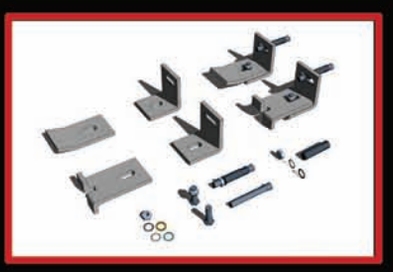
MODERN METAL

INDUSTRIES CO.

MMI ANGEL
CLADDING FIXATION



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Introduction

Cladding and facing fixing division perform an important role among building construction projects.

Fixing anchor whether they are for pre-cast concrete, marble, granite, limestone, sandstone, metal or other cladding can provide an optimized solution for ease of application and structural stability.

MMICO Cladding fixing systems are manufactured and supplied in various materials according to the required system to suit.

The catalogue shows the various types with their physical and mechanical characteristics, and for situations where a special fixing is required.

Principles for the Fixing of Building Cladding

Fixing systems for building claddings are composed of several elements (angles, expansion bolts, screws, nuts, washers, etc), each of which shall present the appropriate mechanical features in respect to the requirements posed by the specific project .

Any type of cladding, once fixed, is subject to two primary types of load:

Corbel Fixing Systems

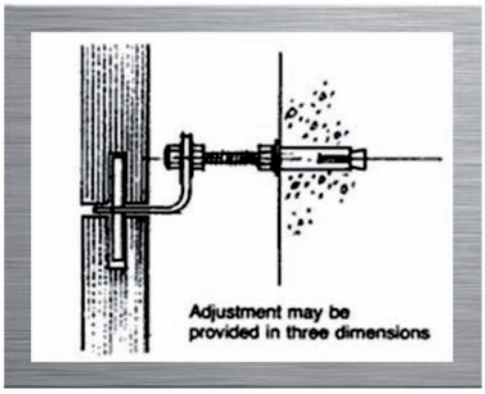
- The permanent load (the dead load), due to the weight of the cladding itself;
- The variable load (applied loads), due to the wind, thermal expansions, seismic motions, etc.

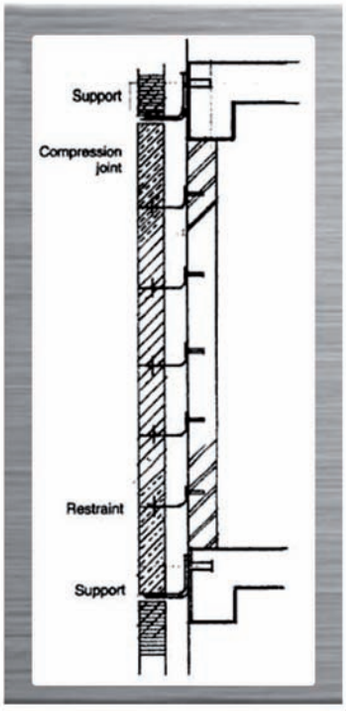
Two fundamental types of fixing systems result:

-Load-bearing fixing: to support the permanent load and the vertical components of the variable loads.
-Restraining fixing: to support the horizontal components of the variable loads.

Load-bearing fixing are usually composed by angles (of adequate dimensions), firmly fixed to the building by the opportunely selected anchoring element complete with expansion anchors and relative bolts.

Restraining fixings instead, serve to maintain the slabs in the positions specified by the project design. Thanks to the system of adjustment with which they are equipped, the absence of perfect verticality in the external surfaces may be easily overcome.



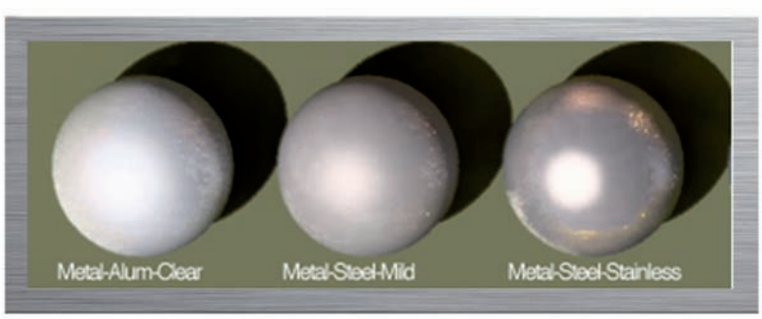


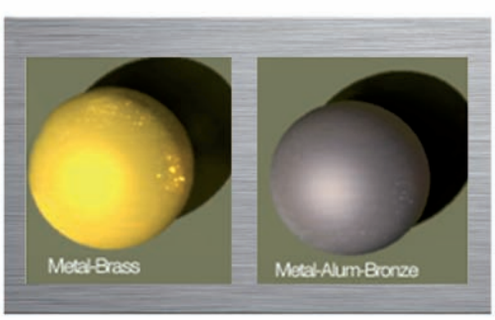
In this case, the set is generally composed of an angle more-contained dimensions in respect to those employed in the load bearing fixings, and an expansion bolt which, with the use of a threaded stud or bolt, permits the adjustment of the horizontal positioning of the angles, thus obtaining the perfect verticality of the cladding.

Therefore, with the correct design, the restraining fixing should not be subject to permanent loads, but will be able to withstand the periodical variable loads due, for example, to the pressures or depressions done by the wind or seismic motion.

Metals Used In fixing systems

The metals used for the realization of the various components comprising the fixing system set shall possess special features which, in addition to assuring a satisfactory mechanical resistance, shall also be immune to the varying forms of corrosion, in order to withstand both the static and dynamic load conditions to which they are subject throughout installation and the harmful atmospheric conditions which may arise as well, with extreme sturdiness and security. Particular attention shall be dedicated to the phenomenon of galvanic corrosion, which comes about whenever a more noble metal is placed into direct contact with another metal in the presence of an electrolyte (water containing salts, acids or substances deriving from combustion). Under such conditions, a chemical reaction takes place which tends to damage the less noble metal. Galvanic corrosion is particularly dangerous whenever the mass of the noble metal is inferior to that of the more noble metal. The ratio between these two masses, the direct-contact surface area, and the difference in potential between the two metals, determine the degree of corrosion or deterioration. For this reason, the material most commonly-advised for the realization of a complete set of fixings is Stainless steel AISI 304 which, in addition to guaranteeing optimum mechanical resistance features, is suited to satisfactory resistance even in particularly harsh environmental surroundings. Several combinations of different metals may be acceptable provided that the designer is aware of the specific environmental conditions, and that the combination is compatible with the same.



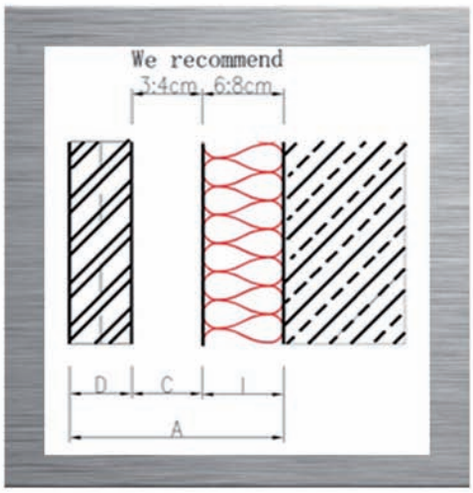


Design criteria

Design for the supporting structures of buildings claddings should be based on some basic principles :

a) The shape and the material of the structure to which the cladding is to be anchored (concrete, hollow brick, etc).
b) The shape and the material of the facing to be anchored.

D = thickness
B = Width
H = Height



Wall structure
D = thickness of stone panel
C= width of air space behind
I = thickness of thermal insulation
A = projection of panel anchor

c) The forces to which the building itself may be subject (winds of particular intensity, seismic activity, etc);
d) The environmental surroundings in which the building is located, paying particular attention harmful atmospheric conditions which may be found in industrial, marine or other areas.
e) Arrangement of panel anchor in vertical or horizontal joint.

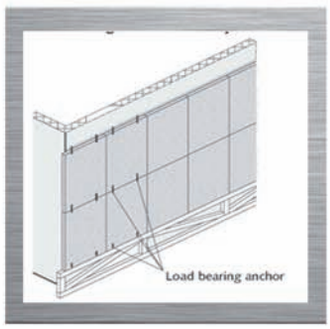
The awareness and a complete analysis of these factors is a necessary condition for the correct planning, in order to guarantee the highest safety levels possible.

Expansion joints in the facing

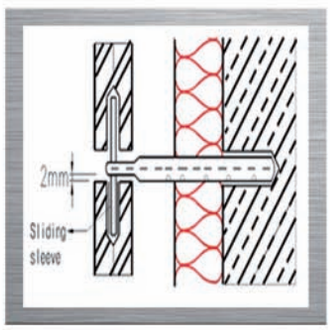
For any cladding with natural-stone panels, in addition to existing building separation joints there shall be horizontal and vertical expansion joints. This applies also to continuous faced strips such as column and parapet claddings. Horizontal expansion joints are provided in each storey, usually at the level of the underside of the ceiling. Expansion joints shall be provided also in outer and inner ceiling areas. Vertical expansion joints shall not be more than 6m apart.

Anchor Pins

a)The load capacity of the anchor pin does not have to be proved if it is at least 4mm in diameter; the width of the panel joint shall not be more than 10mm and the load on each half-pin not more than 750N. For a joint of width more than 10mm and up to 15mm, an anchor pin 6mm thick is used

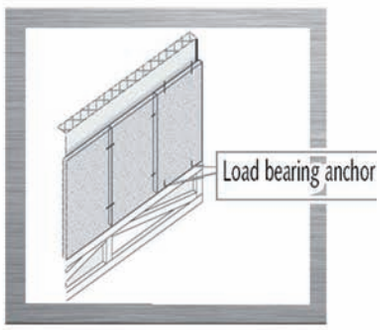


b) The bonding depth for the anchor pin into the panel is at least 25mm and at least 35mm for soft stone. The pin drill holes in the panels shall be 5mm deeper than the bond length of the anchor pins.



c) The diameter of the anchor pin hole is drilled 3 to 4mm wider than the pin diameter.

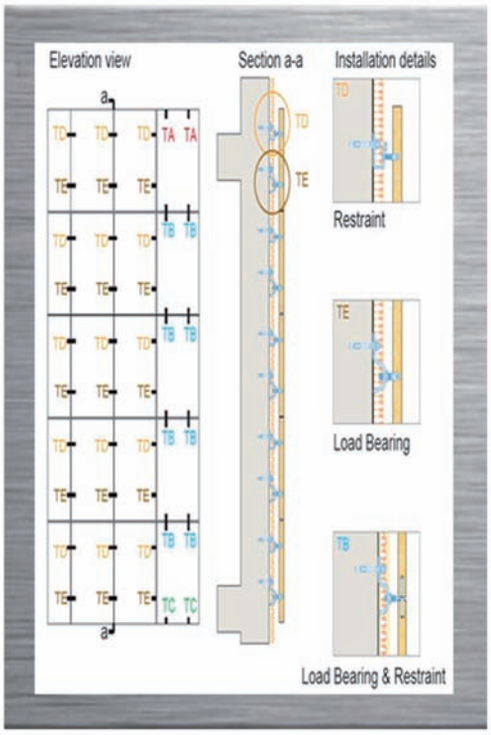
d)If splitting takes place when the pin holes are being drilled, the hole shall be re-drilled in a suitable place.



e) The anchor pin holes should be filled with fine mortar, or some other suitable filler, before the anchor pins are inserted.

Sliding sleeves

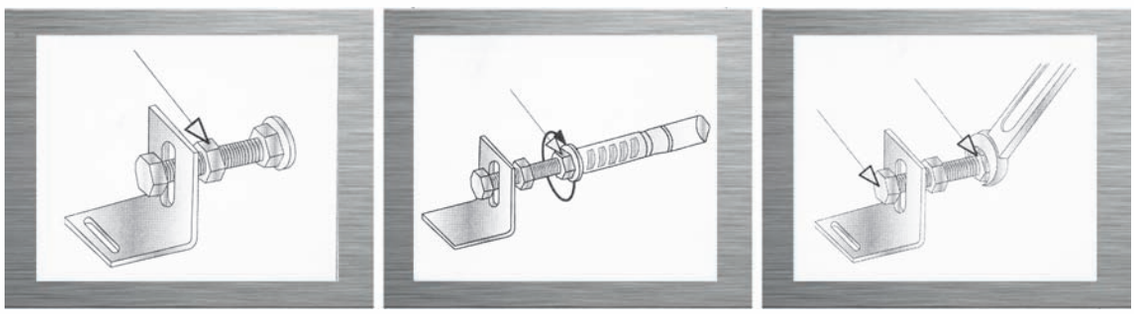
a) The function of sliding sleeves is to compensate for temperature-induced expansion of the natural-stone panels.
b) There shall be a clear space of at least 2mm on one side (sliding sleeve-side) in the panel joint.
c) The sliding sleeves should be inserted in the anchor pin holes together with suitable mortar before the natural-stone panels are mounted.



Installation methods

The dry fixing Installation method

The principle installation phases of a set of fixings for cladding is represented as follows:
1) Accurately locate the position of the drilling hole.
2) Drill a hole of the required depth and diameter.)
3) Insert the expansion bolt into the hole and cause it to expand by screwing down the nut A.
4) To regulate the distance, from the wall to the angle, rotate the screw B, while keeping the nut A locked tightly in position. If necessary, to facilitate the operation, loosen the nut A, which will be re-tightened at the end of the operation.
5) Tighten the lock-nut C for the final locking of the angle in the desired position.
6) Insert the pin in the angle to match the hole in the cladding slab.

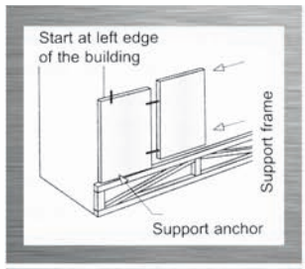


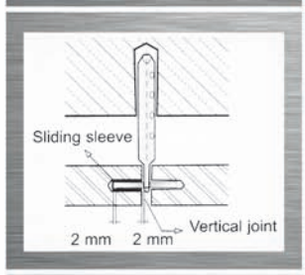
Mounting instructions for MMI Angle mortar

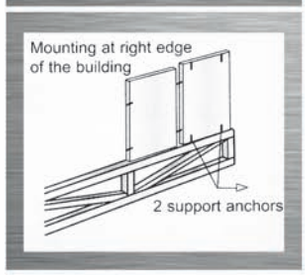
Anchor(wet fixing).

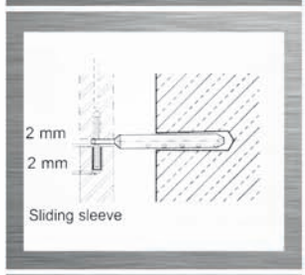
Arrangement of anchors in vertical joint

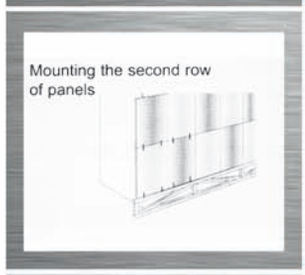
Take exact measurements of building, allowing for existing tolerances. Make sufficiently large recesses in thermal insulation for natural-stone anchors. Drill out anchor-pin holes and remove drilling dust.
Erect support frame for bottom row of panels, left to right and from bottom to top.
Place first natural-stone panel on an anchor in horizontal joint and underlay with wedge.
Wet anchor holes and fill with cement mortar.
Insert anchor in the two anchor holes.
Put anchor pin through anchor and push into sliding sleeve. There shall be a clearance of about 2mm in the sleeve for the anchor pin. Leave clear space of at least 2mm on side (sliding-sleeve side) when inserting anchor.
Pack mortar in anchor hole and re-insert cut-out thermal insulation for exact fit.
Fill anchor holes of second panel with mortar, then mount second panel, etc.
Mounting at right edge of building :
Anchor last panel but one at right edge, with pins on one side in vertical joint.
Mount last panel at right building-edge on 2 support anchors in horizontal joint.

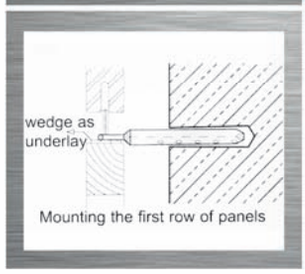












Arrangement of anchors in horizontal joint

Take the exact measurements of the building facade, allowing for existing tolerances.
Cut out recesses in thermal insulation, sufficiently large for natural-stone anchors.
Drill anchor holes and remove drilling dust.
Erect support frame for bottom row of panels.
Wet anchor holes and fill with cement mortar.
Insert support anchor for bottom row of panels and underlay with wedges.
Pack cement mortar in anchor holes.
Insert cut-out thermal insulation for exact fit.
Drill anchor-pin holes in first-row panels and fill with mortar. Insert sliding sleeve at top and then place natural-stone panel on support anchor; align top edge of panel and fix provisionally and with wall hook, etc.
Insert support anchor for second row of panels.
Provide clear space of 2mm between top edge of bottom row of panels and support anchor of second row.

Production Range

The problems inherent in the fixing of cladding and their respective solutions are confronted by MMICO/Angle through either of two well-distinct approaches:

A) Standard fixing solutions:
Which have been done in response to the most representative and demanded dimensional characteristics. These products come to be illustrated in the chapter “Standard Types”

B) Special fixing solutions
for which MMICO ANGLE has organized a staff of specialized technicians, in grade to provide a series of services at the complete disposal of the client. For greater detail, we shall illustrate these additional services to which our clients may avail themselves, as follow:
- Consultant service
- Designing service
- Testing service
- Quality control service
- Installation service

Consultant service

MMICO/Angle puts its entire technical staff specialized in fixing systems, at the complete disposal of the client, whenever indications regarding the most opportune decisions and methods to be adopted for the correct realization of any cladding fixing project are required. In addition, upon the request of the client, technical visits may be effected in the work yard, for the purposes of making realistic estimates, providing technical advice prior to construction, or for a follow-up in regard to the correct utilization of the advised fixing systems.

Designing Service

MMICO/ANGLE can effect a performance study and the complete designing of the most opportune fixing system for the cladding of buildings with marble facings, or facings of other materials.
The Design Department, after having received the essential information, will develop the project in respect to the necessary specifications supplied by the client. The primary objective is to provide the best solution to problems posed by the respective project.

Testing Service

MMICO also grants particular importance to this structure, without which it would be difficult to make and manage an archive of knowledge that allows the preparation of new and advanced technical solutions to be subsequently applied for the perfection and maximum reliability of each specific project.

In order to attain this aim, an effective system of collaboration has been evolved with testing centers. In fact, MMICO is able to provide the documentation belonging to the trial and testing of its own products, whenever requested by interested parties.

Quality control Services

Quality represents one of the most essential characteristics of the finished product for MMICO. In accordance with this concept, the company invests energy, which results in additional advantages for the client. Control operations effected upon the raw material, upon the half- finished work-piece, and further verifications upon the finished product, mean guarantees in regard to the component materials, exact conformity with the desired dimensional features , and the faultless realization of even the smallest details

Installation Service

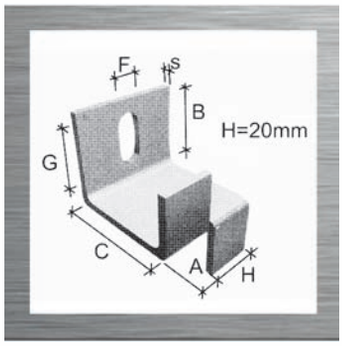
MMICO is also ready to provide assistance service and to carry out the laying of the building cladding with specialized personnel. Our technical staff is at your complete disposal in order to supply any further clarification you should desire.

Standard Types

Type MMI-500 1100/1200

Support angle

Type MMI-500 1100



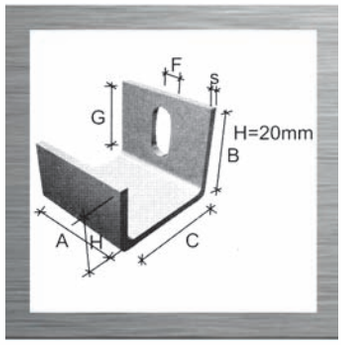
Load-bearing and retaining angles material: stainless steel AISI 304

Standard Items

Slotted hole F x G = 6.5 x 20mm Item no	Slotted hole F x G = 8.5 x 20mm Item no	Slotted hole F x G = 10.5 x 20mm Item no	S mm	A mm	B mm	C mm
1100 20 30	1105 20 30	1110 20 30	2	30	35	30
1100 20 35	1105 20 35	1110 20 35	2	35	35	35
1100 20 40	1105 20 40	1110 20 40	2	40	35	40
1100 30 30	1105 30 30	1110 30 30	3	30	35	30
1100 30 35	1105 30 35	1110 30 35	3	35	35	35
1100 30 40	1105 30 40	1110 30 40	3	40	35	40

Angels of different dimension may be manufactured under specific demand

Type MMI-500 1100



Load-bearing and retaining angles material: stainless steel AISI 304

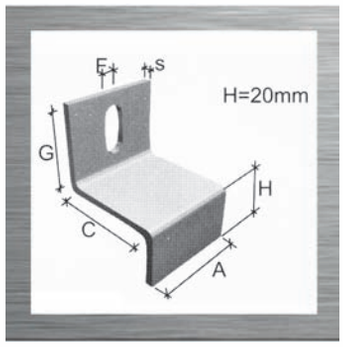
Standard Items

Slotted hole F x G = 6.5 x 20mm Item no	Slotted hole F x G = 8.5 x 20mm Item no	Slotted hole F x G = 10.5 x 20mm Item no	S mm	A mm	B mm	C mm
1130 20 30	1135 20 30	1140 20 30	2	30	35	30
1130 20 35	1135 20 35	1140 20 35	2	35	35	35
1130 20 40	1135 20 40	1140 20 40	2	40	35	40
1130 30 30	1135 30 30	1140 30 30	3	30	35	30
1130 30 35	1135 30 35	1140 30 35	3	35	35	35
1130 30 40	1135 30 40	1140 30 40	3	40	35	40

Angels of different dimension may be manufactured under specific demand

Type MMI-500 / 1100

Load-bearing and retaining angles material: stainless steel AISI 304



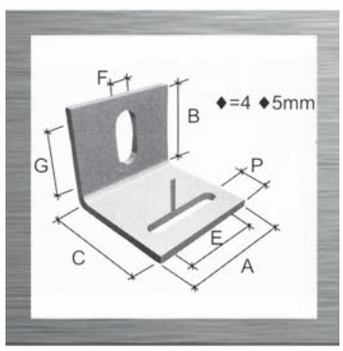
Standard Items

Slotted hole F x G = 6.5 x 20mm Item no	Slotted hole F x G = 8.5 x 20mm Item no	Slotted hole F x G = 10.5 x 20mm Item no	S mm	A mm	B mm	C mm
1160 20 30	1165 20 30	1170 20 30	2	30	35	30
1160 20 35	1165 20 35	1170 20 35	2	35	35	35
1160 20 40	1165 20 40	1170 20 40	2	40	35	40
1160 30 30	1165 30 30	1170 30 30	3	30	35	30
1160 30 35	1165 30 35	1170 30 35	3	35	35	35
1160 30 40	1165 30 40	1170 30 40	3	40	35	40

Angels of different dimension may be manufactured under specific demand

Type MMI-500 / 1100

Load-bearing and retaining angles material: stainless steel AISI 304



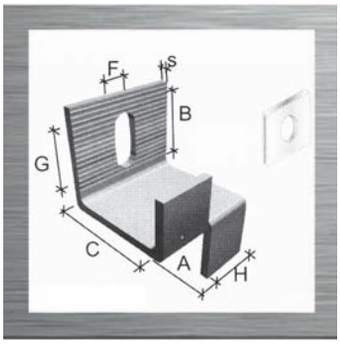
Standard Items

Slotted hole F x G = 6.5 x 20mm Item no	Slotted hole F x G = 8.5 x 20mm Item no	Slotted hole F x G = 10.5 x 20mm Item no	S mm	A mm	B mm	C mm
1175 20 25	1180 20 25	1185 20 25	2	25	30	30
1175 20 30	1180 20 30	1185 20 30	2	30	35	30
1175 20 35	1180 20 35	1185 20 35	2	35	35	35
1175 20 40	1180 30 40	1185 30 40	2	40	35	40
1175 30 30	1180 30 30	1185 30 30	3	30	35	30
1175 30 35	1180 30 35	1185 30 35	3	35	35	35
1175 30 40	1180 30 40	1185 30 40	3	40	35	40

Angels of different dimension may be manufactured under specific demand

Type MMI-500 1200

Load-bearing and retaining angles material: stainless steel AISI 304



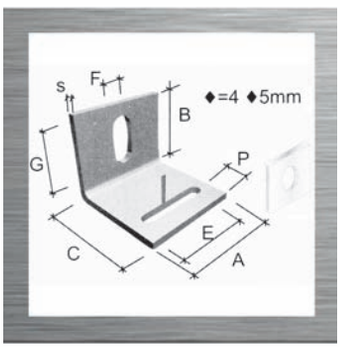
Standard Items

Slotted hole F x G = 6.5 x 20mm Item no	Slotted hole F x G = 8.5 x 20mm Item no	Slotted hole F x G = 10.5 x 20mm Item no	S mm	A mm	B mm	C mm
1200 20 30	1205 20 30	1210 20 30	2	30	35	30
1200 20 35	1205 20 35	1210 20 35	2	35	35	35
1200 20 40	1205 20 40	1210 20 40	2	40	35	40
1200 30 30	1205 30 30	1210 30 30	3	30	35	30
1200 30 35	1205 30 35	1210 30 35	3	35	35	35
1200 30 40	1205 30 40	1210 30 40	3	40	35	40

Angels of different dimension may be manufactured under specific demand

Type MMI-500 1200

Load-bearing and retaining angles material: stainless steel AISI 304



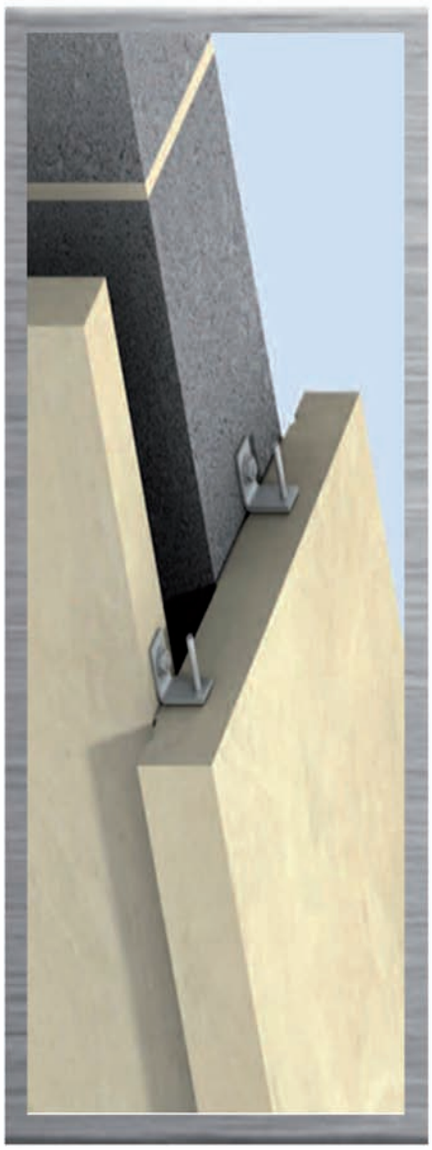
Standard Items

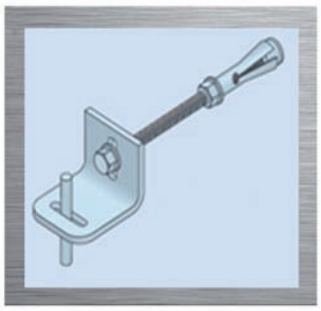
Slotted hole F x G = 6.5 x 20mm Item no	Slotted hole F x G = 8.5 x 20mm Item no	Slotted hole F x G = 10.5 x 20mm Item no	S mm	A mm	B mm	C mm
1230 20 30	1235 20 30	1240 20 30	2	30	35	30
1230 20 35	1235 20 35	1240 20 35	2	35	35	35
1230 20 40	1235 20 40	1240 20 40	2	40	35	40
1230 30 30	1235 30 30	1240 30 30	3	30	35	30
1230 30 35	1235 30 35	1240 30 35	3	35	35	35
1230 30 40	1235 30 40	1240 30 40	3	40	35	40

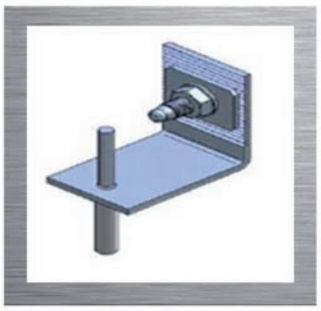
Angels of different dimension may be manufactured under specific demand

System Type MMI 500

Supports Brackets







The structural analysis fully considers the dead load of panel, imposed wind loads and thermal stresses, in accordance with relevant DIN standards.

Loads caused by earthquakes can be transferred into the anchoring base.

The support and restraint brackets are Fixed using expansion anchors, chemical anchors, etc.

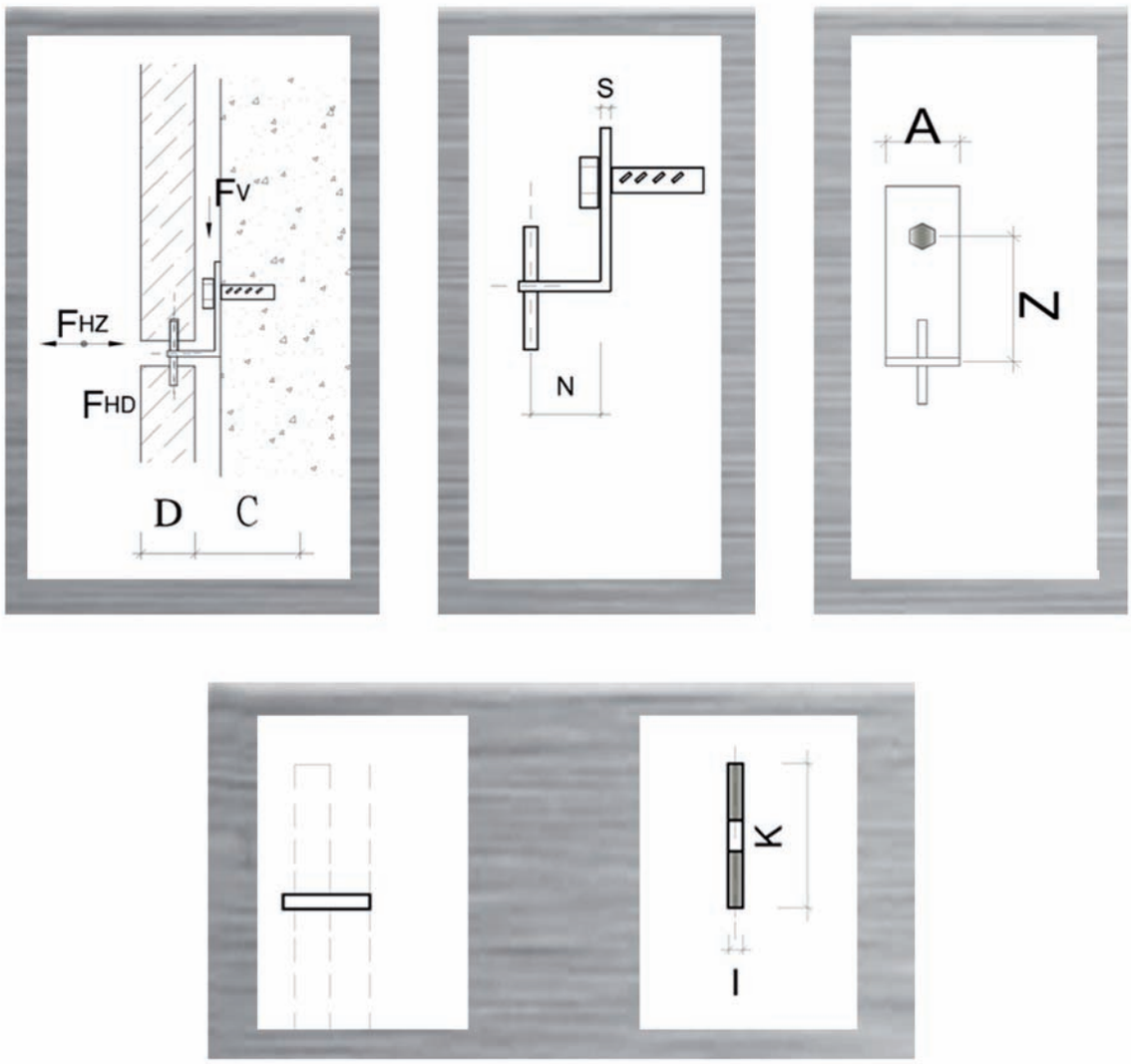
Using expansion bolts, an installation of the facade is also possible during the winter months.

Due to the small drill hole dimensions of the expansion bolts, the facade can be Installed very quickly.

Part of facade slab dead load to be taken by each support Brackett

Wind loads to be transmitted to structure by each support Brackets

Supports
Brackets



Anchoring base:
acc. To the license of
the dowel chosen.

Fv perm = permissible vertical loading capacity
FR = existing load on the dowel with maximum load of the anchor.

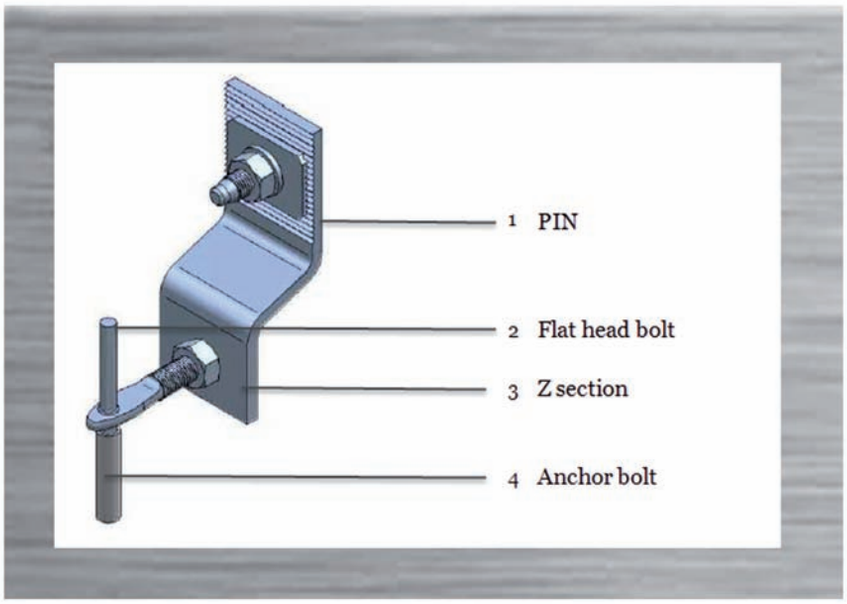
Support brackets
Technical Characteristics

Bracket width A (mm)	A Permissible Load Fv (N)	Installation Dimension					Anchor bolt FR (N)	M * (mm)
		a (mm)	n (mm)	s (mm)	Ø pxl (mm)	Ø fxk (mm)		
25	100	20	20	2	Ø 4x40	Ø 7x25	120	6
30	100	20		2			140	6
35	100	40		2			185	6
40	100	50		2			230	6
30	100	60		3			280	6
40	100	70		3			330	8
40	100	80		4			385	8
25	200	20	20	3	Ø 4x40	Ø 7x25	245	6
30	200	30		3			285	6
40	200	40		3			365	8
30	200	50		4			460	8
35	200	60		4			560	8
40	200	70		4			675	8
40	300	20	20	3	Ø 4x40	Ø 7x25	365	8
30	300	30		4			425	8
35	300	40		4			550	8
40	300	50		4			700	10
35	300	60		5			855	10
40	300	70		5			1010	10
35	400	20	25	3	Ø 4x40	Ø 7x25	545	8
40	400	30		4			510	8
40	400	40		4			630	10
40	400	50		5			775	10
40	400	60		5			925	10
30	500	20	25	4	Ø 4x40	Ø 7x25	695	8
40	500	30		4			635	8
35	500	40		5			790	10
40	500	50		5			965	10
35	600	20	25	4	Ø 4x40	Ø 7x25	830	10
40	600	30		5			765	10
40	600	40		5			945	10

* M thread diameter of anchor bolt

System Type MMI 600

Z – Support brackets



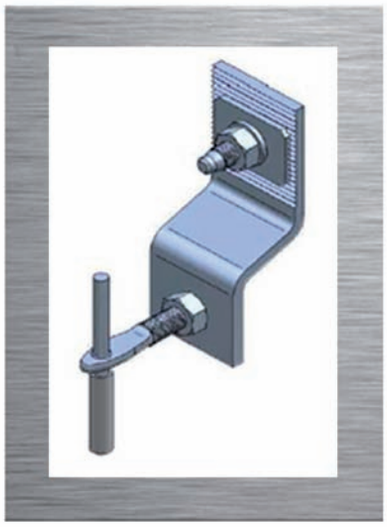
Application
According to DIN 18515 all cladding panels which are larger than 0.1 m2 have to be anchored.

Advantages
The panels are secured to the anchoring base material with absolute safety. Manufactured from stainless steel. The support and restraint brackets are adjustable in 3 directions. The brackets are fixed into the anchoring base by means of anchors.
Due to the small drill hole dimensions of the anchors the facade can be installed very quickly. The small size of drill hole into the anchoring base material means that heavy drilling equipment is not required.

Material
Manufactured from stainless steel AISI 304

Adjustability
±10 mm in three directions.

Z – Support brackets
Vertical joints



The structural analysis fully considers the dead load of panel, imposed wind loads and thermal stresses, in accordance with relevant DIN standards.

Loads caused by earthquakes can be transferred into the anchoring base.

The support and restraint brackets are Fixed using expansion anchors, chemical anchors, etc.

The support and restraint brackets are adjustable in 3 directions.

Due to the small drill hole dimensions of the expansion bolts, the facade can be Installed very quickly.

The restraint anchors of the system 1 to 5 are interchangeable so that any fixing problem can optimally be solved.

Part of facade slab dead load to be taken by each support Brackett

Wind loads to be transmitted to structure by each support Brackets

Z – Restraint/Support brackets Vertical joint

Anchoring base: acc. To the license of the dowel chosen

Adjustability:
in 3 directions
x = ± 10 mm
Y = ± 10 mm
Z = ± 10 mm

FVperm. = permissible vertical loading capacity
FHperm. = permissible horizontal tensile load or pressure load
FR = existing load on the anchor with maximum load of the bracket

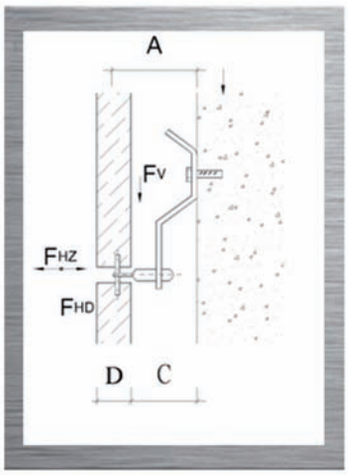
MMI- 600 Vertical joint

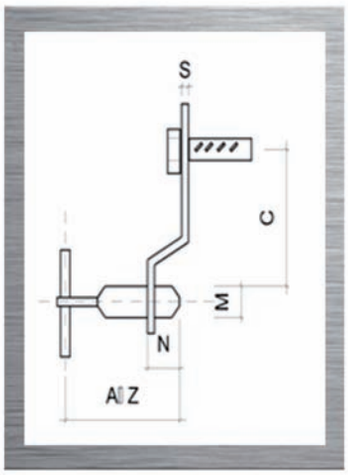
Bracket Width A (mm)	Permissible load		Installation Dimensions					ø pxl (mm)	ø fxk (mm)	Anchor bolt FR (N)	M** (mm)
	$F_v$per (N)	$F_H$per (N)	a (mm)	c (mm)	m* (mm)	v (mm)	s (mm)				
40	145	80	50	45	8	3	3	ø 4x40	ø 7x25	910	8
45	145	80	60	50	8	3	3			1175	8
40	145	80	70	60	8	3	4			1060	8
40	305	160	50	50	10	4	4	ø 4x50	ø 7x25	1605	8
50	305	160	60	55	10	4	4			1895	8
60	305	160	70	65	10	4	4			1695	10
50	555	295	50	55	12	5	5	ø 4x55	ø 7x25	2790	10
60	555	295	60	65	12	5	5			2445	10
70	555	295	70	70	12	5	5			2780	10

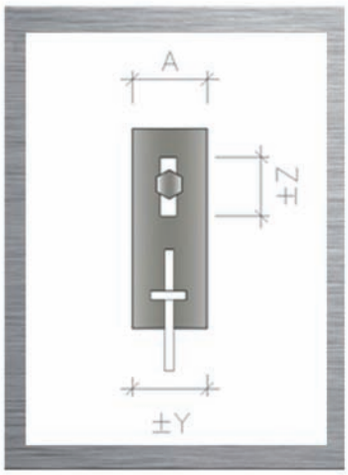
* m Thread diameter of flat head bolt.

** M Thread diameter of anchor bolt.

Z – Support brackets
Horizontal ioints







Anchoring base:
acc. To the license of the dowel chosen.

Adjustability:
in 3 directions
x = ± 10 mm
Y = ± 10 mm
Z = ± 10 mm

FVperm. = permissible vertical loading capacity
FHperm. = permissible horizontal tensile load or pressure load
FR = existing load on the anchor with maximum

MMI- 600 type / horizontal joint

Bracket Width A (mm)	Permissible load		Installation Dimensions					ø pxl (mm)	ø fxk (mm)	Anchor bolt FR (N)	M** (mm)
	$F_V$per (N)	$F_H$per (N)	a (mm)	c (mm)	m* (mm)	v (mm)	s (mm)				
40	170	185	50	45	8	3	3	Ø 4x40	Ø 7x25	1095	8
50	175	190	60	50	8	3	3			1050	8
40	175	190	70	60	8	3	4			1400	8
50	380	410	50	50	10	4	4	Ø 4x50	Ø 7x30	2475	8
40	375	405	60	55	10	4	5			2520	8
45	370	395	70	65	10	4	4			2260	10
60	665	710	50	55	12	5	5	Ø 4x55	Ø 7x35	3640	10
70	665	695	60	65	12	5	6			3605	10
55	660	705	70	70	12	5	6			3695	10
65	1090	1165	60	60	14	6	6	Ø 4x70	Ø 4x45	6595	10
80	1075	1150	70	70	14	6	6			6535	12

* m Thread diameter of flat head bolt.

** M Thread diameter of anchor bolt.

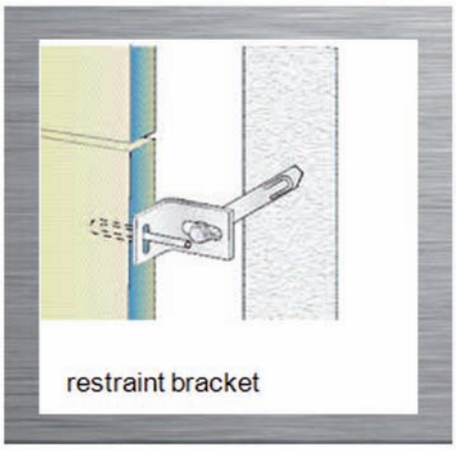
Z – Support brackets Horizontal joints

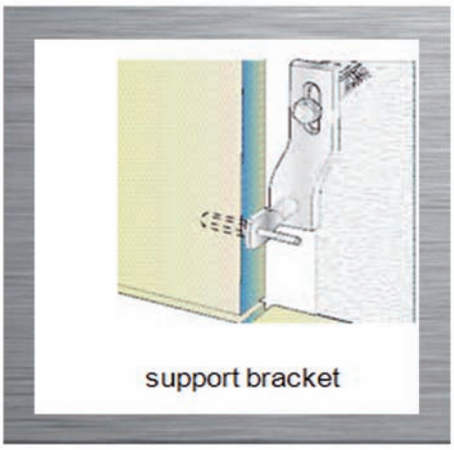
The structural analysis fully considers the dead load of panel, imposed wind loads and thermal stresses, in accordance with relevant DIN standards.

Loads caused by earthquakes can be transferred into the anchoring base.

The support and restraint brackets are adjustable in 3 directions

Due to the small drill hole dimensions of the expansion bolts, the facade can be Installed very quickly.

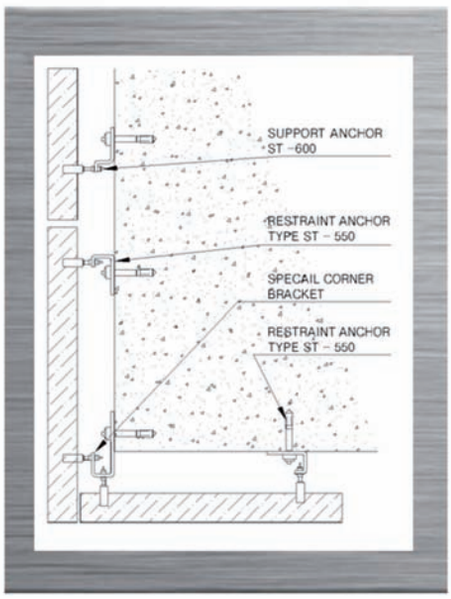




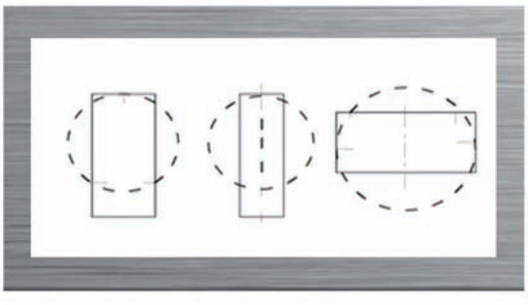
Part of facade slab dead load to be taken by each support Brackett

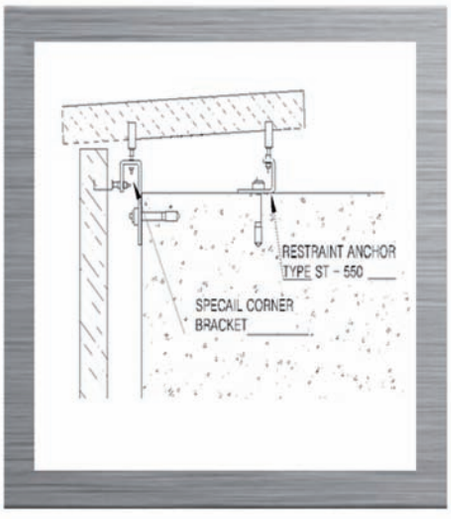
Wind loads to be transmitted to structure by each support Brackets

Detail solution: fixing of slabs at opening. ex . window

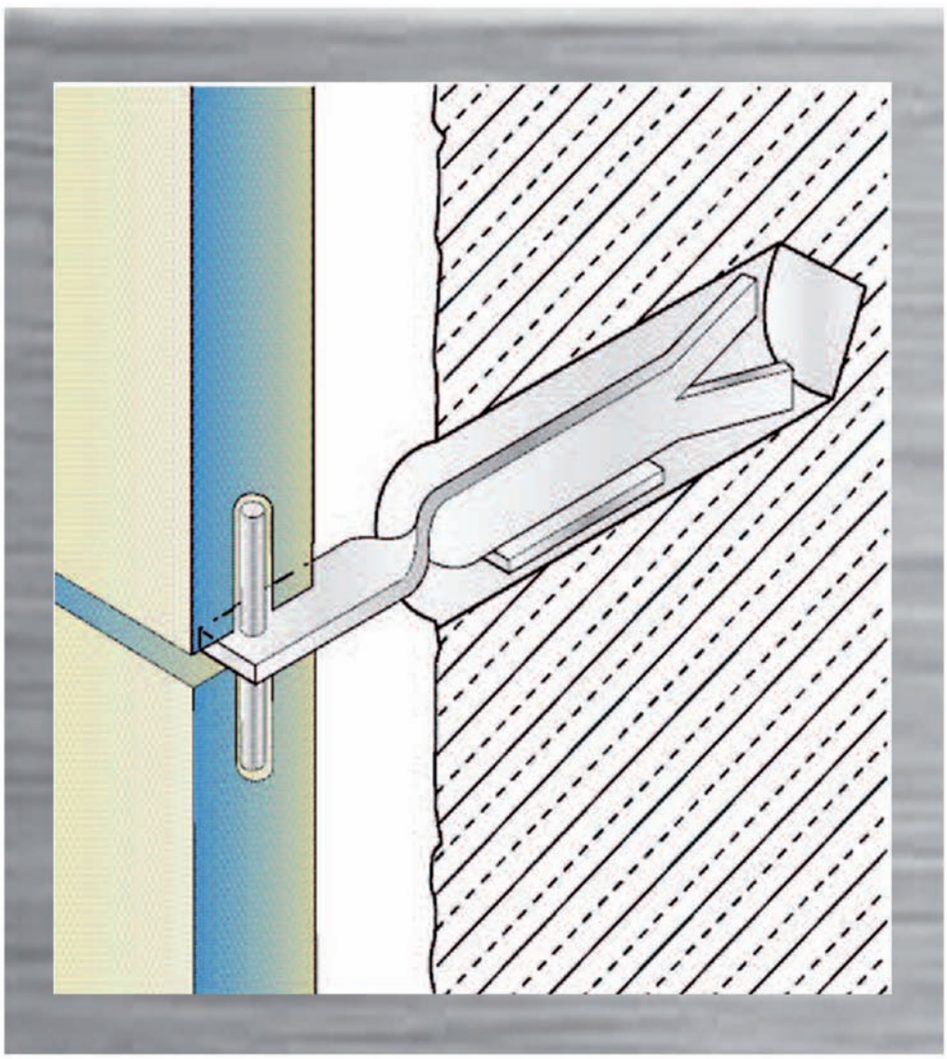


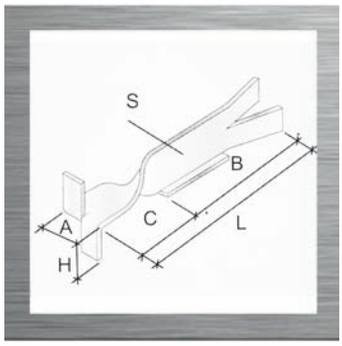
Fixings positions as per DIN 18516 part3
Slabs will be held usually at 4 points.
minimum at 3 points.
Fixings positions have to allow the slab to contract or expand freely when subjected to temperature.
All fixing points have to be located on an imaginary circle if drawn through these points.





System Type MMI- 800 1800





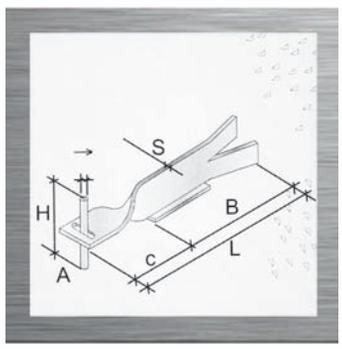
Type MMI 800 1800

Load-bearing and retaining Brackets material stainless steel AISI 304

Standard items

Item no.	S mm	A mm	L mm	C mm	B mm	H mm
1800 20 05	2	20	130	40	90	20
1800 20 10	2	20	140	50	90	20
1800 20 15	2	20	150	60	90	20
1800 30 05	3	25	130	40	90	20
1800 30 10	3	25	140	50	90	20
1800 30 15	3	25	150	60	90	20

Brackets of different dimension may be manufactured under specific demand



Type MMI 800 1800

Load-bearing and retaining Brackets material stainless steel AISI 304

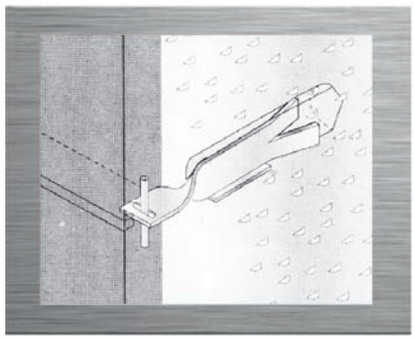
Standard items

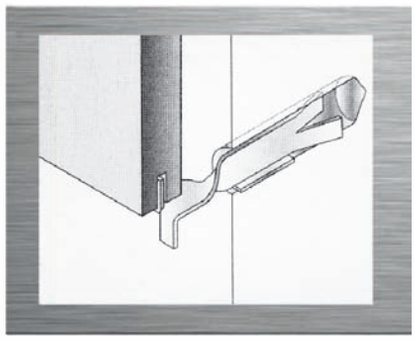
Item no.	S mm	A mm	L mm	C mm	B mm	H mm
1800 20 05	2	20	130	40	90	20
1800 20 10	2	20	140	50	90	20
1800 20 15	2	20	150	60	90	20
1800 30 05	3	25	130	40	90	20
1800 30 10	3	25	140	50	90	20
1800 30 15	3	25	150	60	90	20

Brackets of different dimension may be manufactured under specific demand

Load capacity for type MMI 800 1800

Code	Capacity [mm]	Max. load in [N]
1800 20 05	30	62
1800 20 10	40	46.5
1800 20 15	50	150
1800 30 05	30	37
1800 30 10	40	175
1800 30 15	50	131
1810 20 05	30	105
1810 20 10	40	62
1810 20 15	50	46.5
1810 30 05	30	175
1810 30 10	40	131
1810 30 15	50	105

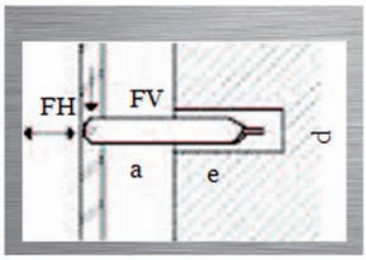


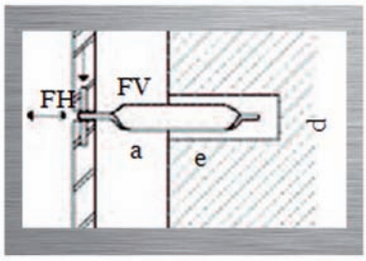


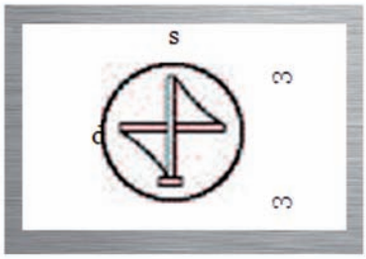
Special Types

Support Anchor

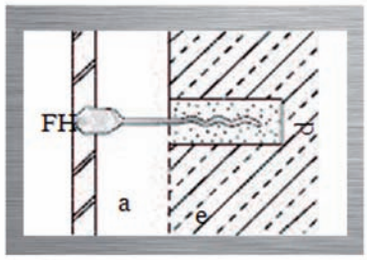
Types MMICO 850-1900

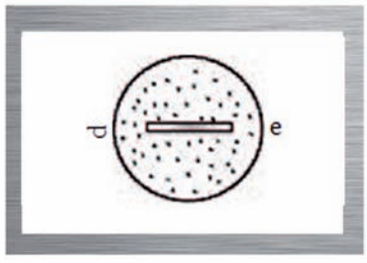


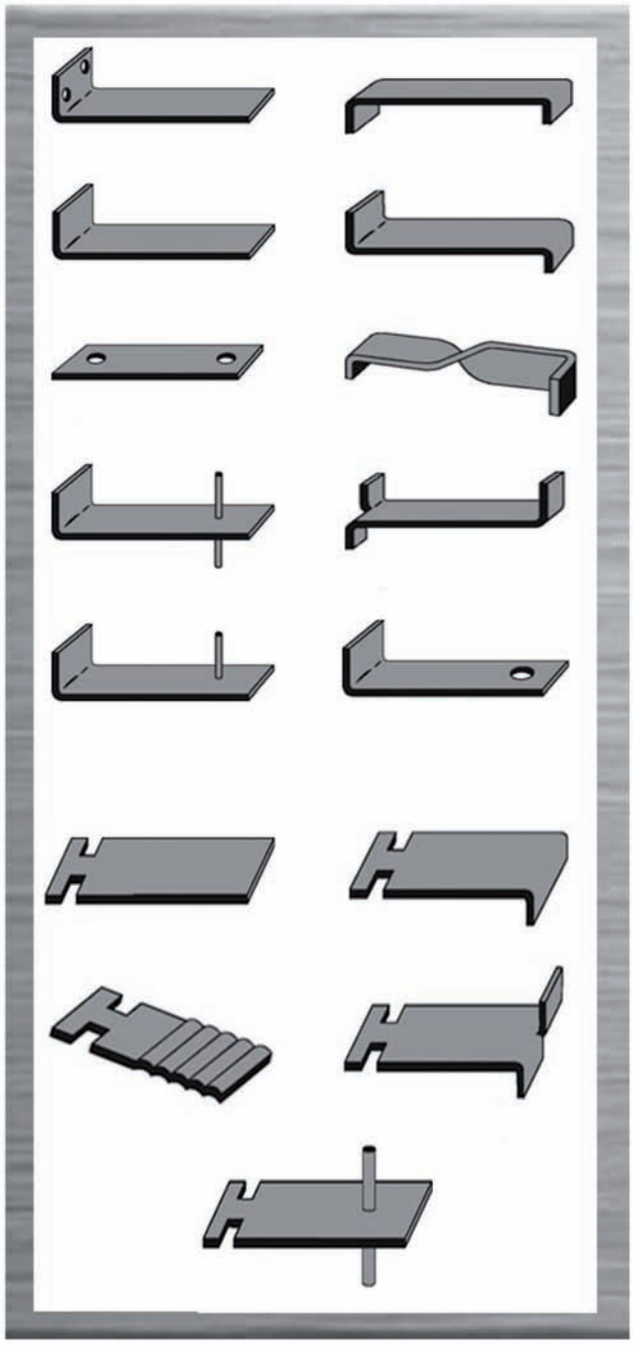




Restraint Anchor







Support Anchor

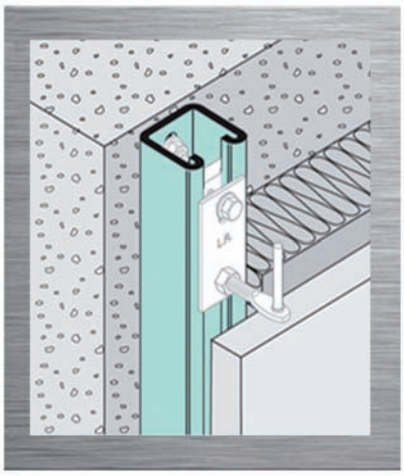
Max. Load			Bending Arm a (mm)	Type N,R,L,G,G1/2,P,P1/2	s (mm)	d (mm)		e (mm)		Pin Dimension	
FV (N)	FH Suction (N)	FH Pressure (N)				EB	EM	EB	EM	Ø (mm)	Length (mm)
200	148	-352	40	1900 30 05	3.0	19	23	80	80	5	70
			60	1900 30 10	3.0	22	26	80	80		
			80	1900 30 15	3.0	23	27	80	80		
			100	1900 30 20	3.0	25	29	80	90		
			120	1900 40 30	3.0	23	28	80	90		
400	296	-704	40	1905 30 05	3.0	26	31	80	80	5	70
			60	1905 30 10	3.0	32	36	80	80		
			80	1905 30 15	3.0	32	36	80	80		
			100	1905 40 20	4.0	29	33	80	80		
			120	1905 40 25	4.0	32	36	80	80		
600	444	-1056	40	1910 40 05	4.0	23	31	80	100	5	70
			60	1910 40 10	4.0	28	35	80	110		
			80	1910 50 15	5.0	28	34	80	125		
			100	1910 50 50	5.0	31	36	80	125		
800	592	-1408	40	1915 40 05	4.0	30	37	80	120	5	70
			60	1915 40 10	4.0	35	41	80	125		
			80	1910 50 15	5.0	35	41	80	125		
			100	1910 50 20	5.0	38	44	80	130		

EB: Bedding in concrete
EM: Bedding in masonry

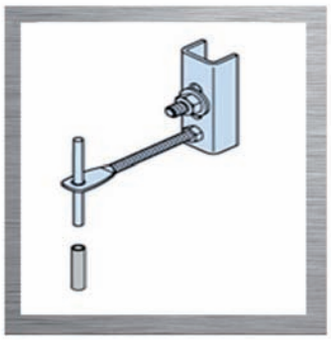
Restraint Anchor

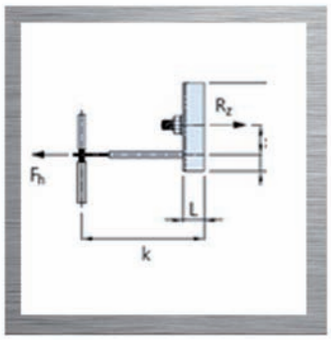
Max. Load		Bending Arm a (mm)	Type G,G1/2,P	s (mm)	d (mm)	e (mm)	Pin Dimension	
FH Suction (N)	FH Pressure (N)						Ø (mm)	Length (mm)
1000	-1000	40	1930 20 05	2.0	21	80	70	70
		60	1930 20 10					
		80	1930 20 15					
		100	1930 20 20					
		120	1930 20 25					
1300	-1400	40	1930 20 30	2.0	26	80	5	70
		60	1930 20 35					
		80	1930 20 40					
		100	1930 20 45					
		120	1930 20 50					

C – channel system



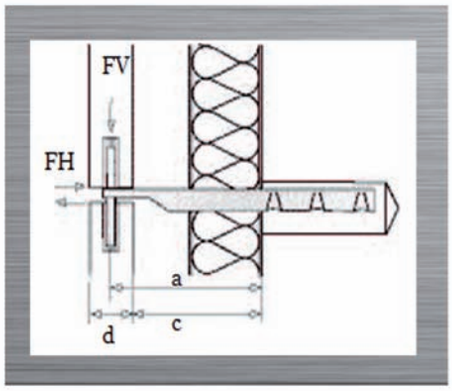
U – Support Brackets

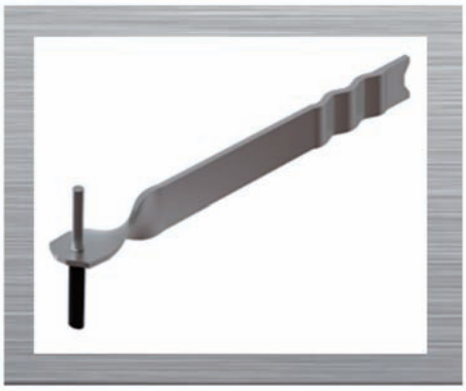




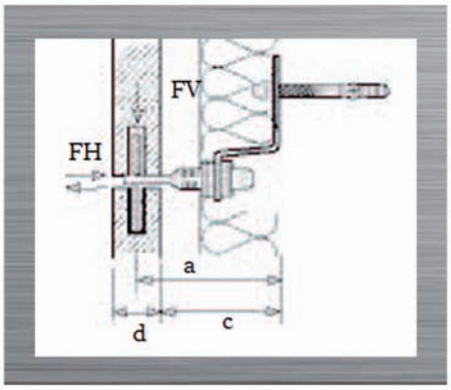
Vertical Load	Horizontal Load	Angle Tension			Projection Dim mm			Expanding Anchor for		Dim. (mm) Fv Projection			
FV (KN)	FH (KN)	max. FH (KN)	max. FH (KN)	max. FH (KN)	a	From-to	t	FH M	max. FH M	KN	a	d	L
0.13	0.20/0.28	0.48	0.3	2.7	55	40 – 70	3	6	8	0.13	55	M 8	60
0.13	0.20/0.32	0.48	0.3	2.7	75	60 – 90	3	6	8	0.13	75	M 8	80
0.29	0.40/0.37	0.60	0.6	2.8	55	40 – 70	4	8	8	0.29	55	M10	60
0.24	0.35/0.42	0.64	0.6	2.8	75	60 – 90	4	8	8	0.24	75	M10	80
0.48	0.65/0.48	0.71	1.0	2.8	55	40 – 70	4	8	10	0.48	55	M12	60
0.44	0.60/0.60	0.82	1.0	2.8	75	60 – 90	4	8	10	0.44	75	M12	80
0.75	1.00/0.87	1.11	1.6	4.0	60	45 – 75	5	10	12	0.75	60	M14	66
0.66	0.90/1.02	1.25	1.6	4.0	80	65 – 95	5	10	12	0.66	80	M14	86

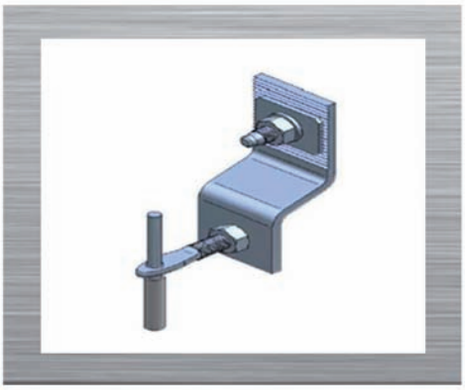
Motor V-brackets



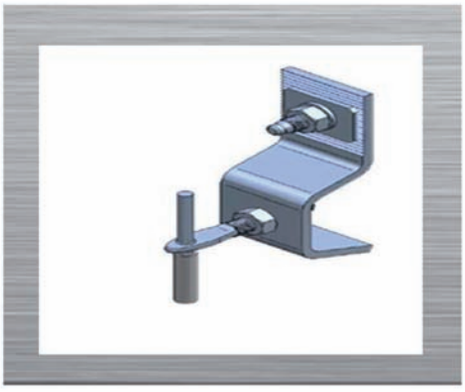


Z – Pendulum bracket





Z – Returned bracket



Its particular shape guarantees secure and high performance and prevents rotation
Yellow zinc plated steel ø 5 µ

Type	Thread	L Anchor Length mm	Drill mm	Minimum Drill hole mm
STM 6	M 6	45	10	55
STM 8	M 8	50	12	60
STM 10	M 10	60	15	75
STM 11	M 12	74	18	90

Type	S max fixing mm
STM 6s.s. with screw M 6x50	5
STM 8s.s. with screw M 8x50	10
STM 8s.s. with screw M 8x50	15

Pull-out values in KN concrete R 250 KN = Kilonewton (1KN=100KG)

	Screw cl. 8.8.			Screw cl. 8.8		
Type	Max Torque mm	Pull out	Shear	Max Torque mm	Pull out hook	Pull put eyelet
STM 6	10	10.3	9.6	3	2.2	6.7
STM 8	25	12.2	17.5	7	4.4	12.4
STM 10	45	17.1	27.8	14	6.2	17.5
STM 11	75	25.3	40.5	22	8.7	26.7

It is advisable to apply a safety factor in consideration (*250 Kg/cm^2).
of the various ways of employment.

Type	O eyelet mm
STM 6	9.5
STM 8	11
STM 10	14
STM 11	17

Type	G hock mm	P
STM 6	9.5	8
STM 8	11	10
STM 10	14	12.5
STM 11	17	15

Type	Screw x length mm	S max Drill hole mm
STM 6	M 6x50	5
STM 8	M 8x60	10
STM 10	M 10x80	20
STM 11	M 12x90	25

Pull-out values in KN-concrete R 250* KN=Kilonewton (1KN=100Kg)

Type	Max torque mm	Pull out	Shear
STM 6 Stainless steel A2	8	9.5	8.4
STM 8 Stainless steel A2	19	14	15.4
STM 10 Stainless steel A2	38	19	24.4

It is advisable to apply a safety factor in consideration of the various ways employment (*250Kg/cm^2)

Interim Guide

To The Design of stainless steel fixing

1.Intorodution

Stainless steel components are widely used for the support and fixing of cladding panels to buildings. The long term durability and Corrosion resistance of stainless steel makes it ideally suited to this application where there is a likelihood of a corrosive working environment for the cavity fixings.

BS 449, The Structural use of steel in building, contains rules for the application of stainless steel bolts and the calculation of their maximum working stresses. The use of stainless steel bolts and the calculation of their maximum working stresses. The use of Stainless steel in other forms is not, however, covered in this or any other British Standard.

It may be noted that whereas BS 449 is based on a permissible stress approach, revised or new codes, such as BS 5950 which is to eventually replace BS 449, are written in terms of limit states. Thus the design of stainless steel components will also be to limit state principles.

2.Materials grades and properties

The following grades of stainless steel are recommended for fixing applications.
2.1 Plate, sheet & strip

The relevant British Standards for the material are:
BS 1449 : Part 2: 1983 and BS 1501: Part 3: 1973

Table 1

Plate, sheet & strip-material to BS 1449: part2: 1983				
Grade	**Supply Condition**	**UTS N/mm^2 (min)**	**0.2% proof stress (min)**	**Elongation (min)**
304S11	Softened	480	180	40 %
304S15	Softened	500	195	40 %
316S11	Softened	490	190	40 %
316S31	Softened	510	205	40 %
321S31	Softened	500	200	50 %

The Hi-proof stainless steels produced to BS 1501: Part 3: 1973 have increased strengths due to the inclusion of nitrogen. Values for hi-proof steels are shown in the standard in terms of UTS and 1% proof stress. Corresponding values for 0.2% proof stress are approximately 30% higher than material to BS 1449.

Table 2

Plate – Hi-Proof Material to BS 1501: part 3				
Grade	**UTS N/mm² (min)**	**1% proof stress N/mm² (min)**	**0.2% proof stress N/mm² (min)**	**Elongation (min)**
304S62	590	315	(250)	35%
304S65	590	315	(250)	35%
316S62	620	340	(270)	35%
316S66	620	340	(270)	35%

2.2 Stainless steel bolts

Bolts of the austenitic type are recommended for fixing purposes the following strengths are shown in BS 6105: 1981, for austenitic bolts:

Table 3

Bolts to BS 6105:1981			
Type	**Property class**	**UTS N/mm² (min)**	**Stress at 0.2% Permanent Strain (min) N/mm2**
A1,A2&A4	50	500	210
	70	700	450
	80	800	600

The permissible stress levels for stainless steel bolts can be calculated in accordance with clause 50 in BS 449 for bolts in clearance holes.

Table 4

Permissible Bolt Stresses			
Property class	**Axial Tension N/mm²**	**Shear N/mm²**	**Bearing N/mm²**
50	107	71	223
70	230	153	478
80	286	190	596

Materials

Plain

A .Hot Rolled Steel Plates, Sheets and Coils S235JIR,S355JR

As per:
EN 10025 -2 / DIN 17100 / BS 4360 /ASTM A 653M /ASTM A 1011/ASTMA 1011- 01a
JIS 3101 I JIS 3106 / GB 700 I GB /T1591.
ASTM A 907 /ASTM A 1018M.
ASTM A570M / ASTM A572M.

B .Cold Rolled Steel DC01,

As per:
EN 10130 / DIN 1623, Part 2 / BS 1449: 1/ASTM A366 /ASTM A 1008 / JIS G 3141 / GB 699.
EN 10131 /ASTM A568M

Galvanized

C .Continuously Pre-Galvanized Hot - Dip Zinc Coated Steel DX51D+Z,

As per:
EN 10327 / DIN 17162 / BS 2989/ ASTM A 527M /ASTM A 653M / AS G 3302.
EN 10326/ EN 10142 /ASTM A 526, 527, 528/ ASTM A 146

D .Electro Galvanized Steel (Electrolytic) Coating) DC01+ZE,

As per:
EN 10152 / DIN 17163 /ASTM A591 / AS G 3313 /JIS G 3141/ 13S 1449:1
EN 10131

Stainless Steel

As per:
ASTM A 240 /EN 10088-2/ DIN 17400 / BS 1449:2 /
ASTM A480 / ASTM A666 / ISO 3506 / EN 10028-7 /JIS G 4304
F.1 Stainless Steel Fasteners EN 3506
F.2 Stainless Steels Wire BS 1554,ASTM A276

Aluminum

G .Aluminum 5052 & 6063

Notes

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