Deutsches Institut für Bautechnik

DIBt

Public-law institution jointly founded by the federal states and the Federation

Technical authority granting approvals and permits for construction products and construction techniques

Date: 17 March 2023

Reference number: I 25-1.21.8-9/23

National technical approval / General construction technique permit

Number:
Z-21.8-1954

Validity
from: **17 March 2023**
to: **2 April 2025**

Applicant:
fischerwerke GmbH & Co. KG
Otto-Hahn-Straße 15
79211 Denzlingen, Germany

Subject of decision:
fischer FCC concrete connector for use in concrete members

The subject named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*).
This decision contains six pages and twelve annexes.
This national technical approval / general construction technique permit replaces national technical approval / general construction technique permit No. Z-21.8-1954 of 2 December 2020. The subject concerned was granted the first national technical approval on 25 November 2011.

Translation authorised by DIBt

I GENERAL PROVISIONS

1 This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).

2 This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.

3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.

4 Notwithstanding further provisions in the 'Special Provisions', copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer of the subject concerned shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.

5 This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.

6 This decision may be revoked. The provisions contained herein may subsequently be supplemented and amended, in particular if this is required by new technical findings.

7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.

II SPECIAL PROVISIONS

1 Subject concerned and field of use and application

1.1 Subject of approval and field of use

The subject of approval is the FCC-H concrete connector (rebar with forged head) and the FCC-HP head plate.

The FCC-H is used as a concrete-to-concrete shear connector. The FCC-HP head plate is used as part of a concrete-to-concrete shear connector with an anchor rod. Both connectors are used for connecting new concrete to existing concrete.

1.2 Subject of the permit and field of application

The subject of the permit is the planning, design and execution of the fischer FCC-B and FCC-H concrete connectors including injection mortar in two concrete members to be connected.

The fischer FCC concrete connectors consist of the following construction products:

- fischer anchor rod (for FCC-B concrete connector) in accordance with the European Technical Assessments ETA-12/0258 dated 17 June 2020, ETA-20/0603 dated 13 November 2020 or ETA-17/0979 dated 17 June 2020
- rebar with forged head (for FCC-H concrete connectors) in accordance with this approval
- injection mortar FIS SB in accordance with European Technical Assessment ETA-12/0258 dated 17 June 2020, FIS V Plus in accordance with European Technical Assessment ETA-20/0603 dated 13 November 2020, FIS EM Plus in accordance with European Technical Assessment ETA-17/0979 dated 17 June 2020 or FIS RC II in accordance with European Technical Assessment ETA-22/0501 dated 20 September 2022
- hex nuts in accordance with DIN EN ISO 4032:2013-04 or DIN EN 1664:1998-02
- FCC-HP head plate in accordance with this approval.

Each fischer FCC concrete connector is anchored in the existing concrete (old concrete) using injection mortar. The connector is anchored in the new concrete (in-situ concrete/precast concrete element) via the nut/head plate (FCC-B) or via the head (FCC-H) by form-fit (headed fastener connection).

Annexes 1, 2 and 3 show the installed FCC concrete connectors.

FCC concrete connectors may be installed in reinforced and unreinforced normal weight concrete with a minimum strength class of C20/25 and a maximum strength class of C50/60 in accordance with DIN EN 206-1:2001-07 as well as in cracked and uncracked concrete.

Steel parts made of B500B reinforcing steel, untreated or galvanised steel may only be used if the minimum concrete cover for protection against corrosion in accordance with DIN EN 1992-1-1:2011-01 and DIN EN 1992-1-1/NA:2013-04 is complied with and if a bond between the existing concrete member and the concrete member to be fixed is ensured.

Steel parts made of stainless or high corrosion-resistant steel may be used depending on their corrosion resistance classes given in Annex 6, Table 6.1 in accordance with DIN EN 1993-1-4:2015-01 and DIN EN 1993-1-4/NA:2020-11.

Separate verifications are required if there are requirements with regard to dynamic loads or loads due to earthquakes.

2 Provisions for the construction product

2.1 Properties and composition

The dimensions and material properties of the FCC-H concrete connector and the FCC-HP head plate shall correspond to the specifications in the annexes.

The material characteristics, dimensions and tolerances that are not specified in this decision shall comply with the specifications deposited with DIBt, the certification body and the external surveillance body.

2.2 Packaging and marking

The packaging, accompanying leaflet or delivery note of the FCC-H concrete connector and the FCC-HP head plate shall be marked by the manufacturer with the national conformity mark (*Ü-Zeichen*) in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The factory identifying mark, the approval number and the complete designation of the construction product shall also be specified.

The mark shall only be applied if the requirements given in Section 2.3 are met.

2.3 Confirmation of conformity

2.3.1 General

The manufacturer shall confirm for each manufacturing plant that the construction product complies with the provisions of this national technical approval by way of a declaration of conformity based on factory production control and a certificate of conformity issued by a certification body recognised for these purposes as well as on regular external surveillance carried out by a recognised inspection body in accordance with the following provisions: To issue the certificate of conformity and for external surveillance including the associated product testing, the manufacturer of the construction product shall use a certification body and an inspection body recognised for these purposes.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction product with the national conformity mark including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control is understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products satisfy the provisions of this national technical approval.

Scope, type and frequency of factory production control shall be in accordance with the test plan deposited with DIBt and the external surveillance body.

The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting material
- type of check or test
- date of manufacture and testing of the construction product or the starting material
- results of checks and tests and, where applicable, comparison with requirements
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and submitted to the inspection body used for external surveillance. They shall be submitted to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately, where technically feasible and necessary to show that the defect has been eliminated.

2.3.3 External surveillance

The factory production control system shall be inspected regularly, i.e. at least once a year, by means of external surveillance at each manufacturing plant.

Within the framework of external surveillance, initial type-testing of the construction product and sample testing shall be carried out. Sampling and testing shall be the responsibility of the recognised inspection body.

Scope, type and frequency of external surveillance shall be in accordance with the test plan deposited with DIBt and the external surveillance body.

The results of certification and external surveillance shall be kept for at least five years. They shall be presented by the certification or inspection body to DIBt and the competent supreme building authority upon request.

3 Provisions for planning, design and execution

3.1 Planning

This decision covers the resistances that can be transmitted by the fischer FCC concrete connector in the joint between existing concrete and new concrete. This decision does not cover the member as a whole.

The concrete-to-concrete connections using fischer FCC concrete connectors in combination with the injection mortars FIS SB, FIS V plus, FIS EM Plus (all of them for the FCC-B and FCC-H connectors) or with the FIS RC II mortar (only for FCC-H) shall be designed by an engineer. Verifiable calculations and design drawings shall be prepared taking into account the loads to be anchored.

Anchoring in the existing concrete shall be designed in accordance with the specifications in ETA-12/0258, ETA-20/0603, ETA-17/0979 or ETA-22/0501 (e.g. member thickness, spacing and edge distances, temperature ranges).

The embedment depth $h_{ef,neu}$ in the new concrete (see Annexes 1, 2, 3) shall be selected taking into account the thickness of the new concrete and in compliance with the required concrete cover in accordance with DIN EN 1992-1-1:2011-01 and DIN EN 1992-1-1/NA:2013-04.

The minimum edge distance of the anchor in the new concrete shall fulfil the following condition: $c_{min} \geq 0.5 \cdot h_{ef,neu}$.

3.2 Design

3.2.1 Anchoring in the existing concrete

The fischer FCC concrete connector anchoring in the existing concrete using injection mortar FIS SB, FIS V plus, FIS EM Plus or FIS RC II shall be designed in accordance with the specifications for the intended use and the characteristic values in the annexes of ETA-12/0258, ETA-20/0603, ETA-17/0979 or ETA-22/0501.

3.2.2 Anchoring in the new concrete (in-situ concrete/precast concrete element)

Anchoring in the new concrete (in-situ concrete/prefabricated element) shall be designed in accordance with DIN EN 1992-4:2019-04, Clause 7, taking into account the following information and additions.

In the verifications for concrete failure and splitting, the value for the embedment depth h_{ef} shall be replaced by $h_{ef,neu}$.

The characteristic anchor values and the characteristic spacing and edge distances for verifications are given in Annexes 7 to 10 of this decision.

The present design provides the verification of the immediate local transmission of the anchor loads into the concrete.

Transfer of the loads to be anchored in the concrete member shall be verified separately.

3.3 Execution

3.3.1 General

The concrete connectors shall be installed in accordance with the design drawings prepared in accordance with Section 3.1.

The executing company shall provide a declaration of conformity in accordance with Sections 16a(5) and 21(2) of the Model Building Code to confirm the conformity of the construction technique with the general construction technique permit included in this decision.

3.3.2 Anchoring in the existing concrete

For installation of the concrete connector in existing concrete using the injection mortars FIS SB, FIS V plus, FIS EM Plus or FIS RC II, the specifications on the intended use in the annexes of ETA-12/0258, ETA-20/0603, ETA-17/0979 or ETA-22/0501 shall apply.

The installation parameters, including the specifications on setting depth marks, shall be taken from the European Technical Assessment of the selected injection system.

3.3.3 Anchoring in the new concrete (in-situ concrete/precast concrete element)

With the fischer FCC-B concrete connector, the hex nut or FCC-HP head plate shall be screwed onto the anchor rod at a distance ≥ $h_{ef,neu}$ and secured in this position after the curing time of the injection mortar has elapsed. The nut or head plate shall be screwed to the thread of the anchor rod or threaded rod over its entire height.

Compliance with the effective embedment depth in the new concrete $h_{ef,neu}$ in accordance with Annex 7, Table 7.1 shall be ensured.

3.3.4 Inspection of execution

During installation of the concrete connectors, the contractor commissioned to install them or the site manager assigned by the contractor or a competent representative of the site manager shall be present at the construction site. They shall ensure that the work is carried out properly.

During installation of the concrete connectors, records on the verification of the existing concrete strength class and the proper installation of the concrete connectors shall be maintained by the site manager or the site manager's representative.

The records shall be available at the construction site during the construction period and shall be submitted to the inspection supervisor upon request. Like the delivery notes, they shall be kept by the company for a minimum of five years after completion of the project.

Dipl.-Ing. Beatrix Wittstock
Head of Section

Drawn up by
Tempel

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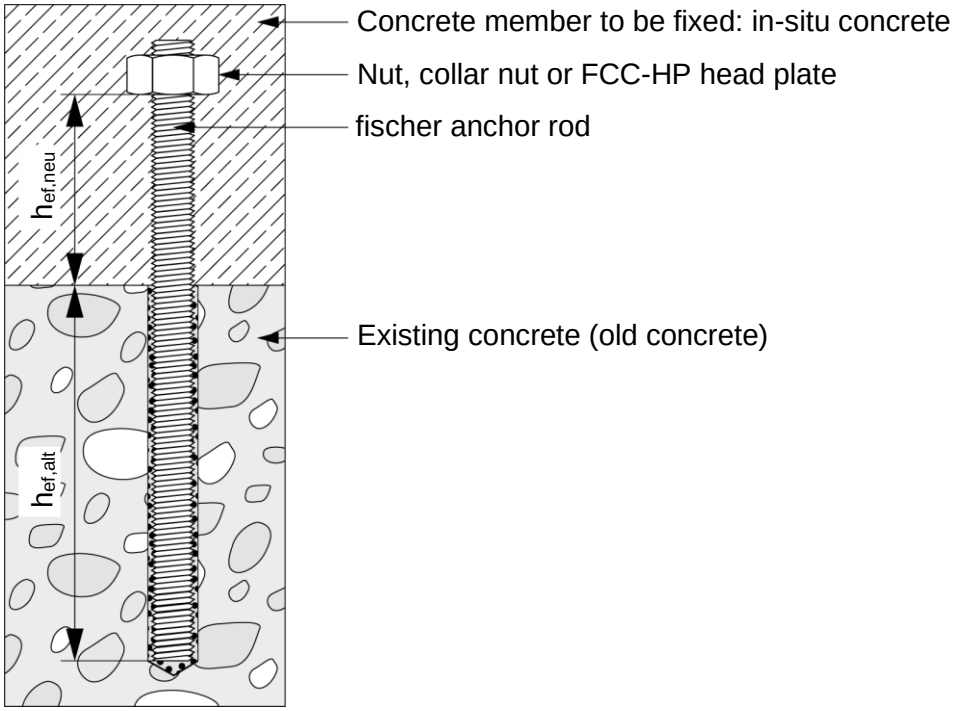
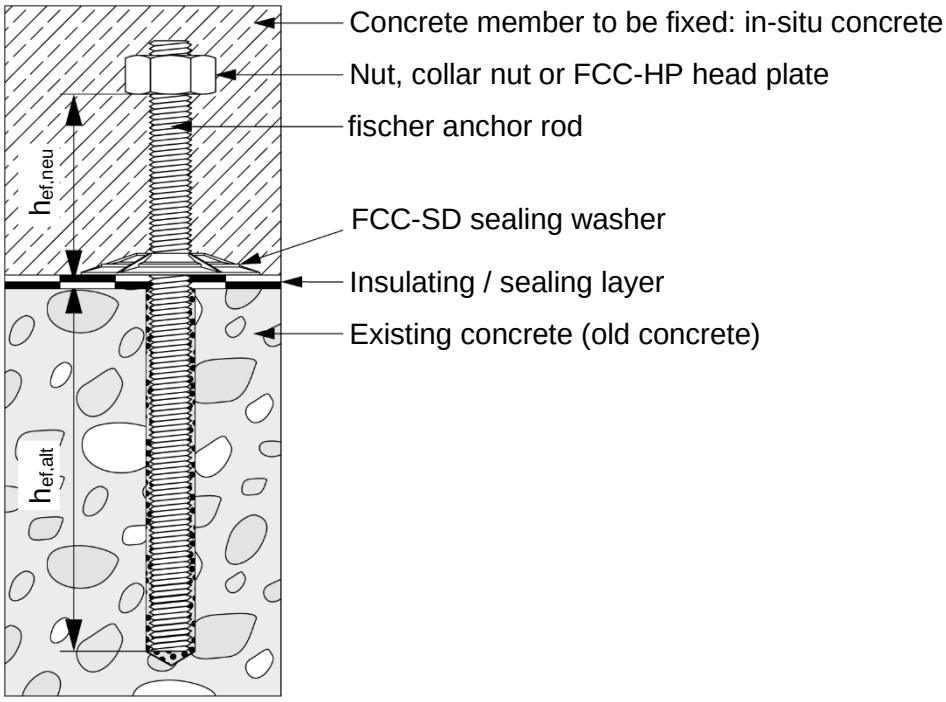
Installed condition 1

FCC-B; connection between existing concrete and in-situ concrete without insulating and / or sealing layer using FIS SB / FIS V Plus / FIS EM Plus in cracked and uncracked concrete



Installed condition 2

FCC-B; connection between existing concrete and in-situ concrete with insulating and /or sealing layer using FIS SB / FIS V Plus / FIS EM Plus in cracked and uncracked concrete



fischer FCC concrete connector for use in concrete members	Annex 1
Installed condition 1 and installed condition 2	

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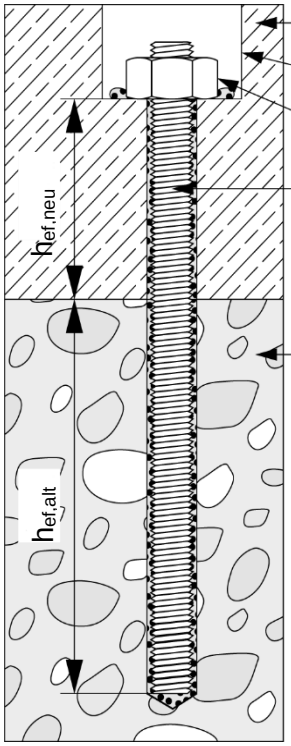
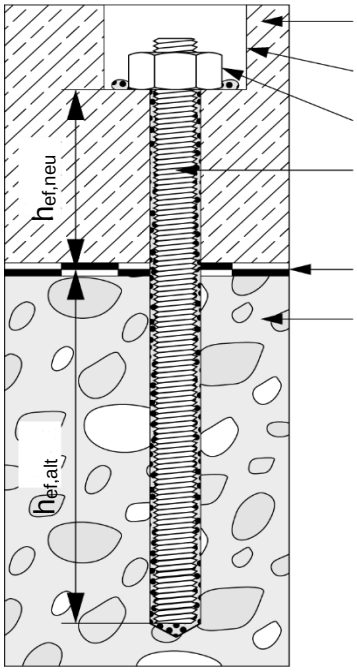
Installed condition 3

FCC-B; connection between existing concrete and concrete / precast concrete element without insulating and / or sealing layer using FIS SB / FIS V Plus / FIS EM Plus in cracked and uncracked concrete



Installed condition 4

FCC-B; connection between existing concrete and concrete / precast concrete element with insulating and / or sealing layer using FIS SB / FIS V Plus / FIS EM Plus in cracked and uncracked concrete



fischer FCC concrete connector for use in concrete members	Annex 2
Installed condition 3 and installed condition 4	

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Installed condition 5
FCC-H; connection between existing concrete and in-situ concrete with insulating and / or sealing layer using FIS SB / FIS V Plus / FIS EM Plus / FIS RC II in cracked and uncracked concrete

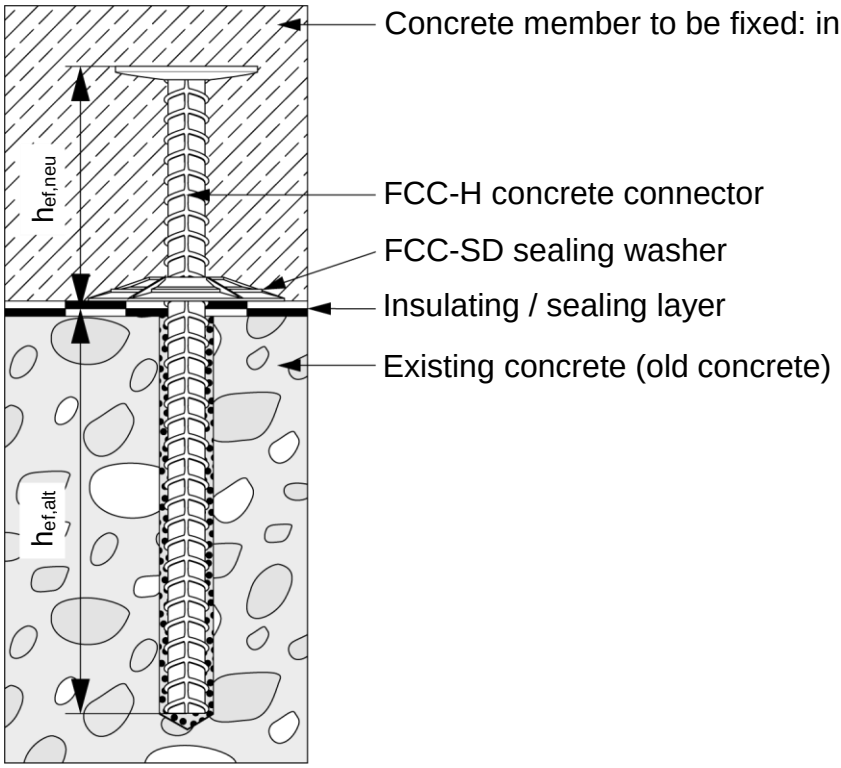

Table 3.1: Permitted fischer injection mortars

		Use			
		FCC-B		**FCC-H**	
Injection mortar	Approval / assessment	Cracked concrete	Uncracked concrete	Cracked concrete	Uncracked concrete
FIS SB	ETA-12/0258	X	X	X	X
FIS V Plus	ETA-20/0603	X	X	X	X
FIS EM Plus	ETA-17/0979	X	X	X	X
FIS RC II	ETA-22/0501	-	-	X	X

The installation conditions and the performances in the existing concrete shall be taken from the respective assessments.

fischer FCC concrete connector for use in concrete members	**Annex 3**
Installed condition 5 Permitted injection mortars	

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FCC-B

Variant 1
Hex nut
DIN EN ISO 4032:2013-04

Variant 2
Hex nut
with collar
DIN EN 1664:1998-02

Variant 3
FCC-HP head plate

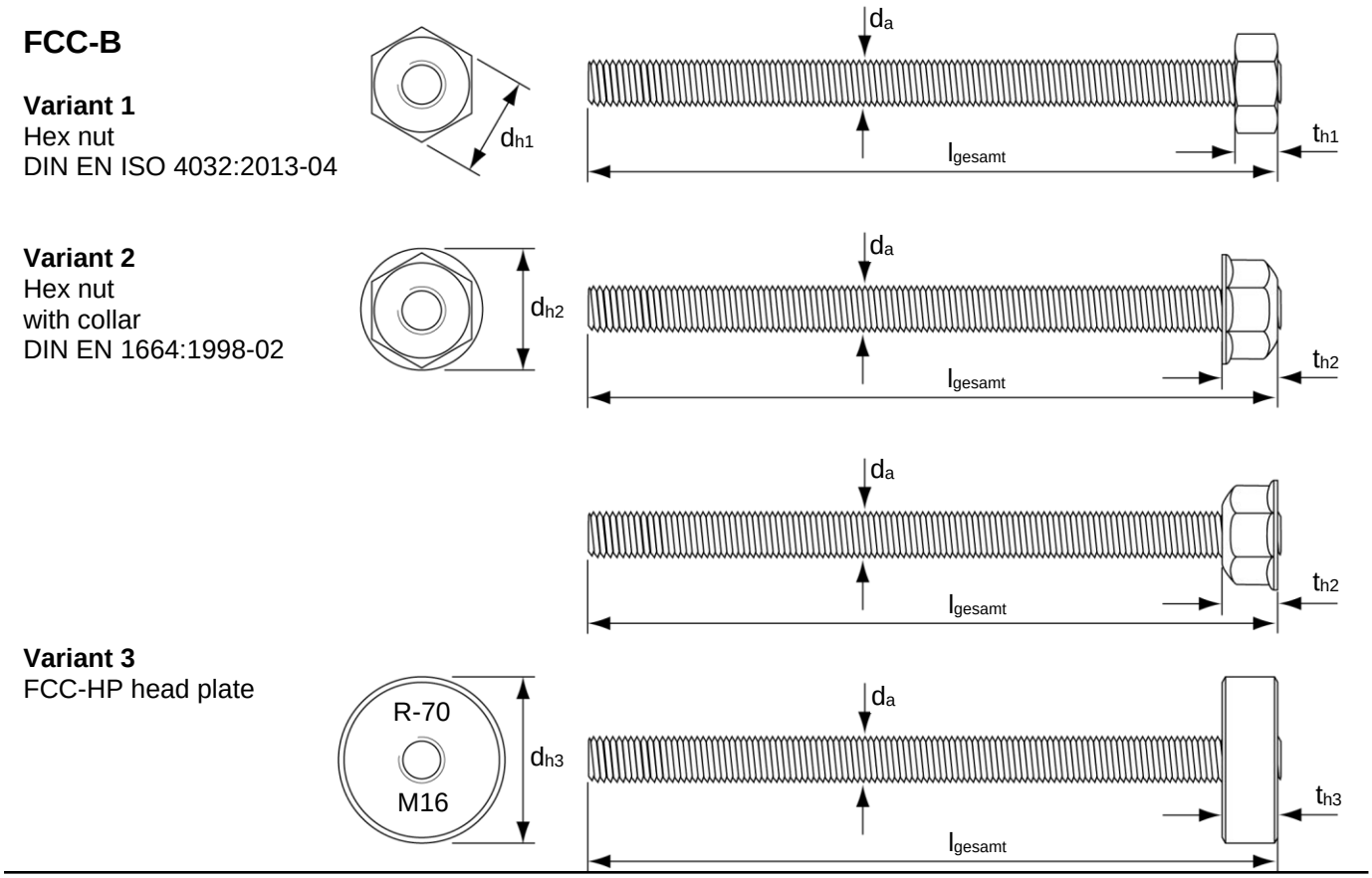

Table 4.1: FCC-B anchor dimensions

FCC-B size				**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Nominal diameter		d_a	[mm]	10.0	12.0	16.0	20.0	24.0	30.0
Hex nut	Variant 1	SW = d_{h1}		17.8	20.0	26.8	33.0	39.6	50.9
Hex nut with collar	Variant 2	d_{h2}		21.8	26.0	34.5	42.8	-	-
FCC-HP head plate	Variant 3	d_{h3}		30.0	36.0	48.0	50.0	70.0	100.0
Head height									
Hex nut	Variant 1	t_{h1}		8.4	10.8	14.8	18.0	21.5	25.6
Hex nut with collar	Variant 2	t_{h2}		11.4	13.8	18.3	22.4	-	-
FCC-HP head plate	Variant 3	t_{h3}		8	10	13	16	19	24
Overall length		l_{gesamt}		< 2,000					

fischer FCC concrete connector for use in concrete members

FCC-B anchor dimensions

Annex 4

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FCC-H

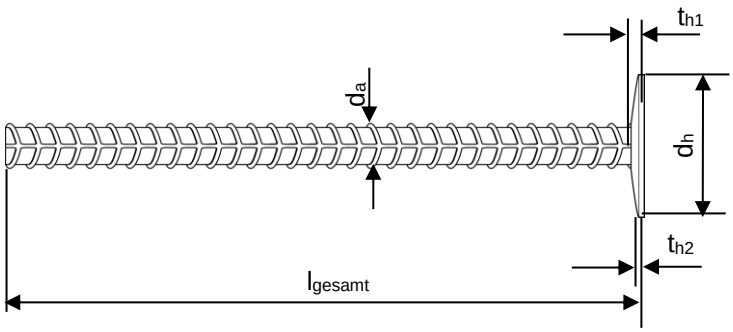

Table 5.1: FCC-H anchor dimensions

FCC-H size			**10**	**12**	**14**	**16**	**20**	**25**	**28**
Nominal diameter	d_a	[mm]	10.0	12.0	14.0	16.0	20.0	25.0	28.0
Head diameter	$d_h \geq$		30.0	36.0	42.0	48.0	60.0	75.0	85.0
Head height	$t_{h1} \geq$		5.0	6.0	7.0	7.0	9.0	12.0	14.0
	$t_{h2} \geq$		2.0	2.0	2.5	2.5	3.0	3.5	3.5
Overall length	l_{gesamt}		< 2,000						

fischer FCC concrete connector for use in concrete members

FCC-H anchor dimensions

Annex 5

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Table 6.1: Materials

Designation	Material		
	Steel	Stainless steel R	High corrosion-resistant steel HCR
		In accordance with DIN EN 10088-1:2014-12 of corrosion resistance class CRC III in accordance with DIN EN 1993-1-4:2015-10 and DIN EN 1993-1-4/NA:2020-11	In accordance with DIN EN 10088-1:2014-12 of corrosion resistance class CRC V in accordance with DIN EN 1993-1-4:2015-10 and DIN EN 1993-1-4/NA:2020-11
FCC-H	Reinforcing steel B500B Bars and de-coiled rods, class B or C with f_{yk} and k in accordance with NDP or NCI of DIN EN 1992-1-1:2011-01 1.0439 $f_{uk} = f_{tk} = k \cdot f_{yk}$	Reinforcing steel B500NR Bars and de-coiled rods, class B or C with f_{yk} and k in accordance with NDP or NCI of DIN EN 1992-1-1:2011-01 1.4571; 1.4301 $f_{uk} = f_{tk} = k \cdot f_{yk}$	Reinforcing steel B500NR Bars and de-coiled rods, class B or C with f_{yk} and k in accordance with NDP or NCI of DIN EN 1992-1-1:2011-01 1.4529 $f_{uk} = f_{tk} = k \cdot f_{yk}$
fischer anchor rod	Strength class 5.8 or 8.8; DIN EN ISO 898-1:2013-05 black, untreated or galvanised ≥ 5 µm, DIN EN ISO 4042:2022-11 or hot-dip galvanised DIN EN ISO 10684:2011-09 $f_{uk} \leq 1000$ N/mm² A5 > 8%	Strength class 50, 70 or 80 DIN EN ISO 3506-1:2020-08 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062: 1.4662; 1.4462 DIN EN 10088-1:2014-12 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$	Strength class 50 or 80 DIN EN ISO 3506-1:2020-08 or strength class 70 with $f_{yk} = 560$ N/mm² 1.4529; 1.4565 DIN EN 10088-1:2014-12 $f_{uk} \leq 1000$ N/mm² $A_5 > 8\%$
Hex nut in accordance with DIN EN ISO 4032:2013-04 or hex nut with collar DIN EN 1664:1998-02	Strength class 5 or 8; DIN EN ISO 898-2:2012-08 black, untreated or galvanised ≥ 5 µm, DIN EN ISO 4042:2022-11 hot-dip galvanised DIN EN ISO 10684:2011-09	Strength class 50; 70 or 80 DIN EN ISO 3506-2:2020-08 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062: 1.4662; 1.4462 DIN EN 10088-1:2014-12	Strength class 50; 70 or 80 DIN EN ISO 3506-2:2020-08 1.4565; 1.4529 DIN EN 10088-1:2014-12
FCC-HP Head plate	Strength class 5.8; DIN EN ISO 898-1:2013-05 black, untreated or galvanised ≥ 5 µm, DIN EN ISO 4042:2022-11	Strength class 70 DIN EN ISO 3506-1:2020-08 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062: 1.4662; 1.4462 DIN EN 10088-1:2014-12	Strength class 70 DIN EN ISO 3506-1:2020-08 or strength class 70 with $f_{yk} = 560$ N/mm² 1.4529; 1.4565 DIN EN 10088-1:2014-12

fischer FCC concrete connector for use in concrete members

Materials

Annex 6

FCC-B

Table 7.1: Characteristic resistance in the concrete member to be fixed under tensile load for FCC-B

Size					**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Tension capacity; steel failure										
Charact. tension capacity $N_{Rk,s}$	Steel, black, untreated or galvanised	Strength class	5.8	[kN]	29	43	79	123	177	281
			8.8		47	68	126	196	282	449
	Stainless steel R and high corrosion-resistant steel HCR		50		29	43	79	123	177	281
			70		41	59	110	172	247	393
			80		47	68	126	196	282	449
Partial safety factors $\gamma_{Ms,N}$	Steel, black, untreated or galvanised	Strength class	5.8	[-]	1.50					
			8.8		1.50					
	Stainless steel R and high corrosion-resistant steel HCR		50		2.86					
			70		1.87 / 1.50[3]					
			80		1.60					
Pull-out										
Charact. tension capacity $N_{Rk,p}$	in **cracked** concrete C20/25		Variant 1	[kN]	19	22	40	59	85	146
			Variant 2		44	63	110	169	-	-
			Variant 3		94	135	241	247	509	1,072
	in **uncracked** concrete C20/25		Variant 1		27	31	56	83	119	205
			Variant 2		62	88	154	263	-	-
			Variant 3		131	190	337	346	713	1,500
Increasing factors for $N_{Rk,p}$ = $\psi_c \cdot N_{Rk,p}$ (C20/25)	C25/30	Ψ_c		[-]	1.25					
	C30/37				1.50					
	C35/45				1.75					
	C40/50				2.00					
	C45/55				2.25					
	C50/60				2.50					
Installation factor		γ_{inst}		[-]	1.0					
Concrete pryout failure[1] and splitting[2]										
Effective embedment depth		$h_{ef,neu}$		[mm]	≥ 40					
Charact. edge distance		$c_{cr,N} = c_{cr,sp}$		[mm]	1.5 • $h_{ef,neu}$					
Charact. spacing		$s_{cr,N} = s_{cr,sp}$		[mm]	3.0 • $h_{ef,neu}$					
Installation factor		γ_{inst}		[-]	1.0					

[1] For verification of concrete pryout failure, see DIN EN 1992-4:2019-04, Clause 7.2.1.4 (h_{ef} shall be replaced by $h_{ef,neu}$).
[2] For verification of splitting, see DIN EN 1992-4:2019-04, Clause 7.2.1.7 (h_{ef} shall be replaced by $h_{ef,neu}$).
[3] For HCR steel with f_{uk} = 700 N/mm² and f_{yk} = 560 N/mm²

fischer FCC concrete connector for use in concrete members

Characteristic resistance in the concrete member to be fixed under tensile load for FCC-B

Annex 7

Deutsches Institut für Bautechnik DIBt

FCC-B

Table 8.1: Characteristic resistance in the concrete member to be fixed under shear load for FCC-B

Size					M10	M12	M16	M20	M24	M30
Steel failure without lever arm										
Charact. shear capacity $V^0_{Rk,s}$	Steel, black, untreated or galvanised	Strength class	5.8	[kN]	17	25	47	74	106	168
			8.8		23	34	63	98	141	225
	Stainless steel R and high corrosion-resistant steel HCR		50		15	21	39	61	89	141
			70		20	30	55	86	124	197
			80		23	34	63	98	141	225
Ductility factor			k_7	[-]	1.0					
Steel failure with lever arm										
Charact. bending moment $M^0_{Rk,s}$	Steel, black, untreated or galvanised	Strength class	5.8	[Nm]	37	65	166	324	560	1,123
			8.8		60	105	266	519	896	1,797
	Stainless steel R and high corrosion-resistant steel HCR		50		37	65	166	324	560	1,123
			70		52	92	232	454	784	1,573
			80		60	105	266	519	896	1,797
Partial safety factor $\gamma_{Ms,V}$	Steel, black, untreated or galvanised	Strength class	5.8	[-]	1.25					
			8.8		1.25					
	Stainless steel R and high corrosion-resistant steel HCR		50		2.38					
			70		1.56 / 1.25[1)]					
			80		1.33					
Concrete pry-out failure [2)]										
Factor			k_8	[-]	1.0 for $h_{ef,neu} < 60$ mm 2.0 for $h_{ef,neu} \geq 60$ mm					
Installation factor			γ_{inst}	[-]	1.0					
Concrete edge failure [2)]										
Effective anchor length for shear load			l_f	[mm]	$h_{ef,neu}$					
Effective diameter			d_{nom}	[mm]	10	12	16	20	24	30
Installation factor			γ_{inst}	[-]	1.0					

[1)] For HCR steel with f_{uk} = 700 N/mm² and f_{yk} = 560 N/mm²

[2)] In verifications in accordance with DIN EN 1992-4:2019-04, h_{ef} shall be replaced by $h_{ef,neu}$.

fischer FCC concrete connector for use in concrete members	**Annex 8**
Characteristic resistance in the concrete member to be fixed under shear load for FCC-B	

FCC-H

Table 9.1: Characteristic resistance in the concrete member to be fixed under tensile load for FCC-H

Size				**10**	**12**	**14**	**16**	**20**	**25**	**28**
Tension capacity, steel failure										
Characteristic tension capacity	$N_{Rk,s}$	All Materials	[kN]	43	62	85	111	173	270	339
Partial safety factor	$\gamma_{Ms,N}$		[-]	1.4						
Pull-out										
Characteristic tension capacity	in **cracked** concrete C20/25	$N_{Rk,p}$	[kN]	94	136	185	241	377	589	759
	in **uncracked** concrete C20/25			132	190	259	338	528	825	1,062
Increasing factors for $N_{Rk,p}$ = $\psi_c \cdot N_{Rk,p}$ (C20/25)	C25/30	Ψ_c	[-]	1.25						
	C30/37			1.50						
	C35/45			1.75						
	C40/50			2.00						
	C45/55			2.25						
	C50/60			2.50						
Installation factor		γ_{inst}	[-]	1.0						
Concrete pryout failure[1] and splitting[2]										
Effective embedment depth		$h_{ef,neu}$	[mm]	≥ 40						
Charact. edge distance		$c_{cr,N} = c_{cr,sp}$	[mm]	1.5 • $h_{ef,neu}$						
Charact. spacing		$s_{cr,N} = s_{cr,sp}$	[mm]	3.0 • $h_{ef,neu}$						
Installation factor		γ_{inst}	[-]	1.0						

[1] For verification of concrete pryout failure, see DIN EN 1992-4:2019-04, Clause 7.2.1.4 (h_{ef} shall be replaced by $h_{ef,neu}$).
[2] For verification of splitting, see DIN EN 1992-4:2019-04, Clause 7.2.1.7 (h_{ef} shall be replaced by $h_{ef,neu}$).

fischer FCC concrete connector for use in concrete members	**Annex 9**
Characteristic resistance in the concrete member to be fixed under tensile load for **FCC-H**	

FCC-H

Table 10.1: Characteristic resistance in the concrete member to be fixed under shear load for FCC-H

Size			**10**	**12**	**14**	**16**	**20**	**25**	**28**
Steel failure without lever arm									
Characteristic shear capacity $V^0_{Rk,s}$	Painting materials	[kN]	22	31	42	55	87	135	170
Partial safety factor $\gamma_{Ms,V}$	Painting materials	[-]	1.5						
Ductility factor	k_7	[-]	1.0						
Steel failure with lever arm									
Characteristic bending moment $M^0_{Rk,s}$	Painting materials	[Nm]	65	112	178	265	518	1,012	1,422
Partial safety factor $\gamma_{Ms,V}$	Painting materials	[-]	1.5						
Concrete pry-out failure [1)]									
Factor	k_8	[-]	1.0 for $h_{ef,neu} < 60$ mm 2.0 for $h_{ef,neu} \geq 60$ mm						
Installation factor	γ_{inst}	[-]	1.0						
Concrete edge failure [1)]									
Effective anchor length for shear load	l_f	[mm]	$h_{ef,neu}$						
Effective diameter	d_{nom}	[mm]	10	12	14	16	20	25	28
Installation factor	γ_{inst}	[-]	1.0						

[1)] In verifications in accordance with DIN EN 1992-4:2019-04, h_{ef} shall be replaced by $h_{ef,neu}$.

fischer FCC concrete connector for use in concrete members	**Annex 10**
Characteristic resistance in the concrete member to be fixed under shear load for FCC-H	

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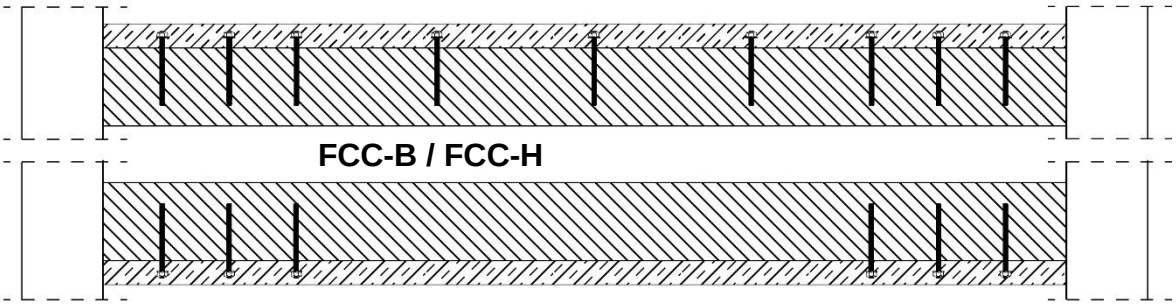
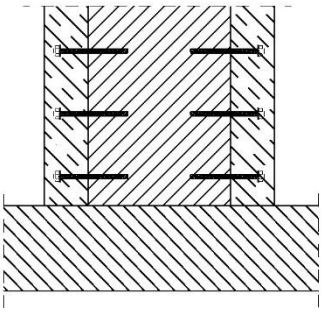
Ceilings



Walls, vaults, columns, pillars



FCC-B / FCC-H

fischer FCC concrete connector for use in concrete members	**Annex 11**
Application examples (schematic representations) part 1	

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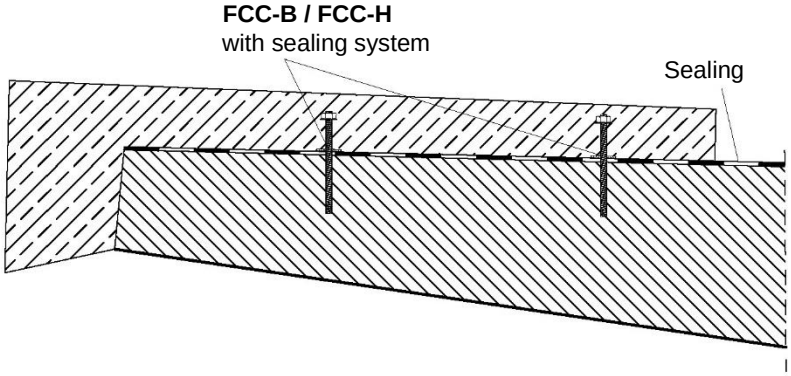
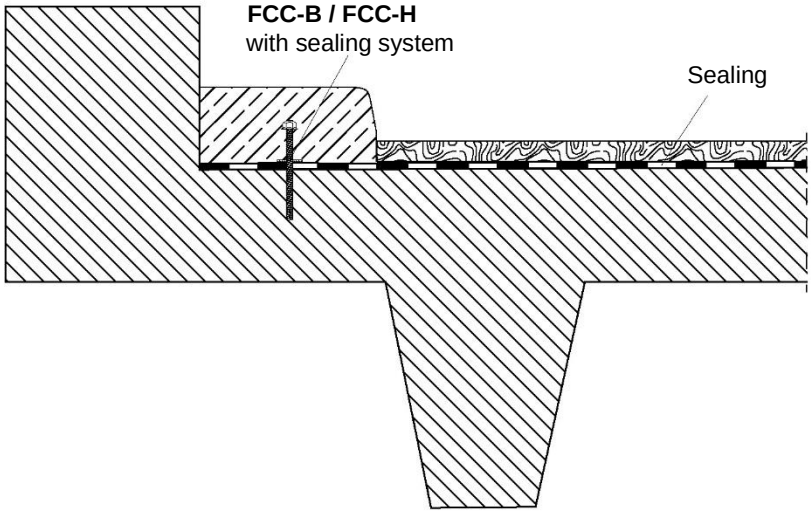
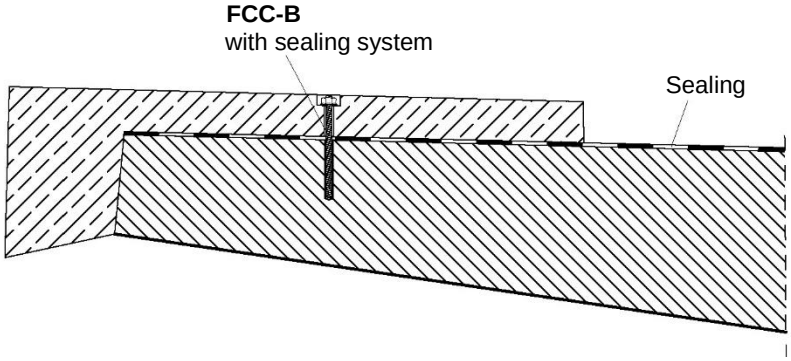
Connection between in-situ concrete caps / in-situ concrete edge beams and structures for road and rail transport



Connection between existing caps / prefabricated caps / existing edge beams and structures for road and rail transport



Connection between e.g. track cover slabs / track base plates / hump plates, ramps, platforms, plinths, sleepers and concrete base layers



fischer FCC concrete connector for use in concrete members	Annex 12
Application examples (schematic representations) part 2	