

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-23/0117
of 4 June 2024

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Ventilated facade system with KeraTwin K20 ceramic
cladding and associated products

Product family
to which the construction product belongs

Kits for external wall claddings, mechanically fixed

Manufacturer

AGROB BUCHTAL GmbH
Buchtal 1
92521 Schwarzenfeld
DEUTSCHLAND

Manufacturing plant

Plant 1

This European Technical Assessment
contains

44 pages including 38 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 090062-01-0404

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Specific Part

1 Technical description of the product

"KeraTwin K20" kit for ventilated external wall claddings complies with the family C of EAD 090062-01-0404. The cladding kit consisting of cladding elements (ceramic façade panels) mechanically fastened to the subframe by metal clips as listed in section 2 of this document. The "KeraTwin K20" ceramic facade panels are factory-equipped with suspension grooves or channels, which are to be used for the planned attachment to the fasteners (assembly kit components).

KeraTwin K20 kit for ventilated external wall claddings consists of:

- Cladding element: ceramic tiles acc. EN 14411; formats of ceramic tiles are from 150 mm to 600 mm in 25 mm steps in heights and 350 mm to 1800 mm in lengths; nominal thickness is 20 with a maximum thickness of 25 mm; two formats are assessed: 1342 x 505 x 21 mm and 1792 x 605 x 21 mm (smaller tiles may be used)
- Cladding fixing: single clamps + double clamps; hooks + double hooks
- Subframe: extruded aluminium profiles section T60/52/2 (clamp fixing) and extruded aluminium profiles section T80/52/2 (rail fixing)

Detailed information and data of all the components are given in the annexes of this ETA and in the associated test reports to this ETA.

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

KeraTwin K20 kit is intended to be used as external wall claddings in ventilated façades (rainscreens). The walls are made of masonry (clay, concrete or stone), concrete (cast on site or as prefabricated panels), timber or metal frame in new or existing buildings (retrofit). The characteristics of the walls shall be verified prior to use of the KeraTwin K20 kit, especially regarding conditions for reaction to fire classification and for mechanical fixing. The fire-classification is valid if the insulation layer placed in the ventilated air space is made of non-combustible material (mineral wool) or if the layer behind the cladding elements is a mineral substrate like masonry or concrete (A1 or A2-s1, d0).

The provisions made in this European Technical Assessment are based on an assumed working life of at least 25 years for KeraTwin K20. 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.

KeraTwin K20 kit is made of non-load bearing construction components. They do not contribute directly to the stability of the wall on which they are installed, but they can contribute to its durability by providing enhanced protection from the effect of weathering. The kit is not intended to ensure the airtightness of the building envelope.

Detailed information and data regarding design, installation, maintenance and repair criteria are given in Annex A and B.

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

3.1 Safety in case of fire (BWR 2)

No	Essential characteristic	Performance
1	Reaction to fire of the cladding elements (ceramic boards), of the aluminium profiles (subframe) and of the metallic fixings	Class A1 accord. to EN 13501-1
2	Façade fire performance	Not assessed
3	Propensity to undergo continuous smouldering	Not assessed

3.2 Hygiene, health and the environment (BWR 3)

No	Essential characteristic	Performance
4	Watertightness of joints (protection against driving rain)	Not watertight (open joints)
5	Water absorption	Not relevant ¹
6	Water vapour permeability (for non-ventilated façades)	Not relevant (kit for ventilated façades)
7	Drainability	Not assessed (See Annex A1)
8	Content, emission and/or release of dangerous substances	See Annex C3

¹ Water absorption acc. EN 14411 (DoP for the ceramic tiles)

3.3 Safety and accessibility in use (BWR 4)

No	Essential characteristic	Performance
9	Wind load resistance	See Annex C1 – C2
10	Resistance to horizontal point loads	Not assessed
11	Impact resistance	Not assessed
12 to 15	Mechanical resistance (*) Cladding elements (see Table 2.1.2 of EAD 090062-01-0404)	
12	Bending strength (acc. EN 14411)	20 N/mm ² (average minimum) 18 N/mm ² (individual minimum)
13	Resistance of grooves	490 N (characteristic value) 535 N (mean value)
14	Resistance at clamp holes	732 N (characteristic value) 815 N (mean value)
15	Resistance to long term or dead load (Creep test) (*)	Not assessed
16 to 21	Mechanical resistance (*). Connexion between the cladding elements and the cladding fixings (see Table 2.1.2 of EAD 090062-01-0404)	
16	Pull-through resistance	Not relevant (for kit family C)

No	Essential characteristic	Performance
17	Pull-through resistance under shear loads	Not relevant (for kit family C)
18	Axial tension resistance	Not relevant (for kit family C)
19	Shear load resistance	Not relevant (for kit family C)
20	Combined tension and shear load resistance (**)	Not relevant (for kit family C)
21	Resistance of slot	Not relevant (for kit family C)
22 to 24	Mechanical resistance (*). Cladding fixings (see Table 2.1.2 of EAD 090062-01-0404)	
22	Resistance to vertical load	See Annex C4
23	Pull-through resistance of fixings from profile	See Annex C4
24	Resistance of punctual cladding fixings – metal clip	See Annex C4
25	Resistance of profiles (*)	Not assessed
26	Tension/pull-out resistance of subframe fixings (*)	Not assessed
27	Shear load resistance of subframe fixings (*)	Not assessed
28	Brackets resistance (horizontal and vertical load) (*)	Not assessed
29	Resistance to seismic loads. Out-of-plane fundamental vibration period	Not assessed
30	Resistance to seismic loads. Out-of-plane acceleration	Not assessed
31	Resistance to seismic loads. In-plane displacement	Not assessed
(*) Only relevant for cladding kits which contain horizontal or sloped surfaces for the use in external ceilings or cornices (not roofs).		
(**) Only relevant for cladding kits which contain sloped surfaces for the use of external walls, ceilings, or cornices (not roofs).		

3.4 Protection against noise (BWR 5)

No	Essential characteristic	Performance
32	Airborne sound insulation	Not assessed

3.5 Energy economy and heat retention (BWR 6)

No	Essential characteristic	Performance
33	Thermal resistance	Not assessed

3.6 Aspects of durability and serviceability

No	Essential characteristic	Performance
34	Hygrothermal behaviour	Not relevant
35	Behaviour after pulsating load	Not assessed
36	Freeze-thaw resistance	Not assessed ¹
37	Behaviour after immersion in water	Not assessed
38	Dimensional stability by humidity	Not assessed
39	Linear thermal expansion	Not assessed
40	Chemical and biological resistance	Not assessed
41	UV radiation resistance	Not assessed
42	Corrosion	Not assessed
43 to 55	Accelerated ageing behaviour of kits when the cladding element is made of thin metallic composite sheets/panels (TMCS/TMCP)	Not assessed
¹ passed acc. EN 14411 (DoP for the ceramic tiles)		

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

The applicable European legal act is Commission Decision: [2003/640/EC].
 System of attestation of conformity applicable to cladding kit is: 2+
 System of attestation of conformity applicable to this cladding kit with ceramic tiles with respect to reaction to fire is: 4

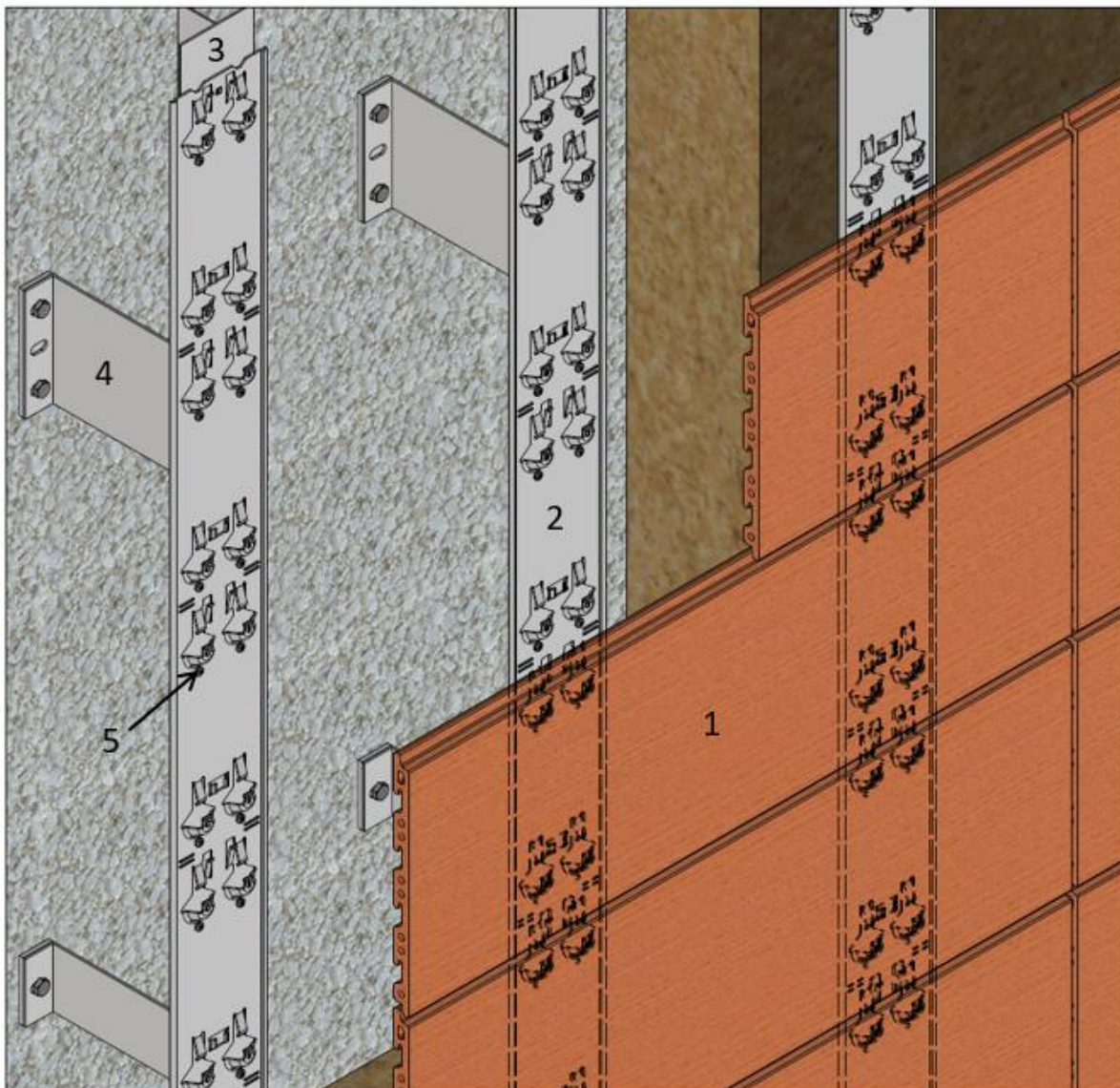
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

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 4 June 2024 by Deutsches Institut für Bautechnik

Renée Kamanzi-Fechner
 Head of Section

beglaubigt:
 Beckmann

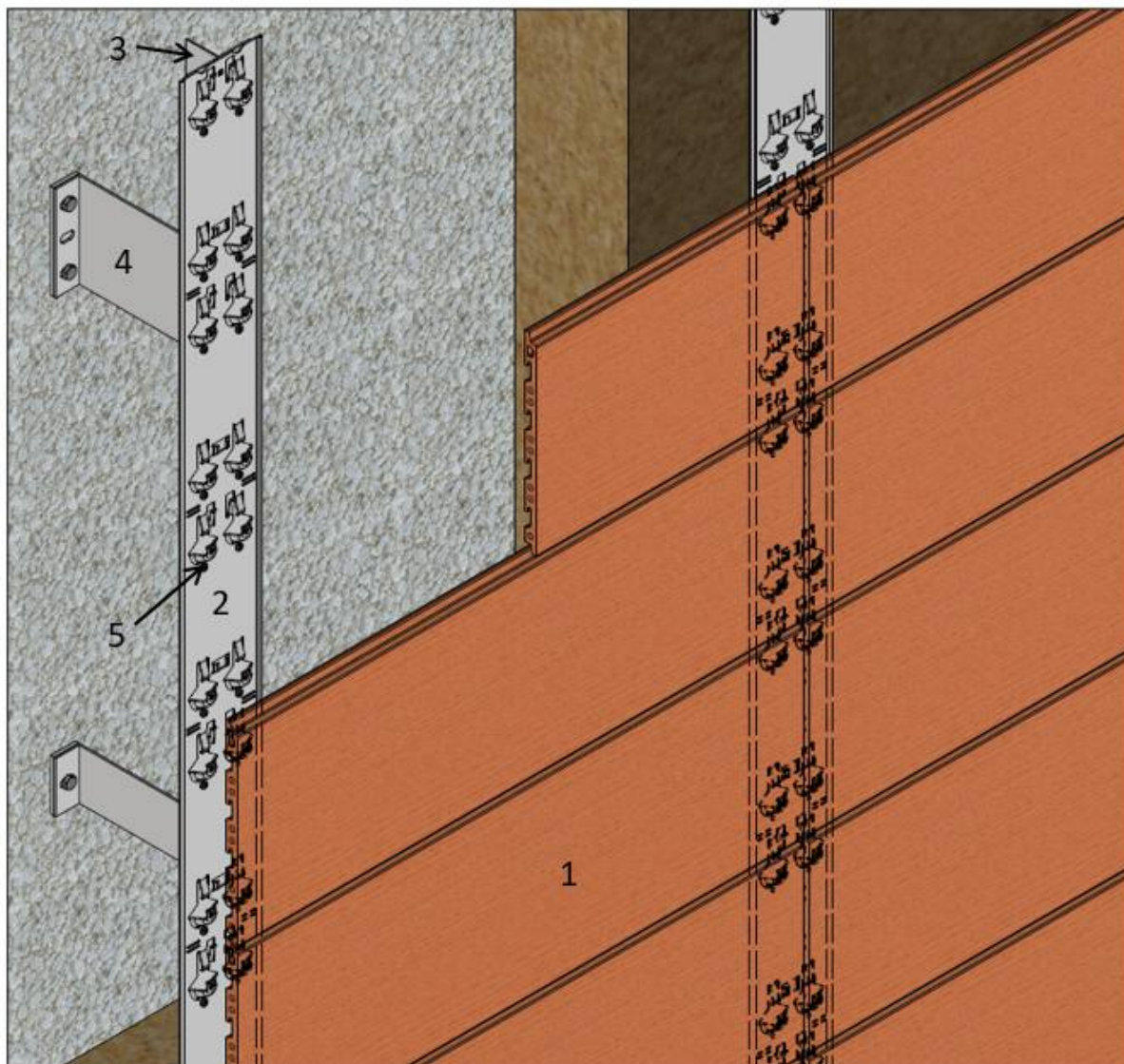


- 1 – KeraTwin[®] K20 - Panel
- 2 – Vertical system rail Art.-Nr.: 625
- 3 – Vertical bearing profile
- 4 – Aluminium wall bracket
- 5 – A4-Stainless steel screw Art.-Nr.: 659-01 /
Al-rivet Art.-Nr.: 658

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Installed KeraTwin K20 Panel with vertical system rail 625

Annex A 1

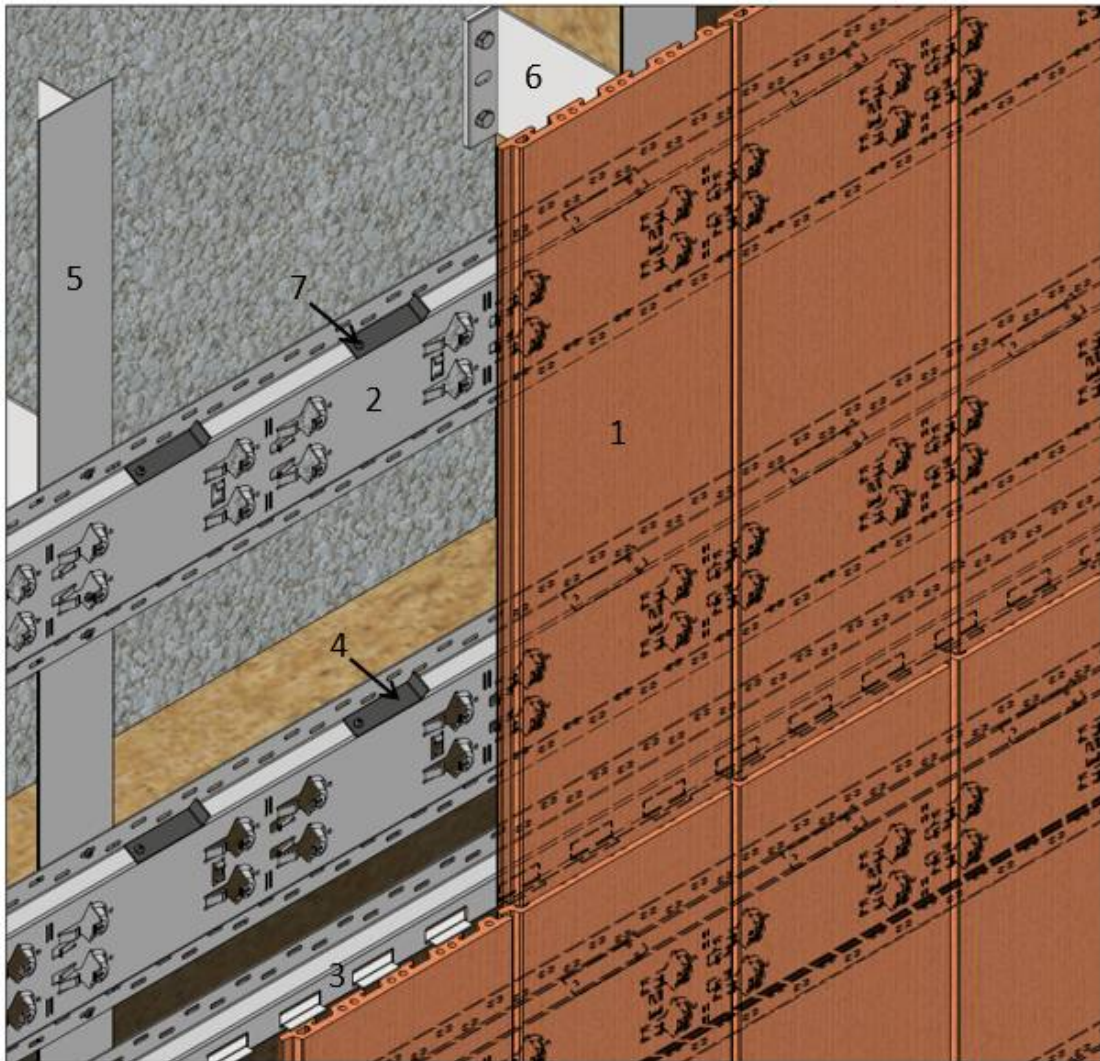


- 1 – KeraTwin[®] K20 - Panel
- 2 – Vertical system rail Art.-Nr.: 620
- 3 – Vertical bearing profile
- 4 – Aluminium wall bracket
- 5 – A4-Stainless steel screw Art.-Nr.: 659-01 /
Al-rivet Art.-Nr.: 658

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Installed KeraTwin K20 Panel with vertical system rail 620

Annex A 2



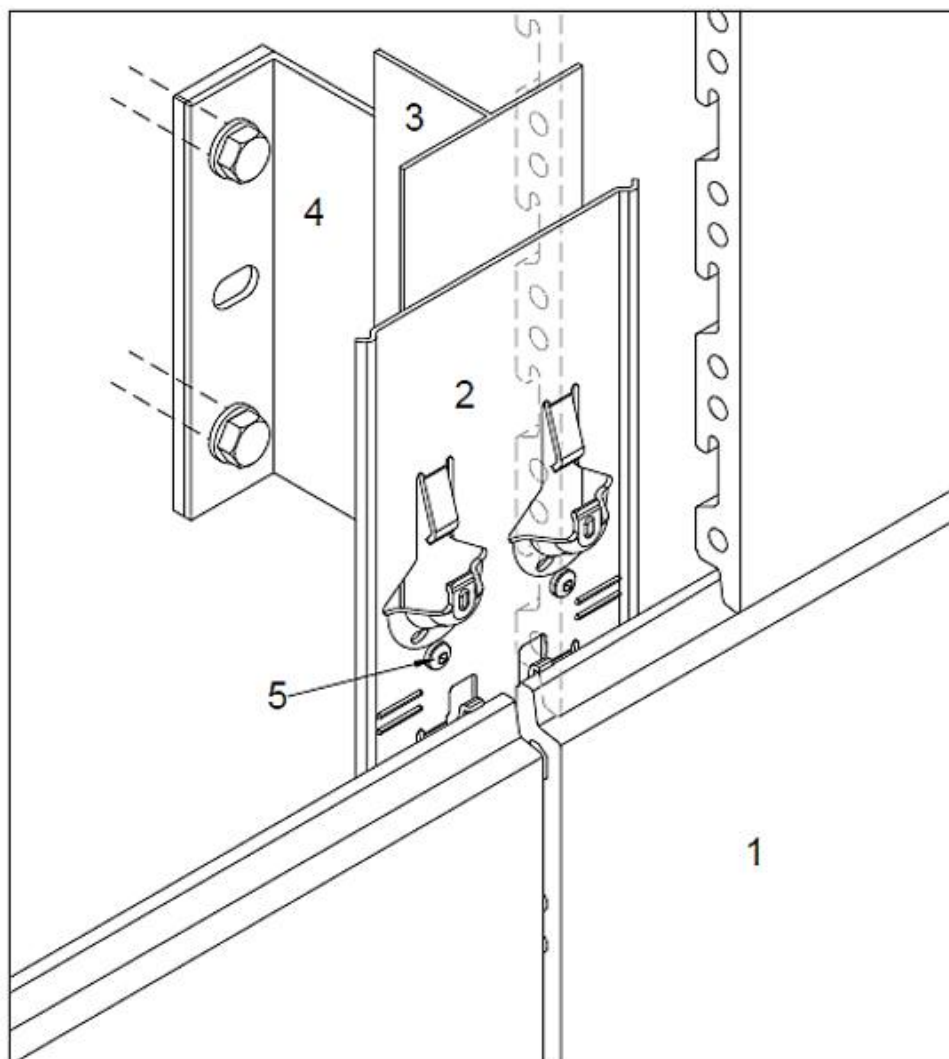
- 1 – KeraTwin® K20 - Panel
- 2 – Omega system rail K20 Art.-Nr.: 627
- 3 – Support profile omega S Art.-Nr.: 710
- 4 – Securing angle Art.-Nr.: 711 / Alternative: R-clamp K20 Art.-Nr.: 684-SK-01
- 5 – Vertical bearing profile
- 6 – Aluminium wall bracket
- 7 - A4-Stainless steel screw Art.-Nr.: 659-01 /
Al-rivet Art.-Nr.: 658

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description

Installed KeraTwin K20 Panel with horizontal omega system rail 627

Annex A 3



- 1 – KeraTwin® K20 - Panel
- 2 – Vertical system rail Art.-Nr.: 620 / 625
- 3 – Vertical bearing profile
- 4 – Aluminium wall bracket
- 5 – A4-Stainless steel screw Art.-Nr.: 659-01 /
Al-rivet Art.-Nr.: 658

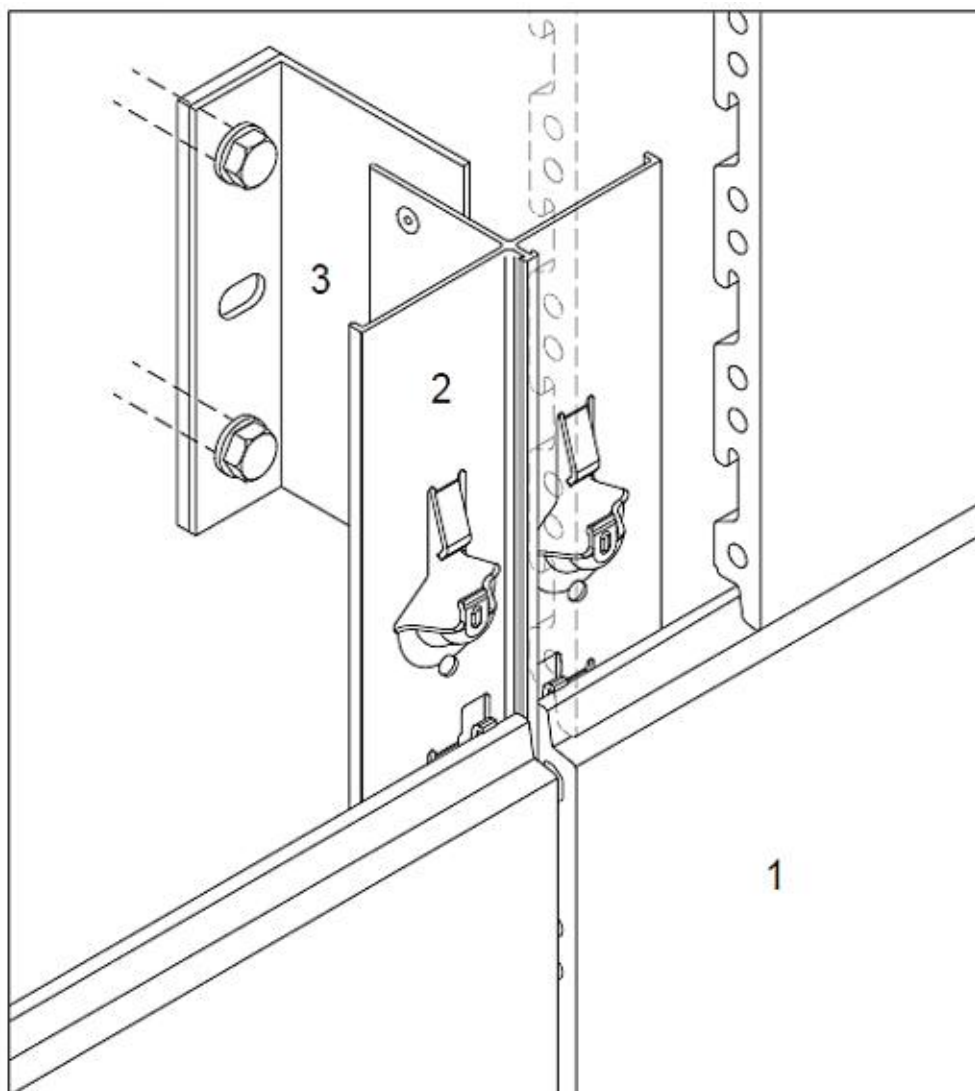
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description

System scheme – System rail fixing

Installation as single span girder without cantilever on vertical system rails

Annex A 4



- 1 - KeraTwin® K20 - Panel
- 2 - T-rail K20 Art.-Nr.: 698
- 3 - Aluminium wall bracket

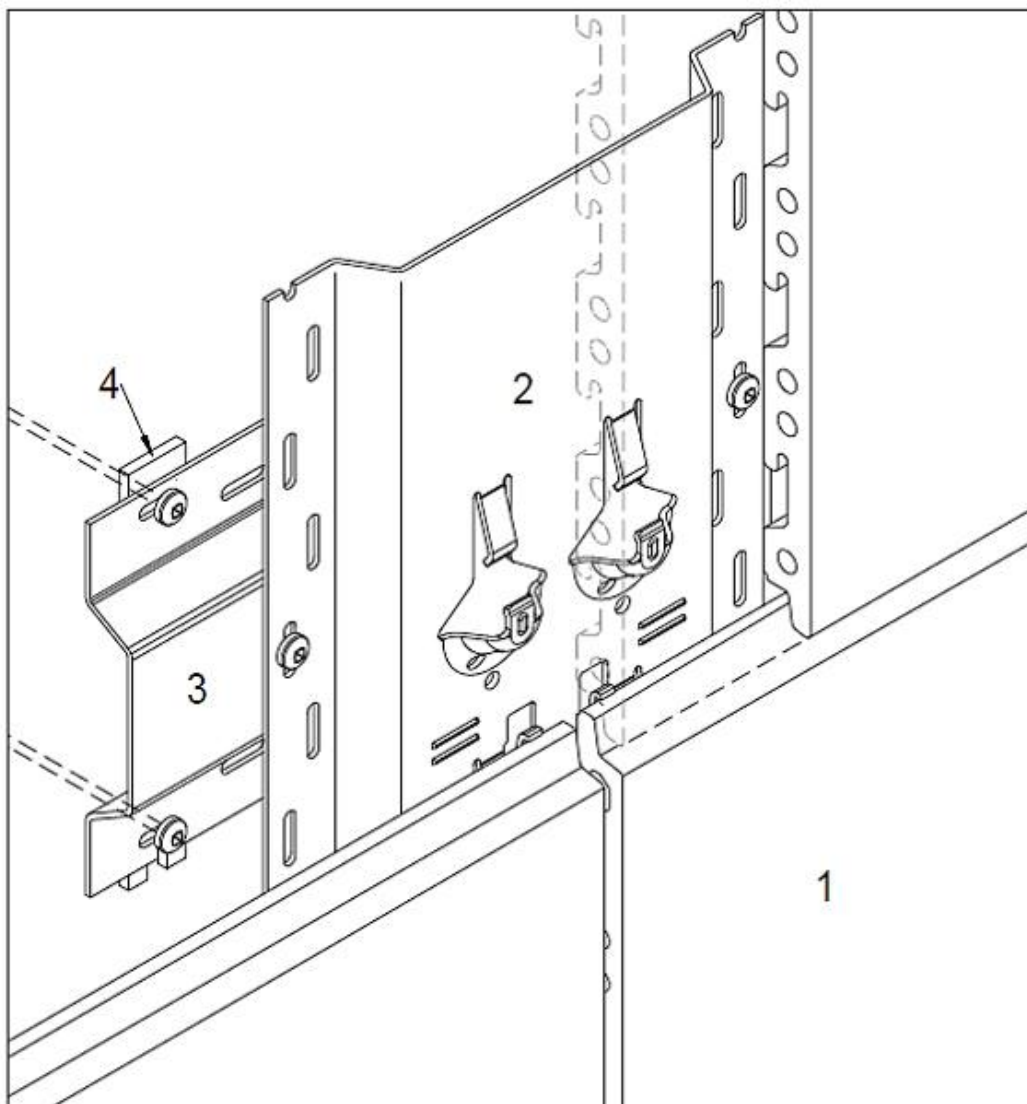
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description

System scheme – T-profile fixing

Installation as single span girder without cantilever on vertical t-profiles

Annex A 5



- 1 - KeraTwin® K20 - Panel
- 2 - Vertical omega system rail Art.-Nr.: 624 / 627
- 3 - Hat profile
- 4 - Distance disc

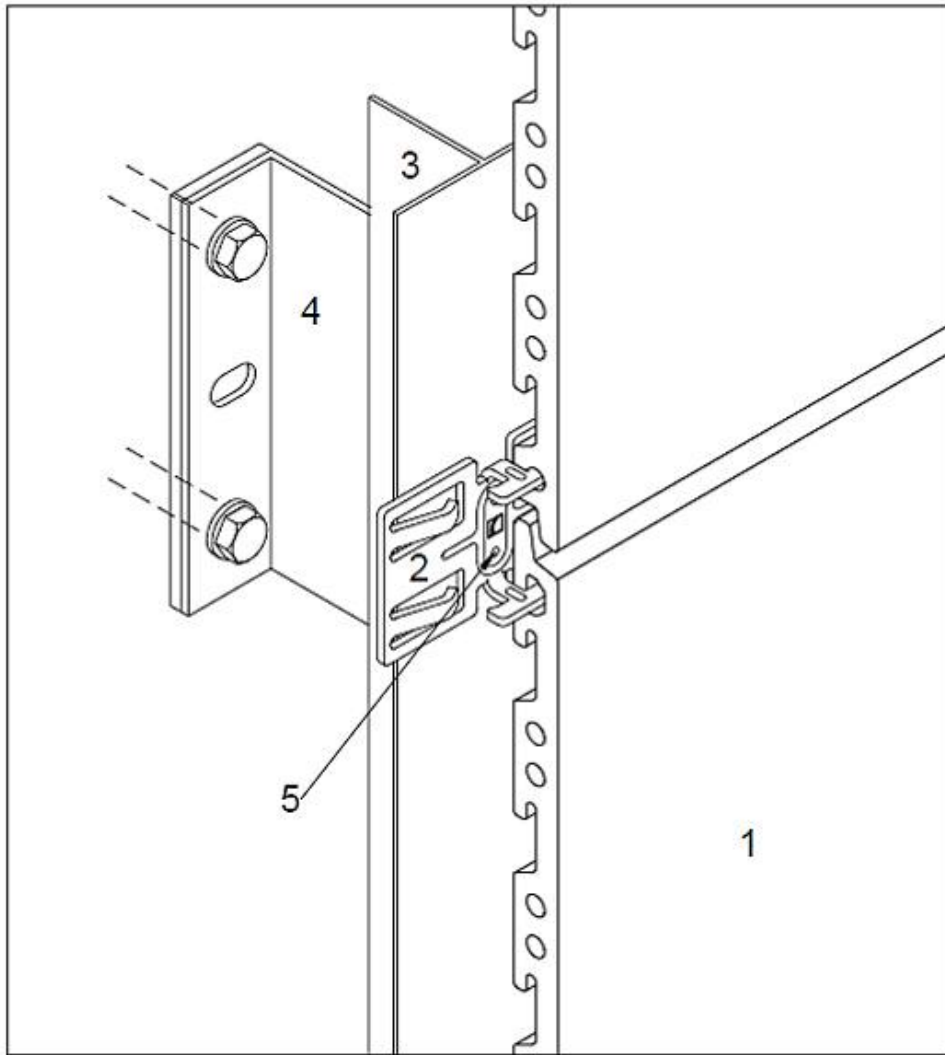
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description

System scheme – Omega system rail

Installation as single-span girder without cantilever on vertical omega system rail

Annex A 6



- 1 - KeraTwin® K20 - Panel
- 2 - Fastening clamp system K20 Art.-Nr.: 680
- 3 - Vertical bearing profile
- 4 - Aluminium wall bracket
- 5 - Stainless steel rivet Art.-Nr.: 675 /
A2-stainless steel screw Art.-Nr.: 657

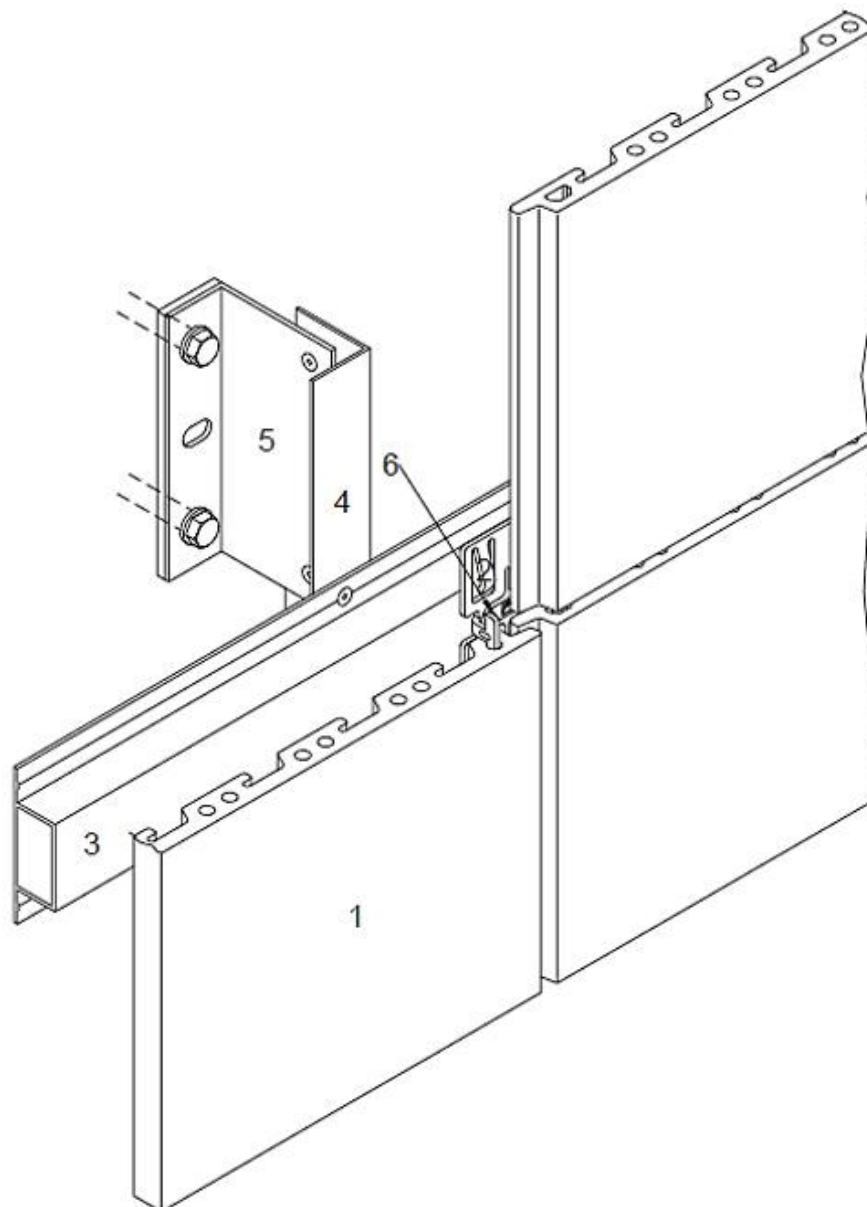
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description

System scheme – clamps

Installation as single-span girder without cantilever with clamps – horizontal laying

Annex A 7



- 1 - KeraTwin® K20 - Panel
- 2 - Fastening clamp system K20 Art.-Nr.: 680
- 3 - Horizontal bearing profile
- 4 - Vertical bearing profile
- 5 - Aluminium wall bracket
- 6 - Stainless steel rivet Art.-Nr.: 675 /
A2-stainless steel screw Art.-Nr.: 657

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description

System scheme – clamps

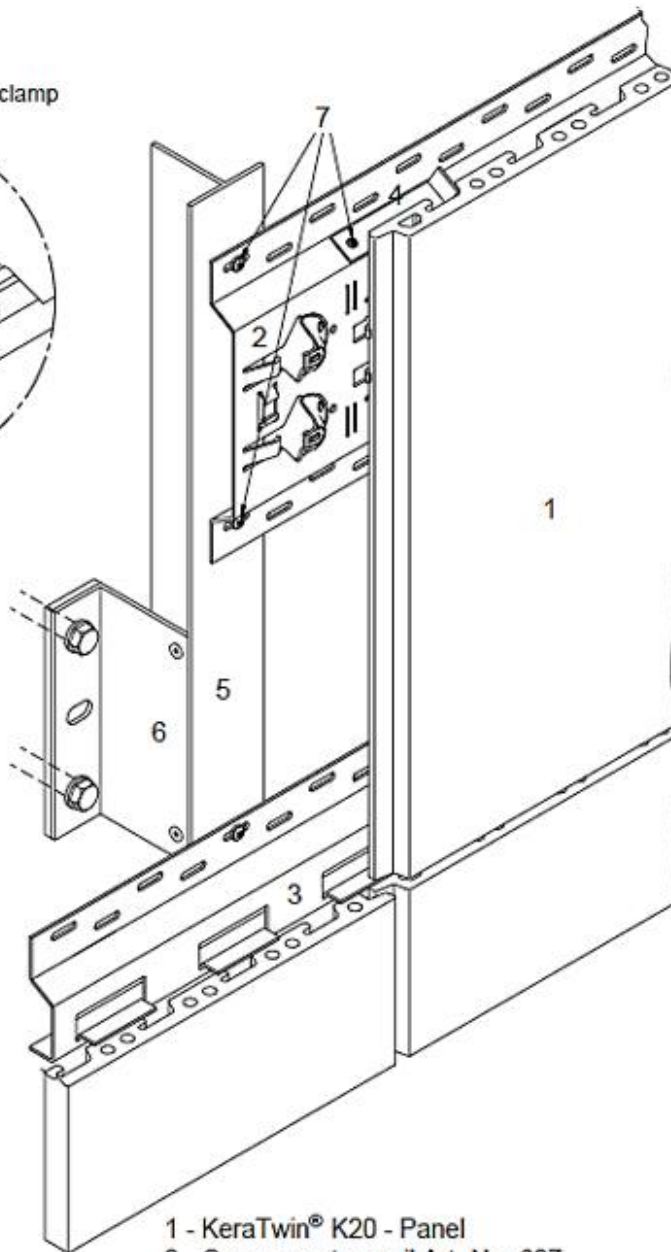
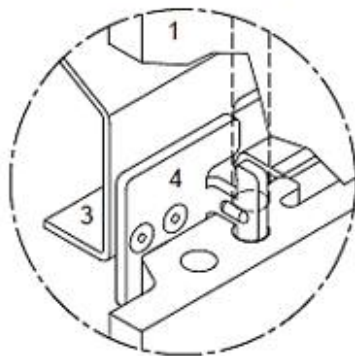
Installation as single-span girder without cantilever with clamps – vertical laying

Annex A 8

System scheme – Omega system rails and support profile

Installation as single-span girder with cantilever on both sides on horizontal omega system rails and support profiles – vertical laying

Alternative:
Position securing with R-clamp



- 1 - KeraTwin® K20 - Panel
- 2 - Omega system rail Art.-Nr.: 627
- 3 - Support profile Omega S Art.-Nr.: 710
- 4 - Securing angle Art.-Nr.: 711 / Alternative:
R-clamp K20 Art.-Nr.: 684R
- 5 - Vertical bearing profile
- 6 - Aluminium wall bracket
- 7 - A4 Stainless steel screw Art.-Nr.: 659-01 /
Al-rivet Art.-Nr.: 658

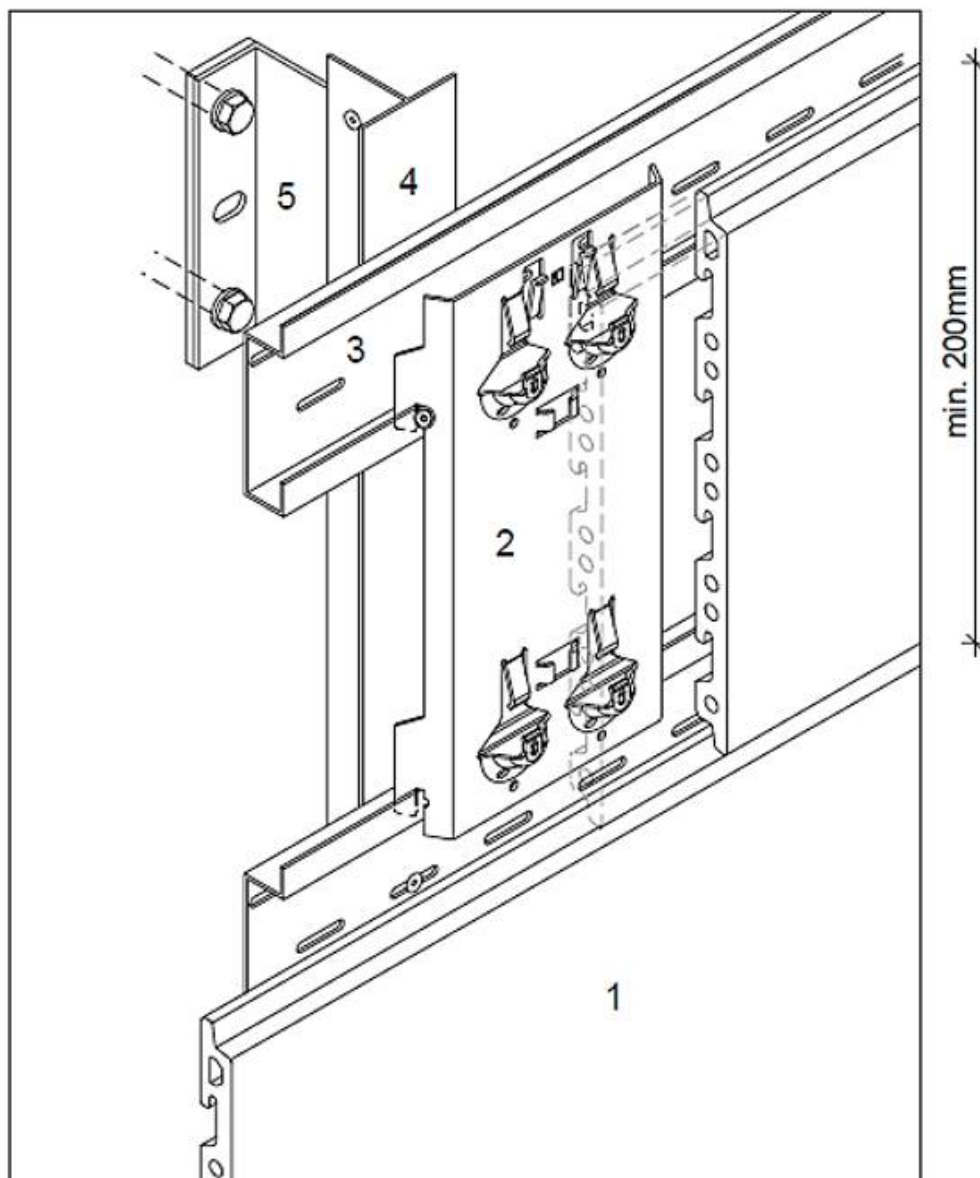
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description

System scheme – Omega system rails and support profile

Installation as single-span girder with cantilever on both sides on horizontal omega system rails

Annex A 9



- 1 - KeraTwin® K20 Panel
- 2 - Omega V rail Art.-Nr.: 700 / 701
- 3 - Horizontal system rail Art.-Nr.: 597-01
- 4 - Vertical bearing profile
- 5 - Aluminium wall bracket

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

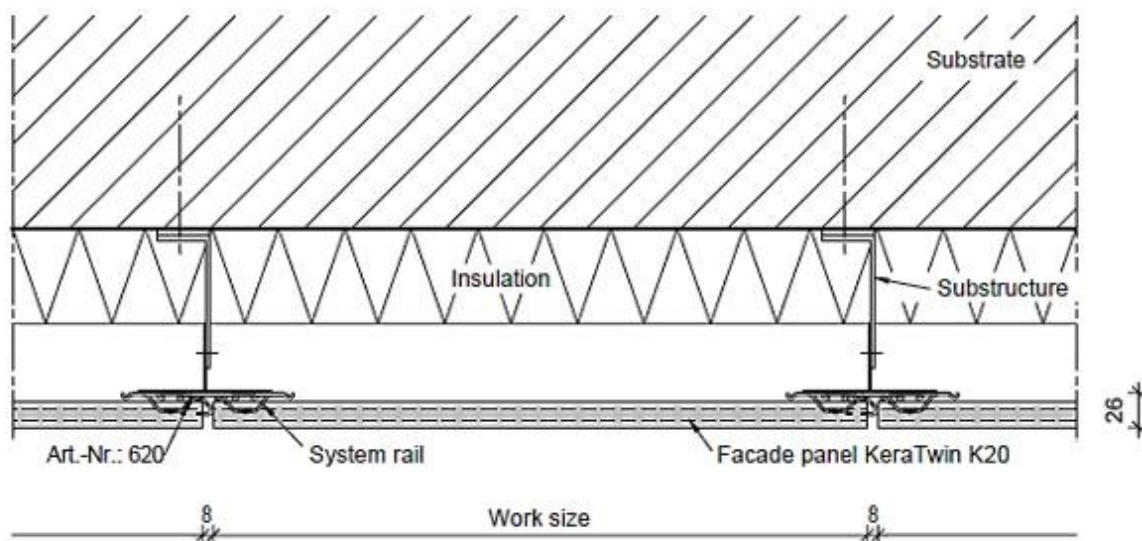
Product description

System scheme – OmegaV-rails for bond layer

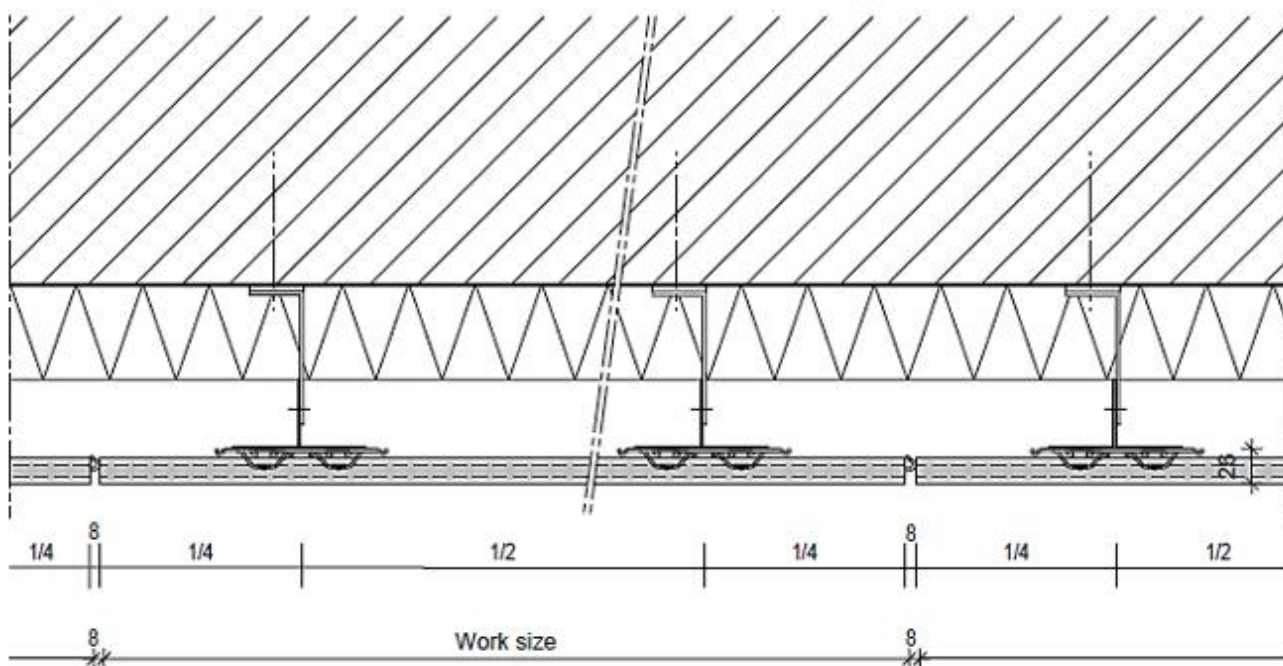
Installation as single span girder without cantilever with OmegaV-rails

Annex A 10

Facade panel as single-span girder without cantilever



Facade panel as single-span girder with cantilever on both sides* ($L_K = 1/4 L$ with $L =$ panel length)

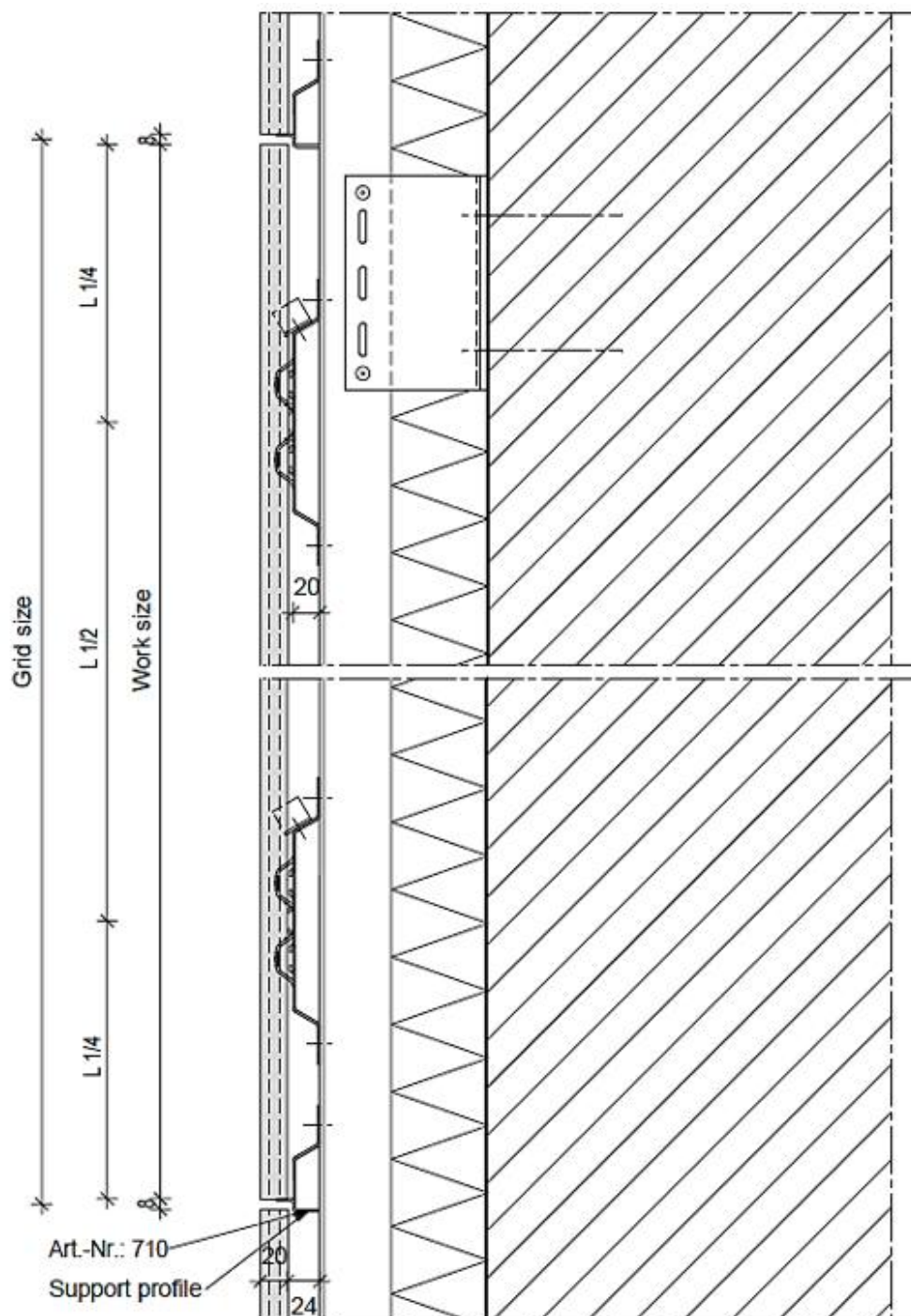


*permissible when mounting on vertical system rails, on T-profiles or on omega profiles.
 $L = 1/4 L$ is the distance between the panel edge and the central axis of the above profiles

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Horizontal section
Example for attachment with vertical system rails

Annex A 11



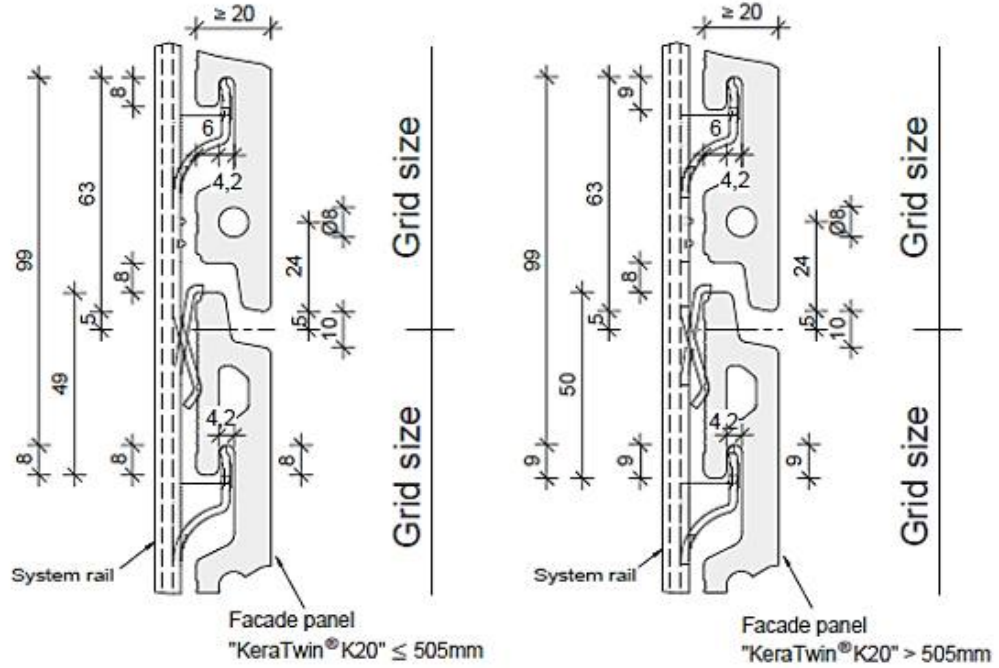
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Vertical section
Vertical installation with OmegaS-system

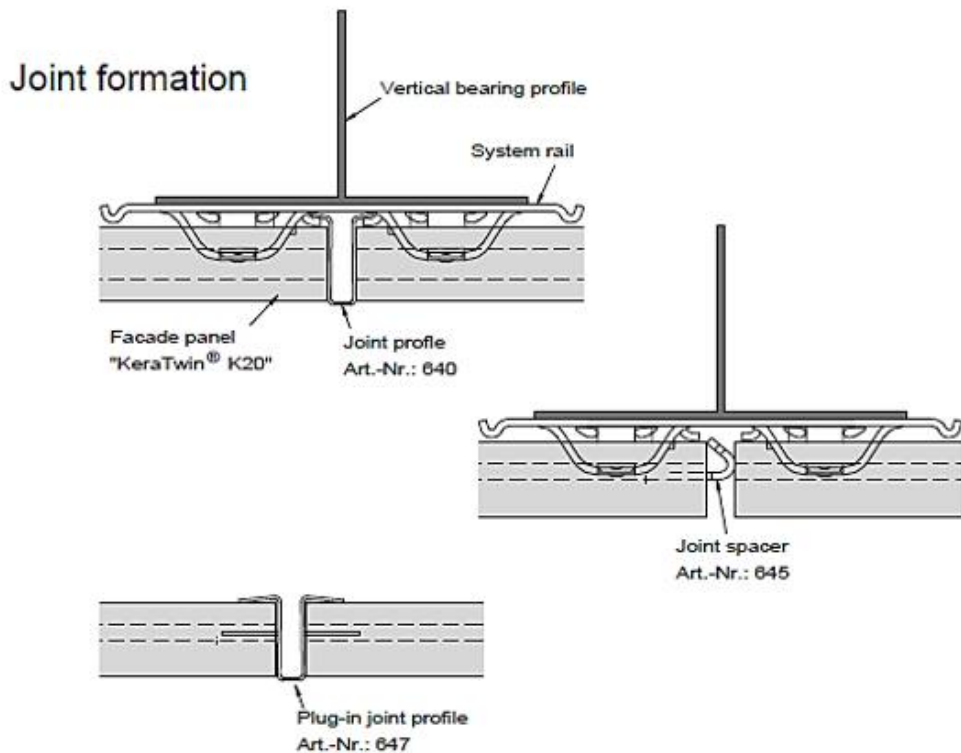
Annex A 12

English translation prepared by DIBt

Detail of fixation with system rails K20



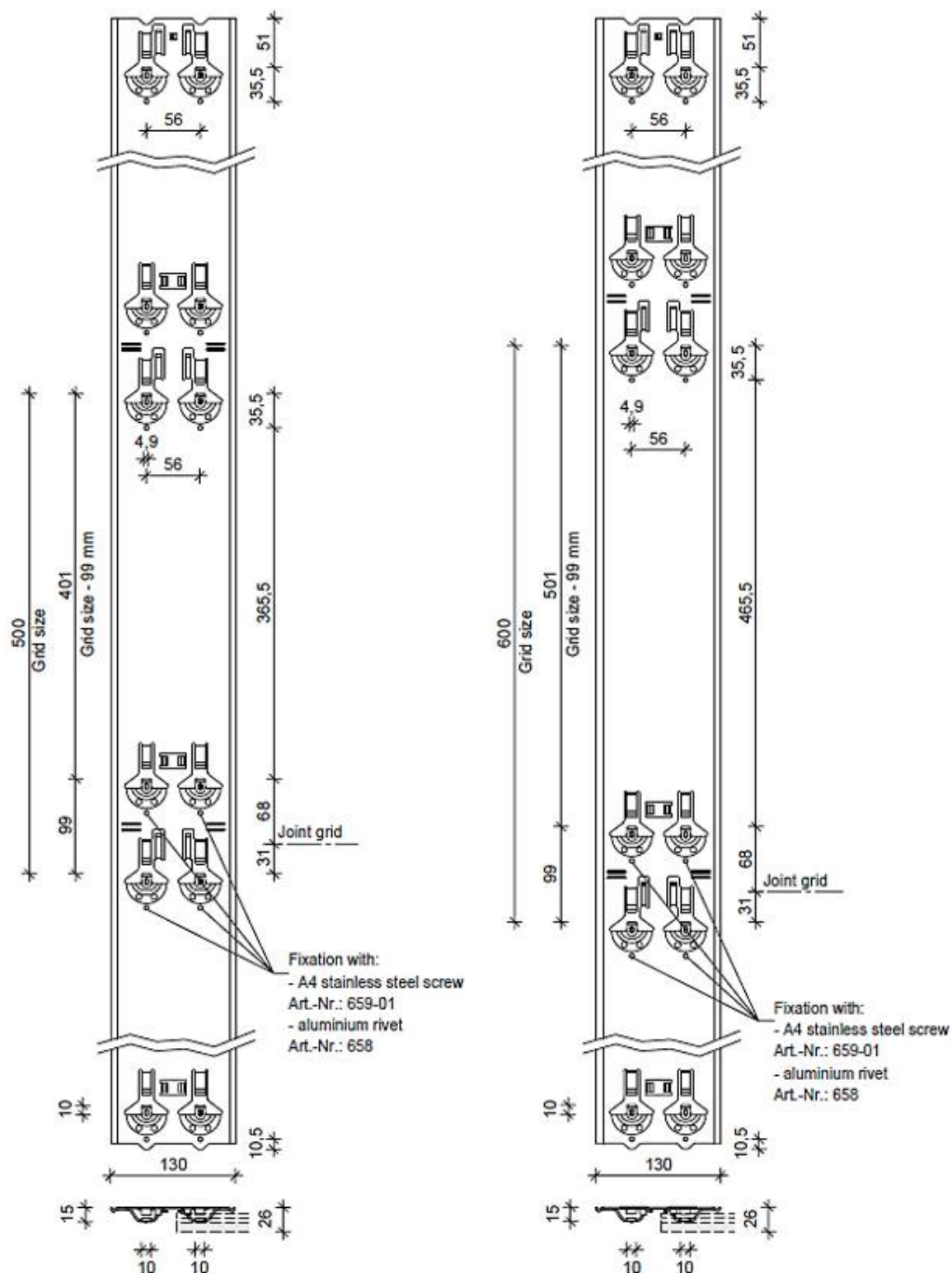
Joint formation



Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Details of fixation with system rails
Details of joint formation

Annex A 13

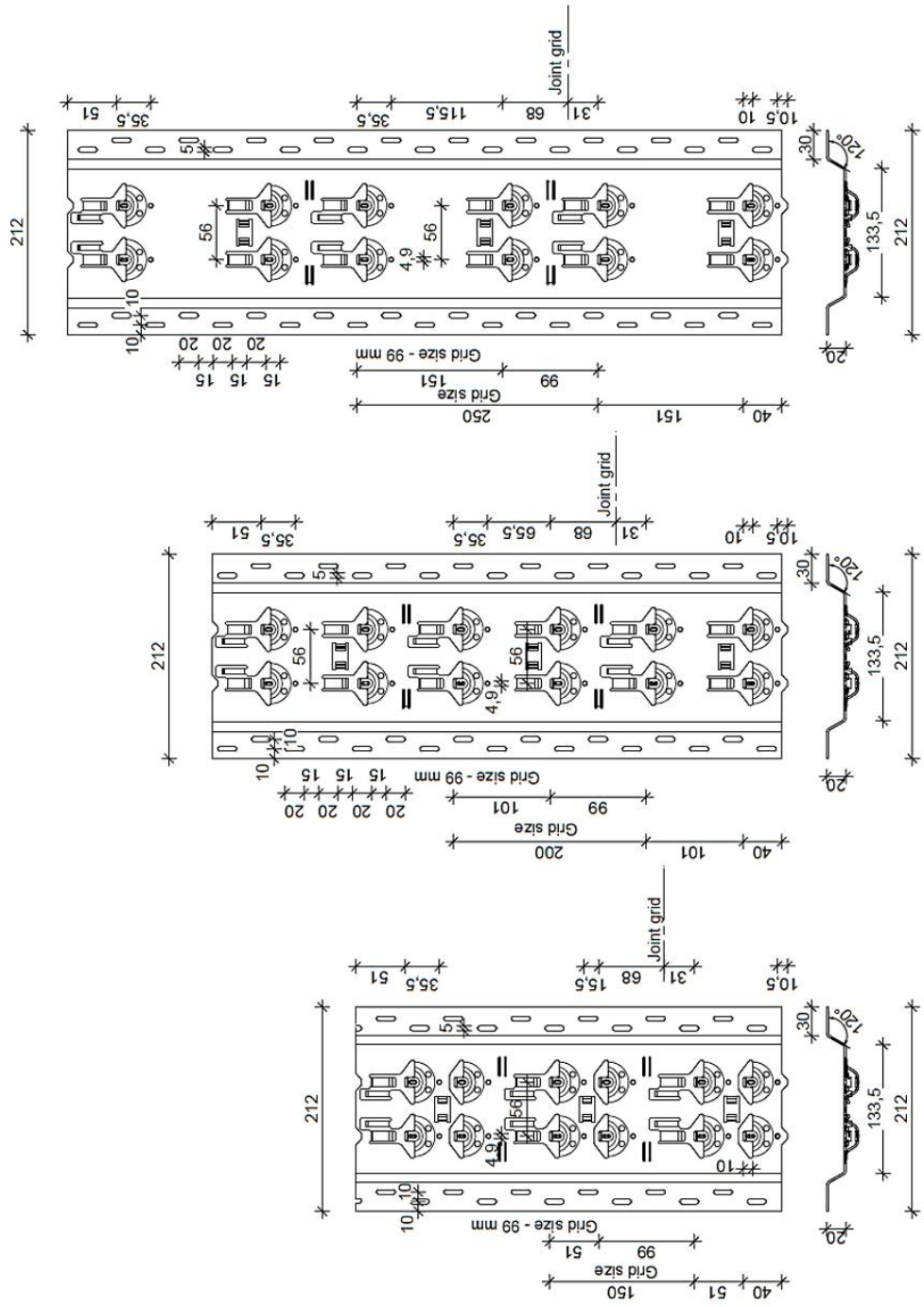


Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
System rails for grid sizes 500 and 600mm

Annex A 16

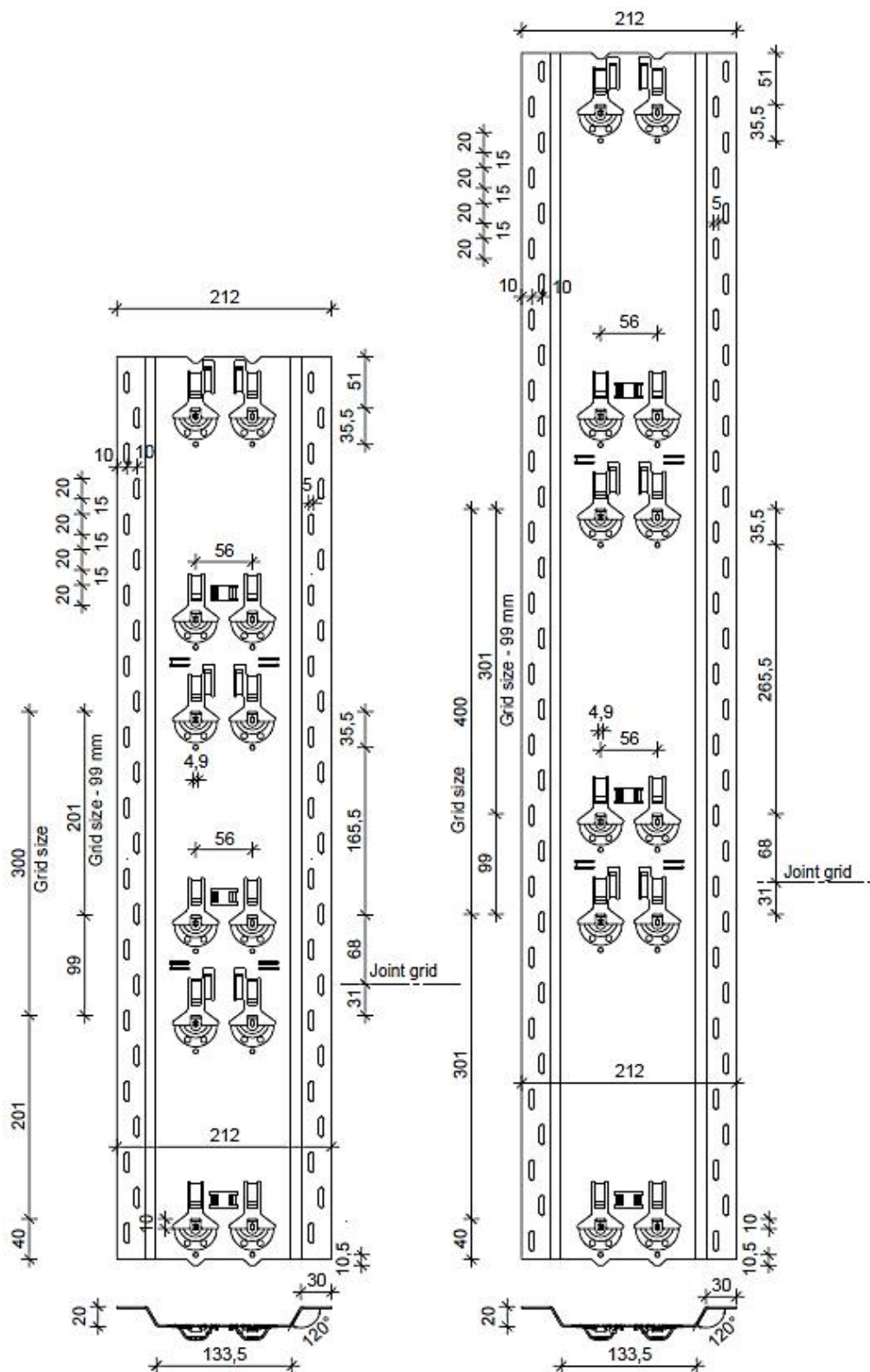
English translation prepared by DIBt



Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
 Omega system rails for panel grid sizes 150, 200 and 250mm

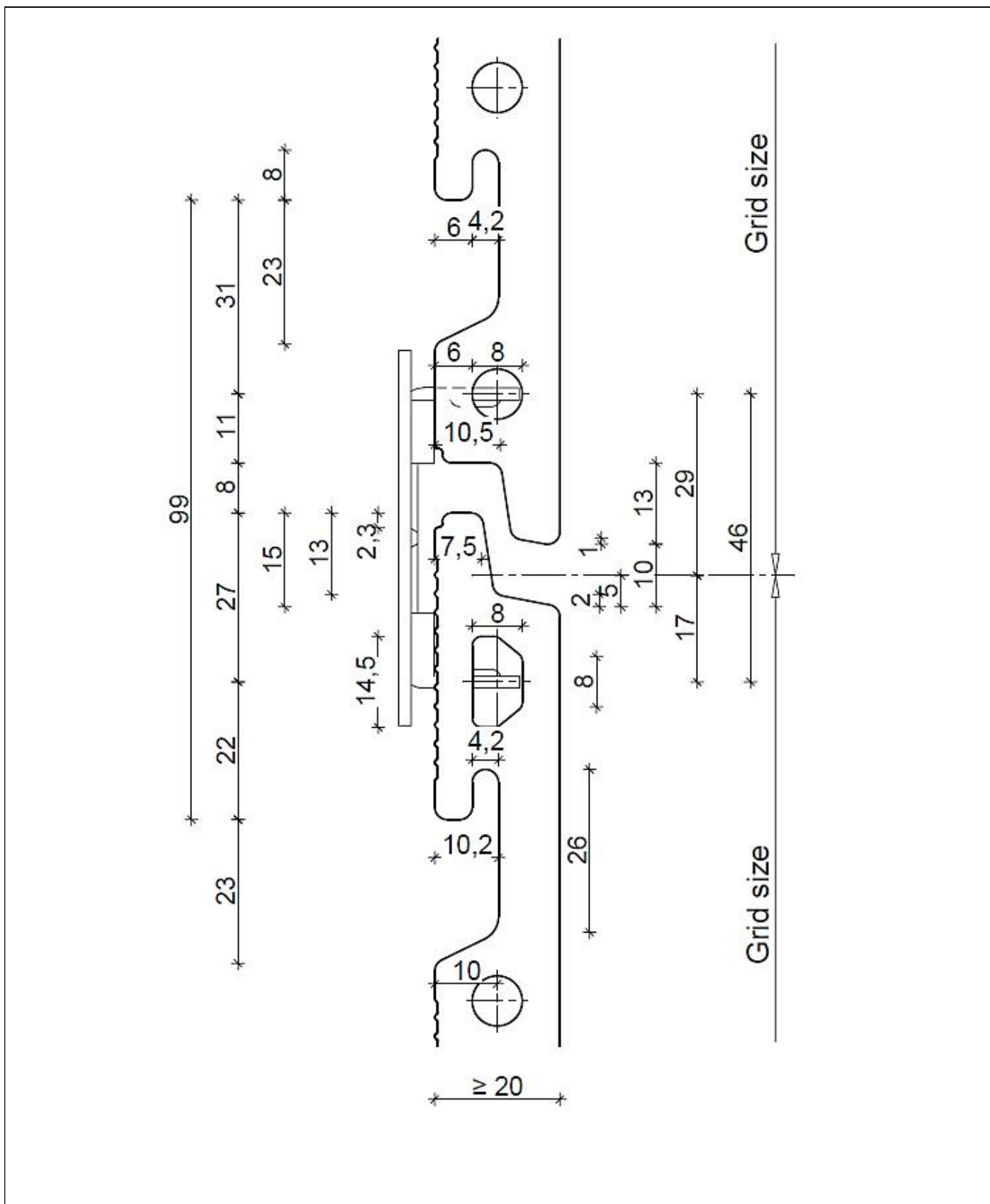
Annex A 17



Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Omega system rails for panel grid sizes 300 and 400mm

Annex A 18

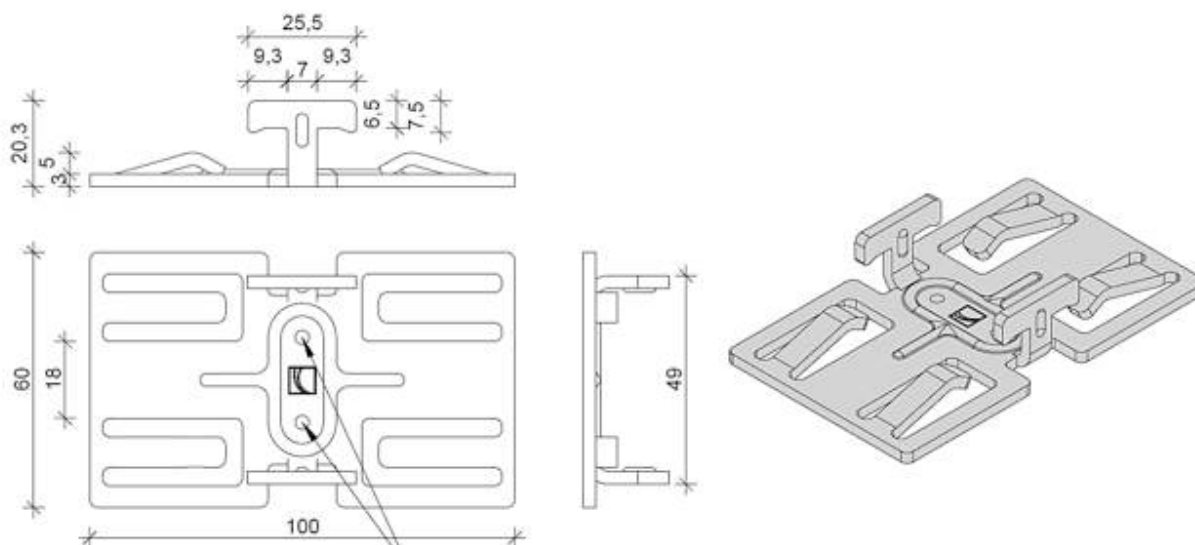


Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Detail of fixation with clamps

Annex A 20

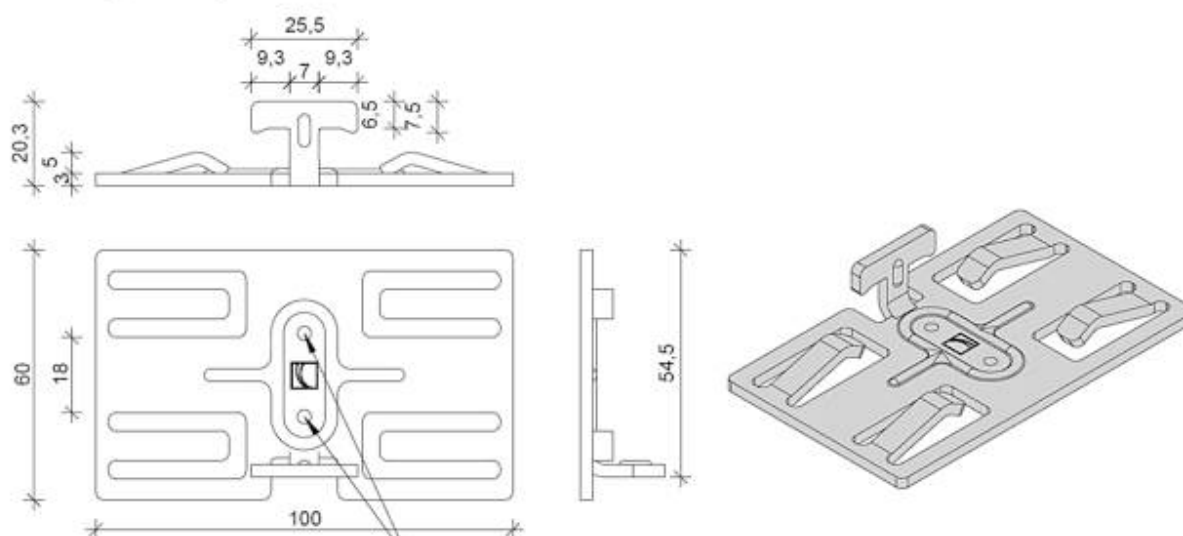
Twin-clamp 3mm, Article: F-680



Fixation with:

- A2-stainless steel screw, head black Art.-Nr.: 657
- A2-stainless steel rivet, black Art.-Nr.: 675

Single-clamp 3mm, Article: F-684



Fixation with:

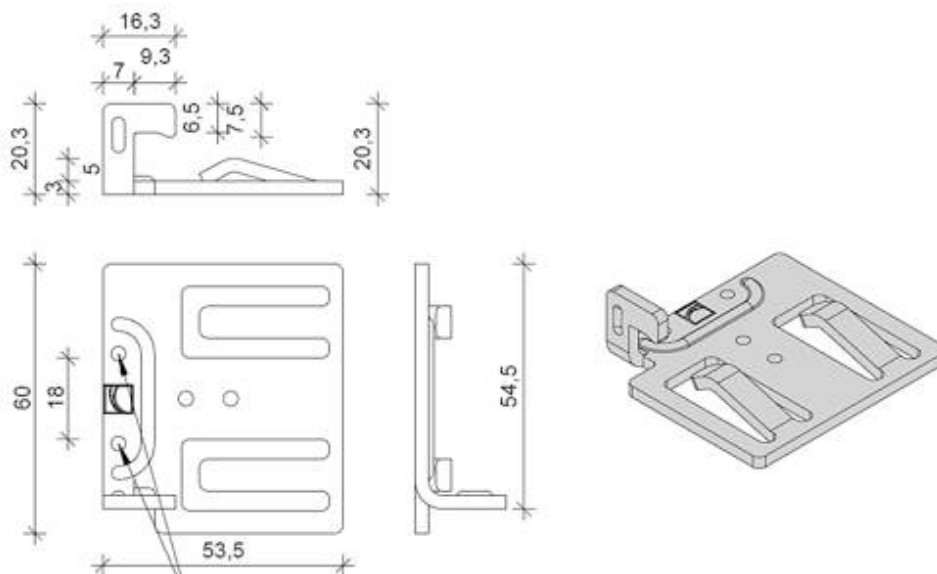
- A2-stainless steel screw, head black Art.-Nr.: 657
- A2-stainless steel rivet, black Art.-Nr.: 675

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Single-part drawings of the Twin-clamp and the single-clamp

Annex A 21

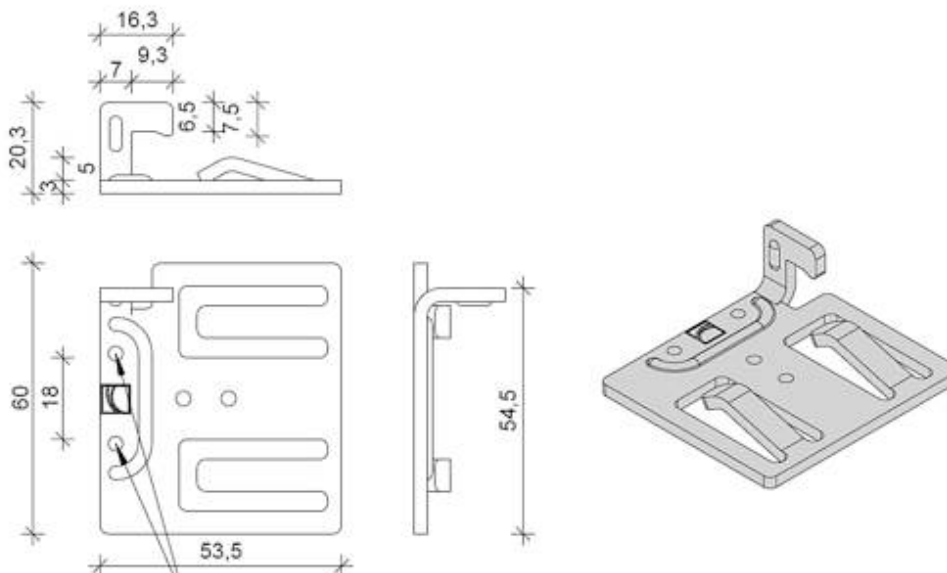
Edge-clamp right 3mm, Article: F-683



Fixation with:

- A2-stainless steel screw, head black Art.-Nr.: 657
- A2-stainless steel rivet, black Art.-Nr.: 675

Edge-clamp left 3mm, Article: F-682



Fixation with:

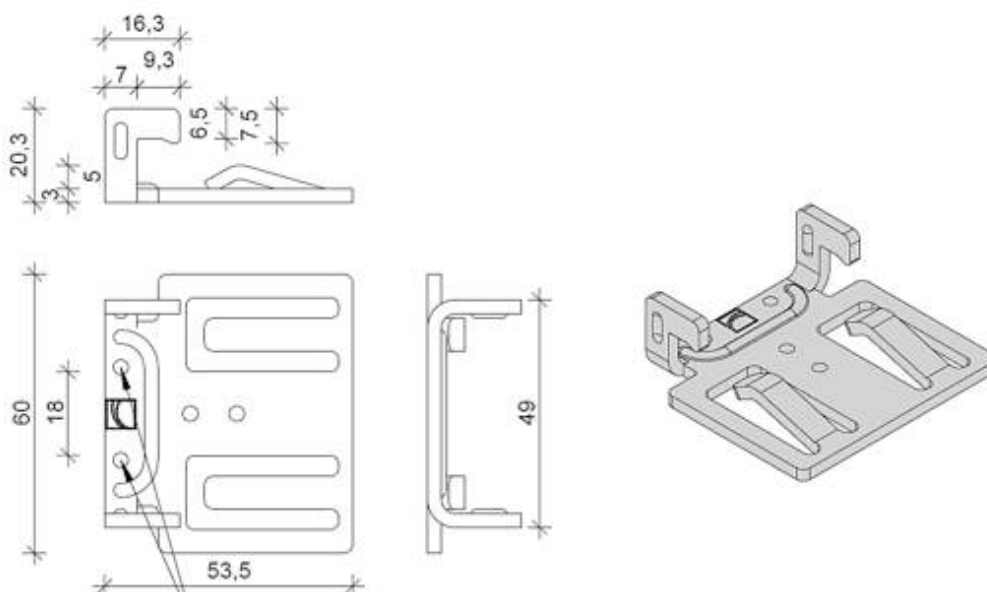
- A2-stainless steel screw, head black Art.-Nr.: 657
- A2-stainless steel rivet, black Art.-Nr.: 675

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Single-part drawings of the Edge-clamp right and Edge-clamp left

Annex A 22

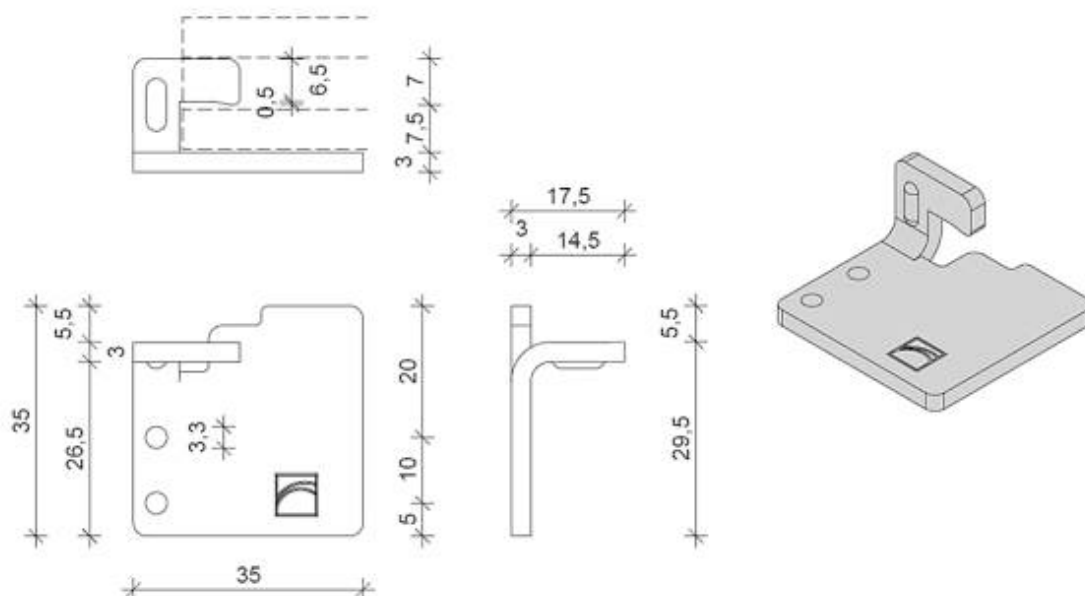
Edge-clamp 3mm, Article: F-681



Fixation with:

- A2-stainless steel screw, head black Art.-Nr.: 657
- A2-stainless steel rivet, black Art.-Nr.: 675

R-clamp K20 left, Article: F-682R

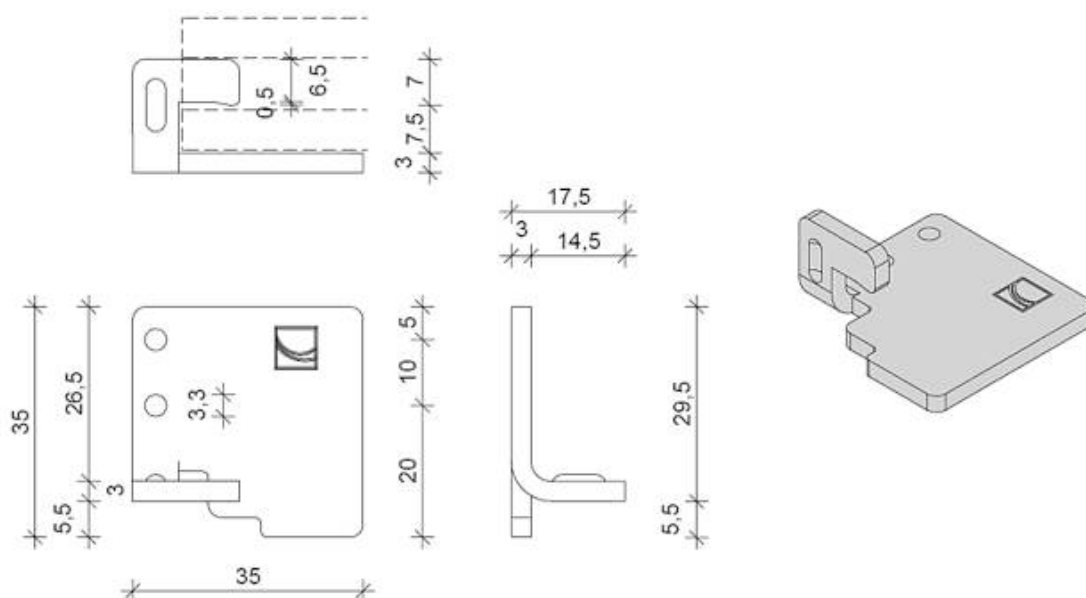


Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

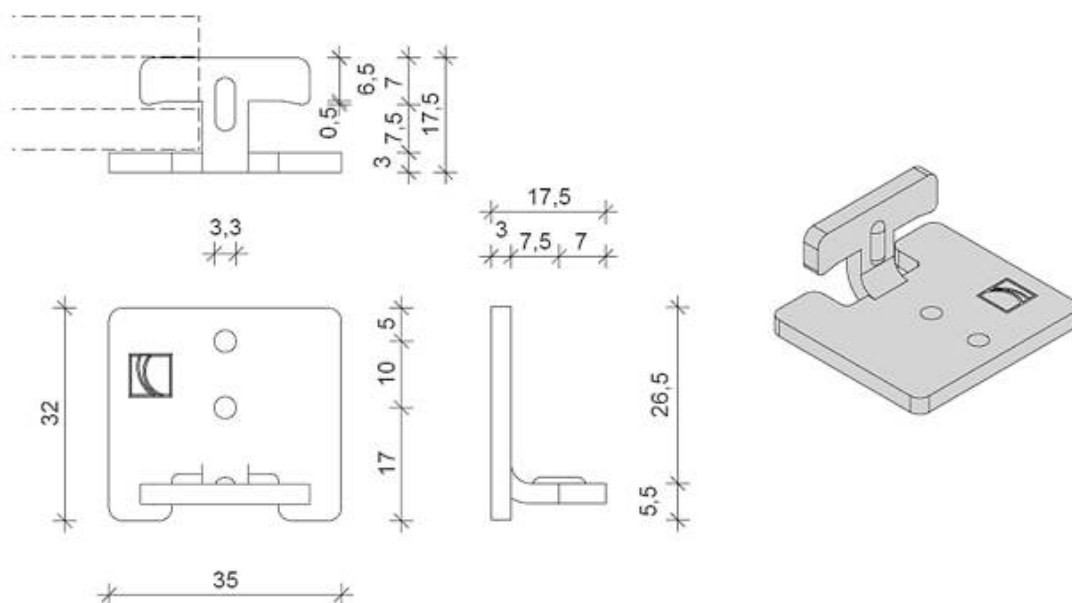
Product description
Single-part drawings of the Edge-clamp and the R-clamp left

Annex A 23

R-clamp K20 right, Article: F-683R



R-clamp K20, Article: F-684R



Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Single-part drawing of the R-clamp right and the R-clamp

Annex A 24

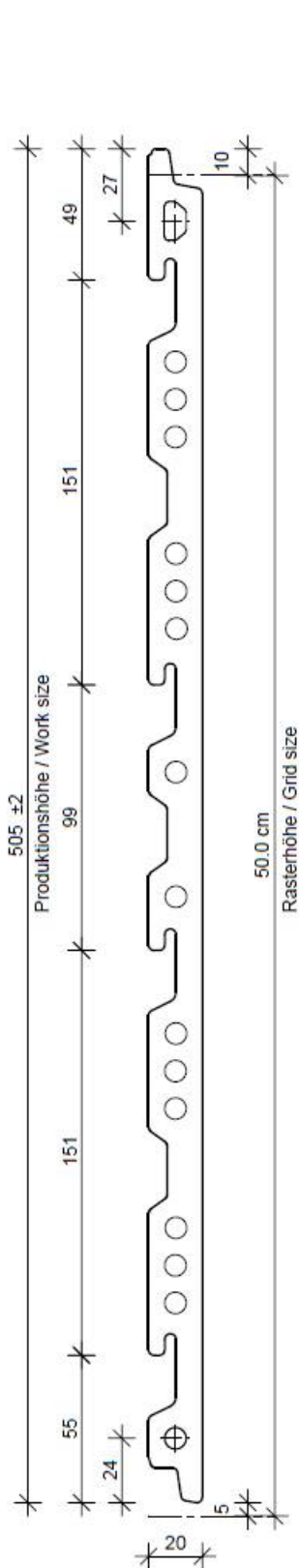
Legend for fastening elements:

Art.-Nr.: 620 System rail, coated (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 681 Edge clamp K20 (EN AW-5754 H22 / EN AW-6060-T6)
Art.-Nr.: 625 System rail, bright (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 682 Edge clamp K20, left (EN AW-5754 H22 / EN AW-6060-T6)
Art.-Nr.: 640 Joint profile K20/8, coated (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 683 Edge clamp K20, right (EN AW-5754 H22 / EN AW-6060-T6)
Art.-Nr.: 645 Joint spacer K20/8, coated (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 684 Single clamp K20 (EN AW-5754 H22 / EN AW-6060-T6)
Art.-Nr.: 647 Plug in joint profile K20/8, coated (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 682R R-clamp K20, left (EN AW-5754 H22 / EN AW-6060-T6)
Art.-Nr.: 624 Omegaprofile, coated (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 683R R-clamp K20, right (EN AW-5754 H22 / EN AW-6060-T6)
Art.-Nr.: 627 Omegaprofile, bright (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 684R R-clamp K20 (EN AW-5754 H22 / EN AW-6060-T6)
Art.-Nr.: 710 OmegaS support profile, coated (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 659-01 A4-stainless steel screw, bright Ø 4,8mm, Mat.-Nr.: 1.4404 or 14578
Art.-Nr.: 711 Securing angle, bright (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 657 A2-stainless steel screw, head black Ø 4,8mm, Mat.-Nr.: 1.4301 or 1.4567
Art.-Nr.: 680 Double clamp K20 (EN AW-5754 H22 / EN AW-6060-T6)	Art.-Nr.: 675-01 A2-stainless steel rivet, black Ø 3,2mm
	Art.-Nr.: 658 Al-rivet, bright Ø 4,8mm

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Legend of the fastening elements

Annex A 26



Stand Juli 2018

Nicht bemaßte Positionen der Ziehlöcher können fertigungsbedingt von der Zeichnung abweichen!

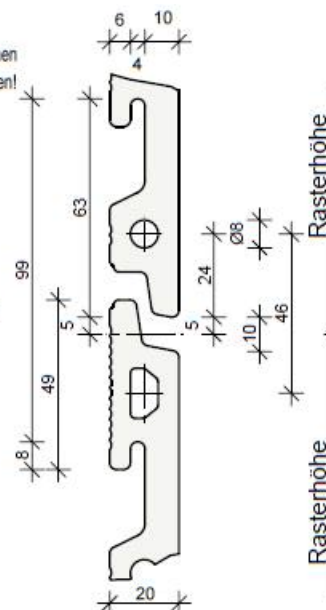
Validity July 2018

Non-dimensioned positions of holes may differ from the drawing due to production!

État juillet 2018

Pour des raisons de fabrication, les positions non dimensionnées des alvéoles peuvent différer du plan de détail !

$W_R =$	28879,04 mm ³
$W_S =$	23249,19 mm ³
$e_R =$	8,92 mm
$e_S =$	11,08 mm



Zeich. Nr. 508206-500
drawing no.

KeraTwin K20 - Standardgröße
standard size

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Product description
Cross section drawing 50 cm grid panel

Annex A 27

Design

For the design of an external wall cladding system for ventilated facades using KeraTwin K20 facade panel (cladding) and the associated products (profile, brackets, clamp, fasteners, etc) the following should take into account:

- the mechanical characteristics values of the kit components in order to resist the actions applying on the specific work
- national regulations and national safety factors
- the substrate material to define the suitable anchorage
- the possible movements of the substrate and the position of the building extension joints
- the dilation of the kit components and the plates
- the category of corrosively of the atmosphere of the works
- the construction of the façade specific parts (e.g. base, top, corners windows etc.)
- the kit and the components must comply with the specific building regulations of the Member State where the work is to be built
- a calculation example is shown in Annex B5

Installation of the kits in works

The assembly shall be carried out in accordance with the specifications of the holder of the ETA and according to the project-specific plans and calculations, using the specific kit components.

The assembly must be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on the construction site.

KeraTwin K20 ceramic facade panels are factory-equipped with suspension grooves or channels.

The ceramic facade panels have to be protected from damage during transport and storage on the construction site; façade panels must not be installed in a jerky manner (if necessary, lifting devices are used to hang the facade panels); damaged ceramic plates must not be installed.

The façade is installed by specialist personnel and the manufacturer's installation instructions must be observed.

The facade panels can be arranged in a "lying" or "standing" position, they can also be attached to soffits.

The fasteners must be attached as specified and described in this document.

Use, maintenance and servicing

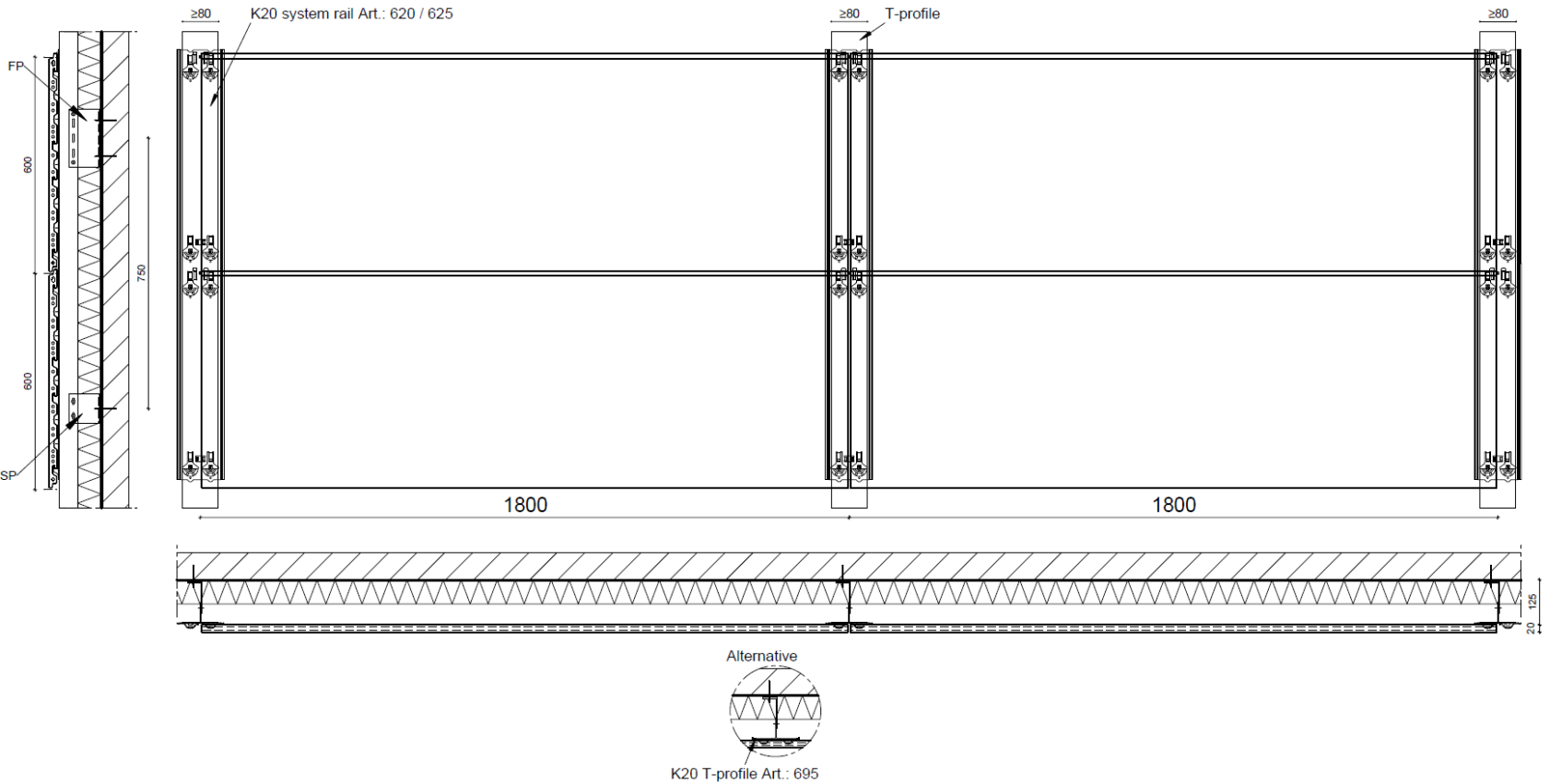
The maintenance of the assembled systems or kit components includes on-site checks taking into account the following aspects:

- regarding to the ceramic panel: visible damage such as cracking, edge breaking or detachment
- regarding the fasteners: occurrence of corrosion or deformation

Necessary local repair work shall be carried out quickly using the same kit components and following the instructions of the ETA holder.

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products	Annex B 1
Intended use Specifications	

Intended use – Set-up of the KeraTwin K20 Façade kit : see Ref.2, Annex C1
 KeraTwin K20 façade cladding tiles (180 x 60 x 2 [cm]) fixed by 1 system rail / T-profiles per tile



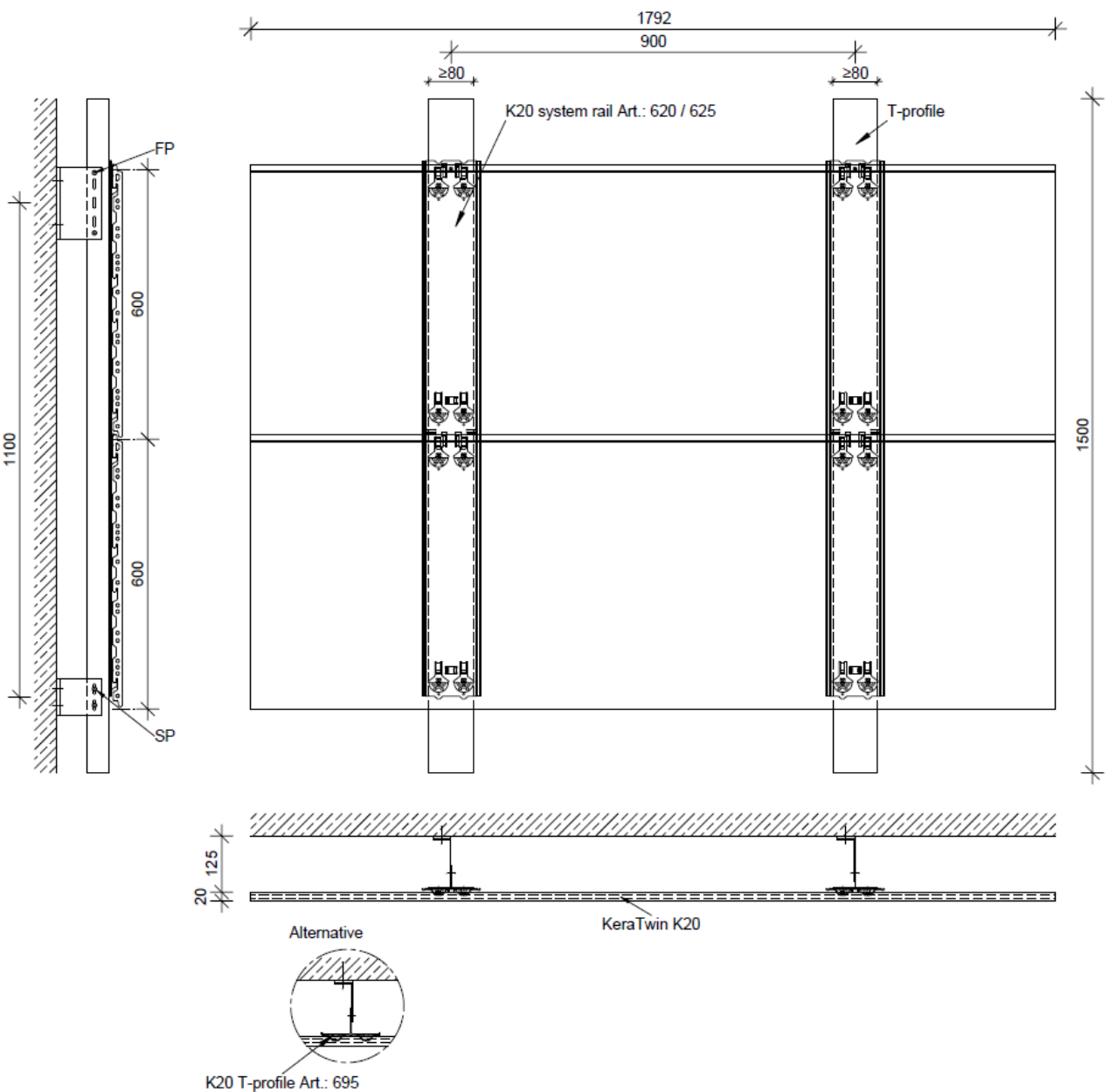
FP: fix-point; SP: sliding points

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Intended use
 Specification of the subframe / cladding / fixing

Annex B 2

Intended use– Set-up of the KeraTwin K20 Façade kit : see Ref.1, Annex C2
 KeraTwin K20 façade cladding tiles (180 x 60 x 2 [cm]) fixed by 2 system rails / T-profiles per tile



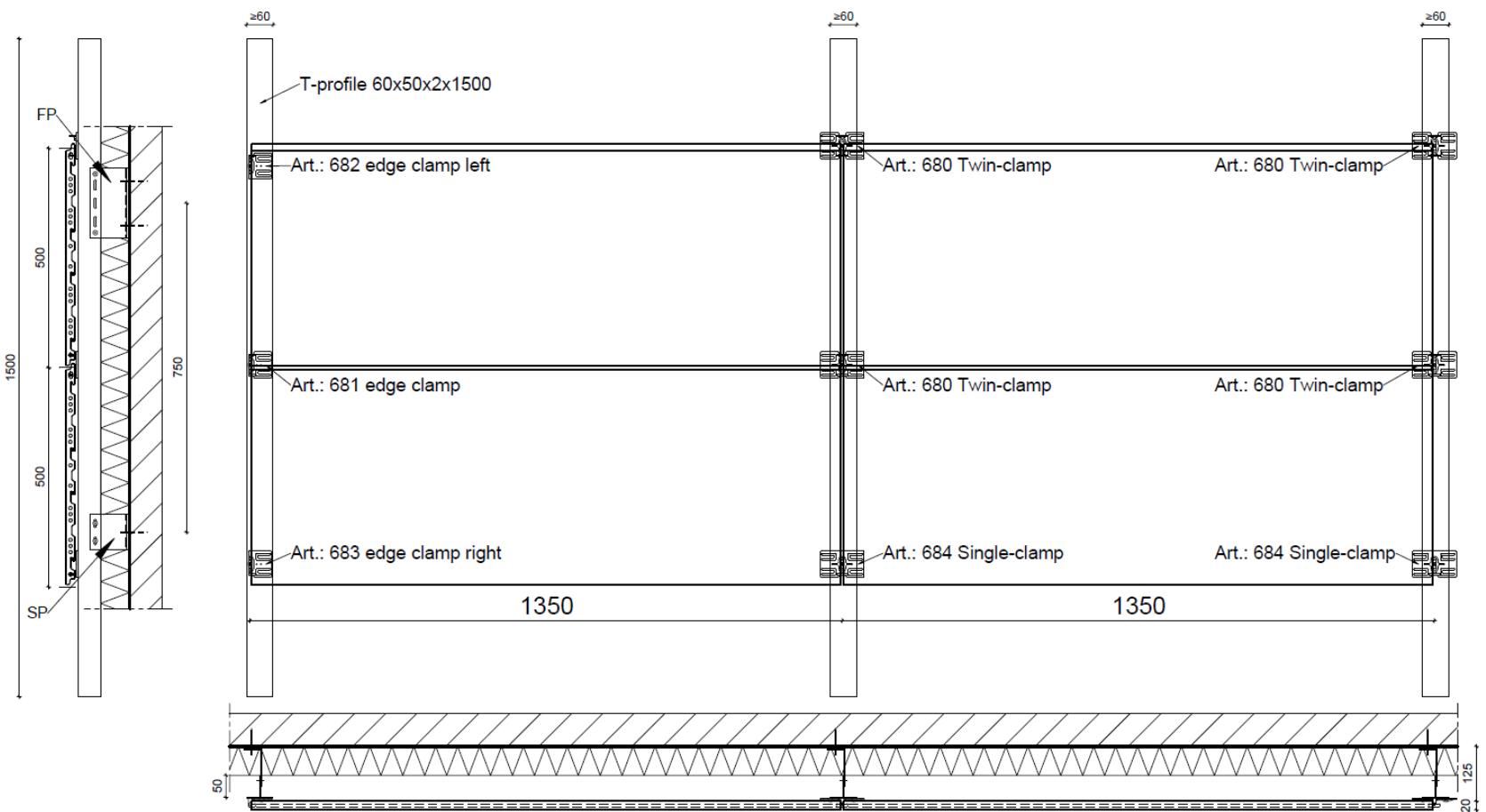
FP: fix-point; SP: sliding points

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Intended use
 Specification of the subframe / cladding / fixing

Annex B 3

Intended use – Set-up of the KeraTwin K20 Façade kit : see Ref, Annex C1
 KeraTwin K20 façade cladding tiles (135 x 50 x 2 [cm]) fixed by 4 clamp-lips per tile



FP: fix-point; SP: sliding points

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Intended use
 Specification of the subframe / cladding / fixing

Annex B 4

Design – calculation example

The following is an example calculation for the KeraTwin K20 and its fastening using the example of a single-span beam without cantilever arm with clamps (Ref.1 Annex C1 and Annex B2).

static single-span beam without cantilever and with clamp

a) bending load capacity

For a single-span beam without cantilever, the following formula is used to verify the bending strength:

$$q_{Rk,B} = 8 * M_k / (h_N * l^2)$$

$$q_{Rk,B} = 8 * 0,4 \text{ kNm} / (0,5 \text{ m} * (1,35 \text{ m})^2)$$

$$q_{Rk,B} = 3,51 \text{ kN/m}^2$$

with $M_k = \sigma_{Rk} * W_S$

$$M_k = 17,2 \text{ N/mm}^2 * 23.249 \text{ mm}^3 = 399.883 \text{ Nmm} = 0,4 \text{ kNm}$$

$$\sigma_{Rk} = 17,2 \text{ N/mm}^2$$

$$W_S = 23.249 \text{ mm}^3$$

$$h_N = 500 \text{ mm}$$

$$l = 1.350 \text{ mm}$$

$q_{Rk,B}$ = char. load-bearing resistance of the bending strength against wind load

M_k = char. ultimate moment [kNm]

σ_{Rk} = 17,2 N/mm² = 5% quantile based on a minimum value of 18 N/mm² according to the declaration of performance

W_S = 23.249 mm³ moment of resistance (geometry according Annex A27) nominal height 500 mm

h_N = nominal height ceramic = 500 mm (geometry according Annex A27)

l = panel length = 1.350 mm

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Intended use
Specifications – design calculation example

Annex B 5

b) support load capacity

$$q_{Rk,A} = F_k / (h_N * l)$$
$$q_{Rk,A} = 2,48 \text{ kN} / (0,5 \text{ m} * 1,35 \text{ m})$$
$$q_{Rk,A} = 3,67 \text{ kN/m}^2$$

with $F_k = 4 * F_{U,C}$

$$F_k = 4 * 0,62 \text{ kN} = 2,48 \text{ kN}$$
$$F_{U,C} = 0,62 \text{ kN}$$
$$h_N = 500 \text{ mm}$$
$$l = \text{panel length} = 1.350 \text{ mm}$$

- $q_{Rk,A}$ = char. load-bearing resistance against wind load to the support points
- F_k = char. resistance of the support of the panel
- $F_{U,C}$ = 0,62 kN char. failure resistance per fastening point (corner retraining clip Art. 682/683) according to No. 23 in Annex C5
- h_N = nominal height ceramic = 500 mm (geometry according Annex A27)
- l = panel length = 1.350 mm

The smallest value from $q_{Rk,A}$ and $q_{Rk,B}$ is relevant for R_k .

$$R_k = \min (q_{Rk,B} ; q_{Rk,A})$$
$$R_k = \min (3,51 \text{ kN/m}^2 ; 3,67 \text{ kN/m}^2) = 3,51 \text{ kN/m}^2$$

R_k with 3,51 kN/m² is smaller than the max w_u (failure load of system test Ref.1 Annex C1) with 3,74 kN/m².

$$R_d = R_k / \gamma_M$$

If no national regulations apply a system-related material safety factor (γ_M) of 2.0 can be used. This leads to the design resistance R_d for the wind load of the single-span beam without cantilever arm of

$$R_d = R_k / 2 = 3,51 \text{ kN/m}^2 / 2,0 = 1,75 \text{ kN/m}^2$$

The stability shall be verified on a case-by-case basis within the field of application set out taking into account the actions of dead load and wind load.

$E_d \leq R_d$ shall be fulfilled

E_d = design value of the action (value of the action in accordance with the "Technical Building Rules" introduced by the national building authorities)

R_d = design value for the structural resistance (material)

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Intended use
Specifications – design calculation example

Annex B 6

Ref.	Test specimen Test set-up ¹	max W_u failure - load [kPa]	Type of failure	Deflection [mm] (a)	
				Permanent	Instantaneous
1	- 2 x 2 ceramic tiles 1342 x 505 x 21 [mm], mounted in landscape format - cladding fixed with 3 single clamps + 6 double clamps - subframe: clamp Type 680, 681, 682, 683, 684 with nominal thickness 3 mm - subframe: 3 extruded aluminium profiles, section T60/52/2, L = 1500 mm - distances between vertical profiles: 1350 mm - distances between clamps: 1350 mm / 500 mm - joint width: 8 mm (nominal width 8 mm) - horizontal joint height: 10mm (including tolerances of structure and tile – most disadvantageous) - fixation of basic clamp plate on profile with 2 self-drilling screws (4,8xL mm)	-	-	0,4 (b) Permanent Deflection < 1 mm For load ≤ 3,7 kPa	-
		3,74	Ceramic failure, draw hole	-	5,8 (b)
2	- 2 x 2 ceramic tiles 1792 x 605 x 21 [mm], mounted in landscape format - cladding fixed with 4 x 4 hooks - subframe: 3 extruded aluminium profiles, Type K20 620, section 130/2, L = 1500 mm - distances between vertical profiles: 1800 mm - distances between hooks: 1744 mm / 501 mm - joint width: 8 mm (nominal width 8 mm) - horizontal joint height: 10mm (including tolerances of structure and tile – most disadvantageous) - fixation of system rail onto basic profile with 1 self-drilling screw per hook(4,8xL mm)	-	-	0,6 (b) Permanent Deflection < 1 mm For load ≤ 1,2 kPa	-
		1,23	Metal hook failure	-	8,5 (b)

- (a) Deflection including displacements of all façade components
 (b) Positions of measurement points in centre of cladding element
 (c) Positions of measurement points at edge of cladding element (next to tile fixing)

¹ The assessment of the kit were carried out under the described conditions and the information given in Annex A an Annex B

Performances
Characteristic values

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Annex C 1

Ref.	Test specimen Test set-up ²	max W _u failure - load [kPa]	Type of failure	Deflection [mm] (a)	
				Permanent	Instantaneous
3	- 2 ceramic tiles 1792 x 605 x 21 [mm], mounted one above the other in landscape format - cladding fixed with 2 x 4 double hooks - subframe: 2 extruded aluminium profiles, Type K20 620, section 130/2, L = 1500 mm - lateral tile projection 446 mm - distances between vertical profiles: 900 mm - distances between hooks: 900 mm / 501 mm - joint width: 8 mm (nominal width 8 mm) - horizontal joint height: 10mm (including tolerances of structure and tile – most disadvantageous) - fixation of system rail onto basic profile with 1 self-drilling screw per hook(4,8xL mm)	-		1,0 (c) Permanent Deflection For load ≤ 1,4 kPa	6,7 (c)
		2,77	Ceramic failure, Suspension point	2,5 (c)	20,1 (c)

- (a) Deflection including displacements of all façade components
- (b) Positions of measurement points in centre of cladding element
- (c) Positions of measurement points at edge of cladding element

² The assessment of the kit were carried out under the described conditions and the information given in Annex A an Annex B

Performances
Characteristic values

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products

Annex C 2

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	
Substance/s, classified as EU-cat. Carc. 1A and/or 1B; Muta. 1A and/or 1B; Repr. 1A and/or 1B	No performance assessed.
Leachable Substances ^{b)} of the cladding element	Cumulative release after 64 days according to NEN 7375
Vandadium (V)	< 5,2
Sulphate (SO ₄)	< 384
Chromium (Cr)	< 1,9
mg/m ²	
Release scenario regarding BWR 3: S/W 2	
a) In accordance with Regulation (EC) No 1272/2008. b) Statement according to the test report	
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products	
Performances Characteristic values - Content, emission and/or release of dangerous substances	Annex C 3

No.	Essential characteristic	Test set-up	Performance
12	Bending strength	1x KeraTwin K20 – ceramic tile, height 300 mm, support span 300 mm according EN 14411	average minimum ≥ 20 MPa individuel minimum ≥ 18 MPa char. bending strenghts 17,2 MPa (5% quantile)
13	Resistance of grooved cladding element	4x KeraTwin K20 - ceramic in horizontal arrangement with length 300 mm, grid height 300 mm, with system rail Art. 620 / 625 according to hook fixed system Annex A2 with critical rear grip 4,6mm (lower panel support) / 5,0 mm (upper panel support), diameter support 270mm	char. failure resistance (Fu,c) = 490 N / fixing point average failure load (Fu,m) = 535 N / fixing point
14	Resistance at dowel hole	4x KeraTwin K20 - ceramic in horizontal arrangement with length 300 mm, grid height 300 mm, with retaining clip field Art. 680 according to clamp fixed system Annex A7 with vertical joint 8.3 mm, diameter support 180 mm fixing point	char. failure resistance (Fu,c) = 732 N average failure load (Fu,m) = 815 N
21	Resistance to vertical load	1x KeraTwin K20 - ceramic in horizontal arrangement with 605 x 1792 mm, with 2x system rail Art. 620 / 625 625 according to hook fixed system Annex A7 , dead load 76.4 kg	average maximum deflection $< 0,1$ mm after 60 min: 0,6 mm after 62 min
		1x KeraTwin K20 - ceramic in horizontal arrangement with 505 x 1342 mm, with 4x retaining clamps Art. 680 / 681 / 683 / 684 according to clamp fixed system Annex A7, dead load 52.7 kg	average maximum deflection $< 0,1$ mm after 60 min: 3,2 mm after 233 min
22	Pull-through resistance of fixings from profile	System rail Art. 620 / 625 according Annex A14, A15 and A16 with 2x Al rivet Art. 658 according Annex A25, diameter of support 135 mm, edge distance Uk 16.5 mm	char. failure resistance (Fu,c) = 3,08 kN average failure load (Fu,m) = 3,27 kN
		System rail Art. 620 / 625 according to Annex A14, A15 and A16 with 2x A4 screw Art. 659-01 according to Annex A25, diameter support 135 mm, edge distance Uk 17 mm	char. failure resistance (Fu,c) = 2,96 kN average failure load (Fu,m) = 3,23 kN
		Omega rails Art. 624 / 627 according to Annex A17, A18 and A19 with 1x Al rivet Art. 658 according to Annex A25, support 90 mm, centered arrangement in the slotted hole at the edge	char. failure resistance (Fu,c) = 1,03 kN average failure load (Fu,m) = 1,10 kN
		Omega rails Art. 624 / 627 according to Annex A17, A18 and A19 with 1x A4 screw Art. 659-01 according to Annex A25, support 90 mm, centered arrangement in the slotted hole at the edge	char. failure resistance (Fu,c) = 1,57 kN average failure load (Fu,m) = 1,82 kN
Ventilated facade system with KeraTwin K20 ceramic cladding and associated products			Annex C 4
Performances Characteristic values			

		Retaining clip edge Art. 681 according to Annex A23, with 2x stainless steel rivets Art. 675 according to Annex A25, diameter support 135 mm, edge distance Uk 16.5 mm	char. failure resistance (Fu,c) = 3,49 kN average failure load (Fu,m) = 3,72 kN
		Holding clamp edge Art. 681 according to Annex A23, with 2x stainless steel screw Art. 657 according to Annex A25, diameter support 135 mm, edge distance Uk 17 mm	char. failure resistance (Fu,c) = 2,27 kN average failure load (Fu,m) = 2,97 kN
23	Resistance of metal clip	System rail Art. 620 / 625 according to Annex A14, A15 und A16 with length 300 mm, support 90 mm	char. failure resistance (Fu,c) = 417 N / hanging tab average failure load (Fu,m) = 437 N / hanging tab
		clamp Art. 680 according to Annex A21, with 2x stainless steel screw Art. 657 according to Annex A25, load-bearing resistance for max. deformation of 1 mm	char. failure resistance (Fu,c) = 681 N / fixing point average failure load (Fu,m) = 758 N / fixing point
		clamp Art. 682 / 683 according to Annex A22, with 2x stainless steel screw Art. 657 according to Annex A25, load-bearing resistance for max. deformation of 1 mm	char. failure resistance (Fu,c) = 620 N / fixing point average failure load (Fu,m) = 681 N / fixing point

Uk = subframe

Ventilated facade system with KeraTwin K20 ceramic cladding and associated products	Annex C 5
Performances Characteristic values	