Leica PowerTracker
Technical Data

- when it has to be **right**

Leica Geosystems

PowerTracker Technical Data

Models and Options

	Machine control Instrument	2 Man Robotic Upgrade	1 Man Robotic Upgrade
Angle Measurement	●	●	●
Dist. Meas. With Reflector (IR-Mode)	●	●	●
Motorised	●	●	●
Automatic Target Recognition (ATR)	●	●	●
Guide Light (EGL)	●	●	●
PowerSearch (PS)*	●	○	●
Single point measurment storage for set-up	●	●	●
Single point measurment storage for survey	○	●	●
Machine control applicaiton SW included	●	●	●
Remote Control Unit (MCP950c) required	●	●	●
Options and Software			
GeoPad Navigator software	●	–	–
GeoPad Construction software	○	●	●
Survey License for GeoPAD	○	●	●
OneMan PS option	○	○	○
PinPoint 250 RL	○	○	○

* PowerSearch is only active in Machine Control applications without the OneMan PS option

● Standard/required
○ Optional
– Not available

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.

	PowerTrackerX	PowerTracker
Accuracy (std. dev. ISO 17123-3)		
Hz, V:	3“ (1 mgon)	5“ (1.5 mgon)
Display least count:	0.1“ (0.5 mgon)	0.1“ (0.5 mgon)
Method	absolute, continuous, diametrical	
Compensator		
Working range:	4‘ (0.07 gon)	
Setting accuracy:	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 a 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), allow dynamic tracking of targets quickly and accurately in 3 dimensions.

	A	B	C
Range			
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, GRZ121, MPR122):	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 (GRZ101):	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
Machine Control Tracking mode:	3 mm + 1.5 ppm / typ. < 0.1 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 R250 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 250 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 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. The new EDM system provides many 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 RL250			
Kodak Gray Card, 90% reflective:	200 m (660 ft)	250 m (820 ft)	250 m (820 ft)
Kodak Gray Card, 18% reflective:	100 m (330 ft)	150 m (490 ft)	200 m (660 ft)
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 20 m:	7 mm x 14 mm
At 100 m:	12 mm x 40 mm
At 200 m:	25 mm x 80 mm

Method

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

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.

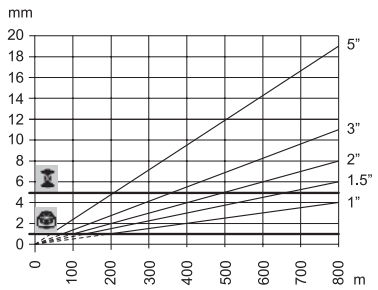
Range

	ATR mode	Lock mode
Standard prism (GPR1):	1000 m (3300 ft)	800 m (2600 ft)
360° prism (GRZ4, GRZ122, GRZ121, MPR122):	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, GRZ121, MPR122):	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

Keyboard:	1 button (On/Off functionality)
LED status indicators:	3 LED status indicators representing Tracking, Bluetooth and Power

Data storage

Memory card:	CompactFlash cards (64 MB and 256 MB)
Interface:	RS232, Bluetooth™ (optional), Radio Modem

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

Remote Control Unit (MCP950c)

Description

The MCP950c is a WinCE controller which is used to interface with the PowerTracker(X). The controller can be used at the instrument connected via Bluetooth or RS232 or remotely from a variety of radio modules. By combining the MCP950c with Smart Holder all equipment is integrated on the pole for easy to use one man surveying. The MCP950c is also fully compatible with the entire range of Redline GNSS sensors giving the user an efficient and economic solution to all sensor control needs. The full QWERTY keyboard of the MCP950c makes it easy and fast to enter alphanumeric point numbers, select or enter codes or even short descriptions.

Control unit

Display:	¼ VGA (320*240 pixels), graphic LCD, touch screen, illumination
Touch screen:	Toughened film on glass
Keyboard:	62 keys (12 function keys, 40 alphanumeric keys), illumination
Interface:	RS232, External Radio Modem or Bluetooth

Internal Battery (GEB211)

Type:	Lithium-Ion
Voltage:	7.4 V
Capacity:	1.9 Ah
Operating time:	MCP950c typ. 8h

Weights

MCP950c:	0.73kg
Smart Holder:	0.32Kg
GFU 23 Radio modem:	0.32Kg
Battery (GEB211):	0.1 kg

Environmental specifications

	MCP950c
Working temperature range:	-30°C to +50°C
Storage temperature range:	-40°C to +80°C
Dust / water (IEC 60529):	IP67
Waterproof (MIL-STD-810F):	temporary submersion to 1m

Remote Control Unit (DX10-R)

Description

The DX10-R is a robust Windows Mobile 5.0 PDA which can be used with GeoPAD Construction for construction measurement tasks in combination with the PowerTracker and PowerBox.The controller can be used at the instrument connected via Bluetooth or RS232 or remotely from a variety of radio modules. By combining the DX10 with Leica Power Holder all equipment is integrated on the pole for easy to use one man surveying.

Control unit

Display:	¼ VGA (320*240 pixels), graphic LCD, touch screen, illumination,
Touch screen:	Sealed, resistive, pressure sensitive
Keyboard:	Four-way directional button, standard key functions, LED backlit keys
Interface:	RS232, External Radio Modem or Bluetooth, USB Host and USB Client, SD and CF Card slots

Internal Battery (GEB211)

Type:	Lithium-Ion
Voltage:	3.7 V
Capacity:	3.9 Ah
Operating Time:	DX10-R typ. 14 h

Weights

DX10-R:	0.48 Kg
PowerHolder:	0.32 Kg
GFU 23 Radio modem:	0.32Kg
Battery (GEB211):	0.1Kg

Environmental specifications

Working temperature range:	-20°C to +50°C
Storage temperature range:	-30°C to +60°C
Dust / water (IEC 60529):	IP67
Waterproof (MIL-STD-810F):	Water, humidity, sand and dust, vibration, altitude, shock, high temperature, low temperature, temperature shock

Leica Geosystems can help you optimise site productivity with a complete range of construction site positioning solutions. From simple stakeout tasks to full 3D machine control Leica Geosystems can offer you unparalleled performance for your entire site.

Dozers, graders, excavators, concrete pavers and asphalt finishers are just some of the construction machines that can be fitted with scaleable, tough and reliable construction machine automation systems. With a wide range of support services to choose from, Leica Geosystems helps master your site.

When it has to be right.

TQM
ISO 9001 / ISO 14001

Total Quality Management – our commitment to total customer satisfaction.

Ask your local Leica Geosystems dealer for more information about our TQM program.

Reflectorless (RL)
Laser class 3R in accordance with IEC 60825-1 resp. EN 60825-1

Distance meter (IR), ATR and PowerSearch, Guide Light (EGL):
Laser class 1 in accordance with IEC 60825-1 resp. EN 60825-1

Laser plummet:
Laser class 2 in accordance with IEC 60825-1 resp. EN 60825-1

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