Deutsches Institut für Bautechnik

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Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment

ETA-16/0710 of 28 March 2019

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	JET-Vario-Norm
Product family to which the construction product belongs	Self supporting translucent roof kits
Manufacturer	JET Tageslicht & RWA GmbH Weidehorst 28 32609 Hüllhorst DEUTSCHLAND
Manufacturing plant	JET Tageslicht & RWA GmbH Weidehorst 28 32609 Hüllhorst DEUTSCHLAND
This European Technical Assessment contains	62 pages including 53 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	ETAG 010, Edition September 2002, used as EAD according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.
This version replaces	ETA-16/0710 issued on 16 November 2016

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Specific part

1 Technical description of the product

1.1 Kit description and setup

The 'JET-Vario-Norm' roof kit is made up of components which are factory-made and assembled on site as a self-supporting translucent roof kit.

The static system of the roof system "JET-Vario-Norm" complies with the category "Curved roof systems with additional bearing profiles parallel to the span" as listed in section 5.1.1.1.1 a) of the ETAG 010[1].

The roof kit comprises 1.05m- or 2.1m-wide arched translucent PC multi-wall sheets which are positioned on bearing profiles and protected from wind loads with covering profiles. The sheets are mounted on the eaves side in an impost profile. The multi-wall sheets are abutted along their longitudinal edges via a bearing profile. For the 2.10m-wide sheets, one (for double-span systems) or two (for triple-span systems) additional bearing profiles are arranged as intermediate supports parallel to the end arches.

The following components are used for the manufacture of the 'JET-Vario-Norm' arched self-supporting translucent roof kit:

- translucent polycarbonate (PC) multi-wall sheets of thickness 10 mm (PC 10), 16 mm (PC 16) or 20 mm (PC 20); including combinations of sheets as described in 1.1.9
- glass fibre-reinforced unsaturated polyester resin (GF-UP) sheet (optionally arranged between the 10mm multi-wall sheets) or
- glass fibre mat (optionally arranged between the 10mm multi-wall sheets)
- 3mm solid sheets made from polycarbonate (optionally arranged on top of a 16mm multi-wall sheet)
- 4 mm double-wall sheet made from polycarbonate (optionally arranged between the 10mm multi-wall sheets)
- aluminium bearing and covering profiles,
- aluminium impost profiles,
- (where required) tension locks
- sealing profiles
- foam tape
- connecting devices.

The components and the system setup of the product are given in Annexes A 1 to A 4.

The material values, dimensions and tolerances of the roof kit not indicated in the annexes shall correspond to the values laid down in the technical documentation[2] of this European technical approval.

1 ETAG 010:2002-09 European Technical Approval Guideline - Self supporting translucent Roof Kits

2 The technical documentation comprises all information of the holder of this ETA necessary for the production, installation and maintenance of the roof kit; these are in particular the structural analysis, design drawings and the manufacturer's installation instructions. The part to be treated confidentially is deposited with Deutsches Institut für Bautechnik.

1.1.1 Multi-wall sheets

The following multi-wall sheets made from polycarbonate (PC) in accordance with the harmonised European standard EN 16153[3] may be used.

Table 1: PC-sheets

Manufacturer	Trade name	Sheet height [mm]	Annex
Covestro AG D – Leverkusen	Makrolon multi UV 2/10-10.5	10	A 4.1
DS Smith Plastics France F – Kaysersberg	Akyver Sun Type 10/1700	10	A 4.2
Covestro AG D – Leverkusen	Makrolon multi UV 2/10-10.5 ES	10	A 4.3
DS Smith Plastics France F – Kaysersberg	Akyver Sun Type 10/2000	10	A 4.4
DS Smith Plastics France F – Kaysersberg	Akyver Sun Type 10/4W-7	10	A 4.5
Koscon Industrial S.A. CH – Stabio	Macrolux LL 4W10	10	A 4.6
Covestro AG D – Leverkusen	Makrolon multi UV 4/10-6	10	A 4.7
Covestro AG D – Leverkusen	Makrolon multi UV 7/16-14	16	A 4.8
DS Smith Plastics France F – Kaysersberg	Akyver Sun Type 16/7W-12	16	A 4.9
Koscon Industrial S.A. CH – Stabio	Macrolux LL 7W16	16	A 4.10
DS Smith Plastics France F – Kaysersberg	Akyver Sun Type 20/7W-12	20	A 4.11
Koscon Industrial S.A. CH – Stabio	Macrolux LL 7W20	20	A 4.12

The multi-wall sheets have unfilled hollow chambers and weatherproofing on the outer surfaces which are unmistakably identified.

1.1.2 Optional (full-surface) covering supplements

1.1.2.1 GF-UP sheet

Sheet made from glass fibre-reinforced unsaturated polyester resin with a thickness of 1.2 mm and with a glass content of at least 20% by mass. It corresponds to the specifications deposited with Deutsches Institut für Bautechnik.

1.1.2.2 Glass fibre mat

Up to two layers of glass fibre mat with a weight per unit area of 120 g/m² (+18/-11 g/m²) each may alternatively be arranged between the 10 mm multi-wall sheets. It corresponds to the specifications deposited with Deutsches Institut für Bautechnik.

[3] DIN EN 16153:2015-05 Light transmitting flat multiwall polycarbonate (PC) sheets for internal and external use in roofs, walls and ceilings - Requirements and test methods

1.1.2.3 Solid sheet

The 3mm-thick solid polycarbonate (PC) sheet 'PC UVP 3 mm' produced by Polycasa N.V., BE-2440 Geel, and possessing a weight per unit area of 3.6 kg/m² in accordance with the harmonised European standard EN 16240[4] can be used.

1.1.2.4 Double-wall sheet

The 4mm double-wall polycarbonate sheet “Sun Type 4” produced by DS Smith Plastics France in accordance with the harmonised European standard EN 16153 can be used.

1.1.3 Bearing and covering profiles

The aluminium profiles are made from the aluminium alloy EN AW-6060 T66 in accordance with EN 15088[5] and exhibit the dimensions given in Annexes A 3.1 to A 3.4 of the ETA.

1.1.4 Impost

1.1.4.1 Impost profiles

The aluminium profiles are made from EN AW-6060 T66 in accordance with EN 15088 and have the dimensions given in Annexes A 3.5.1 to A 3.6.3.

1.1.4.2 Supporting profile

The supporting profiles in the versions ‘supporting profile 18°' and 'supporting profile 30°' are made from the aluminium alloy EN AW-6060 T66 in accordance with EN 15088.

The supporting profiles have the dimensions given in Annex A 3.8.4.

1.1.5 Tension lock

The tension locks made from EN AW-6060 T66 in accordance with EN 15088 have the dimensions given in Annex A 3.10.

1.1.6 Sealing profile

The sealing profile is made from ethylene-propylene terpolymer (EPDM) and has the dimensions given in Annex A 3.9. The Shore A hardness is 60° +/- 5° in accordance with EN ISO 868[6].

1.1.7 Foam tape

The foam tape is made from polyethylene foam and has the dimensions given in annex A 2.3.3. The density is 65kg/m³ in accordance with DIN EN ISO 845[7].

1.1.8 Connecting devices

The tension lock top part and the bearing profile or the tension lock lower part as well as the bearing profile and the covering shell are connected with cup blind rivets ∅ 4.8 x 11.5 Al (sleeve: aluminium AlMg5 (EN AW 5019) – EN 573; mandrel: galvanised steel – EN 10016-2[8] or stainless steel – EN 10088[9] material no. 1.4541).
The blind rivets have the dimensions given in Annex A 3.12.
The tension lock top part and the tension lock lower part are connected using hexagon socket head cap screws in accordance with EN ISO 4762[10] (M6x50 A2-70/ M8x50 A2-70).

4	DIN EN 16240:2014-03	Light transmitting flat solid polycarbonate (PC) sheets for internal and external use in roofs, walls and ceilings - Requirements and test methods
5	DIN EN 15088:2006-03	Aluminium and aluminium alloys - Structural products for construction works - Technical conditions for inspection and delivery
6	DIN EN ISO 868:2003-10	Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness) (ISO 868:2003)
7	DIN EN ISO 845:2009-10	Cellular plastics and rubbers - Determination of apparent density (ISO 845:2006)
8	DIN EN 10016-2:1995-04	Non-alloy steel rod for drawing and/or cold rolling - Part 2: Specific requirements for general purpose rod
9	DIN EN 10088-2:2014-12	Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes
10	DIN EN ISO 4762:2004-06	Hexagon socket head cap screws (ISO 4762:2004)

1.1.9 'JET-Vario-Norm' roof kit

The roof kit is made up of the components described in Sections 1.1.1 and 1.1.3 to 1.1.7. The following combinations are possible:

Table 2: Combinations of the roof kit

Covering	Multi-wall sheet(s) as per Annex	Impost profiles as per Annex	
		Inclination 30°	Inclination 18°
PC 10	A 4.1 - A 4.7	A 3.5.1	
PC 16	A 4.8 - A 4.10	A 3.5.1	A 3.6.1
PC 20	A 4.11 - A 4.12	A 3.5.2	A 3.6.1
PC 10+10 (2x same PC-sheet)	A 4.5 - 4.7	A 3.5.2	A 3.6.2
PC 10+10 DI (2x same PC-sheet with air layer)	A 4.5 - 4.7	A 3.6.3	A 3.6.3

The 'PC 10+10' covering may optionally be used with an intermediate GF-UP sheet (Section 1.1.2.1) or glass fibre mat (Section 1.1.2.2).

The 'PC 10+10 DI' covering may optionally be used with an intermediate GF-UP sheet (Section 1.1.2.1) or a 4mm double wall sheet (Section 1.1.2.4).

The roof kit may be designed as follows with additional use of the solid sheet in accordance with Section 1.1.2.3 and in accordance with table 3:

Table 3: Combinations of the roof kit with solid sheet:

Covering	Multi-wall sheet as per Annex	Impost profiles as per Annex	
		Inclination 30°	Inclination 18°
PC 3+16 (inner multi-wall sheet)	A 4.9 Details in Annexes 1.4 and 2.1.8	A 3.5.2	A 3.6.2

Table 4: Reaction to fire of the components

component	Reaction to fire
Multi-wall sheets/ coverings	Class E as per EN 13501-1[11]
GF-UP sheet	
Glass fibre mat	
Solid sheet	
Base profile	
Roof sheeting connecting profile	
Foam tape	
Bearing and covering profiles	Class A1 as per EN 13501-1 (without further testing as per Commission Decision 96/603/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC)
Load converter	
Covering shell	
Tension lock	
Connecting devices	

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

The self-supporting translucent roof kit may be used in the roof area for open or closed structures. The multi-wall sheets may be combined to form continuous rooflights of any length with rectangular bases.

The roof kit is not a walk-on system; it may not be used for bracing of the roof support structure. The performance data given in Section 3 are only valid if the roof kit is used in compliance with the specifications and the conditions given in Annexes A, B and C.

The verifications and assessment methods on which this European Technical Assessment (hereinafter referred to as 'ETA') is based lead to the assumption of a working life of the roof kit of at least ten years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, 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 structure.

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

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic structural resistance of the multi-wall sheets to forces (actions) resulting from gravity loads and uplift loads [kN/m²] provided that the bearing conditions as described in Annexes A 2.1 to A 2.3 are respected	See Annex B 2
Consideration of the effect of load duration	See Annex B 1
Consideration of ageing and environmental effects	See Annex B 1
Consideration of thermal effects	See Annex B 1
Values for characteristic structural resistance of aluminium bearing and covering profiles	In accordance with structural calculation.

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Fire performance in case of external fire exposure of 'JET-Vario-Norm' roof kit	No performance assessed
Reaction to fire of 'JET-Vario-Norm' roof kit	Class E
Resistance to fire of 'JET-Vario-Norm' roof kit	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Release of dangerous substances or radiation	The chemical composition of the product has to be in compliance with the composition deposited at the Technical Assessment Body (DIBt). The kit does not contain dangerous substances in accordance with EOTA TR 034 (Version October 2015) or based on an individual assessment on current knowledge there is no risk for the environment due to a release of dangerous substances. *
Watertightness and condensation	Category 1 (no leaks with no differential air pressure) up to inclination of the substructure from the horizontal: 5° Design details as per information deposited with DIBt

* Note: In addition to the specific provisions relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). For the purposes of meeting the provisions of the Construction Products Regulation, these requirements shall also be complied with insofar as they are applicable.

3.4 Safety and accessibility (BWR 4)

Essential characteristic	Performance
Resistance to damage by impact loads with a soft object (50 kg)	SB 0 (no requirement)
Resistance to impact loads from a hard object (250 g)	Passed (declaration of performance in accordance with EN 16153)
Resistance to horizontal live loads	No performance assessed

3.5 Protection against noise (BWR 5)

No performance assessed

3.6 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal resistance	No performance assessed
Air permeability	
Radiation Properties – Light transmittance – Solar direct transmittance – Total solar energy transmittance	See declaration of performance as per EN 16153

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

In accordance with the ETAG 010 used as EAD the applicable European legal act is: 98/600/EC
The System to be applied is:

Product	Intended use	Levels or classes (reaction to fire)	Systems
'JET-Vario-Norm' roof kit	For general use in roofs and roof structures	E	3

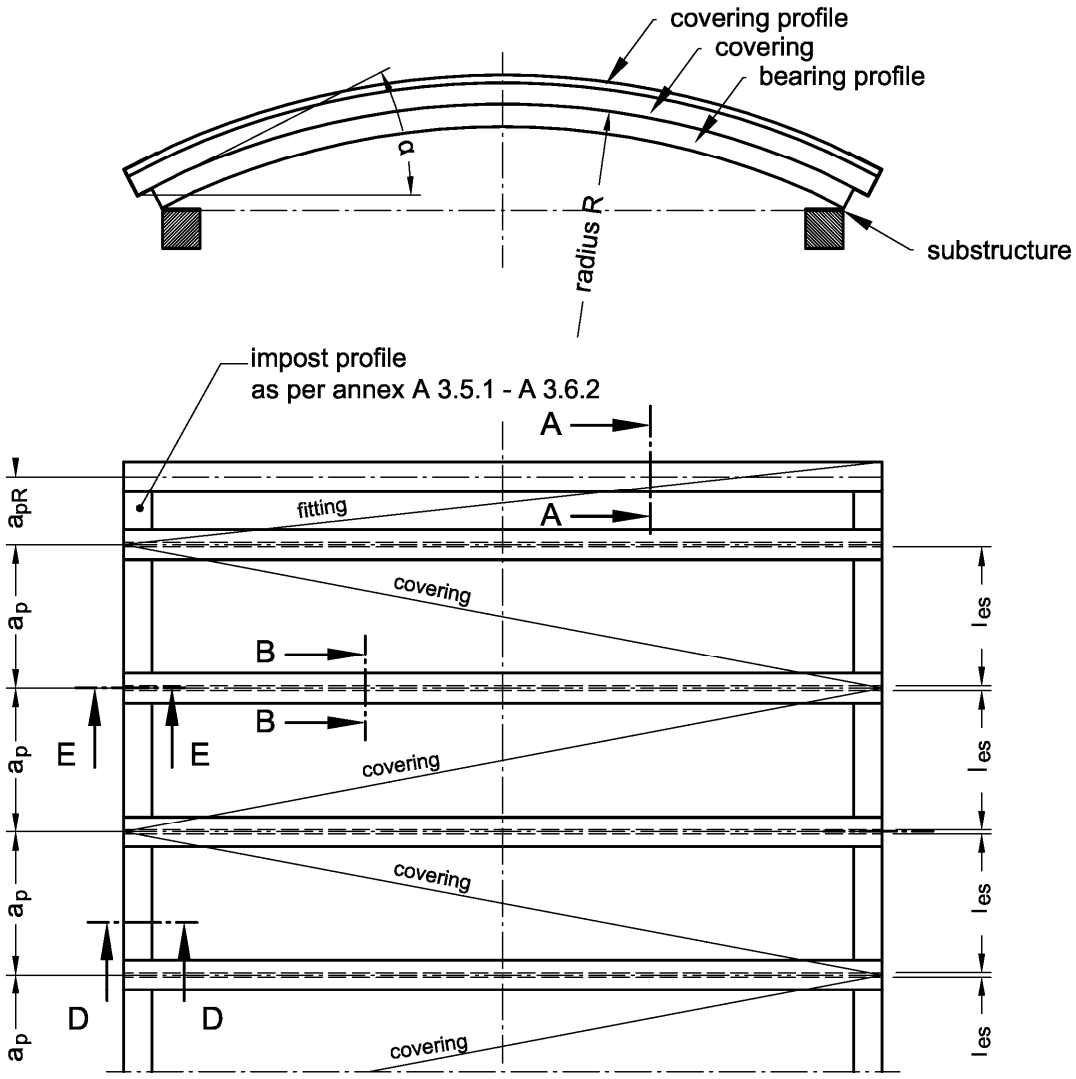
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

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 28 March 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Wachner



a_p: spacing of the bearing profiles

a_p = max 1060 mm

l_{es}: width of covering
cutted from production width l_e

a_{pR} = max a_p

JET-Vario-Norm	Annex A 1.1
System overview 1-span-system	

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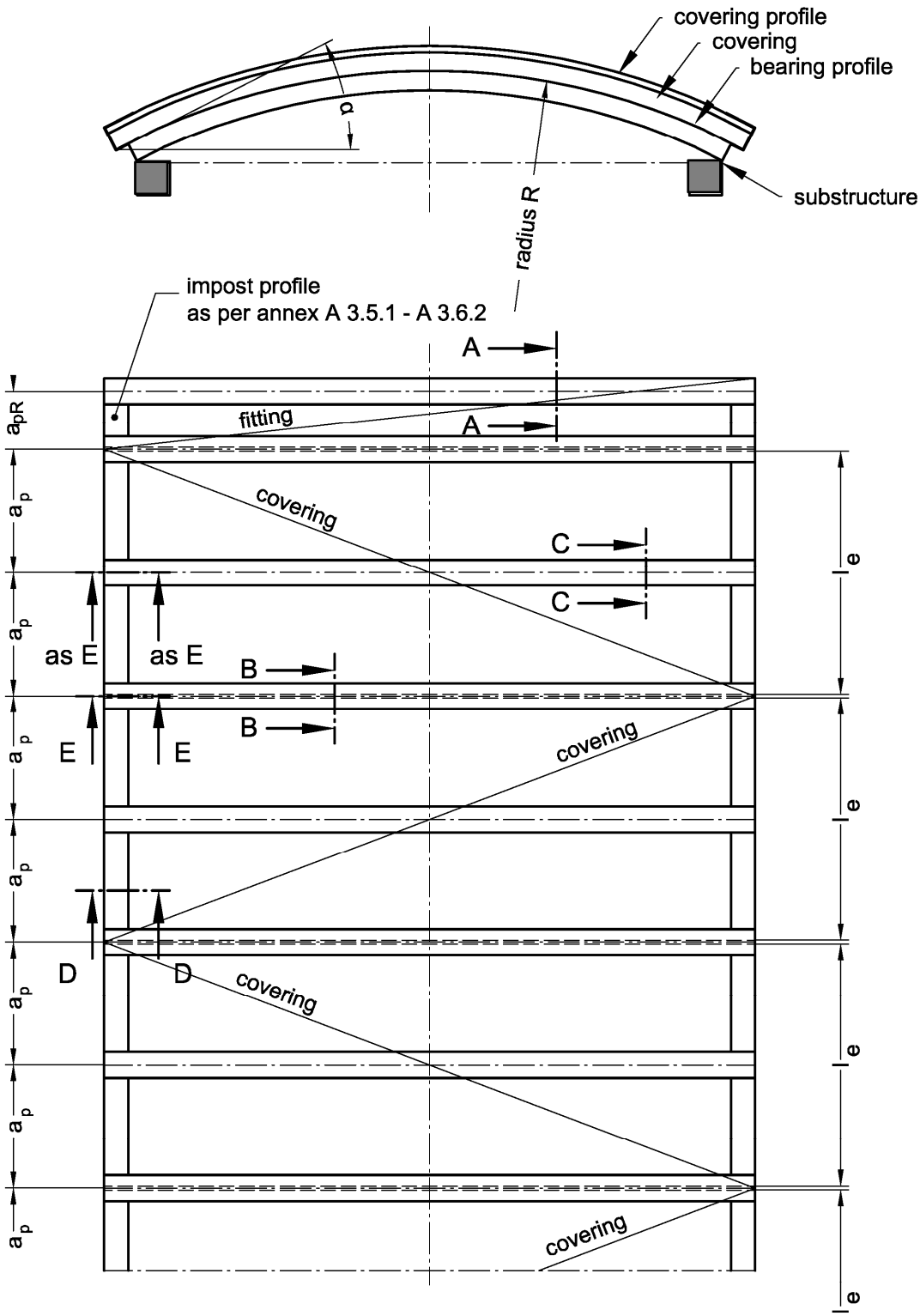
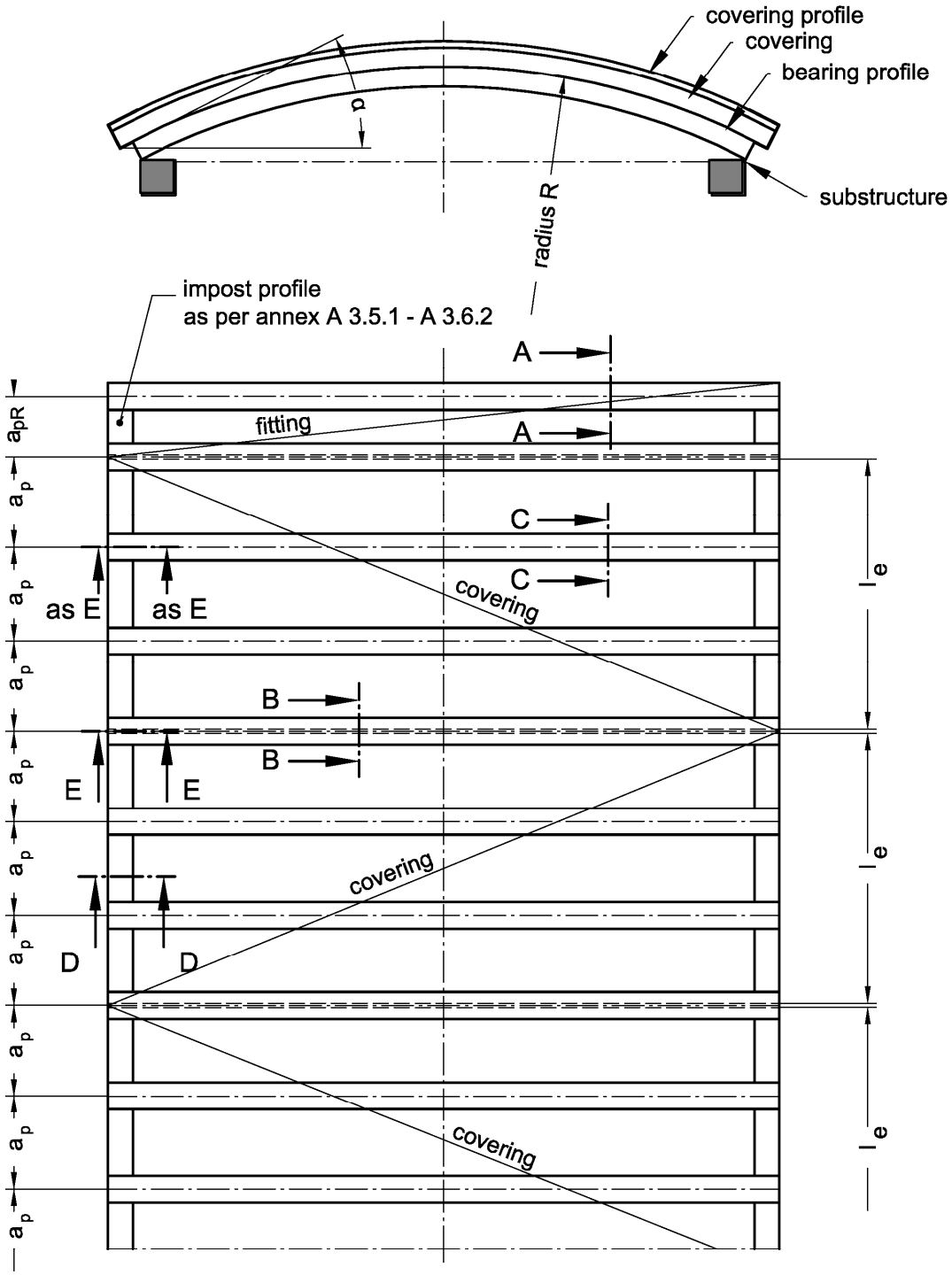


a_p: spacing of the bearing profiles — a_p = max 1060 mm

l_e : width of covering — a_{pR} = max 500 mm

JET-Vario-Norm	Annex A 1.2
System overview 2-span-system	



a_p: spacing of the bearing profiles — a_p = max 707 mm

l_e : width of covering — a_{pR} = max 500 mm

JET-Vario-Norm	Annex A 1.3
System overview 3-span-system	

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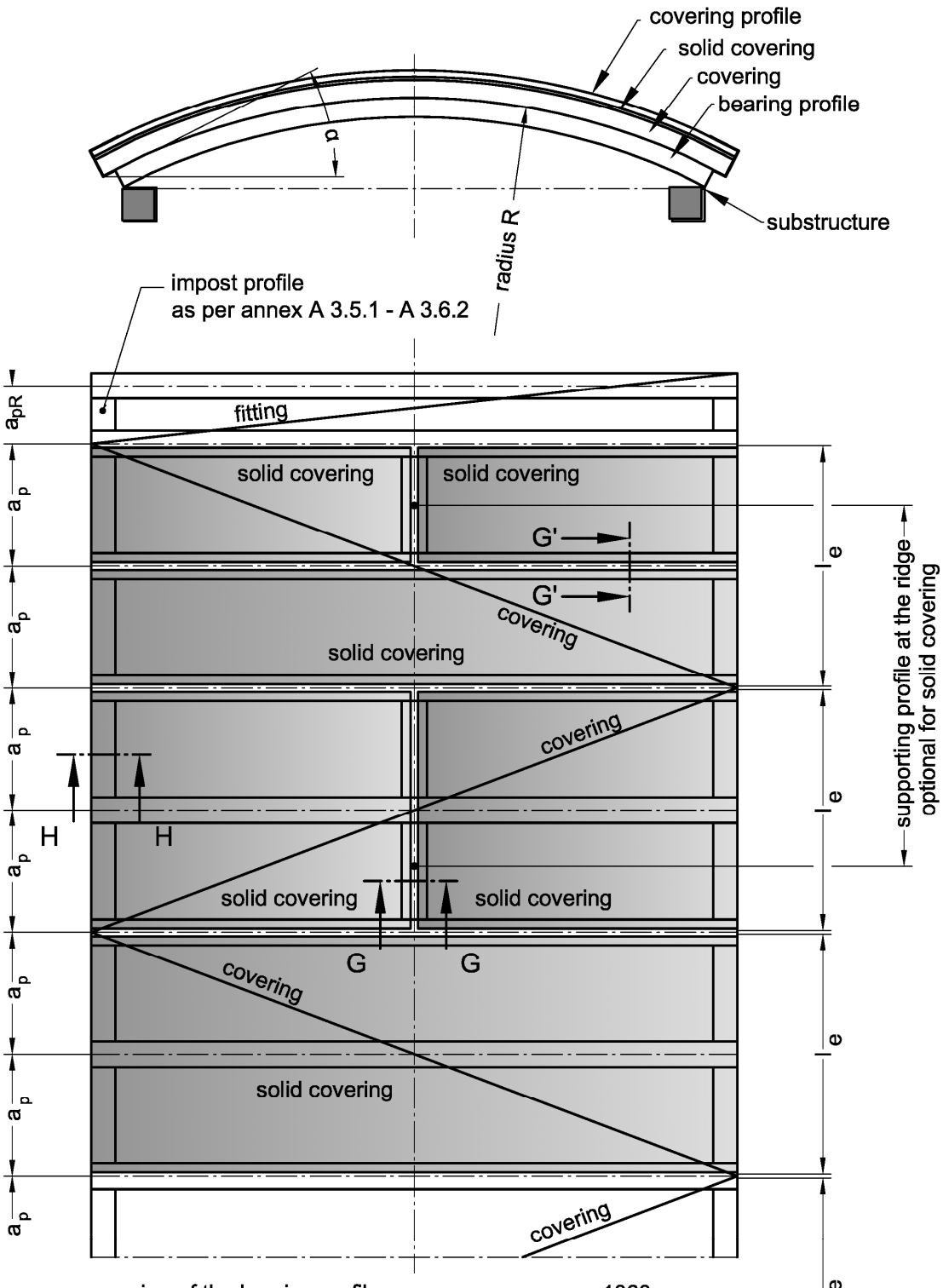

a_p: spacing of the bearing profiles — a_p = max 1060 mm

l_e : width of covering — a_{pR} = max 500 mm

JET-Vario-Norm	Annex A 1.4
Overview of multi-wall-sheet in combination with solid covering 2-span-system	

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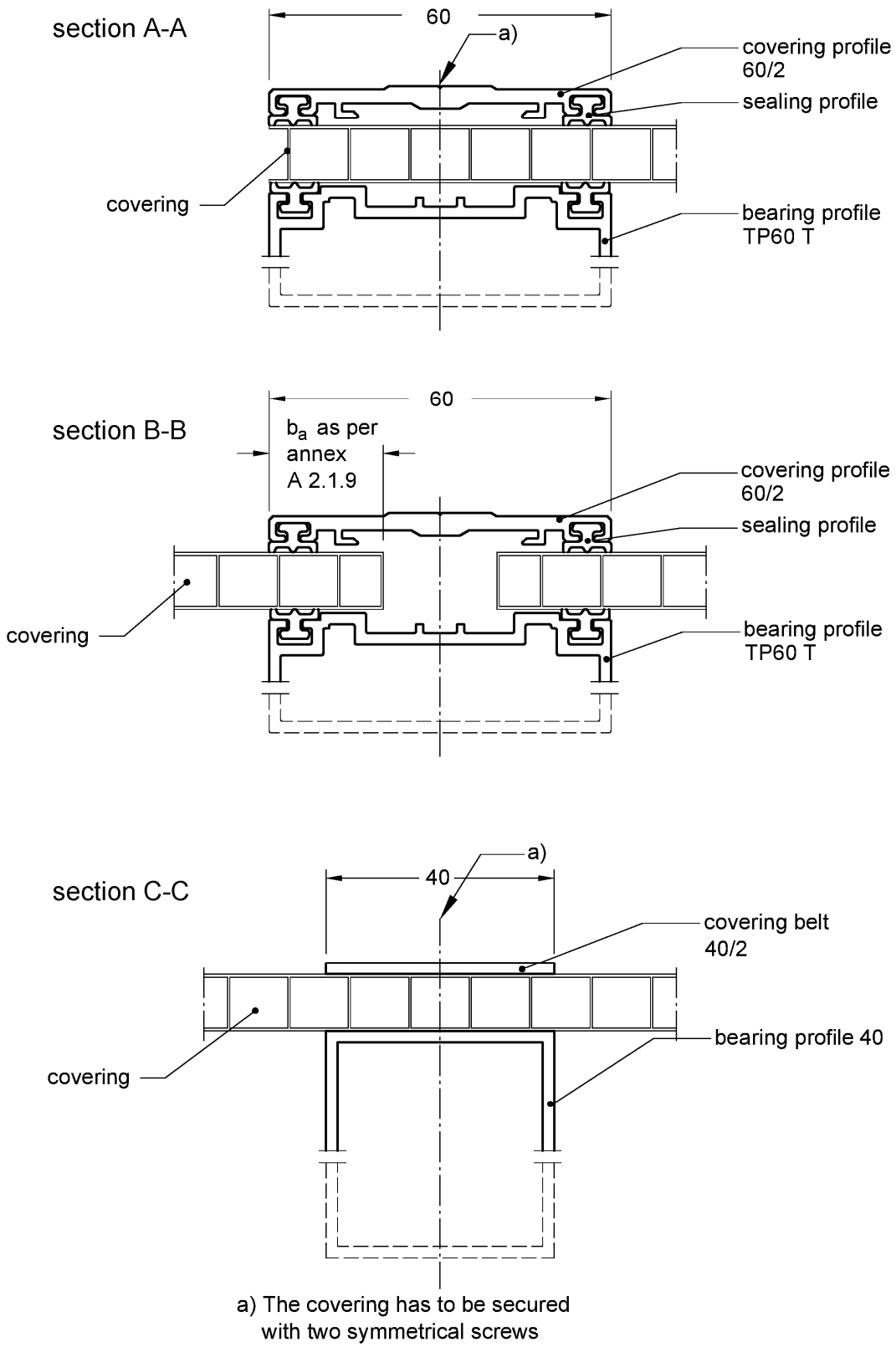

All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.1
Combinations of arch profiles 2-span-system Section A-A, B-B and C-C	

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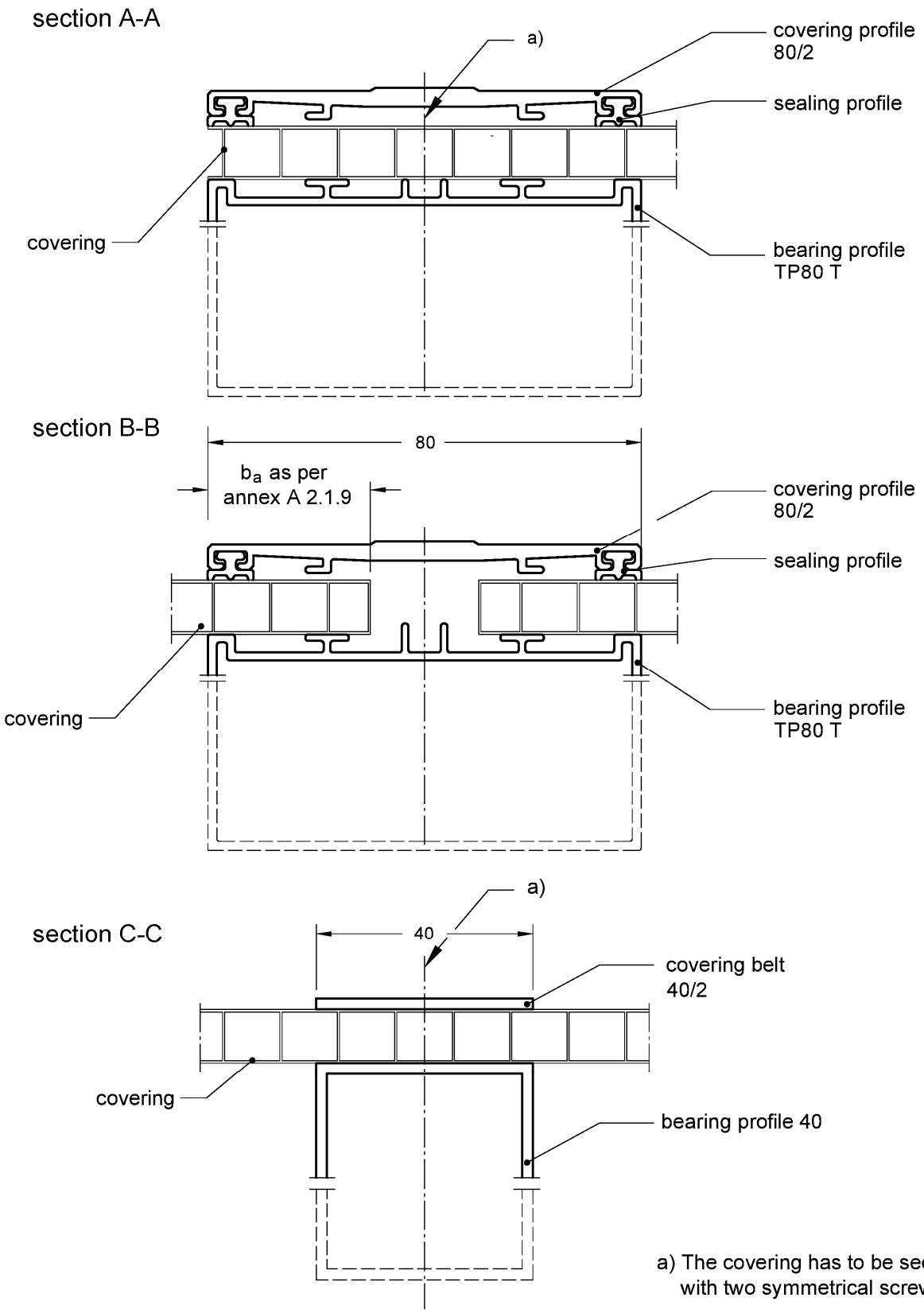

a) The covering has to be secured with two symmetrical screws

All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.2
Combinations of arch profiles 1-, 2- and 3-span-system Section A-A, B-B and C-C	

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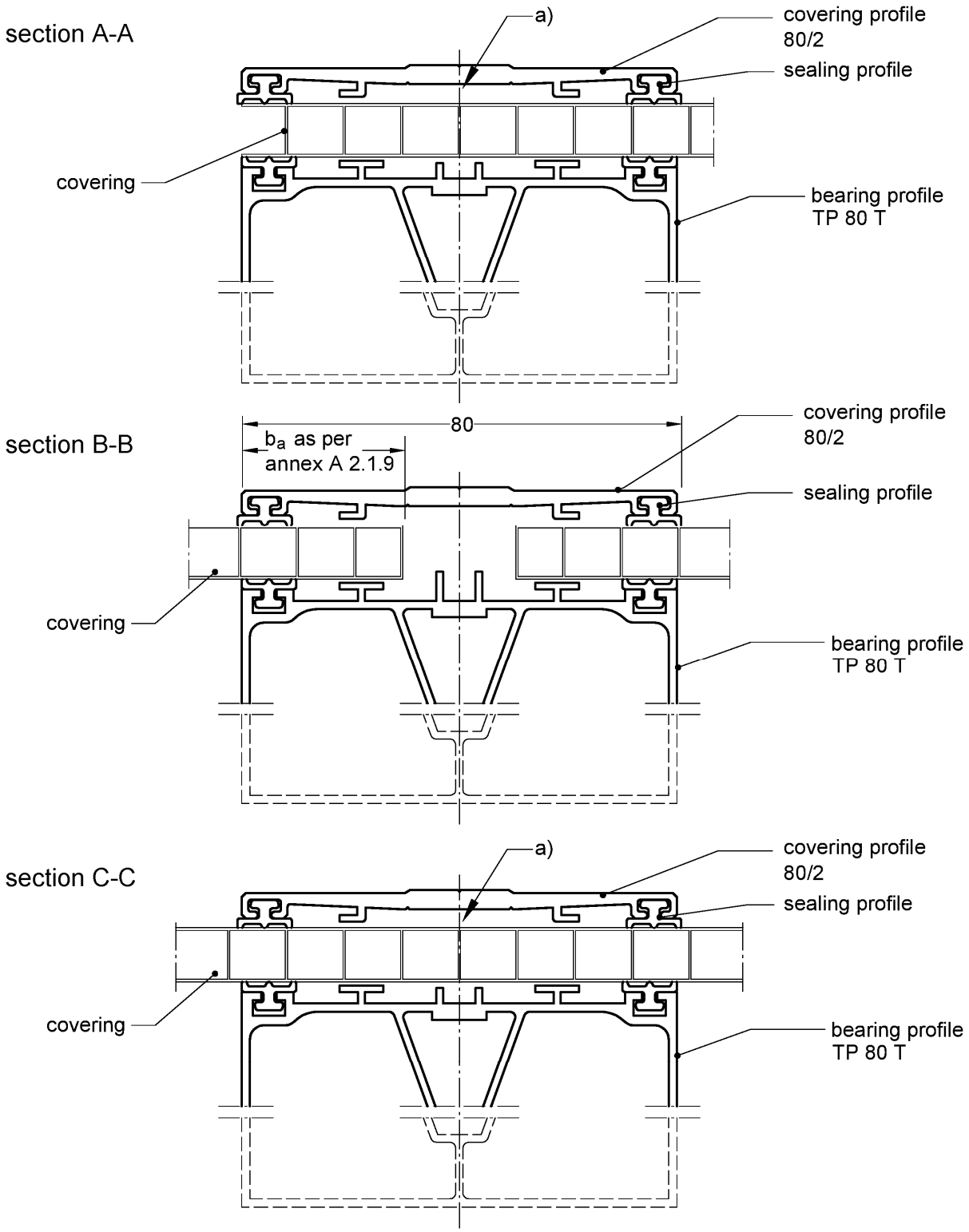


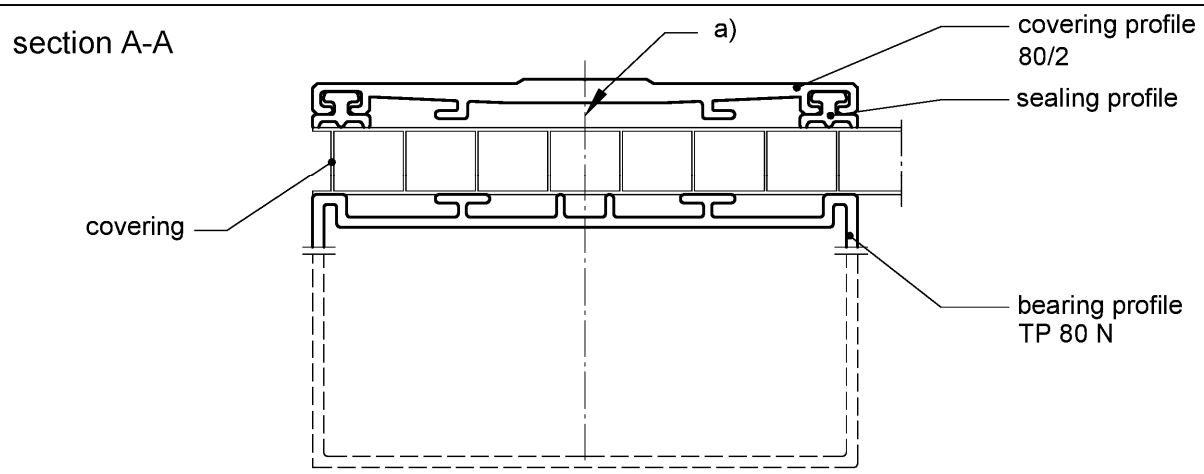
a) The covering has to be secured with two symmetrical screws

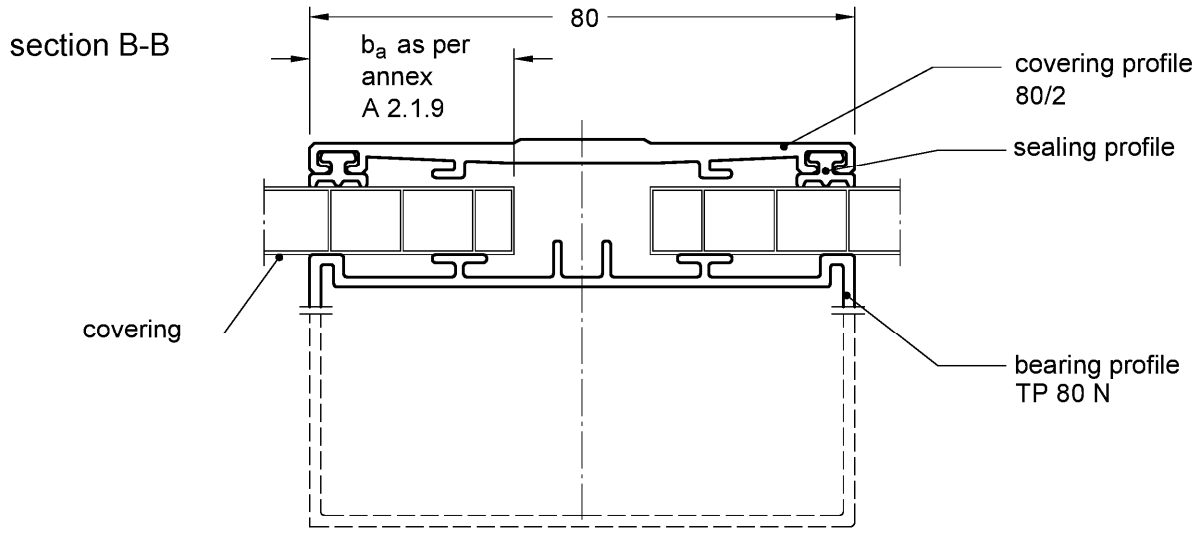
All dimensions in mm

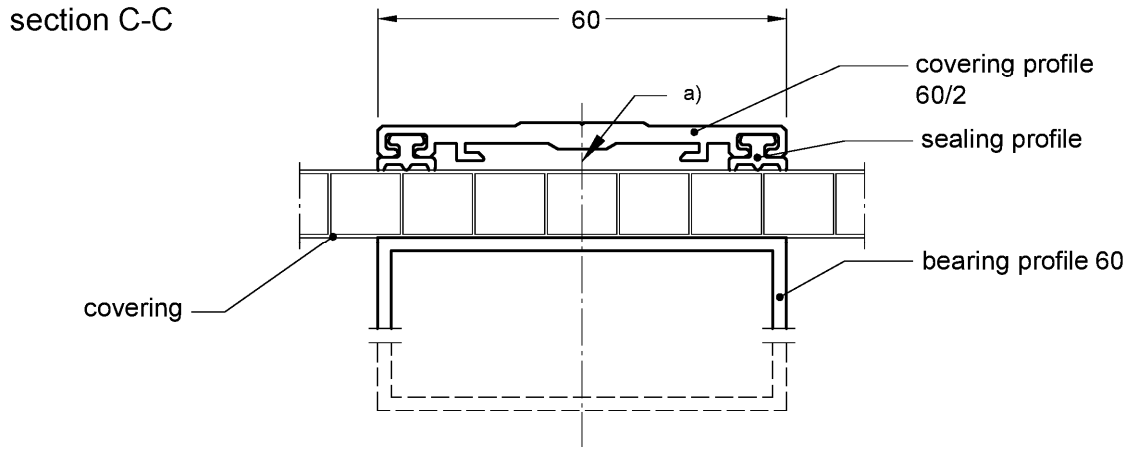
schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.3
Combinations of arch profiles 1-, 2- and 3-span-system Section A-A, B-B and C-C	

Deutsches Institut für Bautechnik DIBt







a) The covering has to be secured with two symmetrical screws

All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.4
Combinations of arch profiles 2- and 3-span-system Section A-A, B-B and C-C	

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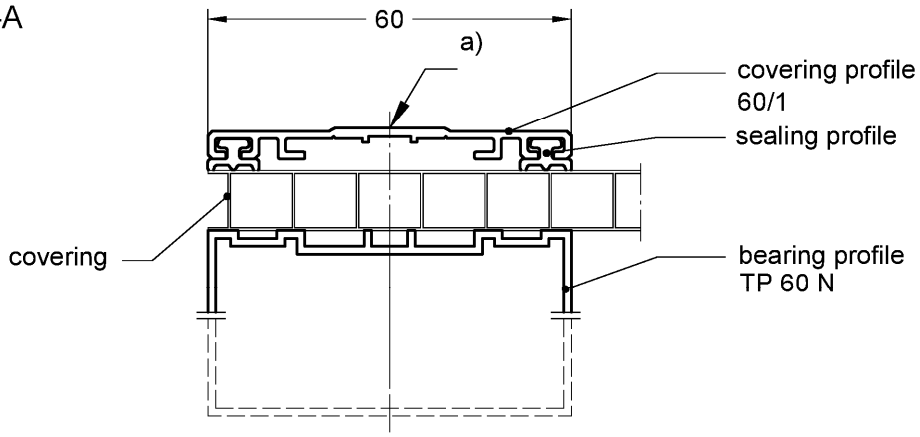
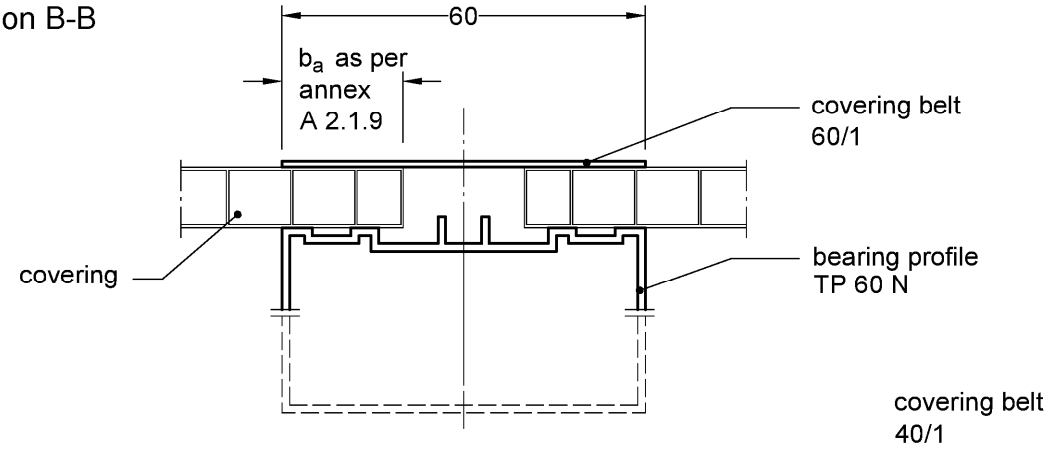
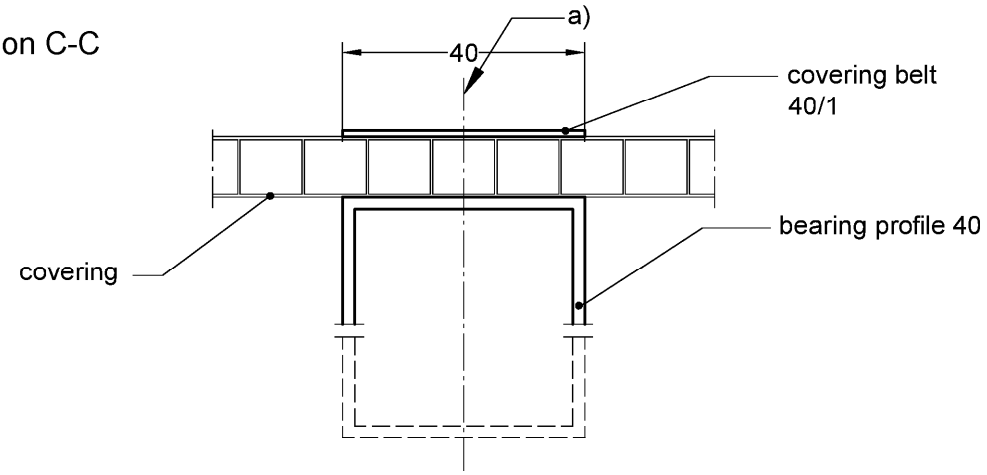
section A-A



section B-B



section C-C



a) The covering has to be secured with two symmetrical screws

All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.5
Combinations of arch profiles 2-span-system Section A-A, B-B and C-C	

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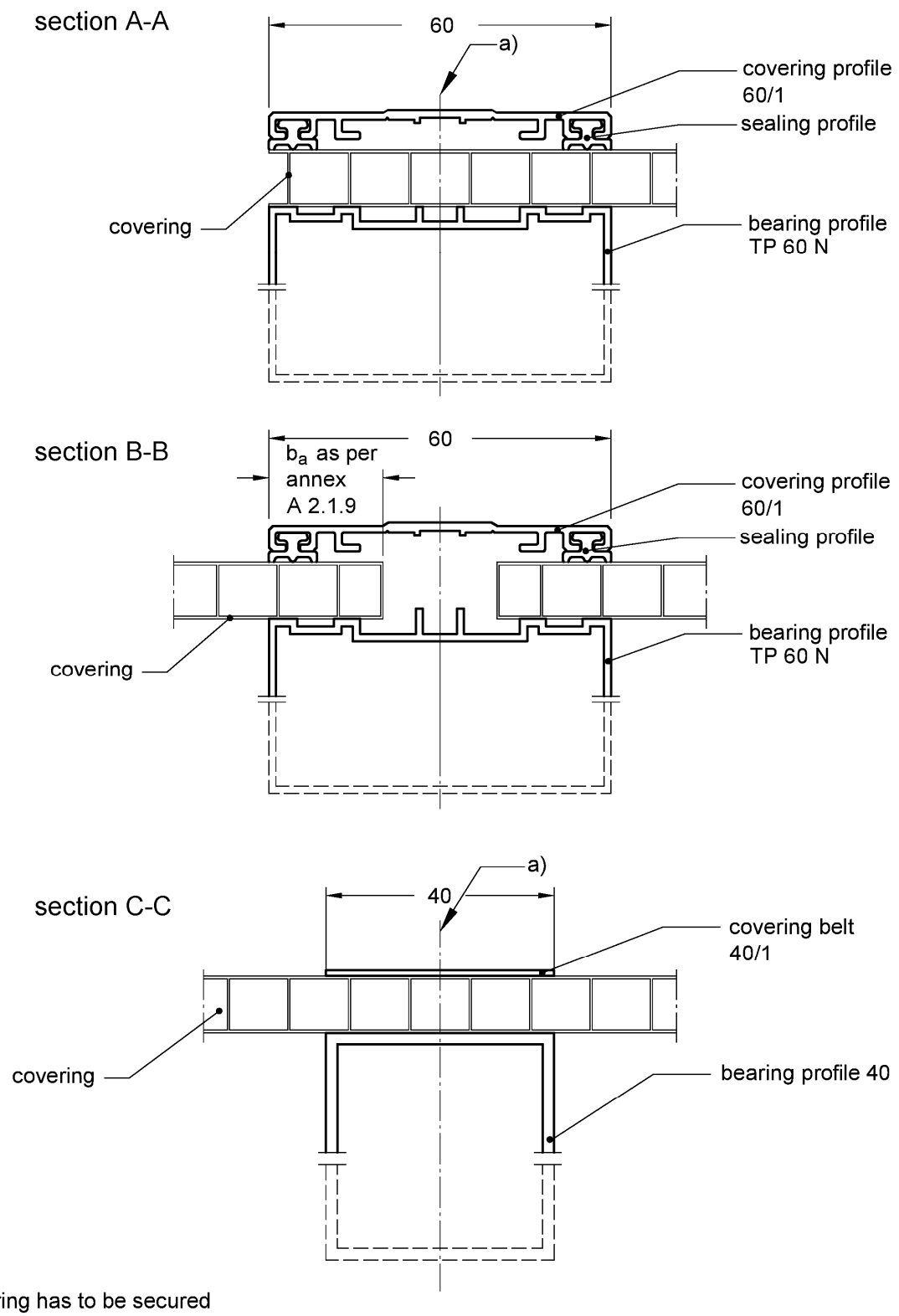

a) The covering has to be secured with two symmetrical screws

All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.6
Combinations of arch profiles 1- and 2-span-system Section A-A, B-B and C-C	

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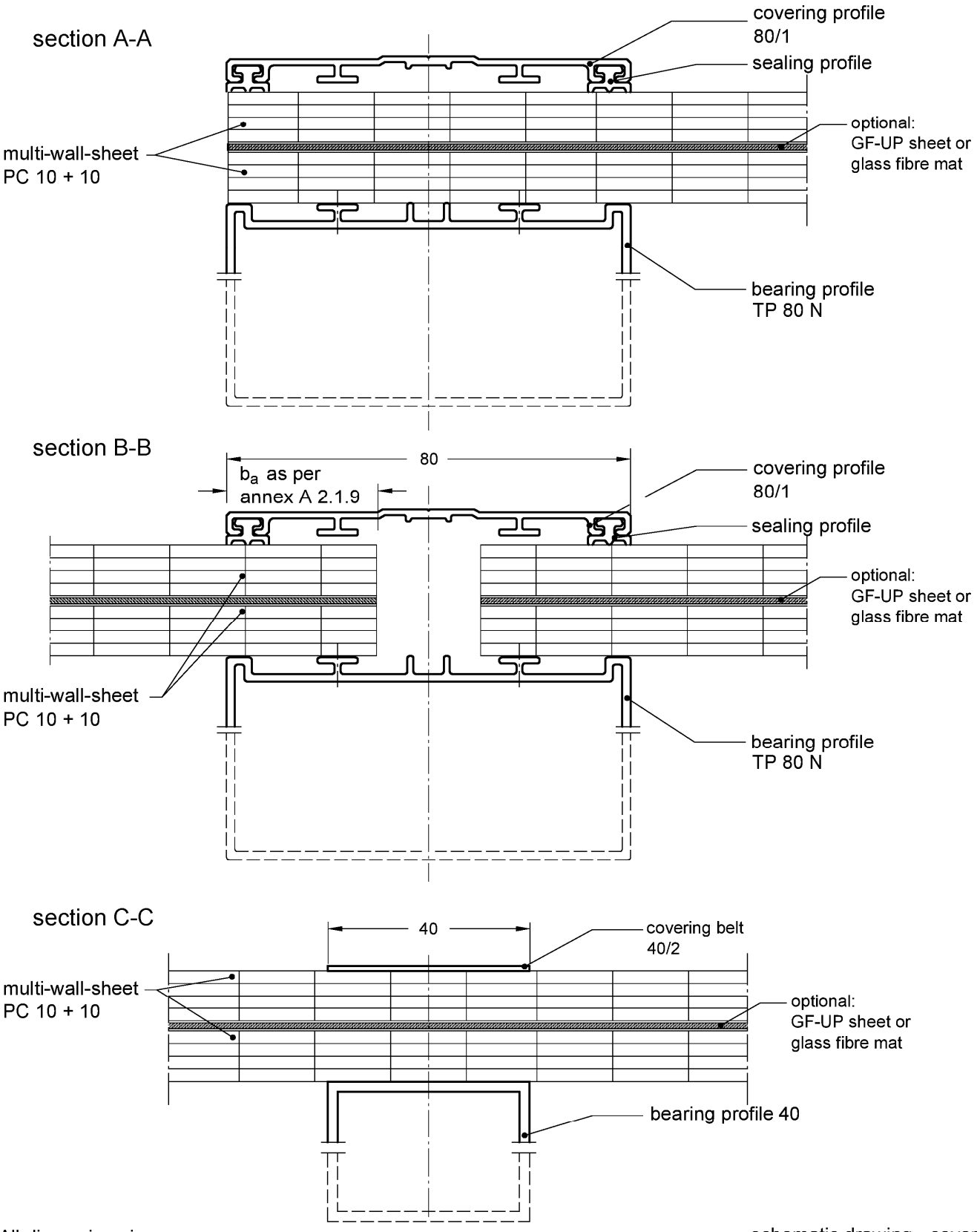

All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.7
Combinations of arch profiles 1-, 2- and 3-span-system Section A-A, B-B and C-C	

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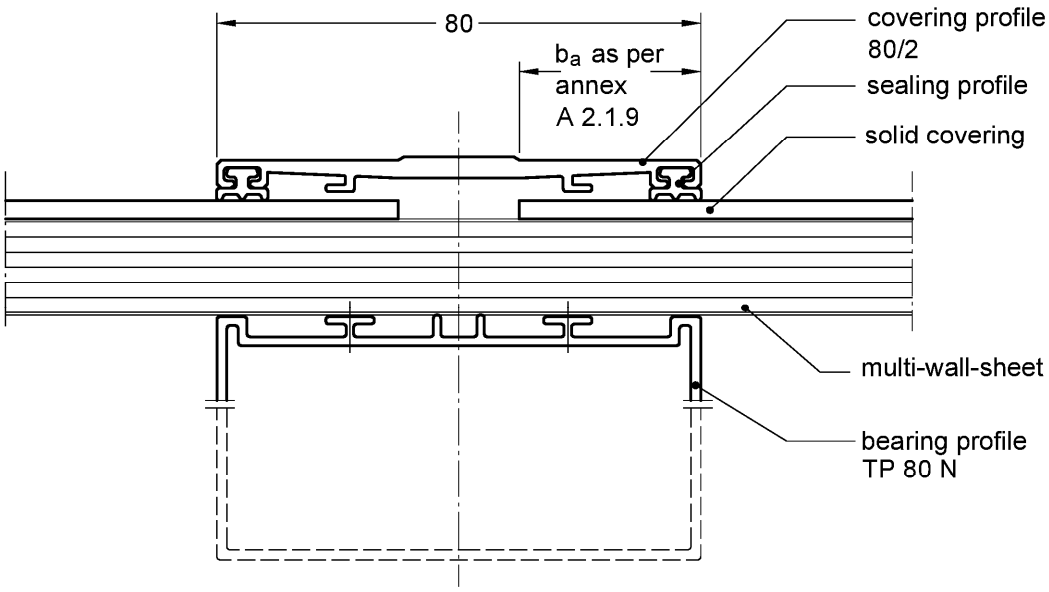
section G-G



All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.8
Combinations of arch profiles 1-, 2- and 3-span-system section G-G/G'-G' for covering "PC UVP 3 mm" + "PC16"	

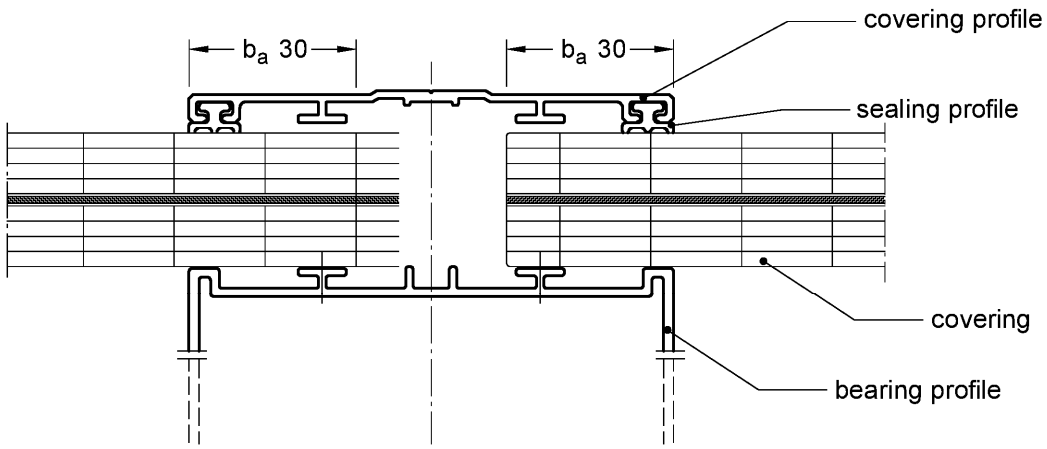
Deutsches Institut für Bautechnik DIBt

Covering	Section B-B or G-G / G'-G' as per Annex	Minimum bearing width b_a [mm] for		
		1-span system	2-span system	3-span system
		$a_p \leq 1060$	$a_p \leq 1060$	$a_p \leq 707$
		l_{es} or $l_e \leq 1050$	$l_e \leq 2100$	$l_e \leq 2100$
PC 10	2.1.1		20	
	2.1.2	30	30	30
	2.1.3	30	30	30
	2.1.4		30	30
	2.1.6		30	
PC 10+10	2.1.7	30	30	30
PC 10+10 DI	2.1.10	30	30	30
PC 16	2.1.1		20	
	2.1.2	30		30
	2.1.3	23	30	
	2.1.4		30	
	2.1.6	20	20	
	2.1.5		20	
PC 20	2.1.6	20	20	
PC 3+16	2.1.8	30	30	30

a_p = spacing of the bearing profiles
l_{es} = width of covering
l_e = production width

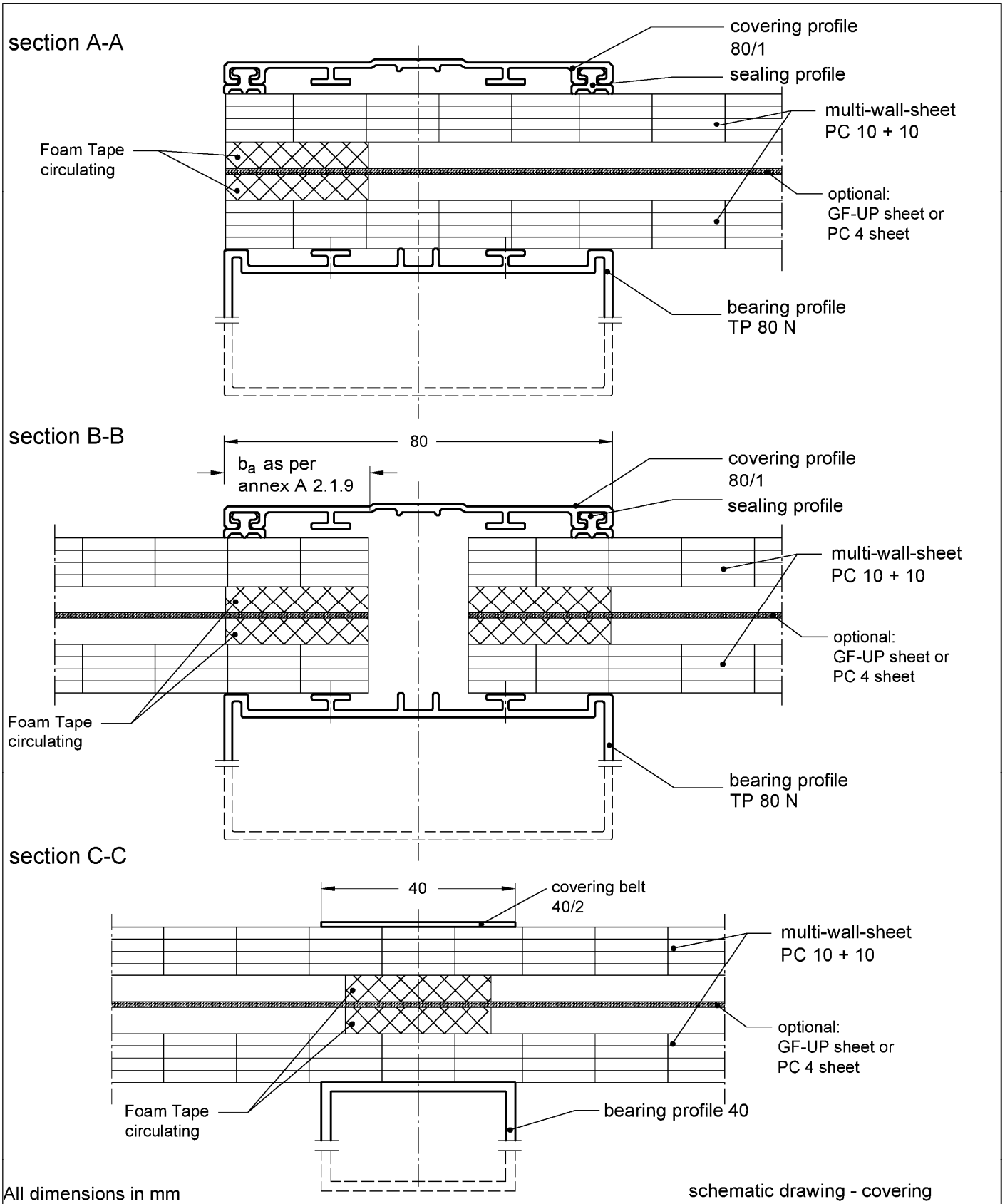
When the sheet edges are cut, the distance between the bearing profile and the last fully preserved rib is considered bearing width b_a.

Example:



JET-Vario-Norm	Annex A 2.1.9
Minimum bearing width at the covering and bearing profile as per section B-B and and G-G / G'-G'	

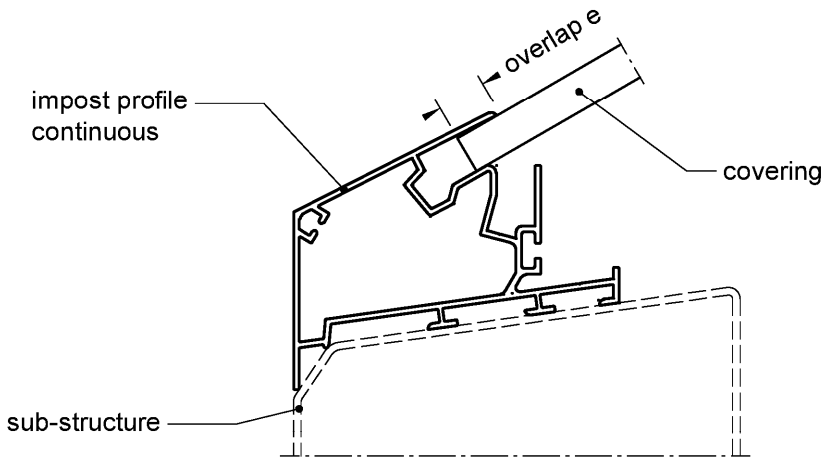
Deutsches Institut für Bautechnik DIBt



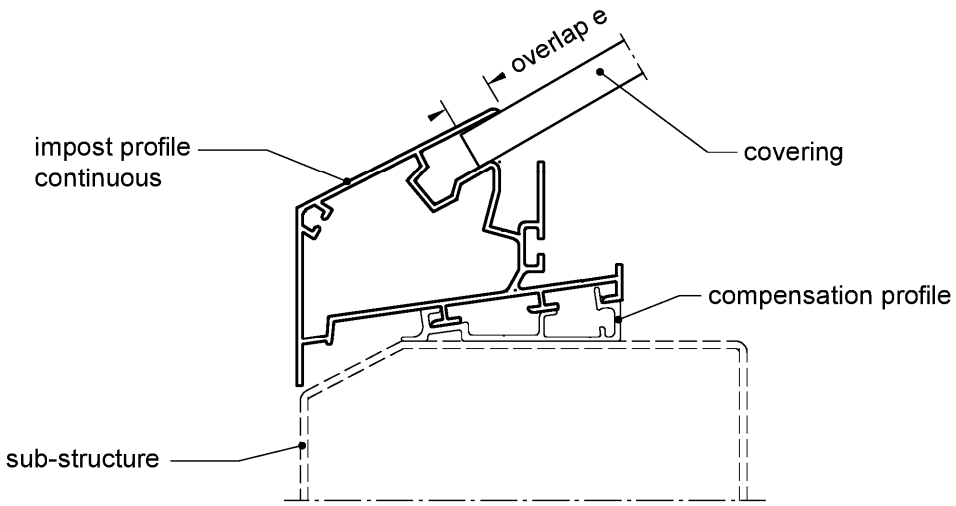
All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex A 2.1.10
Combinations of arch profiles 1-, 2- and 3-span-system Section A-A, B-B and C-C	



optional mounting



covering	impost as per annex	overlap e
PC 10	3.5.1	≥ 13 mm
PC 16	3.5.1 / 3.6.1	≥ 13 mm
PC 10+10	3.5.2 / 3.6.2	≥ 18 mm
PC 10+10 DI	3.6.3	≥ 27 mm
PC 3+16	3.5.2 / 3.6.2	≥ 30 mm

JET-Vario-Norm	Annex 2.2
Impost profile Section D-D	

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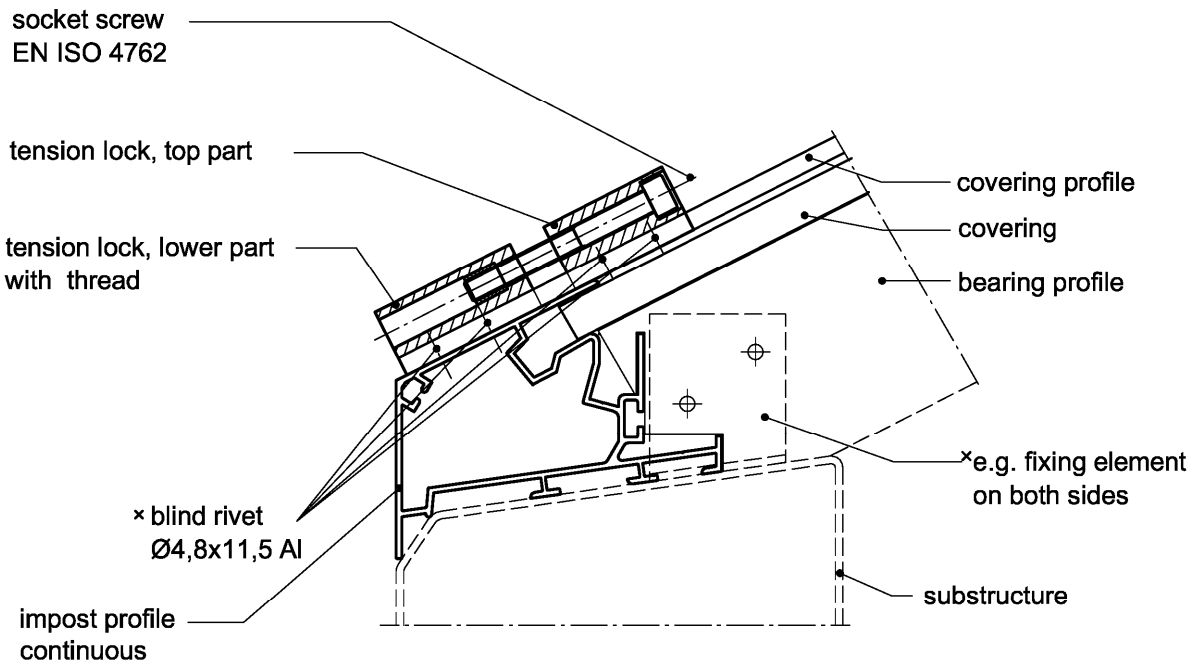
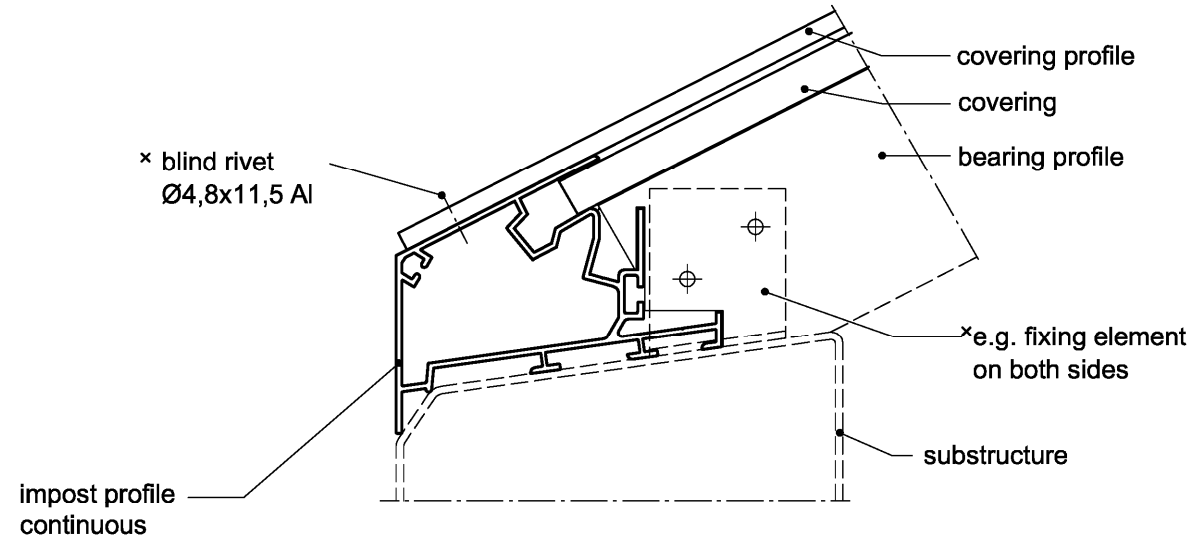


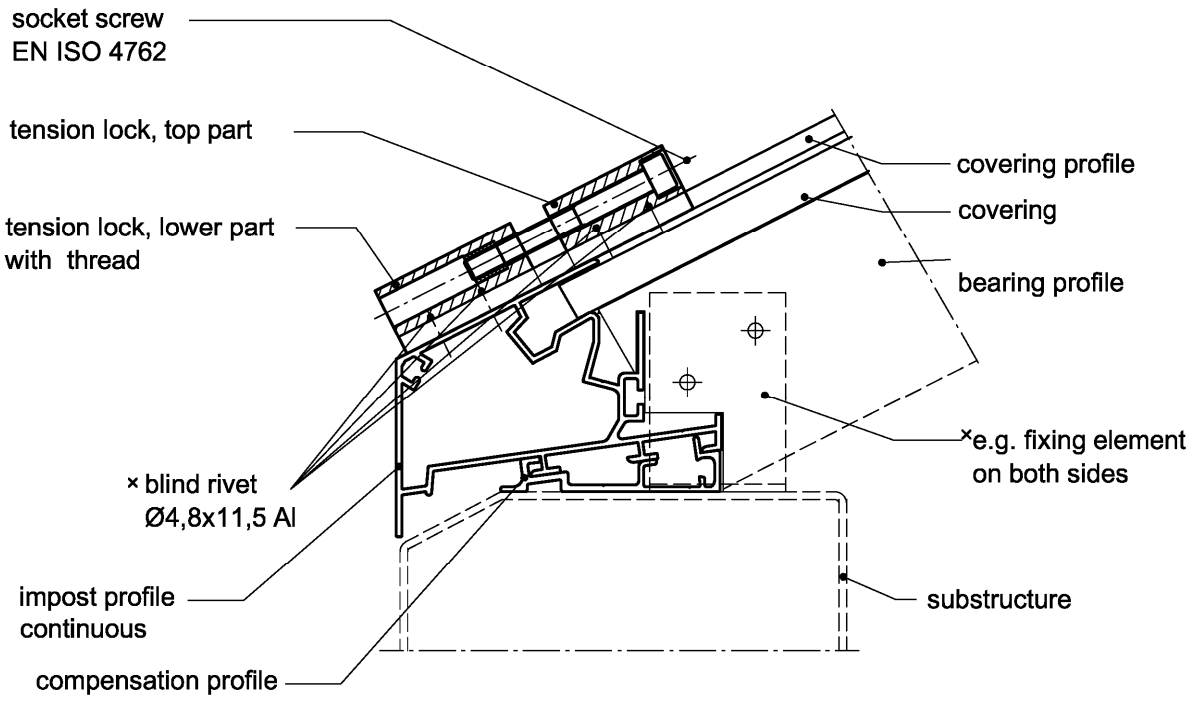
optional mounting covering profile



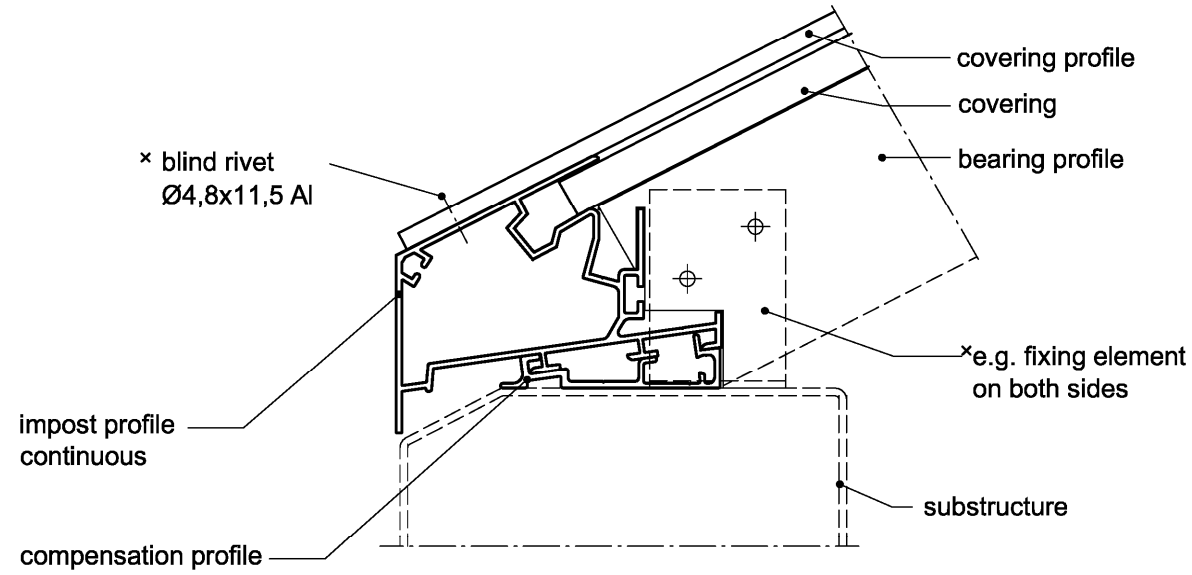
*type and quantity as per
structural requirements

connecting profiles
according structural requirements

JET-Vario-Norm	Annex 2.3.1
Impost profile Section E-E	



optional mounting covering profile



*type and quantity as per
structural requirements

connecting profiles
according structural requirements

JET-Vario-Norm	Annex 2.3.2
Impost profile Section E-E with optional compensation profile	

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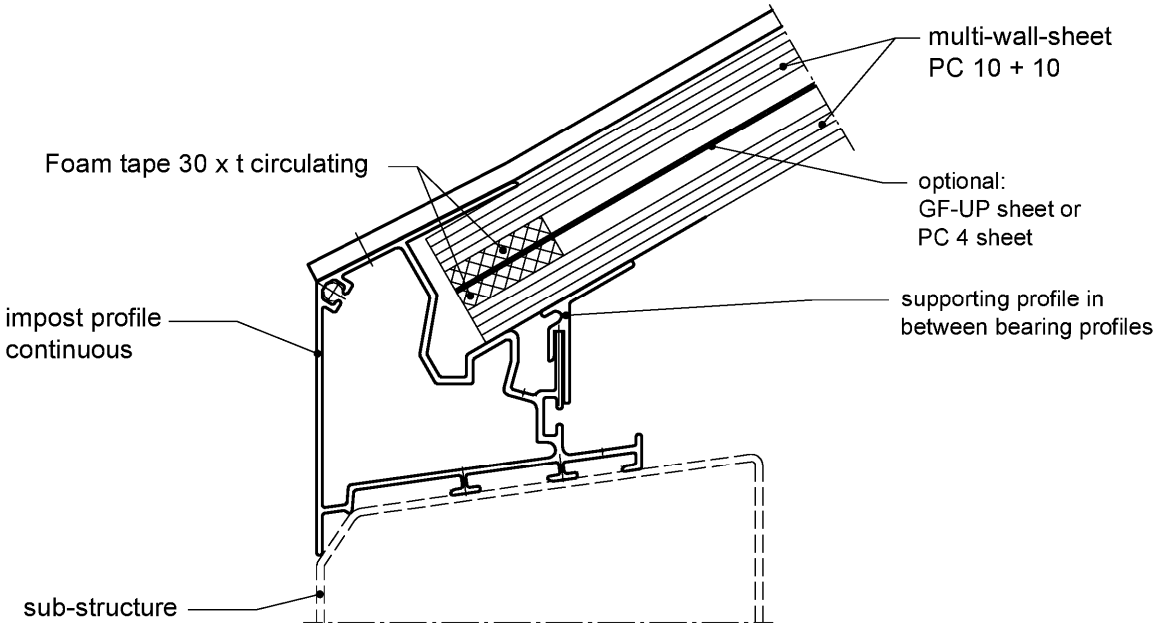

covering	thickness t
PC 10+10 DI	12 mm
PC 10 + GF-UP + 10 DI	5,4 mm
PC 10 + 4 + 10 DI	4 mm

All dimensions in mm

schematic drawing - covering

JET-Vario-Norm	Annex 2.3.3
Impost profile Section D-D	

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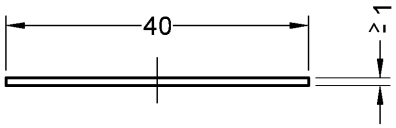
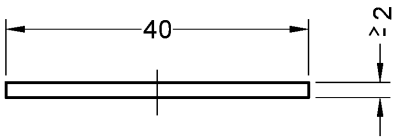
covering belt
40/1



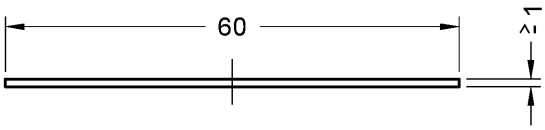
EN AW-6060
T66

covering belt
40/2



EN AW-6060
T66

covering belt
60/1



EN AW-6060
T66

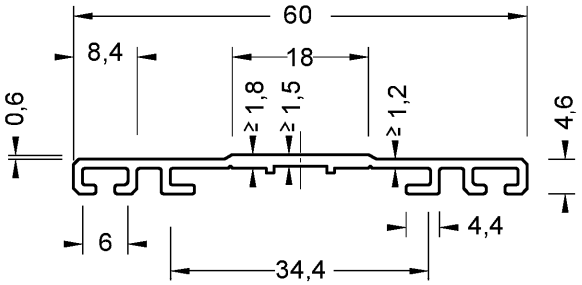
Dimensions and tolerances
as per EN 755-9

All dimensions in mm

JET-Vario-Norm	Annex A 3.1
Covering profiles Sections	

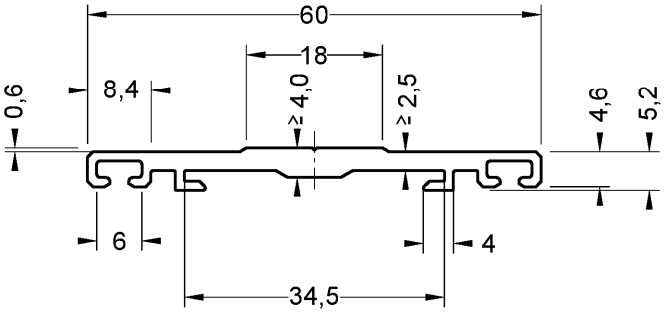
Deutsches Institut für Bautechnik DIBt

covering profile
60/1



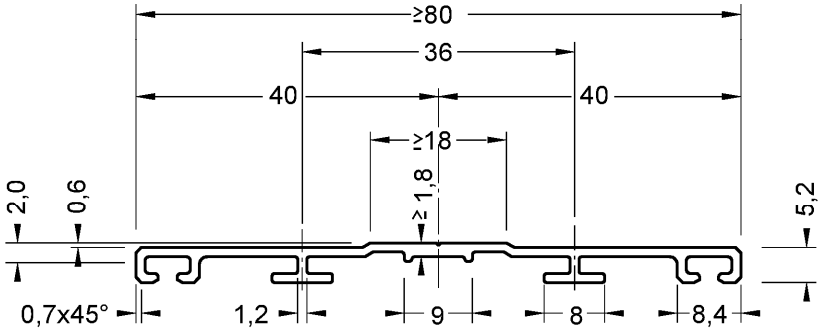
EN AW-6060
T66

covering profile
60/2



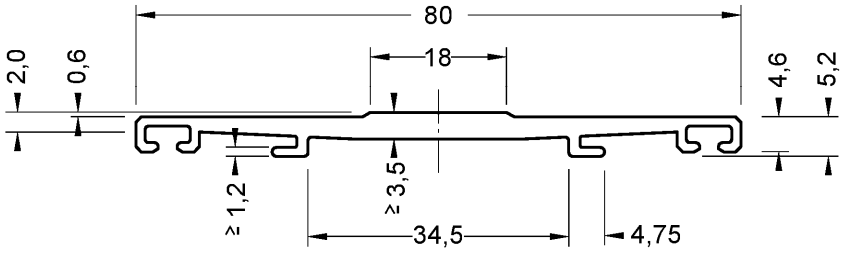
EN AW-6060
T66

covering profile
80/1



EN AW-6060
T66

covering profile
80/2



EN AW-6060
T66

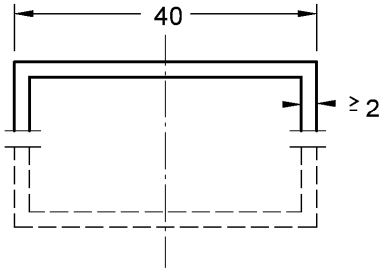
Dimensions and tolerances
as per EN 755-9

All dimensions in mm

JET-Vario-Norm	Annex A 3.2
Covering profiles Sections	

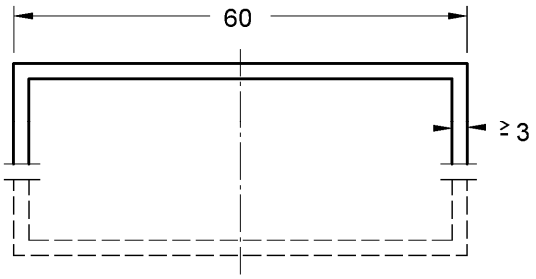
Deutsches Institut für Bautechnik DIBt

bearing profile 40



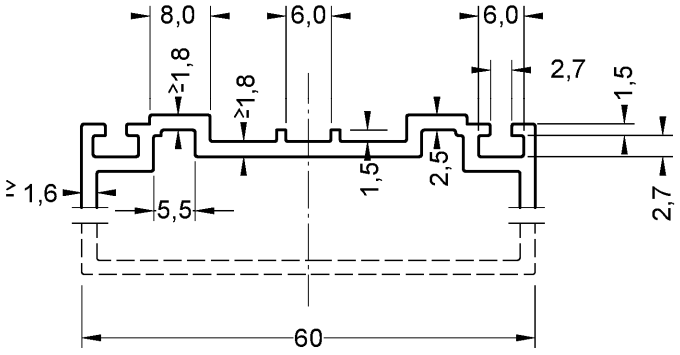
EN AW-6060
T66

bearing profile 60



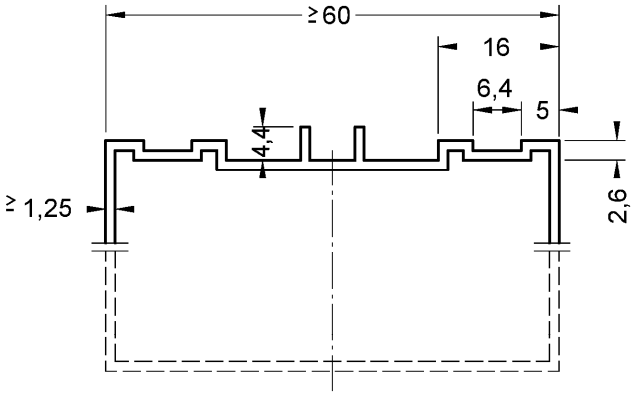
EN AW-6060
T66

bearing profile
TP60 T



EN AW-6060
T66

bearing profile
TP60 N



EN AW-6060
T66

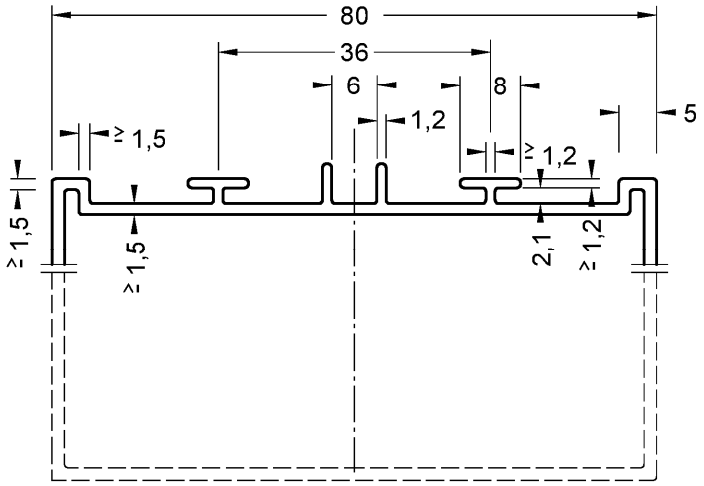
Dimensions and tolerances
as per EN 755-9

All dimensions in mm

JET-Vario-Norm	Annex A 3.3
Bearing profile 40 and 60 Sections	

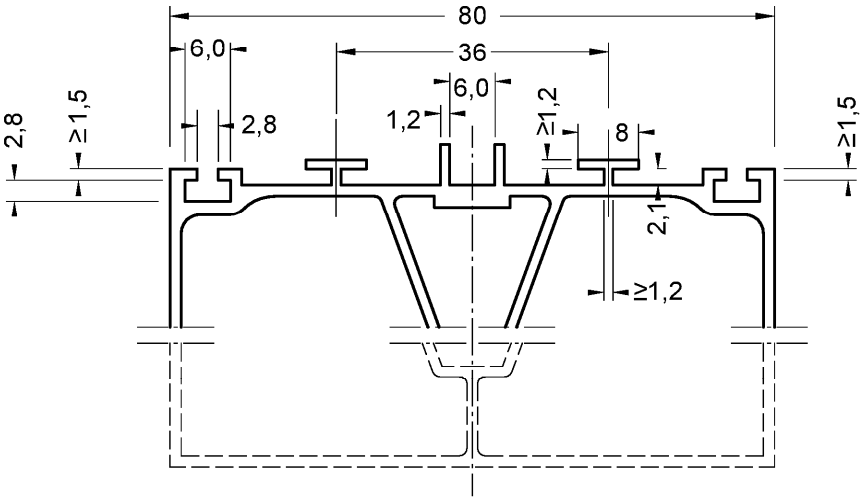
Deutsches Institut für Bautechnik DIBt

bearing profile
TP80 N



EN AW-6060
T66

bearing profile
TP80 T



EN AW-6060
T66

Dimensions and tolerances
as per EN 755-9

All dimensions in mm

JET-Vario-Norm	Annex A 3.4
Bearing profile 80 Sections	

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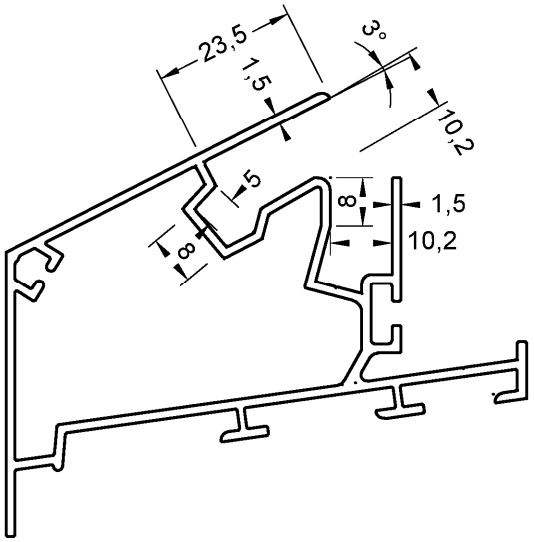
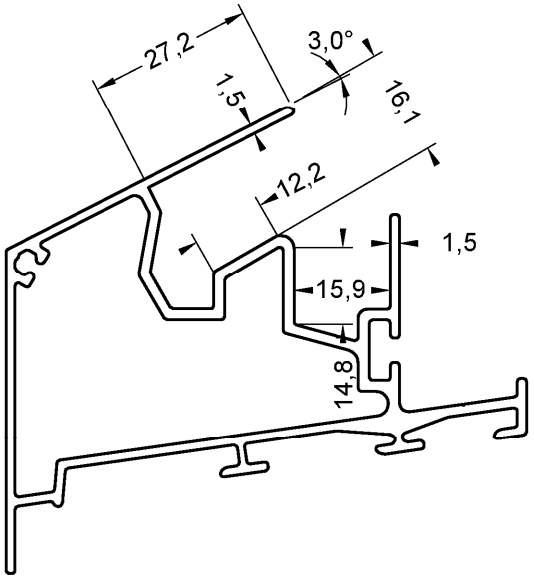
impost profile 10/30°



EN AW-6060
T66
as per EN 755-2

impost profile 16/30°



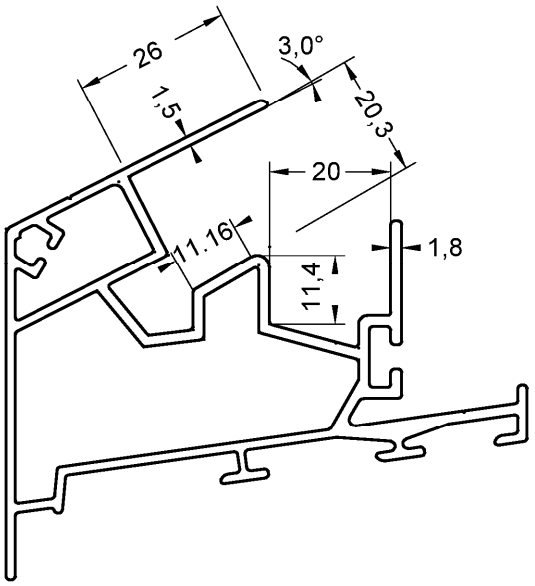
EN AW-6060
T66
as per EN 755-2

All dimensions in mm

JET-Vario-Norm	Annex A 3.5.1
Impost profile 10/30° and impost profile 16/30°	

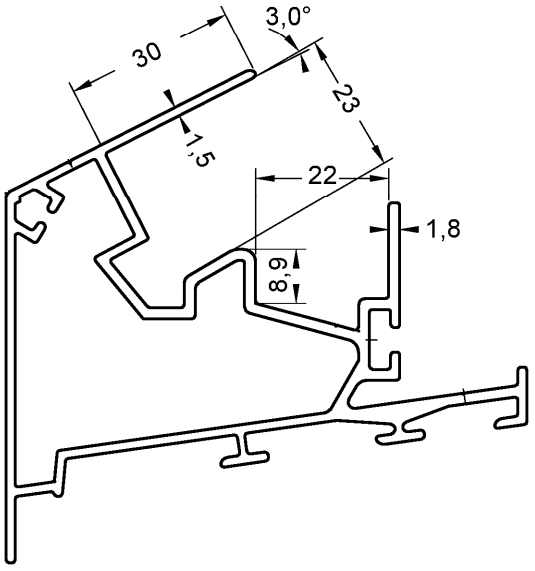
Deutsches Institut für Bautechnik DIBt

impost profile 20/30°



EN AW-6060
T66
as per EN 755-2

impost profile 22/30°



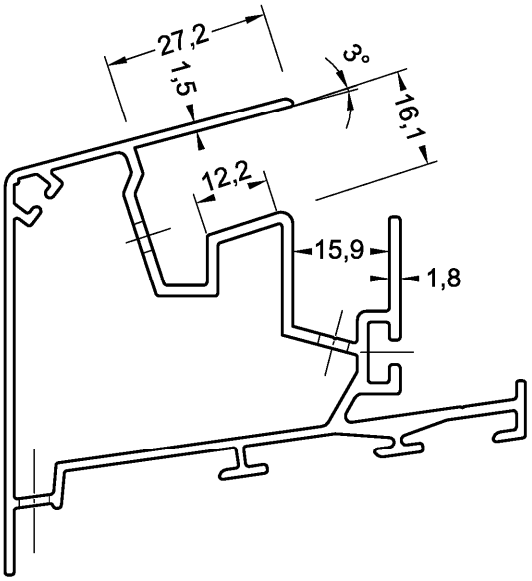
EN AW-6060
T66
as per EN 755-2

All dimensions in mm

JET-Vario-Norm	Annex A 3.5.2
Impost profile 20/30° and impost profile 22/30°	

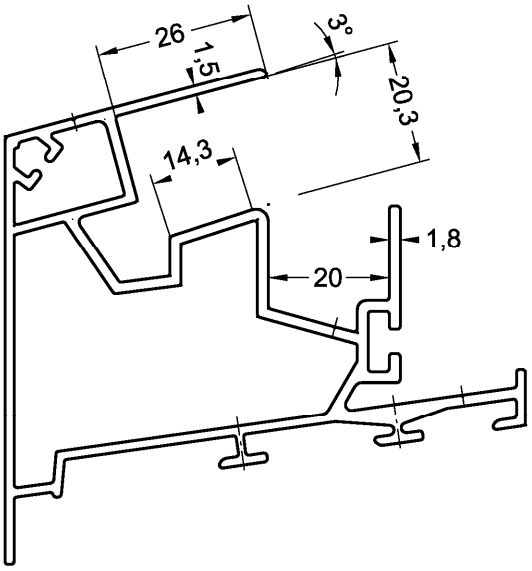
Deutsches Institut für Bautechnik DIBt

impost profile 16/18°



EN AW-6060
T66
as per EN 755-2

impost profile 20/18°



EN AW-6060
T66
as per EN 755-2

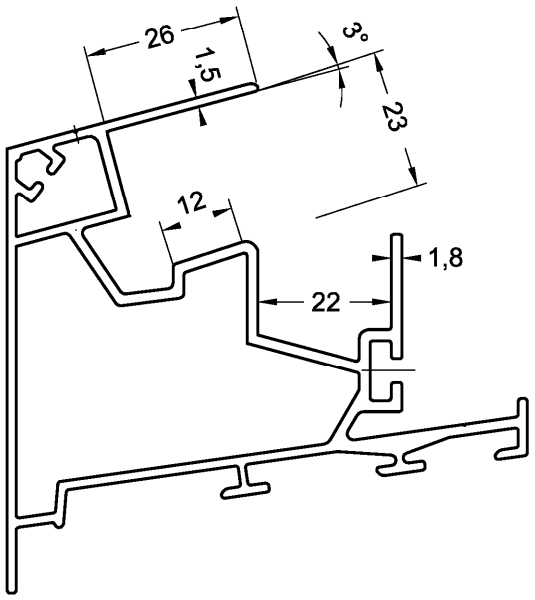
All dimensions in mm

JET-Vario-Norm	Annex A 3.6.1
Impost profile 16/18° and impost profile 20/18° Sections	

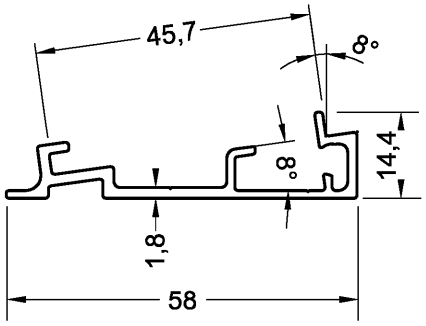
Deutsches Institut für Bautechnik DIBt

impost profile 22/18°

EN AW-6060
T66
as per EN 755-2



compensation profile



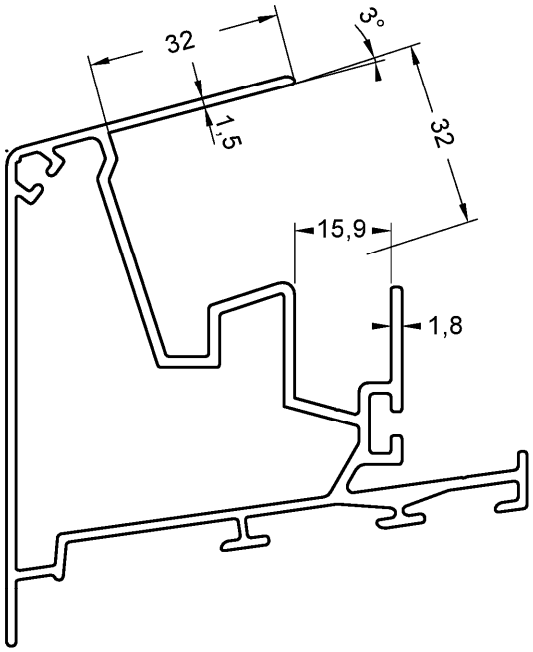
EN AW-6060
T66
as per EN 755-2

All dimensions in mm

JET-Vario-Norm	Annex A 2.6.2
Impost profile 22/18° and compensation profile Sections	

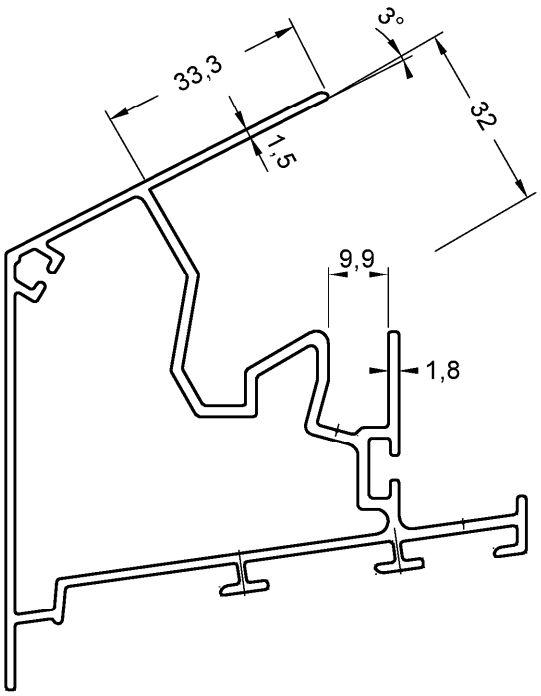
Deutsches Institut für Bautechnik DIBt

impost profile 32/18°



EN AW-6060
T66
as per EN 755-2

impost profile 32/30°

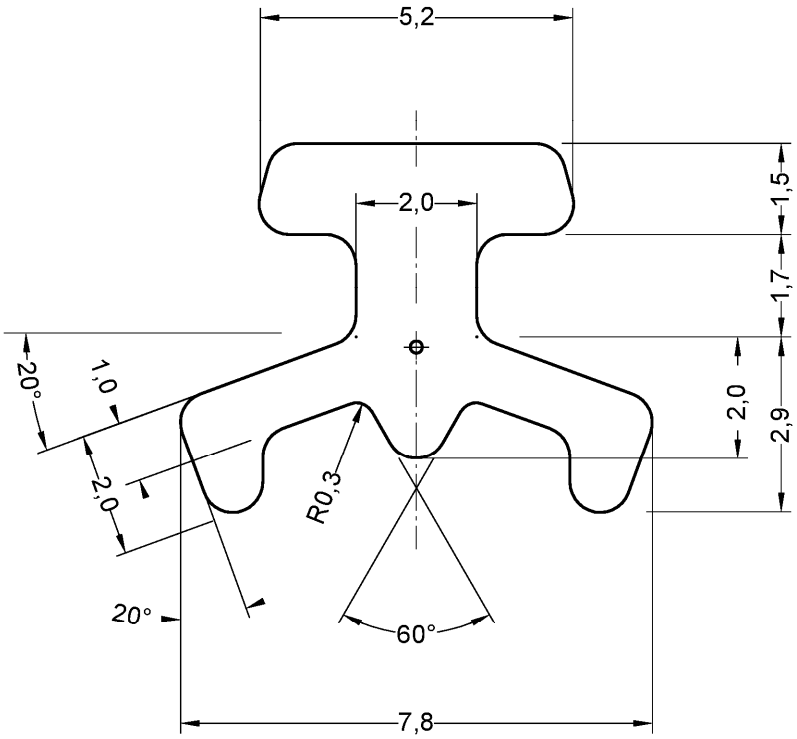


EN AW-6060
T66
as per EN 755-2

All dimensions in mm

JET-Vario-Norm	Annex A 3.6.3
Impost profile 32/18° and 32/20° Sections	

Deutsches Institut für Bautechnik DIBt



undimensioned radius = R 0,5 mm

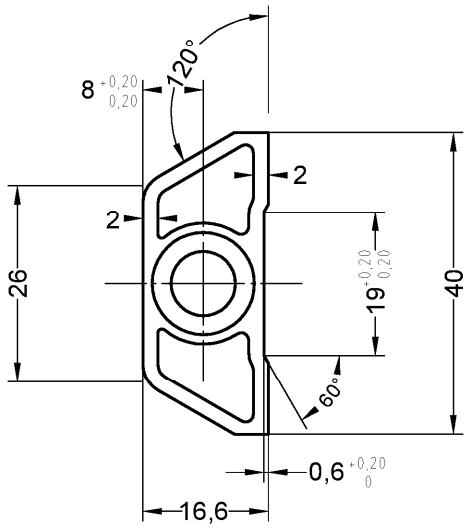
EPDM
(60±5) Shore A
as per EN ISO 868

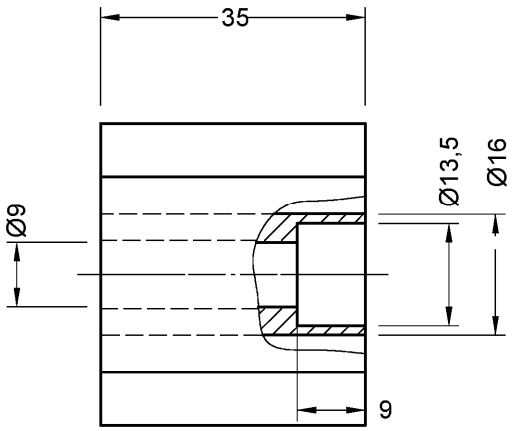
All dimensions in mm

JET-Vario-Norm	Annex A 3.7
Sealing profile Section	

Deutsches Institut für Bautechnik DIBt

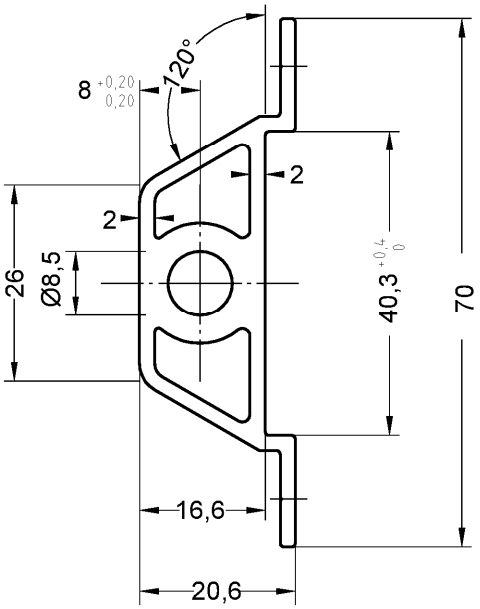
tension lock, top part 40

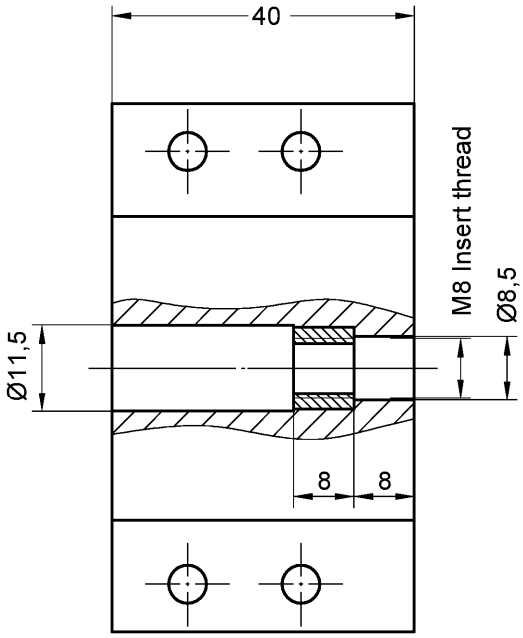




EN AW-6060
T66

tension lock, lower part 40





EN AW-6060
T66

All dimensions in mm

Dimensions and tolerances
as per EN 755-9

JET-Vario-Norm	Annex A 3.8.1
Tension lock Top part and lower part 40	

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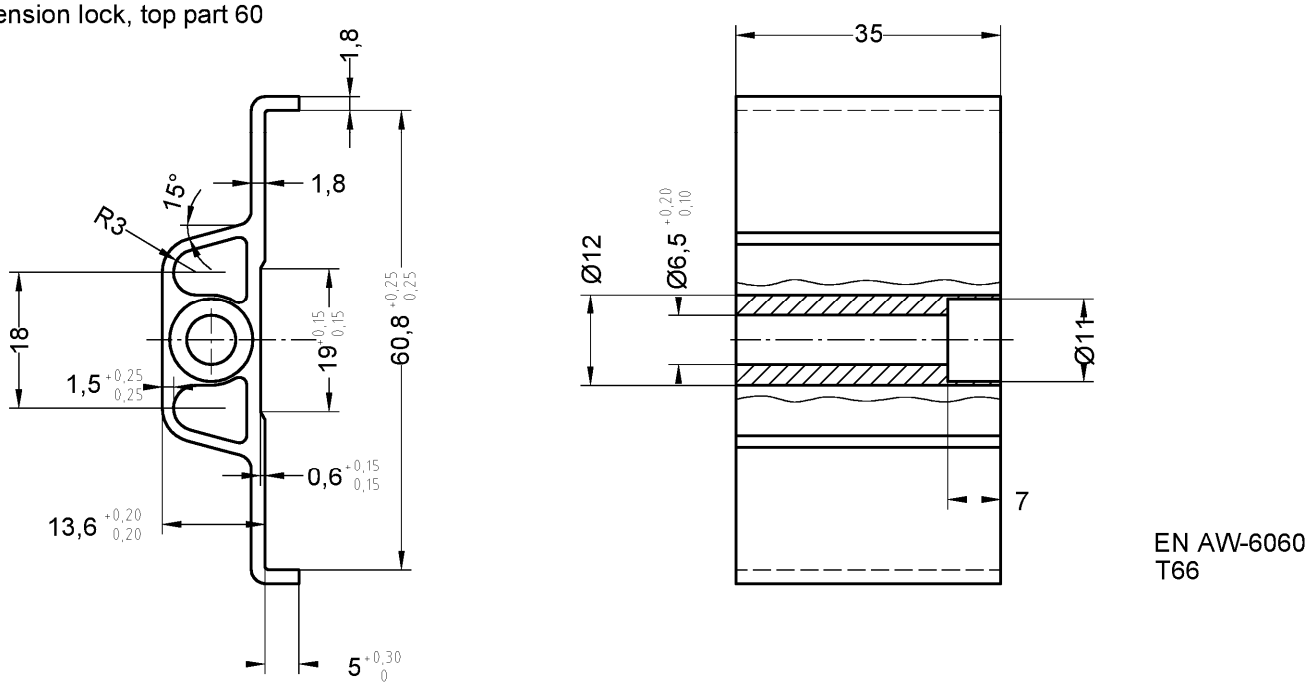
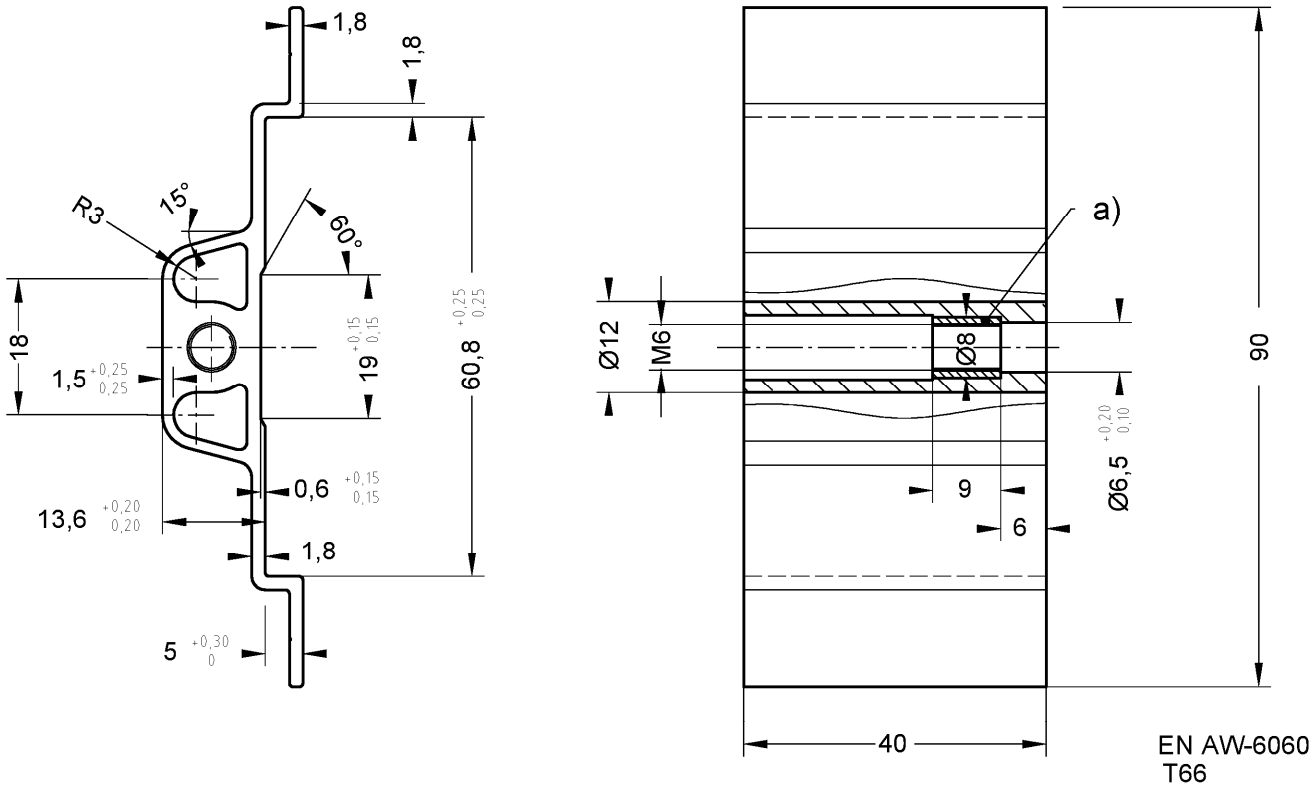
tension lock, top part 60



EN AW-6060
T66

tension lock, lower part 60



EN AW-6060
T66

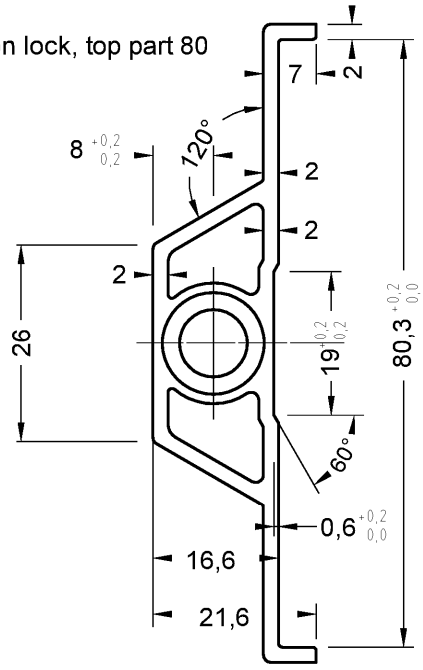
All dimensions in mm

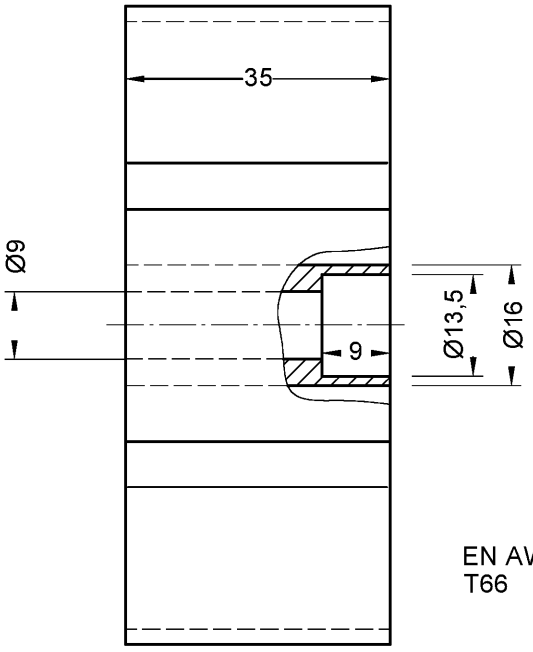
Dimensions and tolerances as per EN 755-9

JET-Vario-Norm	Annex A 3.8.2
Tension lock Top part and lower part 60	

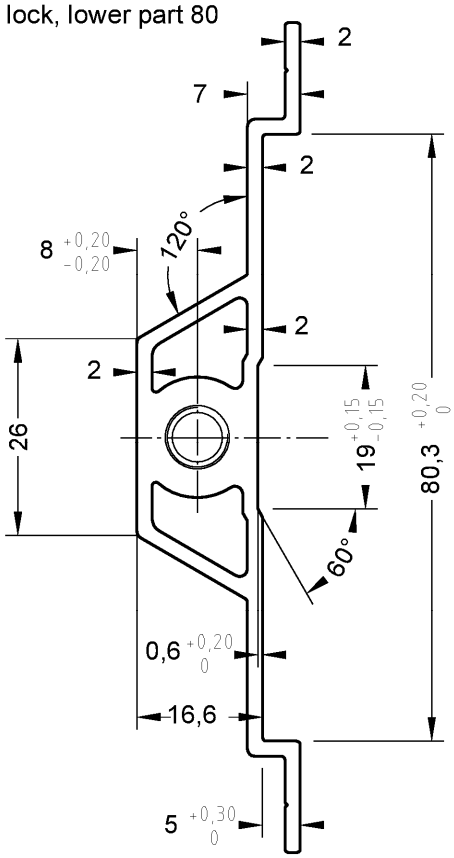
Deutsches Institut für Bautechnik DIBt

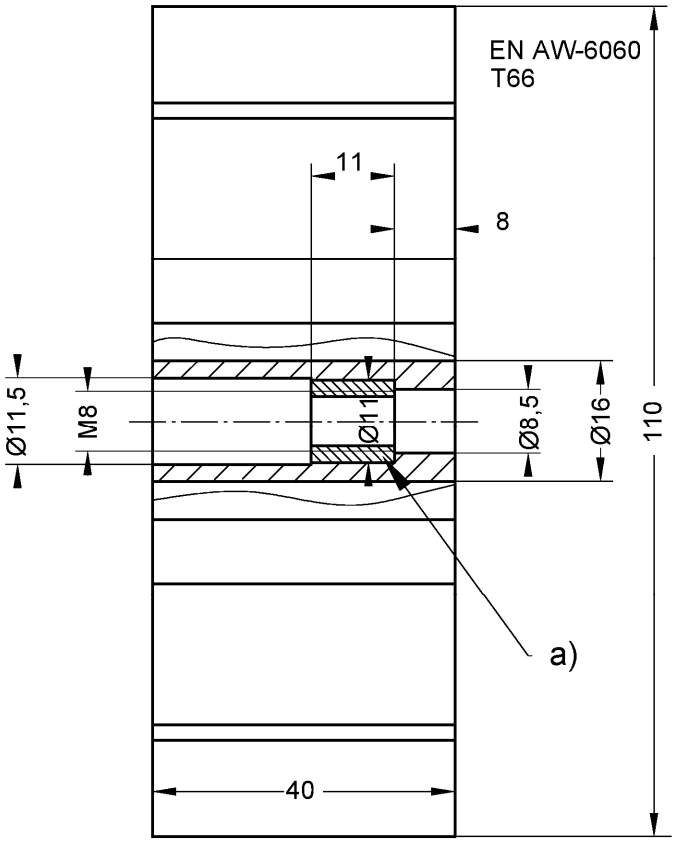
tension lock, top part 80





tension lock, lower part 80





All dimensions in mm

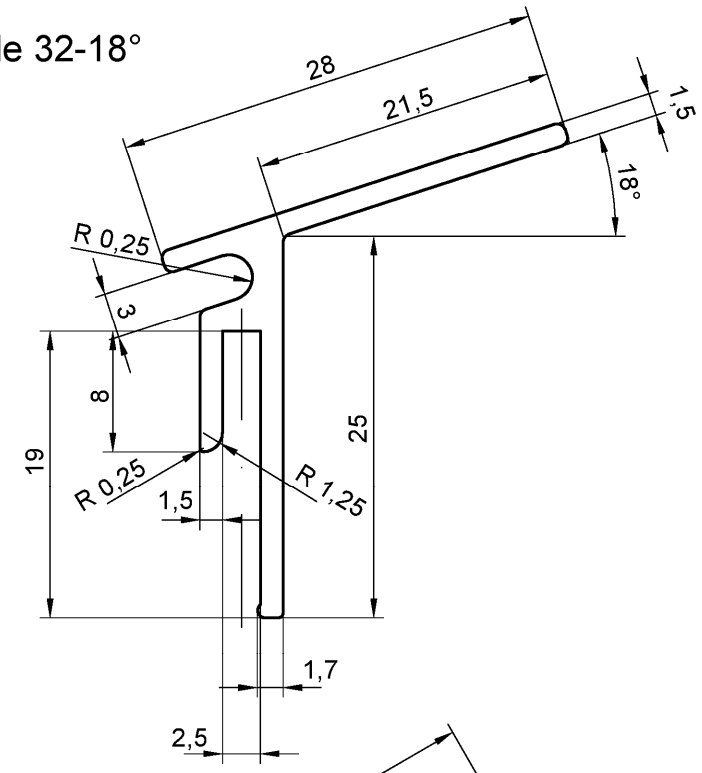
Dimensions and tolerances as per EN 755-9

a) insert thread as per 1.4104 EN 10088-3

JET-Vario-Norm	Annex A 3.8.3
Tension lock Top part and lower part 80	

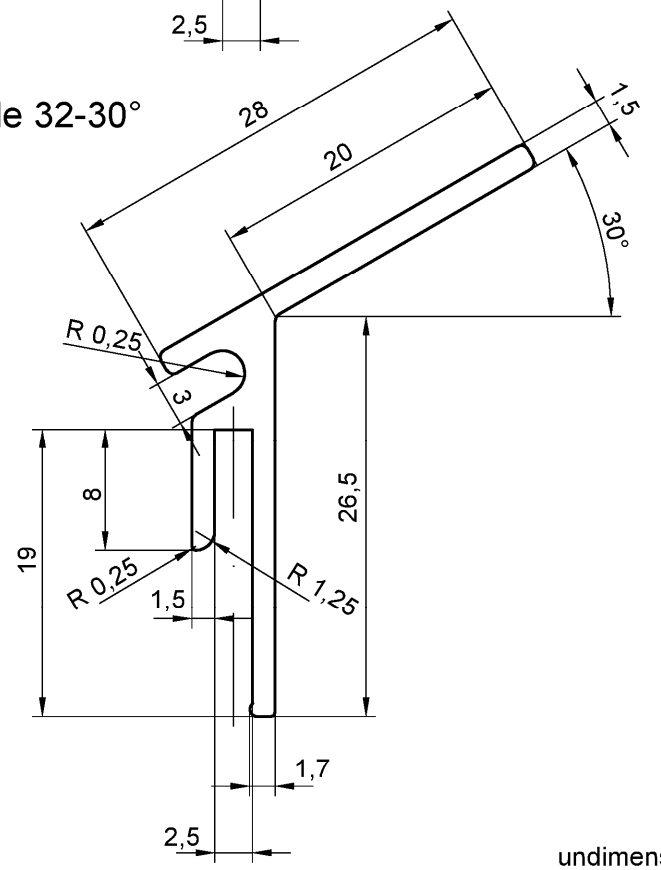
Deutsches Institut für Bautechnik DIBt

supporting profile 32-18°



EN AW-6060
T66
as per EN 755-2

supporting profile 32-30°



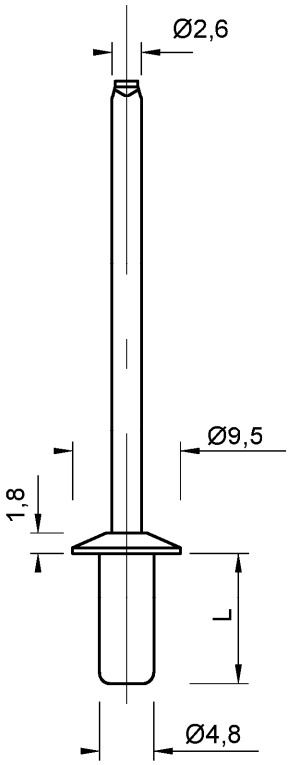
Dimensions and tolerances
as per EN 755-9

All dimensions in mm

undimensioned wall thickness 1,5 $^{+0,1}_{-0,2}$

undimensioned edges R0.5 mm

JET-Vario-Norm	Annex A 3.8.4
Supporting profile	



Joint component: Cup-blind-rivet Ø4,8 x L; Al

Material:

Body:
AlMg5 (EN AW 5019) EN 573
Material number 3.3555

Mandrel:
Steel galvanized EN 10016-2
or stainless steel EN 10088
Material number 1.4541

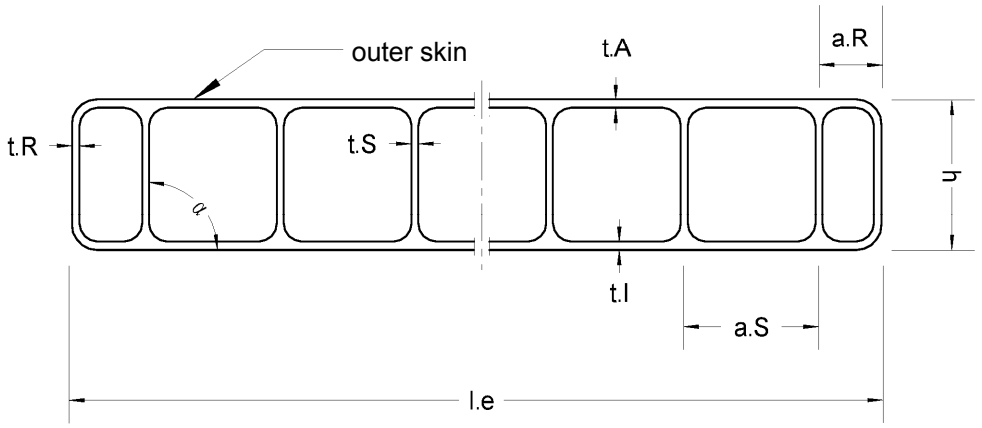
All dimensions in mm

JET-Vario-Norm	Annex A 3.9
Blind rivet connecting element	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ001

Sheet: **Makrolon Multi UV 2/10-10,5**
Manufacturer: **Covestro AG, Leverkusen**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	a_S mm	a_R mm	t_A mm	t_I mm	t_S mm	t_R mm	Flächen-gewicht kg/m²	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
2100	10,3	10,9	4,5	0,49	0,54	0,37	0,27	1,76	
+ 6 - 2	± 0,5	+ 0,2	+ 1,8	- 0,06	- 0,04	- 0,08	- 0,08	+ 0,11 - 0,03	≤ 7°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
64,0	30,9	2362	36,8	43,9
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure
$M_{b,neg}$: inner skin under pressure

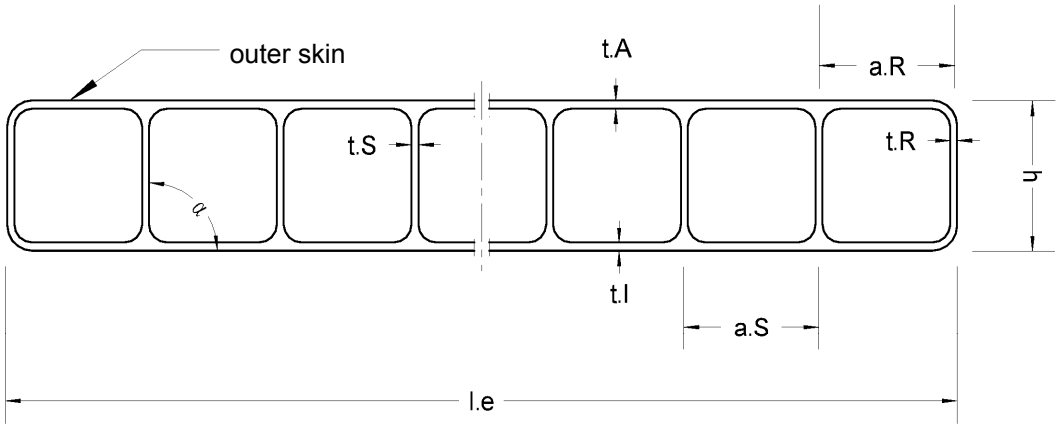
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.1
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Makrolon multi UV 2/10-10,5"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ005

Sheet: **Akyver Sun Type 10/1700**
Manufacturer: **DS Smith Plastics, Kaysersberg**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	a_S mm	a_R mm	t_A mm	t_I mm	t_S mm	t_R mm	Flächen-gewicht kg/m²	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
2100	10,3	10,9	10,1	0,46	0,46	0,47	0,37	1,70	
+ 6 - 2	± 0,5	+ 0,75	+ 1,9	- 0,06	- 0,04	- 0,12	- 0,08	+ 0,10 - 0,07	≤ 7°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
58,1	35,1	2756	35,2	36,1
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

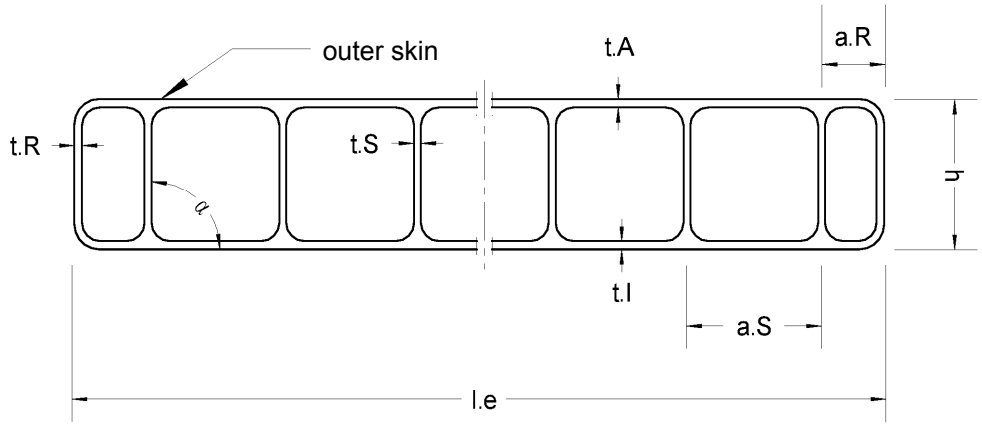
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.2
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Akyver Sun Type 10/1700"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ002

Sheet: **Makrolon Multi UV 2/10-10,5 ES**
Manufacturer: **Covestro AG, Leverkusen**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	a_S mm	a_R mm	t_A mm	t_I mm	t_S mm	t_R mm	Flächen-gewicht kg/m²	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
2100	10,1	10,7	4,3	0,61	0,59	0,46	0,44	1,98	
+6 -2	± 0,5	+ 0,2	+ 0,85	- 0,04	- 0,06	- 0,05	- 0,05	+ 0,12 - 0,10	≤ 4°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
70,3	32,6	3291	60,7	51,9
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

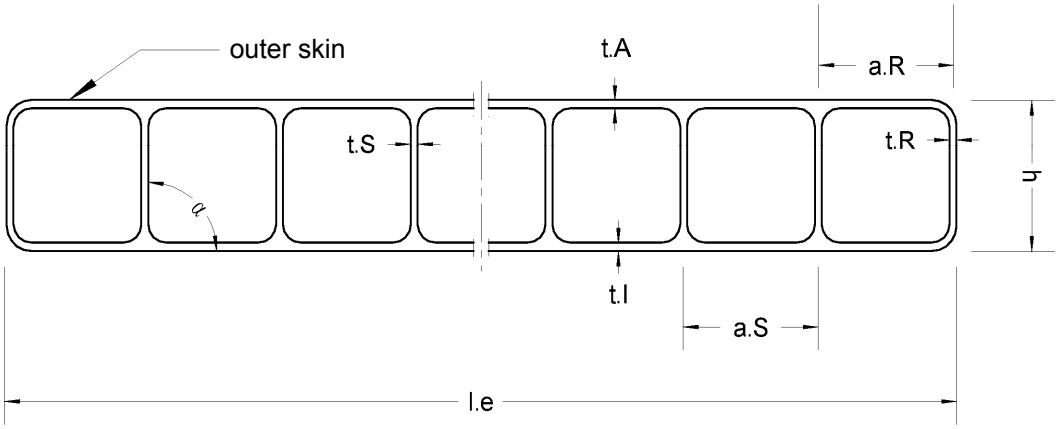
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.3
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Makrolon multi UV 2/10-10,5 ES"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ006

Sheet: **Akyver Sun Type 10/2000**
Manufacturer: **DS Smith Plastics, Kaysersberg**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	a_S mm	a_R mm	t_A mm	t_I mm	t_S mm	t_R mm	Flächen-gewicht kg/m²	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
2100	10,4	11,0	10,3	0,54	0,56	0,57	0,41	1,99	
+ 6 - 2	± 0,5	+ 0,65	+ 1,55	- 0,07	- 0,05	- 0,12	- 0,14	+ 0,12 - 0,10	≤ 5°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
68,4	41,6	4645	58,6	56,0
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

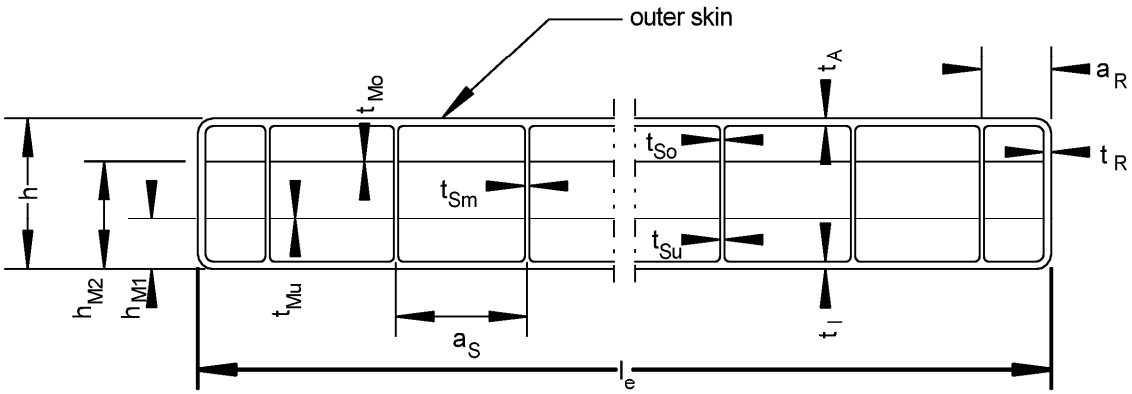
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.4
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Akyver Sun Type 10/2000"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ019

Sheet: **Akyver Sun Type 10/4W-7**
Manufacturer: **DS Smith Plastics, Kaysersberg**
Resin: **ISO 7391 - PC, EL, 61 - 03 - 9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	a_S mm	a_R mm	t_A mm	t_I mm	t_{So} mm	t_{Sm} mm	t_{Su} mm
2100	10,1	3,8	7,1	7,3	4,6	0,44	0,43	0,22	0,21	0,31
+ 6 - 2	+ 0,5 - 0,5	+ 0,1 - 0,1	+ 0,1 - 0,1	+ 0,1	+ 0,2	- 0,04	- 0,05	- 0,01	- 0,02	- 0,02

t_{Mo} mm	t_{Mu} mm	t_R mm	weight per area kg/m²	difference $\lvert\Delta\alpha\rvert$ to 90°
0,05	0,08	0,48	1,72	
- 0,01	- 0,01	- 0,05	+0,10 - 0,01	≤6°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
54,9	40,2	1858	39,6	39,6
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

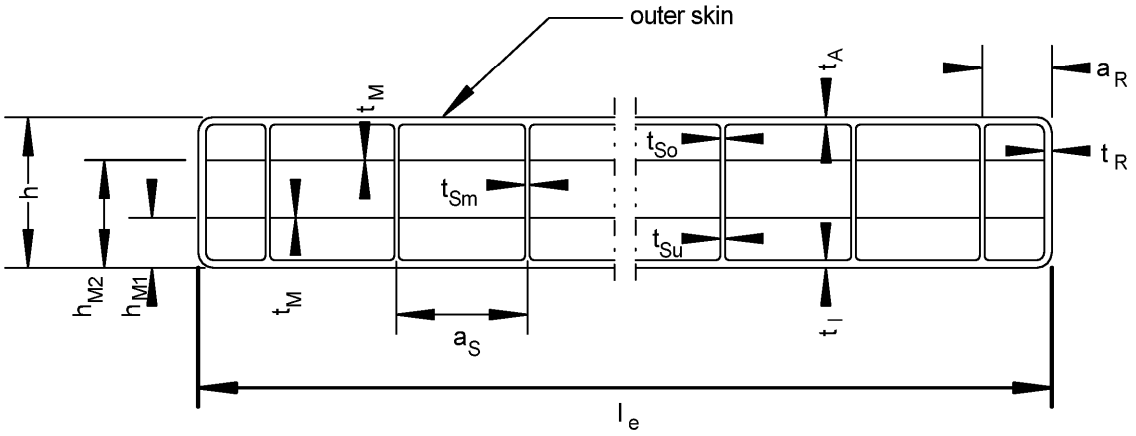
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.5
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Akyver Sun Type 10/4W-7"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ022

Sheet: **Macrolux LL 4W 10**
Manufacturer: **Koscon, Stabio**
Resin: **ISO 7391 - PC, EL, 61 - 03 - 9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	a_S mm	a_R mm	t_A mm	t_I mm	t_{So} mm	t_{Sm} mm	t_{Su} mm
2100	9,9	2,9	7,8	9,1	7,5	0,41	0,49	0,36	0,25	0,33
+6 -2	± 0,5	+ 0,15 - 0,3	+ 0,3 - 0,3	+ 0,6	+ 1,7	- 0,08	- 0,12	- 0,07	- 0,07	- 0,04

t_M mm	t_R mm	weight per area kg/m²	difference $\lvert\Delta\alpha\rvert$ to 90°
0,04	0,56	1,69	
- 0,01	- 0,20	+ 0,16 - 0,10	≤ 8°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
49,7	17,3	2129	41,2	44,0
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

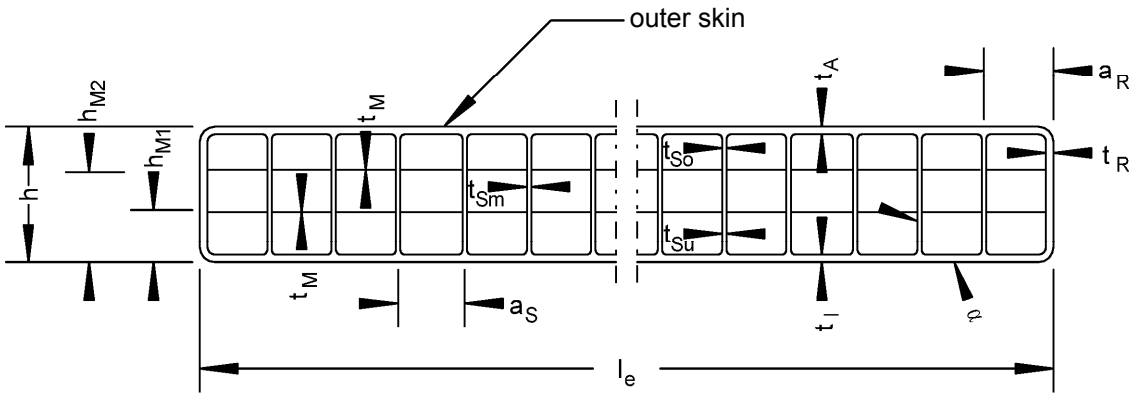
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.6
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Macrolux LL 4W 10"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ003

Sheet: **Makrolon Multi UV 4/10-6**
Manufacturer: **Covestro AG, Leverkusen**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	a_S mm	a_R mm	t_A mm	t_l mm	t_{So} mm	t_{Sm} mm	t_{Su} mm
2100	10,0	3,4	6,8	6,0	3,2	0,44	0,44	0,20	0,16	0,23
+ 6 - 2	+ 0,5 - 0,5	+ 0,4 - 0,3	+ 0,35 - 0,45	+ 0,25	+ 0,3	- 0,04	- 0,05	- 0,03	- 0,05	- 0,04

t_M mm	t_R mm	Flächen-gewicht kg/m²	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
0,08	0,26	1,73	
- 0,02	- 0,08	+0,10 - 0,02	≤8°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
49,0	23,1	2152	47,4	39,6
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

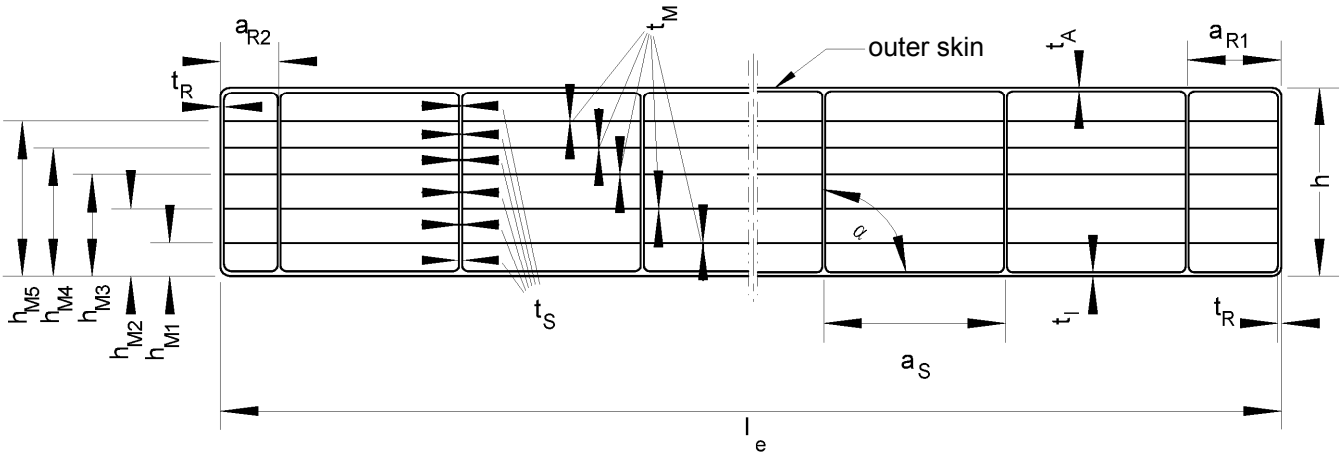
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.7
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Makrolon multi UV 4/10-6"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ004

Sheet: **Makrolon Multi UV 7/16-14**
Manufacturer: **Covestro AG, Leverkusen**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	h_{M3} mm	h_{M4} mm	h_{M5} mm	a_S mm	a_{R1} mm	a_{R2} mm	Flächen-gewicht kg/m²
2100	16,3	3,0	5,4	7,9	10,6	13,4	13,8	10,2	6,6	2,64
+6 -2	± 0,5	+ 0,15 - 0,2	+ 0,2 - 0,15	+ 0,4 - 0,2	+ 0,2 - 0,15	+ 0,25 - 0,35	+ 0,25	+ 0,90	+ 0,75	+ 0,16 - 0,01

t_A mm	t_I mm	t_S mm	t_M mm	t_R mm	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
0,57	0,60	0,37	0,08	0,78	
- 0,04	- 0,05	- 0,08	- 0,01	- 0,06	≤ 3°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
170,9	70,1	2845	63,2	49,9
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

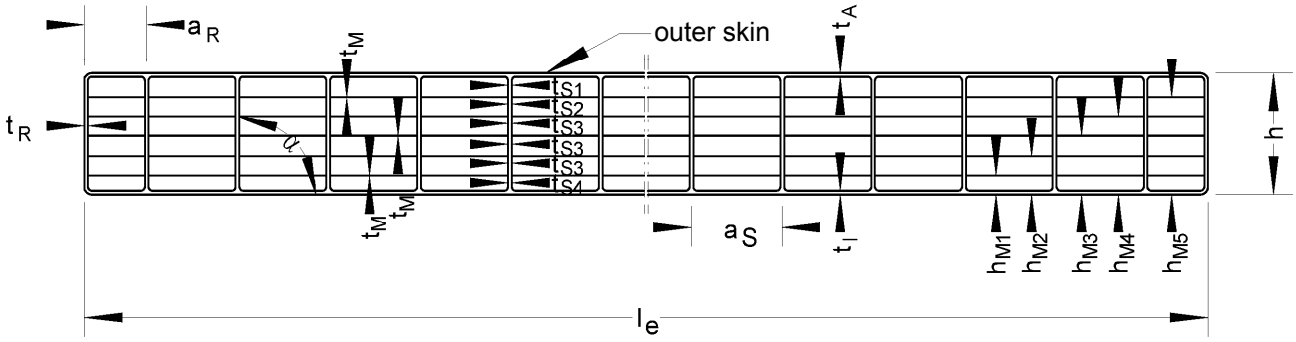
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.8
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Makrolon multi UV 7/16-14"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ008

Sheet: **Akyver Sun Type 16 7W-12**
Manufacturer: **DS Smith Plastics, Kaysersberg**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	h_{M3} mm	h_{M4} mm	h_{M5} mm	a_S mm	a_R mm	t_A mm	t_I mm
2100	16,1	2,7	5,2	7,9	10,5	12,9	12,0	8,0	0,61	0,54
+6 -2	± 0,5	+ 0,45 - 0,3	+ 0,4 - 0,55	+ 0,55 - 0,7	+ 0,5 - 0,7	+ 0,4 - 0,35	+ 0,40	+ 3,05	- 0,11	- 0,11

t_{S1} mm	t_{S2} mm	t_{S3} mm	t_{S4} mm	t_M mm	t_R mm	Flächen-gewicht kg/m²	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
0,45	0,45	0,37	0,36	0,06	0,50	2,63	
- 0,07	- 0,10	- 0,12	- 0,13	- 0,02	- 0,32	+ 0,16 - 0,20	≤ 9°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
176,9	49,0	2566	65,6	54,1
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

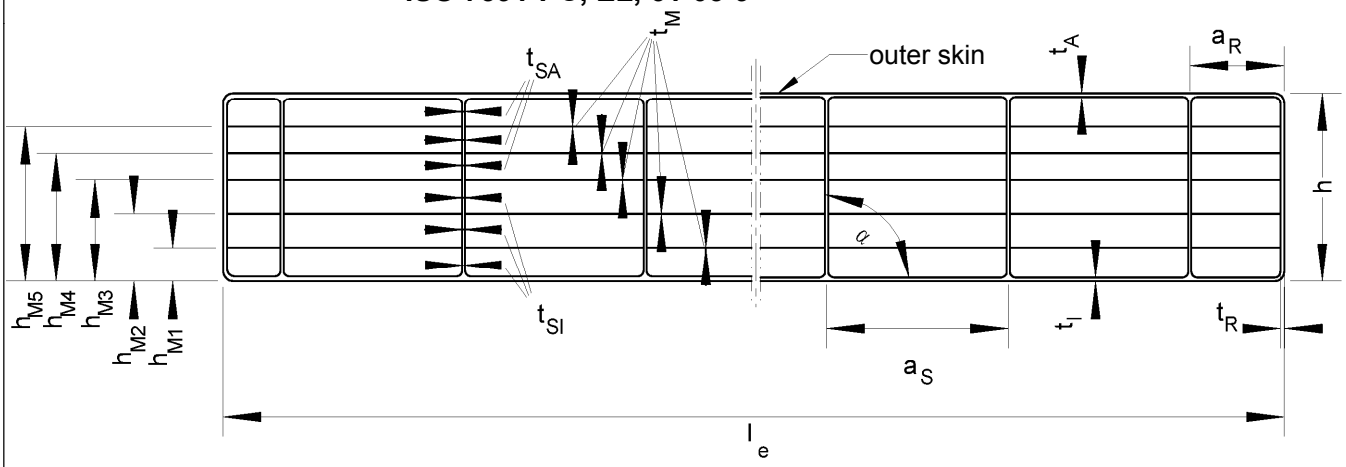
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.9
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Akyver Sun Type 16/7W-12"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ011

Sheet: **Macrolux LL 7W 16**
Manufacturer: **Koscon, Stabio**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	h_{M3} mm	h_{M4} mm	h_{M5} mm	a_S mm	a_R mm	t_A mm	t_I mm
2100	16,2	2,8	5,0	7,4	10,3	13,0	15,8	13,7	0,56	0,60
+6 -2	± 0,5	+ 0,35 - 0,2	+ 0,4 - 0,3	+ 0,4 - 0,25	+ 0,3 - 0,4	+ 0,35 - 0,25	+ 0,55	+ 2,30	- 0,05	- 0,08

t_{SA} mm	t_{SI} mm	t_M mm	t_R mm	weight per area kg/m²	difference $\lvert\Delta\alpha\rvert$ to 90°
0,43	0,59	0,08	0,56	2,70	≤ 5°
- 0,10	- 0,18	- 0,03	- 0,07	+ 0,16 - 0,08	

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
158,6	74,8	2761	60,7	63,1
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

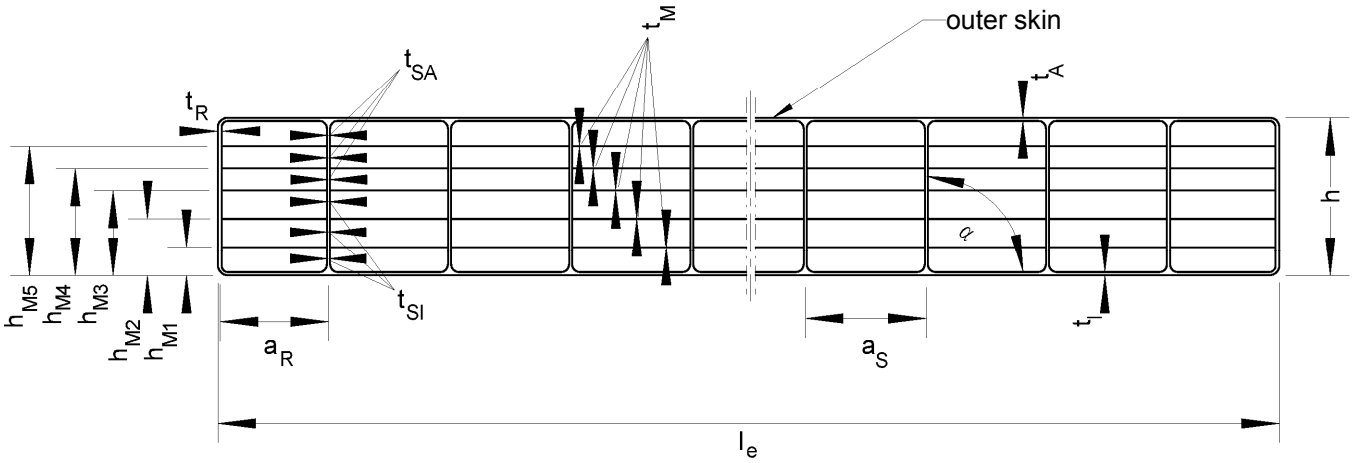
Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.10
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Macrolux LL 7W 16"	

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ021

Sheet: **Akyver Sun Type 20/7W-12**
Manufacturer: **DS Smith Plastics, Kaysersberg**
Resin: **ISO 7391 - PC, EL, 61 - 03 - 9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	h_{M3} mm	h_{M4} mm	h_{M5} mm	a_S mm	a_R mm	t_A mm	t_I mm
2100	20,0	3,9	7,0	9,9	12,4	16,3	12,3	8,9	0,65	0,63
+ 6 - 2	± 0,5	+ 0,15 - 0,15	+ 0,25 - 0,25	+ 0,25 - 0,25	+ 0,3 - 0,3	+ 0,15 - 0,15	+ 0,1	+ 0,35	- 0,05	- 0,05

t_{SA} mm	t_{SI} mm	t_M mm	t_R mm	weight per area kg/m²	difference $\lvert\Delta\alpha\rvert$ to 90°
0,41	0,37	0,07	0,79	2,85	
- 0,02	- 0,04	- 0,01	- 0,04	+ 0,17 - 0,04	≤ 3 °

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
317,7	100,1	2401	68,4	68,4
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm

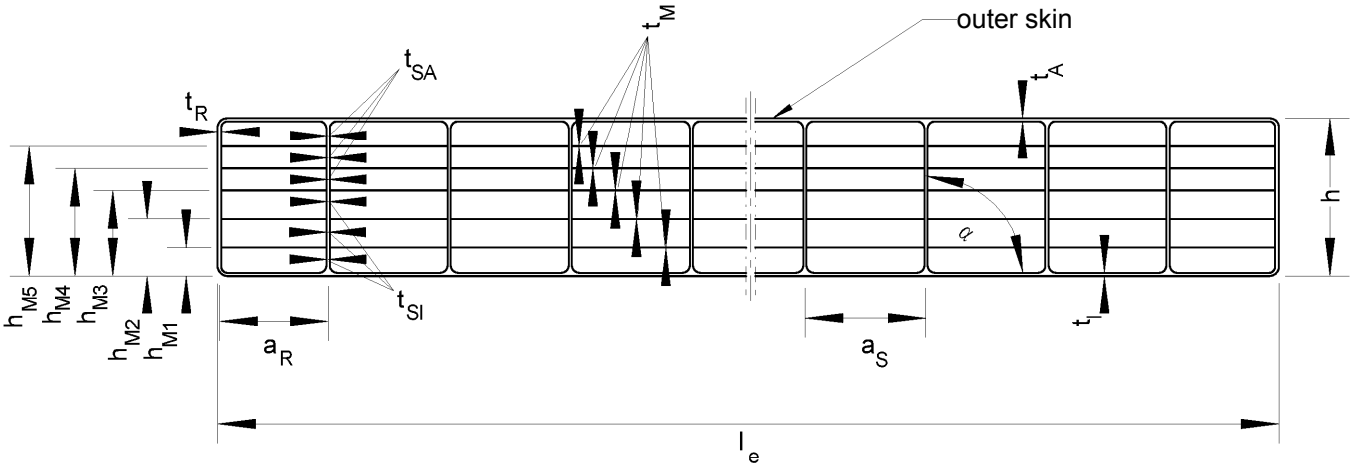
Annex A 4.11

Geometry/ weight per area
Minimum performance levels or classes for the sheets in accordance with EN 16153
"Akyver Sun Type 20/7W-12"

Deutsches Institut für Bautechnik DIBt

JT2015-153-G01-TZ012

Sheet: **Macrolux LL 7W 20**
Manufacturer: **Koscon, Stabio**
Resin: **ISO 7391-PC, EL, 61-03-9**



l_e mm	h mm	h_{M1} mm	h_{M2} mm	h_{M3} mm	h_{M4} mm	h_{M5} mm	a_S mm	a_R mm	t_A mm	t_I mm
2100	20,2	3,3	6,0	8,7	12,3	16,2	15,8	13,8	0,67	0,71
+6 -2	± 0,5	+ 0,55 - 0,3	+ 0,7 - 0,6	+ 0,75 - 0,6	+ 0,7 - 0,8	+ 0,3 - 0,4	+ 0,35	+ 2,9	- 0,07	- 0,11

t_{SA} mm	t_{SI} mm	t_M mm	t_R mm	Flächen-gewicht kg/m²	Differenz $\lvert\Delta\alpha\rvert$ zu 90°
0,36	0,52	0,09	0,60	3,08	
- 0,09	- 0,14	- 0,03	- 0,10	+ 0,18 - 0,11	≤ 3°

Minimum performance levels or classes for the sheets
(as declared in the DoP in accordance with EN 16153)

mechanical resistance (deformation behavior)				
B_x	B_y	S_y	$M_{b,pos}$	$M_{b,neg}$
292,7	75,1	2843	81,9	76,5
Nm²/m	Nm²/m	N/m	Nm/m	Nm/m

$M_{b,pos}$: outer skin under pressure

$M_{b,neg}$: inner skin under pressure

Durability, as variation (after ageing)			
of yellowness index	of the light transmittance	of deformation flexural modulus	of tensile strength
10% (ΔA)	5% (ΔA)	Cu 1	Ku 1

JET-Vario-Norm	Annex A 4.12
Geometry/ weight per area Minimum performance levels or classes for the sheets in accordance with EN 16153 "Macrolux LL 7W 20"	

JET-Vario-Norm **Annex B**

Provisions for design and dimensioning

Dimensioning, installation and execution of the roof kit shall be in compliance with the national technical specifications. These differ in terms of their content as well as their status within the legal frameworks of the member states.

If no national provisions exist, dimensioning can be carried out in accordance with Annexes B 1 and B 2. In case the roof system, in particular the multi-wall sheets are systematically in contact with chemicals, the resistance to these substances shall be checked. Thereby, high concentrations of chemicals in the surrounding air shall be also considered.

Installation, packaging, transport, storage as well as use, maintenance and repair shall be carried out in accordance with the manufacturer's instructions (extract see Annex C).

B 1 Load-bearing capacity and serviceability of the covering

B 1.1 General

The design and arrangement of the multi-wall sheets as described in Section 1.1.1 in the translucent roof kit shall correspond to the specifications given in Annexes A 1 to A 4. The design specifications (see Section 2) shall be complied with.

The stability shall be verified for the ultimate limit state (ULS)

$E_d \leq R_d$

and for the serviceability limit state (SLS)

$E_d \leq C_d$.

E_d: design value of the action

R_d: design value of the structural resistance for verification of the ultimate limit state

C_d: design value of the structural resistance for verification of the serviceability limit state

The multi-wall sheets shall not be used for bracing the aluminium structure.

The multi-wall sheets shall not be walked on.

Assessment pertaining to fall-through protection is not included in this ETA.

B 1.2 Design values for actions, E_d

The action resulting from the dead weight of the multi-wall sheets may be neglected in the roof kit verifications. Live loads are not permitted.

The design values for the actions shall be determined in accordance with the applicable European specifications.

The actions E_k shall be increased through multiplication by the factors C_t in consideration of the action duration and based on load.

Load action	Duration of load action	C_t
Wind	very short	1.00
Snow as an extraordinary snow load (e.g. in the low-lying plains of northern Germany)	short: up to one week	1.15
Snow	medium: up to three months	1.20

For the wind and temperature effects to be considered in the load case 'summer' the ψ coefficient defined in EN 1990 may be applied. In design situations where the wind is applied as the dominant variable action, the ψ coefficient may be considered in the design value of the structural resistance R_d (see Section B.1.3).

If the roof kit is installed with a substructure angle $\alpha \leq 45°$ in roofs with pitches $\leq 20°$ the negative wind pressure loads (wind suction loads) may be applied in simplified form as acting on the transluscent roof kit area with a constant aerodynamic coefficient c_p.

$w_e = q_p(z_e) \cdot c_p$

The gust velocity pressure $q_p(z_e)$ shall be taken from EN 1991-1-4 and DIN EN 1991-1-4/NA.

The coefficient c_p shall be selected in accordance with the roof position and type. For enclosed buildings in which the translucent roof kit is installed in the region H, I or N in accordance with Sections 7.2.3 to 7.2.7 of EN 1991-1-4:2010-12 the external pressure coefficient is $c_{pe} = -0.7$.

If the roof kit is installed on the ridge of a mono-gable roof or a hipped end roof in the region J or K in accordance with Section 7.2.5 or 7.2.6 of EN 1991-1-4:2010-12 with a roof pitch $> 10°$ the factor $c_{pe} = -1.2$ applies for enclosed buildings and $c_{p,net} = -2.0$ for freestanding roofs.

In case of conditions deviating from the specified conditions or use of translucent roof kit in region F, G, L or M in accordance with Sections 7.2.3 to 7.2.7 of EN 1991-1-4:2010-12 the verifications shall be done applying special loads (see Section 1.5 of EN 1991-1-4).

B 1.3 Design values for structural resistance R_d and C_d

The design values for structural resistance R_d and C_d result from the characteristic value of structural resistance R_k in consideration of the material safety factor γ_M, the factor taking into account the effects of media C_u and the temperature factor C_θ as follows:

$$R_d = \frac{R_k}{\gamma_{MR} \cdot C_u \cdot C_\theta} \qquad C_d = \frac{C_k}{\gamma_{MC} \cdot C_u \cdot C_\theta}$$

The following factors shall be applied:

Factor taking into account the effects of media and ageing C_u		1.10
Temperature factor C_θ	summer	1.20
	winter	1.00

The following material safety factors shall be applied as a function of the consequence class (CC) in accordance with EN 1990:

Consequence class	Material safety factor γ_{MR}	Material safety factor γ_{MC}
CC 1	1.25	1.09
CC 2	1.30	1.13

In design situations where wind is considered to be the dominant variable action, the reduction in structural resistance due to temperature may be reduced by means of the ψ coefficient for the summer load case. For this design situation a reduction factor for temperature of $C'_\theta = 1 + \psi \cdot (C_\theta - 1.0)$ may be applied.

The characteristic values for structural resistance R_k and C_k shall be taken from the tables in Annex B 2 for the given multi-wall sheets and direction of loading.

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B 2 Characteristic structural resistances of the covering

Covering "PC 10" – Annexes A 4.1 – A 4.7

Multi-wall sheet in accordance with Annex	Radius R [m]	System	Section as per Annex	Characteristics values of structural resistance [kN/m²]			
				downward load		uplift load	
				R_k	C_k	R_k	C_k
A 4.1 Makrolon multi UV 2/10-10,5	1,50 ≤ R ≤ 2,60	2-span	A 2.1.1	3,98	3,19	1,75	1,36
	1,50 ≤ R ≤ 5,20		A 2.1.3	2,14	1,16	0,76	0,76
	1,50 ≤ R ≤ 3,85	3-span	A 2.1.2	4,35	4,35	2,99	2,99
	1,50 ≤ R ≤ 5,20		A 2.1.3	4,43	3,60	1,71	1,71
	1,50 ≤ R ≤ 9,00		A 2.1.4	3,21	3,11	2,92	2,32
A 4.2 Akyver Sun Type 10/1700	1,50 ≤ R ≤ 2,60	2-span	A 2.1.1	3,98	3,20	1,75	1,36
	1,50 ≤ R ≤ 5,20		A 2.1.3	2,14	1,16	0,76	0,76
	1,50 ≤ R ≤ 3,85	3-span	A 2.1.2	4,35	4,35	2,99	2,99
	1,50 ≤ R ≤ 5,20		A 2.1.3	4,43	3,60	1,71	1,71
	1,50 ≤ R ≤ 9,00		A 2.1.4	3,21	3,11	2,92	2,32
A 4.3 Makrolon Multi UV 2/10-10,5 ES	1,50 ≤ R ≤ 3,85	1-span	A 2.1.2	1,84	1,79	1,72	1,60
	1,50 ≤ R ≤ 5,20		A 2.1.3	1,79	1,79	0,97	0,97
	1,50 ≤ R ≤ 2,60	2-span	A 2.1.1	4,26	2,59	2,33	2,33
	1,50 ≤ R ≤ 3,85		A 2.1.2	2,20	2,17	1,80	1,72
	1,50 ≤ R ≤ 5,20		A 2.1.3	2,26	2,00	1,04	1,04
	1,50 ≤ R ≤ 9,00		A 2.1.4	1,80	1,52	1,64	1,64
A 4.4 Akyver Sun Type 10/2000	1,50 ≤ R ≤ 3,85	1-span	A 2.1.2	1,84	1,79	1,72	1,60
	1,50 ≤ R ≤ 5,20		A 2.1.3	1,79	1,79	0,97	0,97
	1,50 ≤ R ≤ 2,60	2-span	A 2.1.1	4,26	2,59	2,33	2,33
	1,50 ≤ R ≤ 3,85		A 2.1.2	2,20	2,17	1,80	1,72
	1,50 ≤ R ≤ 5,20		A 2.1.3	2,26	2,00	1,04	1,04
	1,50 ≤ R ≤ 9,00		A 2.1.4	1,80	1,52	1,64	1,64
A 4.5 Akyver Sun Type 10/4W-7	1,50 ≤ R ≤ 2,60	2-span	A 2.1.1	3,95	3,17	1,74	1,35
			A 2.1.6	1,69	1,69	1,53	1,53
	1,50 ≤ R ≤ 3,85		A 2.1.2	1,52	1,52	1,00	0,82
	1,50 ≤ R ≤ 5,20		A 2.1.3	2,13	1,15	0,75	0,75
	1,50 ≤ R ≤ 3,85	3-span	A 2.1.2	4,31	4,31	2,97	2,97
	1,50 ≤ R ≤ 5,20		A 2.1.3	4,40	3,57	1,70	1,70
	1,50 ≤ R ≤ 9,00		A 2.1.4	3,18	3,08	2,90	2,30

Multi-wall sheet in accordance with Annex	Radius R [m]	System	Section as per Annex	Characteristics values of structural resistance [kN/m²]			
				downward load		uplift load	
				R_k	C_k	R_k	C_k
A 4.6 Macrolux LL 4W10	1,50 ≤ R ≤ 2,60	2-span	A 2.1.1	3,37	2,71	1,48	1,15
			A 2.1.6	1,67	1,67	1,56	1,56
	1,50 ≤ R ≤ 3,85		A 2.1.2	1,56	1,56	1,05	0,91
	1,50 ≤ R ≤ 5,20		A 2.1.3	1,82	0,98	0,65	0,65
	1,50 ≤ R ≤ 3,85	3-span	A 2.1.2	3,69	3,69	2,53	2,53
	1,50 ≤ R ≤ 5,20		A 2.1.3	3,76	3,05	1,45	1,45
	1,50 ≤ R ≤ 9,00		A 2.1.4	2,72	2,64	2,48	1,97
A 4.7 Makrolon Multi UV 4/10-6	1,50 ≤ R ≤ 2,60	2-span	A 2.1.1	3,41	2,40	1,50	1,17
			A 2.1.6	1,86	1,86	1,56	1,56
	1,50 ≤ R ≤ 3,85		A 2.1.2	1,68	1,68	1,01	0,84
	1,50 ≤ R ≤ 5,20		A 2.1.3	1,84	0,99	0,65	0,65
	1,50 ≤ R ≤ 3,85	3-span	A 2.1.2	3,74	3,74	2,57	2,57
	1,50 ≤ R ≤ 5,20		A 2.1.3	3,81	3,08	1,47	1,47
	1,50 ≤ R ≤ 9,00		A 2.1.4	2,76	2,66	2,51	1,98

Covering "PC 10+10" – Annexes A 4.5 – A 4.7

Multi-wall sheet in accordance with Annex (double configuration)	Radius R [m]	System	Section as per Annex	Characteristics values of structural resistance [kN/m²]			
				downward load		uplift load	
				R_k	C_k	R_k	C_k
A 4.5 Akyver Sun Type 10/4W-7	1,50 ≤ R ≤ 1,90	1-span	A 2.1.7	5,70	5,62	4,06	3,82
	1,50 ≤ R ≤ 2,62	2-span	A 2.1.7	5,29	4,91	3,16	3,09
	1,50 ≤ R ≤ 5,27		A 2.1.7	3,39	3,32	1,55	1,55
	1,50 ≤ R ≤ 2,62	3-span	A 2.1.7	11,0	9,59	6,22	6,14
	1,50 ≤ R ≤ 3,85		A 2.1.7	7,53	6,62	2,53	2,53
A 4.6 Macrolux LL 4W10	1,50 ≤ R ≤ 1,90	1-span	A 2.1.7	5,42	5,33	4,17	3,93
	1,50 ≤ R ≤ 2,62	2-span	A 2.1.7	5,05	4,50	3,25	3,18
	1,50 ≤ R ≤ 5,27		A 2.1.7	3,24	3,18	1,60	1,58
	1,50 ≤ R ≤ 2,62	3-span	A 2.1.7	10,5	9,18	6,40	6,32
	1,50 ≤ R ≤ 3,85		A 2.1.7	7,09	7,09	2,95	2,95
A 4.7 Makrolon Multi UV 4/10-6	1,50 ≤ R ≤ 1,90	1-span	A 2.1.7	5,43	5,36	4,13	3,90
	1,50 ≤ R ≤ 2,62	2-span	A 2.1.7	5,04	4,68	3,22	3,15
	1,50 ≤ R ≤ 5,27		A 2.1.7	3,23	3,16	1,58	1,56
	1,50 ≤ R ≤ 2,62	3-span	A 2.1.7	10,4	9,14	6,34	6,26

Multi-wall sheet in accordance with Annex (double configuration)	Radius R [m]	System	Section as per Annex	Characteristics values of structural resistance [kN/m²]			
				downward load		uplift load	
				R_k	C_k	R_k	C_k
	1,50 ≤ R ≤ 3,85		A 2.1.7	9,12	7,38	2,58	2,58

Covering "PC 16" – Annexes 4.8 - 4.10 (incl."PC 3+16" – Section as per Annex A 2.1.8)

Multi-wall sheet in accordance with Annex	Radius R [m]	System	Section as per Annex	Characteristics values of structural resistance [kN/m²]			
				downward load		uplift load	
				R_k	C_k	R_k	C_k
A 4.8 Makrolon Multi UV 7/16-14	2,40 ≤ R ≤ 3,85	1-span	A 2.1.2	2,34	1,64	1,62	1,62
	2,40 ≤ R ≤ 5,20		A 2.1.3	2,94	1,57	1,45	1,45
	2,40 ≤ R ≤ 2,60	2-span	A 2.1.1	4,29	3,21	2,80	2,80
	2,40 ≤ R ≤ 3,85		A 2.1.2	2,41	2,06	1,59	1,59
	2,40 ≤ R ≤ 5,20		A 2.1.3	2,96	1,54	1,32	1,32
	2,40 ≤ R ≤ 9,00		A 2.1.4	2,22	2,03	1,66	1,64
A 4.9 Akyver Sun Type 16/7W-12	2,40 ≤ R ≤ 3,85	1-span	A 2.1.2	2,40	1,64	1,66	1,66
			A 2.1.6	1,54	1,54	1,35	1,35
	2,40 ≤ R ≤ 5,20		A 2.1.3	3,02	1,61	1,49	1,49
	2,40 ≤ R ≤ 2,60	2-span	A 2.1.1	4,40	3,29	2,87	2,87
			A 2.1.5	1,83	1,83	1,97	1,97
	2,40 ≤ R ≤ 3,85		A 2.1.2	2,44	2,10	1,57	1,57
			A 2.1.6	1,54	1,54	1,35	1,35
	2,40 ≤ R ≤ 5,20		A 2.1.3	3,04	1,58	1,35	1,35
	2,40 ≤ R ≤ 9,00		A 2.1.4	2,28	2,08	1,70	1,68
	2,40 ≤ R ≤ 3,85	3-span	A 2.1.2	5,85	5,85	1,68	1,68
A 4.10 Macrolux LL 7W16	2,40 ≤ R ≤ 3,85	1-span	A 2.1.2	2,29	1,60	1,59	1,59
	2,40 ≤ R ≤ 5,20		A 2.1.3	2,88	1,54	1,42	1,42
	2,40 ≤ R ≤ 2,60	2-span	A 2.1.1	4,20	3,14	2,74	2,74
	2,40 ≤ R ≤ 3,85		A 2.1.2	2,36	2,02	1,56	1,56
	2,40 ≤ R ≤ 5,20		A 2.1.3	2,90	1,51	1,29	1,29
	2,40 ≤ R ≤ 9,00		A 2.1.4	2,17	1,99	1,63	1,60
	2,40 ≤ R ≤ 3,85	3-span	A 2.1.2	5,70	5,15	1,96	1,96

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Covering "PC 20" – Annexes 4.11 - 4.12

Multi-wall sheet in accordance with Annex	Radius R [m]	System	Section as per Annex	Characteristics values of structural resistance [kN/m²]			
				downward load		uplift load	
				R_k	C_k	R_k	C_k
A 4.11 Akyver Sun Type 20/7W-12	3,00 ≤ R ≤ 3,85	1-span	A 2.1.6	1,61	1,61	2,29	2,29
	3,00 ≤ R ≤ 4,40		A 2.1.6	1,23	1,23	2,00	2,00
	3,00 ≤ R ≤ 3,85	2-span	A 2.1.6	1,61	1,61	2,29	2,29
	3,00 ≤ R ≤ 4,40		A 2.1.6	1,23	1,23	2,00	2,00
A 4.12 Macrolux LL 7W20	3,00 ≤ R ≤ 3,85	1-span	A 2.1.6	1,93	1,93	2,29	2,29
	3,00 ≤ R ≤ 4,40		A 2.1.6	1,48	1,48	2,00	2,00
	3,00 ≤ R ≤ 3,85	2-span	A 2.1.6	1,93	1,93	2,29	2,29
	3,00 ≤ R ≤ 4,40		A 2.1.6	1,48	1,48	2,00	2,00

Covering "PC 10+10 DI" – Annexes A 4.5 – A 4.7

Multi-wall sheet in accordance with Annex (double configuration)	Radius R [m]	System	Section as per Annex	Characteristics values of structural resistance [kN/m²]			
				downward load		uplift load	
				R_k	C_k	R_k	C_k
A 4.5 Akyver Sun Type 10/4W-7	1,50 ≤ R ≤ 1,90	1-span	A 2.1.10	5,70	5,62	4,06	3,82
	1,50 ≤ R ≤ 2,62		A 2.1.10	2,94	2,42	3,58	3,00
	1,50 ≤ R ≤ 2,62	2-span	A 2.1.10	5,29	4,91	3,16	3,09
	1,50 ≤ R ≤ 5,27		A 2.1.10	3,39	3,32	1,55	1,55
	1,50 ≤ R ≤ 2,62	3-span	A 2.1.10	11,0	9,59	6,22	6,14
	1,50 ≤ R ≤ 3,85		A 2.1.10	7,53	6,62	2,53	2,53
A 4.6 Macrolux LL 4W10	1,50 ≤ R ≤ 1,90	1-span	A 2.1.10	5,42	5,33	4,17	3,93
	1,50 ≤ R ≤ 2,62		A 2.1.10	2,94	2,42	3,58	3,00
	1,50 ≤ R ≤ 2,62	2-span	A 2.1.10	5,05	4,50	3,25	3,18
	1,50 ≤ R ≤ 5,27		A 2.1.10	3,24	3,18	1,60	1,58
	1,50 ≤ R ≤ 2,62	3-span	A 2.1.10	10,5	9,18	6,40	6,32
	1,50 ≤ R ≤ 3,85		A 2.1.10	7,09	7,09	2,95	2,95
A 4.7 Makrolon Multi UV 4/10-6	1,50 ≤ R ≤ 1,90	1-span	A 2.1.10	5,43	5,36	4,13	3,90
	1,50 ≤ R ≤ 2,62		A 2.1.10	2,94	2,42	3,58	3,00
	1,50 ≤ R ≤ 2,62	2-span	A 2.1.10	5,04	4,68	3,22	3,15
	1,50 ≤ R ≤ 5,27		A 2.1.10	3,23	3,16	1,58	1,56
	1,50 ≤ R ≤ 2,62	3-span	A 2.1.10	10,4	9,14	6,34	6,26
	1,50 ≤ R ≤ 3,85		A 2.1.10	9,12	7,38	2,58	2,58

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JET-Vario-Norm **Anlage C**

Provisions for installation, packaging, transport, storage, use, maintenance and repair

C 1 Installation

The fixing of the roof kit on the substructure is not the subject of this ETA. The stability shall be verified for the respective substructure in accordance with the valid European specifications.

Before the roof kit is installed, the dimensional stability of the substructure shall be checked. Particular care shall be taken to ensure that the substructure exhibits a rectangular footprint. The compliance of the existing substructure with the substructure applied during the planning and verification of its load-bearing capacity shall be checked visually.

The installation of the roof kit may only be performed by specialists who are specially trained for this purpose. The installation guidelines of the manufacturer shall be respected. The manufacturer of the roof kit shall inform the specialists that they may only carry out assembly and installation of the roof kit in accordance with his instructions and the provisions of the ETA. The hollow chambers of the multi-wall sheets may not be filled.

If the translucent roof kit can systematically come into contact with chemical substances, the resistance to these substances of the multi-wall sheets in particular shall be checked.

The impost profiles are placed on the frame and fixed by means of the load converters and the provided threaded connections. If required, the supporting profiles are placed in between the bearing profiles. During installation, the multi-wall sheets are placed on the pre-installed bearing profiles and pushed into the impost profiles. At the butt joints between sheets as well as for the intermediate support arches, the covering profiles which act as tension straps are placed above the bearing profiles if applicable including sealing profiles and fixed to the impost profile, if necessary, with the help of the tension locks. A tensioning distance of 5 mm shall be adhered to. The bearing width as described in Annex A 2.1.9 shall be adhered to at the longitudinal butt joints between the multi-wall sheets. At the impost profiles, the multi-wall sheets shall be kept adjustable in accordance with the specifications given in Annex A 2.2. Connection of the translucent roof kit to the substructure shall be carried out in accordance with the structural analysis. The translucent roof kit shall be installed and connected to the adjacent structure in a manner ensuring that no moisture can penetrate into it and avoiding thermal bridges. These details shall be evaluated on a case-by-case basis.

C 2 Packaging, transport and storage

The components of the roof kit shall be stored and transported in accordance with the manufacturer's specifications such that the components cannot be damaged. In particular, for multi-wall sheets made from polycarbonate it shall be ensured that only those surfaces with UV protective coatings are exposed to UV radiation. The packaging shall protect the material from moisture and weather effects whilst avoiding heat build-up inside the packaging. It is the responsibility of the manufacturer to ensure that this information is passed on to the people in charge.

C 3 Use, maintenance, repair

The roof kit in installed condition is not a walk-on system. For installation purposes, the roof kit may be walked on by a single person using boards laid across the substructure (at least two bearing profiles) for support; the boards shall run perpendicular to the tensioning direction of the bearing profiles.

Within the scope of maintenance, the installed roof kit shall be visually inspected by a qualified expert once a year. The manufacturer shall be consulted if the PC multi-wall sheets exhibit surface cracks or damage or if they are strongly discoloured. The aluminium components of the roof kit shall be examined for pronounced corrosion within the scope of a visual inspection. Repair shall be arranged where necessary.

Only the components listed in the ETA may be used for replacement of components.

Cleaning agents shall be free of solvents and abrasives. Chemical and biological cleaning additives may only be used if they have been proven to be compatible with polycarbonate; otherwise only water and a soft cloth shall be used to clean the multi-wall sheets.