



Using Hilti powder-actuated fasteners to install suspended metal-framed gypsum board ceilings

The application

Selection of fasteners

Technical data

Procedures

Fastening quality

Using powder-actuated fasteners to install suspended metal-framed gypsum board ceilings

Selecting and using suitable fasteners for the application

Types of substructure and classification of fasteners

Metal profile frame substructure	Equal-level metal profile frame substructure
<p>Fastened to concrete</p> <p>Powder-actuated fasteners without predrilling (standard DX):</p> <ul style="list-style-type: none"> • X-CC U27 P8 • X-U 27 P8 S15 <p>Powder-actuated fasteners with predrilling (DX-Kwik):</p> <ul style="list-style-type: none"> • X-CC DKH 48 P8 S15 • X-DKH 48 P8 S15 • DNH 37 P8 S15 	<p>Fastened to concrete</p> <p>Powder-actuated fasteners with predrilling (DX-Kwik):</p> <ul style="list-style-type: none"> • X-CC DKH 48 P8 S15 • X-DKH 48 P8 S15 • DNH 37 P8 S15 <p>Note: Predrilling for powder actuated fasteners is generally necessary due to the lower redundancy achieved by equal-level ceiling frames.</p>
<p>Fastened to steel</p> <ul style="list-style-type: none"> • X-CC U16 P8 	<p>Fastened to steel</p> <ul style="list-style-type: none"> • X-CC U16 P8

Permissible spacing between hangers and supporting profiles (ÖNORM B3415 – Austrian standard)

	Ceiling panel load per area unit [kN/m ²]		
	up to 0.15	over 0.15 to 0.30	over 0.30 to 0.50
Distance (c) between supporting profiles [mm]	1000	850	750
Distance (a) between hangers [mm]	900	750	600

Applicable conditions

- Metal substructures comprising CD 60/27 loadbearing profiles¹ and CD 60/27 ceiling support profiles in accordance with ÖNORM B 3415-2004 (Section 6). Minimum sheet metal thickness of the CD 60/27 C-profiles for the ceiling is 0.6 mm.
- If the stronger UA 50/40 loadbearing profiles are used for the gypsum board ceiling, it is generally necessary to use predrilling with the powder-actuated fasteners (DX-Kwik method).
- Hanger wires, nonius hangers and wires with eyes in accordance with ÖNORM B 3415-2004 (Section 6)
- The dead load imposed by the weight of the ceiling panels is ≤ 0.50 kN/m².
- Ambient conditions: dry interior

¹ The loadbearing profile is the profile to which the hanger is attached (see sketch). In regulations and product literature the terms “primary” or “main” profile (or similar) are also used.

Powder-actuated fasteners for fastening to steel

Powder-actuated fastener	Hanger types	Powder-actuated fastening tool
<p>X-CC U16 P8 loop hanger</p> <p>Item no.: 386228</p>	Hanger wires with a diameter of $d = 4 \text{ mm}$	<p>DX 460 F8 Fastener guide: X-460-F8 Piston: X-460-P8 Cartridge: 6.8/11M, green, yellow, red or black</p> <p>DX 351 F8 Fastener guide: X-FG8 ME-351 Piston: X-P 8S-351 Cartridge: 6.8/11M, green, yellow or red</p>

Loadbearing capacity classes

Powder-actuated fasteners for fastening to concrete

Fastener	Loadbearing capacity class [kN]	Weight of ceiling panels [kN/m ²]	Method	Concrete	Maximum recommended tensile load for DX-Kwik [kN]	Approvals ¹
X-CC U27 P8	0.25	≤ 0.30	DX-Standard	C20/25	-	-
X-U 27 P8 S15	0.40	≤ 0.50	DX-Standard	C20/25	-	-
X-CC DKH 48 P8 S15	0.40	≤ 0.50	DX-Kwik	C20/25 to C50/60	0.90	-
X-DKH 48 P8 S15	0.40	≤ 0.50	DX-Kwik	C20/25 to C50/60	0.90	AbZ Z-21.7-670
DNH 37 P8 S15	0.40	≤ 0.50	DX-Kwik	C20/25 to C50/60	0.60	MA 35 – B540/91 ²

Applicable conditions

- The standard DX method is recommended for C20/25 low-strength concrete ($f_{cc} \leq 45 \text{ N/mm}^2$).
- Some failures may occur when driving fasteners using the standard DX method. Use of the DX-Kwik method is recommended in situations where the rate of failure is greater than 10 %.
- The DX-Kwik method allows fasteners to be driven in normal and high-strength concrete without failures.
- The table shows the classification of powder-actuated fasteners according to the loadbearing capacities of 0.25 and 0.40 kN. The loading capacity utilization level for powder-actuated fasteners when predrilling is used lies above the relevant class limits for ceiling hangers and is thus given additionally in the table for your information.
- Minimum component thickness: 10 cm (DX-Kwik) or 8 cm (standard DX)
- Minimum edge distance: 10 cm
- Minimum spacing distance: 20 cm

¹ Ö-Norm B 3415, as it refers to Ö-Norm EN 13964, demands use of anchoring systems with European Technical Approval (ETA). At present, no ETA can be issued for powder-actuated fastenings in concrete as the necessary criteria are still under revision. Complete conformity with Ö-Norm B 3415 is thus not possible. Assuming that the conditions listed in the data sheet are adhered to, Hilti recommends use of the loadbearing capacity classes in accordance with the table.

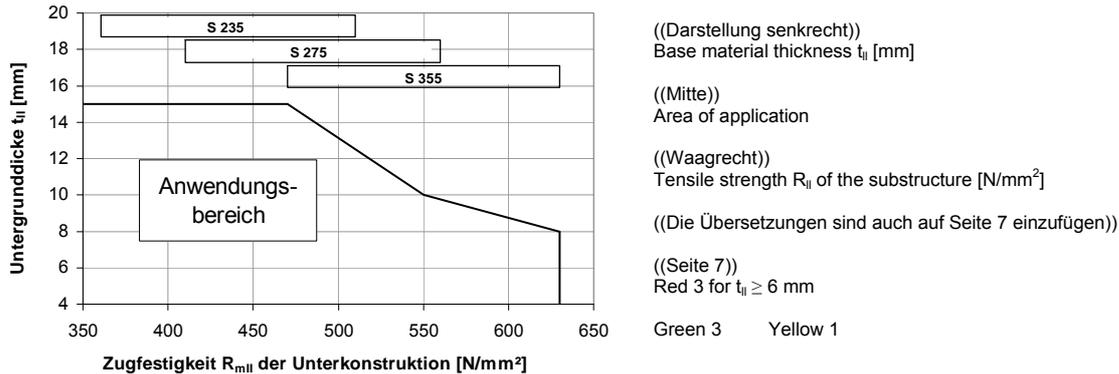
² Use of Hilti DX-Kwik powder-actuated fasteners was approved by the City Council of Vienna for the first time in a ruling issued in 1992. This approval was extended on an ongoing basis until mid 2008 (last extension decision MA64-BA21/2004). As the formal result of a change in Vienna's construction regulations in the year 2008, no further approvals will be issued in the form of rulings by the City Council of Vienna and the validity of existing approvals will no longer be extended. The technical content of the last extension decision MA64-B21/2004 remains valid and applicable.

Powder-actuated fasteners for fastening to steel – application limits

Fastener	Loadbearing capacity class [kN]	Weight of ceiling panels [kN/m ²]	Maximum recommended load [kN]	Steel grade	Base material thickness t _{II}	Approvals
X-CC U16 P8	0.40	≤ 0.50	0.90	S 235	4 to 13 mm	-
				S 355	4 to 8 mm	

Applicable conditions

- The entire tolerance range for the strength of each steel grade is covered for each base material thickness given in the table. For greater thicknesses, the following application limits must be observed:



- The table shows the classification of powder-actuated fasteners in the 0.40 kN loadbearing capacity class. The loading capacity utilization level for powder-actuated fasteners lies above the relevant class limits for ceiling hangers and is thus given additionally in the table simply as information.
- Minimum edge distance 15 mm.

Recommended loads under exposure to fire

If a fire rating for exposure to fire from above is also required for the gypsum board ceiling, i.e. fire in the area between the suspended ceiling and the floor deck above, then the X-DKH 48 P8 S15 powder-actuated fastener should be used.

Fastener	Recommended loads [kN]	Fire rating [min]	Method	Concrete	Approvals
X-DKH 48 P8S15	0.45	60	DX-Kwik	C20/25 to C50/60	AbZ Z-21.7-670
	0.25	90			

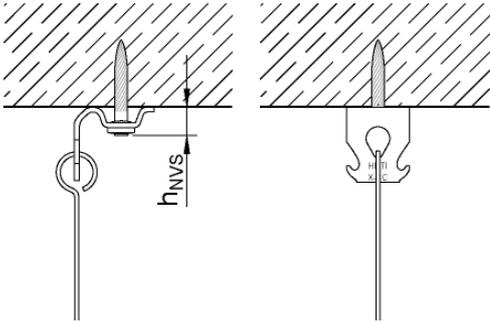
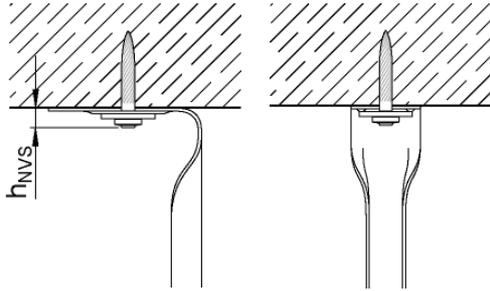
Applicable conditions

- The fire rating given applies to powder actuated fasteners and the hold they obtain in concrete.
- If these ratings are to be quoted then the fire rating of all other components of the suspended ceiling (e.g. hanger, eye wire hanger, substructure) must be at least as high as that of the X-DKH 48 P8 S15.

Installation procedure and fastening quality: fastening to concrete

Standard DX – X-CC U27 P8, X-U 27 P8 S15

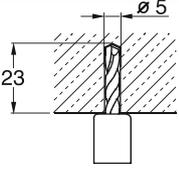
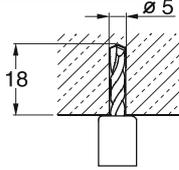
- The cartridge and power setting should be selected so that the fasteners are driven flush and tight. It is recommended that the user begins with a high power setting (“red 4” with the DX 460 F8 or “red 3” with the DX 351 F8). If the nail stand-off achieved is within limits, the driving power may be reduced. Fine adjustment of the power setting should be carried out on the jobsite according to the prevailing conditions. Cartridge power is indicated by a color code: green (light) → yellow (medium) → red (heavy) → black (extra heavy).
- The correct nail stand-off h_{NVS} must be adhered to. h_{NVS} corresponds to the distance between the nail head and the concrete material.

X-CC U27 P8 loop hanger with eye wire	X-U 27 P8 S15 powder-actuated fastener for the upper section of the nonius hanger
 <p style="text-align: center;">$h_{NVS} = 4 - 7 \text{ mm}$</p>	 <p style="text-align: center;">$h_{NVS} = 4 - 7 \text{ mm}$</p>
<p>When nail stand-off is correct, the base of the X-CC is deformed slightly and pressed against the base material. The eye wire can be threaded through the middle opening in the X-CC before or after driving the fastener.</p>	<p>The washer may become “dished” as a result of local stiffness of the sheet metal of the top section of the nonius hanger. This is permissible. The upper section of the nonius hanger should be bent back into the vertical position after the fastener has been driven.</p>

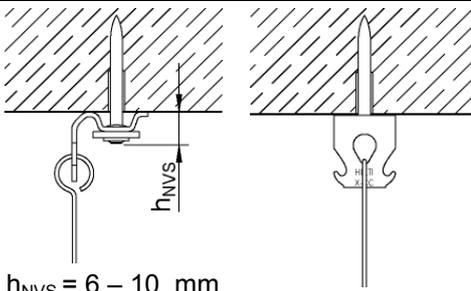
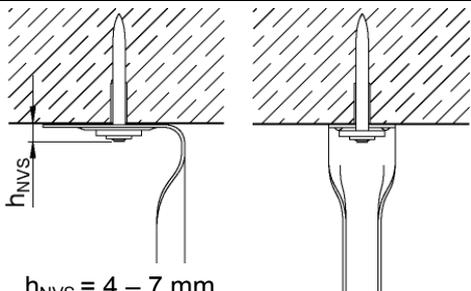
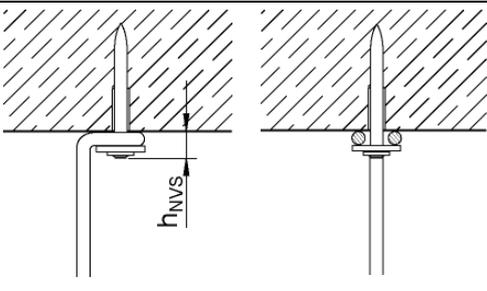
- Each fastener should be checked by pulling on the wire or nonius hanger by hand to ensure that it is securely seated.
- Loose fasteners or fasteners that have failed when driven should be replaced by driving a new fastener.
- The loadbearing capacity of the powder-actuated fasteners should be checked in accordance with Ö-Norm B3415-2004 (section 7.4).
 - Additional Hilti recommendation: Following the example of AbZ Z-21.7-670, Hilti recommends that fasteners are tested to 1.5 times their working load. For the 0.25 kN loadbearing capacity class this results in a test load of 375 N or, respectively, 600 N for the 0.40 kN loadbearing capacity class.
- In accordance with Ö-Norm B3415-2004 (section 7.4), at least 2 powder-actuated fasteners per m^2 should be installed.
 - Additional Hilti recommendation: Where the load per unit area is 0.15 to 0.30 kN/m^2 , the number of fasteners per m^2 can be reduced from 2 to 1.5. Where the load per unit area is 0.15 kN/m^2 or less, the number of fasteners per m^2 can be reduced from 2 to 1.1.

DX-Kwik – X-CC DKH 48 P8 S15, X-DKH 48 P8 S15, DNH 37 P8 S15

- Predrill with the stop drill bit.

<p>X-CC DKH 48 P8 S15 loop hanger X-DKH 48 P8 S15 powder-actuated fastener</p>  <p>Hole depth: 23 mm Stop drill bit: TX-C-5/23 (Item no.: 61787)</p>	<p>DNH 37 P8 S15 powder-actuated fastener</p>  <p>Hole depth: 18 mm Stop drill bit: TX-C-5/18 (Item no.: 61793)</p>
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- The cartridge and power setting should be selected so that the fasteners are driven flush. The yellow cartridge is recommended for low-strength concrete and the red cartridge for high-strength concrete. Fine adjustment of the power setting should be carried out on the jobsite according to the conditions encountered.
- The correct nail stand-off h_{NVS} must be adhered to. h_{NVS} corresponds to the distance between the nail head and the concrete material.

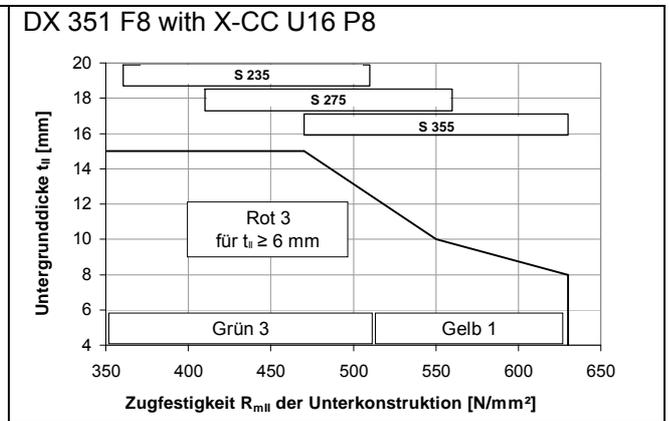
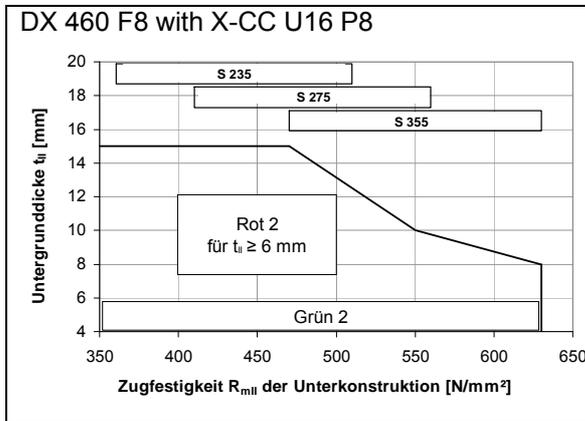
<p>X-CC DKH 48 P8 S15 loop hanger with eye wire.</p>  <p>$h_{NVS} = 6 - 10 \text{ mm}$</p>	<p>X-DKH 48 P8 S15 or DNH 37 P8 S15 for fastening the upper section of the nonius hanger</p>  <p>$h_{NVS} = 4 - 7 \text{ mm}$</p>
<p>When nail stand-off is correct, the base of the X-CC is deformed slightly and pressed against the base material. The eye wire can be threaded through the middle opening in the X-CC before or after driving the fastener.</p>	<p>The washer may become “dished” as a result of local stiffness of the sheet metal of the top section of the nonius hanger. This is permissible.</p>
<p>Fastening eye wires directly using the X-DKH 48 P8S15 or DNH 37 P8S15</p>  <p>$h_{NVS} = 8 - 9 \text{ mm}$</p>	<p>$h_{NVS} = 8 - 9 \text{ mm}$ (for eye wires with a diameter of 4 mm) The powder-actuated fastener should be driven so that the head and the washer are seated tightly against the eye wire. This corresponds to a nail stand-off of approx. 8 – 9 mm for a wire diameter of 4 mm.</p>

- The loadbearing capacity of the powder-actuated fasteners should be checked in accordance with Ö-Norm B3415-2004 (section 7.4).
 - Additional Hilti recommendation:
Following the example of AbZ Z-21.7-670, Hilti recommends that fasteners are tested to 1.5 times their working load. For the 0.25 kN loadbearing capacity class this results in a test load of 375 N or, respectively, 600 N for the 0.40 kN loadbearing capacity class.
- In accordance with Ö-Norm B3415-2004 (section 7.4), at least 2 powder-actuated fasteners per m^2 should be installed.
 - Additional Hilti recommendation:
DX-Kwik powder-actuated fasteners set after predrilling can be treated like anchors, i.e. at least on fastening point per 1.5 m^2 is required.

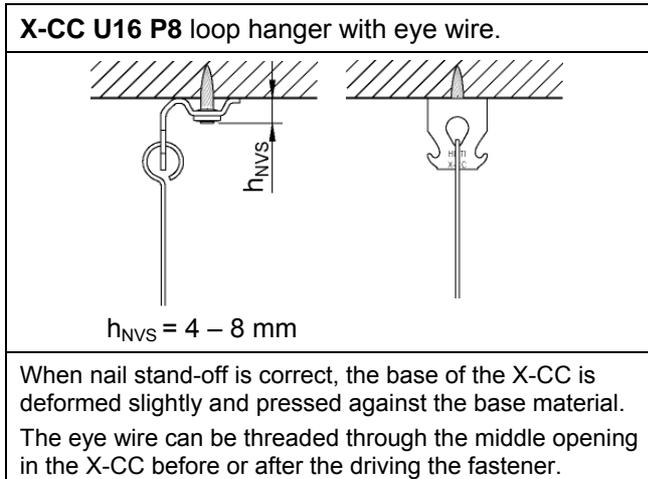
Installation procedure and fastening quality: fastening to steel

X-CC U16 P8

- The application limits for the fastening system must be observed.
- Procedure to determine the optimum driving power:
 - Select the cartridge and driving power in accordance with diagram for the applicable powder-actuated fastening tool DX 460 F8 or DX 351 F8.



- Test fasteners should be driven in order to check the nail stand-off $h_{NVS} = 4$ to 8 mm. h_{NVS} corresponds to the distance between the nail head and the steel material.
 - The power setting on the powder-actuated tool or choice of cartridge should be adjusted as necessary. Die Cartridge power is indicated by a color code: green (light) → yellow (medium) → red (heavy) → black (extra heavy).
- The correct nail stand-off h_{NVS} must be adhered to.



- In the event of a powder-actuated fastener shearing off when driven (driving failure), a new fastener should be driven.
- In accordance with Ö-Norm B3415-2004 (section 7.4), at least 2 powder-actuated fasteners per m² should be installed.
 - Additional Hilti recommendation: Powder-actuated fasteners driven into steel can be treated like anchors, i.e. at least one fastening point per 1.5 m² is required.