Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-18/0862 of 12 August 2019

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	fischer Anchor Channel FES with fischer Channel Bolts FBC
Product family to which the construction product belongs	Anchor Channels
Manufacturer	fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 72178 Waldachtal DEUTSCHLAND
Manufacturing plant	fischerwerke
This European Technical Assessment contains	25 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330008-03-0601

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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 loading (static and quasi-static loading)	See Annex C1 to C2 and C5
Characteristic resistance under shear loading (static and quasi-static loading)	See Annex C3 to C6
Characteristic resistance under combined tension and shear loading (static and quasi-static loading)	See Annex C4
Characteristic resistances under fatigue tension loading	No performance determined
Displacements (static and quasi-static loading)	See Annex C2 and C4
Durability	See Annex B1

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Characteristic resistance to fire	No performance determined

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

In accordance with EAD No. 330008-03-0601, the applicable European legal act is: [2000/273/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

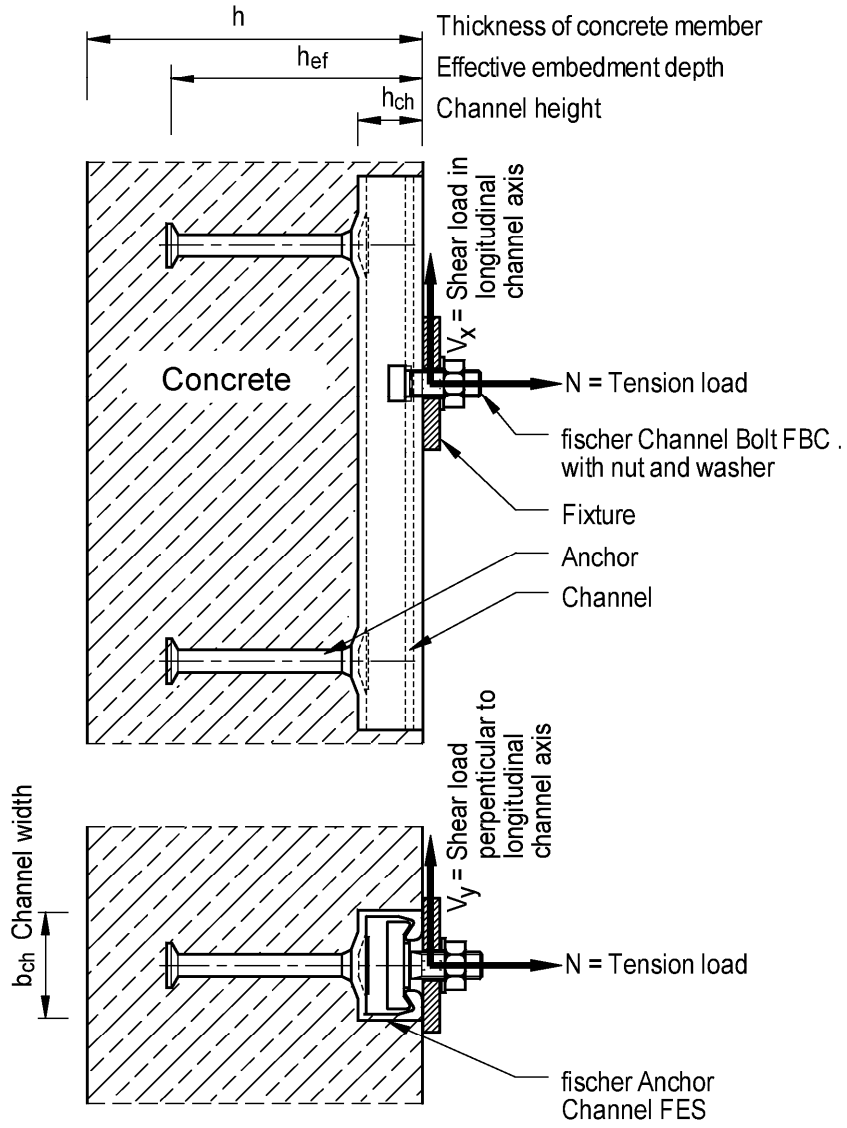
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 12 August 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Müller

Deutsches Institut für Bautechnik DIBt



fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Installed condition

Annex A1

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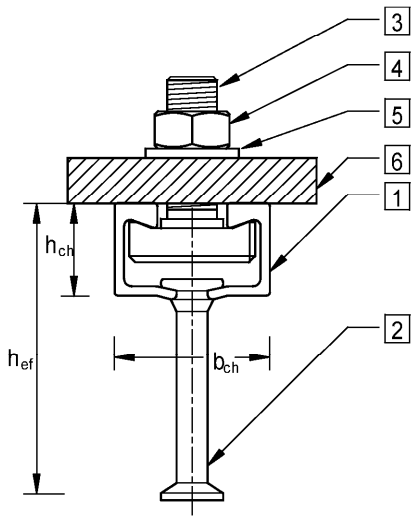
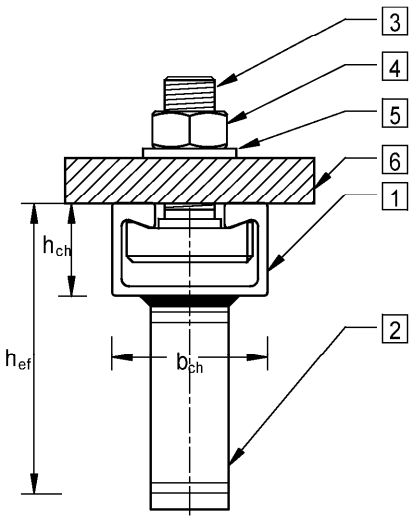


Round anchor



I-anchor

fischer Anchor Channel FES
1 Channel profile
2 Anchor
3 Channel bolt
4 Hexagonal nut
5 Washer
6 Fixture

Marking of the fischer anchor channel FES:

e. g.:  I-40/22

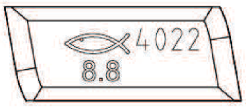
	= Identifying mark of the manufacturer
I	= Additional marking for I-anchors No marking for round anchors
40/22	= Anchor channel size (29/20; 38/23; 40/22; 50/30; 52/34)

Stamped into back of channel
Optional: printed on channel web or channel lips
H = Hot rolled channel
No marking for material acc. A7 Table 6 (Channel profile)

Marking of the fischer channel bolt FBC:

e. g.:  4022 8.8

	= Identifying mark of the manufacturer
4022	= Type of channel bolt
8.8	= Steel grade

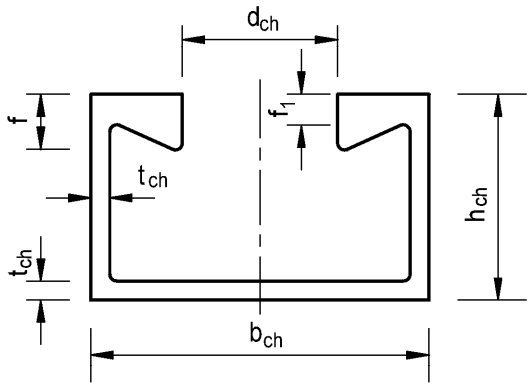


Marking of channel bolt type (smooth, serrated, notching head) according to Annex A6

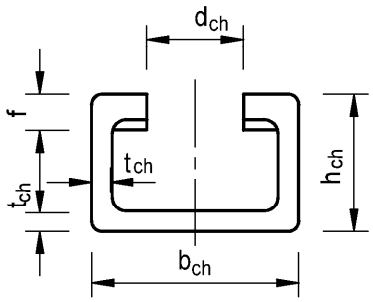
fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Marking and materials

Annex A2



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



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

Table 1: Dimensions of hot-rolled channel profile

Anchor channel	b_{ch} [mm]	h_{ch} [mm]	t_{ch} [mm]	d_{ch} [mm]	f [mm]	f_1 [mm]	I_y [mm^4]
FES-H-S-29/20	30,0	20,0	3,0	14,0	5,2	-	11 150
FES-H-S-38/23	38,0	23,0	3,3	18,0	6,0	-	21 070
FES-H-40/22	40,0	23,5	2,6	18,0	6,2	3,6	21 660
FES-H-(I-)50/30	50,0	30,0	3,0	22,5	8,1	5,5	54 960
FES-H-(I-)52/34	52,5	34,0	4,0	22,5	11,5	8,3	96 330

fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Dimensions of channels

Annex A3

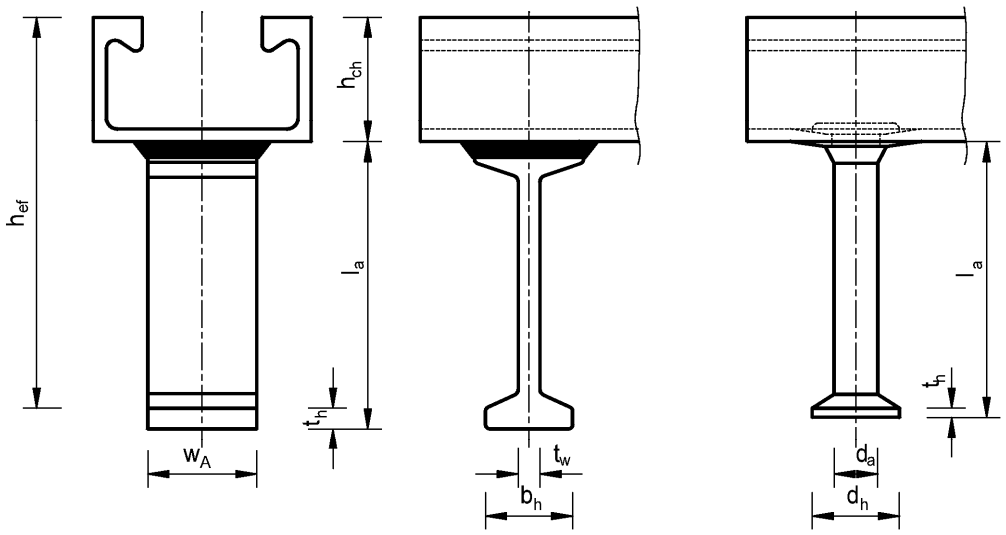


Table 2: Dimensions of anchor (welded I-anchor or forged round anchor)

Anchor channel	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]
FES-H-S-29/20							59,5	10	20	2,5	236
FES-H-S-38/23							76,2	10	20	2,2	236
FES-H-40/22							68,5	8	16	2,0	151
FES-H-(I)-50/30	69	5	20	5	25	375	66,2	10	20	2,2	236
FES-H-(I)-52/34	126	5 [1)]	20 [1)]	5	40	600	123,5	11	24,3	2,5	369

[1)] Alternative I-anchor: t_w = 6 mm b_h = 25 mm

fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Dimensions of anchors

Annex A4

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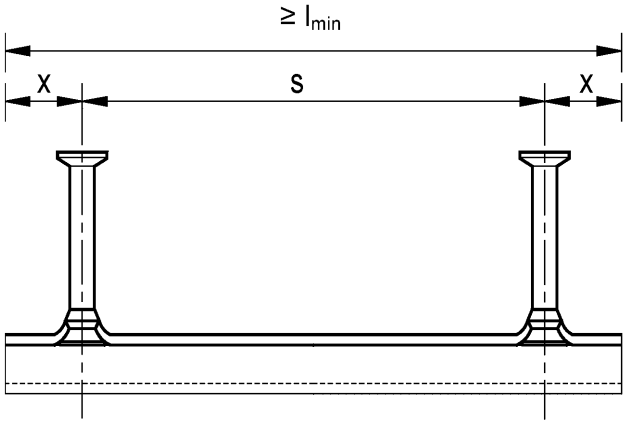
Table 3: Dimensions of Anchor Channels FES-H

Anchor channel	Anchor type	s_{min} [mm]	s_{max} [mm]	x_{min} [mm]	x_{max} [mm]	l_{min} [mm]	l_{max} [mm]
FES-H-S-29/20	round	100	200	25	35	150	6.070
FES-H-S-38/23	round		250				
FES-H-40/22	round						
FES-H-I-50/30	I						
FES-H-50/30	round						
FES-H-I-52/34	I						
FES-H-52/34	round			35		170	



fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Anchor position and channel length

Annex A5

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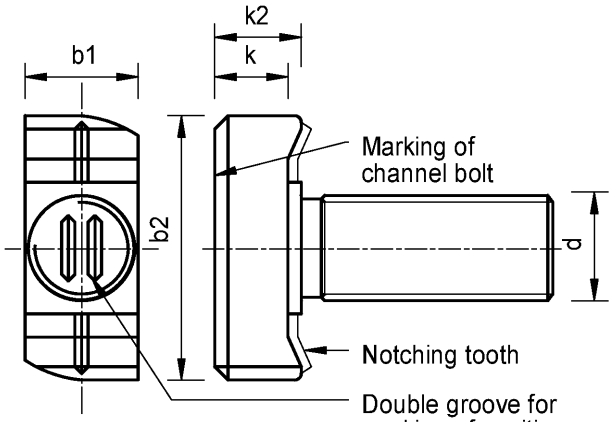
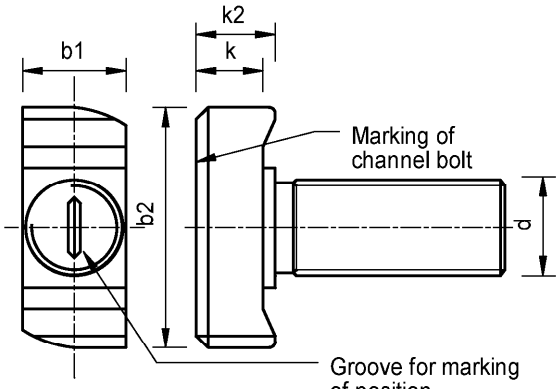
Table 4: Steel grade and corrosion class

Channel Bolt	Carbon steel [1]
Steel grade	8.8
f_{uk} [N/mm²]	800 / 830 [2]
f_{yk} [N/mm²]	640 / 660 [2]
Corrosion class	G [3] F [4]

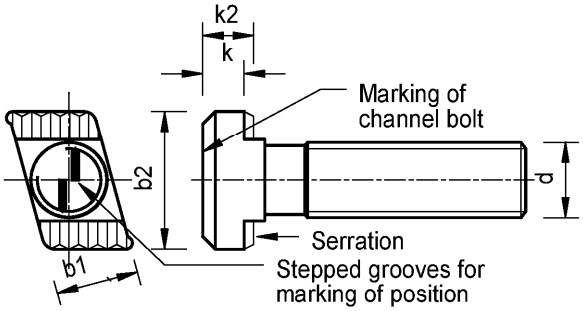
[1] Material properties according to Annex A7
[2] Material properties according to EN ISO 898-1
[3] Electroplated
[4] Hot-dip galvanized



Notching Channel Bolt FBC-N-50/30-M20



Channel Bolt FBC-40/22, FBC-50/30



Serrated Channel Bolt FBC-S-29/20, FBC-S-38/23

Table 5: Dimensions of fischer Channel Bolts FBCand appropriate fischer Anchor Channels FES

Anchor channel	Channel bolt	Dimensions				
		Thread d	b1 [mm]	b2 [mm]	k [mm]	k2 [mm]
FES-H-S-29/20	FBC-S-29/20	M12	13	22	6,5	8
FES-H-S-38/23	FBC-S-38/23	M12	16,7	29,1	5,8	7,3
		M16	16,7	29,1	5,8	7,3
FES-H-40/22	FBC-40/22	M10	14	32,5	8	11
		M12	14	32,5	8	11
		M16	17	32,5	8	11
FES-H-50/30 FES-H-52/34	FBC-50/30	M10	17,1	40,5	9	11,5
		M12	17,1	40,5	10	12,5
		M16	17,1	40,5	11	13,5
		M20	20,5	40,5	12	14,5
	FBC-N-50/30	M20	21	42,5	12	16

fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
fischer Channel Bolts FBC

Annex A6

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Table 6: Materials and properties

Component	Steel		
	Mechanical properties	**Coating**	**Coating**
1	**2a**	**2b**	**2c**
Channel profile	1.0038, 1.0044 acc. to EN 10025:2004 1.0976, 1.0979 acc. to EN 10149:2013	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009
Anchor	1.0038, 1.0213, 1.0214 acc. to EN 10025:2004 1.5523, 1.5535 acc. to EN 10263:2017	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009
Channel bolt	Steel grade 8.8 acc. to EN ISO 898-1:2013	Electroplated acc. to EN ISO 4042:2018	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009
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 4042:2018	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009
Hexagonal nut acc. to EN ISO 4032:2012	Property class 5 or 8 acc. to EN ISO 898-2:2012	Electroplated acc. to EN ISO 4042:2018	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009

[1] Not in the scope of delivery

fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Materials

Annex A7

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Specification of intended use

Anchor channels and channel bolts subject to:

- Static and quasi-static loads in tension and shear perpendicular to the longitudinal axis of the channel for FES in combination with channel bolt FBC.
- Static and quasi-static loads in tension and shear, shear perpendicular to the longitudinal axis of the channel and shear in the direction of the longitudinal axis of the channel for FES-H-50/30 or FES-H-52/34 in combination with notching channel bolt FBC-N-50/30-M20
- Static and quasi-static loads in tension and shear, shear perpendicular to the longitudinal axis of the channel and shear in the direction of the longitudinal axis of the channel for serrated anchor channels FES-H-S in combination with serrated channel bolts FBC-S.

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C12/15 to C90/105 according to EN 206-1:2000
- Cracked or uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (e.g. accommodations, bureaus, schools, hospitals, shops, exceptional internal conditions with usual humidity)
  (anchor channels and channel bolts according to Annex A7, Table 6, column 2b and 2c).
- 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 6, column 2c).

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 fire exposure the anchor channels have to be designed in accordance with EOTA TR 047 “Calculation Method for the Performance of Anchor Channels”, March 2018 or EN 1992-4:2018.
- The characteristic resistances are calculated with the minimum effective embedment depth.

fischer Anchor Channel FES with fischer Channel Bolts FBC	Annex B1
Intended Use Specifications	

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Installation:

- The installation of anchor channels is carried out by appropriately qualified personel 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 3 are generated including end spacing x and minimum channel length l_{min} and only to be used in dry internal conditions.
- 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-50/30 may be used only once after applying the installation torque $T_{inst,s}$.

fischer Anchor Channel FES with fischer Channel Bolts FBC	Annex B2
Intended Use Specification	

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Table 7: Installation parameters for fischer Anchor Channels FES

Anchor Channel FES-H-			**S-29/20**	**S-38/23**	**40/22**	**50/30 I-50/30**	**52/34 I-52/34**
Minimum effective embedment depth	$h_{ef,min}$	[mm]	77	97	90	94	155
Minimum edge distance	c_{min}		75	100	50	75	100
Minimum thickness of concrete member	h_{min} [1)]		100	100	100	100	160 170

[1)] $h_{min} = h_{ef} + t_h + c_{nom}$; c_{nom} according to EN 1992-1-1:2004 + AC:2010

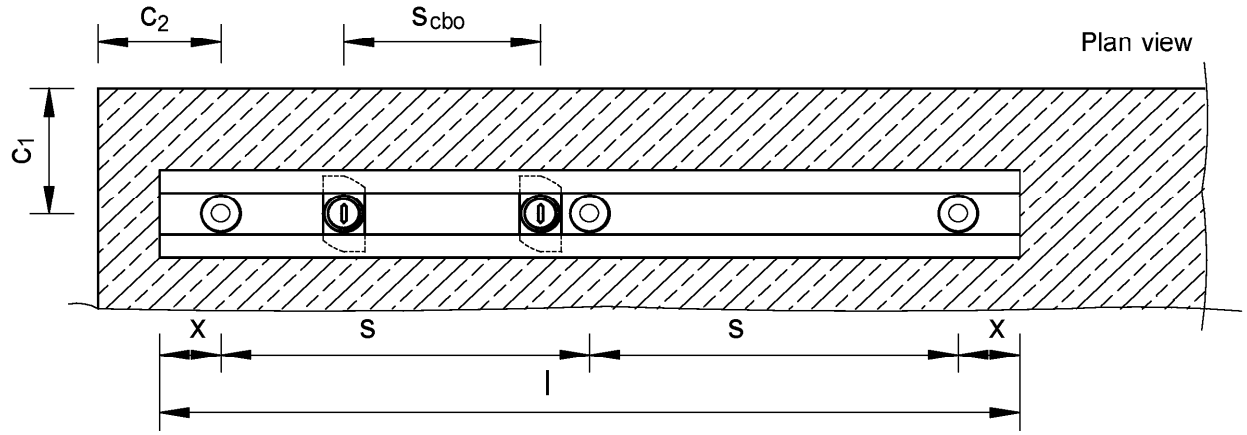

Table 8: Minimum spacing for channel bolts

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

fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use
Installation parameters for fischer Anchor Channels FES

Annex B3

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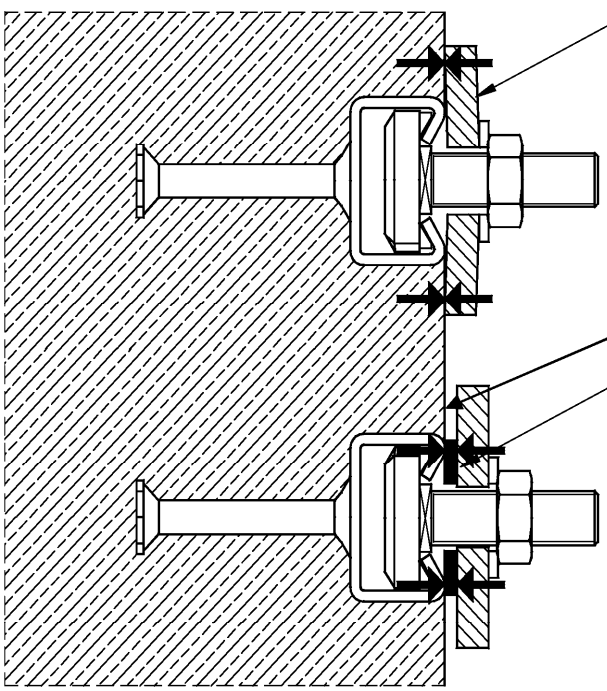
Table 9: Required installation torque T_{inst}

fischer Channel Bolt FBC		T_{inst} [1] [Nm]	
		General	Steel - steel contact
		$T_{inst,g}$	$T_{inst,s}$
S-29/20	M12	80	80
S-38/23	M12	80	80
	M16	100	100
40/22	M10	15	30
	M12	25	45
	M16	50	100
50/30	M10	15	30
	M12	25	45
	M16	60	100
	M20	75	230
N-50/30	M20	-	400

[1] T_{inst} must not be exceeded



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 $T_{inst,s}$.
($T_{inst,s} \geq T_{inst,g}$)

fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use
Installation parameters for fischer Channel Bolts FBC

Annex B4

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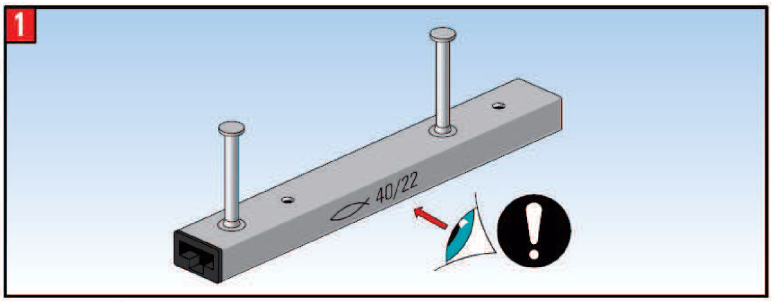
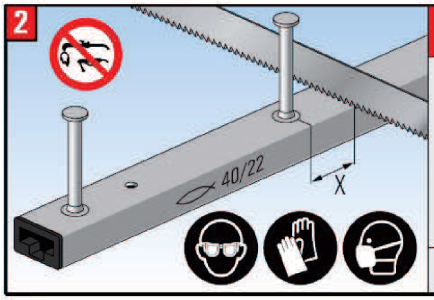
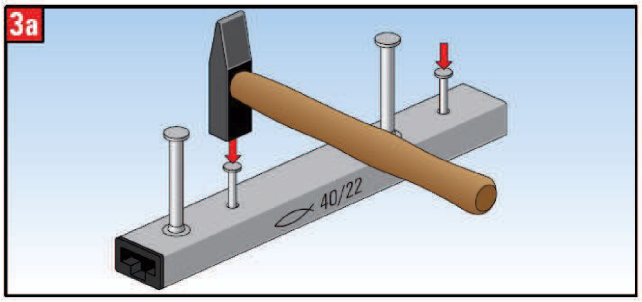
fischer innovative solutions

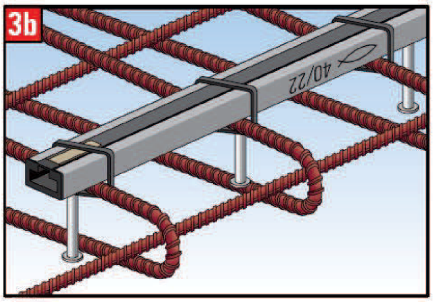
fischer Anchor Channel FES

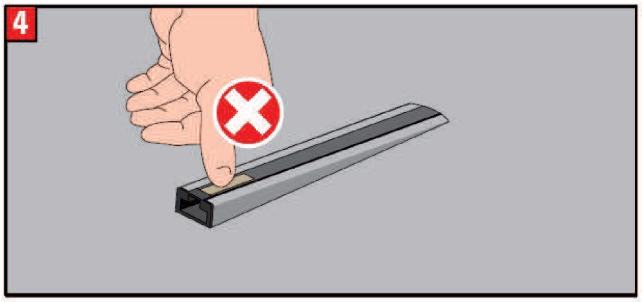


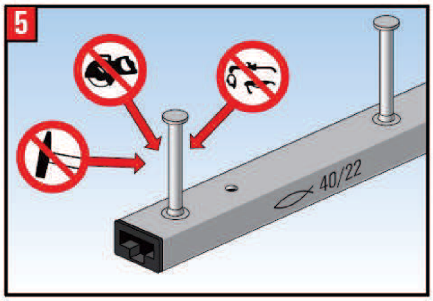


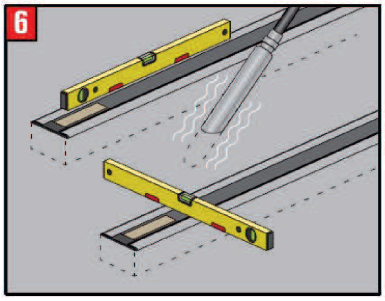
X	T
25 - 35 mm	S - 29/20 S - 38/23 40/22 50/30 I - 50/30 I - 52/34
35 mm	52/34

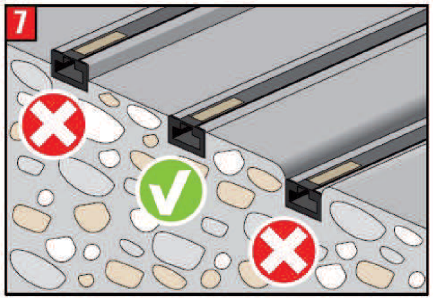


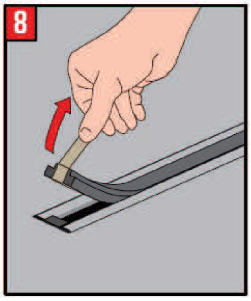












fischer Anchor Channel FES with fischer Channel Bolts FBC

Annex B5

Intended Use
Installation instruction for fischer Anchor Channels FES

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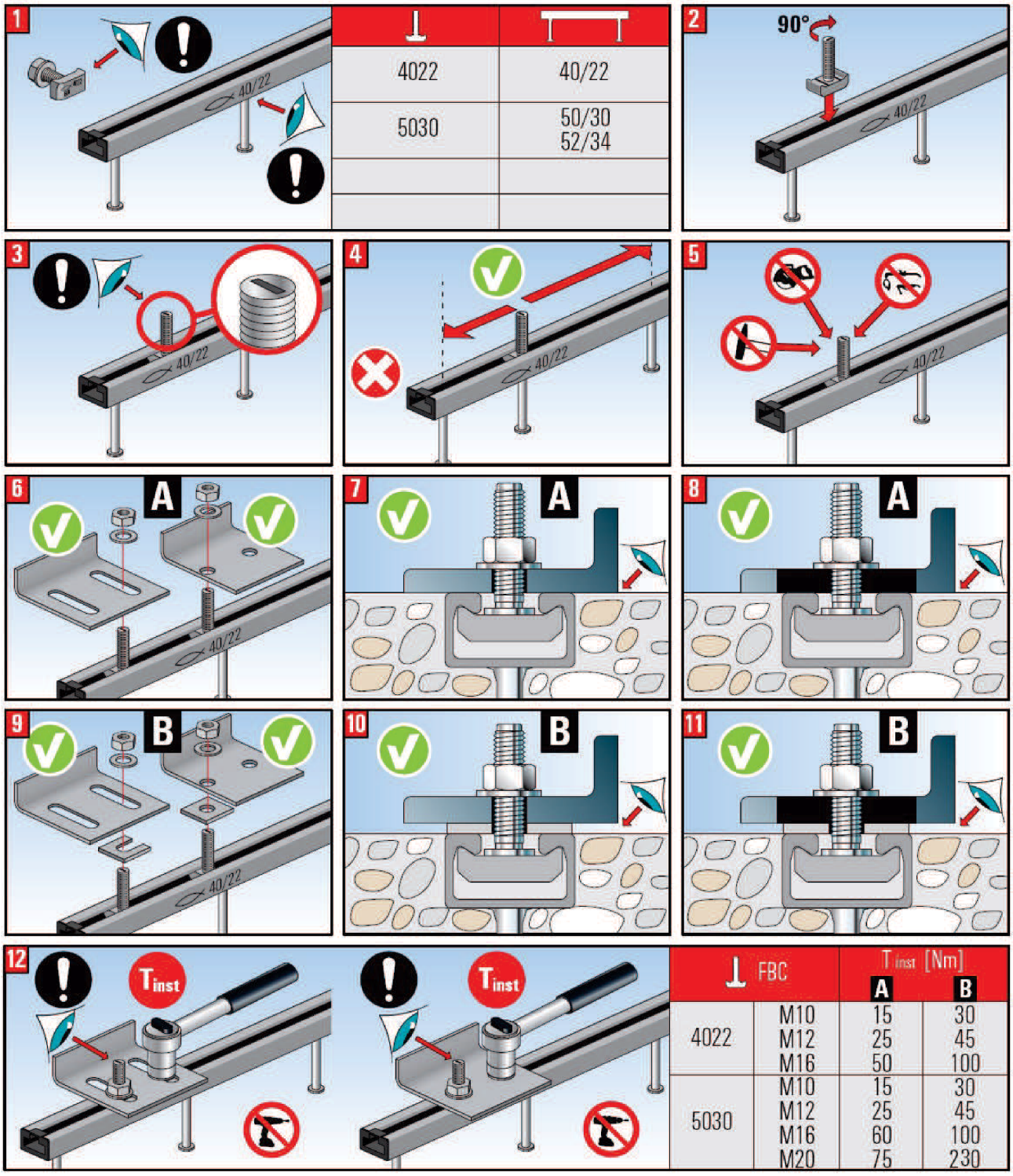
fischer innovative solutions

fischer Channel Bolts FBC



⊥	T
4022	40/22
5030	50/30 52/34

⊥ FBC		T_{inst} [Nm] A	B
4022	M10	15	30
	M12	25	45
	M16	50	100
5030	M10	15	30
	M12	25	45
	M16	60	100
	M20	75	230

T_{inst} must not be exceeded.

fischer Anchor Channel FES with fischer Channel Bolts FBC

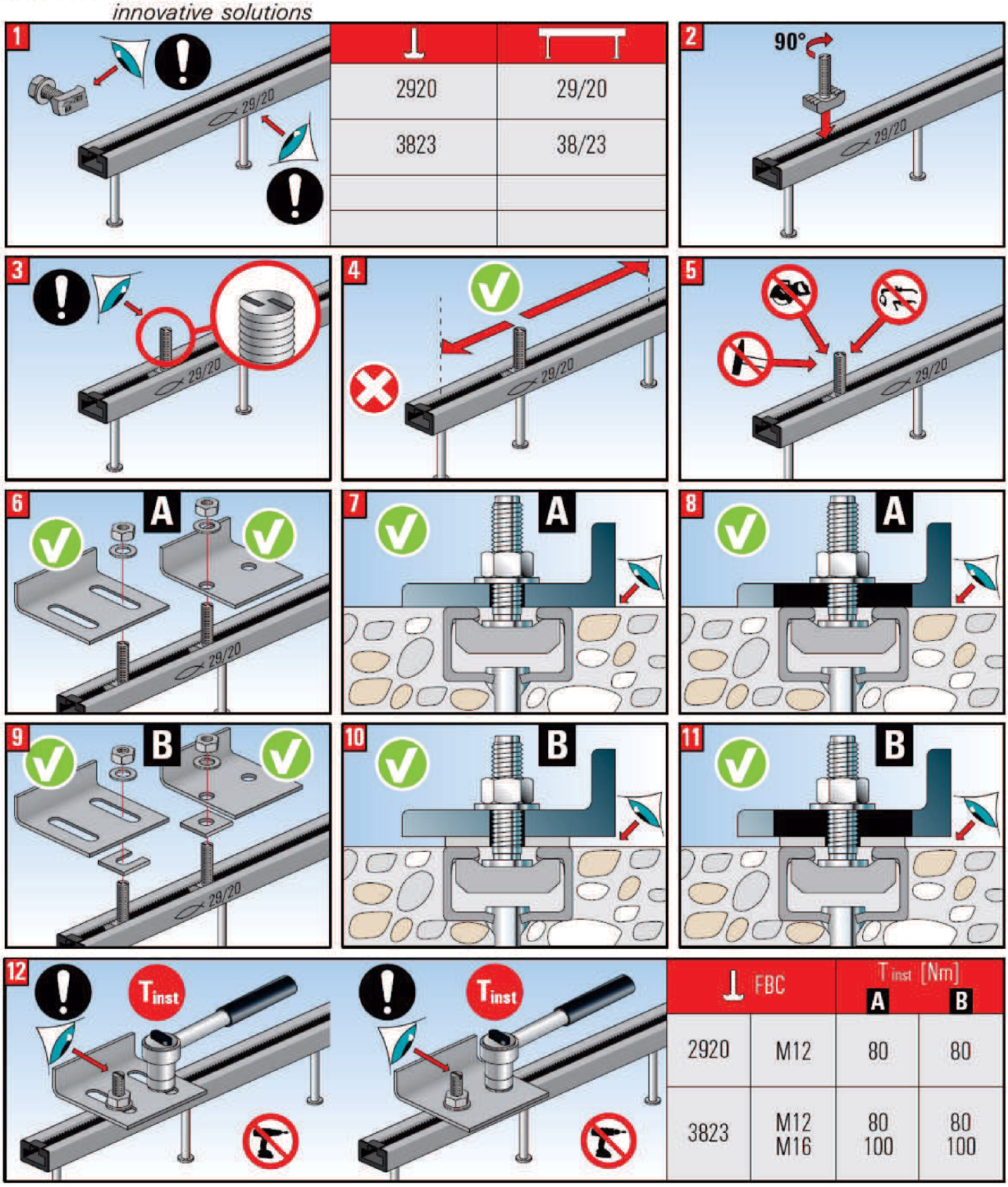
Intended Use
Installation instruction for fischer Channel Bolts FBC

Annex B6

Deutsches Institut für Bautechnik DIBt

fischer innovative solutions

Serrated fischer Channel Bolts FBC-S



⊥	T
2920	29/20
3823	38/23

⊥ FBC		T_{inst} [Nm] A	B
2920	M12	80	80
3823	M12 M16	80 100	80 100

T_{inst} must not be exceeded.

fischer Anchor Channel FES with fischer Channel Bolts FBC

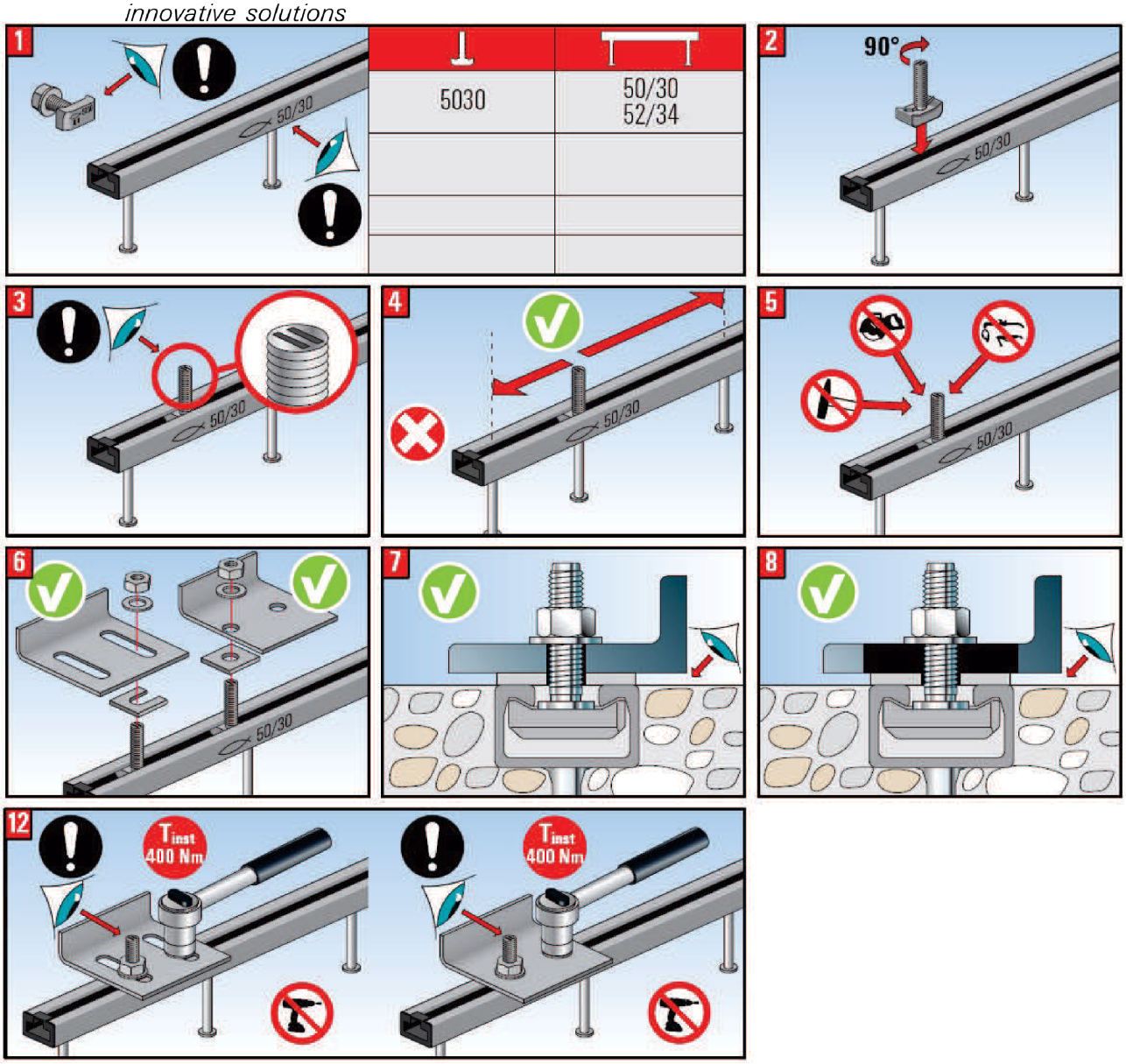
Annex B7

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

Deutsches Institut für Bautechnik DIBt

fischer innovative solutions

Notching fischer Channel Bolts FBC- N



T_{inst} must not be exceeded.

fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use
Installation instruction for Notching fischer Channel Bolts FBC-N

Annex B8

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Table 10: Characteristic resistances under tension load – steel failure of anchor channel

Anchor channel FES-H-			S-29/20	S-38/23	40/22	50/30 I-50/30	52/34 I-52/34
Steel failure: Failure of anchor							
Characteristic resistance	$N_{Rk,s,a}$	[kN]	31,0	31,0	20,0	31,0 44,0	55,0 70,4
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Failure of connection between anchor and channel							
Characteristic resistance	$N_{Rk,s,c}$	[kN]	20,2	30,3	20,0	31,0 40,0	55,0 70,4
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Local failure by flexure of channel lips							
Characteristic spacing of channel bolts for $N_{Rk,s,l}$	$s_{l,N}$	[mm]	60	76	80	100	105
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	20,2	30,3	38,0	43,0	72,0
Partial factor	γ_{Ms} [1)]	[-]	1,8				

[1)] In absence of other national regulations

Table 11: Characteristic flexural resistance of channel under tension load

Anchor channel FES-H-			S-29/20	S-38/23	40/22	50/30 I-50/30	52/34 I-52/34
Steel failure: Flexure of channel							
Characteristic flexural resistance of channel	$M_{Rk,s,flex}$	[Nm]	745	1.241	1.118	2.185 2.185	3.163 2.027
Partial factor	$\gamma_{Ms,flex}$ [1)]	[-]	1,15				

[1)] In absence of other national regulations

fischer Anchor Channel FES with fischer Channel Bolts FBC

Performance
Characteristic resistances of anchor channels under tension load

Annex C1

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Table 12: Characteristic resistances under tension load – concrete failure

Anchor channel FES-H			**S-29/20**	**S-38/23**	**40/22**	**50/30**	**52/34**	**50/30**	**52/34**
Type of anchor			**R**	**R**	**R**	**R**	**R**	**I**	**I**
Concrete failure: Pullout									
Characteristic resistance in cracked concrete C12/15	$N_{Rk,p}$	[kN]	21,2	21,2	13,6	21,2	33,2	33,8	54,0
Characteristic resistance in uncracked concrete C12/15	$N_{Rk,p}$	[kN]	29,7	29,7	19,0	29,7	46,5	47,3	75,6
Factor of $N_{Rk,p}$	C16/20 C20/25 C25/30 C30/37 C35/45 C40/50 C45/55 C50/60 C55/67 C60/75 ≤ C90/105	ψ_c [-]	1,33 1,67 2,08 2,50 2,92 3,33 3,75 4,17 4,58 5,00 5,00						
Partial factor	$\gamma_{Mp} = \gamma_{Mc}$ [1)]	[-]	1,5						
Concrete failure: Concrete cone, factor k_1									
Cracked concrete	$k_{cr,N}$	[-]	7,8	8,1	8,0	8,1	8,7	8,1	8,7
Uncracked concrete	$k_{ucr,N}$	[-]	11,2	11,6	11,4	11,5	12,4	11,5	12,4
Partial factor	γ_{Mc} [1)]	[-]	1,5						
Concrete failure: Splitting									
Characteristic edge distance	$c_{cr,sp}$	[mm]	231	291	270	282	465	282	465
Characteristic spacing	$s_{cr,sp}$	[mm]	$= 2 * c_{cr,sp}$						
Partial factor	$\gamma_{Msp} = \gamma_{Mc}$ [1)]	[-]	1,5						

1) In absence of other national regulations

Table 13: Displacements under tension load

Anchor Channel FES-H-			**S-29/20**	**S-38/23**	**40/22**	**50/30 I-50/30**	**52/34 I-52/34**
Tension load	N	[kN]	8,0	12,0	15,1	17,1	28,6
Short term displacement [1)]	δ_{N0}	[mm]	1,4	2,0	2,2	1,5	1,9
Long term displacement [1)]	$\delta_{N\infty}$	[mm]	2,8	4,0	4,5	2,9	3,7

[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 14: Characteristic resistances under shear load – steel failure of anchor channel

Anchor channel FES-H-			**S-29/20**	**S-38/23**	**40/22**	**50/30 l-50/30**	**52/34 l-52/34**
Steel failure: Anchor							
Characteristic resistance	$V_{Rk,s,a,y}$	[kN]	20,2	30,3	40,0	60,0	100,0
	$V_{Rk,s,a,x}$	[kN]	18,8	18,8	-	18,8 26,4	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]	20,2	30,3	40,0	60,0	100,0
	$V_{Rk,s,c,x}$	[kN]	12,1	18,2	-	18,6 24,0	33,0 42,2
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Flexure of channel lips under shear load perpenticular to the longitudinal axis of the channel							
Characteristic spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,V}$	[mm]	60	76	80	100	105
Characteristic resistance	$V^0_{Rk,s,l,y}$	[kN]	20,2	30,3	40,0	60,0	100,0
Partial factor	γ_{Ms} [1)]	[-]	1,8				
Steel failure: Connection between channel lips and channel bolt for shear load in direction of the longitudinal axis of the channel							
Characteristic resistance							
FBC-S-29/20-M12-8.8	$V_{Rk,s,l,x}$	[kN]	22,5	-	-	-	-
FBC-S-38/23-M12-8.8 and FBC-S-38/23-M16-8.8			-	23,2	-	-	-
FBC-N-5030-M20-8.8			-	-	-	18,7	18,7
Installation factor	γ_{inst} [1)]	[-]	1,2	1,0	-	1,4	1,4

[1)] In absence of other national regulations

Table 15: Characteristic resistances under shear load – concrete failure

Anchor channel FES-H-			S-29/20	S-38/23	40/22	50/30 I-50/30	52/34 I-52/34
Concrete failure: Pryout failure							
Product factor	k_8	[-]	2,0	2,0	2,0	2,0	2,0
Partial factor	γ_{Mc} [1)]	[-]	1,5	1,5	1,5	1,5	1,5
Concrete failure: Concrete edge failure k_{12}							
Cracked concrete	$k_{cr,V}$	[-]	5,6	5,6	7,5	7,5 4,5	7,5 4,5
Uncracked concrete	$k_{ucr,V}$	[-]	7,8	7,8	10,5	10,5 6,3	10,5 6,3
Partial factor	γ_{Mc} [1)]	[-]	1,5	1,5	1,5	1,5	1,5

[1)] In absence of other national regulations

Table 16: Displacements under shear load

Anchor channel FES-H-			S-29/20	S-38/23	40/22	50/30 I-50/30	52/34 I-52/34
Shear load perpenticular to the longitudinal axis of the channel	V_y	[kN]	8,0	12,0	15,9	23,8	39,7
Short time displacement [1)]	$\delta_{V,y,0}$	[mm]	1,4	2,0	2,1	3,7	4,0
Long time displacement [1)]	$\delta_{V,y,\infty}$	[mm]	2,1	3,0	3,2	5,5	5,9
Shear load in direction of the longitudinal axis of the channel	V_x	[kN]	6,6	9,1	-	5,1	5,1
Short time displacement [2)]	$\delta_{V,x,0}$	[mm]	0,6	0,8	-	0,5	0,5
Long time displacement [2)]	$\delta_{V,x,\infty}$	[mm]	0,9	1,3	-	0,8	0,8

[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

Table 17: Characteristic resistances under combined tension and shear load

Anchor channel FES-H-			S-29/20	S-38/23	40/22	50/30 I-50/30	52/34 I-52/34
Steel failure: Local failure by flexure of channel lips and failure by flexure of channel							
Product factor	k_{13}	[-]	Values are taken from EN 1992-4:2018				
Steel failure: Failure of anchor and connection between anchor and channel							
Product factor	k_{14}	[-]	Values are taken from EN 1992-4:2018				

fischer Anchor Channel FES with fischer Channel Bolts FBC

Performance
Characteristic resistances of anchor channels and displacements under shear load
Characteristic resistances under combined tension and shear load

Annex C4

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Table 18: Characteristic resistances under tension and shear load – steel failure of channel bolts

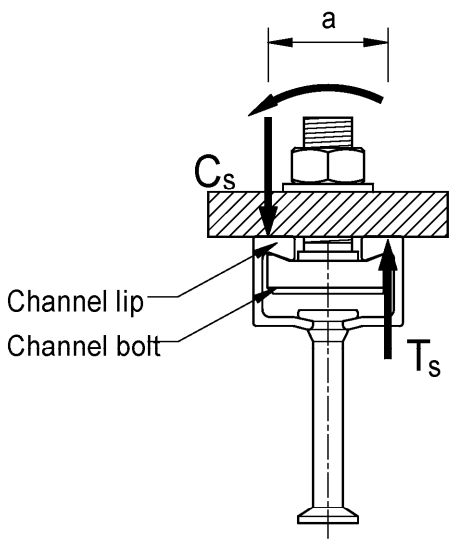
Channel bolt			**M10**	**M12**	**M16**	**M20**
Steel failure: Characteristic tension resistance						
FBC-S-29/20	$N_{Rk,s}$ [1]	[kN]	-	48,5	-	-
FBC-S-38/23			-	67,4	71,5	-
FBC-40/22			46,4	55,1	82,2	-
FBC-50/30			46,4	67,4	96,5	127,2
FBC-N-50/30			-	-	-	142,5
Partial factor	γ_{Ms} [2]	[-]	1,5			
Characteristic shear resistance	$V_{Rk,s,x} = V_{Rk,s,y}$ [1]	[kN]	23,2	33,7	62,8	98,0
Partial factor	γ_{Ms} [2]	[-]	1,25			

[1] In conformity to EN ISO 898-1:1999
[2] In absence of other national regulations

Table 19: Characteristic resistances under shear load with lever arm – steel failure of channel bolts

Channel bolt [2]				**M10**	**M12**	**M16**	**M20**
Steel failure							
Characteristic bending resistance	$M^0_{Rk,s}$ [3]	[Nm]	FBC-S-29/20 FBC-S-38/23 FBC-40/22 FBC-50/30 FBC-N-50/30	59,8	104,8	266,4	519,3
Partial factor	γ_{Ms} [1]	[-]	FBC-S-29/20 FBC-S-38/23 FBC-40/22 FBC-50/30 FBC-N-50/30	1,25			
Internal lever arm	a	[mm]	FBC-S-29/20	-	20,0	-	-
			FBC-S-38/23	-	23,7	25,7	-
			FBC-40/22	23,5	24,8	26,8	-
			FBC-50/30	27,7	29,0	31,0	33,3
			FBC-N-50/30	-	-	-	34,0

[1] In absence of other national regulations
[2] Materials according to Annex A7, Table 6
[3] The characteristic flexure resistance according to Table 19 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 10)

$M^0_{Rk,s} \leq 0{,}5 \cdot N_{Rk,s} \cdot a$ ($N_{Rk,s}$ according to Annex C5, Table 18)

a = Internal lever arm according to Table 19

T_s = Tension force acting on the channel lips

C_s = Compression force acting on the channel lips

fischer Anchor Channel FES with fischer Channel Bolts FBC

Performance
Characteristic flexural resistances of channel bolts under shear load

Annex C6