Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA
www.eota.eu

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 10 August 2017

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	
This European Technical Assessment contains	25 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	European Assessment Document (EAD) 330008-02-0601

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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 C7

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C8

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

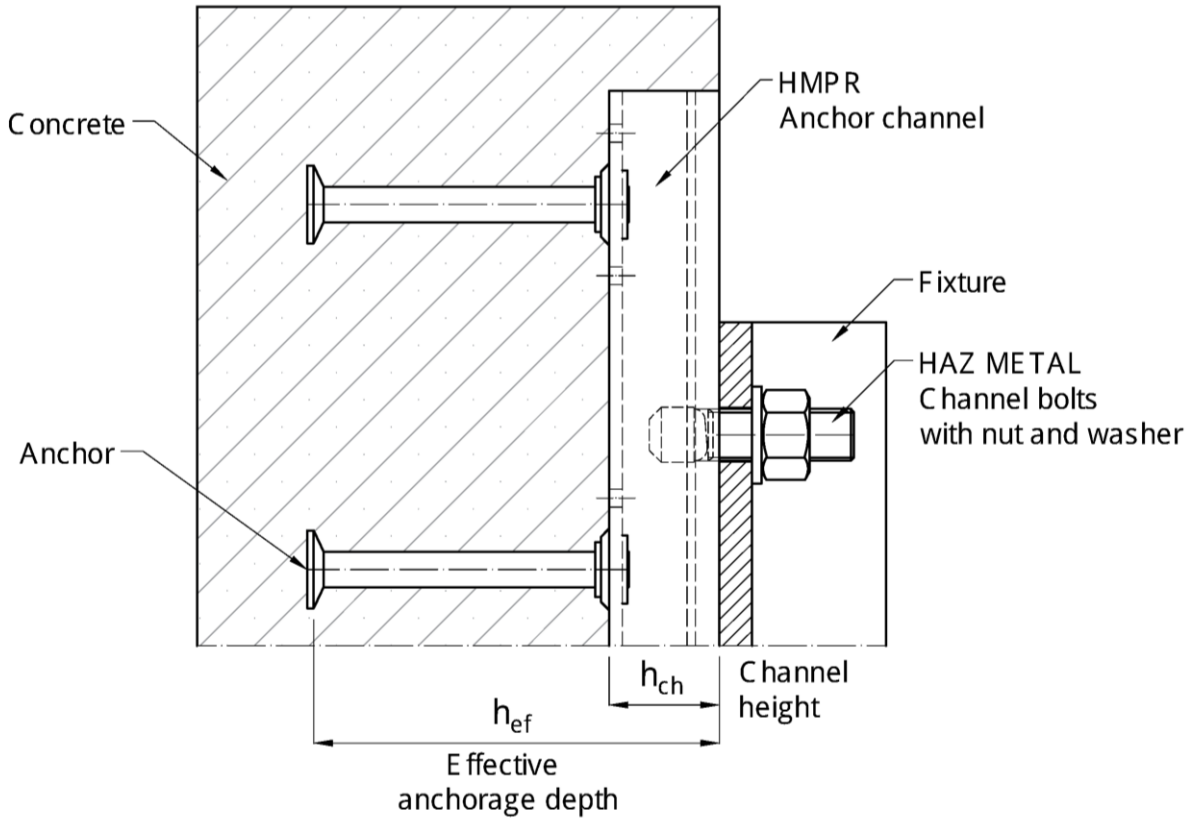
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

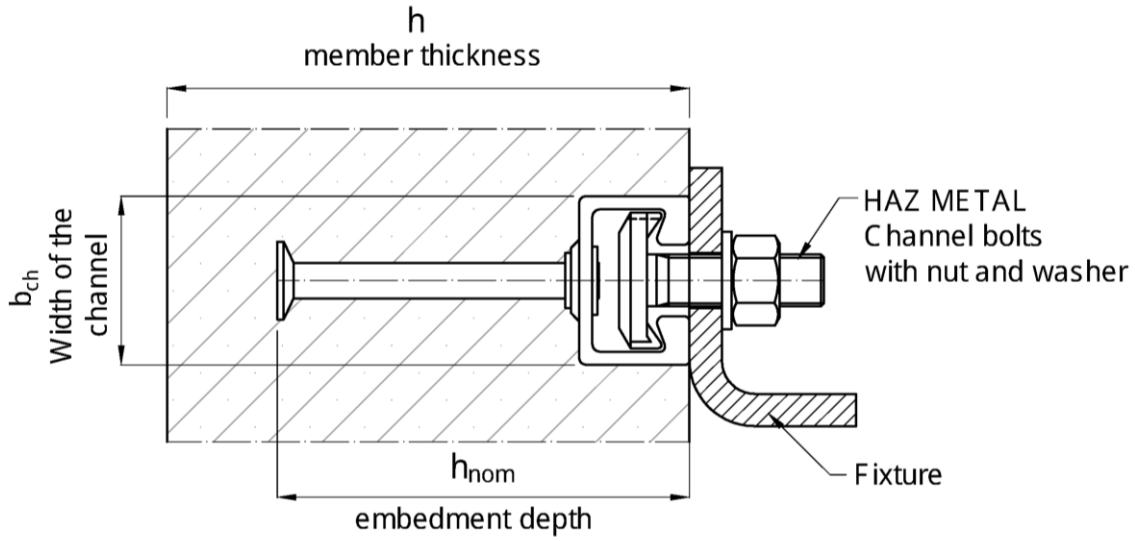
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 10 August 2017 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Müller





HAZ METAL - Anchor Channel HMPR

Product Description
Installed condition

Annex A1

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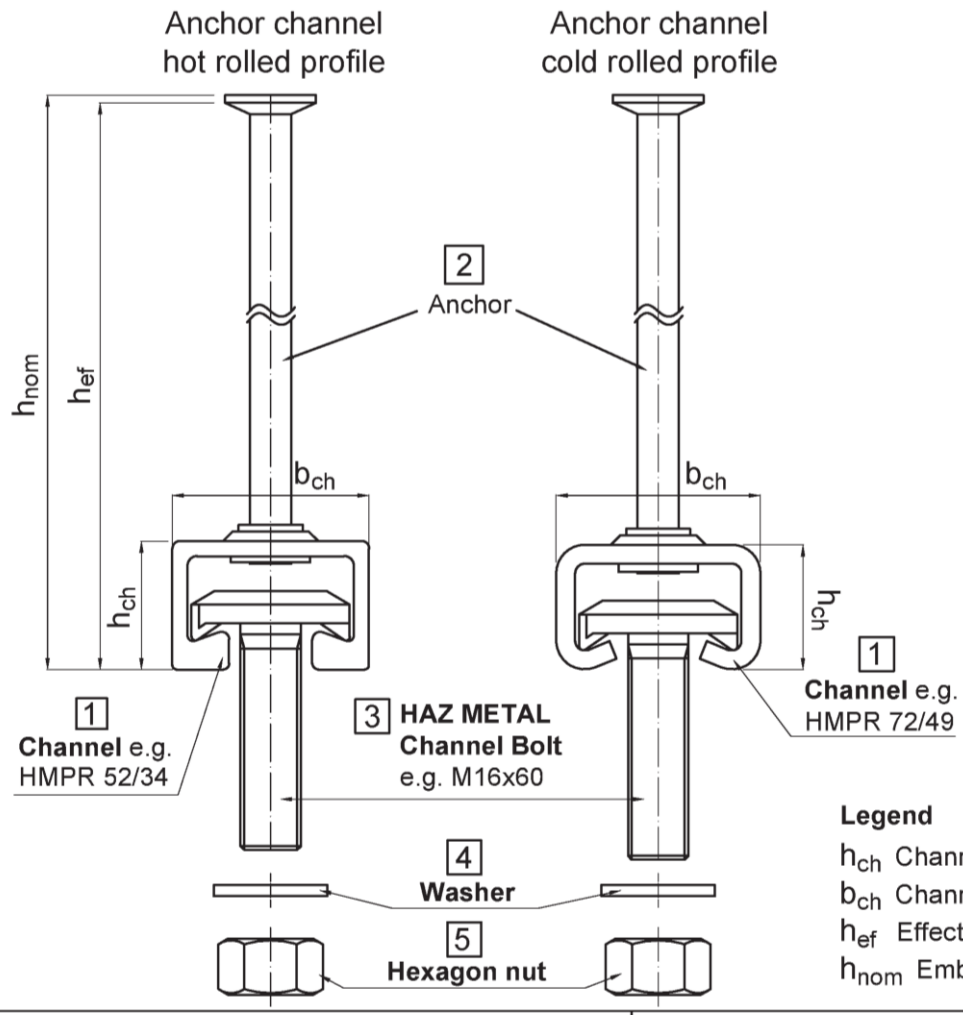
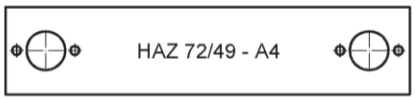


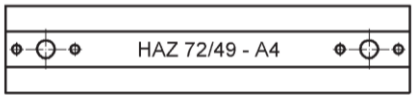
Marking of the HAZ - Anchor channel:
e.g. HAZ 72/49 - A4

HAZ = Identifying mark of the manufacturer
72/49 = 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
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

Table1: 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**
		Anchor channels may only be used in structures subject to dry internal conditions (e.g. accommodations, bureaus, schools, hospitals, shops, exceptional internal conditions with usual humidity acc. column 4)	Anchor channels may also be used in 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)	Anchor channels may also be used in structures subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions, if no particular agressive conditions (e.g. permanent, alternating immersion in seawater etc. acc column 6) exist.	Anchor channels may also be used in structures subject to exposure in particular agressive 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 deicing materials are used)
		Materials			
1	**Channel profile**	Steel 1.0038; 1.0044 EN 10025:2005 hot-dip galv. ≥ 50 µm 4) Stainless steel 1.4301 EN 10088:2005	Steel 1.0038; 1.0044 EN 10025:2005 hot-dip galv. ≥ 50 µm 4)	Stainless steel 1.4401/ 1.4404/ 1.4571; 1.4362, EN 10088:2005	Stainless steel 1.4462 1) 1.4529/1.4547 EN 10088:2005
2	**Anchor**	Steel 1.0038; 1.0214, 1.0401, 1.1132,1.5525 EN 10263:2001 hot-dip galv. ≥ 50 µm 4) Stainless steel 1.4301 EN 10088:2005	Steel 1.0038; 1.0214, 1.0401, 1.1132, 1.5525 EN 10263:2001 hot-dip galv. ≥ 50 µm 4)	Stainless steel 1.4401/ 1.4404/ 1.4571/ 1.4578; 1.4362; 1.0038 2) EN 10088:2005	
3	**HAZ METAL Channel bolt thread and shaft acc. EN ISO 4018:2011**	Steel, strength grade 8.8 EN ISO 898-1:2013 electroplated ≥ 5 µm 3)	Steel, strength grade 8.8 EN ISO 898-1:2013 hot-dip galv. ≥ 50 µm 4)	Stainless steel 1.4401/ 1.4404/ 1.4571; 1.4362; EN 3506-1:2009	Stainless steel 1.4462 1), 1.4529/ 1.4547 EN ISO 3506-1:2009
4	**Washer, EN ISO 7089:2000 and EN ISO 7093-1:2000 production class A, 200HV**	Steel EN 10025:2005 electroplated ≥ 5 µm 3)	Steel EN 10025:2005 hot-dip galv. ≥ 50 µm 4)	Stainless steel 1.4401/ 1.4404/ 1.4571; EN 10088:2005	Stainless steel 1.4462 1), 1.4529/ 1.4547 EN 10088:2005
5	**Hexagonal nuts EN ISO 4032:2012**	Steel, strength grade 8.8 EN 898-2:2012 electroplated ≥ 5 µm 3)	Steel, strength grade 8.8 EN 898-2:2012 hot-dip galv. ≥ 50 µm 4)	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 fo indoor swimming-pools
2) Steel acc. to EN 10025:2005
3) Electroplated acc. to EN ISO 4042:1999
4) 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

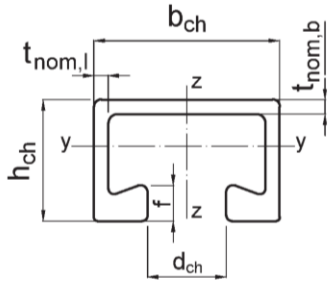


Fig. 1

Cold rolled profile

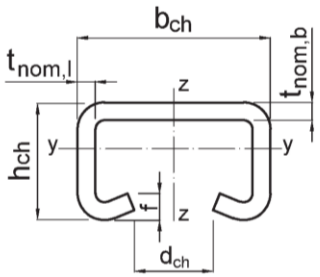
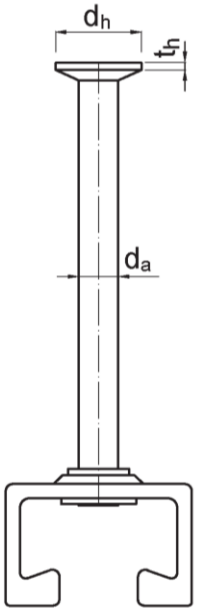


Fig. 2

Table 2: Geometrical profile properties

Anchor Channel	Fig.	Material	Dimensions						
			b_{ch}	h_{ch}	$t_{nom,b}$	$t_{nom,l}$	d_{ch}	f	I_y
			[mm]						[mm^4]
72/49	2	Steel	72.00	49.00	6.00	6.00	33.00	9.00	312071
40/22	1		40.00	22.00	2.50	2.50	18.00	6.00	18970
50/30	1		50.00	30.00	3.00	3.00	22.00	8.00	57630
52/34	1		52.00	34.00	4.00	4.00	22.00	10.00	97150
72/49	2	Stainless Steel	72.00	49.00	6.00	6.00	33.00	9.00	312071

Hot rolled profile



Cold rolled profile

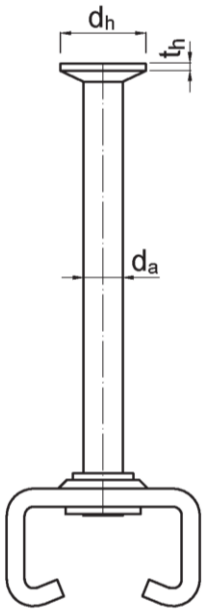


Table 3: Types of round anchors

Type	Anchor Channel	Shaft Φ d_a	Shaft Φ d_h	Head t_h	Shaft A_h
		[mm]			[mm^2]
R	**40/22**	8	16	1,8	150,80
	50/30	10	20	1,8	235,62
	52/34	12	24	2	339,29
	72/79	16	32	3	603,19

HAZ METAL - Anchor Channel HMPR

Product Description
Profile dimensions / Types of anchors

Annex A4

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Round anchor

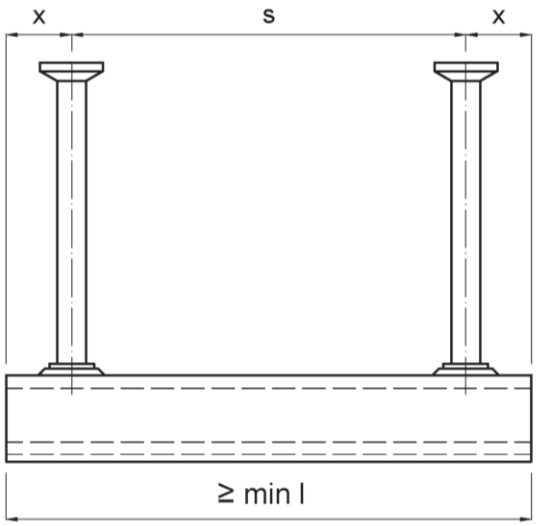

Table 4: Anchor positioning

Anchor Channel	Anchor spacing		End spacing x	min. channel length (min l)
	s_{min}	s_{max}	Round anchor	Round anchor
	[mm]			
40/22	100	250	25	150
50/30 52/34	100	250	35	170
72/49	130	400	35	200

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

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Hook-head channel bolt

Fig. 1

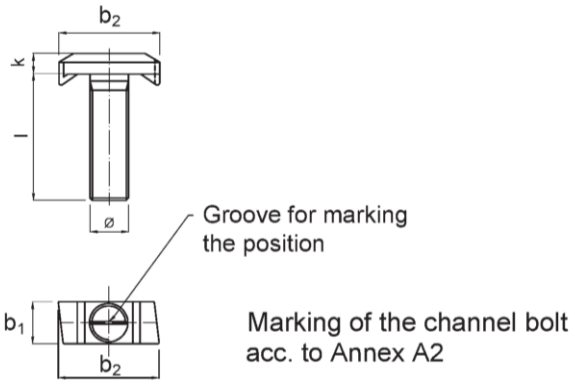

Table 5.1: Dimensions of the HAZ METAL channel bolt - Type HS

HS Channel Bolt		**40/22**			**50/30**			**72/48**		
Anchor channel		**40/22**			**50/30 52/34**			**72/49**		
ø	[mm]	10	12	16	12	16	20	20	24	30
b1	[mm]	14	14	14	13	17	21	23	25	31
b2	[mm]	35	35	34	43,2	43,2	42,2	58	58	58
k	[mm]	7,5	7,5	8,5	10	11	12	14	16	20
Fig.	[-]	1			1			1		
Length l	[mm]	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		**40/22**			**50/30**	
Anchor channel		**40/22**			**50/30 52/34**	
ø	[mm]	10	12	16	12	16
b1	[mm]	14	14	17	17.5	17
b2	[mm]	34	34	34	42	42
k	[mm]	8,5	8,5	8,5	8,5	8,5
Fig.	[-]	1			1	
Length l	[mm]	30-100	50-100	60-100	50-100	50-125

Table 6: Strength grade

Channel bolt	**Steel** [1)]	**Stainless Steel** [1)]
Strenght grade	8.8	A4-70
f_{uk} [N/mm^2]	800	700
f_{yk} [N/mm^2]	640	450
Finish	z.p., h.d.g.	–

[1)] Materials according to Annex A3, Table 1

HAZ METAL - Anchor Channel HMPR

Annex A6

Product Description
HAZ METAL - channel bolts, dimensions and strength grade

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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

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” or Fpr EN 1992-4:2016.
- The characteristic resistances are calculated with the minimum effective embedment depth.

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 B6 and B7.
- 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 B6 and B7) rectangular to the channel axis.
- The setting torques given in Annex B7 must be applied and must not be exceeded.

HAZ METAL - Anchor Channel HMPR	Annex B1
Intended Use Specifications	

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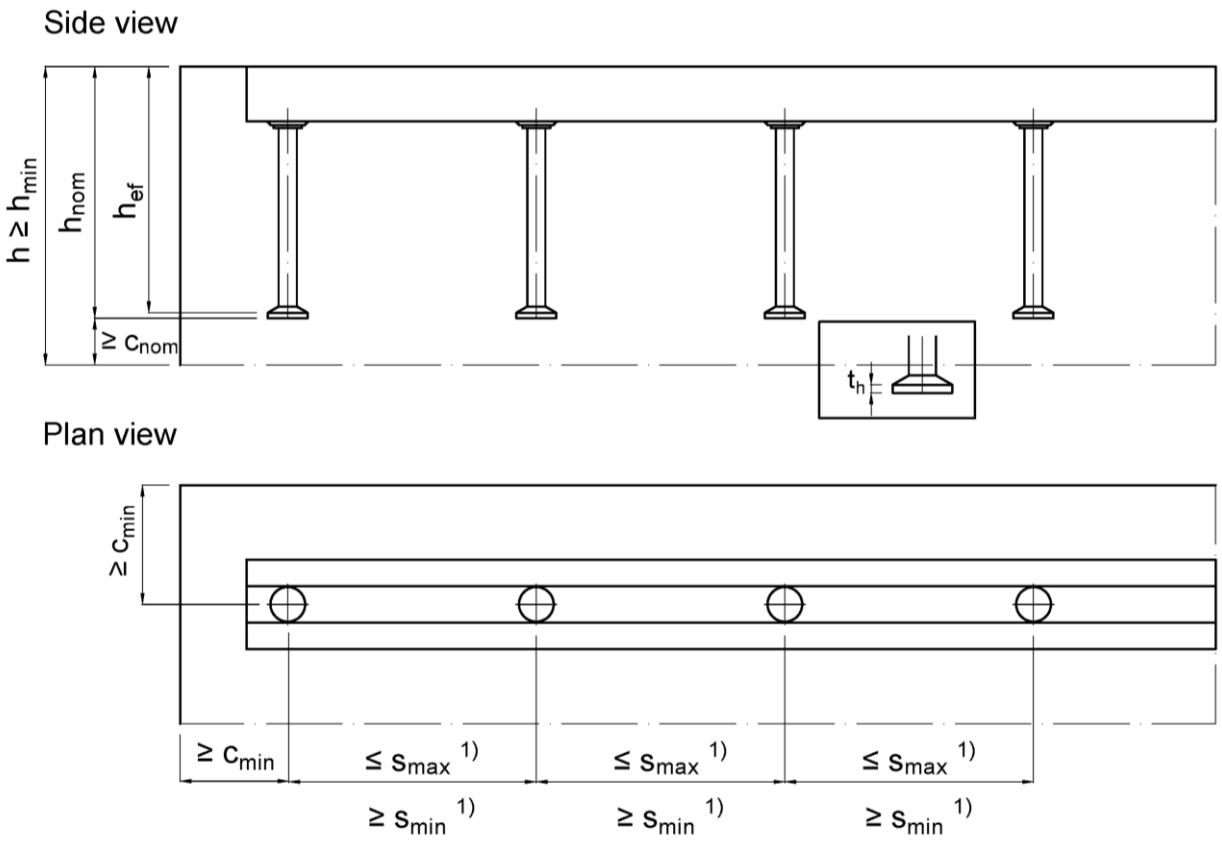

Table 7: Minimum effective embedment depth, edge distance and member thickness for cold rolled and hot rolled profiles

Anchor Channel			Cold Rolled Profile	Hot Rolled Profile		
			72/49	**40/22**	**50/30**	**52/34**
Min. anchorage depth	min h_{ef}	[mm]	179	76	94	156
Min. edge distance	c_{min}		150	50	75	100
Min. member thickness	h_{min}		215	108	126	188

[1] s_{min}, s_{max} acc. to Table 4, Annex A5

HAZ METAL - Anchor Channel HMPR	**Annex B2**
Intended Use Installation parameters of anchor channels	

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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 $s_{min,cbo}$ [4] of the channel bolts	Installation Torque T_{inst} [5]		
			General [2]	Steel-Steel Contact [3]	
			8.8; A4-70 [1]	8.8	A4-70 [1]
	[mm]	[mm]	[Nm]		
72/48	20	100	120	360	130
	24	120	200	360	230
	30	150	380	400	-

Channel bolt for hot profiles	Channel bolt Ø	Min. Spacing $s_{min,cbo}$ [4] of the channel bolt	Installation Torque T_{inst} [5]	
			General [2]	Steel-Steel Contact [3]
			8.8	8.8
	[mm]	[mm]	[Nm]	
40/22	10	50	15	40
	12	60	25	70
	16	80	45	100
50/30	12	60	25	70
	16	80	60	180
	20	100	75	120

[1] Material according to Annex A3, Table 1
[2] Acc. to Annex B5, Fig 1
[3] Acc. to Annex B5, Fig 2
[4] See Annex C1, Fig 1
[5] T_{inst} must not be exceeded

HAZ METAL - Anchor Channel HMPR	Annex B3
Intended Use Installation parameters of HAZ METAL - channel bolts Type HS	

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Table 8.2 Minimum spacing and installation torque HAZ METAL - Channel bolts Type HAZ

Channel bolt for hot profiles	Channel bolt Ø	Min. Spacing $s_{min,cbo}$ [3] of the channel bolt	Installation Torque T_{Inst} [4]	
			General [1]	Steel-Steel Contact [2]
			8.8	8.8
	[mm]	[mm]	[Nm]	
40/22	10	50	15	30
	12	60	25	40
	16	80	45	60
50/30	12	60	25	60
	16	80	60	120

[1] Acc. to Annex B5, Fig 1
[2] Acc. to Annex B5, Fig 2
[3] See Annex C1, Fig 1
[4] T_{inst} must not be exceeded

HAZ METAL - Anchor Channel HMPR

Intended Use
Installation parameters of HAZ METAL - Channel bolts Type HAZ

Annex B4

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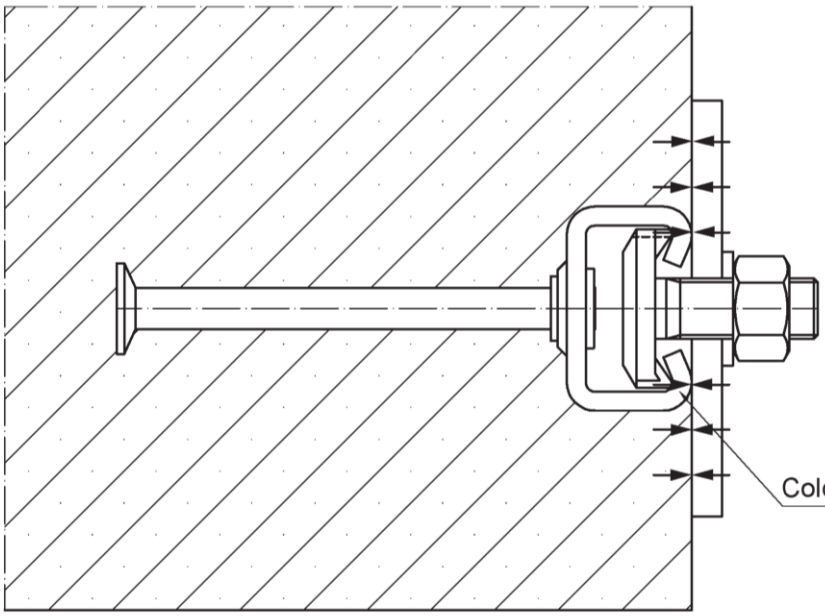

Fig. 1

General:

The fixture is braced to the concrete or to the anchor channel respectively braced to concrete and anchor channel. The installation torques acc. to Annex B3, Table 8.1 or and /or Annex B4, Table 8.2 shall be applied and must not be exceeded.

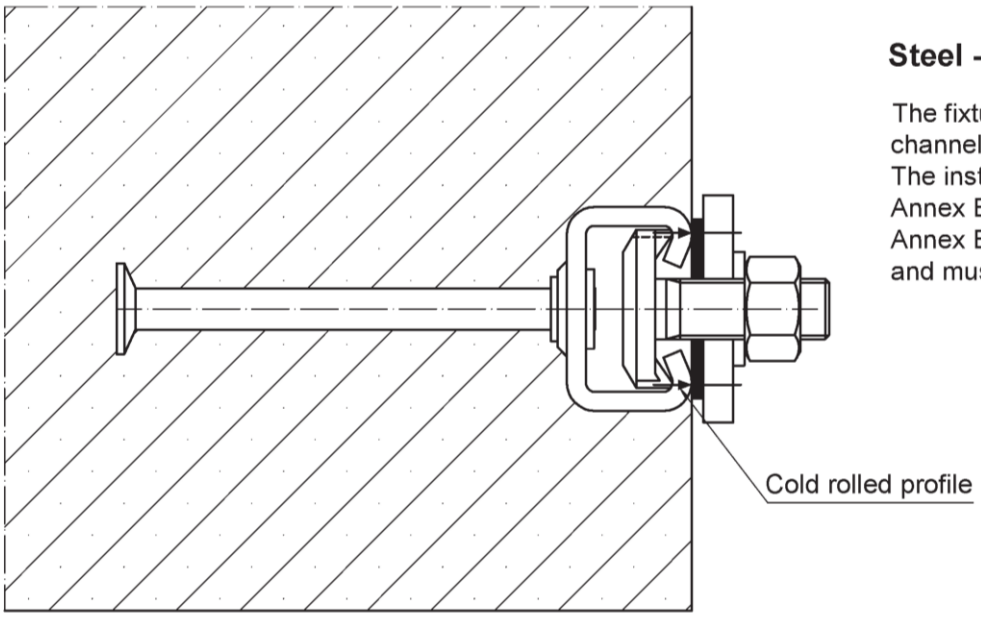

Fig. 2

Steel - Steel Contact:

The fixture is braced to the anchor channel by suitable washer.
The installation torques Annex B3, Table 8.1 or and /or Annex B4, Table 8.2 shall be applied and must not be exceeded.

HAZ METAL - Anchor Channel HMPR	**Annex B5**
Intended Use Positions of the fixture	

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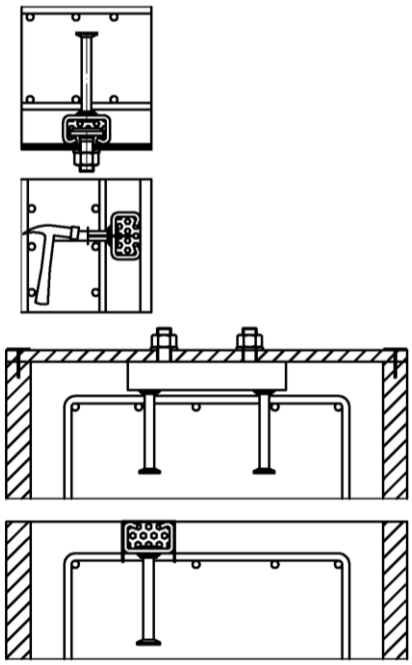
1. Fixing anchor channel

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.

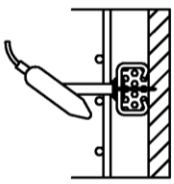
or

c) Fixing to anchor channels at the top

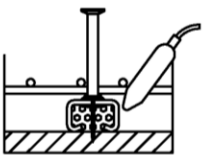
- To timber batten on the side formwork (e.g. with HAZ METAL channel bolts)
- Fixing from above directly to the reinforcement or to a mounting rebar, attach the channel by wire binding.

2. Pouring concrete and regular compacting of concrete

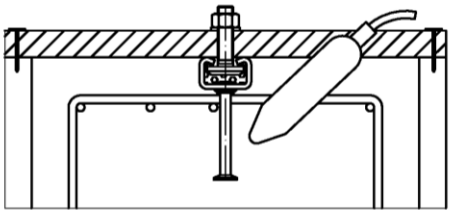
Compact the concrete properly around the channel and the anchors.



a) sidefaces to the formwork or



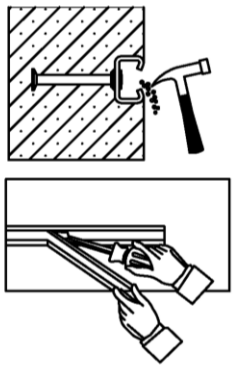
b) in soffits or



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 B6
Intended Use Installation instructions for HAZ METAL anchor channels	

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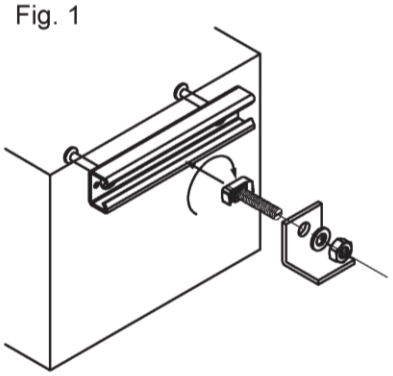
4. Fastening the HAZ METAL channel bolt to the anchor channel

Fig. 1



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 90^0 clockwise and the head of the screw locks in to position (Fig.1)
3. Do not mount the channel bolt closer than 25mm resp. 35 mm (HMPR 52/34) from the end of the channel.
4. Use the washer under the 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 channel 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.

Fig. 2

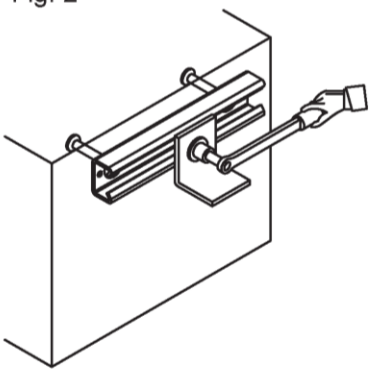


Table 9.1 Installation torques (General) for HAZ METAL-Channel bolts Type HS

Table 9.1	Anchor channel	T_{inst} [Nm]					
		M10	M12	M16	M20	M24	M30
8.8 A4-70	72/49	-	-	-	120	200	380
	40/22	15	25	45	-	-	-
	50/30	-	25	60	75	-	-
	52/34	-	25	60	120	-	-

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

Table 9.2	Anchor channel	T_{inst} [Nm]		
		M10	M12	M16
8.8	40/22	15	25	45
	50/30 52/34	-	25	60

or

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. The installation torque must not be exceeded.

Fig. 3

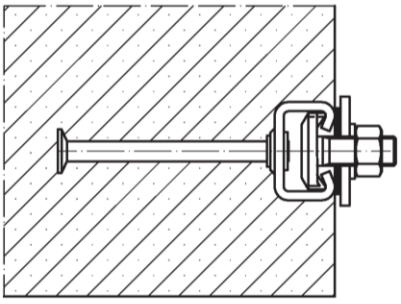


Table 10.1 Installation torques (Steel-Steel contact) for HAZ METAL-Channel bolts Type HS

Table 10.1	Anchor channel	T_{inst} [Nm]					
		M10	M12	M16	M20	M24	M30
8.8	72/49	-	-	-	360	360	400
	40/22	40	70	100	-	-	-
	50/30	-	70	180	120	-	-
	52/34	-	70	180	150	-	-
A4-70	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]		
		M10	M12	M16
8.8	40/22	30	40	60
	50/30	-	60	120
	52/34	-	70	180

HAZ METAL - Anchor Channel HMPR

Intended Use
Installation instructions for HAZ METAL channel bolts

Annex B7

Deutsches Institut für Bautechnik DIBt

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

Anchor Channel		Steel				Stainless Steel
		40/22	50/30	52/34	72/49	72/49
Steel failure, Anchor						
Characteristic resistance	$N_{Rk,s,a}$ [kN]	25	39	56	100	130
Partial safety factor	γ_{Ms} [1)]	1,71	1,71	1,71	1,71	1,42
Steel failure, Connection Channel anchor						
Characteristic resistance	$N_{Rk,s,c}$ [kN]	25	35	59	81	91
Partial safety factor	$\gamma_{Ms,c}$ [1)]	1,80				1,80
Steel failure, Local flexure of channel lips for $s_s \geq s_{slb}$						
Characteristic spacing of channel bolts for $N_{Rk,s,l}$	$s_{l,N}$ [mm]	80	100	104	144	144
Characteristic resistance	$N_{Rk,s,l}$ [kN]	25	36	59	81	91
Partial safety factor	$\gamma_{Ms,l}$ [1)]	1,80				1,80

1) In absance of other regulations

Fig 1

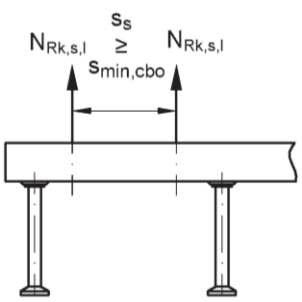


Fig 2

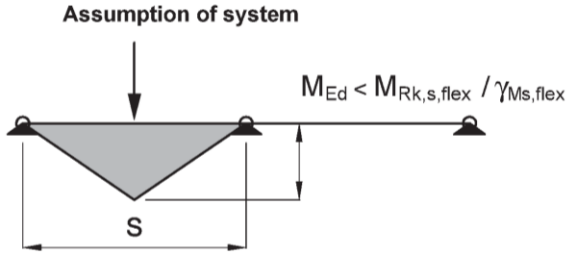


Table 12: Characteristic flexure resistance of channel under tension load

Anchor channel (Fig.2)				40/22	50/30	52/34	72/49
Characteristic flexure resistance of channel	$M_{Rk,s,flex}$	[Nm]	Steel	1450	3110	3741	11349
			Stainless steel	1048	1840	3101	7370
Partial safety factor	$\gamma_{Ms,flex}$ [1)]			1,15			

1) In absence of other regulations

HAZ METAL - Anchor Channel HMPR

Performances
Characteristic resistances under tension load
Steel failure channel

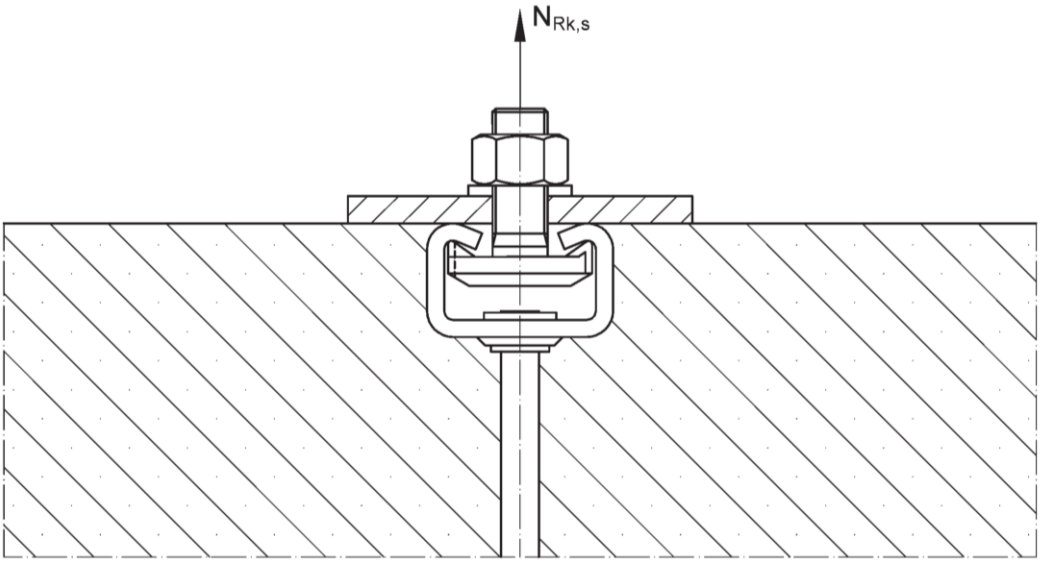
Annex C1

Deutsches Institut für Bautechnik DIBt

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

Steel Failure, Channel Bolts				**40/22**	**50/30**	**72/48**
Characteristic resistance	$N_{Rk,s}$ [2] [kN]	Type HS	M10 8.8	46,4	-	-
			M12 8.8	61,9	63,2	-
			M16 8.8	111,7	108,1	-
			M20 8.8	-	165,7	117,1
			M24 8.8	-	-	214,9
			M30 8.8	-	-	324,1
				72/48		
			M20 A4-70 [1]	128,9		
			M24 A4-70 [1]	171,2		
		Type HAZ		**40/22**	**50/30**	**72/48**
			M10 8.8	43,2	-	-
			M12 8.8	65,6	64,0	-
			M16 8.8	92,6	95,3	-
Partial safety factor	γ_{Ms} [3]		8.8	1,5		
			A4-70 [1]	1,87		

[1] Materials according to Annex A3, Table 1
[2] In conformity to EN ISO 898-1 : 1999
[3] 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

Deutsches Institut für Bautechnik DIBt

Table 14: Characteristic resistances under tension load - Concrete failure

Anchor channel				Steel and Stainless steel			
				40/22	50/30	52/34	72/49
Pull out failure							
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$ [kN]		22,6	35,3	50,9	90,5
Characteristic resistance in uncracked concrete C20/25				31,7	49,5	71,3	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			3,02			
Partial safety factor		$\gamma_{Mp} = \gamma_{Mc}$ [1)]		1,5			
Concrete cone failure							
Product factor	cracked concrete	$k_{cr,N}$	$[N^{0,5}/mm^{0,5}]$	7,8	8,1	8,7	8,9
	uncracked concrete	$k_{ucr,N}$		11,2	11,5	12,4	12,7
Partial safety factor		γ_{Mc} [1)]		1,5			
Splitting							
Characteristic edge distance		$c_{cr,sp}$	[mm]	228	282	468	537
Characteristic spacing		$s_{cr,sp}$		456	564	936	1074
Partial safety factor		$\gamma_{Mp} = \gamma_{Mc}$ [1)]		1,5			

[1)] In absence of other national regulations

Table 15: Displacements under tension load

Material		Steel				Stainless Steel
Anchor channel		**40/22**	**50/30**	**52/34**	**72/49**	**72/49**
Tension Load	N_{Ek} [kN]	12,2	26,1	30,2	52,2	52,2
Short time displacement	δ_{N0} [mm]	0,3	0,4	0,5	0,8	0,8
Long time displacement	$\delta_{N\infty}$ [mm]	1,2	1,2	1,2	1,2	1,2

HAZ METAL - Anchor Channel HMPR

Performances
Characteristic resistances under tension load
Concrete failure and displacements

Annex C3

Deutsches Institut für Bautechnik DIBt

Table 16: Characteristic resistances under shear load

Anchor channel			Steel				Stainless steel
			40/22	50/30	52/34	72/49	72/49
Steel failure: Failure of anchor, connection between anchor and channel or channel lips							
Characteristic resistance		$V_{Rk,s,a}$ [kN]	25	35	56	81	91
		$V_{Rk,s,c}$ [kN]					
		$V^0_{Rk,s,l}$ [kN]					
Partial safety factor		$\gamma_{Ms}=\gamma_{Ms,ca}=\gamma_{Ms,l}$ [1]	1,8				
Pry-out failure							
Product factor		k_8 [2]	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							
Characteristic spacing of channel bolts for $V_{Rk,s,l}$		$s_{l,v}$ [mm]	80	100	104	144	144
Concrete edge failure							
Product factor	cracked concrete	$k_{cr,V}$	6,2	7,5	7,5	7,5	7,5
Product factor	uncracked concrete	$k_{ucr,V}$	8,7	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 reinforecement the factor k_8 should be multiplied with 0,75.

Table 17: Displacements under shear load

Material		Steel				Stainless Steel
Anchor channel		**40/22**	**50/30**	**52/34**	**72/49**	**72/49**
Shear Load	V_{Ek} [kN]	5,5	9,7	13,7	39,6	38,5
Short time displacement	δ_{V0} [mm]	0,2	0,3	0,4	0,6	0,8
Long time displacement	$\delta_{V\infty}$ [mm]	0,3	0,5	0,6	0,9	1,2

HAZ METAL - Anchor Channel HMPR

Performances
Characteristic resistances of anchor channels under shear load
Steel failure of anchor channel, concrete failure, displacements

Annex C4

Deutsches Institut für Bautechnik DIBt

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

Steel Failure, Channel Bolts				**40/22**	**50/30**	**72/48**
Characteristic resistance	$V_{Rk,s}$ [2] [kN]	Type HS	M10 8.8	23,2	-	-
			M12 8.8	33,7	33,7	-
			M16 8.8	62,8	62,8	-
			M20 8.8	-	98,0	98,0
			M24 8.8	-	-	141,2
			M30 8.8	-	-	224,4
				72/48		
			M20 A4-70 [1]	102,9		
			M24 A4-70 [1]	148,3		
		Type HAZ		**40/22**	**50/30**	**72/48**
			M10 8.8	23,2	-	-
			M12 8.8	33,7	33,7	-
			M16 8.8	62,8	62,8	-
Partial safety factor	$\gamma_{Ms,s}$ [3]		8.8	1,25		
			A4-70 [1]	1,56		

[1] Materials according to Annex A3, Table 1
[2] In conformity to EN ISO 898-1 : 1999
[3] In absence of other national regulations

HAZ METAL - Anchor Channel HMPR

Performances
Characteristic resistances under shear load
Steel failure channel bolts

Annex C5

Deutsches Institut für Bautechnik DIBt

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

Steel Failure, Channel Bolts				**40/22**	**50/30**	**72/48**
Characteristic resistance	$M^{0}_{Rk,s}$ [2) 4)] [kN]	Type HS	M10 8.8	59,8	-	-
			M12 8.8	104,8	104,8	-
			M16 8.8	266,4	266,4	-
			M20 8.8	-	519,3	519,3
			M24 8.8	-	-	898,0
			M30 8.8	-	-	1799,2
				72/48		
			M20 A4-70 [1)]	454,4		
			M24 A4-70 [1)]	785,8		
		Type HAZ		**40/22**	**50/30**	**72/48**
			M10 8.8	59,8	-	-
			M12 8.8	104,8	104,8	-
			M16 8.8	266,4	266,4	-
Partial safety factor	$\gamma_{Ms,s}$ [3)]		8.8	1,25		
			A4-70 [1)]	1,56		

[1)] Materials according to Annex A3, Table 1
[2)] In conformity to EN ISO 898-1 : 1999
[3)] In absence of other national regulations
[4)] The characteristic flexure acc. to Table 18.2 is limited as follows:

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

$M^{0}_{Rk,s,I}$ acc. to Annex C1, Table 11
a acc. Annex C7, Table 18.3

HAZ METAL - Anchor Channel HMPR

Performances
Characteristic resistances under shear load
Steel failure channel bolts

Annex C6

Deutsches Institut für Bautechnik DIBt

Table 18.3: Internal lever arm between tension and compression force

Internal lever arm of channel bolts			**40/22**	**50/30**	**72/48**
a [mm]	Type HS	M10 8.8	17,3	-	-
		M12 8.8	18,7	29,7	-
		M16 8.8	20,7	31,7	-
		M20 8.8	-	34,1	42,7
		M24 8.8	-	-	45,0
		M30 8.8	-	-	49,0
			72/48		
		M20 A4-70 [1)]	42,7		
		M24 A4-70 [1)]	43,7		
	Type HAZ		**40/22**	**50/30**	**72/48**
		M10 8.8	23,9	-	-
		M12 8.8	26,3	30,3	-
		M16 8.8	27,3	31,3	-

[1)] Materials according to Annex A3, Table 1

Table 19: Characteristic resistances under combined tension and shear load

Anchor channel		**Steel**				**Stainless steel**
		40/22	**50/30**	**52/34**	**72/49**	**72/49**
Product factor	k_{13}	1.0	1.0	1.0	1.0	1.0
	k_{14}	1.0	1.0	1.0	1.0	1.0

HAZ METAL - Anchor Channel HMPR

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

Annex C7

Deutsches Institut für Bautechnik DIBt

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

Anchor channel				**40/22**	**50/30 52/34**	**72/49**
Channel Bolts ≥			[mm]	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]	1,8	5,7	5,7
	R60			1,5	4,2	4,2
	R90			1,2	2,6	2,6
	R120			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]	$2.h_{ef} \geq c_{cr,N}$		
		$c_{min,fi}$		$2.h_{ef}$ [1]; max ($2.h_{ef}$; 300 mm) [2]		
Characteristic spacing		$s_{cr,N,fi}$	[mm]	$4.h_{ef} \geq s_{cr,N}$		
		$s_{min,fi}$		acc. to Table 4, Annex A5		
Axial spacing of reinforcement [4]						
Max. axial spacing	R30	a	[mm]	35	35	35
	R60	a		35	35	35
	R90	a		45	45	45
	R120	a		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

[4] 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 One sided fire exposure

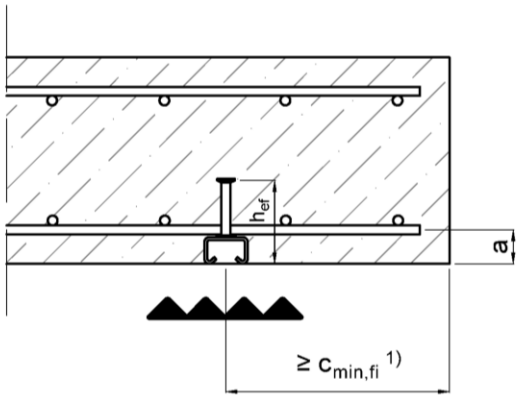
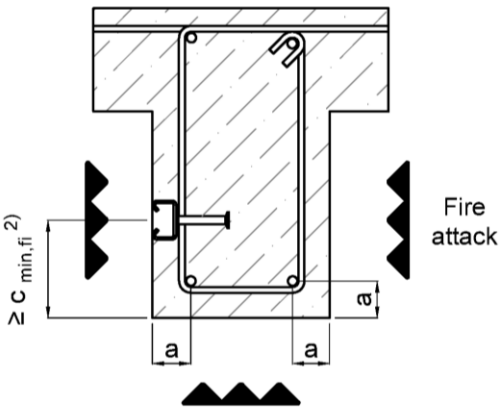


Fig. 2 Multi-sided fire exposure



HAZ METAL - Anchor Channel HMPR

Performances
Characteristic resistances under tension and shear load under fire exposure

Annex C8