

Terrestrial Laser Scanners

This is our third Product Survey (PS) on Terrestrial Laser Scanners (TLS). The first was published in January 2001 and the second in December 2004. A lot has changed since the turn of the millennium.

First of all, the number of systems on the list has more than doubled, from nine to nineteen. Secondly, two formerly listed companies, Mensi and Cyra Technologies, have since been taken over respectively by Trimble and Leica Geosystems. Neither company was included in the 2001 survey but have been since 2004. Optech was already present with the ILRIS-3D, and Callidus, Zoller+Fröhlich and Riegl were also listed with respectively one, two and three systems in 2001. The application areas from which manufacturers diverge into production of TLS fall into three categories:

- high-precision measurement and detailed 3D reconstruction of industrial objects such as cars
- measurement of outdoor scenes featuring objects of complicated shape (construction, architecture, civil engineering)
- land survey; the Trimble VX is based on the total-station concept, modified in an advanced way.

One of the most important features of a TLS is measurement range because range determines to a large extent types of application. In the December 2004 PS a distinction was made between short-range (up to 25m), medium-range (up to 250m) and long-range (larger than 250m). Products from 3rdTech and Basis Software fall into the short-range category, as do the CP3200 from Callidus precision systems and the LS 420/440 from Faro. The Imager 5006 from Zoller+Fröhlich focuses on the medium-range. Manufacturers too recognise range as a decisive factor, some therefore encoding it in the name of the system. For example, the CPW 8000 has a range of 8000cm or 80m, the CP3200 a range of 32m, and the ranges of Faro's LS 420, 440 and 480 are 20m, 40m and 80m respectively. Maximum range does not depend only on the TLS itself but, since laser scanners operate in non-contact mode, also on object reflectivity. Some manufacturers indicate this by accompanying the range with a reflectivity percentage, also called Albedo. Only time-of-flight systems, which make use of pulsed laser, are suited for long-range applications. Phase-shift systems are particularly suited for high-precision short-range and medium-range applications, for which high point densities are required. More details on TLS technology may be found in this month's Pinpoint and Technology in Focus pages.

In contrast to the PS on high-end total stations (June 2007), no TLS products of Chinese origin are listed here, but perhaps we will have some to welcome next time.

Dr Mathias Lemmens, editor-in-chief, GIM International

Company / manufacturer	3rdTech	Basis Software
System	DeltaSphere-3000IR	Surphaser 25HSX
Date of introduction	May 2005	November 2006
Laser Ronger		
Range measurement principle[1]	Phase Shift Measurement	Phase Shift Measurement
Wavelength [nm]	780	690
Laser safety classification	3R	3R (IIIA)
Min./max. range [m]	0.5/15	1.8/39; 1.2/27;
Range resolution	0.25mm	0.1mm
Range accuracy at 50m [mm] (1 sigma)	7mm	1mm @15m
Beam ø at exit [mm]	2,5	2,7
Beam divergence/spot ø at 50 m distance [mm]	11.8mm (at 15m)	3mm @ 10m
Intensity recording (Y[#bits]/N)/export formats	Y[8]/RTPI, XYZ, XYZI, XYZRGB	Y[8]/mns/xyzi/pts/ptx
Scanning Characteristics		
Max. FoV V'H [D]	288 x 360	360 x 270
FoV with manual rotation of scan head	NA	360 x 270
Scan angle step size H/V [D]	0.067/0.067	0.01/0.01
Scan angle accuracy H/V [D] (1 sigma)	0.015/0.015	0.01/0.01
Beam deflection mechanism	Rotating mirror	Rotating mirror
Measurement rate[2] [kHz]	17kHz	190kHz
Scan duration typical/highest resolution [min]	11/13 for 288 x 360 degrees	4.5/40
Selection of area to be scanned (Y/N)	Y	Y
Selection of scan density/spacing	Y (5 to 15 points per degree)	Y
Operation Characteristics		
Dimensions/weight[3] [m,kg]	0.6x0.5x0.3/22 (in crate) + tripod, laptop	510mm L x 170mm W x 285mm H, 10kg
Temperature range/humidity range [°C/ %]	0-45/non-condensing	5-45/non-condensing
Suited for indoor/outdoor/laboratory [Y/N]	Y/Y/Y	Y/Y/Y
Scan time per battery	7 hours	3 hours
Peripherals		
Camera(s) (Y[#,type,sensor size]/N)	Y[1,Fujifilm S5Pro, 12mpixel]	N
Export formats of camera image	Raw, TIFF, JPEG	
User interface (e.g. PC)	PC	PC, Notebook, Ultralight PC
User interface specifications (RAM/OS, etc.)	256mb/WindowsXP	Win XP, Windows Vista, .5GB
Additional sensors	NA	☐
Software Functionality		
Software name	SceneVision-3D	3rd Party Software
Registration/orientation methods	Uses common points for registration	☐
Automatic detection of tie points [Y/N]	N	☐
Integration of data from different scans [Y/N]	Y	☐
Real time visualization during scanning [Y/N]	Y	☐
Fly around, pan and zoom [Y/N]	Y	☐
Geo-referencing [Y/N]	N	☐
Point (group) selection [Y/N]	Y	☐
Fitting of primitives [Y(specify[4])/N]	Y(planes)	☐
Largest model[5] (# of points/# of objects)	100m/NA	☐
Export formats of processed data	RTPI, XYZRGB, VRML	☐
Import formats	RTPI, ASCII XYZI, XYZRGB, VRML, 3DD	☐

[1] Pulsed or phase measurement or triangulation
 [2] Points per second in KHz
 [3] Packed sensor, incl. Power supply, mount (tripod), etc.
 [4] e.g. lines, planes, cylinders, spheres
 [5] supported for practical, real-time visualisation

N/A = Not Applicable
 ☐ = No information received



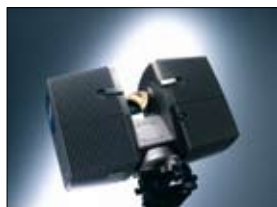
Company / manufacturer	Basis Software	Callidus precision systems	Callidus precision systems	Faro Europe
System	Surphaser 25HS	CPW 8000	CP 3200	LS 420
Date of introduction	May 2005	2007	1997-2006	2005
Laser Ranger				
Range measurement principle[1]	Phase Shift Measurement	Pulsed Wave (combination of pulsed and phase measurement)	Pulsed	Phase Shift Measurement
Wavelength [nm]	690	658	906	785nm
Laser safety classification	3R (IIIA)	3R	I	3R
Min./max. range [m]	1.8/39;1.2/21;	0 - 80	0 - 32	0,6m - 20m
Range resolution	0.1mm	□	□	0.6 mm - 17 Bit
Range accuracy at 50m [mm] (1 sigma)	0.5mm @10m	□	□	3mm @ 20m
Beam ø at exit [mm]	2,7	3	□	3mm, circular
Beam divergence/spot ø at 50 m distance [mm]	3mm @ 10m	0.2 mrad	□	Beam divergence 0,25 mrad
Intensity recording (Y[#bits]/N)/ export formats	Y[8]/mns/xyzi/pts/ptx	Y	□	9 Bit
Scanning Characteristics				
Max. FoV V/H [D]	360 x 270	150° x 360°	140° x 360°	320° x 360°
FoV with manual rotation of scan head	360 x 270	N/A	N/A	N/A
Scan angle step size H/V [D]	0.01/0.01	0.002° (H and V)	0.0625° (H) x 0.25° (V)	0,00067° / 0,009°
Scan angle accuracy H/V [D] (1 sigma)	0.005/0.005	0.002° (H and V)	0.005° (H) x 0.009°	±0.009° / ±0.009°
Beam deflection mechanism	Rotating mirror	Rotating mirror	Rotating mirror	Rotating mirror
Measurement rate[2] [kHz]	190kHz	50kHz	1,75kHz	120kHz
Scan duration typical/highest resolution [min]	7/50	130 seconds (typical res.) / 54 min (highest res.)	□	67s / 111min
Selection of area to be scanned (Y/N)	Y	Y	Y	Y
Selection of scan density/spacing	Y	Y	Y	Y
Operation Characteristics				
Dimensions/weight[3] [m,kg]	510mm L x 170mm W x 285mm H, 11kg	(0.5x0.3x0.2)m, 12kg (measuring head only)	Diameter 0.4m, height 0.5m, 17kg (measuring head only)	1)
Temperature range/humidity range [0C/ %]	5-45/Non condensing	-10 - 50°C / 20-85%	-10 - 40°C / 20-80%	5° - 40° C, non condensing
Suited for indoor/outdoor/laboratory [Y/N]	Y/Y/Y	Y/Y/Y	Y/Y/Y	Y/Y/Y
Scan time per battery	3 hours	8 hours	8 hours (car battery)	up to 8 hours
Peripherals				
Camera(s) (Y[#.type.sensor size]/N)	N	Y	Y	2)
Export formats of camera image		.bmp, .jpg	.bmp, .jpg	.jpg
User interface (e.g. PC)	PC, Notebook, Ultralight PC	PC	PC	3)
User interface specifications (RAM/OS, etc.)	Win XP, Windows Vista, .5GB	Windows	Windows	Windows 2000 or higher, 2GB RAM recommended
Additional sensors	□	□	□	Modular design allows to change sensors
Software Functionality				
Software name	3rd Party Software	3D - Extractor	3D - Extractor	Faro Scene
Registration/orientation methods	□	Best fit, global, with objects	Best fit, global, with objects	4)
Automatic detection of tie points [Y/N]	□	Y	Y	Assisted target detection tools.
Integration of data from different scans [Y/N]	□	Y	Y	Y
Real time visualization during scanning [Y/N]	□	Y	Y	Y
Fly around, pan and zoom [Y/N]	□	Y	Y	Y
Geo-referencing [Y/N]	□	Y	Y	Y
Point (group) selection [Y/N]	□	Y	Y	Y
Fitting of primitives [Y(specify[4])/N]	□	Y (lines, planes, cylinders, spheres)	Y (lines, planes, cylinders, spheres)	Y (points, lines, spheres, cylinders, planes)
Largest model[5] (# of points/# of objects)	□	Not limited	Not limited	Only limited by the PC hardware
Export formats of processed data	□	sat, dxf, ascii, stl, vrml , dgn, Nemetschek, pts, ptc	sat, dxf, ascii, stl, vrml , dgn, Nemetschek, pts, ptc	Faro Scan, Faro Cloud, .dxf, VRML, .igs, .pts, .ptx, .ptc
Import formats	□	sat, dxf, ascii, stl, vrml , dgn, Nemetschek, pts, ptc	sat, dxf, ascii, stl, vrml , dgn, Nemetschek, pts, ptc	Faro Scan, Faro Workspace, .ptx, .txt, .xyz, .cor, .csv, VRML, .bmp, .jpg, .png

[1] Pulsed or phase measurement or triangulation
 [2] Points per second in KHz
 [3] Packed sensor, incl. Power supply, mount (tripod), etc.
 [4] e.g. lines, planes, cylinders, spheres
 [5] supported for practical, real-time visualisation

N/A = Not Applicable
 □ = No information received



Faro Europe	Faro Europe	I-Site	I-Site	Leica Geosystems
LS 840	LS 880	4400-LR	4400-CR	ScanStation 2
2005	2005	2006	2006	July 2007
Phase Shift Measurement	Phase Shift Measurement	Pulsed Time of Flight	Pulsed Time of Flight	Pulsed laser; Time of Flight
785nm	785nm	905nm	905nm	532nm
3R	3R	IEC-60825-1 class 3R	IEC-60825-1 class 3R	3R
0,6m - 40m	0,6m - 76m	5m/700m	2m/500m	5)
0.6mm - 17 Bit	0.6mm - 17 Bit	1mm	1mm	6)
3mm @ 25m	3mm @ 25m	20mm[6]	20mm[6]	4mm at 50m, single measurement, not averaged
3mm, circular	3mm, circular	15mm	15mm	6mm
Beam divergence 0,25 mrad	Beam divergence 0,25 mrad	1.4mrad/70mm	1.4mrad/70mm	0.01°/6mm
9 Bit	9 Bit	Y[10]/3DP	Y[10]/3DP	Y[12]/float
320° x 360°	320° x 360°	80° vertical, 360° horizontal	80° vertical, 360° horizontal	270°; 360°
N/A	N/A	N/A	N/A	360°
0,00067° / 0,009°	0,00067° / 0,009°	0.108° vertical, 0.108° horizontal	0.108° vertical, 0.108° horizontal	0.0002°
±0.009° / ±0.009°	±0.009° / ±0.009°	0.02° +/- 0.04°	0.02° +/- 0.04°	0.0034°
Rotating mirror	Rotating mirror	Scanning mirror	Scanning mirror	Mirror
120kHz	120kHz	4.4kHz	4.4kHz	50
67s / 111min	67s / 111min	10mins/360°	10mins/360°	depends on scan; typical 15min
Y	Y	Y	Y	Y
Y	Y	190mm at 100m	190mm at 100m	Y
1)	1)	43cm x 27cm x 36cm/12kg	43cm x 27cm x 36cm/12kg	7)
5° - 40° C, non condensing	5° - 40° C, non condensing	-10 to 50 / Non-condensing	-10 to 50 / Non-condensing	8)
Y/Y/Y	Y/Y/Y	Y	Y	Y/Y/Y
up to 8 hours	up to 8 hours	3 hours	3 hours	> 3 hours
Y, Nikon D70s, 6MPixel or Nikon D200, 10,2MPixel	Y, Nikon D70s, 6MPixel or Nikon D200, 10,2MPixel	Integral 37 megapixel camera	Integral 37 megapixel camera	Y, internal camera can also be used with any external camera
.jpg	.jpg	.jpg	.jpg	.jpg/ tiff/ bmp
3)	3)	Tablet PC with touch screen	Tablet PC with touch screen	Tablet PC; Notebook
Windows 2000 or higher; 2GB RAM recommended	Windows 2000 or higher; 2GB RAM recommended	Window XP, XP64/1G RAM	Window XP, XP64/1G RAM	512 MB RAM, 1.4 GHz processor; Windows XP; Windows 2000
Modular design allows to change sensors	Modular design allows to change sensors	Inclinometer, Alignment Telescope, Red laser pointer, Battery sensor	Inclinometer, Alignment Telescope, Red laser pointer, Battery sensor	Dual-axis compensator Internal camera
Faro Scene	Faro Scene	I-Site Studio	I-Site Forensic	Leica Cyclone
4)	4)	Survey based/fully automatic	Survey based/fully automatic	Any
Assisted target detection tools.	Assisted target detection tools.	Y	Y	N
Y	Y	Y	Y	Y
Y	Y	N	N	Y
Y	Y	Y	Y	Y
Y	Y	Y	Y	Y
Y (points, lines, spheres, cylinders, planes)	Y (points, lines, spheres, cylinders, planes)	Y(Lines, planes)	Y(Lines, planes)	Y;Y;Y
Only limited by the PC hardware	Only limited by the PC hardware	200 million	20 million	9)
Faro Scan, Faro Cloud, .dxf, VRML, .igs, .pts, .ptx, .ptc	Faro Scan, Faro Cloud, .dxf, VRML, .igs, .pts, .ptx, .ptc	DXF, DWG, VRML, DXB, OBJ, 00T, DGD, TXT, IREG, ARCH_D	DXF, DWG, VRML	10)
Faro Scan, Faro Workspace, .ptx, .txt, .xyz, .cor, .csv, VRML, .bmp, .jpg, .png	Faro Scan, Faro Workspace, .ptx, .txt, .xyz, .cor, .csv, VRML, .bmp, .jpg, .png	DXF, DWG, ASCII, TXT, 00T, 3DP, 3DI, 3DD	DXF, DWG, ASCII, TXT, 00T, 3DP, 3DI, 3DD	11)



Company / manufacturer	Leica Geosystems	Optech	Optech	Riegl Laser Measurement Systems
System	HDS6000	ILRIS-3DER	ILRIS-3D	LMS-Z420i / LMS-Z390i
Date of introduction	December 2006	June 2006	June 2000	2003 / 2007
Laser Ranger				
Range measurement principle[1]	Phase Shift Measurement	Pulsed Time of Flight	Pulsed Time of Flight	Time of Flight
Wavelength [nm]	650, 690nm	1535	1535	Near infrared
Laser safety classification	3R	1M	1	Laser Class I
Min./max. range [m]	79m @90%; 50m @18% albedo	3-1700 @ 80%	3-1200 @ 80%	2 to 1000m / 1 to 400m
Range resolution	12)	Less than 1mm	Less than 1mm	1mm
Range accuracy at 50m [mm] (1 sigma)	13)	7mm	7mm	10mm / 6mm
Beam ø at exit [mm]	3mm at exit;	14mm	14mm	10mm
Beam divergence/spot ø at 50 m distance [mm]	0.22mrad divergence, 14mm @50m	170 uRad/ 8mm @ 50m	170 uRad/ 8mm @ 50m	0,3mrad (16mm)
Intensity recording (Y[#bits]/N)/ export formats	Y[12]/float	Y(8/ 16/ 24 bit RGB)	Y (8/ 16/ 24 bit RGB)	Y[12]/ 3dd, 3pf, vtp, ASCII
Scanning Characteristics				
Max. FoV V/H [D]	310°, 360°	40 x 360	40 x 360	80x360° (VxH)
FoV with manual rotation of scan head	360°	360 x 360	360 x 360	Up to 360°x360° (VxH)
Scan angle step size H/V [D]	0.009°	.00115 (20uRad)	.00115 (20uRad)	0,004° to 0,2° / 0,002° to 0,2°
Scan angle accuracy H/V [D] (1 sigma)	0.0071 degree (25 seconds)	0,0046	0,0046	0,0025° / 0.001°
Beam deflection mechanism	Patented mirror system	Mirror	Mirror	Rotating Polygon, Rotating Head
Measurement rate[2] [kHz]	500	Up to 3.5kHz	Up to 3.5kHz	PRR 24kHz, eff. Meas.rate 11kHz
Scan duration typical/highest resolution [min]	Depends on scan; typical 3 - 7 minutes	Selectable	Selectable	Typ. 1min @ 80°x 80°
Selection of area to be scanned (Y/N)	Y	Y	Y	Y
Selection of scan density/spacing	Y	Y	Y	0,004° / 0,002°
Operation Characteristics				
Dimensions/weight[3] [m,kg]	190mm D x 244mm W x 351.5mm; 14 kg, nominal (includes integrated battery)	320 x 320 x 220 mm/ 13 kg	320 x 320 x 220mm / 13kg	463mmx210mm (LxD), 15kg
Temperature range/humidity range [0C/ %]	Operating temp: 0° C to +40° C; Storage temp: -20° C to +50° C; Humidity: Non - condensing	0-40° C	0-40° C	0° C to +40° C (op.), -10° C to +50° C (stor.)
Suited for indoor/outdoor/laboratory [Y/N]	Y/Y/Y	Y/Y/Y	Y/Y/Y	Y,Y,Y
Scan time per battery	build-in battery >90min external battery > 4 hours	5 hours	5 hours	9 hours @ 60Ah PbGel
Peripherals				
Camera(s) (Y[#.type,sensor size]/N)	N, any external digital camera can be used for photo-overlay using Leica Cyclone software	Y [Internal CMOS]	Y [Internal CMOS]	Y [Nikon D200, 3872x2592 pixels]
Export formats of camera image	.jpg/ tif/ bmp	.jpg	.jpg	.jpg, tif, raw
User interface (e.g. PC)	On-board controls, Tablet PC; Notebook, PDA	PDA, UMPC, PC	PDA, UMPC, PC	TCP/IP; also Serial & ECP
User interface specifications (RAM/OS, etc.)	512 MB RAM, 1.4 GHz processor, Windows XP; Windows 2000	☐	☐	1 GB / Win2000, Win XP, OpenGL graphics card
Additional sensors	Dual-axis sensor	GPS, IMU, High Res Camera	GPS, IMU, High Res Camera	Inclination Sensors integrated, SyncTimer integrated
Software Functionality				
Software name	Leica Cyclone	Open source to 3rd party	Open source to 3rd party	RiSCAN PRO
Registration/orientation methods	Any	Post Process	Post Process	14)
Automatic detection of tie points [Y/N]	N	Y	Y	Y
Integration of data from different scans [Y/N]	Y	Y	Y	Y
Real time visualization during scanning [Y/N]	Y	Y	Y	Y
Fly around, pan and zoom [Y/N]	Y	Y	Y	Y
Geo-referencing [Y/N]	Y	Y	Y	Y
Point (group) selection [Y/N]	Y	Y	Y	Y
Fitting of primitives [Y(specify[4])/N]	Y;Y;Y;Y	Y	Y	Y (lines, planes)
Largest model[5] (# of points/# of objects)	Unlimited points, dynamically managed with approx 40 million max points displayed at a time	Unlimited	Unlimited	Approx. 25 million points
Export formats of processed data	10)	Open source to 3rd party	Open source to 3rd party	15)
Import formats	11)	Unlimited	Unlimited	16)

[1] Pulsed or phase measurement or triangulation
 [2] Points per second in KHz
 [3] Packed sensor, incl. Power supply, mount (tripod), etc.
 [4] e.g. lines, planes, cylinders, spheres
 [5] supported for practical, real-time visualisation

N/A = Not Applicable
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Riegl Laser Measurement Systems	Trimble	Trimble	Zoller+Fröhlich GmbH
LPM-321	GX	VX	Imager 5006
September 2007	2005	2007	September 2006
Time of Flight	Pulsed	Pulsed	Phase Shift Measurement
Near infrared	532	870	
Laser Class 1M	3R	2	3R (ISO EN 60825-1)
10m to 4000m	200 (to 35% reflective surface)	150+ scanning, 300+ single point (to 18% reflective surface)	1.0- 79.0m
5mm	1.6mm @ 50m	10mm minimum point spacing	0.1mm
25mm	4mm	3mm	18)
60mm	Consult Trimble	Consult Trimble	3mm
0,8mrad (40mm)	3	20 x 40	0.22 mrad/ 14 mm
Y[I6] / 3dd, 3pf, vtp, ASCII	Y[8] / PPF, SOI, ascii	Y / JobXML, ascii	16 bit / ASCII/ PTS/ PTX
150°x360° (VxH)	60° / 360°	270° / 360°	310° x 360°
150°x360° (VxH)	360°	360°	
0,018°	0.0018° / 0.0009°	10mm minimum point spacing	0.0018° / 0.0018°
0,009°	Hz = 12"; Vt = 14"	1"	0.007° / 0.007°
Pan & Tilt Mount	Oscillating mirror	Rotating telescope	Rotating mirror (v)/ device (H)
PRR 24kHz, eff. Meas.rate up to 1000Hz	5	Up to 0.015	Max. 500KHz
Typ. 5min @ 10°x10°	Consult Trimble	Consult Trimble	10,000/ 40,000
Y	Y	Y	Y
0,018°	Y	Y	Y
(LxWxH) 315x370x450mm, 16kg	34x27x42cm, 13.6kg	20x18x45cm, 6.3kg	0.268m/ 0.190m/ 0.372m / 14kg
0°C to 45°C (op.), -20°C to +70°C (stor.)	0°C to 40°C, non-condensing	-20°C to +50°C, non-condensing	0°C-40°C
N ,Y,Y	Y/Y/Y	Y/Y/Y	Y / Y / Y
9 hours @ 60Ah PbGel	8 hours	5 hours	1.5 hours (internal battery); 4 hours (external battery)
Y [Canon EOS 350D, 3456x2304 pixels]	Y (1), real-time video, 768x576	Y (1), real-time video, 2048x1536	Y [Nikon D40, 6.1 Mega Pixel]
jpg, tif, raw	.jpg	.jpg	.jpg
TCP/IP; RS422	PC	TSC2 or Trimble CU controllers	Stand alone concept
1GB / Win2000, Win XP, OpenGL graphics card	Consult Trimble	Consult Trimble	internal PC-HDD/ Linux
□	N/A	Integrated pressure sensor	Tilt sensor
RiPROFILE	PointScape, RealWorks Survey	17)	Z+F LaserControl/ LFM
14)	Survey traverse; Bundle adjustment; Least squares	Multiple (including Surveytraverse) Consult Trimble	Bundleadjustment (Targets, Spheres)/ ICP
Y	Y	N/A	Y
Y	Y	Y	Y
Y	Y	Y	Y
Y	Y	Y	Y
Y	Y	Y	Y
Y (lines, planes)	Y.All+	Y	19)
Approx. 25 million points	> hundred million points, > 10,000 objects	Varies depending on controller. Consult Trimble	Database of approx. 2,500 Scans/ a scan: 50. Mio. points
15)	Multiple, Consult Trimble	Multiple, Consult Trimble	Sat, ASCII, PTX, Microstation, AutoCAD, PDS, PDMS
16)	Multiple, Consult Trimble	Multiple, Consult Trimble	ZFS, ZFC, jpg, vrml, PTZ, PTX, ASC, SAT, ASCII, obj, LFD

Notes

- 1) Scanner 400mm x 160mm x 280mm (LxVxH), 14.5kg
Dimensions with equipment depend on the used equipment and cannot be given in a general way
- 2) Y, Nikon D70s, 6MPixel or Nikon D200, 10,2MPixel
- 3) PC, Notebook, PDA, any other device with WiFi interface and a web browser
- 4) Registration to imported survey coordinates or to reference scan positions / best fit
- 5) Min range: < 1m
Max: 300m/90%, 134m/18%
- 6) freely selectable, < 1mm at any range
- 7) Dimension Scanner: 370mmx265mmx510mm
Weight Scanner: 18.5 kg
Operating temp.: 40° to 0°C;
Storage temp: -25°C to 65°C;
Humidity: Non-condensing
- 9) Unlimited points, dynamically managed with approx 40 million max points displayed at a time
DXF, COE (DWG, DGN), ASCII (XYZ, SVY, PTS, PTX, TXT, Customized format), PTZ, BMP, TIFF, JPEG, LandXML, SDNF, PCF, Leica System 1200, Rectified Ortho Photo (GeoTiff), TruView panoramic scenes.
- 11) ASCII (XYZ, SVY PTS, PTX, TXT, customised format)
Zoller+Fröhlich ZFS, ZFC, Riegl .3DD, COE (Cyclone Object Exchange), AutoCAD, MicroStation via Cyclone COE
Data-transfer plug-in (free), BMP, JPEG, CGP, Leica System 1200
- 12) Preview" 50.6x50.6mm @10m; 250x250mm @50m; Middle (4x) 12.6x12.6mm @10m; 62x62mm @50m; High (8x) 6.3x6.3mm @10m; 31.4x31.4mm @50m; Super High (16x) 3.1x3.1mm @10m; 15.8x15.8mm @50; Ultra High (32x) 1.6x1.6mm @10m; 7.9x7.9mm @50m
- 13) 4mm at 90% albedo up to 25m; 5mm at 18% up to 25m; 5mm at 90% up to 50m; 6mm at 18% up to 50m
- 14) Global registration by means of control/ tie points, backsighting with GPS, overlapping surfaces / Multi Station Adjustment Module
- 15) 3DD, DXF, ASCII, SOP, 3PF, ASC, PTC, OBJ, STL, PLY, POL, VRML
- 16) 3DD, VTP, DXF, OCT, ASCII, SOP, JPG, BMP, TIFF, SDW, LAS, OBJ, STL, PLY, POL
- 17) Trimble Survey Controller, Survey Pro, Trimble Survey Manager, RealWorks Survey
- 18) Linearity error up to 50 ≤ 1 mm; Noise: black: 7.5 mm rms; grey: 4.0 mm rms; white: 2.5 mm rms
- 19) Y (LFM-Modeller) – 3D Solids, Meshes, Orthophotos
Plane, Pipe, bend dish end, flange cone, sphere standard objects

