



Inclinometric case



STRUMENTI E MISURE GEOTECNICHE
E STRUTTURALI

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Inclinometric case



WARNINGS



Use a forklift to move the pipes' pallets, be careful;



Every tube weights about 1.40Kg/m, a pallets should contain about 40 tubes of 3000mm so the total weight should be 170Kg;



When you store the pipes it's not raccomandend to overlap much more then 2 pallets;



This pipe line must be utilized only for the application it has been designed for, OTR declines all responsability for any improper use.



Use protective gloves and safety shoes during installation;

Furthermore

- Do not let the tubes fall into the hole quickly.
- Do not put the tubes in flammable liquids or potentially explosive gases;
- Do not use the instrument in water where an electric dissipation is in progress;
- Keep out of reach of children;

Identification

Inclinometric case is identified using the datas on the trip document. In particular is indicated the batch's number of the factory casting. On demand, you can ask with the batch number the Inspection Certificate with the chemistry's characteristics. Since the pipes are made up of alluminium without datas or indication written on, you have to refer to the batch number on the previous documents.

Technical Features

Material	Metal alloy: Aluminium / Silicon / Magnesium T6060
Thickness	~ 2 mm
Weight	~ 1.4 Kg/m
Inner diameter	76 mm



Applications

Inclinometric cases are circular sectioned tubes, with four longitudinal grooves every 90° on the inner surface. They are provided with clips of various length joined to form a column.

After that, in the grooves are scrolled an inclinometric probe to detects the tubes' position in the space: so its displacement in the passing time between the successive measurements.

They are settled in vertical survey holes or installed in horizontal planes. Inclinometric measurements aren't expected in the present Technical Rules because: extremely specialized operations are made by different offices from the executing companies. Every installing procedure have to be made taking care of the pipes' mustn't suffer spiraling phenomena, so the grooves have to be straight.

Tubes' providing

To accept the tubes' providing is necessary:

- Tubes' spiraling is less than 0.5°/m;
- Every piece of tube has got a perpendicularity of the end section, so the orthogonality compared to the own tube's axis, with a maximum tolerance of 1°.

The thickness mustn't fall under 2.5mm. Dimensions and different thickness should be approved by construction supervisors.

Sleeves' providing

Pipes are assembled with joint sleeves with the following size:

- Inner diameter of the sleeve, measured at guide , have to be the same of the external pipes' diameter, measured at guide lenght to; increased by about 1mm;
- The coupling space between the tubes' pieces owing by the sleeves only have to be less than 1° for every joint;
- Minimal lenght of the sleeves shold be 300mm.

Injection devices sealing

It's allows the use of injections sealing devices outhter the inclinometric case (of which you have to fill the gap between the inclinometer tube and the walls of the hole).

Pre-Installation

Inclinometric case should be made of different materials:

- Alluminium (UNI 3569/66);
- A.B.S. (acrylonitrile – butadiene – styrene);

When it isn't will from the construction supervisors, the inclinometric tubes will be realized in alluminium compliant to UNI Norm 3569 of 1966 September (Alluminium, Magnesium, primary Silicon from plastic processing, 0.7% Magnesium 0.4%, Silicon)

In aggressive enviroment (particularly alkaline soil, presence of stray currents) construction supervisors should ask for a different working material from the alluminium.

Alluminium tubes cementation should be made using pozzolannic cement.

Pre-Installation

1. Pre-assemble in worksite the tube in pieces of 6m; everyone of these, except for the last one, should end with a joint, remember to bind to the tube the injection tube of the cavity (for every Sleeves).
2. Fix the injection tube of the cavity to the first piece of case which one should be introduce inside the hole;
3. The first pipe's piece is introduce inside the hole and it's locked with its tie; if the hole is full of fluid you have to fill of water the pipe too, to win the hydrostatical thrust.
4. It's introduced the second terminal part of the piece of tube inside the sleeve inside the first one, taking care that the two tubes are closely in contact; the tube should be holed and bolted with rivets. From now it's needful to avoid to trasmit every movent that could twist the pipe.
5. Joints are seal off with the correct putty (BOSTIC or every one else, Silicon too) and abouth ten minutes are waited before covering them with abboudant parcel tape. The last 40cm of tube and sleeve are dropped till their full emission from the hole or the coating.
6. If the hole is full of fluid the tube will be filled too and than are got back the procedure for the next piece of it.
7. After 7-10 days from the installation of the pipe line, will be executed the Zero-reading to check the variations of the verticality of the pipe line isn't compromised by the installation, exceeding the limito f 1.5%.



Types of poses

Vertical borehole Installation

The hole should be blase a survey hole or specially predisposed, anyway Stratigraphic type of hole with the following characteristics:

- Inner diameter higher than 107mm
- With the chance of pull out the liner with out rotating it (if is there).

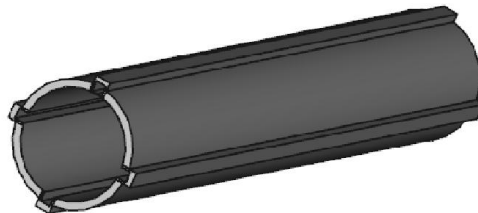
In every chance is allowed, the hole hasn't to be coated and have to use the muds to support its walls.



Inclinometer Casing

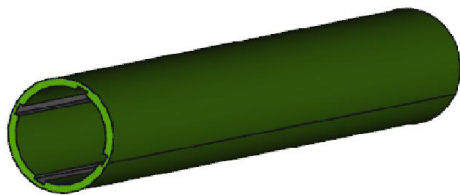
Diametro Interno ϕ 76 o 53 mm
Internal Diameter ϕ 76 o 53 mm

Scanalature



Alluminio T6060
Alluminium Alloy T6060

Spessore 2 mm
Thickness 2 mm



ABS

Esterno Liscio ϕ 70 mm
External ϕ 70 mm

O.T.R. s.r.l.

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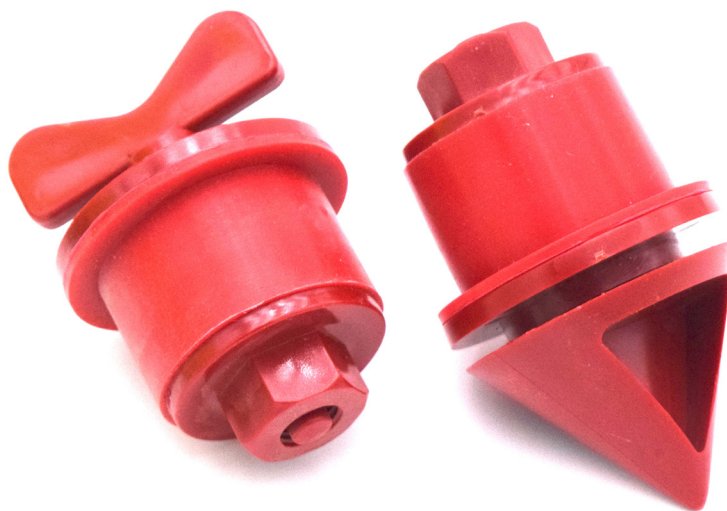
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To the installing procedure keep on mind:

- Don't spiral the tube,
- The vertical deviation should be less than 2.5%,
- Save the alluminium pipe lines from dents and axial forces,
- Lock all the outer surface with soil by an adequate filling of the cavity,
- To comply with this precautions you should work like this:
- Only if strong soil subsidence will be expected, you'll insert an adequate number of semi-open telescopic joints to allow some pipe line's shortening;
- To insert the tube inside the soil it should be filled with a fluid with a right specific weight to avoid exercise any pressure type during the installation;
- Every tube and sleeves should be checked at the installation time,
- An grout injection pipe has to be bound to the inclinometric tube,
- During the installation the lenght of the single pieces must be carefully noted: position, type, joints' opening, to have an exact immagine of the installing piping,
- Joints have to be correctly seal off to prevent the entering of sands, silts or injection mixture,
- The cavity clogging mixture will be in plastic normally use to filling holes, so: cement-bentonite-water in a respectively weight ratio of 30-6-100. In case of inclinometric alluminium tubes, is needed a mixture of pozzolanic cement (different from Portland),
- The mixture will be injected with a very low pressure through the injection tube, observing its external ascent outside the of the pipeline, the eventual coating has to be extracted when the mixture appear on the surface, during the coating extraction phase, the mixture can be topped up gradually from the head of the hole instead of through the injection barrel,
- The mixture will be injected with a very low pressure through the injection tube, observing its external ascent outside the of the pipeline, the eventual coating has to be extracted when the mixture appear on the surface, during the coating extraction phase, the mixture can be topped up gradually from the head of the hole instead of through the injection barrel, the topping up of the mixture must continue for 1-2 days if you notice drops in the level of fluid in the interspace. In case of free holes, the tube should be bonded to the tube's head to prevent the leak of the pipe caused by the different density between grout and water.
- When the operations are ended the inclinometric case has to be washed with clean water or a tool with radial holes.
- After the wash up and when the concrete has set (1 or 2 days), you have to test the case with a testing probe to check the continuity and the integrity of the pipe line
- The upper extremity of the case will be protected creating a cockpit in painted sheet, well cemented in the soil, equipped with a lid with a padlock and keys that will be delivered to the Works management; the pipe line has to be headly free for about 20cm from ground to let the operator measuring.
- The upper edge will be quoted compared with the see level.

Diaphragm's installation

- The diaphragm's installation has to be so accurate because usually the attended displacements are too short.
- It's better, seeing the difficulties, to execute a successive hole from the working phases, inserting (if it's possible and acceptable for working management) a plastic guide tube (200mm diameter PN10 bonded to the cages or the reinforcing) in the most vertical way,
- To an accurate measurement of the inclinometric case some results aren't positives to the installation:
 1. Overall verticality,
 2. Sudden change of inclination between one piece of tube and the next one,
- For the previous motivation isn't advise (if it isn't extremely necessary for the installation deepness and or the geometrical impossibility to place the guide tube) to bind the case to the cage otherwise to cam to it in a second time inside the guide tube dropping carefully it with a steel lanyard. After that the pipe should be cemented from below with an injection tube with previous mix.
- The other advices are the same of the vertical case's installation.



Horizontal inclinometer Casing

The installing has to follow this needs:

- Prevent the presence of stones between the case and the soil, for this reason the case will lay on a sand bed (30cm) at the top and at the bottom,
- Prevent, just for the vertical ones, the penetration of sand or other thing inside the tube, to this end joints and rivets have to be sealed of with putty or tape,
- Allow the access to both the case's extremities (this problem should be resolved using an horizontal probe with double connector), to the operators of the inclinometer; for this reason adequate armed and mantained excavations must be prepared.

