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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-16/0709 of 2024/04/04

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S	
Trade name of the construction product:	K2 Systems SingleHook 3S
Product family to which the above construction product belongs:	Three-dimensional nailing plate (roof brackets for fixing of photovoltaic systems on wooden roof constructions)
Manufacturer:	K2 Systems GmbH Industriestraße 18 D-71272 Renningen Tel. +49 71 59 42 059-0 Fax +49 71 59 42 059-177 Internet www.k2-systems.com
Manufacturing plant:	K2 Systems GmbH Industriestraße 18 D-71272 Renningen
This European Technical Assessment contains:	14 pages including 2 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	EAD 130186-00-0603 for Three-dimensional nailing plates
This version replaces:	The ETA with the same number issued on 2016-10-14

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

K2 solar roof brackets are two-piece non-welded connectors used to fix photovoltaic systems on wooden roof constructions. The roof brackets are produced of aluminium EN AW 6063 T66 according to EN 755-2 with minimum characteristic yield strength of $R_{p0,2}$ = 180 N/mm² and minimum characteristic tensile strength of R_m = 245 N/mm².

The base plate of the fixing system is connected to the rafter or purlin by the following stainless steel wood screws:

- ETA-19/0553
- ETA-11/0284
- ETA-11/0024
- ETA-11/0106
- ETA-11/0283

Sizes of screws covered by this ETA are given in Annex A tables A.2 to A.6

The bracket can be installed in a central or eccentric position regarding the base plate and the rafter or purlin. In the case of central position, 2 wood screws 6,0 x 60 mm or longer or 8,0 x 80 mm or longer are used, and for an eccentric position either 2 wood screws 8,0 x 80 mm or longer or 4 wood screws 6,0 x 60 mm or longer or 8,0 x 80 mm or longer are used as described in table B.1. in annex B.

Dimensions are shown in Annex A and B.

2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

The roof brackets are intended for use in is the fixing of photovoltaic systems on wooden roof constructions, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled.

The static behaviour of the timber members or the supports shall be as described in Annex B.

Annex B states the load-carrying capacities of the roof brackets for the load-cases compression, tension and shear relative to the roof plane. The design of the connections shall be in accordance with Eurocode 3 and Eurocode 5 or a similar national code.

The roof brackets are for use in timber structures subject to the service classes 1, 2 and 3 of Eurocode 5 and for connections subject to static or quasi-static loading. The metal fasteners must be of stainless steel.

The scope of the brackets regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the roof brackets of 50 years.
The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR 1)*)	
Joint Strength - Characteristic load-carrying capacity	See Annex B
Joint Stiffness	See Annex B
Joint ductility	No performance assessed
Resistance to seismic actions	No performance assessed
Resistance to corrosion and deterioration	See section 3.6
3.2 Safety in case of fire (BWR 2)	
Reaction to fire	The roof braackets are made from aluminium classified as **Euroclass A1** in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
Resistance to fire	No performance assessed
3.3 General aspects related to the performance of the product	The connectors have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service classes 1, 2 and 3

*) See additional information in section 3.4 – 3.7.

3.4 Methods of verification

Safety principles and partial factors

The characteristic load-carrying capacities are based on testing.

As aluminium or screw withdrawal failure is decisive, the design value shall be calculated according to EN 1999-1-1 or EN 1995-1-1 by reducing the characteristic values of the load-carrying capacity with different partial factors.

The design value of the load-carrying capacity for compressive or shear loads is according to EN 1999-1-1:

$$F_{Rd} = \frac{F_{Rk,alu}}{\gamma_{M1}}$$

The design value of the load-carrying capacity for tensile loads is according to EN 1995-1-1:

$$F_{Rd} = \frac{k_{mod} \cdot F_{Rk,t}}{\gamma_{M}}$$

3.5 Mechanical resistance and stability

See Annex B for the characteristic load-carrying capacity in the different load-cases compression, tension and shear. Using the load-carrying capacities of the roof brackets, the specifications in Annex A must be fulfilled.

The characteristic capacities of the roof brackets are determined by testing according to Eurocode 9 and Eurocode 5. They should be used for designs in accordance with Eurocode 9 and Eurocode 5 or a similar national code.

No performance has been determined in relation to ductility of a joint under cyclic testing. The contribution to the performance of structures in seismic zones, therefore, has not been assessed.

No performance has been determined in relation to the joint's stiffness properties - to be used for the analysis of the serviceability limit state.

3.6 Aspects related to the performance of the product

3.11.1 Corrosion protection in service class 1, 2 and 3.
In accordance with EAD 130186-00-0603the roof brackets are produced from aluminium EN AW 6063 T66 according to EN 755-2 with minimum characteristic yield strength of $R_{p0,2}$ = 180 N/mm² and minimum characteristic tensile strength of R_m = 245 N/mm².

3.7 General aspects related to the fitness for use of the product

K2 roof brackets are manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.

The nailing pattern used shall be the maximum as defined in Annex B.

The following provisions concerning installation apply:

The structural members to which the brackets are fixed shall be:

- The timber members
  - shall be strength class C24 according to EN 14081 or better,
  - shall be free from wane under the connector base plate

- The fastener spacing, edge and end distances shall be chosen according to Eurocode 5.

- There are no specific requirements relating to preparation of the timber members.

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

4.1 AVCP system

According to the decision 97/638/EC of the European Commission1, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

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 at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2024-04-04 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details and definitions

Table A.1 Specifications of the roof brackets

Roof Bracket		Identification	Metal Fasteners
Type	Dimension	Article-No.	Screws according to ISO 4762
SingleHook 3S Base plate	100 x 124 x 26 mm	2001129	M8x20 – M8x40 A2
SingleHook 3S	154 x 145 x 42 mm	2001534	M8x20 – M8x40 A2

Table A.2 Specifications of the metal fasteners according to ETA-11/0284

Fastener type (1.4567)	Size (mm)			Finish
	Diameter	Length	Thread Length	
wood screw 6,0 x 80 mm	6 mm	80 mm	60 mm	Stainless steel 1.4567

Table A.3 Specifications of the metal fasteners according to ETA-11/0284 and ETA-19/0553

Fastener type (1.4567)	Size (mm)			Finish
	Diameter	Length	Thread Length	
wood screw 6,0 x L mm	6 mm	60 - 120 mm	53 - 113 mm	Stainless steel 1.4567
wood screw 8,0 x L mm	6 mm	80 - 240 mm	54 - 232 mm	Stainless steel 1.4567

Table A.4 Specifications of the metal fasteners according to ETA-11/0024

Fastener type	Size (mm)			Finish
	Diameter	Length	Thread Length	
wood screw 8,0 x L mm	8 mm	80 - 120 mm	48 - 80 mm	Stainless steel 1.4301, 1.4401, 1.4567 or 1.4578

Table A.5 Specifications of the metal fasteners according to ETA-11/0283

Fastener type	Size (mm)			Finish
	Diameter	Length	Thread Length	
wood screw 8,0 x L mm	8 mm	80 - 120 mm	72 - 80 mm	Stainless steel

Table A.6 Specifications of the metal fasteners according to ETA-11/0106

Fastener type	Size (mm)			Finish
	Diameter	Length	Thread Length	
wood screw 6,0 x L mm	6 mm	80 mm	76 mm	Stainless steel
wood screw 8,0 x L mm	8 mm	80 - 120 mm	62 - 80 mm	Stainless steel

Annex B
Characteristic load-carrying capacities

Table B.1 Characteristic load-carrying capacities F_{Rk} for roof brackets “SingleHook 3S” with 2 or 4 wood screws in kN

Roof Bracket			Compression	Shear	Tension
Type	Position	Number of screws			
SingleHook 3S	Central	2 screws 6,0 x 60 or longer	1,65	1,09	1,36
		2 screws 6,0 x 80 or longer	1,65	1,20	1,50
		2 screws 8,0 x 80 or longer	1,65	1,09	1,36
	Eccentric*	4 screws 6,0 x 60 or longer	1,56	0,85	1,20
		4 screws 6,0 x 80 or longer	1,56	1,18	1,67
		2 screws 8,0 x 80 or longer	1,56	0,68	0,96
		4 screws 8,0 x 80 or longer	1,56	0,95	1,34

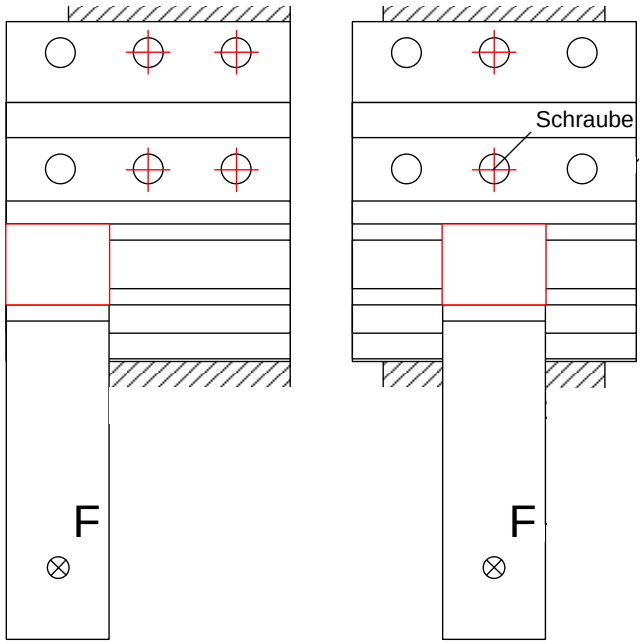
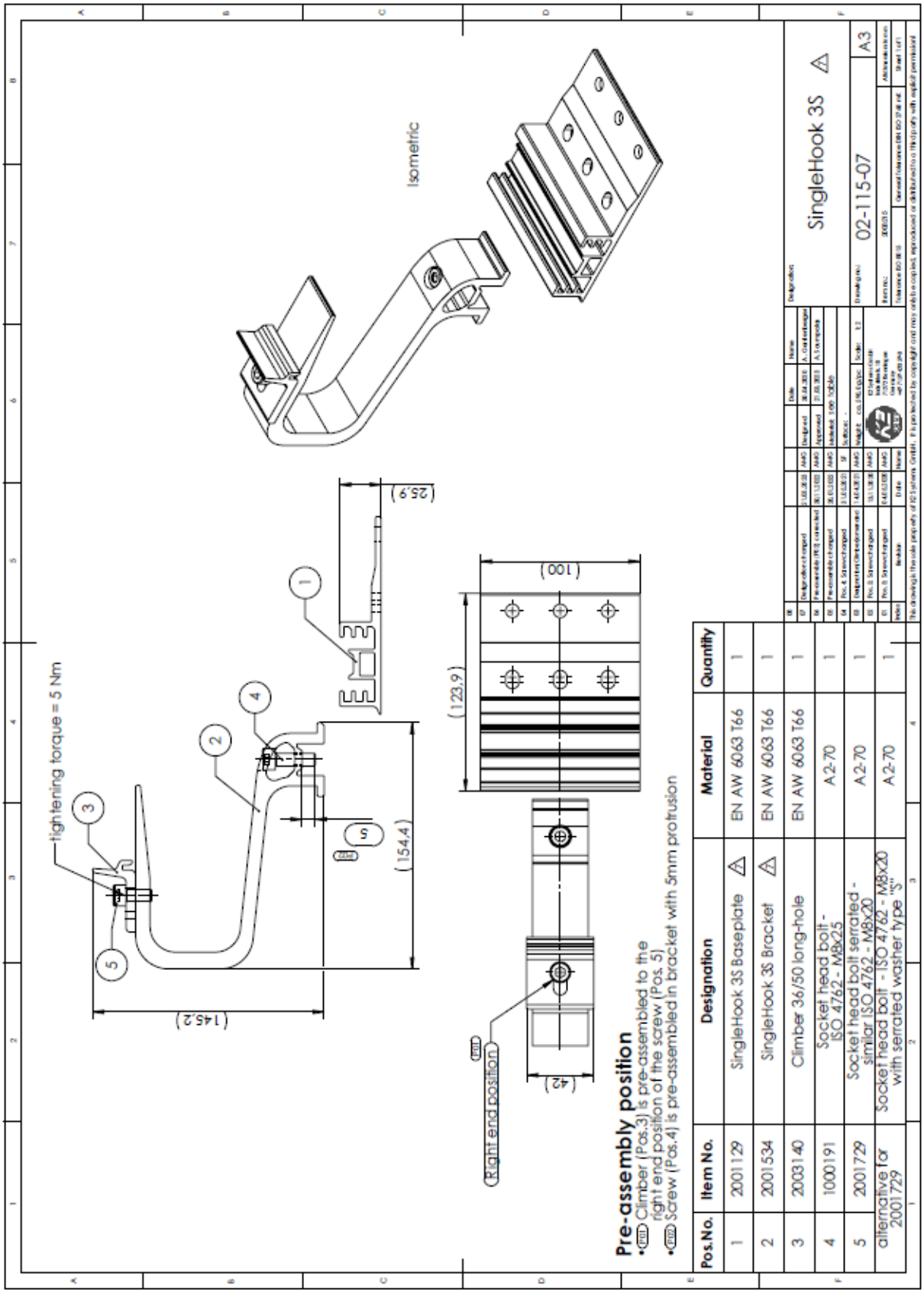


Figure B.1 Maximum eccentric position (left) with four screws and central position (right) with two screws for roof brackets “SingleHook 3S”

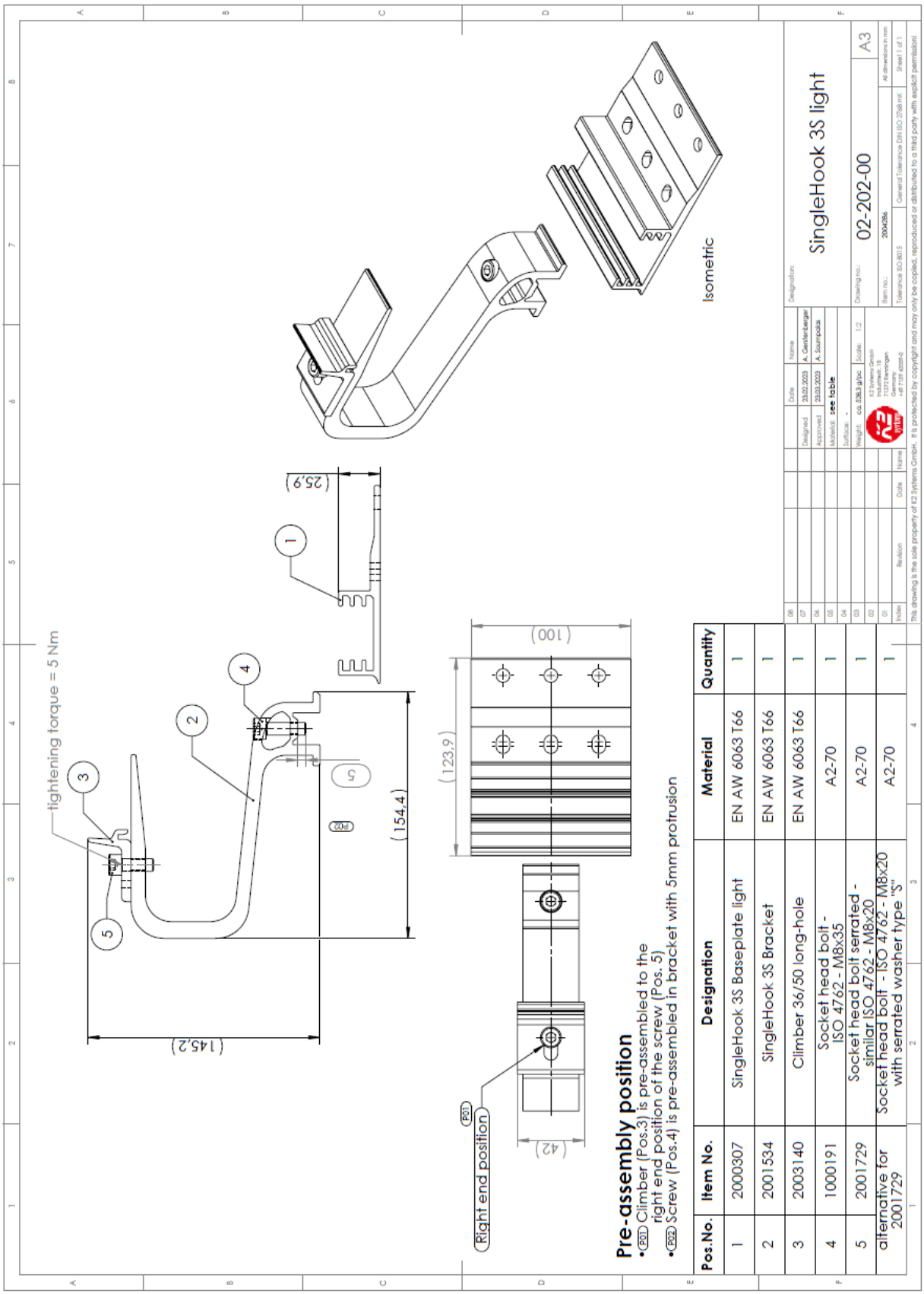
Combined forces

If the compression/tension and shear force act at the same time, the following inequality shall be fulfilled:

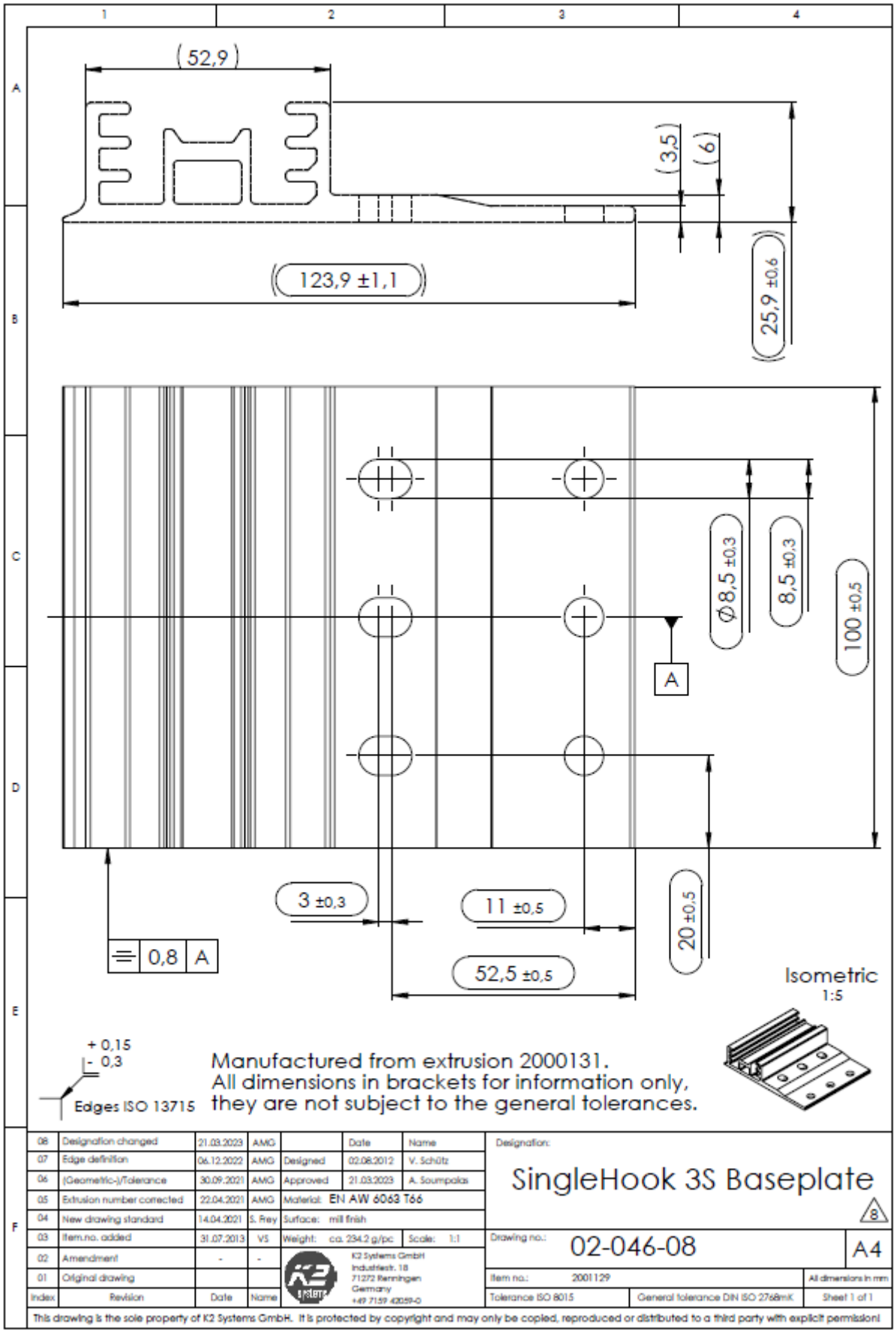
$$\sum \frac{F_{i,d}}{R_{i,d}} \leq 1$$



Pos.No.	Item No.	Designation	Material	Quantity
1	2001129	SingleHook 3S Baseplate	EN AW 6063 T66	1
2	2001534	SingleHook 3S Bracket	EN AW 6063 T66	1
3	2003140	Climber 36/50 long-hole	EN AW 6063 T66	1
4	1000191	Socket head bolt - ISO 4762 - M8x25	A2-70	1
5	2001729	Socket head bolt serrated - similar ISO 4762 - M8x20	A2-70	1
alternative for 2001729		Socket head bolt - ISO 4762 - M8x20 with serrated washer type "S"	A2-70	1



Pos.No.	Item No.	Designation	Material	Quantity
1	2000307	SingleHook 3S Baseplate light	EN AW 6063 T66	1
2	2001534	SingleHook 3S Bracket	EN AW 6063 T66	1
3	2003140	Climber 36/50 long-hole	EN AW 6063 T66	1
4	1000191	Socket head bolt - ISO 4762 - M8x35	A2-70	1
5	2001729	Socket head bolt serrated - similar ISO 4762 - M8x20	A2-70	1
alternative for 2001729		Socket head bolt - ISO 4762 - M8x20 with serrated washer type "S"	A2-70	1



Index	Revision	Date	Name
08	Designation changed	21.03.2023	AMG
07	Edge definition	06.12.2022	AMG
06	(Geometric-)Tolerance	30.09.2021	AMG
05	Extrusion number corrected	22.04.2021	AMG
04	New drawing standard	14.04.2021	S. Frey
03	Item.no. added	31.07.2013	VS
02	Amendment	-	-
01	Original drawing		

Designed	02.08.2012	V. Schütz
Approved	21.03.2023	A. Soumpalas
Material:	EN AW 6063 T66	
Surface:	mill finish	
Weight:	ca. 234.2 g/pc.	Scale: 1:1

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Germany
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Designation:

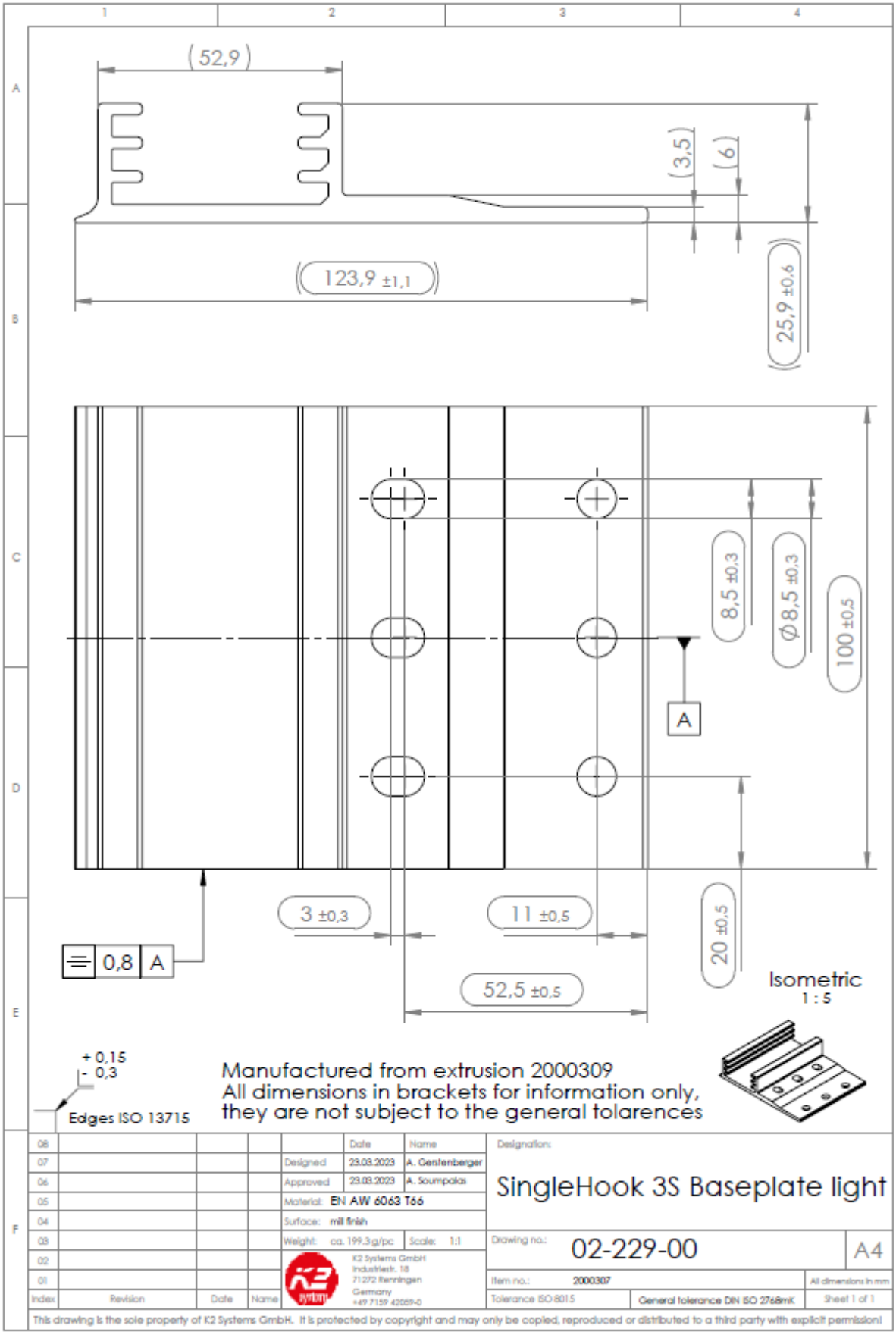
SingleHook 3S Baseplate

8

Drawing no.: 02-046-08 A4

Item no.: 2001129 All dimensions in mm

Tolerance ISO 8015 | General tolerance DIN ISO 2768mK | Sheet 1 of 1


(52,9)
(3,5)
(6)
123,9 ±1,1
25,9 ±0,6
8,5 ±0,3
Ø8,5 ±0,3
100 ±0,5
A
3 ±0,3
11 ±0,5
20 ±0,5
52,5 ±0,5
0,8 A
Isometric
1 : 5
+ 0,15
- 0,3
Edges ISO 13715
Manufactured from extrusion 2000309
All dimensions in brackets for information only,
they are not subject to the general tolarences
Designation:
SingleHook 3S Baseplate light
Drawing no.: 02-229-00
A4
Item no.: 2000307
All dimensions in mm
Tolerance ISO 8015
General tolerance DIN ISO 2768mK
Sheet 1 of 1
Designed 23.03.2023 A. Gentenberger
Approved 23.03.2023 A. Soumpalas
Material: EN AW 6063 T66
Surface: mill finish
Weight: ca. 199,3 g/pc
Scale: 1:1
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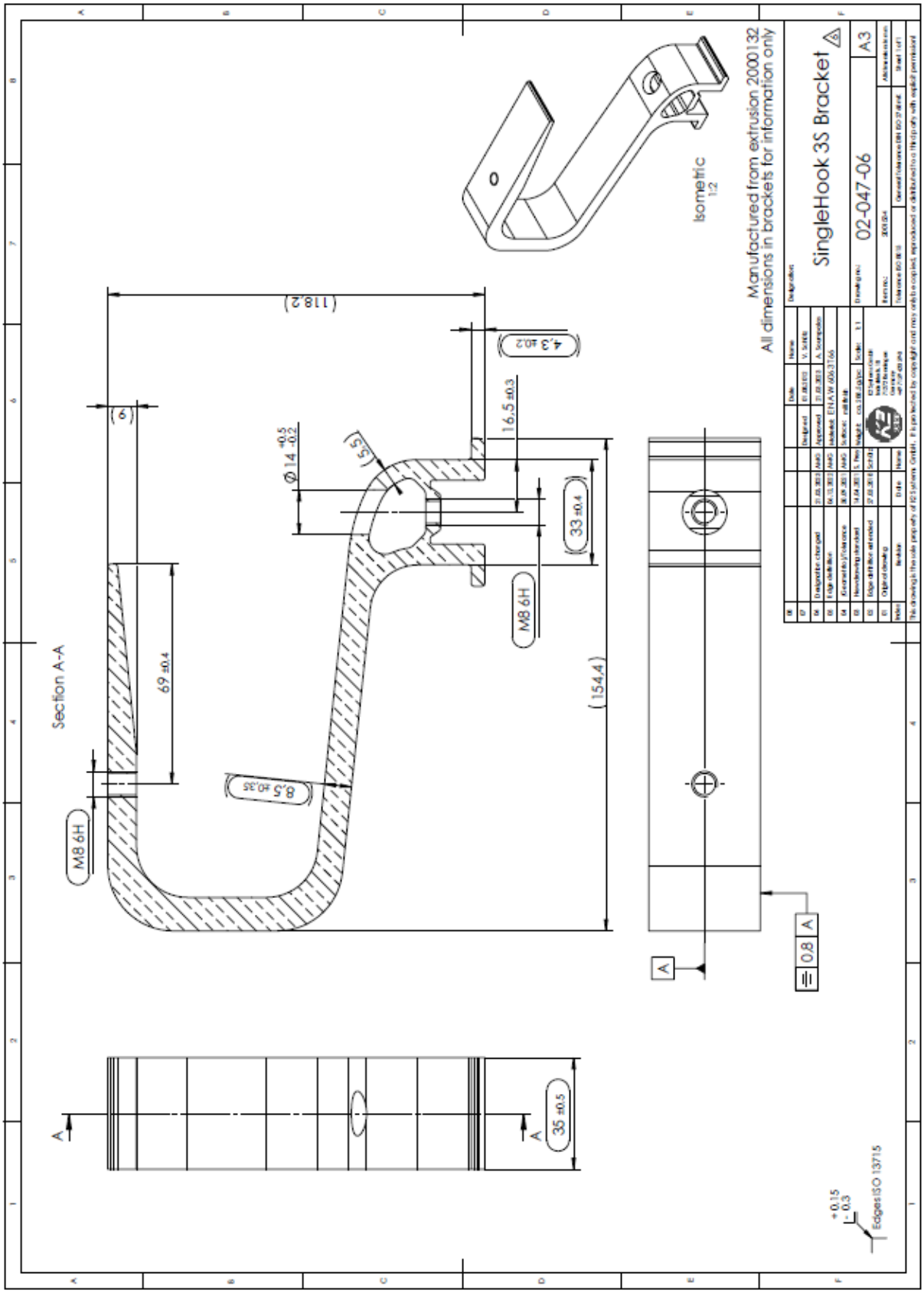
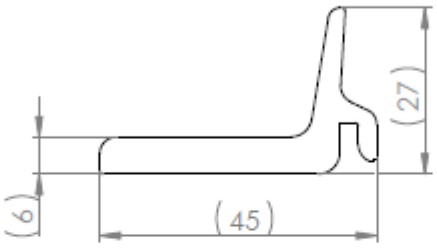
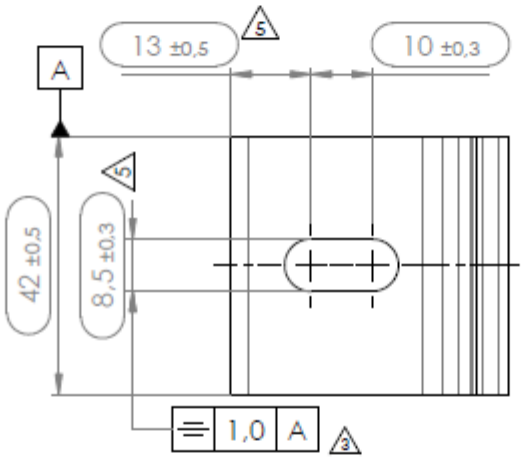
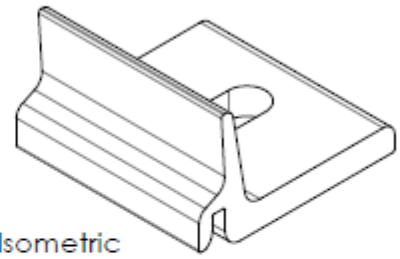

Isometric
1:2
Manufactured from extrusion 2000132
All dimensions in brackets for information only
SingleHook 3S Bracket
02-047-06
A3
Section A-A
(118.2)
(9)
69 ±0.4
M8 6H
8,5 +0.35
Ø14 +0.5 -0.2
5,5
16,5 ±0.3
4,3 ±0.2
33 ±0.4
M8 6H
(154.4)
35 ±0.5
0,8 A
Edges ISO 13715
+0.15
-0.3







Isometric
1:1

+ 0,15
- 0,3
Edges ISO 13715

Manufactured from extrusion 2003139
All dimensions in brackets for information only

Index	Revision	Date	Name		Date	Name
08						
07				Designed	07.08.2019	B. Koch
06	Edge definition	06.12.2022	AMG	Approved	06.12.2022	B. Koch
05	Tolerance changed	05.10.2021	A S	Material: EN AW 6063 T66		
04	Designation amended	14.04.2021	AMG	Surface: mill finish		
03	Tolerance changed	27.03.2020	S. Frey	Weight: ca. 36,5 g/pc	Scale: 1:1	
02	Designation changed	20.03.2020	S. Frey			
01	Dimensions changed	19.11.2019	S. Frey			

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07159/42059-0

Designation: Climber 36/50 long-hole

Drawing no.: 04-017-06 A4

Item no.: 2003140 All dimensions in mm

Tolerance ISO 8015 | General Tolerance DIN ISO 2768mK | Sheet 1 of 2