

DECLARATION OF PERFORMANCE

DoP 0228

for fischer anchor channel FES with fischer Channel Bolts FBC (Anchor channel for use in concrete)

EN

| | | |
|--|--|----------------|
| 1. <u>Unique identification code of the product-type:</u> | DoP 0228 | |
| 2. <u>Intended use/es:</u> | Anchor channel for use in cracked or uncracked concrete. See appendix, especially annexes B1- B8 | |
| 3. <u>Manufacturer:</u> | fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Germany | |
| 4. <u>Authorised representative:</u> | - | |
| 5. <u>System/s of AVCP:</u> | 1 | |
| 6. <u>European Assessment Document:</u> | EAD 330008-03-0601 | |
| European Technical Assessment: | ETA-18/0862; 2020-06-16 | |
| Technical Assessment Body: | DIBt- Deutsches Institut für Bautechnik | |
| Notified body/ies: | 1343 MPA Darmstadt / 2873 TU Darmstadt | |
| 7. <u>Declared performance/s:</u> | | |
| Mechanical resistance and stability (BWR 1) | | |
| Characteristic resistance to tension load (static and quasi-static loading): | Resistance to steel failure of anchors: | Annex C1 |
| | Resistance to steel failure of the connection between anchors and channel: | Annex C1 |
| | Resistance to steel failure of channel lips and sunsequently pullout of channel bolt: | Annex C1 |
| | Resistance to steel failure of channel bolt: | Annex C5 |
| | Resistance to steel failure by exceeding the bending strength of the channel: | Annex C1 |
| | Maximum installation torque moment to avoid damage during installation: | Annex B4 |
| | Resistance to pull-out failure of the anchor: | Annex C2 |
| | Resistance to concrete cone failure: | Annexes B3, C2 |
| | Minimum edge distance, spacing, member thickness to prevent concrete splitting during installation: | Annex B3 |
| | Characteristic edge distance and spacing to avoid splitting of concrete under load: | Annex C2 |
| | Resistance to blowout failure- bearing area of head: | Annex A4 |
| Characteristic resistance to shear load (static and quasi-static loading): | Resistance to steel failure of anchor bolt under shear loading without lever arm: | Annex C5 |
| | Resistance to steel failure by bending of the channel bolt under shear load with lever arm: | Annex C6 |
| | Resistance to steel failure of channel lips, steel failure of connection between anchor and channel or steel failure of anchor channel (shear load in transverse direction): | Annex C3 |
| | Resistance to steel failure of connection between channel lips and channel bolt (shear load in longitudinal channel axis): | Annex C3 |
| | Factor for sensitivity of installation: | NPD |
| | Resistance to steel failure of the anchor: | Annex C3 |
| | Resistance to steel failure of the connection between anchor and channel: | Annex C3 |
| | Resistance to pry-out failure: | Annex C4 |
| | Resistance to concrete edge failure: | Annex C4 |
| | Resistance of steel failure of the anchor channel: | Annex C4 |
| | Durability: | Annexes A4, B1 |
| | Displacements: | Annexes C2, C4 |
| Characteristic resistance under fatigue tension loading: | NPD | |
| Safety in case of fire (BWR 2) | | |
| Reaction to fire: | Class (A1) | |
| Resistance to fire: | NPD | |



8. Appropriate Technical Documentation and/or
Specific Technical Documentation:

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Thilo Pregartner, Dr.-Ing.
Tumlingen, 2020-06-30

Peter Schillinger, Dipl.-Ing.

This DoP has been prepared in different languages. In case there is a dispute on the interpretation the English version shall always prevail.

The Appendix includes voluntary and complementary information in English language exceeding the (language-neutrally specified) legal requirements.

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 A4 and A5, Annex B3 and B4, Annex C1, 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 assessed |
| Displacements (static and quasi-static loading) | See Annex C2 and C4 |
| Durability | See Annex B1 |

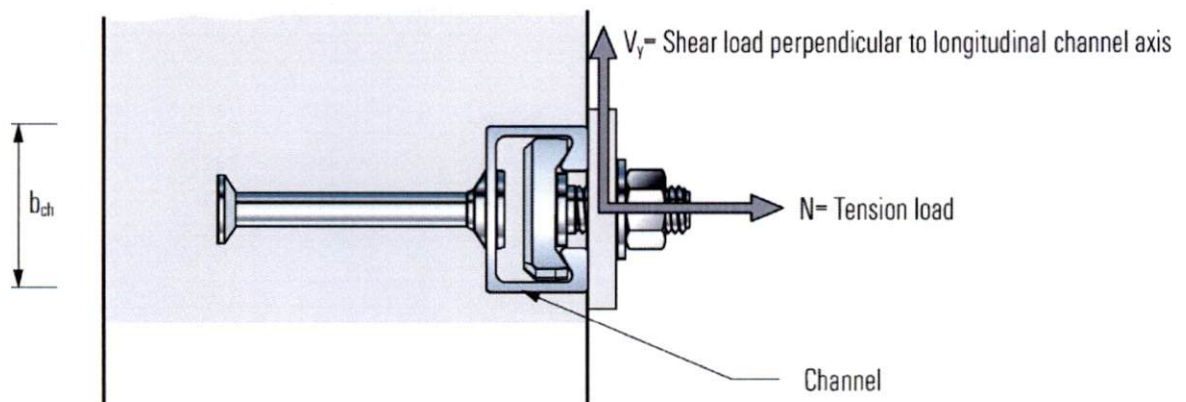
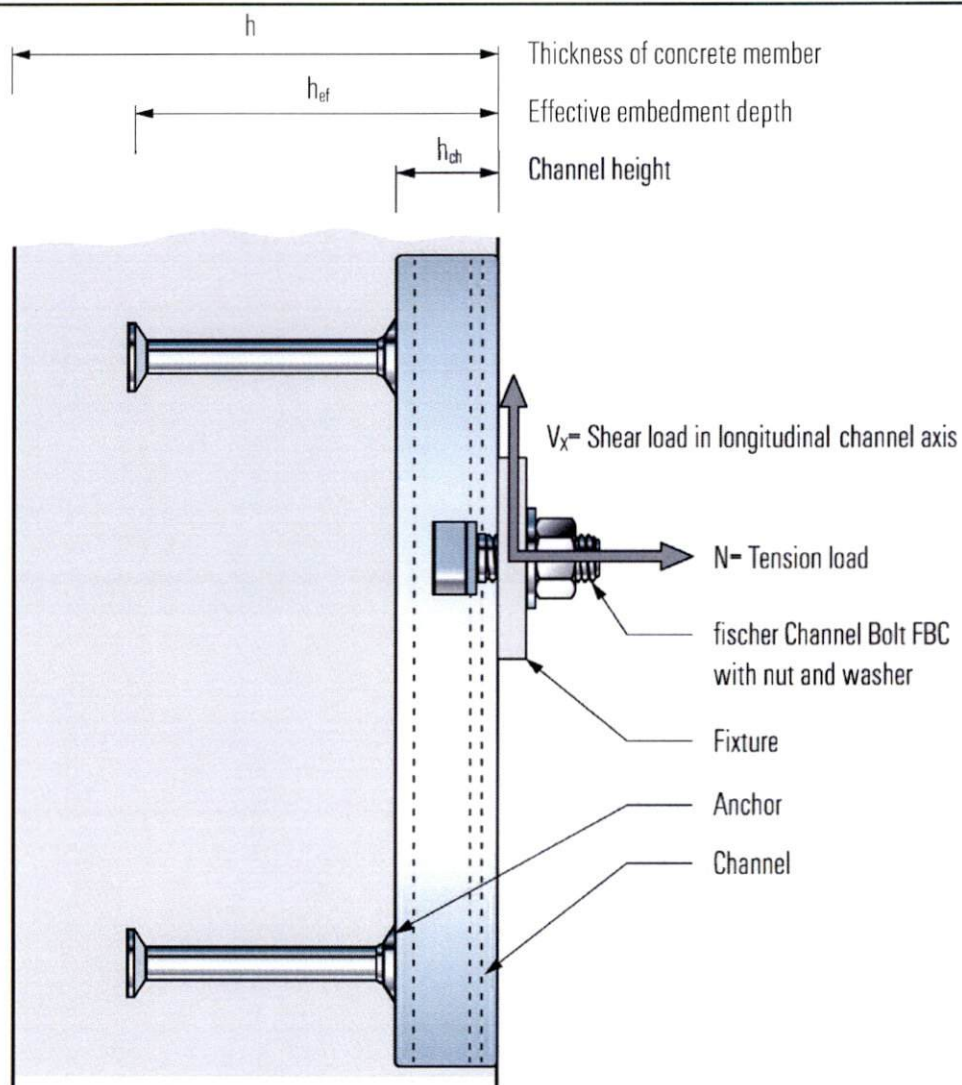
3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|-----------------------------------|-------------------------|
| Reaction to fire | Class A1 |
| Characteristic resistance to fire | No performance assessed |

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

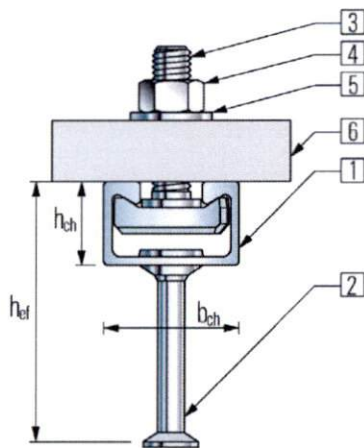


fischer Anchor Channel FES with fischer Channel Bolts FBC

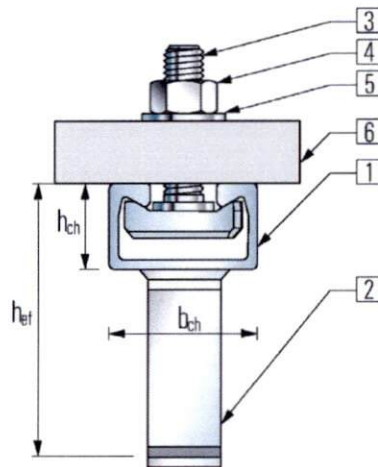
Product Description
 Installed condition

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

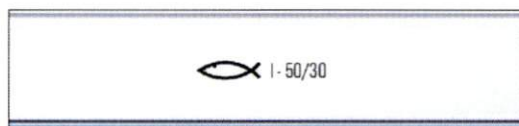
Marking of the fischer anchor channel FES:

e. g.:  I-50/30

 = Identifying mark of the manufacturer

I = Additional marking for I-anchors
No marking for round anchors

50/30 = Anchor channel size
(29/20; 38/23; 40/22; 50/30; 52/34,
28/15; 38/17; 40/25; 49/30; 54/33)



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. A7 Table 6 (Channel profile)

Marking of the fischer channel bolt FBC:

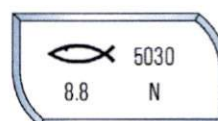
e. g.:  5030 8.8

 = Identifying mark of the manufacturer

5030 = Type of channel bolt

8.8 = Steel grade

N = Notching channel bolt (if applicable)



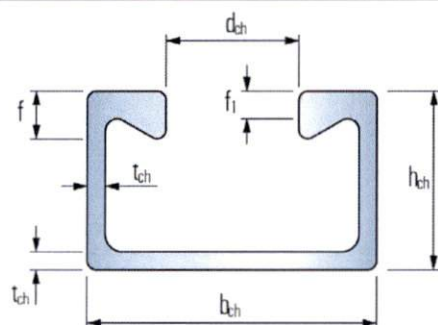
Marking of channel bolt type (smooth, serrated,
notching head) according to Annex A6

fischer Anchor Channel FES with fischer Channel Bolts FBC

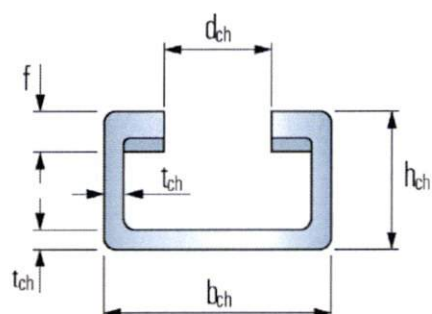
Product Description
Marking and materials

Annex A2

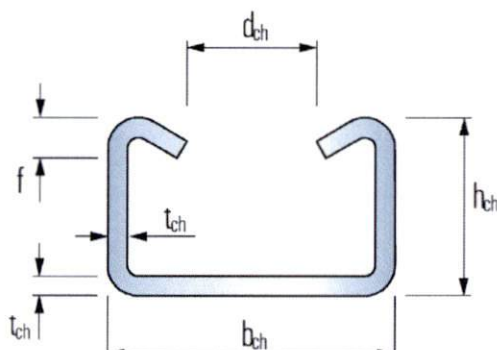
Appendix 4/ 23



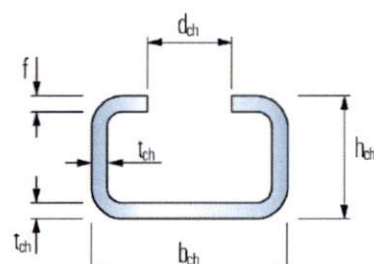
FES-H-(I)-40/22, -50/30, -52/34



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



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



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

Table 1: Dimensions of hot-rolled and cold-formed channel profile

| Anchor Channel FES- | b_{ch} [mm] | h_{ch} [mm] | t_{ch} [mm] | d_{ch} [mm] | f [mm] | f_1 [mm] | I_y [mm ⁴] |
|------------------------|------------------|------------------|------------------|------------------|-------------|---------------|-----------------------------|
| C-28/15 | 28,0 | 15,5 | 2,3 | 12,0 | 2,3 | - | 4280 |
| C-38/17 | 38,0 | 17,3 | 3,0 | 18,0 | 3,0 | - | 8240 |
| C-40/25 | 40,0 | 25,0 | 2,8 | 18,0 | 6,0 | - | 20340 |
| C-49/30 | 50,0 | 30,0 | 3,3 | 22,0 | 7,0 | - | 43080 |
| C-54/33 | 54,0 | 33,0 | 5,0 | 22,0 | 8,5 | - | 74090 |
| H-S-29/20 | 30,0 | 20,0 | 3,0 | 14,0 | 5,2 | - | 11150 |
| H-S-38/23 | 38,0 | 23,0 | 3,3 | 18,0 | 6,0 | - | 21070 |
| H-(I)-40/22 | 40,0 | 23,5 | 2,6 | 18,0 | 6,2 | 3,6 | 21660 |
| H-(I)-50/30 | 50,0 | 30,0 | 3,0 | 22,5 | 8,1 | 5,5 | 54960 |
| H-(I)-52/34 | 52,5 | 34,0 | 4,0 | 22,5 | 11,5 | 8,3 | 96330 |

fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Dimensions of channels

Annex A3

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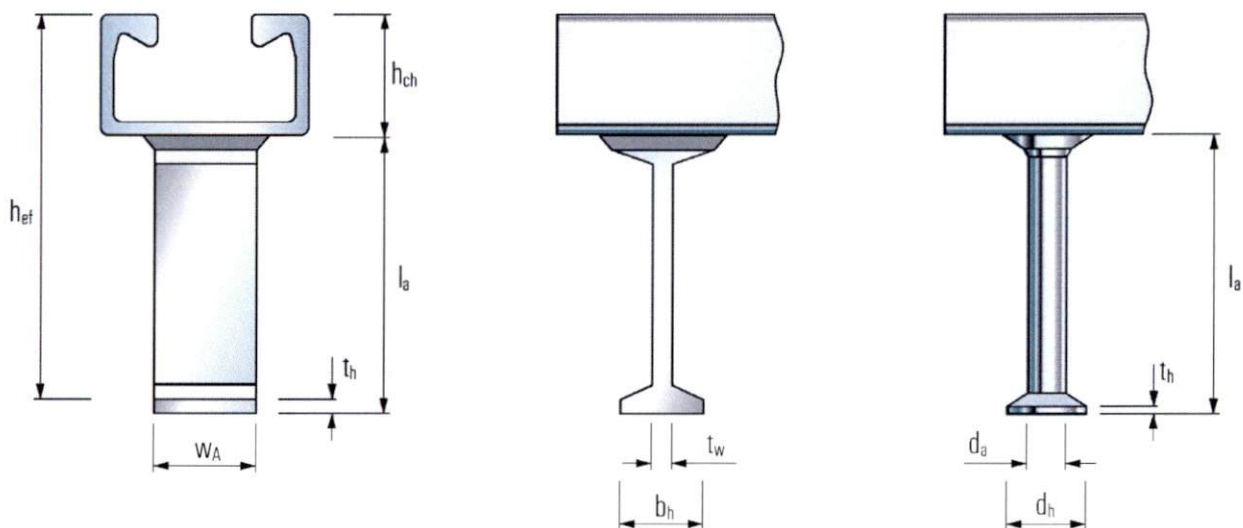


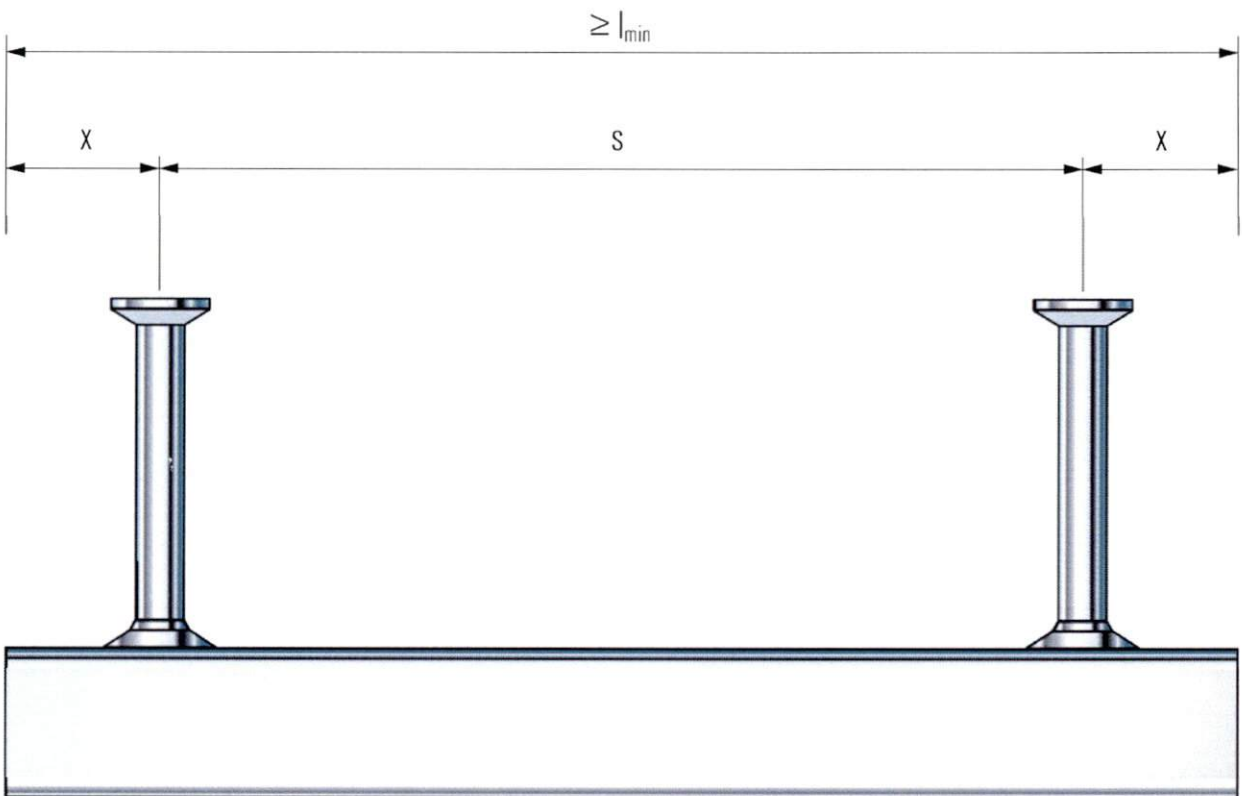
Table 2: Dimensions of anchor (welded I-anchor or forged round anchor)

| 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} [mm ²] | l _{a,min} [mm] | d _a [mm] | d _h [mm] | t _h [mm] | A _h [mm ²] |
| C-28/15 | - | - | - | - | - | - | 31,0 | 6 | 12,0 | 1,3 | 85 |
| C-38/17 | - | - | - | - | - | - | 60,8 | 8 | 16,0 | 2,0 | 151 |
| C-40/25 | - | - | - | - | - | - | 56,0 | 8 | 16,0 | 2,0 | 151 |
| C-49/30 | - | - | - | - | - | - | 66,0 | 10 | 20,0 | 2,2 | 236 |
| C-54/33 | - | - | - | - | - | - | 124,5 | 11 | 24,3 | 2,5 | 369 |
| H-S-29/20 | - | - | - | - | - | - | 59,5 | 10 | 20,0 | 2,5 | 236 |
| H-S-38/23 | - | - | - | - | - | - | 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-(I-)50/30 | 69 | 5 | 20 | 5 | 25 | 375 | 66,2 | 10 | 20,0 | 2,2 | 236 |
| 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

Table 3: 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 | 100 | 200 | 25 | 35 | 150 | 6.070 |
| C-38/17 | | | | | | | |
| C-40/25 | | | | | | | |
| C-49/30 | | | | | | | |
| C-54/33 | | | | | | | |
| H-S-29/20 | | | | | | | |
| H-S-38/23 | | | | | | | |
| H-(I-)40/22 | round or I | | 250 | | | | |
| H-(I-)50/30 | round or I | | | | | | |
| H-I-52/34 | I | | | | | | |
| 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

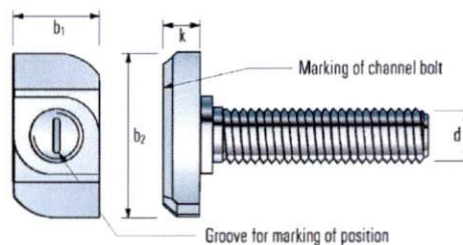
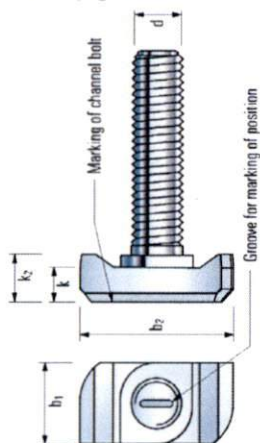
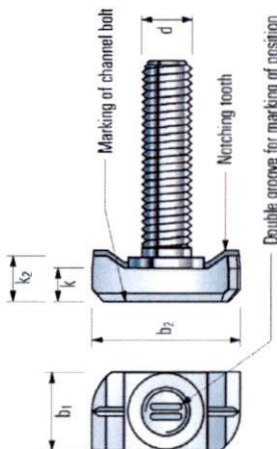
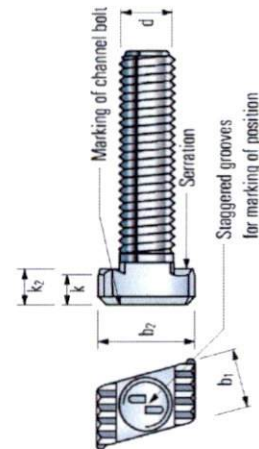
| Channel Bolt | Carbon steel ¹⁾ |
|-------------------------------|---------------------------------|
| Steel grade | 8.8 |
| f_{uk} [N/mm ²] | 800 / 830 |
| f_{yk} [N/mm ²] | 640 / 660 ²⁾ |
| Corrosion protection | G ³⁾ F ⁴⁾ |

¹⁾ Material properties according to Annex A7

²⁾ Material properties according to EN ISO 898-1

³⁾ Electroplated

⁴⁾ Hot-dip galvanized

**Channel Bolt FBC-28/15, FBC-38/17****Channel Bolt
FBC-40/22, FBC-50/30****Notching Channel Bolt
FBC-N-50/30-M20****Serrated Channel Bolt
FBC-S-29/20, FBC-S-38/23****Table 5: Dimensions of fischer Channel Bolts FBC and matching fischer Anchor Channels FES**

| Anchor Channel FES- | Channel Bolt FBC- | Dimensions | | | | |
|--|----------------------|------------|---------|---------|--------|---------|
| | | Thread d | b1 [mm] | b2 [mm] | k [mm] | k2 [mm] |
| C-28/15 | 28/15 | M8 | 11 | 22,2 | 5 | - |
| | | M10 | | | 5 | - |
| | | M12 | | | 7 | - |
| C-38/17 | 38/17 | M10 | 16 | 30 | 6 | - |
| | | M12 | | | 7 | - |
| H-S-29/20 | S-29/20 | M12 | 13 | 22 | 6,5 | 8 |
| H-S-38/23 C-38/17 | S-38/23 | M12 | 16,7 | 29,1 | 5,8 | 7,3 |
| | | M16 | | | | |
| H(-I)-40/22 C-40/25 | 40/22 | M10 | 14 | 32,5 | 8 | 11 |
| | | M12 | 14 | | | |
| | | M16 | 17 | | | |
| C-49/30 H(-I)-50/30 C-54/33 H(-I)-52/34 | 50/30 | M10 | 17,1 | 40,5 | 9 | 11,5 |
| | | M12 | 17,1 | | 10 | 12,5 |
| | | M16 | 17,1 | | 11 | 13,5 |
| | | M20 | 20,5 | | 12 | 14,5 |
| H(-I)-50/30 H(-I)-52/34 | N-50/30 | M20 | 21 | 40,5 | 12 | 16 |

fischer Anchor Channel FES with fischer Channel Bolts FBC

Product Description
Channel bolts

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 1.5525, 1.5535 acc. to EN 10263:2017 1.5523 | 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(-I)-50/30 or FES-H(-I)-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

Intended Use
Specifications

Annex B1
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Installation:

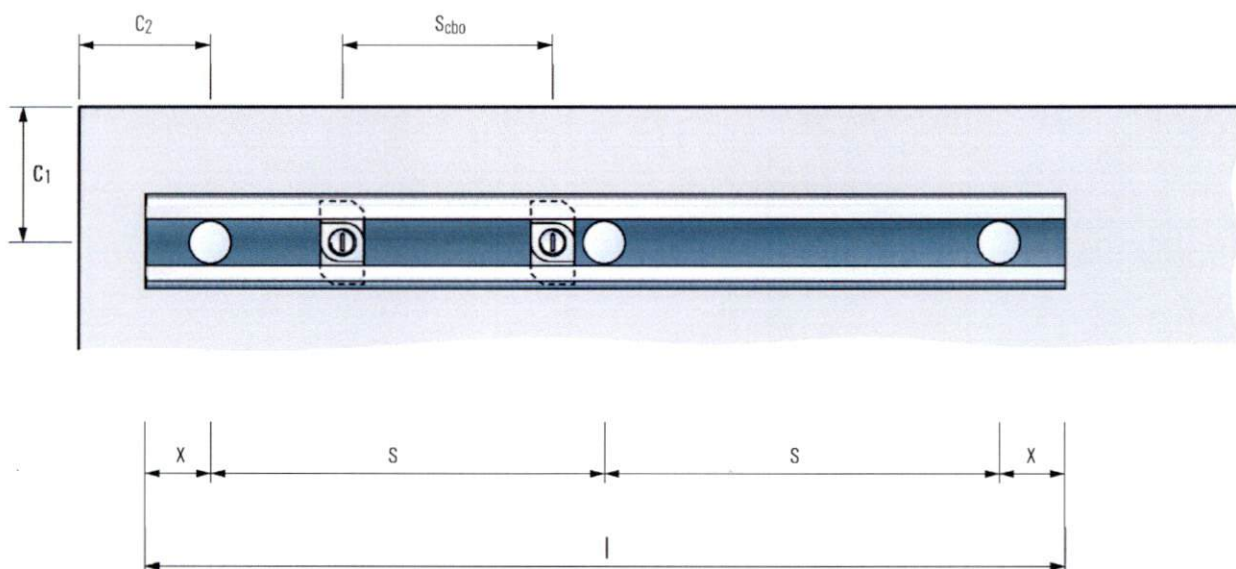
- The installation of anchor channels is carried out by appropriately qualified personnel under the supervision of the person responsible for the technical matters on site.
- Use of the anchor channels only as supplied by the manufacturer - without any manipulations, repositioning or exchanging of channel components.
- Cutting of anchor channels is allowed only if pieces according to Annex A5, Table 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**Intended Use**
SpecificationAnnex B2
Appendix 11/ 23

Table 7: 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-I-40/22 | C-49/30 H-50/30 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 79 | 94 94 94 | 155 155 155 |
| Minimum edge distance | c_{min} | | 40 | 50 | 75 | 100 | 50 50 50 | 75 75 75 | 100 100 100 |
| Minimum thickness of concrete member | $h_{min}^{1)}$ | | 70 | 100 | 100 | 100 | 100 100 100 | 100 100 100 | 160 160 170 |

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 | | | M8 | M10 | M12 | M16 | M20 |
|---------------------------------------|---------------|------|----|-----|-----|-----|-----|
| Minimum spacing between channel bolts | $Sc_{bo,min}$ | [mm] | 40 | 50 | 60 | 80 | 100 |

fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use
Installation parameters for fischer Anchor Channels FES

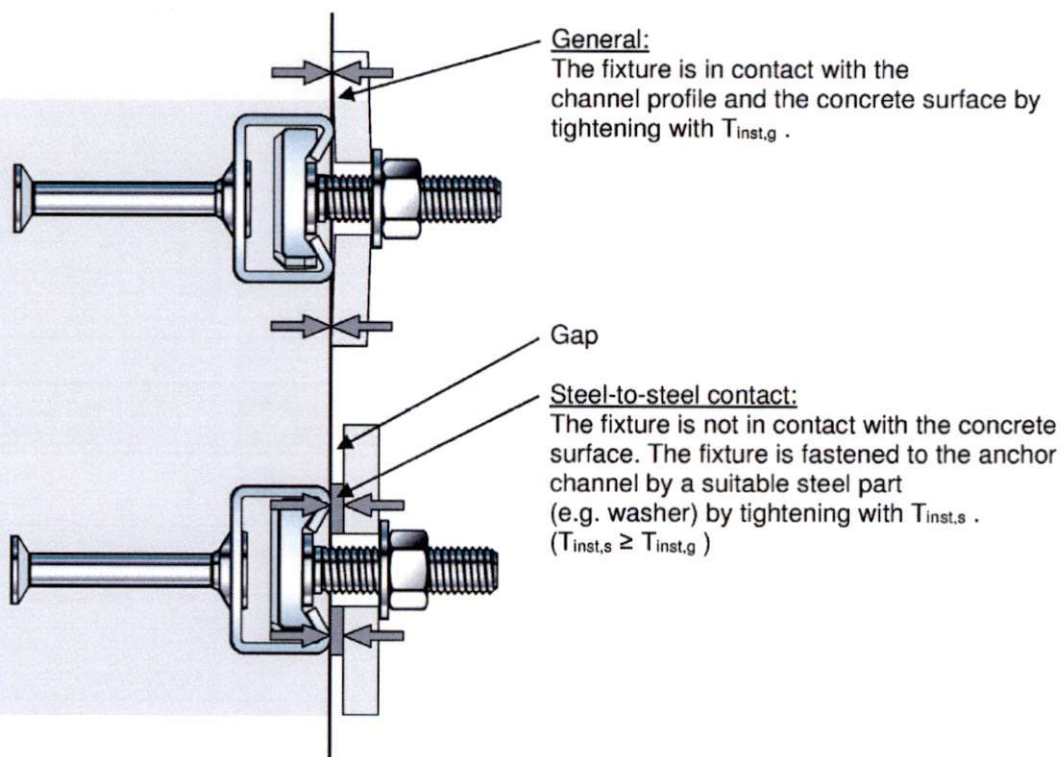
Annex B3
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Table 9: Required installation torque T_{inst}

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

1) T_{inst} must not be exceeded

2) No performance assessed



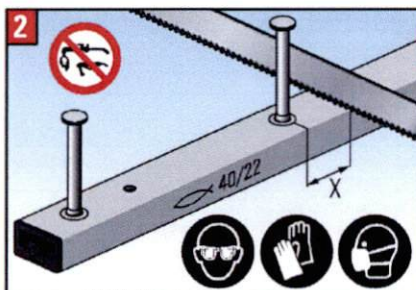
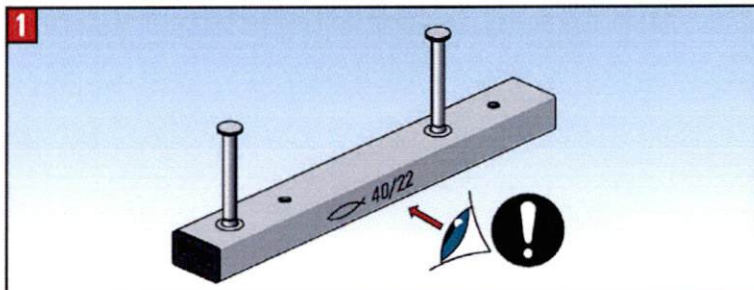
fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use

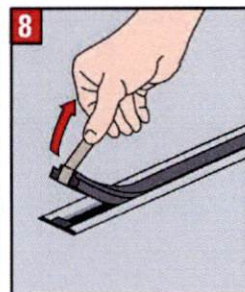
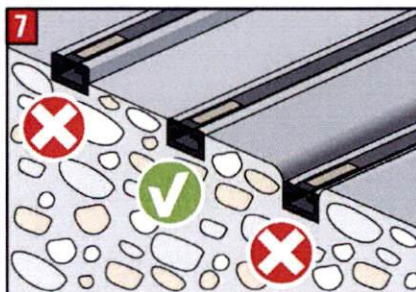
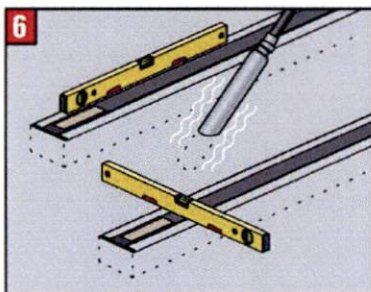
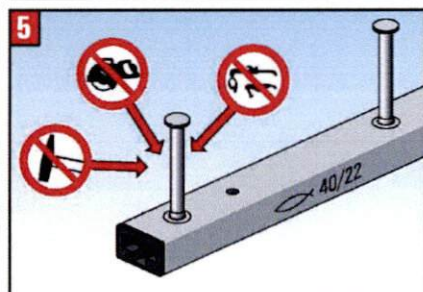
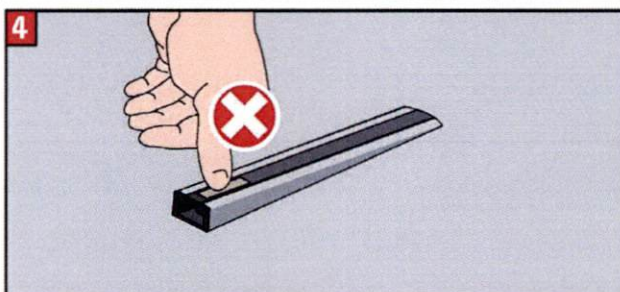
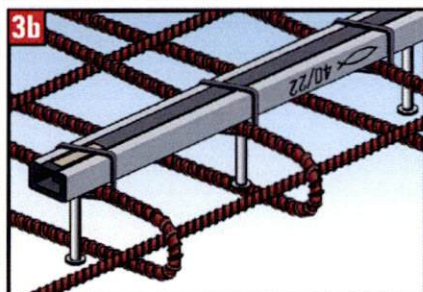
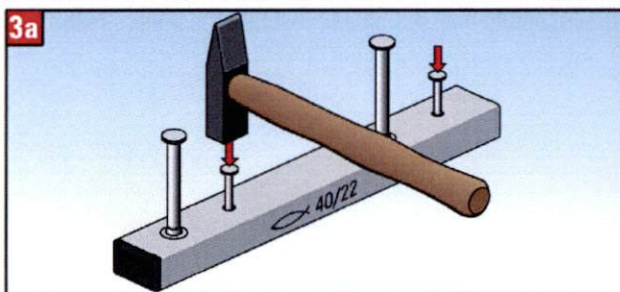
Installation parameters for fischer Channel Bolts FBC

Annex B4

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| X | | |
|------------|--------------|-----------|
| | FES - H - | FES - C - |
| | S - 28 / 20 | 28 / 15 |
| | S - 38 / 23 | 38 / 17 |
| | (1-) 40 / 22 | 40 / 25 |
| | (1-) 50 / 30 | 49 / 30 |
| | 1- 52 / 34 | 54 / 33 |
| 25 - 35 mm | 52 / 34 | - |
| 35 mm | | |



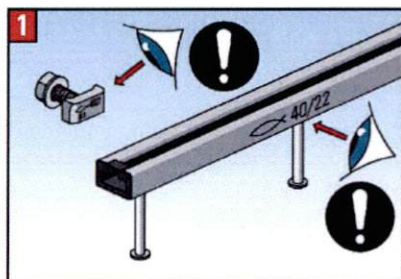
fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use

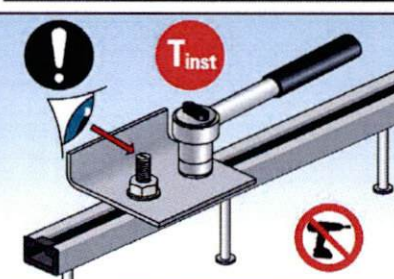
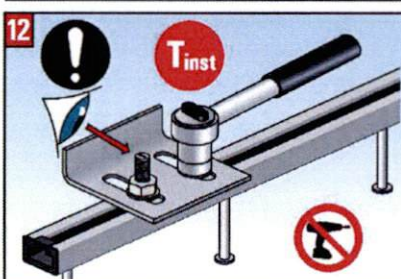
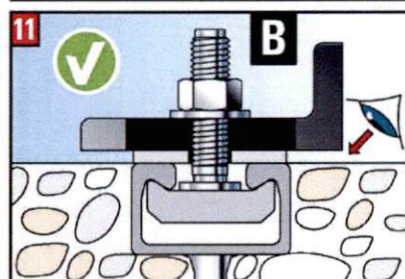
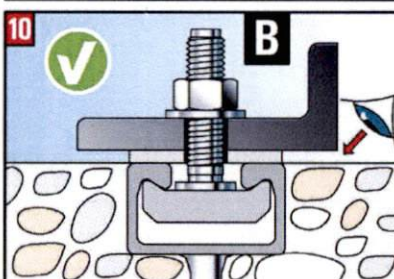
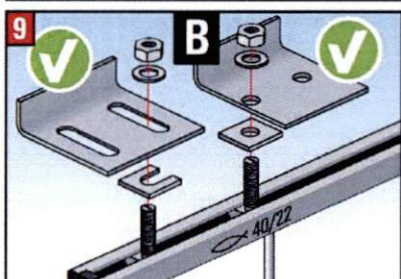
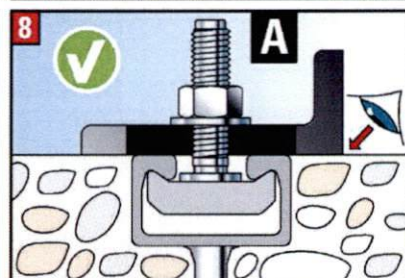
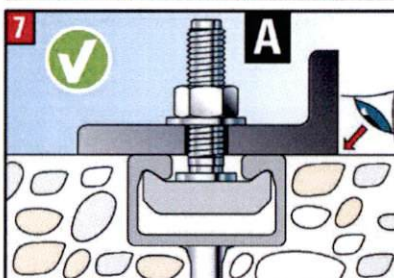
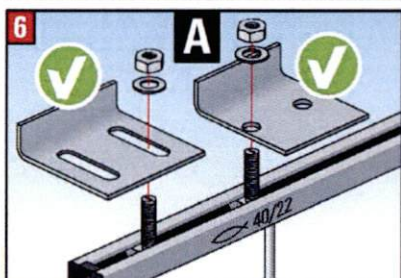
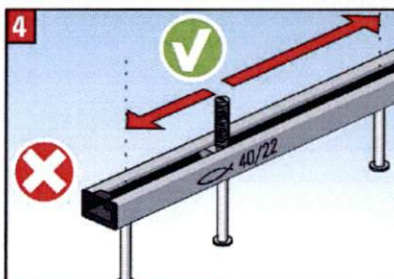
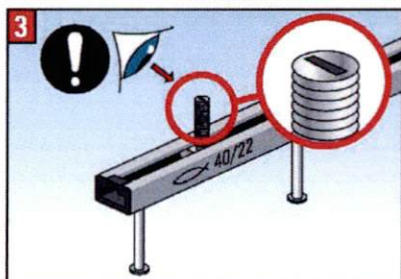
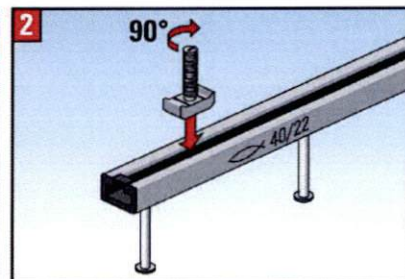
Installation instruction for fischer Anchor Channels FES

Annex B5

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| 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 |



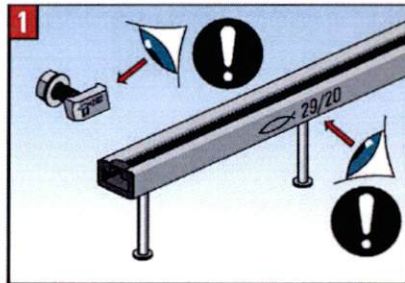
| FBC | T _{inst} [Nm] | M8 | M10 | M12 | M16 | M20 |
|------|------------------------|----|-----|-----|-----|-----|
| 2815 | A | 7 | 10 | 13 | - | - |
| | B | 15 | 30 | 45 | - | - |
| 3817 | A | - | 15 | 20 | - | - |
| | B | - | 30 | 45 | - | - |
| 4022 | A | - | 15 | 25 | 50 | - |
| | B | - | 30 | 45 | 100 | - |
| 5030 | A | - | 15 | 25 | 60 | 75 |
| | B | - | 30 | 45 | 100 | 230 |

T_{inst} must not be exceeded.

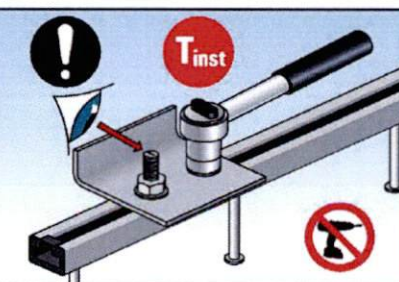
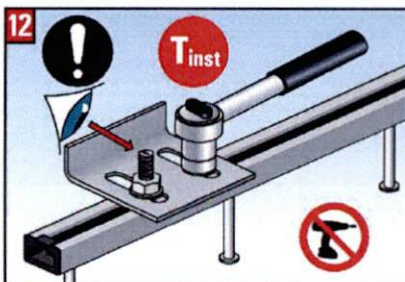
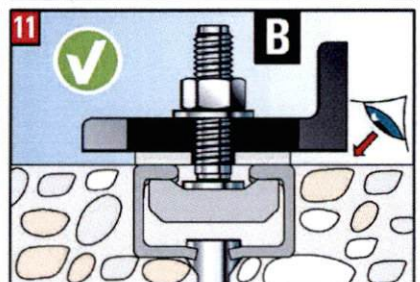
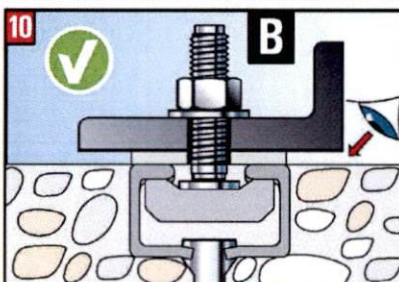
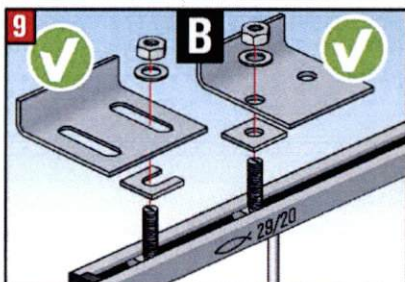
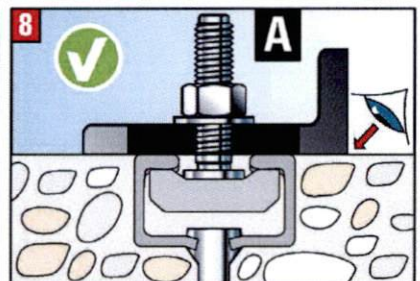
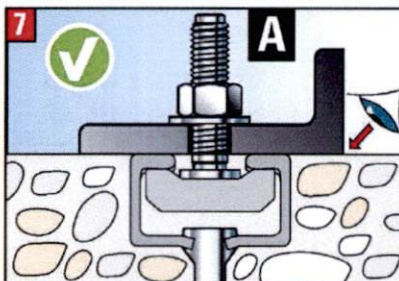
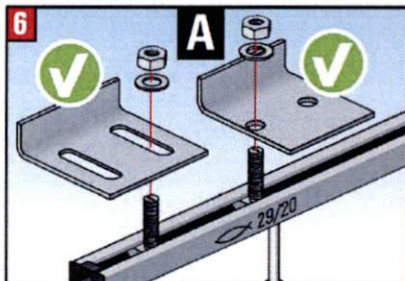
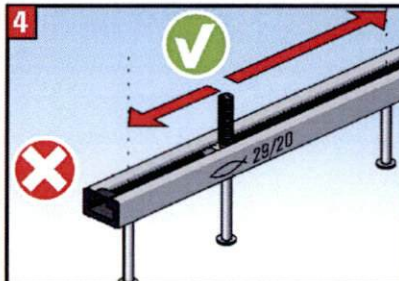
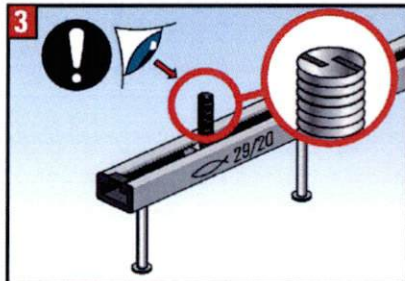
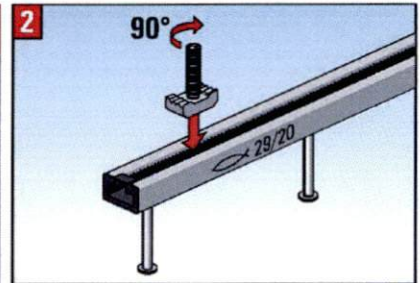
fischer Anchor Channel FES with fischer Channel Bolts FBC

Intended Use
Installation instruction for fischer Channel Bolts FBC

Annex B6
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| | FBC-S- | FES-H-S- | FES-C- |
|------|---------|----------|--------|
| 2920 | 29 / 20 | - | - |
| 3823 | 38 / 23 | 38 / 17 | - |



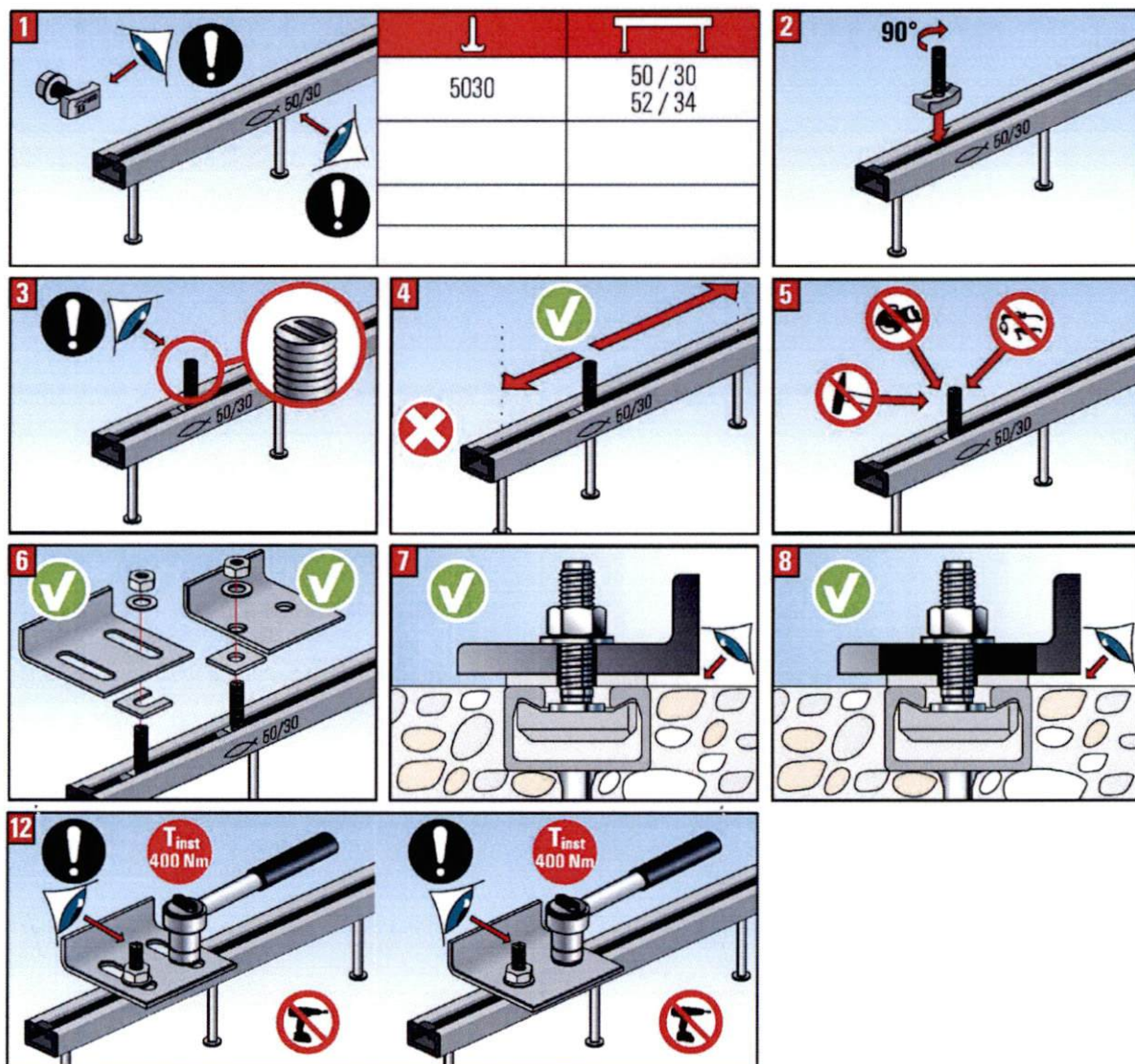
| FBC-S- | FES- | T _{inst} [Nm] | M12 | M16 |
|--------|-------------|------------------------|-----|-----|
| 2920 | H-S-29 / 20 | A | 80 | - |
| | | B | 80 | - |
| 3823 | H-S-38 / 23 | A | 80 | 100 |
| | | B | 80 | 100 |
| | C-38 / 17 | A | 40 | 50 |
| | | B | 80 | 100 |

T_{inst} must not be exceeded.

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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T_{inst} must not be exceeded.

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

| Anchor Channel FES- | | | C-28/15 | C-38/17 | H-S-29/20 | H-S-38/23 | C-40/25 H-40/22 H-I-40/22 | C-49/30 H-50/30 H-I-50/30 | C-54/33 H-52/34 H-I-52/34 |
|---|--------------------|------|---------|---------|-----------|-----------|---------------------------------|---------------------------------|---------------------------------|
| Steel failure: Failure of anchor | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,a}$ | [kN] | 9 | 20 | 31 | 31 | 20 20 35 | 31 31 44 | 55 55 70,4 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,8 | | | | | | |
| Steel failure: Failure of connection between anchor and channel | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,c}$ | [kN] | 9 | 18 | 20,2 | 30,3 | 20 20 38 | 31 31 40 | 55 55 70,4 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 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] | 56 | 76 | 60 | 76 | 80 80 80 | 100 100 100 | 108 105 105 |
| Characteristic resistance | $N^0_{Rk,s,l}$ | [kN] | 9 | 18 | 20,2 | 30,3 | 20 38 38 | 31 43 43 | 55 72 72 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,8 | | | | | | |

¹⁾ In absence of other national regulations

Table 11: Characteristic flexural resistance of channel under tension 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-I-40/22 | C-49/30 H-50/30 H-I-50/30 | C-54/33 H-52/34 H-I-52/34 |
|---|-------------------------|------|---------|---------|-----------|-----------|---------------------------------|---------------------------------|---------------------------------|
| Stahlversagen: Biegung der Schiene | | | | | | | | | |
| Characteristic flexural resistance of channel | $M_{Rk,s,flex}$ | [Nm] | 310 | 567 | 745 | 1.241 | 915 1.118 1.118 | 1.554 2.185 2.185 | 2.350 3.163 3.670 |
| 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- | | | C-28/15 | C-38/17 | H-S-29/20 | H-S-38/23 | C-40/25 H-40/22 H-I-40/22 | C-49/30 H-50/30 H-I-50/30 | C-54/33 H-52/34 H-I-52/34 | |
|--|--|--------------------|--|---------|-----------|-----------|---------------------------------|---------------------------------|---------------------------------|--|
| Pullout failure | | | | | | | | | | |
| Characteristic resistance in cracked concrete C12/15 | N _{Rk,p} | [kN] | 7,6 | 13,6 | 21,2 | 21,2 | 13,6 13,6 27,0 | 21,2 21,2 33,8 | 33,2 33,2 54,0 | |
| Characteristic resistance in uncracked concrete C12/15 | N _{Rk,p} | [kN] | 10,7 | 19,0 | 29,7 | 29,7 | 19,0 19,0 37,8 | 29,7 29,7 47,3 | 46,5 46,5 75,6 | |
| Factor of N _{Rk,p} | C16/20 | ψ _c [-] | | | | | | | 1,33 | |
| | C20/25 | | | | | | | | 1,67 | |
| | C25/30 | | | | | | | | 2,08 | |
| | C30/37 | | | | | | | | 2,50 | |
| | C35/45 | | | | | | | | 2,92 | |
| | C40/50 | | | | | | | | 3,33 | |
| | C45/55 | | | | | | | | 3,75 | |
| | C50/60 | | | | | | | | 4,17 | |
| | C55/67 | | | | | | | | 4,58 | |
| ≤C60/75 | | 5,00 | | | | | | | | |
| Partial factor | γ _{Mp} =γ _{Mc} ¹⁾ | [-] | 1,5 | | | | | | | |
| Concrete cone failure, | | | factor k ₁ | | | | | | | |
| Cracked concrete | k _{cr,N} | [-] | 7,2 | 7,8 | 7,8 | 8,1 | 7,9 8,0 7,9 | 8,1 8,1 8,1 | 8,7 8,7 8,7 | |
| Uncracked concrete | k _{ucr,N} | [-] | =1,427 * k _{cr,N} | | | | | | | |
| Partial factor | γ _{Mc} ¹⁾ | [-] | 1,5 | | | | | | | |
| Splitting failure, | | | | | | | | | | |
| Characteristic edge distance | C _{cr,sp} | [mm] | = 3 * h _{ef} | | | | | | | |
| Characteristic spacing | S _{cr,sp} | [mm] | = 2 * C _{cr,sp} = 6 * h _{ef} | | | | | | | |
| Partial factor | γ _{Msp} | [-] | 1,5 | | | | | | | |

¹⁾ In absence of other national regulations

Table 13: Displacements under tension 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-I-40/22 | C-49/30 H-50/30 H-I-50/30 | C-54/33 H-52/34 H-I-52/34 |
|---------------------------------------|--------------------|------|---------|---------|-----------|-----------|---------------------------------|---------------------------------|---------------------------------|
| Tension load | N | [kN] | 3,6 | 7,1 | 8,0 | 12,0 | 7,9 15,1 15,1 | 12,3 17,1 17,1 | 21,8 28,6 28,6 |
| Short term displacement ¹⁾ | δ_{N0} | [mm] | 0,7 | 1,3 | 1,4 | 2,0 | 1,5 2,2 2,2 | 1,4 1,5 1,5 | 1,2 1,9 1,9 |
| Long term displacement ¹⁾ | $\delta_{N\infty}$ | [mm] | 1,4 | 2,6 | 2,8 | 4,0 | 3,0 4,5 4,5 | 2,8 2,9 2,9 | 2,4 3,7 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

fischer Anchor Channel FES with fischer Channel Bolts FBC
Performance

Characteristic resistances of anchor channels and displacements under tension load

Annex C2

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

| Anchor Channel FES- | | | C-28/15 | C-38/17 | H-S-29/20 | H-S-38/23 | C-40/25 H-40/22 H-I-40/22 | C-49/30 H-50/30 H-I-50/30 | C-54/33 H-52/34 H-I-52/34 |
|---|--------------------|------|---------|---------|-----------|-----------|---------------------------------|---------------------------------|---------------------------------|
| Steel failure: Failure of anchor | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,a,y}$ | [kN] | 9 | 18 | 20,2 | 30,3 | 20 40 40 | 31 60 60 | 55 100 100 |
| | $V_{Rk,s,a,x}$ | [kN] | -2) | -2) | 18,8 | 18,8 | -2) -2) -2) | -2) 18,8 26,4 | -2) 33,0 42,2 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,8 | | | | | | |
| Failure of connection between anchor and channel | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,c,y}$ | [kN] | 9 | 18 | 20,2 | 30,3 | 20 40 40 | 31 60 60 | 55 100 100 |
| | $V_{Rk,s,c,x}$ | [kN] | -2) | -2) | 12,1 | 18,2 | -2) -2) -2) | -2) 18,6 24,0 | -2) 33,0 42,2 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,8 | | | | | | |
| Local failure by flexure of channel lips under shear load perpendicular to the longitudinal axis of the channel | | | | | | | | | |
| Characteristic spacing of channel bolts for $V_{Rk,s,l}$ | $S_{l,V}$ | [mm] | 56 | 76 | 60 | 76 | 80 80 80 | 100 100 100 | 108 108 108 |
| Characteristic resistance | $V_{Rk,s,l,y}^0$ | [kN] | 9 | 18 | 20,2 | 30,3 | 20 40 40 | 31 60 60 | 55 100 100 |
| Partial factor | $\gamma_{Ms}^{1)}$ | [-] | 1,8 | | | | | | |

1) In absence of other national regulations

2) No performance assessed.

Table 15: Characteristic resistance for shear load in direction of the longitudinal axis of the channel – steel failure

| Anchor Channel FES- | | | H-S-29/20 | H-S-38/23 | H-40/22 H-I-40/22 | H-50/30 H-I-40/22 | H-52/34 H-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) |
| | | | FBC-S-38/23-M12-8.8 | ..2) | 23,2 | ..2) | ..2) |
| | | | FBC-S-38/23-M16-8.8 | ..2) | 30,3 | ..2) | ..2) |
| | | | FBC-N-50/30-M20-8.8 | ..2) | ..2) | 18,7 | 18,7 |
| Installation factor | $\gamma_{Inst}^{1)}$ | [-] | 1,2 | 1 | ..2) | 1,4 | 1,4 |

1) In absence of other national regulations

2) No performance assessed.

fischer Anchor Channel FES with fischer Channel Bolts FBC

Performance

Characteristic resistances of anchor channels under shear load

Annex C3

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Table 16: Characteristic resistances under shear load – concrete failure

| Anchor Channel FES- | | | C-28/15 | C-38/17 | H-S-29/20 | H-S-38/23 | C-40/25 H-40/22 H-I-40/22 | C-49/30 H-50/30 H-I-50/30 | C-54/33 H-52/34 H-I-52/34 |
|---------------------------------------|-------------------------------|-----|---------|---------|-----------|-----------|---------------------------------|---------------------------------|---------------------------------|
| Pryout failure | | | | | | | | | |
| Product factor | k ₈ | [-] | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| Partial factor | γ _{MC} ¹⁾ | [-] | 1,5 | | | | | | |
| Concrete edge failure k ₁₂ | | | | | | | | | |
| Cracked concrete | k _{cr,V} | [-] | 5,8 | 6,9 | 5,6 | 5,6 | 7,5 | 7,5 | 7,5 |
| Uncracked concrete | k _{ucr,V} | [-] | 8,1 | 9,7 | 7,8 | 7,8 | 10,5 | 10,5 | 10,5 |
| Partial factor | γ _{MC} ¹⁾ | [-] | 1,5 | | | | | | |

¹⁾ In absence of other national regulations

Table 17: Displacements under 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-I-40/22 | C-49/30 H-50/30 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 | 8,0 | 12,0 | 7,9 15,9 15,9 | 12,3 23,8 23,8 | 21,8 39,7 39,7 |
| Short time displacement ¹⁾ | $\delta_{v,y,0}$ | [mm] | 0,7 | 1,3 | 1,4 | 2,0 | 1,5 2,1 2,1 | 1,4 3,7 3,7 | 1,2 4 4 |
| Long time displacement ¹⁾ | $\delta_{v,y,\infty}$ | [mm] | 1,1 | 2,0 | 2,1 | 3,0 | 2,3 3,2 3,2 | 2,1 5,5 5,5 | 1,8 5,9 5,9 |
| Shear load in direction of the longitudinal axis of the channel | V_x | [kN] | - ³⁾ | - ³⁾ | 6,6 | 12,0 | - ³⁾ - ³⁾ - ³⁾ | 5,1 5,1 5,1 | 5,1 5,1 5,1 |
| Short time displacement ²⁾ | $\delta_{v,x,0}$ | [mm] | - ³⁾ | - ³⁾ | 0,6 | 0,8 | - ³⁾ - ³⁾ - ³⁾ | 0,5 0,5 0,5 | 0,5 0,5 0,5 |
| Long time displacement ²⁾ | $\delta_{v,x,\infty}$ | [mm] | - ³⁾ | - ³⁾ | 0,9 | 1,3 | - ³⁾ - ³⁾ - ³⁾ | 0,8 0,8 0,8 | 0,8 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

³⁾ No performance assessed.

Table 18: 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-I-40/22 | C-49/30 H-50/30 H-I-50/30 | C-54/33 H-52/34 H-I-52/34 |
|---|-----------------|-----|--------------------------------------|---------|-----------|-----------|---------------------------------|---------------------------------|---------------------------------|
| Steel failure: Local failure by flexure of channel lips and failure by flexure of channel | | | | | | | | | |
| Product factor | k ₁₃ | [-] | according to EN 1992-4:2019, 7.4.3.1 | | | | | | |
| Steel failure: Failure of anchor and connection between anchor and channel | | | | | | | | | |
| Product factor | k ₁₄ | [-] | according to EN 1992-4:2019, 7.4.3.1 | | | | | | |

fischer Anchor Channel FES with fischer Channel Bolts FBC
Performance

Displacement and characteristic resistances of anchor channels under shear load, characteristic resistance under combined tension and shear load

Annex C4

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Table 19: Characteristic resistances under tension and shear load – steel failure of channel bolts

| Channel bolt | | | M8 | M10 | M12 | M16 | M20 |
|--|---|------|------|------|------|------|-------|
| Steel failure, Characteristic tension resistance | | | | | | | |
| FBC-28/15 | N _{Rk,s} | [kN] | 29,2 | 33,0 | 45,1 | -2) | -2) |
| FBC-38/17 | | | -2) | 46,4 | 67,4 | -2) | -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-50/30 | | | -2) | 46,4 | 67,4 | 96,5 | 127,2 |
| FBC-N-50/30 | | | -2) | -2) | -2) | -2) | 142,5 |
| Partial factor | γ _{Ms} ¹⁾ | [-] | 1,5 | | | | |
| | | | | | | | |
| Characteristic shear resistance | V _{Rk,s,x} = V _{Rk,s,y} | [kN] | 14,6 | 23,2 | 33,7 | 62,8 | 98,0 |
| Partial factor | γ _{Ms} ¹⁾ | [-] | 1,25 | | | | |

¹⁾ In absence of other national regulations

²⁾ Combination not available

fischer Anchor Channel FES with fischer Channel Bolts FBC

Performance

Characteristic resistances of channel bolts under tension and shear load

Annex C5

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Table 20: Characteristic resistances under shear load with lever arm – steel failure of channel bolts

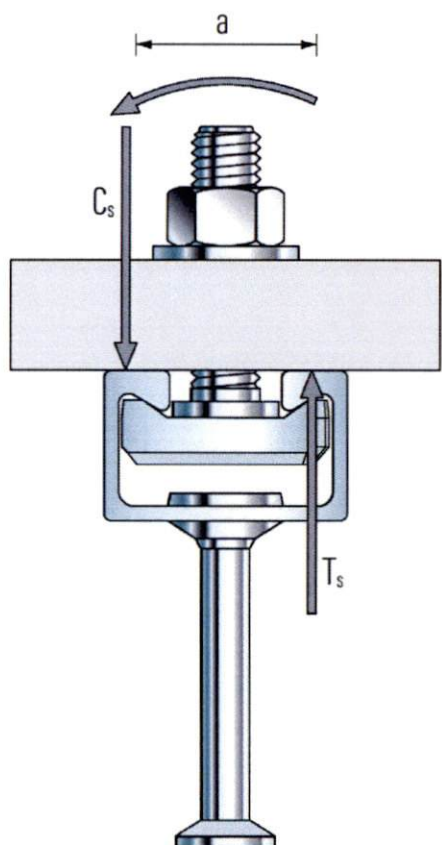
| Channel bolt ²⁾ | | | | M8 | M10 | M12 | M16 | M20 |
|-----------------------------------|-----------------------------|------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Steel failure | | | | | | | | |
| Characteristic bending resistance | $M^0_{Rk,s}$ ³⁾ | [Nm] | FBC-(S-) (N-) | 30,0 | 59,8 | 104,8 | 266,4 | 519,3 |
| Partial factor | γ_{Ms} ¹⁾ | [-] | | 1,25 | | | | |
| Internal lever arm | a | [mm] | FBC-28/15 | 16,7 | 18,1 | 19,4 | - ³⁾ | - ³⁾ |
| | | | FBC-38/17 | - ³⁾ | 22,7 | 24,0 | - ³⁾ | - ³⁾ |
| | | | FBC-S-29/20 | - ³⁾ | - ³⁾ | 20,0 | - ³⁾ | - ³⁾ |
| | | | FBC-S-38/23 | - ³⁾ | - ³⁾ | 23,7 | 25,7 | - ³⁾ |
| | | | FBC-40/22 | - ³⁾ | 23,5 | 24,8 | 26,8 | - ³⁾ |
| | | | FBC-50/30 | - ³⁾ | 27,7 | 29,0 | 31,0 | 33,3 |
| | | | FBC-N-50/30 | - ³⁾ | - ³⁾ | - ³⁾ | - ³⁾ | 34,0 |

¹⁾ In absence of other national regulations

²⁾ Materials according to Annex A7, Table 6

³⁾ Combination not available

⁴⁾ The characteristic flexure resistance according to Table 19 is limited as follows:



$$M^0_{Rk,s} \leq 0,5 \cdot N^0_{Rk,s,l} \cdot a \quad (N^0_{Rk,s,l} \text{ according to Annex C1, Table 10})$$

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

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

Appendix 23/ 23