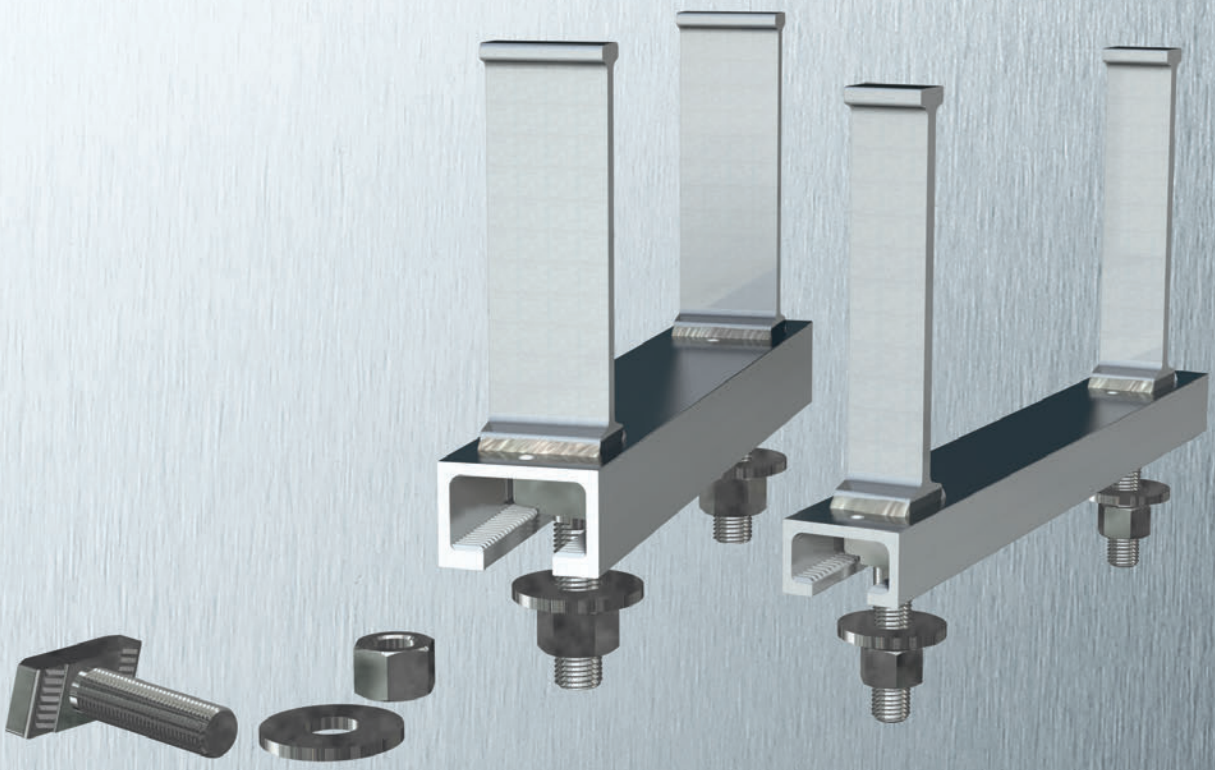
HALFEN HZA ANCHOR CHANNELS
TECHNICAL PRODUCT INFORMATION



HALFEN ANCHOR CHANNELS

CONCRETE

HZA 17-NZ

ICC-ES Approved

HALFEN

YOUR BEST CONNECTIONS

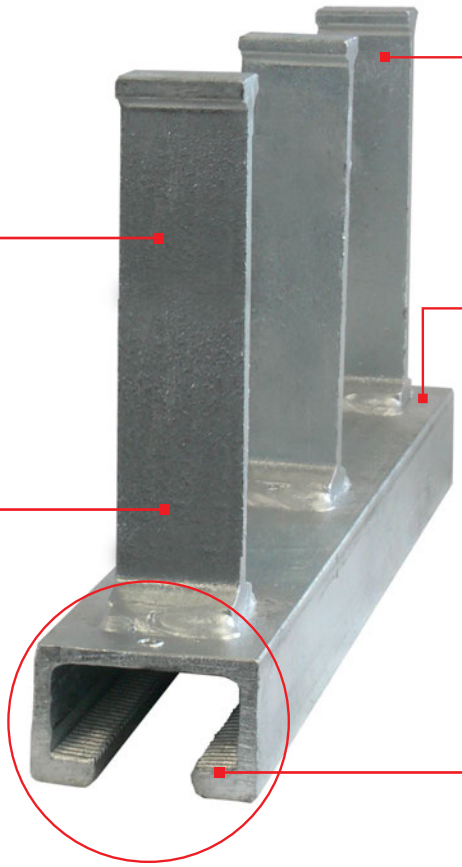
HALFEN HZA Anchor Channels

HALFEN HZA DYNAGRIP® Toothed Anchor Channels

HALFEN cast-in channels are used by designers throughout the world. A new dimension is now available in this established and well accepted anchoring method.

Reduced construction time
Connections to HALFEN Anchor Channels are quick and simple to install using only a torque wrench. Complex and time consuming installation and verification processes as required for on-site welding and drilling are not required.

Resolves tolerance issues
Allows for large tolerances as common with connections to concrete structures.

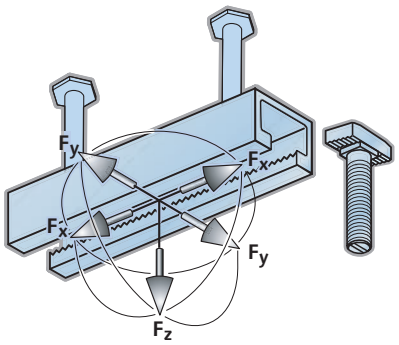


Maximum safety and reliability
HALFEN HZA DYNAGRIP® Toothed Anchor Channels do not damage reinforcement or concrete. They can be safely used in the tension zone of concrete, and will not work loose over time.

Covers all conditions
Three hot-rolled profiles in stainless and carbon steel, in any length up to 6m combined with 3 T-bolt diameters, lengths from 25mm to 200mm; all the choice the designer needs.

Mechanical load transfer
Interlocking connection between channel and T-bolt teeth provides positive transmission of loads in all three planes – including the longitudinal direction.

HALFEN HZA DYNAGRIP® Toothed Anchor Channels with toothed HALFEN T-bolts provide safe threedimensional load capacity with superior seismic performance.



ICC-ESR 4016

Many advantages with one result: HALFEN provides safety, reliability and efficiency for you and your customers.

HALFEN HZA DYNAGRIP® Toothed Anchor Channels are high performance, hot-rolled, toothed profiles with matching toothed T-bolts. This system permits adjustment of the connection combined with particularly high longitudinal load capacity.

HALFEN
YOUR BEST CONNECTIONS

HALFEN HZA ANCHOR CHANNELS

Contents

HALFEN HZA ANCHOR CHANNELS

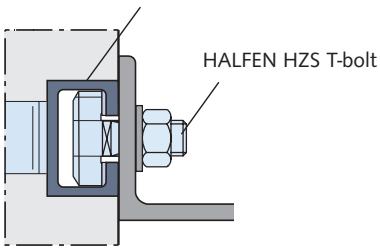
Main Features / Advantages at a Glance

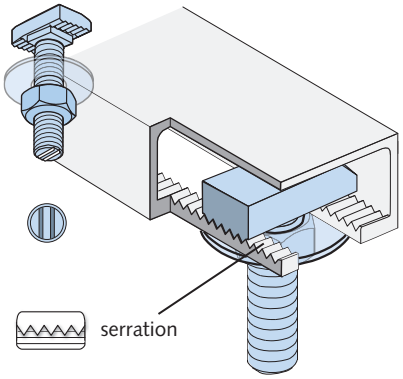
Main Features

HALFEN HZA Anchor Channels and HZS T-bolts work in tandem to provide a reliable, durable and adjustable connection to concrete. HALFEN Anchor Channels are cast into concrete, eliminating the need for post-installed anchors and field welding. This minimises the potential to damage the concrete or reinforcement during installation.

HALFEN Anchor Channels and T-bolts are available in a wide range of profile sizes/diameters and lengths allowing them to be utilised for a wide variety of applications in construction and industrial projects. The system is available in hot-dip galvanised and stainless steel to ensure long lasting performance. Engineered to the highest American standards, HALFEN HZA Anchor Channel system is a proven safe, simple and cost effective method of anchorage to concrete.

HALFEN HZA Anchor Channel





The notches on the T-bolt provide visual confirmation of T-bolt orientation; the final notch position must be at 90° to the channel's longitudinal axis.

Advantages at a Glance

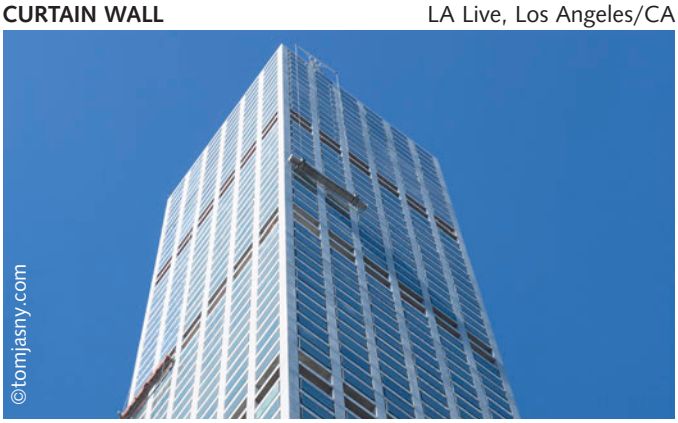
HALFEN Anchor Channels offer the following advantages compared to traditional anchoring methods:

- Extremely short installation time
- Easily adjustable connections
- No welding needed on site
- Allows for construction tolerances
- No specialised workers needed for installation
- Single tool installation (torque wrench)
- No electrical power required during installation
- No on-site corrosion protection needed
- High quality materials and quality galvanisation protect components from corrosion
- Visual check is sufficient to confirm correct installation
- Noise, vibration and dust free installation

Application Examples

CURTAIN WALL LA Live, Los Angeles/CA

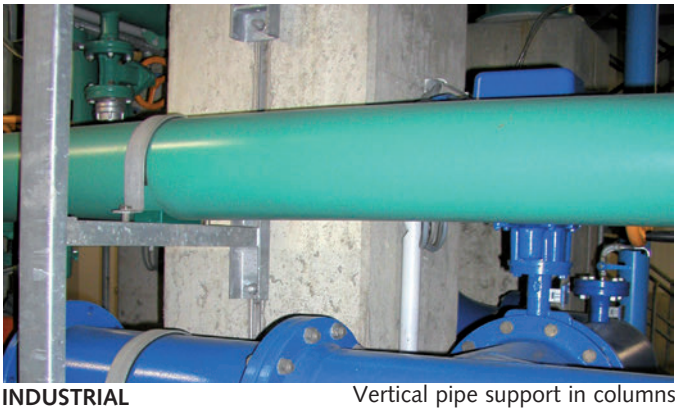
ELEVATOR CONNECTIONS Guide rail connection



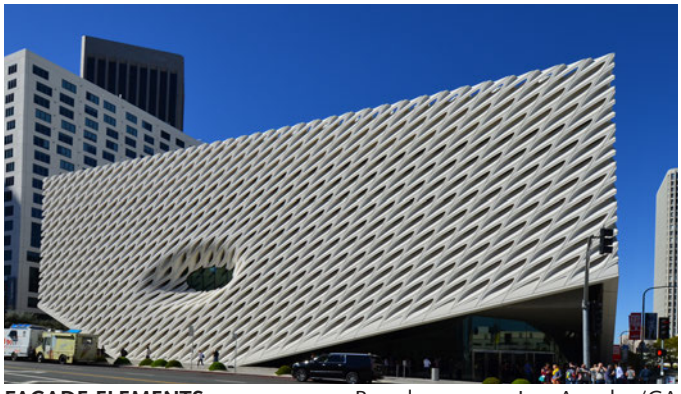
UTILITIES CONNECTIONS 432 Park Avenue, NYC/NY

BRIDGES Connection of a drainage system

MASONRY CONNECTIONS Appalachian State University, Boone/NC



INDUSTRIAL Vertical pipe support in columns

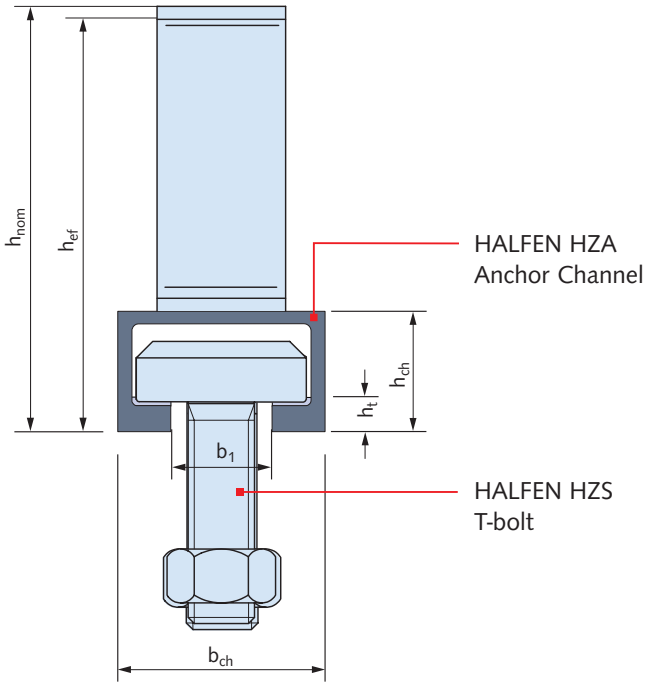


FAÇADE ELEMENTS Broad museum, Los Angeles/CA

PETRO-CHEMICAL Vertical pipe support in columns

HALFEN HZA Anchor Channel Dimensions

HALFEN HZA Anchor Channel



h_{nom} = Installation height
h_{ef} = Effective embedment depth
h_{ch} = Channel height
b_{ch} = Channel width
b_1 = Channel opening
h_t = Height of the channel lips

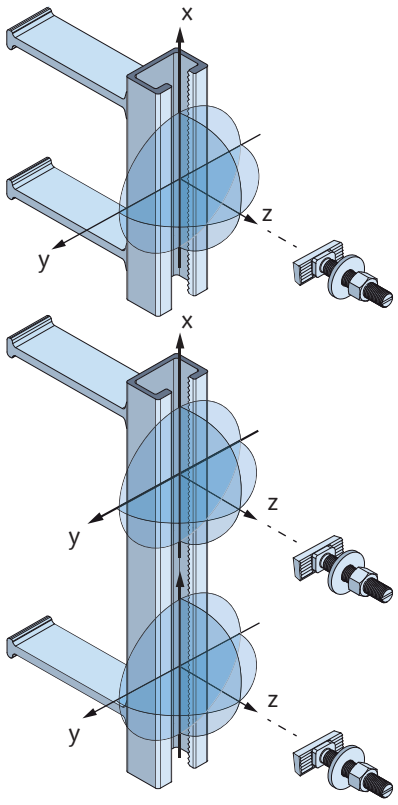
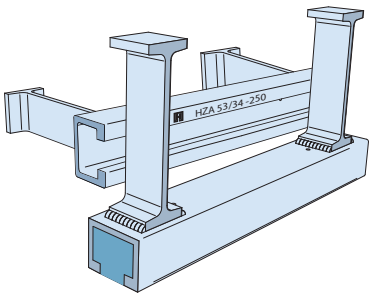


Illustration of loading directions		
tension load	z-direction	in direction of anchor
shear load	y-direction	perpendicular to longitudinal channel axis
	x-direction	longitudinal channel axis

Identification



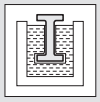
Channel material	Type identification
HDG - Hot-dip galvanised carbon steel	**HZA (Profile)-(length in mm) e.g. HZA 53/34-250**
A4 - Stainless steel	**HZA (Profile)-A4 e.g. HZA 53/34-A4**

Type identification:
The Anchor Channel description is on the anchor channel lip. This ensures the product can be clearly identified before and after installation.

Materials

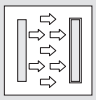
Hot-dip galvanised (HDG)

Dipped in a galvanizing bath at a temperature of approx. 460°C, a method used primarily for open-profile channels.

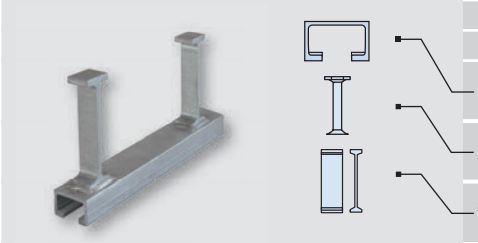


Electro plated (EP)

HALFEN T-bolts are electrogalvanised and coated with a Cr^{VI}-free thick layer passivation.



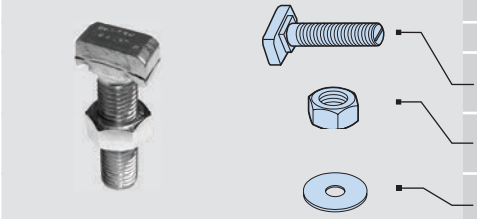
HALFEN Anchor Channels, steel, hot-dip galvanised



	Steel		
	Material	Standard	Zinc coat
Channel profile	Carbon steel ☐	DIN EN 10025-2 ①	HDG: ≥ 55µm
Bolt anchor B6	Carbon steel ☐	DIN EN 10263 or DIN EN 10269	HDG: ≥ 55µm
Weld-on anchor	Carbon steel ☐	DIN EN 10025-2	HDG: ≥ 55µm

① Steel according to DIN EN 10 025-2 and HALFEN specification

HALFEN T-bolts, galvanised steel



	Steel		
	Material/Grade	Standard	Zinc coat
T-bolt	Grade 8.8 ☐ ☒	ISO 898-1 and ISO 4034 (similar to ASTM F68M)	HDG ≥ 50µm EP: ≥ 12µm
Hexagonal nut	Property class 5 or 8 ☐ ☒	ISO 898-2 and ISO 4032 (similar to ASTM F63M)	HDG: ≥ 50µm EP: ≥ 12µm
Washer	Production class A, 200 HV ☐ ☒	ASTM F844	HDG: ≥ 40µm EP: ≥ 12µm

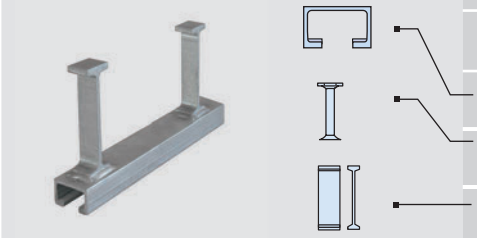
Stainless steel A4

Chromium is the most important alloy element in stainless steel. A specific chromium concentration ensures the generation of a passive layer on the surface of the steel that protects the base material against corrosion.
This explains the high corrosion resistance of stainless steel.

Materials:

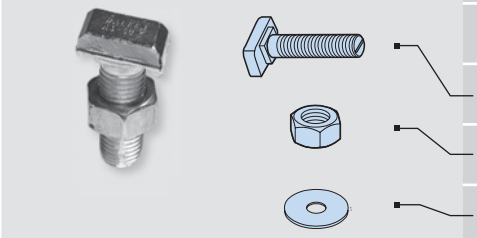
- ☐ **HDG** = Steel hot-dip galvanised
- ☒ **EP** = Steel zinc plated (with special coating)
- ☐ **A4** = Steel stainless

HALFEN Anchor Channels, stainless steel



	Stainless steel	
	Material/Grade	Standard
Channel profile	Stainless steel A4 (similar to 316Ti) ☐	DIN EN 10088 (similar to ASTM A276/A276M)
Bolt anchor B6	Stainless steel A4 (similar to 316Ti) ☐	DIN EN 10088 (similar to ASTM A276/A276M)
Weld-on anchor	Stainless steel A4 (similar to 316Ti) ☐	DIN EN 10088 (similar to ASTM A276/A276M)

HALFEN T-bolts, stainless steel



	Stainless steel	
	Material/Grade	Standard
T-bolt	Stainless steel A4 (similar to 316Ti) ☐	ISO 3506-1 (similar to ASTM A276/A276M)
Hexagonal nut	Stainless steel A4 (similar to 316Ti) ☐	ISO 3506-2 (similar to ASTM A276/A276M)
Washer	Stainless steel A4 (similar to 316Ti) ☐	ISO 7089 and ISO 7093-1

Corrosion Protection

To ensure that connections perform to their full potential throughout their service life it is critical to chose the appropiate corrosion protection.
The corrosion process is complex and can be attributed to many factors.
HALFEN Anchor Channels are available in either hot-dip galvanised (≥ 55 µm) or stainless steel depending on the level of corrosion resistance required.
The corrosion resistance of zinc coatings is primarily dependent on the thickness of the coating relative to the environmental conditions.

Zinc corrosion rates can be obtained from the American Galvanizers Association and ASTM B 633. A table of mean corrosion rates for various environments is provided to the right. It should be noted that these values are for general reference only and are provided only to give a better estimate of the expected service life of the zinc coating. Stainless steel is recommended for moderately to highly corrosive environments (industrial and coastal environments) or where an extended lifetime of the connection is warranted.

Atmosphere	Mean Corrosion Rate
Industrial	5.6 µm/year
Urban non-industrial	1.5 µm/year
Marine	1.5 µm/year
Suburban	1.3 µm/year
Rural	0.8 µm/year
Indoors	< 0.5 µm/year

- Table obtained from ASTM B 633 Appendix X1.
- The mean corrosion rates apply only to zinc and do not include a corrosion rate when zinc is passivated or in contact with other materials.
- All components are hot-dip galvanised in accordance with ASTM A153

Contact Corrosion

Dissimilar metals and alloys have different electrode potentials.
Corrosion can occur between dissimilar metals or alloys when they come in contact and are in the presence of an electrolyte (e.g. water). The electro potential between the dissimilar metals is the cause of an accelerated corrosion of the anode member of the galvanic couple. This type of corrosion is referred to as Galvanic Corrosion or Bi-metal Corrosion.

Interior connections located in dry environments are typically not susceptible to this type of corrosion.

To prevent galvanic corrosion from occurring all T-bolts, nuts, washers and channels are recommended to be of the same material, i.e. stainless steel bolts, nuts and washers shall be used with stainless steel channels.

Corrosion Protection Requirements

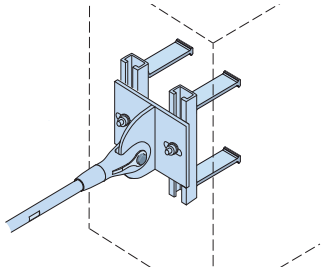
HALFEN HZA Stainless Steel Anchor Channels are also delivered with stainless steel, round bolted anchors. The corrosive resistance of these anchors is not restricted to any minimum concrete cover due to the higher corrosion protection of the material used.

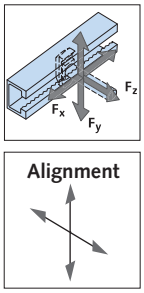
Areas of application

- Bridge and tunnel construction (fastening of pipes, etc.)
- Construction of sewage treatment plants (fixing of spillovers)
- Chemical industry (installations exposed to aggressive substances)
- Ventilated façades, e.g. masonry renders

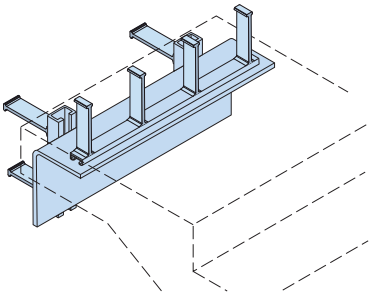
Applications

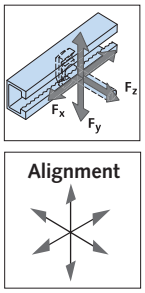
Tension rod connection



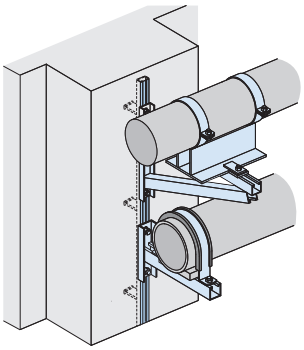


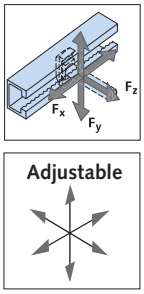
Precast staircase to wall connection



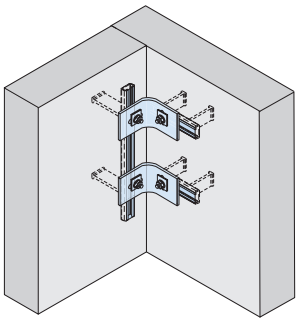


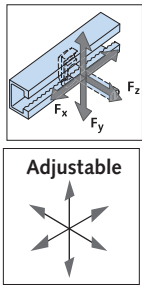
Support for mechanical services



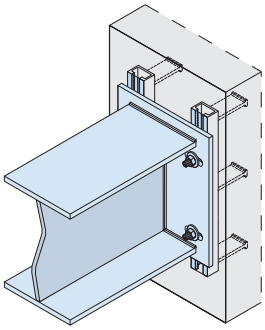


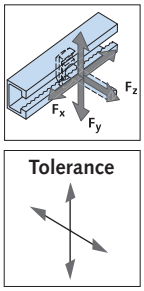
Precast panel to panel connection



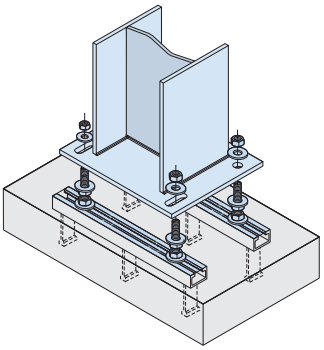


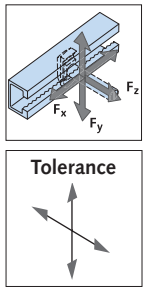
Beam to wall or column connection



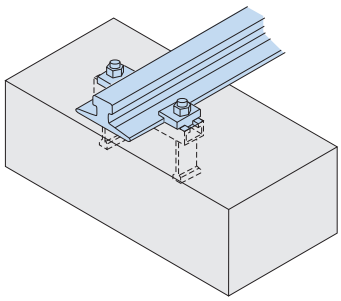


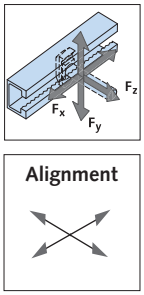
Column/slab connection



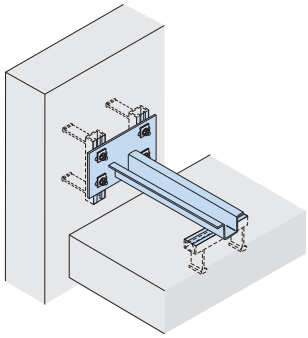


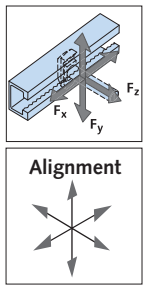
Crane rail connection





Precast panel to structure connection





Calculation Method according to AC232

Bolts and Channel Lips

ϕN_{ss} ($\phi N_{ss,seis}$), ϕN_{sl} ($\phi N_{sl,seis}$) $\geq N^b_{ua}$

ϕV_{ss} ($\phi V_{ss,seis}$), $\phi V_{sl,y}$ ($\phi V_{sl,y,seis}$) $\geq V^b_{ua,y}$

ϕV_{ss} ($\phi V_{ss,seis}$), $\phi V_{sl,x}$ ($\phi V_{sl,x,seis}$) $\geq V^b_{ua,x}$

Channel, Anchors and Concrete

ϕN_{nc} ($\phi N_{nc,seis}$), $\phi N_{ns,a}$ ($\phi N_{ns,a,seis}$) $\geq N^a_{ua}$

ϕV_{nc} ($\phi V_{nc,seis}$), $\phi V_{ns,a}$ ($\phi V_{ns,a,seis}$) $\geq V^a_{ua,y}$

ϕV_{nc} ($\phi V_{nc,seis}$), $\phi V_{ns,a}$ ($\phi V_{ns,a,seis}$) $\geq V^a_{ua,x}$

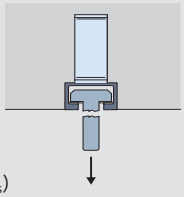
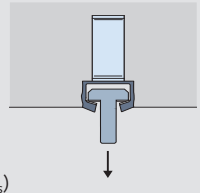
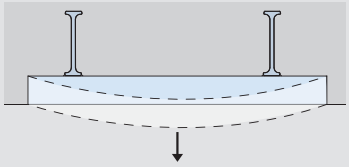
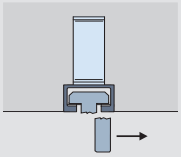
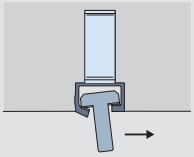
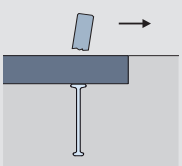
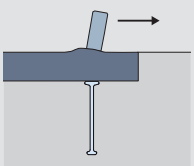
Channel Flexure

$\phi M_{s,flex}$ ($\phi M_{s,flex,seis}$) $\geq M_{u,flex}$

Load types

Load	Description
N^b_{ua}, $V^b_{ua,y}$ and $V^b_{ua,x}$	Loads acting on the T-bolt(s).
N^a_{ua}, $V^a_{ua,y}$ and $V^a_{ua,x}$	Loads acting on the anchors. These loads are determined using the factored tension and shear loads calculated in accordance with ACI 318-14 Sec. 5.3 or ASCE 7-10 Sec. 2.3.
$N_{ns,a}$ and $V_{ns,a}$ ($N_{ns,a,seis}$ and $V_{ns,a,seis}$)	Minimum tension and shear capacities (under seismic loading) for steel failure of an anchor or the connection between the anchor and channel (N_{sa}, N_{sc}, $V_{sa,y}$, $V_{sa,x}$, $V_{sc,y}$, $V_{sc,x}$ or $N_{sa,seis}$, $N_{sc,seis}$, $V_{sa,y,seis}$, $V_{sa,x,seis}$, $V_{sc,y,seis}$, $V_{sc,x,seis}$).
N_{nc} and V_{nc} ($N_{nc,seis}$ and $V_{nc,seis}$)	Nominal tension and shear capacities (under seismic loading) of one anchor from all concrete failure modes (N_{pn}, N_{cb}, $V_{cb,y}$, $V_{cb,x}$, $V_{cp,y}$, $V_{cp,x}$ or $N_{pn,seis}$, $N_{cb,seis}$, $V_{cb,y,seis}$, $V_{cb,x,seis}$, $V_{cp,y,seis}$, $V_{cp,x,seis}$) see table below.
$M_{u,flex}$	Bending moment on the channel due to the factored tension load(s) N^b_{ua}.

Failure modes

	Steel failure modes		
	T-bolt failure	Local flexure of channel lip	Channel flexure
Tension loading (N)	 N_{ss} ($N_{ss,seis}$) ϕ = 0.65 (Grade 8.8)	 N_{sl} ($N_{sl,seis}$) ϕ = 0.75	 $M_{s,flex}$ ($M_{s,flex,seis}$) ϕ = 0.85
Loading in perpendicular shear (V_y)	 V_{ss} ($V_{ss,seis}$) ϕ = 0.60 (Grade 8.8)	 $V_{sl,y}$ ($V_{sl,y,seis}$) ϕ = 0.75	
Loading in longitudinal shear (V_x)	 V_{ss} ($V_{ss,seis}$) ϕ = 0.60 (Grade 8.8)	 $V_{sl,x}$ ($V_{sl,x,seis}$) ϕ = 0.65 Periodic inspection ϕ = 0.75 Continous inspection	

Calculation Method according to AC232

Allowable stress design

For connections designed using Allowable Stress Design (ASD) allowable loads shall be determined as follows:

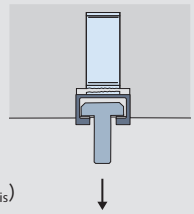
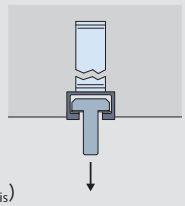
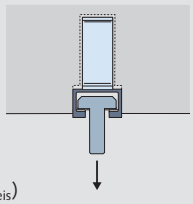
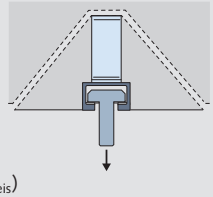
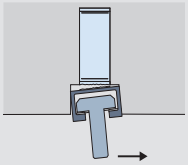
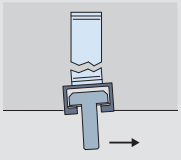
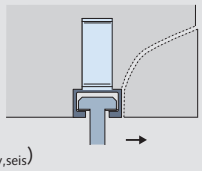
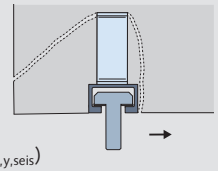
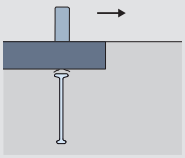
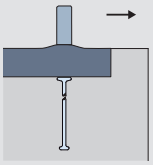
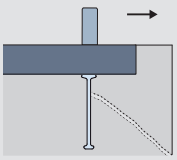
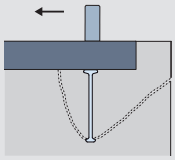
$$T_{allowable,ASD} = \frac{\phi N_n}{\alpha_{ASD}}$$

$$V_{allowable,ASD} = \frac{\phi V_n}{\alpha_{ASD}}$$

α_{ASD} = Conversation factor calculated as a weighted average of the load factors for the controlling load combination.

All relevant strength reduction factors ϕ are provided in the table below. If the load combinations referenced in ACI 318-11 Appendix C are used, the appropriate strength reduction factor should be used in accordance with AC232.

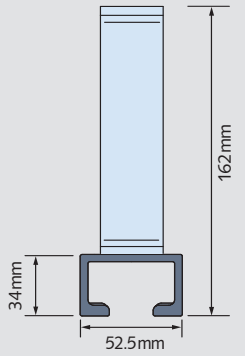
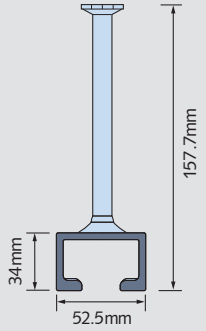
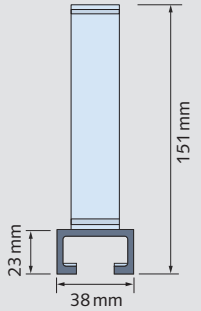
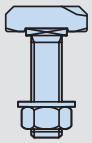
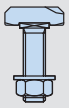
The capacity of HALFEN HZA Anchor Channels is calculated according to ICC-ESR 4016 Evaluation Report by the International Code Council Evaluation Service (ICC-ES). The Evaluation Report refers to the Acceptance Criteria for Anchor Channels in Concrete Elements AC232 by ICC-ES. The design requirements are primarily based on the principles as in ACI 318-14, chapter 17 (previously ACI 318-11, Appendix D) with amendments as applicable to the strength design of anchor channels.

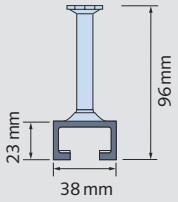
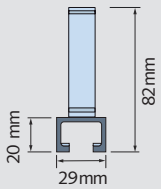
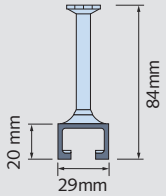
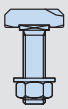
Steel failure modes		Concrete failure modes	
Connection between anchor and channel	Anchor failure	Pull-out failure	Concrete cone failure
 N_{sc} ($N_{sc,seis}$) ϕ = 0.75	 N_{sa} ($N_{sa,seis}$) ϕ = 0.75	 N_{pn} ($N_{pn,seis}$) ϕ = 0.70	 N_{cb} ($N_{cb,seis}$) ϕ = 0.70
		Concrete edge failure	Concrete pry-out failure
 $V_{sc,y}$ ($V_{sc,y,seis}$) ϕ = 0.75	 $V_{sa,y}$ ($V_{sa,y,seis}$) ϕ = 0.75	 $V_{cb,y}$ ($V_{cb,y,seis}$) ϕ = 0.70	 $V_{cp,y}$ ($V_{cp,y,seis}$) ϕ = 0.70
 $V_{sc,x}$ ($V_{sc,x,seis}$) ϕ = 0.75	 $V_{sa,x}$ ($V_{sa,x,seis}$) ϕ = 0.75	 $V_{cb,x}$ ($V_{cb,x,seis}$) ϕ = 0.70	 $V_{cp,x}$ ($V_{cp,x,seis}$) ϕ = 0.70

HALFEN HZA ANCHOR CHANNELS

Product Overview

HALFEN HZA Anchor Channels and bolts – Product Overview

HALFEN HZA Anchor Channel	HZA 53/34		HZA 38/23
			
Material ① ②	■	□	■
Type	hot-rolled	hot-rolled	hot-rolled
Page	13	13	14
Available HALFEN HZS bolts (see also tables on page 18 and 19 for order numbers)	**HZS 53/34** M16 and M20 		**HZS 38/23** M12 and M16 

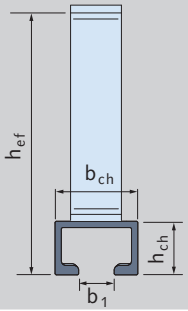
HALFEN HZA Anchor Channel	**HZA 38/23**	**HZA 29/20**	
			
Material ① ②	■	□	□
Type	hot-rolled	hot-rolled	hot-rolled
Page	14	15	15
Available HALFEN HZS bolts (see also tables on page 18 and 19 for order numbers)	**HZS 38/23** M12 and M16 	**HZS 29/20** M12 	

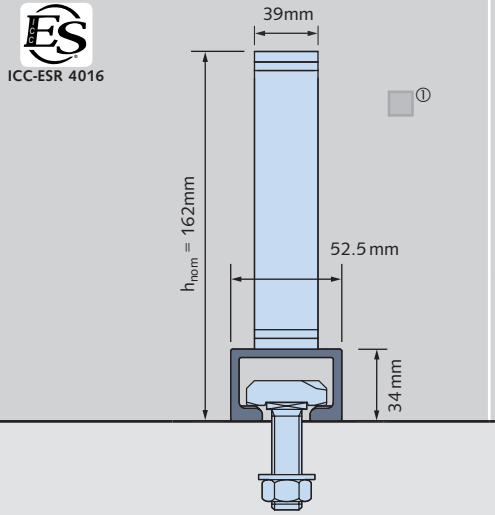
① HDG = Hot-dip galvanised carbon steel ② A4 = Stainless steel

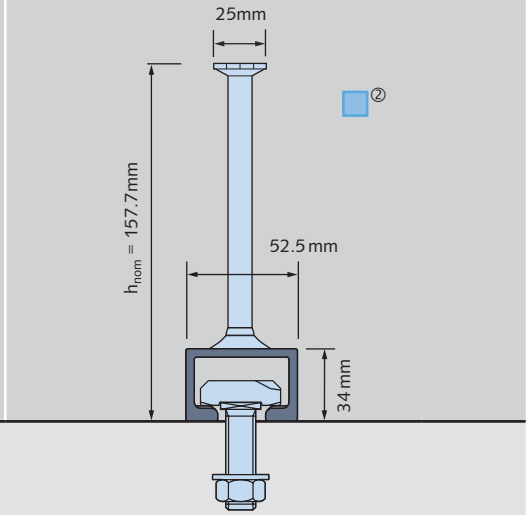
Load Capacities and Ordering Information

HALFEN HZA 53/34 Anchor Channels, hot-rolled

HZA 53/34	
b_{ch}	52.5 mm
h_{ch}	34 mm
h_t	7.5 mm
h_{ef}	157 mm
h_{ef}	155 mm
$c_{a,min}$	100 mm
b_1	22.5 mm







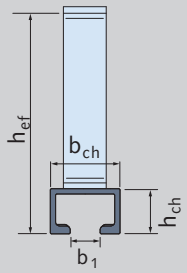
Material	Hot-dip galvanised carbon steel ①	A4 Stainless steel②
T-bolt size /available thread	HZS 53/34 / M16 and M20	
N_{sl} ($N_{sl,seis}$①)	78.7kN	47.5kN
$V_{sl,y}$ ($V_{sl,y,seis}$①)	78.7kN	47.5kN
$V_{sl,x}$ ($V_{sl,x,seis}$①)	59.0kN	47.5kN
$M_{s,flex}$ ($M_{s,flex,seis}$①)	4,095Nm	4,095Nm
I_y	92,600mm⁴	92,600mm⁴
$N_{ns,a}$ = min [N_{sc}, N_{sa}] ($N_{ns,a,seis}$①)	78.7kN	47.5kN
$V_{ns,a,y}$ = min [$V_{sc,y}$, $V_{sa,y}$] ($V_{ns,a,y,seis}$①)	78.7kN	47.5kN
$V_{ns,a,x}$ = min [$V_{sc,x}$, $V_{sa,x}$] ($V_{ns,a,x,seis}$①)	47.2kN	28.5kN

Available lengths	Parts number	Description	Number of anchors	Parts number	Description	Number of anchors
150 mm	0002.050-00501	HZA 53/34-HDG-150	2	0002.052-00801	HZA 53/34-A4-150-B6	2
200 mm	0002.050-00502	HZA 53/34-HDG-200	2	0002.052-00802	HZA 53/34-A4-200-B6	2
250 mm	0002.050-00503	HZA 53/34-HDG-250	2	0002.052-00803	HZA 53/34-A4-250-B6	2
300 mm	0002.050-00504	HZA 53/34-HDG-300	2	0002.052-00804	HZA 53/34-A4-300-B6	2
350 mm	0002.050-00505	HZA 53/34-HDG-350	3	0002.052-00805	HZA 53/34-A4-350-B6	3
400 mm	0002.050-00506	HZA 53/34-HDG-400	3	0002.052-00806	HZA 53/34-A4-400-B6	3
550 mm	0002.050-00507	HZA 53/34-HDG-550	3	0002.052-00807	HZA 53/34-A4-550-B6	3
800 mm	0002.050-00508	HZA 53/34-HDG-800	4	-	-	-
1,050 mm	0002.050-00509	HZA 53/34-HDG-1050	5	0002.052-00809	HZA 53/34-A4-1050-B6	5
3,030 mm	0002.050-00511	HZA 53/34-HDG-3030	13	-	-	-
6,070 mm	0002.050-00512	HZA 53/34-HDG-6070	25	0002.052-00808	HZA 53/34-A4-6070-B6	25

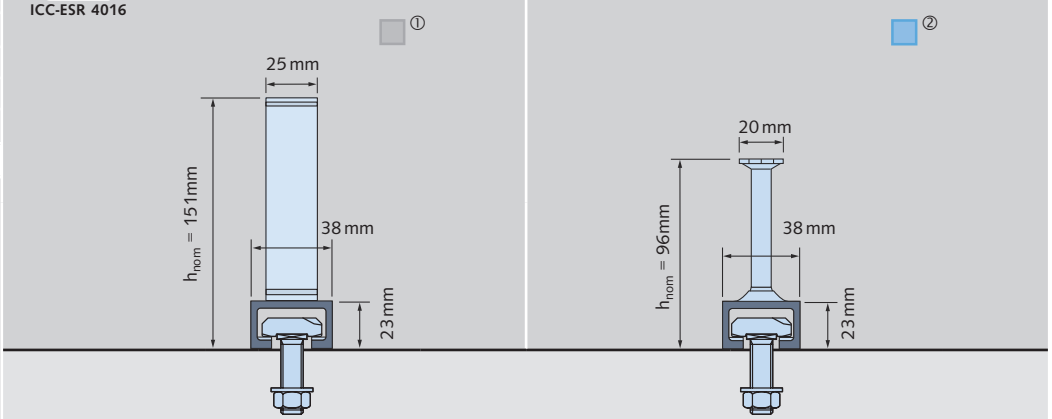
① Welded I-Anchor in HDG finish is included in ICC-ESR 4016, seismic capacities are valid for these items only
② Bolted anchor channel is available in A4 stainless steel on request

HALFEN HZA 38/23 Anchor Channels, hot-rolled

HZA 38/23	
b_{ch}	38mm
h_{ch}	23mm
h_t	5.5mm
h_{ef}	146mm
h_{ef}	93.8mm
$c_{a,min}$	75mm
b_1	18mm



ICC-ESR 4016



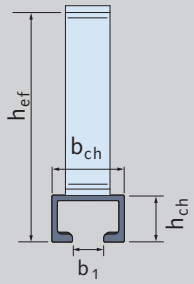
Material	Hot-dip galvanised carbon steel①			A4 Stainless steel②		
T-bolt size /available thread	HZS 38/23 / M12 and M16					
N_{sl} ($N_{sl,seis}$①)	39.3 kN			30.0 kN		
$V_{sl,y}$ ($V_{sl,y,seis}$①)	39.3 kN			30.0 kN		
$V_{sl,x}$ ($V_{sl,x,seis}$①)	19.6 kN			19.6 kN		
$M_{s,flex}$ ($M_{s,flex,seis}$①)	1,663Nm			1,663Nm		
I_y	21,100mm⁴			21,100mm⁴		
$N_{ns,a}$ = min [N_{sc}, N_{sa}] ($N_{ns,a,seis}$①)	39.3 kN			30.0 kN		
$V_{ns,a,y}$ = min [$V_{sc,y}$, $V_{sa,y}$] ($V_{ns,a,y,seis}$①)	39.3 kN			30.0 kN		
$V_{ns,a,x}$ = min [$V_{sc,x}$, $V_{sa,x}$] ($V_{ns,a,x,seis}$①)	23.6 kN			18.0 kN		
Available lengths	Parts number	Description	Number of anchors	Parts number	Description	Number of anchors
150 mm	0002.020-00501	HZA 38/23-HDG-150	2	0002.020-00851	HZA 38/23-A4-150-B6	2
200 mm	0002.020-00502	HZA 38/23-HDG-200	2	0002.020-00852	HZA 38/23-A4-200-B6	2
250 mm	0002.020-00503	HZA 38/23-HDG-250	2	0002.020-00853	HZA 38/23-A4-250-B6	2
300 mm	0002.020-00504	HZA 38/23-HDG-300	2	0002.020-00854	HZA 38/23-A4-300-B6	2
350 mm	0002.020-00505	HZA 38/23-HDG-350	3	0002.020-00855	HZA 38/23-A4-350-B6	3
400 mm	0002.020-00506	HZA 38/23-HDG-400	3	0002.020-00856	HZA 38/23-A4-400-B6	3
550 mm	0002.020-00507	HZA 38/23-HDG-550	3	0002.020-00857	HZA 38/23-A4-550-B6	3
800 mm	0002.020-00508	HZA 38/23-HDG-800	4	0002.020-00858	HZA 38/23-A4-800-B6	4
1,050 mm	0002.020-00509	HZA 38/23-HDG-1050	5	0002.020-00859	HZA 38/23-A4-1050-B6	5
3,030 mm	0002.020-00511	HZA 38/23-HDG-3030	13	0002.020-00860	HZA 38/23-A4-3030-B6	13
6,070 mm	0002.020-00510	HZA 38/23-HDG-6070	25	-	-	-

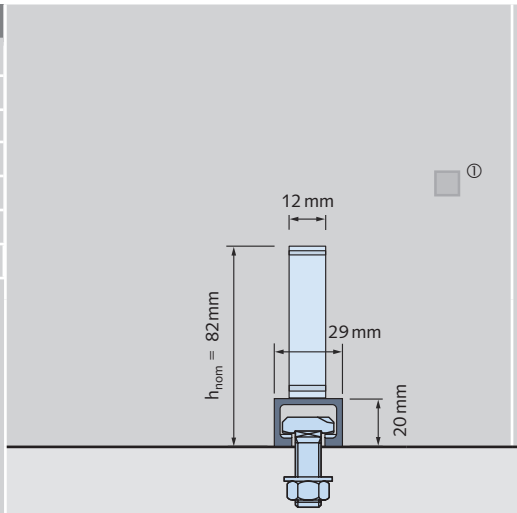
① Welded I-Anchor in HDG finish is included in ICC-ESR 4016, seismic capacities are valid for these items only
② Bolted anchor channel is available in A4 stainless steel on request

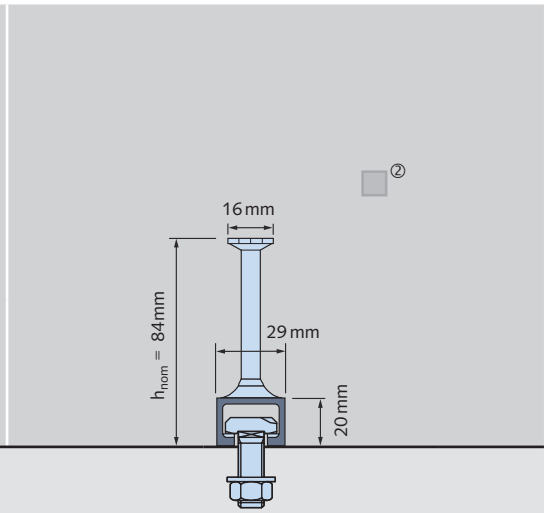
Load Capacities and Ordering Information

HALFEN HZA 29/20 Anchor Channels, hot-rolled

HZA 29/20	
b_{ch}	29mm
h_{ch}	20mm
h_t	5mm
h_{ef} ①	78.7mm
h_{ef} ②	82.1mm
$c_{a,min}$	75mm
b_1	14mm







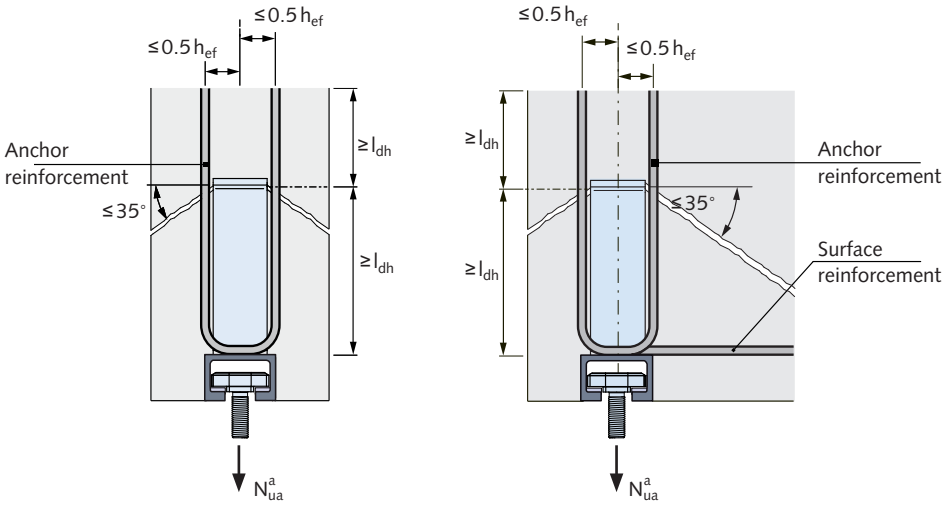
Material	Hot-dip galvanised carbon steel①					
T-bolt size /available thread	HZS 29/20 / M12					
N_{sl}	20.0 kN			20.0 kN		
$V_{sl,y}$	20.0 kN			20.0 kN		
$V_{sl,x}$	20.0 kN			20.0 kN		
$M_{s,flex}$	943 Nm			943 Nm		
I_y	10,200mm^4			10,200mm^4		
$N_{ns,a}$ = min [N_{sc}, N_{sa}]	20.0 kN			20.0 kN		
$V_{ns,a,y}$ = min [$V_{sc,y}$, $V_{sa,y}$]	20.0 kN			20.0 kN		
$V_{ns,a,x}$ = min [$V_{sc,x}$, $V_{sa,x}$]	12.0 kN			12.0 kN		
Available lengths	Parts number	Description	Number of anchors	Parts number	Description	Number of anchors
150 mm	0002.010-00501	HZA 29/20-HDG-150	2	0002.010-00801	HZA 29/20-HDG-150-B6	2
200 mm	0002.010-00502	HZA 29/20-HDG-200	2	0002.010-00802	HZA 29/20-HDG-200-B6	2
250 mm	0002.010-00503	HZA 29/20-HDG-250	2	0002.010-00803	HZA 29/20-HDG-250-B6	2
300 mm	0002.010-00504	HZA 29/20-HDG-300	3	0002.010-00804	HZA 29/20-HDG-300-B6	3
350 mm	0002.010-00505	HZA 29/20-HDG-350	3	0002.010-00805	HZA 29/20-HDG-350-B6	3
400 mm	0002.010-00506	HZA 29/20-HDG-400	3	0002.010-00806	HZA 29/20-HDG-400-B6	3
550 mm	0002.010-00507	HZA 29/20-HDG-550	4	0002.010-00807	HZA 29/20-HDG-550-B6	4
1,050 mm	0002.010-00509	HZA 29/20-HDG-1050	6	0002.010-00809	HZA 29/20-HDG-1050-B6	6
3,030 mm	0002.010-00511	HZA 29/20-HDG-3030	16	0002.010-00815	HZA 29/20-HDG-3030-B6	16
6,070 mm	0002.010-00510	HZA 29/20-HDG-6070	31	0002.010-00008	HZA 29/20-HDG-6070-B6	31

① Welded I-Anchor in HDG finish
② Bolted anchor channel is available in hot-dip galvanised steel on request

Supplementary Reinforcement according to ACI 318-14

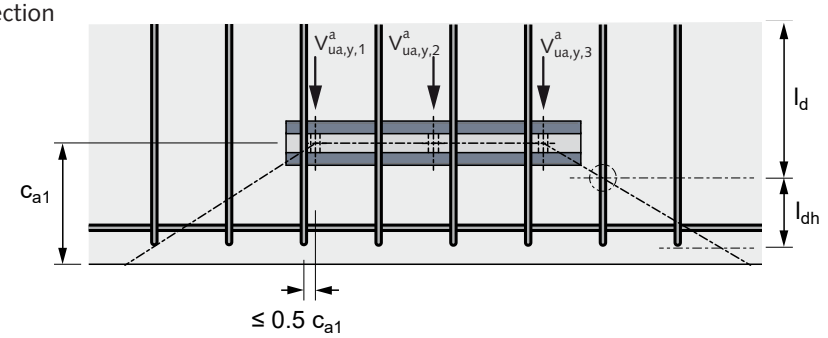
Tensile Anchor Reinforcement

z-direction

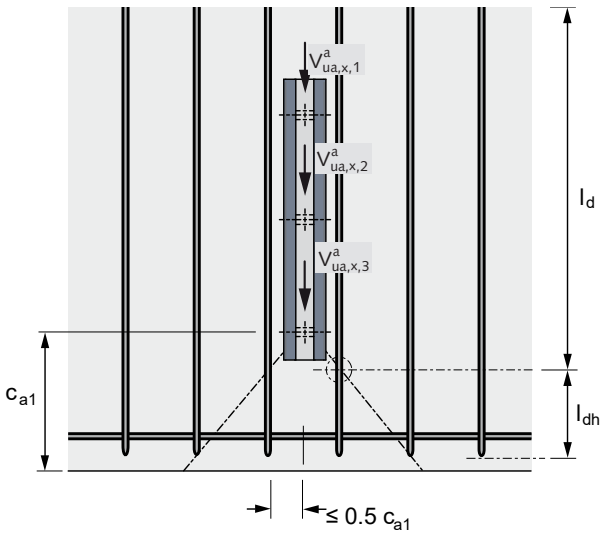


Shear Anchor Reinforcement

y-direction



x-direction



For conditions where the factored tensile and shear force exceed the concrete breakout strength of the HALFEN Anchor Channel or where the breakout strength is not evaluated, it is permitted within AC232 that the nominal strength can be that of anchor reinforcement properly placed as shown in the figures to the left.

Anchor reinforcement should consist of stirrups, ties or hairpins comprised of deformed reinforcing bars with a maximum diameter of 16mm. Rebars shall be placed as close as possible to the anchor and anchor channel. The anchor reinforcement shall be developed in accordance with the latest edition of ACI 318 on both sides of the breakout surface of an anchor or anchor channel.

The anchor reinforcement of an anchor channel shall be designed for the highest anchor load, $V^a_{ua,y}$ ($V^a_{ua,x}$) of all anchor but at least for the highest individual load, $V^b_{ua,y}$ ($V^b_{ua,x}$) acting on the channel.

l_d = Development length in tension of deformed rebar
l_{dh} = Development length in tension of deformed rebar with a standard hook
c_{a1} = Edge distance of anchor channel

HALFEN HZS T-bolts

Product Overview

HALFEN HZA Anchor Channels and HZS T-bolts are designed to work as a system. The loads provided in ICC-ESR 4016 and this catalogue are only valid when the appropriate HZS T-bolt is used together with the appropriate HZA Anchor Channel profile.
HALFEN HZS T-bolts are available in strength class 8.8 and in stainless steel strength class A4-70.

Carbon steel T-bolts are available in two finishes; hot-dip galvanised (HDG) or special electro-plated coating (EP) with thick layer passivation.

HALFEN HZS T-bolts are available in a wide range of diameters and lengths. The following pages show a selection of our available HZS T-bolts sorted by T-bolt type.

For more HALFEN HZS T-bolts please refer to the HALFEN Price Book or contact your local Sales Representative.

Ordering example HALFEN HZS T-bolts:

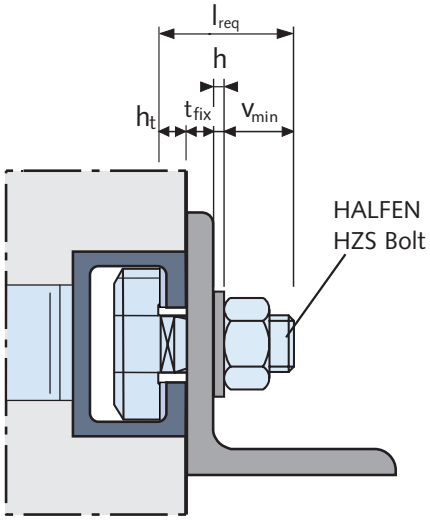
HALFEN HZS	53/34	M16	x 60	EP	- 8.8

- HALFEN T-bolt and nut
- Type
- Diameter / Thread [mm]
- Length [mm]
- Finish
- Strength class

HALFEN T-bolts can be ordered by referencing the corresponding article description (see left) or the 12 digit article number (see tables on page 18 and 19).

Required T-bolt Length

$$l_{req} = t_{fix} + h_t + h + v_{min}$$



l_{req} = Required T-bolt length
t_{fix} = Thickness of clamped component
h_t = Channel lip height
h = Washer thickness

An additional overhang should be considered for the following bolt sizes.

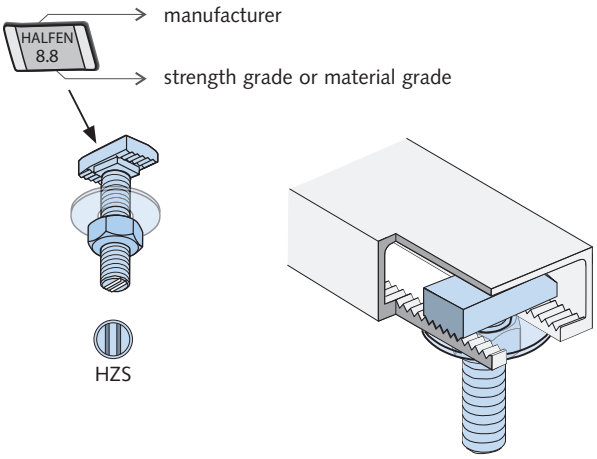
Additional overhang	
Bolt size	additional overhang [mm]
M12 and M16	5.0
M20	7.0
The overhang is included in the listed values of v_{min}.	

Dimension	
T-bolt size	v_{min} [mm]
M12	17.0
M16	20.5
M20	26.0

Channel lip height	
Channel profile	h_t [mm]
29/20	5.0
38/23	5.5
53/34	7.5

HALFEN T-bolts

Load Resistance Values



The tables below show the nominal strength for HALFEN HZS T-bolts.

$\mathbf{N_{ss}}$ **(**$\mathbf{N_{ss,seis}}$**)** is the nominal tensile strength, $\mathbf{V_{ss}}$ **(**$\mathbf{V_{ss,seis}}$**)** the nominal shear strength and $\mathbf{M^0_{ss}}$ **(**$\mathbf{M^0_{ss,seis}}$**)** is the nominal bending strength for T-bolts where a seismic shear force is applied with a lever arm. The strength reduction factors for steel failure are provided in the tables below.

HZS Bolts – Nominal strength values

T-bolt size	Grade	N_{ss} ($N_{ss,seis}$)		V_{ss} ($V_{ss,seis}$)		M^0_{ss} ($M^0_{ss,seis}$)	
		ϕ	[kN]	ϕ	[kN]	ϕ	[Nm]
M12	8.8	0.65	67.4	0.60	40.5	0.60	106.0
M16	8.8		125.6		75.4		267.0
	A4-70		109.9		65.9		233.1
M20	8.8		196.0		117.6		519.3
	A4-70		171.5		102.9		454.4

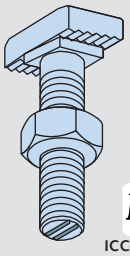
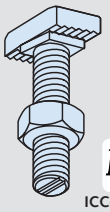
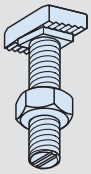
ϕ = Strength reduction factors

HALFEN T-bolts – Order numbers of standard available T-bolts ⓘ

T-bolt size	Type	Material	30	40
M12	HZS 29/20	EP 8.8	0352.040-00001	0352.040-00002
	HZS 38/23	EP 8.8	0352.060-00001	0352.060-00002
		HDG 8.8		
M16	HZS 38/23	EP 8.8		0352.060-00012
	*	HDG 8.8		
		A4-70		
	HZS 53/34	EP 8.8		
		HDG 8.8		
		A4-70		
M20	HZS 53/34	EP 8.8		
		HDG 8.8		
		A4-70		

EP 8.8 = Electroplated grade 8.8
HDG = Hot-dip galvanised
A4-70 = Stainless steel

HALFEN T-bolts

HZS 53/34	HZS 38/23	HZS 29/20
 ICC-ESR 4016	 ICC-ESR 4016	

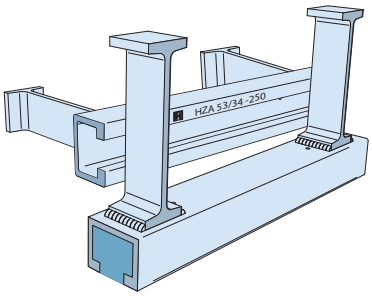
Length of T-bolt in mm						
50	60	65	80	100	125	200
0352.040-00003	0352.040-00004		0352.040-00005			
0352.060-00003	0352.060-00004		0352.060-00005	0352.060-00006	0352.060-00007	
0352.060-00026						
0352.060-00013	0352.060-00014			0352.060-00016	0352.060-00017	0352.060-00019
	0352.060-00023		0352.060-00027			
	0352.060-00021					
	0352.080-00001			0352.080-00002		
	0352.080-00021		0352.080-00022	0352.080-00023		
	0352.080-00011					
		0352.080-00003		0352.080-00004		
		0352.080-00024	0352.080-00025			
		0352.080-00013				

* Order example is for a M16, HZS 38/23 Hot-dip Galvanised bolt, grade 8.8 with a length of 60mm; order number is 0352.060-00023

①Non-listed T-bolt sizes are available on request. Contact your local Sales Representative for more information

Installation of HZA Anchor Channels

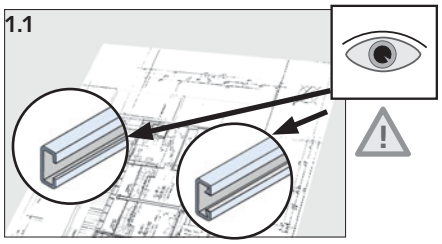
HALFEN Anchor Channels type HZA, ready for installation



HALFEN Anchor Channels are supplied with pre-punched nail holes and a foam or strip filler. Any excess strip filler should be trimmed flush to the channel ends. Before fixing a HALFEN Anchor Channel to formwork, ensure that the profile, material, length, and the selected position is as specified in the plans. Fix the channels securely so that they remain flush with the surface of the formwork and will not be displaced when pouring the concrete. If the selected formwork is not suitable for nails use an alternative method for fixing. In top-of-slab applications make sure the top of the channel is flush with the final concrete surface.

⚠ Remove all steel packing straps from stainless steel HALFEN Anchor Channels immediately after delivery to prevent rust forming. Store the channels separately, with sufficient distance from dissimilar metals. Avoid damage to surface and contact corrosion caused by carbon steel. Store the channels in a dry, protected and well ventilated environment. Only use stainless steel fixing material (e.g. nails, screws etc.) with stainless steel anchor channels.

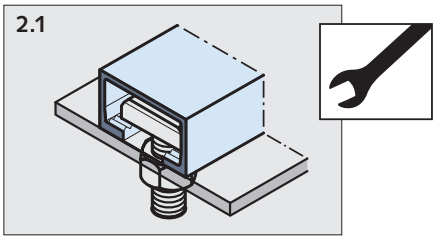
1. Preparations



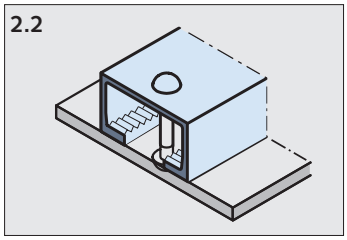
1.1 Select the HALFEN Anchor Channel according to the design plans.

2. Installation alternatives

Steel formwork

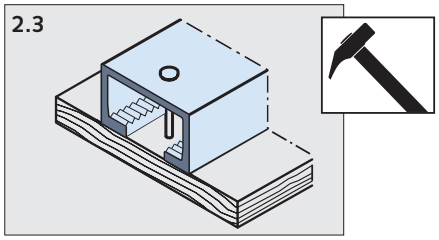


2.1 Secure with a HALFEN T-bolt through the formwork.



2.2 Using rivets or screws (supplied by the contractor) through the prepunched nail holes in the HALFEN Anchor Channel.

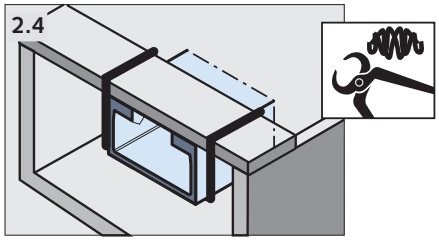
Timber formwork



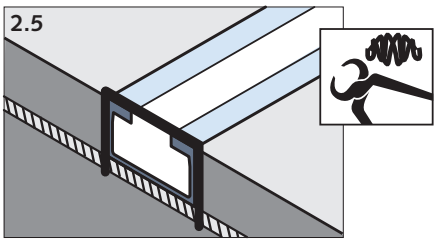
2.3 Fix to timber formwork with nails through the pre-punched holes in the back of the channel.

⚠ **Anchor Channels must be securely fixed** to ensure the lips are flush with the finished concrete surface. Incorrectly positioned channels will not achieve their full load capacity!

Top of slab installation

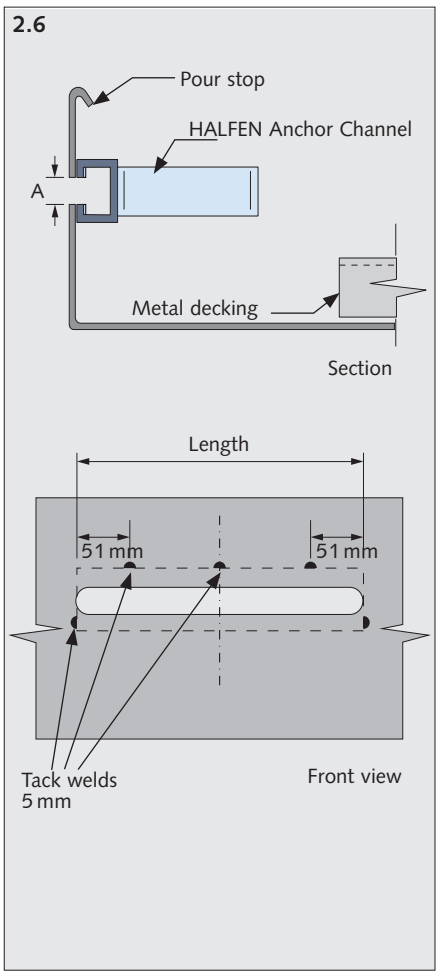


2.4 With a fixing bracket: Meticulous concrete compaction is essential to prevent air bubbles forming underneath the auxiliary work.



2.5 Fixing directly to the reinforcement: Attach the HALFEN Anchor Channel with reinforcement tie-wire.

Metal pour stop



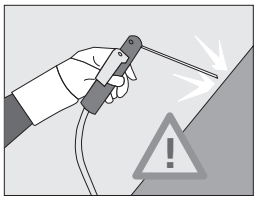
2.6 Securing HALFEN Anchor Channels to metal pour stops

1. Slotted pour stop: Pour stops at HALFEN Anchor Channel locations must be slotted. Slots should be pre-punched by the pour stop supplier. On-site cutting with a welding torch is not recommended. The slot width (dimension A) should be sized and cut to match the distance between the channel lips in the HALFEN Anchor Channel. Oversizing dimension A should be avoided.

2. Welding: Prior to welding, tightly clamp the HALFEN Anchor Channel in position over the slot in the pour stop (Figure 2.6). Care should be taken to ensure the channel is properly aligned with the slot.

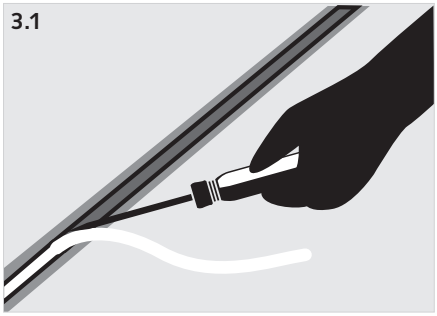
To connect a HALFEN Anchor Channel up to 610 mm long to the pour stop, three 5 mm tack welds should be used along the top edge of the channel.
A 5 mm tack weld should be used at the bottom lip at each end of the channel (refer to figure 2.6). American Welding Society Standard Specification ANSI/AWS provides guidelines for welding to 10-18 gauge galvanised steel (commonly used for pour stops).

After welding, the HALFEN Anchor Channel should be inspected to check it is firmly attached to the pour stop. Large welds or repeated welding should be avoided as this may damage the foam filler in the Anchor Channel. The pour stop should also be inspected after welding to ensure it has not been deformed.



⚠ Welding of galvanised steel components produces hazardous fumes. Appropriate precautions should be taken to ensure safe working conditions for those in the vicinity of the welding operation.

3. After concreting and striking the formwork

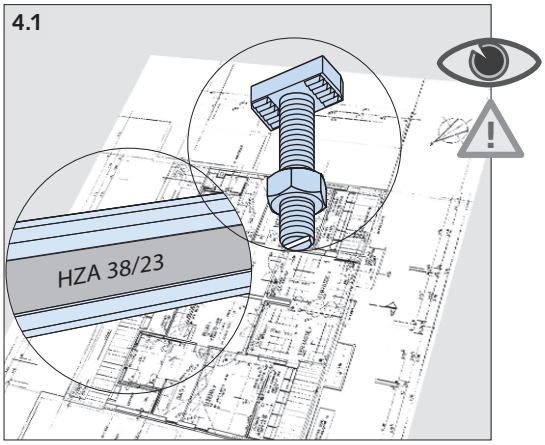


3.1 Remove filler using an appropriate tool, e.g. screwdriver.

⚠ **For correct use of HALFEN T-bolts see the installation instructions for HALFEN T-bolts.**

4. Installation of HALFEN HZS T-bolts

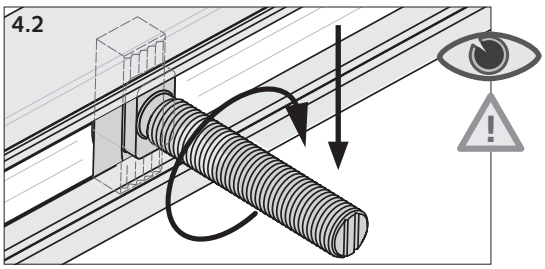
4.1



4.1 Select HALFEN T-bolt according to the planning documentation.

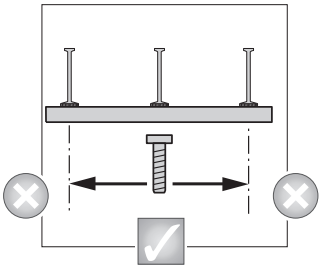
The installation torques provided in these assembly instructions apply only in conjunction with HALFEN HZA Anchor Channels.

4.2



4.2 Insert the HALFEN T-bolt into the channel slot. After a 90° turn clockwise the HALFEN T-bolt locks into position. (Check whether the notch is perpendicular to the longitudinal channel axis)

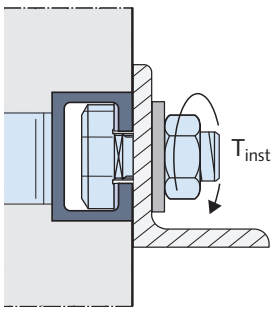
4.3



4.3 Alignment of the HALFEN T-bolt: It is not allowed to install HALFEN T-bolts beyond the center line of the end anchors.

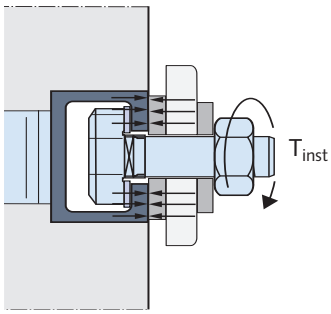
5. Installation torques

5.1



Tighten the nut with the installation torque T_{inst}. Exceeding the given installation torque T_{inst} according to this table may damage the connections and reduce the capacity.
Figure 5.1 shows the general case;

5.2



5.3

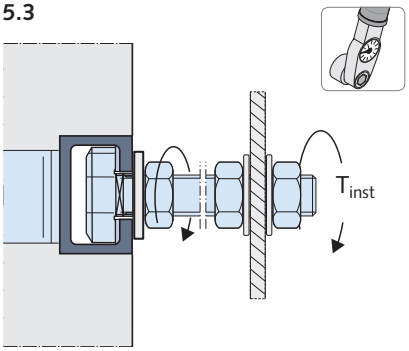
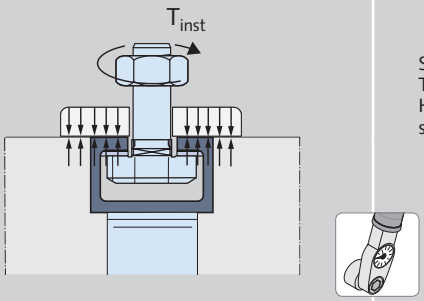


Figure 5.2 and 5.3 show the steel – steel contact case (explanation see next page).

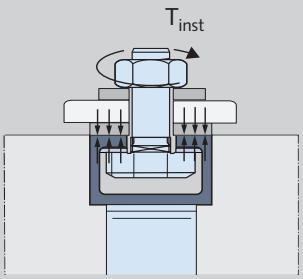
Installation of HZS T-bolts

Position of structural attachment:

General:
The fixture presses directly against concrete and/or to the HALFEN Anchor Channel.



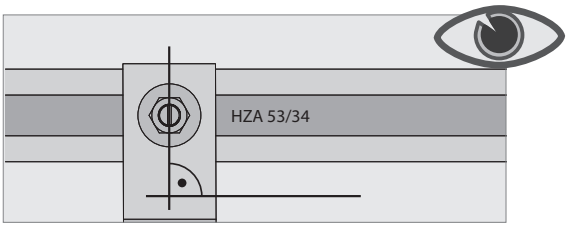
Steel – steel contact:
The fixture presses against the HALFEN Anchor Channel via a suitable shim.



Installation torques: HALFEN HZS T-bolts in combination with HALFEN HZA Anchor Channels

Type of fixture	Strength class	HALFEN Anchor Channel	T_{inst} in Nm		
			M12	M16	M20
General	Steel 8.8	29/20	–	–	–
		38/23	70	94	–
		53/34	–	185	235
Steel-steel contact	Steel 8.8	29/20	80	–	–
		38/23	80	120	–
		53/34	–	200	350
	A4-70	38/23	–	120	–
		53/34	–	200	350

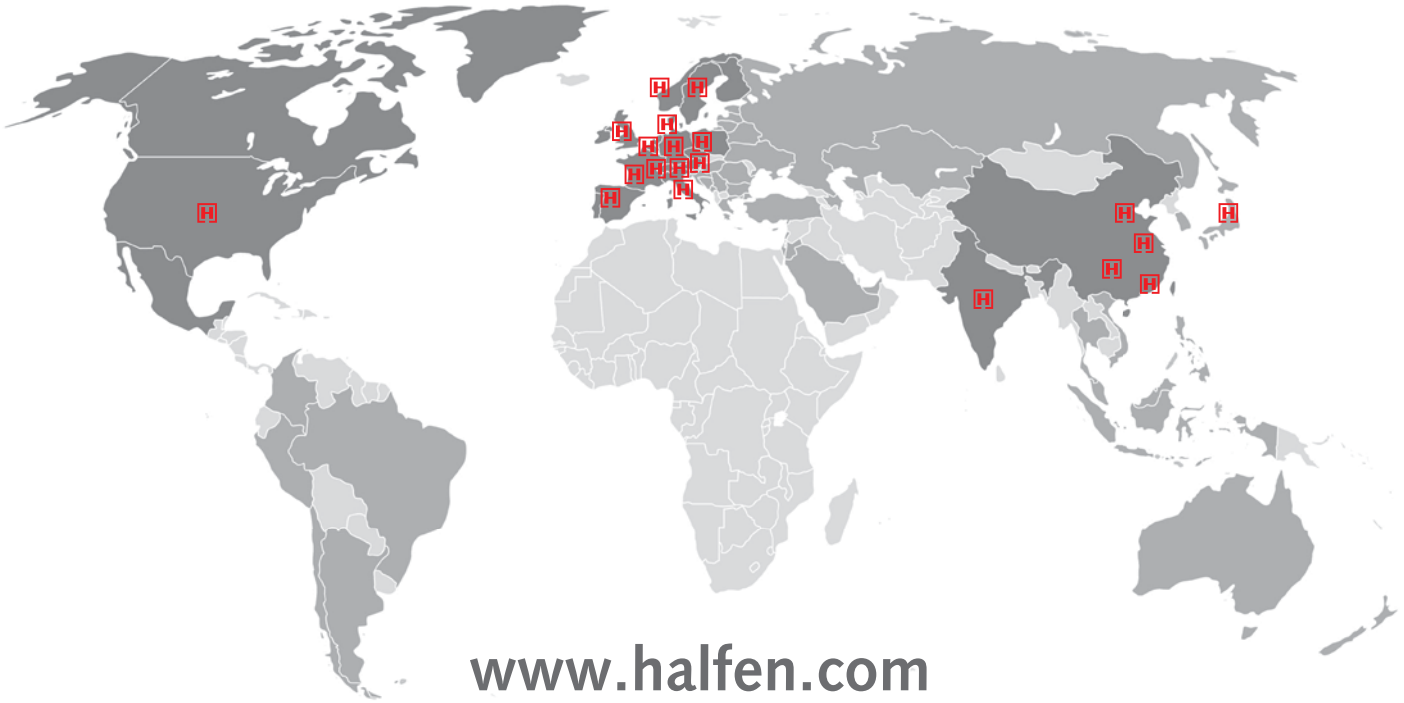
6. Final installation check of assembly



6. After tightening the nut, check whether the T-bolt is properly installed. If the notch is not perpendicular to the longitudinal channel axis, the T-bolt must be completely loosened, re-aligned, re-tightened; finally re-check the orientation of the notch is now correct.

CONTACT HALFEN WORLDWIDE

HALFEN has a global network of Subsidiary Companies to assist you. The main contact information for our European Headquarters and our distributor in New Zealand is provided below. For a full list of HALFEN offices please visit www.HALFEN.com



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