

DECLARATION OF PERFORMANCE

DoP_Halfen-HZA_2025-10

No. H01-20/1081

1.	Unique identification code of the product-type	HALFEN serrated Anchor channels HZA 41/22, HZA DYNAGRIP 29/20, HZA DYNAGRIP 38/23, HZA DYNAGRIP 41/27, HZA DYNAGRIP 53/34, and HZA DYNAGRIP 64/44
2.	Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4)	See ETA-20/1081, 20.10.2025, Annex A1, A2 and A5
3.	Intended use or uses of the construction product, in accordance with the applicable harmonized technical specification, as foreseen by the manufacturer:	
	Generic type and use	Cast-in, C-shaped, hot-rolled (DYNAGRIP) or cold-formed serrated anchor channel with at least 2 metal anchors fixed on the profile back in combination with hammer-head bolts
	Product size covered (anchor channels and corresponding screws)	HZA 41/22 with channel bolt HZS 41/22 M10, M12 & M16, HZA DYNAGRIP 29/20 with channel bolt HZS 29/20 M12, HZA DYNAGRIP 38/23 with channel bolt HZS 38/23 M12 & M16 HZA DYNAGRIP 41/27 with channel bolt HZS 38/23 M12 & M16 HZA DYNAGRIP 53/34 with channel bolt HZS 53/34 M16 & M20 HZA DYNAGRIP 64/44 with channel bolt HZS 64/44 M20 & M24
	For use in	Cracked and non-cracked concrete C12/15 to C90/105 according to EN 206-1:2000-12
	Anchor material / Screw material and intended use	• Hot-dip galv. steel / electroplated steel for dry internal conditions • Hot-dip galv. steel / hot-dip galv. steel or electroplated steel with special coating also for internal conditions with normal humidity • Stainless steel / stainless steel also for medium corrosion exposure • High corrosion resistant steel / high corrosion resistant steel also for high corrosion exposure
	Loading	Static & quasi static tension and shear loads perpendicular to and in the direction of the longitudinal axis of the channel, fatigue cyclic tension load, seismic tension and shear loads perpendicular and in the direction of the longitudinal axis of the channel (seismic performance category C1), and fire exposure
4.	Name, registered trade name or registered trademark and contact address of the manufacturer as required pursuant to Article 11(5)	Leviat GmbH, Liebigstraße 14, 40764 Langenfeld, Germany
5.	Where applicable, name and contact address of the authorized representative whose mandate covers the tasks specified in Article 12(2)	-
6.	System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V	System 1
7.	In case of the declaration of performance concerning a construction product covered by a harmonised standard	-
8.	In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued	Deutsches Institut für Bautechnik (DIBt) issued ETA-20/1081 on the basis of EAD 330008-04-0601. The notified body 2323 performed under system 1 (ii) Initial inspection of the manufacturing plant and of factory production control; (iii) Continuous surveillance, assessment and evaluation of factory production control under system 1;

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		and issued the certificate of conformity 2323-CPR-0072				
9.	Declared performance					
	Essential Characteristics	Design Method	Performance	Harmonized Technical Specification		
	Characteristic resistance for tension	EN 1992-4, EOTA TR 047	ETA-20/1081, Annex C1-C3	EAD 330008-04-0601		
	Characteristic resistance for shear perpendicular and longitudinal to channel axis		ETA-20/1081, Annex C5-C8			
	Characteristic resistance for combined tension and shear		ETA-20/1081, Annex C8			
	Displacement for serviceability limit state		ETA-20/1081, Annex C4, C7			
	Characteristic resistance for fatigue cyclic loading		ETA-20/1081, Annex C9-C10			
	Characteristic resistance for seismic loading		ETA-20/1081, Annex C11-C12			
	Characteristic resistance for fire exposure		ETA-20/1081, Annex C13-C14			
	Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies:		-			
	10.		The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9.			
This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.						

Langenfeld, 04.05.2026

Signed for and on behalf of the manufacturer by



Joachim Liehr
 (Managing Director)



Dr. Ing. Dirk Albartus
 (Prokurist)

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Annex 1:

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	100,0	20,1
			stainless	— ²⁾	31,4	— ²⁾	56,5	100,0	22,6
Partial factor	$\gamma_{Ms}^{1)}$		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 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	$N_{Rk,s,l}^0$	[kN]	carbon	22,9	39,3	53,6	82,5	119,5	20,1
			stainless	— ²⁾	40,0	— ²⁾	70,0	94,4	26,1
Partial 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
Steel failure: Flexure of channel									
Characteristic flexural resistance of channel	$M_{Rk,s,flex}$	[Nm]	carbon	873	1497	2289	3452	6935	733
			stainless	— ²⁾	1670	— ²⁾	3608	7922	749
Partial factor	$\gamma_{Ms,flex}$ ¹⁾		1.15						

¹⁾ In absence of other national regulations

²⁾ No performance assessed

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Annex 2:

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

HALFEN serrated channel bolt thread diameter					M10	M12	M16	M20	M24
Steel failure: Channel bolt									
Characteristic resistance	N _{Rk,s}	[kN]	Carbon steel	8.8	46,4	67,4 (48,5) ¹⁾	125,6 (96,3) ²⁾	196,0	282,4
			Stainless steel	50 ³⁾	— ⁵⁾	40,3	64,0	— ⁵⁾	— ⁵⁾
				70 ³⁾	— ⁵⁾	59,0	109,9	171,5	247,1
Partial 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

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Annex 3:

Table C4: Characteristic resistances under tension load – concrete failure

Serrated anchor channel				29/20	38/23	41/27	53/34	64/44	41/22
Concrete failure: 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 factor		$\gamma_{Mp} = \gamma_{Mc}^{1)}$		1,5					
Concrete failure: 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 factor		$\gamma_{Mc}^{1)}$		1,5					
Concrete failure: Splitting failure									
Characteristic edge spacing		$c_{cr,sp}$	[mm]	246	281	445	465	534	246
Characteristic spacing		$s_{cr,sp}$		492	562	890	930	1068	492
Partial factor		$\gamma_{Msc}^{1)}$		1,5					

¹⁾ In absence of other national regulations

²⁾ No performance assessed

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Annex 4:

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_{No}	[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	δ_{N-}	[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

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Annex 5:

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	29,7
			stainless	— ²⁾	39,0	— ²⁾	95,5	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 factor	$\gamma_{Ms,a}$ 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	29,7
			stainless	— ²⁾	39,0	— ²⁾	95,5	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 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]		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	29,7
			stainless	— ²⁾	39,0	— ²⁾	95,5	94,4	22,6
Partial factor	$\gamma_{Ms,l}$ ¹⁾		1,8						

¹⁾ In absence of other national regulations

²⁾ No performance assessed

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Annex 6:

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]	M10	carbon	— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	13,6
		M12	carbon	12,6	23,6	23,6	— ¹⁾	— ¹⁾	14,4
			stainless	— ¹⁾	20,1	— ¹⁾	— ¹⁾	— ¹⁾	12,1
		M16	carbon	— ¹⁾	23,6	32,0	39,5	— ¹⁾	14,4
			stainless	— ¹⁾	24,9	— ¹⁾	51,7	— ¹⁾	12,1
		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⁾	1,0 ²⁾ 1,2	— ¹⁾	1,4	1,0	1,2	

¹⁾ No performance assessed

²⁾ Valid for HZS 38/23 M12 A4-70

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Annex 7:

Table C7: Characteristic resistances under shear load – concrete failure

Serrated anchor channel		29/20	38/23	41/27	53/34	64/44	41/22
Concrete failure: Pry-out failure							
Product factor	k_s ¹⁾	2,0	2,0	2,0	2,0	2,0	2,0
Partial factor	γ_{Mc} ²⁾	1,5					
Concrete failure: 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 factor	γ_{Mc} ²⁾	1,5					

¹⁾ Without supplementary reinforcement. In case of supplementary reinforcement, the factor k_s 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	17,4	21,3	40,1	62,0	11,8
			stainless	— ³⁾	15,5	— ³⁾	37,9	37,5	9,0
Short-term displacement in y-direction	$\delta_{V,y,0}$	[mm]	carbon	0,9	1,2	0,9	1,3	2,1	1,1
			stainless	— ³⁾	1,1	— ³⁾	2,1	2,1	0,9
Long-term displacement in y-direction	$\delta_{V,y,\infty}$	[mm]	carbon	1,4	1,8	1,4	2,0	3,2	1,7
			stainless	— ³⁾	1,7	— ³⁾	3,2	3,2	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 the direction of longitudinal channel axis)

³⁾ No performance assessed

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Annex 8:

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

HALFEN serrated channel bolt thread diameter				M10	M12	M16	M20	M24	
Steel failure: Channel bolt									
Characteristic resistance	$V_{Rk,s}$	[kN]	steel	8.8	23,2	33,7	62,8	98,0	141,2
			Stainless steel	50 ¹⁾	— ³⁾	25,3	47,1	— ³⁾	— ³⁾
				70 ¹⁾	— ³⁾	35,4	65,9	102,9	148,3
Characteristic flexural resistance	$M^0_{Rk,s}$	[Nm]	steel	8.8	60	105	267	519	898
			Stainless steel	50 ¹⁾	— ³⁾	66	167	— ³⁾	— ³⁾
				70 ¹⁾	— ³⁾	92	233	454	786
Partial factor	$\gamma_{Ms}^{2)}$		steel	8.8	1,25				
			Stainless steel	50 ¹⁾	2,38				
				70 ¹⁾	1,56				

¹⁾ Materials according Annex A2 and A3-A4

²⁾ In absence of other national regulations

³⁾ 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				

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Annex 9:

Table C11: Combinations of anchor channels and channel bolts under fatigue tension load

Anchor channel		Channel bolts			
HZA	Anchor type	Channel bolt	Thread diameter [mm]	Grade	Material
38/23	round anchor	HZS 38/23	M16	8.8	steel electro-plated, hot-dip galv.; stainless steel
41/27					
53/34	round anchor + I-anchor	HZS 53/34	M20	8.8 / A4-70	
64/44	I-anchor	HZS 64/44	M24	8.8	

Table C12: Characteristic fatigue resistances $\Delta N_{Rk,s,lo,n}$ with lower load $N_{lok,s,n}$ – Steel failure

Anchor channel	HZA	38/23		41/27		53/34		64/44	
Characteristic resistances under fatigue tension load	Load cycles n	$\Delta N_{Rk,s,lo,n}$ [kN]	$N_{lok,s,n}$ [kN]	$\Delta N_{Rk,s,lo,n}$ [kN]	$N_{lok,s,n}$ [kN]	$\Delta N_{Rk,s,lo,n}$ [kN]	$N_{lok,s,n}$ [kN]	$\Delta N_{Rk,s,lo,n}$ [kN]	$N_{lok,s,n}$ [kN]
		carbon		carbon		carbon / stainless		carbon	
	$\leq 10^4$	16,0	0,0	16,0	0,0	30,0 / 30,0	0,0 / 0,0	55,0	0,0
	$2 \cdot 10^4$	16,0	0,0	16,0	0,0	29,0 / 27,4	0,0 / 0,0	45,2	0,0
	$5 \cdot 10^4$	13,3	2,5	13,3	2,5	22,5 / 19,7	3,0 / 6,5	34,6	9,4
	$1 \cdot 10^5$	10,9	4,9	10,9	4,9	18,5 / 15,3	6,7 / 10,8	28,3	16,9
	$2 \cdot 10^5$	8,9	6,9	8,9	6,9	15,2 / 11,9	9,7 / 14,2	23,1	23,0
	$5 \cdot 10^5$	6,9	9,0	6,9	9,0	11,8 / 8,6	12,9 / 17,5	17,7	29,4
	$1 \cdot 10^6$	5,6	10,2	5,6	10,2	9,7 / 6,7	14,9 / 19,4	14,5	33,2
	$2 \cdot 10^6$	4,6	11,2	4,6	11,2	8,0 / 5,2	16,5 / 20,9	11,8	36,4
	$5 \cdot 10^6$	3,5	12,3	3,5	12,3	6,2 / 3,7	18,1 / 22,3	9,1	39,6
	$7 \cdot 10^6$	3,5	12,3	3,5	12,3	6,2 / 3,3	18,1 / 22,8	8,2	40,6
	$1 \cdot 10^7$	3,5	12,3	3,5	12,3	6,2 / 3,3	18,1 / 22,8	7,4	41,6
	$5 \cdot 10^7$	3,5	12,3	3,5	12,3	6,2 / 3,3	18,1 / 22,8	4,6	44,9
	$\geq 10^8$	3,5	12,3	3,5	12,3	6,2 / 3,3	18,1 / 22,8	3,8	45,9

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Annex 10:

Table C13: Characteristic resistances under fatigue tension load after n load cycles with static preload N_{Elok} – Concrete failure

Pull-out and concrete cone failure:

Reduction factor for pull-out and concrete cone 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	
	$1 \cdot 10^8$	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

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

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Annex 11:

Table C14: Combinations of anchor channels and channel bolts under seismic load

Anchor channel		Channel bolt			
Profile	Material	Type	Thread Ø	Strength grade	Material
38/23	hot-dip galvanized	HZS 38/23	12 16	8.8	Steel hot-dip galvanized
41/27	hot-dip galvanized	HZS 38/23	12 16	8.8	Steel hot-dip galvanized
53/34	hot-dip galvanized	HZS 53/34	16 20	8.8	Steel electro-plated, hot-dip galvanized
41/22	hot-dip galvanized	HZS 41/22	12 16	8.8	Steel electro-plated, hot-dip galvanized

Table C15: Characteristic resistances under seismic tension load – steel failure

Anchor channel				steel	38/23	41/27	53/34	41/22
Steel failure: Anchor								
Characteristic resistance	$N_{Rk,s,a,eq}$	[kN]	carbon	31,4	54,0	56,5	20,1	
Partial factor	$\gamma_{Ms,a}^{1)}$			1,78	1,80	1,67	1,78	
Steel failure: Connection channel/anchor								
Characteristic resistance	$N_{Rk,s,c,eq}$	[kN]	carbon	36,0	53,6	59,6	18,1	
Partial factor	$\gamma_{Ms,ca}^{1)}$			1,8				
Steel failure: Local flexure of the channel lips								
Spacing of channel bolts for $N_{Rk,s,l,eq}^0$	$s_{l,N}$	[mm]	carbon	76	80	105	83	
Characteristic resistance	$N_{Rk,s,l,eq}^0$	[kN]	carbon	39,3	53,6	82,5	20,1	
Partial factor	$\gamma_{Ms,l}^{1)}$			1,8				

¹⁾ In absence of other national regulations

Table C16: Characteristic flexural resistances under seismic tension load

Anchor channel				steel	38/23	41/27	53/34	41/22
Steel failure: Flexure of channel								
Characteristic resistance	$M_{Rk,s,flex,eq}$	[Nm]	carbon		1497	2289	3452	733
Partial factor	$\gamma_{Ms,flex}^{1)}$				1,15			

¹⁾ In absence of other national regulations

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Annex 12:

Table C17: Characteristic resistances under seismic tension load – steel failure of HALFEN serrated channel bolt HZS

HALFEN serrated channel bolt			M12	M16	M20
Steel failure					
Characteristic resistance	$N_{Rk,s,eq}$	[kN]	67,4 (48,5) ²⁾	125,6 (96,3) ³⁾	196,0
Partial factor	γ_{Ms} ¹⁾		1,5		

¹⁾ In absence of other national regulations

²⁾ For HZS 41/22 M12 8.8

³⁾ For HZS 41/22 M16 8.8

Table C18: Characteristic resistances under seismic shear load – steel failure

Anchor channel			steel	38/23	41/27	53/34	41/22
Steel failure: Anchor							
Characteristic resistance	$V_{Rk,s,a,y,eq}$	[kN]	carbon	43,9	53,6	101,1	29,7
Characteristic resistance	$V_{Rk,s,a,x,eq}$	[kN]	carbon	18,8	32,4	33,9	12,0
Partial factor	$\gamma_{Ms,a}^{1)}$			1,48	1,50	1,39	1,48
Steel failure: Connection channel/anchor							
Characteristic resistance	$V_{Rk,s,c,y,eq}$	[kN]	carbon	43,9	53,6	101,1	29,7
Characteristic resistance	$V_{Rk,s,c,x,eq}$	[kN]	carbon	21,6	32,2	35,8	10,9
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	76	80	105	83
Characteristic resistance	$V_{Rk,s,l,y,eq}^0$	[kN]	carbon	43,9	53,6	101,1	29,7
Partial factor	$\gamma_{Ms,l,x}^{1)}$			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	23,6	23,6	39,5	14,4
Installation factor	γ_{inst}			1,2			

¹⁾ In absence of other national regulations

Table C19: Characteristic resistance under seismic shear load – steel failure of HALFEN serrated channel bolt HZS

HALFEN serrated channel bolt			M12	M16	M20
Steel failure					
Characterist. resistance	$V_{Rk,s,eq}$	[kN]	33,7	62,8	98,0
Partial factor	γ_{Ms} ¹⁾		1,25		

¹⁾ In absence of other national regulations

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Annex 13:

Table C20: Characteristic resistances under tension and shear load under fire exposure – steel failure

Steel failure

Serrated anchor channel				29/20	38/23	41/27	53/34	64/44	41/22	
Steel failure: Anchor, Connection channel / anchor, Local flexure of channel lips, channel bolts										
Characteristic resistances	R30	M12	$N_{Rk,s,fi}$ = $V_{Rk,s,y,fi}$	[kN]	2,7	3,5	3,5	— ¹⁾	— ¹⁾	2,4
		M16			— ¹⁾	4,5	4,5	4,5	— ¹⁾	2,3
		M20			— ¹⁾	— ¹⁾	— ¹⁾	10,3	10,3	— ¹⁾
		M24			— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	17,0	— ¹⁾
	R60	M12			2,1	2,7	2,7	— ¹⁾	— ¹⁾	1,7
		M16			— ¹⁾	3,3	3,3	3,3	— ¹⁾	1,8
		M20			— ¹⁾	— ¹⁾	— ¹⁾	7,8	7,8	— ¹⁾
		M24			— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	14,8	— ¹⁾
	R90	M12			1,5	1,9	1,9	— ¹⁾	— ¹⁾	1,1
		M16			— ¹⁾	2,1	2,1	2,1	— ¹⁾	1,2
		M20			— ¹⁾	— ¹⁾	— ¹⁾	5,3	5,3	— ¹⁾
		M24			— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	9,9	— ¹⁾
	R120	M12			1,3	1,5	1,5	— ¹⁾	— ¹⁾	0,7
		M16			— ¹⁾	1,5	1,5	1,5	— ¹⁾	1,0
		M20			— ¹⁾	— ¹⁾	— ¹⁾	4,0	4,0	— ¹⁾
		M24			— ¹⁾	— ¹⁾	— ¹⁾	— ¹⁾	7,4	— ¹⁾
Partial factor		$\gamma_{Ms,fi}$ ¹⁾	[-]	1,0						

¹⁾ No performance assessed

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Annex 14:

Table C21: Characteristic resistances under tension and shear load under fire exposure – min. axis distance of reinforcement

Serrated anchor channel			29/20	38/23	41/27	53/34	64/44	41/22	
Min. axis distance of reinforcement ¹⁾									
Min. axis distance	R30	a	[mm]	25	30	35	40	50	25
	R60	a		25	30	35	40	50	25
	R90	a		35	35	35	40	50	35
	R120	a		50	50	50	50	50	50

¹⁾ 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

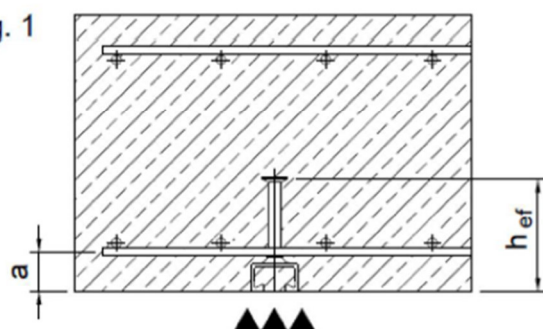


Fig. 2

