

HALFEN HZA DYNAGRIP SERRATED CAST-IN CHANNELS European Technical Assessment ETA-20/1081



HALFEN HZA DYNAGRIP SERRATED CAST-IN CHANNELS

General Note

Use of third-party products

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



Note: This translation of the original German version has not been verified by the Deutsches Institut für Bautechnik.

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-20/1081
of 14 April 2021

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 serrated anchor channel HZA

Product family
to which the construction product belongs

Anchor channels

Manufacturer

HALFEN GmbH
Liebigstraße 14
40764 Langenfeld
DEUTSCHLAND

Manufacturing plant

HALFEN Manufacturing Plants

This European Technical Assessment
contains

28 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 330008-03-0601, Edition 03/2021

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Specific Part

1 Technical description of the product

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

The anchor channel is embedded surface-flush in the concrete. HALFEN serrated channel bolts (hammerhead) 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 under tension load (static and quasi-static loading)	
- Resistance to steel failure of anchors, connection and channel lips	See Annex C1
- Resistance to steel failure of channel bolt	See Annex C2
- Resistance to steel failure by exceeding the bending strength of the channel	See Annex A7 and C1
- Maximum installation torque	See Annex B4
- Resistance to pull-out failure of the anchor and to concrete cone failure	See Annex B3 and C3
- Minimum edge distance, spacing and member thickness	See Annex A7 and B3
- Characteristic edge distance and spacing to avoid splitting of concrete under load	See Annex C3
- Resistance to blow-out failure – bearing area of anchor head	See Annex A6

<p>Characteristic resistance under shear load (static and quasi-static loading)</p> <ul style="list-style-type: none"> - Resistance to steel failure of channel bolt - Resistance to steel failure of channel lips, connection and anchor (shear load perpendicular to longitudinal axis of channel) - Resistance to steel failure of channel lips, anchor and connection (shear load in direction of longitudinal axis of channel) - Resistance to concrete failure 	<p>See Annex C8</p> <p>See Annex C5</p> <p>See Annex C5 and C6</p> <p>See Annex C7</p>
<p>Characteristic resistance under combined tension and shear load (static and quasi-static load)</p>	<p>See Annex C8</p>
<p>Characteristic resistances under cyclic fatigue tension load</p>	<p>No performance assessed</p>
<p>Displacements (static and quasi-static load)</p>	<p>See Annex C4 and C7</p>
<p>Durability</p>	<p>See Annex B1</p>

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No Performance assessed

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

In accordance with EAD No. 330008-03-0601, the applicable European legal act is: [2000/273/EC].

The system to be applied is: 1

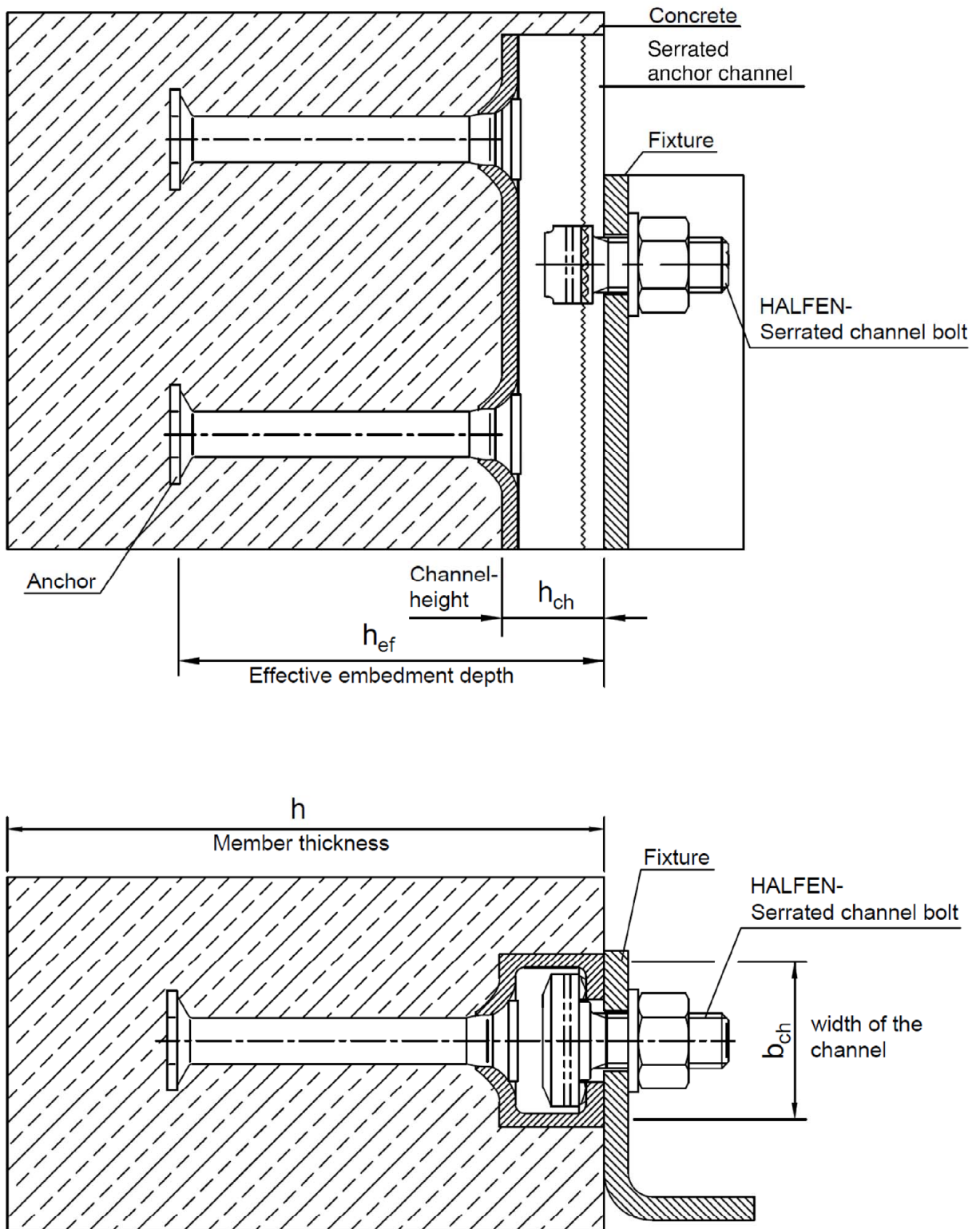
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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 14 April 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing.-. Beatrix Wittstock
Head of Section

beglaubigt:
Müller



HALFEN Serrated Anchor Channels HZA

Product description
Installed condition

Annex A1

Anchor channel HZA DYNAGRIP		Anchor channel HZA	
<p>Legend</p> <p>h_{ch} Channel height</p> <p>b_{ch} Width of the channel</p> <p>h_{ef} Effective anchorage depth</p>		<p>2 Round Anchor (also possible as weld-on I-profil)</p> <p>1 Channel e. g. HZA 38/23</p> <p>1 Channel HZA 41/22</p> <p>3 HALFEN-HZS Serrated channel bolt</p> <p>4 Washer</p> <p>5 Hexagonal Nut</p>	
<p>Marking of the HALFEN serrated anchor channel e.g.: HZA 38/23 A4</p>		<p>Marking of the HALFEN serrated channel bolts e.g.: HALFEN 8.8</p>	
<p>a) Stamped on inner side of channel back</p> <p>H or HALFEN ZA 38/23 A4</p>		<p>b) Printed on channel web</p> <p>Identifying mark of producer Type of anchor channel Size Material</p>	
<p>Material of serrated channel:</p> <p><u>Carbon steel</u></p> <p>No marking for 1.0038/1.0044/1.0045</p> <p>SV 1.0242+Z/1.0529+Z</p> <p><u>Stainless steel</u></p> <p>A2 1.4301/1.4307/1.4567/1.4541</p> <p>A4 1.4401/1.4404/1.4571</p> <p>L4, DX 1.4062/1.4162/1.4362</p> <p>F4, FA 1.4462</p> <p>HCR 1.4529/1.4547</p>		<p>Material of serrated channel bolts:</p> <p><u>Carbon steel</u></p> <p>No marking</p> <p><u>Stainless steel</u></p> <p>A2 1.4301/1.4307/1.4567/1.4541</p> <p>A4 1.4401/1.4404/1.4571/1.4578</p> <p>L4 1.4362</p> <p>F4, FA 1.4462</p> <p>HCR 1.4529/1.4547</p>	
<p>Strength grade of the serrated channel bolts:</p> <p><u>Carbon steel</u></p> <p>8.8 Strength grade 8.8</p> <p><u>Stainless steel</u></p> <p>50, 70 Strength grade 50, 70</p>			
<p>HALFEN Serrated Anchor Channels HZA</p>			<p>Annex A2</p>
<p>Product description Marking and materials</p>			

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			
①	Channel profile	Carbon steel 1.0038 (A), 1.0044 (A), 1.0045 (A) 1.0976 (D) hot-dip galv. $\geq 55 \mu\text{m}$ acc. to (N) 1.0242+Z (U), 1.0529+Z (U) hot-dip coated $\geq 15 \mu\text{m}$	Carbon steel 1.0038 (A), 1.0044 (A), 1.0045(A) 1.0976 (D) hot-dip galv. $\geq 55 \mu\text{m}$ acc. 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) 1.0401 (C) hot-dip galv. $\geq 55 \mu\text{m}$ acc. 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) 1.0401 (C) hot-dip galv. $\geq 55 \mu\text{m}$ acc. to (N) Stainless Steel ⁵⁾ 1.4301 (G), 1.4307 (G) 1.4567 (G), 1.4541 (G)
③	HALFEN serrated channel bolts	Carbon steel strength grade 8.8 (J) hot-dip galv. $\geq 50 \mu\text{m}$ acc. to (P) ¹⁾	Carbon steel strength grade 8.8 (J) hot-dip galv. $\geq 50 \mu\text{m}$ acc. to (P) ¹⁾ Stainless Steel ⁵⁾ strength grade 5,70 (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 10025:2005 electroplated $\geq 5 \mu\text{m}$ acc. to (O)	Carbon steel EN 10025:2005 hot-dip galv. $\geq 50 \mu\text{m}$ acc. to (P) ¹⁾ Stainless Steel ⁵⁾ steel grade A2, A3 (K)
⑤	Hexagonal nuts (T)	Carbon steel strength grade 5/8 (L) electroplated $\geq 5 \mu\text{m}$ acc. to (O)	Carbon steel strength grade 5/8 (L) hot-dip galv. $\geq 50 \mu\text{m}$ acc. to (P) ¹⁾ Stainless steel ⁵⁾ strength grade 70, 80 (M) steel grade A2, A3 (M)

HALFEN Serrated Anchor Channels HZA

Product description
Materials and intended use

Annex A3

Table A1 (continued): Materials and intended use

Item no.	Specification	Intended use		
		3	4	5
		according EN 1993-1-4, Tab. A.2		
		For CRC III	For CRC IV	For CRC V
		Materials		
①	Channel profile	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)	Stainless Steel 1.4529 (G), 1.4547 (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)
③	HALFEN serrated 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)
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)
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)

A - EN 10025-2:2004

F - EN 10088-2:2014

K - EN ISO 3506-1:2009

P - EN ISO 10684:2004

B - EN 10263-2:2017

G - EN 10088-3:2014

L - EN ISO 898-2:2012

R - EN ISO 7089:2000

C - EN 10277-2:2008

H - EN 10269:2013

M - EN ISO 3506-2:2009

S - EN ISO 7093-1:2000

D - EN 10149-2:2013

I - EN 10263-4:2017

N - EN ISO 1461:2009

T - EN ISO 4032:2012

E - EN 10263-3:2017

J - EN ISO 898-1:2013

O - EN ISO 4042:1999

U - EN 10346:2015

¹⁾ or electroplated with special coating $\geq 12 \mu\text{m}$

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 acc. to EN 1992-1-1 + AC:2010

⁵⁾ stainless steel anchors only in combination with stainless steel channel profiles, channel bolts, washers and nuts

HALFEN Serrated Anchor Channels HZA

Product description
Materials and intended use

Annex A4

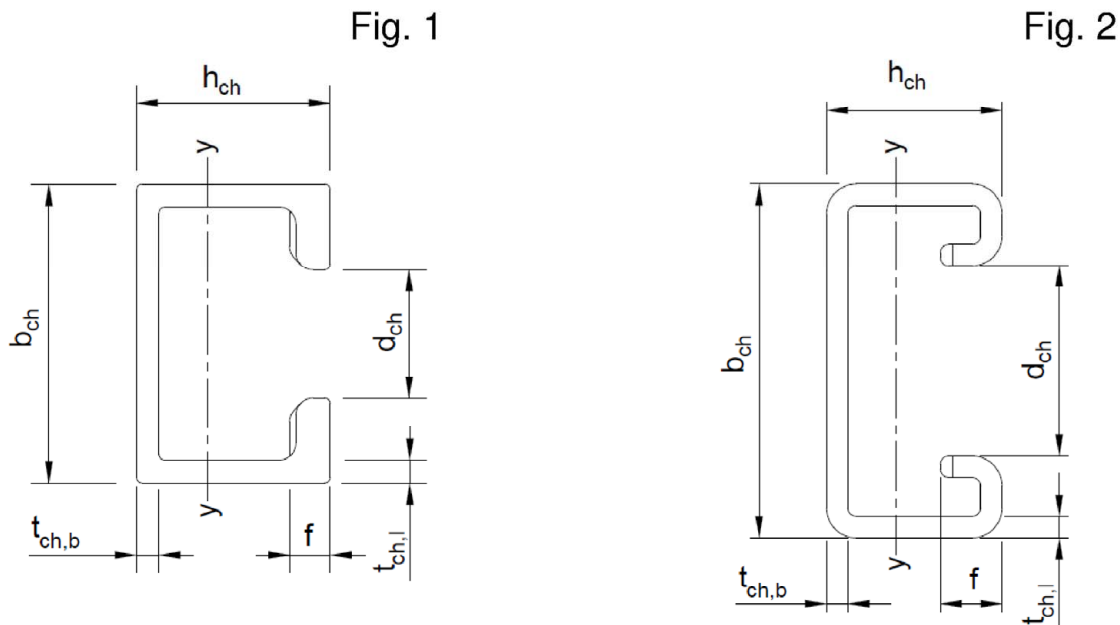


Table A2: Profile dimensions (steel and stainless steel)

Anchor channel HZA	Material		Dimensions						
			b _{ch}	h _{ch}	t _{ch,b}	t _{ch,l}	d _{ch}	f	I _y
			[mm]						
29/20	Carbon steel	Fig. 1	29,0	20,0	2,5	2,5	14,0	5,0	10.200
38/23	Carbon steel & stainless steel		38,0	23,0	3,5	3,0	18,0	5,5	21.100
41/27	Carbon steel		40,0	27,0	4,2	4,0	18,0	7,0	39.000
53/34	Carbon steel & stainless steel		52,5	34,0	4,0	4,0	22,5	7,5	92.600
64/44	Carbon steel & stainless steel		64,0	44,0	4,5	5,0	26,0	10,0	240.300
41/22	Carbon steel & stainless steel	Fig. 2	41,3	20,7	2,5	2,5	22,3	7,2	12.600

HALFEN Serrated Anchor Channels HZA

Product description
Profile dimensions

Annex A5

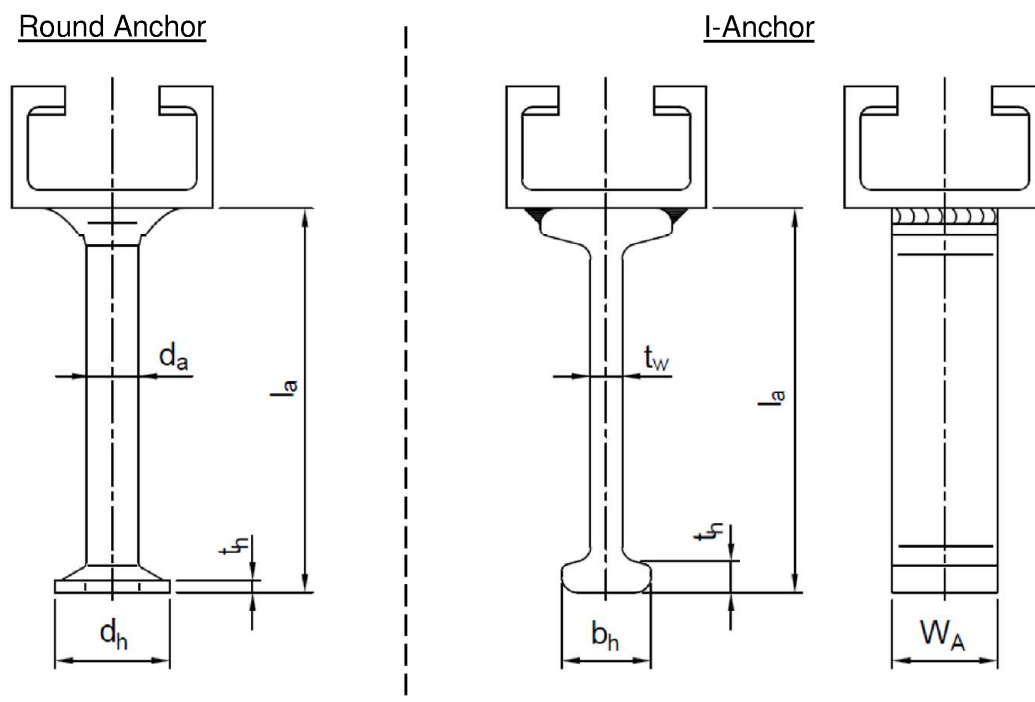


Table A3: Dimensions of anchors (Round Anchor and I-Anchor)

Anchor channel HZA	Round Anchor					I-Anchor					
	min l_a	d_a	d_h	t_h	A_h	min l_a	t_w	b_h	t_h	W_A	A_h
	[mm]					[mm ²]	[mm]				
29/20	64,0	8	16	1,9	151	69	5	18	3,5	12-20	156
38/23	73,0	10	20	2,2	236	128	6	17	5	20-30	220
41/27	124,0	12	25	2,7	378	128	6	17	5	25-35	275
53/34	123,7	12	25	2,7	378	128	6	17	5	30-40	330
64/44	— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	140	7,1	20	6	41-50	529
41/22	63,3	8	16	1,9	151	69	5	18	3,5	12-20	156

¹⁾ Product not available

HALFEN Serrated Anchor Channels HZA

Product description
Dimensions of anchors

Annex A6

Figure 1
Round Anchor

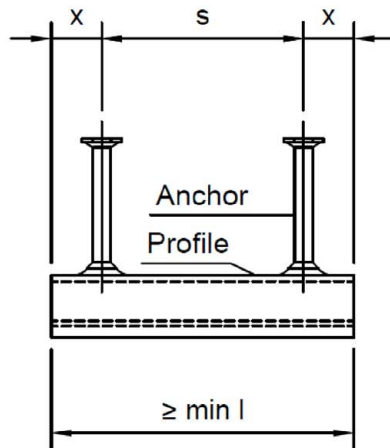


Figure 2
I-Anchor

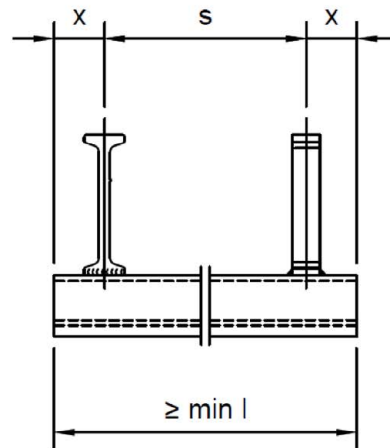


Table A4: Anchor positioning

Anchor channel HZA	Anchor spacing s		End spacing x		Min. Channel length l_{min}	
	s_{min}	s_{max}	Round Anchor Fig. 1	I-Anchor Fig. 2	Round Anchor Fig. 1	I-Anchor Fig. 2
	[mm]					
29/20	50	200	28	28	106	106
38/23	80	250	28	28	136	136
41/27	80	250	35	35	150	150
53/34	80	250	35	35	150	150
64/44	80	300	– ¹⁾	35	– ¹⁾	150
41/22	50	250	25	25	100	100

¹⁾ Product not available

HALFEN Serrated Anchor Channels HZA

Product description
Anchor positioning, channel length

Annex A7

HALFEN serrated channel bolts

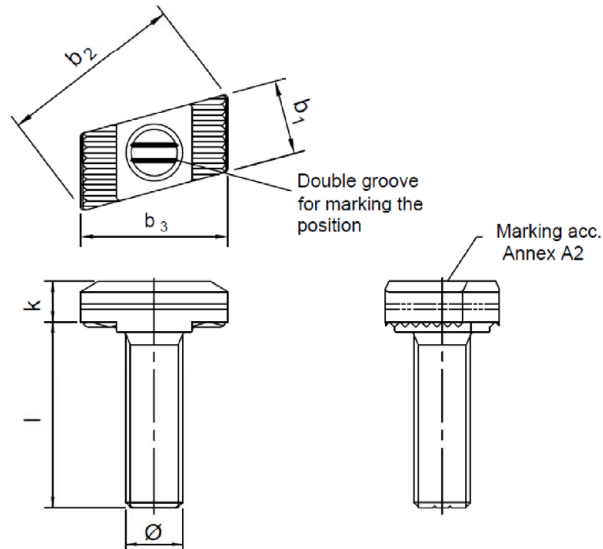


Table A5: Dimensions of HALFEN serrated channel bolts

Anchor channel HZA	Channel bolt HZA	Material	Thread Ø	Width b1	Diagonal b2	Length b3	Thickness k
				[mm]			
29/20	HZA 29/20	8.8	M12	13,4	27,1	20,9	6,5
38/23 and 41/27	HZA 38/23	8.8 A4-70	M12	17,0	37,0	28,8	8,0
		8.8 A4-70	M16	17,0	37,0	28,8	8,0
53/34	HZA 53/34	8.8 A4-70	M16	21,0	51,6	41,6	11,5
		8.8 A4-70	M20	21,0	51,6	41,6	13,0
64/44	HZA 64/44	8.8 A4-70	M20	24,7	63,1	51,0	14,0
		8.8 A4-70	M24	24,7	63,1	51,0	16,0
41/22	HZA 41/22	8.8	M12	20,5	42,5	34,7	5,5
		A4-50	M12	20,5	42,5	34,7	7,5
		8.8 A4-50	M16	20,5	42,5	34,7	7,5

HALFEN Serrated Anchor Channels HZA

Product description
HALFEN serrated channel bolts, dimensions

Annex A8

Table A6: Strength grade

	Steel ¹⁾	Stainless steel ¹⁾	
Strength grade	8.8	50	70
f_{uk} [N/mm ²]	800	500	700
f_{yk} [N/mm ²]	640	210	450
Finish	Hot-dip galvanized	-	

¹⁾ Materials according Annex A2 and Annex A3-A4, Tab. A1

HALFEN Serrated Anchor Channels HZA

Product description
HALFEN serrated channel bolts, strength grade

Annex A9

Specifications for intended use

Anchor channels and channel bolts subject to:

- Static and quasi-static loads in tension, shear perpendicular to the longitudinal axis of the channel and shear in the direction of the longitudinal axis of the channel

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1+A1+A2:2000.
- Strength classes C12/15 to C90/105 according to EN 206-1+A1+A2:2000.
- Cracked or uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
(serrated anchor channels and serrated channel bolts according to Annex A3-A4, Table A1, column 1 - 5)
- 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)
(serrated anchor channels and serrated channel bolts according to Annex A3-A4, Table A1, column 2 - 5)
- According to EN 1993-1-4:2006+A2:2015 relating to corrosion resistance class CRC III
(serrated anchor channels and serrated channel bolts according to Annex A4, Table A1, column 3 - 5)
- According to EN 1993-1-4:2006+A2:2015 relating to corrosion resistance class CRC IV
(serrated anchor channels and serrated channel bolts according to Annex A4, Table A1, column 4 - 5)
- According to EN 1993-1-4:2006+A2:2015 relating to corrosion resistance class CRC V
(serrated anchor channels and serrated channel bolts according to Annex A4, Table A1, column 5)

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 serrated anchor channel and serrated 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 the anchor channels are designed in accordance with EOTA TR 047 "Design of Anchor Channels", March 2018 or EN 1992-4:2018.
- The characteristic resistances are calculated with the minimum effective embedment depth.

HALFEN Serrated Anchor Channels HZA

Intended use
Specifications

Annex B1

Installation:

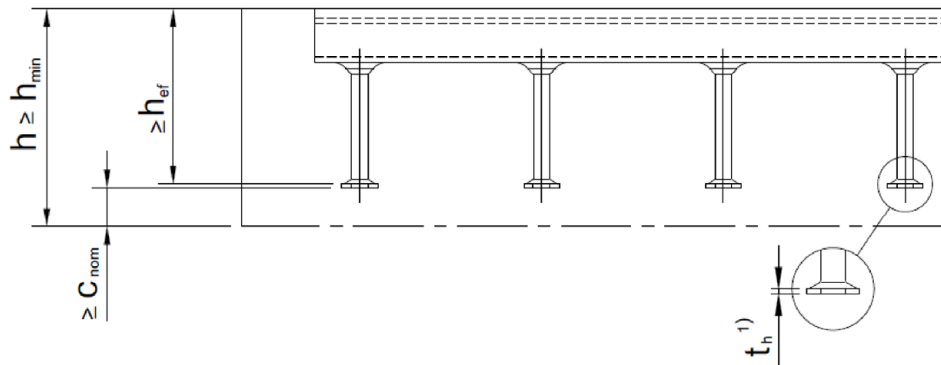
- The installation of anchor channels is carried out by appropriately qualified personnel under the supervision of the person responsible for the technical matters on site.
- Use of the anchor channels only as supplied by the manufacturer – without any manipulations, repositioning or exchanging of channel components.
- Cutting of anchor channels is allowed only if pieces according to Annex A7, Table A4 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-A4 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 Serrated Anchor Channels HZA

Intended use
Specifications

Annex B2

Side view



Plan view

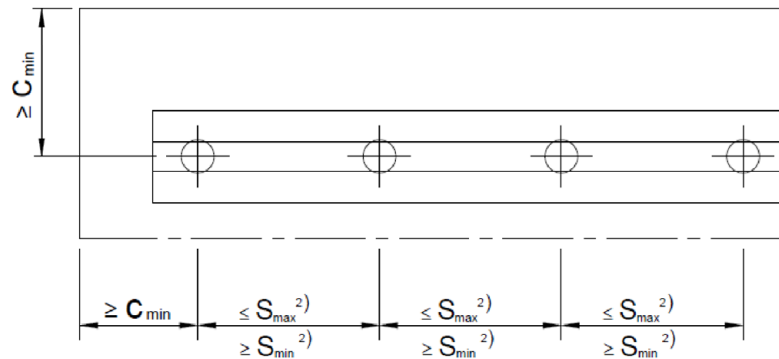


Table B1: Min. effective embedment depth, edge distance and thickness of concrete member

Serrated anchor channel HZA			29/20	38/23	41/27	53/34	64/44	41/22
Minimum effective embedment depth	[mm]	$h_{ef,min}$	82	94	148	155	178	82
Minimum edge distance		C_{min}	50	75	75	100	125	50
Minimum thickness of concrete member		h_{min}	$h_{ef} + t_h^{1)} + C_{nom}^{3)}$					
			125	125	170	200	200	125

1) t_h = Anchor head thickness

2) S_{min} , S_{max} acc. to Annex A7, Tab. A4

3) C_{nom} acc. to EN 1992-1-1 :2004 + AC 2010

HALFEN Serrated Anchor Channels HZA

Intended use
Installation parameters of anchor channels

Annex B3

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

Anchor channel HZA	HALFEN serrated channel bolts \varnothing	Min. spacing of the serrated channel bolts $S_{min,cbo}$	Installation torque T_{inst} ⁴⁾					
			General ²⁾			Steel-to-steel contact ³⁾		
			$T_{inst,g}$			$T_{inst,s}$		
			Steel 8.8 ¹⁾	Stainless steel		Steel 8.8 ¹⁾	Stainless steel	
	50 ¹⁾	70 ¹⁾		50 ¹⁾	70 ¹⁾			
	[mm]		[Nm]					
29/20	12	60	35	— ⁵⁾	— ⁵⁾	75	— ⁵⁾	— ⁵⁾
38/23	12	60	55	— ⁵⁾	50	75	— ⁵⁾	50
	16	80	75	— ⁵⁾	75	185	— ⁵⁾	130
41/27	12	60	75	— ⁵⁾	— ⁵⁾	75	— ⁵⁾	— ⁵⁾
	16	80	125	— ⁵⁾	— ⁵⁾	185	— ⁵⁾	— ⁵⁾
53/34	16	80	135	— ⁵⁾	130	185	— ⁵⁾	130
	20	100	165	— ⁵⁾	165	360	— ⁵⁾	250
64/44	20	100	315	— ⁵⁾	250	360	— ⁵⁾	250
	24	120	375	— ⁵⁾	335	625	— ⁵⁾	435
41/22	12	60	30	20	— ⁵⁾	50	20	— ⁵⁾
	16	80	40	50	— ⁵⁾	140	50	— ⁵⁾

¹⁾ Materials according to Annex A2 and Annex A3-A4, Tab. A1

²⁾ Acc. to Annex B5, Fig.1

³⁾ Acc. to Annex B5, Fig. 2

⁴⁾ T_{inst} must not be exceeded

⁵⁾ Product not available

HALFEN Serrated Anchor Channels HZA

Intended use
Installation parameters

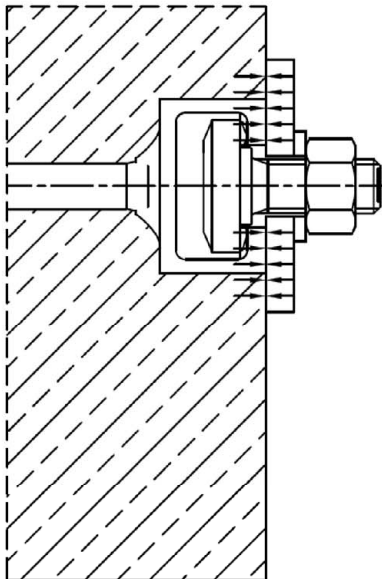
Annex B4

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.

Fig. 1

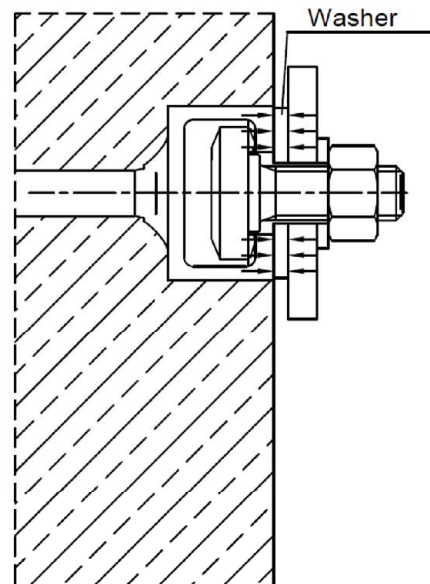


Steel-to-steel contact

The fixture is not in contact with the concrete surface. 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. 2

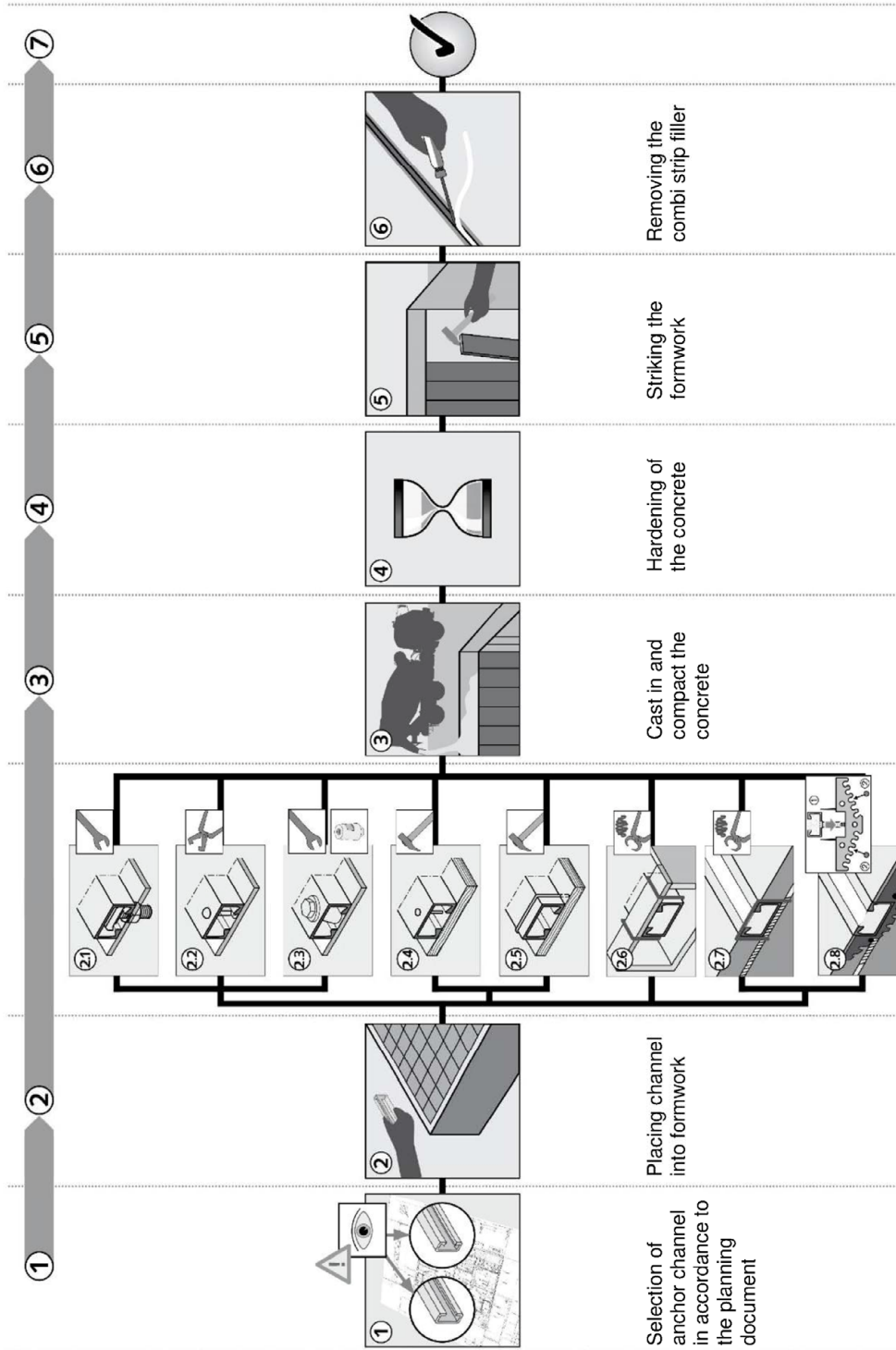


HALFEN Serrated Anchor Channels HZA

Intended use
Position of the fixture

Annex B5

Installation of HALFEN anchor channel



- 2.1 Steel formwork: Fixing with HALFEN serrated 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 Serrated Anchor Channels HZA

Intended use
Installation instruction of HALFEN serrated anchor channel

Annex B6

Installation of HALFEN serrated channel bolts

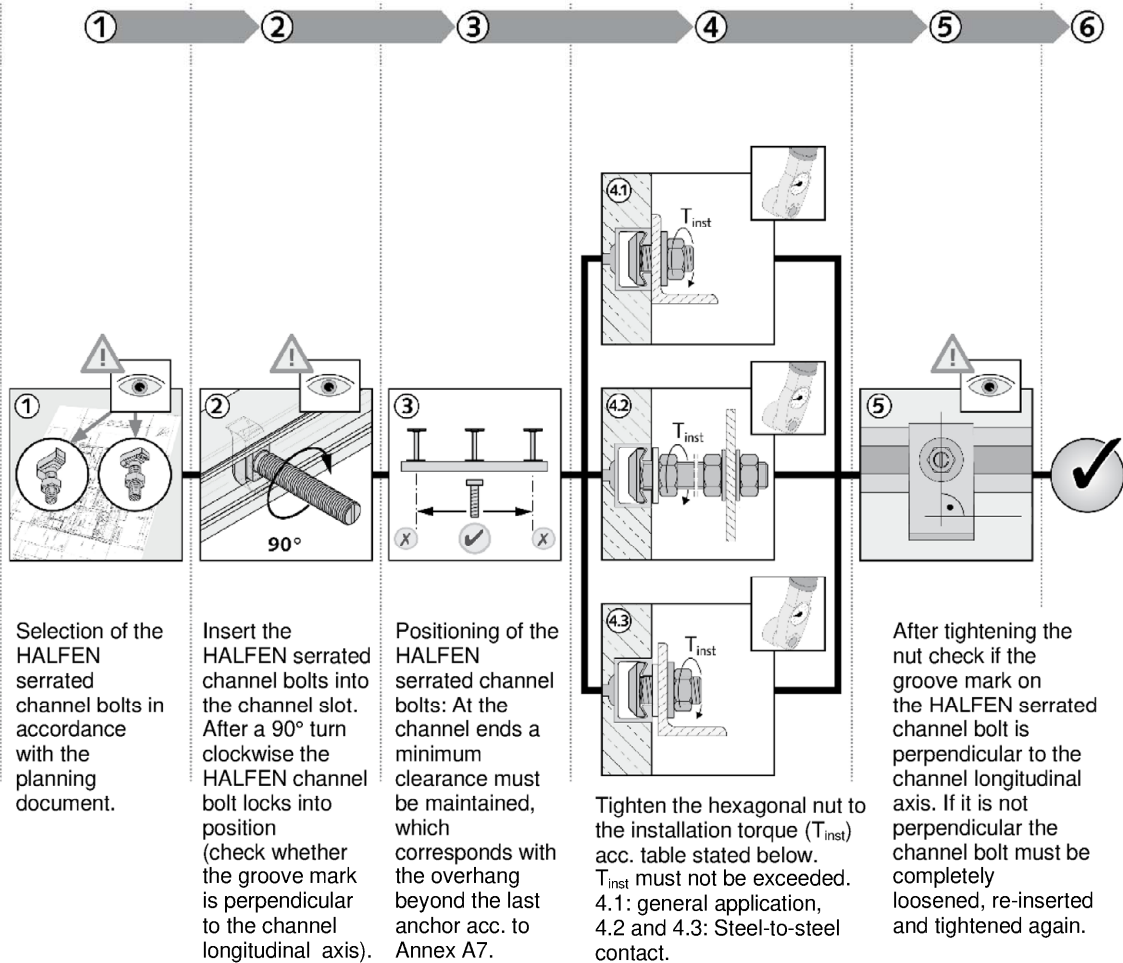


Table B3: Installation torque

Pos. of fixture acc. Annex B5	Material strength grade		Anchor channel HZA	T_{inst} [Nm] ¹⁾					
				M12	M16	M20	M24		
General	Steel 8.8 and (Stainless steel 50 / 70)		29/20	35	— ³⁾	— ³⁾	— ³⁾		
			38/23	55 (50)	75 (75)	— ³⁾	— ³⁾		
			41/27	75	125	— ³⁾	— ³⁾		
			53/34	— ³⁾	135 (130)	165 (165)	— ³⁾		
			64/44	— ³⁾	— ³⁾	315 (250)	375 (335)		
Steel-to-steel contact	Steel	8.8	All profiles	75	50 ²⁾	185	140 ²⁾	360	625
		50		20	50	— ³⁾	— ³⁾		
	Stainless steel	70		50	130	250	435		

¹⁾ T_{inst} must not be exceeded

²⁾ Only for HZS 41/22 M12 8.8 and for HZS 41/22 M16 8.8

³⁾ Product not available

HALFEN Serrated Anchor Channels HZA

Intended use
Installation instruction of HALFEN serrated channel bolts

Annex B7

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

Serrated anchor channel			Steel	29/20	38/23	41/27	53/34	64/44	41/22
Steel failure, anchor									
Characteristic resistance	$N_{Rk,s,a}$	[kN]	carbon	20,1	31,4	54,0	56,5	104,7	20,1
			stainless	– ²⁾	31,4	– ²⁾	56,5	104,7	22,6
Partial safety factor	γ_{Ms} ¹⁾		carbon	1,78	1,78	1,80	1,67	1,80	1,78
			stainless	– ²⁾		– ²⁾			1,80
Steel failure, connection channel/anchor									
Characteristic resistance	$N_{Rk,s,c}$	[kN]	carbon	22,9	36,0	53,6	59,6	106,1	18,1
			stainless	– ²⁾	40,0	– ²⁾	55,0	94,4	26,1
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]	58	76	80	105	128	83	
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	carbon	22,9	39,3	53,6	82,5	106,1	18,1
			stainless	– ²⁾	40,0	– ²⁾	55,0	94,4	26,1
Partial safety factor	$\gamma_{Ms,l}$ ¹⁾		1,8						

¹⁾ In absence of other national regulations

²⁾ No performance assessed

Table C2: Characteristic flexural resistance of channel

Serrated Anchor channel			Steel	29/20	38/23	41/27	53/34	64/44	41/22
Characteristic flexure resistance of channel	$M_{Rk,s,flex}$	[Nm]	carbon	873	1497	2289	3452	6935	733
			stainless	– ²⁾	1670	– ²⁾	3608	7922	749
Partial safety factor	$\gamma_{Ms,flex}$ ¹⁾		1,15						

¹⁾ In absence of other national regulations

²⁾ No performance assessed

HALFEN Serrated Anchor Channels HZA

Performances
Characteristic resistances under tension load – steel failure

Annex C1

Table C3: Characteristic resistance under tension load – steel failure of
HALFEN serrated channel bolt

HALFEN serrated channel bolt Ø				M12	M16	M20	M24	
Steel failure								
Characteristic resistance	N _{Rk,s}	[kN]	Carbon steel	8.8	67,4 (48,5) ¹⁾	125,6 (96,3) ²⁾	196,0	282,4
			Stainless steel	50 ³⁾	40,3	64,0	– ⁵⁾	– ⁵⁾
				70 ³⁾	59,0	109,9	171,5	247,1
Partial safety factor	γ _{Ms} ⁴⁾		Carbon steel	8.8	1,50			
			Stainless steel	50 ³⁾	2,86			
				70 ³⁾	1,87			

¹⁾ For HZS 41/22 M12 8.8

²⁾ For HZS 41/22 M16 8.8

³⁾ Materials according Annex A2, A3 and A4

⁴⁾ In absence of other national regulations

⁵⁾ No performance assessed

HALFEN Serrated Anchor Channels HZA

Performances
Characteristic resistances under tension load – steel failure serrated channel bolts

Annex C2

Table C4: Characteristic resistances under tension load – concrete failure

Serrated anchor channel				29/20	38/23	41/27	53/34	64/44	41/22
Pull-out failure									
Characteristic resistance in cracked concrete C12/15	Round anchors	$N_{Rk,p}$	[kN]	13,6	21,2	34,0	34,0	– ²⁾	13,6
	I-anchors			14,0	19,8	24,8	29,7	47,6	14,0
Characteristic resistance in uncracked concrete C12/15	Round anchors	$N_{Rk,p}$	[kN]	19,0	29,7	47,6	47,6	– ²⁾	19,0
	I-anchors			19,7	27,7	34,7	41,6	66,6	19,7
Increasing factor for $N_{Rk,p}$ $= N_{Rk,p}(C12/15) \cdot \Psi_c$	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	$k_{cr,N}$			7,9	8,1	8,6	8,7	8,9	7,9
	$k_{ucr,N}$			11,3	11,5	12,3	12,4	12,7	11,3
Partial safety factor		$\gamma_{Mc}^{1)}$		1,5					
Splitting failure									
Charact. edge spacing	$c_{cr,sp}$	[mm]		246	281	445	465	534	246
Charact. spacing	$s_{cr,sp}$			492	562	890	930	1068	492
Partial safety factor		$\gamma_{Msp}^{1)}$		1,5					

¹⁾ In absence of other national regulations

²⁾ No performance assessed

HALFEN Serrated Anchor Channels HZA

Performances
Characteristic resistances under tension load – concrete failure

Annex C3

Table C5: Displacements under tension load

Serrated anchor channel			Steel	29/20	38/23	41/27	53/34	64/44	41/22
Tension load	N	[kN]	carbon	6,8	9,1	14,4	22,2	38,5	5,1
			stainless	– ¹⁾	10,9	– ¹⁾	21,8	37,4	8,5
Short-term displacement	δ_{N0}	[mm]	carbon	0,5	0,8	0,9	0,7	0,8	0,6
			stainless	– ¹⁾	0,9	– ¹⁾	0,7	0,7	1,0
Long-term displacement	$\delta_{N\infty}$	[mm]	carbon	0,9	1,7	1,8	1,4	1,7	1,3
			stainless	– ¹⁾	1,8	– ¹⁾	1,5	1,4	1,9

¹⁾ No performance assessed

HALFEN Serrated Anchor Channels HZA

Performances
Characteristic resistances under tension load – displacements

Annex C4

Table C6: Characteristic resistances under shear load – steel failure anchor channel

Serrated anchor channel			Steel	29/20	38/23	41/27	53/34	64/44	41/22
Steel failure, anchor									
Characteristic resistance	$V_{Rk,s,a,y}$	[kN]	carbon	20,1	43,9	53,6	101,1	156,3	18,1
			stainless	– ²⁾	31,4	– ²⁾	55,0	94,4	22,6
	$V_{Rk,s,a,x}$	[kN]	carbon	12,0	18,8	32,4	33,9	62,8	12,0
			stainless	– ²⁾	18,8	– ²⁾	33,9	62,8	13,5
Partial safety factor	$\gamma_{Ms,a,y} ; \gamma_{Ms,a,x}$ ¹⁾		carbon	1,48	1,48	1,50	1,39	1,50	1,48
			stainless	– ²⁾	1,48	– ²⁾	1,39	1,50	1,50
Steel failure, connection channel/anchor									
Characteristic resistance	$V_{Rk,s,c,y}$	[kN]	carbon	20,1	43,9	53,6	101,1	156,3	18,1
			stainless	– ²⁾	31,4	– ²⁾	55,0	94,4	22,6
	$V_{Rk,s,c,x}$	[kN]	carbon	13,7	21,6	32,2	35,8	63,7	10,9
			stainless	– ²⁾	24,0	– ²⁾	33,0	56,6	15,7
Partial safety factor	$\gamma_{Ms,ca,y} ; \gamma_{Ms,ca,x}$ ¹⁾		1,8						
Steel failure, local flexure of channel lips									
Spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,v}$	[mm]	58	76	80	105	128	83	
Characteristic resistance	$V^0_{Rk,s,l,y}$	[kN]	carbon	20,1	43,9	53,6	101,1	156,3	18,1
			stainless	– ²⁾	31,4	– ²⁾	55,0	94,4	22,6
Partial safety factor	$\gamma_{Ms,l,y}$ ¹⁾		1,8						

¹⁾ In absence of other national regulations

²⁾ No performance assessed

HALFEN Serrated Anchor Channels HZA

Performances
Characteristic resistances under shear load – steel failure

Annex C5

Table C6 (continued): Characteristic resistances under shear load – steel failure

Serrated anchor channel		Steel	29/20	38/23	41/27	53/34	64/44	41/22	
Steel failure, connection between channel lips and channel bolt in longitudinal channel axis									
Characteristic resistance	$V_{Rk,s,l,x}$ [kN]	M12	carbon	12,6	23,6	23,6	– ¹⁾	– ¹⁾	14,4
			stainless	– ¹⁾	– ¹⁾	– ¹⁾	– ¹⁾	– ¹⁾	– ¹⁾
		M16	carbon	– ¹⁾	23,6	32,0	39,5	– ¹⁾	14,4
			stainless	– ¹⁾	24,9	– ¹⁾	51,7	– ¹⁾	14,2
		M20	carbon	– ¹⁾	– ¹⁾	– ¹⁾	39,5	85,8	– ¹⁾
			stainless	– ¹⁾	– ¹⁾	– ¹⁾	51,7	68,8	– ¹⁾
		M24	carbon	– ¹⁾	– ¹⁾	– ¹⁾	– ¹⁾	85,8	– ¹⁾
			stainless	– ¹⁾	– ¹⁾	– ¹⁾	– ¹⁾	68,8	– ¹⁾
Installation factor	γ_{inst}	carbon	1,0	1,2	1,2	1,2	1,2	1,2	
		stainless	– ¹⁾	1,2	– ¹⁾	1,4	1,0	1,4	

¹⁾ No performance assessed

HALFEN Serrated Anchor Channels HZA

Performances
Characteristic resistances under shear load – steel failure

Annex C6

Table C7: Characteristic resistances under shear load – concrete failure

Serrated anchor channel		29/20	38/23	41/27	53/34	64/44	41/22
Pry-out failure							
Product factor	k_8 ¹⁾	2,0	2,0	2,0	2,0	2,0	2,0
Partial safety factor	γ_{Mc} ²⁾	1,5					
Concrete edge failure							
Product factor k_{12}	cracked concrete	$k_{cr,V}$	6,1	7,5	7,5	7,5	6,5
	uncracked concrete	$k_{ucr,V}$	8,5	10,5	10,5	10,5	9,1
Partial safety factor	γ_{Mc} ²⁾	1,5					

¹⁾ Without supplementary reinforcement. In case of supplementary reinforcement, the factor k_8 should be multiplied with 0,75.

²⁾ In absence of other national regulations

Table C8: Displacements under shear load

Serrated anchor channel			Steel	29/20	38/23	41/27	53/34	64/44	41/22
Shear load in y-direction ¹⁾	V_y	[kN]	carbon	8,0	12,5	21,3	22,4	41,5	7,2
			stainless	– ³⁾	12,5	– ³⁾	21,8	37,5	9,0
Short-term displacement in y-direction	$\delta_{V,y,0}$	[mm]	carbon	0,9	1,8	0,9	1,4	1,6	0,6
			stainless	– ³⁾	2,3	– ³⁾	2,3	4,1	0,9
Long-term displacement in y-direction	$\delta_{V,y,\infty}$	[mm]	carbon	1,4	2,7	1,4	2,1	2,4	0,9
			stainless	– ³⁾	3,5	– ³⁾	3,4	6,2	1,4
Shear load in x-direction ²⁾	V_x	[kN]	carbon	5,0	7,8	10,5	13,0	28,3	4,7
			stainless	– ³⁾	8,2	– ³⁾	14,6	27,3	4,0
Short-term displacement in x-direction	$\delta_{V,x,0}$	[mm]	carbon	0,4	0,2	0,2	0,3	0,9	0,1
			stainless	– ³⁾	0,6	– ³⁾	0,5	0,9	0,2
Long-term displacement in x-direction	$\delta_{V,x,\infty}$	[mm]	carbon	0,6	0,3	0,3	0,5	1,4	0,2
			stainless	– ³⁾	0,9	– ³⁾	0,8	1,4	0,3

¹⁾ y-direction (perpendicular to longitudinal axis of channel)

²⁾ x-direction (in longitudinal channel axis)

³⁾ No performance assessed

HALFEN Serrated Anchor Channels HZA

Performances
Characteristic resistances under shear load – concrete failure, displacements

Annex C7

Table C9: Characteristic resistance under shear load – steel failure of HALFEN serrated channel bolt

HALFEN serrated channel bolt Ø				M12	M16	M20	M24	
Steel failure								
Characteristic resistance	$V_{Rk,s}$	[kN]	steel	8.8	33,7	62,8	98,0	141,2
			Stainless steel	50 ¹⁾	25,3	47,1	– ⁴⁾	– ⁴⁾
				70 ¹⁾	35,4	65,9	102,9	148,3
Characteristic flexural resistance	$M^0_{Rk,s}$	[Nm]	steel	8.8	105	266 ²⁾	519	898
			Stainless steel	50 ¹⁾	66	167	– ⁴⁾	– ⁴⁾
				70 ¹⁾	92	233	454	786
Partial safety factor	γ_{Ms} ³⁾		steel	8.8	1,25			
			Stainless steel	50 ¹⁾	2,38			
				70 ¹⁾	1,56			

¹⁾ Materials according Annex A2 and A3-A4

²⁾ For HZS 41/22 M16 8.8, $M^0_{Rk,s}$ is limited to 261 Nm.

³⁾ In absence of other national regulations

⁴⁾ No performance assessed

Table C10: Characteristic resistance under combined tension and shear load

Serrated anchor channel	29/20	38/23	41/27	53/34	64/44	41/22
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				

HALFEN Serrated Anchor Channels HZA

Performances
Char. resist. of HALFEN serr. channel bolt under shear, comb. tension and shear

Annex C8

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