Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

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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	ETA-03/0050 issued on 25 March 2022

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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+A1[1], 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 322[2] 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 1995-1-1[3].

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 Gypsum plasterboards - Definitions, requirements and test methods
[5] EN 13501-1:2018 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

Deutsches Institut für Bautechnik DIBt

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 1995-1-1[1], EN 1995-1-2[2] and EN 1993-1-1[3].
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 13501-1[4] are used which are regulated in accordance with EN 13963-1[5].

[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"	Annex 1.1
Specification of intended use Loading and installation	

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 ⊥ 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 ⊥ 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+A1[6], clause 5.6 meets the following minimum requirements:

$f_{m,mean} \geq 5{,}8$ N/mm² for thickness of boards t ≤ 18 mm and
$f_{m,mean} \geq 5{,}0$ N/mm² for thickness of boards t > 18 mm

[6] EN 15283-2:2008+A1:2009 Gypsum boards with fibrous reinforcement- Definitions, requirements and test methods - Part 2 - Gypsum fibre boards

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:

$k_{def,\ NKl.\ 1} = 3$ 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 318[7] 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

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:
  $F_{ax,head,k}$ = table value * $b_R/11$ (mm)
- board thicknesses $t \geq 22$ mm and diameter of the head $d_h < 5.5$ mm:
  $F_{ax,head,k}$ = 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 12572[8], is μ = 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+A1[9], 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

A.2.10 Hard body impact

The value of impact resistance of "fermacell Gipsfaser-Platte", tested in accordance with EN 1128[10], 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 12664[11], 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:

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

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.

[10] EN 1128:1995 — Cement-bounded particleboards - Determination of hard body impact resistance

[11] EN 12664:2001 — 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

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 14592[12] or European Technical Assessments are used under consideration of the following conditions:

- Nails which have diameters of 2,0 mm ≤ d ≤ 3,1 mm and diameters of nail heads which have at least $d_h \geq 4{,}6$ mm.
- The characteristic tensile strength of nail-wire is at least 600 N/mm².
- Staples have wire diameters of 1.5 mm ≤ d ≤ 2.02 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 $f_u \geq 800$ N/mm².
- The screws which have an outside diameter of the screw thread of d ≥ 3,5 mm and a diameter of screw head of $d_h \geq 7{,}0$ mm

The distances of the connectors from the unstressed edge of the fermacell Gypsum fibre boards are at least 4·d, from the stressed edge at least 7·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·d, from the stressed edge at least 10·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 ρk ≤ 420 kg/m³ and are as follows:

- $a_1 = 15 \cdot d$
- $a_2 = 10 \cdot d$
- $a_{3,c} = 10 \cdot d$
- $a_{3,t} = 15 \cdot d$
- $a_{4,c} = 5 \cdot d$
- $a4_{,t} = 7 \cdot d$.

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):

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

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 ≤ 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:

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

There is no increase in the load-bearing capacity by the proportion $F_{v,Rk}$ in case of nail connections with d ≥ 2.8 mm, panel thicknesses t ≥ 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°, the minimum tensile strength of the wire of staples is f_u ≥ 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 Fv,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	≥ 14·d	530 N	570 N	580 N	590 N
d = 1.8 mm	≥ 18·d	650 N	790 N	810 N	830 N

A.3.3 Slip modulus of displacement (informative)

For the slip modulus Kser 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 Kser per shear joint and per staple shall be calculated for shearing stresses under working load with

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

assuming d as the nominal diameter of the staple wire in [mm] and ρm 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"	Annex 3.2
Slip modulus of displacement (informative)	