Deutsches Institut für Bautechnik

DIBt

Approval Body for construction products and types of construction
Structural safety control authority
(*Bautechnisches Prüfamt*)
Public-law institution
Member of EOTA, UEAtc and WFTAO

Allgemeine bauaufsichtliche Zulassung
(National Technical Approval)

Date:	Reference:
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(In case of doubt, the German-language original shall be considered authoritative)

Approval Number:
Z-14.4-766

Validity
from: **11 July 2016**
to: **11 July 2021**

Applicant:
Hilti Deutschland AG
Hiltistraße 2
86916 Kaufering

Subject of approval:
Hilti cartridge fired pin X-R 14P8 in corrosion resistant steel for fastening of attachment profiles for building facades

The subject of approval mentioned above is herewith generally approved in the field of construction. This national technical approval *(allgemeine bauaufsichtliche Zulassung)* comprises six pages and twelve Annexes.

I GENERAL PROVISIONS

1 With the national technical approval (*allgemeine bauaufsichtliche Zulassung*), the fitness for use and the applicability of the subject of approval in accordance with the Building Codes of the Federal States (*Landesbauordnungen*) have been verified.

2 If in the national technical approval (*allgemeine bauaufsichtliche Zulassung*) requirements are made concerning the special expertise and experience of persons entrusted with the manufacture of construction products and construction techniques in accordance with the provisions of the relevant federal state following Section 17, Sub-Section 5 of the Model Building Code (*Musterbauordnung*), it is to be noted that this expertise and experience can also be proven by equivalent verifications from other Member States of the European Union. If necessary, this also applies to verifications presented within the framework of the Agreement on the European Economic Area (EEA) or other bilateral agreements.

3 The national technical approval (*allgemeine bauaufsichtliche Zulassung*) does not replace the permits, approvals or certificates prescribed by law for carrying out building projects.

4 The national technical approval (*allgemeine bauaufsichtliche Zulassung*) is granted without prejudice to the rights of third parties, in particular private property rights.

5 Notwithstanding further provisions in the 'Special Provisions', manufacturers and distributors of the subject of approval shall make copies of the national technical approval (*allgemeine bauaufsichtliche Zulassung*) available to the user and point out that the national technical approval (*allgemeine bauaufsichtliche Zulassung*) shall be available at the place of use. Upon request, copies of the national technical approval (*allgemeine bauaufsichtliche Zulassung*) shall be placed at the disposal of the authorities involved.

6 The national technical approval (*allgemeine bauaufsichtliche Zulassung*) may be reproduced in full only. Partial publication requires the consent of Deutsches Institut für Bautechnik. Texts and drawings in advertising brochures may not be in contradiction to the national technical approval (*allgemeine bauaufsichtliche Zulassung*). In the event of a discrepancy between the German original of the national technical approval (*allgemeine bauaufsichtliche Zulassung*) and this authorised translation, the German version shall prevail.

7 The national technical approval (*allgemeine bauaufsichtliche Zulassung*) is granted until revoked. The provisions of the national technical approval (*allgemeine bauaufsichtliche Zulassung*) can subsequently be supplemented and amended, in particular if this is required by new technical findings.

II SPECIFIC PROVISIONS

1 Subject of approval and field of application

Subject of approval is a mechanical fastening element (Hilti cartridge fired pin X-R 14P8 according to Annex 1) for regular load bearing connection of attachment profiles made of steel or aluminium with supporting structures made of steel. The attachment profiles are considered for mechanical fastening of continuously fixed glazing. The installation of the cartridge fired pins is achieved by using the direct fastening tool Hilti DX 450 (see Annex 1). The application limit of the cartridge fired pin depends on the strength and thickness of the supporting structure.

This national technical approval (*allgemeine bauaufsichtliche Zulassung*) specifies the connections executed with the cartridge fired pin for static and quasi static loads. For the execution the valid technical construction rules shall be taken into account unless otherwise stated in the following.

2 Characteristics of the construction product

2.1 Characteristics and composition

2.1.1 General

The attachment profiles are either cold-formed from steel sheet (see also Annex 5) or produced as extruded aluminium section (see also Annexes 2 to 4 and 6).

2.1.2 Dimensions

For the cartridge fired pin the data in Annex 1 apply. For the attachment profiles and the supporting structure the data in Annexes 2 to 7 apply.

2.1.3 Materials

For the cartridge fired pins (pin and washer) the data in Annex 1, Table 1 apply.

For the attachment profiles and the supporting structure the data in Annex 7 apply.

Further information with regard to the material properties are deposited at Deutsches Institut für Bautechnik.

2.2 Marking

The package of the cartridge fired pins or the enclosed leaflet shall be marked by the manufacturer with the conformity mark Ü (Ü-mark) according to the regulations on the conformity mark of the states of the Federal Republic of Germany (*Übereinstimmungszeichen-Verordnungen der Länder*). The marking may only be applied if the requirements according to Section 2.3 have been met.

Every package shall have an additional label with information about the factory (factory code), the description, the geometry and the material of the cartridge fired pins.

2.3 Verification of conformity

2.3.1 General

Proof of conformity of the construction product with the provisions of this national technical approval (*allgemeine bauaufsichtliche Zulassung*), shall be delivered by means of a certificate of conformity issued for each manufacturing plant and based on factory production control and continuous surveillance including initial-type testing of the construction product in accordance with the following provisions.

The manufacturer of the construction product shall involve an accredited certification body and an accredited monitoring body for the issuing of the certificate of conformity and for the external monitoring, including the related product inspections.

The declaration that a certificate of conformity has been granted shall be given by the manufacturer by marking the construction products with the mark of conformity (*Ü-Zeichen*) ('Ü mark') stating the intended use.

The certification body shall submit, for information, a copy of the relevant certificate of conformity to the Deutsches Institut für Bautechnik.

For the scope, way and frequency of the factory production control and the continuous surveillance by a notified body the "Grundsätze für den Übereinstimmungsnachweis für Verbindungselemente im Metallleichtbau, Fassung August 1999" ('Principles for the proof of conformity of fastening elements for light weight metal structures, version August 1999') (see issue 6/1999 of "DIBt Mitteilungen") apply.

2.3.2 Factory production control

Every manufacturing plant shall have a factory production control system and exercise factory production control. Factory production control means the permanent control of production exercised by the manufacturer by which the latter ensures that the construction products produced by him are in conformity with this national technical approval (*allgemeine bauaufsichtliche Zulassung*).

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

- designation of the construction product or the initial materials and the components
- type of control or test,
- date of manufacture and date of testing of the construction product or the initial materials and the components,
- results of control and comparison with requirements deposited at Deutschem Institut für Bautechnik,
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and shall be presented to the inspection body involved in surveillance. On request, they shall be presented to the Deutsches Institut für Bautechnik and to the relevant supreme building authority.

In case of unsatisfactory test results the manufacturer shall immediately take the measures necessary to rectifying the fault. Construction products not meeting the requirements shall be handled in a way that confusion with the products in compliance with the specifications will be excluded. As soon as the fault has been rectified – as far as technically possible and required for evidence that the fault has been rectified – the corresponding test shall be repeated immediately.

2.3.3 Surveillance

Factory production control exercised in every manufacturing plant shall be continuously verified by surveillance, but at least once a year.

In the framework of surveillance, an initial-type testing of the construction product shall be performed and also samples can be taken for audit-testing. Sampling and testing are in the responsibility of the approved body.

The results of the certification and surveillance shall be kept for at least five years. On request, it shall be presented by the certification body or inspection body to the Deutsches Institut für Bautechnik and to the relevant supreme building authority.

3 Provisions for design and calculation

3.1 Design

The attachment profiles may be fastened to hollow steel sections or other steel sections (see Annex 2 to Annex 7)

For the minimum spacing, end and edge distances the provisions in Annex 9, Table 8 apply.

The application limits according to Annex 8 shall be taken into account. If the tensile strength of the used steel grade is not known the upper limits of the appropriate steel grades given in the graph "Application limits and nail head standoff h_{NVS}" shall be considered.

3.2 Calculation

3.2.1 General

The verification concept given in DIN EN 1990[1] applies.

3.2.2 Characteristic values of resistance

The characteristic values of resistance are specified in Annex 10, Table 9.

The following applies:

N_{Rk} - characteristic value of tension resistance

V_{Rk} - characteristic value of shear resistance

3.2.3 Design values of resistance

For the calculation of the design values of resistance from the characteristic values the following applies:

$$N_{Rd} = \frac{N_{Rk}}{\gamma_M}$$

$$V_{Rd} = \frac{V_{Rk}}{\gamma_M}$$

with $\gamma_M = 1.33$

3.2.4 Combined tension and shear forces

For combined loading by acting design tension forces N_{Sd} and design shear forces V_{Sd} the following verification procedure for interaction applies:

(1) for attachment profiles in steel

$$\frac{N_{Sd}}{N_{Rd}} + \frac{V_{Sd}}{V_{Rd}} \le 1.2 \quad \text{with} \quad \frac{N_{Sd}}{N_{Rd}} \le 1.0 \quad \text{and} \quad \frac{V_{Sd}}{V_{Rd}} \le 1.0$$

(2) for attachment profiles in aluminum

$$\frac{N_{Sd}}{N_{Rd}} + \frac{V_{Sd}}{V_{Rd}} \le 1.0$$

[1] DIN EN 1990:2010-12 Eurocode: Basis of structural design

4 Provisions for execution

The installation of the cartridge fired pins shall be in accordance with this national technical approval (*allgemeine bauaufsichtliche Zulassung*) and the specifications of the manufacturer. A schematic installation instruction is given in Annex 12.

Connections in accordance with clause 1 shall only be executed by companies with the necessary experience unless the instruction of the assembly personnel is arranged by specialists experienced in this field.

The attachment profiles shall be in direct contact with the supporting structure. A zinc coating with a thickness up to approximately 150 µm on hot dip galvanized supporting structures or a dry film thickness up to approximately 160 µm of coatings are allowed.

The cartridge fired pin shall be fixed rectangular to the surface of the component to guarantee a correct load bearing connection.

Only the direct fastening tool Hilti DX 450 intended for installation of the cartridge fired pin shall be used (see Annex 1).

For the fastening of attachment profiles according to Annexes 2 to 5 the distance a between the outside surface of the rectangular profile part and the axis of the pin X-R 14P8 shall be considered in accordance with Tables 2 – 6.

For the fastening of punched attachment profiles according to Annexes 2, 4, 5 and 6 the pins X-R 14P8 shall not be installed through existing holes or slotted holes of the attachment profiles. A minimum distance of 20 mm between the pin axis and the edge of this holes or slotted holes shall be maintained.

Except for attachment profiles according to Annex 6 the nail head standoff h_{NVS} shall be after the installation between 2.0 mm and 3.0 mm for supporting structure thicknesses ≥ 8 mm and between 3.0 mm and 4.5 mm for supporting structure thicknesses < 8 mm.

After the installation of attachment profiles according to Annex 6 the nail head standoff h_{NVS} shall be between 2.0 mm and 3.5 mm.

For cartridge selection and tool energy settings the provisions in Annex 11 apply.

Andreas Schult
Head of section

Beglaubigt ('confirmed')
Hahn

Cartridge fired pin X-R 14P8
(Dimensions in mm)

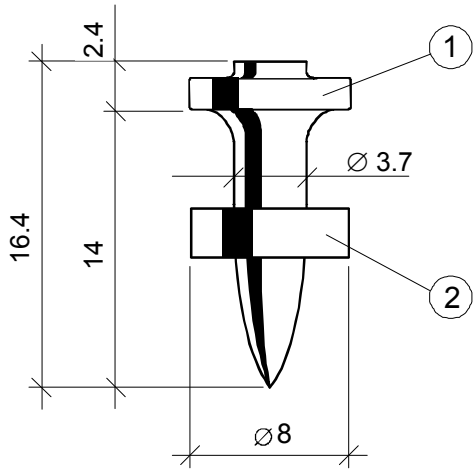
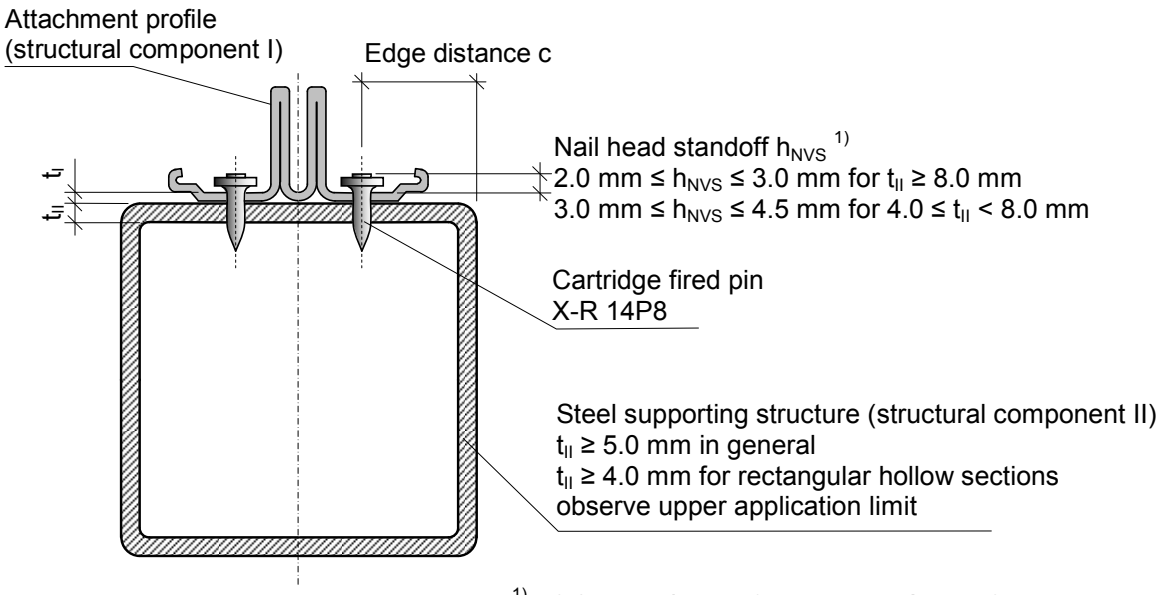


Table 1: Designation and material

Part	Designation	Material
1	Pin	Austenitic CrMnMo-Steel
2	Washer	Plastic

Fastening tool Hilti DX 450 (125%),
8 mm-equipment
with narrow stand plate 45/S5,
125% piston guide
fastener guide 45/F5 and piston 45/DNI-8

Cartridge load cal. 6.8 /11M - yellow, red



1) 2.0 mm ≤ h_{NVS} ≤ 3.5 mm see Annex 6

Hilti cartridge fired pins X-R 14P8 in corrosion resistant steel for fastening of attachment profiles for building facades	Annex 1
Dimensions of the cartridge fired pins, materials, fastening tool, cartridge loads	

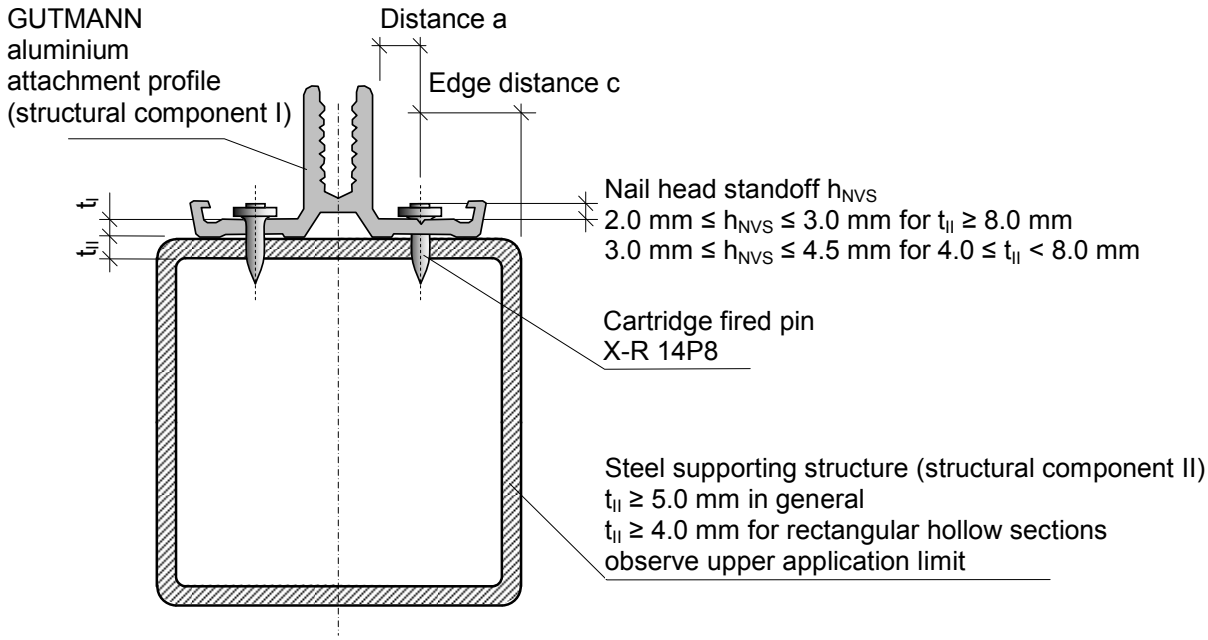


Table 2: GUTMANN aluminum attachment profiles distances[1)]

GUTMANN aluminum attachment profile order number	**F50+** 154003	**F60+** 164003	**P GF 80** 599343
Distance a between the outside surface of the rectangular profile part and the axis of the pin X-R 14P8	5.5 – 6.0 mm		
Minimum distance between the pin axis and the edge of the holes or slotted holes in the attachment profiles [2)]	20 mm		

[1)] The spacing, end and edge distances according to Annex 9 shall be met.
[2)] Pins X-R 14P8 shall not be installed through existing holes or slotted holes.

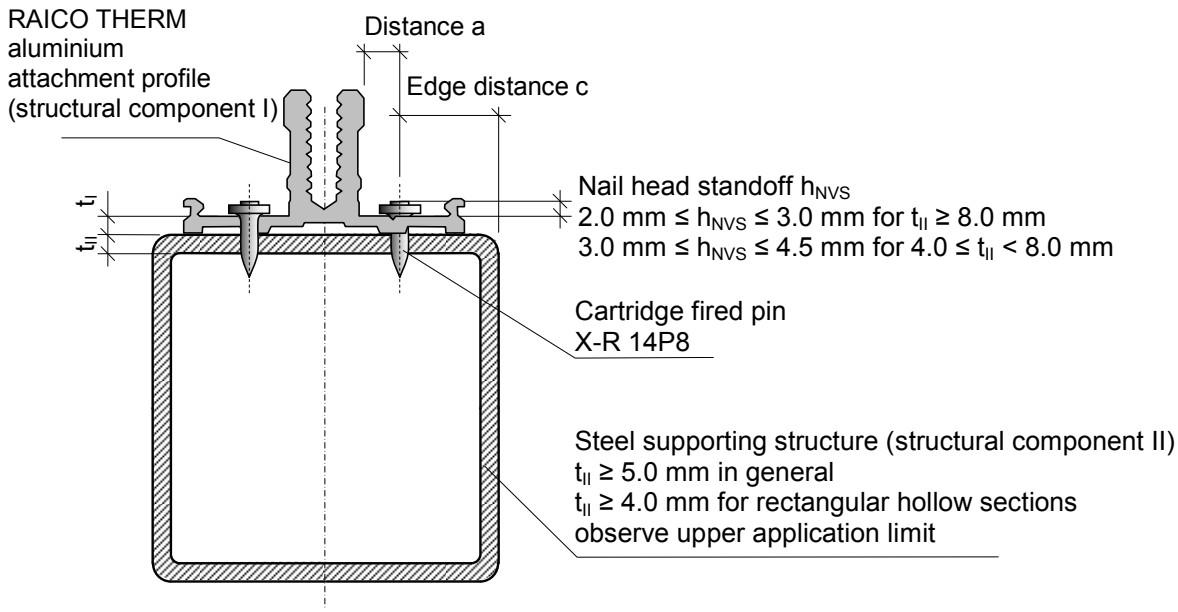


Table 3: RAICO THERM aluminum attachment profiles without punching distance a

RAICO THERM attachment profile order number	**41** 145006	**47** 145011	**67** 145016	**87** 145050	**41V** 144006	**47V** 144011	**67V** 144015
Distance a between the outside surface of the rectangular profile part and the axis of the pin X-R 14P8	5.3 mm The pin guide of the fastening tool shall be in direct contact with the screw channel of the attachment profile						

The spacing, end and edge distances according to Annex 9 shall be met.

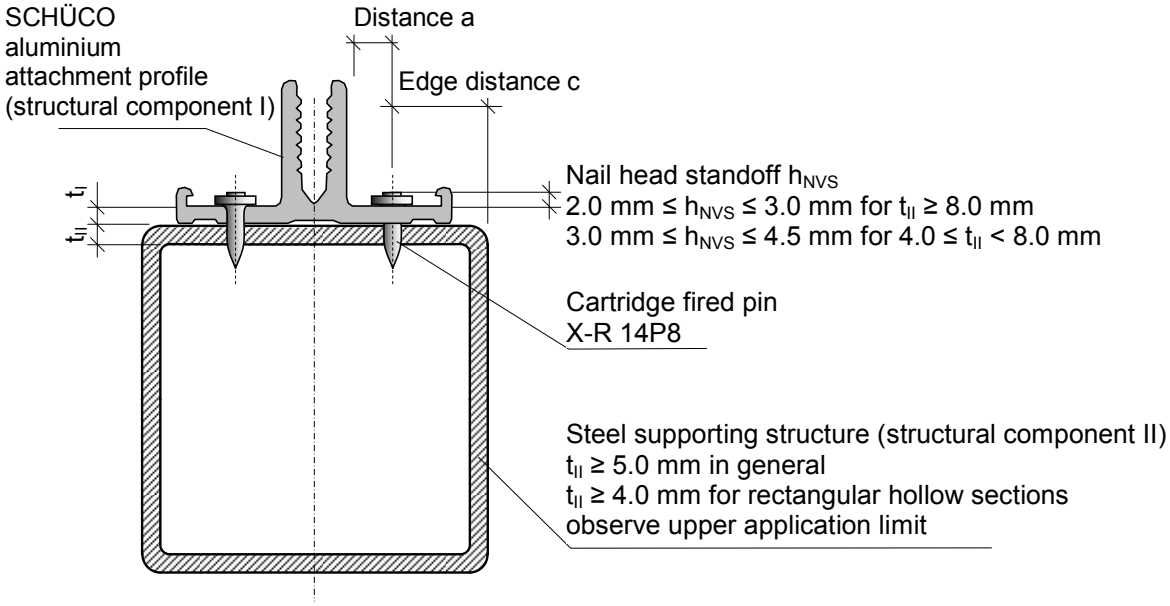


Table 4: SCHÜCO aluminum attachment profiles AOC, punched distances[1)]

SCHÜCO aluminum attachment profile order number	**AOC** 433470
Distance a between the outside surface of the rectangular profile part and the axis of the pin X-R 14P8	7.3 mm
Minimum distance between the pin axis and the edge of the holes or slotted holes in the attachment profiles [2)]	20 mm

1) The spacing, end and edge distances according to Annex 9 shall be met.
2) Pins X-R 14P8 shall not be installed through existing holes or slotted holes.

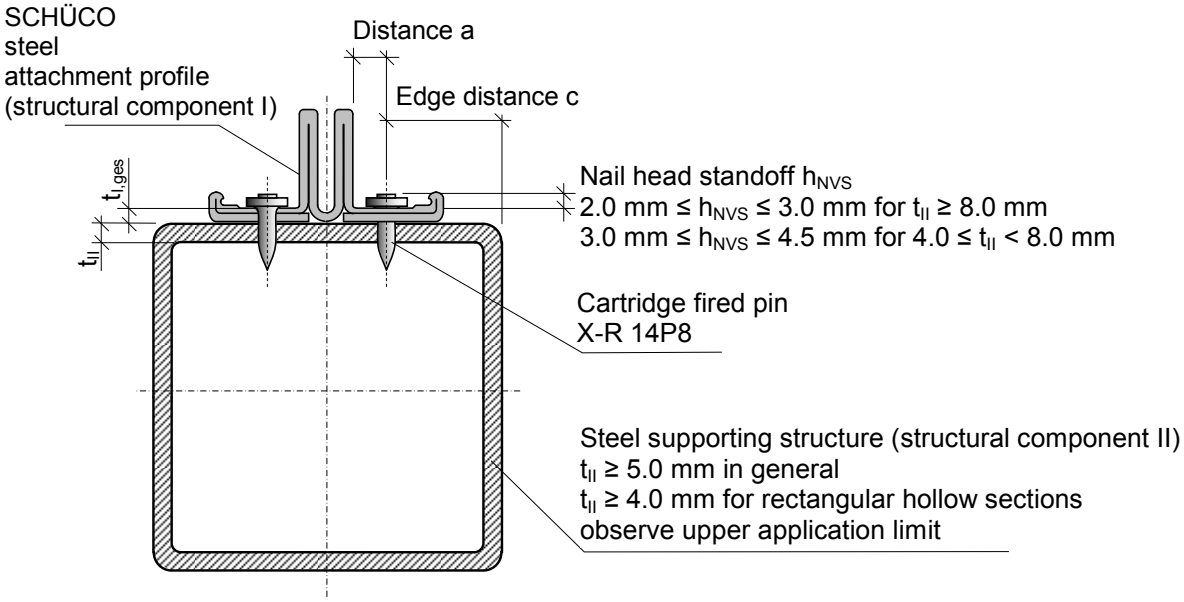


Table 5: SCHÜCO steel attachment profiles AOC, punched and not punched distances[1)]

SCHÜCO steel-attachment profile order number	**AOC, punched** 201298	**AOC, not punched** 201308
Distance a between the outside surface of the rectangular profile part and the axis of the pin X-R 14P8	6.3 mm	
Minimum distance between the pin axis and the edge of the holes or slotted holes in the attachment profiles	20 mm [2)]	not relevant

[1)] The spacing, end and edge distances according to Annex 9 shall be met.
[2)] Pins X-R 14P8 shall not be installed through existing holes or slotted holes.

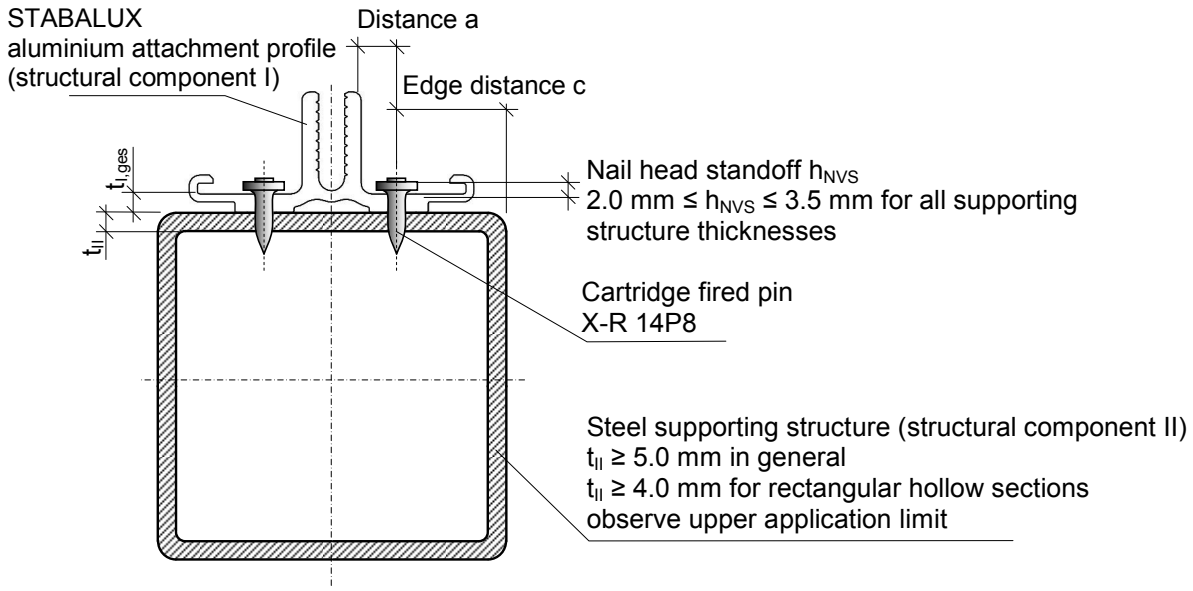
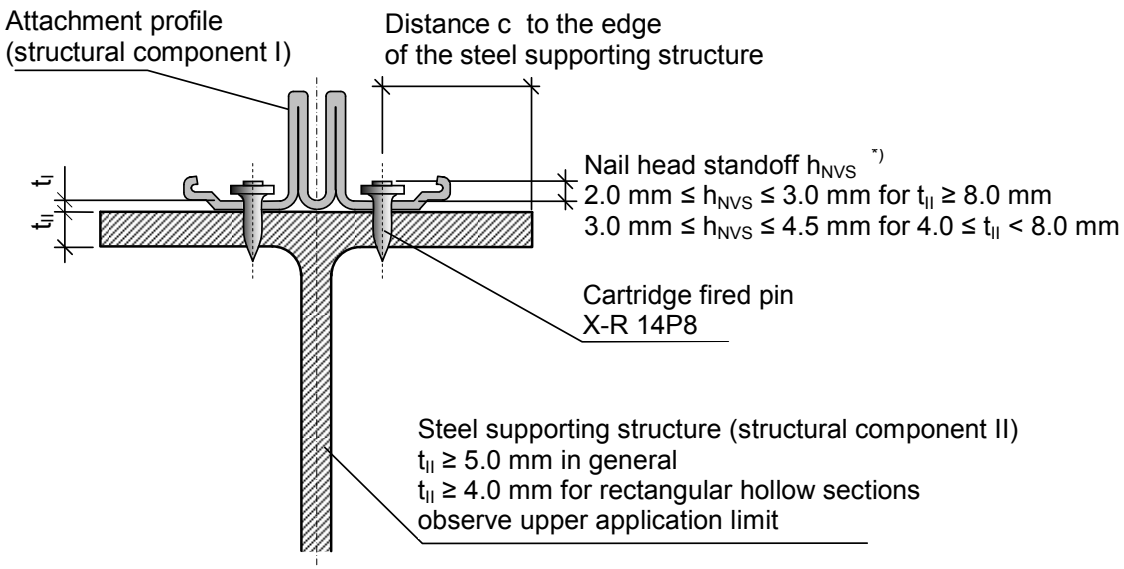


Table 6: STABALUX aluminum attachment profiles AK 6010, punched distances[1)]

STABALUX aluminum attachment profile order number	**AK ALU-S, punched** AK 6010
Distance a between the outside surface of the rectangular profile part and the axis of the pin X-R 14P8	7.5 mm
Minimum distance between the pin axis and the edge of the holes or slotted holes in the attachment profiles	20 mm [2)]

1) The spacing, end and edge distances according to Annex 9 shall be met.
2) Pins X-R 14P8 shall not be installed through existing holes or slotted holes.



*) 2.0 mm ≤ h_{NVS} ≤ 3.5 mm see Annex 6

Table 7: Attachment profile and supporting structure (compare Annexes 1 - 6)

Structural component	Properties		
I	**Attachment profile**		
	material	galvanised steel at least S250 according to DIN EN 10346	aluminum EN AW 6060 T66 according to DIN EN 755-2
	minimum tensile strength	$R_{mI} \geq 330$ N/mm²	$R_{mI} \geq 215$ N/mm²
	thickness t_I	1.5 mm ≤ t_I ≤ 2.5 mm [1)]	1.8 mm [2)]
	maximum profile length	no limitation	6 m
II	**Supporting structure: Steel hollow sections and steel sections**		
	material	steel S235, S275, S355 according to DIN EN 10025-2	
	tensile strength	360 N/mm² ≤ R_{mII} ≤ 630 N/mm² , depending on t_{II} according to the application limits [3)]	
	thickness t_{II}	general: t_{II} ≥ 5 mm or upper application limit[3)] rectangular hollow sections: t_{II} ≥ 4 mm or upper application limit[3)]	

1) e.g. RP-Technik RP-tec 50-1 – 80-1
SCHÜCO steel-attachment profiles according Annex 5: $t_{I,ges}$ = 2.5 mm = 1.0 mm + 1.5 mm

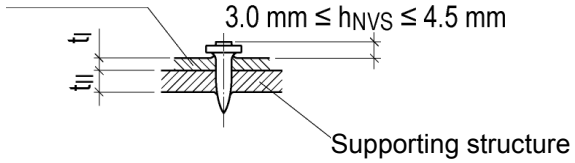
2) e.g. RP-Technik RP-tec 50-1 – 80-1
GUTMANN aluminum- attachment profiles according Annex 2: t_I = 2.5 mm
RAICO THERM aluminum- attachment profiles according Annex 3: t_I = 2.5 mm
SCHÜCO aluminum- attachment profiles according Annex 4: t_I = 3.0 mm
STABALUX aluminum- attachment profiles according Annex 6: t_I = 3.5 mm

3) see Annex 8

Application limits and nail head standoff h_{NVS}

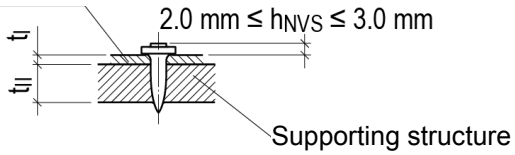
- Attachment profile general
- Attachment profile according to Annexes 2 to 5

Attachment profile



For supporting structure thickness
4.0 mm ≤ t_{II} < 8.0 mm

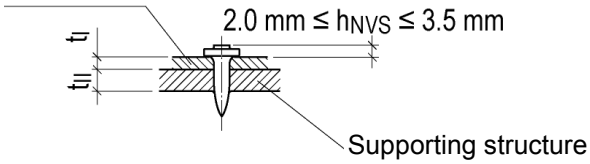
Attachment profile



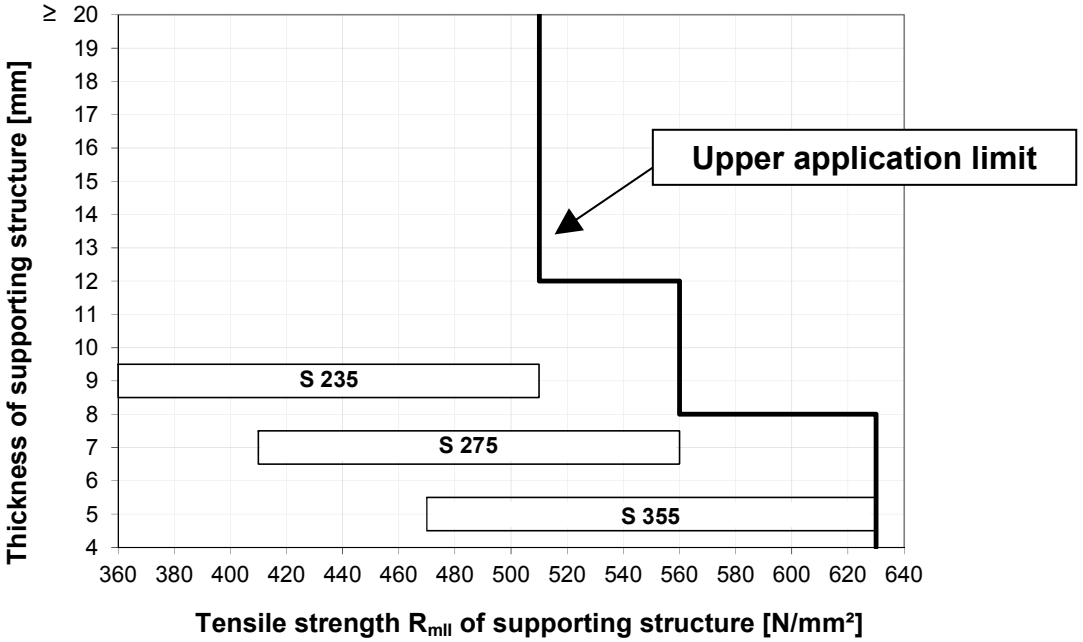
For supporting structure thickness t_{II} ≥ 8.0 mm

- Attachment profile according to Annexes 6

Attachment profile



For supporting structure thickness t_{II} ≥ 4.0 mm



Steel supporting structure (structural component II)

Thickness ≥ 5 mm in general
Thickness ≥ 4 mm for rectangular hollow sections

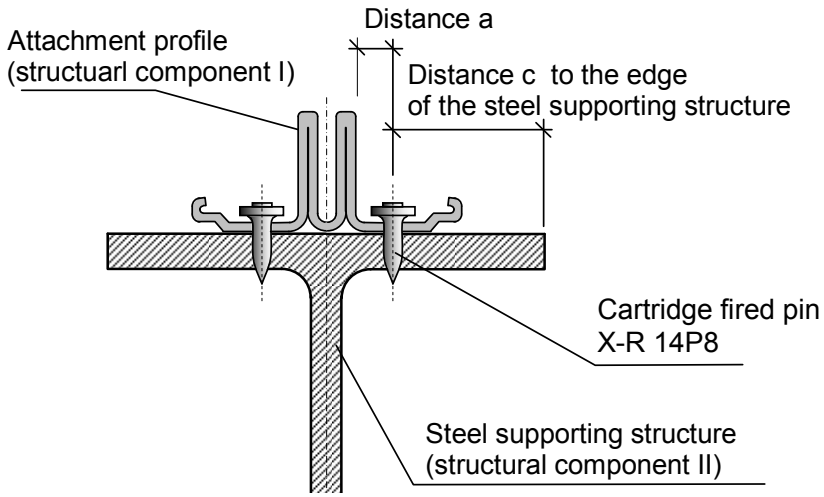
Maximum thickness of steel supporting structure: Observe upper application limit

Hilti cartridge fired pins X-R 14P8 in corrosion resistant steel for fastening of attachment profiles for building facades	Annex 8
Application limit, nail head standoff	

Table 8: Spacing and end and edge distances of the cartridge fired pins for the fastening of aluminum and steel attachment profiles[1)]

Supporting structure (structural component II)	**Steel section**		**Rectangular steel hollow section**	
	5mm ≤ t_{II} < 7mm	**7mm ≤ t_{II} ≤ 12mm**	**4mm ≤ t_{II} < 5mm**	**5mm ≤ t_{II} ≤ 12mm**
distance c to the edge of the steel supporting structure	c ≥ 15 mm	c ≥ 10 mm	10 mm ≤ c ≤ 40 mm	c ≥ 10 mm
distance c_1 to the end-edge of the attachment profiles [2)]	c_1 ≥ 20 mm			
spacing rectangular to the profile axis [2)]	s_2 ≥ 20 mm			
Aluminum-attachment profiles: spacing into profile axis for tensile loads in direction of the pin axis [2)]	50 mm ≤ s_1 ≤ 250 mm			
Aluminum-attachment profiles: spacing into profile axis for shear loads vertical to the pin axis [2)]	20 mm ≤ s_1 ≤ 250 mm			
Steel-attachment profiles: spacing into profile axis [2)]	s_1 ≥ 20 mm			

[1)] additional provisions apply for the attachment profiles according Annexes 2 - 6, see Annexes 2 – 6
[2)] see Annex 10



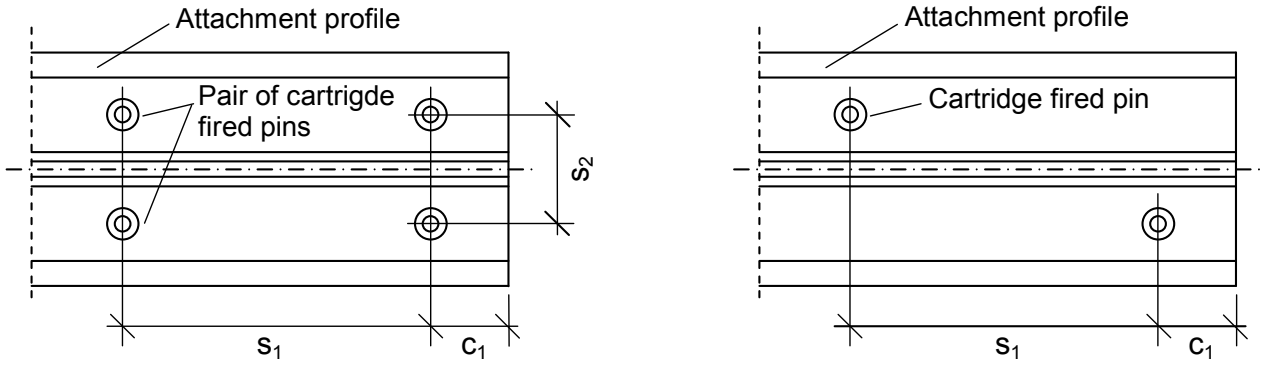


Table 9: Characteristic values of resistance of the cartridge fired pin

Attachment profile (structural component I according Table 7 or according Annexes 2 - 6)	**Galvanised steel at least S250 acc. DIN EN 10346**	**SCHÜCO steel-attachment profiles AOC ST with double-layer design (Annex 5)**	**Aluminum EN AW 6060 T66 acc. DIN EN 755-2**
$\mathbf{N_{Rk}}$ tensile load in the axes of the pin	2.8 kN	2.2 kN	1.9 kN
$\mathbf{V_{Rk}}$ shear load vertical to the axis of the pin	3.2 kN	3.2 kN	2.6 kN

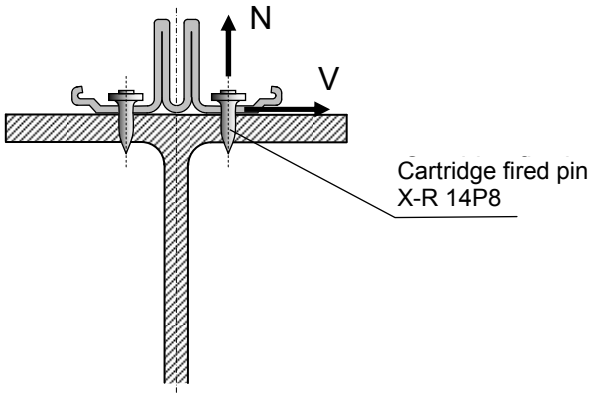
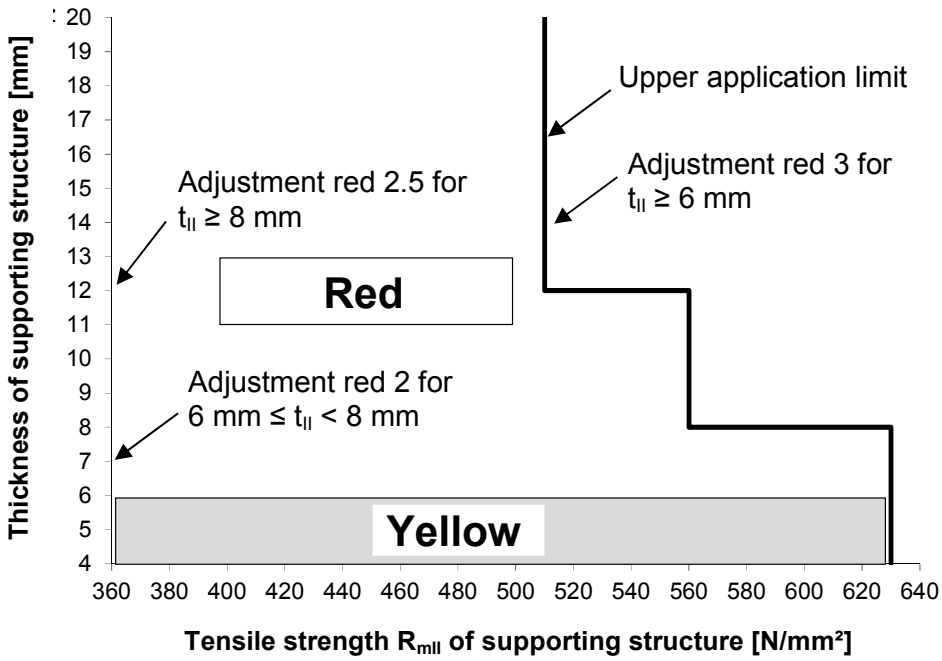


Table 10: Cartridge selection and tool energy setting

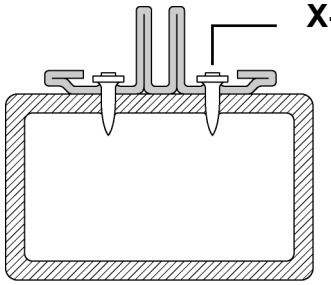
Supporting structure thickness t_{II}	Supporting structure tensile strength R_{mII}	Cartridge selection and tool energy setting at direct fastening tool Hilti DX 450 (125 %)
4 to 5 mm	360 N/mm²	yellow 1.0
	630 N/mm²	yellow 1.5
5 to 6 mm	360 N/mm²	yellow 2.5
	630 N/mm²	yellow 3.0
> 6 mm	360 N/mm²	red 2.0 (6 to 8 mm) and red 2.5 (≥ 8 mm)
	upper application limit	red 3.0



Detection of the optimum tool energy setting at direct fastening tool Hilti DX 450 (125%): Approach

1. Preselection of cartridges and tool energy setting according to Table 10
2. Acceptance settings with a target area of the nail head standoff according to Annex 8
3. Eventually adjustment of the tool energy setting at direct fastening tool with turning wheel

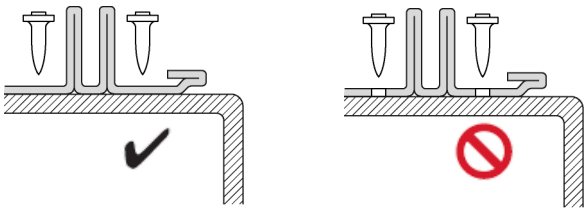
1



2

DX 450 (125%)

3



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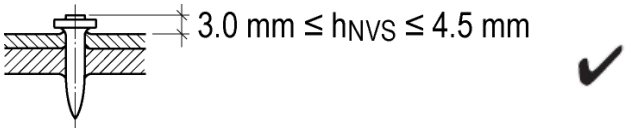
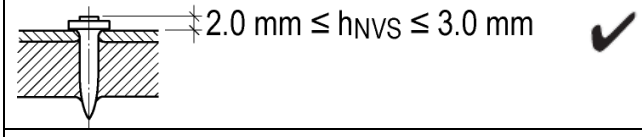
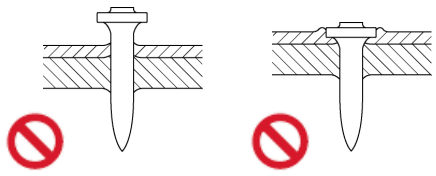


For supporting structure thicknesses
4.0 mm ≤ t_{II} < 8.0 mm



For supporting structure thicknesses
t_{II} ≥ 8.0 mm



Specific provision for STABALUX aluminium-attachment profile AK 6010 according to Annex 6: 2.0 mm ≤ h_{NVS} ≤ 3.5 mm

Hilti cartridge fired pins X-R 14P8 in corrosion resistant steel for fastening of attachment profiles for building facades	Annex 12
Schematic installation instruction	