

European Technical Assessment

fermacell® fibre gypsum boards

Fibre gypsum boards for planking
and lining of building components

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-03/0050
of 14 December 2023

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General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

fermacell Gypsum fibre boards - "fermacell Gipsfaser-
Platte", "fermacell Vapor", "fermacell Gipsfaser-Platte
greenline"

Product family
to which the construction product belongs

Gypsum fibre boards for planking and lining of building
components

Manufacturer

James Hardie Europe GmbH
Bennigsen Platz 1
40474 Düsseldorf
DEUTSCHLAND

Manufacturing plant

Werk 1, Werk 2, Werk 3, Werk 4, Werk 5

This European Technical Assessment
contains

12 pages including 3 annexes which form an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

070006-00-0504

This version replaces

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Specific part

1 Technical description of the product

"fermacell Gipsfaser-Platte", "fermacell Vapor" und "fermacell Gipsfaser-Platte greenline" are special building boards made of gypsum and cellulose fibres. The "fermacell Vapor" additionally has a paper-faced functional layer and the "fermacell Gipsfaserplatte greenline" in contrast is coated. If individual characteristics concerned all previously mentioned building products at the same time, the boards are hereinafter referred as fermacell Gypsum fibre boards.

They are produced with a range of thickness between 10 mm and 30 mm.

Length and width of the boards are at least 500 mm.

The edges of fermacell Gypsum fibre boards are sharp edged or formed, e.g., "fermacell Trockenbau-Kante" (TB-Kante). The "fermacell TB"- edge consists of a 40 mm board, to the edge of the board running flattening, whereby the largest reduction of the nominal thickness of the board is 2,5 mm. At the edge is additionally one chamfer.

The density of fermacell Gypsum fibre boards, tested in accordance with EN 15283-2+A1¹, clause 6.3, is at least 1000 kg/m³ and does not exceed 1250 kg/m³.

"fermacell Gipsfaser-Platte" corresponds to type GF-W2 and type GF-I (see Annex 2, clause A.2.9 and A.2.4)

The moisture content of the fermacell Gypsum fibre boards tested in accordance with EN 322² in normal climate (20 °C/ 65 % humidity), ranges between 1.0 % and 1.5 %. In this case the boards have been dried by 40 °C to mass constancy.

2 Specification of the intended use in accordance with the applicable European Assessment Document

"fermacell Gipsfaser-Platte", "fermacell Vapor" and fermacell Gipsfaser-Platte greenline" are used for planking (structural) and lining (non-structural) of building components. They are used both as loadbearing and as stiffening boards.

"fermacell Gipsfaser-Platte", "fermacell Vapor" and fermacell Gipsfaser-Platte greenline" are used in service classes 1 and 2 in accordance with EN 1995-1-1³.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of "fermacell Gipsfaser-Platte", "fermacell Vapor" and fermacell Gipsfaser-Platte greenline" of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

1	EN 15283-2:2008+A1:2009	Gypsum boards with fibrous reinforcement - Definitions, requirements and test methods - Part 2-Gypsum fibre boards
2	EN 322:1993	Wood-based panels; determination of moisture content
3	EN 1995-1-1:2004+A1:2008+A2:2014	Eurocode 5; Design of timber structures; Part 1-1: General - Common rules and rules for building

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Bending strength	See Annex 2
Shear strength	See Annex 2
Compression strength	See Annex 2
Tension strength	See Annex 2
Mechanical characteristics at increased moisture content	No performance assessed
Racking strength and stiffness	See Annex 2
Density	See Annex 2
Creep and duration of load	See Annex 2
Dimensions	See Annex 2
Dimensional stability	See Annex 2
Surface hardness	See Annex 2
Embedment strength	See Annex 2
Head pull-through resistance	See Annex 2
Structure and cohesion of the core at high temperature	Type F in accordance with EN 520 ⁴
Static ductility	See Annex 2

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	
"fermacell Gipsfaser-Platte" and "fermacell Gipsfaser-Platte greenline"	Class A2-s1, d0 in accordance with EN 13501-1 ⁵
"fermacell Vapor"	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Water vapour permeability – water vapour transmission	See Annex 2
Water absorption of board surface	See Annex 2
Water absorption of board	No performance assessed

3.4 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Hard body impact	See Annex 2

⁴ EN 520:2004+A1:2009

⁵ EN 13501-1:2018

Gypsum plasterboards - Definitions, requirements and test methods

Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

3.5 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal conductivity	See Annex 2
Coefficient of thermal expansion	No performance assessed

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 070006-00-0504 the applicable European legal act is: [95/467/EC(EU)].

The system to be applied is: 3

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 14 December 2023 by Deutsches Institut für Bautechnik

Anja Dewitt
Head of Section

beglaubigt:
Vössing

Annex 1 Specification of intended use

A.1.1 Loading

Only for static and quasi-static load (not relevant to fatigue).

A.1.2 Installation

The installation of building components manufactured with fermacell Gypsum fibre boards can take place in accordance with the Annexes as well as EN 1995-1-1¹, EN 1995-1-2² and EN 1993-1-1³. The reaction to fire class A2-s1, d0 is only verified if "fermacell Gipsfaser-Platte" and "fermacell Gipsfaser-Platte greenline" are butt-jointed or the gap is filled and closed with jointing materials for Gypsum fibre boards. Joint filler materials class A1 or A2-s1,d0 as defined in EN 13501-1⁴ are used which are regulated in accordance with EN 13963-1⁵.

1	EN 1995-1-1:2004+A1:2008+A2:2014	Eurocode 5: Design of timber structures; Part 1-1: General – Common rules and rules for buildings
	EN 1995-1-2:2004+AC:2009	Eurocode 5: Design of timber structures; Part 1-2: General – Structural fire design
3	EN 1993-1-1:2005 + A1:2014	Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings
4	EN 13501-1:2018	Fire classification of construction products and building elements – Part 1:Classification using data from reaction to fire tests
5	EN 13963-1:2005	Jointing materials for gypsum plasterboards, Definitions, requirements and test methods

fermacell Gypsum fibre boards - "fermacell Gipsfaser-Platte", "fermacell Vapor", "fermacell Gipsfaser-Platte greenline"

Specification of intended use
Loading and installation

Annex 1.1

Annex 2 Specification of essential characteristics

A.2.1 Strength and mean stiffness values as well as the characteristic value of density of fermacell Gypsum fibre boards

Table 1: Strength and mean stiffness values as well as the characteristic value of density of "fermacell Gipsfaser-Platte", "fermacell Vapor" and "fermacell Gipsfaser-Platte greenline"

		Thickness of boards [mm]							
		10	12,5	15	18	22	25	28	30
Characteristic strength values									
Perpendicular to the plane of the board [N/mm²]									
Bending	$f_{m,k}$	4,6	4,4	4,4	4,3	4,1	4,1	3,7	3,1
Shear	$f_{v,k}$	1,9	1,8	1,7	1,6	0,7	0,6	0,6	0,6
Compression \perp to the plane	$f_{c,90,k}$	7,3							6,9
In plane of the board [N/mm²]									
Bending	$f_{m,k}$	4,3	4,2	4,1	4,0	4,0	4,0	3,7	3,7
Tension	$f_{t,k}$	2,5	2,4	2,4	2,3	2,2	2,2	1,8	1,4
Compression	$f_{c,0,k}$	8,5							7,9
Shear	$f_{v,k}$	3,7	3,6	3,5	3,4	3,1	3,1	3,1	3,1
Mean stiffness values									
Perpendicular to the plane of the board [N/mm²]									
Modulus of elasticity	$E_{m, mean}$	3800				3000			
Shear modulus	G_{mean}	1600				600			
Compression modulus of elasticity \perp to the plane	$E_{c,perp,mean}$	800				500			
In plane of the board [N/mm²]									
Bending modulus	$E_{m, mean}$	3800				3000			
Tension modulus	$E_{t,mean}$	3800				3700			3400
Compression modulus	$E_{c,mean}$	3800				3500			3000
Shear modulus	G_{mean}	1600							
Characteristic value of density [kg/m³]									
Density	ρ_k	1150							

The mean value of bending strength perpendicular to the board plane, tested as given in EN 15283-2+A1⁶, clause 5.6 meets the following minimum requirements:

$$f_{m,mean} \geq 5,8 \text{ N/mm}^2 \text{ for thickness of boards } t \leq 18 \text{ mm and}$$

$$f_{m,mean} \geq 5,0 \text{ N/mm}^2 \text{ for thickness of boards } t > 18 \text{ mm}$$

⁶ EN 15283-2:2008+A1:2009

Gypsum boards with fibrous reinforcement- Definitions, requirements and test methods - Part 2 - Gypsum fibre boards

fermacell Gypsum fibre boards - "fermacell Gipsfaser-Platte", "fermacell Vapor", "fermacell Gipsfaser-Platte greenline"

Specification of essential characteristics
Strength and stiffness values as well as the value of density

Annex 2.1

A.2.2 Creep and duration of load

Table 2: Modification factor k_{mod}

Class of load action duration	service class 1	service class 2
permanent	0,20	0,15
long	0,40	0,30
average	0,60	0,45
short term	0,80	0,60
very short	1,10	0,80

The deformation parameters for service class 1 and 2 are:

$$k_{def, NKL. 1} = 3 \text{ and}$$

$$k_{def, NKL. 2} = 4.$$

A.2.3 Dimensions and dimensional stability

The thickness of "fermacell Gipsfaser-Platte", "fermacell Vapor" and "fermacell Gipsfaser-Platte greenline" is between 10 mm and 30 mm.

Length and width of the boards are at least 500 mm.

Dimensional tolerances are 0/-4 mm for nominal width of boards, 0/-5 mm for nominal length and ± 0.2 mm for nominal thickness of boards. They correspond to board type C1 in accordance with EN 15283-2+A1.

The relative change in length for fermacell Gypsum fibre boards with thicknesses 10 mm to 18 mm, tested in accordance with EN 318⁷ for swelling is $\delta l_{65,85} = 0.33$ mm/m. The relative change in length for fermacell Gypsum fibre boards for shrinkage is $\delta l_{65,30} = -0.31$ mm/m.

A.2.4 Surface hardness

fermacell gypsum fibre boards with increased surface hardness, tested in accordance with EN 15283-2+A1, section 5.11, comply with type GF-I if the diameter of the indentation is ≤ 15 mm.

A.2.5 Embedment strength

The characteristic value of the embedment strength for fermacell gypsum fibreboards is determined in accordance with equation (1):

$$f_{h,1,k} = 7 \cdot d^{-0.7} \cdot t^{0.9} \quad [N/mm^2] \quad (1)$$

with d = nominal diameter of the connector [mm]

t = thickness of board [mm]

(In the range of the TB-Kante the reduced board thickness is to be set.)

⁷ EN 318:2002 Wood-based panels – Determination of dimensional changes associated with changes in relative humidity

fermacell Gypsum fibre boards - "fermacell Gipsfaser-Platte", "fermacell Vapor", "fermacell Gipsfaser-Platte greenline"	Annex 2.2
Specification of essential characteristics Creep and duration of load, dimension and dimensional stability, surface hardness and embedment strength	

A.2.6 Head pull-through resistance

Table 3: Characteristic values of head pull-through resistance $F_{ax,head,k}$ of fermacell Gypsum fibre boards for board thicknesses 10 mm - 30 mm

Board thicknesses t in (mm)	10	12,5	15	18	22	25	28	30
$F_{ax,head,k}$ in (N)	500	900	1100	1300	1500	1800	2000	2000

Reduction of the values given in Table 3 if:

- width of staple back $b_R \leq 11$ mm:
 $F_{ax,head,k} = \text{table value} * b_R/11$ (mm)
- board thicknesses $t \geq 22$ mm and diameter of the head $d_h < 5.5$ mm:
 $F_{ax,head,k} = \text{table value} * d_{h, exist.} / 5.5$

A.2.7 Static ductility

The static ductility μ of the connection of fermacell gypsum fibre boards sharp-edged and wooden components for minimum edge distances of $a_{4,c} = 4d$ is given in Table 4:

Table 4: Static ductility μ of connections of fermacell Gypsum fibre boards with wooden components for selected fasteners

Fasteners	Thickness t	Length of the fasteners	Static ductility ratio ¹⁾
Nails in accordance with A.3.1 d = 2.1 mm	12.5 mm	≥ 40 mm	> 6
	15 mm	≥ 50 mm	
	18 mm		
Staples in accordance with A.3.1 d ≤ 1.6 mm	12,5 mm	≥ 45 mm	4
	15 mm	≥ 50 mm	
	18 mm	≥ 55 mm	
Staples in accordance with A.3.1 d ≥ 1.8 mm	12.5 mm	≥ 45 mm	> 6
	15 mm		
	18 mm		

1) as described in section 8.3, rule (3) of EN 1998-1:2010-12.

A.2.8 Water vapour permeability – water vapour transmission

The value of water vapour diffusion resistance of "fermacell Gipsfaser-Platte", tested in accordance with EN ISO 12572⁸, is $\mu = 13$.

The s_d -value determined in accordance with EN ISO 12572 of "fermacell Vapor" with thicknesses 10 mm to 30 mm is $s_d = 3.1$ m (wet) or $s_d = 4.5$ m (dry).

A.2.9 Water absorption of board surface

fermacell Gypsum fibre boards, tested in accordance with EN 15283-2+A1⁹, section 5.9, comply with type GF-W2, if the water absorption of board surface is ≤ 1500 g/m².

⁸ EN ISO 12572:2001

Hygrothermal performance of building materials and products - Determination of water vapour transmission properties

⁹ EN 15283-2:2008+A1:2009

Gypsum boards with fibrous reinforcement - Definitions, requirements and test methods - Part 2: Gypsum fibre boards

fermacell Gypsum fibre boards - "fermacell Gipsfaser-Platte", "fermacell Vapor", "fermacell Gipsfaser-Platte greenline"

Specification of essential characteristics
Head pull-through resistance, Static ductility, Water vapour permeability – water vapour transmission and Water absorption of board surface

Annex 2.3

A.2.10 Hard body impact

The value of impact resistance of "fermacell Gipsfaser-Platte", tested in accordance with EN 1128¹⁰, is at least IR = 11 mm / (mm thickness of the board).

A.2.11 Thermal conductivity

The value of thermal conductivity λ of "fermacell Gipsfaser-Platte", tested in accordance with EN 12664¹¹, is $\lambda \leq 0.32$ W/(mK).

For "fermacell Vapor" and "fermacell Gipsfaser-Platte greenline" no performance has been determined.

A.2.12 Racking strength and stiffness of wall panels

For analysis of wall panels, method A - Simplified analysis of wall diaphragms – in accordance with EN 1995-1-1 section 9.2.4.2 should be applied.

For staples coated with coating type 3 in accordance with EN 14592 the design racking load-carrying capacity of each wall panel $F_{I,v,Rd}$ can be calculated in equation (9.22), assuming $b_0 = h/4$.

In addition, the load-bearing capacity of the sheets must be analysed. If no more precise analysis is provided, the analysis may be carried out as a tensile stress analysis in the sheets. The maximum stress on the sheets results from the shear flow, which corresponds to the load-bearing capacity of the connection between the timber frame and the sheets. The following verification must be carried out:

$$\frac{F_{v,Rd}/(t \cdot s)}{f_{t,d}} \leq 1 \tag{2}$$

- with $F_{v,Rd}$ = lateral design capacity of an individual fastener
- $f_{t,d}$ = design capacity of tensile strength of the sheet in plane of the panel
- s = fastener spacing
- t = sheet thickness.

Buckling of the sheets must be taken into account for board thicknesses smaller than 1/35 of the timber frame spacing by reducing the shear capacity by a factor of $35 t / b_{net}$.

The additional stresses on the sheets resulting from the distance between the timber frame axes and the sheet center surfaces and from discontinuous forces and forces directed at right angles to the timber frame axes may be taken into account by reducing the tensile and shear load-bearing capacity of the boards by a factor of 0.5 for sheets on both sides and 0.33 for sheets on one side.

<p>¹⁰ EN 1128:1995 ¹¹ EN 12664:2001</p>	<p>Cement-bounded particleboards - Determination of hard body impact resistance Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance</p>
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fermacell Gypsum fibre boards - "fermacell Gipsfaser-Platte", "fermacell Vapor", "fermacell Gipsfaser-Platte greenline"	Annex 2.4
Specification of essential characteristics Hard body impact, Thermal conductivity and Racking strength and stiffness of wall panels and stiffness	

A.3.1 Connectors (informative)

As connectors for the fermacell Gypsum fibre boards with the substructure zinc-coated and/or stainless nails, screws or staples in accordance with EN 14592¹² or European Technical Assessments are used under consideration of the following conditions:

- Nails which have diameters of $2,0 \text{ mm} \leq d \leq 3,1 \text{ mm}$ and diameters of nail heads which have at least $d_h \geq 4,6 \text{ mm}$.
- The characteristic tensile strength of nail-wire is at least 600 N/mm^2 .
- Staples have wire diameters of $1,5 \text{ mm} \leq d \leq 2,02 \text{ mm}$. The back width b_R of the staples is $5,8 \cdot d \leq b_R < 8 \cdot d$. Minimum tensile strength of the wire of staples is $f_u \geq 800 \text{ N/mm}^2$.
- The screws which have an outside diameter of the screw thread of $d \geq 3,5 \text{ mm}$ and a diameter of screw head of $d_h \geq 7,0 \text{ mm}$

The distances of the connectors from the unstressed edge of the fermacell Gypsum fibre boards are at least $4 \cdot d$, from the stressed edge at least $7 \cdot d$.

If a TB-Kante is implemented at fermacell Gypsum fibre boards, the distances of the connectors from the unstressed edge are at least $7 \cdot d$, from the stressed edge at least $10 \cdot d$.

EN 1995-1-1 applies for the distances of nails and screws in wooden components.

The distances of staples in wood can be related to the staple shaft and are independent of the inclination of the staple-back to the direction of the wood fibre in wooden components with $\rho_k \leq 420 \text{ kg/m}^3$ and are as follows:

- $a_1 = 15 \cdot d$
- $a_{3,c} = 10 \cdot d$
- $a_{4,c} = 5 \cdot d$
- $a_2 = 10 \cdot d$
- $a_{3,t} = 15 \cdot d$
- $a_{4,t} = 7 \cdot d$.

A.3.2 Load-bearing capacity of the fasteners on shear (informative)

The characteristic value of the load-bearing capacity of fasteners for each shear joint $F_{v,Rk}$ can be determined simplified in accordance with equation (3) (the reduced panel thickness is applied in the area of the TB-Kante):

$$F_{v,Rk} = A \cdot \sqrt{2 \cdot M_{y,Rk} \cdot f_{h,1,k} \cdot d} \quad [\text{N}] \quad (3)$$

with $M_{y,Rk}$ = characteristic value of the yield moment of the fastener [Nmm]

A = Factor set out in Table 5

$f_{h,1,k}$ = characteristic value of embedment strength of fermacell Gypsum fibre boards

Table 5: Factor A

Fastener	Board thickness t	Factor A
Nails	10 mm – 30 mm	0,7
Screws	10 mm – 30 mm	0,9
Staples	10 mm – 18 mm	0,7
	22 mm – 30 mm	0,6

If the board thickness t is smaller than 7d, $F_{v,Rk}$ is reduced in the ratio $t / 7d$.

¹² EN 14592:2008+A1:2012 Timber – Dowel-type fasteners - Requirements

If the characteristic load-bearing capacity $F_{v,Rk}$ is determined for boards with TB-Kante, for staples connections with demand perpendicular to edge of the board the characteristic load-bearing capacity, $F_{v,Rk}$ is reduced in ratio 1.5: d. For nailed connections the characteristic load-bearing capacity R_k is always reduced in ratio 2.5: d by a thickness of the board $t \leq 12.5$ mm and a nail diameter $d > 2.5$ mm. In case of single shear connections with predominantly short-term loading parallel to the edge of the gypsum fibreboard, the determined characteristic load carrying capacity $F_{v,Rk}$ may be increased by a proportion $\Delta F_{v,Rk}$ as follows:

$$\Delta F_{v,Rk} = \min\{0,5 \cdot F_{v,Rk}; 0,25 \cdot F_{ax,Rk}\} \quad (4)$$

There is no increase in the load-bearing capacity by the proportion $F_{v,Rk}$ in case of nail connections with $d \geq 2.8$ mm, panel thicknesses $t \geq 22$ mm and connections with uncoated staples or coated staples with coating type 1 or 2 in accordance with EN 14592.

For coated staples with coating type 3 in accordance with EN 14592, an inclination of the staple-backs to wood fibre of $< 30^\circ$, the minimum tensile strength of the wire of staples is $f_u \geq 900$ N/mm² for single shear connections with predominantly short-term loads parallel to the direction of the wood fibres and to the edge of the gypsum fibre board while maintaining the minimum penetration depth in the wood the characteristic values of the shear load capacity $F_{v,Rk}$ given in Table 6 are assumed.

Table 6: Characteristic values of the shear load capacity $F_{v,Rk}$ for coated staples and an inclination of the staple-backs parallel to wood fibre and force direction in wooden components of strength class C24

Diameter staple wire	t_{pen}	Thickness t (mm)			
		10	12.5	15	18
d = 1.5 mm	$\geq 14 \cdot d$	530 N	570 N	580 N	590 N
d = 1.8 mm	$\geq 18 \cdot d$	650 N	790 N	810 N	830 N

A.3.3 Slip modulus of displacement (informative)

For the slip modulus K_{ser} per shear joint, the calculation values as a function of the mean density of the strength class of the used wood given in EN 1995-1-1 are recommended for dowel-type fasteners. In deviation from EN 1995-1-1, the calculation values for nails in non-predrilled woods are used for connections with screws.

The calculation value of the slip modulus of displacement K_{ser} per shear joint and per staple shall be calculated for shearing stresses under working load with

$$K_{ser} = \frac{\rho_m^{1,5} \cdot d^{0,8}}{40} \quad [\text{N/mm}] \quad (5)$$

assuming d as the nominal diameter of the staple wire in [mm] and ρ_m as the geometric mean value of the characteristic density value of the gypsum fibre boards and the mean density of the wooden component in [kg/m³].

fermacell Gypsum fibre boards - "fermacell Gipsfaser-Platte", "fermacell Vapor", "fermacell Gipsfaser-Platte greenline"

Slip modulus of displacement (informative)

Annex 3.2

You will find the latest version of this brochure in digital form on our website. Technical modifications subject to changes.

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The most recent edition applies. Should you require additional information, please contact our customer service.

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