HALFEN
A CRH COMPANY

DECLARATION OF PERFORMANCE
HALFEN Anchor Channel HTA

CONF-DOP_HTA 06/18-E
No. H01-09/0339

1.	Unique identification code of the product-type	**HALFEN Anchor channel HTA 28/15, HTA 38/17, HTA 40/22, HTA 40/22P, HTA 40/25, HTA 49/30, HTA 50/30, HTA 50/30P, HTA 52/34, HTA 54/33, HTA 55/42, HTA 72/48 and HTA 72/49**
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-09/0339, 28.06.2018, Annex A1, A2 and A4
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 or cold-formed anchor channel with at least 2 metal anchors fixed on the profile back in combination with hammer-head bolts (HTA 28/15 und HTA 38/17) and hook-head bolts (HTA 40/22 – HTA 72/49)
	Product size covered (anchor channels and corresponding screws)	HTA 28/15 with channel bolt HS 28/15 M6 – M12, HTA 38/17 with channel bolt HS 38/17 M10 – M16, HTA 40/22 with channel bolt HS 40/22 M10 – M16, HTA 40/22P with channel bolt HS 40/22 M10 – M16, HTA 40/25 with channel bolt HS 40/22 M10 – M16, HTA 49/30 with channel bolt HS 50/30 M10 – M20, HTA 50/30 with channel bolt HS 50/30 M10 – M20, HTA 50/30P with channel bolt HS 50/30 M10 – M20, HTA 52/34 with channel bolt HS 50/30 M10 – M20, HTA 54/33 with channel bolt HS 50/30 M10 – M20, HTA 55/42 with channel bolt HS 50/30 M10 – M24, HTA 72/48 with channel bolt HS 72/48 M20 – M30, HTA 72/49 with channel bolt HS 72/48 M20 – M30
	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 the longitudinal channel axis, fire exposure, fatigue tension loads
4.	Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5)	HALFEN 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-09/0339 on the basis of EAD 330008-02-0601, Version Feb. 2016, the notified body 0432 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.	
9.	Declared performance			
	Essential Characteristics	Design Method	Performance	Harmonized Technical Specification
	Characteristic resistance for tension	EOTA TR 047, EOTA TR 050, EN 1992-4	ETA-09/0339, Annex C1-C3	EAD 330008-02-0601, Version Feb. 2016
	Characteristic resistance for shear (without reinforcement)		ETA-09/0339, Annex C4, C5	
	Characteristic resistance for combined tension and shear		ETA-09/0339, Annex C6	
	Displacement for serviceability limit state		ETA-09/0339, Annex C3, C4	
	Characteristic resistance for fire exposure		ETA-09/0339, Annex C7,C8	
	Characteristic resistance for fatigue loading		ETA-09/0339, Annex C9-C11	
	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, 28.06.2018

Signed for and on behalf of the manufacturer by

Richard Wachter
(Managing Director)

ppa. Dr.-Ing. Dirk Albartus
(Manager Engineering)

H-900-07/18-E

Annex 1:

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

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

[1)] In absence of other national regulations

Table C2: Characteristic flexural resistance of channel

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

[1)] In absence of other national regulations

Annex 2:

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

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

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

Annex 3:

Table C4: Characteristic resistances under tension load – concrete failure

Anchor channel				28/15	38/17	40/25 40/22	40/22P	49/30 50/30	50/30P	54/33 52/34	55/42	72/49 72/48
Pull-out failure												
Characteristic resistance in cr. concrete C12/15	Round anchors	$N_{Rk,p}$	[kN]	7,6	13,6	13,6	21,2	21,2	34,0	34,0	41,6	-
	I-anchors			11,7	11,7	14,0	17,8	21,0	24,7	29,7	40,6	46,4
Characteristic resistance in uncr. concrete C12/15	Round anchors	$N_{Rk,p}$	[kN]	10,6	19,0	19,0	29,7	29,7	47,6	47,6	58,2	-
	I-anchors			16,4	16,4	19,6	24,9	29,4	34,6	41,6	56,8	65,0
Increasing factor for $N_{Rk,p}$	C20/25	Ψ_c	[-]	1,67								
	C25/30			2,08								
	C30/37			2,50								
	C35/45			2,92								
	C40/50			3,33								
	C45/55			3,75								
	C50/60			4,17								
	C55/67			4,58								
	≥C60/75			5,00								
Partial safety factor		$\gamma_{Mp}=\gamma_{Mc}$ [1]		1,5								
Concrete cone failure												
Product factor k_1		$k_{cr,N}$		7,2	7,8	7,9	8,0	8,1	8,2	8,7	8,9	8,9
		$k_{ucr,N}$		10,3	11,2	11,2	11,5	11,5	11,7	12,4	12,6	12,7
Charact.edge spacing		$c_{cr,N}$	[mm]	111	171	176	195	199	216	260	269	270
Charact.spacing		$s_{cr,N}$		2,0 $c_{cr,N}$								
Partial safety factor		γ_{Mc} [1]		1,5								
Splitting failure												
Charact.edge spacing		$c_{cr,sp}$	[mm]	135	228	237	273	282	318	465	525	537
Charact.spacing		$s_{cr,sp}$		2,0 $c_{cr,sp}$								
Partial safety factor		γ_{Msp} [1]		1,5								

[1] In absence of other national regulations

Table C5: Displacements under tension load

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

Annex 4:

Table C6: Characteristic resistances under shear load

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

[1] In absence of other national regulations

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

Table C7: Displacements under shear load

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

Annex 5:

Table C8: 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 safety factor	γ_{Ms} [2)]		4.6	1,67								
			8.8	1,25								
			50 [1)]	2,38								
			70 [1)]	1,56								

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

Annex 6:

Table C9: Characteristic resistances under combined tension and shear load

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

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

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

Annex 7:

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

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

[1] In absence of other national regulations

Annex 8:

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

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

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

Fig. 1

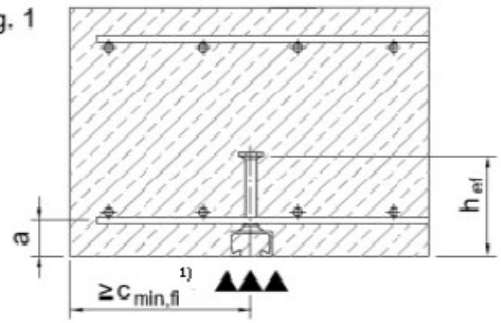
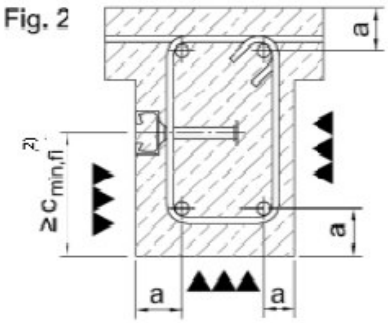


Fig. 2



Annex 9:

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

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

Design Method I acc. EOTA TR 050, November 2015

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

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

Annex 10:

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

Pull-out failure and Concrete cone failure:

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

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

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

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

Annex 11:

Design method II acc. EOTA TR 050, November 2015

Table C15: Characteristic limit resistances under fatigue tension load (n → ∞)
Steel failure

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

Table C16: Characteristic limit resistances under fatigue tension load (n → ∞)
Concrete cone and pull-out failure

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

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

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

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

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

