Deutsches Institut für Bautechnik

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

European Technical Assessment Body for construction products

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European Technical Assessment ETA-22/0035 of 23 May 2025

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 Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S
Product family to which the construction product belongs	Anchor Channels
Manufacturer	fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 72178 Waldachtal DEUTSCHLAND
Manufacturing plant	fischer manufacturing plants
This European Technical Assessment contains	32 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 330008-04-0601, Edition 07/2024
This version replaces	ETA-22/0035 issued on 1 December 2023

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Specific Part

1 Technical description of the product

The fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S 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 Serrated Channel Bolts.

The anchor channel is embedded surface-flush in the concrete. fischer Serrated 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 static and quasi-static tension 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 C6
- Resistance to steel failure by exceeding the bending strength of the channel	s_{max} see Annex A5 $M_{Rk,s,flex}$ see Annex C1
- 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 C2
- Resistance to concrete cone failure	h_{ef} see Annex B3 $k_{cr,N}$; $k_{ucr,N}$ see Annex C2
- 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 C2
- Resistance to blowout failure - bearing area of anchor head	A_h see Annex A4

Essential characteristic	**Performance**
Characteristic resistance under static and quasi-static shear loading	
- Resistance to steel failure of channel bolt under shear loading without lever arm	$V_{Rk,s}$ see Annex C6
- Resistance to steel failure by bending of the channel bolt under shear load with lever arm	$M^0_{Rk,s}$ see Annex C7
- 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 C4
- Resistance to steel failure of connection between channel lips and channel bolt (shear load in longitudinal channel axis)	$V_{Rk,s,l,x}$ see Annex C5
- Factor for sensitivity to installation (longitudinal shear)	γ_{inst} see Annex C5
- Resistance to steel failure of the anchor (longitudinal shear)	$V_{Rk,s,a,x}$ see Annex C4
- Resistance to steel failure of connection between anchor and channel (longitudinal shear)	$V_{Rk,s,c,x}$ see Annex C4
- Resistance to concrete pry-out failure	k_8 see Annex C5
- Resistance to concrete edge failure	$k_{cr,V}$; $k_{ucr,V}$ see Annex C5
Characteristic resistance under combined static and quasi-static tension and shear loading	
- Resistance to steel failure of the anchor channel	k_{13} ; k_{14} see Annex C6
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)	$\Delta N_{Rk,s,lo,n}$; $N_{lok,s,n}$ (n = 10^4 to n = ∞) see Annex C8
- 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)	$\Delta N_{Rk,c,E,n}$; $\Delta N_{Rk,p,E,n}$ (n = 10^4 to n = ∞) see Annex C9

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 C10 $N_{Rk,s,eq}$ see Annex C12
- Resistance to steel failure under seismic shear loading for shear load in transverse direction (seismic performance category C1)	$V^0{}_{Rk,s,l,y,eq}$; $V_{Rk,s,c,y,eq}$; $V_{Rk,s,a,y,eq}$ see Annex C11 $V_{Rk,s,eq}$ see Annex C12
- 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 C11
Characteristic resistance under static and quasi-static tension and/or shear loading	
- Displacements	δ_{N0} ; $\delta_{N\infty}$ see Annex C3 $\delta_{V,y,0}$; $\delta_{V,y,\infty}$; $\delta_{V,x,0}$; $\delta_{V,x,\infty}$ see Annex C6

3.2 Safety in case of fire (BWR 2)

Essential characteristic	**Performance**
Reaction to fire	Class A1
Characteristic resistance to fire	See Annex C13 and C14

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

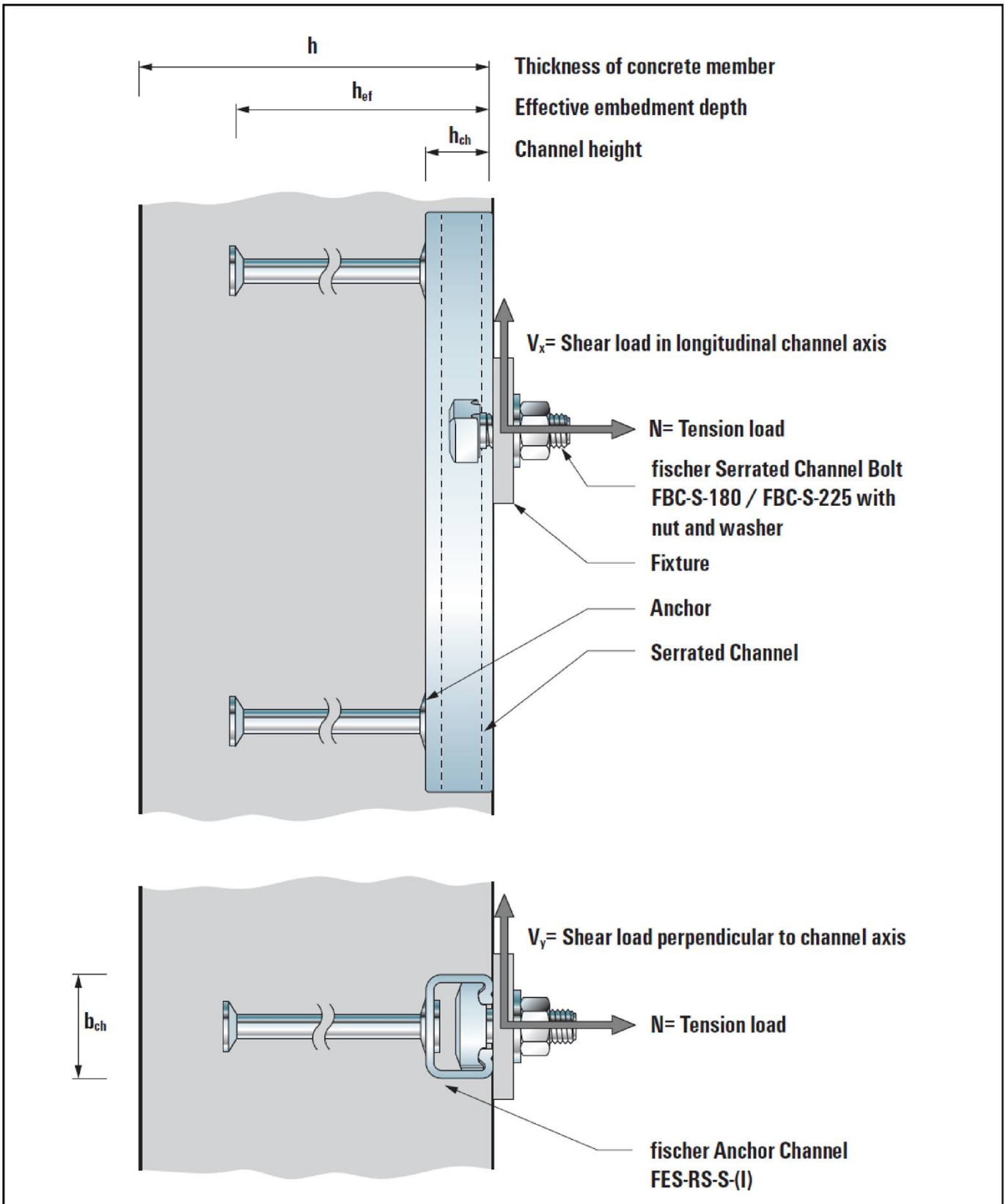
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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 23 May 2025 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Müller



fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex A1**
Product description Installed conditions	

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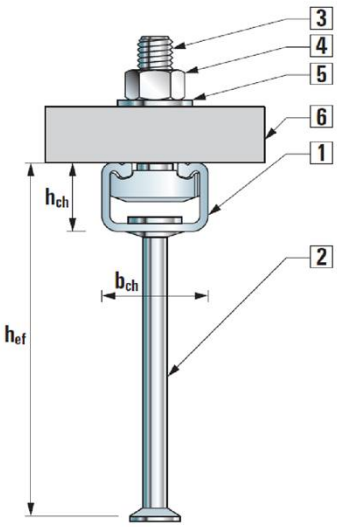
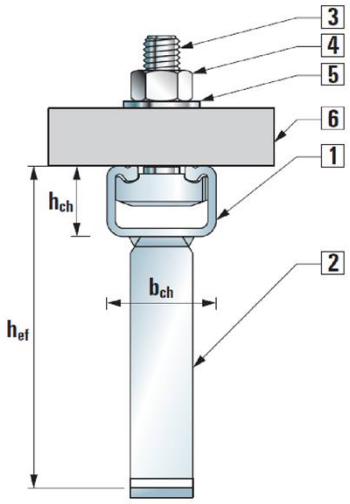


Round anchor



I-anchor

fischer Anchor Channel
FES-RS-S
1 Serrated channel profile
2 Anchor
3 Serrated channel bolt
4 Hexagonal nut
5 Washer
6 Fixture

Marking of the fischer anchor channel FES-RS-S:

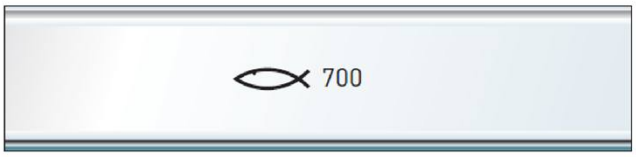
e. g.: 700

	= Identifying mark of the manufacturer
I	= Additional marking for I-anchors No marking for round anchors
700	= Size of the anchor channel (e.g. 700, 600, 500)

Marking of the fischer channel bolt FBC-S:

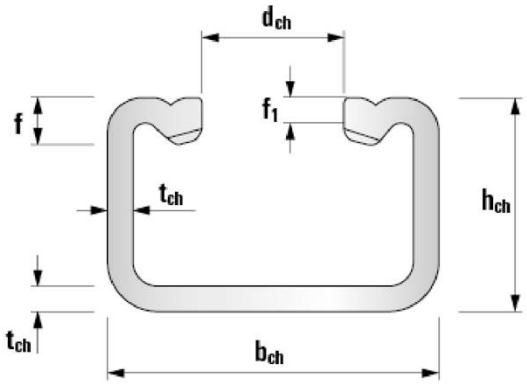
e. g.: 8.8 225 / 8.8 180

	= Identifying mark of the manufacturer
8.8	= Strength grade
A4-70	= Stainless steel
225, 180	= Width of anchor channel opening d_{ch}
●	= Coating electro-plated No marking for hot-dip galvanised



Stamped into back of channel
Optional: printed on channel web or channel lips
RS = Roll-shaped, S = Serrated
No marking for material acc. Table A7.1 (Channel profile)

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex A2**
Product description Product and marking	



Serrated anchor channel FES-RS-S-(I)-

Table A3.1: Dimensions of channel profile

Anchor channel FES-RS-S-(I)-	b_{ch} [mm]	h_{ch} [mm]	t_{ch} [mm]	d_{ch} [mm]	f [mm]	f_1 [mm]	Iy [mm^4]
500	40,0	27,5	2,6	18,0	5,6	2,6	28.420
600	50,5	29,0	3,0	22,5	6,0	3,0	41.862
700	52,5	34,0	4,0	22,5	7,0	4,0	79.168

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Product description
Dimensions of channels

Annex A3

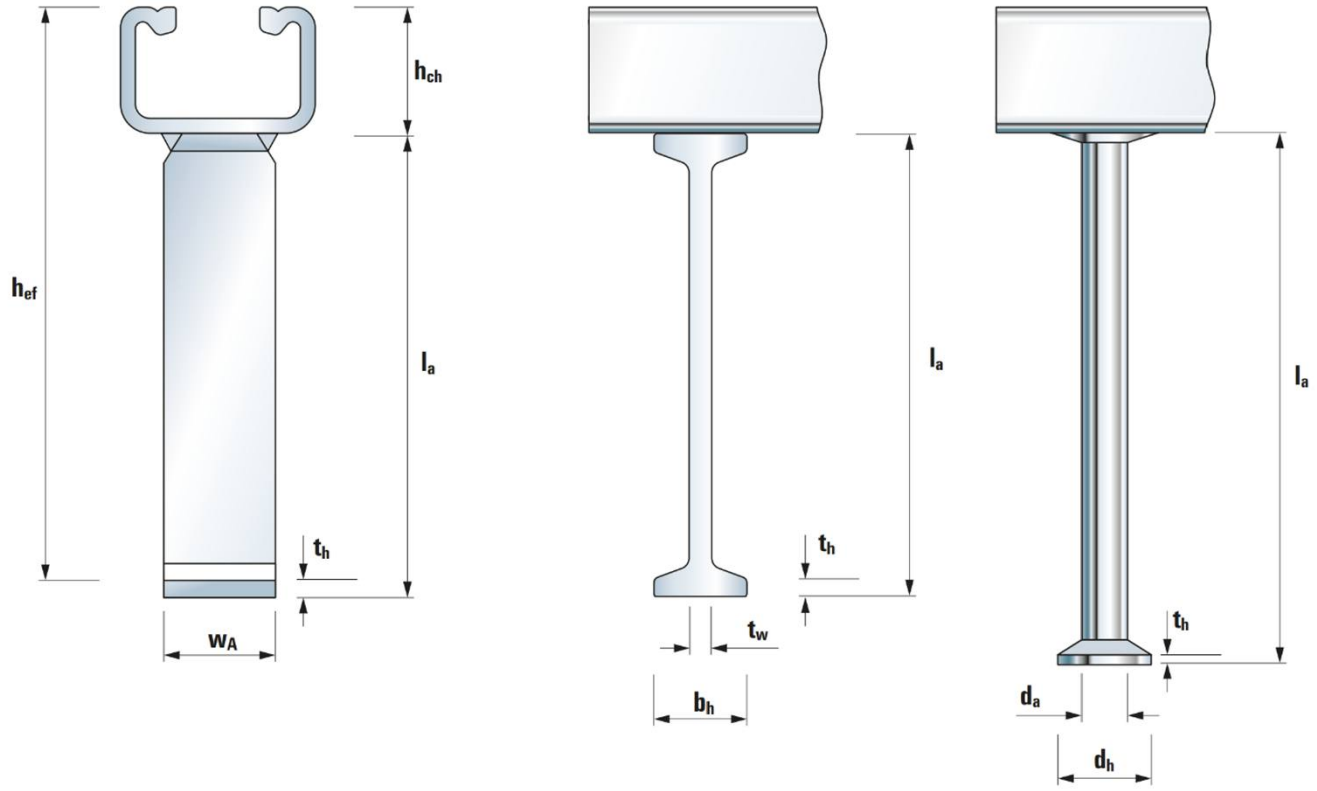


Table A4.1: Dimensions of anchor (welded I-anchor or forged round anchor)

Anchor channel FES-RS-S-(I)-	I-anchor						Round anchor				
	$l_{a,min}$ [mm]	$t_{w,min}$ [mm]	$b_{h,min}$ [mm]	t_h [mm]	$w_{A,min}$ [mm]	$A_{h,min}$ [mm²]	$l_{a,min}$ [mm]	d_a [mm]	d_h [mm]	t_h [mm]	A_h [mm²]
500	89	5	20	5	25	375	85,0	9,6	22,0	2,5	308
600	125	6	25	5	30	570	123,5	11,0	24,3	2,5	368
700	125	6	25	5	30	570	144,0	12,8	26,0	3,0	402

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Product description
Dimensions of anchors

Annex A4

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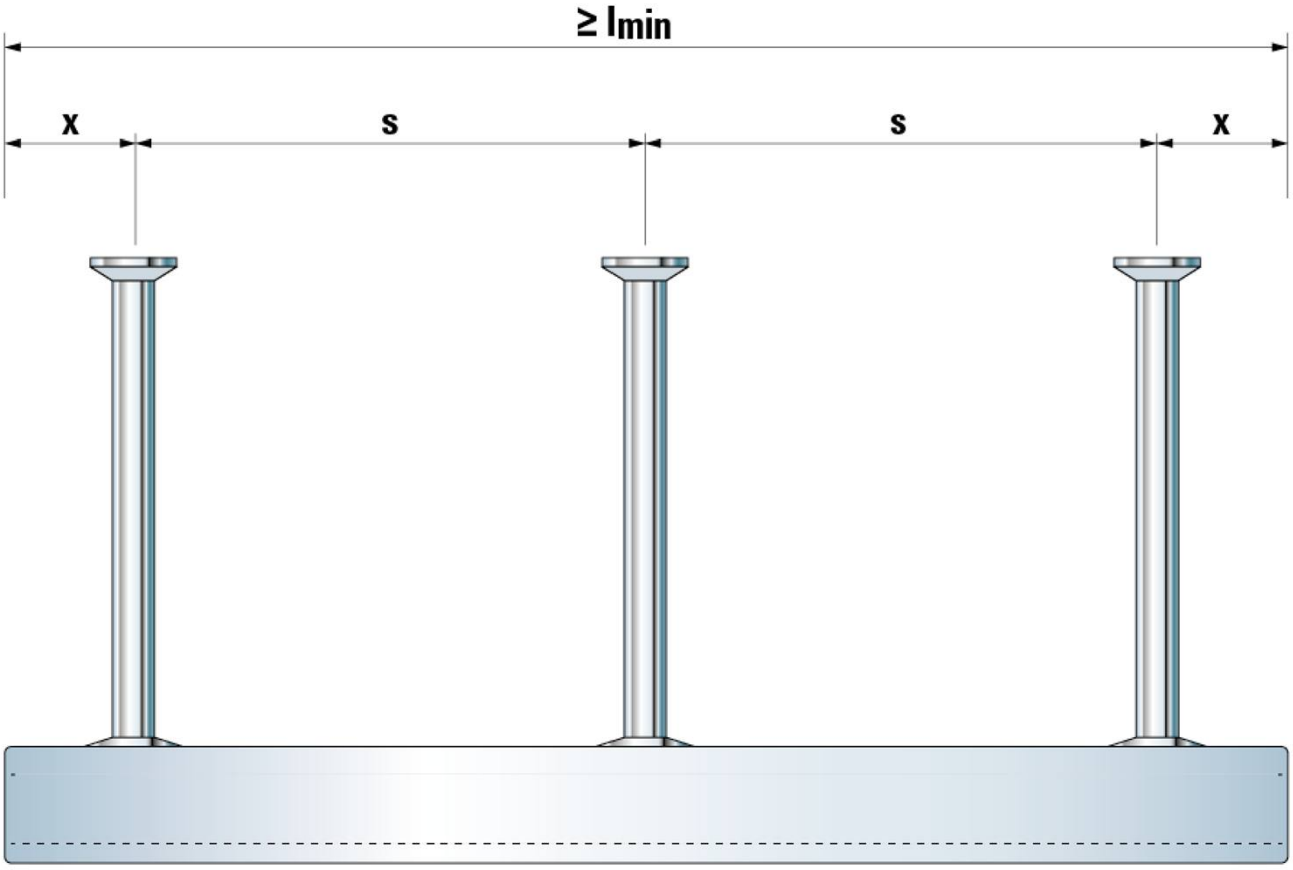
Table A5.1: Anchor position

Anchor channel FES-RS-S-(l)-	Anchor type	s_{min} [mm]	s_{max} [mm]	x_{min} [mm]	x_{max} [mm]	l_{min} [mm]	l_{max} [mm]
500	Round or welded I	80	250	35	40	150	5.700
600				30	35	140	6.070
700							



fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Product description
Anchor position and channel length

Annex A5

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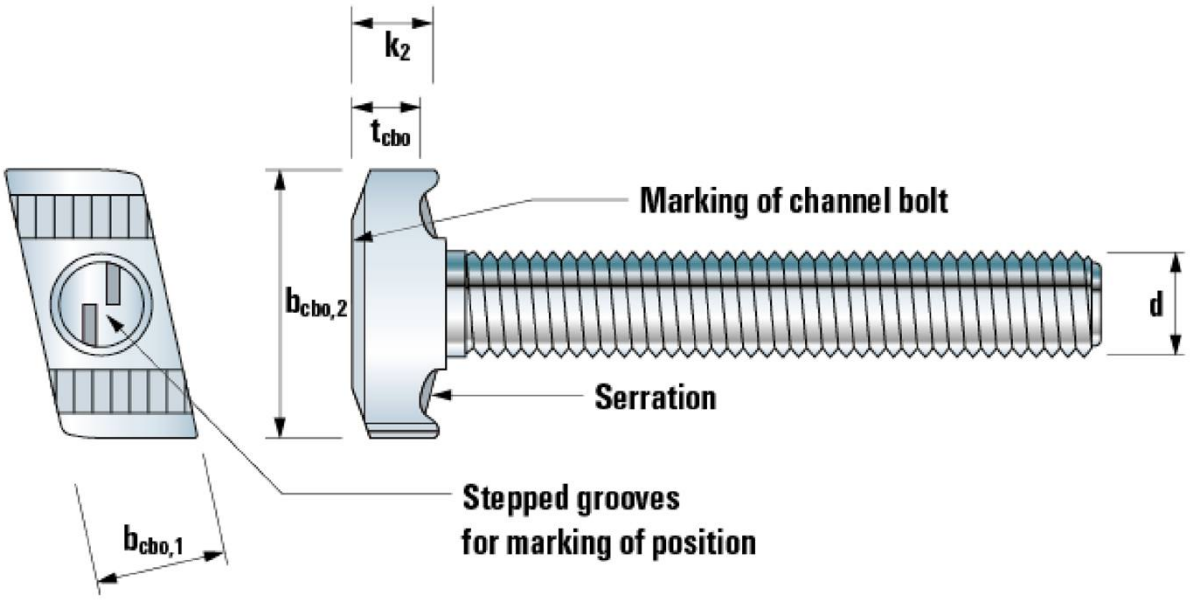
Table A6.1: Strength grade and Coating

Channel bolt	Carbon steel [1]	Stainless steel [1]
Strength grade	8.8	A4-70
f_{uk} [N/mm²]	800 / 830	700
f_{yk} [N/mm²]	640 / 660 [2]	450
Coating	F[3] or Electroplated	-

[1] Material properties according to Annex A7.

[2] Material properties according to EN ISO 898-1:2013.

[3] Hot-dip galvanised.



Serrated channel bolt FBC-S-225 / FBC-S-180

Table A6.2: Dimensions of fischer channel bolt FBC and matching fischer anchor channels FES

Anchor channel FES-RS-S-(l)-	Channel bolt FBC-S	Material	d [mm]	$b_{cbo,1}$ [mm]	$b_{cbo,2}$ [mm]	t_{cbo} [mm]	k_2 [mm]
500	180	8.8	10 12 16	16,5	33,9	9,3	10,6
600	225	8.8, A4-70	12 16 20	21,0	43,0	10,7	15,0
700							

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Product description
Serrated channel bolts

Annex A6

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Table A7.1: Materials and properties

Component	Carbon steel			Stainless steel
	Mechanical properties	Coating		Mechanical properties
1	2	2a	2b	3
Channel profile	1.0976 acc. to EN 10149:2013	Hot-dip galvanised ≥ 55 µm acc. to EN ISO 1461:2022	Hot-dip galvanised ≥ 55 µm acc. to EN ISO 1461:2022	- [2]
Round anchor	1.5525 acc. to EN 10263:2017	Hot-dip galvanised ≥ 55 µm acc. to EN ISO 1461:2022	Hot-dip galvanised ≥ 55 µm acc. to EN ISO 1461:2022	- [2]
I-anchor	1.0045, 1.0976 acc. to EN 10149:2013	Hot-dip galvanised ≥ 55 µm acc. to EN ISO 1461:2022	Hot-dip galvanised ≥ 55 µm acc. to EN ISO 1461:2022	- [2]
Channel bolt	Strength grade 8.8 acc. to EN ISO 898-1:2013	Electroplated acc. to EN ISO 4042:2022	Hot-dip galvanised ≥ 50 µm acc. to EN ISO 10684:2004 + AC:2009	Steel grade 70 acc. 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	Hardness class A ≥ 200 HV 1.4401, 1.4404, 1.4571, 1.4578 acc. to EN 10088-1:2023
Hexagonal nut acc. to EN ISO 4032:2023	Property class 8 acc. to EN ISO 898-2:2022	Electroplated acc. to EN ISO 4042:2022	Hot-dip galvanised ≥ 50 µm acc. to ISO 10684:2004 + AC:2009	Property class 70 or 80 acc. to EN ISO 3506-2:2023 1.4401, 1.4404, 1.4571, 1.4578

[1] Not in the scope of delivery.
[2] Product not available.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Product description
Materials

Annex A7

Specifications of intended use

Anchor channels and channel bolts subject to:

- Static and quasi-static tension, shear perpendicular to the longitudinal axis of the channel and shear in the direction of the longitudinal axis of the channel.
- Fatigue cyclic tension loads
  (anchor channels and channel bolts according to Annex C8).
- 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 C10).
- Fire exposure for concrete strength class C20/25 to C50/60 for tension and shear perpendicular to the longitudinal axis
  (anchor channels and channel bolts according to Annex C13).

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, 2b and 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 and 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 number 1.4401, 1.4404, 1.4571 and 1.4578 according to 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.
- For fatigue loading the anchor channels are designed in accordance with EOTA TR 50 “Calculation method for the performance of Anchor channels under Fatigue Cyclic Loading”, October 2023.
- The characteristic resistances are calculated with the minimum effective embedment depth.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex B1**
Intended Use Specifications, part 1	

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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.
- Installation in accordance with the installation instruction given in Annexes B5 and B6.
- 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.
- Washer may be chosen according to Annex A7 and provided separately by the user.
- Orientating the channel bolt (groove according to Annex B6) rectangular to the channel axis.
- The required installation torque given in Annex B4 must be applied and must not be exceeded.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex B2**
Intended Use Specifications, part 2	

Installation parameters

Table B3.1: Installation parameters

Anchor channel FES-RS-S-			**500**	**I-500**	**600**	**I-600**	**700**	**I-700**
Minimum effective embedment depth	$h_{ef,min}$	[mm]	110	112	150	154	175	154
Minimum edge distance	c_{min}		50	50	75	75	75	75
Minimum thickness of concrete member	h_{min} [1)]		113	117	153	159	178	178

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

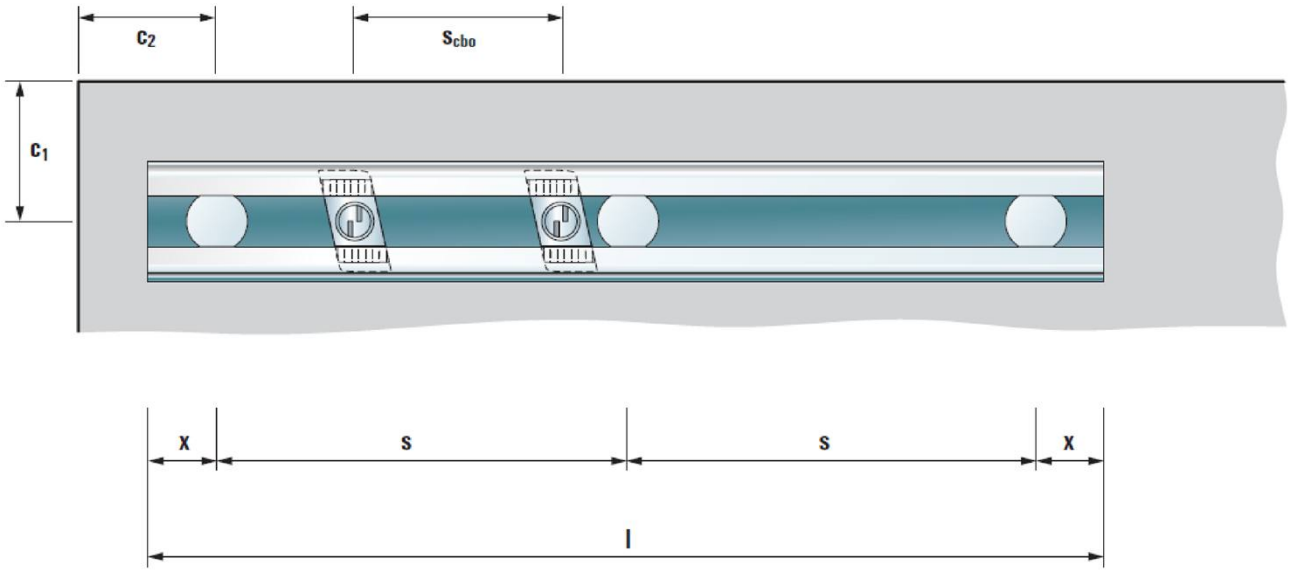


Table B3.2: Minimum spacing for channel bolts

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

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

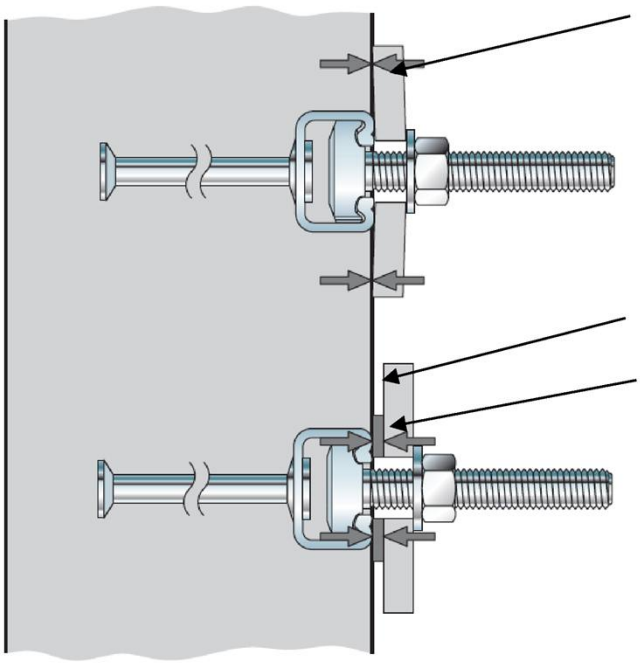
Intended Use
Installation parameters for fischer anchor channels FES-RS-S and channel bolt FBC-S spacing

Annex B3

Table B4.1: Installation torque T_{inst}

fischer anchor channel FES-RS-S-(I)-	fischer channel bolt FBC-S	Thread diameter	T_{inst} [1] [Nm]			
			General $T_{inst,g}$		Steel – steel contact $T_{inst,s}$	
			8.8	A4-70	8.8	A4-70
500	180	M10	35	-	35 - 40	-
		M12	55	-	55 - 70	-
		M16	75	-	75 - 150	-
600	225	M12	80	-	80 - 100	-
		M16	100	120	100 - 200	120 - 130
700		M20	120	-	120 - 360	-

[1] Max. 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 Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Intended Use
Installation parameters for fischer channel bolts FBC-S

Annex B4

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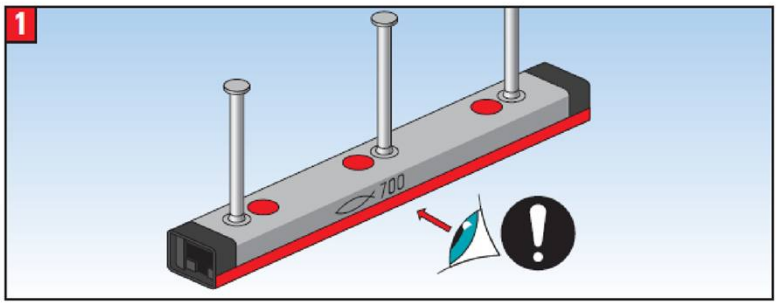
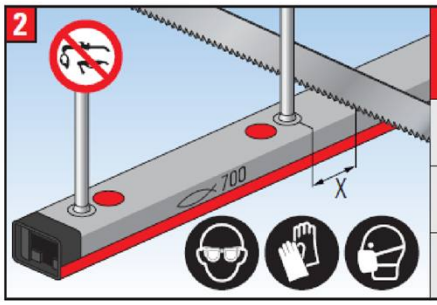
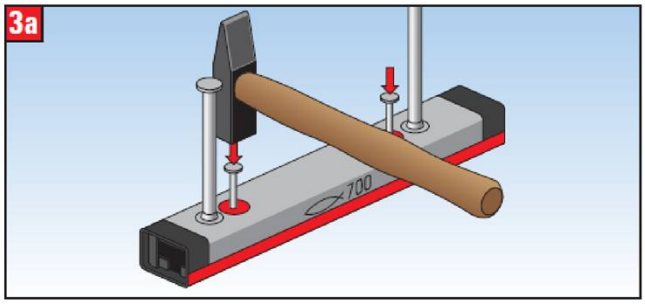
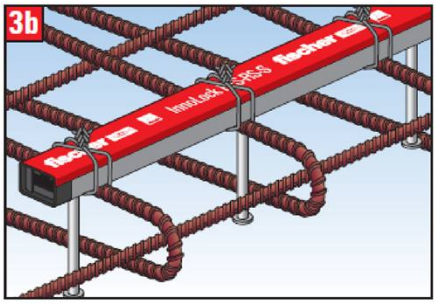
Anchor channel FES-RS-S

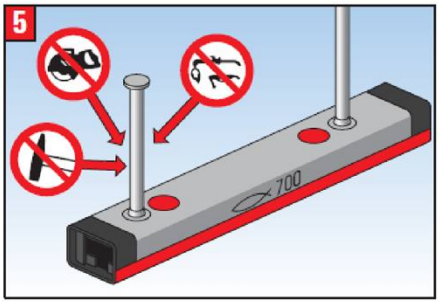


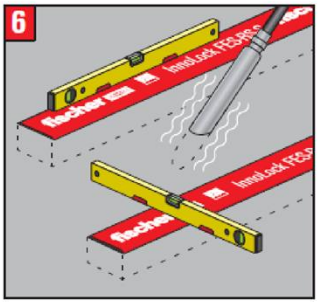


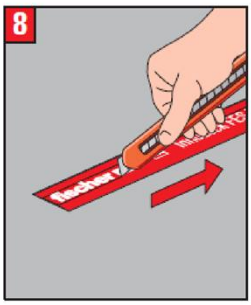
X	FES-RS-S
35 - 40 mm	500
30 - 35 mm	600
30 - 35 mm	700











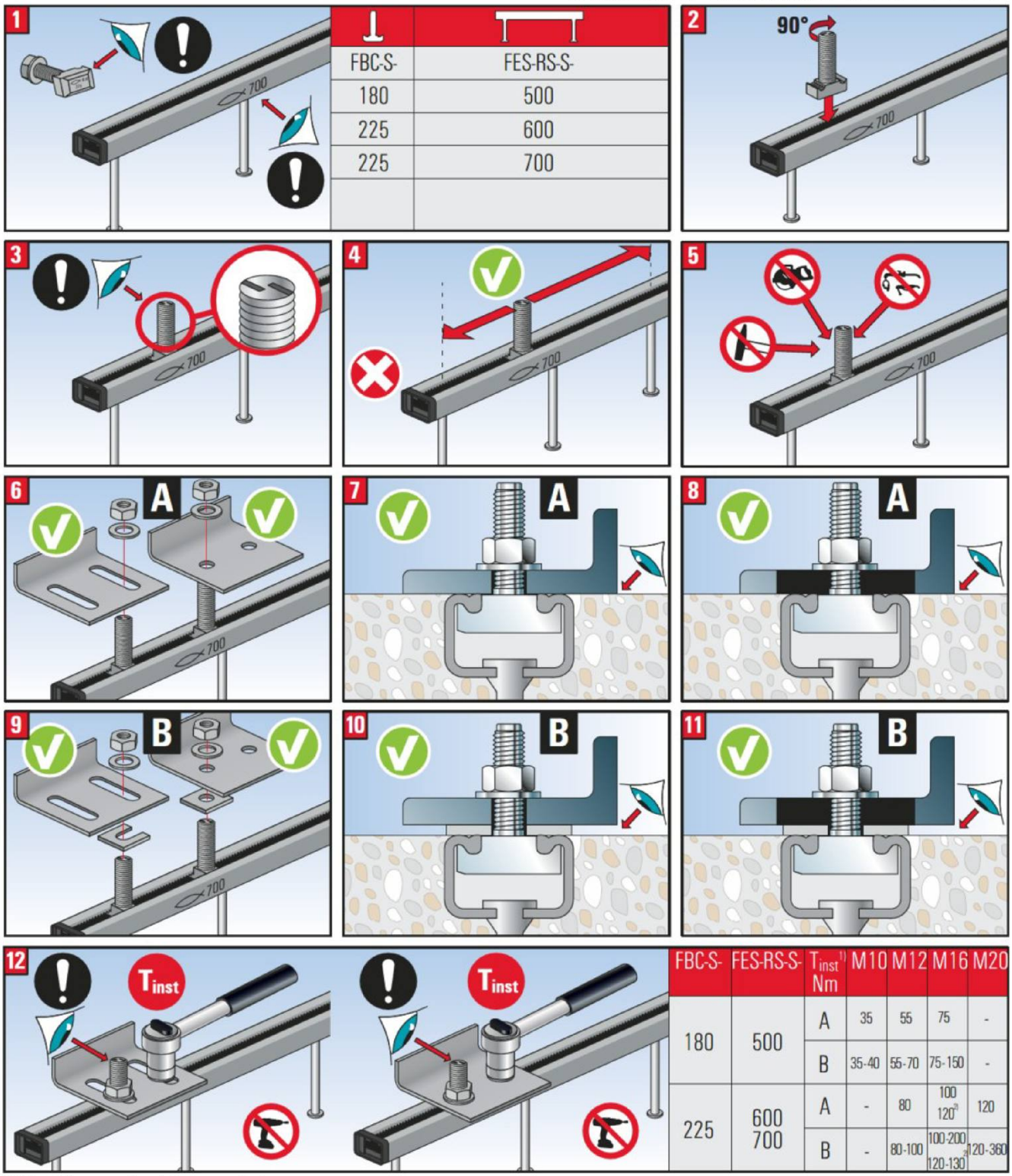
fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Intended Use
Installation instruction for fischer anchor channel FES-RS-S

Annex B5

Deutsches Institut für Bautechnik DIBt

Serrated Channel bolt FBC-S



FBC-S-	FES-RS-S-
180	500
225	600
225	700

FBC-S-	FES-RS-S-	T_{inst} [1] Nm		M10	M12	M16	M20
180	500	A		35	55	75	-
		B		35-40	55-70	75-150	-
225	600 700	A		-	80	100 120[2]	120
		B		-	80-100	100-200 120-130[2]	120-360

[1] Max. T_{inst} must not be exceeded.
[2] Stainless steel.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Intended Use
Installation instruction for serrated fischer channel bolt FBC-S

Annex B6

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

Anchor channel FES-RS-S-			**500**	**I-500**	**600**	**I-600**	**700**	**I-700**
Steel failure: Anchor								
Characteristic resistance	$N_{Rk,s,a}$	[kN]	43,4	44,5	55,2	57,0	73,3	81,0
Partial factor	γ_{Ms} [1)]	[-]	1,8					
Steel failure: Connection between anchor and channel								
Characteristic resistance	$N_{Rk,s,c}$	[kN]	43,3	44,5	55,2	57,0	73,0	80,0
Partial factor	γ_{Ms} [1)]	[-]	1,8					
Steel failure: Local flexure of the channel lips								
Characteristic spacing of channel bolts for $N_{Rk,s,l}$	$s_{l,N}$	[mm]	80		101		105	
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	43,8		64,0		80,0	
Partial factor	γ_{Ms} [1)]	[-]	1,8					

[1)] In absence of other national regulations.

Table C1.2: Characteristic flexural resistance of the channel

Anchor channel FES-RS-S-			**500**	**600**	**700**
Steel failure: Flexure of channel					
Characteristic flexural resistance of channel	$M_{Rk,s,flex}$	[Nm]	1572	2581	3749
Partial factor	$\gamma_{Ms,flex}$ [1)]	[-]	1,15		

[1)] In absence of other national regulations.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistances of anchor channels under tension load – steel failure of anchor channel

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2.1: Characteristic resistances under tension load – concrete failure

Anchor channel FES-RS-S-			**500**	**I-500**	**600**	**I-600**	**700**	**I-700**
Concrete failure: Pull-out failure								
Characteristic resistance in cracked concrete C12/15	$N_{Rk,p}$	[kN]	27,7	33,7	33,1	51,3	36,2	51,3
Characteristic resistance in uncracked concrete C12/15	$N_{Rk,p}$	[kN]	38,7	47,2	46,4	71,8	50,7	71,8
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	$k_{cr,N}$	[-]	8,3	8,3	8,6	8,6	8,9	8,7
	$k_{ucr,N}$	[-]	11,8	11,8	12,3	12,4	12,6	12,5
Partial factor	γ_{Mc} [1)]	[-]	1,5					
Concrete failure: Concrete splitting failure								
Characteristic edge distance	$c_{cr,sp}$	[mm]	330	334	450	462	525	462
Characteristic spacing	$s_{cr,sp}$	[mm]	660	669	900	942	1050	942
Partial factor	$\gamma_{MSp} = \gamma_{Mc}$ [1)]	[-]	1,5					

[1)] In absence of other national regulations.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistances under tension load – concrete failure

Annex C2

Deutsches Institut für Bautechnik DIBt

Table C3.1: Displacements under tension load

Anchor channel FES-RS-S-(I)-			**500**	**600**	**700**
Tension load	N	[kN]	17,9	21,4	31,4
Short-term displacement [1)]	δ_{N0}	[mm]	2,3	2,1	2,1
Long-term displacement [1)]	$\delta_{N\infty}$	[mm]	4,5	4,2	4,2

[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.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Displacement under tension load

Annex C3

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Table C4.1: Characteristic resistances under shear load – steel failure of anchor channels

Anchor channel FES-RS-S-			**500**	**I-500**	**600**	**I-600**	**700**	**I-700**
Steel failure: Anchor								
Characteristic resistance	$V_{Rk,s,a,y}$	[kN]	74,2	74,2	98,5	98,5	120,0	120,0
	$V_{Rk,s,a,x}$		26,1	35,3	34,2	50,7	44,0	48,6
Partial factor	γ_{Ms} [1)]	[-]	1,8					
Steel failure: Connection between anchor and channel								
Characteristic resistance	$V_{Rk,s,c,y}$	[kN]	74,2	74,2	98,5	98,5	120,0	120,0
	$V_{Rk,s,c,x}$		26,0	26,7	33,1	34,9	43,8	48,0
Partial factor	γ_{Ms} [1)]	[-]	1,8					
Steel failure: Local flexure of the channel lips								
Characteristic spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,V}$	[mm]	80		101		105	
Characteristic resistance	$V^0_{Rk,s,l,y}$	[kN]	50,5		77,7		92,0	
Partial factor	γ_{Ms} [1)]	[-]	1,8					

[1)] In absence of other national regulations.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistance of anchor channel under shear load – steel failure of anchor channel

Annex C4

Deutsches Institut für Bautechnik DIBt

Table C5.1: Characteristic resistance for shear load in direction of the longitudinal axis of the channel – steel failure

Anchor channel FES-RS-S-(l)-				**500**	**600**	**700**
Steel failure: Connection between channel lips and serrated channel bolt						
Characteristic resistance	$V_{Rk,s,l,x}$	[kN]	FBC-S-180-M10-8.8	15,6	-[2)]	-[2)]
			FBC-S-180-M12-8.8	17,3	-[2)]	-[2)]
			FBC-S-180-M16-8.8	17,3	-[2)]	-[2)]
			FBC-S-225-M12-8.8	-[2)]	17,6	-[2)]
			FBC-S-225-M16-8.8	-[2)]	17,6	22,5
			FBC-S-225-M16-A4-70	-[2)]	16,3	16,3
			FBC-S-225-M20-8.8	-[2)]	17,6	22,5
Installation factor	γ_{inst}[1)]	[-]	8.8	1,0	M12: 1,4 M16: 1,0 M20: 1,0	1,2
			A4-70	-[2)]	1,4	1,4

[1)] In absence of other national regulations.

[2)] No performance assessed.

Table C5.2: Characteristic resistance of the anchor channel under shear load – concrete failure

Anchor channel FES-RS-S-(l)-				**500**	**600**	**700**
Concrete failure: Pry-out failure						
Product factor		k_8	[-]	2,0	2,0	2,0
Partial factor		γ_{Mc}[1)]	[-]	1,5		
Concrete failure: Concrete edge failure						
Product factor k_{12}	Cracked concrete	$k_{cr,V}$	[-]	7,4	7,5	7,5
	Uncracked concrete	$k_{ucr,V}$	[-]	10,4	10,5	10,5
Partial factor		γ_{Mc}[1)]	[-]	1,5		

[1)] In absence of other national regulations.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex C5**
Performances Characteristic resistance of anchor channel under shear load.	

Deutsches Institut für Bautechnik DIBt

Table C6.1: Displacements under shear load

Anchor channel FES-RS-S-(I)-			**500**	**600**	**700**
Shear load perpenticular to the longitudinal axis of the channel	V_y	[kN]	34,1	30,5	36,5
Short-term displacement [1]	$\delta_{V,y,0}$	[mm]	2,7	2,5	2,9
Long-term displacement [1]	$\delta_{V,y,\infty}$	[mm]	4,0	3,7	4,4
Shear load in direction of the longitudinal axis of the channel	V_x	[kN]	11,4	7,0	6,6
Short-term displacement [2]	$\delta_{V,x,0}$	[mm]	0,8	0,9	1,2
Long-term displacement [2]	$\delta_{V,x,\infty}$	[mm]	1,2	1,3	1,8

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

Table C6.2: Characteristic resistances under tension and shear load – steel failure of channel bolts

Channel bolt FBC-S-[2)]				**M10**	**M12**	**M16**	**M20**
Steel failure:							
Characteristic resistance	$N_{Rk,s}$	[kN]	8.8	46,4	67,4	125,6	170,0
			A4-70	-[3)]	-[3)]	109,9	-[3)]
Partial factor	γ_{Ms}[1)]	[-]	8.8	1,5			
			A4-70	1,87			
Characteristic resistance	$V_{Rk,s}$	[kN]	8.8	23,2	33,7	62,8	98,0
			A4-70	-[3)]	-[3)]	65,9	-[3)]
Partial factor	γ_{Ms}[1)]	[-]	8.8	1,25			
			A4-70	1,56			

[1] In absence of other national regulations.
[2] Material according to Annex A7, Table A7.1.
[3] No performance assessed.

Table C6.3: Characteristic resistances under combined tension and shear load

Anchor channel FES-RS-S-(I)-			**500**	**600**	**700**
Steel failure: Local flexure of channel lips and flexure of channel					
Product factor	k_{13}	[-]	acc. to EN 1992-4:2018, 7.4.3.1		
Steel failure: Anchor and connection between anchor and channel					
Product factor	k_{14}	[-]	acc. to EN 1992-4:2018, 7.4.3.1		

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistance of channel bolts under tension and shear load, displacements under shear load, combined tension and shear load.

Annex C6

Deutsches Institut für Bautechnik DIBt

Table C7.1: Characteristic resistances under shear load with lever arm – steel failure of channel bolts

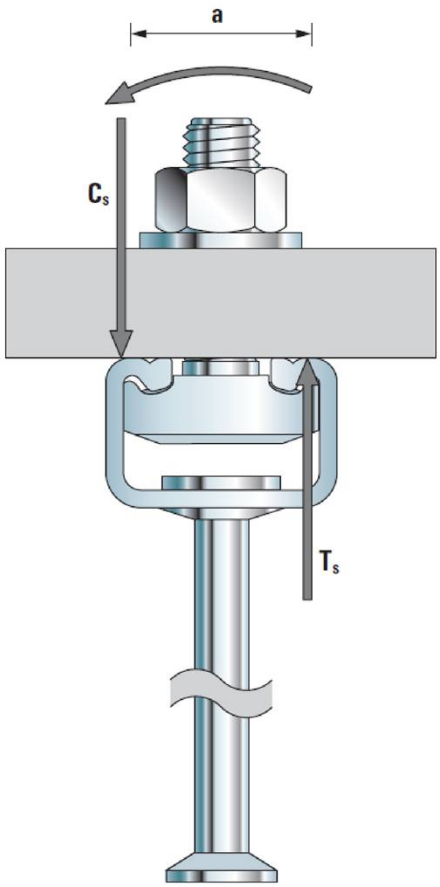
Channel bolt thread diameter [2]					**M10**	**M12**	**M16**	**M20**
Steel failure:								
Characteristic flexural resistance	$M^0_{Rk,s}$	[Nm]	FBC-S-	8.8	59,8	104,8	266,4	519,3
				A4-70	-[3]	-[3]	233,0	-[3]
Partial factor	γ_{Ms}[1]	[-]	FBC-S-	8.8	1,25			
				A4-70	1,56			
Internal lever arm	a	[mm]	FBC-S-180	8.8	24,0	25,3	27,3	-[3]
			FBC-S-225	8.8	-[3]	29,8	31,8	34,2
				A4-70	-[3]	-[3]	31,8	-[3]

[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 C7.1 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 Table C1.1)

$M^0_{Rk,s} \leq 0{,}5 \cdot N_{Rk,s} \cdot a$ ($N_{Rk,s}$ according to Table C6.2)

a = Internal lever arm according to Table C7.1

T_s = Tension force acting on the channel lips

C_s = Compression force acting on the channel lips

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic flexural resistances under shear load of channel bolts

Annex C7

Deutsches Institut für Bautechnik DIBt

Table C8.1: Combination of anchor channels and channel bolts under fatigue tension load (Design method I or II for assessment method C according to EOTA TR050, October 2023)

Anchor channel FES-RS-S-	Channel bolt	Diameter	Steel grade	Corrosion protection
600	FBC-S-225	M16	8.8	G[1]
700		M20		F[2]

[1] Electroplated.

[2] Hot-dip galvanised.

Table C8.2: Characteristic resistances under fatigue tension load – steel failure with n load cycles without static preload (N_{ed} = 0) (Design method I according to EOTA TR050, October 2023)

Anchor channel FES-RS-S-		600	700
Steel failure:	n	$\Delta N_{Rk,s,0,n}$ [kN]	
Characteristic resistances under fatigue tension load without static preload	$\leq 10^4$	18,9	29,4
	$\leq 10^5$	9,5	13,9
	$\leq 10^6$	4,8	6,6
	$\leq 2 \cdot 10^6$	3,9	5,2
	$\leq 5 \cdot 10^6$	3,0	3,9
	$\geq 5 \cdot 10^6$		

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistances under fatigue tension load according to assessment method C

Annex C8

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Table C9.1: Reduction factor $\eta_{c,fat}$ with n load cycles without static preload (N_{ed} = 0) (Design method I or II for assessment method C according to EOTA TR050, October 2023)

Pull-out failure **Concrete cone failure**		$\eta_{k,c,fat} = \eta_{k,p,fat}$ [-]								
Reduction factor for	n	S_{lok}								
		0,0	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8
$\Delta N_{Rk,p,E,n} = \eta_{k,c,fat} \cdot N_{Rk,p}$ $\Delta N_{Rk,c,E,n} = \eta_{k,p,fat} \cdot N_{Rk,c}$ $S_{lok} = 2,25 \cdot N_{Elok} / N_{Rk,c(p)}$[1)] With: $N_{Rk,p}$ according to Annex C2 $N_{Rk,c}$ calculated according to EN 1992-4:2018 and EOTA TR047, May 2021	≤ 10^4	0,725	0,668	0,600	0,527	0,450	0,370	0,288	0,205	0,120
	$2 \cdot 10^4$	0,704	0,650	0,585	0,514	0,439	0,360	0,279	0,197	0,114
	$5 \cdot 10^4$	0,677	0,627	0,566	0,497	0,424	0,347	0,268	0,188	0,106
	$1 \cdot 10^5$	0,656	0,610	0,551	0,484	0,412	0,337	0,260	0,181	0,100
	$2 \cdot 10^5$	0,636	0,592	0,536	0,471	0,401	0,328	0,251	0,174	0,094
	$5 \cdot 10^5$	0,608	0,569	0,516	0,454	0,386	0,315	0,240	0,164	0,087
	$1 \cdot 10^6$	0,588	0,551	0,501	0,441	0,375	0,305	0,232	0,157	0,081
	$2 \cdot 10^6$	0,567	0,534	0,486	0,428	0,364	0,295	0,223	0,150	0,075
	$5 \cdot 10^6$	0,539	0,511	0,466	0,411	0,349	0,282	0,212	0,140	0,067
	$1 \cdot 10^7$	0,519	0,493	0,451	0,398	0,337	0,272	0,204	0,133	0,061
	$2 \cdot 10^7$	0,498	0,476	0,436	0,385	0,326	0,262	0,195	0,126	0,055
	$5 \cdot 10^7$	0,471	0,453	0,416	0,367	0,311	0,250	0,184	0,116	0,047
	≥ 10^8	0,450	0,435	0,401	0,354	0,300	0,240	0,176	0,109	0,041

[1)] N_{Elok} characteristic lower cycle load.

Table C9.2: Characteristic resistances under fatigue load with n ➔ ∞ load cycles without static preload (N_{ed} = 0)
(Design method II according to EOTA TR050, October 2023)

Anchor channel FES-RS-S-		**600**	**700**
Steel failure:	n	$\Delta N_{Rk,s,0,n}$ [kN]	
$\Delta N_{Rk,s,0,\infty}$	[kN]	3,0	3,9
Concrete cone and pull-out failure			
$\eta_{c,fat}$	[-]	0,5	

In absence of other national regulations, the following partial safety factors γ_M and $\gamma_{M,fat}$ are recommended for design method I according to TR050, October 2023:

γ_M according to Annex C1
$\gamma_{M,fat}$ = 1,35

In absence of other national regulations, the following partial safety factor $\gamma_{M,fat}$ is recommended for design method II according to EOTA TR 050, October 2023:

$\gamma_{M,fat}$ = 1,35

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex C9**
Performances Characteristic resistances under fatigue tension load according to assessment method C	

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Table C10.1: Combination of anchor channels and channel bolts under seismic load (performance category C1)

Anchor channel FES-RS-S-	Channel bolt	Diameter	Steel grade	Corrosion protection
600	FBC-S-225	M16	8.8	G[1]
700		M20		F[2]

[1] Electroplated.

[2] Hot-dip galvanised.

Table C10.2: Characteristic resistances under seismic tension load – steel failure of anchor channels (performance category C1)

Anchor channel FES-RS-S-			600	I-600	700	I-700
Steel failure: Anchor						
Characteristic resistance	$N_{Rk,s,a,eq}$	[kN]	55,2	57,0	73,3	81,0
Partial factor	$\gamma_{Ms,eq}$[1]	[-]	1,8			
Steel failure: Connection between anchor and channel						
Characteristic resistance	$N_{Rk,s,c,eq}$	[kN]	55,2	57,0	73,0	80,0
Partial factor	$\gamma_{Ms,eq}$[1]	[-]	1,8			
Steel failure: Local flexure of the channel lips						
Characteristic resistance	$N^0_{Rk,s,l,eq}$	[kN]	64,0		80,0	
Partial factor	$\gamma_{Ms,eq}$[1]	[-]	1,8			

[1] In absence of other national regulations.

Table C10.3: Characteristic flexural resistance of the channel under seismic tension load (performance category C1)

Anchor channel FES-RS-S-			600	700
Steel failure: Flexure of channel				
Characteristic flexural resistance of channel	$M_{Rk,s,flex,eq}$	[Nm]	2581	3749
Partial factor	$\gamma_{Ms,flex,eq}$[1]	[-]	1,15	

[1] In absence of other national regulations.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex C10**
Performances Characteristic resistance of anchor channels under seismic tension load (performance category C1)	

Deutsches Institut für Bautechnik DIBt

Table C11.1: Characteristic resistances for seismic shear load – steel failure of anchor channels (performance category C1)

Anchor channel FES-RS-S-			**600**	**I-600**	**700**	**I-700**
Steel failure: Anchor						
Characteristic resistance	$V_{Rk,s,a,y,eq}$	[kN]	98,5	98,5	120,0	120,0
	$V_{Rk,s,a,x,eq}$		34,2	50,7	44,0	48,6
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8			
Steel failure: Connection between anchor and channel						
Characteristic resistance	$V_{Rk,s,c,y,eq}$	[kN]	98,5	98,5	120,0	120,0
	$V_{Rk,s,c,x,eq}$		33,1	34,9	43,8	48,0
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8			
Steel failure: Local flexure of the channel lips						
Characteristic resistance	$V^0_{Rk,s,l,y,eq}$	[kN]	77,7		92,0	
Partial factor	$\gamma_{Ms,eq}$ [1)]	[-]	1,8			

[1)] In absence of other national regulations.

Table C11.2: Characteristic resistance for seismic shear load in direction of the longitudinal axis of the channel – steel failure (performance category C1)

Anchor channel FES-RS-S-(I)-				**600**	**700**
Steel failure: Connection between channel lips and serrated channel bolt					
Characteristic resistance	$V_{Rk,s,l,x,eq}$	[kN]	FBC-S-225-M12-8.8	-[2)]	-[2)]
			FBC-S-225-M16-8.8	17,6	22,5
			FBC-S-225-M20-8.8	17,6	22,5
Installation factor	$\gamma_{Inst,eq}$ [1)]	[-]		M16: 1,0 M20: 1,0	1,2

[1)] In absence of other national regulations.

[2)] No performance assessed.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S	**Annex C11**
Performances Char. resistance of anchor channels under seismic shear load and seismic shear load in direction of the longitudinal axis of the channel (performance category C1)	

Deutsches Institut für Bautechnik DIBt

Table C12.1: Characteristic resistance under seismic tension and seismic shear load – steel failure of channel bolts (performance category C1)

Channel bolt FBC-S-225				**M12**	**M16**	**M20**
Steel failure:						
Characteristic resistance	$N_{Rk,s,eq}$	[kN]	8.8	-[2)]	125,6	170,0
Partial factor	$\gamma_{Ms,eq}$[1)]	[-]	8.8		1,5	
Characteristic resistance	$V_{Rk,s,eq}$	[kN]	8.8	-[2)]	62,8	98,0
Partial factor	$\gamma_{Ms,eq}$[1)]	[-]	8.8		1,25	

[1)] In absence of other national regulations.

[2)] No performance assessed.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistance of channel bolts under seismic tension and seismic shear load (performance category C1)

Annex C12

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Table C13.1: Characteristic resistances under fire exposure – steel failure

Channel bolt					**M10**	**M12**	**M16**	**M20**
Steel failure: Anchor, connection between anchor and channel, local bending of channel lip								
Characteristic resistance under fire exposure	$N_{Rk,s,fi}$ $=V_{Rk,s,y,fi}$	[kN]	FES-RS-S(-I)-500	R30	-[2)]	-[2)]	-[2)]	-[2)]
				R60	-[2)]	-[2)]	-[2)]	-[2)]
				R90	-[2)]	-[2)]	-[2)]	-[2)]
				R120	-[2)]	-[2)]	-[2)]	-[2)]
			FES-RS-S-(I)-600	R30	-[2)]	2,5	4,8	12,0
				R60	-[2)]	2,0	4,2	8,7
				R90	-[2)]	1,4	3,5	5,2
				R120	-[2)]	1,2	3,1	3,4
			FES-RS-S-(I)-700	R30	-[2)]	2,5	4,8	12,0
				R60	-[2)]	2,0	4,2	8,7
				R90	-[2)]	1,4	3,5	5,2
				R120	-[2)]	1,2	3,1	3,4
Partial factor	$\gamma_{Ms,fi}$[1)]	[-]			1,0			

[1)] In absence of other national regulations.

[2)] No performance assessed.

fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistance of anchor channel and channel bolt under fire exposure.

Annex C13

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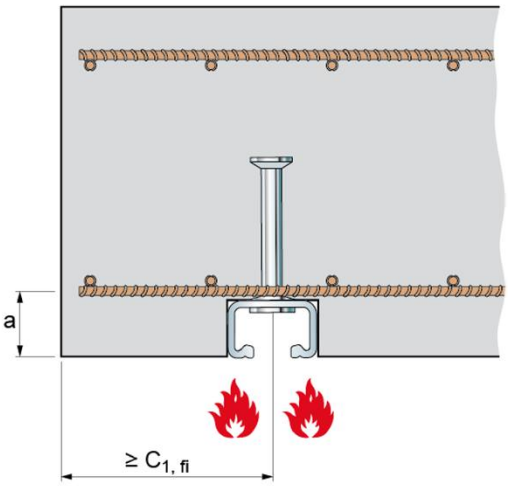
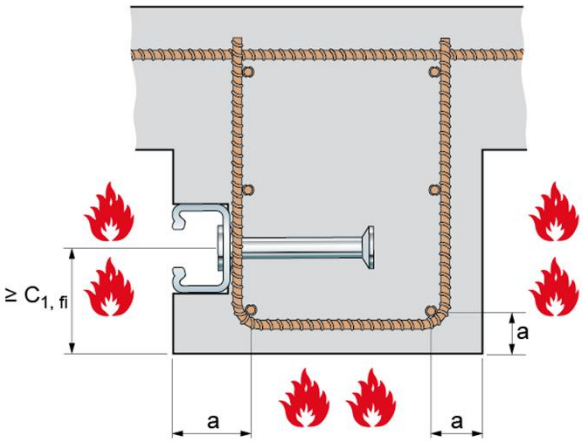
Table C14.1: Minimum axis distance of reinforcement

Anchor channel FES-RS-S-(l)-			**500**	**600**	**700**
Min. axis distance	R30	a [mm]	35	35	50
	R60		35	35	50
	R90		45	45	50
	R120		60	60	65

Fire exposure from one side only



Fire exposure from more than one side



fischer Serrated Anchor Channel InnoLock FES-RS-S with fischer Serrated Channel Bolts FBC-S

Performances
Characteristic resistance of anchor channel and channel bolt under fire exposure

Annex C14