

TcpControl

Deformation Monitoring and Control

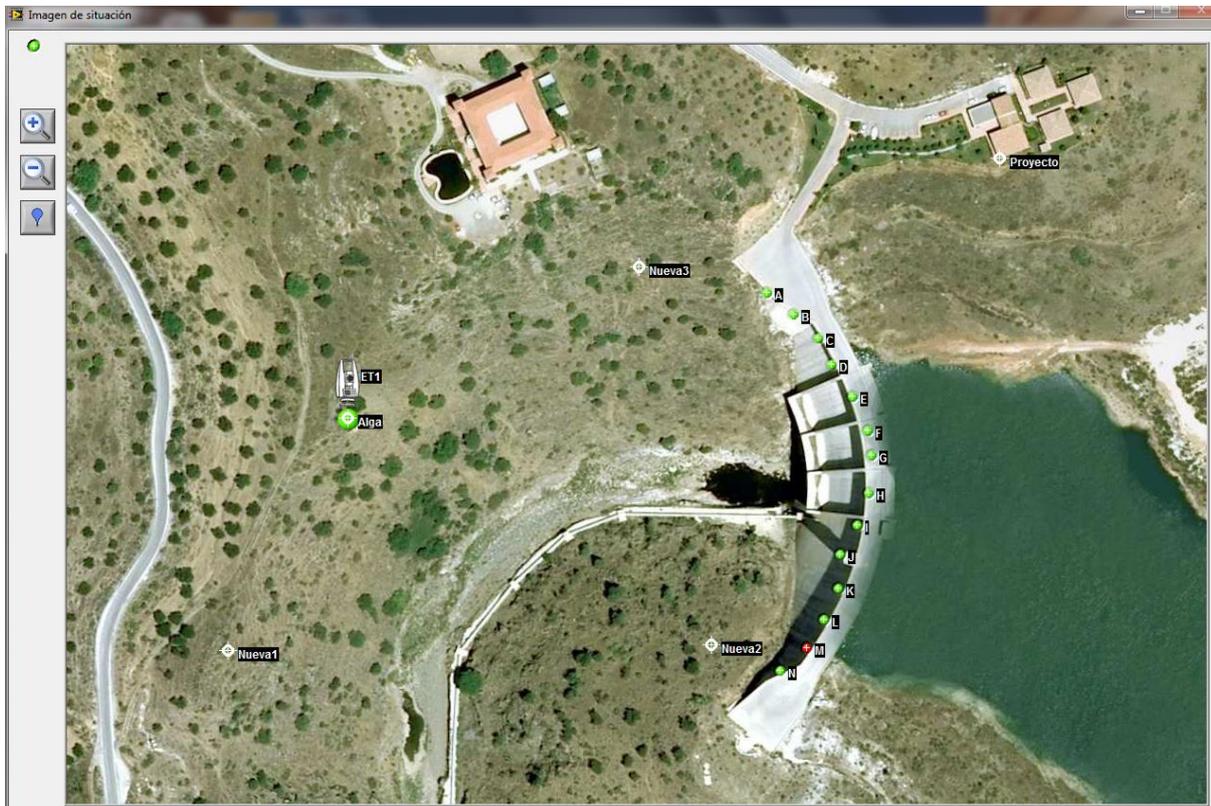
This powerful application allows a real-time monitoring over control points using robotic total stations and other devices. Among the practical applications are the control of slopes, dams, buildings, bridges and other structures.



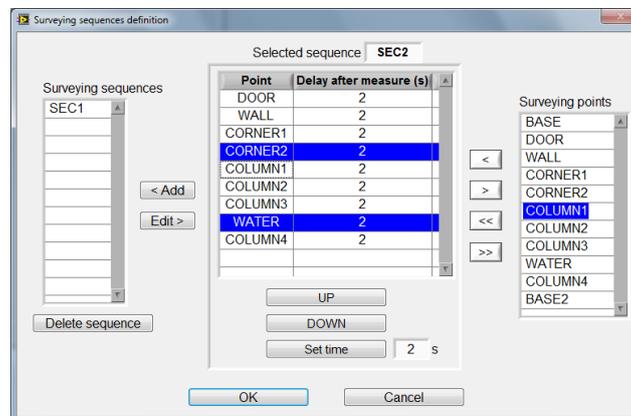
Project Definition

The program requires basic project data, such as a list of fixed and moving points defined by their coordinates and names.

All devices and points are automatically placed in their coordinates over an orthophoto or may be placed manually on a picture or diagram. The color of each element map is updated according to their state, allowing to quickly locate malfunctions or measurement alarms.



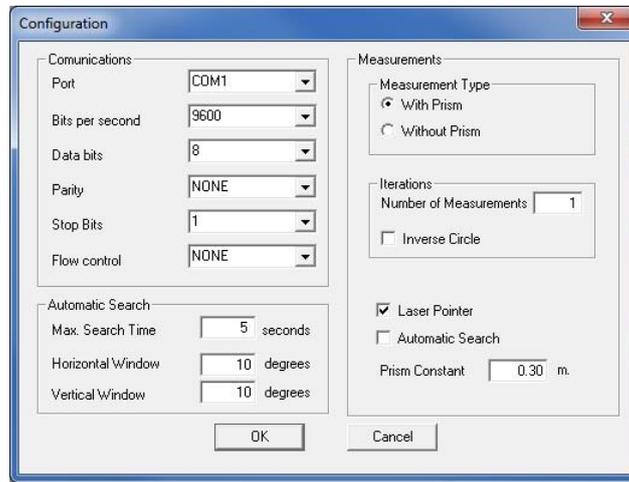
You can also define sequences of points measurements, giving the start and end times, the interval between measures and the number of repetitions. Any given point can be observed by multiple devices. With these data, the operation can be fully automated, leaving the computer unattended.



Devices

TcpControl can be connected to robotic total stations, GNSS/GPS receivers, clinometers, accelerometers, strain gauges, temperature sensors and weather stations, and can be easily adapted to other sensors through National Instruments's Data Acquisition systems. Communication is established via serial or Ethernet cables, Bluetooth or Wifi, radio modem or mobile phone.

All devices can be configured using the software. For example, for total stations, communication parameters, measurement mode, automatic prism search configuration and laser pointer can be defined.



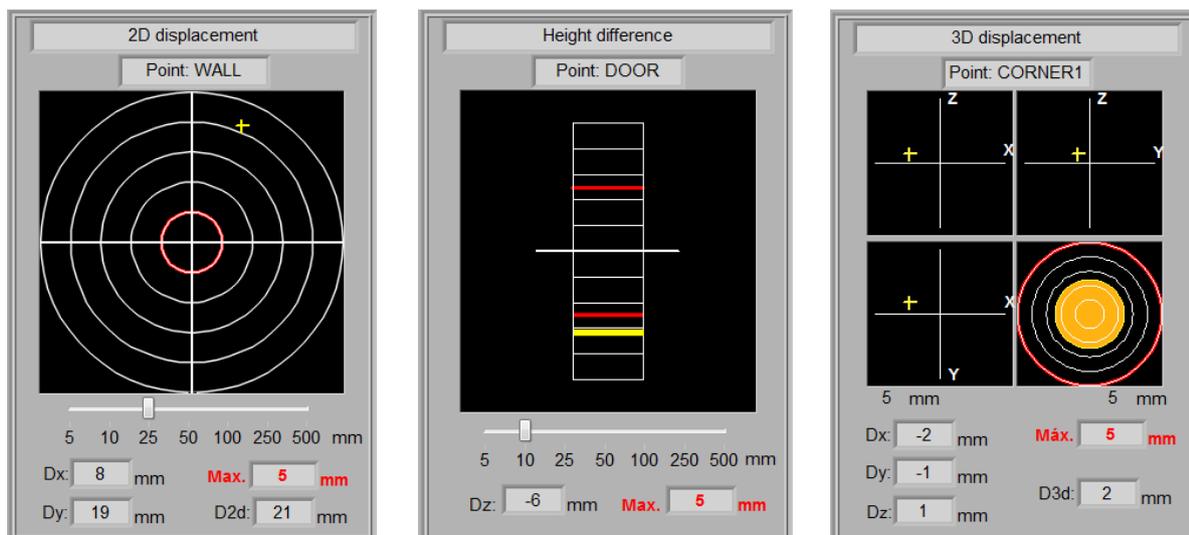
For each total station a resection can be programmed automatically from time to time. For other devices also can be provided alignment intervals.

Restrictions

The program allows to define different types of restrictions to monitor control points. In each of them current and maximum permissible values are indicated graphically and numerically.

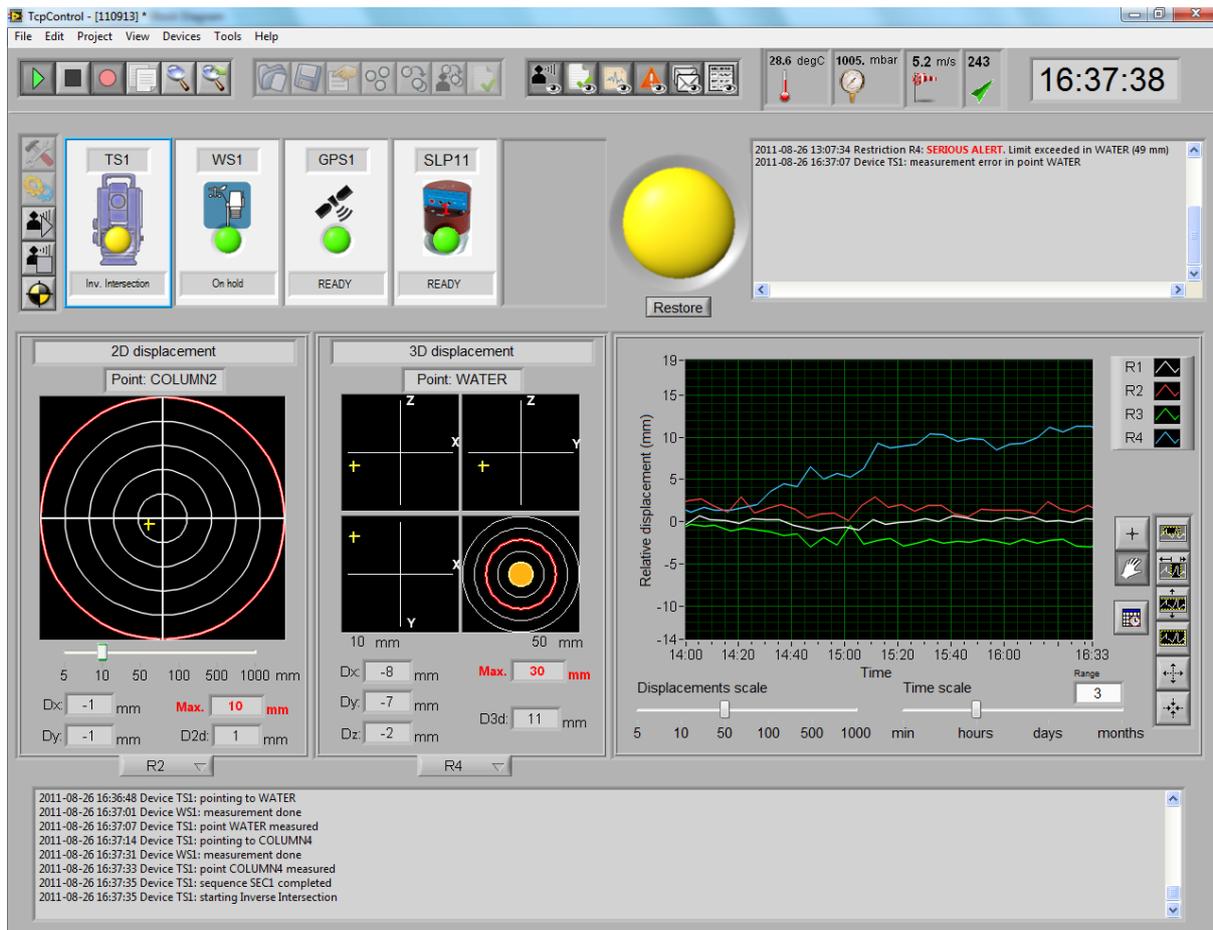
The restrictions can be one of the following:

- Height difference at one point
- 2D Displacement at one point
- 3D Displacement at one point
- Height difference between two points
- 2D Distance between two points
- 3D Distance between two points
- X-Axis inclination
- Y-Axis inclination



Display

The user interface displays clearly the information needed to monitor the project.



It is divided into several regions:

Devices. The status of devices is continuously displayed using a color LED (green if everything is correct, yellow if there is any incident or red if there are serious errors in the device or control point). It also shows the action which is being performed (for example, positioning the station, searching for the prism, measuring a point...).

Alerts. Shows the errors and warnings that have occurred, giving the name of device, date and time and type of error. In addition, an global indicator shows the overall condition, showing intuitively whether there has been any abnormality.

Restrictions. The status of the restrictions defined in the project are displayed graphically and numerically, showing current and maximum values. Up to two may appear simultaneously, and changing of selection at any time is allowed.

Historical. It represents a graph with the evolution of different indicators. Range of representation (minutes, hours, days or months), scale and symbology to use can be selected.

Messages. This area displays all messages on the activity of the application, showing date and time and allowing to search keywords.

Meteorological Data. It shows the current temperature, atmospheric pressure, wind speed and direction, if the appropriate devices are available. Meteorological data are also recorded in the database.

Data Logging

All information about the measurements, constraints values, messages and alerts is saved in a standard SQL Server database. From a number of predefined views and its documented data model allows the analysis of these data with external tools.

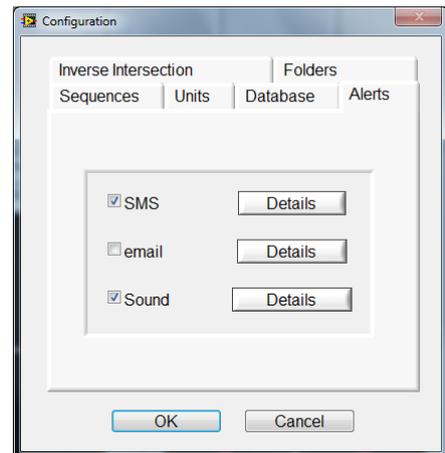
It is possible to load initially the database by converting observation files previously measured.

The application allows you to stop, pause and resume data recording at any time, make backups and export measurements and coordinates to other standard file formats.

Alerts

The program continuously monitors all the restrictions previously defined, so that if their values exceed the maximum the screen clearly displays a warning and an alarm is generated. Other warnings are shown in case of communications or measurement failures as well. Alarms are classified into levels according to severity.

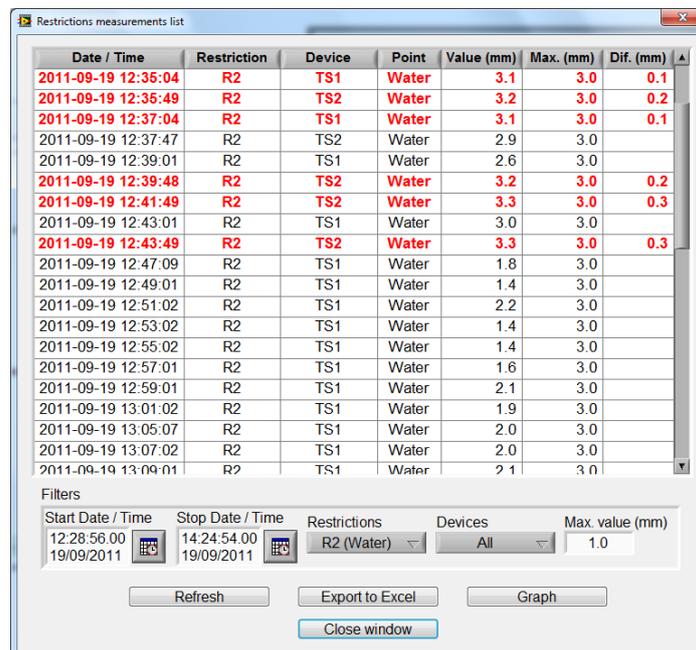
There are also other means of notification, such as playing sound or sending an SMS or e-mail to multiple receivers.



Reports and Charts

User can immediately generate the following reports by request:

- Measurements registered by any of devices
- Restriction values
- Coordinates of control points
- Inverse intersections
- Alerts
- Errors



Date / Time	Restriction	Device	Point	Value (mm)	Max. (mm)	Dif. (mm)
2011-09-19 12:36:04	R2	TS1	Water	3.1	3.0	0.1
2011-09-19 12:36:49	R2	TS2	Water	3.2	3.0	0.2
2011-09-19 12:37:04	R2	TS1	Water	3.1	3.0	0.1
2011-09-19 12:37:47	R2	TS2	Water	2.9	3.0	
2011-09-19 12:39:01	R2	TS1	Water	2.6	3.0	
2011-09-19 12:39:48	R2	TS2	Water	3.2	3.0	0.2
2011-09-19 12:41:49	R2	TS2	Water	3.3	3.0	0.3
2011-09-19 12:43:01	R2	TS1	Water	3.0	3.0	
2011-09-19 12:43:49	R2	TS2	Water	3.3	3.0	0.3
2011-09-19 12:47:09	R2	TS1	Water	1.8	3.0	
2011-09-19 12:49:01	R2	TS1	Water	1.4	3.0	
2011-09-19 12:51:02	R2	TS1	Water	2.2	3.0	
2011-09-19 12:53:02	R2	TS1	Water	1.4	3.0	
2011-09-19 12:55:02	R2	TS1	Water	1.4	3.0	
2011-09-19 12:57:01	R2	TS1	Water	1.6	3.0	
2011-09-19 12:59:01	R2	TS1	Water	2.1	3.0	
2011-09-19 13:01:02	R2	TS1	Water	1.9	3.0	
2011-09-19 13:05:07	R2	TS1	Water	2.0	3.0	
2011-09-19 13:07:02	R2	TS1	Water	2.0	3.0	
2011-09-19 13:09:01	R2	TS1	Water	2.1	3.0	

Filters

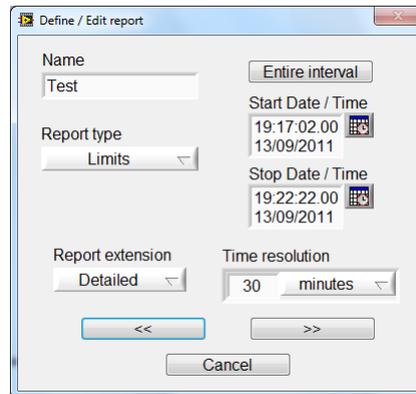
Start Date / Time: 12:28:56.00 19/09/2011
Stop Date / Time: 14:24:54.00 19/09/2011
Restrictions: R2 (Water)
Devices: All
Max. value (mm): 1.0

Buttons: Refresh, Export to Excel, Graph, Close window

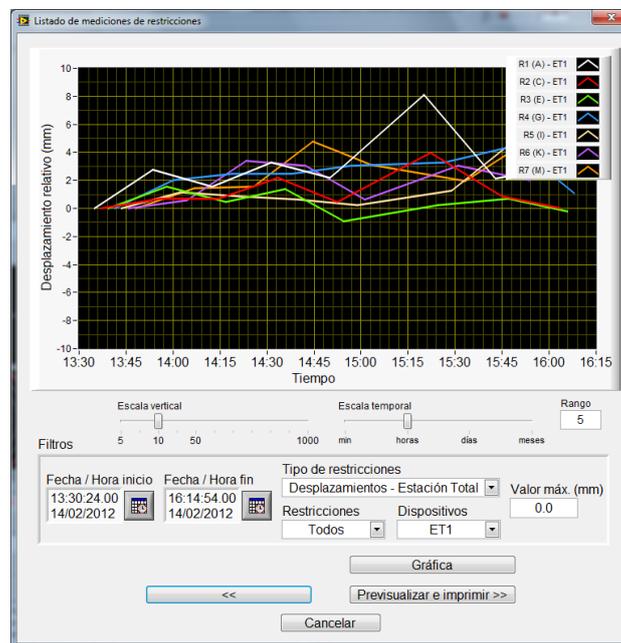
In each of them we can specify start and end date/time, interval and the elements to include. Custom reports can be saved by the user, setting margins and adding the company logo. Reports can be sent directly to printer, ASCII file, Microsoft Excel or PDF.

The program incorporates a wide variety of graphics that represent one or more variables. All graphics can be printed or exported to image format.

On screen reports help you get the most relevant information, allowing to filter by devices, points, restrictions and range of values.



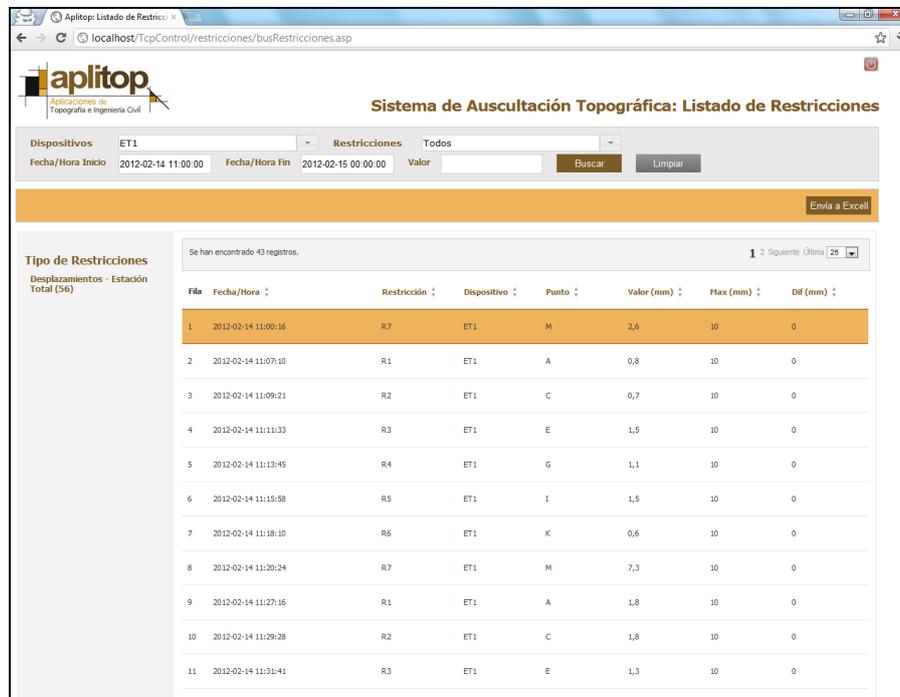
Moreover, the program display graphs representing one or more variables and can customize scales and representation options. All graphics can be copied to the clipboard, printed or exported to image format.



Web Access

The system offers the ability to access real-time values of measurements and alarms via the Internet, using the most popular browsers.

After entering username and password, measurements can be examined applying filters by date/time, device and restriction of the project.



The screenshot shows a web browser window displaying the ApliTop application. The page title is "Sistema de Auscultación Topográfica: Listado de Restricciones". The interface includes a search bar with filters for "Dispositivos" (ET1), "Restricciones" (Todos), and date ranges. A table lists 11 records of restrictions with columns for "Fecha/Hora", "Restricción", "Dispositivo", "Punto", "Valor (mm)", "Max (mm)", and "Dif (mm)".

Fila	Fecha/Hora	Restricción	Dispositivo	Punto	Valor (mm)	Max (mm)	Dif (mm)
1	2012-02-14 11:00:16	R7	ET1	M	2,6	10	0
2	2012-02-14 11:07:10	R1	ET1	A	0,8	10	0
3	2012-02-14 11:09:21	R2	ET1	C	0,7	10	0
4	2012-02-14 11:11:33	R3	ET1	E	1,5	10	0
5	2012-02-14 11:13:45	R4	ET1	G	1,1	10	0
6	2012-02-14 11:15:58	R5	ET1	I	1,5	10	0
7	2012-02-14 11:18:10	R6	ET1	K	0,6	10	0
8	2012-02-14 11:20:24	R7	ET1	M	7,3	10	0
9	2012-02-14 11:27:16	R1	ET1	A	1,8	10	0
10	2012-02-14 11:29:28	R2	ET1	C	1,8	10	0
11	2012-02-14 11:31:41	R3	ET1	E	1,3	10	0

Requirements ⁽¹⁾

PC

Operating System	Windows XP / Vista / 7 (32 and 64 bits)
Database	Microsoft SQL Server Express 2008 R2 or higher
Web Server	Internet Information Server
Graphic Card	Minimum resolution 1024x768 pixels
Memory	2 Gb or more
Processor	Dual-core 2 Ghz or higher
Ports	Serial RS232 / USB to serial adapter Local Area Network (optional)

DEVICES AND SENSORS ⁽²⁾

Total Stations

Leica	TM30, TPS1200, TS11, TS15, TS30 ⁽³⁾
Geomax	Zoom80
Sokkia	SRX, FX, DX, SX
Topcon	9000, DS, IS, MS, OS, PS, QS
Trimble	5600

GNSS/GPS Receivers

Compatibles with NMEA 0183 output

Clinometers ⁽⁴⁾

Wyler	Zeromatic 2/1
Wyler	Zeromatic 2/2
ClineLabs	Cline

Acelerometers ⁽⁴⁾

PCB Piezotronics	3711B, 478A01
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Strain Gauges ⁽⁴⁾

TML	PFL-10-11, LFLA-10-11, FLA-6-350-11
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Weather Stations and Temperature Sensors

Ultimeter	2100
TML	RTD-PT100-CRZ-2005 ⁽⁴⁾

NOTES:

- ⁽¹⁾ This information is subject to change. Visit the website for more details.
- ⁽²⁾ In order to connect sensors from other brands or type such as piezometers, inclinometers, tiltmeters, pressure cells, load cells, strain gauges, extensometers, crackmeters, pendulums, optical fiber, etc., please contact us giving brand and model
- ⁽³⁾ Require GeoCOM license
- ⁽⁴⁾ Connected through National Instrument's Data Acquisition systems. Visit www.ni.com

APLITOP

Sumatra, 9 – Urb. El Atabal
E-29190 Málaga (Spain)
Phone: +34 95 2439771
Fax: +34 95 2431371
e-mail: info@aplitop.com
Web: www.aplitop.com

