

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-16/0082**  
**of 25 August 2016**

English translation prepared by DIBt - Original version in German language

### General Part

Technical Assessment Body issuing the  
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Hilti Powder-actuated fastener X-U16 S12

Product family  
to which the construction product belongs

Powder-actuated fastener

Manufacturer

Hilti AG  
Feldkircherstraße 100  
9494 Schaan  
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti Herstellwerk 1  
Feldkircherstraße 100  
9494 Schaan

This European Technical Assessment  
contains

11 pages including 7 annexes which form an integral part  
of this assessment

This European Technical Assessment is  
issued in accordance with Regulation (EU)  
No 305/2011, on the basis of

European Assessment Document (EAD)  
330153-00-0602

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**Specific part**

**1 Technical description of the product**

The powder-actuated fastener<sup>1</sup> X-U16 S12 made of carbon steel is driven through the structural steel component to be fastened (sheeting) in the steel base material by using the powder-actuated fastening tool DX 462 and a cartridge 6.8/11M Black as propellant charge. The anchorage of the fastener in the base material is realised by cold welding, clamping and mechanical interlock.

The product description is given in Annex A1 and A2

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

The performances given in Section 3 are only valid if the fastener is used in compliance with the specifications and conditions given in Annex B1 to B4.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fastener of at least 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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**

**3.1 Mechanical resistance and stability (BWR 1)**

Essential characteristic	Performance
Tension resistance of connection	See Annex C1
Shear resistance of connection	See Annex C1
Design resistance in case of combined tension and shear forces (interaction)	No performance assessed
Check of deformation capacity in case of constraining forces due to temperature	No performance assessed
Determination and check of application limits	See Annex B3

**3.2 Safety in case of fire (BWR 2)**

Essential characteristic	Performance
Reaction to fire	No performance assessed
Resistance to fire	See Annex C1

**3.3 Hygiene, health and the environment (BWR 3)**

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

<sup>1</sup> Both terms (cartridge fired pin and powder-actuated fastener) are commonly used

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**3.4 Safety and accessibility in use (BWR 4)**

Essential characteristic	Performance
Tension resistance of connection	See Annex C1
Shear resistance of connection	See Annex C1
Design resistance in case of combined tension and shear forces (interaction)	No performance assessed
Check of deformation capacity in case of constraining forces due to temperature	No performance assessed
Determination and check of application limits	See Annex B3

**3.5 Protection against noise (BWR 5)**

Not relevant

**3.6 Energy economy and heat retention (BWR 6)**

Not relevant

**3.7 Sustainable use of natural resources (BWR 7)**

Essential characteristic	Performance
Durability	No performance assessed

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

In accordance with EAD No. 330153-00-0602, the applicable European legal act is 1998/214/EC, amended by 2001/596/EC

The system to be applied is: **2+**

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

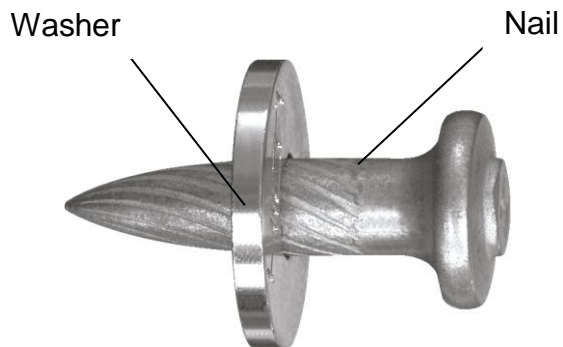
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 25 August 2016 by Deutsches Institut für Bautechnik

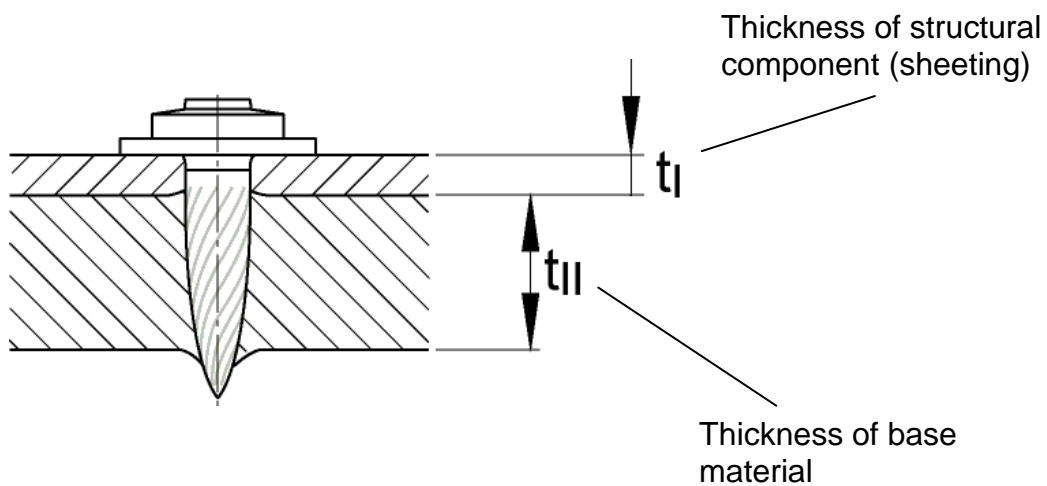
Uwe Bender  
Head of Department

*beglaubigt:*  
Hahn

### Powder-actuated fastener X-U16 S12



#### Installation condition



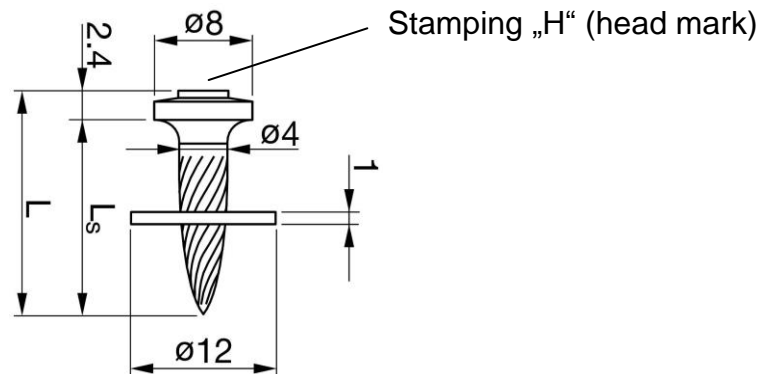
Powder-actuated fastener X-U16 S12

Product and installation condition

Annex A1

## Powder-actuated fastener: dimensions, identification and materials

X-U16 S12



**Table 1: Dimensions and materials**

Powder-actuated fastener	X-U16 S12	
Shank length $L_s$	[mm]	16.0
Total length $L$	[mm]	18.4
Shank diameter	[mm]	4.0
Head diameter	[mm]	8.0
Washer diameter	[mm]	12.0
Washer thickness	[mm]	1.0
Material of nail	[-]	Steel C67 quenched, tempered and galvanised
Material of steel washer	[-]	Steel DC01 galvanised

Powder-actuated fastener X-U16 S12

Dimensions, identification and materials

Annex A2

### Specification of intended use

The fasteners are intended to be used for fastening of steel sheeting to steel members. The sheeting can either be used as cladding or as load bearing wall and roof element. The fastener can also be used for the fastening of other thin gauge steel members, e.g. C-profiles of drywalls.

#### Anchorage subject to:

- Static and quasi-static loads.

#### Sheeting (flat products and therewith produced profiled products):

- Structural steel S235, S275 and S355 in qualities JR, JO, J2, K2 according to EN 10025-2.
- Steel flat products S280GD, S320GD, S350GD, S390GD and S550GD according to EN 10346.

Thickness see Table 2.

#### Base materials:

- Structural steel S235, S275 and S355 in qualities JR, JO, J2, K2 according to EN 10025-2.

Thickness see Table 2.

#### Use conditions (Environmental conditions):

- The intended use only comprises fasteners and connections which are not directly exposed to external weather conditions or moist atmosphere.

#### Design:

- The verification concept stated in EN 1990:2002 + A1:2005 + A1:2005/AC:2010 is used for the design of the connection made with the fasteners.
- The partial safety factor of  $\gamma_M = 1.25$  is used in order to determine the corresponding design resistance, provided no values are given in national regulations of the member state in which the fastener is used or in the respective National Annex to Eurocode 3.
- In case of combined tension and shear forces the linear interaction formula according to EN 1993-1-3:2006 + AC:2009 is taken into account.
- The possibly required reduction of the tension resistance due to the position of the fastener is taken into account in accordance with EN 1993-1-3:2006 + AC:2009, section 8.3 (7).
- For the type of connection a listed in Annex B2 it is not necessary to take into account the effect of constraints due to temperature.

#### Installation:

- The installation is only carried out according to the manufacturer's instructions.
- The steel sheeting is in direct contact with the steel base material in the area of the connection.
- Cartridge selection and tool energy settings in order to match the application limit diagram are taken into account, see Annex B3.
- Installation tests are carried out (e.g. check of nail head standoff  $h_{NVS}$ ), provided the fitness of the recommended cartridge cannot be checked otherwise.

**Powder-actuated fastener X-U16 S12**

Specification of intended use

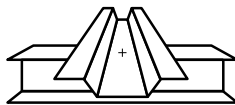
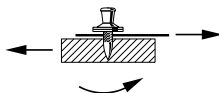
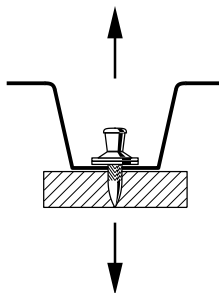
**Annex B1**

**Table 2: Steel grades and installation parameters**

Powder-actuated fastener		X-U16 S12
Minimum steel grade for sheeting	[-]	S235, S280GD
Minimum steel grade for base material	[-]	S235
Maximum steel grade for sheeting $t_i \leq 1.25$ mm	[-]	S355, S550GD
Maximum steel grade for sheeting $t_i > 1.25$ mm	[-]	S235, S350GD
Thickness of fastened steel sheeting $t_i$	[-]	$0.75 \text{ mm} \leq t_i \leq 1.50 \text{ mm}$
Nail head standoff $h_{NVS}$ according to Annex C1	[mm]	4 – 5.5
Thickness of base material $t_{II}^{*)}$	[mm]	$t_{II} \geq 6 \text{ mm}$ for $t_i \leq 1.25 \text{ mm}$ $t_{II} \geq 8 \text{ mm}$ for $1.25 \text{ mm} < t_i \leq 1.50 \text{ mm}$

\*) The application limits according to the Application limit diagram in Annex B3 have to be taken into account additionally

**Table 3: Type of connection and corresponding loading conditions**

Type of connection	
Type a	
	
Type of loading	Single connection
Shear loading	
Tension loading	

**Powder-actuated fastener X-U16 S12**

Steel strength classes, installation parameters and types of connection

**Annex B2**



**Powder-actuated fastening tool DX 462 with 12 mm fastener guide and cartridge 6.8/11M**



Piston: X-462-P8, Fastener Guide: X-462-F8S12



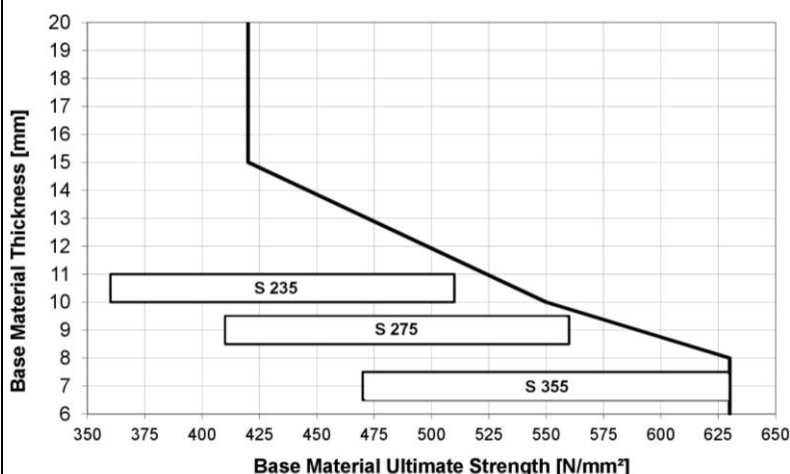
Wheel on tool allowing regulation of the driving energy:

Setting 1: Minimum energy  
Setting 4: Maximum energy



Black: Extra high load (level 7)  
S235 – S355: Black

**Application limit diagram:**



**Tool energy setting:**

The powder-actuated fasteners are to be driven flush.

After installation the nail head standoff  $h_{NVS}$  has to meet the values given in Annex C1. The driving energy is adjusted at the fastening tool by means of trial installations.

- 1 ... for thin low strength base material
- 4 ... along the upper application limit curve

**Powder-actuated fastener X-U16 S12**

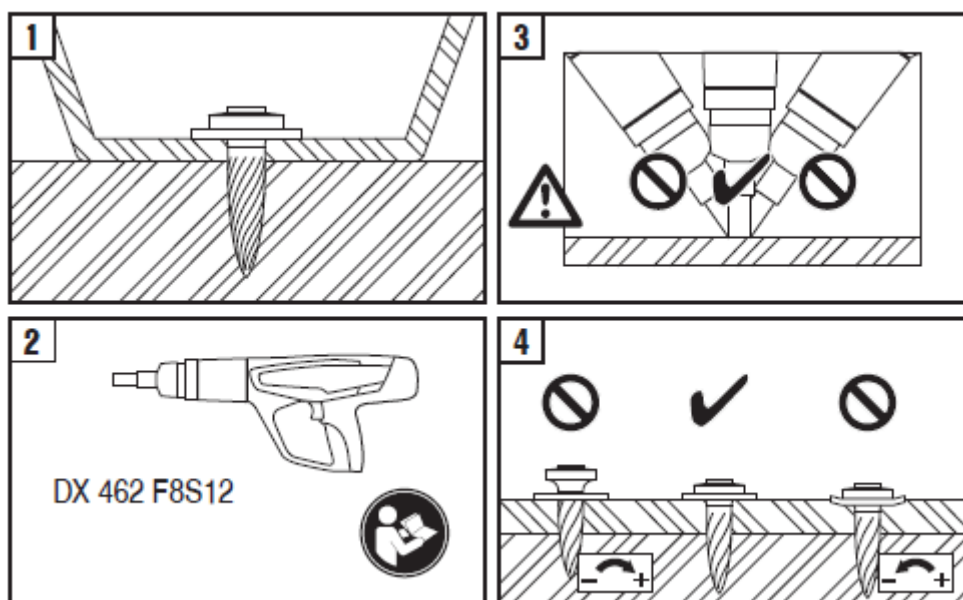
**Annex B3**

Powder-actuated fastening tool, cartridge selection and application limit

### Instructions for use

- The powder-actuated fastener is driven by using the powder-actuated fastening tool DX 462 according to Annex B3 and a black cartridge 6.8/11M as propellant charge.
- The driving energy shall be determined by fine regulation at test settings according to Annex B3 – in relation to the characteristics of steel (e.g. steel strength, steel thickness). A control by measuring the fastener nail head standoff shall be done according to Annex C1.
- The powder-actuated fastener is properly set if the metal sheet tightened against the steel surface and the nail head standoff  $h_{NVS}$  is met.
- Powder-actuated fasteners, which don't meet the required nail head standoff, must not be loaded.

### X-U16 S12



Powder-actuated fastener X-U16 S12

Instructions for use

Annex B4

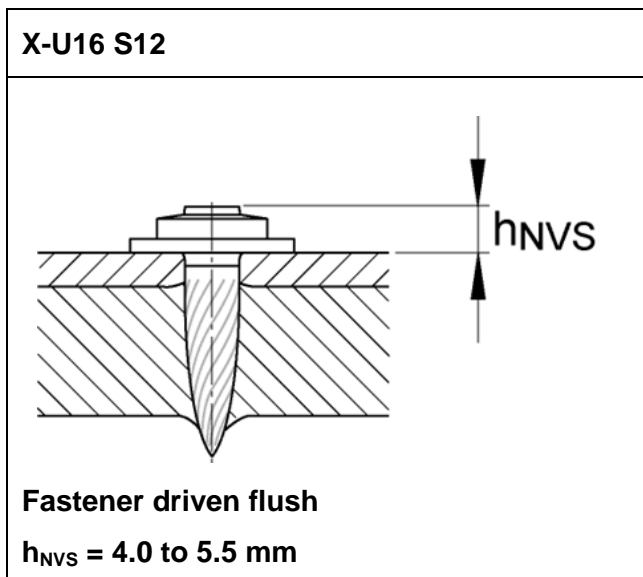
**Table 4: Characteristic shear resistance  $V_{Rk}$  and tension resistance  $N_{Rk}$**

sheeting thickness $t_l$ [mm]	Shear $V_{Rk}$ [kN]	Tension $N_{Rk}$ [kN]	Types of connection
0.75	2.4	2.8	a
1.00	3.6	3.6	a
1.25	5.2	4.4	a
1.50	5.2	4.4	a

**Table 5: Design shear resistance  $V_{Rd}$  and tension resistance  $N_{Rd}$**

$V_{Rd} = V_{Rk} / \gamma_M$	$N_{Rd} = \alpha_{cycl} N_{Rk} / \gamma_M$ $\alpha_{cycl} = 1.0$
$\gamma_M = 1.25$ in the absence of national regulations	$\alpha_{cycl}$ considers the effect of repeated wind loads $\alpha_{cycl} = 1.0$ for all sheeting thickness $t_l$ $\gamma_M = 1.25$ in the absence of national regulations

**Fastener inspection – nail head standoff  $h_{NVS}$**



**Resistance to fire**

The part of the structure in which the powder-actuated fasteners X-U16 S12 are intended to be installed shall be tested, using the test method relevant for the corresponding fire resistance class, in order to be classified according to the appropriate part of EN 13501.

<b>Powder-actuated fastener X-U16 S12</b>	<b>Annex C1</b>
Characteristic and design values, fastener inspection, resistance to fire	