



Austrian Institute of Construction Engineering
Schenkenstrasse 4 | T +43 1 533 65 50
1010 Vienna | Austria | F +43 1 533 64 23
www.oib.or.at | mail@oib.or.at



European Technical Assessment

ETA-23/0395
of 20.10.2023

General part

Technical Assessment Body issuing the European Technical Assessment

Österreichisches Institut für Bautechnik (OIB)
Austrian Institute of Construction Engineering

Trade name of the construction product

Knauf Diamant SX / Knauf Diamond SX

Product family to which the construction product belongs

Gypsum plasterboards for load-bearing
applications

Manufacturer

Knauf Gips KG
Am Bahnhof 7
97346 Iphofen
Germany

Manufacturing plants

Knauf Diamant manufacturing plants

This European Technical Assessment contains

17 pages including 4 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

European Assessment Document (EAD)
070001-02-0504 "Gypsum plasterboards,
gypsum boards with fibrous reinforcement and
expanded glass boards with fibrous
reinforcement for sheathing and lining of building
elements".

Remarks

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may be made with the written consent of Austrian Institute of Construction Engineering. Any partial reproduction has to be identified as such.

Specific parts

1 Technical description of the product

This European Technical Assessment (ETA) applies to the gypsum plasterboards for load-bearing applications with trade name Knauf Diamant SX / Knauf Diamond SX. The gypsum plasterboards are composed of an impregnated special gypsum plaster core encased in, and firmly bonded to paper liners to form a flat, rectangular boards. Board type according to EN 520 is DEFH1IR. Class of Reaction to fire performance is A2-s1,d0 (B) according to EN 520.

The nominal thickness of the gypsum plasterboards is 12.5 mm, 15 mm or 18 mm. The length of the boards varies between 1 000 mm and 4 000 mm and the width between 600 mm and 1 400 mm. The density amounts to at least 1 100 kg/m³.

The edges of the boards can be produced sharp edged, or formed (usually square edge and tapered edge).

The gypsum plasterboards corresponds to the specifications given in Annex 1. The material characteristics, dimensions and tolerances of Knauf Diamant SX / Knauf Diamond SX, not indicated in these Annex, are given in the technical file¹ of the European Technical Assessment.

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

2.1 Intended use

The gypsum plasterboards are used for load bearing applications as system components for drywall constructions (e.g. on wooden based or steel-based substructures). Knauf Diamant SX / Knauf Diamond SX can also be used as sheeting for restraining or bracing substructures according to EN 1993-1-3.

The gypsum plasterboards shall be subjected to static and quasi static actions only.

The gypsum plasterboards are intended to be used in service classes 1 and 2 according to EN 1995-1-1².

The substructure is not part of this European Technical Assessment.

2.2 General assumptions

The gypsum plasterboards are manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical file.

The manufacturer shall ensure that the requirements in accordance with the Clauses 1, 2 and 3 as well as with the Annexes of the European Technical Assessment are made known to those who are concerned with design and execution of the works.

¹ The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik.

² Reference documents are listed in Annex 4.

Design

The European Technical Assessment only applies to the manufacture and use of the gypsum plasterboards. Verification of stability of the works including application of loads on the products is not subject to the European Technical Assessment.

The following conditions shall be observed:

- Design of the gypsum plasterboards is carried under the responsibility of an engineer experienced in these elements.
- Design of the works shall account for the protection of the gypsum plasterboards.
- The gypsum plasterboards are installed correctly.

The design, calculation and execution of building components which are manufactured using the gypsum plasterboards can take place according to Annex 2 and 3 or accomplish the standards EN 1995-1-1 and EN 1993-1-3.

The data of this European Technical Assessment and if necessary the references in valid additional national regulations are to be considered.

Packaging, transport, storage, maintenance, replacement and repair

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

Installation

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

The gypsum plasterboard shall only be installed in structures where it is protected from wetting and weathering (service classes 1 and 2 according to EN 1995-1-1).

The use considerations for walls according to Annex 3 shall be considered.

2.3 Working life/Durability

The provisions made in the European Technical Assessment (ETA) are based on an assumed intended working life for the gypsum plasterboards of 50 years, when installed in the works, provided that the gypsum plasterboards are subject to appropriate installation, use and maintenance (see clause 2.2). These provisions are based upon the current state of the art and the available knowledge and experience³.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA nor by the Technical Assessment Body, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

³ The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

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

3.1 Essential characteristics of the product

Table 1: Essential characteristics of the product and product performance

No	Essential characteristic	Product performance
Basic requirement for construction works 1: Mechanical resistance and stability		
1	Bending strength	Annex 1
2	Shear strength	Annex 1
3	Compressive strength	Annex 1
4	Tensile strength	Annex 1
5	Load bearing capacity of the wall elements	Annex 1
6	Embedment strength of fasteners (staples, nails, screws) in boards	Annex 1
7	Head pull-through resistance of fasteners (staples, nails, screws) in boards	No performance assessed.
8	Creep and duration of the load	Annex 2
9	Structure of the cohesion of the core at high temperature	Annex 1
10	Dimensional stability	Annex 1
11	Surface hardness	Annex 1
12	Static ductility of dowel-type fasteners (staples, screws) in boards	No performance assessed.
Basic requirement for construction works 2: Safety in case of fire		
13	Reaction to fire	Annex 1
Basic requirement for construction works 3: Hygiene, health and the environment		
14	Water vapour permeability (expressed as water vapour resistance factor)	Annex 1
15	Water absorption of board surface	Annex 1
16	Total water absorption	Annex 1
Basic requirement for construction works 4: Safety and accessibility in use		
17	Hard body impact resistance	Annex 1
Basic requirement for construction works 5: Protection against noise		
18	Airborne sound insulation	No performance assessed.
19	Sound absorption	No performance assessed.

No	Essential characteristic	Product performance
Basic requirement for construction works 6: Energy economy and heat retention		
20	Thermal resistance (expressed as thermal conductivity)	Annex 1
21	Air permeability	No performance assessed.
22	Coefficient of thermal expansion	No performance assessed.
Aspects of durability		
23	Mould resistance	No performance assessed.

3.2 Assessment methods

3.2.1 General

The assessment of the essential characteristics in Clause 3.1 of the gypsum plasterboards for the intended use, and in relation to the requirements for mechanical resistance and stability, for safety in case of fire, for hygiene, health and the environment, for safety and accessibility in use and for energy economy and heat retention in the sense of the basic requirements for construction works № 1, 2, 3, 4 and 6 of Regulation (EU) № 305/2011 has been made in accordance with the European Assessment Document EAD 070001-02-0504, Gypsum plasterboards, gypsum boards with fibrous reinforcement and expanded glass boards with fibrous reinforcement for sheathing and lining of building elements.

3.2.2 Identification

The European Technical Assessment for the gypsum plasterboards is issued on the basis of agreed data that identify the assessed product. Changes to materials, to composition, to characteristics of the product, or to the production process could result in these deposited data being incorrect. Österreichisches Institut für Bautechnik should be notified before the changes are implemented, as an amendment of the European Technical Assessment is possibly necessary.

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

4.1 System of assessment and verification of constancy of performance

According to Commission Decision 1995/467/EC the system of assessment and verification of constancy of performance to be applied to Knauf Diamant SX / Knauf Diamond SX is System 3. System 3 is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.4., and provides for the following items

- (a) the manufacturer shall carry out factory production control;
- (b) the notified laboratory shall assess the performance on the basis of testing (based on sampling carried out by the manufacturer), calculation, tabulated values or descriptive documentation of the construction product.

4.2 Construction products for which a European Technical Assessment has been issued

Notified bodies undertaking tasks under System 3 shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Notified bodies shall therefore not undertake the tasks referred to in point 4.1 (b).

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

5.1 Tasks for the manufacturer

5.1.1 Factory production control

In the manufacturing plant the manufacturer shall establish and continuously maintain a factory production control. All procedures and specifications adopted by the manufacturer shall be documented in a systematic manner. The factory production control shall ensure the constancy of performances of the product with regard to the essential characteristics.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents presented by the manufacturer of the raw materials.

The frequencies of controls conducted during manufacturing and on the finalised product are defined by taking account of the manufacturing process of the product and are laid down in the control plan.

The results of factory production control are recorded and evaluated. The records include at least the following data:

- Designation of the product, basic materials and components
- Type of control or test
- Date of manufacture of the product and date of testing of the product or basic materials or components
- Results of controls and tests and, if appropriate, comparison with requirements
- Name and signature of person responsible for factory production control

The records shall be kept at least for ten years time after the construction product has been placed on the market. On request they shall be presented to Österreichisches Institut für Bautechnik.

5.1.2 Declaration of performance

The manufacturer is responsible for preparing the declaration of performance. When all the criteria of the assessment and verification of constancy of performance are met, the manufacturer shall issue a declaration of performance.

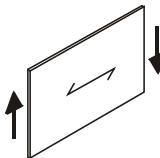
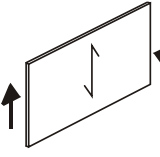
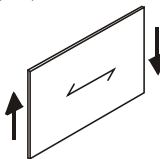
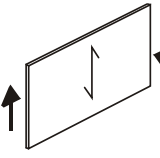
Issued in Vienna on 20.10.2023
by Österreichisches Institut für Bautechnik

The original document is signed by:

Georg Kohlmaier
Deputy Managing Director

BWR	Essential characteristic	Assessment method	Level / Class / Description		
1	Mechanical resistance and stability				
	1. Mechanical actions perpendicular to the gypsum plasterboard				
	Thickness		12.5 mm	15 mm	18 mm
	Bending strength				
	– in cross direction $f_{m,\perp,CD,k}$	EAD 070001-02-0504 2.2.1.1	4,1 MPa	3,8 MPa	3,0 MPa
	– in machine direction $f_{m,\perp,MD,k}$	EAD 070001-02-0504 2.2.1.1	8,2 MPa	7,0 MPa	5,4 MPa
	Bending modulus of elasticity				
– in cross direction $E_{m,\perp,CD,k}$	EAD 070001-02-0504 2.2.1.1	4 800 MPa	4 900 MPa	4 200 MPa	
– in machine direction $E_{m,\perp,MD,k}$	EAD 070001-02-0504 2.2.1.1	5 700 MPa	5 800 MPa	5 000 MPa	
Compressive strength					
– in both directions $f_{c,\perp,MCD,k}$	EAD 070001-02-0504 2.2.3.1	9,8 MPa	9,8 MPa	9,8 MPa	

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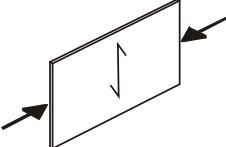
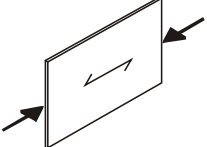
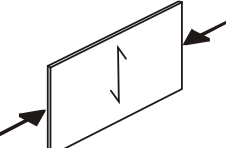
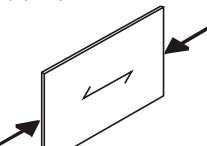
BWR	Essential characteristic	Assessment method	Level / Class / Description		
1	2. Mechanical actions in plane of the gypsum plasterboard				
	Thickness		12,5 mm	15 mm	18 mm
	Shear strength in cross direction $f_{v,II,CD,k}$	EAD 070001-02-0504 2.2.2	4,3 MPa	4,3 MPa	4,3 MPa
					
	– in machine direction $f_{v,II,MD,k}$	EAD 070001-02-0504 2.2.2	4,3 MPa	4,3 MPa	4,3 MPa
					
Shear modulus					
– in cross direction $G_{v,II,CD,mean}$	EAD 070001-02-0504 2.2.2	2 400 MPa	2 400 MPa	2 400 MPa	
					
– in machine direction $G_{v,II,MD,mean}$	EAD 070001-02-0504 2.2.2	2 400 MPa	2 400 MPa	2 400 MPa	
					

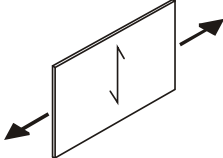
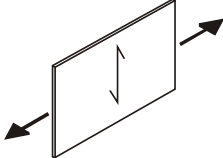
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BWR	Essential characteristic	Assessment method	Level / Class / Description		
			12,5 mm	15 mm	18 mm
1	Thickness		12,5 mm	15 mm	18 mm
	Compression strength – in cross direction $f_{c,II,CD,k}$	EAD 070001-02-0504 2.2.3.1	8,0 MPa	8,0 MPa	8,0 MPa
					
	– in machine direction $f_{c,II,MD,k}$	EAD 070001-02-0504 2.2.3.1	8,0 MPa	8,0 MPa	8,0 MPa
					
	Compression modulus of elasticity – in cross direction $E_{c,II,CD,k}$	EAD 070001-02-0504 2.2.3.1	6 000 MPa	6 000 MPa	6 000 MPa
					
	– in machine direction $E_{c,II,MD,k}$	EAD 070001-02-0504 2.2.3.1	6 000 MPa	6 000 MPa	6 000 MPa
					
Knauf Diamant SX / Knauf Diamond SX		Annex 1			
Product characteristics		of European Technical Assessment ETA-23/0395 of 20.10.2023			

BWR	Essential characteristic	Assessment method	Level / Class / Description
1	Tensile strength – in all directions $f_{t,II,\alpha,k}$ 	EAD 070001-02-0504 2.2.4	t = 12,5 mm and t = 15 mm: $f_{t,II,\alpha,k} = \text{MAX} \begin{cases} 2,7 - 0,0145 \cdot \alpha \\ 2,0 \end{cases}$ t = 18 mm: $f_{t,II,\alpha,k} = \text{MAX} \begin{cases} 2,0 - 0,011 \cdot \alpha \\ 1,5 \end{cases}$
	Tensile modulus of elasticity – in all directions $E_{t,II,\alpha,\text{mean}}$ 		t = 12,5 mm to t = 18 mm: 7 200 MPa
Knauf Diamant SX / Knauf Diamond SX		Annex 1	
Product characteristics		of European Technical Assessment ETA-23/0395 of 20.10.2023	

BWR	Essential characteristic	Assessment method	Level / Class / Description
1	3. Other mechanical actions		
	Load bearing capacity of the wall elements	EAD 070001-02-0504 2.2.5.1	Calculation acc. to EN 1995-1-1 and Annex 3
	Embedment strength of fasteners in boards – in both directions $f_{h,MD,k} = f_{h,CD,k}$	EAD 070001-02-0504 2.2.6.1	$16 d^{-0,7} t^{0,6} \text{ } ^{1)}$
	Creep and duration of the load	EAD 070001-02-0504 2.2.8	Annex 2
	Structure of the cohesion of the core at high temperature	EN 520	Board type F acc. to EN 520
	Dimensional stability		
	Shrinkage and swelling	EAD 070001-02-0504 2.2.9.1	<p>t = 12,5 mm: $\delta l_{65,85,mean} = 0,18 \text{ mm/m}$ $\delta l_{65,30,mean} = -0,16 \text{ mm/m}$</p> <p>t = 15 mm: $\delta l_{65,85,mean} = 0,11 \text{ mm/m}$ $\delta l_{65,30,mean} = -0,13 \text{ mm/m}$</p> <p>Moisture content during service shall not change to such an extend that adverse deformation will occur.</p>
	Surface hardness	EN 520	<p>t = 12,5 mm: D = 11,21 mm</p> <p>t = 15 mm: D = 10,78 mm</p> <p>t = 18 mm: D = 11,25 mm</p> <p>Board type I acc. to EN 520</p>

¹⁾ With d as the (core)diameter of the fastener and for $1,5 \text{ mm} \leq d \leq 5,5 \text{ mm}$

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Annex 1

Product characteristics

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BWR	Essential characteristic	Assessment method	Level / Class / Description
2	Reaction to fire		
	Gypsum plasterboards for load-bearing applications	EC Decision 2006/673/EC	Euroclass A2-s1, d0 (B)
3	Hygiene, health and environment		
	Vapour permeability μ	EN ISO 12572 Test conditions A/D	t = 12,5 mm: 15,8/8,4 t = 15 mm: 14/7,8 t = 18 mm: 13,7/8,7
	Water absorption – board surface (front/back) – total	EN 520 EN 520	Board type H1 acc. to EN 520 $\leq 180 \text{ g/m}^2$ $\leq 5 \%$
4	Safety and accessibility in use		
	Hard body impact resistance	EN 1128	t = 12,5 mm: IR = 24,1 mm/mm t = 15 mm: IR = 25,2 mm/mm t = 18 mm: IR = 20,0 mm/mm
6	Energy economy and heat retention		
	Thermal resistance, λ	EN 12664	0,37 W/(m·K)

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Annex 1

Product characteristics

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k_{def}	
Service class	
1	2
3.0	4.0

k_{mod}					
Service class	Load duration class				
	Permanent action	Long action	Medium action	Short action	Very short action
1	0.2	0.4	0.6	0.8	1.1
2	0.15	0.3	0.45	0.6	0.8

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Annex 2

Creep and duration of load - k_{def} and k_{mod} valuesof European Technical Assessment
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Design of wall elements may be according to EN 1995-1-1, 9.2.4.2 “Simplified verification of wall elements – Method A”. Hereby, the following considerations shall be taken into account:

Construction

Single openings in the cladding, smaller than 200 mm x 200 mm, may be neglected for calculation of load. For multiple openings the sum of lengths and the sum of heights must be smaller than 10 % of the cladding length or height. Effects of bigger openings need to be considered.

Shear

The load-bearing capacity of the cladding must be verified. A simplified verification of shear stress in the cladding is allowed when a verification of load bearing capacity of the cladding is not required during assessment of the wall elements. The maximum load bearing capacity of the cladding results from the shear flow, which correlates to the load bearing capacity of the connection between the studs and the cladding. The following must be verified:

$$\frac{\tau_d}{f_{v,d}} = \frac{F_{f,Rd} / (t \cdot s)}{f_{v,d}} \leq 1$$

With

- τ_d ... design value of shear stress in the cladding
- $f_{v,d}$... design value of shear strength for mechanical actions in plane of the gypsum plasterboard
- $F_{f,Rd}$... design value of the load bearing capacity for shearing off the single fastener
- s ... spacing of fasteners
- t ... thickness of the cladding

Additional stress resulting from the spacing of studs and middle areas of the cladding as well as discontinuous forces and forces acting perpendicular to the stud axes may be considered by a reduction in the shear strength of the plates with a factor of 0.5 for both-sided and 0.33 for one-sided cladding.

For thicknesses of plates smaller than 1/35 of stud distances, buckling of the cladding must be considered through reduction of load bearing capacity by the factor $35 \cdot \frac{t}{b_{net}}$.

Standards and regulations in force at the place of use shall be considered. If it is required that the shear strength must be taken equal or lower than the tensile strength then the value for tensile strength depending on the direction of production according to Annex 1 of the board for mechanical actions in plane of the gypsum plasterboard is applicable.

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Use considerations for walls	

Imperfection

Effects of imperfection of a vertically loaded wall in terms of inclination may be taken into account by the following horizontal equivalent load:

$$F_{Ed} = \frac{q_{Ed} \cdot l}{70}$$

Hereby l is the length of the wall, loaded vertically through a line load q_{Ed} . F_{Ed} acts as a pair of forces at the bottom and at the top of the wall on the stiffening elements.

The horizontal displacement of the components resulting from this equivalent load F_{Ed} as well as the external forces must be smaller than $h/100$.

Consideration of imperfections in terms of inclination as well as verification of horizontal deformations is not necessary in the following cases:

- The length of the cladding is minimum $h/3$,
- Width of the plates is minimum $h/4$,
- The cladding is embedded in a stiff underconstruction,
- An increase of characteristic values of load bearing capacity of fasteners according to EN 1995-1-1, 9.2.4.2(5) is not taken into account.

Edge distance

Edge distance of fasteners plates and studs for wall elements with all-over shear rigid connected plates may be taken as $a_{4,c}$.

Butt of claddings

There may be one butt for wall elements calculated according to this section if the edges of the plates are connected in a rigid manner. Without detailed verification of deformations and when the width of the plate is smaller than $0.5 h$, the load bearing capacity for slabs with horizontal butts under horizontal loads must be reduced by $1/6$.

Pressure in studs

For verification of transmission of rip-pressure loads through for transverse studs according to EN 1995-1-1, 9.2.4.2(14) the characteristic load bearing capacity may be considered with 20 % increased values.

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Use considerations for walls

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Claddings with two layers

Design of wall elements cladded with two layers on one or both sides may be according to the provisions given above. Hereby, the two layers are divided into an intermediate and an outer layer.

The following verifications are necessary, whereas the lowest load-bearing capacity is decisive:

- Shear in the panel
- Buckling
- Load bearing capacity of the fasteners

Shear and buckling in the panel

Load bearing capacity in shear and buckling may be calculated according to EN 1995-1-1, 9.2.4.2 “Simplified verification of wall elements – Method A” and summed up.

Load bearing capacity of the fasteners

The load bearing capacity of the fasteners in the outer layer may be determined according to Johansen using the thickness of the outer layer.

The load bearing capacity of the fasteners in the intermediate layer may be determined according to Johansen by using a reduced (effective) thickness of the intermediate layer

$t_{il,eff} = t_{il} / 2$

with

- $t_{il,eff}$ effective thickness of the intermediate layer
 t_{il} thickness of the intermediate layer

The total load bearing capacity is the sum of the load bearing capacities of the fasteners in the intermediate and outer layer.

Design of wall elements cladded on both sides may be according to EN 1995-1-1, 9.2.4.2 (7).
The substructure is to be verified separately.

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Use considerations for walls	

European Assessment Document EAD 070001-02-0504: Gypsum plasterboards for load-bearing applications

EN 520:2004+A1 (08.2009): Gypsum plasterboards – Definitions, requirements and test methods

EN 1128 (10.1995), Cement-bonded particleboards – Determination of hard body impact resistance

EN 1993-1-3 (10.2006), + AC (05.2009) and + AC (11.2009): Eurocode 3 – Design of steel structures – Part 1-3: General rules – Supplementary rules for cold-formed members and sheeting

EN 1995-1-1 (11.2004), + AC (06.2006), + A1 (06.2008) and + A2 (05.2014): Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings

EN 12664 (01.2001), 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

EN ISO 12572 (08.2016): Hygrothermal performance of building materials and products – Determination of water vapour transmission properties

Knauf Diamant SX / Knauf Diamond SX

Reference documents

Annex 4

of European Technical Assessment
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