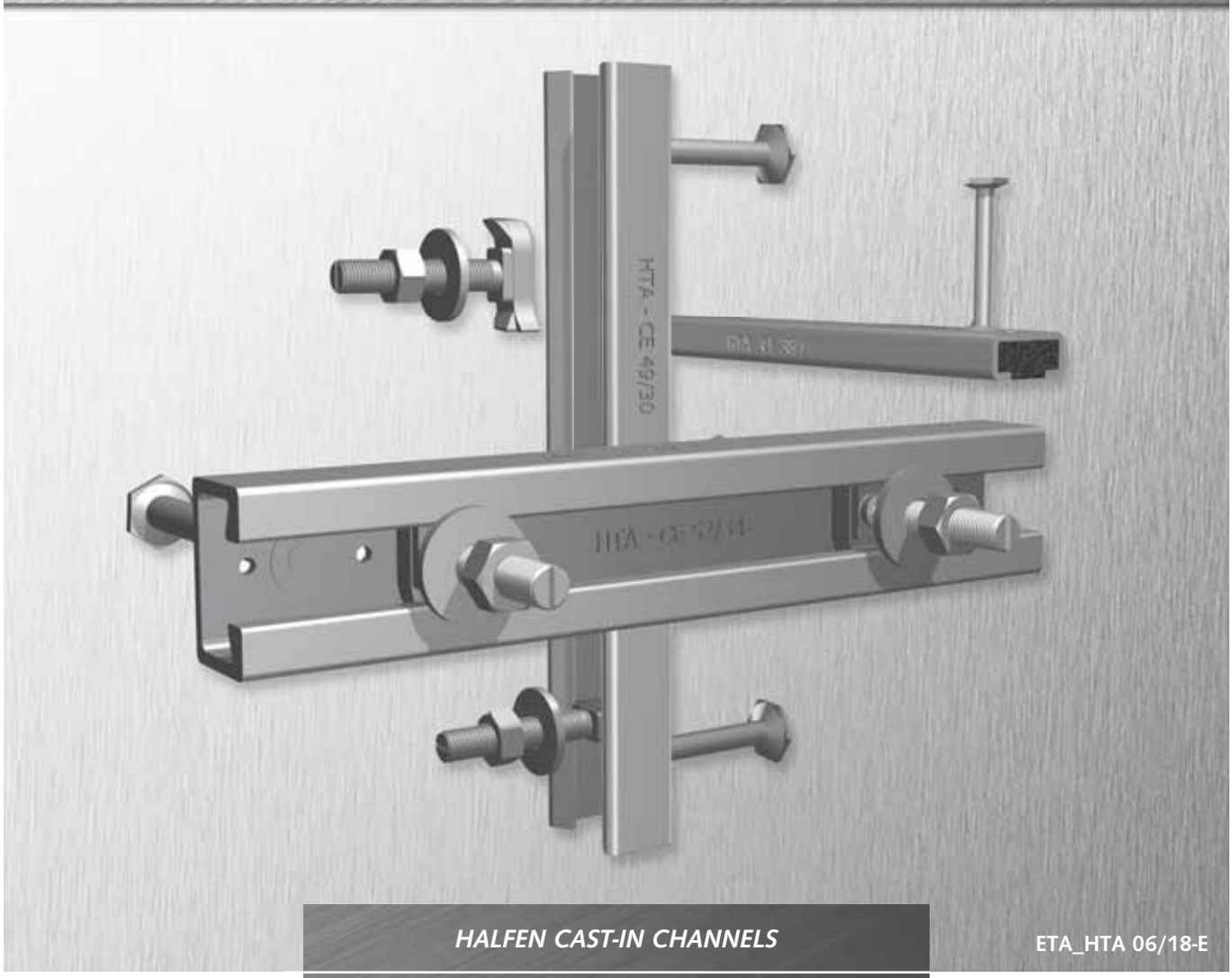
HALFEN HTA-CE CAST-IN CHANNELS

EUROPEAN TECHNICAL ASSESSMENT ETA-09/0339



HALFEN CAST-IN CHANNELS

ETA_HTA 06/18-E

CONCRETE

HALFEN

A CRH COMPANY

General note

Use of third-party products

This approval only applies to original HALFEN products manufactured by HALFEN.
The specifications in this approval are not transferable to other products.
Users are fully liable for personel injuries and material damage caused by third-party products used instead of HALFEN products.

Deutsches Institut für Bautechnik

Member of EOTA
www.eota.eu

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment ETA-09/0339 of 28 June 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Halfen anchor channel HTA
Product family to which the construction product belongs	Cast-in anchor channels
Manufacturer	Halfen GmbH Abt. Forschung und Entwicklung Liebigstraße 14 40764 Langenfeld DEUTSCHLAND
Manufacturing plant	Werk Langenfeld Liebigstraße 14 40764 Langenfeld
This European Technical Assessment contains	30 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330008-02-0601

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Specific Part

1 Technical description of the product

The Halfen anchor channel HTA is a system consisting of a C-shaped channel profile of steel and stainless steel and at least two metal anchors non-detachably fixed on the channel back and channel bolts.

The anchor channel is embedded surface-flush in the concrete. Halfen-channel bolts (hammerhead or hooked) with appropriate hexagon 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 to tension load (static and quasi-static loading)	See Annex C1 to C3 and C6
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C4 to C6
Displacements (static and quasi-static loading)	See Annex C3 to C4
Characteristic resistance under fatigue cyclic loads (tension)	See Annex C9 to C11

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C7 and C8

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

In accordance with EAD No. 330008-02-0601, the applicable European legal act is: [2000/273/EC].

The system to be applied is: 1

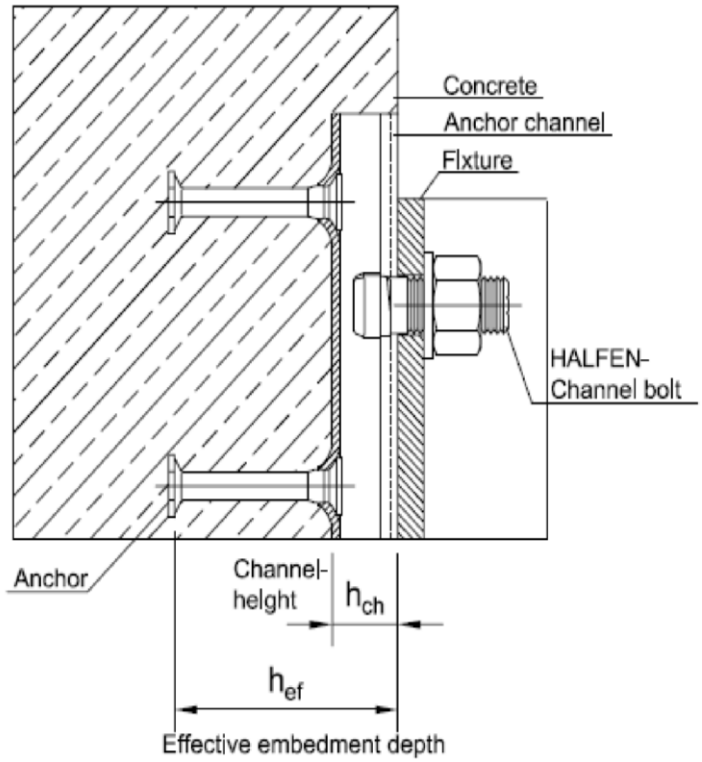
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

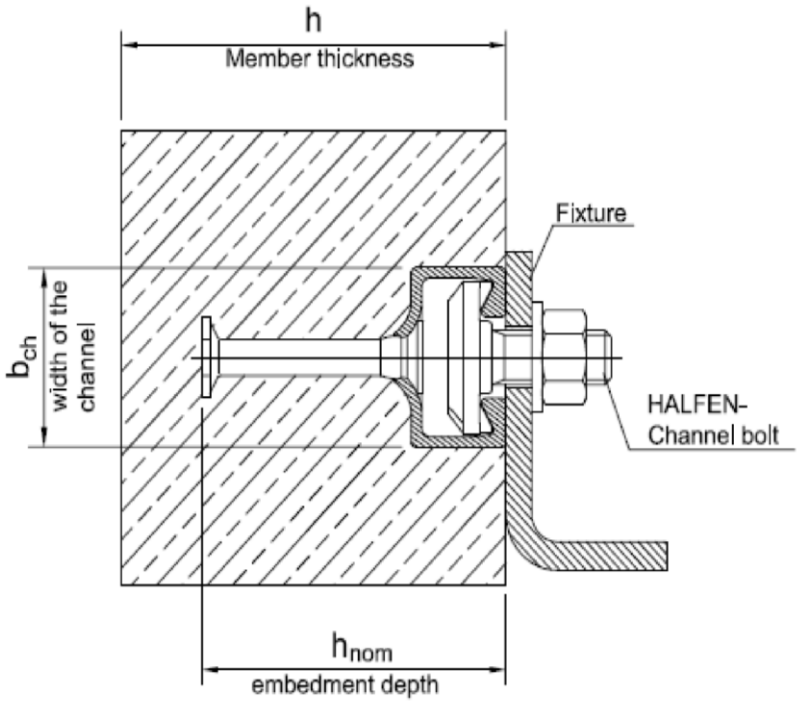
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 28 June 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Müller





HALFEN Anchor Channels HTA	Annex A1
Product description Installed condition	

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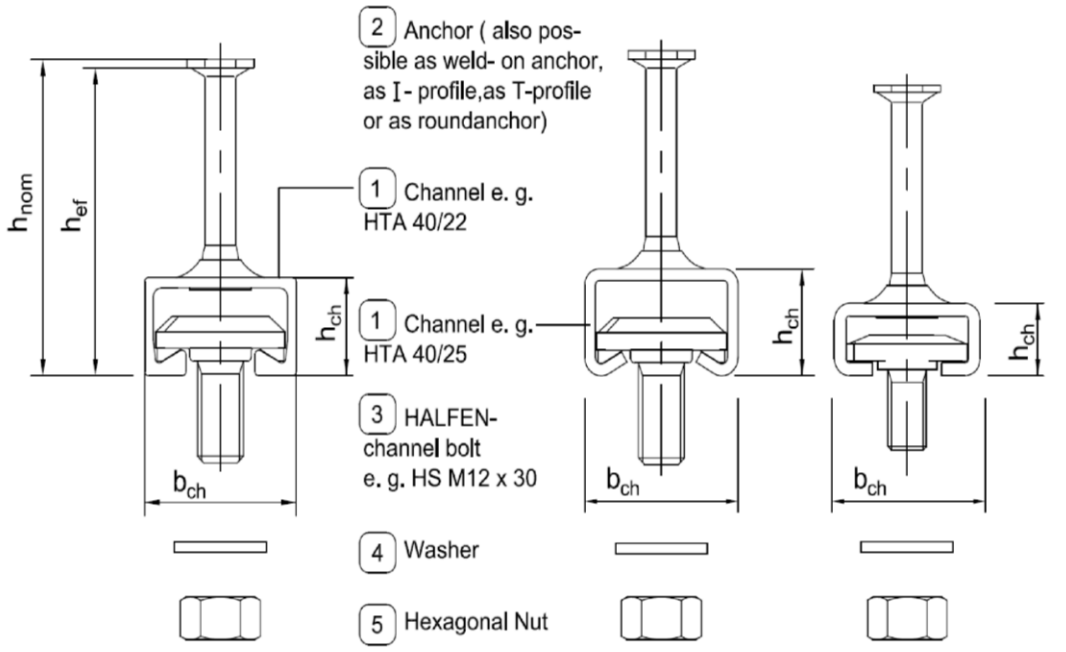

Marking of the HALFEN anchor channel e.g.: HTA-CE 40/22 A4

a) Stamped on back of channel

b) Printed on channel web

H or HALFEN	Identifying mark of producer
TA	Type of anchor channel
40/22	Size
A4	Material

Close to the anchor a nail hole is positioned.

Material of channel:

Steel	
No marking for	1.0038/1.0044
SV	1.0242+Z/1.0529+Z
Stainless steel	
A2	1.4301/1.4307/1.4567/1.4541
A4	1.4401/1.4404/1.4571
L4, DX	1.4062/1.4162/1.4362
F4, FA	1.4462
HCR	1.4529/1.4547

Marking oft the HALFEN channel bolts e.g.: HALFEN A4-70

H or HALFEN	Identifying mark of the producer
A4	Material
70	Strength grade

Material of channel bolts::

Steel	
No marking	
Stainless steel	
A2	1.4301/1.4307/1.4567/1.4541
A4	1.4401/1.4404/1.4571/1.4578
L4	1.4362
F4, FA	1.4462
HCR	1.4529/1.4547

Strength grade of the channel bolts:

Steel	
4.6, 8.8	Strength grade 4.6, 8.8
Stainless steel	
50, 70	Strength grade 50, 70

HALFEN Anchor Channels HTA	Annex A2
Product description Marking and materials	

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Table A1: Materials and intended use

Item 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. accomodations, bureaus, schools, hospitals, shops, exceptional internal conditions with usual humidity acc. column 2	Anchor channels may also be used in 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 may also be used in structures subject to external atmospheric exposure (incl. industrial and marine environment) or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. e.g. structures subject to external atmospheric exposure if no particular aggressive conditions exist acc. column 4	Anchor channels may also be used in structures subject to exposure inparticular aggressive conditions e.g. permanent, alternating immersion in seaw ater or the splash zone of seaw ater, chloride atmosphere of indoor sw imming pools or atmosphere w ith chemical pollution (e.g. in desulphurization plants or road tunnels w here de-icing materials are used)
		Materials			
①	Channel profile	**Steel** 1.0038 (A), 1.0044 (A), 1.0976 (D) hot-dip galv. ≥ 55 µm acc. to (N) 1.0242+Z (U), 1.0529+Z (U) hot-dip coated ≥ 15 µm	**Steel** 1.0038 (A), 1.0044 (A), 1.0976 (D) hot-dip galv. ≥ 55 µm acc. to (N) **Stainless Steel** [5] 1.4301 (G), 1.4307 (G), 1.4567 (G) 1.4541 (G), 1.0213 (B), 1.1122 (E)	**Stainless Steel** 1.4401 (G), 1.4404 (G), 1.4571 (G) 1.4362 (G), 1.4062 (F), 1.4162 (F)	**Stainless Steel** 1.4462 [2] (G), 1.4529 (G), 1.4547 (G)
②	Anchor	**Steel** 1.0038 (A), 1.0214 (B), 1.0401 (C) 1.1132 (E), 1.5525 (I), 1.5535 (I) 1.5523 (H) hot-dip galv. ≥ 55 µm acc. to (N)	**Steel** 1.0038 (A), 1.0214 (B), 1.0401 (C) 1.1132 (E), 1.5525 (I), 1.5535 (I) 1.5523 (H) hot-dip galv. ≥ 55 µm acc. to (N) **Stainless Steel** [5] 1.4301 (G), 1.4307 (G), 1.4567 (G), 1.4541 (G)	**Stainless Steel** 1.4401 (G), 1.4404 (G), 1.4571 (G) 1.4362 (G), 1.4578 (G) **Steel** 1.0038 (A) [4]	**Stainless Steel** 1.4462 [2] (G), 1.4529 (G), 1.4547 (G)
③	HALFEN channel bolts	**Steel** strength grade 4.6 / 8.8 (J) electroplated ≥ 5 µm acc. to (O)	**Steel** strength grade 4.6 / 8.8 (J) hot-dip galv. ≥ 50 µm acc. to (P) [1] **Stainless Steel** [5] strength grade 50,70 (K) 1.4301 (G), 1.4307 (G), 1.4567 (G), 1.4541 (G)	**Stainless Steel** strength grade 50,70 (K) 1.4401 (G), 1.4404 (G), 1.4571 (G) 1.4362 (G), 1.4578 (G)	**Stainless Steel** strength grade 50,70 (K) 1.4462 [2] (G), 1.4529 (G), 1.4547 (G)
④	Washer [3] (R) and (S) production class A, 200 HV	**Steel** EN 10025:2005 electroplated ≥ 5 µm acc. to (O)	**Steel** EN 10025:2005 hot-dip galv. ≥ 50 µm acc. to (P) [1] **Stainless Steel** [5] steel grade A2, A3 (K)	**Stainless Steel** steel grade A4, A5 (K)	**Stainless Steel** 1.4462 [2] (G), 1.4529 (G), 1.4547 (G)
⑤	Hexagonal nuts (T)	**Steel** strength grade 5/8 (L) electroplated ≥ 5 µm acc. to (O)	**Steel** strength grade 5/8 (L) hot-dip galv. ≥ 50 µm acc. to (P) [1] **Stainless steel** [5] strength grade 70, 80 (M) steel grade A2, A3 (M)	**Stainless Steel** strength grade 70, 80 (M) steel grade A4, A5 (M)	**Stainless Steel** strength grade 70, 80 (M) 1.4462 [2] (G), 1.4529 (G), 1.4547 (G)

A - EN 10025-2:2004
B - EN 10263-2:2017
C - EN 10277-2:2008
D - EN 10149-2:2013
E - EN 10263-3:2017
F - EN 10088-2:2014
G - EN 10088-3:2014
H - EN 10269:2013
I - EN 10263-4:2017
J - EN ISO 898-1:2013
K - EN ISO 3506-1:2009
L - EN ISO 898-2:2012
M - EN ISO 3506-2:2009
N - EN ISO 1461:2009
O - EN ISO 4042:1999
P - EN ISO 10684:2004
R - EN ISO 7089:2000
S - EN ISO 7093-1:2000
T - EN ISO 4032:2012
U - EN 10346:2015

[1] or electroplated w ith special coating ≥ 12 µm
[2] 1.4462 not applicable for indoor sw imming pools
[3] not included in scope of delivery
[4] only for w eld-on anchors w ith sufficient concrete cover acc. to EN 1992-1-1 + AC:2010
[5] stainless steel anchors only in combination w ith stainless steel channel profiles, channel bolts, w ashers and nuts

HALFEN Anchor Channels HTA

Product description
Materials and intended use

Annex A3

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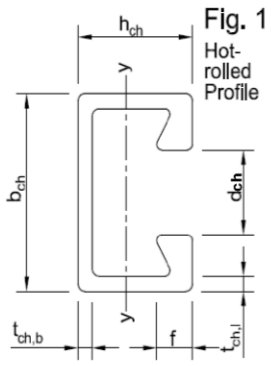

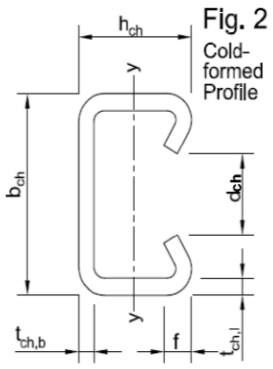

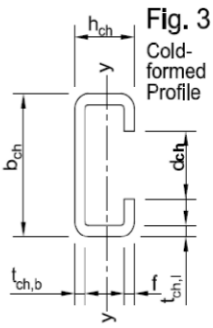

Table A2: Profile dimensions (steel and stainless steel)

Anchor-channel	Figure	Dimensions						Material	I_y
		b_{ch}	h_{ch}	$t_{ch,b}$	$t_{ch,l}$	d_{ch}	f		
		[mm]							[mm^4]
28/15	3	28,00	15,25	2,25	2,25	12,00	2,25	Steel	4060
38/17	3	38,00	17,50	3,00	3,00	18,00	3,00		8547
40/25	2	40,00	25,00	2,75	2,75	18,00	5,60		20570
49/30	2	50,00	30,00	3,00	3,00	22,00	7,39		41827
54/33	2	54,00	33,00	4,50	4,50	22,00	7,90		72079
72/49	2	72,00	49,00	6,00	6,00	33,00	9,90		293579
40/22 40/22P	1	39,50	23,00	2,60	2,40	18,00	6,00		20029
50/30 50/30P	1	49,00	30,00	3,20	2,75	22,50	7,85		52896
52/34	1	52,50	33,50	4,10	4,00	22,50	10,50		93262
55/42	1	54,50	42,00	5,00	5,00	26,00	12,90		187464
72/48	1	72,00	48,50	4,50	5,00	33,00	15,50		349721
28/15	3	28,00	15,25	2,25	2,25	12,00	2,25	Stainless steel	4060
38/17	3	38,00	17,50	3,00	3,00	18,00	3,00		8547
40/25	2	39,50	25,00	2,50	2,50	18,00	5,40		19097
49/30	2	50,00	30,00	3,00	3,00	22,00	7,39		41827
54/33	2	54,00	33,00	4,50	4,50	22,00	7,90		72079
72/49	2	72,00	49,00	6,00	6,00	33,00	9,90		293579
40/22 40/22P	1	39,50	23,00	2,60	2,40	18,00	6,00		20029
50/30 50/30P	1	49,00	30,00	3,20	2,75	22,50	7,85		52896
52/34	1	52,50	33,50	4,10	4,00	22,50	10,50		93262
55/42	1	54,50	42,00	5,00	5,00	26,00	12,90		187464
72/48	1	72,00	48,50	4,50	5,00	33,00	15,50		349721

HALFEN Anchor Channels HTA

Product description
Profile dimensions

Annex A4

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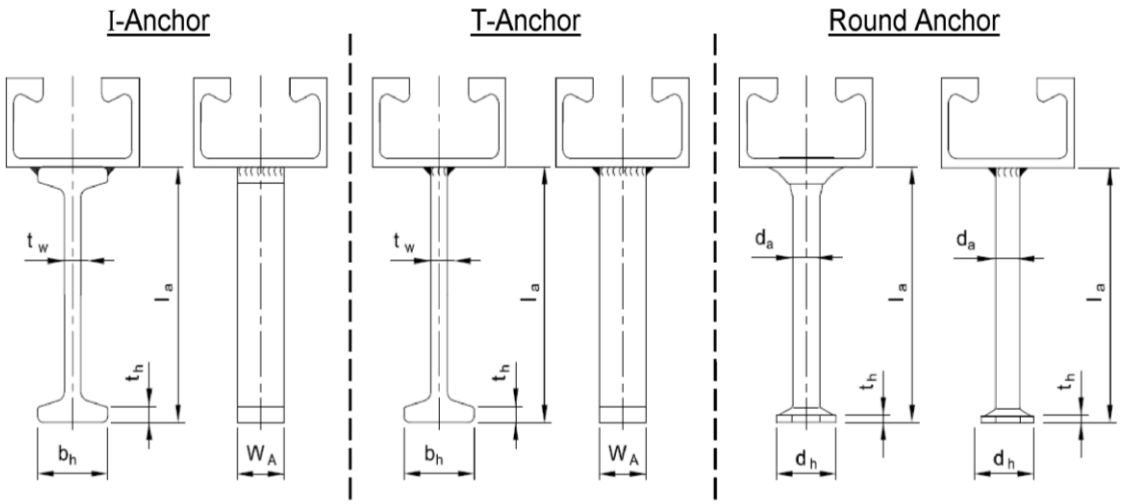

Table A3: Dimensions of anchors (I-Anchor, T-Anchor or Round Anchor)

Anchor channel	I-Anchor und T-Anchor						Round Anchor				
	min l_a	t_w	b_h	t_h	w_A	A_h	min l_a	d_a	d_h	t_h	A_h
	[mm]					[mm²]	[mm]				[mm²]
28/15	62	5	18	3,3	10 - 20	130	32	6	12	1,3	85
38/17	62	5	18	3,3	10 - 20	130	60,4	8	16	1,9	151
40/25	62	5	18	3,3	12 - 24	156	60,9	8	16	1,9	151
40/22	62	5	18	3,3	12 - 24	156	60,9	8	16	1,9	151
40/22P	128	6	17	5	18 - 30	198	70,2	10	20	2,2	236
49/30	69	5	18	3,5	18 - 30	234	69,2	10	20	2,2	236
50/30	69	5	18	3,5	18 - 30	234	69,2	10	20	2,2	236
50/30P	128	6	17	5	25 - 35	275	78,7	12	25	2,7	378
54/33	128	6	17	5	30 - 40	330	126	12	25	2,7	378
52/34	128	6	17	5	30 - 40	330	125,5	12	25	2,7	378
55/42 [1)]	140	7,1	20	6	35 - 45	452	136,2	14	28	3,2	462
72/49	140	7,1	20	6	40 - 50	516	-				
72/48	140	7,1	20	6	40 - 50	516	-				

[1)] HTA 55/42 in stainless steel only with weld-on anchors.

HALFEN Anchor Channels HTA	Annex A5
Product description Dimensions of anchors	

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Figure 1

Round anchor
(B6-anchor)

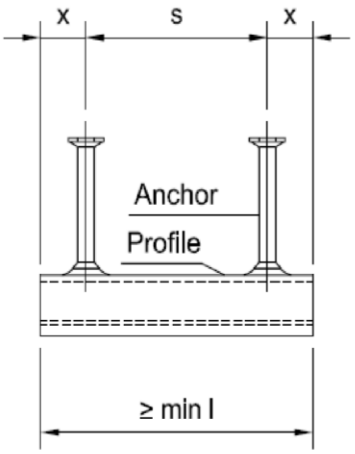

Figure 2

Weld- on anchor
(I-anchor and T-anchor)

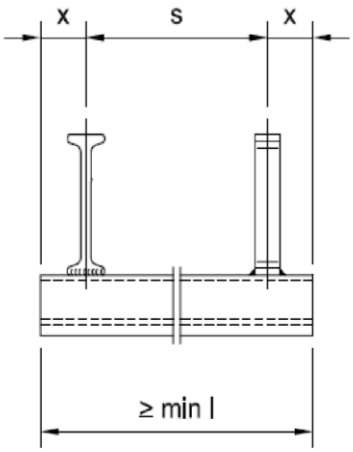

Figure 3

Weld- on anchor
round

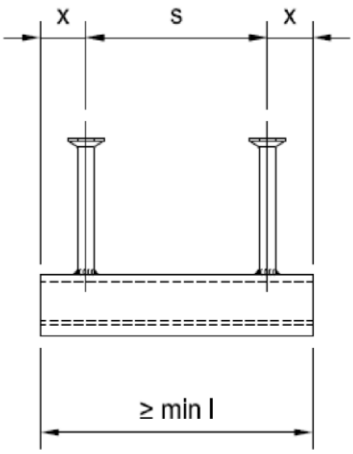

Table A4: Anchor positioning

Anchor channel	Anchor spacing s		End spacing x [1]		Min. Channel length l_{min}	
	s_{min}	s_{max}	Round anchor Fig. 1	Welded anchor Fig. 2 and 3	Round anchor Fig. 1	Welded anchor Fig. 2 and 3
	[mm]					
28/15 38/17	50	200	25	25	100	100
40/25 40/22 40/22P 49/30 50/30 50/30P	100 (50)	250	25 [2]	25 [2]	100	150
52/34 54/33	100 (80)	250	35	25 [2]	150	150
55/42	100 (80)	300	35	25 (35)	150	150
72/48 72/49	100 (80)	400	-	25 (35)	-	150

( ) valid for round anchor acc. Fig. 1.
[1] For channels with l = 6070 mm the end spacing x is always 35 mm.
[2] End spacing may be increased up to 35 mm.

HALFEN Anchor Channels HTA	Annex A6
Product description Anchor positioning, channel length	

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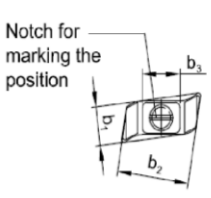
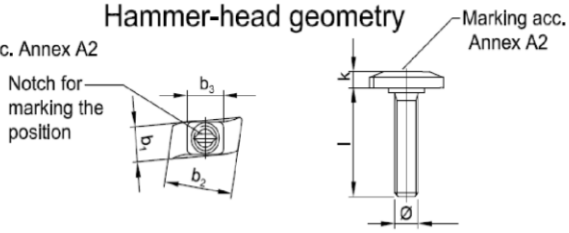
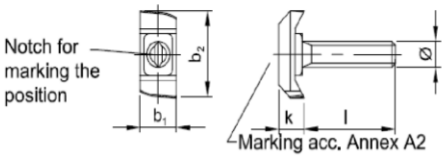
HALFEN channel bolt, Hook-head geometry



HALFEN channel bolt, Hammer-head geometry



alternative Hook-head geometry



alternative Hammer-head geometry

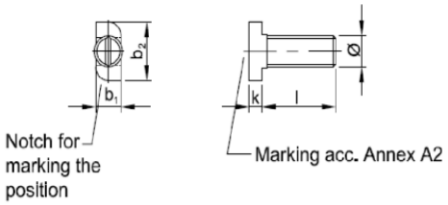


Table A5: Dimensions of HALFEN channel bolts

Head	HS	Thread Ø	Channel bolts - wing shape			Channel bolts - alternative shape			Anchor channel
			Width b_1 [mm]	Length b_2 [mm]	Thickness k [mm]	Width b_1 [mm]	Length b_2 [mm]	Thickness k [mm]	
Hook-head	40/22	M10	15	30.8	7.2	-	-	-	40/22 40/22P 40/25
		M12	15	30.8	7.2	-	-	-	
		M16	17.4	30.8	8.2 (9.8)	-	-	-	
	50/30	M10	16.3	40.2	10	15	41.5	10	49/30 50/30 50/30P 52/34 54/33 55/42
		M12	16.3	40.2	10	15	41.5	10	
		M16	19.4	40.2	11	20	41.5	11	
		M20	21	39.5	12.5	21	41.5	12	
		M24	-	-	-	24.5	41	18	55/42
	72/48	M20	-	-	-	23	58	14	72/48 72/49
		M24	-	-	-	25	58	16	
		M27	-	-	-	28	58	18	
		M30	-	-	-	31	58	20	
Hammer-head	28/15	M6	10.6	21.1	4	10.1	22.7 (22.2)	4	28/15
		M8	10.6	21.1 (20.7)	4.5	10.1	22.7 (22.2)	4	
		M10	10.9	20.2	5	10.1	22.7 (22.2)	5 (4)	
		M12	10.8	20.1	6.5	10.1	22.7 (22.2)	5.5	
	38/17	M10	13.6-14.1	29	6	13 (12)	30.5	6	38/17
		M12	13.6-14.1	29	6	13 (12)	30.5	7 (6)	
		M16	16	29	8.5	16	30.5	7	

( ) Value applies for strength grade 8.8

HALFEN Anchor Channels HTA	Annex A7
Product description HALFEN channel bolts, dimensions	

Deutsches Institut für Bautechnik DIBt

Table A6: Strength grade

	Steel [1]		Stainless steel [1]	
Strength grade	4.6	8.8	50	70
f_{uk} [N/mm²]	400	800	500	700
f_{yk} [N/mm²]	240	640	210	450
Finish	electroplated, hot-dip galv.		-	

[1] Materials according Annex A2 and Annex A3, Tab. A1

HALFEN Anchor Channels HTA	Annex A8
Product description HALFEN channel bolts, strength grade	

Specifications for 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.
- Fatigue cyclic loads.
- Fire exposure for concrete class C20/25 to C50/60.

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 A3, Table A1, 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 A3, Table A1, column 2 - 4)
- Structures subject to external atmospheric exposure (incl. industrial and marine environment) or exposure to 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 A3, Table A1, 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 indoor swimming pools or atmosphere with chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used))
  (anchor channels and channel bolts according to Annex A3, Table A1, column 4)

Design:

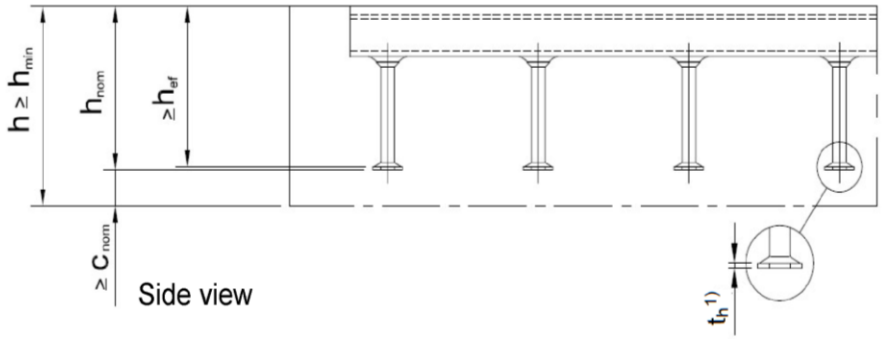
- Anchor channels are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor channel and channel bolts are indicated on the design drawings (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 are designed in accordance with EOTA TR 047 “Design of Anchor Channels”, March 2018 or Fpr EN 1992-4:2016.
- For fatigue loading the anchor channels are designed in accordance with EOTA TR 050 “Calculation Method for the Performance of Anchor Channels under Fatigue Loading”, November 2015.
- The characteristic resistances are calculated with the minimum effective embedment depth.

HALFEN Anchor Channels HTA	Annex B1
Intended use Specifications	

Installation:

- The installation of anchor channels is carried out by appropriately qualified personnel under the supervision of the person responsible for the technical matters on site.
- Use of the anchor channels only as supplied by the manufacturer – without any manipulations, repositioning or exchanging of channel components.
- Cutting of anchor channels is allowed only if pieces according to Annex A5, Table A5 are generated including end spacing and minimum channel length and only to be used in dry internal conditions (Annex A3, Table A1, column 1). For anchor channels made of stainless steel there are no restrictions regarding corrosion resistance when using cut channel pieces, if cutting is done professionally and contamination of cutting edges with corroding material is avoided.
- Installation in accordance with the installation instruction given in Annexes B6 and B7.
- The anchor channels are fixed on the formwork, reinforcement or auxiliary construction such that no movement of the anchor 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.
- Washer may be chosen according to Annex A3 and provided separately by the user.
- Orientating the channel bolt (groove mark according to Annex B7) rectangular to the channel axis.
- The required installation torque given in Annex B4 must be applied and must not be exceeded.

HALFEN Anchor Channels HTA	Annex B2
Intended use Specifications	



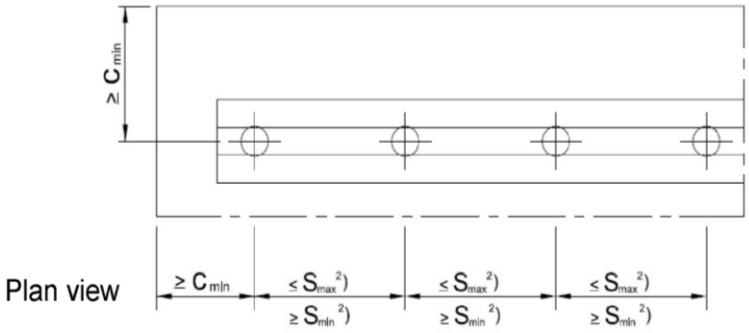


Table B1-1: Minim. anchorage depth, edge distance and member thickness

Anchor channel			**28/15**	**38/17**	**40/25**	**49/30**	**54/33**	**72/49**
Min. anchorage depth	[mm]	$h_{ef,min}$	45	76	79	94	155	179
Min. edge distance		c_{min}	40	50	50	75	100	150
Tot. heigth round anchor		$h_{nom,min}$	47,3	77,9	85,9	99,2	159	-
Tot. heigth I- &T-anchor			77,3	79,5	87	99	161	189
Min. member thickness		h_{min}	actual h_{nom} + c_{nom} [3)]					
			55	90	90	105	170	195

Table B1-2: Minim. anchorage depth, edge distance and member thickness

Anchor channel			**40/22**	**40/22P**	**50/30**	**50/30P**	**52/34**	**55/42**	**72/48**
Min. anchorage depth	[mm]	$h_{ef,min}$	79	91	94	106	155	175	179
Min. edge distance		c_{min}	50	50	75	75	100	100	150
Tot. heigth round anchor		$h_{nom,min}$	83,9	93,2	99,2	108,7	159	178,2	-
Tot. heigth I- &T-anchor			85	151	99	158	161,5	182	188,5
Min. member thickness		h_{min}	actual h_{nom} + c_{nom} [3)]						
			90	105	105	120	170	190	195

[1)] t_h = Anchor head thickness
[2)] s_{min}, s_{max} acc. Annex A6, Table A4
[3)] c_{nom} acc. EN 1992-1-1:2004 + AC:2010

HALFEN Anchor Channels HTA

Intended use
Installation parameters of anchor channels

Annex B3

Deutsches Institut für Bautechnik DIBt

Table B2: Minimum spacing and installation torque of HALFEN channel bolts

Anchor channel	HALFEN Channel bolts Ø	Min. spacing $s_{min,cbo}$ of the channel bolts	Installation torque T_{inst} [4]				
			General [2]	Steel – steel contact [3]			
			Steel 4.6; 8.8 Stainless steel 50; 70 [1]	Steel 4.6	Stainless steel 50 [1]	Steel 8.8	Stainless Steel 70 [1]
	[mm]	[mm]	[Nm]				
28/15	6	30	3	3	3	-	-
	8	40	8	8	8	20	15
	10	50	13	15	15	40	30
	12	60	15	25	25	70	50
38/17	10	50	15	15	15	40	30
	12	60	25	25	25	70	50
	16	80	40	65	60	180	130
40/25 40/22 40/22P	10	50	15	15	15	40	30
	12	60	25	25	25	70	50
	16	80	45	65	60	180	130
49/30 50/30 50/30P	10	50	15	15	15	40	30
	12	60	25	25	25	70	50
	16	80	60	65	60	180	130
	20	100	75	130	120	360	250
52/34 54/33	10	50	15	15	15	40	30
	12	60	25	25	25	70	50
	16	80	60	65	60	180	130
	20	100	120	130	120	360	250
55/42	10	50	15	15	15	40	30
	12	60	25	25	25	70	50
	16	80	60	65	60	180	130
	20	100	120	130	120	360	250
	24	120	200	230	200	620	440
72/48 72/49	20	100	120	130	120	360	250
	24	120	200	230	200	620	440
	27	135	300	340	300	900	650
	30	150	380	460	400	1200	850

[1] Materials according to Annex A2 and Annex A3, Tab. A1

[2] Acc. to Annex B5, Fig.1

[3] Acc. to Annex B5, Fig. 2

[4] T_{inst} must not be exceeded

HALFEN Anchor Channels HTA	Annex B4
Intended use Installation parameters	

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General

The fixture is in contact with the channel profile and the concrete surface.
The installation torque according to Annex B4, Table B2 shall be applied and must not be exceeded.

Steel to steel contact

The fixture is fastened to the anchor channel by suitable steel parts (e.g. washer). The installation torque according to Annex B4, Table B2 shall be applied and must not be exceeded.

Fig. 1

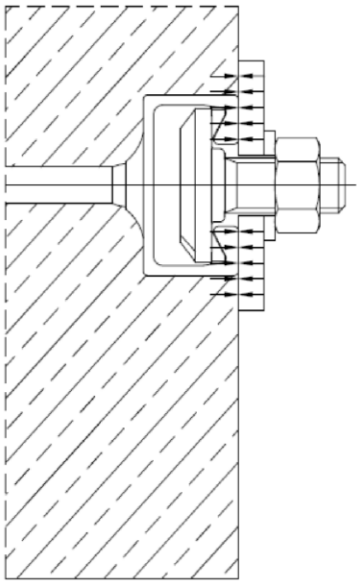
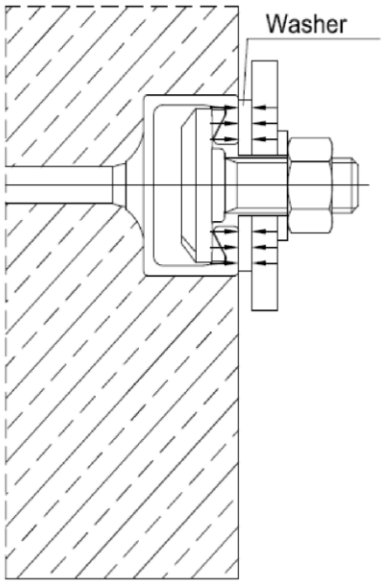


Fig. 2



HALFEN Anchor Channels HTA	
Intended use Position of the fixture	Annex B5

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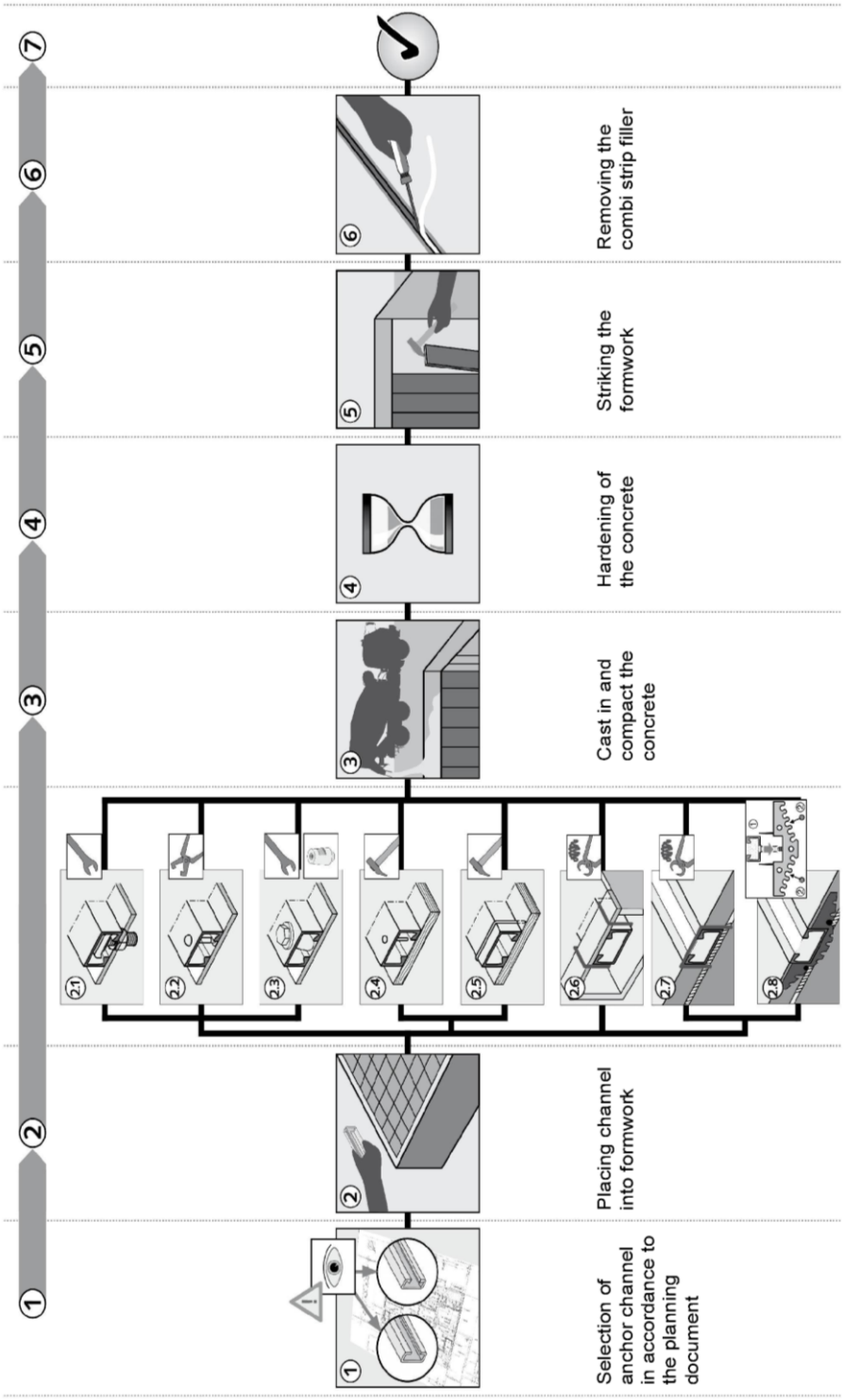
Installation of HALFEN anchor channel



2.1 Steel formwork: Fixing with HALFEN channel bolts through formwork penetration
2.2 Steel formwork: Fixing with rivets
2.3 Steel formwork: Fixing with HALFEN Fixing cone
2.4 Timber formwork: Fixing with nails
2.5 Timber formwork: Fixing with staples
2.6 Fixing in the top surface of concrete: Fixing by using auxiliary construction
2.7 Fixing in the top surface of concrete: Fixing from above directly to the reinforcement
2.8 Fixing in the top surface of concrete: Fixing from above to the reinforcement, using the HALFEN ChanClip

HALFEN Anchor Channels HTA	Annex B6
Intended use Installation instruction – HALFEN Anchor channel	

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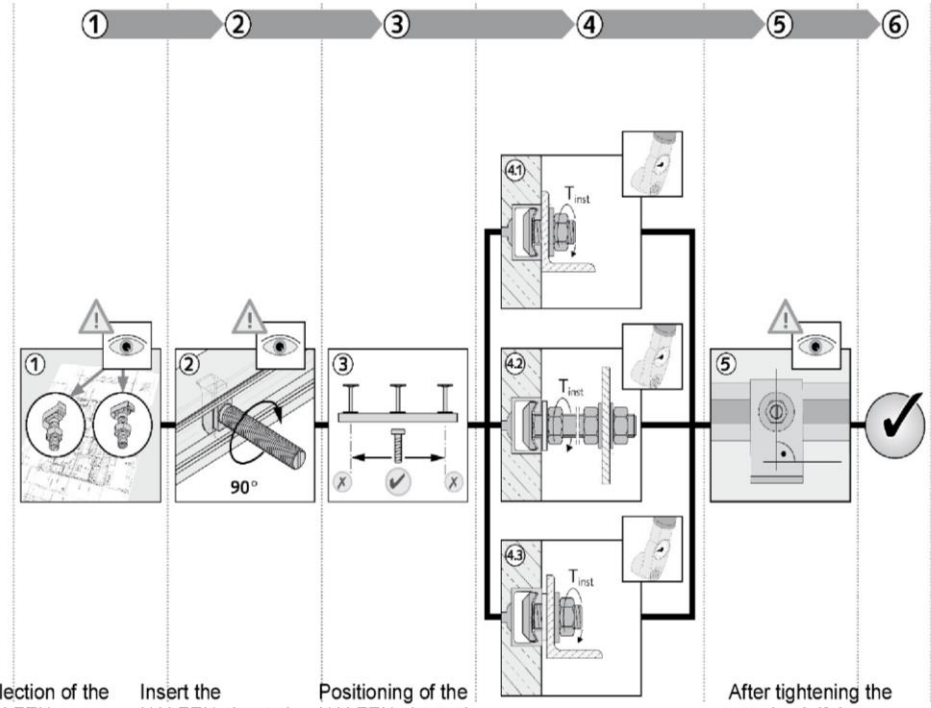
Installation of HALFEN channel bolts



1. Selection of the HALFEN channel bolts in accordance with the planning document.
2. Insert the HALFEN channel bolts into the channel slot. After a 90° turn clockwise the HALFEN screw locks into position (check whether the groove mark is perpendicular to the channel longitudinal axis).
3. Positioning of the HALFEN channel bolts: At the channel ends a minimum clearance must be maintained, which corresponds with the overhang beyond the last anchor acc. to Annex A6.
4. Tighten the hexagonal nut to the installation torque (T_{inst}) acc. table stated below. T_{inst} must not be exceeded.
   4.1: general application,
   4.2 and 4.3: steel to steel contact.
5. After tightening the nut check if the groove mark on the HALFEN channel bolt is perpendicular to the channel longitudinal axis. If it is not perpendicular the screw must be completely loosened, re-inserted and tightened again.

Table B3: Installation torque

Pos. of fixture acc. Annex B5	Material strength grade		Anchor channel	T_{inst} [Nm] [1]								
				M6	M8	M10	M12	M16	M20	M24	M27	M30
General	Steel 4.6 / 8.8 and Stainless steel 50 / 70		28/15	3	8	13	15	-	-	-	-	-
			38/17	-	-	15	25	40	-	-	-	-
			40/22, 40/22P, 40/25	-	-	15	25	45	-	-	-	-
			49/30, 50/30, 50/30P	-	-	15	25	60	75	-	-	-
			54/33, 53/34	-	-	15	25	60	120	-	-	-
			55/42	-	-	15	25	60	120	200	-	-
			72/49, 72/48	-	-	-	-	-	120	200	300	380
Steel to steel contact	Steel	4.6	All profiles	3	8	15	25	65	130	230	340	460
		8.8		-	20	40	70	180	360	620	900	1200
	Stainl. Steel	50		3	8	15	25	60	120	200	300	400
		70		-	15	30	50	130	250	440	650	850

[1] T_{inst} must not be exceeded

HALFEN Anchor Channels HTA

Intended use
Installation instruction – HALFEN channel bolts

Annex B7

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Table C1: Characteristic Resistances under tension load – steel failure anchor channel

Anchor channel			28/15	38/17	40/25 40/22	40/22P	49/30 50/30	50/30P	54/33 52/34	55/42	72/49 72/48
Steel failure, anchor											
Characteristic resistance	$N_{Rk,s,a}$	[kN]	9	18	20	31	31	54	56	80	102
Partial safety factor	γ_{Ms} [1)]		1,8								
Steel failure, connection channel/anchor											
Characteristic resistance	$N_{Rk,s,c}$	[kN]	9	18	20	29	31	39	55	80	100
Partial safety factor	$\gamma_{Ms,ca}$ [1)]		1,8								
Steel failure, local flexure of the channel lips											
Spacing of channel bolts for $N_{Rk,s,l}$	$s_{l,N}$	[mm]	56	76	80 79	79	100 98	98	107 105	109	144
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	9	18	20 38	38	31 43	43	55 72	110	100 120
Partial safety factor	$\gamma_{Ms,l}$ [1)]		1,8								

[1)] In absence of other national regulations

Table C2: Characteristic flexural resistance of channel

Anchor channel				28/15	38/17	40/25	40/22	40/22P	49/30	50/30	50/30P	54/33	52/34	55/42	72/49	72/48
Characteristic flexure resistance of channel	$M_{Rk,s,flex}$	[Nm]	Steel / Stainless Steel	317	580	1071	1389	1389	1673	2803	2803	2984	3373	6447	8617	8593
Partial safety factor	$\gamma_{Ms,flex}$ [1)]			1,15												

[1)] In absence of other national regulations

HALFEN Anchor Channels HTA

Performances
Characteristic resistances under tension load – steel failure anchor channel

Annex C1

Table C3: Char. resistances under tension load – steel failure of HALFEN channel bolts

HALFEN Channel bolts Ø				**M6**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure												
Charakt. resistance	$N_{Rk,s}$	[kN]	4.6	8,0	14,6	23,2	33,7	62,8	98,0	141,2	183,6	224,4
			8.8	16,1	29,3	46,4	67,4	125,6	196,0	282,4	367,2	448,8
			50 [1]	10,1	18,3	29,0	42,2	78,5	122,5	176,5	229,5	280,5
			70 [1]	14,1	25,6	40,6	59,0	109,9	171,5	247,1	321,3	392,7
Partial safety factor	γ_{Ms} [2]		4.6	2,00								
			8.8	1,50								
			50 [1]	2,86								
			70 [1]	1,87								

[1] Materials according Annex A2 and A3
[2] In absence of other national regulations

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Table C4: Characteristic resistances under tension load – concrete failure

Anchor channel				28/15	38/17	40/25 40/22	40/22P	49/30 50/30	50/30P	54/33 52/34	55/42	72/49 72/48
Pull-out failure												
Characteristic resistance in cr. concrete C12/15	Round anchors	$N_{Rk,p}$	[kN]	7,6	13,6	13,6	21,2	21,2	34,0	34,0	41,6	-
	I-anchors			11,7	11,7	14,0	17,8	21,0	24,7	29,7	40,6	46,4
Characteristic resistance in uncr. concrete C12/15	Round anchors	$N_{Rk,p}$	[kN]	10,6	19,0	19,0	29,7	29,7	47,6	47,6	58,2	-
	I-anchors			16,4	16,4	19,6	24,9	29,4	34,6	41,6	56,8	65,0
Increasing factor for $N_{Rk,p}$	C20/25	Ψ_c	[-]	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 safety factor		$\gamma_{Mp}=\gamma_{Mc}$ [1)]		1,5								
Concrete cone failure												
Product factor k_1		$k_{cr,N}$		7,2	7,8	7,9	8,0	8,1	8,2	8,7	8,9	8,9
		$k_{ucr,N}$		10,3	11,2	11,2	11,5	11,5	11,7	12,4	12,6	12,7
Charact.edge spacing		$c_{cr,N}$	[mm]	111	171	176	195	199	216	260	269	270
Charact.spacing		$s_{cr,N}$		$2,0\ c_{cr,N}$								
Partial safety factor		γ_{Mc} [1)]		1,5								
Splitting failure												
Charact.edge spacing		$c_{cr,sp}$	[mm]	135	228	237	273	282	318	465	525	537
Charact.spacing		$s_{cr,sp}$		$2,0\ c_{cr,sp}$								
Partial safety factor		γ_{Msp} [1)]		1,5								

[1)] In absence of other national regulations

Table C5: Displacements under tension load

Anchor channel			28/15	38/17	40/25 40/22	40/22P	49/30 50/30	50/30P	54/33 52/34	55/42	72/49 72/48
Tension load	N_{Ek}	[kN]	3,6	7,1	7,9	11,5	12,3	15,5	21,8	31,7	39,7
Short time displacement	δ_{N0}	[mm]	0,3	0,3	0,4	0,4	0,4	0,5	0,5	0,5	0,5
Long time displacement	$\delta_{N\infty}$	[mm]	0,6	0,6	0,8	0,8	0,8	1,0	1,0	1,0	1,0

HALFEN Anchor Channels HTA

Performances
Characteristic resistances under tension load – concrete failure and displacements

Annex C3

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Table C6: Characteristic resistances under shear load

Anchor channel			**28/15**	**38/17**	**40/25 40/22**	**40/22P**	**49/30 50/30**	**50/30P**	**54/33 52/34**	**55/42**	**72/49 72/48**
Steel failure, anchor											
Characteristic resistance	$V_{Rk,s,a}$	[kN]	9	18	20 35	35	31 52	59	55 78	110	100 146
Partial safety factor	γ_{Ms} [1]		1,8								
Steel failure, connection channel / anchor											
Characteristic resistance	$V_{Rk,s,c}$	[kN]	9	18	20 35	35	31 52	59	55 78	110	100 146
Partial safety factor	$\gamma_{Ms,ca}$ [1]		1,8								
Steel failure, local flexure of channel lips											
Spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,V}$	[mm]	56	76	80 79	79	100 98	98	107 105	109	144
Characteristic resistance	$V^0_{Rk,s,l}$	[kN]	9	18	20 35	35	31 52	59	55 78	110	100 146
Partial safety factor t	$\gamma_{Ms,l}$ [1]		1,8								
Pry-out failure											
Product factor	k_8 [2]		1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
Partial safety factor	γ_{Mc} [1]		1,5								
Concrete edge failure											
Product-factor k_{12}	cracked concrete	$k_{cr,V}$	4,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5
	uncracked concrete	$k_{ucr,V}$	6,3	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5
Partial safety factor	γ_{Mc} [1]		1,5								

[1] In absence of other national regulations

[2] Without supplementary reinforcement. In case of supplementary reinforcement the factor k_8 should be multiplied with 0,75.

Table C7: Displacements under shear load

Anchor channel			**28/15**	**38/17**	**40/25 40/22**	**40/22P**	**49/30 50/30**	**50/30P**	**54/33 52/34**	**55/42**	**72/49 72/48**
Shear load	V_{Ek}	[kN]	3,6	7,1	7,9 13,9	13,9	12,3 20,6	23,4	21,8 31,0	43,7	39,7 57,9
Short time displacements	δ_{V0}	[mm]	0,6	0,6	0,6	0,6	0,6	0,6	1,2	1,2	1,2
Long time displacements	$\delta_{V\infty}$	[mm]	0,9	0,9	0,9	0,9	0,9	0,9	1,8	1,8	1,8

HALFEN Anchor Channels HTA

Performances
Character. resistances under shear load – steel failure anchor channel, concrete failure, displacements

Annex C4

Table C8: Charact. resistances under shear load – steel failure of HALFEN channel bolts

HALFEN Channel bolts Ø				M6	M8	M10	M12	M16	M20	M24	M27	M30
Stahlversagen												
Charact.eristic resistance	$V_{Rk,s}$	[kN]	4.6	4,8	8,8	13,9	20,2	37,7	58,8	84,7	110,2	134,6
			8.8	8,0	14,6	23,2	33,7	62,8	98,0	141,2	183,6	224,4
			50 [1)]	6,0	11,0	17,4	25,3	47,1	73,5	105,9	137,7	168,3
			70 [1)]	8,4	15,4	24,4	35,4	65,9	102,9	148,3	192,8	235,6
Charact.eristic flexure resistance	$M^0_{Rk,s}$	[Nm]	4.6	6,3	15,0	29,9	52,4	133,2	259,6	449,0	665,8	899,6
			8.8	12,2	30,0	59,8	104,8 [3)]	266,4 [4)]	519,3 [5)]	898,0	1331,5	1799,2
			50 [1)]	7,6	18,7	37,4	65,5	166,5	324,5	561,3	832,2	1124,5
			70 [1)]	10,7	26,2	52,3	91,7 [3)]	233,1 [4)]	454,4	785,8	1165,1	1574,3
Partial safety factor	γ_{Ms} [2)]		4.6	1,67								
			8.8	1,25								
			50 [1)]	2,38								
			70 [1)]	1,56								

[1)] Materials according Annex A2 and A3
[2)] In absence of other national regulations
[3)] For HTA 28/15 $M^0_{Rk,s}$ is limited to 84 Nm.
[4)] For HTA 38/17 $M^0_{Rk,s}$ is limited to 231 Nm.
[5)] For HTA 49/30 $M^0_{Rk,s}$ is limited to 509 Nm.

HALFEN Anchor Channels HTA

Performances
Characteristic resistances under shear load – steel failure channel bolts

Annex C5

Table C9: Characteristic resistances under combined tension and shear load

Anchor channel		**28/15**	**38/17**	**40/25** **40/22**	**40/22P**	**49/30** **50/30**	**50/30P**	**54/33** **52/34**	**55/42**	**72/49** **72/48**
Steel failure: Local failure by flexure of channel lips and failure by flexure of channel										
Product factor	k_{13}	2,0	2,0	2,0	2,0	2,0 1,0 [1)]	1,0 [1)]	2,0 1,0 [1)]	2,0	2,0 1,0 [1)]
Steel failure: Failure of anchor and connection between anchor and channel										
Product factor	k_{14}	2,0	2,0	2,0 1,0 [2)]	1,0 [2)]	2,0 1,0 [2)]	1,0 [2)]	2,0 1,0 [2)]	1,0 [2)]	2,0 1,0 [2)]

[1)] k_{13} can be taken as 2.0 if $V_{Rd,s,l}$ is limited to $N_{Rd,s,l}$.

[2)] k_{14} can be taken as 2,0 if max ($V_{Rd,s,a}$; $V_{Rd,s,c}$) are limited to the minimum of $N_{Rd,s,a}$ and $N_{Rd,s,c}$.

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Table C10: Characteristic resistances under tension and shear load under fire exposure – steel failure

Anchor channel					**28/15**	**38/17**	**40/25 40/22**	**40/22P**	**49/30 50/30**	**50/30P**	**54/33 52/34**	**55/42**	**72/49 72/48**
Steel failure: Anchor, Connection channel / anchor, Local flexure of channel lips, channel bolts													
Characteristic resistances	R30	M8	$N_{Rk,s,fi}$ = $V_{Rk,s,fi}$	[kN]	1,0	-	-	-	-	-	-	-	-
		M10			1,0	1,7	1,9	1,9	1,9	1,9	1,9	-	-
		M12			1,9	1,7	1,9 2,5	2,5	2,5	2,5	2,5	-	-
		M16			-	3,2	3,6 6,0	6,0	4,0 6,0	6,0	6,0	6,3	6,3
		M20			-	-	-	-	4,0 9,5	9,5	8,9 10,1	10,3	10,3
		M24			-	-	-	-	-	-	-	14,8	14,8
	R60	M8			0,8	-	-	-	-	-	-	-	-
		M10			0,8	1,5	1,5	1,5	1,5	1,5	1,5	-	-
		M12			1,3	1,5	1,5 2,5	2,5	2,5	2,5	2,5	-	-
		M16			-	2,4	3,6 4,5	4,5	3,5 4,5	4,5	4,5	4,8	4,8
		M20			-	-	-	-	3,5 7,1	7,1	6,5 7,5	7,6	7,6
		M24			-	-	-	-	-	-	-	11,1	11,1
	R90	M8			0,6	-	-	-	-	-	-	-	-
		M10			0,6	1,0	1,1	1,1	1,1	1,1	1,1	-	-
		M12			0,7	1,0	1,1 1,6	1,6	1,6	1,6	1,6	-	-
		M16			-	1,4	2,0 2,9	2,9	2,5 3,0	3,0	3,0	3,3	3,3
		M20			-	-	-	-	2,5 4,8	4,8	4,2 4,8	4,9	4,9
		M24			-	-	-	-	-	-	-	7,3	7,3
	R120	M8			0,5	-	-	-	-	-	-	-	-
		M10			0,5	0,8	0,8	0,8	0,8	0,8	0,8	-	-
		M12			0,5	0,8	0,8 1,1	1,1	1,2	1,2	1,2	-	-
		M16			-	1,0	1,2 1,6	1,6	2,1 2,3	2,3	2,3	2,6	2,6
		M20			-	-	-	-	2,1 3,6	3,6	3,0 3,5	3,6	3,6
		M24			-	-	-	-	-	-	-	5,4	5,4
Partial safety factor			$\gamma_{Ms,fi}$ [1)]	[-]	1,0								

[1)] In absence of other national regulations

HALFEN Anchor Channels HTA

Performances
Characteristic resistances under tension and shear load under fire exposure

Annex C7

Table C11: Characteristic resistances under tension and shear load under fire exposure – concrete cone failure and min. axis distance of reinforcement

Anchor channel				**28/15**	**38/17**	**40/25 40/22**	**40/22P**	**49/30 50/30**	**50/30P**	**54/33 52/34**	**55/42**	**72/49 72/48**
Concrete cone failure												
Char. edge spacing		$c_{cr,N,fi}$	[mm]	$2 \cdot h_{ef} \geq c_{cr,N}$								
		$c_{min,fi}$		$2 \cdot h_{ef}$ [1]; $\max(2 \cdot h_{ef}; 300\ mm)$ [2]								
Char. spacing		$s_{cr,N,fi}$	[mm]	$4 \cdot h_{ef} \geq s_{cr,N}$								
		$s_{min,fi}$		Acc. Table A4, Annex A6								
Min. axis distance of reinforcement [3]												
Min. axis distance	R30	a	[mm]	35	35	35	35	35	35	50	50	50
	R60	a		35	35	35	35	35	35	50	50	50
	R90	a		45	45	45	45	45	45	50	50	50
	R120	a		60	60	60	60	60	60	65	70	70

[1] Fire exposure from one side only.
[2] Fire exposure from more than one side.
[3] The reinforced concrete has to be designed acc. to EN 1992. The fire resistance class of the concrete member is not part of this ETA.

Fig. 1

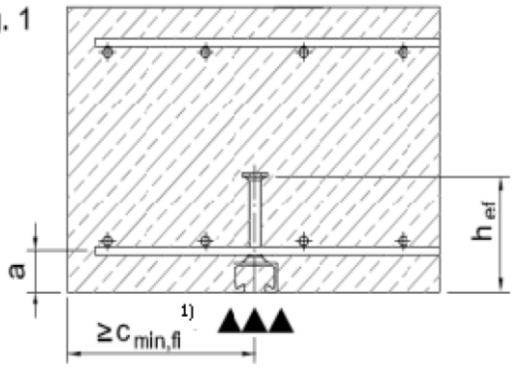
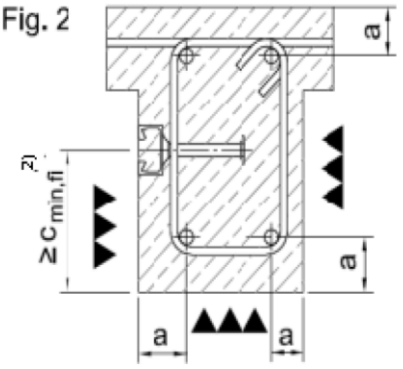


Fig. 2



HALFEN Anchor Channels HTA

Performances
Characteristic resistances under tension and shear load under fire exposure

Annex C8

Table C12: Combinations of anchor channels and channel bolts under fatigue tension load

Anchor channel				Channel bolts			
Profile	Anchor	d_1 [mm]	Material	Channel bolt	Thread Ø [mm]	Grade	Material
40/22	B6	8	Steel hot-dip galv.	HS 40/22	M12	8.8	Steel electroplated, hot-dip galv.
					M16	4.6	
						8.8	
40/22P	B6	10		HS 40/22	M12	8.8	
					M16	4.6	
						8.8	
50/30	B6	10		HS 50/30	M16	4.6	
					M20	8.8	
50/30P	B6	12		HS 50/30	M16	4.6	
					M20	8.8	
52/34	B6	12		HS 50/30	M16	8.8	
					M20		

Design Method I acc. EOTA TR 050, November 2015

Table C13: Characteristic resistances under fatigue tension load after n load cycles without static preload (N_{Ed} = 0) – Steel failure

Anchor channel	Load cycles n	**40/22**	**40/22P**	**50/30** / **50/30P**	**52/34**
		$\Delta N_{Rk,s;0;n}$ [kN]			
Characteristic resistances under fatigue tension load without static preload	≤ 10^4	11,7	12,8	16,5	22,2
	≤ 10^5	6,7	7,7	9,8	13,2
	≤ 10^6	3,8	4,7	5,8	7,9
	≤ $2 \cdot 10^6$	3,2	4,0	4,9	6,7
	≤ $5 \cdot 10^6$	2,6	3,3	4,0	5,5
	≤ 10^8	1,2			
	> 10^8	-			

HALFEN Anchor Channels HTA	Annex C9
Performances Characteristic resistances under fatigue tension load – Design method I	

Table C14: Characteristic resistances under fatigue tension load after n load cycles without static preload (N_{Ed} = 0) – Concrete failure

Pull-out failure and Concrete cone failure:
Reduction factor for pull-out and concrete cone failure without static preload (N_{Ed} = 0)

	Load cycles n	$\eta_{c,fat}$ [-]
Reduction factor for $\Delta N_{Rk,c;0;n} = \eta_{c,fat} \cdot N_{Rk,c}$ [1] $\Delta N_{Rk,p;0;n} = \eta_{c,fat} \cdot N_{Rk,p}$ [2]	$\leq 10^4$	0,736
	$\leq 10^5$	0,665
	$\leq 10^6$	0,600
	$\leq 2 \cdot 10^6$	0,582
	$\leq 5 \cdot 10^6$	0,559
	$\leq 6 \cdot 10^7$	0,500
	$> 6 \cdot 10^7$	

[1] $N_{Rk,c}$ static resistance according to Annex C3 and EOTA TR 047, March 2018 or Fpr EN 1992-4:2016
[2] $N_{Rk,p}$ static resistance according to Annex C3

Design method II acc. EOTA TR 050, November 2015

Table C15: Characteristic limit resistances under fatigue tension load ($n \rightarrow \infty$)
Steel failure

Anchor channel	**40/22P**	**50/30** **50/30P**	**52/34**
Characteristic resistances under fatigue tension load	$\Delta N_{Rk,s;0;\infty}$ [kN]		
	3,3	4,0	5,5

Table C16: Characteristic limit resistances under fatigue tension load ($n \rightarrow \infty$)
Concrete cone and pull-out failure

Anchor Channel	**40/22P**	**50/30** **50/30P**	**52/34**
Characteristic resistances under fatigue tension load	$\eta_{c,fat}$ [-]		
$\Delta N_{Rk,c;0;\infty} = \eta_{c,fat} \cdot N_{Rk,c}$ [1] $\Delta N_{Rk,p;0;\infty} = \eta_{c,fat} \cdot N_{Rk,p}$ [2]	0,5		

[1] $N_{Rk,c}$ static resistance according Annex C3 and EOTA TR 047, March 2018 or Fpr EN 1992-4:2016

[2] $N_{Rk,p}$ static resistance according Annex C3

In absence of other national regulations the following safety factors $\gamma_{M,fat}$ are recommended for design method I and II (Tables C12 to C15) according to EOTA TR 050, November 2015.

$\gamma_{Ms,fat}$ = 1,35 (steel)
$\gamma_{Mc,fat} = \gamma_{Mp,fat}$ = 1,5 (concrete)

HALFEN Anchor Channels HTA	Annex C11
Performances Characteristic resistances under fatigue tension load – Design method II	

CONTACT HALFEN WORLDWIDE

HALFEN is represented by subsidiaries in the following countries, please contact us:

Austria	HALFEN Gesellschaft m.b.H. Leonard-Bernstein-Str. 10 1220 Wien	Phone: +43-1-259 6770 E-Mail: office@halfen.at Internet: www.halfen.at	Fax: +43-1-259-677099
Belgium / Luxembourg	HALFEN N.V. Borkelstraat 131 2900 Schoten	Phone: +32-3-658 07 20 E-Mail: info@halfen.be Internet: www.halfen.be	Fax: +32-3-658 15 33
China	HALFEN Construction Accessories Distribution Co.Ltd. Room 601 Tower D, Vantone Centre No. A6 Chao Yang Men Wai Street Chaoyang District Beijing · P.R. China 100020	Phone: +86-10 5907 3200 E-Mail: info@halfen.cn Internet: www.halfen.cn	Fax: +86-10 5907 3218
Czech Republic	HALFEN s.r.o. Business Center Šafránkova Šafránkova 1238/1 155 00 Praha 5	Phone: +420 -311-690 060 E-Mail: info@halfen.cz Internet: www.halfen.cz	Fax: +420-235-314 308
France	HALFEN S.A.S. 18, rue Goubet 75019 Paris	Phone: +33-1- 44523100 E-Mail: halfen@halfen.fr Internet: www.halfen.fr	Fax: +33-1-44523152
Germany	HALFEN Vertriebsgesellschaft mbH Liebigstr. 14 40764 Langenfeld	Phone: +49-2173-970-0 E-Mail: info@halfen.de Internet: www.halfen.de	Fax: +49-2173-970225
Italy	HALFEN S.r.l. Soc. Unipersonale Via F.lli Bronzetti N° 28 24124 Bergamo	Phone: +39-035-0760711 E-Mail: tecnico@halfen.it Internet: www.halfen.it	Fax: +39-035-0760799
Netherlands	HALFEN b.v. Oostermaat 3 7623 CS Borne	Phone: +31-74-267 14 49 E-Mail: info@halfen.nl Internet: www.halfen.nl	Fax: +31-74-267 26 59
Norway	HALFEN AS Postboks 2080 4095 Stavanger	Phone: +47-51 82 34 00 E-Mail: post@halfen.no Internet: www.halfen.no	
Poland	HALFEN Sp. z o.o. Ul. Obornicka 287 60-691 Poznan	Phone: +48-61-622 14 14 E-Mail: info@halfen.pl Internet: www.halfen.pl	Fax: +48-61-622 14 15
Spain	HALFEN IBERICA, S.L. Polígono Industrial Santa Ana c/ Ignacio Zuloaga 20 28522 Rivas-Vaciamadrid	Phone: +34 916 669 181 E-Mail: info@halfen.es Internet: www.halfen.es	Fax: +34 916 669 661
Sweden	Halfen AB Vädursgatan 5 412 50 Göteborg	Phone: +46-31-98 58 00 E-Mail: info@halfen.se Internet: www.halfen.se	Fax: +46-31-98 58 01
Switzerland	HALFEN Swiss AG Hertistrasse 25 8304 Wallisellen	Phone: +41-44-849 78 78 E-Mail: info@halfen.ch Internet: www.halfen.ch	Fax: +41-44-849 78 79
United Kingdom / Ireland	HALFEN Ltd. A1/A2 Portland Close Houghton Regis LU5 5AW	Phone: +44 -1582- 47 03 00 E-Mail: info@halfen.co.uk Internet: www.halfen.co.uk	Fax: +44-1582-47 03 04
United States of America	HALFEN USA Inc. PO Box 18687 San Antonio TX 78218	Phone: +1 800.423.91 40 E-Mail: info@halfenusa.com Internet: www.halfenusa.com	Fax: +1 877.683.4910
For countries not listed **HALFEN International**	HALFEN International GmbH Liebigstr. 14 40764 Langenfeld / Germany	Phone: +49 -2173-970-0 E-Mail: info@halfen.com Internet: www.halfen.com	Fax: +49-2173-970-849

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