



# REPORT

issued by an Accredited Testing Laboratory

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SIA Stali  
Kingas, Priekulu pagasts  
Priekulu novads  
LV-4126  
Latvia

## Fire resistance test of an openable window

(3 appendices)

### Test method

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in the accredited test methods EN 1634-1:2014, EN 1363-1:2012 and where appropriate EN 1363-2:1999.

Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

### Product

IV 90/Fire

### Sponsor

SIA Stali  
Kingas, Priekulu pagasts  
Priekulu novads  
LV-4126  
Latvia

### Reference number

5P04139-1

In this test one additional window was tested, which construction, test setup and test results are shown in the report 5P04139-2.

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## 1 Purpose of the test

The purpose of the test was to determine the fire resistance of the test specimen described in section 2.

## 2 Test construction

### 2.1 General information

The test specimen consisted of an openable window, designated IV 90/Fire.

Manufacturer of the test specimen was SIA Stali. Supplier of the glass was Contraflam.

### 2.2 Description of the test specimen

The test specimen consisted of an openable window made out of a frame of oak wood, incorporating a 35 mm thick Contraflam 30 glass. The glazing bead was fastened to the frame with a total of 20 steel screws, 5 on each side, designated HECO- FIX – Plus 4.5 x 50 mm. The spacing between the screws was 200-250 mm.

The outer dimension of the test specimen was (width x height) 1200 x 1200 mm.

The following key components were included in the test specimen.

<i>Component</i>	<i>Product designation</i>	<i>Manufacturer/Supplier</i>
Glass	Contraflam 30	Contraflam
Intumescent strips	Kerafix Flexspan 200, 16 x 1.5	KUHN
Rubber sealing	Deventer DS 7594	-
Intumescent strips	Kerafix Flexpress 100, 36 x 2	KUHN
Impregnating glazing blocks	Flammi 12, 36 x 2	GLUSKE
Silicone	Kerafix Fireproof silicone	GLUSKE
Frame	Oak	-
Steel screw	HECO- FIX – Plus 4.5 x 50 mm	-
Insulating strips	Kerafix 2000	GLUSKE

The construction of the test specimen can be seen from the sponsor's drawings and specifications in appendix 1. In case that the sponsor's drawings and specifications fail to correspond with the construction SP has crossed details or altered the drawings and specifications.

### 2.3 Supporting construction

The test specimen was mounted in a rigid wall consisting of 150 mm thick aerated concrete, with a density of 550 kg/m<sup>3</sup>. The dimensions of the opening in the supporting construction

(width x height) were 1220 x 1220 mm. The supporting construction is defined as a rigid standard supporting construction as described in EN 1363-1:2012.

The supporting construction was built in SPs concrete frame for fire tests with opening dimension (width x height) 3020 x 3020 mm. The wall was built by SPs personnel.

## **2.4 Delivery and mounting of the test specimen**

The test specimen was selected and delivered to SP by the sponsor. The test specimen arrived to SP on June 10, 2015.

The test specimen was mounted by TK Bygg, contracted by the sponsor, in SPs furnace hall on June 26, 2015. The mounting of the test specimen was overseen by SP.

The test specimen was mounted by a total of 6 screws, three screws on each vertical side. The space between the test specimen and the supporting construction was sealed with strips of rock wool insulation and silicone.

The concrete frame with the test specimen was placed on SP's vertical furnace.

## **2.5 Number of test specimens and test direction**

The test specimen consisted of an asymmetrical construction.

For a full evaluation of the fire resistance the test specimen shall be tested from both directions. On request of the sponsor the test specimen was tested with fire against one side only. The test was performed with the leaf opening towards the furnace.

## **2.6 Conditioning**

The test specimen was stored in SP's furnace hall before the test. The temperature in the furnace hall was in average 17 °C and the relative humidity was in average 63 % during this time.

## **2.7 Verification**

### **2.7.1 Verification of the test specimen**

The sponsor supplied two identical test specimens. SP picked one specimen for verification and one specimen for the fire test.

The verification that the test specimen corresponded to the drawings and specifications provided by the sponsor was performed during the mounting of the test specimen at SP and also after the fire test on the sample picked for verification.

## 2.7.2 Verification of included materials

<i>Material</i>	<i>Density (kg/m<sup>3</sup>)</i>	<i>Moisture ratio<sup>1)</sup> (%)</i>
Outer frame	712	8.5
Glass frame	741	8.8
Glazing bead	779	8.5

1) Moisture ratio calculated from weight loss after being heated at 105 °C.  
The verification was performed on July 2, 2015 on the test specimen picked by SP for verification.

The purpose of the control is to verify and/or determine material data and dimensions of the materials and components included in the test specimens. The extent of performed measurements and applied methodology can deviate from standardized methods. The results shall therefore not be considered as formal material data.

## 3 Test procedure and test results

The test was performed on July 2, 2015. The test lasted 51 minutes and 50 seconds.

### 3.1 Pre-test examination and preparation

#### 3.1.1 Mechanical conditioning

Operability test was performed in accordance with EN 14600:2005, section 5.1.1.1. The operable window was operated from fully closed to fully open for 25 cycles. The window was opened and closed manually.

#### 3.1.2 Gap measurements

The clearance between the leafs and the adjacent frame members were measured prior to the test. The measuring points and the measuring results are shown in appendix 3.

#### 3.1.3 Final setting

The operable window was opened 300 mm and closed manually. The handle was not removed.

### 3.2 Witness of test

The test was witnessed by Mr Uldis Babris from SIA Stali.

### 3.3 Furnace control

The furnace was controlled in accordance with EN 1363-1:2012.

#### 3.3.1 Temperatures

The furnace temperature was measured with 6 plate thermometers (PT1 – PT6). The plate thermometers were positioned approximately 100 mm from the fire exposed surface of the test specimen at the commencement of the test.

The average temperature in the furnace (average of PT1 – PT6) in relation to the standard time-temperature curve is shown in appendix 2.

The temperature at each plate thermometer (PT1 – PT6) in relation to the standard time-temperature curve is shown in appendix 2.

The percent deviation of the area under the average furnace time-temperature curve from the area under the standard time-temperature curve and permitted deviation is shown in appendix 2.

#### 3.3.2 Pressure

The furnace pressure was controlled so that a pressure of 20 Pa was kept on level with the upper edge of the test specimen.

The furnace pressure probe was positioned 280 mm below the lower edge of the test specimen. Using a vertical pressure gradient of 8.5 Pa/m the control pressure was calculated to 7.38 Pa.

The calculated furnace pressure on level with the upper edge of the test specimen is shown in a graph in appendix 2.

### 3.4 Ambient temperature

The ambient air temperature was measured with one thermocouple. The ambient air temperature during the test is shown in appendix 2. The ambient air temperature at the beginning of the test was 22 °C.

### 3.5 Measurements on the test specimen

#### 3.5.1 Temperatures

Thermocouples according to the standard procedure in 1634-1:2014, were applied to the test specimen.

The temperature rise on the unexposed side of the test specimen was measured with 13 thermocouples (C1-C13).

The positions of the thermocouples are shown in appendix 3.

The measured temperature rises on the test specimen are shown in appendix 3.

The average temperature of the thermocouples at the start of the test was 22.7 °C.

### 3.5.2 Deflection

The deflection of the test specimen during the test was measured with a laser meter. The measuring points and the deflection of the test specimen during the test are shown in appendix 3.

## 3.6 Observations

Photographs taken in connection with the test are shown in appendix 3.

### 3.6.1 Observations during the test

<i>Time min:s</i>	<i>Observations (the observations refer to the unexposed side if nothing else is stated)</i>
00:00	Test starts.
01:11	Light smoke from lower edge.
02:43	The inner glass starts to crack.
03:49	The inner glass detach.
04:04	The glass is discoloured white.
51:40	The glass falls of, sustained flaming > 10 seconds occurs.
51:50	The test ends.

Tests with gap gauges was not performed during the test since no through gaps were observed.

Tests with cotton wool pad was not performed since no hot gases were observed.

### 3.6.2 Observations after the test

Fire exposed side: The frame is completely burnt and there is nothing left of the glass.

## 4 Summary

The test specimen, a frame with an openable window, described in chapter 2, has been tested according to EN 1634-1:2014, EN 1363-1:2012 and where appropriate EN 1363-2:1999.

The result of the pre-test measurements is shown in chapter 3.1 and the result of the fire test is shown in chapter 4.1 below.

## 4.1 Fire test

On request of the sponsor the test specimen was tested with the leaf opening towards the furnace. The test lasted for 51 minutes. The following results were obtained:

### Integrity

- Sustained flaming: 51 minutes
- Gap gauge: 51 minutes, no failure\*
- Cotton wool pad: 51 minutes, no failure\*

### Insulation

- Average temperature: 51 minutes, no failure\*
- Maximum temperature 180 °C: 51 minutes, no failure\*
- Maximum temperature 360 °C: 51 minutes, no failure\*

\* The test having been discontinued on request of the sponsor

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

## 5 Field of direct application of test results

The direct applicability of the test results to constructions similar to the construction described in this report is described in chapter 13 of EN 1634-1:2014.

### SP Technical Research Institute of Sweden Fire Research - Fire Resistance

Performed by

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### Appendices

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