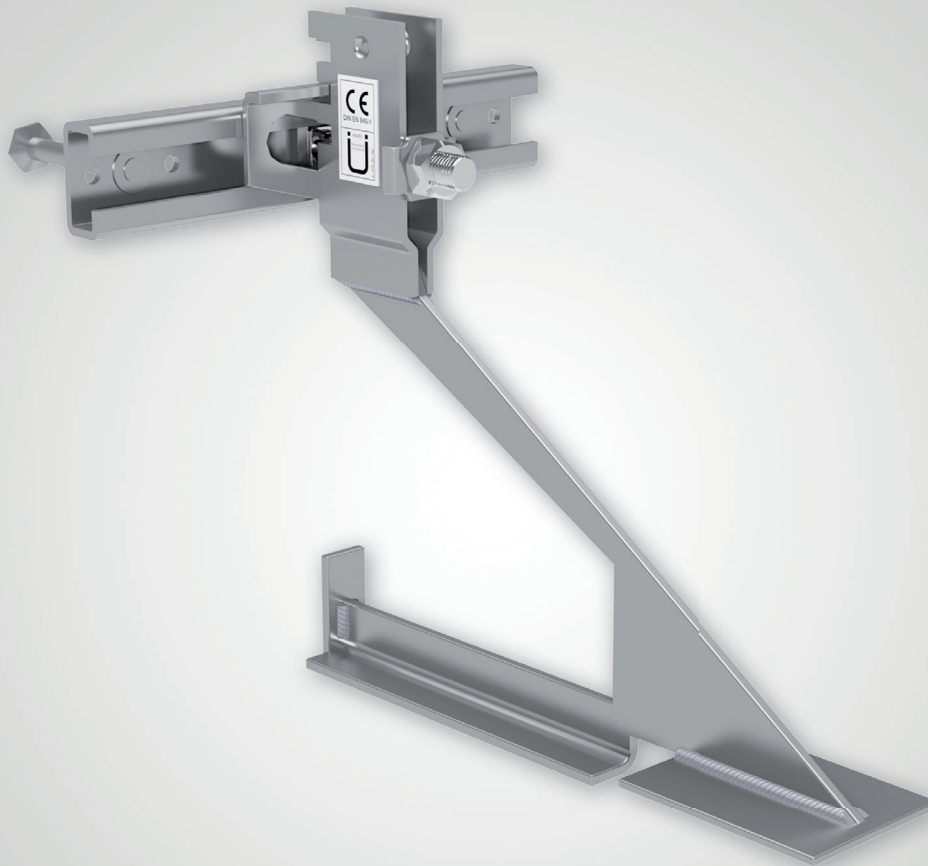


HALFEN BRICKWORK SUPPORT

Technical Product Information





We are one team. **We are Leviat.**

Leviat is the new name of CRH's construction accessories companies worldwide.

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The products you know and trust, including HALFEN Brickwork support brackets, will remain an integral part of Leviat's comprehensive brand and product portfolio. As Leviat, we can offer you an extended range of specialist products and services, greater technical expertise, a larger and more agile supply chain and better, faster innovation.

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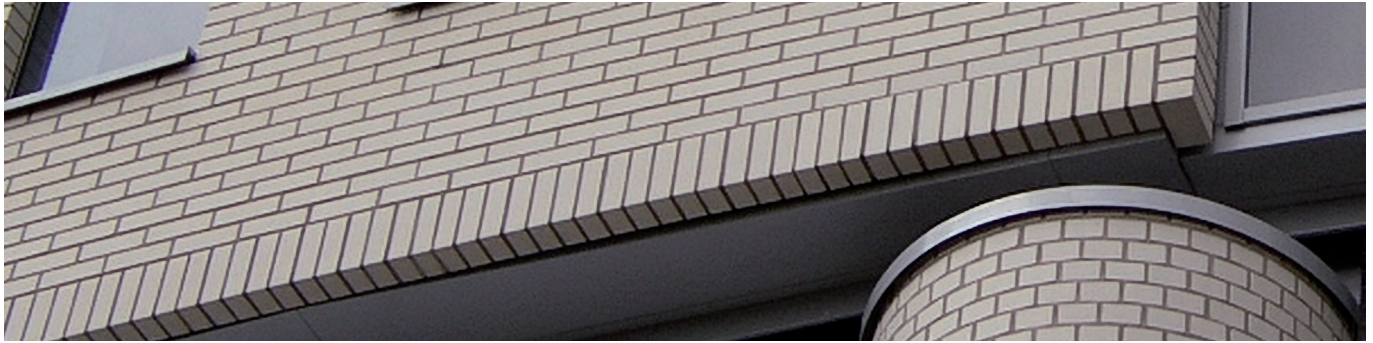
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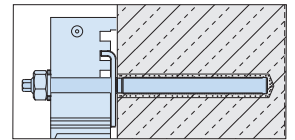


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HALFEN HB-VMU Injection system for solid brick masonry

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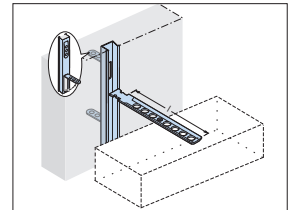
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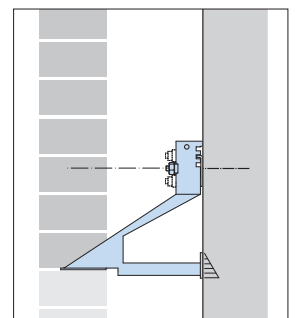
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References

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Contact us worldwide

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HALFEN SUPPORT BRACKETS

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

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 Brickwork support bracket 5.0

HK5 – with increased load capacities and reduced thermal heat transfer

The new 5.0 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 now suitable for up to 14% higher loads.

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

Façade construction becomes more economic with higher energy efficiency.



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



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.



HK5 Brickwork support bracket

Reduced thermal heat transfer

- › the slim structural design improves χ -values by up to 27%
- › an expert report confirms a reduced influence to the heat transmission coefficient U [$W/(m^2 K)$] of a façade
- › no additional thermal insulation is required

New load range

- › up to 14% increased load capacities
- › 4.0 kN instead of 3.5 kN
- › 8.0 kN instead of 7.0 kN
- › 12.0 kN instead of 10.5 kN

Quality check system

- › building authority approved bracket head
- › type tested brackets for up to 350 mm cantilevers

Our familiar quality

- › up to 350 mm cantilevers
- › ± 20 mm vertical adjustability
- › ± 15 mm horizontal adjustability

New lean duplex material

- › stainless high-grade steel of corrosion resistance class (CRC) III
- › building authority approved
- › yield limit ≥ 400 N/mm² allows the cross section to be reduced without reducing the load capacity



HALFEN Brick ties

HALFEN Brick ties

- › universal application
- › time saving, no bending of ties required
- › verified and building authority approved for numerous bricks and mortar combinations
- › approved for large gaps

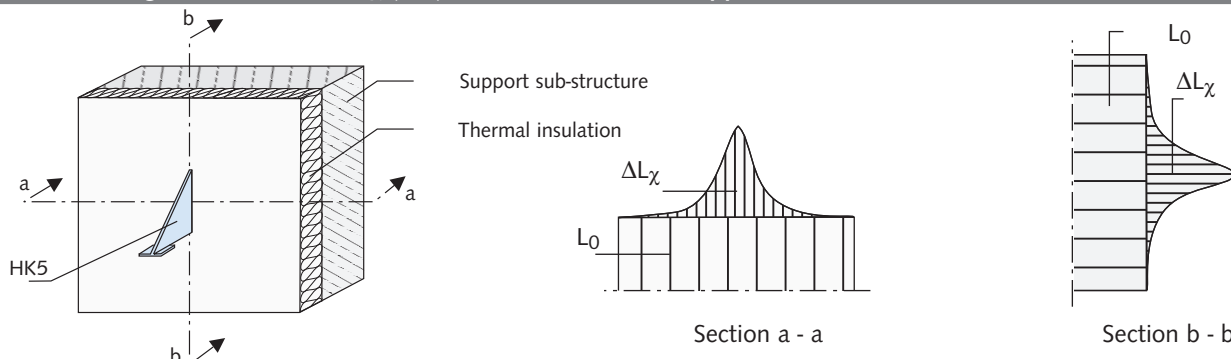


More information available on our homepage
www.halfen.com ▶ products ▶ brickwork support systems

HALFEN SUPPORT BRACKETS

Thermal Bridges

Thermal bridge loss coefficient χ (chi) for HK5 Brickwork supports



Thermal-bridges in HK5 Single support brackets

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 χ (chi) it is possible to determine the exact effect of the HK5 Support brackets on the heat transmission coefficient for the wall.

Thermal conductivity - insulation / $\lambda = 0.035$ (W/mK) ; χ (chi) -value per bracket (W/K)													
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											
HK5 - 8.0 - 130	0.114	0.108											
HK5 - 12.0 - 130	0.128	0.123											
HK5 - 4.0 - 150	0.074	0.077	0.055										
HK5 - 8.0 - 150	0.098	0.110	0.083										
HK5 - 12.0 - 150	0.110	0.125	0.096										
HK5 - 4.0 - 170	0.066	0.063	0.041	0.028									
HK5 - 8.0 - 170	0.082	0.083	0.058	0.040									
HK5 - 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								
HK5 - 8.0 - 190	0.082	0.081	0.055	0.038	0.031								
HK5 - 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							
HK5 - 8.0 - 210	0.081	0.081	0.053	0.035	0.030	0.026							
HK5 - 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						
HK5 - 8.0 - 230	0.081	0.081	0.053	0.036	0.029	0.025	0.021						
HK5 - 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					
HK5 - 8.0 - 250	0.081	0.081	0.063	0.035	0.028	0.024	0.022	0.019					
HK5 - 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				
HK5 - 8.0 - 270	0.081	0.082	0.053	0.035	0.028	0.024	0.021	0.019	0.017				
HK5 - 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			
HK5 - 8.0 - 290	0.081	0.082	0.053	0.035	0.028	0.024	0.021	0.019	0.017	0.016			
HK5 - 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		
HK5 - 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		
HK5 - 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	
HK5 - 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	
HK5 - 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	0.014
HK5 - 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	0.016
HK5 - 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	0.017

Façade with core insulation

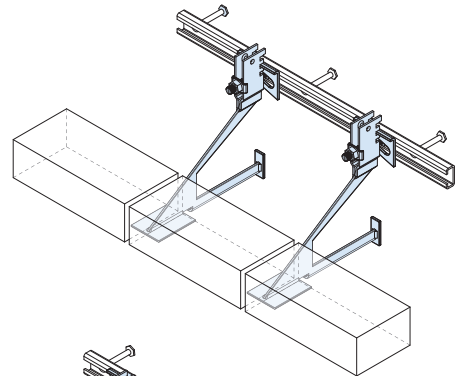
HALFEN SUPPORT BRACKETS

Sample Applications

Applications

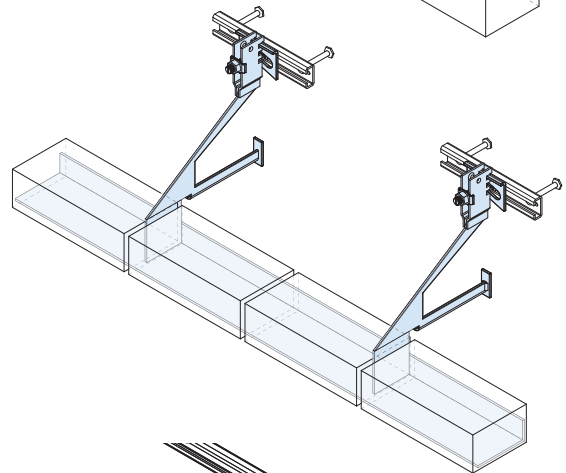
HK5-U

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



HK5-FV

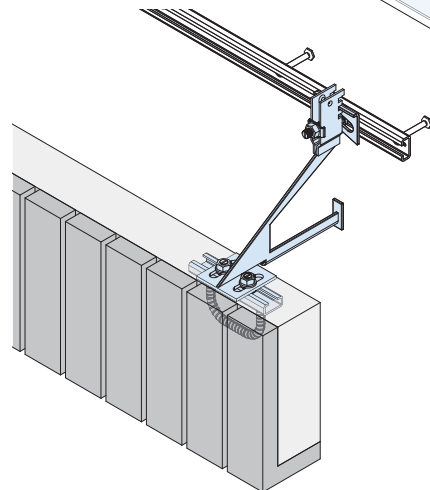
The standard type for support above window openings allows larger spacing behind the support brackets. Variants for different applications are available, see page 14–15



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 (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: 2006, table A.1, row 3 (Group 1.4404, 1.4571...).

A2: Steel, corrosion resistance class (CRC) II according to Z-30.3-6 and EN 1993-1-4: 2006, table A.1, row 2 (Group 1.4307...).

HCR: Steel, corrosion resistance class (CRC) V according to Z-30.3-6 and EN 1993-1-4: 2006, table A.1, row 4 (Group 1.4565, 1.4529...).

HALFEN SUPPORT BRACKETS

Sample Applications

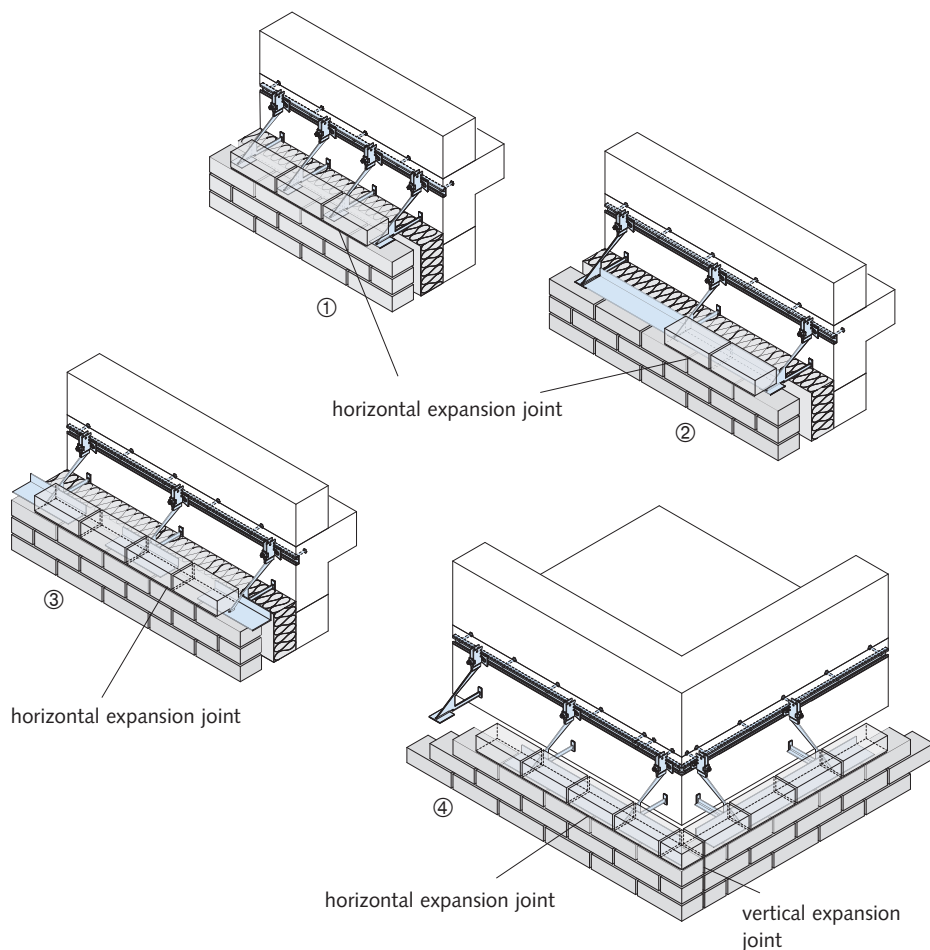
Continuous wall surface

① HK5-U Single support brackets, spacing $e = 25\text{ cm}$, see page 12–13

② HK5-U Single support brackets, spacing $e \geq 50\text{ cm}$, and HW 95 Support angle, see page 12 and page 20–21

③ HK5-P Angle support brackets, spacing $e = 50\text{ cm}$, see page 18

④ HK5-F Angle support brackets, see page 15



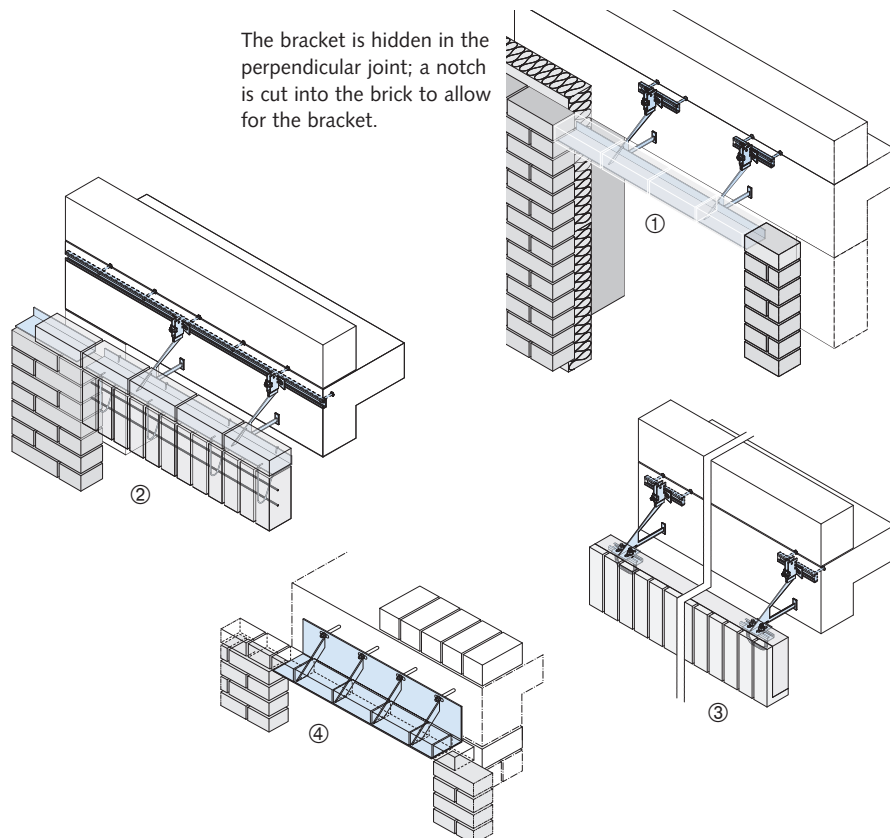
Support over wall openings

① HK5-F Support with visible angle support bracket, see page 15

② HK5-F Support with hidden angle support bracket and HSL Suspension loops, see page 14–17

③ Support brackets for precast lintels with HK5-SV single support brackets, the lintel is supported by HALFEN HTA-ES Channels with cast-in metal loops, see page 22–23

④ KWL Angles; anchor bolt fixing, see page 19



HALFEN SUPPORT BRACKETS

Sample Applications

KM Grout-in wall anchors

Support with grout-in brackets and angle support brackets 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

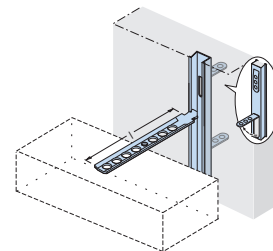
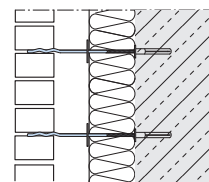
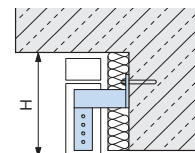
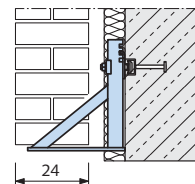
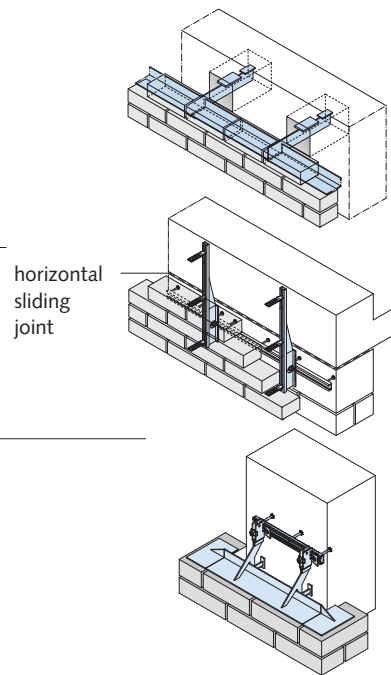
With angle support brackets, special construction, see page 15

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



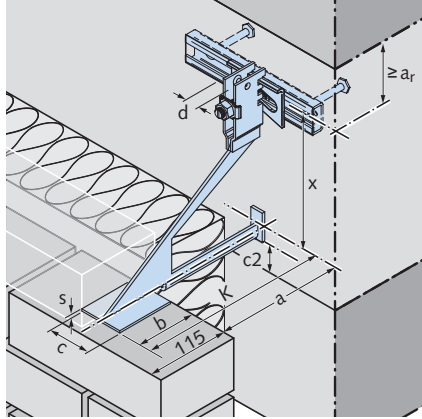
Installation with HALFEN Anchor bolt systems: More information can be found in Technical Product Information: "HALFEN HB Anchor bolt systems".



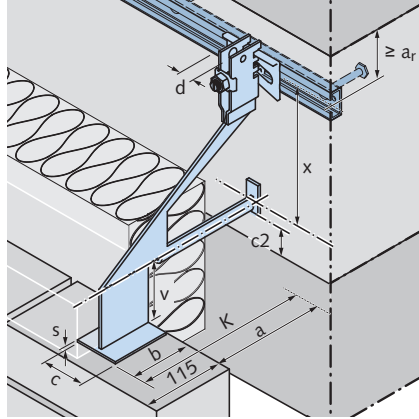
HALFEN SUPPORT BRACKETS

HK5-U, HK5-W Single Support Brackets

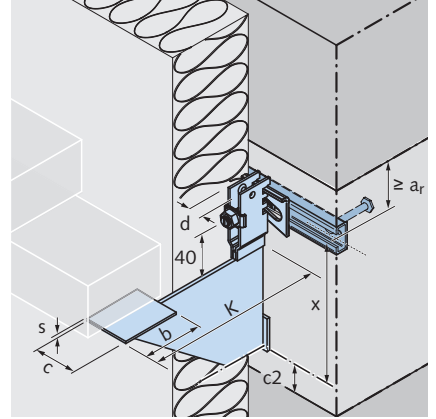
HK5 - U 



HK5 - UV 



HK5 - UT 



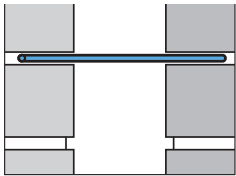
The HK5-U Single support bracket is a standard single bracket with optimized web plate and a support-plate. Used in combination with HALFEN HTA Cast-in channels, the adjustable HK5-U Wall bracket provides an easy-to-install, cost-effective and safe construction.

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

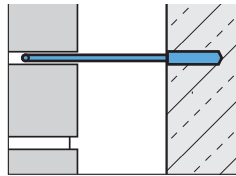
Note:

- c_2 = required edge distance according to type test report or static calculation
- additional suspension height up to 350mm
- a_r = required edge distance according to the technical approval for the anchorage

Accessories

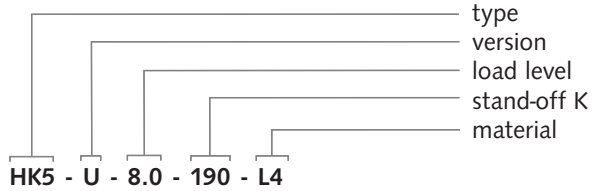


Brick wall tie for drill fixing, see page 27, 28



Brick wall tie, see page 26

Order example:



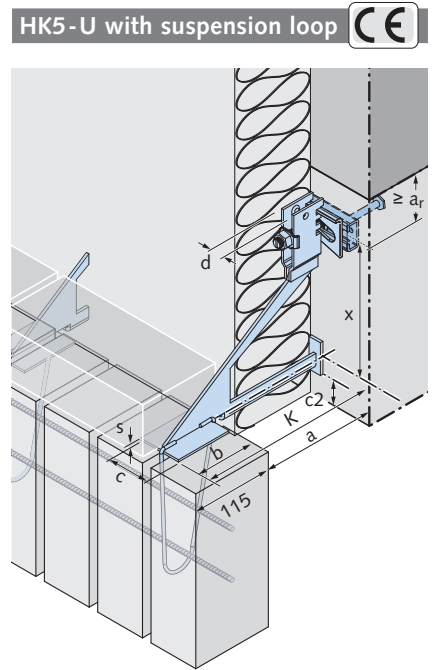
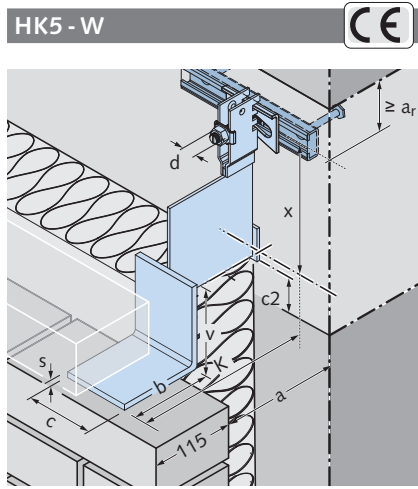
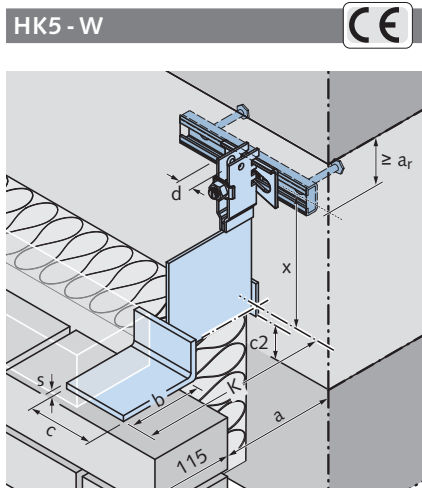
Selecting HK5 Single support brackets		Spacing a from wall [mm]	Allowable load $F_V = 4.0 \text{ kN}$ ($F_{Rd} = 5.4 \text{ kN}$)		Allowable load $F_V = 8.0 \text{ kN}$ ($F_{Rd} = 10.8 \text{ kN}$)		Allowable load $F_V = 12.0 \text{ kN}$ ($F_{Rd} = 16.2 \text{ kN}$)	
 Dimensions in mm			Length K	x	Length K	x	Length K	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
	-UT	100 ± 15	190	150	190	200	190	264
	-UT	120 ± 15	210	150	210	200	210	264
	-W*	140 ± 15	230	175	230	250	230	314
	-W*	160 ± 15	250	175	250	250	250	314
	-W*	180 ± 15	270	180	270	270	270	334
	-W*	200 ± 15	290	200	290	290	290	354
-W*	220 ± 15	310	220	310	310	310	374	
-W*	240 ± 15	330	240	330	330	330	394	
-W*	260 ± 15	350	260	350	350	350	414	
Support plate $b \times c \times s$		80 × 60 × 3		80 × 60 × 4		100 × 80 × 5		
Notch spacing d		12.5		16.5		16.5		

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

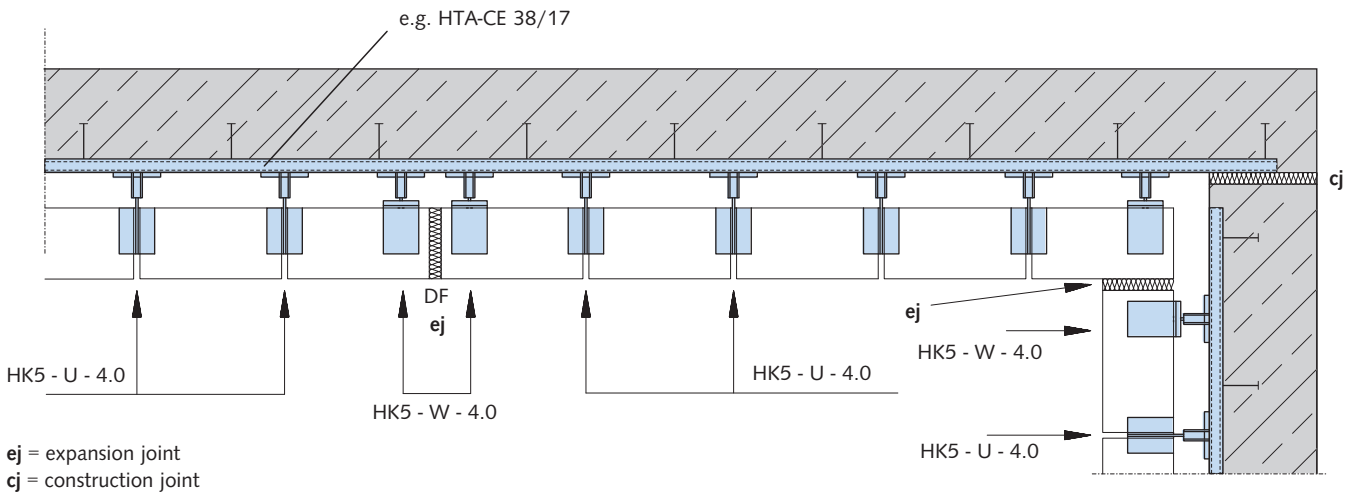
① other brick dimensions are also possible

HALFEN SUPPORT BRACKETS

HK5-U, HK5-W Single Support Brackets

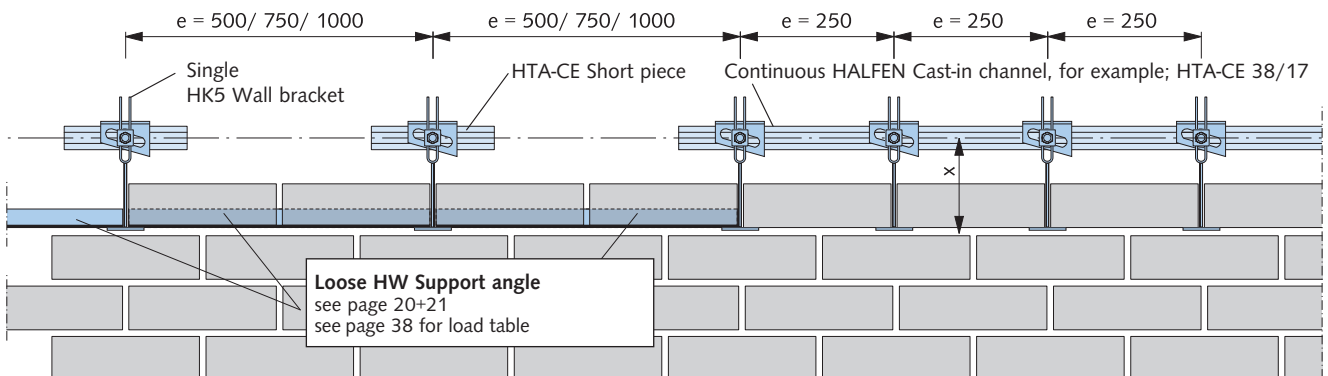


Example:
Brickwork cladding support with height = $H \leq 6.00\text{m}$



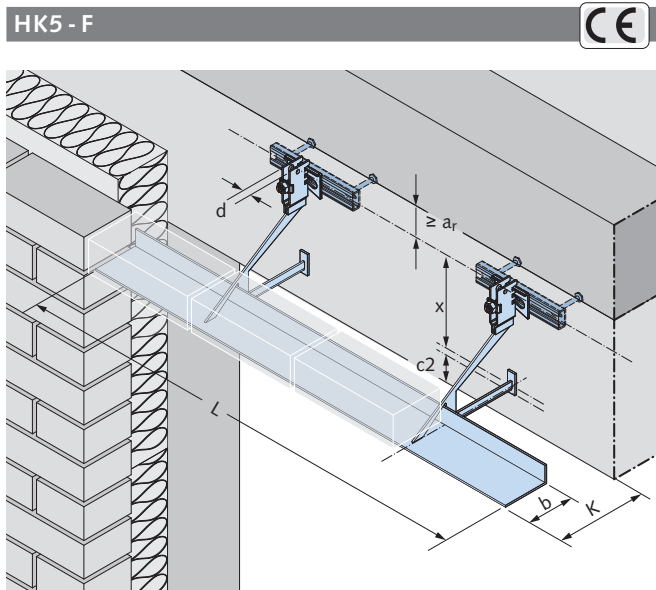
Example:
Support with and without support angle

All dimensions in mm

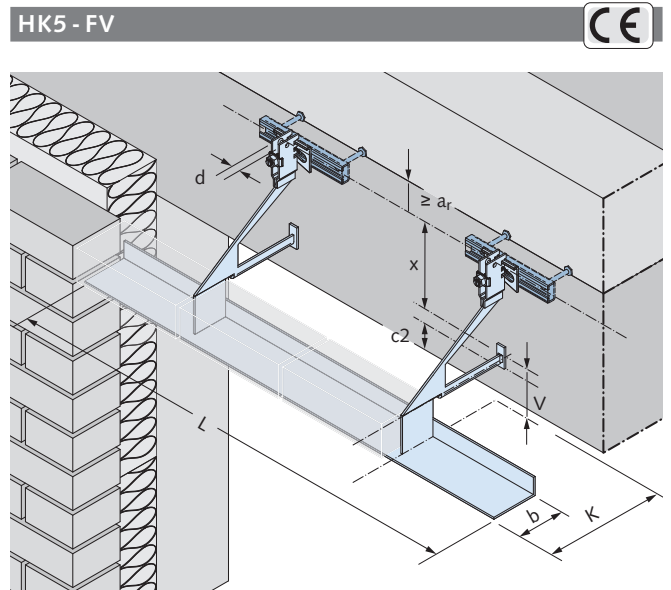


HALFEN SUPPORT BRACKETS

Continuous HK5 - F Angle Support Bracket



Standard version HK5 with angle and two supports



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

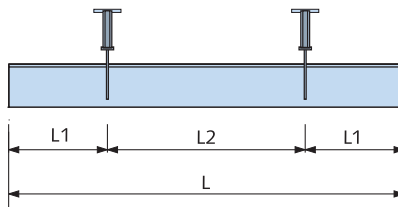
For support of low-height brickwork cladding, e.g. parapets above window openings; allows larger brackets spacing.

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

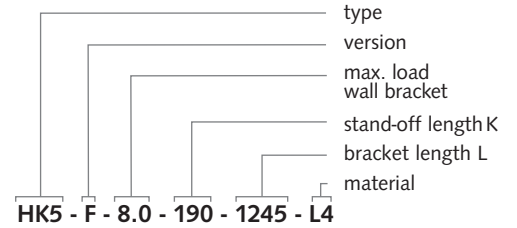
Standard lengths [mm] for HK5 - F/- FV		
L1	L2	L
247.5	500	995
247.5	750	1245
247.5	1000	1495

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 according to the technical approval for the anchorage



Order example:



Selecting HK5 Angle support bracket

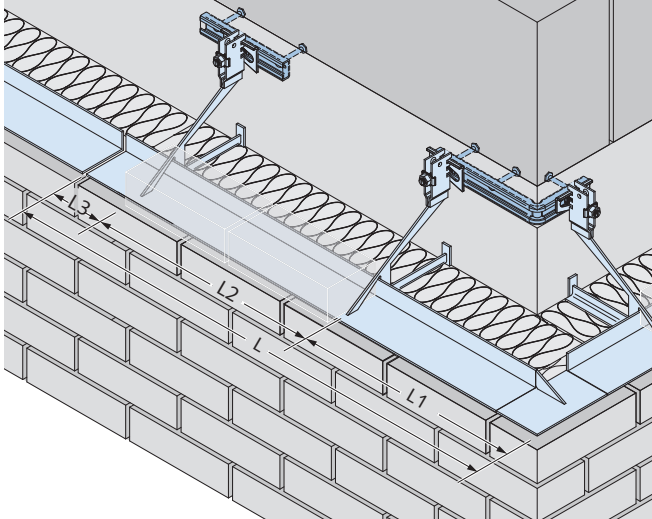
		Spacing a from wall [mm]	Allowable load $F_V = 4.0 \text{ kN}^{\text{①}}$ ($F_{Rd} = 5.4 \text{ kN}$)		Allowable load $F_V = 8.0 \text{ kN}^{\text{①}}$ ($F_{Rd} = 10.8 \text{ kN}$)		Allowable load $F_V = 12.0 \text{ kN}^{\text{①}}$ ($F_{Rd} = 16.2 \text{ kN}$)	
			Length K	x	Length K	x	Length K	x
		40 ± 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
Dimensions in mm	Angle width b		100		100		100	
	Width of notched bracket d		12.5		16.5		16.5	

① allowable load, HK5 Angle support brackets

HALFEN SUPPORT BRACKETS

Continuous HK5-F Angle Support Bracket

HK5 - FR

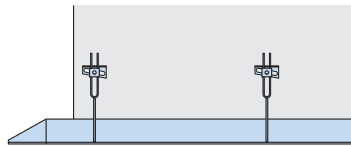


Right-corner support element

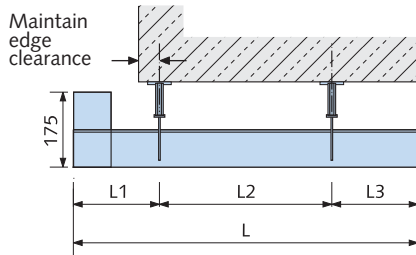
Custom solutions:

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

Elevation



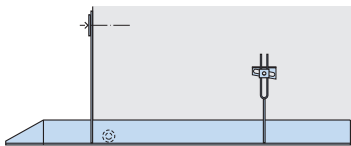
Plan



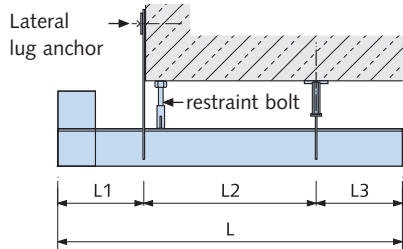
Order example: HK5-FL-8.0 - 180 - 990 (305/440/245)

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

Elevation

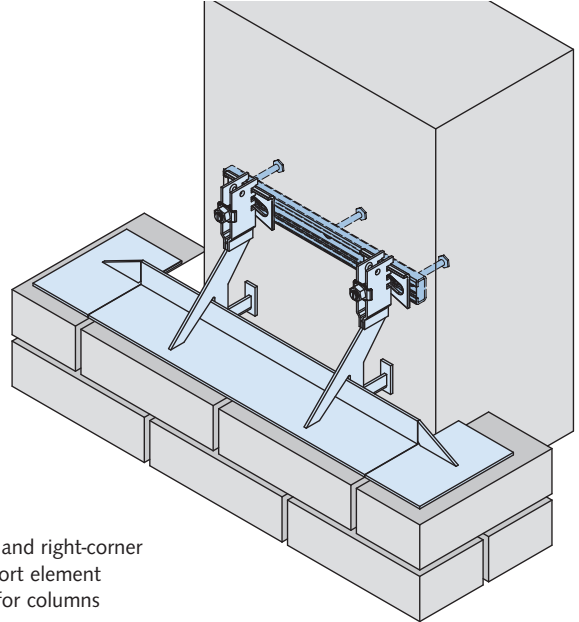


Plan



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

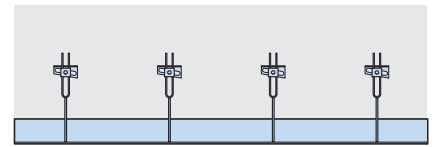
HK5 - FLR



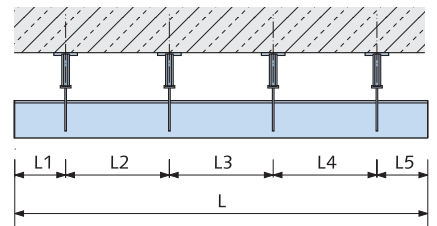
Left- and right-corner support element
e.g. for columns

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

Elevation

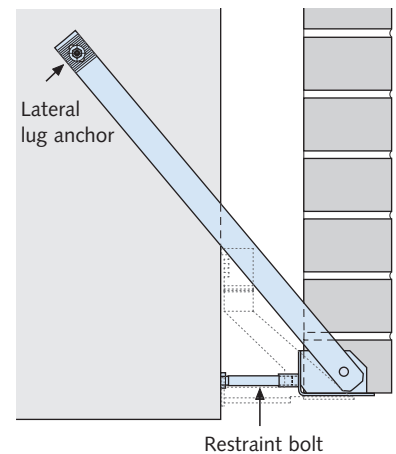


Plan



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

Vertical section

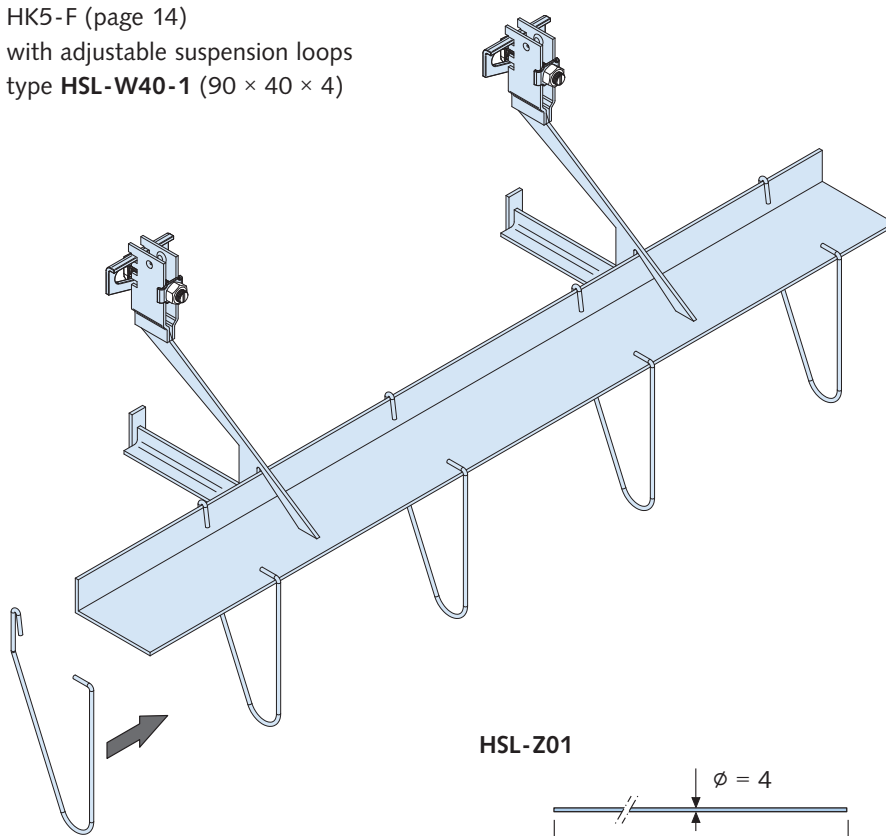


HALFEN SUPPORT BRACKETS

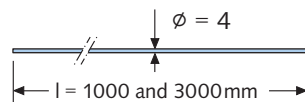
Suspension Loops

Overview

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

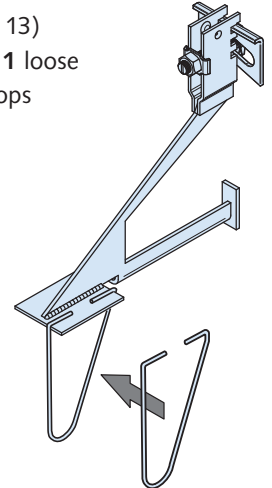


HSL-Z01



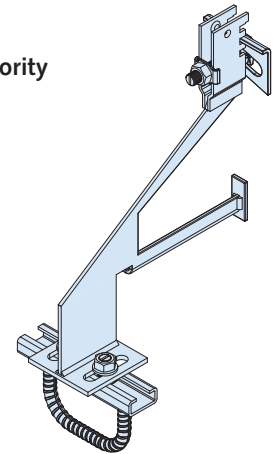
Stainless steel wire as longitudinal reinforcement for suspended soldier courses, diameter \varnothing 4 mm, material: W 1.4571 or 1.4404 (A4)

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



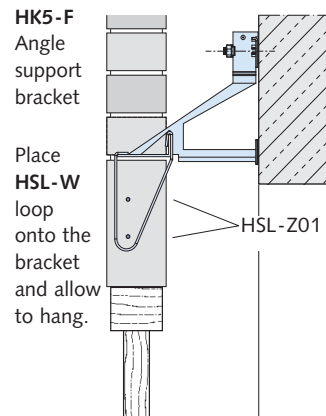
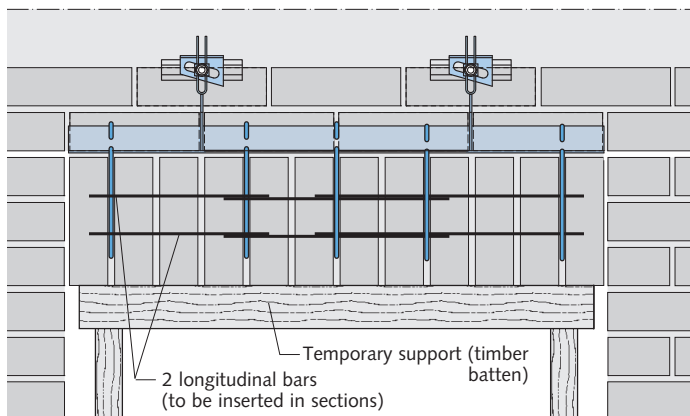
HK5-S (see page 22)
with **HTA-ES**

building authority approved

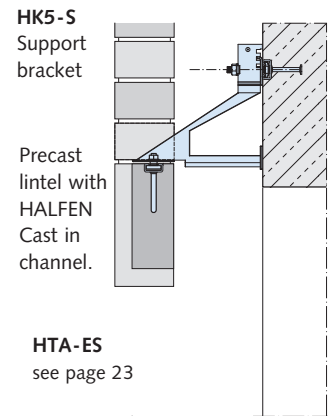


Example: supporting soldier courses with concealed supports

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



Detail with prefabricated lintel



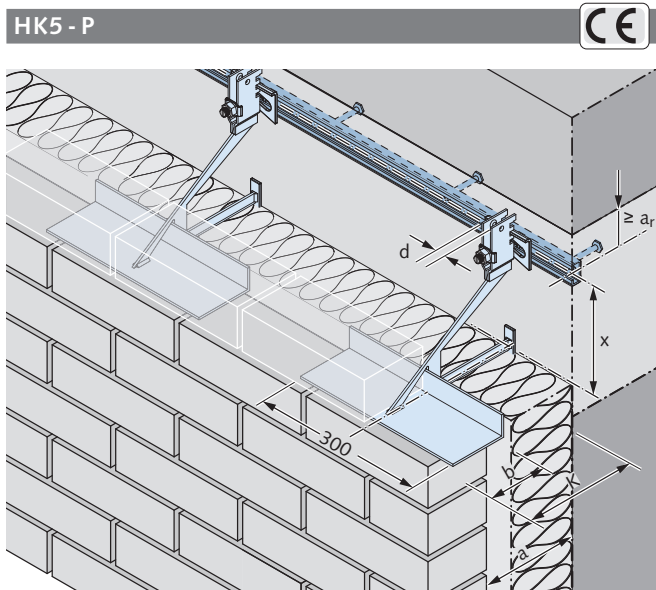
HALFEN SUPPORT BRACKETS

Suspension Loops

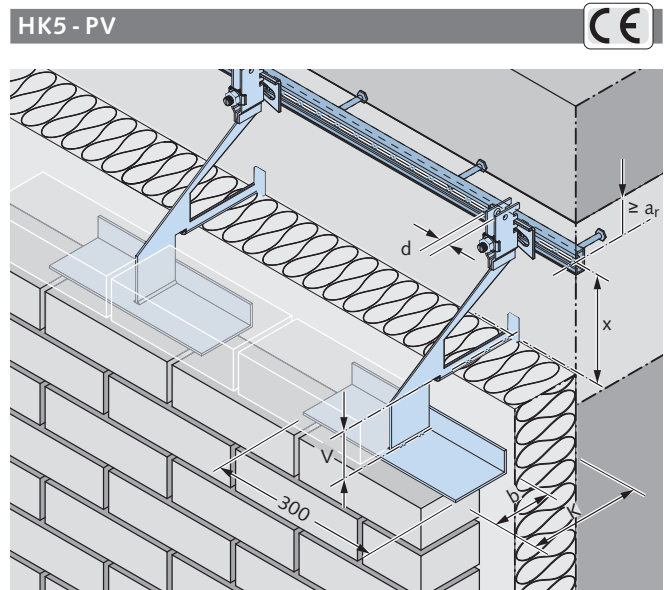
Selection – suspension loop type HSL						
Design	Type	Support bracket dimensions [mm]				Article name
			b	c	s	
<p>HSL - A1 - 1</p>	1	W20	90 - 100	20	2 - 6	HSL - W20 - 1
	1	W30	90 - 100	30	3 - 6	HSL - W30 - 1
	1	W40	90 - 100	40	3 - 6	HSL - W40 - 1
	1	W50	90 - 100	50	3 - 6	HSL - W50 - 1
	1	W60	90 - 100	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			
<p>HSL - A1 - 2</p>	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			
<p>HSL - A1 - 3</p>	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
	3	A1	Support bracket b = 80			
<p>HSL - A1 - 4</p>	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
	4	A1	Support bracket b = 80			
<p>HSL - D1</p>	5	W20	90 - 100	20	2 - 6	HSL - W20 - 5
	5	W30	90 - 100	30	3 - 6	HSL - W30 - 5
	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
	5	D1	For expansion joints			

HALFEN SUPPORT BRACKETS

HK5-P Angle Support Brackets

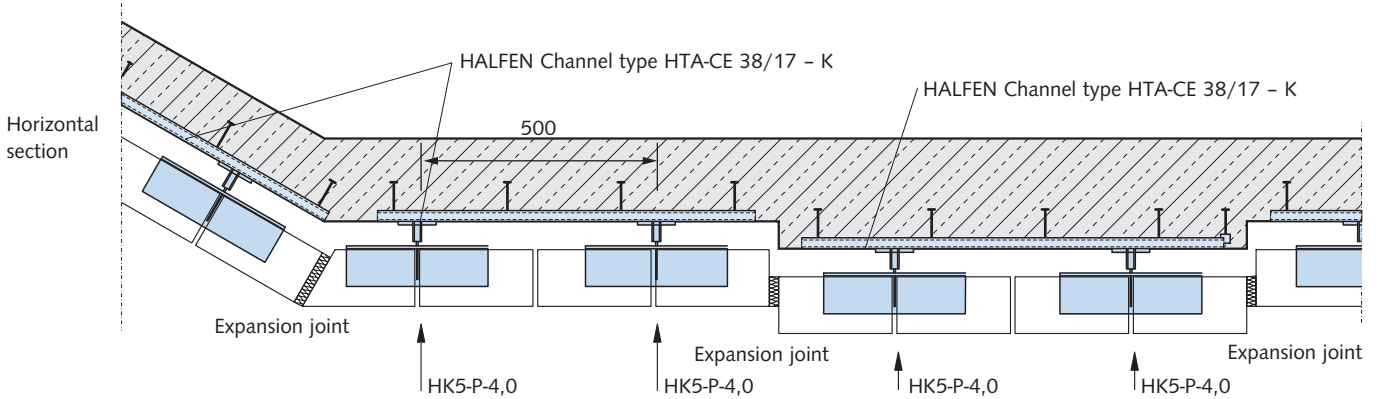


The HK5-P are used primarily in standard wall situations and at corners, e.g. internal corners or vertical joints.



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

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



Selecting HK5 Angle support brackets

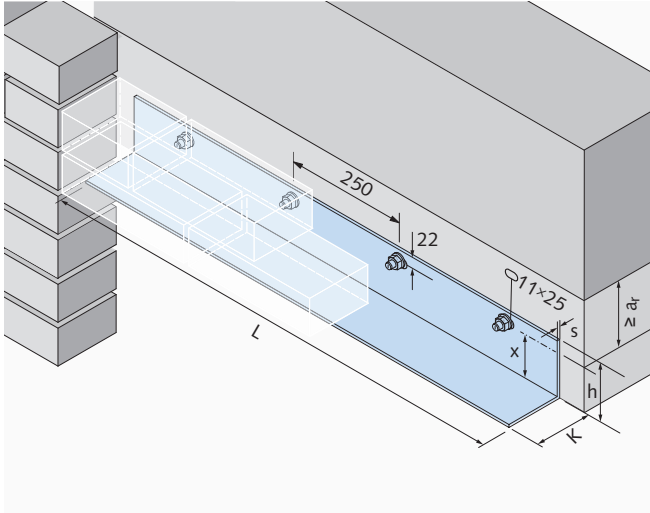
Dimensions in mm	Distance a from wall [mm]	Allowable load $F_V = 4.0 \text{ kN}$ ② ($F_{Rd} = 5.4 \text{ kN}$)		Allowable load $F_V = 8.0 \text{ kN}$ ② ($F_{Rd} = 10.8 \text{ kN}$)		Allowable load $F_V = 12.0 \text{ kN}$ ② ($F_{Rd} = 16.2 \text{ kN}$)	
		Length K	x	Length K	x	Length K	x
	40 ± 15	130	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

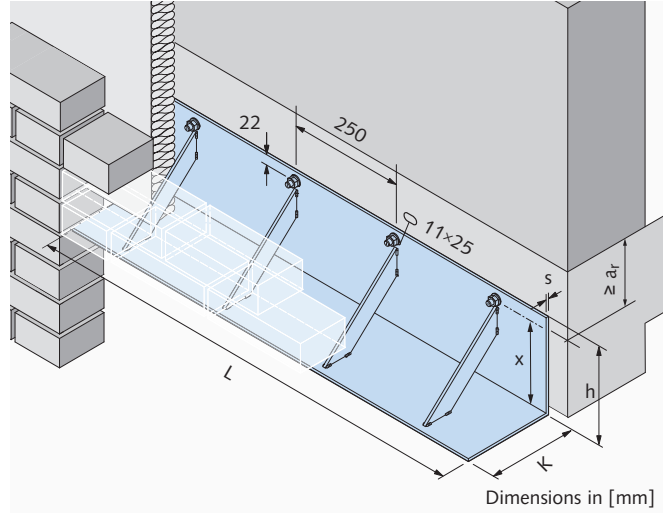
HALFEN SUPPORT BRACKETS

KW and KWL Bolt-on Angle

Bolt-on angle KW



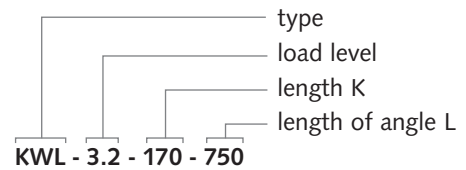
Bolt-on angle KWL



Dimensions in [mm]

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 support structure is intended to remain visible from below but the ventilation gap and the thermal insulation are to be concealed.

Order example:



Selecting KW Bolt-on angle

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

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

Selecting KWL Bolt-on angle

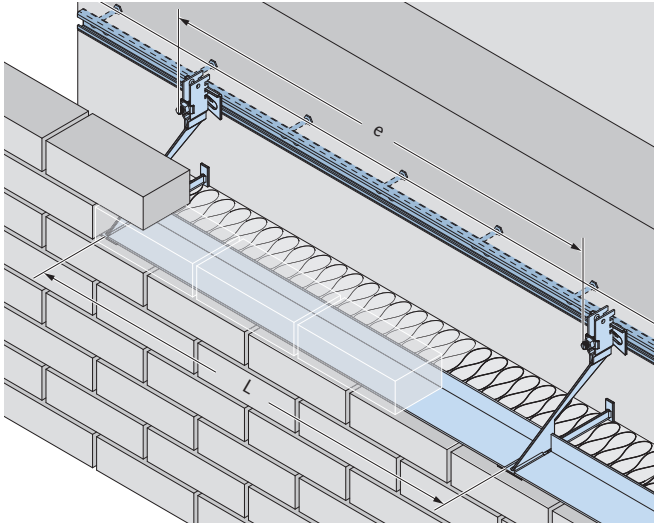
 dimensions in mm	Spacing a from wall [mm]	Allowable load $F_V = 1.5 \text{ kN} \text{②}$ ($F_{Rd} = 2.0 \text{ kN}$)			Allowable load $F_V = 3.2 \text{ kN} \text{②}$ ($F_{Rd} = 4.3 \text{ kN}$)		
		Length K	x	h	Length K	x	h
		20 - 40	130	104	130	130	102
	45 - 60	150	124	150	150	122	150
	65 - 85	170	144	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
	Material thickness s	3			4		

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



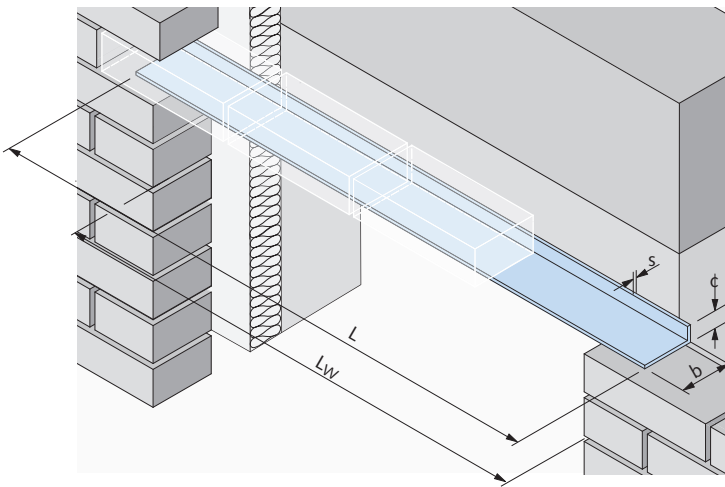
The HW-95 Support angles are placed between two HK5 Single support brackets on the support flanges. Only used with brick arch-action.

For article number, see price list.

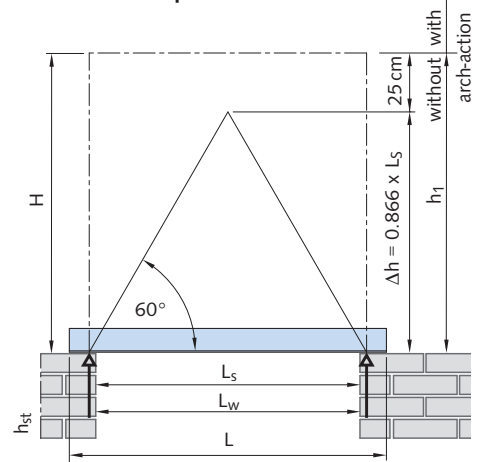
 dimensions in mm	Spacing between the HK5 Support brackets	Length of support bracket	Angle dimensions
	e	L	b × c × s
	500	480	95 × 20 × 2
	750	730	95 × 30 × 3
	1000	980	95 × 40 × 4

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

 Dimensions in mm	Clear width L_w	Support angle length L	Load height H [m] for $d \leq 11.5$ cm, $\gamma \leq 18$ kN/m ³							Δh [m]
			≤ 1.00	≤ 1.25	≤ 1.50	≤ 1.75	≤ 2.00	≤ 2.25	≥ 2.25	
			Dimensions of angle support $b \times c \times s$ [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
	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:

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

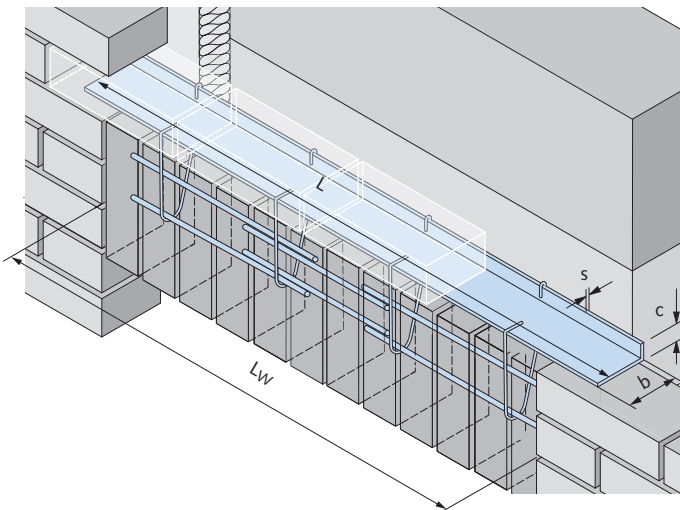
With arch-action (see also DIN 1996).

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

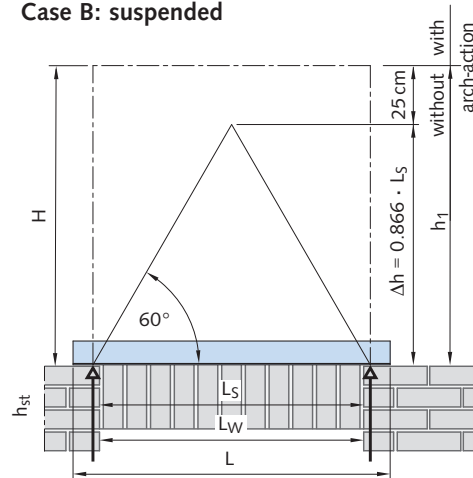
- Assumption
1. Load height $\Delta h \leq H$
 2. No openings in the arch-triangle
 3. No point loads in arch-triangle
 4. Space available at sides to transfer shear forces (see PFM Design handbook)

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

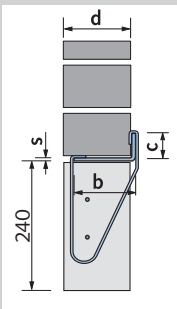
Case B: HW Support angle used as a suspended lintel over an opening



Case B: suspended



Case B: HW with suspended lintel



dimensions in mm

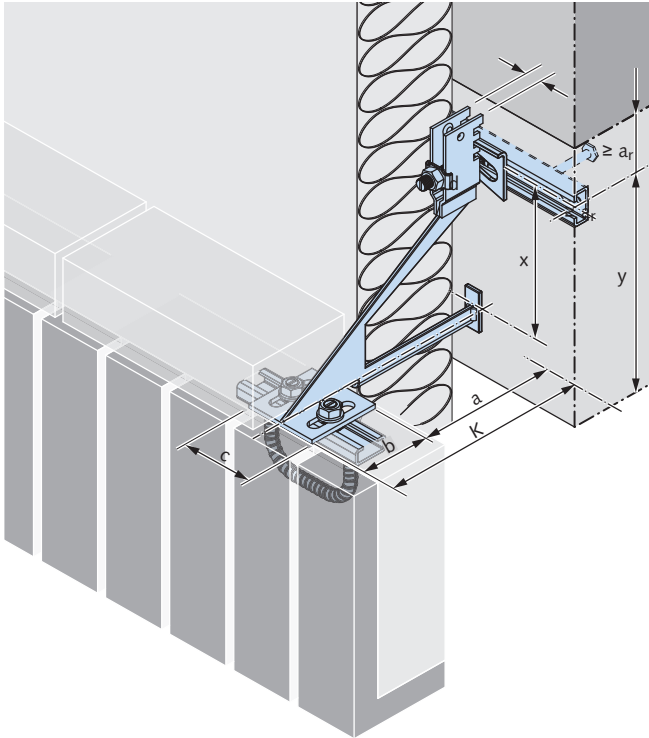
Clear width L_w	Angle support length L	Load height H [m] for $d \leq 11.5$ cm. $\gamma \leq 18$ kN/m ³								Δh [m]
		≤ 1.00	≤ 1.25	≤ 1.50	≤ 1.75	≤ 2.00	≤ 2.25	≥ 2.5		
Dimensions of angle support $b \times c \times s$ [mm]										
510	700	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	90 × 30 × 3	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	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	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	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	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	90 × 90 × 5	1.579
2,010	2,200	90 × 100 × 8	90 × 100 × 8	90 × 110 × 8	SK	SK	SK	SK	90 × 100 × 8	1.796

- = with arch-action
- = without arch-action
- SK = custom bracket including static verification

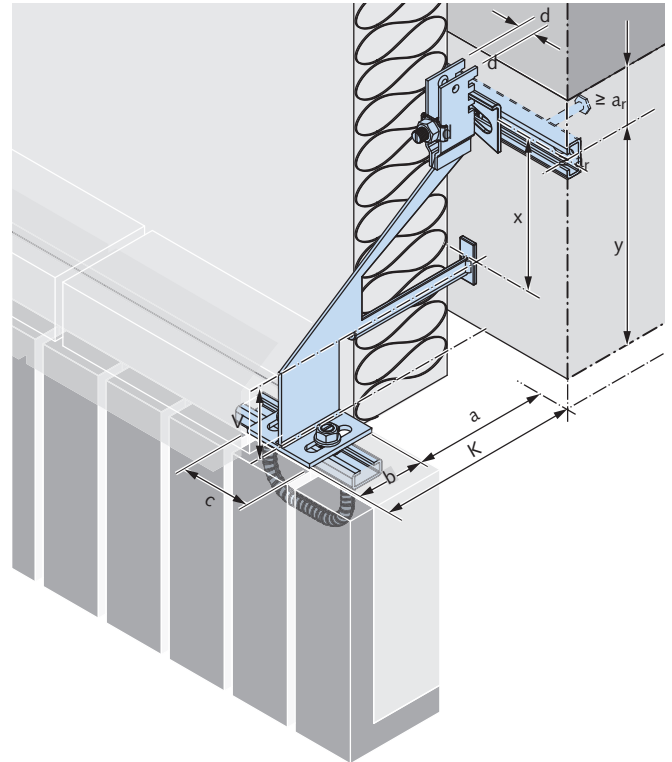
HALFEN SUPPORT BRACKETS

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.

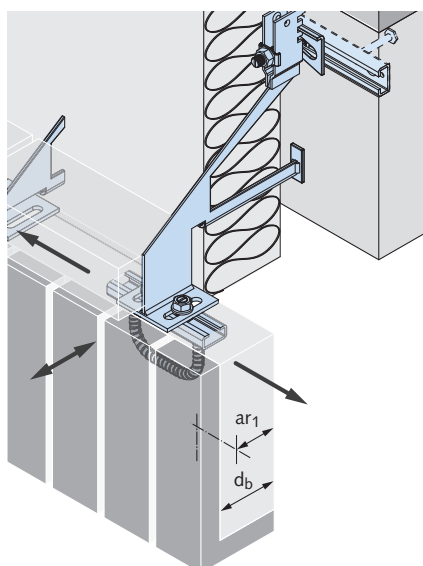
HK5 Single support bracket types

	Distance a from wall [mm]	Load level allow. $F_V = 4.0 \text{ kN}$ ② ($F_{Rd} = 5.4 \text{ kN}$)		Load level allow. $F_V = 8.0 \text{ kN}$ ② ($F_{Rd} = 10.8 \text{ kN}$)		Load level allow. $F_V = 12.0 \text{ kN}$ ② ($F_{Rd} = 16.2 \text{ kN}$)	
		Length K	x	Length K	x	Length K	x
		① -S -SV	40 ± 15	130	150	130	200
	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 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

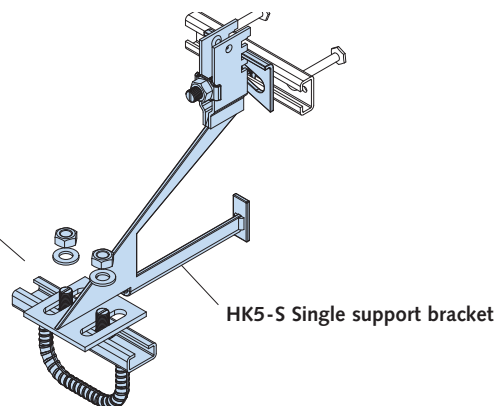
HALFEN SUPPORT BRACKETS Ties for Precast Lintels

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**

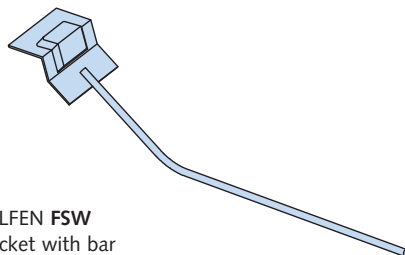
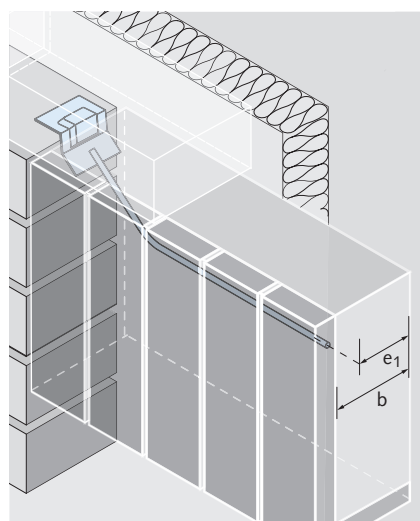
- smallest minimal width of $d_b = 60$ mm possible
- minimal reinforcement required (no additional reinforcement required)
- optional; also available with a centric bolt
- optionally available in HCR quality

Extract from the approval,
see approval Z-21.4-1989 for complete 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

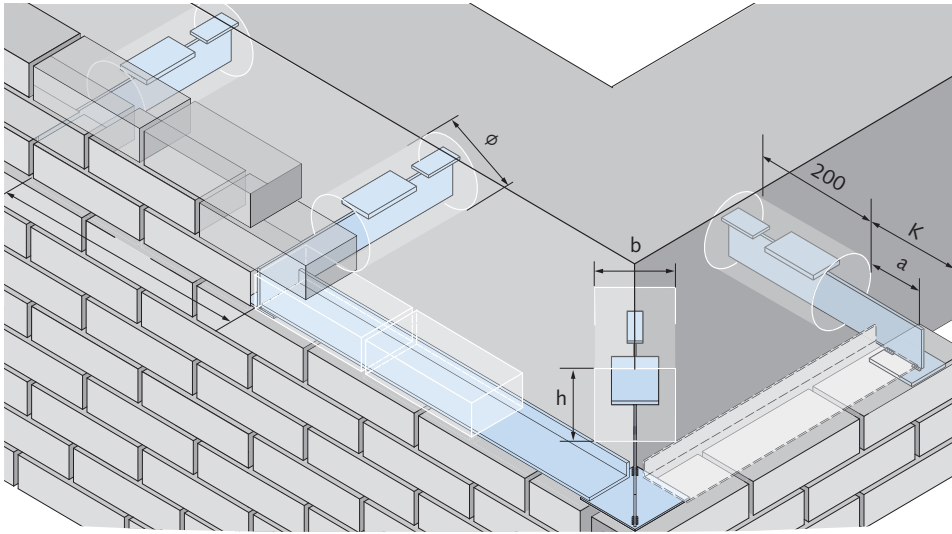
For all variants;
 e_1 is dependent on b

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

Precast lintel bracket	Allowable load per bracket [kN]					
	$F_V = 3.5$ ($F_{Rd} = 4.7$)	$F_V = 2.6$ ($F_{Rd} = 3.5$)	$F_V = 3.9$ ($F_{Rd} = 5.3$)	$F_V = 5.1$ ($F_{Rd} = 6.9$)	$F_V = 5.3$ ($F_{Rd} = 7.2$)	$F_V = 6.8$ ($F_{Rd} = 9.2$)
Precast lintel bracket	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

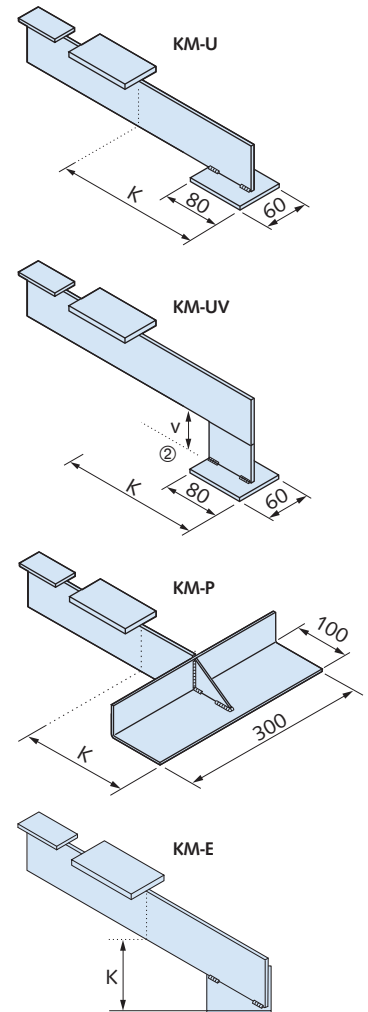
The support brackets are suitable for supporting brick cladding constructed on the face of existing buildings. First, sufficiently deep recesses are core-drilled or cut into the existing brickwork. The brackets are then fixed with mortar in the recesses.

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 $\geq 0.5 \text{ MN/m}^2$ 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.

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



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

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
		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.

HALFEN SUPPORT BRACKETS

Parapet Support Brackets HAV

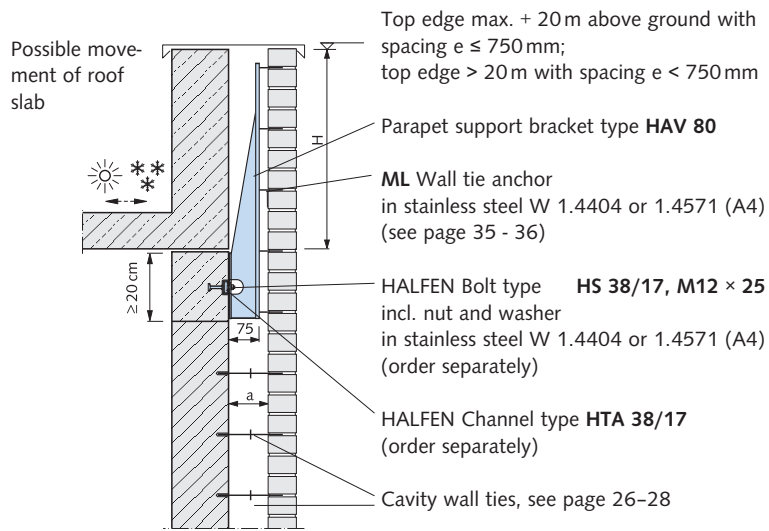
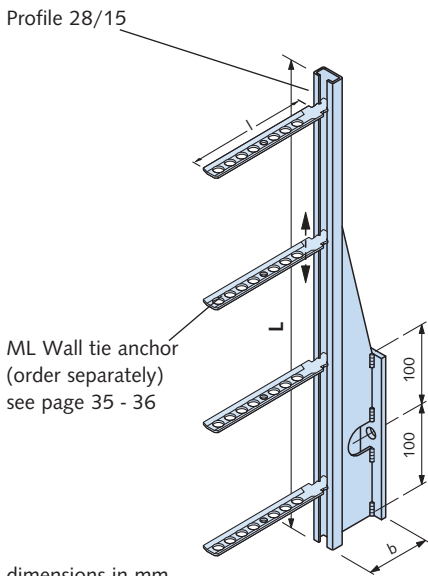
Parapet support brackets HAV 80/...

Flat, reinforced concrete roof slabs are subject to exceptional forces from temperature fluctuations. The resulting longitudinal expansion and contraction of the roof structure are solved with sliding bearings between the slab and the supporting structure.

Longitudinal movements would result in cracks in the brick cladding if attached directly to the roof parapet. This is why it is required to separate any brick cladding from the parapet. The HAV Parapet support bracket achieves this purpose. The brick cladding is fixed to the parapet support bracket using ML Wall tie anchors.

Suitable fixing points for the parapet support brackets are HALFEN Channels cast into the ring beam. Any subsequent movement in the roof slab does not affect the brick cladding.

Material:
Stainless steel 1.4404 or 1.4571 (A4)



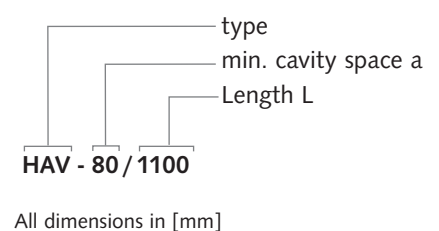
dimensions in mm

HAV	Length L [mm]			Wall tie anchor	
	600	850	1.100	Wall spacing a [mm]	With wall tie anchor
	Article name			80 - 110	ML 85
	HAV 80/600	HAV 80/850	HAV 80/1100	90 - 145	ML 120
				145 - 200	ML 180
Dimension b:	75	75	75	Larger cavity spacings are possible (Type HAV 140/... 600, 850 or 1100)	
Required number of ML brackets:	3	4	5		

Anchored in concrete:

	Recommended HALFEN Channel with HALFEN Bolt and nut	HS 38/17 - M 12 x 25 separate calculations required
	HALFEN HB Injection anchor bolts for cracked and non-cracked concrete	HB-VMZ-A-70 - M12-25/115-A4 (Order no. 0432.380-00062) separate calculations required; order cartridge and accessories separately

Order example:



HALFEN SUPPORT BRACKETS

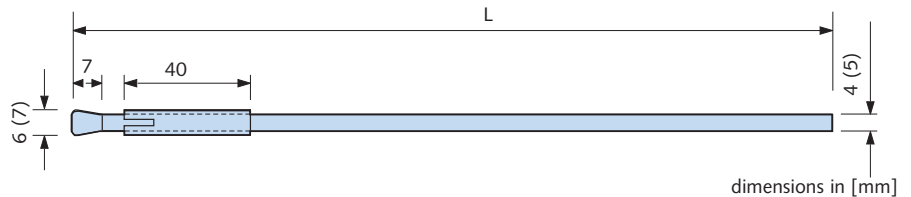
Cavity Wall Tie

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.



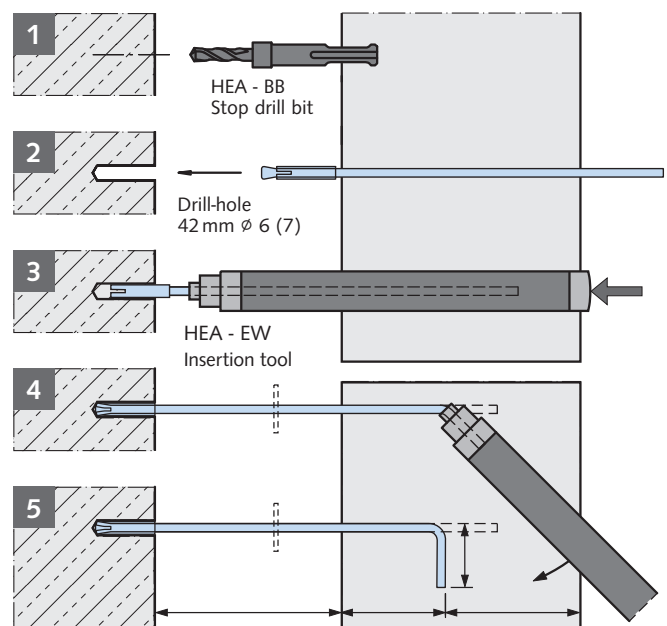
HEA Cavity wall impact anchors			
Article name. L/∅ [mm]	Order no. 0140.010-	Cavity size a [mm]	Number of anchors per m ² acc. to general construction technique permit Z-21.1-910
HEA - 160/4	00001	0 - 45	
HEA - 200/4	00002	45 - 85	
HEA - 250/4	00004	85 - 135	
HEA - 300/4	00006	135 - 185	
HEA - 200/5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



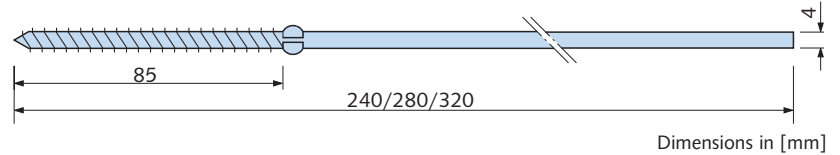
HALFEN SUPPORT BRACKETS

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)



Dimensions in [mm]

HPV-L Cavity wall tie for aerated concrete

Article name L / \varnothing [mm]	Order no. 0141.010-	Cavity spacing a [mm]
HPV - L - 240/4	0001	0 - 80
HPV - L - 280/4	0002	80 - 120
HPV - L - 320/4	0003	120 - 160*

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

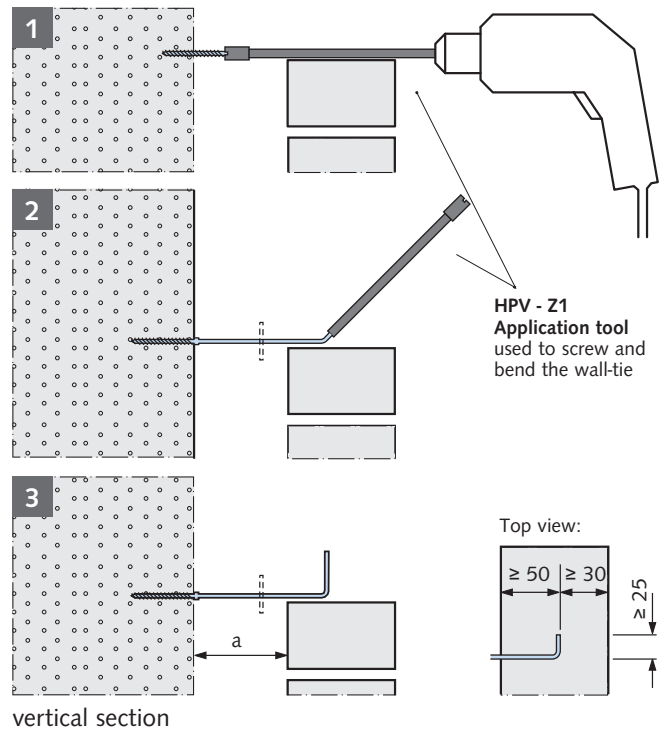
Number of anchors per m² according to DIN EN 1996-2/NA Table NA.D.1 and according to DIN EN 1996-1-1 chapter 6.5.

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.



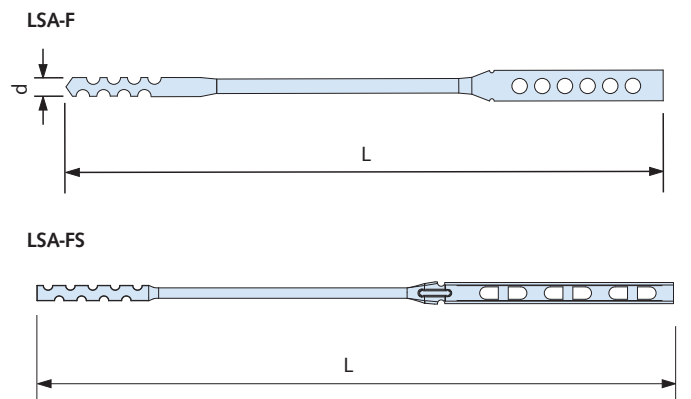
LSA-F/-FS Cavity wall tie



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 m² can be found in general construction technique permit no. Z-17.1-888/Z-17.1-633.

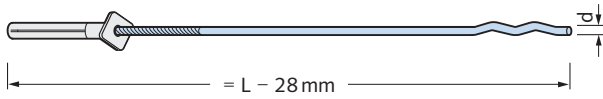
HALFEN SUPPORT BRACKETS

Cavity Wall Tie

LSA-DW Cavity wall anchor including 8 × 60 dowel



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

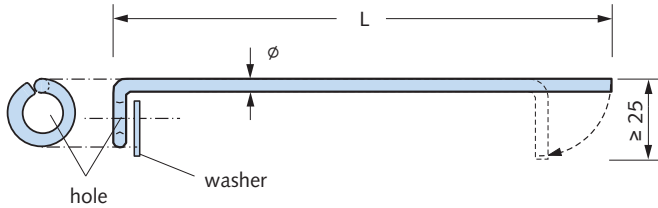
LSA-DW Cavity wall anchor including dowel

Article name L / d [mm]	Order no. 0142.080-	Cavity spacing [mm]	Number of anchors per m ² 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	

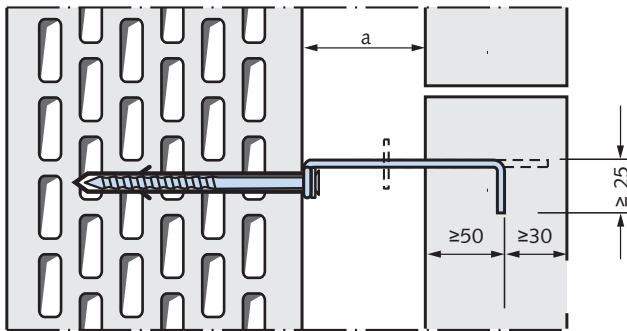
LSA-L Cavity wall anchor



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 / phi [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 m² according to DIN EN 1996-2/NA Table NA.D.1 and according to DIN EN 1996-1-1 chapter 6.5.

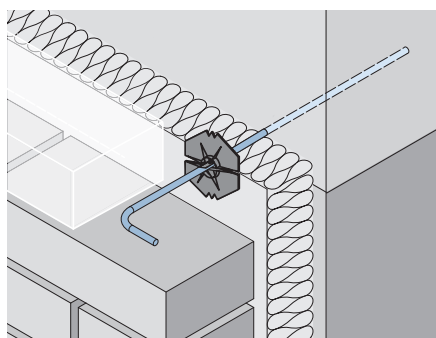
Dowel and screw for LSA-L-235/4

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

Impact tool for LSA-L

Article name	Order no. 0143.080-
LSZ-E	00001

LSZ Insulation clip ISO-CLIP



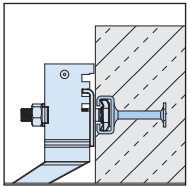
LSZ Insulation clip ISO-CLIP

Article name	for anchor phi [mm]	phi 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

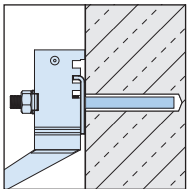


Installation to HALFEN **HTA-CE** Cast-in channels, see page 30.

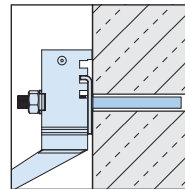
For detailed information please refer to our catalogue "Technical Product Information HALFEN Cast-in channel".



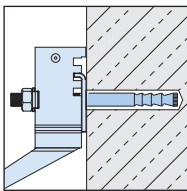
Bonded anchor bolt systems



Installation with HALFEN **HB-V** Bonded anchor; only for non-cracked concrete, see page 31.



Installation with HALFEN **HB-VMU plus** Injection anchors; for cracked concrete and non-cracked concrete, see page 32.

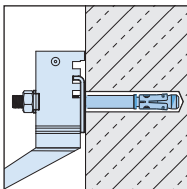


Installation with HALFEN **HB-VMZ** Injection anchors; for cracked concrete and non-cracked concrete, see page 31, 32.

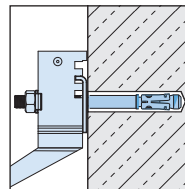
Please refer to our catalogue "Technical Product Information HALFEN Anchor bolt systems"



Mechanical Heavy Duty Anchors

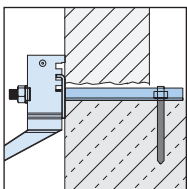


Installation with HALFEN **HB-BZ** Wedge anchors; for cracked and non-cracked concrete, see page 33.



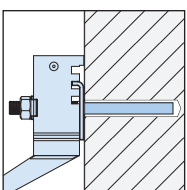
Installation with **HB-B** HALFEN Wedge anchors; for non-cracked concrete, see page 33.

Special slab fixing



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

Masonry



Installation with HALFEN **HB-VMU plus** Injection anchors, for masonry, see page 34.

For detailed information please refer to our catalogue "Technical Product Information HALFEN Anchor bolt systems".



HALFEN SUPPORT BRACKETS

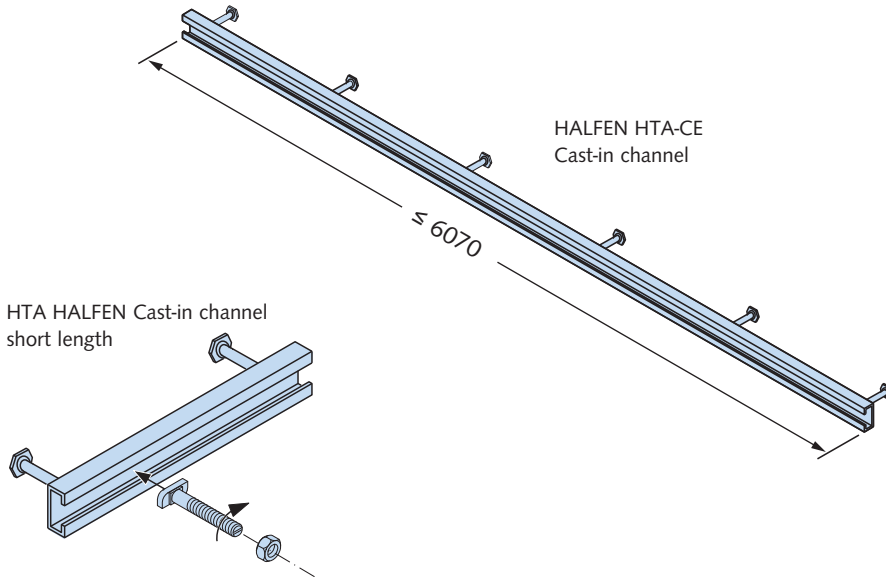
Fixing Systems for Concrete

HALFEN Cast-in channels



HTA HALFEN Cast-in channels

all dimensions in mm



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

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

Application for brick faced façades		HALFEN HTA-CE Channel		with HALFEN HS Bolt incl. nut						
Recommended HALFEN Channels Verification is according to EOTA TR 047 in combination with ETA-09/0339 (HALFEN Channels).										
HK5 Support brackets Load capacities: See page 12 to 23		Article name: (add length in mm)		Article name:	Order no.	Thread	l [mm]		Torque [Nm]	
	4.0	HTA-CE 38/17	- A4	HS 38/17	0161.050-00001	M12	x	72	- A4	25
	8.0	HTA-CE 40/25	- A4	HS 40/22	0350.070-00007	M12	x	80	- A4	25
		HTA-CE 49/30	- A4	HS 50/30	0161.090-00001	M12	x	87	- A4	25
		HTA-CE 40/22P	- A4	HS 40/22	0350.070-00013	M16	x	80	- A4	60
		HTA-CE 50/30P	- A4	HS 50/30	0161.090-00002	M16	x	87		
	12.0	HTA-CE 54/33	- A4							

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

HALFEN SUPPORT BRACKETS

Fixing Systems for Concrete

HALFEN HB-V Bonded anchor bolt – for non-cracked concrete



HB-V A4 Anchor stud



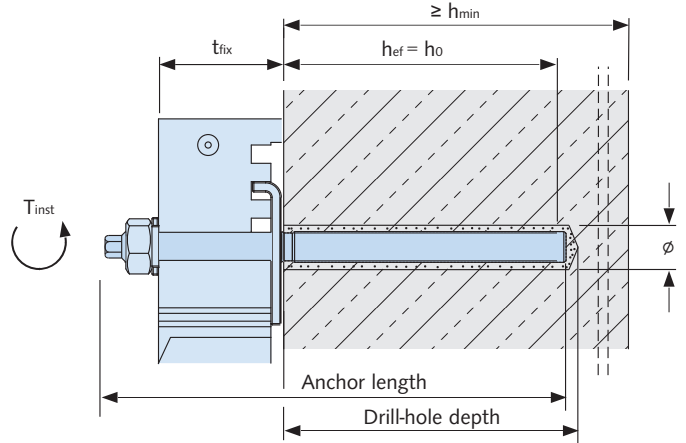
HB-V-P Adhesive capsule



ETA-07/0257
M8 - M24



Stainless steel

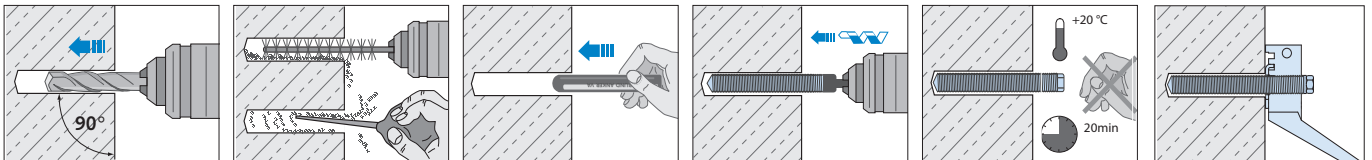


Anchor HB-V A4 stud

Article name	Order no.	Drill-hole $\varnothing \times$ 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}
HB-V-A 10-65/165 A4	0430.100-00004	12 × 90	165	65	90	120	20
HB-V-A 12-65/190 A4	0430.100-00064	14 × 110	190	65	110	140	40
HB-V-A 16-65/210 A4	0430.100-00012	18 × 125	210	65	125	160	80

HB-V-P Chemical dowels

Article name	Order no. 0433.050-
Capsule HB-V-P 10	00002
Capsule HB-V-P 12	00003
Capsule HB-V-P 16	00005



HALFEN HB-VMZ Injection system, for cracked and non-cracked concrete



HB-VMZ-A A4 Anchor stud

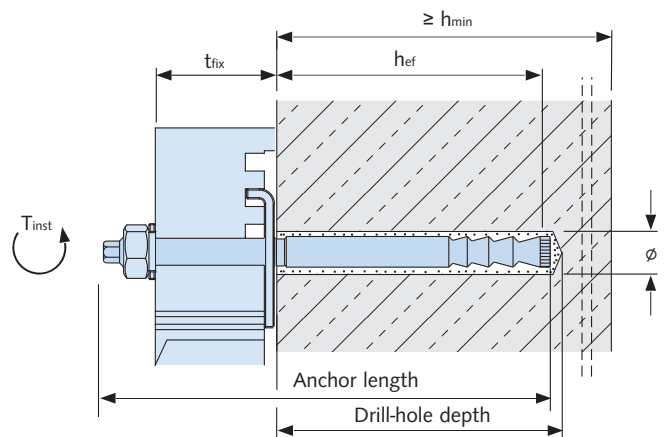


HB-VMZ 280 ml Cartridge
Order no. 0433.040-00100
can be dispensed with a standard silicone dispenser



HB-VMZ 420 ml Cartridge
Order no. 0433.040-00101

Matching dispenser
HB-VM-P 345 for 280 ml Cartridge
Order no. 0433.040-00077
HB-VM-P 420 Profi for 420 ml Cartridge
Order no. 0433.040-00080



ETA-07/0256
M8 - M24

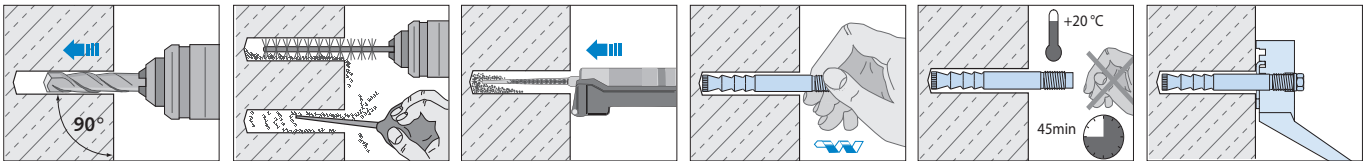


Stainless steel

HALFEN SUPPORT BRACKETS

Fixing Systems for Concrete

HB-VMZ-A A4 Anchor plug									
Article name	Order no. 0432.380-	Drill-hole $\varnothing \times$ depth [mm]	Max. clamping thickness t_{fix} [mm]	Anchor length [mm]	Thread [mm]	Anchoring depth h_{ef} [mm]	Building component depth h_{min} [mm]		Torque T_{inst} [Nm]
							h_{min}	h_{min}	
HB-VMZ-A 60 M10-60/135 A4	00007	12 × 65	60	135	M10x47	60	100	15	
HB-VMZ-A 80 M12-60/160 A4	00096	14 × 85	60	160	M12x56	80	110	25	
HB-VMZ-A 100 M12-60/180 A4	00016	14 × 105	60	180	M12x56	100	130	30	
HB-VMZ-A 125 M16-60/210 A4	00119	18 × 133	60	210	M16x74	125	170	50	



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



HB-VMU plus 280 ml Cartridge
 Order no. 0433.040-00137
 can be dispensed with a standard silicone dispenser,
 or HB-VM-P 345 Order no. 0433.040-00077



Stainless steel



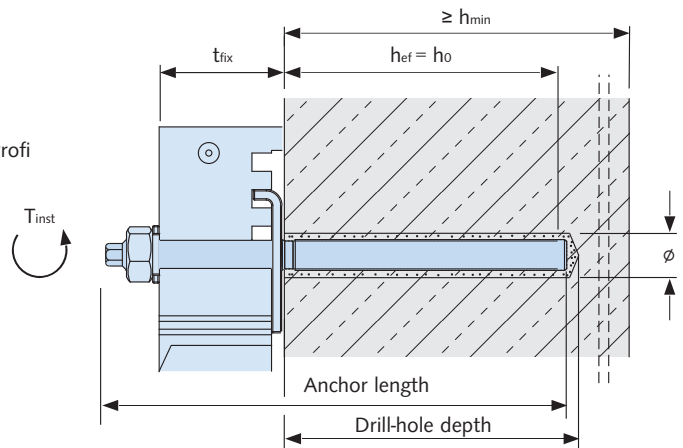
HB-VMU plus 410 ml Cartridge
 Order no. 0433.040-00136
 matching dispenser HB-VM-P 420 Profi
 Order no. 0433.040-00080



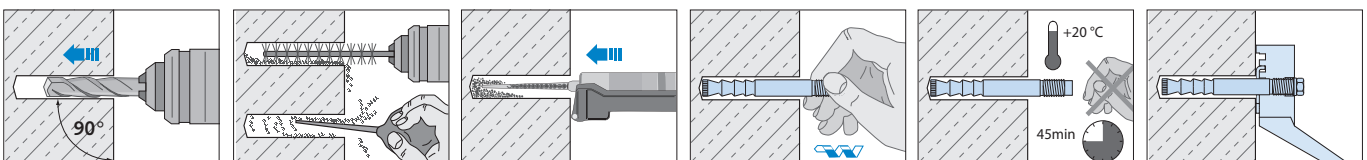
HB-VMU-A A4 Anchor rod



HB-VM-X Mixing nozzle
 Order no. 0433.040-00039



HB-VMU A4 Anchor stud									
Article name	Order no. 0430.190-	Drill-hole $\varnothing \times$ depth [mm]	Anchor length [mm]	Max. clamping thickness t_{fix} [mm]	Anchoring depth [mm]		Building component thickness [mm]		Torque T_{inst}
					$h_{ef,min}$	$h_{ef,max}$	h_{min} (für $h_{ef,min}$)	h_{min} (für $h_{ef,max}$)	
HB-VMU-A 10-90/190 A4	00008	12 × 90	190	90	60	200	100	230	20
HB-VMU-A 12-85/210 A4	00016	14 × 110	210	85	70	240	100	270	40
HB-VMU-A 16-60/210 A4	00021	18 × 125	210	60	80	320	116	356	80



HALFEN SUPPORT BRACKETS

Fixing Systems for Concrete

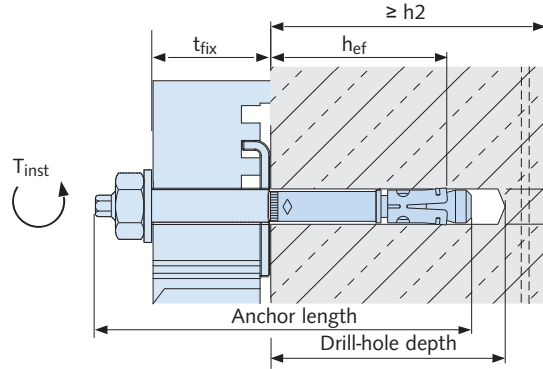
Fixing HK5 Support brackets with HALFEN HB-BZ Wedge anchor – for cracked and non-cracked concrete



HB-BZ A4 Wedge anchor



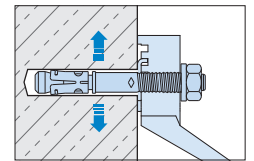
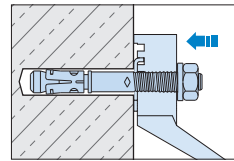
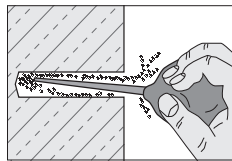
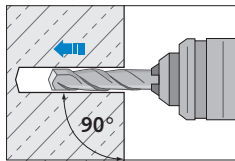
Stainless steel



HB-BZ A4 Wedge anchor (specification standard anchorage depth)

Article name	Order no. 0432.040-	Drill-hole $\phi \times$ depth [mm]	Embedment depth [mm]	Max. clamping thickness t_{fix} [mm]	Anchor length [mm]	Thread [mm]	Anchoring depth h_{ef} [mm]	Building component thickness h_2 [mm]	Torque T_{inst} [Nm]
HB-BZ 10-50-70/130 A4	00030	10 × 75	67	70	130	M10x60	60	100	35
HB-BZ 12-50-70/145 A4	00032	12 × 90	80	70	145	M12x65	70	120	50
HB-BZ 16-50-70/170 A4	00034	16 × 110	97	70	170	M16x70	85	140	110

Installation:



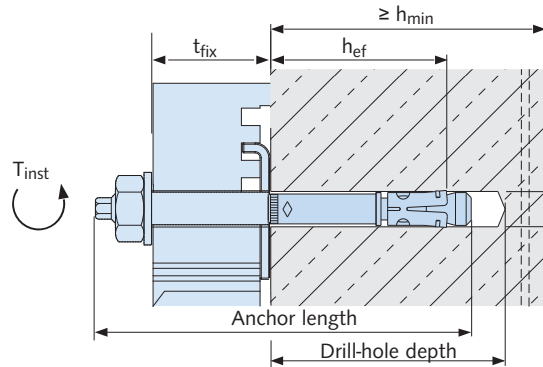
Fixing HK5 Support brackets with HALFEN HB-B Wedge anchors – for non-cracked concrete



HB-B A4 Wedge anchor



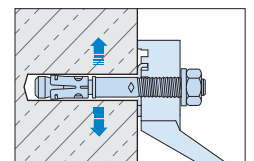
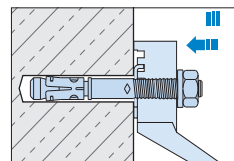
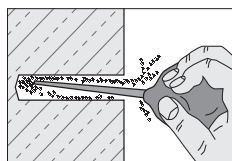
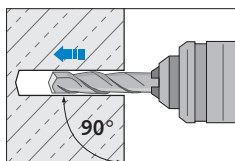
Stainless steel



HB-B A4 Wedge anchor (specification standard anchorage depth)

Article name	Order no. 0432.060-	Drill-hole $\phi \times$ depth [mm]	Embedment depth [mm]	Max. clamping thickness t_{fix} [mm]	Anchor length [mm]	Thread [mm]	Anchoring depth h_{ef} [mm]	Building component depth h_{min} [mm]	Torque T_{inst} [Nm]
HB-B 10-50-56/125 A4	00030	10 × 70	62	50	125	M10 × 80	48	100	25
HB-B 12-65-80/160 A4	00035	12 × 90	81	65	160	M12 × 100	65	130	50
HB-B 16-60-76/180 A4	00020	16 × 95	99	60	180	M16 × 110	80	160	100

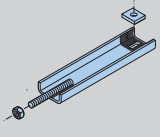
Installation:



HALFEN SUPPORT BRACKETS

Fixing Systems for Brickwork

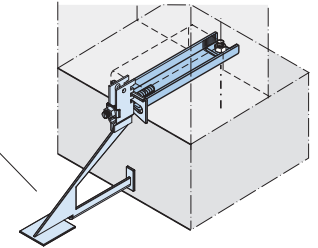
Fixing the HK5 Support bracket to thin slabs with the HALFEN HB-VMU Injection system

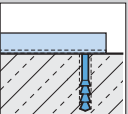
Selection – HK - DA Slab anchors						
	Load range [kN] (F_{Rd} [kN])	Order no.	M	c	a_1	l
		0156.010-		[mm]	[mm]	[mm]
	4.0 - L (5.4)	00001	M12	10	293 ± 10	320
	4.0 - K (5.4)	00002	M12	10	173 ± 10	200
	8.0 - L (10.8)	00005	M12	11	293 ± 10	320
8.0 - K (10.8)	00006	M12	11	173 ± 10	200	

Included in delivery, notched plate and (hexagonal) nut

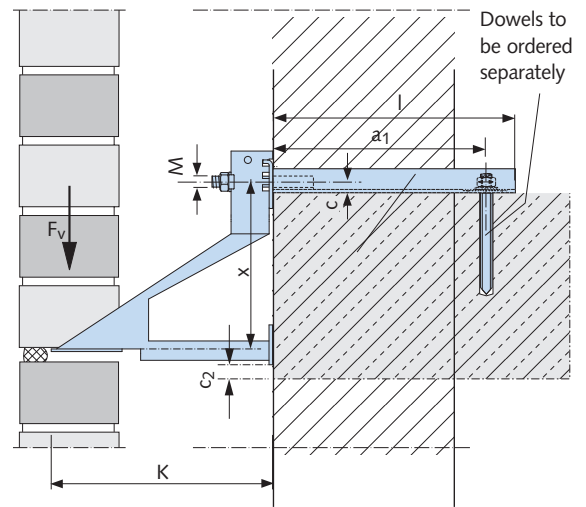
Suitable for load range 4.0 kN and 8.0 kN

Note:
• c_2 = required edge distance in according with type test report or static calculation



Fixing to concrete slab - C 20/25			
For HK - DA -	Load range [kN] (F_{Rd} [kN])	4.0 (5.4)	8.0 (10.8)
	HALFEN Injection anchor for cracked and non-cracked concrete	60 M10 - 20/95 separate calculation required	80 M12 - 25/125 separate calculation required

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



Fixing HK5 Support brackets with HALFEN HB-VMU Injection dowels to solid masonry



HB-VMU-A4 Anchor rod



HB-VMU plus 280 Cartridge
Order-no. 0433.040-00137
suitable for standard silicone dispenser (gun) or HB-VM-P 345
Order-no. 0433.040-00077



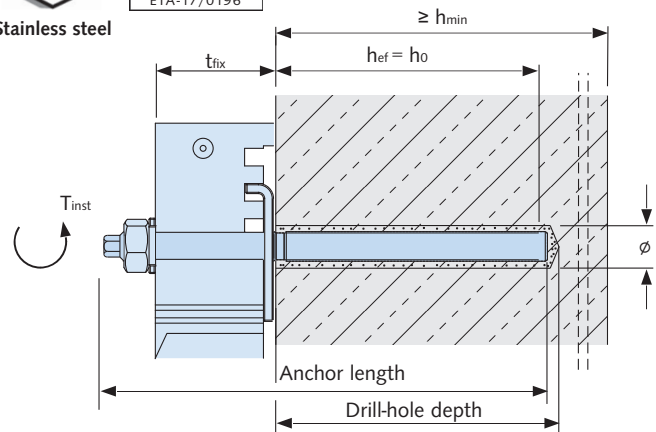
HB-VMU plus 410 Cartridge
Order-no. 0433.040-00136
matching dispenser HB-VM-P 420 Profi
Order-no. 0433.040-00080



HB-VM-X Mixing nozzle
Order-no. 0433.040-00039



Stainless steel



HB-VMU A4 Thread anchor							
Article name	Order no. 0430.190-	Drill-hole $\phi \times$ depth	Anchor length	Max. clamping range t_{fix}	Anchor depth	Min. required thickness for component for $h_{ef, min}$	Torque
		[mm]					[mm]
HB-VMU-A 12-85/210 A4	00016	14 x 110	210	85	70	160	40

Allowable loads for tension, shear and diagonal tension for all angle support brackets MZ12/KS12 = 1.7 kN

HALFEN SUPPORT BRACKETS

Brick tie Systems

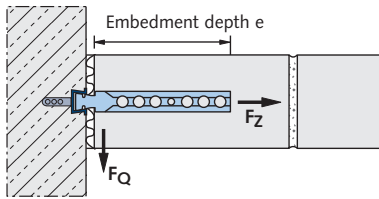
HALFEN Brick tie systems are economic and proved fixing systems using HALFEN ML Brick ties for fixing brickwork, in-fill panels, partition walls, cladding panels (with or without air gap or thermal insulation) to steel or

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.**

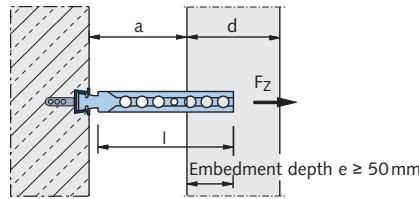
All HTA-CE and HMS profiles have a foam filling to prevent concrete ingress. The channels are attached to the formwork using standard nails.

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.

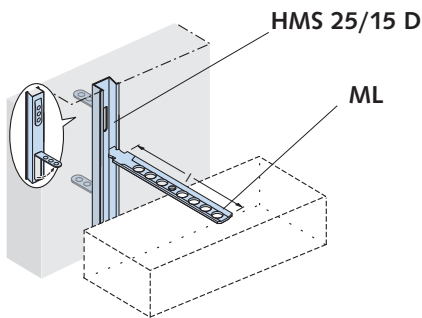
Wall connection



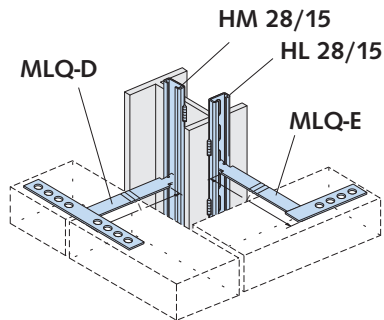
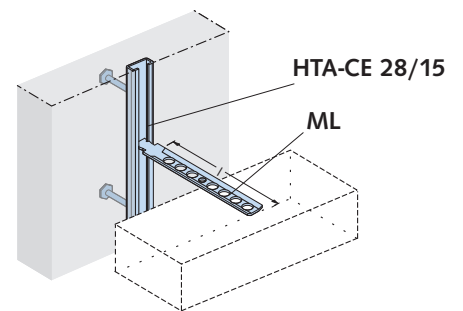
Facing brickwork connection



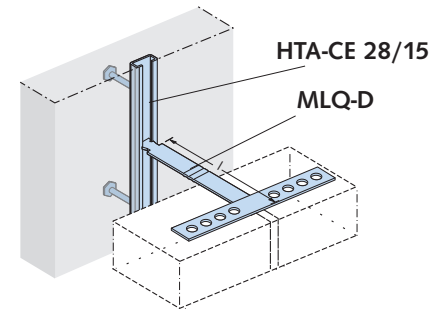
ML Brick ties in combination with HALFEN Channels HMS, HTA, HM and HL



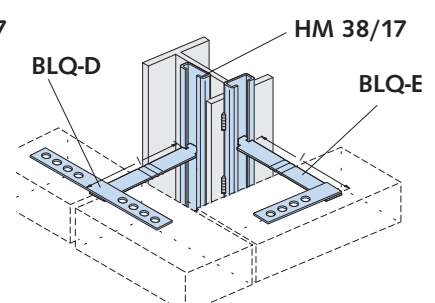
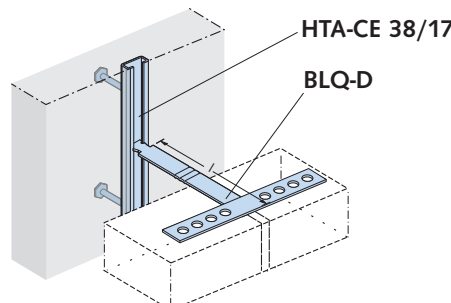
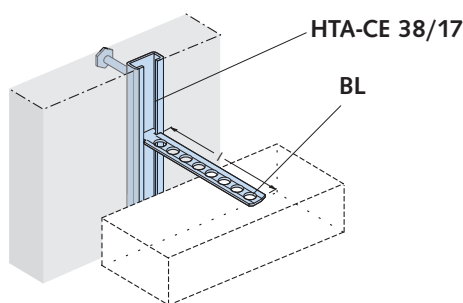
The pre-punched anchors in the HMS Channels are bent out by hand every 250 mm on-site to ensure safe anchorage in the concrete.



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



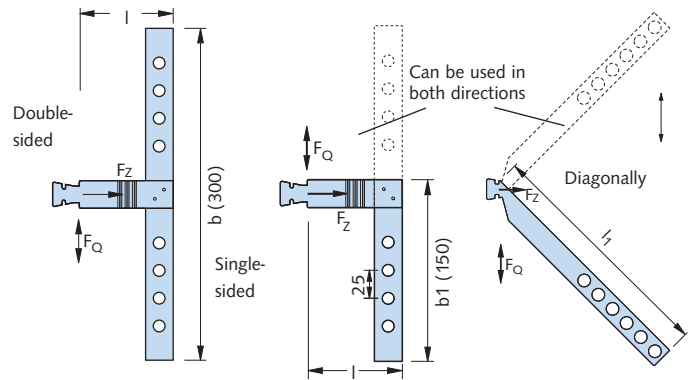
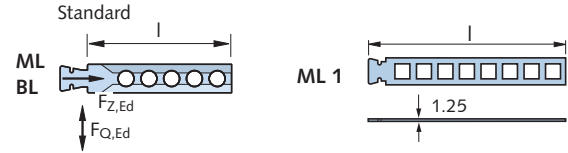
HALFEN SUPPORT BRACKETS

Brick tie Systems

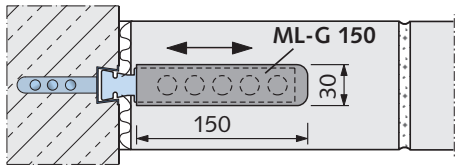
Allowable wall spacing a			
Connection two-leaf masonry	Length l (l ₁) [mm]	Spacing a [mm]	d [mm]
	85	20 - 45	115
	120	40 - 80	
	180	85 - 140	
	(300)	0 - 80	240
(350)	20 - 95		
(400)	35 - 115		

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

Characteristic load-bearing capacity (validated performance)				
		BL	ML	ML1
F _Z [kN] Axial load	HTA-CE	3.2	2.7	2.5
	HMS	-	1.6	1.6
F _Q [kN] Shear load	HTA/HMS	2.7	1.5	1.4
F _D [kN] Compression load	HTA/HMS	1.0 (BL180)	1.0 (ML180)	0.375 (ML1-245)



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



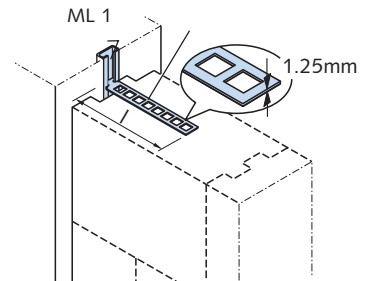
Allows movement in the anchor longitudinal direction; this helps to avoid cracking in long sections of brick wall or infill brickwork connected to concrete structures.

Material: Soft-PVC Order no. 0134.010-00001

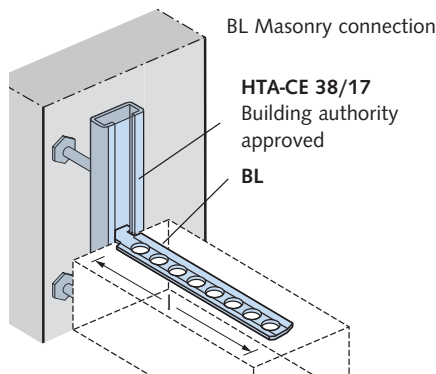
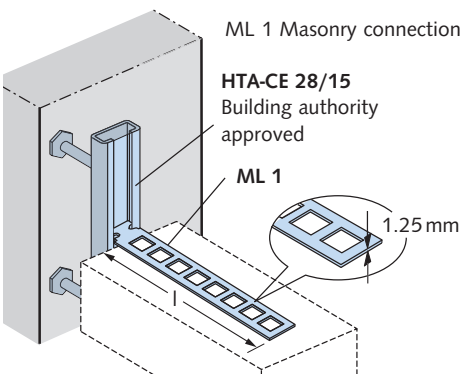
Brick ties ML 1 for connections in interior applications

Material: Stainless steel W1.4301 A2

Type	Length l [mm]	Order no. 0013.010-
ML1 -	125	00001
	185	00002
	245	00003



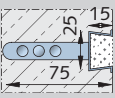
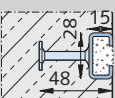
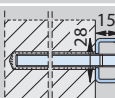
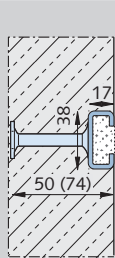
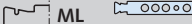
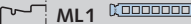
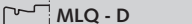
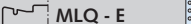
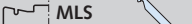
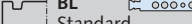
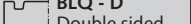
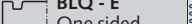
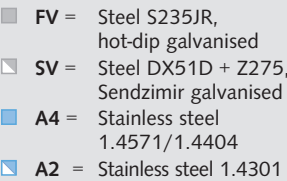
Channels load-bearing capacity with wall tie spacing of ≥ 25 cm			
Brick tie channel	HMS 25/15 D	HTA-CE 28/15	HTA-CE 38/17
Centric tension F _Z [kN] (F _{Z,Rd})	1.2 (1.6)	3.0 (4.0)	4.5 (6.1)
Transverse stress F _Q [kN] (F _{Q,Rd})	1.5 (2.0)	3.0 (4.0)	4.5 (6.1)



ML/BL Masonry connection

HALFEN SUPPORT BRACKETS

Brick tie Systems

Brick-tie channel		Brick-tie anchor											
 <p>HMS 25/15 D L = 2500 mm</p>	 <p>HTA-CE 28/15 L = 1050 mm^① L = 6070 mm^①</p>	 <p>HL 28/15 L = 6070 mm^①</p>	 <p>HTA-CE 38/17 L = 1050 mm^① L = 6070 mm^①</p>	 <p>ML Standard</p>		 <p>ML1</p>		 <p>MLQ - D Double-sided</p>		 <p>MLQ - E One-sided</p>		 <p>MLS Diagonal</p>	
				26 × 2 [mm]		25 × 1.25 [mm]		25 × 3 [mm]		25 × 3 [mm]		22 × 3 [mm]	
				Type	Length l [mm]	Type	Length l [mm]	Type	Length l [mm]	Type	Length l [mm]	Type	Length l ₁ [mm]
				ML - 85		ML 1 - 125		MLQ-D - 85		MLQ-E - 85		MLS - 300	
ML - 120		ML 1 - 185		MLQ-D - 120		MLQ-E - 120		MLS - 350					
ML - 180		ML 1 - 245		MLQ-D - 180		MLQ-E - 180		MLS - 400					
				 <p>BL Standard</p>		 <p>BLQ - D Double-sided</p>		 <p>BLQ - E One-sided</p>		Material:  <ul style="list-style-type: none"> ■ FV = Steel S235JR, hot-dip galvanised ▣ SV = Steel DX51D + Z275, Sendzimir galvanised ■ A4 = Stainless steel 1.4571/1.4404 ▣ A2 = Stainless steel 1.4301 			
30 × 2 [mm]		30 × 3 [mm]		30 × 3 [mm]									
Type	Length l [mm]	Type	Length l [mm]	Type	Length l [mm]								
BL - 85		BLQ-D - 85		BLQ-E - 85									
BL - 120		BLQ-D - 120		BLQ-E - 120									
BL - 180		BLQ-D - 180		BLQ-E - 180									
											① Other lengths: Available on request		

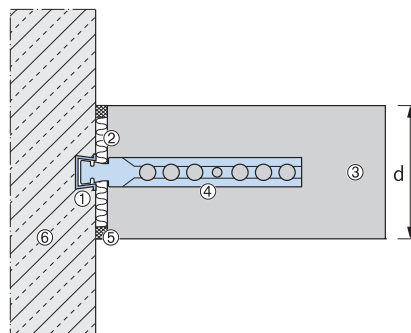
Firewall connection according to DIN 4102-4 : 2016-05

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).



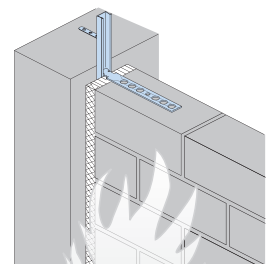
Definition, DIN regulations

- 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 ≥ 1000°C as stated in DIN 4102-17; and have a gross density of ≥ 30 kg/m³" 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**

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	-

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)



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	Single support bracket e.g. HK5 - P	Single support bracket e.g. HK5 - U with intermediate angle brackets			Support bracket Load range
	$e = 250\text{ mm}$ F_V [kN] ($F_{V,d}$ [kN])	$e = 500\text{ mm}$ F_V [kN] ($F_{V,d}$ [kN])	$e = 500\text{ mm}$	$e = 750\text{ mm}$	$e = 1000\text{ mm}$	
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)	10.9 (14.7)		
6	3.1 (4.2)	6.2 (8.4)	6.2 (8.4)	9.3 (12.6)		
5	2.6 (3.5)	5.2 (7.0)	5.2 (7.0)	7.8 (10.5)	10.4 (14.0)	
4	2.1 (2.8)	4.1 (5.6)	4.1 (5.5)	6.2 (8.4)	8.3 (11.2)	
3	1.6 (2.1)	3.1 (4.2)	3.1 (4.2)	4.7 (6.3)	6.2 (8.4)	
2	1.0 (1.4)	2.1 (2.8)	2.1 (2.8)	3.1 (4.2)	4.1 (5.6)	
1	0.5 (0.7)	1.0 (1.4)	1.0 (1.4)	1.6 (2.1)	2.1 (2.8)	4.0 (5.4)

Example: Load height $H = 5.0\text{ m}$; support with standard support brackets; HK5 - U with angle bracket, $e = 750\text{ mm}$ → $F_V = 7.8\text{ kN}$
 → selected support bracket for load group **8.0 kN**

Load groups **4.0** **8.0** **12.0**

Calculation

1. Load calculation

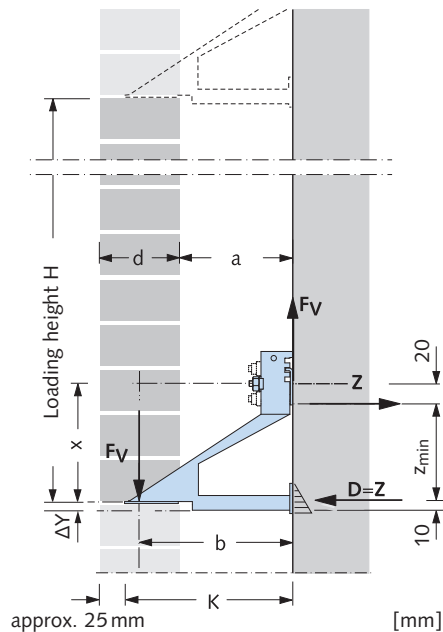
- H = load height [m]
- γ = brickwork factor [kN/m^3]
- a = cavity dimension [mm]
- $b = a + \frac{d}{2} + \text{tolerance}$ [mm]
tolerance = 15 mm
- d = brick thickness [m]
- e = spacing of HK5 support brackets [m]
- F_V = vertical loading per fixing point

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

→ $F_V = H \times e \times 2.07$ 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 level, results in → x (see tables; HK5 support brackets, page 12–23)



3. Calculating the acting load R_z

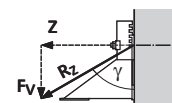
$$z_{\min} = x + \Delta Y - 10 - 20 \text{ [mm]}$$

→ 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 $R_z = \sqrt{Z^2 + F_V^2}$

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



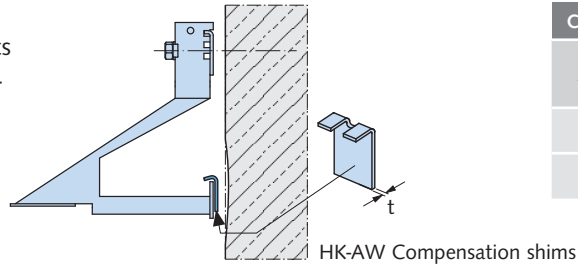
Note: Refer to the approval for the selected fixing method for calculation.

HALFEN SUPPORT BRACKETS

Depth Adjustments for HK5 Support Brackets

HK - AW Compensation shims

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



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

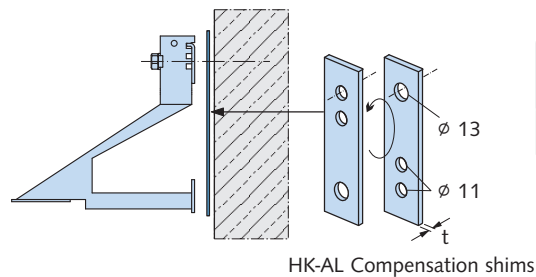
HK - AL Compensation shims

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



Note: Take the following into count when using HK-AL Compensation shims:

- cantilever K increase
- increased bending moment



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

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 ± 20 mm,
type tested with general building authority approval for the bracket head,
with CE marking,

Type HK5-U-LS-K

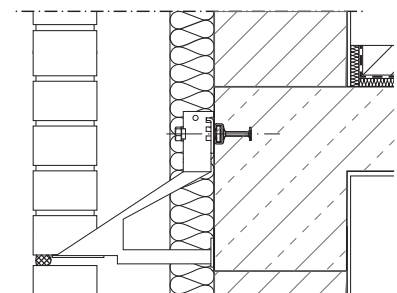
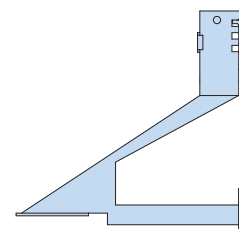
with

U = Standard single support bracket,

LS = Load groups [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 $(K - 90 \text{ mm}) \pm 15 \text{ mm}$,

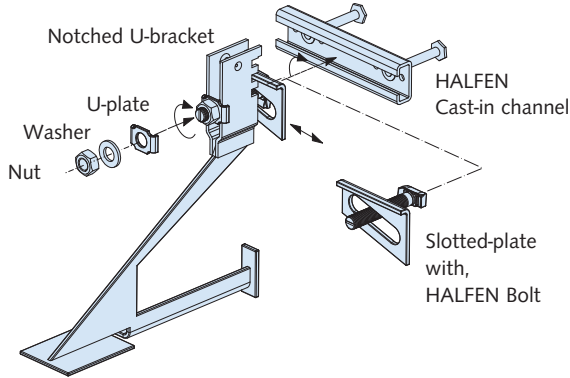
or similar; deliver and install according to manufacturers instructions.
Fixing system not included.



HALFEN SUPPORT BRACKETS

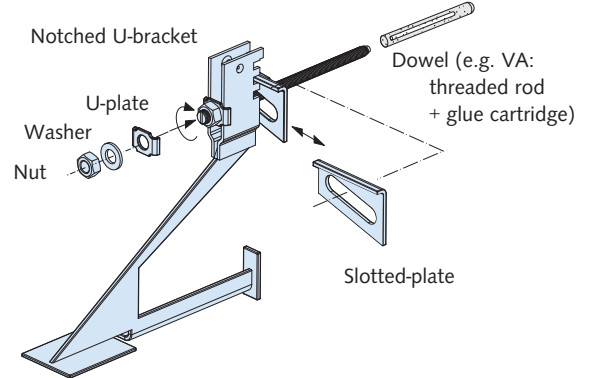
Installation Instructions

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 dowels

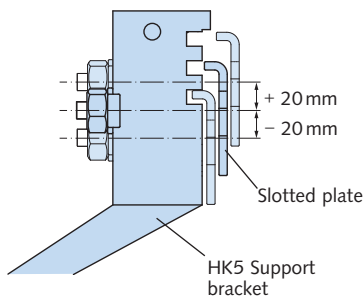


1. Install the dowel according to the approval.
 2. Place the slotted plate and the support bracket on to the threaded rod using the U-plate, washer and nut as illustrated.
 3. Adjust the height of the support bracket. A notch in the U-bracket must be resting on the slotted plate; if necessary, tap the 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.



Tightening:

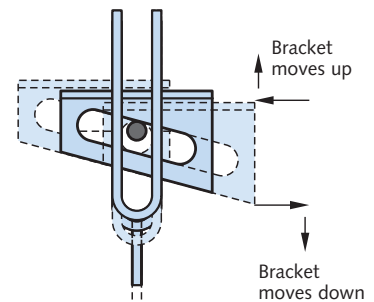
After height adjustment, use a torque spanner to tighten the nut with the required torque in accordance with the values shown in the table below.

Method of fastening:	Required torque [Nm] for thread:		
	M10	M12	M16
HALFEN Bolt HS	15	25	60
HALFEN Bonded anchor V	20	40	80
HALFEN Injection anchor VMZ	15	25/30 ^①	50
HALFEN Injection anchor VMU	20	40	60
HALFEN Bolt-anchor BZ	35	50	110

^① see page 31-32

Exact height adjustment:

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



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.

- a) Only the thickness of the main structural wall is to be used for verification.
- b) 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. [...]
- d) 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. [...]
- e) 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. [...]
- f) 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 Ia;
- 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_{tmin} 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 ^a	7	8
$10 \text{ m} \leq h \leq 18$ m	7 ^b	8	9
$18 \text{ m} \leq h \leq 25$ m	7	8 ^c	

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. [...]

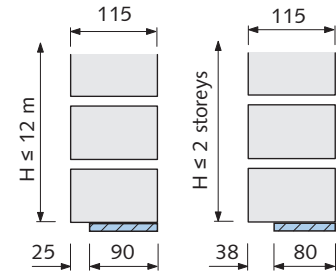
While taking their structural effectiveness into account, the wire wall ties must be designed to ensure they do not conduct moisture from the outer skin to the inner main structure (e.g. by fitting a drip disc, see picture NA.D.1). [...]

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

- a) 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

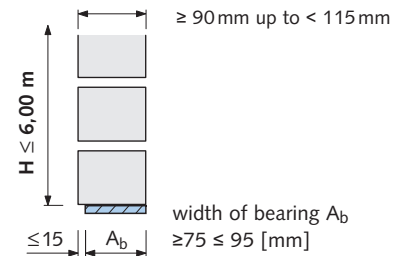
- for 115 mm thick brick skin



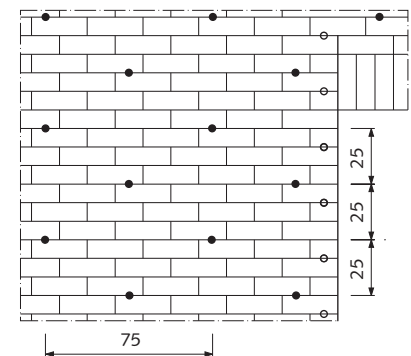
Full bearing width 2/3 bearing width

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 ≥ 90 mm to < 115 mm thick



Layout of cavity wall ties

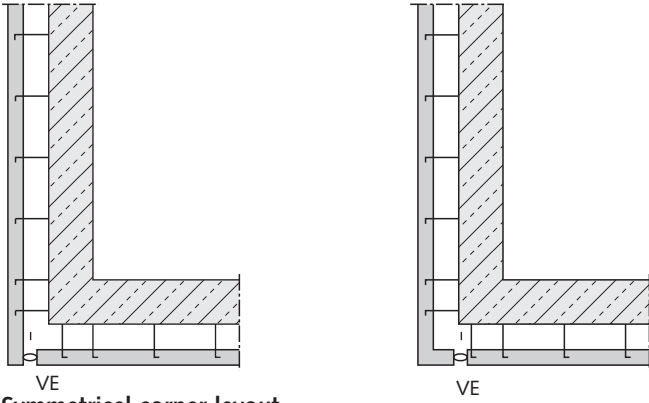


- number of ties in the area of wall: 7 ties/ m^2
- 3 additional ties have to be fitted next to openings, expansion joints, near edges and per linear metre of edge

HALFEN SUPPORT BRACKETS

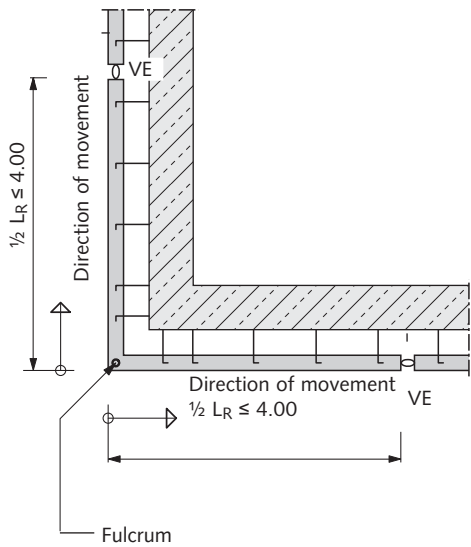
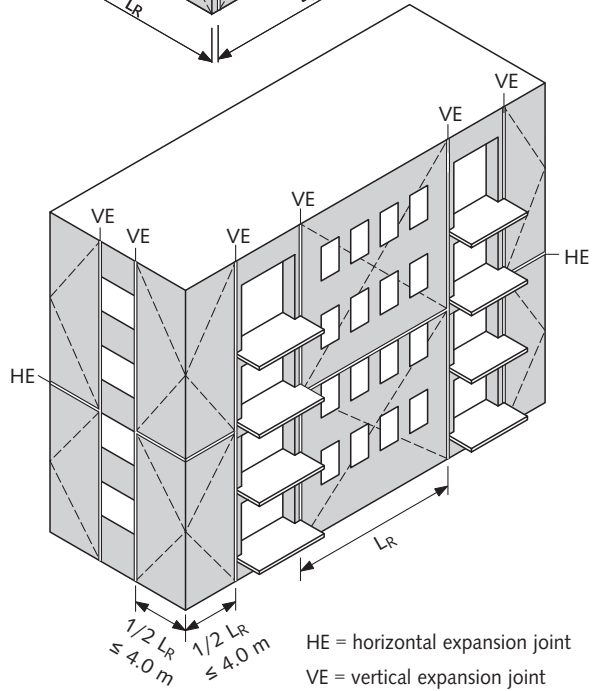
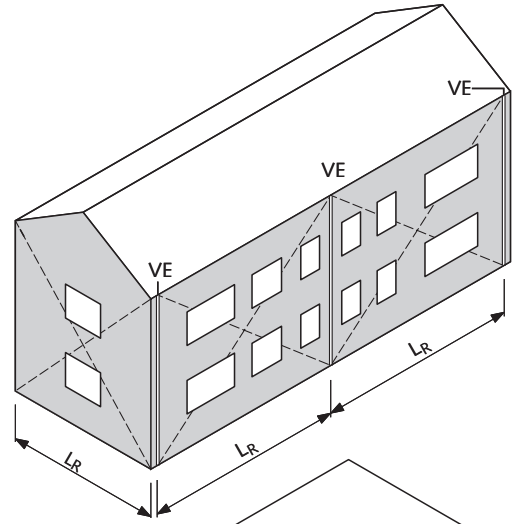
Expansion Joints

Expansion joints at corners



Symmetrical corner layout with expansion joints

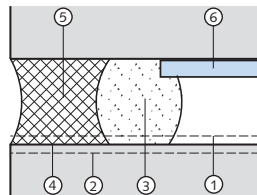
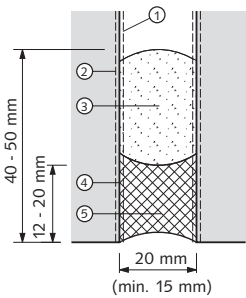
Horizontal and vertical expansion joints



Vertical expansion joint

Horizontal expansion joint under support brackets

Recomm. spacing of expansion joints



Maximum spacing of expansion joints L_R [m] for cavity wall with facing leaf ⑦ in	With air gap and insulation	With core insulation
standard clay bricks	10 - 12	10 - 12
calcium silicate blocks	6 - 8	5 - 6
concrete module blocks	6 - 8	5 - 6

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

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

- ⑤ elastoplastic joint sealing compound
- ⑥ HALFEN HK5 Support brackets
- ⑦ as recommended by the brick/lime-stone industry and the concrete industry

HALFEN SUPPORT BRACKETS

Further Façades Fixing Systems

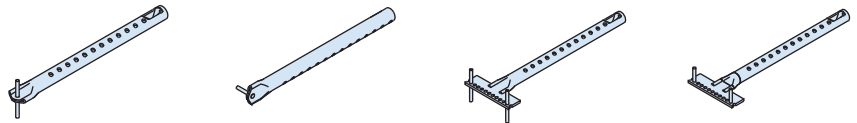
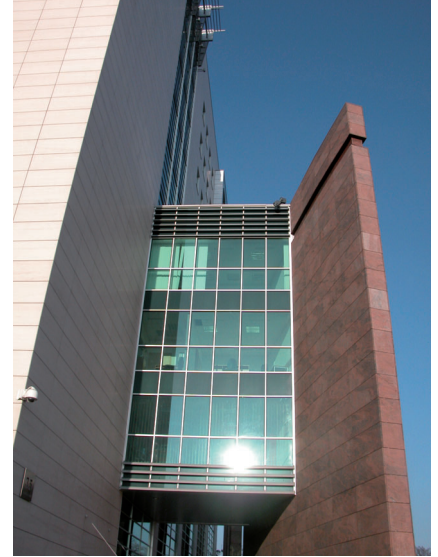
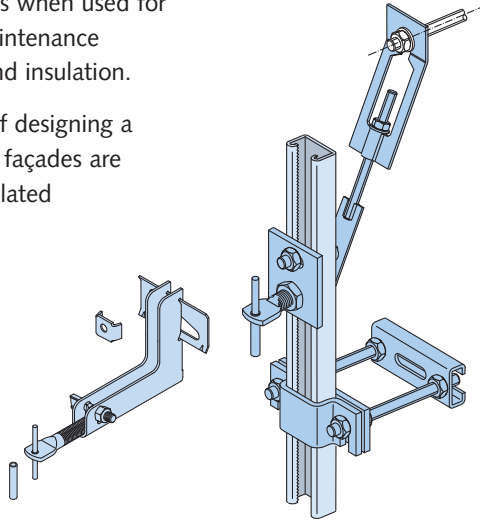
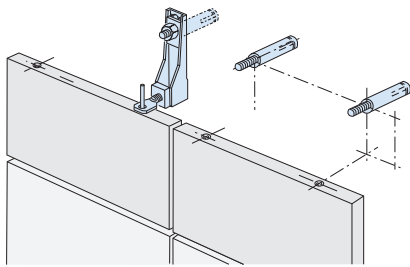
Natural stone façades

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

These are only a few of the advantages of designing a façade using natural stone. 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



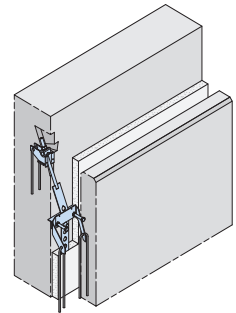
Concrete façades

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.

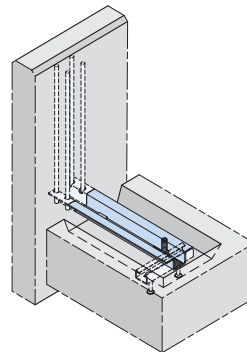
Following distinctions in construction type are made:



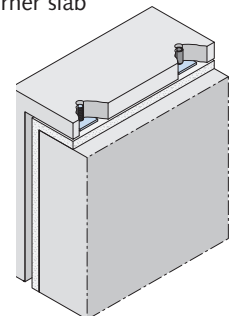
Suspended façade slab



Parapet element

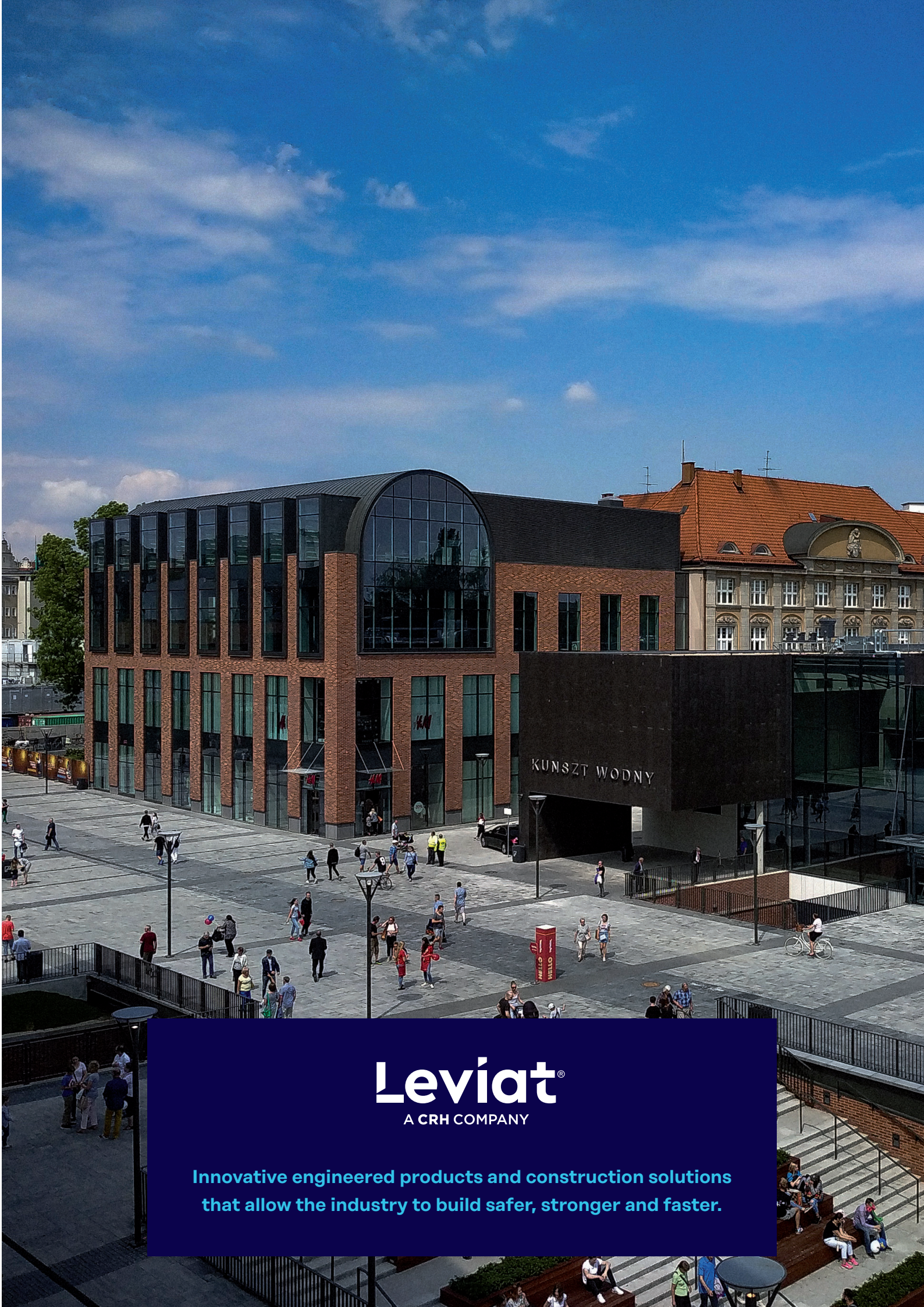


Corner slab



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





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