



MFPA Leipzig GmbH

Testing, monitoring and certification body for
building materials, building products and
building systems

Division III - Structural Fire Protection

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Working Group 3.2 - Fire behaviour of types of construction and
Special constructions

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Test report no. PB 3.2/18-111-1

of 31 May 2018

1st copy

Subject: Testing of a non-load-bearing, room-enclosing, thermally insulating wall construction in timber post-and-beam design with two-layer symmetrical cladding/planking made of clay building board "Lemix 2.0" as well as compartment insulation made of jute insulation "Thermo Jute" for determining the fire resistance duration under one-sided fire exposure in accordance with DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1: 2012-10

Client: Hart Keramik AG
Mitterteicher Straße 6
D-95652 Waldsassen

Order date: 25 March 2018

Sample receipt: 16 April 2018

Sampling: Information on an official withdrawal is not available to the inspection

Marking: Test
date: body. none
09, May 2018

Processor: Dipl.-Ing. (FH) E. Dorn

This test report comprises 9 pages and 7 appendices.

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1 General

On 25 March 2018, Hart-Keramik AG commissioned MFGPA Leipzig GmbH with the fire resistance testing of a non-load-bearing, room-enclosing and thermally insulating wall construction in timber stud construction consisting of timber stud frame with two-layer symmetrical cladding/planking made of clay building board "Lemix 2.0" as well as compartment insulation made of jute insulation "Thermo Jute" to determine the fire resistance duration under one-sided fire load.

This test report describes the design including the assembly procedure, the test conditions as well as the results for the specific component described here after it was tested in accordance with DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1: 2012-10. The test was carried out on the premises of MFGPA Leipzig GmbH - Brandprüfstelle, MFGPA-Allee 1, D-04509 Laue bei Delitzsch.

2 Description of the tested construction

2.1 Structural design of the wall construction

The wall construction in timber stud construction was assembled by the client on site. Table 1 shows the construction of the non-load-bearing, two-ply symmetrically clad wall construction in timber post-and-beam construction in more detail.

Table 1 List of construction details of the symmetrical partition wall construction

Overall dimensions of the tested construction : Width: b = 3000 mm, Height: h = 3000 mm, Total thickness: d = 144 mm		
Position	Material/ Dimensions	Notes
Support structure	KVH wood studs Grading class S10 Strength class C24 Wooden stand b x t = 60 mm x 80 mm Threshold / Frame b x t = 60 mm x 80 mm Distance between upright axles a = 625 mm	<u>Notes:</u> Uprights with sill / frame each on one side over S(ahlwinkel) 70 mm x 70 mm x 2.0 mm fixed Three-sided fastening of the construction to the test frame <u>Fastening means:</u> steel angle: Four screws per leg Würth Assy 3.0 Screw AB 5.0 x 50/30 mm Test framework: Würth Kst. frame anchor countersunk head screw 0 8.0 x 30/100 mm Fastener spacing a = 500 mm
Compartment insulation	"Thermo Jute 100" insulation mat made of jute fibres Mineral thermal insulation felt 0.038 {W/m "K} Single mat dimension l x b = 1200 mm x 580 mm d = 80 mm	<u>Notes:</u> Compartments fully insulated over the cross-section depth Panel joint tight and butt-jointed Installation with 10 mm oversize (compression approx. 10 mm)

Continuation of table 1 see next page

Continuation Table 1 List of constructional details of the symmetrical partition wall construction

POGi iOfi	Material/ Dimensions	Notes
<p>Structure symmetrical partition wall construction starting from the timber studs</p>	<p><u>Inner panel layer:</u> "Lemix 2.0" clay building panel Hart Ceramics (back-laminated) with jute fabric) Single panel dimension l x b = 1250 mm x 625 mm d = 16 mm Panel alignment: Horizontal <u>Outer plate laqe:</u> Clay building board "Lemix 2.0" Hart Keramik (laminated with jute fabric on the back) Single panel dimension l x b = 1250 mm x 625 mm d = 16 mm Panel alignment: Horizontal <u>Rendering only foot cover:</u> Agaton "Feinputz" clay plaster mortar according to DIN 18947 LPM 0/0.5 f-SII- 1.8 Application thickness 2.0 m. Application width approx. 170 mm</p>	<p><u>Fasteners for the inner panel:</u> screws from Eurotec. Ø 6.0 x 50 mm Fastener spacing a = 300 mm Row spacing on the wooden uprights a = 625 mm <u>Fastening screws for outer panels' screws</u> Eurotec Co. Ø 6.0 x 60 mm Fastening spacing a = 300 mm Row spacing on the wooden uprights a = 625 mm <u>Notes:</u> Joint offset between inner and outer panel layer: Side facing fire approx. 300 mm Side facing away from fire approx. 250 mm Panel cross joints always butted on the timber studs <u>Notes'</u> Sakret Reinforcing Mesh 4 mm x 4 mm was used to cover the joints.</p>
<p>Information on the installation of installations</p>		
<p>An ELT empty box was installed in the partition wall construction on the side facing away from the fire and on the side facing the fire, each at a height of approx. 460 mm from the upper end of the partition wall construction. These cavity wall boxes were enclosed with three layers of "Lemix 2.0" clay building boards. Here, the outer dimensions of the enclosure were prepared to 200 mm x 200 mm and the inner cladding layer was exposed so that two complete panel layers acted as a cover. The two panel layers of the enclosure were connected to each other with four 3.9 x 45 mm dia. drywall screws. The enclosure was fixed to the partition wall construction with four Eurotec screws Ø 6.0 x SQ mm through the cladding layers into the enclosure body.</p>		
POGi tiOfi	Material / Dimensions	Note/s
<p>Enclosure</p>	<p>Clay building board "Lemix 2.0" External dimensions: 3 layers of clay building board (one layer of which is exposed) w x h x d = 200 x 200 x 48</p>	<p><u>Fastening the panels to each other'</u> 4 screws each Würth Assy 3.0 Ø 5.0 x 50/30 mm <u>Fastening to the specimen'</u> 4 screws Company Eurotec Ø 6,0 x 50 mm</p>

Further design details can be found in Appendix 1.

2.2 Specimen and building material properties

The materials were not officially sampled. At the time of testing, the strength and moisture content of the test specimen corresponded approximately to the condition to be expected in normal use. For the tested construction and the building materials used, the information compiled in Table 2 applies with regard to the building material classification, the gross densities and the moisture contents.

Table 2 Building material characteristics of the wall construction in timber post-and-beam construction

Building material designation	Nominal thickness / dimensions [mm]	Weight per unit area [kg/m ²]	Bulk density (installed condition) [kg/m ³]	Humidity-salary [M.-%]	Building material-classification
Clay building board "Lemix 2.0" Hart Ceramics Classification report *!	16	23,5	1468,5	1,60	A1 according to DIN EN 13501-1
Solid structural timber Strength class C24 DIN EN 338:2016-07 b x t = 60 mm x 80 mm	60	26,2	436,5	11,15	D-s2,d0 according to DIN EN 13501-1
Steel angle leg length 70 mm x 70 mm x 2.0 mm	2,0				A1 Decision CWFT List (96/603/EC)
"Thermo Jute 100" insulation mat made of jute fibres Fa. Thermo Natur GmbH ETA ² ! ETA 14/0479	80	2,7	34,2	9,10	E according to DIN EN 13501-1
Panel fixing: screws from Eurotec ff 6.0 x 50 mm + 60 mm	6,0				A1 Decision CWFT List (96/603/EC)
Bel. Supporting structure: Würth Kst. frame anchor countersunk screw B 8.0 x 30/100 mm	8,0				A1 Decision CWFT List (96/603/EC)
Angle fastening: Würth Assy 3.0 screw AB 5.0 x 50/30 mm	4,5				A1 Decision CWFT List (96/603/EC)
Joint covering: Agaton "fine plaster Clay plaster mortar DIN 18947 LPM 0/0.5 f-SII-1.8		1)	1)	1)	A1 according to DIN EN 13501-1
Sakret Reinforcement Fabric 4 mm x 4 mm		Nominal value 165 ginn ¹	1)	1)	

not determined

² European technical approval

Test Institute High Classification Report KB-Hoch-171381

3 Test arrangement and execution

The tested wall construction was installed by the client on site in accordance with Section 2 as a 3-sided wall in a standard supporting frame made of reinforced concrete (internal dimension $h \times w = 3000 \text{ mm} \times 3040 \text{ mm}$) as a vertical room closure.

For the furnace closure, the lateral gap of 40 mm between the vertical edge (free edge) of the test structure and the test frame was precipitated/blocked with mineral wool (melting point $> 1000^\circ\text{C}$) according to DIN EN 1364-1: 2015-09.

The heating of the fire room was carried out according to the unit temperature-time curve (ETK) in accordance with DIN EN 1363-1: 2012-10. To measure the temperatures in the fire room, eight plate thermometers were installed at a distance of 100 mm from the surface of the wall construction in accordance with DIN EN 1363-1: 2012-10, section 4.5.1.1. They were used to control the fire room temperature.

Twenty-one NiCr-Ni thermoelements B 12 mm were used to verify the temperatures on the unfired side of the specimen in accordance with DIN EN 1363-1: 2012-10, section 4.5.1.2 in conjunction with DIN EN 1364-1: 2015-09. In addition, twenty-seven further NiCr-Ni thermoelements were placed within the construction in order to record the temperature course within the component. The measuring point arrangement of the designated thermocouples can be found in Appendix 2 and Appendix 3.

The ambient temperature was determined laterally at a distance of about 1 m from the specimen in its plane.

The pressure measurement in the fire room was carried out in accordance with DIN EN 1363-1: 2012-10, sections 4.5.2 and 5.2 using a differential pressure transmitter PU z 100 Pa at a height of 2.90 m measured from the floor of the test furnace.

To measure and record the deformations, potentiometric displacement sensors were installed at three different locations halfway up the wall of the specimen. The location of the displacement sensors can be found in Appendix 2.

All fire room and surface temperatures, the deformations of the wall construction as well as the pressure in the fire room were measured and recorded at time intervals of ten seconds.

The surface temperatures on the side facing away from the fire, the fire room temperature, the temperatures in the wall construction, the deformation of the wall construction and the pressure in the fire room determined during the fire resistance test can be taken from Annex 4.

4 Test results and observations

The observations during the fire resistance test are shown in Table 3.

Table 3 Observations during the fire resistance test on 09 May 2018

Test time [min:sj]	Observations during the examination	Observe page ¹ gs-
0:00	Start of the exam.	
2:00	Spot discolouration on the outer layer of the clay building panel "Lemix 2.0.	F
4:00	Increasing discolouration of the panel surface of the outer panel layer.	F
7:00	Black colouring of the panel surface of the outer panel layer.	F
11:00	Cracks can be seen in the clay plaster.	F
16:00	Components of the clay plaster fall off in the upper area of the construction.	F
19:00	Branched cracks visible in the outer layer of the slab.	F
22:00	Clay plaster falls off over a large area.	F
26:00	Outer layer of panels curves slightly in the upper area.	F
28:00	Partially opening branched cracks in the outer layer of the slab.	F
30:00	Increasing slackening of the branched cracks in the outer layer of the slab.	F
39:00	Slight smoke leakage at the left wall connection in the upper area.	FA
44:00	Panel part of the outer panel layer has fallen off in the lower part of the construction.	F
45:00	The noise is perceived as a crackling sound.	
47:00	Slightly increasing smoke leakage at the left wall connection in the upper area.	FA
52:00	Further panel parts of the outer panel layer fall off.	F
53:00	Slight smoke leakage at the upper end on the right construction side.	FA
59:00	Light smoke leakage on the left wall flange with slight discolouration of the clay plaster.	FA
65:00	Persistent cracking noises can be perceived.	
67:00	Crack in the inner slab layer approx. halfway up the wall and in the middle of the construction.	F
77:00	Measurement with the hand element at the left wall connection.	FA
82:00	Diminishing smoke emission at the named left wall connection.	FA
85:00	Start opening the horizontal joints of the inner layer of panels.	F
100:00	No further significant change on the test specimen.	
115:00	Slight smoke leakage from the socket.	FA
118:00	Beginning to open the horizontal joint of the inner piatten layer.	F
125:00	Completion of the fire resistance test in coordination with the client.	

! F = Fire side

FA = Fire averted side

5 Summary of the **test results** and comparison with the performance criteria according to **DIN EN1364-1:2015-09** in conjunction with **DIN EN 1363-1: 2012-10**

On 09 May 2018, the wall construction of Hart-Keramik AG described in section 2 was subjected to a fire resistance test under one-sided fire exposure in accordance with DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1: 2012-10. To determine the fire resistance duration with regard to the room closure, the thermal insulation in accordance with DIN EN 1364-1:2015-09 in conjunction with DIN EN 1363-1: 2012-10.

The comparison of the test results with the performance criteria according to DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1: 2012-10 for non-load-bearing, room-enclosing, thermally insulating walls under one-sided fire exposure is shown in Table 4 with regard to room closure E and insulation I.

Table 4 Comparison of the test results with the performance criteria according to DIN EN 1364-1 in conjunction with DIN EN 1363-1 for the non-load-bearing wall construction in timber post and beam design

Line	Norm reference Data according to DIN EN 1363-1: 2012-10 Section:	Requirements		Test results on the non-load-bearing timber stud wall construction with symmetrical cladding/planking					Comparison of the test results with the performance criteria according to DIN EN 1364-1: 2015-09
				Description					
1	11.2	Room off-schluss i.e. Avoidance of:	Inflammation of the cotton pad	Entzündung of the Wadding was made after:	Test not required				fulfils
2			Occurrence of columns	The penetration of a splitting gauge was carried out according to:	Test not required				brightens
3			Flames on the opposite side	Sustained Flame formation occurred after:	not done				fulfils
4	11.3	Thermal insulation i.e. temperature increase on the side facing away from the fire. Page about the initial temperature: max. permissible mean value T = 140 K Max. permissible single value AT' 180	Test duration in min:	30	60	90	120	125	e#öt
5			max. determined Temperature increase: Mean value in K:	3	23	42	69	75	
6			max, determined Temperature increase: - Single value in K:	11	38	59	106	123	
			- at measuring point:	OF 7	OF 7	OF 7	OF 5	OF 5	
7	5.6	Other information	Ambient temperature at the start of Prüfung in the laboratory:	22 °C				For information, e.g. on building materials, weights per unit area, rofi densities and moisture content, see Table 2.	
8			The ambient temperature rose/ fell during the Check by max:	+ 3K					
9	5.2.2.1		Pressure in the fire room:	according to DIN EN 1363-1 cf. annex 4					
10		Smoke development: horizontal	low '!						
11		Deformation:	WS2						
		- Size	9 mm						
		- Time	108 min						

¹ According to DIN EN 1363-1: 2012-10, section 10.4.7, a documentation of the smoke emission was made, but this has no



influence on the classification into a fire resistance class.

6 Conclusions and recommendations based on DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1: 2012-10

Based on the test results obtained and listed in Table 4, a fire resistance duration of 125 minutes results for the non-load-bearing, room-enclosing and thermally insulating wall construction in timber stud construction with fire exposure on one side.

The tested wall construction in timber post and beam construction has fulfilled the requirements regarding the room closure and the thermal insulation according to DIN EN 13501-2: 2010-02 for the fire resistance class EI 120 when exposed to fire on one side. A prerequisite for the validity of the above statements is that the boundary conditions specified in this test report are met.

6.1 Direct application area according to DIN EN 1364-1: 2015-09

The results of the fire resistance test are directly transferable to similar designs of the wall construction where one or more of the following modifications are made and where the design still meets the requirements of the relevant design standard in terms of stiffness and strengths:

- Reducing the height of the wall;
- increasing the width of the wall;
- increasing the thickness of the wall;
- Increasing the thickness of building components (associated materials);
- reducing the distances between uprights;
- Reducing the spacing of fixings;
- Arrangement of horizontal and vertical joints of the tested type;

Increase in the number of horizontal joints, as a horizontal joint was tested at a distance of 500 f 150 mm from the top edge of the specimen.

Sockets, switch boxes or distribution boxes may be installed in the tested wall construction on the side facing the fire as well as on the side facing away from the fire, since installations or installation parts were tested at a distance of $h = 300$ mm from the upper edge. The arrangement, installation principles and back-up design must be carried out in accordance with the tested fixtures in section 2.

6.2 Remark according to DIN EN 1363-1: 2012-10, para. 12.1

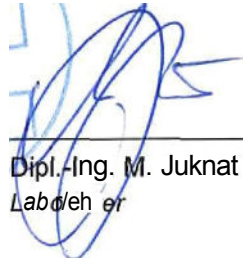
This test report describes in detail the assembly procedure, the test conditions and the results obtained with the specific component described herein after it has been tested according to the procedure presented in DIN EN 1363-1: 2012-10. Any significant deviation in size, design details, loads, stress conditions, boundary conditions other than those allowed in the relevant test method for the direct scope of application is not covered by this test report.

Due to the inherent nature of fire resistance duration tests and the consequent difficulties in quantifying the uncertainty in fire resistance duration measurements, it is not possible to specify a fixed level of accuracy of the result.

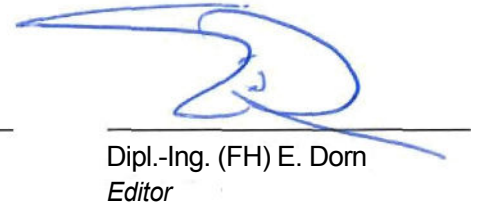
The results of the tests refer exclusively to the tested objects. This document does not replace a certificate of conformity or usability in the sense of the building regulations (national/European).

Leipzig, en 31 May 2018

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List of Annexes

Appendix 1 Constructive design

Appendix 2 Measuring point arrangement and displacement sensors (surface measuring points) Appendix 3 Measuring point arrangement (measuring points in the sample body)

Appendix 4 Graphical representation of the measurement results Appendix 5 Photo documentation of the test setup

Annex 6 Photo documentation on the performance of the test and after completion of the test

Annex 7 Evaluation and recommendation based on DIN 4102-2