Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment

ETA-17/0549 of 20 March 2019

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	HAZ METAL - Anchor Channel HMPR
Product family to which the construction product belongs	Anchor channels
Manufacturer	Haz Metal Deutschland GmbH Leonhard-Karl-Straße 29 97877 Wertheim DEUTSCHLAND
Manufacturing plant	HAZ Metal AS Iskenderun Türkei
This European Technical Assessment contains	31 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330008-02-0601
This version replaces	ETA-17/0549 issued on 26 June 2018

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Specific part

1 Technical description of the product

The HAZ METAL - Anchor Channel HMPR is a system consisting of C-shaped channel profile of carbon steel or stainless steel and at least two metal anchors non-detachably fixed to the channel back and channel bolts.

The anchor channel is embedded surface-flush in the concrete. HAZ METAL channel bolts 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 resistances under static and quasi-static loads and displacements	See Annex C1 to C8
Characteristic resistance under fatigue cyclic loads	See Annex C10 to C12

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C9

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

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

The system to be applied is: 1

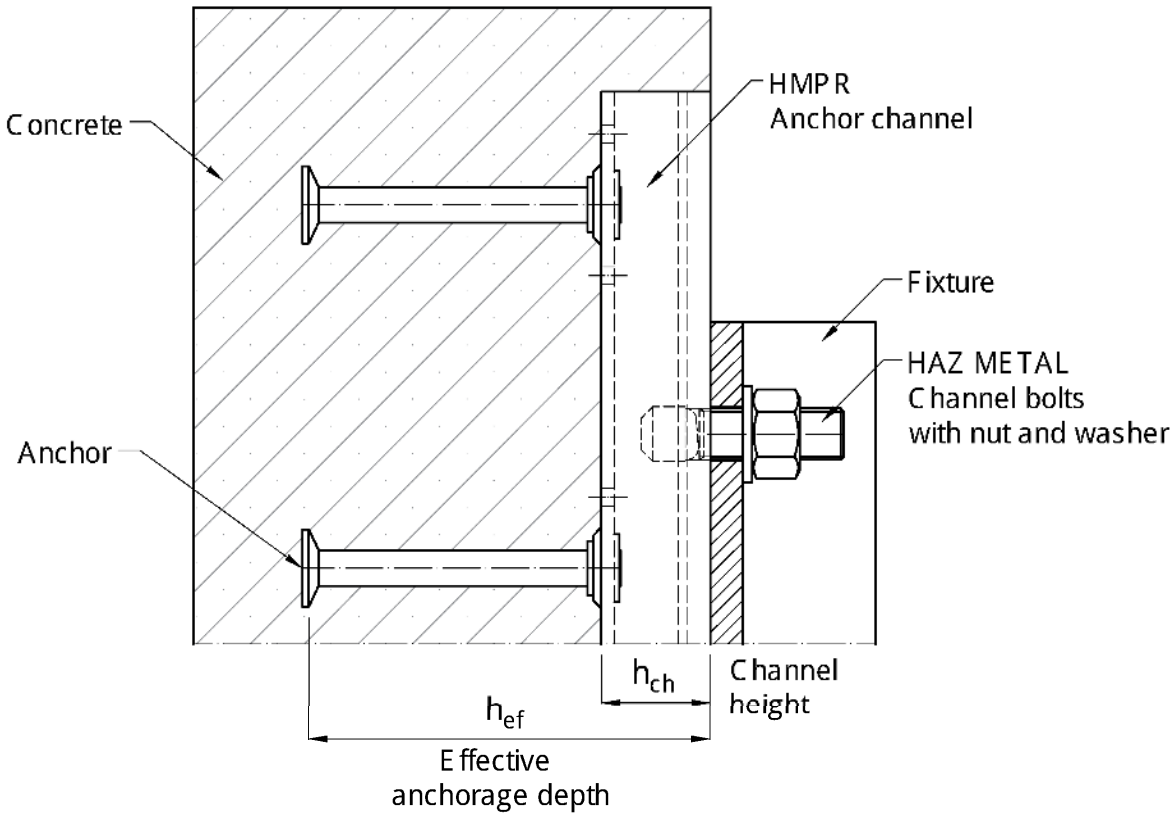
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

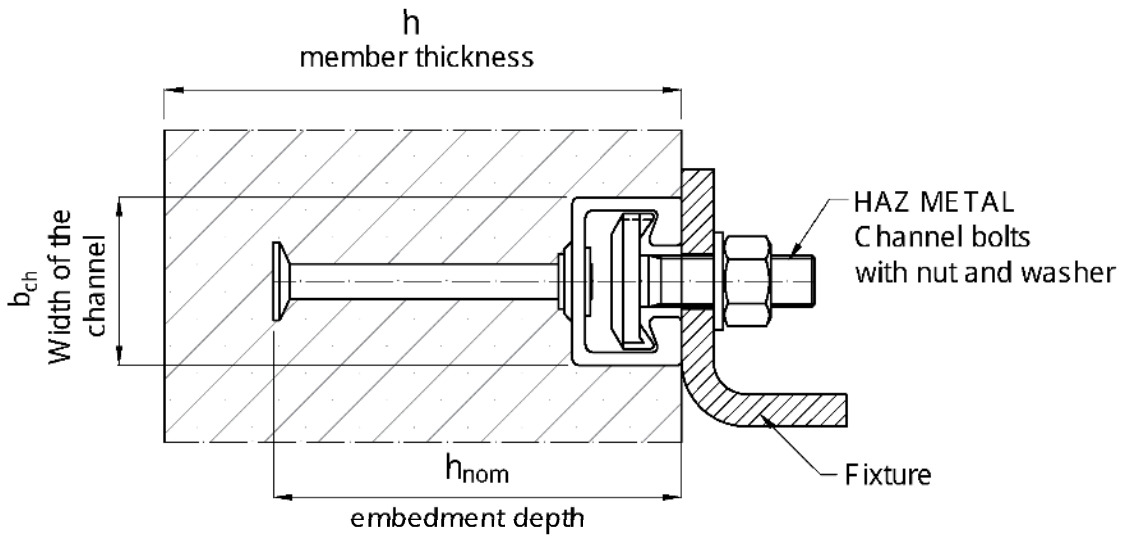
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 20 March 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Stiller

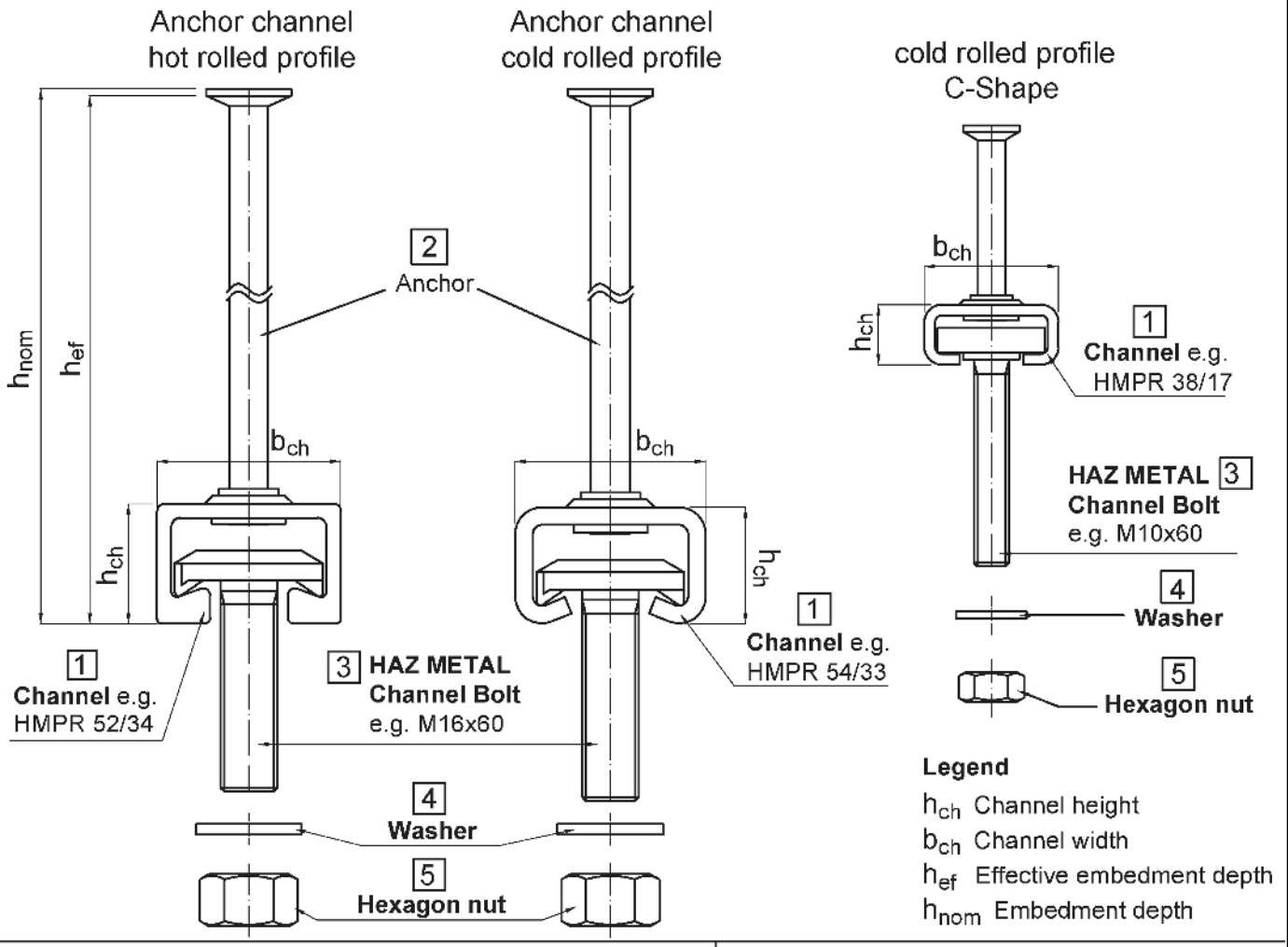




HAZ METAL – Anchor Channel HMPR

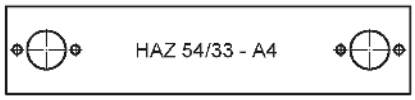
Product Description
Installed condition

Annex A1



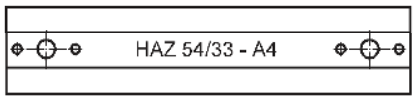
Marking of the HAZ - Anchor channel:
e.g. HAZ 54/33 - A4

HAZ = Identifying mark of the manufacturer
54/33 = Size
A4 = Material



Marked on the back of channel

or



Marked inside of channel

Material channels :
No marking for
1.0038 / 1.0044

A4 = 1.4401 / 1.4404 / 1.4571
A2 = 1.4301
L4 = 1.4362
HC = 1.4529 / 1.4547
F4 = 1.4462

Marking of the HAZ METAL - Channel bolt
e.g. HS A4-70

HS/HAZ = Identifying mark of the manufacturer
A4 - 70 = Material / Strength grade

Material / Strenght grade channel bolts:
8.8 = Strenght grade 8.8

A4-70 = Stainless steel (1.4401 / 1.4404 / 1.4571) Grade - 70
L4-70 = Stainless steel (1.4362) Grade - 70
HC-70 = Stainless steel (1.4529 / 1.4547) Grade - 70
F4-70 = Stainless steel (1.4462) Grade - 70

HAZ METAL – Anchor Channel HMPR

Product Description
Marking and Materials

Annex A2

Deutsches Institut für Bautechnik DIBt

Table 1: Materials and intended use

1	2	3	4	5	6
Item No	**Specification**	**Intended use**			
		Dry internal conditions	**Internal conditions with usual humidity**	**Medium corrosion exposure**	**High corrosion exposure**
		Structures subject to dry internal conditions (e.g. accommodations, bureaus, schools, hospitals, shops, exceptional internal conditions with usual humidity acc. column 4)	Structures subject to internal conditions with usual humidity (e.g. kitchen, bath and laundry in residential buildings, exceptional permanently damp conditions and application under water)	Structures subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions, if no particular aggressive conditions (e.g. permanent, alternating immersion in seawater etc. acc. column 6) exist.	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)
		Materials			
1	**Channel Profile**	Steel 1.0038/ 1.0044 EN 10025:2004 hot-dip galv.≥ 50 µm [3] Stainless steel 1.4301 EN 10088:2005	Steel 1.0038/ 1.0044 EN 10025:2004 hot-dip galv. ≥ 50 µm [3]	Stainless steel 1.4401/1.4404/ 1.4571/ 1.4362 EN 10088:2014	Stainless steel 1.4462 [1]/ 1.4529/ 1.4547 EN 10088:2014
2	**Anchor**	Steel 1.0038/ 1.0214/ 1.0401, 1.1132/ 1.5525 EN 10263:2017 hot-dip galv.≥ 50 µm [3] Stainless steel 1.4301 EN 10088:2014	Steel 1.0038/ 1.0214/ 1.0401/ 1.1132/ 1.5525 EN 10263:2017 hot-dip galv. ≥ 50 µm [3]	Stainless steel 1.4401/ 1.4404/ 1.4571/ 1.4578/ 1.4362 EN 10088:2014	
3	**HAZ METAL Channel bolt thread and shaft EN ISO 4018:2011**	Steel, strength grade 8.8 EN ISO 898-1:2013 electroplated ≥ 5 µm [2]	Steel, strength grade 8.8 EN ISO 898-1:2013 hot-dip galv. ≥ 50 µm [3]	Stainless steel 1.4401/ 1.4404/ 1.4571/ 1.4362 EN ISO 3506-1:2009	Stainless steel 1.4462 [1]/ 1.4529/ 1.4547 EN ISO 3506-1:2009
4	**Washer, EN ISO 7089:2000, EN ISO 7093-1:2000 production class A, 200HV**	Steel EN 10025:2004 electroplated ≥ 5 µm [2]	Steel EN 10025:2004 hot-dip galv. ≥ 50 µm [3]	Stainless steel 1.4401/ 1.4404/ 1.4571 EN 10088:2014	Stainless steel 1.4462 [1]/ 1.4529/ 1.4547 EN 10088:2014
5	**Hexagonal nuts EN ISO 4032:2012**	Steel, strength grade 8.8 EN ISO 898-2:2012 electroplated ≥ 5 µm [2]	Steel, strength grade 8.8 EN ISO 898-2:2012 hot-dip galv. ≥ 50 µm [3]	Stainless steel 1.4401/ 1.4404/ 1.4571 EN ISO 3506-2:2009	Stainless steel 1.4462 [1]/ 1.4529/ 1.4547 EN ISO 3506-2:2009

[1] 1.4462 not applicable for indoor swimming pools
[2] Electroplated acc. EN ISO 4042:2018
[3] Hot-dip galvanized on the basis of EN ISO 1461:2009, but coating thickness ≥ 50 µm

HAZ METAL – Anchor Channel HMPR

Product Description
Materials and intended use

Annex A3

Hot rolled profile

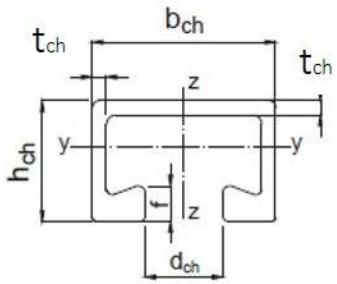


Fig. 1

Cold rolled profile

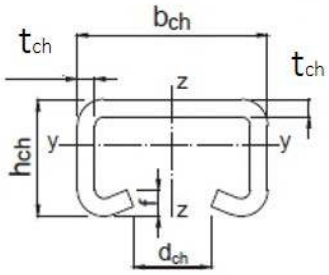


Fig. 2

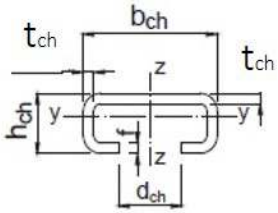
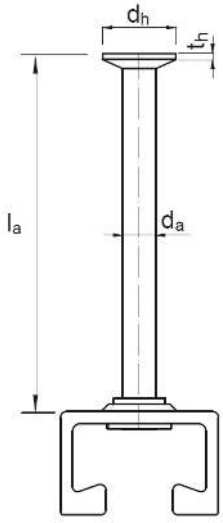


Fig. 3

Table 2: Geometrical profile properties

Anchor channel	Fig.	Material	Dimensions					
			b_{ch}	h_{ch}	t_{ch}	d_{ch}	f	I_y
			[mm]					[mm^4]
28/15	3	Steel	28.00	15.00	2.30	12.00	2.30	3727
38/17	3		38.00	17.00	3.00	18.00	3.00	7629
40/25	2		40.00	25.00	2.75	18.00	6.00	19448
49/30	2		49.00	30.00	3.25	22.00	7.50	41119
54/33	2		54.00	33.00	5.00	22.00	7.50	72572
72/49	2		72.00	49.00	6.00	33.00	9.00	312071
40/22 40/22P	1		40.00	22.00	2.50	18.00	6.00	18970
50/30 50/30P	1		50.00	30.00	3.00	22.00	8.00	57630
52/34 52/34P	1		52.00	34.00	4.00	22.00	10.00	97150
28/15	3	Stainless Steel	28.00	15.00	2.30	12.00	2.30	3727
38/17	3		38.00	17.00	3.00	18.00	3.00	7629
40/25	2		40.00	25.00	2.75	18.00	6.00	19448
49/30	2		49.00	30.00	3.25	22.00	7.50	41119
54/33	2		54.00	33.00	5.00	22.00	7.50	72572
72/49	2		72.00	49.00	6.00	33.00	9.00	312071

Hot rolled profile



Cold rolled profile

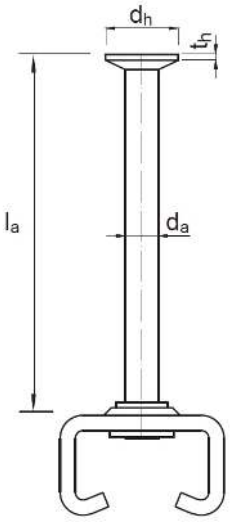


Table 3: Types of round anchors

Type	Anchor Channel	Shaft Φ d_a	Shaft Φ d_h	Head t_h	Shaft l_a	Shaft A_h
		[mm]				[mm^2]
R	**28/15**	6	12	1.8	32	84.82
	38/17	8	16	1.8	61	150.80
	40/25 40/22	8	16	1.8	56	150.80
	40/22P	10	20	1.8	67	235.62
	49/30 50/30	10	20	1.8	66	235.62
	50/30P	12	24	2.0	78	339.29
	54/33 52/34	12	24	2.0	124	339.92
	54/32P	14	28	2.0	124	461.81
	72/49	16	32	2.0	133	603.19

HAZ METAL – Anchor Channel HMPR

Product Description
Profile Dimensions / Types of anchors

Annex A4

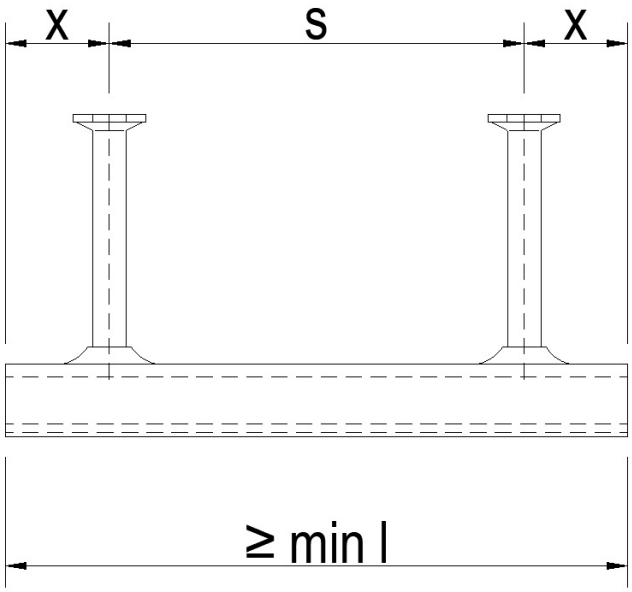


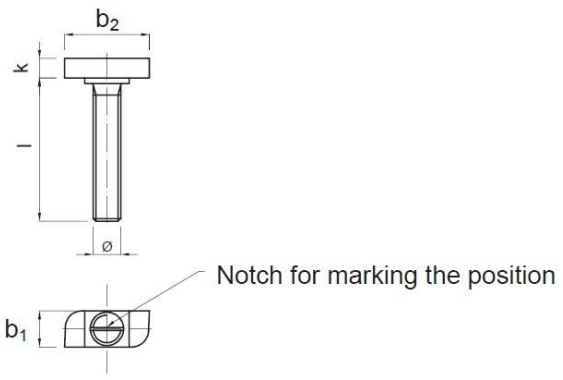
Table 4: Anchor Positioning

Anchor channel	Anchor spacing		End spacing	Min. channel length (min. l)
	s_{min}	s_{max}	Round anchor	Round anchor
	[mm]			
28/15 **38/17**	50	200	25	100
40/25 **40/22** **40/22P** **49/30**	100	250	25	150
50/30 **50/30P** **54/33** **52/34** **52/34P**	100	250	35	170
72/49	130	400	35	200

HAZ METAL – Anchor Channel HMPR	**Annex A5**
Product Description Anchor positioning, channel length	

Hammer-head channel bolt

Fig. 1



Hook-head channel bolt

Fig. 2

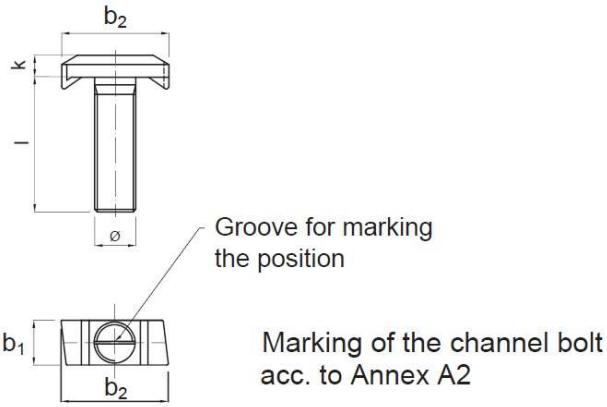


Table 5.1: Dimension of the HAZ METAL channel bolt – Type HS

HS Channel bolt		**28/15**			**38/17**			**40/22**			**50/30**			**72/49**		
Anchor channel		**28/15**			**38/17**			**40/25 40/22 40/22P**			**49/30 50/30 50/30P 54/33 52/34 52/34P**			**72/49**		
ø	[mm]	8	10	12	10	12	16	10	12	16	12	16	20	20	24	30
b1	[mm]	10	10	10	13	13	16	14	14	14	13	17	21	23	25	31
b2	[mm]	23	23	23	31	31	31	35	35	34	43.2	43.2	42.2	58	58	58
k	[mm]	4	5	5	6	7	7	7.5	7.5	8.5	10	11	12	14	16	20
Fig.	[-]	1			1			2			2			2		
Length l	[mm]	15-200	20-300	20-300	20-300	20-300	30-300	20-300	20-300	30-300	20-300	20-300	30-300	50-300	50-300	50-300

Table 5.2: Dimensions of the HAZ METAL channel bolt – Type HAZ

HAZ Channel bolt		**28/15**			**38/17**			**40/22**			**50/30**	
Anchor channel		**28/15**			**38/17**			**40/25 40/22P 40/22P**			**49/30 50/30 50/30P 54/33 52/34 52/34P**	
ø	[mm]	8	10	12	10	12	16	10	12	16	12	16
b1	[mm]	10.5	10.5	12	13	13	17	14	14	17	17.5	17
b2	[mm]	23	23	23	31	31	31	34	34	34	42	42
k	[mm]	4	5	5	7	7	7	8.5	8.5	8.5	8.5	8.5
Fig.	[-]	1			1			2			2	
Length l	[mm]	25-100	30-100	50-100	40-100	40-100	60-150	30-100	50-100	60-100	50-100	50-125

Table 6: Strength grade

Channel bolt	**Steel**	**Stainless steel**
Strength grade	8.8	70
f_{uk} [N/mm^2]	800	700
f_{yk} [N/mm^2]	640	450
Finish	electroplated, hot-dip galvanized	-

HAZ METAL – Anchor Channel HMPR	**Annex A6**
Product Description HAZ METAL – Channel bolts dimensions and strength grade	

Deutsches Institut für Bautechnik DIBt

Specifications of intended use

Anchor channel and channel bolts subject to:

- Static and quasi-static loads in tension and shear perpendicular to the longitudinal of axis of the channel
- Fatigue cyclic loads
- Fire exposure for concrete class C20/25 to C50/C60

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000
- Strength classes C20/25 to C90/105 according to EN 206-1:2000
- Cracked or uncracked concrete

Use conditions (Environmental conditions):

- Structures subject to environmental conditions acc. Annex A3

Design:

- Anchor channel 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 the supports)
- For static and quasi-static loading as well as fire exposure the anchor channels are designed in accordance with EOTA TR 047 "Calculation Method for the performance 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.

HAZ METAL – Anchor Channel HMPR	**Annex B1**
Product Description 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 the channel components.
- Cutting of anchor channels is allowed only if pieces according Annex A5, Table 4 are generated including end spacing and minimum channel length and only to be used in dry internal conditions.
- Installation in accordance with the manufacturer's specifications given in Annexes B7 to B9.
- The anchor channels are fixed on the formwork or reinforcement such that no movement of the 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 are properly compacted. The channels are protected from penetration of concrete into the internal space of the channels.
- Washer may be chosen according to Annex A3 and provided separately by the user.
- Orientating the channel bolts (groove according to Annex B7 and B8) rectangular to the channel axis.
- The setting torques given in Annex B4 and B5 shall be applied and shall not be exceeded.

HAZ METAL – Anchor Channel HMPR	**Annex B2**
Product Description Specifications	

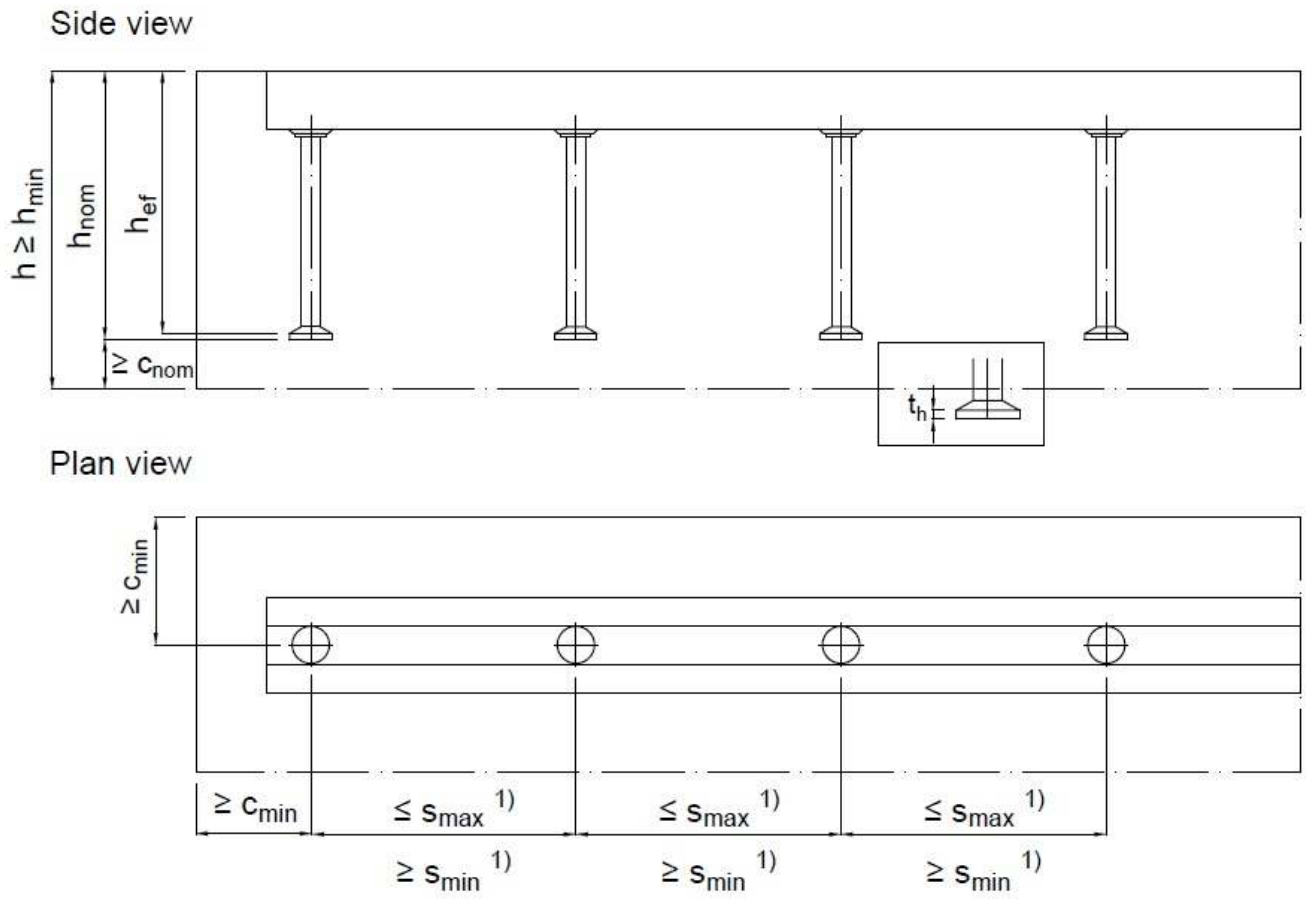


Table 7: Minimum effective embedment depth, edge distance and member thickness for cold rolled and hot rolled profiles

Anchor Channel			Cold rolled profile						Hot rolled profile		
			28/15	38/17	40/25	49/30	54/33	72/49	40/22 40/22P	50/30 50/30P	52/34 52/34P
Min. anchorage depth	min h_{ef}	[mm]	45	76	79	94	155	179	76 91	94 106	156
Min. edge distance	c_{min}		40	50	50	75	100	150	50	75	100
Min. member thickness	h_{min} 2)		77	108	111	126	187	215	108 123	126 138	188

1) s_{min}, s_{max} acc. to Table 4, Annex A5
2) $h_{min} \geq l_a + h_{ch} + c_{nom}$; c_{nom} acc. to EN 1992-1-1:2004 + AC 2010

HAZ METAL – Anchor Channel HMPR	**Annex B3**
Product Description Installation parameters of anchor channels	

Deutsches Institut für Bautechnik DIBt

Table 8.1: Minimum spacing and installation torque of HAZ METAL – Channel bolts Type HS

Channel bolt for cold profiles	Channel bolt Ø	Min. spacing $S_{min,cbo}$ [3] of the channel bolts	Installation torque T_{Inst} [4]		
			General [1]	Steel-steel contact [2]	
			8.8; 70	8.8	70
	[mm]	[mm]	[Nm]		
28/15	8	40	8	20	20
	10	50	13	40	40
	12	60	15	40	40
38/17	10	50	15	40	40
	12	60	25	70	70
	16	80	40	120	120
40/25	10	50	15	40	40
	12	60	25	70	50
	16	80	40	150	140
49/30	12	60	25	70	50
	16	80	60	180	160
	20	100	75	90	150
54/33	12	60	25	70	50
	16	80	60	180	180
	20	100	120	120	240
72/49	20	100	120	360	130
	24	120	200	360	230
	30	150	380	400	-
Channel bolt for hot profiles	**Channel bolt Ø**	**Min. spacing $S_{min,cbo}$ [3] of the channel bolts**	**Installation torque T_{Inst} [4]**		
			General [1]	**Steel-steel Contact [2]**	
			8.8	**8.8**	
	[mm]	**[mm]**	**[Nm]**		
40/22 40/22P	10	50	15	40	
	12	60	25	70	
	16	80	45	100	
50/30 50/30P	12	60	25	70	
	16	80	60	180	
	20	100	75	120	
52/34 52/34P	12	60	25	70	
	16	80	60	180	
	20	100	120	150	

1) Acc. to Annex B6, Fig 1
2) Acc. to Annex B6, Fig 2
3) See Annex C1, Fig 1
4) T_{inst} shall not be exceeded

HAZ METAL – Anchor Channel HMPR

Intended Use
Installation parameters of HAZ METAL – Channel bolts Type HS

Annex B4

Table 8.2: Minimum spacing and installation torque of HAZ METAL – Channel bolts Type HAZ

Channel bolt for cold profiles	Channel bolt Ø	Min. spacing $S_{min,cbo}$ [3] of the channel bolts	Setting torque T_{Inst} [4]	
			General [1]	Steel-steel contact [2]
			8.8	8.8
	[mm]	[mm]	[Nm]	
28/15	8	40	8	15
	10	50	13	20
	12	60	15	20
38/17	10	50	15	30
	12	60	25	40
	16	80	45	50
40/25	10	50	15	40
	12	60	25	50
	16	80	45	70
49/30	12	60	25	70
	16	80	60	120
54/33	12	60	25	70
	16	80	60	180
Channel bolt for hot profiles	**Channel Bolt Ø**	**Min. spacing $S_{min,cbo}$ [3] of the channel bolts**	**Installation torque T_{Inst} [4]**	
			General [1]	**Steel-steel contact [2]**
			8.8	**8.8**
	[mm]	**[mm]**	**[Nm]**	
40/22 40/22P	10	50	15	30
	12	60	25	40
	16	80	45	60
50/30 50/30P	12	60	25	60
	16	80	60	120
52/34 52/34P	12	60	25	70
	16	80	60	180

1) Acc. to Annex B6, Fig 1
2) Acc. to Annex B6, Fig 2
3) See Annex C1, Fig 1
4) T_{inst} shall not be exceeded

HAZ METAL – Anchor Channel HMPR	**Annex B5**
Intended Use Installation parameters of HAZ METAL – Channel bolts Type HAZ	

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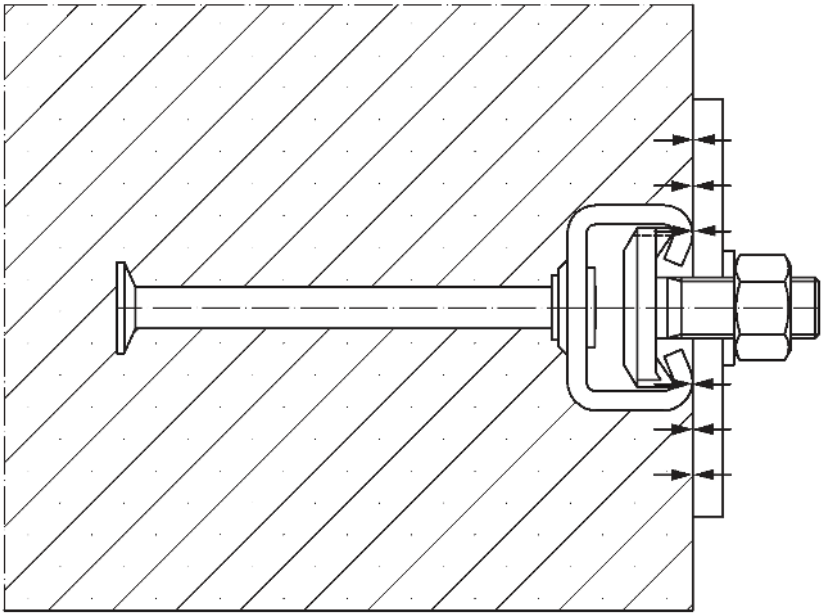

Fig.1

General:

The fixture is in contact with the channel profile and the concrete surface.

The installation torques acc. Annex B4, Table 8.1 or and / or Annex B5, Table 8.2 shall be applied and shall not be exceeded.

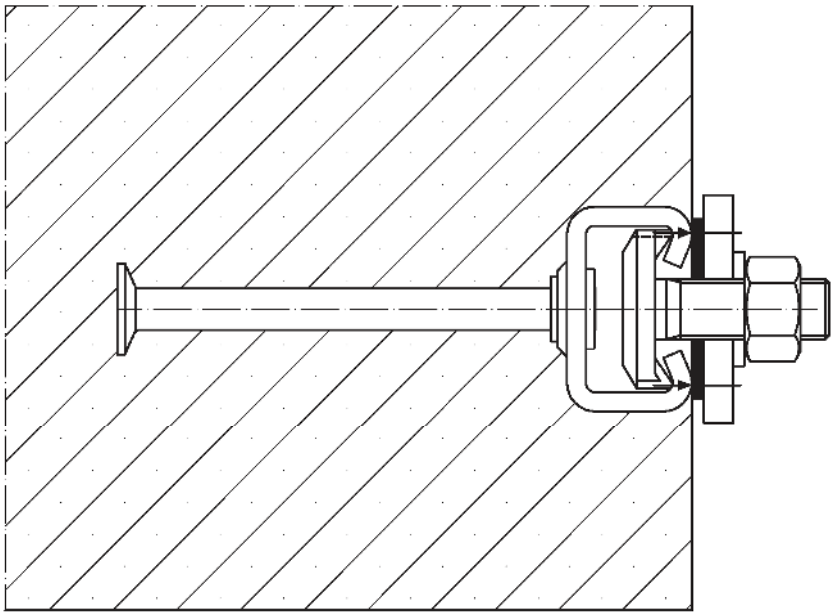

Fig.2

Steel – Steel Contact:

The fixture is fastened to the anchor channel by suitable steel part (e.g. washer). Fixture is in contact with the channel profile only.

The installation torques Annex B4, Table 8.1 or and / or Annex B5, Table 8.2 shall be applied and shall not be exceeded.

HAZ METAL – Anchor Channel HMPR	**Annex B6**
Intended Use Positions of the fixture	

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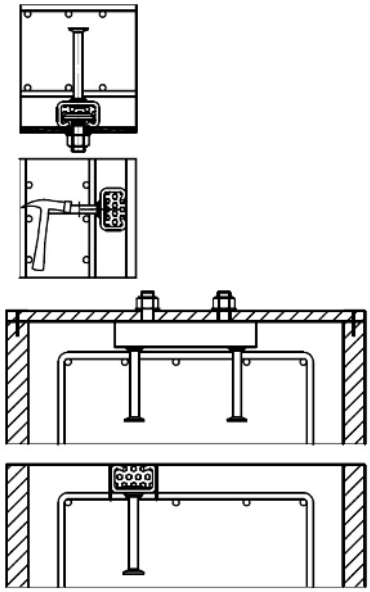
1. Fixing anchor channel
Install the channel surface flush and fix the channel undisplaceable to the formwork or to the reinforcement



a) Fixing to steel formwork

With HAZ METAL channel bolts and nuts, with rivets cramps or with magneting fixings.
or

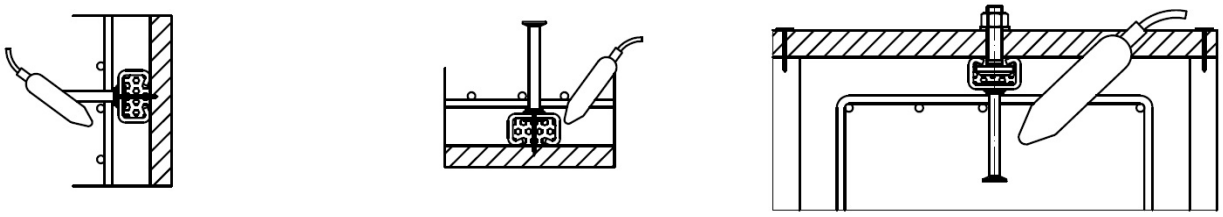
b) Fixing to timber formwork

With nails through the pre-punched holes in the back of the channels and with staples.
or

c) Fixing to anchor channels at the top

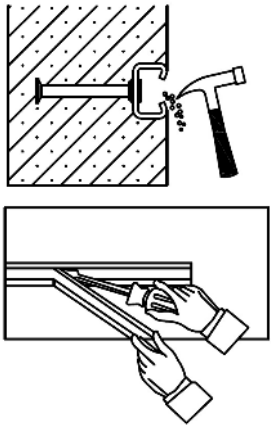
- To timber batten on the side formwork (e.g. with HAZ METAL channel bolts)
- Fixing from above directly to the reinforcement or to a mounting rebar, attach the channel by wire binding.

2. Pouring concrete and regular compacting of concrete
Compact the concrete properly around the channel and the anchors.



a) Sidefaces to the formwork b) in soffits c) into top surfaces of concrete up stands

3. Removing of the channel infill
Clean the channel on the outside after removing the formwork



a) Foam infill

With a hammer or a hook

or

b) PE – foam infill

By hand or with help of a screw driver in one piece

HAZ METAL – Anchor Channel HMPR	**Annex B7**
Intended Use Installation instructions for HAZ METAL anchor channels	

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4. Fastening the HAZ METAL channel bolt to the anchor channel

Fig. 1

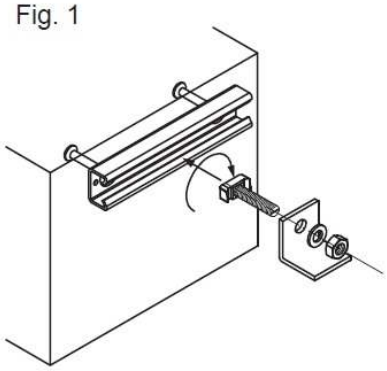
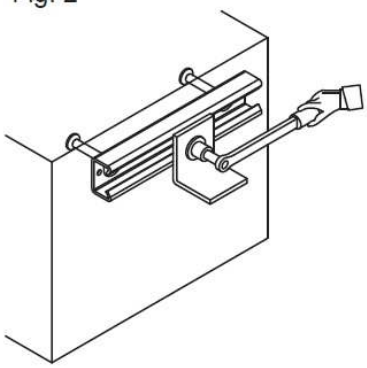
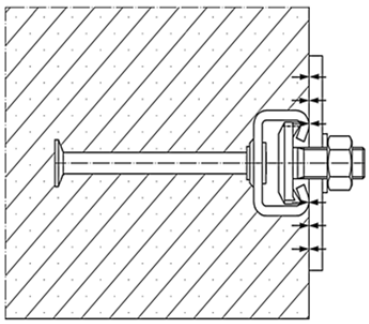


Fig. 2





a) Setting torques (General)

1. Insert the HAZ METAL channel bolt into the channel slot at any point along the channel length (Fig.1)
2. Turn the channel bolt 90° clockwise and the head of the screw locks into position (Fig.1)
3. Do not mount the channel bolt close than 25mm resp. 35mm (HMPR 54/33) from the end of the channel.
4. Use the washer under nut (Fig.1)
5. Check the correct fit of the screw. The groove on the shank end of the channel bolt must be perpendicular to the longitudinal axis.
6. Tighten the nuts to the installation torque according to Table 9.1 & 9.2 (Fig.2). The installation torque must not be exceeded.

Table 9.1 Installation torques (General) for HAZ METAL channel bolts Type HS

Table 9.1	Anchor channel	T_{inst} [Nm]						
		M8	M10	M12	M16	M20	M24	M30
8.8 70	28/15	8	13	15	-	-	-	-
	38/17	-	15	25	40	-	-	-
	40/25	-	15	25	40	-	-	-
	49/30	-	-	25	60	75	-	-
	54/33	-	-	25	60	120	-	-
	72/49	-	-	-	-	120	200	380
	40/22 40/22P	-	15	25	45	-	-	-
	50/30 50/30P	-	-	25	60	75	-	-
	52/34 52/34P	-	-	25	60	120	-	-

Table 9.2 Installation torques (General) for HAZ METAL Channel bolts Type HAZ

Table 9.2	Anchor channel	T_{inst} [Nm]			
		M8	M10	M12	M16
8.8	28/15	8	13	15	-
	38/17 40/25 40/22 40/22P	-	15	25	45
	49/30 54/33 50/30 50/30P 52/34 52/34P	-	-	25	60

HAZ METAL – Anchor Channel HMPR

Intended Use
Installation instructions for HAZ METAL channel bolts

Annex B8

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Fig. 1

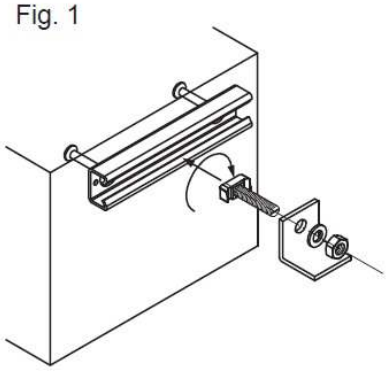
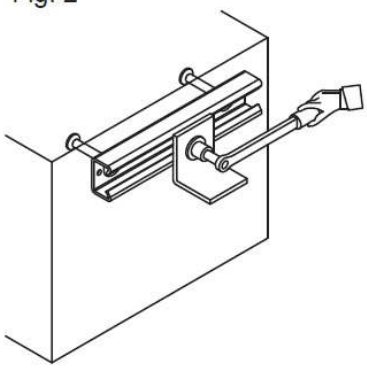
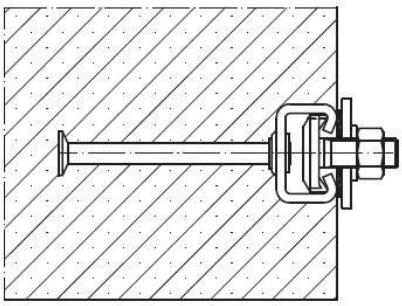


Fig. 2





b) Installation torques (Steel-Steel Contact)

1. Use washers between the channel and the fixture to create a defined contact.
2. Tighten the nuts to the installation torque according to Table 10.1 and Table 10.2

Table 10.1 Installation torques (Steel-Steel contact) for HAZ METAL channel bolts Type HS

Table 10.1	Anchor channel	T_{inst} [Nm]						
		M8	M10	M12	M16	M20	M24	M30
8.8	28/15	20	40	40	-	-	-	-
	38/17	-	40	70	120	-	-	-
	40/25	-	40	70	150	-	-	-
	49/30	-	-	70	180	90	-	-
	54/33	-	-	70	180	120	-	-
	72/49	-	-	-	-	360	360	400
	40/22 40/22P	-	40	70	100	-	-	-
	50/30 50/30P	-	-	70	180	120	-	-
	52/34 52/34P	-	-	70	180	150	-	-
70	28/15	20	40	40		-	-	-
	38/17	-	40	70	120	-	-	-
	40/25	-	40	50	140	-	-	-
	49/30	-	-	50	160	150	-	-
	54/33	-	-	50	180	240	-	-
	72/49	-	-	-	-	130	230	-

Table 10.2 Installation torques (Steel-Steel contact) for HAZ METAL channel bolts Type HAZ

Table 10.2	Anchor channel	T_{inst} [Nm]			
		M8	M10	M12	M16
8.8	28/15	15	20	20	-
	38/17	-	30	40	50
	40/25	-	40	50	70
	49/30	-	-	70	120
	54/33	-	-	70	120
	40/22 40/22P	-	30	40	60
	50/30 50/30P	-	-	60	120
	52/34 52/34P	-	-	70	180

HAZ METAL – Anchor Channel HMPR

Intended Use
Installation instructions for HAZ METAL channel bolts - 2

Annex B9

Deutsches Institut für Bautechnik DIBt

Table 11: Characteristic resistances under tension load – Steel failure channel

Anchor Channel		Steel failure anchor		Connection anchor-channel		Local flexure of channel lips [2]		
		$N_{Rk,s,a}$ (kN)	γ_{Ms} [1]	$N_{Rk,s,c}$ (kN)	$\gamma_{Ms,c}$ [1]	$s_{l,N}$ (mm)	$N^0_{Rk,s,l}$ (kN)	$\gamma_{Ms,l}$ [1]
Steel	**28/15**	14	1.71	13	1.80	56	13	1.80
	38/17	25		19		76	19	
	40/25	25		22		80	22	
	49/30	39		31		98	31	
	54/33	90		75		108	75	
	72/49	100		81		144	81	
	40/22	25		22.7		80	22.7	
	50/30	39		31.8		100	32.7	
	52/34	56	1.41	53.6		104	53.6	
	40/22P	39.3	1.71	23.8	1.80	80	25.3	1.80
	50/30P	56.5		40.2		100	50.1	
	52/34P	77		51.6		104	70.1	
Stainless Steel	**28/15**	17	1.42	15	1.80	56	15	1.80
	38/17	30		22		76	22	
	40/25	30		27		80	27	
	49/30	47		45		98	45	
	54/33	68		66		108	66	
	72/49	130		91		144	91	

[1] In absence of other regulations
[2] $s_{min,cbo}$ acc. to Table 8.1, Annex B4 and / or Table 8.2, Annex B5

Fig 1

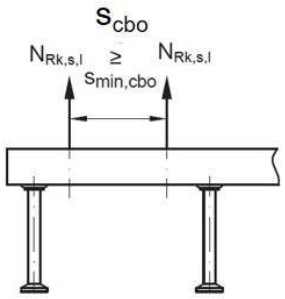


Table 12: Characteristic flexure resistance of channel under tension load

Anchor Channel				28/15	38/17	40/25 40/22 40/22P	49/30 50/30 50/30P	54/33 52/34 52/34P	72/49
Characteristic flexure resistance of channel	$M_{Rk,s,flex}$	[Nm]	Steel	349	595	1356 1450	1893 3110	3257 2806	11349
			Stainless Steel	348	651	1048 -	1840 -	3101 -	7370
Partial safety factor	$\gamma_{Ms,flex}$ [1]			1.15					

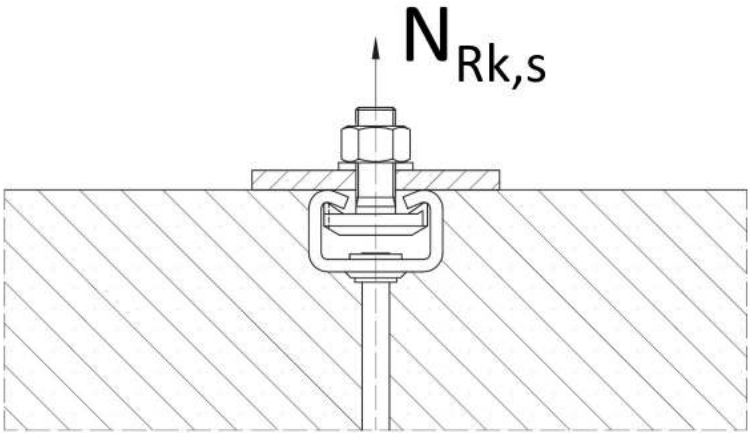
[1] In absence of other regulations

HAZ METAL – Anchor Channel HMPR	**Annex C1**
Performances Characteristic resistances under tension load Steel failure channel	

Table 13: Characteristic resistances under tension load – Steel failure channel bolts

Steel failure, channel bolts				**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
Characteristic resistance	$N_{Rk,s}$ [kN]	Type HS	M8 8.8	28.8	-	-	-	-
			M10 8.8	36.5	41.9	46.4	-	-
			M12 8.8	43.2	31.2	61.9	63.2	-
			M16 8.8	-	42.5	111.7	108.1	-
			M20 8.8	-	-	-	165.7	117.1
			M24 8.8	-	-	-	-	214.9
			M30 8.8	-	-	-	-	324.1
				28/15	**38/17**	**49/30**	**54/33**	**72/48**
			M8 70	25.6	-	-	-	-
			M10 70	30.0	15.2	36.9	-	-
			M12 70	49.7	52.3	44.8	43.5	-
			M16 70	-	52.0	79.5	93.4	-
			M20 70	-	-	-	120.3	128.9
			M24 70	-	-	-	-	171.2
		Type HAZ		**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
			M8 8.8	27.9	-	-	-	-
			M10 8.8	39.2	44.4	43.2	-	-
			M12 8.8	43.9	63.9	65.6	64.0	-
			M16 8.8	-	86.6	92.6	95.3	-
Partial safety factor	γ_{Ms} [1)]		8.8	1.50				
			70	1.87				

[1)] In absence of other national regulations



Channel under tension load

HAZ METAL – Anchor Channel HMPR

Performances
Characteristic resistances under tension load
Steel failure channel bolts

Annex C2

Table 14: Characteristic resistances under tension load – Concrete failure under tension load

Anchor channel			Steel and Stainless Steel								
			28/15	38/17	40/25 40/22	40/22P	49/30 50/30	50/30P	54/33 52/34	52/34P	72/49
Pull out failure											
Charac. resistance in cracked concrete C20/25		$N_{Rk,p}$ [kN]	12.7	22.6	22.6	35.4	35.3	50.9	50.9	69.4	90.5
Charac. resistance in uncracked concrete C20/25			17.8	31.7	31.7	49.6	49.5	71.4	71.3	97.1	126.7
Increasing factor of $N_{Rk,p}$	C25/30	Ψ_c [-]	1.25								
	C30/37		1.50								
	C35/45		1.75								
	C40/50		2.00								
	C45/55		2.25								
	C50/60		2.50								
	C55/67		2.75								
	≥ C60/75		3.00								
Partial safety factor		$\gamma_{Mp} = \gamma_{Mc}$ [1)]	1.50								
Concrete cone failure											
Product factor	Cracked concrete	$k_{cr,N}$	7.2	7.8	7.8	8.0	8.2	8.1	8.7	8.7	8.9
	Uncracked concrete	$k_{ucr,N}$	10.3	11.2	11.2	11.5	11.7	11.5	12.4	12.4	12.7
Partial safety factor		γ_{Mc} [1)]	1.5								
Concrete splitting failure											
Characteristic edge distance		$c_{cr,sp}$ [mm]	135	228	237	228	282	282	465	468	537
					273	273	318	318	468	468	
Characteristic spacing		$s_{cr,sp}$ [mm]	270	456	474	456	564	564	930	930	1074
					546	546	636	636	936	936	
Partial safety factor		$\gamma_{Msp} = \gamma_{Mc}$ [1)]	1.5								

[1)] In absence of other national regulations

HAZ METAL – Anchor Channel HMPR

Performances
Characteristic resistances under tension load

Annex C3

Table 15: Characteristic resistances under shear load

Anchor channel			Steel						Stainless steel					
			28/15	38/17	40/25 40/22 40/22P	49/30 50/30 50/30P	54/33 52/34 52/34P	72/49	28/15	38/17	40/25	49/30	54/33	72/49
Steel failure: Failure of anchor, connection between anchor and channel or channel lips														
Characteristic resistance	$V_{Rk,s,a}$ [kN]		13	19	22 25 39.3	31 35 56.5	75 56 77	81	15	22	27	45	66	91
	$V_{Rk,s,c}$ [kN]				22 22.7 23.8	31 31.8 40.2	75 53.6 51.6							
	$V^0_{Rk,s,l}$ [kN]				22 22.7 37.4	31 32.7 50.1	75 53.6 70.1							
Partial safety factor	γ_{Ms} [1]		$\gamma_{Ms,a}$=1.43, $_{Ms,c,}$=1.8, $_{Ms,l,}$=1.8											
Pry-out failure														
Product factor	k_8 [2]		1.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0
Partial safety factor	γ_{Mc} [1]		1.5											
Steel failure: Local flexure of channel lips														
Charac. spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,v}$ [mm]		56	76	80	98 100	108 104	144	56	76	80	98	108	144
Concrete edge failure														
Product factor	cracked concrete	$k_{cr,V}$	6.,1	7.5	7.2 6.5 7.3	6.8 7.5 7.5	7.5 7.5 7.5	7.5	5.1	6.4	5.4	6.8	7.0	7.5
Product factor	uncracked concrete	$k_{ucr,V}$	8.5	10.5	10.1 9.1 10.2	9.0 10.5 10.5	10.5 10.5 10.5	10.5	7.1	9.0	7.6	8.8	9.8	10.5
Partial safety factor	γ_{Mc} [1]		1.5											

[1] In absence of other national regulations
[2] In case of supplementary reinforcement, the factor k_8 should be multiplied with 0.75.

Table 16: Displacements under tension load

Anchor Channel		Tension load	Short time displacement	Long time displacement
		N [kN]	δ_{N0} [mm]	$\delta_{N\infty}$ [mm]
Steel	**28/15**	3.8	0.3	0.6
	38/17	6.5	0.4	0.8
	40/25	9.5	0.5	1.0
	49/30	17.4	0.7	1.4
	54/33	28.3	0.8	1.6
	72/49	52.2	0.8	1.6
	40/22	12.2	0.3	0.6
	50/30	26.1	0.4	0.8
	52/34	30.2	0.5	1.0
	40/22P	9.5	0.2	0.4
	50/30P	16.0	0.2	0.4
	52/34P	20.5	0.3	0.6
Stainless Steel	**28/15**	2.5	0.3	0.6
	38/17	4.5	0.3	0.6
	40/25	7.4	0.4	0.8
	49/30	14.1	0.6	1.2
	54/33	24.2	0.8	1.6
	72/49	31.2	0.8	1.6

Table 17: Displacements under shear load

Anchor channel		Shear load	Short time displacement	Long time displacement
		V [kN]	δ_{V0} [mm]	$\delta_{V\infty}$ [mm]
Steel	**28/15**	5.6	0.1	0.2
	38/17	8.2	0.2	0.3
	40/25	8.8	0.2	0.3
	49/30	10.7	0.2	0.3
	54/33	17.5	0.4	0.6
	72/49	39.6	0.6	0.9
	40/22	5.5	0.2	0.3
	50/30	9.7	0.3	0.5
	52/34	13.7	0.4	0.6
	40/22P	5.5	0.5	0.8
	50/30P	9.7	0.6	0.9
	52/34P	13.7	0.8	1.2
Stainless Steel	**28/15**	3.1	0.2	0.3
	38/17	4.5	0.3	0.5
	40/25	6.4	0.5	0.8
	49/30	10.4	0.6	0.9
	54/33	18.4	0.7	1.1
	72/49	38.5	0.8	1.2

HAZ METAL – Anchor Channel HMPR

Performances
Displacements under tension and shear load

Annex C5

Table 18.1: Characteristic resistances under shear load – Steel failure channel bolts

Steel failure, channel bolts				**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
Characteristic resistance	$V_{Rk,s}$ [kN]	Type HS	M8 8.8	14.6	-	-	-	-
			M10 8.8	23.2	23.2	23.2	-	-
			M12 8.8	33.7	33.7	33.7	33.7	-
			M16 8.8	-	62.8	62.8	62.8	-
			M20 8.8	-	-	-	98.0	98.0
			M24 8.8	-	-	-	-	141.2
			M30 8.8	-	-	-	-	224.4
				28/15	**38/17**	**40/25**	**49/30 54/33**	**72/48**
			M8 70	15.4	-	-	-	-
			M10 70	24.4	24.4	24.4	-	-
			M12 70	35.4	35.4	35.4	35.4	-
			M16 70	-	65.9	65.9	65.9	-
			M20 70	-	-	-	102.9	102.9
			M24 70	-	-	-	-	148.3
		Type HAZ		**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
			M8 8.8	14.6	-	-	-	-
			M10 8.8	23.2	23.2	23.2	-	-
			M12 8.8	33.7	33.7	33.7	33.7	-
			M16 8.8	-	62.8	62.8	62.8	-
Partial safety factor	$\gamma_{Ms,s}$ [1)]		8.8	1.25				
			70	1.56				

[1)] In absence of other national regulations

HAZ METAL – Anchor Channel HMPR	**Annex C6**
Performances Characteristic resistances under shear load Steel failure channel bolts	

Table 18.2: Characteristic resistances under shear load – Steel failure channel bolts

Steel failure, channel bolts				**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
Characteristic resistance	$M^0_{Rk,s}$ [2] [Nm]	Type HS	M8 8.8	30.0	-	-	-	-
			M10 8.8	59.8	59.8	59.8	-	-
			M12 8.8	104.8	104.8	104.8	104.8	-
			M16 8.8	-	266.4	266.4	266.4	-
			M20 8.8	-	-	-	519.3	519.3
			M24 8.8	-	-	-	-	897.6
			M30 8.8	-	-	-	-	1799.2
				28/15	**38/17**	**40/25**	**49/30 54/33**	**72/48**
			M8 70	26.2	-	-	-	-
			M10 70	52.3	52.3	52.3	-	-
			M12 70	91.7	91.7	91.7	91.7	-
			M16 70	-	233.1	233.1	233.1	-
			M20 70	-	-	-	454.4	454.4
			M24 70	-	-	-	-	785.8
		Type HAZ		**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
			M8 8.8	30.0	-	-	-	-
			M10 8.8	59.8	59.8	59.8	-	-
			M12 8.8	104.8	104.8	104.8	104.8	-
			M16 8.8	-	266.4	266.4	266.4	-
Partial safety factor	$\gamma_{Ms,s}$ [1]		8.8	1.25				
			70	1.56				

[1] In absence of other national regulations
[2] The characteristic flexure acc. to Table 18.2 is limited as follows:

$M^0_{Rk,s} \leq 0{,}5 \cdot N_{Rk,s,l} \cdot a$

$M^0_{Rk,s} \leq 0{,}5 \cdot N_{Rk,s} \cdot a$

$M^0_{Rk,s,l}$ acc. to Annex C1, Table 11

a acc. to Annex C8, Table 18.3

Table 18.3: Internal lever arm between tension and compression force

Internal lever arm of channel bolts							
			28/15	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
a [mm]	Type HS	M8 8.8	17.0	-	-	-	-
		M10 8.8	18.3	23.0	17.3	-	-
		M12 8.8	19.7	24.3	18.7	29.7	-
		M16 8.8	-	26.3	20.7	31.7	-
		M20 8.8	-	-	-	34.1	42.7
		M24 8.8	-	-	-	-	45.0
		M30 8.8	-	-	-	-	49.0
			28/15	**38/17**	**40/25**	**49/30 54/33**	**72/48**
		M8 70	18.3	-	-	-	-
		M10 70	20.7	25.3	24.3	-	-
		M12 70	20.3	26.3	26.7	28.0	-
		M16 70	-	23.0	27.7	29.0	-
		M20 70	-	-	-	-	42.7
		M24 70	-	-	-	-	43.7
	Type HAZ		**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 52/34 52/34P 54/33**	**72/48**
		M8 8.8	16.9	-	-	-	-
		M10 8.8	18.3	22.8	23.9	-	-
		M12 8.8	20.6	25.2	26.3	30.3	-
		M16 8.8	-	26.2	27.3	31.3	-

Table 19: Characteristic resistances under combined tension and shear load

Anchor channel		**Steel**						**Stainless steel**					
		28/15	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P**	**54/33 52/34 52/34P**	**72/49**	**28/15**	**38/17**	**40/25**	**49/30**	**54/33**	**72/49**
Product factor	k_{13}	2.0	2.0	2.0 / 1.0[1)]	2.0 / 1.0[1)]	2.0 / 1.0[1)]	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	k_{14}	2.0	2.0	2.0 / 1.0[2)]	2.0 / 1.0[2)]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

[1)] k_{13} can be taken as 2,0 if $V_{RD,s,l}$ 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 min ($N_{Rd,s,a}$; $N_{Rd,s,c}$)

HAZ METAL – Anchor Channel HMPR

Performances
Characteristic resistances under combined tension and shear load
Steel failure channel bolts

Annex C8

Table 20: Characteristic resistances under tension and shear load under fire exposure

Anchor channel				**28/15**	**38/17**	**40/25 40/22 40/22P**	**49/30 50/30 50/30P 54/33 52/34 52/34P**	**72/49**
Channel Bolts ≥			[mm]	M12	M16	M16	M16	M16
Steel failure: Anchor, connection channel/anchor, local flexure of channel lips								
Characteristic resistance	R30	$N_{Rk,s,fi}$ = $V_{Rk,s,fi}$	[kN]	0.9	1.8	1.8	5.7	5.7
	R60			0.7	1.5	1.5	4.2	4.2
	R90			0.5	1.2	1.2	2.6	2.6
	R120			0.4	1.1	1.1	1.8	1.8
Partial safety factor		$\gamma_{Ms,fi}$ 3)	[-]	1.0				
Concrete cone failure								
Characteristic edge distance		$c_{cr,N,fi}$	[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)				
Characteristic spacing		$s_{cr,N,fi}$	[mm]	$4 \cdot h_{ef} \geq s_{cr,N}$				
		$s_{min,fi}$		acc. to Table 4, Annex A5				
Axial spacing of reinforcement								
Max. axial spacing	R30	a	[mm]	35	35	35	35	35
	R60	a		35	35	35	35	35
	R90	a		45	45	45	45	45
	R120	a		60	60	60	60	60

1) Fire exposure from one side only
2) Fire exposure from more than one side
3) In absence of other national regulations

Fig. 1 One sided fire exposure

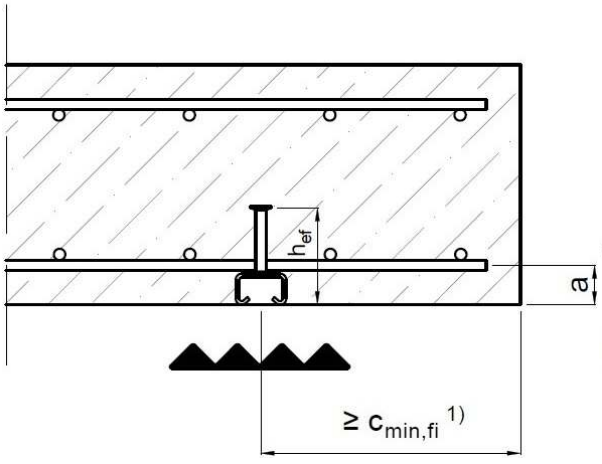
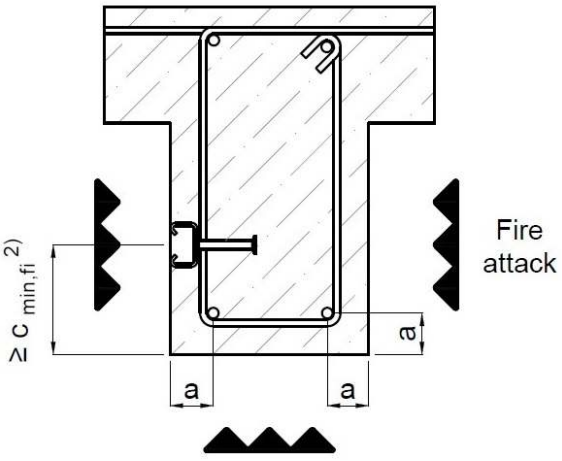


Fig. 2 Multi-sided fire exposure



HAZ METAL – Anchor Channel HMPR

Performances
Characteristic resistances under tension and shear load under fire exposure

Annex C9

Table 21: Anchor channel / special screw combinations for fatigue cyclic loading

Anchor channels				Channel bolts			
Profile	**d1 [mm]**	**d_h [mm]**	**Material**	**Special screw**	**Diameter Ø [mm]**	**Strength class**	**Material**
40/22P	10	20	Hot dip galvanized	Type HS	M12	8.8	electro-plated
50/30P	12	24	Hot dip galvanized	Type HS	M16	8.8	electro-plated
52/34P	14	28	Hot dip galvanized	Type HS	M16	8.8	electro-plated

Design Method I

Table 22: Characteristic fatigue resistance for any steel failure after n load cycles without static preload (N_{Ed} =0) – Design method I

Anchor channel	Load cycles n	40/22P	50/30P	52/34P
		$\Delta N_{Rk,s;0;n}$		
Characteristic resistances under fatigue tension after n load cycles without static load component	≤ 10^4	13.3	18.1	26.6
	≤ 10^5	6.6	9.4	15.6
	≤ 10^6	3.1	5.3	9.1
	≤ 2 x 10^6	2.7	4.8	8.2
	≤ 5 x 10^6	2.4	4.5	7.5
	≤ 10^8	2.3	4.2	7.0
	> 10^8	2.3	4.2	7.0

HAZ METAL – Anchor Channel HMPR-P	**Annex C10**
Performances Characteristic resistances under fatigue cyclic tension loading (Steel failure) – Design Method I	

Pull-out and concrete failure:

Table 22: Reduction factor of characteristic fatigue resistance for concrete related failure after n load cycles without static preload (N_{Ed} =0) – Design method I

Anchor channel		**40/22P**	**50/30P**	**50/30P**
Reduction factor for concrete cone / pullout fatigue resistance after n load cycles without static preload (N_{Ed} =0) $\Delta N_{Rk,c;0;n} = \eta_{k,c,fat} \cdot N_{Rk,c}$ $\Delta N_{Rk,p;0;n} = \eta_{k,p,fat} \cdot N_{Rk,p}$	**Load Cycles n**	**$\eta_{k,c,fat} = \eta_{k,p,fat}$ [-]**		
	≤ 10^4	0.736		
	≤ 10^5	0.665		
	≤ 10^6	0.600		
	≤ 2 x 10^6	0.582		
	≤ 5 x 10^6	0.559		
	≤ 6 x 10^7	0.500		

Design Method II

Table 23: Characteristic fatigue limit resistance for any steel failure without static preload (N_{Ed} =0) – Design method II

Anchor channel	40/22P	50/30P	52/34P
	$\Delta N_{Rk,s;0;n;\infty}$ [kN]		
Characteristic fatigue limit resistance ($n \rightarrow \infty$) for any steel failure without static preload (N_{Ed} =0)	2.3	4.2	7.0

Table 24: Characteristic resistance under fatigue tension load – Concrete failure

Anchor channel	40/22P	50/30P	52/34P
Characteristic resistances under fatigue tension load $\Delta N_{Rk,c;0;n;\infty} = \eta_{k,c,fat} \cdot N_{Rk,c}$	**$\eta_{k,c,fat} = \eta_{k,p,fat}$ [-]**		
$\Delta N_{Rk,p;0;n;\infty} = \eta_{k,p,fat} \cdot N_{Rk,p}$	0.5		

In absence of other national regulations, the following partial safety factor $\gamma_{M,fat}$ for the calculation procedure I and II (Tables from 21 to 24) according to EOTA TR 050, it is recommended that:

$\gamma_{M,fat}$ = 1,35 (Steel)
$\gamma_{M,fat}$ = 1,5 (Concrete)