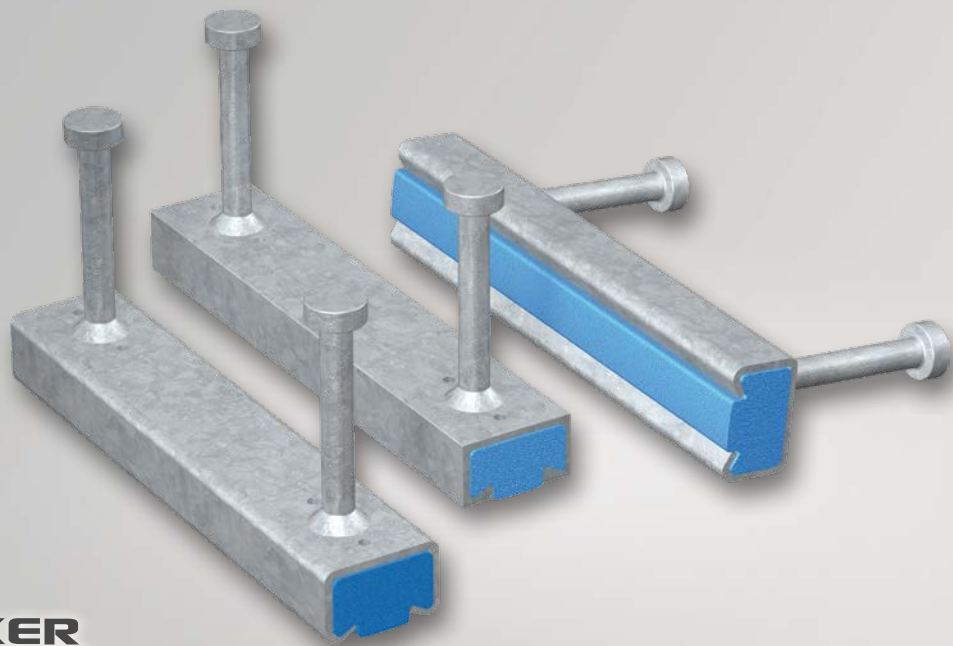


PHILIPPGROUP

Cast-in anchor channel



VB3-BZ-003-en-EU - 02/19

PROFIANKER

ETA - 18 / 1162

European Technical Assessment

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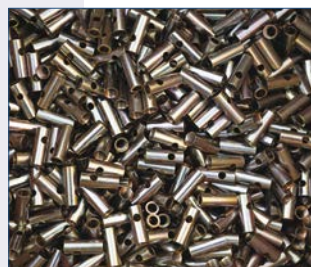
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European Technical Assessment ETA - 18 / 1162



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 Internet www.etadanmark.dk

Authorised and notified according
 to Article 29 of the Regulation (EU)
 No 305/2011 of the European
 Parliament and of the Council of 9
 March 2011

MEMBER OF EOTA



European Technical Assessment ETA-18/1162 of 2019/02/18

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 66 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:

Profilanker, anchor channel "BPA CE"

Product family to which the above construction product belongs:

Anchor Channels

Manufacturer:

Profilanker GmbH
 Adam-Opel-Straße 3
 DE-58840 Plettenberg
 Tel.: +49 23 91 6072-0
 Fax: +49 23 91 6072-00
www.profilanker.de

Manufacturing plant:

Profilanker GmbH
 Manufacturing Plant II
 Adam-Opel-Straße 3
 DE-58840 Plettenberg

This European Technical Assessment contains:

33 pages including 24 annexes which form an integral part of the document

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, based on:

European Assessment Document (EAD)
 330008-02-0601, dated February 2016

This version replaces:

-

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Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product

The Profilanker, anchor channel “BPA CE” are hot-rolled (dimensions: 40/22, 50/30, 52/34) and cold-rolled (dimensions: 28/15, 38/17, 40/25, 49/30) anchor channels for anchorage in cracked and noncracked normal weight concrete $\geq C20/25$ in accordance to European Assessment Document (EAD) 330008-02-0601, February 2016.

The anchor channel consists of a C-shaped hot-rolled or cold-formed channel, as a minimum two round anchors welded on the back of the channel and hammerhead or hook-head channel bolts. The anchor channel was cast in a specimen up to its full depth. The appropriate channel bolt was hooked in the channel. The anchor channel is intended to be used for anchorage under predominately static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes $> C20/25$. Galvanized steel (S235JR) or stainless steel (1.4571) is used for the channel, the anchor is made of galvanized steel (S235JR) or stainless steel (1.4404). The channel bolt consists of material class 4.6, A4-50 and A4-70

Detailed specifications for identification and performance criteria for fire safety regarding the construction products are given in ANNEXES.

2 Specification of the intended use in accordance with the applicable EAD

The performance 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 anchor channel is intended to be used for anchorage under static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes $\geq C20/25$.

Galvanized steel (S235JR) or stainless steel (1.4571) is used for the channel, the anchor is made of galvanized steel (S235JR) or stainless steel (1.4404). The channel bolt consists of material class 4.6, A4-50 and A4-70.

The tensile strength of the channel has been tested according to EAD, the results are shown in table 1.1 and 1.2

Table 1.1: Strength properties of the anchor channel -S235JR

Channel	Anchor	Material	Certificate	Test Results		nominal value for S235JR according to DIN EN 10025-2	
				Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]	Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]
28/15	8/16	S235JR	P 81	292	390	235	360-510
38/17	10/19	S235JR	P 100	275	402		
40/22	10/19	S235JR	P 8.56	352	471		
40/25	10/19	S235JR	P 83	303	441		
49/30	13/25	S235JR	P 76	309	415		
50/30	13/25	S235JR	P 73	287	432		
52/34	16/32	S235JR	P 86	298	384		

Table 1.2: Strength properties of the anchor channel – 1.4571

Channel	Material	Certificate	Test Results		nominal value for 1.4571 according to DIN EN 10025-2	
			Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]	Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]
28/15	1.4571	P 106	278	579	200	500-700
38/17	1.4571	P 94	322	593		
40/22	1.4571	P 99	325	583		
40/25	1.4571	P 23	296	586		
49/30	1.4571	P 95	256	574		
50/30	1.4571	P 88	387	621		

The tensile strength of the anchor has been tested according to EAD, the results are shown in table 1.3 & 1.4.

Table 1.3: Strength properties of the anchor – S235JR

Anchor	Material	Certificate	Test results		nominal value for S235JR according to DIN EN ISO 13918	
			Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]	Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]
8/16	S235JR	F1	559	597	235	400-550
10/19	S235JR	C1	487	521		
13/25	S235JR	K5	522	541		

Table 1.4: Strength properties of the anchor – 1.4404

Anchor	Material	Certificate	Test results		nominal value for 1.4404 according to DIN EN 10088-3	
			Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]	Yield strength f_{yk} [N/mm ²]	Tensile strength f_{tk} [N/mm ²]
8/16	1.4404	B1	484	586	200	500-700
10/19	1.4404	T2	489	604		
13/25	1.4404	J2	431	601		
16/32	1.4404	N3	458	598		

The tensile strength of the channel bolt has been tested according to the EAD, the results are shown in table 1.5.

Table 1.5: Strength properties of the channel bolt

Material	Tensile strength f_{tk} [N/mm ²]	Yield strength f_{yk} [N/mm ²]
4.6	400	240
A4-50	500	210
A4-70	700	450

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The provisions made in this European Technical Assessment are based on an assumed intended working life of the anchor channels of 50 years, provided the manufacturers conditions for the packaging, transport, storage, installation, use, maintenance and repair are met.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, 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*

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR1)	
2.2.2. Characteristic resistance for tension under static and quasi-static loading	See Annex C1 to C10
2.2.3 Characteristic resistance for shear and combined tension and shear under static and quasi-static loading	See annex C1 to C10
2.2.4 Characteristic resistance for tension under fatigue loading	No Performance Assessed
2.2.2.4 Steel failure of the channel bolt under tension load $N_{Rk,s}$ [kN]	See annex C2
2.2.2.5 Steel failure by exceeding the bending strength of the channel under tension load $N_{Rk,s,flex}$ [kN]	See annex C3
Characteristic resistance of the anchor pull-out failure for $\geq C20/25$ $N_{Rk,p}$ (Uncracked/Cracked concrete) [kN]	See annex C4
2.2.2.8 Concrete cone failure under tension load $k_{ucr,N} = \alpha_{ch,N} \times 12,7$ (Uncracked concrete) [$N^{0,5}/mm^{0,5}$] $k_{cr,N} = \alpha_{ch,N} \times 8,9$ (Uncracked concrete) [$N^{0,5}/mm^{0,5}$]	See annex C4
2.2.2.9 Concrete splitting failure due to installation	$c_{min} = 65$ mm $s_{min} = 130$ mm
2.2.3 Characteristic resistance for shear under static and quasi-static loading	No tests are required, since the characteristic resistance for steel failure is calculated with $\alpha_s = 0,6$ for all types of material.
2.2.3.1 Steel failure of channel bolt $V_{Rk,s}$ [kN]	See annex C6
2.2.3.2 Local steel failure of channel lips, steel failure of connection anchor/channel of anchor under shear load. $N_{Rk,s,c}$ [kN]	See annex C1
2.2.3.3. Steel failure by bending of the channel bolt. $M^0_{Rk,s}$ [Nmm]	See Annex C7
2.2.3.4. Steel failure by bending of the channel bolt under shear load with lever arm	According to EAD the tests may be omitted, if $V^0_{Rk,s,l} \leq N^0_{Rk,s,l}$ and $V_{Rk,s,c} \leq N_{Rk,c}$ and $V_{Rk,s,a} \leq N_{Rk,s}$ or $k13 = k14 = 1$ are accepted, no test methods are currently specified. The values $k13$ and $k14$ correspond to 1.
2.2.3.5 Concrete pry-out failure under shear load k_8	See annex C8

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Characteristic	Assessment of characteristic
2.2.3.6 Concrete edge failure under shear load	No tests are required, since $k_{cr,v} = 4,5 [N^{0,5}/mm^{0,33}]$ and $k_{ucr,v} = 6,3 [N^{0,5}/mm^{0,33}]$ and the conditions $h_{ch}/h_{ef} = 0,28 < 0,4$; $b_{ch}/h_{ef} = 0,51 < 0,7$ are fulfilled.
2.2.4 Characteristic resistance for tension under static loading	No Performance Assessed
3.2 Safety in case of fire (BWR2)	
2.2.10 Reaction to fire	Class A1 according to EC Decision 96/603/EC
2.2.11 Resistance to fire $N_{Rk,s,fi}$	Resistances for steel failure, see annex C10

*) See additional information in section 3.6 – 3.7.

3.6 Methods of verification

The product is fully covered by EAD 330008-02-0601, February 2016. According to the Regulation (EU) No 305/2011.

3.7 General aspects related to the fitness for use of the product

The European Technical Assessment is issued for the product based on agreed data/information, deposited with ETA-Danmark, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to ETA-Danmark before the changes are introduced. ETA-Danmark will decide if such changes affect the ETA and consequently the validity of the CE marking based on the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

The Profilanker, anchor channel “BPA CE” are manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.

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4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 1999/454/EC of the European Commission, as amended, the system(s) of assessment and verification of constancy of performance is system 1 (see Annex V to Regulation (EU) No 305/2011).

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

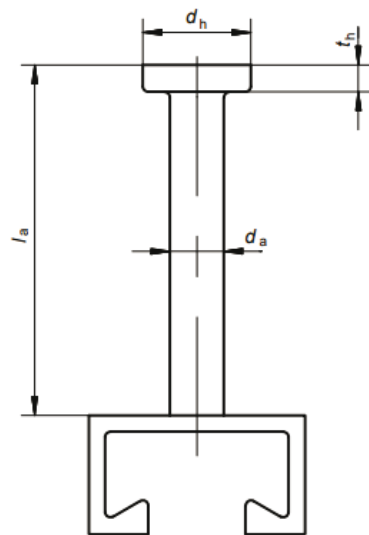
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking

Issued in Copenhagen on 2019-02-18 by

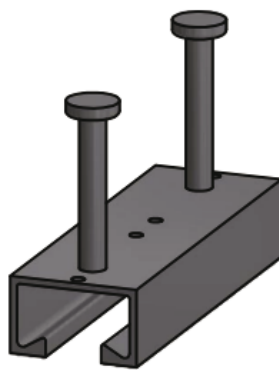


Thomas Bruun
Managing Director, ETA-Danmark

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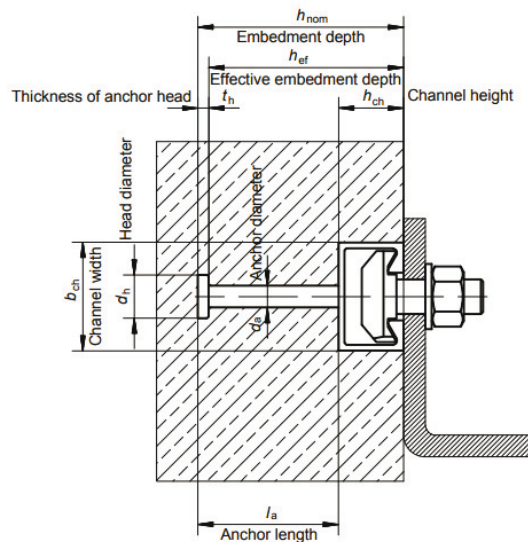
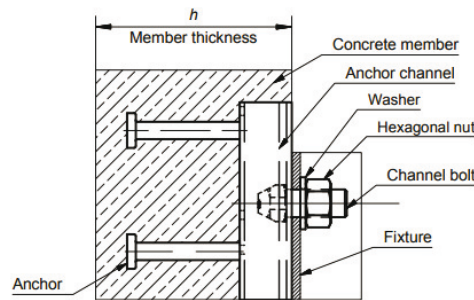
<p>Profilanker anchor channel “BPA CE”</p>	<p>Annex A1</p>
<p>Illustration of the Anchor</p>	

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Anchor channel		Anchor	Channel bolt		Minimum spacing to anchor s_{min} [mm]	Edge distance c_{min} [mm]	Effective embedded depth h_{ef} [mm]	Maximum spacing to anchor s_{max} [mm]	Minimum member thickness of concrete h_{min} [mm]	Minimum spacing between channel bolts $s_{min,cb}$ [mm]		
Dimensions	Material	Dimensions	Material	Diameter								
28/15	S235JR	8/16	4.6	12	50	65	45	125	75	60		
38/17		10/19		16	50	100	84	250	115	80		
40/22		10/19		16	100	130	90	250	125	80		
40/25		10/19		16	100	130	93	250	125	80		
49/30		13/25		20	100	195	100	250	130	100		
50/30		13/25		20	100	195	100	250	130	100		
52/34		16/32		20	100	260	154	250	185	100		
28/15		1.4571		8/16	A4-70	12	50	65	45	125	75	60
38/17				10/19		16	50	100	84	250	115	80
40/22				10/19		16	100	130	90	250	125	80
40/25	10/19		16	100		130	93	250	125	80		
49/30	13/25		20	100		195	100	250	130	100		
50/30	13/25		20	100	195	100	250	130	100			

Table A2, installation conditions

Installation parameters



<p>Profilanker anchor channel “BPA CE”</p>	<p>Annex A2</p>
<p>Installation conditions</p>	

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Anchor channel		Anchor			Project load bearing area of the head of the fastener A_h [mm ²]	Channel height h_{ch} [mm]	Channel width b_{ch} [mm]
Dimensions	Material	Anchor diameter d_a [mm]	Anchor head diameter d_h [mm]	Anchor head height t_h [mm]			
S235JR							
BPA CE 28/15 KB ST 300mm	S235JR	8	16	5	150,8	45	28
BPA CE 38/17 KB ST 300mm	S235JR	10	19	7,1	205,0	84	38
BPA CE 40/22 KB ST 300mm	S235JR	10	19	7,1	205,0	90	40
BPA CE 40/25 KB ST 300mm	S235JR	10	19	7,1	205,0	93	40
BPA CE 49/30 KB ST 300mm	S235JR	13	25	8	358,1	100	49
BPA CE 50/30 KB ST 300mm	S235JR	13	25	8	358,1	100	50
BPA CE 52/34 KB ST 300mm	S235JR	16	32	8	603,2	154	52
I.4571							
BPA CE 28/15 KB A4 300mm	I.4571	8	16	5	150,8	15	28
BPA CE 38/17 KB A4 300mm	I.4571	10	19	7,1	205,0	17	38
BPA CE 40/22 KB A4 300mm	I.4571	10	19	7,1	205,0	22	40
BPA CE 40/25 KB A4 300mm	I.4571	10	19	7,1	205,0	25	40
BPA CE 49/30 KB A4 300mm	I.4571	13	25	8	358,1	30	49
BPA CE 50/30 KB A4 300mm	I.4571	13	16	5	358,1	30	50

Profilanker anchor channel "BPA CE"	Annex A3
Geometric parameters of the channel	

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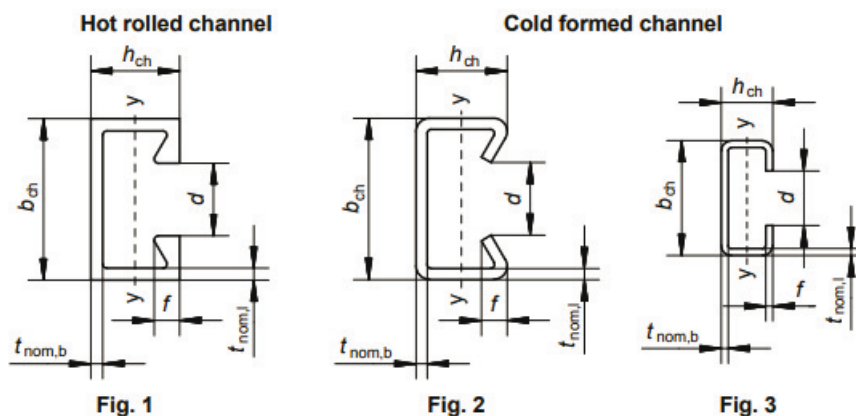


Table A2: Dimensions of channel profile

Anchor channel	Figure	Dimension						Material	I_y [mm ⁴]
		b_{ch}	h_{ch}	$t_{nom,b}$	$t_{nom,l}$	d	f		
		[mm]							
28/15	3	28,0	15,0	2,30	2,30	12,0	2,3	Carbon steel	3928
38/17	3	38,0	17,0	3,00	3,00	18,0	3,0		7914
40/22	1	40,0	22,0	2,50	2,50	18,0	6,0		18299
40/25	2	40,0	25,0	2,75	2,75	18,0	6,5		20234
49/30	2	49,0	30,0	3,25	3,25	22,0	7,5		42548
50/30	1	50,0	30,0	2,75	2,75	22,0	8,0		54253
52/34	1	52,0	34,0	3,50	4,00	22,0	11,5		94785
28/15	3	28,0	15,0	2,30	2,30	12,0	2,3	Stainless steel	3928
38/17	3	38,0	17,0	3,00	3,00	18,0	3,0		7914
40/22	1	40,0	22,0	2,50	2,50	18,0	6,0		18299
40/25	2	40,0	25,0	2,75	2,75	18,0	6,5		20234
49/30	2	49,0	30,0	3,25	3,25	22,0	7,5		42548
50/30	1	50,0	30,0	2,75	2,75	22,0	8,0	54253	

Profilanker anchor channel "BPA CE"	Annex A4
Dimensions of channel profile	

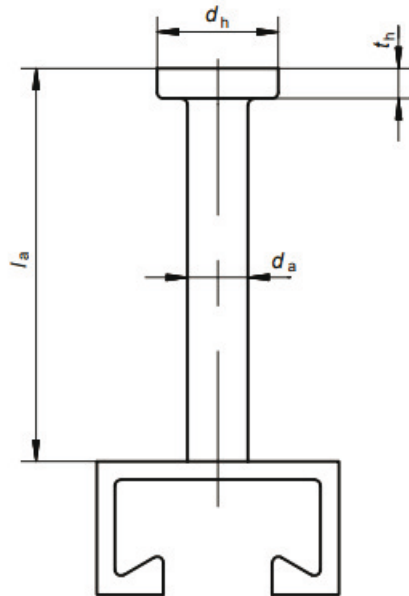


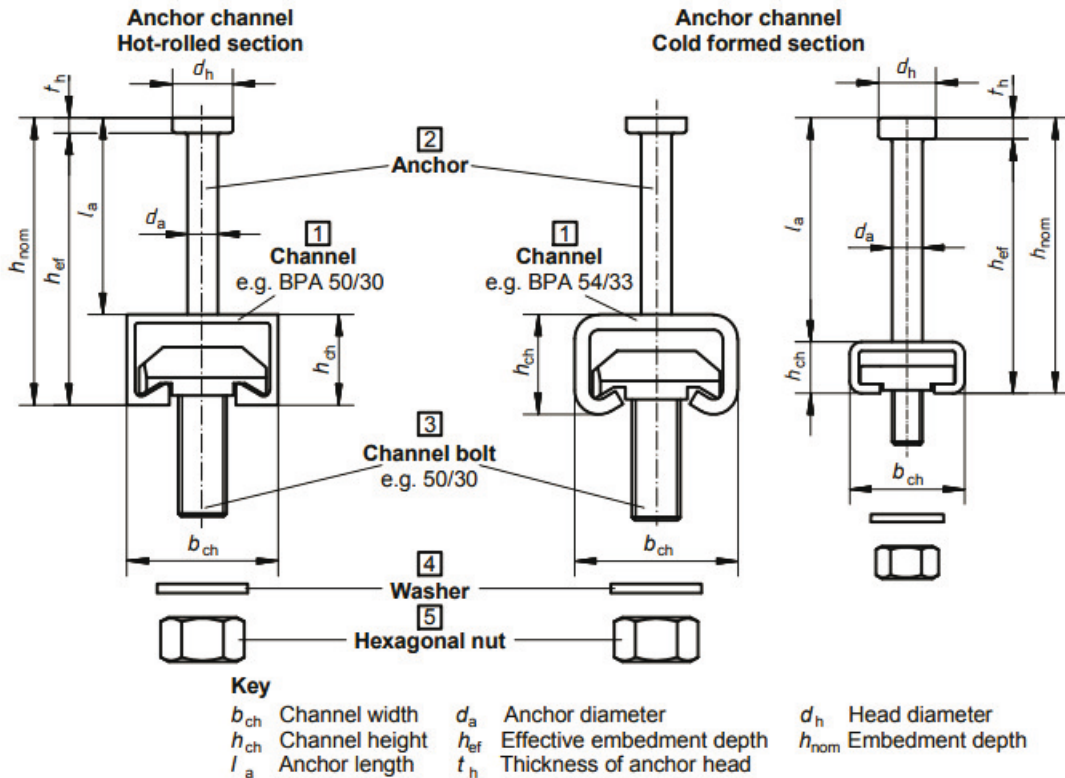
Table A3: Anchor types

Anchor-channel	Anchor length l_a	Shaft \varnothing d_a	Head \varnothing d_h	Head height t_h	Weld Thickness / length	Bearing area A_h [mm ²]
28/15	35	8	16	5	a3 x 19	150,8
38/17	74	10	19	7	a3 x 25	205,0
40/22	75	10	19	7	a3 x 25	205,0
40/25	75	10	19	7	a3 x 25	205,0
49/30	78	13	25	8	a3 x 31	358,1
50/30	78	13	25	8	a3 x 31	358,1
52/34	128	16	32	8	a3 x 41	603,2

Dimensions in mm

Profilanker anchor channel "BPA CE"	Annex A5
Anchor types	

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Marking of the Profilanker - Anchor channel

e.g. BPA 50/30 A4

BPA = Identifying mark of the producer

50/30 = Size

A4 = Material

Close to the anchor a nail hole is positioned

Material of the channel:

Carbon steel:

No marking for 1.0038 / 1.0044

Stainless steel:

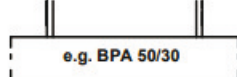
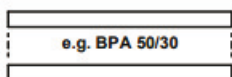
A4 = 1.4404, 1.4571, 1.4567, 1.4541

Manufacturing method:

W = hot-rolled

K = cold formed

- a) Embossment at the bottom of the channel optional b) Imprint on the web of the channel



Marking of the channel bolt

e.g. PA A4/50

PA = Identifying mark of the producer

A4 = Material

50 = Strength grade

Material:

Carbon steel:

No marking

Stainless steel:

A4 = 1.4401, 1.4404, 1.4571

1.4062, 1.4162, 1.4529, 1.4547, 1.4578, 1.4362

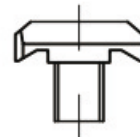
Strength grades:

Carbon steel:

4.6, 8.8

Stainless steel

50, 70



<p>Profilanker anchor channel "BPA CE"</p>	<p>Annex A6</p>
<p>Marking and materials</p>	

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Part no.	Specification	Intended use			
		1	2	3	4
		Dry internal conditions	Internal conditions with usual humidity	Medium corrosion exposure	High corrosion exposure
		Anchor channels may only be used in structures subject to dry internal conditions (e.g. accommodations, bureaus, schools, hospitals, shops exceptional internal conditions with usual humidity according to column 2).	Anchor channels may also be used in structures subject to internal conditions with usual humidity (e.g. kitchens, bath and laundries in residential buildings exceptional permanent damp conditions and application under water).	Anchor channels may also be used in structures subject to external atmospheric exposure (including industrial and marine environments) or exposure in permanently damp internal condition, if no particular aggressive conditions (e.g. permanent, alternating immersion in seawater according to column 4) exist.	Anchor channels may also be used in structures subject to exposure in particular aggressive conditions (e.g. permanent, alternating immersion in seawater or in the splash zone of swimming pools or atmosphere with chemical pollution (e.g. desulphurisation plants or road tunnels where de-icing materials are used)).
Materials					
1	Channel profile	Steel 1.0038; 1.0044 acc. EN 10025 hot-dip galvanised $\geq 50\mu\text{m}$ 5)	Steel 1.0038, 1.0044 acc. EN 10025 hot-dip galvanised $\geq 50\mu\text{m}$ 5) Stainless steel 1.4567, 1.4541 acc. EN 10088	Stainless steel 1.4401, 1.4404, 1.4571 1.4062, 1.4162, 1.4362 acc. EN 10088	Stainless steel 1.4462 1), 1.4529, 1.4547 acc. EN 10088
2	Anchor	Steel 1.0038 acc. EN 10025; 1.0214 acc. EN 10263; 1.0401 acc. EN 10269 hot-dip galvanised $\geq 50\mu\text{m}$ 5)	Steel 1.0038 acc. EN 10025; 1.0214, 1.1132, 1.5525 acc. EN 10263; 1.0401 acc. EN 10269 hot-dip galvanised $\geq 50\mu\text{m}$ 5)	Stainless steel 1.4401, 1.4404, 1.4571, 1.4578, 1.4362 acc. EN 10088 Steel 1.0038 2)	
3	Channel bolt	Steel, strength grade 4.6, 8.8 EN ISO 898-1 electroplated $\geq 5\mu\text{m}$ 3)	Steel strength grade 4.6, 8.8; EN ISO 898-1 hot-dip galvanised $\geq 50\mu\text{m}$ 4)	Stainless steel strength grade 50, 70 1.4401, 1.4404, 1.4571 EN ISO 3506-1	Stainless steel strength grade 50, 70 1.4462 1), 1.4529/ 1.4547 EN ISO 3506-1
4	Washer EN ISO 7089	Steel EN 10025 electroplated $\geq 5\mu\text{m}$ 3)	Steel EN 10025 hot-dip galvanised $\geq 50\mu\text{m}$ 4)	Stainless steel 1.4401, 1.4404, 1.4571 acc. EN 10088	Stainless steel 1.4462 1), 1.4529, 1.4547 EN 10088
5	Hexagonal nut EN ISO 4032	Steel strength grade 5, 8 EN ISO 898-2 electroplated $\geq 5\mu\text{m}$ 3)	Steel strength grade 5, 8; EN ISO 898-2 hot-dip galvanised $\geq 50\mu\text{m}$ 4)	Stainless steel strength grade 50, 70 1.4401, 1.4404, 1.4571 EN ISO 3506-2	Stainless steel strength grade 50, 70 1.4462 1), 1.4529, 1.4547 EN ISO 3506-2

1) 1.4462 not suitable for swimming pools

2) Steel according to EN 10025, 1.0038 not suitable for anchor channels 28/15 and 38/17

3) Electroplated $\geq 5\mu\text{m}$

4) Hot-dip galvanised according to EN ISO 10684

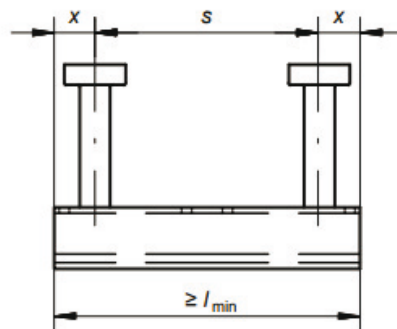
5) Hot-dip galvanised according to EN ISO 1461

Profilanker anchor channel “BPA CE”	Annex A7
Materials and intended use	

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Anchor-channel	Centre distance of anchors		End distance	Minimum channel length
	s_{min}	s_{max}	x	l_{min}
28/15	50	125	25	100
38/17	50	250	25	100
40/22	100	250	25	150
40/25	100	250	25	150
49/30	100	250	25	150
50/30	100	250	25	150
52/34	100	250	25	150

Dimensions in mm



Profilanker anchor channel "BPA CE"

Anchor positioning

Annex A8

Fig. 1 Hook-head bolt

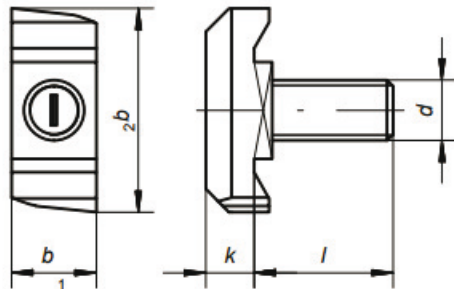


Table A5a: Dimensions of channel bolts hook-head bolts

Bolt	Thread d	Head width b_1	Head length b_2	Head thickness k	Length l	Anchor channel
40/22	M 10	14,0	33,7	8,0	20-150	40/22
40/22	M 12	14,0	33,7	8,0	20-250	
40/22	M 16	17,0	32,7	9,0	30-300	40/25
50/30	M 10	13,0	43,3	10,0	25-50	49/30
50/30	M 12	13,0	43,3	10,0	30-200	50/30
50/30	M 16	17,0	42,0	11,0	30-300	52/34
50/30	M 20	21,0	42,0	12,0	35-300	

Dimensions in mm

Fig. 2 Hammer-head bolt

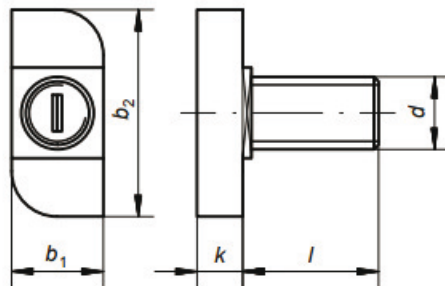


Table A5b: Dimensions of channel bolts hammer-head bolts

Bolt	Thread d	Head width b_1	Head length b_2	Head thickness k	Length l	Anchor channel
28/15	M 8	10,1	22,8	4,0	20-150	28/15
28/15	M 10	10,1	22,8	5,0	15-200	
28/15	M 12	11,8	22,8	6,0	20-200	
38/17	M 10	13,0	31,0	6,0	20-175	38/17
38/17	M 12	13,0	31,0	7,0	20-200	
38/17	M 16	16,0	31,0	7,0	20-200	

Dimensions in mm

Table A6: Strength grade

Strength grade	Carbon steel		Stainless steel	
		4.6	50	70
f_{uk} [N/mm ²]	400	500	700	
f_{yk} [N/mm ²]	240	210	450	
Coating	Hot-dip galvanised, electroplated		-	

Profilanker anchor channel "BPA CE"	Annex A9
Channel bolts, dimensions and strength grade	

Specifications of intended use

Anchor channel and channel bolts subject to:

- Static and quasi-static loads in tension and shear perpendicular to the longitudinal axis of the channel.
- Fire exposure for concrete classes C20/25 to C50/60.

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1.
- Strength classes C20/25 to C90/105 according to EN 206-1.
- 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, column 1 - 4).
- Structures subject to internal conditions with usual humidity (e.g. kitchen, bath and laundry in residential buildings, exceptional permanent damp conditions and application under water). (Anchor channels and channel bolts according to Annex A7, column 2 - 4).
- Structures subject to external atmospheric exposure (including industrial and marine environment) or in permanently damp internal conditions, if no particular aggressive conditions (e.g. permanent, alternating immersion in seawater etc.) exist. (Anchor channels and channel bolts according to Annex A7, column 3 - 4).
- Structures subject to exposure in particular aggressive conditions (e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of swimming pools or atmosphere with chemical pollution (e.g. desulphurisation plants or road tunnels where de-icing materials are used)). (Anchor channels and channel bolts according to Annex A7, column 4).

Design:

- Anchor channels are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculations 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 are designed in accordance with EOTA TR 047 "Calculation Method for the Performance of Anchor Channels" or for EN 1992-4.
- The characteristic resistances are calculated with the minimum effective embedment depth.

Installation:

- The installation of the 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.
- Installation in accordance with the manufacturer's specifications given in Annexes B6 and B7.
- 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 under the head of the anchors is properly compacted. The anchor channels are protected from penetration of concrete into the internal space of the channel profiles.
- Orientating the channel bolts (groove according to Annex B7) rectangular to the channel axis.
- The required installation torques given in Annex B4 must be applied and must not be exceeded

Profilanker anchor channel "BPA CE"	Annex B1
Specifications	

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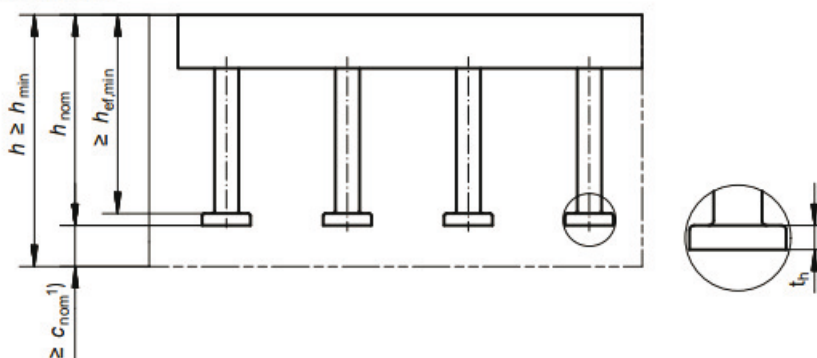
Minimum effective embedment depths, edge distances and thicknesses of concrete members for cold-formed anchor channels:

Anchor channel		28/15	38/17	40/25	49/30
Minimum effective embedment depth	$h_{ef,min}$	45	84	93	100
Minimum edge distance	c_{min}	65	100	130	195
Minimum member thickness	h_{min}	75	115	125	130

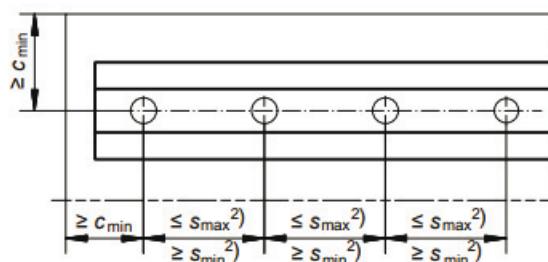
Minimum effective embedment depths, edge distances and thicknesses of concrete members for hot-rolled anchor channels:

Anchor channel		40/22	50/30	52/34
Minimum effective embedment depth	$h_{ef,min}$	90	100	154
Minimum edge distance	c_{min}	130	195	260
Minimum member thickness	h_{min}	125	130	185

Lateral view



Top view



1) c_{nom} according to EN 1992-1-1
 2) s_{min} , s_{max} according to Annex A6, Table A4

Profilanker anchor channel "BPA CE"	Annex B2
Installation parameters of anchor channels	

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Anchor channel	Channel bolt	Minimum spacing between channel bolts $S_{min, cbo}^{2)}$	Setting torque $T_{inst.}^{3)}$		
			4.6 ¹⁾	A4-50 ¹⁾	A4-70 ¹⁾
	[mm]	[mm]	[Nm]		
28/15	8	40	5		8
	10	50	8		13
	12	60	15		15
38/17	10	50	11		15
	12	60	20		25
	16	80	40		40
40/22 40/25	10	50	13		15
	12	60	19	25	
	16	80	32	45	
49/30 50/30 52/34 ⁴⁾	10	50	12		15
	12	60	19	24	
	16	80	40		60
	20	100	46	75	

¹⁾ Material according to Annex A6 and A7

²⁾ See Annex C1

³⁾ T_{inst} must not be exceeded

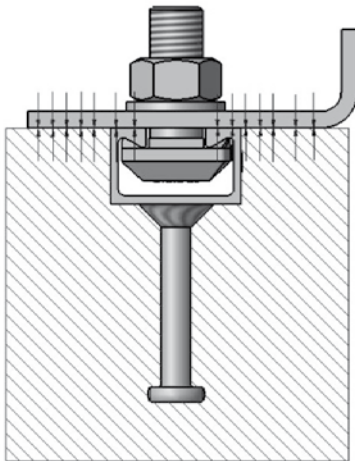
⁴⁾ Carbon steel only

Profilanker anchor channel "BPA CE"	Annex B3
Installation parameters for channel bolt	

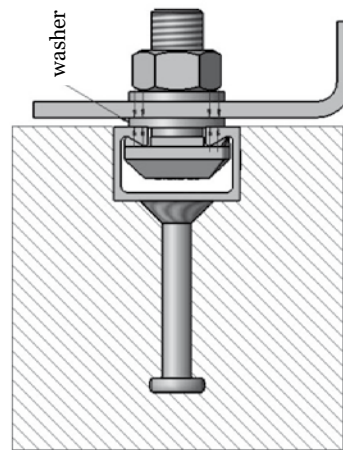
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General:



Steel-Steel Contact:



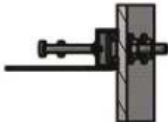

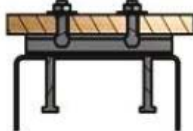


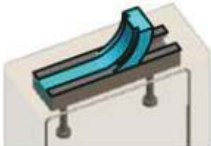
<p>Profilanker anchor channel “BPA CE”</p>	<p>Annex B4</p>
<p>Positions of the fixture</p>	

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PROFILANKER

Installation instruction BPA-Anchor channels

Installation of the anchor channel
 The anchor channel shall be fixed to the formwork or to the reinforcement in each direction flush to the surface. Protruding or recessing of the anchor channel shall be avoided. In case of protruding filling material, this shall be removed.

Fastening to the formwork

Steel formwork:
by means of Profilanker channel bolts and nuts, suitable studs, clips, cramps or magnetic fixing systems.

Wooden formwork:
by means of nails or wood screws through the nail holes on the back.
In the case of stainless steel channels or in outdoor areas stainless steel wire nails shall be used.
Fixing of the anchor channels by nailing with several cramps.

Fastening on the topside of the construction member

The anchor channel shall be fixed to an auxiliary structure by means of Profilanker channel bolts.

Direct fastening to the reinforcement or to the suspended reinforcement by means of wire.

Adequate compaction of the concrete
In all cases thorough compaction of the concrete around the channel and the anchors is required.

Removal of filling material
After stripping of the formwork the external surfaces of the channels shall be cleaned from concrete residues. The filling material shall be removed from the channel slot.

Installation of the Profilanker channel bolts
For correct installation the separate installation instruction shall be regarded!

Profilanker anchor channel “BPA CE”	Annex B5
Installation instruction for the anchor channel	

PROFILANKER

Installation instruction for hammer- and hook-head channel bolts in BPA-anchor channels

1. Inserting the channel bolt into the slot of the channel.
2. Positioning the channel bolt in the channel by turning it clockwise by 90°, paying attention to correct alignment (mark under 90° to longitudinal axis of the channel) and to specified minimum distance to the channel end.
3. Mounting of the fixture.
4. In case of steel-steel contact attention should be paid to direct support of the fixture on the channel by means of a washer.
5. The correct position of the channel bolt should be checked again. The nut shall be tightened with the torque moment T_{inst} according to the following table. The torque moment T_{inst} must not be exceeded.

Anchor channel	K 28/15			K 38/17			W 40/22, K 40/25			K 49/30, W 50/30, W 52/34				
Thread diameter	M8	M10	M12	M10	M12	M16	M10	M12	M16	M10	M12	M16	M20	
Setting torque T_{inst} [Nm]	4.6	5	8	15	11	20	4.0	13	19	32	12	18	4.0	4.6
	A4-50							25	45		24		75	
	A4-70	8	13	15	15	25	4.0	15		15		60		

Profilanker anchor channel “BPA CE”	Annex B5
Installation instructions for the channel bolts	

Anchor channel				28/15	38/17	40/22	40/25	49/30	50/30	52/34
Steel failure, anchor										
Characteristic resistance	$N_{Rk,s,a}$	Steel	[kN]	18,6	29,1	29,1	29,1	49,1	49,1	74,4
		Stainl. steel		27,1	42,4	42,4	42,4	71,7	71,7	-
Partial safety factor 1)	γ_{Ms}	Steel		2,0						
		Stainl. steel		3,0						
Steel failure, connection channel / anchor										
Characteristic resistance	$N_{Rk,s,c}$	Steel	[kN]	19,4	25,8	21,1	29,2	47,2	35,7	59,0
		Stainl. steel		23,6	31,6	32,0	35,0	64,3	51,8	-
Partial safety factor 1)	$\gamma_{Ms,ca}$			1,8						
Steel failure, local flexure of the channel lips										
Spacing of the channel bolts for $N_{Rk,s,l}^0$	$s_{l,N}$	[mm]		56	76	80	80	98	100	104
Characteristic resistance	$N_{Rk,s,l}^0$	Steel	[kN]	11,3	19,3	17,7	22,6	30,4	19,2	54,4
		Stainl. steel		16,1	23,8	25,4	31,5	48,3	37,1	-
Partial safety factor 1)	$\gamma_{Ms,l}$			1,8						

1) In the absence of other national regulations

Fig. 1

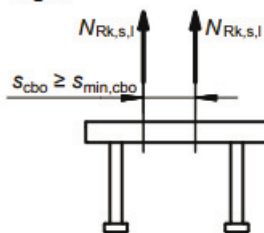


Fig. 2 System assumptions

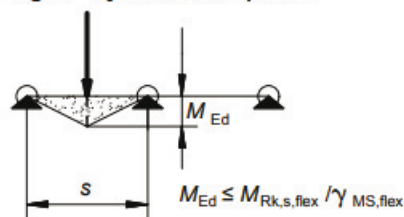
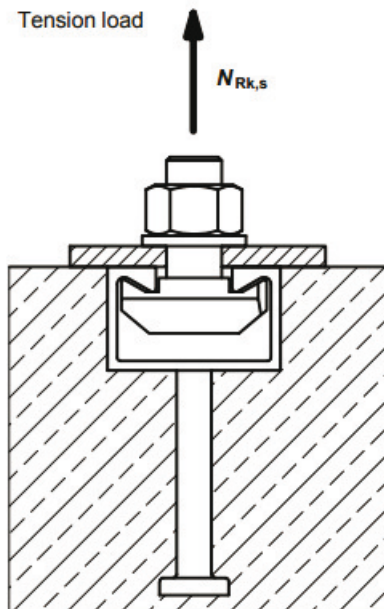


Table C2: Characteristic bending moment of the anchor channel under tension

Anchor channel				28/15	38/17	40/22	40/25	49/30	50/30	52/34
Steel failure, anchor channel										
Characteristic bending moment of the channel	$M_{Rk,s,flex}$	Steel	[Nm]	296,4	523,8	925,7	924,6	1620,7	1984,7	3161,9
		Stainl. steel		252,3	445,8	787,8	786,9	1379,4	1689,1	-
Partial safety factor 1)	$\gamma_{Ms,flex}$			1,15						

1) In the absence of other national regulations

<p>Profilanker anchor channel "BPA CE"</p>	<p>Annex C1</p>
<p>Characteristic resistances under tension load Steel failure of anchor channel</p>	



**Table C3: Characteristic resistances under tension load
Steel failure of the channel bolts**

Channel bolt			M 8	M 10	M 12	M 16	M 20	
Steel failure								
Characteristic resistance	$N_{Rk,s}^{2)}$ [kN]	28/15	4.6	14,6	23,2	33,7	-	-
			A4-70 ¹⁾	25,6	40,6	59,0	-	-
		38/17	4.6	-	23,2	33,7	62,8	-
			A4-70 ¹⁾	-	40,6	59,0	100,8	-
		40/22	4.6	-	23,2	33,7	62,8	-
			A4-50 ¹⁾	-	-	42,2	61,7	-
			A4-70 ¹⁾	-	28,8	-	-	-
		50/30	4.6	-	22,2	33,7	62,8	92,4
			A4-50 ¹⁾	-	-	42,2	-	115,9
			A4-70 ¹⁾	-	40,6	-	108,6	-
Partial safety factor	$\gamma_{Ms,s}^{3)}$	4.6	2,00					
		A4-50 ¹⁾	2,86					
		A4-70 ¹⁾	1,87					

¹⁾Material according to Annex A6 and A7

²⁾In accordance with EN ISO 898-1

³⁾In the absence of other national regulations

Profilanker anchor channel “BPA CE”	Annex C2
Characteristic resistances under tension load Steel failure channel bolts	

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Anchor Channel		Anchor	Channel Bolt		$N_{Rk,s,flex}$
Dim.	Mat.	Dimensions	Material	Diameter [mm]	[kN]
28/15	S235JR	8/16	4.6	12	23,8
38/17		10/19		16	42,1
40/22		10/19		16	37,2
40/25		10/19	A4-70	16	37,1
49/30		13/25		20	65,1
50/30		13/25		20	79,7
52/34		16/32		20	127,0
28/15		1.4571	8/17	A4-50	12
38/17	10/19		16		35,8
40/22	10/19		16		31,6
40/25	10/19		16		31,6
49/30	13/25		20		55,4
50/30	13/25		20		67,9

Profilanker anchor channel "BPA CE"	Annex C3
Steel failure by exceeding the bending strength of the channel under tension load	

Characteristics resistances under tension load – concrete failure

Anchor channel			28/15	38/17	40/22	40/25	49/30	50/30	52/34	
Pull-out failure										
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$ [kN]	22,6	30,7	30,7	30,7	53,7	53,7	90,5	
Characteristic resistance in uncracked concrete C20/25			31,7	43,0	43,0	43,0	75,2	75,2	126,7	
Increasing factor of $N_{Rk,p}$	Strength class	ψ_{c1} / ψ_{c2}							not linear conversion	
	C25/30								1,12	
	C30/37								1,22	
	C35/45								1,32	
	C40/50								1,41	
	C45/55								1,50	
	C50/60								1,58	
	C55/67								1,66	
$\geq C60/75$							1,73			
Partial safety factor ¹⁾		$\gamma_{Mp} = \gamma_{Mc}$							1,5	
Concrete failure $N_{Rk,c}^0$										
Cracked concrete		$k_{cr,N}$	7,2	7,9	8,0	8,1	8,1	8,1	8,7	
Uncracked concrete		$k_{ucr,N}$	10,3	11,3	11,4	11,5	11,6	11,6	12,4	
Partial safety factor ¹⁾		γ_{Mc}							1,5	
Splitting										
Effective embedment depth		h_{ef}	45	84	90	93	100	100	154	
Characteristic edge distance		$c_{cr,sp}$ [mm]	135	252	270	279	300	300	462	
Characteristic centre distance		$s_{cr,sp}$	270	504	540	558	600	600	924	
Partial safety factor ¹⁾		γ_{Mc}							1,5	

¹⁾ In the absence of other national regulations

Displacements under tension load

Anchor channel			28/15	38/17	40/22	40/25	49/30	50/30	52/34
Steel	Tensile load	N [kN]	5,7	7,7	8,9	9,1	12,1	12,8	23,3
	Short-term displacement	δ_{N0} [mm]	0,5	1,5	0,5	0,5	0,5	0,5	0,5
	Long-term displacement	$\delta_{N\infty}$ [mm]	1,0	3,0	1,0	1,0	1,0	1,0	1,0
Stainl. steel	Tensile load	N [kN]	7,7	9,6	12,1	12,5	19,3	17,3	-
	Short-term displacement	δ_{N0} [mm]	0,4	1,3	0,6	1,1	0,7	0,4	-
	Long-term displacement	$\delta_{N\infty}$ [mm]	0,8	2,6	1,2	2,2	1,4	0,8	-

<p>Profilanker anchor channel “BPA CE”</p> <p>Characteristic resistances under shear load Concrete failure and displacements</p>	<p>Annex C4</p>
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Anchor channel				28/15	38/17	40/22	40/25	49/30	50/30	52/34
Steel failure, anchor										
Characteristic resistance	$V_{Rk,s,a}$	Steel	[kN]	18,6	29,1	29,1	29,1	49,1	49,1	74,4
		Stainl. steel		27,1	42,4	42,4	42,4	71,7	71,7	-
Partial safety factor 1)	γ_{Ms}	Steel	1,7							
		Stainl. steel	2,5							
Steel failure, connection channel / anchor										
Characteristic resistance	$V_{Rk,s,c}$	Steel	[kN]	19,4	25,8	21,1	29,2	47,2	35,7	59,0
		Stainl. steel		23,6	31,6	32,0	35,0	64,3	51,8	-
Partial safety factor 1)	$\gamma_{Ms,ca}$	1,8								
Steel failure, local flexure of channel lips										
Spacing of the channel bolts for $V_{Rk,s,l}^0$	$s_{l,v}$	[mm]	56	76	80	80	98	100	104	
Characteristic resistance	$V_{Rk,s,l}^0$	Steel	[kN]	11,3	19,3	17,7	22,6	30,4	19,2	54,4
		Stainl. steel		16,1	23,8	25,4	31,5	48,3	37,1	-
Partial safety factor 1)	$\gamma_{Ms,l}$	1,8								
Concrete pry-out failure										
Product factor 2)	k_8	1,0				2,0				
Partial safety factor 1)	γ_{Mc}	1,5								
Concrete edge failure										
Product factor k_{12}	Cracked concrete	$k_{cr,v}$	4,5							
	Uncracked concrete	$k_{ucr,v}$	6,3							
Partial safety factor 1)	γ_{Mc}	1,5								

1) In the absence of other national regulations

2) Without supplementary reinforcement.

In case of supplementary reinforcement the factor k_8 should be multiplied by 0,75.

Profilanker anchor channel "BPA CE"	Annex C5
Characteristic resistances under shear load Steel failure anchor channel and concrete failure	

Characteristic resistances under shear load – steel failure of channel bolts

Channel bolt				M 8	M 10	M 12	M 16	M 20	
Steel failure									
Characteristic resistance ⁴⁾	$V_{Rk,s}$ ²⁾	[kN]		4,6	8,8	13,9	20,2	37,7	58,8
			A4-50 ¹⁾	-	-	25,3	47,1	73,5	
			A4-70 ¹⁾	15,4	24,4	35,4	65,9	-	
Characteristic bending resistance	$M_{Rk,s}^0$ ²⁾	[Nm]		4,6	15,0	29,9	52,3	133,0	259,7
			A4-50 ¹⁾	-	-	65,4	166,2	324,6	
			A4-70 ¹⁾	26,2	52,3	91,6	232,7	-	
Partial safety factor ³⁾		$\gamma_{Ms,s}$		1,67					
			A4-50 ¹⁾	2,38					
			A4-70 ¹⁾	1,56					
Internal lever arm	a	[mm]	28/15	16,9	18,3	19,6	-	-	
			38/17	-	23,0	24,3	26,3	-	
			40/22	4,6	-	23,9	25,2	26,9	-
			40/25						
			49/30	A4-70 ¹⁾	-	28,4	29,8	31,3	33,7
			50/30						
52/34									

¹⁾ Materials according to Annex A6 and A7

²⁾ According to EN ISO 898-1

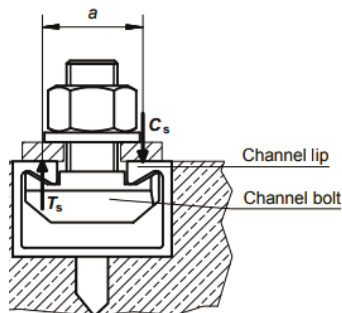
³⁾ In the absence of other national regulations

⁴⁾ The characteristic bending moment according to Table C7 is limited as follows:

$M_{Rk,s}^0 \leq 0,5 \cdot a \cdot (N_{Rk,s})$ according to annex C1

$M_{Rk,s}^0 \leq 0,5 \cdot a \cdot (N_{Rk,s})$ according to annex C2

a = Internal lever arm according Table above



T_s = tension force acting on the channel lips
 C_s = compression force acting on the channel lips

Interaction under combined tension and shear load

Anchor channel		28/15	38/17	40/22	40/25	49/30	50/30	52/34
Product factor	k_{13}	1,0						
Product factor	k_{14}	1,0						

Profilanker anchor channel “BPA CE”	Annex C6
Characteristic resistances under shear load Steel failure channel bolts	

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Anchor channel	Anchor	Channel Bolt		M ⁰ _{Rk,s} [Nmm]
		Material	Diameter [mm]	
S235JR				
28/15	8/16	4.6	8	14976
			10	29904
			12	52320
38/17	10/19	4.6	10	29904
			12	52320
			16	132960
40/22	10/19	4.6	10	29904
			12	52320
			16	132960
40/25	10/19	4.6	10	29904
			12	52320
			16	132960
49/30	13/25	4.6	10	29904
			12	52320
			16	132960
			20	259680
50/30	13/25	4.6	10	29904
			12	52320
			16	132960
			20	259680
52/34	16/34	4.6	10	29904
			12	52320
			16	132960
			20	259680
1.4571				
28/15	8/16	A4-70	8	26208
			10	52332
			12	91560
38/17	10/19	A4-70	10	52332
			12	91560
			16	232680
40/22	10/19	A4-70	10	52332
		A4-50	12	65400
			16	166200
50/30	13/25	A4-70	10	52332
		A4-50	12	65400
		A4-70	16	166200
		A4-50	20	52332

Profilanker anchor channel "BPA CE"	Annex C7
Steel failure by bending of the channel bolt	

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Dimensions	Material	Dimensions/ material	Anchor bolt dimensions	Effective embedment depth h_{ef} [mm]	k_g
S235JR					
BPA 28/15 KB ST 300mm	S235JR	28/15 S235JR	8x35	45	1,0
BPA 38/17 KB ST 300mm	S235JR	38/17 S235JR	10x75	84	2,0
BPA 40/22 KB ST 300mm	S235JR	40/22 S235JR	10x75	90	2,0
BPA 40/25 KB ST 300mm	S235JR	40/25 S235JR	10x75	93	2,0
BPA 49/30 KB ST 300mm	S235JR	49/30 S235JR	13x75	100	2,0
BPA 50/30 KB ST 300mm	S235JR	50/30 S235JR	13x75	100	2,0
BPA 52/34 KB ST 300mm	S235JR	52/34 S235JR	16x125	154	2,0
1.4571					
BPA 28/15 KB A4 300mm	1.4571	28/15 1.4571	8x35	45	1,0
BPA 38/17 KB A4 300mm	1.4571	38/17 1.4571	10x75	84	2,0
BPA 40/22 KB A4 300mm	1.4571	40/22 1.4571	10x75	90	2,0
BPA 40/25 KB A4 300mm	1.4571	40/25 1.4571	10x75	93	2,0
BPA 49/30 KB A4 300mm	1.4571	49/30 1.4571	13x75	100	2,0
BPA 50/30 KB A4 300mm	1.4571	50/30 1.4571	13x75	100	2,0

Profilanker anchor channel "BPA CE"	Annex C8
Concrete pry-out failure under shear load	

Tests according EAD	Anchor channel		Anchor		Nominal tensile strength of channel back ^{1,4} [N/mm ²]	Actual tensile strength of channel back ^{1,4} [N/mm ²]	Nominal thickness of channel lip depending on the failure mode $t_{b,0,act}$ [mm]	Actual thickness of channel back or channel lips depending on the failure mode $t_{b,act}$ [mm]	5%-fractile of ultimate load $N_{b,c,5\%}$ [kN]	Characteristic resistance of the connection anchor/channel $N_{b,c}$ [kN]	Type of failure
	Dimensions	Material	Dimensions	Material							
5235/R	28/15	S235JR	8/16	S235JR	360	390	2,3	2,3	20,5	18,9	5= anchor pulled out of weld seam
	38/17	S235JR	10/19	S235JR	360	402	3	3,6	33,6	25,1	7= anchor and weld seam pulled out of anchor channel
	40/22	S235JR	10/19	S235JR	360	471	2,5	3,2	34,5	20,6	3= failure of anchor at the shaft 4= failure of anchor right above weld seam 5= anchor pulled out of weld seam
	40/25	S235JR	10/19	S235JR	360	441	2,75	3,0	37,9	28,4	4= failure of anchor right above weld seam 5= anchor pulled out of weld seam
	49/30	S235JR	13/25	S235JR	360	415	3,25	3,7	60,2	45,9	4= failure of anchor right above weld seam 5= anchor pulled out of weld seam
2.2.2.2 channel/anchor	50/30	S235JR	13/25	S235JR	360	432	2,75	3,2	48,5	34,7	4= failure of anchor right above weld seam 5= anchor pulled out of weld seam 6= anchor and weld seam pulled out
	52/34	S235JR	16/32	S235JR	360	384	4	4,5	68,9	57,4	5= anchor pulled out of weld seam 6= anchor and weld seam pulled out of anchor channel 7= anchor and weld seam pulled out of anchor channel
1.4571	28/15	1.4571	8/16	1.4571	500	579	2,3	2,5	29,7	23,6	3= failure of anchor at the shaft 5= anchor pulled out of weld seam 6= anchor and weld seam pulled out
	38/17	1.4571	10/19	1.4571	500	593	3	3,4	42,4	31,6	3= failure of anchor at the shaft 7= anchor and weld seam pulled out of anchor channel
	40/22	1.4571	10/19	1.4571	500	583	2,5	2,9	43,3	32,0	3= failure of anchor at the shaft 4= failure of anchor right above weld seam
	40/25	1.4571	10/19	1.4571	500	586	2,75	3,0	44,8	35,0	3= failure of anchor at the shaft
	49/30	1.4571	13/25	1.4571	500	574	3,25	3,3	74,9	64,3	3= failure of anchor at the shaft
2.2.2.2 channel/anchor	50/30	1.4571	13/25	1.4571	500	621	2,75	3,2	74,9	51,8	5= anchor pulled out of weld seam

Profilanker anchor channel “BPA CE”	Annex C9
Characteristic resistance for shear and combined tension and shear under quasi-static loading Failure of the connection between anchor and channel.	

Characteristic resistances under tension and shear load under fire exposure:

Anchor channel		28/15	49/30
Channel bolt \geq [mm]		M8	M12
Steel failure: Anchor, connection anchor/channel, bending of the channel lips			
Characteristic resistance	R90	$N_{Rk,s,fi}$	0,5
	R120	$V_{Rk,s,fi}$	0,4
Partial safety factor ¹⁾		$\gamma_{Ms,fi}$	1,0

¹⁾ In the absence of other national regulations

Fig. 1: Fire exposure from one side only

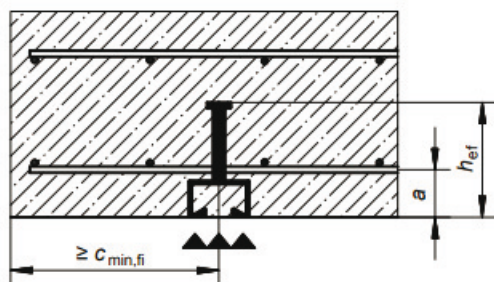
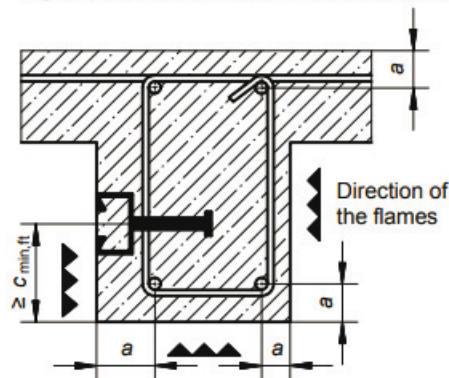


Fig. 2: Fire exposure from more than one side



Profilanker anchor channel “BPA CE”	Annex C10
Characteristic resistances under tension and shear load under fire exposure	

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