

High-end Total Stations

Clear trends characterising today's high-end total stations are cool design and 'all in one' instruments. Most remarkable, however, is China's emergence as manufacturer of instruments for the most demanding area of the market.

Four years ago (see Product Survey October 2002) we predicted that China would become a significant player as manufacturer of High-end Total Stations. We wrote: "For the future [...] competition may come from an unexpected part of the world, and that is China. At the moment, the total-station industry in China is still focusing on construction-site personnel. However, the industry there is developing very fast and it is only a matter of time before the Chinese survey industry has risen on the ladder to reach high-order precision instruments directed towards the professional surveying market." The moment at which China enters the top segment of the market has now definitely arrived. Already last year we welcomed the frontrunners, the firm called South, of Guangzhou, and FOIF from Suzhou. This year we welcome another three companies: Phenix from Shanghai City, LHL from Tianjin, and Geotech, based in Xiamin. Some are so brand new that English-language brochures are not yet ready.

Designers increasingly determine the look of our instruments; striking colours and strong lines characterise today's instruments. Maybe survey instruments will follow the same way travelled by so many consumer goods, appearance becoming at least as important as functionality. Perhaps one day the look of a total station will be personalised, so that we can order our favourite colour. Chinese manufacturers, however, still have to take that turning. At present their products remarkably resemble those of others in appearance.

Today's instruments often integrate several specific functionalities for which up until a few years ago the surveyor had to buy different instruments. Leica's smartstation, for example, is a combination of theodolite, EDM device(s), GPS receiver and powerful software. Topcon's GPT 7000i combines theodolite, EDM(s) and digital camera, so that the instrument offers photogrammetric capabilities. Software enables some instruments to be used as a scanner. Integration enables the surveyor on the spot to choose the best method. This trend will continue for the foreseeable future, and maybe within a few years we may welcome instruments equipped with two-way radio, one in the instrument and another in the reflector or mobile phone for online transfer of data to the office.

By Henk Key, contributing editor and Dr Mathias Lemmens, editor, GIM International, e-mail: henk.key@gitc.nl

Brand	FOIF	FOIF
Product name	RTS702/705, RTS712/715	RTS602/RTS605
Category	I	I
Date of Introduction	October 2005	July 2006
Angle Measurement		
Accuracy [sec (mgon)]	2" (0.6)/ 5" (1.5)	2" (0.6)/ 5" (1.5)
Division/least increment [sec (mgon)]	0.5" (0.1)	1" (0.2)
Distance Measurement		
Accuracy [mm+pmm] in standard mode on prism and reflectorless	2+2	2+2
Least increment [mm]	1/fine, 10/tracking	1/fine, 10/tracking
Maximum range with reflectors (mini prism) [m]	N/A	N/A
Maximum range with reflectors (standard prism) [m]	2	2
Maximum range with reflectors (number of prisms) [m]	N/A	N/A
Maximum non-prism range [m] on kodac gray	N/A	N/A
Maximum non-prism range [m] on kodac white	N/A	N/A
Reflectorless: size of spot at 100m and at max range	N/A	N/A
Automatic Tracking and Locking		
Range [m]	N/A	N/A
Maximum speed of angle [m/s]	N/A	N/A
Automatic aiming accuracy in autolock mode [mm]	N/A	N/A
Data Storage/Transport		
Memory system: nr of points [Mb]	16Mb	16Mb
Internal or External	Internal	Internal
Exchangeable (Floppy, CD-Rom or Memory board) Y/N	Y, memory board	Y, memory board
Number and type(s) of I/O ports	USB and RS-232S	RS-232S
Display/Keyboard		
Number of faces	2 faces, Touch screen	2 faces
Number of rows/characters per row	Graphic display(320x240 dots)	LCD 8rows/24 characters
Total Numbers of keys (alpha/numeric)	21 keys, alphanumeric	29 keys, alphanumeric
Dimensions		
Size (h x w x d) [mm]	370 x 234 x 212	360 x 184 x 220
Weight (incl. battery, telemetry & tracker, case) [kg]	6.5	6.1
Power Supply		
Battery: standard or branche	Li-ion, rechargeable	Li-ion, rechargeable
Capacity [Volt/Ah]	7.2V/2.8Ah	7.2V/2.2Ah
Operation time on one battery by one measurement per sec [h]	5	8
Miscellaneous		
On board Bluetooth preparation Y/N	N/A	N/A
Laser Plummet available Y/N (on instrument or tribrach)	Y, on instrument	Y, on instrument
Guiding light available Y/N (on instrument or rod)	N/A	N/A
Automatic scanning of objects Y/N, solution mgon / mm	N/A	N/A
Notes/remarks	RTS702/705 applied photo-electric incremental encoder, RTS712/715 applied absolute encoder.	☐



N/A = Not Applicable
☐ = No information received

FOIF	FOIF	Geo-Tech	Leica	Leica
OTS632/OTS635	RTS632/RTS635	402	TCRP1201 R300	TCPI203
2	1	1	1+2+3+4	2+3
August 2004	August 2004	2005	February 2004	February 2004
2" (0.6)/ 5" (1.5)	2" (0.6)/ 5" (1.5)	2" (0.6)	1"	3"
1" (0.2)	1" (0.2)	1" (0.2)	0.1" (0.1mgon)	0.1" (0.5)
3+3	3+2	2+2	2+2 / 3+2	2+2
1/fine, 10/tracking	1/fine, 10/tracking	2 (fine); 1 (tracking)	0.1	0.1
1.2	N/A	500	1,200 (max.2,000)	1,200 (max.2,000)
5	1.8	1P:1,600	3,000 (max.3,500)	3,000 (max.3,500)
N/A	N/A	3P:2,500	4,500 (max.5,400), 3Prism	4,500 (max.5,400), 3Prism
N/A	N/A	N/A	300	N/A
60	N/A	N/A	500 (max.760)	N/A
12mm/50m	N/A	N/A	12mmx40mm	N/A
N/A	N/A	N/A	1,000 / 800m	1,000 / 800m
N/A	N/A	N/A	25m/s at 100m	25m/s at 100m
N/A	N/A	N/A	<2mm	<2mm
8Mb	8	8,000	1,750 Pts per Mb, max. 1,000MB	1,750 Pts per Mb, max. 1,000MB
Internal	Internal	Internal	64Mb int./1,000Mb CF-Card	64Mb int./1,000Mb CF-Card
Y, memory board	Y, memory board	N	CF-Cards	CF-Cards
RS-232S	RS-232S	1xRS232C	RS232/Bluetooth/Radio	RS232/Bluetooth/Radio
2 faces	2 faces	2	1 / 2 opt.	1 / 2 opt.
4 row/16 characters	4 row/16 characters	4x20	14 / 34 (320x240pix)	14 / 34 (320x240pix)
23 keys, alphanumeric	23 keys, alphanumeric	23	34keys, (12 function, 12 alphanumeric, Cursor, Enter, PROG, USER, Shift, ESC, CE	34keys, (12 function, 12 alphanumeric, Cursor, Enter, PROG, USER, Shift, ESC, CE
350 x 170 x 175	350 x 170 x 175	330 x 160 x 150	345 x 226 x 203	345 x 226 x 203
5.3	4.5	5.5	6.5 / 2.9	6.5 / 2.9
Ni-MH, rechargeable	Ni-MH, rechargeable	NiMH, Rechargeable	Lilon, branch	Lilon, branch
7.2V/1.8Ah	7.2V/1.8Ah	6V DC/3.6Ah	7.4V/3.8Ah	7.4V/3.8Ah
3.5	3.5	6	6-8	6-8
N/A	N/A	N/A	Y, option	Y, option
Y, on instrument	Y, on instrument	N/A	Y	Y
N/A	N/A	N/A	Y, on instrument	Y, on instrument
N/A	N/A	N/A	Y, 0.1mgon / 1-2mm	Y, 0.1mgon / 1-2mm
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Full robotic total station with powerful reflectorless PinPoint EDM allows 'One-Person' operation. All Leica TPS1200 can be equipped with integrated GNSS 'Smart-Antenna'.	Full robotic total station allows 'One-Person' operation. All Leica TPS1200 can be equipped with integrated GNSS 'Smart-Antenna'. Same user interface and direct data transfer to GPS1200.



Brand	Leica	Leica	LHL	Nikon
Product name	TCA1201	TCA2003	LTS	DTM-502/652
Category	I+2	3		I
Date of Introduction	February 2004	June 1995	September 2004	2002 - 2006
Angle Measurement				
Accuracy [sec (mgon)]	1"	0.5"	2"	1" (0.3), 2" (0.5) 3" (1)
Division/least increment [sec (mgon)]	0.1" (0.1)	0.1"	1"	0.5" (0.1)
Distance Measurement				
Accuracy [mm+pmm] in standard mode on prism and reflectorless	2+2	1+1	3+2 (with prism)	2 + 2
Least increment [mm]	0.1	0.1	1	0.1
Maximum range with reflectors (mini prism) [m]	1,200 (max.2,000)	1,000 (max.1,400)m	500	1100
Maximum range with reflectors (standard prism) [m]	3,000 (max.3,500)	2,500 (max.3,500)m	1.6	2,700 (1 prism)
Maximum range with reflectors (number of prisms) [m]	4,500 (max.5,400), 3Prism	3,500 (max.5,000)m , 3Prism	2,500 (3 prisms)	3,600 (3 prisms)
Maximum non-prism range [m] on kodac gray	N/A	N/A	Under research	N/A
Maximum non-prism range [m] on kodac white	N/A	N/A	Under research	N/A
Reflectorless: size of spot at 100m and at max range	N/A	N/A	Under research	N/A
Automatic Tracking and Locking				
Range [m]	1,000 / 800m	1,000 / 500m	Under research	N/A
Maximum speed of angle [m/s]	25m/s at 100m	5m/s at 100m	Under research	N/A
Automatic aiming accuracy in autolock mode [mm]	<2mm	<1mm	Under research	N/A
Data Storage/Transport				
Memory system: nr of points [Mb]	1,750 Pts per Mb, max. 1,000MB	6,000 Pts per Mb, max. 2MB	15,000	10,000
Internal or External	64Mb int./1,000MB CF-Card	2Mb	Internal	Internal, 652 Both
Exchangeable (Floppy, CD-Rom or Memory board) Y/N	CF-Cards	PCMCIA-Card	N	N
Number and type(s) of I/O ports	RS232/Bluetooth/Radio	RS232	1xRS232	1x RS232C
Display/Keyboard				
Number of faces	1 / 2 opt.	2	2	2
Number of rows/characters per row	14 / 34 (320x240pix)	8 / 35 (210x364pix)	5/20	Graphic 128 x 64 pixel
Total Numbers of keys (alpha/numeric)	34 keys, (12 function, 12 alpha-num, Cursor, Enter, PROG, USER, Shift, ESC, CE)	32 keys (6 function, 6 direct, 12 alphanumeric, Cursor, Enter, Shift, ESC, CE)	23	25. Full numeric keyboard with alphanumeric entry
Dimensions				
Size (h x w x d) [mm]	345 x 226 x 203	355 x 255 x 225	335 x 200 x 200	166 x 168 x 365
Weight (incl. battery, telemetry & tracker, case) [kg]	5.7 / 2.9	7.8 / 4.0	5.8 (only instrument)	5.5 kg w/o case
Power Supply				
Battery: standard or branche	Lilon, branch	NiMh, branch	Branch	NiMH internal
Capacity [Volt/Ah]	7.4V / 3.8Ah	12.0V / 1.8Ah	7.2V/3.5Ah	7.2V / 3.8Ah
Operation time on one battery by one measurement per sec [h]	6-8	3-4	7	24 (1x msr / 30sec)
Miscellaneous				
On board Bluetooth preparation Y/N	Y, option	N	Under research	N
Laser Plummet available Y/N (on instrument or tribrach)	Y	Y	Y	N
Guiding light available Y/N (on instrument or rod)	Y, on instrument	Y	Under research	Y
Automatic scanning of objects Y/N, solution mgon / mm	Y, 0.1mgon / 1-2mm	N	Under research	N
Notes/remarks	Full robotic total station allows 'One-Person' operation. All Leica TPS1200 can be equipped with integrated GNSS 'Smart-Antenna'. Same user interface and direct data transfer to GPS1200.	High performance total station with unique precision (angle 0.5", dist 1+1mm). Extremely robust and excellently suited for continuous applications such as monitoring or engineering survey tasks.	Quick measuring, dual speed focus, good appearance.	Powerful and intuitive onboard programs. Includes data collection, staking programs, special programs, advanced feature coding options, etc.

N/A = Not Applicable
 □ = No information received



Nikon	Nikon	Pentax	Phenix	Sokkia	Sokkia
DTM-362/352/332	NPL-362/352/332/632	R-300X	MTS-802/MTS-805	Series230RM: SET3230RM/4230RM	Series030R: SET1030R3/2030R3/3030R3
2	1, 2, 4	4	1.2	1, 2, 3, 4	1, 2, 4
2002 - 2004	2003 - 2006	March 2006	March 2006	September 2005	September 2003
3", (1) 5" (1.5) 1" (0.2)	2" (0.5), 3" (1), 5" (1.5) 0.5" (0.1)	2" to 6" 1"	2" /5"	3" (1) / 5" (1.5) 1" (0.2) / 1" (0.2)	1" (0.3) / 2" (0.6) / 3" (1) 0.5" (0.1) / 0.5" (0.1) / 1" (0.2)
3 + 2	3 + 2	Prism : +/- (2 + 2ppm x D)mm; Reflectorless: 1,5 to 200m= +/- (5 + 2/(3)ppm x D)mm - 200 to 270m= +/- (7 + 10ppm x D)mm	2+2/3+2	W/prism: 2+2, Reflectorless: 3+2 (over 200m, 5+10)	W/prism: 2+2, Reflectorless: 3+2 (over 200m, 5+10)
1	0.1	Fine mode: 0,1mm - Normal mode: 1mm - Track mode: 1cm	1	1 / 1	0.1/ 0.1/ 1
N/A	3000	1.600	□	800	800
2,300 (1 prism)	5,000 (1 prism)	4.500	2,000/1,300	5	5
N/A	N/A	3P: 5,600	3,000 triple prism/ 2,000 triple prism	6,000 (3)	6,000 (3)
N/A	85	-	N/A	170 *1	170 *1
N/A	210	800	N/A	350 *1	350 *1
N/A	0.09m (100m)	270	N/A	N/A	N/A
N/A	N/A	N/A	N/A	2 to 800m *2	N/A
N/A	N/A	N/A	N/A	180 degrees / 10 s	N/A
N/A	N/A	N/A	N/A	Better than 2.5mm upto 100m, better than 5" over 100m	N/A
10,000	10,000	18.600	15,000; optional up to 50,000	10,000	10,000
Internal	Internal, 632 Both	Internal	Internal	Internal	Internal (CF card is supported)
N	N	Y	N	N	Y
1x RS232C	1x RS232C	1 serial com port	1 x RS232	1 x RS232C	1 x RS232C
2 / 2 / 1	2 / 2 / 1	Graphic LCD display: 1, 2nd optional	2	1	2
Graphic 128 x 64 pixel	Graphic 128 x 64 pixel	8 rows, 20 alphanumeric characters	□	8 / 20	8 / 20
25. Full numeric keyboard with alphanumeric entry	25. Full numeric keyboard with alphanumeric entry	22 each: 12 numeric, 5 function, 5 special	□	4 soft keys and 24 other keys. Alphanumeric. One trigger key on reverse side.	4 soft keys and 39 other keys. Full alphanumeric. (Full alphanumeric wireless keyboard is optionally available.)
173 x 168 x 335	166 x 168 x 365	343 x 177 x 177	190x210x350	380 x 202 x 171	345 x 186 x 171
5.5 (w/o case)	5.3 (w/o case)	9.5	6.0	7.0 (w/o case)	5.9 (w/o case)
NiMH internal	NiMH internal	Standard camcorder battery, Ni-MH rechargeable DC6V	Standard	Ni-MH	Ni-MH
7.2V / 3.8Ah	7.2V / 3.8Ah	Input voltage AC 100~240V Output voltage DC7.5	2.7 Ah	N/A	6V
27 (1x msr / 30sec)	15 (1x msr / 30sec)	6	□	Approx. 3.5 *3	Approx. 6 *2
N	N	N	N	N	N
N	N	Y	N	N	N
Y	Y	Y, visible laser	N	Y, on instrument	Y, on instrument, option
N	N	N	N	N/A	N/A
Powerful and intuitive onboard programs. Includes data collection, staking programs, special programs, advanced feature coding options, etc.	Powerful and intuitive onboard programs. Includes data collection, staking programs, special programs, advanced feature coding options, etc.	The new R-300X Series also has the user-friendly Power Topo Lite software on-board.	□	RED-tech II EDM. *1 minimum range 30cm. *2 on-demand target acquisition system. Constant tracking not necessary. *3 single measurement alternately at each face with 30-seconds intervals, using auto-pointing function.	RED-tech II EDM. IP64. EXPERT programs pre-installed. *1 minimum range 30cm. *2 angle and distance measurement with 30-second interval.



Brand	Sokkia	Sokkia	Sokkia	Sokkia
Product name	Series I30R: SET I130R3/ 2130R3/ 3130R3 / 4130R3	Series30RK: SET230RK3 / 330RK3 / 530RK3 / 230RK / 330RK / 530RK / 630RK	Series30R: SET230R3 / 330R3/ 530R3 / 230R / 330R / 530R/ 630R	Series10K: SET210K / 310K / 510K / 610K
Category	1, 2, 4	1, 2, 4	1, 2, 4	1, 2
Date of Introduction	January 2004	September 2005	October 2002	April 2006
Angle Measurement				
Accuracy [sec (mgon)]	1" (0.3) / 2" (0.6) / 3" (1) / 5" (1.5)	2" (0.6) / 3" (1) / 5" (1.5) / 2" (0.6) / 3" (1) / 5" (1.5) / 6" (1.9)	2" (0.6) / 3" (1) / 5" (1.5) / 2" (0.6) / 3" (1) / 5" (1.5) / 6" (1.9)	2" (0.6) / 3" (1) / 5" (1.5) / 6" (1.9)
Division/least increment [sec (mgon)]	0.5" (0.1) / 0.5" (0.1) / 1" (0.2) / 1 (0.2)	1" (0.2)	1" (0.2)	1" (0.2)
Distance Measurement				
Accuracy [mm+pmm] in standard mode on prism and reflectorless	W/prism: 2+2, Reflectorless: 3+2 (over 200m, 5+10)	W/prism: 2 + 2, Reflectorless: RK3: 3+2 (over 200m, 5+10), RK: 3+2 (over 100m, 5+10)	w/prism: 2 + 2, Reflectorless: R3: 3+2 (over 200m, 5+10), R: 3+2 (over 100m, 5+10)	2 + 2 with prism
Least increment [mm]	0.1/ 0.1/ 1/ 1	1	1	1
Maximum range with reflectors (mini prism) [m]	800	800	800	800
Maximum range with reflectors (standard prism) [m]	5	5,000, (630RK: 4,000)	5,000, (630R: 4,000)	2.7
Maximum range with reflectors (number of prisms) [m]	6,000 (3)	6,000, (630RK: 5,000) (3)	6,000, (630R: 5,000) (3)	3,500 (3)
Maximum non-prism range [m] on kodac gray	170 *I	RK3: 170m *I, RK: 80m *I	R3: 170m *I, R: 80m *I	N/A
Maximum non-prism range [m] on kodac white	350 *I	RK3: 350m *I, RK: 200m *I, 630RK: 150m *I	R3: 350m *I, R: 200m *I, 630R: 150m *I	N/A
Reflectorless: size of spot at 100m and at max range	N/A	N/A	N/A	N/A
Automatic Tracking and Locking				
Range [m]	N/A	N/A	N/A	N/A
Maximum speed of angle [m/s]	N/A	N/A	N/A	N/A
Automatic aiming accuracy in autolock mode [mm]	N/A	N/A	N/A	N/A
Data Storage/Transport				
Memory system: nr of points [Mb]	10,000	10,000	10,000	10,000
Internal or External	Internal (CF card is optionally supported)	Internal (CF card is optionally supported except for 630RK)	Internal (CF card is optionally supported except for 630R)	Internal (CF card is optionally supported except for 610K)
Exchangeable (Floppy, CD-Rom or Memory board) Y/N	Y, option	Y, option	Y, option	Y, option
Number and type(s) of I/O ports	1 x RS232C, Bluetooth (option)	1 x RS232C	1 x RS232C, Bluetooth (option)	1 x RS232C
Display/Keyboard				
Number of faces	2	2, (630RK: 1)	2, (630R: 1)	2, (610K: 1)
Number of rows/characters per row	6 rows, 192 x 80 dots	6 rows, 192 x 80 dots	6 rows, 192 x 80 dots	6 rows, 192 x 80 dots
Total Numbers of keys (alpha/numeric)	4 soft keys and 27 other keys. Alphanumeric. (Full alphanumeric wireless keyboard is optionally available.)	4 soft keys and 23 other keys. Alphanumeric. (Full alphanumeric wireless keyboard is optionally available except for 630RK)	4 soft keys and 11 other keys. (Full alphanumeric wireless keyboard is optionally available except for 630R)	Series10K: 4 soft keys and 23 other keys. Alphanumeric. (Full alphanumeric wireless keyboard is optionally available except for 610K)
Dimensions				
Size (h x w x d) [mm]	345 x 175 x 171	341 x 165 x 180, (630RK: 341 x 165 x 173)	341 x 165 x 171	341 x 165 x 180 (610K: 341 x 165 x 137)
Weight (incl. battery, telemetry & tracker, case) [kg]	5.8 (w/o case)	5.5 (w/o case), (630RK: 5.4 w/o case)	5.4 (w/o case), (630R: 5.3 w/o case)	5.2 (w/o case), (610K: 5.1 w/o case)
Power Supply				
Battery: standard or branche	Ni-MH	Li-Ion	Li-Ion	Li-Ion
Capacity [Volt/Ah]	6V	7.2V	7.2V	7.2V
Operation time on one battery by one measurement per sec [h]	Approx. 7 *2	Approx. 7 *2	Approx. 7 *2	Approx. 7.5 *1
Miscellaneous				
On board Bluetooth preparation Y/N	Y, option	N	Y, option	N
Laser Plummet available Y/N (on instrument or tribrach)	N	Y, on instrument, option	Y, on instrument, option	Y, on instrument, option
Guiding light available Y/N (on instrument or rod)	Y, on instrument, option	Y, on instrument, option	Y, on instrument, option	N
Automatic scanning of objects Y/N, solution mgon / mm	N/A	N/A	N/A	N/A
Notes/remarks	RED-tech II EDM. IP64: *1 minimum range 30cm. *2 angle and distance measurement with 30-second interval	RED-tech II EDM. IP66: *1 Minimum range 30cm. *2 angle and distance measurement with 30-second interval.	RED-tech II EDM. IP66: Low temperature Models are available. *1 minimum range 30cm. *2 angle and distance measurement with 30-second interval	IP66: *1 (angle and distance measurement with 30-second interval)



N/A = Not Applicable
□ = No information received

Sokkia	Spectra Precision	SOUTH	SOUTH	SOUTH	SOUTH
Series I0: SET210 / 310 / 510 / 610	Focus 10	NTS-320 Series	NTS-350 Series	NTS-660 Series	NTS-350R Series
1, 2	1, 2, 4	1, 2	1, 2	1, 2	1, 2
February 2002	October 2005	2002	2003	2004	2005
2" (0.6) / 3" (1) / 5" (1.5) / 6" (1.9)	1.5" (0.46)	NTS-322: 2"(0.6n); NTS-325: 5"(1.5)	NTS-352: 2"(0.6); NTS-355: 5"(1.5)	NTS-662: 2"(0.6); NTS-663: 3"(1.0); NTS-665: 5"(1.5)	NTS-352R: 2"(0.6); NTS-355R: 5"(1.5)
1" (0.2)	1" (0.2)	1" (0.2)/ 5"(1.0)	1" (0.2)/ 5"(1.0)	1" (0.2)/ 5"(1.0)	1" (0.2)/ 5"(1.0)
2 + 2 with prism	3 + 3	3+2XD	2+2XD	2+2XD	2+2XD
1	0.1	3"(Fine); 1"(Tracking)	3"(Fine); 1"(Tracking)	3"(Fine); 1"(Tracking)	3"(Fine); 1"(Tracking)
800	2,500 (1 prism)	500	500	500	500
2.7	5,500 (1 prism)	1P: 1,800 (NTS-322); 1,600 (NTS-325)	1P: 1,800 (NTS-352); 1,600 (NTS-355)	1P: 1,800 (NTS-662); 1,600 (NTS-663); 1,400 (NTS-665)	1P: 1,800 (NTS-352R); 1,600 (NTS-355R)
3,500 (3)	5,500 (3 prisms)	3P: 2,600 (NTS-322); 2,300 (NTS-325)	3P: 2,600 (NTS-352); 2,300 (NTS-355)	3P: 2,600 (NTS-662); 2,300 (NTS-663); 2,000 (NTS-665)	3P: 3,000 (NTS-352R); 2,300 (NTS-355R)
N/A	>200	N/A	N/A	N/A	100
N/A	>600	N/A	N/A	N/A	100
N/A	0.04m Horizontal & 0.08m Vertical (100m)	☐	☐	☐	☐
N/A	N/A				Reflectorless 100m
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
10,000	>10,000	256k for 8,000	256k for 8,000	16Mb for 40,000	256k for 8,000
Internal (CF card is optionally supported except for 610)	Both	Internal	Internal	Internal	Internal
Y, option	Y	Available	Available	Available	Available
1 x RS232C	Geo I/O two-way, RS-232 two-way	1xRS232C	1xRS232C	1xRS232C	1xRS232C
2, (610: 1)	1	2	2	2	2
6 rows, 192 x 80 dots	4 row 20 characters or other depending on Controller	4 rows x 20 characters	4 rows x 20 characters	10 rows x 40 characters	4 rows x 20 characters
Series I0: 4 soft-keys and other 11 keys. (Full alphanumeric wireless keyboard is optionally available except for 610)	33 or other depending on Controller	12 keys	23 keys, Full numeric keyboard with alphanumeric entry	25 keys, Full numeric keyboard with alphanumeric entry	23 keys, Full numeric keyboard with alphanumeric entry
341 x 165 x 170	390 x 225 x 170	310 x 180 x 160	310 x 180 x 160	310 x 180 x 160	310 x 180 x 160
5.2 (w/o case), (610: 5.0 w/o case)	7.5 w/o case	9.5	9.5	9.5	9.5
Li-Ion	NiMH	NiMH, Rechargeable	NiMH, Rechargeable	Internal	NiMH, Rechargeable
7.2V	12V / 1.6Ah internal, 12V / 3.5 Ah external	6V DC/3.6Ah	6V DC/3.6Ah	6V DC/3.6Ah	6V DC/3.6Ah
Approx. 7.5 *1	3.5 - 7.0 (external depending on use)	8	8	8	8
N	Y, supported in Controller	N/A	N/A	N/A	N/A
Y, on instrument, option	Y	Y, on tribrach, default: optical plummet	Y, on tribrach, default: optical plummet	Y, on tribrach, default: optical plummet	Y, on tribrach, default: optical plummet
N	N	N/A	N/A	N/A	N/A
N/A	N	N/A	N/A	N/A	N/A
IP66: Low-temperature models are available. *1 (angle and distance measurement with 30-second interval)	Fast, reliable, accurate. Designed to meet the needs of surveyors around the world, the FOCUS 10 delivers maximum productivity, precision and affordability.	☐	☐	☐	☐



Brand	Topcon	Topcon	Topcon	Topcon
Product name	GTS-230N serie: GTS233 / GTS-235N / GTS-236N / GTS-239N	GPT-3000LN serie:GPT-3002LN/ GPT-3003LN / GPT-3005LN / GPT-3007LN	GTS-720 serie: GTS-721 / GTS-722 / GTS-723 / GTS-725	GPT-7000L serie: GPT-7001L / GPT-7002L / GPT-7003L / GPT-7005L / GPT-7000i serie: GPT-7001i / GPT-7002i / GPT-7003i / GPT-7005i
Category	2	2,4	1	1,4
Date of Introduction	September 2005	April 2005	October 2003	September 2005 / May 2005
Angle Measurement				
Accuracy [sec (mgon)]	3(1.0) / 5(1.5) / 6(1.8) / 9(2.7)	2(0.6) / 3(1.0) / 5(1.5) / 7(2.0)	1(0.3) / 2(0.6) / 3(1.0) / 5(1.5)	1(0.3) / 2(0.6) / 3(1.0) / 5(1.5)
Division/least increment [sec (mgon)]	1/5(0.2/1.0) / 1/5(0.2/1.0) / 1/5(0.2/1.0) / 5/10(1/2)	1/5(0.2/1.0) / 1/5(0.2/1.0) / 1/5(0.2/1.0) / 5/10(1/2)	0.5/1(0.1/0.5) / 0.5/1(0.1/0.5) / 1/5(0.2/1.0) / 1/5(0.2/1.0)	0.5/1(0.1/0.5) / 0.5/1(0.1/0.5) / 1/5(0.2/1.0) / 1/5(0.2/1.0)
Distance Measurement				
Accuracy [mm+pmm] in standard mode on prism and reflectorless	2+2 / 2+2 / 2+2 / 3+3 m.s.e.	2+2 m.s.e. (5 for non prism)	2+2 m.s.e.	2+2 m.s.e. (5 for non prism)
Least increment [mm]	1 / 0.2 (fine);1 / 10 (course); 10 (tracking)	1 / 0.2 (fine);1 / 10 (course); 10 (tracking)	1 / 0.2 (fine);1 / 10 (course); 10 (tracking)	1 / 0.2 (fine);1 / 10 (course); 10 (tracking)
Maximum range with reflectors (mini prism) [m]	1,000 / 1,000 / 1,000 / 900	1	1,000 except for GTS-725 900	1
Maximum range with reflectors (standard prism) [m]	(1) 3,500 / 3,500 / 3,500/ 2,300	4	3,500 except for GTS-725 2,300	3
Maximum range with reflectors (number of prisms) [m]	(3) 4,700 / 4,700 / 4,700 / 3,100 (9) 5,800 / 5,800 / 5,800 / 4,000	(3) 5,300 (9) 6,500	(3) 4,700 / (9) 5,800 except for GTS-725 (3) 3,100/ (9) 4,000	(3) 4,000 (9) 5,000
Maximum non-prism range [m] on kodac gray	N/A	500	N/A	
Maximum non-prism range [m] on kodac white	N/A	1.2	N/A	1,200 / 250
Reflectorless: size of spot at 100m and at max range	N/A	0.02	N/A	0.02
Automatic Tracking and Locking				
Range [m]	N/A	N/A	N/A	N/A
Maximum speed of angle [m/s]	N/A	N/A	N/A	N/A
Automatic aiming accuracy in autolock mode [mm]	N/A	N/A	N/A	N/A
Data Storage/Transport				
Memory system: nr of points [Mb]	24,000	24,000	2 x 64Mb intern + extern up to 2TB	3 x 64Mb intern + extern up to 2TB / 1 x 128Mb + 1 x 256Mb intern + extern up to 2TB
Internal or External	Internal and external	Internal and external	Internal and external	Internal and external
Exchangeable (Floppy, CD-Rom or Memory board) Y/N	N	N	Y	Y
Number and type(s) of I/O ports	1 RS-232C	1 RS-232C	4 (RS-232C, USB, parallel, CF card)	4 (RS-232C, USB, parallel, CF card)
Display/Keyboard				
Number of faces	2 / 2 / 1 / 1	2 / 2 / 2 / 1	2/2/2/1	2/2/2/1
Number of rows/characters per row	Graphic display 4/20	Graphic display 4/20	Full-colour graphic screen	Full-colour graphic screen
Total Numbers of keys (alpha/numeric)	24	24	28 keys + touch-panel display	28 keys + touch-panel display
Dimensions				
Size (h x w x d) [mm]	336 x 184 x 172	336 x 184 x 172	343 x 245 x 219 except for GTS-725: 343 x 245 x 199	343 x 245 x 219 except for GPT-7005L, and GPT-7005i: 343 x 245 x 199
Weight (incl. battery, telemetry & tracker, case) [kg]	4.9 (excl case)	5.3 (excl case)	6.2 / 6.2 / 6.2 / 6.1 (excl case)	6.5 / 6.5 / 6.5 / 6.4 (excl case) / 6.6 / 6.6 / 6.6 / 6.5 (excl case)
Power Supply				
Battery: standard or branche	Standard	Standard	Standard	Standard
Capacity [Volt/Ah]	7.2/2.7	7.2/2.7	7.4/4.4	7.4/4.4
Operation time on one battery by one measurement per sec [h]	10	4.2	7.5	4.2 / 3.5
Miscellaneous				
On board Bluetooth preparation Y/N	Y	Y	Y	Y
Laser Plummet available Y/N (on instrument or tribrach)	Y	Y	Y	Y
Guiding light available Y/N (on instrument or rod)	Y	Y	Y	Y
Automatic scanning of objects Y/N, solution mgon / mm	N/A	N/A	N/A	N/A / Y with images
Notes/remarks	Standard Software preinstalled and absolute angle encoders.IP66 water resistant. Over 20 languages available.	Standard Software preinstalled and absolute angle encoders. IP66 water resistant. Class 1 laser. Over 20 languages available.	Windows CE.NET operating system. TopSURV OnBoard. Standard with Card slot and absolute encoders. Over 20 languages available.	Windows CE.NET operating system. TopSURV OnBoard. Standard with Card slot and absolute encoders. Over 20 languages available. Class 1 laser / GPT-7000i with imaging capabilities.



N/A = Not Applicable
□ = No information received

Topcon	Trimble	Trimble	Trimble	Trimble
GTS-900A series: GTS-901A / GTS-903A / GTS-905A / GPT-9000A series: GPT-9001A / GPT-9003A / GPT-9005A	Trimble M3	Trimble 3600	Trimble 5500/5600	Trimble S6
3 / 3, 4	2, 4	1, 2, 4	1, 2, 3, 4	1, 2, 3, 4
June 2006	October 2005	February 2001	February 2001	January 2005
1(0.3) / 3(1.0) / 5(1.5) 0.5/1(0.1/0.5) / 1/5(0.2/1.0) / 1/5(0.2/1.0)	3", (1) 5" (1.5) 1" (0.2)	1.5" (0.46) 0.1" (0.01)	1" (0.3) 0.1" (0.01)	1" (0.3) 0.1" (0.01)
2+2 m.s.e. / 5 for non prism	prism: 3+2 nonprism: 5+2	1 + 1	DR Standard 2 + 2 / DR200+, DR300+ 3+ 3	High Precision 1+ 1, DR300+ 3+ 2
1 / 0.2 (fine); 1 / 10 (course)	1	0.1	0.1	0.1
1	N/A	3,000 (1 prism)	DR Standard 3,000 / DR200+, DR300+ 2,500 (1 prism)	High-precision 3,000, DR300+ 2,500 (1 prism)
3	5,000 (1 prism)	5,000 (1 prism)	DR Standard 5,000 / DR200+, DR300+ 5,500 (1 prism)	High-precision 5,000, DR300+ 5,500 (1 prism)
(3) 4,000 (9) 5,000	5,000 (3 prism)	7,500 (3 prisms)	DR Standard 7,500 / DR200+, DR300+ 5,500 (3 prisms)	High-precision 7,000, DR300+ 5,500 (3 prism)
N/A	85	DRStandard 80	DRStandard 50m, DR200+ >200m, DR300+ >300m	High-precision >120m, DR300+ >300m
N/A / 2000	210	DRStandard 120	DRStandard 70, DR200+ >600, DR300+ >800	High-precision >150, DR300+ >800
N/A / 0.02	0.09m (100m)	0.04m Horizontal & 0.08m Vertical (100m)	0.04m Horizontal & 0.08m Vertical (100m)	0.04m Horizontal & 0.08m Vertical (100m)
1	N/A	N/A	2,200 Autolock, 1,200 Robotic	700
85°/sec	N/A	N/A	25 grads/s / 23 deg/sec	115 deg/sec
	N/A	N/A	<2mm @ 200m standard deviation	<2mm @ 200m standard deviation
2 x 64 Mb intern + extern up to 2 TB	10,000 points	4Mb - 128MB Varies with Controller	4Mb - 128MB Varies with Controller	256Mb - 512MB Varies with Controller
Internal and external	Internal	Both	Both	Both
Y	N	Y	Y	Y
7 (RS-232C, USB type A, USB type mini B, CF mem card, Bluetooth, SS radio and RC-3)	1x RS232C	IR port two-way, RS232 two-way	Geo I/O two-way, RS-232 two-way	USB, RS-232 two-way
1 (2 optional)	2 / 2 / 1	2	2	2
Full-colour graphic screen	Graphic 128 x 64 pixel	8/40 or depends on Controller	4 row 20 characters or other depending on Controller	Reflective colour TFT LCD displayed at 320 x 240 pixels (QVGA) or other depending on Controller
26	25. Full numeric keyboard with alphanumeric entry	33, 28 or 22 depending on Controller	33 or other depending on Controller	19-key alphanumeric + 4-way arrow key or other depending on Controller
	173 x 168 x 335	370 x 222 x 185	Varies with optional accessories	385 x 190 x 185
6.5 (excl case)	5.3 w/o case	Approx 12.6	Approx 12.6	Approx 12.8
Standard	NiMH internal	NiMH	NiMH	Li-Ion
7.4/4.4	7.2V / 3.8Ah	6V / 3.5Ah internal, 6V / 7.0 Ah external	12V / 1.6Ah internal, 12V / 3.5 Ah external	11.1V / 4.4Ah internal, 11.1V / 13.2Ah external
4.5	15 (1x msr / 30sec)	8.5 internal, 12 external	3.5 - 7.0 (external depending on use)	6 internal, 18 external
Y	N	Y, supported in Controller	Y, supported in Controller	Y, supported in Controller
Y	N	Y	Y	Y
Y	Y	Y	Y	Y
Y	N	N	Y, ~15 points / min	Y, ~30 points / min
TopSURV OnBoard with ROADS, image scan and monitor pre-installed. Over 20 languages available. Class 1 laser. SS Radio and optical link (RC-3) optional for one-man operation.	Powerful and intuitive onboard programs. Includes data collection, staking programs, special programs, advanced feature coding options, etc.	Arctic -32°C variant available in 3"(0.9 mgon) and 5"(1.5 mgon) models. Contact Trimble dealer for more information.	Available as Servo, Autolock or Robotic. Communicates with a variety of Controllers with different software applications to best suit your every measurement need.	GPS Search for target acquisition within 3 sec. Trimble IS rover: Integrated Trimble GPS/GNSS and Trimble S6 robotic rover.

