

TPS1200 - Setting New Measurement Performance Standards

The TPS1100 series was well known for many years as a total station with outstanding measurement performance and technology.

The TPS1200 series builds on the proven concepts and strengths of the TPS1100, but also improves these concepts and strengths to reach an even higher level of measurement performance. This measurement performance directly translates into the productivity of a surveyor by allowing more points to be measured in the same time.

So what are factors, which contribute to the higher performance and productivity? The main contributors are high reliability, the highest accuracy and measurement speed, longest range, highest measurement confidence and minimized non-productive time.

TPS1200 provides all of the above through improvements to all measurement technologies: an **enhanced angle measuring system** and **compensator**, a **new EDM**, a **new ATR** and a **new automation concept** – this newsletter focuses on these new technologies.

Exceptional RL EDM Performance

TPS1200 offers the choice between two reflectorless EDMs with different ranges - the **PinPoint R100** and the **PinPoint R300**.

Both PinPoint EDMs provide unique advantages such as very high accuracy, a visible laser beam and small measurement spot size.

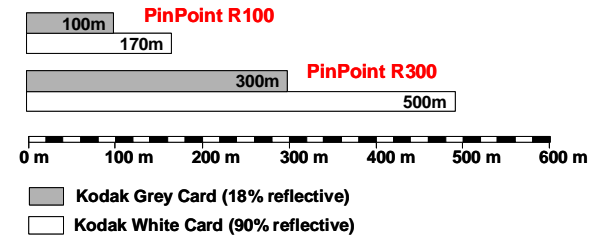
The PinPoint R100 uses the proven phase shift measurement principle, whereas a completely new measurement principle – the **System Analyzer** - was developed for the PinPoint R300 in order to achieve maximum range and performance.

Outstanding Range

The range, which can be achieved with the PinPoint R300, is outstanding: 300 m to Kodak grey and 500m to Kodak white. Obviously such

a large range is not always needed, but when surveying to difficult-to-measure surfaces, such as rocks, roads or dark objects the PinPoint R300 has a very strong performance and can measure where other instruments cannot.

Some customers are finding that in good conditions they can even measure up to 700m reflectorless!



However, long range is not all that counts - only when the accuracy of the measurements is high and the surveyor can be confident that the measured distance truly represents the real world, can the overall performance of the EDM can then be rated as 'high'.

Highest Accuracy

Both PinPoint EDMs have a very high measurement accuracy: 3 mm + 2 ppm up to 500 m range.

The table below shows that the accuracy of the Pin Point EDM is higher than competitors using pulsed laser technology.

	PinPoint	Competitor (Pulsed Laser)
0 m – 200 m	3 mm + 2 ppm	3 mm + 3 ppm
200 m – 500 m	3 mm + 2 ppm	5 mm + 3 ppm
> 500 m	5 mm + 2 ppm	5 mm + 3 ppm

This high accuracy ensures that the best measurements are achieved for all reflectorless measurements – regardless of the surface.

However, when measuring directly to smaller objects or to building corners for example then another characteristic of the EDM becomes very important: the measurement spot size.

WORKING TOGETHER

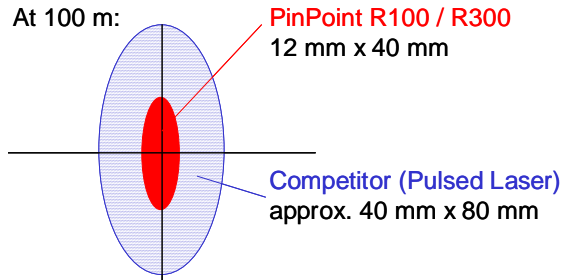
FUNCTION
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LEICA SYSTEM 1200

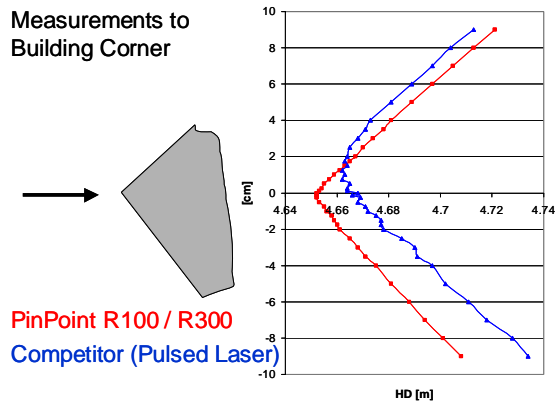


Smallest Measurement Spot Size

The measurement spot of the PinPoint EDM is significantly smaller than competitors using pulsed laser technology. This allows measuring to small objects or building corners - quickly and directly with only one measurement.



Look at the red line in the graph below, which shows measurements to a building corner.



These measurements, which were taken with TPS1200, show that all measurements are accurate and represent the real dimensions of the measured corner.

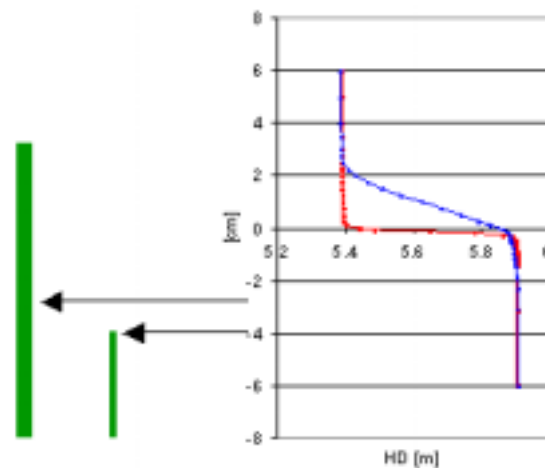
Now look at the blue line, which were taken with the competitor's EDM using pulsed laser technology. During the survey you may think that you were measuring to the corner of the building, but in fact you were not. Imagine completing a survey of a building to only find out later that the corners have not been correctly measured.

A similar graph can be plotted when measuring to internal corners – again, using a competitor's EDM, you may think you are measuring to

the corner, but the reality may be very different.

In fact, competitors even recognize that they have a problem to measure accurately to such corners. There are special routines built into competitor's instruments, which allow the true corner of the building to be measured by measuring multiple points on the walls in order to correctly calculate the corner! This obviously requires additional measurements and therefore more time...

Now look at the plot below. You want to measure to a surface but the EDM beam will pass very close to another surface, which is nearer to you.



The red line again shows the measurements made with the TPS1200 – the blue line is a competitor's EDM. Once more, the TPS1200 represents reality; the competitor is measuring something different.

Unfortunately for the user with the competitor's instrument, in this case there are no special routines to help the surveyor measure reality...

Outstanding New ATR System

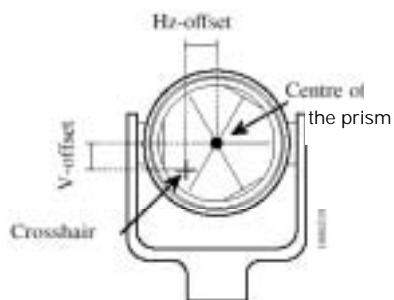
The new ATR sensor within System 1200 retains the general concept and advantages of the TPS1100 system - the coaxial laser beam and the possibility to measure onto standard prisms – but also introduces a number of addi-



tional improvements which significantly increase performance.

How Does The ATR Work?

The ATR sensor transmits a laser beam, which is reflected by a prism back to the TPS instrument and received by an internal camera. The intensity and the spot size of the reflected light are calculated in respect to the CCD-camera centre. The offsets from this centre are computed in vertical and horizontal directions. These offsets are then used to control the motors, which turn the instrument and move the crosshairs onto the prism centre.



To minimize the measurement time, the crosshairs are only positioned to within a 5mgon tolerance (2" instrument; EDM Mode IR Standard) of the center of the prism. The remaining offsets are measured and mathematically applied to the Hz and V angles – note however, you are always actually measuring to the centre of the prism, even if the telescope does not seem to be aligned to the centre of the prism.

Note the new ATR sensor achieves highest measurement accuracy as a result of a new digital camera with a very high resolution.

Highly Robust ATR System

The "robustness" against foreign light reflections of the new System1200 ATR has been significantly improved – this is particularly noticeable when working in certain environments such as close to traffic or in car parks.

This has been achieved with new algorithms, which are better able to detect the prism based on signal strength and spot shape – it is therefore very important to select the correct prism type before starting the ATR measurements.

Outstanding LOCK Performance

The ATR measurement frequency is doubled in comparison to TPS1100, which results in an improved LOCK performance for dynamic applications - see later in this newsletter how this helps improve the automation of the TPS1200.

Reducing the Field of View

The new ATR also allows reducing the active ATR Field of View to one third via GeoCOM commands. This functionality can be very beneficial in situations when multiple prisms are located in a row (e.g. tunneling or alignments) – prisms "outside" of the "wanted" field of view are then ignored.

Low Power Consumption

Additionally, the power consumption of the ATR is extremely low due to state-of-the-art electronic design and built-in image processor – this is one of the reasons why it is now possible to survey between 6-8 hours with one internal battery.

Unique Automation Concept

Robotic total stations allow surveyors to work much more efficiently – surveying becomes both easier and quicker with automated functionality.

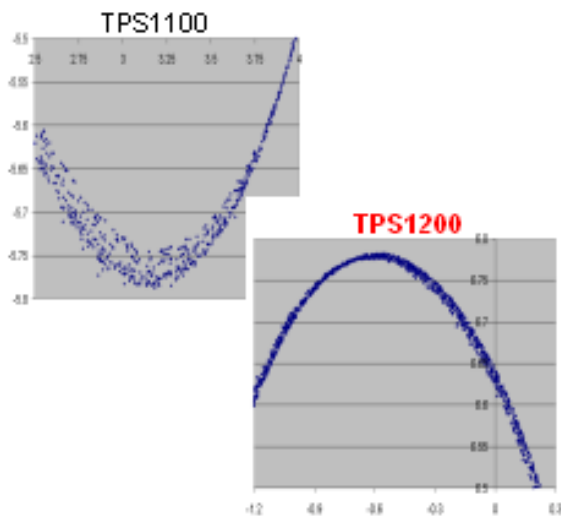
For example, the LOCK functionality (see below) enables the total station to follow a moving target automatically and still allows measurements to be made at any time. This technology is particularly advantageous when it comes to mass point surveys or (DTM) profiling and has proven its values over many years in Leica's existing products. With TPS1200 it is now further improved.

Outstanding Measurement Rate

The use of the LOCK mode allows auto points to be measured and stored at a speed of up to **8 measurements per second**. Note, the same data collection speed is of course maintained with external communication devices (when using GeoCom commands).



The TPS1200 not only allows very high measurements rates, it also delivers the **highest accuracy for dynamic measurements**.



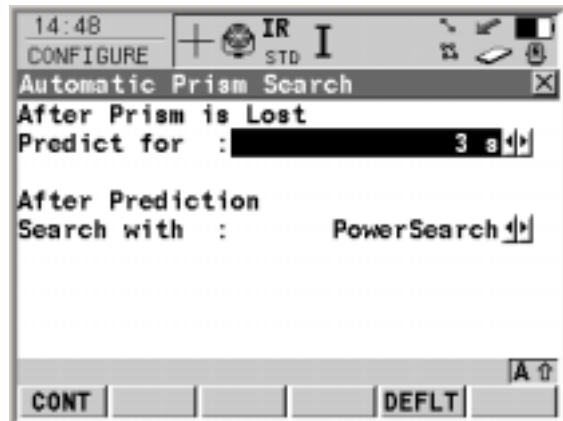
The graphic above shows a point cluster comparison between TPS1200 and TPS1100 measuring to a moving target with measurement deviations of approx. $\pm 30\text{mm}$ for TPS1100 and only $\pm 10\text{mm}$ for **TPS1200**.

Minimized Non-Productive Time

Increased productivity and reduced survey times are not only a result of faster measurements with higher accuracy – a reduction in “non-productive time” is also important.

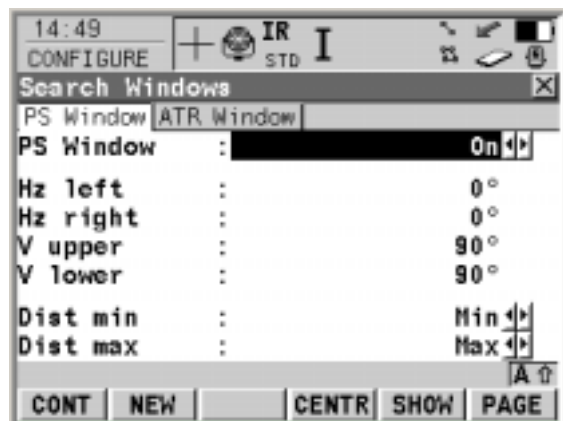
Due to the tighter integration of the unique **PowerSearch** sensor into the TPS1200, an interrupted line of sight to the prism is not a problem. Configure the system to automatically start a PowerSearch after the prism prediction period. If the normal “prism prediction” methods do not find the prism then a PowerSearch is made. You only need wait a short moment for the LOCK icon to appear again – and then get back to work.

The instrument behavior when the line of sight to the prism is interrupted can be defined in the **CONFIGURE Automatic Prism Search** panel (from the main menu choose **5 Configure...** and then **3 Automatic Prism Search**).



More advanced users can even speed up these searches by creating a search window by defining the angular and distance limits within which the PowerSearch should operate.

This can be configured in the **CONFIGURE Automatic Prism Search** panel (from the main menu choose **5 Configure...** and then **3 Automatic Prism Search**).



Rapid prism movements, line of sight interruptions or limited working areas, **TPS1200** does it all – fast and fully automated.

The TPS1200 is perfectly suited for one-man surveying work and designed to keep the reflector pole light – no batteries, no cables and no hassles. Compare the TPS1200 one-man setup to that of the competitor's who require batteries, cables and so-called active prisms on the reflector pole in order for the EDM to follow the surveyor.



System 1200 Newsletter – No.2

Use standard equipment and simply benefit and enjoy working with TPS1200.

Summary

The combination of the new **PinPoint EDM**, greatly **improved ATR** and **outstanding automated performance** within the TPS1200 all contribute to one unique system to deliver the highest performance and productivity to surveyors.

Remember, the **smaller spot size** and **measurement accuracy** of the TPS1200 PinPoint EDM allows the most difficult of corners to be accurately measured.

The much improved **ATR performance** means that the tracking of the prism is now much more robust against foreign light sources.

The unique TPS1200 one-man setup means that a minimum of equipment – no cables or batteries - is carried on the pole and any standard reflector can be used.



Please contact your local Selling Unit or local Leica dealer if there are specific topics you would like covered in these newsletters.

We welcome all suggestions for TPS1200, GPS1200, specific applications or LGO. We look forward to receive your idea.

WORKING
TOGETHER

 **FUNCTION**
integrated

LEICA SYSTEM 1200

