KIVOLT

TRADING COMPANY

Cladding Fixation Catalogue

www.kivolt-lb.com

Index

About Us

We, in KIVOLT Team, aim not just to conduct business with our clients but to make win-win situations through adding value by supporting them with our expertise, knowledge and highly technical team. Our products and services are of high quality and high cost efficiency at the same time because we believe that this is the perfect combination in any market and at any level.

The company trades building and construction material that conform with international standards of quality and safety that are manufactured in international factories equipped with high tech robotics, welding machines, CNC machines and an in-house Galvanization facility.

Looking forward for future collaboration.

Kivolt Team

Natural Stone

Natural Stone is one of nature's most beautiful materials. Each piece stands out for its unique value and good performance over time. Compared to other materials, stone stands out for its high level of resistance and excellent durability.

Types of Natural Stone

In short, the rocks most used in construction are:

• **Granite:** crystalline rock with magmatic origins and a good level of resistance against compression and erosion caused by abrasion, as well as an excellent environmental performance.

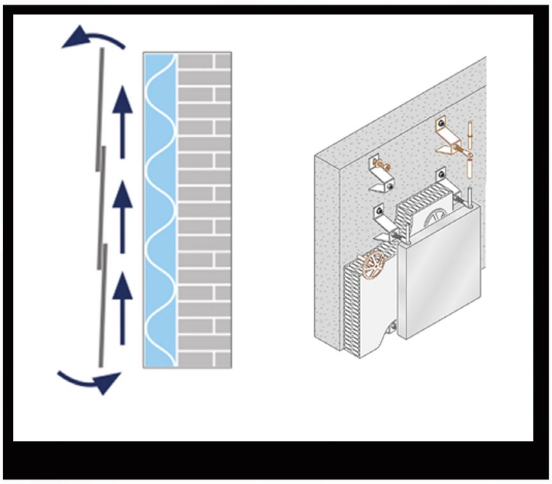
• **Marble:** carbonated rock with metamorphic qualities made of calcite or dolomite crystals with a compact and crystalline texture, liable of good polishing. It has a good level of flexural and compression strength and, to a lesser degree, to erosion caused by abrasion.

• **Limestone:** a sedimentary rock made of calcite carbonate crystals but less crystalline than marble. They are frequently presented in different bioclastic varieties with abundance of fossilized shell remains.

• **Sandstone:** a sedimentary rock made of quartz sand, feldspar, etc. bound together by variable composition cement.

Rainscreen Stone
Cladding System

Ventilated rainscreen cladding is a system of cladding in which the stone panels are used as part of a system that shields the majority of the supporting structure from direct rainfall. It combines a cavity and drainage system behind the panels to remove any moisture that gets past the rainscreen panels.



The rainscreen cladding system is made with a bearing wall, an insulation layer and a cladding material that is fixed to the building using a supporting structure. Thanks to this structure, an air cavity is created between the load bearing wall and the cladding material, allowing continuous ventilation.

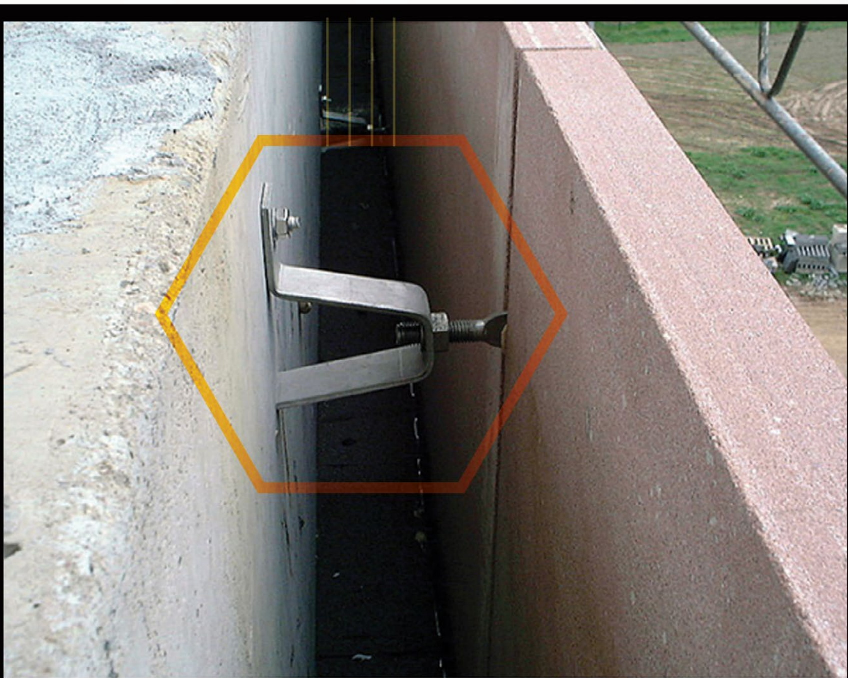
There usually is an insulation layer between the load bearing wall and the cladding, but it depends on the project. Sometimes the load bearing wall itself can be insulating or the insulating material can be placed inside the house.

External Wall

Types Behind The Façade Stone Panel

1 • Concrete Column & Wall

Reinforced concrete (RC) (also called reinforced cement concrete or RCC) is a composite material in which concrete's relatively low tensile strength and ductility are counteracted by the inclusion of reinforcement having higher tensile strength or ductility.



Concrete Column & Wall

2• Hollow or Filled CMU Wall

A concrete masonry unit (CMU) is a standard size rectangular block used in building construction. Concrete masonry walls may be solid , ungrouted, partially grouted, or fully grouted, the latter two enhancing their structural strength. Additionally, steel reinforcement bars (rebar) can be used both vertically and horizontally inside a CMU wall to maximize its structural performance. The cells in which the rebar is placed must be grouted for the bars to bond to the wall.

Hollow or Filled CMU Wall

3• Steel Stud Drywall Wall

Steel Stud Drywall Wall

Stone Cladding Systems

Our Cladding Systems :


LB-1


LB-2


LB-3


LB-4

A • L-bracket Types


LBA-1


LBA-2

B • Adjustable L-bracket Types

Our Cladding Systems :

ZB-1

ZB-2

C• Z-bracket Types

OB-1

D• Omega-bracket Type

CB-1

E• C-bracket Type

FHB

F• Flat Head Bolt

PIN

G• Pin

Channels and Accessories

C-CH 41 x 21

BTB C-CH 41 x 41

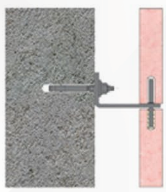
Spring Nut

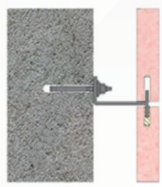
Anchor

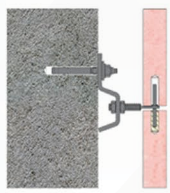
H • Channels and Accessories

Cladding Systems Details

Details for L-bracket Types



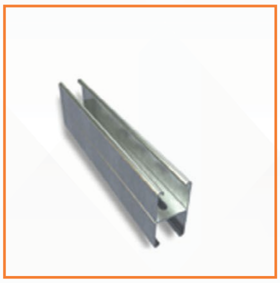


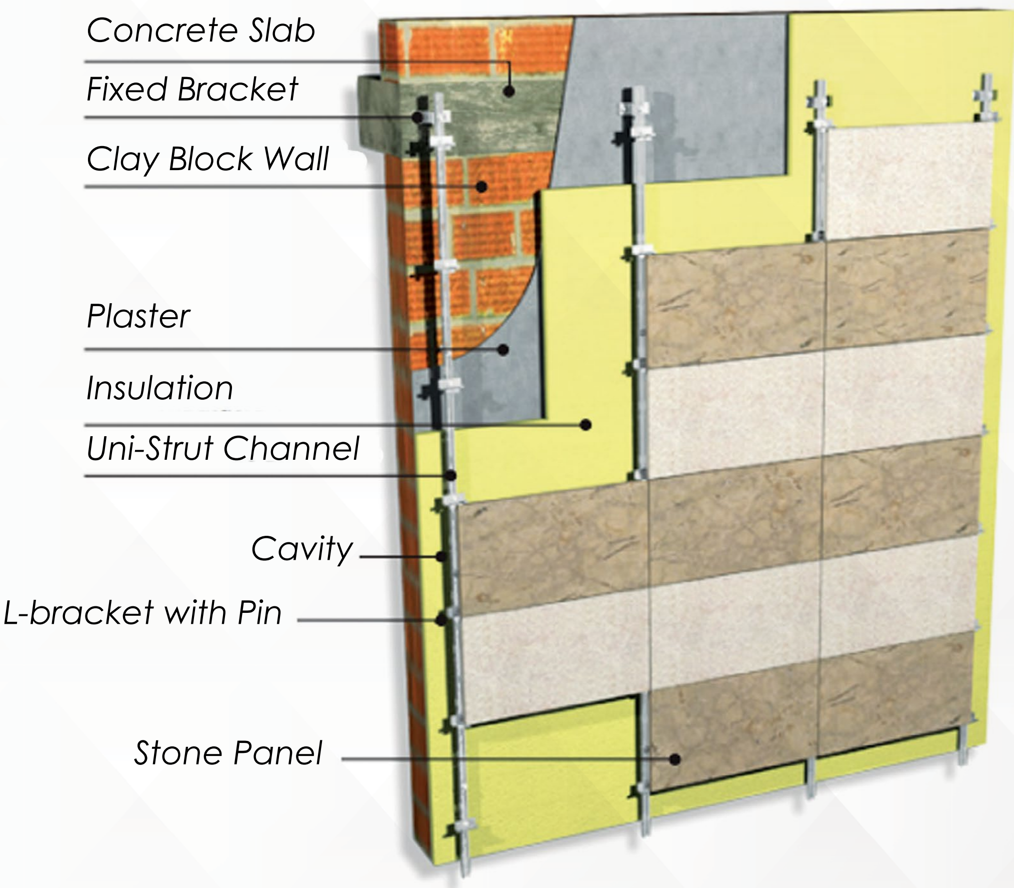


LB-1	LB-2	ZB-2

Note: Sizes for each type vary as per the applied loads.

Details for Frame Type



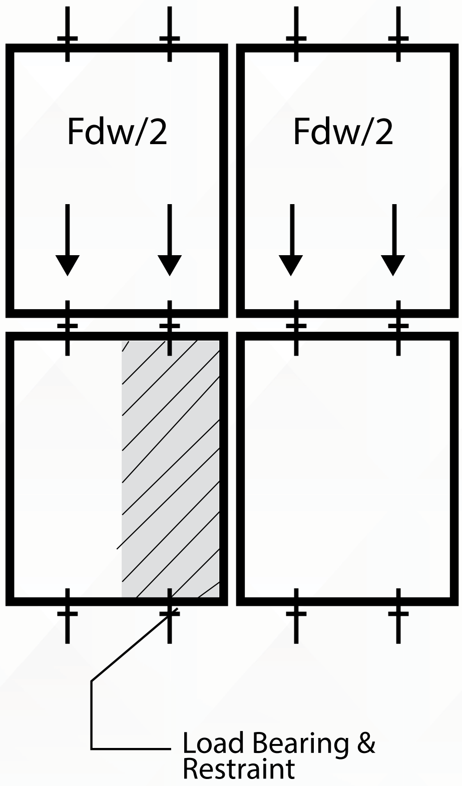


Horizontal and Vertical Joints

A-Installation of Stone Panels with Horizontal Joints

In this instance the dead load of the stone panel is divided in two, as half the weight of the stone is transferred to the load-bearing anchors.

• In horizontal joint installation slabs are pinned on the lower and upper edges.
Anchors are load-bearing carrying half the weight of the slabs above. Anchors also act as restraints, holding the slabs below and restraining against wind suction and pressure.

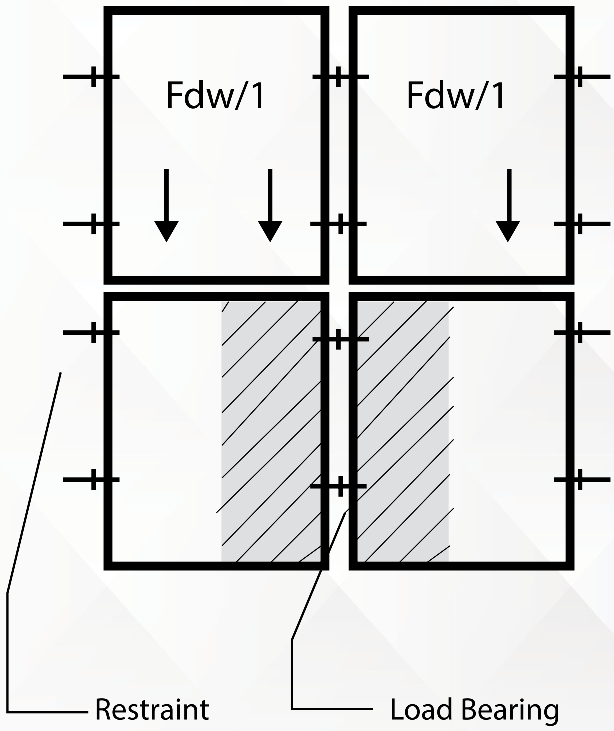


B-Installation of Stone Panels with Vertical Joints

The dead load of the stone panel is divided by one, as the load-bearing anchors take the whole weight of the slab.

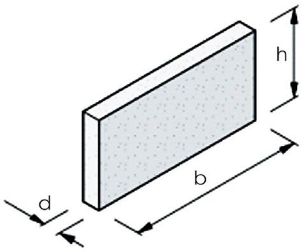
• In vertical joint installation slabs are pinned at the left and right sides. Anchors on the bottom are load-bearing anchors carrying half the weight of the slab on the left and half the weight of the slab on the right. Anchors on the top are restraint anchors holding the slabs and restraining against wind suction and pressure.

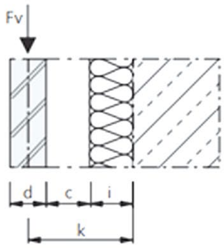
• The design and structural calculations of these anchors are made by our technical department.



Design and Calculations

Material	g [kN/M3]
Ceramic, volcanic stone	20
Limestone compositions, travertine	24
Sandstone, ophiolite, greywacke	26
Limestone, dolomite, shell marl, marble	27
Granite, porphyry, syenite, slate	28
Basalt, diorite, gabbro, gneiss	30





Dimension of Stone Panel

Width b

Height h

Thickness d

Stone Panel Weight

F_V = b [m] x h [m] x d [m] x g [kN/m³]

Applied Loads

1- Dead Load (Mainly from the façade stone panel)

You can find the density for various natural stones in the below table.

Example:

Granite Stone panel with dimensions as follows:

Width: 1.2 m, Height: 0.6 m

Thickness: 0.03 m

has a weight Fv = 1.2 x 0.6 x 0.03 x 28 = 0.605 KN

Applied Loads

2- Wind Load (depends mainly on the height of the building).

Use the below table to find the wind pressure / wind suction with respect to the structure height as per DIN 1055.

h	v	q		wind pressure	suction in middle zone		suction in edge zone
(m)	(m/s)	(kg/m²)	(kN/m²)	$C_p = 0.8$ Wp = 1.25 X 0.8 X q	$C_p = 0.5$ $h/b \leq 0.25$ Wp = 0.5 X q kN/m2	$C_p = 0.7$ $h/b \leq 0.5$ Wp = 0.7 X qkN/m2	$C_p = 2.0$ $b/8 \leq 2m$ W_p= 2.0 X q kN/m²
0 - 8	28.3	50	0.5	(kN/m²)	0.25	0.35	1.0
8 - 20	35.8	80	0.8		0.4	0.56	1.6
20 - 100	42.0	110	1.1		1.55	1.77	2.2
>100	45.6	130	1.3		1.65	0.91	2.6

Where :

h: building height , m

b: building width , m

v : wind velocity , m/s

q: wind load , kg/m² - KN/m²

Wp/s : wind pressure / wind suction , KN/m²

cp: correction factor

Applied Loads

3-Seismic Load

The maximum design base shear is $V = \frac{2.5\ C_a\ I}{R} W$

Where :

Ca is a seismic co-efficient depending on the soil conditions at the site and regional seismicity. The seismic zone factor is essentially to know the value for Ca. Five seismic zones , numbered 1 2A 2B 3 4 .The numerical values of Z are :

Zone	1	2A	2Bone	3	4
Z	0.075	0.15	0.2	0.3	0.4

I is the importance factor
R is Structural System Coefficient ,it is a measure of the ductility and over strength of the structural system, based primarily on performance of similar systems in past earthquakes.
W: Weight of the structure

Applied Loads

4- Deflection due to Thermal Expansion

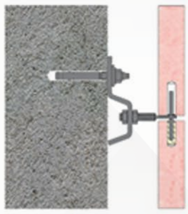
The thermal expansion of natural stone is an important consideration where natural stone is used with dissimilar materials to form large units which are rigidly fixed.The coefficient of thermal expansion varies from one variety of naturalstone to another ,so the actual thermal characteristics of a specific natural stone should be obtained from the supplier when the final choice of a naturalstone is made.

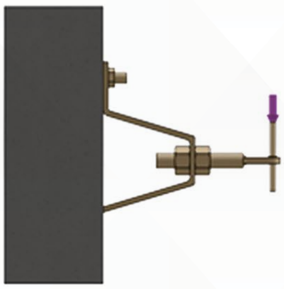
Applied Loads

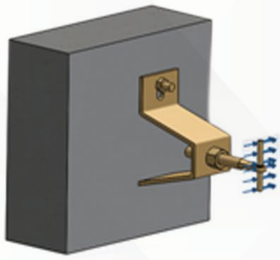
For ZB-2 Type

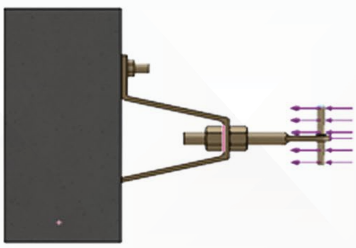
The thermal expansion of natural stone is an important consideration where natural stone is used with dissimilar materials to form large units which are rigidly fixed.The coefficient of thermal expansion varies from one variety of naturalstone to another, so the actual thermal characteristics of a specific natural stone should be obtained from the supplier when the final choice of a naturalstone is made.

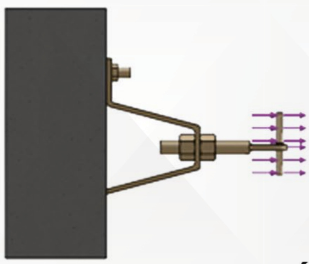

ZB-2


ZB-2


Dead Load (Stone panel)


Seismic Load


Wind Load Pressure

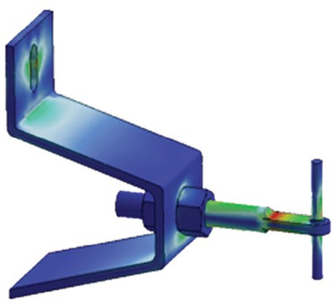

Wind Suction Load

Results (Stresses & Deformation)

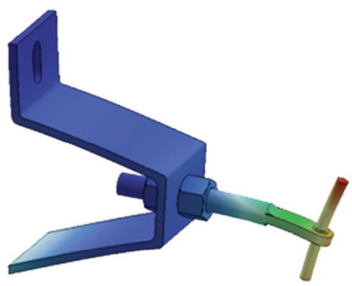
For ZB-2 Type

By FE Analysis

ZB-2



Results for Stress



Results for Deflection

Distribution of Facade Stone Panels

Standard Type

Staggered Type

Kivolt Anchors

Technofix STM Anchor

For Fixing Stone Cladding Brackets, Unistrut Channels...into Hollow Concrete Block, Solid Concrete Block, Reinforced Cconcrete Beams, Slabs, Columns & Walls

Typical Applications

In **Hollow Block or Solid Block** (compressive strength = 7 MPA).
The maximum tension load is 0.7 KN and Shear load is 0.7 KN

Materials

1- Zinc plated steel.
2- Stainless steel [SS 304 (A2) , SS 316 (A4)].

Technical Data

Recommended loads (non-cracked concrete C 20/25).316 (A4)].

Type (order No)	Tension Load (KN)	Shear Load (KN)	Torque Moment (Nm)	Screw Grade
M6	2.5	2.3	10	4.6
M8	3.3	4.4	17	4.6
M10	4.7	6.5	34	4.6
M12	6.9	8.5	60	4.6

Features

1- The Hexagonsl bolt length varies as per the fixture thickness.
2- Suitable also to be used with Threaded Rod.
3- By tightening the hexagonal bolt head or hexagonal nut, the cone pulls into the expansion anchor and apply forces against the drill hole internal surface.
4- Suitable for various facade building substrates

Setting Data

Edge distance > 1,5 x H eff., distance between anchors > 3 x H eff.
Thickness of foundation > 2 x H eff.

Size	H eff. (mm)	Edge Distance C (mm)	Distance Between Anchors S (mm)	Thickness of Foundation hmin (mm)	Washer (Ø)	Tightening Torque (Nm)	Spanner size (mm)
M6	40	60	120	100	12 x 1.6	10	10
M8	45	68	135	100	16 x 1.6	20	13
M10	55	83	165	110	20 x 2.0	40	17
M12	70	105	210	140	24 x 2.5	75	19

Installation Parmeters

H eff = Effective anchorage depth.

Bolt Size	Length exp.unit (mm)	Drill (Ø) (mm)	Drilling depth (mm)	H eff. (mm)	Usable Length (mm)	Screw Ø x Length (mm)
M6	45	10	55	40	5	M6 x 50
M8	50	12	60	45	10	M8 x 60
M10	60	15	80	55	20	M10 x 80
M12	75	18	90	70	25	M12 x 90

Typical Applications

For Fixing Stone Cladding Brackets, Unistrut Channels,... into Reinforced Concrete Beams, Slabs, Columns & Walls.

THROUGH BOLT
Mechanical Anchor

Materials

1- Zinc plated steel.
2 Stainless steel [SS 304 (A2) , SS 316 (A4)].

Technical Data

Through bolt zinc plated (non-cracked concrete C20/25).

Bolt Size	Tension Load (KN)	Shear Load (KN)	Torque Moment (Nm)
M6	2.0	1.90	4.0
M8	4.0	4.0	15.0
M10	5.95	5.95	30.0
M12	7.5	10.0	50.0
M16	12.0	16.0	100

Setting Data

Edge distance > 1,5 H eff. , distance between anchors > 3 x H eff.
Thickness of foundation > 2 x H eff.

Size	H eff. (mm)	Edge Distance C (mm)	Distance Between Anchors S (mm)	Thickness of Foundation hmin (mm)	Washer (Ø)	Tightening Torque (Nm)	Spanner size (mm)
M6	40	50	80	100	12 x 1.6	7	10
M8	50	55	55	100	16 x 1.6	14	13
M10	58	60	60	120	20 x 2.0	30	17
M12	68	85	85	140	24 x 2.5	35	19
M16	80	85	85	160	30 x 3.0	80	24

Installation Parameters

Through bolt zinc plated, stainless steel or hot dip galvanized.

Bolt Size	Bolt Length (mm)	Drill Ø (mm)	Hole Ø in Fixture (mm)	Drilling Depth (mm)	Setting Depth (mm)	H eff. (mm)	Usable Length Fix (mm)
M6	40	6	6.5	35	27	....	3
	55	6	6.5	35	35	35	15
	70	6	6.5	35	35	35	30
	95	6	6.5	35	35	35	55
M8	50	8	9	35	35	...	10
	65	8	9	40	40	...	20
	80	8	9	40	40	40	35
	95	8	9	40	40	40	50
	105	8	9	40	40	40	60
M10	65	10	11	40	40	40	15
	80	10	11	50	50	50	20
	95	10	11	50	50	50	35
	115	10	11	50	50	50	55
	120	10	11	50	50	50	60
M12	80	12	13	65	50	50	60
	100	12	13	65	60	50	20
	120	12	13	65	60	60	30
	135	12	13	65	60	60	50
M16	105	16	18	85	70	70	15
	140	16	18	85	80	80	40
	180	16	18	85	80	80	80
	220	16	18	85	80	80	120

H eff.= Effective anchorage depth

Kivolt Accessories

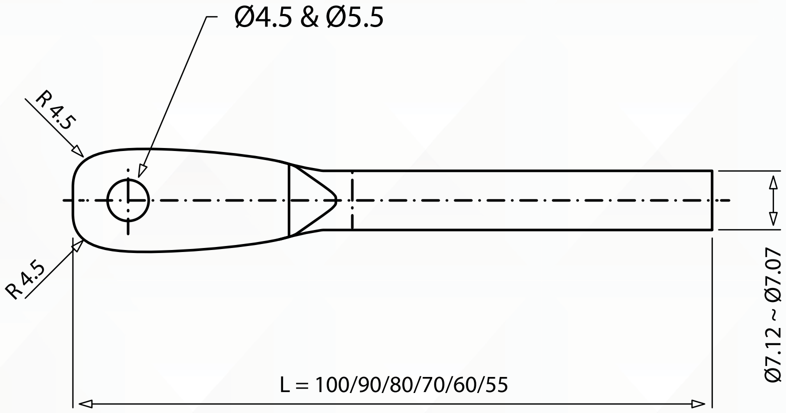
Flat Head Bolt

Ultimate Tensile Strength MPa (N/mm2)	0.2 % Proof Stress MPa (N/mm2)	% Elognation	Property Class
700	450	0.4 d	A4

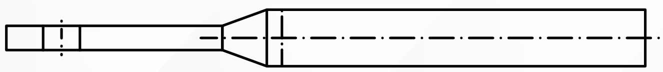
Ultimate Tensile Strength MPa (N/mm2)	0.2 % Proof Stress MPa (N/mm2)	% Elognation	Property Class
700	450	0.4 d	A2

Stainless Steel 304 & 316 Flat Head Bolt

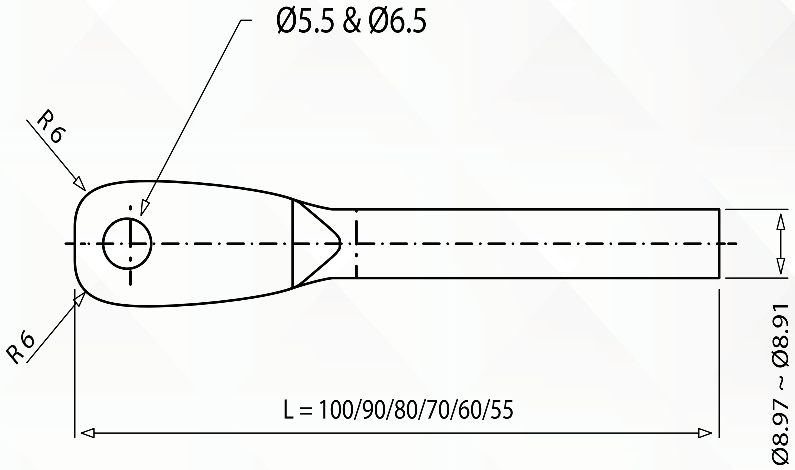
FHB M8



Kindly contact our sales team for other dimensions.



FHB M10



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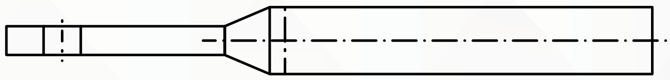
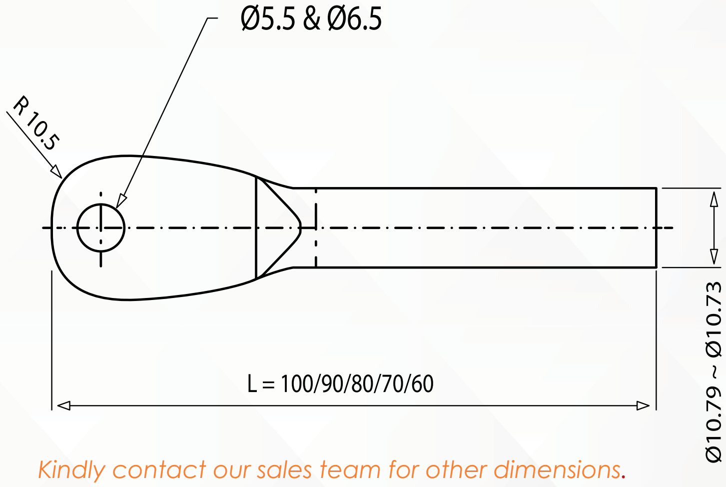


FHB M12



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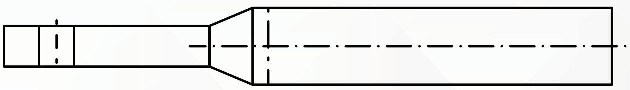


Pin with Ring

Diameter D1 (mm)	Length L1 (mm)
M4	50-60
M5	50-60
M6	50-60

Pin Mechanical Properties

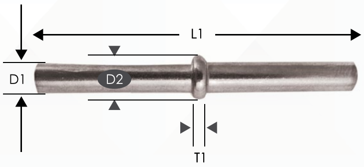
Stainless Steel 316L/A4
Mechanical Properties

Ultimate Tensile Strength MPa (N/mm^2)	0.2 % Proof Stress MPa (N/mm2)	% Elognation	Hardness HRB	Property Class
600	305	54	82	A4

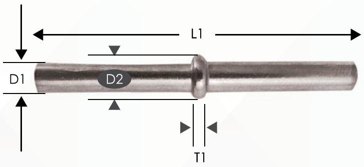
Stainless Steel 304/A2
Mechanical Properties

Ultimate Tensile Strength MPa (N/mm^2)	0.2 % Proof Stress MPa (N/mm2)	% Elognation	Hardness HRB	Property Class
636	322	52	82	A2

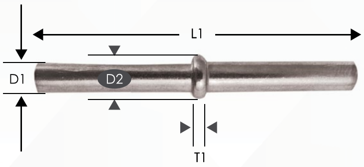
Diameter (mm) (D1)	Length (mm) (L1)	Ring Thickness (mm) (T1)	Ring Diameter (mm) (02)
M4	50	1.20	5.20



Diameter (mm) (D1)	Length (mm) (L1)	Ring Thickness (mm) (T1)	Ring Diameter (mm) (02)
M5	50	1.65	7.00



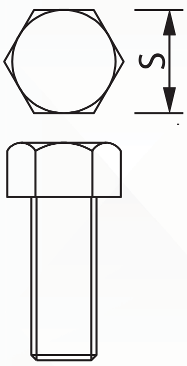
Diameter (mm) (D1)	Length (mm) (L1)	Ring Thickness (mm) (T1)	Ring Diameter (mm) (02)
M6	50	2.2	9.00



Hexagonal Bolt

Machine HexHead Bolts
DIN 933, DIN 24017

Hex Head Bolt (SHB)
DIN 933 or
EN 24017
(without nut)



Dimension	S DIN mm	S EN mm
M6 x 12	10	10
M6 x 25		
M8 x 25	13	13
M8 x 40		
M10 x 20	17	16
M10 x 30		
M10 x 45		
M10 x 60		
M10 x 70		
M12 x 22	19	18
M12 x 25		
M12 x 30		
M12 x 40		
M12 x 50		
M12 x 60		
M12 x 80		
M12 x 90		
M16 x 40	24	24
M16 x 60		
M16 x 90		

Finishing Available : Electroplated, HDG, SS AISI 316 & 304

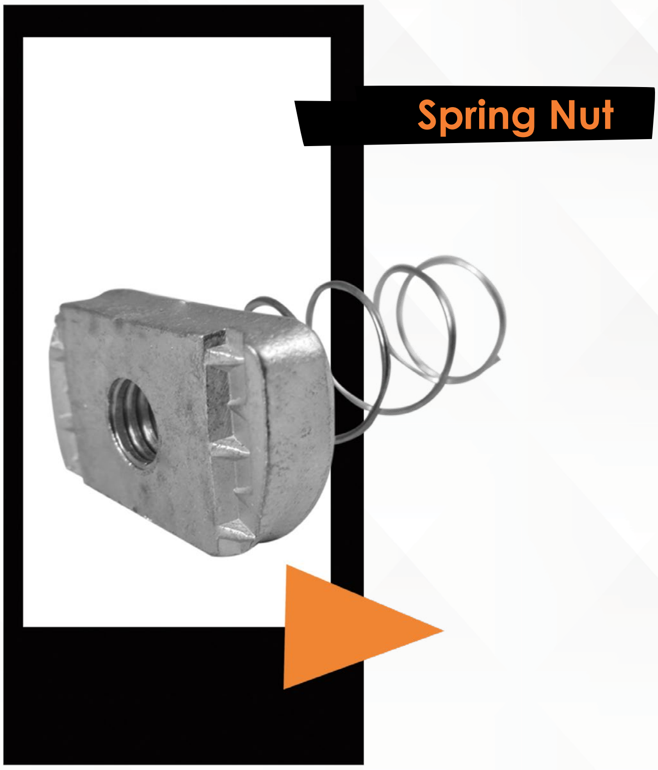
Threaded Rod

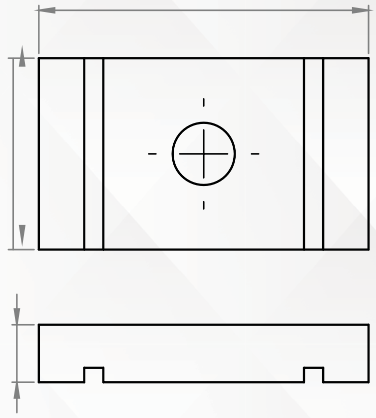
Fully Threaded Rods

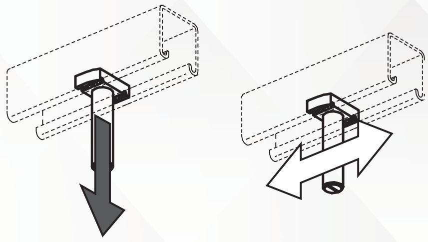
Grade 4.6 DIN 9

STR DIN 975

Zinc Plated Thread	Length mm	Load Cap KN
M6	2000/ 3000	2.2
M8	2000/ 3000	4.0
M10	2000/ 3000	6.4
M12	2000/ 3000	12.9
M16	2000/ 3000	17.3







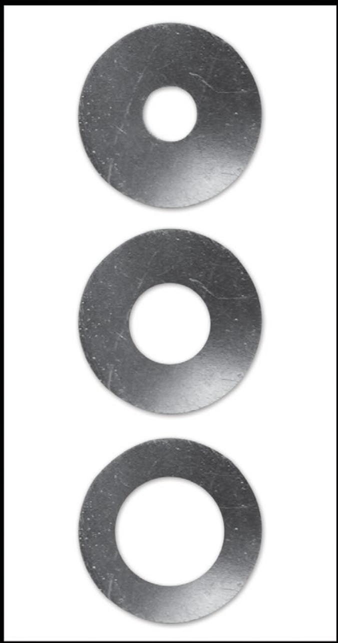
ALLOWABLE LOAD CAPACITIES FOR CHANNEL, NUTS AND BOLTS

Mild Steel Channels, Bolt Material zinc plated or hot dip-galvanized

Thread Size	Pull Out Force Fv (kN)	Longitudinal Force FL (kN)	Tightening Torque (Nm)
M6	5.0	1.0	12.0
M8	6.0	2.4	28.0
M10	7.0	3.5	55.0
M12	7.0	5.0	55.0

Stainless Steel Channels, Bolt Material Stainless steel A4

Thread Size	Pull Out Force Fv (kN)	Longitudinal Force FL (kN)	Tightening Torque (Nm)
M6	5.0	0.3	6.5
M8	6.0	0.6	16.0
M10	7.0	1.2	31.5
M12	7.0	1.7	55.0

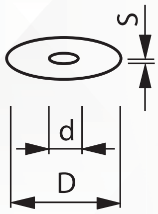


Round Washer

Round Washers

DIN 440,DIN 9021

Washers (SRW)
DIN 440,DIN 9021



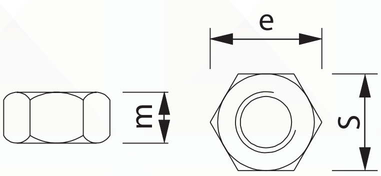
DIN	Dimension	D mm	d mm	s mm
440	M6	22	6.6	2
9021	M8	24	8.4	2
9021	M10	30	10.5	2.5
440	M12	45	13.5	4
9021	M12	37	13	3
9021	M16	50	17	3

Hex Nut

Hexagonal Nut

DIN 934, DIN EN 24032

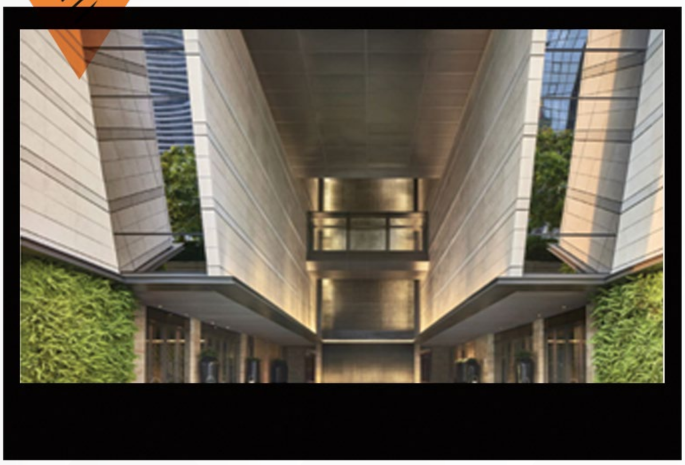
(= DIN EN 24032)



Dimension Thread	**S/m** DIN mm	**S/m** ISO mm	**e** mm
M6	10/5	10/6	11.5
M8	13/6.5	13/7.5	15.0
M10	17/8	16/9.5	19.6
M12	19/10	18/12	21.9
M16	24/13	24/15.5	27.7

Finishing Available : Electroplated, HDG, SS AISI 316 & 304

Checklist



The project data for the below topics shall be provided in order to submit the suitable Cladding fixing system.

1- Stone Dimension (Width x Length x Thickness)
2- Stone type (Limestone , Granite , Marble,..)
3- Wall Type (Concrete, Hollow CMU, Filled CMU, Solid CMU,...)
4-Cavity between wall and face of panel
5- Insulation thickness
6- Application (Vertical Joint or Horizontal Joint)
7- Distribution for panels (Standard or Staggered)
8- Wind Load (Pressure & Suction) with its reference standard
9- Seismic Load with its reference Standard
10- Project Specification
11- Detailed Drawings (Vertical Section, Elevation,...)

Technical Specifications

1-For Channel, base plate, Cantaliver Brackets ....

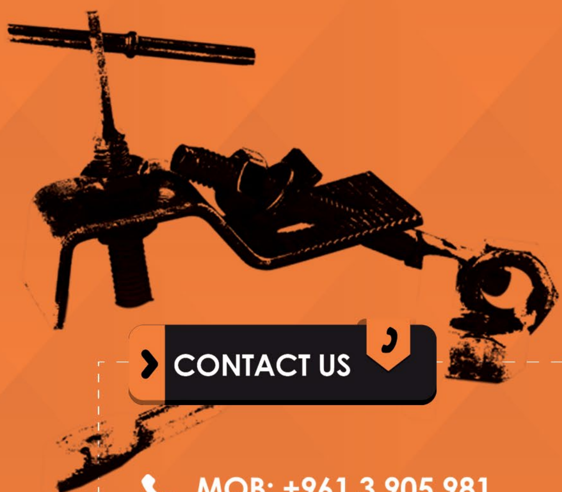
-Mild Steel (MS)
For cold rolled steel : accoding to EN 10130 , ASTM A 366
For hot rolled steel : according to EN 10025-2 , ASTM A 907

With

-Hot Dipped Galvanized Finish after fabrication (HDG)
Accoding to EN ISO 1461 , BS 729 , ASTM A 123

2-For L-bracket , Z-bracket , Flat Head Bolt , Pin

-Stainless Steel (SS)
Austenitic Stainless Steel SS 304 , 304 L & 316 , 316 L:
according to EN 10088-1: 2005-ASTM A 240



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