DÉCLARATION DES PERFORMANCES

DoP 0238

pour le système d'injection fischer FIS V Zero (fixation à scellement pour utilisation dans le béton) FR

1. Code d'identification unique du type de produit: **DoP 0238**

2. Usage(s) prévu(s): **Fixation dans du béton fissuré ou non fissuré, voir annexes, en particulier les annexes B1 - B10.**

3. Fabricant: **fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Allemagne**

4. Mandataire: **–**

5. Système(s) d'évaluation et de vérification de la constance des performances: **1**

6. Document d'évaluation européen: **EAD 330499-01-0601, Edition 04/2020**
   Evaluation Technique Européenne: **ETA-20/0572; 2021-04-28**
   Organisme d'évaluation technique: **DIBt- Deutsches Institut für Bautechnik**
   Organisme(s) notifié(s): **2873 TU Darmstadt**

7. Performance(s) déclarée(s):

Résistance mécanique et stabilité (BWR 1)

Résistance caractéristique à la charge de traction (charge statique et quasi-statique):

Résistance à la rupture de l'acier (charge de traction): Annexes C1 - C3 E_S= 210 000 MPa
Résistance à la rupture par extraction glissement: et rupture du cône béton: Annexes C4 - C7 $\tau_{Rk,100}$= NPD
Résistance à la rupture du cône béton: Annexe C4
Distance au bord pour éviter la rupture par fendage sous charge: Annexe C4
Robustesse: Annexes C4 - C7
Couple de serrage maxi: Annexes B3, B4, B6
Distance au bord et entraxe mini: Annexes B3 - B6

Résistance caractéristique à la charge de cisaillement (charge statique et quasi-statique):

Résistance à la rupture de l'acier: Annexes C1 - C3
Résistance à la rupture par effet de levier: Annexe C4
Résistance à la rupture du béton en bord de dalle: Annexe C4

Résistance caractéristique et déplacements pour les catégories de performance sismique C1 et C2:

Résistance à la charge de traction, catégorie C1: NPD
Résistance à la charge de traction, catégorie C2: NPD
Résistance à la charge de cisaillement, catégorie C1: NPD
Résistance à la charge de cisaillement, catégorie C2: NPD
Facteur espace annulaire: NPD

Déplacements sous charge à court et long terme:

Déplacements sous charge à court et long terme: Annexes C8, C9

Hygiène, santé et environnement (BWR 3)

Contenu, émission et/ou rejet de substances dangereuses: NPD –

8. Documentation technique appropriée et/ou documentation technique spécifique: **–**

Les performances du produit identifié ci-dessus sont conformes aux performances déclarées. Conformément au règlement (UE) no 305/2011, la présente déclaration des performances est établie sous la seule responsabilité du fabricant mentionné ci-dessus.

Signé pour le fabricant et en son nom par:

Dr. Oliver Geibig, Directeur Général Business Units & Ingénierie

Jürgen Grün, Directeur Général Chimie & Qualité

Tumlingen, 2021-05-12

Cette DoP a été préparée en plusieurs langues. En cas de différend relatif à l'interprétation, la version anglaise prévaudra.

L'annexe comprend des informations volontaires et complémentaires en langue anglaise dépassant les exigences légales (spécifiées de manière neutre).

Specific Part

1 Technical description of the product

The fischer injection system FIS V Zero is a bonded fastener consisting of an injection cartridge with injection mortar FIS V Zero and a steel element according to Annex A.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, 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 anchor 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 anchor 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 to tension load (static and quasi-static loading)	See Annex C 1 to C 7, B 3 to B 6
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 to C 4
Displacements under short-term and long-term loading	See Annex C 8 to C 9
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

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

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

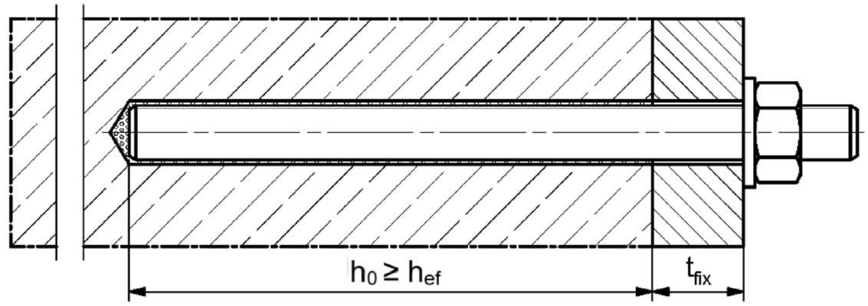
In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

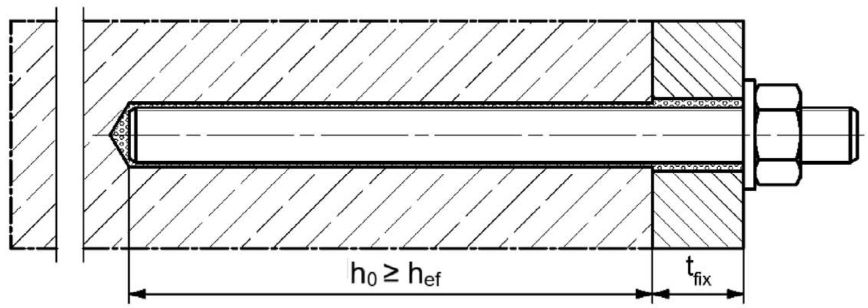
Installation conditions part 1

fischer anchor rod

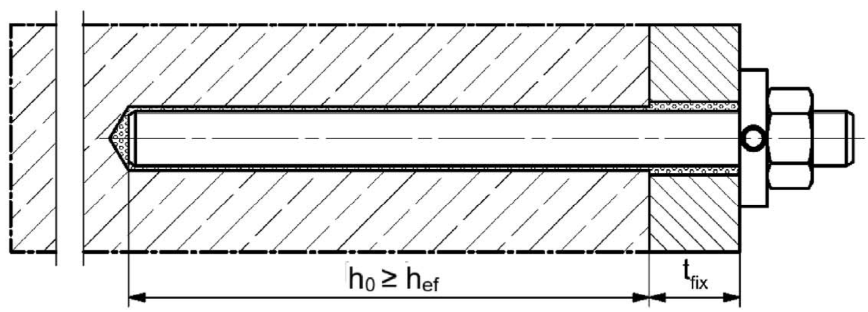
Pre-positioned installation



Push through installation (annular gap filled with mortar)



Pre-positioned or push through installation with subsequently injected fischer filling disc
(annular gap filled with mortar)



Figures not to scale

h_0 = drill hole depth

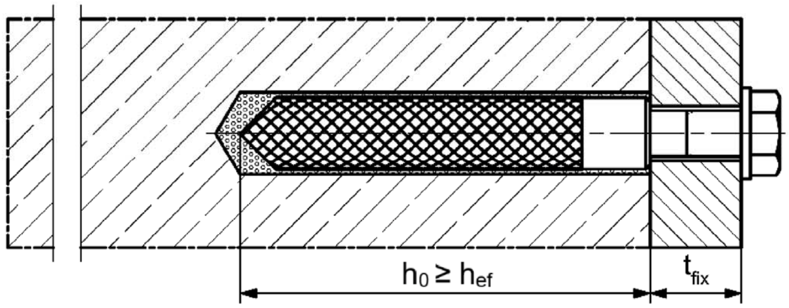
h_{ef} = effective embedment depth

t_{fix} = thickness of fixture

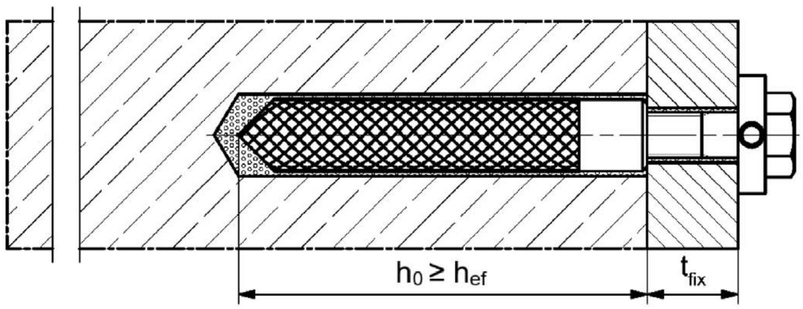
Installation conditions part 2

fischer internal threaded anchor RG M I

Pre-positioned installation



Pre-positioned installation with subsequently injected fischer filling disc (annular gap filled with mortar)



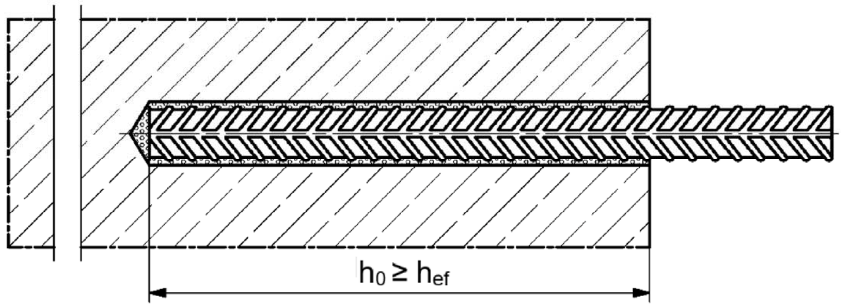
Figures not to scale

h_0 = drill hole depth h_{ef} = effective embedment depth

t_{fix} = thickness of fixture

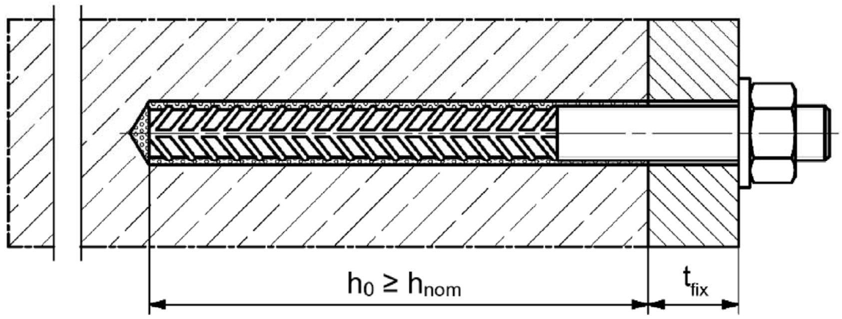
Installation conditions part 3

Reinforcing bar

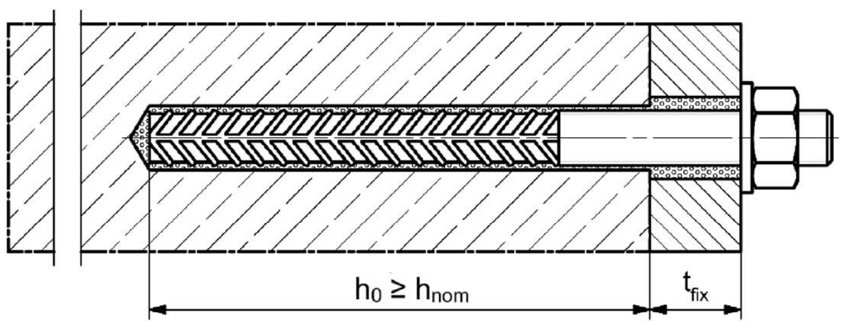


fischer rebar anchor FRA

Pre-positioned installation



Push through installation (annular gap filled with mortar)



Figures not to scale

h_0 = drill hole depth

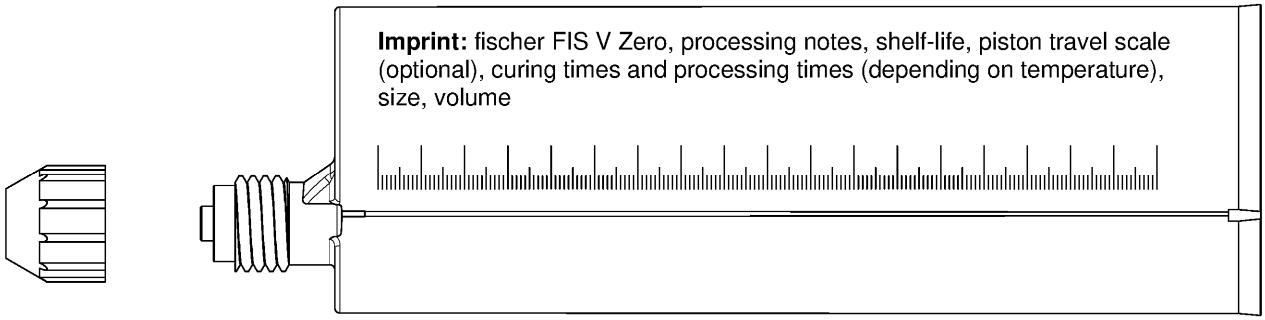
t_{fix} = thickness of fixture

h_{ef} = effective embedment depth

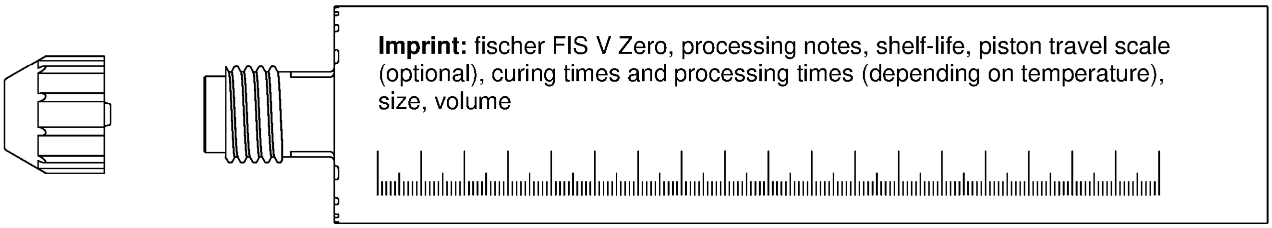
h_{nom} = overall fastener embedment depth in the concrete

Overview system components part 1

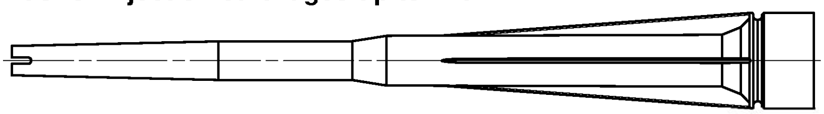
Injection cartridge (shuttle cartridge) with sealing cap; Sizes: 360 ml, 825 ml



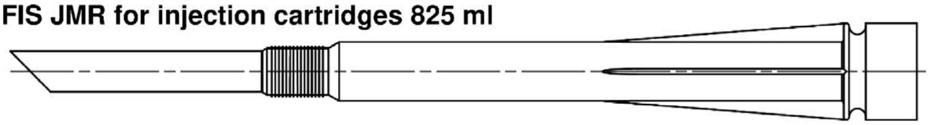
Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml



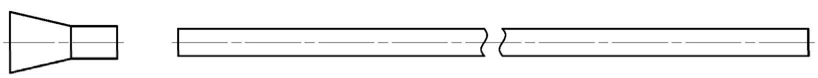
Static mixer FIS MR Plus for injection cartridges up to 410 ml



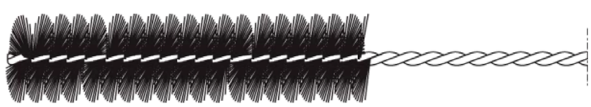
Static mixer FIS JMR for injection cartridges 825 ml



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



Cleaning brush BS



Blow-out pump

AB G

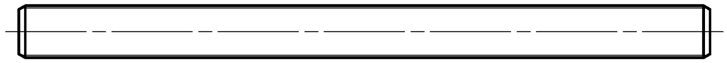
ABP:

Figures not to scale

Overview system components part 2

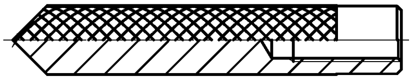
fischer anchor rod

Size: M8, M10, M12, M16, M20, M24

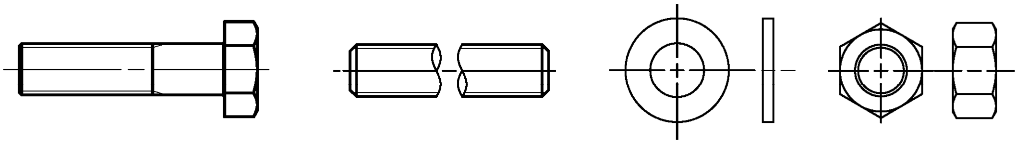


fischer internal threaded anchor RG M I

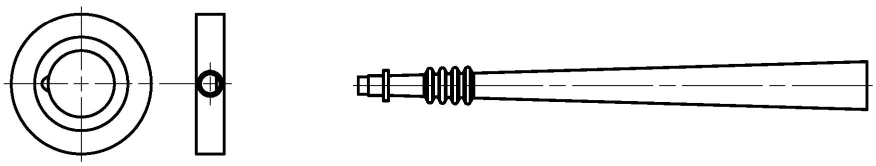
Size: M8, M10, M12, M16



Screw / threaded rod / washer / hexagon nut

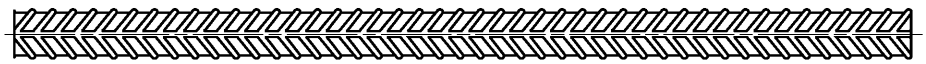


fischer filling disc with injection adapter



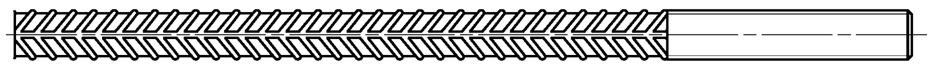
Reinforcing bar

Nominal diameter: ϕ8, ϕ10, ϕ12, ϕ14, ϕ16, ϕ20, ϕ22, ϕ24, ϕ25



fischer rebar anchor FRA

Size: M12, M16, M20, M24



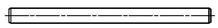
Figures not to scale

Table A6.1: Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
	Steel grade	Steel	Stainless steel R	High corrosion resistant steel HCR
		zinc plated	acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015	acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015
2	Anchor rod	Property class 4.8, 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004 $f_{uk} \le 1000$ N/mm^2 $A_5 > 8\%$ fracture elongation	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; EN 10088-1:2014 $f_{uk} \le 1000$ N/mm^2 $A_5 > 8\%$ fracture elongation	Property class 50 or 80 EN ISO 3506-1:2009 or property class 70 with f_{yk}= 560 N/mm^2 1.4565; 1.4529; EN 10088-1:2014 $f_{uk} \le 1000$ N/mm^2 $A_5 > 8\%$ fracture elongation
3	Washer ISO 7089:2000	zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565; 1.4529; EN 10088-1:2014
4	Hexagon nut	Property class 4, 5 or 8; EN ISO 898-2:2012 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014
5	fischer internal threaded anchor RG M I	Property class 5.8 ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K)	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014
6	Commercial standard screw or threaded rod for fischer internal threaded anchor RG M I	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) $A_5 > 8$ % fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014 $A_5 > 8$ % fracture elongation	Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529; EN 10088-1:2014 $A_5 > 8$ % fracture elongation
7	fischer filling disc similar to DIN 6319-G	zinc plated ≥ 5 µm, ISO 4042:2018/Zn5/An(A2K) or hot dip galvanised ≥ 40 µm EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565;1.4529; EN 10088-1:2014
8	Reinforcing bar EN 1992-1-1:2004 and AC:2010, Annex C	Bars and de-coiled rods, class B or C with f_{yk} and k according to NDP or NCL of according to EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$ ($A_5 > 8\%$)		
9	fischer rebar anchor FRA	Rebar part: Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1:2004+AC:2010 $f_{uk} = f_{tk} = k \cdot f_{yk}$	Threaded part: Property class 70 or for M24 PC 80, EN ISO 3506-1:2009 1.4401, 1.4404, 1.4571, 1.4578, 1.4439, 1.4362, 1.4062 acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015 1.4565; 1.4529 acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015	

Specifications of intended use (part 1)

Table B1.1: Overview use and performance categories

		FIS V Zero with …							
		Anchor rod 		fischer internal threaded anchor RG M I 		Reinforcing bar 		fischer rebar anchor FRA 	
Hammer drilling with standard drill bit		all sizes							
Hammer drilling with hollow drill bit  (fischer „FHD“, Heller „Duster Expert“; Bosch „Speed Clean“; Hilti „TE-CD, TE-YD“)		Nominal drill bit diameter (d_0) 12 mm to 30 mm							
Static and quasi static load, in	uncracked concrete	all sizes	Tables: C1.1 C4.1 C5.1 C8.1	all sizes	Tables: C2.1 C4.1 C6.1 C8.2	all sizes	Tables: C3.1 C4.1 C7.1 C9.1	all sizes	Tables: C3.2 C4.1 C7.2 C9.2
	cracked concrete [2]	all sizes		all sizes		-[1]		-[1]	
Seismic performance category	C1[1]	-[1]		-[1]		-[1]		-[1]	
	C2[1]								
Use conditions	I1 dry or wet concrete	all sizes		all sizes		all sizes		all sizes	
	I2 water filled hole [2]	all sizes		all sizes		all sizes		all sizes	
Installation direction		D3 (downward and horizontal and upwards (e.g. overhead) installation)							
Installation temperature		$T_{i,min}$ = -10 °C to $T_{i,max}$ = +40 °C for the standard variation of temperature after installation							
In-service temperature	Temperature range I	-40 °C to +40 °C		(max. short term temperature +40 °C; max. long term temperature +24 °C)					
	Temperature range II	-40 °C to +80 °C		(max. short term temperature +80 °C; max. long term temperature +50 °C)					
	Temperature range III	-40 °C to +120 °C		(max. short term temperature +120 °C; max. long term temperature +72 °C)					

[1] No performance assessed
[2] No performance assessed for installation with hollow drill bit in cracked concrete or water filled hole

Specifications of intended use (part 2)

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres of strength classes C20/25 to C50/60 according to EN 206:2013+A1:2016

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc plated steel, stainless steel or high corrosion resistant steel).
- For all other conditions according to EN 1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 6 table A6.1.

Design:

- Anchorages have to be designed by a responsible engineer with experience of concrete anchor design.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with: EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

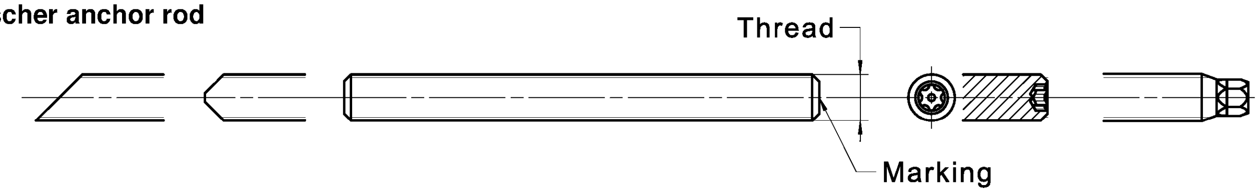
Installation:

- Anchor installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- In case of aborted hole: The hole shall be filled with mortar
- Anchorage depth should be marked and adhered to installation
- Overhead installation is allowed (necessary equipment see installation instruction)

Table B3.1: Installation parameters for **anchor rods**

Anchor rods			Thread	M8	M10	M12	M16	M20	M24
Width across flats		SW	[mm]	13	17	19	24	30	36
Nominal drill hole diameter		d_0	[mm]	10	12	14	18	22	28
Drill hole depth		h_0	[mm]	$h_0 = h_{ef}$					
Effective embedment depth		$h_{ef,min}$	[mm]	60	60	70	80	90	96
		$h_{ef,max}$	[mm]	160	200	240	320	400	480
Minimum spacing and minimum edge distance		$s_{min} = c_{min}$	[mm]	40	45	55	65	85	105
Diameter of the clearance hole of the fixture	pre-positioned installation	d_f	[mm]	9	12	14	18	22	26
	push through installation	d_f	[mm]	12	14	16	20	24	30
Minimum thickness of concrete member		h_{min}	[mm]	$h_{ef} + 30$ (≥100)			$h_{ef} + 2d_0$		
Maximum installation torque		max T_{inst}	[Nm]	10	20	40	60	120	150

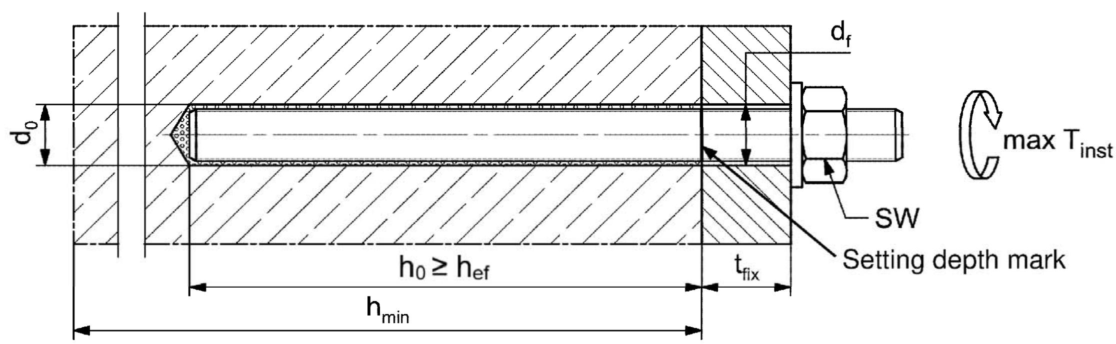
fischer anchor rod



Marking (on random place) fischer anchor rod:

Steel zinc plated PC[1)] 8.8	● or **+**	Steel hot-dip PC[1)] 8.8	●
High corrosion resistant steel HCR PC[1)] 50	●	High corrosion resistant steel HCR PC[1)] 70	-
High corrosion resistant steel HCR PC[1)] 80	**(**	Stainless steel R property class 50	~
Stainless steel R property class 80	∗		
Alternatively: Colour coding according to DIN 976-1: 2016			[1)] PC = property class

Installation conditions:



Commercial standard threaded rods, washers and hexagon nuts may also be used, if the following requirements are fulfilled:

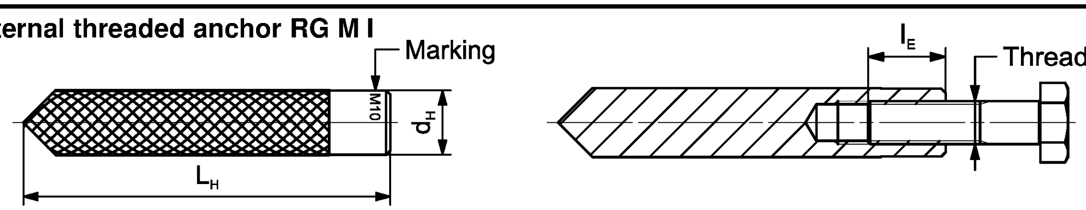
- Materials, dimensions and mechanical properties according to Annex A 6, Table A6.1
- Inspection certificate 3.1 according to EN 10204:2004, the documents have to be stored
- Setting depth is marked

Figures not to scale

Table B4.1: Installation parameters for **fischer internal threaded anchors RG M I**

Internal threaded anchors RG M I		**Thread**	**M8**	**M10**	**M12**	**M16**
Diameter of anchor	$d_{nom} = d_H$	[mm]	12	16	18	22
Nominal drill hole diameter	d_0	[mm]	14	18	20	24
Drill hole depth	h_0	[mm]	$h_0 = h_{ef} = L_H$			
Effective embedment depth ($h_{ef} = L_H$)	h_{ef}	[mm]	90	90	125	160
Minimum spacing and minimum edge distance	$s_{min} = c_{min}$	[mm]	55	65	75	95
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18
Minimum thickness of concrete member	h_{min}	[mm]	120	125	165	205
Maximum screw-in depth	$l_{E,max}$	[mm]	18	23	26	35
Minimum screw-in depth	$l_{E,min}$	[mm]	8	10	12	16
Maximum installation torque	max T_{inst}	[Nm]	10	20	40	80

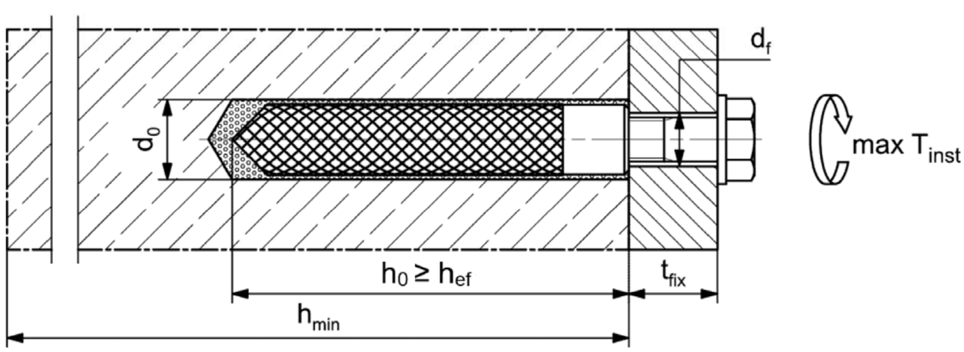
fischer internal threaded anchor RG M I



Marking: Anchor size e. g.: **M10**
Stainless steel → additional **R**; e.g.: **M10 R**
High corrosion resistant steel → additional **HCR**; e.g.: **M10 HCR**

Retaining bolt or threaded rods (including nut and washer) must comply with the appropriate material and strength class of Annex A 6, Table A6.1

Installation conditions:



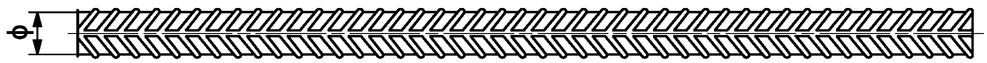
Figures not to scale

Table B5.1: Installation parameters for **reinforcing bars**

Nominal diameter of the bar		**ϕ**	**8**[1)]		**10**[1)]		**12**[1)]		**14**	**16**	**20**	**22**	**24**	**25**
Nominal drill hole diameter	d_0	[mm]	10	12	12	14	14	16	18	20	25	28	30	30
Drill hole depth	h_0		$h_0 = h_{ef}$											
Effective embedment depth	$h_{ef,min}$		60		60		70		75	80	90	94	98	100
	$h_{ef,max}$		160		200		240		280	320	400	440	480	500
Minimum spacing and minimum edge distance	s_{min} = c_{min}		40		45		55		60	65	85	95	105	110
Minimum thickness of concrete member	h_{min}		$h_{ef} + 30$ (≥ 100)				$h_{ef} + 2d_0$							

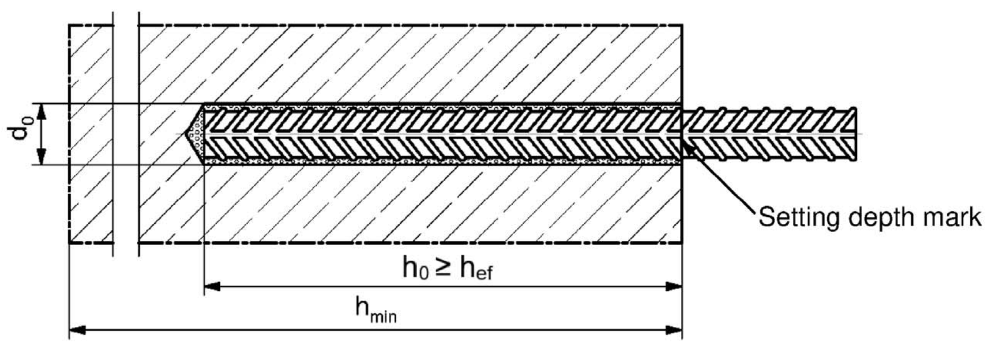
[1)] Both drill hole diameters can be used

Reinforcing bar



- The minimum value of related rib area $f_{R,min}$ must fulfil the requirements of EN 1992-1-1:2004+AC:2010
- The rib height must be within the range: $0{,}05 \cdot \phi \leq h_{rib} \leq 0{,}07 \cdot \phi$
  (ϕ = Nominal diameter of the bar, h_{rib} = rib height)

Installation conditions:



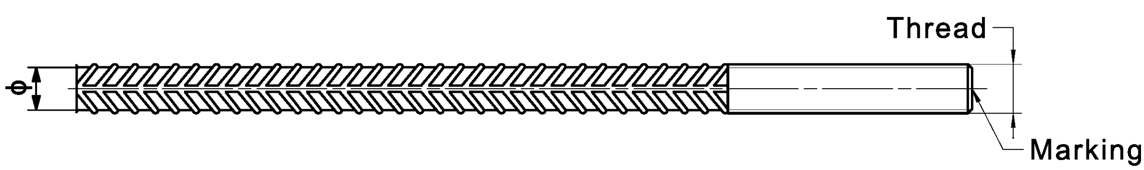
Figures not to scale

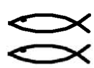
Table B6.1: Installation parameters for **fischer rebar anchor FRA**

Rebar anchor FRA		**Thread**	**M12**[1)]		**M16**	**M20**	**M24**
Nominal diameter of the bar	ϕ	[mm]	12		16	20	25
Width across flats	SW	[mm]	19		24	30	36
Nominal drill hole diameter	d_0	[mm]	14	16	20	25	30
Drill hole depth	h_0	[mm]	$h_{ef} + l_e$				
Effective embedment depth	$h_{ef,min}$	[mm]	70		80	90	96
Effective embedment depth	$h_{ef,max}$	[mm]	140		220	300	380
Distance concrete surface to welded joint	l_e	[mm]	100				
Minimum spacing and minimum edge distance	$s_{min} = c_{min}$	[mm]	55		65	85	105
Diameter of clearance hole in the fixture – pre-positioned anchorage	$\leq d_f$	[mm]	14		18	22	26
Diameter of clearance hole in the fixture – push through anchorage	$\leq d_f$	[mm]	18		22	26	32
Minimum thickness of concrete member	h_{min}	[mm]	$h_0 + 30$	$h_0 + 2d_0$			
Maximum installation torque	max T_{inst}	[Nm]	40		60	120	150

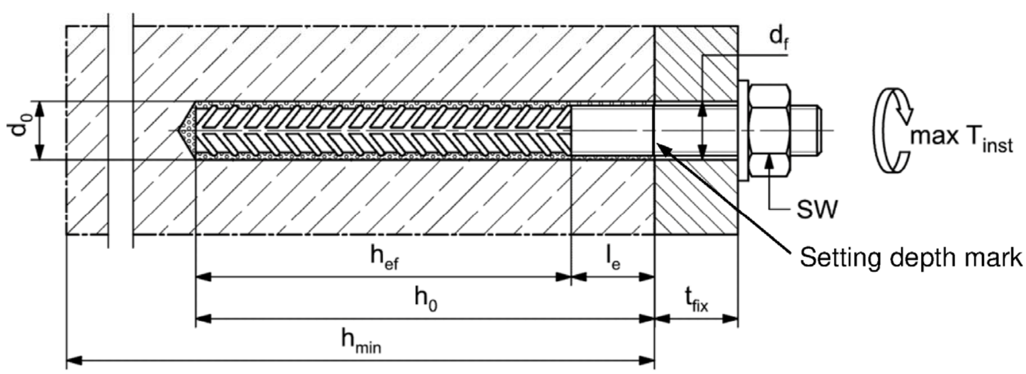
1) Both drill hole diameters can be used

fischer rebar anchor FRA



Marking frontal e.g:  FRA (for stainless steel); FRA HCR (for high corrosion resistant steel)

Installation conditions:



Figures not to scale

Table B7.1: Parameters of the **cleaning brush** BS (steel brush with steel bristles)

The size of the cleaning brush refers to the drill hole diameter

Nominal drill hole diameter	d_0	[mm]	10	12	14	16	18	20	22	24	25	28	30
Steel brush diameter	d_b	[mm]	11	14	16	20		25		26	27	30	40

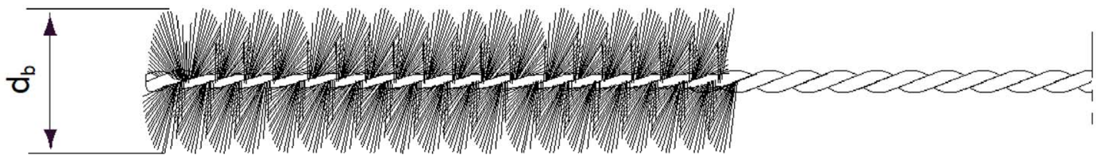


Table B7.2: Conditions for use **static mixer** without an **extension tube**

Nominal drill hole diameter	d_0	[mm]	10	12	14	16	18	20	22	24	25	28	30
Drill hole depth h_0 by using	FIS MR Plus	[mm]	≤90		≤120	≤140	≤150	≤160	≤170	≤190	≤210		
	FIS JMR	[mm]	-	-	≤90	≤160	≤180	≤190	≤210	≤220		≤250	

Table B7.3 **Maximum processing** time of the mortar and **minimum curing** time
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

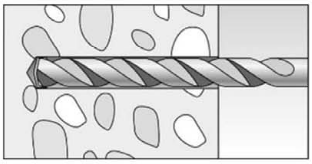
Temperature at anchoring base [°C]	Maximum processing time t_{work}	Minimum curing time [1] t_{cure}
	FIS V Zero	FIS V Zero
-10 to -5 [2]	6 h	72 h
> -5 to 0 [2]	2 h	24 h
> 0 to 5 [2]	45 min	12 h
> 5 to 10	20 min	6 h
> 10 to 15	8 min	3 h
> 15 to 20	5 min	2 h
> 20 to 25	3 min	1 h
> 25 to 30	2 min	45 min
> 30 to 40	1 min	30 min

[1] In wet concrete or water filled holes the curing times must be doubled
[2] Minimum cartridge temperature +5°C

Installation instructions part 1

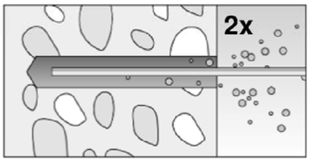
Drilling and cleaning the hole (hammer drilling with standard drill bit)

1

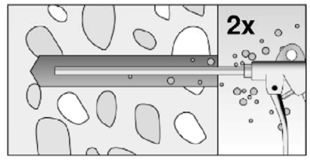


Drill the hole.
Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$
see **tables B3.1, B4.1, B5.1, B6.1**

2

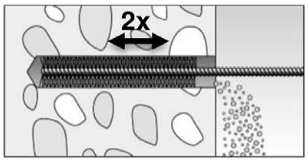


Clean the drill hole:
For $h_{ef} \leq 12d$ and
$d_0 < 18$ mm
blow out the hole twice
by hand



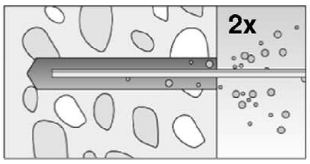
For $h_{ef} > 12d$ and / or
$d_0 \geq 18$ mm blow out
the hole twice with
oil-free compressed air
($p \geq 6$ bar)

3

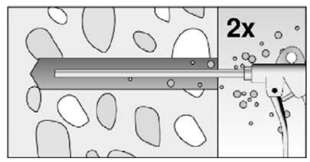


Brush the drill hole twice. For drill hole diameter $d_0 \geq 18$ mm and / or $h_{ef} > 12d$ use a power drill. For deep holes use an extension. Corresponding brushes see **table B7.1**

4



Clean the drill hole:
For $h_{ef} \leq 12d$ and
$d_0 < 18$ mm
blow out the hole twice
by hand



For $h_{ef} > 12d$ and / or
$d_0 \geq 18$ mm blow out the
hole twice with
oil-free compressed air
($p \geq 6$ bar)

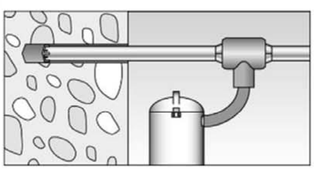
Go to step 5

Drilling and cleaning the hole (hammer drilling with hollow drill bit)

1

Check a suitable hollow drill (see **table B1.1**)
for correct operation of the dust extraction

2



Use a suitable dust extraction system, e.g.
fischer FVC 35 M or a comparable dust extraction system
with equivalent performance data

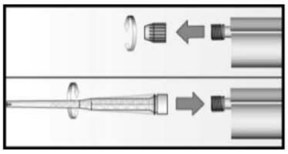
Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Nominal drill hole diameter $\mathbf{d_0}$ and drill hole depth $\mathbf{h_0}$
see **tables B3.1, B4.1, B5.1, B6.1**

Go to step 5

Installation instructions part 2

Preparing the cartridge

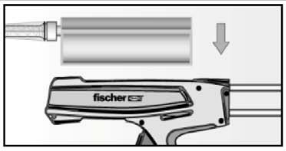
5

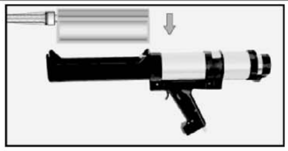


Remove the sealing cap

Screw on the static mixer
(the spiral in the static mixer must be clearly visible)

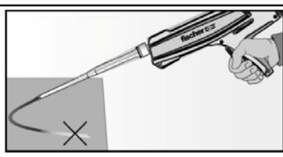
6

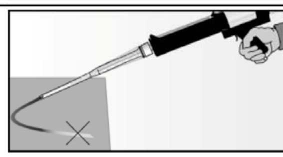




Place the cartridge into the dispenser

7



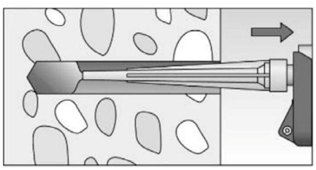


Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey

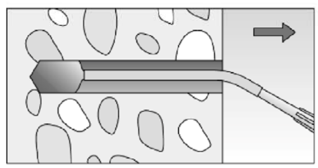
Go to step 8

Injection of the mortar

8

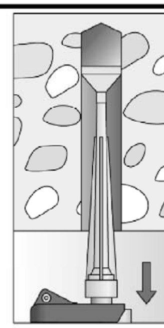


Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles



The conditions for mortar injection without extension tube can be found in **table B7.2**

For deeper drill holes, than those mentioned in **table B7.2,** use a suitable extension tube

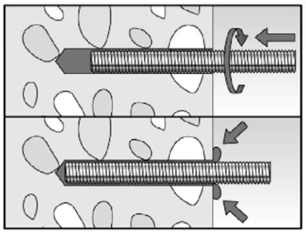
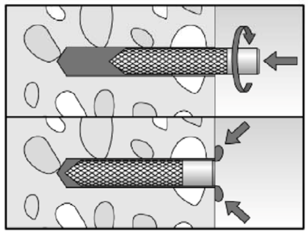
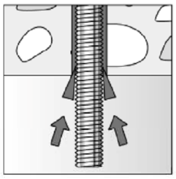
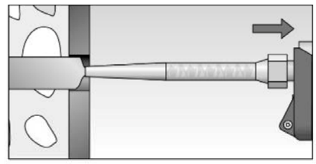
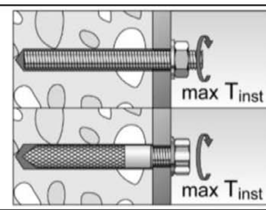
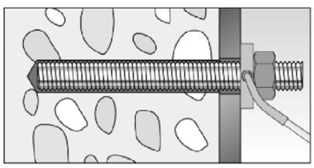


For overhead installation, deep holes (h_0 > 250 mm) or drill hole diameter (d_0 = 30 mm) use an injection adapter

Go to step 9

Installation instructions part 3

Installation of anchor rods or fischer internal threaded anchors RG M I

9	 	Only use clean and oil-free metal parts. Mark the setting depth of the metal part. Push the anchor rod or fischer internal threaded RG M I anchor down to the bottom of the hole, turning it slightly while doing so. After inserting the metal parts, excess mortar must be emerged around the anchor element.
		For overhead installations support the metal part with wedges (e.g. fischer centering wedges) or fischer overhead clips.
		For push through installation fill the annular gap with mortar
10		Wait for the specified curing time t_{cure} see **table B7.3**
11		Mounting the fixture max T_{inst} see **tables B3.1 and B4.1**
Option		After the minimum curing time is reached, the gap between metal part and fixture (annular clearance) may be filled with mortar via the fischer filling disc. Compressive strength ≥ 50 N/mm² (e.g. fischer injection mortars FIS V Zero, FIS HB, FIS SB, FIS V, FIS V Plus, FIS EM Plus). ATTENTION: Using fischer filling disc reduces t_{fix} (usable length of the anchor)

Installation reinforcing bars and fischer rebar anchor FRA

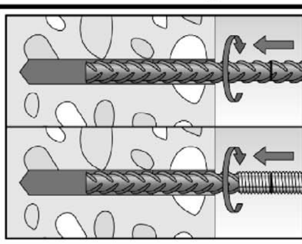
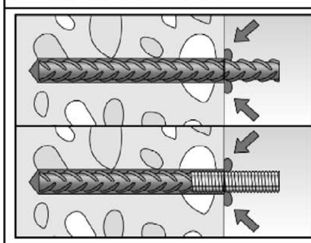
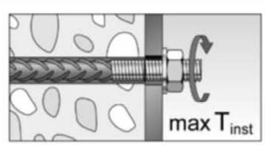
9		Only use clean and oil-free reinforcing bars or fischer rebar anchor FRA. Mark the setting depth. Push the reinforcement bar or the fischer rebar anchor FRA into the filled hole up to the setting depth mark. Recommendation: Rotation back and forth of the reinforcement bar or the fischer rebar anchor FRA makes pushing easy
		When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.
10		Wait for the specified curing time t_{cure} see **table B7.3**
11		Mounting the fixture max T_{inst} see **table B6.1**

Table C1.1: Characteristic values **for steel failure** under **tension / shear load** of **fischer anchor rods** and **standard threaded rods**

Anchor rod / standard threaded rod					M8	M10	M12	M16	M20	M24
Bearing capacity under tension load, steel failure [3]										
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	4.8	[kN]	15(13)	23(21)	33	63	98	141
			5.8		19(17)	29(27)	43	79	123	177
			8.8		29(27)	47(43)	68	126	196	282
	Stainless steel R and high corrosion resistant steel HCR		50		19	29	43	79	123	177
			70		26	41	59	110	172	247
			80		30	47	68	126	196	282
Partial factors [1]										
Partial factor $\gamma_{Ms,N}$	Steel zinc plated	Property class	4.8	[-]	1,50					
			5.8		1,50					
			8.8		1,50					
	Stainless steel R and high corrosion resistant steel HCR		50		2,86					
			70		1,50[2] / 1,87					
			80		1,60					
Bearing capacity under shear load, steel failure [3]										
without lever arm										
Characteristic resistance $V^0_{Rk,s}$	Steel zinc plated	Property class	4.8	[kN]	9(8)	14(13)	20	38	59	85
			5.8		11(10)	17(16)	25	47	74	106
			8.8		15(13)	23(21)	34	63	98	141
	Stainless steel R and high corrosion resistant steel HCR		50		9	15	21	39	61	89
			70		13	20	30	55	86	124
			80		15	23	34	63	98	141
Ductility factor			k_7	[-]	1,0					
with lever arm										
Characteristic resistance $M^0_{Rk,s}$	Steel zinc plated	Property class	4.8	[Nm]	15(13)	30(27)	52	133	259	448
			5.8		19(16)	37(33)	65	166	324	560
			8.8		30(26)	60(53)	105	266	519	896
	Stainless steel R and high corrosion resistant steel HCR		50		19	37	65	166	324	560
			70		26	52	92	232	454	784
			80		30	60	105	266	519	896
Partial factors [1]										
Partial factor $\gamma_{Ms,V}$	Steel zinc plated	Property class	4.8	[-]	1,25					
			5.8		1,25					
			8.8		1,25					
	Stainless steel R and high corrosion resistant steel HCR		50		2,38					
			70		1,25[2] / 1,56					
			80		1,33					

[1] In absence of other national regulations
[2] Only admissible for high corrosion resist. steel HCR, with f_{yk} / f_{uk} ≥ 0,8 and A_5 > 12 % (e.g. fischer anchor rods)
[3] Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot dip galvanised standard threaded rods according to EN ISO 10684:2004+AC:2009

Table C2.1: Characteristic values **for steel failure** under **tension / shear load** of **fischer internal threaded anchors RG M I**

fischer internal threaded anchors RG M I					M8	M10	M12	M16
Bearing capacity under tension load, steel failure								
Charact. resistance with screw	$N_{Rk,s}$	Property class	5.8	[kN]	19	29	43	79
			8.8		29	47	68	108
		Property class 70	R		26	41	59	110
			HCR		26	41	59	110
Partial factors[1]								
Partial factors	$\gamma_{Ms,N}$	Property class	5.8	[-]	1,50			
			8.8		1,50			
		Property class 70	R		1,87			
			HCR		1,87			
Bearing capacity under shear load, steel failure								
Without lever arm								
Charact. resistance with screw	$V^0_{Rk,s}$	Property class	5.8	[kN]	9,2	14,5	21,1	39,2
			8.8		14,6	23,2	33,7	54,0
		Property class 70	R		12,8	20,3	29,5	54,8
			HCR		12,8	20,3	29,5	54,8
Ductility factor			k_7	[-]	1,0			
With lever arm								
Charact. resistance with screw	$M^0_{Rk,s}$	Property class	5.8	[Nm]	20	39	68	173
			8.8		30	60	105	266
		Property class 70	R		26	52	92	232
			HCR		26	52	92	232
Partial factors[1]								
Partial factors	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25			
			8.8		1,25			
		Property class 70	R		1,56			
			HCR		1,56			

[1] In absence of other national regulations

Table C3.1: Characteristic values **for steel failure** under tension / shear load of **reinforcing bars**

Nominal diameter of the bar		ϕ	8	10	12	14	16	20	22	24	25
Bearing capacity under tension load, steel failure											
Characteristic resistance	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$ [2]								
Bearing capacity under shear load, steel failure											
Without lever arm											
Characteristic resistance	$V^0_{Rk,s}$	[kN]	k_6 [1] $\cdot A_s \cdot f_{uk}$ [2]								
Ductility factor	k_7	[-]	1,0								
With lever arm											
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	$1{,}2 \cdot W_{el} \cdot f_{uk}$ [2]								

[1] In accordance with EN 1992-4:2018 section 7.2.2.3.1
k_6 =0,6 for fasteners made of carbon steel with $f_{uk} \leq 500$ N/mm²
=0,5 for fasteners made of carbon steel with $500 < f_{uk} \leq 1000$ N/mm²
=0,5 for fasteners made of stainless steel

[2] f_{uk} or f_{yk} respectively must be taken from the specifications of the reinforcing bar

Table C3.2: Characteristic values **for steel failure** under tension / shear load of **fischer rebar anchors FRA**

fischer rebar anchor FRA			M12	M16	M20	M24
Bearing capacity under tension load, steel failure						
Characteristic resistance	$N_{Rk,s}$	[kN]	59	110	172	270
Partial factor[1]						
Partial factor	$\gamma_{Ms,N}$	[-]	1,4			
Bearing capacity under shear load, steel failure						
Without lever arm						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	30	55	86	141
Ductility factor	k_7	[-]	1,0			
With lever arm						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	92	233	454	898
Partial factor[1]						
Partial factor	$\gamma_{Ms,V}$	[-]	1,56			

[1] In absence of other national regulations

Table C4.1: Characteristic values for **concrete failure** under **tension / shear load**

Size			All sizes
Tension load			
Installation factor	γ_{inst}	[-]	See annex C 5 to C 8
Factors for the compressive strength of concrete > C20/25			
Increasing factor for τ_{Rk} — C25/30	Ψ_c	[-]	1,03
C30/37			1,06
C35/45			1,09
C40/50			1,11
C45/55			1,13
C50/60			1,15
Splitting failure			
Edge distance — $h / h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	1,0 h_{ef}
$2,0 > h / h_{ef} > 1,3$			4,6 h_{ef} - 1,8 h
$h / h_{ef} \leq 1,3$			2,26 h_{ef}
Spacing	$s_{cr,sp}$		2 $c_{cr,sp}$
Concrete cone failure			
Uncracked concrete	$k_{ucr,N}$	[-]	11,0
Cracked concrete	$k_{cr,N}$		7,7
Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}
Spacing	$s_{cr,N}$		2 $c_{cr,N}$

Factors for sustained tension load					
Temperature range		[-]	24 °C / 40 °C	50 °C / 80 °C	72 °C / 120 °C
Factor	Ψ^0_{sus}	[-]	0,67	0,67	0,75

Shear load			
Installation factor	γ_{inst}	[-]	1,0
Concrete pry-out failure			
Factor for pry-out failure	k_8	[-]	2,0
Concrete edge failure			
Effective length of fastener in shear loading	l_f	[mm]	for $d_{nom} \leq 24$ mm: min (h_{ef}; 12 d_{nom}) for $d_{nom} > 24$ mm: min (h_{ef}; 8 d_{nom}; 300 mm)

Calculation diameters								
Size			M8	M10	M12	M16	M20	M24
fischer anchor rods and standard threaded rods	d_{nom}	[mm]	8	10	12	16	20	24
fischer internal threaded anchors RG M I	d_{nom}		12	16	18	22	-[1)]	-[1)]
fischer rebar anchor FRA	d_{nom}		-[1)]	-[1)]	12	16	20	25

Size (nominal diameter of the bar)		ϕ	8	10	12	14	16	20	22	24	25
Reinforcing bar	d_{nom}	[mm]	8	10	12	14	16	20	22	24	25

[1)] Anchor type not part of the assessment

Table C5.1: Characteristic values for **combined pull-out** and **concrete failure** for **fischer anchor rods** and **standard threaded rods** in hammer drilled holes; **uncracked or cracked concrete**

Anchor rod / standard threaded rod				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Combined pullout and concrete cone failure									
Calculation diameter		d	[mm]	8	10	12	16	20	24
Uncracked concrete									
Characteristic bond resistance in uncracked concrete C20/25									
Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)									
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	10	10	10	10	9,5	8,5
	II: 50 °C / 80 °C			10	10	10	10	9,5	8,5
	III: 72 °C / 120 °C			8	8	8	8	8	7
Hammer-drilling with hollow drill bit (dry or wet concrete)									
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	- [1)]	6,5	6	6	6	5
	II: 50 °C / 80 °C			- [1)]	6,5	6	6	6	5
	III: 72 °C / 120 °C			- [1)]	5,5	5	5	5	4,5
Installation factors									
Dry or wet concrete and water filled hole		γ_{inst}	[-]	1,4					
Cracked concrete									
Characteristic bond resistance in cracked concrete C20/25									
Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)									
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	4	4	4	4	4	4
	II: 50 °C / 80 °C			4	4	4	4	4	4
	III: 72 °C / 120 °C			3	3	3,5	3,5	3,5	3,5
Installation factors									
Dry or wet concrete and water filled hole		γ_{inst}	[-]	1,4					

1) No performance assessed

Table C6.1: Characteristic values for **combined pull-out** and **concrete failure** for **fischer internal threaded anchors RG M I** in hammer drilled holes; **uncracked** or **cracked concrete**

Internal threaded anchor RG M I				**M8**	**M10**	**M12**	**M16**
Combined pullout and concrete cone failure							
Calculation diameter		d	[mm]	12	16	18	22
Uncracked concrete							
Characteristic bond resistance in uncracked concrete C20/25							
Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)							
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	7,5	7,5	7,5	7
	II: 50 °C / 80 °C			7,5	7,5	7,5	7
	III: 72 °C / 120 °C			6,5	6,5	6,5	6
Hammer-drilling with hollow drill bit (dry or wet concrete)							
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	6,5	6,5	6,5	6,5
	II: 50 °C / 80 °C			6,5	6,5	6,5	6,5
	III: 72 °C / 120 °C			5,5	5,5	5,5	5,5
Installation factors							
Dry or wet concrete and water filled hole		γ_{inst}	[-]	1,4			
Cracked concrete							
Characteristic bond resistance in cracked concrete C20/25							
Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)							
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	4,5	4	4	3,5
	II: 50 °C / 80 °C			4,5	4	4	3,5
	III: 72 °C / 120 °C			3,5	3,5	3	3
Installation factors							
Dry or wet concrete and water filled hole		γ_{inst}	[-]	1,4			

Table C7.1: Characteristic values for **combined pull-out** and **concrete failure** for **reinforcing bars** in hammer drilled holes; **uncracked concrete**

Nominal diameter of the bar			**ϕ**	**8**	**10**	**12**	**14**	**16**	**20**	**22**	**24**	**25**
Combined pullout and concrete cone failure												
Calculation diameter		d	[mm]	8	10	12	14	16	20	22	24	25
Uncracked concrete												
Characteristic bond resistance in uncracked concrete C20/25												
Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)												
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	6,5	7	7	7,5	7,5	8	8	8	8
	II: 50 °C / 80 °C			6,5	7	7	7,5	7,5	8	8	8	8
	III: 72 °C / 120 °C			5,5	5,5	6	6	6,5	6,5	6,5	6,5	6,5
Hammer-drilling with hollow drill bit (dry or wet concrete)												
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	6	6	6	6	6	6	5,5	5,5	5,5
	II: 50 °C / 80 °C			6	6	6	6	6	6	5,5	5,5	5,5
	III: 72 °C / 120 °C			5	5	5	5	5	5	4,5	4,5	4,5
Installation factors												
Dry or wet concrete and water filled hole		γ_{inst}	[-]	1,4								

Table C7.2: Characteristic values for **combined pull-out** and **concrete failure** for **fischer rebar anchors FRA** in hammer drilled holes; **uncracked concrete**

fischer rebar anchors FRA				**M12**	**M16**	**M20**	**M24**
Combined pullout and concrete cone failure							
Calculation diameter		d	[mm]	12	16	20	25
Uncracked concrete							
Characteristic bond resistance in uncracked concrete C20/25							
Hammer-drilling with standard drill bit (dry or wet concrete, water filled hole)							
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	7	7,5	8	8
	II: 50 °C / 80 °C			7	7,5	8	8
	III: 72 °C / 120 °C			6	6,5	6,5	6,5
Hammer-drilling with hollow drill bit (dry or wet concrete)							
Temperature range	I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	6	6	6	5,5
	II: 50 °C / 80 °C			6	6	6	5,5
	III: 72 °C / 120 °C			5	5	5	4,5
Installation factors							
Dry or wet concrete and water filled hole		γ_{inst}	[-]	1,4			

Table C8.1: **Displacements** for **anchor rods**

Anchor rod		M8	M10	M12	M16	M20	M24
Displacement-Factors for tension load[1]							
Uncracked concrete; Temperature range I, II, III							
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,04	0,04	0,05	0,06	0,07	0,08
$\delta_{N\infty\text{-Factor}}$		0,04	0,04	0,05	0,06	0,07	0,08
Cracked concrete; Temperature range I, II, III							
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,10	0,11	0,11	0,13	0,14	0,16
$\delta_{N\infty\text{-Factor}}$		0,10	0,11	0,11	0,13	0,14	0,16
Displacement-Factors for shear load[2]							
Uncracked or cracked concrete; Temperature range I, II, III							
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,18	0,15	0,12	0,09	0,07	0,06
$\delta_{V\infty\text{-Factor}}$		0,27	0,22	0,18	0,14	0,11	0,09

[1] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau_{Ed}$

$\delta_{N\infty} = \delta_{N\infty\text{-Factor}} \cdot \tau_{Ed}$

(τ_{Ed}: Design value of the applied tensile bond stress)

[2] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V_{Ed}$

$\delta_{V\infty} = \delta_{V\infty\text{-Factor}} \cdot V_{Ed}$

(V_{Ed}: Design value of the applied shear force)

Table C8.2: **Displacements** for **fischer internal threaded anchors RG M I**

Internal threaded anchor RG M I		M8	M10	M12	M16
Displacement-Factors for tension load[1]					
Uncracked concrete; Temperature range I, II, III					
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,06	0,07	0,07	0,07
$\delta_{N\infty\text{-Factor}}$		0,06	0,07	0,07	0,07
Cracked concrete; Temperature range I, II, III					
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,10	0,11	0,11	0,12
$\delta_{N\infty\text{-Factor}}$		0,10	0,11	0,11	0,12
Displacement-Factors for shear load[2]					
Uncracked or cracked concrete; Temperature range I, II, III					
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,12	0,09	0,08	0,07
$\delta_{V\infty\text{-Factor}}$		0,18	0,14	0,12	0,10

[1] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau_{Ed}$

$\delta_{N\infty} = \delta_{N\infty\text{-Factor}} \cdot \tau_{Ed}$

(τ_{Ed}: Design value of the applied tensile bond stress)

[2] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V_{Ed}$

$\delta_{V\infty} = \delta_{V\infty\text{-Factor}} \cdot V_{Ed}$

(V_{Ed}: Design value of the applied shear force)

Table C9.1: Displacements for reinforcing bars

Nominal diameter of the bar		ϕ	8	10	12	14	16	20	22	24	25
Displacement-Factors for tension load[1]											
Uncracked concrete; Temperature range I, II, III											
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]		0,05	0,06	0,07	0,08	0,09	0,10	0,11	0,12	0,12
$\delta_{N\infty\text{-Factor}}$			0,05	0,06	0,07	0,08	0,09	0,10	0,11	0,12	0,12
Displacement-Factors for shear load[2]											
Uncracked concrete; Temperature range I, II, III											
$\delta_{V0\text{-Factor}}$	[mm/kN]		0,18	0,15	0,12	0,10	0,09	0,07	0,07	0,06	0,06
$\delta_{V\infty\text{-Factor}}$			0,27	0,22	0,18	0,16	0,14	0,11	0,10	0,09	0,09

[1] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau_{Ed}$

$\delta_{N\infty} = \delta_{N\infty\text{-Factor}} \cdot \tau_{Ed}$

(τ_{Ed}: Design value of the applied tensile bond stress)

[2] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V_{Ed}$

$\delta_{V\infty} = \delta_{V\infty\text{-Factor}} \cdot V_{Ed}$

(V_{Ed}: Design value of the applied shear force)

Table C9.2: Displacements for fischer rebar anchors FRA

fischer rebar anchor FRA		M12	M16	M20	M24
Displacement-Factors for tension load[1]					
Uncracked concrete; Temperature range I, II, III					
$\delta_{N0\text{-Factor}}$	[mm/(N/mm²)]	0,07	0,09	0,10	0,12
$\delta_{N\infty\text{-Factor}}$		0,07	0,09	0,10	0,12
Displacement-Factors for shear load[2]					
Uncracked concrete; Temperature range I, II, III					
$\delta_{V0\text{-Factor}}$	[mm/kN]	0,12	0,09	0,07	0,06
$\delta_{V\infty\text{-Factor}}$		0,18	0,14	0,11	0,09

[1] Calculation of effective displacement:

$\delta_{N0} = \delta_{N0\text{-Factor}} \cdot \tau_{Ed}$

$\delta_{N\infty} = \delta_{N\infty\text{-Factor}} \cdot \tau_{Ed}$

(τ_{Ed}: Design value of the applied tensile bond stress)

[2] Calculation of effective displacement:

$\delta_{V0} = \delta_{V0\text{-Factor}} \cdot V_{Ed}$

$\delta_{V\infty} = \delta_{V\infty\text{-Factor}} \cdot V_{Ed}$

(V_{Ed}: Design value of the applied shear force)

DÉCLARATION DES PERFORMANCES

DoP 0239

pour le système d'injection fischer FIS V Zero (cheville à scellement pour utilisation dans la maçonnerie) FR

1. Code d'identification unique du type de produit: **DoP 0239**

2. Usage(s) prévu(s): **Fixation dans la maçonnerie, Voir annexes, en particulier les annexes B1 - B14.**

3. Fabricant: **fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Allemagne**

4. Mandataire: **–**

5. Système(s) d'évaluation et de vérification de la constance des performances: **1**

6. Document d'évaluation européen: **EAD 330076-01-0604, Edition 05/ 2021**
   Evaluation Technique Européenne: **ETA-21/0267; 2021-08-27**
   Organisme d'évaluation technique: **DIBt- Deutsches Institut für Bautechnik**
   Organisme(s) notifié(s): **2873 TU Darmstadt**

7. Performance(s) déclarée(s):

Résistance mécanique et stabilité (BWR 1)

Résistance caractéristique à la rupture de l'acier d'un ancrage isolé sous charge de traction: Voir annexes, en particulier les annexes C1, C3

Résistance caractéristique à la rupture de l'acier d'un ancrage isolé sous charge de cisaillement avec et sans bras de levier: Voir annexes, en particulier les annexes C2, C3

Résistance caractéristique à la rupture par extraction glissement ou rupture de la maçonnerie d'un ancrage isolé sous charge de traction, facteur de réduction: Voir annexes, en particulier les annexes C5, C7, C10, C13, C15, C16

Résistance caractéristique à la rupture locale de la brique ou à la rupture en bord de la brique d'un ancrage isolé sous charge de cisaillement: Voir annexes, en particulier les annexes C5, C7, C11, C13, C15

Résistance caractéristique à la rupture de la brique d'un groupe de chevilles sous charge de traction: Voir annexes, en particulier les annexes B13, B14, C4, C6, C8, C9, C12, C14

Résistance caractéristique à la rupture locale de la brique ou à la rupture en bord de la brique d'un groupe de chevilles sous charge de cisaillement: Voir annexes, en particulier les annexes B13, B14, C4, C6, C8, C9, C12, C14

Distances au bord, entraxes, épaisseur du support: Voir annexes, en particulier les annexes B2, B13, C4, C6, C8, C9, C12, C14

Déplacements sous charge de traction et de cisaillement: Voir annexes, en particulier les annexes C17

Couple de serrage maximum: Voir annexes, en particulier les annexes C4, C6, C8, C9, C12, C14

Sécurité en cas d'incendie (BWR 2)

Réaction au feu: Classe (A1)

Résistance au feu sous charge de traction et de cisaillement avec et sans bras de levier, distances au bord et entraxes minimums: NPD

Hygiène, santé et environnement (BWR 3)

Contenu, émission et/ou rejet de substances dangereuses: NPD

8. Documentation technique appropriée et/ou documentation technique spécifique: **–**

Les performances du produit identifié ci-dessus sont conformes aux performances déclarées. Conformément au règlement (UE) no 305/2011, la présente déclaration des performances est établie sous la seule responsabilité du fabricant mentionné ci-dessus.

Signé pour le fabricant et en son nom par:

Dr.-Ing. Oliver Geibig, Directeur Général Business Units & Ingénierie

Jürgen Grün, Directeur Général Chimie & Qualité

Tumlingen, 2021-09-06

Cette DoP a été préparée en plusieurs langues. En cas de différend relatif à l'interprétation, la version anglaise prévaudra.

L'annexe comprend des informations volontaires et complémentaires en langue anglaise dépassant les exigences légales (spécifiées de manière neutre).

Specific Part

1 Technical description of the product

The fischer injection system FIS V Zero for masonry is a bonded anchor (injection type) consisting of a mortar cartridge with injection mortar fischer FIS V Zero, a perforated sleeve and an anchor rod with hexagon nut and washer or an internal threaded rod. The steel elements are made of zinc coated steel, stainless steel or high corrosion resistant steel.

The anchor rod is placed into a drilled hole filled with injection mortar and is anchored via the bond between steel element, injection mortar and masonry and mechanical interlock.

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 anchor 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 anchor 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 to steel failure of a single anchor under tension loading	See Annexes C 1 and C 3
Characteristic resistance to steel failure of a single anchor under shear loading with and without lever arm	See Annex C 2 and C 3
Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading, Reduction factor	See Annex C 5, C 7, C 10, C 13, C 15 and C 16
Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading	See Annex C 5, C 7, C 11, C 13 and C 15
Characteristic resistance to brick breakout failure of an anchor group under tension loading	See Annex B 13, B 14, C 4, C 6, C 8, C 9, C 12 and C 14
Characteristic resistance to local brick failure or brick edge failure of an anchor group under shear loading	See Annex B 13, B 14, C 4, C 6, C 8, C 9, C 12 and C 14
Edge distances, spacing, member thickness	See Annex B 2, B 13, C 4, C 6, C 8, C 9, C 12 and C 14
Displacements under tension and shear loading	See Annex C 17
Maximum installation torque	See Annex C 4, C 6, C 8, C 9, C 12 and C 14

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire under tension and shear loading with and without lever arm, minimum edge distances and spacing	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

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

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

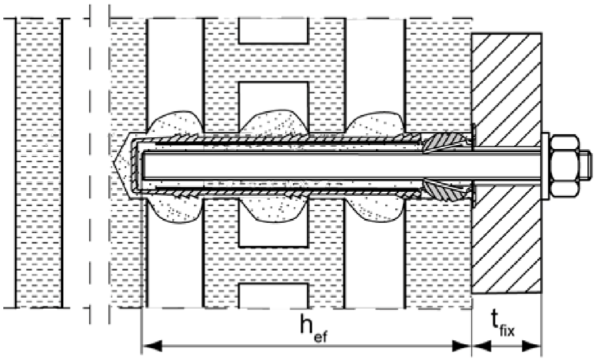
In accordance with the European Assessment Document EAD 330076-01-0604 the applicable European legal act is: [97/177/EC].

The system to be applied is: 1

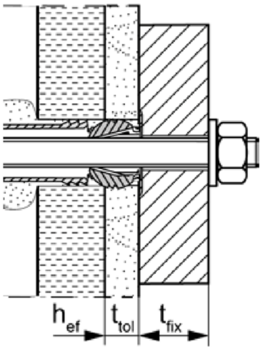
Installation conditions part 1

Anchor rods with perforated sleeve FIS H K; Installation in perforated and solid brick masonry

Pre-positioned installation:

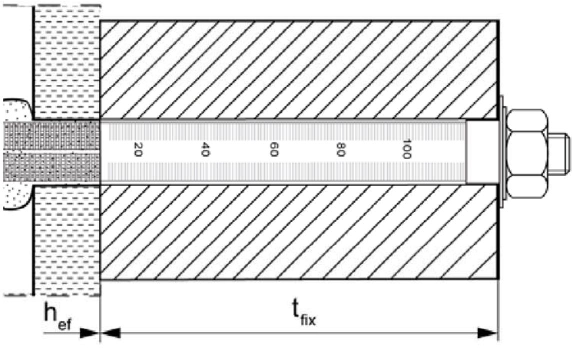


Installation with render bridge

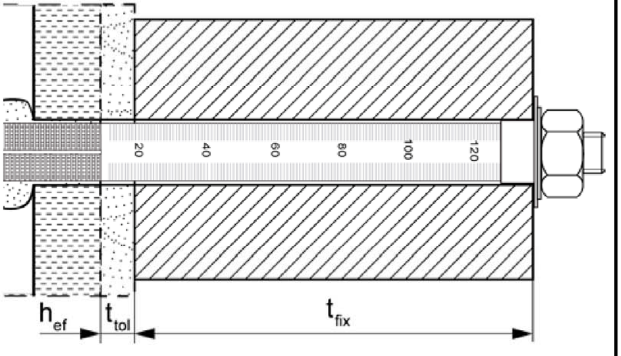


Size of the perforated sleeve: FIS H 12x50 K, FIS H 12x85 K, FIS H 16x85 K, FIS H 16x130 K, FIS H 20x85 K, FIS H 20x130 K

Push through installation:



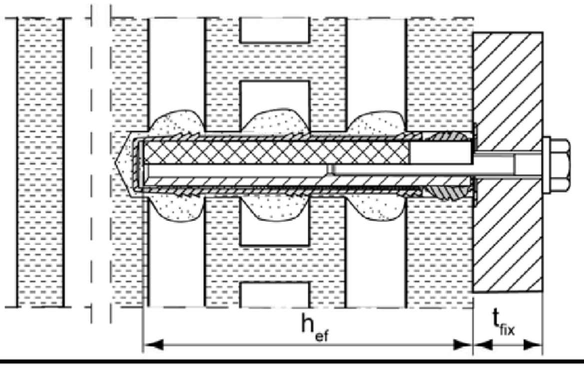
Installation with render bridge



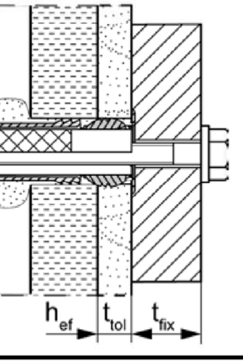
Size of the perforated sleeve: FIS H 18x130/200 K FIS H 22x130/200 K

Internal threaded anchor FIS E with perforated sleeve FIS H K;
Installation in perforated and solid brick masonry

Pre-positioned installation:



Installation with render bridge



Figures not to scale

h_{ef} = effective embedment depth

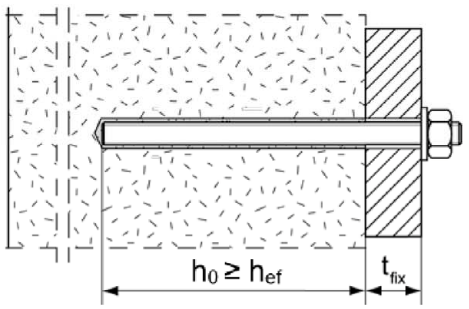
t_{fix} = thickness of fixture

t_{tol} = thickness of unbearing layer (e.g. plaster)

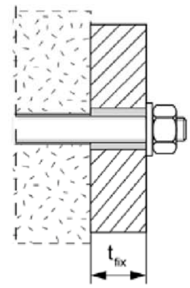
Installation conditions part 2

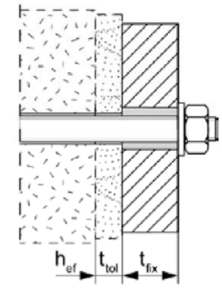
Anchor rods without perforated sleeve FIS H K; installation in solid brick masonry

Pre-positioned installation:



Push through installation: Annular gap filled with mortar

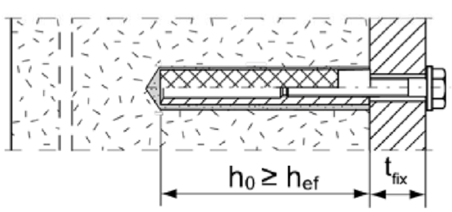




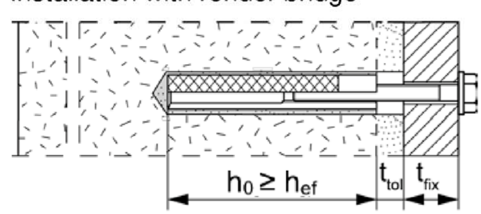
Installation with render bridge

Internal threaded anchors FIS E without perforated sleeve FIS H K; installation in solid brick masonry

Pre-positioned installation:



Installation with render bridge



Figures not to scale

h_0 = depth of drill hole

h_{ef} = effective embedment depth

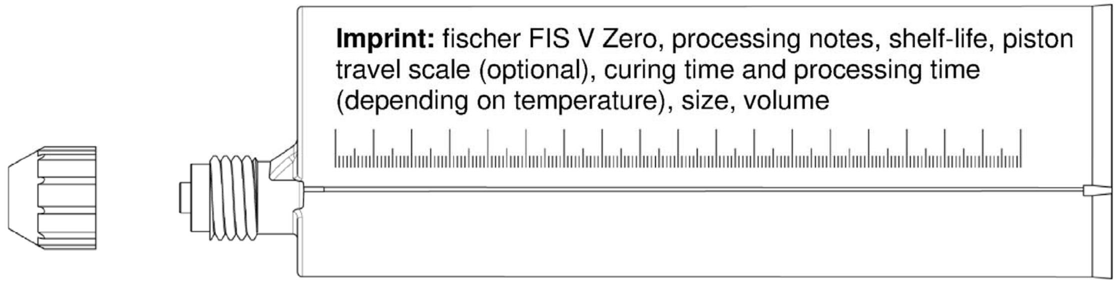
t_{tol} = thickness of unbearing layer (e.g. plaster)

t_{fix} = thickness of fixture

Overview system components part 1

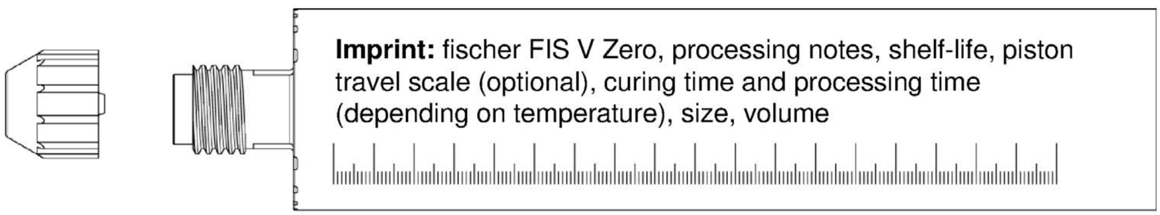
Injection cartridge (shuttle cartridge) with sealing cap

Size: 360 ml, 825 ml



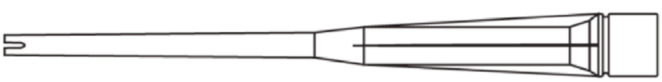
Injection cartridge (coaxial cartridge) with sealing cap

Size: 100 ml, 150 ml, 300 ml, 380 ml, 400 ml, 410 ml



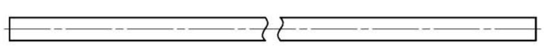
Static mixer MR Plus or FIS JMR (only 825ml) and extension tube

Static mixer MR Plus

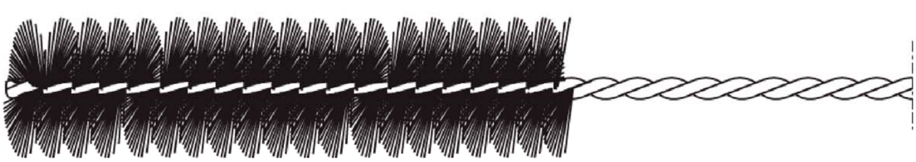


Static mixer JMR Plus

Extension tube



Cleaning brush BS



Blow-out pump ABG or ABP

Figures not to scale

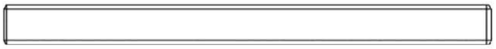
fischer injection system FIS V Zero for masonry

Product description
Overview system components part 1: cartridge / static mixer / cleaning tools

Annex A 3

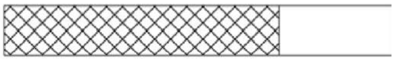
Overview system components part 2

fischer anchor rod



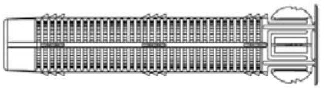
Size: M8, M10, M12, M16

Internal threaded anchor FIS E



Size: 11x85 M8
15x85 M10 / M12

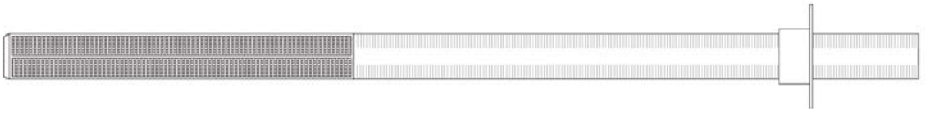
Perforated sleeve FIS H K



Size: FIS H 12x50 K
FIS H 12x85 K
FIS H 16x85 K
FIS H 20x85 K

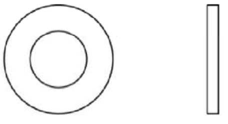
Size: FIS H 16x130 K
FIS H 20x130 K

Perforated sleeve FIS H K (push through installation)

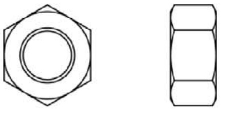


Size:
FIS H 18x130/200 K
FIS H 22x130/200 K

Washer



Hexagon nut



Figures not to scale

Table A5.1: Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener; filler		
	Steel grade	Steel	Stainless steel R	High corrosion-resistant steel HCR
		zinc plated	acc. to EN 10088-1:2014 Corrosion resistance class CRC III acc. to EN 1993-1-4:2015	acc. to EN 10088-1:2014 Corrosion resistance class CRC V acc. to EN 1993-1-4:2015
2	Anchor rod	Property class 4.6; 4.8; 5.8 or 8.8; EN ISO 898-1: 2013 zinc plated ≥ 5µm, ISO 4042:2018 Zn5/An(A2K) or hot-dip galvanised EN ISO 10684:2004 f_{uk} ≤ 1000 N/mm² A_5 > 8% fracture elongation	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062; 1.4662; 1.4462; EN 10088-1:2014 f_{uk} ≤ 1000 N/mm² A_5 > 8% fracture elongation	Property class 50 or 80 EN ISO 3506-1:2020 or property class 70 with f_{yk}= 560 N/mm² 1.4565; 1.4529 EN 10088-1:2014 f_{uk} ≤ 1000 N/mm² A_5 > 8% fracture elongation
3	Washer ISO 7089:2000	zinc plated ≥ 5µm, ISO 4042:2018 Zn5/An(A2K) or hot-dip galvanised EN ISO 10684:2004	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	1.4565;1.4529 EN 10088-1:2014
4	Hexagon nut	Property class 5 or 8; EN ISO 898-2:2012 zinc plated ≥ 5µm, ISO 4042:2018 Zn5/An(A2K) or hot-dip galvanised ISO 10684:2004	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 50, 70 or 80 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2014
5	Internal threaded anchor FIS E	Property class 5.8; EN 10277-1:2008-06 zinc plated ≥ 5µm, ISO 4042:2018 Zn5/An(A2K)	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2014
6	Commercial standard screw or threaded rod for internal threaded anchor FIS E	Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated ≥ 5µm, ISO 4042:2018 Zn5/An(A2K)	Property class 70 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2014	Property class 70 EN ISO 3506-1:2020 1.4565; 1.4529 EN 10088-1:2014
7	Perforated sleeve and centring sleeve	PP / PE		

Specifications of intended use (part 1)

Table B1.1: Overview installation and use

		fischer injection system FIS V Zero for masonry	
Hole drilling with hammer drill mode		all bricks	
Hole drilling with rotary drill mode		all bricks	
Static and quasi-static load		all bricks	
Use conditions	dry masonry	all bricks	
Installation	Pre-positioned	Anchor rod or internal threaded anchor (in solid brick masonry)	Perforated sleeve with anchor rod or internal threaded anchor (in perforated and solid brick masonry) Size: FIS H 12x50 K FIS H 12x85 K FIS H 16x85 K FIS H 16x130 K FIS H 20x85 K FIS H 20x130 K
	Push through	Anchor rod (in solid brick masonry)	Perforated sleeve with anchor rod (in perforated and solid brick masonry) Size: FIS H 18x130/200 K FIS H 22x130/200 K
Installation and use conditions	condition d/d (dry/dry)	all bricks	
Installation temperature		$T_{i,min}$ = -10 °C to $T_{i,max}$ = +40 °C	
Service temperature	Temperature range Ta	-40 °C to +40 °C	(max. short term temperature +40 °C max. long term temperature +24 °C)
	Temperature range Tb	-40 °C to +80 °C	(max. short term temperature +80 °C max. long term temperature +50 °C)
	Temperature range Tc	-40 °C to +120 °C	(max. short term temperature +120 °C; max. long term temperature +72 °C)

Specifications of intended use (part 2)

Anchorages subject to:

- Static and quasi-static loads

Base materials:

- Solid brick masonry (base material group b), acc. to Annex B 12
- Hollow brick masonry (base material group c), according to Annex B 12
- Minimum thickness of masonry member is h_{ef}+30mm
- Mortar strength class of the masonry M2,5 at minimum according to EN 998-2:2010
- For other bricks in solid masonry, hollow or perforated masonry the characteristic resistance of the anchor may be determined by job site tests according to EOTA Technical Report TR 053:2016-04 under consideration of the β-factor according to Annex C 16, Table C16.1

  Note (only applies to solid bricks):
  The characteristic resistance is also valid for larger brick sizes, higher mean compressive strength and higher mean gross dry density of the masonry unit.

Temperature Range:

- **Ta:** from -40°C to +40°C (max. short term temperature +40°C and max. long term temperature +24°C)
- **Tb:** from -40°C to +80°C (max. short term temperature +80°C and max. long term temperature +50°C)
- **Tc:** from -40°C to +120°C (max. short term temperature +120°C and max. long term temperature +72°C)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc plated steel, stainless steel or high corrosion resistant steel)
- For all other conditions according to EN 1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 5, Table A5.1.

Specifications of intended use (part 2 continued)

Design:

- The anchorages have to be designed in accordance with EOTA Technical Report TR 054:2021-05, Design method A under the responsibility of an engineer experienced in anchorages and masonry work.

  Applies to all bricks, if no other values are specified:

  $N_{Rk} = N_{Rk,b} = N_{Rk,p} = N_{Rk,b,c} = N_{Rk,p,c}$

  $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$

  For the Calculation of pulling out a brick under tension load $\mathbf{N_{Rk,pb}}$ or

  pushing out a brick under shear load $\mathbf{V_{Rk,pb}}$ see EOTA Technical Report TR 054:2021-05.

  $\mathbf{N_{Rk,s}}$, $\mathbf{V_{Rk,s}}$ and $\mathbf{M^0_{Rk,s}}$ see annex C1-C3

  Factors for job site tests and displacements see Annex C16

- Verifiable calculation notes and drawings have to be prepared taking account the relevant masonry in the region of the anchorage, the loads to be transmitted and their transmission to the supports of the structure. The position of the anchor is indicated on the design drawings.

Installation:

- Condition d/d: Installation and use in structures subject to dry, internal conditions
- Hole drilling see **Annex B1.1**
- In case of aborted hole: The hole shall be filled with mortar
- Bridging of unbearing layer (e.g. plaster) at perforated brick masonry see Annex B 6, Table B6.1
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Fastening screws or anchor rods (including nut and washer) must comply with the appropriate material and property class of the fischer internal threaded anchor FIS E.
- Minimum curing time see Annex B 8, Table B8.2
- Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:

  Material dimensions and mechanical properties of the metal parts according to the specifications are given in Annex A 5, Table 5.1

  Conformation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents shall be stored

  Marking of the anchor rod with the effective embedment depth. This may be done by the manufacturer of the rod or by a person on job site

Table B4.1: Installation parameters for anchor rods in solid bricks without perforated sleeves

Anchor rod		**Thread**	**M8**	**M10**	**M12**	**M16**
Nominal drill hole diameter		d_0 [mm]	10	12	14	18
Effective embedment depth h_{ef}[1)] in solid brick (depth of drill hole $h_0 = h_{ef}$)		$h_{ef,min}$ [mm]	50			
		$h_{ef,max}$ [mm]	h-30, ≤200			
Diameter of clearance hole in the fixture	pre-positioned installation	$d_f \leq$ [mm]	9	12	14	18
	push through installation	$d_f \leq$ [mm]	11	14	16	20
Diameter of cleaning brush		$d_b \geq$ [mm]	see Table B8.1			
Maximum installation torque		max T_{inst} [Nm]	see parameters of brick Annex C			

[1)] $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ is possible.

fischer anchor rods M8, M10, M12, M16

Marking (on random place) fischer anchor rod:

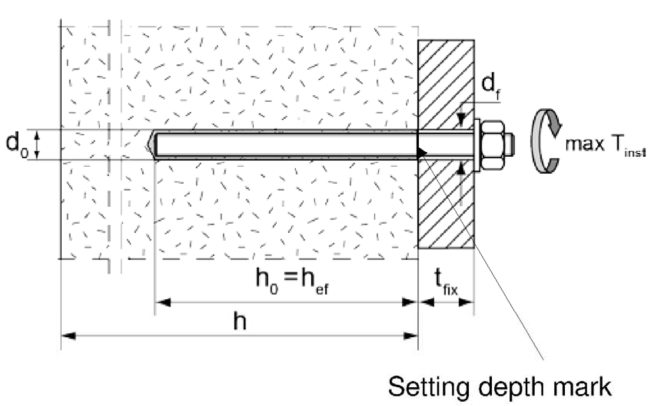
Steel zinc plated PC[1)] 8.8	• or +	Steel hot-dip galvanised PC[1)] 8.8	•
High corrosion resistant steel HCR PC[1)] 50	•	High corrosion resistant steel HCR PC[1)] 70	–
High corrosion resistant steel HCR PC[1)] 80	(	Stainless steel R property class 50	~
Stainless steel R property class 80	*		

Alternatively: Colour coding according to DIN 976-1: 2016; property class 4.6 marking according to EN ISO 898-1:2013

[1)] PC = property class

Installation conditions:

Anchor rod

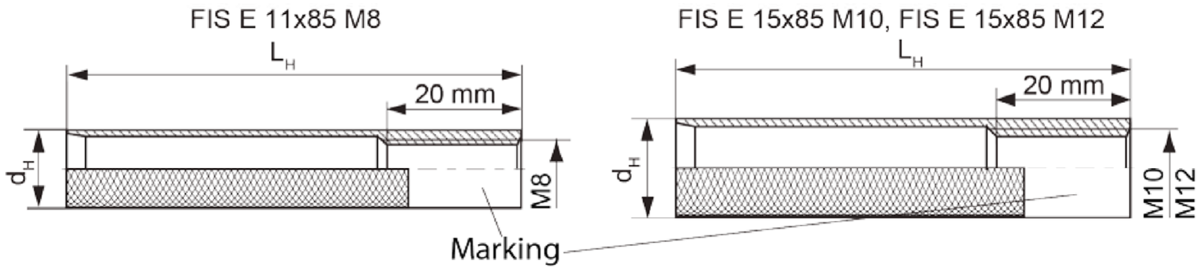


Figures not to scale

Table B5.1: Installation parameters for internal threaded anchors FIS E in solid bricks without perforated sleeves

Internal threaded anchor FIS E		11x85 M8	15x85 M10	15x85 M12
Diameter of anchor	d_H [mm]	11	15	
Nominal drill hole diameter	d_0 [mm]	14	18	
Length of anchor	L_H [mm]	85		
Effective embedment depth	$h_0 = h_{ef}$ [mm]	85		
Diameter of cleaning brush	$d_b \geq$ [mm]	see Table B8.1		
Maximum installation torque	max T_{inst} [Nm]	see parameters of brick Annex C		
Diameter of clearance hole in the fixture	d_f [mm]	9	12	14
Screw-in depth	$l_{E,min}$ [mm]	8	10	12
	$l_{E,max}$ [mm]	60		

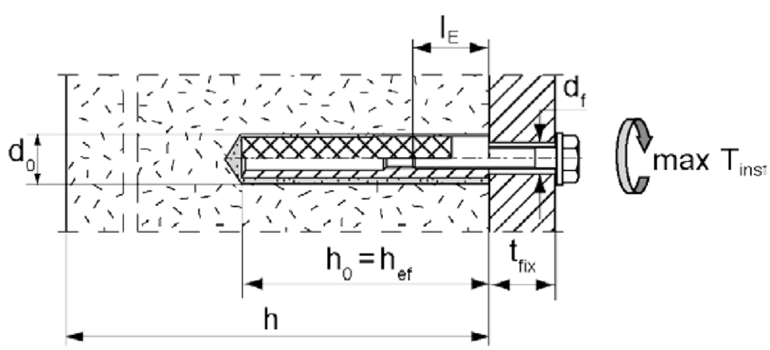
fischer Internal threaded anchor FIS E



Marking:
Size, e.g. **M8**, Stainless steel: R, e.g. **M8 R**, High corrosion-resistant steel: HCR, e.g. **M8 HCR**

Installation conditions:

Internal threaded anchor



Figures not to scale

Table B6.1: Installation parameters for anchor rods and internal threaded anchors FIS E with perforated sleeves (pre-positioned installation)

perforated sleeve FIS H K		12x50	12x85[2)]	16x85	16x130[2)]	20x85	20x130[2)]
Nominal drill hole diameter $d_0 = D_{sleeve,nom}$	d_0 [mm]	12		16		20	
Depth of drill hole	h_0 [mm]	55	90	90	135	90	135
Effective embedment depth	$h_{ef,min}$ [mm]	50	65	85	110	85	110
	$h_{ef,max}$ [mm]	50	85	85	130	85	130
Size of threaded rod	[-]	M8		M8 and M10		M12 and M16	
Size of internal threaded anchor FIS E		-	-	11x85	-	15x85	-
Diameter of cleaning brush [1)]	$d_b \geq$ [mm]	see Table B8.1					
Maximum installation torque	max T_{inst} [Nm]	see parameters of brick Annex C					

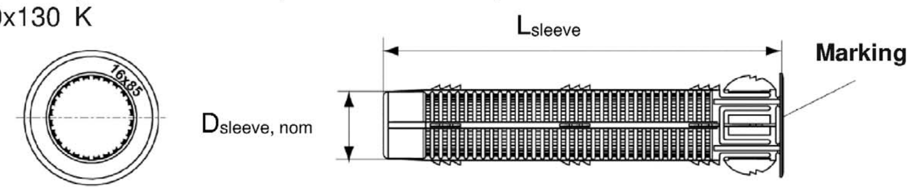
[1)] Only for solid areas in hollow bricks and solid bricks.

[2)] Bridging of unbearing layer (e.g. plaster) is possible. When reducing the effective embedment depth $h_{ef,\,min}$, the values of the next shorter perforated sleeve of the same diameter must be used. The smaller value of charastereristic resistance must be taken.

Perforated sleeve

FIS H 12x50 K; FIS H 12x85 K; FIS H 16x85 K; FIS H 16x130 K;
FIS H 20x85 K; FIS H 20x130 K

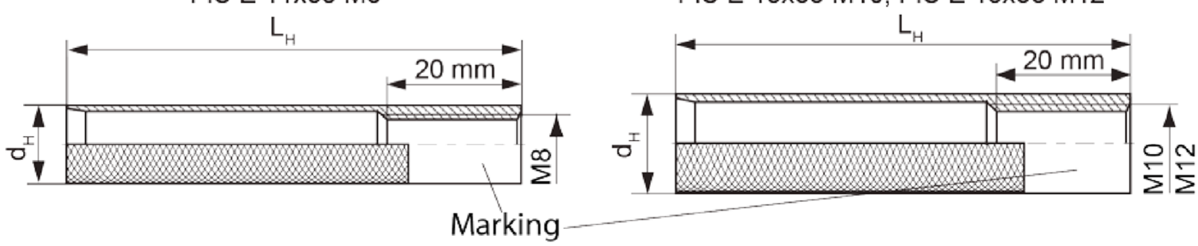
Marking:
Size $D_{sleeve,\,nom}$ x L_{sleeve}
(e.g.: 16x85)



fischer Internal threaded anchor FIS E

FIS E 11x85 M8

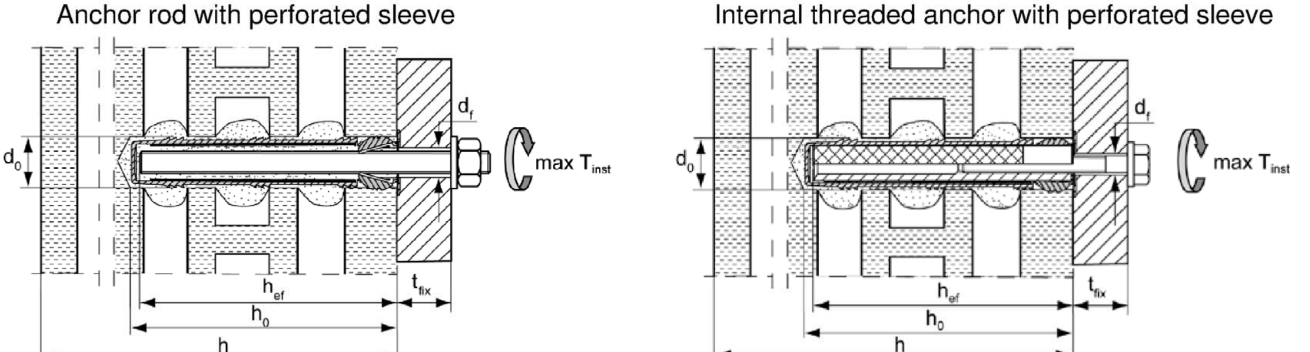
FIS E 15x85 M10, FIS E 15x85 M12



Installation conditions:

Anchor rod with perforated sleeve

Internal threaded anchor with perforated sleeve



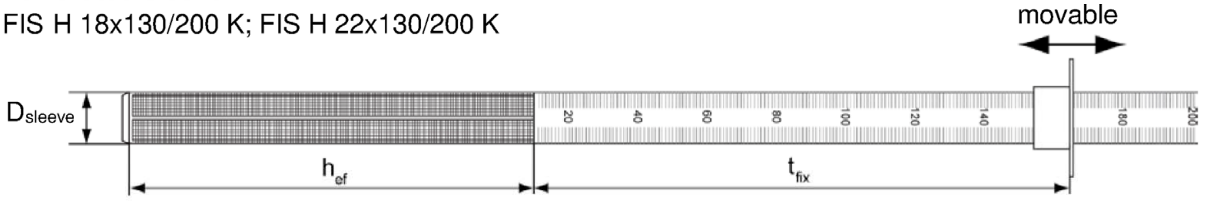
Figures not to scale

Table B7.1: Installation parameters for anchor rods with perforated sleeves (push through installation)

Perforated sleeve FIS H K		18x130/200		22x130/200
Nominal sleeve diameter	$D_{sleeve,nom}$ [mm]	16		20
Nominal drill hole diameter	d_0 [mm]	18		22
Depth of drill hole	h_0 [mm]	135		
Effective embedment depth	h_{ef} [mm]	≥130		
Diameter of cleaning brush [1]	$d_b \geq$ [mm]	see Table B8.1		
Size of threaded rod	[-]	M10	M12	M16
Maximum installation torque	max T_{inst} [Nm]	see parameters of brick Annex C		
Thickness of fixture	$t_{fix,max}$ [mm]	200		

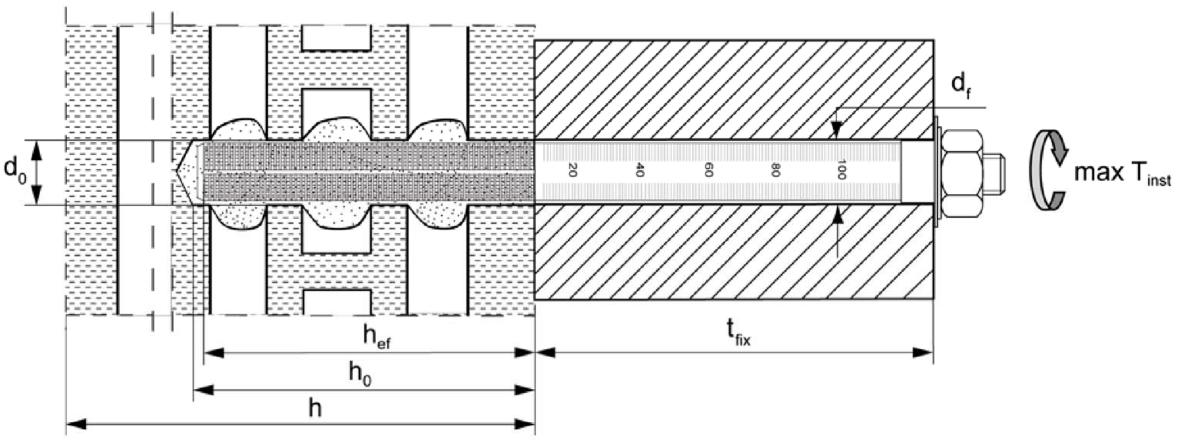
[1] Only for solid areas in hollow bricks and solid bricks.

Perforated sleeve
FIS H 18x130/200 K; FIS H 22x130/200 K



Installation conditions:

Anchor rod with perforated sleeve

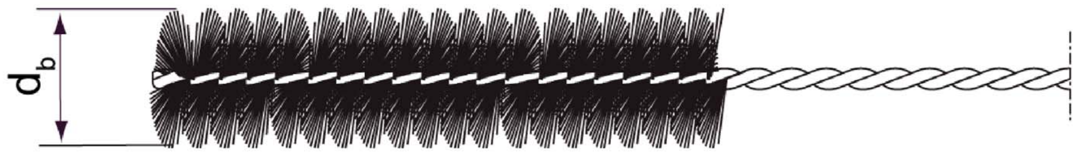


Figures not to scale

Table B8.1: Parameters of the cleaning brush BS (steel brush with steel bristles)

The size of the cleaning brush refers to the drill hole diameter

Nominal drill hole diameter	d_0 [mm]	10	12	14	16	18	20	22
Steel brush diameter	d_b [mm]	11	14	16	20	20	25	25



Only for solid areas in hollow bricks and solid bricks

Table B8.2: Maximum processing times and minimum curing times (During the curing time of the mortar the temperature of the anchoring base may not fall below the listed minimum temperature)

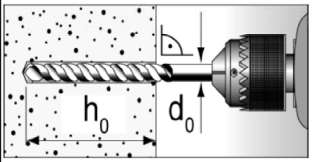
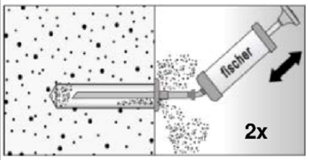
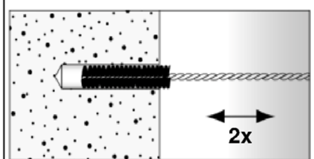
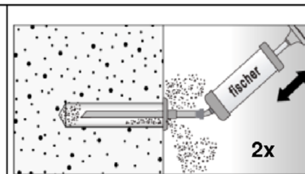
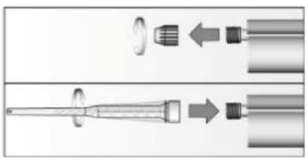
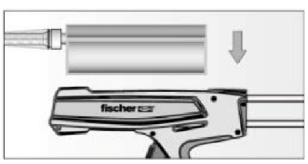
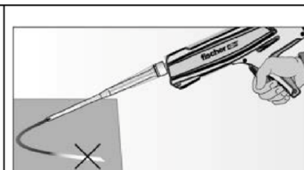
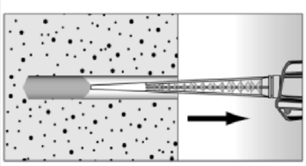
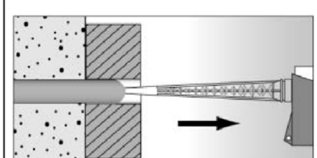
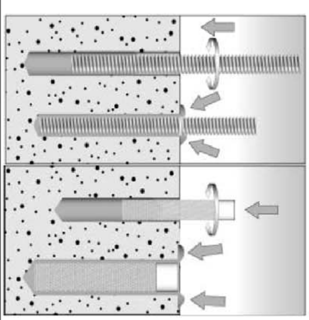
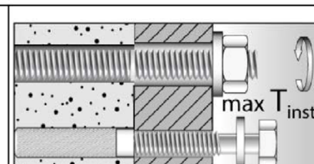
Temperature at anchoring base [°C]	Maximum processing time t_{work}	Minimum curing time t_{cure}
	FIS V Zero	FIS V Zero
-10 to -5 1)	6 h	72 h
> -5 to 0 1)	2 h	24 h
> 0 to 5 1)	45 min	12 h
> 5 to 10	20 min	6 h
> 10 to 15	8 min	3 h
> 15 to 20	5 min	2 h
> 20 to 25	3 min	1 h
> 25 to 30	2 min	45 min
> 30 to 40	1 min	30 min

1) Minimum cartridge temperature +5°C

Figures not to scale

Installation instruction part 1

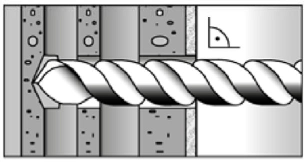
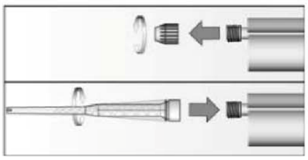
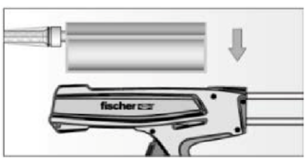
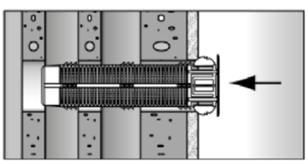
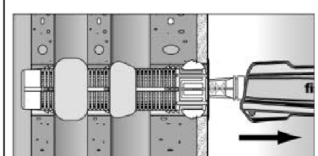
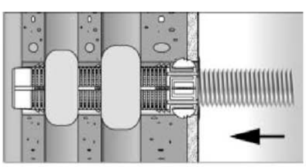
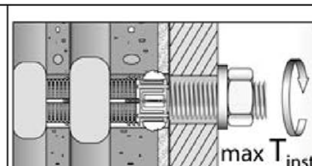
Installation in solid brick without perforated sleeve

1		Drill the hole (drilling method see Annex C of the respective brick) depth of drill hole $\mathbf{h_0}$ and nominal drill hole diameter $\mathbf{d_0}$ see **Table B4.1; B5.1**		
2				Blow out the drill hole twice. Brush twice and blow out twice again.
3		Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)		
4		Place the cartridge into a suitable dispenser		Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey.
5		Fill approximetly 2/3 of the drill hole with mortar beginning from the bottom of the hole[1]. Avoid bubbles.		For push through installation fill the annular gap with mortar.
6		Only use clean and oil-free metal parts. Mark the setting depth. Insert the anchor rod or internal threaded anchor FIS E by hand. Recommendation: Rotation back and forth of the anchor rod or internal threaded anchor FIS E makes pushing easy. When reaching the setting depth mark, excess mortar must emerge from the mouth of the drill hole.		
7		Do not touch. Minimum curing time see Table **B8.2**		Mounting the fixture. max T_{inst} see parameter of brick.

[1] Exact volume of mortar see manufacturer´s specifications

Installation instruction part 2

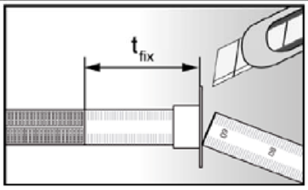
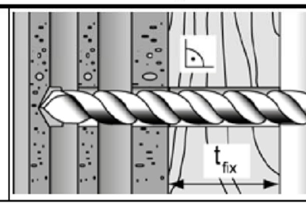
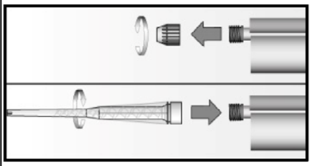
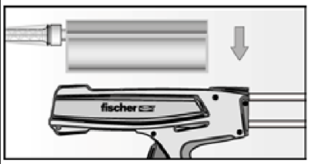
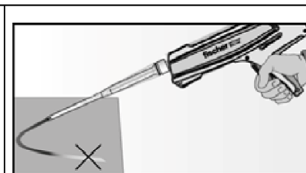
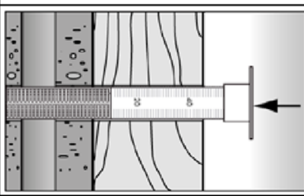
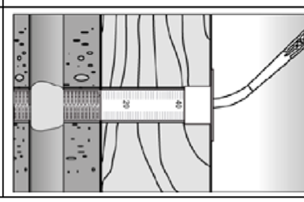
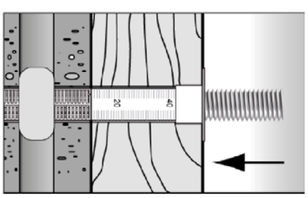
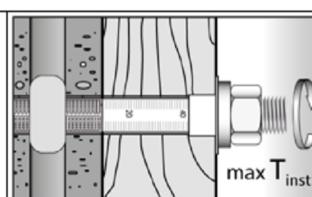
Installation in perforated or solid brick with perforated sleeve (pre-positioned installation)

1		Drill the hole (drilling method see Annex C of the respective brick). depth of drill hole **h_0** and nominal drill hole diameter **d_0** see **Table B6.1**	When install perforated sleeves in solid bricks or solid areas of hollow bricks, also clean the hole by blowing out and brushing.	
2		Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)		
3		Place the cartridge into a suitable dispenser.		Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey.
4		Insert the perforated sleeve flush with the surface of the masonry or plaster.		Fill the perforated sleeve completely with mortar beginning from the bottom of the hole. [1)]
5		Only use clean and oil-free metal parts. Mark the setting depth. Insert the anchor rod or the internal threaded anchor FIS E by hand. Recommendation: Rotation back and forth of the anchor rod or internal threaded anchor FIS E makes pushing easy until reaching the setting depth mark (anchor rod) or flush with the surface (internal threaded anchor).		
6		Do not touch. Minimum curing time see Table **B8.2**		Mounting the fixture. max T_{inst} see parameter of brick.

[1)] Exact volume of mortar see manufacturer´s specification.

Installation instruction part 3

Installation in perforated or solid brick with perforated sleeve (push through installation)

1		Push the movable stop up to the correct thickness of fixture and cut the overlap.		Drill the hole through the fixture. Depth of drill hole **($h_0 + t_{fix}$)** and nominal drill hole diameter **d_0** see **Table B7.1**
2		Remove the sealing cap. Screw on the static mixer. (the spiral in the static mixer must be clearly visible)		
3		Place the cartridge into a suitable dispenser.		Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey.
4		Insert the perforated sleeve flush with the surface of the fixture into the drill hole.		Fill the sleeve with mortar beginning from the bottom of the hole. [1)] For deep drill holes use an extension tube.
5		Only use clean and oil-free metal parts. Mark the setting depth. Insert the anchor rod by hand. Recommendation: Rotation back and forth of the anchor rod makes pushing easy until reaching the setting depth mark (anchor rod).		
6		Do not touch. Minimum curing time see Table **B8.2**		Mounting the fixture. max T_{inst} see parameter of brick.

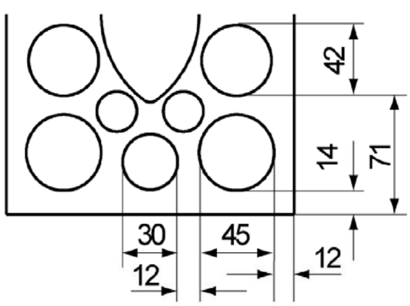
[1)] Exact volume of mortar see manufacturer´s specification.

Table B12.1: Overview of assessed bricks

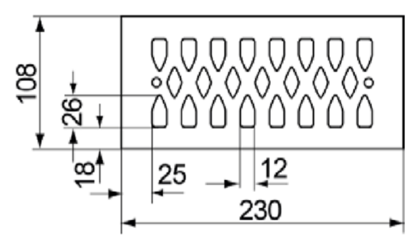
Kind of masonry	Brick format [mm]	Mean compressive strength [N/mm²]	Main country of origin	Mean gross dry density ρ [kg/dm³]	Annex
Solid brick Mz					
Solid brick Mz	≥ 230x108x55	36 - 48	Denmark	≥2,0	C4/C5
Solid calcium silicate (sand - lime) brick KS / perforated calcium silicate (sand - lime) brick KSL					
Solid calcium silicate brick KS	**NF** ≥240x115x71	8- 20	Germany	≥2,0	C6/C7
Perforated calcium silicate brick KSL	**3DF** 240x175x113	8 - 16	Germany	≥1,6	C8 – C11
Vertical perforated brick HLz					
Vertical perforated brick HLz	230x108x55	6 - 16	Denmark	≥1,6	C12/C13
Lightweight aggregate concrete hollow block Hbl					
Lightweight aggregate concrete hollow block Hbl	500x200x200	2 - 4	France	≥1,0	C14/C15

Picture B12.1: Overview dimensions of perforated and hollow bricks

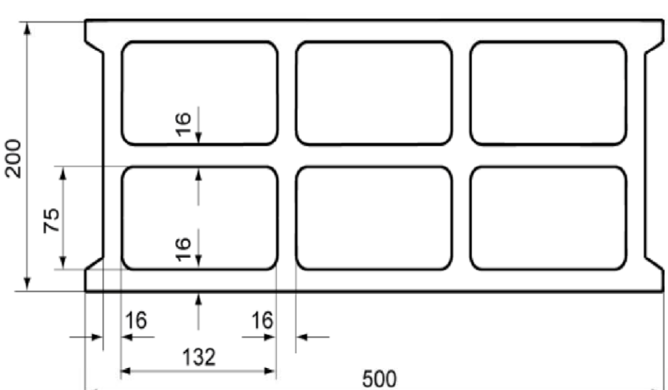
Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2:2015; e.g. KS Wemding according to Annex C 8



Vertical perforated brick HLz, EN 771-1:2015; e.g. Wienerberger according to Annex C 12



Lightweight aggregate concrete hollow block Hbl, EN 771-3:2015; e.g. Sepa according to Annex C 14



Measures in [mm]

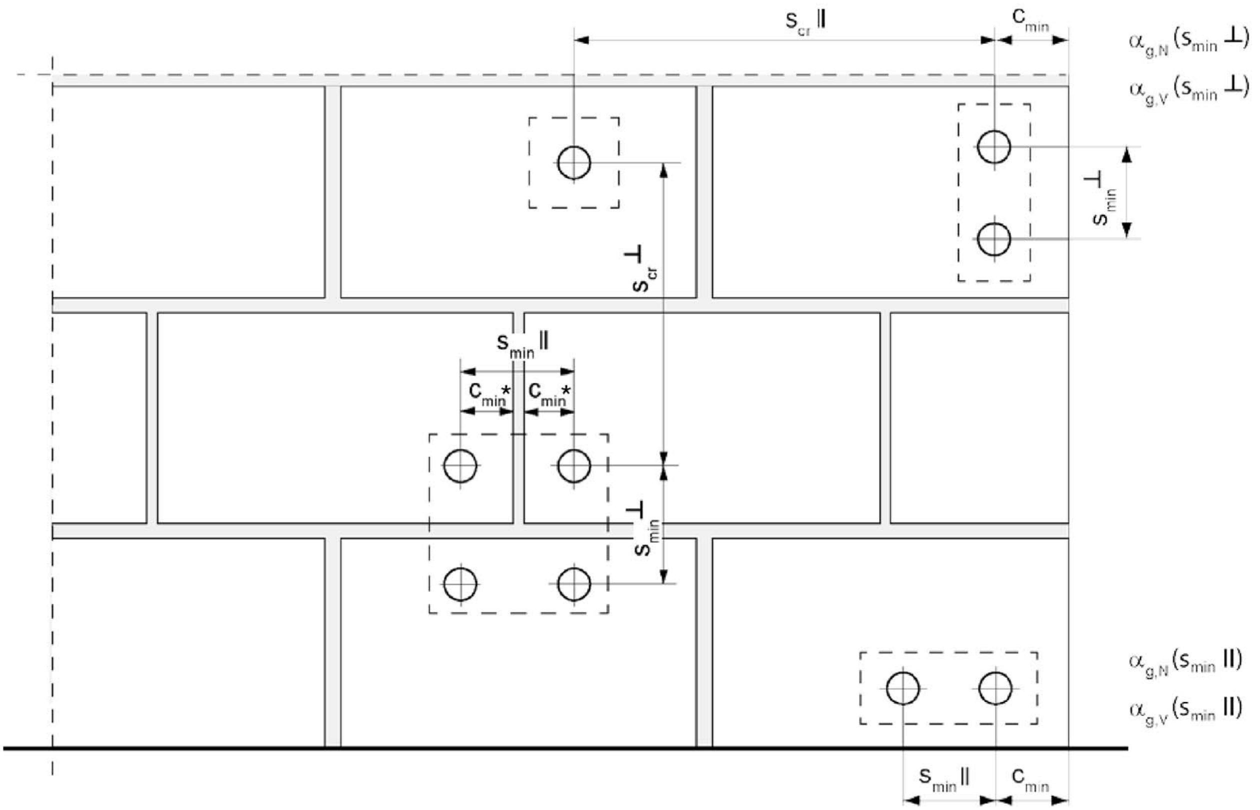
Figures not to scale

fischer injection system FIS V Zero for masonry

Intended use
Overview of assessed bricks
Overview dimensions of perforated and hollow bricks

Annex B 12

Spacing and edge distance



* Only, if vertical joints are not completely filled with mortar

s_{min} II	=	Minimum spacing parallel to horizontal joint
$s_{min} \perp$	=	Minimum spacing perpendicular to horizontal joint
s_{cr} II	=	Characteristic spacing parallel to horizontal joint
$s_{cr} \perp$	=	Characteristic spacing perpendicular to horizontal joint
$c_{cr} = c_{min}$	=	Edge distance
$\alpha_{g,N}$ (s_{min} II)	=	Group factor for tension load, anchor group parallel to horizontal joint
$\alpha_{g,V}$ (s_{min} II)	=	Group factor for shear load, anchor group parallel to horizontal joint
$\alpha_{g,N}$ ($s_{min} \perp$)	=	Group factor for tension load, anchor group vertical to horizontal joint
$\alpha_{g,V}$ ($s_{min} \perp$)	=	Group factor for shear load, anchor group vertical to horizontal joint

Spacing and edge distance (continuation)

For $s \geq s_{cr}$ $\alpha_g = 2$

For $s_{min} \leq s < s_{cr}$ α_g according to installation parameters of brick Annex C

Group of 2 anchors

$N^g_{Rk} = \alpha_{g,N} \cdot N_{Rk}$; $V^g_{Rk,b} = V^g_{Rk,c,II} = V^g_{Rk,c,\perp} = \alpha_{g,V} \cdot V_{Rk}$

Group of 4 anchors

$N^g_{Rk} = \alpha_{g,N} (s_{min} II) \cdot \alpha_{g,N} (s_{min} \perp) \cdot N_{Rk}$;

$V^g_{Rk,b} = V^g_{Rk,c,II} = V^g_{Rk,c,\perp} = \alpha_{g,V} (s_{min} II) \cdot \alpha_{g,V} (s_{min} \perp) \cdot V_{Rk}$

with N_{Rk} and $\alpha_{g,N}$ depending on s_{min}II or $s_{min}\perp$ acc. to Annex C

with V_{Rk} and $\alpha_{g,V}$ depending on s_{min}II or $s_{min}\perp$ acc. to Annex C

Table C1.1: Characteristic resistance to **steel failure** of a single anchor under **tension loading** of **fischer anchor rods** and **standard threaded rods**

Anchor rod / standard threaded rod					M8[3)]	M10[3)]	M12	M16
Characteristic resistance to steel failure under tension loading								
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	Property class	4.6	[kN]	15(13)	23(21)	33	63
			4.8		15(13)	23(21)	33	63
			5.8		19(17)	29(27)	43	79
			8.8		29(27)	47(43)	68	126
	Stainless steel R and High corrosion resistant steel HCR		50		19	29	43	79
			70		26	41	59	110
			80		30	47	68	126
Partial factors [1)]								
Partial factors $\gamma_{Ms,N}$	Steel zinc plated	Property class	4.6	[-]	2,00			
			4.8		1,50			
			5.8		1,50			
			8.8		1,50			
	Stainless steel R and High corrosion resistant steel HCR		50		2,86			
			70		1,50[2)] / 1,87			
			80		1,60			

1) In absence of other national regulations

2) Only for fischer FIS A made of high corrosion-resistant steel HCR

3) Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot dip galvanised standard threaded rods according to EN ISO 10684:2004+AC:2009

Table C2.1: Characteristic resistance to **steel failure** of a single anchor under **shear loading** with and without lever arm of **fischer anchor rods** and **standard threaded rods**

Anchor rod / standard threaded rod					M8[3)]	M10[3)]	M12	M16
Characteristic resistance to steel failure under shear loading								
without lever arm								
Characteristic resistance $V_{Rk,s}$	Steel zinc plated	Property class	4.6	[kN]	9(8)	14(13)	20	38
			4.8		9(8)	14(13)	20	38
			5.8		11(10)	17(16)	25	47
			8.8		15(13)	23(21)	34	63
	Stainless steel R and High corrosion resistant steel HCR		50		9	15	21	39
			70		13	20	30	55
			80		15	23	34	63
with lever arm								
Characteristic resistance $M^0_{Rk,s}$	Steel zinc plated	Property class	4.6	[Nm]	15(13)	30(27)	52	133
			4.8		15(13)	30(27)	52	133
			5.8		19(16)	37(33)	65	166
			8.8		30(26)	60(53)	105	266
	Stainless steel R and High corrosion resistant steel HCR		50		19	37	65	166
			70		26	52	92	232
			80		30	60	105	266
Partial factors [1)]								
Partial factors $\gamma_{Ms,V}$	Steel zinc plated	Property class	4.6	[-]	1,67			
			4.8		1,25			
			5.8		1,25			
			8.8		1,25			
	Stainless steel R and High corrosion resistant steel HCR		50		2,38			
			70		1,25[2)] / 1,56			
			80		1,33			

1) In absence of other national regulations

2) Only for fischer FIS A made of high corrosion-resistant steel HCR

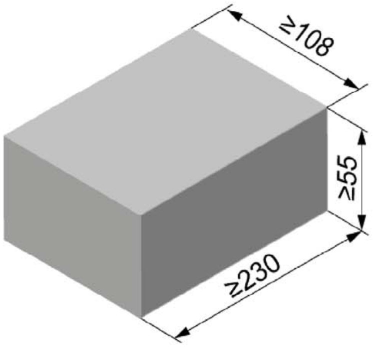
3) Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot dip galvanised standard threaded rods (M8 resp. M10) according to EN ISO 10684:2004+AC:2009.

Table C3.1: Characteristic resistance to **steel failure** of a single anchor under **tension / shear loading** of **internal threaded anchors FIS E**

fischer internal threaded anchor FIS E					**M8**	**M10**	**M12**
Characteristic resistance to steel failure under tension loading							
Characteristic resistance with screw	$N_{Rk,s}$	Property class	5.8	[kN]	18	29	42
		Property class 70	R		26	41	59
			HCR		26	41	59
Partial factors [1]							
Partial factors	$\gamma_{Ms,N}$	Property class	5.8	[-]	1,50		
		Property class 70	R		1,87		
			HCR		1,87		
Characteristic resistance to steel failure under shear loading							
without lever arm							
Characteristic resistance with screw	$V_{Rk,s}$	Property class	5.8	[kN]	9	15	21
		Property class 70	R		13	20	30
			HCR		13	20	30
with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	Property class	5.8	[Nm]	19	37	65
		Property class 70	R		26	52	92
			HCR		26	52	92
Partial factors [1]							
Partial factors	$\gamma_{Ms,V}$	Property class	5.8	[-]	1,25		
		Property class 70	R		1,56		
			HCR		1,56		

[1] In absence of other national regulations

Solid brick Mz, EN 771-1:2015



Solid brick Mz, EN 771-1:2015			
Producer	e.g. Wienerberger		
Nominal dimensions [mm]	length L	width W	height H
	≥ 230	≥ 108	≥ 55
Mean gross dry density ρ [kg/dm³]	≥ 2,0		
Mean compressive strength [N/mm²]	36 / 48		
Standard	EN 771-1:2015		

Table C4.1: Installation parameters

Anchor rod			M8		M10		M12		M16		-	-	
Internal threaded anchor FIS E			-		-		-		-		M8	M10	M12
											11x85	15x85	
Anchor rod and internal threaded anchor FIS E without perforated sleeve													
Effective embedment depth	h_{ef}	[mm]	50	80	50	80	50	80	50	80	85		
Max. installation torque	max T_{inst}	[Nm]	10								10		
General installation parameters													
Edge distance	c_{min}	[mm]	100										
Spacing	s_{min} II	[mm]	100										
	s_{cr} II	[mm]	3 x h_{ef}										
	s_{min} ⊥	[mm]	100										
	s_{cr} ⊥	[mm]	3 x h_{ef}										
Drilling method													
Hole drilling with rotary drill mode or hammer drilling with hard metal hammer drill													

Table C4.2: Group factors

Anchor rods			M8	M10	M12	M16	-	-	
Internal threaded anchor FIS E			-	-	-	-	M8	M10	M12
							11x85	15x85	
Group factors	$\alpha_{g,N}$ (s_{min} II)	[-]	1,81						
	$\alpha_{g,V}$ (s_{min} II)	[-]	1,49						
	$\alpha_{g,N}$ (s_{min} ⊥)	[-]	1,74						
	$\alpha_{g,V}$ (s_{min} ⊥)	[-]	1,49						

Solid brick Mz, EN 771-1:2015

Table C5.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

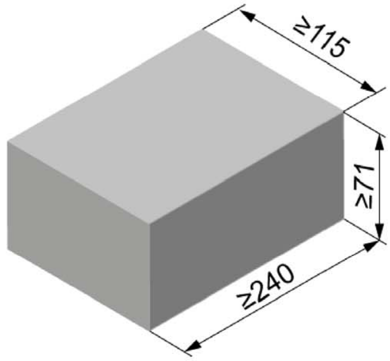
Anchor rod	**M8**		**M10**		**M12**		**M16**		**-**	**-**	
Internal threaded anchor FIS E	-		-		-		-		**M8**	**M10**	**M12**
									11x85	**15x85**	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C)											
Mean compressive strength $\mathbf{f_b}$	Effective embedment depth h_{ef} [mm]										
	50	80	50	80	50	80	50	80	85		
36 N/mm²	2,5	3,0	3,0	3,0	3,0	3,0	3,0	4,5	2,5		
48 N/mm²	3,0	3,5	3,5	3,5	3,5	3,5	3,5	5,0	3,0		
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 50/80°C and 72/120°C)											
Mean compressive strength $\mathbf{f_b}$	Effective embedment depth h_{ef} [mm]										
	50	80	50	80	50	80	50	80	85		
36 N/mm²	1,5	2,0	2,0	2,0	2,0	2,0	2,0	3,5	1,5		
48 N/mm²	1,5	2,5	2,5	2,5	2,5	2,5	2,5	4,0	1,5		

Table C5.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	**M8**		**M10**		**M12**		**M16**		**-**	**-**	
Internal threaded anchor FIS E	-		-		-		-		**M8**	**M10**	**M12**
									11x85	**15x85**	
Shear resistance $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C, 50/80°C and 72/120°C)											
Mean compressive strength $\mathbf{f_b}$	Effective embedment depth h_{ef} [mm]										
	50	80	50	80	50	80	50	80	85		
36 N/mm²	2,5	4,5	2,5	4,5	2,5	4,5	2,5	4,5	2,5	2,5	
48 N/mm²	3,0	5,0	3,0	5,0	3,0	5,0	3,0	5,0	3,0	3,0	

Factor for job site tests see annex C16 and displacements see annex C17

Solid calcium silicate (sand-lime) brick KS, NF, EN 771-2:2015



Solid calcium silicate (sand-lime) brick KS, NF, EN 771-2:2015				
Producer		---		
Nominal dimensions	[mm]	length L	width W	height H
		≥ 240	≥ 115	≥ 71
Mean gross dry density	[kg/dm³]	≥ 2,0		
Mean compressive strength	[N/mm²]	12 / 16 / 20		
Standard		EN 771-2:2015		

Table C6.1: Installation parameters

Anchor rod			M8		M10		M12		M16		-	-	
Internal threaded anchor FIS E			-		-		-		-		M8	M10	M12
											11x85	15x85	
Anchor rod and internal threaded anchor FIS E without perforated sleeve													
Effective embedment depth	h_{ef}	[mm]	50	80	50	80	50	80	50	80	85	85	
Max. installation torque	max T_{inst}	[Nm]	8		10						8	10	
General installation parameters													
Edge distance	c_{min}	[mm]	100										
Spacing	s_{min} II	[mm]	100										
	s_{cr} II	[mm]	3 x h_{ef}										
	s_{min} ⊥	[mm]	100										
	s_{cr} ⊥	[mm]	3 x h_{ef}										
Drilling method													
Hole drilling with rotary drill mode or hammer drilling with hard metal hammer drill													

Table C6.2: Group factors

Anchor rod			M8	M10	M12	M16	-	-	
Internal threaded anchor FIS E			-	-	-	-	M8	M10	M12
							11x85	15x85	
Group factors	$\alpha_{g,N}$ (s_{min} II)	[-]	1,67						
	$\alpha_{g,V}$ (s_{min} II)	[-]	1,26						
	$\alpha_{g,N}$ (s_{min} ⊥)	[-]	1,67						
	$\alpha_{g,V}$ (s_{min} ⊥)	[-]	2,0						

Solid calcium silicate (sand-lime) brick KS, NF, EN 771-2:2015

Table C7.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

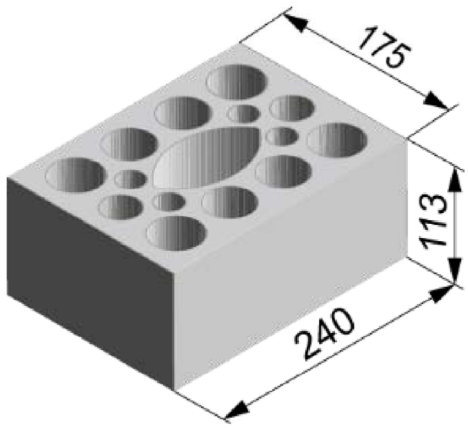
Anchor rod	M8		M10		M12		M16		-	-
Internal threaded anchor FIS E	-		-		-		-		M8 11x85	M10 / M12 15x85
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d (temperature range 24/40°C)										
Mean compressive strength f_b	Effective embedment depth h_{ef} [mm]									
	50	80	50	80	50	80	50	80	85	85
12 N/mm²	2,0	2,0	2,5	4,5	2,0	4,5	2,0	2,0	2,0	
16 N/mm²	2,5	2,5	2,5	5,0	2,5	5,0	2,5	2,5	2,5	
20 N/mm²	2,5	3,0	3,0	6,0	2,5	6,0	2,5	3,0	2,5	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d (temperature range 50/80°C and 72/120°C)										
Mean compressive strength f_b	Effective embedment depth h_{ef} [mm]									
	50	80	50	80	50	80	50	80	85	85
12 N/mm²	1,5	1,5	1,5	3,0	1,5	3,0	1,5	1,5	1,5	
16 N/mm²	1,5	1,5	2,0	3,5	1,5	3,5	1,5	1,5	1,5	
20 N/mm²	2,0	2,0	2,0	4,0	2,0	4,0	2,0	2,0	2,0	

Table C7.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

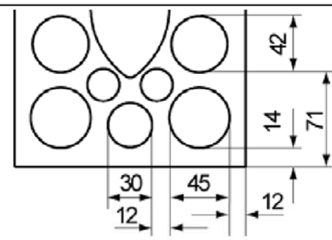
Anchor rod	M8		M10		M12		M16		-	-
Internal threaded anchor FIS E	-		-		-		-		M8 11x85	M10 / M12 15x85
Shear resistance $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d (temperature range 24/40°C, 50/80°C and 72/120°C)										
Mean compressive strength f_b	Effective embedment depth h_{ef} [mm]									
	50	80	50	80	50	80	50	80	85	85
12 N/mm²	3,5	3,5	4,5	4,5	3,5	4,0	3,5	4,0	3,5	3,5
16 N/mm²	4,0	4,0	5,0	5,0	4,0	4,5	4,0	4,5	4,0	4,0
20 N/mm²	4,5	4,5	6,0	6,0	4,5	5,0	4,5	5,0	4,5	4,5

Factor for job site tests see annex C16 and displacements see annex C17

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2:2015



Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2:2015			
Producer	e.g. KS Wemding		
Nominal dimensions [mm]	length L	width W	height H
	240	175	113
Mean gross dry density ρ [kg/dm³]	≥ 1,6		
Mean compressive strength [N/mm²]	6 / 8 / 10 / 12 / 16		
Standard	EN 771-2:2015		



Dimensions see also Annex B 12

Table C8.1: Installation parameters (Pre-positioned installation with perforated sleeve FIS H K)

Anchor rod			M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E			-	-	M8	-		-		M10	M12	-		-	
					11x85					15x85					
Perforated sleeve FIS H K			12x50	12x85	16x85			16x130		20x85				20x130	
Anchor rod and internal threaded anchor FIS E with perforated sleeve FIS H K															
Max. installation torque	max T_{inst}	[Nm]	8	8	8	8	10	8	10	10					
General installation parameters															
Edge distance	c_{min}	[mm]	100												
Spacing	s_{min} II	[mm]	100												
	s_{cr} II	[mm]	240												
	s_{min} ⊥	[mm]	100												
	s_{cr} ⊥	[mm]	115												
Drilling method															
Hole drilling with rotary drill mode or hammer drilling with hard metal hammer drill															

Table C8.2: Group factors

Anchor rod			M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E			-	-	M8	-		-		M10	M12	-		-	
					11x85					15x85					
Perforated sleeve FIS H K			12x50	12x85	16x85			16x130		20x85				20x130	
Group factors	$\alpha_{g,N}$ (s_{min} II)	[-]	1,14												
	$\alpha_{g,V}$ (s_{min} II)	[-]	1,51												
	$\alpha_{g,N}$ (s_{min} ⊥)	[-]	1,14												
	$\alpha_{g,V}$ (s_{min} ⊥)	[-]	1,54												

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2:2015

Table C9.1: Installation parameters
(Push through installation with perforated sleeve FIS H K)

Anchor rod			**M10**	**M12**	**M16**
Perforated sleeve FIS H K			**18x130/200**		**22x130/200**
Anchor rod with perforated sleeve FIS H K					
Max. installation torque	max T_{inst}	[Nm]	10		
General installation parameters					
Edge distance	c_{min}	[mm]	100		
Spacing	s_{min} II	[mm]	100		
	s_{cr} II	[mm]	240		
	s_{min} ⊥	[mm]	100		
	s_{cr} ⊥	[mm]	115		
Drilling method					
Hole drilling with rotary drill mode or hammer drilling with hard metal hammer drill					

Table C9.2: Group factors

Anchor rod			**M10**	**M12**	**M16**
Perforated sleeve FIS H K			**18x130/200**		**22x130/200**
Group factors	$\alpha_{g,N}$ (s_{min} II)	[-]	1,14		
	$\alpha_{g,V}$ (s_{min} II)	[-]	1,51		
	$\alpha_{g,N}$ (s_{min} ⊥)	[-]	1,14		
	$\alpha_{g,V}$ (s_{min} ⊥)	[-]	1,54		

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2:2015

Table C10.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Pre-positioned installation)

Anchor rod	M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E	-	-	M8 11x85	-		-		M10 15x85	M12	-		-	
Perforated sleeve FIS H K	12x50	12x85	16x85			16x130		20x85				20x130	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C)													
Mean compressive strength f_b													
6 N/mm²	1,2		0,9			2,0		0,9				2,0	
8 N/mm²	1,5		1,2			2,5		1,2				2,5	
10 N/mm²	1,5		1,5			3,0		1,5				3,0	
12 N/mm²	2,0		1,5			3,5		1,5				3,5	
16 N/mm²	2,5		2,0			4,5		2,0				4,5	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 50/80°C and 72/120°C)													
Mean compressive strength f_b													
6 N/mm²	0,6		0,75			1,5		0,75				1,5	
8 N/mm²	0,75		0,9			2,0		0,9				2,0	
10 N/mm²	0,9		0,9			2,5		0,9				2,5	
12 N/mm²	0,9		1,2			2,5		1,2				2,5	
16 N/mm²	1,2		1,5			3,5		1,5				3,5	

Table C10.2: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading (Push through installation)

Anchor rod	M10	M12	M16
Perforated sleeve FIS H K	18x130/200		22x130/200
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C)			
Mean compressive strength f_b			
6 N/mm²	2,0		
8 N/mm²	2,5		
10 N/mm²	3,0		
12 N/mm²	3,5		
16 N/mm²	4,5		
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 50/80°C and 72/120°C)			
Mean compressive strength f_b			
6 N/mm²	1,5		
8 N/mm²	2,0		
10 N/mm²	2,5		
12 N/mm²	2,5		
16 N/mm²	3,5		

Factor for job site tests see annex C16 and displacements see annex C17

Perforated calcium silicate (sand-lime) brick KSL, 3DF, EN 771-2:2015

Table C11.1: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Pre-positioned installation)

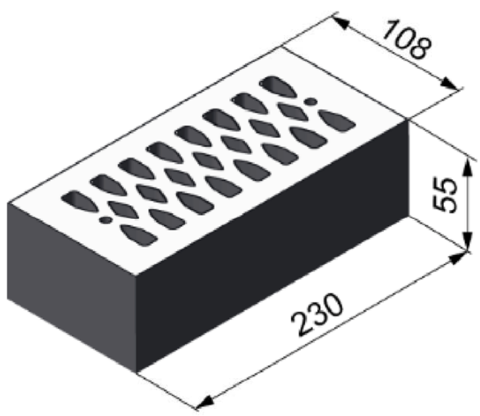
Anchor rod	M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E	-	-	M8	-		-		M10	M12	-		-	
			11x85					15x85					
Perforated sleeve FIS H K	12x50	12x85	16x85			16x130		20x85				20x130	
Shear resistance $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C, 50/80°C and 72/120°C)													
Mean compressive strength f_b													
6 N/mm²	1,5		2,0					3,0					
8 N/mm²	2,0		2,5					3,5					
10 N/mm²	2,5		3,0					4,5					
12 N/mm²	2,5		3,5					5,0					
16 N/mm²	3,5		4,0					6,5					

Table C11.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading (Push through installation)

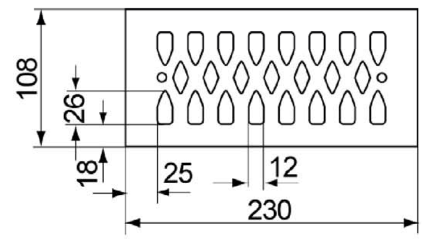
Anchor rod	M10	M12	M16
Perforated sleeve FIS H K	18x130/200		22x130/200
Shear resistance $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C, 50/80°C and 72/120°C)			
Mean compressive strength f_b			
6 N/mm²	2,0		3,0
8 N/mm²	2,5		3,5
10 N/mm²	3,0		4,5
12 N/mm²	3,5		5,0
16 N/mm²	4,0		6,5

Factor for job site tests see annex C16 and displacements see annex C17

Vertical perforated brick HLz, EN 771-1:2015



Vertical perforated brick HLz, EN 771-1:2015			
Producer	e.g. Wienerberger.		
Nominal dimensions [mm]	length L	width W	height H
	230	108	55
Mean gross dry density ρ [kg/dm³]	≥ 1,6		
Mean compressive strength [N/mm²]	8 / 10 / 12 / 16		
Standard	EN 771-1:2015		



Dimensions see also Annex B 12

Table C12.1: Installation parameters

Anchor rod	M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E	-	-	M8 11x85	-		-		M10 15x85	M12 15x85	-		-	
Perforated sleeve FIS H K	12x50	12x85	16x85			16x130		20x85				20x130	

Anchor rod and internal threaded anchor FIS E with perforated sleeve FIS H K			
Max. installation torque	max T_{inst}	[Nm]	5
General installation parameters			
Edge distance	c_{min}	[mm]	100
Spacing	s_{min} II	[mm]	100
	s_{cr} II	[mm]	230
	s_{min} ⊥	[mm]	60
	s_{cr} ⊥	[mm]	60
Drilling method			
Hole drilling with rotary drill mode or hammer drilling with hard metal hammer drill			

Table C12.2: Group factors

Anchor rod	M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E	-	-	M8 11x85	-		-		M10 15x85	M12 15x85	-		-	
Perforated sleeve FIS H K	12x50	12x85	16x85			16x130		20x85				20x130	

Group factors	$\alpha_{g,N}$ (s_{min} II)	[-]	1,65
	$\alpha_{g,V}$ (s_{min} II)	[-]	1,64
	$\alpha_{g,N}$ (s_{min} ⊥)	[-]	1,65
	$\alpha_{g,V}$ (s_{min} ⊥)	[-]	2,00

Vertical perforated brick HLz, EN 771-1:2015

Table C13.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

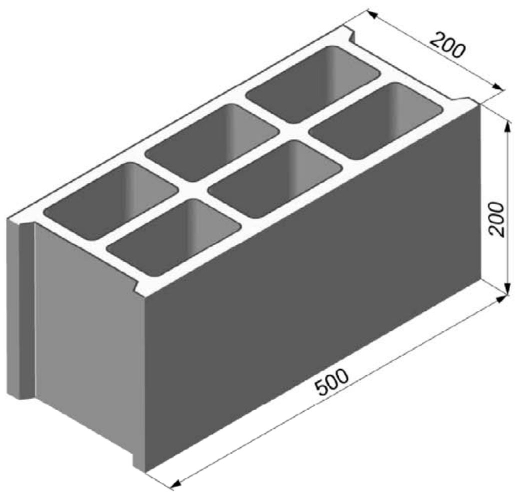
Anchor rod	M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E	-	-	M8 11x85	-		-		M10 15x85	M12 15x85	-		-	
Perforated sleeve FIS H K	12x50	12x85	16x85			16x130		20x85				20x130	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C)													
Mean compressive strength f_b													
8 N/mm^2	1,2	1,5	1,5			2,5		1,5				2,5	
10 N/mm^2	1,2	2,0	2,0			2,5		2,0				2,5	
12 N/mm^2	1,5	2,0	2,0			3,0		2,0				3,0	
16 N/mm^2	1,5	2,5	2,5			3,5		2,5				3,5	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 50/80°C and 72/120°C)													
Mean compressive strength f_b													
8 N/mm^2	0,6	1,2	1,2			1,5		1,2				1,5	
10 N/mm^2	0,75	1,2	1,2			2,0		1,2				2,0	
12 N/mm^2	0,75	1,5	1,5			2,0		1,5				2,0	
16 N/mm^2	0,9	1,5	1,5			2,5		1,5				2,5	

Table C13.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

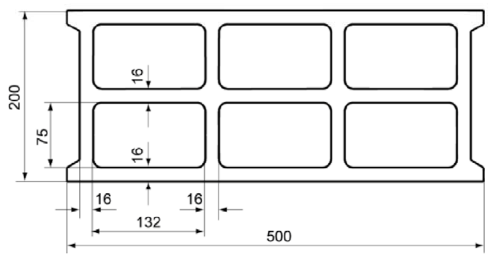
Anchor rod	M8	M8	-	M8	M10	M8	M10	-		M12	M16	M12	M16
Internal threaded anchor FIS E	-	-	M8 11x85	-		-		M10 15x85	M12 15x85	-		-	
Perforated sleeve FIS H K	12x50	12x85	16x85			16x130		20x85				20x130	
Shear resistance $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C, 50/80°C and 72/120°C)													
Mean compressive strength f_b													
8 N/mm^2	2,0	3,5	2,5			3,5		2,5				3,5	
10 N/mm^2	2,0	4,0	3,0			4,0		3,0				4,0	
12 N/mm^2	2,0	4,0	3,0			4,5		3,0				4,5	
16 N/mm^2	2,5	5,0	3,5			5,0		3,5				5,0	

Factor for job site tests see annex C16 and displacements see annex C17

Lightweight aggregate concrete hollow block Hbl , EN 771-3:2015



Lightweight aggregate concrete hollow block Hbl, EN 771-3:2015			
Producer	e.g. Sepa		
Nominal dimensions [mm]	length L	width W	height H
	500	200	200
Mean gross dry density ρ [kg/dm³]	≥ 1,0		
Mean compressive strength [N/mm²]	2 / 4		
Standard	EN 771-1:2015		



Dimensions see also Annex B 12

Table C14.1: Installation parameters

Anchor rod	-	M8	M10	M8	M10	M10	M12	-		M12	M16	M12	M16
Internal threaded anchor FIS E	M8	-		-		-		M10	M12	-		-	
	11x85							15x85					
Perforated sleeve FIS H K	16x85			16x130		18x130/200		20x85				20x130	

Anchor rod and internal threaded anchor FIS E with perforated sleeve FIS H K			
Max. installation torque	max T_{inst}	[Nm]	2
General installation parameters			
Edge distance	c_{min}	[mm]	100
Spacing	s_{min} II	[mm]	100
	s_{cr} II	[mm]	500
	s_{min} ⊥	[mm]	100
	s_{cr} ⊥	[mm]	200
Drilling method			
Hole drilling with rotary drill mode or hammer drilling with hard metal hammer drill			

Table C14.2: Group factors

Anchor rod	-	M8	M10	M8	M10	M10	M12	-		M12	M16	M12	M16
Internal threaded anchor FIS E	M8	-		-		-		M10	M12	-		-	
	11x85							15x85					
Perforated sleeve FIS H K	16x85			16x130		18x130/200		20x85				20x130	

Group factors	$\alpha_{g,N}$ (s_{min} II)	[-]	2,00
	$\alpha_{g,V}$ (s_{min} II)	[-]	1,28
	$\alpha_{g,N}$ (s_{min} ⊥)	[-]	1,40
	$\alpha_{g,V}$ (s_{min} ⊥)	[-]	2,00

Lightweight aggregate concrete hollow block Hbl, EN 771-3:2015

Table C15.1: Characteristic resistance to pull-out failure or brick breakout failure of a single anchor under tension loading

Anchor rod	-	M8	M10	M8	M10	M10	M12	-		M12	M16	M12	M16
Internal threaded anchor FIS E	M8 11x85	-		-		-		M10	M12	-		-	
								15x85					
Perforated sleeve FIS H K	16x85			16x130		18x130/200		20x85				20x130	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C)													
Mean compressive strength f_b													
2 N/mm²	0,4											0,6	
4 N/mm²	0,5											0,75	
Tension resistance $N_{Rk} = N_{Rk,p} = N_{Rk,b} = N_{Rk,p,c} = N_{Rk,b,c}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 50/80°C and 72/120°C)													
Mean compressive strength f_b													
2 N/mm²	0,3											0,5	
4 N/mm²	0,4											0,6	

Table C15.2: Characteristic resistance to local brick failure or brick edge failure of a single anchor under shear loading

Anchor rod	-	M8	M10	M8	M10	M10	M12	-		M12	M16	M12	M16
Internal threaded anchor FIS E	M8 11x85	-		-		-		M10	M12	-		-	
								15x85					
Perforated sleeve FIS H K	16x85			16x130		18x130/200		20x85				20x130	
Shear resistance $V_{Rk} = V_{Rk,b} = V_{Rk,c,II} = V_{Rk,c,\perp}$ [kN] depending on the mean compressive strength f_b; Installation and use condition d/d; (temperature range 24/40°C, 50/80°C and 72/120°C)													
Mean compressive strength f_b													
2 N/mm²	1,5												
4 N/mm²	2,0												

Factor for job site tests see annex C16 and displacements see annex C17

β-factors for job site tests

Table C16.1: β-factors for job site tests

Installation and use conditions	d/d		
temperature range [°C]	24/40	50/80	72/120
M8	0,81	0,47	0,45
M10	0,62	0,49	0,45
M12 / FIS E 11x85	0,62	0,49	0,52
M16 / FIS E 15x85	0,56	0,45	0,59

Table C17.1: Displacements

Material	Size	Effective embedment depth [mm]	N [kN]	δN0 [mm]	δN∞ [mm]	V [kN]	δV0 [mm]	δV∞ [mm]
Solid brick acc. to C4-C5	M8	50	0,57	0,00	0,00	0,71	0,08	0,12
		80	1,00	0,00	0,00	1,71	0,32	0,48
	M10	50	0,57	0,00	0,00	0,71	0,18	0,27
		80	1,00	0,01	0,02	1,71	0,50	0,75
	M12	50	1,29	0,03	0,06	0,71	0,05	0,08
		80	1,00	0,01	0,02	1,71	0,75	1,13
	M16	50	1,29	0,03	0,06	0,71	0,35	0,53
		80	1,71	0,04	0,08	1,71	0,20	0,30
Solid calcium silicate (sand-lime) brick acc. to C6-C7	M8	50	0,86	0,03	0,06	1,43	0,32	0,48
		80	0,86	0,00	0,00	1,43		
	M10	50	0,86	0,00	0,00	1,43	0,34	0,51
		80	1,71	0,02	0,04	1,43		
	M12	50	0,86	0,03	0,06	1,43	0,12	0,18
		80	1,71	0,04	0,08	1,43	0,32	0,48
	M16	50	0,86	0,03	0,06	1,43	0,57	0,86
		80	1,14	0,02	0,04	1,43	0,20	0,03
Perforated calcium silicate (sand-lime) brick acc. to C8-C11	M8	12x50	0,71	0,01	0,02	1,00	0,16	0,24
		12x85						
	M8 M10	16x85	0,57	0,02	0,04	1,14	0,57	0,86
		16x130	1,29	0,06	0,12	1,14	1,03	1,55
	M12 M16	20x85	0,57	0,03	0,06	1,86	1,15	1,73
		20x130	1,29	0,04	0,08	1,86	1,24	1,86
Perforated brick HIz acc. to C12-C13	M8	12x50	0,43	0,00	0,00	0,71	0,25	0,38
		12x85	0,71	0,00	0,00	1,43	0,61	0,92
	M8 M10	16x85	0,71	0,03	0,06	1,00	0,36	0,54
		16x130	1,00	0,02	0,04	1,43	0,30	0,45
	M12 M16	20x85	0,71	0,00	0,00	1,00	0,22	0,33
		20x130	1,00	0,04	0,08	1,43	0,17	0,26
Lightweight aggregate concrete hollow block Hbl acc. to C14-C15	M8 M10	16x85	0,14	0,03	0,06	0,57	1,54	2,31
		16x130	0,14	0,02	0,04	0,57	1,01	1,52
	M12 M16	20x85	0,14	0,06	0,12	0,57	1,31	1,97
		20x130	0,21	0,04	0,08	0,57	0,82	1,23

DÉCLARATION DES PERFORMANCES

DoP 0240

pour le système d'injection fischer FIS V Zero (résine pour les scellements d'armatures rapportées) FR

1. Code d'identification unique du type de produit: **DoP 0240**

2. Usage(s) prévu(s): **Système pour les scellements d'armatures rapportées pour utilisation dans le béton., Voir annexes, en particulier les annexes B1 - B12.**

3. Fabricant: **fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Allemagne**

4. Mandataire: **–**

5. Système(s) d'évaluation et de vérification de la constance des performances: **1**

6. Document d'évaluation européen: **EAD 330087-00-0601, Edition 05/2018**
   Evaluation Technique Européenne: **ETA-20/0574; 2021-05-04**
   Organisme d'évaluation technique: **DIBt- Deutsches Institut für Bautechnik**
   Organisme(s) notifié(s): **2873 TU Darmstadt**

7. Performance(s) déclarée(s):
   Résistance mécanique et stabilité (BWR 1)
   Résistance caractéristique à la charge de traction (charge statique et quasi-statique):
   Résistance d'adhérence des armatures rapportées: Annexe C2
   Facteur de réduction: Annexe C1
   Facteur d'augmentation profondeur d'ancrage minimum: Annexe C1

   Sécurité en cas d'incendie (BWR 2)
   Réaction au feu: Classe (A1)

   Résistance au feu:
   Résistance d'adhérence en cas de températures élevées: Annexe C3

8. Documentation technique appropriée et/ou documentation technique spécifique: **–**

Les performances du produit identifié ci-dessus sont conformes aux performances déclarées. Conformément au règlement (UE) no 305/2011, la présente déclaration des performances est établie sous la seule responsabilité du fabricant mentionné ci-dessus.

Signé pour le fabricant et en son nom par:

Dr.-Ing. Oliver Geibig, Directeur Général Business Units & Ingénierie

Jürgen Grün, Directeur Général Chimie & Qualité

Tumlingen, 2021-05-11

Cette DoP a été préparée en plusieurs langues. En cas de différend relatif à l'interprétation, la version anglaise prévaudra.

L'annexe comprend des informations volontaires et complémentaires en langue anglaise dépassant les exigences légales (spécifiées de manière neutre).

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 injection mortar fischer FIS V Zero in accordance with the regulations for reinforced concrete construction.

Reinforcing bars made of steel with a diameter ϕ from 8 to 25 mm or the fischer rebar anchor FRA or FRA HCR of sizes M12, M16, M20 and M24 and injection mortar fischer FIS V Zero are used for the rebar connection. The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between embedded element, 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 anchor 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

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C2 and C3

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. 330087-00-0601, 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

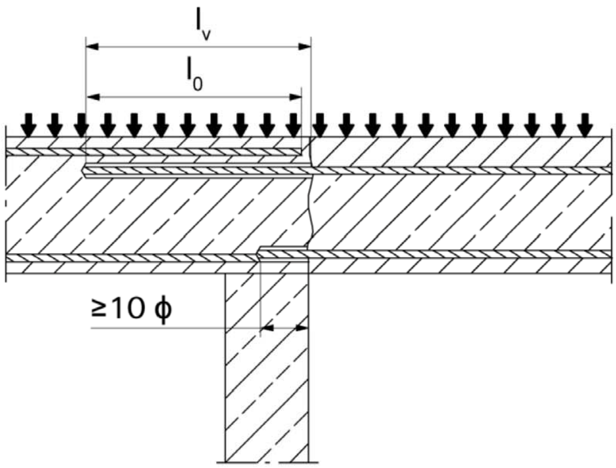


Figure A1.2:
Overlap joint with existing reinforcement at a foundation of a column or wall where the rebars are stressed

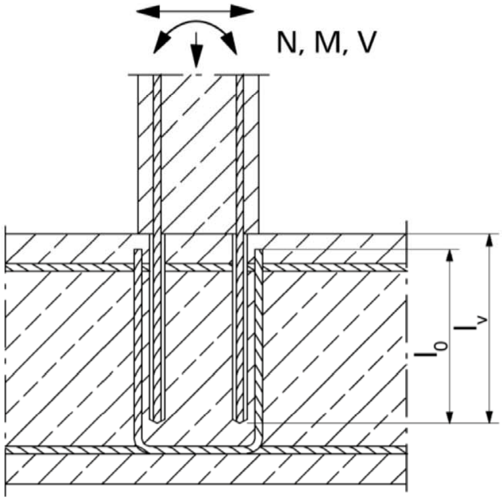
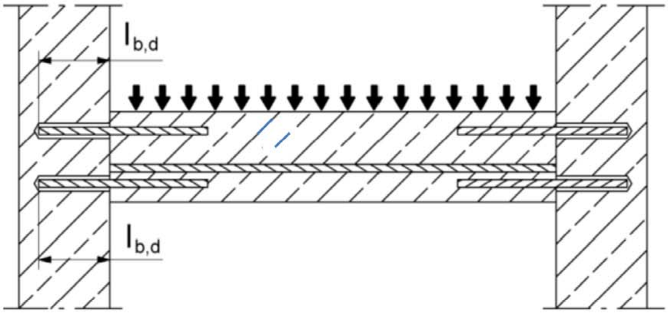


Figure A1.3:
End anchoring of slabs or beams (e.g. designed as simply supported)



Figures not to scale

Installation conditions and application examples reinforcing bars, part 2

Figure A2.1:

Rebar connection for stressed primarily in compression

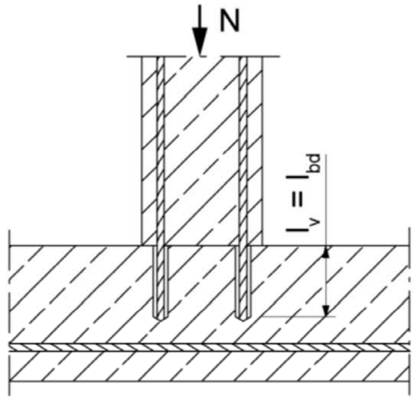
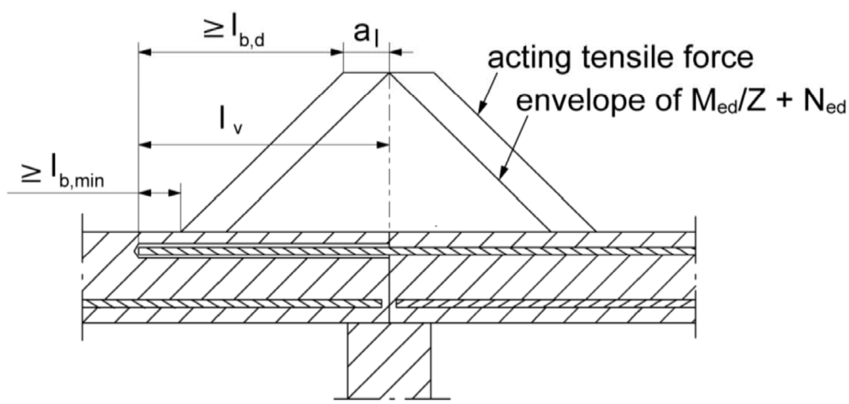


Figure A2.2:

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



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 shall comply with EN 1992-1-1:2004+AC:2010

Preparing of joints according to **Annex B 2**

Figures not to scale

Installation conditions and application examples fischer rebar anchor

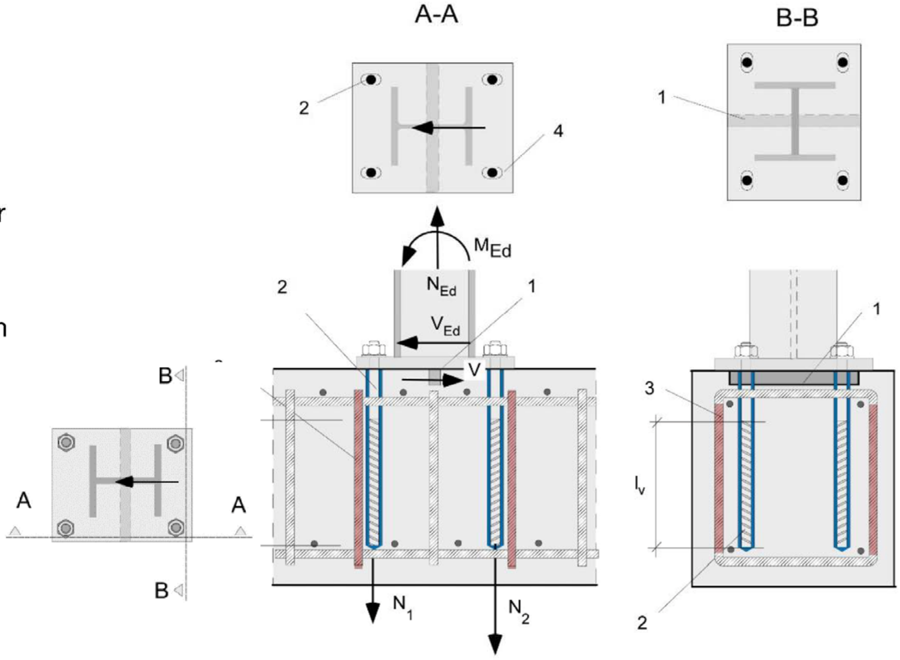


Figure A3.1:
Lap to a foundation of a column under bending.

1. Shear lug (or fastener loaded in shear)
2. fischer rebar tension anchor (tension only)
3. Existing stirrup / reinforcement for overlap (lap splice)
4. Slotted hole

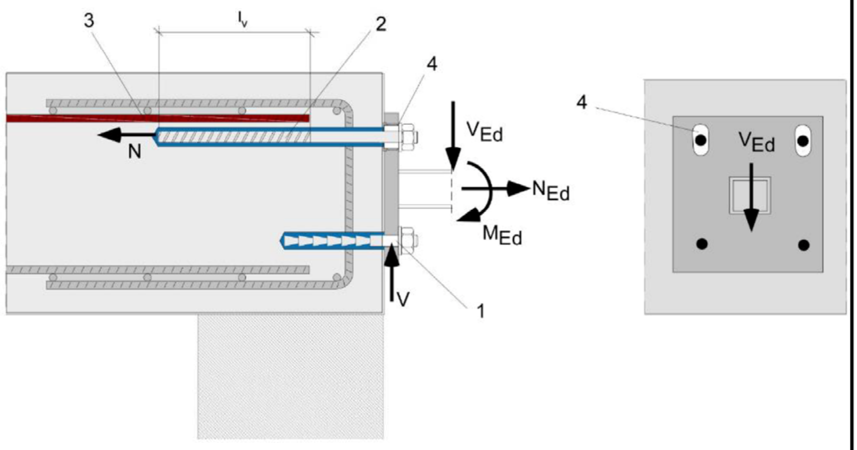


Figure A3.2:
Lap of the anchoring of guardrail posts or anchoring of cantilevered building components.
In the anchor plate, the drill holes for the fischer rebar anchors have to be designed as slotted holes with axial direction to the shear force.

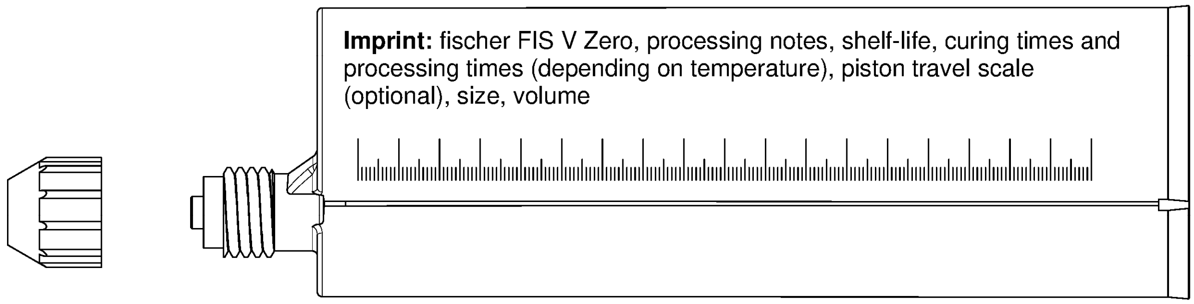
1. Fastener for shear load transfer
2. fischer rebar tension anchor (tension only)
3. Existing stirrup / reinforcement for overlap (lap splice)
4. Slotted hole

The required transverse reinforcement acc. to EN 1992-1-1:2004+AC:2010 is not shown in the figures. **The fischer rebar anchor may be only used for axial tensile force.** The tensile force must transferred by lap to the existing reinforcement of the building. The transfer of the shear force has to be ensured by suitable measures, e.g. by means of shear force or anchors with European Technical Assessment (ETA).

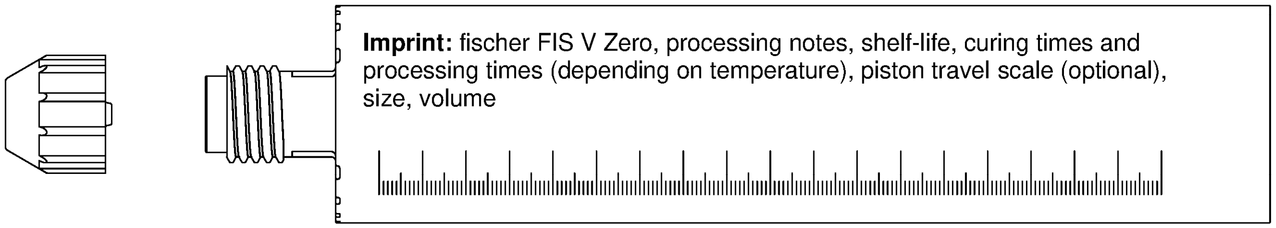
Figures not to scale

Overview system components

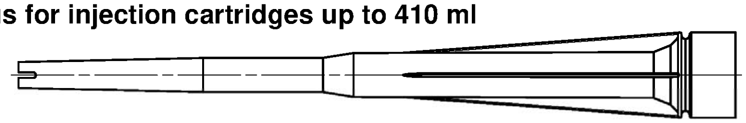
Injection cartridge (shuttle cartridge) FIS V Zero with sealing cap; Sizes: 360 ml, 825 ml



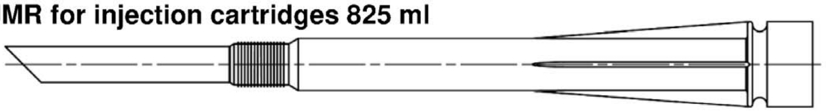
Injection cartridge (coaxial cartridge) FIS V Zero with sealing cap; Sizes: 300 ml ,380 ml, 400 ml, 410 ml



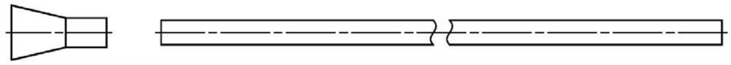
Static mixer FIS MR Plus for injection cartridges up to 410 ml



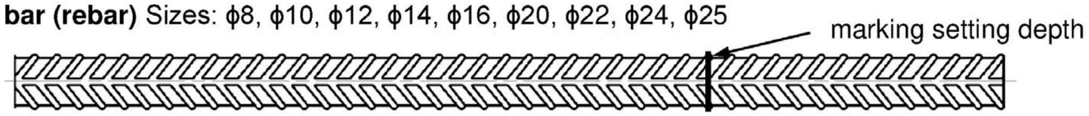
Static mixer FIS JMR for injection cartridges 825 ml



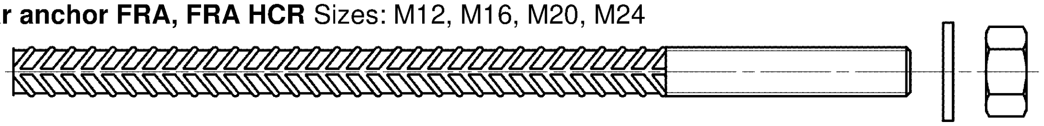
Injection adapter and extension tube Ø 9 for static mixer FIS MR Plus;
Injection adapter and extension tube Ø 9 or Ø 15 for static mixer FIS JMR



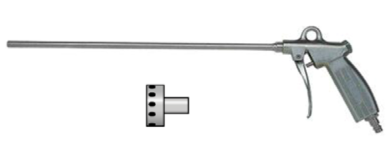
Reinforcing bar (rebar) Sizes: ϕ8, ϕ10, ϕ12, ϕ14, ϕ16, ϕ20, ϕ22, ϕ24, ϕ25



fischer rebar anchor FRA, FRA HCR Sizes: M12, M16, M20, M24



Blow out pump ABP with cleaning nozzle: **or AB G:**

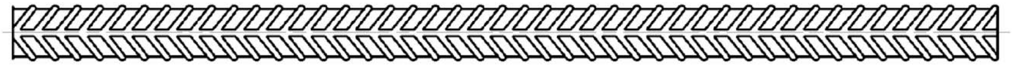


Figures not to scale

Rebar connection with fischer injection system FIS V Zero	**Annex A 4** Appendix 5 / 22
Product description Overview system components: injection mortar, static mixer, injection adapter, reinforcing bar, fischer rebar anchor, blow out pump	

Properties of reinforcing bars (rebar)

Figure A5.1:



- The minimum value of related rip area $f_{R,min}$ according to EN 1992-1-1:2004+AC:2010
- The maximum outer rebar diameter over the rips shall be:
  - The nominal diameter of the bar with rip $\phi + 2 * h$ ($h \leq 0{,}07 * \phi$)
  - (ϕ: Nominal diameter of the bar; h: rip height of the bar)

Table A5.1: Installation conditions for rebars

Nominal diameter of the bar		**ϕ**	**8[1)]**		**10[1)]**		**12[1)]**		**14**	**16**	**20**	**22**	**24**	**25**
Nominal drill hole diameter	d_0	[mm]	10	12	12	14	14	16	18	20	25	28	30	30
Drill hole depth	h_0	[mm]	$h_0 = l_v$											
Effective embedment depth	l_v	[mm]	acc. to static calculation											
Minimum thickness of concrete member	h_{min}	[mm]	$l_v + 30$ (≥ 100)					$l_v + 2d_0$						

[1)] Both drill hole diameters can be used

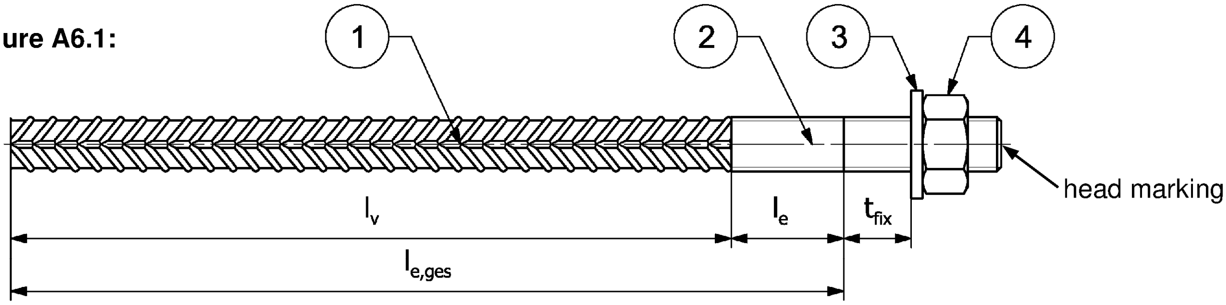
Table A5.2: Materials of rebars

Designation	**Reinforcing bar (rebar)**
Reinforcing bar EN 1992-1-1:2004+AC:2010, Annex C	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$

Figures not to scale

Properties of fischer rebar anchors

Figure A6.1:



Head marking e.g.: FRA (for stainless steel)

FRA HCR (for high corrosion-resistant steel)

Table A6.1: Installation conditions for fischer rebar anchors

Threaded diameter			**M12** [2)]		**M16**	**M20**	**M24**
Nominal diameter	ϕ	[mm]	12		16	20	25
Width across flat	SW	[mm]	19		24	30	36
Nominal drill bit diameter	d_0	[mm]	14	16	20	25	30
Drill hole depth ($h_0 = l_{e,ges}$)	$l_{e,ges}$	[mm]	$l_v + l_e$				
Effective embedment depth	l_v	[mm]	acc. to static calculation				
Distance concrete surface to welded joint	l_e	[mm]	100				
Diameter of clearance hole in the fixture[1)]	Pre-positioned ≤ d_f	[mm]	14		18	22	26
	Push through ≤ d_f	[mm]	16	18	22	26	32
Minimum thickness of concrete member	h_{min}	[mm]	h_0+30 (≥ 100)		$h_0 + 2d_0$		
Maximum torque moment for attachment of the fixture	max T_{fix}	[Nm]	50		100	150	150

1) For bigger clearance holes in the fixture see EN 1992-4:2018
2) Both drill bit diameters can be used

Table A6.2: Materials of fischer rebar anchors

Part	Description	Materials: FRA Corrosion resistance class CRC III acc. to EN 1993-1-4:2015	Materials: FRA HCR Corrosion resistance class CRC V acc. to EN 1993-1-4:2015
1	Reinforcing bar	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1:NA; $f_{uk} = f_{tk} = k \cdot f_{yk}$; ($f_{yk}$ =500 N/mm^2)	
2	Round bar with partial or full thread	Stainless steel, strength class 70 or for M 24 PC 80, according to EN 10088-1:2014	Stainless steel, strength class 70 or for M 24 PC 80, according to EN 10088-1:2014
3	Washer ISO 7089:2000	Stainless steel, according to EN 10088-1:2014	Stainless steel, according to EN 10088-1:2014
4	Hexagon nut	Stainless steel, strength class 80, acc. to EN ISO 3506-2:2009, according to EN 10088-1:2014	Stainless steel, strength class 80, acc. to EN ISO 3506-2:2009, according to EN 10088-1:2014

Figures not to scale

Specifications of intended use (part 1)

Table B1.1: Overview use and performance categories

Anchorages subject to	**FIS V Zero with …**			
	Reinforcing bar 		fischer rebar anchor 	
Hammer drilling with standard drill bit or compressed air drilling	all sizes			
Hammer drilling with hollow drill bit (fischer “FHD”, Heller "Duster Expert"; Bosch „Speed Clean“; Hilti "TE-CD, TE-YD") 	Nominal drill bit diameter (d_0) 12 mm to 30 mm			
Static and quasi static load, in uncracked concrete	all sizes	Tables: C1.1 C1.2 C2.1	all sizes	Tables: C1.1 C1.2 C1.3 C2.1
Installation temperature	$T_{i,min}$ = -10 °C to $T_{i,max}$ = +40 °C			
Resistance to fire	all sizes	Annex C3	all sizes	Table C2.2

Specifications of intended use (part 2)

Anchorages subject to:

- Static and quasi-static loads: reinforcing bar (rebar) size 8 mm to 25 mm
- Resistance to fire

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013+A1:2016
- Strength classes C12/15 to C50/60 according to EN 206:2013+A1:2016
- Maximum chloride content of 0,40 % (CL 0.40) related to the cement content according to EN 206:2013+A1:2016
- 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 :2004+AC:2010. The foregoing may be neglected if building components are new and not carbonated and if building components are in dry conditions.

Application temperature Range:

- -40°C to +80°C (max. short term temperature +80°C and max long-term temperature +50°C).

Installation temperature:

- -10 °C to +40 °C

Use conditions (Environmental conditions) for fischer rebar anchors:

- For all conditions according to EN 1993-1-4:2015 corresponding to corrosion resistance classes to Annex A 6 table A6.2

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the forces to be transmitted.
- Design according to EN 1992-1-1:2004+AC:2010, EN 1992-1-2:2004+AC:2008 and Annex B 3 and B 4.
- 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.

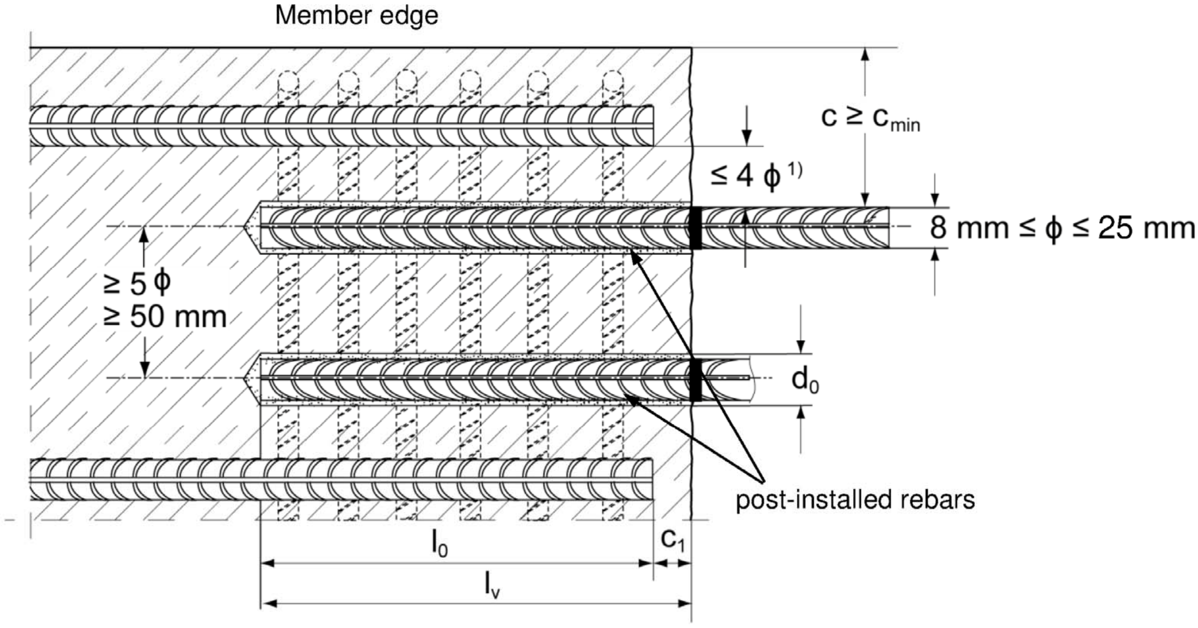
Installation:

- Dry or wet concrete
- It must not be installed in water filled holes
- Hole drilling by hammer drill, hollow drill or compressed air drill mode
- Overhead installation allowed
- The installation of post-installed rebar respectively fischer rebar anchor 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 1992-1-1:2004+AC:2010.
- 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 then the lap length shall be increased by the difference between the clear bar distance and 4 ϕ

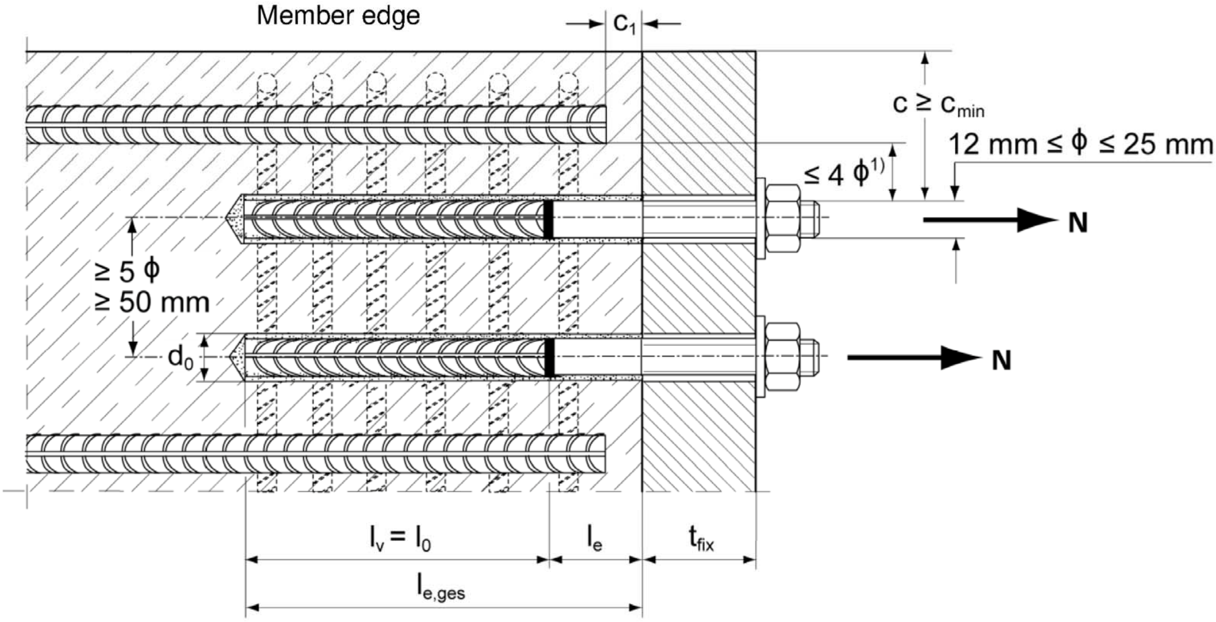
c	concrete cover of post-installed rebar
c_1	concrete cover at end-face of existing rebar
c_{min}	minimum concrete cover according to table B5.1 and to EN 1992-1-1:2004+AC:2010, Section 4.4.1.2
ϕ	nominal diameter of reinforcing bar
l_0	lap length, according to EN 1992-1-1:2004+AC:2010
l_v	effective embedment depth, ≥: $l_0 + c_1$
d_0	nominal drill bit diameter, see Annex B 6

Figures not to scale

General construction rules for post-installed fischer rebar anchors

Figure B4.1:

- Only tension forces in the axis of the fischer rebar anchor may be transmitted.
- The tension force must be transferred via an overlap joint to the reinforcement in the building part.
- The transmission of the shear load shall be ensured by appropriate additional measures, e.g. by shear lugs or by anchors with a European Technical Assessment (ETA).
- In the anchor plate, the holes for the tension anchor shall be executed as slotted holes with the axis in the direction of the shear force.

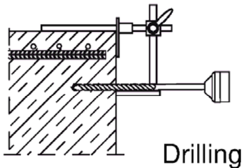


[1)] If the clear distance between lapped bars exceeds 4 ϕ then the lap length shall be increased by the difference between the clear bar distance and 4 ϕ.

c	concrete cover of post-installed fischer rebar anchor
c_1	concrete cover at end-face of existing rebar
c_{min}	minimum concrete cover according to table B5.1 and to EN 1992-1-1:2004+AC:2010, Section 4.4.1.2
ϕ	nominal diameter of reinforcing bar
l_0	lap length, according to EN 1992-1-1:2004+AC:2010, Section 8.7.3
$l_{e,ges}$	overall embedment depth, $\geq l_0 + l_e$
d_0	nominal drill bit diameter, see Annex B 6
l_e	length of the bonded in threaded part
t_{fix}	thickness of the fixture
l_v	effective embedment depth

Figures not to scale

Table B5.1: **Minimum concrete cover** c_{min}[1)] depending on 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]	Minimum concrete cover c_{min} With drilling aid [mm]	
Hammer drilling with standard drill bit or Hammer drilling with hollow drill bit (fischer “FHD”, Heller "Duster Expert"; Bosch „Speed Clean“; Hilti "TE-CD, TE-YD")	< 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 B 3, figure B3.1 and Annex B 4, figure B4.1
Note: The minimum concrete cover as specified in EN 1992-1-1:2004+AC:2010 must be observed.

Table B5.2: Dispensers and cartridge sizes corresponding to maximum embedment depth $l_{v,max}$ resp. $l_{e,ges,max}$

reinforcing bars (rebar)	fischer rebar anchor	Manual dispenser	Pneumatic or cordless dispenser (small)	Pneumatic or cordless dispenser (large)
		Cartridge size ≤ 500 ml (e.g. 300 ml, 360 ml, 380 ml, 400 ml, 410 ml)		Cartridge size >500 ml (e.g. 825 ml)
ϕ [mm]	[-]	$l_{v,max}$ / $l_{e,ges,max}$ [mm]		$l_{v,max}$ / $l_{e,ges,max}$ [mm]
8	---	700	1000	1500
10	---			
12	FRA M12 FRA HCR M12			
14	---			
16	FRA M16 FRA HCR M16			
20	FRA M20 FRA HCR M20			
22	---			
24	---			
25	FRA M24 FRA HCR M24			

Table B5.3: Conditions for use **static mixer** without an **extension tube**

Nominal drill hole diameter	d_0	[mm]	10	12	14	16	18	20	22	24	25	28	30
Drill hole depth h_0 by using	FIS MR Plus	[mm]	-		≤120	≤140	≤150	≤160	≤170	≤190	≤210		
	FIS JMR	[mm]	-	-	-	≤160	≤180	≤190	≤210	≤220		≤250	

Table B6.1: **Working times** t_{work} **and curing times** t_{cure}

Temperature at anchoring base [°C] 3)	Maximum processing time 1) t_{work}	Minimum curing time 2) t_{cure}
	FIS V Zero	FIS V Zero
-10 to -5	6 h	72 h
> -5 to 0	2 h	24 h
> 0 to 5	45 min	12 h
> 5 to 10	20 min	6 h
> 10 to 15	8 min	3 h
> 15 to 20	5 min	2 h
> 20 to 25	3 min	1 h
> 25 to 30	2 min	45 min
> 30 to 40	1 min	30 min

1) Maximum time from the beginning of the injection to rebar / fischer rebar anchor 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 has to be warmed up to +20°C.
If the temperature in the concrete exceeds 30°C the cartridge has to be cooled down to +20°C

Table B6.2: Installation tools for drilling and cleaning the bore hole and injection of the mortar

reinforcing bars (rebar)	fischer rebar anchor	Drilling and cleaning				Injection	
		Nominal drill bit diameter	Diameter of cutting edge	Steel brush diameter	Diameter of cleaning nozzle	extension tube 9mm – Injection adapter	extension tube 15mm – Injection adapter
ϕ [mm]	[-]	d_0 [mm]	d_{cut} [mm]	d_b [mm]	[mm]	[colour]	[colour]
8 1)	---	10 2)	≤ 10,50	11	---		---
		12	≤ 12,50	14	11	nature	---
10 1)	---	12	≤ 12,50	14			
		14	≤ 14,50	16		blue	---
12 1)	FRA M12 1) FRA HCR M12 1)	14	≤ 14,50	16	15		
		16	≤ 16,50	20		red	---
14	---	18	≤ 18,50	20		yellow	---
16	FRA M16 FRA HCR M16	20	≤ 20,55	25	19	green	green
20	FRA M20 FRA HCR M20	25	≤ 25,55	27		black	black
22	---	28	≤ 28,55	30	28	blue	blue
24	---	30	≤ 30,55	40		grey	grey
25	FRA M24 1) FRA HCR M24 1)	30	≤ 30,55	40			

1) Both drill bit diameters can be used
2) Only hammer drilling with standard drill bit

Safety regulations

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

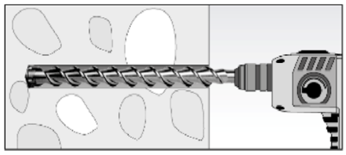
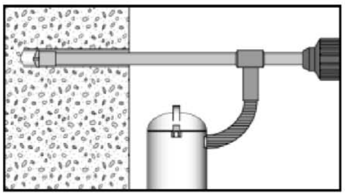
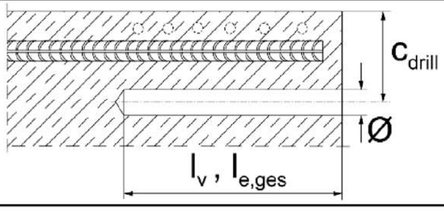
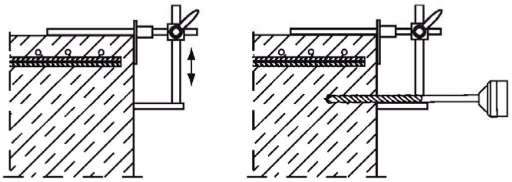
Wear well-fitting protective goggles and protective gloves when working with mortar FIS V Zero.

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

Installation instruction part 1

Hole drilling

Note: Before drilling, remove carbonated concrete; clean contact areas (see Annex B 2)
In case of aborted drill holes the drill hole shall be filled with mortar.

1	**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 B6.2**.
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 B 8**. Drill bit sizes see **table B6.2**
2		Measure and control concrete cover c (c_{drill} = c + Ø / 2) Drill parallel to surface edge and to existing rebar. Where applicable use fischer drilling aid.
		For holes l_v > 20 cm use drilling aid. Three different options can be considered: A) fischer drilling aid B) Slat or spirit level C) Visual check Minimum concrete cover c_{min} see **table B5.1**

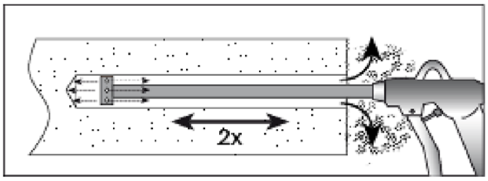
Go to step 3 or 4

Installation instruction part 2

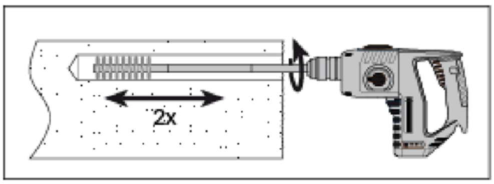
Drill hole cleaning with oil-free compressed air

3

Hammer or compressed air drilling 

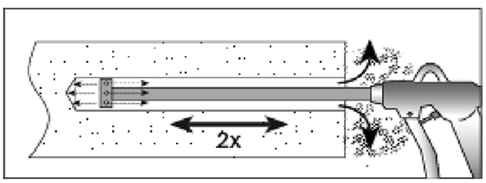


Blowing
twice from the back of the hole with the appropriate nozzle (oil-free compressed air ≥ 6 bar) until return air stream is free of noticeable dust.
Personal protective equipment must be used. (see safety regulations **Annex B 7**).



Brushing (with power drill)
Check steel brush with brush control template. The brush must produce a noticeable resistance when it is inserted into the drill hole.

Fix an adequate steel brush with an extension into a drilling machine and brush the bore hole twice.



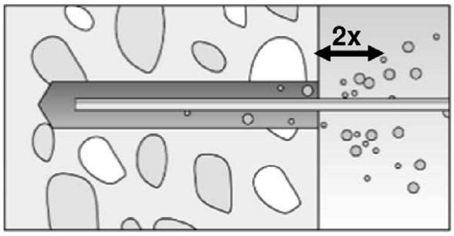
Blowing
twice from the back of the hole with the appropriate nozzle (oil-free compressed air ≥ 6 bar) until return air stream is free of noticeable dust.
Personal protective equipment must be used. (see safety regulations **Annex B 7**).

Go to step 7

Installation instruction part 3

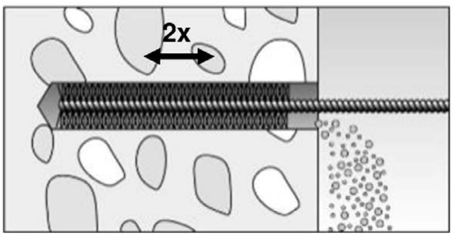
Drill hole cleaning: manual cleaning is permitted for hammer drilled boreholes up to hole diameters $d_0 < 18$ mm and depths l_v resp. $l_{e,ges} \leq 12 \times \phi$

4



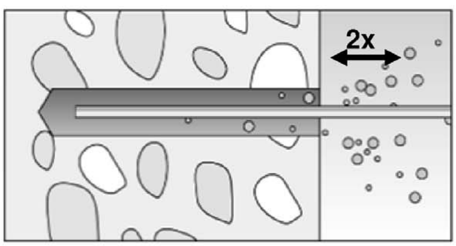
Blowing
blow out the hole twice by hand from the back of the hole. Use only the fischer blow out pump AB G.
Personal protective equipment must be used (see safety regulations **Annex B 7**).

5



Brushing
Twice with the specified brush size by inserting the round steel brush to the back of the hole and twisting motion. The brush must produce a noticeable resistance when it is inserted into the drill hole. Corresponding brushes see **table B6.2**.

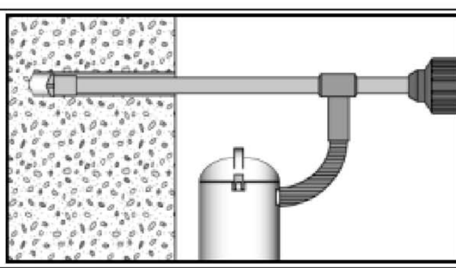
6



Blowing
blow out the hole twice by hand from the back of the hole. Use only the fischer blow out pump AB G.
Personal protective equipment must be used. (see safety regulations **Annex B 7**).

6b

Hammer drilling with hollow drill bit

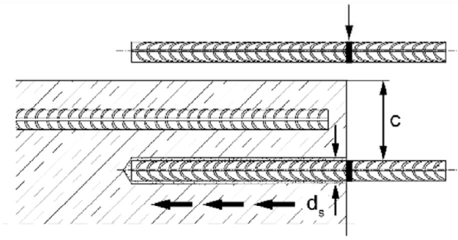
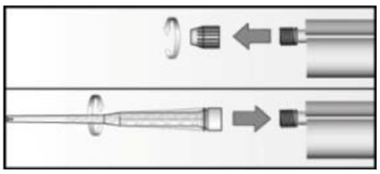
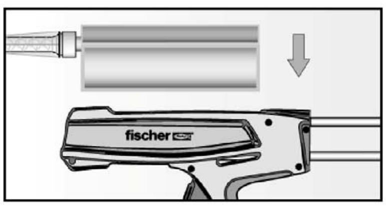
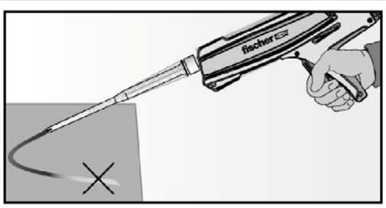


Use a suitable dust extraction system, e. g.
fischer FVC 35 M or a comparable dust extraction system with equivalent performance data.
Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power.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

Go to step 7

Installation instruction part 4

reinforcing bars (rebar) / fischer rebar anchor and cartridge preparation

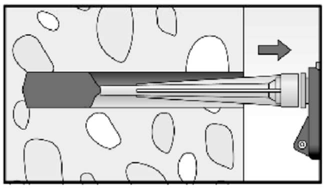
7		Before use, make asure that the rebar or the fischer rebar anchor is dry and free of oil or other residue. Mark the embedment depth l_v resp. $l_{e,ges}$ (e.g. with tape) Insert rebar in borehole, to verify drill hole depth and setting depth l_v resp. $l_{e,ges}$
8		Twist off the sealing cap Twist on the static mixer (the spiral in the static mixer must be clearly visible).
9		Place the cartridge into a suitable dispenser.
10		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.

Go to step 11

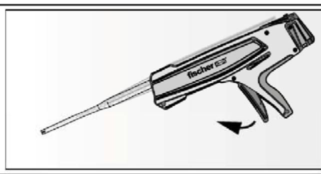
Installation instruction part 5; Installation with FIS V Zero

Injection of the mortar without extension tube

11a



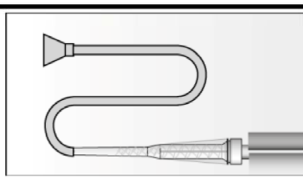
Inject the mortar from the back of the hole towards the front and slowly withdraw the mixing nozzle step by step with each trigger pull.
Avoid bubbles.
Fill holes approximately 2/3 full, to ensure that the annular gap between the rebar and the concrete will be completely filled with adhesive over the entire embedment length.
The conditions for mortar injection without extension tube can be found in **table B5.3**



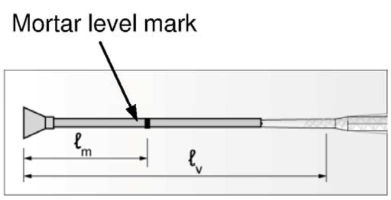
After injecting, release the dispenser. This will prevent further mortar discharge from the mixing nozzle.

Injection of the mortar with extension tube

11b



Assemble mixing nozzle FIS MR Plus or FIS JMR, extension tube and appropriate injection adapter (see **table B6.2**)



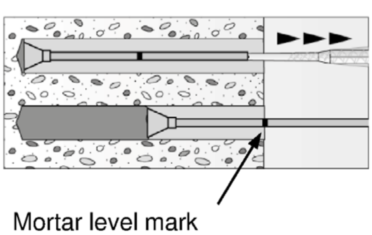
Mark the required mortar level l_m and embedment depth l_v resp. $l_{e,ges}$ with tape or marker on the injection extension tube.

a) Estimation:

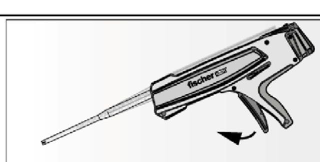
$$l_m = \frac{1}{3} * l_v \; resp. \; l_m = \frac{1}{3} * l_{e,ges}$$

b) Precise equation for optimum mortar volume:

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



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 B5.2**

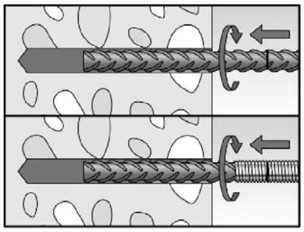
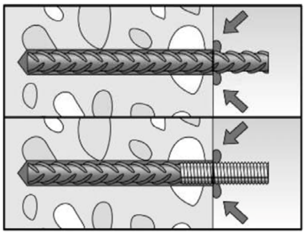
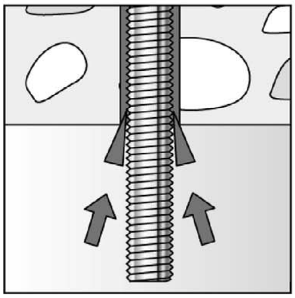
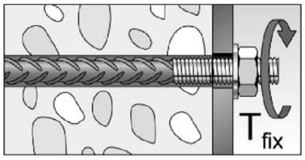


After injecting, release the dispenser. This will prevent further mortar discharge from the mixing nozzle.

Go to step 12

Installation instruction part 6; Installation with FIS V Zero

Insert rebar / fischer rebar anchor

12		Insert the rebar / fischer rebar anchor slowly twisted into the borehole until the embedment mark is reached. Recommendation: Rotation back and forth of the reinforcement bar or the fischer rebar anchor FRA makes pushing easy
13		After installing the rebar or fischer rebar anchor 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 or fischer rebar anchor have been fully inserted up to the embedment mark.
14		For overhead installation, support the rebar / fischer rebar anchor and secure it from falling till mortar started to harden, e.g. using wedges.
15		Observe the working time "t_{work}" (see **table B6.1**), which varies according to temperature of base material. Minor adjustments to the rebar / fischer rebar anchor position may be performed during the working time Full load may be applied only after the curing time "t_{cure}" has elapsed (see **table B6.1**)
16		Mounting the fixture, max T_{fix} see **table A 6.1**

Minimum anchorage length and minimum lap length

The minimum anchorage length $l_{b,min}$ and the minimum lap length $l_{o,min}$ according to EN 1992-1-1:2004+AC:2010 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 / fischer rebar anchor	**Amplification factor α_{lb}**								
	Concrete strength class								
ϕ [mm]	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 to 25	1,5								

Table C1.2: Bond efficiency factor k_b for hammer drilling, hollow drilling and compressed air drilling

Hammer drilling, hollow drilling and compressed air drilling									
Rebar / fischer rebar anchor	**Bond efficiency factor k_b**								
	Concrete strength class								
ϕ [mm]	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8	1,0	1,0	1,0	0,86	0,76	0,69	0,73	0,67	0,63
10	1,0	1,0	1,0	0,86	0,76	0,69	0,63	0,67	0,63
12	1,0	1,0	1,0	0,86	0,76	0,69	0,63	0,58	0,54
14	1,0	1,0	0,86	0,74	0,76	0,69	0,63	0,58	0,54
16	1,0	1,0	0,86	0,74	0,66	0,59	0,63	0,58	0,54
20	1,0	0,83	0,71	0,74	0,66	0,59	0,54	0,50	0,47
22	1,0	0,83	0,71	0,61	0,54	0,59	0,54	0,50	0,47
24	1,0	0,83	0,71	0,61	0,54	0,49	0,45	0,50	0,47
25	1,0	0,83	0,71	0,61	0,54	0,49	0,45	0,41	0,47

Table C1.3: Characteristic values for **steel failure** under tension load of **fischer rebar anchors**

fischer rebar anchor FRA / FRA HCR			**M12**	**M16**	**M20**	**M24**
Bearing capacity under tension load, steel failure						
Characteristic resistance	$N_{Rk,s}$	[kN]	59	110	172	270
Partial factor						
Partial factor	$\gamma_{Ms,N}$	[-]	1,4			

Table C2.1: Design values of the bond strength $f_{bd,PIR}$ in N/mm² for hammer drilling, hollow drilling, compressed air drilling

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

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 η_1 = 0,7) and recommended partial factor γ_c = 1,5 according to EN 1992-1-1: 2004+AC:2010

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

Hammer drilling, hollow drilling and compressed air drilling

Rebar / fischer rebar anchor ϕ [mm]	**bond strength $f_{bd,PIR}$ [N/mm²]**								
	Concrete strength class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8	1,6	2,0	2,3	2,3	2,3	2,3	2,7	2,7	2,7
10	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,7	2,7
12	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
14	1,6	2,0	2,0	2,0	2,3	2,3	2,3	2,3	2,3
16	1,6	2,0	2,0	2,0	2,0	2,0	2,3	2,3	2,3
20	1,6	1,6	1,6	2,0	2,0	2,0	2,0	2,0	2,0
22	1,6	1,6	1,6	1,6	1,6	2,0	2,0	2,0	2,0
24	1,6	1,6	1,6	1,6	1,6	1,6	1,6	2,0	2,0
25	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	2,0

Table C2.2: Essential characteristics to **steel failure** for **fischer rebar anchors** under fire exposure R30 to R120

For concrete strength classes C12/C15 to C50/60

fischer rebar anchor FRA / FRA HCR				**M12**	**M16**	**M20**	**M24**
Characteristic tensile resistance	R30	$N_{Rk,s,fi}$	[kN]	1,7	3,1	4,9	7,1
	R60			1,3	2,4	3,7	5,3
	R90			1,1	2,0	3,2	4,6
	R120			0,8	1,6	2,5	3,5

The bond strength $f_{bk,fi}$ at increased temperature for concrete strength classes C12/15 to C50/60 (all drilling methods)

The bond strength $f_{bk,fi}$ at increased temperature has to be calculated by the following equation:

$$f_{bk,fi} = k_{fi}(\theta) \cdot f_{bd,PIR} \cdot \gamma_c$$

If: $\theta > 37$ °C $\quad k_{fi}(\theta) = \dfrac{13{,}898 \cdot e^{-0{,}009 \cdot \theta}}{f_{bd,PIR} \cdot 4{,}3} \leq 1.0$

If: $\theta > \theta_{max}$ (347,0 °C) $\quad k_{fi}(\theta) = 0$

$f_{bk,fi}$	=	The bond strength at increased temperature in N/mm²
(θ)	=	Temperature in °C in the mortar layer
$k_{fi}(\theta)$	=	Reduction factor at increased temperature
$f_{bd,PIR}$	=	Design value of the bond strength in N/mm² in cold condition according to table C2.1 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1:2004+AC:2010
γ_C	=	Partial factor according to EN 1992-1-1:2004+AC:2010

For evidence at increased temperature the anchorage length shall be calculated according to EN 1992-1-1:2004+AC:2010 Equation 8.3 using the temperature-dependent ultimate bond strength $f_{bk,fi}$.

Figure C3.1: Example graph of reduction factor $k_{fi}(\theta)$ for concrete class C20/25 for good bond conditions