SUORITUSTASOILMOITUS

DoP 0357

fischer Superbond dynamic (Jälkikäteen tehtäviin kiinnityksiin halkeilevassa tai halkeilemattomassa betonissa) FI

1. Tuotetyypin yksilöllinen tunniste: **DoP 0357**

2. Aiottu käyttötarkoitus (aiotut käyttötarkoitukset): **Jälkiasennettavat kiinnikkeet käytettäväksi betonissa väsyttävään sykliseen kuormitukseen, katso lisäys, erityisesti liitteet B1 - B16.**

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

4. Valtuutettu edustaja: **–**

5. Suoritustason pysyvyyden arvioinnissa ja varmentamisessa käytetty järjestelmä/käytetyt järjestelmät: **1**

6. Eurooppalainen arviointiasiakirja: **EAD 330250-01-0601, Edition 10/2023**
   Eurooppalainen tekninen arviointi: **ETA-19/0501; 2024-06-11**
   Teknisestä arvioinnista vastaava laitos: **DIBt- Deutsches Institut für Bautechnik**
   Ilmoitettu laitos/ilmoitetut laitokset: **2873 TU Darmstadt**

7. Ilmoitettu suoritustaso/ilmoitetut suoritustasot:

EAD 330250-01-0601; Table 2.1.3
Arviointimenetelmä C: Lineaaristettu funktio
Mekaaninen kestävyys ja vakaus (BWR 1)

1 Ominainen teräksen väsymiskestävyys jännityskuormituksessa: Liitteet C1, C3, C4

2 Ominaispiirteet betonikartion, vetolujuuden, halkeilun ja puhallusväsymyksen kestävyys vetokuormituksessa: Liitteet C1, C3, C4

3 Ominainen vetolujuus tai yhdistetty vetolujuus/betonikartion väsymiskestävyys vetokuormituksessa: Liitteet C1, C3, C4

4 Tyypillinen teräksen väsymiskestävyys leikkauskuormituksessa: Liitteet C2, C3, C4

5 Tyypillinen betonin reunojen väsymiskestävyys leikkauskuormituksessa: Liitteet C2, C3, C4

6 Ominainen betonin vääntökuormituksen aiheuttama väsymiskestävyys: Liitteet C2, C3, C4

7 Tyypillinen teräksen väsymiskestävyys jännityksen ja leikkauksen alaisena: Liitteet C1-C4

8 Kuormituksen siirtoaste jännitys- ja leikkauskuormitukselle: Liitteet C1-C4

8. Asianmukainen tekninen asiakirja ja/tai tekninen erityisasiakirja: **-**

Edellä yksilöidyn tuotteen suoritustaso on ilmoitettujen suoritustasojen joukon mukainen. Tämä suoritustasoilmoitus on asetuksen (EU) N:o 305/2011 mukaisesti annettu edellä ilmoitetun valmistajan yksinomaisella vastuulla.

Valmistajan puolesta allekirjoittanut:

Dr.Ronald Mihala, Kehitys- ja tuotantojohtaja

Dieter Pfaff, Kansainvälisen tuotantoliiton ja laadunhallinnan johtaja

Tumlingen, 2026-02-20

Tämä suoritustasoilmoitus on laadittu useilla kielillä. Jos tulkinnasta syntyy erimielisyyttä, englanninkielinen versio on aina katsottava ensisijaiseksi.
Lisäys sisältää vapaaehtoisesti ilmoitettua ja täydentävää englanninkielistä tietoa, joka ylittää (kielestä riippumatta määritellyt) lakisääteiset vaatimukset.

EAD 330250-01-0601; Table 2.1.3; Assessment Method C: Linearized function

EAD 330250-01-0601; Table 2.1.3; Arviointimenetelmä C: Lineaaristettu funktio

Mechanical resistance and stability (BWR 1) **Mekaaninen kestävyys ja vakaus (BWR 1)**		
1	Characteristic steel fatigue resistance under tension loading: **Ominainen teräksen väsymiskestävyys jännityskuormituksessa:**	$\Delta N_{Rk,s,0,n}$ (n=1 to n=∞)
2	Characteristic concrete cone, pull-out, splitting and blow out fatigue resistance under tension loading: **Ominaispiirteet betonikartion, vetolujuuden, halkeilun ja puhallusväsymyksen kestävyys vetokuormituksessa:**	$\Delta N_{Rk,c,0,n;}$ $\Delta N_{Rk,sp,0,n}$ (n=1 to n=∞)
3	Characteristic pull-out or combined pull-out /concrete cone fatigue resistance under tension loading: **Ominainen vetolujuus tai yhdistetty vetolujuus/betonikartion väsymiskestävyys vetokuormituksessa:**	$\Delta\tau_{Rk,p,0,n;}$ (n=1 to n=∞) $\Delta\tau_{Rk,p,0,n}$; (n=1 to n=10^8) $\Delta N_{Rk,p,0,n}$; (n=1 to n=∞)
4	Characteristic steel fatigue resistance under shear loading: **Tyypillinen teräksen väsymiskestävyys leikkauskuormituksessa:**	$\Delta V_{Rk,s,0,n}$ (n=1 to n=∞)
5	Characteristic concrete edge fatigue resistance under shear loading: **Tyypillinen betonin reunojen väsymiskestävyys leikkauskuormituksessa:**	$\Delta V_{Rk,c,0,n}$ (n=1 to n=∞)
6	Characteristic concrete pry-out fatigue resistance under shear loading: **Ominainen betonin vääntökuormituksen aiheuttama väsymiskestävyys:**	$\Delta V_{Rk,cp,0,n}$ (n=1 to n=∞)
7	Characteristic steel fatigue resistance under tension and shear: **Tyypillinen teräksen väsymiskestävyys jännityksen ja leikkauksen alaisena:**	α_s
8	Load transfer factor for tension and shear loading: **Kuormituksen siirtoaste jännitys- ja leikkauskuormitukselle:**	ψ_{FN}, ψ_{FV}

Specific Part

1 Technical description of the product

The fischer superbond dynamic is a bonded anchor consisting of a cartridge with injection mortar FIS SB or FIS SB High Speed or mortar capsule RSB and a steel element according to Annex A3.

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 resin capsule is placed into the hole and the steel element is driven by machine with simultaneous hammering and turning. The anchor rod is anchored via the bond between steel element, chemical 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 (Assessment method C: Linearized function)	**Performance**
Characteristic fatigue resistance under cyclic tension loading	
Characteristic steel fatigue resistance $\Delta N_{Rk,s,0,n}$ (n = 1 to n = ∞)	See Annex C1, C3 and C4
Characteristic concrete cone and splitting fatigue resistance $\Delta N_{Rk,c,0,n}$ $\Delta N_{Rk,sp,0,n}$ (n = 1 to n = ∞)	
Characteristic combined pull-out /concrete cone fatigue resistance $\Delta\tau_{Rk,p,0,n}$ (n = 1 to n = ∞)	
Characteristic fatigue resistance under cyclic shear loading	
Characteristic steel fatigue resistance $\Delta V_{Rk,s,0,n}$ (n = 1 to n = ∞)	See Annex C2, C3 and C4
Characteristic concrete edge fatigue resistance $\Delta V_{Rk,c,0,n}$ (n = 1 to n = ∞)	
Characteristic concrete pry out fatigue resistance $\Delta V_{Rk,cp,0,n}$ (n = 1 to n = ∞)	

Essential characteristic (Assessment method C: Linearized function)	**Performance**
Characteristic fatigue resistance under cyclic combined tension and shear loading	
Characteristic steel fatigue resistance a_s (n = 1 to n = ∞)	See Annex C1 to C4
Load transfer factor for cyclic tension and shear loading	
Load transfer factor ψ_{FN}, ψ_{FV}	See Annex C1 to C4

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

In accordance with European Assessment Document No. 330250-01-0601, the applicable European legal act is: [96/582/EC].

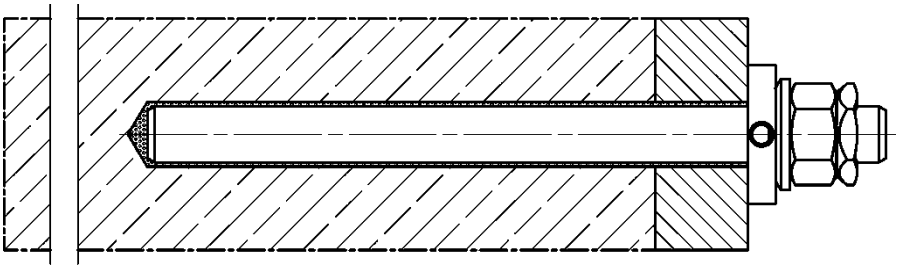
The system to be applied is: 1

Installation conditions

fischer anchor rod FIS A or RG M with fischer injection system FIS SB

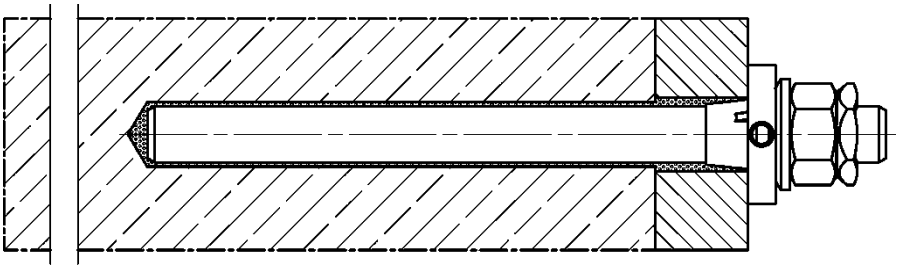
Pre-positioned installation with dynamic set (annular gap filled with mortar)

Size: M12, M16, M20, M24



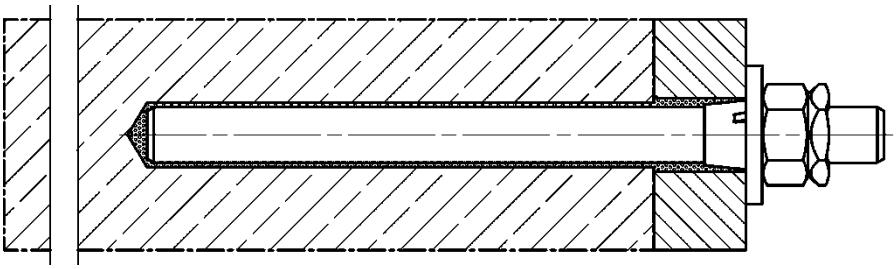
Push through installation with dynamic set (annular gap filled with mortar)

Size: M12, M16, M20, M24



Push through installation with washer and centering sleeve (annular gap filled with mortar)

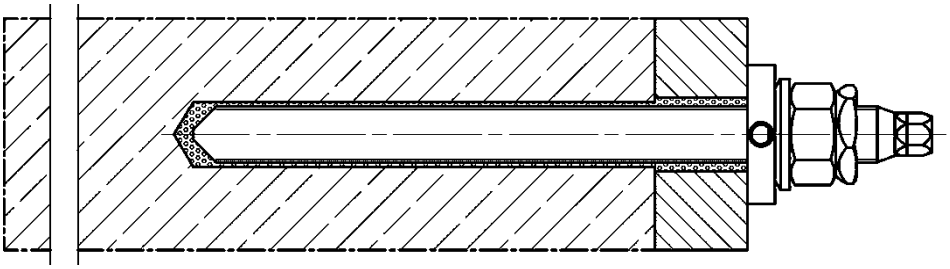
Size: M12, M16, M20, M24



fischer anchor rod RG M with fischer mortar capsule system RSB

Pre-positioned or push through installation the dynamic set (annular gap filled with mortar)

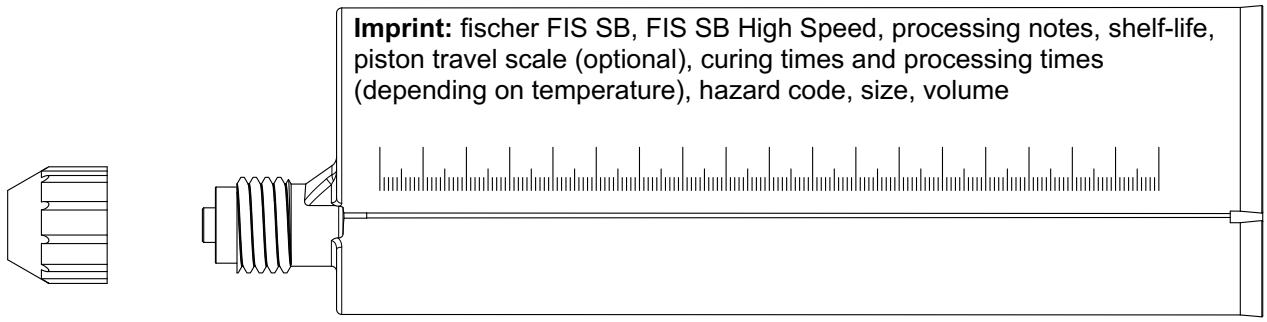
Size: M12, M16, M20, M24



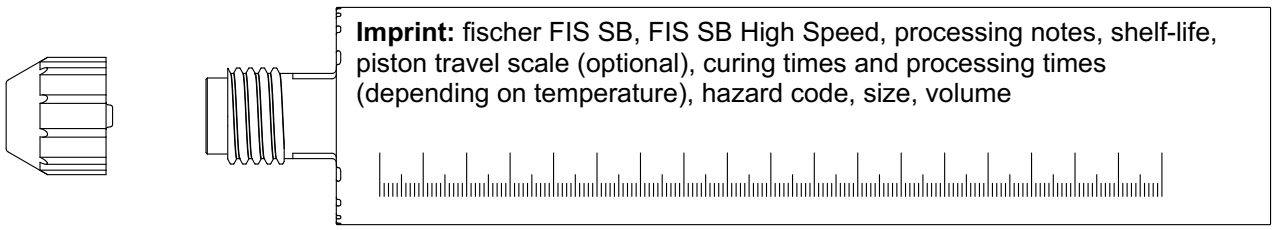
Figures not to scale

Overview system components Part 1

Mortar cartridge (shuttle cartridge) with sealing cap; Size: 390 ml, 585 ml, 1100 ml, 1500 ml



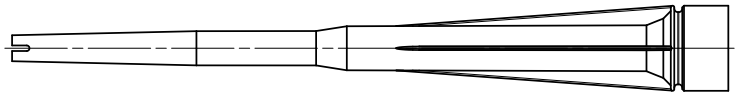
Mortar cartridge (coaxial cartridge) with sealing cap; Size: 150 ml, 300 ml ,380 ml, 410 ml



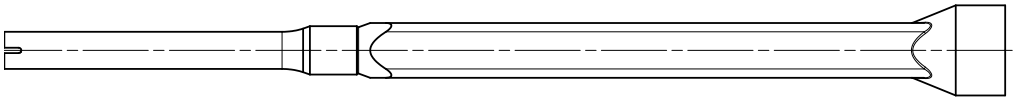
Mortar capsule

Size: 12 mini, 12, 16 mini, 16, 20, 20 E /24

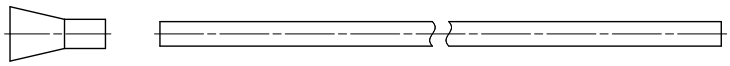
Static mixer FIS MR Plus for injection cartridges up to 410 ml



Static mixer FIS UMR for injection cartridges from 585 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 UMR



Figures not to scale

fischer Superbond dynamic

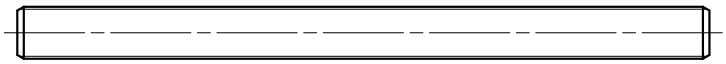
System description
Overview system components part 1;
cartridges / capsule / static mixer / injection adapter

Annex A2

Overview system components Part 2

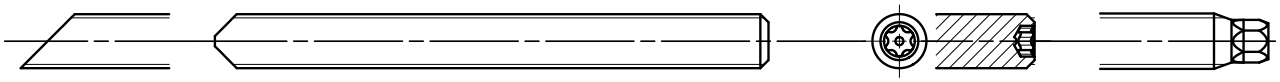
fischer anchor rod FIS A

Size: M12, M16, M20, M24

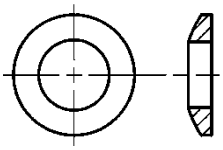


fischer anchor rod RG M

Size: M12, M16, M20, M24

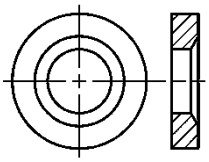


spherical washer

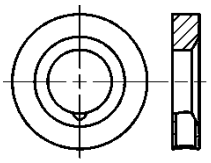


conical washer (various versions; partly fillable)

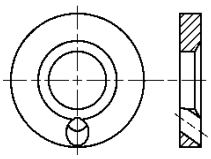
without drill hole



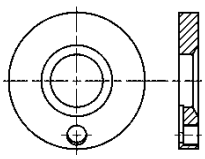
radial



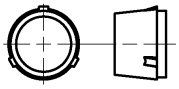
angular



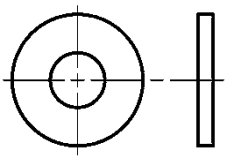
axial



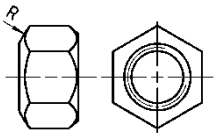
centering sleeve
(only push through installation)



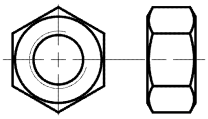
washer



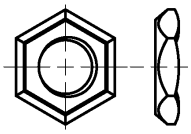
hexagonal nut with spherical contact surface



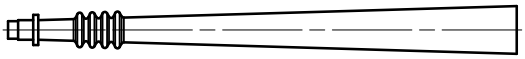
hexagon nut



lock nut

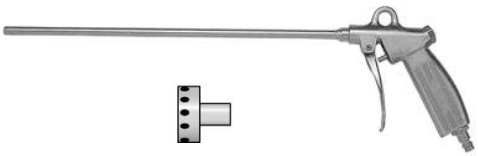


Injection adapter



Cleaning brush BS

Compressed-air cleaning tool ABP or ABG



Figures not to scale

fischer Superbond dynamic

System description
Overview system components part 2;
Steel components / injection adapter / cleaning brush / blow-out pump

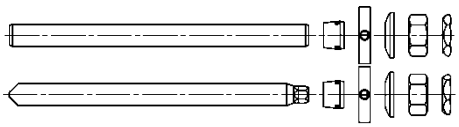
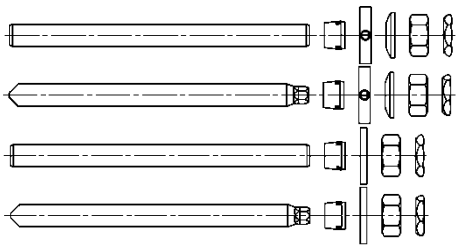
Annex A3

Table A4.1: Materials

Part	Designation	Material	
1	Injection cartridge	Mortar, hardener, filler	
2	Resin capsule	Mortar, hardener, filler	
	Steel grade	Steel	Stainless steel R
		zinc plated	acc. to EN 10088-1:2023 Corrosion resistance class CRC III acc. to EN 1993-1-4:2006+A1:2015
3	fischer anchor rod FIS A or RG M	Property class 8.8; EN ISO 898-1:2013 zinc plated ≥ 5 µm EN ISO 4042:2022 f_{uk} ≤ 1000 N/mm²	Property class 70 EN ISO 3506-1:2020 1.4401 (M12 to M24) 1.4062 (M12 and M16) 1.4362 (M12 and M16) EN 10088-1:2023 f_{uk} ≤ 1000 N/mm²
4	Centering sleeve	Plastic	
5a	Washer ISO 7089:2000	---	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023
5b	Fillable conical washer similar to DIN 6319-G	zinc plated ≥ 5 µm, EN ISO 4042:2022	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023
6	Spherical washer	zinc plated ≥ 5 µm, EN ISO 4042:2022	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023
7a	Hexagon nut	Property class 8; EN ISO 898-2:2022 zinc plated ≥ 5 µm, EN ISO 4042:2022	Property class 80 EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023
7b	Hexagonal nut with spherical contact surface		
8	Lock nut	zinc plated ≥ 5 µm, EN ISO 4042:2022	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; EN 10088-1:2023

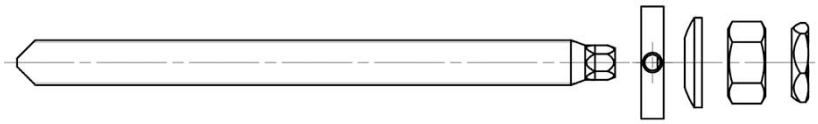
Specifications of intended use part 1

Table B1.1: Overview use and performance categories injection motar system

	FIS SB with	
	fischer anchor rod FIS A or fischer anchor rod RG M	
	Steel, zinc plated M12 + M16 	Stainless steel R M12 - M24 
Hammer drilling with standard drill bit	Nominal drill bit diameter (d_0) 14 mm to 18 mm	Nominal drill bit diameter (d_0) 14 mm to 28 mm
Hammer drilling with hollow drill bit (fischer “FHD”, Heller "Duster Expert"; Bosch “Speed Clean”; Hilti “TE-CD, TE-YD"; DreBo „D-Plus“; DreBo „D-Max“)		
Diamond drilling	no performance assessed	
Fatigue load, in uncracked concrete / cracked concrete	Steel, zinc plated: M12 and M16	Stainless steel R: M12, M16, M20 and M24
Design method I acc. to EOTA TR 061:2023	n = 1 to n = ∞	
Design method II acc. to EOTA TR 061:2023	n = ∞	
Use category I1 dry or wet concrete	M12, M16, M20 and M24	
Installation direction	D3 Downwards, horizontal and upwards (overhead) installation	
Installation method	pre-positioned or push through installation	
Installation temperature	FIS SB: $T_{i,min}$ = -15 °C to $T_{i,max}$ = +40 °C FIS SB High Speed: $T_{i,min}$ = -20 °C to $T_{i,max}$ = +30 °C	
In-service temperature – Temperature range I:	-40 °C to +40 °C	(max. short term temperature +40 °C; max. long term temperature +24 °C)
In-service temperature – Temperature range II:	-40 °C to +80 °C	(max. short term temperature +80 °C; max. long term temperature +50 °C)

Specifications of intended use part 2

Table B2.1: Overview use and performance categories resin capsule system

	RSB with	
	fischer anchor rod RG M 	
Hammer drilling with standard drill bit	Nominal drill bit diameter (d_0) 14 mm to 18 mm	Nominal drill bit diameter (d_0) 14 mm to 28 mm
Hammer drilling with hollow drill bit (fischer “FHD”, Heller "Duster Expert"; Bosch „Speed Clean“; Hilti "TE-CD, TE-YD"; DreBo „D-Plus“; DreBo „D-Max“)		
Diamond drilling	Nominal drill bit diameter (d_0) 18 mm	Nominal drill bit diameter (d_0) 18 mm to 28 mm
Fatigue load, in uncracked concrete / cracked concrete	Steel, zinc plated: M12 and M16	Stainless steel R: M12, M16, M20 and M24
Design method I acc. to EOTA TR 061:2023	n = 1 to n = ∞	
Design method II acc. to EOTA TR 061:2023	n = ∞	
Use category I1 dry or wet concrete	M12, M16, M20 and M24	
Installation direction	D3 Downward, horizontal and upwards (overhead) installation	
Installation method	pre-positioned or push through installation	
Installation temperature	RSB: $T_{i,min}$ = -30 °C to $T_{i,max}$ = +40 °C	
In-service temperature – Temperature range I:	-40 °C to +40 °C	(max. short term temperature +40 °C; max. long term temperature +24 °C)
In-service temperature – Temperature range II:	-40 °C to +80 °C	(max. short term temperature +80 °C; max. long term temperature +50 °C)

Specifications of intended use part 3

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibers of strength classes C20/25 to C50/60 according to EN 206:2013+A2:2021.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc plated steel, stainless steel R).
- For all other conditions according to EN 1993-1-4:2006+A1:2015 corresponding to corrosion resistance classes to Annex A4 Table A4.1.

Design:

- Fastenings 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 have to be designed in accordance with:
  - EN 1992-4:2018 and
  - EOTA Technical Report TR 061 "Design method for fasteners in concrete under fatigue cyclic loading", Edition 2023.
- Static and quasi-static loading see ETA-12/0258 of 24.10.2023. Centering sleeve and lock nut are additional parts for fatigue loading, which are not part of ETA-12/0258 of 24.10.2023.
- Fastenings shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure.
- Fastenings in stand-off installation or with a grout layer are not covered by this European Technical Assessment (ETA).

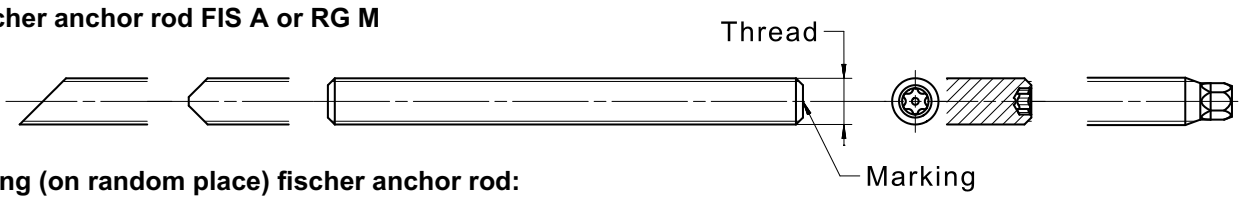
Installation:

- 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.
- Fastening depth should be marked and adhered to on installation.
- If only tension loads are involved in the application, the annular gap does not need to be filled.
- Overhead installation is allowed.
- Setting the fastener with clearance between concrete and anchor plate (only if the fastener is loaded in axial direction)

Table B4.1: Installation parameters for fischer anchor rods in combination with injection mortar system FIS SB

fischer anchor rods		Thread	M12	M16	M20	M24
Material			zinc plated steel or stainless steel R		stainless steel R	
Nominal drill hole diameter	d_0	[mm]	14	18	24	28
Drill hole depth	h_0	[mm]	$h_0 = h_{ef}$			
Effective embedment depth Design method I	$h_{ef,\,min}$	[mm]	70	80	90	96
	$h_{ef,\,max}$	[mm]	240	320	400	480
Effective embedment depth Design method II	$h_{ef,\,min}$	[mm]	95	125	160	190
	$h_{ef,\,max}$	[mm]	240	320	400	480
Minimum spacing and minimum edge distance	s_{min} = c_{min}	[mm]	55	65	85	105
Diameter of the clearance hole of the fixture – pre-positioned installation	d_f	[mm]	14-16	18-20	22-26	26-30
Diameter of the clearance hole of the fixture – push through installation	d_f	[mm]	15-16	19-20	25-26	29-30
Fixture thickness	$t_{fix,min}$	[mm]	6	8	10	12
	$t_{fix,max}$	[mm]	200			
Minimum thickness of concrete member	h_{min}	[mm]	$h_{ef} + 30$	$h_{ef} + 2d_0$	$h_{ef} + 2d_0$	$h_{ef} + 2d_0$
Installation with dynamic set						
Protrusion anchor rod FIS A or RG M without hexagon head	$h_{p,min}$	[mm]	$25 + t_{fix}$	$30 + t_{fix}$	$36 + t_{fix}$	$43 + t_{fix}$
Protrusion anchor rod RG M (with hexagon head)	$h_{p,min}$	[mm]	$32 + t_{fix}$	$38 + t_{fix}$	$43 + t_{fix}$	---
Installation with washer (only with stainless steel R)						
Protrusion anchor rod FIS A or RG M without hexagon head	$h_{p2,min}$	[mm]	$19 + t_{fix}$	$23 + t_{fix}$	$27 + t_{fix}$	$32 + t_{fix}$
Protrusion anchor rod RG M (with hexagon head)	$h_{p2,min}$	[mm]	$26 + t_{fix}$	$31 + t_{fix}$	$34 + t_{fix}$	---
Required installation torque	T_{inst}	[Nm]	40	60	120	150

fischer anchor rod FIS A or RG M



Marking (on random place) fischer anchor rod:

Property class 8.8: **+**

Installation conditions see Annex B5

Figures not to scale

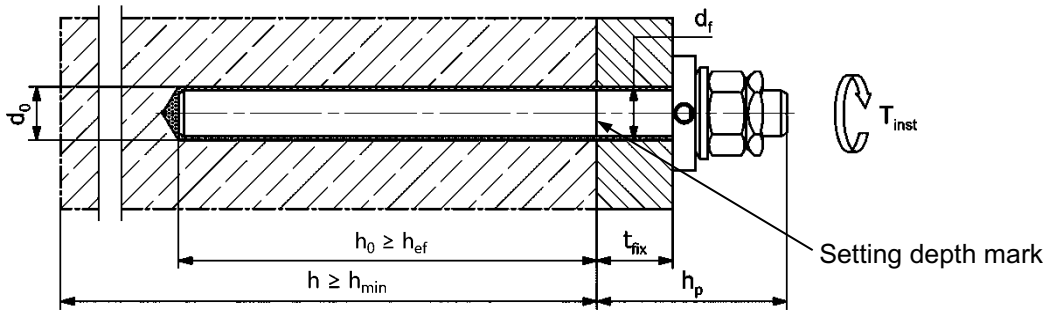
fischer Superbond dynamic

Intended use
Installation parameters fischer anchor rods FIS A and RG M in combination with injection mortar system FIS SB

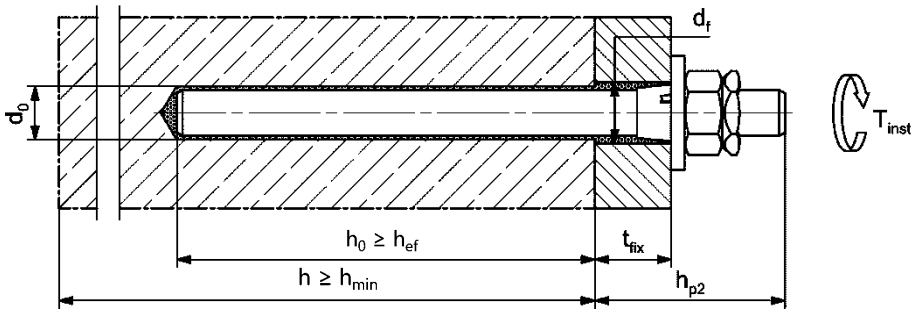
Annex B4

Installation conditions FIS A or RG M with dynamic set or washer with centering sleeve

Installation conditions FIS A or RG M **with dynamic set**



Installation conditions FIS A R or RG M R **with washer and centering sleeve**



Installation conditions for RG M see **Annex B6**

Figures not to scale

fischer Superbond dynamic

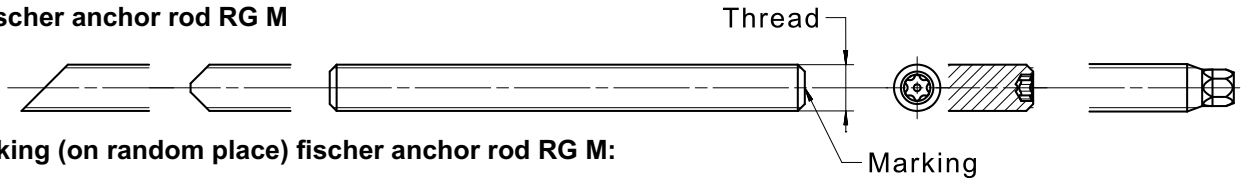
Intended use
Installation conditions FIS A or RG M with dynamic set or washer with centering sleeve

Annex B5

Table B6.1: Installation parameters for fischer anchor rods RG M in combination with resin capsule system RSB

fischer anchor rod RG M		Thread	M12	M16	M20	M24
Material			zinc plated steel or stainless steel R		stainless steel R	
Nominal drill hole diameter	d_0	[mm]	14	18	25	28
Drill hole depth	h_0	[mm]	$h_0 = h_{ef}$			
Effective embedment depth	$h_{ef,1}$	[mm]	75	95	---	---
	$h_{ef,2}$	[mm]	110	125	170	210
	$h_{ef,3}$	[mm]	150	190	210	---
Minimum spacing and minimum edge distance	s_{min} = c_{min}	[mm]	55	65	85	105
Diameter of the clearance hole of the fixture – pre-positioned installation	d_f	[mm]	14-16	18-20	22-26	26-30
Diameter of the clearance hole of the fixture – push through installation	d_f	[mm]	15-16	19-20	26	29-30
Fixture thickness	$t_{fix,min}$	[mm]	6	8	10	12
	$t_{fix,max}$	[mm]	200			
Minimum thickness of concrete member	h_{min}	[mm]	$h_{ef} + 30$	$h_{ef} + 2d_0$	$h_{ef} + 2d_0$	$h_{ef} + 2d_0$
Installation with dynamic set						
Protrusion anchor rod RG M	$h_{p,min}$	[mm]	$32 + t_{fix}$	$38 + t_{fix}$	$43 + t_{fix}$	---
Protrusion anchor rod RG M without hexagon head	$h_{p,min}$	[mm]	---	---	---	$43 + t_{fix}$
Required installation torque	T_{inst}	[Nm]	40	60	120	150

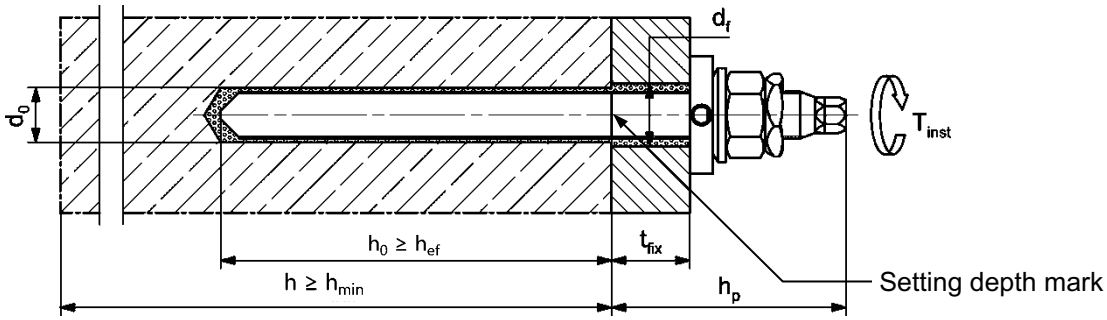
fischer anchor rod RG M



Marking (on random place) fischer anchor rod RG M:

Property class 8.8: **+**

Installation conditions:



Figures not to scale

fischer Superbond dynamic

Intended use
Installation parameters fischer anchor rod RG M in combination with resin capsule system RSB

Annex B6

Table B7.1: Dimension of resin capsule RSB

Resin capsule RSB			12 mini	12	16 mini	16	20	20 E / 24
Capsule diameter	d_P	[mm]	12,5		16,5		23,0	
Capsule length	L_P		72	97	72	95	160	190

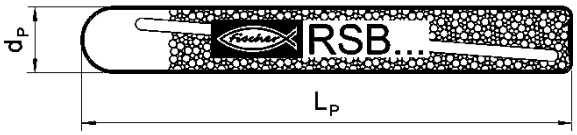


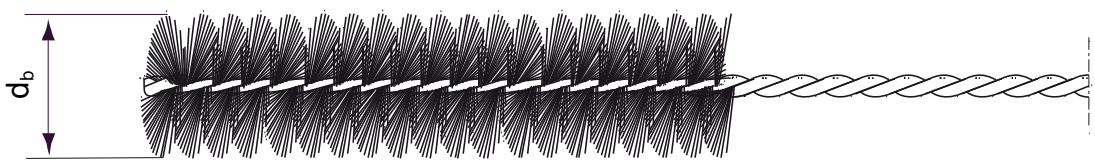
Table B7.2: Assignment of resin capsule RSB to fischer anchor rod RG M

Anchor rod RG M			M12	M16	M20	M24
Effective anchorage depth	$h_{ef,1}$	[mm]	75	95	---	---
Related capsule RSB		[-]	12 mini	16 mini	---	---
Effective anchorage depth	$h_{ef,2}$	[mm]	110	125	170	210
Related capsule RSB		[-]	12	16	20	20 E / 24
Effective anchorage depth	$h_{ef,3}$	[mm]	150	190	210	---
Related capsule RSB		[-]	2x 12 mini	2x 16 mini	20 E / 24	---

Table B7.3: 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]	14	18	24	25	28
Steel brush diameter	d_b		16	20	26	27	30



fischer Superbond dynamic

Intended use
Dimensions of the capsules; Assignment of the capsule to the anchor rod RG M;
Cleaning brush (steel brush)

Annex B7

Table B8.1: Conditions for use **static mixer** without an **extension tube**

Nominal drill hole diameter	d_0	[mm]	14	18	24	25	28
Drill hole depth h_0 by using	FIS MR Plus	[mm]	≤ 120	≤ 150	≤ 190	≤ 210	
	FIS UMR	[mm]	≤ 90	≤ 180	≤ 220		≤ 250

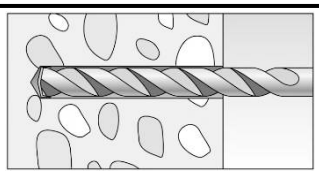
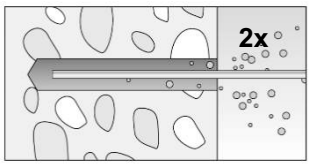
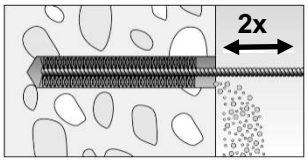
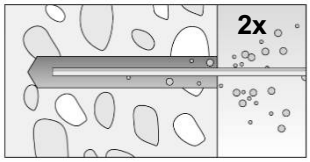
Table B8.2: **Maximum processing time** of the mortar and **minimum curing time**

During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature.
Minimal cartridge temperature +5 °C; minimal resin capsule temperature -15 °C

Temperature at anchoring base [°C]	Maximum processing time t_{work}		Minimum curing time t_{cure}		
	FIS SB	FIS SB High Speed	FIS SB	FIS SB High Speed	RSB
-30 to -20	---	---	---	---	120 h
> -20 to -15	---	60 min	---	24 h	48 h
> -15 to -10	60 min	30 min	36 h	8 h	30 h
> -10 to -5	30 min	15 min	24 h	3 h	16 h
> -5 to ±0	20 min	10 min	8 h	2 h	10 h
> ±0 to +5	13 min	5 min	4 h	1 h	45 min
> +5 to +10	9 min	3 min	2 h	45 min	30 min
> +10 to +20	5 min	2 min	1 h	30 min	20 min
> +20 to +30	4 min	1 min	45 min	15 min	5 min
> +30 to +40	2 min	---	30 min	---	3 min

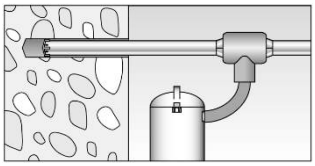
Installation instructions part 1; injection mortar system FIS SB

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 **Table B4.1**.
2		Clean the drill hole: Blow out the drill hole twice, with oil free compressed air (p ≥ 6 bar). In uncracked concrete the use of the manual blow-out pump ABG is possible (Installation parameters: d_0 < 18 mm and h_{ef} < 10d).
3		Brush the drill hole twice. For deep holes use an extension. Corresponding brushes see **Table B7.3**.
4		Clean the drill hole: Blow out the drill hole twice, with oil free compressed air (p ≥ 6 bar). In uncracked concrete the use of the manual blow-out pump ABG is possible (Installation parameters: d_0 < 18 mm and h_{ef} < 10d).

Go to step 5 **Annex B10**.

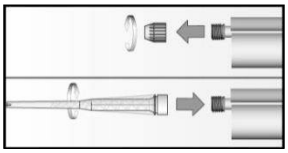
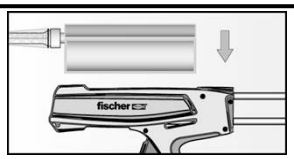
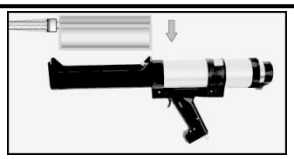
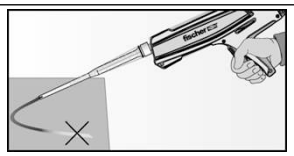
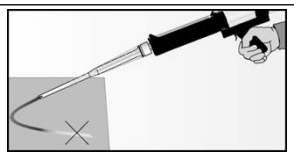
Drilling and cleaning the hole (hammer drilling with hollow drill bit)

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 **Table B4.1**.

Go to step 5 **Annex B10**.

Installation instructions part 2; injection mortar system FIS SB

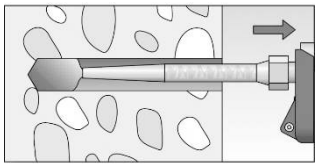
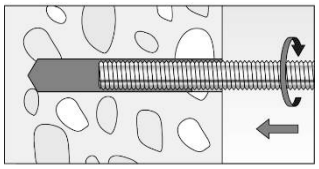
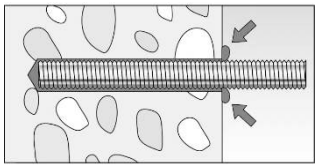
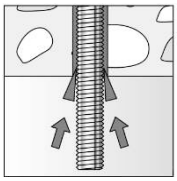
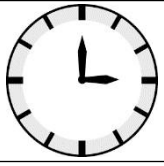
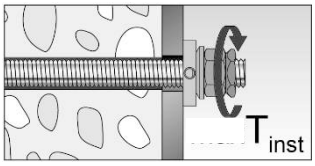
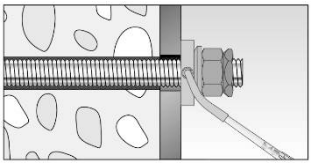
Preparing the cartridge

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 (pre-positioned installation **Annex B11** or push through installation **Annex B12**).

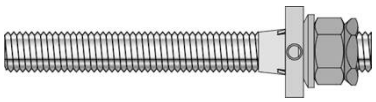
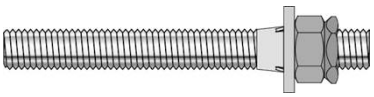
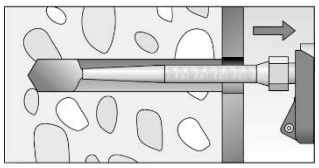
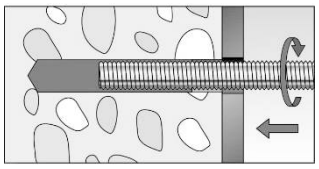
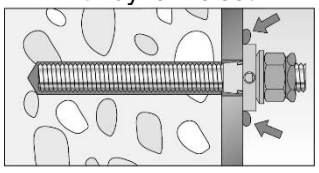
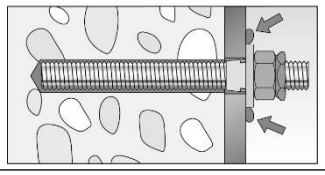
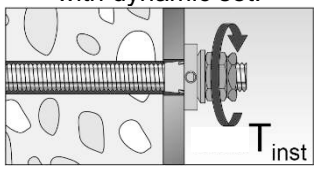
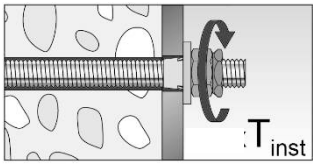
Installation instructions part 3, injection mortar system FIS SB

Pre-positioned installation

8		Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth ≥ 150 mm use an extension tube see **Table B8.1**. For overhead installation or deep holes h_0 > 250mm use an injection adapter.
9		Only use clean and oil-free metal parts. Mark the setting depth of the anchor rod. Push the fischer anchor rod down to the bottom of the hole, turning it slightly while doing so.
		After inserting the anchor rod, excess mortar must be emerged around the anchor element. If not, pull out the anchor element immediately and reinject mortar.
		For overhead installations support the anchor rod with wedges (e.g. fischer centering wedges) until the mortar begins to harden.
10		Wait for the specified curing time t_{cure} see **Table B8.2**.
11		Attach the component and install the washer and nuts - without centering sleeve. Tighten the hexagon nut with torque wrench, T_{inst} see **Table B4.1**. Tighten lock nut manually, then use wrench to give another quarter or half turn.
12		The gap between anchor and fixture (annular clearance) has to be filled with mortar (FIS SB, FIS SB High Speed, FIS V Plus or FIS EM Plus) via the fillable conical washer. If only tension loads are involved in the application, the annular gap does not necessarily have to be filled.

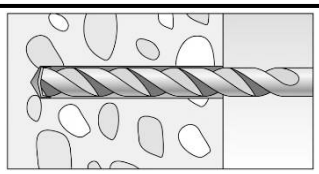
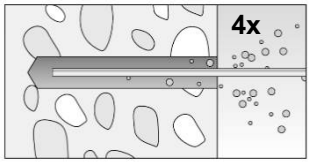
Installation instructions part 4, injection mortar system FIS SB

Push through installation

8	 or 	**Pre-assemble the anchor!** (Position of the conical washer or washer = embedment depth + fixture thickness).
9		Fill approximately 2/3 of the drill hole incl. fixture with mortar. Always begin from the bottom of the hole and avoid bubbles. For drill hole depth ≥ 150 mm use an extension tube see **Table B8.1**. For overhead installation, deep holes h_0 > 250 mm use an injection adapter.
10		Only use clean and oil-free metal parts. Push the pre-assembled fischer anchor rod into the drill hole until the conical washer or washer is in full contact with the surface, turning it slightly while doing so.
	with dynamic set:  with washer: 	After inserting the anchor rod with pre-assembled components, excess mortar must be emerged around the anchor element (minimum on one point of the conical washer or washer). If not, pull out the anchor element immediately and reinject mortar.
11		Wait for the specified curing time t_{cure} see **Table B8.2**.
12	with dynamic set:  with washer: 	Tighten the hexagon nut with torque wrench, T_{inst} see **Table B4.1**. Tighten lock nut manually, then use wrench to give another quarter or half turn.

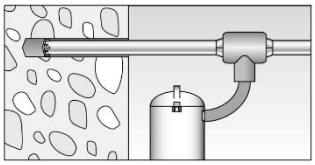
Installation instructions part 5; resin capsule RSB

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 **Table B6.1**.
2		Clean the drill hole: Blow out the drill hole four times, with oil free compressed air (p ≥ 6 bar). In uncracked concrete the use of the manual blow-out pump ABG is possible (Installation parameters: d_0 < 18 mm and h_{ef} < 10d).

Go to step 6 (pre-positioned installation **Annex B15** or push through installation **Annex B16**).

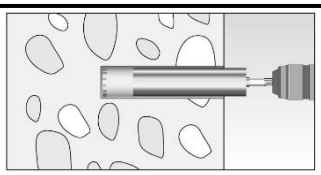
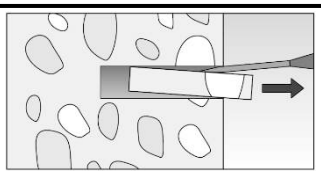
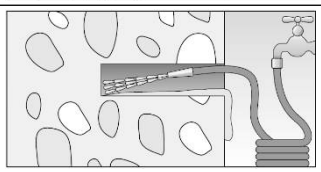
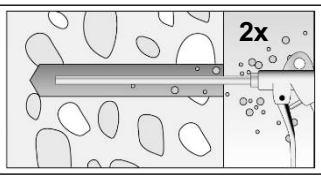
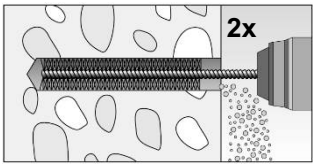
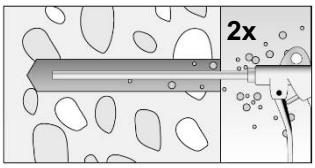
Drilling and cleaning the hole (hammer drilling with hollow drill bit)

1		Check a suitable hollow drill (see **Table B2.1**) 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 **Table B6.1**.

Go to step 6 (pre-positioned installation **Annex B15** or push through installation **Annex B16**).

Installation instructions part 6; resin capsule RSB

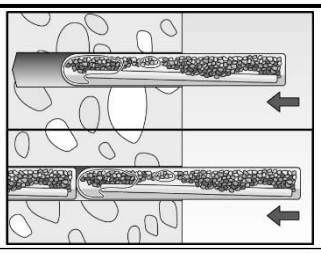
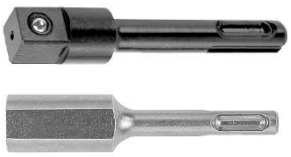
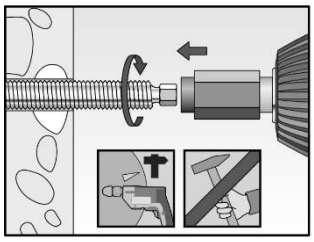
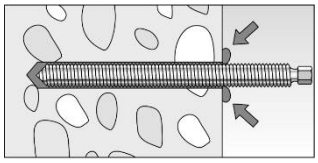
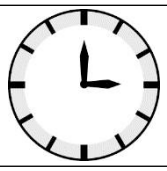
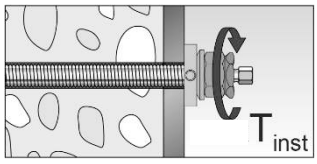
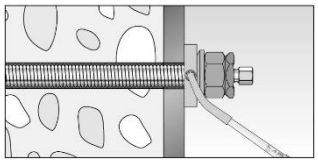
Drilling and cleaning the hole (wet drilling with diamond drill bit)

1		Drill the hole. Drill hole diameter $\mathbf{d_0}$ and nominal drill hole depth $\mathbf{h_0}$ see **Table B6.1**.		Break the drill core and remove it.
2		Flush the drill hole, until clear water emerges from the drill hole.		
3		Blow out the drill hole twice, using oil-free compressed air (p > 6 bar).		
4		Brush the drill hole twice using a power drill. Corresponding brushes see **Table B7.3**.		
5		Blow out the drill hole twice, using oil-free compressed air (p > 6 bar).		

Go to step 6 (pre-positioned installation **Annex B15** or push through installation **Annex B16**).

Installation instructions part 7; resin capsule RSB

Pre-positioned installation fischer anchor rod RG M

6		Insert the resin capsule into the drill hole by hand. Suitable resin capsule RSB or RSB mini see **Table B7.2**.		Depending on the metal part, use a suitable setting tool / adapter.
7		Only use clean and grease-free metal parts. Drive the fischer anchor rod RG M into the capsule using suitable adapter and hammer drill set on rotary hammer action. Stop when the metal part reaches the bottom of the hole and the correct embedment depth is reached.		
8		When the correct embedment depth is reached, excess mortar must emerge from the mouth of the drill hole. If not, the metal part must be pulled out directly and another resin capsule must be pushed into the drill hole. Setting process (Step 7) must be repeated.		
9		Wait for the specified curing time t_{cure} see **Table B8.2**.		
10		Attach the component and install the washer and nuts - without centering sleeve. Tighten the hexagon nut with torque wrench, T_{inst} see **Table B6.1**. Tighten lock nut manually, then use wrench to give another quarter or half turn.		
11		The gap between anchor and fixture (annular clearance) has to be filled with mortar (FIS SB, FIS SB High Speed, FIS V Plus or FIS EM Plus) via the fillable conical washer. If only tension loads are involved in the application, the annular gap does not necessarily have to be filled.		

Installation instructions part 8; resin capsule RSB

Push through installation fischer anchor rod RG M

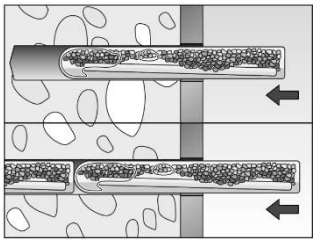
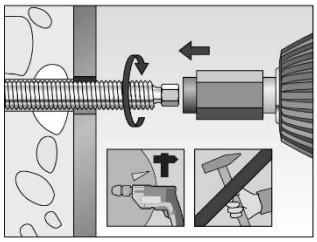
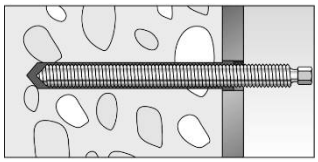
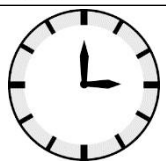
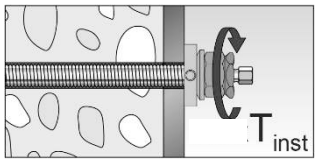
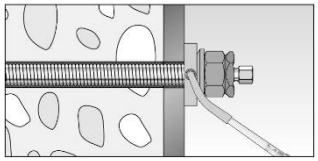
6		Insert the resin capsule through the fixture into the drill hole by hand. Suitable resin capsule RSB or RSB mini see **Table B7.2**.		Depending on the metal part, use a suitable setting tool / adapter.
7		Only use clean and grease-free metal parts. Drive the fischer anchor rod RG M into the capsule using suitable adapter and hammer drill set on rotary hammer action. Stop when the metal part reaches the bottom of the hole and the correct embedment depth is reached.		
8		When the correct embedment depth is reached, excess mortar must be visible in the mounting part. If not, the metal part must be pulled out directly and another resin capsule must be pushed into the drill hole. Setting process (Step 7) must be repeated.		
9		Wait for the specified curing time t_{cure} see **Table B8.2**.		
10		Install the washer and nuts - without centering sleeve. Tighten the hexagon nut with torque wrench, T_{inst} see **Table B6.1**. Tighten lock nut manually, then use wrench to give another quarter or half turn.		
12		The gap between anchor and fixture (annular clearance) has to be filled with mortar (FIS SB, FIS SB High Speed, FIS V Plus or FIS EM Plus) via the fillable conical washer. If only tension loads are involved in the application, the annular gap does not necessarily have to be filled.		

Table C1.1: Essential characteristics under tension fatigue loading for FIS SB / RSB; **Design method I** according to **TR 061**

Required evidence			
Number of load cycles (n)			
$n \leq 10^4$	$10^4 < n \leq 5 \cdot 10^6$	$5 \cdot 10^6 < n \leq 10^8$	$n > 10^8$
Tension loading			
Characteristic steel fatigue resistance (zinc plated steel 8.8) $\Delta N_{Rk,s,0,n}$ (8.8) [kN]			
$0{,}75 \cdot N_{Rk,s,(8.8)} \cdot 0{,}33$	$0{,}75 \cdot N_{Rk,s,(8.8)} \cdot 10^{(-0{,}12 \cdot \log(n))} \leq 0{,}75 \cdot N_{Rk,s,(8.8)} \cdot 0{,}33$	$0{,}75 \cdot N_{Rk,s,(8.8)} \cdot 10^{(-0{,}438 - 0{,}057 \cdot \log(n))}$	$0{,}75 \cdot N_{Rk,s,(8.8)} \cdot 0{,}12$
Characteristic steel fatigue resistance (stainless steel R, property class 70) $\Delta N_{Rk,s,0,n}$ (R-70) [kN]			
$0{,}75 \cdot N_{Rk,s,(R\text{-}70)} \cdot 0{,}33$	$0{,}75 \cdot N_{Rk,s,(R\text{-}70)} \cdot 10^{(-0{,}16 - 0{,}09 \cdot \log(n))}$	$0{,}75 \cdot N_{Rk,s,(R\text{-}70)} \cdot 10^{(-0{,}469 - 0{,}043 \cdot \log(n))}$	$0{,}75 \cdot N_{Rk,s,(R\text{-}70)} \cdot 0{,}15$
Characteristic combined pull-out / concrete cone fatigue resistance, in uncracked and cracked concrete			
Characteristic bond strength in uncracked concrete $\Delta\tau_{Rk,p,ucr,0,n}$ [N/mm²]			
$\tau_{Rk,ucr} \cdot 0{,}575$	$\tau_{Rk,ucr} \cdot 10^{(-0{,}06 \cdot \log(n))}$	$\tau_{Rk,ucr} \cdot 10^{(-0{,}207 - 0{,}029 \cdot \log(n))}$	$\tau_{Rk,ucr} \cdot 0{,}35$
Characteristic bond strength in cracked concrete $\Delta\tau_{Rk,p,cr,0,n}$ [N/mm²]			
$\tau_{Rk,cr} \cdot 0{,}575$	$\tau_{Rk,cr} \cdot 10^{(-0{,}06 \cdot \log(n))}$	$\tau_{Rk,cr} \cdot 10^{(-0{,}207 - 0{,}029 \cdot \log(n))}$	$\tau_{Rk,cr} \cdot 0{,}35$
Characteristic concrete cone and splitting fatigue resistance			
Characteristic concrete fatigue resistance in uncracked concrete $\Delta N_{Rk,c/sp,ucr,0,n}$ [kN]			
$N_{Rk,c/sp,ucr} \cdot 0{,}66$	$N_{Rk,c/sp,ucr} \cdot 1{,}1 \cdot n^{-0{,}055} \geq N_{Rk,c/sp,ucr} \cdot 0{,}50$		$N_{Rk,c/sp,ucr} \cdot 0{,}50$
Characteristic concrete fatigue resistance in cracked concrete $\Delta N_{Rk,c/sp,cr,0,n}$ [kN]			
$N_{Rk,c/sp,cr} \cdot 0{,}66$	$N_{Rk,c/sp,cr} \cdot 1{,}1 \cdot n^{-0{,}055} \geq N_{Rk,c/sp,cr} \cdot 0{,}50$		$N_{Rk,c/sp,cr} \cdot 0{,}50$

Exponents and load transfer factor					
Exponent for combined loading					
		M12	M16	M20	M24
$\alpha_s = \alpha_{sn}$	[–]	0,5	0,7		
Load transfer factor					
ψ_{FN}	[–]	0,5			

$N_{Rk,s}$, $\tau_{Rk,ucr}$, $\tau_{Rk,cr}$ see ETA-12/0258 of 24.10.2023, for τ_{Rk} (M24-R-70) ≤ 0,85 · τ_{Rk} (M20-R-70)
$N_{Rk,c/sp,ucr}$, $N_{Rk,c/sp,cr}$ see ETA-12/0258 of 24.10.2023 and EN 1992-4:2018

Table C2.1: Essential characteristics under shear fatigue loading for FIS SB / RSB; **Design method I** according to **TR 061**

Required evidence			
Number of load cycles (n)			
$n \leq 10^4$	$10^4 < n \leq 5 \cdot 10^6$	$5 \cdot 10^6 < n \leq 10^8$	$n > 10^8$
Shear loading			
Characteristic steel fatigue resistance (zinc plated steel 8.8) $\Delta V_{Rk,s,0,n}$ (8.8) [kN]			
$V_{Rk,s,(8.8)} \cdot 0{,}23$	$V_{Rk,s,(8.8)} \cdot 10^{(-0{,}147 \cdot \log(n))} \leq V_{Rk,s,(8.8)} \cdot 0{,}23$	$V_{Rk,s,(8.8)} \cdot 10^{(-0{,}573 - 0{,}068 \cdot \log(n))} \geq V_{Rk,s,(8.8)} \cdot 0{,}08$	$V_{Rk,s,(8.8)} \cdot 0{,}08$
Characteristic steel fatigue resistance (stainless steel R, property class 70) $\Delta V_{Rk,s,0,n}$ (R-70) [kN]			
$V_{Rk,s,(R\text{-}70)} \cdot 0{,}31$	$V_{Rk,s,(R\text{-}70)} \cdot 10^{(-0{,}042 - 0{,}118 \cdot \log(n))}$	$V_{Rk,s,(R\text{-}70)} \cdot 10^{(-0{,}461 - 0{,}056 \cdot \log(n))}$	$V_{Rk,s,(R\text{-}70)} \cdot 0{,}12$
Characteristic concrete pry out fatigue resistance in cracked and uncracked concrete $\Delta V_{Rk,cp,0,n}$ [kN]			
$V_{Rk,cp} \cdot 0{,}574$	$V_{Rk,cp} \cdot 1{,}2 \cdot n^{-0{,}08} \geq V_{Rk,cp} \cdot 0{,}50$		$V_{Rk,cp} \cdot 0{,}50$
Characteristic concrete edge fatigue resistance in cracked and uncracked concrete $\Delta V_{Rk,c,0,n}$ [kN]			
$V_{Rk,c} \cdot 0{,}574$	$V_{Rk,c} \cdot 1{,}2 \cdot n^{-0{,}08} \geq V_{Rk,c} \cdot 0{,}50$		$V_{Rk,c} \cdot 0{,}50$

Exponents, load transfer factor					
Exponent for combined loading, steel failure					
		M12	M16	M20	M24
$\alpha_s = \alpha_{sn}$	[-]	0,5	0,7		
Exponent for combined loading, verification regarding failure modes other than steel failure					
α_c	[-]	1,5			
Load transfer factor					
ψ_{FV}	[-]	0,5			

$V_{Rk,s}$ see ETA-12/0258 of 24.10.2023

$V_{Rk,c}$, $V_{Rk,cp}$ see ETA-12/0258 of 24.10.2023 and EN 1992-4:2018

Table C3.1: Essential characteristics under tension and shear fatigue loading; **Design method II** according to **TR 061; zinc plated steel 8.8**

Size			**M12**	**M16**
Tension loading				
Effective embedment depth	$h_{ef,min}$	[mm]	95	125
Steel failure				
Characteristic steel fatigue resistance	$\Delta N_{Rk,s,0,\infty}$	[kN]	6,1	11,3
Exponent for combined loading	$\alpha_s = \alpha_{sn}$	[-]	0,5	0,7
Combined pull-out / concrete cone failure				
Characteristic bond fatigue resistance	$\Delta\tau_{Rk,p,ucr,0,\infty}$	[N/mm²]	$\tau_{Rk,ucr} \cdot 0{,}35$	
	$\Delta\tau_{Rk,p,cr,0,\infty}$	[N/mm²]	$\tau_{Rk,cr} \cdot 0{,}35$	
Concrete cone failure and concrete splitting failure				
Characteristic concrete fatigue resistance	$\Delta N_{Rk,c,0,\infty}$	[-]	$0{,}5 \cdot N_{Rk,c}$ [1)]	
	$\Delta N_{Rk,sp,0,\infty}$	[-]	$0{,}5 \cdot N_{Rk,sp}$ [1)]	
Exponent for combined loading	α_c	[-]	1,5	
Load transfer factor	ψ_{FN}	[-]	0,5	
Shear loading				
Shear loading, steel failure without lever arm				
Characteristic steel fatigue resistance	$\Delta V_{Rk,s,0,\infty}$	[kN]	2,7	5,0
Exponent for combined loading	$\alpha_s = \alpha_{sn}$	[-]	0,5	0,7
Concrete pryout failure				
Characteristic concrete fatigue resistance	$\Delta V_{Rk,cp,0,\infty}$	[kN]	$0{,}5 \cdot V_{Rk,cp}$ [1)]	
Concrete edge failure				
Characteristic concrete fatigue resistance	$\Delta V_{Rk,c,0,\infty}$	[kN]	$0{,}5 \cdot V_{Rk,c}$ [1)]	
Effective length of fastener	l_f	[mm]	min (h_{ef}; $12 \cdot d_{nom}$)	
Effective outside diameter of the anchor	d_{nom}	[mm]	12	16
Exponent for combined loading	α_c	[-]	1,5	
Load transfer factor	ψ_{FV}	[-]	0,5	

[1)] $N_{Rk,c}$, $N_{Rk,sp}$, $V_{Rk,c}$ and $V_{Rk,cp}$ – Essential characteristics for concrete failure under static and quasi-static loading according to ETA-12/0258 of 24.10.2023 and EN 1992-4:2018.

Table C4.1: Essential characteristics under tension and shear fatigue loading; **Design method II** according to **TR 061; stainless steel R property class 70**

Size			**M12**	**M16**	**M20**	**M24**
Tension loading						
Effective embedment depth	$h_{ef,min}$	[mm]	95	125	170	220
Steel failure						
Characteristic steel fatigue resistance	$\Delta N_{Rk,s,0,\infty}$	[kN]	6,6	12,4	19,4	27,8
Exponent for combined loading	$\alpha_s = \alpha_{sn}$	[-]	0,5	0,7		
Combined pull-out / concrete cone failure						
Characteristic bond fatigue resistance	$\Delta\tau_{Rk,p,ucr,0,\infty}$	[N/mm²]	$\tau_{Rk,ucr} \cdot 0{,}35$			
	$\Delta\tau_{Rk,p,cr,0,\infty}$	[N/mm²]	$\tau_{Rk,cr} \cdot 0{,}35$			
Concrete cone failure and concrete splitting failure						
Characteristic concrete fatigue resistance	$\Delta N_{Rk,c,0,\infty}$	[-]	$0{,}5 \cdot N_{Rk,c}$ [1)]			
	$\Delta N_{Rk,sp,0,\infty}$	[-]	$0{,}5 \cdot N_{Rk,sp}$ [1)]			
Exponent for combined loading	α_c	[-]	1,5			
Load transfer factor	ψ_{FN}	[-]	0,5			
Shear loading						
Shear loading, steel failure without lever arm						
Characteristic steel fatigue resistance	$\Delta V_{Rk,s,0,\infty}$	[kN]	3,6	6,6	10,3	14,9
Exponent for combined loading	$\alpha_s = \alpha_{sn}$	[-]	0,5	0,7		
Concrete pryout failure						
Characteristic concrete fatigue resistance	$\Delta V_{Rk,cp,0,\infty}$	[kN]	$0{,}5 \cdot V_{Rk,cp}$ [1)]			
Concrete edge failure						
Characteristic concrete fatigue resistance	$\Delta V_{Rk,c,0,\infty}$	[kN]	$0{,}5 \cdot V_{Rk,c}$ [1)]			
Effective length of fastener	l_f	[mm]	min (h_{ef}; $12 \cdot d_{nom}$)			
Effective outside diameter of the anchor	d_{nom}	[mm]	12	16	20	24
Exponent for combined loading	α_c	[-]	1,5			
Load transfer factor	ψ_{FV}	[-]	0,5			

[1)] $N_{Rk,c}$, $N_{Rk,sp}$, $V_{Rk,c}$ and $V_{Rk,cp}$ – Essential characteristics for concrete failure under static and quasi-static loading according to ETA-12/0258 of 24.10.2023 and EN 1992-4:2018, for τ_{Rk} (M24-R-70) ≤ 0,85 · τ_{Rk} (M20-R-70)