

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



INCREMENTAL EXTENSOMETER USER MANUAL



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Warnings

This instrument must be utilized only for the application it has been designed for, OTR declines all responsibility for any improper use;

- Use protective gloves;
- Do not let the instrument fall into the hole quickly;
- Do not let the cable slide quickly in the hands;
- Do not put the instrument in flammable liquids or potentially explosive gases;
- Do not open the instrument, contact the manufacturer for checks and repairs;
- Do not use the instrument in water where an electric dissipation is in progress;
- Keep out of reach of children;
- During the recharge phase insert protective caps on sensor and USB connectors;
- During the recharge phase don not touche the datalogger with wet hands;
- During the recharge phase, disconnect the datalogger from the probe or from any device connected to the AC power supply (e.g. Personal Computer by USB);
- Do not recharge for more than 12 Hours;
- Do not connect the instrument to the readout unit with wet hands;
- Use only its original power supply unit to recharge the datalogger;
- Clean the instrument and its cable with alcohol or water, do not use acetone or aggressive liquids for plastics or labels.



Applications

The Incremental Extensometer is an instrument designed for monitoring:

- Landslides
- Unstable Slopes
- Deformation of rock masses
- Tunnels excavations
- Bulkheads and levees
- Dams

Description

The Incremental Extensometer allows to measure a vertical component of the movement. In order to complete a 3D positioning in the space of the inspected casing the same must be measured by a traditional inclinometer also. The instrument is used in an ABS inclinometer on which are pre-installed appropriated magnet rings.

The probe is 1470 mm long with a body diameter of 40 mm , it is watertight up to 1.5 MPa. The wheels are suitable for inclinometer tubes with nominal inside diameter of 60 mm. The type of electrical output is designed to have high thermal stability (central zero signal) and compatibility with the existing data logger OTR.

The probe is equipped with breakable arms to recover the probe if blocked in the casing. The datalogger allows measurements quickly and confidently.

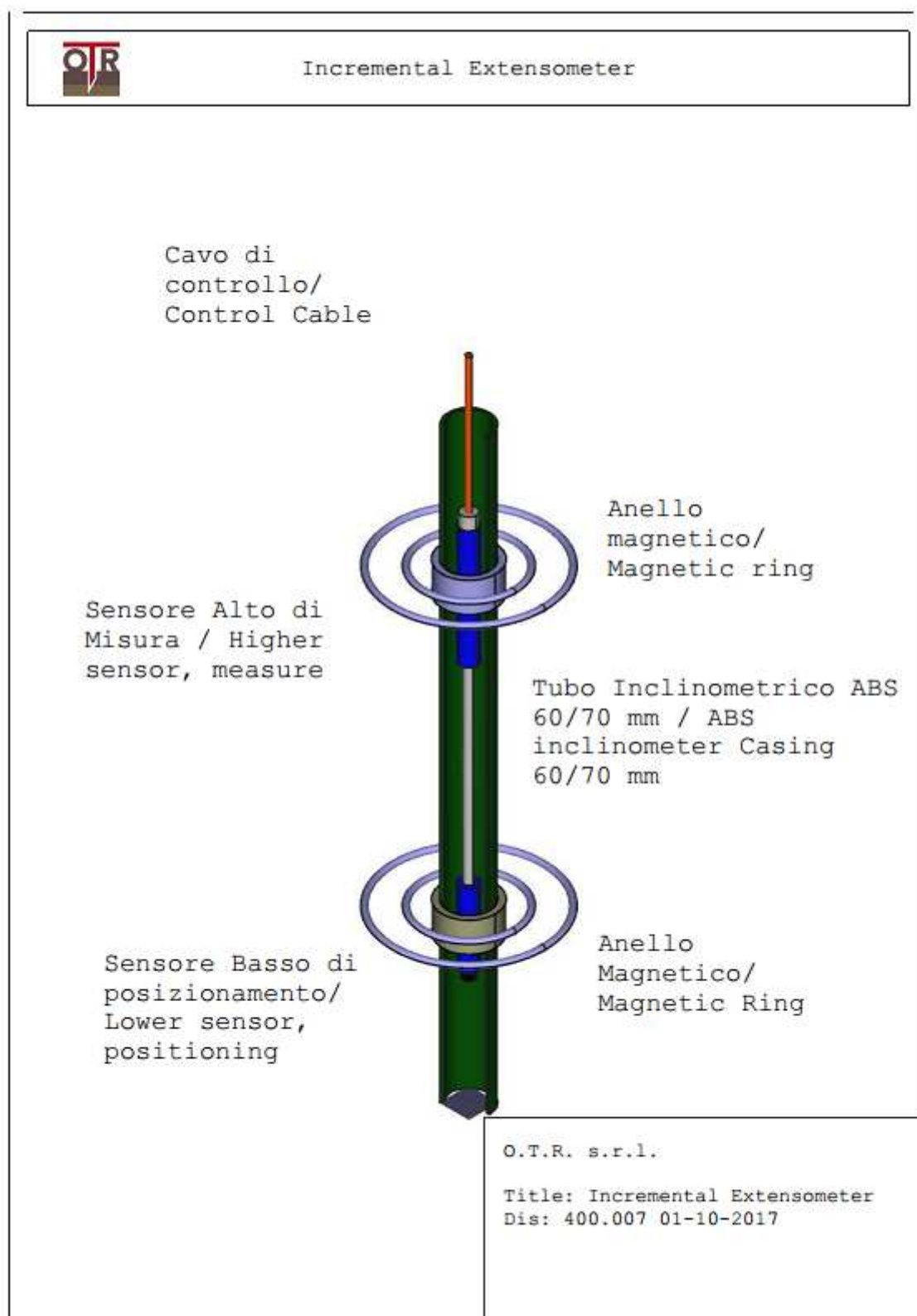


Figura 1 Incremental System Inside the Pipe



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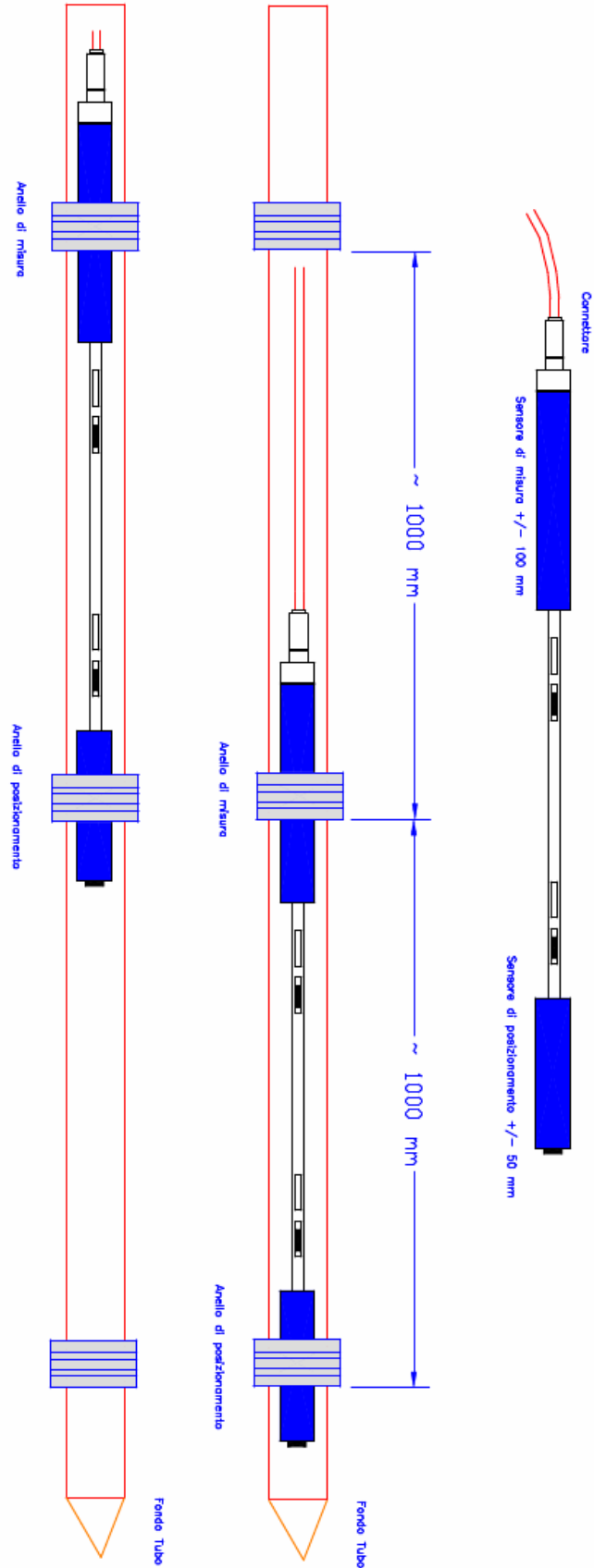
20/09/2017



Datalogger OG397

Extensometer can be used by datalogger OG397 using modality "Extensometer".

Taking measures



**Figura 2 Measuring scheme**

Extensometer is lowered in a pipe surrounded by magnetic rings which are ideally positioned 1000mm apart from each other.

In the probe there are 2 sensors. Each of them measures its distance to its corresponding ring.

Sensor B (lower) measures its distance to the lower ring, which is the positioning ring.

Sensor A (higher) measures its distance to the higher ring, which is the measure ring.

These distances are expressed as [mm x 100].

Extensometer is used to measure the relative drift of two consecutive rings. This drift is called D and equals B-A [mm x 100]. When two rings get closer, D gets lower.

Data acquisition is performed for each pair of rings in the pipe, and consists in getting sensor B as close as possible to the positioning ring (lower) in order to measure the drift of the measure ring (high).

N. B.

It is highly recommended to put the probe at the bottom of the pipe and to wait for at least 10 min. for its thermal stabilization before the beginning of data acquisition, which in turn will start from the head of the pipe towards its bottom. Do always use the same side of the pipe.

Stabilizzare la sonda
a fondo foro
per almeno 10 minuti

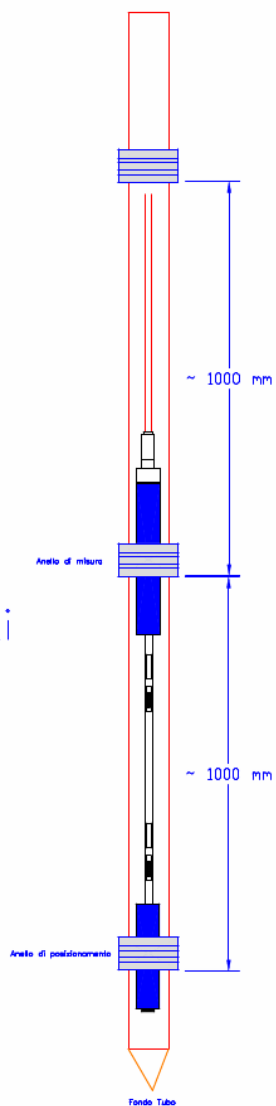


Figura 3 Let the probe stabilizes 10 minutes in the bottom of the pipe



```
< Measure >
Free files: 32
Saved files: 1
<ACQ> to enter menu
```

Pressing the ACQ button, the display will appear as follows:

```
< Instrument Type >
<ACQ> Inc Vertical
<A> Inc Horizontal
<B> Extensometer
```

Choose the instrument pressing

B for an extensometer.

```
<Data Extensometer >
File: 1 Slides: 1
Zone:
Pipe:
```

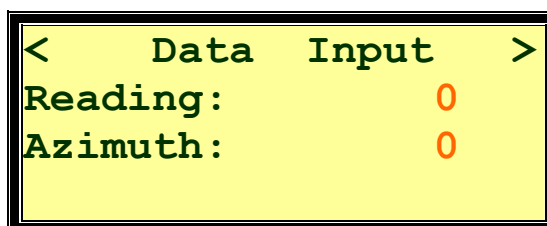
Display explanation

<Data>	Type of instrument: Inc Vertical, Inc Horizontal, Extensometer
File	First available file to save the next measurement
Slides	Number of slides that are to be measured (1 for extensometers)
Zone	Zone name or code (max 14 characters)
Pipe	Inclinometric casing name or code (max 14 characters)



The cursor is under the Slides value.

- 1) The value is 1.
- 2) Press ACQ to write the zone name or code: the cursor moves to the beginning of the zone name
- 3) Press A or B to choose a character
- 4) Press D to write the selected character and skip to the next character
To delete the last characters press C one ore more times.
If you delete all the Zone name characters and press C once again, the cursor moves to the Slide value and the overall procedure begins restarts.
- 5) Press ACQ to write the Pipe name or code: the cursor moves to the beginning of the casing name or code
- 6) Press A or B to choose a character
- 7) Press D to write the selected character and skip to the next character
To delete the last characters press C one ore more times.
(If you delete all of the Pipe name characters and press C once again, the cursor moves to the Zone name and the procedure returns to step 3)
- 8) Press ACQ to save entered values. The display will appear as follows:



- 9) Press A or B to change at will the optional Reading value, a number that indicates which measurement operation is under way
Available values are between 0 and 999.
Pressing C the procedure will restart from the beginning, at step 1)
- 10) Press ACQ to confirm and proceed .
- 11) Press A o B to change the Azimuth value for the first slide
Azimuth is measured in degrees (°) and must be a number between 0 and 359
Pressing C will take you back to enter the Reading value, at step **Errore. L'origine riferimento non è stata trovata.**
- 12) Press ACQ to confirm and proceed
The display will show the main form to take extensometric measurements, and will appear as follows:



```
Mode:mm x 100 Direct
D: ****** B:
Step: 1 Slide: 1
Beep: On B+C ->Off
```

Display explanation

Mode	Measure Mode
D	Difference between B computed value and A computed value ($D = B - A$)
B	Sensor B computed value
Step	Next measuring step
Slide	Current slide
Beep	Sound mode (On/Off)

- 13) When the probe is far from its correct reading point (i.e. sensor B is far from the magnetic ring), D will not be computed and ********* will appear instead of a computed value.
- 14) Shift the probe to reach the next measuring step, at an intermediate speed (about 1-2 cm per second).
When B reaches a value between -2000 and +4000 (i.e. sensor B is less than 4 cm above or 2 cm below the magnetic ring), D will be computed and Datalogger will emit an intermittent beep. These beeps let the operator know that the probe is close to its correct position, but not there yet.
Sound is On by default, and is a help for the operator to reach the next measuring position.
By pressing B+C, you may turn sound on or off.
- 15) Shift the probe to get the lowest possible value for B.
When B reaches a value between -400 and +400 (i.e. sensor B is less than 4mm far from the magnetic ring), directional arrows will appear on screen and Datalogger will emit a continuous sound.

```
Mode:mm x 100 Direct
D:   -120  B:   +276
Step: 1 Slide: 1
          >>>>>>
```

*Probe is above its correct reading position.
Do not take your measure in this position.*



```
Mode:mm x 100 Direct
D:   -118   B:   -8
Step:  1   Slide:  1
      <>
```

*Probe is at its correct reading position.
You can take your measure.*

```
Mode:mm x 100 Direct
D:   -121   B:   -90
Step:  1   Slide:  1
      <<<
```

*Probe is below its correct reading position.
Do not take your measure in this position*

16) Press ACQ to take your measure.

The datalogger rests on hold until it gets stable data from the probe, then it computes the received values and shows them on screen. Three acoustic confirmations (BEEP) are emitted.

Repeat this operation at each magnetic ring along the pipe.

You need to keep the probe still. If instead the probe is moved during data acquisition, Datalogger will wait for sensor stabilization for no longer than 15 sec. After that, a message of error will appear on screen.

```
Mode:mm x 100 Direct
D:   -121   B:  -104
Step:  2   Slide:  1
*** Bad Measure ***
```

*In case of errors you may want to repeat a measure. To do that, press **A** or **B** until you skip to the step you want to measure again and press **ACQ**. The **Step:** indicator always shows the step you are about to measure.*

*Please note that if you press **A** more than once, and skip back more than one step, and press **ACQ** to take that measure again, **all the measures starting from that step on will be lost, and will need to be taken again.***

17) Repeat steps 14) 15) and 16) until necessary.

18) After the last measure in the pipe, press C+D again to save your measurement file and exit.

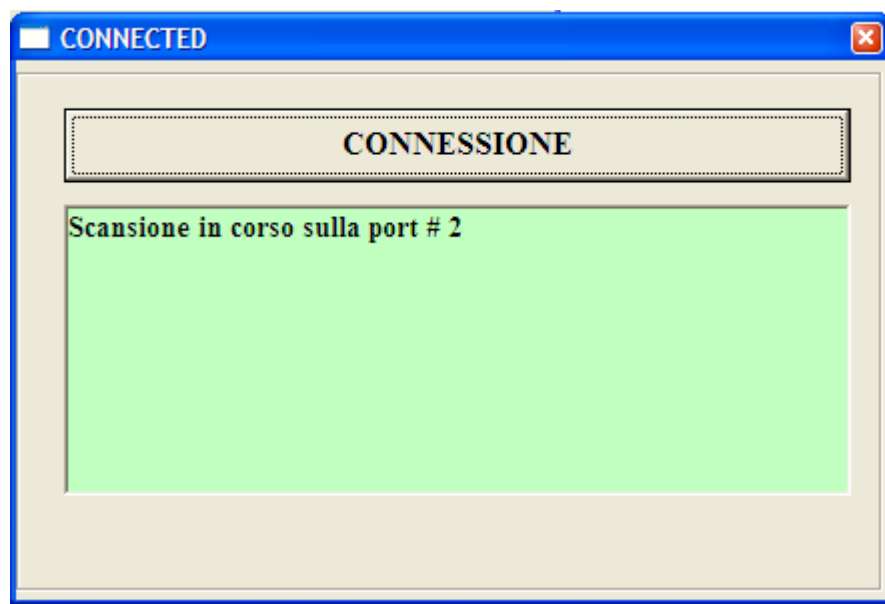
Free files are now one less, and Saved files are one more.

**Important:**

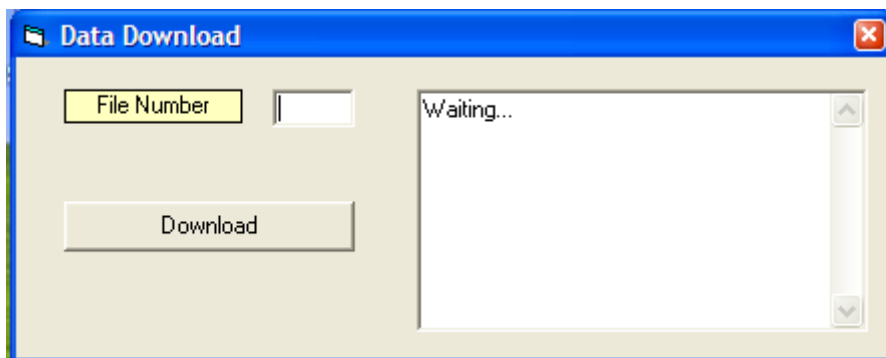
To download data of incremental extensometer from datalogger it is necessary to use tool OG397 DataDownload.

Data Download

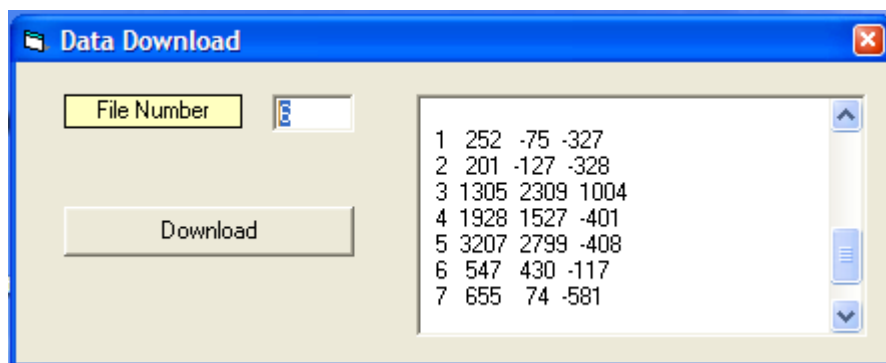
1. Install the software OG397 data-download;
2. Install the driver of datalogger (usb to serial port must be in the first 16 ports);
3. Press button "ConneSSIONE";



This screen will compare:



Insert the number of the file inside datalogger to download.



The software will download data as this example:

#	A	B	Delta
1	-422	-29	393
2	-422	-26	396
3	288	-42	-330
4	-1077	-6	1071
5	-286	-14	272
6	0	0	0

step (1 meter)

A measure of the higher sensor in mm x 100;

B measure of the lower sensor in mm x 100 (centering quality)

Delta = B-A. It is the value to process in mm x 100,