

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 fastener¹ 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 | See Annex B1 |
| 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 |

¹ 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 | See Annex B1 |
| 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

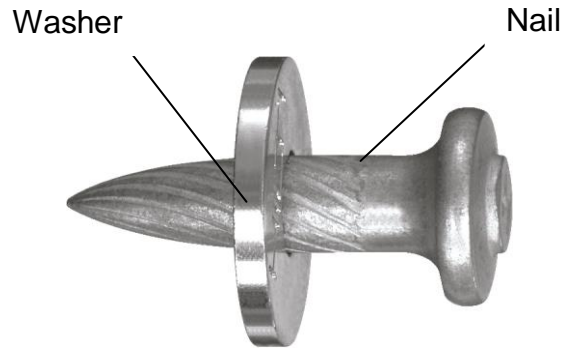
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

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

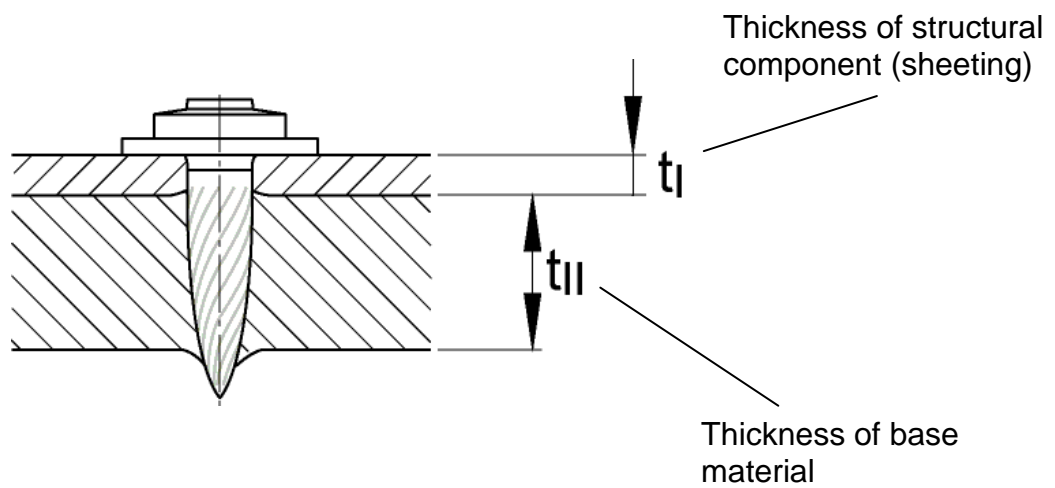
Uwe Bender
Head of Department

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

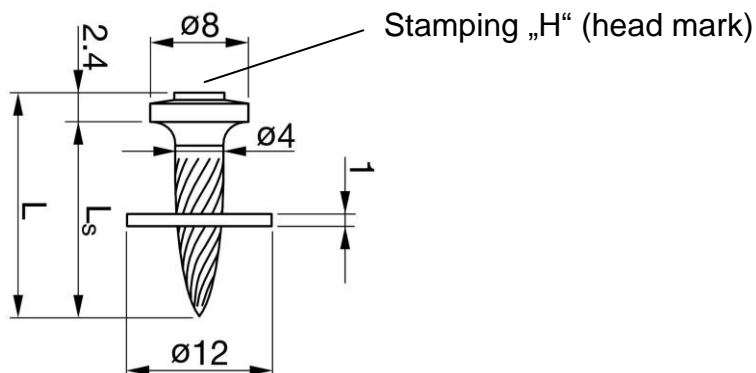


Table 1: Dimensions and materials

| 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

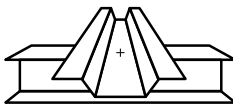
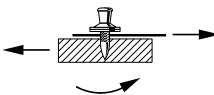
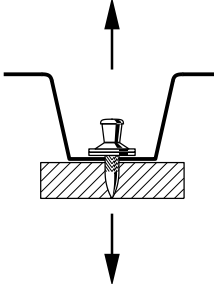
Annex B1

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 $t_f \leq 1.25$ mm | [-] | S355, S550GD |
| Maximum steel grade for sheeting $t_f > 1.25$ mm | [-] | S235, S350GD |
| Thickness of fastened steel sheeting t_f | [-] | $0.75 \text{ mm} \leq t_f \leq 1.50 \text{ mm}$ |
| 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 $t_f \leq 1.25 \text{ mm}$ $t_{II} \geq 8 \text{ mm}$ for $1.25 \text{ mm} < t_f \leq 1.50 \text{ mm}$ |

*) 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



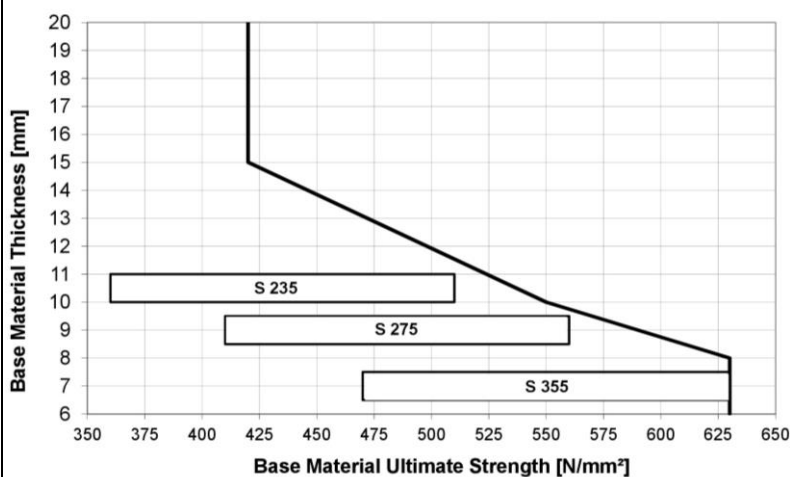
Wheel on tool allowing regulation of the driving energy:

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

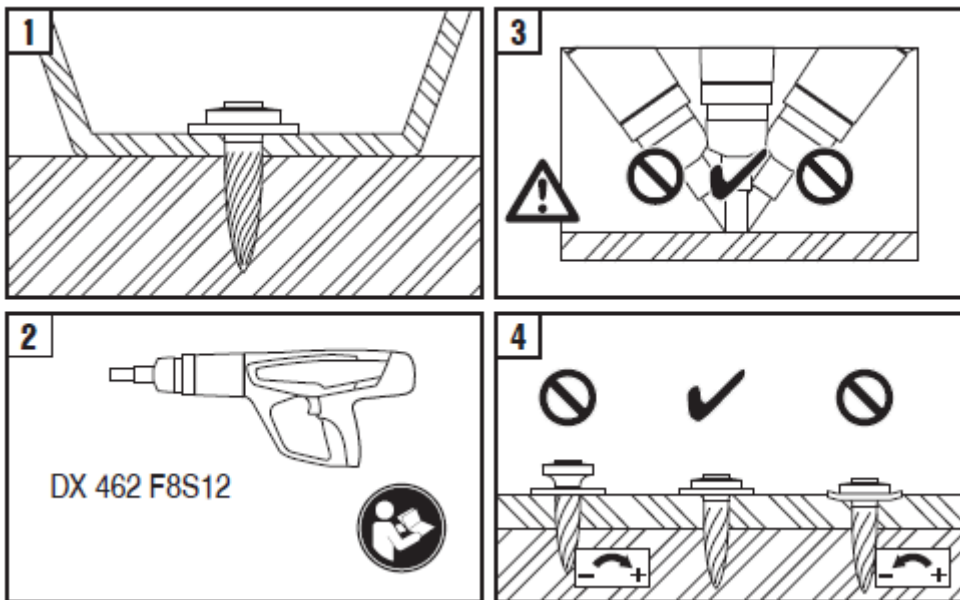
Powder-actuated fastening tool, cartridge selection and application limit

Annex B3

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

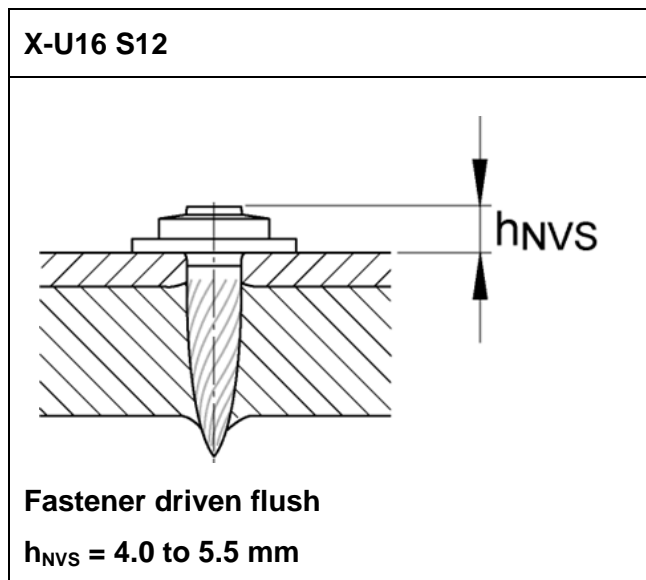
Table 4: Characteristic shear resistance V_{Rk} and tension resistance N_{Rk}

| 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}

| | |
|---|---|
| $V_{Rd} = V_{Rk} / \gamma_M$ <p>$\gamma_M = 1.25$ in the absence of national regulations</p> | $N_{Rd} = \alpha_{cycl} N_{Rk} / \gamma_M$ $\alpha_{cycl} = 1.0$ <p>α_{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</p> |
|---|---|

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.

Powder-actuated fastener X-U16 S12

Characteristic and design values, fastener inspection, resistance to fire

Annex C1