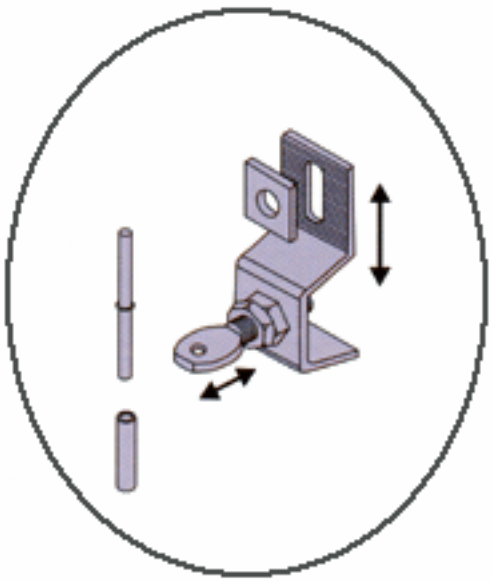
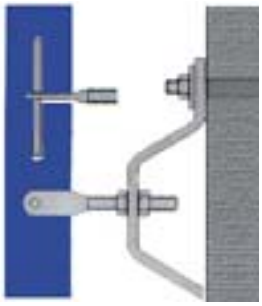


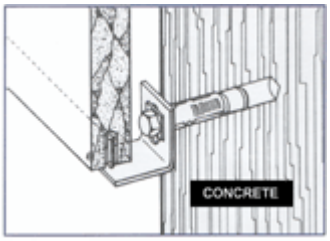
GERPA ELEKTRIK TEKSTIL SAN.TIC.A.S.

MECHANICAL FACADE FIXING PRODUCTS

Gerpa is a dedicated manufacturer of high quality facade fixing system elements.
Here in this report, the information provided reflects the general characteristics and technical qualities of the S anchors manufactured within our production facilities.



Z Anchor



L Anchor

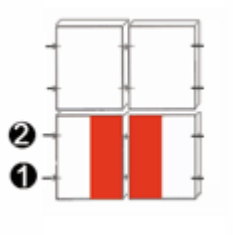
OVERVIEW

External cladding is the most preferred way of facade protection primarily in regions with high climatic conditions due to its insulation related advantages.

It also is much preferred due to its aesthetic view. The significant fact about marble and granite facade fixing is that these natural stones possess the quality to resist the natural weather conditions.
Especially, sunlight becomes a serious problem as facade covering except for natural stone material is exposed to continious rain, snow, or direct sunlight for a long duration.

In mechanical facade cladding systems, we find ourselves before a system formed by a multitude of small "structural" elements that should work with total static independence one from the other, and that, at the same time, will be the only ones responsible for supporting the rigid visual cladding unit.

It is important to know the underlying facts & techniques about the **load bearing and restraint system**.



1 – Restraint
2 – Load bearing

1 – Restraint

This is the support phase of the entire system.
It acts as a “holder” of the slab since it enables the slab get it’s support from a stable point.
As the Load Bearing shares the load of the slab with the other anchors on the sides, the restraint avoids the stone lose its point of fixation.

2 – Load bearing

It plays the key role within the system.
Load bearing is the “weight lifter” in another words, which gives the notion that is is of great importance in mechanical facade fixing systems.
As the manufacturer of the facade cladding fixings, load bearing also plays an important role for our production mentality.
The anchors that function as the load bearing part in the fixings must be made of the material with the uttermost quality, endurance and strength: Stainless steel.
We, as a manufacturer company, recommend the use of stainless steel for mechanical facade fixings.

MATERIAL & FINISH

Due to its superior strength and qualities especially against corrosion, the use of stainless steel mechanical fixings is our recommendation on the first part.

We manufacture stainless steel 304 grade fixings which are also included within our catalogue. (The properties of 304 grade stainless steel material will be provided in the coming pages.)

There is no “Finish” option(s) for stainless steel material such as galvanization or else.
However, there exists one facade fixing system product that has options other than stainless steel.
The profiles that are used to construct the grid system on the facade can also be made of galvanized standard steel (ST-37 grade or like grades recommended).

Galvanization types available are;

- Hot dip galvanized
- Hot deep pregalvanized
- Electrogalvanized

STAINLESS STEEL

What causes corrosion ?

Carbon steels without any protection will form a coating of rust which will in a sense protect the rest of the steel. So constantly removing the rust exposes a new fresh layer of steel to be attacked. This is called general corrosion. Various coatings will impede the rusting process, in particular painting, coating with zinc (galvanised steel), and epoxy resins. Another lateral way of reducing corrosion is to put corrosion inhibitors into the solutions that would otherwise cause iron to corrode. One of the most common examples of this is the corrosion inhibitors added to the coolant used in cars.

The unique advantage of stainless steel

The success of stainless steel is based on the fact that it has one unique advantage. The chromium in the stainless steel has a great affinity for oxygen, and will form on the surface of the steel at a molecular level a film of chromium oxide. The film itself is about 130 Angstroms in thickness, one Angstrom being one millionth of one centimeter . This is like a tall building being protected from the rain with a roof the thickness of one sheet of ordinary copy paper. This layer is described as passive, tenacious and self renewing. Passive means that it does not react or influence other materials; tenacious means that it clings to the layer of steel and is not transferred elsewhere; self renewing means that if damaged or forcibly removed more chromium from the steel will be exposed to the air and form more chromium oxide. In normal use galvanised steel can last many years without corrosion occurring and in these cases there would be little advantage apart from aesthetic reasons to switch to stainless steel. Where stainless comes into its own is where the galvanized coating is constantly being worn away, for example by chains being dragged over it, or constantly being walked over, or where very corrosive chemicals are being randomly splashed onto it.

The main element of stainless steel is iron (Fe) hence it is an iron alloy containing a minimum of 10.5% chromium. Additional alloying elements are added to provide strength, cold working ability and toughness
for example:-

Copper----------
Molybdenum----------
Titanium----------
Nickel----------

Other non-metals are added primarily Nitrogen and Carbon.
Grade 304 or Grade 316

Grade 304 is generally specified for normal environmental applications.
Grade 316 is specified where a higher level of corrosion resistance is required e.g. marine environment.

WHY CHOOSE?

The cost of stainless steel is very competitive compared with other nickel or titanium based alloys and offers a range of corrosion resistant properties suitable for large number of industrial applications. Their strength is superior to plastics materials stainless steel can be hot or cold worked and fabricate using standard and traditional engineering techniques. Unlike certain plastics stainless steel is fully recyclable.

TYPES OF STAINLESS STEEL
Stainless steels are divided into four main group types namely:-
Austenitic, Ferritic, Martensitic and Duplex.
These names describe the crystalline structure of the steel.

Austenitic
Duplex
Martensitic
Duplex

Austenitic stainless steels have typically 18% chromium and contain nickel. This changes the metallic structure from ferritic to austenitic and improves the corrosion resistance. They cannot be hardened by heat treatment. They are non-magnetic however a small amount of local magnetism is produced after cold forming such as bending and rolling.

Ferritic stainless steels contain chromium as their main alloying element of between 13% - 17% and have a low carbon content. They are magnetic and cannot be hardened by heat treatment.

Martensitic stainless steels have typically 12% chromium with higher carbon content than the ferritic types. They are magnetic and can be hardened by normal quenching and tempering techniques like medium and high plain carbon steels. Martensitic steels are commonly used in the production of cutlery and are also used in the aerospace industry.

Duplex stainless steels are used where both corrosion resistance and strength are required. They cannot be hardened by heat treatment. Their metallic structure is a combination of austenite and ferrite.
"Super" Austenitic and "Super" Duplex stainless steels have a greater resistance to pitting or crevice corrosion than the ordinary austenitic or duplex steels. This is due to additional chromium, nitrogen and molybdenum.
Precipitation Hardening stainless steels can be hardened and strengthened like the martensitic group by heat treatment. The metallic structure has a different mechanism to the process of the martensitic types consequently either austenitic or martensitic precipitation hardening structures can be formed.

ANTI-CORROSION

As a general rule, the higher the chromium content of stainless steel the higher the corrosion resistance.

When nickel is added to create the austenitic steel the oxide film is strengthened and increases the durability in more aggressive environments. If molybdenum is added to either austenitic or ferritic stainless steel the pitting corrosion resistance is greatly improved.

MECHANICAL PROPERTIES OF STAINLESS STEEL

	EN	Rp0.2 N/mm²	Rp1.0 N/mm²	Rm N/mm²	ASTM	Rp0.2 N/mm²	Rm N/mm²
Ferritic	1.4512	220	-	380	S40910	170	380
	1.4000	230	-	400	S41008	205	415
	1.4016	260	-	430	S43000	205	450
	1.4510	240	-	420	S43035	205	415
Mart.	1.4021	-	-	-	S42010	-	-
	1.4028	-	-	-	S42000	-	-
	1.4018	680	-	840	-	-	-
Duplex	1.4362	400	-	630	S32304	400	600
	1.4460	460	-	620	S31200	485	620
	1.4462	460	-	640	S31803	450	620
	1.4410	530	-	730	S32750	550	795
Austenitic	1.4372	350	380	750	S20100	260	655
	1.4310	250	280	600	S30100	205	515
	1.4307	200	240	500	S30403	170	485
	1.4301	210	250	520	S30400	205	515
	1.4311	270	310	550	S30453	205	515
	1.4541	200	240	500	S32100	205	515
	1.4306	200	240	500	S30403	170	485
	1.4303	220	250	500	S30500	205	515
	1.4404	220	260	520	S31603	170	485
	1.4401	220	260	520	S31600	205	515
	1.4406	280	320	580	S31653	205	515
	1.4571	220	260	520	S31603	205	515
	1.4432	220	260	520	S31603	170	485
	1.4436	220	260	530	S31600	205	515
	1.4435	220	260	520	S31603	170	485
	1.4438	220	260	520	S31703	205	515
	1.4434	270	310	540	S31753	240	550
	1.4439	270	310	580	S31726	240	550
	1.4539	220	260	520	N08904	215	490
	1.4547	300	340	650	S31254	300	650
	1.4652	430	470	750	S32654	430	750
	1.4948	190	230	510	S30409	205	515
	1.4878	190	230	500	S32109	205	515
	1.4818	290	330	600	S30415	290	600
	1.4833	210	250	500	S30908	205	515
	1.4828	230	270	550	-	-	-
	1.4835	310	350	650	S30815	310	600
	1.4845	210	250	500	S31008	205	515
	1.4854	300	340	650	S35315	270	650

PHYSICAL CHARACTERISTICS OF STAINLESS STEEL

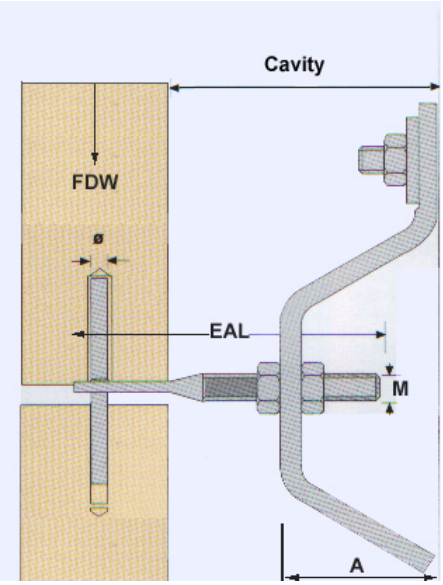
		Density	Modulus of elasticity		Thermal expansion RT to	
		ρKg/dm³	EKN/mm²		αx10⁻⁶	C°
	EN	RT	RT	400°C	100°C	400°C
Ferritic	1.4512	7.7	220	195	10.5	12.0
	1.4000	-	-	-	10.5	12.0
	1.4016	-	-	-	10.5	10.5
	1.4510	-	-	-	10.5	10.5
Mart.	1.4021	7.7	215	190	10.5	12.0
	1.4028	-	215	190	10.5	12.0
	1.4018	-	200	170	10.3	11.6
Duplex	1.4362	7.8	200	172	16.0	17.5
	1.4460	-	-	-	-	-
	1.4462	-	-	-	-	-
	1.4410	-	-	-	-	-
Austenitic	1.4372	7.8	200	172	16.0	17.5
	1.4310	7.9	-	-	-	-
	1.4307	7.9	200	172	16.0	17.5
	1.4301	-	-	-	-	-
	1.4311	-	-	-	-	-
	1.4541	-	-	-	-	-
	1.4306	7.9	200	172	16.0	17.5
	1.4303	-	-	-	-	-
	1.4404	8.0	200	172	16.0	17.5
	1.4401	-	-	-	-	-
	1.4406	-	-	-	-	-
	1.4571	-	-	-	-	-
	1.4432	8.0	200	172	16.0	17.5
	1.4436	-	-	-	-	-
	1.4435	-	-	-	-	-
	1.4438	8.0	200	172	16.0	17.5
	1.4434	-	-	-	-	-
	1.4439	8.0	200	172	16.0	17.5
	1.4539	-	195	166	16.0	17.0
	1.4547	-	195	166	16.0	18.0
	1.4652	-	190	163	15.0	16.2
		Density	500	1000°C	500	1000°C
	1.4948	7.9	160	125	18.2	-
	1.4878	7.9	-	-	18.2	-
	1.4818	7.8	-	-	18.2	20.0
	1.4833	7.9	160	125	17.8	19.5
	1.4828	7.9	-	-	17.8	19.5
	1.4835	7.8	-	-	18.2	19.5
	1.4845	7.9	-	-	17.3	19.0
	1.4854	7.9	-	-	16.5	18.0

		Uluslararası Standartlar		Finland.	İsveç	Ülke Standartları				Kimyasal Değerler (%)				
		ASTM	EN	Polarit	Avesta Sheffield	DIN	BS	NF	SS	C	Cr	Ni	Mo	Diğer
GENEL AMAÇLI KULLANIM	Ferritik	409	1.4512	853	409HyForm	1.4512	409S19	Z3CT12	-	0.02	12	-	-	Ti
		S41050	1.4003		3/12HyFab	1.4003	-	-	-	0.02	11.5	0.4	-	-
		410S	1.4000		410S	1.4000	403S17	Z8C12	2301	0.04	12	-	-	-
		430	1.4016		430	1.4016	430S17	Z8C17	2320	0.04	16.5	-	-	-
	Martenzitik	S42010	1.4021		420L	1.4021	420S29	Z20C13	2303	0.20	13	-	-	-
		420	1.4028		420M	1.4028	420S45	Z33C13	2304	0.30	12.5	-	-	-
		-	1.4418		248SV	1.4418	-	Z6CND16-05-01	2387	0.03	16	5	1	-
	Duplex	S32304	1.4362		SAF2304	1.4362	-	Z3CN23-04Az	2327	0.02	23	4.5	-	-
		329	1.4460		329	1.4460	-	25CND27-05-A2	2324	0.02	25	5	1.5	-
		S31803	1.4462		S31803	1.4462	318S13	Z3CND22-05Az	2377	0.02	22	5.5	3	-
		S32750	1.4410		S32750	-	-	Z3CND25-06Az	2328	0.02	25	7	4	-
	Austenitic	201	1.4372	710	17-5Mn	-	-	Z12CMN17-07Az	-	0.05	17	5	-	Mn
		301	1.4310		17-7	1.4310	301S21	Z11CN18-08	2331	0.10	17	7	-	-
		304L	1.4307	710	18-8L	-	304S11	Z3CN18-10	2352	0.02	18.3	9.2		-
		304	1.4301	725	18-8	1.4301	304S31	Z7CN18-09	2333	0.04	18.3	8.7		-
		304LN	1.4311	721	18-8LN	1.4311	304S61	Z3CN18-10Az	2371	0.02	18.3	8.7		-
		321	1.4541	731	18-10Ti	1.4571	321S31	Z6CNT18-10	2337	0.04	17.3	9.2		Ti
		S30430	1.4567		18-8Cu	1.4567	-	Z3CND18-09FF	-	0.01	18	9		Cu
		304L	1.4306	720	19-11L	1.4306	304S11	Z3CN18-10	2352	0.02	18.3	10.2		-
		305	1.4303		18-12	1.4303	305S19	Z1CN18-10	-	0.02	18	11.5		-
		316L	1.4404	750	17-11-2L	1.4404	316S11	Z3CND17-11-02	2348	0.02	17.3	11	2.2	-
			1.4401	755	17-11-2	1.4401	316S31		2347	0.04	16.8	10.7	2.2	-
		316	1.4406	751	17-11-2LN	1.4406	316S61	Z7CND17-11-02	-	0.02	17.5	11	2.2	-

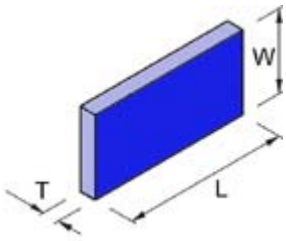
		316LN 316Ti	1.4571	761	17-11-2Ti	1.4571	320S31	Z3CND17-11Az Z6CNDT17-12	2350	0.04	17	11	2.2	Ti
		316L	1.4432	752	17-12-2.5L	-	316S13	Z3CND17-12-03	2353	0.02	17	11.7	2.7	-
		316	1.4436	757	17-12-2.5	1.4436	316S33	Z7CND18-12-03	2343	0.04	17	11	2.7	-
		316L	1.4435	752	17-14-2.5L	1.4435	316S13	Z3CND18-14-03	2353	0.02	17.3	12.7	2.7	-
		317L	1.4438	770	18-14-3L	1.4438	317S12	Z3CND19-15-04	2367	0.02	18.3	12.2	3.2	-
		317LN	1.4434		17-11-3NL	-	-	Z3CND19-14Az	2373	0.02	17	11	3.2	-
		S31726	1.4439		17-14-4LN	1.4439	-	Z3CND18-14-05Az	-	0.02	17.3	12.7	4.2	-
		N08904	1.4539	772	904L	1.4539	904S13	Z2NCDU25-20	2562	0.01	20	25	4.5	Cu
		S31254	1.4547	774	254SMO	-	-	-	2378	0.01	20	18	6.1	Cu
		S32654	1.4652		654SMO	-	-	-	-	0.01	24	22	7.3	Mn,Cu
ISIYA DAYANIKLI	Austenitic	304H	1.4948		18-8	1.4948	304S51	Z6CN18-09	2333	0.05	18.3	8.7	-	-
		321H	1.4878		18-10Ti	1.4878	321S51	Z6CNT18-10	2337	0.05	17.3	9.2	-	Ti
		S30415	1.4818		153MA	-	-	-	2372	0.05	18.5	9.5	-	Si,Ce
		309S	1.4833		23-13	1.4833	309S16	Z15CN24-13	-	0.06	22.5	12.5	-	-
		-	1.4828		20-12Si	1.4828	-	Z17CNS20-12	-	0.04	20	12	-	Si
		S30815	1.4835	744	253MA	-	-	-	2368	0.09	21	11	-	Si,Ce
		310S	1.4845		25-20	1.4845	310S16	Z8CN25-20	2361	0.05	25	20	-	-
		S35315	1.4854		353MA	-	-	-	-	0.05	25	35	-	Si,Ce

TECHNICAL DETAILS OF ADJUSTABLE S ANCHORS

CODE	Dead Load FDW (KN)	Cavity	A	Wind Pressure FWP	Wind Suction FWS	Concrete Anchor	Load on conc.anc. Y (KN)	Adjustable Arm	Pin Ø
GE-ZA 01	0.20	30	10	0.15	0.30	M8x80	0.20	M10x70	5
GE-ZA 02	0.20	40	20	0.15	0.30	M8x80	0.20	M10x70	5
GE-ZA 03	0.20	50	40	0.15	0.30	M8x80	0.25	M10x70	5
GE-ZA 04	0.20	60	60	0.15	0.30	M8x80	0.30	M10x70	5
GE-ZA 05	0.30	30	20	0.20	0.40	M8x80	0.30	M10x70	5
GE-ZA 06	0.30	40	40	0.20	0.40	M8x80	0.33	M10x70	5
GE-ZA 07	0.30	50	60	0.30	0.60	M8x80	0.35	M10x70	5
GE-ZA 08	0.30	60	80	0.30	0.60	M8x80	0.40	M10x70	5
GE-ZA 09	0.30	70	100	0.30	0.60	M8x80	0.43	M10x70	5
GE-ZA 10	0.30	70	120	0.30	0.60	M8x80	0.45	M10x70	5
GE-ZA 21	0.40	40	20	0.35	0.70	M10x90	0.50	M10x70	5
GE-ZA 22	0.40	50	40	0.35	0.70	M10x90	0.50	M10x70	5
GE-ZA 23	0.40	60	60	0.35	0.70	M10x90	0.55	M10x70	5
GE-ZA 24	0.40	70	80	0.35	0.70	M10x90	0.60	M10x70	5
GE-ZA 25	0.40	80	100	0.35	0.70	M10x90	0.60	M10x70	5
GE-ZA 26	0.40	90	120	0.35	0.70	M10x90	0.60	M10x70	5



SLAB WEIGHT:
In order to have a precise result, the design weight of the stone type has to be known.



T :Thickness
W :Width
L :Length
DW: Design Weight
Slab Weight: FV (Vertical Load per anchor)

Material	DW kN/m³
Ceramic	**20**
Travertine	**24**
Sandstone	**26**
Marble, Limestone	**27**
Granite, Slate	**28**
Basalt, Gabbro	**30**

TEMEL HESAPLAMALARLA İLGİLİ ULUSLARARASI STANDARTLAR.
INTERNATIONAL STANDARDS ON CALCULATION PRINCIPLES

DIN 18 516 Dış duvarlara kaplama, sondan havalandırılmalı
Cladding for external walls, ventilated at rear

BS 8298 Doğal Taş Kaplama Proje ve Montajı
Design and installation of natural stone cladding

BS 970 Part 3 1991 M Paslanmaz çelik mekanik özellikleri
Mechanical properties for stainless steel

ASTM A 276 Paslanmaz çelik çubuk ve diğer malzemeler için standart spesifikasyonlar
Standard specification for stainless steel bars and shapes

AISI 304 (A2) AISI 304 kalite paslanmaz çelik
AISI 304 grade stainless steel

AISI 316 (A4) AISI 316 kalite paslanmaz çelik
AISI 316 grade stainless steel

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