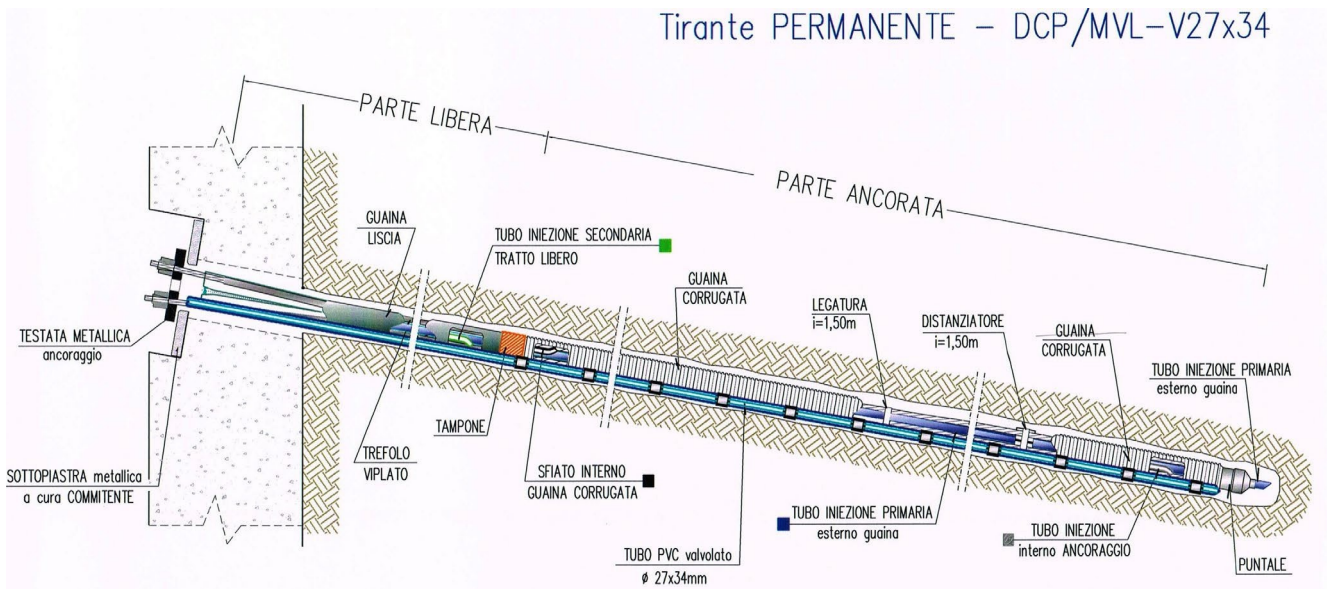


PERMANENT TENSORS

DCP/MVL-V27x34



Encoding, classification, and static function :

Tie rod for geotechnics, **active** type, **permanent**, complying with UNI EN 1537:2013, suitable for installations by **high-pressure cementing** operations ( $p_{max}=40\text{bar}$ ), particularly suitable for **loose soils**.

Assembly type :

- *Metal reinforcement* → 0.6-inch strands of stabilized harmonic steel type c.a.p., according to UNI EN10138.
- *strand number* → No. 2-8.
- *maximum operating pull* → 300-1200 kN
- *Cementation mode* → high-pressure ( $p_{max}=40\text{bar}$ ), repeated and selective (IRS) injection, using double-piston packer
- *permanent protection stretch anchor* → corrugated sheathing
- *permanent protection free stretch* → smooth sheath
- *protection single stranded* → single stranded
- *free stretch/anchor stretch separation* → buffer separator

- *permanent underplate protection* → metal inlet pipe
- *permanent protection single locking* → single-reflection cover (polyolefin-based synthetic polymer)
- *permanent protection tested anchor* → CAP protection (polyolefin-based synthetic polymer)

#### Assembly mode :

The protection of the free part is achieved by impregnating the strands by suitable anti-corrosive product (grease), after opening the individual strands and subsequent monoplying of the strands themselves using polyethylene pipe  $\varnothing$  16.5x19.5mm.

The bundle of strands (No. 2-8) is then wrapped externally with smooth polyethylene sheathing

In order to increase the adherence of the reinforcement in the cemented anchorage section (foundation portion), the strand bundle is configured with the prescribed 'sinusoidal' pattern, alternating 'binding' sections with the placement of specific spacers, arranged with spacing of no more than 1.50 ml.

Protection of the entire foundation length of the tie rod (anchor section) is achieved by wrapping the strand bundle with a corrugated polyethylene sheath of suitable diameter and equal length.

The end of the tie rod is equipped with a ferrule (polyolefin-based synthetic polymer) to facilitate the insertion of the tie rod into the borehole and protect the end of the anchor from infiltration of harmful agents.

The ferrule is installed, covering the strands, with metal strapping and tape.

The separation pad between the free part and the foundation part of the tie rod, made with the use of specific sealing product (called 'z-strip') and plasticized adhesive tape, is intended to prevent the cement injection mixture from seeping, even partially, toward the free part, restricting the free flow of the strands.

For this purpose, to prevent filtration of even the liquid phase of the cement mixture, specific sealing product is applied between the strands of the strand, immediately upstream of the pad.

To ensure the watertightness of the conduit joints (corrugated and smooth) at the height of the ferrule and the separation pad, a specific 'heat-shrink' sleeve is applied.

Inside the borehole, in the anchorage section, the correct positioning of the tie rod is ensured

through the use of specific 'centering devices', with variable section, made of non-oxidizable material (PVC), of the 'flask' type, the installation of which ensures the correct minimum overburden expected.

The 'primary injection' of the foundation section, inside the corrugated sheath, using suitable cement mixture, is performed at low pressure ( $p_{max}=2-4bar$ ), through a polyethylene pipe





∅ 12x16mm, with the end placed about 10cm from the bottom tip, while a similar polyethylene tube

∅ 12x16mm, with an outlet downstream of the separation pad, ensures the escape of any air pockets and serves as an indicator light to find that the foundation itself has been filled.

A third polyethylene tube, ∅ 16x20mm, with the end passing through the bottom ferrule, allows the execution of the 'primary injection' of the foundation section, outside the corrugated casing, i.e., the cavity between hole wall and tie rod, operating at low pressure ( $p_{max}=2-4bar$ )

An additional polyethylene tube, ∅ 16x20mm, inserted inside the smooth sheathing, is used to perform the 'secondary injection' of the free part, after the tensioning of the tie rod has taken place.

Identification of injection and vent pipes, according to their operational function, is done by reference to their color :

- |                                |   |  |
|--------------------------------|---|--|
| - gray color → pipe conduit    |  | ∅ 12x16mm iniezione primary - inside corrugated    |
| - black color → pipe ∅ 12x16mm |  | primary injection vent - inside corrugated conduit |
| - blue color → pipe conduit    |  | ∅ 16x20mm iniezione primary - outer corrugated     |
| - green color → tube sheath    |  | ∅ 16x20mm iniezione secondary - inside smooth      |

To enable repeated and selective injection, under pressure (I.R.S. /  $p_{max}=40bar$ ), of the interspace between corrugated sheathing and hole wall, a pvc pipe, ∅ 7x33.3mm (blue color), equipped with 'manchettes' valves at the full length of the anchor line is placed (by taping) outside the protective sheaths.

The pitch of the injection valves ( $i=33-150cm$ ) is made according to the design and execution requirements provided by the Construction Designer.

The above tube is used to carry out repeated and selective high-pressure injection, after performing primary (or sheath) injection, at low pressures ( $p=2-4\text{bar}$ ), through the tube  $\varnothing 16 \times 20\text{mm}$  passing through the bottom tip.

'Post-injection,' is performed after a few hours of curing of the primary (or liner) injection mixture, operating, via "double-piston packer," at high pressure ( $p_{\text{max}}=40\text{bar}$ ) and injecting cementitious mixture, with the purpose of creating sbulbling on the previously made cementitious liner and improving the bulb-soil adherence effect.

Tie rods are complete with metal header plates, of appropriate size and varying according to the number of strands planned, as well as clamping systems (monotube) for stringing them.

In order to preserve the metal anchor header from the effects of corrosion over time (which can be generated by weathering, chemical/physical attack, and the presence of percolating water in the wall and/or rising at the end of the tie rod) and to ensure the functionality of the tie rod, permanently, the following guards are to be placed :

- ➔ a specific under-plate protection device (metal inlet tube), which makes it possible to preserve, over time, the end of the strands from the effects of corrosion.
- ➔ individual strand covers, for each strand.
- ➔ a specific over-plate protection device (protective CAP), which is watertight, impervious to water, resistant to aging brittleness and damage from ultraviolet radiation during I storage, transportation and installation. - In addition, the adoption of a 'High' rather than 'Low' series protection CAP also ensures that the header can be inspected over time and re-tensioning of the strands over time if necessary and/or planned.