Designated according to The Construction Products (Amendment etc.) (EU Exit) Regulations 2020 (as amended 2022)

UK Technical Assessment	UKTA-0836-22/6116 of 08/01/2026
Technical Assessment Body issuing the UK Technical Assessment:	British Board of Agrément
Trade name of the construction product:	Halfen anchor channel HTA
Product family to which the construction product belongs:	Product Area Code 33 Cast-in anchor channels
Manufacturer:	Leviat GmbH Liebigstraße 14 40764 Langenfeld Germany
Manufacturing plant(s):	Werk Langenfeld Liebigstraße 14 40764 Langenfeld Germany
This UK Technical Assessment contains:	34 pages including 3 Annexes which form an integral part of this assessment
This UK Technical Assessment is issued in accordance with The Construction Products (Amendment etc.) (EU Exit) Regulations 2020 (as amended 2022) on the basis of:	UKAD 330008-02-0601 *Anchor channels*

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 non-detachable metal anchors, fixed to the back of the channel 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 used to secure the channel.

The product description is given in Annex A

2. Specification of the intended use(s) in accordance with the applicable UK Assessment Document (hereinafter UKAD)

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 UK 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 Annexes C1, C2, C3, A6, A7, B3 and B4
Characteristic resistance to shear load (static and quasi-static loading)	See Annexes C4 to C6
Characteristic resistance under combined tension and shear load (static and quasi-static loading)	See Annex C7
Displacements (static and quasi-static loading)	See Annex C7
Characteristic resistance under fatigue cyclic loads (tension)	See Annexes C8 to C9

3.2. Safety in case of fire (BWR 2)

Characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annexes C12 and C13

3.3. Health, hygiene and the environment (BWR 3)

Not relevant.

3.4. Safety and accessibility in use (BWR 4)

Same as BWR 1.

3.5. Protection against noise (BWR 5)

Not relevant.

3.6. Energy economy and heat retention (BWR 6)

Not relevant.

3.7. Sustainable use of natural resources (BWR 7)

No performance assessed.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied

4.1. System of assessment and verification of constancy of performance

According to UKAD No. 330008-02-0601 and Annex V of the Construction Products (Amendment etc.) (EU Exit) Regulations 2020 (as amended 2022) 305/2011 as brought into UK law and amended, the system of assessment and verification of constancy of performance (AVCP) 1 applies.

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable UKAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the British Board of Agrément and made available to the UK Approved Bodies involved in the conformity attestation process.

5.1. UKCA marking for the product/ system must contain the following information:

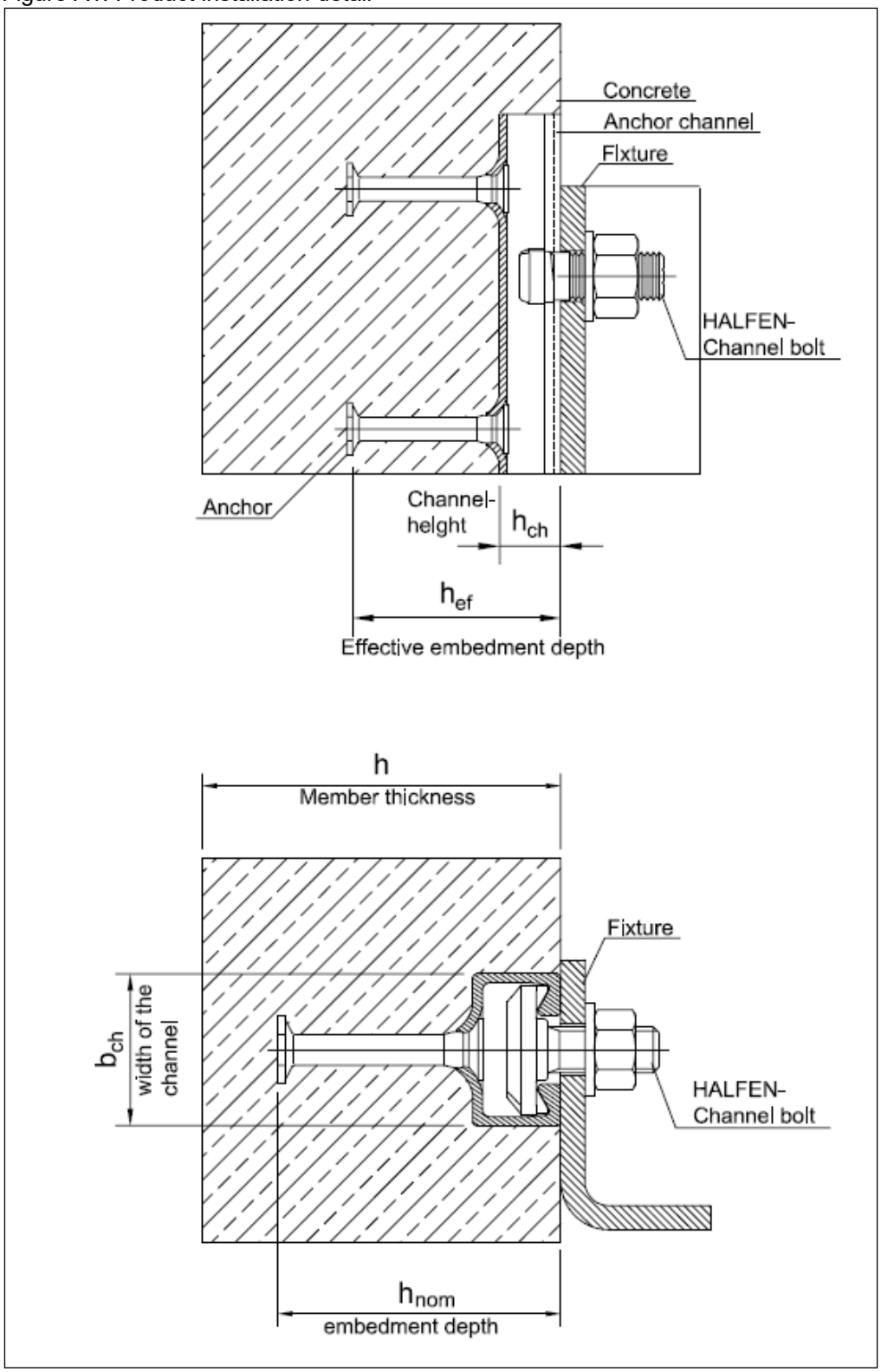
- Identification number of the Approved Body
- Name/ registered address of the manufacturer of the product/ system
- Marking including date of Marking and the intended use as stated in the Designated technical specification
- Unique identification code of the product type
- The reference number of the Declaration of Performance
- The level or class of the performance declared
- The reference to the Designated technical specification applied
- UKTA number.

On behalf of the British Board of Agrément 	
Date of second issue: 8 January 2026	**Hardy Giesler** Chief Executive Officer

British Board of Agrément,
1st Floor Building 3,
Hatters Lane,
Croxley Park
Watford
WD18 8YG

ANNEX A1: HALFEN Anchor Channel HTA: Product description / Installed condition

Figure A1: Product installation detail



ANNEX A2: HALFEN Anchor Channel HTA: Product description / Marking and Materials

Figure A2: Anchor channel material specifications

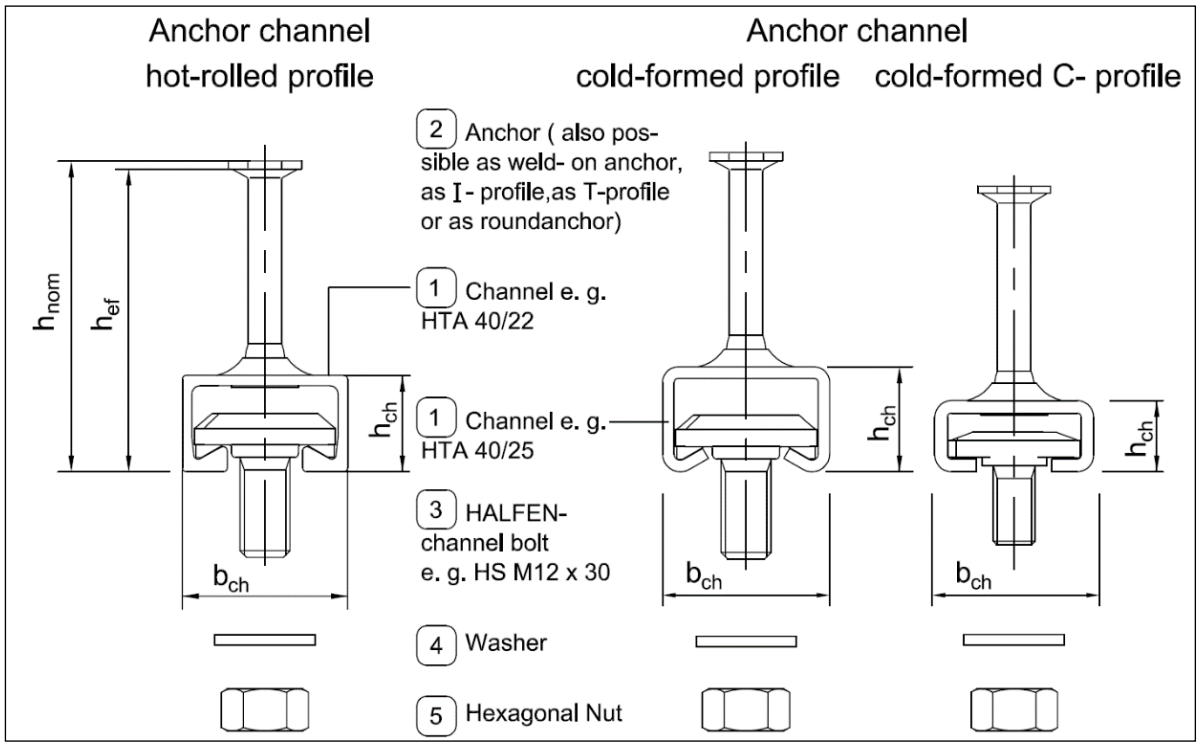
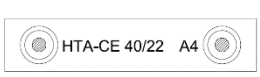
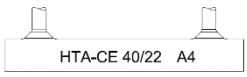
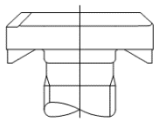


Table A1 : Materials and markings

Marking of the HALFEN anchor channel e.g. : HTA-CE 40/22 A4		Marking of the HALFEN channel bolts e.g.: HALFEN A4-70	
 a) Stamped on back of channel	 b) Printed on channel web		
H or HALFEN	Identifying mark of producer	H or HALFEN	Identifying mark of the producer
TA	Type of anchor channel	A4	Material
40/22	Size	70	Strength grade
A4	Material	Material of channel bolts:	
		Steel: No marking	
Material of channel:			
Steel		Stainless steel	
No marking for	hot-dip galvanized	A2	CRC II
SV	Pre-galvanized	A4	CRC III
Stainless steel		D4	CRC III
A2	CRC II	FA/D6	CRC IV
A4	CRC III	HCR/A8	CRC V
D4	CRC III	Strength grade of the channel bolts:	
D6	CRC IV	Steel	
HCR/A8	CRC V	4.6, 8.8	Strength grade 4.6, 8.8
		Stainless steel	
Close to the anchor a nail hole is positioned.		50, 70	Strength grade 50, 70

ANNEX A3: HALFEN Anchor Channel HTA: Product description / Materials and intended use

Table A1: Materials and intended use

Item no.	Specification	Intended use	
		1	2
		Dry internal conditions	Internal conditions with usual humidity
		Anchor channels may only be used in structures subject to dry internal conditions	Anchor channels may also be used in structures subject to internal conditions with usual humidity. For examples see use conditions in Annex B1
		Materials [6]	
1	Channel profile	Carbon steel 1.0038 (A), 1.0044 (A), 1.0045 (A) 1.0976 (D) hot-dip galvanized ≥ 55 µm according to (N) 1.0242+Z (U), 1.0529+Z (U) hot-dip galvanized ≥ 15 µm (pre-galvanized)	Carbon steel 1.0038 (A), 1.0044 (A), 1.0045(A) 1.0976 (D) hot-dip galvanized ≥ 55 µm according to (N) Stainless steel [5] 1.4301 (G), 1.4307 (G), 1.4567 (G) 1.4541 (G)
2	Anchor	Carbon steel 1.0038 (A), 1.0214 (B), 1.0213 (B) 1.1132 (E), 1.1122 (E), 1.5525 (I) 1.5535 (I), 1.5523 (H), 1.0045 (A) hot-dip galvanized ≥ 55 µm according to (N)	Carbon steel 1.0038 (A), 1.0214 (B), 1.0213 (B) 1.1132 (E), 1.1122 (E), 1.5525 (I) 1.5535 (I), 1.5523 (H), 1.0045 (A) hot-dip galvanized ≥ 55 µm according to (N) Stainless steel [5] 1.4301 (G), 1.4307 (G) 1.4567 (G), 1.4541 (G)
3	HALFEN channel bolts	Carbon steel strength grade 4.6 / 8.8 (J) hot-dip galvanized ≥ 50 µm according to (P) [1]	Carbon steel strength grade 4.6 / 8.8 (J) hot-dip galvanized ≥ 50 µm according to (P) [1] Stainless steel [5] strength grade 50 / 70 (K) 1.4301 (G), 1.4307 (G) 1.4567 (G), 1.4541 (G)
4	Washer [3] (R) and (S) production class A, 200 HV	Carbon steel EN 10025-1:2017 electroplated ≥ 5 µm according to (O)	Carbon steel EN 10025-1:2017 hot-dip galvanized ≥ 50 µm according to (P) [1] Stainless steel [5] steel grade A2, A3 (K)
5	Hexagonal nuts (T)	Carbon steel strength grade 5/8 (L) electroplated ≥ 5 µm according to (O)	Carbon steel strength grade 5/8 (L) hot-dip galvanized ≥ 50 µm according to (P) [1] Stainless steel [5] strength grade 70 / 80 (M) steel grade A2, A3 (M)

Table A1 (continued): Materials and intended use

Item no.	Specification	Intended use		
		3	4	5
		According to EN 1993-1-4:2006+A1:2015, Tab. A.2		
		For CRC III	For CRC IV	For CRC V
		Materials [7]		
1	Channel profile	Stainless steel 1.4401 (G), 1.4404 (G) 1.4571 (G), Stainless steel D4 1.4062 (F), 1.4162 (F), 1.4362 (G)	Stainless steel 1.4462[2] (G)	Stainless steel 1.4529 (G), 1.4547 (G), 1.4410 (G)
2	Anchor	Stainless steel 1.4401 (G), 1.4404 (G) 1.4571 (G), 1.4362 (G) 1.4578 (G) Carbon steel [4] 1.0038 (A)	Stainless steel 1.4462[2] (G)	Stainless steel 1.4529 (G), 1.4547 (G), 1.4410 (G)
3	HALFEN channel bolts	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)	Stainless steel strength grade 50 / 70 (K) 1.4529 (G), 1.4547 (G), 1.4410 (G)
4	Washer [3] (R) and (S) production class A, 200 HV	Stainless steel steel grade A4, A5 (K)	Stainless steel 1.4462[2] (G)	Stainless steel 1.4529 (G), 1.4547 (G), 1.4410 (G)
5	Hexagonal nuts (T)	Stainless steel strength grade 70 / 80 (M) steel grade A4, A5 (M)	Stainless steel strength grade 70 / 80 (M) 1.4462[2] (G)	Stainless steel strength grade 70 / 80 (M) 1.4529 (G), 1.4547 (G), 1.4410 (G)

A - EN 10025-2:2004
B - EN 10263-2:2017
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+AC:2013
K - EN ISO 3506-1:2020
L - EN ISO 898-2:2022
M - EN ISO 3506-2:2020
N - EN ISO 1461:2022
O - EN ISO 4042:2022
P - EN ISO 10684:2004+AC:2009
R - EN ISO 7089:2000
S - EN ISO 7093-1:2000
T - EN ISO 4032:2023
U - EN 10346:2015

[1] or electroplated with special coating ≥ 12 µm
[2] 1.4462 not applicable for indoor swimming pools
[3] not included in scope of delivery
[4] only for weld-on anchors with sufficient concrete cover according to EN 1992-1-1:2004+AC:2010+A1:2014
[5] stainless steel anchors only in combination with stainless steel channel profiles, channel bolts, washers and nuts
[6] expected working life at least 50 years
[7] expected working life at least 100 years

Figure A3: Channel profile dimensions

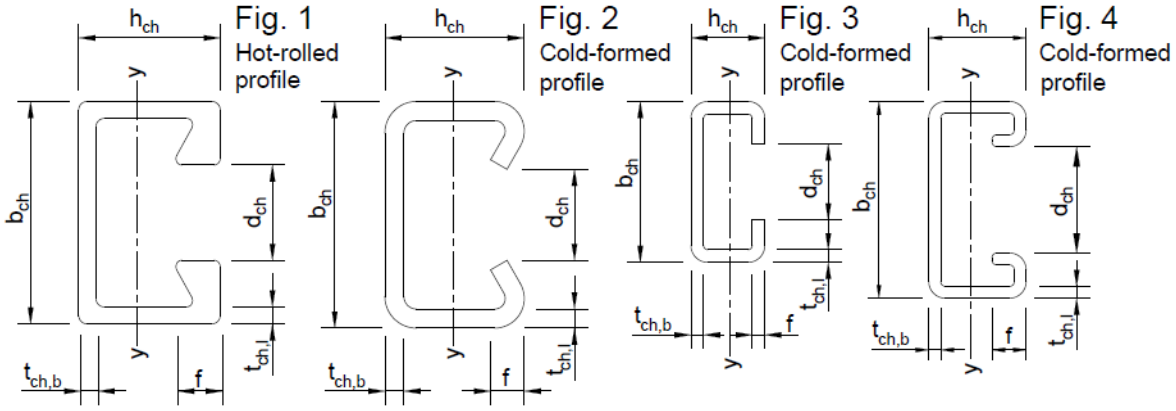


Table A2: Profile dimensions (steel and stainless steel)

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	4.060
38/17	3	38,00	17,50	3,00	3,00	18,00	3,00		8.547
41/22	4	41,30	20,70	2,50	2,50	22,30	7,20		12.600
40/25	2	40,00	25,00	2,75	2,75	18,00	5,60		20.570
49/30	2	50,00	30,00	3,00	3,00	22,00	7,39		41.827
54/33	2	54,00	33,00	4,50	4,50	22,00	7,90		72.079
72/49	2	72,00	49,00	6,00	6,00	33,00	9,90		293.579
40/22 / 40/22P	1	39,50	23,00	2,60	2,40	18,00	6,00		20.029
50/30 / 50/30P	1	49,00	30,00	3,20	2,75	22,50	7,85		52.896
52/34	1	52,50	33,50	4,10	4,00	22,50	10,50		93.262
55/42	1	54,50	42,00	5,00	5,00	26,00	12,90		187.464
72/48	1	72,00	48,50	4,50	5,00	33,00	15,50		349.721
28/15	3	28,00	15,25	2,25	2,25	12,00	2,25	Stainless steel	4.060
38/17	3	38,00	17,50	3,00	3,00	18,00	3,00		8.547
41/22	4	41,30	20,70	2,50	2,50	22,30	7,20		12.600
40/25	2	39,50	25,00	2,50	2,50	18,00	5,40		19.097
49/30	2	50,00	30,00	3,00	3,00	22,00	7,39		41.827
54/33	2	54,00	33,00	4,50	4,50	22,00	7,90		72.079
72/49	2	72,00	49,00	6,00	6,00	33,00	9,90		293.579
40/22 / 40/22P	1	39,50	23,00	2,60	2,40	18,00	6,00		20.029
50/30 / 50/30P	1	49,00	30,00	3,20	2,75	22,50	7,85		52.896
52/34	1	52,50	33,50	4,10	4,00	22,50	10,50		93.262
55/42	1	54,50	42,00	5,00	5,00	26,00	12,90		187.464
72/48	1	72,00	48,50	4,50	5,00	33,00	15,50		349.721

Figure A4: Anchor dimensions

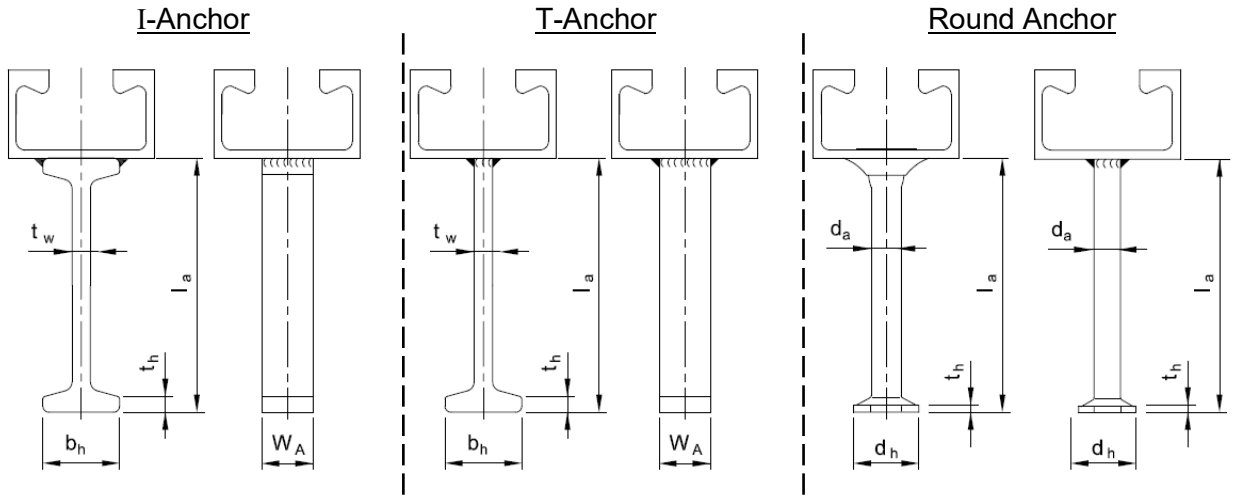


Table A3: Dimensions of anchors (I-Anchor, T-Anchor or Round Anchor)

Anchor channel	I-Anchor und T-Anchor						Round Anchor				
	min l_a	t_w	b_h	t_h	w_A (4)	A_h (4)	min l_a	d_a	d_h	t_h	A_h
	[mm]					[mm^2]	[mm]				[mm^2]
28/15	62	5	18	3,3	10 - 20	130	32	6	12	1,3	85
38/17 (3)	62	5	18	3,3	10 (14) - 20	130 (182)	60,4	8	16	1,9	151
41/22	69	5	18	3,5	10 (14) - 20	130 (182)	63,3	8	16	1,9	151
40/25	62	5	18	3,3	12 (14) - 24	156 (182)	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 (20) - 30	234 (260)	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	- (2)				
72/48	140	7,1	20	6	40 - 50	516	- (2)				

(1) HTA 55/42 in stainless steel only with weld-on anchors.
(2) Product not available.
(3) HTA 38/17 in stainless steel D4 only with round anchors.
(4) values in brackets for anchor channels in stainless steel

ANNEX A6: HALFEN Anchor Channel HTA: Product description / Anchors positioning, channel length

Figure A5: Anchor positioning

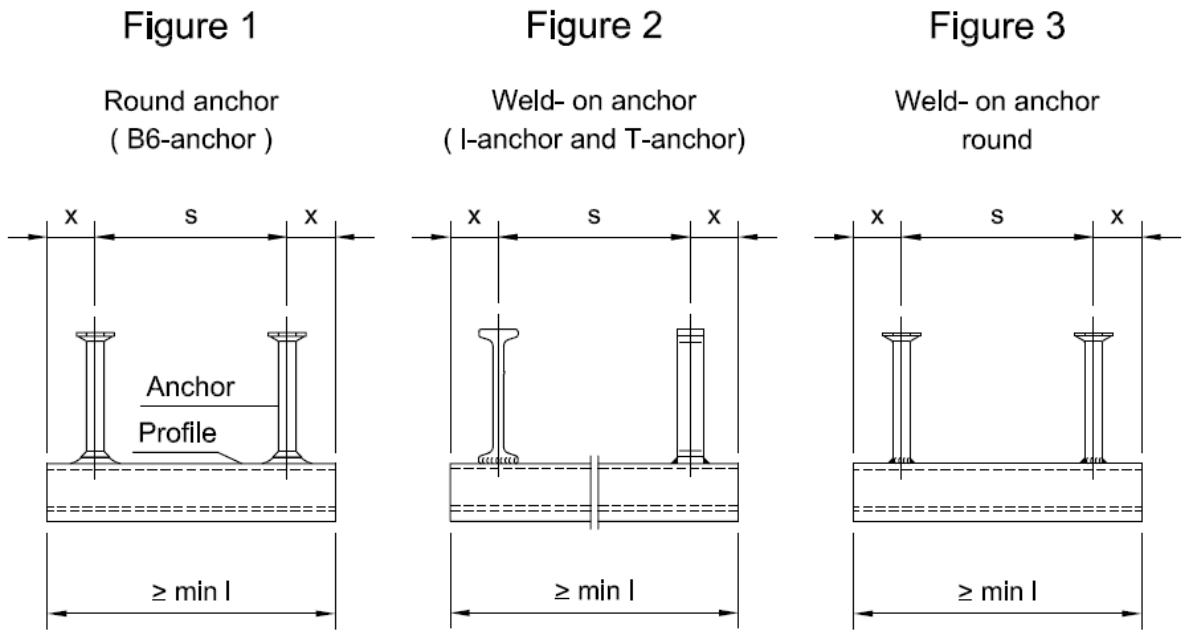


Table A4: Anchor positioning

Anchor channel	**Anchor spacing s**		**End spacing x** (1)		**Minimum 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
41/22 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 (2)	150	150
72/48 72/49	100 (80)	400	- (3)	25 (2)	- (3)	150

Valid for round anchor according to 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.
(3) Product not available.

ANNEX A7: HALFEN Anchor Channel HTA: channel bolts, dimensions

Figure A6: Bolt dimensions and markings

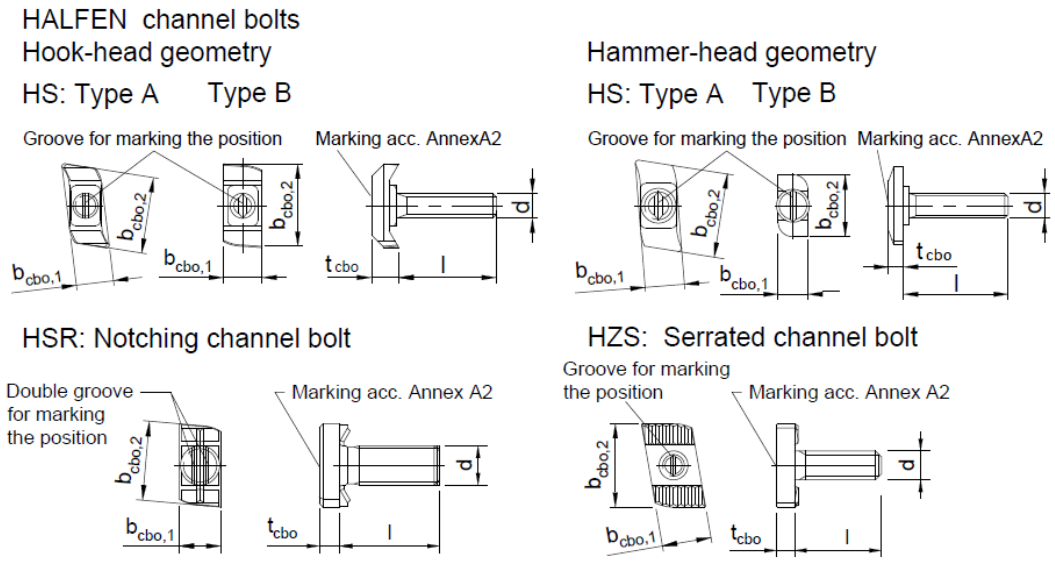


Table A5: Dimensions of HALFEN channel bolts

Head		Thread Ø	Channel bolts (Type A)			Altern. channel bolts (Type B)			Anchor channel
			Width	Length	Thickness	Width	Length	Thickness	
			$b_{cbo,1}$	$b_{cbo,2}$	t_{cbo}	$b_{cbo,1}$	$b_{cbo,2}$	t_{cbo}	
Hook-head	HS 40/22	M10	15,0	30,8	7,2	- [1]	- [1]	- [1]	40/22
		M12	15,0	30,8	7,2	- [1]	- [1]	- [1]	40/22P
		M16	17,4	30,8	8,2 (9,8)	- [1]	- [1]	- [1]	40/25
	HSR 40/22	M16 [2]	17,0	32,3	8,5	- [1]	- [1]	- [1]	40/22P
	HS 50/30	M10	16,3	40,2	10,0	15,0	41,5	10,0	49/30
		M12	16,3	40,2	10,0	15,0	41,5	10,0	50/30, 50/30P
		M16	19,4	40,2	11,0	20,0	41,5	11,0	52/34, 54/33
		M20	21,0	39,5	12,5	21,0	41,5	12,0	55/42
		M24	- [1]	- [1]	- [1]	24,5	41,0	18,0	55/42
	HS 72/48	M20	- [1]	- [1]	- [1]	23,0	58,0	14,0	72/48 72/49
		M24	- [1]	- [1]	- [1]	25,0	58,0	16,0	
		M27	- [1]	- [1]	- [1]	28,0	58,0	18,0	
		M30	- [1]	- [1]	- [1]	31,0	58,0	20,0	
Hammer-head	HS 28/15	M6	10,6	21,1	4,0	10,1	22,7 (22,2)	4,0	28/15
		M8	10,6	21,1 (20,7)	4,5	10,1	22,7 (22,2)	4,0	
		M10	10,9	20,2	5,0	10,1	22,7 (22,2)	5,0 (4,0)	
		M12	10,8	20,1	6,5	10,1	22,7 (22,2)	5,5	
	HS 30	M10	10,8	20,2	7,0	- [1]	- [1]	- [1]	
		M12	10,8	20,2	7,0	- [1]	- [1]	- [1]	
	HS 38/17	M10	13,6-14,1	29,0	6,0	13 (12)	30,5	6,0	38/17
		M12	13,6-14,1	29,0	6,0	13 (12)	30,5	7,0 (6,0)	
		M16	16,0	29,0	8,5	16,0	30,5	7,0	
	HZS 41/22	M12 [3]	20,5	34,7	7,5 (5,5)	- [1]	- [1]	- [1]	41/22
		M16 [3]	20,5	34,7	7,5	- [1]	- [1]	- [1]	

( ) Value applies for strength grade 8.8 [1] Product not available [2] strength grade 8.8 only [3] strength grade 8.8 and 50

ANNEX A8: HALFEN Anchor Channel HTA: channel bolts, strength grade

Table A7: 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

ANNEX B1: HALFEN Anchor Channel HTA: Intended use / Specifications

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, except internal conditions with usual humidity) (anchor channels and channel bolts according to Annex A3, Table A1, column 1)
- Structures subject to internal conditions with usual humidity (e.g., kitchen, bath and laundry in residential buildings, except permanent damp conditions and application under water) (anchor channels and channel bolts according to Annex A3, Table A1, column 2)
- 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)
- 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 EN 1992-4:2018.
- 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.

ANNEX B2: HALFEN Anchor Channel HTA: 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 A6, 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 manufactured from 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.

ANNEX B3 : HALFEN Anchor Channel HTA: Installation parameters of anchor channels
Figure B1 : Anchor channel positioning

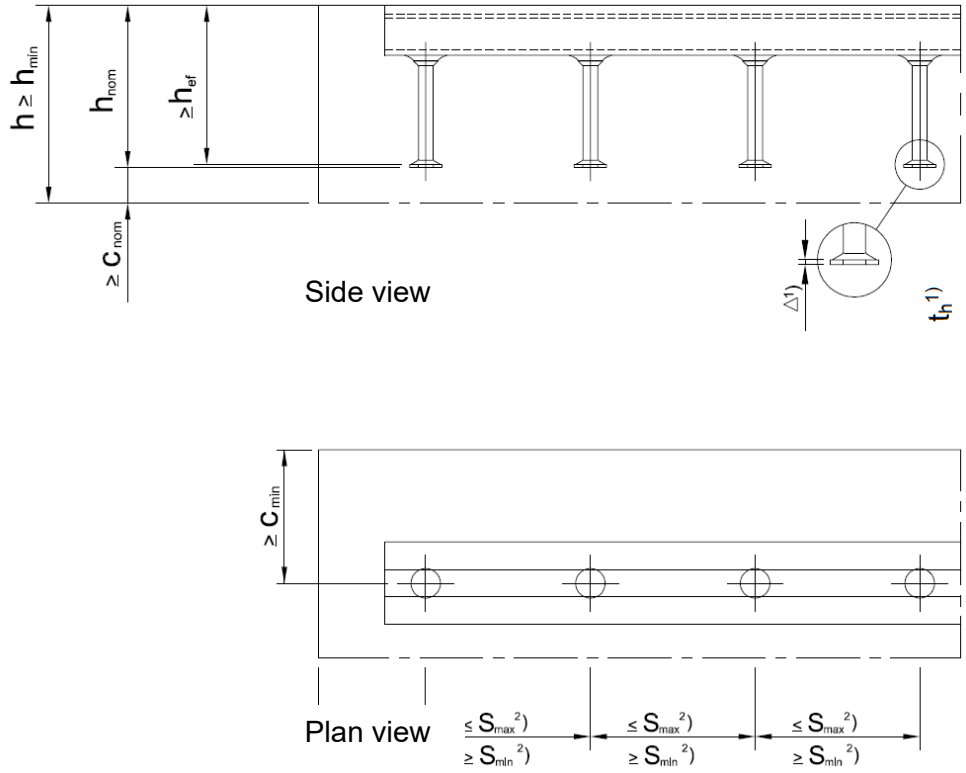


Table B1-1: Minimum effective anchorage depth, edge distance and member thickness

Anchor channel			28/15	38/17	41/22	40/25	49/30	54/33	72/49
Minimum effective anchorage depth – round anchor	[mm]	$h_{ef,min}$	45	76	82	84	94	155	- (4)
Minimum effective anchorage depth – I- & T-anchor		$h_{ef,min}$	74	76	82	84	96	156	183
Minimum edge distance		c_{min}	40	50	50	50	75	100	150
Minimum member thickness		h_{min}		actual $h_{ef} + t_h + c_{nom}$ (3)					
			55	90	90	90	105	170	195

Table B1-2: Minimum effective anchorage depth, edge distance and member thickness

Anchor channel			40/22	40/22P	50/30	50/30P	52/34	55/42	72/48
Minimum effective anchorage depth – round anchor	[mm]	$h_{ef,min}$	82	91	94	106	155	175	- (4)
Minimum effective anchorage depth – I- & T-anchor		$h_{ef,min}$	82	146	95	153	156	176	182
Minimum edge distance		c_{min}	50	50	75	75	100	100	150
Minimum member thickness		h_{min}	actual $h_{ef} + t_h + c_{nom}$ (3)						
			90	105	105	120	170	190	195

(1) t_h = Anchor head thickness
(2) s_{min}, s_{max} according to Annex A7, Table A4
(3) c_{nom} according to EN 1992-1-1:2004 + AC:2010
(4) Product not available

ANNEX B4: HALFEN Anchor Channel HTA: Intended use / Installation parameters

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

Anchor channel	**HALFEN Channel bolts** ∅	**Minimum spacing $s_{min,cbo}$ of the channel bolts**	**Installation torque T_{inst}** (4)				
			General (2) $T_{inst,g}$	Steel – steel contact (3) $T_{inst,s}$			
			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	- (5)	- (5)
	8	40	8	8	8	20	15
	10	50	13	15	15	40	30
	12	60	15	25	25	70 (7)	50
38/17	10	50	15	15	15	40	30
	12	60	25	25	25	70	50
	16	80	40	65	60	180	130
41/22	12	60	20	- (5)	20	55	- (5)
	16	80	40	- (5)	50	140	- (5)
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
40/22P	16 (6)	80	150	- (5)	- (5)	180	- (5)
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-A4, Tab. A1

(2) According to Annex B5, Fig.1

(3) According to Annex B5, Fig. 2

(4) T_{inst} must not be exceeded

(5) Product not available

(6) Valid for channel bolt type HSR

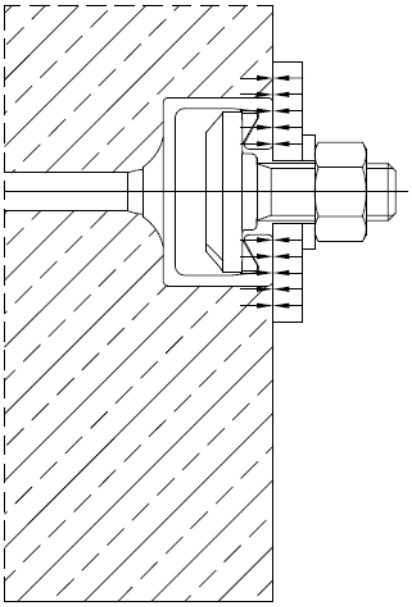
(7) 55 Nm for HS 30

ANNEX B5: HALFEN Anchor Channel HTA: Intended use / Position of the fixture
Figure B2: Installed fixing detail

General

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

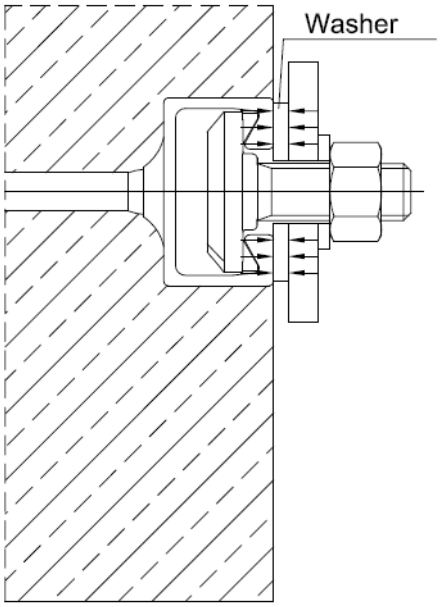
Fig. 1



Steel to steel contact

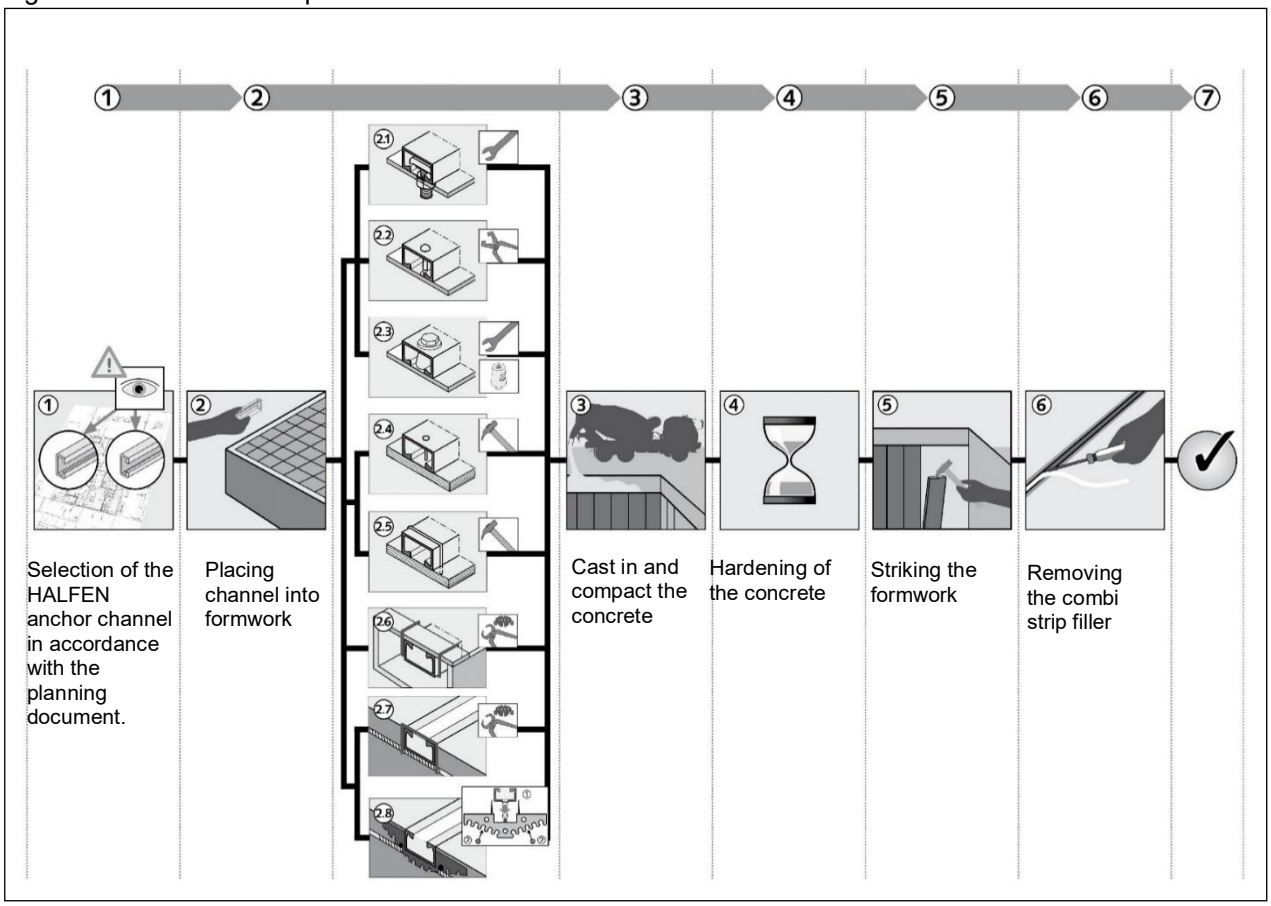
The fixture is fastened to the anchor channel by suitable steel parts (e.g., washer). The installation torque according to Annex B4, Table B2 must be applied and must not be exceeded.

Fig. 2



ANNEX B6: HALFEN Anchor Channel HTA: Installation instructions / HALFEN anchor channel

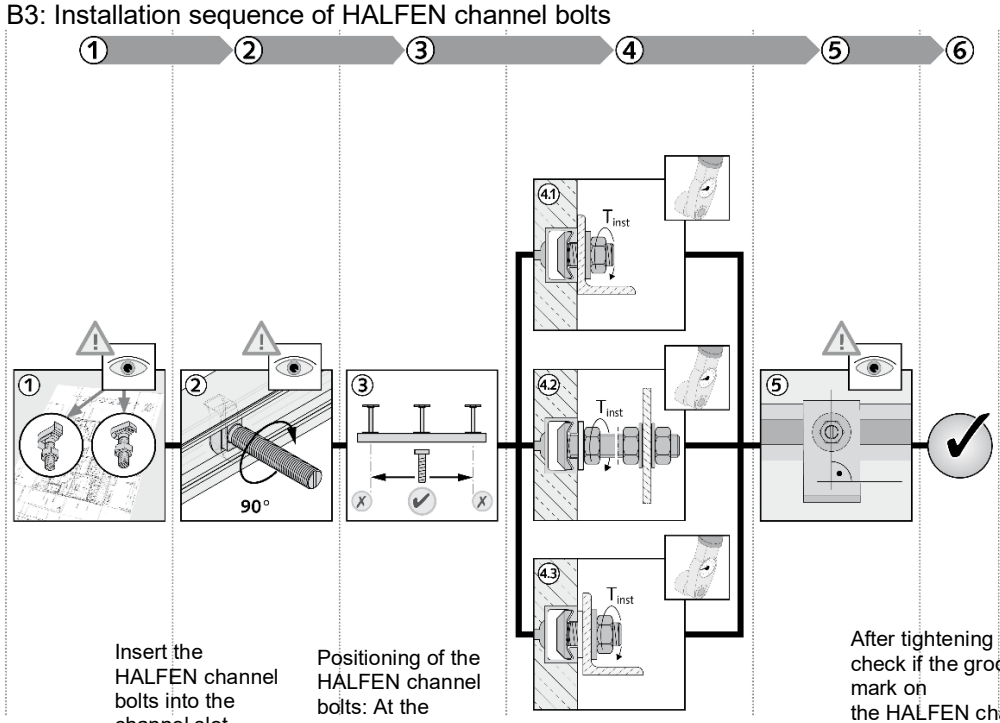
Figure B2: Installation sequence of HALFEN anchor channel



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

ANNEX B7: HALFEN Anchor Channel HTA: Installation instruction / HALFEN channel bolts

Figure B3: Installation sequence of HALFEN channel bolts



Selection of the HALFEN channel bolts in accordance with the planning document.

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).

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 according to Annex A6.

Tighten the hexagonal nut to the installation torque (T_{inst}) according to table stated below. T_{inst} must not be exceeded.
4.1: general application,
4.2 and 4.3: steel to steel contact.

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

Position of fixture according to 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	-(2)	-(2)	-(2)	-(2)	-(2)
			38/17	-(2)	-(2)	15	25	40	-(2)	-(2)	-(2)	-(2)
			41/22	-(2)	-(2)	-(2)	20	40	-(2)	-(2)	-(2)	-(2)
			40/22, 40/22P, 40/25	-(2)	-(2)	15	25	45	-(2)	-(2)	-(2)	-(2)
			49/30, 50/30, 50/30P	-(2)	-(2)	15	25	60	75	-(2)	-(2)	-(2)
			54/33, 53/34	-(2)	-(2)	15	25	60	120	-(2)	-(2)	-(2)
			55/42	-(2)	-(2)	15	25	60	120	200	-(2)	-(2)
			72/49, 72/48	-(2)	-(2)	-(2)	-(2)	-(2)	120	200	300	380
Steel to steel contact	Steel	4.6	All profiles	3	8	15	25	65	130	230	340	460
		8.8		-(2)	20	40	70 (55)	180 (140)	360	620	900	1200
	Stainless Steel	50		3	8	15	25 (20)	60 (50)	120	200	300	400
		70		-(2)	15	30	50	130	250	440	650	850

(1) T_{inst} must not be exceeded (2) values in brackets for HZS 41/22

ANNEX C1: HALFEN Anchor Channel HTA: Performances / Characteristic resistances under tension load – steel failure anchor channel

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

Anchor channel			**steel**	**28/15**	**38/17**	**41/22** / **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]	carbon	9	18	18 20	20 31	31	31 56	56	56	80	102
			stainless [3]	12,7	22,6	22,6	20 31	35,3	31 56	56,5	56	- [2]	102
			stainless D4	15,3	27,2	22,6	- [2]	35,3	- [2]	56,5	- [2]	- [2]	- [2]
Partial factor	γ_{Ms} [1]		1,8										
Steel failure: Connection channel/anchor													
Characteristic resistance	$N_{Rk,s,c}$	[kN]	carbon	9	18	18 20	20 29	31	31 39	55	55	80	100
			stainless [3]	12,7	22,6	22,6	20 29	35,3	31 39	56,5	55	- [2]	100
			stainless D4	15,3	27,2	22,6	- [2]	35,3	- [2]	56,5	- [2]	- [2]	- [2]
Partial factor	$\gamma_{Ms,ca}$ [1]		1,8										
Steel failure: Local flexure of the channel lips													
Spacing of channel bolts for $N^0_{Rk,s,l}$	$s_{l,N}$	[mm]	all materials	56	76	83 80	79	100	98	107	105	109	144
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	carbon	9	18	20	38	31	43	55	72	110	100 120
			stainless [3]	12,7	22,6	26 22,6	38	35,3	43	56,5	72	- [2]	100 120
			stainless D4	16,1	35,4	26 22,6	- [2]	35,3	- [2]	56,5	- [2]	- [2]	- [2]
Partial factor	$\gamma_{Ms,l}$ [1]		1,8										

[1] In absence of other national regulations [2] No performance assessed

[3] Valid for all stainless steel materials except D4, see Annex A4

Table C2: Characteristic flexural resistance of channel

Anchor channel			**steel**	**28/15**	**38/17**	**41/22** / **40/25**		**40/22** / **40/22P**	**49/30**	**50/30** / **50/30P**	**54/33**	**52/34**	**55/42**	**72/49**	**72/48**
Char. flexure resistance of channel	$M_{Rk,s,flex}$	[Nm]	carbon, stainless [3]	317	580	733	1071	1389	1673	2803	2984	3373	6447	8617	8593
			stainless D4	432	836	749	1262	- [2]	2528	- [2]	2984	- [2]	- [2]	- [2]	- [2]
Partial factor	$\gamma_{Ms,flex}$ [1]		1,15												

[1] In absence of other national regulations [2] No performance assessed

[3] Valid for all stainless steel materials except D4, see Annex A4

ANNEX C2 : HALFEN Anchor Channel HTA: Performances / Characteristic Resistances under tension load – concrete failure

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

HALFEN Channel bolts ∅		M6	M8	M10	M12	M16	M20	M24	M27	M30
Steel failure										
Characteristic 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 [4] (48.5)	125.6 (96.3)	196.0	282.4	367.2	448.8
	50[1]	10.1	18.3	29.0	42.2 (40.3)	78.5 (64.0)	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 to Annex A2 and A3
[2] In absence of other national regulations
[3] values in brackets for HZS 41/22
[4] 50.7 kN for HS 30

ANNEX C3 : HALFEN Anchor Channel HTA: Performances / Characteristic resistances under tension load – concrete failure and displacements

Table C4: Characteristic resistances under tension load – concrete failure

Anchor channel				28/15	38/17	41/22 40/22 40/25	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(2)			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(2)			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	246/ 252	273	282	318	465	525	546
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

(2) Value valid for minimum I-anchor size; for other sizes the characteristic resistance can be calculated using Ah from Annex A6, Table A3 or the actual dimension.

ANNEX C4 : HALFEN Anchor Channel HTA: Performances / Characteristic resistances under shear load – steel failure anchor channel, concrete failure

Table C5: Characteristic resistances under shear load

Anchor channel			**steel**	**28/15**	**38/17**	**41/22** **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	$V_{Rk,s,a,y}$	[kN]	carbon	9	18	29,7 20	35	31	52 59	55	78	110	100 146
			stainless (4)	12,7	22,6	22,6	35	35,3	52 59	56,5	78	- (3)	100 146
			stainless D4	18	30	22,6 30,8	- (3)	58,9	- (3)	56,5	- (3)	- (3)	- (3)
Partial factor	γ_{Ms} (1)		1,8										
Steel failure: Connection channel / anchor													
Characteristic resistance	$V_{Rk,s,c,y}$	[kN]	carbon	9	18	29,7 20	35	31	52 59	55	78	110	100 146
			stainless (4)	12,7	22,6	22,6	35	35,3	52 59	56,5	78	- (3)	100 146
			stainless D4	18	30	22,6 30,8	- (3)	58,9	- (3)	56,5	- (3)	- (3)	- (3)
Partial 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]	all materials	56	76	83 80	79	100	98	107	105	109	144
Characteristic resistance	$V^0_{Rk,s,l,y}$	[kN]	carbon	9	18	29,7 20	35	31	52 59	55	78	110	100 146
			stainless (4)	12,7	22,6	22,6	35	35,3	52 59	56,5	78	- (3)	100 146
			stainless D4	18	30	22,6 30,8	- (3)	58,9	- (3)	56,5	- (3)	- (3)	- (3)
Partial factor	$\gamma_{Ms,l}$ (1)		1,8										
Concrete failure: Pry-out													
Product factor		k_8 (2)	all materials	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
Partial factor		γ_{Mc} (1)	1,5										
Concrete failure: Concrete edge													
Product-factor k_{12}	cracked concrete	$k_{cr,V}$	all materials	4,5	7,5	6,5 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	9,1 10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5
Partial 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.

(3) No performance assessed

(4) Valid for all stainless steel materials except D4, see Annex A4

Table C5 (continued): Characteristic resistances under shear load

Anchor channel			**steel**	**40/22P**
Steel failure: Anchor				
Characteristic resistance	$V_{Rk,s,a,x}$	[kN]	carbon	18,6
Partial factor	γ_{Ms} (1)		1,8	
Steel failure: Connection channel / anchor				
Characteristic resistance	$V_{Rk,s,c,x}$	[kN]	carbon	17,4
Partial factor	$\gamma_{Ms,ca}$ (1)		1,8	
Steel failure: Connection between channel lips and channel bolt				
Characteristic resistance	$V_{Rk,s,l,x}$	[kN]	carbon	13,5
Installation factor	γ_{inst} (1)		1,2	

(1) In absence of other national regulations

Table C6: Charact. resistances under shear load – steel failure of HALFEN channel bolts

HALFEN Channel bolts ∅				**M6**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure												
Characteristic 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
Characteristic 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 factor	γ_{Ms} (2)		4.6	1,67								
			8.8	1,25								
			50 (1)	2,38								
			70 (1)	1,56								

(1) Materials according to 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.

ANNEX C7 : HALFEN Anchor Channel HTA: Performances / Displacement and characteristic resistances under combined tension and shear loadshear load

Table C7: Displacements under tension load

Anchor channel			**28/15**	**38/17** **41/22**	**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-term displacement	δ_{N0}	[mm]	0,3	0,3 0,6	0,4	0,4	0,4	0,5	0,5	0,5	0,5
Long-term displacement	$\delta_{N\infty}$	[mm]	0,6	0,6 1,3	0,8	0,8	0,8	1,0	1,0	1,0	1,0

Table C8: Displacements under shear load

Anchor channel			**28/15**	**38/17** **41/22**	**40/25** **40/22**	**40/22P**	**49/30** **50/30**	**50/30P**	**54/33** **52/34**	**55/42**	**72/49** **72/48**
Shear load in y-direction (1)	V_y	[kN]	3,6	7,1 11,8	7,9 13,9	13,9	12,3 20,6	23,4	21,8 31,0	43,7	39,7 57,9
Short-term displacements	$\delta_{V,y,0}$	[mm]	0,6	0,6 1,1	0,6	0,6	0,6	0,6	1,2	1,2	1,2
Long-term displacements	$\delta_{V,y,\infty}$	[mm]	0,9	0,9 1,7	0,9	0,9	0,9	0,9	1,8	1,8	1,8
Shear load in x-direction (2)	V_x	[kN]	- (3)	- (3)	- (3)	4,5	- (3)	- (3)	- (3)	- (3)	- (3)
Short-term displacements	$\delta_{V,x,0}$	[mm]	- (3)	- (3)	- (3)	0,2	- (3)	- (3)	- (3)	- (3)	- (3)
Long-term displacements	$\delta_{V,x,\infty}$	[mm]	- (3)	- (3)	- (3)	0,3	- (3)	- (3)	- (3)	- (3)	- (3)

(1) y-direction (perpendicular to longitudinal axis of channel)
(2) x-direction (in direction of the longitudinal channel axis)
(3) No performance assessed

Table C9: Characteristic resistances under combined tension and shear load

Anchor channel		**28/15**	**38/17** **41/22**	**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}	Values according to EN 1992-4:2018, section 7.4.3.1								
Steel failure: Failure of anchor and connection between anchor and channel										
Product factor	k_{14}	Values according to EN 1992-4:2018, section 7.4.3.1								

ANNEX C8: HALFEN Anchor Channel HTA: Performances / Characteristic resistances under fatigue load according to assessment method C

For design method I or II for assessment method C according to EOTA TR 050, June 2022

Table C10: 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 galvanized	HS 40/22	M12	8.8	Steel electro-plated, hot-dip galvanized; stainless steel
					M16	4.6 8.8	
40/22P	B6	10	Steel hot-dip galvanized; stainless steel	HS 40/22	M12	8.8 / A4-70	
					M16	4.6	
						8.8 / A4-70	
50/30	B6	10	Steel hot-dip galvanized	HS 50/30	M16	4.6 8.8	
					M20		
50/30P	B6	12	Steel hot-dip galvanized	HS 50/30	M16	4.6 8.8	
					M20		
52/34	B6	12	Steel hot-dip galvanized; stainless steel	HS 50/30	M16	8.8 / A4-70	
					M20		

Design Method I according to EOTA TR 050, June 2022

Table C11: Characteristic resistances under fatigue tension load after n load cycles without static preload (N_{Ed} = 0) – Steel failure

Anchor channel		**40/22**	**40/22P**		**50/30** **50/30P**	**52/34**	
	Load cycles n	$\Delta N_{Rk,s;lo;n}$ with $N_{lok,s,n}$ = 0 [kN]					
		carbon	carbon	stainless	carbon	carbon	stainless
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	
	≤ $7 \cdot 10^6$	2,4	3,3	3,0		5,5	5,1
	≤ 10^8	1,2					
	> 10^8	-					

ANNEX C9: HALFEN Anchor Channel HTA: Performances / Characteristic resistances under fatigue load according to assessment method C

For design method I or II for assessment method C according to EOTA TR 050, June 2022

Table C12: Characteristic resistances under fatigue tension load after n load cycles with lower load share N_{Elok} – Concrete cone and pull-out failure

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

(1) $N_{Rk,c}$ static resistance according to Annex C3 and EN 1992-4:2018 or EOTA TR 047, May 2021
(2) $N_{Rk,p}$ static resistance according to Annex C3
(3) N_{Elok} characteristic value of the static pre-load decisive for concrete cone or pull-out failure

In absence of other national regulations the following partial factors $\gamma_{M,fat}$ are recommended for design method I and II according to EOTA TR 050, June 2022 for test method C.

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

ANNEX C10: HALFEN Anchor Channel HTA: Performances / Characteristic resistances under seismic tension load (informative only)

For seismic performance category C1

Table C13: Combinations of anchor channels and channel bolts under seismic load

Anchor channel		Channel bolt			
Profile	Material	Channel bolt	Thread Ø	Grade	Material
40/22P	hot-dip galvanized	HSR 40/22	16	8.8	Steel electro-plated, hot-dip galvanized

Table C14: Characteristic resistances under seismic tension load – steel failure

Anchor channel			**steel**	**40/22P**
Steel failure: Anchor				
Characteristic resistance	$N_{Rk,s,a,eq}$	[kN]	carbon	31
Partial factor	$\gamma_{Ms,a}$ (1)		1,8	
Steel failure: Connection channel/anchor				
Characteristic resistance	$N_{Rk,s,c,eq}$	[kN]	carbon	29
Partial factor	$\gamma_{Ms,ca}$ (1)		1,8	
Steel failure: Local flexure of the channel lips				
Spacing of channel bolts for $N^0_{Rk,s,l,eq}$	$s_{l,N}$	[mm]	carbon	79
Characteristic resistance	$N^0_{Rk,s,l,eq}$	[kN]	carbon	38
Partial factor	$\gamma_{Ms,l}$ (1)		1,8	

(1) In absence of other national regulations

Table C15: Characteristic flexural resistances under seismic tension load

Anchor channel			**steel**	**40/22P**
Steel failure: Flexure of channel				
Characteristic flexural resistance of channel	$M_{Rk,s,flex,eq}$	[Nm]	carbon	1389
Partial factor	$\gamma_{Ms,flex}$ (1)		1,15	

(1) In absence of other national regulations

Table C16: Characteristic resistances under seismic tension load – steel failure of HALFEN HSR channel bolt

HALFEN HSR channel bolt			**M16**
Steel failure			
Characteristic resistance	$N_{Rk,s,eq}$	[kN]	125,6
Partial factor	γ_{Ms} (1)		1,5

(1) In absence of other national regulations

ANNEX C11: HALFEN Anchor Channel HTA: Performances / Characteristic resistances under seismic shear load (informative only)

Table C17: Characteristic resistances under seismic shear load – steel failure

Anchor channel			**steel**	**40/22P**
Steel failure: Anchor				
Characteristic resistance	$V_{Rk,s,a,y,eq}$	[kN]	carbon	35
Characteristic resistance	$V_{Rk,s,a,x,eq}$	[kN]	carbon	18,6
Partial factor	$\gamma_{Ms,a}$ (1)		1,8	
Steel failure: Connection channel/anchor				
Characteristic resistance	$V_{Rk,s,c,y,eq}$	[kN]	carbon	35
Characteristic resistance	$V_{Rk,s,c,x,eq}$	[kN]	carbon	17,4
Partial factor	$\gamma_{Ms,ca}$ (1)		1,8	
Steel failure: Local flexure of channel lips under shear load perpendicular to the longitudinal axis of the channel				
Spacing of channel bolts for $V_{Rk,s,l,eq}$	$s_{l,V}$	[mm]	carbon	79
Characteristic resistance	$V^0_{Rk,s,l,y,eq}$	[kN]	carbon	35
Partial factor	$\gamma_{Ms,l}$ (1)		1,8	
Steel failure: Connection between channel lips and channel bolt under shear in the direction of the longitudinal channel axis				
Characteristic resistance	$V_{Rk,s,l,x,eq}$	[kN]	carbon	13,5
Installation factor	γ_{inst} (1)		1,2	

(1) In absence of other national regulations

Table C18: Characteristic resistance under seismic shear load – steel failure of HALFEN channel bolt HSR

HALFEN channel bolt HSR			**M16**
Steel failure			
Characterist. resistance	$V_{Rk,s,eq}$	[kN]	62,8
Partial factor	γ_{Ms} (1)		1,25

(1) In absence of other national regulations

Table C19: Characteristic resistances under tension and shear load under fire exposure – steel failure

Anchor channel					28/15	38/17	41/22	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	$N_{Rk,s,fi}$ = $V_{Rk,s,y,fi}$	[kN]	1,0	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)
		M10			1,0	1,7	- (2)	1,9	1,9	1,9	1,9	1,9	- (2)	- (2)
		M12			1,9	1,7	2,4	1,9	2,5	2,5	2,5	2,5	- (2)	- (2)
		M16			- (2)	3,2	2,3	3,6	6,0	4,0	6,0	6,0	6,3	6,3
		M20			- (2)	- (2)	- (2)	- (2)	- (2)	4,0	9,5	8,9 10,1	10,3	10,3
		M24			- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	14,8	14,8
	R60	M8			0,8	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)
		M10			0,8	1,5	- (2)	1,5	1,5	1,5	1,5	1,5	- (2)	- (2)
		M12			1,3	1,5	1,7	1,5	2,5	2,5	2,5	2,5	- (2)	- (2)
		M16			- (2)	2,4	1,8	3,6	4,5	3,5	4,5	4,5	4,8	4,8
		M20			- (2)	- (2)	- (2)	- (2)	- (2)	3,5	7,1	6,5 7,5	7,6	7,6
		M24			- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	11,1	11,1
	R90	M8			0,6	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)
		M10			0,6	1,0	- (2)	1,1	1,1	1,1	1,1	1,1	- (2)	- (2)
		M12			0,7	1,0	1,1	1,1	1,6	1,6	1,6	1,6	- (2)	- (2)
		M16			- (2)	1,4	1,2	2,0	2,9	2,5	3,0	3,0	3,3	3,3
		M20			- (2)	- (2)	- (2)	- (2)	- (2)	2,5	4,8	4,2 4,8	4,9	4,9
		M24			- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	7,3	7,3
	R120	M8			0,5	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)
		M10			0,5	0,8	- (2)	0,8	0,8	0,8	0,8	0,8	- (2)	- (2)
		M12			0,5	0,8	0,7	0,8	1,1	1,2	1,2	1,2	- (2)	- (2)
		M16			- (2)	1,0	1,0	1,2	1,6	2,1	2,3	2,3	2,6	2,6
		M20			- (2)	- (2)	- (2)	- (2)	- (2)	2,1	3,6	3,0 3,5	3,6	3,6
		M24			- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	- (2)	5,4	5,4
Partial factor			$\gamma_{Ms,fi}$ (1)	[-]	1,0									

(1) In absence of other national regulations (2) No performance assessed

Table C20: Characteristic resistances under tension and shear load under fire exposure – concrete cone failure and minimum axis distance of reinforcement

Anchor channel				**28/15**	**38/17**	**41/22** **40/25**	**40/22** **40/22P**	**49/30**	**50/30** **50/30P**	**54/33** **52/34**	**55/42**	**72/49** **72/48**
Minimum axis distance of reinforcement (1)												
Minimum 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) The reinforced concrete has to be designed according to EN 1992. The fire resistance class of the concrete member is not part of this ETA.

Fig. 1

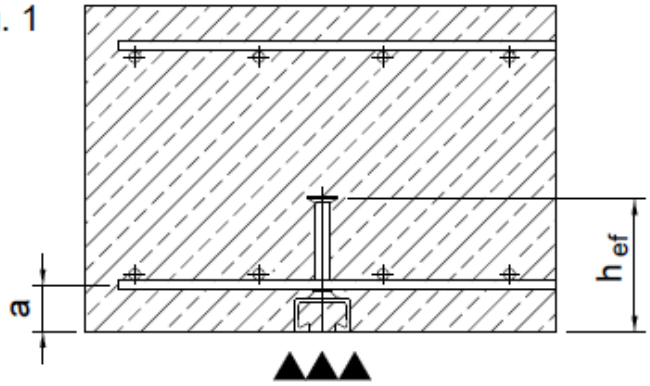
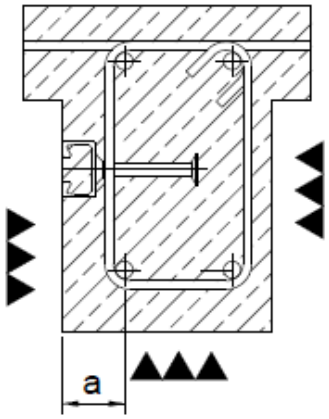


Fig. 2



British Board of Agrément,
1st Floor Building 3,
Hatters Lane,
Croxley Park
Watford
WD18 8YG