

STRAND ANCHOR

TEMPORARY ANCHOR A1

Technical data sheet n°: FT En C IX 1 1 3

- Temporary strand anchor
- Unitary Glogal Injection (UGI)
- Anchor head according to ETE 06/0226 (CE marked)
- Safe handling
- Easy monitoring and maintenance

Presentation

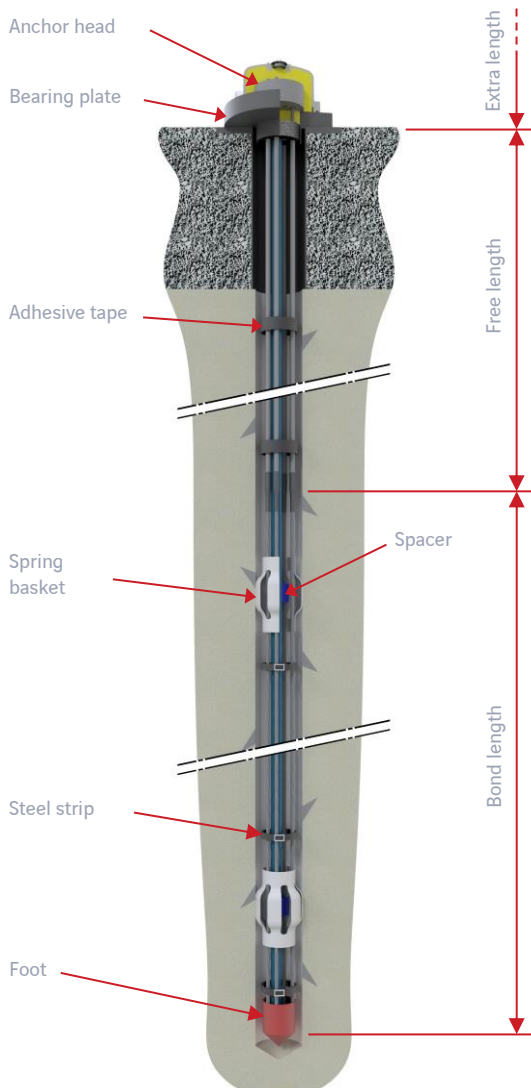
Freyssinet temporary ground anchors are mainly used for temporary support structures. Their service life, which varies according to the aggressiveness of the surrounding environment, is about 2 years, so they are frequently used for excavations or tunnels, for example.

The A1 anchor is designed to be fitted with an UGI (Unitary Global Injection) grouting system.

Description

The strand anchor consists of a part contained in a borehole (anchor body) and an external part (anchor head) which provides the reaction on the structure.

The anchor body is bonded in the ground over a length that depends on the anchor's capacity and the characteristics of the soil. This is achieved by injecting a cement grout using the UGI method.



General view of a strand anchor A1

Range of strand anchors

The Freyssinet stand anchor consists of a bundle of prestressing strands. The capacity of a tendon is defined by the cross-section, steel class and number of strands making up a given cable.

Type		Nominal ultimate strength (N/mm ²)	Nominal yield strength (N/mm ²)	Cross section (mm ²)	Weight (kg/m)	Nominal ultimate load (kN)	Nominal yield load (kN)
2T15,2	2x0,6"	1 860	1 640	280	2,20	521	459
3T15,2	3x0,6"			420	3,30	781	689
4T15,2	4x0,6"			560	4,40	1 042	918
5T15,2	5x0,6"			700	5,50	1 302	1 148
6T15,2	6x0,6"			840	6,59	1 562	1 378
7T15,2	7x0,6"			980	7,69	1 823	1 607
8T15,2	8x0,6"			1 120	8,79	2 083	1 837
9T15,2	9x0,6"			1 260	9,89	2 344	2 066
10T15,2	10x0,6"			1 400	10,99	2 604	2 296
11T15,2	11x0,6"			1 540	12,02	2 864	2 526
12T15,2	12x0,6"			1 680	13,19	3 125	2 755
13T15,2	13x0,6"			1 820	14,29	3 385	2 985
2T15,7	2x0,62"			1 860	1 640	300	2,36
3T15,7	3x0,62"	450	3,53			837	738
4T15,7	4x0,62"	600	4,71			1 116	984
5T15,7	5x0,62"	750	5,89			1 395	1 230
6T15,7	6x0,62"	900	7,07			1 674	1 476
7T15,7	7x0,62"	1 050	8,24			1 953	1 722
8T15,7	8x0,62"	1 200	9,42			2 232	1 968
9T15,7	9x0,62"	1 350	10,60			2 511	2 214
10T15,7	10x0,62"	1 500	11,78			2 790	2 460
11T15,7	11x0,62"	1 650	12,95			3 069	2 706
12T15,7	12x0,62"	1 800	14,13			3 348	2 952
13T15,7	13x0,62"	1 950	15,31			3 627	3 198

The young modulus of the strand is 195 000 MPa $\pm 10\ 000$

The properties given above are those of the prEN10138 and ASTM416 standards.

Larger capacity strand anchors, with more strands, can be designed on request. The stress rate is set in relation to the nominal ultimate or the nominal yield load, depending on the standard applicable to the project.



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Packing

The tendon fitted with injection tubes that makes up the Freyssinet A1 strand anchor can be wound to a diameter of around 2 metres. It is packaged in coils for easy transport. These coils can be stored on different supports:



Lockable metal frames for truck transport



Wooden boxes for container or air transport

Installation

Several methods of installing the strand anchors are possible. When the strand anchor is handled by crane, it can be fitted with a lifting point on request, to ensure maximum safety during the operation.



Installation by hand



Installation with an uncoiler

Anchor body

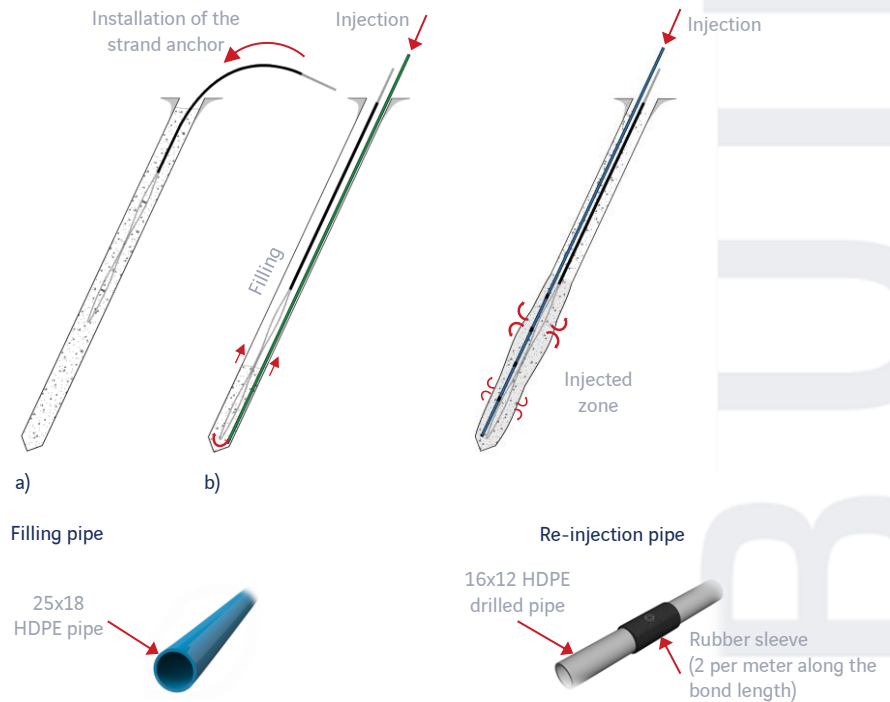
The strands are greased and individually sheathed in PE on the free length, and in bare steel on the bond length. They are arranged so that different injection tubes can be positioned to make up the injection system, according to the customer's choice of method:

Phase 1: Filling

The borehole can be filled with cement grout:
a) Before installing the strand anchor: in this case, no filling tube is provided.
b) After the strand anchor has been installed: in this case, a filling tube is fitted to the tendon.

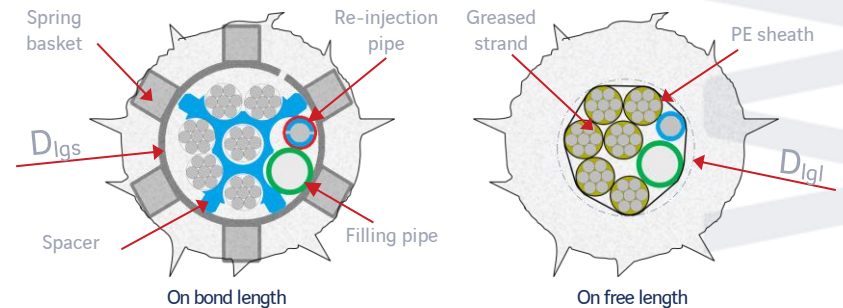
Phase 2: UGI Injection

Injection takes place via a single reinjection sleeve tube mounted on the strand anchor. Several injection tubes can be placed in parallel to repeat the operation several times. In this case, the tubes can be of different lengths to select different injection zones.



The grouting parameters (grout properties, drilling diameter, injection pressures, lengths, etc.) are defined by the geotechnical designer and the contractor, then validated by preliminary or compliance tests.

Example of combination with 8-slot spacer:



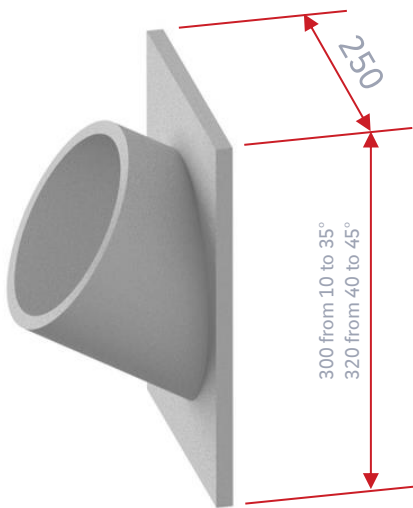
Tendon	With 1 pipe		With 2 pipes		With 3 pipes		With 4 pipes	
	D_{igs}	D_{igl}	D_{igs}	D_{igl}	D_{igs}	D_{igl}	D_{igs}	D_{igl}
2 to 4T15	60	60	60	62	65	63	65	65
5 to 7T15	80	75	80	75	83	77	85	78
8 and 9 T15	90	85	90	85	91	87	93	88
10 to 13T15	110	93	110	94	112	95	114	97

Ground anchor dimensions (mm)

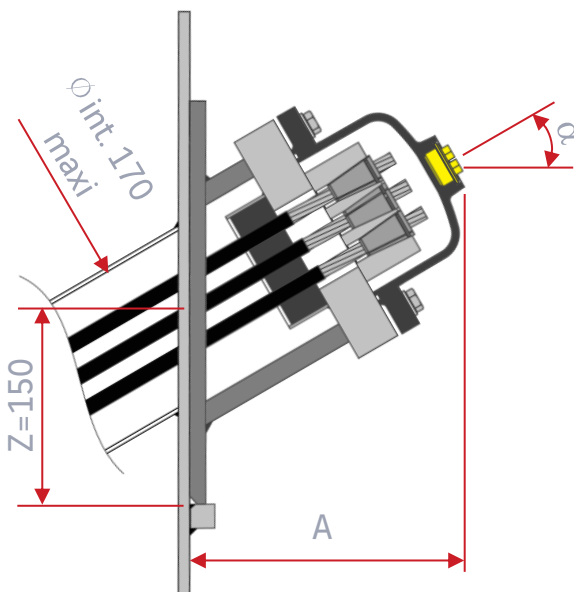
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Anchor head equipped with an angular chair



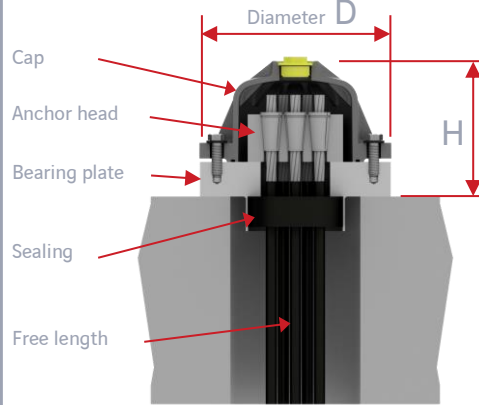
Dimensions of the standard angular chair



Position of the anchor head equipped with an angular chair

Anchor head

The anchor head, which is installed after the bonding grout has hardened and the injection pipes have been recut, is made up of a block and jaws from Freyssinet's C range prestressing system technology, which has undergone European Technical Evaluation and is CE marked. It bears on a plate that transmits forces to the structure and ensures the continuity of the anti-corrosion protection of the stands. The cover and the area where the strands are stripped, located between the rear of the anchor block and the joint, are filled with wax or grease.



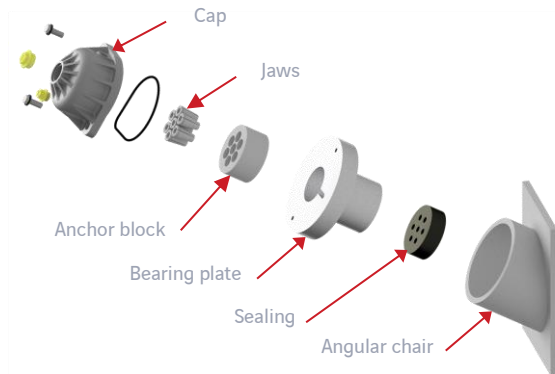
Tendon	Dimensions (mm)	
	H	D
2 to 4T15	155	220
5 to 7T15	170	220
8 and 9 T15	185	280
10 to 13T15	200	280

Note: the dimensions shown correspond to a maximum recess diameter of 170 mm. The strength of the concrete support surface must be checked separately. If necessary, these dimensions can be adapted on request.

The bearing plate is manufactured in accordance with EN1090-2 in execution class EXC2. By default, the plate is untreated, without any anti-corrosion protection. A surface treatment can be applied on request.

Angular chair

When the bearing plate is not perpendicular to the contact surface with the structure, an angular chair should be installed. The chair has the same anti-corrosion treatment as the bearing plate.



Tendon	10°	15°	20°	25°	30°	35°	40°	45°
4T15	244	250	255	257	251	251	253	251
7T15	259	265	269	271	264	263	268	267
9T15	276	283	287	289	285	284	304	305
13T15	291	297	301	303	298	296	316	315

Dimensions of the anchor head with a standard angular chair (dimension A in mm) depending on angle α

The support chair is manufactured in accordance with EN1090-2 in execution class EXC2. Angular chairs with different geometries can be designed on request. This is particularly the case when:

- The recess diameter is higher than 170 mm
- The angle is different from those shown above
- The dimension Z is different from 150 mm
- The ground anchors are drilled with an azimuth (lateral angle)

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Environment

Freyssinet can issue environmental data sheets quantifying the carbon footprint of products ex-works. They consider the production of raw materials, their transport and the processing required to manufacture finished products.



Other services and solutions

Testing and stressing

Freyssinet offers on-site technical assistance to supervise stressing and testing operations. If these services are carried out by Freyssinet, a report complying with the applicable standard is issued for each ground anchor.



Equipment

Freyssinet is able to provide specific equipment for stressing and testing ground anchors according to site requirements.



Studies

For special requirements, Freyssinet's technical department is able to study tailor-made solutions, such as anchor heads adapted to an existing structure, a FreyssiCell load cell measurement acquisition system, or handling devices adapted to the particularities of a project.

Monitoring and surveillance

To monitor the behaviour of a wall fitted with temporary ground anchors, it is recommended to instrument a certain number of anchors (5% to 10%). This can be done by installing FreyssiCell load cells (see FreyssiCell data sheet for more details), which allow to monitor changes in tension over time. In addition, the use of threaded anchor blocks on all the ground anchors makes it possible to "weigh" each of them, through a lift off test, in order to refine the analysis if the load cells indicate abnormal behaviour in the wall. The customer is free to choose how to use these devices.



Instrumented anchor head



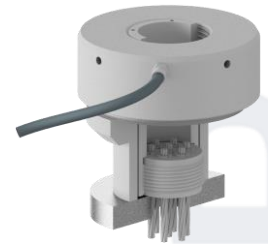
Lift-off test on a threaded block

Threaded anchor head option

The use of a threaded anchor block offers the possibility of stressing the ground anchor once the strands have been cut. This makes it possible to carry out lift off test or tension adjustment operations by interposing washers under the anchor block, without acting directly on the jaws.



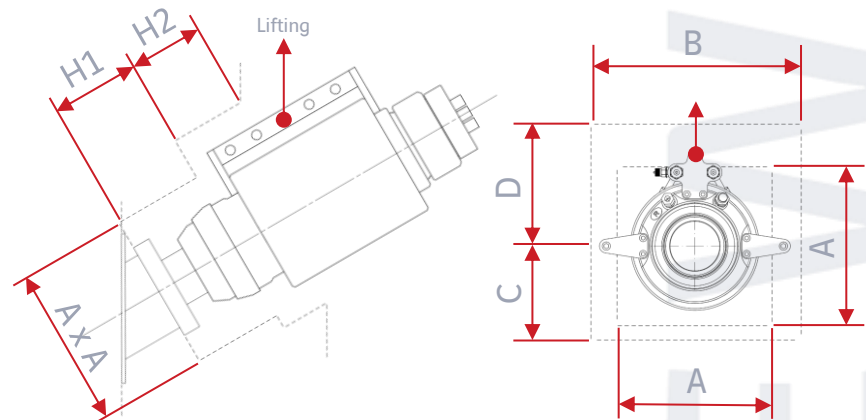
Threaded block before stressing



Lift off jack principle

Practical arrangements

To ensure the correct installation of the tensioning and testing equipment, a minimum clearance must be maintained around the anchor heads.



Tendon	Jack	H1	H2	A	B	C	D
2 to 4T15	VP 110	240	100	350	400	200	225
5 to 7T15	VP 185	200	100	390	440	220	245
8 to 13T15	VP 260	250	100	460	510	255	280

Dimensions in mm

Smaller jacks can be used if necessary.