# TM TP



#### SYSTEM OVERVIEW

substructure systems for ventilated facades



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# TEHNOMARKET TM TP

substructure systems for ventilated facades

SYSTEM OVERVIEW



#### VENTILATED FACADE STRUCTURE

#### **COMMON NOTES**

The dimensions, thickness of barriers and the weight of the products listed in this catalogue are theoretical and they can deviate inside of permitted tolerances for each material. Detailed drawings and cutting schemes presented in this catalogue aren't dependent on deviations inside the permitted tolerances. Because of the aforementioned reasons, it is recommended to check product dimensions and tool precision before work.

This catalogue presents static and geometric characteristics of carrying elements relevant for the most convenient product choice in the project phase. It is necessary to take the location and structure of the object and frontal and horizontal wind load for determination of maximum facade module size according to prescribed standards of construction and installation.

The system is manufactured, inspected and tested exclusively with its own original parts. Usage of the "TEHNOPLAST" brand name for identification is only allowed when the original parts only are used according to technical instructions contained in this catalogue.

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#### SYSTEM DESCRIPTION

"TEHNOPLAST" substructure system enables the production of self-ventilating facade with different types of decorative, artificial or natural panels. Also, TMTP system allows for usage of non-transparent glass or photovoltaic panels, and special glazing used for multimedial and interactive facades.

The system is designed for manufacturing of ventilated facade with aluminium substructure, that consists of anchors for fixing on existing building construction, vertical load-barring, extruded aluminium profiles and regulating (visible or hidden) panels' girder. The whole substructure enables the regulation in all three axes, so that he panels can be adjusted during the placement, and be individually exchanged after the finishing of whole facade.

Aluminium alloy ALMgSiO.5 is sused for extrusion of profiles, and a harder alloy AlMg3 is used for rolled sheet metal. The other metal parts, fixing accessories and hardware are made with A2 quality stainless steel. All substructure elements are delivered raw, with no surface treatment, and there is an optional powder coating finish upon request.

The presented system options offer a wide spectrum of design possibilities from static and architectural point of the view. The tables and details of potential system applications, cited in this catalogue, offer necessary information and recommendations for engineers and designers, indispensable for correct selection of products and solving of structural issues. TEHNOPLAST's team of architects and engineers is always available for all questions and additional information regarding the products in this catalogue. We also offer technical consultation for engineers and construction companies and customized solutions not mentioned in this publication.

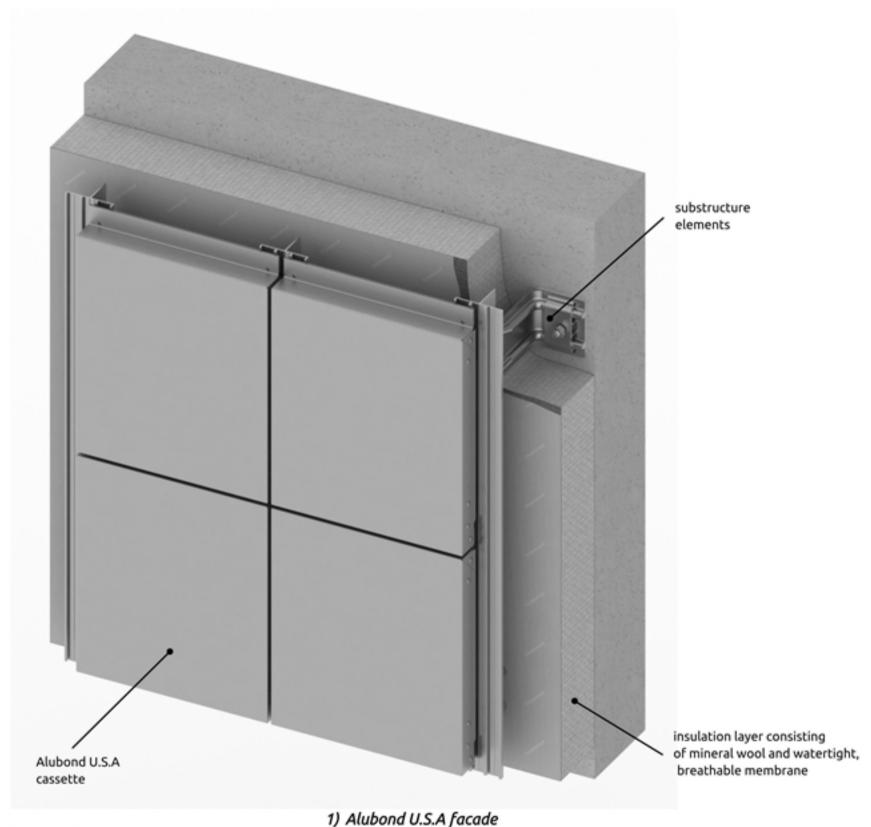




#### ALUBOND FACADE SYTEMS

ALUBOND U.S.A is a multi-layered, composite sandwich material of the new generation and it has a remarkable use in civil engineering, architecture, energetics, advertising etc. It is characterized by good insulation properties and modern, clean appearance. This waterproof, easy to machine material is also simple to install. The basic Alubond U.S.Aconsists of three layers. Two outer layers are made from 0.5mm thick, specially sealed and painted Aluminium sheets, while the core can be made either from polyethylene or special, fireproof mineral core ranging from 2 to 5 mm in thickness.

The following picture presents Alubond U.S.A facade segment with substructure elements. Alubond U.S.A cassette dimensions are relative and they vary according to project documentation.



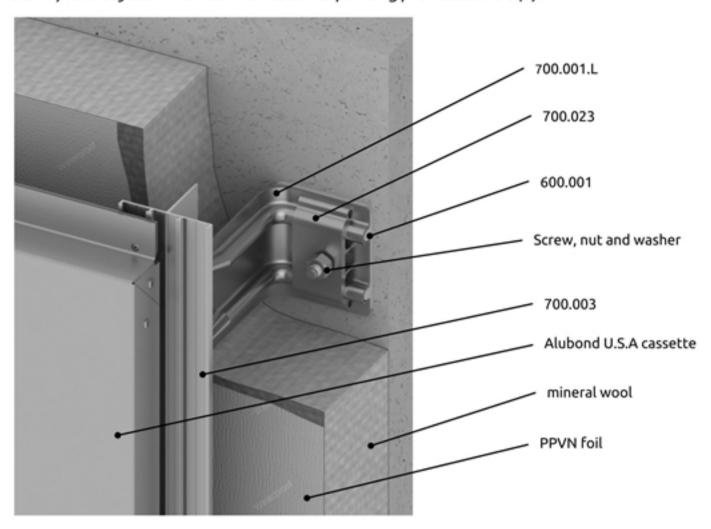
\* watertight, breathable membrane

ij Alabona O.S.A jacac



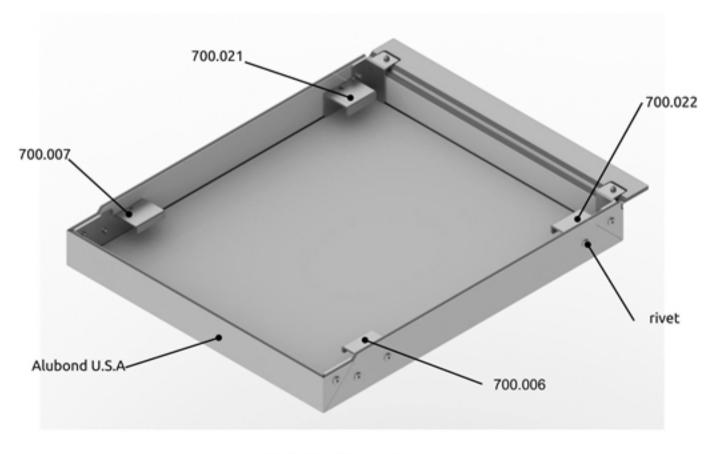


In the next picture we can see the elements of the subconstruction in details and the parts of the ALUBOND U.S.A facade system marked with its corresponding product code 's (2).



2) Alubond U.S.A facade system details

Beside Alubond U.S.A panel, the finished cassette includes additional accesories required for installation (3)



3) Alubond U.S.A cassette



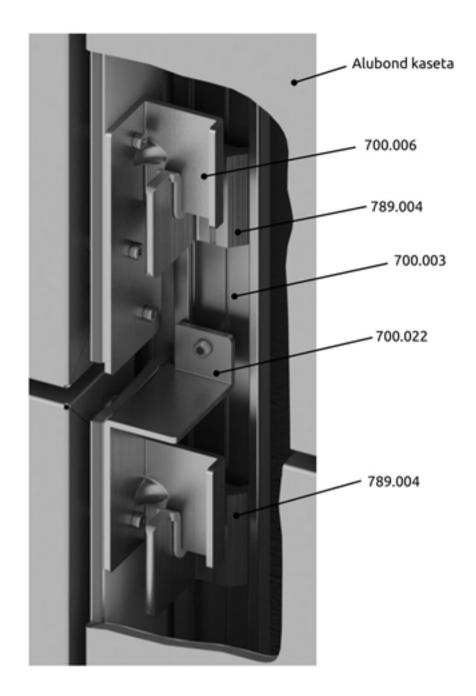


#### INSTALLATION

The installation of finished Alubond U.S.A is simple and the is best observed on meeting point of four Alubond U.S.A cassettes where only two have surface cutouts.

After

After the substructure is installed on a load barring wall (2), special cassette girders are installed( 789.004 for left side, or 789.003 for right side of the cassette) into groove of the vertical load barring profile 700.003. The girders are positioned and fastened on the vertical profile via screw (see catalogue pages with specific parts). Then, the cassette is pressed against the vertical profile and the girders will lock when it is pushed downwards. The girder grooves have special plastic inlays that provide firm connection between the girder and the buckle, and they lessen cassette vibrations caused by wind load.



### 4)Alubond U.S.A cassette - left side section

#### DIMENSIONAL CALCULATION FOR ALUBOND U.S.A FACADES

The most important part for determination of the characteristic dimensions of Alubond U.S.A facade is calculation of necessary anchor length. All necessary dimensions for calculation can be seen in the annexed sketch (5). The marks are as follows:

pv - distance between vertical profile and mineral wool, minimum 5 mm

ZF - distance between wall and front of Alubond U.S.A cassette

dk - Alubond U.S.A cassette is arround 40 mm thick

mv - thickness of mineral wool and waterimpermeable foil

Ls-standard anchor lenght

sp - distance between anchor and profile, from 0 to maximum 10 mm

Vs-thickness of ventilating layer

There are numerous options for anchor length calculation, but it is usually determined by project parameters like mineral wool thickness, ventilating layer dimensioning and distance from Alubond U.S.A cassette from the wall. For example, when mv and Vs are calculated, then it follows:

ZF=mv+Vs+dk

From here you can calculate the maximal anchor length Lsmax.

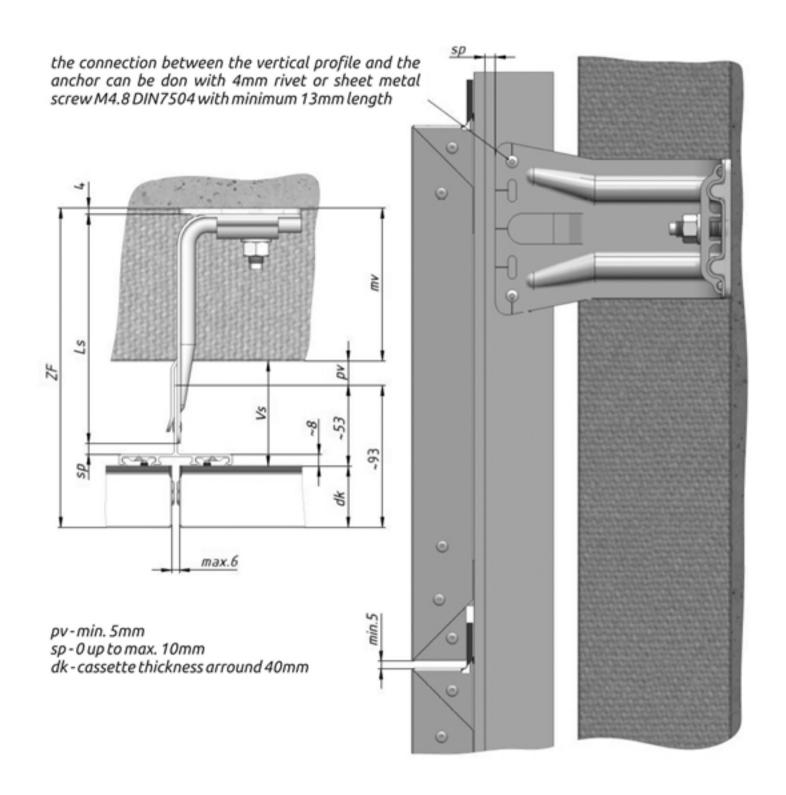
LSmax = ZF - 4 - 8 - dk





If Lsmaxi doesn't satisfy encircled value within 65 to 500 mm, with a step 5 mm, the first lower measure is chosen and it is a real length of anchor. There is a rule according to installation conditions:

sp = Lsmax - Ls, for  $0 \le sp \le 10$ mm sp - the distance between the anchor and the profile (check sketch)



5) The sketch with characteristic Alubond U.S.A facade dimensions





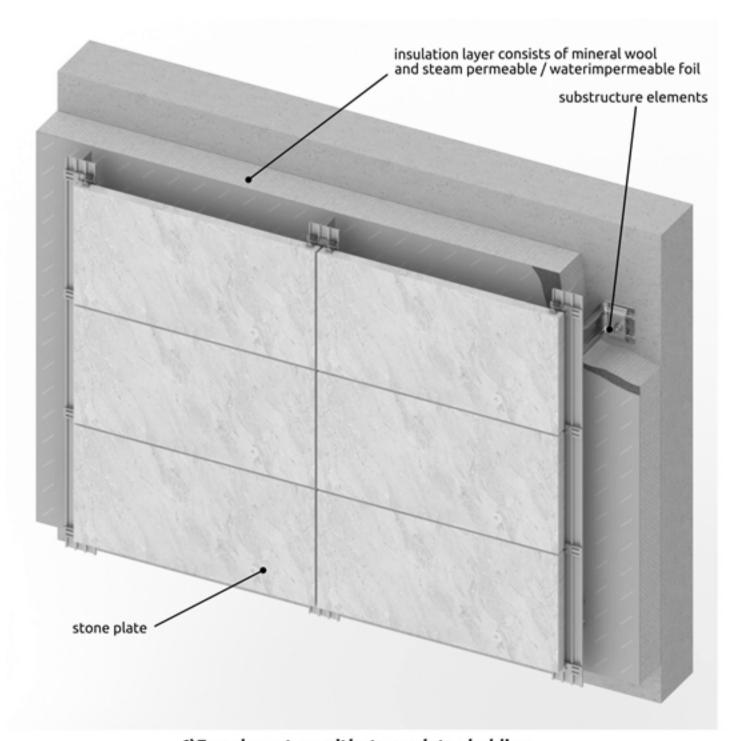
#### STONE FACADES

The widest palette of products for facade systems in TEHNOPLAST PROFILI d.o.o. product range is developed for facades with stone plates (slabs). This facade type is also suitable for similar vladding materials, like marble. There are numerous element combinations to be used depending on project's parameters. All substructure elements are comaptible and can be combined to adapt to even most complicated projects. Stone facade systems differ mostly by buckle type and installation method. According to this, there are two different systems.

The first one features invisible buckle that is glued in previously prepared hole on the back of the stone plate. This invisible attachment system creates clean and modern facade appearance.

Second method eatures visible buckles & cleats that can be removed from the stone plates. This system is simpler and faster to install, and the finished facade features gaps between individual plates.

Pictured below is the typical facade system with stone plates and visible buckles and cleats (6). Substructure elements pictured in Alubond U.S.A facade systems are shred with other facade systems, and also pictured below.



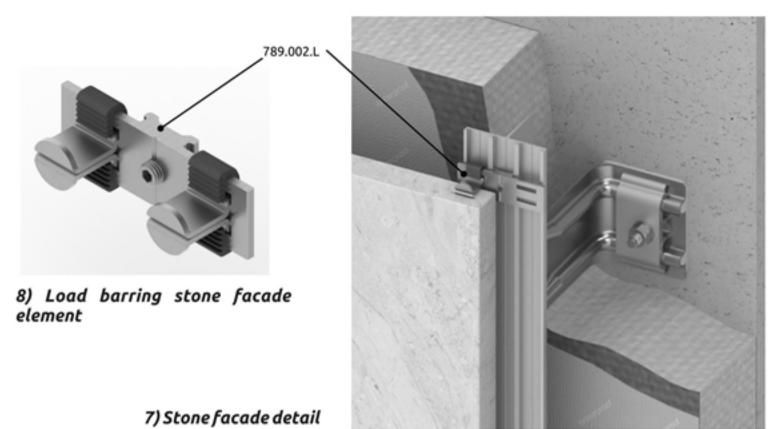
6) Facade system with stone plate cladding

steam permeable and waterimpermeable foil





Detailed picture of one installation method is pictured here (7), with corresponding load barring element (8).



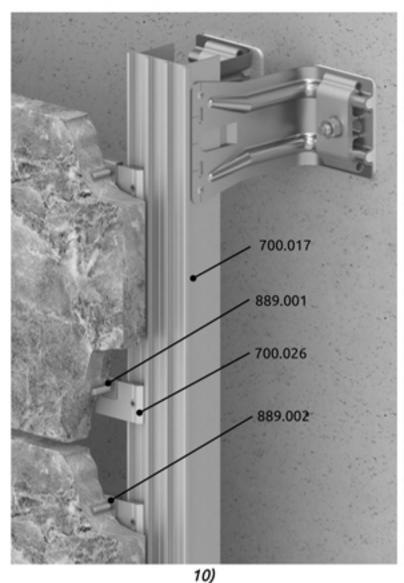
Second installation method with glued, invisible cleats is pictured below. This picture also shows optional load barring vertical profiles and other compatible facade elements.

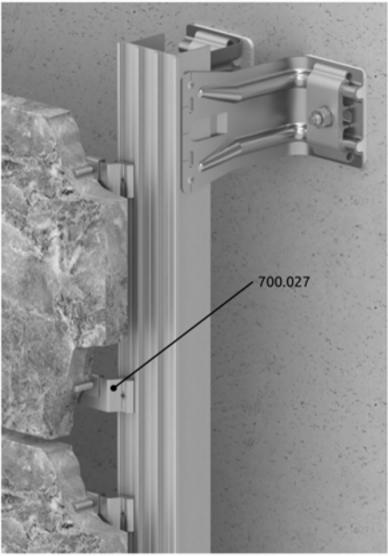


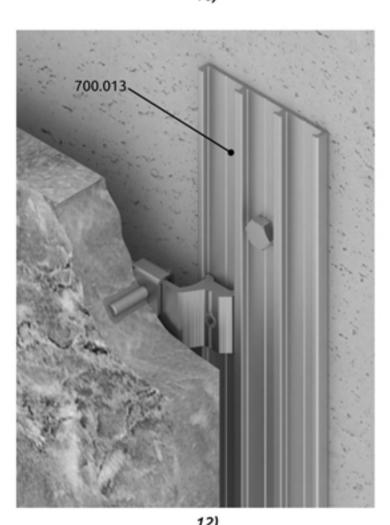
9)Stone facade with glued, invisible buckles











10) Detail in picture 9 shows substructure elements. There are two types of buckles, the upper 889.001, and the lower 889.002. They are both glued into place and attached to a girder 700.026. This attachment system allows easier adjustment of individual facade plates. There is a wide array of vertical load barring profiles compatible with stone facade systems. This picture shows profile 700.017 with two load barring fins. This profile is used for higher loads.

11)

\* 889.002 is delivered with M6xDIN914 screw for buckle tightening and stone plae fastening

11) This picture shows load barring element 700.027 that is bulging variant of element 700.026. Alternating usage of these two buckles results in 3D relief of the stone facade.

12) Sometimes, if there is no need for insulation layer and if small ventilation space is sufficient, usage of shallow load barring vertical profile 700.013 is optimal. This profile is attached directly to a wall. In this case it is best to use 700.027 buckle girder.

This picture shows method of glueing buckles into stone plates. The bottom of the hole is wider andit prevents fallout of the hardened glue. The glue also has vibration dampening properties and lowers possible vibration transfer from substructure to plates and back.

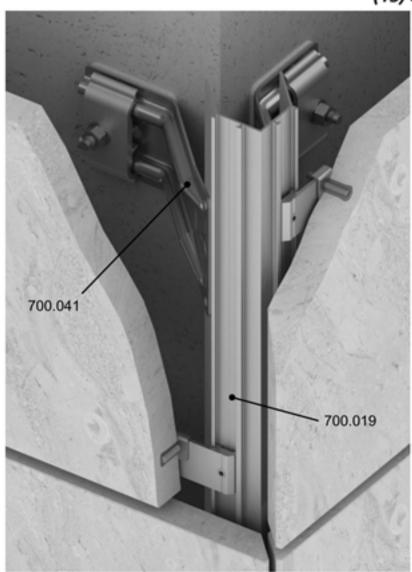




It is important to create a quality horizontal and vertical juncture of individual plates on wall edges. These places are especially loaded by wind pressure and the plate weight itself (13)



(13) Corner juncture of stone facade



14) Corner juncture detail

It is possible to create a fine edge juncture (14) that can be finely adjusted both horizontally and vertically with vertical load barring profile 700.019 and corner anchor 700.014. This type of juncture with one vertical profile is more durable and compact than two profiles. It takes less material because it takes one profile instead of two, and anchor numbers varies depending on load.





Facade system with stone with stone plates attached to load barring aluminum elements is shown on pictures 7 and 8. TEHNOPLAST PROFILI d.o.o. manufactures a wide range of buckles that are simply mounted on horizontal or vertical load barring profiles. It is also possible to create a surface with staggered plate rows, both horizontal and vertical.

It is possible to install a facade with horizontal or vertical load barring profiles and additional L or T profiles, according to project specification.

Details on picture 18.

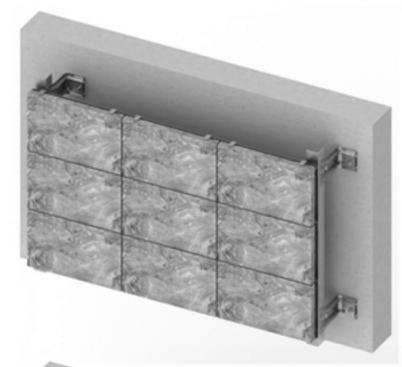
### 15) Horizontally and vertically aligned facade plates

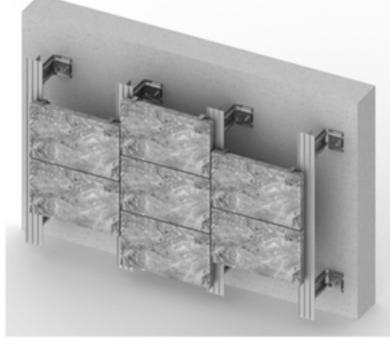
Vertically staggered plates can be installed by using more than one solution, and with usage of standard vertical load barring profiles and both types of buckles (in this case, visible buckles were used). Details in picture 19.

## 16) Vertically staggered stone plates

Horizontally staggered plates can be installed by using more than one solution, and with usage of standard vertical load barring profiles and both types of buckle Two different solutions are shown on pictures 20 an 21.

## 17)Horizontally staggered stone plates











The buckles with fins 889.005.D, 889.003.S i 889.06 are installed into pre-drilled holes in stone plates. This way, the plates are aligned and adjusted both horizontally and vertically. Horizontal load barring profiles 700.050 i 700.051 are attached into vertical profile 700.015.L via screws..

### 18) Continual facade. Picture 15 detail.





Buckles with fins 889.005.D, 889.003.S and 889.06 are installed when vertically staggered plates are required. Other substructure elements can be seen on previous pctures.

18) Continual facade. Picture 16 detail.



Horizontally staggered rows can be installed with previously mentioned buckles (picture 18). This option also uses the same substructure profiles as the others, aready mentioned. The installation is simple but precisely drilled holes in stone panels are required.

20) Horizontally staggered rows with shared buckles





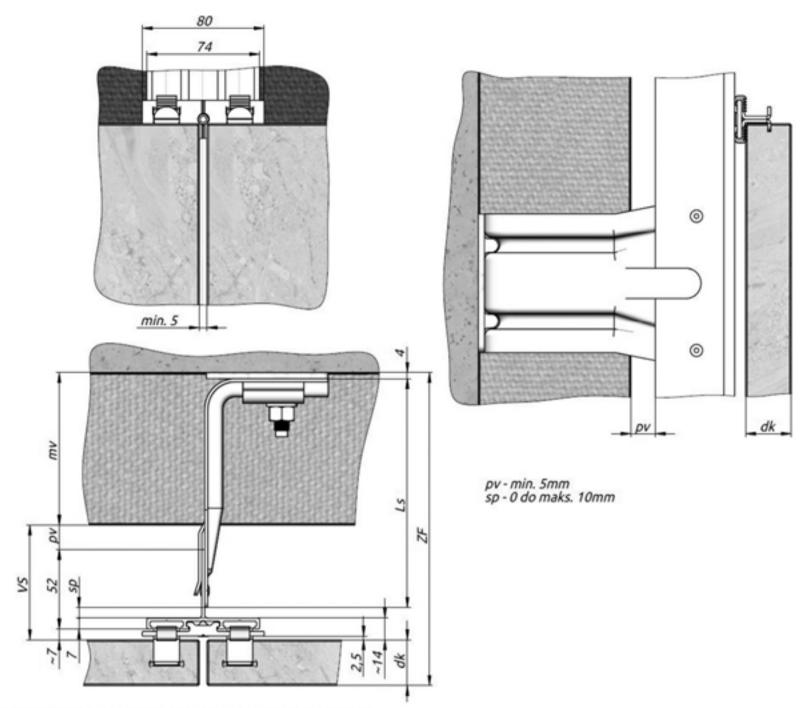
In case that shared buckles are not appropriate, it is possible to attach a buckle 889.004.G, to a upper edge of plate, and create a required horizontal gap.

21) Horizontally staggered rows with indipendent buckles

889.004.G

889.005.D





#### DIMENSIONAL CALCULATION FOR STONE FACADES

The calculation of maximal anchor length is done with following formulas and their combinations (all measurements are in mm). The upper picture is applicable for element 789.002.L

$$Vs = 52 + pv + 7$$

Vs-ventilated layer width, pv-the distance between mineral wool and vertical profile, min. 5mm

ZF = mv + Vs + dk

 $ZF = distance\ between\ the\ wall\ and\ outer\ edge\ of\ stone\ plate,\ dk$  -  $stone\ plate\ thickness,\ mv$  -  $mineral\ wool\ thickness$ 

LSmax = ZF - 4 - dk - 14

Lsmax - maximal allowed anchor length

If Lvmax does not satisfy the encircled value within 65-500 mm range with a step 5 mm, the first lower size is chosen. For example: the calculatedLs<sub>max</sub> = 318,5mm, then it's Ls = 315mm. You can go with even smaller value, and then the following rule applies:

 $sp = Ls_{max} - Ls$ , with condition that  $sp \le 10mm$ 

sp - the distance between anchor and profile (pictured above)





#### GLAS AND CERAMIC FACADES

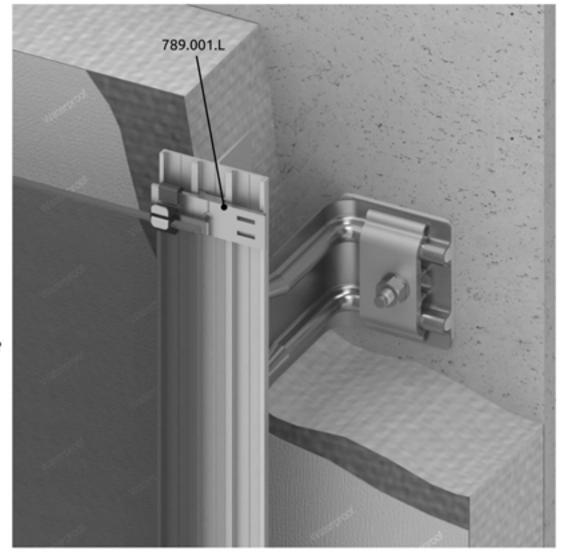


Glass facades are specially sensitive to vibration and load. TEHNOPLAST PROFILI d.o.o. has special product for this type of facades. Typical glass cladded facade can be seen on picture 22.

## 22) Glass cladded ventilated facade

Similar to a stone facade on pictures 7 and 8, where load barring girders 789.002.L, were used, we see here a similar girder for glass facade - 789.001.L. This girder features special plastic inlays that protect the glass from contact with the metal buckle (23).

### 23)Glass cladded facade detail





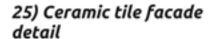


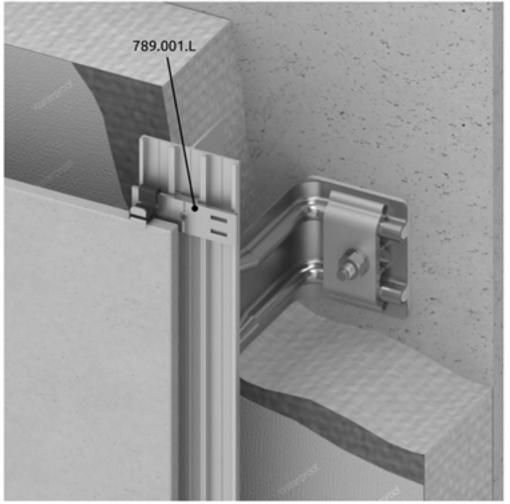


According to some of its's characteristics, ceramic cladded facades are similar to glass facades. Ceramic tiles are brittle, but to a lesser degree than glass, so it is also required to protect the ceramic tile from contact with metal buckle (24).

24) Ceramic tile facade

Glass and ceramic cladding use the same girder, but the plastic inlays are different for ceramic tiles (25).





The similar priciple is used when calculating glass and ceramic facade dimensions.



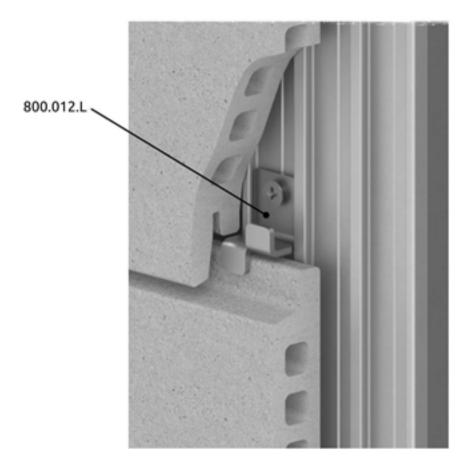


#### **EXTRUDED CERAMIC FACADES**

Today, there is a wast selection of extruded ceramic available. Extruded, hollow ceramic has good insulation properties and it is very easy to install due to it's design. TEHNOPLAST PROFILI d.o.o. manufactures buckles for this type of facade according to client's needs. The buckles are safe and easy to install. The lower picture shows the facade with one type of extruded ceramics (26). Small cutout was made in the middle for better view of details (27).



26) Extruded ceramics facade



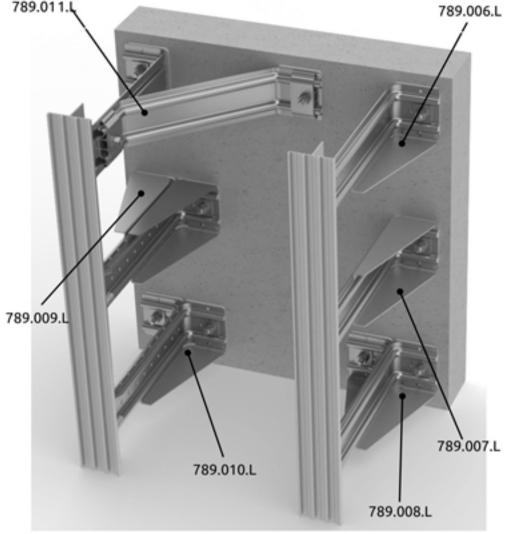
Extruded ceramic buckles 800.012.L, attached via sheet metal screw or rivet.

27) Extruded ceramics facade detail





#### INSTALLATION OPTIONS FOR FACADE SYSTEMS



TEHNOPLAST facade systems can be used for installation of more types of elements for same type of requests, according to client's needs. One of the options is installation of various anchors with different reinforcements (28).

28) Anchors with different reinforcements



29) Stone plate girder variation



30) Ceramic tile girder variation



31) Glass plate girder variation

Pictures 29 to 31 show installation options for girders and buckles. There are three locations of buckles:upper, middle and lower row. By implementation of this method of installation of buckles for top and bottom row, it's possible to achieve the same gap as in the middle of the facade.





#### **PRODUCT CATALOGUE**

Product catalogue is arranged by numbers. In case that no material is specified, it is a part of a set and is ordered together. Some of the sets have specified materials if that material is prevalent in the set..Dimensions and other features are not stated here and can be found in the price list. The mark L means that the product comes in several sizes.

Code	Product description and n	naterial	Description	Remark
600.001		PP	Plastic washer between the wall and the anchor It is used as an insulator or "thermal bridge"	
700.001.L		AlMg3	Anchor. Available lengths from 65 to 500mm, with 5mm step.	
700.002		AlMg3	Washer on junction screw- nut-anchor. Used for lighter loads.	
700.003		AlMg0.5Si	Standard load barring "T" profile for facade cladding.	Length L = 6m.
700.004		AlMg3	Drainage sheet metal for junction of standard and "T" girders.	
700.006		AlMg3	Buckle for Alubond U.S.A facade cassettes - lower right.	





Code	Product description and material	Description	Remark
700.007	AlMg3	Buckle for Alubond U.S.A facade cassettes - lower left.	
700.012	AlMg0.5Si	Reinforced load barring "T" for facade cladding. Used for higher loads.	Length L =6m.
700.013	AlMg0.5Si	Load barring profile for direct installation to a wall withoout anchors.	Length L = 6m.
700.014	AlMg0.5Si	Standard "T" profile for glued or riveted cladding plates.	Available in more sizes.
700.015	AlMg0.5Si	Standard "L" for glued or riveted cladding plates.	Available in more sizes.
700.016	AlMg0.5Si	Single groove profile.	Length L = 6m.
700.017	AlMg0.5Si	Profile with two fins for increased loads.	Length L = 6m.





Code	Product description and material		Description	Remark
700.018		AlMg0.5Si	Double groove profile.	Length L = 6m.
700.019		AlMg0.5Si	Load barring ledge profile.	Application with corner anchor. Length L = 6m.
700.021		AlMg3	Buckle for Alubond U.S.A facade cassettes - upper right.	Delivered with screw M5x8 DIN 914
700.022		AlMg3	Kopča za fasadne kasete od Alubond US.A panela - gornjaleva.	Delivered with screw M5x8 DIN 914
700.023		AlMg3	Washer on junction screw- nut-anchor. Used for higher loads.	
700.024		AlMg3	Washer on junction screw- nut-anchor. Used with "U" anchor.	
700.026		AlMg0.5Si	Hidden buckle girder for stone standard type.	Delivered with screw M8x10 DIN 914





Code	Product description and material	Description	Remark
700.027	Almg0.5Si	Hidden buckle girder for stone-deep type.	Delivered with screw M8x10 DIN 914
700.041	AlMg3	Corner anchor. Used for walledges.	
700.042	AlMg3	"U" anchor. Used for short walls and can be used for party walls on balconies.	
700.043	AlMg3	Anchor buckle.	
700.061	AlMg3	Horizontal "C" profile.	
700.062	AlMg3	Horizontal "G" profile.	





Code	Product description and material	Description	Remark
789.001.L		Buckle and girder set for glass/ceramic cladding plates.	Delivered with screw M8x10 DIN 914
789.002.L		Buckle and girder set for stone cladding plates.	Delivered with screw M8x10 DIN 914
789.003	AlMg0.5Si	Buckle and girder set for Alubond U.S.A cassettes - right.	Delivered with screw M8x10 DIN 914
789.004	AlMg0.5Si	Buckle and girder set for Alubond U.S.A cassettes - left.	Delivered with screw M8x10 DIN 914
789.006.L	AIMg3	Reinforced anchor.	
789.007.L	AlMg3	Double reinforced anchor.	
789.008.L	AlMg3	Double anchor with single reinforcement.	





Code	Product description and ma	terial	Description	Remark
789.009.L		AlMg3	Double anchor with 4 reinforcements.	
789.010.L	· ·	AlMg3	Double anchor.	
789.011.L		AlMg3	Anchor with ties. For big anchor lengths and high loads.	
789.012.L			Buckle and girder set for stone plate. One sided, left or right	
800.006.L		X5CrNi8-10	Stone buckle. To be used with horizontal profiles.	Attached via rivet or sheet metal screw.
800.007.L		X5CrNi8-10	Stone buckle. To be used with horizontal profiles.	Attached via rivet or sheet metal screw.
800.009.L		X5CrNi8-10	Stone buckle.	Attached via rivet or sheet metal screw.
800.012.L		X5CrNi8-10	Extruded ceramics buckle.	Attached via rivet or sheet metal screw.



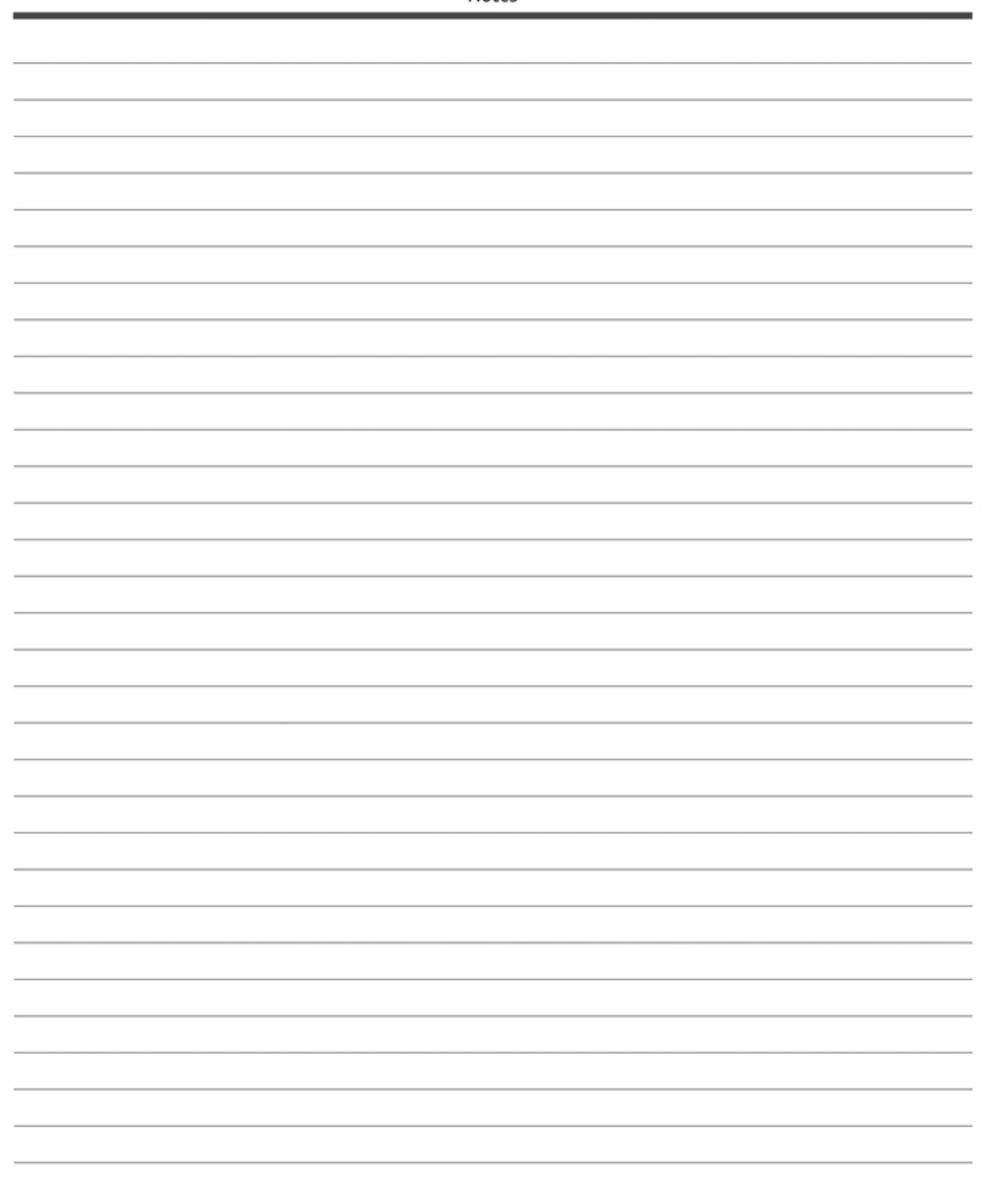


Code	Product description and material	Description	Remark
800.013.L	X5CrNi8 -10	Stone buckle.	Attached via rivet or sheet metal screw.
889.001	X5CrNi8 -10	Upper hidden buckle for stone plate girders.	Delivered with screw M6x8DIN 914
889.002	X5CrNi8 -10	Lower hidden buckle for stone plate girders.	Delivered with screw M6x8DIN 914
889.003.S	X5CrNi8 -10	Stone buckle with safety pin-middle.	Delivered with screw M6x8DIN 914
889.004.G	X5CrNi8 -10	Stone buckle with safety pin-upper.	Delivered with screw M6x8DIN 914
889.005.D	X5CrNi8 -10	Stone buckle with safety pin-lower.	Delivered with screw M6x8DIN 914
889.006	X5CrNi8-10	Stone buckle with safety pin for finishing upper row	Delivered with screw M6x8DIN 914





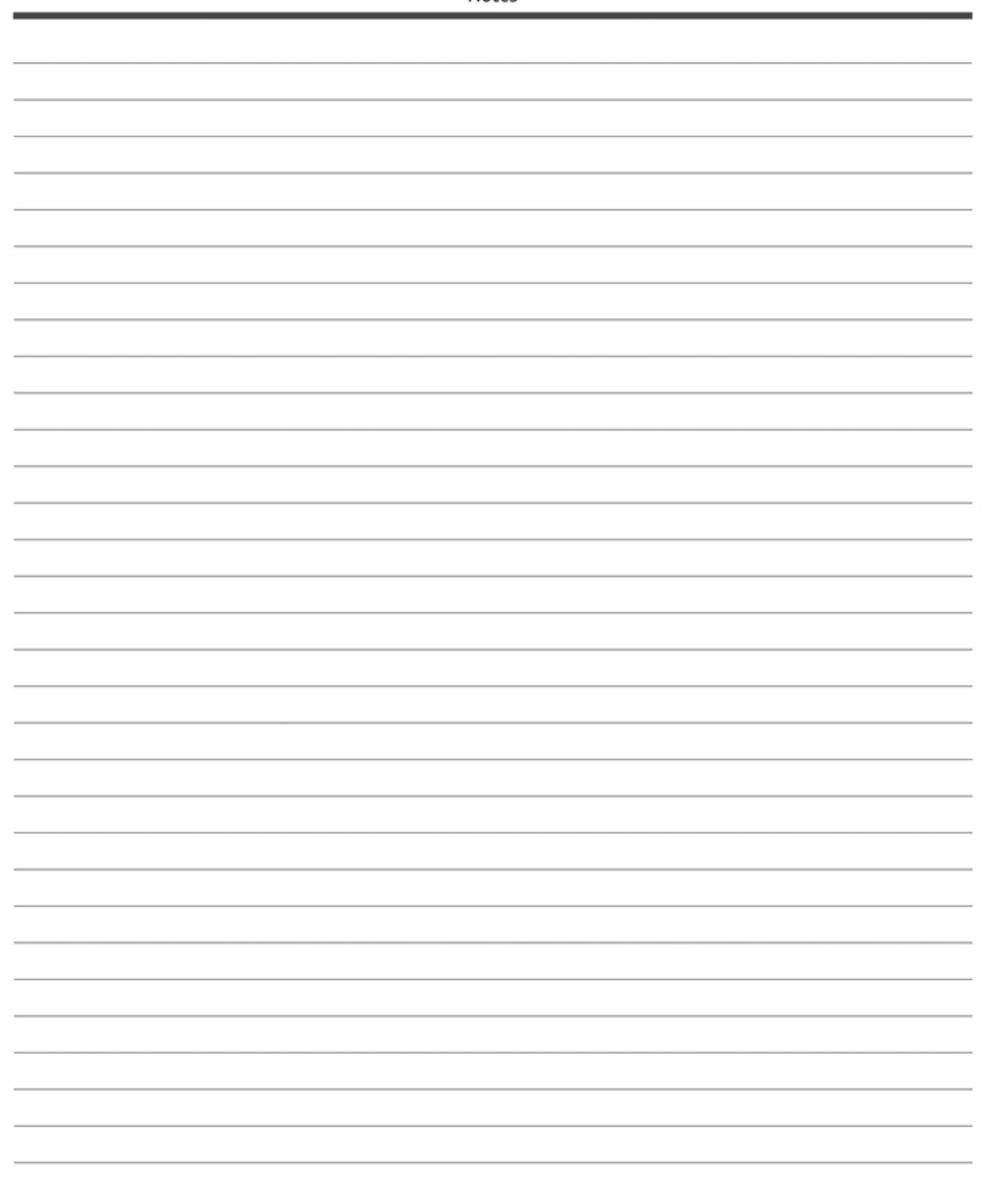
### Notes







### Notes







# MORE INFORMATION ABOUT VENTILATED FACADE SYSTEMS







### 2014.3



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