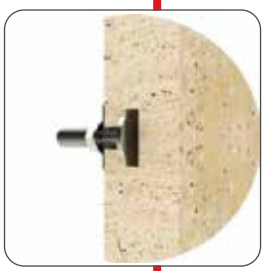
HAZ METAL
FIXING SYSTEMS

Your Fixing Systems Specialist

# Stone Attachments

## Product Technical Catalogue

HAZ-SA-EN/04.20





Texas Engineering College, Doha

## Contents



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# HAZ Undercut Bolts - Introduction

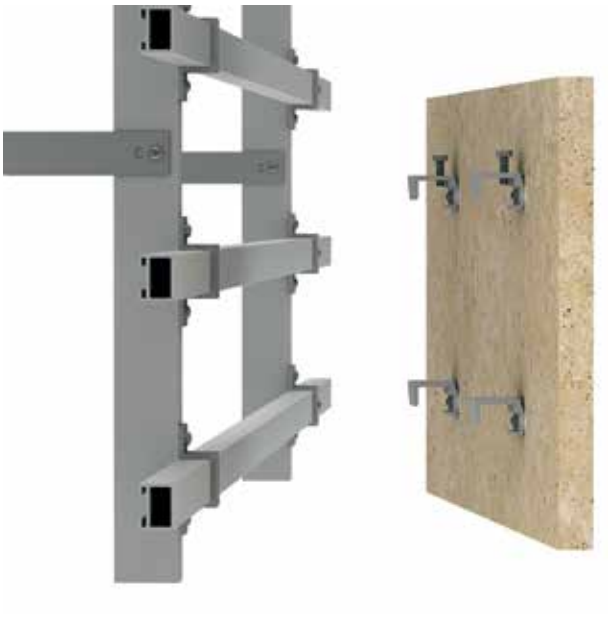
The HB11 and T31 Undercut bolts are designed for attachments on the rear surfaces of stone panels. This method of attachnment becomes necessary when the use of conventioanl pin system is not suitable. The undercut stone attachment method has advantages which can result in various benefits in material cost and installation time. HAZ Metal provides service in the design and technical support for using these systems.

HB11 Attachment to Stone

T31 Attachment to Stone

Advantages:
* Free positioning of the undercut bolt anywhere on the rear side of the panel
* Higher pull out values can be achieved using undercut bolts
* Optimization of bending moments of the stone panels which result in thinner panels and larger panel dimensions.
* No appearance of fixing elements at joints.

Indirect fixing of panels on to sub channel system using undercut anchors



In order to achieve easy and secure fixing of the undercut anchors, special drilling needs to be made on the rear surface of the panels. This must be done with great care as any incorrect drilled holes will prevent the firm attachment of the undercut bolts on to the panels. Drilling is done using special drill bits with wet machining system. Machines and drill bits can be supplied by HAZ.

Drilling for HB11 Undercut Bolts

Drilling is made with no core drill bits using wet system drilling machines. No tolerance drilled hole is essential for proper fixing.

Drilling for T31 Undercut Bolts

Drilling is made with a customized designed machine using electroplated special made bits to drill the hole required.

# Undercut Bolts - Introduction

HAZ Undercut bolts are used in a various range of stone fixing applications. HAZ Metal designs their own fixing systems for use with under cut bolts. A variety of systems are available for direct and indirect installation of stone panels.

Structural analysis and in house testing is carried out in order to guarantee the highest quality and secure installation. external testing and certirfication is also carried out for project approvals.

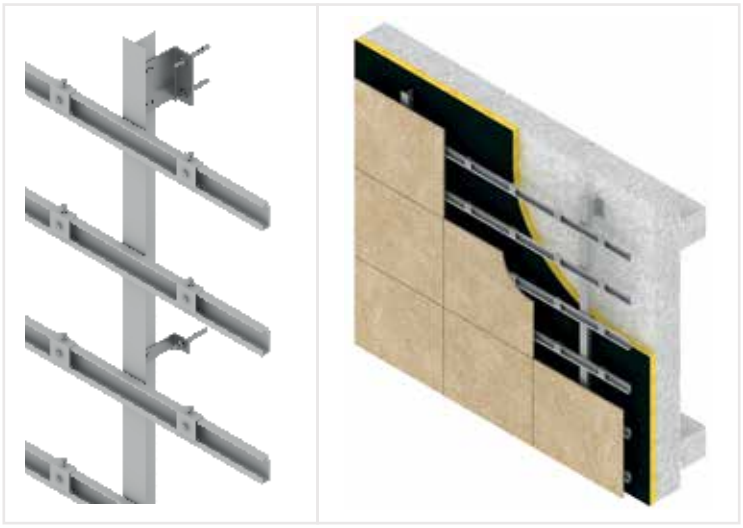
- Aluminium agraf brackets for connection insto aluminium sub channel systems

- Stainless steel brackets for connection on to steel sub channel systems

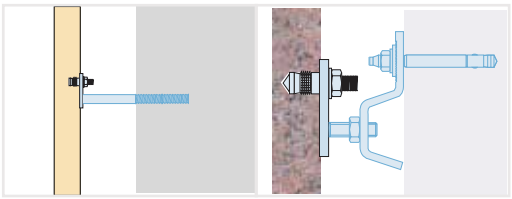
## Application examples

### Indirect Fixing on to Steel Sub Channel System

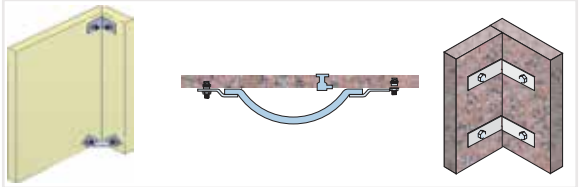
### Indirect Fixing On To Aluminium Sub Channel System



### Fixing Direct On To Concrete Walls

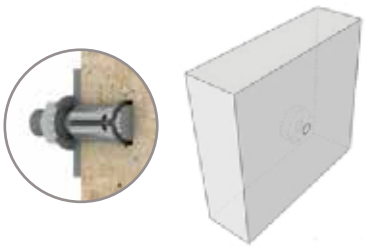


### Assembly Of Panels

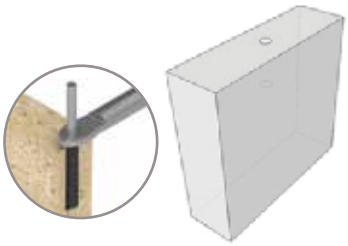


# HAZ Stone Attachments - Design Principles

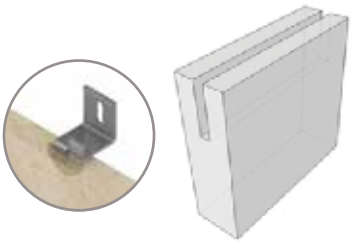
There are different methods of attachments made to stone for facade fixing systems. The type of stone attachment is chosen according to the performance requirements and the available drilling equipment for opening the required holes and slots on the stone. It is essential that the correct type of stone attachment is chosen in order achieve the best results.



Undercut system



Pin System

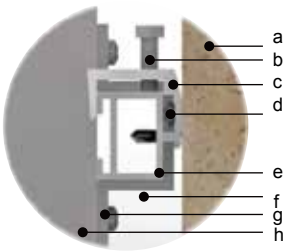


Kerf system

## Fixing design:

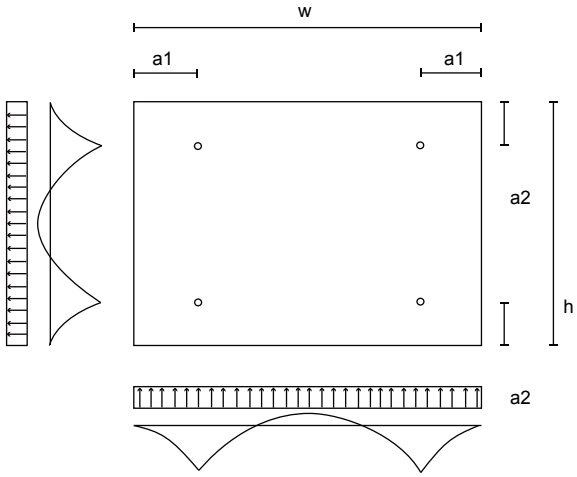
When designing undercut fixing systems, most often a grid of vertical and horizontal channels are used. Special brackets are attached on the back of the stone with undercut bolts. The special brackets are used to fix the stones on the horizontal channels with the hang on method.

a: Stone
b: Leveling bolt
c: Agraffe bracket
d: Undercut bolt
e: horizontal channel
f: cavity
g: channel connection
h: vertical channel



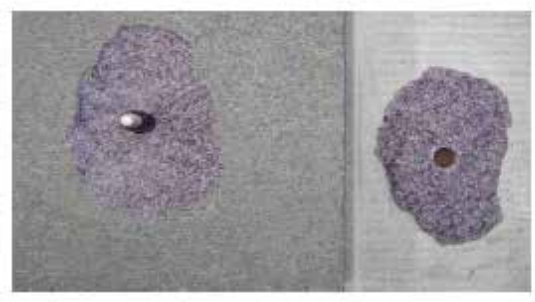

## Undercut hole locations:

Hole locations are determined according to the designed loads exposed on the stone panel and the resistance load of the stone. Overall thickness and dimensions of the panel should be checked accordingly. The minimum edge distance from the edge of the stone panel and the undercut hole is 15 cm for the long side a1 and 10 cm for the short side a2 of the panel.



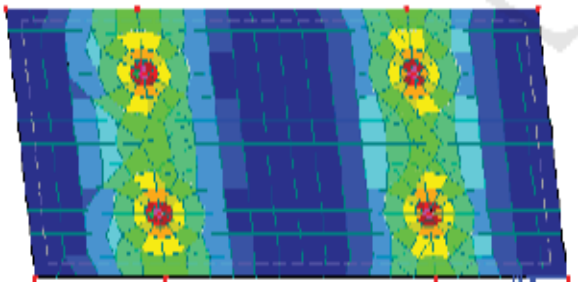

## Undercut pull out test:

Pull out test shoul be made for each stone and the results should be evaluated to design a secure fixing system.



## Finite Element Analysis:

FEM analysis should be conducted using the stone mechanical properties to determine the thickness, dimensions and the locations of the connections against the designed loads.

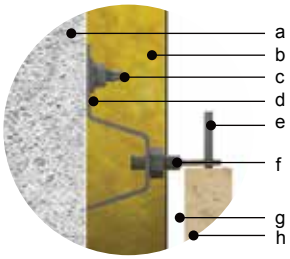


# HAZ Stone Attachments - Design Principles

## Fixing design:

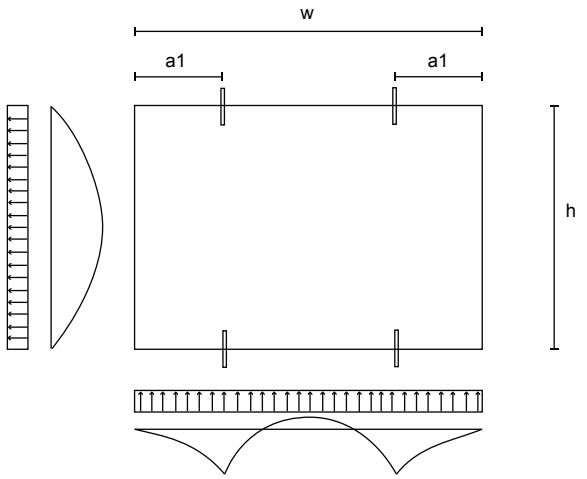
When designing fixing systems by using pin system, atachments to stone can be made at either horizontal or vertical joints. This is determined according to the pattern of the stone layout. Adjustable anchors are used and can be fixed directly to load bearing walls or fixed on channel systems.

a: load bearing wall
b: insulation
c: anchor bolt
d: z anchor set
e: flanged pin
f: adjustable arm
g: cavity
h: stone



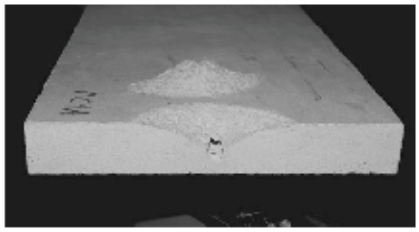

## Pin hole locations:

Pin hole locations are drilled on the edge of the stone panel on two sides. The normal distance of between the pin hole and the edge of the stone is 1/4 of the size of the stone edge length. the minimum distance a1 should be 2.5 times the thickness of the stone panel.



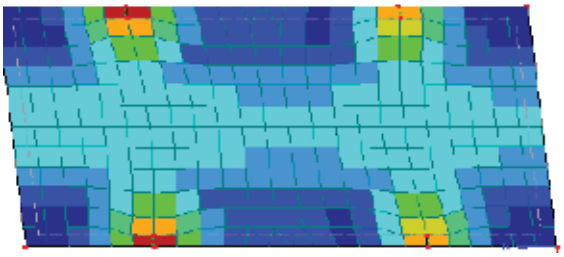

## Pin (dowel) pull out test:

Pull out test should be made for each stone and the results should be evaluated to design a secure fixing system.



## Finite Element Analysis:

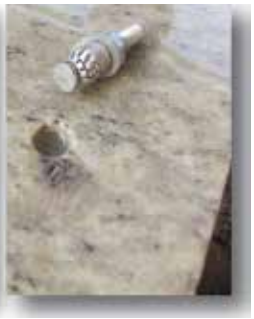
FEM analysis should be conducted using the stone mechanical properties to determine the thickness, dimensions and the locations of the connections against the designed loads.



## Stone Drilling:

It is utmost important to use the suitable drilling machine and diamond drill bits to drill the stone panels. Use of hand tools with normal bits must not be used as it can cause the panels to crack.

Proper drilling equipment with water application should be used to achieve the exact geomatry of the hole without damaging the stone.



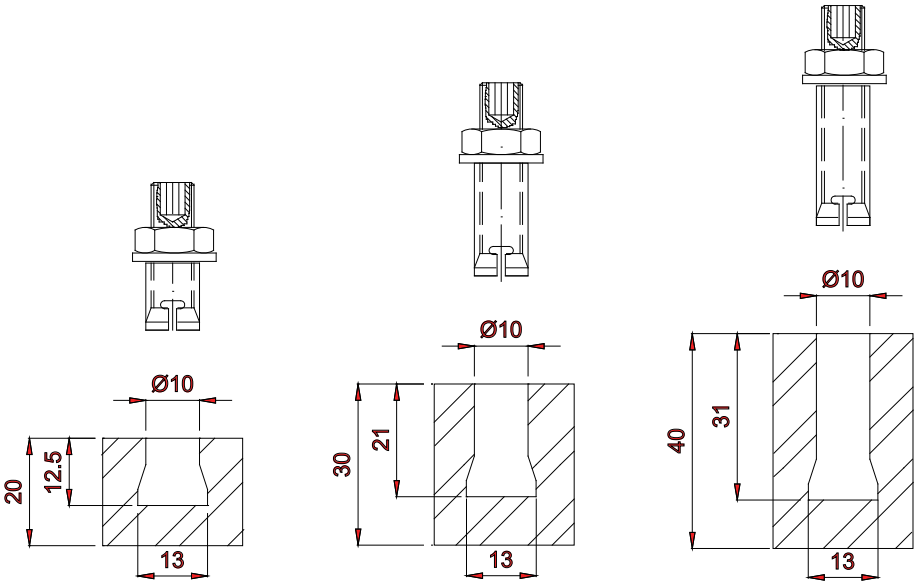
# HB11 HAZ Super Undercut Bolt - Introduction

The HB11 HAZ Undercut bolt was developed to meet the special requirements in stone installation where attachments from the rear surface of stone panels are required without exerting stresses on the stone. The HB11 undercut bolt are fixed mechanically in to undercut holes that are drilled with special drilling machines and drill bits. Stone thicknesses from 20 mm to 50 mm are applicable.

Drilling Hole

Checking Hole

Placing Bolt




Placing Pipe

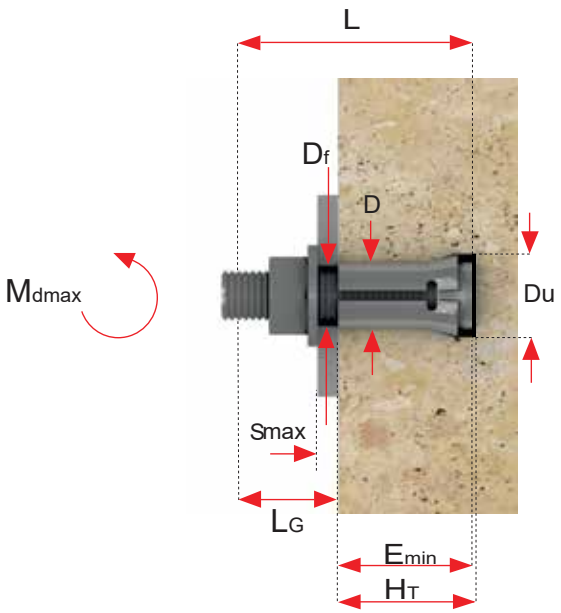
Drilling rear surface of panels using special drilling machine with drilling wet system and non core drill bits.

Minimal tolerances in hole size to be achieved in order for proper and secure attachment.

Fastening

Final

# HB11 Undercut Bolt - Technical Details




| Product Code | Technical Details | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bolt Size | Stone Thickness | Drill Hole Diameter | Drill Length | Min. Embedment | Max. Fixture Thickness | Fixture Hole Diameter | Max. Torque | Bolt Lenght | Thread Lenght |
| | (mm) | St (mm) | D/Du (mm) | Ht (mm) | Emin (mm) | Smax (mm) | Df (mm) | Mdmax (Nm) | (mm) | (mm) |
| HB11-20 | M6x30 | 20 | 8/ 11 | 12.50 | 12.50 | 5 | 7 | 5 | 30 | 23.5 |
| HB11-30 | M8x40 | 30 | 10 / 13 | 21.00 | 21.00 | 5 | 9 | 12 | 40 | 33 |
| HB11-40 | M8x50 | 40 | 10 / 13 | 31.00 | 31.00 | 5 | 9 | 12 | 50 | 43 |

## Product Code

HB11 - 20

- 20 — Panel Thickness
- HB11 — Type

## Hard Granite Based Values

| Allowable load (kN) | | | | |
|---|---|---|---|---|
| Load direction | a degree | M6(20mm tck.) | M8(30mm tck) | M8(40mm tck) |
| pull out | 0 | 1.20 | 3.00 | 4.00 |
| shear | 90 | 1.80 | 3.50 | 4.50 |

## Application Examples:

- Facade applications
- connections to curtain wall unitized panels
- corner stone fixing and reveal fixing

## Marble Based Values

| Allowable load (kN) | | | | |
|---|---|---|---|---|
| Load direction | a degree | M6(20mm tck.) | M8(30mm tck) | M8(40mm tck) |
| pull out | 0 | 1.10 | 2.20 | 2.50 |
| shear | 90 | 1.40 | 2.50 | 2.70 |

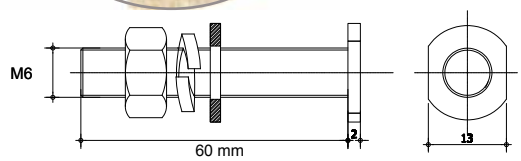
A safety factor of 3.5 is taken for mean ultimate failure loads.

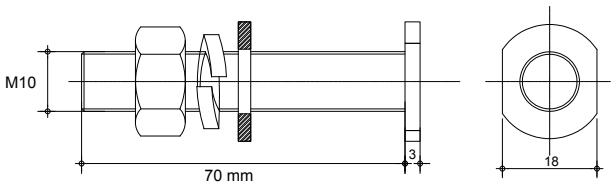
## Fixing Instructions

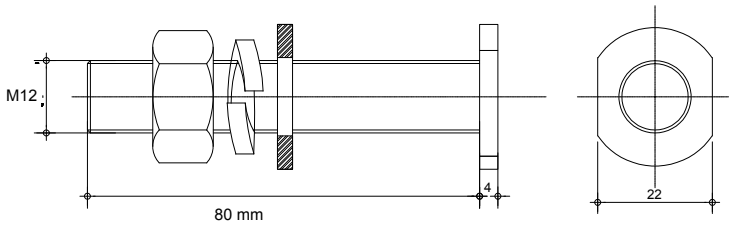
Drilling | Drilling | Drilling | Cleaning | Placing | Control | Fastening

# HAZ T31 Undercut Bolt - Introduction

The T31 undercut bolt was developed to meet the special requirements in stone installation where the conventional pin method were not suitable. With the T31 bolts we can achieve attachments to the stone at the back surface. This provides freedom in design and creates an appearance where the joints will be clear of anchor tips. T31 undercut bolt is suitable for stone thicknesses between 20 and 50 mm.

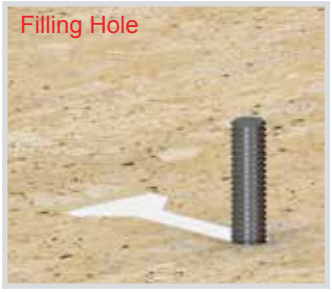


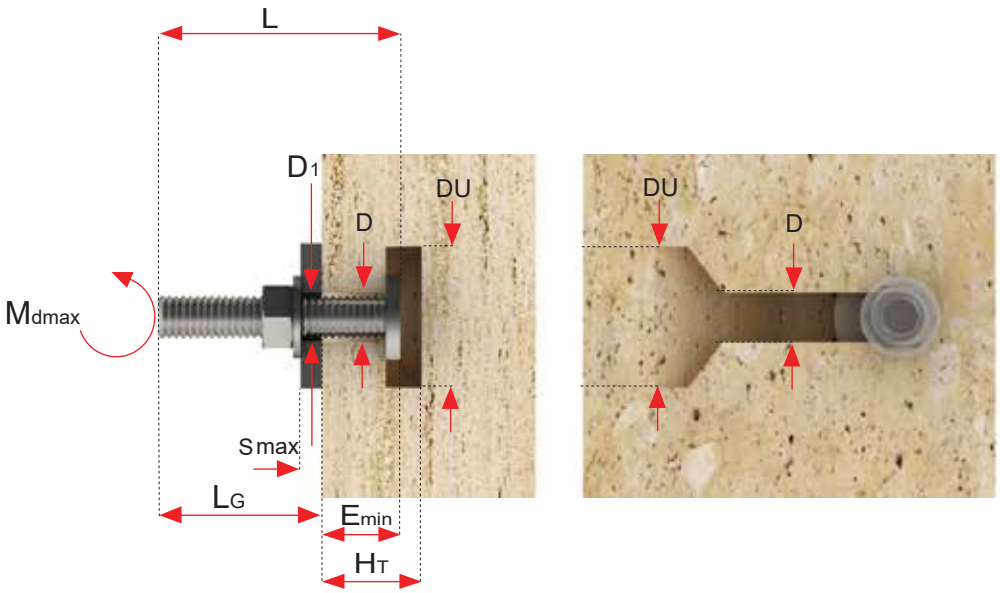




Special drilling is made with suitable equipment to achieve the slot hole for fixing the T31 under cut bolt.




# T31 Undercut Bolt - Technical Details




| Product Code | Technical Details | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bolt Size | Stone Thickness | Drill Hole Diameter | Drill Length | Min Embed-ment | Max Fixture Thickness | Fixture Hole Diameter | Max. Torque | Bolt Length | Thread Length |
| | (mm) | St (mm) | DU (mm) | Ht (mm) | Emin (mm) | Smax (mm) | D1 (mm) | Mdmax (Nm) | (mm) | (mm) |
| HAZ T31-6/40 | M6x60 | 40 | 7 | 21 | 21 | 5 | 7 | 7 | 40 | 37 |
| HAZ T31-10/50 | M10x50 | 50 | 11 | 31 | 31 | 6 | 11 | 20 | 50 | 47 |
| HAZ T31-12/70 | M12x70 | 70 | 13 | 41 | 41 | 8 | 13 | 35 | 70 | 66 |

## Product Code

HAZ T31 - 6 / 40

- Length
- Diameter
- Type

## Application:

For fastening fixtures to natural stone

## Available in:

Stainless Steel AISI 304 & AISI 316

Hard Granite Based Values

| Allowable Load values | | | | |
|---|---|---|---|---|
| Load Direction | a degree | M6 | M10 | M12 |
| pull out | 0 | 1,40 | 2,40 | 3,20 |
| shear | 90 | 3,00 | 3,40 | 3,80 |

## Application Examples:

attachements made on to brackets for stone installation direct on to walls.

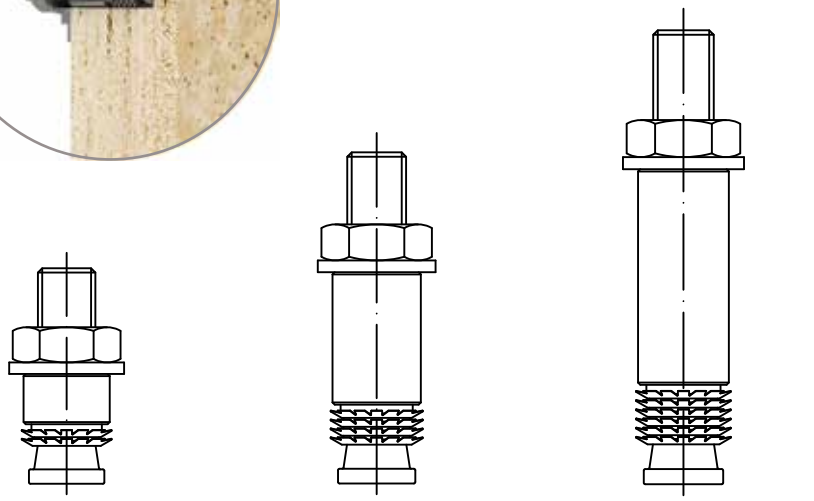
attachments made on to brackets fro stone lintels, cornishes or soffits.

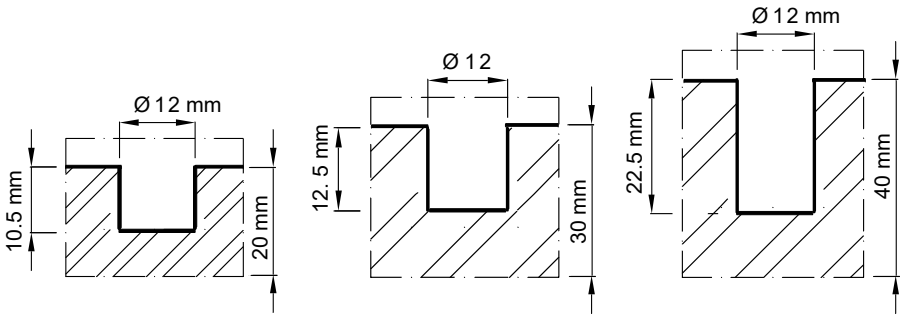
## Fixing Instructions

Drilling | Cleaning | Placing Bolt | Hammering Bolt | Control | Fastening

# HB09 HAZ Super Undercut Bolt - Introduction

The HB09 HAZ Super bolt was developed to meet the special requirements in stone installation where attachments from the rear surface of stone panels were required. With the use of HB09 HAZ Super bolts and suitable drilling method, this is achieved. HB09 HAZ Super bolt is suitable for stone thicknesses between 20 and 50 mm.






Drilling rear surface of panels using wet system machines and no core drill bits.

Zero tolerance in hole size to be achieved in order for proper and secure attachment.

Drilling Hole

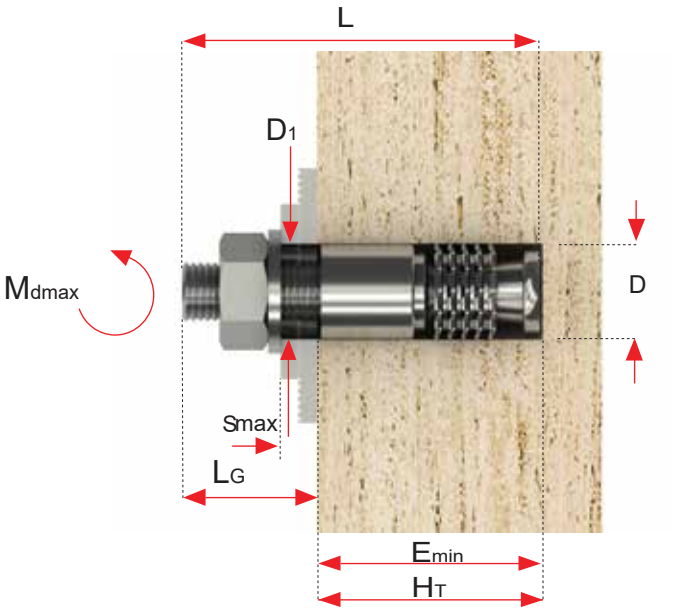
Checking Hole

Placing Bolt

Hammering Bolt

Fastening Fixture

# HB09 HAZ Super Undercut Bolt - Technical Details




| Product Code | Technical Details | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bolt Size | Stone Thickness | Drill Hole Diameter | Drill Length | Min. Embedment | Max Fixture Thickness | Fixture Hole Diameter | Max. Torque | Bolt Lenght | Thread Lenght |
| | (mm) | St (mm) | D (mm) | Ht (mm) | Emin (mm) | Smax (mm) | D1 (mm) | Mdmax (Nm) | (mm) | (mm) |
| HB09-24/30 | M8x30 | 20 | 12 | 10,5 | 10 | 5 | 9 | 13 | 30 | 20 |
| HB09-48/45 | M8x45 | 30 | 12 | 12,5 | 12 | 5 | 9 | 13 | 45 | 40 |
| HB09-72/60 | M8x60 | 40 | 12 | 22,5 | 22 | 5 | 9 | 13 | 60 | 55 |

## Product Code

HB09 24/30

- Length
- Diameter
- Type

## Application:

For fastening fixtures to natural stone

## Available in:

Stainless Steel AISI 304 & AISI 316

## Advantages of HB09 Haz Super Bolt

- No use of special and expensive drilling tools.
- No need of expensive drill bits.
- No stone breakage during fixation of bolt

Hard Granite Based Values

| Working Load Resistance (KN) | | |
|---|---|---|
| Load direction | a degree | M8 |
| pull out | 0 | 1,40 |
| shear | 90 | 3,00 |

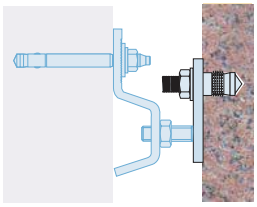
Marble Based Values

| Working Load Resistance (KN) | | |
|---|---|---|
| Load direction | a degree | M8 |
| pull out | 0 | 1,00 |
| shear | 90 | 2,10 |

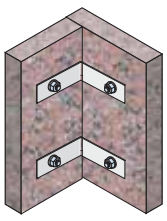
A safety factor of 2.5 is taken for mean ultimate failure loads.

## Application Examples:

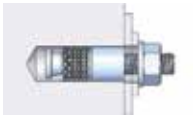
Facade Cladding



Corner Stone Fixing



Vanity Top Fixing



## Fixing Instructions

Drilling

Cleaning

Placing Bolt

Hammering Bolt

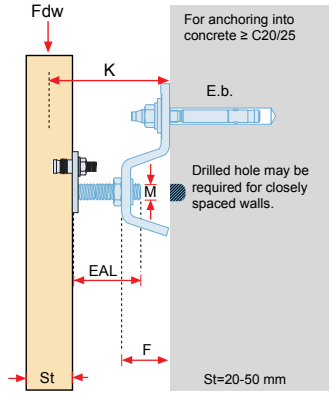
Control

Fastening

# Adjustable Anchors - Technical Details

## HZ02-E Z Anchor

- Load bearing & restraint.
- Projection sizes between 45 and 135 mm.
- Loads up to 800 N.
- Suitable for rear surface fixing.
- Stone thicknesses above 20mm.
- Fastened on walls with expansion bolts.
- Stone installation is made with undercut bolts attched at the rear surface of the stone panels.
- Special drilling required.




| Product Code | Technical Details | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Projec-tion | Min. Projec-tion | Max. Projec-tion | Dead Load | Offset | Wind Pressure | Wind Suction | Bolt Size | Pin Dia. | Adj Arm Metric | Adj Arm Thick. | Adj Arm Length |
| | K (mm) | K - (mm) | K + (mm) | Fdw (N) | F (mm) | Fwp (N) | Fws (N) | E.b. (mm) | Ø (mm) | M (mm) | T (mm) | T (mm) |
| HZ02-E-452 | 45 | 40 | 60 | 200 | 10 | 312 | 219 | M8x80 | 5 | M10 | 3,5 | 45 |
| HZ02-E-552 | 55 | 50 | 70 | | 20 | | | | | | | 50 |
| HZ02-E-752 | 75 | 60 | 90 | | 40 | | | | | | | 60 |
| HZ02-E-952 | 95 | 80 | 110 | | 60 | | | | | | | 70 |
| HZ02-E-554 | 55 | 50 | 70 | 400 | 20 | 624 | 437 | M8x80 | 5 | M12 | 4 | 50 |
| HZ02-E-754 | 75 | 60 | 90 | | 40 | | | | | | | 60 |
| HZ02-E-954 | 95 | 80 | 110 | | 60 | | | | | | | 70 |
| HZ02-E-1154 | 115 | 100 | 130 | | 80 | | | | | | | 70 |
| HZ02-E-756 | 75 | 60 | 90 | 600 | 20 | 936 | 655 | M10x90 | 6 | M14 | 5,5 | 60 |
| HZ02-E-956 | 95 | 80 | 110 | | 40 | | | | | | | 70 |
| HZ02-E-1156 | 115 | 100 | 130 | | 60 | | | | | | | 80 |
| HZ02-E-1356 | 135 | 120 | 150 | | 80 | | | | | | | 80 |

• Material : Stainless Steel 1.4301 (A2) & 1.4401 (A4). • Table below is prepared according to DIN 18516 standard. • Loads stated are working resistance loads. • Other sizes are available for production upon request. • Structural calculations are available upon request.

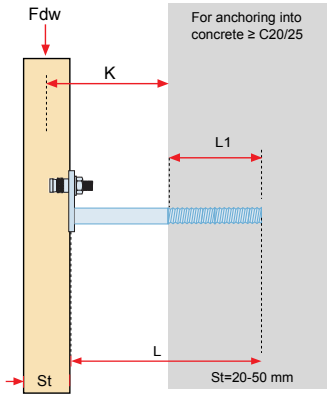
Product Code Description

HZ02-E- 45 2

- Dead Load (x10Kg)
- Projection
- Type

## HRD02-E Mortar Anchor

- Load bearing & restraint.
- Projection sizes between 35 and 75 mm.
- Loads up to 400 N.
- Suitable for rear surface fixing
- Stone thicknesses above 20mm.
- Fastened on walls with expansion bolts.
- Installation is made with undercut bolts attched at the rear surface of the stone panels.
- Special drilling required.




| Product Code | Technical Details | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Projec-tion | Min. Projec-tion | Max. Projec-tion | Dead Load | Wind Pressure | Wind Suction | Anchor Lenght | Dowel Embed length | Pin Dia. | Bore Dia. | Flat. Thick. |
| | K (mm) | K - (mm) | K + (mm) | Fdw (N) | Fwp (N) | Fws (N) | L (mm) | L1 (mm) | Ø (mm) | BØ (mm) | T (mm) |
| HRD02-E-352 | 35 | 20 | 50 | 200 | 312 | 219 | 135 | 90 | 4 | 14 | 3 |
| HRD02-E-452 | 45 | 30 | 60 | | | | 145 | | | | |
| HRD02-E-552 | 55 | 40 | 70 | | | | 155 | | | 16 | 3,5 |
| HRD02-E-652 | 65 | 50 | 80 | | | | 165 | | | | |
| HRD02-E-752 | 75 | 60 | 90 | | | | 175 | | | | |
| HRD02-E-354 | 35 | 20 | 50 | 400 | 624 | 437 | 135 | 90 | 5 | 18 | 4 |
| HRD02-E-454 | 45 | 30 | 60 | | | | 145 | | | | |
| HRD02-E-554 | 55 | 40 | 70 | | | | 155 | | | | |
| HRD02-E-654 | 65 | 50 | 80 | | | | 165 | | | | |
| HRD02-E-754 | 75 | 60 | 90 | | | | 175 | | | | |

• Technical details are prepared according to DIN 18516 standard. • Loads stated are working characteristic loads.
• Material: Stainless Steel 1.4301 (A2) & 1.4401 (A4). • Other sizes are available for production upon request.

Product Code Description

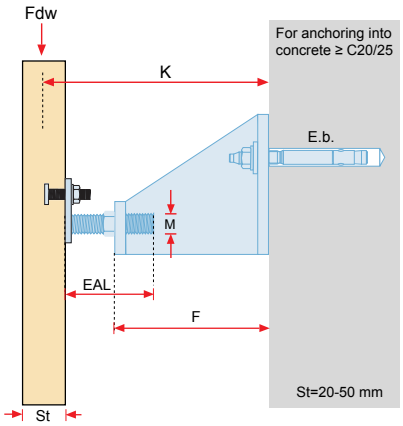
HRD02-E- 35 2

- Projection
- Dead load (x10Kg)
- Type

# Adjustable Anchors - Technical Details

## HZ08-E Z Anchor

- Load bearing & restraint.
- Projection sizes between 45 and 135 mm.
- Loads up to 800 N.
- Suitable for rear surface fixing.
- Stone thicknesses above 20mm.
- Fastened on walls with expansion bolts.
- Stone installation is made with undercut bolts attached at the rear surface of the stone panels.
- Special drilling required.




| Product Code | Technical Details | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Projection | Min. Projection | Max. Projection | Dead Load | Offset | Wind Pressure | Wind Suction | Bolt Size | Pin diameter | Adj Arm Metric | Adj Arm Flat.Thick. | Adj Arm Length |
| | K (mm) | K - (mm) | K + (mm) | Fdw (N) | F (mm) | Fwp (N) | Fws (N) | E.b. (mm) | Ø (mm) | M (mm) | T (mm) | T (mm) |
| HZ08-E-1552 | 155 | 150 | 170 | 200 | 10 | 312 | 219 | M8x80 | 5 | M10 | 3,5 | 45 |
| HZ08-E-1752 | 175 | 170 | 190 | | 20 | | | | | | | 50 |
| HZ08-E-1952 | 195 | 180 | 210 | | 40 | | | | | | | 60 |
| HZ08-E-2052 | 205 | 190 | 220 | | 60 | | | | | | | 70 |
| HZ08-E-1554 | 155 | 150 | 170 | 400 | 20 | 624 | 437 | M8x80 | 5 | M12 | 4 | 50 |
| HZ08-E-1754 | 175 | 160 | 190 | | 40 | | | | | | | 60 |
| HZ08-E-1954 | 195 | 180 | 210 | | 60 | | | | | | | 70 |
| HZ08-E-2054 | 205 | 190 | 220 | | 80 | | | | | | | 70 |
| HZ08-E-1556 | 155 | 140 | 170 | 600 | 20 | 936 | 655 | M10x90 | 6 | M14 | 5,5 | 60 |
| HZ08-E-1756 | 175 | 160 | 190 | | 40 | | | | | | | 70 |
| HZ08-E-1956 | 195 | 180 | 210 | | 60 | | | | | | | 80 |
| HZ08-E-2056 | 205 | 190 | 220 | | 80 | | | | | | | 80 |

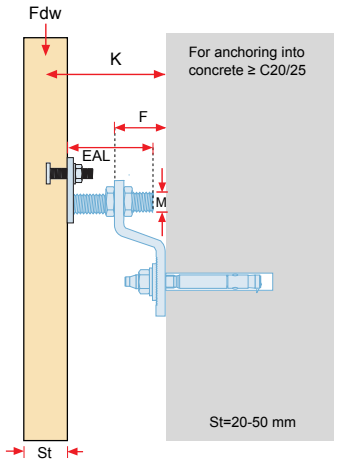
Product code description

HZ02-E- 45 2

- Dead Load (x10Kg)
- Projection
- Type

## HZ20-E Z anchor

- Projection sizes between 45 and 135 mm.
- Loads up to 800 N.
- Suitable for rear surface fixing.
- Stone thicknesses above 20mm.
- Fastened on walls with expansion bolts.
- Stone installation is made with undercut bolts attached at the rear surface of the stone panels.
- Special drilling required.




| Product Code | Technical Details | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Projection | Min. Projection | Max. Projection | Dead Load | Offset | Wind pressure | Wind Suction | Bolt Size | Pin Diameter | Adj Arm Metric | Adj arm Flat. Thick. | Adj Arm Length |
| | K (mm) | K - (mm) | K + (mm) | Fdw (N) | F (mm) | Fwp (N) | Fws (N) | E.b. (mm) | Ø (mm) | M (mm) | T (mm) | T (mm) |
| HZ20-E-452 | 45 | 40 | 60 | 200 | 10 | 312 | 219 | M8x80 | 5 | M10 | 3,5 | 45 |
| HZ20-E-552 | 55 | 50 | 70 | | 20 | | | | | | | 50 |
| HZ20-E-752 | 75 | 60 | 90 | | 40 | | | | | | | 60 |
| HZ20-E-952 | 95 | 80 | 110 | | 60 | | | | | | | 70 |
| HZ20-E-755 | 75 | 60 | 90 | 500 | 20 | 780 | 546 | M8x80 | 5 | M12 | 4 | 60 |
| HZ20-E-955 | 95 | 80 | 110 | | 40 | | | | | | | 70 |
| HZ20-E-1155 | 115 | 100 | 130 | | 60 | | | | | | | 80 |
| HZ20-E-1355 | 135 | 120 | 150 | | 80 | | | | | | | 80 |

Product Code Description

HA03-30 2 A

- Shape
- Projection
- Dead load (x10Kg)
- Type

• Material : Stainless Steel 1.4301 (A2) & 1.4401 (A4). • Table below is prepared according to DIN 18516 standard. • Loads stated are working resistance loads. • Other sizes are available for production upon request. • Structural calculations are available upon request.

# HB Undercut Bolts Application Pictures

Stone installation made on to stainless steel channel system. T31 undercut bolt is used with specially designed anchors. T31 bolt is fastened on to the anchor using contra nuts.

Sub channel support system designed to bear heavy loads at projection sizes exceeding 40 cm. Stone panels are installed using T31 undercut bolts.

A flexible and rigid sub channel system suitable to take the variation in projection sizes and turn in corners. T31 and suitable anchors accommodate this system to enable secure installation.

Sub channel support system provides adjustable in lateral direction. This enables quick positioning of the anchors along the horizontal channels to meet the T31 bolts fixed on the back of the stone panels.

# HB Undercut Bolts Application Pictures

HB09 HAZ Super bolts are used for the assembly of a stone column. HCA corner anchors are available wit slot holes enabling adjustability and easy fixing.

HB09 HAZ Super bolts and HCA corner anchors used to fix a reveal panel on to a stone panel.

Irregular patterned reveal panels fixed on to a stone panel at different positions. Firm and secure connections are made using HB09 Haz Super bolts.

HB09 Haz Super bolts and specially designed fixing elements are used as restraints in fixing slanted coping stone panels.

# Pin & Kerf Systems - Introduction

The pin & kerf attachment system is the conventional method for attachments made to stone. A pin hole or a kerf groove is opened at the edge of stone panels. Plastic sleeves are used along with suitable resin to securely attach the pin or kerf in place. The use of this system is applicable for stone thickness of 3 cm and above, depending on the strength of the stone. A breaking load test at pin or kerf areas may be necessary to determine the correct thickness of stone panels that may differ for different natural stone types.

## HFP Pin Attachment To Stone

## Kerf Attachment To Stone

Advantages:

- More freedom in facade design and anchor positioning
- No need for expansive drilling equipment
- Fine adjustment is possible
- Fast & easy installation

Special processing needs to be made on the edges of the of the panels where attachments are to be made. This process must be made using suitable drilling machines and drill bits. High precision is required with very tight tolerances. Failure to conduct proper processing to stones will result in breakage and will jeopardize the security of the stone panel installation.

## Drilling for Pin holes

Drilling is made with no core drill bits using wet system drilling machines. No tolerance drilled hole is essential for proper fixing.

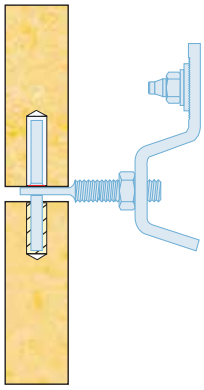
## Opening Grooves

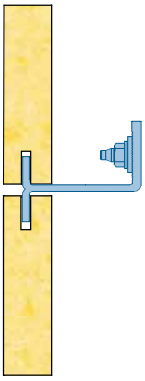
Drilling is made with a customized designed machine using electroplated special made bits to drill the hole required.

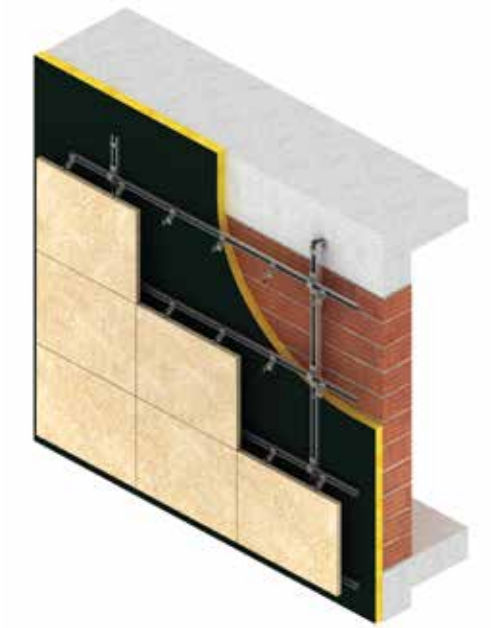
# Pin & Kerf Systems - Introduction

Pin & Kerf systems are the most conventional attachment systems made to stone. Pin holes for pins and grooves for kerf are opened on the edge of the stone at desired locations. Connections in to the openings are made using pins with adjustable arms or kerfs anchors.

Anchors are either fastened directly to load bearing walls using anchor bolts or they are fastened to sub channel systems with lock nuts or set screws. Careful analysis of the stone thicknesses and edge locations must be made in order to ensure the stability of the stone panels.

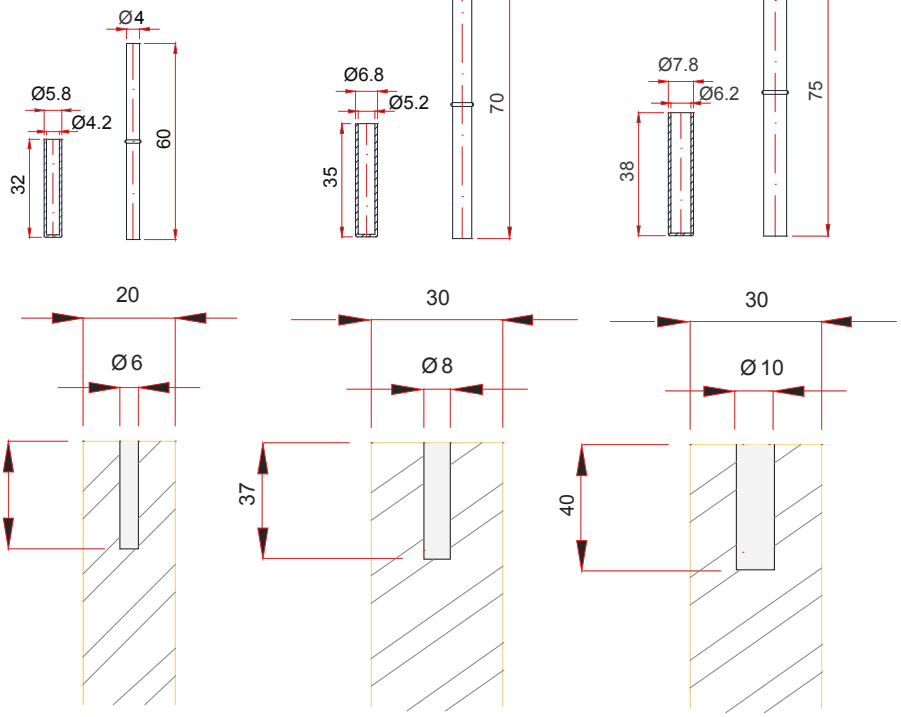






# HFP Flanged Pin - Introduction

The HFP Flanged pin is an attachment element made to stone slabs which are used by placing the pin into a hole that is drilled on the edge of the stone. The pin is set in to a plastic sleeve which has a debouncing feature and absorbed lateral loads.




Drilling of the pin holes must be made with special machines that use no core drill bits with water in flow. The pin hole should be drilled according to the specification in order avoid damaging the stone.




Drilling Hole

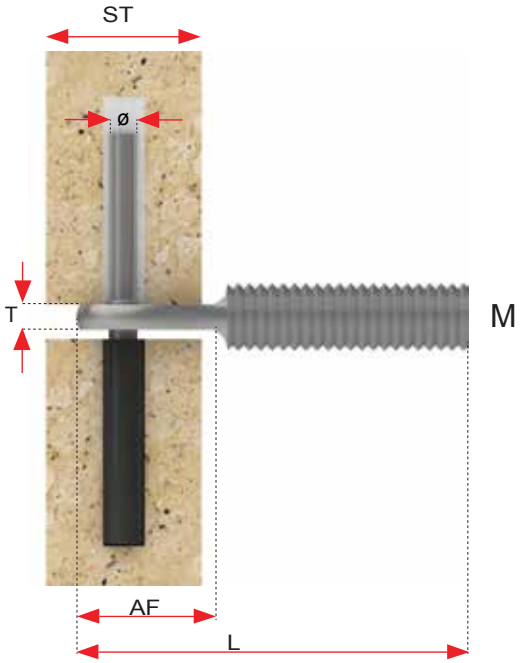
Checking Hole

Placing Plastic Tube

Positioning Adj Arm

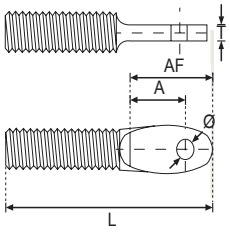
Placing Pin

# HFP Flanged Pin - Technical Details



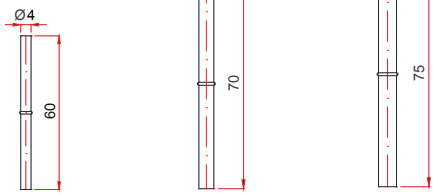

## HAA Adjustable Arm

| Product Code | Technical Detail | | | | | | |
|---|---|---|---|---|---|---|---|
| | Metric Size | Length | Flat length Size | Flattening Thickness | Pin Diameter | Stone Thickness | Distance Between Edge & Hole |
| | M (mm) | L (mm) | AF (mm) | T (mm) | Ø (mm) | St (mm) | A (mm) |
| HAA-8/50 | 8 | 50 | A+6 | 3 | 4 | 20 | 12-13 |
| HAA-8/60 | 8 | 60 | A+6 | 3 | 4 | 25 | 14-16 |
| HAA-8/70 | 8 | 70 | A+6 | 3 | 4 | 30 | 16-17 |
| HAA-10/50 | 10 | 50 | A+8 | 3.5 | 5 | 40 | 22-24 |
| HAA-10/60 | 10 | 60 | A+8 | 3.5 | 5 | 50 | 26-29 |
| HAA-10/70 | 10 | 70 | A+8 | 3.5 | 5 | | |
| HAA-10/80 | 10 | 80 | A+8 | 3.5 | 5 | | |
| HAA-12/50 | 12 | 50 | A+8 | 4.5 | 5 | | |
| HAA-12/60 | 12 | 60 | A+8 | 4.5 | 5 | | |
| HAA-12/70 | 12 | 70 | A+8 | 4.5 | 5 | | |
| HAA-12/80 | 12 | 80 | A+8 | 4.5 | 5 | | |
| HAA-14/50 | 14 | 50 | A+8 | 5.5 | 6 | | |
| HAA-14/60 | 14 | 60 | A+8 | 5.5 | 6 | | |
| HAA-14/70 | 14 | 70 | A+8 | 5.5 | 6 | | |
| HAA-14/80 | 14 | 80 | A+8 | 5.5 | 6 | | |
| HAA-16/50 | 16 | 50 | A+8 | 6 | 6 | | |
| HAA-16/60 | 16 | 60 | A+8 | 6 | 6 | | |
| HAA-16/70 | 16 | 70 | A+8 | 6 | 6 | | |
| HAA-16/80 | 16 | 80 | A+8 | 6 | 6 | | |



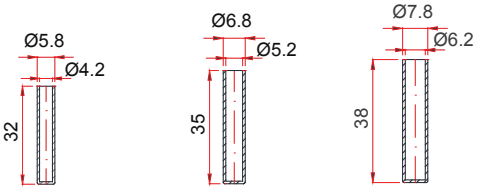

## HFP Flanged Pin

| Product Code | Technical Details | | |
|---|---|---|---|
| | Diameter | Length | Flange Diameter |
| | Ø (mm) | L (mm) | FØ (mm) |
| HFP-4/50 | 4 | 50 | 5 |
| HFP-5/60 | 5 | 60 | 6 |
| HFP-5/70 | 5 | 70 | 6 |
| HFP-6/70 | 6 | 70 | 7 |




## HPT Plastic Tube

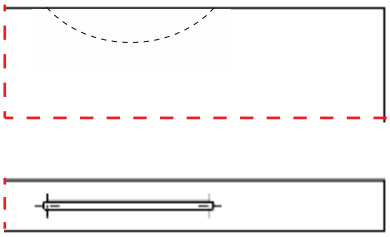
| Product Code | Technical Details | | |
|---|---|---|---|
| | Inner Diameter | Outer Diameter | Length |
| | In. Ø (mm) | Ou. Ø (mm) | L (mm) |
| HPT-4 | 4.2 | 5.8 | 32 |
| HPT-5 | 5.2 | 6.8 | 35 |
| HPT-6 | 6.2 | 7.8 | 38 |



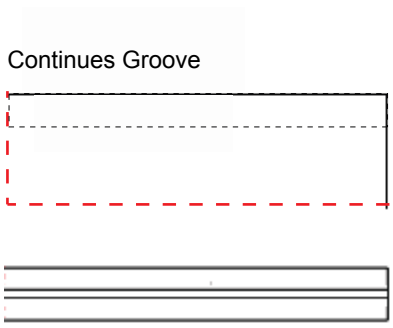
# HA03 Kerfed Anchor - Introduction

The HA03 Kerfed type anchor is an attachment method that is used to insert kerfed angles in to the grooves openings in the stone edges. A special diamond spiral is used to open a groove on the stone edge at specified dimensions. HA03 anchor with up and down bent kerfs are used to insert the kerf end of the anchor in to the stone edge.

Single Groove




Continues Groove




Grooves on the edge of the stone panels must be opened with suitable machines and diamond tools. Diamond discs using wet processing techniques are to be used in order achieve economic and cast results.

Using Spiral for Grooving

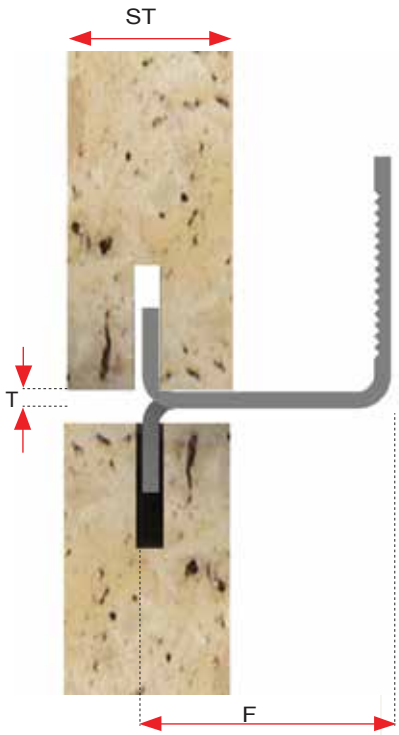
Opening Groove

Checking Groove

Positioning Kerfed Anchor

Placing Kerf In Groove

# HA03 Kerfed L Anchor - Technical Details



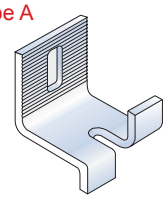

| Product Code | Technical Details | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Projection | Dead Load | Wind Pressure | Wind Suction | Bolt Size | Pin Diameter | Anchor Length | Anchor Thickness |
| | K (mm) | Fdw (N) | Fwp (N) | Fws (N) | E.b. (mm) | Ø (mm) | L (mm) | T (mm) |
| HA03-302 | 30 | 200 | 312 | 219 | M8X80 | 12 | 32 | 3 |
| HA03-352 | 35 | | | | | | 37 | |
| HA03-402 | 40 | | | | | | 42 | |
| HA03-452 | 45 | | | | | | 47 | |
| HA03-502 | 50 | | | | | | 52 | 4 |
| HA03-552 | 55 | | | | | | 57 | |
| HA03-304 | 30 | 400 | 624 | 437 | M8X80 | 15 | 32 | 3 |
| HA03-354 | 35 | | | | | | 37 | 4 |
| HA03-404 | 40 | | | | | | 42 | |
| HA03-454 | 45 | | | | | | 47 | |
| HA03-504 | 50 | | | | | | 52 | |
| HA03-554 | 55 | | | | | | 57 | |

HA03 - 30 2 A
- A — Shape
- 2 — Dead Load (x10 Kg)
- 30 — Projection (K mm)
- HA03 — Type

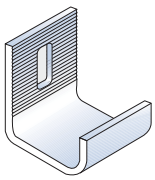
### HA03 L Anchor

- Load bearing & restraint.
- Projection sizes between 30 and 55 mm.
- Loads up to 400 N.
- Suitable for horizontal joints.
- Stone thicknesses above 20mm.
- Fastened on walls with expansion bolts.
- Installation is made with kerf system where there are slit edges in the slabs.

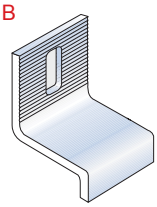
Shape A



Shape C



Shape B

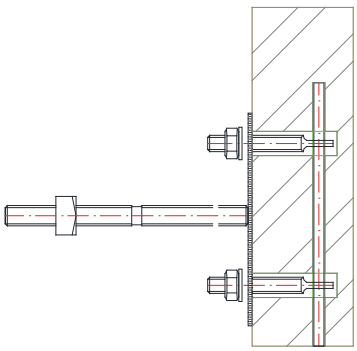


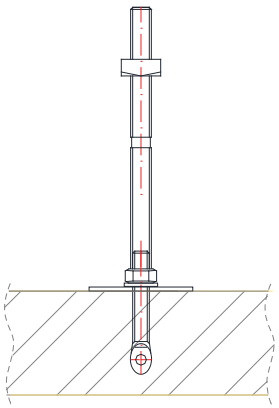
# Adjustable arm Drop-in pin

The drop in pin system is another technique that is can be used for stone atachments when higher pullout loads are required. And Adjsutable arm and a pin are used to be placed in side of the specially drilled holes. The holes are drilled at the edge and the rear side of the stne panels where the pins and the adjustable arms intersect, forming a strong connection.



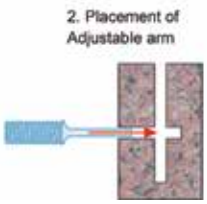


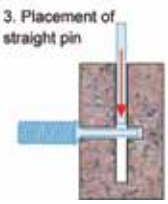



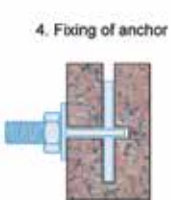


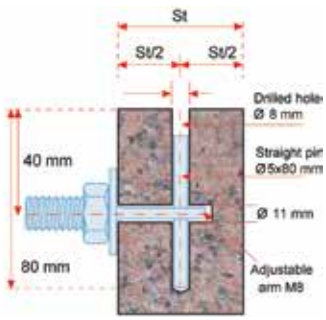
## Special Drilling for Drop in pin connection

Special drilling is done to the slabs at the upper face and at the back. The drilling must be done precisely as shown on the illustration. The adjustable arm inserted from the back of the stone meets the pin which is inserted from the edge surface of the stone.

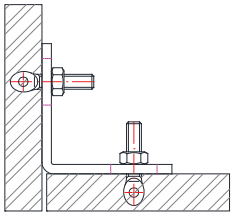
# HCA Corner Anchors

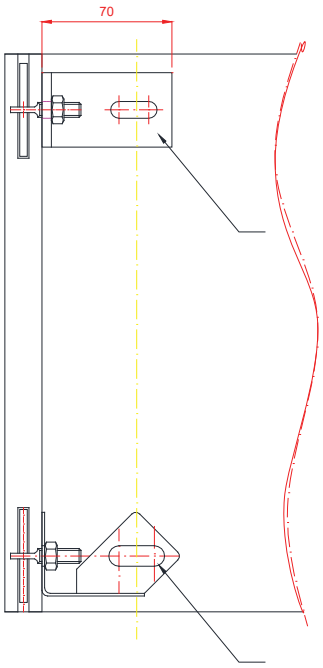
- For fixing small slabs on to supported facade slabs.
- Used for reveal, column, soffit and sill slabs.
- Slabs can be assembled in the work shop for faster installation on site.
- Special drilling is required on the slabs, details of which are shown at the bottom of the page.

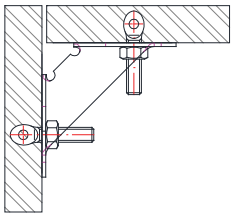
HCA02

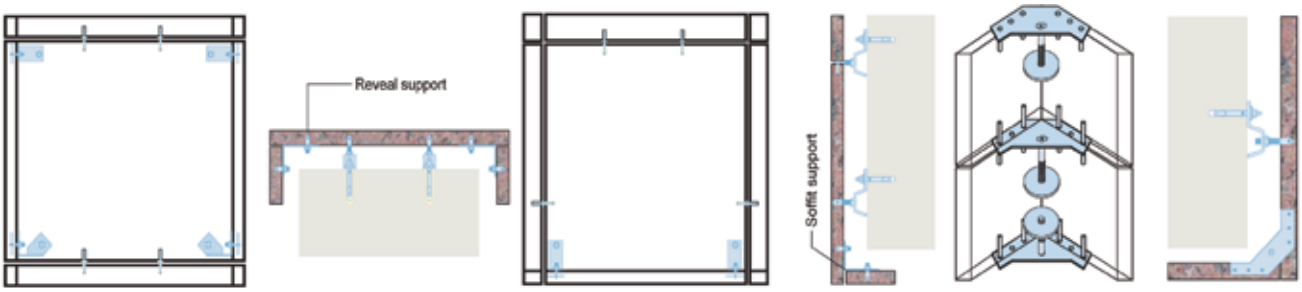
HCA01

HCA01







# Stone Drilling Tools - Introduction

## HAZ-MC-11
Special Drilling Machine for HB-11 Undercut Bolt

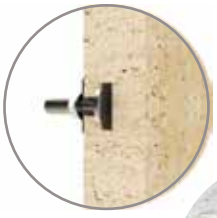
- HAZ-MC-11 undercut drilling machine
- Suitable for HB11 type undercut bolt
- UC 12, vacuum basement
- Drilling unit 1400 W
- 230 V Electric power
- GFI switch undercut drilling head

## HAZ-DB-11
Special No Core Drill Bit

- Sintered diamond segment with steel shank
- M10x1.5 adaptor for ways & secure fit
- Inner tube for water flow
- Available in diameter 12 mm

## HAZ-MC-T31
Special Drilling Machine for T31 Undercut Bolt

- HAZ-MC-T31 undercut drilling machine
- Vacuum pad
- Pneumatic drilling
- GFI switch undercut drilling head



## HAZ-DB-T31
Special Drill Bit

- Electro plated diamond bit with steel extension
- Inner tube for water flow
- Available in diameter 6,10 & 12 mm

# Stone Drilling Tools - Introduction

HAZ-MC-PN
Drilling Machine for HFP pin system

- HAZ-MC-PN drilling machine for pins
- Suitable for HFP type pins
- Clamping device 10-50 mm
- Driving motor unit 1000 W
- Water sleeve
- 220 V Electric power
- GFI safety switch

HAZ-DB-PN
No Core Drill bit

- Sintered diamond segment with steel shank
- Inner tube for water flow
- Available in diameters 6, 8 and 10 mm

HAZ-MC-09
Special Drilling Machine for HB09 Undercut Bolt

- HAZ-MC-09 drilling machine for core bits
- Suitable for HB09 type undercut bolt
- Vacuum pad
- Driving motor unit 2200 W
- Leveller device up to 30 cm
- 220 V Electric power
- GFI  safety switch

HAZ-DB-09
No Core Drill Bit

- Sintered diamond segment with steel shank
- Inner tube for water flow
- Available in diameter 12 mm

## Notes

HAZ
Group of Companies
Establishment
www.hazgrp.com

HAZ Metal Sanayi ve Ticaret A.S.
is a member of HAZ Group of Companies

HAZ METAL
FIXING SYSTEMS

HAZ Metal is certified with integrated management systems by TUV SUD for ISO 9001 & OHSAS 18001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Always at the forefront of fixing technology, HAZ METAL has earned a reputation as the leaders in fixing systems innovation and is regarded as the one to follow. HAZ METAL fixing systems of today become the standard of tomorrow.

HAZ METAL combines the very latest international technology with its own research and development team to establish a technical excellence within the industry. HAZ METAL readily embraces the responsibility of a major producer and shares its expertise with problem solving solutions.