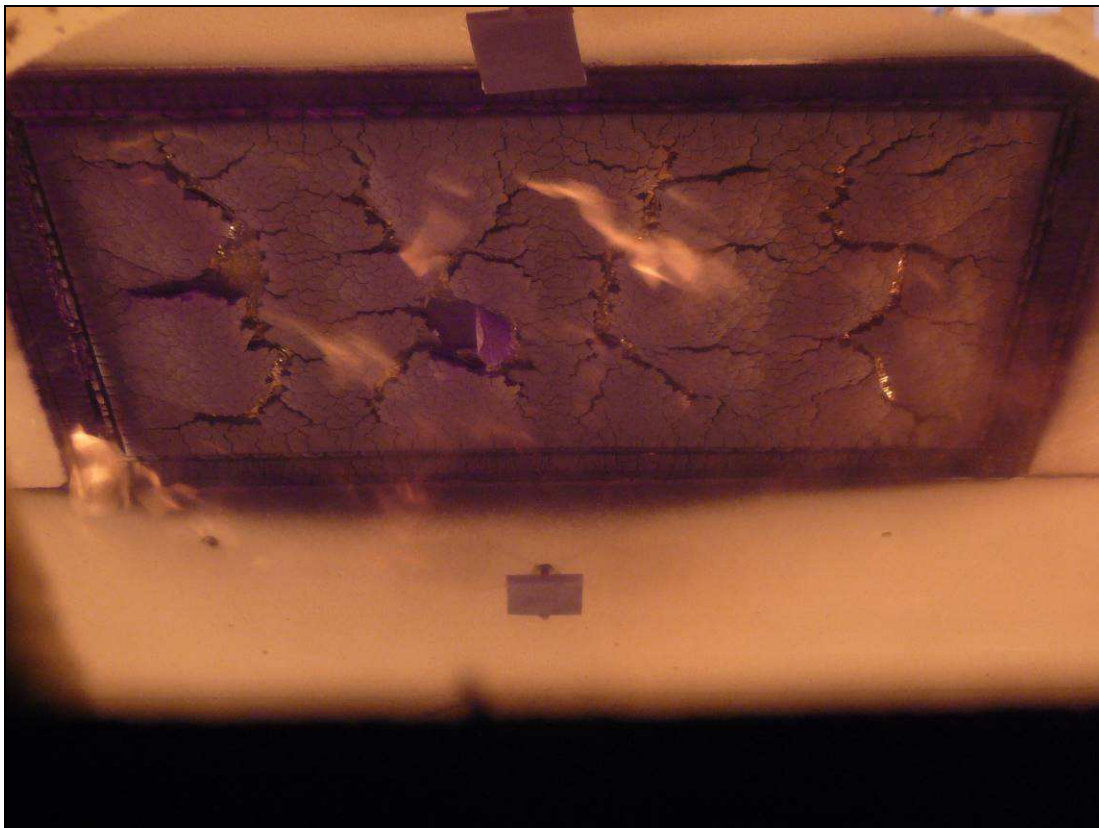
ANNEX 4: PHOTOGRAPHIC DOCUMENTATION



EF prior to test



UF prior to test



EF of specimen No. 2 – 14th test minute



Specimen No. 2 – reaction of intumescent tape in gap – 20th test minute



Specimen No. 1 and 2 – 31st test minute



End of test, integrity failure of specimen No. 2 – 39th test minute

