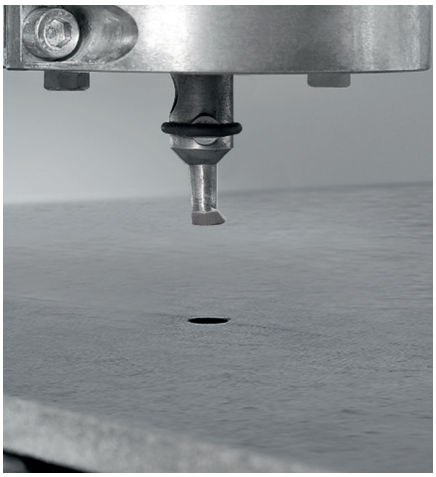
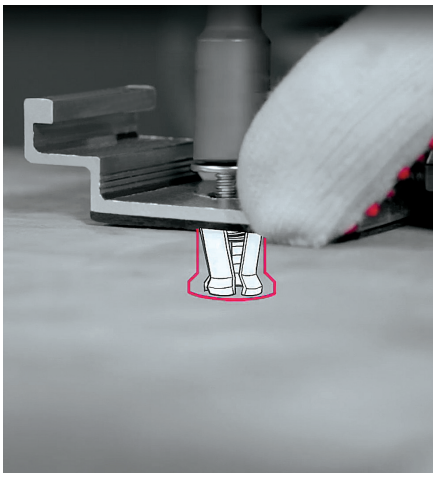
FIXING

BY UNDERCUT TECHNIQUE





www.keil-fixing.de/en

Quality forms the basis of our work

The corporate structure of our family-run company, based in the area of Bergisches Land, is medium-sized, which gives us a partner-like flexibility and reliability. This service is supported by our professional knowledge and our continuous and close cooperation with specialized institutions and universities. Fixing professionals can rely on the high quality of KEIL's products. We offer you reliable solutions for attachments in ventilated rainscreens.

Our fifty years experience in drilling and fixing enables us to be your competent partner. Our field service and our technicians will be pleased to give comprehensive and professional advice on your specific fixing issue.

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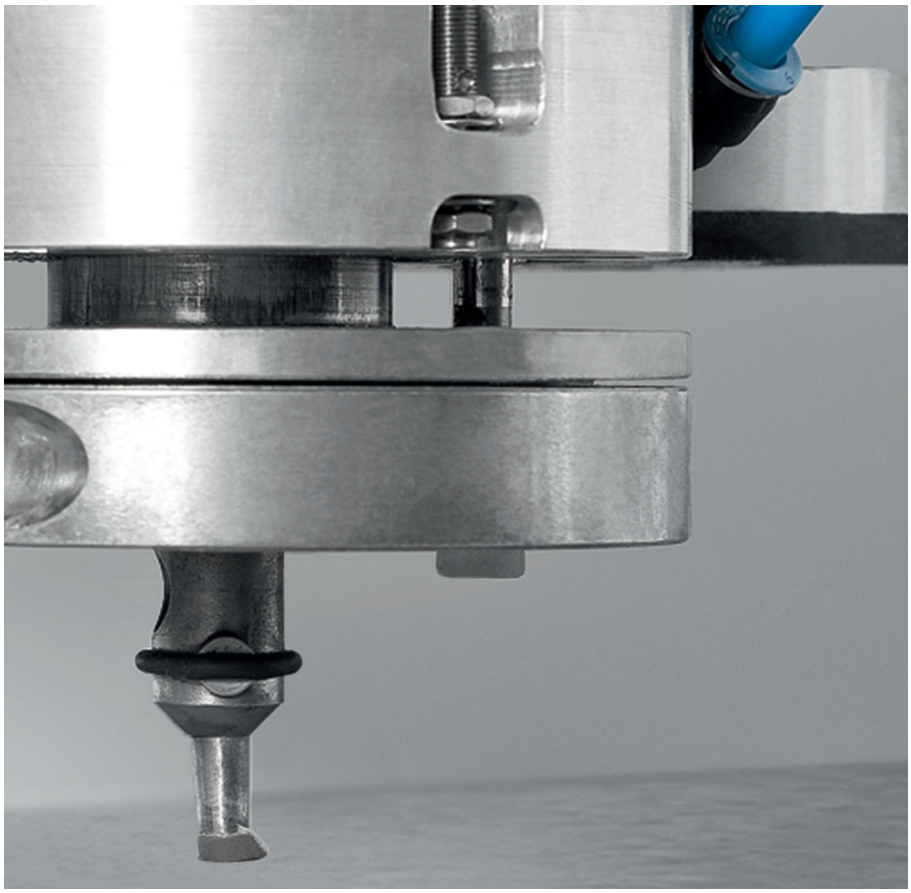
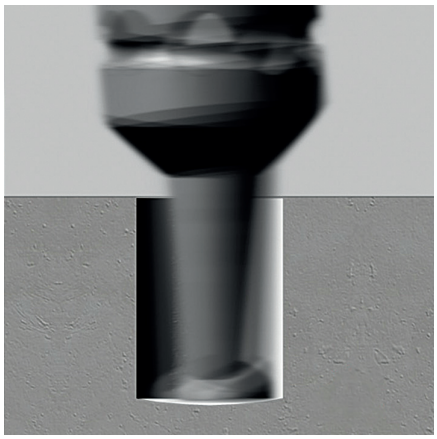
UNDERCUT – AN OVERVIEW

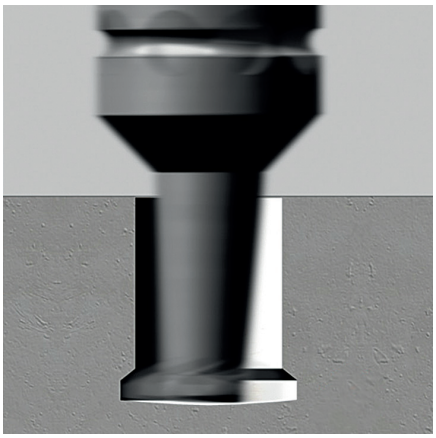
SSC - University of Cologne, Cologne, DE © KEIL

High-quality façade panels transform dreary buildings into fascinating objects. Architects will face creative design possibilities. The underlying secret is the invisible attachment by an elaborate fixing device called undercut technique.





Drilling

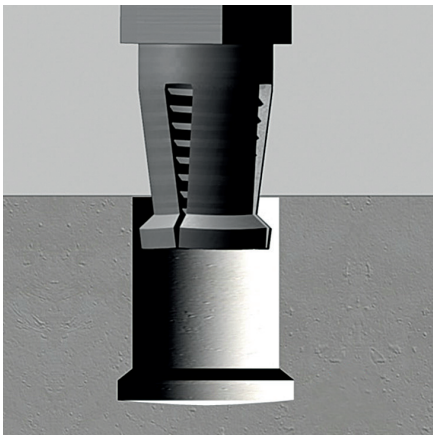


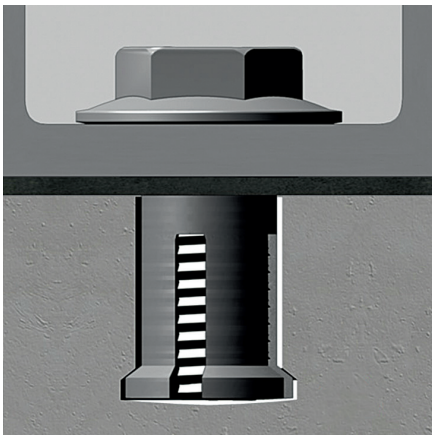
Undercutting

- Cylindrical drilling and conical undercutting are carried out in one single process and by only one tool.
- Different levels of automation are possible, depending on the type of machinery and the material of the panel.
- Drilling time for ceramics is less than 10 seconds.
- Panels of any desired size and weight will get a patented undercut in a precise and consistent symmetric shape.

SSC - University of Cologne, Cologne, DE © KEIL

The undercut technique is as simple as it is ingenious. By means of a patented drilling system a blind hole with an expanded base is drilled into the backside of the façade panel. Subsequently, the KEIL undercut façade anchor is inserted into the hole. This anchor guarantees a positive-locking attachment, which is free of expansion force. As soon as the panel is equipped with brackets, it can be mounted directly on to the substructure.





Assembly

- For the assembly, an undercut anchor is inserted into the hole and locked positively by a screw.
- The assembly is fast, safe and simple.

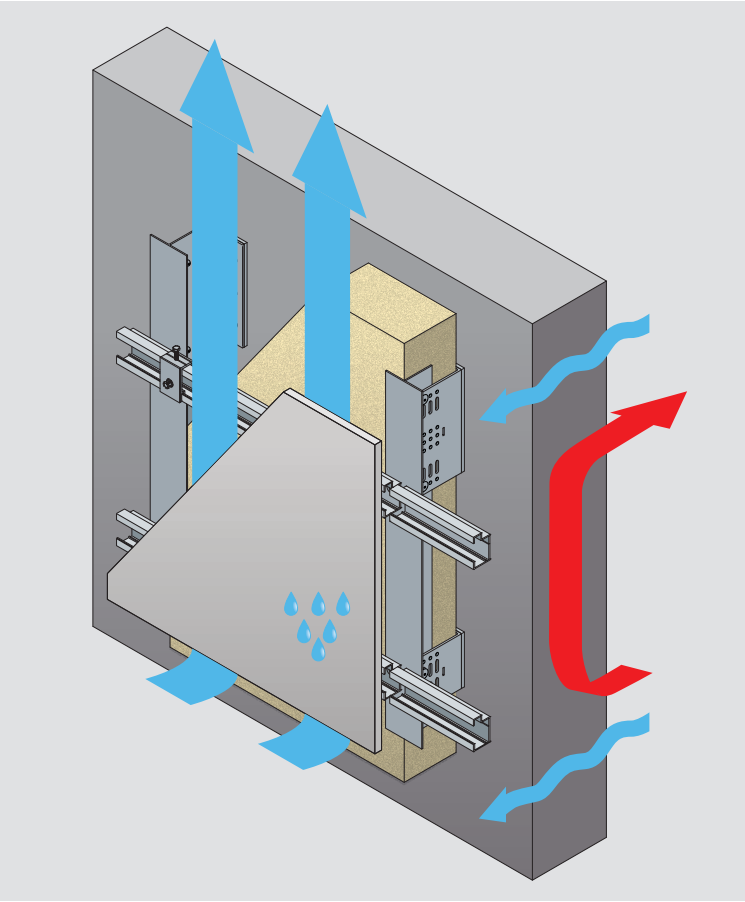
Insertion depths

h_s = 4,0 mm | h_s = 5,5 mm | h_s = 7,0 mm | h_s = 8,5 mm | h_s = 10,0 mm | h_s = 11,5 mm | h_s = 13,0 mm | h_s = 15 mm

VHF – VENTILATED RAINSCREENS

Antel Tower, Montevideo, UY © Ricardo Almeida

Due to their enormous freedom of design, – e.g. concerning colour, material surface – ventilated rainscreens (VHF) offer a special identity for buildings and their inhabitants. They can be easily planned and sustainably incorporated into the overall concept of the assessment of the life cycle.



Ventilated rainscreens

For a ventilated rainscreen, the cladding will not be applied directly onto the masonry, but mounted onto a substructure. Thus, insulation (moisture, thermal, sound and fire protecions) and weather protection are constructionally seperated. This method creates a ventilation space between the components, which regulates the moisture balance within the building structure.

Today's ventilated rainscreens are amongst the most successful façade systems. Current studies of the façade market verify that, besides its functional safety, architects most highly appreciate the creative possibilities of a ventilated rainscreen.

The system of the ventilated rainscreen allows for a choice of the most different claddings. Therefore, the design of the façade can be individually matched to the characteristics of a building. Even combinations of different materials can be easily implemented – by the use of different cladding materials.

VHF – ADVANTAGES

Longevity and efficiency

Due to their long lifetime and the low maintenance and repair costs, ventilated rainscreens prove a very efficient and sustainable investment. Furthermore, the constructional seperation of the functions of thermal and weather protection makes it less damage prone than other façade systems.

Design variety and building culture

A wide range of materials is available for the cladding of a ventilated rainscreen. Durability, light fastness and frost-resistance of these materials are the basic requirements for the increasingly demanded longevity of the façade. Proven materials are ceramics, porcelain stoneware, natural stone, HPL and fibre-enforced resin composite panels, fibre cement panels etc..

Safety

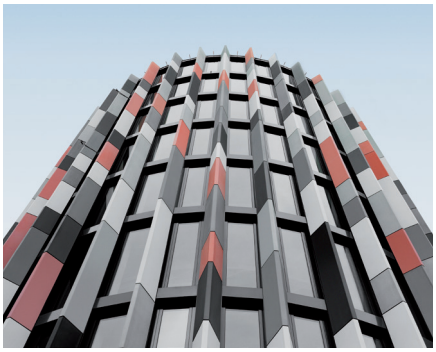
The substructure is the statical connection between the exterior bearing wall and the façade cladding. Substructures are three-dimensionally adjustable and lie tension-free around the building structure. Uneven surfaces and wall projections can be counterbalanced and special requirements concerning fire protection, sound insulation or lightning protection can be implemented without any problems and in a creatively appealing way.

Climate control

Within the system of the ventilated rainscreen, the components of insulation (thermal insulation, cold insulation and fire protection) and cladding (weather protection) are constructionally seperated. The use of mineral insulation materials with heat conductivity groups 035 or 032 is a frequent practice with ventilated rainscreens on buildings of any height or use. The requirements of the current energy saving regulations are fulfilled, as the system allows for the incorporation of any required insulaton. The ventilation space between the components regulates the moisture balance within the building structure. Building moisture and moisture due to occupancy are discharged reliably through this ventilation space. Moist external walls will desiccate within a short period of time, permanently ensuring the optimum indoor climate.

Whitehall Station - South Ferry, New York, US © KEIL

Nike Store, Miami Fl, US © Michael Wells


Main Point Karlin, Prague, CZ, Ditz Fejer © Rieder Group

FVHF®
WIR SIND MITGLIED
Fachverband Baustoffe und Bauteile für vorgehängte hinterlüftete Fassaden e.V. (FVHF)

The FVHF is the lobby of the manufacturers of claddings, substructures and thermal insulation materials as well as anchoring, connecting and fixing elements for ventilated rainscreens (VHF).

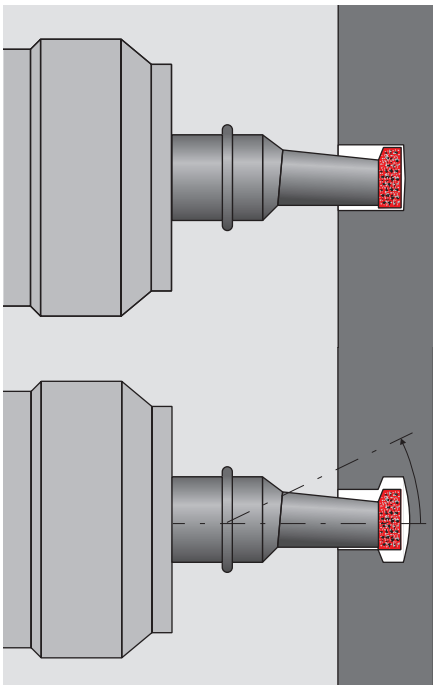
Maison Cannes, Cannes, FR © Mathieu Ducros, Material: HI-MACS® - Design: Pierre Guidoni, Jean Rogliano - Fabrication: Menuiserie Bareau

Sponsoring member:
DENAK DEUTSCHE NATURSTEIN AKADEMIE
DNV Deutscher Naturwerkstein-Verband e.V.

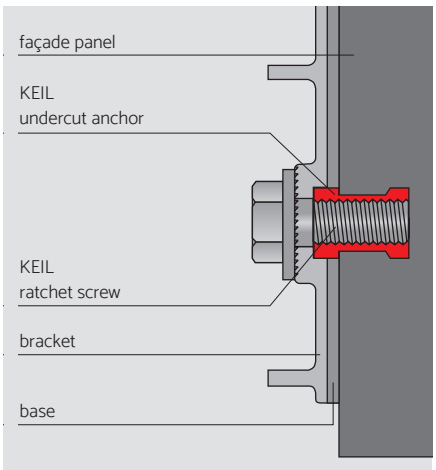
Member:
MADE IN GERMANY DEUTSCHES WERKZEUG
FWI

Associate member:
FVF

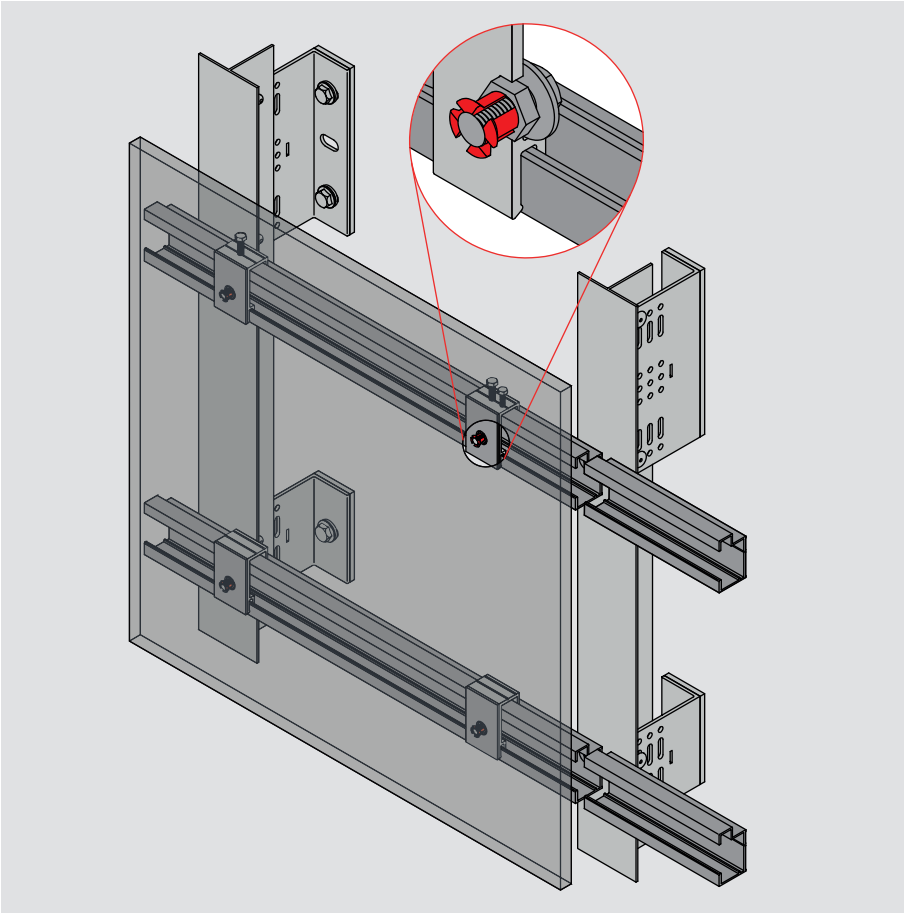
UNDERCUT– THE SYSTEM



Drilling and undercutting in one step



Structure



The KEIL undercut drilling

Cylindrical drilling and conical undercutting are carried out with only one tool and in one single step. Different levels of automation are possible, depending on the type of machinery and material. Drilling time in ceramics is less than 10 seconds. Panels of any size and weight will get a patented undercutting with a precise and consistent symmetric shape. For a cylindrical drilling with a diameter of ø 7 mm, the diameter of the undercut will be ø 9 mm. For the assembly, the undercut anchor is placed in the drill hole and locked positively with a screw. Quick, simple and safe, with customary tools, e.g. cordless screwdrivers.

The KEIL undercut anchor

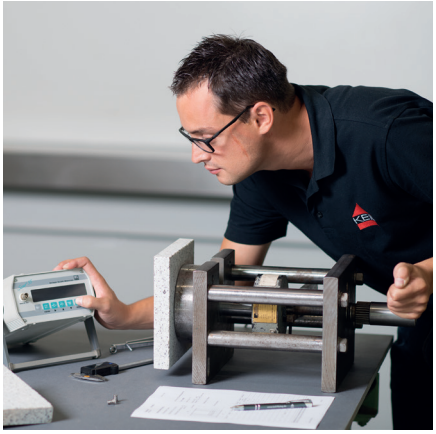
The KEIL undercut anchor for the hidden attachment of thin panels is manufactured from stainless steel. Its geometry, which matches the KEIL undercut drill hole, guarantees an attachment free from expansion pressure in all common panel materials from a panel thickness of 6 mm onwards. Different insertion depths are possible, depending on the thickness of the panel or the necessary bearing capacity. The KEIL undercut anchor is designed to carry more weight than that of the panel material. Due to its high assembly safety, the KEIL undercut anchor offers significant advantages. The displacement-controlled assembly of the anchor in all panel thicknesses will be carried out quickly, simply and safely with the aid of the coordinated KEIL system: anchor, bracket and KEIL ratchet screw with integrated screw lock. Only two parts (anchor sleeve and screw) are necessary for a secure fastening. Other screw-in parts for the KEIL undercut anchor allow for your individual connection variant, e.g.:

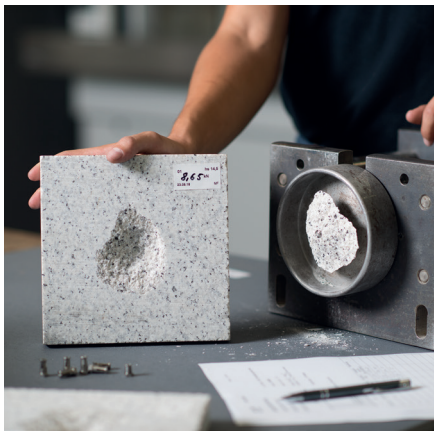
- connection to substructures
- connection to cassette designs
- attachment to reveal panels with interior angles
- direct attachment to the wall with fork or plug-in anchors
- fixing of wash basins, work tops, furniture, grave borders or radiators made from natural stone

Safety instructions

Safety and product liability require, that the KEIL undercut fixing system must always be used as one unit. The function will only be guaranteed, if the coordinated KEIL products (anchor with screw or grub screw, chuck and façade drill) are used in combination. The use as a system is also regulated in the approvals hitherto granted resp. applied for. Parts of the KEIL undercut fixing system are patented.

KEIL – SERVICE





1 Pull-out tests

How efficient are the materials of KEIL's products? Which KEIL anchors are the best for a particular building project? We offer our customers pull-out tests on our premises.

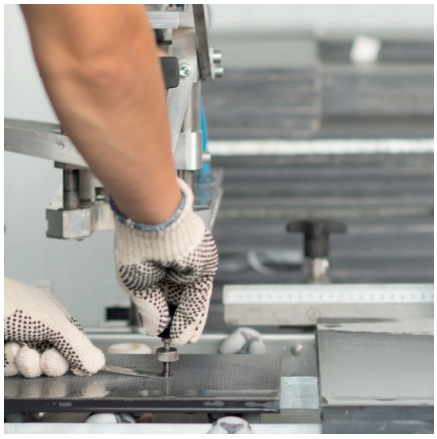
The resulting data will provide an orientation for applications for approval.

2 Support for approvals

KEIL will be pleased to advise you on obtaining approval from building supervision authorities or European Technical valuations with the KEIL undercut techniqe.

Approvals for a variation of materials and formats with and without substructure are availabe.

www.keil-fixing.de/en/approvals



3 Recommendations on handling and implementation / training

We are pleased to offer you a presentation of the advantages, the handling and the drilling technique of the undercut system.

If you have any questions concerning the planning of your individual façade fixing, please contact our service team.

4 Drilling

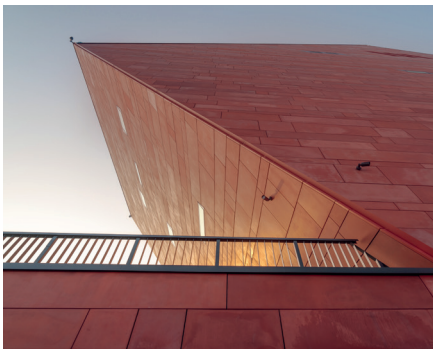
If required, we are pleased to offer you drilling capacities at our factory. These can be matched with your requirements and are also sufficiently available for large projects.

5 Rental service

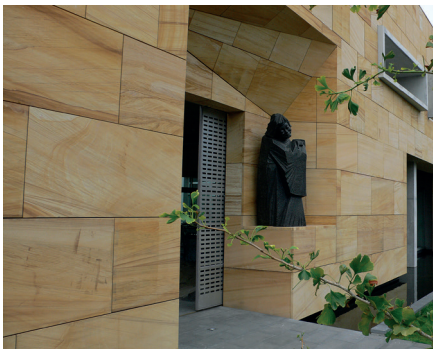
KEIL as well as a variety of national and international distributors offer different drilling machines for drilling undercut holes. Please make use of this possibility to temporarily expand your available machinery or to have the optimum machine for a special object at your disposal without locking any capital.

Please find our current overview of relevant documents on planning permissions under www.keil-fixing.de/en/approvals.

KEIL – ADVANTAGES



Museum of WW II, Gdańsk, PL © Kwadrat Gdyni



Buddhist Temple, Christchurch, NZ © KEIL

Museum of Liverpool, Liverpool, GB © Vincent Phillips

Pandion Vista, Cologne, DE © KEIL

Quality and safety

- Highest safety owing to a wide range of patents and approvals, e.g. European Technical Approvals (ETA) for the attachment of façade panels.
- Highest quality MADE IN GERMANY using material A4.
- Complete system, approved by building inspectorate, sophisticated, highly tried and trusted.
- Hurricane proof and earthquake tested up to magnitude 9.4 on the open-ended Richter scale.
- Proven in climate zones all over the world.
- Non-combustible, mechanical and permanently safe attachment guarantees highest retention force without stress on the façade panel.
- Higher pull-out load for the same panel thickness than with conventional systems, which support the edges of the panel.

Assembly

- Highest assembly safety for the façade company due to a self-controlling system: The KEIL undercut anchor can only be mounted into a correctly drilled hole.
- Short lead time due to an easily established and clearly defined drilling and assembly process.
- Contrary to many alternative systems, a certification of the operators will not be necessary.
- Assembly independent of temperature, climate and weather conditions.
- The possibility of a high level of prefabrication allows for an assembly independent of place and time.
- Approved and uncomplicated fixing of reveal panels.
- Tolerances in panel thickness can be balanced automatically by spacer discs.
- Precise drilling technique (façade drill rotates at 10.000 rpm. in a deflected condition) guarantees a drill hole of a consistent geometry.
- Optimal use of the technical material characteristics due to a variable position of the undercut anchors.
- The panel will not be pierced.

Efficiency

- All required thermal resistances in new buildings and modernisation can be implemented, guaranteeing a pronounced energy efficiency.
- Due to the constructional separation of insulation and weatherproofing all used materials can be separated and recycled, should the construction be dismantled later on.
- Subsequent replacement of façade panels e.g. for repairs.
- Thin façade panels from a thickness of 6 mm onwards – economic and resource-friendly.
- Assembly of anchor and bracket in one process on the building site.
- Economical transport of the drilled panels without protruding fixing elements.

Advantages of the system

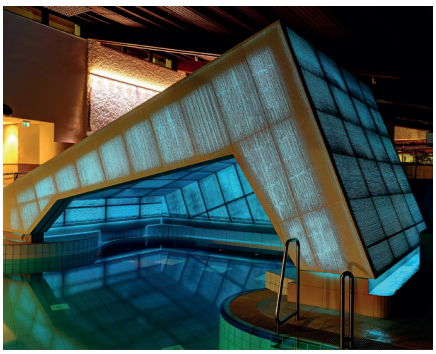
- Bigger façade panels of the same thickness can be attached with undercut anchors than with fixing devices according to DIN 18516-3.
- Breaking loads are up to seven times higher than with attachments on the edge of the panel (e.g. pin anchors).
- Minimisation of bending stress in the façade panel in comparison to attachments on the edge of the panel.
- Stress is not reduced to the edges of the panel, as common with pin attachment.

Design and aesthetics

- Creativity has no limits. Be it elegant, traditional, modern, delicate or unconventional – even the boldest façade ideas can be implemented and allow for free planning.
- The façade shows a clean, uninterrupted image without visible fixing points.
- More than 50 different panel materials are available, e.g. ceramics, porcelain stoneware, natural stone, synthetic materials/HPL, fibre cement, glass fibre reinforced concrete, glass ceramics, artificial stone, UHPC, polymer concrete, solid surface materials or glass.
- Combinations and alternations of different materials, shapes and colours are possible and assist in implementing planned effects.
- Variable panel formats.
- Closed or open joints without visible anchors are distinctive of high quality façades.
- Due to the attachment on the back side of the panel, there will be no dirt or rust streaks.
- In comparison to the attachment on the edge of the panel, larger sized panels can be fixed with a high safety level.
- Your property will increase in value in regard to acceptance and marketing.
- Technical equipment can be integrated behind the façade, e.g. lighting, sun protection, supply cables, gutters, lightning protection, security systems.
- Aesthetics and energy efficiency are not mutually exclusive.

Vanke Pavilion (EXPO 2015), Mailand, IT © Hufton + Crow, Studio Libeskind

Penthouse, Hamburg, DE © Klaus Stemmler, Material: HI-MACS® - Design: Gerdt Architektur - Fabrication: Kiebitzberg GmbH & Co.KG



Obermaintherme, Bad Staffelstein, DE © LUCEM light transmitting concrete

Alice Trully Hall, New York, US © KEIL

Sophisticated and approved by building authorities

Undercut attachments for façade panels in ventilated rainscreens are nowadays state-of-the-art. The Deutsches Institut für Bautechnik (DIBt; German institute for building technique) drew up an approval concept for this purpose.

General building approvals

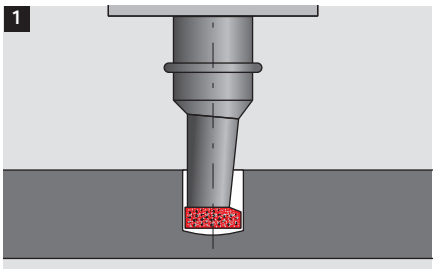
General building approvals will be granted for construction products and techniques within the scope of state regulation for which there are no generally acknowledged technical regulations, especially DIN norms, or which differ from them in a significant way. They are reliable verifications of applicability of construction products resp. of types of construction in regard to constructional requirements of buildings.

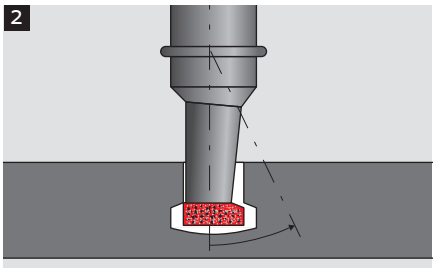
European Technical Assessments

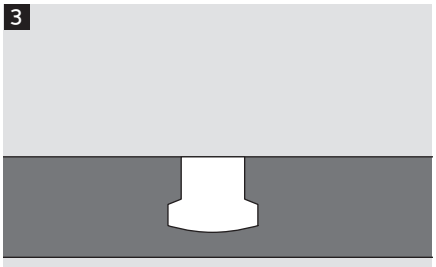
European Technical Assessments (ETA) will be issued for construction products in the scope of the EU Construction Products Regulation. They evaluate the performance of a construction product.

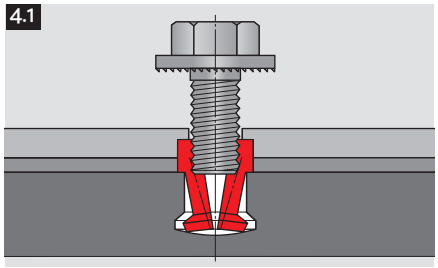
Please find our current overview of relevant documents on planning permissions under www.keil-fixing.de/en/approvals.

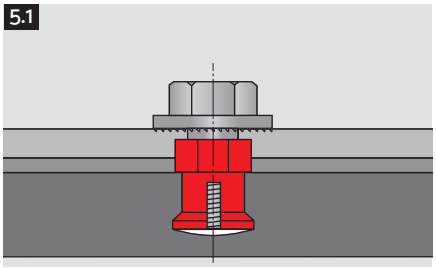
ASSEMBLY INSTRUCTIONS FOR ANCHORS











Drilling and undercutting

Façade panels must be provided with undercut drill holes on the back side. These holes must be drilled with KEIL system tools under workshop conditions.

The KEIL system tool consists of the KEIL façade drill bit, the KEIL drill head and the undercut drilling machine (e.g. KEIL portable drilling machine, KEIL drilling table or automated drilling machine with KEIL chuck).

The undercut drilling is carried out in one single step (cylindrical drilling 1 and undercutting 2).

The undercut anchor can only be assembled correctly, if there is a precise undercut drill hole 3. The KEIL depth control guide, which matches the insertion depth of the anchor, will periodically monitor the geometry of the drill hole. The insertion depth h_S is set by this depth control guide and all major measurements of the drill hole can be monitored efficiently.

Variant 1 (type AA): anchor sleeves and bolt with locking ratschets (screw) for defined clamping thicknesses, e.g. brackets.

The undercut anchor consists of an anchor sleeve with matching hex screw.

The drill hole, the anchor sleeve and the thread length of the screw must be tailored to the desired insertion depth h_S of the undercut anchor and the bracket of choice. Only the use of matching parts will guarantee a quick, simple and safe assembly.

Assembly process:

1. Insert the at the base compressed anchor sleeve, together with the required bracket, into the undercut hole 4.1.
2. Screw in the screw, exerting gentle pressure on the bracket (in order to fix the anchor) 5.1. The locking ratchets of the screw will cut into the bracket, securing the screw.

For this type of installation, the bracket and the KEIL undercut anchor will form a solid unit.

The anchor sleeve is expanded to its original dimensions by inserting the scew to a controlled depth, making it sit snugly against the undercut area of the drill hole. After the assembly, the anchor will sit in the undercut hole free of expansion pressure (i.e. the bracket can still be rotated with a certain amount of physical effort).

Note: If the matching screw is used for a defined clamping thickness, the screw-in depth will always be correct. The assembly is quick, simple and safe. The exact screw-in depth is determined by the system of the KEIL plug-in bolts in the same way. The screwed in part must fit flush with the tip of the anchor sleeve.

Caution: Before any assembly, please check, if the screwed in part fits flush with the tip of the anchor sleeve by way of a test assembly.

Variant 2 (type BH/CA): anchor sleeves and threaded pins vor variable clamping thicknesses

The undercut anchor consists of an anchor sleeve with matching threaded pin.

The drill hole, the anchor sleeve and the threaded pin must be tailored to the desired insertion depth h_S of the undercut anchor and the bracket of choice. Only the use of matching parts will guarantee a quick, simple and safe assembly.

Assembly process:

1. Insert the at the base compressed anchor sleeve into the undercut hole 4.2.
2. Insert the threaded pin into the screw-in-tool.
3. Hold the anchor sleeve with an open-ended spanner and screw in the threaded pin with the screw-in tool up to the stop – undo the screw-in tool.
4. Control measurement Ü 5.2.
5. Screw on the bracket with the nut.

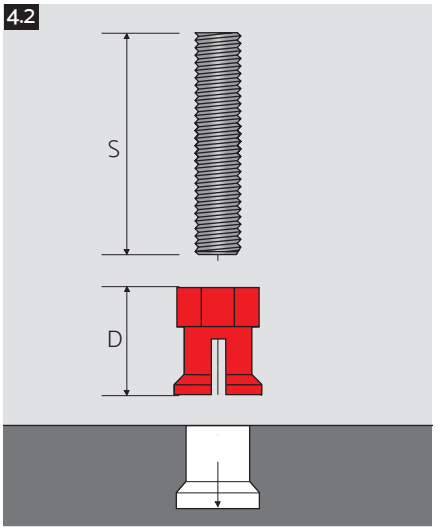
The anchor sleeve is expanded to its original dimensions by screwing in the threaded pin to a controlled depth, making it sit snugly against the façade panel in the undercut area of the drill hole. After the assembly, the anchor will sit in the undercut hole free of expansion pressure

Note: The use of the matching assembly tool, the KEIL screw-in tool and attention to the assembly process will guarantee the correct screw-in depth. The correct projection Ü will automatically be adhered to.

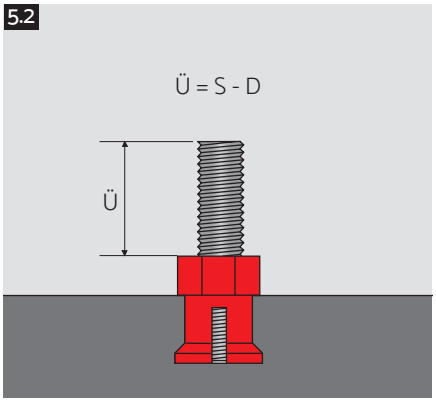
Caution: Before any assembly, please check, if the screwed in part fits flush with the tip of the anchor sleeve and if the matching tool has been inserted by way of a test assembly.

The correct screw-in depth is also determined by the system for KEIL plug-in bolts (anchor type CA).

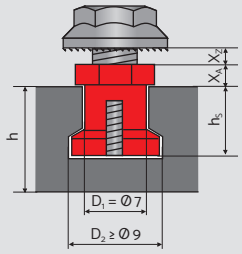
4.2



5.2



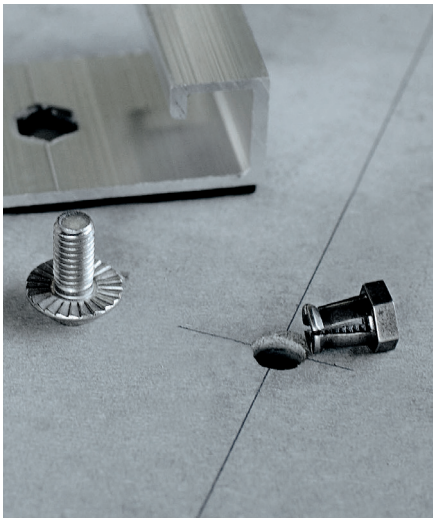
Geometry of the drill hole – image



D_1 = diameter of drill hole (Ø 7 mm)
D_2 = diameter of undercut (≥ Ø 9 mm)
h = panel thickness (from 6 mm)
h_S = insertion depth of undercut anchor
x_A = anchor hex (3 mm)
x_Z = thickness of bracket (clamping thickness)

Safety instructions (general)

Faultless performance can only be guaranteed, if all parts of the KEIL undercut system are being used. The controlled expansion of the anchor sleeve necessitates the exact attunement of the length of the screw to the anchor and the bracket by KEIL. The drilling of the undercut holes and the assembly should be carried out under workshop conditions. These can also be created on site. The dimensions of the undercut holes must be monitored according to the applicable regulations. Approvals, norms, regulations and relevant provisions applying for the construction and use must be adhered to. According to the EU construction products regulation declarations of performance for the CE label will be necessary. New ETAs will not contain any information about the use of the approved product any longer. Relevant regulations of use and approvals can be found in our download area under www.keil-fixing.de/en.



APPLICATIONS

Type of machinery		Portable drilling machine KSDV	Portable drilling machine KRDV
Application		portable - professional	portable
		p. 38	p. 40
Undercut anchors	p. 17	●	●
Drilling tools			
Façade drill bit diamond tipped	p. 28	●	●
Façade drill bit diamond tipped with countersink	p. 29	●	●
Façade drill bit diamond tipped R 1/2"	p. 30		
Façade drill bit diamond tipped CNC	p. 31		
Façade drill bit diammond tipped 9/12	p. 32	●	●
Façade drill bit diamond tipped with countersink 9/12	p. 33	●	●
Façade drill bit carbide tipped HM	p. 34		
Façade drill bit HM CNC	p. 35		
Machine accessories			
Circulation water supply	p. 48	●	●
Water pressure tank	p. 48	●	●
Filter cartridge (for circulation water supply)	p. 48	●	●
Collecting tray for KRT	p. 48		
Air connector	p. 49	●	●
Blow out nozzle for KSHV	p. 49		
Cooling lubricant	p. 49	●	●
Conversion set KRT "front face related drilling"	p. 49		
Drilling unit KG	p. 50		
Undercut unit HSE	p. 50		
Control for drilling unit KG	p. 50		
Chuck P	p. 51		
Transport case for KSDV, KRDV, KSHV	p. 51	●	●
Whetstones	p. 51	●	●
Spare parts			
Chuck for portable drilling machines	p. 52	●	●
Flushing chuck for KSDV, KRDV	p. 52	●	●
Chuck for undercut unit HSE	p. 52		
Flushing chuck for undercut unit HSE	p. 52		
Grooved ball bearing	p. 52	●	●
Silencer	p. 52	●	●
Fastener set 1	p. 53	●	●
Fastener set 2	p. 53		
Fastener set 3	p. 53		
Gasket for vacuum base	p. 53	●	●
Carbon brush set	p. 53	●	●
Assembly aids			
Depth control guide	p. 56	●	●
Washer for depth control guide	p. 59	●	●
Torque wrench 1-6 Nm	p. 60	●	●
Torque screwdriver 3.0 Nm	p. 60	●	●
Tool set	p. 61	●	●
Screw-in tool for stud bolts	p. 61	●	●

	Portable drilling machine KSHV	Drilling table with roller conveyor KRT	Automatic drilling machine KG	Drilling / milling / CNC systems
	mobile - professional (dry)	stationary	stationary - automated	customized
	p. 42	p. 44	p. 46	on demand
	●	●	●	●
		●	●	●
		●	●	●
				●
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	●	●	●	●

CHECK LIST

for a request / order for finding the correct product.

Which panel?

Customer

Material description:

Material thickness [mm]:

Tolerances in panel thickness [mm] +/-:

Which substructure?

Customer/KEIL

Manufacturer:

Thickness of brackets [mm]:

Through bore for KEIL anchors:

- ☐ Hex punched
- ☐ Hex stamped
- ☐ Groove
- ☐ Miscallaneous:

Which KEIL undercut anchor?

Customer/KEIL

- ☐ Type AA anchor sleeve with screw
- ☐ Type BH anchor sleeve with threaded pin and ratchet screw
- ☐ Type CA anchor sleeve with thread bolt
- ☐ Customized solution:

Anchor insertion depth h_s = ☐ 4 ☐ 5.5 ☐ 7 ☐ 8.5 ☐ 10 ☐ 11.5 ☐ 13 ☐ 15 [mm]

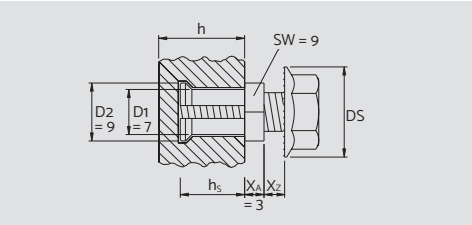
Thread length M6x _____ [mm]

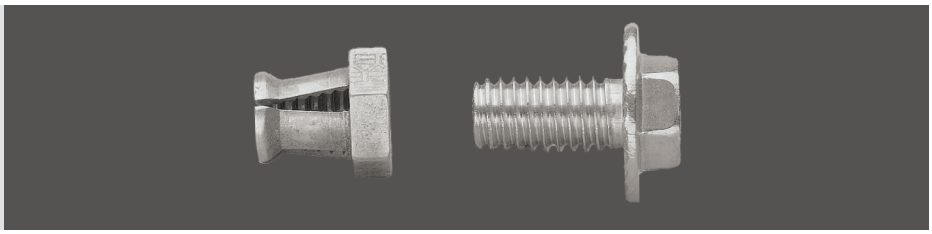
UNDERCUT ANCHORS

KEIL undercut anchors attach façade panels securely and invisibly to the substructure. Our high-quality fixing elements are available in different designs and with matching spacer discs.

Museum of WW II, Gdańsk, PL, © Kwadrat Gdyni

UNDERCUT ANCHOR KH AA





D1 = drill hole Ø; D2 = undercut Ø; SW = shaft spanner gap
X_A = anchor hex

Product information

- The undercut anchor consists of an anchor sleeve with matching hex bolt with locking ratchets (screw).
- Drill hole, anchor sleeve and screw length must be matched to the desired insertion depth and the bracket of choice. Only the use of matching parts will make the assembly **quick, simple** and **safe.**
- Insert the at the base compressed anchor sleeve, together with the required bracket, into the undercut hole.
- Screw in the screw, exerting gentle pressure on the bracket (in order to fix the anchor). The locking ratchets of the screw will cut into the bracket, securing the screw.
- The anchor sleeve is expanded to its original dimensions by inserting the scew to a controlled depth, making it sit snugly against the panel in the undercut area of the drill hole. After the assembly, the anchor will sit in the undercut hole **free of expansion pressure** (i.e. the bracket can still be rotated with a certain amount of physical effort).
- KEIL undercut anchors are monitored externally.

h_{min} = panel thickness [mm]	h_S= insertion depth [mm]	X_Z= clamping thickness [mm]	l4 = nominal length [mm]	DS = bolt head Ø [mm]	article no.
6.0	4.0	1.5	M6x8.5	14	555 020 820
6.0	4.0	3.0	M6x10	14	555 020 742
8.0	5.5	0.0	M6x8.5	14	555 020 856
8.0	5.5	1.5	M6x10	14	555 020 724
8.0	5.5	3.0	M6x11.5	14	555 020 712
9.5	7.0	0.0	M6x10	14	555 020 804
9.5	7.0	1.5	M6x11.5	14	555 020 780
9.5	7.0	3.0	M6x13	14	555 020 830
11.0	8.5	0.0	M6x11.5	14	555 020 823
11.0	8.5	1.5	M6x13	14	555 020 752
11.0	8.5	3.0	M6x14.5	14	555 020 777
13.0	10.0	0.0	M6x13	14	555 020 809
13.0	10.0	1.5	M6x14.5	14	555 020 734
13.0	10.0	3.0	M6x16	14	555 020 715
13.0	10.0	6.0	M6x19	14	555 020 848
14.5	11.5	0.0	M6x14.5	14	555 020 700
16.0	13.0	1.5	M6x17.5	14	555 020 802
18.0	15	0.0	M6x17.5	14	555 020 815
18.0	15	1.5	M6x19	14	555 020 756
18.0	15	3.0	M6x20.5	14	555 020 759
18.0	15	6.0	M6x23.5	14	555 020 826

Further dimensions on request.

Application

- Natural stone
- Artificial stone
- Manufactured stone
- Ceramics
- Laminate (HPL)
- Synthetic material
- Fibre cement
- Glass fibre reinforced concrete (GFRC)
- Glass ceramics
- Solid surface materials
- Ultra high performance concrete (UHPC)

Accessories

- Depth control guide (p. 56)
- Torque wrench 1–6 Nm (p. 60)
- Wrench sockets, DIN 3126 (p. 61)
- Special open-ended spanner, SW9 (p. 61)

Design

Anchor sleeve incl. hex bolt with locking ratchets, stainless steel A4.

Instructions for use

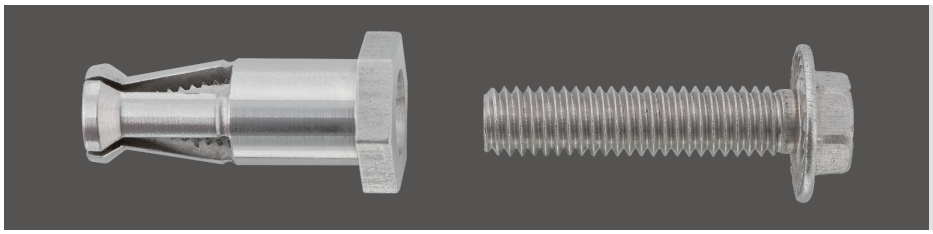
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.

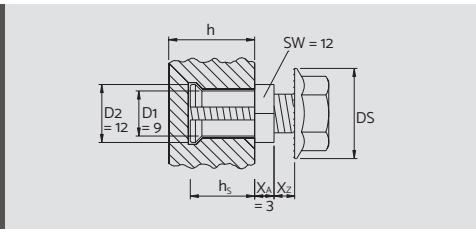
Packaging unit - surcharges

- Packaging unit = 500.
  For orders of less than 500 pieces the following surcharges will accrue:
  - 1–49 + 40 %
  - 50–99 + 25 %
  - 100–499 + 10 %

Microsoft Germany Headquarters, Munich, DE © Andreas Frisch, GSP Architekten

UNDERCUT ANCHOR KH AA 9/12





D1 = drill hole Ø; D2 = undercut Ø; SW = shaft spanner gap; X_A = anchor hex

h_{min} = panel thickness [mm]	h_S = insertion depth [mm]	Xz = clamping thickness [mm]	thread length [mm]	DS = bolt head Ø [mm]	article no.
25.0	20.0	0.0	M6x23	14	555 020 601
25.0	20.0	1.5	M6x24.5	14	555 020 602
25.0	20.0	3.0	M6x26	14	555 020 603
25.0	20.0	6.0	M6x29	14	555 020 604

Further dimensions on request.

Application
For the invisible, back-mounted attachment of façade panels, especially of soft stones.

Accessories
- Depth control guide (p. 56)
- Torque wrench, 1–6 Nm (p. 60)

Design
EDELSTAHL Rost frei

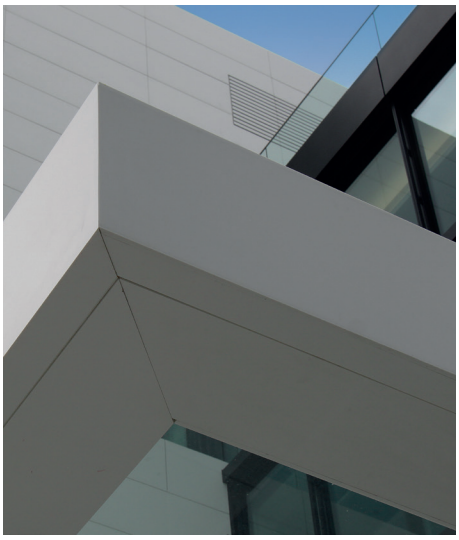
Anchor sleeve incl. hex bolt with locking ratchets, stainless steel A4.

Instructions for use
- Use according to KEIL assembly instructions for anchors (p. 12).

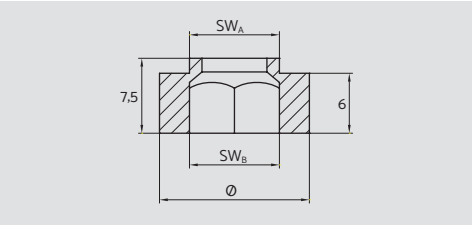
Packaging unit - Surcharges
- Packaging unit = 100.
  For orders of less than 100 pieces the following surcharges will accrue:
  - 1–49 + 40 %
  - 50–99 + 25 %

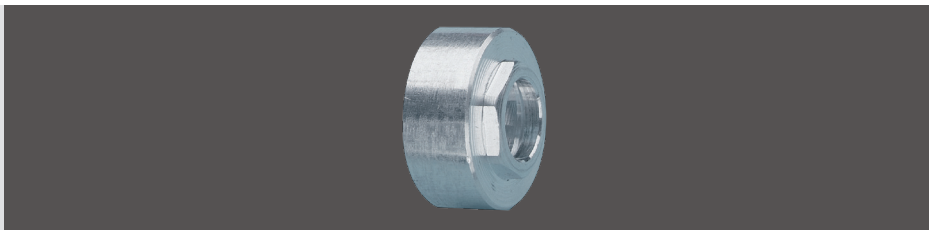
Product information
- The undercut anchor consists of an anchor sleeve with matching hex bolt with locking ratchets (screw)
- Drill hole, anchor sleeve and screw length must be matched to the desired insertion depth and the bracket of choice. Only the use of matching parts will make the assembly **quick, simple** and **safe.**
- Insert the at the base compressed anchor sleeve, together with the required bracket, into the undercut hole.
- Screw in the screw, exerting gentle pressure on the bracket (in order to fix the anchor). The locking ratchets of the screw will cut into the bracket, securing the screw.
- The anchor sleeve is expanded to its original dimensions by inserting the scew to a controlled depth, making it sit snugly against the panel in the undercut area of the drill hole. After the assembly, the anchor will sit in the undercut hole **free of expansion pressure** (i.e. the bracket can still be rotated with a certain amount of physical effort).

Microsoft Germany Headquarters, Munich, DE © Andreas Frisch, GSP Architekten



SPACER DISC KH





Product information

Panel attachment for substructure independent of panel thickness.

Advantages of the KEIL fixing system for the attachment of façade panels with high tolerances in thickness:

- Balancing of tolerances in panel thickness up to 6 mm (4 mm for drill head).
- No reduction in pull-out load for thinner panels.
- For thicker panels, the countersink will be manufactured in one single step together wich the drilling and undercutting of the panel.
- The front side of the panel is always the reference measure (therefore there will be no more need for different spacers.
- The insertion of the anchor and the bracket can be carried out in one step.

outer Ø [mm]	height up to hex [mm]	height incl. hex [mm]	SW_A = spanner gap without [mm]	SW_B = spanner gap within [mm]	article no.
15	6	7.5	SW9	SW9	555 432 200
18	6	7.5	SW9	SW12	555 432 201

Application

- Mount the spacer disc inside the calibrated undercut drill hole in order to balance tolerances in panel thickness.
- The spacer disc will offer a reference surface with a consistent distance to the front side of the panel for the assembly of the bracket.
- Natural stone
- Artificial stone
- Manufactured stone
- Glass fibre reinforced concrete (GFRC)

Accessories

- façade drill bit diamond tipped with countersink (p. 29)

Design

Disc with inner and outer hex from AlCuMgPb

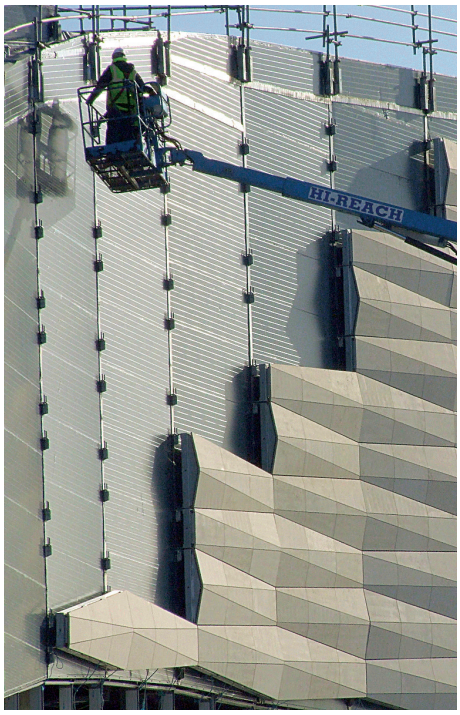
Instructions for use

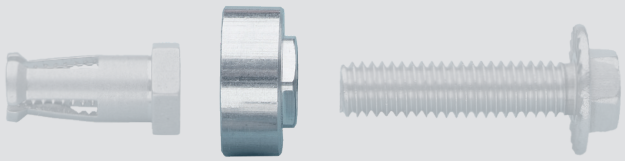
- Only for drilling machines which are designed to drill consistantly with the front side of the panel.
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.

Packaging unit - surcharges

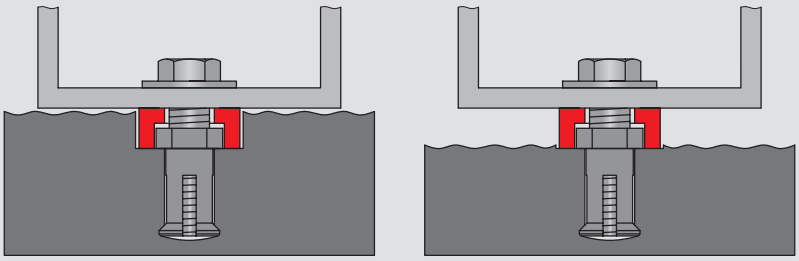
- Packaging unit = 500.
  For orders of less than 500 pieces the following surcharges will accrue:
  - 1–49 + 40 %
  - 50–99 + 25 %
  - 100–499 + 10 %

Museum of Liverpool, Liverpool, GB © Vincent Phillips

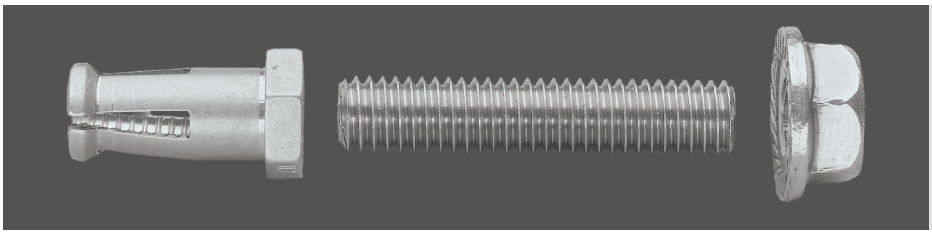


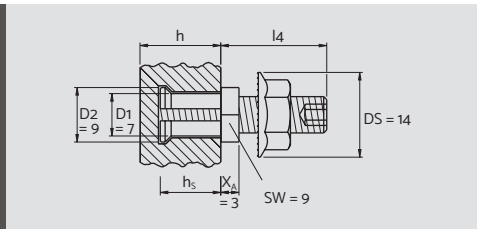


Panel attachment to substructure independent of panel thickness and rear surface flatness.



UNDERCUT ANCHOR KH BH





D1 = drill hole Ø; D2 = undercut Ø; SW = shaft spanner gap; DS = nut head; X_A = anchor hex

h_{min} = panel thickness [mm]	h_S= insertion depth [mm]	X_Z= clamping thickness [mm]	l4 = nominal length [mm]	article no.
9.5	7.0	4.0	M6x20	555 020 708
9.5	7.0	14.0	M6x30	555 020 736
11.0	8.5	2.5	M6x20	555 020 790
11.0	8.5	12.5	M6x30	555 020 822
13.0	10.0	11.0	M6x30	555 020 741
13.0	10.0	21.0	M6x40	555 020 744
13.0	10.0	31.0	M6x50	555 020 757
13.0	10.0	41.0	M6x60	555 020 748
18.0	13.0	3.0	M6x25	555 020 853
18.0	15	1.5	M6x25	555 020 714
18.0	15	6.5	M6x30	555 020 710
18.0	15	11.5	M6x35	555 020 781
18.0	15	16.5	M6x40	555 020 749
18.0	15	26.5	M6x50	555 020 764
18.0	15	36.5	M6x60	555 020 788
18.0	15	46.5	M6x70	555 020 803

Further dimensions on request.

Product information

- The undercut anchor consists of an anchor sleeve, a threaded pin and a nut with locking ratchets.
- Drill hole, anchor sleeve and threaded pin length must be matched to the desired insertion depth and the bracket of choice. Only the use of matching parts will make the assembly **quick, simple** and **safe.**
- Insert the at the base compressed anchor sleeve into the undercut hole.
- The anchor sleeve is expanded to its original dimensions by inserting the threaded pin to a controlled depth, making it sit snugly against the panel in the undercut area of the drill hole. After the assembly, the anchor will sit in the undercut hole **free of expansion pressure** (i.e. the bracket can still be rotated with a certain amount of physical effort).
- Screw on the bracket with the nut.
- KEIL undercut anchors are monitored externally.

Application

- Natural stone
- Artificial stone
- Manufactured stone
- Ceramics
- Laminate (HPL)
- Synthetic material
- Fibre cement
- Glass fibre reinforced concrete (GFRC)
- Glass ceramics

Accessories

- Depth control guide (p. 56)
- Wrench sockets, DIN 3126 (p. 61)
- Special open-ended spanner, SW9 (p. 61)
- Screw-in tool for stud bolts (p. 61)

Design

Anchor sleeve incl. threaded pin with inner hex and nut with locking ratchets from stainless steel A4

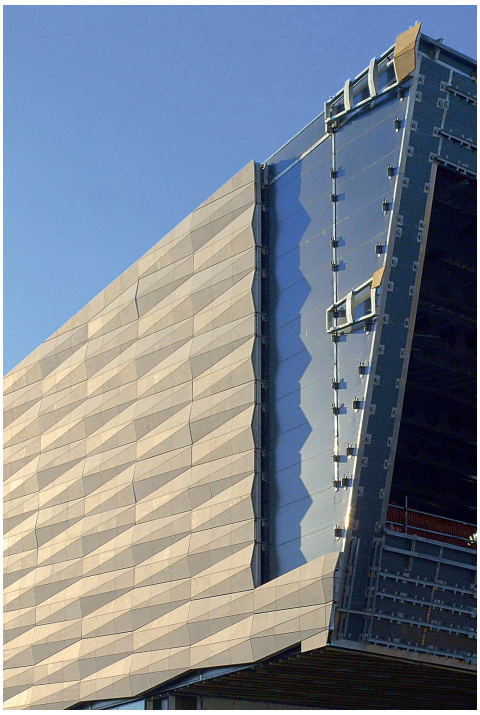
Instructions for use

- When screwed in, the threaded pin must fit flush with the tip of the anchor sleeve.
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.

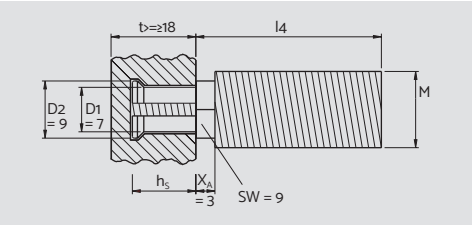
Packaging unit - surcharges

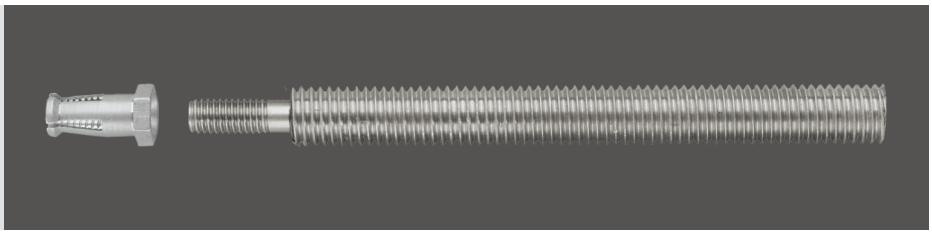
- Packaging unit = 500.
  For orders of less than 500 pieces the following surcharges will accrue:
  - 1–49 + 40 %
  - 50–99 + 25 %
  - 100–499 + 10 %

Museum of Liverpool, Liverpool, GB © Vincent Phillips



PLUG-IN ANCHOR CA

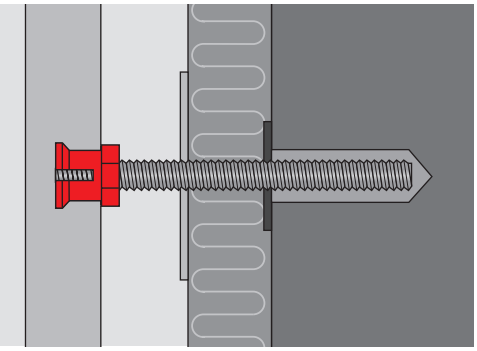




D1 = drill hole Ø; D2 = undercut Ø; h = panel thickness;
SW = shaft spanner gap; X_A = anchor hex

Product information

- The KEIL plug-in-bolt in connection with the KEIL undercut anchor allows for the attachment of natural stone panels without any substructure.
- The retaining and load-baring bolts are attached to the back side of the panel with the aid of the undercut anchor.
- The holes drilled into the substrate are filled with permissible mortar.
- The plug-in-bolts on the façade panel are inserted into the filled drill holes.
- The façade panel is adjusted and fixed. After the temperature-related setting time, the panel is anchored safely and **without expansion pressure**. With/without insulation.
- Single panels can be replaced subsequently.
- High degree in safety due to the optimal distribution of the weight load.
- The correct screw-in depth is warranted by the system.
- KEIL undercut anchors are monitored externally.



h_S = insertion depth [mm]	M = bolt Ø [mm]	l4 = nominal length [mm]	article no.
15	8	15	555 720 713
15	8	100	555 720 716
15	8	150	555 720 620
15	8	200	555 720 625
15	8	300	555 720 629
15	10	15	555 720 721
15	10	100	555 720 610
15	10	150	555 720 613
15	10	200	555 720 636
15	12	100	555 720 641
15	12	150	555 720 645
15	12	200	555 720 649
15	14	100	555 720 655
15	14	200	555 720 663
15	16	200	555 720 678
15	16	300	555 720 739
15	18	200	555 720 689
15	18	300	555 720 740
15	20	200	555 720 698
15	20	300	555 720 741
15	22	300	555 720 742

Further dimensions on request.

Applications
- Natural stone
- Artificial stone
- Manufactured stone
- Ceramics
- Laminate (HPL)
- Synthetic material
- Fibre cement
- Glass ceramics

Accessories
- Depth control guide (p. 56)
- Special open-ended wrench, SW9 (p. 61)

Design

Anchor sleeve incl. reduced threaded bolt from stainless steel A4

Instructions for use
- from l4 > 90 mm surface grooving onwards
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.

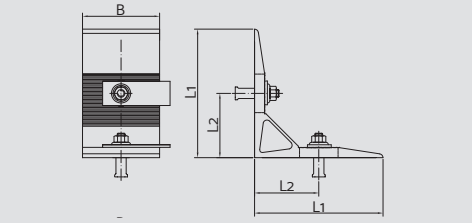
Packaging - surcharges
- Packaging unit = 500.
  For orders of less than 500 pieces the following surcharges will accrue:
  - 1–49 + 40 %
  - 50–99 + 25 %
  - 100–499 + 10 %

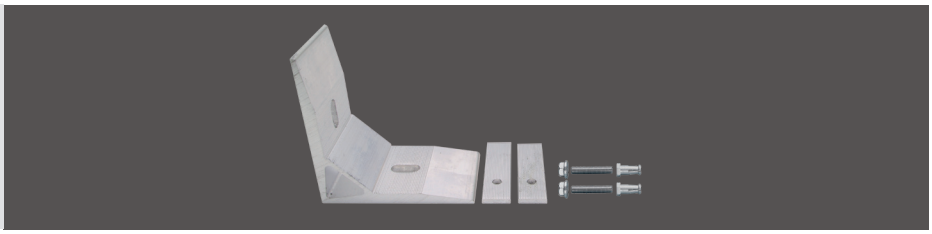
FIXING DEVICES

KEIL fixing devices offer a wide range of invisible solutions in connection with the undercut anchor. They allow for the attachment of reveal panels to main façade panels with minimal effort and the implementation of many other demanding assembly challenges.

Bootswerft Beneteau, Saint-Gilles-Croix-de-Vie , FR © Mathieu Ducros, Material: HI-MACS® - Design: PAD Architectes for BERI 21 - Fabrication: LCCA

REVEAL ATTACHMENT SET FA WITH ANCHOR





Images show L-bracket 100 x 100

Product information

- KEIL offers reveal angle attachments for the attachment of jamb panels to main façade panels with the undercut anchor
- These attachments have been developed from the point of view of a precise and quick assembly as well as a particularly simple handling.
- Place the jamb angle on the drilled façade panel.
- The assembly of the anchor is carried out as a pre-positioned installation with the threaded pin. The serrated washer is fixed with the ratchet nut.
- Alternatively, insert the anchor with the screw and the serrated washer through the slotted hole into the undercut hole and tighten.
- KEIL undercut anchors are monitored externally.

h_s = insertion depth [mm]	L1 = leg length [mm]	L2 = centre distance [mm]	B = leg width [mm]	t = leg thickness [mm]	packaging unit [quantity]	article no.
15	100 x 100	50	60	8.0	100	555 500 000
15	100 x 100	50	60	8.0	1	555 500 009
15	60 x 60	35	40	5.0	250	555 500 002
15	60 x 60	35	40	5.0	1	555 500 011

Further dimensions on request.

Application

- For the invisible, back-sided attachment of reveal or lintel panels.
- Natural stone
- Artificial stone
- Manufactured stone
- Ceramics
- Laminate (HPL)
- Synthetic material
- Fibre cement
- Glass ceramics

Accessories

- Depth control guide (p. 56)
- Special open-ended spanner, SW9 (p. 61)
- Allen key (p. 61)
- Screw-in tool for stud bolts (p. 61)

Design

Aluminium L-bracket incl. 2 serrated washers and 2 complete anchors KEIL BH h_s 15 M6x35

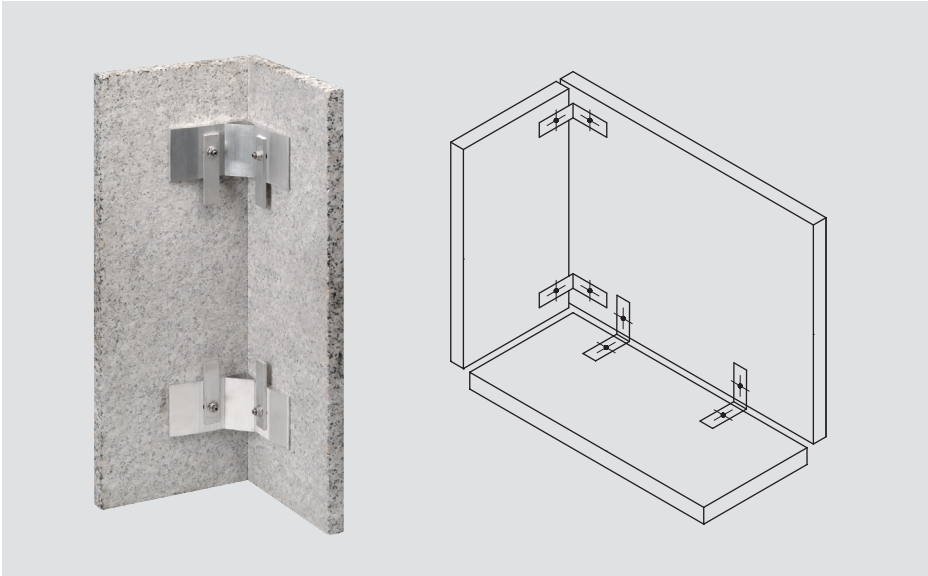
Instructions for use

- The screwed in threaded pin must fit flush with the tip of the anchor sleeve.
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.

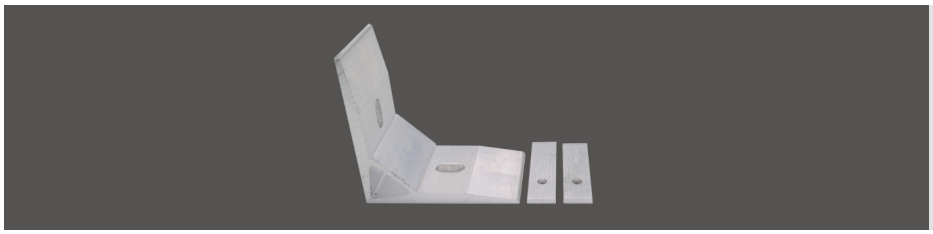
Note

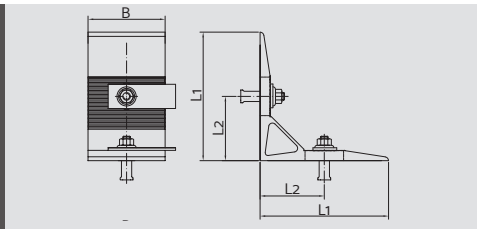
- Relevant approvals and consents are available on request.
- Assembly tools (e. g. screw-in tool) on request
- Ratchet nut in quality A4.

Rathscheck office and training building, Mayen, DE © Rathscheck Schiefer



REVEAL ATTACHMENT FA WITH 2 SERRATED WASHERS





Images show L-bracket 100 x 100

L1 = leg length [mm]	L2 = centre distance [mm]	B = leg width [mm]	t = leg thickness [mm]	packaging unit [quantity]	article no.
100 x 100	50	60	8.0	100	555 500 004
100 x 100	50	60	8.0	1	555 500 014
60 x 60	35	40	5.0	250	555 500 006
60 x 60	35	40	5.0	1	555 500 016

Application

- Assembly with undercut anchors KH type BH
- For the invisible, back-sided attachment of reveal oder lintel panels.
- Natural stone
- Artificial stone
- Manufactured stone
- Ceramics
- Laminate (HPL)
- Synthetic material
- Fibre cement
- Glass ceramics

Accessories

- Undercut anchor KH BH (p. 21)
- Depth control guide (p. 56)
- Special open-ended spanner, SW9 (p. 61)
- Allen key (p. 61)
- Screw-in tool for stud bolts (p. 61)

Design

Aluminium L-bracket incl. 2 serrated washers

Instructions for use

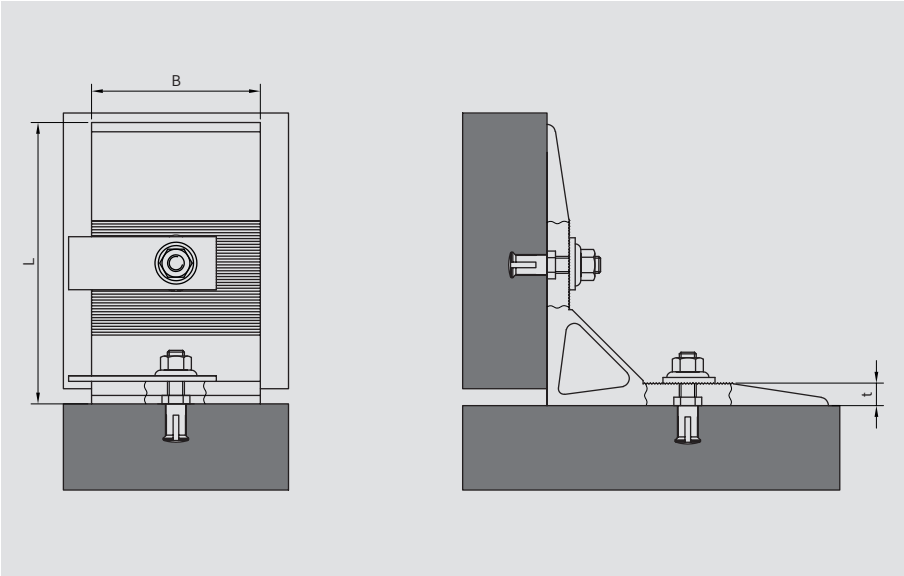
- The screwed in threaded pin must fit flush with the tip of the anchor sleeve.
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.

Note

- Relevant approvals and consents are available on request.
- Assembly tools (e. g. screw-in tool) on request

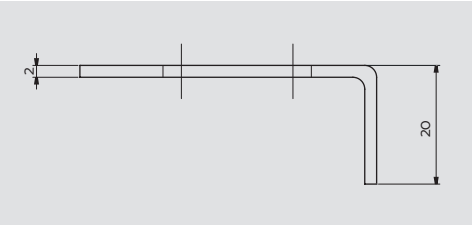
Product information

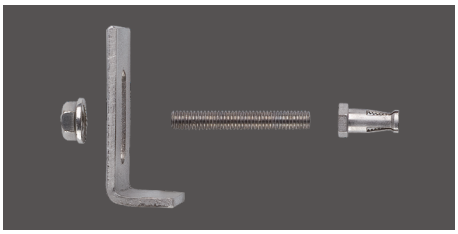
- KEIL offers reveal angle attachment for the attachment of jamb panels to main façade panels with the undercut anchor
- These attachments have been devoped from the point of view an precise and quick assembly as well as a particularly simple handling.
- Place the jamb angle on the drilled façade panel.
- The assembly of the anchor is carried out as a pre-positioned installation with the threaded pin. The serrated washer is fixed with the ratchet nut.
- Alternatively, insert the anchor with the screw and the serrated washer through the slotted hole into the undercut hole and tighten.
- KEIL undercut anchors are monitored externally.



Rathscheck office and training building, Mayen, DE © Rathscheck Schiefer

WASH BASIN ATTACHMENT





Product information

- The KEIL wash basin attachment is used in connection with the KEIL undercut anchor KH BH for the attachment of wash basins.
- Wash basins will be fixed mechanically safe in work surfaces made of natural stone or ceramics panels.
- As soon as the panels have been provided with undercut holes, the wash basin can be screwed on and plumbed in without any setting time.
- Advantages are the fast assembly, the **high retention force** and the **immediate load-bearing capacity** of the attachment.

Version	dimensions [mm]	packaging unit [quantity]	Artikel-Nr.
clamp	50 x 20 x 2	12	570 010 002
complete set of undercut anchor and clamp	50 x 20 x 2	12	570 010 004

Application

- For the attachment of wash basins to kitchen work surfaces or bathroom cabinets.
- Assembly with undercut anchor KH BH
- Natural stone
- Artificial stone
- Ceramics

Accessories

- Depth control guide (p. 56)
- Special open-ended spanner, SW9 (p. 61)
- Allen key (S. 61)

Design

Wash basin attachment WB 50x20 single or in set with undercut anchor KH BH h_s = 15, M6x40

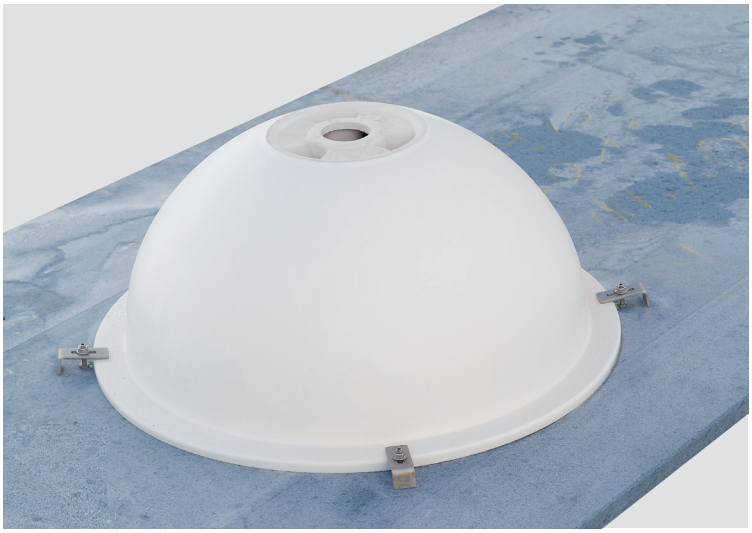
- Clamp from stainless steel
- Undercut anchor from stainless steel A4
- Further insertion depths on demand.

Instructions for use

- The screwed in threaded pin must fit flush with the tip of the anchor sleeve.
- Use according to KEIL assembly instructions.

Note

- Ratchet nut in quality A4.
- KEIL undercut anchors are monitored externally.

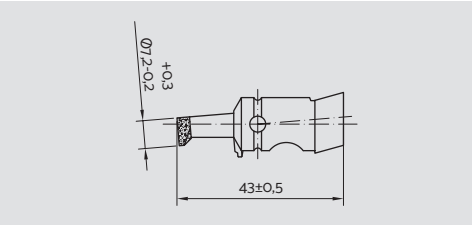


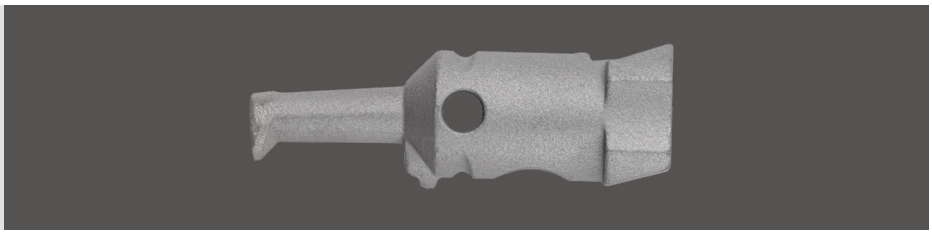
DRILLING TOOLS

The feature setting KEIL undercut drilling tools apart is their exact hole geometry in combination with minimum drilling time and maximum tool life. The tools are part of the KEIL undercut system, which may only be used as a whole.

SSC - University of Cologne, Cologne, DE © KEIL

DIAMOND TIPPED FAÇADE DRILL BIT





Product information

- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.
- The KEIL façade drill bit is inserted into the KEIL chuck.

h_S = insertion depth [mm]	drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	type	article no.
≤ 13	7	9	0.8	1	515 010 022
≤ 15	7	9	1.3	2	515 017 022

Application

- Diamond tipped
- Wet drilling
- For all "hard" materials, e.g.
  - Ceramics
  - Porcelaine stoneware
  - Natural stone
  - Glass
  - Artificial stone
- Central cooling through the façade drill bit.

Accessories

- Fastener set 1 (p. 53)
- Fastener set 2 (p. 53)
- Fastener set 3 (p. 53)
- Depth control guide (p. 56)
- Whetstones (p. 51)

Design

Diamond tipped façade drill bit

Instructions for use

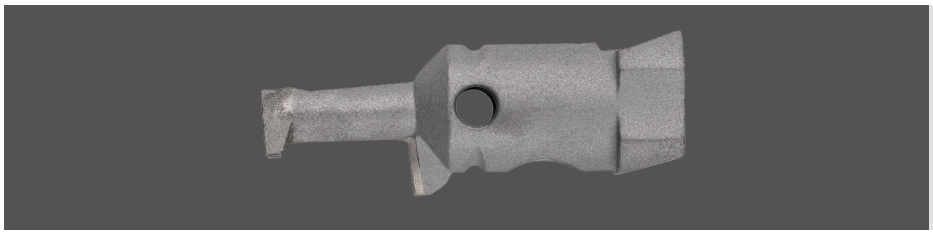
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- For KEIL chucks / undercut drilling machines.
- Recommended rotational speed > 7,000 rpm.
- Water pressure > 4 bar
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

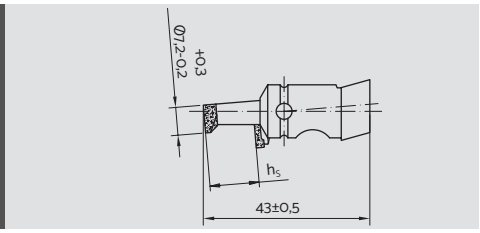
Packaging unit

- Packaging unit = 2 pieces.

Residential building, Frankfurt, DE © Rathscheck Schiefer

DIAMOND TIPPED FAÇADE DRILL BIT WITH COUNTERSINK





h_S = insertion depth [mm]	drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	countersink Ø [mm]	article no.
10	7	9	1.3	15	515 012 000
15	7	9	1.3	15	515 017 000

Application

- Diamond tipped
- Wet drilling
- For all "hard" materials, e.g.
  - Ceramics
  - Porcelaine stoneware
  - Natural stone
  - Glass
  - Artificial stone
- Central cooling through the façade drill bit.

Accessories

- Fastener set 1 (p. 53)
- Fastener set 2 (p. 53)
- Fastener set 3 (p. 53)
- Depth control guide (p. 56)
- Whetstones (p. 51)

Design

Diamond tipped façade drill bit with countersink

Instructions for use

- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- Only for drilling machines, which are designed to drill consistant with the front side of the panel
- For KEIL chucks / undercut drilling machines.
- Recommended rotational speed > 7,000 rpm.
- Water pressure > 4 bar
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

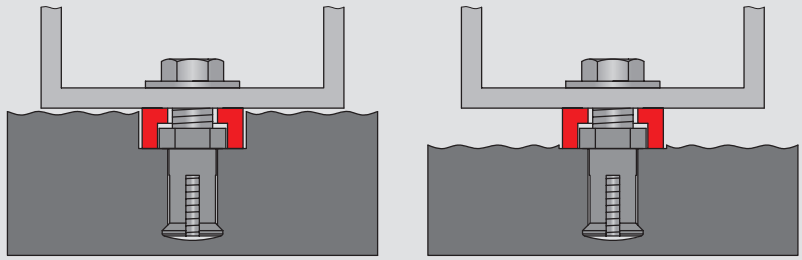
Packaging unit

- Packaging unit = 2 pieces.

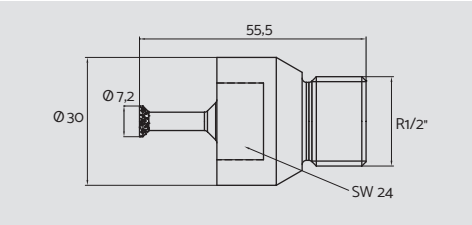
Product information

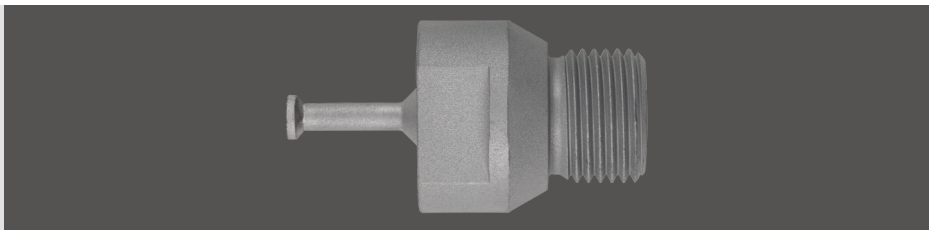
- Especially for the drilling of undercut holes in façade panels with unequal panel thicknesses.
- In order to balance tolerances in panel thicknesses, the countersink will be carried out in one step together with the drilling and undercutting.
- The front side of the panel is always the reference measure.
- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.
- The KEIL façade drill bit is inserted into the KEIL chuck.

Panel attachment to substructure independent of panel thickness and rear surface flatness.



DIAMOND TIPPED FAÇADE DRILL BIT R 1/2“





Product information

- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.

h_S = insertion depth [mm]	drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	article no.
≤ 15	7	9	1.3	515 020 001

Application

- Diamond tipped
- Wet drilling
- For all ”hard” materials, e.g.
  - Ceramics
  - Porcelaine stoneware
  - Natural stone
  - Glass
  - Artificial stone
- Central cooling through the façade drill bit.

Accessories

- Depth control guide (p. 56)
- Whetstones (p. 51)

Design

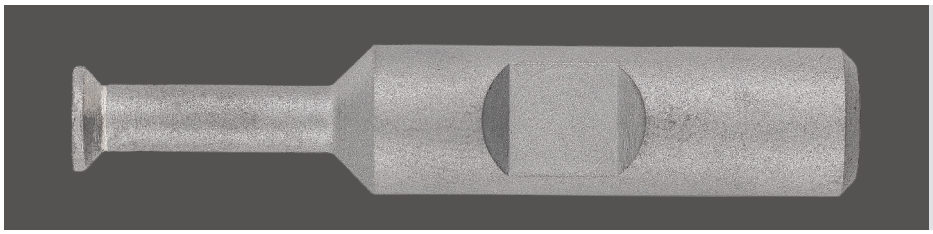
Diamond tipped undercut façade drill bit

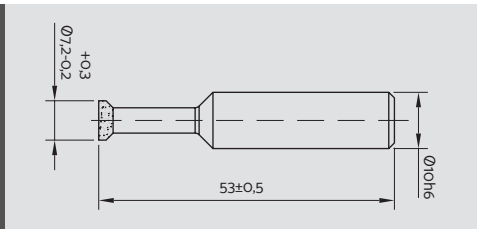
Instructions for use

- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- CNC machines with R 1/2“ tool holder.
- CNC controlled undercutting
- Recommended rotational speed > 7,000 rpm.
- Water pressure > 4 bar
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

Research and Collection Centre, Hall, AT © Rieder Group

DIAMOND TIPPED FAÇADE DRILL BIT CNC





h_s = insertion depth [mm]	drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	variant	article no.
≤ 15	7	9	1.3	cyl. shaft	515 020 002

Application

- Diamond tipped
- Wet drilling
- For all "hard" materials, e.g.
  - Ceramics
  - Porcelaine stoneware
  - Natural stone
  - Glass
  - Artificial stone
- Central cooling through the façade drill bit.

Accessories

- Depth control guide (p. 56)
- Whetstones (p. 51)

Design

Diamond tipped façade drill bit with cylindrical shaft

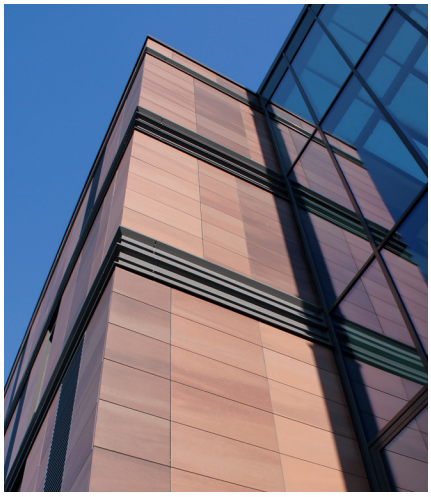
Instructions for use

- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- CNC machines
- CNC controlled undercutting
- Recommended rotational speed > 7,000 rpm.
- Water pressure > 4 bar
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

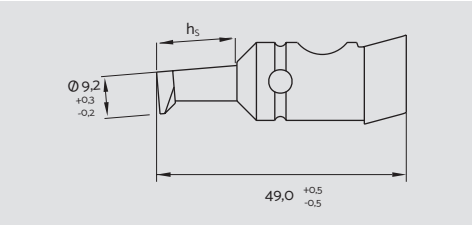
Product information

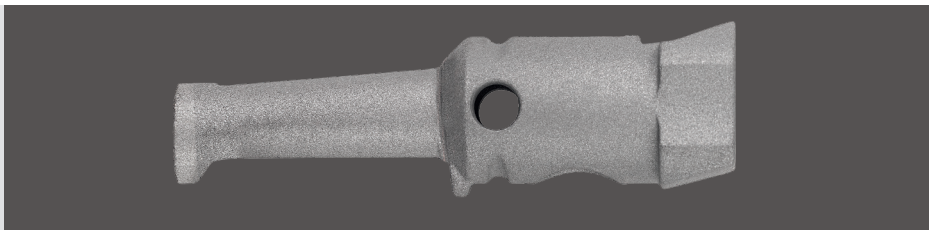
- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.

Frankfurt School of Finance & Management, Frankfurt, DE © KEIL



DIAMOND TIPPED FAÇADE DRILL BIT 9/12





Product information

- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.
- The KEIL façade drill bit is inserted into the KEIL chuck.

h_S = insertion depth [mm]	drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	article no.
≤ 20	9	12	1.5	515 019 001

Application
- Diamond tipped
- Wet drilling
- For all "soft" stones with low strength.
- Central cooling through the façade drill bit.

Accessories
- Fastener set 1 (p. 53)
- Fastener set 2 (p. 53)
- Fastener set 3 (p. 53)
- Depth control guide (p. 56)
- Whetstones (p. 51)

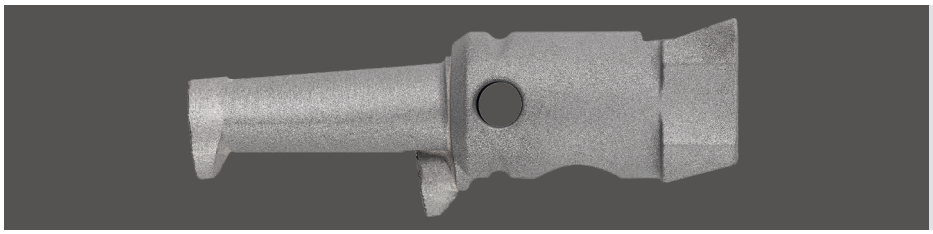
Design
Diamond tipped undercut façade drill bit

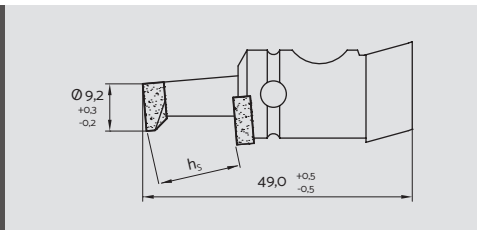
Instructions for use
- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- For KEIL chucks / undercut drilling machines.
- Recommended rotational speed > 7,000 rpm.
- Water pressure > 4 bar
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

Packaging unit
- Packaging unit = 2 pieces.

Oxford Brookes University, Oxford, GB, Rasmus Norlander © Rieder Group

DIAMOND TIPPED FAÇADE DRILL BIT WITH COUNTERSINK 9/12





h_S = insertion depth [mm]	drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	countersink Ø [mm]	article no.
20	9	12	1.5	20	515 019 002

Application

- Diamond tipped
- Wet drilling
- For all "soft" stones with low strength.
- Central cooling through the façade drill bit.

Accessories

- Fastener set 1 (p. 53)
- Fastener set 2 (p. 53)
- Fastener set 3 (p. 53)
- Depth control guide (p. 56)
- Whetstones (p. 51)

Design

Diamond tipped façade drill bit with countersink

Instructions for use

- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- Only for drilling machines designed to drill consistant with the front side of the panel.
- For KEIL chucks / undercut drilling machines.
- Recommended rotational speed > 7,000 rpm.
- Water pressure > 4 bar
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

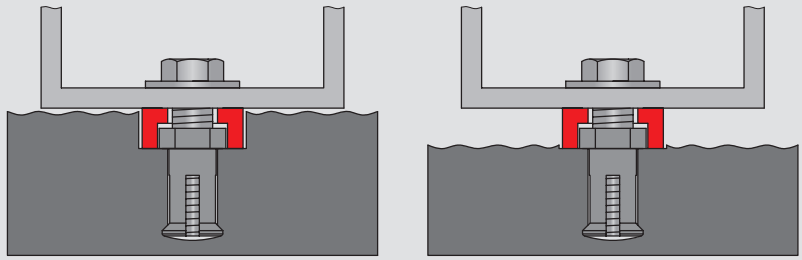
Packaging unit

- Packaging unit = 2 pieces.

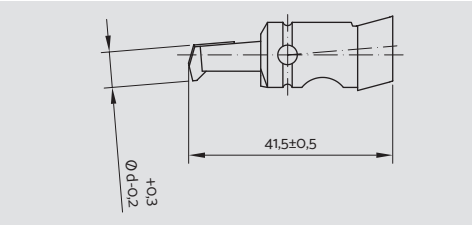
Product information

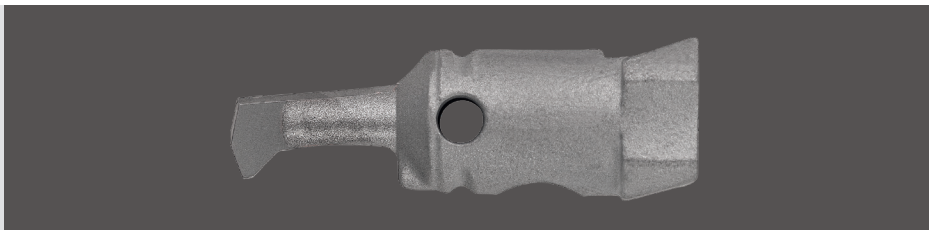
- Especially for the drilling of undercut holes in façade panels with unequal panel thicknesses.
- In order to balance tolerances in panel thicknesses, the countersink will be carried out in one step together with the drilling and undercutting.
- The front side of the panel is always the reference measure.
- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.
- The KEIL façade drill bit is inserted into the KEIL chucks.

Panel attachment to substructure independent of panel thickness and rear surface flatness.



CARBIDE TIPPED FAÇADE DRILL BIT HM





Product information

- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.
- The KEIL façade drill bit is inserted into the KEIL chuck.

h_S = insertion depth [mm]	d = drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	variant	article no.
4	7	9	0.5	X flat	517 010 007
≤ 12	7	9	0.8	flat	517 010 003
≤ 12	7	9	0.8	standard	517 010 002
≤ 15	7	9	1.3	long	517 010 004
≤ 12	8	10	0.5	square anchor	517 010 001
≤ 12	8	10	0.5	square anchor, flat	517 010 006

Application

- For façade panels from e.g.
  - Fibre cement
  - Laminate (HPL)
  - Synthetic materials
  - Specified artificial and natural stones
  - Solid surface materials

Accessories

- Fastener set 1 (p. 53)
- Fastener set 2 (p. 53)
- Fastener set 3 (p. 53)
- Depth control guide (p. 56)

Design

Carbide tipped undercut façade drill bit

Instructions for use

- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- For KEIL chucks / undercut drilling machines.

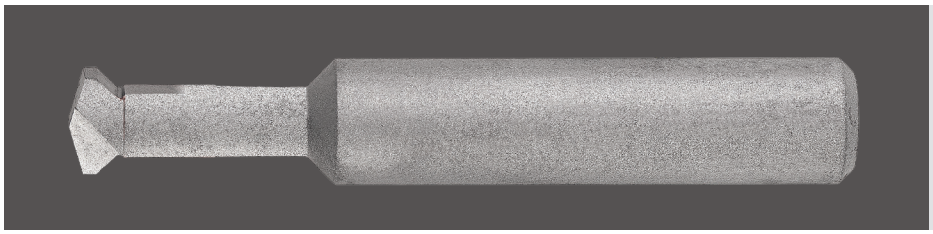
Packaging unit

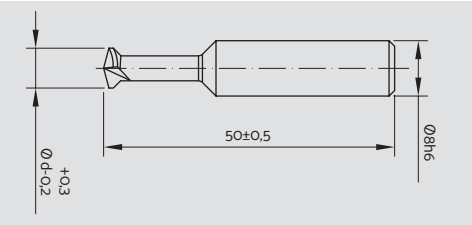
- Packaging unit = 2 pieces.

Silex 1, Lyon, FR © KEIL

Silex 1, Lyon, FR © Kevin Dolmaire, AIA Architectes / Corian® Facade

FAÇADE DRILL BIT HM CNC





h_s = insertion depth [mm]	d = drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	drill shaft Ø [mm]	variant	article no.
≤ 13	7	9	0.8	8	2 cutters for CNC	517 020 005

Product information

- The KEIL façade drill bit is available in various designs matching the KEIL undercut anchor.
- We offer diamond or carbide tipped façade drill bits, which are used depending on the panel material to be drilled.
- Optimized, small diameters with large undercutting cause minimization of the drilling time and maximization of the tool life.
- The KEIL drilling technique warrants optimally short drilling times, long tool life and precise drill hole geometry.

Application

- For façade panels from e.g.
  - Fibre cement
  - Laminate (HPL)
  - Synthetic materials
  - Specified artificial and natural stones
  - Solid surface materials

Accessories

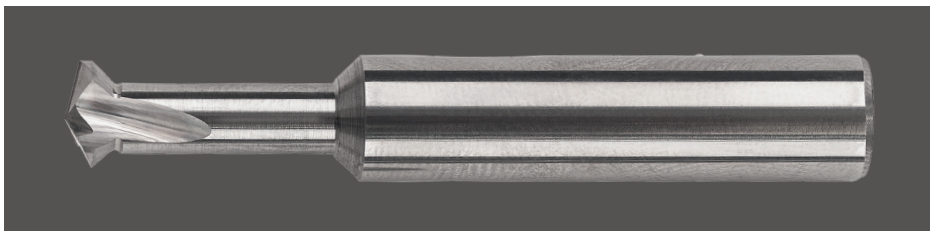
- Depth control guide (p. 56)

Design

Undercut façade drill bit with soldered in carbide blade and cylindrical shaft

Instructions for use

- Use according to approval and KEIL assembly instructions for anchors (p. 12). Please find documents with relevance to building regulations under www.keil-fixing.de/en/approvals.
- Adjust the insertion depth and monitor the life time of the façade drill bit with the aid of the depth control guide.
- For CNC machines.



h_s = Insertion depth [mm]	d = drill hole Ø cylindrical [mm]	drill hole Ø undercut [mm]	height undercut [mm]	drill-shaft Ø [mm]	variant	article no.
≤ 13	7	9	0.8	8	2 cutters	517 020 002
≤ 13	7	9	0.8	8	3 cutters	517 020 001
≤ 13	8	10	0.8	8	2 cutters square anchor	517 020 003

Application

see above

Accessories

see above

Design

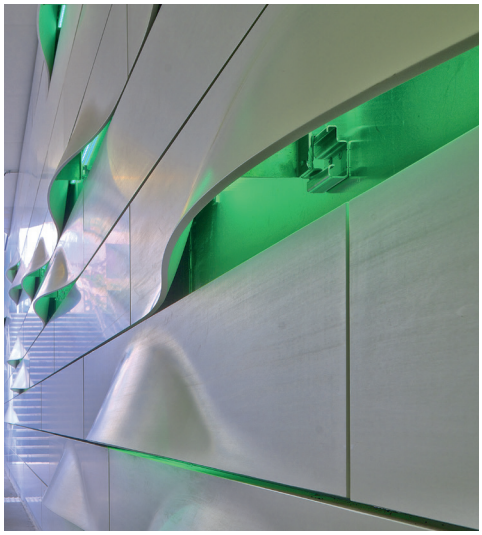
Full carbide undercut façade drill with cylindrical shaft

Instructions for use

see above

Silex 1, Lyon, FR © Kevin Dolmaire, AIA Architectes / Corian® Facade

Railway Station, Schwäbisch Gmünd, DE © Uwe Röder, Material: HI-MACS® - Design: preiswerk marek architekten - Engineering: 5D Engineering

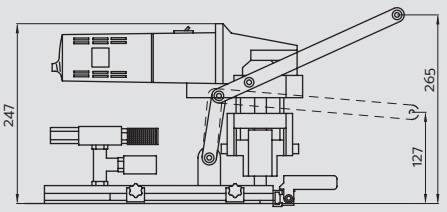


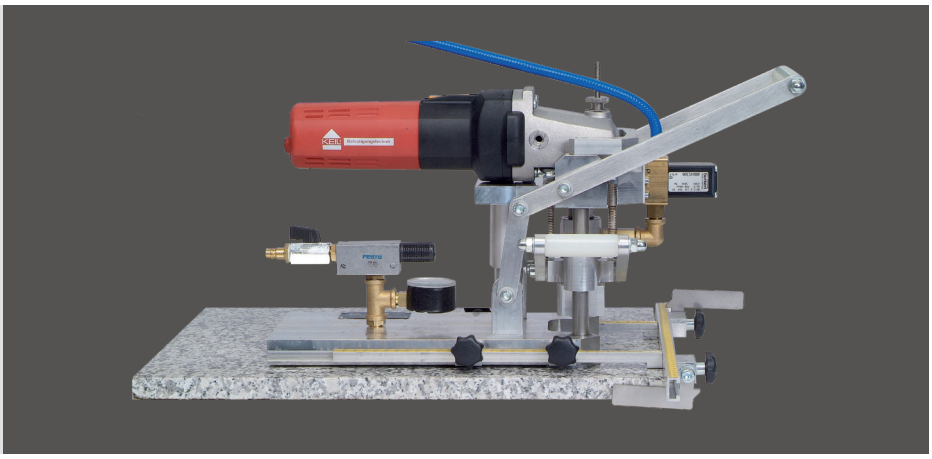
DRILLING TECHNIQUE

The comprehensive KEIL drilling technique consists of a full range of machinery for all kinds of application purposes, from handheld drilling machines up to industrial drilling and from drilling tables with roller conveyors to automatic drilling, machines, warranting an optimum and fast application of the KEIL system.

University of Swanse, Swansea, GB © Shakerley

PORTABLE DRILLING MACHINE KSDV





Product information

- KEIL portable drilling machines are used for professional and mobile drilling and undercutting of small batches, infill and special size panels.
- The portable drilling machine is placed in an optional position on the façade panel and firmly connected via the vacuum base.
- Exact positioning can also be achieved via stop rails.
- The KSDV portable drilling machine has been developed for **water cooled** drilling with KEIL diamond tipped façade drills.
- The simple handling is supported by the low weight of this handheld machine and allows for its use on the building site.
- Panels of any size or weight can be drilled efficiently and undercut precisely.

Volt	Hertz	PRCD	plug	article no.
230 V	50 Hz	yes	D	532 500 000
115 V	50–60 Hz	yes	EU	532 500 002

Applications
- For drilling and undercutting.

Possible usage
- With KEIL diamond tipped façade drills.

Fitting drilling tools
- Diamond tipped façade drill bit (p. 28, 32)
- Diamond tipped façade drill bit with countersink (p. 29, 33)
- Drilling table with roller conveyor KRT (p. 44)

Spare parts
- Chuck for portable drilling machines (p. 52)
- Flushing chuck for KSDV, KRDV (p. 52)
- Grooved ball bearing (p. 52)
- Silencer (p. 52)
- Fastener set 1 (p. 53)
- Gasket for vacuum base (p. 53)
- Carbon brush set (p. 53)

Design

CE

Portable undercut drilling machine with vacuum base
- Professional design
- Flushing chuck
- Drilling chuck
- Vacuum base
- Venturi nozzle
- PRCD
- Electrical water locking
- Stop rail

Instructions for use
- Rotational speed approx. 10,000 rpm.
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

ACCESSORIES KSDV

Water pressure tank

Mobile stainless steel pressure tank 10 l with manual pump and connection for pneumatic line (p. 48).

Circulation water supply

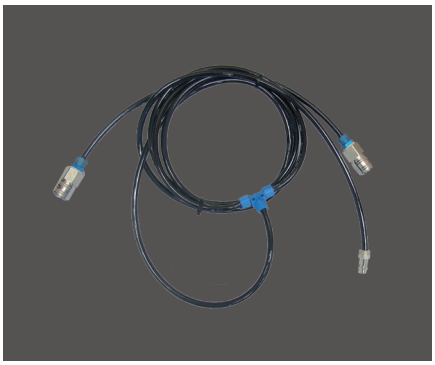
Circulation water supply for one / several KEIL undercut drilling machines (p. 48).

Cooling lubricant

Anticorrosive additive for cooling water (p. 49).

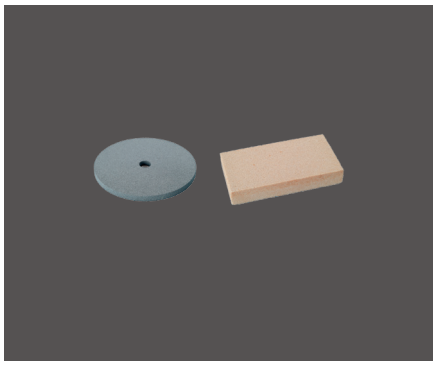
Transport case

Sturdy wooden case for transport and storage (p. 51).



Air connection

Connecting hose (T-piece) for the simultaneous connection of the water tank and and the machine to a compressed air supply (p. 49).

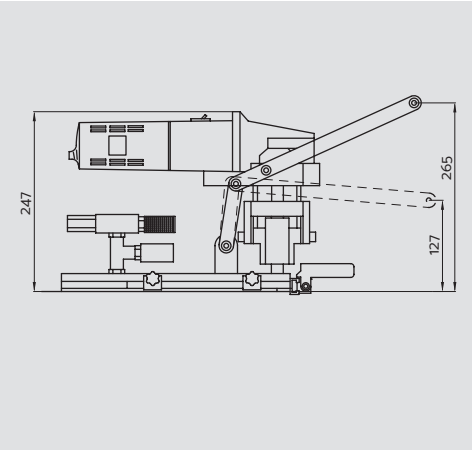


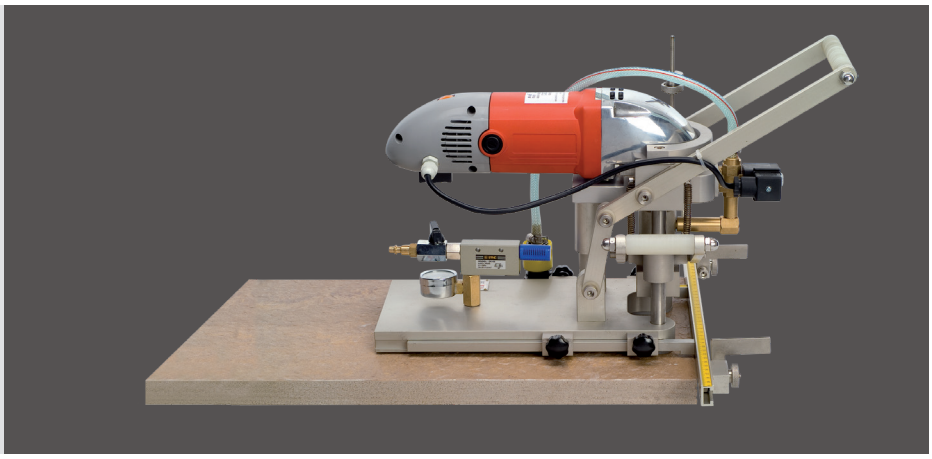
Whetstones

For whetting diamond tipped façade drill bits (p. 51).

Porcelanosa Showroom, Lyon, FR © Butech (Porcelanosa Group)

PORTABLE DRILLING MACHINE KRDV





Product information

- KEIL portable drilling machines are used for mobile drilling and undercutting of small batches, infill and special size panels.
- The portable drilling machine is placed in an optional position on the façade panel and firmly connected via the vacuum base.
- Exact positioning can also be achieved via stop rails.
- The KSDV portable drilling machine has been developed for **water cooled** drilling with KEIL diamond tipped façade drills.
- The simple handling is supported by the low weight of this handheld machine and allows for its use on the building site.
- Panels of any size or weight can be drilled efficiently and undercut precisely.

Volt	Hertz	PRCD	plug	article no.
230 V	50 Hz	yes	D	532 600 000
120 V	60 Hz	yes	USA	532 600 025

Applications
- For drilling and undercutting.

Possible usage
- With KEIL diamond tipped façade drills.

Fitting drilling tools
- Diamond tipped façade drill bit (p. 28, 32)
- Diamond tipped façade drill bit with countersink (p. 29, 33)
- Drilling table with roller conveyor KRT (p. 44)

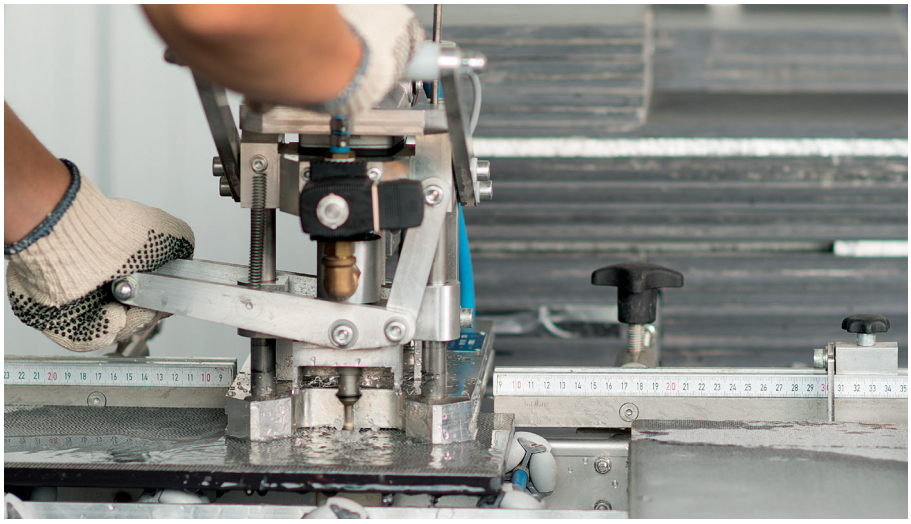
Spare parts
- Chuck for portable drilling machines (p. 52)
- Flushing chuck for KSDV, KRDV (p. 52)
- Grooved ball bearing (p. 52)
- Silencer (p. 52)
- Fastener set 1 (p. 53)
- Gasket for vacuum base (p. 53)
- Carbon brush set (p. 53)

Design

CE

Portable undercut drilling machine with vacuum base
- Flushing chuck
- Drilling chuck
- Vacuum base
- Venturi nozzle
- PRCD
- Electrical water locking
- Stop rail

Instructions for use
- Rotational speed adjustable up to approx. 6,500 rpm.
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.



ACCESSORIES KRDV

Water pressure tank

Mobile stainless steel pressure tank 10 l with manual pump and connection for pneumatic line (p. 48).

Circulation water supply

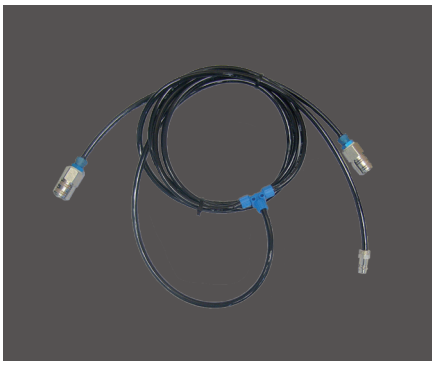
Circulation water supply for one / several KEIL undercut drilling machines (p. 48).

Cooling lubricant

Anticorrosive additive for cooling water (p. 49).

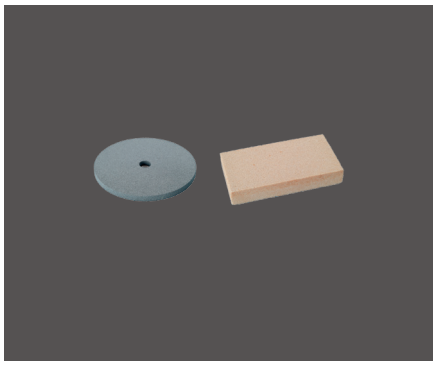
Transport case

Sturdy wooden case for transport and storage (p. 51).



Air connection

Connecting hose (T-piece) for the simultaneous connection of the water tank and and the machine to a compressed air supply (p. 49).

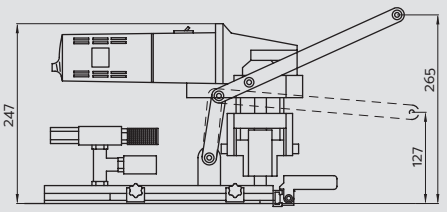


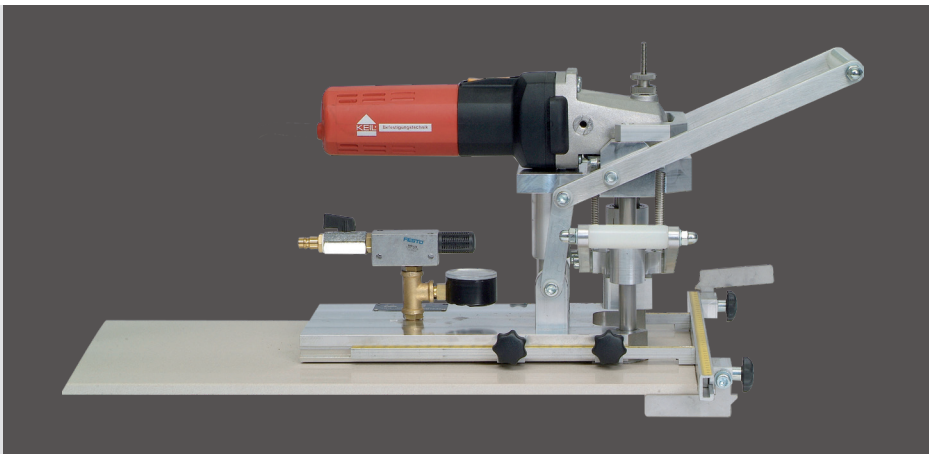
Whetstones

For whetting diamond tipped façade drill bits (p. 51).

Villa Wiese, Berlin, DE © Dirk Wilhelmy, Material: HI-MACS® - Design: Dipl.-Ing. Volker Wiese - Engineering: Kaden Klingbeil Architects - Fabrication: Kiebitzberg GmbH & Co.KG, Germany

PORTABLE DRILLING MACHINE KSHV





Product information

- KEIL portable drilling machines are used for professional and mobile drilling and undercutting of small batches, infill and special size panels.
- The portable drilling machine is placed in an optional position on the façade panel and firmly connected via the vacuum base.
- Exact positioning can also be achieved via stop rails.
- The KSDV portable drilling machine has been developed for dry drilling with KEIL carbide tipped façade drills.
- The simple handling is supported by the low weight of this handheld machine and allows for its use on the building site.
- Panels of any size or weight can be drilled efficiently and undercut precisely.

Volt	Hertz	plug	article no.
230 V	50 Hz	D	532 550 000
115 V	50–60 Hz	–	532 550 002

Application
- For drilling and undercutting

Possible usage
- With KEIL carbide tipped façade drill bits.

Fitting drilling tools
- Carbide tipped façade drill bit (p. 34)
- Drilling table with roller conveyor (p. 44)

Spare parts
- Chuck for portable drilling machines (p. 52)
- Grooved ball bearing (p. 52)
- Silencer (p. 52)
- Fastener set 1 (p. 53)
- Gasket for vacuum base (p. 53)
- Carbon brush set (p. 53)

Design

CE

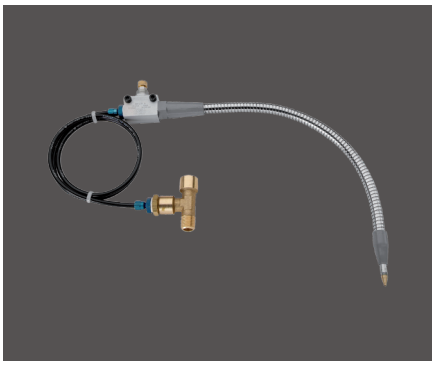
Portable undercut drill with vacuum base
- Professional design
- Chuck for dry drilling
- Vacuum base
- Venturi nozzle
- Stop rail

Instruction for use
- Rotational speed
  230 V: 1,400–4,200 rpm.
  115 V: 1,700–6,800 rpm.

ACCESSORIES KSHV

Transport case

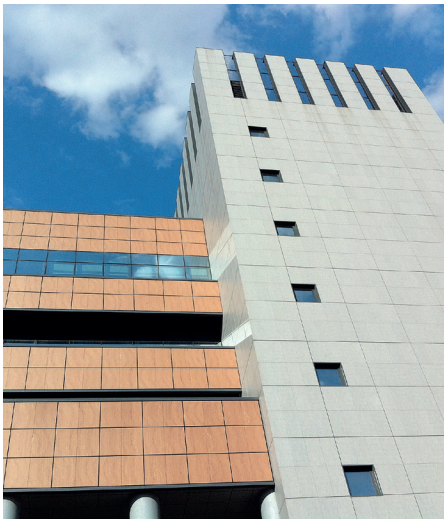
Sturdy wooden case for transport and storage (p. 51).



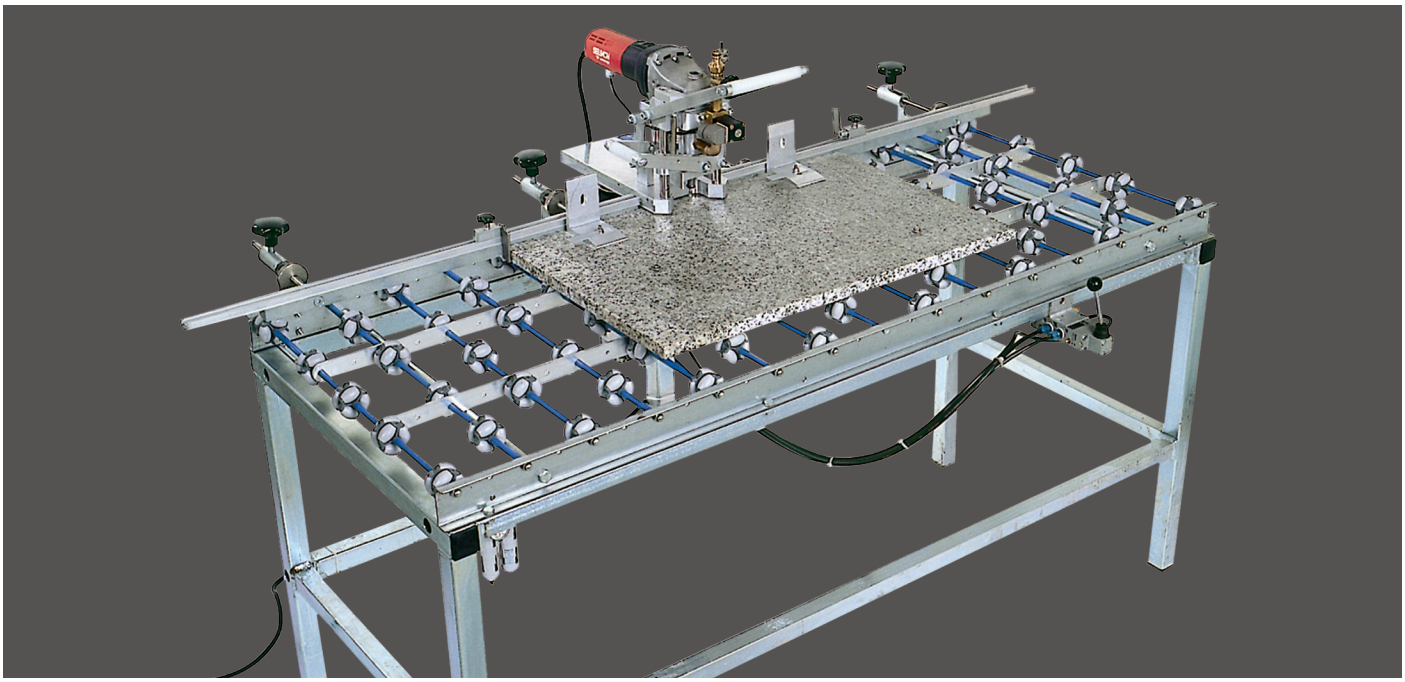
Blow out nozzle

Nozzle for air ejection with cooling effect during drilling (p. 49).

Porta Europa, Bologna, IT © KEIL



DRILLING TABLE WITH ROLLER CONVEYOR KRT



Product information

- Drilling machine for efficient drilling of KEIL undercut drill holes for use in the workshop or on the building site (total weight approx 90 kg). The multidirectional roller conveyor (1,500 mm x 600 mm) with pneumatic panel fixing equipment warrants very good handling, simple operation and fast conversion to another hole distance.
- Once the insertion depth h_S has been set, panels of different thicknesses can be drilled without further adjustments.
- The depth position of the undercut hole can be chosen in consistence with either the front or the back side of the panel. For undercut drillings in consistence with the front side of the panel the conversion set for front face related must be fitted.
- The portable undercut drilling machine can be disassembled and used with the vacuum base (without roller conveyor).
- Feet adjustable in height
- Machine can be used separately
- Max. panel format 1,200 x 600 mm

Volt	Hertz	PRCD	plug	article no.
230 V	50 Hz	yes	D	532 500 201
115 V	50–60 Hz	on demand		

Application
- For drilling and undercutting.

Possible usage
- With KEIL diamond tipped façade drill bits.

Fitting drilling tools
- Diamond tipped façade drill bit (p. 28, 32)
- Diamond tipped façade drill bit with countersink (p. 29, 33)
- Carbide tipped façade drill bit HM (p. 34)
- Portable drilling machine KRDV (p. 40)
- Portable drilling machine KSHV (p. 42)

Spare parts
- Chuck for portable drilling machines (p. 52)
- Flushing chuck for KSDV, KRDV (p. 52)
- Grooved ball bearing (p. 52)
- Fastener set 1 (p. 53)
- Carbon brush set (p. 53)

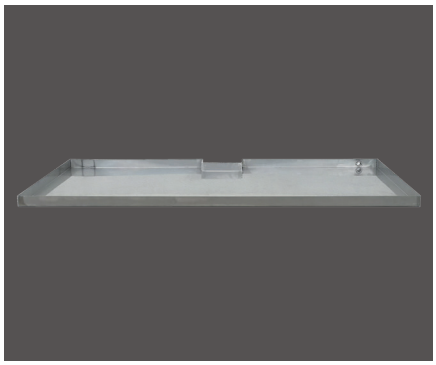
Design

CE

Drilling table with multidirectional roller conveyor 1,500 mm x 600 mm incl. portable undercut drilling machine KSDV
- Stainless steel
- With pneumatic panel fixing (manual control)
- 2 stop rails
- 4 swivelling stops
- Service unit
- Max. edge distance of drill hole in y = 150 mm
- Wooden crate

Instructions for use
- Rotational speed approx. 10,000 rpm.
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the parts covered in cooling water from corrosion.

ACCESSORIES DRILLING TABLE WITH ROLLER CONVEYOR KRT



Collection basin

Basin for collecting the cooling water (p. 48).

Circulation water supply

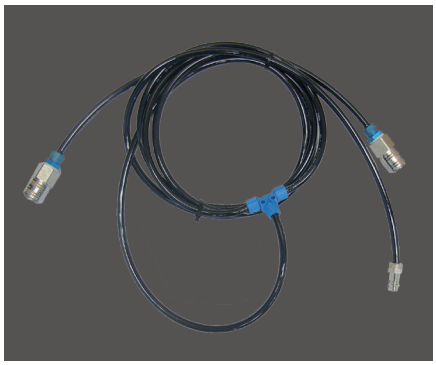
Circulation water supply for one / several KEIL undercut drilling machines (p. 48).

Cooling lubricant

Anticorrosive additive for cooling water (p. 49).

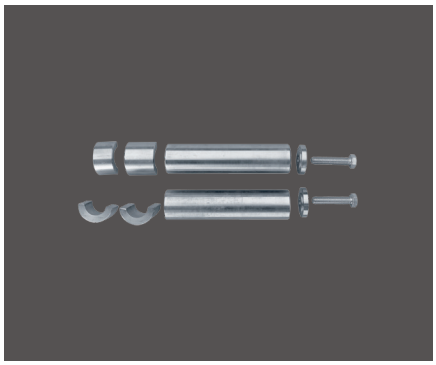
Water pressure tank

Mobile stainless steel pressure tank 10 l with manual pump and connection for pneumatic line (p. 48).



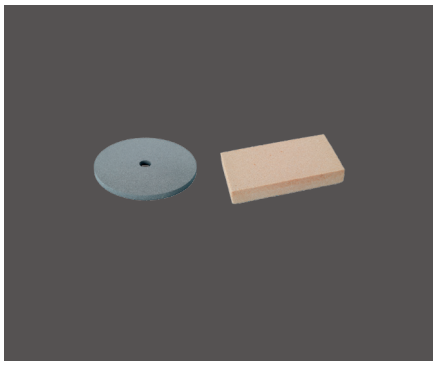
Air connection

Connecting hose (T-piece) for the simultaneous connection of the water tank and and the machine to a compressed air supply (p. 49).



Conversion set KRT “Front face related drilling“

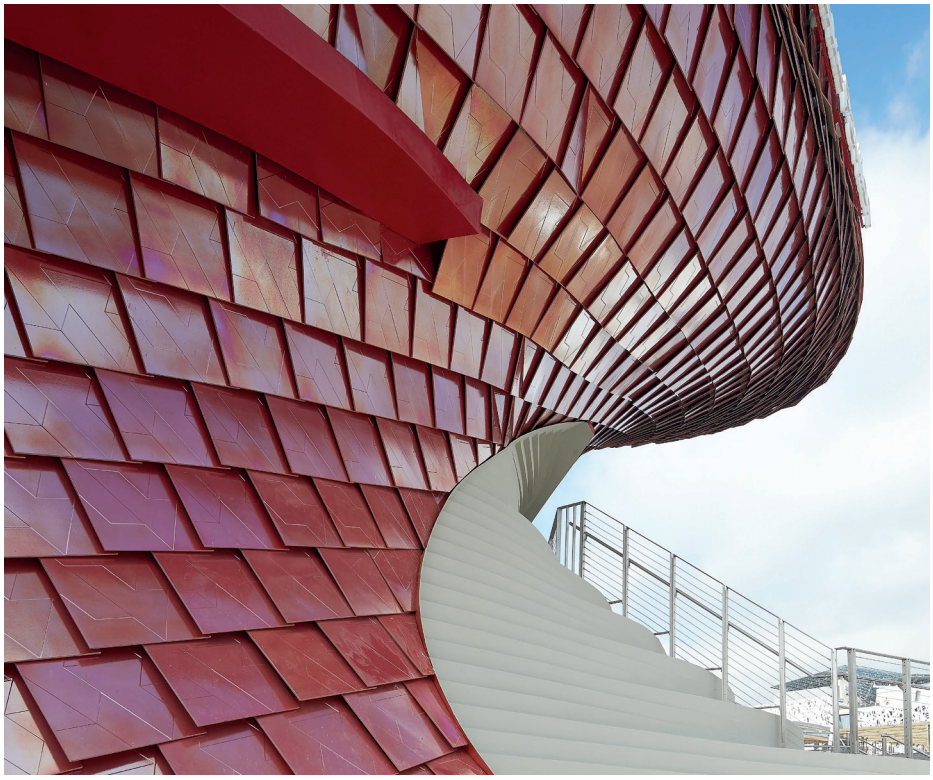
(p. 49).



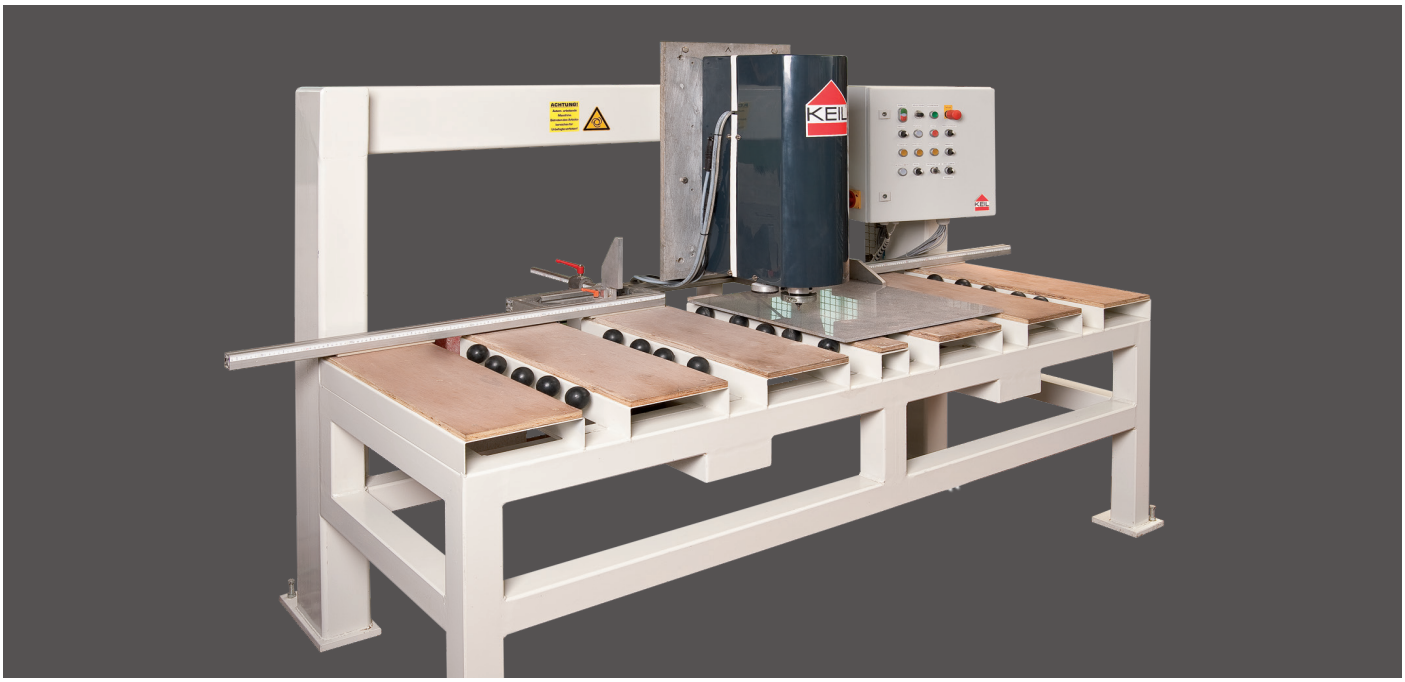
Whetstones

For whetting diamond tipped façade drill bits (p. 51).

Vanke Pavilion (EXPO 2015), Mailand, IT © Hufton + Crow, Studio Libeskind



AUTOMATIC DRILLING MACHINE TYPE KG



Product information

- KEIL offers automated drilling machines for automated drilling and undercutting with KEIL undercut technique in cooperation with renowned machine manufacturers.
- The individual customer request regarding computer assistance, panel size, automatic panel transport and so on forms the basis of the design of your machine.
- Best handling of the panels to be worked.
- Materials like natural stone, ceramics, laminate (HPL), fibre cement, glass etc. can be worked (max. panel size e.g. 3,500 mm x 1,800 mm).
- The simultaneous processing of two panels warrants efficient working conditions. While the drillings are being carried out all-automatically in panel 1, panel 2 can be checked and re-edited. Simple programming of the drilling patterns.

article no.
532 200 050

Design by arrangement.

Application
- For drilling and undercutting.

Possible usage
- With KEIL diamond tipped façade drill bits.

Fitting drilling tools
- Diamond tipped façade drill bit (p. 28, 32)
- Diamond tipped façade drill bit with countersink (p. 29, 33)

Spare parts
- Fastener set 1 (p. 53)

Design

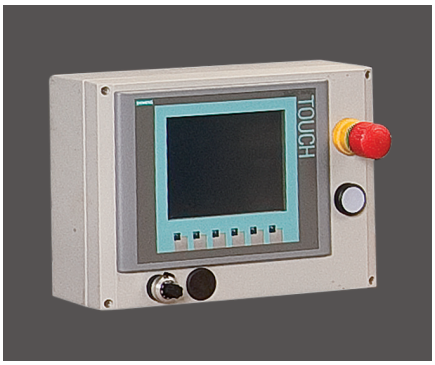
CE

Automatic driling machine for undercut drilling.
- Customized table size / panel size.
- Incl. rack.
- Incl. bridge.
- Available with one or two KEIL undercut units.
- Programmable logic controller (SPS)
- Positioning accuracy approx. +/- 0.2 mm
- Consistant distance from front or back side of the panel.

ACCESSORIES AUTOMATIC DRILLING PLANT TYPE KG

Drilling unit KG

For Drilling plants incl. water supply and pneumatic drill feed (p. 50).



Control drill unit KG

SPS control incl. touchpanel and frequency converter for drilling unit KG (p. 50).

Circulation water supply

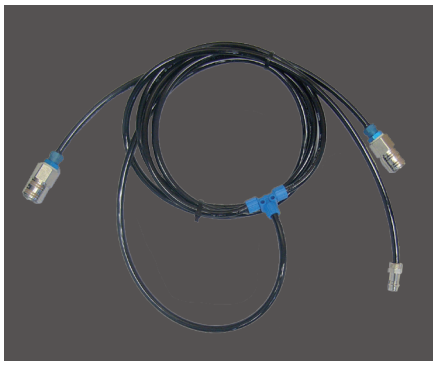
Circulation water supply for one / several KEIL undercut drilling machines (p. 48).

Cooling lubricant

Anticorrosive additive for cooling water (p. 49).

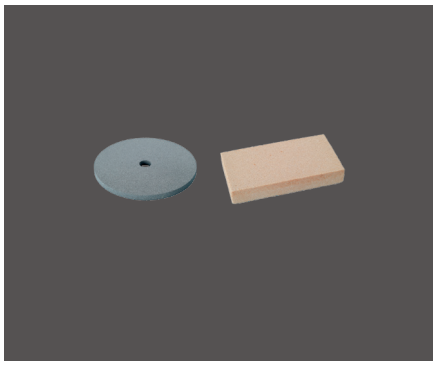
Water pressure tank

Mobile stainless steel pressure tank 10 l with manual pump and connection for pneumatic line (p. 48).



Air connection

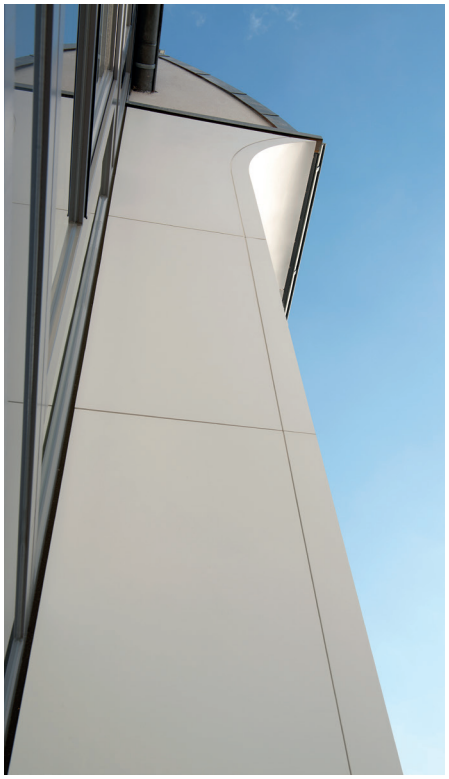
Connecting hose (T-piece) for the simultaneous connection of the water tank and and the machine to a compressed air supply (p. 49).



Whetstones

For whetting diamond tipped façade drill bits (p. 51).

Photos: Ice Loft, Hamburg, DE © see p. 63



MACHINE ACCESSORIES

Circulation water supply

Product information

The stainless steel water container with two chambers collects the cooling water and returns it to the system with steady pressure ready for drilling and undercutting with diamond tipped façade drill bits.

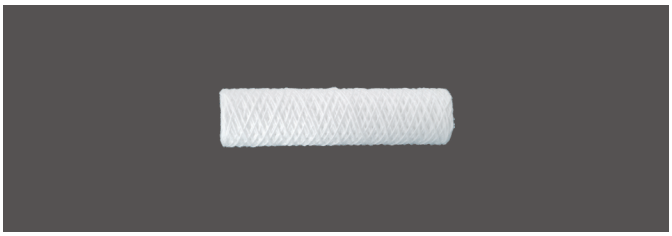
- The bore dust will settle due to the two chamber system. The filter makes clean cooling water available at all times. The filter control will indicate, if the filter needs cleaning resp. changing.
- The strong, industrial pump will ensure a constant supply pressure, even if several drilling machines are connected.
- Usage of the cooling lubricant 532 500 035 will prolong the life time of the diamond tipped façade drill bit significantly and protect the metal parts covered in cooling water from corrosion.

Volt	Hertz	article no.
400 V, 3~	50 Hz	532 800 010

Usage
- Circulation water supply for one / several KEIL undercut drilling machines.

Design
- Stainless steel two-chamber water container
- Strong industrial pump
- Filter control
- incl. Fu switch and Y connector

Filter cartridge



suitable for	article no.
circulation water supply	532 870 020

Possible applications
- Filter for the circulation water supply

Water pressure tank

Product information

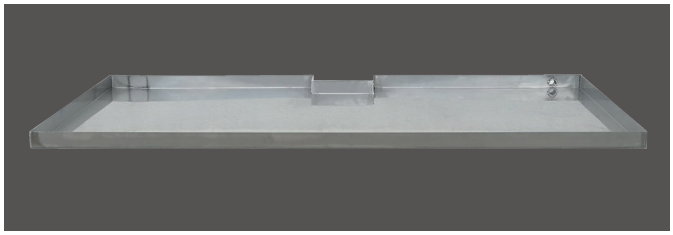
- Portable stainless steel pressure tank for the cooling water supply during drilling and undercutting with diamond tipped façade drill bits.
- The tank can not only be connected to the manual pump, but also to a compressed air supply, keeping the water pressure constant from the first up to the last drop.
- Water pressure should be set to more than 4 bar.

suitable for	article no.
KSDV / KRDV / KRT	532 500 032

Usage
- Circulation water supply for one KEIL undercut drilling machine.

Design
- Portable stainless steel pressure tank 10 l
- With manual pump and connector for pneumatic line.

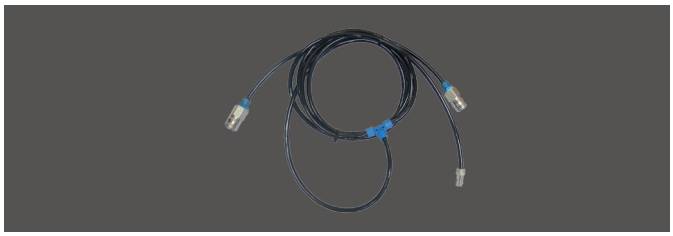
Collecting tray for KRT



suitable for	article no.
KRT	532 800 027

Design
- Tray for collecting the cooling water.
- Stainless steel.
- Dimensions: 1,420 x 655 x 40 mm
- With hose connector.

Air connector

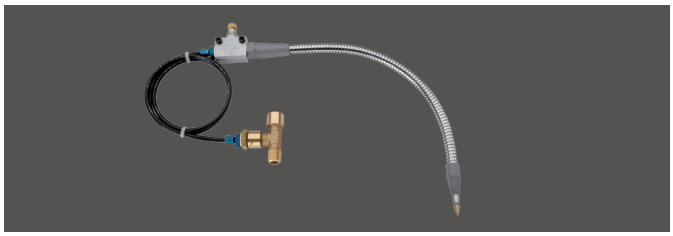


suitable for	article no.
1 x 532 500 032	532 800 023

Usage
- Connecting hose (T-piece) for simultaneously connecting a water tank and a machine to a compressed air supply.

Design
- Compressed air hoses with T-piece, 2 clutches and one plug

Blow out nozzle for KSHV



suitable for	article no.
KSHV	532 500 106

Usage
- Nozzle for air ejection with cooling effect during drilling

Design
- Flexibly adjustable nozzle head.
- Control for discharge pressure.

Cooling lubricant

Product information

- KEIL recommend usage of cooling lubricant in addition to the cooling water. This is an anticorrosive additive, which is added to the cooling water (approx. 2 %)

Advantages:
- The machine parts covered in cooling water are protected from corrosion, which can siginficantly prolong the lifetime of the diamond tipped façade drill bits, especially when used for very hard and dense panel materials (e.g. fine porcelain stoneware).

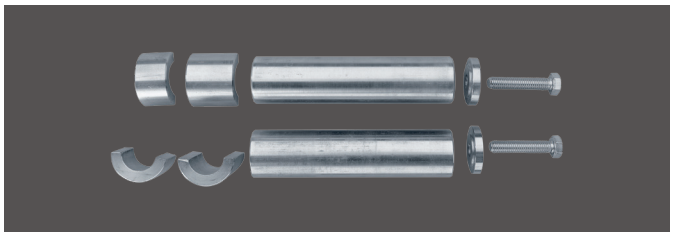
variant	article no.
5 l	532 500 035

Usage
- Anticorrosive additive for cooling water.

Design
- SK 88

Instructions for use
- Check the tolerance of the cooling lubricant to the panel material before use.

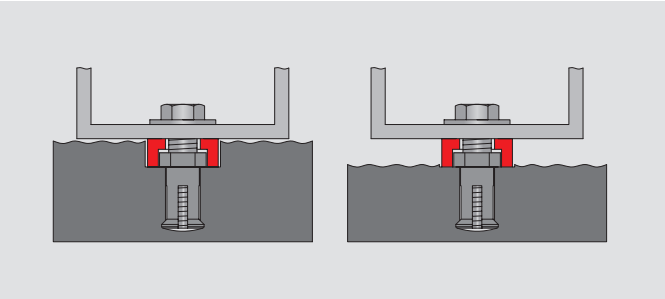
Conversion set KRT "Front face related drilling"



suitable for	article no.
KRT	532 500 135

Design
- For panel thicknesses 20 and 30 mm.

Note
- Necessary for front face related drilling for balancing tolerances in panel thickness with the KEIL drilling table with roller conveyor KRT.



MACHINE ACCESSORIES

Drilling unit KG

Volt	Hertz	article no.
230 V, 3~	37.5–150 Hz	532 200 055

Usage
- For drilling and undercutting.

Possible applications
- With KEIL diamond tipped façade drill bits.

Instructions for use
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the metal parts covered in cooling water from corrosion.

Design
- For automatic drilling machines incl. water supply and pneumatic drill feed.
- Dimensions: 220 x 690 x 400 mm

Notes
- 2,100–8,730 rpm. (HM approx. 2,100 rpm; Dia approx. 7,000 rpm.)
- Driven via frequency converter (not included in delivery).

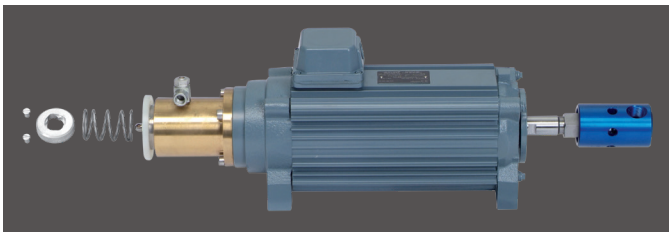
Control for drilling unit KG

suitable for	article no.
1 x 532 200 055	532 200 051
2 x 532 200 055	532 200 052

Usage
- SPS control incl. touch panel and frequency converter for drilling unit KG.

Design
- For controlling the drilling unit KG.

Undercut unit HSE



Product information
- The KEIL undercut unit for drilling plants is the optimal automated unit for drilling and undercutting.
- Nearly all available drilling and milling systems can be retrofitted with this unit.
- The undercut unit will receive the diamond or carbide tipped façade drill bit, depending on the panel material.
- As soon as the preselected drilling depth has been reached, the drill head will be pneumatically deflected for undercutting. When the diamond tipped façade drill bit is in use, water will be supplied centrally through the shaft.
- The KEIL undercut unit is carried by the carriage of the machine with frequency controlled engine, allowing for the egine's rotational speed to be adjusted to drilling with the carbide tipped façade drill bit (approx. 2,000 rpm) or with the diamond tipped façade drill bit (approx. 7,000 rpm).

Volt	Hertz	article no.
230 V, 3~	37.5–150 Hz	532 200 023

Usage
- For drilling and undercutting

Possible applications
- With KEIL diamond tipped façade drill bits.

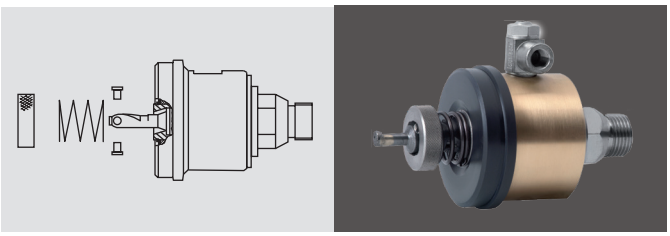
Suitable drilling tools
- Diamond tipped façade drill bit (p. 28, 32)
- Diamond tipped façade drill bit with countersink (p. 29, 33)

Spare parts
- Chuck HSE
- Flushing head HSE
- Fastener set 2
- Fastener set 3

Design
- For drilling plants with flushing chuck
- Dimensions: 500 x 110 x 170 mm

Notes
- 2,100–8,730 rpm.
- Driven by frequency converter (not included in delivery)

Chuck P



Product information

- The chuck can be attached to any available drilling or milling plant (mount according to customer's demand).
- Several connection requirements have to be fulfilled for the KEIL chuck P with pneumatic deflection to be mounted to existing machines.
- The rotational speed of the shaft must be appox. 6,000–7,000 rpm. for water cooled drilling with the diamond tipped façade drill bit and approx. 2,000 rpm for drilling with the carbide tipped façade drill bit. Bearing at zero clearance and flawless running of the dill shaft are requirements for a precise undercut and a long lifetime of the façade drill bits. Locking in the different feed directions is required as well.
- For drilling with the diamond tipped façade drill bit, water is supplied through the drill shaft (water pressure > 4 bar). We recommend the use of a water filter in order to avoid possible water outages, which may lead to unsoldering of the diamond surface.

To be carried out by the customer:
- Screwing chuck in or inserting it into the collet chuck.
- Mounting spin-lock for chuck.
- The chuck can be controlled either mechanically or programme controlled, depending on the machine. For the mechanical control, a KEIL pneumatic unit has to be mounted, which is controlled by an end switch for starting the undercutting process.

variant	article no.
R 1/2"	581 000 023

Usage
- For drilling and undercutting.

Possible applications
- With diamond tipped KEIL façade drill bits.

Instructions for use
- Usage of the cooling lubricant 532 500 035 (p. 49) will prolong the life time of the diamond tipped façade drill bit significantly and protect the metal parts covered in cooling water from corrosion.

Accessories
- Fastener set 2 (p. 53)
- Fastener set 3 (p. 53)

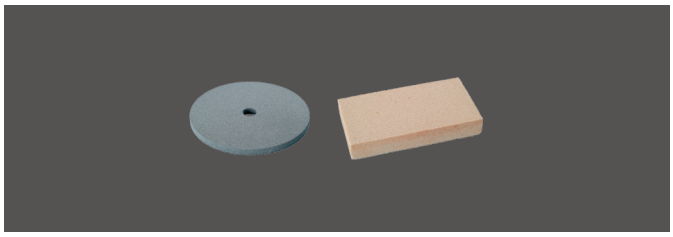
Design
- Chuck for mounting to suitable drilling / milling / CNC machines.
- Pneumatic deflection of the façade drill bit.
- Drive R 1/2"
- Water supply through shaft
- For drilling plants
- With integrated support and throttle check valve.
- Façade drill bit not included.

Transport case for KSDV, KSHV, KRDV

suitable for	article no.
KSDV / KSHV / KRDV	532 500 120

Application
- Sturdy wooden case for transport and storage.

Whetstones



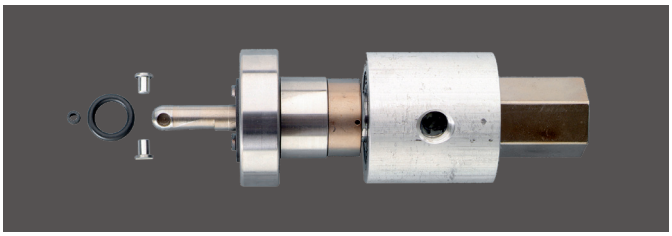
variant	suitable for	article no.
Ø 175 x 10	e.g. fine porcelain stoneware	532 110 351
155 x 82 x 25	e.g. natural stone	532 110 352

Application
- For whetting diamond tipped façaded drill bits.

Main Point Karlin, Prag, CZ, Ditz Fejer © Rieder Group

SPARE PARTS

Chuck for portable drilling machines

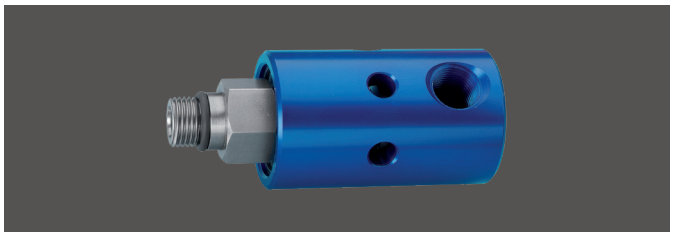


suitable for	variant	thread/ connection	article no.
KSDV		M14	581 000 017
KSHV		M14	581 000 018
KSDV	replacement chuck	M14	581 000 028
KRDV	replacement chuck	M14	581 600 028

Possible applications

- Chuck with / without flushing chuck for use in KEIL portable drilling machines.

Flushing chuck for undercut unit HSE

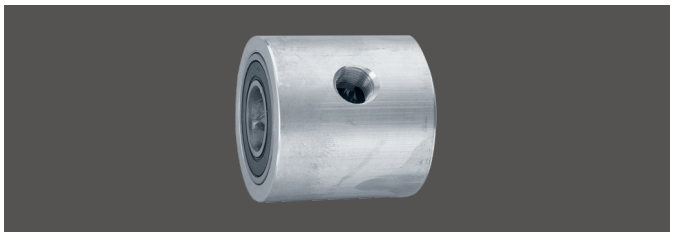


suitable for	article no.
undercut unit HSE	581 000 026

Possible applications

- Flushing chuck for undercut unit

Flushing chuck for KSDV, KRDV

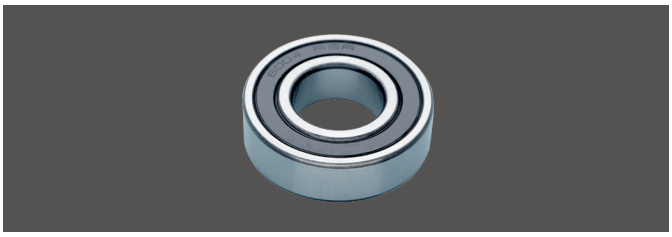


suitable for	article no.
chuck KSDV / KRDV	581 000 012

Possible applications

- Flushing chuck for undercut units

Grooved ball bearing

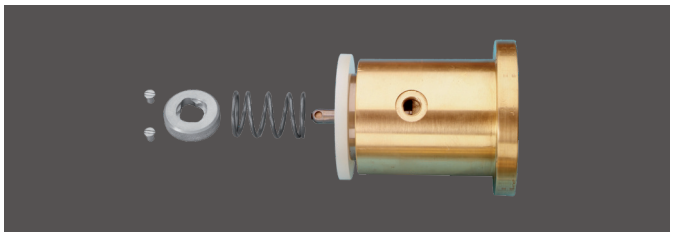


article no.
581 001 320

Possible application

- Undercut bearing for chuck unit

Chuck for undercut unit HSE

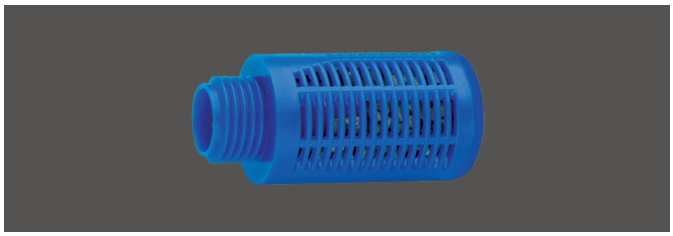


suitable for	thread/ connection	article no.
undercut unit HSE	cone MK1	581 000 020

Possible applications

- Pneumatic chuck for use in KEIL undercut unit.

Silencer



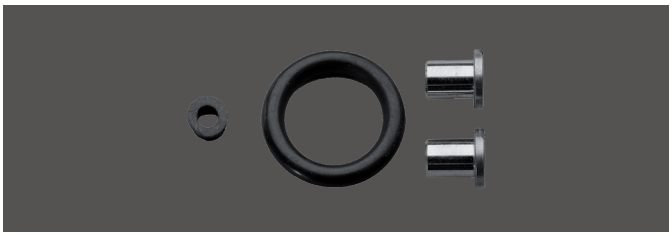
suitable for	article no.
KSDV	532 500 059

Possible applications

- For venturi nozzles.

SPARE PARTS

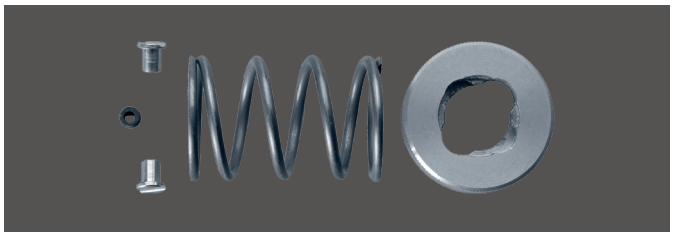
Fastener set 1



article no.
585 900 001

Possible applications
- For KEIL façade drill bits.

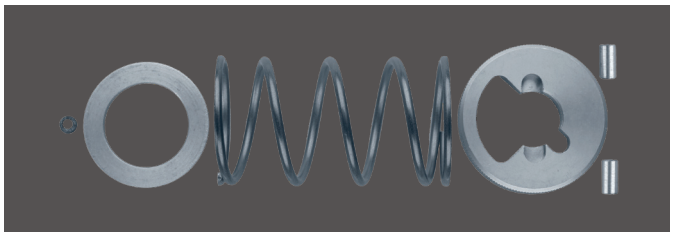
Fastener set 2



article no.
585 900 002

Possible applications
- For KEIL façade drill bits without countersink in chuck P for HSE.

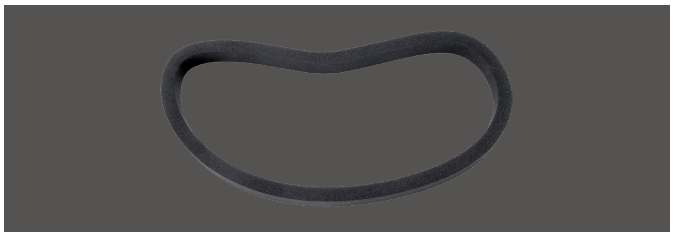
Fastener set 3



article no.
585 900 003

Possible applicatons
- For KEIL façade drill bits with countersink in chuck P for HSE.

Gasket for vacuum base

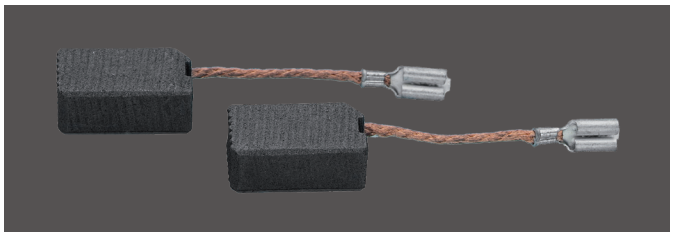


suitable for	variant	article no.
KSDV / KSHV / KRDV	735	532 500 108
KSDV / KSHV	600	532 500 110

Possible applications
- Portable machines with vacuum base.

Note
- 735 = default
- 600 = inner groove

Carbon brush set



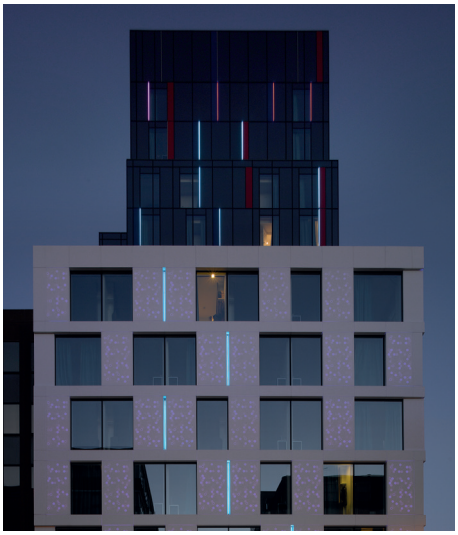
suitable for	Volt	Hertz	article no.
KSDV	230 V	50 Hz	532 500 040
KRDV	230 V	50–60 Hz	532 600 040
KRDV	120 V	60 Hz	532 600 042

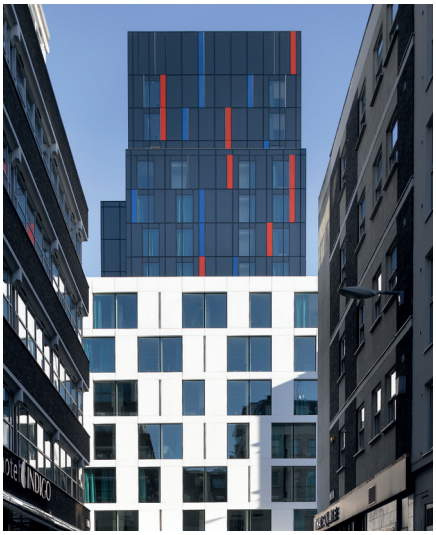
Possible applications
- Replacement carbon brushes for portable drilling machines

Note
- Please always state machine type with order.

Museum of Liverpool, Liverpool, GB © Vincent Phillips

Motel One, London, GB © Nick Kane 2015



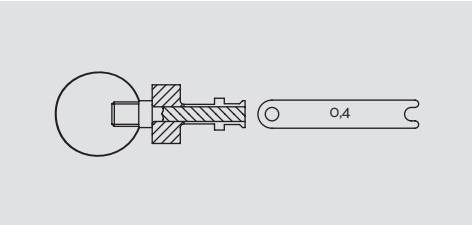


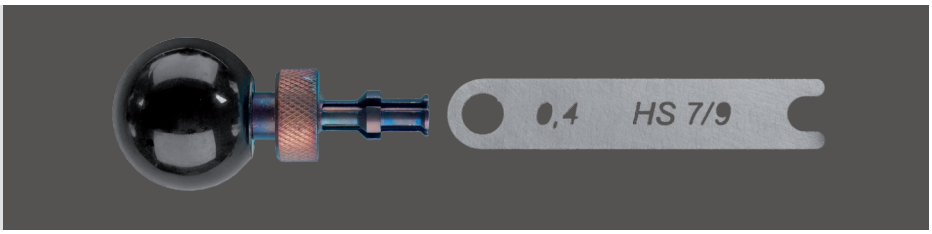
ASSEMBLY AIDS

Our range of KEIL assembly aids offers measuring devices such as depth control guides and feeler gauges for controlling the drill hole geometry as well as screw drivers, torque wrenches, tool sets and further carefully selected work and machine accessories.

College Of Business Studies PAAET, Kuwait, KW © Imola Tecnica s.r.l.

DEPTH CONTROL GUIDE





Product information

Checking the undercut hole

- With this measuring device all significant dimensions of the drill hole are inspected, the insertion depth is set and the life time of the façade drill bit is monitored. Every KEIL undercut anchor has its own depth control guide with feeler gauge.

h_s = insertion depth [mm]	D1 = drill hole Ø [mm]	h_z = [mm]	article no.
4.0	7.0	0.5	585 100 040
5.5	7.0	0.8	585 100 055
7.0	7.0	0.8	585 100 070
8.0*	8.0	0.5	585 100 080
8.5	7.0	0.8	585 100 085
10.0	7.0	0.8	585 100 100
11.5	7.0	0.8	585 100 115
13.0	7.0	0.8	585 100 130
15	7.0	1.3	585 100 150
20.0	9.0	1.5	585 102 200

Usage
- Inspection of the undercut hole.
- Monitoring of the life time of the façade drill bits.

Possible applications
- Depth control guide fitting for the insertion depth of the undercut anchor.

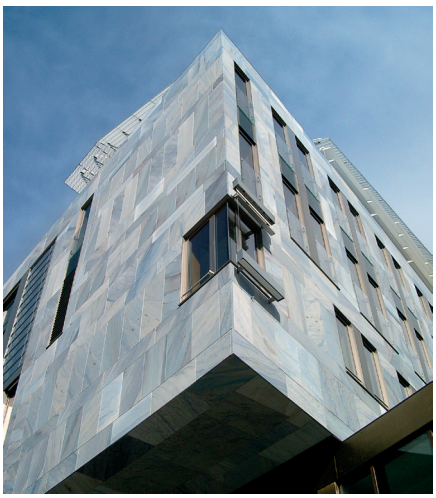
Accessories
- Washer for depth control guide (p. 59)

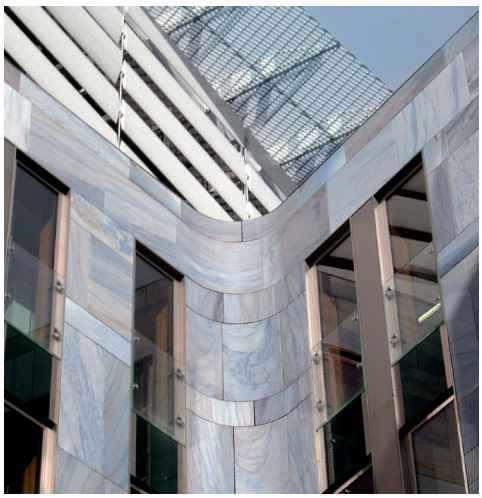
Design
Depth control guide with feeler gauge

Note
- For measuring undercut holes in uneven panel back sides we recommend using the 3 mm washer in combination with a 3 mm longer depth control guide.
- * depth control guide for square anchor

Instructions for use
- Use according to inspection instruction and according to approval and depth control guide information. (p. 57)

Nord LB, Magdeburg, DE © KEIL

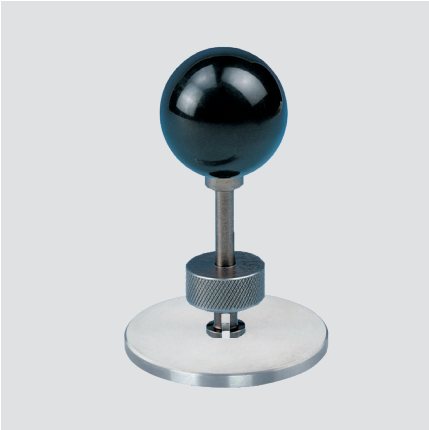




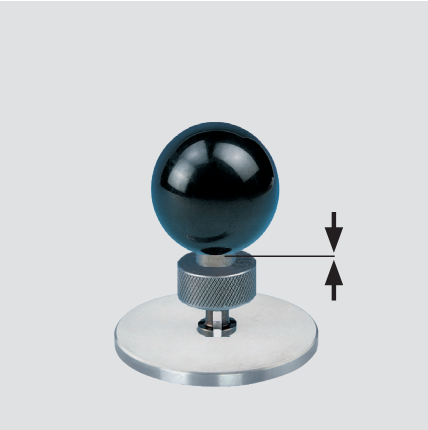
DEPTH CONTROL GUIDE

Inspection of the undercut hole

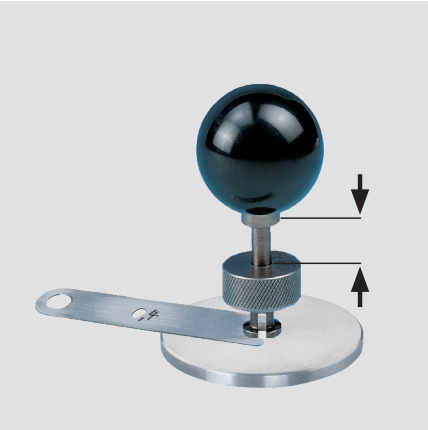
For inspecting all significant dimensions of the drill hole, setting the insertion depth and monitoring the life time of the façade drill bits. Every KEIL undercut anchor has its own depth control guide with feeler gauge.



Place base of depth control guide in undercut drill hole.

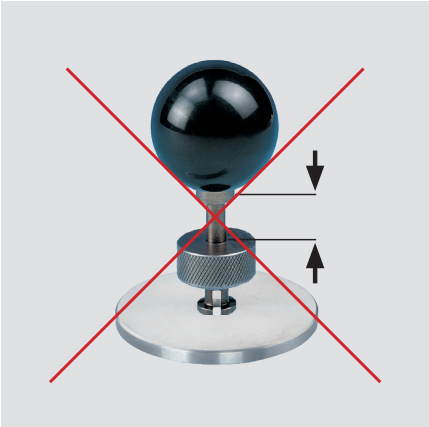


Inspection 1: insert bolt to stop.



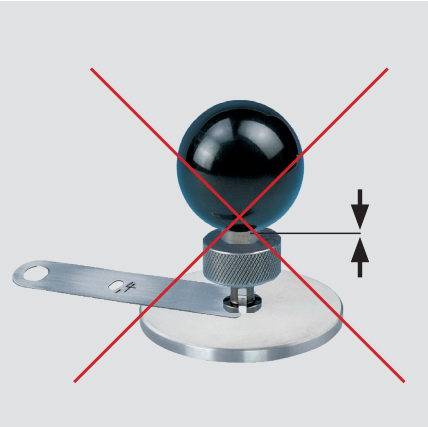
Inspection 2: push in feeler gauge between panel and depth control guide base. If the bolt now **cannot** be pushed in to the base, the drill hole is in order.

Not properly executed drillings



Depth control guide cannot be inserted without feeler gauge.

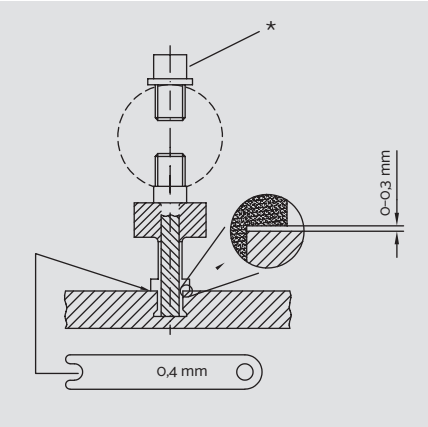
Error:
Drill hole too deep or lack of undercut.



Depth control guide can be pushed to stop although feeler gauge has been inserted.

Error:
Drill hole not deep enough.

Depth control guide geometry



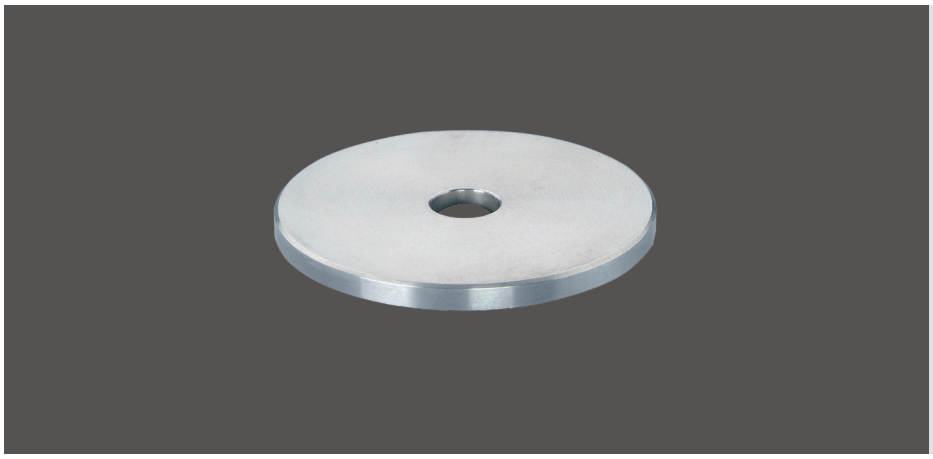
*optional tester for max. cylindrical drill hole diameter (alternatively internal cylindrical gauge)

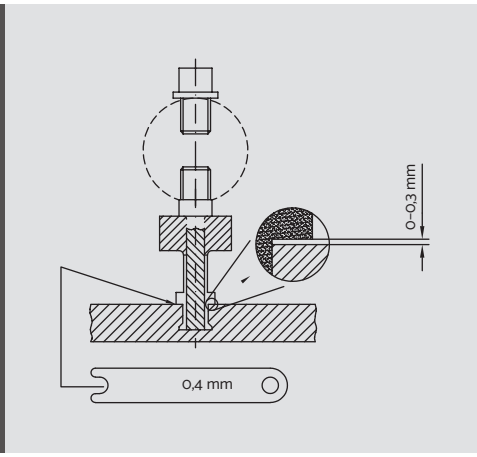
Control of depth control guide (simple and fast control by user)

- Monitoring of the undercut diameter via fitted hole in the sensor.
- Insert base of depth control guide into the fitted hole in the sensor.
- Push in bolt to stop.
- If the depth control guide can now be pulled out of the drill hole, it will need to be replaced.

0,4 HS 7 / 9

WASHER FOR DEPTH CONTROL GUIDE





article no.
585 100 001

Usage

- In connection with depth control guide (h_S + 3 mm)

Possible applications

- For façade panels with textured back sides

Design

Stainless steel washer for depth control guide

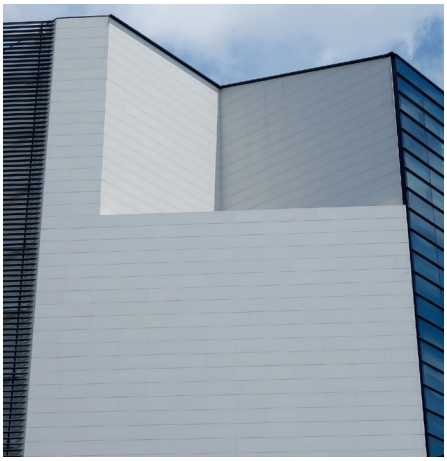
- Thickness 3 mm, Ø 40 mm

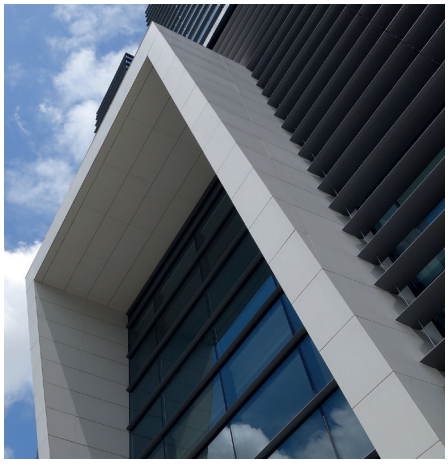
Product information

- For textured back sides of façade panels (e.g. made of ceramics). The washer generates a reference surface for setting the insertion depth h_S.
- As the washer is 3 mm thick, a bigger depth control guide with a 3 mm longer insertion depth needs to be employed.
- The measuring process for the inspection of the undercut hole will proceed as described for the depth control guide, placing the feeler gauge between washer and depth control guide.

Example:
For an insertion depth of h_{SP} = 7 mm within the panel using the 3 mm washer, a depth control guide with an insertion depth h_S = 10 mm needs to be employed.

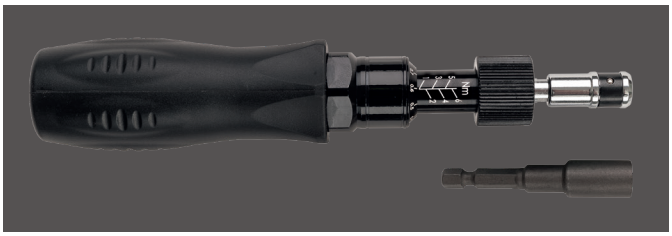
Tribunal Judicial de Base, Macau © MCM





ASSEMBLY AIDS

Torque wrench 1–6 Nm

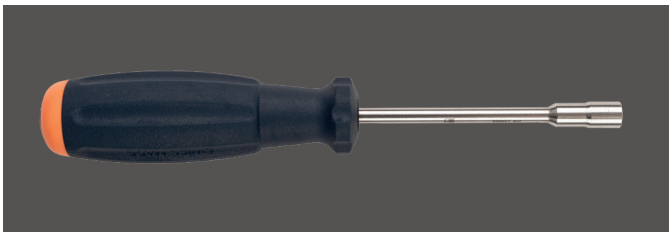


article no.
585 300 122

Application
- For the assembly with controlled torque value.
- According to approval 2.5–4 Nm

Design
- With adjusting scale
- SW 8
- With hex wrench socket

Torque screwdriver 3.0 Nm



article no.
585 300 121

Application
- For the assembly with controlled torque value

Accessories
- Wrench sockets DIN 3126 E6.3 (p. 61)

Design
- With replacement bit 6.3 (1/4" bit holder)
- Power grip with non-slip surface
- Preset torque value 3.0 Nm

Cordless screw driver with controlled torque value

Product information

- The General Building Approval and the European Technical Assessment (Approval) amongst other things regulate the tightening torque of the screws for the assembly of the KEIL undercut anchors. Their demands are as follows: "The assembly of the anchor must be carried out with only one screwdriver, which has to be set to a tightening torque of 2.5 Nm ≤ T_{inst} ≤ 4.0 Nm"
- This assembly with controlled torque value is possible with appropriately equipped cordless screwdrivers. Those should have verifyable machine and process capability.
- Suppliers for screwdrivers of this sort, also with preset torque value, can be provided upon request.

Explanations on the torque value

Basically, the KEIL undercut anchor is an anchor with a "displacement-controlled assembly". For the segments to fit snugly into the undercut, they have to be "folded out" with the aid of a screw or a threaded pin. The high assembly safety of the KEIL system is demonstrated by the fact that this is only possible with correctly undercut drillings. A restriction of the tightening torque value will ensure that mistakes are recognized even for incorrect drillings or too short undercut anchors and that the assembly will be safe at all times.

Tool set

article	spanner gap
tool set consisting of:	
special open-ended spanner	SW 9
screwdriver with 1/4" holder	
wrench socket, DIN 3126 E6.3	SW 8
wrench socket, DIN 3126 E6.3	SW 10
screw driver bit	SW 3
screw driver bit	TX 30
Allen key	SW 3

article no.: 585 300 200

Design

special open-ended spanner
- flat open-endes spanner for anchor assembly

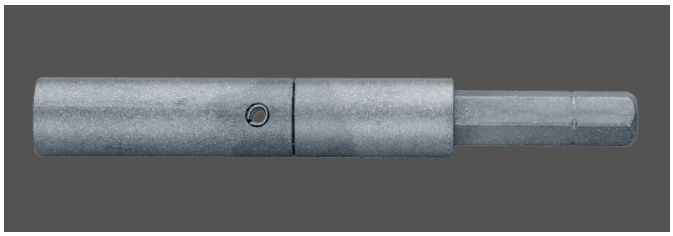
Screw driver with 1/4" holder
- With telescopic blade
- Quick release holder
- With three-component handle

Wrench socket, DIN 3126 E6.3
- For hex bolds and nuts

Screw driver bit
- Drive DIN 3126 C6,3
- For threaded pins resp. anchor screws

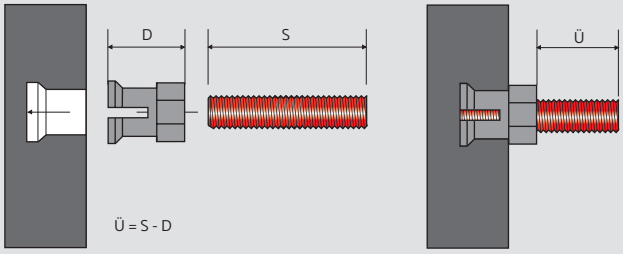
Allen key
- DIN 911
- For threaded pins

Screw-in tool for stud bolts



Product information

- The screw-in tool limits the scew-in depth of a threaded pin into an undercut anchor.
- The threaded pin is inserted into the tool and screwed into the undercut anchor up to the stop.
- The integrated hinge in the screw-in tool ensures that the threaded pin remains in position in the undercut anchor when the tool is unscrewedf from the pin.
- This ensures that the threaded pin is mounted flush with the tip of the undercut anchor. The correct screw-in depth has to be monitored.
- The individual protrusion has to be determined for every combination of undercut anchor and threaded pin length.
- For further information please refer to the assembly instructions.



variant	article no.
Ü up to 18	585 300 010
Ü from 18	585 300 011

Design
- Assembly aid for undercut anchor BH with threaded pin.
- 1/4" bit drive DIN 3126 - E 6.3

Accessories
- Tool set (p. 61)

Note
- Please specify the insertion depth of the undercut anchor and the length of the threaded pin with your order.

Instructions for use
- The protrusion is to be determined individually according to the lengths of the undercut anchor and the threaded pin.
- Please observe KEIL assembly instructions for anchors.

GENERAL TERMS AND CONDITIONS OF THE KEIL BEFESTIGUNGSTECHNIK GMBH

valid from: 01.01.2019

I. Geltungsbereich
1. Unsere Lieferungen und Leistungen erfolgen ausschließlich aufgrund der nachstehenden Bedingungen. Die Allgemeinen Geschäftsbedingungen gelten auch für alle künftigen Verträge und Geschäfte mit dem Partner. Geschäftsbedingungen des Partners, die von uns nicht ausdrücklich anerkannt werden, haben keine Gültigkeit.
2. Diese Allgemeinen Geschäftsbedingungen gelten nur gegenüber Unternehmern, juristischen Personen des öffentlichen Rechts und öffentlich-rechtlichen Sondervermögen i.S.d. § 310 Abs. 1 BGB.

II. Allgemeine Bestimmungen
1. Verträge kommen zustande, wenn wir den Auftrag ausdrücklich annehmen oder die bestellte Ware zusenden oder wenn wir den Auftrag des Partners nicht unverzüglich, spätestens innerhalb von 14 Tagen schriftlich ablehnen.
2. Die in Prospekten und Katalogen enthaltenen Angaben und Abbildungen sind branchenübliche Näherungswerte, es sei denn, dass sie von uns ausdrücklich als verbindlich bezeichnet wurden.
3. Technische Änderungen sowie Änderungen in Form, Farbe, Verpackungseinheit und/oder Gewicht bleiben im Rahmen des Zumutbaren vorbehalten

III. Langfrist- und Abrufverträge, Vertragsanpassung
1. Unbefristete Verträge sind für beide Vertragspartner mit einer Frist von 2 Monaten kündbar.
2. Tritt bei Langfristverträgen (Verträge mit einer Laufzeit von mehr als 12 Monaten und unbefristete Verträge) eine wesentliche Änderung der Lohn-, Material- oder Energiekosten ein, so ist jeder Vertragspartner berechtigt, eine angemessene Anpassung des Preises unter Berücksichtigung dieser Faktoren zu verlangen.
3. Ist eine verbindliche Bestellmenge nicht vereinbart, so legen wir unserer Kalkulation die vom Partner für einen bestimmten Zeitraum erwartete, unverbindliche Bestellmenge (Zielmenge) zugrunde. Nimmt der Partner weniger als die Zielmenge ab, sind wir berechtigt, den Stückpreis angemessen zu erhöhen. Nimmt er mehr als die Zielmenge ab, senken wir den Stückpreis angemessen, soweit der Partner den Mehrbedarf mindestens 2 Monate vor der Lieferung angekündigt hat.
4. Bei Lieferverträgen auf Abruf sind uns, wenn nichts anderes vereinbart ist, verbindliche Mengen mindestens 2 Monate vor dem Liefertermin durch Abruf mitzuteilen. Mehrkosten, die durch einen verspäteten Abruf oder nachträgliche Änderungen des Abrufs hinsichtlich Zeit oder Menge durch unseren Partner verursacht sind, gehen zu Lasten des Partners; dabei ist unsere Kalkulation maßgebend.
5. Wesentliche Änderungen, Zusatzwünsche oder ergänzende Leistungsvorgaben nach Vertragsschluss verpflichten beide Teile zur angemessenen Anpassung der Vergütung, der Termine und der Leistungsbeschreibung. Dies gilt entsprechend für bei der Auftragsannahme nicht absehbare technische Probleme.
6. Bei Abrufaufträgen ist die Ware innerhalb von 12 Monaten nach Auftragsbestätigung vollständig abzurufen. Wird die Ware innerhalb dieser Frist nicht vollständig abgerufen, so ist der Partner verpflichtet, die restliche Ware abzunehmen. Nach Ablauf der 12-Monatsfrist sind wir daher berechtigt, die restliche Ware zuzusenden und in Rechnung zu stellen.

IV. Vertraulichkeit
1. Jeder Vertragspartner wird alle Unterlagen (dazu zählen auch Muster, Modelle und Daten) und Kenntnisse, die er aus der Geschäftsverbindung erhält, nur für die gemeinsam verfolgten Zwecke verwenden und mit der gleichen Sorgfalt wie entsprechende eigene Unterlagen und Kenntnisse gegenüber Dritten geheim halten, wenn der andere Vertragspartner sie als vertraulich bezeichnet oder an ihrer Geheimhaltung ein offenkundiges Interesse hat. Diese Verpflichtung beginnt ab erstmaligem Erhalt der Unterlagen oder Kenntnisse und gilt zeitlich unbeschränkt.
2. Die Verpflichtung gilt nicht für Unterlagen und Kenntnisse, die allgemein bekannt sind oder die bei Erhalt dem Vertragspartner bereits bekannt waren, ohne dass er zur Geheimhaltung verpflichtet war, oder die danach von einem zur Weitergabe berechtigten Dritten übermittelt werden oder die von dem empfangenden Vertragspartner ohne Verwertung geheimzuhaltender Unterlagen oder Kenntnisse des anderen Vertragspartners entwickelt werden.

V. Zeichnungen und Beschreibungen, Muster und Fertigungsmittel
1. Stellt ein Vertragspartner dem anderen Zeichnungen oder technische Unterlagen über die zu liefernde Ware oder ihre Herstellung zur Verfügung, bleiben diese Eigentum des vorlegenden Vertragspartners.
2. Die Herstellungskosten für Muster und Fertigungsmittel (Werkzeuge, Formen, Schablonen etc.) werden, sofern nichts anderes vereinbart ist, von der zu liefernden Ware gesondert in Rechnung gestellt. Dies gilt auch für Fertigungsmittel, die infolge von Verschleiß ersetzt oder instandgesetzt werden müssen.
3. Setzt der Partner während der Anfertigungszeit der Muster oder Fertigungsmittel die Zusammenarbeit aus oder beendet er sie, gehen alle bis dahin entstandenen Herstellungskosten zu seinen Lasten.
4. Die Fertigungsmittel bleiben, auch wenn der Partner sie bezahlt hat, mindestens bis zur Abwicklung des Liefervertrages in unserem Besitz. Danach ist der Partner berechtigt, die Fertigungsmittel herauszuverlangen, wenn über den Zeitpunkt der Herausgabe eine einvernehmliche Regelung erzielt wurde und der Partner seinen vertraglichen Verpflichtungen in vollem Umfang nachgekommen ist.
5. Abnehmerbezogene Fertigungsmittel dürfen von uns nur mit vorheriger schriftlicher Zustimmung unseres Partners für Zulieferungen an Dritte verwendet werden.

VI. Preise und Zahlungsbedingungen
1. Unsere Preise verstehen sich in Euro zuzüglich Umsatzsteuer, Verpackung, Fracht, Porto und Versicherung.
2. Der Partner erklärt sich einverstanden, dass wir automatisch in den im Katalog aufgeführten Verpackungseinheiten liefern.
3. Der Partner kann nur mit rechtskräftig festgestellten oder unbestrittenen Gegenansprüchen aufrechnen. Zur Ausübung eines Zurückbehaltungsrechts ist der Partner insoweit befugt, als sein Gegenanspruch auf dem gleichen Vertragsverhältnis beruht.
4. Bei Zahlungsverzug können wir nach schriftlicher Mitteilung an den Partner die Erfüllung unserer Verpflichtungen bis zum Erhalt der Zahlungen einstellen.
5. Schecks werden nur erfüllungshalber und unter der Voraussetzung ihrer ordnungsgemäßen Einlösung angenommen.
6. Wenn nach Vertragsschluss erkennbar wird, dass unser Zahlungsanspruch durch mangelnde Leistungsfähigkeit des Partners gefährdet wird, so können wir die Leistung zurückhalten und dem Partner eine angemessene Frist bestimmen, in welcher er Zug um Zug gegen Lieferung zu zahlen oder Sicherheit zu leisten hat. Bei Verweigerung des Partners oder erfolglosem Fristablauf sind wir berechtigt, vom Vertrag zurückzutreten und Schadenersatz zu verlangen.

VII. Lieferung, Versand, Gefahrübergang
1. Sofern nichts anderes vereinbart ist, liefern wir „EXW Engelskirchen" (Incoterms 2010). Maßgebend für die Einhaltung des Liefertermins oder der Lieferfrist ist die Meldung der Versand- bzw. Abholbereitschaft durch uns. Mangels besonderer Vereinbarung wählen wir das Transportmittel und den Transportweg.
2. Die Lieferfrist beginnt mit der Absendung unserer Auftragsbestätigung und verlängert sich angemessen, wenn die Voraussetzungen von Ziffer XII vorliegen. 3. Teillieferungen sind in zumutbarem Umfang zulässig. Sie werden gesondert in Rechnung gestellt.
4. Innerhalb einer Toleranz von 15 Prozent der Gesamtauftragsmenge sind fertigungsbedingte Mehr- oder Minderlieferungen bei Sonderanfertigungen zulässig. Ihrem Umfang entsprechend ändert sich dadurch der Gesamtpreis.
5. Versandbereit gemeldete Ware ist vom Partner unverzüglich zu übernehmen. Anderenfalls sind wir berechtigt, sie nach eigener Wahl zu versenden oder auf Kosten und Gefahr des Partners zu lagern.
6. Mit der Übergabe an die Bahn, den Spediteur oder den Frachtführer bzw. mit Beginn der Lagerung, spätestens jedoch mit Verlassen des Werkes oder Lagers, geht die Gefahr auf den Partner über, und zwar auch, wenn wir die Anlieferung übernommen haben.
7. Alle Sendungen ab einem Warenwert von € 250,-- netto werden innerhalb der Bundesrepublik Deutschland frei Haus einschließlich Verpackung abgefertigt. Expressgebühr bzw. Eilzustellung wird grundsätzlich berechnet. Alle Post- und Paketdienstgebühren werden frankiert. Sofern der Warenwert unter € 250,-- liegt, wird die Fracht in Rechnung gestellt.

VIII. Lieferverzug
1. Können wir absehen, dass die Ware nicht innerhalb der Lieferfrist geliefert werden kann, so werden wir den Partner unverzüglich und schriftlich davon in Kenntnis setzen, ihm die Gründe hierfür mitteilen, sowie nach Möglichkeit den voraussichtlichen Lieferzeitpunkt nennen.
2. Verzögert sich die Lieferung durch einen in Ziffer XII aufgeführten Umstand oder durch ein Handeln oder Unterlassen des Partners, so wird eine den Umständen angemessene Verlängerung der Lieferfrist gewährt.
3. Der Partner ist zum Rücktritt vom Vertrag nur berechtigt, wenn wir die Nichteinhaltung des Liefertermins zu vertreten haben und er uns erfolglos eine angemessene Nachfrist gesetzt hat.

IX. Eigentumsvorbehalt
1. Wir behalten uns das Eigentum an der gelieferten Ware bis zur Erfüllung aller, auch künftig entstehender Forderungen aus der Geschäftsverbindung mit dem Partner vor. Besteht zwischen uns und dem Partner ein Kontokorrentverhältnis, behalten wir uns das Eigentum an der Ware bis zur Zahlung der Forderungen aus einem anerkannten Kontokorrentsaldo vor.
2. Der Partner ist berechtigt, diese Waren im ordentlichen Geschäftsgang zu veräußern und Forderungen einzuziehen, solange er seinen Verpflichtungen aus der Geschäftsverbindung mit uns rechtzeitig nachkommt. Nimmt der Partner die Forderung in ein Kontokorrentverhältnis mit seinem Vertragspartner auf, tritt er bereits jetzt seine Forderung aus dem Schlusssaldo im Sinne von § 355 HGB in Höhe unserer fälligen Forderungen an uns ab. Wird die Vorbehaltsware zusammen mit anderer Ware weiterveräußert, so erstreckt sich die Vorausabtretung nur bis zur Höhe des Wertes der Vorbehaltsware. Der Partner darf jedoch die Vorbehaltsware weder verpfänden noch zur Sicherheit übereignen. Er ist verpflichtet, unsere Rechte beim kreditierten Weiterverkauf der Vorbehaltsware zu sichern.
3. Alle Forderungen und Rechte aus dem Verkauf oder einer gegebenenfalls dem Partner gestatteten Vermietung von Waren, an denen uns Eigentumsrechte zustehen, tritt der Partner schon jetzt zur Sicherung an uns ab. Wir nehmen die Abtretung hiermit an.
4. Bei Pflichtverletzungen des Partners, insbesondere bei Zahlungsverzug, sind wir nach erfolglosem Ablauf einer dem Partner gesetzten angemessenen Frist zur Leistung zum Rücktritt und zur Rücknahme berechtigt; die gesetzlichen Bestimmungen über die Entbehrlichkeit einer Fristsetzung bleiben unberührt. Der Partner ist zur Herausgabe verpflichtet. Wir sind zum Rücktritt vom Vertrag berechtigt, wenn Antrag auf Eröffnung des Insolvenzverfahrens über das Vermögen des Partners gestellt wird.
5. Wir sind berechtigt, die Ermächtigungen zur Weiterveräußerung und Einziehung der abgetretenen Forderungen zu widerrufen, wenn der Partner seinen Zahlungsverpflichtungen aus den vereinnahmten Erlösen nicht nachkommt, in Zahlungsverzug gerät, ein Antrag auf Eröffnung eines Insolvenzverfahrens gestellt ist oder Zahlungseinstellung vorliegt. Ist dies der Fall, ist der Partner auf unser Verlangen bei Widerruf der Einziehungsermächtigung verpflichtet, uns die abgetretenen Forderungen und deren Schuldner bekannt zu geben, den Schuldnern die Abtretung mitzuteilen, alle zum Einzug der Forderungen durch uns erforderlichen Angaben zu machen und Unterlagen herauszugeben.
6. Eine etwaige Be- oder Verarbeitung der Vorbehaltsware nimmt der Partner stets für uns vor, ohne dass uns hieraus Verpflichtungen treffen. Wird die Vorbehaltsware mit anderen, nicht uns gehörenden Gegenständen verarbeitet oder untrennbar vermischt, so erwerben wir das Miteigentum an der neuen Sache im Verhältnis des Rechnungswertes der Vorbehaltsware zu den anderen verarbeiteten oder vermischten Gegenständen zum Zeitpunkt der Verarbeitung oder Vermischung. Werden unsere Waren mit anderen beweglichen Gegenständen zu einer einheitlichen Sache verbunden oder untrennbar vermischt und ist die andere Sache als Hauptsache anzusehen, so überträgt der Partner uns anteilmäßig Miteigentum, soweit die Hauptsache ihm gehört. Der Partner verwahrt das Eigentum oder Miteigentum unentgeltlich für uns. Für die durch Verarbeitung oder Verbindung bzw. Vermischung entstehende Sache gilt im übrigen das gleiche wie für die Vorbehaltsware.
7. Über Zwangsvollstreckungsmaßnahmen Dritter in die Vorbehaltsware, in die uns abgetretenen Forderungen oder in sonstige Sicherheiten hat der Partner uns unverzüglich schriftlich unter Übergabe der für eine Intervention notwendigen Unterlagen zu unterrichten. Dies gilt auch für Pfändungen oder sonstige rechtliche oder tatsächliche Beeinträchtigungen durch Dritte. Der Partner ist verpflichtet, den Dritten auf unseren Eigentumsvorbehalt hinzuweisen.
8. Übersteigt der Wert der bestehenden Sicherheiten die gesicherten Forderungen insgesamt um mehr als 10 Prozent, so sind wir auf Verlangen des Partners insoweit zur Freigabe von Sicherheiten nach unserer Wahl verpflichtet.
9. Sofern die verkauften Waren in den Geltungsbereich eines anderen Staates verbracht werden, ist der Partner verpflichtet, auf seine eigenen Kosten vor Beginn der Lieferung sicherzustellen, dass die Rechtsordnung des Staates, in den die Waren verbracht werden, einen Eigentumsvorbehalt kennt, der mit den Regelungen dieser Ziffer IX. vergleichbar ist. Der Partner ist insoweit verpflichtet, alle Handlungen vorzunehmen, Maßnahmen zu ergreifen und Registrierungen durchzuführen, die erforderlich und durchführbar sind, um unsere Eigentumsrechte an den verkauften Waren zu sichern. Hierzu verpflichten wir uns, den Partner mit allen rechtlich erforderlichen Handlungen zu unterstützen und dem Partner die notwendigen Informationen schriftlich zu erteilen und entsprechende Unterlagen zur Verfügung zu stellen. Der Partner haftet uns gegenüber für jeden entstandenen Schaden, der sich daraus ergibt, dass keine ausreichende Sicherung unseres Eigentums an den verkauften Waren besteht oder der Eigentumsvorbehalt nach dieser Ziffer IX. ganz oder teilweise von dem Recht des Staates, in den die verkauften Waren verbracht wurden, nicht anerkannt wird.

X. Sachmängel, Mängelrügen, Gewährleistung, Verjährung
1. Die Beschaffenheit der Ware richtet sich ausschließlich nach den vereinbarten technischen Liefervorschriften. Das Risiko der Eignung der Waren für den vorgesehenen Verwendungszweck trägt der Partner. Entscheidend für die Bestimmung des vertragsgemäßen Zustands der Ware ist der Zeitpunkt des Gefahrübergangs gemäß Ziffer VII. 6.
2. Die von uns gelieferten Waren hat der Partner unverzüglich nach dem Eintreffen am Bestimmungsort auf Fehler oder Mängel zu untersuchen, auch wenn Muster übersandt waren. Die Lieferung bzw. Leistung gilt als genehmigt, wenn erkennbare oder bei der Untersuchung festgestellte Mängel nicht ohne schuldhaftes Zögern bei uns gerügt werden. Versteckte Mängel hat der Partner ohne schuldhaftes Zögern nach ihrer Entdeckung, spätestens jedoch innerhalb von einem Jahr ab Erhalt der Ware unter gleichzeitiger Übergabe der beanstandeten Waren bei uns zu rügen. Entscheidend für die Einhaltung der Frist ist die Absendung der Mängelanzeige.
3. Uns ist Gelegenheit zu geben, den gerügten Mangel festzustellen. Beanstandete Ware ist auf Verlangen unverzüglich an uns zurückzusenden; wir übernehmen die Transportkosten, wenn die Mängelrüge berechtigt ist. Wenn der Partner diesen Verpflichtungen nicht nachkommt oder ohne unsere Zustimmung Änderungen an der bereits beanstandeten Ware vornimmt, verliert er etwaige Sachmängelansprüche.
4. Unsere Gewährleistung ist zunächst beschränkt auf Nachbesserung bzw. Ersatzlieferung nach unserer Wahl. Hierzu hat uns der Partner in angemessener Weise Zeit und Gelegenheit zu geben. Schlagen Nachbesserungen oder Ersatzlieferungen fehl oder wird die Beseitigung des Mangels infolge eines unverhältnismäßig hohen Aufwandes von uns verweigert, kann der Partner Minderung des Preises verlangen oder vom Vertrag zurücktreten. Eine Kostenerstattung ist ausgeschlossen, soweit die Aufwendungen sich erhöhen, weil die Ware nach unserer Lieferung an einen anderen Ort verbracht worden ist, es sei denn, dies entspricht dem bestimmungsgemäßen Gebrauch der Ware. Das Recht des Partners auf Nacherfüllung bei unerheblichen Mängeln ist ausgeschlossen.
5. Für Sachmängel, die durch ungeeignete oder unsachgemäße Verwendung, fehlerhafte Montage bzw. Inbetriebsetzung durch den Partner oder Dritte, übliche Abnutzung, fehlerhafte oder nachlässige Behandlung entstehen, stehen wir ebenso wenig ein wie für die Folgen unsachgemäßer und ohne unsere Einwilligung vorgenommener Änderungen oder Instandsetzungsarbeiten des Partners oder Dritter. Gleiches gilt für Mängel, die den Wert oder die Tauglichkeit der Ware nur unerheblich mindern.
6. Sachmängelansprüche verjähren in einem Jahr ab Gefahrübergang. Dies gilt nicht, soweit das Gesetz längere Fristen zwingend vorschreibt, insbesondere für Mängel bei einem Bauwerk und bei einer Ware, die entsprechend ihrer üblichen Verwendungsweise für ein Bauwerk verwendet wurde und dessen Mangelhaftigkeit verursacht hat. In Fällen des Lieferregresses im Verbrauchsgüterkauf gelten die Verjährungsfristen gemäß §§ 478, 479 BGB.
7. Gesetzliche Rückgriffsansprüche des Partners gegen uns bestehen nur insoweit, als der Partner mit seinem Abnehmer keine Vereinbarungen getroffen hat, die über die gesetzlichen Mängelansprüche hinausgehen. Für den Umfang der Rückgriffsansprüche gilt ferner Ziffer X. 4 Satz 4 entsprechend.
8. § 444 BGB bleibt von den Bestimmungen dieser Ziffer X. unberührt.

XI. Sonstige Ansprüche, Haftung
1. Wir haften nach Maßgabe der nachfolgenden Bestimmungen für Schäden – gleich aus welchem Rechtsgrund –, wenn wir, unser gesetzlicher Vertreter oder Erfüllungsgehilfe sie schuldhaft verursacht haben.
2. Bei Vorsatz, grober Fahrlässigkeit und bei leicht fahrlässiger Verletzung des Lebens, des Körpers oder der Gesundheit haften wir – mit Ausnahme des nachfolgenden Satzes – unbeschränkt. Unsere Haftung bei grober Fahrlässigkeit ist auf den bei Vertragsschluss vorhersehbaren, typischen Schaden begrenzt, wenn nicht dieser Schaden auf einer Verletzung des Lebens, des Körpers oder der Gesundheit beruht.
3. Im übrigen gilt bei leichter Fahrlässigkeit folgendes: Unsere Haftung für leichte Fahrlässigkeit ist – mit Ausnahme bei der Verletzung von Kardinalpflichten – ausgeschlossen. Ansonsten ist unsere Haftung für leichte Fahrlässigkeit auf den bei Vertragsschluss vorhersehbaren, typischen Schaden begrenzt.
4. Verschuldensunabhängige, gesetzliche Haftungstatbestände, insbesondere die Haftung nach dem Produkthaftungsgesetz, bleiben unberührt. Wir haften unbeschränkt, sofern Ansprüche des Partners gegen uns bereits vor Vertragsschluss entstanden sind.
5. Die Rechte des Partners aus Gewährleistung oder wegen Lieferverzugs bleiben unberührt.
6. Wir haften nicht für Schäden, die auf unsachgemäßer Verwendung und Lagerung, fehlerhaftem Einbau oder natürlicher Abnutzung beruhen.
7. Soweit die Schadensersatzhaftung uns gegenüber ausgeschlossen oder eingeschränkt ist, gilt dies auch im Hinblick auf die persönliche Schadenersatzhaftung unserer Angestellten, Arbeitnehmer, Mitarbeiter, Vertreter und Erfüllungsgehilfen.

XII. Höhere Gewalt
Höhere Gewalt, Arbeitskämpfe, Unruhen, behördliche Maßnahmen, Ausbleiben von Zulieferungen unserer Lieferanten und sonstige unvorhersehbare, unabwendbare und schwerwiegende Ereignisse befreien die Vertragspartner für die Dauer der Störung und im Umfang ihrer Wirkung von den Leistungspflichten. Dies gilt auch, wenn diese Ereignisse zu einem Zeitpunkt eintreten, in dem sich der betroffene Vertragspartner in Verzug befindet, es sei denn, dass er den Verzug vorsätzlich oder grob fahrlässig verursacht hat. Die Vertragspartner sind verpflichtet, im Rahmen des Zumutbaren unverzüglich die erforderlichen Informationen zu geben und ihre Verpflichtungen den veränderten Verhältnissen nach Treu und Glauben anzupassen.

XIII. Erfüllungsort, Gerichtsstand und anwendbares Recht
1. Sofern sich aus der Auftragsbestätigung nichts anderes ergibt, ist unser Geschäftssitz Erfüllungsort.
2. Für alle Rechtsstreitigkeiten, auch im Rahmen eines Scheckprotestes, ist unser Geschäftssitz Gerichtsstand. Wir sind auch berechtigt, am Sitz des Partners zu klagen.
3. Die Vertragsbeziehungen unterliegen ausschließlich deutschem Recht. Die Geltung des UN-Kaufrechts (CISG) ist ausgeschlossen.

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