

PEND



— DIRECT AND INVERTED PENDULUMS

INCLINOMETERS
& PENDULUMS





DIRECT AND INVERTED PENDULUMS

Direct and inverted pendulums are simple, reliable and accurate systems used to monitor horizontal movements.

Commonly utilized in concrete dams, they permit to measure the change of verticality of the structures and monitor their safety.

The inverted pendulum anchored in foundation in combination with a direct pendulum can be read by manual optical coordinometer or automatically with TEL310 telependulum.

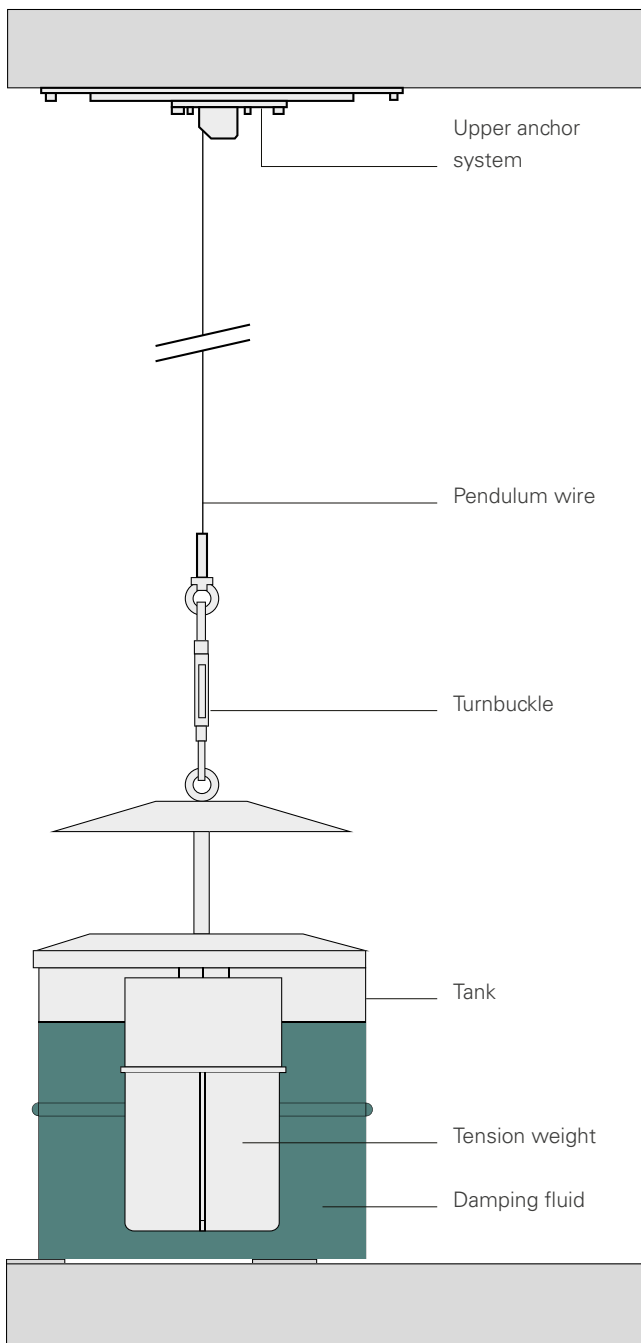
APPLICATIONS

- Arch dams
- Concrete dams
- Skyscrapers
- Slender structures
- Bell towers
- Minarets

FEATURES

- Simple and reliable in long-term monitoring
- Measurements can be taken at different locations on the same plumb line
- Movements can be monitored manually or automatically

DIRECT HANGING PENDULUM



The direct hanging pendulum is a gravity-referenced instrument, composed by:

Tank consisting of a stainless steel cylinder filled by fluid and covered by a stainless steel conic cap fixed to the wire. Tensioning weight is suspended to the wire and immersed in the fluid tank for damping the wire oscillations. Tank is supplied without liquid.

Tensioning weight all made in stainless steel, is a cylindrical tank containing lead ballast with a damping unit made by 4 cross blades.

Upper anchor system is composed by a galvanized steel plate to be fixed to the wall on which is mounted and a stainless steel rail with a sliding block bringing a tail sheave and the locking nut for the wire. The sliding block allows the perfect positioning of the wire and tensioning weight inside the tank while the locking nut allows adjustment of the wire length.

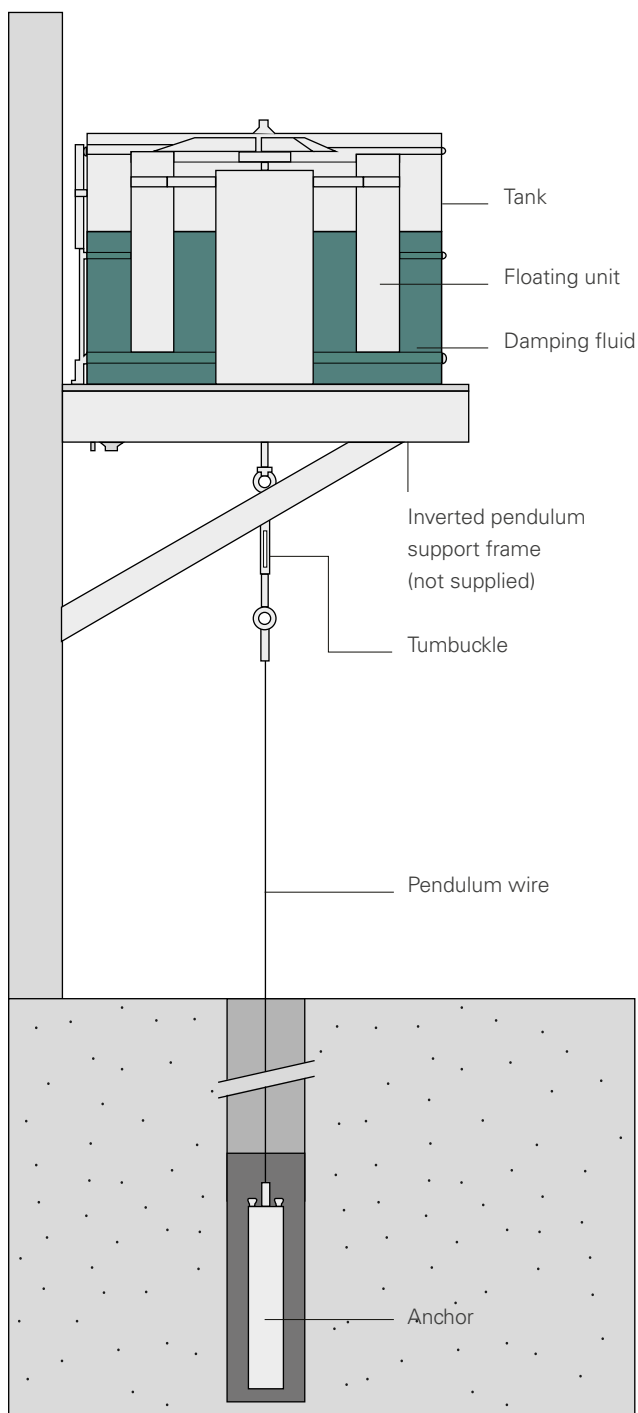
Turnbuckle mounted on the wire for trimming the position of the damping unit in the tank.

DIRECT PENDULUM	MODEL OS911002500
Tank dimension	diameter 410 mm height 415 mm
Tank weight	15 kg
Tensioning weight dimension	diameter 200 mm height 310 mm
Tensioning weight	30 kg
Damping fluid (*)	not supplied

PENDULUM WIRE	MODEL 0WRAC200000
Material	stainless steel
Diameter	2 mm

(*) Damping fluid is usually a mineral oil and should be selected with viscosity according to the application and the local temperature condition (i.e. SAE 50-90)

INVERTED HANGING PENDULUM



The inverted pendulum provides a fixed datum from which structural movements can be measured. It is composed by:

Floating unit consists of a stainless steel anular chamber with an internal stainless steel float. The float is fixed to the pendulum wire by an adjustable tie bar having 80 mm of vertical stroke. The standard floating unit permits ± 72 mm movement in any direction.

Tank is usually filled by oil and has a stainless steel top cover. Checking of the fluid level inside the tank is possible by an external tube. The floating unit is usually positioned on a support metal frame anchored to the structure (not supplied)

Anchor for inverted pendulums consists of a steel ballast with centralizing pins for installation in cased borehole. Installation must be made by proper installtion tool. The anchor is grouted in a cased borehole having a minimum diameter of 150 mm.

INVERTED PENDULUM

MODEL OS912006000

Tank dimensions	diameter 615 mm height 497 mm
Tank weight	35 kg
Floating unit	diameter 465 mm height 350 mm material: stainless steel
Groutable anchor	diameter 75mm, adjustable from 80mm to 160mm by centralized pins. material: galvanized steel
Damping fluid (*)	not supplied

PENDULUM WIRE

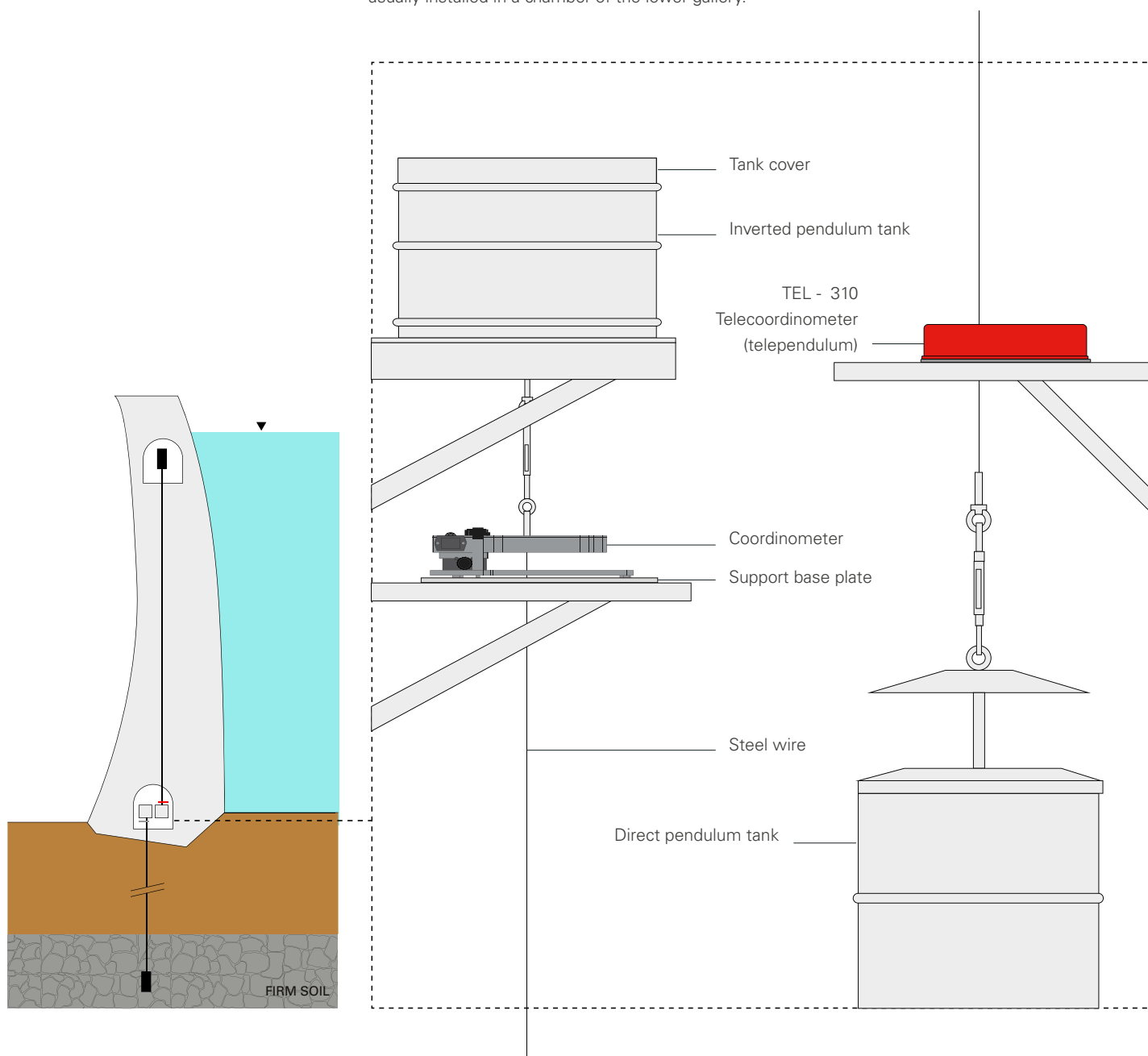
MODEL 0WRAC200000

Material	stainless steel
Diameter	2 mm

(*) Damping fluid is usually a mineral oil and should be selected with viscosity according to the application and the local temperature condition (i.e. SAE 10)

TYPICAL DAM APPLICATION

In arch and gravity dams can be installed one or more pendulum sections to monitor horizontal displacements (upstream-downstream directions and left bank-right bank directions). A typical simple section include one direct pendulum and one inverted pendulum, read with manual or automatic devices, usually installed in a chamber of the lower gallery.



All the information in this document is the property of Sisgeo S.r.l. and should not be used without permission from Sisgeo S.r.l.

We reserve the right to change our product without prior notice.