Leviat®
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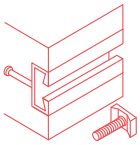
HALFEN

# Halfen Cast-In Channels

Technical Product Information
New Zealand Edition with NZS Compliance

Anchoring & Fixing
**Cast-In Channels, T-Bolts & Accessories**

English / New Zealand

**Imagine. Model. Make.**

Leviat®
A CRH COMPANY

# We imagine, model and make engineered products and innovative construction solutions that help turn architectural visions into reality and enable our construction partners to build better, safer, stronger and faster.

**Leviat is a world leader in connecting, fixing, lifting and anchoring technology.**

From the build of new schools, hospitals, homes and infrastructure, to the repair and maintenance of heritage structures, our engineering skills are making a difference around the world.

We provide technical design assistance at every stage of a project, from initial planning to installation and beyond.

Our technical support services range from simple product selection through to the development of a fully customised project-specific design solution.

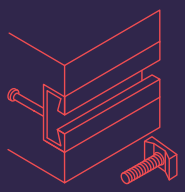
Every promise we make locally, has the commitment and dedication of our global team behind it. We employ almost 3,000 people at 60 locations across North America, Europe and Asia-Pacific, providing an agile and responsive service worldwide.

**Leviat, a CRH company, is part of the world's leading building materials business.**

**>3,000**
People

**60+**
Locations

**~20**
Countries



## Anchoring & Fixing

Systems for fixing secondary fixtures to concrete, including anchor channels, bolts and inserts; also tension rod systems for roofs and canopies.

- Cast-in Channels, T-Bolts & Accessories
- Threaded Inserts
- Rod Systems
- Attachment Points
- Post Installed Anchor Systems

## Other areas of expertise:

### Structural Connections

Systems to form robust, efficient connections, and continuity of concrete reinforcement as necessary, between walls, slabs, columns, beams and balconies, providing structural integrity as well as enhanced thermal and acoustic performance.

### Lifting & Bracing

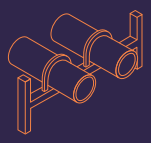
Systems for the safe and efficient transportation, lifting and temporary bracing of cast concrete elements and tilt-up panels before permanent structural connections are made.

### Façade Support & Restraint

Systems for the safe and thermally-efficient fixing of the external building envelope, including brick and natural stone, insulated sandwich panels, curtain walling and suspended concrete façades, and also the repair and strengthening of existing masonry installations.

### Formwork & Site Accessories

Non-structural accessories that complement our engineered solutions and help keep your construction environment operating safely and efficiently, including moulds for casting standard and special concrete elements and construction essentials such as reinforcing bar spacers.



### Industrial Technology

Mounting channels, pipe clamps and other versatile framing systems that provide safe fixing in a wide range of industrial applications.

## Leviat product ranges:

Ancon | Aschwanden | Connolly | Halfen | Helifix | Isedio | Meadow Burke | Modersohn | Moment | Plaka | Scaldex | Thermomass

# Halfen Cast-in Channels

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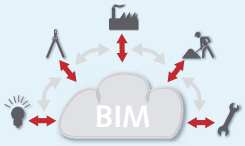


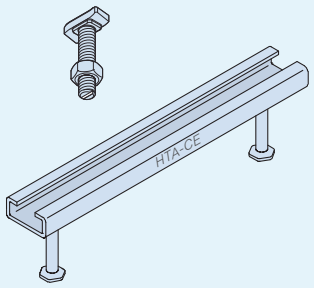


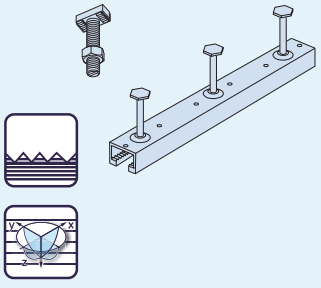

# Halfen Cast-in Channels

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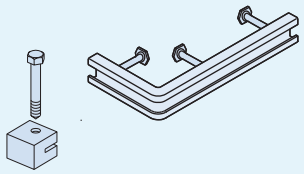

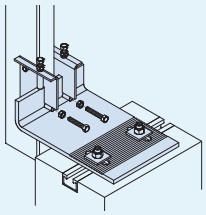

The data in this catalogue is based partially on ICC-ES Evaluation or Appraisal Reports and partially on Eurocode EN 1990 – EN 1999. Special attention should be drawn to NZS compliant values taken from European Technical Assessments, resp. Eurocode EN 1990 – EN 1999.

Please consider the footnotes on the respective tables for information about the reduction factors.

For any questions, please contact your local distributor. Adresses can be found at the end of this catalogue.

ICC ES

CE European Technical Assessments

**NZS Compliance**

**Please note that during our transition period, you will get support for the Halfen products in New Zealand from www.ancon.co.nz**

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# Halfen Cast-in Channels

## Integrated Quality – from Start to Finish

Quality and safety are the ultimate targets in the production of the original Halfen Anchor Channel system. Therefore all our production locations are ISO 9001 certified to provide products that meet strict quality management standards. On the one hand this involves continual inspections, machine maintenance and quality testing during the manufacturing process and on the other hand it involves stringent quality control procedures of incoming raw materials right through to dispatch of the finished product.

Quality always comes first for our products and is guaranteed during each step of production! The extent, type and frequency of production checks carried out by us is determined by standards set and recorded.

Halfen Anchor Channels and Halfen Bolts, originating from our certified manufacturing plants, are produced of strictly regulated raw material. The complete raw material or semi-finished goods are procured solely from resources that meet our stringent in-house material specifications. Our suppliers must be ISO 9001 certified and must provide complete documentation on the required performance and quality. Therefore, our suppliers have to prove compliance with our material specifications with a 3.1 inspection certificate in accordance to DIN EN 10204.

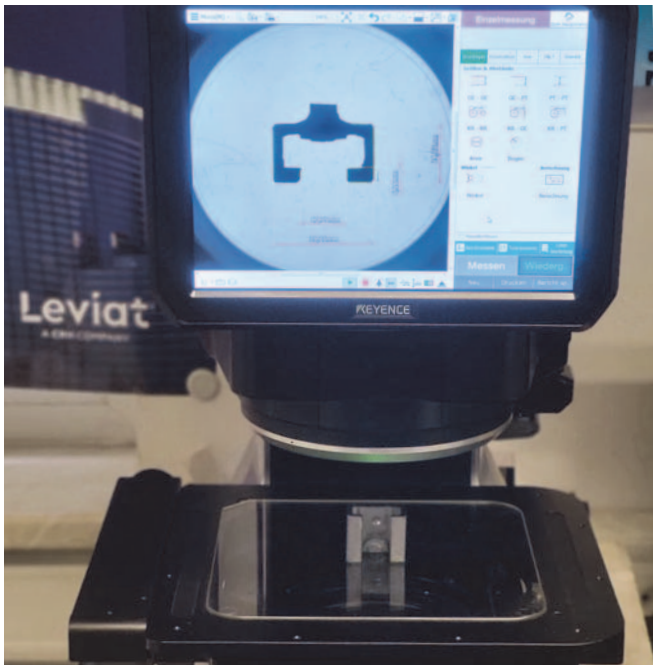
The inspection of incoming material is not limited to visual examination and dimensional checks. Every consignment is also analysed via spectral analysis. Moreover, the required tensile strength values, yield stress and rupture points are tested. Raw material is released for production only if all tests results are satisfying and comply with the provided 3.1 certification. The Halfen Anchor Channels and Halfen Bolts are continually checked during production for dimensional precision. The required frequency for quality checks is set in our quality control procedures.

At the end of the production process, before dispatch or storage, our (quality management system QMS) regulations require visual checks, dimensional control and tensile tests on a predetermined percentage of finished products. All tested anchor channels must prove a minimum safety factor against steel failure.

Our stringent Quality Assurance and Quality Control processes, part of the implemented QMS at our factories, ensure strict compliance to required quality standards and warrant the complete process chain, from the receipt of the raw material until final delivery of the finished products, are controllable and traceable. Therefore, complete traceability and a guarantee of the required performance and quality can be provided for all our products. Our focused approach on high quality and continuous improvement has been one of the reasons that our stakeholders have trusted us for the last almost 100 years! We are fully aware of our responsibility and will continue to maintain our excellent reputation with high quality products!

CERTainable

www.certainable.com




## References

### Tunnels

Lötschberg-Base tunnel, Switzerland

### Bridges

Passerelle Simone de Beauvoir, Paris/France

# Halfen Cast-in Channels
General

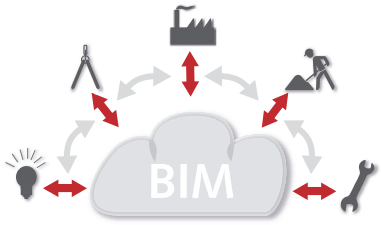
## Sustainability

An EPD® (Environmental Product Declaration) provides transparent and comparable ecological data which helps to evaluate the sustainability of a building.
Already during the planning phase the data provided here is of great significance for architects and planners. The data provided also helps to ensure the high demands on the environmental performance of the building are met. Health Product Declarations (abbrev. = HPD) complement our information on sustainability. The HPDs include a list of all components and information on the health effects of these components. The HPD for hot-dip galvanized Halfen Cast-in Channels helps to achieve additional points in the Leed v4 system.

www.halfen.com / Downloads / Brochures / Environmental/ Health declarations


## BIM

Having completed various projects using BIM methodology, we have considerable experience as a BIM partner. All Leviat engineers are trained to supervise this process in precise detail. Our combination of extensive experience and highly-trained engineers means we are perfectly placed to meet the increasing demand for BIM projects. Examples of our previous projects developed using BIM can be found at www.halfen.com / Service / BIM / BIM references.

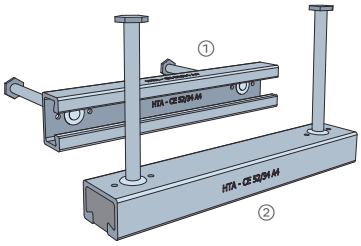



## Fire-resistance / Material fatigue

A wide variety of Halfen Cast-in Channels are tested under fire exposure (according to TR 020 "Evaluation of anchorages in concrete with regard to fire resistance") as well as under cyclic loading. More details, characteristic resistances under fire exposure and fatigue resistances, are provided in the respective European Technical Assessments.

## Type identification

① Inside on the bottom of the channel.
② Additionally on the channel side




| Identification | |
|---|---|
| **Channel material** | **Type identification example** |
| 1.0038 / 1.0044 | HTA-CE 38/17<br>HZA 53/34 |
| A4: 1.4404 / 1.4571 | HTA-CE 38/17 - A4<br>HZA 53/34 - A4 |
| HCR: 1.4529 / 1.4547 | HTA-CE 38/17 - HCR |

**Sports**

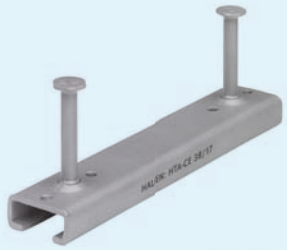
Rheinenergiestadion, Cologne/Germany

**Curtain wall**

Edificio Gas Natural, Barcelona/Spain

# Halfen Cast-in Channels

## Product Famillies in Overview

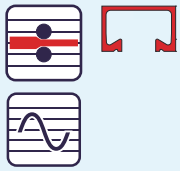


### HTA-CE cold-formed

- Medium performance - from lowest to medium load range
- As with all Halfen Channels, perfect for adjustable, surface-flush fixings
- Economic solution
- Complies with NZS 3101. Compliance with International Building Codes independently appraised by the ICC Evaluation Service①
- European Technical Assessment ETA - 09/0339 by DIBt*.

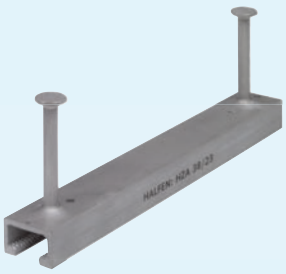
### HZA cold-formed, serrated

- Suitable for 3-D loads
- Medium load capacities in longitudinal direction
- Complies with NZS 3101. Compliance with the New Zealand Building Code independently appraised by the ICC Evaluation Service, reference ESR-4016-NZ.
- Compliance with International Building Codes independently appraised by the ICC Appraisal Service①.
- European Technical Assessment ETA - 20/1081 by DIBt*



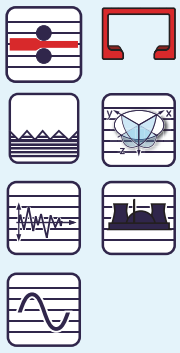
### HTA-CE hot-rolled

- Medium to high load capacity
- Low stress profile with high resistance to dynamic and impact loads, unmatched by cold-formed alternatives
- High resistance against local flexure due to optimized channel lip geometry
- In combination with Halfen HSR Bolts, *medium load bearing in longitudinal channel direction is possible. (*proportionally to the channel cross-section area, load bearing is lower than in application of serrated channels)
- Complies with NZS 3101. Compliance with International Building Codes independently appraised by the ICC Evaluation Service①.
- European Technical Assessment ETA - 09/0339 by DIBt*



### HZA DYNAGRIP® hot-rolled, serrated

- Superior performance
- High load capacities in longitudinal direction due mechanical interlock between serrated channel lips and T-bolt heads
- Best suitable in seismic regions
- Complies with NZS 3101. Compliance with the New Zealand Building Code independently appraised by the ICC Evaluation Service, reference ESR-4016-NZ.
- Compliance with International Building Codes independently appraised by the ICC Appraisal Service①.
- European Technical Assessment ETA - 20/1081 by DIBt*



### HZA-PowerSolution hot-rolled, serrated

- Highest performance level
- Developed for applications in safety relevant structures with highest requirements
- Suitable for crack width up to 1.5 mm
- Tested for extra-ordinary impact loads
- European Technical Assessment ETA - 17/0728 by DIBt*

① Refer to ESR-1008

*DIBt Deutsches Institut für Bautechnik = German Institute of Construction Engineering


cold formed channel profile


hot rolled channel profile


serrated


3D - Loads

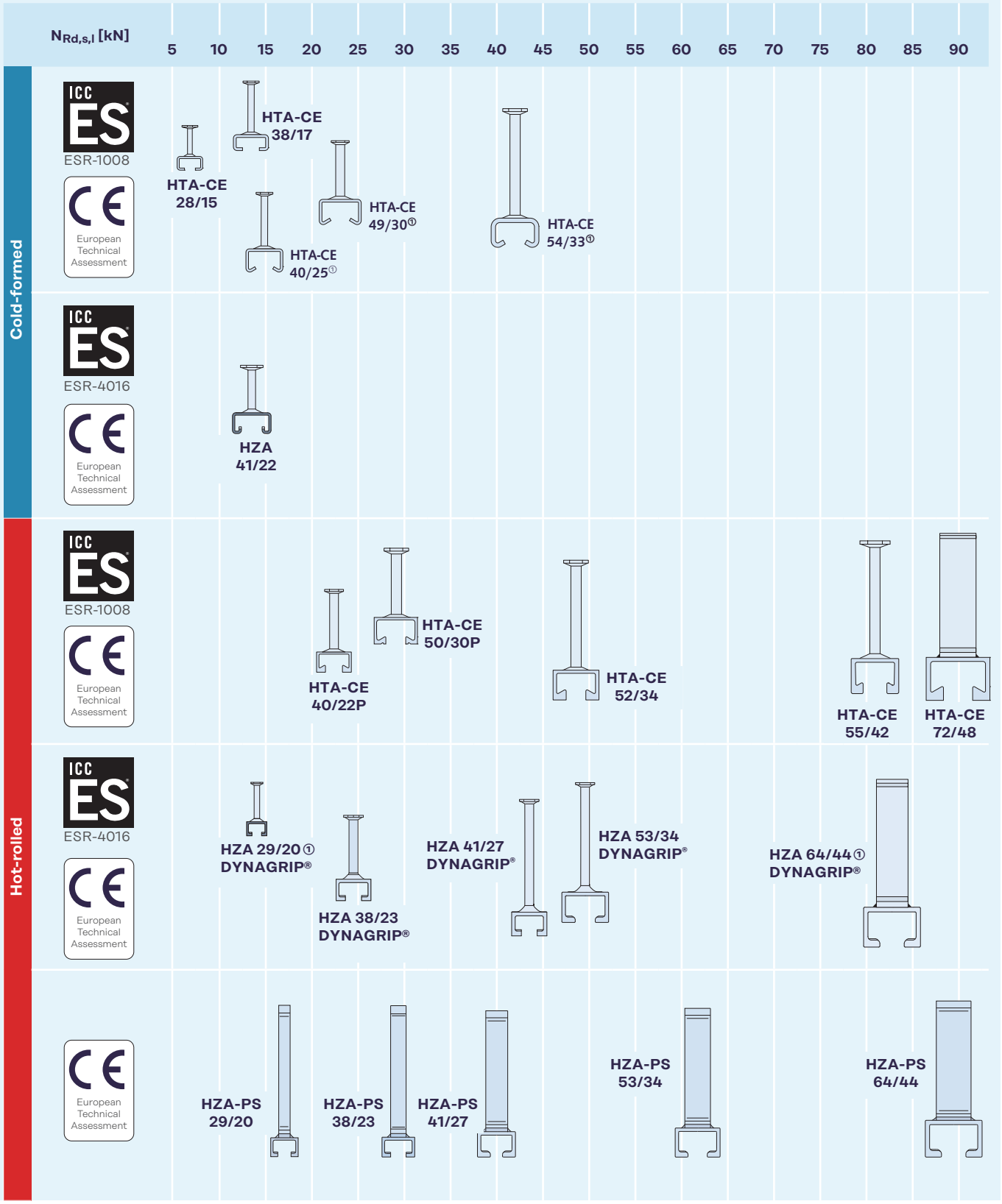

suitable for fatigue loads


suitable for seismic loading


suitable for applications in safety relevant areas in nuclear facilities

# Halfen Cast-in Channels

## Product Range – for Preliminary Computation




This overview shows the performance of the Halfen Cast-in Channels by comparing their design values of the load-bearing capacity of the channel lips. Other types of failure as shown on page 14 may also be decisive for the evidence. Not all channel types or sizes are stocked or supplied in NZ. Please contact Leviat to check on available Products.

① These channels are not part of the ICC-ES Report

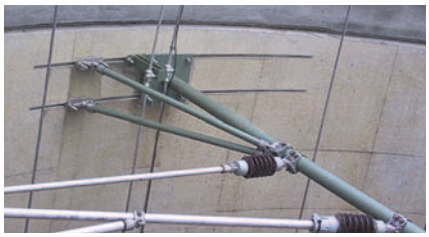
# Halfen Cast-in Channels

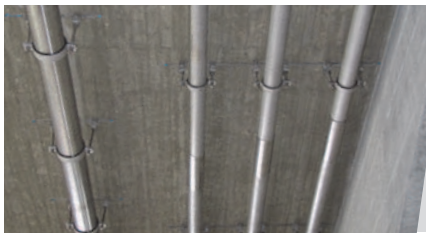
## Application Segments and Application Examples

### Traffic infrastructure:

**Tunnels, bridges, roads, airports and railway stations**

- OCS support
- drainage pipe installation
- fixing of signage or traffic lights
- fixing of rescue gates, stairways, emergency or maintenance ways
- various adjustable fixings to concrete whether with a straight or rounded shape

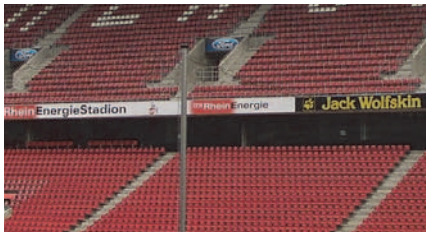




### Public and residential buildings:

**Stadiums, sports and leisure, trade and utility buildings, office and residential towers or detached houses**

- adjustable fixing of all kind of elements — concrete, masonry, steel, wood or synthetics to concrete
- curtain wall façades
- stadium seatings
- lifts and elevators
- brickwork, concrete, or natural stone facade claddings
- rail and banister fixings




# Halfen Cast-in Channels

## Application Segments and Application Examples

### General infrastructure:

**Power plants, energy & infrastructure, energy storage or transport, water and sewage projects**

- cable tray support
- pipe support
- ventilation duct support
- fixing of stairs, ladders, signage, switch cabinets etc.
- application in critical buildings with high seismic risk or where protection against high impact loads is required

### Industry:

**All kind of plants; production, automotive, agriculture, building industry ...**

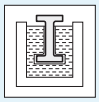
- machinery fixing
- fixing of general infrastructure
- fixing of stairs, ladders, maintenance levels etc.
- fixings in highly stressed areas or when exposed to chemical environments
- fixing of elements exposed to fatigue loads

# Halfen Cast-in Channels

## General – all Channels

**Hot-dip galvanized FV:**

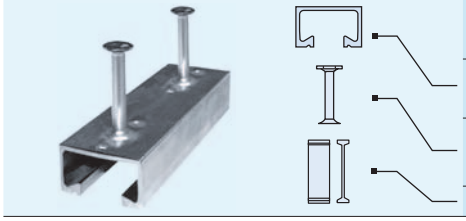
Dipped in galvanizing bath, with a temperature of app. 460°C; this method is used for the Halfen Anchor Channels and a range of Halfen Bolts.



**Zinc galvanized GVs:**

Halfen Bolts are hot-dip galvanized or electrogalvanized. We always guarantee the best possible corrosion protection. Passivation layers are Cr(VI)-free.

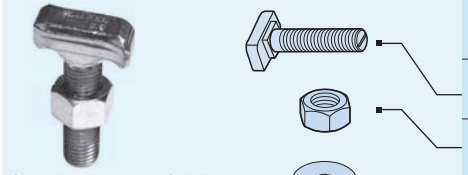
### Halfen Cast-in Channels, steel, hot-dip galvanized



| | Steel | | |
|---|---|---|---|
| | Material | Standard | Zinc coat |
| Channel profile | 1.0038 ■ | EN 10 025-2 ① | FV: ≥ 55 µm |
| | 1.0044 ■ | EN 10 025-2 ① | FV: ≥ 55 µm |
| Bolt anchor B6 | Steel ■ | EN 10263 or EN 10269 | FV: ≥ 55 µm |
| Weld-on anchor | Steel ■ | EN 10 025-2 | FV: ≥ 55 µm |

① Steel according to EN 10 025-2 and Halfen specification

### Halfen Bolts, galvanized steel



Standard scope of delivery is bolt incl. nut. The washers must be ordered separately.

| | Steel | | |
|---|---|---|---|
| | Material | Standard | Zinc coat |
| T-bolt | Steel (Sc) 4.6 or (Sc) 8.8 ■ ☒ | EN ISO 898-1 | FV: ≥ 50 µm<br>GVs: ≥ 12 µm |
| Hexagonal nut | Steel (Sc) 5 or (Sc) 8 ■ ☒ | EN 898-2 | FV: ≥ 50 µm<br>GVs: ≥ 12 µm |
| Washer | Steel ■ ☒ | EN ISO 7089, EN ISO 7093 | FV: ≥ 50 µm<br>GVs: ≥ 12 µm |

(Sc) = Strength class

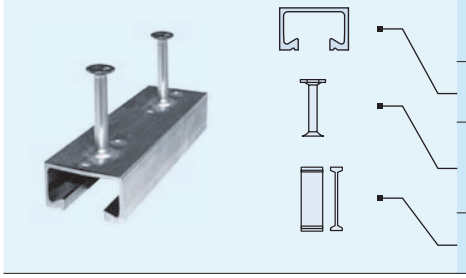
**Stainless steel (SST):**

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:**

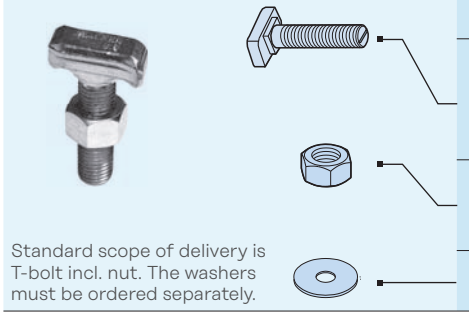
- □ **WB** = Steel, mill finished
- ■ **FV**= Steel, hot-dip galvanized
- ☒ **GVs**= Steel, zinc plated (special coating)
- ■ **A4** = Stainless steel 1.4571/1.4404/1.4578
- ◩ **FA** = Stainless steel 1.4462
- ☒ **HCR** = Stainless steel 1.4547/1.4529

### Halfen Cast-in Channels, stainless steel



| | Stainless steel | | |
|---|---|---|---|
| | Material | Standard | Corrosion resistance class ② |
| Channel profile | 1.4404 or 1.4571 ■ | EN 10 088 | III |
| | 1.4529 or 1.4547 ☒ | | V |
| Bolt anchor B6 | 1.4404, 1.4571 or 1.4578 ■ | EN 10 088 | III |
| | 1.4529 or 1.4547 ☒ | | V |
| Weld-on anchor | 1.4404 or 1.4571 ■ | EN 10 088 | III |
| | Steel ③ ■ | EN 10 025-2 | |

### Halfen Bolts, stainless steel



Standard scope of delivery is T-bolt incl. nut. The washers must be ordered separately.

| | Stainless steel | | |
|---|---|---|---|
| | Material | Standard | Corrosion resistance class ② |
| T-bolt | 1.4404, 1.4571, 1.4578 (A4-50 or A4-70 ④) ■ | EN 3506-1 and EN 10 088 | III |
| | 1.4462 (FA-70 ④) ◩ | | III ④ |
| | 1.4529, (HCR-50) ☒ | EN 3506-1 | V |
| Hexagonal nut | 1.4404, 1.4571, 1.4578 (A4-50, A4-70) ■ | EN 3506-2 and EN 10 088 | III |
| | 1.4529, (HCR-50) ☒ | | V |
| Washer | 1.4404, 1.4571 ■ | EN 10 088 | III |
| | 1.4529 or 1.4547 ☒ | | V |

② See EN 1993-1-4, table A.3; ③ Corrosion protection of mill finished anchor, see page 13
④ Stainless steel, strength class 70 T-bolts are delivered subject to availability from stock in A4-70 grade material or in a higher FA-70 (1.4462) grade material. This applies to all Halfen Bolts listed as A4-70 and FA-70 material in this catalogue.

# Halfen Cast-in Channels

## General – all Channels

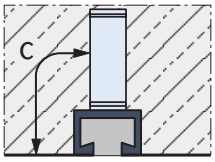
| Corrosion protection requirements – Material and applications | | | | |
|---|---|---|---|---|
| **Description** | **1** | **2** | **3** | **4** |
| | **Dry interior rooms** | **Damp interior rooms** | **Medium corrosion level** | **High level of corrosion** |
| **Definition of application areas** | Anchor channels may only be used in components in indoor environments. For example: living and office spaces, schools, hospitals, commercial shops with the exception of wet rooms as in column 2. | Anchor channels may also be used in components in areas with normal humidity For example: kitchens, bathrooms and laundry-rooms in residential buildings. Exceptions; where permanent steam is present, and under water. | Anchor channels may also be used in outdoor environments (including industrial environments and coastal regions) or in wet rooms, if conditions are not especially aggressive (for example: continual immersion in sea water etc. as in column 4). | Anchor channels may also be used in exceptionally aggressive environments (for example: continual immersion in sea water) or in seawater spray zones, chloride environments in swimming pools or in environments with an extremely aggressive chemical atmosphere (for example: flue gas desulphurization plants or road tunnels where de-icer systems are in use). |
| **Channel profile**  | Steel 1.0038, 1.0044; EN 10025 Hot-dip galvanized ≥ 55 µm ⑥ | Steel 1.0038, 1.0044; EN 10025 Hot-dip galvanized ≥ 55 µm ⑥ Stainless steel 1.4307, 1.4567, 1.4541; EN 10088 | Stainless steel 1.4404, 1.4571, 1.4062, 1.4162, 1.4362 EN 10088 | Stainless steel 1.4462 ②, 1.4529, 1.4547 EN 10088 |
| **Anchor**  | Steel 1.0038, 1.0214, 1.1132, 1.5525; EN 10263, EN 10269 Hot-dip galvanized 55 µm ⑥ | Steel 1.0038, 1.0214, 1.1132, 1.5525; EN 10263, EN 10269 Hot-dip galvanized ≥ 55 µm ⑥; Stainless steel 1.4307, 1.4567, 1.4541; EN 10088 | Stainless steel 1.4404, 1.4571, 1.4362, 1.4578 EN 10088 Mill finish, 1.0038 ③ | |
| **Special Halfen Bolts with shaft and bolts in accordance with EN ISO 4018**  | Steel strength class 4.6 / 8.8 EN ISO 898-1 Zinc galvanized ≥ 5 µm ④ | Steel strength class 4.6 / 8.8; EN ISO 898-1, Hot-dip galvanized ≥ 50 µm ①⑤ Stainless steel, strength class 50, 70 1.4307, 1.4567, 1.4541; EN ISO 3506-1 | Stainless steel Strength class 50, 70 1.4404, 1.4571, 1.4362, 1.4578 EN ISO 3506-1 | Stainless steel Strength class 50, 70 1.4462 ②, 1.4529, 1.4547 EN ISO 3506-1 |
| **Washers * EN ISO 7089 and EN ISO 7093-1 Product classification A, 200 HV**  | Steel EN 10025 Zinc galvanized ≥ 5 µm ④ | Steel EN 10025 Hot-dip galvanized ≥ 50 µm ①⑤ Stainless steel, Steel grade A2, A3; EN ISO 3506-1 | Stainless steel Steel grade A4, A5 EN ISO 3506-1 | Stainless steel 1.4462 ②,1.4529, 1.4547 EN ISO 3506-1 |
| **Hexagonal nut EN ISO 4032**  | Steel strength class 5/8 EN ISO 898-2 Zinc galvanized ≥ 5 µm ④ | Steel strength class 5/8 EN ISO 898-2 Hot-dip galvanized ≥ 50 µm ①⑤ Stainless steel, strength class 70, 80; Steel grade A2, A3 EN ISO 3506-2 | Stainless steel Strength class 70, 80 Steel grade A4, A5 EN ISO 3506-2 | Stainless steel Strength class 70, 80 1.4462 ②, 1.4529, 1.4547 EN ISO 3506-2 |

* All washers must be ordered separately

① or zinc galvanized with special coating ≥ 12 µm
② 1.4462 not suitable for swimming baths
③ Steel in accordance with EN 10025, 1.0038 not for anchor channels 28/15 and 38/17
④ Zinc galvanized in accordance with EN ISO 4042
⑤ Hot-dip galvanized in accordance with EN ISO 10684
⑥ Hot-dip galvanized in accordance with EN ISO 1461

### Halfen Channels (SST) mill finish welded-on anchors

Corrosion protection of the mill finished weld-on anchor is based on the following concrete cover c:



Concrete cover c

| Concrete cover c [mm] | | | | | |
|---|---|---|---|---|---|
| | **30** | **35** | **40** | **50** | **60** |
| **Profile HTA-CE** | - | 40/22P | 52/34 | 55/42 | 72/48 |
| | - | 40/25 | 54/33 | - | - |
| | - | - | 50/30P | - | - |
| | - | - | 49/30 | - | - |
| **Profile HZA** | 38/23 | 41/22 | 53/34 | 64/44 | - |

### Halfen Channels (SST) made completely in stainless steel

The Halfen Cast-in Channels "entirely of stainless steel" are not restricted to any minimum concrete cover as no relevant corrosion occurs.

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
- also for all structural reinforced concrete elements with higher demands on the concrete cover

### Halfen Channels made in stainless steel – HCR

The high corrosion resistance (HCR) Halfen Cast-in Channels are mandatory when high concentrations of chlorides, sulphur and nitrogen oxides are present.

Areas of application

- road tunnels
- structures in salt water
- indoor swimming pools
- areas not routinely cleaned
- poorly ventilated parking garages
- in narrow, major city streets

# Halfen Cast-In Channels

## Dimensioning HTA-CE and HZA Cast-in Channels

### Verification methods

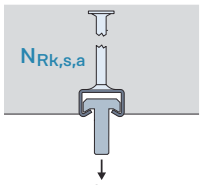
**in accordance with ICC-ES Evaluation Report ESR-1008, ICC-ES Appraisal Report ESR-4016-NZ, NZS 3101, EN 1992-4, EOTA TR 047**

**VERIFICATION**

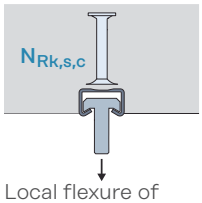
**Tension**

**Steel**

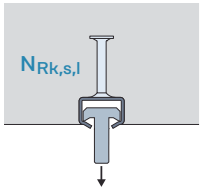
Steel failure of the anchor



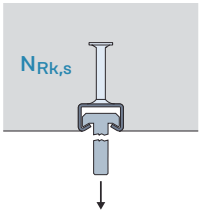

Failure of channel-anchor connection



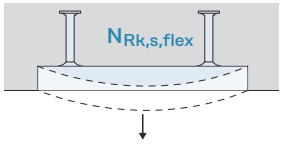

Local flexure of the channel lip




Steel failure of T-bolt




Failure due to flexure of the channel



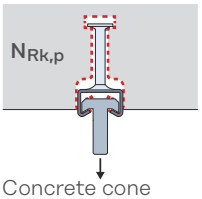

Additional verifications / tension

Steel failure in the supplementary reinforcement

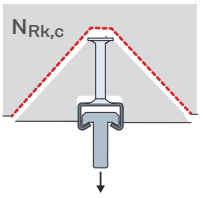
Failure of the supplementary reinforcement in the breakout cone

**Concrete**

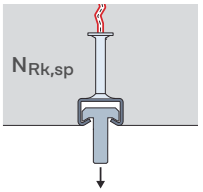
Pull-out



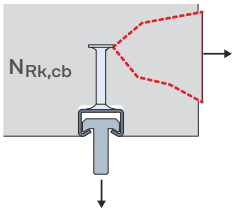

Concrete cone failure




Splitting



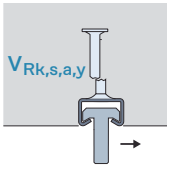

Blow-out

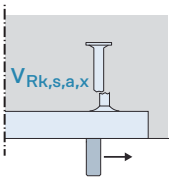



**Shear**

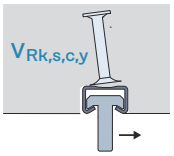
**Steel**

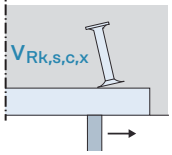
Steel failure of the anchor



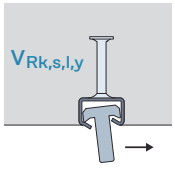




Failure of channel-anchor connection

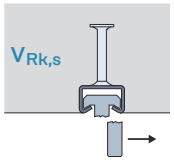


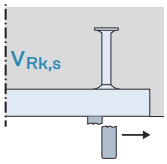




Local flexure of the channel lip

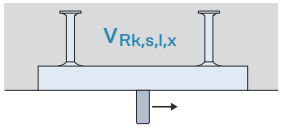



Steel failure of the T-bolt



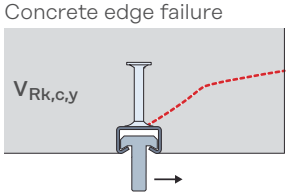




Steel failure of the connection between channel lips and T-bolt

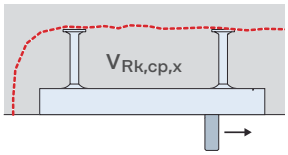



**Concrete**

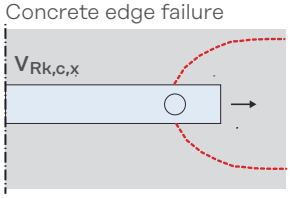
Concrete edge failure



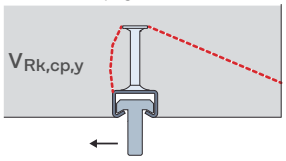

Concrete pry-out failure




Concrete edge failure




Concrete pry-out failure




**Note:**
x-direction steel failure cases apply for HZA Channels or HTA with HSR Bolts

Additional verifications / shear

Halfen Bolt for shear loads with lever arm

Steel failure in the supplementary reinforcement

Bond failure of reinforcement

Decisive verifications for tension and shear

Superposition of tension and shear loadings

# Halfen Cast-In Channels

## Dimensioning HTA-CE and HZA Cast-in Channels

### Calculation basics

The data in this catalogue is based partially on ICC-ES Evaluation or Appraisal Reports and partially on Eurocode EN 1990 – EN 1999.

Special attention should be drawn to NZS compliant values taken from European Technical Assessments, resp. Eurocode EN 1990 – EN 1999. Please consider the footnotes on the respective tables for information about the reduction factors.

For any questions, please contact your local distributor.

Adresses can be found at the end of this catalogue.

ICC ES CE European Technical Assessment

The following information is necessary to verify an anchor channel:

- type of Halfen Cast-in Channel and material
- length of the Halfen Cast-in Channel with number of anchors and spacing
- position of the Halfen Cast-in Channel in the concrete, defined by its distance from the lower, upper, left and right edges of the component
- thickness of the concrete elements
- concrete strength class
- condition of the concrete; cracked or verified as non-cracked
- dense reinforcement in the vicinity of the anchor channel
- Halfen Bolt thread size
- T-bolt positions
- tensile load and shear load applied to each T-bolt

### Verification method

1. Select channel.
2. Verify local load application (channel lips) for tension, shear and combined loading.
3. Calculate the anchor loads resulting from tensile loads and shear loads according to the load influence model (unfavourable anchor and load position).
4. Verify the connection between anchor and channel (tension loading).
5. Verify anchor pull-out failure (tension loading).
6. Verify concrete cone failure (tension loading).
7. Verify pry-out failure (loading in shear).
8. Verify concrete edge failure (loading in shear) considering a possible structural edge reinforcement.

If verification is negative, determine required additional reinforcement.

9. Verify concrete failure for combined loading, (combination of 6. and 7. as well as combination of 6. and 8.).

If last verification is negative, determine required additional reinforcement.

**Technical support**

Engineering services and technical support for your individual projects. Our contact information can be found at the end of this catalogue.

# HTA-CE Cast-in Channels

The benefits at a glance

## Benefits

In addition to their excellent adjustability, Halfen Cast-in Channels save considerable installation time.

The result — faster construction and therefore increased cost savings.

### Safe and reliable

- no damage to the reinforcement
- approved for fire-resistant structural elements
- suitable for use in concrete pressure and tensile stress zones
- high corrosion resistance steels available
- hot-rolled profiles suitable for fatigue loads
- with ICC-ES Evaluation Report ESR-1008
- European Technical Assessment (ETA)

### Quick and economical

- adjustable anchoring
- bolts instead of welding
- maximum efficiency when installing matrices and rows
- cost effective installation using standard tools
- optimised pre-planning reduces construction time
- large range of types available for various requirements
- no noise, no dust and no vibration during installation

## Halfen HTA-CE Cast-in Channels, hot-rolled

ICC ES

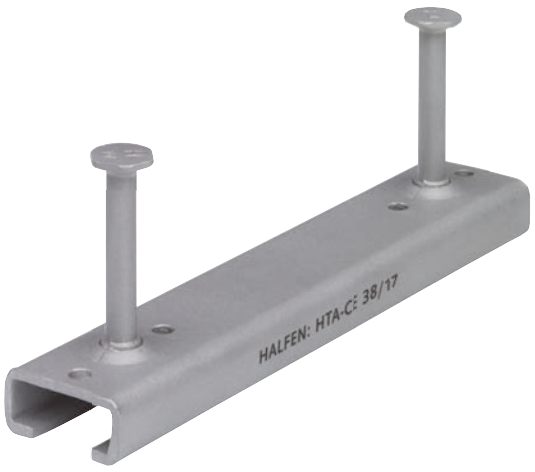
CE European Technical Assessment

suitable for fatigue loads


## Halfen HTA-CE Cast-in Channels, cold-formed

ICC ES

CE European Technical Assessment



# HTA-CE Cast-in Channels

## Application Examples

### Curtain wall

Crown Sydney/Australia

### Sports


Seat fixing in stadiums

### Lifts/Elevator fixings

Fixing guide-rails with Halfen Anchor Channels

### Noise barriers

Fixings of noise barriers to concrete posts

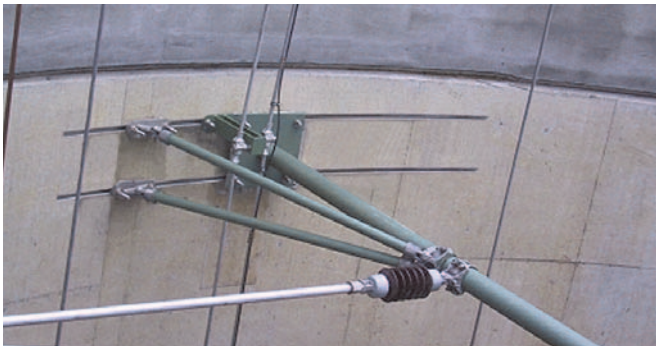
### Bridges

Fixings for drainage systems

### Utility tunnels

Utility fixings in TBM tunnels with curved anchor channels

### Tunnels

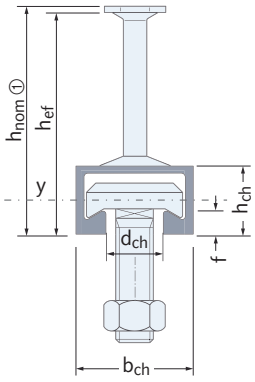
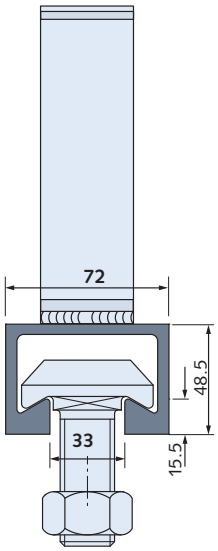
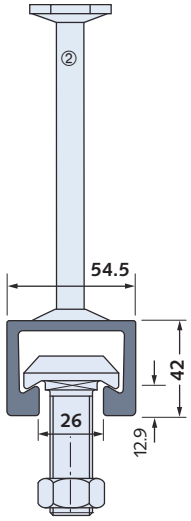
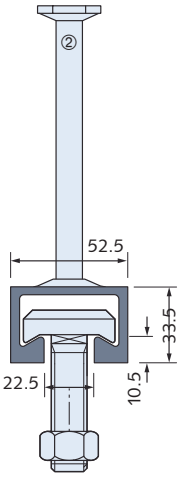
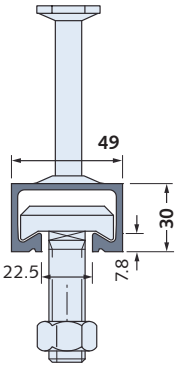
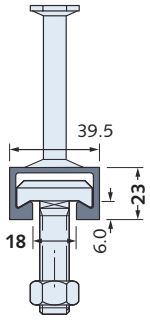


Fixing of overhead cables in railway tunnels

# Halfen HTA-CE Cast-in Channels

## Product Range – Overview: Channel and T-bolts

**Dimensions and properties Halfen HTA-CE Cast-in Channel**

| Profile | | HTA-CE 72/48 | HTA-CE 55/42 | HTA-CE 52/34 | HTA-CE 50/30P | HTA-CE 40/22P |
|---|---|---|---|---|---|---|
| **Type** | | **hot-rolled** | **hot-rolled** | **hot-rolled** | **hot-rolled** | **hot-rolled** |
| **Geometry Halfen HTA-CE Channels** | |  |  |  |  |  |  |
| **Material** description: see page 12 | **Steel** | ■ | ■ | ■ | ■ | ■ |
| | **A4** | ■ | - | ■ | ■ | ■ |
| | **HCR** | - | - | - | - | - |
| **T-bolts** | | HS 72/48 | HS 50/30 | HS 50/30 | HS 50/30 | HS 40/22 |
| **Threads** | | M20 - M30 | M10 - M20 | M10 - M20 | M10 - M20 | M10 - M16 |
| **$s_{l,N}$ [mm]** | | 144 | 109 | 105 | 98 | 79 |
| **Profile load capacity*** | | | | | | |
| **$N^0_{Rd,s,l}$ [kN]** | | 90.0 | 71.2 | 48.7 | 29.2 | 22.5 |
| **$V^0_{Rd,s,l}$ [kN]** | | 90.0 | 75.0 | 52.5 | 33.7 | 22.5 |
| **$M_{Rd,s,flex}$ [Nm]** | | 7465 | 5211 | 3126 | 1905 | 1136 |
| **Geometry** | | | | | | |
| **$h_{nom}$ [mm]** ① ② | | (191) | 182 (185) | 162 (164) | 112 | 97 |
| **$b_{ch}$ [mm]** | | 72 | 54.5 | 52.5 | 49 | 39.5 |
| **$h_{ch}$ [mm]** | | 48.5 | 42 | 33.5 | 30 | 23 |
| **$I_y$ [mm⁴]** | **Steel** | 349721 | 187464 | 93262 | 52896 | 20029 |
| | **SST** | | | | | |
| **$h_{ef}$ [mm]** | | 179 | 175 | 155 | 106 | 91 |
| **$c_{min}$ [mm]** | | 150 | 100 | 75 | 75 | 50 |

$c_{min}$ = minimal spacing channel/concrete edge
$s_{l,N}$ = axial spacing for T-bolts for $N^0_{Rd,s,l}$
SST = Stainless steel

$N^0_{Rd,s,l}$ = channel lip load capacity (tension)
$V^0_{Rd,s,l}$ = channel lip load capacity (shear)

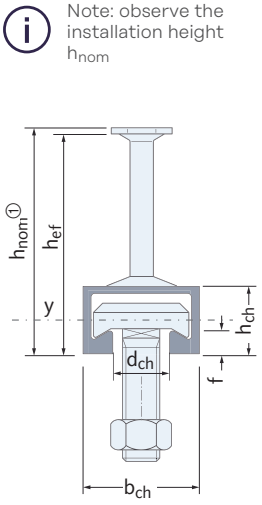
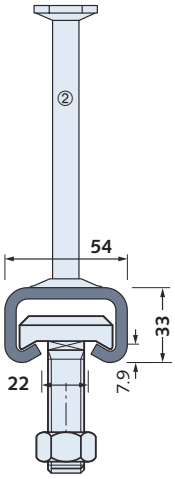
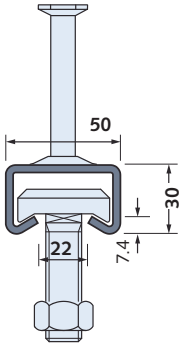
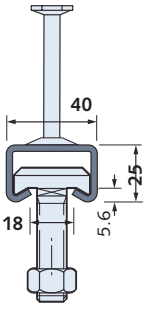
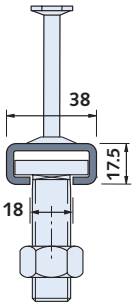
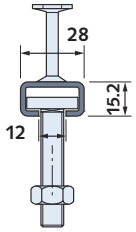
① Nominal size and tolerance
② weld-on I- or T-anchors subject to available stock; for these ($h_{nom}$) values are in brackets.

* Other failure modes might be decisive and have to be verified for each individual case (taking the geometric boundary conditions into account). Reduction factors in accordance with ICC ESR-1008 are included within all design load capacities in this table.
** Other Halfen products are also available on request.

# Halfen HTA-CE Cast-in Channels

## Product Range – Overview: Channel and T-bolts

**Dimensions and properties Halfen HTA-CE Cast-in Channel**

| Profile | | HTA-CE 54/33 | HTA-CE 49/30 | HTA-CE 40/25 | HTA-CE 38/17 | HTA-CE 28/15 |
|---|---|---|---|---|---|---|
| **Type** | | **cold-formed** | **cold-formed** | **cold-formed** | **cold-formed** | **cold-formed** |
| **Geometry Halfen HTA-CE Channels**<br>Note: observe the installation height $h_{nom}$ | |  |  |  |  |  |  |
| **Material** description: see page 12 | **Steel** | ■ | ■ | ■ | ■ | ■ |
| | **A4** | ■ | ■ | ■ | ■ | ■ |
| | **HCR** | - | ☒ | - | ☒ | ☒ |
| **T-bolts** | | HS 50/30 | HS 50/30 | HS 40/22 | HS 38/17 | HS 28/15 |
| **Threads** | | M10-M20 | M10-M20 | M10-M16 | M10-M16 | M6-M12 |
| **$s_{l,N}$ [mm]** | | 107 | 100 | 80 | 76 | 56 |
| **Profile load capacity*** | | | | | | |
| **$N^0_{Rd,s,l}$ [kN]** | | 41.2 | 23.2 | 15.0 | 13.5 | 6.7 |
| **$V^0_{Rd,s,l}$ [kN]** | | | | | | |
| **$M_{Rd,s,flex}$ [Nm]** | | 2536 | 1422 | 910 | 493 | 264 |
| **Geometry** | | | | | | |
| **$h_{nom}$ [mm]** ① ② | | 162 (164) | 103 | 89 | 81 | 50 |
| **$b_{ch}$ [mm]** | | 54 | 50 | 40 | 38 | 28 |
| **$h_{ch}$ [mm]** | | 33 | 30 | 25 | 17.5 | 15.25 |
| **$I_y$ [mm4]** | **Steel** | 72079 | 41827 | 20570 | 8547 | 4060 |
| | **SST** | | | 19097 | | |
| **$h_{ef}$ [mm]** | | 155 | 94 | 79 | 76 | 45 |
| **$c_{min}$ [mm]** | | 100 | 75 | 50 | 50 | 40 |

$c_{min}$ = minimal spacing channel/concrete edge
$s_{l,N}$ = axial spacing for bolts for $N^0_{Rd,s,l}$
SST = general for all stainless steel variants

$N^0_{Rd,s,l}$ = channel lip load capacity (tension)
$V^0_{Rd,s,l}$ = channel lip load capacity (shear)

① Nominal size and tolerance
② weld-on I- or T-anchors subject to available stock; for these ($h_{nom}$) values are in brackets.

* Other failure modes might be decisive and have to be verified for each individual case (taking the geometric boundary conditions into account). Reduction factors in accordance with ICC ESR-1008 are included within all design load capacities in this table.

# Halfen HTA-CE Cast-In Channels

## Halfen HS Bolts

**Halfen Bolts type HS (no nib or serration) for profile types HTA**

Other Halfen bolt lengths and materials are available on request!

FV = Steel, hot-dip galvanised

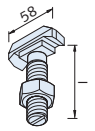
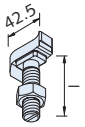
GV = Steel, zinc-plated

A4 = Stainless steel

HCR = Stainless steel

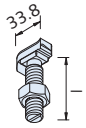
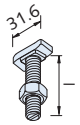
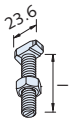
Material details and corrosion protection: see page 12–13

*on request

| Halfen HS Bolts | Halfen Bolt | HS 72/48 | | | | HS 50/30 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Suitable for profile | HTA-CE 72/48 | | | | HTA-CE 55/42, 52/34, 54/33, 50/30P, 49/30 | | | |
| | Halfen Bolt dimensions |  | | | |  | | | |
| | l [mm] | M20 | M24 | M27 | M30 | M10 | M12 | M16 | M20 |
| | 20 | - | - | - | - | - | - | - | - |
| | 30 | - | - | - | - | | FV4.6 | - | - |
| | | - | - | - | - | FV8.8 | - | - | - |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | A4-70 | - | - |
| | 40 | - | - | - | - | - | FV4.6 | FV4.6 | - |
| | | - | - | - | - | FV8.8 | FV8.8 | FV8.8 | - |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | A4-70 | A4-70 | - |
| | 45 | - | - | - | - | - | - | - | FV4.6 |
| | | - | - | - | - | - | FV8.8 | - | FV8.8 |
| | | - | - | - | - | - | - | - | - |
| | 50 | FV4.6 | FV4.6 | - | - | - | FV4.6 | FV4.6 | - |
| | | - | - | - | - | FV8.8 | FV8.8 | - | - |
| | | - | A4-50 | - | - | - | - | - | - |
| | | - | - | - | - | - | A4-70 | A4-70 | - |
| | | - | - | - | - | - | - | HCR-50* | - |
| | 55 | - | - | - | - | - | - | - | FV4.6 |
| | | - | - | - | - | - | - | - | FA-70 |
| | 60 | - | - | - | - | - | FV4.6 | FV4.6 | - |
| | | FV8.8 | - | - | - | - | FV8.8 | FV8.8 | FV8.8 |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | A4-70 | - |
| | 65 | - | - | - | - | - | - | - | FV4.6 |
| | | - | - | - | - | - | - | - | FV8.8 |
| | 70 | - | - | - | - | - | FV8.8 | - | - |
| | 75 | FV4.6 | FV4.6 | FV4.6 | FV4.6 | - | - | - | FV4.6 |
| | | - | FV8.8 | - | - | - | - | - | - |
| | | GVs8.8 | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | FA-70 |
| | 80 | - | - | - | - | - | FV4.6 | FV4.6 | FV4.6 |
| | | - | - | - | - | - | FV8.8 | FV8.8 | FV8.8 |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | A4-70 | - |
| | 100 | FV4.6 | FV4.6 | - | FV4.6 | - | FV4.6 | FV4.6 | FV4.6 |
| | | - | - | FV8.8 | - | - | FV8.8 | FV8.8 | FV8.8 |
| | | - | - | - | - | - | - | - | - |
| | | GVs8.8 | GVs8.8 | - | - | - | - | - | - |
| | | - | A4-50 | - | - | - | - | - | - |
| | | - | - | - | - | - | FA-70 | - | FA-70 |
| | | - | - | - | - | - | - | HCR-50* | - |
| | 125 | - | - | - | - | - | FV4.6 | - | FV4.6 |
| | | - | - | - | - | - | FV8.8 | - | FV8.8 |
| | | - | - | - | - | - | - | - | - |
| | 150 | FV4.6 | FV4.6 | - | FV4.6 | - | - | FV4.6 | - |
| | | - | - | - | - | - | GVs4.6 | - | FV8.8 |
| | | - | GVs8.8 | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | FA-70 | FA-70 |
| | | - | - | - | - | - | - | HCR-50* | - |
| | 175 | - | - | - | - | - | - | FV8.8 | - |
| | 200 | FV4.6 | FV4.6 | - | FV4.6 | - | - | - | - |
| | | - | - | - | - | - | GVs4.6 | GVs4.6 | GVs4.6 |
| | | - | - | - | - | - | - | - | - |
| | 250 | - | - | - | - | - | - | - | - |
| | 300 | - | - | - | - | - | - | GVs4.6 | |

# Halfen HTA-CE Cast-In Channels

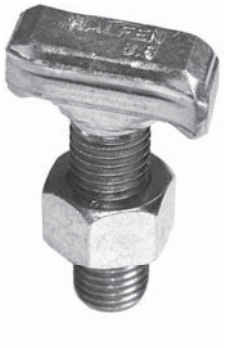
## Halfen HS Bolts

| | Halfen Bolt | HS 40/22 | | | HS 38/17 | | | HS 28/15 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Suitable for profile | HTA-CE 40/22P, 40/25 | | | HTA-CE 38/17 | | | HTA-CE 28/15 | | | |
| | Halfen Bolt dimensions |  | | |  | | |  | | | |
| | l [mm] | M10 | M12 | M16 | M10 | M12 | M16 | M6 | M8 | M10 | M12 |
| | 20 | FV4.6 | - | - | - | - | - | - | - | - | - |
| | 30 | FV4.6 | FV4.6 | - | FV4.6 | FV4.6 | - | - | - | FV4.6 | - |
| | | FV8.8 | FV8.8 | - | GVs4.6 | GVs4.6 | GVs4.6 | GVs4.6* | GVs4.6 | GVs4.6 | GVs4.6 |
| | | - | - | - | - | - | A4-50 | - | - | - | - |
| | | A4-70 | A4-70 | - | A4-70 | A4-70 | - | - | A4-70 | A4-70 | - |
| | 40 | FV4.6 | FV4.6 | FV4.6 | - | - | FV4.6 | - | - | - | - |
| | | FV8.8 | FV8.8 | FV8.8 | - | - | - | - | - | FV8.8 | - |
| | | - | - | - | GVs4.6 | GVs4.6 | GVs4.6 | GVs4.6* | GVs4.6 | GVs4.6 | - |
| | | - | - | - | - | - | A4-50 | - | - | - | - |
| | | A4-70 | A4-70 | A4-70 | - | A4-70 | - | - | - | A4-70 | - |
| | 45 | - | - | - | - | - | - | - | - | - | - |
| | | - | FV8.8 | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | 50 | FV4.6 | FV4.6 | FV4.6 | FV4.6 | FV4.6 | FV4.6 | - | - | FV4.6 | - |
| | | - | FV8.8 | FV8.8 | GVs4.6 | GVs4.6 | GVs4.6 | - | GVs4.6 | GVs4.6 | GVs4.6 |
| | | - | - | - | - | - | A4-50 | - | - | A4-50 | - |
| | | A4-70 | A4-70 | A4-70 | - | A4-70 | - | - | - | - | - |
| | | - | - | - | HCR-50* | - | HCR-50* | - | - | HCR-50* | - |
| | 55 | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | 60 | FV4.6 | FV4.6 | FV4.6 | - | - | - | - | - | - | - |
| | | FV8.8 | FV8.8 | FV8.8 | - | - | FV8.8 | - | - | - | - |
| | | - | - | - | GVs4.6 | GVs4.6 | GVs4.6 | - | GVs4.6 | GVs4.6 | - |
| | | - | - | - | - | GVs8.8 | - | - | - | - | - |
| | | - | - | - | - | - | A4-50 | - | - | - | - |
| | | - | - | A4-70 | - | A4-70 | - | - | - | A4-70* | - |
| | 65 | - | - | - | - | - | - | - | | - | |
| | | - | - | - | - | - | - | - | - | - | - |
| | 70 | - | - | - | - | FV8.8 | - | - | - | - | - |
| | 75 | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | 80 | FV4.6 | FV4.6 | FV4.6 | - | - | FV4.6 | - | - | - | - |
| | | - | FV8.8 | FV8.8 | - | - | - | - | - | - | - |
| | | - | - | - | GVs4.6 | GVs4.6 | GVs4.6 | - | GVs4.6 | GVs4.6 | GVs4.6 |
| | | - | - | - | - | - | A4-50 | - | - | - | - |
| | | - | A4-70 | A4-70 | - | A4-70 | - | - | - | A4-70 | - |
| | 100 | FV4.6 | FV4.6 | FV4.6 | - | - | FV4.6 | - | - | - | - |
| | | - | FV8.8 | FV8.8 | - | - | - | - | - | - | - |
| | | - | - | - | GVs4.6 | GVs4.6 | GVs4.6 | - | GVs4.6 | GVs4.6 | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | A4-50 | - | - | - | A4-50* | - |
| | | - | - | FA-70 | - | - | - | - | - | - | - |
| | | - | - | - | HCR-50* | - | HCR-50* | - | - | HCR-50* | - |
| | 125 | FV4.6 | FV4.6 | FV4.6 | - | - | - | - | - | - | - |
| | | - | - | | - | GVs4.6 | GVs4.6 | - | - | GVs4.6 | - |
| | | - | - | - | - | - | - | - | - | A4-50* | - |
| | 150 | - | - | FV4.6 | - | - | - | - | - | - | - |
| | | - | GVs4.6 | | GVs4.6 | GVs4.6 | GVs4.6 | - | GVs4.6 | GVs4.6 | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - | A4-50* | - |
| | | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | HCR-50* | - | - | - | - |
| | 175 | - | - | - | - | - | - | - | - | - | - |
| | 200 | - | - | - | - | - | - | - | - | - | - |
| | | - | GVs4.6 | GVs4.6 | - | GVs4.6 | GVs4.6 | - | - | GVs4.6 | - |
| | | - | - | - | - | - | - | - | - | A4-50* | - |
| | 250 | - | - | GVs4.6 | - | - | - | - | - | - | - |
| | 300 | - | - | GVs4.6 | - | - | - | - | - | - | - |

# Halfen HTA-CE Cast-In Channels

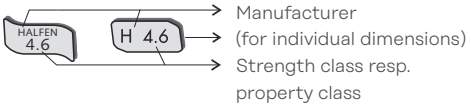
## Halfen HS Bolts

### Halfen Bolts — Type HS



**Standard Halfen Bolts (no nib or serration) for all profile types HTA**

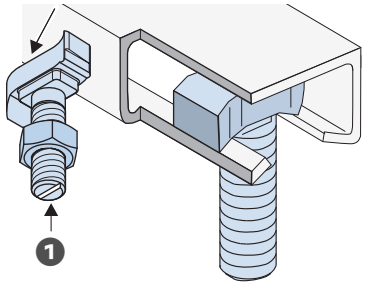
**Two direction load capacity identified on ❶ T-bolt tip with 1 notch**




HALFEN 4.6 — Strength class 4.6 / 8.8 galvanized (GVs) or hot-dip galvanized (FV)

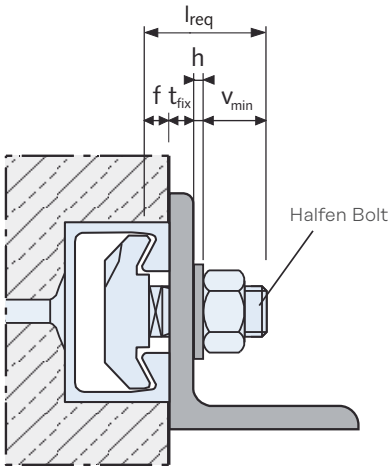
HALFEN A4-70 — Material grade A4-50 / A4-70/FA-70 Stainless steel

HALFEN HCR50 — Strength class 50 Stainless steel (1.4529/1.4547)




### Calculating the bolt length $l_{req}$ for Halfen Bolts

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




| Dimensions $V_{min}$ | |
|---|---|
| **T-bolt diameter** | **$v_{min}$ [mm]** |
| **M6** | 11.0 |
| **M8** | 12.5 |
| **M10** | 14.5 |
| **M12** | 17.0 |
| **M16** | 20.5 |
| **M20** | 26.0 |
| **M24** | 29.0 |
| **M27** | 31.5 |
| **M30** | 33.5 |

| Lip dimensions f | |
|---|---|
| **Channel profile** | **f [mm]** |
| **28/15** | 2.3 |
| **38/17** | 3.0 |
| **40/22P** | 6.0 |
| **40/25** | 5.6 |
| **49/30** | 7.4 |
| **50/30P** | 7.9 |
| **52/34** | 10.5 |
| **54/33** | 7.9 |
| **55/42** | 12.9 |
| **72/48** | 15.5 |

$l_{req}$ = required t-bolt length
$t_{fix}$ = thickness of clamped component
f = profile lip height
h = washer thickness
$v_{min}$ = nut height EN ISO 4032 + overhang approximately 5 mm (≥ M20: 7 mm)

### Bolt design values

The table on the right lists the design resistance of Halfen Bolts with different thread diameters, materials and strength classes.

$N_{Rd,s,s}$ is the resistance against tension loads, $V_{Rd,s,s}$ is the the resistance against shear loads and $M^0_{Rd,s,s}$ is the flexural resistance when subjected to transverse load induced with a lever arm.

ⓘ Strength reduction factors from ESR-1008 are included.

The values in this table are conservatively simplified. Depending on the size of the bolt head or with more favorable load combinations, higher design resistances are possible. Detailed information can be found in the ESR-1008 report.

| Design resistance | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Material / Strength class** | | **M8** | **M10** | **M12** | **M16** | **M20** | **M24** | **M27** | **M30** |
| **4.6** | **$N_{Rd,s,s}$ [kN]** | 9.9 | 13.9 | 16.5 | 41.1 | 73.5 | 105.9 | 137.7 | 168.3 |
| | **$V_{Rd,s,s}$ [kN]** | 5.7 | 9.0 | 13.1 | 24.5 | 38.2 | 55.0 | 71.6 | 87.4 |
| | **$M^0_{Rd,s,s}$ [Nm]** | 11.2 | 22.4 | 39.3 | 99.9 | 194.7 | 336.7 | 499.3 | 674.7 |
| **8.8** | **$N_{Rd,s,s}$ [kN]** | 19.0 | 30.1 | 37.9 | 60.1 | 127.4 | 183.5 | 238.6 | 291.7 |
| | **$V_{Rd,s,s}$ [kN]** | 10.5 | 16.6 | 24.3 | 45.2 | 70.5 | 101.6 | 132.1 | 161.5 |
| | **$M^0_{Rd,s,s}$ [Nm]** | 19.5 | 38.8 | 68.1 | 173.1 | 337.5 | 583.7 | 865.4 | 1169.4 |
| **A4-50** | **$N_{Rd,s,s}$ [kN]** | 13.7 | 21.7 | 31.6 | 37.3 | 91.8 | 132.3 | 172.1 | 210.3 |
| | **$V_{Rd,s,s}$ [kN]** | 5.7 | 9.0 | 13.1 | 24.4 | 38.1 | 54.9 | 71.4 | 87.2 |
| | **$M^0_{Rd,s,s}$ [Nm]** | 14.0 | 28.0 | 39.2 | 99.6 | 243.3 | 420.9 | 624.1 | 843.3 |
| **A4-70** | **$N_{Rd,s,s}$ [kN]** | 16.6 | 26.3 | 28.6 | 71.4 | 111.4 | 160.6 | 208.8 | 255.2 |
| | **$V_{Rd,s,s}$ [kN]** | 9.2 | 14.6 | 21.2 | 39.5 | 61.7 | 88.9 | 115.6 | 141.3 |
| | **$M^0_{Rd,s,s}$ [Nm]** | 17.0 | 33.9 | 59.6 | 151.5 | 295.3 | 510.7 | 757.3 | 1023.2 |

# Halfen HTA-CE Cast-In Channels

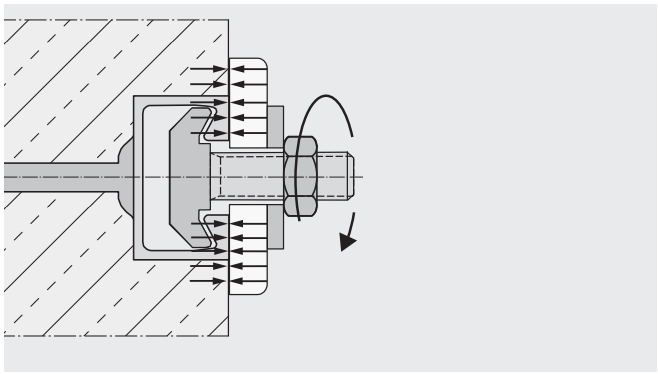
## Halfen HS Bolts

### Torque values HS

**Standard**

Components are braced against the concrete and anchor channel.

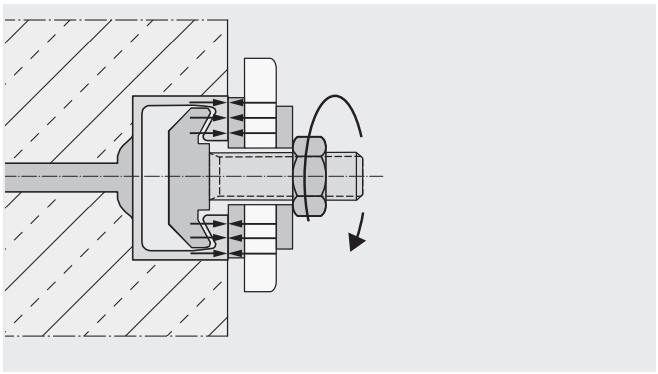
Torque is applied as in the following table and must not be exceeded.



**Steel - Steel**

Components are braced against the anchor channels using suitable washers.

Torque is applied as in the following table and must not be exceeded.



**Standard: Recommended torque values $T_{inst}$**

| HTA-CE Profile | Halfen Bolt HS...M [mm] | Torque value $T_{inst}$ [Nm] Steel 4.6; 8.8; Stainless steel; strength class 50; strength class 70 |
|---|---|---|
| 28/15 | 6 | 3 |
| | 8 | 7 |
| | 10 | 12 |
| | 12 | 15 |
| 38/17 | 10 | 14 |
| | 12 | 19 |
| | 16 | 40 |
| 40/22P 40/25 | 10 | 15 |
| | 12 | 25 |
| | 16 | 45 |
| 49/30 50/30P | 10 | 15 |
| | 12 | 25 |
| | 16 | 60 |
| | 20 | 75 |
| 52/34 54/33 | 10 | 15 |
| | 12 | 25 |
| | 16 | 60 |
| | 20 | 120 |
| 55/42 | 10 | 15 |
| | 12 | 25 |
| | 16 | 60 |
| | 20 | 120 |
| 72/48 | 20 | 120 |
| | 24 | 200 |
| | 27 | 300 |
| | 30 | 380 |

These tables, show the respective values of the tightening torque of the T-bolts from both approvals, ESR-1008 and ETA-09/0339 adapted to be conservative. Higher values are possible according to the respective situation and can be found in the approval that is used for the proof.

**Steel-Steel: Recommended torque values $T_{inst}$**

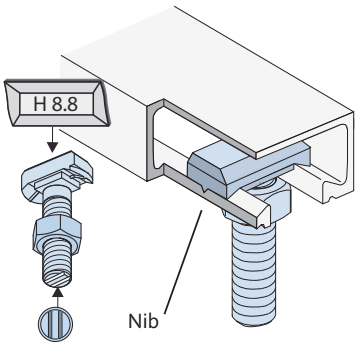
| HTA-CE Profile | Halfen Bolt HS...M [mm] | Torque value $T_{inst}$ [Nm] Steel 4.6 | Steel 8.8 | Stainless steel Strength class 50 | Stainless steel Strength class 70 |
|---|---|---|---|---|---|
| 28/15 | 6 | 3 | – | 3 | – |
| | 8 | 7 | 20 | 8 | 15 |
| | 10 | 13 | 40 | 15 | 30 |
| | 12 | 18 | 70 | 25 | 50 |
| 38/17 | 10 | 15 | 40 | 15 | 30 |
| | 12 | 23 | 65 | 25 | 40 |
| | 16 | 60 | 135 | 45 | 130 |
| 40/22P 40/25 | 10 | 15 | 40 | 15 | 30 |
| | 12 | 25 | 70 | 25 | 50 |
| | 16 | 65 | 180 | 60 | 130 |
| 49/30 50/30P | 10 | 15 | 40 | 15 | 30 |
| | 12 | 25 | 70 | 25 | 50 |
| | 16 | 65 | 180 | 60 | 130 |
| | 20 | 130 | 360 | 120 | 250 |
| 52/34 54/33 | 10 | 15 | 40 | 15 | 30 |
| | 12 | 25 | 70 | 25 | 50 |
| | 16 | 65 | 180 | 60 | 130 |
| | 20 | 130 | 360 | 120 | 250 |
| 55/42 | 10 | 15 | 40 | 15 | 30 |
| | 12 | 25 | 70 | 25 | 50 |
| | 16 | 65 | 180 | 60 | 130 |
| | 20 | 130 | 360 | 120 | 250 |
| 72/48 | 20 | 130 | 360 | 120 | 250 |
| | 24 | 230 | 620 | 200 | 440 |
| | 27 | 340 | 900 | 300 | 650 |
| | 30 | 460 | 1200 | 400 | 850 |

Tightening torques are also provided in the installation instructions, included with any box of bolts. Torque values apply only to bolts in delivery condition (unlubricated).

# Halfen HTA-CE Cast-In Channels

## Halfen HSR Bolts with Nib

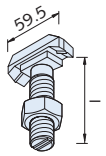
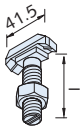
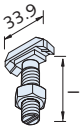
### Halfen Bolts — Type HSR (not part of the ETA)




**Halfen Bolts with nib**

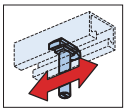
- available for hot-rolled profiles: 40/22P, 50/30P, 52/34, 72/48
- only for carbon steel: FV
- load capacity in all directions
- load capacity in channel longitudinal direction according to expert report
- identification on T-bolt tip with 2 notches
- Tightening torques are provided also in the installation instructions, included with every box of bolts.

### Bolt design values HSR

| Available HSR | | | | |
|---|---|---|---|---|
| **Suitable for profile** | **72/48** | **52/34, 50/30P** | | **40/22P** |
| **Halfen Bolt** | **HSR 72/48** | **HSR 50/30** | | **HSR 40/22** |
| **Bolt dimensions** |   |   | |   |
| **l [mm]** | **M20** | **M16** | **M20** | **M16** |
| **40** | - | FV8.8 | - | GVs8.8, FV8.8 |
| **45** | - | - | GVs8.8, FV8.8 | - |
| **60** | - | GVs8.8, FV8.8 | GVs8.8, FV8.8 | GVs8.8, FV8.8 |
| **75** | FV8.8 | GVs8.8 | GVs8.8, FV8.8 | - |
| **80** | - | FV8.8 | - | - |
| **100** | - | GVs8.8 | - | - |

**GVs = Zinc galvanized with special coating**
**FV = Hot-dip galvanized**

| Torque values HSR | |
|---|---|
| **HSR 8.8** | **Torque values [Nm]** |
| **M16** | 200 |
| **M20** | 400 |

| Load capacity HSR | |
|---|---|
|  **Halfen Bolt HSR** | **Grade 8.8 in channel longitudinal direction** |
| | **$F_{Rd}$ [kN]** |
| **40/22 - M16** | 6.3 |
| **50/30 - M16** | 6.3 |
| **50/30 - M20** | 10.5 |
| **72/48 - M20** | 10.5 |

If loads in the channel's longitudinal direction have to be verified, we recommend using serrated Halfen HZA Channels with serrated Halfen HZS Bolts. See pages 28–36.

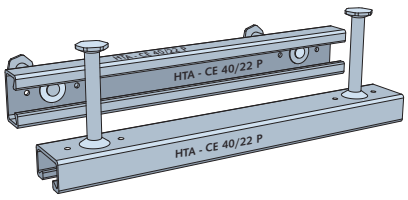
### Halfen HTA-CE tender text example

Halfen HTA-CE type Channel 40/22P - FV - 300 - KF

Halfen HTA-CE Channel 40/22P with smooth channel lips for adjustable fixing of components,

according to ICC-ES Evaluation Report ESR-1008 in compliance with NZS 3101, suitable for anchoring in cracked or uncracked normal-weight concrete with compressive strength of 20 MPa to 69 MPa, under static, quasi-static, dynamic loading as well as fire exposure.

ESR-1008




Type HTA-CE 40/22P - FV - 300 - KF

with

$N_{Rk,s,c}$ = 29 kN = char. resistance, steel failure (tension), connection channel anchor
FV = Corrosion protection, hot-dip galvanized

300 = Channel length [mm] with 2 anchors,

KF = Foam strip filler,

or equivalent; deliver and install according to the manufacturer's instructions.

# Halfen HTA-CE Cast-In Channels

## HTA-CE Fatigue Loads/Edge and Bolt Spacing

### Design resistance for n = 2 × 10⁶ load cycles

| Profile HTA-CE | Type | $\Delta N_{Rd,s,0,n}$ | Allowable bolts | Material |
|---|---|---|---|---|
| **40/22P** | FV | 2.94* | M12<br>M16 | 8.8<br>4.6 / 8.8 |
| **50/30P** | FV | 3.6* | M16<br>M20 | 4.6 / 8.8<br>4.6 / 8.8 |
| **52/34** | FV | 4.9* | M16<br>M20 | 8.8<br>8.8 |

* Safety factor of 1.35 included

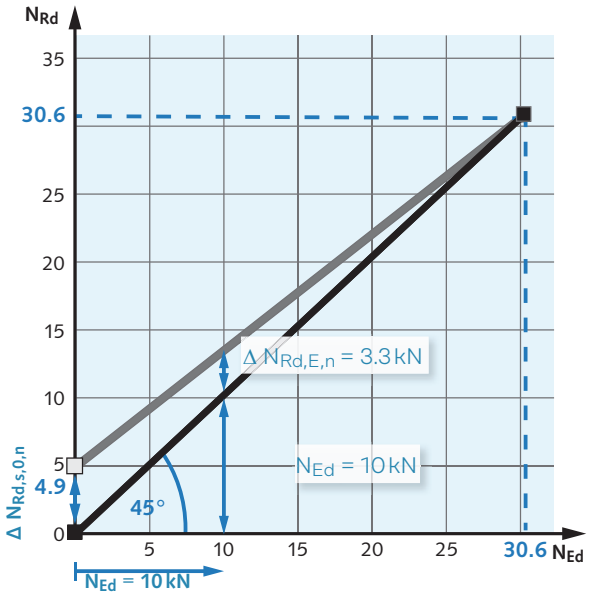
Example (also see diagram to the right):
Profile HTA-CE 52/34 - FV (standard, hot-dip galvanized),
for n = 2 × 10⁶ load cycles:

$N_{Rd}$ = 55 ÷ 1.8 = 30.6 (taken from the ETA-09/0339)

$N_{Ed}$ from permanent load = 10 kN (assumption)

$\Delta N_{Rd,E,n}$ = (30.6 − 10) × 4.9/30.6 = 3.3 kN

**Diagram: HTA-CE 52/34 - FV for n = 2 × 10⁶ load cycles**




### Minimum edge distances and minimum Halfen Bolt spacing

Anchors must be installed at a minimum distance from the component edges. The distance depends on the selected channel profile. According to the ETA, the spacing between bolts $s_{cbo}$ must not be less than $s_{s,min} = 5 \times d_s$. Reduction of the load bearing capacity is required if $s_{cbo} < s_{sl,N}$*.

The concrete load-bearing capacity must be verified for each individual case! (see ESR-1008)

*$s_{sl,N}$ = centre distance of the bolts subject to $N_{Rd,s,l}$
See tables pages 18–19

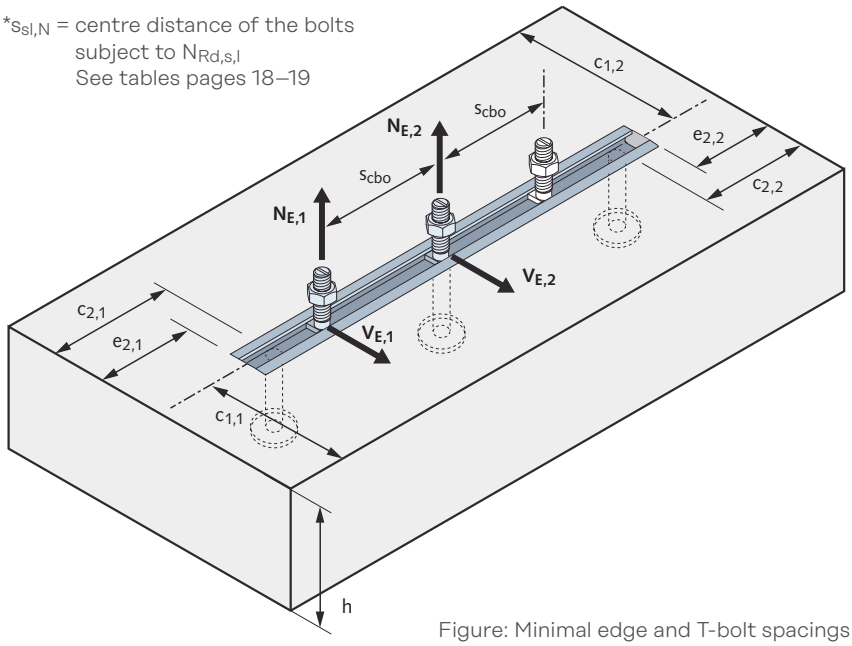



Figure: Minimal edge and T-bolt spacings

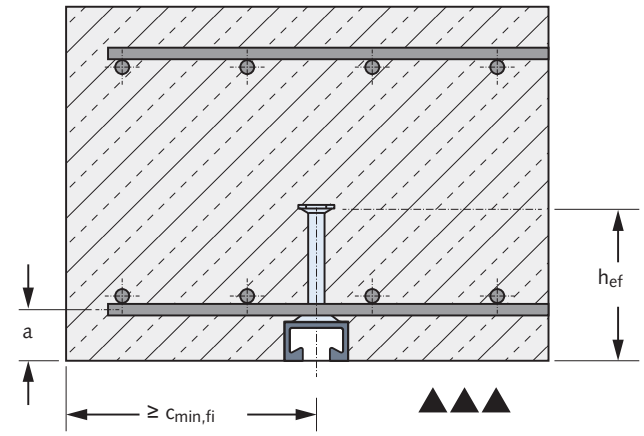
| Edge and T-bolt spacing [mm] | | | | |
|---|---|---|---|---|
| **HTA-CE Profiles** | **M** | **$s_{s,min}$** | **$c_{min}$** | **$e_{min}$** |
| **28/15** | 6 | 30 | 40 | 15 |
| | 8 | 40 | 40 | 15 |
| | 10 | 50 | 40 | 15 |
| | 12 | 60 | 40 | 15 |
| **38/17** | 10 | 50 | 50 | 25 |
| | 12 | 60 | 50 | 25 |
| | 16 | 80 | 50 | 25 |
| **40/25 40/22P** | 10 | 50 | 50 | 25 |
| | 12 | 60 | 50 | 25 |
| | 16 | 80 | 50 | 25 |
| **49/30** | 10 | 50 | 75 | 50 |
| | 12 | 60 | 75 | 50 |
| | 16 | 80 | 75 | 50 |
| | 20 | 100 | 75 | 50 |
| **50/30P** | 10 | 50 | 75 | 40 |
| | 12 | 60 | 75 | 40 |
| | 16 | 80 | 75 | 40 |
| | 20 | 100 | 75 | 40 |
| **52/34 54/33** | 10 | 50 | 100 | 65 |
| | 12 | 60 | 100 | 65 |
| | 16 | 80 | 100 | 65 |
| | 20 | 100 | 100 | 65 |
| **55/42** | 10 | 50 | 100 | 65 |
| | 12 | 60 | 100 | 65 |
| | 16 | 80 | 100 | 65 |
| | 20 | 100 | 100 | 65 |
| **72/48** | 20 | 100 | 150 | 115 |
| | 24 | 120 | 150 | 115 |
| | 27 | 135 | 150 | 115 |
| | 30 | 150 | 150 | 115 |

# Halfen HTA-CE Cast-In Channels

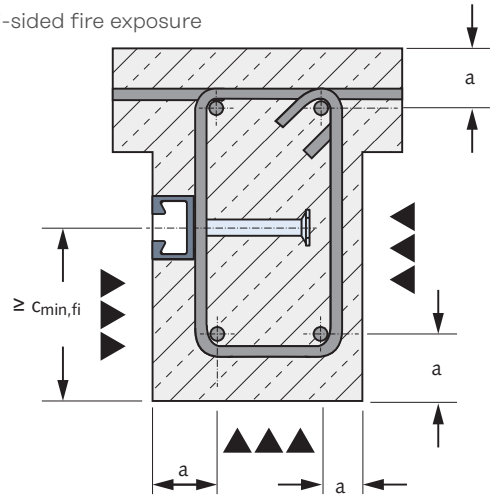
## HTA-CE Fire Resistances

Halfen HTA-CE Cast-in Channels have been tested and classified for direct exposure to fire in accordance with EAD 330008 using the Standard ISO time-temperature curve (STC). The values shown in the table below are taken from ETA-09/0339.

Single-sided fire exposure




Multi-sided fire exposure



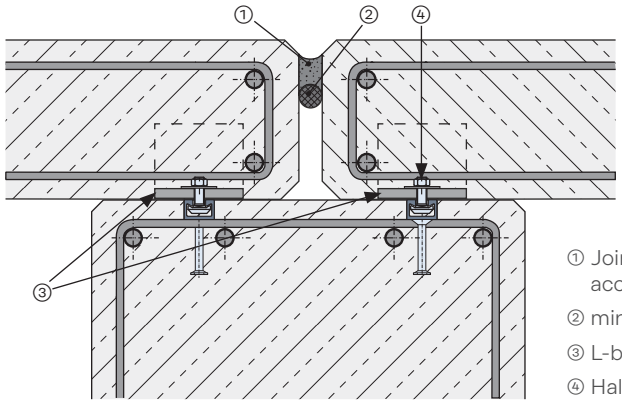

▲▲▲ fire exposure direction

**Fire resistance capacities for HTA-CE Cast-in Channels — steel failure***

| Fire protection classes depending design resistances $N_{Rd.s.fi} = V_{Rd.s.fi}$ [kN] | HTA-CE | 28/15 | 38/17 | 40/25 | 40/22P | 49/30 | 50/30P | 54/33 | 52/34 | 55/42 | 72/48 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Halfen Bolt | M12 | M16 | M16 | M16 | M16 | M20 | M20 | M20 | M20 | M24 |
| | R30 | 1.9 | 3.2 | 3.6 | 6.0 | 4.0 | 9.5 | 8.9 | 10.1 | 10.3 | 14.8 |
| | R60 | 1.3 | 2.4 | 3.6 | 4.5 | 3.5 | 7.1 | 6.5 | 7.5 | 7.6 | 11.1 |
| | R90 | 0.7 | 1.4 | 2.0 | 2.9 | 2.5 | 4.8 | 4.2 | 4.8 | 4.9 | 7.3 |
| | R120 | 0.5 | 1.0 | 1.2 | 1.6 | 2.1 | 3.6 | 3.0 | 3.5 | 3.6 | 5.4 |
| Minimum axial spacing **a** [mm] | R30 | 35 | | | | | | 50 | | | |
| | R60 | 35 | | | | | | 50 | | | |
| | R90 | 45 | | | | | | 50 | | | |
| | R120 | 60 | | | | | | 65 | 70 | | |
| Minimum edge spacing $c_{min.fi}$ [mm] | fire exposure single-sided | 90 | 152 | 158 | 182 | 188 | 212 | 310 | 310 | 350 | 358 |
| | fire exposure multi-sided | 300 | 300 | 300 | 300 | 300 | 300 | 310 | 310 | 350 | 358 |

Load capacities are valid for Halfen Cast-in Channels made of steel and stainless steel. Partial safety factor is = 1.0
* Concrete load capacity under fire exposure has to be verified for each individual case in accordance with EOTA TR 047 for strength classes C20/25 to C50/60.

Halfen Cast-in Channels are suitable for design connections of non-load bearing fire walls to concrete walls or columns.




① Joint sealing compound acc. to EN ISO 6927
② mineral fibre sealing rope
③ L-bracket ≥ 60 x 5 mm
④ Halfen Bolt diam. ≥ 10 mm

# Halfen HTA-CE Cast-In Channels

## HTA-CE Standard Lengths/HTA-CS — Curved Solution

### HTA-CE Standard lengths

Standard lengths listed in the accompanying table are optimized lengths to reduce cut-offs.

Please contact Leviat for pricing and product information for items stocked locally. Non-stocked items subject to international freight lead times.

**HTA-CE standard lengths and number of anchors**

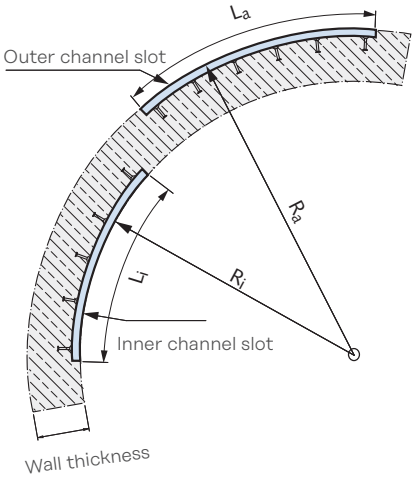
| Length [mm] / Number of anchors | | | | |
|---|---|---|---|---|
| **HTA-CE 72/48** | **HTA-CE 55/42** | **HTA-CE 40/25, 50/30P, 49/30, 52/34, 54/33** | **HTA-CE 40/22P** | **HTA-CE 28/15, 38/17** |
| 150/2 | 150/2 | 150/2 | 150/2 | 100/2 |
| 200/2 | 200/2 | 200/2 | 200/2 | 150/2 |
| 250/2 | 250/2 | 250/2 | 250/2 | 200/2 |
| 300/2 | 300/2 | 300/2 | 300/2 | 250/2 |
| 350/3 | 350/3 | 350/3 | 350/3 | 300/3 |
| 400/3 | 400/3 | 400/3 | 400/3 | 350/3 |
| 550/3 | 550/3 | 550/3 | 550/3 | 450/3 |
| 1050/5 | 1050/5 | 800/4 | 800/4 ② | 550/4 |
| 6070/25 | 6070/25 | 1050/5 | 1050/5 | 850/5 |
| - | - | 3030/13 ① | 1300/6 ② | 1050/6 |
| - | - | 6070/25 | 1550/7 ② | 3030/16 |
| - | - | - | 1800/8 ② | 6070/31 |
| - | - | - | 2050/9 ② | - |
| - | - | - | 2300/10 ② | - |
| - | - | - | 2550/11 ② | - |
| - | - | - | 3030/13 ② | - |
| - | - | - | 6070/25 | - |
| Anchor spacing ≤ 250 mm | | | | Anchor spacing ≤ 200 mm |

① Does not apply to HTA-CE 52/34, HTA-CE 54/33
② Does not apply to HTA-CE 40/22P - A4

### Halfen HTA-CS Channels — Curved Solution

Areas of application:

- tunnel construction
- precast segments for utility tunnels
- curved walls
- sewage plants




$R_i$ = Radius of inner channel slot
$R_a$ = Radius of outer channel slot
L = Length of channel after bending (maximum 5400 mm)

Curved Halfen Cast-in Channels in tunnel segments

**Ordering example:**

Halfen Cast-in channel, curved
HTA-CS 52/34-Q - A4, $R_i$ = 4000 mm, L = 1050 mm

**HTA-CS Smallest radius [m]***

| Profile / Material | | HTA-CS 72/48 | HTA-CS 54/33 | HTA-CS 52/34 | HTA-CS 50/30P | HTA-CS 49/30 | HTA-CS 40/22P | HTA-CS 40/25 | HTA-CS 38/17 | HTA-CS 28/15 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inner channel slot: min. $R_i$** | ■ | on request | 0.80 m | 0.75 m | on request | 0.80 m | on request | 1.10 m | 0.70 m | 0.75 m |
| | ■ | on request | 0.80 m | 0.80 m | on request | 0.80 m | on request | 0.90 m | 0.70 m | 0.75 m |
| **Outer channel slot: min. $R_a$** | ■ | on request | 4.00 m | 3.60 m | on request | 3.00 m | on request | 2.20 m | 3.20 m | 2.00 m |
| | ■ | on request | 4.00 m | 3.60 m | on request | 5.70 m | on request | 1.70 m | 5.40 m | 7.80 m |

■ hot-dip galvanized ■ stainless A4

* please contact our technical support team for more detailed information

# Halfen HZA Cast-in Channels, serrated

## The benefits at a glance

**In addition to their excellent adjustability, Halfen Cast-in Channels save considerable installation time.**

**The result – faster construction and therefore increased cost savings.**

### Safe and reliable

- load bearing capacity in all directions
- HZA and HZA DYNAGRIP® with Evaluation Report ESR-4016-NZ
- European Technical Assessment ETA
- innovative serration on channel lips and T-bolt heads provides additional mechanical interlock connection
- approved for fire-resistant structural elements
- hot-rolled channels, suitable for fatigue loads
- suitable for use in earthquake safety design
- hot-rolled channels are free from inherent stress

### Quick and economical

- adjustable anchorage
- bolts instead of welding
- maximum efficiency when installing in rows
- cost-effective installation using standard tools
- optimized pre-planning reduces construction time
- user-friendly installation; no noise, dust and vibration

## HZA Cast-in Channels, cold-formed, serrated

ICC ES

CE European Technical Assessment

serrated

3D - Loads

approved for seismic loading


## HZA DYNAGRIP® Cast-in Channels, serrated

ICC ES

CE European Technical Assessment

serrated

3D - loads

suitable for fatigue loads

suitable for seismic loading


## HZA-PS Cast-in Channels, hot-rolled, serrated

CE European Technical Assessment

serrated

3D - loads

suitable for fatigue loads

suitable for seismic loading

suitable for applications in safety relevant areas in nuclear facilities

**HZA-PS Cast-in Channels**

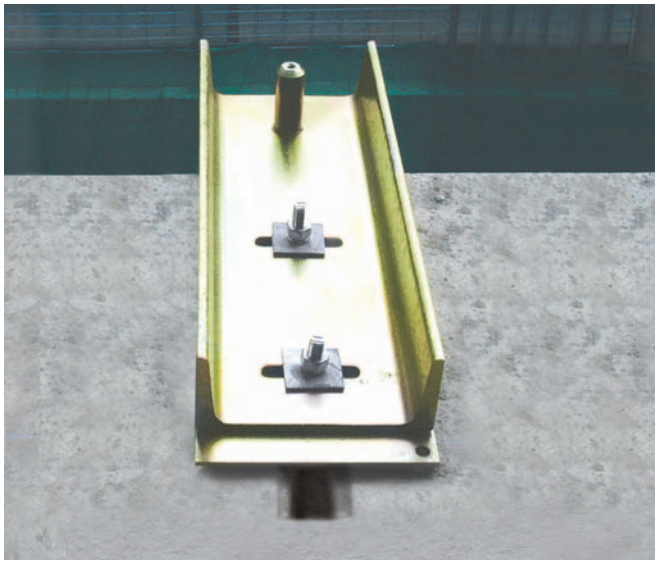
More Information on the HZA-PS is available at:

**www.ancon.co.nz**

# Halfen HZA Cast-In Channels

Application Examples: Installations with Halfen HZA Cast-In Channels

### Curtain wall

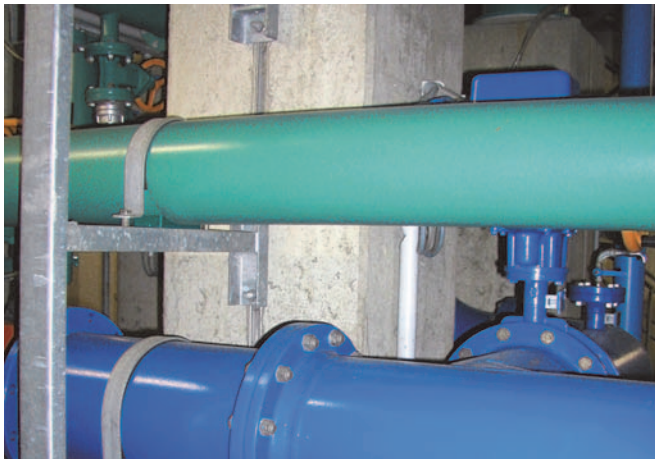


Fixings of a Curtain wall façade, HZA near edge installation

### Façade

Fixings for emergency access balconies
(Vertical installation of Halfen Channels)

### Industrial plant installations

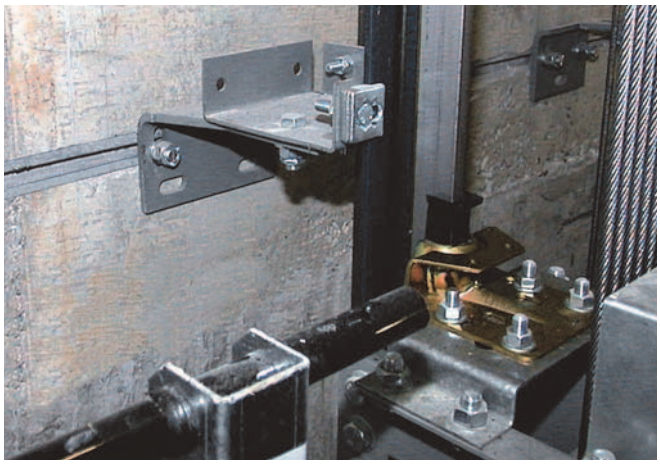


Pipe supports on vertical HZA Channels

### Ski lift

Fixing of the drive unit for a ski lift

### Lifts/Elevators



Fixing for guide-rails

### Industrial building

Vertical channels in columns to attach further components

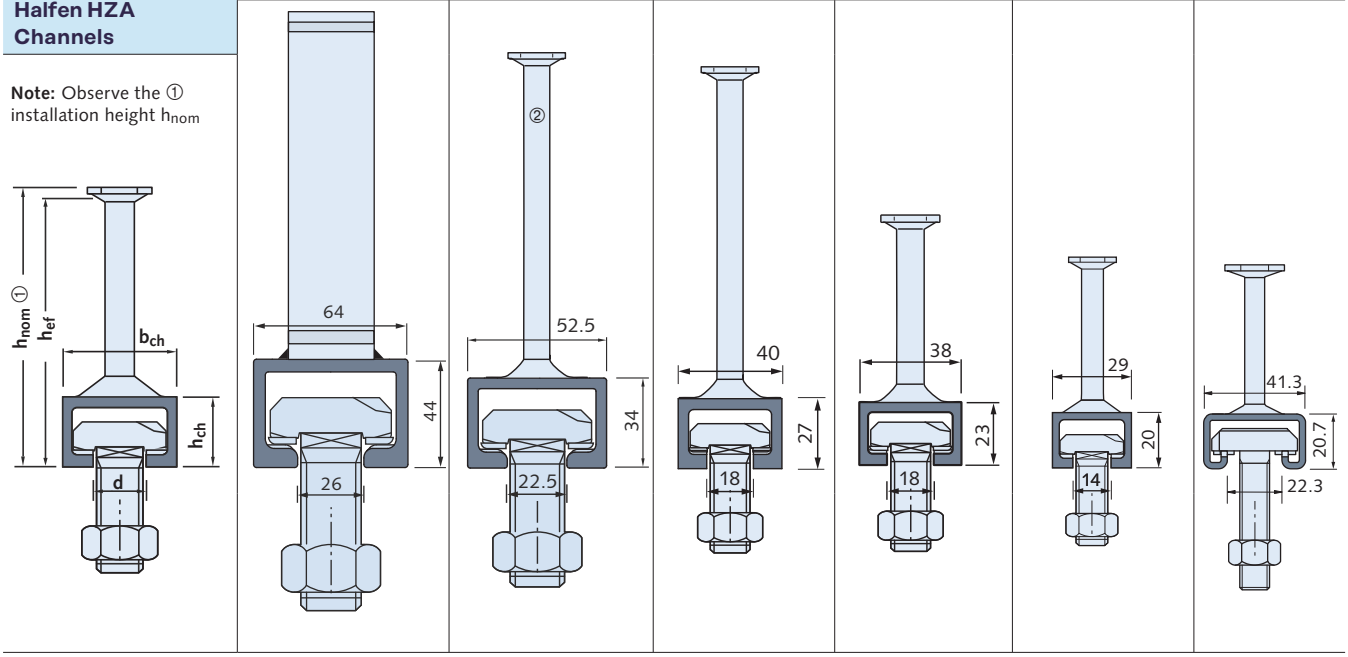
# Halfen HZA Cast-In Channels

## Product Range

**Dimensions and properties Halfen HZA Cast-in Channels, serrated**

| Profile | HZA 64/44 DYNAGRIP® | HZA 53/34 DYNAGRIP® | HZA 41/27 DYNAGRIP® | HZA 38/23 DYNAGRIP® | HZA 29/20 DYNAGRIP® | HZA 41/22 |
|---|---|---|---|---|---|---|
| **Geometry Halfen HZA Channels** | hot-rolled | | | | | cold-formed |

**Note:** Observe the ① installation height $h_{nom}$




① Nominal size and tolerance

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Material** material description: see page 12 | Steel | □ | □ | □ | □ | □ | □ |
| | A4 | ■ | ■ | - | ■ | - | ■ |
| **T-bolt** | | HZS 64/44 | HZS 53/34 | HZS 38/23 | HZS 38/23 | HZS 29/20 | HZS 41/22 |
| **Threads** | | M20-M24 | M16-M20 | M12-M16 | M12-M16 | M12 | M12-M16 |
| **$s_{l,N} = s_{l,V}$ [mm]** | | 128 | 105 | 80 | 76 | 58 | 83 |
| **Profile load capacity*** | | | | | | | |
| **$N^0_{Rd,s,l}$ [kN]** | Steel | 89.6 | 59.0 | 40.2 | 29.5 | 17.2 | 13.6 |
| | SST | 70.8 | 52.5 | - | 29.5 | - | 13.6 |
| **$V^0_{Rd,s,l,y}$ [kN]** | Steel | 101.6 | 51.1 | 34.8 | 25.5 | 13.0 | 14.7 |
| | SST | 61.4 | 51.1 | - | 25.5 | - | 14.7 |
| **$V_{Rd,s,l,x}$ [kN]** | Steel | 55.8 | 38.4 | 15.3 | 12.7 | 9.5 | 7.9 |
| | SST | 51.6 | 28.4 | - | 12.7 | - | 7.9 |
| **$M_{Rd,s,flex}$ [Nm]** | Steel | 5895 | 3481 | 1955 | 1414 | 742 | 623 |
| | SST | 6734 | 3067 | - | 1414 | - | 623 |
| **Geometry** | | | | | | | |
| **$h_{nom}$ [mm] ① ②** | | (187) | 161 (165) | 155 | 99 | 87 | 85 |
| **$b_{ch}$ [mm]** | | 64.0 | 52.5 | 40.0 | 38.0 | 29.0 | 41.3 |
| **$h_{ch}$ [mm]** | | 44.0 | 34.0 | 27.0 | 23.0 | 20.0 | 20.7 |
| **$I_y$ [mm⁴]** | | 240300 | 92600 | 39000 | 21100 | 10200 | 12600 |
| **$h_{ef}$ [mm]** | | 178 | 155 | 148 | 94 | 82 | 82 |
| **$c_{min}$ [mm]** | | 125 | 100 | 75 | 75 | 50 | 50 |

$c_{min}$ = minimal spacing channel/concrete edge
$s_{l,N}$ = axial spacing for bolts for $N^0_{Rd,s,l}$
SST = general for all stainless steel variants

$N^0_{Rd,s,l}$ = channel lip load capacity (tension)
$V^0_{Rd,s,l}$ = channel lip load capacity (perpendicular shear)
$V_{Rd,s,l,x}$ = channel lip load capacity (longitudinal shear)

① Nominal size and tolerance
② weld-on I- or T- anchors subject to available stock; for these ($h_{nom}$) values are in brackets.

* Other failure modes might be decisive and have to be verified for each individual case (taking the geometric boundary conditions into account). Reduction factors in accordance with ICC ESR-4016-NZ are included within all design load capacities in this table.

All hot-rolled profiles are suitable for fatigue loads. Adittionally the channels HZA 53/34, HZA 38/23 and HZA 41/27 have an ETA approval for fatigue loading.

# Halfen HZA Cast-In Channels

## Standard Lengths/Halfen HZA Channels Curved Solution

### Halfen HZA Channels — Standard lengths

This tables lists the standard lengths of cast-in channel in the Halfen HZA Product range.

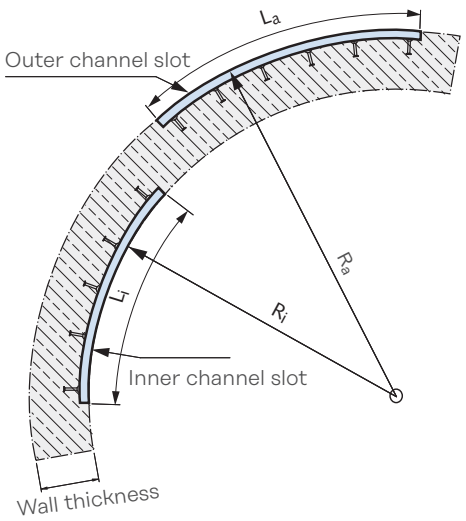
Standard lengths listed in the accompanying table are optimized lengths to reduce cut-offs.

Please contact Leviat for pricing and product information for items stocked locally.

Non-stocked items subject to international freight lead times.

| Standard lengths – Length [mm] / Number of anchors | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| HZA 64/44; 53/34 | HZA-PS 64/44; 53/34 | HZA 41/27 | HZA-PS 41/27 | HZA 38/23 | HZA-PS 38/23 | HZA 29/20 | HZA-PS 29/20 | HZA 41/22 |
| - | - | - | - | - | - | - | - | 100/2 |
| 150/2 | - | 150/2 | - | 150/2 | - | 150/2 | - | 150/2 |
| 200/2 | 200/2 | 200/2 | 200/2 | 200/2 | 200/2 | 200/2 | 200/2 | 200/2 |
| 250/2 | - | 250/2 | - | 250/2 | - | 250/2 | - | 250/2 |
| 300/2 | - | 300/2 | - | 300/2 | - | 300/3 | - | 300/2 |
| 350/3 | 350/3 | 350/3 | 350/3 | 350/3 | 350/3 | 350/3 | 350/3 | 350/3 |
| 400/3 | - | 400/3 | - | 400/3 | - | 400/3 | - | 400/3 |
| 550/3 | 550/3 | 550/3 | 550/3 | 550/3 | 550/3 | 550/4 | 550/4 | 550/3 |
| - | 800/4 | - | 800/4 | 800/4 | 800/4 | - | 800/5 | - |
| 1050/5 | 1050/5 | 1050/5 | 1050/5 | 1050/5 | 1050/5 | 1050/6 | 1050/6 | 1050/5 |
| - | 3030/13 | - | 3030/13 | 3030/13 | 3030/13 | 3030/16 | 3030/16 | - |
| 6070/25 | 6070/25 | 6070/25 | 6070/25 | 6070/25 | 6070/25 | 6070/31 | 6070/31 | 6070/25 |

### Halfen HZA Channels curved solution




$R_i$ = Radius of inner channel slot

$R_a$ = Radius of outer channel slot

L = Length of channel after bending (maximum 5400 mm)

Areas of application:

- tunnel construction
- reinforced concrete tunnels for utilities
- curved walls
- sewage plants

Curved Halfen Cast-in Channels in tunnel segments

**Ordering example:**

Halfen Cast-in channel, curved
HZA-CS 53/34-Q - A4, $R_i$ = 4000 mm, L = 1050 mm

| Smallest radius [m]* | | | | | | | |
|---|---|---|---|---|---|---|---|
| Profile | | HZA-CS | HZA-CS | HZA-CS | HZA-CS | HZA-CS | HZA-CS |
| Material | | 64/44 | 53/34 | 41/27 | 38/23 | 29/20 | 41/22 |
| Inner channel slot: min. $R_i$ | ■ | on request | on request | on request | 2.60 m | 0.85 m | 0.70 m |
| | ■ | on request | on request | - | 1.20 m | - | 0.70 m |
| Outer channel slot: min. $R_a$ | ■ | on request | on request | on request | 1.40 m | 1.10 m | 2.20 m |
| | ■ | on request | on request | - | 3.50 m | - | 4.80 m |

■ hot-dip galvanized ■ A4 stainless steel

* please contact our technical support for more information

# Halfen HZA Cast-In Channels

## Halfen HZS Bolts

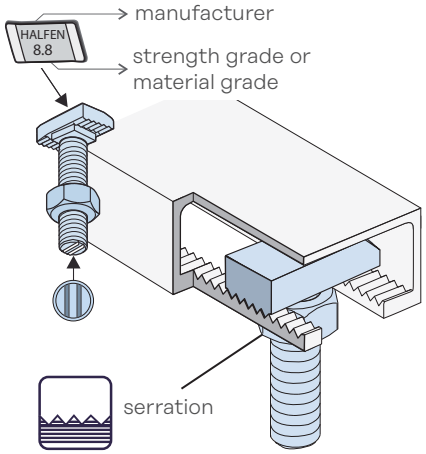
### Available Halfen HZS Bolts

European Technical Assessment

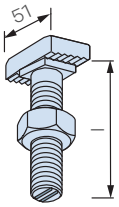
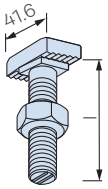
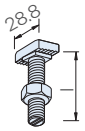
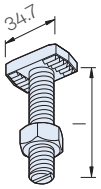
**Halfen HZS Bolt, serrated, incl. nut**

Please order washer separately

- The serration additionally ensures a positive load transmission in the longitudinal channel direction. The danger of T-bolt slippage is minimized.
- The Halfen Bolt is marked on the shaft end with 2 notches.
- Strength grade or material grade is marked on the T-bolt heads


**Halfen HZS Bolts**

| Halfen Bolt | HZS 64/44 | | HZS 53/34 | | HZS 38/23 | | HZS 29/20 | HZS 41/22 | |
|---|---|---|---|---|---|---|---|---|---|
| Suitable for profile | 64/44 | | 53/34 | | 41/27; 38/23 | | 29/20 | 41/22 | |
| Bolts dimensions |  | |  | |  | |  |  | |
| Ø / l [mm] | M20 | M24 | M16 | M20 | M12 | M16 | M12 | M12 | M16 |
| 30 | - | - | - | - | GVs 8.8 | - | GVs 8.8 | - | - |
| 35 | - | - | - | - | - | - | - | A4-50 FV 8.8 | - |
| 40 | - | - | - | - | GVs 8.8 | GVs 8.8 | GVs 8.8 | - | - |
| 50 | - | - | - | - | FV 8.8* GVs 8.8 | GVs 8.8 | FV 8.8* GVs 8.8 | A4-50 FV 8.8 | A4-50 FV 8.8 |
| 60 | - | - | A4-70 FV 8.8* GVs 8.8 | - | GVs 8.8 | A4-70 FV 8.8 GVs 8.8 | GVs 8.8 | - | - |
| 65 | - | - | - | FV 8.8* A4-70 GVs 8.8 | - | - | - | - | - |
| 80 | A4-70* FV 8.8* GVs 8.8* | A4-70* GVs 8.8* | FV 8.8* | FV 8.8* | GVs 8.8 | A4-70 FV 8.8* GVs 8.8 | GVs 8.8 | A4-50 | - |
| 100 | - | FV 8.8* | A4-70 FV 8.8* GVs 8.8 | A4-70 GVs 8.8 | GVs 8.8 | GVs 8.8 | - | - | FV 8.8 |
| 125 | A4-70* GVs 8.8* | - | - | - | - | - | - | - | - |
| 150 | - | A4-70* GVs 8.8* | - | - | - | GVs 8.8 | - | - | - |

Other Halfen bolt lengths and materials are available on request!

FV = Steel, hot-dip galvanised

GV = Steel, zinc-plated

A4 = Stainless steel

Material details and corrosion protection: see page 12–13

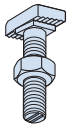
*on request

# Halfen HZA Cast-In Channels

## Halfen Bolts: Dimensioning

### Halfen HZS Bolts — Load capacity and bending moment

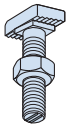
**Design resistance HZS with hot-rolled HZA DYNAGRIP® Cast-in Channels**



**DYNAGRIP®**
**HZA 64/44; HZA 53/34; HZA 41/27; HZA 38/23; HZA 29/20**

| Material / Strength class | | M12 | M16 | M20 | M24 |
|---|---|---|---|---|---|
| 8.8 | $N_{Rd,s,s}$ [kN] | 43.8 | 81.6 | 127.4 | 183.6 |
| | $V_{Rd,s,s}$ [kN] | 24.3 | 45.2 | 70.6 | 101.6 |
| | $M^0_{Rd,s,s}$ [Nm] | 68.9 | 173.6 | 336.8 | 583.7 |
| A4-70 | $N_{Rd,s,s}$ [kN] | 38.4 | 71.4 | 111.5 | 160.6 |
| | $V_{Rd,s,s}$ [kN] | 21.2 | 39.5 | 61.7 | 89.0 |
| | $M^0_{Rd,s,s}$ [Nm] | 59.5 | 151.6 | 295.6 | 510.9 |

**Design resistance HZS with cold-formed HZA Cast-in Channels**



**HZA 41/22**

| Material / Strength class | | M12 | M16 |
|---|---|---|---|
| 8.8 | $N_{Rd,s,s}$ [kN] | 31.5 | 62.6 |
| | $V_{Rd,s,s}$ [kN] | 24.3 | 45.2 |
| | $M^0_{Rd,s,s}$ [Nm] | 68.9 | 173.6 |
| A4-50 | $N_{Rd,s,s}$ [kN] | 30.2 | 48.0 |
| | $V_{Rd,s,s}$ [kN] | 13.1 | 24.4 |
| | $M^0_{Rd,s,s}$ [Nm] | 49.1 | 125.3 |

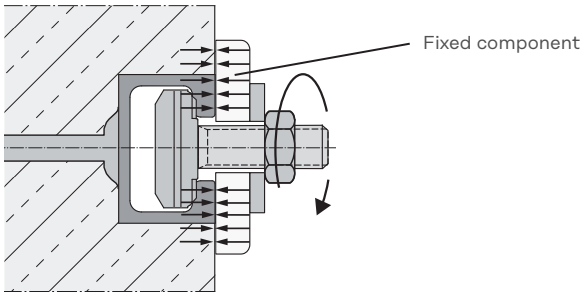
Strength reduction factors from ICC ESR-4016-NZ are included. The values in this table are simplified for the safe side. Depending on the size of the bolt head or with more favorable load combinations, higher design resistances are possible. Detailed information can be found in the ICC ESR-4016-NZ report.

HZS 64/44 and HZS 29/20 and all M24 bolts are not part of the ICC Approval.

### Torque values for Halfen HZS Bolts

**Standard**

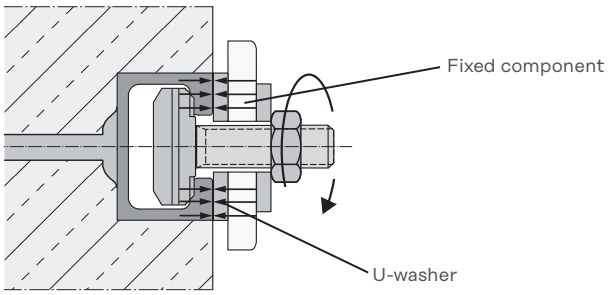
Components are braced against the concrete and anchor channel. Torque is applied as in the following table and must not be exceeded.




Standard torque values

**Steel-Steel**

Components are braced against the anchor channels using suitable washers. Torque is applied as in the following table and must not be exceeded.




Torque values steel-steel

**Standard: Recommended torque values $T_{inst}$**

| HZA Profile | Halfen Bolt HZS...M [mm] | Torque value $T_{inst}$ [Nm] | | |
|---|---|---|---|---|
| | | Steel 8.8 | Stainless steel Strength class 50 | Stainless steel Strength class 70 |
| 41/22 | 12 | 30 | 20 | - |
| | 16 | 40 | 50 | - |
| 29/20 | 12 | 35 | - | - |
| 38/23 | 12 | 70 | - | 50 |
| | 16 | 94 | - | 75 |
| 41/27 | 12 | 70 | - | - |
| | 16 | 129 | - | - |
| 53/34 | 16 | 185 | - | 130 |
| | 20 | 235 | - | 165 |
| 64/44 | 20 | 315 | - | 250 |
| | 24 | 375 | - | 335 |

**Steel-Steel: Recommended torque values $T_{inst}$**

| HZA Profile | Halfen Bolt HZS...M [mm] | Torque value $T_{inst}$ [Nm] | | |
|---|---|---|---|---|
| | | Steel 8.8 | Stainless steel Strength class 50 | Stainless steel Strength class 70 |
| 41/22 | 12 | 50 | 20 | - |
| | 16 | 140 | 50 | - |
| 29/20 | 12 | 75 | - | - |
| 38/23 | 12 | 70 | - | 50 |
| | 16 | 185 | - | 130 |
| 41/27 | 12 | 70 | - | - |
| | 16 | 185 | - | - |
| 53/34 | 16 | 185 | - | 130 |
| | 20 | 360 | - | 250 |
| 64/44 | 20 | 360 | - | 250 |
| | 24 | 625 | - | 435 |

These tables, show the respective values of the tightening torque of the bolts from both approvals, ESR-4016-NZ and ETA-09/0339 adapted to be conservative. Higher values are possible according to the respective situation and can be found in the approval that is used for the proof.

Tightening torques [lbf] and [Nm] are also provided in the installation instructions of the bolts.

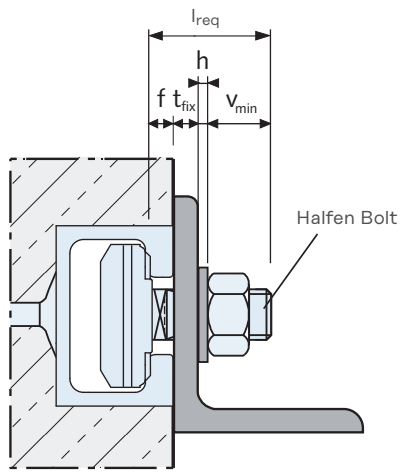
Torque values apply only to bolts in delivery condition (unlubricated).

# Halfen HZA Cast-In Channels

## Minimum Edge Distances and Minimum Bolt Spacing/Bolt Length

### Calculating the bolt length $l_{req}$ for Halfen HZS Bolts

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




| Dimensions $V_{min}$ | |
|---|---|
| **T-bolt diameter** | **$v_{min}$ [mm]** |
| **M12** | 17.0 |
| **M16** | 20.5 |
| **M20** | 26.0 |
| **M24** | 29.0 |

| Lip dimensions f | |
|---|---|
| **Channel profile** | **f [mm]** |
| **64/44** | 10.0 |
| **53/34** | 7.5 |
| **41/27** | 7.0 |
| **38/23** | 5.5 |
| **29/20** | 5.0 |
| **41/22** | 7.0 |

$l_{req}$ = required T-bolt length
$t_{fix}$ = thickness of clamped component
f = profile lip height
h = washer thickness
$v_{min}$ = nut height EN ISO 4032 + overhang approximately 5 mm (≥ M20: 7 mm)

### Minimum edge distances and minimum Halfen Bolt spacing

Anchors must be installed at a minimum distance from the component edges. The distance depends on the selected channel profile. According to the ETA, the spacing between bolts $s_{cbo}$ must not be less than $s_{s,min} = 5 \times d_s$. Reduction of the load bearing capacity is required if $s_{cbo} < s_{sl,N}$* (see table on page 30).

**The concrete load-bearing capacity must be verified for each individual case! (see ESR-4016-NZ)**

*$s_{sl,N}$ = centre distance of the bolts subject to $N_{Rd,s,l}$
See tables on page 30

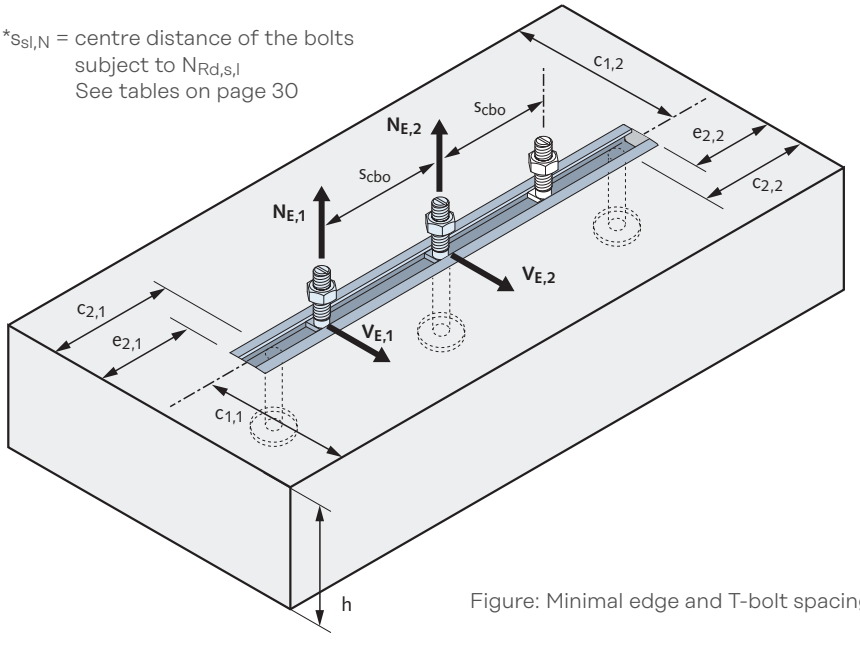



Figure: Minimal edge and T-bolt spacings

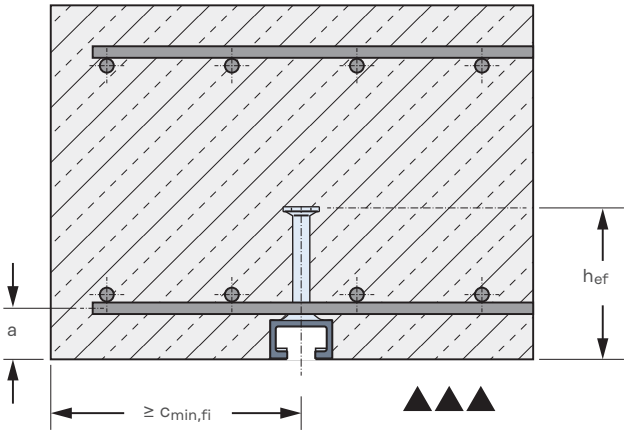
| Edge and T-bolt spacing [mm] | | | | |
|---|---|---|---|---|
| **HZA Profiles** | **M** | **$s_{s,min}$** | **$c_{min}$** | **$e_{min}$** |
| **64/44** | 24 | 120 | 125 | 90 |
| | 20 | 100 | | |
| **53/34** | 20 | 100 | 100 | 65 |
| | 16 | 80 | | |
| **41/27** | 16 | 80 | 75 | 40 |
| | 12 | 60 | | |
| **38/23** | 16 | 80 | 75 | 47 |
| | 12 | 60 | | |
| **29/20** | 12 | 60 | 50 | 22 |
| **41/22** | 16 | 80 | 50 | 22 |
| | 12 | 60 | | |

# Halfen HZA Cast-In Channels

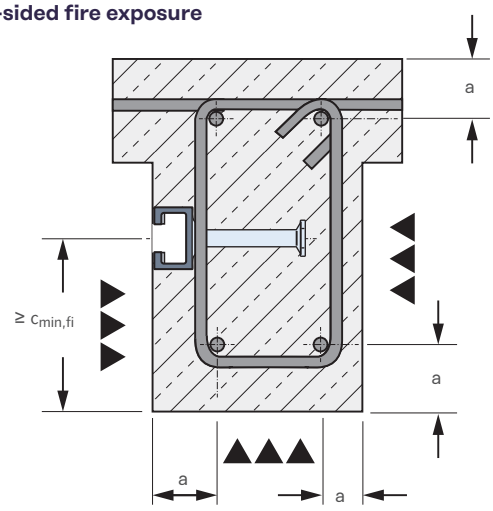
## HZA Fire Resistances

**Halfen HZA Cast-in Channels have been tested and classified for direct exposure to fire in accordance with EAD 330008 using the Standard ISO time-temperature curve (STC). The values shown in the table below are taken from ETA-20/1081.**

**Single-sided fire exposure**




**Multi-sided fire exposure**




▲▲▲ fire exposure direction

**Fire resistance capacities for HZA Cast-in Channels, serrated — steel failure***

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fire protection classes depending design resistances $N_{Rd,s,fi} = V_{Rd,s,y,fi}$ [kN]** | **HZA** | **29/20** | **38/23** | | **41/27** | | **53/34** | | **64/44** | | **41/22** | |
| | **Halfen Bolt** | **M12** | **M12** | **M16** | **M12** | **M16** | **M16** | **M20** | **M20** | **M24** | **M12** | **M16** |
| | **R30** | 2.7 | 3.5 | 4.5 | 3.5 | 4.5 | 4.5 | 10.3 | 10.3 | 17.0 | 2.4 | 2.3 |
| | **R60** | 2.1 | 2.7 | 3.3 | 2.7 | 3.3 | 3.3 | 7.8 | 7.8 | 14.8 | 1.7 | 1.8 |
| | **R90** | 1.5 | 1.9 | 2.1 | 1.9 | 2.1 | 2.1 | 5.3 | 5.3 | 9.9 | 1.1 | 1.2 |
| | **R120** | 1.3 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 4.0 | 4.0 | 7.4 | 0.7 | 1.0 |
| **Minimum axial spacing a [mm]** | **R30** | 25 | 30 | | 35 | | 40 | | 50 | | 25 | |
| | **R60** | 25 | 30 | | 35 | | 40 | | 50 | | 25 | |
| | **R90** | 35 | 35 | | 35 | | 40 | | 50 | | 35 | |
| | **R120** | 50 | 50 | | 50 | | 50 | | 50 | | 50 | |
| **Minimum edge spacing $c_{min,fi}$ [mm]** | **fire exposure single-sided** | 164 | 188 | | 296 | | 310 | | 356 | | 164 | |
| | **fire exposure multi-sided** | 300 | 300 | | 300 | | 310 | | 356 | | 300 | |

Load capacities are valid for serrated Halfen HZA Cast-in Channels made of steel and stainless steel.
Reduction factor is = 1.0

* Concrete load capacity under fire exposure has to be verified for each individual case in accordance with EOTA TR 047 for strength classes C20/25 to C50/60.

# Halfen HZA Cast-In Channels

## Fatigue Loads

### HZA Cast-in Channels; design resistance for n = 2 × 10⁶ load cycles

| Profile HZA | Type | $\Delta N_{Rd,s,0,n}$ | $N_{lod,s,n}$ | Allowable bolts | Material |
|---|---|---|---|---|---|
| 38/23 | FV | 3.4* | 6.2** | M16 | 8.8 |
| 41/27 | | 3.4* | 6.2** | M16 | |
| 53/34 | | 5.9* | 9.2** | M20 | |
| 64/44 | | 8.7* | 20.2** | M24 | |

*Safety factor of 1.35 included in accordance with ETA-20/1081
** For $N_{lod,s,n}$ safety factor is 1.8

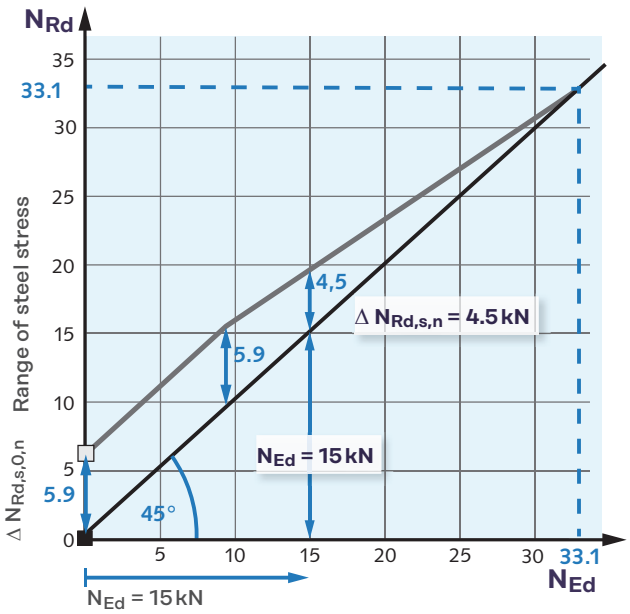
Example (also see diagram to the right):
Profile HZA 53/34 - FV (serrated, hot-dip galvanized), for n = 2 × $10^6$ load cycles:

$N_{Rd}$ = 59.6 ÷ 1.8 = 33.1 (taken from the ETA-20/1081)

$N_{Ed}$ from permanent load = 15 kN (assumption)

$\Delta N_{Rd,E,n}$ = (33.1 – 15.0) × 5.9/(33.1 – 9.2) = 4.5 kN

**Diagram: HZA 53/34 - FV for n = 2 × $10^6$ load cycles**



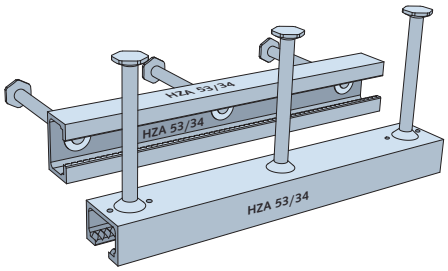

### Tender text example

**Halfen HZA type Channel 53/34 - FV - 350 - KF**

ESR-4016

Halfen HZA Channel, serrated 53/34 DYNAGRIP® with serrated channel lips for adjustable fixing of components,

according to ICC-ES Appraisal Report ESR-4016-NZ in compliance with NZS 3101, suitable for anchoring in cracked or uncracked normal-weight concrete with compressive strength of 20.0 MPa to 69.0.MPa, under static, quasi-static, dynamic loading as well as fire exposure.




Type HZA 53/34 - FV - 350 - KF

with

$N_{Rk,s,c}$ = 59 kN = char. resistance, steel failure (tension), connection channel anchor

$\Delta N_{Rk,s,lo,n}$ = 8,0 kN = char. fatigue resistance (2 × $10^6$ load cycles), steel failure (tension),

FV = Corrosion protection, hot-dip galvanized

350 = Channel length [mm] with 3 anchors,

KF = Foam strip filler,

or equivalent; deliver and install according to the manufacturer's instructions.

# Halfen HTA-CE/HZA Cast-In Channels
Installation Aids/Further Channel Parts

## ANK-E end anchor; for on-site custom cut-length of Halfen Cast-in Channels

### Notes for assembling end anchor, type ANK-E

Cut the Halfen Cast-in channel at the selected point.
The cut face must be at a right angle to the longitudinal axis of the channel. The end projection "e" should not be less than 35 mm and not more than 175 (225) mm*.

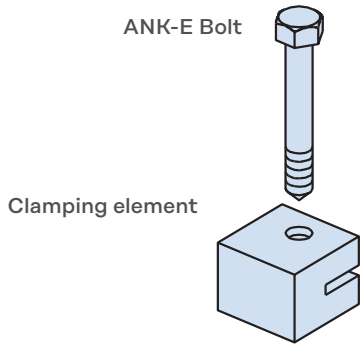
Select the correct ANK-E End anchor for the Halfen Cast-in channel profile; see table on the right.
Slide the clamping element on to the back of the channel.
If necessary, push in the foam filler at the end of the channel.

Tighten the bolt by applying the required torque.
See table (right) for correct torque value.

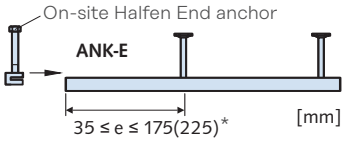
**End anchor selection**

| for profile | End anchor | Thread | Torque $T_{inst}$ [Nm] |
|---|---|---|---|
| **28/15 - FV** | ANK-E1 - FV | M8 | 10 |
| **28/15 - A4** | ANK-E1 - A4 | M8 | 10 |
| **38/17 - FV** | ANK-E2 - FV | M10 | 20 |
| **40/25 - FV** | | | |
| **41/22 - FV** ① | | | |
| **38/17 - A4** | ANK-E2 - A4 | M10 | 20 |
| **40/25 - A4** | | | |
| **41/22 - A4** ① | | | |

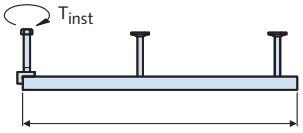
① Short HZA 41/22 sections may be used with one end anchor only. Not included in the approval.




### Custom lengths




* 175: for 28/15, 38/17
225: for 40/25, 41/22



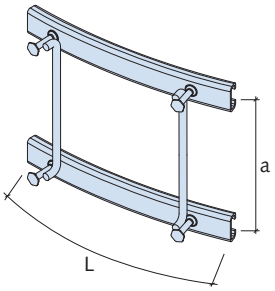

Custom length, ready to install

## Halfen Channel pairs

Material/type:
Channel (Type straight or curved):
FV = Hot-dip galvanized
A4 = Stainless steel

Spacer:
Reinforcement steel B500B or B500B/A SST, ø 10-16 mm

Recommended for stainless steel type spacers in: B500B/A SST.




### Ordering example:

Type: Halfen Channel pair HTA-CE 38/17
Dimensions: L = 350 mm, a = 200 mm
Material: hot-dip galvanized, with filler
Radius: $R_i$ =... (for curved type)

## Halfen Corner channel

Material/type:
Channel (Type straight or curved):
FV = Hot-dip galvanized
A4 = Stainless steel

Standard type:
a/b = 125/250 mm

Other lengths for a and b and other profiles are available on request

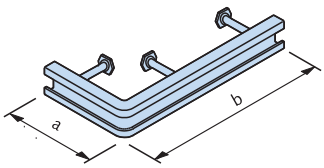



Figure: HTA-CE 38/17 – Corner piece

### Area of application:

- fixing for Halfen Console anchors for supporting brickwork cladding
- other near edge fixings

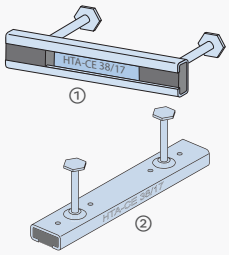
# Halfen HTA-CE/HZA Cast-In Channels

## Installation/Assembly

### 1.1 Delivery and identification

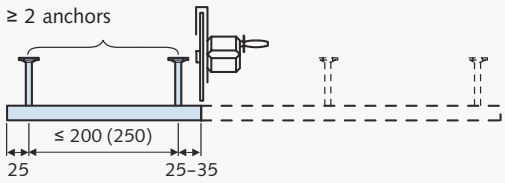
We can supply ready to install short channels and standard lengths.

Product identification
① inside the channel
② also on the channel side




### 1.2 Installing to formwork

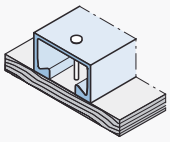
If required, Halfen Cast-in Channels can also be cut to size on site.

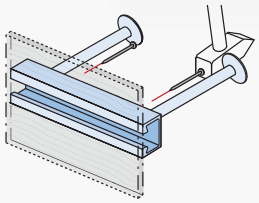



### 2.1 Fixing to the formwork

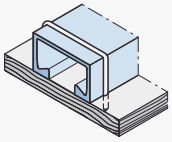
**Timber formwork**

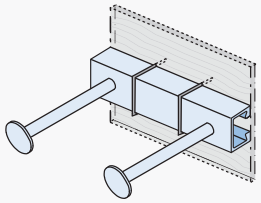
2.1.1 with nails





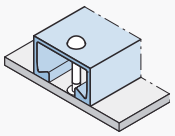
2.1.2 with staples

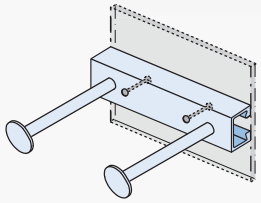




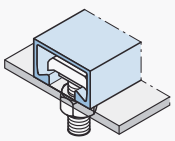
**Steel formwork**

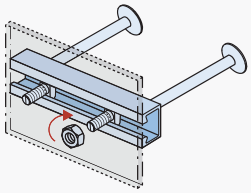
2.1.3 aluminium rivets





2.1.4 Halfen Bolt and nut

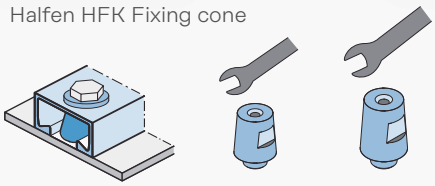




### 2.1 Fixing to the formwork, continued

**Steel formwork**

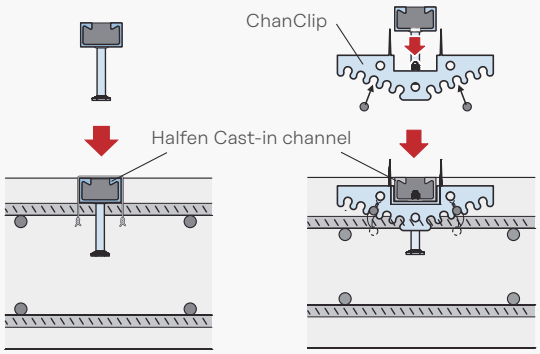
2.1.5 Halfen HFK Fixing cone

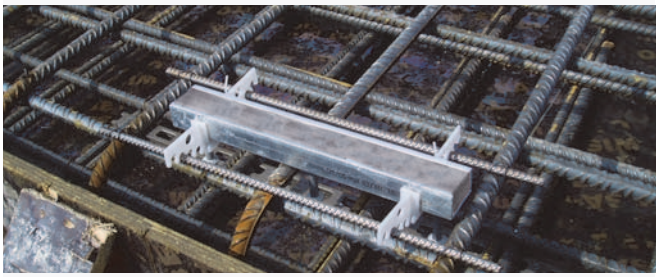


### 2.2 Top face installation

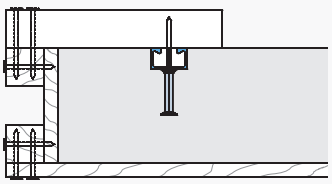
2.2.1 directly to reinforcement: with tying wire

2.2.2 with Halfen HCP ChanClip



2.2.3 Installation using an auxiliary aid

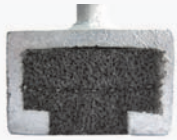


# Halfen HTA-CE/HZA Cast-In Channels

## Installation/Assembly

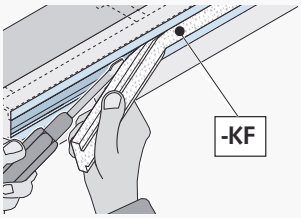
### 3.1 Removing the filler

Strip filler, available in two versions:



KF – PE strip filler
with reinforcement layer

KF – PE strip filler




**Removing the strip filler**
Grip the strip filler at one end and pull out in one piece by hand; use a tool, e.g. a screwdriver.

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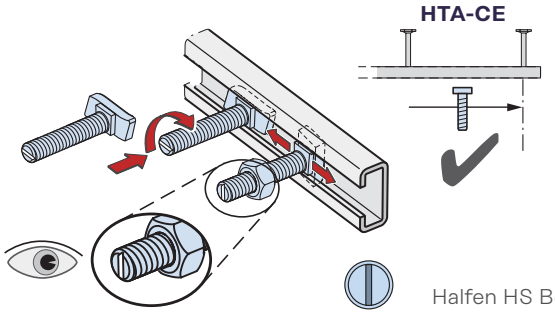
### 4.1 Installing Halfen Bolts






Halfen HS Bolt,
non-serrated

HSR Bolt with nib
or HZS serrated

Safe assembly with Halfen Cast-in Channels

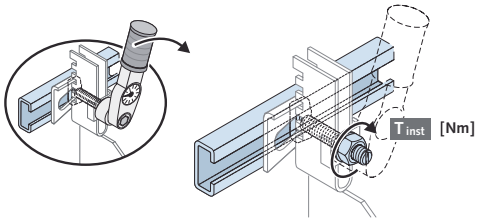
Halfen Bolts can be inserted anywhere in the channel slot, turned 90° and then locked in place by tightening the nut. Do not position bolts at channel ends past the last anchor.

On channels with bolt anchors, the anchor locations are visible through the channel slot.

Check

Bolts: After installation check that the bolts are properly aligned; the notch or notches in the tip of the shank must be at right angles to the longitudinal axis of the channel.

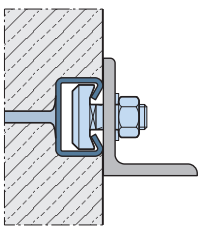
---



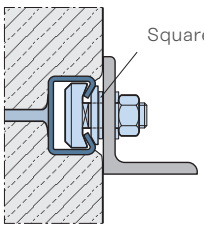

Fixings

The T-bolt heads must sit flush on both lips of the anchor channel and be secured by tightening the nut with a torque wrench with the required value. Observe the torque values in the tables on page 23-24 for HS/HSR or page 33 for HZS.

**Direct attachment ①**



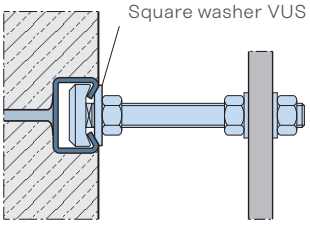
**Surface-flush installation**




**Non-flush installation**

① If the front surface of the channel is set back from the concrete surface, the attached structure must be shimmed with a washer (VUS).
In case of shear stress, add bolt flexure to the tensile force.

**Stand-off installation ②**




**Example:**

Halfen Channel: HTA-CE 49/30

Halfen Bolt: HS 50/30 - M16

Washer: VUS 49/30 - M16

**① Always install a square washer for stand-off installations.**

**Assembly instructions**

Multi-language assembly instructions are delivered with the Halfen Cast-in Channels and with each Halfen Bolt card box.

Additionally they can be found at www.halfen.com / Downloads / Brochures / Assembly Instructions.

# Halfen HTA-CE/HZA Assembly

## Installation in Pre-stressed Concrete

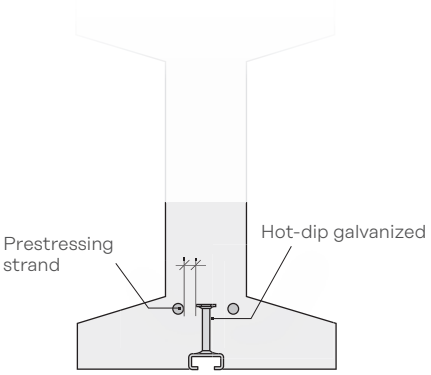
### Halfen Anchor Channels, hot-dip galvanized with stainless steel anchors

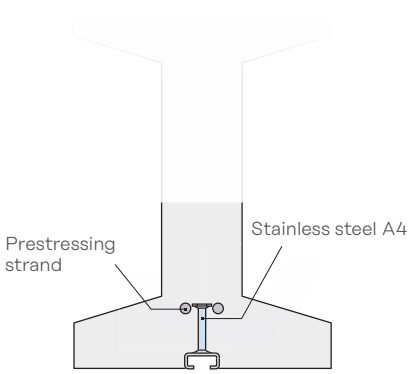
Requirements according to EN 1992-1-1/NA (EC 2 with German National Annex, 2nd edition, 2016, chapter 8.10.1.1) "Ensure at least 20 mm concrete between pre-stressed tension strands and galvanized components." Otherwise there is a risk of hydrogen induced cracking.

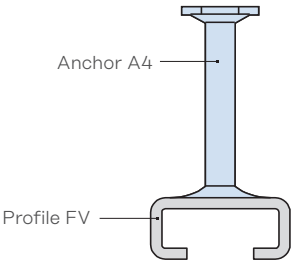
**Solution**
If hot-dip galvanized channels are used together with stainless steel bolt anchors then the pre-stressed tension-strands are allowed to have contact with the stainless steel bolt anchor.

**Types:**
Lengths available:
up to 6.07 m

Available profiles:
50/30P
49/30
40/25
38/17



# Halfen Cast-In Channels

## Dimensioning HTA-CE and HZA Cast-in Channels

### Halfen HTA-CE/HZA Software

**The Halfen Calculation program for Halfen Cast-in Channels according to the ETA provides the user with a convenient and very powerful calculation tool.**

#### Verifications

All necessary verifications are processed by the user-friendly dimensioning software. In just a few seconds the user is provided with a list of suitable Halfen Cast-in Channels for the relevant load situation.

#### Boundary conditions

The calculation takes into account all necessary boundary conditions, typical examples being:

- cracked or non-cracked concrete
- the geometry of the concrete components, in particular the distances from the channel to the component edge
- various reinforcement patterns
- consideration of several dimensioning or characteristic loads
- position of the loads with a definable adjustment range, and the option of shifting the defined T-bolt pattern along the complete channel length
- verification of the required Halfen Bolts and if required also for stand-off installations
- verification of longitudinal forces in Halfen HZA serrated cast-in channels

#### Input

The geometry and loads are entered interactively. Entries are displayed promptly in a 3D graphic. Entries can also be changed directly in the graphic. Click on the load, the measurement or the component line you want to change, to make the required modification.

#### Input loads

In addition to direct input of bolt loads, it is also possible to calculate the resulting loads by entering the actions/loads caused by secondary components (for example, curtain wall applications).

#### Results

After calculation, the software output provides either the results for a preselected profile, or in the case of automatic selection a list of all suitable profiles. Profiles and bolts with in-complete verifications are high-lighted in red.

#### Visual control

All verifications for the current channel profile are listed in a tree structure. Green check-marks indicate successful verifications. Red check-marks indicate unsatisfactory verifications.

For further visual control a progress bar on the right indicates the status of the verification process. Here too, red bars mean that a load has been exceeded, while green bars symbolize verifications that meet the criteria.

Detailed calculation information (with load positions, section sizes and utilization factors) can also be selected in a tree menu.

After selecting a Halfen Cast-in Channel and suitable T-bolts, the dimensioning results can be imported into the data list and saved.

#### Print-outs

Print-outs are possible in a brief and in a verifiable long version. The long version includes all decisive verifications, a diagram of necessary reinforcement and a 2D graphic of the geometry and load.

The latest version of the dimensioning program is available for download on the Internet at www.ancon.co.nz

#### System requirements:

Windows 11, Windows 10,
Windows 8,

Microsoft .NET Framework 4.7.2 or higher version

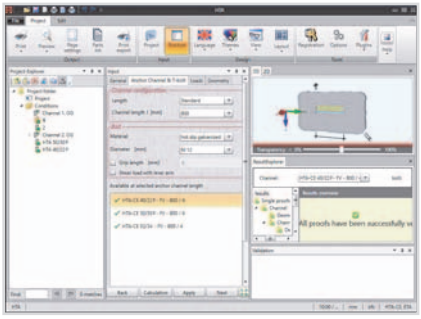
(.NET framework can be downloaded from our software portal)

**The Halfen design software also contains calculation kernels for verifications according to AS 5216 and ICC-ES–AC232*.**

**The values of ICC ESR-4016-NZ are not part of the design software**

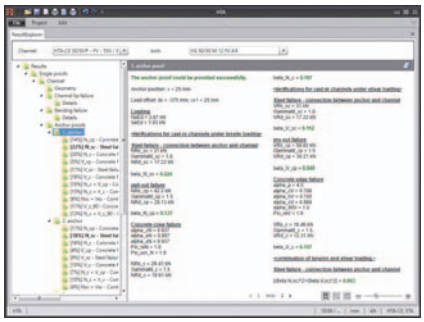
* ICC ESR-1008 values are part of the ICC-ES -AC232 calculation kernel.
For any questions, please contact your local distributor. Adresses can be found at the end of this catalogue.

All software can be found under:
**www.ancon.co.nz**

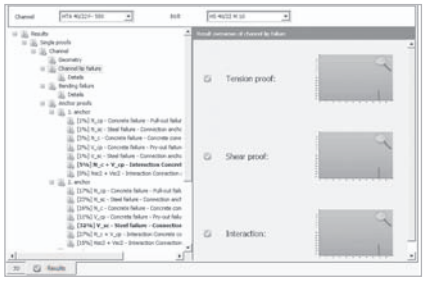


Input screen, Halfen Anchor Channel Software

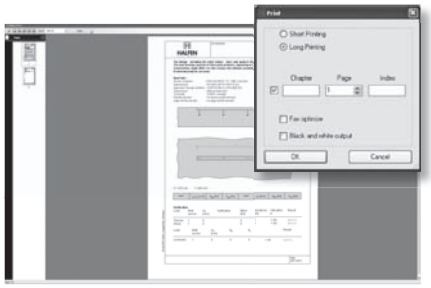
Interactive 3D display



Results list



Overview of results



Print preview

# Halfen Curtain Wall System

The benefits at a glance

**Modern buildings require façades of the highest quality that can be installed quickly and safely.**

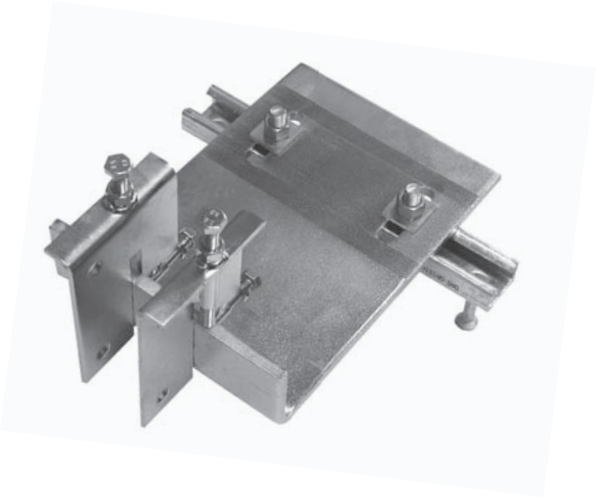
**This is the reason the Halfen Curtain Wall System is chosen more and more frequently by architects and investors.**

## Fast and cost-effective

- 3-dimensional adjustable connection when used with cast-in channels
- uses bolts instead of welding
- fast assembly reduces installation time

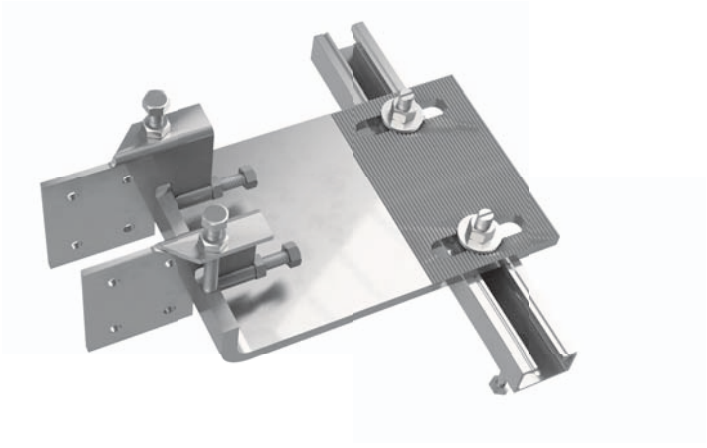
## HCW-B2 Bracket

**For modular façades. Anchored to the top surface of floor slabs.**



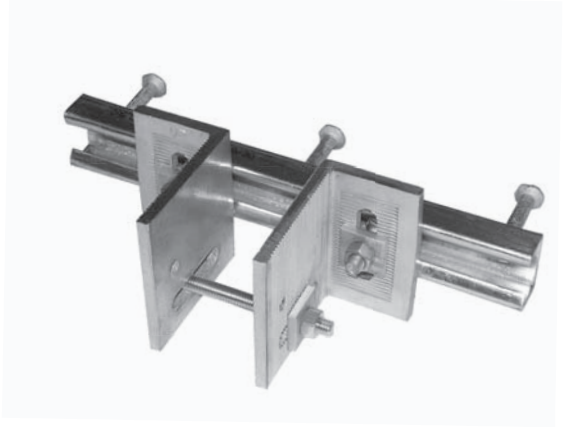
## HCW-B1 Bracket

**For post and beam façades. Anchored to the top surface of floor slabs.**



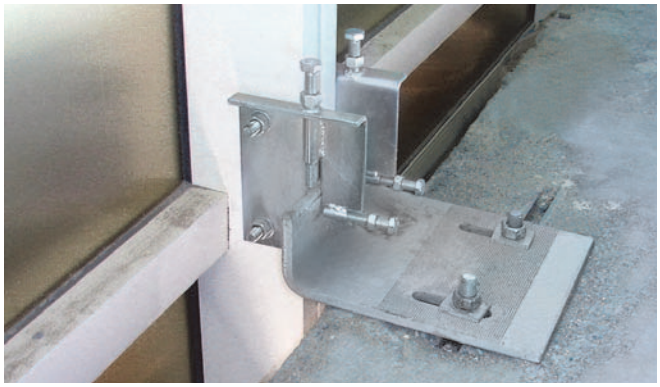
## HCW-ED/-EW Brackets

**For post and beam façades. Anchored to the edges of slabs.**



# Halfen Curtain Wall System

## Application Examples



Fixing of a curtain wall system using HCW-B2 Brackets connected to HTA-CE Cast-in Channels

Liberty Life, Johannesburg

Torre Espacio, Madrid

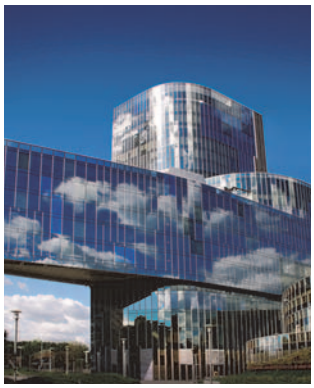
Fixing of a post and beam façade using HCW-ED Brackets on HTA-CE Cast-in Channels

Post office Tower, Bonn

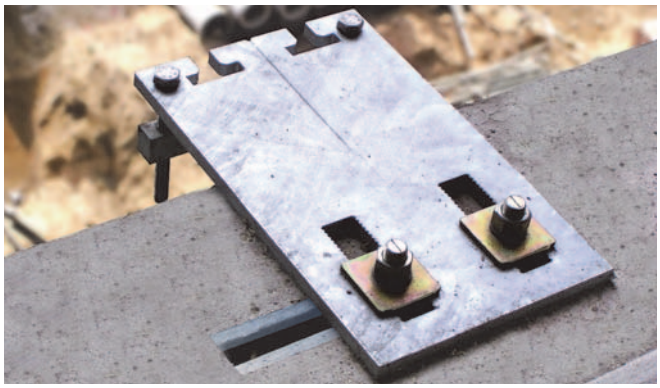
Sage Centre, Gateshead

Fixing of a modular façade using HCW-ED Brackets on HTA-CE Cast-in Channels

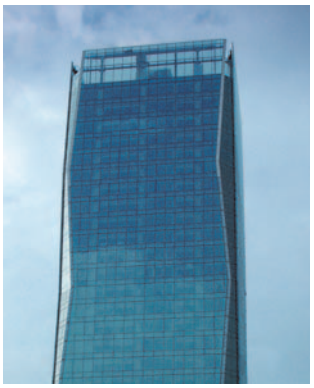
Burj Chalifa, Dubai



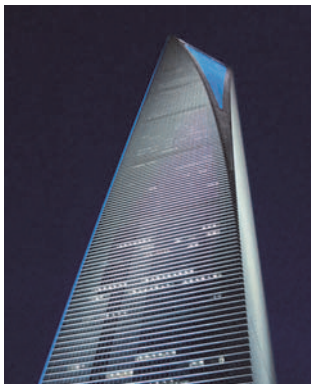
Edificio Gas Natural, Barcelona



Typical curtain wall fixing with HTA-CE Cast-in Channels



Westin Libertador Hotel, Lima



World Financial Center, Shanghai

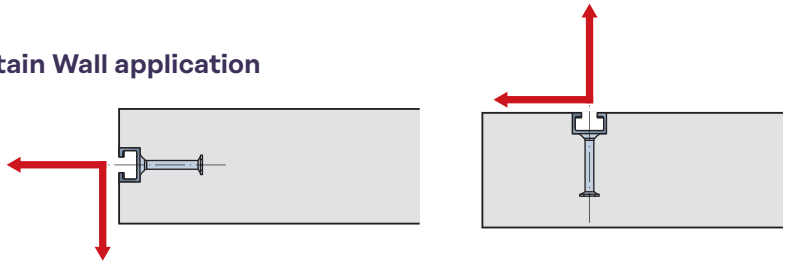
# Halfen Curtain Wall Support Systems

Product Range

## Halfen Cast-in Channels and bolts for Curtain Wall application

**Load case:** for standard slab thickness with standard tensile and transverse tensile loads

**Halfen Channels HTA/HZA with bolt anchors or weld-on I-anchors**

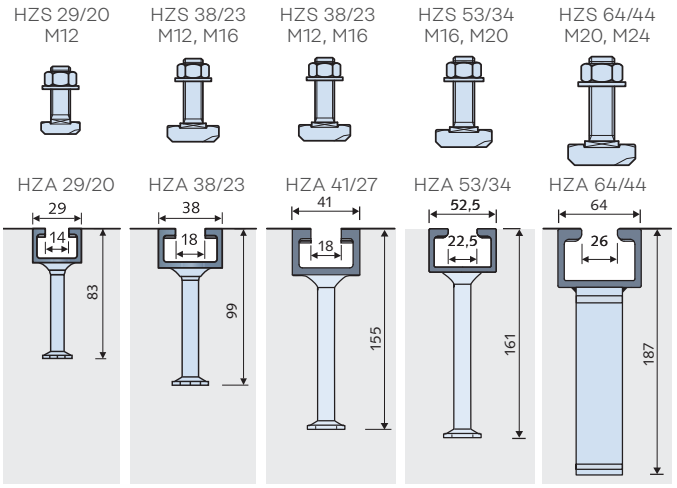


### Hot-rolled serrated channels and bolts

ESR-4016

European Technical Assessment

see pages 28 – 36

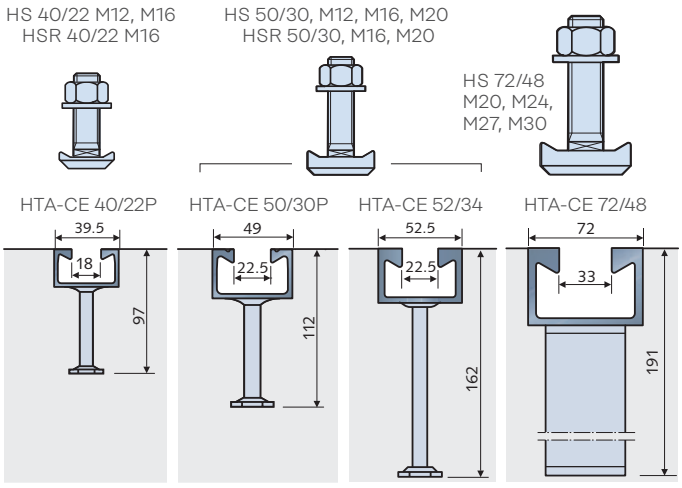



### Hot-rolled (standard) channels and bolts

ESR-1008

European Technical Assessment

see pages 16 – 27



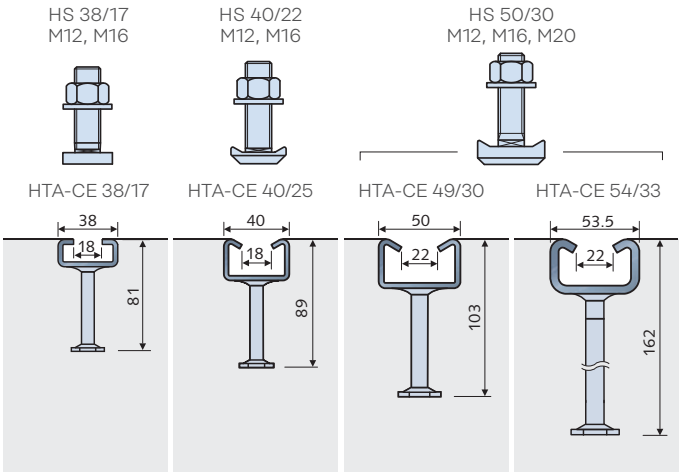

HSR T-bolt application is possible in accordance with an expert report for load capacity in channel longitudinal direction.

### Cold-rolled (standard) channels and bolts

ESR-1008

European Technical Assessment

see pages 16 – 27



# Halfen Curtain Wall Support Systems

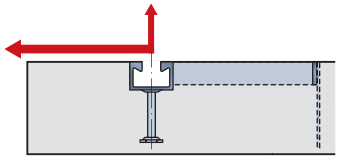
Product Range

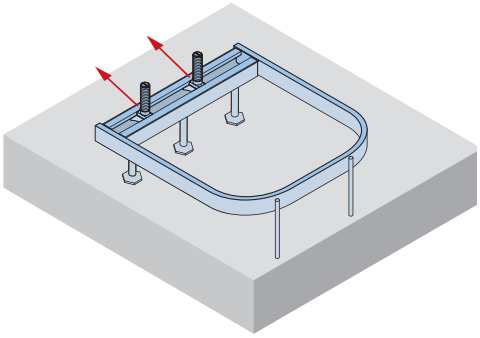
## Halfen HCW 52/34 Channels for Curtain Wall application

**Load case:** for thin slabs (thickness ≥ 12.5 cm) with high transverse tensile loads and small edge distance

**Halfen Curtain wall channel HCW 52/34**

(not included in the HTA-CE approvals)





### HCW 52/34 and Halfen Bolt

see pages 47–48

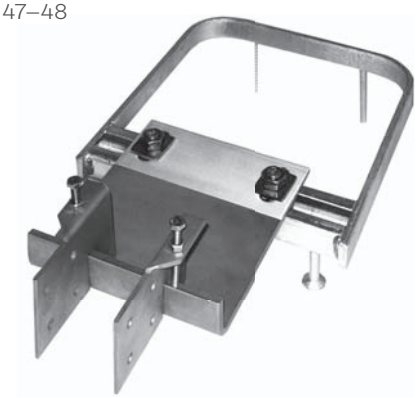
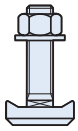


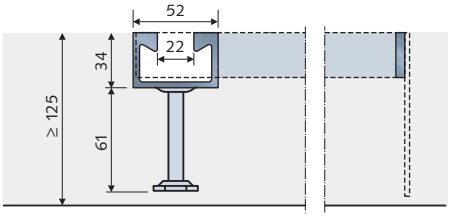
Fig. HCW 52/34 with bolts and bracket

HS 50/30 M16, M20

Grade 8.8

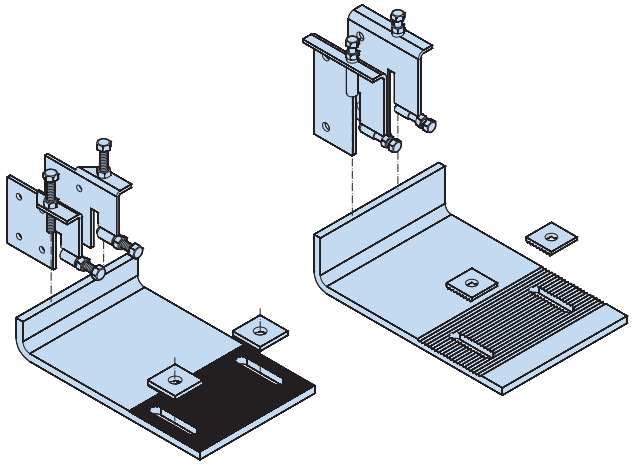


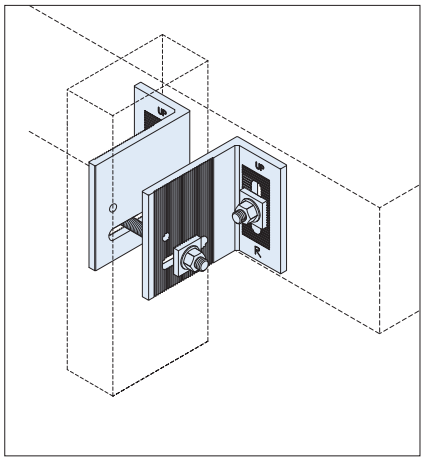
HCW 52/34




### Curtain wall installation brackets

see pages 49–53





# Halfen Curtain Wall Support Systems

Design principles

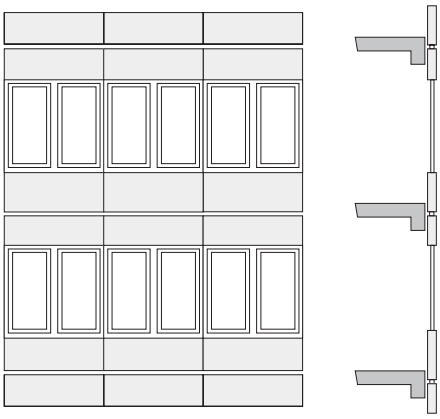
## Halfen Curtain wall system

The curtain wall facade system gets its name from the fact that the construction hangs like a curtain in front of the floor slabs. (See figure 1 section)

The system is thin and lightweight, usually aluminum and glass. The façade is attached to the main structure of the building using only the required number of point-load connections. It is not structural, and by design, only able to carry its own weight, but it transfers load of wind and gravity to the structure of the building.

Specifically, this includes sufficient stability against wind loads, adequate ability to shrink and expand as well as insulation against frost in winter, heat in summer and against external noise.

In addition, various requirements must be met to protect against fire and other critical situations.



**Curtain wall**

Figure 1 partial (view) of a façade (section)

## Post and beam façade and the modular façade

Basically, we distinguish between two methods of curtain wall façades:

- the post and beam façade
- and the modular façade.

### Post and beam façade

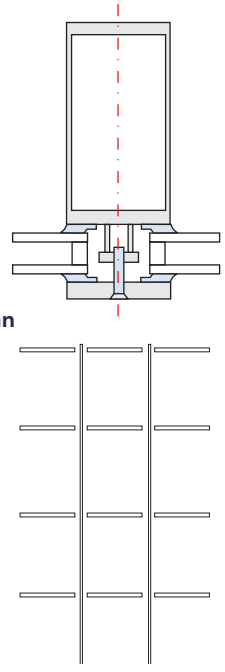
One basic distinctive difference is the way expansion in the façade is distributed (for example; thermal expansion). With the post and beam façade (see figure 2) the vertical and horizontal frame supports are installed in spacings corresponding to the façade elements. The supports are installed with an expansion gap between components allowing for sufficient expansion.

The respective longitudinal and transverse connections have an expandable joint. The filler elements (glass or panel) installed in a post and beam structure permit movement within the tolerance of the designed expansion joint. The glass and filler elements are delivered separately and are then installed on site, requiring on-site scaffolding.

### Modular façade

With the modular façade method (see figure 3), the façade is made of prefabricated elements, in which glass, natural stone or infills are pre-installed. The façade profiles are designed as a key and slot system to allow for expansion.

**Post and beam façade**



**Plan**

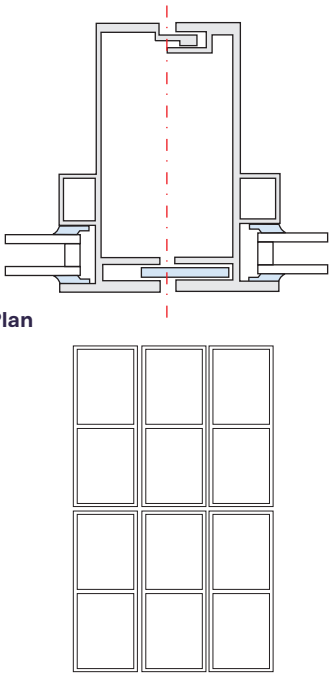
**View**

Figure 2

This method provides immediate weather protection and allows the building contractor to start interior work on the respective floor directly after the prefabricated modules have been installed.

Scaffolding is not required with this method of construction.

**Modular façade**



**Plan**

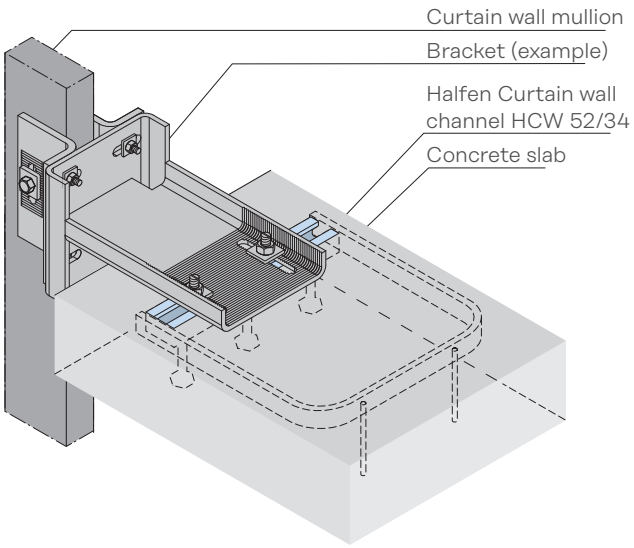
**View**

Figure 3

# Halfen Curtain Wall Support Systems

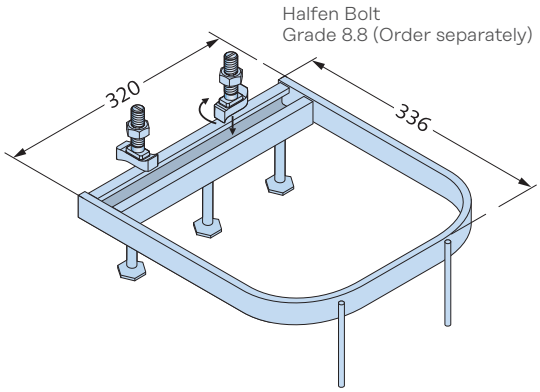
## Halfen Channel HCW 52/34

### Typical installation



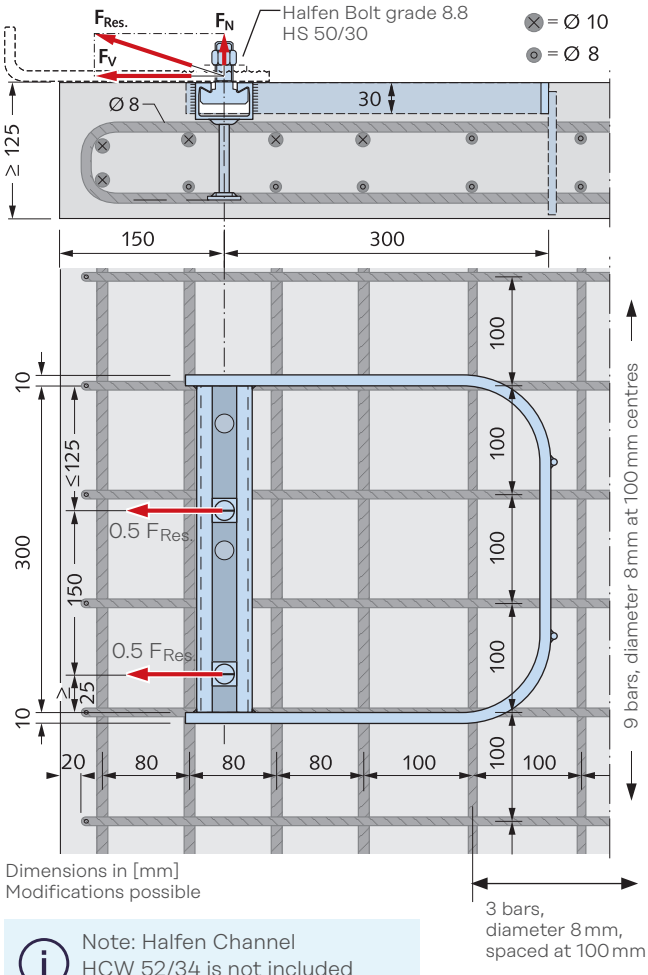

### Product description

Identification: HCW 52/34
Material: hot-dip galvanized




Dimensions in [mm]

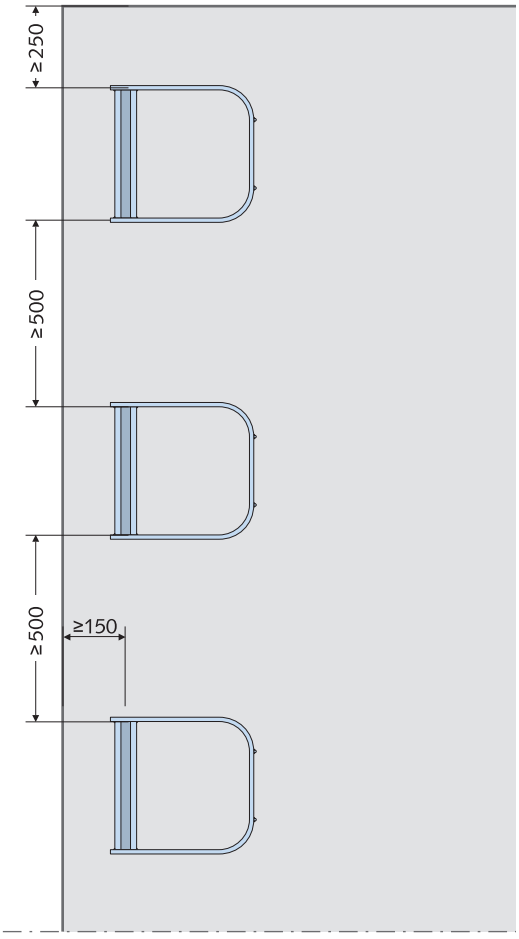
### Reinforcement requirements




Dimensions in [mm]
Modifications possible

Note: Halfen Channel HCW 52/34 is not included in the HTA-CE approval.

### Edge and element spacing



# Halfen Curtain Wall Support Systems

## Halfen Channel HCW 52/34

### Channel load data

The following rupture loads were averaged from three tests:

| | | |
|---|---|---|
| $F_{V\ failure}$ | | = 142.3 kN |
| $F_{N\ failure}$ | | = 47.4 kN |
| $F_{res,failure}$ | = $\sqrt{F_N^2 + F_V^2}$ | = 150.0 kN |

**The load deformation diagram (see right) may be used to determine allowable loads based on acceptable displacement and the required safety factor according to local building codes. The diagram is based on the following:**

tensile and transverse loads were increased at a ratio of 1:3 up to breaking point

concrete slab thickness ≥ 125 mm and reinforcement as shown on page 47

concrete strength class ≥ C 20/25 N/mm²

load is transferred into the channel via two Halfen Bolts HS 50/30 M20 Grade 8.8. The T-bolt spacing is 150 mm.
A sample calculation is shown below.
The safety factor is freely selected. However, it must be determined which factors are actually to be implemented, whether these are based on project specific boundary condition or on valid building regulations.

**Calculation example:** Assumed safety factor γ = 3
(failure test load / working load)
Average failure load from the tests:

| | | | |
|---|---|---|---|
| Transverse tensile stress | $F_{V\ ultimate}$ | = | 142.3 kN |
| Tensile stress | $F_{N\ ultimate}$ | = | 47.4 kN |
| Res. diagonal tensile load | $F_{res,ultimate}$ | = | 150.0 kN |

Actual working loads at bolts (specification by façade engineer):

| | |
|---|---|
| Transverse tensile stress | $F_V$ = 35 kN |
| Tensile stress | $F_N$ = 10 kN |

Allowable load with γ = 3 against average ultimate load from tests:

| | | | |
|---|---|---|---|
| perm. $F_V$ | = | 142.3 / 3 | = 47.4 kN |
| perm. $F_N$ | = | 47.4 / 3 | = 15.8 kN |
| perm. $F_{res}$ | = | 150 / 3 | = 50.0 kN |

Control:

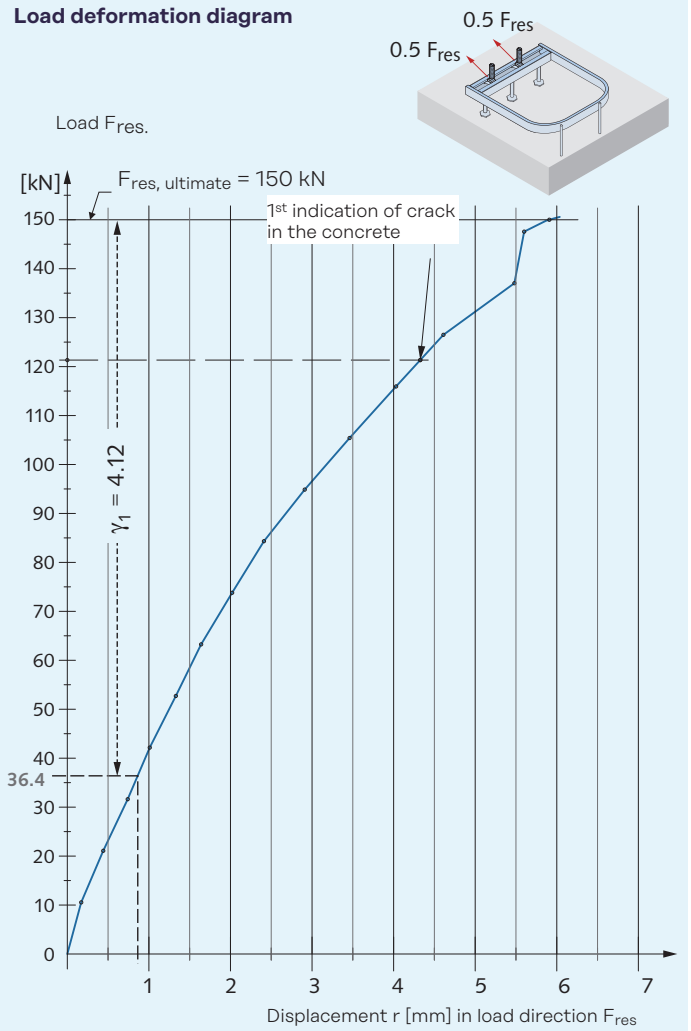
Working load $F_V$ = 35 kN < 47.4 kN

Working load $F_N$ = 10 kN < 15.8 kN

Working load $F_{res} = \sqrt{(10)^2 + (35)^2}$ = 36.4 kN < 50 kN

Displacement at working load < 1 mm (see diagram).
Actual safety factor for average ultimate load γ1 = (150 / 36.4) = 4.12.

**Load deformation diagram**




### Corresponding Halfen Bolts HS 50/30

Depending on the load size, we also recommend using Halfen Bolts HS 50/30 M16 or M20, grade 8.8 in combination with Halfen Cast-in channel HCW 52/34. The bolts stated below are hot-dip galvanized. Other bolt sizes and materials can be supplied. Please contact us for detailed information. Addresses can be found at the end of this catalogue.

**Type selection Halfen Bolts HS 50/30 FV Grade 8.8**

| Thread | Material grade | Available length L [mm] | Allowable resulting T-bolt load (all directions) perm. $F_s$ [kN] | Allowable bending moment [Nm] | Recommended torque [Nm] |
|---|---|---|---|---|---|
| **M 16** | 8.8 | 40, 60, 80, 100 | 36.1 | 111 | 60 |
| **M 20** | 8.8 | 45, 60, 80, 100 | 56.4 | 216 | 120 |

If the Halfen Bolt is stressed in the direction of a slot its load capacity must be verified taking bolt flexure into account.

# Halfen Curtain Wall Support Systems

## Edge of Slab Brackets HCW-ED Post and Beam Façades

### Application example

Halfen Edge of slab brackets are connected in pairs, one each side of the mullion, and are available in two types:

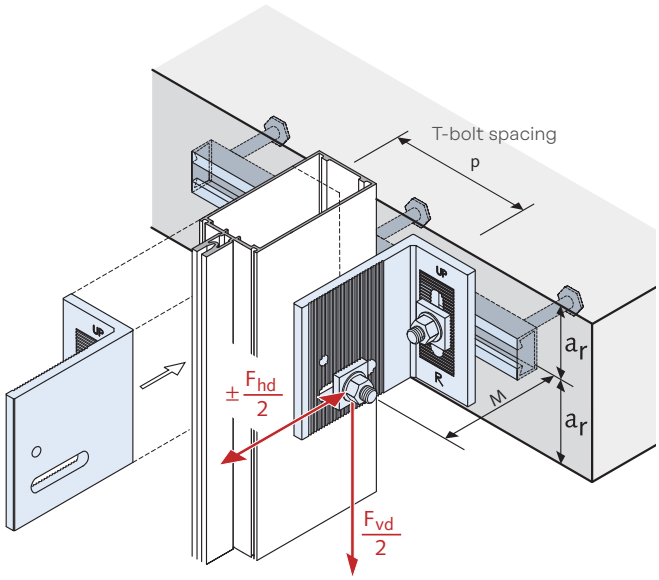
Type HCW-ED Brackets are designed to support both vertical and horizontal loads.

Type HCW-EW Brackets are designed to support only horizontal wind loads.

The brackets guarantee a simple adjustable connection. The Halfen Bolts (connection: bracket to Halfen Channel) and the standard hexagonal bolts M12 (connection: bracket to façade mullion) must be grade strength 8.8.
A round auxiliary hole in the long arm of the brackets can be used for temporary attachments. For example; temporary fixing of brackets to support the post with self-tapping screws until the final connection is made.

The brackets are made of high quality aluminium material. Special nylon discs are placed between the "Wind load" Bracket HCW-EW and support post.

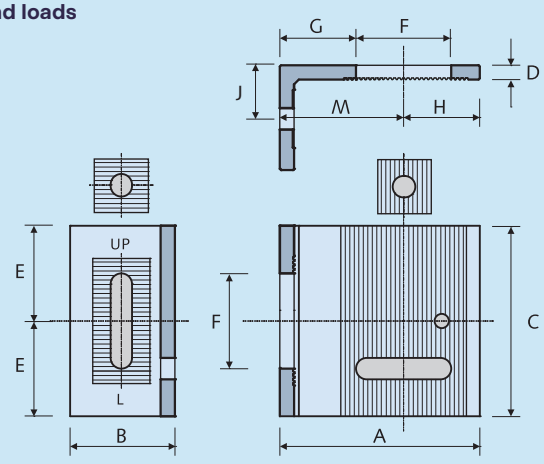
To guarantee correct installation, the HCW-ED brackets are marked `R´ for right, `L´ for left and `UP´ for top.




**Bracket dimensions [mm]**

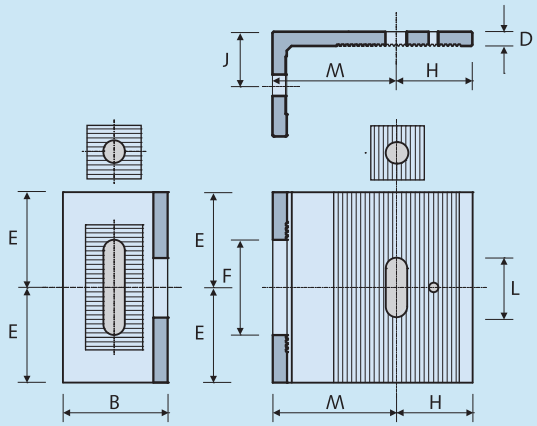
### HCW-ED Brackets

**for dead loads and wind loads**




### HCW-EW Brackets

**wind loads only**




**Serrated washers must be ordered separately**

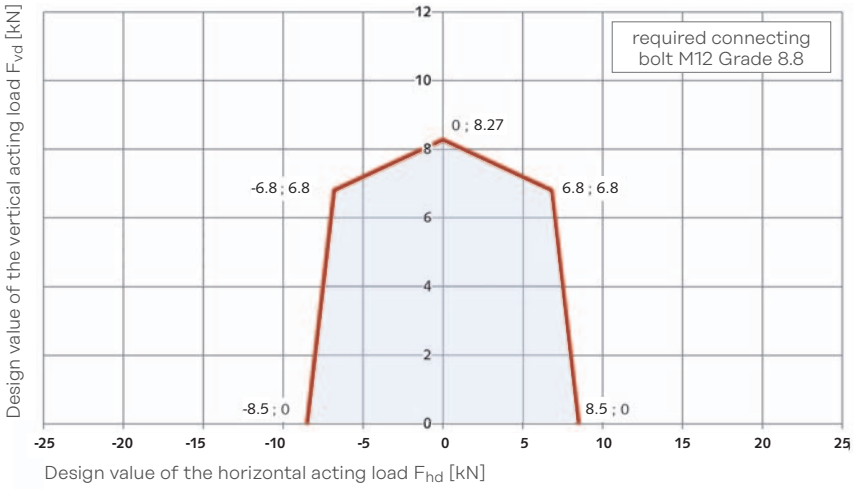
**Serrated washers must be ordered separately**

| Size | Bracket code | A | B | C | D | E | F | G | H | J | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Small | HCW-ED 1<br>HCW-EW 1 | 108 | 70 | 114 | 10 | 57 | 64 | 25 | 51 | 36 | 40 | 57 |
| Medium | HCW-ED 2 | 133 | 70 | 127 | 10 | 64 | 64 | 51 | 51 | 36 | 40 | 82 |
| Large | HCW-ED 3<br>HCW-EW 3 | 159 | 70 | 140 | 10 | 70 | 64 | 76 | 51 | 36 | 40 | 108 |

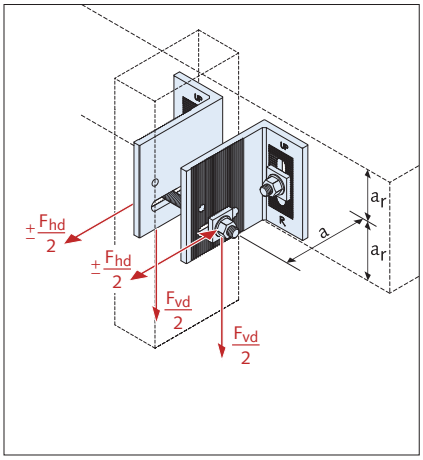
# Halfen Curtain Wall Support Systems

## Dimensioning

### Interaction diagram for type HCW-ED1 (small)

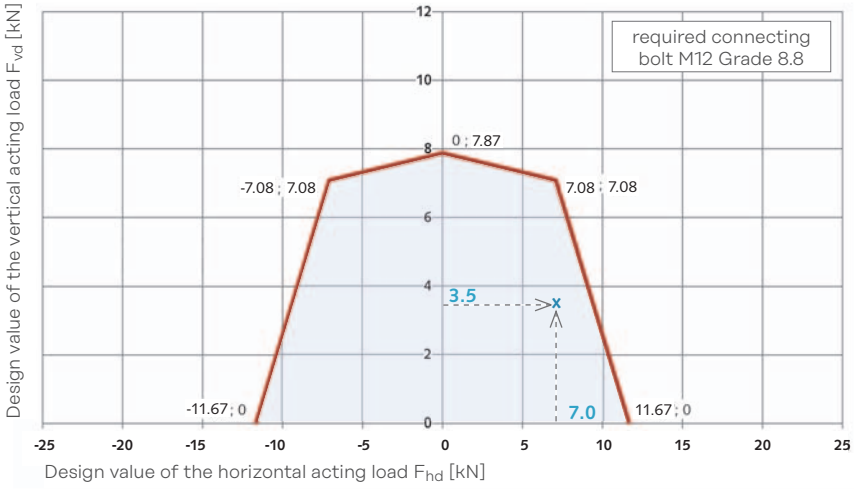



### Calculation basis

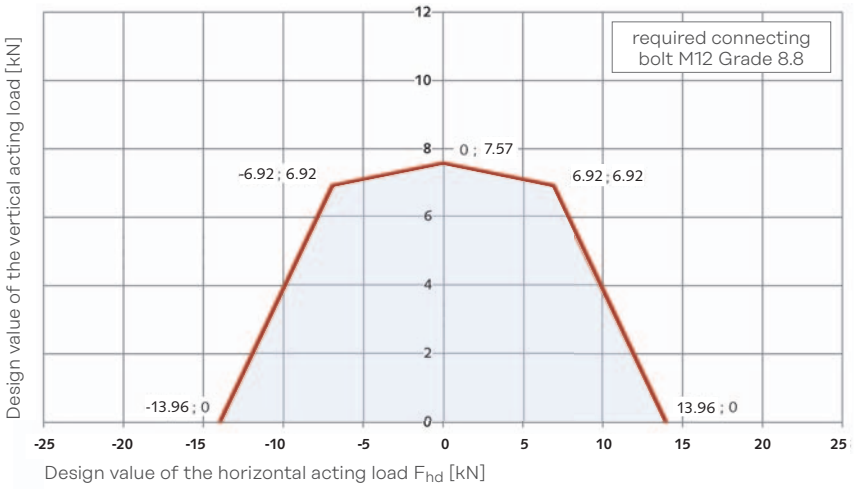



Permitted load interaction area

### Interaction diagram for type HCW-ED2 (medium)




### Interaction diagram for type HCW-ED3 (large)



# Halfen Curtain Wall Support Systems

Design loads HCW-EW; HCW-ED

## Design loads using two HCW-EW Brackets, loads in the Halfen Bolts (HCW-ED)

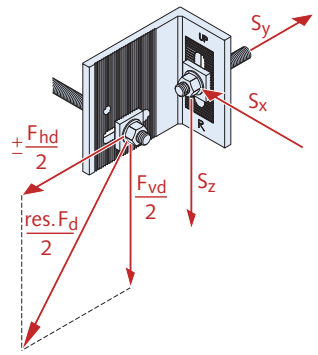
### Design wind loads for type HCW-EW

| Max. applied design load $F_{hd}$ [kN] | | | |
|---|---|---|---|
| Size | Bracket code | max. $F_{vd}$ [kN] | max. $F_{hd}$ [kN] |
| Small | **HCW-EW 1** | 0 | 8.5* |
| Large | **HCW-EW 3** | 0 | 13.96* |

HCW-EW Brackets are only suitable for wind loads.
*Safety factors from EN 1992 included

### Calculation basis

Definition of the loads in the
- bracket/post connection
- bracket/channel connection

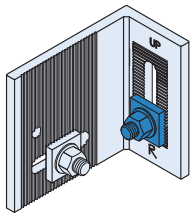



### Forces acting on the Halfen Bolts at the channel (HCW-ED)

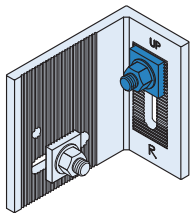
The components of the design-reaction forces in the Halfen Bolts at the connection of the curtain wall bracket to Halfen Cast-in channel, are calculated by multiplying the design loads $F_{vd}$ and $F_{hd}$ at connection curtain wall bracket and façade support post with the factors $s_x$, $s_y$ and $s_z$. The factors are dependent on the bracket geometry, the load direction and the bolt position (see figure on the right). See table below for multiplication factors for determining the design reaction forces in the Halfen Bolts.

| Lower installation position of Halfen Bolt (Position 3) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Dead load $S_i = (F_{vd} / 2) \times s_i$ | | | Wind load $S_i = (F_{hd} / 2) \times s_i$ | | | Resulting load 45° $S_i = (\text{res. } F_d / 2) \times s_i$ | | |
| Bracket | $s_x$ | $s_y$ | $s_z$ | $s_x$ | $s_y$ | $s_z$ | $s_x$ | $s_y$ | $s_z$ |
| **HCW-ED 1** | 0.5 | 3.2 | −1.0 | −1.0 | 1.0 | 0.0 | −0.3 | 3.0 | −0.7 |
| **HCW-ED 2** | 0.5 | 3.6 | −1.0 | −0.5 | 1.0 | 0.0 | 0.0 | 3.3 | −0.7 |
| **HCW-ED 3** | 0.5 | 4.0 | −1.0 | −0.4 | 1.0 | 0.0 | 0.1 | 3.5 | −0.7 |
| **Upper installation position of Halfen Bolt (Position 1)** | | | | | | | | | |
| **HCW-ED 1** | 0.6 | 1.3 | −1.0 | −1.0 | 3.6 | 0.0 | −0.3 | 3.4 | −0.7 |
| **HCW-ED 2** | 0.6 | 1.6 | −1.0 | −0.5 | 3.1 | 0.0 | 0.0 | 3.4 | −0.7 |
| **HCW-ED 3** | 0.6 | 1.9 | −1.0 | −0.4 | 2.9 | 0.0 | 0.1 | 3.4 | −0.7 |

① Lower installation position of Halfen Bolts **(Position 3)**



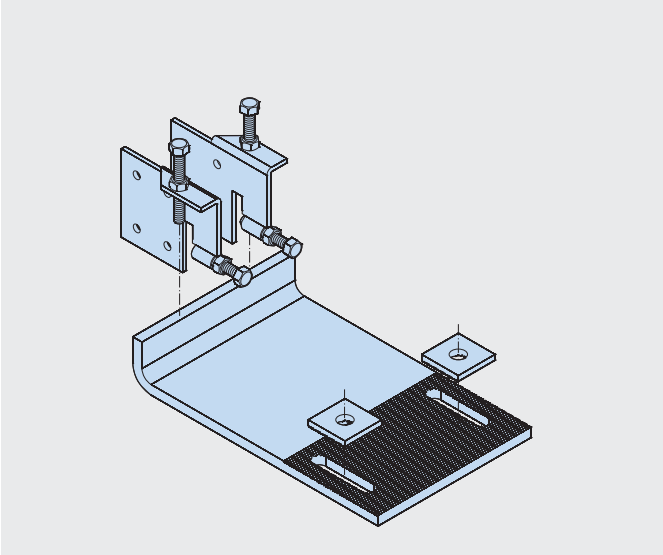
② Upper installation position of Halfen Bolts **(Position 1)**



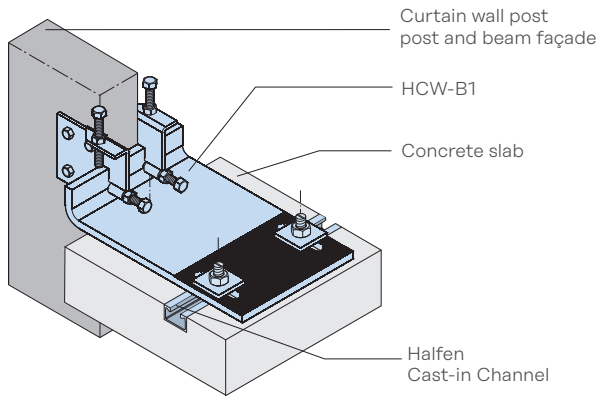
# Halfen Curtain Wall Support Systems

## Top of Slab Brackets HCW-B1

### Support brackets for horizontal and vertical loads



**Typical installation**

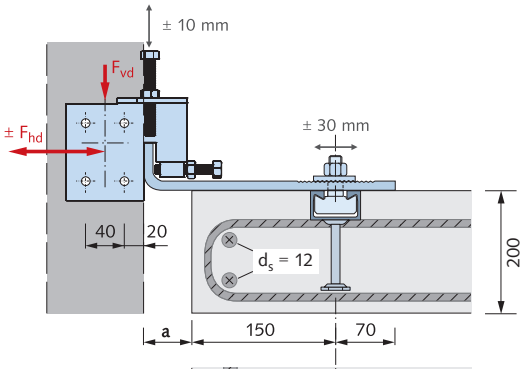



**Halfen Brackets HCW-B1**

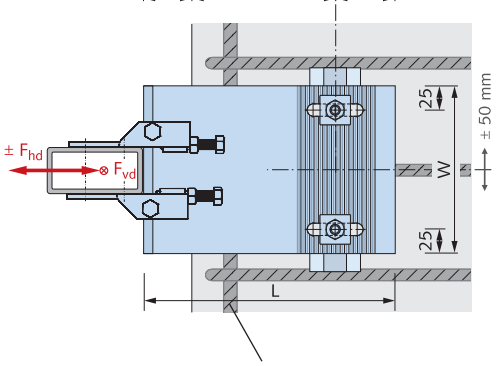
Halfen Brackets HCW-B1 for installing to the top of concrete slabs, are available in two load ranges and three cantilever sizes.
The brackets are made in grade S355 quality galvanized steel.
Vertical adjustability is ±10 mm.
Three-dimensional adjustability is ensured when used in combination with Halfen HTA-CE Cast-in Channels.

The lateral connecting plates are connected to the façade posts using M8 screws (not included). The façade planner is responsible for providing the static verification for the support posts. Use M16 Halfen Bolts, grade 8.8 (order separately), to connect the base bracket to the Halfen Cast-in channel. Depending on the façade type, the connection between the connecting plate and the base bracket can be designed either laterally adjustable or as a fixed point.

**Section**




**Plan**




Required edge reinforcement ≥ ø12 (B500B)

## Dimensioning / Type selection

**Design load ranges**

| Load range [kN] | dead load $F_{vd}$ [kN] | wind load $F_{hd}$ [kN] (wind suction + compression) |
|---|---|---|
| **4/12** | 4 | ±12 |
| **7/20** | 7 | ±20 |

$F_{vd}$, $F_{hd}$: allowable design loads with a partial safety factor $\gamma_F$ = 1.35 for dead load and $\gamma_F$ = 1.5 for wind load.

**Type selection**

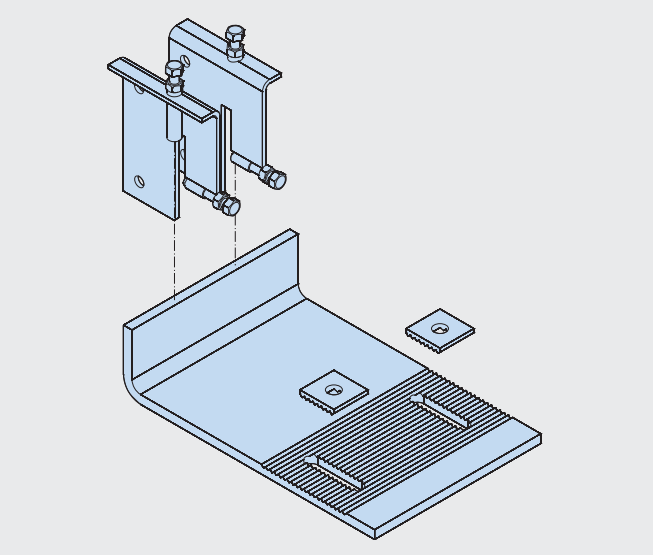
| Load range [kN] | a [mm] | Item name HCW-B1-... | L [mm] | W [mm] | Halfen Channel ① | Recommended Halfen Bolt |
|---|---|---|---|---|---|---|
| **4/12** | 50 | ...-4/12-50 | 270 | 150 | HTA-CE 40/22P-250 2 Anchors | HS 40/22 M16×60 8.8 |
| | 75 | ...-4/12-75 | 295 | 150 | | |
| | 100 | ...-4/12-100 | 320 | 150 | | |
| **7/20** | 50 | ...-7/20-50 | 270 | 175 | HTA-CE 50/30P-300 3 Anchors | HS 50/30 M16×60 8.8 |
| | 75 | ...-7/20-75 | 295 | 175 | | |
| | 100 | ...-7/20-100 | 320 | 200 | | |

① Recommended Halfen Channel exploiting full load capacity of bracket

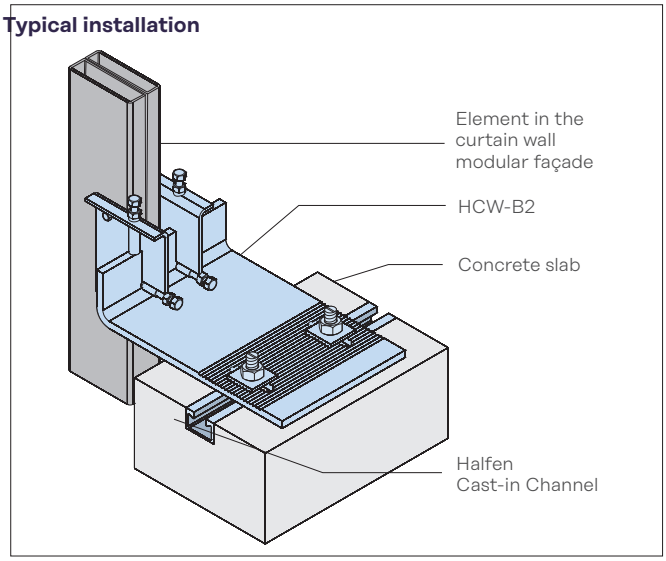
# Halfen Curtain Wall Support Systems

## Top of Slab Brackets HCW-B2

### Brackets for horizontal and vertical loads



**Typical installation**



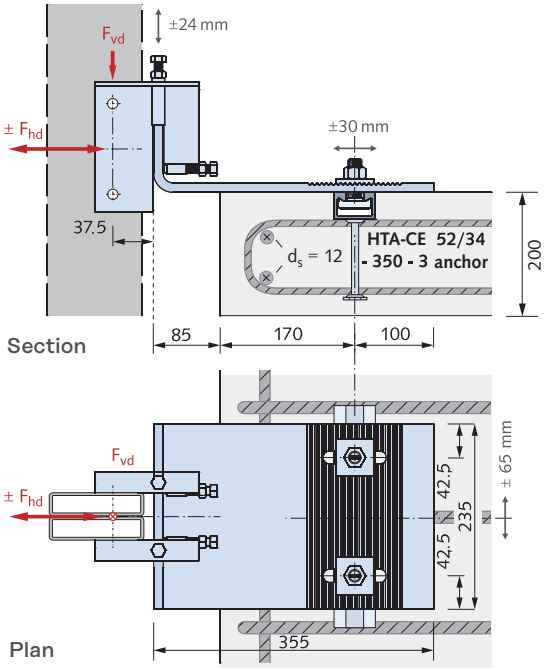

#### Halfen Brackets HCW-B2

Halfen Brackets HCW-B2 are made in grade S355 quality galvanized steel. The vertical adjustability is ±24 mm. Three-dimensional adjustability is ensured when used in combination with Halfen Cast-in Channels HTA-CE.

The lateral connecting plates are connected to the façade posts using M12 screws (not included in delivery).

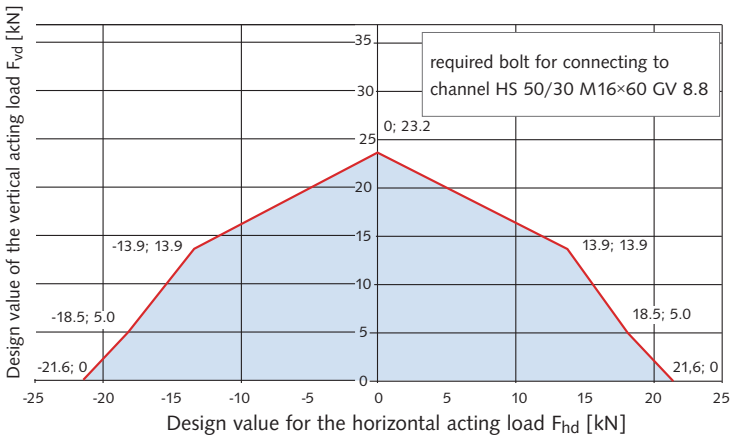
The façade planner is responsible for providing the static verification for the support posts.

Use M16 Halfen Bolts, grade 8.8 (order separately), to connect the base bracket to the Halfen Cast-in channel. Depending on the façade type, the connection between the connecting plate and the base bracket can be designed either laterally adjustable or as a fixed point.




Required edge reinforcement ≥ ø12 (B500B)

#### Dimensioning




Allowable load interaction area

**This diagram is based on Eurocode**
For any questions, please contact your local distributor.
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