



Knaut AQUAPANEL® Exterior Wall

04/2011

Technical solutions for drywall exteriors

Knauf AQUAPANEL® Exterior Wall

AQUAPANEL®

Be certain, choose AQUAPANEL®

Knauf AQUAPANEL® Exterior Wall

Performance that leaves brick and block behind

Product description

The Knauf AQUAPANEL® Exterior Wall sets new standards for the design and construction of buildings world-wide. As a high performance exterior wall system built entirely using drywall techniques, it offers architects and contractors a high quality and economical alternative to traditional methods of construction such as brick and block.

The Knauf AQUAPANEL[®] Exterior Wall is suitable for a wide range of new building applications and thermal or aesthetic renovation projects including offices, hotels, sports facilities, schools, hospitals and residential complexes. Each standard construction type includes:

- AQUAPANEL[®] Cement Board
 Outdoor panels and accessories for exterior finishing
- Knauf profiles
- Knauf Insulation materials
- Knauf Gypsum Boards, joint compounds and interior finishing options.

The Knauf AQUAPANEL[®] Exterior Wall is available from

one source: Knauf. This brochure of Technical Solutions is for architects and planners. It includes:

- Technical construction details, based on standard construction types in matrix
- Vertical and horizontal crosssections
- Test reports for key building physical requirements (fire, sound, thermal)
 Electronic CAD files and sample specification texts can be

downloaded from the web site: www.Knauf-AQUAPANEL.com





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I. Knauf AQUAPANEL® Exterior Wall construction types

The following pages show detailed construction drawings and performance characteristics for standard construction types and further options for local building conventions such as slotted profile and timber framework.

Constructions between floors

The between floor constructions provide fast, flexible and easy construction solutions. They can be used as a base for further performance enhancing façade systems such as behind cladding (ventilated systems) or with additional performance with ETICS (External Thermal Insulation Composite System).

Constructions in front of floors

The in front of floor constructions are optimal for reduction of thermal bridges in the façade.

Curtain wall constructions Renovation projects made easier.

Standard construction types

Constructions between floors

Exterior wall construction directly-applied / water-managed



Ventilated construction: Exterior wall building envelope behind cladding







Single stud

Page 6 Single stud between floors -

slotted profile



Double stud + intermediate board Page 13



Single stud ventilated slotted profile

Page 25





Double stud





Page 29 **Timber constructions**



Exterior wall construction with ETICS





Single stud + ETICS

Page 17

Constructions in front of floors

Exterior wall construction directly-applied / water-managed





Double stud

Page 18

Curtain wall contructions

Renovation





With insulation

Page 21

II. Details a. Constructions between floors





Single stud





W384E-B1 Cross section with joint



W384E-BFU1 Expansion joint (vertical)



W384E-A1 Connection to solid wall



W384E-BFU2 Structural expansion joint



W 384E-E1 Outside corner





Single stud





W384E-HS1 Connection to column

W384E-VM1 Connection to ceiling





Single stud





W 384E-V2 Vertical cross section, option 2





Single stud





W384E-VOG1 Sliding ceiling connection, option 1



W384E-VMG1 sliding ceiling connection, option 1





Solutions with angles

Depending on wind loads and static calculation, brackets should be used for fixation of vertical profiles at top and foot points. Angles can be used for Knauf UA Metal Profiles and Knauf CW Metal Profiles. The fastening of profiles and angles should be completed using appropriate screws, either self-drilling, or machine screws with pre-drilled holes. Anchors or dowels must be approved according to the static calculation. The corrosion protection requirements for profiles, fasteners and anchors must be fulfilled.





Double stud



W388E-B1 Cross-section with joint



W388E-BFU1 Structural expansion joint



W388E-D1 Inside corner with expansion joint



W388E-DBFU1 Inside corner with expansion joint





W388E-HS1 Connection to column

W388E-E1 Outside corner





Double stud



W388E-V1 Vertical cross section





Double stud, window connections





W388E-FE-VU1 Lower window connection, option 1









W388E-FE-VM2 Side connection to window, option 2







W388E-FE-VO2 Upper connection to window, option 2





Double stud with intermediate board







W387E-B1 Cross section with joint







W387E-BFU2 Structural expansion joint

W387E-BFU1 Expansion joint (vertical)





Double stud with intermediate board





W387E-DBFU1 Inside corner with expansion joint



W387E-E1 Outside corner



W387E-HS1 Connection to column



W387E-VM1 Expansion joint (horizontal)



Solutions with angles

Depending on wind loads and static calculation, brackets should be used for fixation of vertical profiles at top and foot points. Angles can be used for Knauf UA Metal Profiles and Knauf CW Metal Profiles. The fastening of profiles and angles should be completed using appropriate screws, either self-drilling, or machine screws with pre-drilled holes. Anchors or dowels must be approved according to the static calculation. The corrosion protection requirements for profiles, fasteners and anchors must be fulfilled.





Double stud with intermediate board



W387E-V1 Vertical cross-section





Double stud with intermediate board, window connections



W387E-FE-VU1 Lower connection to window, option 1



W387E-FE-VU2 Lower connection to window, option 2



W387E-FE-HM1 Side connection to window, option 1



W387E-FE-HM2 Side connection to window, option 1







W387E-FE-VO2 Upper connection to window, option 2





Single stud with ETICS



W384E-E-ETICS1 Outside corner with ETICS



W384E-VM-ETICS1 Inside corner with ETICS







W384E-V-ETICS1 Vertical cross-section

b. Constructions in front of floors





Double stud



W388E-VM1 - Connection to ceiling: Steel angle and end plate, option 1



Constructions in front of floors





Double stud window connections





Solutions with angles

Depending on wind loads and static calculation, brackets should be used for fixation of vertical profiles at top and foot points. Angles can be used for Knauf UA Metal Profiles and Knauf CW Metal Profiles. The fastening of profiles and angles should be completed using appropriate screws, either self-drilling, or machine screws with pre-drilled holes. Anchors or dowels must be approved according to the static calculation. The corrosion protection requirements for profiles, fasteners and anchors must be fulfilled.

W388E-FE-VO1 Upper connection to window



c. Curtain wall constructions





Ventilated construction*



W638E-V1 Vertical section

W682-H1 Horizontal section

Ventilated construction*

W682-BFU1 Expansion joint

W682-E1 Outer corner

Curtain wall constructions

Ventilated construction*

W684T-V1 Cross-section

W684T-SO-V1 Base point, option 1

W684T-SO-V2 Base point, option 2

W684T-H1 Horizontal section

Curtain wall constructions

Ventilated construction*

W684T-DA-VO1 Roof connection

W684T-FE-VO1 Upper window connection

W684T-D1 Inner corner

W684T-E1 Outer corner

W684T-FE-VU1 Lower window connection

Exterior wall with slotted profiles

Single stud, ventilated

W684W-D1 Inside corner

Solutions with angles

Depending on wind loads and static calculation, brackets should be used for fixation of vertical profiles at top and foot points. Angles can be used for Knauf UA Metal Profiles and Knauf CW Metal Profiles. The fastening of profiles and angles should be completed using appropriate screws, either self-drilling, or machine screws with pre-drilled holes. Anchors or dowels must be approved according to the static calculation. The corrosion protection requirements for profiles, fasteners and anchors must be fulfilled.

Single stud, non-ventilated

W573-H1 Horizontal section

W571-H1 Horizontal section

Exterior wall with timber framework

Single stud, non-ventilated

W572-H1 Horizontal section

W572-H2 Horizontal section

Exterior wall with timber framework

Single stud, non-ventilated

W572-E1 Outside corner

W572-SO-V1 Base point

W573-DA-V1 Roof connection

W573-DA-V2 Roof connection

W573-VM1 Connection to ceiling

Solutions with angles

Depending on wind loads and static calculation, brackets should be used for fixation of vertical profiles at top and foot points. Angles can be used for Knauf UA Metal Profiles and Knauf CW Metal Profiles. The fastening of profiles and angles should be completed using appropriate screws, either self-drilling, or machine screws with pre-drilled holes. Anchors or dowels must be approved according to the static calculation. The corrosion protection requirements for profiles, fasteners and anchors must be fulfilled.

Exterior wall with timber framework

Single stud, ventilated

W681-H1 Horizontal section

W681-H2 Horizontal section

a.Stability and construction

1a. Substructure and fastening

Stud spacing:

In the constructions shown, AQUAPANEL® Cement Board Outdoor is fastened at a centre distance of 600/625 mm.

The vertical laths should have a minimum flange width of 50 mm to allow for the relevant edge gaps of the fasteners.

In buildings with eaves of over 8.0 m in height the distance between vertical support sections must be reduced to 300/312.5 mm at the corners and edges of the façade.

Double panelling:

The use of double panelling with AQUAPANEL[®] Cement Board Outdoor or other board material under the exterior panelling for fire protection purposes can also be done.

Anchoring, fastenings and connectors:

The effects on the façades resulting from wind, snow, ice and particular loads are dissipated in the load-bearing structure by the substructure and its anchorings, fastenings and connectors. In this, the components mentioned above fulfil the following functions.

Anchorings:

A component which mechanically anchors the substructure to the ground.

Fastenings:

A metal unit that mechanically fastens the cladding to the substructure. The load-bearing strength of the substrate should be checked. Appropriate fixation materials should be used. An alternative fastening method is with steel staples or nail screws.

Connectors:

A metallic component which joins the substructures together.

With regards to standardisation, special requirements exist for anchoring, fastening and connectors; these are indicated on the following pages under the design recommendations.

Profile connection to primary structure:

Profiles which take wind loads have to be connected by brackets to the load bearing primary structure.

Note: The sizes of profiles, brackets, screws and anchoring material has to be calculated by a specialised planner.

Solutions with angles

2a. Material selection and corrosion protection

External façades are designed to resist changing weather conditions. A suitable material is to be selected for the substructure, depending on moisture loading. For the metal substructure and fastening kits, sufficient corrosion protection must be observed. Where different materials are being combined, compatibility must be checked in each case.

Note: The relevant moisture loads and resulting corrosion protection classes are to be set by the specialist planner.

AQUAPANEL® Maxi Screws have a special corrosion resistant coating, which gives an approved 720 hours corrosion resistance in a salt spray test.

Corrosion protection classes:

Corrosion protection classes acc. to EN 13964	Description
A	Building components generally exposed to varying relative humidity up to 70% and varying temperatures up to 25°C but without corrosive pollutants.
В	Building components frequently exposed to varying relative humidity up to 90% and varying temperature up to 30°C but without corrosive pollutants.
C	Building components exposed to an atmosphere with a level of humidity higher than 90% and accompanied by a risk of condensation. This includes typical swimming pool environments.
D	More severe than the above. Includes conditions typical in salt-water swimming pools, thermal baths, steam saunas.

Timber frameworks:

The timber of the framework construction should be of at least S10/MS10 quality according to DIN 4074 or stress graded C24 according to EN 338 and wood preservation to DIN 68800.

Depending on wind loads and static calculation, brackets should be used for fixation of vertical profiles at top and foot points. Angles can be used for Knauf UA Metal Profiles and Knauf CW Metal Profiles. The fastening of profiles and angles should be completed using appropriate screws, either self-drilling, or machine screws with pre-drilled holes. Anchors or dowels must be approved according to the static calculation. The corrosion protection requirements for profiles, fasteners and anchors must be fulfilled

3a. Pre-dimensioning of substructure according to windload

Along with their own weight, external façades, depending on the height and geometry of the building, are mainly subject to the effect of wind. The dimensions and cross-sections of the substructure must be matched to the effects of wind pressure and wind suction. In certain cases, snow and ice must be taken into consideration. The functionality of the individual elements of the substructure is to be technically demonstrated. Proof of fitness for use is shown by a deformation limit of max. f=I/500.

Note: For proof of components, the relevant norms and standards should be considered.

Table to iden	Table to identify substructure																
Windload		Recon	nmendeo	d solutio	on (depe	ending o	n heigh	ts betwe	en flooi	rs)							
[kN / m ²]		250	260	270	280	290	300	310	320	330	340	350	360	370	380	390	400
0.50	400/417	A	A	A	A	A	В	В	В	В	В	В	В	В	C	С	С
	600/625	В	В	В	В	C	C	С	С	С	D	D	D	D	D	E	E
0.60	400/417	A	A	A	A	В	В	В	В	В	В	С	С	С	С	С	С
	600/625	В	В	С	С	С	С	С	D	D	D	D	D	E	E	E	E
0.70	400/417	A	A	В	В	В	В	В	В	В	C	С	С	C	C	С	D
	600/625	В	C	С	С	C	D	D	D	D	D	E	E	E	F	F	F
0.80	400/417	A	В	В	В	В	В	В	С	С	С	С	С	С	D	D	D
	600/625	С	C	С	С	D	D	D	D	D	E	E	E	F	F	F	F
0.90	400/417	В	В	В	В	В	С	С	С	С	С	С	С	D	D	D	D
	600/625	С	C	С	D	D	D	D	E	E	E	F	F	F	F	F	F
1.00	400/417	В	В	В	В	В	C	С	С	С	C	D	D	D	D	D	D
	600/625	С	С	D	D	D	D	E	E	E	F	F	F	F	F	G	G
1.10	400/417	В	В	В	В	С	С	С	С	С	D	D	D	D	D	E	E
	600/625	С	D	D	D	D	E	E	E	F	F	F	F	F	G	G	G
1.20	400/417	В	В	В	С	С	С	С	С	D	D	D	D	D	E	E	E
	600/625	С	D	D	D	E	E	E	F	F	F	F	F	G	G	G	G
1.30	400/417	В	В	С	С	С	С	С	D	D	D	D	D	E	E	E	E
	600/625	D	D	D	D	E	E	F	F	F	F	F	G	G	G	G	G
1.40	400/417	В	В	С	С	С	С	С	D	D	D	D	E	E	E	E	F
	600/625	D	D	D	E	E	F	F	F	F	F	G	G	G	G	G	G
1.50	400/417	В	С	С	С	С	С	D	D	D	D	D	E	E	E	F	F
	600/625	D	D	E	E	E	F	F	F	F	G	G	G	G	G	G	G

Construction between floors

Profile types

G

А	Knauf CW 75/50/06
В	Knauf CW 100/50/06
С	Knauf CW 125/50/06
D	Knauf CW 150/50/06
E	2 x Knauf CW 125/50/06
F	2 x Knauf CW 150/50/06

2 x Knauf UA 125/40/20

Note:

Profiles for regular facade areas are shown according to their proven adequacy. The table gives a selection of possible profiles. It provides an indication for preliminary design purposes only. Final selection of profiles should be made based on actual wall constructions and the proof of stability report. Constructions should be chosen according to national climatic conditions, under consideration of avoiding thermal bridges.

Stability and construction

4a. Expansion joints

Expansion joints should be installed at a spacing of at most 15 m to accommodate expansion and contraction due to weather. Expansion joints from the load-bearing construction must be taken up into the façade.

The installation of additional expansion joints may be required for certain façade geometries, such as complex surfaces and façades subject to increased stress.

5a. Particular loads on façades

Particular loads, resulting from advertising facilities, external wall greening or solar protection devices for example, are to be included in the load-bearing subor primary construction, independently of the AQUAPANEL® Cement Board Outdoor cladding and where necessary included in the standard safety declaration.

Light loads, such as from the inherent weight of ornamental elements, decorative sections and lighting may be anchored into the AQUAPANEL® Cement Board Outdoor using at least two metal cavity wall plugs. The gap between the plugs must be at least 75 mm. For wall constructions the amount of the light load is to be restricted to a maximum of 25 kg using individually occurring, non-plane point loads.

6a. Plug load capacity for interiors e.g. under tension and shear

Panelling thickness mm	Plastic cavity plug Ø 8 or Ø 10 mm	Metal cavity plug screw M5 or M6
1 x 12.5	25 kg	30 kg
2 x 12.5	40 kg	50 kg

Cavity plug

Interior shaft of double stud construction: stability and maximum height Indoor partition walls with Knauf Gypsum Board or AQUAPANEL® Cement Board Indoor are non-loadbearing, interior partition walls similar to DIN 4103.

They have no loadbearing function within the building but are suitable for bearing console loads and higher wall loads. DIN 4103 differs between two partition walls depending on their application.

Stability and construction

7a. Substructure for interiors

Installation range I

Areas less frequented by people as are assumed in e.g. flats, hotel rooms, offices or wards and similarly used rooms including corridors.

Installation range II

Areas highly frequented by people as are assumed in e.g. larger meeting rooms, lecture theatres, exhibition and retail spaces and similarly used rooms. Additionally, rooms with a height difference of the floors of 1 m or more are categorised in installation range II.

Earthquake-proof walls are in the category installation range II.

Differing maximal wall heights are admissible depending on the location of installation. These are specified separately for every wall construction. Admissible wall heights for installation range II with Knauf Gypsum Boards are listed below according to board thicknesses and profile sizes.

Maximal wall height h for installation range II of shaft walls, free-standing facings and partition walls with separated double stud frames: with Knauf Gypsum Boards: 12.5 mm and 15 mm thick according to DIN 18180 (unit of h in m)

Metal stud frame (d = 0.6 mm)	Distance between centres	Board thickness in mm		
	in mm	1 x 12.5	2 x 12.5	2 x 15
	625	(2.65)/-	(2.95)/-	(3.10)/-
CW 50	417	(3.20)/2.45	(3.60)/3.15	3.80
CW 50	312.5	(3.60)/3.30	4.00	4.00
	156.3	N/A	4.05	4.25
	625	4.00	4.00	4.00
CWL 75	417	4.00	4.00*	4.15
CW 75	312.5	4.15	4.50	4.75
	156.3	N/A	5.95	6.25
	625	4.15	4.50	4.65
CW 100	417	4.90	5.40	5.60
	312.5	5.55	6.10	6.35
	156.3	N/A	7.95	8.25
	625	5.25	5.80	6.00
CW 125	417	6.25	6.90	7.15
	312.5	7.00	7.75	8.05
	156.3	N/A	9.80	10.10
	625	6.45	7.15	7.35
CW 150	417	7.60	8.40	8.65
	312.5	8.50	9.30	9.60
	156.3	N/A	11.35	11.60

() value for installation range I

*Deflection \leq h/350

N/A - Not specified

Stability and construction

Maximal wall height h of shaft walls, free-standing facings and partition walls with separated double stud frames: with Knauf Gypsum Boards 20 mm and 25 mm thick according to DIN 18180 (unit of h in m):

Metal stud frame (d = 0.6 mm)	Distance between centres	Board thickness in mm	
· · ·	in mm	2 x20	2x25
	1000	(2.70)/-	(3.10)/-
	625	(3.55)/2.80	4.00
CW 50	417	4.00	4.00
	312.5	4.00	4.05
	156.3	4.80	5.40
	1000	3.95	4.00
	625	4.00	4.05
CW 75	417	4.55	4.95
	312.5	5.20	5.70
	156.3	6.85	7.50
	1000	4.00	4.10
	625	5.00	5.40
CW 100	417	6.10	6.55
	312.5	6.90	7.45
	156.3	8.90	9.50
	1000	4.95	5.25
	625	6.40	6.85
CW 125	417	7.70	8.20
	312.5	8.60	9.15
	156.3	10.65	11.15
	1000	6.15	6.50
	625	7.85	8.30
CW 150	417	9.20	9.70
	312.5	10.10	10.60
	156.3	12.00	12.00

() value for installation range I

b. Thermal properties

b. Thermal properties

1b. Thermal insulation standards

Energy saving and controlling carbon dioxide emission are today central topics of environmental protection. In Germany the proportion of energy consumed by private households is approximately 44%. The significance of energy saving for buildings is also high. The German Energy Saving Directive (EnEV) combines The Thermal Insulation Directive and The Heating System Directive. It considers the energy impact as a whole for the entire building.

An important change to the German Energy Saving Directive is the intention to convert the requirements for new buildings from the annual heating requirement to the annual primary energy requirement of the building. Gearing the requirements to the primary energy need takes into account that by deciding in favour of a certain configuration of building and facilities, the client is making a long-term selection in favour of the energy consumption associated with the heating of the building. The primary energy requirement includes the whole path of energy generation, which apart from system losses is also subject to the losses incurred in acquiring, producing, enriching and transporting the relevant energy category. New buildings with normal internal temperatures, i.e. buildings heated to an internal temperature of 19°C and more, as well as more than four months in the year, must be built so that the annual primary energy requirement and the figures for specific heat transmission losses are not exceeded.

The level of annual primary energy requirement essentially depends on the following determining factors:

- A/V_e= ratio of the heat-transmitting envelope area to the volume it encloses (m²/m³)
- A_N = heated useable floor space in the building (m²)
- type of water heating

The German Energy Saving Order provides for two possible verification procedures for calculating the annual primary energy requirement. These calculations are based on the European standard EN 832, entitled 'Thermal Performance of Buildings - Calculation of Energy Use for Heating - Residential Buildings'. For buildings with a proportionate window area not exceeding 30% either a simplified or the detailed energy balance procedure can be applied. For other buildings adherence to the detailed procedure must be verified. For a large number of dwellings it will be possible to calculate in accordance with the simplified verification procedure. The annual primary energy requirement is determined in a simplified fashion based on the following equation. Qp = (Qh + Qw) * ep

Qp for the annual primary energy requirement, Qh for the annual heating requirement, Qw for the supplement for water heating and ep for the installation cost figure

2b. Avoiding thermal bridges

According to European standards thermal bridges need to be avoided. In general the minimizing of a thermal bridge can be done by one or several layers of insulation.

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A fire resistant mineral insulation a wool especially a stone wool is appropriate. The conductivity of the insulation with λ = 0.035 W/mK will provide good results.

A thermal bridge is an area within a building (e.g. wall edge or connection between two different building sections such as a window and wall) that conducts the heat to the exterior more readily compared to the rest of the building. In brief it is a leak in the building shell.

According to German norm (DIN 4108) thermal bridges occur only when a structure is not separated by at least two different materials and the insulation, with a λ value of 0.040 W/mK, has a thickness of at least 100mm. The energy always flows from a warm to a cold area and could therefore cause different façade appearance or moisture in areas where it is not allowed (e.g. inner surface).

Simply put, the U-value represents the thermal conductivity of a wall. The smaller the value, the better the insulation of the wall. Below are some of the possible construction types of a double structured wall.

To avoid condensation on the interior surface the temperature according to German norms must not fall under 12.6 °C. This limit has been considered for the construction details for the Knauf AQUAPANEL[®] Exterior Wall system. Nevertheless the details make no claim of being complete.

Note: For each individual case the construction details should be checked for thermal bridges and appropriate U-value by a specialised planner.

3b. Determining U-values for construction types

The thermal insulation quality of the individual components is important for the verification and is described by the U-value, which is necessary for determining heat transmission losses. The U-value describes the heat compensation resulting from a difference in temperature between two different energy systems. Constructional details must be taken into account as well as the quality of the components. It is therefore necessary to investigate thermal bridges, for example.

Where external walls or roofs are not ventilated the entire construction from the internal cladding to the outer cladding is taking into account when determining the U-value. For ventilated external walls, only the areas from the internal cladding to the ventilation level are included. A rear ventilated façades makes an important contribution to thermal insulation because it keeps wind, rain and snow away from the second wall shell and so prevents rapid cooling.

Thermal properties

Summary of U-values for construction types

	U-value with profiles [W/m²K]	U-value without profiles [W/m²K]	ψ-value [W/mK]
01 - Standard construction	0.28	0.18	0.0635
02 - Construction staggered profiles	0.25	0.18	0.0415
03 - Construction with fish plated profiles	0.29	0.18	0.0667
04 - Construction with intermediate insulation	0.22	0.16	0.0396
05 - Construction with slotted profiles	0.22	0.18	0.0259
06 - Combination of staggered profiles 02 and	0.20	0.16	0.0280
intermediate insulation 04 construction			

4	
<u>, 625</u> ,	. 625 .

01 Standard construction

5

04 Construction with intermediate insulation

03 Construction with fish plated profiles

Μ.

625

06 Combination of staggered profiles 02 and intermediate insulation 04 construction

c. Moisture proofing

The most important task of a façade is protection against wind and weather. The basic structure is protected from the damaging effects of weather, moisture, damp or driving rain. A façade cladding must therefore have the following characteristics as far as weather-proofness is concerned:

- resistance to moisture and dimensional stability of the cladding and other components.
- resistance to freeze-thaw cycles
- resistance to mould and algae
- resistance to wind
- resistance to driving rain and hail

AQUAPANEL[®] Cement Board Outdoor meets moisture proofing requirements ideally with the appropriate surface coatings. AQUAPANEL[®] Cement Board Outdoor is 100% moisture-resistant. It exhibits extremely slight and essentially non-detrimental structural changes when subject to water loading, and changes neither its structural coherence nor its static characteristics. AQUAPANEL[®] Cement Board Outdoor in combination with AQUAPANEL[®] Tyvek[®] StuccoWrap[™] protects the basic structure safely from the effects of driving rain.

AQUAPANEL[®] Cement Board Outdoor is due to its alkalinity resistant to the growth of mould, as verified by the Institute for Building Biology in Rosenheim in its report No. 3008-308. This means that AQUAPANEL[®] Cement Board Outdoor, as a purely mineral structural panel, is ideally suitable as a render substrate in façade constructions. AQUAPANEL[®] render finishes are also fungicidal.

Response to diffusion:

In exterior components condensation can form at any time of the year from convection or vapour diffusion. A wall system must be structured in such a way to ensure that moisture from convection and diffusion is safely directed outside.

With ventilated structures it is generally the air layer that takes on the task of conducting water vapour safely to the outside air. Non ventilated external walls must be constructed so that condensation arising in bad weather can safely diffuse into the outside air. This means that to achieve the correctly layered construction the planner must ensure a suitable sequence of vapour-inhibiting and diffusion-tolerant materials. In recent years more work has been carried out with permeable wall structures. AQUAPANEL® Cement Board Outdoor displays very good vapour diffusion behaviour for cement-bound boards, with a diffusion resistance of μ = 66. This ensures that the panelling does not exhibit any vapour-inhibiting behaviour, which is extremely important to ensure the best possible layer construction from a building point of view.

Note: Protecting wooden structures by constructional or chemical means is laid down in DIN 68800 "Wood preservation". By planning the construction carefully it is often possible to avoid using chemical wood preservatives. Front-mounted, ventilated façades, such as the plaster façade with AQUAPANEL® Cement Board Outdoor, can also contribute to reducing the use of chemicals with the ventilated façade forming a secure weather protection for all external wall constructions.

Thermal and moisture-related characteristics				
Material	Water vapour diffusion resistance (µ)	s _d (m)	Thermal conductivity λ (W/mK)	
AQUAPANEL [®] Cement Board Outdoor	66	0.825	0.35	
AQUAPANEL [®] Tyvek [®] StuccoWrap™	50	0.02	-	
AQUAPANEL® Exterior Basecoat – white	15-35	0.075 - 0.175	0.87	
AQUAPANEL® Exterior Mineral Finish- white	7	0.014	0.47 at P = 50%	
			0.54 at P = 90%	
AQUAPANEL [®] Exterior Equalising Paint	<500	<0.05	-	

d. Fire protection

d. Fire protection

'The protection of people and property from fire is the essential aim of fire protection.'

Preventative structural fire protection has to meet the following planning and construction requirements:

- Fire risk is reduced if as many non-flammable building materials as possible are used.
- In the event of a fire, people within the building must be able to leave the building safely.
- The construction must be such that it remains stable sufficiently long in the event of fire, and prevents spread of fire and smoke to other buildings or other parts of the building for long enough.

From these requirements comes the need to research building materials and components both structurally and technically for their applicable fire behaviour and ability to protect against fire. Each building material is given a building material classification according to how it behaves during a fire. AQUAPANEL[®] Cement Board Outdoor is classified as "non-combustible", building material class A1 in accordance with EN 13501.

The behaviour of AQUAPANEL[®] Cement Board Outdoor constructions in the event of a fire has been proven by extensive fire tests.

Before the formation of the European community, the tests took place according to national standards, e.g. according to DIN 4102. This brochure also contains constructions whose behaviour in case of fire is proven according to DIN 4102.

The fire resistance tests according to European standards are conducted to EN 1364 for non-load bearing components and to EN 1365 for load-bearing ones, in each case following EN 1363.

The fire resistance time of the tested AQUAPANEL® Cement Board Outdoor constructions extends, according to the type of construction, up to a maximum of 120 minutes and is indicated by a precise fire resistance classification for each component. Based on the classification designation, you can recognise whether the test was carried out according to national DIN 4102 or European standard. National tests use designations F or particularly W for non load-bearing external walls. The European standard uses different designations. The most important designations for the description of the performance criteria are given below, together with their meanings.

The following table shows the allocation of the fire grading periods according to DIN and EN.

Comparison of fire resist Allocation of classes for					
Building designation	Load-bearing construc	tion	Non-load bearing inner wall	Non-load bearing exterior wall	
	Without enclosure	With enclosure of			
	of space	space			
Fire-retardent	R 30	REI 30	EI 30	E 30 (i→o) and EI 30 (i←o)	
	[F 30]	[F 30]	[F 30]	[W 30]	
	R 60	REI 60	EI60	E 60 (i→o) and EI 60 (i←o)	
	[F 60]	[F 60]	[F 60]	[W 60]	
Fire-resistant	R 90	REI 90	EI 90	E 90 (i→o) and EI 90 (i←o)	
	[R 90]	[R 90]	[F 90]	[W 90]	
Fire-resistance 120 min.	R 120	REI 120	-	-	
	[R 120]	[F 120]	-	-	
Firewall		REI-M90	EI-M 90	-	

Testing and classification must also only be carried out on one side. Independent of the test/tests performed, the classifications are described as follows:

i $\ \mbox{->}\ \ \mbox{o},$ when the intention is to classify from inside to outside;

i <- o, when the intention is to classify from outside to inside;

i <-> o, when the intention is to classify from inside to outside and from outside to inside.

According to EN, the description of fire resistance is described by the following performance criteria:

Derivation of abbreviation	Criterion
R (Résistance - Strength)	Bearing capacity
E (Etanchéité - Seal)	Room sealing
I (Isolation - Insulation)	Heat insulation (under the effect of fire)
W (Radiation)	Limitation of radiation penetration
M (Mechanical)	Mechanical effect on walls (impact load)
i -> 0	Direction of classification of fire resistance
i <- 0	
i <-> o (in-out)	

Fire protection

Single stud

Fire resistance	Profile	Measurements from inside to outside	Wall thickness	Insulation	System p	System properties		
Approval No					Weight (kg/m²)	Fire	Approv. sound insulation*	Sound insulation dB R _{w,P} (R _{w,R})
PB 3031/2742	CW 75	GKF 12.5 + CW75 + OD 12.5	100 mm	40 mm	28.6	EI 30	420001590-9 +	50 (48)
DR 3032/2752	Timbor		85 mm	(40 kg/m ³)	34.8	EL 60		
FD 3032/2732	stud		03 11111	(10 kg/m^3)	54.0			-
	60/60			(40 kg/iii)				
PB 3220/5032	CW 75	ID 12 5 + CW 75 + OD 12 5	100 mm	60 mm	33.6	EL 30	N/A	-
				(30 kg/m ³)				
PB 3973/1183	CW 75	2x GKF12.5 + CW 75 + 12.5 OD	112.5 mm	60 mm	40.2	EI 60	420001276-8	48 (46)
				(50kg/m ³)				
PB 3321/2155	CW 100	2x ID 12.5 + CW 100 + 2x OD 12.5	150 mm	80 mm	65.3	EI 120	N/A	-
				(30kg/m ³)				
PB 3258/1525	CW 50	ID 12.5 + CW 50 + OD 12.5	75 mm	none	31.7	EI 30	N/A	-
PB 3015/2882	CW 75	2x ID 12.5 + CW 75 + 2x OD 12.5	125 mm	60 mm	65.8	EI 120	N/A	-
				(50 kg/m ³)				
PB 3672/6696	CW 50	2x ID 12.5 + CW 50 + 2x OD 12.5	100 mm	none	62.7	EI 90	N/A	-
PB	CW 50	ID 12.5 + CW 50 + OD 12.5	75 mm	none	31.7	EI 30	N/A	-
3054/119/09	014/ 50		75		24.7			
	CW 50	ID 12.5 + CW 50 + OD 12.5	100 mm	none	31.7	-	N/A	-
	CW 100	ID 12.5 + CW 100 + OD 12.5	125 mm	none	31.0	-	N/A N/A	-
	CW 50	GKFi 12.5 + CW 50 + OD 12.5	75 mm	none	26.9	-	420001276-7 +	45 (43)
							insulation	
	CW 75	GKFi 12.5 + CW 75 + OD 12.5	100 mm	none	27	1	AC3-D2-05-XVI	50 (48)
							+ insulation	
abP	CW 100	GKFi 12.5 + CW 100 + OD 12.5	125 mm	none	27.1	EI 30	420001590-9 +	50 (48)
3239/5122						_	insulation	
	CW 50	GKBi 12.5 + CW 50 + OD 12.5	75 mm	none	26		420001276-7 +	45 (43)
						-	insulation	
	CW 75	GKBi 12.5 + CW 75 + OD 12.5	100 mm	none	26.1		AC3-D2-05-XVI	50 (48)
	CW/ 100	CKB: 12.5 + CW 100 + OD 12.5	125 mm		26.2	-	+ insulation	50 (49)
		GRB 12.3 + GW 100 + OD 12.3	123 11111	none	20.2		insulation	30 (40)
	CW 50	2xID 12.5 + CW 50 + 2xOD 12.5	100 mm	none	62.7		N/A	-
	CW 75	2xID 12.5 + CW 75 + 2xOD 12.5	125 mm	none	62.8	1	N/A	-
	CW 100	2xID 12.5 + CW 100 + 2xOD 12.5	150 mm	none	62.9	1	N/A	-
	CW 50	ID 12.5 + GKF 12.5 + CW 50 + GKF 12.5 + OD 12.5	100 mm	none	52.1	1	N/A	-
	CW 75	ID 12.5 + GKF 12.5 + CW 75 + GKF 12.5 + OD 12.5	125 mm	none	52.2		N/A	-
	CW 100	ID 12.5 + GKF 12.5 + CW 100 + GKF 12.5 + OD 12.5	150 mm	none	52.3		N/A	-
	CW 50	2x GKF 12.5 + CW 50 + 2x OD 12.5	100 mm	none	53.1		420001276-8 +	48 (46)
			105			-	insulation	
abP	CW 75	2x GKF 12.5 + CW 75 + 2x OD 12.5	125 mm	none	53.2	F 90-A	AC3-D2-05-XVI	50 (48)
3243/5162	CW/ 100	2x CKE 12 5 + CW 100 + 2x OD 12 5	150 mm	nono	53.3	-		50 (48)
		2X GNT 12.3 + GW 100 + 2X UD 12.3			33.3		+ insulation	50 (40)
	CW 50	2x GKE 12 5 + CW 50 + GKE 12 5 + OD 12 5	100 mm	none	47.3	-	N/A	-
	CW 75	2x GKF 12.5 + CW 75 + GKF 12.5 + OD 12.5	125 mm	none	47.4	-	N/A	-
	CW 100	2x GKF 12.5 + CW 100 + GKF 12.5 + OD 12.5	150 mm	none	47.5	-	N/A	-
	CW 50	ID 12.5 + GKF 12.5 + CW 50 + 2x OD 12.5	100 mm	none	57.9	1	N/A	-
	CW 75	ID 12.5 + GKF 12.5 + CW 75 + 2x OD 12.5	125 mm	none	58	1	N/A	-
	CW 100	ID 12.5 + GKF 12.5 + CW 100 + 2x OD 12.5	150 mm	none	58.1]	N/A	-

GKB = Knauf Standard Gypsum Board

GKBi = Impregnated Gypsum Board

GKF = Fireboard

GKFi = Knauf Impregnated Fireboard ID = AQUAPANEL[®] Cement Board Indoor

OD = AQUAPANEL[®] Cement Board Outdoor

Fire protection

Single stud

Fire	Profile	Measurements from inside to outside	Wall	Insulation	System p	oroperties	S	
resistance			thickness					
					Weight	Fire	Approv. sound	Sound
Approval No					(kg/m²)		insulation*	insulation dB
								$R_{w,P}(R_{w,R})$
	CW 75	2x ID + CW 75 + 2x OD	125 mm	60 mm	65.8		N/A	-
abP				(50kg/m ³)		E 120-A		
3244/5172	CW 100	2x ID 12.5 + CW 100 + 2x OD 12.5	150 mm	60 mm	65.9	1 120-A	N/A	-
				(50 kg/m ³)				
	CW 50	1x ID 12.5 + CW 50 + 1x OD 12.5	75 mm	60 mm	33.3		N/A	-
				(25kg/m ³)				
				or MW				
				40 mm				
				(40 kg/m ³)				
	CW 75	1x ID 12.5 + CW 75 + 1x OD 12.5	100 mm	60 mm	33.4		N/A	-
				(25kg/m ³)				
P 3649/9454				or MW		F 30-A		
				40 mm				
				(40 kg/m ³)				
	CW 100	1x ID 12.5 + CW 100 + 1x OD 12.5	125 mm	60 mm	33.5		N/A	-
				(25kg/m ³)				
				or MW				
				40 mm				
				(40 kg/m ³)				

Double stud

Fire	Profile	Measurements from inside to outside	Wall	Insulation	System p	oropertie	s	
resistance			thickness			1		
Approval No					Weight	Fire	Approv. sound	Sound
					(kg/m²)		insulation*	insulation dB
								$R_{w,P}(R_{w,R})$
	CW 50	2x ID 12.5 + CW 50 + e = 50 mm + CW 50 + 2x OD	200 mm	60 mm	65.2		N/A	-
		12.5		(30 kg/m ³)				
	CW 75	2x ID 12.5 + CW 75 + CW 75 + 2x OD 12.5	200 mm	60 mm	65.4		N/A	-
				(30 kg/m ³)				
	CW 100	2x ID 12.5 + CW 100 + CW 100 + 2x OD 12.5	250 mm	60 mm	65.6		N/A	-
				(30 kg/m ³)				
	CW 50	1xID 12.5 + 1x GKF 12.5 + CW 50 + e = 50 mm +	200 mm	60 mm	58.6]	N/A	-
		CW 50 + 2x OD 12.5		(30 kg/m ³)				
	CW 75	1xID 12.5 + 1x GKF 12.5 + CW 75 + CW 75 + 2x OD	200 mm	60 mm	60.6]	N/A	-
		12.5		(30 kg/m ³)				
	CW 100	1xID 12.5 + 1x GKF 12.5 + CW 100 + CW 100 + 2x	250 mm	60 mm	60.8		N/A	-
D 2650/0464		OD 12.5		(30 kg/m ³)				
P 3050/9404	CW 50	2x GKF 12.5 + CW 50 + e = 50 mm + CW 50 + CW	200 mm	60 mm	55.6	F 90-A	AC3-D2-05 XVIII	62 (60)
		50 + 2x OD 12.5		(30 kg/m ³)				
	CW 75	2x GKF 12.5 + CW 75 + CW 75 + 2x OD 12.5	200 mm	60 mm	55.8]	AC3-D2-05 XVII	58 (56)
				(30 kg/m ³)				
	CW 100	2x GKF 12.5 + CW 100 + CW 100 + 2x OD 12.5	250 mm	60 mm	56		N/A	-
				(30 kg/m ³)				
	CW 50	2x GKF 12.5 + CW 50 + e = 50 mm + CW 50 + 1x	200 mm	60 mm	49.8]	N/A	-
		GKF 12.5 + 1x OD 12.5		(30 kg/m ³)				
	CW 75	2x GKF 12.5 + CW 75 + CW 75 + 1x GKF 12.5 + 1x	200 mm	60 mm	50]	N/A	-
		OD 12.5		(30 kg/m ³)				
	CW 100	2x GKF 12.5 + CW 100 + CW 100 + 1x GKF 12.5 +	250 mm	60 mm	50.2]	N/A	-
		1x OD 12.5		(30 kg/m ³)				

44 Note: e = Distance between studs/profiles of inner and outer shell.

Combination of profile sizes are possible as long as the minimum wall thickness is reached

e. Sound protection

e. Sound protection

Protecting people in living rooms from unreasonable disturbance by sound transmission is the meaning and objective of sound protection. The increasing demand for sound protection in buildings is at the same time raising the demands placed on materials and constructions.

The requirements and verification for noise protection in structural engineering are laid down in DIN 4109. The requirements have been introduced by the building inspectorate and are therefore binding (minimum) requirements. Increased sound protection and sound protection in one's own living and working area may be agreed depending on the planning requirement.

Components meeting the minimum requirements of DIN 4109 can be produced using AQUAPANEL® Cement Board Outdoor. These minimum requirements can be verified by adequately testing the components. The requirements are made in the form of necessary evaluated sound insulation measures (R'_) for airborne sound emissions and necessary (i.e. maximum permissible) evaluated standard impact sound levels (L', w) for impact sound insulation. The exterior wall is evaluated as a total construction including the windows. The DIN requirements are formulated as $R'_{w,res}$ -values. They give the required, resultant sound insulation measure of the exterior component while taking into account the entire exterior services of wall and windows. The values required in DIN are increased or reduced depending on the respective ratio of the entire exterior surface of the room to its floor space. The requirements for airborne sound insulation by exterior components are geared to the respective exterior noise level. Depending on the space category they come to required. R' = 30-50 dB for the resultant sound insulation by external walls including windows and for the wall portion alone between 30 and 60 dB depending on the existing window surface. In residential areas a resultant sound insulation measure of R' = 35 dB is often sufficient. In noisy residential areas a maximum R', value of 60 dB may be necessary. DIN 4109, Supplement 2 even suggests a value of R' = 67 dB for increased sound protection for house separating walls between single family semi-detached or terraced houses. Curtained façades normally have a positive impact on sound protection, provided the gap between the curtain layer and the actual wall is at least 40 mm. With smaller gaps unpleasant resonances may arise.

Note: The above information is based on the German national DIN standard and is given as a reference for sound and insulation requirements for a project. Other national or local requirements may differ.

Sound protection

Single stud

Sound insulation	Profile	Measurements from inside to outside	Wall thick-	Insulation	System properti	es
Approval No			mm	Weight	Weight [kg/m²]	Sound
						insulation dB
						$R_{_{w,P}}(R_{_{w,R}})$
420001276-7	CW50	1x GKF+CW50+1x OD	75	50 mm	28	45 (43)
				(MW 22 kg/m ³)		
420001276-8	CW50	2x GKF+CW50+1x OD	87.5	50 mm	38.2	48 (46)
				(MW 22 kg/m ³)		
AC3-D2-05 XVI	CW75	2x GKB+CW75+1x OD	112.5	40 mm (40 kg/m ³)	37	50 (48)
420001590-9	CW100	1x GKF+CW100+1x OD	125	80 mm (14 kg/m ³)	28.2	50 (48)
AC3-D2-05 XIX	CW100	2x GKB+CW100+1x OD	137.5	40 mm (40 kg(m ³)	35.5	50 (48)
AC3-D2-05 XXI	CW100	2x GKB (GKB15 mm)+CW100+1x OD	142.5	40 mm (40 kg/m ³)	29.7	51 (48)

Double stud

Sound insulation	Profile	Measurements from inside to outside	Wall thick- ness	Insulation	System properti	es
Approval No			mm	Weight	Weight [kg/m²]	Sound insulation dB R _{w,P} (R _{w,R})
420001276-6	CW 50	1x GKF+CW50+e=120 mm+CW50+12.5 (fish plated)	245	2x 50 mm (22 kg/m ³)	29.8	53 (51)
5,013,871	MC48+CW50	1x GKB (15 mm)+MC48+e=39,5 mm+CW50+1x OD	165	2x 40 mm (40 kg/m ³)	31.8	52 (50)
AC3-D2-05-XVIII	MC48+CW75	2x GKB+MC48+e=20 mm+CW75+1x OD	180.5	40 mm + 60 mm (40 kg/m ³)	40.1	62 (60)
AC3-D2-05-XXII	MC48+CW100	2x GKB+MC48+e=20 mm+CW100+1x OD	205.5	3x 40 mm (40 kg/m ³)	41	64 (62)
AC3-D2-05-XXIII	MC48+CW100	2x GKB (15 mm)+MC48+e=20 mm+CW100+1x OD (with basecoat)	210.5	3x 40 mm (40 kg/m ³)	44.8	65 (63)
AC3-D2-05-XXIV	MC48+CW100	2x GKB (15 mm)+MC48+e=20 mm+CW100+1x OD (with render)	210.5	3x 40 mm (40 kg/m ³)	44.8	66 (64)
AC3-D2-05-XVII	MC70+CW75	1x GKB (15 mm)+MC70+GKB12.5+20 mm+CW75+1x OD	205	2x 60 mm (40 kg/m ³)	42.9	58 (56)
AC3-D2-05-XX	MC70+CW100	1x GKB (15 mm)+MC70+GKB12.5+20 mm+CW100+1x OD	230	60 mm (40 kg/m ³) + 2x 40 mm (40 kg/m ³)	43.8	61 (59)
420001276-9	Timber 60/120	1x GKF+1x Vidiwall(15 mm)+HS 120+1x Vidiwall (15mm)+1x OD	175	120 mm (26 kg/m ³)	65,7*	47 (45)
420001276-10	Timber 60/120	1x GKF+HS 120+1x Vidiwall (15 mm)+2x Battens 30mm+ 1x OD	220	120 mm (26 kg/m³)	57,7*	50 (48)
PB 0093-09- P 138	CW75+CW150	2x GKB+CW75+40 mm+CW150+1x OD (fishplated with a=416 mm)	302.5	140 mm (18 kg/m ³) + 40 mm (15 kg/m ³)	30.4	58 (56)
PB 0092-09 - P 138	CW75+CW150	2x GKB+CW75+40 mm+CW150+1x OD (fishplated with a=625 mm)	302.5	140 mm (18 kg/m ³) + 40 mm (15 kg/m ³)	30.2	60 (58)

* weight without timber batten/beam material

In case of fire resistance the dimension of the wall (thickness) or the dimension of single wall components could always be increased. Further the dry density of the insulation can be increased (acc. EN1364-1). In case of sound insulation note the following: an increased wall thickness (with increased dimensions of the wall components) always benefits the system (excluding an increased material thickness of the stud). A flow resistance of >= 5 for the insulation material is always a benefit for the system in case of sound issues. An increased dry density of the insulation could downgrade the sound performance of the system.

Weight of components	kg/m	Board type	kg/m²
CW 50	0.70	GKB 12.5 mm	9.3
CW 75	0.80	GKF 12.5 mm	10.2
CW 100	0.90	GKF 15 mm	13.3
CW 125	0.95	Diamant 12.5 mm	12.8
CW 150	1.00	Diamant 15 mm	16.0
		Vidiwall 12.5 mm	15.0
		Vidiwall 15 mm	18.2

f. System properties

System properties

European technical approval, declared product life

ETA-07/0173	European Technical Approval ETA-07/0173 for AQUAPANEL® Cement Board Outdoor declared product
	life of 50 years

Serviceability and freeze-thaw cycle resistance

Report no. EOTA 01.1.01/1	Tested serviceability of ventilated systems, including climate chamber tests (according to EOTA standard)
Report no. EOTA 02.1.15/1	Tested serviceability in directly-applied systems including climate chamber tests (according to EOTA
	standard)
Freeze/thaw cycle resistance	according to: EN 12467

Impact resistance

Report no. 220004884	Impact tests of AQUAPANEL® Cement Board Outdoor (according to BS 8200)
Impact tests of AQUAPANEL® Cement Board	Testing of AQUAPANEL® Cement Board Outdoor (according to ASTM Standard C 1325-04)
Outdoor(according to BS 8200)	
Testing of AQUAPANEL® Cement Board Outdoor	Certified hygrothermal behaviour of AQUAPANEL Cement Board Outdoor of Scientific Centre for Building
(according to ASTM Standard C 1325-04)	Techniques, France (CSTB)

Ecology and sustainablity

Certificate of mold resistance, material safety and	Expert assessment of building biology and mold resistance for AQUAPANEL® Cement Board Outdoor and
hygiene of AQUAPANEL® Cement Board Outdoor and	AQUAPANEL® Cement Board Indoor
AQUAPANEL [®] Cement Board Indoor	Certified and recommended according to the criteria of the Institute for Building Biology in Rosenheim,
	Germany (IBR) as part of the IBR report no. 3008-008
Certificate of material safety and hygiene of	Certified and recommended according to the criteria of the Institute for Building Biology in Rosenheim,
Knauf Gypsum Board	Germany (IBR)
Environmental Exterior Wall System Certificate of	Environmental Exterior Wall System Certificate according to the Life Cycle Assessments for Environmental
Knauf AQUAPANEL [®] Exterior Wall	Product Declarations (EPD) acc. to ISO 14025
	Calculation of the CO ₂ output and the primary energy consumption for the Knauf AQUAPANEL®
	Exterior Wall
	Project: IAL-10-0356 (WESSLING Beratende Ingenieure GmbH, Germany)
Environmental Product Declaration (EPD) of	Registered for sustainable building at the Institute of Construction and Environment, Königswinter, Germany
AQUAPANEL [®] Cement Board Outdoor and	(IBU) under the declaration number EPD-KNA-2010111-D
AQUAPANEL [®] Cement Board Indoor	The Environmental Product Declaration is developed according to ISO 14025, Type III
Blauer Engel product label of Knauf Insulation glass	Certified for environmental friendliness and free from hazardous substances (formaldehyde-free bonding
mineral wool materials	material ECOSE® for most glass mineral wool insulation materials)

System properties

Features of exterior wall components

AQUAPANEL® Cement Board Outdoor

Physical properties	
According to ETA-07/0173	
Min. bending radius for 900/1200 mm wide board (m)	3
Min. bending radius for 300 mm wide strip (m)	1
Dry bulk density (kg/m ³) according to EN 12467	approx. 1150
Bending strength (MPa) according to EN 12467	9.6
Tensile strength perpendicular to the plane of the board (N/mm ²) according	0.65
to EN 319	
Shearing strength (N) according to EN	607
pH-value	12
E-modulus (N/mm ²)	арргох. 4000-7000
Thermal conductivity (W/mK) according to EN ISO 10456	0.35
Thermal expansion (10 ⁻⁶ K)	7
Water vapour diffusion resistance μ (-) according to EN ISO 12572	66
Length variation 65% - 85% humidity (mm/m) according to EN 318	0.23
Thickness variation 65% - 85% humidity (mm/m) according to EN 318	0.2
Building material class according to EN 13501	A1, non-combustible

AQUAPANEL® Cement Board Outdoor Climateshield

Physical properties				
Weight per unit area (kg/m ²)	approx. 11			
Dry density (kg/m ³)	approx. 1375			
Building material class acc. to EN 13501	A1, non-combustible			

* Driving rain protection limit for building envelope made with the AQUAPANEL® Cement Board Outdoor Climateshield system is 0-300 Pa according to SP method (SP Technical Research Institute of Sweden), according to EN 12865.

Standard Gypsum Board

Physical properties	
Board type acc. EN 520	A

Impregnated Gypsum Board

Physical properties	
Board type acc. EN 520	H2

Fireboard

Physical properties	
Density (kg/m³)	≥ 780
Min. bending radius (m)	4 - 50
Bending tensile strength (Fireboard 20 mm) (N/mm ²)	parallell: approx. 4.9
	perpendicular: approx. 1.8
Water vapour diffusion coefficient acc. EN 12524, Table 1 (µ)	10
Thermal conductivity acc. EN 12524, Table 1 (λ) (W/mK)	0.25
Building material class acc. EN 13501	A1, non-combustible

System properties

Massivbauplatte

Physical properties		
Board type acc. EN 520	DF / DFH2	
Building material class acc. EN 13501	A2	

AQUAPANEL® Cement Board Indoor

Physical properties	
According to ETA-07/0173	
Min. bending radius for 900/1200 mm wide board (m)	3
Min. bending radius for 300 mm wide strip (m)	1
Dry bulk density (kg/m ³) according to EN 12467	approx. 1050
Bending strength (MPa) according to EN 12467	8.75
Tensile strength perpendicular to the plane of the board (N/mm ²) according to EN	0.49
319	
Shearing strength (N) according to EN	696
pH-value	12
Thermal conductivity (W/mK) according to	0.35
EN ISO 10456	
Thermal expansion (10 ⁻⁶ K)	7
Water vapour diffusion resistance μ (-) according to EN ISO 12572	50
Length variation 65% - 85% humidity (mm/m) according to EN 318	0.25
Thickness variation 65% - 85% humidity (%) according to EN 318	0.1
Building material class according to EN 13501	A1, non-combustible

System properties

Diamant Hard Gypsum Board

Physical properties	
Board type acc. EN 520	DFH2IR
Characteristic compressive strength perpendicular (N/mm ²)	approx. 10
Bending E-Modulus (N/mm²)	approx. 3500
Building material class acc. EN 13501	A2-s1,d0 (B)

Silentboard

Physical properties		
Board type acc. EN 520	DF	
Building material class acc. EN 13501	A2	

Vidiwall Gypsum Fibre Board

Physical properties	
Density (kg/m³)	≥ 1050
Compression strength (N/mm ²)	~ 25
Bending tensile strength (N/mm ²)	≥ 5,8
Bending E-Modulus (N/mm ²)	3900
Water vapour diffusion coefficient (µ)	~ 21
Thermal conductivity λ (W/mK)	0,30
Building material class acc. DIN EN 13501	A2; A2-s1, d0

Profiles

Physical properties	
acc. to DIN 18182-1. Accessories for use with gypsum plasterboards — Part 1: Steel plate sections	

Insulation

Physical properties

acc. to EN 13162. Thermal insulation products for buildings - Factory made mineral wool (MW) products