

HALFEN HZA CAST-IN CHANNELS

APPROVAL Z-21.4-145



HALFEN CAST-IN CHANNELS

Z_HZA_08/18-E

CONCRETE



HALFEN
A CRH COMPANY

HALFEN HZA CAST-CHANNELS

General note

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

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Technical assessment institute for construction products and methods:

Deutsches Institut für Bautechnik (DIBt)
German Centre of Competence for Construction
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National Technical Approval

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Z-21.4-145

Applicant:

HALFEN GmbH
Liebigstraße 14
40764 Langenfeld

Period of validity:

Valid from: 2nd April 2018

Expires on: 2nd April 2021

Approved product: HALFEN Anchor channel HZA 41/22

The aforementioned construction product is herewith granted a general building authority approval. This general building authority approval comprises eight pages and seven annexes.

I. GENERAL PROVISIONS

1. This national technical approval verifies the usability and applicability of the aforementioned construction product in accordance with the Regional Building Codes of the German Federal States (*Landesbauordnungen*).
2. The national technical approval does not replace any permits, approvals and certificates legally required for the execution of building projects.
3. The granting of this national technical approval does not affect the legal rights of any third party; in particular those pertaining to private protection laws.
4. The manufacturer and distributor of the aforementioned construction product must make copies of the national technical approval available to the purchaser i.e. the end-user irrespective of further regulations as stated in the "Specific Provisions", and must give notice that the national technical approval for the product must be available at the point of application. Copies of the national technical approval must be made available to the respective authorities on request.
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6. This national technical approval can be revoked at any time. The provisions of this national technical approval may be subsequently amended or modified, especially if technical progress makes this necessary.
7. This certificate applies to the information provided and the documents submitted by the applicant. Any change to these principles is not covered by this certificate, and the German Centre of Competence for Construction (*Deutsches Institut für Bautechnik*) is to be notified without delay.
8. This approval also includes a general building authority approval. The general type approval provided by this certificate may also be regarded as a general building authority design approval certificate.

II. SPECIFIC PROVISIONS

1.1 Object of approval and intended use

The HALFEN HZA Cast-in anchor channel consists of a C-shaped channel with serration and at least two weld-on anchors, or riveted bolt anchors on the profile back.

The cast-in anchor channel is embedded in concrete flush with the surface. Serrated hammer-head bolts or including corresponding nuts and washers are inserted into the channel, with which any secondary construction element can be fastened.

The HALFEN HZA Cast-in anchor channel is shown in an installed state in annex 1.

1.2 Area of application

HALFEN Cast-in anchor channels may be used under static or quasi-static loading in reinforced and non-reinforced normal weight concrete of strength class of at least C20/25 according to DIN EN 206-1: 2001-07 "Concrete - Part 1: Specification, performance, production and conformity".

If requirements for fire resistance duration are demanded for the concrete components in which the cast-in anchor channels are anchored, the restrictions in accordance with section 3.2.6 must be observed.

For fire resistance requirements the cast-in anchor channel may only be exposed perpendicular to the longitudinal axis of the channel.

When anchored in concrete in the tensile zone generated by load stresses or when the minimum spacing between single anchor channels is used, additional reinforcement is required to account for bursting resulting from local transverse tensile stresses; unless constructive measures or other favourable methods (e.g. shear pressure) are used to prevent the concrete from cracking.

The areas of application for a cast-in anchor channel (channel profile, anchor, bolt, nut and washer) in respect to corrosion is dependent on the selected materials; see annex 4, table 4.

A galvanized cast-in anchor channel (channel and anchor) may only have contact with reinforcement steel when the temperature at the contact points between the reinforcement and the galvanized steel does not exceed 40 °C.

In pre-stressed concrete members, the distance between a galvanized cast-in anchor channel (channel and anchor) and the tendon ducts or a prestressing wire of pretensioned member must be at least 2 cm.

If the hot-dip galvanized channel has bolt anchors made of stainless steel, the tendon ducts or tendons may have contact with the stainless steel anchor bolt but not touch the hot-dip galvanized channel.

2 Provisions for the construction product

2.1 Properties and materials

The individual parts of the cast-in anchor channel (channel, anchor, bolt, nut and washer) must correspond with the drawings and specifications in the annexes.

The characteristic material values not specified in this general building authority approval, dimensions and tolerances for the anchor channels and bolts must correspond with the information provided to the German Centre of Competence for Construction (*Deutsches Institut für Bautechnik*), to the certification body and the third party monitoring body.

2.2 Production and marking

2.2.1 Production (connection channel/anchor)

The connections of the anchors to the channel (welding, riveting) must be done in a controlled factory environment.

MAG/MAGM inert gas welding (Process 135 according to DIN EN ISO 4063:2000-04) must be used for welding the weld-on anchors.

Depending on the requirements specified for the construction and in coordination with the structural engineer and the approval authority, the regulations according to DIN EN 1090-2:2011-10 apply for the execution of the weld seams.

The bolt anchors are inserted through prefabricated holes in the back of the channel and securely riveted in a factory environment.

2.2.2 Marking

All packaging and delivery documents for the cast-in anchor channels and bolts must be marked by the manufacturer with the conformity mark (Ü-mark) in accordance with the conformity mark regulations are specified by the Federal States of Germany.

In addition, the factory mark, the approval number and the complete designation of the cast-in anchor channel and bolts must be indicated on the delivery note.

The marking may only be used if the conditions in accordance with section 2.3 are met.

The cast-in anchor channels are marked as HZA 41/22. The hammer-head bolts are marked according to the thread size

Each cast-in anchor channel must be marked as illustrated in annex 4. The t-bolts must be stamped and marked as illustrated in annex 3.

2.3 Verification of conformity

2.3.1 General information

Confirmation of the conformity of the cast-in anchor channel and t-bolts with the specifications of the general building authority approval must be provided for each manufacturing location with a declaration of conformity based on factory production control and a certificate of conformity issued by a recognized body. Also required is regular third party monitoring by an approved inspection body in accordance with the following provisions: To issue a certificate of conformity and for third party monitoring including any required product tests, the manufacturer of the cast-in anchor channel and t-bolts must contact an approved certification body as well as an approved inspection agency.

The manufacturer is required to mark the product(s) with a conformity mark (Ü-mark) including a declaration of the intended use.

A copy of the certificate of conformity issued by the certification body must be submitted to the German Centre of Competence for Construction (*Deutsches Institut für Bautechnik*).

2.3.2 Factory production controls

Each manufacturing plant must set up and implement an in-house, factory production control. Factory production control is understood as the continuous internal monitoring of the production process, implemented by the manufacturer, to ensure the products manufactured by them are in conformity with the provisions of this national technical approval.

The extent, type and frequency of factory production control is determined by the inspection plan deposited with the German Centre of Competence for Construction (*Deutsches Institut für Bautechnik*) and the third-party certification body.

The results of the factory production control must be documented and evaluated and must include at minimum the following:

- identification of the construction product, raw material or components
- method of test or inspection
- production date, test date of the construction product, raw material or components
- results of the inspection and tests, and evaluation against the requirements
- signature of the person responsible for factory quality control plan

The documents must be kept for at least five years and be submitted to the inspection body responsible for third-party inspection. On request, these records must be made available to the German Centre of Competence for Construction (*Deutsches Institut für Bautechnik*) and to the responsible building authority (*oberste Bauaufsichtsbehörde*).

In case of unsatisfactory test results the manufacturer must take immediate action to resolve the deficiency. Construction products which do not comply with the requirements must be handled in a manner to ensure they cannot be mistaken for products complying with the requirements. After a problem has been resolved, the respective test must be repeated immediately; as far as this is technically feasible and necessary to verify that the deficiency has been eliminated.

2.3.3 Third-party controls

The factory production control in each manufacturing plant must be regularly inspected, at least twice a year, by a third-party monitoring body.

Independent inspection must include an initial test of the cast-in anchor channel and bolts and samples taken for random inspections. The respective approved inspection body is responsible for taking samples and testing.

The extent, type and frequency of third-party control is as recorded in the document deposited with the German Centre of Competence for Construction (*Deutsches Institut für Bautechnik*) and the third-party monitoring authority. The results of the certification and third-party control must be kept for at least five years. On request, they must be made available by the appointed certification or inspection body to the German Centre of Competence for Construction (*Deutsches Institut für Bautechnik*) and to the responsible building authority (*obersten Bauaufsichtsbehörde*).

3 Provisions for design, dimensioning and execution

3.1 Planning

The anchorages must be designed according to standard engineering practices. Verifiable calculations and technical drawings must be compiled considering the planned anchor loads.

The technical drawings must contain precise information on the size, length and installation position of the cast-in anchor channel as well as the size of the allowable t-bolt.

3.2 Design and calculation

3.2.1 Introduction

The anchorages must be designed according to standard engineering practices. Verification of the immediate, local-loads application into the concrete has been provided.

Transfer of the loads to be anchored into the concrete component has to be verified.

Weakening of the concrete cross-section caused by the installation of cast-in anchor channel has to be considered in the static analysis.

Bending loading on the t-bolt may be disregarded only if;

- the connected component is made of metal and can be braced against the channel without an intermediate layer and
- the through hole in the connected component does not exceed 14 mm for M12 and 18 mm for M16 t-bolts.

Additional loads that may occur in the cast-in anchor channel, in the connected component or in the concrete component in which the cast-in anchor channel is installed, resulting from restraint deformation, must be taken into account. (for example; temperature fluctuations).

The individual load or the load pair can be applied at any point on the cast-in anchor channel.

The axis of the t-bolts must be at least 2.5 cm from the end of the cast-in anchor channel.

The minimum spacings (axial, edge and corner spacings) and minimum component thicknesses according to annex 5, table 5 must be observed.

If the channels are subjected to diagonal and transverse load perpendicular to the edge, restraint reinforcement must be arranged with edge spacings of 75 mm to 100 mm in accordance with the illustration at the top of the page in annex 6.

3.2.2 Design resistances

The design resistances of the cast-in anchor channel are specified in annex 5, table 6 subject to the profile length.

The anchor channel may be subjected to load in all directions (x shear load, y shear load and z tension load).

The design value of the load resultant F_{Ed} must not exceed the design resistances F_{Rd} .

3.2.3 Bending loads on bolts

The bending design resistances are specified in annex 5, table 6. The calculated point of restraint is the upper edge of the anchor channel.

The design value of the bolt bending moment may not exceed the design resistance against bending if, in accordance with Section 3.2.1, a bending stress must be considered.

$$F_{z,Ed} \leq F_{Rd} (1 - M_{Ed} / M_{Rd})$$

F_{Rd} = Design resistance of the bolt according to annex 5, table 6

M_{Rd} = Design resistance against bending of the bolt according to annex 5, table 6

$F_{z,Ed}$ = Design value of the acting tensile load component

M_{Ed} = Design value of the acting bending moment.

For façade claddings with variable bending loads, the alternating stress amplitude $\sigma_A = \pm 50 \text{ N} / \text{mm}^2$ in respect to the mean value σ_m in relation to the calculated stress cross-section of the bolt must not be exceeded.

3.2.4 Special cases; thin concrete elements

A cast-in anchor channel installed in the end face of an at least 10 cm thick minimal loaded reinforced concrete member (façade panels, walls subjected to low loads) may only be subjected to centric tension load in accordance with the design resistance as in annex 5, table 6, if additional reinforcement is provided in accordance with annex 6.

3.2.5 Displacement behaviour

Shear load perpendicular to the longitudinal direction of the channel:

Displacements up to 0.5 mm in direction of the load can be expected when subjected to full service load. With shear loads, the existing clearance between t-bolt and fixture must also be taken into account.

Displacements of up to 1.5 mm perpendicular to the longitudinal direction of the channel can be expected when subjected to service load. If the t-bolts are installed under load, displacements of up to 0.6 mm can be expected. This value increases to 2.0 mm when the load direction is reversed.

The hole clearance between the t-bolt and the attached component must also be taken into account in cases of transverse loads.

3.2.6 Fire resistance

If demands on the fire resistance duration of the concrete components are made, the cast-in anchor channels may only be subjected to static and quasi-static loading perpendicular (z tension load and y shear load) to the channels axis in reinforced and non-reinforced normal weight concrete of strength class C20/25 or higher. The design resistances for each cast-in anchor channel are specified in table 7, annex 7, for fire resistance duration of 90 minutes (F90) or 60 minutes (F60) subject to the t-bolt size; these values must not be exceeded.

The minimum spacings as specified in annex 7, table 8 must be observed.

The evaluation of fire resistance duration of the concrete component and the connected elements is not subject of this approval.

3.3 Application

3.3.1 Installation of the cast-in anchor channels

The cast-in anchor channels including the anchors are not to be modified or any anchors subsequently added or removed.

The installation of the cast-in anchor channels must be carried out according to the design drawings in accordance with section 3.1.

The cast-in anchor channels must be securely fixed to the formwork in a manner to ensure they do not move when the reinforcement is installed or when the concrete is poured and compacted. The concrete must be meticulously compacted around the cast-in anchor channels and under the anchor heads. The cast-in anchor channels must be protected to prevent concrete seeping into the channel.

When pouring the concreting, care must be taken to ensure that the concrete is carefully compacted, particularly under the anchor heads.

3.3.2 Fixing the connecting elements (t-bolt installation)

The required t-bolt and size must be as specified in the technical drawings.

If the front edge of the cast-in anchor channel is not flush with the concrete surface due to inadequate installation, any gap must be fully shimmed when fixing the connecting secondary element(s).

The heads of the t-bolts are inserted into the cast-in anchor channel and after turning clockwise 90° must fully rest on both sides of the channel slot and engage with the serration, the nut is secured with a torque wrench. The installation torques in annex 5 table 6 must be observed.

After final assembly, check that the t-bolt is correctly installed, the notches at the end of the t-bolt shaft must be at right angles to the longitudinal direction of the channel. The spacing for the t-bolts must not be less than specified in annex 5.

3.3.3 Checking the installation

The responsible contractor or a designated site manager or a designated competent representative must be present when installing the cast-in anchor channels, and also on site for final installation of the t-bolts (fixing of secondary elements). It is their responsibility to ensure the work is carried out properly and document the installation.

They are especially responsible for checking the installation and position of the cast-in anchor channels as well as any restraint reinforcement.

The documentation must remain available on site during the construction period and be submitted to inspection personnel on request. The documentation, with the delivery notes, must be kept by the contractor for at least five years after completion of the project.

Beatrix Wittstock
Referatsleiter (Head of Division)

Installed channel (Dimensions in mm)

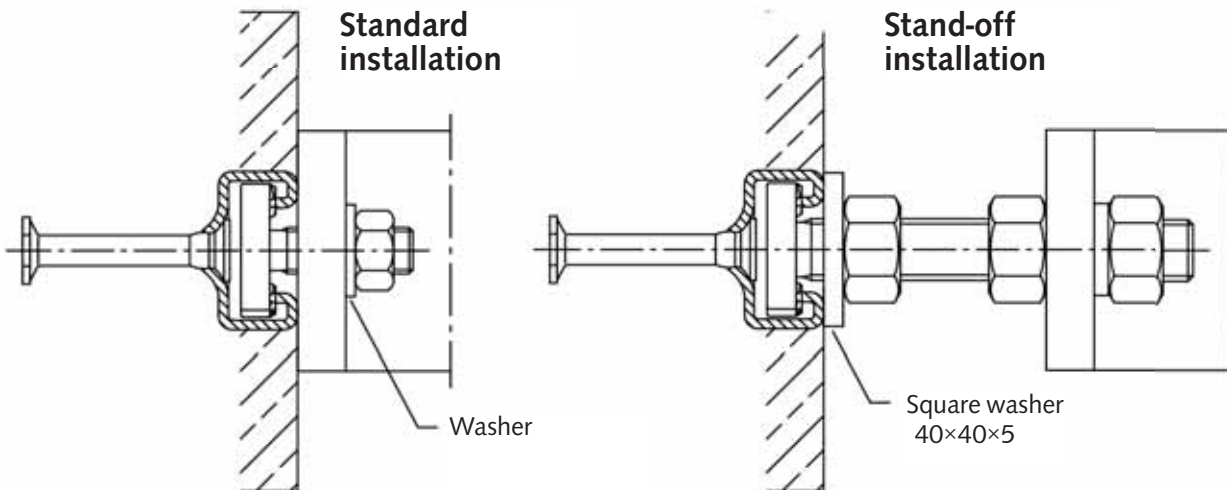
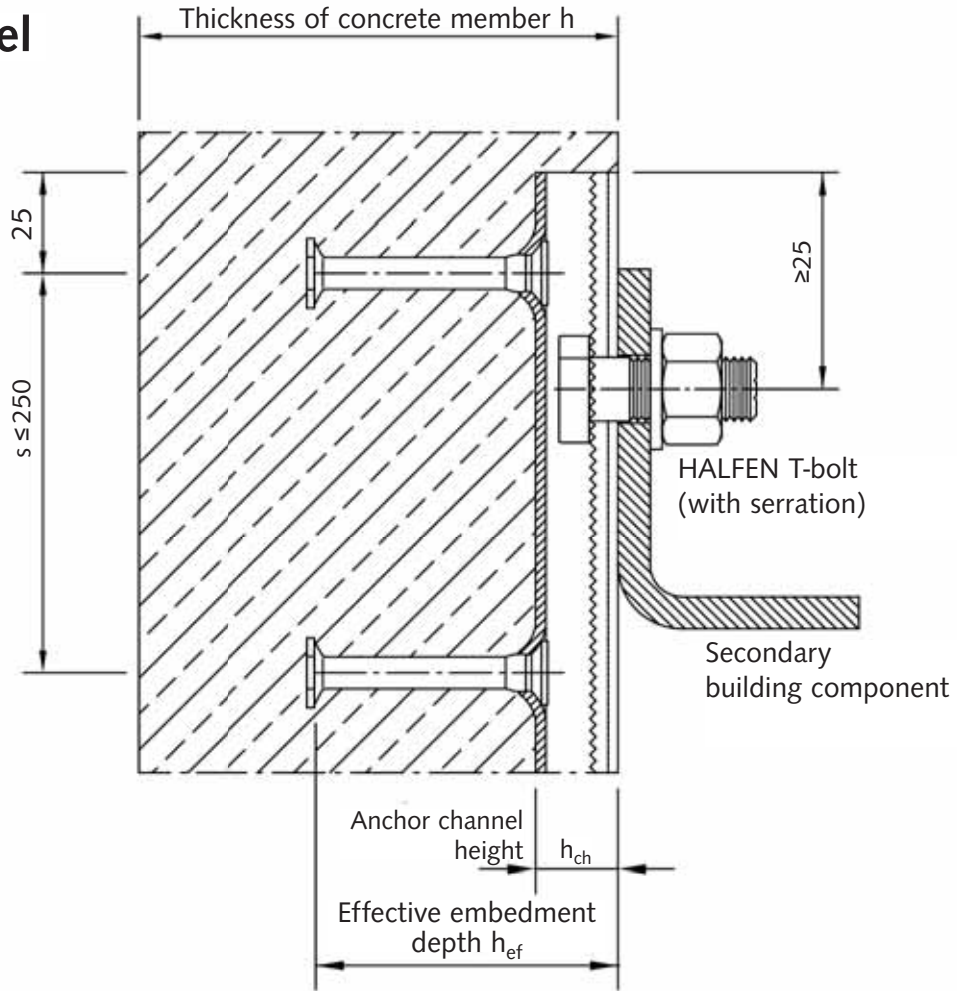
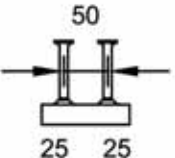
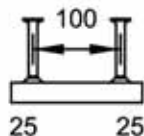
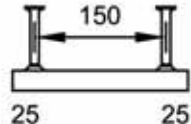
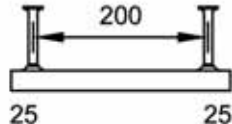
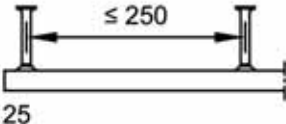
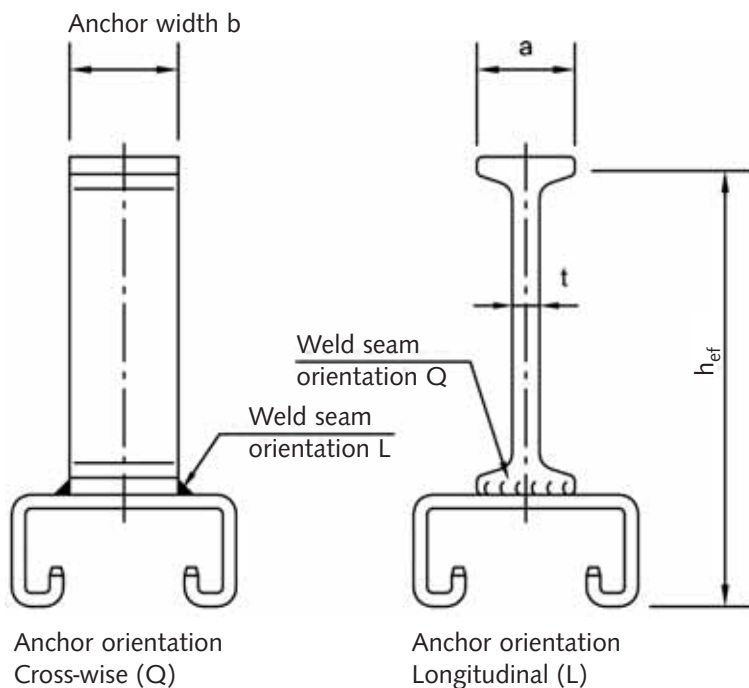


Table 1: Standard lengths and anchor positions

Anchor channel length, end spacing and spacing of the anchors (mm)					
Length	100	150	200	250	> 250
Profile 41/22					

Anchor
Weld-on anchor, type I



Bolt anchor, type B6
 With hexagonal head

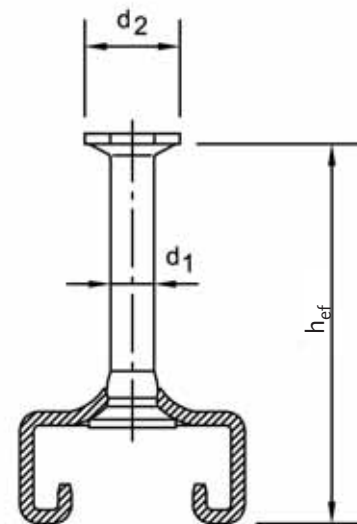


Table 2: Anchor dimensions

(Dimensions in mm)

Weld-on anchors	Profile	Type	a	min. b	Anchor height	min. h _{ef}	t	Anchor orientation	Weld seam orientation	Weld seam min. a × l
			(mm)							
41/22	41/22	I 62	18	12	62	79	5.0	L/Q	L/Q	3×12
		I 69	18	12	69	86	5.0	L/Q	L/Q	3×12
		I 128	17	20	128	135.5	6.0	Q	Q	3×20

Bolt anchors	Profile	Type	d ₁	d ₂	min. h _{ef}
			(mm)		
41/22	41/22	B6	Ø8	16	79.8



Annex 2

HALFEN HZA Cast-in anchor channel, type 41/22
 Anchor positions, dimensions

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Channel dimensions and M12 and M16 bolts

(Shaft and thread design according to DIN EN ISO 4018:2011-07)

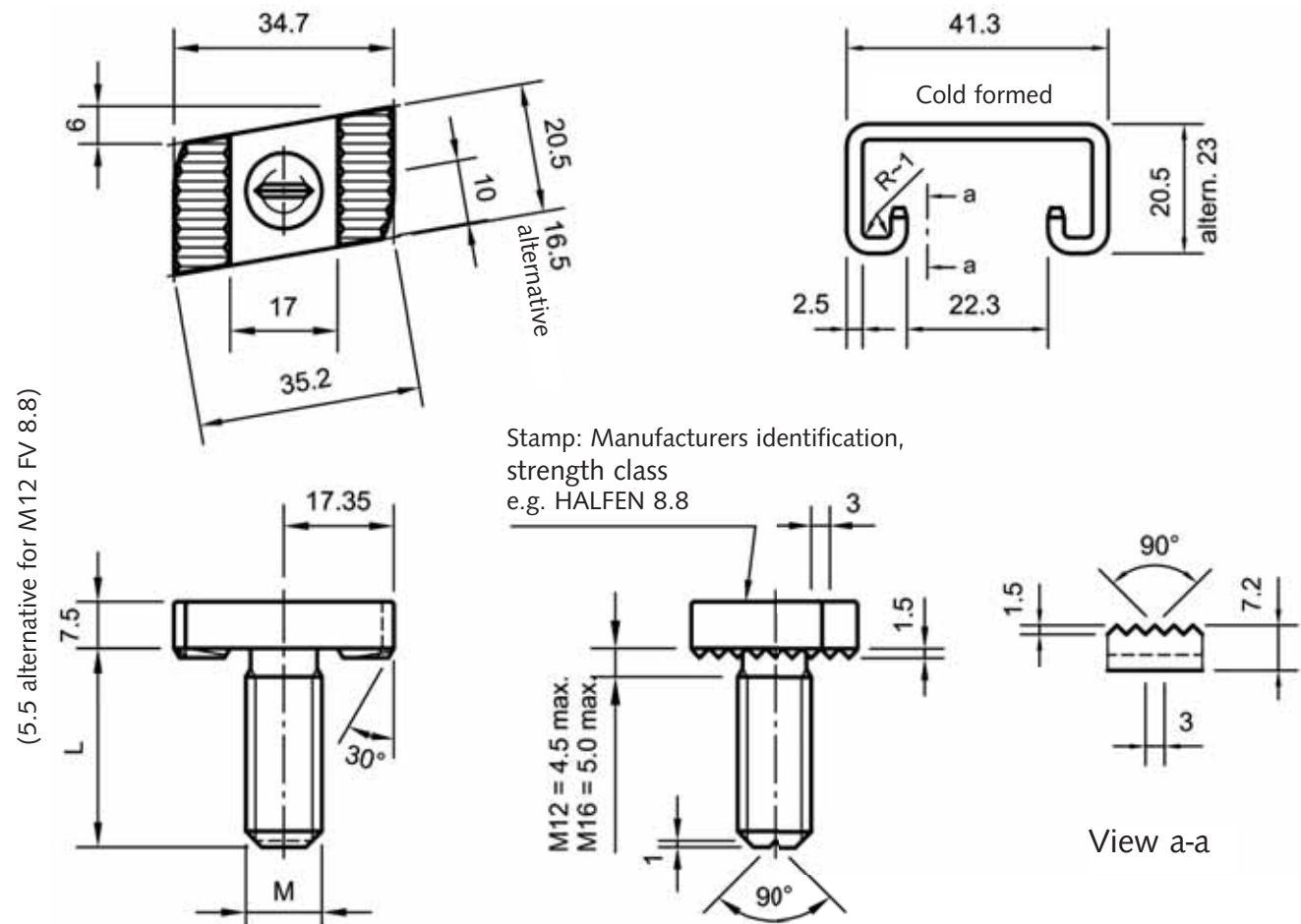


Table 3: Materials

Part	Name	Material	
		Steel	Stainless steel
1	Channel	DIN EN 10 025:2005-04 1.0038 (S235JR)	DIN EN 10 088:2009-08 1.4401, 1.4404 or 1.4571
2	Weld-on anchor	DIN EN 10 025:2005-04 1.0038 (S235JR)	DIN EN 10 088:2009-08 1.4401, 1.4404 or 1.4571
3	Bolt anchor with B6 hexangonal head	DIN EN 10 263-2:2018-02 or DIN EN 10 263-3:2018-02	DIN EN 10 088:2009-08 1.4401, 1.4404, 1.4571 or 1.4578
4	Bolt	DIN EN ISO 898-1:2013-05 strength class 8.8	A4-50 acc. DIN EN ISO 3506-1:2010-04 1.4401, 1.4404, 1.4571 or 1.4578
5	Hexangonal nuts	DIN EN ISO 898-2:2012-08, strength class 8	A4-50 acc. DIN EN ISO 3506-2:2010-04 1.4401, 1.4404 or 1.4571
6	Washers	DIN EN ISO 10025:2005-04 and DIN EN ISO 7089:2000-11 or DIN EN ISO 7090:2000-11	DIN EN 10 088:2009-08 1.4401, 1.4404 or 1.4571

Table 4: Material and areas of application

	Component			Area of application
	Channel	Anchor	T-bolt, nut, washer	
1	Mill-finished	Mill-finished	No corrosion protection	Use only allowable if all fixing elements are protected by a minimum concrete cover according to DIN EN 1992-1-1:2011-01 with DIN EN 1992-1-1/NA:2013-04, depending on the ambient conditions.
2	Hot-dip galvanized (coating $\geq 50 \mu\text{m}$)	Hot-dip galvanized (coating $\geq 50 \mu\text{m}$)	Zinc galvanized (coating $\geq 5 \mu\text{m}$)	Components used in indoors environments, e.g. residential flats, offices, schools, hospitals, shops - with the exception of rooms with an increased level of humidity.
3	Hot-dip galvanized (coating $\geq 50 \mu\text{m}$)	Hot-dip galvanized (coating $\geq 50 \mu\text{m}$)	Hot-dip galvanized ① (coating $\geq 40 \mu\text{m}$)	Components used indoors in environments with normal humidity (incl. kitchens, bathrooms and laundry rooms in residential buildings)
4	Stainless steel 1.4401, 1.4404 or 1.4571	Weld-on anchor mill-finished ② (only for Type I with weld-on anchor)	Stainless steel A4 - 50	Components in corrosion resistance class III, according to Z-30.3-6
5	Stainless steel 1.4401, 1.4404 or 1.4571	Stainless steel 1.4401, 1.4404 1.4571 or 1.4578	Stainless steel A4 - 50	Components in corrosion resistance class III, according to Z-30.3-6

① or zinc galvanized with special coating, thickness $\geq 12 \mu\text{m}$.

② in regards to corrosion protection a concrete cover c of 30 mm may be used as a basis for the weld-on anchors.



Identification marks on the HALFEN HZA Cast-in anchor channels

The anchor channels must be permanently marked to ensure identification (inside or on the outside of the channel) on the channel web or on the anchor. The information may be printed, stamped or using other suitable measures. (Minimum requirements: Channel profile information, in addition with A4 if stainless steel)

Examples:



a) Marking on the back of the channel



b) Marking on the side of the channel

Load directions

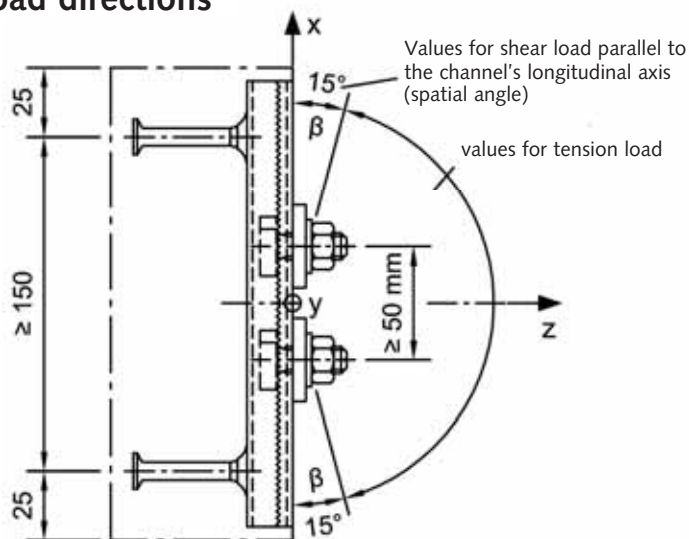


Figure a, Single loads

for all load directions

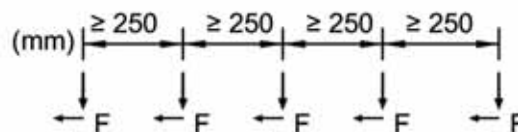


Figure b) Load pairs

perpendicular to the channel's longitudinal axis

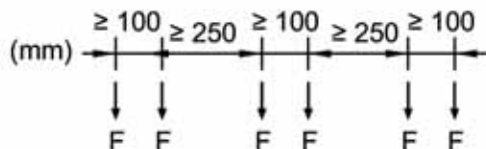


Figure c, Load pairs

parallel to the channel's longitudinal axis

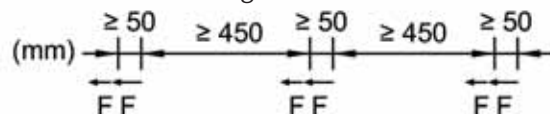
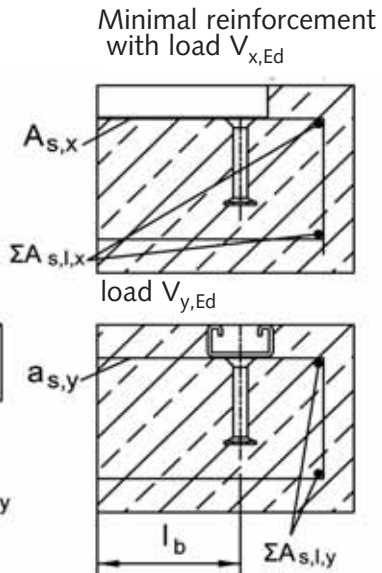
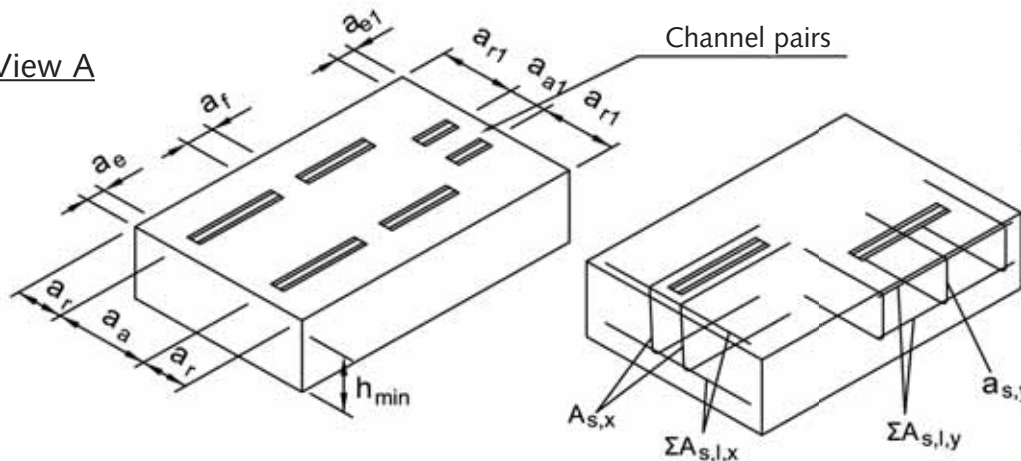


Table 5: Minimum spacings and minimum component dimensions

Minimum spacings and minimum component dimensions (mm)						Channel pairs ^②			Edge reinforcement		
HZA 42/22	a_r	a_e	a_a	a_f	h_{min} ^①	a_{r1}	a_{a1}	a_{e1}	with load $V_{x,Ed}$ $A_{s,x}$	with load $V_{y,Ed}$ $a_{s,y}$ ^③	$\sum A_{s,l,x}$ or $\sum A_{s,l,y}$ ^④
reinforced concrete ^{⑤⑦}	110	90	$2 \times a_r$	220	105	50	100	150	2Ø6	Ø6/200	2Ø10
non-reinforced concrete ^{⑥⑦}	2 anchors	90	200	$2 \times a_r$					220	105	50
	> 2 anchors	150	230								

View A



- ① Determined by the length of the anchors and the height of the channel profiles, as well as the required concrete cover according to DIN EN 1992-1-1:2011-01 with DIN EN 1992-1-1/NA:2013-04. Must be increased if necessary, depends on the exposure class.
- ② Only allowable for centric; applies to cracked and non-cracked concrete.
- ③ Symmetrical configuration, distribution along entire anchor channel length and at a_r beyond anchor channel end; anchorage length l_b according to DIN EN 1992-1-1.
- ④ Install at least one reinforcement bar at the corners.
- ⑤ Applies to cracked concrete of concrete strength classes $\geq C30/37$.
- ⑥ Applies to cracked and non-cracked concrete $\geq C30/37$. To take cracked concrete into account, the spacings must be increased by a factor of 1.5. Alternatively, the design resistances can be reduced by a factor of (1/1.4).
- ⑦ For concrete strength classes C20/25 and C25/30, the spacings must be increased by a factor of 1.25 and 1.15 respectively. Alternatively, the design resistances can be reduced by the factor (1/1.25) or (1/1.15).

Table 6: Design resistance for the anchor channels, torque values, Design resistance for bending in the t-bolts

Design resistance F_{Rd} (kN)	Tension and shear load perpendicular to the channel's longitudinal axis		Shear load parallel to the channel's longitudinal axis $\beta \leq 15^\circ$		Design resistances against bending M_{Rd} (Nm) in relation to channel or top surface of concrete	Strength class. 8.8		Material grade A4-50	
	Single load	Load pairs ^⑧	Single load	Load pairs ^⑨		M12	M16	M12	M16
		7.0	4.9	7.0		7.0	83.8	213.1	27.5
Profile length (mm)	≥ 100	≥ 200	≥ 100	≥ 200	Profile length (mm)	50	120	50	80

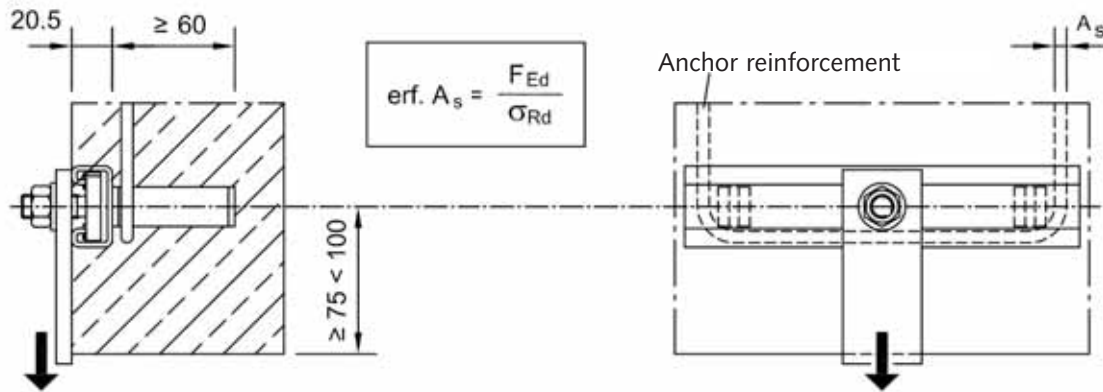
- ⑧ With simultaneous tension or transverse load loading perpendicular to the longitudinal axis of the anchor channel and transverse load parallel to the longitudinal axis of the channel; the load resultant must not exceed the design value $F_{Rd} = 4.9$ kN for load pairs.
- ⑨ if the load direction deviates from the longitudinal axis of the channel by more than $\beta = 15^\circ$ the design load must be reduced to $F_{Rd} = 4.9$ kN.



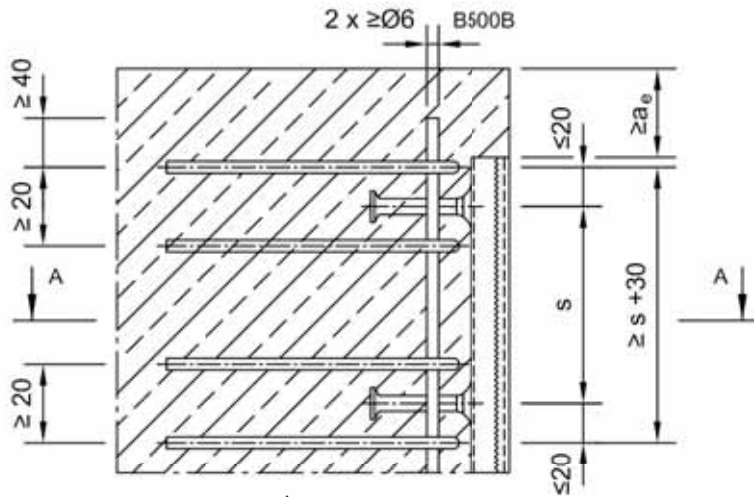
Annex 5
 HALFEN HZA Cast-in anchor channel, type 41/22
 Installation parameters and design resistances
 for reinforced and non-reinforced concrete

HALFEN GmbH
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Additional reinforcement for edge distances of the anchor channels from ≥ 75 mm up to < 100 mm and load direction perpendicular to the edge (according to section 3.2.4)



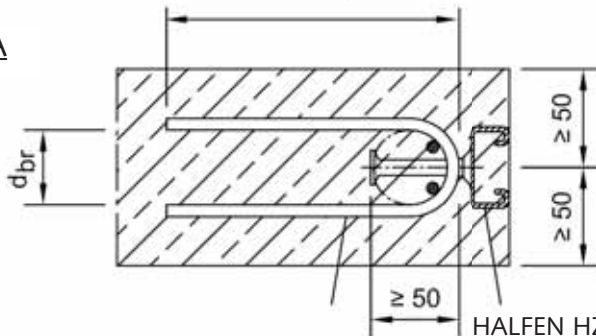
Additional reinforcement for anchor channels installed in end facings of slabs with $d \geq 100$ mm up to $2 a_r$ i.e. $2 a_{r1}$ (in accordance with section 3.2.4).



l_{bd}
 DIN EN 1992-1-1:2011-01
 with DIN EN 1992-1-1/NA:2013-04

$$\text{erf. } A_s = \frac{F_{Ed}}{4 \times \sigma_{Rd}}$$

Section A-A



allowable steel stress $\sigma_{Rd} = 11.0 \text{ kN/cm}^2$
 A_s = Reinforcement cross section (cm^2)
 F_{Ed} = max. design value of the load (kN)

HALFEN HZA Anchor channel

Dimensions in mm

A_s (B500B)
 d_{br} = lowest allowable

bending roll diameter \varnothing according to DIN EN 1992-1-1:2011-01 with DIN EN 1992-1-1/ NA:2013-04



Annex 6

HALFEN HZA Cast-in anchor channel, type 41/22
 Restraint reinforcement with reduced edge distances

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Table 7: Design resistances (kN) perpendicular to the longitudinal axis of the channel, central tension and shear tension under fire exposure according to fire resistance class F90 and F60 (value in brackets) for HALFEN Cast-in anchor channels, taking the corresponding HALFEN T-bolts into account.

Profile ① HZA	Design resistance in kN HALFEN Bolts according to section 3 strength class 8.8 / A4-50	
	M12	M16
41/22	1.8	4.0

① Profile in mill-finished steel, zinc galvanized or stainless steel

Subjected to fire from one direction

Subjected to fire from multiple directions

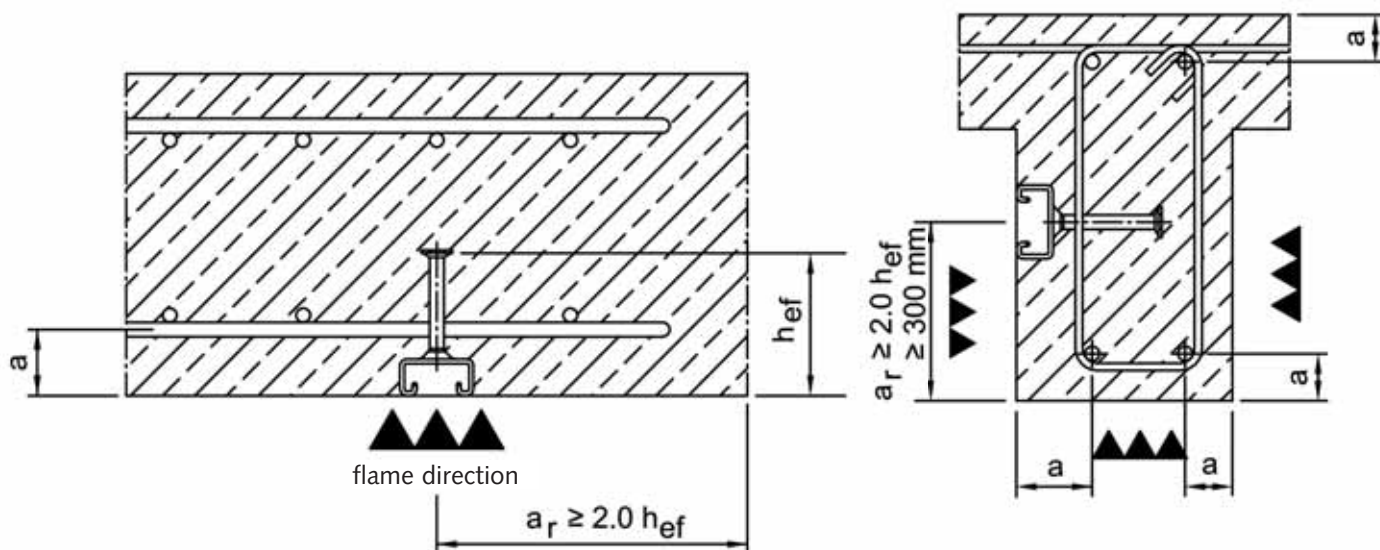


Table 8: Required centre spacing a (mm) for a fire resistance duration F60 and F90 in the vicinity of the HALFEN Cast-channels

Profile ① HZA	Required axial spacing a (mm) for fire resistance duration	
	60 Minutes	90 Minutes
41/22	35	45

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