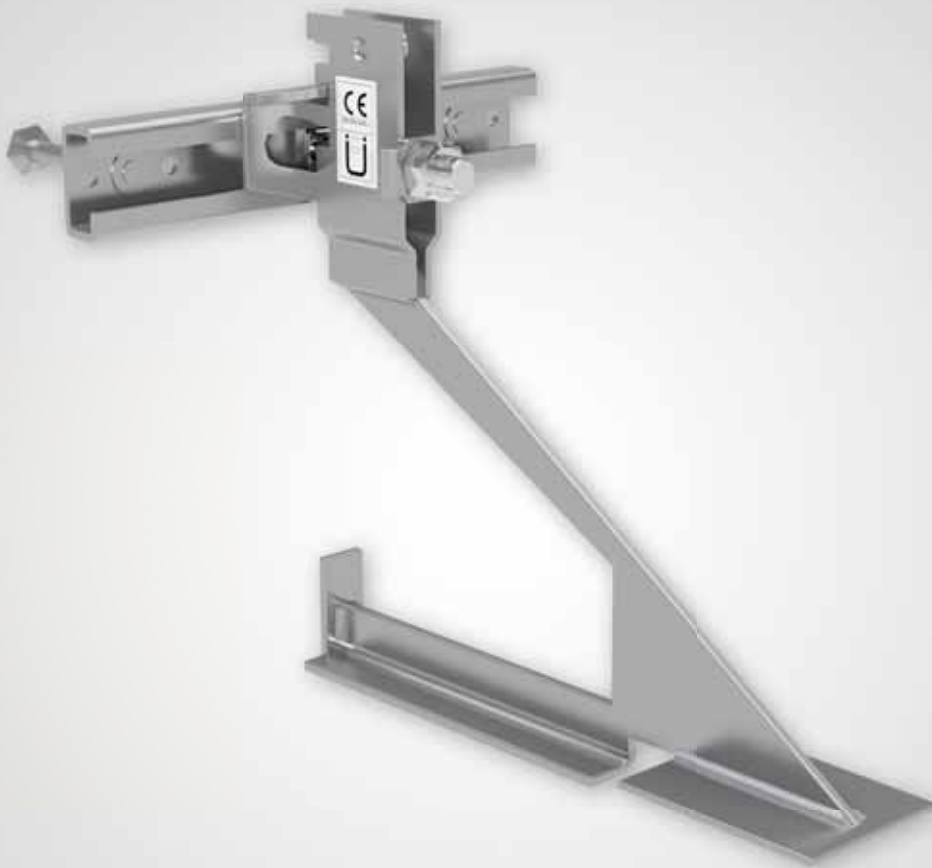


# **HALFEN BRICKWORK SUPPORT**

## **Technical Product Information**





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Leviat is the new name of  
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companies worldwide.

Under the Leviat brand, we have united the expertise, skills and resources of HALFEN and its sister companies to create a world leader in fixing, connecting and anchoring technology.

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By bringing together CRH's construction accessories family as one global organisation, we are better equipped to meet the needs of our customers, and the demands of construction projects, of any scale, anywhere in the world.

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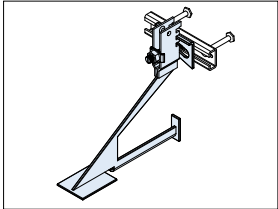
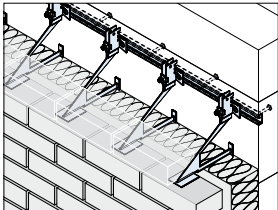
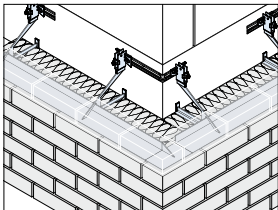
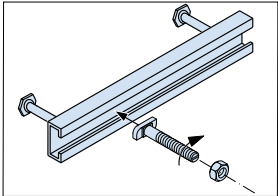
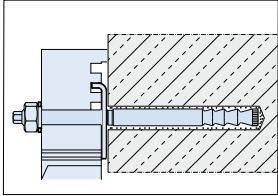
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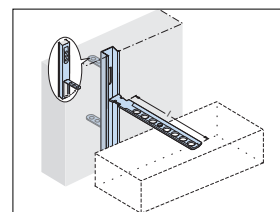
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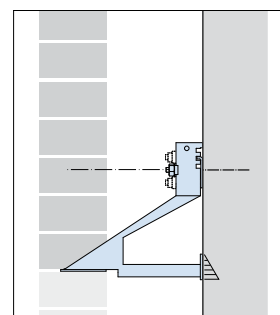


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# HALFEN BRICKWORK SUPPORT BRACKETS

## The advantages at a glance

Our products for façade construction are a combination of many years of experience with continuous innovation. This ensures: top safety standards, fastest building progress and cost efficient high durability.



### Optimized thermal heat transfer

- › slender structural design allows minimal  $\chi$ -values
- › an expert report confirms a reduced effect to the heat transmission coefficient  $U$  [ $W/(m^2 K)$ ] of a façade
- › no additional thermal insulation is required

### High load ranges

- › 4.0 kN
- › 8.0 kN
- › 12.0 kN

### Quality check system

- › building authority approved/ General construction technique permit for the bracket head
- › type tested brackets for up to 350 mm cantilevers

### Our familiar quality

- › up to 350 mm cantilevers
- ›  $\pm 20$  mm vertical adjustability
- ›  $\pm 15$  mm horizontal adjustability

### Lean duplex material

- › stainless high-grade steel of corrosion resistance class (CRC) III
- › in acc. with Z-30.3-6 ie. in acc. with EN 1993-1-4: 2015, Table A.3
- › yield limit  $\geq 400$  N/mm<sup>2</sup> allows smaller cross sections with higher load capacities

### HALFEN Brick ties

- › universal application
- › time saving, no bending of ties required
- › verified and building authority approval/ General construction technique permit for numerous bricks and mortar combinations
- › approved for large cantilevers



More information available on our homepage  
[www.halfen.com](http://www.halfen.com) › products › brickwork support systems



## HALFEN SUPPORT BRACKETS

### More than just a pretty face – an introduction to brick façades

#### The Brickwork support bracket HK5

Facing bricks have excellent material characteristics and are therefore an outstanding solution for durable façade construction. They are maintenance free and weather resistant. With the broad selection available they offer numerous design possibilities and are suitable for different architectural styles. Used in the proven two-leaf construction method they also provide optimal thermal and acoustic insulation.

Based on many years of experience and with our focus on the increased requirements on energy efficiency, we continue to develop and improve our brickwork façade support brackets. The HK5 generation of brickwork support anchors has significant advantages: With its slim structural design thermal bridging has again been reduced by up to 27% in comparison with the already improved HK4 Thermo. Additional measures for insulation, for example, placing insulation strips between the wall and the brackets or similar insulation components are no longer necessary.



In addition, the HALFEN HK5 Brickwork support brackets are suitable for high loads.

The number of anchors and the time required for installation can therefore be reduced.

Façade construction becomes more economic with higher energy efficiency.

#### Certification

Manufactured with in-house production control and CE marked according to DIN EN 845-1/ DIN EN 845-2



#### Quality management-system

for production facilities according to DIN EN ISO 9001

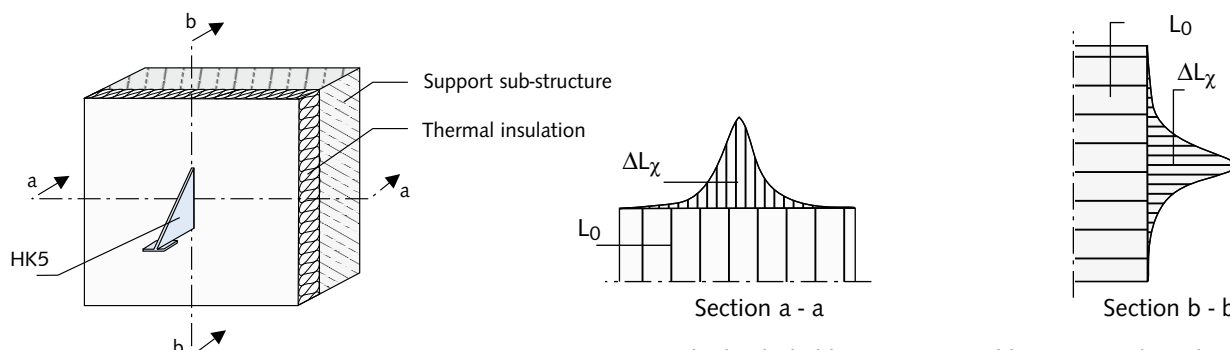


HK5 – with high load capacities and optimized thermal heat transfer

## HALFEN SUPPORT BRACKETS

### Thermal Bridges

Thermal bridge loss coefficient  $\chi$  (chi) for HK5 Brickwork supports



#### Minimal thermal-bridges

A brickwork façade is a durable construction with a pleasing aesthetic appearance and low maintenance costs. Cavity wall construction is a very reliable design method providing good heat insulation, a good moisture barrier as well as being a good noise barrier. Of increased importance is thermal heat loss.

The brick-cladding is supported by HK5 Brackets through the insulation layer to the main structure. These brackets cause thermal heat bridges. With effective planning our aim is to keep the thermal heat bridges as small as possible. Using the thermal heat loss coefficient  $\chi$  (chi) it is possible to determine the exact effect of the HK5 Support brackets on the heat transmission coefficient for the wall.

Thermal bridge loss coefficient $\chi$ (chi) -value per bracket [W/K](thermal conductivity of insulation / $\lambda = 0.035$ [W/(mK)]); fixing to concrete substrate)													
Thermal insulation d [cm]	2	4	6	8	10	12	14	16	18	20	22	24	26
HK5 -	4.0 - 130	0.087	0.080										
	8.0 - 130	0.114	0.108										
	12.0 - 130	0.128	0.123										
HK5 -	4.0 - 150	0.074	0.077	0.055									
	8.0 - 150	0.098	0.110	0.083									
	12.0 - 150	0.110	0.125	0.096									
HK5 -	4.0 - 170	0.066	0.063	0.041	0.028								
	8.0 - 170	0.082	0.083	0.058	0.040								
	12.0 - 170	0.094	0.098	0.069	0.045								
HK5 -	4.0 - 190	0.066	0.062	0.039	0.028	0.022							
	8.0 - 190	0.082	0.081	0.055	0.038	0.031							
	12.0 - 190	0.093	0.096	0.065	0.044	0.035							
HK5 -	4.0 - 210	0.065	0.062	0.038	0.027	0.022	0.018						
	8.0 - 210	0.081	0.081	0.053	0.035	0.030	0.026						
	12.0 - 210	0.093	0.095	0.064	0.042	0.034	0.029						
HK5 -	4.0 - 230	0.066	0.064	0.041	0.029	0.024	0.021	0.018					
	8.0 - 230	0.081	0.081	0.053	0.036	0.029	0.025	0.021					
	12.0 - 230	0.094	0.097	0.065	0.043	0.033	0.028	0.025					
HK5 -	4.0 - 250	0.066	0.063	0.041	0.029	0.024	0.021	0.018	0.016				
	8.0 - 250	0.081	0.081	0.063	0.035	0.028	0.024	0.022	0.019				
	12.0 - 250	0.094	0.097	0.065	0.043	0.033	0.028	0.025	0.022				
HK5 -	4.0 - 270	0.067	0.064	0.041	0.029	0.024	0.021	0.018	0.016	0.014			
	8.0 - 270	0.081	0.082	0.053	0.035	0.028	0.024	0.021	0.019	0.017			
	12.0 - 270	0.094	0.096	0.065	0.043	0.033	0.028	0.025	0.022	0.020			
HK5 -	4.0 - 290	0.067	0.064	0.041	0.029	0.024	0.021	0.018	0.016	0.015	0.013		
	8.0 - 290	0.081	0.082	0.053	0.035	0.028	0.024	0.021	0.019	0.017	0.016		
	12.0 - 290	0.097	0.100	0.070	0.047	0.038	0.032	0.028	0.026	0.023	0.021		
HK5 -	4.0 - 310	0.067	0.064	0.041	0.030	0.025	0.022	0.019	0.017	0.015	0.014	0.012	
	8.0 - 310	0.081	0.081	0.053	0.036	0.029	0.025	0.022	0.019	0.017	0.016	0.014	
	12.0 - 310	0.097	0.100	0.070	0.048	0.038	0.033	0.029	0.026	0.023	0.021	0.019	
HK5 -	4.0 - 330	0.073	0.071	0.049	0.037	0.031	0.027	0.024	0.022	0.020	0.018	0.017	0.015
	8.0 - 330	0.087	0.088	0.061	0.043	0.036	0.031	0.027	0.025	0.022	0.021	0.019	0.017
	12.0 - 330	0.097	0.100	0.070	0.047	0.038	0.033	0.028	0.025	0.023	0.021	0.020	0.018
HK5 -	4.0 - 350	0.072	0.070	0.049	0.036	0.031	0.027	0.024	0.022	0.020	0.018	0.017	0.016
	8.0 - 350	0.086	0.087	0.060	0.043	0.036	0.029	0.027	0.024	0.022	0.020	0.019	0.018
	12.0 - 350	0.095	0.098	0.069	0.046	0.037	0.031	0.026	0.025	0.023	0.021	0.019	0.018

Façade with core insulation



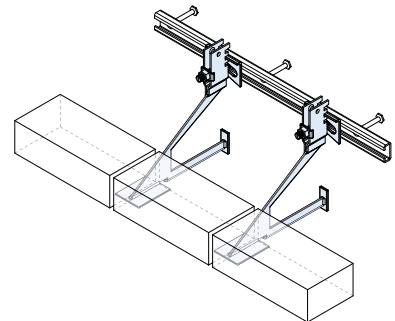
## HALFEN SUPPORT BRACKETS

### Sample Applications

#### Applications

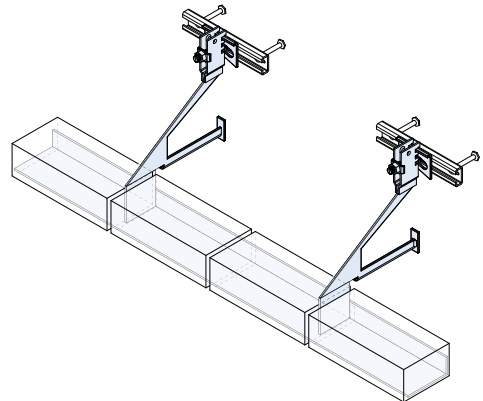
##### HK5-U

The universal standard for support in perpend joints is available in several types, see page 12–13



##### HK5-FV

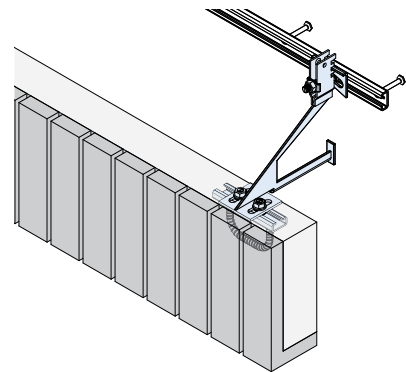
The standard type for support above window openings allows larger spacing between the support brackets. Variants for different applications are available, see page 14–15



##### HK5-S with HTA-ES

Precast lintel support

The precast unit is horizontally and vertically adjustable for exact alignment, see page 23



#### Materials:

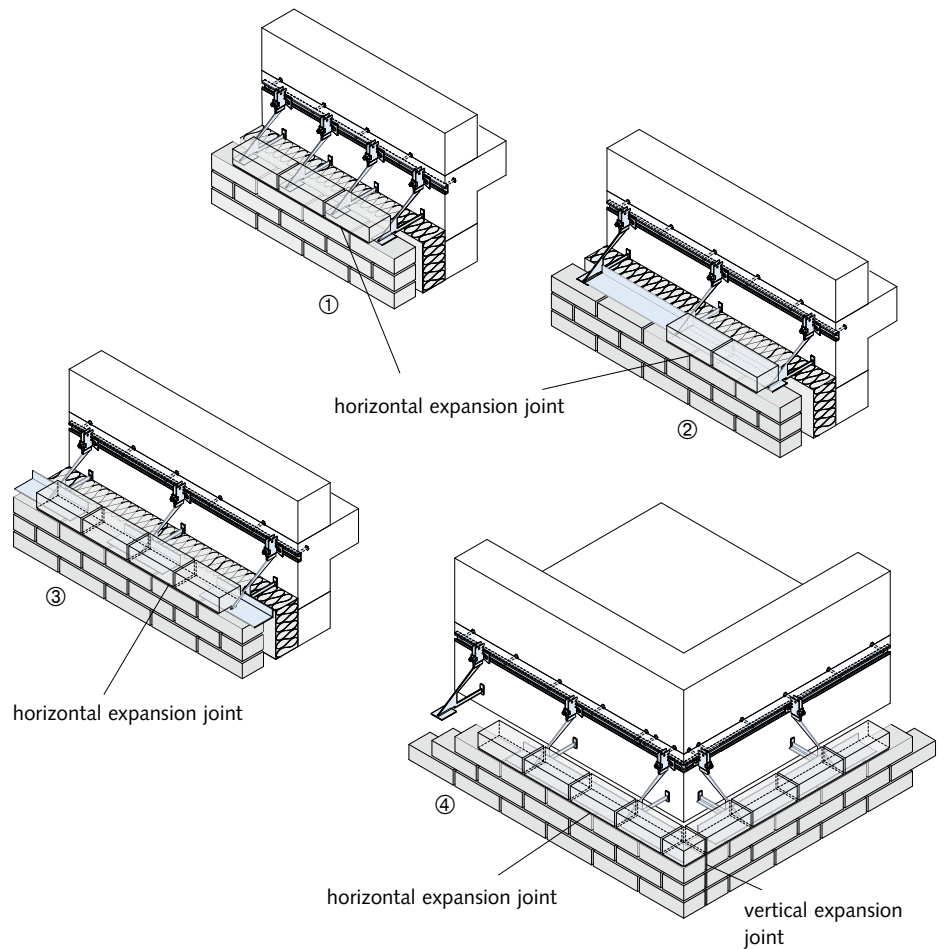
- L4: Steel, corrosion resistance class (CRC) III according to Z-30.3-6 and EN 1993-1-4: 2015, table A.3 (Group 1.4062, 1.4162, 1.4362...).
- A4: Steel, corrosion resistance class (CRC) III according to Z-30.3-6 and EN 1993-1-4: 2015, table A.3 (Group 1.4404, 1.4571...).
- A2: Steel, corrosion resistance class (CRC) II according to Z-30.3-6 and EN 1993-1-4: 2015, table A.3 (Group 1.4307...).
- HCR: Steel, corrosion resistance class (CRC) V according to Z-30.3-6 and EN 1993-1-4: 2015, table A.3 (Group 1.4565, 1.4529...).

## HALFEN SUPPORT BRACKETS

### Sample Applications

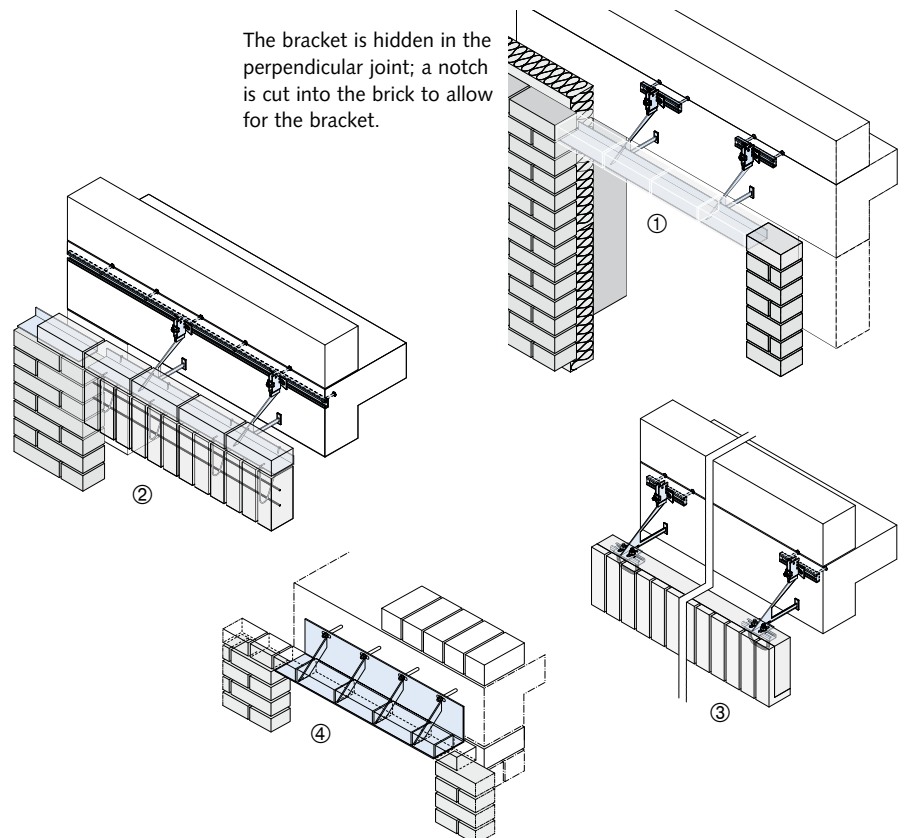
#### Continuous wall surface

- ① HK5-U Single support brackets,  
spacing  $e = 25$  cm,  
see page 12–13
- ② HK5-U Single support brackets,  
spacing  $e \geq 50$  cm,  
and HW 95 Support angle,  
see page 12 and page 20–21
- ③ HK5-P Angle support brackets,  
spacing  $e = 50$  cm,  
see page 18
- ④ Edge situation with  
HK5-F Angle support brackets,  
see page 14–15



#### Support over wall openings

- ① Visible support with  
HK5-F angle support bracket,  
see page 14–15
- ② Invisible support with  
HK5-F angle support bracket  
and HSL Suspension loops,  
see page 14–17
- ③ Precast lintel support with HK5-S or SV  
Single support bracket in combination  
with HTA-ES Cast-in channels,  
see page 22–23
- ④ KWL Angles; anchor bolt fixing,  
see page 19



## HALFEN SUPPORT BRACKETS

### Sample Applications

#### KM Grout-in brackets

Support with grout-in brackets and support angles placed between the grout-in brackets, see page 24

#### HAV Parapet support brackets

Wind-resistant support of parapet brickwork facing on horizontally sliding roof slabs, see page 25

#### HK5-FLR Support brackets for brick-facing on columns

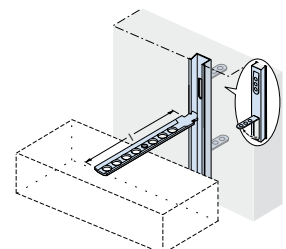
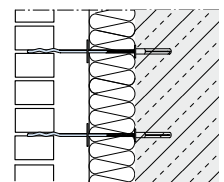
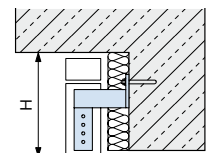
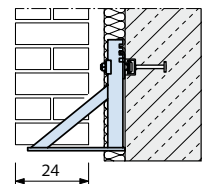
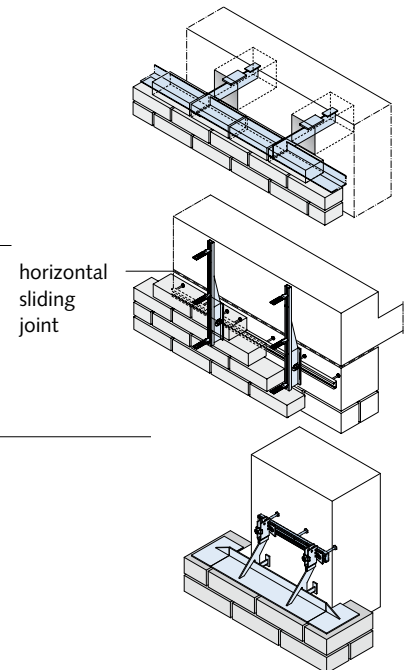
With angle support brackets, special construction, see page 15

HK Special support brackets for larger loads (loads up to 26 kN)

Model HK0-UL – 0.5 for low height installations

Cavity wall ties for horizontal load support, see page 26–28

Brickwork connection anchor for horizontal load support, see page 35–37



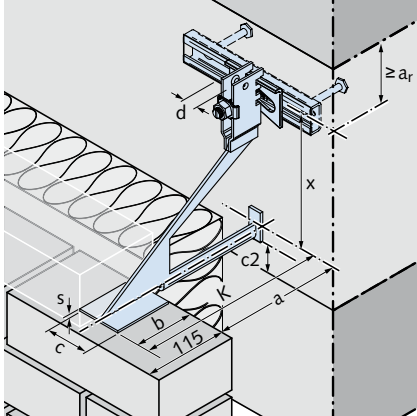
Installation with HALFEN Anchor bolt systems: More information can be found in Technical Product Information: "HALFEN HB Anchor bolt systems".  
[www.halfen.com](http://www.halfen.com) ▷ Product Ranges ▷ Fixing systems ▷ Anchor bolt systems



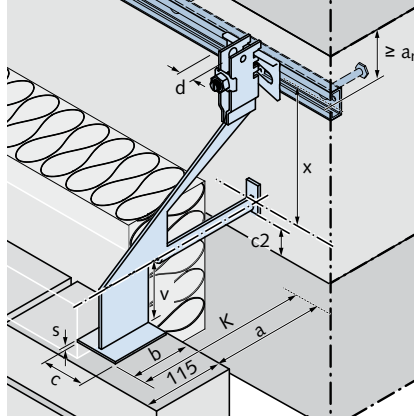
## HALFEN SUPPORT BRACKETS

### HK5-U, HK5-W Single Support Brackets

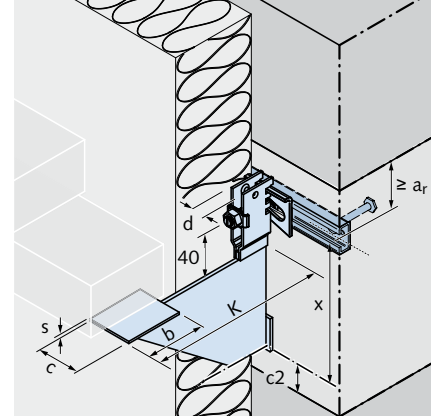
HK5 - U



HK5 - UV



HK5 - UT

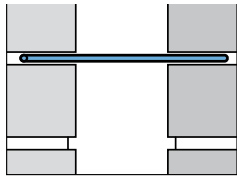


The HK5-U Single support bracket is a standard single bracket with optimized web plate and a support-plate.

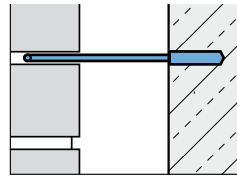
Used in combination with HALFEN HTA Cast-in channels, the adjustable HK5-U Wall bracket provides an easy-to-install, cost-effective and safe construction.

The specified load-bearing capacities are for fixings in concrete  $\geq C20/25$ .

#### Accessories

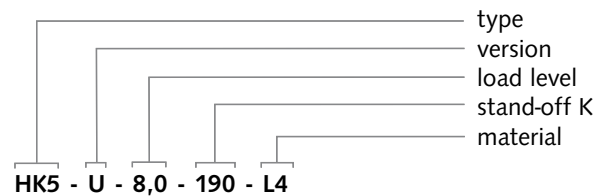


Cavity wall tie,  
see page 27, 28



Cavity wall tie  
for drill fixing  
see page 26

#### Order example



#### Note

- $c_2$  = required edge distance according to type test report or static calculation
- additional suspension height up to 350 mm
- $a_r$  = required edge distance in accordance with the ETA (European Technical Assessment) for the anchorage

#### Selecting HK5 Single support brackets

		Spacing a from wall [mm]	Load class $F_V = 4.0 \text{ kN}$ ( $F_{Rd} = 5.4 \text{ kN}$ )		Load class $F_V = 8.0 \text{ kN}$ ( $F_{Rd} = 10.8 \text{ kN}$ )		Load class $F_V = 12.0 \text{ kN}$ ( $F_{Rd} = 16.2 \text{ kN}$ )	
			Length K		Length K		Length K	
			x		x		x	
    	-U	40 ± 15	130	150	130	200	130	264
	-UV	60 ± 15	150	150	150	200	150	264
	-UT	80 ± 15	170	150	170	200	170	264
	-W*	100 ± 15	190	150	190	200	190	264
	-WV*	120 ± 15	210	150	210	200	210	264
		140 ± 15	230	175	230	250	230	314
		160 ± 15	250	175	250	250	250	314
		180 ± 15	270	180	270	270	270	334
		200 ± 15	290	200	290	290	290	354
		220 ± 15	310	220	310	310	310	374
		240 ± 15	330	240	330	330	330	394
		260 ± 15	350	260	350	350	350	414
Dimensions in mm	Support plate b × c × s		80 × 60 × 3		80 × 60 × 4		100 × 80 × 5	
	Notch spacing d		12.5		16.5		16.5	

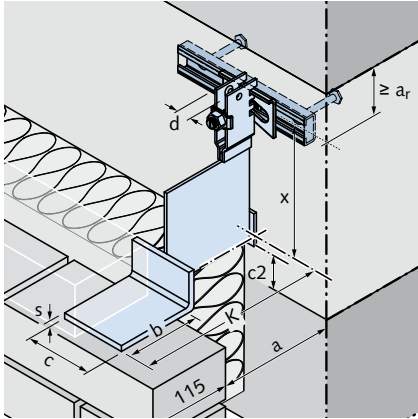
\* HK5-W only for load range 4.0 kN and 8.0 kN / HK5-WV only for load range 4.0 kN

① other brick dimensions are also possible

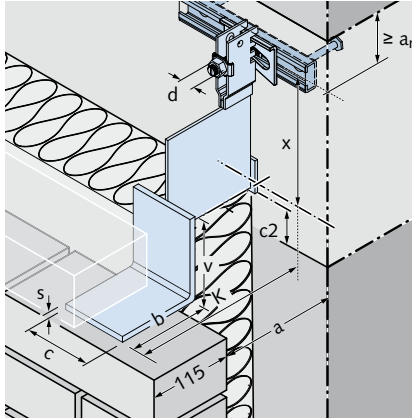
## HALFEN SUPPORT BRACKETS

### HK5-U, HK5-W Single Support Brackets

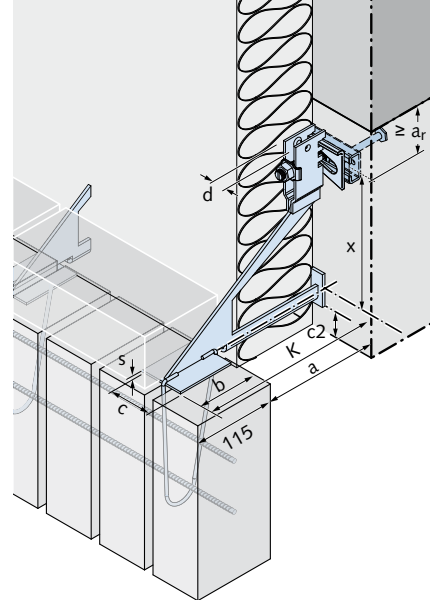
HK5 - W



HK5 - W

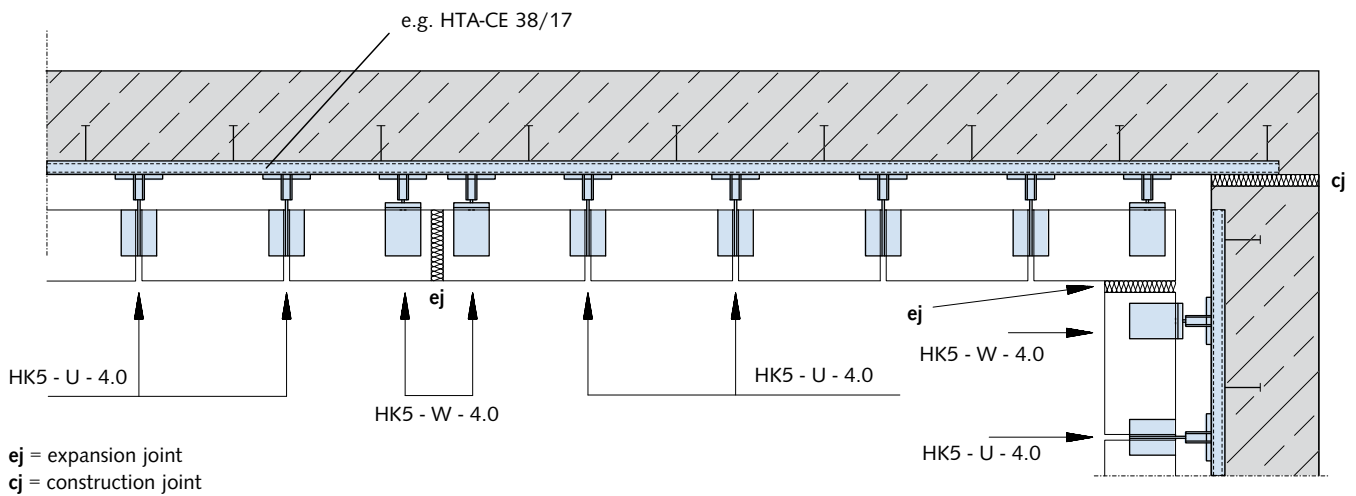


HK5-U with suspension loop



#### Example:

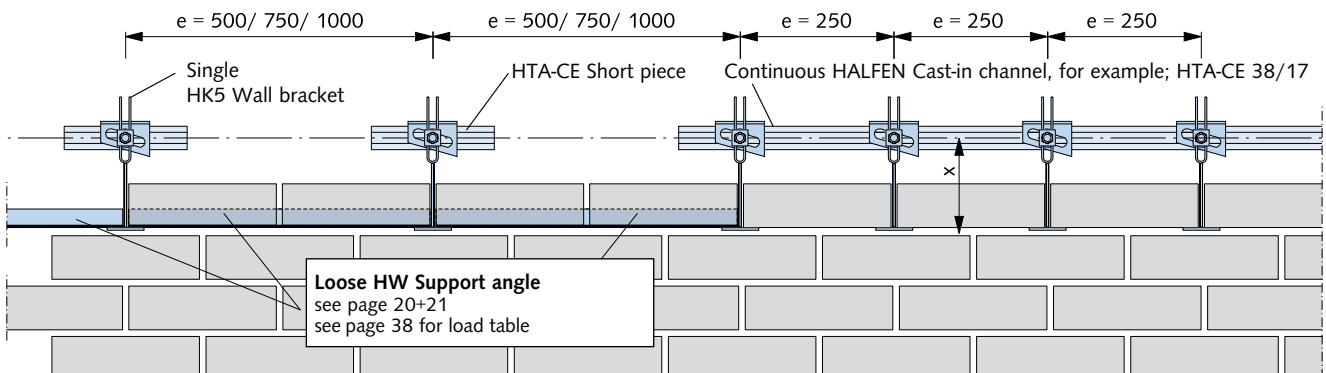
Brickwork cladding support with height =  $H \leq 6.00\text{ m}$



#### Example:

Support with and without support angle

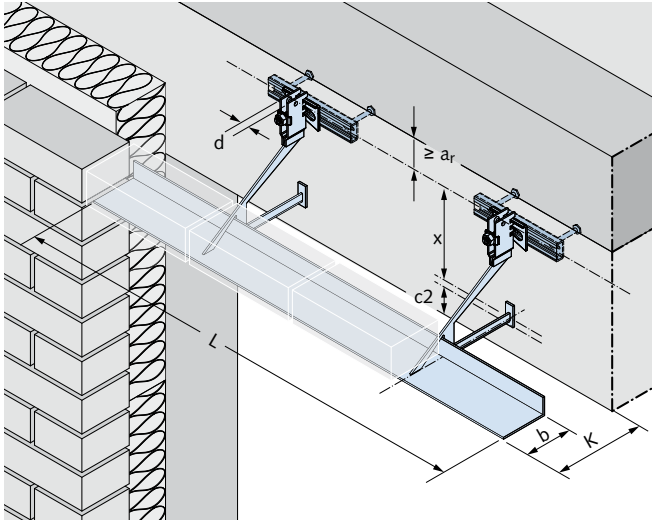
All dimensions in mm



## HALFEN SUPPORT BRACKETS

### Continuous HK5 - F Angle Support Bracket

HK5 - F



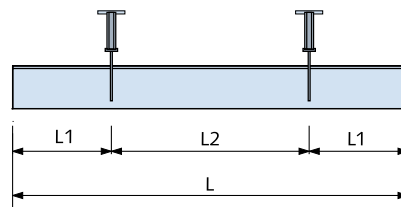
Standard version HK5 with angle and two supports

For support of low-height brickwork cladding, e.g. parapets above window openings; allows larger brackets spacing.

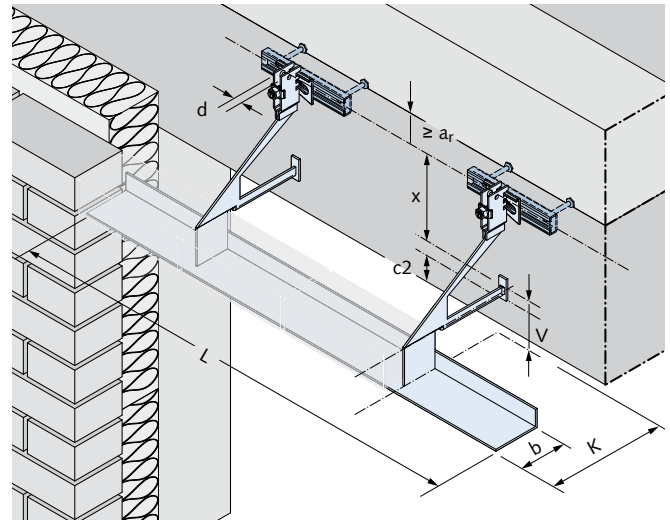
**Note:** Support the brickwork while work is in progress until sufficient stability has been reached to avoid excessive deflection of the angle support bracket.

#### Note

- $c_2$  = required edge distance according to type test report or static calculation
- additional suspension height up to 350 mm
- $a_r$  = required edge distance in accordance with the ETA for the anchorage



HK5 - FV

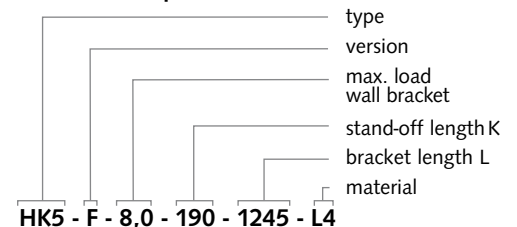


With height offset to the front;  
additional suspension height  $v$  up to 350 mm

Standard lengths [mm] for HK5 - F/- FV

L1	L2	L
247.5	500	995
247.5	750	1245
247.5	1000	1495

#### Order example



#### Selecting HK5 Angle support bracket

		Spacing $a$ from wall [mm]	Load class $F_V = 4.0 \text{ kN}^{\text{①}}$ ( $F_{Rd} = 5.4 \text{ kN}$ )		Load class $F_V = 8.0 \text{ kN}^{\text{①}}$ ( $F_{Rd} = 10.8 \text{ kN}$ )		Load class $F_V = 12.0 \text{ kN}^{\text{①}}$ ( $F_{Rd} = 16.2 \text{ kN}$ )	
			Length K		Length K		Length K	
			x		x		x	
		40 ± 15	130	150	130	200	130	264
		60 ± 15	150	150	150	200	150	264
		80 ± 15	170	150	170	200	170	264
		100 ± 15	190	150	190	200	190	264
		120 ± 15	210	150	210	200	210	264
		140 ± 15	230	175	230	250	230	314
		160 ± 15	250	175	250	250	250	314
		180 ± 15	270	180	270	270	270	334
		200 ± 15	290	200	290	290	290	354
		220 ± 15	310	220	310	310	310	374
		240 ± 15	330	240	330	330	330	394
		260 ± 15	350	260	350	350	350	414
Dimensions in mm	Angle width b		100		100		100	
	Width of notched bracket d		12.5		16.5		16.5	

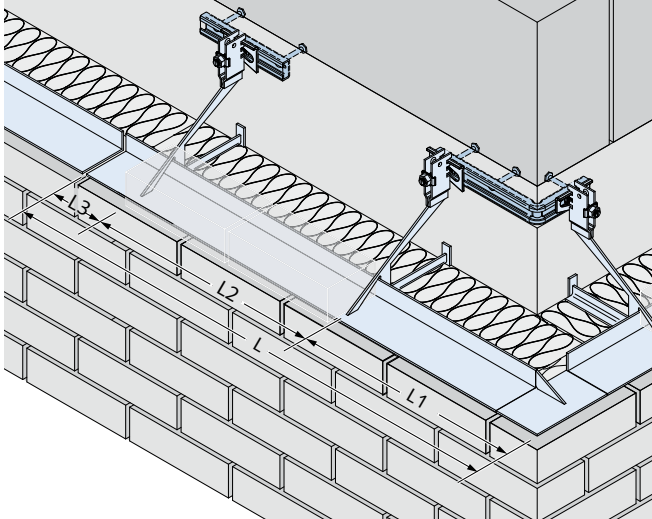
① load class, HK5 Angle support brackets



## HALFEN SUPPORT BRACKETS

### Continuous HK5-F Angle Support Bracket

HK5 - FR

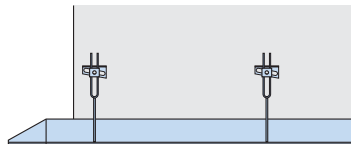


Right-corner support element

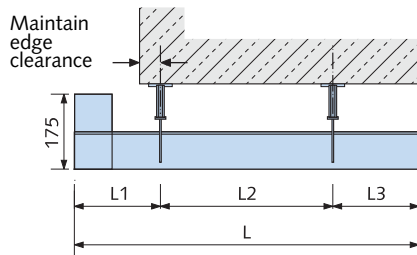
#### Custom solutions:

**HK5-FL with left-hand corner**  
(HK5-FLR for columns, 2 corner elements)

Elevation

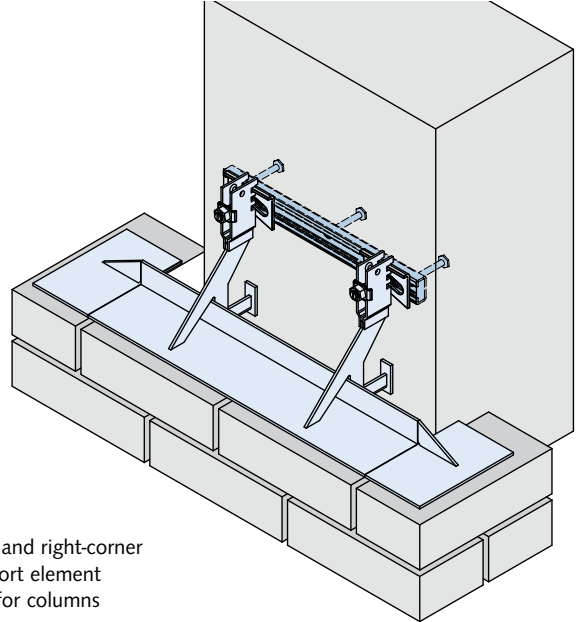


Plan



Order example: HK5-FL-8.0 - 180 - 990 (305/440/245)

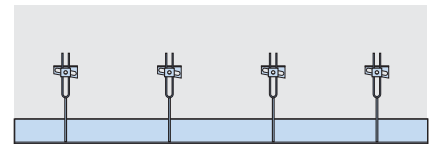
HK5 - FLR



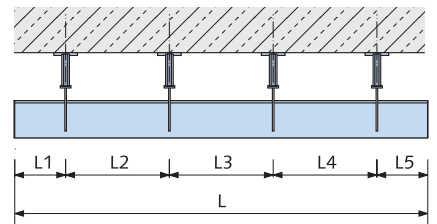
Left- and right-corner  
support element  
e.g. for columns

Angle support brackets; more than 2 brackets and custom  
dimensions, max.  $L \leq 4000$  mm

Elevation



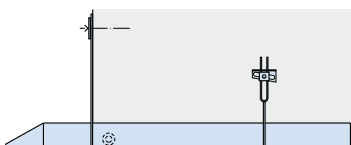
Plan



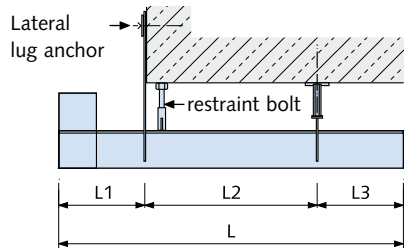
HK5-F - 8.0 - 180 - L (L1/L2/L3/L4/L5)

#### HK5-FL with left-corner, with 1 lateral anchor strap

Elevation

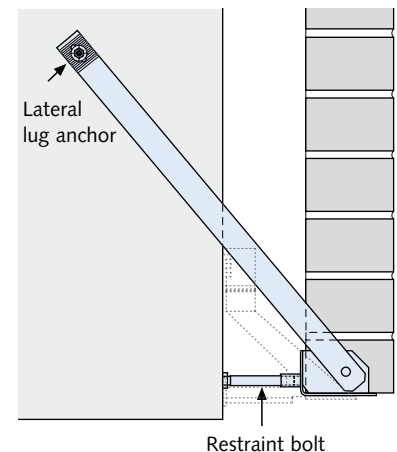


Plan



Order example: HK5-FL - 8.0 - 180 - L (L1/L2/L3) with 1 lateral strap anchor, **left**

Vertical section

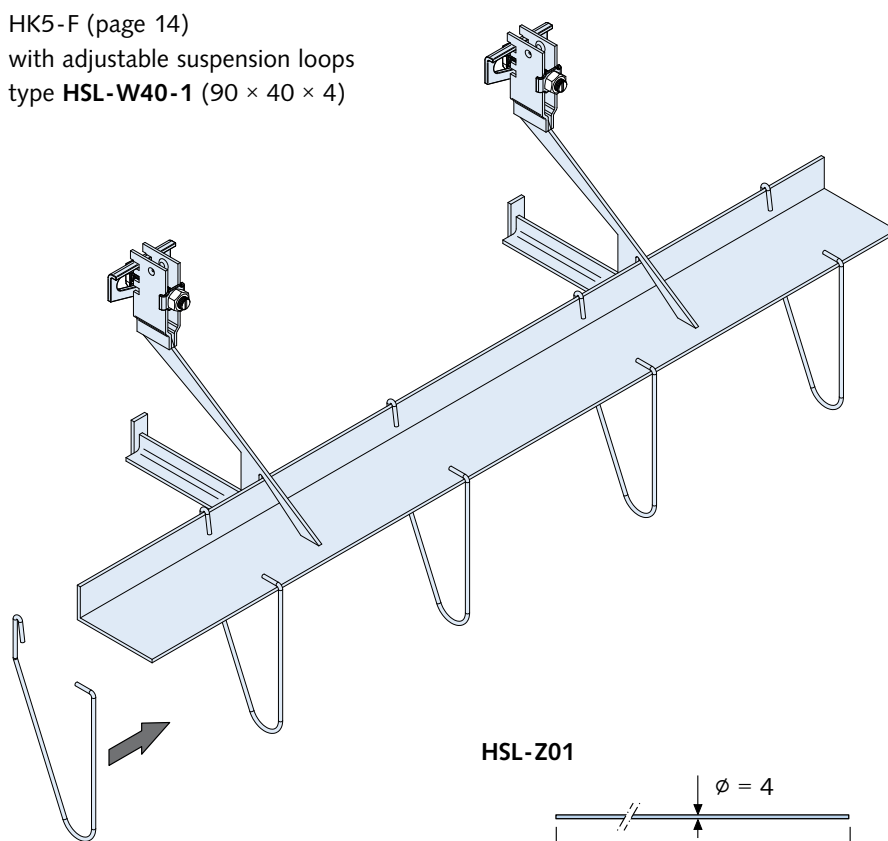


## HALFEN SUPPORT BRACKETS

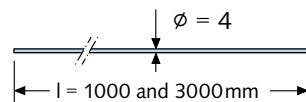
### Suspension Loops

#### Overview

HK5-F (page 14)  
with adjustable suspension loops  
type **HSL-W40-1** ( $90 \times 40 \times 4$ )

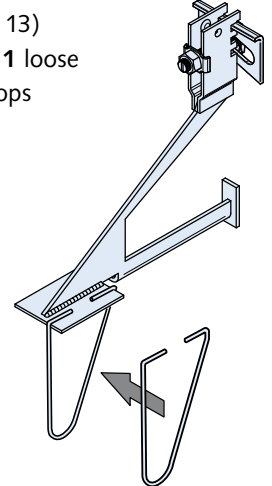


**HSL-Z01**



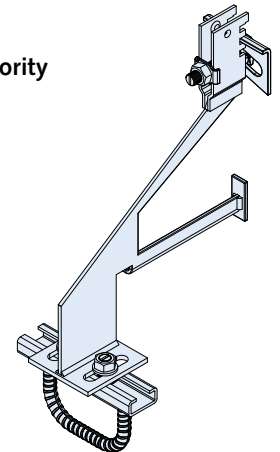
Stainless steel wire as longitudinal reinforcement for suspended soldier courses, diameter  $\phi$  4 mm, material: W 1.4571 or 1.4404 (A4)

HK5-U (page 13)  
with **HSL-A1-1** loose  
suspension loops



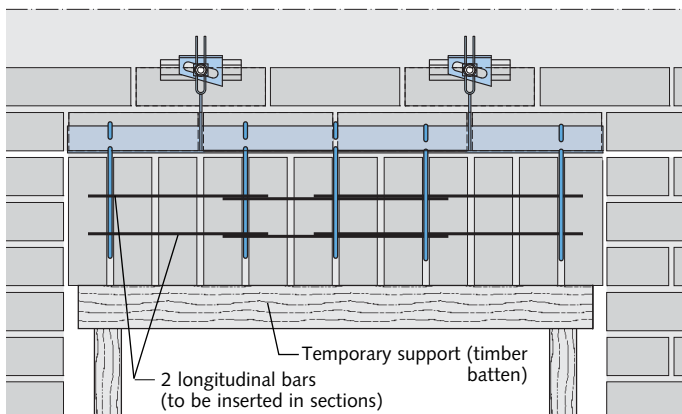
HK5-S (see page 22)  
with **HTA-ES**

building authority  
approved



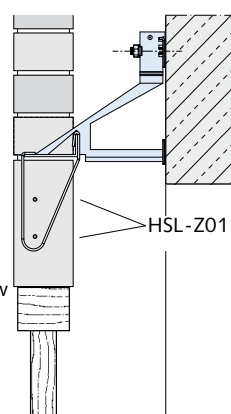
Example: supporting soldier courses with concealed supports

**Note:** Bricks have to be suitable for application in soldier courses (rough surface).



**HK5-F**  
Angle  
support  
bracket

Place  
**HSL-W**  
loop  
onto the  
bracket  
and allow  
to hang.

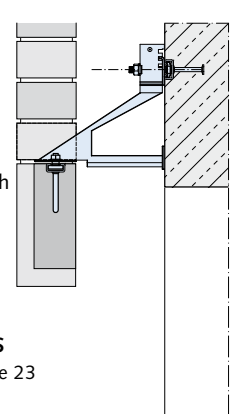


Detail with prefabricated lintel

**HK5-S**  
Support  
bracket

Precast  
lintel with  
**HALFEN**  
Cast in  
channel.

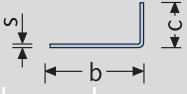
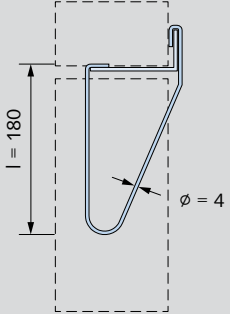
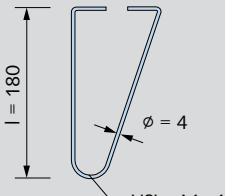
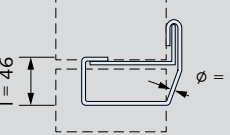

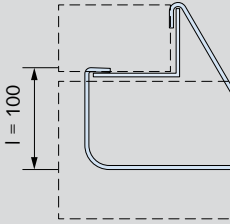
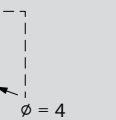
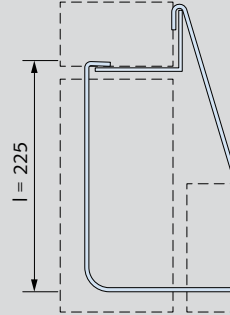

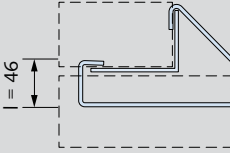
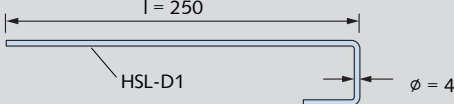
**HTA-ES**  
see page 23



## HALFEN SUPPORT BRACKETS

### Suspension Loops

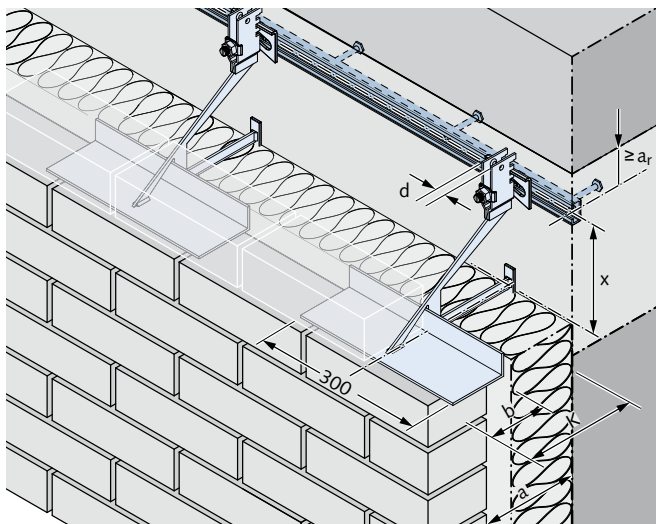
Selection – suspension loop type HSL

Design		Type	Support bracket dimensions [mm]				Article name
				b	c	s	
  HSL - A1 - 1	1	W20	90 - 100	20	2 - 6	HSL - W20 - 1	
	1	W30	90 - 100	30	3 - 6	HSL - W30 - 1	
	1	W40	90 - 100	40	3 - 6	HSL - W40 - 1	
	1	W50	90 - 100	50	3 - 6	HSL - W50 - 1	
	1	W60	90 - 100	60	3 - 6	HSL - W60 - 1	
	1	W70	90 - 100	70	4 - 8	HSL - W70 - 1	
	1	W80	90 - 100	80	4 - 8	HSL - W80 - 1	
	1	W90	90 - 100	90	4 - 8	HSL - W90 - 1	
	1	A1	Support bracket b = 80			HSL - A1 - 1	
  HSL - A1 - 2	2	W20	90 - 100	20	2 - 6	HSL - W20 - 2	
	2	W30	90 - 100	30	3 - 6	HSL - W30 - 2	
	2	W40	90 - 100	40	3 - 6	HSL - W40 - 2	
	2	W50	90 - 100	50	3 - 6	HSL - W50 - 2	
	2	W60	90 - 100	60	3 - 6	HSL - W60 - 2	
	2	W70	90 - 100	70	4 - 8	HSL - W70 - 2	
	2	W80	90 - 100	80	4 - 8	HSL - W80 - 2	
	2	W90	90 - 100	90	4 - 8	HSL - W90 - 2	
	2	A1	Support bracket b = 80			HSL - A1 - 2	
 	3	W20	90 - 100	20	2 - 6	HSL - W20 - 3	
	3	W30	90 - 100	30	3 - 6	HSL - W30 - 3	
	3	W40	90 - 100	40	3 - 6	HSL - W40 - 3	
	3	W50	90 - 100	50	3 - 6	HSL - W50 - 3	
	3	W60	90 - 100	60	3 - 6	HSL - W60 - 3	
	3	W70	90 - 100	70	4 - 8	HSL - W70 - 3	
	3	W80	90 - 100	80	4 - 8	HSL - W80 - 3	
	3	W90	90 - 100	90	4 - 8	HSL - W90 - 3	
 	4	W20	90 - 100	20	2 - 6	HSL - W20 - 4	
	4	W30	90 - 100	30	3 - 6	HSL - W30 - 4	
	4	W40	90 - 100	40	3 - 6	HSL - W40 - 4	
	4	W50	90 - 100	50	3 - 6	HSL - W50 - 4	
	4	W60	90 - 100	60	3 - 6	HSL - W60 - 4	
	4	W70	90 - 100	70	4 - 8	HSL - W70 - 4	
	4	W80	90 - 100	80	4 - 8	HSL - W80 - 4	
	4	W90	90 - 100	90	4 - 8	HSL - W90 - 4	
  HSL - D1	5	W20	90 - 100	20	2 - 6	HSL - W20 - 4	
	5	W30	90 - 100	30	3 - 6	HSL - W30 - 4	
	5	W40	90 - 100	40	3 - 6	HSL - W40 - 5	
	5	W50	90 - 100	50	3 - 6	HSL - W50 - 5	
	5	W60	90 - 100	60	3 - 6	HSL - W60 - 5	
	5	W70	90 - 100	70	4 - 8	HSL - W70 - 5	
	5	W80	90 - 100	80	4 - 8	HSL - W80 - 5	
	5	W90	90 - 100	90	4 - 8	HSL - W90 - 5	
		D1	For expansion joints			HSL - D1	

## HALFEN SUPPORT BRACKETS

### HK5-P Angle Support Brackets

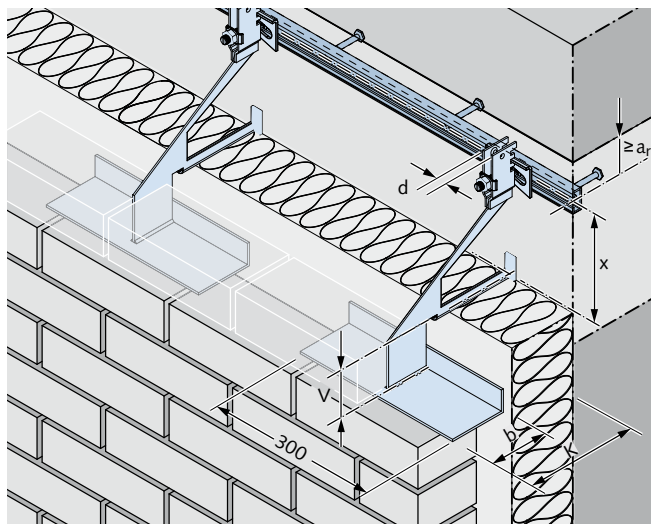
HK5 - P



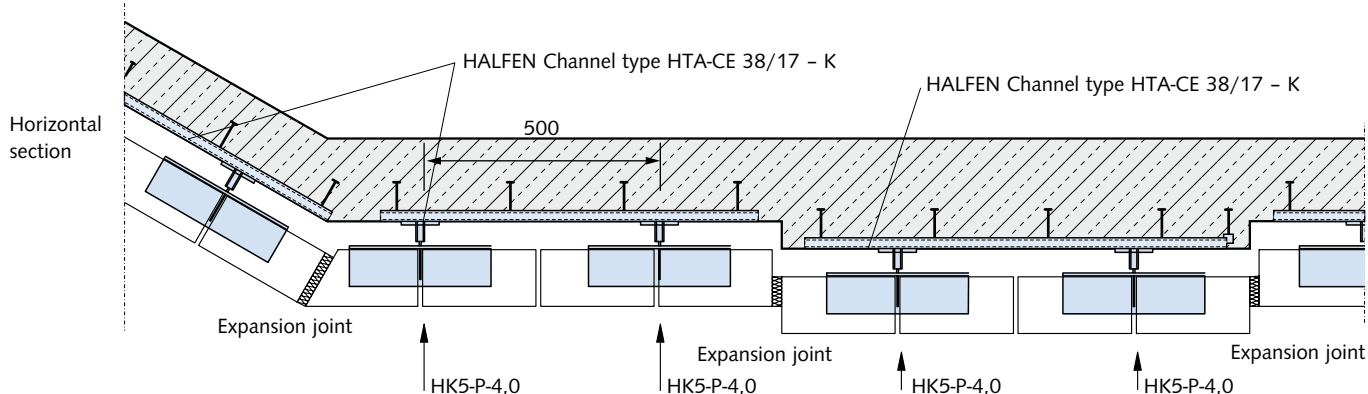
The HK5-P are used primarily in standard wall situations and at corners, e.g. internal corners or vertical joints.

**Example:** Supporting brickwork cladding with height  $H \leq 3.00$  m

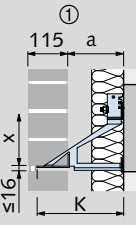


HK5 - PV



Each side of the short angle provides ample support for a brick. The HK5 Angle support brackets are spaced at 50 cm.



#### Selecting HK5 Angle support brackets

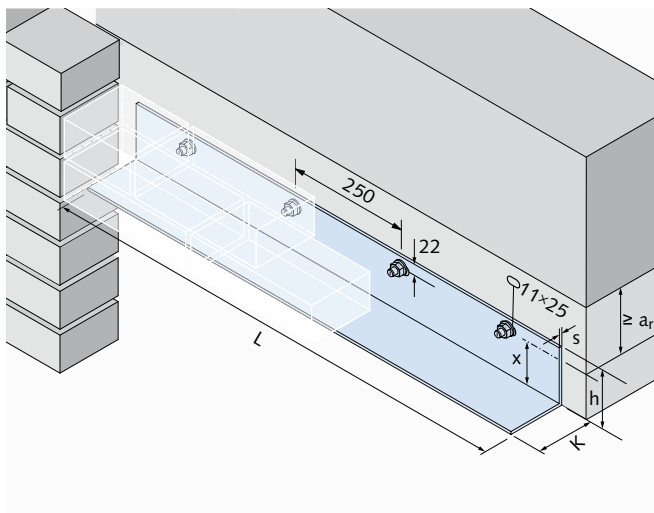
 Dimensions in mm	 - P  - PV	Distance a from wall [mm]	Load class $F_V = 4.0 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 5.4 \text{ kN}$ )		Load class $F_V = 8.0 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 10.8 \text{ kN}$ )		Load class $F_V = 12.0 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 16.2 \text{ kN}$ )	
			Length K	x	Length K	x	Length K	x
		40 ± 15	130	150	130	200	130	264
		60 ± 15	150	150	150	200	150	264
		80 ± 15	170	150	170	200	170	264
		100 ± 15	190	150	190	200	190	264
		120 ± 15	210	150	210	200	210	264
		140 ± 15	230	175	230	250	230	314
		160 ± 15	250	175	250	250	250	314
		180 ± 15	270	180	270	270	270	334
		200 ± 15	290	200	290	290	290	354
		220 ± 15	310	220	310	310	310	374
		240 ± 15	330	240	330	330	330	394
		260 ± 15	350	260	350	350	350	414
	Support angle b		100		100		100	
	Notch width d		12.5		16.5		16.5	

① other brick dimensions are also possible ② load range/HK5 Angle support brackets ③ additional suspension height up to 350 mm

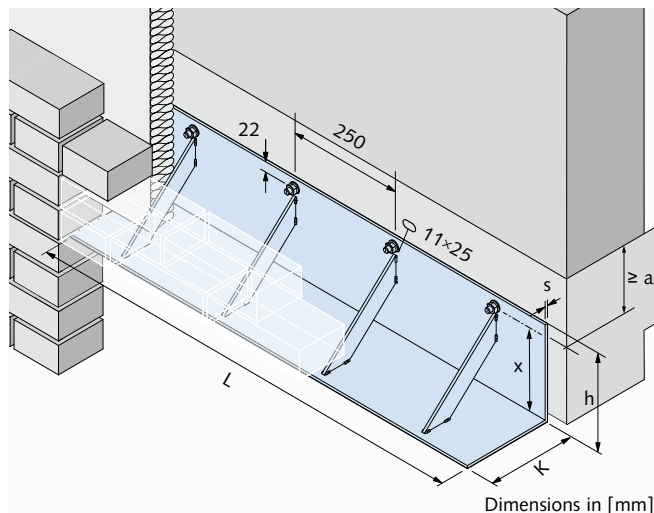
## HALFEN SUPPORT BRACKETS

### KW and KWL Bolt-on Angle

Bolt-on angle KW



Bolt-on angle KWL



The KWL and KW Bolt-on angles provide a simple alternative for supporting continuous brick cladding. The KW and KWL Bolt-on angles are used when the brick support is intended to remain visible from below, but the ventilation gap and the thermal insulation are to be concealed.

Order example:

type  
load level  
length K  
length of angle L

**KWL - 3,2 - 170 - 750**

Selecting KW Bolt-on angle

<p>dimensions in mm</p>	Spacing a from wall [mm]	Load class $F_V = 1.2 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 1.6 \text{ kN}$ )			Load class $F_V = 2.1 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 2.8 \text{ kN}$ )			Load class $F_V = 3.2 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 4.3 \text{ kN}$ )		
		Length K	x	h	Length K	x	h	Length K	x	h
	Material thickness s	4			6			8		
	10 – 20	100	74	100	100	72	100	100	70	100
	30 – 40	120	94	120	120	92	120	120	90	120

- ① other brick dimensions are also possible  
② load range/bolt-on angle

Selecting KWL Bolt-on angle

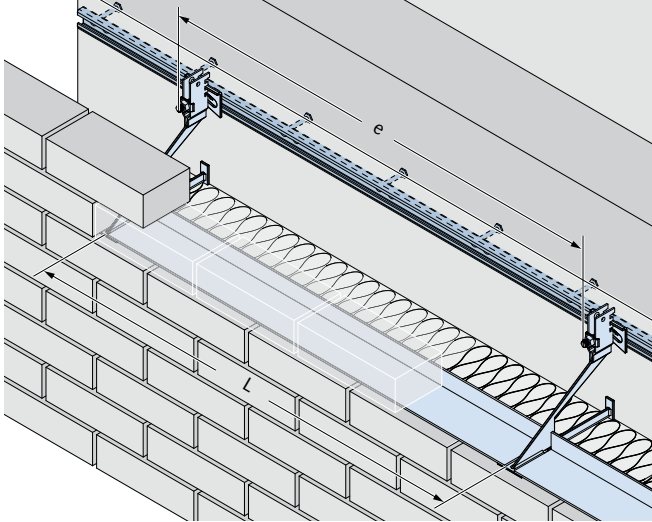
<p>dimensions in mm</p>	Spacing a from wall [mm]	Load class $F_V = 1.5 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 2.0 \text{ kN}$ )			Load class $F_V = 3.2 \text{ kN}^{\text{②}}$ ( $F_{Rd} = 4.3 \text{ kN}$ )		
		Length K	x	h	Length K	x	h
	Material thickness s	3			4		
	20 – 40	130	104	130	130	102	130
	45 – 60	150	124	150	150	122	150
	65 – 85	170	144	170	170	142	170
	85 – 100	190	174	200	190	172	200
	105 – 120	210	194	220	210	192	220
	125 – 140	230	224	250	230	222	250
	145 – 160	250	244	270	250	242	270

- ① other brick dimensions are also possible  
② load range/bolt-on angle

## HALFEN SUPPORT BRACKETS

### HW Support Angle Brackets

#### HW-95 Support angle, type-tested



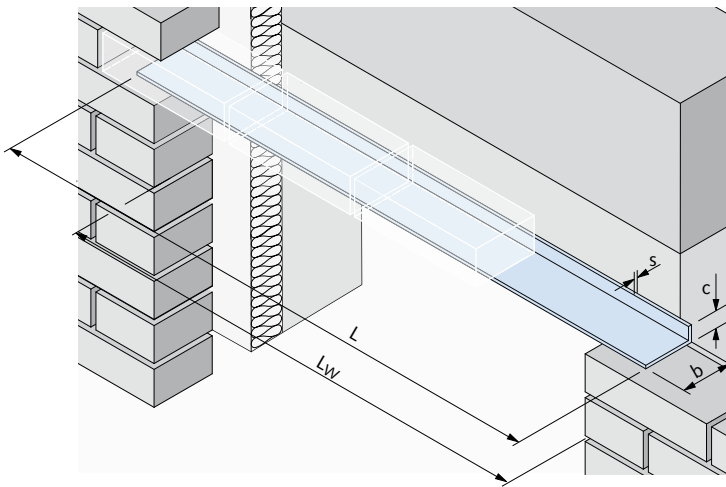
The HW-95 Support angles are placed between two HK5 Single support brackets on the support flanges. Only used with brick arch-action.

For article number, see price list.

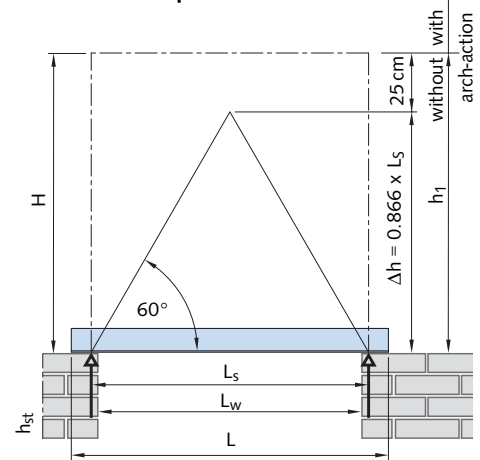
 dimensions in mm	Spacing between the HK5 Support brackets e	Length of support bracket L	Angle dimensions b × c × s
	500	<b>480</b>	95 × 20 × 2
	750	<b>730</b>	95 × 30 × 3
	1000	<b>980</b>	95 × 40 × 4

Note: HW Support angles with a support width of 80 mm are available for bricks of d = 90 mm

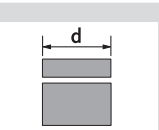
#### Case A: HW Support angle used in a non-suspended lintel over an opening



#### Case A: Non-suspended



#### Case A: HW for a non-suspended lintel

	Clear width	Support angle length	Load height H [m] for d ≤ 11.5 cm, γ ≤ 18kN/m³							Δh [m]
	L <sub>W</sub>	L	≤ 1.00	≤ 1.25	≤ 1.50	≤ 1.75	≤ 2.00	≤ 2.25	≥ 2.25	
	Dimensions of angle support b × c × s [mm]									
	510	700	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	0.497
	760	950	90 × 60 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	0.713
	1,010	1,200	90 × 60 × 4	90 × 60 × 4	90 × 45 × 3	90 × 45 × 3	90 × 45 × 3	90 × 45 × 3	90 × 45 × 3	0.930
	1,260	1,450	90 × 60 × 5	90 × 60 × 5	90 × 70 × 5	90 × 60 × 3	90 × 60 × 3	90 × 60 × 3	90 × 60 × 3	1.146
	1,510	1,700	90 × 90 × 4	90 × 90 × 4	90 × 90 × 4	90 × 90 × 5	90 × 90 × 4	90 × 90 × 4	90 × 90 × 4	1.363
	1,760	1,950	90 × 90 × 5	90 × 90 × 5	90 × 90 × 6	90 × 90 × 8	90 × 90 × 4	90 × 90 × 4	90 × 90 × 4	1.579
Dimensions in mm	2,010	2,200	90 × 90 × 8	90 × 100 × 8	90 × 100 × 8	SK	SK	SK	90 × 90 × 8	1.796

= with arch-action

= without arch-action

SK = custom angle including static verification



## HALFEN SUPPORT BRACKETS

### HW: Application, Calculations

#### Loading on the support angle

Without arch-action:

$$\begin{aligned} \text{Load height} &= H \text{ [m]} \\ \text{Load } q &= H \times d \times \gamma \text{ [kN/m]} \\ \text{Static span } L_S &= L_w + 2 \times \text{support length}/3 \text{ [m]} \\ M_{\max} &= q \times L_S^2/8 \text{ [kNm]} \\ V_{\max} &= q \times L_S/2 \text{ [kN]} \end{aligned}$$

With arch-action (see also DIN 1996).

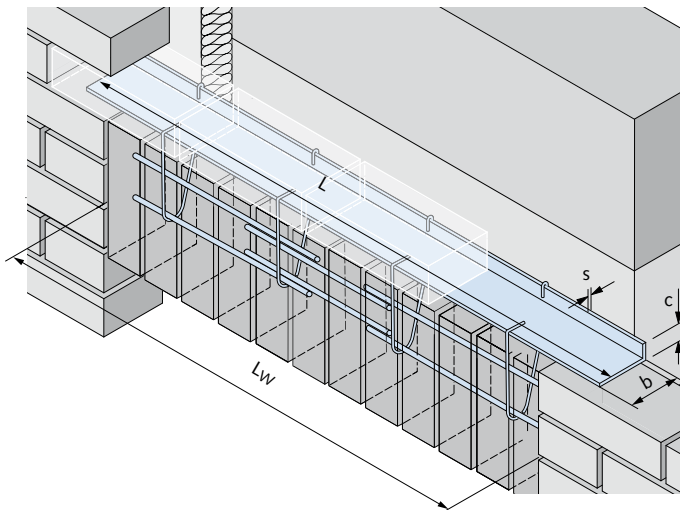
**Note:** Support the lintel until the mortar has hardened, (timber batten, see page 16)

Assumption

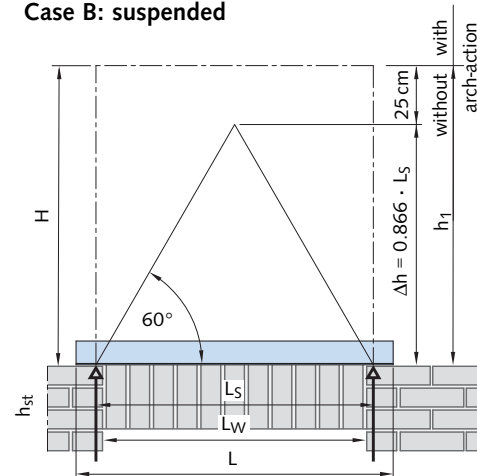
1. Load height  $\Delta h \leq H$
2. No openings in the arch-triangle
3. No point loads in arch-triangle
4. Space available at sides to transfer shear forces (see PFM Design handbook)

$$\begin{aligned} \text{Load height } \Delta h &= 0.866 \times L_S \text{ [m]} \\ \text{Load } q &= \Delta h \times d \times \gamma \text{ [kN/m]} \\ \text{Length of angle } L &= L_w + 2 \times \text{support length} \text{ [m]} \\ \text{Static span } L_S &= L_w + 2 \times \text{support length}/3 \text{ [m]} \\ M_{\max} &= q \times L_S^2/12 \text{ [kNm]} \\ V_{\max} &= q \times L_S/4 \text{ [kN]} \end{aligned}$$

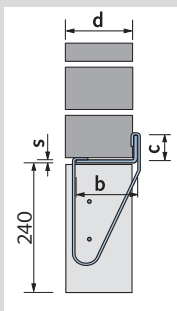
#### Case B: HW Support angle used as a suspended lintel over an opening



#### Case B: suspended



#### Case B: HW with suspended lintel



dimensions in mm

Clear width  L <sub>W</sub>	Angle support length  L	Load height H [m] for d ≤ 11.5 cm. γ ≤ 18 kN/m³							Δh [m]
		≤ 1.00	≤ 1.25	≤ 1.50	≤ 1.75	≤ 2.00	≤ 2.25	≥ 2.5	
Dimensions of angle support b × c × s [mm]									
510	700	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	0.497
760	950	90 × 60 × 4	90 × 45 × 3	90 × 45 × 3	90 × 45 × 3	90 × 45 × 3	90 × 45 × 3	90 × 45 × 3	0.713
1,010	1,200	90 × 60 × 4	90 × 60 × 5	90 × 60 × 3	90 × 60 × 3	90 × 60 × 3	90 × 60 × 3	90 × 60 × 3	0.930
1,260	1,450	90 × 90 × 4	90 × 90 × 5	90 × 90 × 5	90 × 60 × 4	90 × 60 × 4	90 × 60 × 4	90 × 60 × 4	1.146
1,510	1,700	90 × 90 × 5	90 × 90 × 5	90 × 90 × 6	90 × 90 × 6	90 × 90 × 4	90 × 90 × 4	90 × 90 × 4	1.363
1,760	1,950	90 × 90 × 5	90 × 90 × 6	90 × 90 × 8	90 × 90 × 8	90 × 90 × 5	90 × 90 × 5	90 × 90 × 5	1.579
2,010	2,200	90 × 100 × 8	90 × 100 × 8	90 × 110 × 8	SK	SK	SK	90 × 100 × 8	1.796

= with arch-action

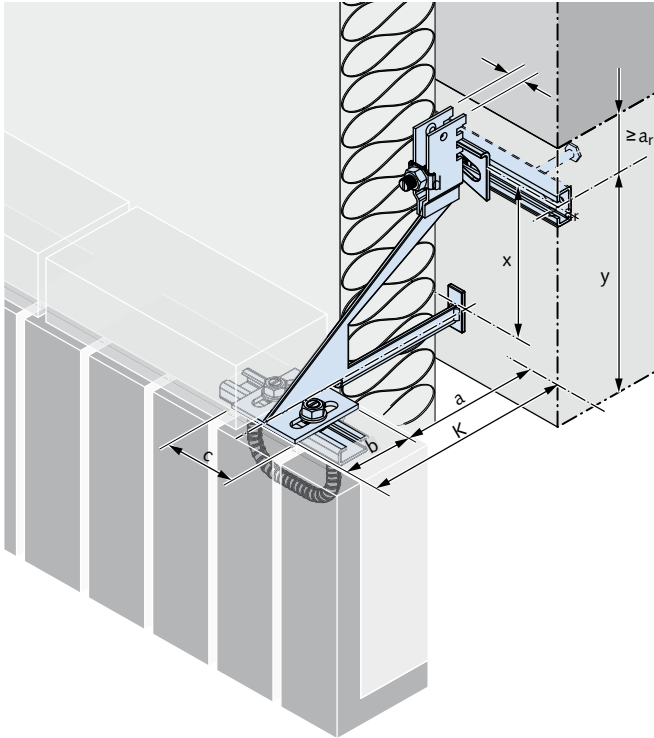
= without arch-action

SK = custom bracket including static verification

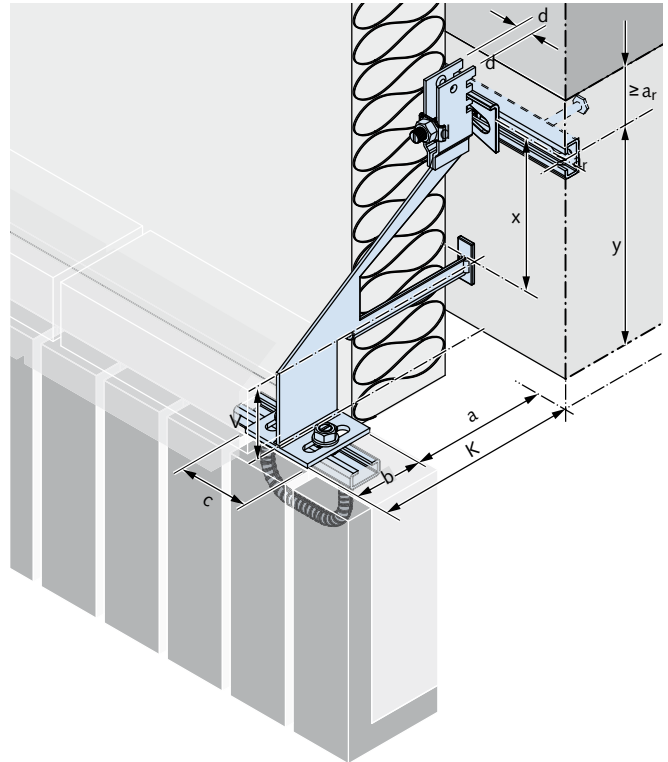
## HALFEN SUPPORT BRACKETS

### Single HK5-S Support Brackets for Precast Lintels

HK5-S



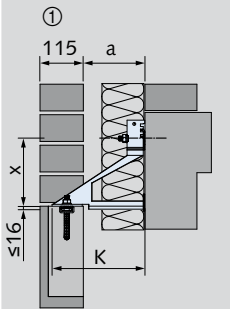
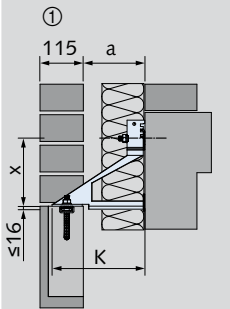
HK5-SV



HK5-S Single support brackets can be used for precast lintels supporting brick cladding over openings without load transfer to the sides (vertical joint).

Each precast lintel is supported by at least 2 support brackets. Static proof for the precast lintel must be provided by a structural engineer or the precast manufacturer. Horizontal and vertical adjustability allow accurate alignment of the lintel.

HK5 Single support bracket types

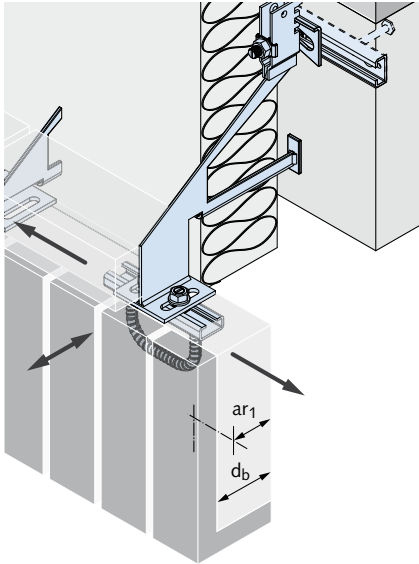
 Dimensions in mm	Distance a from wall [mm]	Load class $F_V = 4.0 \text{ kN}$ ② ( $F_{Rd} = 5.4 \text{ kN}$ )		Load class $F_V = 8.0 \text{ kN}$ ② ( $F_{Rd} = 10.8 \text{ kN}$ )		Load class $F_V = 12.0 \text{ kN}$ ② ( $F_{Rd} = 16.2 \text{ kN}$ )	
		Length K	x	Length K	x	Length K	x
 Dimensions in mm	40 ± 15	130	150	130	200	130	264
	60 ± 15	150	150	150	200	150	264
	80 ± 15	170	150	170	200	170	264
	100 ± 15	190	150	190	200	190	264
	120 ± 15	210	150	210	200	210	264
	140 ± 15	230	175	230	250	230	314
	160 ± 15	250	175	250	250	250	314
	180 ± 15	270	180	270	270	270	334
	200 ± 15	290	200	290	290	290	354
	220 ± 15	310	220	310	310	310	374
	240 ± 15	330	240	330	330	330	394
	260 ± 15	350	260	350	350	350	414
Angle support b × c × s		80 × 80 × 4		80 × 80 × 6		80 × 80 × 8	
Notched range d		12.5		16.5		16.5	

① other brick dimensions are also possible ② load range/HK5 Support bracket

## HALFEN SUPPORT BRACKETS

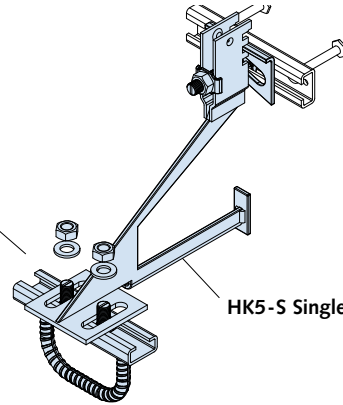
### Ties for Precast Lintels

HTA-ES: HALFEN Cast-in channel (approved) and HK5-S Single support bracket



**HTA-ES Installation set**  
(order separately)  
two HALFEN Bolts  
including  
nuts and washers

HALFEN Channel  
**HTA . . . / . . . - ES**  
with loop anchor



HK5-S Single support bracket

**Building authority  
approved**

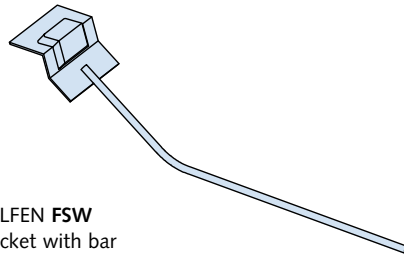
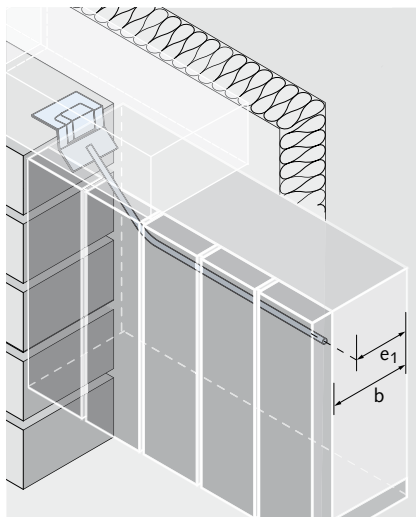
- smallest minimal width of  $d_b = 60$  mm possible
- minimal reinforcement required (no additional reinforcement required)
- optional; also available with a centric bolt
- optionally available in HCR quality

Extract from the approval/  
General construction technique permit  
see approval Z-21.4-1989 for further data

$d_b$ [mm]	60	80
$a_{r1}$ [mm]	40	50

HALFEN Channel	HTA-ES 28/15	HTA-ES 38/17	HTA-ES 49/30
Rated resistance for concrete C30/37	$F_V = 3.5$ kN ( $F_{Rd} = 4.7$ kN)	$F_V = 7.0$ kN ( $F_{Rd} = 9.5$ kN)	$F_V = 10.5$ kN ( $F_{Rd} = 14.2$ kN)
Rated resistance for concrete C40/50	$F_V = 4.0$ kN ( $F_{Rd} = 5.4$ kN)	$F_V = 8.0$ kN ( $F_{Rd} = 10.8$ kN)	$F_V = 12.0$ kN ( $F_{Rd} = 16.2$ kN)
Installation set: HALFEN Bolt including nut + washer	2 × HS 28/15 - M10×30 2 × US M10 (DIN 9021)	2 × HS 38/17 - M10×30 2 × US M10 (DIN 9021)	2 × HS 50/30 - M 12×40 2 × US M12 (DIN 125)
Material	Stainless steel W 1.4404, 1.4571 (A4) or Duplex steel 1.4062, 1.4162, 1.4362 (L4), HCR on request		

FSW: Precast lintel bracket with bar – type tested



HALFEN FSW  
Bracket with bar

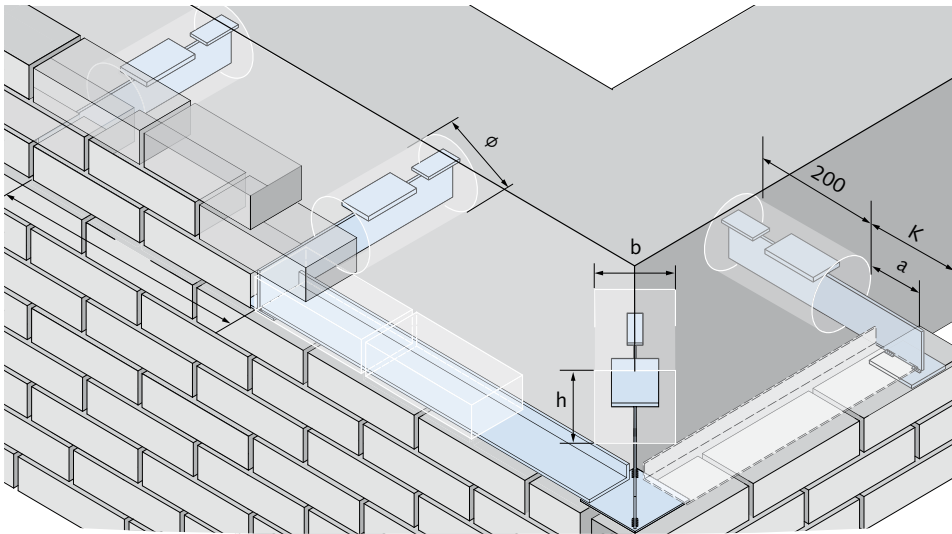
For all variants;  
 $e_1$  is dependent on  $b$

$b$ [mm]	60	80
$e_1$ [mm]	40	50

FSW Precast lintel bracket with bar						
Precast lintel bracket	Load class per bracket [kN]					
	$F_V = 3.5$ ( $F_{Rd} = 4.7$ )	$F_V = 2.6$ ( $F_{Rd} = 3.5$ )	$F_V = 3.9$ ( $F_{Rd} = 5.3$ )	$F_V = 5.1$ ( $F_{Rd} = 6.9$ )	$F_V = 5.3$ ( $F_{Rd} = 7.2$ )	$F_V = 6.8$ ( $F_{Rd} = 9.2$ )
	FSW - 3.5 - 80	FSW - 2.6 - 60	FSW - 3.9 - 60	FSW - 5.1 - 60	FSW - 5.3 - 80	FSW - 6.8 - 80
Material:	Rebar material: B500 Angle bracket: W 1.4404 or 1.4571 (A4) or duplex 1.4062, 1.4162, 1.4362 (L4)					

## HALFEN SUPPORT BRACKETS

### Grout-in Brackets KM



Application example; corner of building with HALFEN KM Grout-in brackets

The support brackets are suitable for supporting brick cladding constructed on the face of existing buildings. First, sufficiently deep recesses are core-drilled or cut into the existing brickwork. The brackets are then fixed with mortar in the recesses.

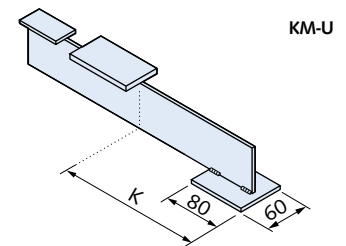
Only use (group III) cement mortar.

The intermediate angle support brackets are placed between the brackets. The maximum allowable height of the brick cladding supported by the brackets is 3.00 m.

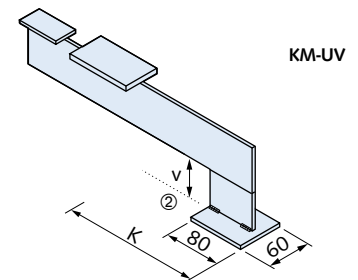
It may be required to statically verify the load transfer from the pressure plate into the main structure of the building. Minimum compressive strength of the existing brickwork must be  $f_{d,min} \geq 1,35-2,35 \text{ N/mm}^2$  with a wall thickness  $\geq 24 \text{ cm}$ .

Note:

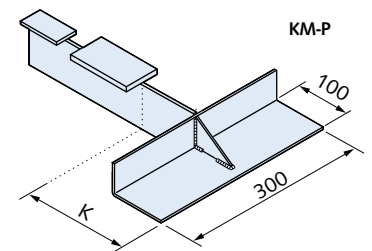
Larger cladding heights up to approximately 6 m may be possible if the compressive strength of the supporting brickwork allows.



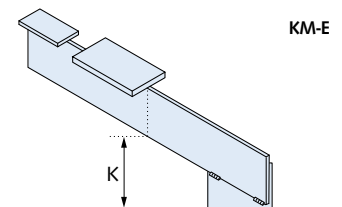
KM-U



KM-UV



KM-P



KM-E

**i** Structural calculations are required. Technical support is available from us.

The load class of the KM grout-in brackets is:  $F_V = 3.0 \text{ kN}$  ( $F_{Rd} = 4.0 \text{ kN}$ ).

KM		Wall spacing a [mm]	Length K [mm]	Dimensions; rectangular cut and chiselled recess h × b [mm]	Core-drill-hole diameter Ø [mm]
	-U	20 ± 15	110	110 × 80	110
	-UV	40 ± 15	130	115 × 85	115
	-P	60 ± 15	150	120 × 90	120
	-PV	80 ± 15	170	125 × 90	125
	-E	100 ± 15	190	125 × 90	125
	-EV	120 ± 15	210	130 × 95	130
		140 ± 15	230	140 × 100	140
		160 ± 15	250	150 × 120	150

① dimensions of the support plates of types KM-U and KM-P; see HK5-U and HK5-P Wall brackets (see page 12–18).  
 ② standard dimension v = 60 mm; other dimensions on request.  
 ③ other brick dimensions are also possible.

**Note:** A structural engineer must be consulted when adding brick cladding to existing buildings to determine if the existing walls and foundations are suitable to support the extra load with a sufficient safety factor. If these are insufficient, the new brick cladding must be supported on separate foundations.

## Parapet support brackets HAV 80/...

## HALFEN SUPPORT BRACKETS

### Cavity Wall Tie

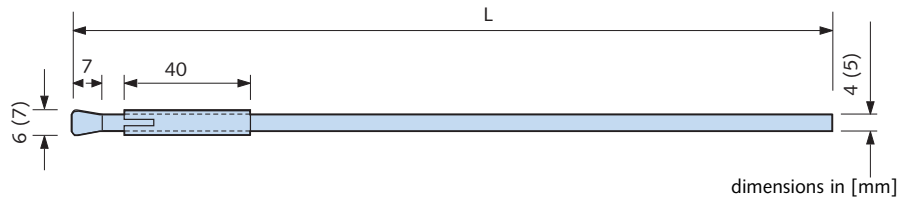
#### HEA Cavity wall ties



For anchoring in concrete  $\geq$  C 20/25. General construction technique permit Z - 21.1 - 910.

Material: Stainless steel A4/L4.

The cavity wall tie only requires a 6 or 7 mm diameter, 42 mm deep drilled hole (see table below), resulting in a quick and simple installation. A durable safe anchorage is ensured with a stainless steel plug, building material class A according to DIN 4102; therefore the plugs are also suitable for use in building-components with increased fire resistance requirements.



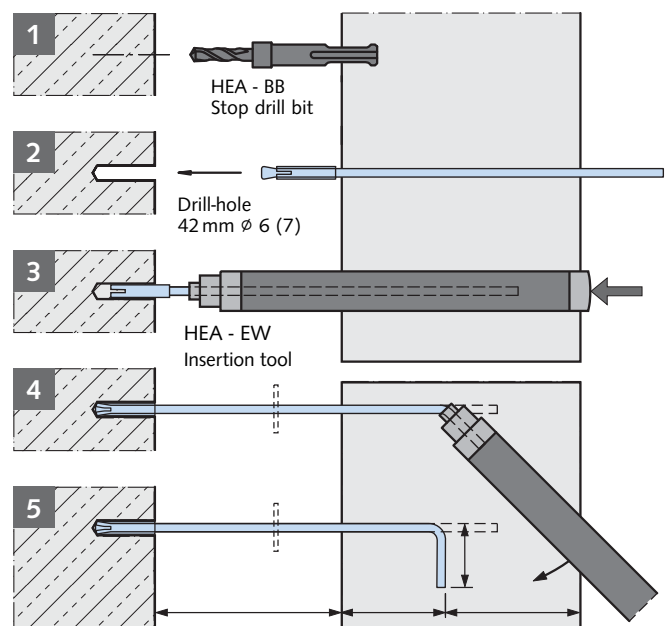
HEA Cavity wall impact anchors			
Article name. L/ø [mm]	Order no. 0140.010-	Cavity size a [mm]	Number of anchors per m <sup>2</sup> acc. to general construction technique permit Z-21.1-910
HEA - 160/4	00001	0 - 45	
HEA - 200/4	00002	45 - 85	
HEA - 250/4	00004	85 - 135	
HEA - 300/4	00006	135 - 185	
HEA - 200/5	00003	45 - 85	
HEA - 250/5	00005	85 - 135	
HEA - 300/5	00007	135 - 185	

Installation accessories for HEA Cavity wall impact anchors			
Article name	Order no.		ø [mm]
Stop drill bit	0143.010-		
HEA-BB 4	00001	for HEA - .../4	6
HEA-BB 5	00002	for HEA - .../5	7
Insertion tool	0143.020-		
HEA-EW 4	00001	for HEA - .../4	4
HEA-EW 5	00002	for HEA - .../5	5

#### Installation instructions

1. Drill a 6 mm or a 7 mm hole respectively to a depth of 42 mm using a HEA BB4 or HEA BB5 Stop drill bit.
2. Clean out the hole and insert the pre-fitted expansion sleeve end of the HEA Cavity wall tie into the hole.
3. Use the HEA - EW 4 or the HEA - EW 5 Insertion tool to drive the expansion sleeve into the hole until the end of the expansion sleeve is flush with the surface of the concrete.
4. Bend the tip of the HEA Cavity wall tie by 90°
5. Embed the brick tie in the mortar joint in the brickwork.

#### Vertical section





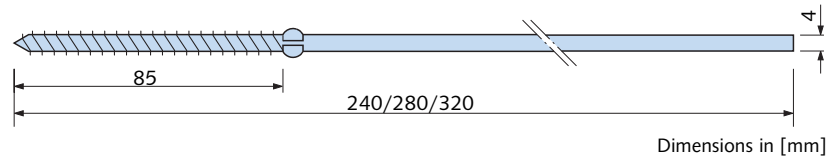
## HALFEN SUPPORT BRACKETS

### Cavity Wall Tie

#### HPV-L Cavity wall tie for aerated concrete



To anchor facing brickwork to load-bearing aerated concrete brick walls.  
Material: Stainless steel W 1.4404, 1.4571 (A4)



HPV-L Cavity wall tie for aerated concrete		
Article name L / Ø [mm]	Order no. 0141.010-	Cavity spacing a [mm]
HPV - L - 240/4	00001	0 - 80
HPV - L - 280/4	00002	80 - 120
HPV - L - 320/4	00003	120 - 160*)
*) Cavity spacings $\geq 150$ mm are not included in DIN 1996, a separate verification is required.		

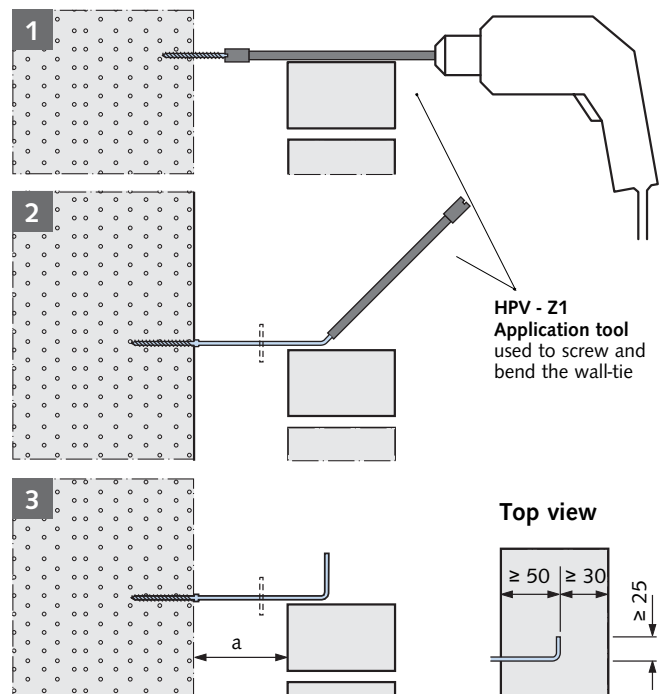
HPV-L Application tool		
Article name	Order no.	
HPV - Z1	0143.030-00001	for HPV - L - .../4

#### Installation instructions

1. Use a power drill and the application tool to screw the HPV-L Cavity wall tie into aerated concrete brick; it is not necessary to pre-drill the hole. The cavity wall tie self-anchors on reaching the specified screw depth.
2. Bend the end of the HPV-L Cavity wall tie using the application tool.
3. Embed the end wall tie in the mortar of the wall joint.

Number of anchors per m<sup>2</sup> according to DIN EN 1996-2/NA Table NA.D.1 and according to DIN EN 1996-1-1 chapter 6.5.

#### Vertical section

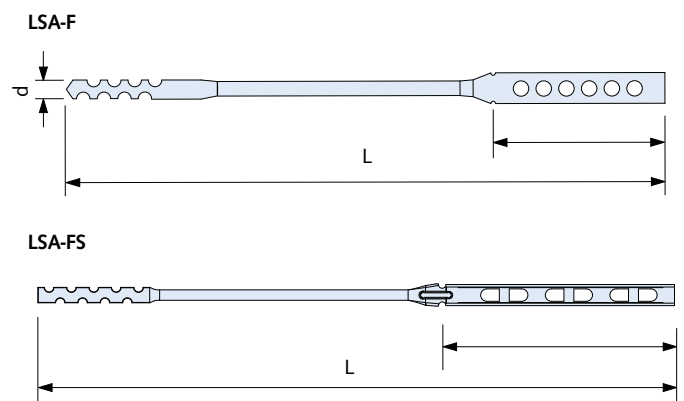


#### LSA-F/-FS Cavity wall tie



LSA-F/-FS: For application in masonry (also suitable for thin-bed mortar). General construction technique permit Z-17.1-888/Z-17.1-633 Material: Stainless steel W 1.4571 (A4) or 1.4362 (L4)

Cavity wall ties LSA-F/-FS		
Article name length / d [mm]	Order no. 0142.	Cavity spacing a [mm]
LSA-F-280/6	120-00001	115-135
LSA-F-300/6	120-00002	135-155
LSA-F-320/6	120-00003	155-175
LSA-F-340/6	120-00004	175-195
LSA-F-360/6	120-00005	195-210
LSA-FS-280-A4	140-00001	up to 130
LSA-FS-300-A4	140-00002	up to 150
LSA-FS-320-A4	140-00003	up to 170



More information on cavity spacing and the number of anchors required per m<sup>2</sup> can be found in general construction technique permit no. Z-17.1-888/Z-17.1-633.

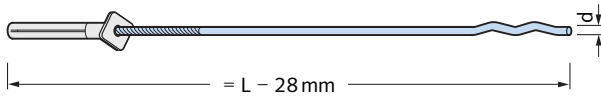
## HALFEN SUPPORT BRACKETS

### Cavity Wall Tie

LSA-DW Cavity wall anchor including 8 × 60 dowel according to DIN EN 845-1



Suitable for wall cavities up to 250 mm.



For anchorage in solid masonry + concrete. General construction technique permit Z-21.2-1009, Z-17.1-825 and Z-17.1-1138. Material: Stainless steel W 1.4404, 1.4571 (A4). Drill-hole diameter: 8 × 65 mm

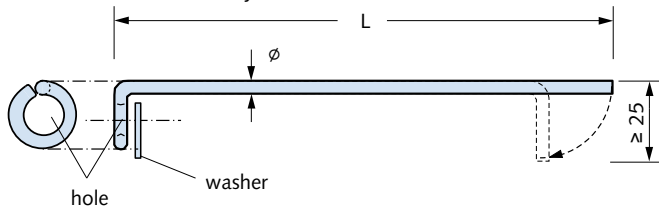
#### LSA-DW Cavity wall anchor including dowel

Article name L / d [mm]	Order no. 0142.080-	Cavity spacing [mm]	Number of anchors per m <sup>2</sup> in accordance with general construction technique permit Z-21.2-1009, no. Z-17.1-825 and Z-17.1-1138
LSA-DW-180/4	00002	25 - 45	
LSA-DW-210/4	00003	45 - 75	
LSA-DW-250/4	00004	75 - 115	
LSA-DW-275/4	00005	115 - 140	
LSA-DW-300/4	00006	140 - 165	
LSA-DW-320/4	00007	165 - 185	
LSA-DW-350/4	00008	185 - 215	
LSA-DW-400/4	00009	215 - 250	

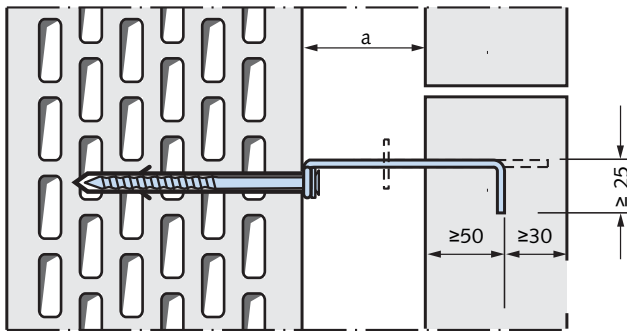
#### LSA-L Cavity wall anchor



Building authority approved dowel and stainless steel screw, for anchorage in vertical coring brick masonry and cored hole sand-lime brick masonry.



LSA-L Cavity wall anchor with washer (stainless steel A4) and ISO-Clip (see below)



#### LSA-L Cavity wall anchor

Article name Type L / φ [mm]	Cavity spacing a [mm]	Order no. 0142.050-
LSA-L-235/4	20 - 150*	00001

\*) Cavity spacings ≥ 150 mm are not included in DIN 1996, a separate verification is required.

Number of anchors per m<sup>2</sup> according to DIN EN 1996-2/NA Table NA.D.1 and according to DIN EN 1996-1-1 chapter 6.5.

#### Dowel and screw for LSA-L-235/4

Article name	Order no. 0432.010-
DUE-FUR 10×80 SS A4	00001

do = 10 mm

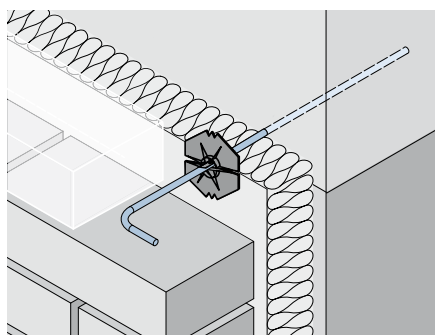
Nylon-dowel

Hexagonal-fixing bolt (stainless steel A4)

#### Impact tool for LSA-L

Article name	Order no. 0143.080-
LSZ-E	00001

#### LSZ Insulation clip ISO-CLIP



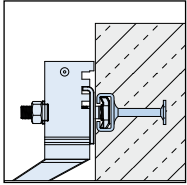
#### LSZ Insulation clip ISO-CLIP

Article name	for anchor φ [mm]	φ D [mm]	Order no. 0143.050-
LSZ-ISO-Clip 3-6 Insulation clip with drip	3 - 6	60	00002
LSZ-ISO-CLIP Maxi-F Insulation clip	6	100	00003

## HALFEN SUPPORT BRACKETS

### Fixing HALFEN Support Brackets - Overview

#### Concrete



Installation to  
HALFEN **HTA-CE** Cast-in channels,  
see page 30.

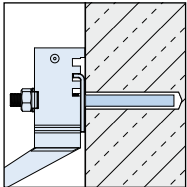


More information can be found in  
Technical Product Information:  
"HALFEN Cast-in channels"

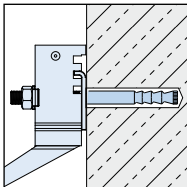
[www.halfen.com](http://www.halfen.com) ▷ **Product  
Ranges** ▷ **Fixing systems**  
▷ **HALFEN Cast-in channels**



#### Chemical anchor bolt systems



Installation with  
HALFEN **HB-VZ** Chemical anchor;  
for cracked and non-cracked concrete,  
see page 31.

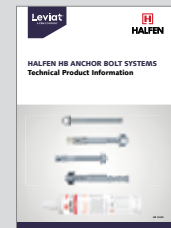


Installation with  
HALFEN **HB-VMZ** Injection system;  
for cracked and non-cracked concrete,  
see page 31, 32.

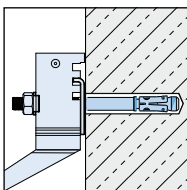


More information can be found in  
Technical Product Information:  
"HALFEN HB Anchor bolt systems"

[www.halfen.com](http://www.halfen.com) ▷ **Product  
Ranges** ▷ **Fixing systems**  
▷ **Anchor bolt systems**

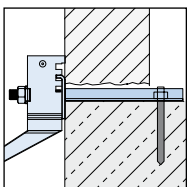


#### Mechanical Heavy Duty Anchors



Installation with  
HALFEN **HB-BZ** Wedge anchors;  
for cracked and non-cracked concrete,  
see page 33.

#### Special slab fixing



**HK-DA** Slab anchor for installation with  
HALFEN **HK5** Support bracket to thin  
slab edges,  
see page 34.

## HALFEN SUPPORT BRACKETS

### Fixing Systems for Concrete

#### HALFEN Cast-in channels



##### HTA HALFEN Cast-in channels

HALFEN Cast-in channels have pressed or welded anchor studs and are ETA approved for application in load-bearing structures:

Approval no. ETA - 09/0339.

##### Foam filler

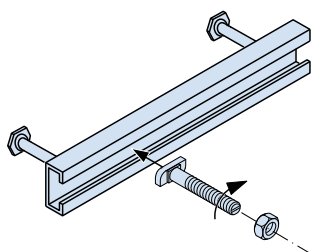
HALFEN Cast-in channels are foam strip filled to stop concrete filling the channel. The foam will also keep the channel free of dirt after striking the formwork. The foam is easily removed using a suitable tool (e.g. a standard screwdriver).

Further information can be found in "HALFEN Cast-in channels"

Technical Product Information

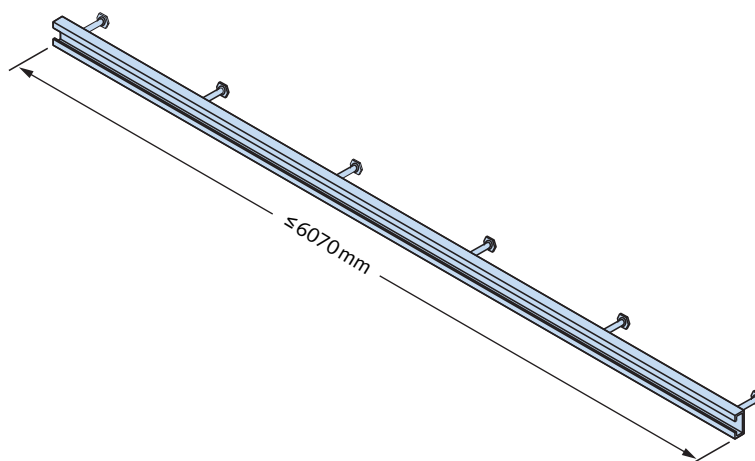


HTA HALFEN Cast-in channel, short length



HALFEN Bolt incl. nut  
(see table below for available bolts)

HALFEN HTA-CE Cast-in channel

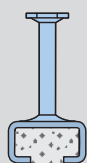


#### Applications in brick faced façades

##### Recommended HALFEN Channels

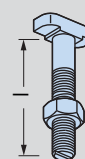
"Verification is according to EOTA TR 047 in combination with ETA-09/0339 (HALFEN Channels)"

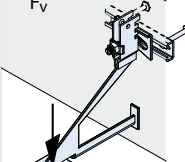
##### HALFEN HTA-CE Channel



Article name:  
(add length in mm)

##### with HALFEN HS Bolt incl. nut



HK5 Support brackets Load class: → pages 12 to 23		Article name: (add length in mm)		Article name:	Order no.	Thread		l [mm]		Torque [Nm]
	HK5 load class 4,0 kN	HTA-CE 38/17	- A4	HS 38/17	0161.050-00001	M12	x	72	- A4	25
	HK5 load class 4,0 kN	HTA-CE 40/25	- A4	HS 40/22	0350.070-00007	M12	x	80	- A4	25
	HK5 load class 8,0 kN	HTA-CE 49/30	- A4	HS 50/30	0161.090-00001	M12	x	87	- A4	25
	HK5 load class 8,0 kN	HTA-CE 40/22P	- A4	HS 40/22	0350.070-00013	M16	x	80	- A4	60
	HK5 load class 12,0 kN	HTA-CE 50/30P	- A4	HS 50/30	0161.090-00002	M16	x	87	- A4	60
	HK5 load class 12,0 kN	HTA-CE 54/33	- A4	HS 50/30	0161.090-00002	M16	x	87	- A4	60

All anchor elements are stainless steel W 1.4404, 1.4571 (A4)

## HALFEN SUPPORT BRACKETS

### Fixing Systems for Concrete

Fastening the support bracket with HALFEN HB-VZ Chemical anchor bolts for cracked and non-cracked concrete



HB-V A4 Anchor stud

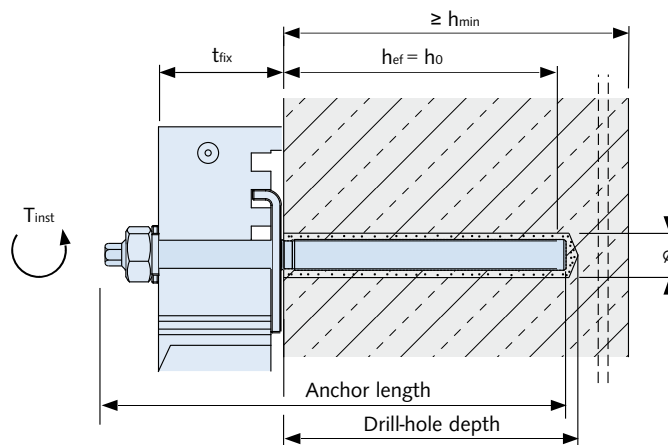


HB-VZ-P Adhesive capsule



M8 - M20

Stainless steel

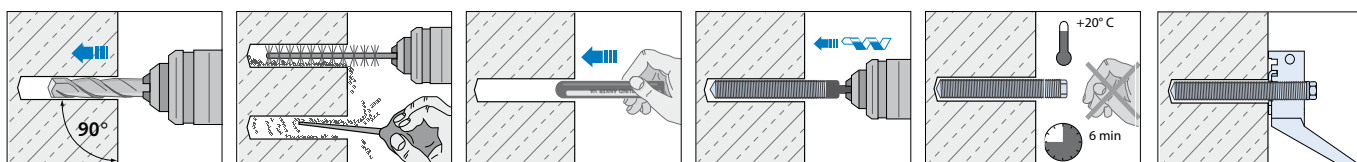


Anchor HB-V A4 stud

HK5 loads	Article name	Order - no. 0430.100-	Drill-hole $\phi \times$ depth [mm]	Plug-length [mm]	Maximum clamping thickness $t_{fix}$ [mm]	Anchorage depth $h_{ef}$ [mm]	Min. component depth $h_{min}$ [mm]	Torque $T_{inst}$
4.0 kN	HB-V-A 10-65/165 A4	00004	12 × 90	165	65	90	120	20
8.0 kN	HB-V-A 12-65/190 A4	00064	14 × 110	190	65	110	140	40
12.0 kN	HB-V-A 16-65/210 A4	00012	18 × 125	210	65	125	160	80

HB-VZ-P Adhesive capsule

Article name	Order no. 0433.070-
HB-VZ-P 10	00002
HB-VZ-P 12	00003
HB-VZ-P 16	00005



## HALFEN SUPPORT BRACKETS

### Fixing Systems for Concrete

Installing the support brackets with the HALFEN HB-VMZ Injection system, for cracked and non-cracked concrete



HB-VMZ-A A4 Anchor stud



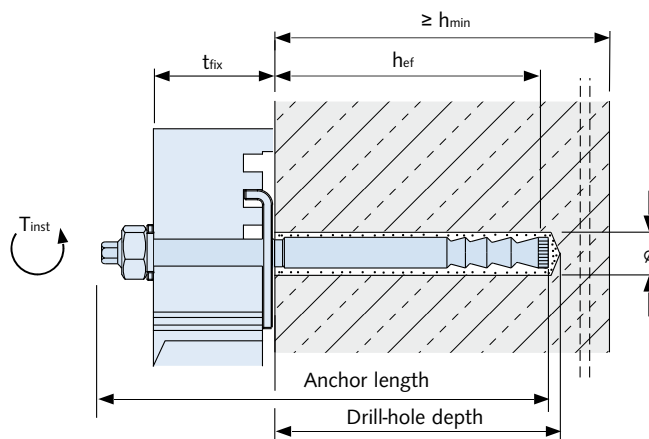
HB-VMZ 300 ml Cartridge  
Order.-no. 0433.040-00138  
can be dispensed with a  
standard silicone dispenser



M8 - M24



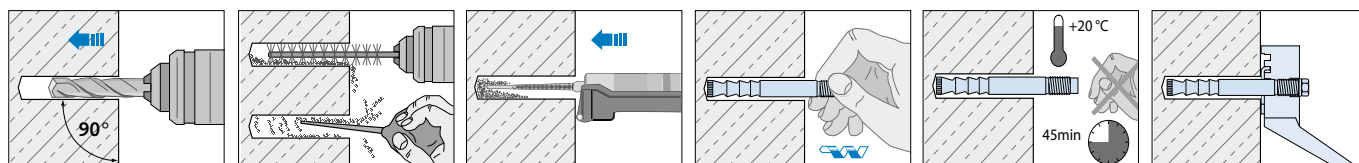
Stainless steel



HB-VMZ-A A4 Anchor plug

HK5 loads	Article-name	Order no. 0432.380-	Drill-hole $\varnothing \times$ depth [mm]	Max. clamping thickness $t_{fix}$ [mm]	Anchor- length [mm]	Thread [mm]	Anchorage- depth $h_{ef}$ [mm]	Min. building component depth $h_{min}$ [mm]	Torque $T_{inst}$ [Nm]
4.0 kN	HB-VMZ-A 60 M10-60/135 A4	00007	12 × 65	60	135	M10×47	60	100	15
8.0 kN	HB-VMZ-A 80 M12-60/160 A4	00096	14 × 85	60	160	M12×56	80	110	25
8.0 kN	HB-VMZ-A 100 M12-60/180 A4	00016	14 × 105	60	180	M12×56	100	130	30
12.0 kN	HB-VMZ-A 125 M16-60/210 A4	00119	18 × 133	60	210	M16×74	125	170	50

### Installation








# HALFEN SUPPORT BRACKETS Fixing Systems for Concrete

Fixing HK5 Support brackets with HALFEN HB-BZ Wedge anchor – for cracked and non-cracked concrete
 

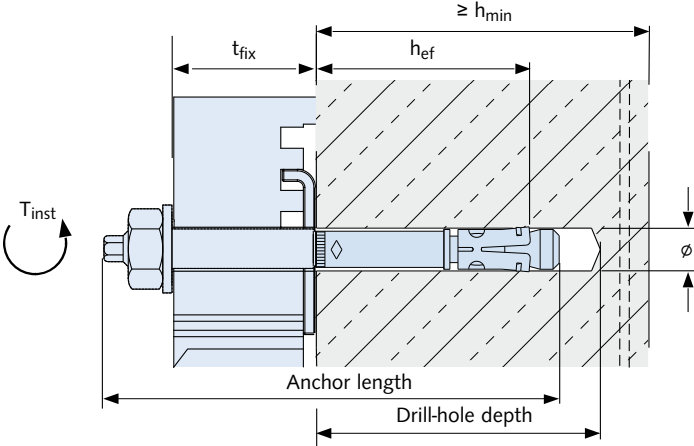
CE



HB-BZ A4 Wedge anchor

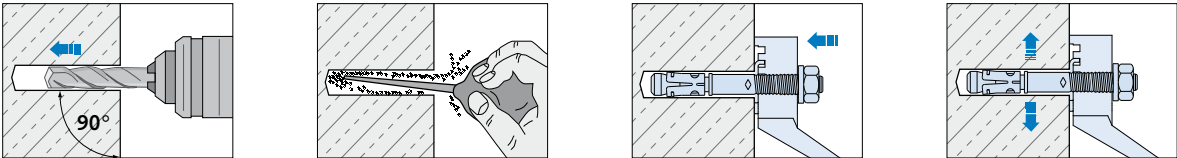



Stainless steel



HB-BZ A4 Wedge anchor (specification standard anchorage depth)										
HK5 loads	Article name	Order no. 0432.040-	Drill-hole $\varnothing$ × depth [mm]	Setting depth [mm]	Max. clamping thickness $t_{fix}$ [mm]	Anchor length [mm]	Thread [mm]	Anchorage depth $h_{ef}$ [mm]	Min. building component thickness $h_{min}$ [mm]	Torque $T_{inst}$ [Nm]
4.0 kN	HB-BZ 12-50-70/145 A4	00032	12 × 90	80	70	145	M12×65	70	120	50
8.0 kN	HB-BZ 16-50-70/170 A4	00034	16 × 110	97	70	170	M16×70	85	140	110

## Installation



## HALFEN SUPPORT BRACKETS

### Fixing Systems for Concrete

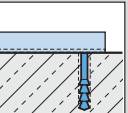
#### Fixing the HK5 Support bracket to thin slabs with the HALFEN HK-DA Slab anchors

Selection – HK - DA Slab anchors

 <b>HK-DA -</b>	Load class [kN]	( $F_{Rd}$ [kN])	Order-no. 0156.010-	M	c [mm]	$a_1$ [mm]	l [mm]
	4,0 - L	(5,4)	00001	M 12	10	$293 \pm 10$	320
	4,0 - K	(5,4)	00002	M 12	10	$173 \pm 10$	200
	8,0 - L	(10,8)	00005	M 12	11	$293 \pm 10$	320
	8,0 - K	(10,8)	00006	M 12	11	$173 \pm 10$	200

Included in delivery, notched plate and (hexagonal) nut

Fixing to concrete slab - C 20/25

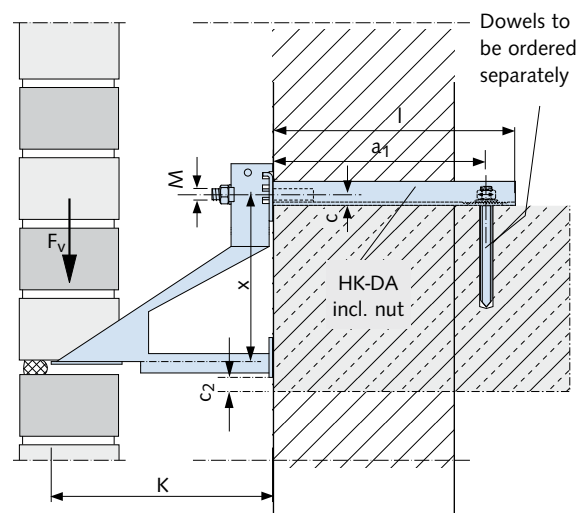
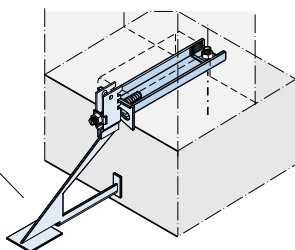
for HK-DA-	Load class [kN]: ( $F_{Rd}$ [kN]):	4,0 (5,4)	8,0 (10,8)
	HALFEN Injection anchor for cracked and non-cracked concrete	HB-VMZ-A 60 M10-20/95-A4, Order-no. 0432.380-00005, separate calculation required	HB-VMZ-A 80 M12-25/125-A4, Order-no. 0432.380-00010, separate calculation required

All anchor parts are stainless steel; W 1.4571, 1.4404 (A4)

Suitable for  
load class 4.0kN  
and 8.0kN

#### Note:

- $c_2$  = required edge distance  
in according with type test  
report or static calculation



## HALFEN SUPPORT BRACKETS

### Brick tie Systems

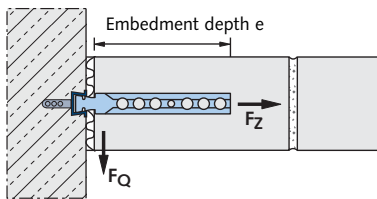
HALFEN Brick tie systems are economic and proved fixing systems using HALFEN ML Brick ties for fixing brickwork, in-fill panels, partition walls, cladding panels (with or without air gap or thermal insulation) to steel or

timber structures or concrete walls and columns. **The brick ties are able to move vertically in the wall connector channels; this greatly reduces movement cracks in the brickwork.**

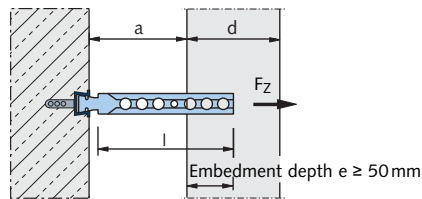
All HTA-CE and HMS profiles have a foam filling to prevent concrete ingress. The channels are attached to the formwork using standard nails.

The HALFEN Brick tie anchors are inserted at the recommended intervals (static requirements) in the brick wall during construction. The anchors are inserted in the brick tie channels, turned 90°, laid flat between the rows of brick and pressed into the mortar. The perforations in the anchors optimise anchorage with the mortar.

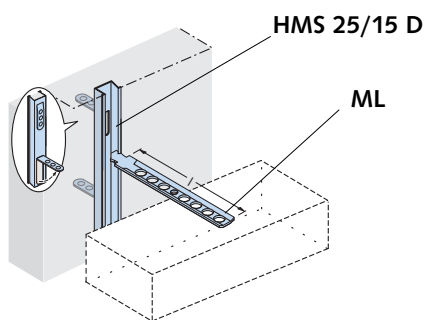
Wall connection



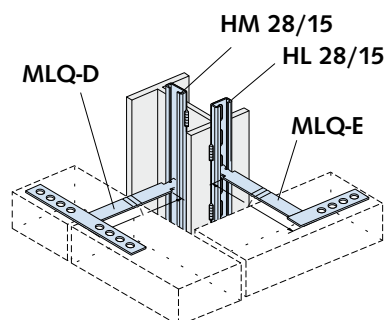
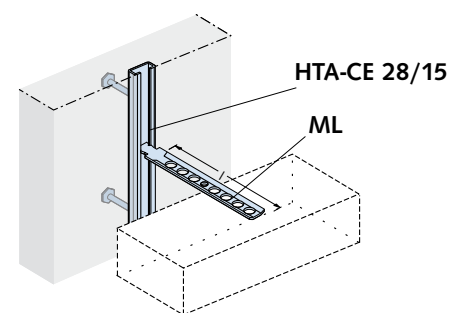
Facing brickwork connection



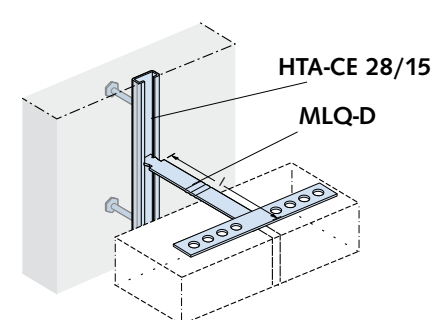
ML Brick ties in combination with HALFEN Channels HMS, HTA, HM and HL



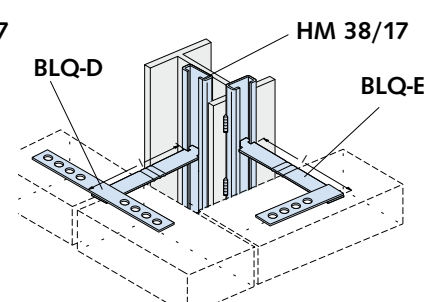
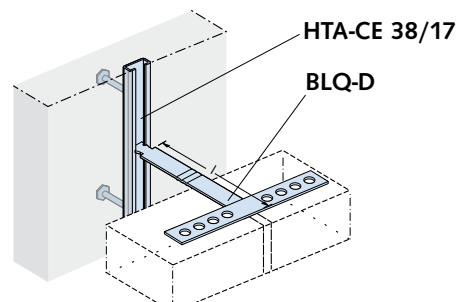
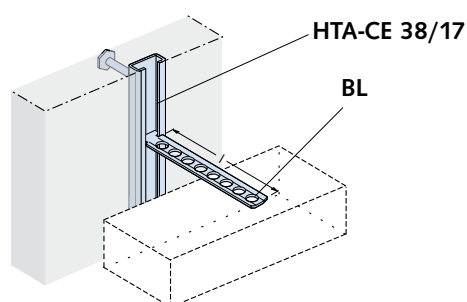
The pre-punched anchors in the HMS Channels are bent out by hand every 250 mm on-site to ensure safe anchorage in the concrete.



HM 28/15 welded to steel column.  
HL 28/15 can be alternatively bolted with dowels to concrete.



BL Brick tie in combination with HALFEN Channel type HTA 38/17 and HM 38/17



## HALFEN SUPPORT BRACKETS

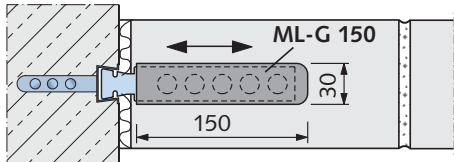
### Brick tie Systems

Allowable wall spacing a			
Connection two-leaf masonry	Length l (l <sub>1</sub> ) [mm]	Spacing a [mm]	d [mm]
	85	20 - 45	115
	120	40 - 80	
	180	85 - 140	
	(300)	0 - 80	240
	(350)	20 - 95	
	(400)	35 - 115	

HALFEN Brick ties are verified in accordance with EN 845-1 for various anchor channels with a minimum embedment depth of 50 mm:

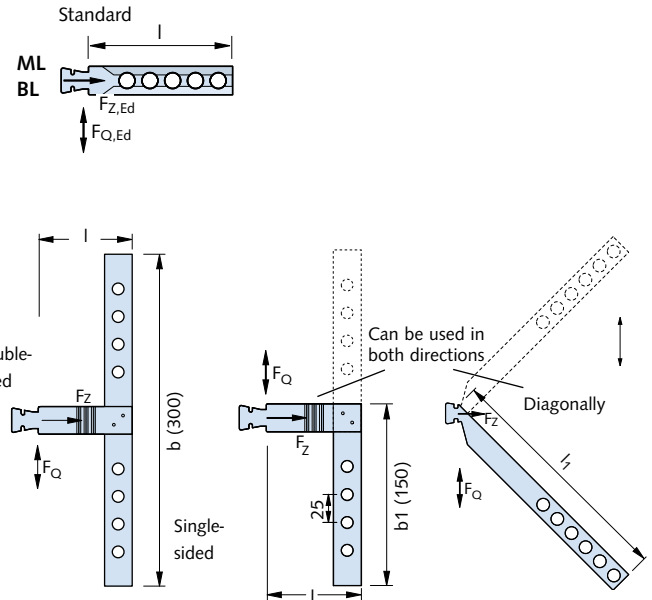
Declared load capacity performance (EN 845-1)				
		BL	ML	ML1
F <sub>Z</sub> [kN] Axial load	HTA-CE	3.2	2.7	2.5
	HMS	-	1.6	1.6
F <sub>Q</sub> [kN] Shear load	HTA/HMS	2.7	1.5	1.4
F <sub>D</sub> [kN] Compression load	HTA/HMS	1.0 (BL180)	1.0 (ML180)	-

#### Sliding sleeve ML-G 150 for ML-Anchor, for wall connections



Allows movement in the anchor longitudinal direction; this helps to avoid cracking in long sections of brick wall or infill brickwork connected to concrete structures.

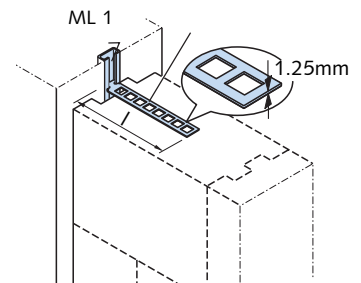
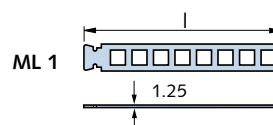
**Material:** Soft-PVC **Order no.** 0134.010-00001



#### Brick ties ML 1 for connections in thin-bed mortar in interior applications

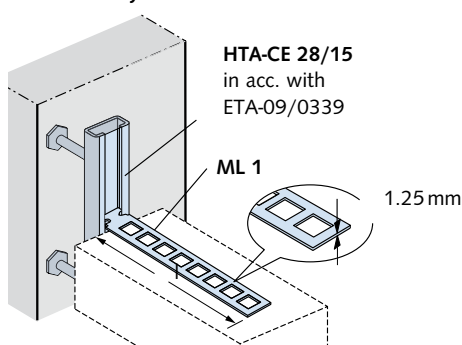
**Material:** Stainless steel A2

Type	Length l [mm]	Order no. 0132.080-
ML1 -	125	00001
	185	00002
	245	00003

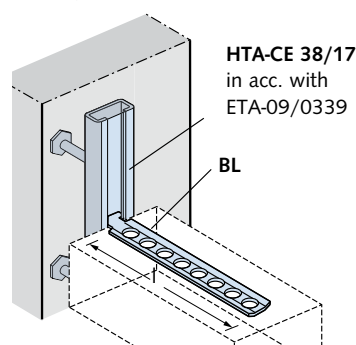


Channels load-bearing capacity with wall tie spacing of ≥ 25 cm			
Brick tie channel	HMS 25/15 D	HTA-CE 28/15	HTA-CE 38/17
Centric tension F <sub>Z</sub> [kN] (F <sub>Z,Rd</sub> )	1.2 (1.6)	3.0 (4.0)	4.5 (6.1)
Transverse stress F <sub>Q</sub> [kN] (F <sub>Q,Rd</sub> )	1.5 (2.0)	3.0 (4.0)	4.5 (6.1)

#### ML 1 Masonry connection



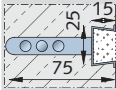







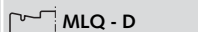


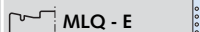


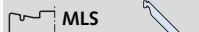


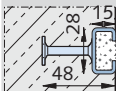

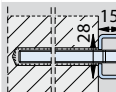

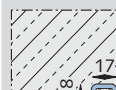




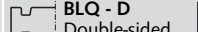


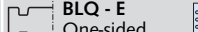






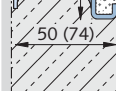

#### BL Masonry connection



ML/BL Masonry connection

## HALFEN SUPPORT BRACKETS

### Brick tie Systems

Brick-tie channel		Brick-tie anchor									
	<b>HMS 25/15 D</b> L = 2500 mm 	 <b>ML Standard</b>  26 × 2 [mm] 		 <b>ML1</b>  25 × 1.25 [mm] 		 <b>MLQ - D Double-sided</b>  25 × 3 [mm] 		 <b>MLQ - E One-sided</b>  25 × 3 [mm] 		 <b>MLS Diagonal</b>  22 × 3 [mm] 	
	<b>HTA-CE 28/15</b> L = 1050 mm <sup>①</sup> L = 6070 mm <sup>①</sup> 	Type	Length l [mm]	Type	Length l [mm]	Type	Length l [mm]	Type	Length l [mm]	Type	Length l <sub>1</sub> [mm]
	<b>HL 28/15</b> L = 6070 mm <sup>①</sup> 	<b>ML - 85</b>		<b>ML 1 - 125</b>		<b>MLQ-D - 85</b>		<b>MLQ-E - 85</b>		<b>MLS - 300</b>	
		<b>ML - 120</b>		<b>ML 1 - 185</b>		<b>MLQ-D - 120</b>		<b>MLQ-E - 120</b>		<b>MLS - 350</b>	
		<b>ML - 180</b>		<b>ML 1 - 245</b>		<b>MLQ-D - 180</b>		<b>MLQ-E - 180</b>		<b>MLS - 400</b>	
	<b>HTA-CE 38/17</b> L = 1050 mm <sup>①</sup> L = 6070 mm <sup>①</sup> 	 <b>BL Standard</b>  30 × 2 [mm] 		 <b>BLQ - D Double-sided</b>  30 × 3 [mm] 		 <b>BLQ - E One-sided</b>  30 × 3 [mm] 		<b>Material:</b>  <b>FV</b> = Steel S235JR, hot-dip galvanised  <b>SV</b> = Steel DX51D + Z275, Sendzimir galvanised  <b>A4</b> = Stainless steel 1.4571/1.4404  <b>A2</b> = Stainless steel 1.4301			
		<b>BL - 85</b>		<b>BLQ-D - 85</b>		<b>BLQ-E - 85</b>		<sup>①</sup> Other lengths: Available on request			
		<b>BL - 120</b>		<b>BLQ-D - 120</b>		<b>BLQ-E - 120</b>					
		<b>BL - 180</b>		<b>BLQ-D - 180</b>		<b>BLQ-E - 180</b>					

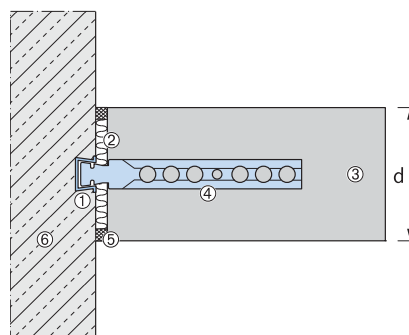
#### Firewall connection according to DIN 4102-4:2016-05

##### Solid masonry fire walls

Statically required connections of load bearing, room-enclosing, masonry walls can also be designed as fire walls in accordance DIN 4102-4 section 9.8.4 using HALFEN Brick tie channels. The anchorage to adjacent components (steel reinforced concrete supports or walls) meet the requirements for stability and fire resistance if the anchorage conforms to the standards set in DIN 4102-4 section 9.8.4 (figure 9.13, variant 2).

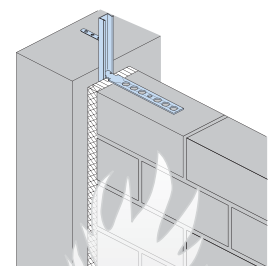
##### Anchor spacings

HALFEN Brick tie anchors can be used at any position along the whole length of the brick tie channel. Generally the standard spacing between the anchors is 250 mm (4 anchors per metre).



##### Definition, DIN regulations

- ① **HALFEN Cast-in channel**
- ② **Insulation layer:**  
According to DIN 4102-4 section 9.2.14 insulation layers in connecting joint gaps must, "[...] be made of non-flammable mineral fibre; have a melting point  $\geq 1000^{\circ}\text{C}$  as stated in DIN 4102-17; and have a gross density of  $\geq 30 \text{ kg/m}^3$ " and must not smoulder.
- ③ **Masonry:**  
Bricks (gross density class) and minimum wall thickness according to DIN EN 1996-1-2: 2011-04.
- ④ **Masonry connection** (vertically adjustable)
- ⑤ **Expansion joint**
- ⑥ **Concrete**



Connection of a load bearing masonry wall as a firewall according to DIN 4102-4 section 9.8.4 (figure 9.13) or according to DIN EN 1996-1-2: 2011-04 (figure E.4B)

Product information		
HALFEN Cast-in channel Type ①	④ Brick tie anchor	
	for standard grout	for thin mortar
HMS 25/15 D	ML	ML 1
HTA 28/15	ML	ML 1
HTA 38/17	BL	-

# HALFEN SUPPORT BRACKETS

## Calculation Table for Support Brackets

Dimensioning support brackets for brick cladding  $d = 11.5 \text{ cm}$  with  $\gamma = 18 \text{ kN/m}^2$

Load height H [m]	Single support bracket e.g. HK5 - U $F_V$ [kN] ( $F_{V,d}$ [kN]) $e = 250 \text{ mm}$	Single support bracket e.g. HK5 - P $F_V$ [kN] ( $F_{V,d}$ [kN]) $e = 500 \text{ mm}$	Single support bracket e.g. HK5 - U with intermediate angle brackets $F_V$ [kN] ( $F_{V,d}$ [kN]) $e = 500 \text{ mm}$   $e = 750 \text{ mm}$   $e = 1000 \text{ mm}$	Support bracket Load class $F_V$ [kN] per bracket ( $F_{V,d}$ [kN])
12	6.2 (8.4)			12.0 (16.2)
11	5.7 (7.7)	11.4 (15.4)	11.4 (15.4)	
10	5.2 (7.0)	10.4 (14.0)	10.4 (14.0)	
9	4.7 (6.3)	9.3 (12.6)	9.3 (12.6)	
8	4.1 (5.6)	8.3 (11.2)	8.3 (11.2)	
7	3.6 (4.9)	7.2 (9.8)	7.2 (9.8)	
6	3.1 (4.2)	6.2 (8.4)	6.2 (8.4)	
5	2.6 (3.5)	5.2 (7.0)	5.2 (7.0)	10.4 (14.0)
4	2.1 (2.8)	4.1 (5.6)	4.1 (5.5)	8.3 (11.2)
3	1.6 (2.1)	3.1 (4.2)	3.1 (4.2)	6.2 (8.4)
2	1.0 (1.4)	2.1 (2.8)	2.1 (2.8)	4.1 (5.6)
1	0.5 (0.7)	1.0 (1.4)	1.0 (1.4)	2.1 (2.8)
Example: Load height $H = 5.0 \text{ m}$ ; support with standard support brackets; HK5 - U with angle bracket, $e = 750 \text{ mm} \rightarrow F_V = 7.8 \text{ kN}$ → selected support bracket for load group <b>8.0 kN</b>				

Load groups 4.0 8.0 12.0

### Calculation

#### 1. Load calculation

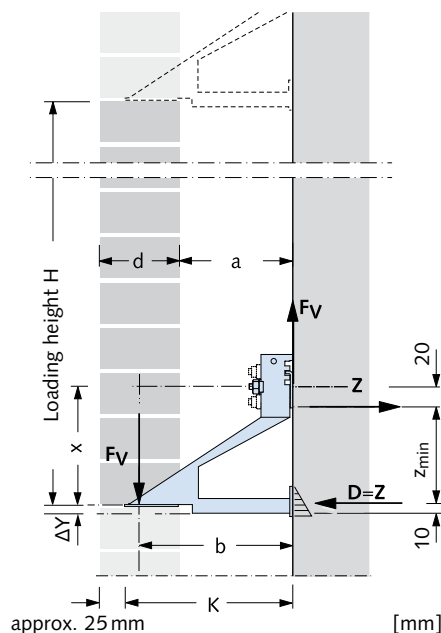
$H$  = load height [m]  
 $\gamma$  = brickwork factor [ $\text{kN/m}^3$ ]  
 $a$  = cavity dimension [mm]  
 $b = a + \frac{d}{2} + \text{tolerance}$  [mm]  
 tolerance = 15 mm  
 $d$  = brick thickness [mm]  
 $e$  = spacing of HK5 support brackets [m]  
 $F_V$  = vertical loading per fixing point

$$F_V = H \times e \times d \times \gamma \text{ [kN]}$$

$\rightarrow F_V = H \times e \times 2.07$  for  $\gamma = 18 \text{ kN/m}^3$  and  $d = 0.115 \text{ m}$   
 $(F_{V,d} = 1.35 \cdot F_V)$

#### 2. Selecting a HK5 Support bracket

Max.  $F_V$  = load class, results in  $\rightarrow x$   
 (see tables; HK5 support brackets, page 12–23)



#### 3. Calculating the acting load $R_Z$

$$z_{\min} = x + \Delta Y - 10 - 20 \text{ [mm]}$$

$\rightarrow$  HK5 - adjustability =  $\pm 20 \text{ mm}$

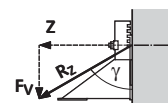
Tension/compression load  $Z = -D$

$$\max Z = F_V \times b / z_{\min}$$

$$(Z_d = F_{V,d} \times b / z_{\min})$$

Resulting load  $R_Z = \sqrt{Z^2 + F_V^2}$

$$R_{Z,d} = \sqrt{Z_d^2 + F_{V,d}^2}$$



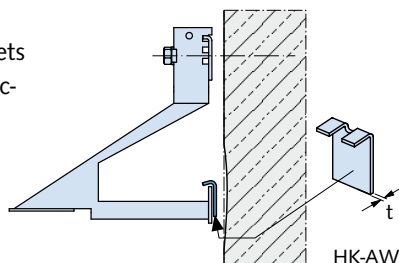
**Note:** Refer to the ETA approval for the selected fixing method for calculation.

## HALFEN SUPPORT BRACKETS

### Depth Adjustments for HK5 Support Brackets

#### HK - AW Compensation shims

For aligning the HK5 Support brackets vertically (compensating for construction tolerances).



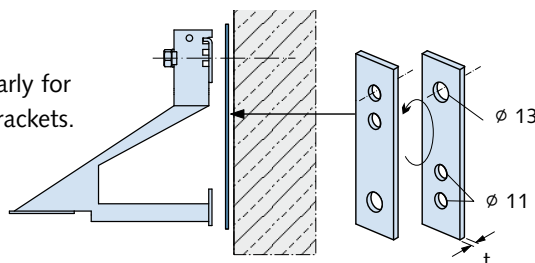
HK-AW Compensation shims

#### Compensation shims

Article name	Order no. 0156.020-	t [mm]
HK - AW - 3	00001	3
HK - AW - 6	00002	6

#### HK - AL Compensation shims

For depth adjustments, particularly for HK5-F and -FV Angle support brackets.



#### Compensation shims

Article name	Order no. 0156.030-	t [mm]
HK - AL - 3	00001	3



#### Note:

Take **cantilever K increase** and **increased bending moment** into count when using HK-AL Compensation shims!

#### Tender text example

##### Single support bracket

HALFEN HK5-U Support bracket,  
to support brick facing masonry, made from stainless steel, corrosion resistance class III  
according to approval Z-30.3-6 and according to approval EN 1993-1-4: 2006, table A.1,  
section 3;  
optimised thermal properties,  
height adjustable  $\pm 20$  mm,  
type tested with general building authority approval/  
General construction technique permit for the bracket head, with CE marking,

Type HK5-U-LS-K

with

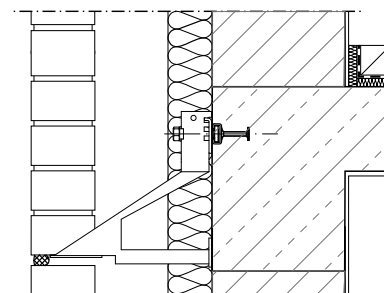
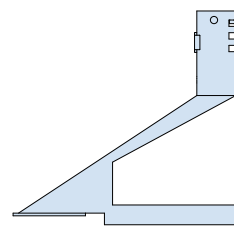
U = Standard single support bracket,

LS = Load class [kN] ..... (4,0 / 8,0 / 12,0),

K = bracket cantilever length [mm] ..... (130 / 150 / 170 / 190 / 210 / 230 / 250 / 270 / 290 / 310 / 330 / 350) for a wall spacing of  $(K - 90 \text{ mm}) \pm 15 \text{ mm}$ ,

or similar; deliver and install according to manufacturers instructions.

Fixing system not included.

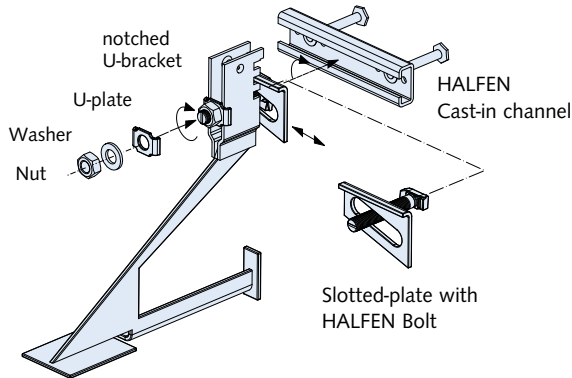




## HALFEN SUPPORT BRACKETS

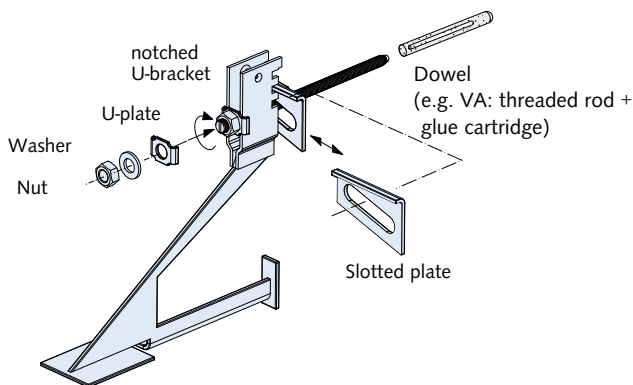
### Installation Instructions

#### Fixing to HALFEN Channels



1. Check the HALFEN Cast-in channel is properly installed.
2. Assemble the support bracket, the HALFEN Bolt, slotted plate, U-plate, washer and nut as illustrated. Insert the head of the bolt horizontally into the HALFEN Channel, then turn to the right and tighten the nut by hand. The notch at the shaft-end of the bolt has to be vertical.
3. Adjust the height of the support bracket. A notch in the U-bracket must be resting on the slotted plate; if necessary, tap the bracket lightly with a hammer until contact is made. Use a torque spanner to tighten the nut.

#### Fixing with HALFEN dowels



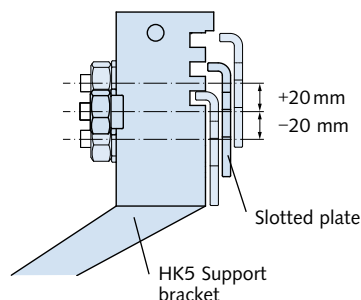
1. Install the dowel in accordance with the ETA approval.
2. Place the slotted plate and the support bracket on to the threaded rod using the U-plate, washer and nut as illustrated.
3. Adjust the height of the support bracket. A notch in the U-bracket must be resting on the slotted plate; if necessary, tap the bracket lightly with a hammer until contact is made. Use a torque spanner to tighten the nut.

**Note:** Only use suitable, approved dowels in cracked concrete (e.g. HALFEN Injection anchors).

#### Adjustment and tightening

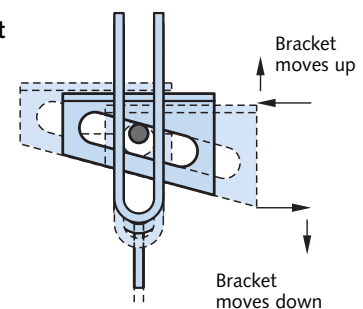
##### Rough height adjustment

Select a suitable notch for initial adjustment.



##### Exact height adjustment

Move the slotted plate sideways for fine adjustment of the HK5 Support bracket.



##### Tightening

After height adjustment, use a torque spanner to tighten the nut with the required torque in accordance with the values shown in the table below.

##### Required torque [Nm] for threads

Method of fastening	M 10	M 12	M 16
HALFEN Bolt HS	15	25	60
HALFEN Chemical anchor VZ	15	25/30	50
HALFEN Injection anchor VMZ	15	25/30 <sup>①</sup>	50
HALFEN Bolt anchor BZ	35	50	110

<sup>①</sup> see page 31–32

##### **i** Notes for on-site handling

1. Remove the packaging straps as soon as possible after delivery to the construction site to avoid rust stains on the stainless steel.
2. All stainless steel parts must be immediately rinsed thoroughly with water if they have come into contact with acidic solutions, as sometimes used for cleaning brickwork. We strongly advise against using hydrochloric acid based products.

## HALFEN SUPPORT BRACKETS

### Brick Cladding in Accordance with DIN 1996

#### HALFEN SUPPORT BRACKETS

##### Brick cladding in accordance with DIN EN 1996

Excerpt from DIN EN 1996-2/NA,  
Issue 2012-01  
(non-official translation)

NA.D Cavity wall construction  
NA.D.1 General directives for execution  
[...]

(4) The following points need to be observed when designing a non-load-bearing outer skin (brick cladding or plastered masonry leaf) to front a load-bearing structure wall.

- Only the thickness of the main structural wall is to be used for verification.
- The minimum thickness of the outer skin is 90 mm. Thinner outer skins are called cladding and their construction is detailed in DIN 18 515. The minimum length of brick piers in the outer skin that have to support loads only from the outer skin is 240 mm. The outer skin must be supported for its full width and length. Where the support is interrupted (e.g. on brackets), all bricks/blocks must be supported on both sides at the level of the support. [...]
- Outer skins with a thickness of 115 mm should be supported in vertical intervals of about 12 m. They may project up to 25 mm beyond their load bearing support. If the 115 mm thick outer skin is not higher than two floors or it is supported every two floors, it may project up to 38 mm from its bearing. These projections have to be taken into account when calculating the compression in the load bearing support. [...]
- Outer skins with a thickness of  $t \geq 105$  mm and  $t < 115$  mm must not be built to a height of more than 25 m above ground level and have to be supported in vertical intervals of about 6 m. On buildings with two full floors, a triangle gable up to a height of 4 m can be included without additional supports. These exterior skin may protrude a maximum of 15 mm from the load bearing support. [...]
- Outer skins with a thickness of  $t \geq 90$  mm and  $t < 105$  mm must not be built to a height of more than 20 m above ground level and have to be supported in vertical intervals of about 6 m. On buildings with two full storeys, a gable triangle up to a height of 4 m can be included without additional supports. For the joints of the facing surface, smooth pointing is required (no separate pointing).

The outer skin may protrude a maximum of 15 mm from their load bearing support.

g) In accordance with the general building approval the facing wall must be secured with stainless steel wire ties or with anchors in stainless steel in accordance with DIN EN 845-1; the application of which is regulated by a general building approval. The wire wall ties must be of the shape and size as shown in picture NA.D.1 with:

- vertical spacing: max. 500 mm;
- horizontal spacing: max. 750 mm;
- cavity between the walls : max. 150 mm;
- diameter: 4 mm;
- minimum mortar class IIa;
- minimum number of anchors: see table NA.D.1; if nothing else is regulated in a general building authority approval

Table NA.D.1 – Minimum number  $n_{\min}$  of wire ties per  $m^2$  façade (wind zones acc. to DIN EN 1991-1-4/NA)

building height	windzone 1 to 3 windzone 4 on shore	windzone 4 coast of North Sea and Baltic Sea including islands	windzone 4 North Sea islands
$h \leq 10$ m	7 <sup>a</sup>	7	8
$10 \text{ m} \leq h \leq 18$ m	7 <sup>b</sup>	8	9
$18 \text{ m} \leq h \leq 25$ m	7	8 <sup>c</sup>	

a) in windzone 1 and 2 inland zone: 5 anchors/ $m^2$   
b) in windzone 1: 5 anchors/ $m^2$   
c) if one side length of the building is smaller than  $h/4$ : 9 anchors/ $m^2$

On all free edges (of openings, building corners, along expansion joints and along the top edges of the outer leaves), three wire wall ties per linear metre of edge must be fitted in addition to table NA.D.1. [...]

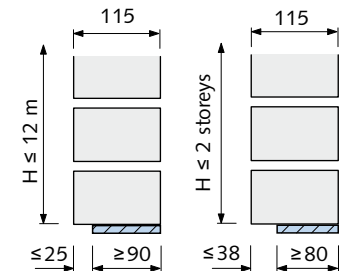
While taking their structural effectiveness into account, the wire wall ties must be designed to ensure they do not conduct moisture from the outer skin to the inner main structure (e.g. by fitting a drip disc, see picture NA.D.1). [...]

NA.D.2 Ventilation gap  
(1) The following must be maintained:

- If a ventilation gap is planned in the cavity, it should be at least 60 mm. The air gap may be reduced to 40 mm if all excess mortar protruding into the cavity is removed. [...]

#### Bearing on the support brackets

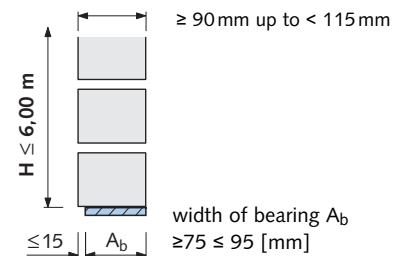
- for 115 mm thick brick skin



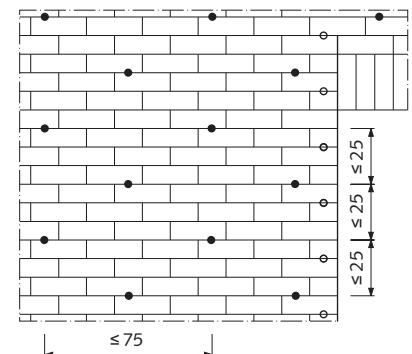
Full bearing width      2/3 bearing width

If the outer skin is not higher than 2 storeys or it is supported every two storeys, it may protrude beyond the support by up to 38 mm.

- for brickwork skins  $\geq 90$  mm to  $< 115$  mm thick



#### Layout of cavity wall ties

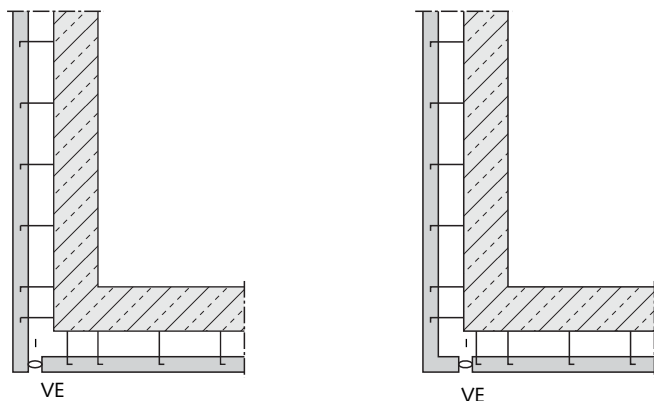


- min. number of ties in the wall-area 5 ties/ $m^2$
- 3 additional ties have to be fitted per linear metre next to openings, expansion joints and along edges

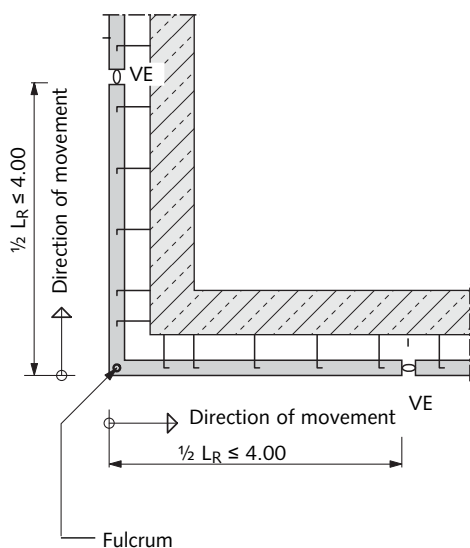
## HALFEN SUPPORT BRACKETS

### Expansion Joints

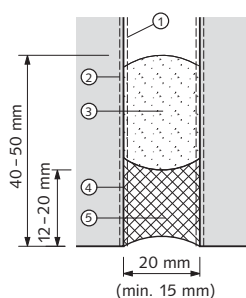
#### Expansion joints at corners



Symmetrical corner layout with expansion joints

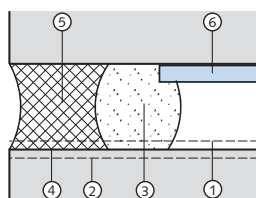


#### Vertical expansion joint



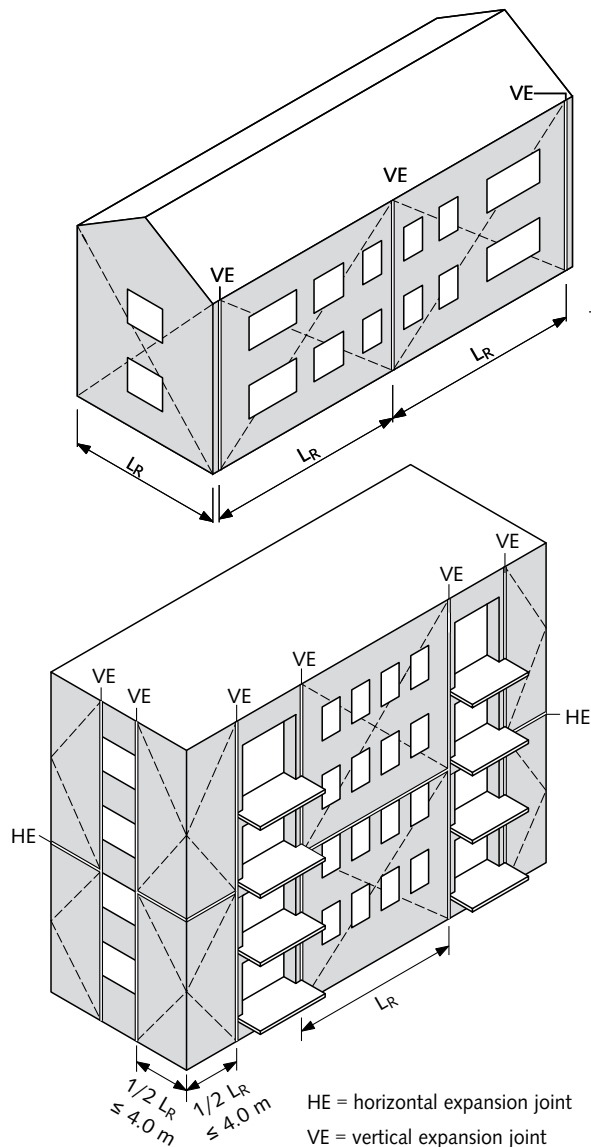
Example; detail of expansion joint, recommendation from the German Society for Masonry Construction (*Deutsche Gesellschaft für Mauerwerksbau*).

#### Horizontal expansion joint under support brackets



- ① joint compressed
- ② joint expanded
- ③ closed-cell foam profile
- ④ bonding primer

#### Horizontal and vertical expansion joints



HE = horizontal expansion joint  
VE = vertical expansion joint

#### Recomm. spacing of expansion joints

Max. distance between vertical expansion joints in acc. with EC 6	
Masonry type	max L <sub>R</sub>
Brick masonry	12.0 m
Calcium-silicate masonry	8.0 m
Concrete masonry (with admixtures) and concrete cast stone	6.0 m
Aerated concrete block masonry	6.0 m
Natural stone masonry	12.0 m

- ⑤ elastoplastic joint sealing compound
- ⑥ HALFEN HK5 Support brackets

## HALFEN SUPPORT BRACKETS Further Façades Fixing Systems

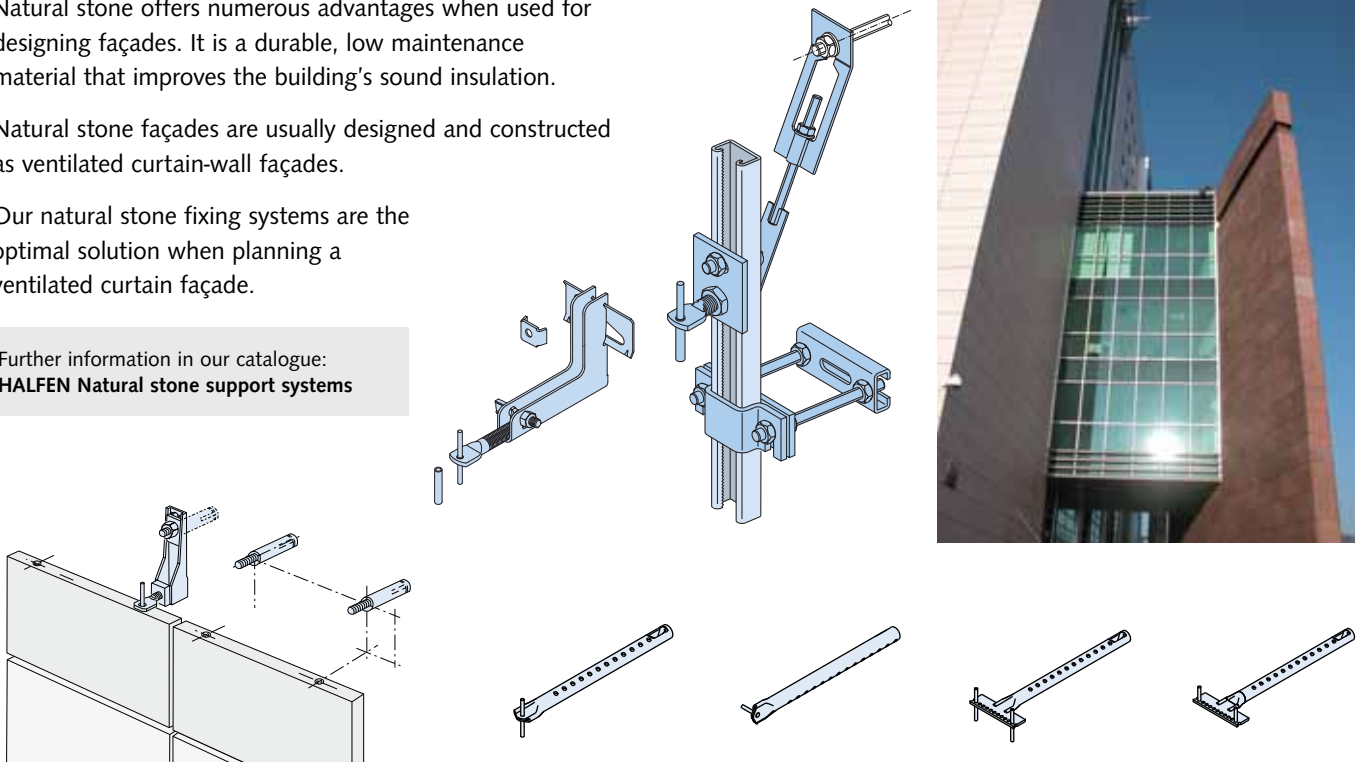
### Natural stone façades

Natural stone offers numerous advantages when used for designing façades. It is a durable, low maintenance material that improves the building's sound insulation.

Natural stone façades are usually designed and constructed as ventilated curtain-wall façades.

Our natural stone fixing systems are the optimal solution when planning a ventilated curtain façade.

Further information in our catalogue:  
**HALFEN Natural stone support systems**



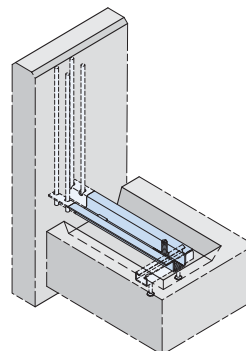
### Concrete façades

Innovative production methods in precast concrete plants and new self-compacting concretes allow contemporary surface textures. Therefore, high quality, economical as well as functional, good quality precast-concrete components are possible. These façade components are secured to the load-bearing structure of the building as separate, thin façade elements.

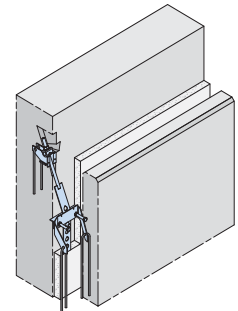
Following distinctions in construction type are made:



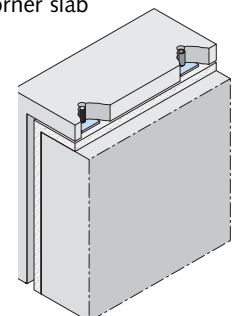
Parapet element



Suspended façade slab



Corner slab



Further information in our catalogue: **HALFEN Concrete façade anchor systems**













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