DÉCLARATION DES PERFORMANCES

DoP 0376

pour rail d'ancrage fischer FES avec vis spéciales fischer FBC (rail d'ancrage pour utilisation dans le béton) FR

1. Code d'identification unique du type de produit: **DoP 0376**

2. Usage(s) prévu(s): **Rails d'ancrage pour utilisations dans le béton fissuré et non fissuré, voir annexes, en particulier les annexes B1- B8.**

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

4. Mandataire: **–**

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

6. Document d'évaluation européen: **EAD 330008-04-0601, Edition 07/2024**
   Evaluation Technique Européenne: **ETA-18/0862; 2025-05-19**
   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):

1) Résistance à la rupture de l'acier de l'ancrage: Annexe C1
2) Résistance à la rupture de l'acier de la connexion entre l'ancrage et le rail: Annexe C1
3) Résistance à la rupture de l'acier des lèvres du rail et extraction glissement du boulon: Annexe C1
4) Résistance à la rupture de l'acier du boulon: Annexe C10
5) Résistance à la rupture de l'acier par dépassement de la résistance à la flexion du rail: Annexes A5, C2
6) Couple de serrage maxi. pour éviter les dommages lors de l'installation: Annexe B4
7) Résistance à l'extraction glissement de l'ancrage: Annexes C3,C4
8) Résistance à la rupture du cône béton: Annexes B3, C3, C4
9) Distance au bord, entraxe et épaisseur du support mini. pour éviter la rupture par fendage lors de l'installation: Annexes A5, B3
10) Distance au bord et entraxe caractéristiques pour éviter la rupture par fendage sous charge: Annexes C3, C4
11) Résistance à la rupture par éclatement- zone d'appui de la tête: Annexe A4

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

12) Résistance à la rupture de l'acier du boulon sous charge de cisaillement sans bras d levier: Annexe C10
13) Résistance à la rupture de l'acier par flexion du boulon sous charge de cisaillement sans bras d levier: Annexe C11
14) Résistance à la rupture de l'acier des lèvres du rail, à la rupture de l'acier de la connexion entre l'ancrage et le rail ou à la rupture de l'acier du rail d'ancrage (charge de cisaillement perpendiculaire au rail): Annexes C6, C7
15) Résistance à la rupture de l'acier de la connexion entre les lèvres du rail et le boulon (charge de cisaillement dans l'axe longitudinal du rail): Annexe C8
16) Coefficient de sécurité pour l'installation (Cisaillement longitudinal): Annexe C8
17) Résistance à la rupture de l'acier de l'ancrage (Cisaillement longitudinal): Annexes C6, C7
18) Résistance à la rupture de l'acier de la connexion entre ancrage et rail (charge de cisaillement dans l'axe longitudinal du rail): Annexes C6, C7
19) Résistance à la rupture par effet de levier : Annexe C8
20) Résistance à la rupture du béton en bord de dalle: Annexe C8

Résistance caractéristique sous charge combinée de traction et de cisaillement (charges statiques et quasi-statiques)

21) Résistance à la rupture de l'acier du rail d'ancrage: Annexe C9

Résistance caractéristique sous charge de fatigue sous sollicitation en traction:

22) Résistance à la fatigue jusqu'à la rupture de l'acier de l'ensemble du système (fonction continue ou trilinéaire,Méthode d'évaluation A1, A2):
23) Résistance limite à la fatigue de l'ensemble du système à la rupture de l'acier (Méthode d'évaluation B): NPD
24) Résistance à la fatigue jusqu'à la rupture de l'acier de l'ensemble du système (Fonction linéarisée,Méthode d'évaluation C): NPD
25) Résistance à la fatigue à la rupture du béton (fonction exponentielle, Méthode d'évaluation A1, A2): NPD
26) Résistance limite à la fatigue à la rupture du béton (Méthode d'évaluation B): NPD
27) Résistance à la fatigue à la rupture du béton (Fonction linéarisée, Méthode d'évaluation C): NPD

Résistance caractéristique sous charge sismique (catégorie de performance sismique C1)

28) Résistance à la rupture de l'acier sous charge sismique en traction (catégorie de performance sismique C1): Annexes C12, C14
29) Résistance à la rupture de l'acier sous charge sismique de cisaillement pour effort tranchant en direction transversale (catégorie de performance sismique C1): Annexes C13, C14
30) Résistance à la rupture de l'acier sous charge sismique de cisaillement pour effort tranchant selon l'axe longitudinal du canal (catégorie de performance sismique C1): Annexe C13

Résistance caractéristique sous charge de traction et/ou de cisaillement statique et quasi-statique

31) Déplacements: Annexes C5, C9

Sécurité en cas d'incendie (BWR 2)

32) Réaction au feu: Classe (A1)

33) Résistance au feu: Annexes C15, C16

Durabilité:

34) Durabilité: Annexes A7, B1

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. Ronald Mihala, Director general de Investigación y Desarrollo

Dieter Pfaff, Chef de la Fédération Internationale de Production et Gestion de la Qualité

Tumlingen, 2025-06-02

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).

Translation guidance Essential Characteristics and Performance Parameters for Annexes

Guide de traduction des caractéristiques essentielles et des paramètres de performance pour les annexes

Mechanical resistance and stability (BWR 1) **Résistance mécanique et stabilité (BWR 1)**		
Characteristic resistance to tension load (static and quasi-static loading): **Résistance caractéristique à la charge de traction (charge statique et quasi-statique):**		
1	Resistance to steel failure of anchors: **Résistance à la rupture de l'acier de l'ancrage:**	$N_{Rk,s,a}$
2	Resistance to steel failure of the connection between anchors and channel: **Résistance à la rupture de l'acier de la connexion entre l'ancrage et le rail:**	$N_{Rk,s,c}$
3	Resistance to steel failure of channel lips and sunsequently pullout of channel bolt: **Résistance à la rupture de l'acier des lèvres du rail et extraction glissement du boulon:**	$N^0_{Rk,s,l}$; $s_{l,N}$
4	Resistance to steel failure of channel bolt: **Résistance à la rupture de l'acier du boulon:**	$N_{Rk,s}$
5	Resistance to steel failure by exceeding the bending strength of the channel: **Résistance à la rupture de l'acier par dépassement de la résistance à la flexion du rail:**	$M_{Rk,s,flex}$; s_{max}
6	Maximum installation torque moment to avoid damage during installation: **Couple de serrage maxi. pour éviter les dommages lors de l'installation:**	$T_{inst,g}$; ($T_{inst,s}$)
7	Resistance to pull-out failure of the anchor: **Résistance à l'extraction glissement de l'ancrage:**	$N_{Rk,p}$
8	Resistance to concrete cone failure: **Résistance à la rupture du cône béton:**	$k_{cr,N}$; $k_{ucr,N}$; h_{ef}
9	Minimum edge distance, spacing, member thickness to prevent concrete splitting during installation: **Distance au bord, entraxe et épaisseur du support mini. pour éviter la rupture par fendage lors de l'installation:**	$s_{min;}$ $c_{min;}$ h_{min}
10	Characteristic edge distance and spacing to avoid splitting of concrete under load: **Distance au bord et entraxe caractéristiques pour éviter la rupture par fendage sous charge:**	$s_{cr,sp}$; $c_{cr,sp}$
11	Resistance to blowout failure- bearing area of head: **Résistance à la rupture par éclatement- zone d'appui de la tête:**	A_h
Characteristic resistance to shear load (static and quasi-static loading): **Résistance caractéristique à la charge de cisaillement (charge statique et quasi-statique):**		
12	Resistance to steel failure of channel bolt under shear loading without lever arm: **Résistance à la rupture de l'acier du boulon sous charge de cisaillement sans bras d levier:**	$V_{Rk,s}$
13	Resistance to steel failure by bending of the channel bolt under shear load with lever arm: **Résistance à la rupture de l'acier par flexion du boulon sous charge de cisaillement sans bras d levier:**	$M^0_{Rk,s}$
14	Resistance to steel failure of channel lips, steel failure of connection between anchor and channel or steel failure of anchor (shear load in transverse direction): **Résistance à la rupture de l'acier des lèvres du rail, à la rupture de l'acier de la connexion entre l'ancrage et le rail ou à la rupture de l'acier du rail d'ancrage (charge de cisaillement perpendiculaire au rail):**	$V^0_{Rk,s,l,y}$; $s_{l,V}$; $V_{Rk,s,c,y}$; $V_{Rk,s,a,y}$
15	Resistance to steel failure of connection between channel lips and channel bolt (shear load in longitudinal channel axis): **Résistance à la rupture de l'acier de la connexion entre les lèvres du rail et le boulon (charge de cisaillement dans l'axe longitudinal du rail):**	$V_{Rk,s,l,x}$
16	Factor for sensistivity to installation: **Coefficient de sécurité pour l'installation (Cisaillement longitudinal):**	γ_{inst}
17	Resistance to steel failure of the anchor: **Résistance à la rupture de l'acier de l'ancrage (Cisaillement longitudinal):**	$V_{Rk,s,a,x}$
18	Resistance to steel failure of connection between anchor and channel (shear load in longitudinal channel axis): **Résistance à la rupture de l'acier de la connexion entre ancrage et rail (charge de cisaillement dans l'axe longitudinal du rail):**	$V_{Rk,s,c,x}$
19	Resistance to concrete pry-out failure: **Résistance à la rupture par effet de levier :**	k_8
20	Resistance to concrete edge failure: **Résistance à la rupture du béton en bord de dalle:**	$k_{cr,V}$; $k_{ucr,V}$
Characteristic resistance under combined static and quasi-static tension and shear loading **Résistance caractéristique sous charge combinée de traction et de cisaillement (charges statiques et quasi-statiques)**		
21	Resistance to steel failure of the anchor channel: **Résistance à la rupture de l'acier du rail d'ancrage:**	k_{13}, k_{14}
Characteristic resistance under fatigue tension loading: **Résistance caractéristique sous charge de fatigue sous sollicitation en traction:**		
22	Fatigue resistance to steel failure of the whole system (continuous or tri-linear function): **Résistance à la fatigue jusqu'à la rupture de l'acier de l'ensemble du système (fonction continue ou trilinéaire,Méthode d'évaluation A1, A2):**	$\Delta N_{Rk,s,0,n}$ (n=1 to n=∞)
23	Fatigue limit resistance to steel failure of the whole system: **Résistance limite à la fatigue de l'ensemble du système à la rupture de l'acier (Méthode d'évaluation B):**	$\Delta N_{Rk,s,0,\infty}$
24	Fatigue resistance to steel failure of the whole system (linearized function,assessment method C): **Résistance à la fatigue jusqu'à la rupture de l'acier de l'ensemble du système (Fonction linéarisée,Méthode d'évaluation C):**	$\Delta N_{Rk,s,l0,n}$; $N_{lok,s,n}$ (n=10^4 to n=∞)
25	Fatigue resistance to concrete related failure (exponential function): **Résistance à la fatigue à la rupture du béton (fonction exponentielle, Méthode d'évaluation A1, A2):**	$\Delta N_{Rk,c,0,n}$; $\Delta N_{Rk,p,0,n}$ (n=1 to n=∞)
26	Fatigue limit resistance to concrete related failure: **Résistance limite à la fatigue à la rupture du béton (Méthode d'évaluation B):**	$\Delta N_{Rk,c,0,\infty}$; $\Delta N_{Rk,p,0,\infty}$
27	Fatigue resistance to concrete related failure (linearized function, assessment method C): **Résistance à la fatigue à la rupture du béton (Fonction linéarisée, Méthode d'évaluation C):**	$\Delta N_{Rk,c,E,n}$; $N_{Rk,p,E,n}$ (n=10^4 to n=∞)

Characteristic resistance under seismic loading (seismic performance category C1) **Résistance caractéristique sous charge sismique (catégorie de performance sismique C1)**		
28	Resistance to steel failure under seismic tension loading (seismic performance category C1): **Résistance à la rupture de l'acier sous charge sismique en traction (catégorie de performance sismique C1):**	$N_{Rk,s,a,eq}$; $N_{Rk,s,c,eq}$; $N^0_{Rk,s,l,eq}$; $N_{Rk,s,eq}$; $M_{Rk,s,flex,eq}$
29	Resistance to steel failure under seismic shear loading for shear load in transverse direction (seismic performance category C1): **Résistance à la rupture de l'acier sous charge sismique de cisaillement pour effort tranchant en direction transversale (catégorie de performance sismique C1):**	$V_{Rk,s,eq}$; $V^0_{Rk,s,l,y,eq}$; $V_{Rk,s,c,y,eq}$; $V_{Rk,s,a,y,eq}$
30	Resistance to steel failure under seismic shear loading for shear load in longitudinal channel axis (seismic performance category C1): **Résistance à la rupture de l'acier sous charge sismique de cisaillement pour effort tranchant selon l'axe longitudinal du canal (catégorie de performance sismique C1):**	$V_{Rk,s,l,x,eq}$; $V_{Rk,s,a,x,eq}$; $V_{Rk,s,c,x,eq}$
Characteristic resistance under static and quasi-static tension and / or shear loading: **Résistance caractéristique sous charge de traction et/ou de cisaillement statique et quasi-statique**		
31	Displacements: **Déplacements:**	δ_{N0}; $\delta_{N\infty}$; $\delta_{V,y,0}$; $\delta_{V,y,\infty}$ $\delta_{V,x,0}$; $\delta_{V,x,\infty}$
Safety in case of fire (BWR 2) **Sécurité en cas d'incendie (BWR 2)**		
32	Reaction to fire: **Réaction au feu:**	Class
33	Resistance to fire: **Résistance au feu:**	$N_{Rk,s,fi}$; $V_{Rk,y,s,fi}$, $c_{min,fi}$; $s_{min,fi}$
Durability: **Durabilité:**		
34	Durability: **Durabilité:**	Description

Specific Part

1 Technical description of the product

The fischer Anchor Channel FES with fischer Channel Bolts FBC is a system consisting of a C-shaped channel profile of steel and at least two metal anchors non-detachably fixed on the channel back and fischer Channel Bolts.

The anchor channel is embedded surface-flush in the concrete. fischer Channel Bolts with appropriate hexagonal nuts and washers are fixed to the channel.

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 channel 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 channel 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 tension load (static and quasi-static loading)	
- Resistance to steel failure of anchors	$N_{Rk,s,a}$ see Annex C1
- Resistance to steel failure of the connection between anchors and channel	$N_{Rk,s,c}$ see Annex C1
- Resistance to steel failure of channel lips and subsequently pull-out of channel bolt	$N^{0}_{Rk,s,l}$; $s_{l,N}$ see Annex C1
- Resistance to steel failure of channel bolt	$N_{Rk,s}$ see Annex C10
- Resistance to steel failure by exceeding the bending strength of the channel	s_{max} see Annex A5 $M_{Rk,s,flex}$ see Annex C2
- Maximum installation torque to avoid damage during installation	$T_{inst,g}$; $T_{inst,s}$ see Annex B4
- Resistance to pull-out failure of the anchor	$N_{Rk,p}$ see Annex C3 and C4
- Resistance to concrete cone failure	h_{ef} see Annex B3 $k_{cr,N}$; $k_{ucr,N}$ see Annex C3 and C4
- Minimum edge distances, spacing and member thickness to avoid concrete splitting during installation	s_{min} see Annex A5 c_{min} ; h_{min} see Annex B3
- Characteristic edge distance and spacing to avoid splitting of concrete under load	$s_{cr,sp}$; $c_{cr,sp}$ see Annex C3 and C4
- Resistance to blowout failure - bearing area of anchor head	A_h see Annex A4

Essential characteristic	Performance
Characteristic resistance under shear load (static and quasi-static loading)	
- Resistance to steel failure of channel bolt under shear loading without lever arm	$V_{Rk,s}$ see Annex C10
- Resistance to steel failure by bending of the channel bolt under shear load with lever arm	$M^{0}_{Rk,s}$ see Annex C11
- Resistance to steel failure of channel lips, steel failure of connection between anchor and channel and steel failure of anchor (shear load in transverse direction)	$V^{0}_{Rk,s,l,y}$; $s_{l,V}$; $V_{Rk,s,c,y}$; $V_{Rk,s,a,y}$ see Annex C6 and C7
- Resistance to steel failure of connection between channel lips and channel bolt (longitudinal shear)	$V_{Rk,s,l,x}$ see Annex C8
- Factor for sensitivity to installation (longitudinal shear)	γ_{inst} see Annex C8
- Resistance to steel failure of the anchor (longitudinal shear)	$V_{Rk,s,a,x}$ see Annex C6 and C7
- Resistance to steel failure of connection between anchor and channel (longitudinal shear)	$V_{Rk,s,c,x}$ see Annex C6 and C7
- Resistance to concrete pry-out failure	k_8 see Annex C8
- Resistance to concrete edge failure	$k_{cr,V}$; $k_{ucr,V}$ see Annex C8
Characteristic resistance under combined tension and shear load (static and quasi-static load)	
- Resistance to steel failure of the anchor channel	k_{13} ; k_{14} see Annex C9
Characteristic resistance under fatigue tension loading	
- Fatigue resistance to steel failure of the whole system (continuous or tri-linear function, assessment method A1, A2)	No Performance assessed
- Fatigue limit resistance to steel failure of the whole system (assessment method B)	No Performance assessed
- Fatigue resistance to steel failure of the whole system (linearized function, assessment method C)	No performance assessed
- Fatigue resistance to concrete related failure (exponential function, assessment method A1, A2)	No Performance assessed
- Fatigue limit resistance to concrete related failure (assessment method B)	No Performance assessed
- Fatigue resistance to concrete related failure (linearized function, assessment method C)	No performance assessed

Essential characteristic	Performance
Characteristic resistance under seismic loading (seismic performance category C1)	
Resistance to steel failure under seismic tension loading (seismic performance category C1)	$N_{Rk,s,a.eq}$; $N_{Rk,s,c.eq}$; $N^0{}_{Rk,s,l.eq}$; $M_{Rk,s,flex.eq}$ see Annex C12 $N_{Rk,s.eq}$ see Annex C14
Resistance to steel failure under seismic shear loading for shear load in transverse direction (seismic performance category C1)	$V_{Rk,s.eq}$ see Annex C14 $V^0{}_{Rk,s,l,y.eq}$; $V_{Rk,s,c,y.eq}$; $V_{Rk,s,a,y.eq}$ see Annex C13
Resistance to steel failure under seismic shear loading for shear load in longitudinal channel axis (seismic performance category C1)	$V_{Rk,s,l,x.eq}$; $V_{Rk,s,a,x.eq}$; $V_{Rk,s,c,x.eq}$ see Annex C13
Characteristic resistance under static and quasi-static tension and/or shear loading	
Displacements	δ_{N0} ; $\delta_{N\infty}$ see Annex C5 $\delta_{V,y,0}$; $\delta_{V,y,\infty}$; $\delta_{V,x,0}$; $\delta_{V,x,\infty}$ see Annex C9

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Characteristic resistance to fire	$N_{Rk,s,fi}$;$V_{Rk,s,y,fi}$ see Annex C15

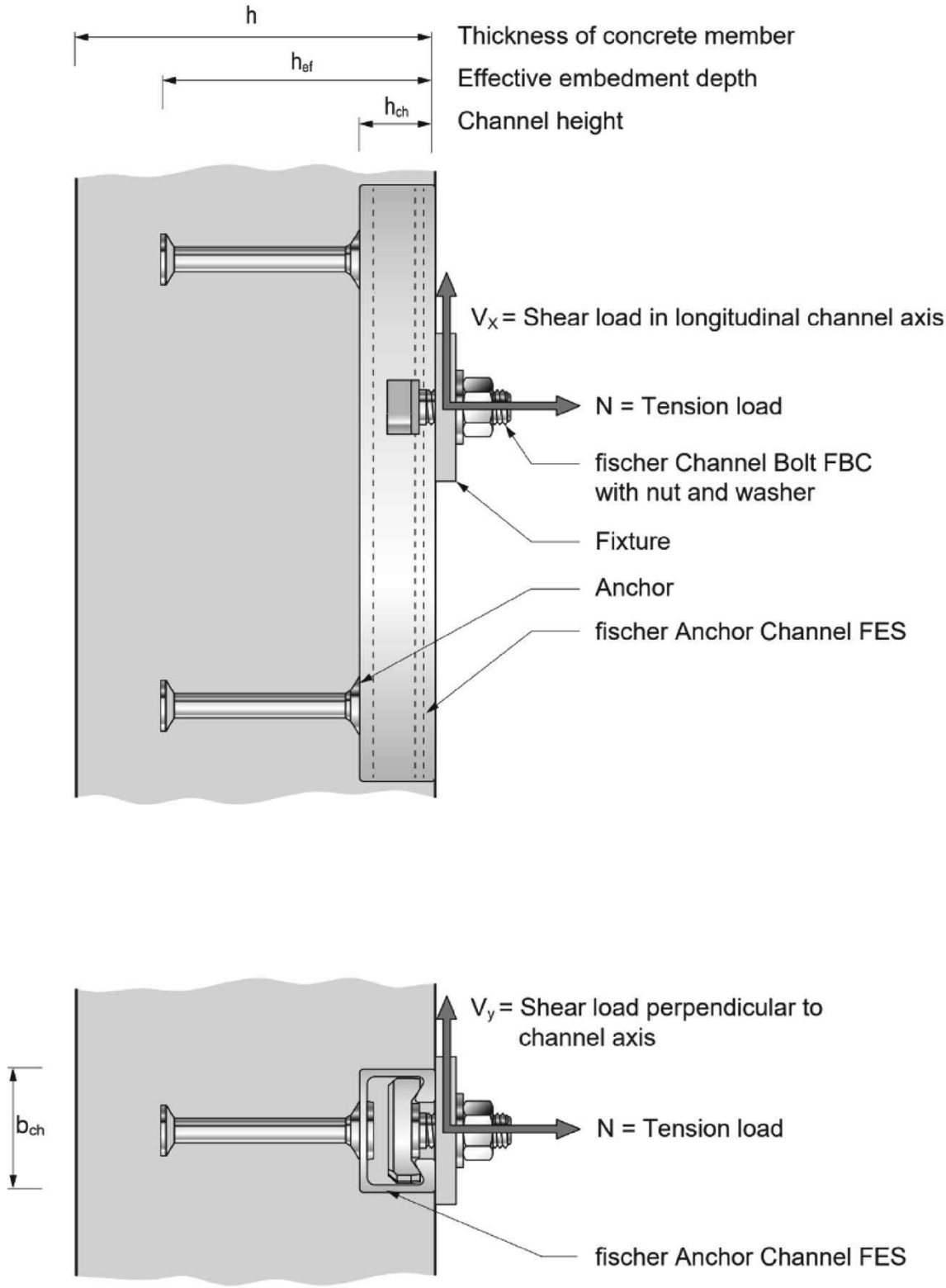
3.3 Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

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

In accordance with EAD No. 330008-04-0601, the applicable European legal act is: [2000/273/EC].

The system to be applied is: 1



fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Installed condition

Annex A1

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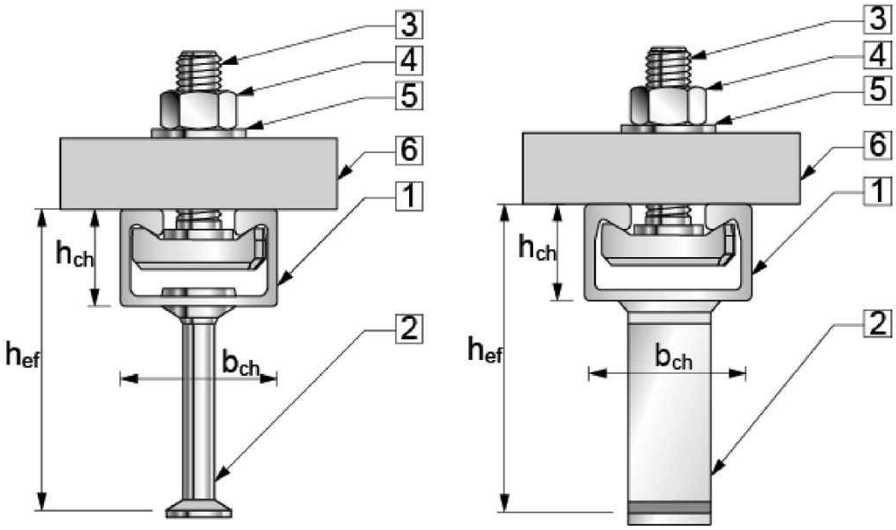


Fischer Anchor channel FES with fischer Channel Bolt FBC:
1 Channel profile
2 Anchor
3 Channel bolt
4 Hexagonal nut
5 Washer
6 Fixture

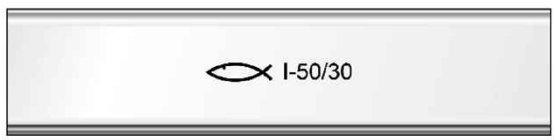
Round Anchor

I-Anchor

Marking of the fischer anchor channel FES:

e.g.: I-50/30

	= Identifying mark of the manufacturer
I	= Additional marking for I-anchors No marking for round anchors
50/30(-P)	= Anchor channel size (29/20; 38/23; 40/22; 50/30; 52/34, 28/15; 38/17; 40/25; 49/30; 54/33)
P	= Additional marking for P-version

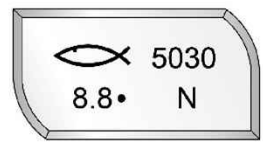


Stamped into back of channel
Optional: printed on channel web or channel lips
H = Hot rolled channel, C = Cold formed channel
No marking for material acc. Annex A7 Table A7.1 (Channel profile)

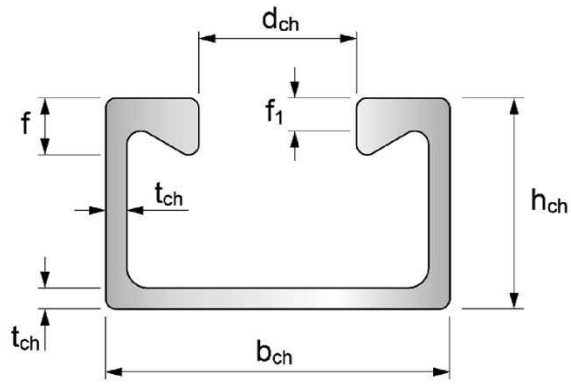
Marking of the fischer channel bolt FBC:

e.g.: 5030 8.8 N

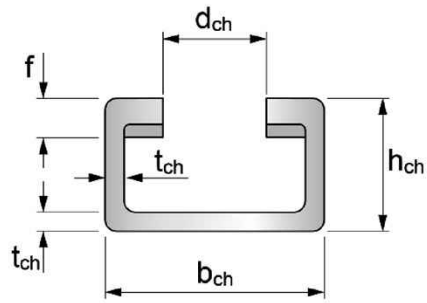
	= Identifying mark of the manufacturer
5030	= Size of channel bolt
8.8	= Steel grade
A4-70	= Stainless steel
N	= Notching channel bolt (if applicable)
●	= Electroplated No marking for hot-dip galvanised



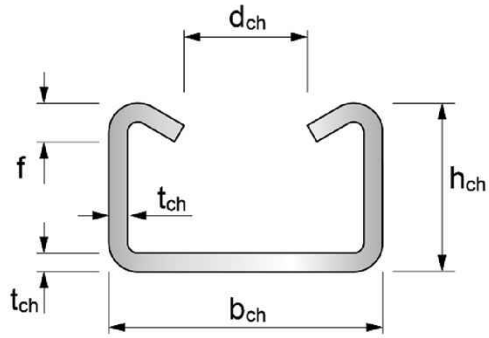
Additional marking of channel bolt (smooth, serrated, notching channel bolt head) according to Annex A6 at the top of thread.



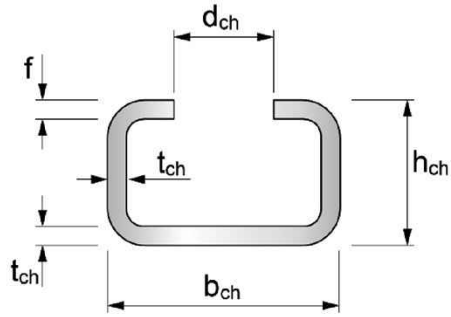
FES-H-(I-)-40/22(-P), -50/30(-P), -52/34



FES-H-S-29/20, -38/23 (serrated)



FES-C-40/25, -49/30, -54/33



FES-C-28/15, -38/17

Table A3.1: Dimensions of hot-rolled and cold-formed channel profile (steel and stainless steel)

Anchor Channel FES-	Material	b_{ch} [mm]	h_{ch} [mm]	t_{ch} [mm]	d_{ch} [mm]	f [mm]	f_1 [mm]	I_y [mm^4]
C-28/15	Steel	28,0	15,5	2,3	12,0	2,3	-[1)]	4.280
C-38/17	Steel	38,0	17,3	3,0	18,0	3,0	-[1)]	8.240
C-40/25	Steel	40,0	25,0	2,8	18,0	6,0	-[1)]	20.340
C-49/30	Steel	50,0	30,0	3,3	22,0	7,0	-[1)]	43.080
C-54/33	Steel	54,0	33,0	5,0	22,0	8,5	-[1)]	74.090
H-S-29/20	Steel	30,0	20,0	3,0	14,0	5,2	-[1)]	11.150
H-S-38/23	Steel/ Stainless steel	38,0	23,0	3,3	18,0	6,0	-[1)]	21.070
H-(I-)40/22(-P)	Steel	40,0	23,5	2,6	18,0	6,2	3,6	21.660
H-(I-)50/30(-P)	Steel	50,0	30,0	3,0	22,5	8,1	5,5	54.960
H-(I-)52/34	Steel	52,5	34,0	4,0	22,5	11,5	8,3	96.330

[1)] This dimension is not available for this product.

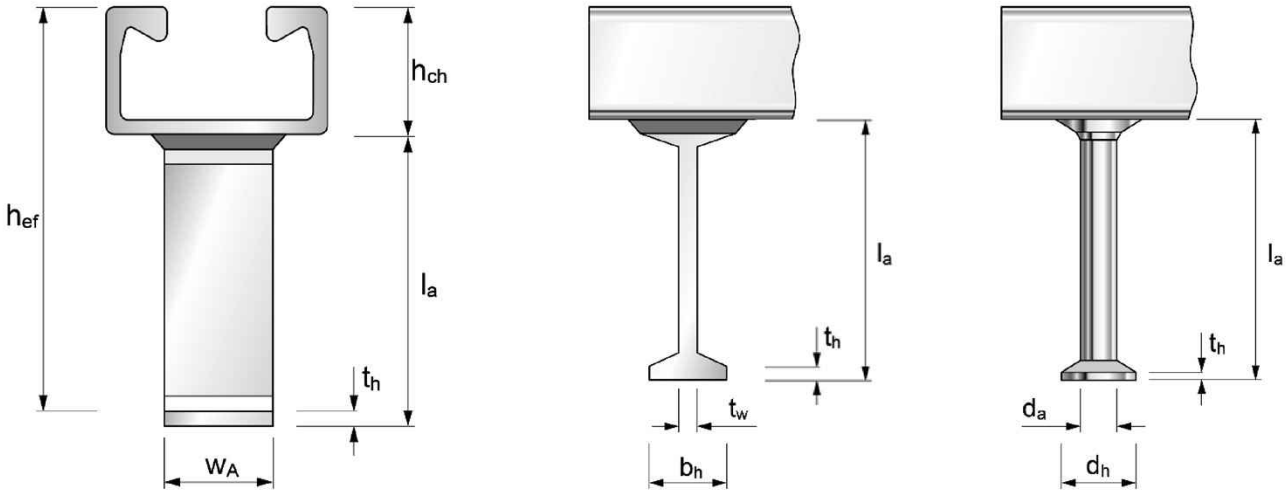


Table A.4.1: Dimensions of anchor (welded I-anchor or forged round anchor)

Anchor Channel FES -	I-anchor						Round anchor				
	$l_{a,min}$ [mm]	$t_{w,min}$ [mm]	$b_{h,min}$ [mm]	t_h [mm]	w_A [mm]	$A_{h,min}$ [mm²]	$l_{a,min}$ [mm]	d_a [mm]	d_h [mm]	t_h [mm]	A_h [mm²]
C-28/15	- [2]						31,0	6	12,0	1,3	85
C-38/17	- [2]						60,8	8	16,0	2,0	151
C-40/25	- [2]						56,0	8	16,0	2,0	151
C-49/30	- [2]						66,0	10	20,0	2,2	236
C-54/33	- [2]						124,5	11	24,3	2,5	369
H-S-29/20 [1]	- [2]						59,5	8	18,0	2,0	204
H-S-38/23	- [2]						76,2	10	20,0	2,2	236
H-(I-)40/22	62	5	20	5	20	300	68,5	8	16,0	2,0	151
H-40/22-P	- [2]						69,7	10	20,0	2,2	236
H-(I-)50/30	69	5	20	5	25	375	66,2	10	20,0	2,2	236
H-50/30-P	- [2]						78,5	11	24,3	2,5	369
H-(I-)52/34 [3]	126	5	20	5	40	600	123,5	11	24,3	2,5	369

[1] Alternative round anchor: d_a = 10 mm, d_h = 20 mm, t_h = 2,5 mm, A_h = 236 mm², $l_{a,min}$ = 59,5 mm.
[2] Product not available.
[3] Alternative I-anchor: t_w = 6 mm, b_h = 25 mm, t_h = 5 mm, w_A = 40 mm, l_{amin} = 126 mm.

Table A5.1: Dimensions of Anchor Channels FES

Anchor channel FES-	Anchor type	s_{min} [mm]	s_{max} [mm]	x_{min} [mm]	x_{max} [mm]	l_{min} [mm]	l_{max} [mm]
C-28/15	round	50	200	25	35	100	6.070
C-38/17							
C-40/25			250				
C-49/30		100				150	
C-54/33							
H-S-29/20		50	200			100	
H-S-38/23		100	250			150	
H-(I-)40/22(-P)	round or I						
H-(I-)50/30	round or I						
H-I-52/34	I						
H-50/30-P H-52/34	round			35		170	

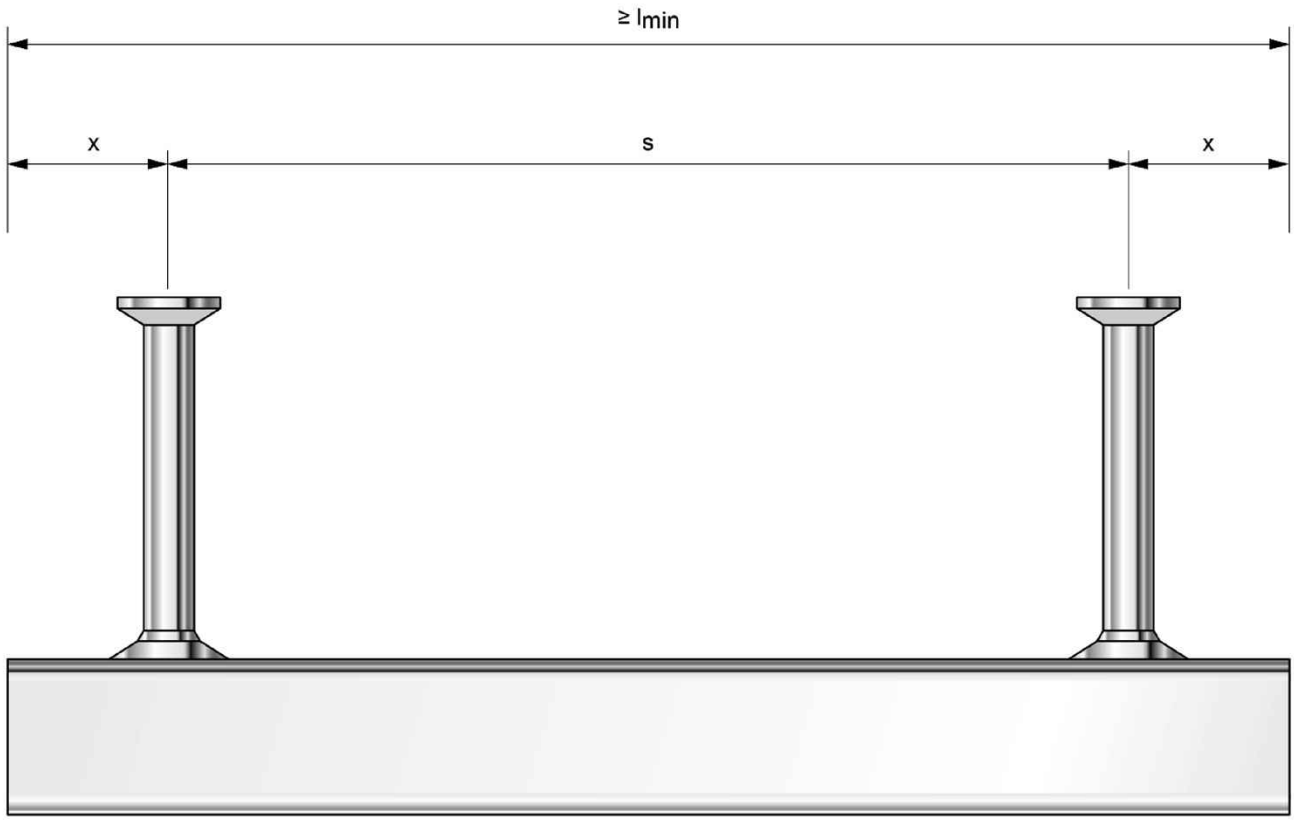


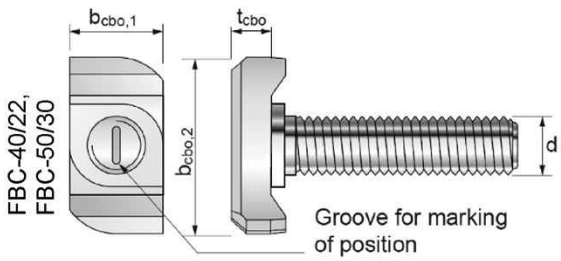
Table A6.1: Steel grade and coating

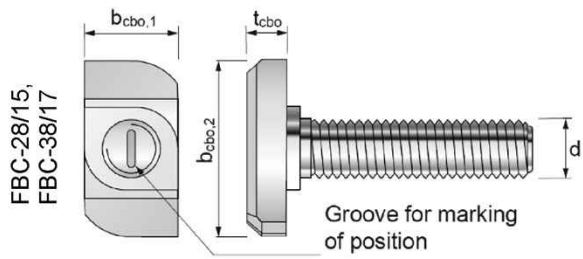
Channel Bolt	Carbon steel [1)]	Stainless steel[1)]
Steel grade	8.8	A4-70
f_{uk} [N/mm²]	800 / 830	700
f_{yk} [N/mm²]	640 / 660 [2)]	450
Coating	G [3)] F [4)]	-

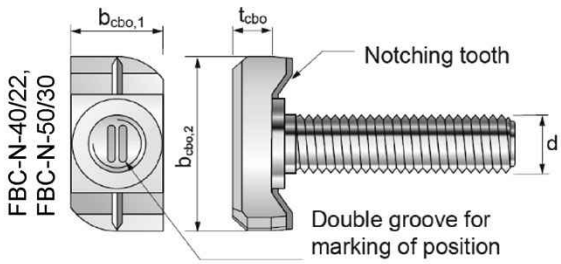
[1)] Material properties according to Annex A7.
[2)] Material properties according to EN ISO 898-1:2013+AC:2013.
[3)] Electroplated.
[4)] Hot-dip galvanised.

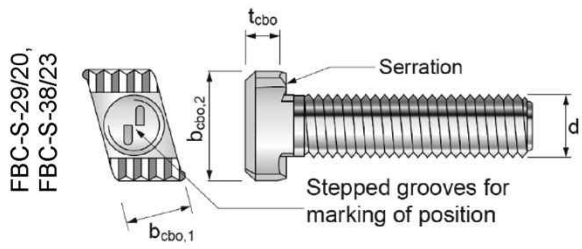
Table A6.2: Dimensions of fischer Channel Bolts FBC

Anchor Channel FES-	Channel Bolt FBC-	Steel grade	Dimensions			
			d [mm]	$b_{cbo,1}$ [mm]	$b_{cbo,2}$ [mm]	t_{cbo} [mm]
C-28/15	28/15	8.8	8 10 12	11,0	22,2	5,0 5,0 7,0
C-38/17	38/17	8.8	10 12 16	16,0	30,0	6,0 7,0 8,0
H-S-29/20	S-29/20	8.8	12	13,0	22,0	6,5
H-S-38/23 C-38/17	S-38/23	8.8 A4-70	12 16	16,7	29,1	5,8
H(-I)-40/22(-P) C-40/25	40/22	8.8	10	14,0	32,5	8,0
		8.8 A4-70	12 16	14,0 17,0		
H(-I)-40/22(-P)	N-40/22	8.8	16	17,0	33,0	7,8
C-49/30 H(-I)-50/30 C-54/33 H(-I)-52/34	50/30	8.8	10	17,1	40,5	9,0
		8.8 A4-70	12 16 20	17,1 17,1 20,5		10,0 11,0 12,0
H(-I)-50/30(-P) H(-I)-52/34	N-50/30	8.8	16 20	17,5 21,0	42,2	12,0 12,0









fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Channel bolts

Annex A6

Appendix 9 / 34

Table A7.1: Materials and properties

Component	Carbon steel			Stainless steel
	Mechanical properties	Coating	Coating	Mechanical properties
1	2	2a	2b	3
Channel profile	1.0038, 1.0044 acc. to EN 10025:2004 1.0976, 1.0979 acc. to EN 10149:2013	Hot-dip galvanised ≥ 50 µm acc. to EN ISO 1461:2022		1.4401, 1.4404, 1.4571, 1.4578 according to EN 10088: 2023
Anchor	1.0038, 1.0213, 1.0214 acc. to EN 10025:2004 1.5525, 1.5535 acc. to EN 10263:2017 1.5523 acc. to EN 10269:2014-02	Hot-dip galvanised ≥ 50 µm acc. to EN ISO 1461:2022		1.4401, 1.4404, 1.4571, 1.4578 according to EN 10088: 2023
Channel bolt	Steel grade 8.8 acc. to EN ISO 898-1:2013 +AC:2013	Electroplated acc. to EN ISO 4042:2022	Hot-dip galvanised ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009	Steel grade 70 according to EN ISO 3506-1: 2020
Plain washer [1] acc. to EN ISO 7089:2000 and EN ISO 7093-1:2000	Hardness class A ≥ 200 HV	Electroplated acc. to EN ISO 4042:2022	Hot-dip galvanised ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009	1.4401, 1.4404, 1.4571; 1.4578 according to EN 10088: 2023
Hexagonal nut acc. to EN ISO 4032:2023	Property class 5 or 8 acc. to EN ISO 898-2:2022	Electroplated acc. to EN ISO 4042:2022	Hot-dip galvanised ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009	Property class 70 or 80 according to EN ISO 3506-2: 2020

[1] Not in the scope of delivery.

Specification of intended use

Anchor channels and channel bolts subject to:

- Static and quasi-static tension, shear perpendicular to the longitudinal axis of the channel
- Static and quasi-static shear in the direction of the longitudinal axis of the channel.
  (anchor channels FES-H(-I)-40/22(-P) with notching channel bolts FBC-N-40/22, anchor channels FES-H(-I)-50/30(-P) or FES-H(-I)-52/34 with notching channel bolts FBC-N-50/30 and serrated anchor channels FES-H-S in combination with serrated channel bolts FBC-S).
- Seismic tension, seismic shear perpendicular to the longitudinal axis of the channel and seismic shear in the direction of the longitudinal axis of the channel (seismic performance category C1)
  (anchor channels and channel bolts according to Annex C12).
- Fire exposure for concrete strength class C20/25 to C50/60 for tension and shear perpendicular to the longitudinal axis of the channel
  (anchor channels and channel bolts according to Annex C15).

Base materials:

- Reinforced or unreinforced compacted normal weight concrete without fibres according to EN 206:2013+A2:2021.
- Strength classes C12/15 to C90/105 according to EN 206:2013+A2:2021.
- Cracked or uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (anchor channels and channel bolts according to Annex A7, Table A7.1, column 2a and 2b, 3).
- Structures subject to internal conditions with usual humidity (e.g. kitchens, bathrooms and laundries in residential buildings, exceptional permanent damp conditions and application under water)
  (anchor channels and channel bolts according to Annex A7, Table A7.1, column 2b, 3).
- According to EN 1993-1-4:2006 +A1:2015+A2:2020 relating to corrosion resistance class CRC III
  (anchor channels, channel bolts, washers and nuts made of stainless steel according to Annex A7, Table A7.1, column 3).

Design:

- Anchor channels 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 loads to be anchored. The position of the anchor channel and channel bolts are indicated on the design drawings (e.g. position of the anchor channel relative to the reinforcement or to supports).
- For static and quasi-static loading as well as seismic loading (performance category C1) and fire exposure the anchor channels are designed in accordance with EN 1992-4:2018 and EOTA TR 047 “Design of Anchor Channels”, May 2021.
- The characteristic resistances are calculated with the minimum effective embedment depth.

Installation:

- The installation of anchor channels is carried out by appropriately qualified personnel under the supervision of the person responsible for the technical matters on site.
- Use of the anchor channels only as supplied by the manufacturer - without any manipulations, repositioning or exchanging of channel components.
- Cutting of anchor channels is allowed only if pieces according to Annex A5, Table A5.1 are generated including end spacing x and minimum channel length l_{min} and only to be used in dry internal conditions. For anchor channels made of stainless steel there are no restrictions regarding corrosion resistance when using channel pieces, if cutting is done professionally and contamination of cutting edges with corroding material is avoided.
- Installation in accordance with the installation instruction given in Annexes B5, B6, B7 or B8.
- The anchor channels are fixed on the formwork, reinforcement or auxiliary construction such that no movement of the channels will occur during the time of laying the reinforcement and of placing and compacting the concrete.
- The concrete around the head of the anchors is properly compacted. The channels are protected from penetration of concrete into the internal space of the channels.
- Washers may be chosen according to Annex A7 and provided separately by the user.
- Orientating the channel bolt (groove according to Annex B6, B7 and B8) rectangular to the channel axis.
- The required installation torque given in Annex B4 must be applied and must not be exceeded.
- Notching channel bolts FBC-N may be used only once after applying the installation torque $T_{inst,s}$.

Table B3.1: Installation parameters

Anchor Channel FES-			C-28/15	C-38/17	H-S-29/20	H-S-38/23	C-40/25 H-40/22 H-40/22-P H-I-40/22	C-49/30 H-50/30 H-50/30-P H-I-50/30	C-54/33 H-52/34 H-I-52/34
Minimum effective embedment depth	$h_{ef,min}$	[mm]	45	76	77	97	79 90 91 79	94 94 106 94	155 155 155
Minimum edge distance	c_{min}		40	50	50	75	50 50 50 50	75 75 75 75	100 100 100
Minimum thickness of concrete member	h_{min} 1)		55	87 2)	120 3)	100	90 100 100 100	100 100 109 100	160 160 170

1) For corrosion protection: $h_{min} = h_{ef} + t_h + c_{nom}$; c_{nom} acc. to EN 1992-1-1:2004 + AC:2010.

2) h_{min} = 100 mm for FES-C-38/17 in combination with FBC-S-38/23.

3) h_{min} = 100 mm if c_{min} = 100 mm and s_{min} = 100 mm.

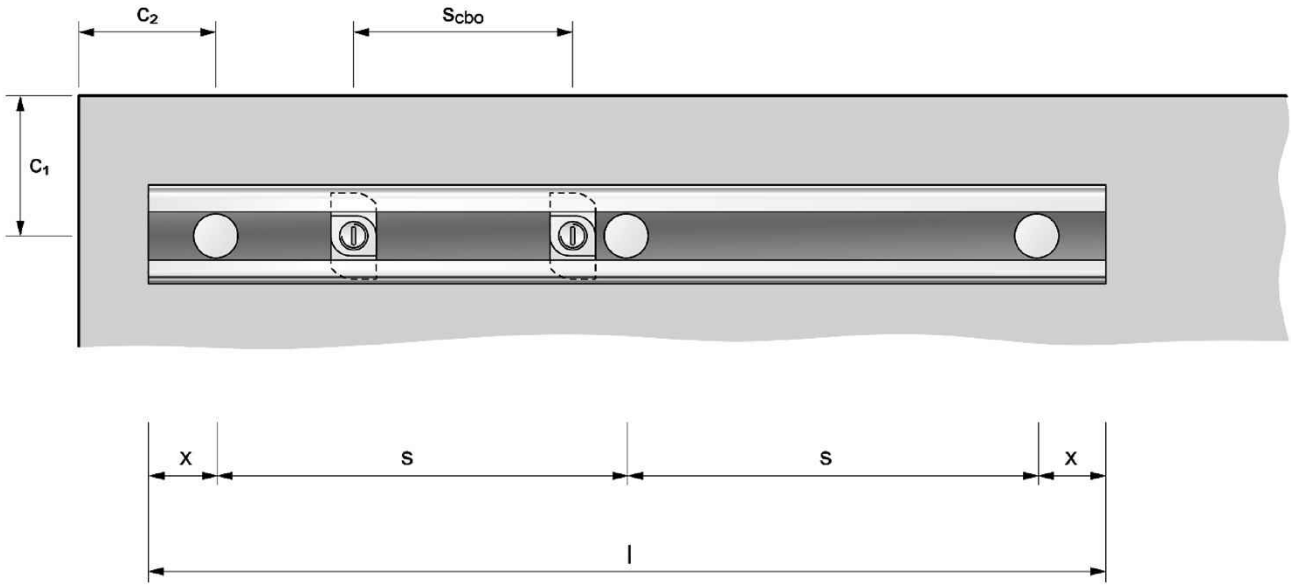


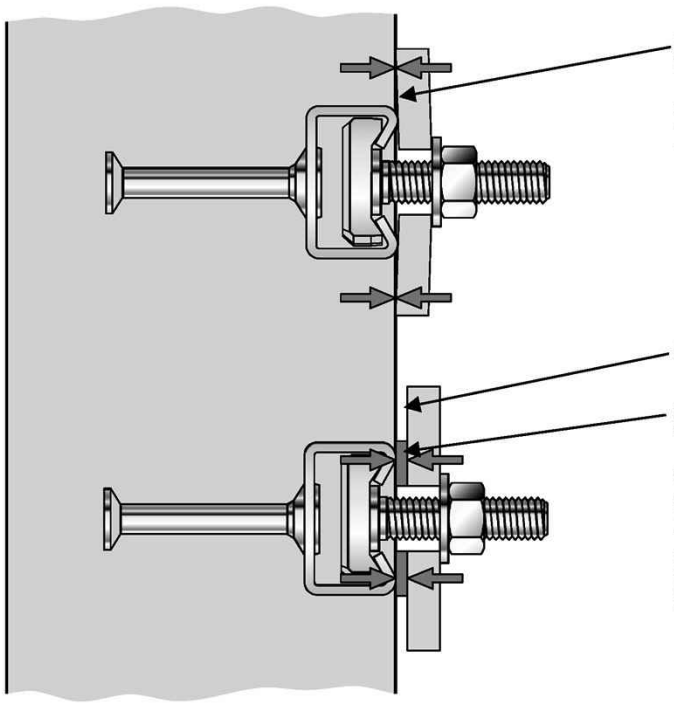
Table B3.2: Minimum spacing for channel bolts

Channel bolt			M8	M10	M12	M16	M20
Minimum spacing between channel bolts	$s_{cbo,min}$	[mm]	40	50	60	80	100

Table B4.1: Required installation torque T_{inst}

fischer Anchor channel FES-	fischer Channel Bolt FBC	Thread diameter	T_{inst} [1] [Nm]			
			General		Steel - steel contact	
			$T_{inst,g}$		$T_{inst,s}$	
			8.8	A4-70	8.8	A4-70
C-28/15	28/15	M8	7	-[2]	15	-[2]
		M10	10	-[2]	30	-[2]
		M12	13	-[2]	45	-[2]
C-38/17	38/17	M10	15	-[2]	30	-[2]
		M12	20	-[2]	45	-[2]
		M16	30	-[2]	100	-[2]
H-S-29/20	S-29/20	M12	80	-[2]	80	-[2]
H-S-38/23	S-38/23	M12	80	80	80	80
		M16	100	100	100	100
C-38/17		M12	40	-[2]	80	-[2]
		M16	50	-[2]	100	-[2]
H(-I)-40/22(-P) C-40/25	40/22	M10	15	-[2]	30	-[2]
		M12	24	24	45	45
		M16	32	32	100	100
	N-40/22	M16	-[2]	-[2]	200	-[2]
C-49/30 H(-I)-50/30(-P) C-54/33 H(-I)-52/34	50/30	M10	15	-[2]	30	-[2]
		M12	25	25	45	45
		M16	60	60	100	100
		M20	75	75	230	230
H(-I)-50/30(-P), H(-I)-52/34	N-50/30	M16	-[2]	-[2]	200	-[2]
		M20	-[2]	-[2]	400	-[2]

[1] T_{inst} must not be exceeded.
[2] No performance assessed.

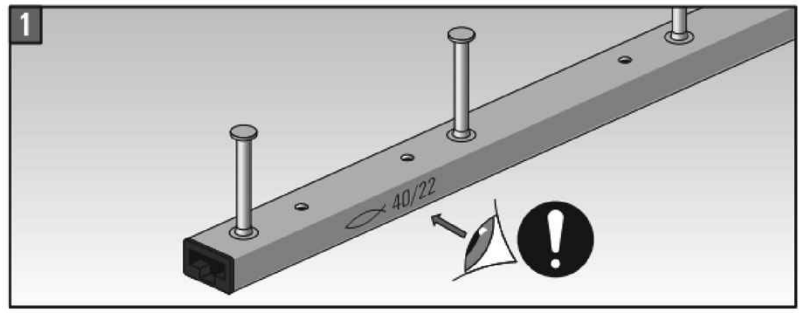


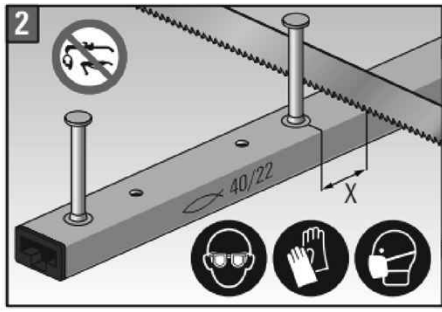
General:
The fixture is in contact with the channel profile and the concrete surface by tightening with $T_{inst,g}$.

Gap

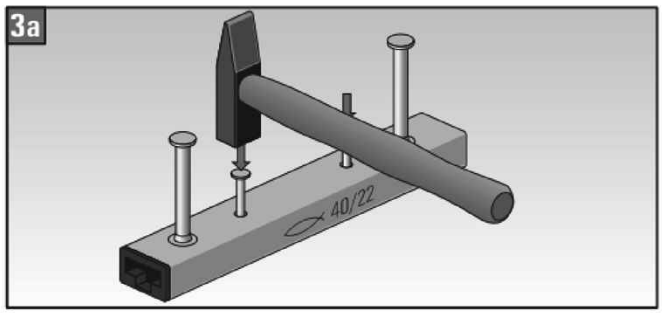
Steel-to-steel contact:
The fixture is not in contact with the concrete surface. The fixture is fastened to the anchor channel by a suitable steel part
(e.g. washer) by tightening with $T_{inst,s}$.
($T_{inst,s} \geq T_{inst,g}$)

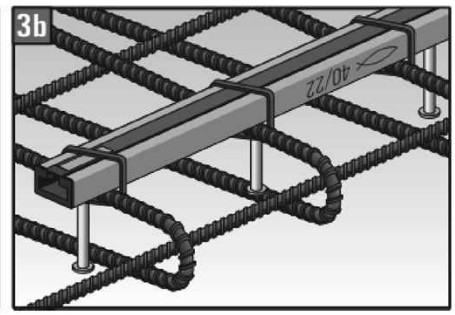
Anchor channel FES

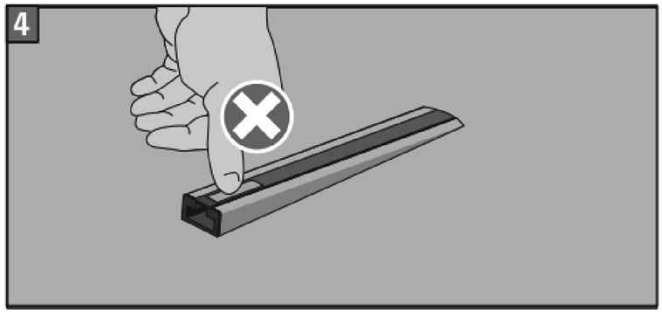


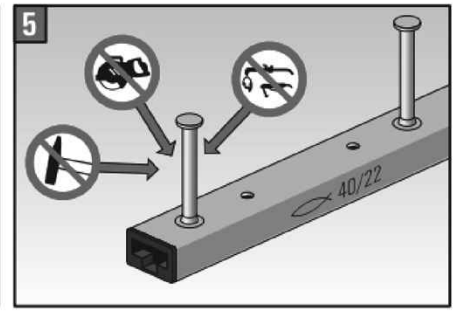


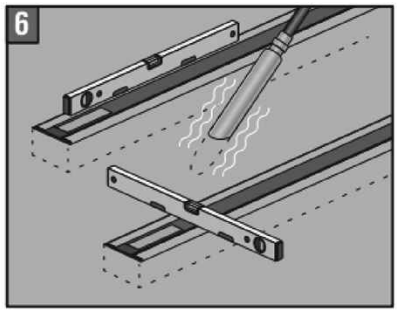
X		
	FES-H-	FES-C-
25 - 35 mm	S - 29/20	28/15
	S - 38/23	38/17
	(I-)40/22(-P)	40/25
	(I-)50/30	49/30
	I-52/34	54/33
35 mm	50/30-P	
	52/34	

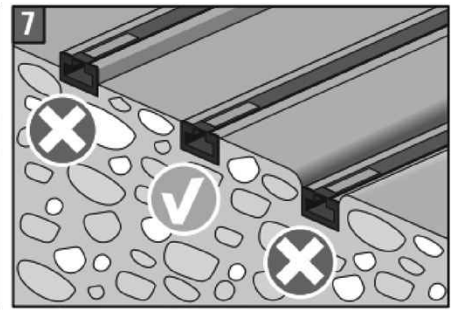


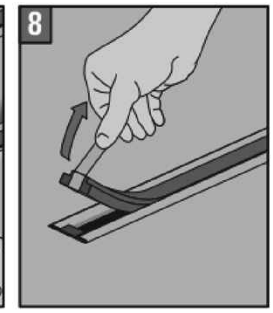










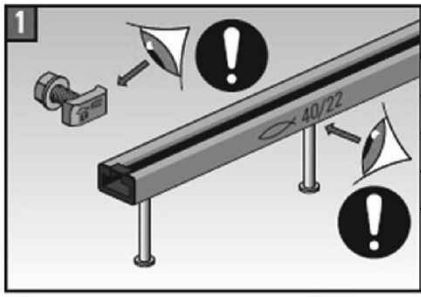


fischer Anchor Channel FES with fischer Channel Bolts FBC

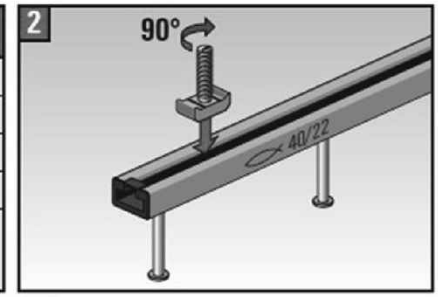
Intended Use
Installation instruction for fischer Anchor Channels FES

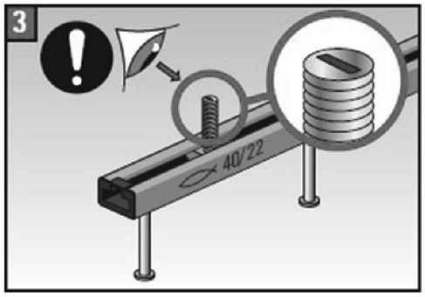
Annex B5

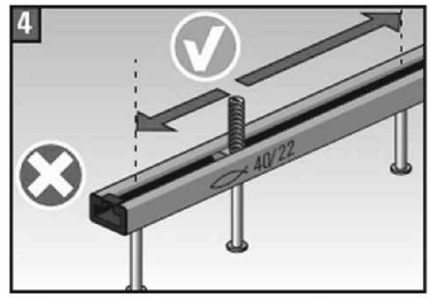
Channel bolt FBC

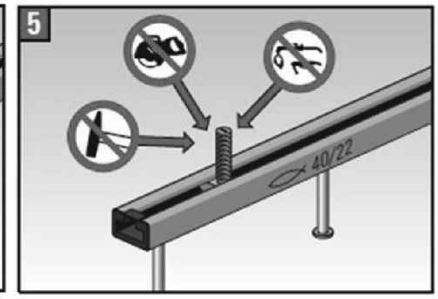


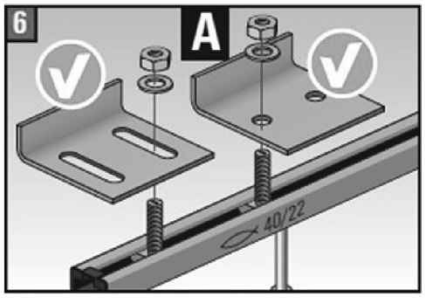
FBC-	FES-H-(I-)	FES-C-
2815	-	28/15
3817	-	38/17
4022	40/22	40/25
5030	50/30 52/34	49/30 54/33

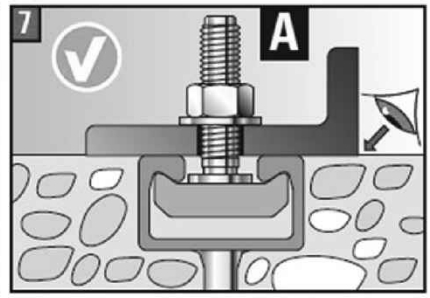


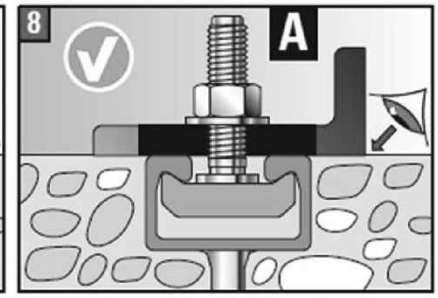


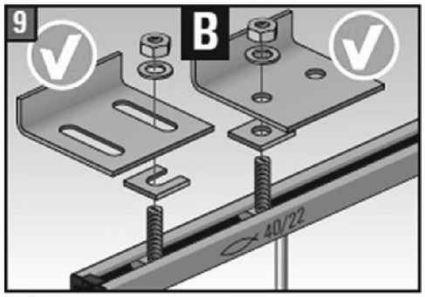


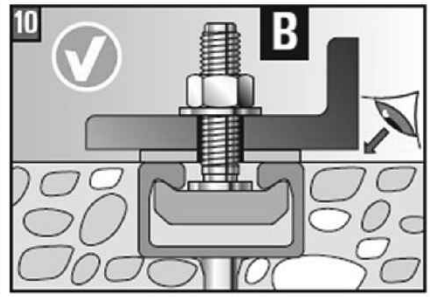


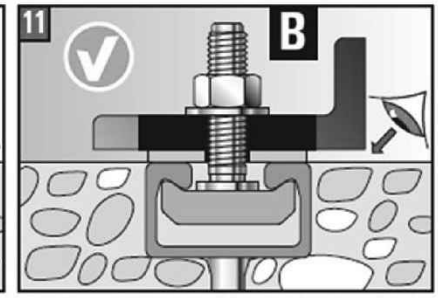


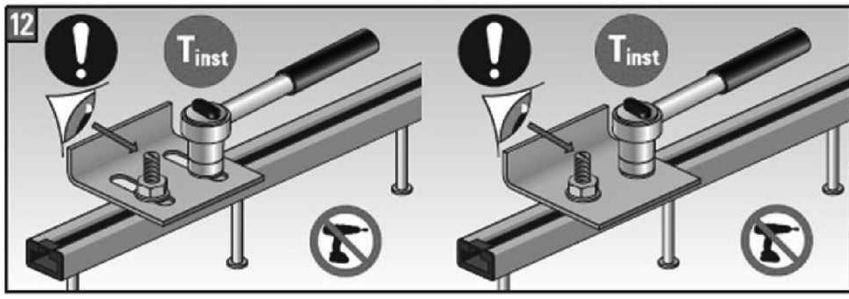












FBC	T_{inst}[1] [Nm]	M8	M10	M12	M16	M20
2815	A	7	10	13	-	-
	B	15	30	45	-	-
3817	A	-	15	20	30	-
	B	-	30	45	100	-
4022[2]	A	-	15	24	32	-
	B	-	30	45	100	-
5030[2]	A	-	15	25	60	75
	B	-	30	45	100	230

[1] T_{inst} must not be exceeded.
[2] applies to all materials (8.8 and A4-70).

fischer Ankerschiene FES mit fischer Spezialschrauben FBC

Verwendungszweck
Montageanleitung für fischer Zahnschrauben FBC-S

Anhang B7

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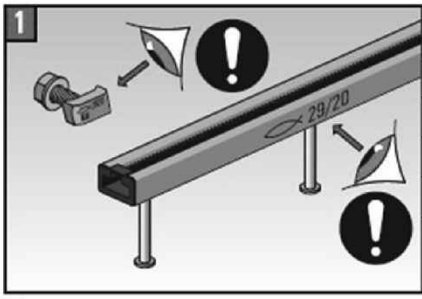
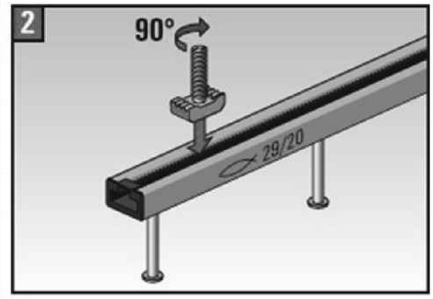
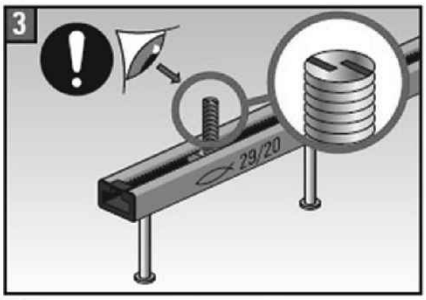
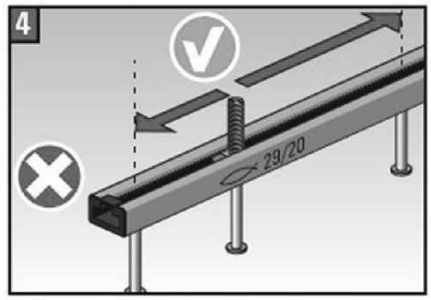
Serrated channel bolt FBC-S

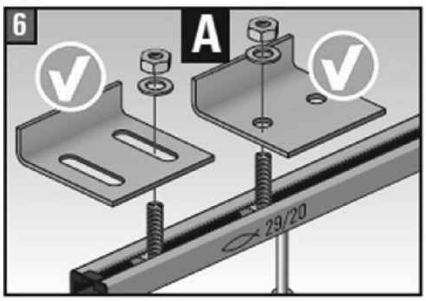


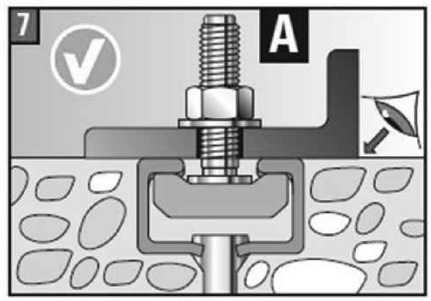
FBC-S-	FES-H-S-	FES-C-
2920	29/20	-
3823	38/23	38/17

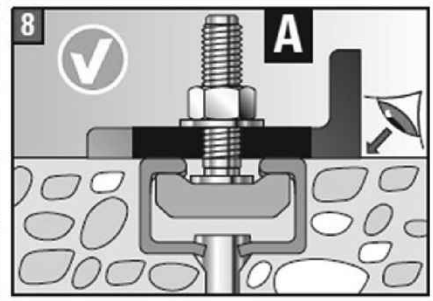


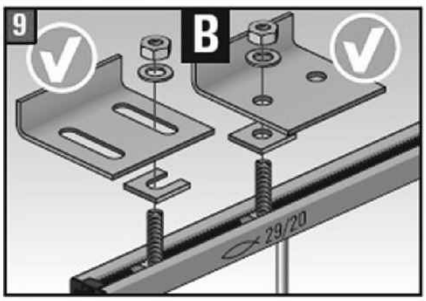


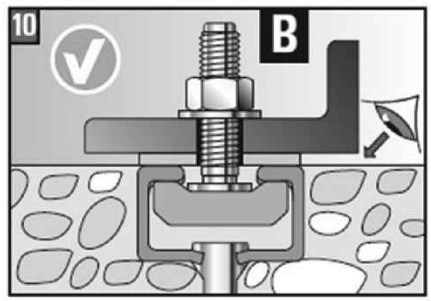


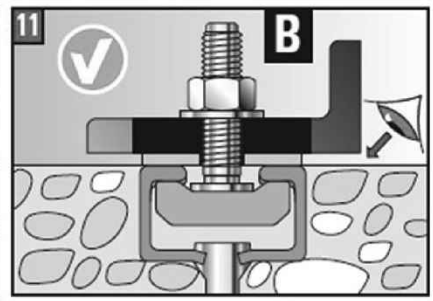


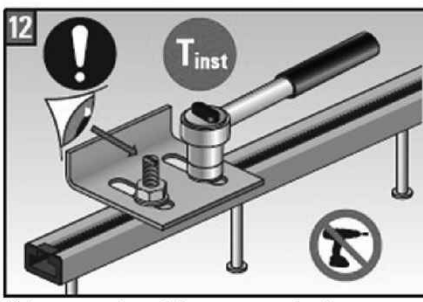












FBC-S-	FES-	T inst 1) [Nm]	M12	M16
2920	H-S-29/20	A	80	-
		B	80	-
3823 2)	H-S-38/23	A	80	100
		B	80	100
	C-38/17	A	40	50
		B	80	100

1) T_{inst} must not be exceeded.
2) Applies to all materials (8.8 and A4-70).

fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use
Installation instruction for Serrated fischer Channel Bolts FBC-S

Annex B7

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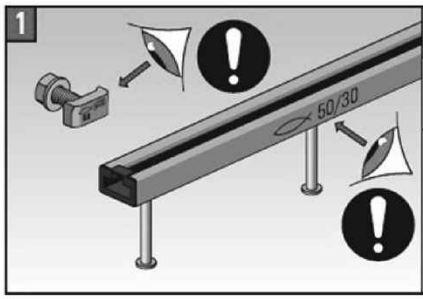
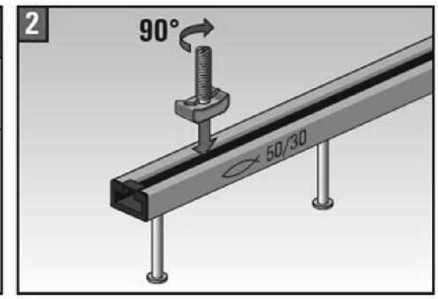
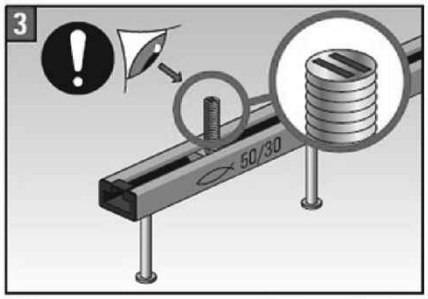
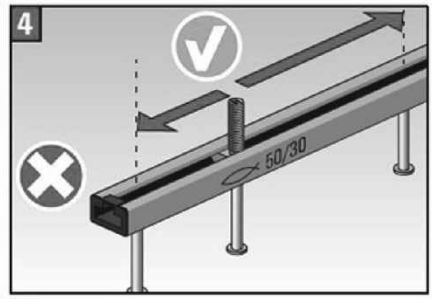
Notching channel bolt FBC-N

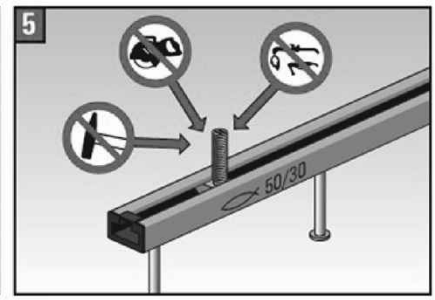


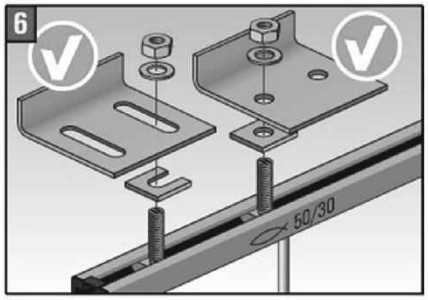
FBC-N-4022	40/22
FBC-N-5030	50/30 52/34

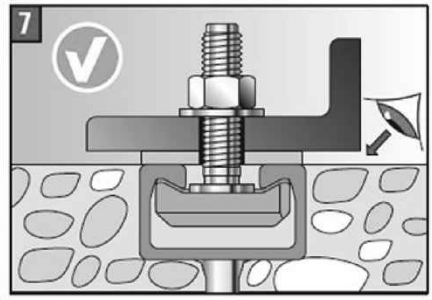


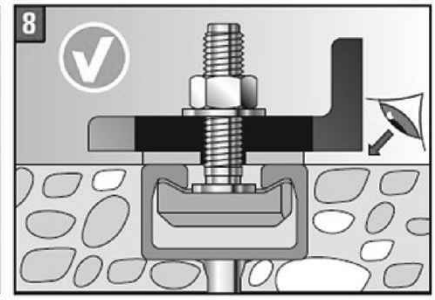


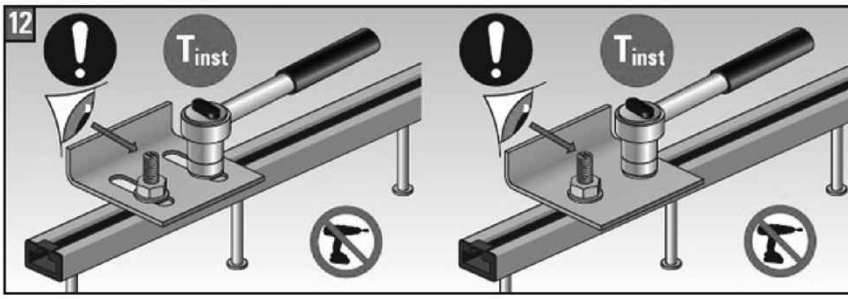












FBC-N-	FES-	T inst 1) [Nm]		
		M12	M16	M20
4022	H-(I-)4022(-P)	-	200	-
5030	H-(I-)5030(-P)	-	200	400
	H-(I-)52/34	-	200	400

1) T_{inst} must not be exceeded.

Table C1.1: Characteristic resistances under tension load – steel failure of hot-rolled anchor channels

Anchor Channel FES-H-			S-29/20	S-38/23 S-38/23-A4	40/22 40/22-P I-40/22	50/30 50/30-P I-50/30	52/34 I-52/34
Steel failure: Anchor							
Characteristic resistance	$N_{Rk,s,a}$	[kN]	25,0	31,0 40,0	20,0 42,0 35,0	31,0 44,0 44,0	55,0 70,4
Partial factor	γ_{Ms} 1)	[-]	1,8				
Steel failure: Connection between anchor and channel							
Characteristic resistance	$N_{Rk,s,c}$	[kN]	25,0	30,3 40,0	20,0 40,1 38,0	31,0 44,0 40,0	55,0 70,4
Partial factor	γ_{Ms} 1)	[-]	1,8				
Steel failure: Local flexure of channel lips							
Characteristic spacing of channel bolts for $N_{Rk,s,l}$	$s_{l,N}$	[mm]	60	76	80 80 80	100 100 100	105 105
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	25,0	30,3 45,0	38,0 42,0 38,0	43,0 52,0 43,0	72,0 72,0
Partial factor	γ_{Ms} 1)	[-]	1,8				

1) In absence of other national regulations.

Table C1.2: Characteristic resistances under tension load – steel failure of cold-formed anchor channels

Anchor Channel FES-C-			28/15	38/17	40/25	49/30	54/33
Steel failure: Anchor							
Characteristic resistance	$N_{Rk,s,a}$	[kN]	9,0	20,0	20,0	31,0	55,0
Partial factor	γ_{Ms} 1)	[-]	1,8				
Steel failure: Connection between anchor and channel							
Characteristic resistance	$N_{Rk,s,c}$	[kN]	9,0	18,0	20,0	31,0	55,0
Partial factor	γ_{Ms} 1)	[-]	1,8				
Steel failure: Local flexure of channel lips							
Characteristic spacing of channel bolts for $N_{Rk,s,l}$	$s_{l,N}$	[mm]	56	76	80	100	108
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	9,0	18,0	20,0	31,0	55,0
Partial factor	γ_{Ms} 1)	[-]	1,8				

1) In absence of other national regulations.

Table C2.1: Characteristic flexural resistance of hot rolled channels under tension load

Anchor Channel FES-H-			S-29/20	S-38/23 S-38/23-A4	40/22 40/22-P I-40/22	50/30 50/30-P I-50/30	52/34 I-52/34
Steel failure: Flexure of channel							
Characteristic flexural resistance of channel	$M_{Rk,s,flex}$	[Nm]	704	1.240 1.305	1.118 1.118 1.118	2.185 2.185 2.185	3.163 3.670
Partial factor	$\gamma_{Ms,flex}$ [1)]	[-]	1,15				

[1)] In absence of other national regulations.

Table C2.2: Characteristic flexural resistance of cold-formed channels under tension load

Anchor Channel FES-C-			28/15	38/17	40/25	49/30	54/33
Steel failure: Flexure of channel							
Characteristic flexural resistance of channel	$M_{Rk,s,flex}$	[Nm]	310	567	915	1.554	2.350
Partial factor	$\gamma_{Ms,flex}$ [1)]	[-]	1,15				

[1)] In absence of other national regulations.

Table C3.1: Characteristic resistances under tension load – concrete failure of hot rolled anchor channels

Anchor Channel FES-H-			S-29/20	S-38/23	40/22 40/22-P I-40/22	50/30 50/30-P I-50/30	52/34 I-52/34
Concrete failure: Pull-out failure							
Characteristic resistance in cracked concrete C12/15	$N_{Rk,p}$	[kN]	18,4	21,2	13,6 21,2 27,0	21,2 33,2 33,8	33,2 54,0
Characteristic resistance in uncracked concrete C12/15			25,7	29,7	19,0 29,7 37,8	29,7 46,5 47,3	46,5 75,6
Increasing factor of $N_{Rk,p}= N_{Rk,p}(C12/15)*\psi_c$	C16/20 C20/25 C25/30 C30/37 C35/45 C40/50 C45/55 C50/60 C55/67 ≥C60/75	ψ_c [-]	1,33 1,67 2,08 2,50 2,92 3,33 3,75 4,17 4,58 5,00				
Partial factor	$\gamma_{Mp}=\gamma_{Mc}$ [1)]	[-]	1,5				
Concrete failure: **Concrete cone failure**							
Product factor k_1	$k_{cr,N}$	[-]	7,8	8,1	8,0 8,0 7,9	8,1 8,2 8,1	8,7 8,7
	$k_{ucr,N}$	[-]	11,2	11,6	11,4 11,5 11,2	11,5 11,7 11,5	12,4 12,4
Partial factor	γ_{Mc} [1)]	[-]	1,5				
Concrete failure: Splitting							
Characteristic edge distance	$c_{cr,sp}$	[mm]	231	291	270 273 237	282 318 282	465 465
Characteristic spacing	$s_{cr,sp}$	[mm]	462	582	540 546 474	564 636 564	930 930
Partial factor	$\gamma_{Msp}=\gamma_{Mc}$ [1)]	[-]	1,5				

[1)] In absence of other national regulations.

Table C4.1: Characteristic resistances under tension load – concrete failure of cold-formed anchor channels

Anchor Channel FES-C-			**28/15**	**38/17**	**40/25**	**49/30**	**54/33**
Concrete failure: Pull-out failure							
Characteristic resistance in cracked concrete C12/15	$N_{Rk,p}$	[kN]	7,6	13,6	13,6	21,2	33,2
Characteristic resistance in uncracked concrete C12/15			10,7	19,0	19,0	29,7	46,5
Increasing factor of $N_{Rk,p}$= $N_{Rk,p}$(C12/15)*ψ_c	C16/20 C20/25 C25/30 C30/37 C35/45 C40/50 C45/55 C50/60 C55/67 ≥C60/75	ψ_c [-]	1,33 1,67 2,08 2,50 2,92 3,33 3,75 4,17 4,58 5,00				
Partial factor	$\gamma_{Mp}=\gamma_{Mc}$ [1)]	[-]	1,5				
Concrete failure: **Concrete cone failure**							
Product factor k_1	$k_{cr,N}$	[-]	7,2	7,8	7,9	8,1	8,7
	$k_{ucr,N}$	[-]	10,3	11,2	11,2	11,5	12,4
Partial factor	γ_{Mc} [1)]	[-]	1,5				
Concrete failure: Splitting failure							
Characteristic edge distance	$c_{cr,sp}$	[mm]	135	228	237	282	465
Characteristic spacing	$s_{cr,sp}$	[mm]	270	456	474	564	930
Partial factor	$\gamma_{Msp}=\gamma_{Mc}$ [1)]	[-]	1,5				

[1)] In absence of other national regulations.

Table C5.1: Displacements of hot-rolled anchor channels under tension load

Anchor Channel FES-H-			S-29/20	S-38/23 S-38/23-A4	40/22 40/22-P I-40/22	50/30 50/30-P I-50/30	52/34 I-52/34
Tension load	N	[kN]	14,6	19,4 19,2	15,1 16,7 15,1	17,1 20,6 17,1	28,6 28,6
Short-term displacement [1]	δ_{N0}	[mm]	2,3	1,4 1,3	2,2 2,5 2,2	1,5 1,8 1,5	1,9 1,9
Long-term displacement [1]	$\delta_{N\infty}$	[mm]	4,6	2,8 2,6	4,4 5,0 4,4	3,0 3,6 3,0	3,8 3,8

[1] Displacements in midspan of the anchor channel, including slip of channel bolt, deformation of channel lips, bending of the channel and slip of the anchor channel in concrete.

Table C5.2: Displacements of cold-formed anchor channels under tension load

Anchor Channel FES-C-			28/15	38/17	40/25	49/30	54/33
Tension load	N	[kN]	3,6	7,1	7,9	12,3	21,8
Short-term displacement [1]	δ_{N0}	[mm]	0,7	1,3	1,5	1,4	1,2
Long-term displacement [1]	$\delta_{N\infty}$	[mm]	1,4	2,6	3,0	2,8	2,4

[1] Displacements in midspan of the anchor channel, including slip of channel bolt, deformation of channel lips, bending of the channel and slip of the anchor channel in concrete.

Table C6.1: Characteristic resistances under shear load – steel failure of hot-rolled anchor channels

Anchor Channel FES-H-			S-29/20	S-38/23 S-38/23-A4	40/22 40/22-P I-40/22	50/30 50/30-P I-50/30	52/34 I-52/34
Steel failure: Anchor							
Characteristic resistance	$V_{Rk,s,a,y}$	[kN]	25,0	30,3 40,0	40,0 50,8 40,0	60,0 87,9 60,0	100 100
	$V_{Rk,s,a,x}$	[kN]	15,1	18,8 24,0	12,0 25,4 22,8	18,6 26,8 24,0	33,0 42,2
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Connection between anchor and channel							
Characteristic resistance	$V_{Rk,s,c,y}$	[kN]	25,0	30,3 40,0	40,0 50,8 40,0	60,0 87,9 60,0	100 100
	$V_{Rk,s,c,x}$	[kN]	15,0	18,2 24,0	12,0 25,2 22,8	18,6 26,4 24,0	33,0 42,2
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Local flexure of channel lips							
Characteristic spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,V}$	[mm]	60	76	80 80 80	100 100 100	108 108
Characteristic resistance	$V^0_{Rk,s,l,y}$	[kN]	25,0	30,3 40,0	40,0 50,8 40,0	60,0 87,9 60,0	100 100
Partial factor	γ_{Ms} [1)]	[-]	1,8				

[1)] In absence of other national regulations.

Table C7.1: Characteristic resistances under shear load – steel failure of cold-formed anchor channels

Anchor Channel FES-C-			28/15	38/17	40/25	49/30	54/33
Steel failure: Anchor							
Characteristic resistance	$V_{Rk,s,a,y}$	[kN]	9	18	20	31	55
	$V_{Rk,s,a,x}$	[kN]	-[2)]	-[2)]	-[2)]	-[2)]	-[2)]
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Connection between anchor and channel							
Characteristic resistance	$V_{Rk,s,c,y}$	[kN]	9	18	20	31	55
	$V_{Rk,s,c,x}$	[kN]	-[2)]	-[2)]	-[2)]	-[2)]	-[2)]
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Local flexure of channel lips							
Characteristic spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,V}$	[mm]	56	76	80	100	108
Characteristic resistance	$V^0_{Rk,s,l,y}$	[kN]	9	18	20	31	55
Partial factor	γ_{Ms} [1)]	[-]	1,8				

[1)] In absence of other national regulations.
[2)] No performance assessed.

Table C8.1: Characteristic resistance for shear load in direction of the longitudinal axis of the channel – steel failure

Anchor Channel FES-H-				S-29/20	S-38/23	40/22 40/22-P I-40/22	50/30 50/30-P I-50/30	52/34 I-52/34
Steel failure: Connection between channel lips and channel bolt								
Characteristic resistance	$V_{Rk,s,l,x}$	[kN]	FBC-S-29/20-M12-8.8	22,5	-[2]	-[2]	-[2]	-[2]
			FBC-S-38/23-M12-8.8	-[2]	23,2	-[2]	-[2]	-[2]
			FBC-S-38/23-M12-A4-70	-[2]	29,0	-[2]	-[2]	-[2]
			FBC-S-38/23-M16-8.8	-[2]	30,3	-[2]	-[2]	-[2]
			FBC-S-38/23-M16-A4-70	-[2]	29,0	-[2]	-[2]	-[2]
			FBC-N-40/22-M16-8.8	-[2]	-[2]	14,0	-[2]	-[2]
			FBC-N-50/30-M16-8.8	-[2]	-[2]	-[2]	10,7	10,7
			FBC-N-50/30-M20-8.8	-[2]	-[2]	-[2]	21,0	21,0
Installation factor	γ_{inst} [1]	[-]		1,2	8.8: 1,0 A4-70: 1,2	1,2	M16: 1,2 M20: 1,4	M16: 1,2 M20: 1,4

[1] In absence of other national regulations.
[2] No performance assessed.

Table C8.2: Characteristic resistances of the hot-rolled anchor channel under shear load – concrete failure

Anchor Channel FES-H-			S-29/20	S-38/23	40/22 40/22-P I-40/22	50/30 50/30-P I-50/30	52/34 I-52/34
Concrete failure: Pry-out failure							
Product factor	k_8	[-]	2,0	2,0	2,0	2,0	2,0
Partial factor	γ_{Mc} [1]	[-]	1,5				
Concrete failure: Concrete edge failure							
Product factor k_{12}	$k_{cr,V}$	[-]	7,5	7,5	7,5	7,5	7,5
	$k_{ucr,V}$	[-]	10,5	10,5	10,5	10,5	10,5
Partial factor	γ_{Mc} [1]	[-]	1,5				

[1] In absence of other national regulations.

Table C8.3: Characteristic resistances of the cold-formed anchor channel under shear load – concrete failure

Anchor Channel FES-C			28/15	38/17	40/25	49/30	54/33
Concrete failure: Pry-out failure							
Product factor	k_8	[-]	1	2	2	2	2
Partial factor	γ_{Mc} [1]	[-]	1,5				
Concrete failure: Concrete edge failure							
Product factor k_{12}	$k_{cr,V}$	[-]	5,8	7,5	7,5	7,5	7,5
	$k_{ucr,V}$	[-]	8,1	10,5	10,5	10,5	10,5
Partial factor	γ_{Mc} [1]	[-]	1,5				

[1] In absence of other national regulations.

Table C9.1: Displacements under shear load

Anchor Channel FES-			C-28/15	C-38/17	H-S-29/20	H-S-38/23 H-S-38/23-A4	C-40/25 H-40/22 H-40/22-P H-I-40/22	C-49/30 H-50/30 H-50/30-P H-I-50/30	C-54/33 H-52/34 H-I-52/34
Shear load perpendicular to the longitudinal axis of the channel	V_y	[kN]	3,6	7,1	14,6	23,0 23,0	7,9 15,9 20,2 15,9	12,3 23,8 34,9 23,8	21,8 39,7 39,7
Short-term displacement [1]	$\delta_{V,y,0}$	[mm]	0,7	1,3	2,3	3,8 2,8	1,5 2,1 2,2 2,1	1,4 3,7 2,1 3,7	1,2 4,0 4,0
Long-term displacement [1]	$\delta_{V,y,\infty}$	[mm]	1,1	2,0	3,5	5,7 4,2	2,3 3,2 3,3 3,2	2,1 5,5 3,2 5,5	1,8 5,9 5,9
Shear load in direction of the longitudinal axis of the channel	V_x	[kN]	-[3]	-[3]	16,6	15,4 21,2	-[3] 4,6 4,6 4,6	-[3] [4] [4] [4]	-[3] [4] [4]
Short-term displacement [2]	$\delta_{V,x,0}$	[mm]	-[3]	-[3]	1,9	0,8 2,0	-[3] 0,9 0,9 0,9	-[3] [5] [5] [5]	-[3] [5] [5]
Long-term displacement [2]	$\delta_{V,x,\infty}$	[mm]	-[3]	-[3]	2,9	1,2 3,0	-[3] 1,4 1,4 1,4	-[3] [6] [6] [6]	-[3] [6] [6]

[1] Displacements in midspan of the anchor channel, including slip of channel bolt, deformation of channel lips and slip of the anchor channel in concrete.
[2] Displacements of the anchor channel, including slip of channel bolt, deformation of channel lips and slip of the anchor channel in concrete.
[3] No performance assessed.
[4] For FBC-N-5030-M16 V_x = 3,5 kN, for FBC-N-5030-M20 V_x = 6,7 kN.
[5] For FBC-N-5030-M16 $\delta_{V,x,0}$ = 0,4 mm, for FBC-N-5030-M20 $\delta_{V,x,0}$ = 0,1 mm.
[6] For FBC-N-5030-M16 $\delta_{V,x,\infty}$ = 0,6 mm, for FBC-N-5030-M20 $\delta_{V,x,\infty}$ = 0,2 mm.

Table C9.2: Characteristic resistances under combined tension and shear load

Anchor Channel FES-			C-28/15	C-38/17	H-S-29/20	H-S-38/23	C-40/25 H-40/22 H-40/22-P H-I-40/22	C-49/30 H-50/30 H-50/30-P H-I-50/30	C-54/33 H-52/34 H-I-52/34
Steel failure: Local flexure of channel lips and flexure of channel									
Product factor	k_{13}	[-]	according to EN 1992-4:2018, 7.4.3.1						
Steel failure: Anchor and connection between anchor and channel									
Product factor	k_{14}	[-]	according to EN 1992-4:2018, 7.4.3.1						

Table C10.1: Characteristic resistances under tension and shear load – steel failure of channel bolts

Channel bolt thread diameter				M8	M10	M12	M16	M20
Steel failure: Special screw 8.8								
Characteristic tensile resistance	FBC-28/15	$N_{Rk,s}$	[kN]	29,2	33,0	45,1	-2)	-2)
	FBC-38/17			-2)	46,4	67,4	89,9	-2)
	FBC-S-29/20			-2)	-2)	48,5	-2)	-2)
	FBC-S-38/23			-2)	-2)	67,4	71,5	-2)
	FBC-40/22			-2)	46,4	55,1	82,2	-2)
	FBC-N-40/22			-2)	-2)	-2)	100,9	-2)
	FBC-50/30			-2)	46,4	67,4	96,5	127,2
	FBC-N-50/30			-2)	-2)	-2)	113,5	134,0
Partial factor		γ_{Ms} 1)	[-]	1,5				
Steel failure: Special screw A4-70								
Characteristic tensile resistance	FBC-S-38/23	$N_{Rk,s}$	[kN]	-2)	-2)	59,0	71,5	-2)
	FBC-40/22			-2)	-2)	54,9	102,8	-2)
	FBC-50/30			-2)	-2)	59,0	82,8	163,1
Partial factor		γ_{Ms} 1)	[-]	1,87				
Characteristic shear resistance 8.8		$V_{Rk,s}$	[kN]	14,6	23,2	33,7	62,8	98,0
Characteristic shear resistance A4-70				-2)	-2)	35,4	65,9	102,9
Partial factor (shear loads 8.8)		γ_{Ms} 1)	[-]	1,25				
Partial factor (shear loads A4-70)		γ_{Ms} 1)	[-]	1,56				

1) In absence of other national regulations.
2) No performance assessed.

Table C11.1: Characteristic resistances under shear load with lever arm – steel failure of channel bolts

Channel bolt [2] thread diameter					M8	M10	M12	M16	M20
Steel failure									
Characteristic flexural resistance	$M^0_{Rk,s}$	[Nm]	FBC-(S-) (N-)	8.8	30,0	59,8	104,8	266,4	519,3
				A4-70	-[3]	-[3]	91,7	233,1	454,4
Partial factor	γ_{Ms} [1]	[-]	FBC-(S-) (N-)	8.8	1,25				
				A4-70	1,56				
Internal lever arm	a	[mm]	FBC-28/15	8.8	16,7	18,1	19,4	-[3]	-[3]
			FBC-38/17	8.8	-[3]	22,7	24,0	26,0	-[3]
			FBC-S-29/20	8.8	-[3]	-[3]	20,0	-[3]	-[3]
			FBC-S-38/23	8.8 A4-70	-[3]	-[3]	22,4	25,7	-[3]
			FBC-40/22	8.8	-[3]	23,5	24,8	26,8	-[3]
			FBC-N-40/22	8.8	-[3]	-[3]	-[3]	26,9	-[3]
			FBC-50/30	8.8	-[3]	27,7	29,0	31,0	33,3
			FBC-N-50/30	8.8	-[3]	-[3]	-[3]	31,5	33,9
			FBC-40/22	A4-70	-[3]	-[3]	24,7	26,7	-[3]
			FBC-50/30	A4-70	-[3]	-[3]	28,8	30,9	33,1

[1] In absence of other national regulations.

[2] Materials according to Annex A7, Table A7.1.

[3] No performance assessed.

The characteristic flexure resistance according to Table C11.1 is limited as follows:

$M^0_{Rk,s} \leq 0{,}5 \cdot N^0_{Rk,s,l} \cdot a$ ($N^0_{Rk,s,l}$ according to Annex C1, Table C1.1 and Table C1.2)

$M^0_{Rk,s} \leq 0{,}5 \cdot N_{Rk,s} \cdot a$ ($N_{Rk,s}$ according to Annex C10, Table 10.1)

a = Internal lever arm according to Table C11.1

T_s = Tension force acting on the channel lips

C_s = Compression force acting on the channel lips

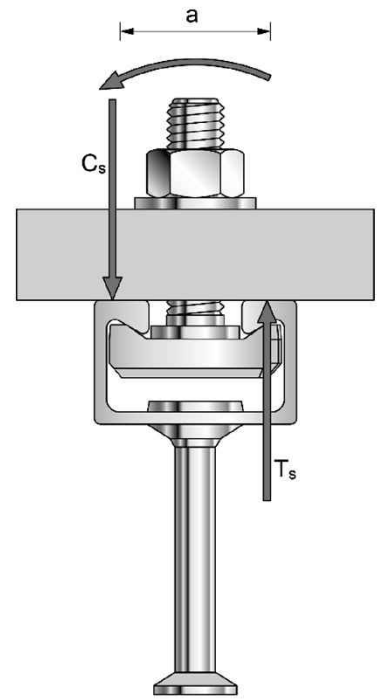


Table 12.1: Combination of anchor channels and channel bolts under seismic load (performance category C1)

Anchor channel FES-	Channel Bolt FBC-	Thread diameter	Steel grade	Corrosion protection
H-S-38/23	S-38/23	M12 M16	8.8	G[1)] F[2)]
H-50/30 H-52/34	N-50/30	M20		

[1)] Electroplated.

[2)] Hot-dip galvanised.

Table C12.2: Characteristic resistance under seismic tension load- steel failure of anchor channels (performance category C1)

Anchor Channel FES-H-			S-38/23	H50/30	H52/34
Steel failure: Anchor					
Characteristic resistance	$N_{Rk,s,a,eq}$	[kN]	31,0	31,0	31,0
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8		
Steel failure: Connection between anchor and channel					
Characteristic resistance	$N_{Rk,s,c,eq}$	[kN]	30,3	31,0	31,0
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8		
Steel failure: Local flexure of channel lips					
Characteristic resistance	$N^0_{Rk,s,l,eq}$	[kN]	30,3	43,0	43,0
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8		

[1)] In absence of other national regulations.

Table 12.3: Characteristic flexural resistance of the channel under seismic tension load (performance category C1)

Anchor Channel FES-			H-S-38/23	H-50/30	H-52/43
Steel failure: Flexure of channel					
Characteristic flexural resistance of channel	$M_{Rk,s,flex,eq}$	[Nm]	1.240	2.185	2.185
Partial factor	$\gamma_{Ms,flex,eq}$ [1)]	[-]	1,15		

[1)] In absence of other national regulations.

Table C13.1: Characteristic resistance under seismic shear load- steel failure of anchor channels (performance category C1)

Anchor Channel FES-			H-S-38/23	H-50/30	H-52/34
Steel failure: Anchor					
Characteristic resistance	$V_{Rk,s,a,y,eq}$	[kN]	30,3	60,0	60,0
	$V_{Rk,s,a,x,eq}$	[kN]	18,8	18,6	18,6
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8		
Steel failure: Connection between anchor and channel					
Characteristic resistance	$V_{Rk,s,c,y,eq}$	[kN]	30,3	60,0	60,0
	$V_{Rk,s,c,x,eq}$	[kN]	18,2	18,6	18,6
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8		
Steel failure: Local flexure of channel lips					
Characteristic resistance	$V^0_{Rk,s,l,y,eq}$	[kN]	30,3	60,0	60,0
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8		

[1)] In absence of other national regulations.

Table C13.2: Characteristic resistance for seismic shear load in direction of the longitudinal axis of the channel - steel failure (performance category C1)

Anchor Channel FES-				H-S-38/23	H-50/30	H-52/34
Steel failure: Connection between channel lips and channel bolt						
Characteristic resistance	$V_{Rk,s,l,x,eq}$	[kN]	FBC-S-38/23-M12-8.8	23,2	-[2)]	-[2)]
			FBC-S-38/23-M16-8.8	23,2	-[2)]	-[2)]
			FBC-N-50/30-M20-8.8	-[2)]	21,0	21,0
Installation factor	γ_{inst} [1)]	[-]		1,0	1,4	1,4

[1)] In absence of other national regulations.
[2)] No performance assessed.

Table C14.1: Characteristic resistance under seismic tension and seismic shear load – steel failure of chancel bolt (performance category C1)

Channel bolt thread diameter				**M12**	**M16**	**M20**
Steel failure: Special screw						
Characteristic tensile resistance	FBC-S-38/23	$N_{Rk,s,eq}$	[kN]	67,4	67,4	-[2]
	FBC-N-50/30			-[2]	-[2]	134,0
Partial factor		γ_{Ms} [1]	[-]	1,5		
Characteristic shear resistance 8.8		$V_{Rk,s,eq}$	[kN]	33,7	33,7	98,0
Partial factor (shear loads 8.8)		γ_{Ms} [1]	[-]	1,25		

[1] In absence of other national regulations.
[2] No performance assessed.

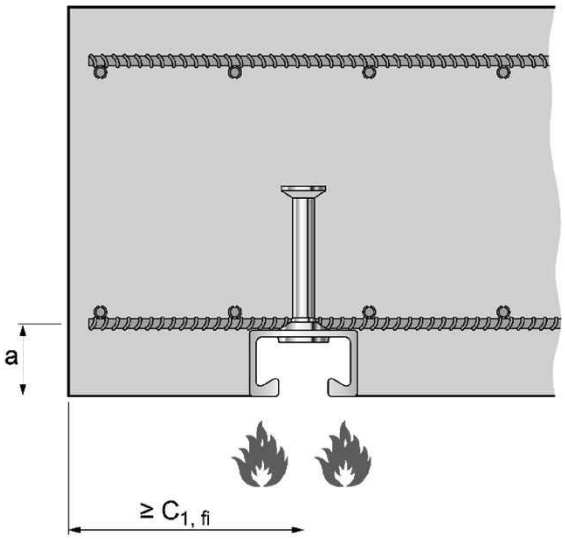
Table C15.1: Characteristic resistance under fire exposure – steel failure

Channel bolt thread diameter						M8	M10	M12	M16	M20
Steel failure:		**Anchor, connection between anchor and channel, local flexure of channel lips, channel bolts**								
Characteristic resistance under fire exposure [3]	FES-H-S-29/2	FBC-S-29/20	R30 R60 R90 R120	$N_{Rk,s,fi}$ = $V_{Rk,s,y,fi}$	[kN]	- [2]	- [2]	2,5 2,4 1,7 1,4	- [2]	- [2]
	FES-H-S-38/23	FBC-S-38/23	R30 R60 R90 R120			- [2]	- [2]	4,6 4,1 2,8 2,1	4,6 4,1 2,8 2,1	- [2]
	FES-H(-I)-40/22(-P)	FBC-40/22	R30 R60 R90 R120			- [2]	1,3 1,0 0,7 0,6	2,0 1,7 1,4 1,3	4,5 3,4 2,3 1,7	- [2]
	FES-H(-I)-50/30(-P)	FBC(-N)-50/30	R30 R60 R90 R120			- [2]	1,3 1,0 0,7 0,6	2,0 1,7 1,4 1,3	5,2 4,2 3,2 2,7	5,2 4,2 3,2 2,7
	FES-H(-I)-52/34	FBC(-N)-50/30	R30 R60 R90 R120			- [2]	1,3 1,0 0,7 0,6	4,6 4,1 2,8 2,1	5,2 4,2 3,2 2,7	8,0 6,5 5,0 4,2
	FES-C-28/15	FBC-28/15	R30 R60 R90 R120			0,6 0,6 0,5 0,4	1,3 1,0 0,7 0,6	1,3 1,0 0,7 0,6	- [2]	- [2]
	FES-C-38/17	FBC-38/17 FBC-S-38/23-M16	R30 R60 R90 R120			- [2]	1,3 1,0 0,7 0,6	1,3 1,0 0,7 0,6	3,5 2,8 1,8 1,3	- [2]
	FES-C-40/25	FBC-40/22	R30 R60 R90 R120			- [2]	1,8 1,5 1,1 0,8	3,0 2,4 1,7 1,4	3,5 2,8 1,8 1,3	- [2]
	FES-C-49/30	FBC-50/30	R30 R60 R90 R120			- [2]	1,3 1,0 0,7 0,6	2,9 2,4 1,8 1,6	3,1 2,5 1,9 1,6	3,1 2,5 1,9 1,6
	FES-C-54/33	FBC-50/30	R30 R60 R90 R120			- [2]	1,3 1,0 0,7 0,6	2,9 2,4 1,8 1,6	3,1 2,5 1,9 1,6	3,1 2,5 1,9 1,6
Partial factor				$\gamma_{Ms,fi}$ [1]	[-]	1,0				

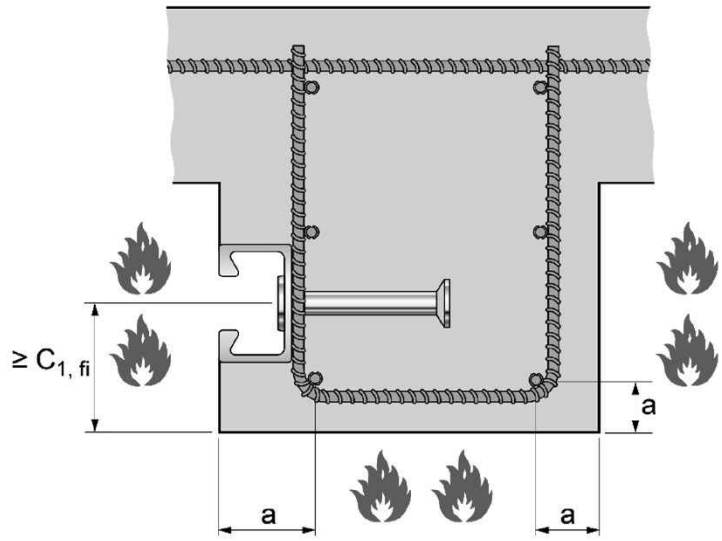
[1] In absence of other national regulations.
[2] No performance assessed.
[3] Values also valid for stainless steel A4-70.

Table C16.1: Minimum axis distance of the reinforcement under fire exposure

Anchor Channel FES-			C-28/15	C-38/17	H-S-29/20	H-S-38/23	C-40/25 H-40/22 H-40/22-P H-I-40/22	C-49/30 H50/30 H-50/30-P H-I-50/30	C-54/33 H-52/34 H-I-52/34
Minimum axis distance	R30	a [mm]	35	35	35	35	35	35	50
	R60		35	35	35	35	35	35	50
	R90		45	45	45	45	45	45	50
	R120		60	60	60	60	60	60	65



Fire exposure from one side only.



Fire exposure from more than one side.