High-end Total-Stations

As in last year's printed edition of the Product Survey, the equipment published here is the absolute top-of-the-class among these instruments. Let's call it the Champions' League, which means that besides meeting the criteria for accuracy they also have to be motorised. The complete Product Survey is to be found on our website www.GIM-International.com, along with an easy-to-use tool for comparing instruments of your choice.

I have not noticed any spectacular technical improvements in these instruments over last year's offering; perhaps R&D budgets are coming under pressure from the world financial crisis? In contrast to the paucity of technical improvements, however, instrument design is getting more and more eye-catching: bright colours, sometimes even two-tone splendour. If you compare this to the moss-green colour of the former Wild and Kern instruments, it is a true revolution!

The use of touch-screens is still very limited. While applications like cellular phones cameras and navigation systems have embraced the touch-screen to a more or less standard degree, surveyors seem to dislike them. Could this be down to wintry weather conditions and the use of gloves? Speaking of wintry weather, Geomax has let us in on its special 'Polar edition', which can operate in temperatures down to -30°C. The news feature that appeared in our June 2010 issue covered working in extreme weather conditions, temperatures far exceeding -30°C; this instrument will need an extra blanket when operating there.

I would like to invite you to send me your comments on specific instruments. Positive or negative, all feedback could be useful to a colleague faced with a decision about buying instruments.

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Categories

1. TSs designed for 'classic triangulation & trilateration' over distances exceeding 250m. The prime requirement is a relative high angular accuracy (better than about 1mgon, or 3").
2. TSs designed for detailed surveying and staking out. Accuracy between 1 (3") and 3 (10") mgon. Distance accuracy is supposed to be better than 1 cm at 250m. Reflectorless and traditional total-stations.
3. TS-s as in category 1 or 2, but in a one-man's version, i.e. (robotic) TS-s that enable 'automatic target detection & tracking'.
4. TSs comparable to those in category 1, 2 or 3, but including a reflectorless measurement option.

N/A = Not Applicable
□ = No information received

Brand	Leica Geosystems
Product name	TCRP1200+ R1000
Category	1, 2, 3, 4
Date of Introduction	Oct '07
Angle Measurement	
Accuracy [sec (mgon)] (H and V)	1"[0.3], 2"[0.6], 3"[1], 5"[1.5]
Division/least increment [sec (mgon)]	0.1" [0.1]
Distance Measurement	
Accuracy [mm+pmm] in standard mode on prism and reflectorless	1+1.5 (to prism) 2+2 (to any surface)
Least increment [mm]	0.1mm
Maximum range with 1 reflector (mini prism) [m]	2,000m
Maximum range with 1 reflector (standard prism) [m]	3,500m (STD) 10,000m (Long Range - 1 prism)
Maximum distance with combined reflectors (number of prisms) [m]	5,400m (STD - 3 prisms) 12,000m (Long Range - 3 prisms)
Maximum non-prism range [m] on kodac gray	>500m
Maximum non-prism range [m] on kodac white	>1,000m
Reflectorless: size of spot at 100m and at max range	16mm x 40 mm
Automatic Tracking and Locking	
Range [m]	1,000/800m
Maximum speed of angle [m/s]	25m/s at 100m
Automatic aiming accuracy in autolock mode [mm]	base positioning accuracy 1mm
Target recognition system Y/N	Y
Data Storage/Transport	
Memory system: nr of points [Mb], Internal / External	1,750 Pts per MB, max. 1GB, 256MB int./max. 1GB CF-Card
Exchangeable (Card, CD-Rom or Memory board) Y/N	Exchangeable CF Card (256 MB, 1 GB)
Number and type(s) of I/O ports	RS232/Bluetooth wireless/Radio
Display/Keyboard	
Number of faces	1 / 2 optional
Graphic display: nr of pixels (w*h), Colour (Y/N)	320 x 240, colour
Screen size (w*h mm.), touch screen (Y/N),	1/4 VGA, touch screen
Number of rows/characters per row	9 rows, 32 char/row
Total Numbers of keys (alpha/numeric) [max 20 words]	34 keys, (12 function keys, 12 alphanumeric, Cursor, Enter, PROG, USER, Shift, ESC, CE), illuminated
Dimensions	
Size (h x w x d) [mm]	345 x 226 x 203
Weight (incl. battery, telemetry & tracker, case) [kg]	6.5kg
Power Supply	
Battery: standard or branche	Li-Ion, branche
Capacity [Volt/Ah]	7.4V/4.4Ah
Operation time on one battery by one measurement per sec [h]	5-8h
Miscellaneous	
Onboard Bluetooth preparation Y/N	Y (option)
Laser Plummet available Y/N (on instrument or tribrach)	Y (on instrument)
Guiding light available Y/N (on instrument or rod)	Y (on instrument)
Automatic scanning of objects Y/N, solution mgon/mm	Y (0.1mgon/1-2mm)
Imaging possibilities Y/N	N
Notes/remarks (max 25 words)	Full robotic total station with powerful reflectorless PinPoint EDM allows 'One-Person' operation. Use the Leica GNSS "SmartAntenna" for a full robotic GPS-TPS combined into a system called Leica SmartPole! Use GNSS-SmartAntenna on top of instrument (instead of handle) to use it as a Leica SmartStation for immediate station coordinates. All System 1200+ support new Leica Viva controllers CS10 and CS15

Leica Geosystems	SOKKIA	SOKKIA	SOKKIA	Spectra Precision
TS30/TM30	SRX: SRX1/SRX2/SRX/SRX5	NET05 / NET1	NET05X	Focus 30
1, 2, 3, 4	1, 2, 3, 4	1, 3, 4	1, 4	1, 2, 3, 4
Apr '09	Oct 2006	NET05: February 2008 NET1: August 2007	July 2009	September, 2009
0.5" [0.15], 1" [0.3]	1, 2, 3, 5 (0.3, 0.6, 1, 1.5)	NET05: 0.5 (0.15), NET1: 1 (0.3)	0.5 (0.15)	2" (0.5)/ 3" (1)/ 5" (1.5)
0.01" [0.01]	SRX1/2: 0.5 (0.1), SRX3/5: 1 (0.2)	0.1 (0.02)	0.1 (0.02)	1" (0.2)
0.6+ 1(to prism) 2+ 2 (to any surface)	Prism: 2+2, Sheet: 3+2, Reflectorless: 3+2	(NET05/NET1) Prism: 0.8+1 / 1+1, Sheet: 0.5+1 / 1+1, Reflectorless: 1+1 / 3+1	Prism: 0.8+1, Sheet: 0.5+1, Reflectorless: 1+1	Prism: 2mm+2ppm , RL: 3mm+2ppm
0.1mm	SRX1/2: 0.1, SRX3/5: 1	NET05: 0.01, NET1: 0.1	0,01	0.1mm
2,000m	2,500	NET05: 800, NET1: 1,000	800	---
3,500m (STD) 10,000m (Long Range - 1 prism)	6,000	3,500	3,500	4,000m
5,400m (STD - 3 prisms) 12,000m (Long Range - 3 prisms)	10,000	N/A	N/A	7,000m
> 500m	250	N/A	N/A	400m
>1,000m	500	NET05: 100, NET1: 200	100	800m
16mm x 40mm	29x24mm@100m, 123x89mm@500m	N/A	11x9mm@40m	4cm x 3cm at 100m
3,000m/1,000m	800 (tracking)/1000 (pointing)	800 (tracking)/1000 (pointing)	N/A	800m
45m/s at 100m	5m/s@20m, 25m/s@100m	5m/s@20m, 25m/s@100m	N/A	90 degrees per second
base positioning accuracy 1mm	N	N	N/A	<2mm at 200m
Y	☐	☐	☐	Y - passive target
1,750 Pts per MB, max. 1GB, 256MB int./ max. 1GB CF-Card	>1MB / Up to 4GB	>1MB / Up to 4GB	>1MB/Up to 4GB	Memory (128M internal). See Spectra Precision for specific details. Typically over 100,000 points
Exchangeable CF Card (256 MB, 1 GB)	Y (CF/SD/USB)	Y (CF/SD/USB)	Y (CF/SD/USB)	Y
RS232/Bluetooth wireless/Radio	5: Serial/CF card/USB Type A/USB Type mini B/Bluetooth (optional)	5: Serial/CF card/USB Type A/USB Type mini B/Bluetooth (optional)	5: Serial/CF card/USB Type A/USB Type mini B/Bluetooth (optional)	USB, Bluetooth, 2.4 GHz radio.
2	1 (2 optional)	1 (2 optional)	2	2
320 x 240, colour	320x240, Y (full-colour)	320x240, Y (full-colour)	320x240, Y (full-colour)	Front: 320x240 Pixel, Colour Rear: 96x49, Monochrome
1/4 VGA, touch screen	72.5x49.5, Y (touch screen)	72.5x49.5, Y (touch screen)	72.5x49.5, Y (touch screen)	Front: 74x55mm, touchscreen Rear: 34x24mm, non-touchscreen
9 rows, 32 char/row	Configurable	Configurable	Configurable	Front: N/A, Graphical display Rear: 6 lines, 18 characters per row
34 keys, (12 function keys, 12 alphanumeric, Cursor, Enter, PROG, USER, Shift, ESC, CE), illuminated	32 with backlight	32 with backlight	32 with backlight	Front: 24, alphanumeric Rear: 4, non-alphanumeric
351 x 248 x 228	375 x 201 x 202	375 x 201 x 202	375 x 201 x 220	370mm x 190mm x 190mm
Instrument 7.25kg Container with accessories: 4.50kg	7.7 w/o case	7.6 w/o case	7.1 w/o case	10.5kg (instrument only 5.0kg)
Li-Ion, branche	Li-ion, 2 as standard	Li-ion, 2 as standard	Li-ion, 2 as standard	1x Li-ion internal
14.8V/4.8Ah	7.2V / 4.3Ah	7.2V / 4.3Ah	7.2V / 4.3Ah	11.1V/4.4Ah
9h	2.5 (continuous tracking), 3.5 (auto-pointing every 30s)	3 (auto-pointing every 30s)	14	Approx. 6 hours
Y	Y/N selectable	Y/N selectable	Y/N selectable	Y
Y (on instrument)	N	N	N	N
Y (on instrument)	Y (GuideLight on instrument for rod person guidance, SearchLight on rod for fast auto-pointing)	N (Built-in target illumination instead of guide light)	N (Built-in target illumination instead of guide light)	Y - instrument
Y (0.1mgon / 1-2mm)	Y, configurable	Y, configurable	N	Y - surface scan, at RL precision: 2" (0.5)/ 3" (1)/, 5" (1.5), 3mm+2ppm
Y (Target Capture)	N	N	N	N
Highest angular accuracy paired with unique high-precision PinPoint EDM SmartWorx - most complete Software Suite 24 months warranty For TM30:SmartEye Vision (3 km ATR, Target View) All support new Leica Viva controllers CS10 and CS15	Complete remote control using search laser and directional sensor for fast target lock. Ultra-small measuring beam spot in reflectorless mode.	NET05 features the sub-millimetre EDM with 0.5 to 0.7mm precision with sheet targets up to 200m. Both models have 0.1" (0.02mgon) angle resolution.	NET05X features the sub-millimetre EDM with 0.5 to 0.7mm precision with sheet targets up to 200m. 0.1" (0.02mgon) angle resolution.	The FOCUS 30 robotic solution is best described as simply powerful. Packaged in a modern, sleek, and streamlined design, it's easy-to-use, affordable and tough. IP55.

Topcon	**Topcon**	**Trimble**	**Trimble**	**Trimble**
IS Series: IS01 / IS03	MS series: MS05A / MS1A	Trimble S8	Trimble S6	Trimble S3
1,2,3,4	1,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Dec '07	Feb '10	Sep '07	Jan '05	Sep '09
1(0.3)/3(1.0)	0.5 (0.15)/1 (0.3)	0.5 (0.15) / 1 (0.3) / 2 (0.6)	2 (0.6) / 3 (1.0) / 5 (1.5)	2 (0.6) / 5 (1.5)
0.5/1(0.1/0.5) / 1/5(0.2/1.0)	0.1 (0.02)	0.1 (0.03)	0.1 (0.03)	0.1 (0.03)
2+2 m.s.e. / 5 for non-prism / 10 for long-range non-prism	MS05A: 0.8+1 / 1+1, MS1A: 1+1 / 3+1	DR HP EDM - Prism 0.8mm+1ppm, reflectorless 3mm+2ppm; DR Plus™ EDM - Prism 1mm+2ppm, reflectorless 2mm+2ppm	DR Plus™ EDM - Prism 1mm+2ppm, reflectorless 2mm+2ppm	DR EDM - Prism 1.5mm+2ppm, reflectorless 3mm+2ppm
1 / 0.2 (fine);1 / 10 (course); 10 (tracking)	MS05A: 0.01 / MS1A: 0.1	0.1	0.1	0.1
1,000	MS05A: 800 / MS1A: 1,000	DR HP EDM - 5,000m; DR Plus™ EDM - 5,500m	5,500m	2,500m
3,000	3,500	DR HP EDM - 5,000m; DR Plus™ EDM - 5,500m	5,500m	2,500m
4,000	N/A	DR HP EDM - 7,000m (3); DR Plus™ EDM - 5,500m (1)	5,500m (1)	5,000m (3)
N/A	N/A	DR HP EDM - 120m; DR Plus™ EDM - 1,000m (Ext range mode)	1,000m (Ext range mode)	250m
2,000	MS05A: 100 / MA1A: 200	DR HP EDM - 150m; DR Plus™ EDM - 2,200m (Ext range mode)	2,200m (Ext range mode)	400m
☐	☐	DR HP EDM - 4cm x 4cm at 100m; DR Plus™ EDM - 4cm x 8cm at 100m;	4cm x 8cm at 100m	4cm x 4cm at 100m
1,000	Tracking: 800, Lock: 1,000	800m	800m	500m
85°/sec	5m/s at 20m, 25m/s at 100m	115 deg/sec	115 deg/sec	86 deg/sec
N	N	<1mm at 300m standard deviation	<2mm at 200m standard deviation	<2mm at 200m standard deviation
☐	☐	Y	Y	N
128Mb internal + 1Gb micro SD / CF up to 2Gb	>1Mb internal / CF/USB up to 4Gb	Expandable memory. Varies with controller. See Trimble for specific details.	Expandable memory. Varies with controller. See Trimble for specific details.	Expandable memory. Varies with controller. See Trimble for specific details.
Y	Y	Y	Y	Y
8 (RS-232C, USB type A, USB type mini B, CF card, Bluetooth, SS radio, WLAN and RC-3)	4 (RS-232C, USB type A, USB type mini B and CF card)	USB, RS-232 Serial, Bluetooth, 2.4 GHz radio, CF card, SD card	USB, RS-232 Serial, Bluetooth, 2.4 GHz radio, CF card, SD card	USB, RS-232 Serial, Bluetooth, 2.4 GHz radio, CF card, SD card
1	2	2	2	1
320 x 240, Y	320 x 240, Y	320x240, Y (varies with controller)	320x240, Y (varies with controller)	320x240, Y (varies with controller)
3.5", Y	3.5", Y	79x60, Y (varies with controller)	79x60, Y (varies with controller)	79x60, Y (varies with controller)
Full colour graphic screen	Configurable	N/A, reflective TFT LCD graphical colour touch screen (varies with controller)	N/A, reflective TFT LCD graphical colour touch screen (varies with controller)	N/A, reflective TFT LCD graphical colour touch screen (varies with controller)
28 keys + touch panel display	32 keys & touchpanel display & trigger key	Choose either the attachable Trimble CU or handheld Trimble TSC2. Contact Trimble for specific details.	Choose either the attachable Trimble CU or handheld Trimble TSC2. Contact Trimble for specific details.	Choose either the fixed CU on Servo and Autolock versions or handheld Trimble TSC2 on Robotic. Contact Trimble for specific details.
338 x 220 x 185	375 x 201 x 220	385 x 190 x 185	385 x 190 x 185	385 x 190 x 185
7.2 (excl case)	7.7 (excl case)	Robotic instrument: 5.6	Robotic instrument: 5.6	Robotic instrument: 5.6
Standard	Detachable Li-ion batteries, 2 as standard	Li-Ion, 1 internal, 3 external	Li-Ion, 1 internal, 3 external	Li-Ion, 1 internal, 3 external
7.4/5	7.2 / 4.3	11.1/4.4	11.1/4.4	11.1/4.4
4	3	1 internal battery: 6 hours	1 internal battery: 6 hours	1 internal battery: 6 hours
Y	N	Y	Y	N
Y (Option)	N	Y	Y	Y
N	N	Y	Y	Y
Y	Y	Y	Y	Y
Full capabilities	N	Y (Trimble S8 with Trimble VISION™ integrates surveyed data with live scene image and allows the capture of calibrated photo documentation)	Y (With Trimble Access or Trimble Survey Controller with High Accuracy GIS option turned on in field s/w)	Y (With Trimble Access or Trimble Survey Controller with High Accuracy GIS option turned on in field s/w)
TopSURV OnBoard with ROADS, image scan and monitor pre-installed. IS Series adds TopSURV OnBoard with Imaging including iSCAN, iDRIVE technologies. Over 20 languages available. Class 1 laser and XTrac7 tracking system. SS Radio, XTrac7 and optical link (RC-3) optional for one-man operation. Two digital cameras, one wide angle and one co-axial.	MS05A features the sub-millimetre EDM with 0.5 to 0.7mm precision w/sheet target up to 200m. Both models have 0.1" (0.02mgon) angle resolution.	The Trimble S8 is the most advanced total station available today for everyday survey tasks or for demanding engineering projects. Find out more at www.trimble.com.	Scalable, flexible, and ready for anything. The Trimble S6 provides unmatched, fast, and smooth performance with unique features like Trimble DR Plus™, MagDrive™, SurePoint™, and MultiTrack™.	Everything you need to perform efficient surveying jobs. Built on proven, reliable Trimble technology. Dependability backed by world-class training, service, and support.