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NATIONAL TECHNICAL ASSESSMENT ITB-KOT-2020/0554 1st edition

This National Technical Assessment has been issued in compliance with the Regulation of the Ministry of Infrastructure and Construction dated 17 November 2016 on national technical assessments (Official Journal of the Republic Poland of 2016, item 1968) by Instytut Techniki Budowlanej in Warsaw, at the request of:

**Przedsiębiorstwo TOOLCO Kazimierz Mitroszewski
ul. Komunalna 11, 15-197 Białystok**

The National Technical Assessment ITB-KOT-2020/0554 1st edition is a positive assessment of the performance of the following construction products for their intended use:

TOOLCO roof accessories

Date of expiry of the National Technical Assessment:

March 13, 2025

[stamp:]
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[illegible signature]
dr inż. [PhD, Eng] Robert Geryło

[round seal with the emblem of Poland and the inscription in the rim:] INSTYTUT TECHNIKI
BUDOWLANEJ

Warszawa, March 13, 2020

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1. TECHNICAL DESCRIPTION OF THE PRODUCT

The subject of the National Technical Assessment are TOOLCO roof accessories, manufactured by Przedsiębiorstwo TOOLCO, Kazimierz Mitroszewski, ul. Komunalna 11, 15-197 Białystok, in a manufacturing plant in Poland.

The National Technical Assessment includes the following types of TOOLCO roof accessories:

1. Clips (Fig. A1 ÷ A8):

- for cement tiles, with a hook NORD II or NORD III, made of galvanized steel wire, with a diameter of 1,8 ÷ 2,5 mm and a steel strip with a thickness of 0,5 ÷ 1,0 mm,
- for cement tiles, type U, made of galvanized steel wire or stainless spring steel wire, with a diameter of 1,5 ÷ 3,0 mm,
- side clips for tiles, type K, made of galvanized steel wire or stainless spring steel wire, with a diameter of 1,5 ÷ 3,0 mm,
- for cut roof tiles, made of stainless steel strip with a thickness of 0,8 ÷ 1,8 mm and stainless spring steel wire, with a diameter of 0,8 ÷ 1,8 mm,
- universal, types 300, 320 and 340, made of galvanized stainless spring steel wire or stainless spring steel wire, with a diameter of 1,5 ÷ 3,0 mm,
- with high lock, made of galvanized steel wire or stainless spring steel wire, with a diameter of 1,5 ÷ 3,0 mm,
- for monk and nun tiles, type MM, made of galvanized spring steel wire or stainless steel with a diameter of 1,5 ÷ 2,5 mm,
- used to protect ceramic tiles from storm, type J, made of galvanized spring steel wire or stainless spring steel wire, with a diameter of 1,5 ÷ 3,0 mm.

2. Ridge batten grips (Fig. A9 ÷ A10):

- type BL, made of galvanized steel sheet, with a thickness of 1,5 ÷ 2,0 mm,
- type GW, made of galvanized steel sheet, with a thickness of 1,5 ÷ 2,0 mm and galvanized steel wire with a diameter of 6,0 ÷ 8,0 mm.

3. Snow pipe systems (Fig. A11 ÷ A29):

- universal snow guard bracket (flat) for shingles, flat and trapezoidal metal sheets or a grip for seam, the lower part is made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm, the upper part is made of a galvanized steel sheet 2,0 ÷ 4,0 mm,
- snow guard brackets for roof sheets or roof panels, on standing seam: types: for one pipe, two or three pipes, made of galvanized steel sheet, copper sheet or aluminum sheet, with a thickness of 3,0 ÷ 4,0 mm,
- 2-pipe snow guard brackets for metal sheet tiles: types 350, 400, 460, 35/35, 33/35,

- 400/35, modular - shingle, Gerard-Classic, Gerard-Diamant, Iryd and Tysenia, the lower part is made of a flat bar or galvanized steel strip with a thickness of 3,0 ÷ 4,0 mm, the upper part is made of galvanized steel sheet, with a thickness of 1,5 ÷ 4,0 mm,
- 2-pipe snow guard bracket for plain tiles: batten 40, batten 50, batten 60, the lower part is made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm, the upper part is made of galvanized steel sheet 1,5 ÷ 4,0 mm,
 - 2-pipe snow guard bracket for ceramic and concrete tiles: type A and B, the lower part is made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm, the upper part is made of galvanized steel sheet 1,5 ÷ 4,0 mm,
 - pipe snow guard bracket for concrete or ceramic tiles with hook, made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm, the upper part is made of galvanized steel sheet, with a thickness of 1,5 ÷ 4,0 mm,
 - snow guard pipe, made of galvanized steel or copper or aluminum pipe, with a thickness of 1,3 ÷ 2,0 mm.
4. Snow guard systems (Fig. A30 ÷ A40):
- snow stopper fences: 1,2 m, 1,5 m, 2,0 m, 3,0 m, made of a galvanized steel angle bar, with a thickness of 1,8 ÷ 2,0 mm and galvanized steel sheet, with a thickness of 0,6 mm,
 - universal snow stopper fence bracket, assembled to shingles, flat and trapezoidal metal sheets or a grip for seam: type: flat, made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm,
 - snow stopper fence brackets for metal sheet tiles: types 350, 400, 460, 35/35, 33/35, 400/35, modular - shingle, Gerard-Classic, Gerard-Diamant, Iryd and Tysenia, made of a flat bar or galvanized steel strip with a thickness of 3,0 ÷ 4,0 mm,
 - snow stopper fence brackets for plain tiles: batten 40, batten 50, batten 60, made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm,
 - snow stopper fence brackets for ceramic and concrete tiles: type A and B, made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm,
 - snow stopper fence brackets for ceramic and concrete tiles with hook, made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm,
 - solar panel bracket, made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷ 4,0 mm,
5. Snow breakers (Fig. A41 ÷ A49):
- model ST: flat (universal), for metal sheet tiles, for plain tiles, for ceramic and concrete tiles, made of a flat bar or galvanized steel strip, with a thickness of 3,0 ÷

- 4,0 mm,
- model BL: type A, B and C, type A, B, made of a flat bar or galvanized steel strip, with a thickness of 1,0 ÷ 1,5 mm.
6. Clamps for ridge tiles and roof valleys (Fig. A50 ÷ A63):
- clamps for ridge tiles: types A, B, C, D, E, F, G, H, I, J, K and L, made of a flat bar or an aluminum strip, with a thickness of 1,0 ÷ 1,8 mm,
 - clamps for roof valley: types A and B, made of a flat bar or an aluminum strip, with a thickness of 0,4 ÷ 0,6 mm.
7. Roof valley flashing installation clips (Fig. A64 ÷ A65):
- unmovable, made of sheet metal or stainless steel strip, with a thickness of 0,2 ÷ 0,5 mm,
 - movable, made of sheet metal or stainless steel strip, with a thickness of 0,2 ÷ 0,5 mm.

The snow pipe systems can be equipped with additional elements:

- snow guard pipe lock, made of galvanized steel or an aluminum pipe, with a thickness of 2,0 ÷ 3,0 mm,
- snow guard pipe plug, made of low-density polyethylene (LDPE),
- pipe connector, made of high-density polyethylene (HDPE).

The snow guard systems can be equipped with an additional element: snow fence connector, made of galvanized steel sheet or strip, with a thickness of 0,4 ÷ 1,0 mm,

The TOOLCO roof accessories should be made of S235JR+AR steel according to the norm PN-EN 10025-2:2019 or PN-EN 10051:2011, copper sheet, M1E alloy, hardening: z4 according to the norm PN-EN 13599:2014 or PN-EN 1652:1999 and aluminum sheet EN-AW 6060 according to the norm PN-EN 573-3: :2014, hardening: T6 according to the norm PN-EN 515:1996, EN-AW 6060 according to the norm PN-EN 573-3:2014, hardening: T66 according to the norm PN-EN 515:1996, EN-AW 5083 according to the norm PN-EN 573-3:2014, hardening: T6 according to the norm PN-EN 515:1996 or EN-AW 5083 according to the norm PN-EN 573-3:2014, hardening: T66 according to the norm PN-EN 515:1996.

TOOLCO roof accessories, made of steel, covered by this National Technical Assessment, are galvanized:

- a) hot galvanizing, zinc coating characterized by a thickness of not less than 45 µm and a mass of not less than:
 - for steel sections 700 g/m² (double-sided),
 - for steel wire for the production of clips 180 g/m², or
- b) electrolytic zinc coating, zinc coating characterized by a thickness of not less than 7 µm and a mass of not less than 100 g/m² (double-sided), for steel sections.

TOOLCO roof accessories (except on the clips), made of steel, are additionally covered

with powder coating.

The shape and the dimensions of products covered by this National Technical Assessment are given in Attachment A.

Tolerances for unspecified linear dimensions of products should correspond to a very coarse class V according to PN-EN 22768-1:1999. Thickness deviations of galvanized steel sheets should be consistent with the concerned relevant norm.

2. THE INTENDED APPLICATION OF THE PRODUCT

TOOLCO roof accessories are an auxiliary equipment and are designed for use in sloping roofs, with an angle of inclination of the roof of $10^\circ \div 60^\circ$, covered with tiles, slate, roofing sheet, corrugated plates, flat sheet metal, profiled sheet, sheet combined with a standing seam, roofing paper or paper shingles.

The elements of snow protection (brackets, fences and breakers) are designed for protection against snow used to prevent snow sliding down the roofing.

Due to the requirements for corrosion resistance, the TOOLCO roof accessories, made of steel according to item 1, should be protected by anticorrosive coatings adapted to the category of the atmospheric corrosivity according to the norm PN-EN ISO 14713-1:2017 or PN-EN ISO 9223:2012 and according to item 1.

Due to the requirements for corrosion resistance, the TOOLCO roof accessories, made of copper sheet according to item 1, should be used according to the norm PN-EN ISO 9223:2012 and according to item 1.

Due to the requirements for corrosion resistance, the TOOLCO roof accessories, made of aluminium sheet according to item 1, should be used according to the norm PN-EN 1999-1-1:2011 or PN-EN ISO 9223:2012 and according to item 1.

The TOOLCO roof accessories should be attached to the elements of the roof structure with mechanical connectors, protected against corrosion with coatings adapted to the of the atmospheric corrosivity according to PN-EN ISO 12944-2:2018.

The arrangement of snow fences, brackets, snow-brakers, holders and snow stopper pipes and the number of fastening connectors and their dimensions should be determined in the technical project, depending on the angle of inclination of the roof and the snow load zone, in accordance with the norm PN-EN 1991-1-3:2005/A1:2015-10, taking into account the bearing strength of the products specified in Table 1.

In the case of roofing made of aluminum or copper sheets, plastic distance pieces should be used between the coating and the fixed element.

The TOOLCO roof accessories should be used in accordance with:

- the technical design developed for a specific application, Polish standards and technical and construction regulations, and in particular with the Regulation of the

Minister of Infrastructure of 12 April 2002 on technical conditions to be met by buildings and their location (Journal of Laws of the Republic of Poland of 2019, item 1065),

- provisions of this National Technical Assessment,
- instructions for applying the products, developed by the manufacturer and delivered to the recipients.

3. PERFORMANCE PROPERTIES OF THE CONSTRUCTION PRODUCT AND METHODS OF THEIR ASSESSMENT

3.1. Performance properties of the product

The performance properties of the TOOLCO roof accessories and methods used for their assessment are given in Tables 1 and 2.

Table 1

Item	Basic characteristics	Performance properties	Test methods
1	2	3	4
1	Zinc coating		
1.1	Zinc coating, hot galvanizing		
	a) mass, g/m ²	700 (steel sections) 180 (steel wire)	PN-EN ISO 1460:2001 PN-EN 10244-2:2010
	b) thickness, μm	≥ 45	PN-EN ISO 2808:2008

Table 1, continuation

Item	Basic characteristics	Performance properties	Test methods
1	2	3	4
1	Zinc coating		
1.2	Zinc coating, electrolytic zinc coating		
	a) mass, g/m ²	100 (steel sections)	PN-EN ISO 1460:2001
	b) thickness, μm	≥ 7	PN-EN ISO 2808:2008
2	Powder varnish coating		
	a) thickness, μm	≥ 75	PN-EN ISO 2808:2008
	b) Buchholz hardness	≥ 80	PN-EN ISO 2815:2004
	c) Stripping strength for separation from substrates in the cross-cut test	degree 0	PN-EN ISO 2409:2013
3	Mechanical strength - destructive force	According to Table 2	item 3.2.1

Table 2

Item	Product type	Destructive force, N
1	Clips	≥ 120
2	Ridge batten grips BL type	≥ 1700
3	Ridge batten grips GW type	≥ 2500
4	Snow pipe systems - universal snow guard bracket	≥ 1900
5	Snow pipe systems - snow guard brackets for metal sheet tiles on a standing seam	≥ 900

6	Snow pipe systems - 2-pipe snow guard brackets for metal sheet tiles	≥ 1300
7	Snow pipe systems - 2-pipe snow guard brackets for plain tiles	≥ 400
8	Snow pipe systems - 2-pipe snow guard bracket for ceramic and concrete tiles	
9	Snow pipe systems - snow guard pipe	≥ 1500
10	Snow guard systems - snow stopper fences	≥ 600
11	Snow guard systems - universal snow stopper fence bracket	
12	Snow guard systems - snow stopper fence bracket for metal sheet tiles	
13	Snow guard systems - snow stopper fence bracket for plain tiles	≥ 400
14	Snow guard systems - snow stopper fence bracket for ceramic and concrete tiles	
15	Snow guard systems - solar panel bracket	≥ 730
16	Snow breaker- model ST	
17	Snow breaker- model BL	≥ 107
18	Clamps for ridge tileless	
19	Clamps for roof valleys	≥ 124
20	Roof valley flashing installation clips	

3.2. Methods used to assess the performance

The assessment methods are given in Table 1 and in item 3.2.1.

3.2.1. Mechanical strength (destructive force). The checking of mechanical strength (destructive force) is performed on products fixed in accordance with the manufacturer's instructions, gradually applying the load according to the schemes shown in Attachment B.

The measurement of the force is made using a device with a range chosen to the expected value of the destructive force, enabling a permanent and slow increasing of the force until destruction.

4. PACKAGING, TRANSPORT AND STORAGE AND THE WAY IN WHICH THE PRODUCT IS MARKED

Products covered by this National Technical Assessment should be delivered in the manufacturer's packaging and stored and transported in such a way as to ensure that their technical properties remain unchanged.

The manner of marking the products with the construction mark shall be in accordance with the Regulation of the Minister of Infrastructure and Construction of 17 November 2016 on the manner of declaring the functional properties of construction products and the manner of marking them with the construction mark (Journal of Laws of the Republic of Poland of 2016, item 1966, as amended).

The product marking with a construction mark should be accompanied by the following information:

- the last two digits of the year in which the construction mark was first placed on the construction product,
- the name and address of the manufacturer's registered office or an identification mark allowing explicit identification of the name and address of the manufacturer's registered office;
- the name and type designation of the construction product,
- the number and year of issue of the national technical assessment, which served as the basis for the declaration of performance (ITB-KOT-2020/0544 1st edition),
- the number of the national declaration of performance,
- the level or class of the declared performance,
- the address of the manufacturer's website, if the national declaration of performance is made available on that website.

A safety data sheet and/or information on hazardous substances contained in a construction product referred to in the Articles 31 or 33 of Regulation (EC) No. 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and establishing the European Chemicals Agency, should be provided or made available together with the national declaration of performance, as appropriate.

Moreover, the marking of a construction product, being a hazardous mixture according to the REACH regulation, should comply with the requirements of Regulation (EC) No. 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures (CLP), amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No. 1907/2006.

5. ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

5.1. National system for the assessment and verification of constancy of performance

In accordance with the Regulation of the Minister of Infrastructure and Construction of November 17, 2016 on the manner of declaring the performance characteristics of construction products and the manner of marking them with a construction mark (Official Journal of the Republic of Poland of 2016, item 1966, as amended), the System 4 of the Assessment and verification of constancy of performance is applicable.

5.2. Type testing

The performance characteristics assessed in the item 3 constitute the product type testing until there are changes in raw materials, constituents, production line or plant.

5.3. Factory production control

At the manufacturing plant the manufacturer shall have implemented a factory production control system. All the elements, requirements and provisions adopted by the manufacturer for the system shall be documented in a systematic manner in the form of written policies and procedures, including test records. The factory production control shall be adapted to the manufacturing processes and ensure the achievement of the declared performance properties of the product in serial production.

The factory production control includes the specification and verification of raw materials and constituents, controls and tests to be carried out during manufacture and control tests (according to item 5.4), conducted by the manufacturer in accordance with the established test plan and according to the principles and procedures specified in the factory production control documentation.

The results of production control shall be recorded on a regular basis. The records of the register should show whether the products has satisfied the criteria of the assessment and verification of the constancy of performance. Individual products or batches of products and related manufacturing details shall be fully identifiable and traceable.

5.4. Control tests

5.4.1. Test plan. The test plan shall include:

- a) ongoing tests,
- b) periodic tests.

5.4.2. Ongoing tests. Ongoing tests shall include checking of shape and dimensions.

5.4.3. Periodic tests. Periodic tests include:

- a) checking the mechanical strength (destructive force),
- b) zinc coating properties,
- c) properties of the powder varnish coatings.

5.5. Frequency of tests

The ongoing tests should be conducted in accordance with the prescribed test plan, but not less frequently than for each batch of products. The size of a batch of products should be specified in the documentation of factory production control.

Periodic tests should be performed at least once every 3 years.

6. INSTRUCTIONS

6.1. The National Technical Assessment ITB-KOT-2020/0544 1st edition is a positive assessment of the performance of those essential characteristics of the TOOLCO roof accessories which, in accordance with the intended use, resulting from the provisions of the Assessment, influence the fulfilment of basic requirements by the construction objects in which the product will be applied.

6.2. The National Technical Assessment ITB-KOT-2020/0544 1st edition is not a document authorizing to mark a construction product with a construction mark.

Pursuant to the Act on Construction Products of April 16, 2004 (Journal of Laws of 2020, item 215), products to which this National Technical Assessment applies may be marketed or made available on the domestic market, if the manufacturer has assessed and verified the constancy of performance, drawn up a national declaration of performance in accordance with the ITB-KOT-2020/0544 National Technical Assessment 1st edition and marked the products with a construction mark in accordance with the applicable regulations.

6.3. The National Technical Assessment ITB-KOT-2020/0544 1st edition does not infringe the rights resulting from the provisions on industrial property protection, in particular the Act of June 30, 2000 – Industrial Property Law (Journal of Laws of 2017, item 776 as amended). Ensuring these rights is the responsibility of the users of this ITB National Technical Assessment.

6.4. When issuing a National Technical Assessment, the ITB shall not be held responsible for any possible infringement of exclusive and acquired rights.

6.5. The National Technical Assessment does not release the manufacturer of products from responsibility for their proper quality, and the contractors of construction works from responsibility for their proper use.

6.6. The validity of this National Technical Assessment may be extended for further periods, not exceeding 5 years.

7. A LIST OF DOCUMENTS USED IN THE PROCEEDINGS

7.1. Reports, test reports, evaluations, classifications

- 1) 03148/18/Z00NZK. Research work on the TOOLCO roof accessories. Department of Building Construction, Geotechnics and Concrete. Warsaw, 2019
- 2) LZK00-03148/18/Z00NZK. Test report concerning the TOOLCO roof accessories. Department of Building Construction, Geotechnics and Concrete. Warsaw, 2019
- 3) LZM00-03371/18/Z00NZM. Test report concerning the TOOLCO roof accessories. Building Elements Engineering Department. Warsaw, 2018
- 4) LK00-2254/11/Z00NK. Test report concerning the TOOLCO roof accessories. Department of Building Constructions and Elements, Building Research Institute. Warsaw, 2012
- 5) LM00-2254/11/Z00NK. Expertise on the effectiveness of anti-corrosion protection of roof accessories. Building Elements Engineering Department, Building Research Institute (ITB). Warsaw, 2012
- 6) LK00-0695/13/Z00NK. Test report concerning the roof accessories. Department of Building Constructions and Elements, Building Research Institute. Warsaw, 2013
- 7) LM00-00844/14/Z00NM. Test report concerning the roof accessories. Zinc and powder

varnish coating. Building Elements Engineering Department, Building Research Institute (ITB). Warsaw, 2014

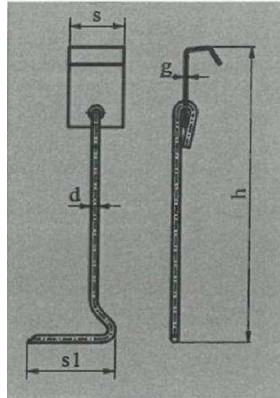
- 8) LK01-0695/13/Z00NK. Test report concerning the clips for attaching the tiles. Department of Building Constructions and Elements, Building Research Institute. Warsaw, 2014

7.2. Related standards and documents

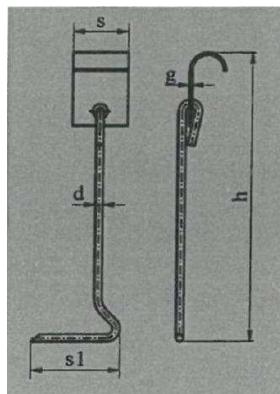
PN-EN 1991-1-3:2005/A1:2015-10	<i>Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads</i>
PN-EN 10346:2015	<i>Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions</i>
PN-EN 10149-1:2014	<i>Hot rolled flat products made of high yield strength steels for cold forming - Part 1: General technical delivery conditions</i>
PN-EN ISO 1461:2011	<i>Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods</i>
PN-EN ISO 4017:2014	<i>Fasteners - Hexagon head screws - Product grades A and B</i>
PN-EN ISO 9223:2012	<i>Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation</i>
PN-EN ISO 12944-2:2018	<i>Paints and varnishes. Corrosion protection of steel structures by protective paint systems - Part 2: Classification of environments</i>
AT-15-8853/2014	<i>TOOLCO roof accessories</i>

ATTACHMENTS

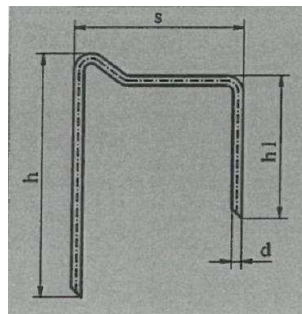
Attachment A.	Shape and dimensions	13
Attachment B.	Testing schemes.	44

Attachment A.


d, mm	g, mm	h, mm	s, mm	s1, mm
1,8 ÷ 2,5	0,5 ÷ 1,0	75 ÷ 85	10 ÷ 20	20 ÷ 30

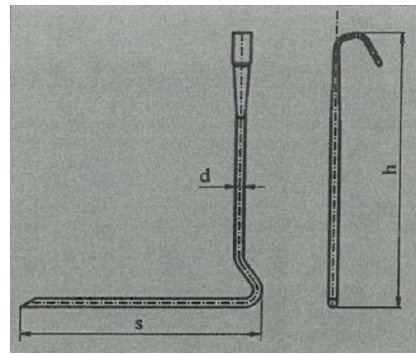
Figure A1. Clip with hook NORD II


d, mm	g, mm	h, mm	s, mm	s1, mm
1,8 ÷ 2,5	0,5 ÷ 1,0	75 ÷ 85	10 ÷ 20	20 ÷ 30

Figure A2. Clip with hook NORD III


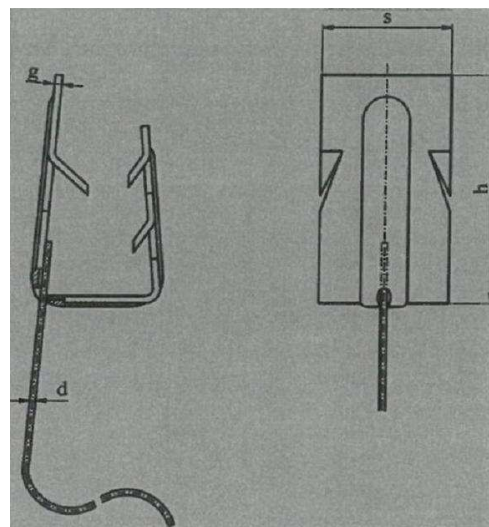
d, mm	h, mm	s1, mm	s, mm
1,5 ÷ 3,0	20 ÷ 80	20 ÷ 80	35 ÷ 65

Figure A3. Clip type U



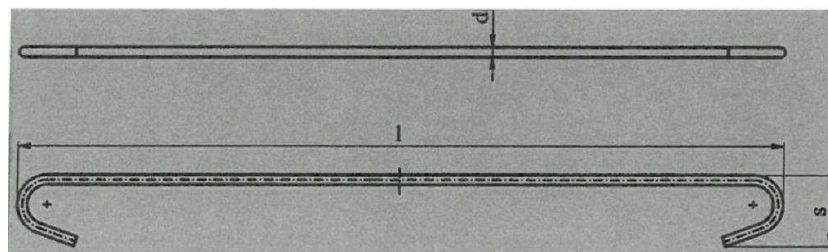
d, mm	h, mm	s, mm
1,5 ÷ 3,0	65 ÷ 95	45 ÷ 80

Figure A3. Clip type K



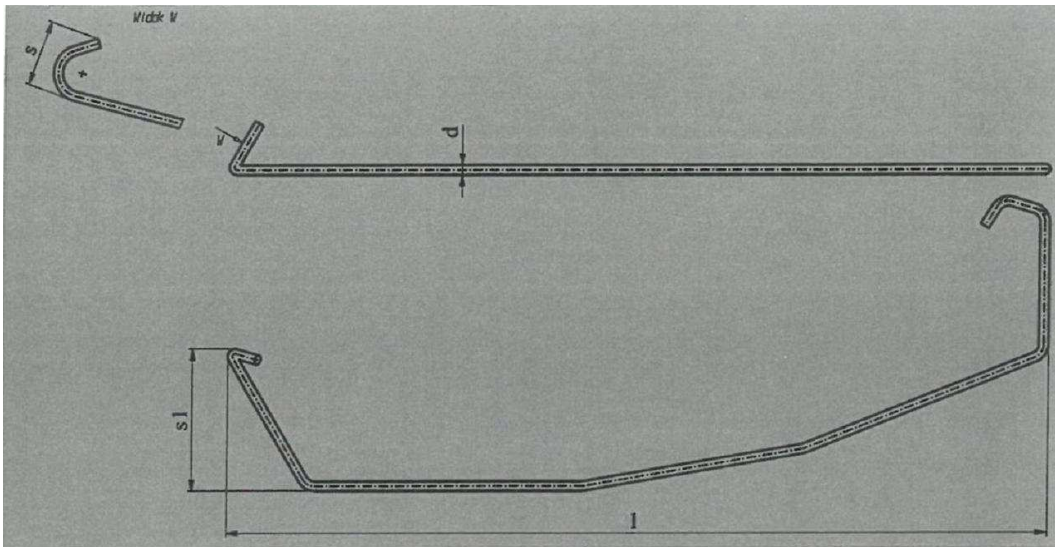
d, mm	g, mm	h, mm	s, mm
0,6 ÷ 1,8	0,8 ÷ 1,8	25 ÷ 35	15 ÷ 20

Figure A4. Clip for cut roof tiles



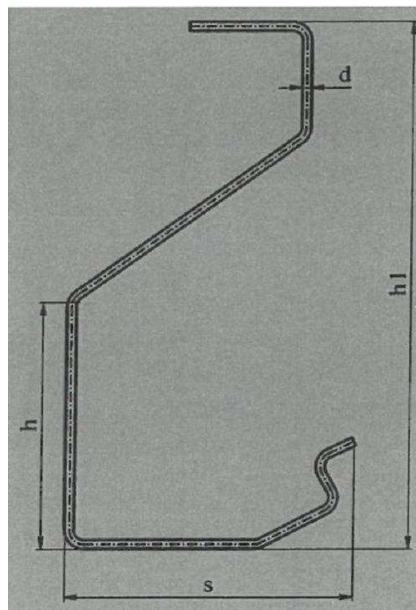
d, mm	l, mm	s, mm
1,5 ÷ 3,0	175 ÷ 400	14 ÷ 20

Figure A5. Clip, universal



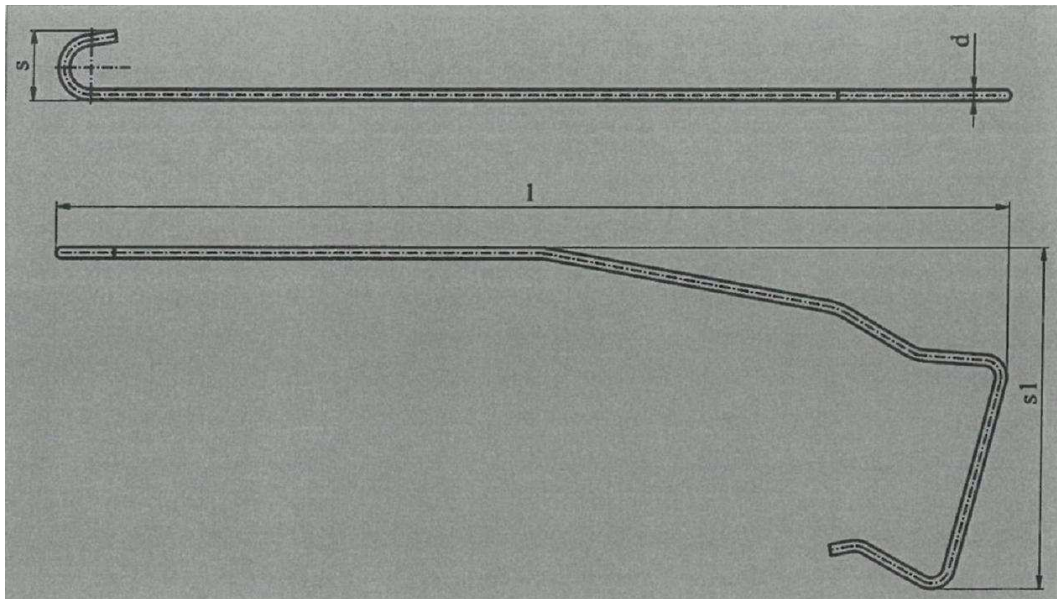
d, mm	l, mm	s, mm	s1, mm
1,5 ÷ 3,0	175 ÷ 380	14 ÷ 20	30 ÷ 50

Figure A6. Clip with high lock



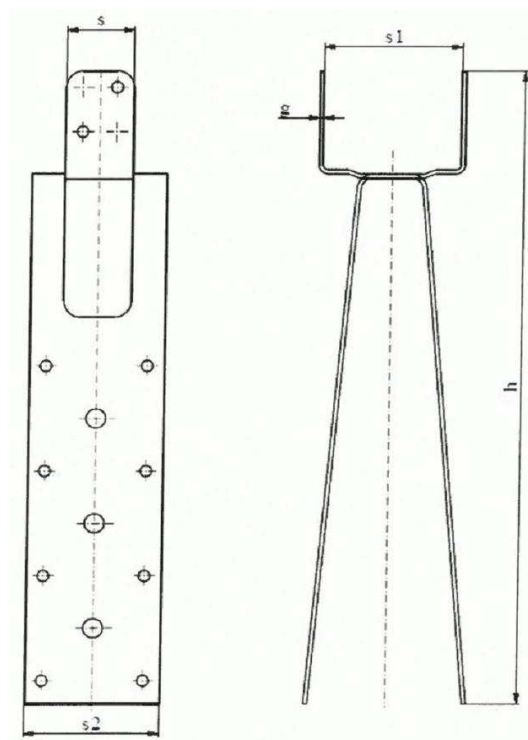
d, mm	h, mm	h1, mm	s, mm
1,8 ÷ 2,5	30 ÷ 100	80 ÷ 150	60 ÷ 80

Figure A7. Clip for monk and nun tiles



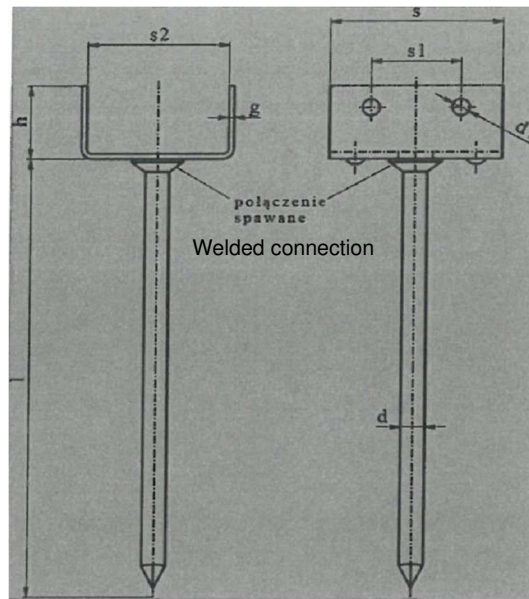
d, mm	l, mm	s, mm	s1, mm
1,5 ÷ 3,0	160 ÷ 380	14 ÷ 20	40 ÷ 55

Figure A8. Clip type J



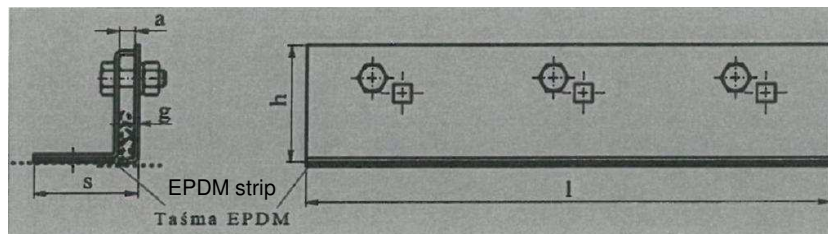
g, mm	h, mm	s, mm	s1, mm	s2, mm
1 ÷ 2	170 ÷ 250	20	30, 40, 50	40, 50

Figure A9. Ridge batten grip BL type



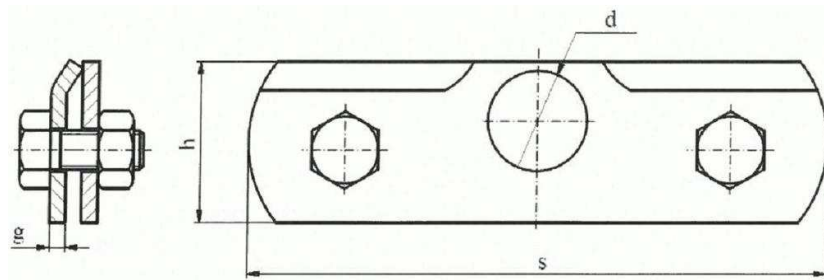
d, mm	d1, mm	g, mm	h, mm	l, mm	s, mm	s1, mm	s2, mm
6 ÷ 8	4,5 ÷ 5,5	1,5 ÷ 2,0	20 ÷ 25	160 ÷ 400	30 ÷ 60	25	40, 50, 60

Figure A10. Ridge batten grip GW type



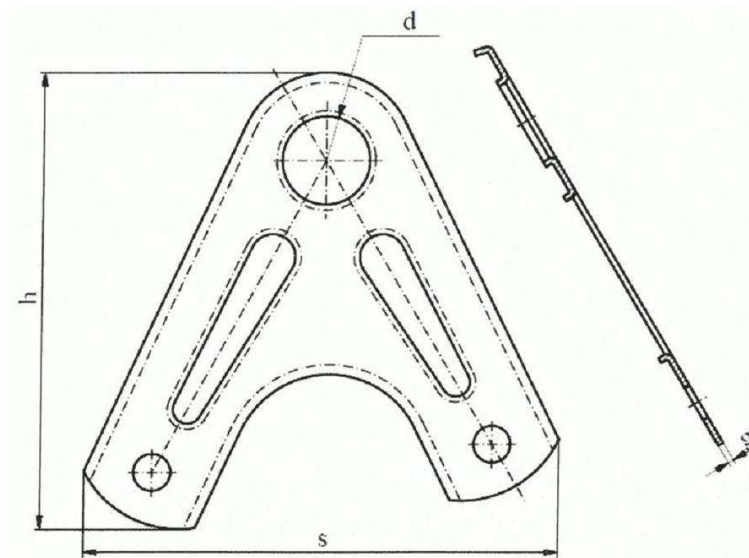
a, mm	g, mm	h, mm	l, mm	s, mm
8	1,5 ÷ 4	50 ÷ 70	200 ÷ 350	40 ÷ 60

Figure A11. Grip for roof sheets or roof panels on a standing seam



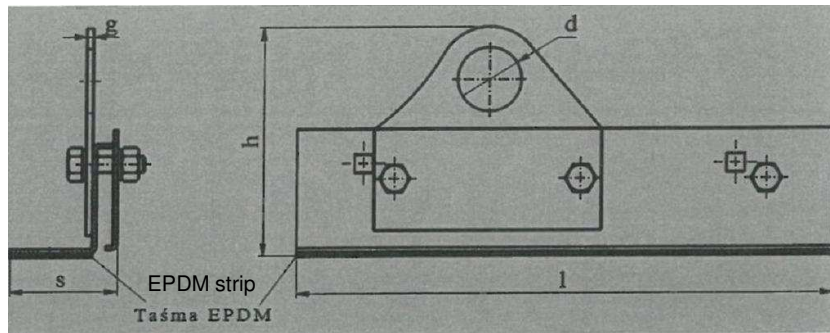
d, mm	g, mm	h, mm	s, mm
25 ÷ 35	4 ÷ 6	40 ÷ 60	150 ÷ 250

Figure A12. 1-pipe bracket for sheet on a standing seam



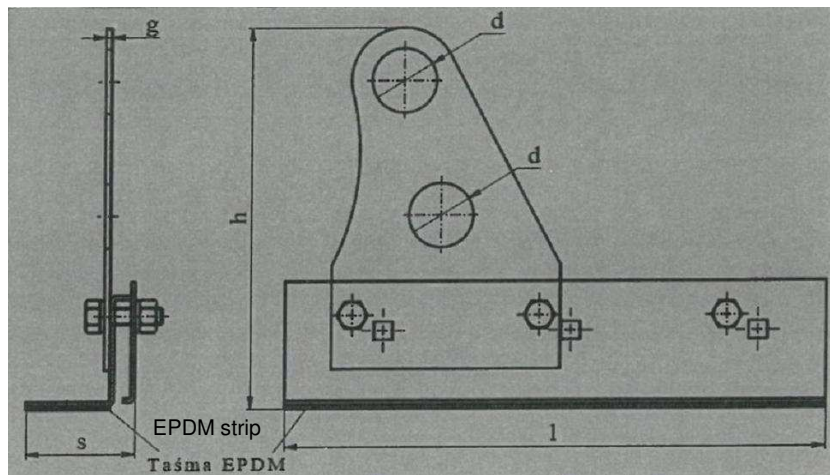
d, mm	g, mm	h, mm	s, mm
25 ÷ 35	1 ÷ 4	140 ÷ 200	150 ÷ 250

Figure A13. Additional element - grip for the second pipe for 1-pipe bracket for sheets on a standing seam



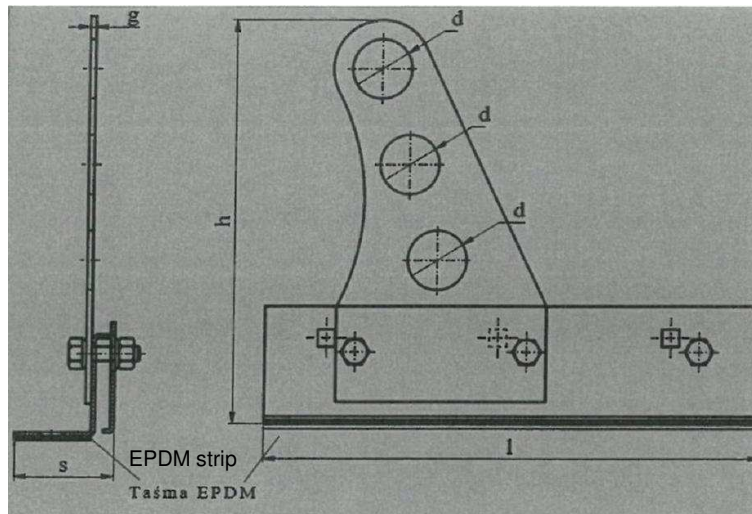
d, mm	g, mm	h, mm	l, mm	s, mm
31	1,5 ÷ 4	100 ÷ 200	200 ÷ 350	40 ÷ 60

Figure A14. Bracket for roof sheets or roof panels on a standing steam – 1-pipe



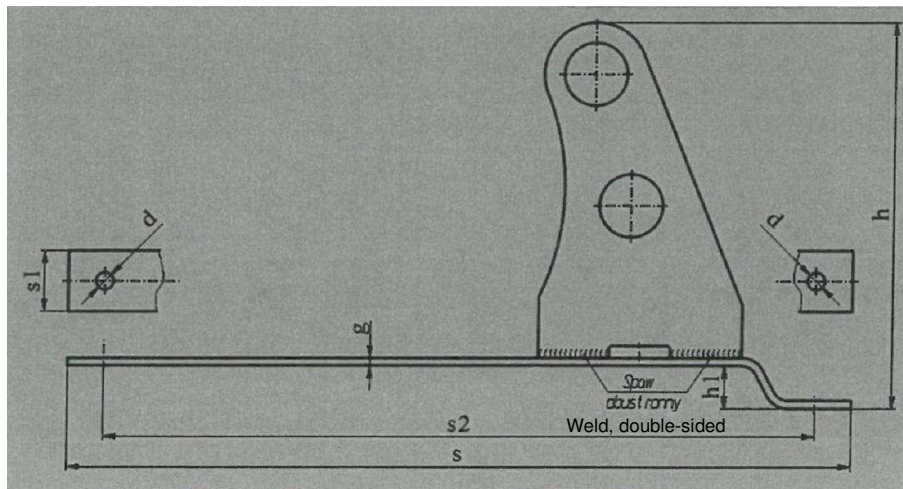
d, mm	g, mm	h, mm	l, mm	s, mm
31	1,5 ÷ 4	150 ÷ 250	200 ÷ 350	40 ÷ 60

Figure A15. Bracket for roof sheets or roof panels on a standing steam – 2-pipes



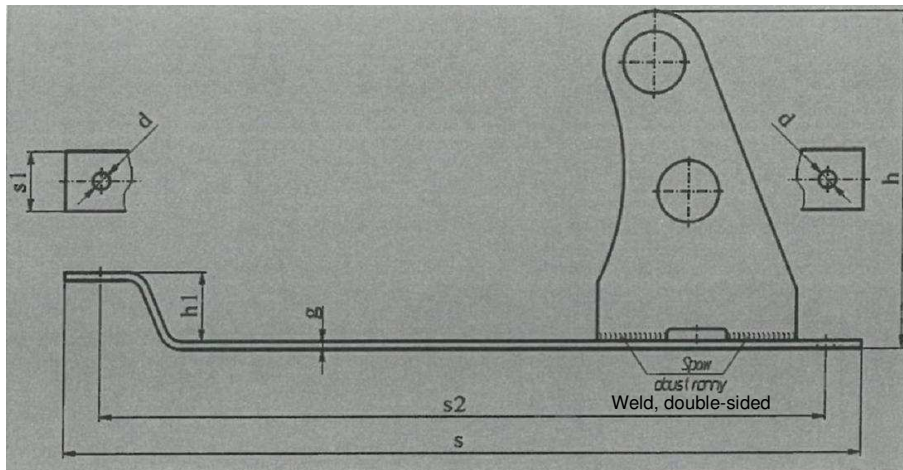
d, mm	g, mm	h, mm	l, mm	s, mm
31	1,5 ÷ 4	200 ÷ 350	200 ÷ 350	40 ÷ 60

Figure A16. Bracket for roof sheets or roof panels on a standing seam – 3-pipes



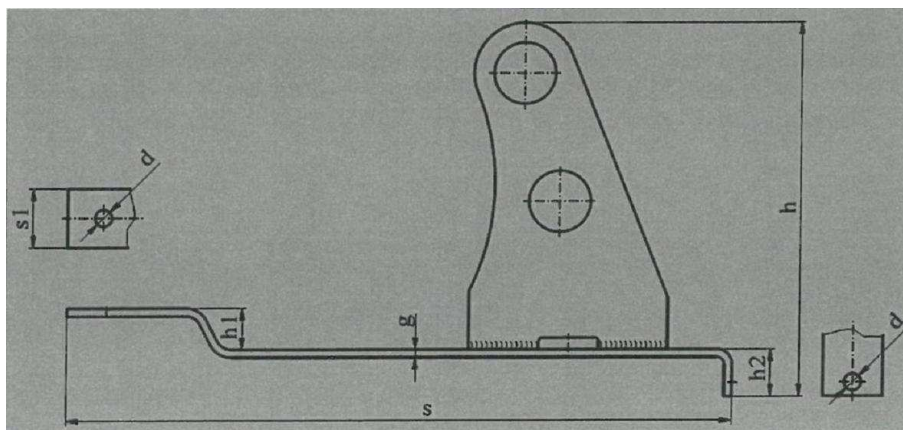
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm	s2, mm
8,5	3 ÷ 4	190 ÷ 210	21;35	340 ÷ 550	30 ÷ 40	310 ÷ 510

Figure A17. 2-pipe snow guard bracket for metal sheet tiles – types 350, 400, 460, 35/35, 33/35 and 400/35



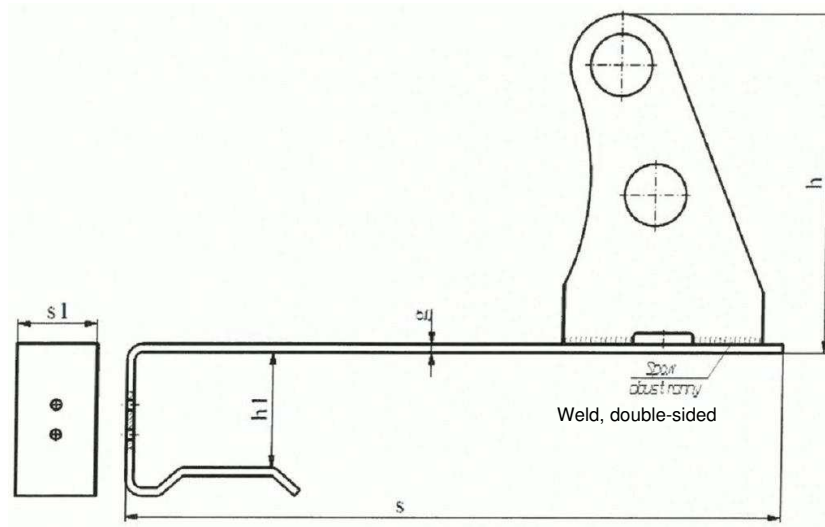
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm	s2, mm
8,5	3 ÷ 4	160 ÷ 180	21;35	340 ÷ 550	30 ÷ 40	310 ÷ 510

Figure A18. 2-pipe snow guard bracket for metal sheet tiles - modular - shingle, Gerard Classic, Iryd and Tyseia



d, mm	g, mm	h, mm	h1, mm	h2, mm	s, mm	s1, mm
8,5	3 ÷ 4	185 ÷ 195	21;35	20 ÷ 50	340 ÷ 550	30 ÷ 40

Figure A19. 2-pipe snow guard bracket for metal sheet tiles – type Gerard-Diamant



g, mm	h, mm	h1, mm	s, mm	s1, mm
3 ÷ 4	160 ÷ 180	40 ÷ 70	340 ÷ 550	30 ÷ 40

Figure A20. 2-pipe snow guard bracket with hook for concrete or ceramic tiles

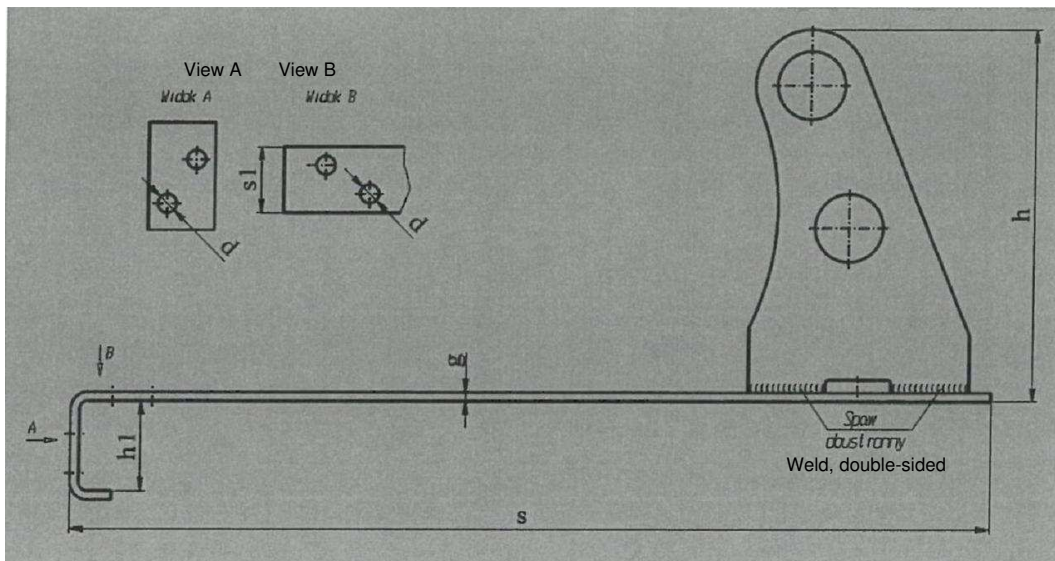
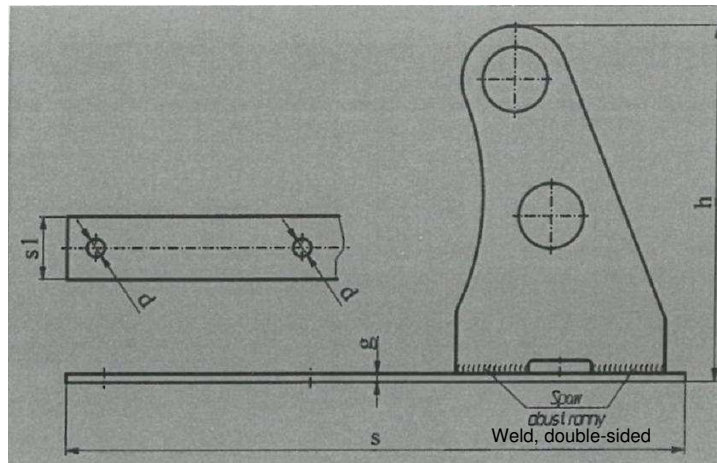
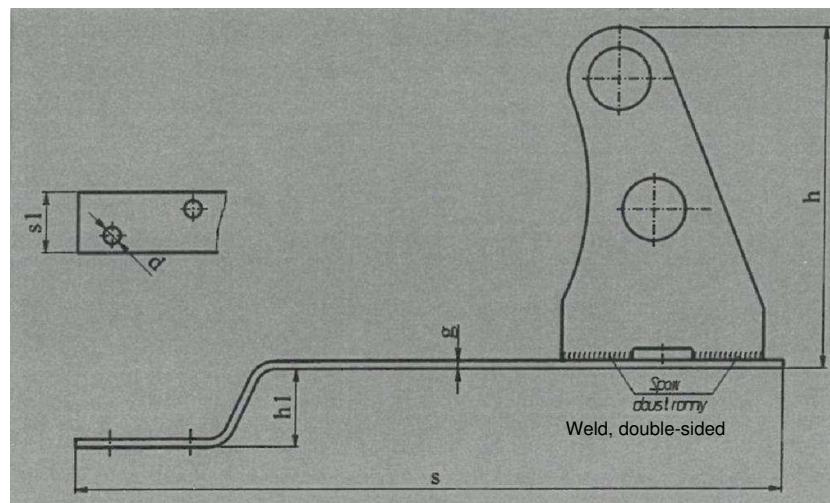


Figure A21. 2-pipe snow guard bracket for plain tiles



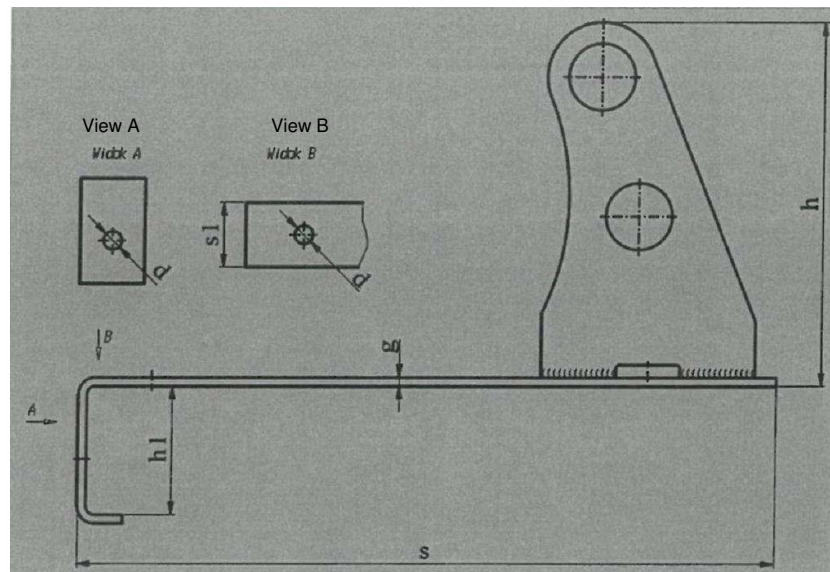
d, mm	g, mm	h, mm	l, mm	s, mm
8,5	3 ÷ 4	165 ÷ 175	280 ÷ 310	30 ÷ 40

Figure A22. 2-pipe snow guard bracket universal (flat) for shingles, flat and trapezoidal metal sheets or a grip for seam



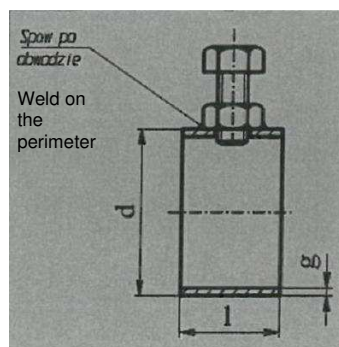
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm
8,5	3 ÷ 4	165 ÷ 175	21; 35	350 ÷ 550	30 ÷ 40

Figure A23. 2-pipe snow guard bracket for ceramic and concrete tiles – type A



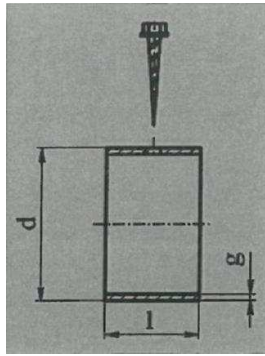
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm
8,5	3 ÷ 4	165 ÷ 175	40 ÷ 60	300 ÷ 500	30 ÷ 40

Figure A24. 2-pipe snow guard bracket for ceramic and concrete tiles – type B



d, mm	g, mm	l, mm
32 ÷ 34	2 ÷ 4	15 ÷ 30

Figure A25. Snow guard pipe lock – type A



d, mm	g, mm	l, mm
32 ÷ 34	2 ÷ 4	15 ÷ 30

Figure A26. Snow guard pipe lock – type B

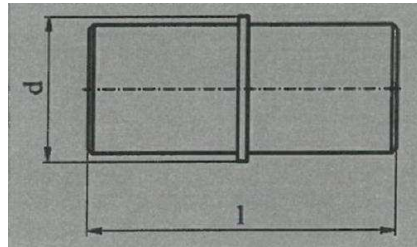
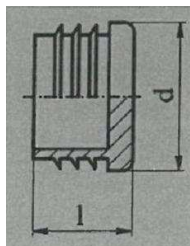


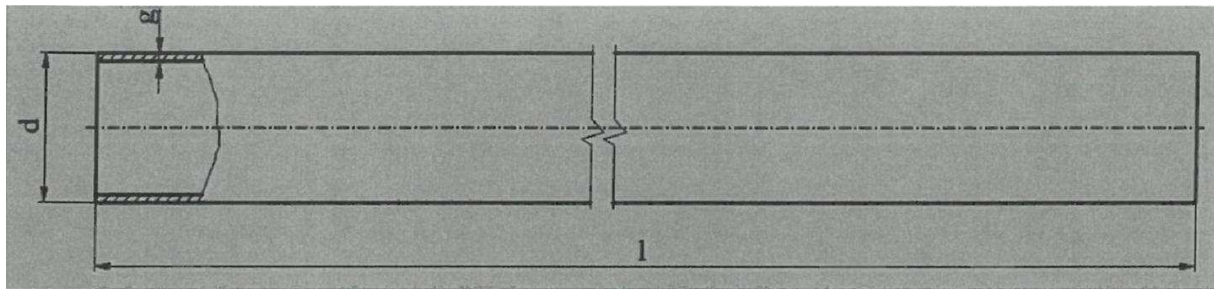
Figure A27. Pipe connector

d, mm	g, mm
30 ÷ 31	65



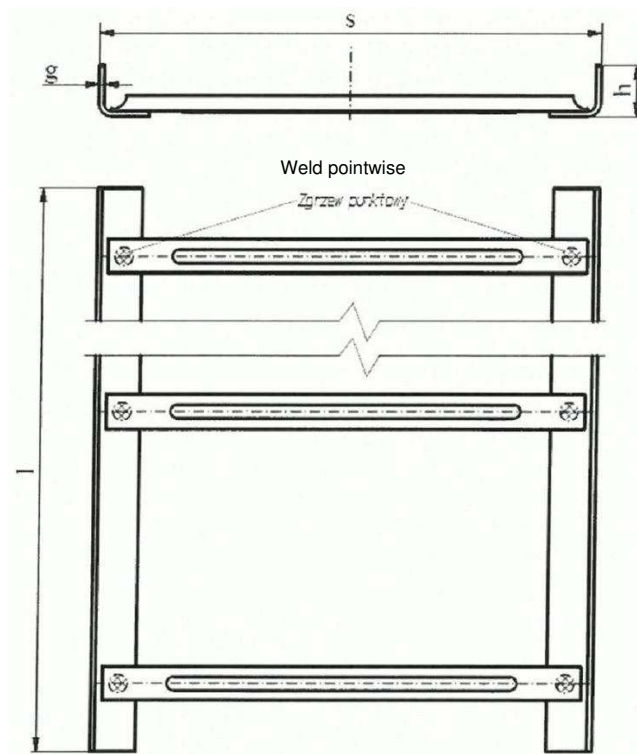
d, mm	l, mm
30	20

Figure A28. Snow guard pipe plug



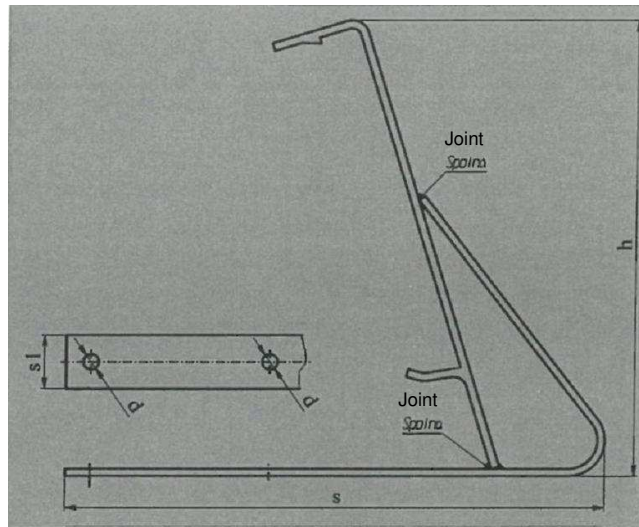
d, mm	g, mm	l, mm
28 ÷ 30	1,5	1000, 1500, 2000, 3000

Figure A29. Snow guard pipe



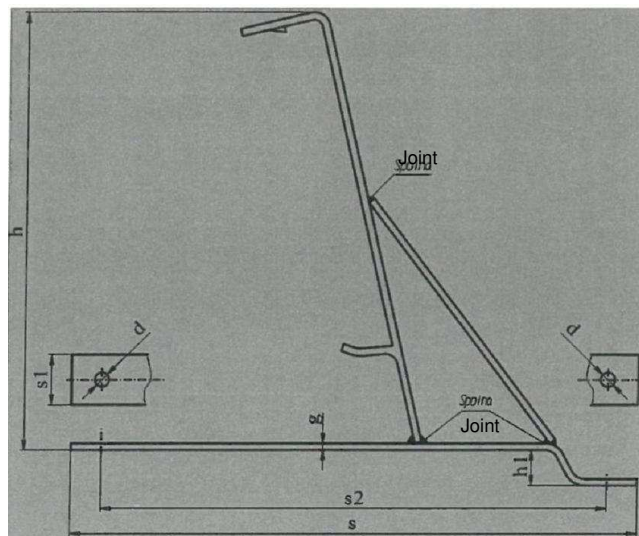
g, mm	h, mm	l, mm	s, mm
1,8 ÷ 2,0	15 ÷ 25	1200	150 ÷ 210
		1500	
		2000	
		3000	

Figure A30. Snow stopper fence



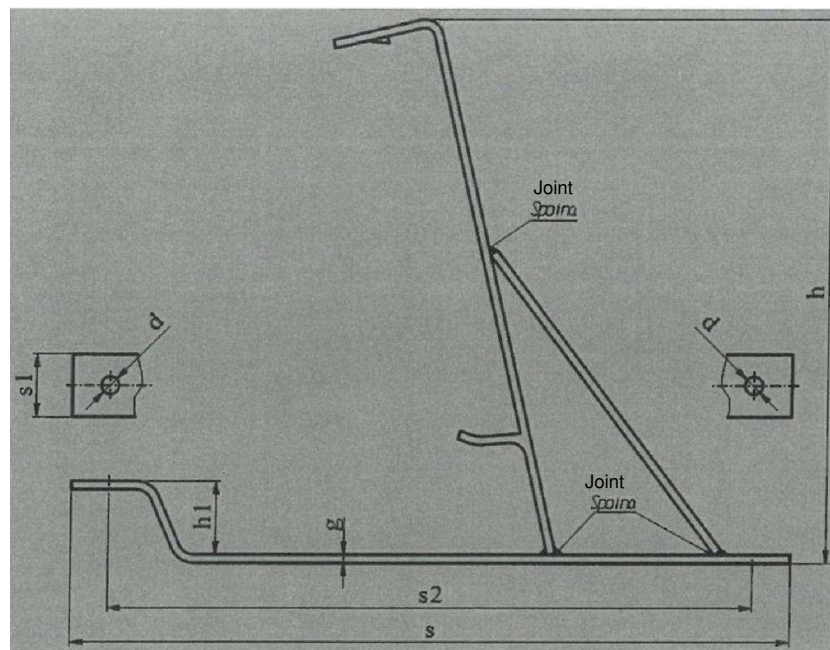
d, mm	g, mm	h, mm	s, mm	s1, mm
8,5	3 ÷ 4	245 ÷ 265	280 ÷ 310	30 ÷ 40

Figure A31. Universal snow stopper fence bracket



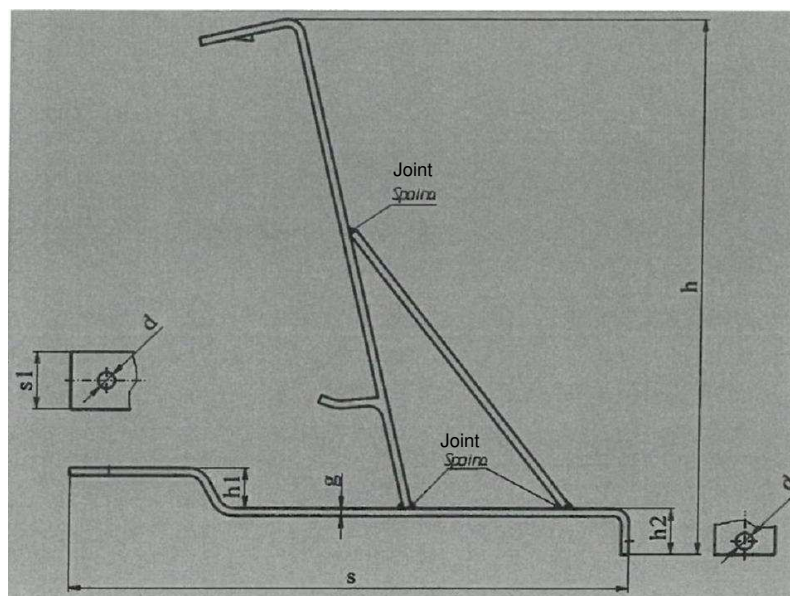
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm	s2, mm
8,5	3 ÷ 4	245 ÷ 265	21,35	340 ÷ 550	30 ÷ 40	310 ÷ 510

Figure A32. Snow stopper fence bracket for metal sheet tiles – types 350, 400, 460, 35/35, 33/35 and 400/35



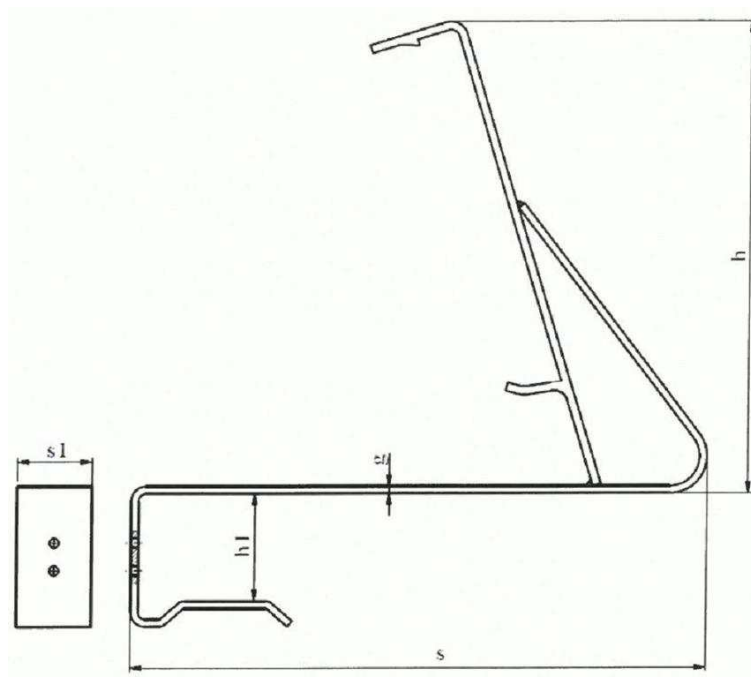
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm	s2, mm
8,5	3 ÷ 4	245 ÷ 265	21,35	340 ÷ 550	30 ÷ 40	310 ÷ 510

Figure A33. Snow stopper fence bracket for metal sheet tiles - modular - shingle, Gerard Classic, Iryd and Tysenia



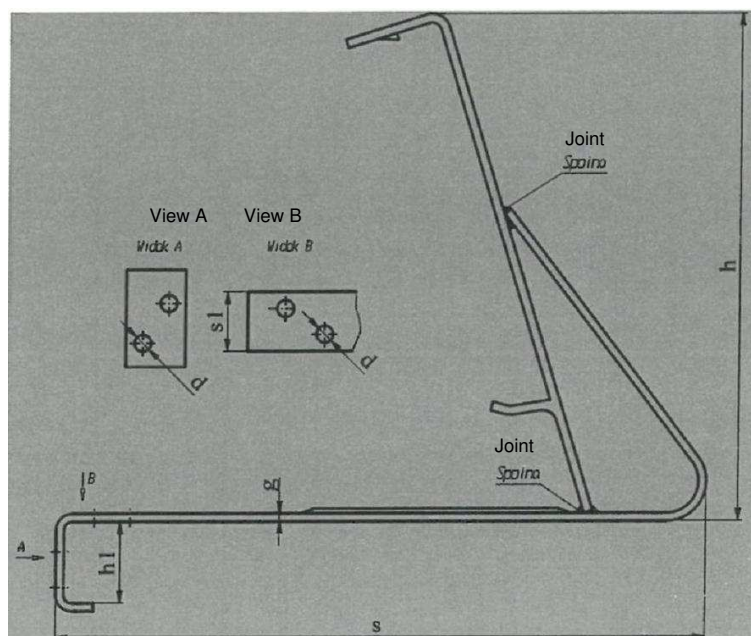
d, mm	g, mm	h, mm	h1, mm	h2, mm	s, mm	s1, mm
8,5	3 ÷ 4	260 ÷ 300	21,35	20 ÷ 50	340 ÷ 550	30 ÷ 40

Figure A34. Snow stopper fence bracket for metal sheet tiles – type Gerard - Diamant



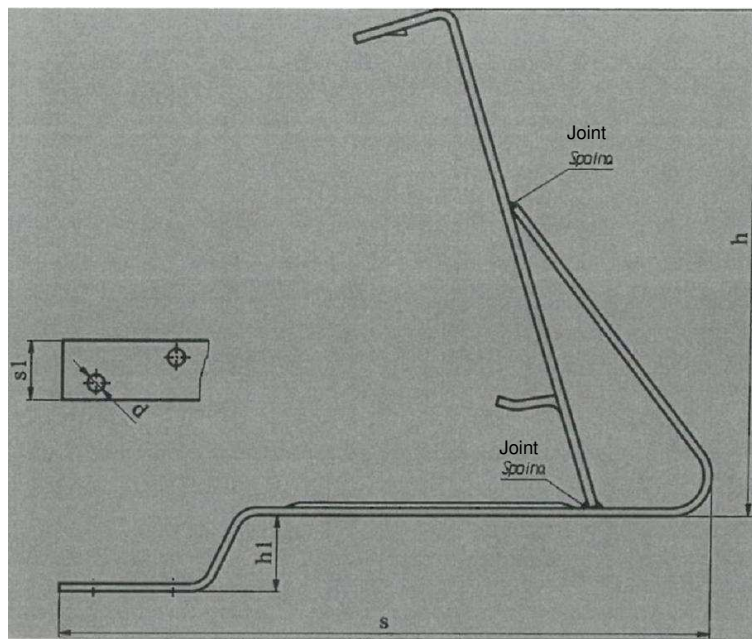
g, mm	h, mm	h1, mm	s, mm	s1, mm
3 ÷ 4	245 ÷ 265	40 ÷ 70	340 ÷ 550	30 ÷ 40

Figure A35. Snow stopper fence bracket with hook for ceramic and concrete tiles



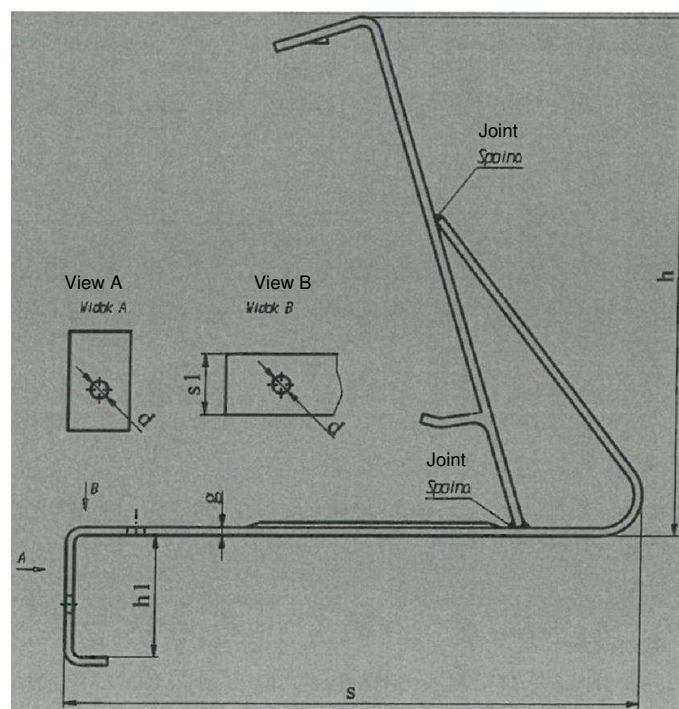
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm
8,5	3 ÷ 4	245 ÷ 265	40 ÷ 60	340 ÷ 550	30 ÷ 40

Figure A36. Snow stopper fence bracket for plain tiles



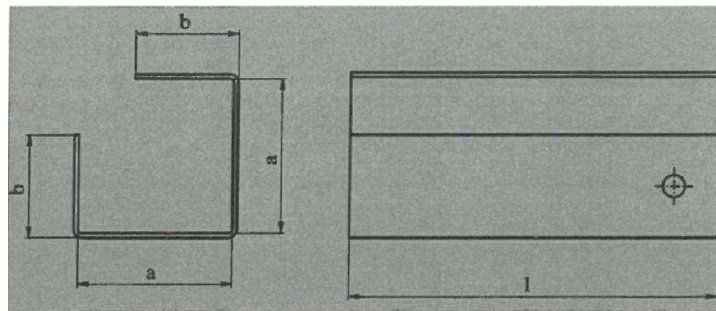
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm
8,5	3 ÷ 4	245 ÷ 265	21,35	340 ÷ 550	30 ÷ 40

Figure A37. Snow stopper fence bracket for ceramic and concrete tiles – type A

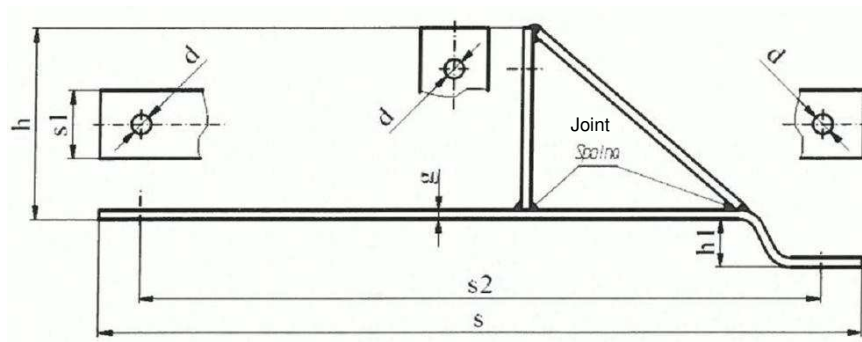


d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm
8,5	3 ÷ 4	245 ÷ 265	40 ÷ 60	300 ÷ 550	30 ÷ 40

Figure A38. Snow stopper fence bracket for ceramic and concrete tiles – type B

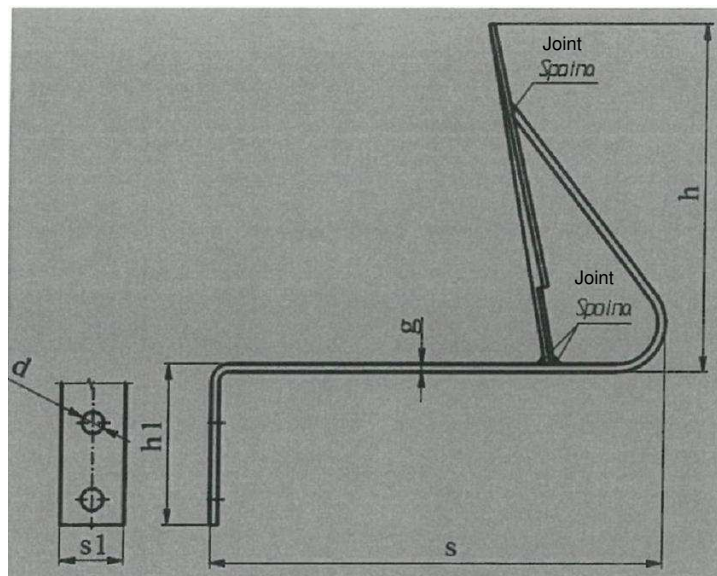


a, mm	b, mm	l, mm
14	21	50

Figure A39. Snow fence connector


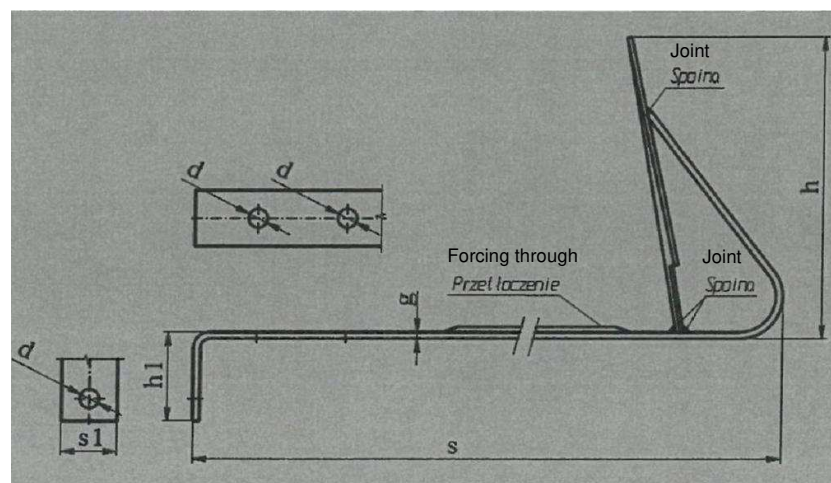
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm	s2, mm
8,5	3 ÷ 4	50 ÷ 200	21,35	350 ÷ 550	30 ÷ 40	310 ÷ 510

Figure A40. Solar panel bracket



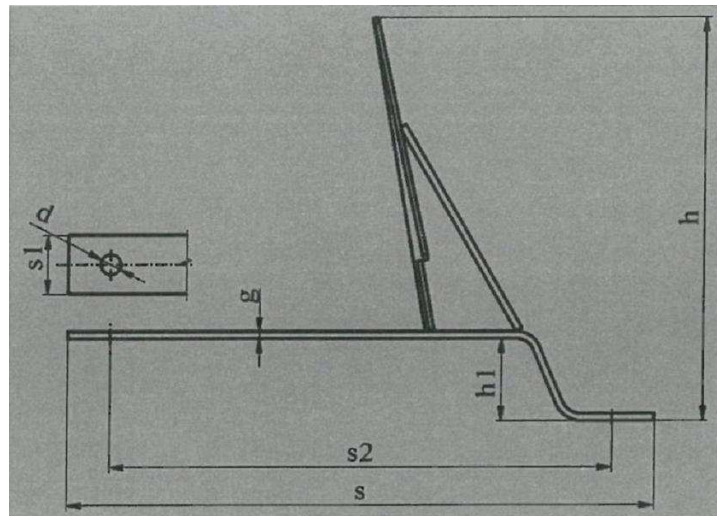
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm
8,5	3	136	63	177	25

Figure A41. Snow breaker model ST – type for ceramic and concrete tiles



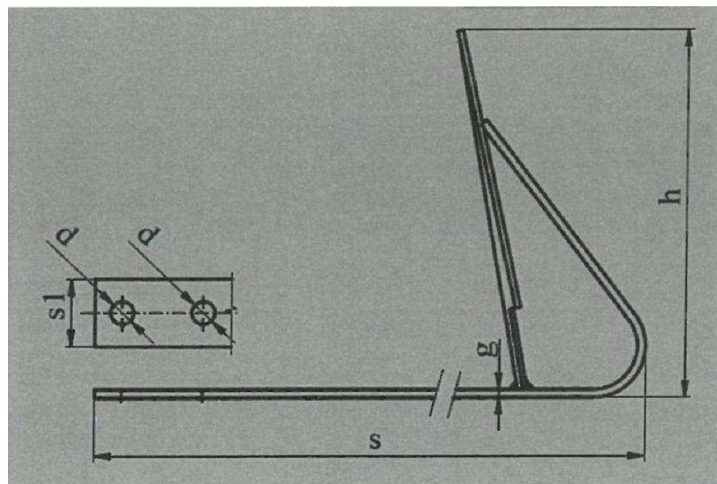
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm
8,5	3	136	40	347	25

Figure A42. Snow breaker- model ST – type A



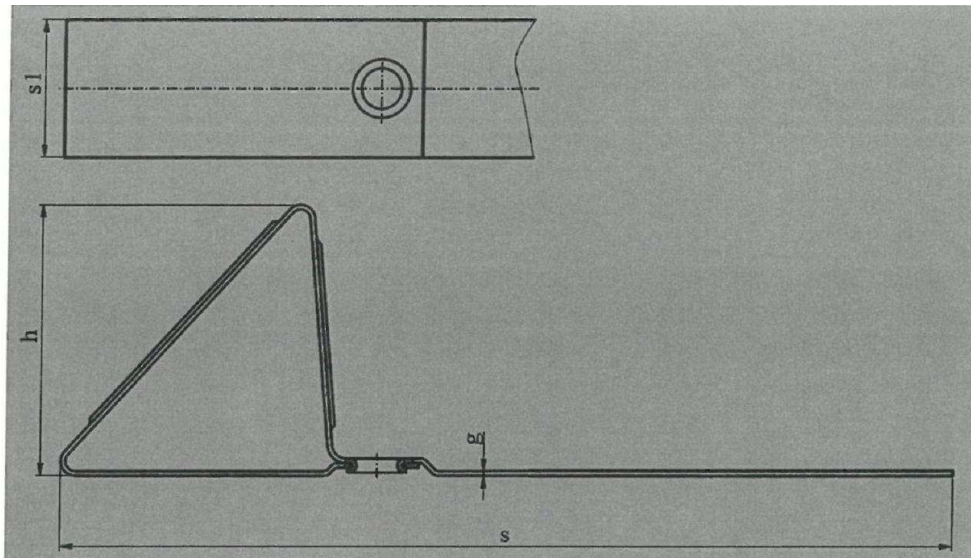
d, mm	g, mm	h, mm	h1, mm	s, mm	s1, mm	s2, mm
8,5	3	150 ÷ 180	21,35	385 ÷ 440	25	350 ÷ 400

Figure A43. Snow breaker- model ST – type B



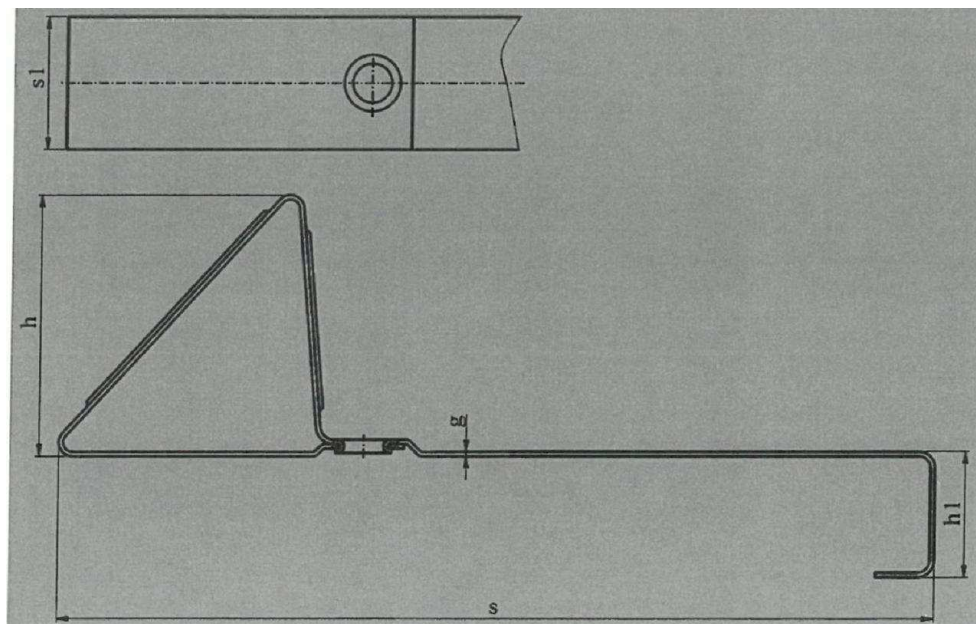
d, mm	g, mm	h, mm	s, mm	s1, mm
8,5	3	136	135	25

Figure A44. Snow breaker- model ST – type C



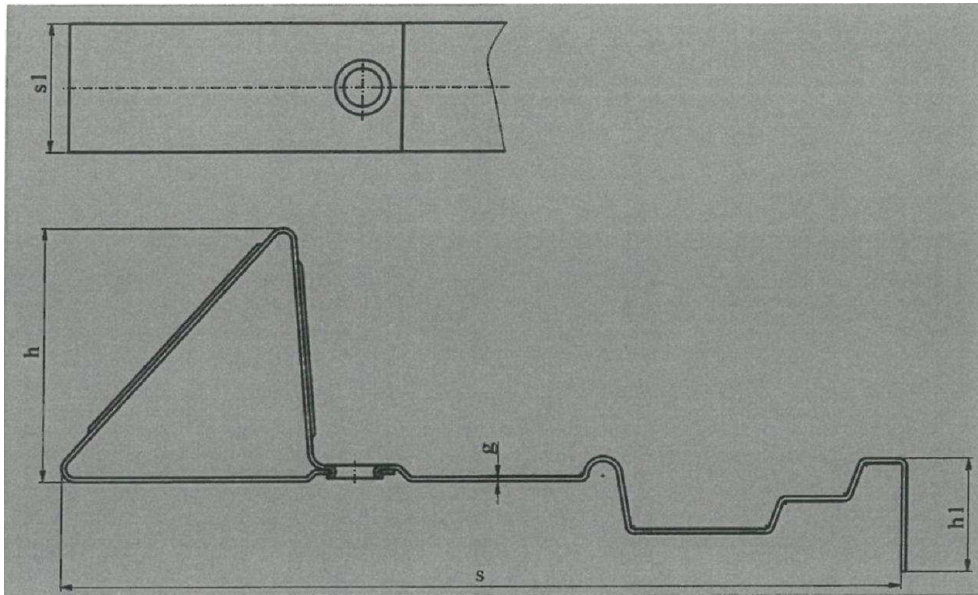
g, mm	h, mm	s, mm	s1, mm
1,0 ÷ 1,5	50 ÷ 100	200 ÷ 500	25 ÷ 50

Figure A45. Snow breaker- model BL – type universal



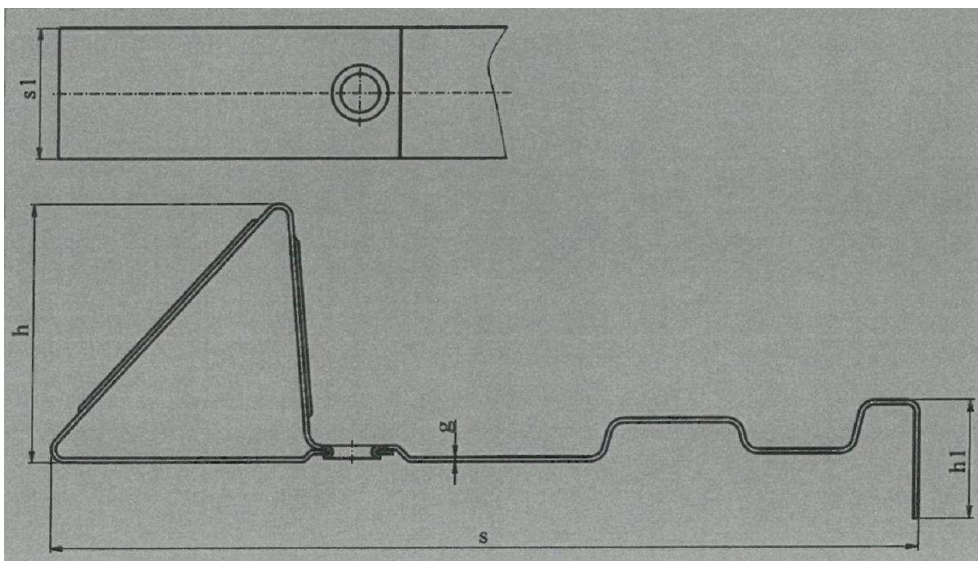
g, mm	h, mm	h1, mm	s, mm	s1, mm
1,0 ÷ 1,5	50 ÷ 100	20 ÷ 50	200 ÷ 500	25 ÷ 50

Figure A46. Snow breaker model BL – type for concrete tiles



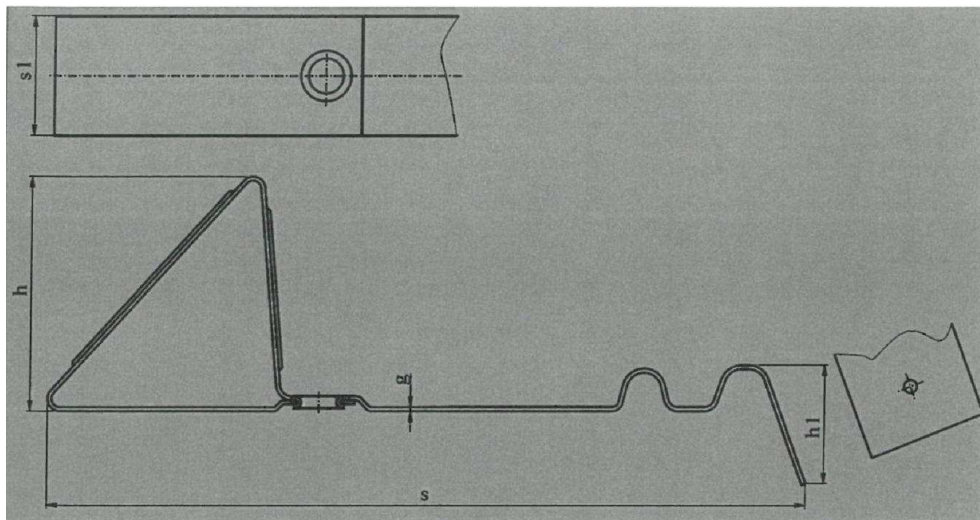
g, mm	h, mm	h1, mm	s, mm	s1, mm
1,0 ÷ 1,5	50 ÷ 100	25 ÷ 35	200 ÷ 500	25 ÷ 50

Figure A47. Snow breaker model BL - type Creaton Simpla



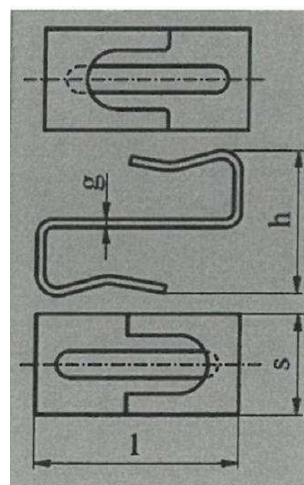
g, mm	h, mm	h1, mm	s, mm	s1, mm
1,0 ÷ 1,5	50 ÷ 100	20 ÷ 50	200 ÷ 500	25 ÷ 50

Figure A48. Snow breaker- model BL – type Titania



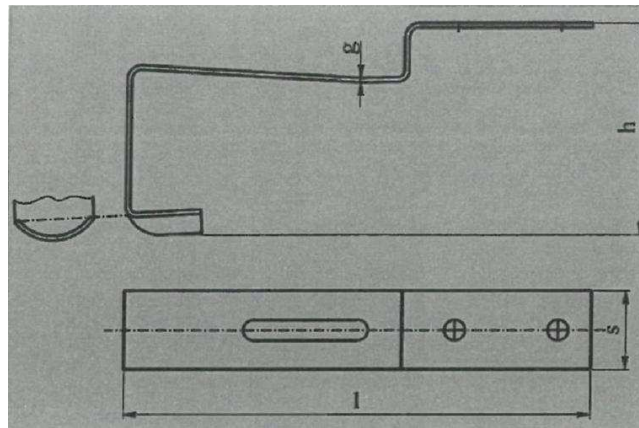
g, mm	h, mm	h1, mm	s, mm	s1, mm
1,0 ÷ 1,5	50 ÷ 100	20 ÷ 50	200 ÷ 500	25 ÷ 50

Figure A49. Snow breaker- model BL – type A



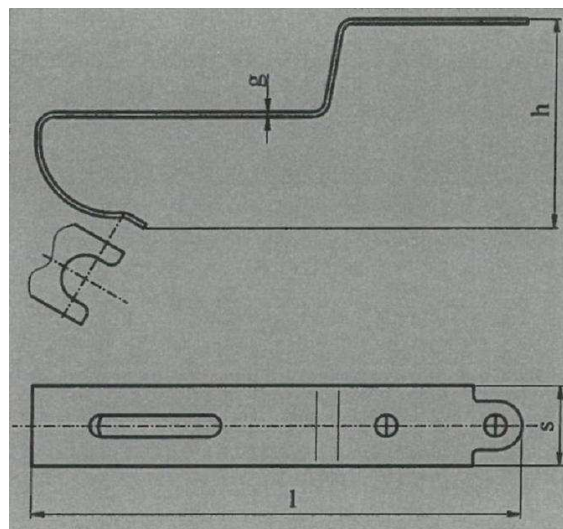
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	20 ÷ 30	30 ÷ 50	17 ÷ 20

Figure A50. Clamp for ridge tiles - type A



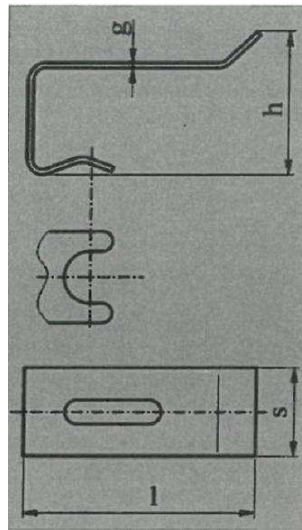
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	40 ÷ 65	100 ÷ 130	17 ÷ 20

Figure A51. Clamp for ridge tiles - type B



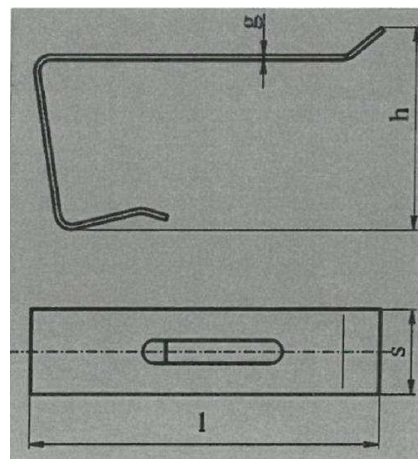
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	40 ÷ 65	100 ÷ 130	17 ÷ 20

Figure A52. Clamp for ridge tiles - type C



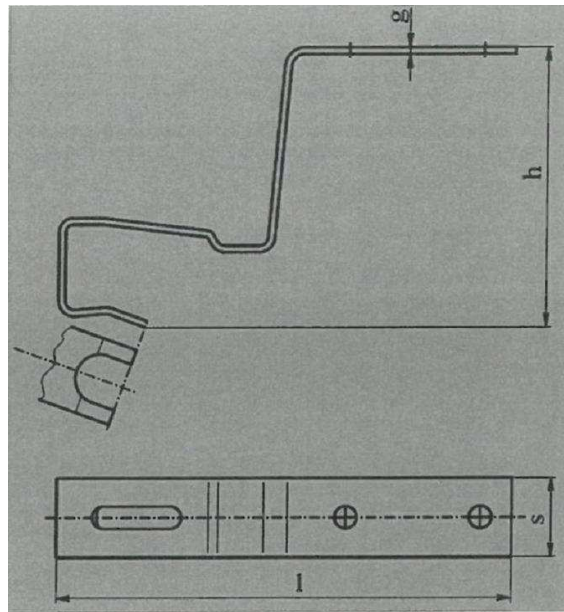
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	25 ÷ 35	45 ÷ 55	17 ÷ 20

Figure A53. Clamp for ridge tiles - type D



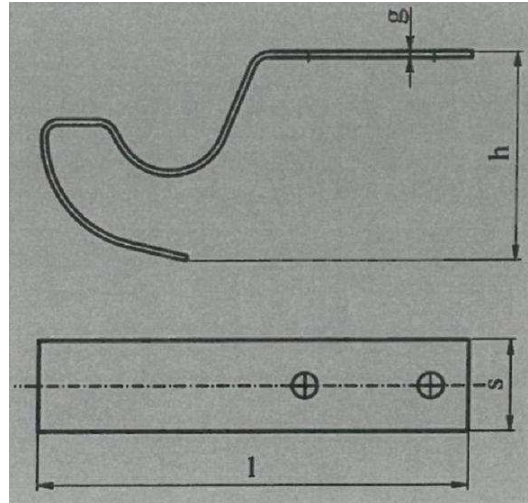
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	40 ÷ 50	70 ÷ 85	17 ÷ 20

Figure A54. Clamp for ridge tiles - type E



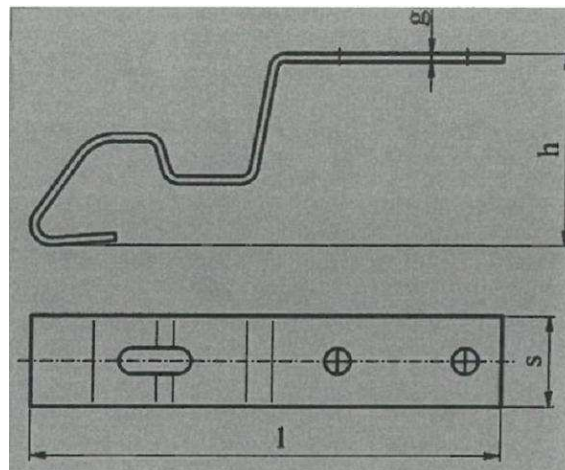
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	60 ÷ 70	80 ÷ 110	17 ÷ 20

Figure A55. Clamp for ridge tiles - type F



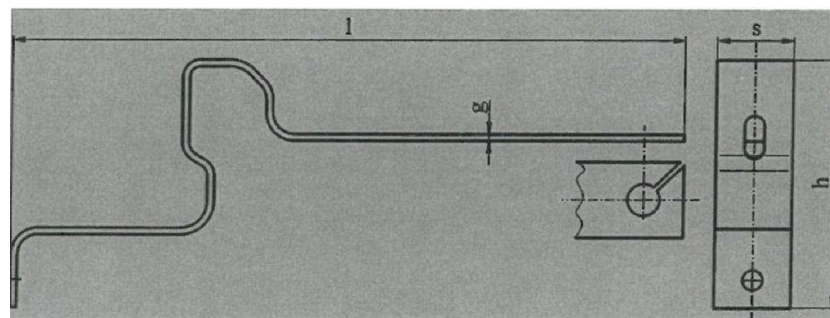
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	35 ÷ 70	70 ÷ 100	17 ÷ 20

Figure A56. Clamp for ridge tiles - type G



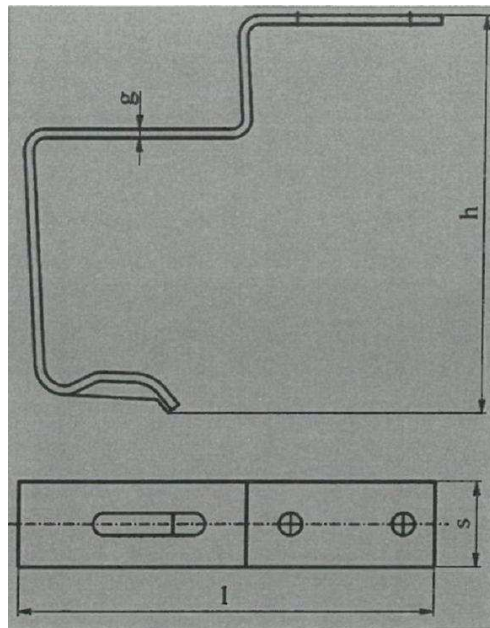
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	30 ÷ 45	70 ÷ 100	17 ÷ 20

Figure A57. Clamp for ridge tiles - type H



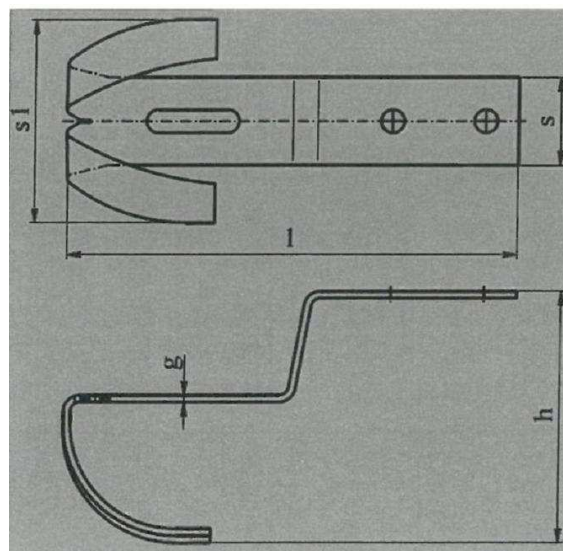
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	50 ÷ 70	150 ÷ 180	17 ÷ 20

Figure A58. Clamp for ridge tiles - type I



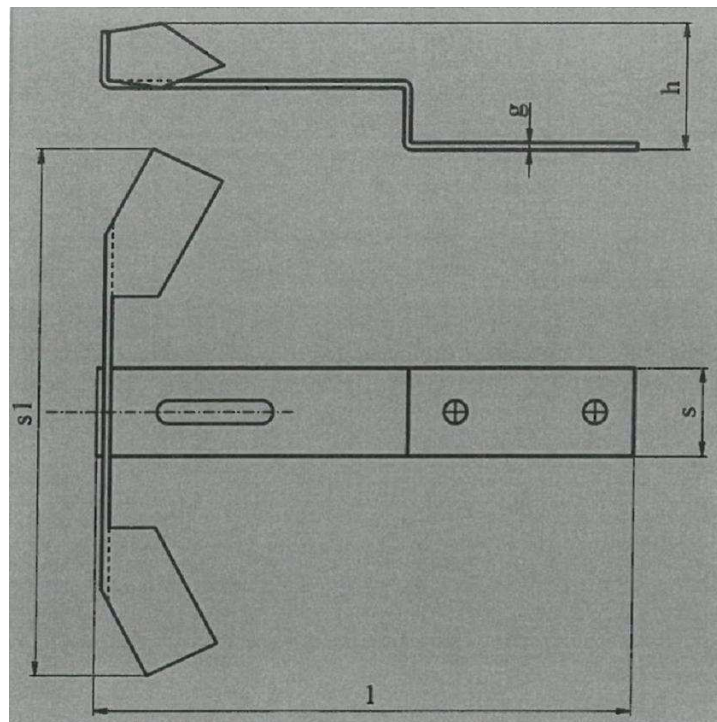
g, mm	h, mm	l, mm	s, mm
1,0 ÷ 1,8	70 ÷ 100	80 ÷ 120	17 ÷ 20

Figure A59. Clamp for ridge tiles - type J



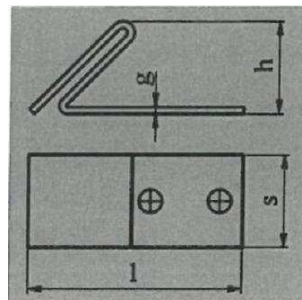
g, mm	h, mm	l, mm	s, mm	s1, mm
1,0 ÷ 1,8	40 ÷ 60	80 ÷ 120	17 ÷ 20	40 ÷ 50

Figure A60. Clamp for ridge tiles - type K



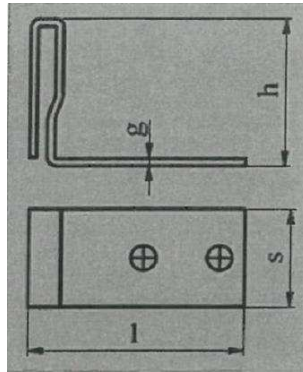
g, mm	h, mm	l, mm	s, mm	s1, mm
1,0 ÷ 1,8	20 ÷ 40	100 ÷ 130	17 ÷ 20	100 ÷ 130

Figure A61. Clamp for ridge tiles - type L

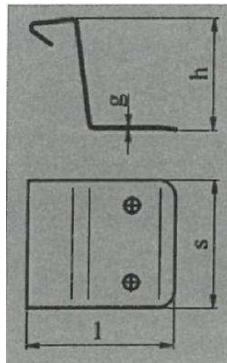


g, mm	h, mm	l, mm	s, mm
0,4 ÷ 0,6	10 ÷ 30	37 ÷ 42	17 ÷ 20

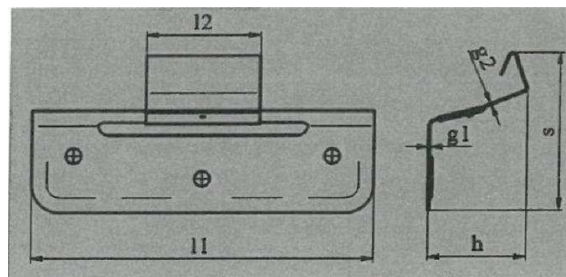
Figure A62. Clamp for roof valley - type A



g, mm	h, mm	l, mm	s, mm
0,4 ÷ 0,6	20 ÷ 60	37 ÷ 42	17 ÷ 20

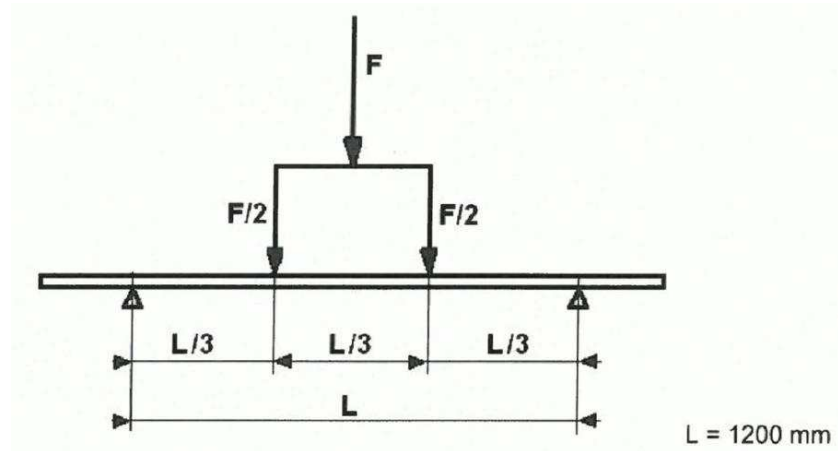
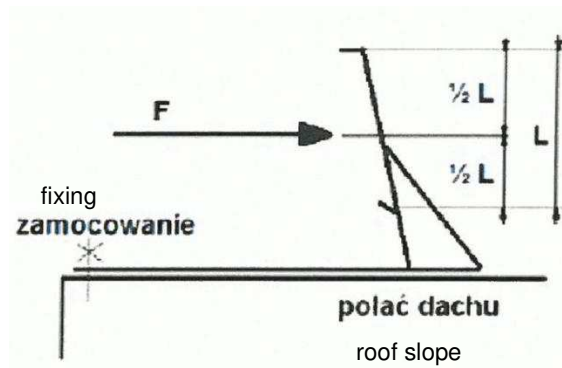
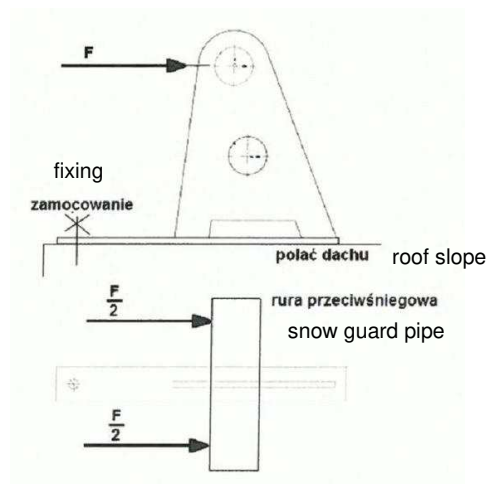
Figure A63. Clamp for roof valley - type B


g, mm	h, mm	l, mm	s, mm
0,2 ÷ 0,5	20 ÷ 30	25 ÷ 40	25 ÷ 35

Figure A64. Roof valley flashing installation clip unmovable


g1, mm	g2, mm	h, mm	l1, mm	l2, mm	s, mm
0,2 ÷ 0,5	0,2 ÷ 0,5	15 ÷ 35	50 ÷ 150	15 ÷ 60	30 ÷ 60

Figure A65. Roof valley flashing installation clip movable

Attachment B.

Figure B1. Testing scheme of the destructive forces on the snow stopper fence

Figure B2. Testing scheme of the destructive forces on the snow stopper fence bracket and the snow stopper beam bracket

Figure B3. Testing scheme of the destructive forces on the pipe snow guard bracket of the snow protector

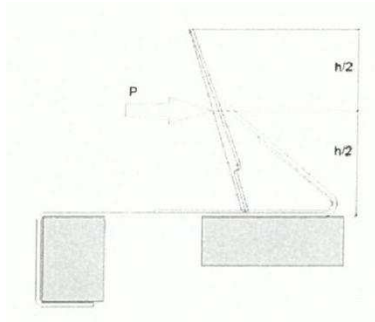


Figure B4. Testing scheme of the destructive forces on the snow breaker

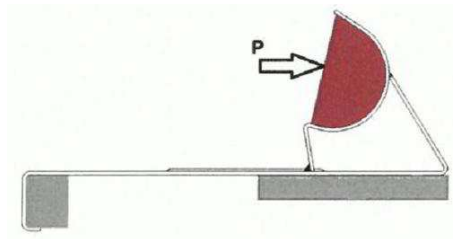


Figure B5. Testing scheme of the destructive forces on the snow stopper beam bracket