PENDULUMS
DIRECT and INVERTED

Pendulums are widely used in civil engineering to monitor rotation movements in structures. They are used in many types of construction such as dams, viaducts, buildings and in all cases where highly accurate long-base rotation measurements are needed.

In general, pendulums can be divided in two main categories: direct and inverted.

They both work using the same principle: a suspended plumb-line, weighted at one end, acts as a perfect gravitational vertical line.

The reading is taken by measuring the displacement of one or more points along the vertical length of the plumb line. In the case of inverted pendulums the wire is anchored at the bottom, usually at the lower end of a bore-hole, and attached at the top to a special floating system which allows the wire to be held in a perfect vertical position.

In the case of manual reading they are taken using sighted mobile reading units which measure any deviation of the plumb line from the vertical.
For automatic readings AGISCO has developed two innovatory measuring systems offering extremely low cost yet with high accuracy, reliability and long life.

Such measuring systems are supplied with the pendulum models mentioned below and can be used with both direct or inverted plumb-lines. In addition, AGISCO has developed a special new three-axis type pendulum. It houses a third transducer, mounted on the Z axis, which detects and measures the vertical deformation of a structure.

The same pendulum can therefore be used to monitor both rotation and deformation affecting all or just part of a structure.

On request the triaxial model (for pendulums of extreme length) may be supplied with automatic mechanical rod length compensator for temperature variation. This can only be used with a rod pendulum.

For very long pendulums it is possible to have intermediate reading stations situated along the length of the pendulum.
This system is particularly useful for brick or stone built structures where the deformation of the

DISPLACEMENT-ROTATION

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building is not uniform such as castles and bell towers. This system is a good cost effective alternative to inclinometers.

Inverted pendulums are the usual preferred method of measurement when the rotation is between a specific point on a structure and it's foundation.

It is often used in dams to check the absolute displacement between it's structure and foundation. In this case the anchorage of the pendulum is sunk to a level which is considered totally stable and the target level is placed at the same level as the base of the foundation.

The upper part of the pendulum is fitted with a floating system housed in a tank damping liquid. This float keeps the rod in a perfectly vertical state.

TECHNICAL SPECIFICATIONS

DIRECT and INVERTED PENDULUMS		
	DIRECT Pendulum	***INVERTED Pendulum***
Damping system	special silicon oil	special silicon oil
Material	stainless steel	stainless steel
Dimensions	Ø 200/300 mm or bigger	Ø 400 mm (or different on request)
Plumb line	stainless steel wire or rod	stainless steel wire or rod
Gauge type	inductive	inductive
Measuring range:	± 20 mm (standard range)	X-Axis (standard): ± 20 mm Y-Axis (standard): ± 20 mm
Supply:	9 ÷ 30 Vdc	9 ÷ 30 Vdc
Output:	4 ÷ 20 mA	4 ÷ 20 mA
Accuracy:	0.05 mm	0.05 mm
Sensitivity	0.01 mm	0.01 mm

Agisco reserve the right to change their products and specifications without notice

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