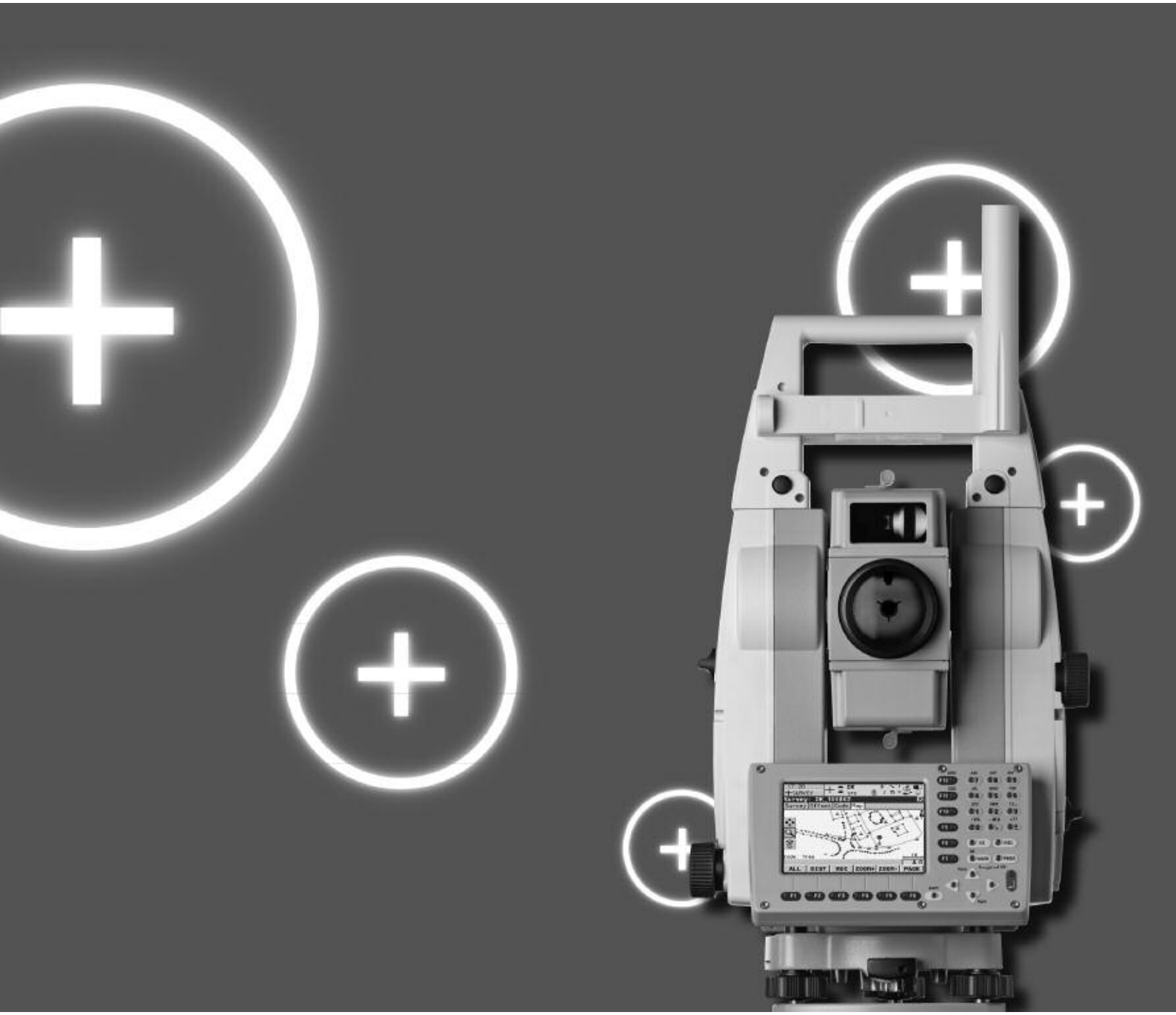
Leica TPS1200+ Series
Technical Data



- when it has to be **right**

Leica Geosystems

TPS1200+ Technical Data

Models and Options

	TC	TCR	TCRM	TCA	TCP	TCRA	TCRP
Angle measurement	●	●	●	●	●	●	●
Dist. meas. with Reflector (IR-Mode)	●	●	●	●	●	●	●
Dist. meas. without Reflector (RL-Mode)		●	●			●	●
Distance measurement – Long Range		●	●			●	●
Motorized			●	●	●	●	●
Automatic Target Recognition (ATR)				●	●	●	●
PowerSearch (PS)					●		●
Guide Light (EGL)	○	○	○	●	●	●	●
Remote Control Unit (RX1220)	○	○	○	○	○	○	○
Laser Guide GUS74				○		○	
SmartStation (ATX1230, ATX1230GG)	○	○	○	○	○	○	○

● Standard ○ Optional

Angle measurement

Description

The highly accurate and reliable angle measurement system consists of a static line-coded glass circle, which is read by a linear CCD array. A special algorithm determines the exact position of the code lines on the array and determines the precise measurement instantly. As the code on the glass circle is absolute and continuous, no initialization of the instrument is required prior to measurements.

A dual axis compensator constantly monitors both axes of the vertical axis tilt. The compensator consists of an illuminated line pattern on a prism, which is reflected twice by a liquid mirror forming the reference horizon. The reflected image of the line pattern is read by a linear CCD array and then used to mathematically determine both tilt components. These components are then used to immediately correct all angle measurements.

	Type 1201+	Type 1202+	Type 1203+	Type 1205+
Accuracy (std. dev. ISO 17123-3)				
Hz, V:	1“ (0.3 mgon)	2“ (0.6 mgon)	3“ (1 mgon)	5“ (1.5 mgon)
Display least count:	0.1“ (0.1 mgon)	0.1“ (0.1 mgon)	0.1“ (0.5 mgon)	0.1“ (0.5 mgon)
Method	absolute, continuous, diametrical			
Compensator				
Working range:	4′ (0.07 gon)			
Setting accuracy:	0.5“ (0.2 mgon)	0.5“ (0.2 mgon)	1.0” (0.3 gon)	1.5” (0.5 mgon)
Method:	centralized dual axis compensator			

Distance measurement with Reflector (IR-mode)

Description

The IR mode EDM transmits an visible laser beam to specular targets such as prisms or reflector tapes. The reflected light is detected by a sensitive photo receiver and converted into an electrical signal. After digitizing and accumulating the signal, the distance is determined by means of modern phase measurement techniques. A modulation frequency of 100 MHz is the time base for the high distance accuracy. The coaxiality and the divergence angle of the laser beam together with the automatic target recognition (ATR), allo w dynamic tracking of targets quickly and accurately in 3 dimensions.

Range

	A	B	C
Standard prism (GPR1):	1800 m (6000 ft)	3000 m (10000 ft)	3500 m (12000 ft)
3 standard prisms (GPR1):	2300 m (7500 ft)	4500 m (14700 ft)	5400 m (17700 ft)
360° prism (GRZ4, GRZ122):	800 m (2600 ft)	1500 m (5000 ft)	2000 m (7000 ft)
360° mini prism (GRZ101):	450 m (1500 ft)	800 m (2600 ft)	1000 m (3300 ft)
Mini prism (GMP101):	800 m (2600 ft)	1200 m (4000 ft)	2000 m (7000 ft)
Reflector tape (60 mm x 60mm):	150 m (500 ft)	250 m (800 ft)	250 m (800 ft)
Shortest measuring distance:	1.5 m		

Atmospheric conditions:

A: Strong haze, visibility 5 km; or strong sunlight, severe heat shimmer
B: Light haze, visibility about 20 km; or moderate sunlight, slight heat shimmer
C: Overcast, no haze, visibility about 40 km; no heat shimmer

Accuracy (standard deviation ISO 17123-4) / Measure time

Standard mode:	1 mm + 1.5 ppm / typ. 2.4 s
Fast mode:	3 mm + 1.5 ppm / typ. 0.8 s
Tracking mode:	3 mm + 1.5 ppm / typ. < 0.15 s
Averaging mode:	1 mm + 1.5 ppm
Display resolution:	0.1 mm

Method

Principle:	Phase measurement
Type:	Coaxial, visible red laser
Carrier wave:	660 nm
Measuring system:	Special phase shift analyzer ~ 100 MHz

Distance measurement without Reflector

Description

The reflectorless EDM PinPoint R400 transmits an accurately collimated visible red laser beam to the target. The distance is measured by an optimally designed System Analyzer technique that allows measuring to targets at distances more than 400 m. The coaxiality of the measurement beam and its extremely small “diffraction limited” spot size allow the highest degree of pointing and measurement accuracy.

The reflectorless EDM PinPoint R1000 measures to targets more than 1000 m away. To measure to targets at such long distances with high measurement accuracy, a new measurement technology was developed. The main component of the EDM is a system analyzer, which uses modulation frequencies in the range of 100 MHz. The system analyzer properties are defined for each individual measurement for both the EDM beam and the target qualities. As a result of the system analysis, the parameters for every individual measurement are now known. The distance is calculated using modern signal processing based on the principle of maximum-likelihood. Besides the drastically increased sensitivity which leads to a sensational increase in reflectorless measurement range, the new EDM system provides many other advantages such as a very high measurement quality and reliability even when measuring in rain, fog, dust or snow. In addition the measurement system helps to prevent errors, by detecting if there are multiple targets within the measurement beam.

	D	E	F
Range PinPoint R400			
Kodak Gray Card, 90% reflective:	200 m (660 ft)	300 m (990 ft)	› 400 m (1310 ft)
Kodak Gray Card, 18% reflective:	100 m (330 ft)	150 m (490 ft)	› 200 m (660 ft)
Range PinPoint R1000			
Kodak Gray Card, 90% reflective:	600 m (1970 ft)	800 m (2630 ft)	› 1000 m (3280 ft)
Kodak Gray Card, 18% reflective:	300 m (990 ft)	400 m (1310 ft)	› 500 m (1640 ft)
Range of measurement:	1.5 m to 1200 m		
Display unambiguous:	up to 1200 m		
Atmospheric conditions:	**D:** Object in strong sunlight, severe heat shimmer **E:** Object in shade, or sky overcast **F:** Underground, night and twilight		

Accuracy / Measure time

Standard mode (standard deviation ISO 17123-4)	
0 m - 500 m:	2 mm + 2 ppm / typ. 3-6 s, max. 12 s
› 500 m:	4 mm + 2 ppm / typ. 3-6 s, max. 12 s
Atmospheric conditions:	Object in shade, sky overcast (E)
Display resolution:	0.1 mm

Tracking mode*)

5 mm + 3 ppm	typ. 0.25 s

*) Accuracy and measure time depend on atmospheric conditions, target object and observation situation.

Laser dot size

At 30 m:	7 mm x 10 mm
At 50 m:	8 mm x 20 mm
At 200 m:	25 mm x 80 mm

Method

Type:	Coaxial, visible red laser
Carrier wave:	660 nm
Measuring system PinPoint R400/R1000:	System analyzer basis 100 MHz - 150 MHz

Distance measurement – Long Range

Description

The highly collimated red laser beam of the PinPoint R400 can also be used to measure to prism targets at distances between 1000 m and 12000 m or reflector tape at extended ranges. The visibility of the laser beam simplifies the search of far distant reflectors, because the reflected light is even visible at distances more than 5000 m. The distance is measured by the same phase measurement technique as for the infrared beam.

The accurately collimated red laser beam of the PinPoint R1000 is similar to that of the PinPoint R400, the ambiguity range is also 12000 m. The main module of the long range EDM is again a system analyzer (similar to the system analyzer used for reflectorless measurements) but with a reduced frequency set between 100 MHz and 150 MHz. The distance is calculated by an estimation method using modern signal processing incorporating the advantages such as high measurement quality and reliability when measuring in rain or snow positive and the detection of multiple targets within the measurement beam.

	A	B	C
Range			
Standard prism (GPR1):	2200 m (7300 ft)	7500 m (24600 ft)	› 10000 m (› 32800 ft)
Reflector tape (60 mm x 60mm):	600 m (2000 ft)	1000 m (3300 ft)	› 1300 m (› 4300 ft)
Range of measurement to prism:	1000 m to 12000 m		
Display unambiguous:	up to 12000 m		
Atmospheric conditions:	**A:** Strong haze, visibility 5 km; or strong sunlight, severe heat shimmer **B:** Light haze, visibility about 20 km; or moderate sunlight, slight heat shimmer **C:** Overcast, no haze, visibility about 40 km; no heat shimmer		

Accuracy (standard deviation ISO 17123-4) / Measure time

Entire measurement range:	5 mm + 2 ppm/ typ. 2.5 s, max. 12 s
Display resolution:	0.1 mm

Method

Principle:	System analyzer
Type:	Coaxial, visible red laser
Carrier wave:	660 nm

Motorized

Maximum speed

Rotating speed:	45° / s

Automatic Target Recognition (ATR)

Description

The ATR sensor transmits an invisible laser beam, which is reflected by any standard prism (no active prisms emitting special signals are required) and is received by an internal high-resolution CMOS camera. The intensity and the "spot" characteristics of the reflected light are calculated in respect to the CMOS camera center. The offset components from this reference are computed in both the vertical and horizontal planes. These offsets are then used to control the motors of the telescope axes, which react immediately to position the instrument's crosshairs onto the prism. To minimize measurement time the crosshairs are only positioned within a 5 mgon tolerance (EDM mode IR-Fine) of the actual prism center. The remaining offsets are then mathematically applied to the Hz and V angles.

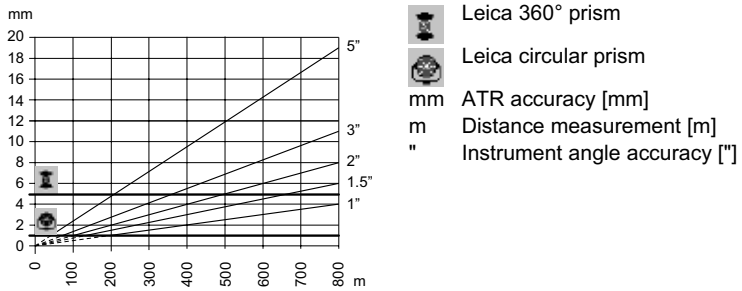
Range

	ATR mode	Lock mode
Standard prism (GPR1):	1000 m (3300 ft)	800 m (2600 ft)
360° prism (GRZ4, GRZ122):	600 m (2000 ft)	500 m (1600 ft)
360° mini prism (GRZ101):	350 m (1150 ft)	300 m (1000 ft)
Mini prism (GMP101):	500 m (1600 ft)	400 m (1300 ft)
Reflector tape (60 mm x 60mm):	55 m (175ft)	-
Shortest measuring distance:	1.5 m	5 m

Accuracy (std. dev. ISO 17123-3) / Measure time

ATR angle accuracy Hz, V:	1" (0.3 mgon)
Base Positioning accuracy:	± 1 mm
Measure time for GPR1:	3-4 s

The accuracy with which the position of a prism can be determined with Automatic Target Recognition (ATR) depends on several factors such as internal ATR accuracy, instrument angle accuracy, prism type, selected EDM measuring program and the external measuring conditions. The ATR has a basic standard deviation level of ± 1 mm. Above a certain distance, the instrument angle accuracy predominates and takes over the standard deviation of the ATR.
The following graph shows the ATR standard deviation based on two different prism types, distances and instrument accuracies.



Leica 360° prism

Leica circular prism

mm ATR accuracy [mm]
m Distance measurement [m]
" Instrument angle accuracy ["]

Maximum speed (LOCK mode)

Tangential (standard mode):	5 m / s at 20 m, 25 m / s at 100 m
Radial (tracking mode):	5 m / s

Searching

Search time in field of view:	Typ. 1.5 s
Field of view:	1° 30' (1.66 gon)
Definable search windows:	Yes

Method

Principle:	Digital image processing
Type:	infrared laser

PowerSearch (PS)

Description

This fast and reliable prism search uses a sender / receiver couple to detect prisms by means of digital signal processing algorithms. An invisible, vertical laser fan sized 40 gon in height and 0.025 gon in width is sent out while the instrument rotates around its standing axis. Once this fan comes across a prism, the reflected signal is evaluated on the fly to verify the target. If the specified signal patterns are matched, the horizontal position of the prism is determined and the rotation is stopped. Now an ATR search limited to the vertical line of the fan is launched, which precisely positions to the prism center. With this technique any standard prism (no active prisms emitting special signals are required) can be used.

Range

Standard prism (GPR1):	300 m (650 ft)
360° prism (GRZ4, GRZ122):	300 m (650 ft) (perfectly aligned to the instrument)
Mini prism (GMP101):	100 m (330 ft)
Shortest measuring distance:	1.5 m

Searching

Search time:	Typ. < 10 s
Default search area:	Hz: 400 gon V: 40 gon
Definable search windows:	Yes

Method

Principle:	Digital signal processing
Type:	infrared laser

Guide Light (EGL)

Range

Working range:	5 m - 150 m

Accuracy

Positioning accuracy:	5 cm at 100 m

General data

Telescope

Magnification:	30 x
Free objective aperture:	40 mm
Field of view:	1°30' (1.66 gon) / 2.7 m at 100 m
Focusing range:	1.7 m to infinity

Keyboard and Display

Display:	1/4 VGA (320*240 pixels), graphic LCD, colour, illumination, touch screen
Keyboard:	34 keys (12 function keys, 12 alphanumeric keys), illumination
Angle display:	360° ' ", 360° decimal, 400 gon, 6400 mil, V%
Distance display:	meter, int. ft, int. ft/inch, US ft, US ft/inch
Position:	face I standard / face II optional

Data storage

Internal memory:	256 MB (optional)
Memory card:	CompactFlash cards (64 MB and 256 MB)
Number of data records:	1750 / MB
Interface:	RS232, Bluetooth™ (optional)

Laser plummet

Centering accuracy:	1 mm at 1.5 m (deviation from plumb line)
Laser dot diameter:	2 mm at 1.5 m

Endless drives

Number of drives:	1 horizontal / 1 vertical

Circular level

Sensitivity:	6' / 2 mm

Internal Battery (GEB221)

Type:	Lithium-Ion
Voltage:	7.4 V
Capacity:	3.8 Ah
Operating time:	Typ. 5 - 8 h

Dimensions

Tilting axis height:	196 mm above tribrach
Height:	345 mm
Width:	226 mm
Length:	203 mm

Weights

Total station:	4.8 - 5.5 kg (depending on type and options)
Battery (GEB221):	0.2 kg
Tribrach (GDF121):	0.8 kg

Environmental specifications

Working temperature range:	-20°C to +50°C
Storage temperature range:	-40°C to +70°C
Dust / water (IEC 60529):	IP54
Humidity:	95%, non-condensing

Onboard Software

User Interface

Graphics:	Graphical representation of points, lines and areas Application result plots
Icons:	Icons indicating the current status of measure modes, settings, battery etc.
Quick settings menu:	Quick settings menu for toggling reflectorless EDM, ATR, LOCK, EDM Tracking etc. on and off
Function keys:	Direct function keys for quick and easy operation.
User menu:	User menu for quick access of the most important functions and settings

Configuration

Configuration sets:	Ability to store and transfer all instrument and application configuration settings for different operators, survey tasks etc.
Displays masks:	User definable measurement display
User menu:	User definable menu for quick access to specific functions
Hot keys:	User configurable hot keys for quick access to specific functions

Coding

Free Coding:	Recording codes with optional attributes in between of measurements Manual code entry or selection from a user defined codelist
Thematical Coding:	Coding points, lines and areas with optional attributes when measuring Manual code entry or selection from a user defined codelist
Quick Coding:	Recording a measurement with a point, line, area or free code by entering an alphanumerical or a numerical quick code from a user defined codelist. Line and area quick codes automatically create line and area objects.
Smart Coding:	Provides another quick and easy way of selecting a code and measuring a point. Simply use the touch screen to select the code from a user defined listing. This feature is integrated with all existing coding, linework and point measurement functionalities.
Line Work:	Recording additional point information which effects creating lines, curves, splines, areas.

Data Management

Jobs:	User definable jobs containing measurements, points, lines, areas and codes Directly transferable to LEICA Geo Office software
Points, lines, areas:	Creating, viewing, editing, and deleting points, lines and areas and codes
Functions:	Sorting and filtering of points, lines and areas Averaging of multiple points within user defined averaging limits

Data Import & Export

Data import:	Character delimited ASCII files with point id, easting, northing, height and point code GSI8 and GSI16 files with point id, easting, northing, height and point code Direct onboard upload of DXF files for interactive maps and drawings
Data export:	User defined ASCII files with measurements, points, lines, codes

Standard application programs

Setup:

Setting up and orienting the instrument using various set-up methods. For all setup methods that require a known setup point the coordinates can be measured by GNSS whenever a SmartAntenna is connected.

- Set Azimuth:
  Setting up the instrument on a known point and orienting to a backsight with known or unknown coordinates. Once the coordinates of the backsight are known all measurements are automatically updated.
- Known Backsight Point:
  Setting up the instrument on a known point and orienting to a known backsight point.
- Orientation and Height Transfer:
  Setting up the instrument on a known point and setting the orientation by measuring angles or angles and distances to known targets points.
- Resection, Resection Helmert:
  Setting up the instrument on an unknown point and set the orientation and calculate the station coordinates by measuring angles or angles and distances to up to 10 known targets points.

Survey:

Measuring points, lines and areas with codes and offsets.

- Auto Points:
  Tracking 3D movements of the target by automatically logging points at a given time interval, minimum distance difference or minimum height difference.
- Remote Points:
  Determining the 3D coordinates of inaccessible points by measuring the distance to a base point directly underneath or above the target and then measuring the angles to the inaccessible point.

Stakeout:

3D Staking of points using various stakeout methods:

- Orthogonal:
  Displaying distances forwards / backwards, left / right from or to the station and cut / fill.
- Polar:
  Displaying direction, distance and cut / fill.
- Coordinate differences:
  Displaying coordinate differences and cut /fill.
- Stakeout direct from graphical map

COGO:

Computation of coordinates of points using various coordinate geometrical methods:

- Inverse: Compute bearing and distance between 2 points, point and line, point and arc and between point and the actual position.
- Traverse: Compute coordinates of points using bearing and distance from origin point
- Intersections: Compute coordinates of points using intersections created from other points
- Line Calculations: Compute coordinates of points based on distance and offsets along lines
- Arc Calculation: various arc related calculations, like arc center, offset-points related to an arc or segmentation of arcs
- Shift, Rotate and Scale: Compute coordinates of group of points based on a shift, rotate and scale from their existing coordinates. The shift, rotate and scale values can be manually entered or computed
- Area Division: Divide areas into smaller areas using a variety of methods

Determine Coordinate System:

GNSS coordinates are measured relative to the global geocentric datum known on WGS 1984. A transformation is required to convert the WGS 1984 coordinates to local coordinates. Three different transformation methods are available:

- Onestep
- Twostep
- Classic 3D (Helmert transformation)

GNSS Survey:

Measuring points with GNSS if a SmartAntenna is connected, optional entry of codes.

Optional application programs

Reference Line:

Defining lines and arcs, which can be stored and used for other tasks, using various methods:

- Measuring to a line / arc where the coordinates of a target point are calculated from its current position relative to the defined reference line / arc.
- Staking to a line / arc where a target point is known and instructions to locate the point are given relative to the reference line / arc.
- Gridstaking to a line / arc where a grid can be staked relative to a reference line / arc.
- Defining and staking slopes along defined lines and arcs.

DTM Stakeout:

- Staking out a Digital Terrain Model.
- Comparing actual and design height and displaying height differences.

RoadRunner:

Stake-out and as-built check of roads and any type of alignment related design (e.g. pipeline, cable, earthworks)

- Handles any combination of geometric elements in the horizontal alignment, from simple straights to different types of partial spirals
- Vertical alignment supports straights, arcs and parabolas
- Covers all working tasks including stake-out/check of lines, grades/slopes (e.g. road surface, cut & fill), DTMs and many more
- Visualization of cross-sections and planar view of design
- Graphical selection of elements to stake-out/check
- Smart project management of design data
- Support of multiple road layers (construction phases)
- Enhanced station equation capabilities
- Comprehensive, user definable log files and cut sheets
- Seamless data flow from all major design packages via PC conversion tool.

RoadRunner Rail:

Version of RoadRunner to stake-out and as-built check for rail construction and maintenance

- Stake-out of rails
- As-built checks of rails
- Superelevation (cant) supported
- Clearance (gauge) control
- View design data
- Reporting

RoadRunner Tunnel:

Version of RoadRunner to stake-out and as-built check for Tunnel construction and maintenance

- Stake-out of Tunnel Faces allows setting out at the point of excarvation (e.g. for Drill and Blast or excarvation using a roadheader)
- Stake-out of Tunnel Profiles for any point of the tunnel at the given chainage (e.g. after excavation to indicate the position of tunnel design elements or services such as lightning or ventilation.
- As-built checks of Tunnels by measuring profiles perpendicular to the centre line (Scan profile)
- As-built checks by measuring any point in the Tunnel and comparing the meassured point with the theoretical design point (Check profile)
- Support of multiple Tunnel layers (construction phases)
- View and edit design data
- Reporting

Sets of Angles:

Measuring directions and distances to targets in one or two faces in various measurement routines.

- Calculating the average directions and distances of all sets.
- Calculating the standard deviations for single directions / distance and average directions / distances.

Monitoring option to repeat measurements at given time intervals.

Traverse:

Measuring a traverse with unlimited number of legs:

- Measuring sets to angles to backsight and multiple foresights.
- Measuring topographic points from any station.
- Using known points during traverse to validate quality of traverse.
- Calculating traverse closure results for field checking.

Reference Plane:

Stake-out or measure points relative to a reference plane:

- Defining a plane by either measuring or selecting points.
- Calculate the perpendicular distance and height difference from a measured point to the plane.
- Scanning of points on a defined plane.

Cross Section Survey:

Survey cross sections (such as highway profiles, river profiles, beach profiles) using code templates. The appropriate code for the next point on the profile is always correctly suggested

- Also shows distance from last cross section
- Free, point, line or area codes can be used

Area Division	Area Division as an optional add on functionality of COGO Application ■ Divide areas into smaller areas using a variety of methods ■ Full graphical support
Volume Calculation	■ Defining and Editing of surfaces and boundaries ■ Calculating of Digital Terrain Models ■ Computation of Volumes of defined surfaces in relation of a defined reference height
Hidden Point:	Easily measures points that are not directly visibly by using a hidden point rod with 2 to 3 reflectors attached. The rod can be held at any angle and the spacing between reflectors is configurable. The program calculates the measurements to the hidden points as if they were observed directly.
Monitoring:	Monitoring is designed to assist you by automatically repeating measurements to defined targets at pre-defined measurement intervals. It is ideal for small scale monitoring applications without the need of a fixed PC set-up at the reference.

Remote Control Unit (RX1250T, or RX1250Tc with colour display)

Description

The RX1250T / Tc is a WinCE controller which uses the latest in spread spectrum 2.4 GHz radio technology to permitting total remote control of the TPS1200+ total station and GNSS Smart Antenna while at the Smart Pole. The RX1250 can be ordered with a next generation colour screen for bright, high contrast visibility in all conditions. Two different ways of remote controlling a TPS1200+ can be selected: the traditional concept mirrors the user interface of the TPS1200+ on the RX1250. This easy to learn and simple to use concept ensures that no valuable measurement data is relayed over the radio link totally eliminating the risk of data loss. With the second concept, the RX1250 takes over the master role. All applications are running on the RX1250, and all data are recorded into the database of the RX1250. Further more, the RX1250 is completely interchangeable with both the TPS1200+ and the GPS1200 giving the user an efficient and economic solution to all sensor control needs. Such features result in a system, which offers total remote data flexibility. The full QWERTY keyboard of the RX1250 makes it easy and fast to enter alphanumeric point numbers, select or enter codes or even short descriptions. The encrypted protocol and frequency band hopping technology used in the data transmission greatly reduce the cases of interference from any other 2.4 GHz transmitters. In addition, a number of user selectable 'link numbers' can be configured easily in cases where more than one RX1250 is being used in the same area.

Communication

Communication:	via integrated radio modem

Control unit

Display:	1/4 VGA (320*240 pixels), graphic LCD, touch screen, illumination, grey scale or colour
Keyboard:	62 keys (12 function keys, 40 alphanumeric keys), illumination
Interface:	RS232

Internal Battery (GEB211)

Type:	Lithium-Ion
Voltage:	7.4 V
Capacity:	1.9 Ah
Operating time:	RX1250T: typ. 9h RX1250Tc: typ. 8h

Weights

RX1250T/Tc:	0.8 kg
Battery (GEB211):	0.1 kg
Reflector pole adapter:	0.25 kg

Environmental specifications

	RX1250T	RX1250Tc
Working temperature range:	-30°C to +65°C	-30°C to +50°C
Storage temperature range:	-40°C to +80°C	-40°C to +80°C
Dust / water (IEC 60529):	IP67	IP67
Waterproof (MIL-STD-810F):	temporary submersion to 1m	temporary submersion to 1m

SmartStation (ATX1230, ATX1230 GG)

Description

SmartStation is a TPS1200+ with ATX1230 or ATX1230GG 72 channel L1+L2 Smart Antenna. All GNSS and TPS operations are controlled from the TPS keyboard, all data are in the same database, all information is shown on the TPS screen. RTK GNSS fixes the position to centimeter accuracy, then the setup routine is completed using the total station. SmartAntenna can also be used independently on a pole with a GX1230 and a RX1210 controller or as a smart pole with the RX1250 Windows CE controller.

Important Note

Measurement precision and accuracy in position and accuracy in height are dependent upon various factors including number of satellites, geometry, observation time, ephemeris accuracy, ionospheric conditions, multipath etc. Figures quoted assume normal to favourable conditions. Times can also not be quoted exactly. Times required are dependent upon various factors including number of satellites, geometry, ionospheric conditions, multipath etc.The following accuracies, given as root mean square, are based on real-time measurements.

Accuracy

Position accuracy:	Horizontal: 10mm + 1ppm Vertical: 20mm + 1ppm When used within reference station networks the position accuracy is in accordance with the accuracy specifications provided by the reference station network.

Initialisation

Method:	Real time (RTK)
Reliability of initialisation:	Better than 99.99%
Time for initialisation:	Typically 8 sec, with 5 or more satellites on L1 and L2
Range:	Up to 50 km, assuming reliable data-link is available

RTK Data Formats

RTK Data Formats for data reception:	Leica proprietary format, CMR, CMR+, RTCM V2.1/2.2/2.3/3.0

ATX1230 SmartAntenna

Receiver technology:	SmartTrack - patented. Discrete elliptical filters. Fast acquisition. Strong signal. Low noise. Excellent tracking, even to low satellites and in adverse conditions. Interference resistant. Multipath mitigation.
No. of channels ATX1230:	14 L1 + 14 L2
No. of channels ATX1230GG:	72, 14 L1 +14 L2 GPS, 2 SBAS, 12 L1 + 12 L2 GLONASS
Groundplane:	Built-in groundplane
Dimensions (diameter x height):	186mm x 89mm
Weight:	1.12kg

Leica Geo Office Software

Description

Easy, fast and comprehensive, automated suite of programs for TPS, GNSS and Level data. View and manage TPS, GNSS and Level data in an integrated way. Process independently or combine data – including post processing and support of real-time GNSS measurements.
Manages all data in an integrated manner. Project management, data transfer, import/export, processing, viewing data, editing data, adjustment, coordinate systems, transformations, codelists, reporting etc.
Consistent operating concepts for handling GNSS, TPS and level data, based on Windows standards. An embedded help system includes tutorials with additional information.
Runs on Windows™ 2000 and XP platforms.

User Interface

Intuitive graphical interface with standard Windows™ operating procedures. Customizable built-in configuration options allow users to set up the software exactly to suit their specific needs and preferences.

Standard components

Data and Project Management:	Fast, powerful database manages automatically all points and measurements within projects according to well-defined rules to ensure data integrity is always maintained. Projects, coordinate systems, antennas, report templates and codelists all have their own management. Numerous transformations, ellipsoids and projections, as well as user-defined geoid models and country specific coordinate systems which are based on a grid of correction values are supported. Six different transformation types are supported, giving the flexibility to select the approach which suits the project needs best. Antenna management system for offsets and correction values. Codelist management for code groups / code / attributes.
Import & Export:	Import data from compact-flash cards, directly from receivers, total stations and digital levels, or from reference stations and other sources via the Internet. Import of real-time (RTK), DGPS coordinates.
ASCII Import & Export:	Import coordinate lists as user-defined ASCII files using the import wizard. Export results in any format to any software using the ASCII export function. Transfer point, line, area, coordinate, code and attribute data to GIS, CAD and mapping systems.
View & Edit:	The various graphical displays form the basis for visualizing data and giving an instant overview of the data contained within a project. Point, line and area information may be viewed in View/Edit together with coding and attribute information. Editing functionality is embedded allowing to query and clean up the data before processing or exporting it further.
TPS Processing:	Re-calculate TPS setups to update station coordinates and orientations Define setups and traverses and process with preferred parameters Display traverse results in HTML-based reports
Codelist Manager:	Generation of codelists with code groups, codes, and attributes. Management of codelists.
Reporting:	HTML-based reporting provides the basis for generating modern, professional reports. Measurement logs in field book format, reports on averaged coordinates, various processing log files and other information can be prepared and output. Configure reports to contain the information that are required and define templates to determine the presentation style.
Tools:	Powerful Tools like Codelist Manager, Data Exchange Manager, Format Manager and Software Upload are common tools for GNSS receivers, total stations and also for digital levels.

GNSS Options

L1 data processing:	Graphical interface for baseline selection, processing commands etc. Automatic or manual selection of baselines and definition of processing sequence. Single baseline or multi-baseline batch processing. Wide range of processing parameters. Automatic screening, cycle-slip fixing, outlier detection etc. Automated processing or user-controlled processing.

L1 / L2 data processing:	Graphical interface for baseline selection, processing commands etc. Automatic or manual selection of baselines and definition of processing sequence. Single baseline or multi-baseline batch processing. Wide range of processing parameters. Automatic screening, cycle-slip fixing, outlier detection etc. Automated processing or user-controlled processing.
GLONASS data processing:	Allows processing of GLONASS data in addition to GPS data processing.
RINEX Import:	Import of data in RINEX format.

Level Options

Level data processing:	View the data collected from the Leica digital level in the Geo Office level booking sheet. Select the preferred processing settings and process the level lines. Processing runs quickly and automatically. Use Results Manager to inspect and analyze the leveling results and generate a report. Finally, store the results and/or export them as required.
Design & Adjustment 1D:	Powerful MOVE3 Kernel with rigorous algorithms for 1D adjustment. Furthermore, network design and analysis is supported.

General Options

Datum & Map:	LEICA Geo Office supports numerous transformations, ellipsoids and projections, as well as user-defined geoid models and country specific coordinate systems, which are based on a grid of correction values. The optional Datum/Map component supports the determination of transformation parameters. Six different transformation types are supported, giving the flexibility to select the approach which suits the project needs best.
Design & Adjustment 3D:	Combine all measurements in a least-squares network adjustment to obtain the best possible set of consistent coordinates and check that the measurements fit with the known coordinates. Use adjustment to help identify blunders and outliers based upon the extensive statistical testing. Using the powerful MOVE3 Kernel, the algorithms are rigorous and the user can choose between whether a 3D, 2D or 1D adjustment is computed. Furthermore, the component supports network design – allowing to design and analyze a network before actually going into the field.
GIS / CAD Export:	Permits export to GIS/CAD systems such as AutoCAD (DXF / DWG), MicroStation
Surfaces & Volumes:	Assign measured points of surfaces and calculate Digital Terrain Models Use automatic boundary creation or define boundaries manually Introducing breaklines will automatically update the model Visualize the surface in a 2D or 3Dview Calculate volumes above the reference heights or between surfaces

System requirements

Recommended PC configuration:	Pentium® 1GHz processor or higher 512 MB RAM or more Microsoft® Windows 2000 or XP Microsoft® Internet Explorer 5.5 or higher

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