

National technical approval /
general construction
technique permit

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DIBt>>
**Approval Body for Construction Products and
Techniques**

Structural Design Control Authority

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from: **23 April 2019**
to: **12 June 2023**

Applicant:
BEMO Systems GmbH
Max-Eyth-Straße 2
74532 Ilshofen

Subject matter of this notification:
“BEMO-BOND” composite panels for use for rear-ventilated external wall claddings

A national technical approval/general construction technique permit has herewith been
granted for the subject matter mentioned above.

This notification consists of 14 pages and 26 annexes with 27 pages.

This national technical approval/general construction technique permit replaces the national
technical approval/general construction technique permit no. Z-10.3-807 of 12 June 2018.

DIBt

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I GENERAL PROVISIONS

- 1 This notification proves the usability or applicability of the subject matter within the scope of the building codes of the German federal states.
- 2 This notification does not replace the permits, approvals and certificates which are mandatory for the implementation of building projects.
- 3 This notification is issued without prejudice to third-party rights, especially private industrial property rights.
- 4 Copies of this notification must be made available to the user or operator of the subject matter without prejudice to further regulations in the "Special provisions". Furthermore, it must be pointed out to the user or operator of the subject matter that this notification must be available at the place of use or application. On request, copies must also be made available to the authorities involved.
- 5 This notification may only be reproduced in its entirety. Any publication in the form of extracts requires the consent of *Deutsche Institut für Bautechnik*. Texts and drawings in brochures must not contradict this notification, Translations must contain the note "*Vom Deutschen Institut für Bautechnik nicht geprüfte Übersetzung der deutschen Originalfassung*" [Translation of the German original version, which was not verified by the *Deutsche Institut für Bautechnik*].
- 6 This notification is granted subject to revocation. The provisions may be supplemented and amended at a later date, especially if this is required due to new technical knowledge.
- 7 This notification refers to the specifications provided by the applicant and the documents submitted by the latter. Any amendment to these bases is not covered by this notification and must be reported to the *Deutsche Institut für Bautechnik* without undue delay.
- 8 The general construction technique permit included in this notification is, at the same time, considered to be a national technical approval for the construction technique.

II SPECIAL PROVISIONS

1 Subject matter and field of use or application

1.1 Subject matter

The subject matter of this approval is the 4 mm and 6 mm thick “BEMO-BOND” composite panels and their fasteners (unless they are regulated by an ETA or a harmonised standard). The 4 mm thick composite panels consist of a 3 mm thick core layer and the 6 mm thick composite panels consist of a 5 mm thick core layer with two cover layers made of 0.5 mm thick aluminium sheet respectively. Depending on the core layer material, a distinction is made between two types of panels:

- The “BEMO-BOND/fr ACM405” and the “BEMO-BOND/fr ACM605” composite panels with a core layer made of thermoplastically bound aluminium hydroxide are flame-resistant.
- The “BEMO-BOND/A2 ACM405” and the “BEMO-BOND/A2 ACM605” composite panels with a core layer made of inorganic fillers with thermoplastic binders are non-flammable.

The subject matter of this permit is the façade system “BEMO-BOND” consisting of the “BEMO-BOND” composite panels as flat panels or as coffers and their fastening system on the substructure. The flat panels are fastened to a wooden or to an aluminium substructure. The coffers are fastened to an aluminium substructure.

The structural stability of substructure and its anchoring to the building are not covered by this national technical approval.

1.2 Field of use or application

The “BEMO-BOND” composite panels may be used for rear-ventilated external wall claddings according to DIN 18516¹.

The building height permissible for the use of the composite panels results from the certificate of structural stability unless lower heights result from the respective applicable fire protection regulations of the German federal states.

Any thermal insulation must be fastened directly to the building irrespective of the substructure. The composite panels may be installed with the longitudinal side facing in vertical or in horizontal direction.

2 Provisions for the construction products

2.1 Properties and composition

2.1.1 “BEMO-BOND” composite panels

The composite panels according to Annex 1 must consist of two cover layers made of aluminium sheet and a core layer made of thermoplastically bound aluminium hydroxide (BEMO-BOND/fr ACM405 and BEMO-BOND/fr ACM605) or made of inorganic fillers with thermoplastic binders (BEMO-BOND/A2 ACM405 and BEMO-BOND/A2 ACM605) respectively.

¹ DIN 18516-1:2010-06 Cladding for external walls, ventilated at rear – Part 1: Requirements, principles of testing

The properties of the composite panels, the cover sheets and the core layer must comply with the specifications according Annex 1 and according to the following Tables 1 and 2.

Table 1: Dimensions of the composite panels

Panel type "BEMO- BOND"	Cover sheets (± 0.04 mm)	Core layer	Total thickness t (± 0.2 mm)	Maximum panel dimensions Width X length
"BEMO- BOND/fr ACM405" and "BEMO- BOND/A2 ACM405"	2 x 0.5 mm	3.0 mm	4 mm	2050 mm x 7300 mm
"BEMO- BOND/fr ACM605" and "BEMO- BOND/A2 ACM605"	2 x 0.5 mm	5.0 mm	6 mm	2050 mm x 7300 mm

Table 2: Alloy of the aluminium cover sheets and surface treatment

Panel type "BEMO-BOND"	Alloy and mechanical properties of the cover sheets	Surface treatment of the cover sheets
"BEMO-BOND/fr ACM405" and "BEMO-BOND/A2 ACM405" as well as "BEMO-BOND/fr ACM605" and "BEMO-BOND/A2 ACM605"	EN AW-3105, material condition H14 according to DIN EN 485-2 ² with: E ≥ 70,000 N/mm ² R _m ≥ 150 N/mm ² and ≤ 200 N/mm ² R _{P 0.2} ≥ 130 N/mm ² A _{50 mm} ≥ 2 % or EN AW-3005, material condition H14 according to DIN EN 485-2 ² with: E ≥ 70,000 N/mm ² R _m ≥ 170 N/mm ² and ≤ 215 N/mm ² R _{P 0.2} ≥ 130 N/mm ² A _{50 mm} ≥ 1 % or EN AW-5005A, material condition H14 according to DIN EN 485-2 ² with: E ≥ 70,000 N/mm ² R _m ≥ 150 N/mm ² and ≤ 185 N/mm ² R _{P 0.2} ≥ 130 N/mm ² A _{50 mm} ≥ 1 %	On one side or on both sides, the surfaces of the composite panels may be - factory-made blank, coated with a primer or anodised, or - coated with FEVE- fluoropolymer (≤ 7 µm), primer (≤ 7 µm) and a clear coat (≤ 20 µm)

²
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The bulk density of the core layer must, on average, be 1.63 g/cm³ (± 0.1) for BEMO-BOND/fr ACM405 and BEMO-BOND/fr ACM605 and 1.80 g/cm³ (± 0.15) for BEMO-BOND/A2 ACM405 and BEMO-BOND/A2 ACM605.

With respect to the reaction to fire, the composite panels “BEMO-BOND/fr ACM405” and “BEMO-BOND/fr ACM605” must meet the requirements for class B -s1,d0 according to DIN EN 13501-1³.

With respect to the reaction to fire, the composite panels “BEMO-BOND/A2 ACM405” and “BEMO-BOND/A2 ACM605” must meet the requirements for class A2 -s1,d0 according to DIN EN 13501-1³.

The composition of the composite panels (cover sheets, core layer as well as of the adhesives for the connection of the cover layers with the core layer and coating) must comply with the recipe and further specifications stored at *Deutsche Institut für Bautechnik*.

2.1.2 Fasteners

2.1.2.1 Fasteners for the flat panels

- a) As fasteners for the flat panels “BEMO-BOND” composite panels at aluminium substructures, the fasteners according to Annex 9 and according to the following specifications must be used:
 - SFS-Gesipa blind rivet aluminium/stainless steel, Ø 5.0, according to ETA 13/0255, Annex 3-4; head K11, K14 or K16, body K11 and K14 made of EN AW-5754 and body K16 made of EN AW-5019 according to DIN EN 573-3⁴; mandrel made of stainless steel, material no. 1.4541 according to DIN EN 10088⁵
 - MBE blind rivet aluminium/stainless steel, Ø 5.0; head K11, K14 or K16 according to Annex 9, body made of EN AW-5754 according to DIN EN 573-3⁴; mandrel made of stainless steel, material no. 1.4541 according to DIN EN 10088⁵
 - Ipex blind rivet aluminium/stainless steel, Ø 5.0; head K11, K14 or K16 according to Annex 9, body made of EN AW-5754 according to DIN EN 573-3⁴; mandrel made of stainless steel, material no. 1.4541 according to DIN EN 10088⁵
- b) As fasteners for the flat panels “BEMO-BOND” composite panels at wooden substructures, the façade screw according to Annex 8 made of stainless steel bearing the CE marking according to EN 14592⁶, material no. 1.4567 according to DIN EN 10888⁵ of the type LE-MBE-FA 4.8x30 mm K16 mm with the associated MBE Ø 14 mm x 4 mm Fa-Ze-Di seal ring made of TPE (thermoplastic elastomers) according to Annex 7 must be used.

³ DIN EN 13501-1:2010-01 Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

⁴ DIN EN 573-3:2013-12: Aluminium and aluminium alloys – Chemical composition and form of wrought products – Part 3: Chemical composition and form of products

⁵ DIN EN 10088-1:2014-12: Stainless steels – Part 1: List of stainless steels

⁶ DIN EN 14592:2008 Timber structures – Dowel-type fasteners – Requirements

- c) As fasteners for the flat composite panels with the “BEMO INVISIO fastening system”, the M6 x 10 Invisio screw made of stainless steel of the material number 1.4578 according to DIN EN 10888 according to Annex 23 with the associated components must be used. The “BEMO INVISIO fastening system” is a concealed fastening system. The Invisio agraffes 53 according to Annex 24 or the Invisio agraffes 68 according to Annex 25 made of extruded aluminium profile EN AW-6063 T66 according to DIN EN755-2 are fastened to the rear sides of the composite panels using the Invisio screw. The Invisio screw is inserted into the existing CNC-milled Invisio perforation at the rear cover sheet of the composite panel (cf. Annex 12). The composite panel with the fastened Invisio agraffes (53 or 68) is attached to the related Invisio supporting profile (53 or 68) made of aluminium EN AW-6063 T66 according to DIN EN 755-2.

2.1.2.2 Fasteners for the coffers

The coffers must be fastened at the longitudinal edges by means of attachment slots on bolts according to the Annex 2 to 4.

Ø 8 mm bolts with a Ø 12 x 1.9 plastic sleeve or Ø 10 mm bolts without a sleeve made of stainless steel A4 may be used.

2.2 Manufacturing, packaging, transport, storage and marking

2.2.1 Manufacturing

The composite panels must be continuously manufactured in the plant.

The coffers may only be manufactured in plants with trained personnel and under the supervision and direction of the applicant. The flat panels may be folded in the area of the groove by applying the routing and folding technique according to Annex 3.

The attachment slots on the coffer side are prefabricated in the factory, either in the folded longitudinal edge of the BEMO-BOND composite panel or in the 3 mm thick aluminium sheet made of EN-AW-5005 H 24 according to DIN EN 485-2 which is riveted at the longitudinal edge with SFS-Gesipa Ø 5.0 blind rivet aluminium/stainless steel with head K11 or K14; MBE Ø 5.0 blind rivet aluminium/stainless steel, head K11 or K14 or IpeX Ø 5.0 blind rivet aluminium/stainless steel, head K11 or K14 according to Section 2.1.2.1.

The Invisio perforation at the rear cover sheet of the flat composite panel must be factory-made by means of CNC machining.

2.2.2 Packaging, transport and storage

The composite panels may only be transported and stored in protected packaging materials; damaged composite panels must not be installed.

2.2.3 Marking

The composite panels according to Section 2.1.1 and the MBE and IPEX blind rivet according to Section 2.1.2.1 as well as the fasteners according to Section 2.1.2.1c or their packaging or the delivery note must be marked by the manufacturer with the national conformity mark (*Ü-Zeichen*) according to the conformity mark regulations of the German federal states. They may only be marked if the prerequisites according to Section 2.3 Verification of conformity have been complied with.

In addition to this, the “BEMO-BOND” composite panels, their packaging or the delivery note must be marked by indicating the panel type and the following information:

- “flame-resistant” (for “BEMO-BOND/fr ACM405” and “BEMO-BOND/fr ACM605”)
- “non-flammable” (for “BEMO-BOND/A2 ACM405” and “BEMO-BOND/A2 ACM605”)
- batch number
- manufacturing plant
- specification of the aluminium alloy and the surface treatment of the cover layers
- in case the rear Invisio recess is made: “INVISIO perforation”

2.3 Confirmation of conformity

2.3.1 General

2.3.1.1 Confirmation of conformity for the composite panels and the “BEMO INVISIO” fastening system

The confirmation of the conformity of the composite panels according to Section 2.1.1 and the fasteners according to Section 2.1.2.1c) with the provisions of the national technical approval covered by this notification must be made for each manufacturing plant by means of a declaration of conformity by the manufacturer based on a factory production control and a certificate of conformity by a recognised certification body as well as regular external monitoring of the composite panels according to the following provisions.

For obtaining the certificate of conformity and for the external monitoring, including the product testing to be carried out, the manufacturer of the composite panels must engage the services of a recognised certification body as well as a recognised inspection body.

The manufacturer must make the declaration of conformity by marking the construction products with the national conformity mark (*Ü-Zeichen*) referring to the intended use.

The certification body must submit a copy of the certificate of conformity issued by the latter to the *Deutsche Institut für Bautechnik* for their attention.

2.3.1.2 Confirmation of conformity for the MBE and IPEX blind rivet

The confirmation of the conformity of the above-mentioned fasteners according to Section 2.1.2.1a) with the provisions of the national technical approval covered by the notification must be made for each manufacturing plant by means of a declaration of conformity of the manufacturer based on a factory production control and initial testing by a recognised inspection body.

The manufacturer must make the declaration of conformity by marking the construction products with the national conformity mark (*Ü-Zeichen*) referring to the intended use.

The manufacturer must submit a copy of the declaration of conformity to the *Deutsche Institut für Bautechnik* for their attention.

2.3.2 Factory production control

A factory production control must be set up and carried out in each manufacturing plant. Factory production control is understood as continuous production monitoring carried out by the manufacturer by means of which the latter ensures that the construction products manufactured by them comply with the provisions of this national technical approval.

The factory production control must at least include the measures listed below:

Table 3: Factory production control of composite panels and Invisio screw

Building product	Product property/testing	Frequency	Requirements
"BEMO" composite panels	Cover layers	Thickness	5 x per coil See Section 2.1.1 Table 1
		Tensile strength R_m	1 x per coil
		0.2 % yield strength $R_{p0.2}$	1 x per coil
	Composite panels	Elongation at break $A_{50\text{ mm}}$	1 x per coil
Composite panels	Thickness	3 x every working day 5 measurements	t = 4 mm For tolerance, see Annex 1
	Testing the compound structure by means of the climbing drum peel test method according to ASTM 1781	3 x every working day at both cover layers in the edge area and in panel centre	Peel strength $\geq 80\text{ Nmm/mm}$
	Dimensions and position of the Invisio perforation	At least 1% of the Invisio perforation	For the dimension and position of the agraffe position, see Annex 12
Invisio screw	Tensile fracture strength	10 x per production batch	Breaking strength $\geq 5270\text{ N}$
	Dimensions and material	10 x per production batch	See Section 2.1.2.1c) and Annex 23

For the MBE and IPEX blind rivet, it must be verified that the materials and the properties of the fasteners comply with the specifications according to Section 2.1.2 a and Annex 9 and that they have a shear fracture strength of $\geq 1.65\text{ kN}$ and a tensile fracture strength of $\geq 2.50\text{ kN}$. With respect to the reaction to fire of the composite panels "BEMO-BOND/fr ACM405" and "BEMO-BOND/fr ACM605", the "*Richtlinien zum Übereinstimmungsnachweis schwerentflammbarer construction materials (Baustoffklasse DIN 4102-B1) nach allgemeiner bauaufsichtlicher Zulassung*"⁷ [Guidelines on the verification of conformity of flame-resistant construction materials (construction material class DIN 4102-B1) according to national technical approval] must be applied correspondingly.

With respect to the reaction to fire of the composite panels "BEMO-BOND/A2 ACM405" and "BEMO-BOND/A2 ACM605", the "*Richtlinien zum Übereinstimmungsnachweis nichtbrennbarer Baustoffe (Baustoffklasse DIN 4102-A) nach allgemeiner bauaufsichtlicher Zulassung*"⁷ [Guidelines on the verification of conformity of non-flammable construction materials (construction material class DIN 4102-A) according to national technical approval] must be applied correspondingly.

⁷ Published in the "*Mitteilungen*" [Messages] of the DIBt

The results of the factory production control must be recorded and evaluated. The records must at least contain the following information:

- designation of the construction product or the source material and the components
- type of control or testing
- date of manufacturing and testing of the construction product or the source material or the components
- result of the controls and tests and, where applicable, comparison with the requirements
- signature of the person responsible for the factory production control

The records must be kept for at least five years and submitted to the inspection body responsible for external monitoring.

They must be submitted to the *Deutsches Institut für Bautechnik* and the responsible supreme building supervisory authority on request.

In case of an unsatisfactory test result, the manufacturer must take the measures required to correct the shortcoming without undue delay. Construction products which do not comply with the requirements must be handled in such a way that mistaking them for conforming construction products is excluded. After the shortcoming has been corrected, the respective test must— as far as technically possible and required to verify the correction of shortcomings – be repeated without undue delay.

2.3.3 External monitoring

In each manufacturing plant, the factory production control of the composite panels and the “BEMO INVISIO” fastening system must be inspected by means of external monitoring at regular intervals, however, at least twice a year.

As part of the external monitoring, an initial test must be carried out. The sampling and tests are the responsibility of the recognised inspection body. At least the tests according to Section 2.3.2, Table 3, must be carried out. In addition to this, the composite panels’ reaction to fire of the must be tested.

In addition to this, the BEMO Invisio fastening system must have a tensile force of ≥ 1.10 kN when carrying out the test according to Annex 22.

To monitor the “BEMO-BOND/fr ACM405” and “BEMO-BOND/fr ACM605” composite panels’ reaction to fire, the “*Richtlinien zum Übereinstimmungsnachweis schwerentflammbarer Baustoffe (Baustoffklasse DIN 4102-B1) nach allgemeiner bauaufsichtlicher Zulassung*”⁷ [Guidelines on the verification of conformity of flame-resistant construction materials (construction material class DIN 4102-B1) according to national technical approval] and with respect to the “BEMO-BOND/A2 ACM405” and “BEMO-BOND/A2 ACM605” composite panels’ reaction to fire, the “*Richtlinien zum Übereinstimmungsnachweis nichtbrennbarer Baustoffe (Baustoffklasse DIN 4102-A) nach allgemeiner bauaufsichtlicher Zulassung*”⁷ [Guidelines on the verification of conformity of non-flammable construction materials (construction material class DIN 4102-A) according to national technical approval] must be applied correspondingly.

The results of the certification and external monitoring must be kept for at least five years. They must be submitted by the certification body or inspection body to the *Deutsches Institut für Bautechnik* on request.

2.3.4 Initial test of the MBE and IPEX blind rivet

As part of the initial test by a recognised testing body, the product properties specified in Section 2.1.2, Annex 9, as well as the shear fracture strength of ≥ 1.65 kN and a tensile fracture of strength ≥ 2.50 kN must be tested.

3 Provisions for planning, design and implementation

3.1 Planning and design

3.1.1 Verification of stability

3.1.1.1 General

The stability of the external wall cladding must be verified on a project-by-project basis by means of a static calculation.

The substructure and its anchoring to the building must be verified separately according to the Technical Building Rules⁸ introduced by the building supervisory authorities or the corresponding approvals/assessments for the anchors.

The influences from the wind load as well as the partial safety factors for the influences γ_F result from the Technical Building Rules⁸ introduced by the building supervisory authorities.

When determining the temperature difference, the limit temperature and assembly temperature defined in DIN 18516-1⁹ must be assumed. Regardless of this, however a reduced temperature difference of $\Delta T = 10$ K can be assumed in the direction of the supporting profiles of the substructure if the composite panels and the substructure are in direct contact with each other, i.e. if there is no thermal separation.

The supporting profiles of the substructure must be at least 1.9 mm thick aluminium profiles with a tensile strength of $R_m \geq 245$ N/mm² and a yield strength of $R_{p0.2} \geq 200$ N/mm² (alloy EN AW-6063 T66 according to DIN EN 755-2).

For the BEMO Invisio fastening system, the substructure and system profiles made of aluminium EN AW-6063 T66 according to Annex 24 (INVISIO type 53) or Annex 25 (INVISIO 68) must be used.

3.1.1.2 Verification of stability for the flat composite panels and their fastening system

3.1.1.2.1 For the composite panels according to Section 2.1.1, it must be verified that the design value of the bending stress under the influence of wind load (without relief due to the membrane effect) is nowhere greater than the design value of the bending strength δ_{Rd} specified in Annex 1.1, Table 1.

In addition to this, the maximum deflection f (without membrane effect) in the panel centre under service load must be limited to $f \leq L/70$ with negative wind pressure (wind suction) or $f \leq L/40$ with positive wind pressure, with L = supporting width of the panel (fastener spacing).

3.1.1.2.2 For the blind rivets and screws according to Section 2.1.2.1 a) and b), the design values of the resistance can be found in Annex 1.1, Table 2 and 3.

The stress of the blind rivet under tension must be determined¹⁰ taking into consideration the ratio of the bending stiffness of the façade panel according to Annex 1.1, Table 1, to the bending stiffness of the substructure and compared to the design values of the resistance according to Annex 1.1., Table 2 and 3. For diagonal tension, the design value of the resistance must be determined according to the formula in Annex 1.1, Table 2 and 3.

⁸ See www.dibt.de, Rubrik: >Geschäftsfelder<, Unterrubrik: >Bauregellisten/Technische Baubestimmungen< [Category: >Business areas<, Subcategory: >Building Rules Lists/Technical Building Rules<]

⁹ DIN 18516-1:2010-06 Cladding for external walls, ventilated at rear – Part 1: Requirements, principles of testing

¹⁰ e.g. according to E. Zuber: *Einfluss nachgiebiger Fassadenunterkonstruktionen auf Bekleidungen und Befestigungen* [Influence of flexible façade substructures on claddings and fastening systems] in the "Mitteilungen" [Messages] of the *Institut für Bautechnik* [Institute for Structural Engineering], Heft 2 [Issue 2], 1979, p.45-50

It may be assumed that no shear forces act on the fasteners due to the chord reduction of the façade panel as a result of the deflection if the following conditions are met:

a) Table 4: Panel lengths depending on the hole diameter and hole clearance

Hole diameter D in the panels [mm]	Hole clearance δ [mm]	Panel length in the direction of the supporting width [m]	Panel length in the direction of the supporting profiles [m]
\varnothing 7.5	2.5	≤ 1.153	≤ 4.093
\varnothing 8.5	3.5	≤ 1.543	≤ 7.300
\varnothing 9.5	4.5	≤ 2.050	≤ 7.300
\varnothing 9.5*	4.7	≤ 1.543	≤ 7.200

* for the screw connection

b) Central positioning of the fasteners in the holes using a drilling jig when producing the holes in the substructure (\varnothing 3.3 mm in wooden substructures; \varnothing 5.1 in aluminium substructures)

c) Limitation of deflection according to Section 3.1.1.2.1

Further limitations of deflection due to special requirements concerning the end-use performance remain unaffected.

3.1.1.2.3 Instead of the verification according to Section 3.1.1.2.2, the stability of the fasteners may be verified as follows:

The design values of the resistance for the fasteners of Annex 1.1, Table 2 and 3 must be complied with. The shear stress of the fasteners must be determined by taking into consideration the chord reduction of the flat composite panel under deflection (combined bending and membrane effect). It is sufficient to examine the loading condition "wind" combined with simultaneous cooling by 40 K. Per fastener, a constant spring stiffness of 1.69 kN/mm must be applied. The available free hole clearance may be taken into consideration. Stresses resulting from vertical loads must be added vectorially.

3.1.1.2.4 For the Invisio fastening system according to Section 2.1.2.1 c), the design value of the resistance can be found in Annex 13, Table 1, or Annex 17, Table 1. When using the type 53 INVISIO agraffe, the maximum panel dimensions are $W \times H = 7200 \times 1250$ mm; the panels must be installed horizontally (horizontal format). When using the type 68 INVISIO agraffe, the maximum panel dimensions are $W \times H = 7200 \times 2050$ mm in the horizontal format and $W \times H = 2050 \times 4060$ mm in the vertical format. The minimum panel dimensions are 300 x 300 mm when using 4 agraffes. For diagonal tension, the design values of the resistance must be determined according to the formula in Annex 13 or Annex 17. In addition to this, the maximum deflection f (without membrane effect) in the panel centre under service load must be limited to $f \leq L/70$, with L = supporting width of the panel (fastener spacing). The deflection of the Invisio supporting profile must be limited to $L/500$.

3.1.1.3 Stability for the coffers and their fasteners

The coffers may be dimensioned according to the elasticity theory, whereby a selective comparison with the test results¹¹ stored at the DIBt must confirm that the calculation results are on the safe side. Extrapolations are not possible, intermediate values may be interpolated.

¹¹ The test reports und expert opinions referred to in the test report of the *Prüfamt für Baustatik – Stuttgart* – [Control Authority for Structural Analysis in Stuttgart], "Validierungsprüfung TP/2014/005" [Validation test TP/2014/005] of 13 March 2015 and the test report no. 902 9913 00/P1 of 16 February 2016 of the *Materialprüfanstalt Universität Stuttgart* [Materials Testing Institute of the University of Stuttgart]. Can be obtained from the applicant.

To recalculate the test results, nonlinear calculations may be carried out taking into consideration large deformations (so-called third order theory) with element formulations which include membrane effects. The stability of the coffers must be verified. When performing the recalculation, tolerances and temperature expansions must be taken into consideration.

It is recommended to have the static calculation of the coffers verified unless such a verification is already mandatory under the building codes of the German federal states. The relevant authorities or engineers responsible for the verification of the structural stability must be charged with this verification.

The load must be taken into consideration as distributed load both in the wind suction and in wind pressure direction.

A safety factor of $\gamma_M = 1.1$ against reaching the 0.2 % yield strength of the cover sheets and a safety factor of $\gamma_M = 1.7$ against reaching the failure load in the test and/or the calculated load must be complied with.

The maximum deflection in the centre of the coffer may be up to $1/30 \times L$ (with L = distance between the attachment points = coffer width); however, it must not exceed the value of 50 mm.

When verifying the fastening of the coffers to the substructure, the design values of the component resistance of the coffer attachment $F_{R,d,tension}$ according to Table 1 in Annex 2 must be applied according to the implementation described in Section 2.1.2.2.

The connection of the riveted aluminium sheets with the coffers must be verified. For the rivet fastening of aluminium sheet to the coffer at the longitudinal edge, the design values of the resistance $F_{Q,Rd}$ according to Table 1 in Annex 1.2 must be applied.

For the corner design shown in Annex 3 with riveted corner connectors made of at least 4 mm thick BEMO-BOND composite panels or at least 2 mm thick aluminium sheets made of EN AW-1050A according to DIN EN 485-2², the transverse force of the cross folds is transmitted into the longitudinal folds with adequate safety.

3.1.2 Fire protection

The composite panels “BEMO-BOND/fr ACM405” and “BEMO-BOND/fr ACM605” are flame-resistant.

The composite panels “BEMO-BOND/A2 ACM405” and “BEMO-BOND/A2 ACM605” are non-flammable in connection with an aluminium substructure and flame-resistant in connection with a rod-shaped wooden substructure.

The verification of the flame resistance or non-flammability applies to the use on solid mineral substrates or if there is any thermal insulation made of non-flammable mineral wool insulation panels (thickness of at least 50 mm) according to DIN EN 13162 and the depth of the ventilation gap between the panels and the insulation or substrate is at least 30 mm. The joint width between the composite panels must be limited to 20 mm. Otherwise, the façade system may be used with “BEMO-BOND aluminium composite panels” where the normal flammability is required by the building supervisory authorities.

For flame-resistant and non-flammable façade systems, the Technical Building Rules concerning special fire protection measures for rear-ventilated external wall claddings according to DIN 18516-1 must be observed.

3.1.3 Thermal protection and protection against moisture subject to climate conditions

DIN 4108-2¹² applies to the verification of the thermal protection.

When calculating the thermal resistance (R value) according to DIN EN ISO 6946¹³ for the external wall construction, the air layer (ventilation gap) and the composite panels must not be taken into consideration.

¹²

DIN 4108-2:2013-02

Thermal protection and energy economy in buildings – Part 2: Minimum requirements to thermal insulation

For the verification of thermal protection, the design value of the thermal conductivity according to DIN 4108-4¹⁴ Table 2 must be applied for the insulating material used. The thermal bridges caused by the substructure and its anchoring due to a penetration of the thermal insulation layer or its thickness being reduced, must be taken into consideration.

DIN 4108-3¹⁵ applies to the verification of the protection against moisture subject to climate conditions.

3.1.4 Sound insulation

DIN 4109-1¹⁶ and 4109-2¹⁷ apply to the verification of the sound insulation.

3.1.5 Protection against corrosion

If there is moisture between the building and façade panel as planned and if there are corrosive influences, special precautions must be taken to avoid crevice corrosion between the façade panel and substructure, whereby only such construction products which do not have an adverse effect on the reaction to fire may be used. This can be assumed if a building supervisory authority's verification of fitness for use with respect to the non-flammability is available for powder-coated aluminium profiles and separating layers.

3.2 Implementation

The façade system "BEMO-BOND" and/or the composite panels must be implemented according to the following provisions and according to the specifications in the annexes as well as by taking the planning specifications (see Section 3.1) into consideration.

Only products according to Section 2.2 may be used.

The provisions according to DIN 18516-1¹ including the related annexes in the List of the Technical Building Rules must be observed.

The façade system may be used both with or without thermal insulation.

Profile joints in the substructure must not be bridged by the composite panels.

3.2.1 Requirements for the applicant and for the company responsible for implementing the work

- Applicant

The applicant is obliged to make the special provisions of this national technical approval and all information and further details required for the proper implementation of the construction technique available to the persons entrusted with the design and implementation of the façade system.

- Company responsible for implementing the work (contractor)

The specialist personnel of the company responsible for implementing the work must obtain information about the special provisions of this national technical approval as well as about all details required for the proper implementation of the construction technique from the applicant.

The company responsible for implementing the work must confirm the implementation of the façade system in line with the requirements of the approval according to Annex 26. This confirmation must be handed over to the building owner.

¹³ DIN EN ISO 6946:2008-04 Building components and building elements – Thermal resistance and thermal transmittance – Calculation methods

¹⁴ DIN 4108-4:2013-02 Thermal protection and energy economy in buildings – Part 4: Hygrothermal design values

¹⁵ DIN 4108-3:2014-11 Thermal protection and energy economy in buildings – Part 3: Protection against moisture subject to climate conditions – Requirements, calculation methods and directions for planning and construction

¹⁶ DIN 4109-1 Sound insulation in buildings – Part 1: Minimum requirements

¹⁷ DIN 4109-2 Sound insulation in buildings – Part 2: Verification of compliance with the requirements by calculation

3.2.2 Receiving inspection of the construction products

For the construction products according to Section 2.1.1 to 2.1.3, a receiving inspection of the marking according to Section 2.2.3 or according to the ETA or European standards specified in Section 2.1.2 must be carried out on the construction site.

3.2.3 Assembly of the flat composite panels with rivets on aluminium substructures

The rivet fastening of the composite panels must be carried out without technical constraints using a fixed point with a \varnothing 5.1 mm hole diameter in the composite panels and with sliding points according to the annexes according to Table 4. The fixed point must be positioned as near as possible to the panel centre.

The holes for the fasteners in the composite panels and in the supporting profiles must be carried out with stepped bores at the building or only in the supporting profiles using the already pre-drilled composite panels as a gauge.

The fasteners must be inserted centrally into the panel holes. The rivets are to be set using a distance gauge (distance \geq 0.3 mm).

The distance of the fasteners from the panel edges must be at least 16 mm.

3.2.4 Assembly of the flat composite panels with screws on wooden substructures

The screw fastening of the composite panels must be carried out without technical constraints using a fixed point (using the fixed point sleeve) and sliding points according to Annex 7. The hole diameters in the composite panel must be \varnothing 9.5 mm; the fixed point must be positioned as near as possible to the panel centre. The assembly instructions of the BEMO-BOND aluminium composite panels on wooden structures must be observed.

The holes for façade screws in the composite panels and in the rod-shaped wooden structure must be carried out with stepped bores at the building. The pre-drilled holes of the wooden substructure must be carried out centrally with a drilling jig using the already pre-drilled façade panel. The façade screws with the related FA-ZE-DI sealing ring (with an inserted fixed point sleeve, if necessary) must be tightened until the screw head is in contact with the sealing ring.

The fasteners must be inserted centrally into the panel holes.

The distance of the fasteners from the panel edges must be at least 16 mm.

3.2.5 Assembly of the flat composite panels with "BEMO-Invisio" on aluminium substructures

The horizontally arranged composite panels with the factory-made Invisio perforation must be mounted to the horizontal type 53 or type 68 Invisio supporting profiles without any offsets and twisting. Supporting profiles which consist of several parts and are joined behind the panel length must be carried out with suitable connectors.

For the vertical substructure profiles used as support for the above-mentioned horizontal Invisio supporting profiles, a profile joint between the agraffes within a composite panel is not permissible.

When assembling the Invisio agraffe, the nut of the Invisio screw must be fastened with a torque of 3 Nm (see Annex 16).

The distances and storage conditions according to Annex 12 to 14 or Annex 17 to 20 must be adhered to.

3.2.6 Assembly of the folded coffers on bolts

The coffers must be mounted to the substructure according to Annex 4 (attachment to bolts) and according to the specifications according to Section 2.1.2.2 as well as Annex 2 to 4.

Renée Kamanzi-Fechner
Division Head

Certified
<<Signature, illegible>>
<<Stamp: *Deutsches Institut für Bautechnik*, 20>>

Table 1: Dead load, bending stiffness, moment of resistance and design value of the bending strength for the “BEMO-BOND” composite panels

Panel type “BEMO-BOND”	Dead load	Bending stiffness E I	Moment of resistance W	Moment of resistance W _{INVISIO*}	Design value of the bending strength
	[kg/m ²]	[Nm ² /m]	[cm ³ /m]	[cm ³ /m]	[N/mm ²]
BEMO-BOND fr ACM405	7.6	230	1.54	1.27	118
BEMO-BOND A2 ACM405	8.1	230	1.54	1.27	118
BEMO-BOND fr ACM605	10.6	547	2.53	2.09	118
BEMO-BOND A2 ACM605	11.9	602	2.53	2.09	118

* Reduction of the moment of resistance resulting from the recess for the verification of the support moments for the Invisio fastening system (range of influence = within a radius of 100 mm)

Table 2: Design values of the resistance for the rivet fastening of the flat composite panel to the substructure

Blind rivet according to Section 2.1.2.1a	Head diameter	Tension F _{z,Rd} [N]			Shear F _{Q,Rd} [N]
		Edge	Corner	Centre	Shear
MBE 5.0x14 Ipex 5.0x14	K11 – 11 mm	531	380	665	752
MBE 5.0x14 Ipex 5.0x14	K14 – 14 mm	672	420	879	747
MBE 5.0x14 Ipex 5.0x14	K16 – 16 mm	697	477	879	732
SFS-Gesipa 5.0x14	K11 – 11 mm	579	419	740	870
SFS-Gesipa 5.0x14	K14 – 14 mm	641	506	790	972
SFS-Gesipa 5.0x14	K16 – 16 mm	762	590	822	1139

For diagonal tension, the following must be verified:

$$\frac{F_{Q,Ed}}{F_{Q,Rd}} + \frac{F_{Z,Ed}}{F_{Z,Rd}} \leq 1.0$$

Table 3: Design values of the resistance for the screw fastening

Screw according to Section 2.1.2.1b	Arrangement	Tension F _{z,Rd} [N]	Shear F _{Q,Rd} [N]	Diagonal tension It must be verified:
FA 4.8 x 30 K16	Panel centre or edge	610	541	F _{Q,Ed} / F _{Q,Rd} + F _{Z,Ed} / F _{Z,Rd} ≤ 1
	Panel corner	479	541	

“BEMO-BOND” composite panels for use for rear-ventilated external wall claddings

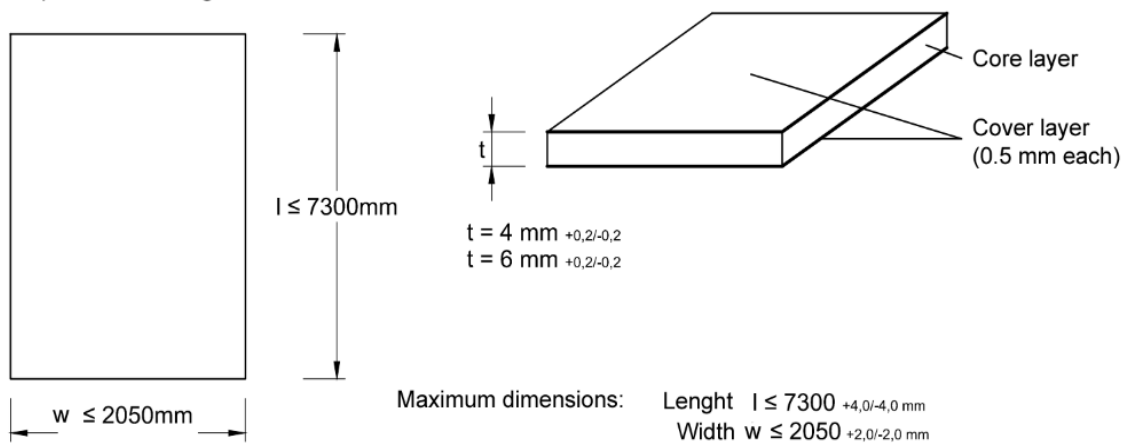
Annex 1.1

Properties; design values of the resistance for the façade panels, rivet fastening and screw fastening

Table 1: Design values of the resistance for the rivet fastening of the aluminium sheet to the folded coffer

Blind rivet according to Section 2.2.1	Arrangement	Shear FQ,Rd [N]
SFS-Gesipa Ø 5.0 with head K11/14	Longitudinal edge according to Annex 6	630
MBE/lpex blind rivet Ø 5.0 with head K11/14		470

Façade panels according to Section 2.1.1



“BEMO-BOND” composite panels for use for rear-ventilated external wall claddings

Annex 1.2

Design values of the resistance for the rivet fastening of the aluminium sheets to the coffer edges / dimensions of the façade panels (composite panels)

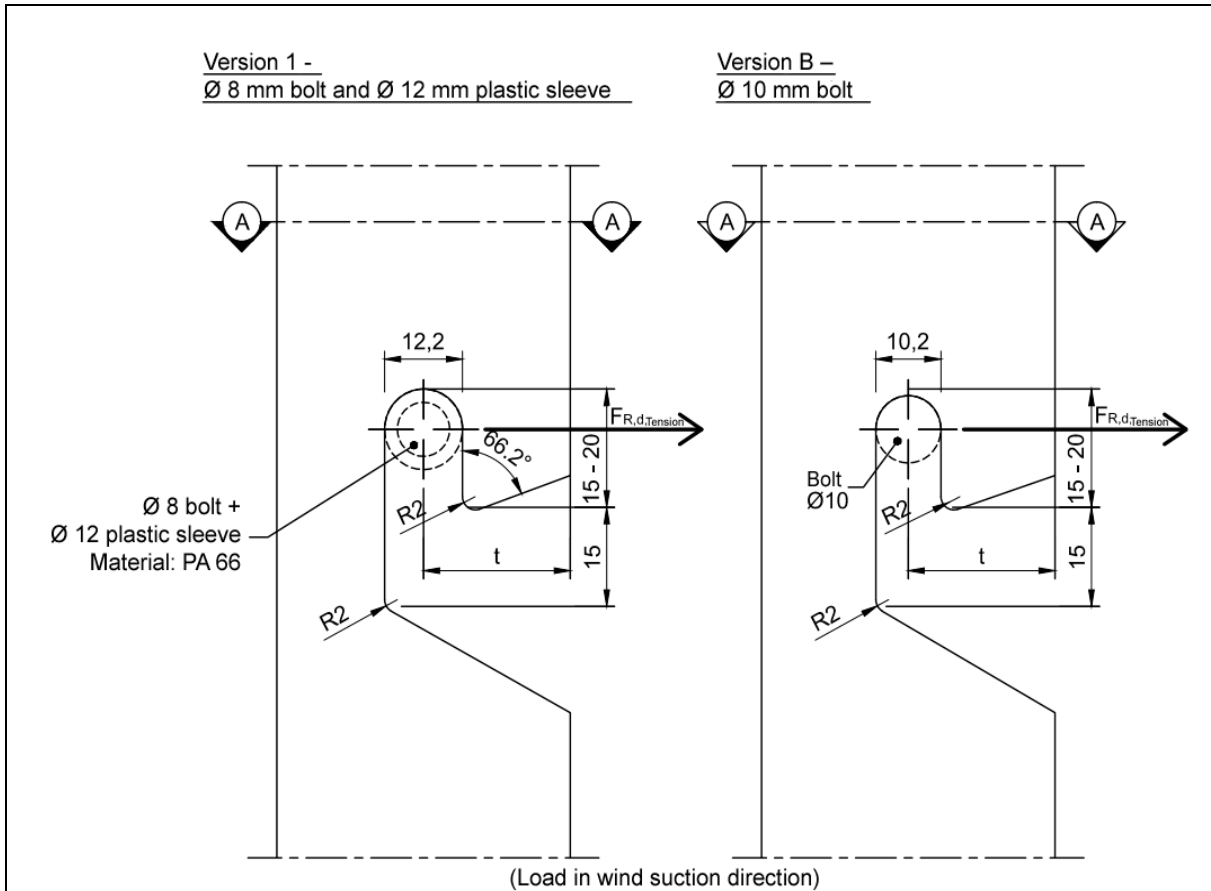
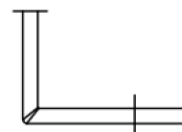


Table 1: Design value of the reaction forces $F_{R,d,tension}$ at the attachment point

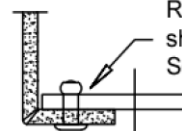
Attachment points in the coffer edge for version A and B		t mm	$F_{R,d,tension}$ kN
Coffer edge design			
1	BEMO-BOND composite panels	20	0.44
2	BEMO-BOND composite panels	25	0.57
3*	Aluminium sheet, d = 3 mm	20	0.86
4*	Aluminium sheet, d = 3 mm	15	0.47

All dimensions in mm
 * according to Annex 6

Section A-A – design 1 + 2



Section B-B – design 3 + 4

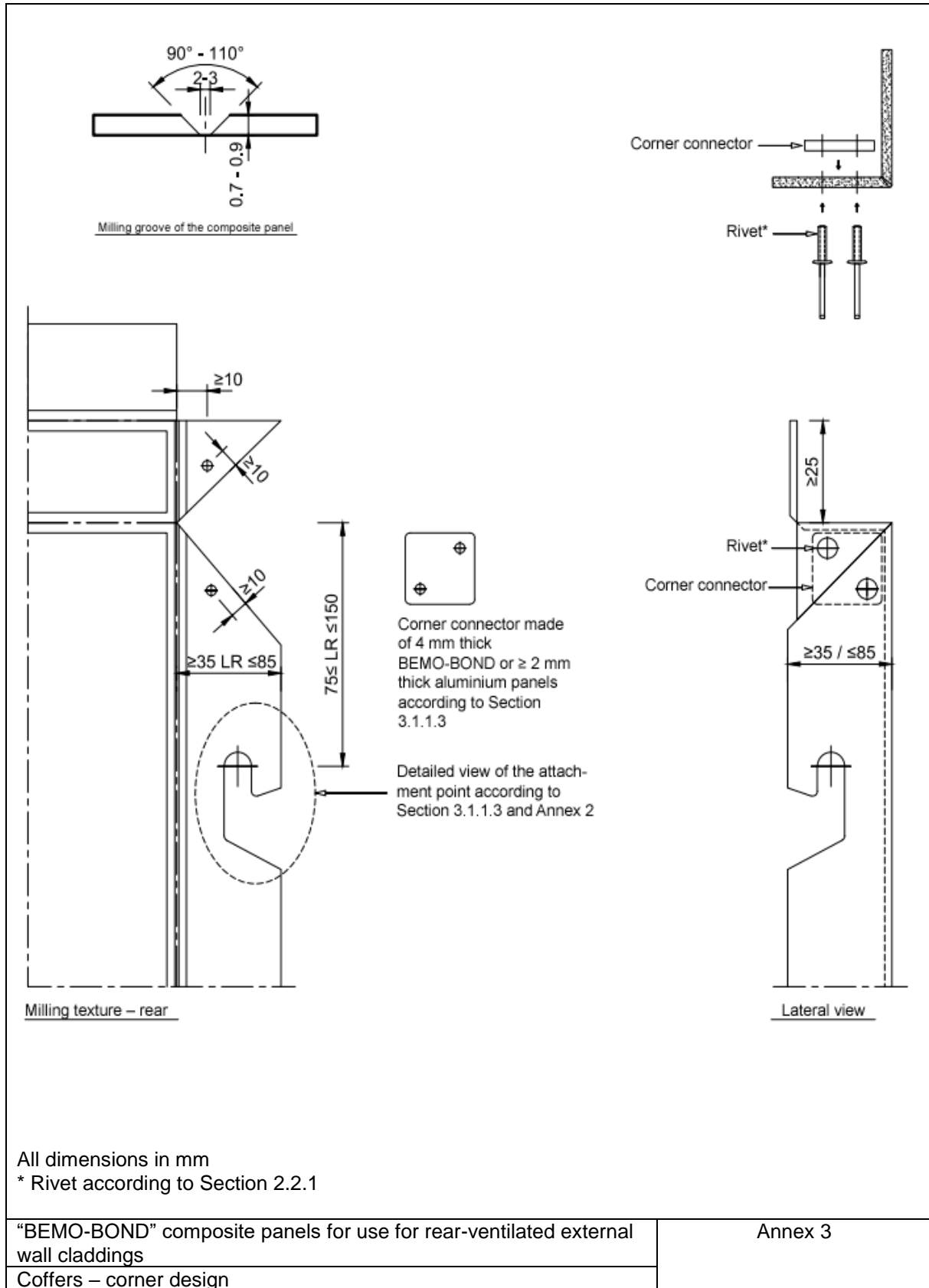


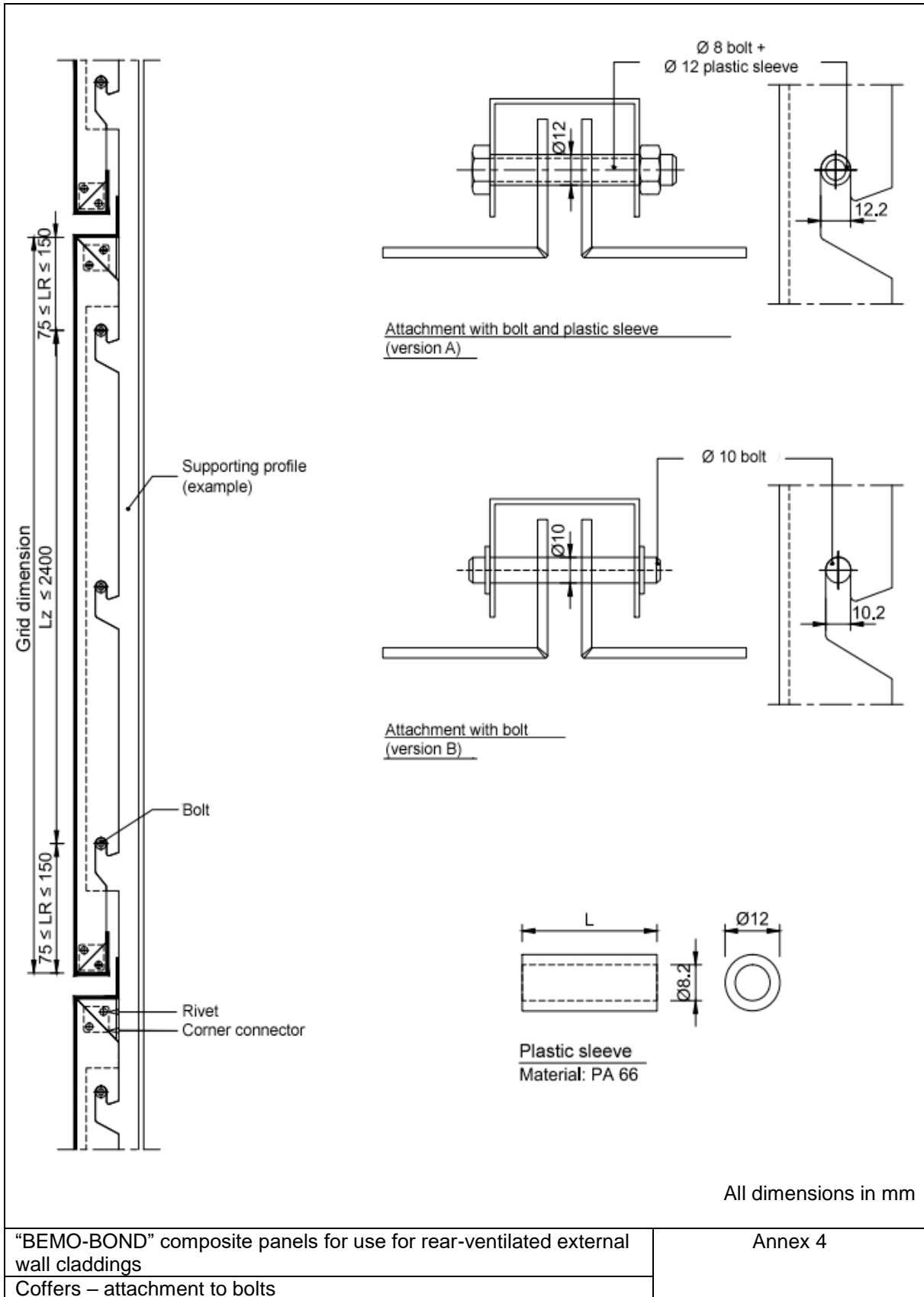
Rivet + aluminium sheet according to Section 2.2.1

“BEMO-BOND” composite panels for use for rear-ventilated external wall claddings

Annex 2

Coffers, design values of the reaction forces at the attachment points of the coffer

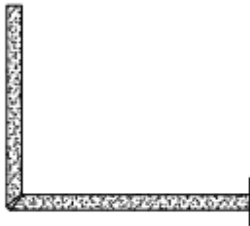




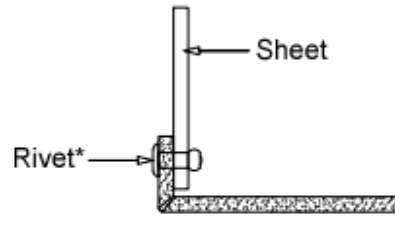
“BEMO-BOND” composite panels for use for rear-ventilated external
 wall claddings
 Coffers – attachment to bolts

Annex 4

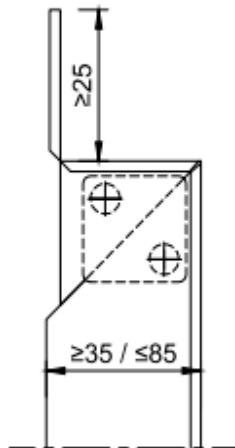
single longitudinal fold



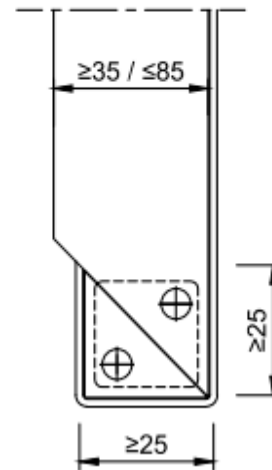
single longitudinal fold - reinforced



double cross fold 1



double cross fold 2



All dimensions in mm

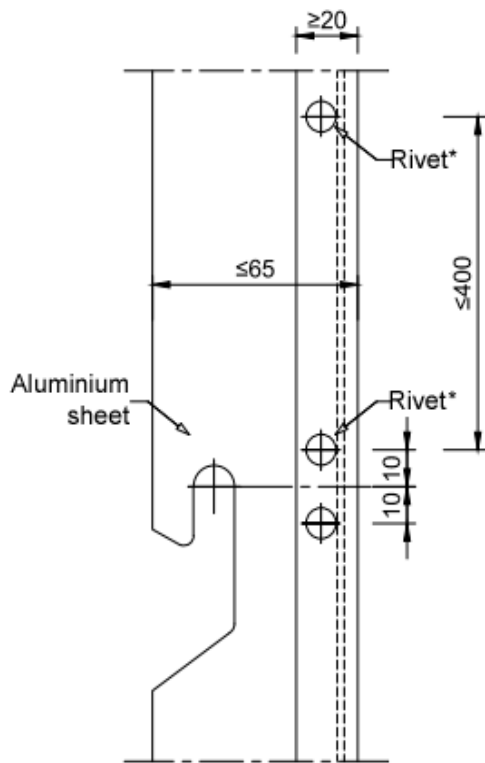
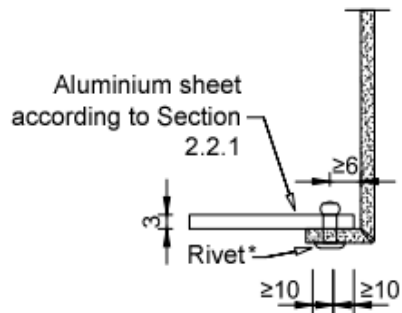
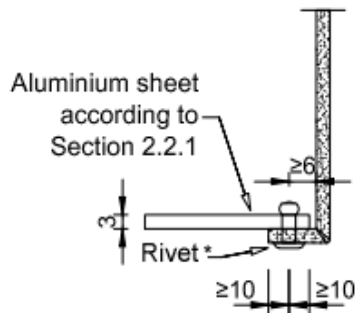
* Rivet according to Section 2.2.1

All dimensions in mm

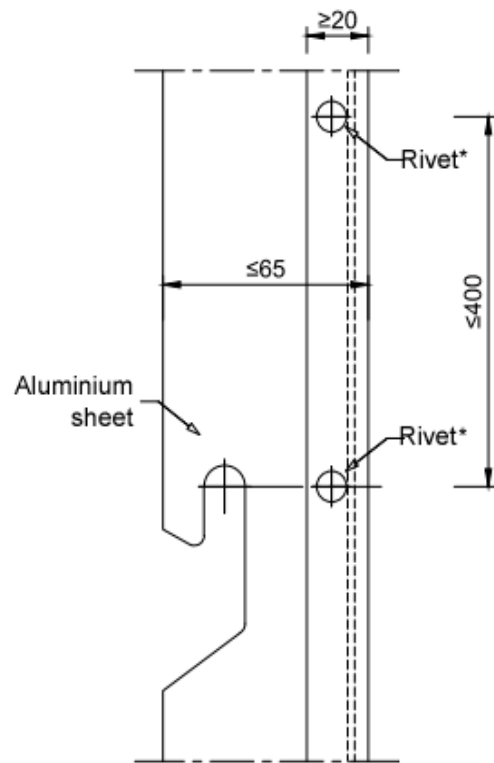
"BEMO-BOND" composite panels for use for rear-ventilated external
 wall claddings

Annex 5

Coffers – folds



Design 3, Table 1 (Annex 2)
 - with two rivets per attachment point



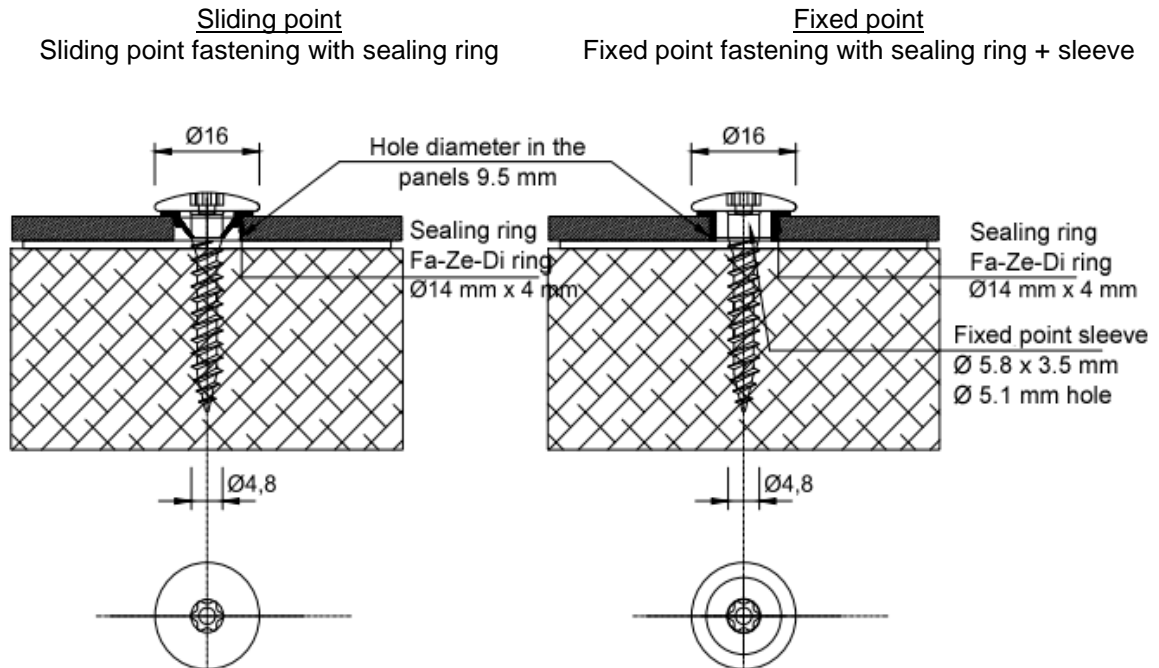
Design 4, Table 1 (Annex 2)
 - with one rivet per attachment

All dimensions in mm
 * Rivet according to Section 2.2.1

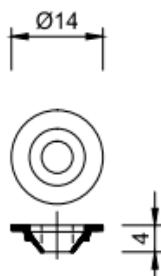
"BEMO-BOND" composite panels for use for rear-ventilated external
 wall claddings
 Coffers with reinforced longitudinal fold

Annex 6

Sliding points and fixed points of the screw fastening
 on wooden substructures

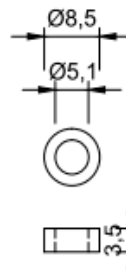


Ø 14 mm x 4 mm Fa-Ze-Di sealing ring



Material: TPE, hardness Shore D: 35
 according to DIN ISO 7619

Ø 8.5 x 3.5 mm fixed point sleeve – Ø 5.1 mm hole



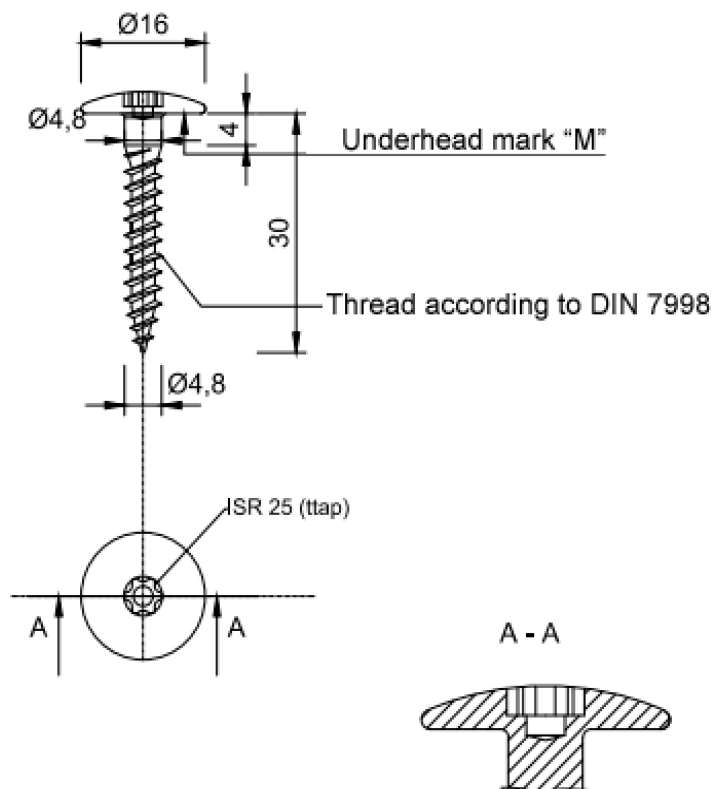
Material: Aluminium, material condition: T8 / T6

“BEMO-BOND” composite panels for use for rear-ventilated external
 wall claddings

Sliding points and fixed points of the screw fastening to wooden
 substructures

Annex 7

Façade screw FA 4.8x30 K16
 with CE marking according to EN 14592



- Fastening of flat 4 mm thick flat composite panels to wooden substructures
 Hole diameter in the panel Ø 9.5 mm
- Minimum edge distance of the flat composite panel of 16 mm
- Performance according to declaration of performance of 13 January 2015 of MBE GmbH stored at DIBt
- The load-bearing capacity of the façade screw in the wooden substructure must be verified separately according to the Technical Building Rule introduced by the building supervisory authorities.

All dimensions in mm.

"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings

Annex 8

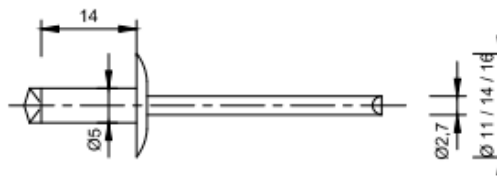
Fasteners for the flat 4 mm BEMO-BOND composite panels to a wooden substructure (see Section 2.1.2. 1b)

Fasteners for the flat composite panels – blind rivet according to Section 2.1.2

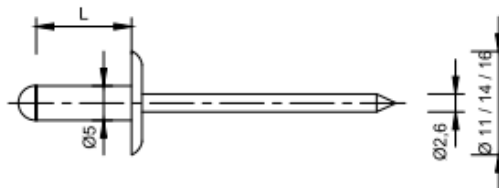
SFS / Gesipa Ø 5 mm blind rivet aluminium / stainless steel, K11, K14
 and K16 according to ETA 13/0255



MBE Ø 5 mm blind rivet aluminium / stainless steel, K11, K14 and K16



IPEX Ø 5 mm blind rivet aluminium / stainless steel, K11, K14 and K16

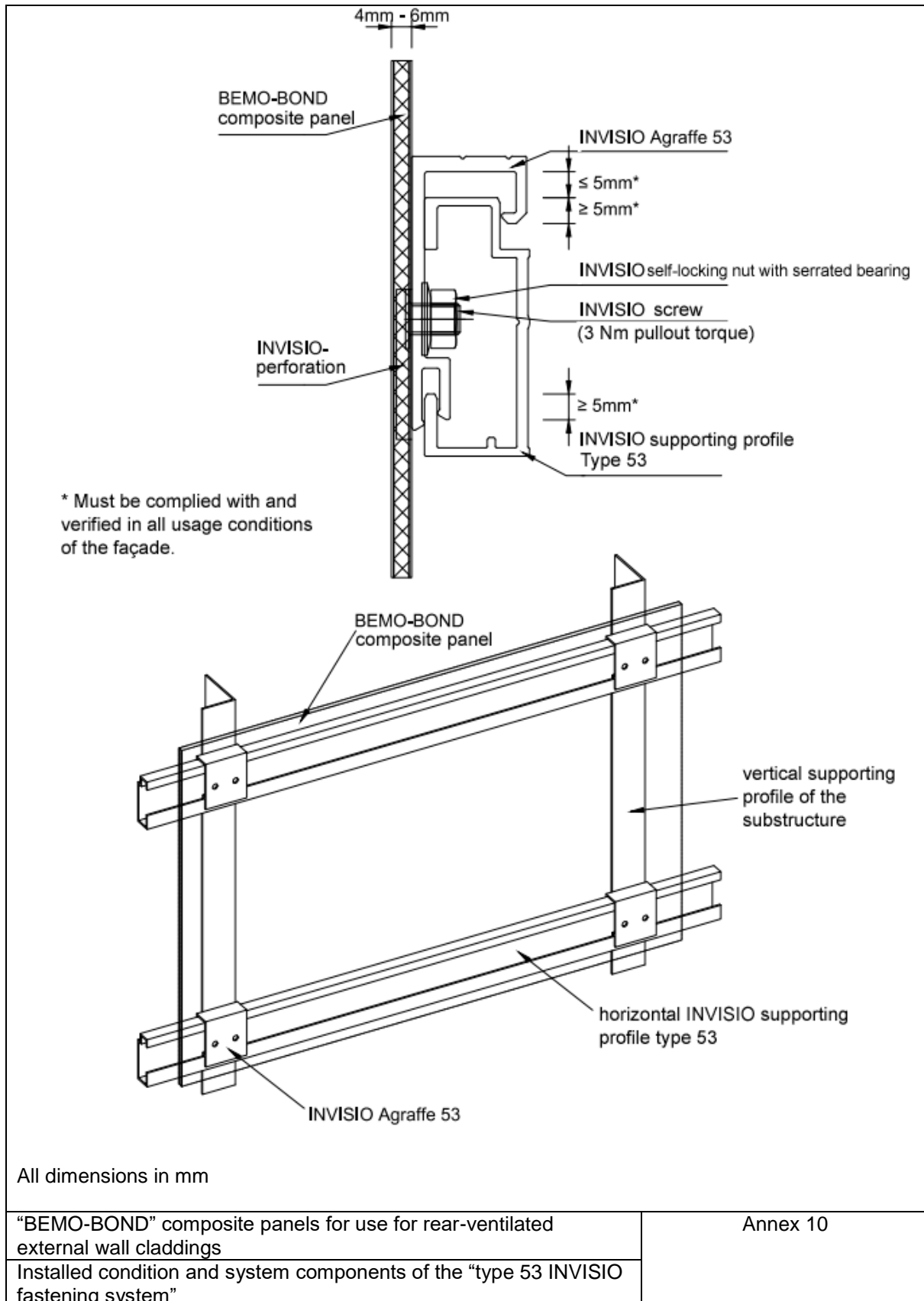


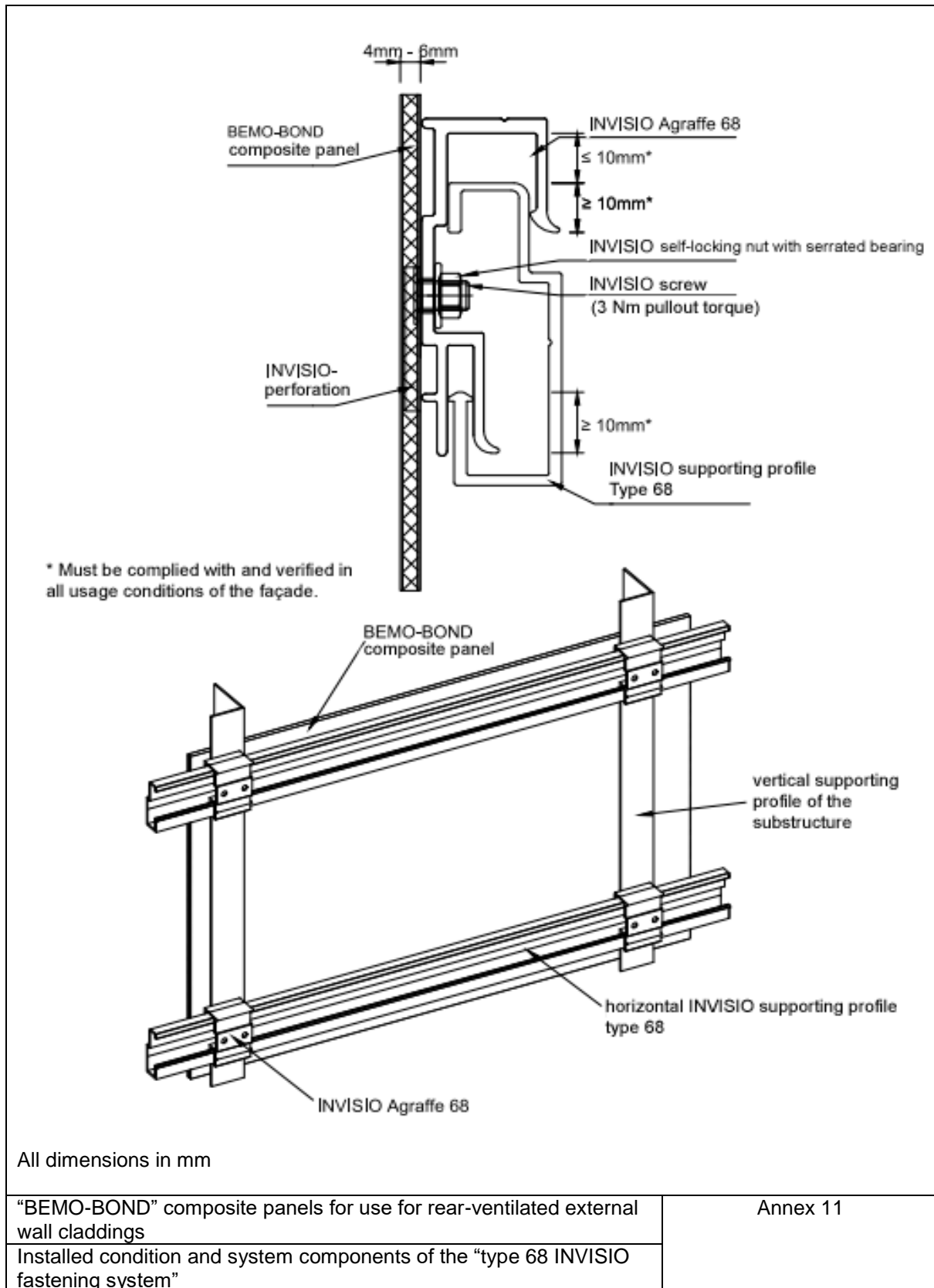
All dimensions in mm.

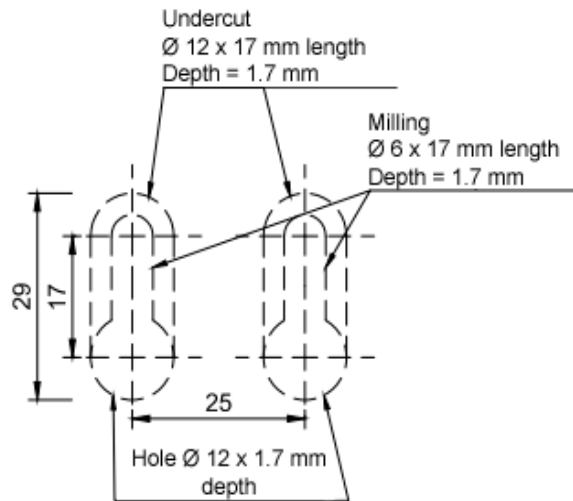
“BEMO-BOND” composite panels for use for rear-ventilated external
 wall claddings

Annex 9

Fasteners for the flat composite panels – blind rivet

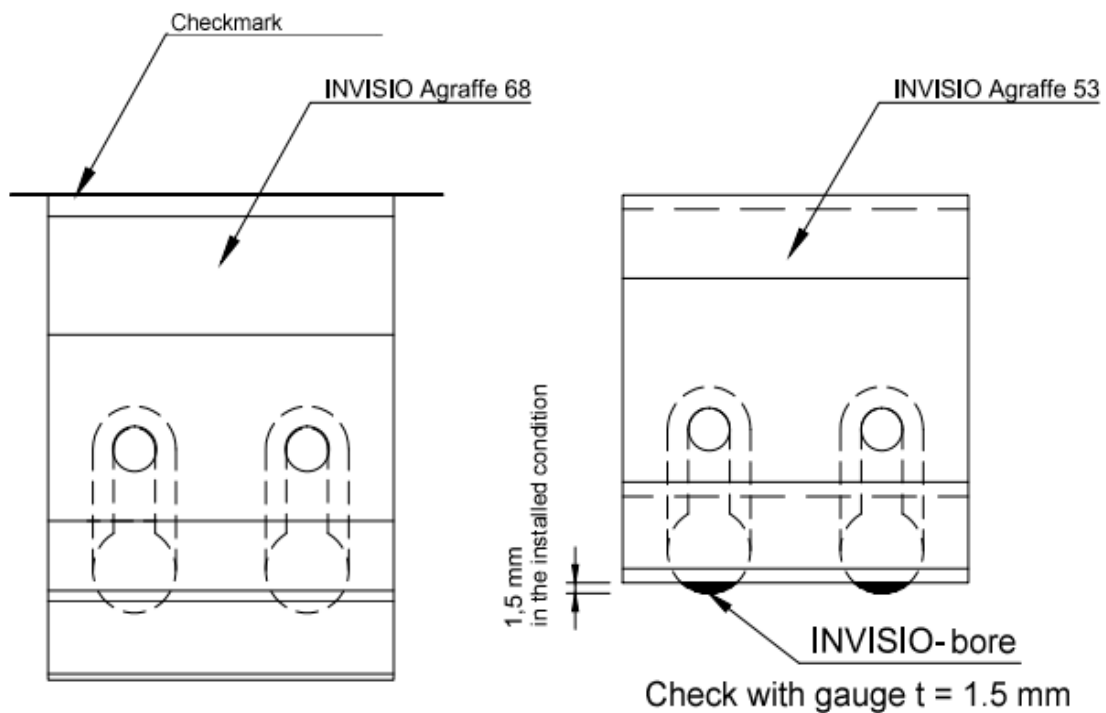






Dimensions of the INVISIO perforation

- Tolerance of the agraffe position ± 0.3 mm on the panel's rear side



All dimensions in mm

"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings

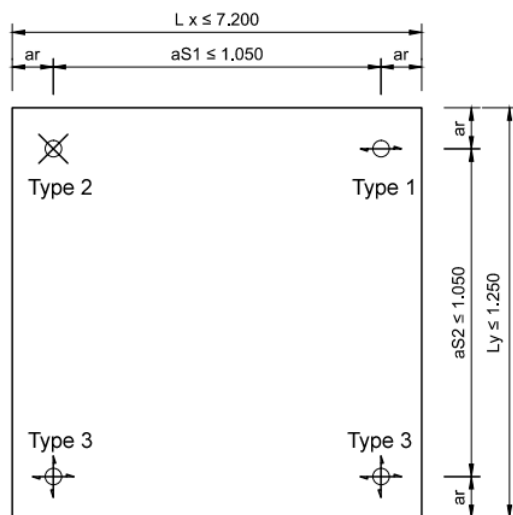
Annex 12

Dimension of the INVISIO perforation and check of the agraffe position in the installed condition

Table 1: Design values and storage conditions of the INVISIO fastening system

INVISIO agraffes 53 with 2 INVISIO screws	
Design values of the tensile strength $Z_{r,d=1)2)}$	430 N
Design values of the transverse tensile strength $Q_{r,d=1)2)}$	1135 N
Permissible deflection of the Planbond composite panel	$l/70$
Permissible deflection of the INVISIO supporting profile 53	$l/500$
Tightening torque of the INVISIO self-locking nut with serrated bearing	3 Nm
Length of the BEMO-BOND composite panel in horizontal direction L_x	7200 mm
Length of the BEMO-BOND composite panel in vertical direction L_y	1250 mm
Distance $aS1 = aS2$	max. 1050 mm

- 1) If the INVISIO fastening point is under both tensile stress and transverse tensile stress at the same time, the following interaction equation must be complied with:
 $(Q_{E,d} / Q_{r,d}) + (Z_{E,d} / Z_{r,d}) \leq 1.0$
- 2) For edge distances $125 \text{ mm} < a_r \leq 50 \text{ mm}$, the design values of the tensile strength and transverse tensile strength must be reduced by the reduction factor f_a :
 $f_a = f_{ay} \times f_{ax}$ (with $f_{ax} = a_{ry} [\text{mm}] / 125 \text{ mm}$ and $f_{ay} = a_{rx} [\text{mm}] / 125 \text{ mm}$)



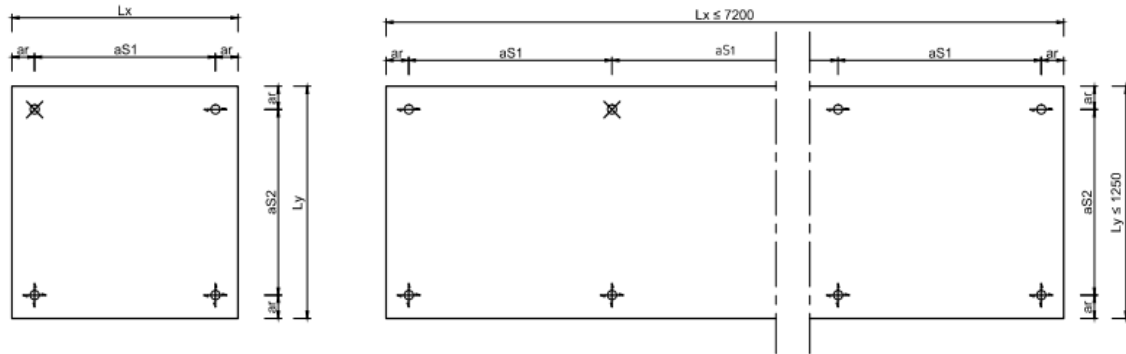
Key/explanations

- = fixed point between BEMO-BOND panel and substructure
- = horizontal sliding point between BEMO-BOND panel and substructure
- = horizontal and vertical sliding point between BEMO-BOND panel and substructure

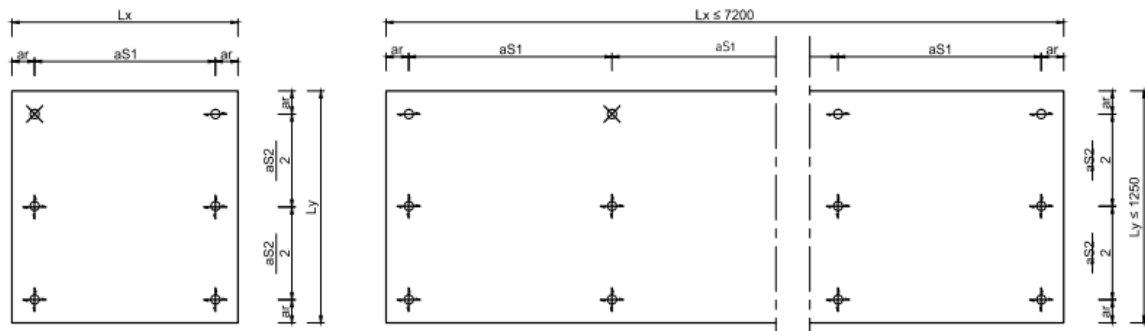
All dimensions in mm

"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings	Annex 13
Design values and storage conditions of the fastening points in the installed condition – INVISIO type 53	

Storage condition A (2-rowed)
 Agraffes required according to the static calculation



Storage condition B (3-rowed)
 Agraffes required according to the static calculation



Lx	≤	7,200 mm
Ly	≤	1,250 mm
aS1	≤	1,050 mm
aS2	≤	1,050 mm
ar _{nom}	≤	125 mm

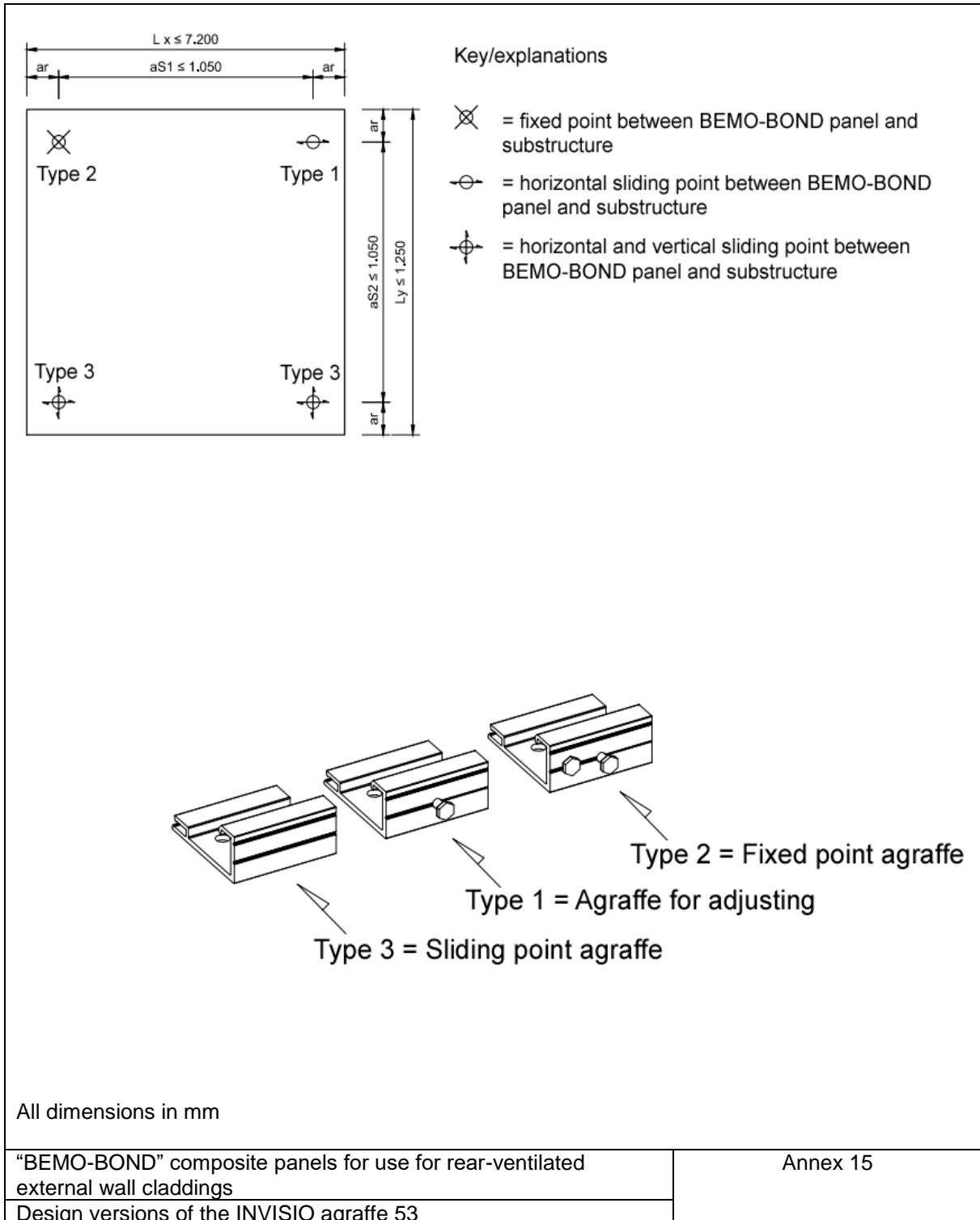
Tolerances:
 - INVISIO perforation on the panel's rear side ± 0.3 mm
 - Assembly tolerance for horizontal supporting profiles ± 1.5 mm

All dimensions in mm

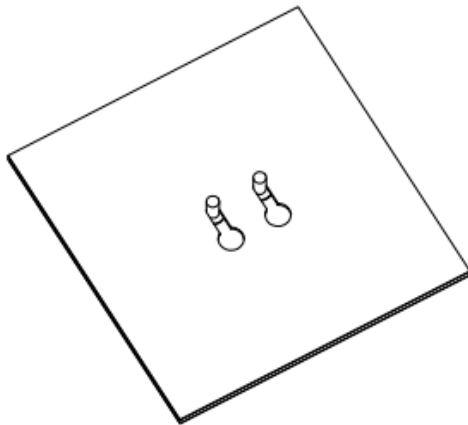
"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings

Annex 14

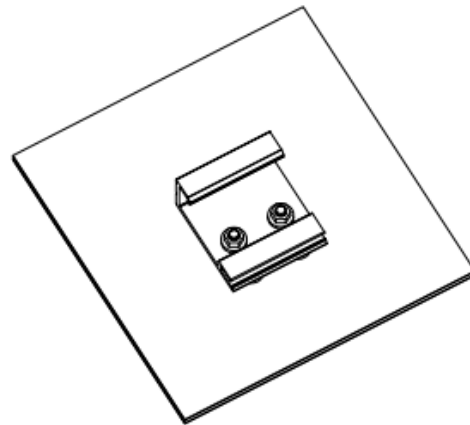
Storage conditions, panel dimensions, distances of the fastening points and assembly tolerances, INVISIO 53



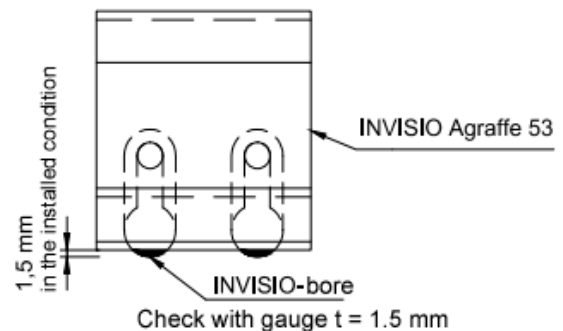
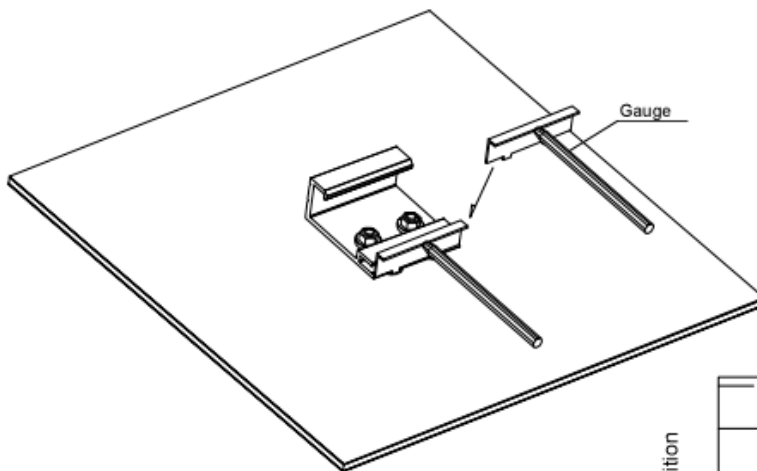
1. Insert the Invisio screw into the factory-made BEMO-BOND INVISIO bore with an undercut.



2. Attach the agraffe to the Invisio screw. Observe its direction. While tightening the M6 nut, push the agraffe up to the stop (torque = 3 Nm).



3. In addition to the visual inspection, the correct installation of the agraffes must be checked by inserting the gauge.



All dimensions in mm

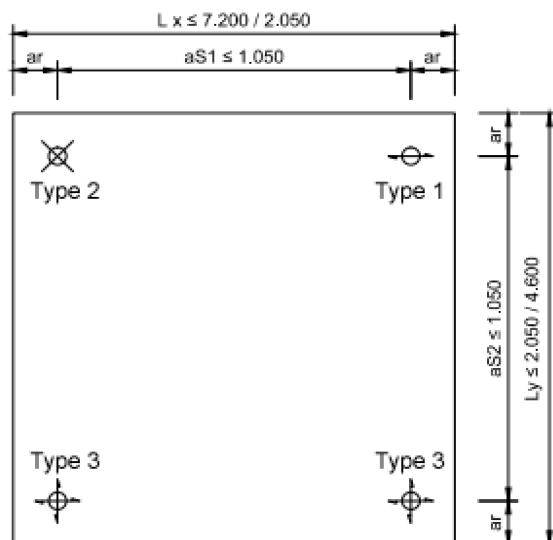
“BEMO-BOND” composite panels for use for rear-ventilated
 external wall claddings
 Assembly of the INVISIO agraffes 53

Annex 16

Table 1: Design values and storage conditions of the INVISIO fastening system

INVISIO agraffes 68 with 2 INVISIO screws	
Design values of the tensile strength $Z_{r,d=1)2)}$	419 N
Design values of the transverse tensile strength $Q_{r,d=1)2)}$	917 N
Permissible deflection of the Planbond composite panel	$l/70$
Permissible deflection of the INVISIO supporting profile 53	$l/500$
Tightening torque of the INVISIO self-locking nut with serrated bearing	3 Nm
Length of the BEMO-BOND composite panel in horizontal direction L_x	7200 mm
Length of the BEMO-BOND composite panel in vertical direction L_y	4600 mm
Distance $aS1 = aS2$	max. 1050 mm

- 1) If the INVISIO fastening point is under both tensile stress and transverse tensile stress at the same time, the following interaction equation must be complied with:
 $(Q_{E,d} / Q_{r,d}) + (Z_{E,d} / Z_{r,d}) \leq 1.0$
- 2) For edge distances $100 \text{ mm} < a_r \leq 50 \text{ mm}$, the design values of the tensile strength and transverse tensile strength must be reduced by the reduction factor f_a :
 $f_a = f_{ay} \times f_{ax}$ (with $f_{ay} = a_{ry} [\text{mm}] / 100 \text{ mm}$ and $f_{ax} = a_{rx} [\text{mm}] / 100 \text{ mm}$)



Key/explanations

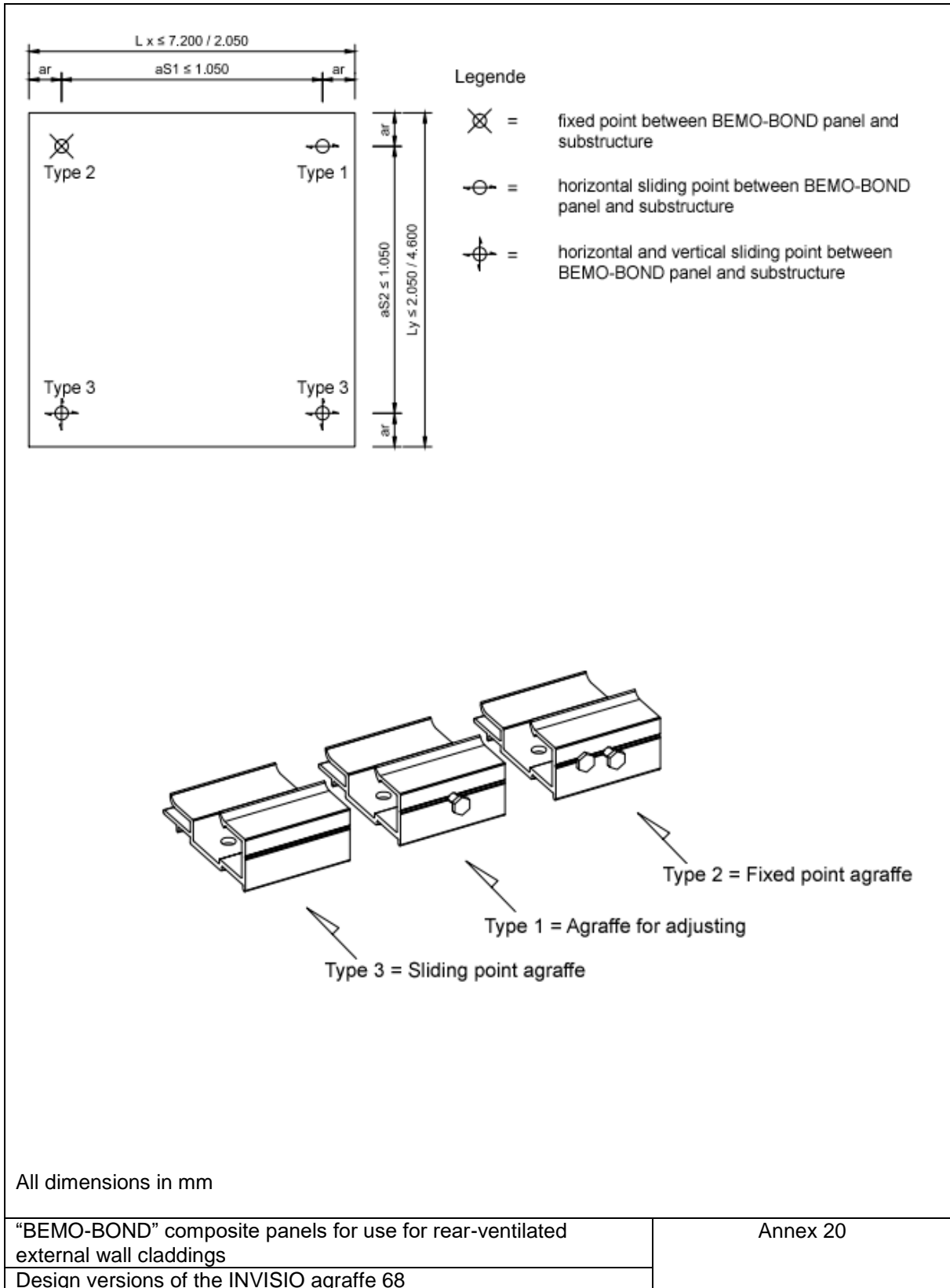
- = fixed point between BEMO-BOND panel and substructure
- = horizontal sliding point between BEMO-BOND panel and substructure
- = horizontal and vertical sliding point between BEMO-BOND panel and substructure

All dimensions in mm

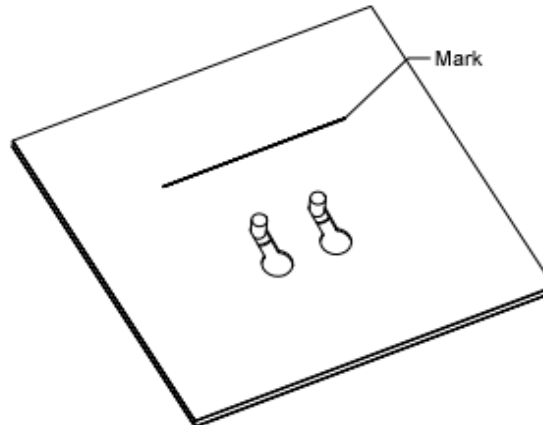
"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings	Annex 17
Design values and storage conditions of the fastening points in the installed condition – INVISIO type 68	

<p>Storage condition A (2-rowed) Agraffes required according to the static calculation</p>	<p>horizontal installation</p>
<p>Storage condition B (3-rowed) Agraffes required according to the static calculation</p>	<p>horizontal installation</p>
<p>Storage condition C (4-rowed) Agraffes required according to the static calculation</p>	<p>horizontal installation</p>
<p> $Lx \leq 7.200 \text{ mm}$ $Lx \leq 2.050 \text{ mm}$ $Ly \leq 1.050 \text{ mm}$ $aS1 \leq 1.050 \text{ mm}$ $aS2 \leq 100 \text{ mm}$ aT_{nom} </p>	<p>Tolerances: - INVISIO perforation on the panel's rear side $\pm 0.3 \text{ mm}$ - Assembly tolerance for horizontal supporting profiles $\pm 1.5 \text{ mm}$</p>
<p>All dimensions in mm</p>	
<p>"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings</p>	
<p>Storage conditions, panel dimensions, distances of the fastening points and assembly tolerances, INVISIO 68</p>	
<p>Annex 18</p>	

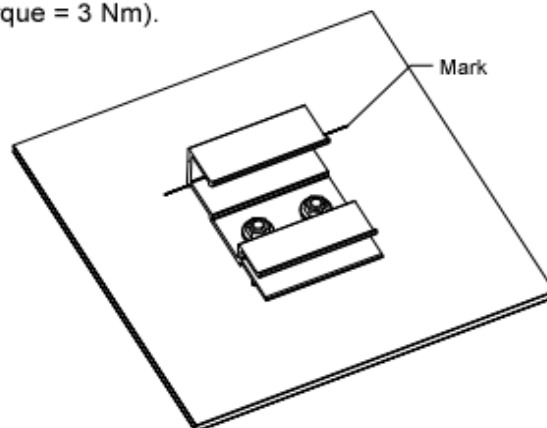
<p>Storage condition D (2-rowed) Agraffes required according to the static calculation Vertical installation</p>	<p>Storage condition E (3-rowed) Agraffes required according to the static calculation Vertical installation</p>	<p>Storage condition F (4-rowed) Agraffes required according to the static calculation Vertical installation</p>
<p>Lx ≤ 2.050 mm Ly ≤ 4.600 mm aS1 ≤ 1.050 mm aS2 ≤ 1.050 mm ar_{nom} ≤ 100 mm</p>	<p>Tolerances: - INVISIO perforation on the panel's rear side ± 0.3 mm - Assembly tolerance for horizontal supporting profiles ± 1.5 mm</p>	
<p>All dimensions in mm</p>		
<p>“BEMO-BOND” composite panels for use for rear-ventilated external wall claddings</p>		<p>Annex 19</p>
<p>Storage conditions, panel dimensions, distances of the fastening points and assembly tolerances, INVISIO 68</p>		



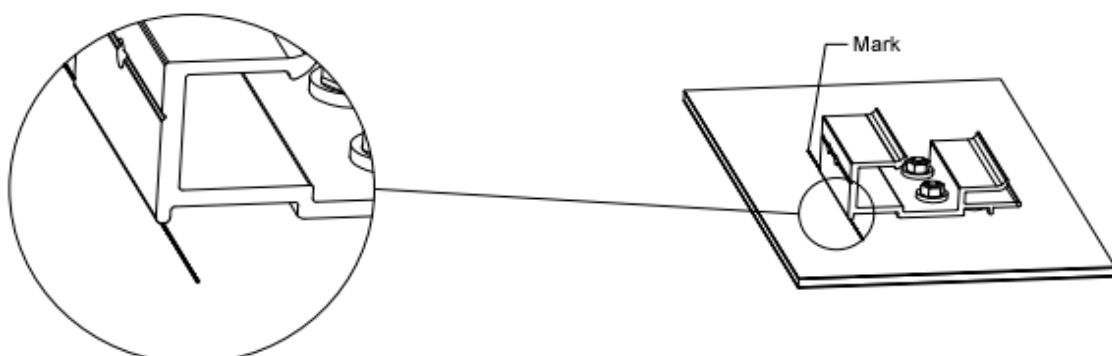
1. Insert the Invisio screw into the BEMO-BOND INVISIO bore with an undercut.



2. Attach the agraffe to the Invisio screw. Observe its direction. While tightening the M6 nut, push the agraffe up to the stop (torque = 3 Nm).



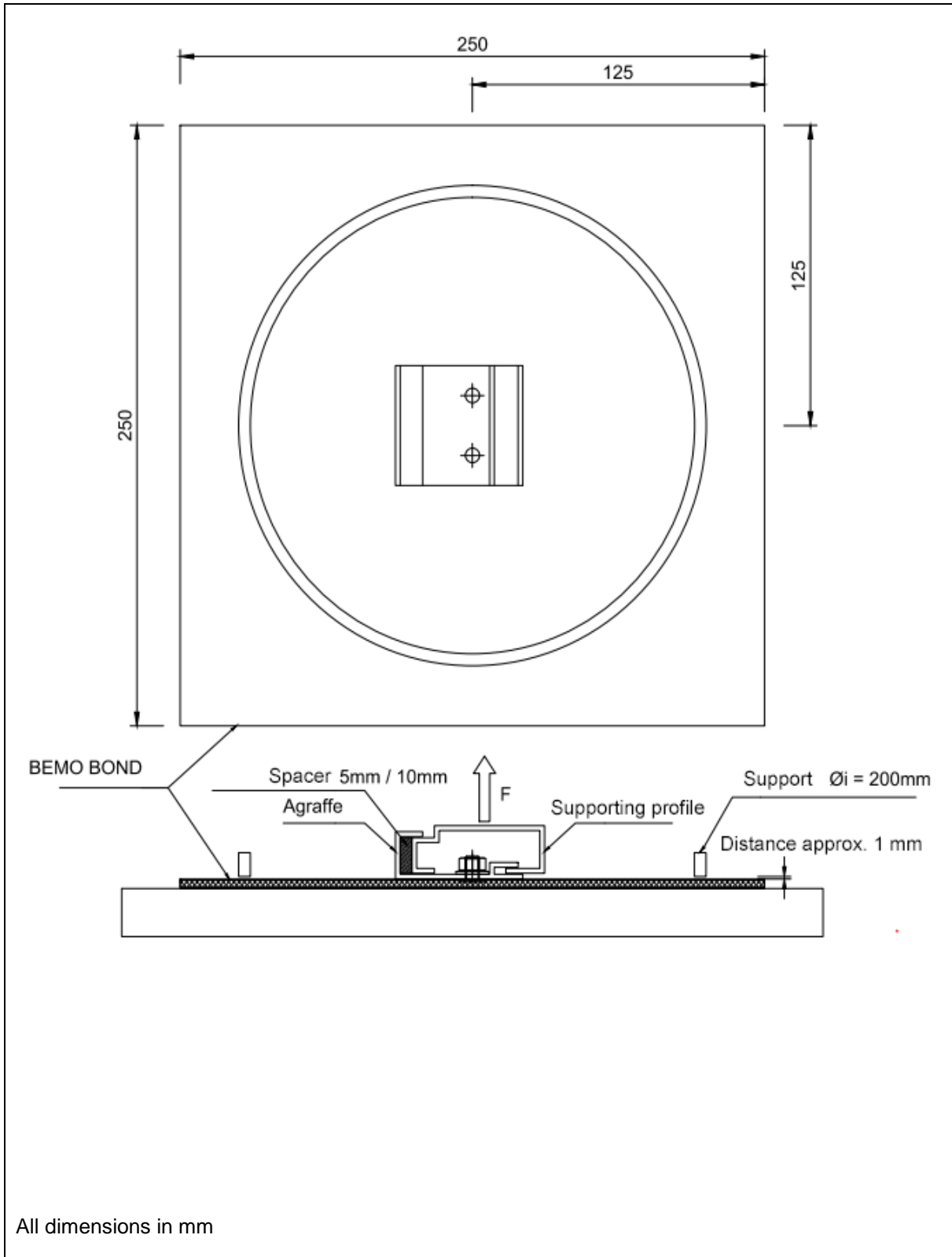
3. The installation is checked by means of a visual inspection at the mark.



All dimensions in mm

“BEMO-BOND” composite panels for use for rear-ventilated external
wall claddings
Assembly of the INVISIO agraffes 68

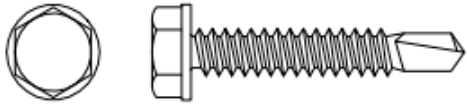
Annex 21



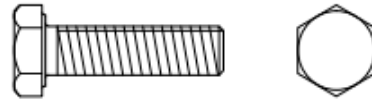
“BEMO-BOND” composite panels for use for rear-ventilated external
 wall claddings
 Schematic diagram of the test setup for the tensile test

Annex 22

For the INVISIO agraffes according to Annex 15 and 20

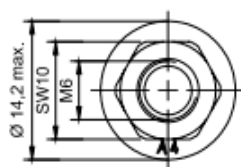


Fixing screw
 DIN 7504 A2 K 3.9 x 19 mm
 (agraffes type 2)

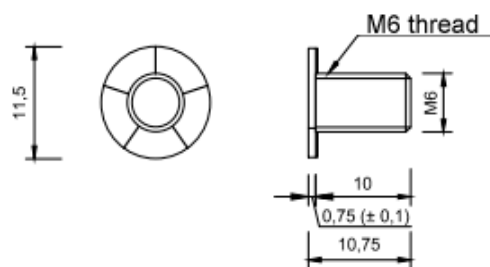


Adjusting screw
 DIN 933 A2 M5 x 18 mm
 (agraffes type 1+2)

For fastening the INVISIO agraffes to the panel's rear side according to Annex 16 and 21



M6 self-locking nut with flange A4 similar
 to DIN 6923-M6

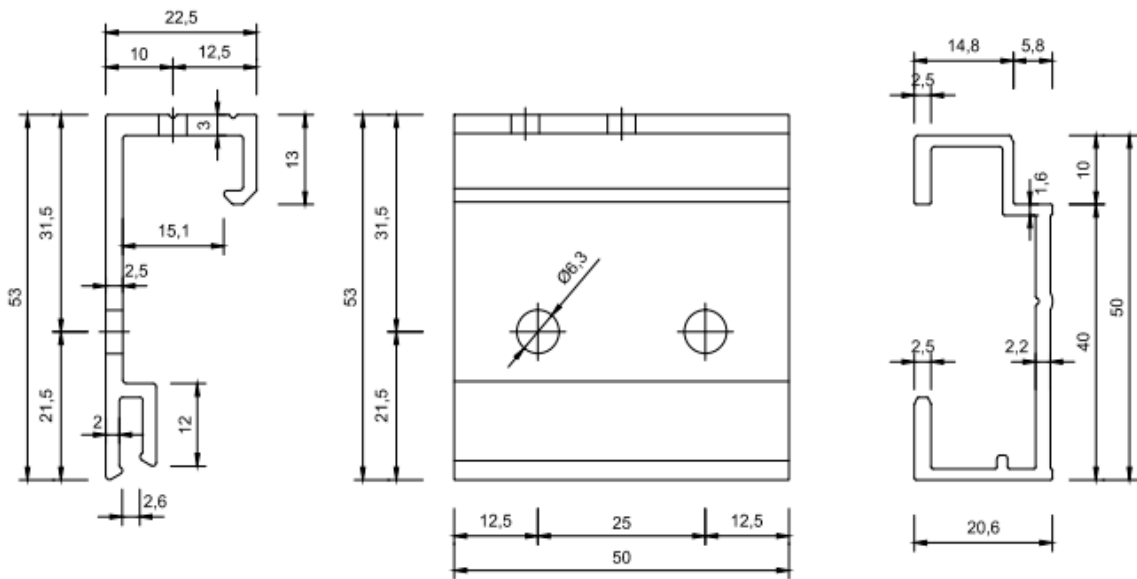


M6 x 10 A4 INVISIO screw

All dimensions in mm

"BEMO-BOND" composite panels for use for rear-ventilated external
 wall claddings
 Invisio fasteners

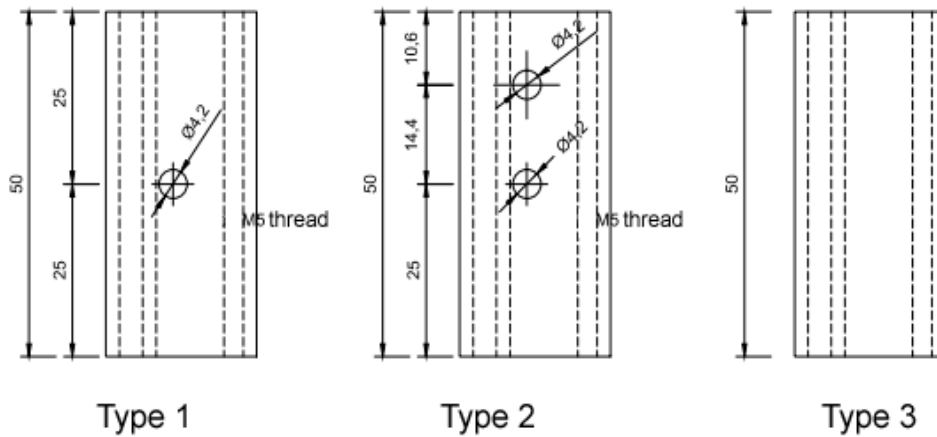
Annex 23



Cross-section

Lateral view

Supporting profile



Type 1

Type 2

Type 3

Product information:

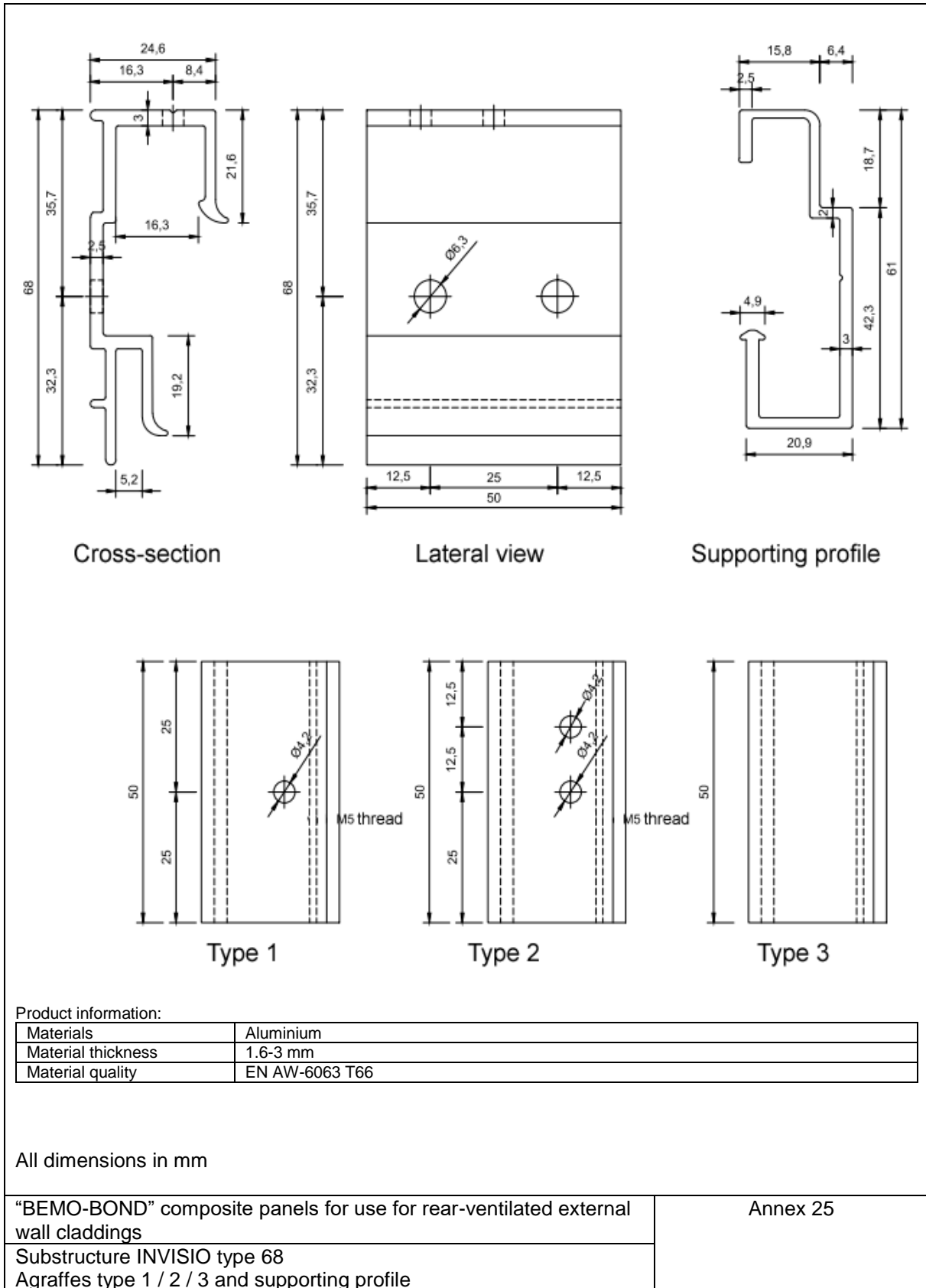
Materials	Aluminium
Material thickness	1.6-3 mm
Material quality	EN AW-6063 T66

All dimensions in mm

"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings

Substructure INVISIO type 53
 Agraffes type 1 / 2 / 3 and supporting profile

Annex 24



After the façade system has been completed on the construction site, this confirmation must be completed by the specialist craftsman of the company responsible for implementing the work and handed over to the client (building owner).

Postal address of the building:

Street address: _____ Postcode/city: _____

**Description of the processed BEMO-BOND façade system
 according to the national technical approval / general construction technique permit no. Z-10.3-807**

Used BEMO-BOND composite panel (according to Section 2.2.1)

- BEMO-BOND/fr ACM405 (4 mm)
- BEMO-BOND/fr ACM605 (6 mm)
- BEMO-BOND/A2 ACM405 (4 mm)
- BEMO-BOND/A2 ACM605 (6 mm)

as

- flat panel
- flat panel with INVISIO perforation
- coffer with coffer edge design (according to Annex 2)

Used substructure (according to Section 3.1.1.1)

- aluminium substructure
- wooden substructure

Used fasteners (according to Section 2.1.2)

- according to Section 2.1.2.1 a) (flat panel) blind rivet, type with head K: mm
- according to Section 2.1.2.1 b) (flat panel) screw LE-MBE-FA 4.8x30 mm K16 with sealing ring
- according to Section 2.1.2.1 c) (flat panel) INVISIO system 53, tightening torque 3 Nm
- according to Section 2.1.2.1 c) (flat panel) INVISIO system 68, tightening torque 3 Nm
- according to Section 2.1.2.2 (coffer) attachment to Ø 10 mm bolts

Reaction to fire of the BEMO façade system according to Section 3.1.2 of the approval

- non-flammable
- flame-resistant
- normally flammable

Postal address of the company responsible for implementing the work:

Company name: _____ Street: _____
 Postcode/city: _____ Country: _____

We hereby declare that we have installed the façade system described above according to the provisions of the national technical approval no. Z-10.3-807 and the manufacturer's processing instructions.

Date/signature of the specialist craftsman:

"BEMO-BOND" composite panels for use for rear-ventilated external wall claddings

Annex 26

Confirmation of the company responsible for implementing the work for the building owner