

# MFPA Leipzig GmbH

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

Division III - Structural Fire Protection  
Dipl.-Ing. Sebastian Hauswaldt

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

Dipl.-Ing. (FH) Eik Dorn  
Phone +49 (0) 341-6582-144  
dorn@mfpa-leipzig.de

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Test report no. PB 3.2/16-288-3

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**Subject:** Fire resistance test of a non-load-bearing, approx. 114 mm thick, room-enclosing and thermally insulating partition wall construction in timber stud construction with symmetrical cladding/ planking as well as compartment insulation for fire behaviour according to DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1:2012-10 to determine the fire resistance duration with one-sided fire exposure.

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

**Order date:** 27 October 2016

**Sample receipt:** 17 November 2016

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

**Marking: Test** body. none

**date:** 07, December 2016

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

This test report comprises 9 pages and 7 appendices.

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Gesellschaft für Materialforschung und Prüfungsanstalt für das  
Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

Seat: Hans-Weigel-Sir, 2b - 04319 Leipzig/Germany  
Managing Director: Prof. Pr.-Ing. Frank Dehn  
Handelsregister: Amtsgericht Leipzig HRB 17719  
USt-Id Nr.: DE 813200649  
Tel.- \*49 (0) 341-65824  
Fax: +49 (0) 311-6582-135

## 1 General

On 27 October 2016, Hart Keramik AG commissioned MFPA Leipzig GmbH to test the fire resistance of a non-load-bearing, approx. 114 mm thick, room-enclosing and thermally insulating partition wall construction in timber post-and-beam design with symmetrical cladding / panelling made of single-layer  $d = 22$  mm thick clay building boards "Lehmix 2.0" as well as compartment insulation made of  $d = 60$  mm thick jute insulation to determine the fire resistance duration under one-sided fire load.

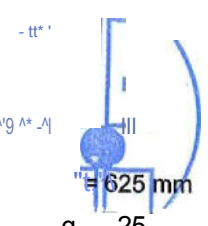
This test report describes the constructional design including the assembly procedure, the test conditions as well as the results for the specific component described here after it has been tested in accordance with DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1: 2012-10 at the fire test centre of MFPA Leipzig GmbH, MFPA-Allee 1, 04509 Laue (near Delitzsch).

## 2 Description of the tested construction

### 2.1 Structural design of the partition wall construction

The partition wall construction in timber stud construction was assembled by the client on site. Table 1 explains the structure of the non-load-bearing partition wall construction in timber stud construction in more detail.

Table 1 Listing of the structural details of the symmetrical partition wall construction

Overall dimensions of the tested construction: Width: $b = 3000$ mm, Height: $h = 3000$ mm, Total thickness: $d = 114$ mm		
Position	Material/ Dimensions	Notes
Support structure	KVH wood studs Grading class S10 Strength class C24  Wooden stand $w \times d = 60$ mm $\times$ 60 mm  Threshold / Frame $b \times d = 60$ mm $\times$ 60 mm  Distance between upright axles $a =$ 625 mm	<u>Notes'</u>  Uprights with sill / frame each on one side via steel angles 70 mm $\times$ 70 mm $\times$ 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 A y 3.0 Screw 0 4, 5 $\times$ 4 3 M M . . . - tt*'  Test frame: Fischer Nageldübel Cl 8.0 $\times$ 120/80S --'"" Fasteningmitt I §4t q 25  
Compartment insulation	"Thermo Jute 100" insulation mat made of jute fibres Mineral thermal insulation felt 0.038 [W/m <sup>2</sup> K]  Single mat dimension $l \times b = 1200$ mm $\times$ 580 mm  $d = 60$ mm	<u>Notes'</u>  Compartments fully insulated Panel joint tight and butt-jointed Installation with 10 mm oversize (compression approx. 10 mm)

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

Position	material/ dimensions	Notes
Structure symmetrical partition wall construction starting from the timber studs	<p><b>Plate lage:</b> Clay building board "Lemix 2.0 Hart Ceramics Single panel dimension l x b = 1250 mm x 620 mm d = 22 mm Panel alignment! Horizontal</p> <p><b>Rendering:</b> Flush-mounted: Agaton "Oberputz" clay plaster mortar according to DIN 18947 LPM 0/2-SII-1,8 with Fabric insert Knauf Aquapanel joint tape in the area of the joints as well as Sakret reinforcement fabric 4 mm x 4 mm for the surface plaster. Application thickness 3.0 mm Top coat: Agaton "Feinputz" clay plaster mortar according to DIN 18947 LPM 0/0.5 f-SII-1.8 Application thickness 2.0 mm</p>	<p><b>Notes:</b> Joint offset between inner and outer panel layer a - 312.5 mm Panel cross joints always butted on the timber studs <b>Fasteners:</b> Drywall screw 0 3,9 x 45 mm with Holding plate HV 36 Fastening miWeJ spacing a = 312.5 mm Row spacing on the wooden uprights a = 625 mm</p> <p><b>Notes:</b> Horizontal and vertical panel recesses were plastered with Agaton "Oberputz" clay plaster mortar before the actual plaster application. In the course of the plaster application in the area of the joints, a Cewe strip of glass fibre fabric Knauf Aquapanel joint tape was inserted.  Sakret Reinforcement Fabric 4 mm x 4 mm was used for the surface plaster. The overlap of the fabric layers was 100 mm.</p>

Information on the installation of installations

A Kaiser cavity wall box HWD 90 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 460 mm from the top of the partition wall construction. These cavity wall boxes were covered with two layers of clay building boards. "Lehmix 2.0" enclosure. The outer dimensions of the enclosure were prepared to 200 mm x 200 mm and the inner cladding layer was circled so that a complete panel layer functioned as a cover. The two panel layers of the enclosure were connected to each other with four drywall screws B 3.9 x 45 mm. The enclosure was fixed to the partition wall construction with four Würth Assy 3.0 IB 4.5 x 40/33 mm screws through the cladding layer into the enclosure body.

Position	Material / Dimensions	Note
Enclosure	Clay building board "Lehmix 2.0" External dimensions: 2 layers of clay building board (one layer of which is circled) w x h x d = 200 x 200 x 44 mm	<u>Fastening to the specimen</u> Screws w "Fth Assy 3.0 IB 4.5s 40/33 mm

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 approximately corresponded 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 as well as the moisture contents.

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

Building material designation	Nominal thickness / dimensions [mm]	Weight per unit area [kg/m <sup>2</sup> ]	Bulk density (state of installation) [kg/m <sup>3</sup> ]	Humidity-salary [M.-%]	Building material classification Mark of conformity
Clay building board "Lemix 2.0" Hart Ceramics Company Classification report KB-Hoch-160736	22	31,21	1560,36	1,21	A1 according to DIN EN 13501-1
Solid structural timber w x d -- 60 mm x 60 mm	60	29,53	492,12	10,04	D-s2,d0 according to DIN EN 13501-1
"Thermo Jute" insulation mat made from jute fibres Fa.Thermo Natur GmbH ETA <sup>1</sup> ETA 14/0479	60	2,35	39,17	8,10	E according to DIN EN 13501-1
Fischer nail plug CI 8.0 x 120/80S	8,0				Decision CWFT List (96/603/EC)
Drywall screw 0 3.9 x 45 mm with retaining plate HV 36	3,9				Decision CWFT List (96/603/EC)
Würth Assy 3.0 Screw IB 4.5 x 40/33 mm	4,5				Decision CWFT List (96/603/EC)
Kaiser HWD 90 Cavity wall box AbZ <sup>2</sup> ): Z-19.21-1788					
Angle leg length 70 mm x 70 mm, d = 2.0 mm	2,0	1)	1)	1)	
Sakret Reinforcement Fabric 4 mm x 4 mm.		Nominal value 165g/m <sup>2</sup>	1)	1)	
Knauf Aquapanel@ Joint Tape Width 100 mm		1)	1)	1)	
Concealed Agaton "Top Plaster Clay plaster mortar DIN 18947 LPM 0/2-SII-1,8		1)	1)	1)	A1 according to DIN EN 13501-1
Finishing Plaster 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

<sup>1</sup> not determined

<sup>2</sup> AbZ - general technical approval

\*\* ETA - European technical approval

### 3 Test arrangement and execution

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

For the furnace closure, the lateral gap at the free edge between the vertical edge of the test structure and the test frame was filled/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 in accordance with DIN EN 1363-1: 2012-10, section 4.5.1.1 at a distance of 100 mm from the surface of the partition wall construction. They were used to control the fire room temperature.

Twenty-one NiCr-Ni thermocouples B 12 mm according to DIN EN 1363-1, section 4.5.1.2 in conjunction with DIN EN 1364-1: 2015-9 were used to verify the temperatures on the unfired side of the specimen. In addition, fifteen 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 taken from 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 at half wall height. The location of the displacement sensors can be found in Appendix 2.

All fire room and surface temperatures, the deformations of the partition wall construction as well as the pressure in the fire room were measured and recorded in a time interval of five seconds. The surface temperatures on the fire-attenuated side, the fire room temperature, the temperatures in the wall construction, the deformations per partition 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 test on 07 December 2016

Test time [min:s]	Observations during the examination	Observation-page
0:00	Start of the fire resistance test.	
3:30	Spot discolourations distributed over the plaster surface can be seen,	F
5:00	Visible deformation of the test specimen towards the fire compartment.	FA
8:00	Clear reaction of the Kaiser can.	F
10:00	Large areas of black discolouration distributed over the plaster surface.	F
11:00	Horizontal crack in the plaster approx. halfway up the wall.	F
12:00	Plaster cracking on the left side of the test specimen with condensation water leakage.	FA
16:00	Blackening of the plaster at the lower and upper wall connection with clear deformation of the plaster surface.	F
17:00	Several cracks visible in the plaster surface.	F
19:00	The plaster protrudes from the test specimen in the upper area and is discoloured black in the outlet area.	F
26:00	In the area of the cracks slight flame emission.	F
32:00	Increase of cracks in the plaster as well as crack widening of the already existing cracks.	F
35:00	Deformation of the entire plaster surface.	F
3g:00	The pulp is increasingly bulging in several places.	F
45:00	Inner cladding layer has almost completely fallen off as well as some of the timber frame insulation. Wooden studs are mainly exposed on three sides.	F
49:00	Increasing charring of the exposed timber studs.	F
52:00	Incipient discolouration of the plaster surface in the upper area as well as in all compartment sections.	FA
57:00	Increasing discolouration of the powder surface in the upper area as well as in all compartment sections.	FA
60:00	Beend 9ung of the fire test in coordination with the client.	.....t

"! F = Fire side

FA = Averted fire side



## 5 Summary of the test results and comparison with the performance criteria according to DIN EN 1364-1: 2015-09 in conjunction with DIN EN 1363-1: 2012-10

On 7 December 2016, the non-load-bearing, room-sealing partition wall construction in timber stud construction described in section 2 of this report was tested for fire behaviour in accordance with DIN EN 1364-1:2015-09 in conjunction with DIN EN 1363-1:2012-10 to determine the fire resistance duration under one-sided fire exposure. The comparison of the test results with the performance criteria for room-enclosing, thermally insulating walls under one-sided fire exposure is shown in Table 4 of this test report.

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

Line	Standard - reference data according to DIN EN 1363-1: 2012-10 Section:	Requirements		Test results on the symmetrical partition wall construction			Comparison of the test results with the performance criteria according to DIN EN 1364-1' 2015-09	
				Description	Symmetrical wall construction			
1	11.2	Room off-close i.e. avoidance of:	Inflammation of the Walte's hump	Inflammation of the Wadding was made after:	not done		falls	
			Occurrence of columns	The penetration of a splitting gauge was carried out according to:	not done		brightens	
3			Flames on the opposite side	Persistent flame formation occurred after:	not done		fulfils	
4	11.3	Insulation i.e. temperature increase on the side facing away from the fire above the initial temperature: Max. permissible mean value AT = 140 K max. permissible single value z\T = 180 K	Test duration in min:	30	45	60	erfüllt	
5			max. recorded temperature increase: <b>Mean value</b> in K:	31	63	225 <sup>1!</sup>		
6			max. determined Temperature-increase: <b>- Single value</b> in K:	58	85	290 <sup>2!</sup>		
			- on measuring place:	OFB	OF8	OF2		
7	56	Other information	Ambient temperature at Start of the examination in the laboratory:	1d °C			Information, e.g. on building materials, weights per unit area, bulk densities and moisture content, see Table 2.	
8			The ambient temperature increased/decreased during the test by max:	-4 K				
9			5.2.2.1	Pressure in the Fire room:	according to DIN EN 1363-1 cf. annex 5			
10				Smoke development:	low			
11				horizontal <u>Verformung</u> :	WS2			
				- Great	90 mm			
		- Time	60 min					

<sup>1</sup> Limit criterion of 140 K exceeded in the 54th minute of operation

<sup>2</sup> Limit criterion of 180 K exceeded in the 54th test minute

## **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 54 minutes results for the non-load-bearing, room-enclosing and thermally insulating partition wall construction in timber post and beam design under one-sided fire load (symmetrical construction).

The tested partition wall construction in timber post and beam design has fulfilled the requirements regarding room closure and thermal insulation according to DIN EN 13501-2:2010-02 for fire resistance class EI 45.

A prerequisite for the validity of the above statements is that the boundary conditions specified in this test report are complied with.

### **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 partition 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 skills:

- Widening of the partition wall, as it was tested with a minimum nominal width of 3000 mm and with a free edge;
- Reduction of the height of the partition wall construction;
- Increase the thickness of the partition;
- Increasing the thickness of individual components (associated materials);
- Reduction of the stand spacing;
- Increase the cross-section of the upright;
- Reducing the spacing of fixings;
- The partition wall construction may be increased to 4000 mm because the deflection of the specimen has not exceeded 100 mm and the expansion possibilities are increased proportionally.
- Increase the number of horizontal joints, as a horizontal joint was tested at a distance of 500 + 150 mm from the top edge of the specimen. Horizontal joints as well as vertical joints must be executed according to the tested type.

In die geprüfte Trennwandkonstruktion dürfen Kaiser Hohlwanddosen HWD 90 (allgemeine bauaufsichtliche Zulassung abZ: Z-19.21-1788) installiert werden, da die Einbauten bzw. Installationsteile im Abstand von  $h = 460$  mm zum oberen Rand geprüft wurden.





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

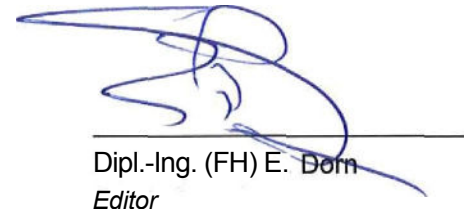
This test report describes in detail the assembly procedure, the test conditions and the results obtained with the specific component described herein after it has been tested according to the procedure presented in DIN EN 1363-1: 2012-10. Any significant deviation in size, design details, loads, stress 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, 02 October 2017

-In . M. Juknat  
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*s ähsbereichsleiter*



Dipl.-Ing. (FH) E. Dorn  
*Editor*

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