

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

ETA-17/0304
of 21 June 2021

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 fixing element XI-FV

Product family to which the construction product belongs

Powder-actuated fastener for the fixing of ETICS in concrete

Manufacturer

Hilti AG
Feldkircherstraße 100
9494 Schaan
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti manufacturing plant

This European Technical Assessment contains

13 pages including 3 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

EAD 330965-00-0601, edition 03/2017

This version replaces

ETA-17/0304 issued on 4 May 2017

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Specific Part

1 Technical description of the product

The Hilti fixing element XI-FV (referred to in the following only as fixing element) consists of a plastic part (shaft and insulation plate) made of high-density polyethylene and a powder-actuated fastener which is driven into the concrete using a powder-actuated fastening tool with a cartridge as propelling charge.

The powder actuated fastener X-CPH 72 is made of tempered carbon steel with a Delta-Tone coating.

The fixing element may in addition be combined with the plates HDT-FV 90 made of high-density polyethylene or the plate HDT-FV 140 made of polyamide which can be slipped-on. The components and the system setup of the product are given in Annex A.

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 fixing element is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fixing element 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
Characteristic load bearing capacity <ul style="list-style-type: none"> - Characteristic resistance under tension load - Minimum edge distances and spacing 	See Annex C1 See Annex C1
Displacement	See Annex C1
Plate stiffness	See Annex C1
Durability of the plastic parts	See Annex B1

3.2 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Point thermal transmittance	See Annex C1

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

In accordance with EAD No. 330965-00-0601 the applicable European legal act is: [97/463/EC].
The system to be applied is: 2+

English translation prepared by DIBt

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

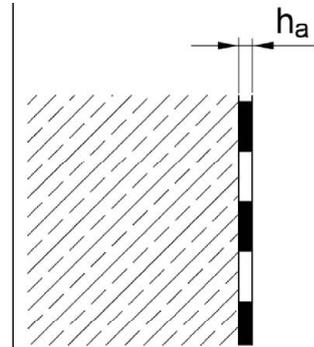
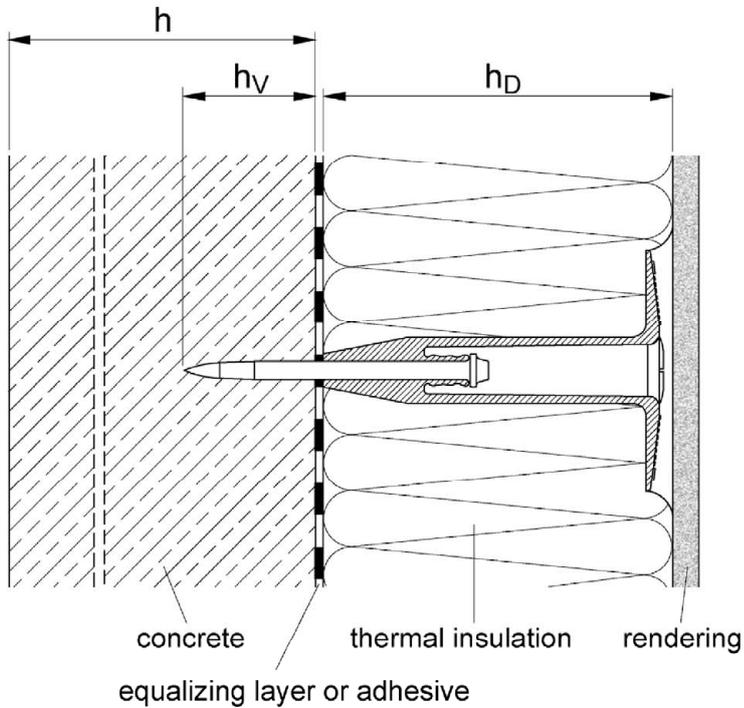
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 21 June 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Ziegler

Installed condition in uncoated concrete



h_a ... thickness of equalizing layer
or adhesive

$h_a \leq 20 \text{ mm}$

h_D ... thickness of insulation material
 h ... thickness of member (wall)
 h_v ... anchorage depth in concrete

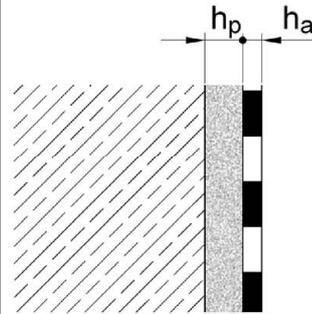
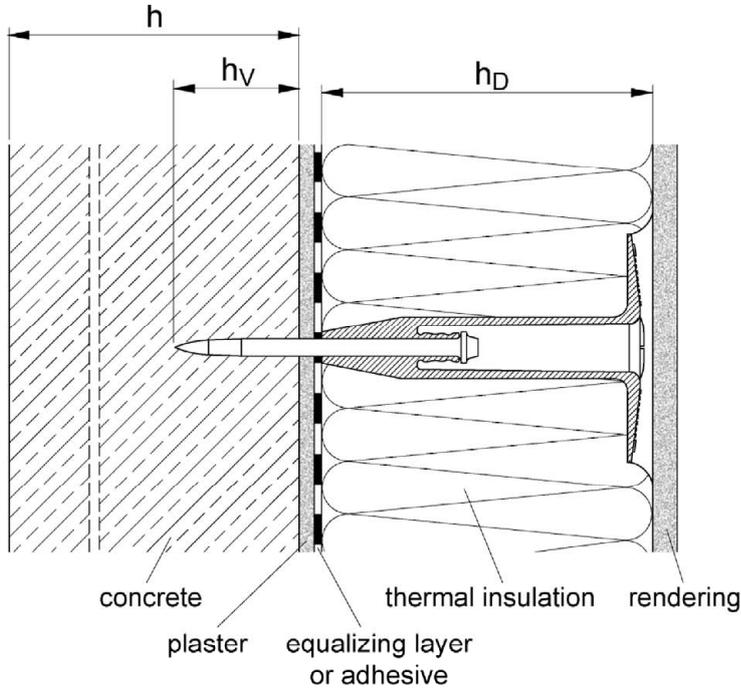
Hilti fixing element XI-FV

Product description
Installed condition in uncoated concrete

Annex A1

Installed condition in coated concrete

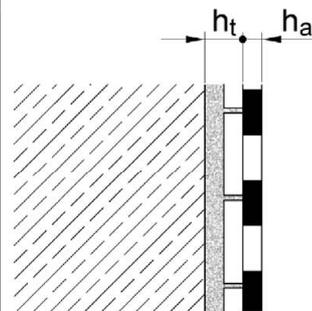
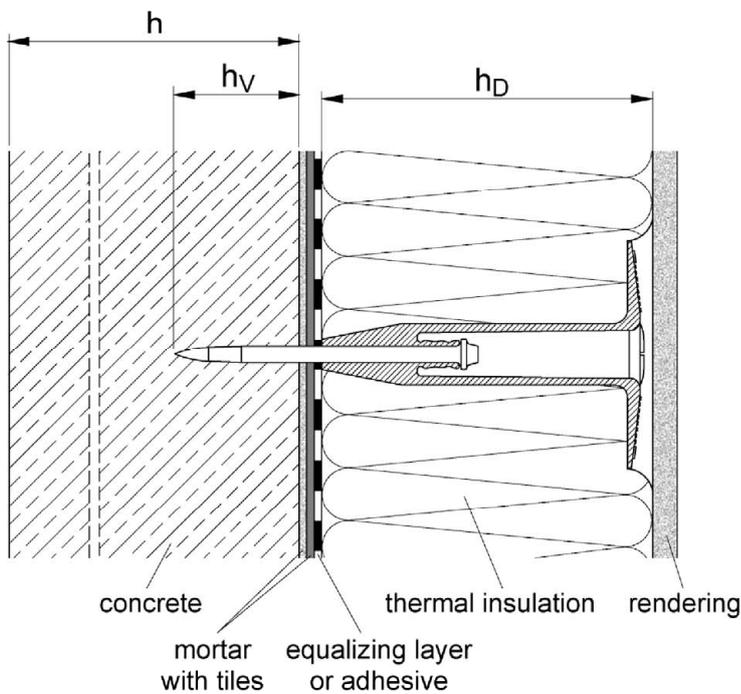
Concrete coated with plaster



h_p ... thickness of plaster
 h_a ... thickness of equalizing layer
or adhesive

$h_p \leq 15 \text{ mm}$
and
 $(h_p + h_a) \leq 25 \text{ mm}$

Concrete coated with tiles



h_t ... thickness of tiles including
mortar for bonding of tiles
 h_a ... thickness of equalizing layer
or adhesive

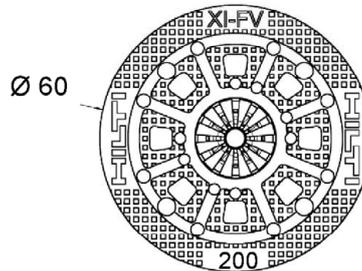
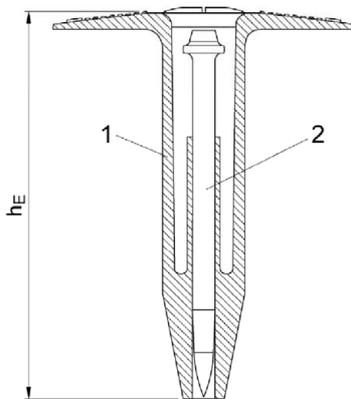
$h_t \leq 10 \text{ mm}$
and
 $(h_t + h_a) \leq 20 \text{ mm}$

Hilti fixing element XI-FV

Product description
Installed condition in coated concrete

Annex A2

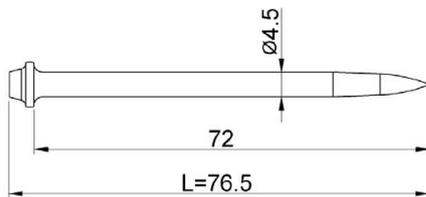
XI-FV fixing element



Marking:

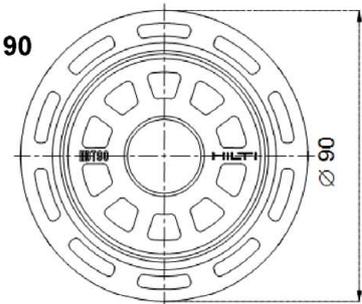
Manufacturer Hilti
Fixing element name XI-FV
Thickness of insulation
Example: Hilti XI-FV 200

Powder-actuated fastener X-CPH72



Slip-on insulation discs

HDT-FV 90



HDT-FV 140

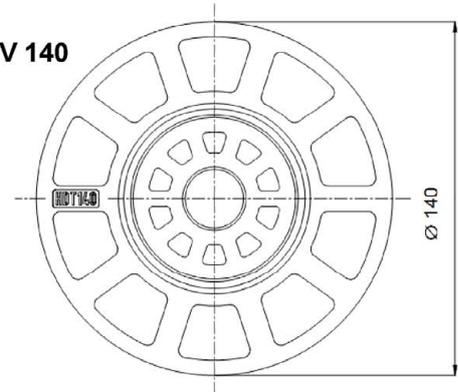


Table 1: Fixing elements XI-FV

Fixing element	insulation thickness [mm]	h_E [mm]
XI-FV 60	60	59
XI-FV 80	80	79
XI-FV 100	100	99
XI-FV 120	120	119
XI-FV 130	130	129
XI-FV 140	140	139
XI-FV 150	150	149
XI-FV 160	160	159
XI-FV 180	180	179
XI-FV 200	200	199

Table 2: Materials

Component	Designation	Material
1	Plastic part	Polyethylene PE-HD (High-Density), colour: orange
2	Powder-actuated fastener X-CPH72	Tempered carbon steel with a core hardness of 58 HRC Coating: 3 layers Delta-Tone zinc flake coating

Table 3: Slip-on insulation discs

Insulation disc	Outer diameter [mm]	Material
HDT-FV 90	90	Polyethylene PE-HD (High-Density), colour: orange
HDT-FV 140	140	Polyamide, fibre reinforced, colour: white or orange

Hilti fixing element XI-FV

Product description

Dimensions, marking and materials

Annex A3

Specification of intended use

Anchorage subject to:

- The fixing element may only be used for transmission of wind suction loads and shall not be used for the transmission of dead loads of the thermal insulation composite system.

Base materials:

- Reinforced or unreinforced normal weight concrete C12/15 – C35/45 according to EN 206-1:2000.
- The concrete can either be uncoated (Annex A1) or coated (Annex A2).
- For coated concrete the cement plaster complies with general purpose plastering mortar (GP) of compressive strength category CS III or CS IV according to EN 998-1:2016.
- If the plaster specification is unknown or deviates from the above specification or if the concrete is coated with tiles, job-site tests according to Annex B5 may be done to determine the characteristic pull-out resistance in coated concrete.

Temperature Range:

- 20 °C to + 60 °C.

Use conditions (environmental conditions)

- Structures subject to dry conditions.
- Structures subject to external atmospheric exposure.

Design:

- The anchorages are designed under the responsibility of an engineer experienced in anchorages.

- Design: $N_{Ed} \leq N_{Rd}$

with:

N_{Ed} ... design value of wind action

N_{Rd} ... design value of resistance of the fixing element,
either controlled by pull-out of the fastener ($N_{Rd,p} = N_{Rk,p} / \gamma_M$) or
failure of the plastic part ($N_{Rd,PI} = N_{Rk,PI} / \gamma_{M,PI}$);

$$N_{Rd} = \min (N_{Rd,p}; N_{Rd,PI})$$

- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fixing elements is indicated on the design drawings.
- The fixing elements are only to be used for multiple fixings of thermal insulation composite systems.

Installation:

- The installation is only carried out according to the manufacturer's instructions, Annex B3.
- Fixing element installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- The minimum setting temperature of the fixing element is +5 °C.
- Exposure to UV due to solar radiation of the fixing element not protected by rendering ≤ 6 weeks.

Hilti fixing element XI-FV

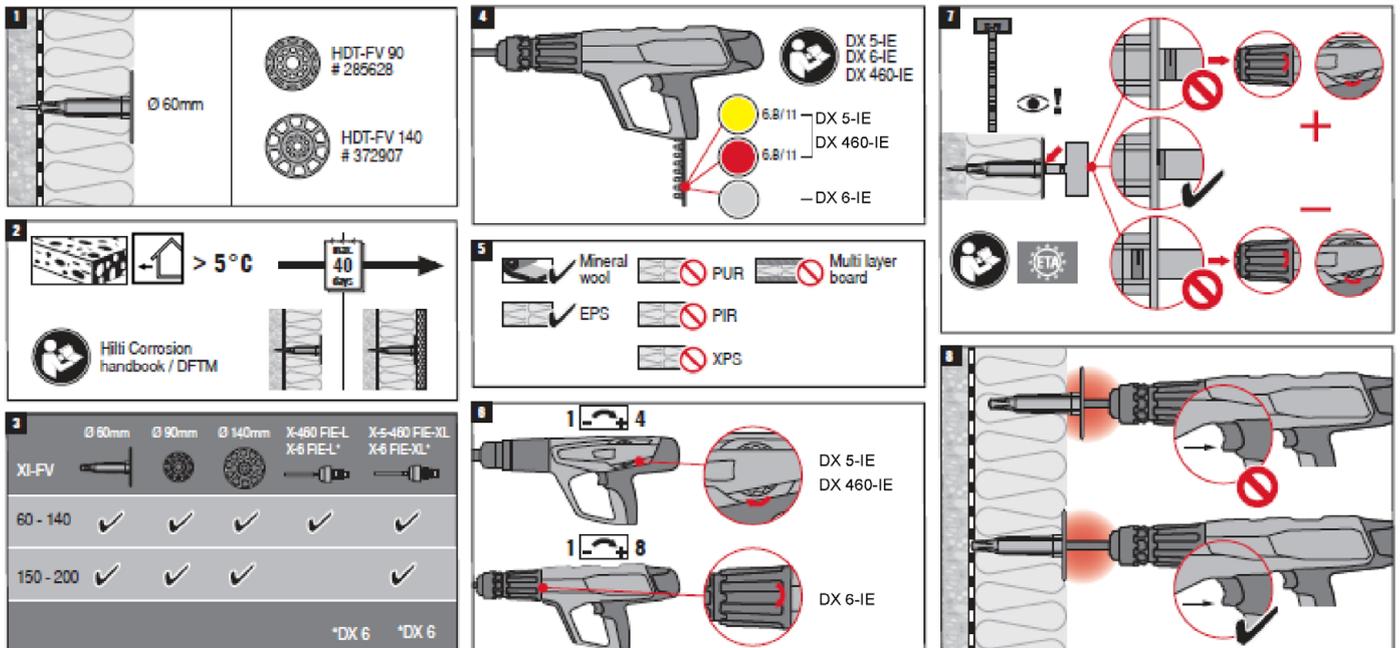
Intended use
Specification

Annex B1

Hilti DX 5 and DX 460 powder-actuated fastening tool	
	XL-equipment for XI-FV 60 to XI-FV 200 Fastener guide: X-5-460-FIE-XL Piston: X-5-460-PIE-XL or X-6-5-PIE-XL
	L-equipment for XI-FV 60 to XI-FV 140 Fastener guide: X-5-460-FIE-L Piston: X-5-460-PIE-L or X-6-5-PIE-L
	Short equipment for XI-FV 60 to XI-FV 100 Fastener guide: X-5-460-FIE Piston: X-5-460-PIE
	Wheel on tool allowing regulation of the driving energy: Setting 1: Minimum energy Setting 4: Maximum energy
	 Cartridges 6.8/11 M10 Yellow: Low medium load (energy scale 4) Red: Medium high load (energy scale 6) Black: Extra high load (energy scale 7)
Hilti DX 6 powder-actuated fastening tool	
	XL-equipment for XI-FV 60 to XI-FV 200 Fastener guide: X-6-FIE-XL Piston: X-6-5-PIE-XL
	L-equipment for XI-FV 60 to XI-FV 140 Fastener guide: X-6-FIE-L Piston: X-6-5-PIE-L
	Power regulation wheel allowing wide adjustment of the driving energy: Setting 1: Minimum energy Setting 8: Maximum energy
	 DX 6 cartridge 6.8/11 M10 Red (Medium high load – energy scale 6) collated in Titanium plastic strip DX 6 cartridge 6.8/11 M10 Black (Extra high load – energy scale 7)
Cartridge selection:	
DX 5 and DX 460: C12/15 – C25/30: Yellow / Red C30/37 – C35/45: Red / Black	
DX 6: C12/15 – C35/45: DX 6 cartridge Titanium (Red, energy scale 6)	
The fixing elements are to be installed according to Annex B3. The driving energy can be fine adjusted at the fastening tool by means of power regulation wheels. The following graph shows the energy overlap of the cartridges Yellow, Red and Black used for the fastening tools DX 5 and DX 460. It further shows the energy overlap with the DX 6 cartridges. In general the DX 6 cartridge in the Titanium strip will provide sufficient driving energy to cover all concretes.	
<div style="border: 1px solid black; padding: 2px; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> DX 5 DX 460 </div>	 <p>Yellow 1 ————— Yellow 4 Red 1 ————— Red 4 Black 1 ————— Black 4</p>
<div style="border: 1px solid black; padding: 2px; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> DX 6 </div>	 <p>Titanium 3 ————— Titanium 8 Black 6 ————— Black 8</p>
Hilti fixing element XI-FV	
Intended use Powder-actuated fastening tools and cartridge selection	
Annex B2	

Instructions for use

- The fixing element is driven in the concrete by using the powder-actuated fastening tool DX 460, DX 5 or DX 6 and a cartridge 6.8/11 M10 as propellant charge. The tools have to be used with the fastener guides and pistons as shown in Annex B2.
- The driving energy shall be determined by means of control tests in order to achieve the required anchorage depth in the concrete. The respective provisions for use in uncoated concrete (Annex B4) or in coated concrete (Annex B5) are observed.
- The driving energy applied in the job-site tests (Annex B5) is to be used for driving the fixing element into coated concrete with equalizing layer or adhesive.
- The fixing elements are driven properly if the plate of the plastic part is flush with the insulation.
- The fastening tool allows the detection of setting failures. In case of defective settings a new fixing element shall be installed.
- Instructions for use as shown below are supplied with every box of fasteners.



Hilti fixing element XI-FV

Intended use
Instructions for use

Annex B3

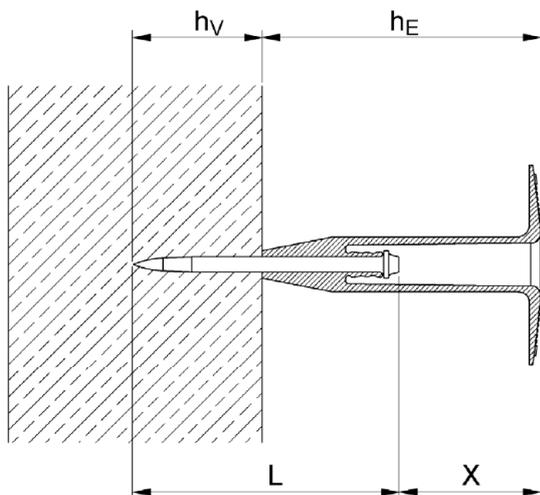
Control tests in uncoated concrete

The energy required for driving the fixing element into uncoated concrete according to Annex A1 is determined by means of 10 control tests.

These control tests shall only be carried out on the uncoated concrete without equalizing layer or adhesive.

Control of the anchorage depth is carried out by measuring the dimension "X".

Table 4: Control dimension "X" in uncoated concrete



Fixing element	X [mm] uncoated concrete
XI-FV 60	≥ 12,5
XI-FV 80	≥ 32,5
XI-FV 100	≥ 52,5
XI-FV 120	≥ 72,5
XI-FV 130	≥ 82,5
XI-FV 140	≥ 92,5
XI-FV 150	≥ 102,5
XI-FV 160	≥ 112,5
XI-FV 180	≥ 132,5
XI-FV 200	≥ 152,5

- h_v ... mean anchorage depth in concrete
- h_E ... length of plastic part of fixing element (see Annex A3)
- L ... length of powder-actuated fasteners ($L = 76,5$ mm)
- X ... mean control dimension

The energy to drive the fastener is to be selected such that the mean anchorage depth h_v amounts to minimum 30 mm.

$$h_v = (76,5 + X) - h_E = 30 \text{ mm}$$

Hilti fixing element XI-FV

Intended use
Control tests in uncoated concrete

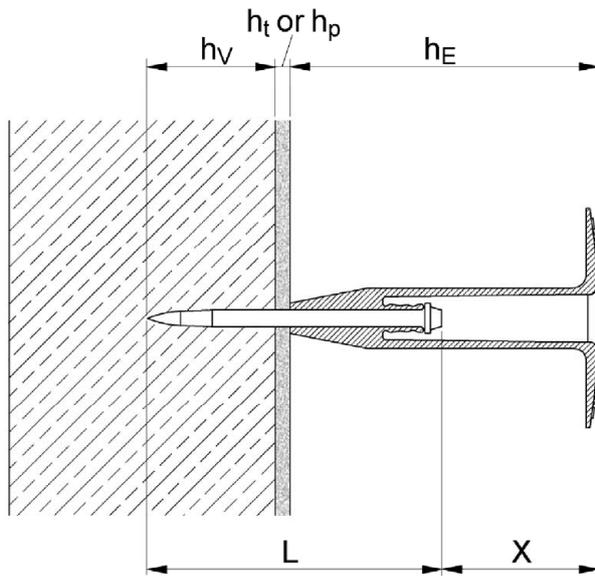
Annex B4

Job-site tests in coated concrete

In case of coated concrete according to Annex A2 the characteristic resistance may be determined (see Annex B1) by means of job-site tests according to EOTA Technical Report TR 052 Edition February 2017.

Control of the anchorage depth is carried out by measuring the dimension "X". Table 5 shows the minimum measure "X" for typical coating thickness of 10 and 15 mm.

Table 5: Control dimension "X" in coated concrete



Fixing element	X [mm] coated concrete	
	hp = ht = 10 mm	hp = 15 mm
XI-FV 60	≥ 12,5	≥ 17,5
XI-FV 80	≥ 32,5	≥ 37,5
XI-FV 100	≥ 52,5	≥ 57,5
XI-FV 120	≥ 72,5	≥ 77,5
XI-FV 130	≥ 82,5	≥ 87,5
XI-FV 140	≥ 92,5	≥ 97,5
XI-FV 150	≥ 102,5	≥ 107,5
XI-FV 160	≥ 112,5	≥ 117,5
XI-FV 180	≥ 132,5	≥ 137,5
XI-FV 200	≥ 152,5	≥ 157,5

- hv ... mean anchorage depth in concrete
- hp ... thickness of plaster
- ht ... thickness of tiles with mortar
- hE ... length of plastic part of fixing element (see Annex A3)
- L ... length of powder-actuated fasteners (L = 76,5 mm)
- X ... mean control dimension

The energy to drive the fastener is to be selected such that the mean anchorage depth hv amounts to minimum 20 mm.

$$h_v = (76,5 + X) - h_p - h_E \geq 20 \text{ mm} \dots \text{ in case of concrete with plaster}$$

$$h_v = (76,5 + X) - h_t - h_E \geq 20 \text{ mm} \dots \text{ in case of concrete with tiles}$$

Hilti fixing element XI-FV

Intended use
Job-site tests on coated concrete

Annex B5

Table 6: Characteristic resistance, spacing and edge distance

Hilti XI-FV			
Characteristic tension resistance in uncoated concrete – fastener pull-out	$N_{Rk,p}$	[kN]	1,0
Characteristic tension resistance in coated concrete – fastener pull-out ¹⁾	$N_{Rk,p}$	[kN]	0,9
Partial safety factor – fastener pull-out ²⁾	γ_M	[-]	2,0
Characteristic tension resistance – plastic part	$N_{Rk,Pl}$	[kN]	1,1
Partial safety factor – plastic part ²⁾	$\gamma_{M,Pl}$	[-]	1,3
Minimum spacing	s_{min}	[mm]	100
Minimum edge distance	c_{min}	[mm]	75
Minimum thickness of concrete member	h_{min}	[mm]	100

1) Applicable for concrete coated with cement plaster complying with general purpose plastering mortar (GP) of compressive strength category CS III or CS IV according to EN 998-1:2016.

2) In the absence of national regulations

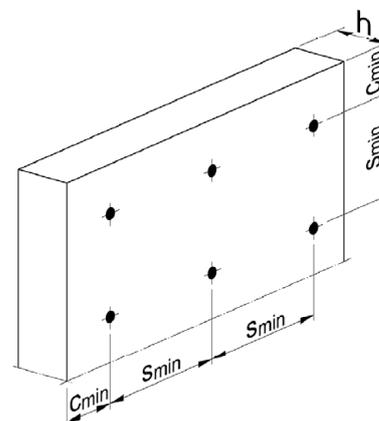


Table 7: Point thermal transmittance

Fixing element	Insulation thickness h_D [mm]	χ [W/K]
Hilti XI-FV	$60 \leq h_D < 140$	0,002
	$140 \leq h_D \leq 200$	0,001

Table 8: Plate stiffness

Fixing element	Diameter of the plate [mm]	Load resistance of the plate [kN]	Plate stiffness c [kN/mm]
Hilti XI-FV	60	1,6	0,4

Table 9: Displacements

Fixing element	Base material	Tension load N [kN]	Displacement $\delta_N(N)$ ³⁾ [mm]
Hilti XI-FV	Concrete C12/15 – C35/45	0,33	0,8

³⁾ Linear interpolation between $\delta_N(N)$ and $\delta_N(0) = 0$ is possible

Hilti fixing element XI-FV

Performances

Characteristic resistance, point thermal transmittance, plate stiffness, displacements

Annex C1