

HALFEN NATURAL STONE SUPPORT SYSTEMS

TECHNICAL PRODUCT INFORMATION



HALFEN NATURAL STONE SUPPORT SYSTEMS

FS 18-E

FAÇADE



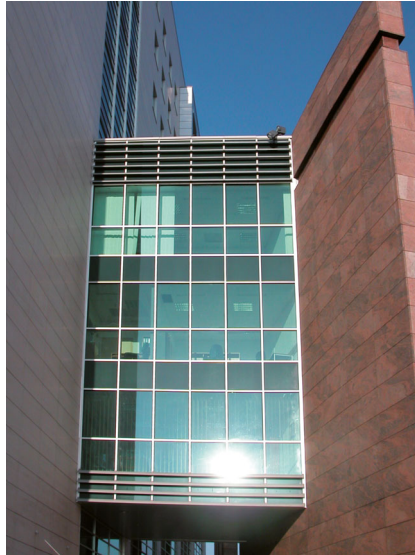
HALFEN
A CRH COMPANY

HALFEN Natural stone façades – many advantages from one source

Natural stone has numerous advantages when used for designing façades. It is a durable, low maintenance material which improves a building's sound insulation. Natural stone façades also contribute to the aesthetic appearance of your project and makes it "standout".

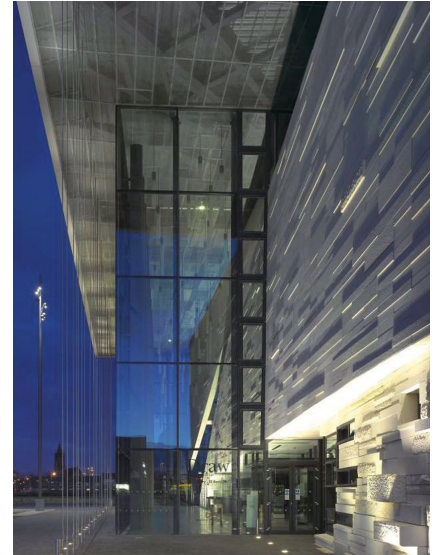
Its heat storage properties make it an excellent material for insulating against summer heat. The heat is kept away from the core of the building, reducing the necessity to cool the building. These are just a few of the many advantages of designing façades with natural stone.

Natural stone façades are usually designed and constructed as ventilated curtain façades. HALFEN Natural stone fixing systems are the optimal solution for realising this type of ventilated curtain façade.



Office building
Posen, Poland

HALFEN has numerous years of experience and competence in façade construction, as our highly experienced project engineers have proven time and time again in various major projects with which we have been entrusted.



mima (Middlesbrough Institute of Modern Art),
Middlesbrough, England

We offer customers a comprehensive package of planning and engineering services to reliably plan and realise their natural stone façades as reliably and as efficiently as possible.

Certified HALFEN quality

Quality assurance and safety are of ever increasing importance in the construction of buildings. The HALFEN Body anchors and HALFEN Grout-in anchors have been quality tested and certified by the Nuremberg LGA Landesgewerbeanstalt (Nuremberg based independent certification agency).

The LGA is part of the "TÜV Rheinland Group", Germany's renowned, inde-

pendent and neutral, safety and quality testing organisation. The quality certificate is the first independent quality certificate awarded for the production and the construction of façade systems of this type.

The precondition for a quality-seal award are comprehensive tests by the LGA. This includes assessment of the manufacturing process, the static load

capacities, and the complete documentation of the load-bearing anchors. It is a comprehensive and independent quality assurance covering all characteristics of the product.



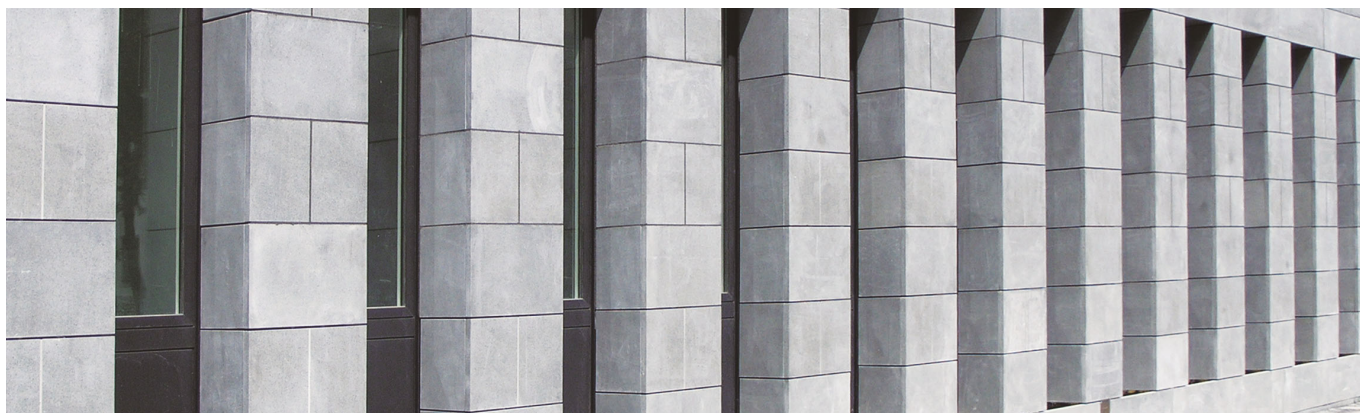
Steel structures

A4: Steel, corrosion resistance class (CRC) III acc. to EN 1993-1-4: 2015-10, Table A.3 (group 1.4362, 1.4571...)

A2: Steel, corrosion resistance class (CRC) II acc. to EN 1993-1-4: 2015-10, Table A.3 (group 1.4311, 1.4307...)

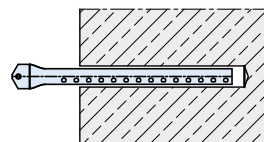
HALFEN NATURAL STONE SUPPORT SYSTEMS

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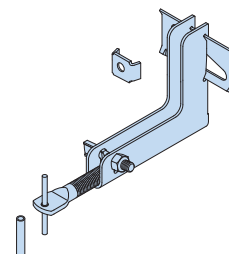
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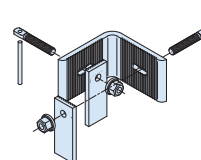
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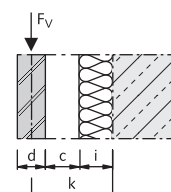
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HALFEN NATURAL STONE SUPPORT SYSTEMS

Introduction

Thermal bridges with HALFEN Natural stone support systems







To meet the requirements for calculating thermal bridges, HALFEN provides the thermal bridge coefficient χ for their body anchors, HALFEN SUK Sub-structures elements and grout-in anchors.

The χ -value defines the effect of a three-dimensional point thermal bridge caused by the fixing of the anchor and penetration of the thermal insulation. Using these values the planner can exactly calculate the effect on the thermal transfer coefficients U [$W/m^2 \times K$]

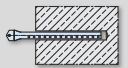
of the building caused by the HALFEN Natural stone support system.

The values are dependent on both the thickness and thermal conductivity of the insulation, and the material of the main structure (concrete/brickwork).

Thermal bridge coefficient χ [W/K] for $\lambda_{ins} = 0.035$ (thermal conductivity of the insulation) for body anchors in concrete

	Insulation thickness d_{ins} [cm]													
	4	6	8	10	12	14	16	18	20	22	24	26	28	30
DT-4xx 	0.025	0.020	0.017	0.014	0.012	0.011	0.010	0.009	0.008	0.008	0.007	0.007	0.006	0.006
DT-13xx 	0.045	0.037	0.031	0.026	0.023	0.020	0.018	0.017	0.015	0.014	0.013	0.012	0.011	0.011
BA-6xx 	0.020	0.016	0.014	0.012	0.010	0.009								
BA-13xx 	0.035	0.029	0.024	0.021	0.018	0.016								
DH-10xx 	0.007	0.006	0.005	0.004	0.004									
DH-17xx 	0.011	0.009	0.007	0.006	0.005	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.002

Thermal bridge coefficient χ [W/K] for $\lambda_{ins} = 0.035$ (thermal conductivity of the insulation) for grout-in anchors in concrete

	Insulation thickness d_{ins} [cm]													
	4	6	8	10	12	14	16	18	20	22	24	26	28	30
 UHA - 5	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
UHA - 7	0.007	0.005	0.005	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
UMA - 10	0.007	0.006	0.005	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
UMA - 12	0.009	0.007	0.006	0.005	0.004	0.004	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002
UMA - 16	0.012	0.010	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003
UMA - 18	0.018	0.014	0.012	0.010	0.009	0.008	0.007	0.006	0.006	0.005	0.005	0.005	0.004	0.004
UMA - 22	0.022	0.018	0.015	0.013	0.011	0.010	0.009	0.008	0.007	0.007	0.006	0.006	0.006	0.005
UMA - 25	0.026	0.021	0.017	0.015	0.013	0.011	0.010	0.009	0.009	0.008	0.007	0.007	0.006	0.006
UMA - 28	0.035	0.029	0.024	0.020	0.018	0.016	0.014	0.013	0.012	0.011	0.010	0.009	0.009	0.008
UMA - 33	0.046	0.038	0.031	0.027	0.023	0.021	0.019	0.017	0.015	0.014	0.013	0.012	0.011	0.011

Technical Support




HALFEN Engineering Support

HALFEN engineering can provide planning and design service plus complementary consultation for your individual projects. Please contact us: see page 28 for contact information. Alternatively, simply scan the QR Code to visit our mobile website.



HALFEN NATURAL STONE SUPPORT SYSTEMS

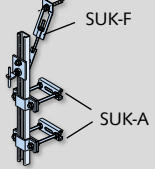
Introduction

Thermal bridge coefficient χ [W/K] for $\lambda_{\text{ins}} = 0.035$ (thermal conductivity of the insulation) for grout-in anchors in perforated brick														
	Insulation thickness d_{ins} [cm]													
	4	6	8	10	12	14	16	18	20	22	24	26	28	30
UHA - 5	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
UHA - 7	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001
UMA - 10	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001
UMA - 12	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
UMA - 16	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.002
UMA - 18	0.008	0.008	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004
UMA - 22	0.010	0.010	0.009	0.009	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.004
UMA - 25	0.011	0.011	0.011	0.010	0.009	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.005
UMA - 28	0.016	0.016	0.015	0.014	0.013	0.012	0.011	0.010	0.009	0.009	0.008	0.008	0.007	0.007
UMA - 33	0.021	0.021	0.019	0.018	0.016	0.015	0.014	0.013	0.012	0.012	0.011	0.010	0.010	0.009

Channel support systems are the optimal solution for reducing thermal bridges. HALFEN SUK and UKB are anchored to the building at only a few fixing points. All elements anchored to the load-bearing structure are manufactured from stainless steel.

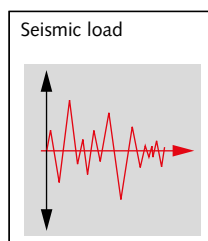
Stainless steel has a fourteen times lower thermal conductivity than aluminium. The higher strength of stainless steel compared to aluminium also makes it possible to design elements with a smaller cross-section.

This has a positive effect on heat transmission through the anchor element. It is also possible to place a thermal separator between the anchor and the load-bearing structure. This feature reduces thermal bridging and therefore heat loss.

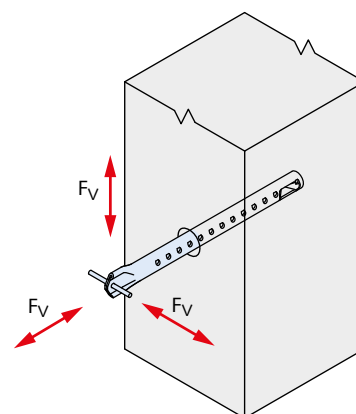
Thermal bridge coefficient χ [W/K] for $\lambda_{\text{ins}} = 0.035$ (thermal conductivity of the insulation) for SUK individual parts anchored in concrete														
	Insulation thickness d_{ins} [cm]													
	4	6	8	10	12	14	16	18	20	22	24	26	28	30
SUK - F	0.0217	0.0164	0.0131	0.0109	0.0094	0.0082	0.0073	0.0065	0.0059	0.0054	0.0050	0.0047	0.0043	0.0041
SUK - A	0.0360	0.0271	0.0217	0.0181	0.0155	0.0135	0.0120	0.0108	0.0098	0.0090	0.0083	0.0077	0.0072	0.0067

Dynamic loads with HALFEN Natural stone support systems

HALFEN Natural stone support systems can also be installed in seismic active regions.



Grout-in anchors UMA/UHA are statically designed for seismic loads and can fully transfer the vertical loads on pages 13 and 15 in all three load directions. With appropriate design all HALFEN Natural stone anchors can be adapted to meet safety requirements for the relevant earthquake zones.



HALFEN NATURAL STONE SUPPORT SYSTEMS

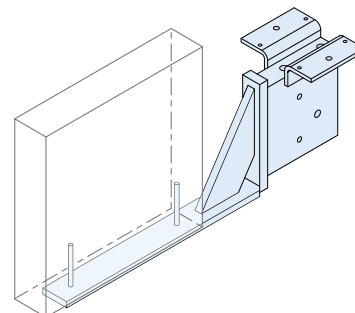
Introduction

Custom solutions

Construction project: Allerhuset, Denmark

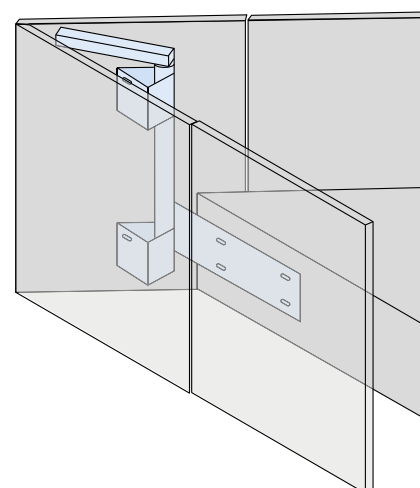
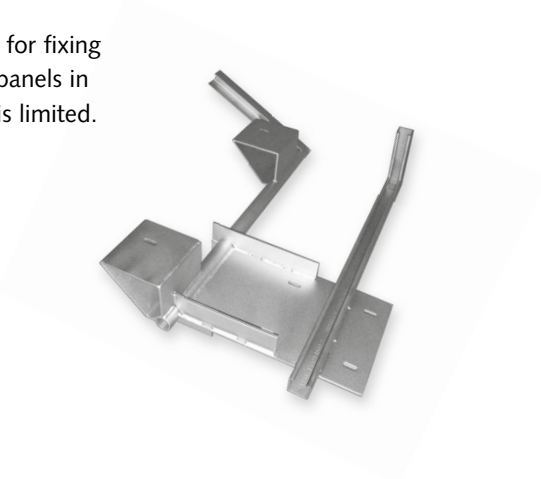
The unique design of natural stone façades demands special solutions for anchoring. The following are examples of custom solutions developed by HALFEN for natural stone façades.

An important design feature in this façade are the 90 degrees projecting natural stone strips. These strips are attached to the precast sub structure of the building using HALFEN Natural stone anchors.



Construction project: Multihuset, Denmark

Special custom element for fixing HALFEN Natural stone panels in locations where access is limited.



References

More references can be found on our website www.halfen.com.
Or simply scan the QR Code.

HALFEN NATURAL STONE SUPPORT SYSTEMS

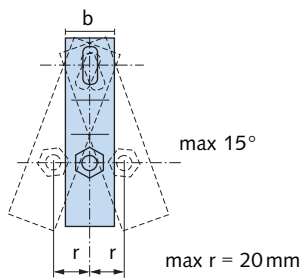
Applications

HALFEN Body anchors

Features

HALFEN Body anchors used together with HALFEN HTA/HZA Cast-in channels guarantee maximum adjustability to compensate for on-site tolerances.

HALFEN Body anchors can also be fixed to a suitable load-bearing structure using HALFEN Anchor bolt systems. HALFEN Body anchors cover a wide range of applications for fixing natural stone.



Advantages

- three-dimensional adjustability
- flexible fixing methods
- vertical anchor adjustment (using a serrated plate or wedge plate)
- horizontal anchor adjustment (using a spade bolt)
- anchors are adjustable by 15°
- TÜV/LGA quality tested
- can be subjected to load immediately after installation → fast construction
- natural stone panel with pin support
- quantifiable thermal bridge coefficient χ [W/K]



HALFEN Grout-in anchors

Features

HALFEN Grout-in anchors are a traditional method of anchoring natural stone façades. The tubular section of the UMA/UHA anchors makes them suitable for both horizontal and vertical joints in natural stone panel façades.

Adjustment is by casting the anchors in a sufficiently large, pre-drilled mortar filled hole.

The joints between the natural stone slabs must be supported with shims until the mortar has hardened and final load-bearing capacity has been reached.

Advantages

- type tested
- one type of anchor for both horizontal and vertical joint fixing
- TÜV / LGA tested quality
- anchored in the drillhole using cement based mortar
- can be used for large stand-off installations and high loads
- suitable for seismic loads in earthquake regions
- natural stone panel with pin bearing
- quantifiable thermal bridge coefficient χ [W/K]



HALFEN NATURAL STONE SUPPORT SYSTEMS

Applications

HALFEN SUK Stainless steel support structure

Features

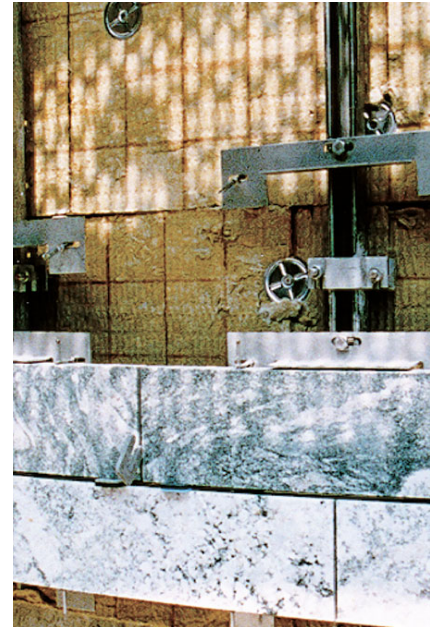
The HALFEN SUK Stainless steel support system is ideal both for new building and modernization projects. Its unique characteristic is the capacity to span a non-load-bearing substrate.

It can be used for installation of large, varying stand-off distances from the load-bearing structure. A4/AISI 316 grade stainless steel material guarantees a high resistance against corrosion.

Fewer required fixing points reduce installation costs for the whole support system. Fewer fixing points also reduce heat-loss, resulting in very good thermal properties when using the SUK System.

Advantages

- height of suspended channel system freely adjustable
- horizontal adjustment (using a spade bolt)
- fast assembly and therefore faster construction times
- proven in numerous projects
- spans non-load-bearing sub structures
- panel/slab support with pin bearing
- suitable for custom designed constructions
- high corrosion resistance
- high load bearing capacity



HALFEN UKB Support structure in stainless steel and aluminium

Features

Light weight and easy to use support system: Support and restraint brackets in A4/AISI 316 stainless steel, vertical channels in aluminium.

HALFEN Body anchors type BA-606 are quickly and easily fixed to the aluminium profile with self-tapping screws.

This system combines the advantages of both body anchors and channel systems.

Advantages

- suspended channel system with multiple adjustment possibilities
- spans non-load-bearing sub structures
- stone slabs are supported with pins
- quickly assembled and therefore faster construction times
- proven success in many projects
- aluminium channels can be drilled and cut to length on site



HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Body Anchors

HALFEN Body anchor

The HALFEN Body anchors product range provides solutions for all installation requirements for natural stone façades.

Body anchors are three-dimensionally adjustable and are available for various stand-off sizes and load ranges. Vertical adjustment is with a serrated or wedge plate.

The stand-off distance of the natural stone slab is adjusted using a spade bolt. It is also possible to swivel the anchor by up to 15°.

The anchors can be subjected to load immediately after installation to HALFEN Cast-in channels or to a suitable load-bearing structure. Pins secure the natural stone slabs to the anchors.

The anchor pins are available with full pins ($\varnothing 5 \times 70$ mm), design 1, and with half-pins ($\varnothing 5 \times 35$ mm), design 2.

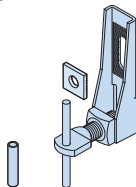
HALFEN also provides various special custom designs, for example design 3 and 4.

Illustrations of available designs:

→ page 12



HALFEN BA Body anchor

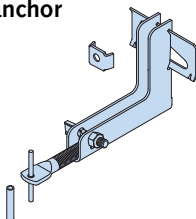


- stand-off distances between **60 and 120 mm**^①
- max. permissible load **600 N to 1300 N**
- material^②; stainless steel A4 or A2

① Nominal dimensions

② Material specifications → page 2

HALFEN DT Body anchor

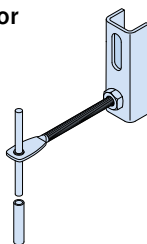


- stand-off distances between **140 and 300 mm**^①
- max. permissible load **400 N to 1300 N**
- spade bolt secured with a locking bolt
- material^②; stainless steel A4 or A2

① Nominal dimensions

② Material specifications → page 2

HALFEN DH Body anchor

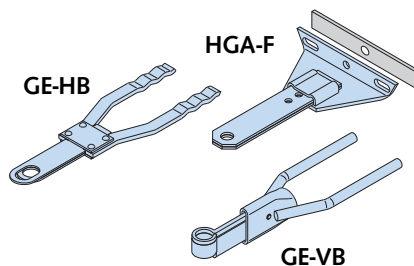


- restraint anchor only, not suitable for carrying dead load of element
- stand-off distances between **60 and 320 mm**^①
- max. permissible load **850 N to 1300 N**
- material^②; stainless steel A4 or A2

① Nominal dimensions

② Material specifications → page 2

HALFEN Scaffolding anchors for natural stone façades



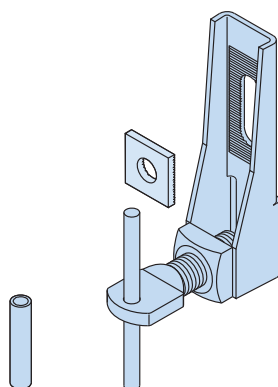
See page 23. More information about HALFEN Scaffold anchors can be found in Technical Product Information "HALFEN Scaffold anchors". Complimentary download at: www.halfen.com/brochures/Catalogues/accessories



HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Body Anchors

HALFEN BA Body anchor



Material:

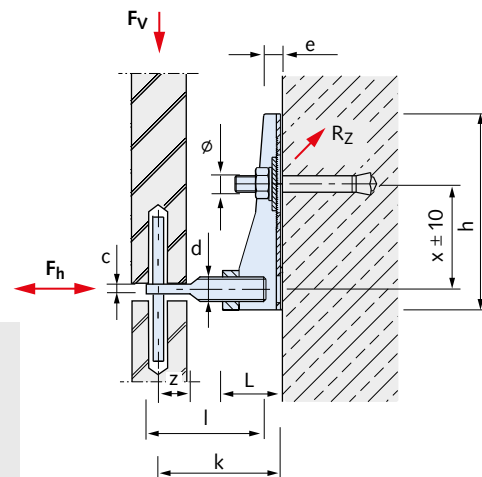
Stainless steel A4 or A2

Material specifications → page 2



Note

Please order fixings separately
(→ page 20). Select by R_z , ϕ and
type of material in which anchored.



HALFEN BA Body anchors are designed for 60 to 120 mm stand-off distances with a maximum load of 1300 N.

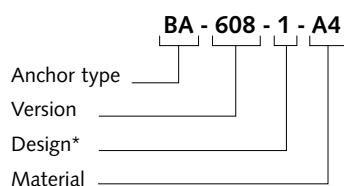
The anchors consist of a sturdy base element, a serrated plate and a spade bolt.

The BA Body anchor is fixed according to the installation instructions, either in the horizontal or vertical joint in load-bearing substrate to HALFEN Cast-in channels or HALFEN Anchor bolt systems.
The bracket has a vertical 8.5×28 mm

slot and a serrated plate for easy height adjustment.

As with all body anchors the distance to the load-bearing substrate is adjusted by turning the spade bolt in or out. The anchor bracket can be adjusted laterally by swivelling the whole unit.

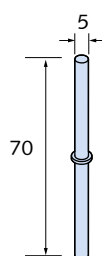
Ordering example



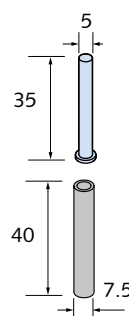
* see page 12

Pin dimensions of all HALFEN Body anchors:

Loose anchor pin
with collar for designs
1, 3 and 7
 $\phi 5 \times 70$ mm



Fixed half-pin
for designs 2 and 4
 $\phi 5 \times 35$ mm



Sleeve
 $\phi 7.5 \times 40$ mm

Body anchors BA

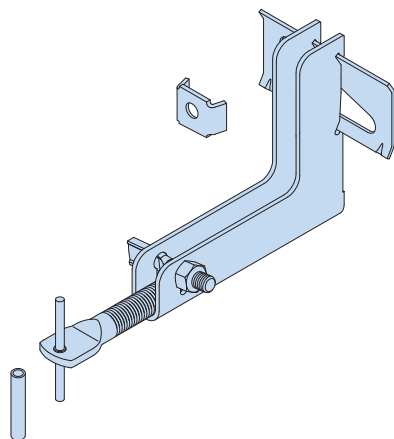
Type	Perm. load F_v [N]	Stand-off distance			Support body				Spade bolt				Connection ϕ [mm]
		k [mm]	min k [mm]	max k [mm]	x [mm]	L [mm]	h [mm]	e [mm]	d [mm]	c [mm]	l [mm]	z [mm]	
606	900	60	52	70	50	29	95	10	12	4	58	15	8.5×28
608	600	80	65	90	55	36	95	10	12	4	71	18	8.5×28
610	600	100	80	120	55	56	95	10	12	4	85	18	8.5×28
612	600	120	100	140	55	76	95	10	12	4	85	18	8.5×28
1308	1,300	80	70	100	65	47	110	10	16	5	74	18	8.5×28
1310	1,300	100	90	120	65	47	110	10	16	5	94	18	8.5×28
1312	1,300	120	105	135	65	47	110	10	16	5	106	18	8.5×28

perm. F_h = actual F_v

HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Body Anchors

HALFEN DT Body anchor

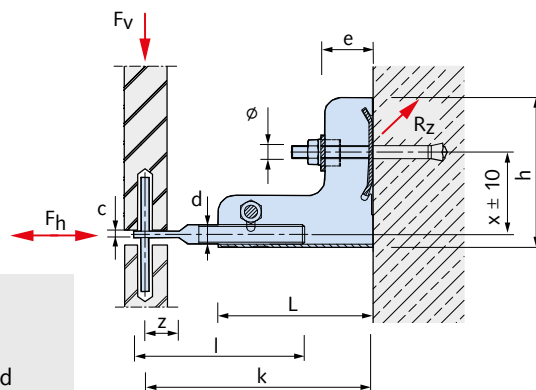


Material:
Stainless steel A4 or A2
Material specifications → page 2



Note

Please order fixings separately
(→ page 20). Select by R_z , ϕ and
type of material in which anchored.



HALFEN DT Body anchors are suitable for large stand-off distances of 140 mm up to 300 mm and high loads up to 1300 N. The pre-assembled anchor consisting of the bracket, the adjustable wedge plate and a clamping bolt

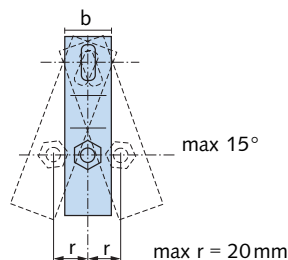
is supplied ready for installation. The stand-off distance is adjusted using the spade bolt. The anchor can be pivoted for lateral adjustment. The clamping bolt is pre-assembled at the factory for left to right installation

but is easily adaptable for right to left installation. After aligning each natural stone panel the clamping bolts are tightened with a torque of 5 Nm.

Ordering example

Anchor type **DT** - 414 - 1 - A4
Version
Design*
Material

* see page 12



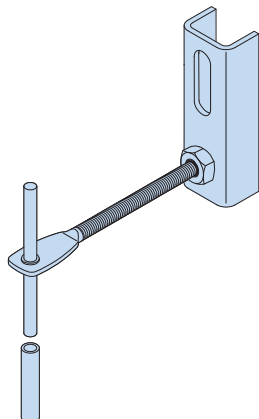
Body anchors DT													
Type	Perm. load F_V [N]	Stand-off distance [mm]			Support body [mm]					Spade bolt [mm]			Connection [mm]
		k	min k	max k	x	L	h	e	d	c	l	z	ϕ
414	400	140	120	170	50	95	92	30	12	4	105	21	9
416	400	160	140	190	55	115	97	30	12	4	105	21	9
418	400	180	160	210	60	135	102	30	12	4	105	21	9
420	400	200	180	230	65	155	107	30	12	4	105	21	9
422	400	220	200	250	70	175	112	30	12	4	105	21	9
424	400	240	220	270	75	195	117	30	12	4	105	21	9
426	400	260	240	290	80	215	122	30	12	4	105	21	9
428	400	280	260	310	85	235	127	30	12	4	105	21	9
430	400	300	280	330	90	255	132	30	12	4	105	21	9
1314	1,300	140	120	170	80	90	130	36	16	5	115	21	11
1316	1,300	160	140	190	85	110	135	36	16	5	115	21	11
1318	1,300	180	160	210	95	130	145	36	16	5	115	21	11
1320	1,300	200	180	230	80	150	130	36	16	5	115	21	13
1322	1,300	220	200	250	90	170	140	41	16	5	115	21	13
1324	1,300	240	220	270	95	190	145	41	16	5	115	21	13
1326	1,300	260	240	290	100	210	150	41	16	5	115	21	13
1328	1,300	280	260	310	105	230	155	41	16	5	115	21	13
1330	1,300	300	280	330	110	250	160	41	16	5	115	21	13

perm. F_H = actual F_V

HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Body Anchors

HALFEN DH Body anchor

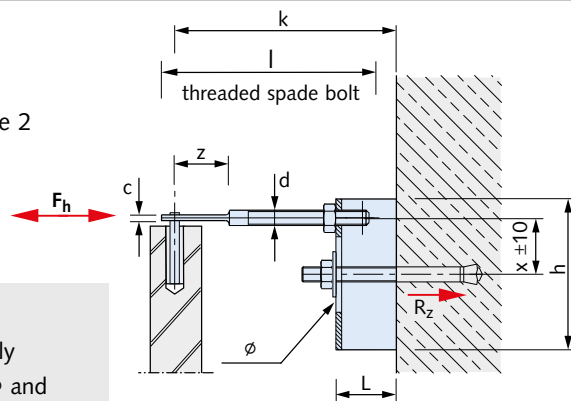


Material:
Stainless steel A4 or A2
Material specifications → page 2



Note

Please order fixings separately
(→ page 20). Select by R_z , ϕ and
type of material in which anchored.



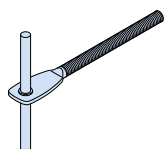
HALFEN DH Body anchors are 3-dimensionally adjustable. They are designed to carry only horizontal tension or pressure loads. DH Body anchors are used in combination with HALFEN BA and DT Body anchors.

The anchor is mainly used at slab edges and corners or for parapet elements. It is designed for stand-off installation of 60 to 320 mm and horizontal loads of up to 1,300 N. The stand-off distance from the main load-bearing structure is adjusted using the spade bolt.

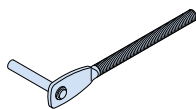
Vertical adjustment is with the 9 × 30 mm slot. This anchor is also laterally adjustable by swivelling the whole unit. The body anchor is delivered with an additional counter nut, which additionally locks the spade bolt.

Standard designs for BA, DT and DH:

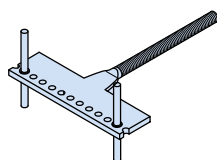
Special designs for BA, DT and DH (on request):



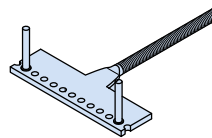
Design 1
Spade bolt with loose
pin and sleeve



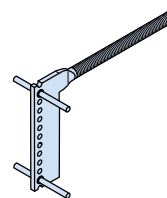
Design 2
Spade bolt with
fixed half-pin



Design 3
Spade bolt with 2 loose
pins and 2 sleeves



Design 4
Spade bolt with
2 fixed half-pins



Design 7
Spade bolt with L-bracket,
2 loose pins and 2 sleeves

Body anchors DH

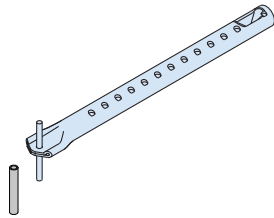
Type including locking nut	Perm. load F_h [N]	Stand-off distance [mm]			Support body [mm]			Spade bolt [mm]				Connection [mm]
		k	min k	max k	x	h	L	d	c	l	z	
1006	850	60	53	68	26	80	18	6	2	60	21	9 × 30
1008	850	80	73	88	26	80	18	6	2	80	21	9 × 30
1010	850	100	93	108	26	80	18	6	2	100	21	9 × 30
1712	1,300	120	105	134	25	80	32	8	3	112	27	9 × 30
1714	1,300	140	125	154	25	80	32	8	3	132	27	9 × 30
1716	1,300	160	145	174	25	80	32	8	3	152	27	9 × 30
1718	1,300	180	165	194	25	80	32	8	3	172	27	9 × 30
1720	1,300	200	185	214	25	80	32	8	3	192	27	9 × 30
1722	1,300	220	205	234	25	80	32	8	3	212	27	9 × 30
1724	1,300	240	225	254	25	80	32	8	3	232	27	9 × 30
1726	1,300	260	245	274	25	80	32	8	3	252	27	9 × 30
1728	1,300	280	265	294	25	80	32	8	3	272	27	9 × 30
1730	1,300	300	285	314	25	80	32	8	3	292	27	9 × 30
1732	1,300	320	305	334	25	80	32	8	3	312	27	9 × 30

HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Grout-in Anchors

HALFEN UMA Support anchor

Type tested*

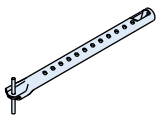


Material:

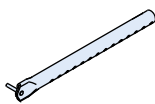
Stainless steel A4 or A2 → page 2

Separate serviceability certificates for anchor bending are required.

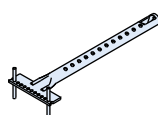
Available UMA designs:



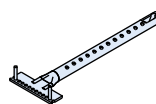
Design 1*
Support anchor with loose pin and sleeve



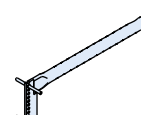
Design 2*
Support anchor with fixed half-pin



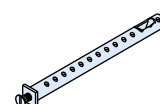
Design 3
Support anchor with 2 loose pins and 2 sleeves



Design 4
Support anchor with 2 fixed half-pins



Design 7
Support anchor with L-bracket, 2 loose pins and 2 sleeves

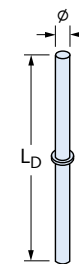


Design 8
Threaded anchor with countersink screw (from UMA-16) incl. 2 x EPDM washers

The round cross section of the HALFEN UMA Grout-in anchor makes it especially suitable for grouting in brickwork (> M12/IIa) and in concrete (> C12/15). The anchor has the same load-bearing capacity in horizontal and vertical joints. Depending on the anchor type, stand-off installations of up to 300 mm with maximum vertical loads of 4300 N are possible. A sufficiently dimensioned drill hole, filled with cement mortar, allows three-dimensional adjustability of the anchor. The anchors are type tested and are available in various designs.

Ordering example

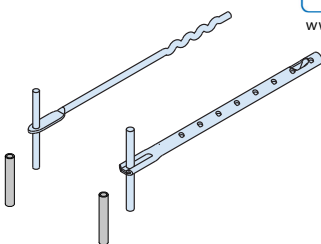
UMA - 16 - 3 - 210
Anchor type — Diameter d [mm] — Design — Anchor length [mm] —



loose pin with fixed collar for designs 1, 3 and 7.

HALFEN UHA Restraint anchor

Type tested*



Material:

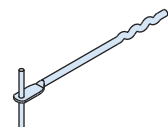
Stainless steel A4 or A2 → page 2

Independent serviceability certificate for anchor flexing is required.

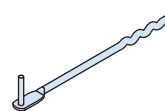
HALFEN UHA Restraint anchors are used to support horizontal compression and tension forces. The UHA Restraint anchor is used in combination with UMA Grout-in anchors. Restraint anchors are used

mainly at edges and at corners for parapets. The anchor is type tested and has the same advantages as the UMA Grout-in anchor. Loads of up to 2500 N are possible. The anchor is available in three standard designs.

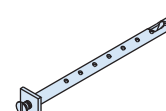
Available UHA designs:



Design 1*
Restraint anchor with loose pin and sleeve



Design 2*
Restraint anchor with fixed half-pin



Design 8
Threaded anchor with countersink screw (only for UHA-10) incl. 2 x EPDM washers

	UMA Support anchor								UHA Restraint anchor		
Type	UMA-10	UMA-12	UMA-16	UMA-18	UMA-22	UMA-25	UMA-28	UMA-33	UHA-5	UHA-7	UHA-10
d [mm]	10	12	16	18	22	25	28	33	5	7	10
c [mm]	5.0	5.5	7.0	7.0	8.0	8.0	8.0	8.0	1.6	2.5	5.0
anchor pin for design 1	∅5 × 70	∅5 × 70	∅6 × 75	∅6 × 75	∅6 × 75	∅6 × 75	∅6 × 75	∅6 × 75	∅5 × 70	∅5 × 70	∅5 × 70
anchor pin for design 2	∅5 × 35	∅5 × 35	∅6 × 37	∅6 × 37	∅6 × 37	∅6 × 37	∅6 × 37	∅6 × 37	∅5 × 35	∅5 × 35	∅5 × 35

*only design 1 and 2 are type tested

HALFEN NATURAL STONE SUPPORT SYSTEMS

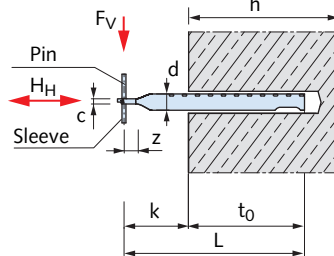
HALFEN Grout-in Anchors in Concrete

Anchoring substrate: Concrete \geq C12/15

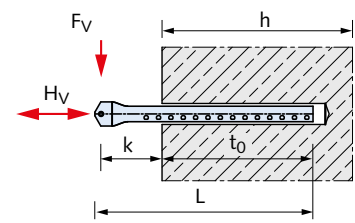
Legend (pages 14–15)

F_V = perm. vertical load per anchor [N] ^①
 H_H = perm. horizontal load in horizontal joint [N]
 H_V = perm. horizontal load in vertical joint [N]
 ϕ_i = diameter of drill hole [mm]
 h = min. component thickness [mm]
 with min. grout depth
 t_0 = min. grout depth of anchor in drill hole [mm]
 k = cantilever
 z = 21 mm
 c = → table on page 13

Anchoring in horizontal joints



Anchoring in vertical joints



Anchor selection:
 → see notes on page 15

① When determining the vertical load F_V it may be necessary to take into account not only the dead weight of the façade panels (plus any additional loads) but also a reaction force caused by the inclined position of the restraint anchor; in accordance with DIN 18516-3.

Concrete \geq C20/25 ②		Support anchor								Restraint anchor ④ (Standard grout)			Restraint anchor ⑤ (Dry ready mixed grout)		
Cantilever k [mm]	Anchor type	UMA 10	UMA 12	UMA 16	UMA 18	UMA 22	UMA 25	UMA 28	UMA 33	UHA 5	UHA 7	UHA 10	UHA 5	UHA 7	UHA 10
	Drill hole ϕ_i	$\phi 20$	$\phi 22$	$\phi 26$	$\phi 28$	$\phi 32$	$\phi 35$	$\phi 40$	$\phi 45$	$\phi 15$	$\phi 17$	$\phi 20$	$\phi 15$	$\phi 17$	$\phi 20$
	Bonding depth ③	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 110$	$t_0 \geq 110$	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 120$	$t_0 \geq 120$	$t_0 \geq 120$
	Component thickness	$h \geq 150$	$h \geq 150$	$h \geq 150$	$h \geq 150$	$h \geq 154$	$h \geq 160$	$h \geq 190$	$h \geq 200$	$h \geq 120$	$h \geq 124$	$h \geq 130$	$h \geq 150$	$h \geq 154$	$h \geq 160$
40 50 60	F_V	275	420	800	1380										
	H_H	649	880	1173	1319					523			1131		
	H_V	325	496	944	1319					523			1131		
	L	150	150	150	150					150			180		
70 80 90	F_V	215	325	620	1030										
	H_H	508	767	1173	1319					523	733		1131	1584	
	H_V	254	384	732	1216					523	733		1131	1584	
	L	180	180	180	180					180	180		210	210	
100 110 120	F_V	170	265	505	820	1330	1750	2720	4300						
	H_H	401	626	1173	1319	1613	1833	2509	2957	523	733		1131	1584	
	H_V	201	313	596	968	1570	1833	2509	2957	523	733		1131	1584	
	L	210	210	210	210	210	210	230	230	210	210		240	240	
130 140 150	F_V			425	690	1100	1465	2240	3540						
	H_H			1003	1319	1613	1833	2509	2957	523	733	733	1131	1584	1584
	H_V			502	815	1299	1730	2509	2957	523	733	733	1131	1584	1584
	L			240	240	240	240	260	260	240	240	240	270	270	270
160 170 180	F_V				595	930	1265	1930	3005						
	H_H				1319	1613	1833	2509	2957	523	733	733	1100	1584	1584
	H_V				702	1098	1493	2278	2957	523	733	733	1100	1584	1584
	L				270	270	270	290	290	270	270	270	300	300	300
190 200 210	F_V				525	820	1100	1695	2615						
	H_H				1240	1613	1833	2509	2957	523	733	733		1584	1584
	H_V				620	968	1299	2001	2957	523	733	733		1584	1584
	L				300	300	300	320	320	300	300	300		330	330
220 230 240	F_V				470	730	975	1510	2335						
	H_H				1110	1613	1833	2509	2957		733	733		1584	1584
	H_V				555	862	1151	1783	2757		733	733		1584	1584
	L				330	330	330	350	350		330	330		360	360
250 260 270	F_V				420	660	875	1360	2100						
	H_H				992	1558	1833	2509	2957		733	733			1584
	H_V				496	779	1033	1606	2479		733	733			1584
	L				360	360	360	380	380		360	360			390
280 290 300	F_V					600	795	1240	1920						
	H_H					1417	1833	2509	2957			733			
	H_V					708	939	1464	2267			733			
	L					390	390	410	410			390			

② Concrete C12/15 is possible; req. pull-out resistance tests. ③ min $t_0 \geq 80$ mm; acc. to type test reports higher loads are possible if more bonding depth

④ according to procedure A, DIN 18516-3, 6.3.7.2. ⑤ according to procedure C, DIN 18516-3, 6.3.7.4.

HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Grout-in Anchors in Brickwork

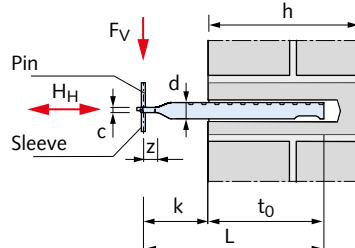
Anchoring substrate: Brickwork min. M 12/IIa

Notes on anchor selection

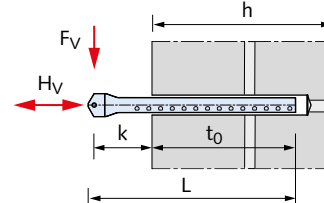
for pages 14 and 15:

1. Select cantilever size k
2. Select suitable vertical load F_V (for each anchor) from the column, taking H_H and H_V into consideration
3. Select anchor type and length L and enter as shown in the ordering example (→ page 13)

Anchoring in horizontal joints



Anchoring in vertical joints



Brickwork M 12/IIa		Support anchor								Restraint anchor		
Cantilever k [mm]	Anchor type	UMA 10	UMA 12	UMA 16	UMA 18	UMA 22	UMA 25	UMA 28	UMA 33	UHA 5	UHA 7	UHA 10
	Drill hole ϕ_i	$\phi 20$	$\phi 22$	$\phi 26$	$\phi 32$	$\phi 40$	$\phi 40$	$\phi 50$	$\phi 50$	$\phi 15$	$\phi 17$	$\phi 20$
	Bonding depth $\textcircled{1}$	$t_0 \geq 120$	$t_0 \geq 120$	$t_0 \geq 120$	$t_0 \geq 120$	$t_0 \geq 120$	$t_0 \geq 120$	$t_0 \geq 140$	$t_0 \geq 140$	$t_0 \geq 90$	$t_0 \geq 90$	$t_0 \geq 90$
	Component thickness	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$	$h \geq 240$
40 50 60	F_V	275	420	800	1380							
	H_H	649	992	1067	1067					1067		
	H_V	325	496	944	1067					1067		
	L	180	180	180	180					150		
70 80 90	F_V	215	325	620	1030							
	H_H	508	767	1067	1067					1067	1067	
	H_V	254	384	732	1067					1067	1067	
	L	210	210	210	210					180	180	
100 110 120	F_V	170	265	505	820	1330	1750	2720	4300			
	H_H	401	626	1067	1067	1067	1067	1067	1067	1067	1067	
	H_V	201	313	596	968	1067	1067	1067	1067	1067	1067	
	L	240	240	240	240	240	240	260	260	210	210	
130 140 150	F_V			425	690	1100	1465	2240	3540			
	H_H			1003	1067	1067	1067	1067	1067	1067	1067	1067
	H_V			502	815	1067	1067	1067	1067	1067	1067	1067
	L			270	270	270	270	290	290	240	240	240
160 170 180	F_V				595	930	1265	1930	3005			
	H_H				1067	1067	1067	1067	1067	1067	1067	1067
	H_V				702	1067	1067	1067	1067	1067	1067	1067
	L				300	300	300	320	320	270	270	270
190 200 210	F_V				525	820	1100	1695	2615			
	H_H				1067	1067	1067	1067	1067	880	1067	1067
	H_V				620	968	1067	1067	1067	880	1067	1067
	L				330	330	330	350	350	300	300	300
220 230 240	F_V				470	730	975	1510	2335			
	H_H				1067	1067	1067	1067	1067		1067	1067
	H_V				555	862	1067	1067	1067		1067	1067
	L				360	360	360	380	380		330	330
250 260 270	F_V							1360	2100			
	H_H							1067	1067		1067	1067
	H_V							1067	1067		1067	1067
	L							410	410		360	360
280 290 300	F_V							1240	1920			
	H_H							1067	1067			1067
	H_V							1067	1067			1067
	L							440	440			390

$\textcircled{1}$ min $t_0 \geq 80$ mm; acc. to type test reports higher loads are possible if more bonding depth

$\textcircled{2}$ The maximal horizontal load must always be verified through tests in accordance with section 8 of DIN18516-3.
According to DIN18516-3, 6.3.6, for static verification of a single anchor a maximum of $H = 1067$ N ($F_{rk} = 4.0$ kN) can be assumed.

HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Support Structure Systems

Advantages of the HALFEN Support structure systems

The standard HALFEN Support structure system consists of a series of vertical channels between floors. Fixings are only required at comparatively large intervals. This reduces the number of required connections to the underlying main support structure.

The Advantages

- the building's weatherproofing and insulation is penetrated less
- the number of thermal bridges is reduced. This helps to observe the applicable energy-saving regulations. In Germany: EnEV = German Energy-Saving Regulations

HALFEN Support structures are also suitable for spanning non-load-bearing constructions.

Furthermore, using pre-install support construction systems permit fast and economical fixing of façade panels and slabs.

Two main categories of support structures for different requirements are available from HALFEN:

- HALFEN SUK Stainless steel support structures
- HALFEN UKB Aluminium support structures

The **HALFEN SUK** stainless steel support structure is suitable for durable constructions in harsh environments and for high loads.

The **HALFEN UKB System** channel support structure is very easy to install and a cost effective alternative.

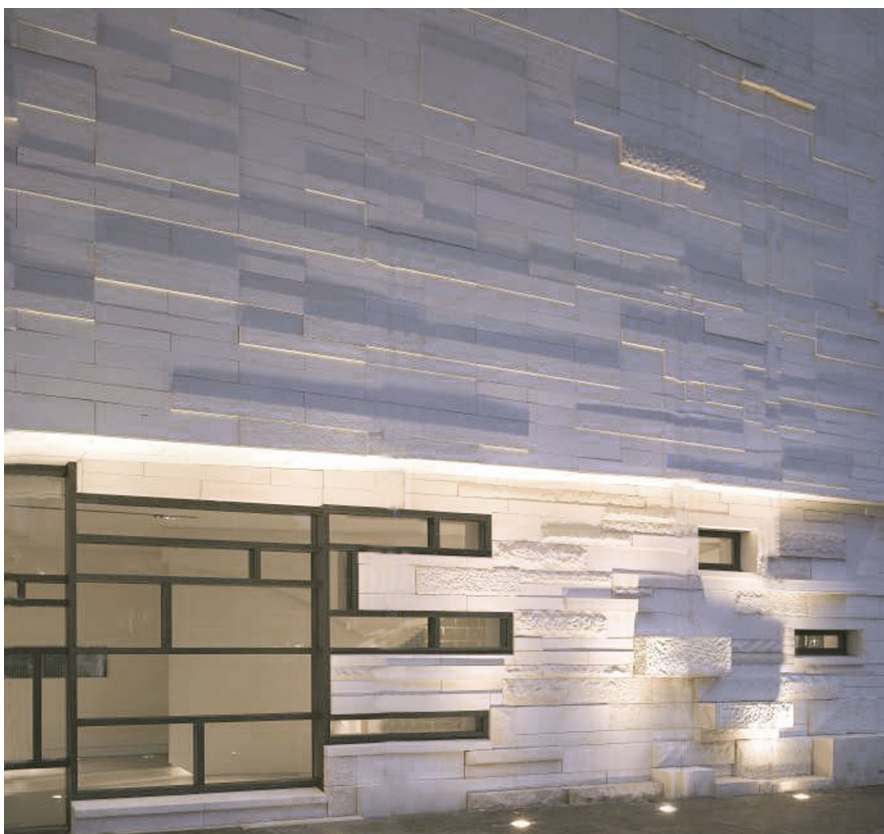


For detailed information about HALFEN Support structure systems please contact us.

→ see page 28 for contact information or just scan the code.



Applications



mima – Middlesbrough Institute of Modern Art/England

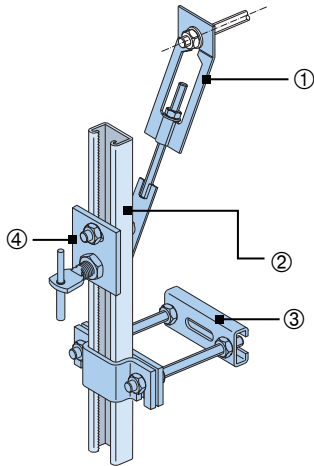


HALFEN SUK Channel support structure

HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN SUK Stainless Steel Support Structure

Support Structure System SUK



- ① Façade anchor fixed with bolt
- ② Channel
- ③ Compression-tension brace
- ④ SUK-TSG Design 1 including installation parts

The HALFEN SUK System is an adjustable suspended channel system with support and restraint anchors that can easily be adjusted to any height for façade stand-off installations > 160 mm.

It is ideal for new constructions and remodelling projects. The system is especially suited for natural stone façades with large and varying distances to the load-bearing wall.

The system is made up of a small number of easy to install components and is therefore increases ease of installation. Non-load-bearing areas and recesses can be spanned.

The necessity for fewer anchor points allows quick installation of the stainless steel support structure and therefore faster façade element installation.

Material:

Stainless steel A4

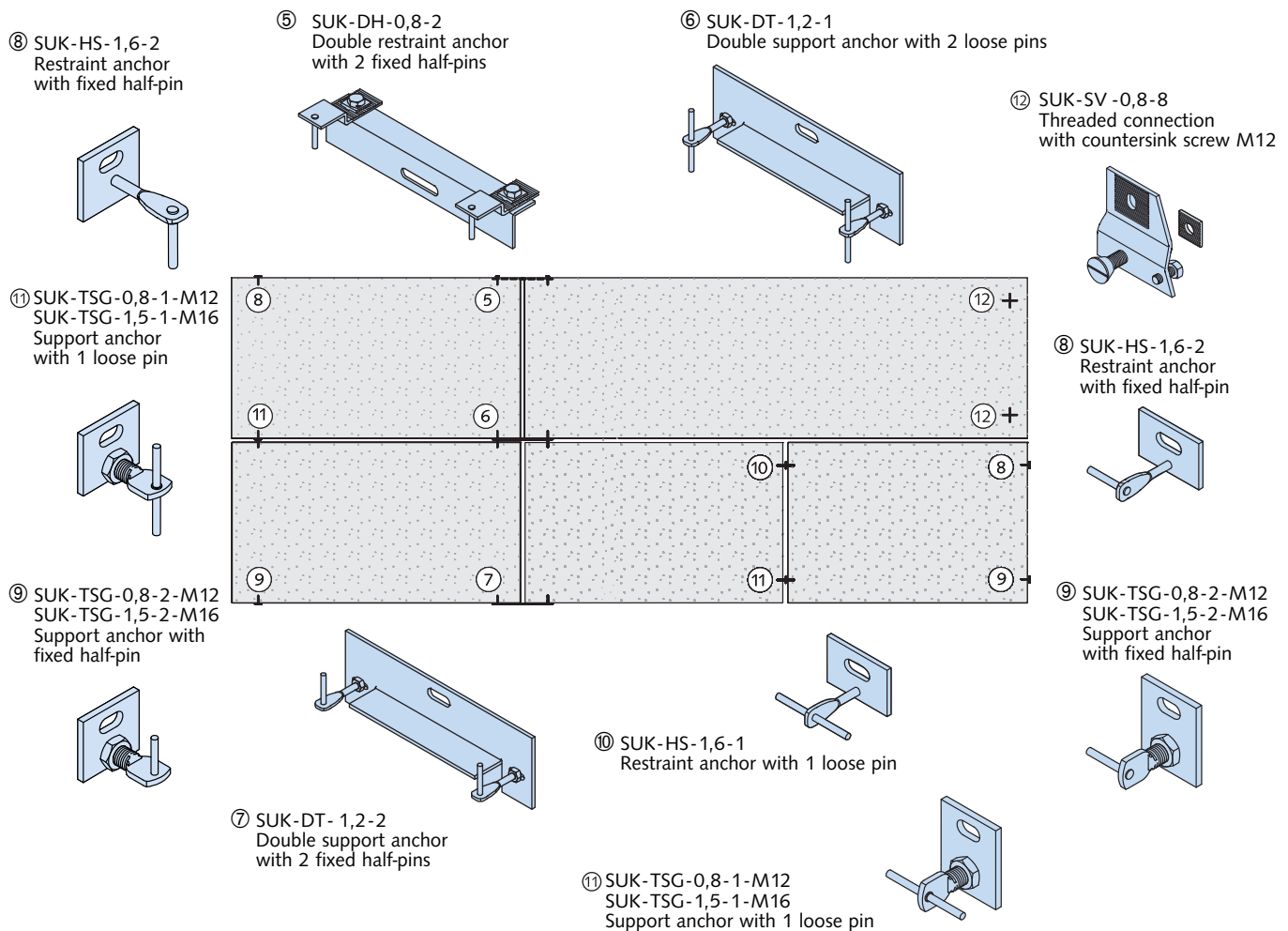
Material specifications → page 2



Please contact our technical office for planning and ordering services.

→ see page 28 for contact information.

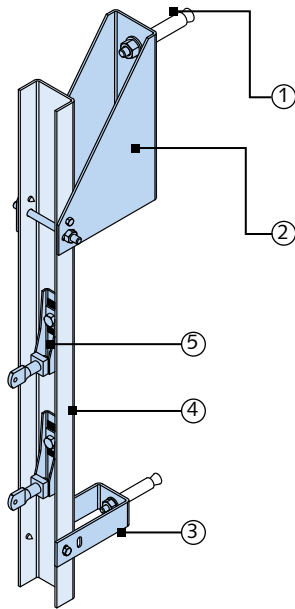
SUK types and their applications



HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN UKB Aluminium Support Structure

Support structure with body anchors, system UKB



- ① Fastening with bolts
- ② Support bracket
- ③ Compression/tension brace
- ④ Vertical aluminium channel
- ⑤ HALFEN BA Body anchor, type 606

The HALFEN UKB System is a freely adjustable aluminium and stainless steel support structure with vertical U-profiled support elements for use in the ventilation gap of natural stone façades. This type of construction reduces thermal bridges to a minimum.

The type 606 HALFEN BA Body anchors are fixed to the front of the vertical channels.

The UKB Support structure allows for **stand-off installation between 130 and 320 mm** and three-dimensional adjustments of ± 20 mm.

The **support brackets** are made of stainless steel A4.

They are either fastened to HALFEN Cast-in channels or to the load-bearing main structure using HALFEN Anchor bolts. Depending on environmental conditions, protection against surface corrosion must be taken into account, for example with barrier tape.

Material:

Aluminium (EN-A W6060)

stainless steel A4

material specifications → page 2



For smaller stand-off sizes and exact details please contact us.

→ see page 28 for contact information.



Police station in Eberswalde, Germany

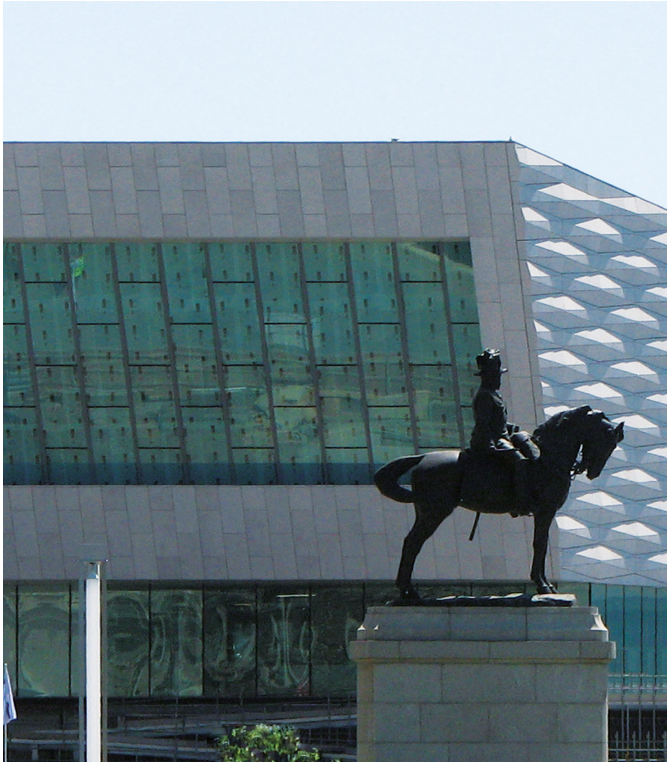


HALFEN UKB Channel support structure

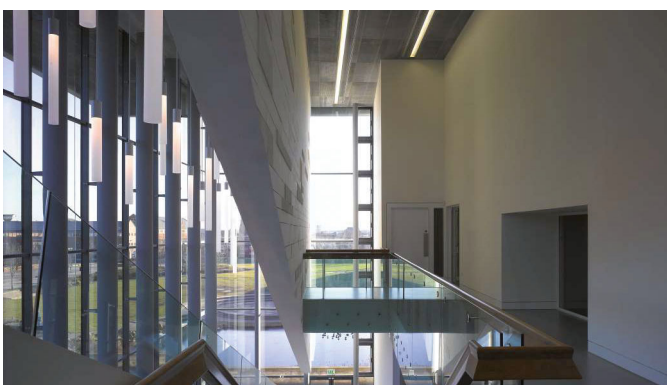
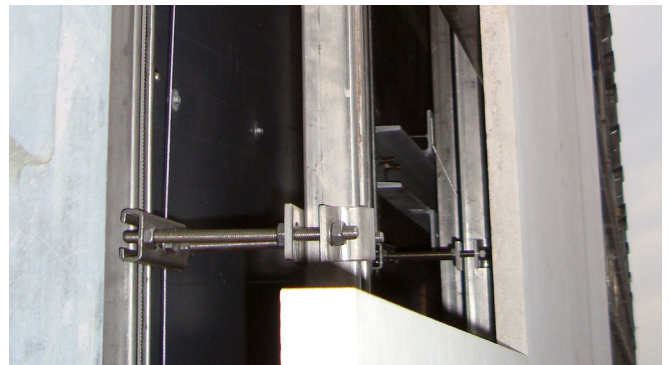
HALFEN NATURAL STONE SUPPORT SYSTEMS

HALFEN Support structure

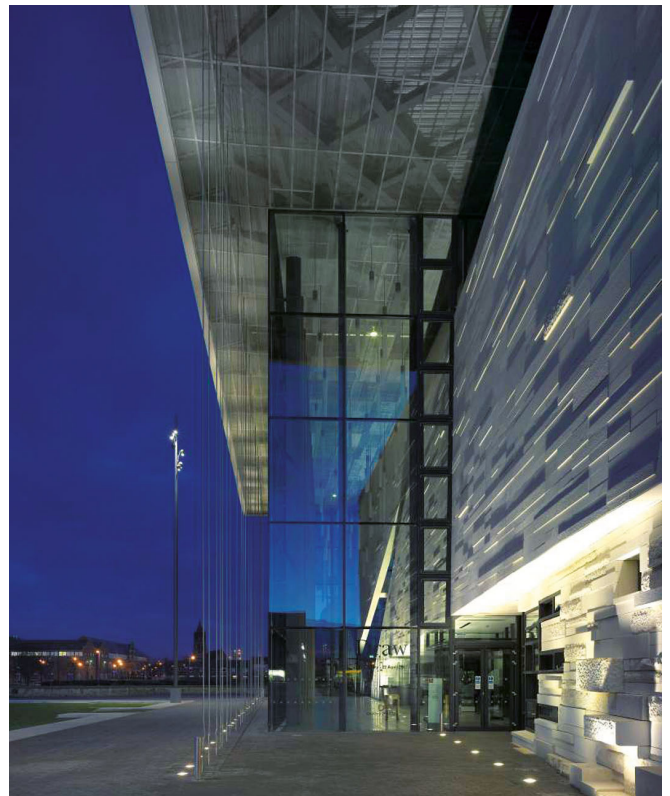
References



Museum of Liverpool/England



mima – Middlesbrough Institute of Modern Art/England



HALFEN NATURAL STONE SUPPORT SYSTEMS

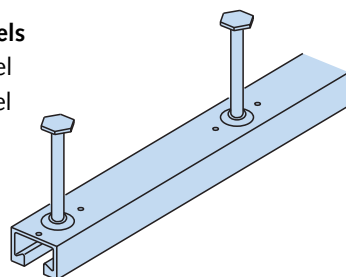
HALFEN Fixing Material

Body anchor fixing with HALFEN Cast-in channels and HALFEN T-head bolts

HALFEN HTA-CE Cast-in channels

HTA-CE 28/15-A4 stainless steel

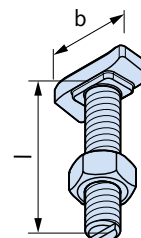
HTA-CE 38/17-A4 stainless steel



HALFEN T-head bolts for HTA-CE

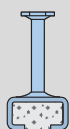
HS 28/15

HS 38/17

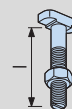


Body anchor fixing with HALFEN Cast-in channels

HALFEN HTA-CE Cast-in channel



with HALFEN HS T-head bolt
including
hexagonal nut



		Designation	Thread		l [mm]		b [mm]
HTA-CE 28/15	- A4	HS 28/15 -	M8	×	30	- A4	20
			M10				
HTA-CE 38/17	- A4	HS 38/17 -	M10	×	30	- A4	29
			M12				

Fixing the body anchors with HALFEN HB-B Wedge anchor



HALFEN HB-B Wedge anchor for non-cracked concrete

HALFEN Wedge anchor	Order no.	suitable for body anchor type
HB-B- 8-10-19/ 75-A4	0432.060-00024	- BA 606 to BA 1312 - SOF 805 to SOF 819
HB-B- 8-30-39/ 95-A4	0432.060-00007	- DT 414 to DT 430 - DH 1006 to DH 1732
HB-B-10-30-36/105-A4	0432.060-00029	- DT 1314 to DT 1318
HB-B-12-50-65/145-A4	0432.060-00016	- DT 1320 to DT 1330

Fixing the HALFEN Body anchors with HALFEN HB-BZ Wedge anchor



HALFEN HB-BZ Wedge anchor for cracked concrete

HALFEN Wedge anchor	Order no.	suitable for body anchor type
HB-BZ- 8-10-21/ 75-A4	0432.040-00027	- BA 606 to BA 1312 - SOF 805 to SOF 819
HB-BZ- 8-50-61/115-A4	0432.040-00028	- DT 414 to DT 430 - DH 1006 to DH 1732
HB-BZ-10-50-70/130-A4	0432.040-00030	- DT 1314 to DT 1318
HB-BZ-12-50-70/145-A4	0432.040-00032	- DT 1320 to DT 1330

HALFEN NATURAL STONE SUPPORT SYSTEMS

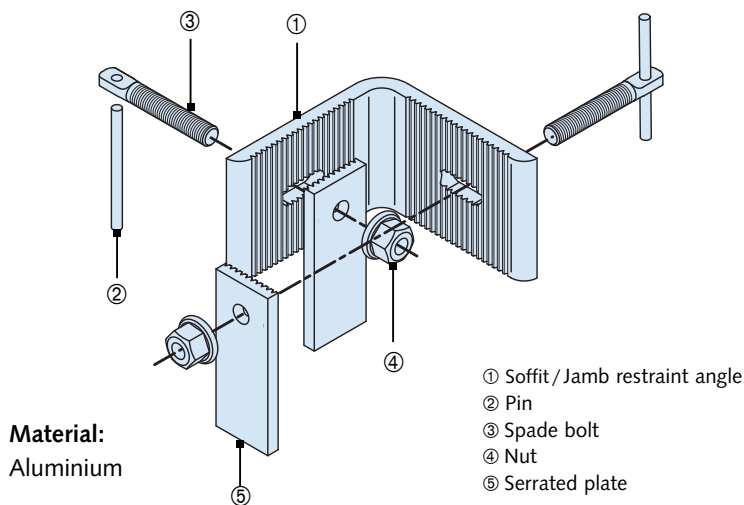
Fixing Material for Natural Stone

HALFEN LW-ALU Soffit angles

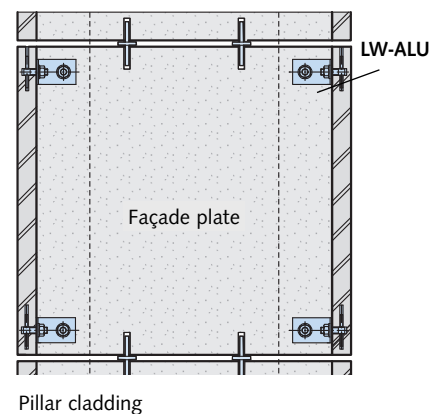
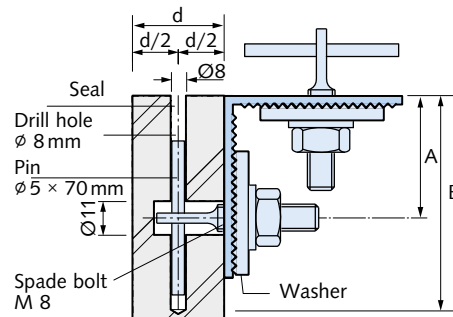
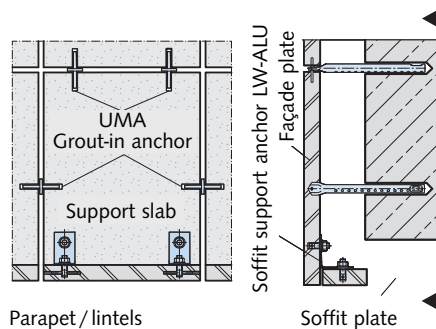
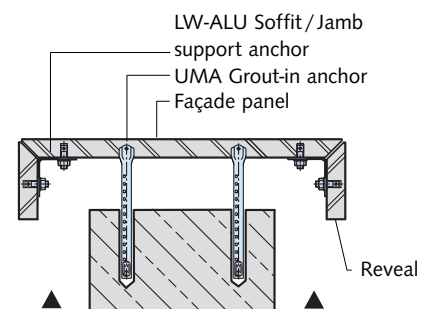
The soffit/jamb brackets and restraint angles significantly improve the connection between façade and soffit/jamb elements, especially when using natural stone.

The non DIN compliant pin and glue process can be omitted. The façade slabs can be installed quickly, simply and efficiently in the precast factory or on site.

The support anchors are adjustable (up to ± 5 mm); façade, soffit and jamb panels can also be installed with open joints. To prevent stresses the panels are fixed with support brackets and restraint anchors.



i Soffit /jamb support anchors are available in stainless steel on request.



HALFEN LW Jamb / recess bracket: dimensions

HALFEN LW -ALU Jamb / recess bracket	Side length [mm]	Angle height [mm]	Dimension A	Dimension B
LW- 60/40-ALU	60	40	35	80
LW- 60/60-ALU	60	60	35	80
LW- 80/40-ALU	80	40	50	90
LW- 80/60 ALU	80	60	50	90
LW- 90/40-ALU	90	40	50	90
LW- 90/60 ALU	90	60	50	90
LW-100/40-ALU	100	40	50	90
LW-100/60-ALU	100	60	50	90

i Further details

Please contact our technical team for inquiries concerning specific detailing.
Contact information: see page 28.

HALFEN NATURAL STONE SUPPORT SYSTEMS

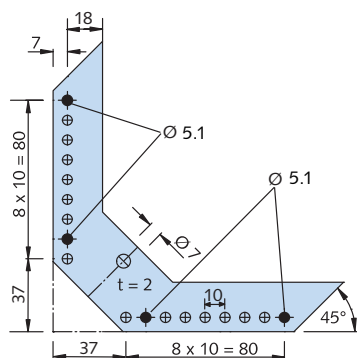
Natural Stone Anchor Accessories

HALFEN LW Soffit angles and LW-J Adjustable soffit angles

Dimensions

LW -1/-2 and

LW J-1/J-2, adjustable



Material:

Stainless steel A4

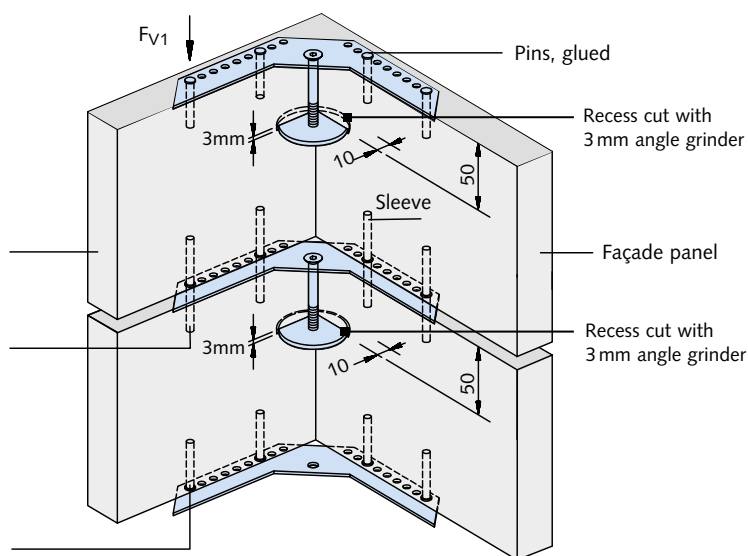
Material specifications → page 2

LW-J2

LW-J1

LW-2

Pins, glued



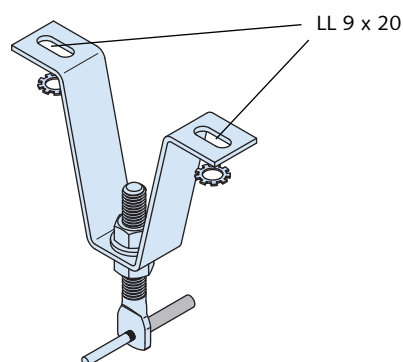
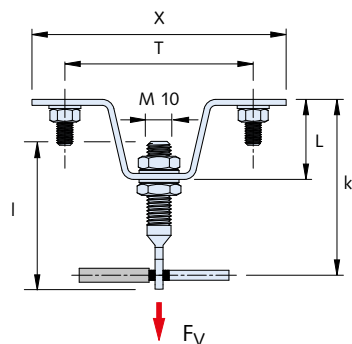
HALFEN SOF Soffit anchor

HALFEN SOF Soffit anchors are intended for suspending natural stone slabs and panels.

Maximum loading $F_V = 800\text{N}$

Dimensions

HALFEN SOF Soffit anchor



SOF Soffit anchor

Type	Stand-off distance			Body			Spade bolt M10
	k [mm]	min k [mm]	max k [mm]	X [mm]	T [mm]	L [mm]	
SOF 805	50	48	53	115	82	15	55
SOF 806	60	50	63	120	87	25	55
SOF 807	70	65	80	120	87	25	72
SOF 808	80	65	95	127	94	40	72
SOF 810	100	85	115	136	105	60	72
SOF 813	130	115	145	150	117	90	72
SOF 816	160	145	175	164	131	120	72
SOF 819	190	175	205	178	141	150	72

Material:

Stainless steel A4

Material specifications → page 2

HALFEN NATURAL STONE SUPPORT SYSTEMS

Natural Stone Anchor Accessories

HALFEN Scaffolding anchors

Scaffolding used in the construction industry must be planned in accordance with DIN EN 12810 and DIN EN 12811. These standards include type specific requirements for initial scaffolding for building and also for façade installations and maintenance work. To connect to the supporting structure of the buildings, scaffolding anchors are used which must be technically capable of securing the scaffolding reliably through the thickness of the façade. This is the only safe method to install the insulation and façade elements for the building from the scaffolding.

The position, fixing method and load-bearing capacity of the scaffold anchors must be taken into account when planning the façade and included in the building's documentation. The choice of anchors depends on the type of scaffolding selected, the anchor grid

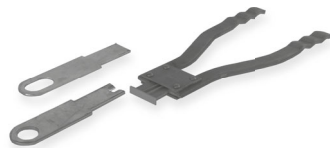
of the scaffolding and the distribution of the joints in the façade.

HALFEN manufactures the scaffold anchors and also specifies the maximum working loads for each anchor both vertically and horizontally to the façade to ensure the required reliability in planning and application.

Loads from the scaffold are transferred to the HALFEN Scaffold anchors using reusable straps or ringbolts. HALFEN Scaffold anchors remain in the building after dismantling the scaffold and are concealed so not to disrupt the façade appearance. This ensures that a scaffold can be re-erected later without

additional anchoring measures.

To meet the ever-increasing demands on thermal insulation HALFEN HGA-F Scaffold anchors can be installed with a thermal separation strip between the building and the anchor. The thermal separation strips reduce the heat loss caused by the scaffold anchors and improves the heat transmission efficiency of the building.

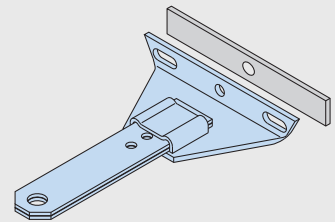


HALFEN GE-HB
Scaffolding
anchors

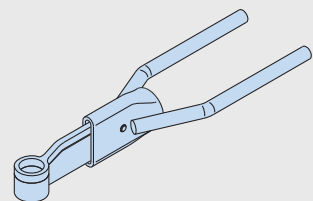


Pipe scaffold system

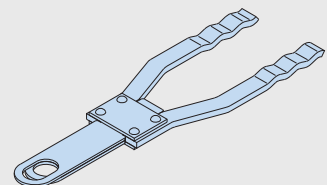
HALFEN Scaffold anchors for natural stone façades



HALFEN HGA-F
Scaffold anchor



HALFEN GE-VB
Scaffold anchor

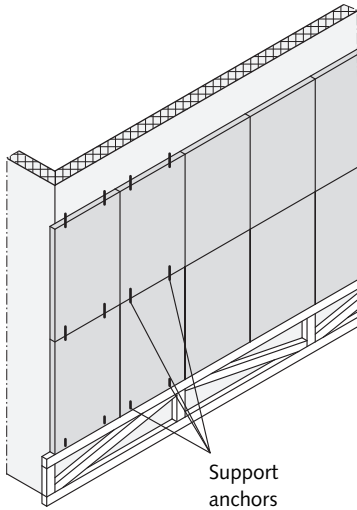


HALFEN GE-HB
Scaffold anchor

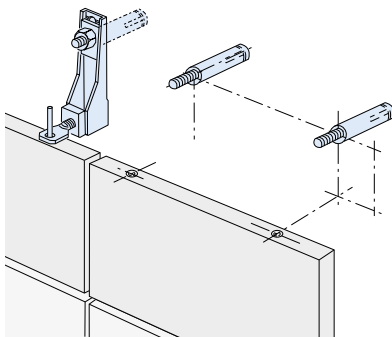
HALFEN NATURAL STONE SUPPORT SYSTEMS

Installation Sequence

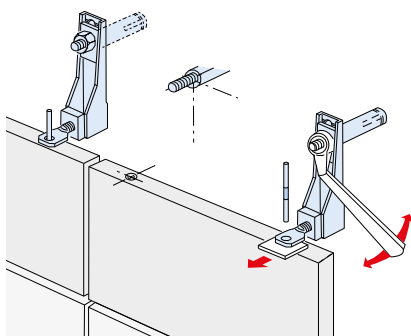
Anchoring in horizontal joints



Façade view



Placing the dowels



Installation of the body anchors

Installation direction:

from **left** → **right** or
from **right** → **left**
always from **bottom** → **top**

- ▶ Ensure the façade is measured correctly and tolerances have been considered.
- ▶ Erect any required scaffolding.
- ▶ Cut and remove a section of the thermal insulation to drill the hole for the anchor bolt. The insulation is replaced after anchor installation.
- ▶ Drill the dowel holes for the first and second row of slabs, ensure correct hole diameter and minimum drill hole depth.
- ▶ Remove all dust from the hole.
- ▶ Fix and align the lower row of body anchors (support anchors) with approved anchor bolts i.e. HALFEN HB-BZ.

Note: Always use the supplied washer when using HALFEN Bolts or HALFEN Dowels to attach the HALFEN DH Body anchor to the main load bearing structure.

- ▶ Replace the previously removed thermal insulation.
- ▶ Fill the pin holes above the anchor with mortar.
- ▶ Place the first row of slabs onto the support anchors.
- ▶ Fix and align the support anchors for the second row of slabs with approved anchor bolts i.e. HALFEN HB-BZ.
- ▶ Make any fine adjustments to the first row of slabs: allow at least a 2 mm gap between the top edge of the lower row of façade slabs and the bottom edge of the arm of the support anchor for the second slab row (see detail).
- ▶ Push the anchor pin through the hole in the spade bolt and into the sleeve in the slab below.
- ▶ Dimensions acc. to the detail "Pin, fixing hole and joint dimensions [mm]" (see right) must be observed!
- ▶ The second row of slabs is then installed and the procedure repeated.

Note:

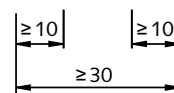
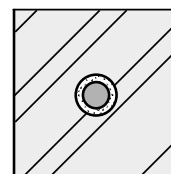
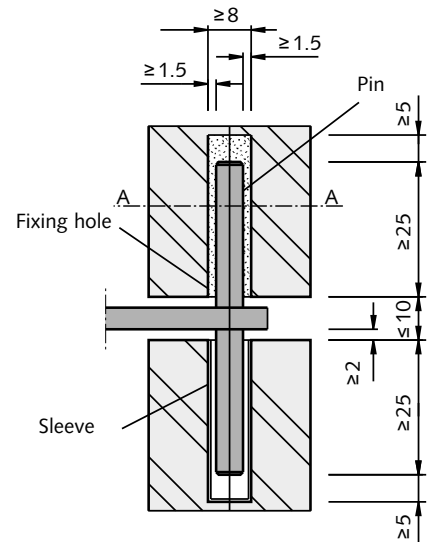
Natural stone slabs are generally fixed at four points. Thermal insulation should be cut out before drilling the fixing holes.

Important:

Tighten all countersink screws and anchor bolts using a torque wrench adjusted to the correct torque!

Detail

Pin, fixing hole and joint dimensions [mm]

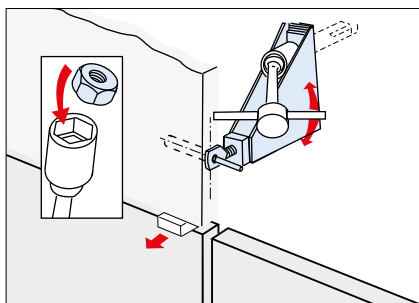
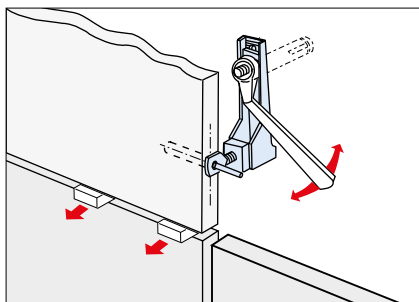
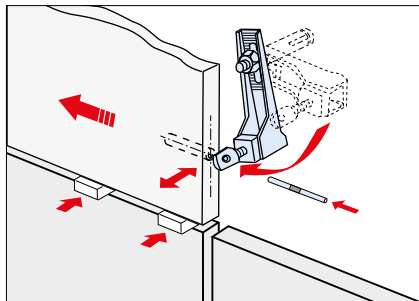
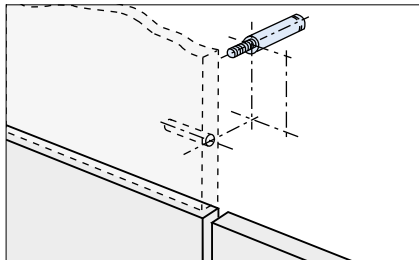
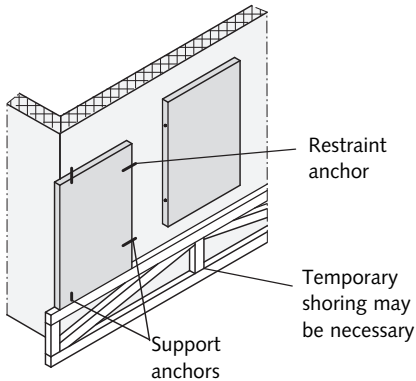


Section A-A

HALFEN NATURAL STONE SUPPORT SYSTEMS

Installation Sequence

Anchoring in vertical joints



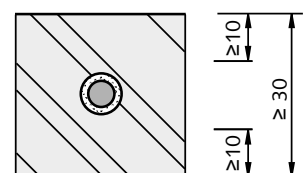
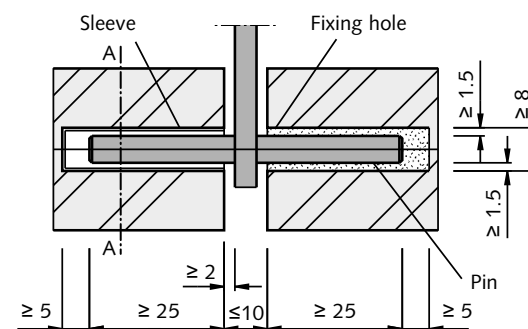
Installation starts from building edge,
left to right or right to left

Example installation direction:
from **left** → **right**
always from **bottom** → **top**

- ▶ Ensure the façade is correctly measured and tolerances have been considered.
 - ▶ Erect any required scaffolding.
 - ▶ Cut and remove a section of the thermal insulation to drill the hole for the anchor bolt. The insulation is replaced after anchor installation.
 - ▶ Drill the dowel holes for the support and restraint anchors; ensure correct minimum drill hole depth and diameter.
 - ▶ Remove all dust from the hole.
 - ▶ Fix and align the body anchors (support and restraint anchors) with approved anchor bolts i.e. HALFEN HB-BZ.
- Note:** Always use the supplied washer when using HALFEN Bolts or HALFEN Dowels to attach the HALFEN DH Body anchor to the main load bearing structure.
- ▶ Replace the previously removed thermal insulation.
 - ▶ Place the natural stone slab on the first support anchor and place a wedge under the right edge.
 - ▶ Fix support and restraint anchor for the first vertical joint with approved anchor bolts i.e. HALFEN HB-BZ, and make any fine adjustments.
 - ▶ Push the anchor pins through the holes in the spade bolts.
 - ▶ Fill the lower fixing holes (support anchor) of the second natural stone slab

Detail:

Pin, fixing hole and joint dimensions [mm]

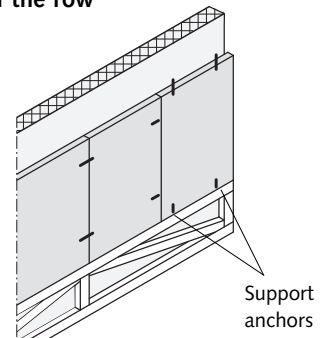


Section A-A

with mortar.

- ▶ Push the second natural stone slab against the first slab.
- ▶ Dimensions acc. to the detail below "Pin, fixing hole and joint dimensions [mm]" must be observed!
- ▶ Fix the support and the restraint anchors for the second vertical joint; then finely adjust the slab; repeat the procedure for the next anchors.

Installation of the last natural stone slab of the row



- ▶ Anchor the penultimate slab using single-head pins inserted in the right hand vertical panel edge.
- ▶ The last panel at the right-hand edge of the building is installed on two support anchors in the horizontal joint.



Important:

Tighten all countersink screws and anchor bolts with the correct torque!

HALFEN NATURAL STONE SUPPORT SYSTEMS

Design Fundamentals

Construction details from DIN 18 516, section 3

Anchor pins

The anchor pins extend into the holes drilled for the pins in the edges of the slabs. The holes are approximately 3 mm larger than the diameter of the pins.

Anchor material

Anchors and pins must be of stainless steel corrosion resistant class III material, according to EN 1993-1-4: 2015. For detailed steel material specifications see page 2.

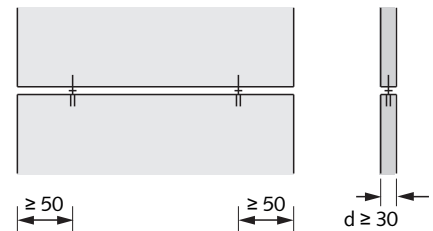
Edge distances

The standard distance from the corner of the panel to the centre of the hole is 50 mm.

The thickness of the panel from the hole to the panel face must not be less than 10 mm (see section A-A on page 24).
Minimal thickness of panel ≥ 30 mm.

Concrete anchoring substrate

Where the load-bearing structures are heavily reinforced and highly stressed, for example reinforced concrete columns or lintels, the type and location of the anchors should be specified in cooperation with the structural engineer.
Anchors connected to HALFEN Cast-in channels must be installed in accordance with the approval for HALFEN HTA Channels.



Note

For further details refer to DIN 18 516, section 3 and our installation instructions.



Design and calculation

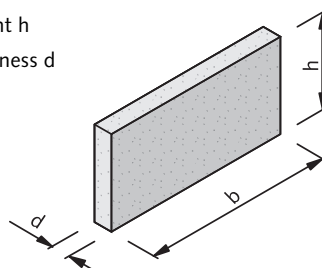
The planning of natural stone anchor fixings is based on the details shown in figures a) to e). This allows fast and accurate installation to ensure cost effective fixing of natural stone panels.

a) Weights of natural stone panels

Material	g [kN/m³]
Ceramic, volcanic stone	20
Limestone compositions, Travertine	24
Sandstone, ophiolite, greywacke	26
Limestone, dolomite, shell marl, marble	27
Granite, porphyry, syenite, slate	28
Basalt, diorite, gabbro, gneiss	30

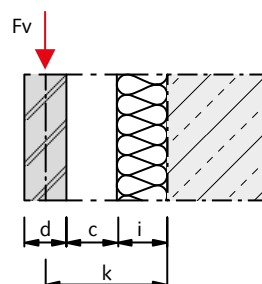
b) Dimensions of natural stone

width b
height h
thickness d

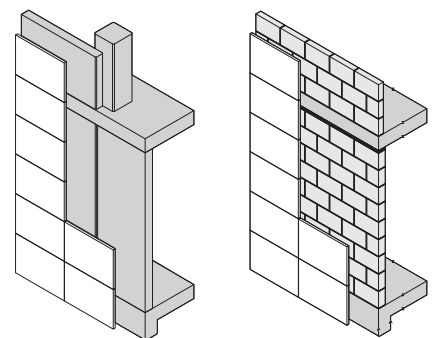


c) Wall section

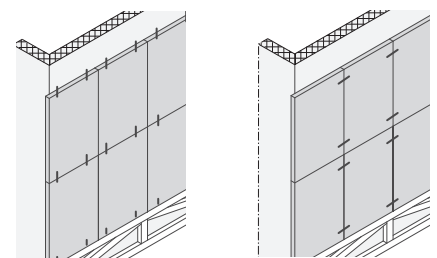
d = thickness of natural stone panels
c = size of ventilation gap
i = thickness of thermal insulation
k = stand-off installation distance of natural stone anchor



d) Anchoring in concrete or masonry structures



e) Installation of natural stone anchors in vertical or horizontal joints



Calculating the panel weight:

Panel weight:

$$F_V = b \text{ [m]} \times h \text{ [m]} \times d \text{ [m]} \times g \text{ [kN/m}^3\text{]}$$

HALFEN NATURAL STONE SUPPORT SYSTEMS

Tender Specifications / Examples

HALFEN Grout-in anchor type UMA 16

HALFEN UMA Grout-in anchor,
support anchor for connecting façade elements made of natural stone or concrete
for grouting into concrete \geq C12/15 or masonry M12/IIa.
For use in horizontal or vertical joints in façades,
type tested,
with TÜV/LGA certification of quality,

Type UMA 16-D-L-A4

with

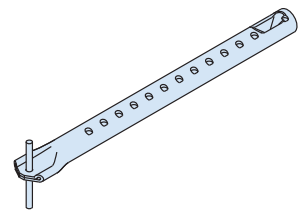
16 = anchor diameter 16 mm,

D = design alternative

(1 = 1 with loose pin and sliding sleeve, 2 = with press-fit half-pin)

L = anchor length (120 / 150 / 180 / 210 / 240 / 270 mm)

A4 = stainless steel, corrosion resistance class (CRC) III
acc. to EN 1993-1-4: 2015-10, Table A.3



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

number of items required item price total

HALFEN Body anchor type BA 1308

HALFEN BA Body anchor,
support anchor for connecting façade elements made of natural stone or concrete
to HALFEN Cast-in channels
or to approved HALFEN Dowels (both ordered separately),
for use in horizontal or vertical joints in façades,
with TÜV/LGA certification of quality,

Type BA 1308-D-A4

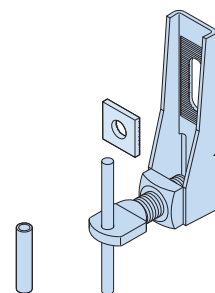
with

1308 = permitted load $F_V = 1300\text{ N}$, with a stand-off installation $k = 80\text{ mm}$

D = design alternative

(1 = with loose pin and sliding sleeve, 2 = with press-fit half-pin)

A4 = stainless steel, corrosion resistance class (CRC) III
acc. to EN 1993-1-4: 2015-10, Table A.3



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

number of items required item price total



Tender specifications on the Internet

Further tender specifications can be found at [www.halfen.de/Service/Tender texts](http://www.halfen.de/Service/Tender%20texts).
Or just scan the QR code. Tender texts are only available in German.

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