

**Our firm acquired this activity from the Officine Galileo S. p. A. (including instrumentation projects, patents, drawings, testing and manufacturing devices, etc.). For this reason we are able to provide any type of technical assistance for the instrumentation supplied in the past by the aforementioned firm: instrumentation for which, in every possible case, we have maintained the interchangeability and the possibility for the implementation of new devices and accessories.**

**The present publication gives only a synthetic review of our production program. We would be pleased to supply more detailed documentation and technical information regarding every instrument or system upon request.**



**MONITORING AND MEASUREMENT OF:**

**Displacements**  
**Settlements**  
**Inclinations**  
**Rotations**  
**Deformations**  
**Strains**  
**Pressures**  
**Temperatures**  
**Water levels**  
**Other**

**WITH:**

optical and electro-optical collimators  
plumb lines  
coordinometers  
plate settlement devices  
mechanical settlement probes  
inductive settlement probes  
magnetic settlement probes  
electro-hydrostatic cells  
levels in communicating vessels  
inclinometric probes  
clinometers  
mechanical strain gauges  
convergence measuring instruments  
extensometer  
manometers  
piezometers  
electric probes  
load cells  
tensiometric cells  
thermometers  
scales for water-level measurement weirs  
instruments for the measurement of small water levels  
other

The instrument of our production, show in this short form catalogue, have been specifically developed for the controls connected with the management and safety monitoring of dams and, more generally, large structures and constructions. Operating principles, accuracies, materials, installation procedures and relevant accessories have been designed taking into account not only the special characteristics of the structure to be monitored, but also considering the method in use for their realization and the environmental conditions foreseen for their use.

The same instruments can be effectively used in the field of geotechnical controls and, in several cases, in industrial applications, for quality and/ or process controls.

In our activity as instrument makers, we use the most up-to-date techniques and technologies in the fields of optical system, precision mechanics, analogic and digital electronic system. These resource enable us to realize (or select) specific instrumentation to be made according to customers' specifications.

Besides supplying instrumentation, whether of standard productions or custom made, we can assure our customers of most qualified assistance in the definition phase of the instrumentation, operation and maintenance.



**OPTICAL ALIGNMENT COLLIMATOR 60X, D= 80 MM**

This instruments, together with its wide range of accessories, permits the easy precision-measurements of points displacement with respect to a reference alignment, established between pairs of points located outside the structure to be monitored.



**AUTOMATIC COLLIMATOR DELTA 2000**

The instrument, designed for the automatic monitoring of small movements in the crest of concrete dams, finds a use in several other similar controls.

DELTA 2000 can offer accuracies that, according to the geometry of the installation, can reach a tenth of a millimeter on distance of over 500 meters.

The instruments which operates in fixed installations, requires some auxiliary works for stabilising and safety.

For each installation it is necessary to make a preliminary study to insure the possibility of installation and the definition of any components having to be made specifically for each plant.



**MECHANICAL STRAIN GAUGE BASE 150-200 MM 700 MM  
BASE REMOVABLE STRAIN GAUGE**

Removable mechanical instruments, with precision respectively of 1 mm and 2 mm, they have 5mm of measuring range. Both instruments, built of INVAR steel, are supplied with installation and control fixtures and invar testing templates. Other base lengths are available on request.



**BUBBLE LEVEL CLINOMETER**

The coincidence level clinometer has a 30' measuring field with a 2" accuracy. As accessories are available circular bases for punctual control, 800 mm extension bases, fixtures and seats for the realisation of clinometric chains.



**CONVERGENCE MEASURING INSTRUMENT**

The instruments makes possible the measurement of the relative movement of two points spaced between 1 to 20 meters (standard ) apart.

The basic version is equipped with perforated inox steel tape. The fixing studs can be ball or ring or screw type.



**AUTOMATIC CLINOMETERS**

Several types of punctual clinometers for fixed installation are available.

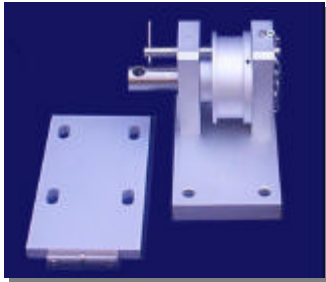
Among these are vibrating-types. Different attachments. Shape and measuring fields make possible their use on embankments and in rigid structures.





**STRAIGHT AND INVERTED PLUMB LINES**

The straight plumb lines are comprised of upper winch-type fixing devices, wire guiding plate, lower wire attachment with plumb bob and oil damper. The inverted plumb lines are formed by a suspension tank, float with stabilisation weight, wire tensioning and a positioning weight wire attachment



**COORDINOMETER FOR PLUMB LINES**

Automatic: Available with one or two orthogonal coordinates, it permits the automatic monitoring of the position of straight and inverted plumb lines. The instrument, fixed to the structure, can be supplied with 24 V. a. c. or d. c. and/ or 110- 220 V. a. c. The measurement values are displayed by the instrument on mechanical counters, the same values, Gray- coded, are transmitted to remote electronic visualisation and recording units.

Measuring field: X= 100 mm Y= 50 mm - Accuracy 1/10 mm on both coordinates.

Manual: Available into different models; optical or electronic type. Ranges 3 cm in both directions (5 cm for electronic type). The instrument are removable.



**AUTOMATIC DYNAMOMETRIC SCALE FOR WATER LEVEL MEASUREMENT**

The instrument possible makes possible the continuous automatic measurement of water levels, with an accuracy of 1 cm on a measuring field of 80 m or of 2 cm on a field 160 m.

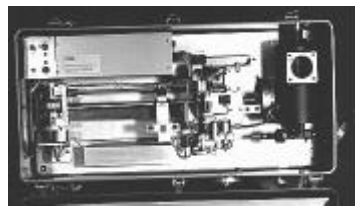
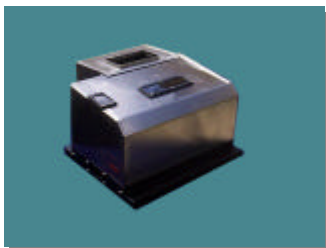
The measured data is displayed on the instrument by means of a mechanical counter and is transmitted in Gray- code to a remote station.

The accessories system allows the installation of the dynamometric scale with direct connection to the hydrostatic pressure, or to a pneumatic pressure, group.



**ELECTRIC PROBE**

This is used for the measurement of the water level in open piezometers, wells, assestimetric columns provided with filtering lower elements, etc.



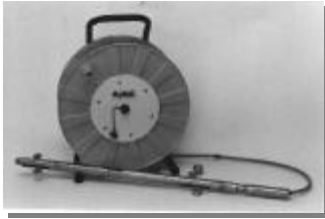


**SETTLEMENT PROBE DIFFERENTIAL TRANSFORMER TYPE PERMANENT MAGNETIC SETTLEMENT PROBE**

Both instruments, used in conjunction with specific settlement columns, allow detection of the position of steel rings, guided by the aforementioned column and following the ground movement.

The passing of the probe through the ring is detected by means of the relevant electronic unit; a graduated suspension electrical cable with a steel core permits the measurement of the probe position.

As accessories a stadia device and a cable reel with a mechanical counter are available.



**USBR PROBE**

The mechanical settlement probe, type USBR, with retractable, is used in conjunction with zinc-plated telescopic steel-pipe columns. The column is provided with strong steel cross-arm, for a very solid connection with the ground.

The inox steel probe is connected to a winch by means of an inox steel graduated tape and with a nylon safety cord.



**MONO AND BI-AXIAL INCLINOMETER PROBES**

These are available in several version differing in their measuring field, accuracy and measuring bases.

All types are equipped with a 0.5 m steel core, graduated cable reel. Standard digital units display the measured data; special version also make possible magnetic data-recording.

For the formation of inclinometric columns, aluminium or ABS grooved elements and relevant accessories are available.



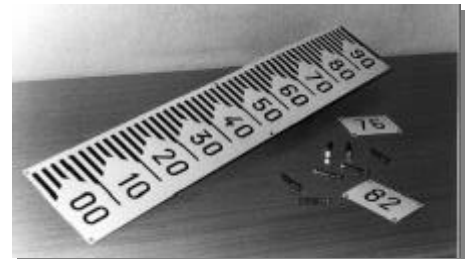
**WATERFLOW MEASURING INSTRUMENTS**

For the measurement of water leakages or, more generally, of small waterflows we can offer several types of weirs and instruments for the measurement of water levels. The simplest measuring device is a mechanical type which makes use of a single micrometric screw.

Several types of measuring instruments for automatic or remote operations are available.

**SINGLE AND TWIN PIPE TYPES PIEZOMETERS**

Several models of heads for the realisation of open piezometers are available. The head of the twin-pipe type is comprised of a porous silicate element with standard porosity of 20 mm an attachment for 1/ 4" PVC pipes.





**LEVEL IN COMMUNICATING VESSELS-HYDROSTATIC LEVELS**

Used for the formation of clinometric chains or as settlement measuring devices, these realise a simple but often acceptable system of measurement. The measurement of the liquid level is made by observing visually, or with the aid of an ohmmeter, the contact of point with the liquid.

The position of said point, which is driven by a micrometric screw, is given on a graduated scale and relevant graduated drum.



**CONCRETE STEES CELLS AND LOAD CELLS**

Available in several version, each differing in shape and measuring field.

Mechanical and electrical deal gauges are available.



**PIEZOMETRIC CELLS**

Vibrating-wire instruments. available with measuring field of 3 -5 -10 -15 -20 Kg/ cm<sup>2</sup> in the version with 60 mm outer diameter and 33 mm diameter.

All types built of inox steel, are proved for long-term operation with accuracy. Ceramic and brass filters make possible their use in different types of soil. Connected by means of our special bipolar cable, suitable for direct embedding into embankments. They can be read with DEC digital units and / or with our automatic data- acquisition system.



**STRAIN GAUGES**

The instruments we produce are based on the vibrating-wire technique. All advantages offered by this operating principle are enhanced by the very solid and careful construction and by the facility of installation.

Available in several shapes and with different measuring of deformations, stresses, joint and crack-openings and closing etc.

For reading, portable digital readout units and / or automatic data-acquisition systems are available.

The instrument can also be used for temperature measurements.





#### **ROD EXTENSOMETERS**

The most common use for these instruments is the monitoring of rock and soil movement following tunnel excavation, mining and made with lightening of material. Available in the "single road " and " multiple road " version, with measuring bar of different materials such as invar steel aluminium, inox steel, fiberglass, etc. The measurements can be collected with mechanical dial gauges and / or with electrical sensor



#### **THERMOMETERS**

Our standard thermometric sensor, based on resistance variation with the temperature are built in " for air", "for water" and " for concrete" version. All type are connected with our special 3-pole cable and can be read with a portable digital unit or by our automatic data-acquisition system. In both cases, the reading units nullify the effect of the cable length.



#### **PORTABLE DIGITAL UNITS**

For measurements with our vibrating-wire instruments, two portable digital units are available: the DEC-4 specifically for these instruments, and the UC-DAS unit that also allows measurement in digital form of the temperature with all vibrating-wire sensor and other analogic sensor. All the aforementioned units, which present the data on a digital display, include internal rechargeable batteries and battery charger



#### **AUTOMATIC DATA ACQUISITION-SYSTEM**

We can supply system for automatic data acquisition from monitoring instrumentations. Making use of our standard modular electronic units we can provide system exactly tailored to the specific needs of every installation at effective cost and with high reliability. Among the very interesting features of our systems we wish to stress the following:

- the possibility for the user to pre-set several cycles of data acquisition going on simultaneous executions. This permits the differentiation for groups of instruments of the data-acquisition frequency in order to optimise for each group the number of the collected data.
- the presentation of the measurements data on digital display and on printing units together with additional information: for instance the time of data collection the index for the instrument measured the unit in which the measurement is expressed eventual warning signals transmitted by or associated with the measuring instrument etc.
- the possibility for recording the collected data on magnetic supports.
- the availability of standard communication ports (RS232 C) for tele-transmission and / or linking with micro or host- computers.



Different configuration and different locations of the units in the system are possible