

European Technical Assessment ETA-03/0050

fermacell® Gypsum Fibreboards



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
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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

10 pages including 2 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

EAD 070006-00-0504

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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 broad, 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.

"fermacell Gipsfaser-Platte" corresponds to type GF-W2 and type GF-I (see Annex 2, clause A.2.10 and A.2.4)

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 according to EN 1995-1-1¹.

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.

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	No performance assessed

¹

EN 1995-1-1:2010-12

Eurocode 5; Design of timber structures; Part 1-1: General - Common rules and rules for building

Essential characteristic	Performance
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 according to EN 520 ²
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 according to EN 13501-1 ³
"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

3.5 Energy economy and heat retention (BWR 6)

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

²
³

EN 520:2004+A1:2009
EN 13501-1:2007+A1:2009

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

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 31 January 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Warns

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 according to the Annexes as well as EN 1995-1-1¹ in conjunction with the respective national annex, 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 according to EN 13501-1⁴ are used which are regulated in accordance with EN 13963-1⁵.

A.1.3 Connectors

As connectors for the fermacell Gypsum fibre boards with the substructure zinc-coated and/or stainless nails, screws or staples according to EN 14592⁶ 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 nails is at least 600 N/mm^2 .
- Staples which have wire diameters $d \geq 1,5 \text{ mm}$. The back width b_R of the staples is $b_R > 9 \text{ mm}$. 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 nail 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 $10 \cdot d$.

A.1.4 Durability

The moisture content of the fermacell Gypsum fibre boards tested according to EN 322⁷ 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.

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
2	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 + AC:2009	Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings
4	EN 13501-1:2007+A1:2009	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
6	EN 14592:2008+A1:2012	Timber – Dowel-type fasteners - Requirements
7	EN 322:1993	Wood-based panels; determination of moisture content

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

Specification of intended use

Loading, installation, connectors and durability

Annex 1

Annex 2 Specification of essential characteristics

A.2.1 Characteristic strength and stiffness values as well as the value of density of fermacell Gypsum fibre boards

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

Type of stress		Thickness of boards [mm]							
		10	12,5	15	18	22	25	28	30
Characteristic strength values									
Perpendicular to the plane of the board									
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									
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
Stiffness values									
Perpendicular to the plane of the board									
Modulus of elasticity	$E_{m, mean}$	3800				3000			
Shear modulus	G_{mean}	1600				600			
Compression modulus of elasticity $\perp$ to the plane	$E_{c,perp}$	800				500			
In plane of the board									
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							
Value of density [kg/m³]									
Density	ρ_k	1150							

The value of bending strength perpendicular to the board plane, tested according to EN 15283-2+A1⁸, clause 5.6 meets the following minimum requirements:

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

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

⁸ 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

Characteristic strength and stiffness values as well as the value of density

Annex 2.1

The density of fermacell Gypsum fibre boards, tested according to EN 15283-2+A1⁹, clause 6.3, is at least 1000 kg/m³ and does not exceed 1250 kg/m³.

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 according to EN 318¹⁰ 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 according to 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 intrados strength for fermacell gypsum fibreboards is determined according to equation (1):

$$f_{h,1,k} = 7 \cdot d^{-0,7} \cdot t^{0,9} \quad [\text{N/mm}^2] \quad (1)$$

with d = nominal diameter of the connector [mm]

t = thickness of board [mm]

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

⁹ EN 15283-2:2008+A1:2009 Gypsum boards with fibrous reinforcement - Definitions, requirements and test methods - Part 2-Gypsum fibre boards

¹⁰ EN 318:2002 Wood-based panels – Determination of dimensional changes associated with changes in relative humidity

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Specification of essential characteristics
Creep and duration of load, dimension and dimensional stability, surface hardness and embedment strength

Annex 2.2

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 table values if:

- width of staple back $b_R \leq 11$ mm:
 $F_{ax,head,k} = \text{table value} \cdot b_R / 11$ (mm)
- board thicknesses $t \geq 22$ mm and diameter of the head $d_h < 5,5$ mm:
 $F_{ax,head,k} = \text{table value} \cdot d_{h, exist.} / 5,5$

A.2.7 Load-bearing capacity of the fasteners on shear

The characteristic value of the load-bearing capacity of fasteners for each shear joint $F_{v,Rk}$ can be determined simplifying according to equation (2) (the reduced panel thickness is applied in the area of the TB-Kante):

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

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

A = Factor according to Table 4

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

Table 4: 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 $t / 7d$.

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:

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

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 and panel thicknesses $t \geq 22$ mm.

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Specification of essential characteristics

Head pull-through resistance, load-bearing capacity of the fasteners on shear

Annex 2.3

A.2.8 Static ductility

The static ductility μ of the connection of fermacell gypsum fibre boards 12.5 mm thick with wooden components is given in Table 5:

Table 5: Static ductility μ and edge distance $a_{4,c}$ of connections of fermacell Gypsum fibre boards of thickness $d = 12.5$ mm with wooden components for selected fasteners

Fasteners	Edge distance	Ductility
Nails according to A.1.3 Minimum penetration length in wood 37,5 mm	7d	10
Staples according to A.1.3 Wire Diameter maximum 2,0 mm	7d	6
Minimum penetration length in wood 32,5 mm	4d	4

A.2.9 Water vapour permeability – water vapour transmission

The value of water vapour diffusion resistance of "fermacell Gipsfaser-Platte", tested according to EN ISO 12572¹¹, is $\mu = 13$.

The s_d -value determined according to 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.2.10 Water absorption of board surface

fermacell Gypsum fibre boards, tested in accordance with EN 15283-2+A1¹², section 5.9, comply with type GF-W2, if the water absorption of board surface is ≤ 1500 g/m².

A.2.11 Hard body impact

The value of impact resistance of "fermacell Gipsfaser-Platte", tested according to EN 1128¹³, is at least IR = 11 mm / (mm thickness of the board).

A.2.12 Thermal conductivity

The value of thermal conductivity λ of "fermacell Gipsfaser-Platte", tested according to EN 12664¹⁴, is $\lambda \leq 0.32$ W/(mK).

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

A.2.13 Slip modulus of displacement

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 1995-1-1¹⁵ 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.

11	EN ISO 12572:2001	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties
12	EN 15283-2:2008+A1:2009	Gypsum boards with fibrous reinforcement - Definitions, requirements and test methods - Part 2: Gypsum fibre boards
13	EN 1128:1995	Cement-bounded particleboards - Determination of hard body impact resistance
14	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
15	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

fermacell Gipsfaserplatten - "fermacell Gipsfaser-Platte", "fermacell Vapor", fermacell Gipsfaser-Platte greenline"

Specification of essential characteristics
Static ductility, water vapour permeability – water vapour transmission, water absorption of board surface, hard body impact, thermal conductivity, slip modulus of displacement

Annex 2.4

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