TELJESÍTMÉNYNYILATKOZAT

DoP 0404

mert fischer injektált FIS VL rendszerhez (Ragasztó az utólag telepített betonacél kapcsolatokhoz) HU

1. A terméktípus egyedi azonosító kódja: **DoP 0404**

2. Felhasználás célja(i): **Rendszer az utólagosan szerelt betonacél kapcsolatokhoz, ld. a Mellékletet, különösen ezt a mellékletet B1-B10.**

3. Gyártó: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Németország**

4. A meghatalmazott képviselő: **–**

5. Az AVCP-rendszer(ek): **1**

6. Az európai értékelési dokumentum: **EAD 330087-01-0601 Edition 06/2021**
   Európai műszaki értékelés: **ETA-15/0539; 2025-11-20**
   A műszaki értékelést végző szerv: **DIBt- Deutsches Institut für Bautechnik**
   Bejelentett szerv(ek): **2873 TU Darmstadt**

7. A nyilatkozatban szereplő teljesítmény(ek):
   Mechanikus szilárdság és stabilitás (BWR 1)
   Karakterisztikus ellenállás értéke statikus és kvázi-statikus terhelésre:
   Tapadófeszültség utólagosan szerelt betonacél kapcsolatoknál: Melléklet C1
   Csökkentő tényező: Melléklet C1
   Növelési tényezö a minimális rögzítési mélységhez: Melléklet C1
   Karakterisztikus ellenállás értéke acél tönkremenetelnél húzott betonacél esetében: NPD

   Karakterisztikus ellenállás értéke szeizmikus terhelésre:
   Ragasztó szilárdsága szeizmikus terhelésre, Ragasztó szeizmikus hatékonysági tényező: NPD
   Minimális betonfedés szeizmikus terhelésre: NPD

   Biztonság tűz esetén (BWR 2)
   Tűzzel szembeni viselkedés: Osztály (A1)

   Tűzállóság:
   Ragasztó szilárdsága megnövelt hőmérsékleten utólag elhelyezett betonacélnál 50 évre: NPD
   Ragasztó szilárdsága megnövelt hőmérsékleten utólag elhelyezett betonacélnál 100 évre: NPD
   Karakterisztikus ellenállás értéke acél tönkremenetelnél húzott betonacél esetében tüzhatás után: NPD

8. Megfelelő műszaki dokumentáció és/vagy egyedi műszaki dokumentáció: **–**

A fent azonosított termék teljesítménye megfelel a bejelentett teljesítmény(ek)nek. A 305/2011/EU rendeletnek megfelelően e teljesítménynyilatkozat kiadásáért kizárólag a fent meghatározott gyártó a felelős.

A gyártó nevében és részéről aláíró személy:

Dr. Ronald Mihala, Üzleti egységek és Mérnökségért felelős vezérigazgató

Dieter Pfaff, Nemzetközi Termelési Szövetségért és Minőségért felelős vezérigazgató

Tumlingen, 2025-12-08

Ez a Teljesítmény nyilatkozat különböző nyelveken elkészült. Vitás értelmezés esetén az angol verzió az irányadó.

A melléklet a (nyelvsemleges formában megadott) törvényi előírásokon túl önkéntesen megadott, kiegészítő információkat is tartalmaz angolul.

Translation guidance Essential Characteristics and Performance Parameters for Annexes

Mellékletek Alapvető jellemzői és Teljesítményparaméterei fordítási útmutató

Mechanical resistance and stability (BWR 1) **Mechanikus szilárdság és stabilitás (BWR 1)**		
	Characteristic resistance under static and quasi-static loading: **Karakterisztikus ellenállás értéke statikus és kvázi-statikus terhelésre:**	
1	Bond strength of post-installed rebar: **Tapadófeszültség utólagosan szerelt betonacél kapcsolatoknál:**	$f_{bd,PIR}$ [N/mm^2], $f_{bd,PIR,100y}$ [N/mm^2]
2	Bond efficiency factor: **Csökkentő tényező:**	k_b [-], $k_{b,100y}$ [-]
3	Amplification factor for minimum anchorage length: **Növelési tényezö a minimális rögzítési mélységhez:**	α_{lb} [-], $\alpha_{lb,100y}$ [-]
4	Characteristic resistance to steel failure for rebar tension anchors: **Karakterisztikus ellenállás értéke acél tönkremenetelnél húzott betonacél esetében:**	$N_{Rk,s}$ [kN]
	Characteristic resistance under seismic loading: **Karakterisztikus ellenállás értéke szeizmikus terhelésre:**	
5	Bond strength under seismic loading, Seismic bond efficiency factor: **Ragasztó szilárdsága szeizmikus terhelésre, Ragasztó szeizmikus hatékonysági tényező:**	$f_{bd,PIR,seis}$ [N/mm^2], $k_{b,seis}$ [-], $f_{bd,PIR,seis,100y}$ [N/mm^2], $k_{b,seis,100y}$ [-]
6	Minimum concrete cover under seismic loading: **Minimális betonfedés szeizmikus terhelésre:**	$c_{min,seis}$ [mm]
Safety in case of fire (BWR 2) **Biztonság tűz esetén (BWR 2)**		
7	Reaction to fire: **Tűzzel szembeni viselkedés:**	Class
	Resistance to fire: **Tűzállóság:**	
8	Bond strength at increased temperature for post-installed rebar assessed for 50 years: **Ragasztó szilárdsága megnövelt hőmérsékleten utólag elhelyezett betonacélnál 50 évre:**	$f_{bd,fi}(\theta)$ [N/mm^2], k_{fi} (θ) [-], θ_{max} [^{o}C]
9	Bond strength at increased temperature for post-installed rebar assessed for 100 years: **Ragasztó szilárdsága megnövelt hőmérsékleten utólag elhelyezett betonacélnál 100 évre:**	$f_{bd,fi,100y}(\theta)$ [N/mm^2], $k_{fi,100y}(\theta)$ [-], θ_{max} [^{o}C]
10	Characteristic resistance to steel failure for rebar tension anchors under fire exposure: **Karakterisztikus ellenállás értéke acél tönkremenetelnél húzott betonacél esetében tüzhatás után:**	$N_{Rk,s,fi}$ [kN]

Specific Part

1 Technical description of the product

The subject of this European Technical Assessment is the post-installed connection, by anchoring or overlap connection joint, of reinforcing bars (rebars) in existing structures made of normal weight concrete, using the "Rebar connection with injection system FIS VL" in accordance with the regulations for reinforced concrete construction.
Reinforcing bars made of steel with a diameter ϕ from 10 to 25 mm according to Annex A and injection mortar FIS VL are used for rebar connections. The rebar is placed into a drilled hole filled with injection mortar and is anchored via the bond between rebar, injection mortar and concrete.

The product description is 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 rebar connection 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 rebar connections of at least 50 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 resistance under static and quasi-static loading	See Annex C1
Characteristic resistance under seismic loading	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	**Performance**
Reaction to fire	Class A1
Resistance to fire	No performance assessed

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

In accordance with European Assessment Document EAD No. 330087-01-0601, the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

Installation conditions and application examples reinforcing bars, part 1

Figure A1.1:
Overlap joint with existing reinforcement for rebar connections of slabs and beams

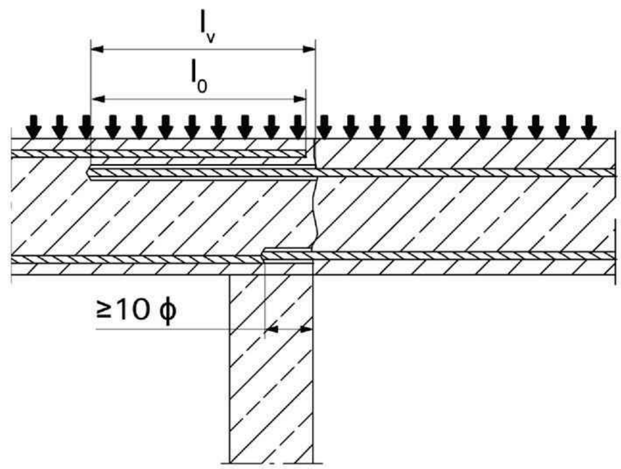


Figure A1.2:
Overlap joint with existing reinforcement at a foundation of a column or wall where the rebars are stressed

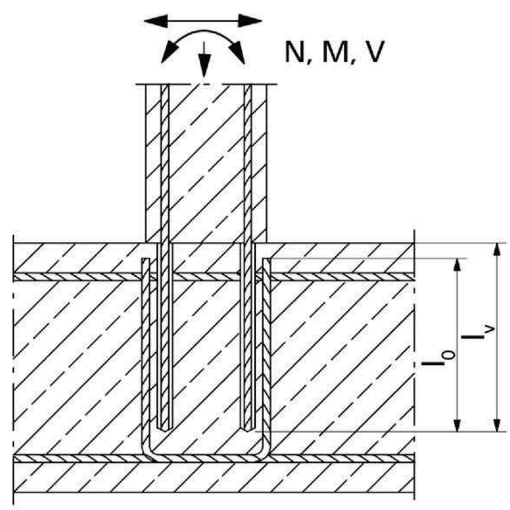
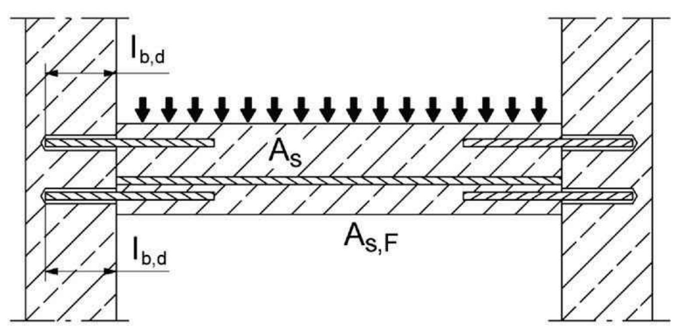


Figure A1.3:
End anchoring of slabs or beams (e.g. designed as simply supported)



Figures not to scale

Rebar connection with injection system FIS VL

Product description
Installation conditions and application examples reinforcing bars, part 1

Annex A1

Installation conditions and application examples reinforcing bars, part 2

Figure A2.1:

Rebar connection for stressed primarily in compression

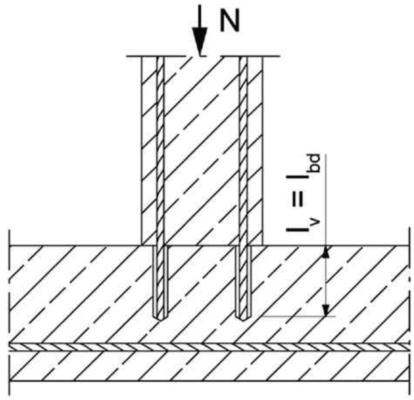
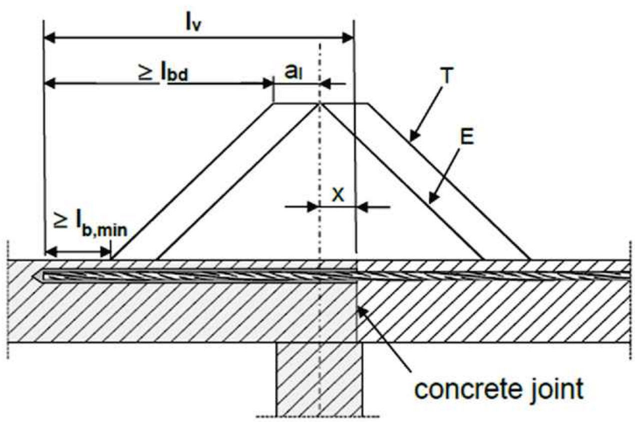


Figure A2.2:

Anchoring of reinforcement to cover the enveloped line of acting tensile force in the bending member



(only post-installed rebar is plotted)

Key to Figure

T Acting tensile force

E Envelope of M_{ed} / z + N_{ed} (see EN 1992-1-1:2011)

x Distance between the theoretical point of support and concrete joint

Note to **figure A1.1** to **A1.3** and **figure A2.1** to **A2.2**

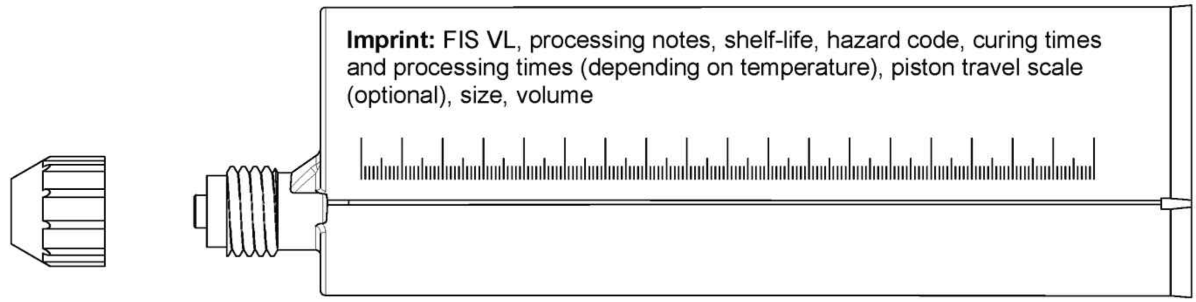
In the figures no traverse reinforcement is plotted, the transverse reinforcement as required by EN 1992-1-1:2011 shall be present.

The shear transfer between old and new concrete shall be designed according to EN 1992-1-1:2011. Preparation of joints according to **Annex B3** of this document

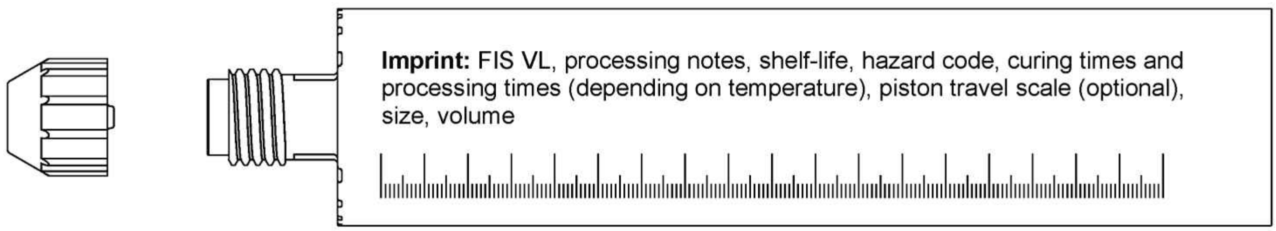
Figures not to scale

Overview system components

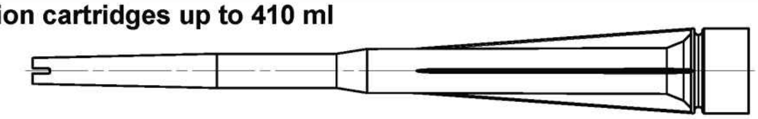
Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 360 ml, 825 ml



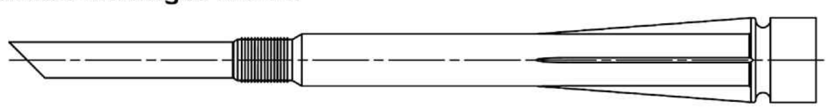
Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 300 ml, 380 ml, 400 ml, 410 ml



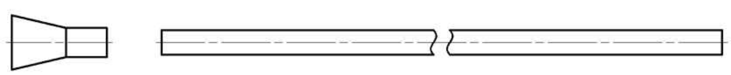
Static mixer FIS MR Plus for injection cartridges up to 410 ml



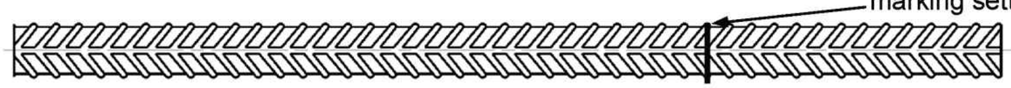
Static mixer FIS JMR for injection cartridges 825 ml



Injection adapter and extension tube Ø 9 for static mixer FIS MR Plus;
Injection adapter and extension tube Ø 9 or Ø 15 for static mixer FIS JMR



Reinforcing bar (rebar) Sizes: ϕ10, ϕ12, ϕ14, ϕ16, ϕ20, ϕ25



Blow out pump AB G

Compressed-air cleaning tool AB P with fischer compressed-air nozzle

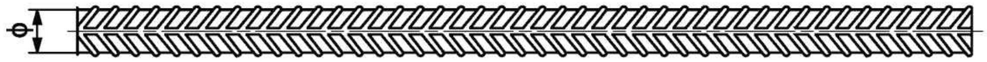
Figures not to scale

Rebar connection with injection system FIS VL

Product description
Overview system components; Injection mortar, static mixer, injection adapter, reinforcing bar

Properties of reinforcing bars (rebar)

Figure A4.1:



- The minimum value of related rib area $f_{R,min}$ according to EN 1992-1-1:2011
- The maximum outer rebar diameter over the ribs shall be:
  - The nominal diameter of the bar with rib $\phi + 2 \cdot h$ ($h \leq 0{,}07 \cdot \phi$)
  - (ϕ: Nominal diameter of the bar; h_{rib} = rib height of the bar)

Table A4.1: Installation conditions for rebars

<table>
<tr><th colspan="2">Nominal diameter of the bar</th><th>ϕ</th><th colspan="2">10[1)]</th><th colspan="2">12[1)]</th><th>14</th><th>16</th><th>20</th><th colspan="2">25[1)]</th></tr>
<tr><td>Nominal drill hole diameter</td><td>d_0</td><td rowspan="4">[mm]</td><td>12</td><td>14</td><td>14</td><td>16</td><td>18</td><td>20</td><td>25</td><td>30</td><td>35</td></tr>
<tr><td>Drill hole depth</td><td>h_0</td><td colspan="9">$h_0 = l_v$</td></tr>
<tr><td>Effective embedment depth</td><td>l_v</td><td colspan="9">acc. to static calculation</td></tr>
<tr><td>Minimum thickness of concrete member</td><td>h_{min}</td><td colspan="3">$l_v + 30$
(≥ 100)</td><td colspan="6">$l_v + 2d_0$</td></tr>
</table>

[1)] Both drill hole diameters can be used.

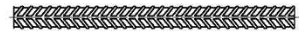
Table A4.2: Materials of rebars

Designation	**Reinforcing bar (rebar)**
Reinforcing bar EN 1992-1-1:2011, Annex C	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCI of EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$

Figures not to scale

Specifications of intended use part 1

Table B1.1: Overview use and performance categories

Anchorages subject to		**FIS VL with …**	
		Reinforcing bar 	
Hammer drilling or compressed air drilling with standard drill bit		all sizes	
Hammer drilling with hollow drill bit  (fischer "FHD" & "FHD II", Heller "Duster Expert", Bosch "Speed Clean", Hilti "TE-CD, TE-YD")		Nominal drill bit diameter (d_0) 12 mm to 35 mm	
Use category I1	dry or wet concrete	all sizes	
Characteristic resistance under static and quasi static loading, in	uncracked concrete	all sizes	Tables: C1.1 C1.2 C1.3
	cracked concrete		
Characteristic resistance under seismic loading		-[1)]	
Installation direction		D3 (downward and horizontal and upwards (e.g. overhead))	
Installation temperature		$T_{i,min}$ = 0 °C to $T_{i,max}$ = +40 °C	
Service temperature	Temperature range	-40 °C to +80 °C	(max. short term temperature +80 °C; max long term temperature +50 °C)
Resistance to fire		-[1)]	

[1)] No performance assessed

Specifications of intended use part 2

Anchorages subject to:

- Static and quasi-static loading: reinforcing bar (rebar) size 10 mm to 25 mm;

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013+A2:2021
- Concrete strength classes C20/25 to C35/45 according to EN 206:2013+A2:2021
- Maximum chloride content of 0,40 % (CL 0.40) related to the cement content according to EN 206:2013+A2:2021
- Non-carbonated concrete
  Note: In case of a carbonated surface of the existing concrete structure the carbonated layer shall be removed in the area of the post-installed rebar connection with a diameter of ϕ + 60 mm prior to the installation of the new rebar. The depth of concrete to be removed shall correspond to at least the minimum concrete cover in accordance with EN 1992-1-1:2011. The foregoing may be neglected if building components are new and not carbonated and if building components are in dry conditions.

Design:

- The structural design according to EN 1992-1-1:2011, EN 1992-1-2:2011 and Annex B3 and B4 are conducted under responsibility of a designer expierenced in the field of anchorages and concrete works.
- Verifiable calculation notes and drawings are prepared taking account of the forces to be transmitted.
- The actual position of the reinforcement in the existing structure shall be determined on the basis of the construction documentation and taken into account when designing.

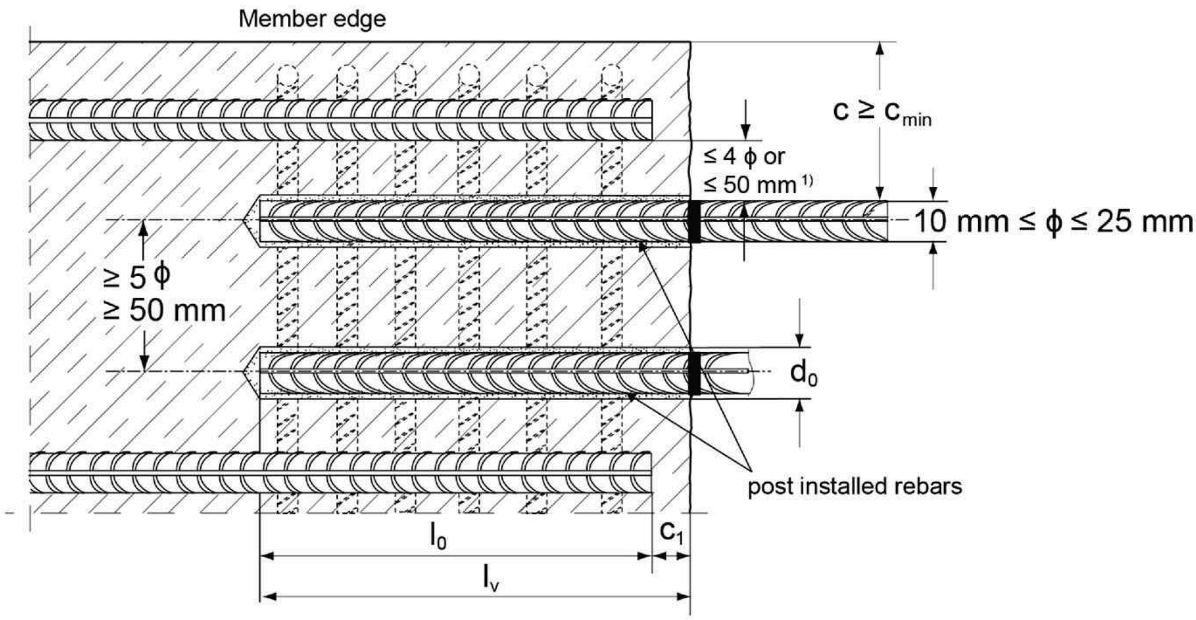
Installation:

- The installation of post-installed rebar shall be done only by suitable trained installer and under Supervision on site; the conditions under which an installer may be considered as suitable trained and the conditions for Supervision on site are up to the Member States in which the installation is done.
- Check the position of the existing rebars (if the position of existing rebars is not known, it shall be determined using a rebar detector suitable for this purpose as well as on the basis of the construction documentation and then marked on the building component for the overlap joint).

General construction rules for post-installed rebars

Figure B3.1:

- Only tension forces in the axis of the rebar may be transmitted.
- The transfer of shear forces between new concrete and existing structure shall be designed additionally according to EN 1992-1-1:2011.
- The joints for concreting must be roughened to at least such an extent that aggregate protrude.

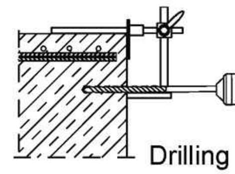


[1)] If the clear distance between lapped bars exceeds 4 ϕ or 50 mm then the lap length shall be increased by the difference between the clear bar distance and the smaller 4 ϕ or 50 mm.

c	concrete cover of post-installed rebar
c_1	concrete cover at end-face of existing rebar
c_{min}	minimum concrete cover according to **Table B4.1** and to EN 1992-1-1:2011, Section 4.4.1.2
ϕ	nominal diameter of reinforcing bar
l_0	lap length, according to EN 1992-1-1:2011 for static loading
l_v	effective embedment depth, $\geq l_0 + c_1$
d_0	nominal drill bit diameter, see **Annex B5**

Figures not to scale

Table B4.1: Minimum concrete cover c_{min}[1)] depending of the drilling method and the drilling tolerance

Drilling method	nominal diameter of reinforcing bar ϕ [mm]	Minimum concrete cover c_{min}		
		Without drilling aid [mm]	With drilling aid [mm]	
Hammer drilling with standard drill bit or hollow drill bit	< 25	30 mm + 0,06 $l_v \geq 2\ \phi$	30 mm + 0,02 $l_v \geq 2\ \phi$	 Drilling aid
	≥ 25	40 mm + 0,06 $l_v \geq 2\ \phi$	40 mm + 0,02 $l_v \geq 2\ \phi$	
Compressed air drilling	< 25	50 mm + 0,08 l_v	50 mm + 0,02 l_v	
	≥ 25	60 mm + 0,08 $l_v \geq 2\ \phi$	60 mm + 0,02 $l_v \geq 2\ \phi$	

[1)] See Annex B3, figure B3.1
Note: The minimum concrete cover as specified in EN 1992-1-1:2011 must be observed.

Table B4.2: Dispensers and cartridge sizes corresponding to maximum embedment depth $l_{v,max}$

reinforcing bars (rebar)	Manual dispenser	Accu and pneumatic dispenser (small)	Accu and pneumatic dispenser (large)
	Cartridge size		
	< 500 ml		> 500 ml
ϕ [mm]	$l_{v,max}$ / $l_{e,ges,max}$ [mm]		$l_{v,max}$ / $l_{e,ges,max}$ [mm]
10	1000	1000	1800
12		1200	
14			
16		1500	
20	700	1300	
25		1000	2000

Table B4.3: Conditions for use **static mixer** without an **extension tube**

Nominal drill hole diameter	d_0	[mm]	10	12	14	16	18	20	24	25	30	35
Drill hole depth h_0 by using	FIS MR Plus		≤ 90		≤ 120	≤ 140	≤ 150	≤ 160	≤ 190	≤ 210		
	FIS JMR		-	-	≤ 90	≤ 160	≤ 180	≤ 190	≤ 220		≤ 250	

Figures not to scale

Table B5.1: Working times t_{work} and curing times t_{cure}

Temperature in the anchorage base [°C]	Maximum working time[1)] t_{work} **FIS VL**	Minimum curing time[2)] t_{cure} **FIS VL**
0 to 5 [3)]	13 min	3 h
> 5 to 10 [3)]	9 min	90 min
> 10 to 20	5 min	60 min
> 20 to 30	4 min	45 min
> 30 to 40 [4)]	2 min	35 min

[1)] Maximum time from the beginning of the injection to rebar setting and positioning.
[2)] For wet concrete the curing time must be doubled.
[3)] If the temperature in the concrete falls below 10 °C the cartridge must be warmed up to +15 °C.
[4)] If the temperature in the concrete exceeds 30 °C the cartridge must be cooled down to +15 °C up to 20 °C.

Table B5.2: Installation tools for drilling and cleaning the bore hole and injection of the mortar

reinforcing bars (rebar)	Drilling and cleaning				Injection	
	Nominal drill bit diameter	Diameter of cutting edge	Steel brush diameter	Diameter of fischer compressed air nozzle	Diameter of extension tube	Injection adapter
ϕ [mm]	d_0 [mm]	d_{cut} [mm]	d_b [mm]	[mm]	[mm]	[colour]
10[1)]	12	≤ 12,50	12,5	11	9	nature
	14	≤ 14,50	15			blue
12[1)]	14	≤ 14,50	15	15		
	16	≤ 16,50	17			red
14	18	≤ 18,50	19		9 or 15	yellow
16	20	≤ 20,55	21,5	19		green
20	25	≤ 25,55	26,5			black
25[1)]	30	≤ 30,55	32	28		grey
	35	≤ 35,70	37			brown

[1)] Both drill bit diameters can be used.

Safety regulations

Review the Safety Data Sheet (SDS) before use for proper and safe handling!

Wear well-fitting protective goggles and protective gloves when working with mortar FIS VL.

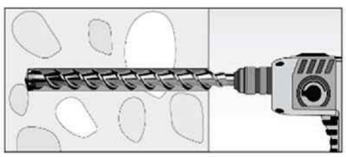
Important: Observe the instructions for use provided with each cartridge.

Installation instruction part 1; Installation with FIS VL

Hole drilling

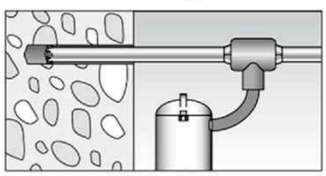
Note: Before drilling, remove carbonized concrete; clean contact areas (see **Annex B2**)
In case of aborted drill holes the drill hole shall be filled with mortar.

1a **Hammer drilling or compressed air drilling**



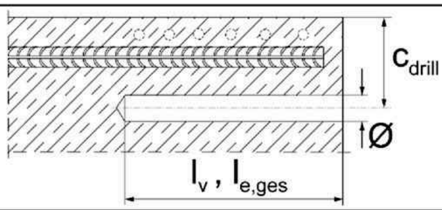
Drill the hole to the required embedment depth using a hammer drill with carbide drill bit set in rotation hammer mode or a pneumatic drill.
Drill bit sizes see **Table B5.2**.

1b **Hammer drilling with hollow drill bit**

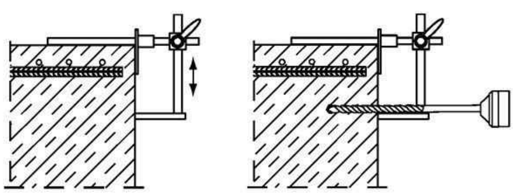


Drill the hole to the required embedment depth using a hammer drill with hollow drill bit in rotation hammer mode.
Dust extraction conditions see drill hole cleaning **Annex B7**.
Drill bit sizes see **Table B5.2**.

2



Measure and control concrete cover c
(c_{drill} = c + Ø / 2)
Drill parallel to surface edge and to existing rebar.
Where applicable use drilling aid.



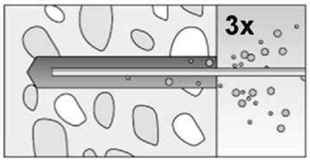
For holes l_v > 20 cm use drilling aid.
Three different options can be considered:

A) drilling aid
B) Slat or spirit level
C) Visual check

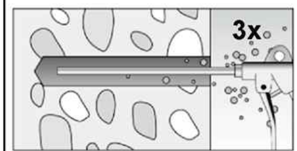
Minimum concrete cover c_{min} see **Table B4.1.**

3a

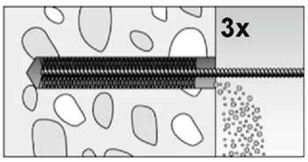
Hammer or compressed air drilling



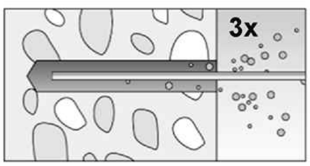
Clean the drill hole:
For d_0 < 18 mm and depths l_v resp. $l_{e,ges} \leq 12 \cdot \phi$ blow out the hole three times by hand.



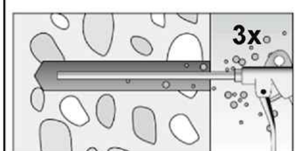
For d_0 > 18 mm and depths l_v resp. $l_{e,ges} > 12 \cdot \phi$ blow out the hole three times with oil-free compressed air ($p \geq 6$ bar). Use suitable compressed-air nozzle (see T**able B5.2**).



Brush drill hole three times; for drill hole diameters $d_0 \geq 30$ mm attach brush to a power tool and brush hole with a speed of max. 550 revolutions per minute.
For deep holes a brush extension is mandatory.
Use suitable brushes (see **Table B5.2**).



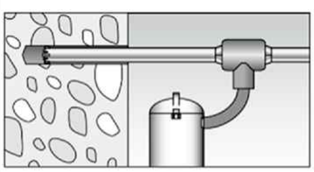
Clean the drill hole:
For d_0 < 18 mm and depths l_v resp. $l_{e,ges} \leq 12 \cdot \phi$ blow out the hole three times by hand.



For d_0 > 18 mm and depths l_v resp. $l_{e,ges} > 12 \cdot \phi$ blow out the hole three times with oil-free compressed air ($p \geq 6$ bar) Use suitable compressed-air nozzle (see **Table B5.2**).

3b

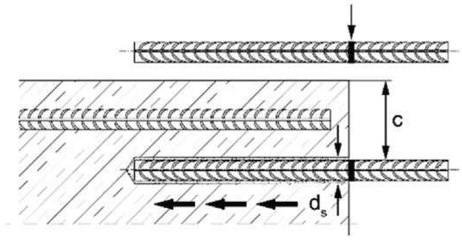
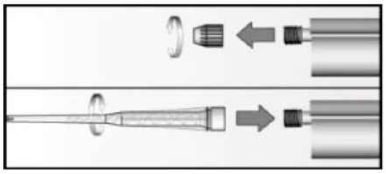
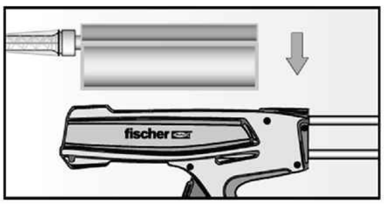
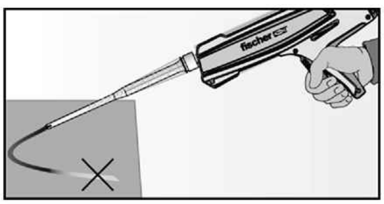
Hammer drilling with hollow drill bit



Use a suitable dust extraction system, e. g.
fischer FVC 35 M or a comparable dust extraction system with equivalent performance data.
Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power.
No further drill hole cleaning necessary.

Installation instruction part 3; Installation with FIS VL

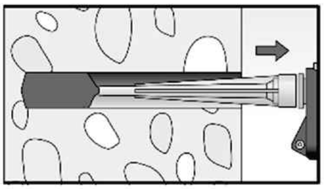
reinforcing bars (rebar) and cartridge preparation

4		Before use, make asure that the rebar is dry and free of oil or other residue. Mark the embedment depth l_v (e.g. with tape) Insert rebar in borehole, to verify drill hole depth and setting depth l_v resp. $l_{e,ges.}$
5		Twist off the sealing cap Twist on the static mixer (the spiral in the static mixer must be clearly visible).
6		Place the cartridge into a suitable dispenser.
7		Press out approximately 10 cm of mortar until the resin is permanently grey in colour. Mortar which is not grey in colour will not cure and must be disposed.

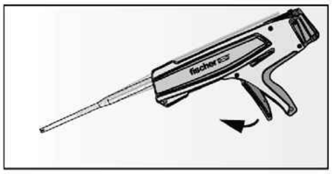
Installation instruction part 4; Installation with FIS VL

Injection of the mortar without extension tube

8a



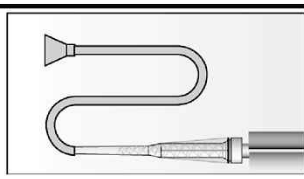
Inject the mortar from the back of the hole towards the front and slowly withdraw the static mixer step by step with each trigger pull.
Avoid bubbles.
Fill holes approximately 2/3 full, to ensure that the annular gap between the rebar and the concrete will be completely filled with adhesive over the entire embedment length.
The conditions for mortar injection without extension tube can be found in **Table B4.3**.



After injecting, release the dispenser. This will prevent further mortar discharge from the static mixer.

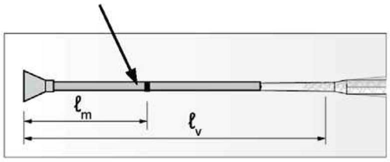
Injection of the mortar with extension tube

8b



Assemble static mixer FIS MR Plus or FIS JMR, extension tube and appropriate injection adapter (see **Table B5.2**).

Mortar level mark



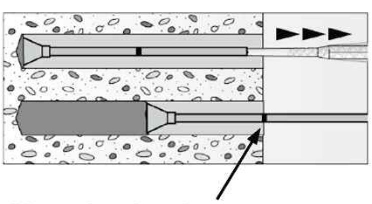
Mark the required mortar level l_m and embedment depth l_v resp. $l_{e,ges}$ with tape or marker on the injection extension tube.

a) Estimation:

$$l_m = \frac{1}{3} \cdot l_v \; resp. \; l_m = \frac{1}{3} \cdot l_{e,ges} \text{ [mm]}$$

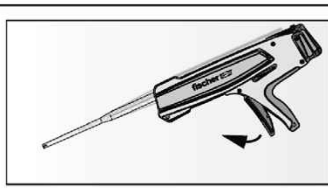
b) Precise equation for optimum mortar volume:

$$l_m = l_v \; resp. \; l_{e,ges} \left((1{,}2 \cdot \frac{d_s^2}{d_0^2} - 0{,}2) \right) \text{ [mm]}$$



Mortar level mark

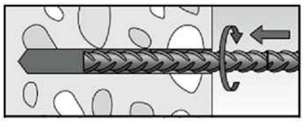
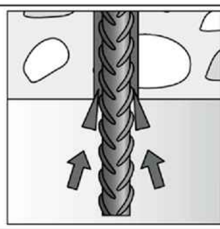
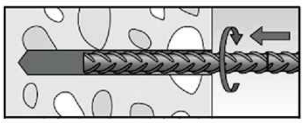
Insert injection adapter to back of the hole. Begin injection allowing the pressure of the injected adhesive mortar to push the injection adapter towards the front of the hole. Do not actively pull out!
Fill holes approximately 2/3 full, to ensure that the annular gap between the rebar and the concrete will be completely filled with adhesive over the embedment length.
When using an injection adapter continue injection until the mortar level mark l_m becomes visible.
Maximum embedment depth see **Table B4.2**.



After injecting, release the dispenser. This will prevent further mortar discharge from static mixer.

Installation instruction part 5; Installation with FIS VL

Insert rebar

9		Insert the rebar slowly twisted into the borehole until the embedment mark is reached. Recommendation: Rotation back and forth of the reinforcement bar makes pushing easy.
10		For overhead installation, support the rebar and secure it from falling till mortar started to harden, e.g. using wedges.
11		After installing the rebar the annular gap must be completely filled with mortar. Proper installation • Desired embedment depth is reached l_v, resp. $l_{e,ges}$: embedment mark at concrete surface • Excess mortar flows out of the borehole after the rebar has been fully inserted up to the embedment mark.
12		Observe the working time "t_{work}" (**see Table B5.1**), which varies according to temperature of base material. Minor adjustments to the rebar position may be performed during the working time Full load may be applied only after the curing time "t_{cure}" has elapsed (**see Table B5.1**).

Minimum anchorage length and minimum lap length

The minimum anchorage length $l_{b,min}$ and the minimum lap length $l_{0,min}$ according to EN 1992-1-1:2011 shall be multiplied by the relevant amplification factor α_{lb} according to **Table C1.1.**

Table C1.1: Amplification factor α_{lb} related to concrete strength class and drilling method

Hammer drilling, hollow drilling and compressed air drilling

Rebar ϕ [mm]	**Amplification factor α_{lb}** Concrete strength class			
	C20/25	C25/30	C30/37	C35/45
10 to 25	1,0			

Table C1.2: Bond efficiency factor k_b related to concrete strength class and drilling method

Hammer drilling, hollow drilling and compressed air drilling

Rebar ϕ [mm]	**Bond efficiency factor k_b** Concrete strength class			
	C20/25	C25/30	C30/37	C35/45
10 to 25	1,0			

Table C1.3: Design values of the bond strength $f_{bd,PIR}$ in N/mm² related to concrete strength class and drilling method for good bond conditions

$$\mathbf{f_{bd,PIR} = k_b \cdot f_{bd}}$$

f_{bd}: Design value of the bond strength in N/mm² considering the concrete strength classes and the rebar diameter for good bond condition (for all other bond conditions multiply the values by $\eta_1 = 0{,}7$)
and recommended partial factor $\gamma_c = 1{,}5$ according to EN 1992-1-1: 2011

k_b: Bond efficiency factor according to **Table C1.2**

Hammer drilling, hollow drilling and compressed air drilling

Rebar ϕ [mm]	**Bond strength $f_{bd,PIR}$ [N/mm²]** Concrete strength class			
	C20/25	C25/30	C30/37	C35/45
10 to 25	2,3	2,7	3,0	3,4