COMPANY PROFILE

NAOVARAT SURVEYING COMPANY LIMITED

OFFICE OF LICENSING LAND SURVEY 'NAOVARAT SURVEY'

119/142 Moo6, Soi.101 Nawamin Road, Soi.101 Klongkum, Bungkum, Bangkok 10240

Telephone: 662-9483014-6, Fax: 662-9483017

URL: http://www.nvsurvey.com E-mail: nao.c@nvsurvey.com

DECEMBER 2019

INDEX

PART 1 COMPANY BACKGROUND AND RANGE OF SERVICES

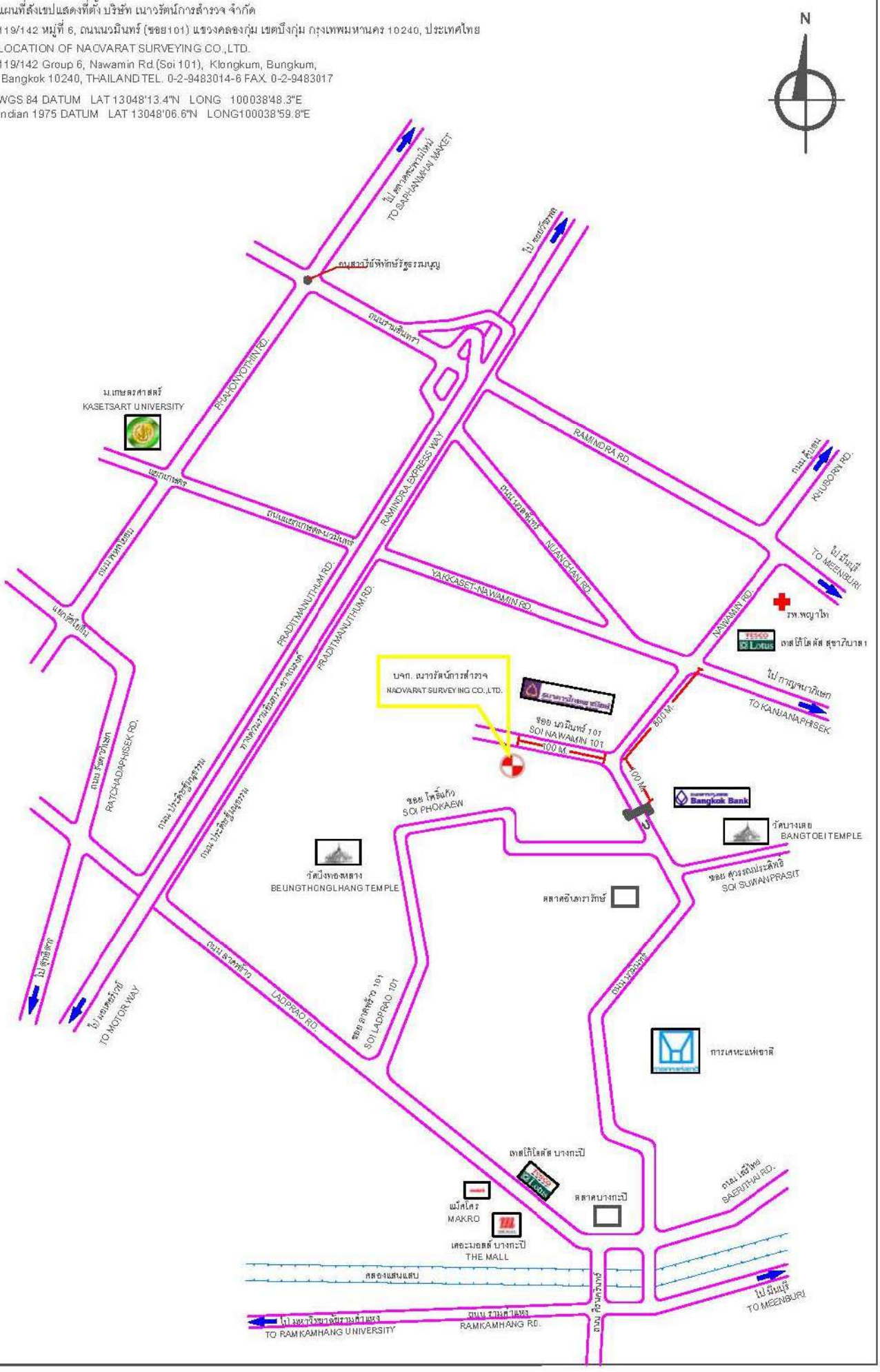
แผนที่สังเขปแสดงที่ตั้ง บริษัท เนาวรัตน์การสำรวจ จำกัด

119/142 หมู่ที่ 6, ถนนนวมินทร์ (ซอย101) แขวงคลองกุ่ม เขตบึงกุ่ม กรุงเทพมหานคร 10240, ประเทศไทย

LOCATION OF NAOVARAT SURVEYING CO.,LTD.

119/142 Group 6, Nawamin Rd.(Soi 101), Klongkum, Bungkum,
Bangkok 10240, THAILAND TEL. 0-2-9483014-6 FAX. 0-2-9483017

WGS 84 DATUM LAT 13048'13.4"N LONG 100038'48.3"E
Indian 1975 DATUM LAT 13048'06.6"N LONG100038'59.8"E



NAOVARAT SURVEYING COMPANY LIMITED

COMPANY PROFILE

COMPANY BACKGROUND

Naovarat Surveying Group was established in **February 1992** by three most experienced companies in the field of surveying and mapping.

1. **Naovarat Civil Engineering Ltd., Part.**
2. **Naovarat Office of Licensing Land Survey**
3. **Naovarat Surveying Company Limited**

And our company is servicing the Surveying Works such as Topographic Survey & digital Mapping, Route Survey & Road Design, Setting-out Survey, Pile Location Survey, Construction Survey, Survey Design, Subdivision Land Survey and Civil Work Construction Management for the purposes of Hotel, Apartment, Condominium, Factory, Sub-station and Housing Construction Projects. We also make the Surveying Works for calculation of cut and fill volume of mining project, access road project, air field project and so on. We got the license of Land Department can work Cadastral Survey in the name of Office of Licensing Land Surveyor “Naovarat Survey”. We made the above surveying works with modernized Electronic Survey Instrument, Computerized Data Transferring, Calculation and Plotting procedures and advanced communication & Transportation system. The details of the Instruments and computation lists are attached with the profile. Our company has already undertaken many projects in Thailand and we have many experiences in Surveying Field.

DIRECTORS

Mr.	Naovarat	Chaichart	Chairman
Mrs.	Praneet	Rungruangsri	Director
Mr.	Haris	Chaichart	Member
Miss.	Sauwalak	Chaichart	Member
Mrs.	Sudthiwan	Sathonghoy	Member
Mr.	Montri	Chaichart	Member
Mr.	Adisak	Teachai	Member

MANAGEMENT AND STAFFS

1.	Mr. Naovarat	Chaichart	Managing Director
2.	Ms. Sudthiwan	Sathonghoy	Financial/General Manager
3.	Mr. Suchat	Marn-Noi	Project Manager
4.	Mr. Surachet	Surachet	Project Manager
5.	Mr. Winai	Kaewsuwan	Project Manager
6.	Mr. Thinnawat	PethChai	Survey Engineer
7.	Ms. Wareerat	Onsri	Project Administrator
8.	Mr. Mungkon	Wanwong	Party Chief Surveyor
9.	Mr. Datpitak	Janead	Party Chief Surveyor
10.	Ms. Hunsa	Phungthong	Draftsman
11.	Mr. Nattpong	Pranee	Helper
12.	Mr. Jirasak	Khamker	Surveyor
13.	Ms. Kanlayanee	Chaichana	HR Officer / Administrator
14.	Ms. Somjit	Khumjai	Data Processer
15.	Mr. Rungfa	Khamkeaw	Assistant Surveyor
16.	Mr. Chao	Jankrajang	Helper
17.	Mr. Oatthachai	Chansiri	Driver
18.	Mr. Phitthaya	Phetrot	Party Chief Surveyor
19.	Mr. Pana	Sayjit	Surveyor
20.	Ms. Penpisut	Pakson	Data Processor
21.	Mr. Poramate	Siriwach	Civil Engineer
22.	Mr. Thanesuan	Muangruen	Draftsman
23.	Mr. Methee	Santhisong	Data Processor
24.	Mr. Kreangkai	Inoakson	Party Chief Surveyor
25.	Mr. Kittisak	Khunasa	Party Chief Surveyor
26.	Mr. Peerapon	Janejob	Draftsman
27.	Ms. Pradtana	Booncumchoo	Hr. Officer
28.	Mr. Jaran	Inleang	Driver
29.	Ms. Naree	Aelmmak	Data Processor
30.	Mr. Nattapong	Sukjam	Draftsman
31.	Ms. Janjira	Prakongjai	Occupational Safety Officer
32.	Mr. Warodom	Aiemsaard	Draftsman

33.	Mr. Khwanchon	Wutthisen	Engineer
34.	Ms. Lasinee	Umphy	GIS Officer
35.	Mr. Yoothakorn	Hongchaisakun	GIS Officer
36.	Mr. Saman	Phasomsup	Driver
37.	Mr. Korakot	Numburi	Surveyor
38.	Mr. Nopparoot	Sangmora	Surveyor
39.	Mr. Chaithawat	Muangmaithong	Surveyor
40.	Mr. Satapat	Intachot	Surveyor
41.	Mr. Adinant	Dolo	GIS Officer
42.	Ms. Yanin	Chandaeng	Data Processer
43.	Ms. Pud	Meesuk	Maid

SAFETY TEAMS

1.	Mr. Naovarat	Chaichart	Managing Safety Officer
2.	Mr. Suchat	Man-Noi	Managing Safety Officer
3.	Ms. Janjira	Prakongjai	Occupational Safety Officer
4.	Mr. Poramate	Siriwach	Permit to Work Authority
5.	Mr. Thanesuan	Muangruen	Permit to Work Authority
6.	Mr. Methee	Santhisong	Permit to Work Authority
7.	Mr. Kreangkai	Inoakson	Task Supervisor
8.	Mr. Kittisak	Khunasa	Task Supervisor
9.	Mr. Pana	Sayjit	Task Supervisor


บริษัท เนาวรัตน์การสำรวจ จำกัด

REGISTERED OFFICE

Naovarat Surveying Company Limited

119/142 Moo 6, Nawamin Road, Klongkum, Bungkum, Bangkok, 10240 Thailand

Phone +66 2 948 3014-6

Fax. +66 2 948 3017

WGS 84 DATUM Gepgraphic Coordinate: LAT 13.803767 N. LONG 100.646610 E

Company URL: http://www.nvsurvey.com

E-mail: nao.c@nvsurvey.com

RANGE OF SERVICES

- TOPOGRAPHIC SURVEY AND DIGITAL MAPPING
- GEOTECHNICAL ENGINEERING
- ROUTE SURVEY, ROAD SURVEY, SURVEY DESIGN
- SETTING OUT AND CONTROL SURVEY
- CONSTRUCTION SURVEY
- SUBDIVISION LAND SURVEY, CADASTRAL SURVEY
- GLOBAL NAVIGATION SATELLITE SYSTEM, (GNSS) SURVEYING
- UNMANNED AERIAL VEHICLE, (UAV / DRONE) PHOTOGRAMMETRY
- REMOTE SENSING & GEOGRAPHIC INFO SYSTEM
- ASSETS APPRAISAL
- INVENTORY SURVEY

PART 2 COMPANY DOCUMENTS

แบบ สช.๒

เลขที่ 62

ใบอนุญาตจัดตั้งสำนักงานช่างรังวัดเอกชน

ใบอนุญาตฉบับนี้ออกให้เพื่อแสดงว่า

บริษัท เนาวรัตน์การสำรวจ จำกัด

เป็นผู้ได้รับใบอนุญาตจัดตั้งสำนักงานช่างรังวัดเอกชน ชื่อ สำนักงานช่างรังวัดเอกชน เนาวรัตน์เซอเวย์

ตั้งอยู่เลขที่ 119/142 ตรอก/ซอย - ถนน นวมินทร์

หมู่ที่ 6 ตำบล/แขวง คลองกุ่ม อำเภอ/เขต บึงกุ่ม

จังหวัด กรุงเทพมหานคร

ออกให้ ณ วันที่ 7 กุมภาพันธ์ พ.ศ. 2546

(นายบัญญัติ จันทน์เสนะ)
ประธานกรรมการ

(นายไกวิทย์ พรหมจรรย์)
นายทะเบียน

PART 3 LIST OF PROJECT 2015-2019 YAER

LIST OF SOME PROJECTS UNDERTAKEN IN 2019 YEAR

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
1	1505	PTTEP Onshore Survey Services	Topographical Survey	3 Year	S1, Suphanburi, Konkaen, Udonthani	PTTEP PCL
2	1901	Clarified Water Unit Expansion, CWP	Topographical Survey	5 - 0 - 28 Rai	Asia IE., Ban Chang, Rayong	S. Napa (Thailand) Co., Ltd.
3	0952-2	Rajthewi Land	Topographical Survey	1-2-77 Rai	Petchaburi, Rajthevi, Bkk.	คุณพินนุวัฒน์ โทร. 086-516-551
4	1902	Shell KDR-Kittipachaneepun	Topographical Survey	4-0-0 Rai	Pakching, Nakornratchasima	Arcadia (Thailand) Co., Ltd.
5	1903	PORWOR INTERNATIONAL BUILDING	As-Built Drawing	5-SC Bldg.	Dusit, Bkk.	คุณศักดิ์สิน โรจน์สราญรมย์
6	1904	Shell Shell NTI Korat OB (Replace DO Jirasak)	Topographical Survey	4-1-24 Rai	BanMai, Nakornratchasima	Arcadia (Thailand) Co., Ltd.
7	1905	Shell Shell NTI Ratchapruek OB: Phetkasem to Borom	Topographical Survey	2-0-69 Rai	Bangramad, Talingchun, Bkk.	Arcadia (Thailand) Co., Ltd.
8	1906	Bang Chak Service Station	Topographical Survey	1-1-55 Rai	Sukhumvit6, Phrakanong, Bkk.	บมจ. บางจาก คอร์ปอเรชั่น
9	1907	Shell Phuttasakorn OB to Rama 2 - Adhoc Plot	Topographical Survey	3-1-26.8 Rai	RR # 3091, Nadi, Samutsakorn	Arcadia (Thailand) Co., Ltd.
10	1856	Shell Shell NTI HW 3574 Eastern Seaboard OB to HW 331	Topographical Survey	4-1-50 Rai	RR # 3574 , Siracha, Chonburi	Arcadia (Thailand) Co., Ltd.
11	1908	Shell 10042005 Varattaya Borikarn	Topographical Survey	2-2-91 Rai	HW # 331, Siracha, Chonburi	Arcadia (Thailand) Co., Ltd.
12	1909	Shell 10041796 VA - Rungpattana Best ServiceD	Topographical Survey	2-0-01 Rai	Ramkamhaeng, Minburi, Bkk.	Arcadia (Thailand) Co., Ltd.
13	1910	Na JomTian Land (T/D 74473)	Topographical Survey	0-1-33 Rai	NajomTian, Sattahip, Chonburi	บจก. สโนว์ เอสเตท
14	1911	Na JomTian Land (T/D 51511, 38839)	Topographical Survey	3-0-52.82 Rai	NajomTian, Sattahip, Chonburi	บจก. ซีสเคป โฮลดิ้งส์
15	1912	Shell NTI Preakasa OB to Theparak - Plot 2	Topographical Survey	3-0-25 Rai	RR # 3256, Praekasa, Samutprakarn	Arcadia (Thailand) Co., Ltd.
16	1913	Shell NTI Wangmanao OB to Bangkok	Topographical Survey	5-0-49.4 Rai	HW # 35, Wangmanao, Paktor, Rajburi	Arcadia (Thailand) Co., Ltd.
17	1914	Thai Oil Clean	Topographical Survey	500 Rai	Sukhumvit Rd., Tungsukla, Sriracha, Chonburi	Petrofac/Saipem/Samsung Consortium
18	1915	Wat Pra Ngoen Land	Topographical Survey	14 2 80 Rai	BangMuang, Bangyai, Nonthaburi	บจก. ไทยพัฒนกิจเจริญ
19	1916	Sarnies Project	As-Built Drawing	5-SC Bldg.	Charoen Krung Soi 42/1, Bangrak, Bkk.	Studiomake Co., Ltd
20	1917	NTS Udonthani OB to Khon Kaen	Topographical Survey	3-0-58 Rai	HW # 2, Banjan, MuangUdonthani	Arcadia (Thailand) Co., Ltd.
21	1918	Nong Prue Land	Topographical Survey	5-2-76 Rai	Nonprue, Banglamung, Chonburi	Patara Group
22	1919	Shell NTI Thepharak	Topographical Survey	4-0-6 Rai	Bangplee, Samutprakarn	Arcadia (Thailand) Co., Ltd.
23	1920	Ekchai 52 Land	Topographical Survey	0-1-9.2 Rai	Bangbon, Bkk.	คุณสมชาย เอื้ออารีรัชต์

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
24	1921	Shell NTI Phaholyothin - Pratunamprain - Plot2	Topographical Survey	3-0-0 Rai	Klongluang, Pathumthani	Arcadia (Thailand) Co., Ltd.
25	1922	Shell NTI HW 3013 PAKRUAM OB TO HW 331	Topographical Survey	3-0-7.5 Rai	RR # รย.3013, Bowin, Siracha, Chonburi	Arcadia (Thailand) Co., Ltd.
26	1923	Shell NTI HW 304 Korat OB to Kabinburi	Topographical Survey	3-0-7.5 Rai	Pruyai, Muang Nakornratchasima	Arcadia (Thailand) Co., Ltd.
27	1924	Thonburi Automotive Assembly Plant 1	Topographical Survey	34-0-0 Rai	Bang Mueang Mai, Mueang Samut Prakan	Mercedes-Benz Manufacturing (Thailand) Ltd.
28	1925	Shell NTI Phuket Rawai IB	Topographical Survey	3-0-0 Rai	RR # 4024, Rawai, Phuket	Arcadia (Thailand) Co., Ltd.
29	1926	Buildings of Public Health Ministry	Topo & Soil Test	21-0-38 Rai	Taladkwan, Muang Nonthaburi	Gateway Architect Co., Ltd.
30	1927	Shell NTI Romklao OB to Kanchanapisek	Topographical Survey	3-0-0 Rai	KlongSongTonNoon, Ladkrabang, Bkk.	Arcadia (Thailand) Co., Ltd.
31	1928	Shell NTI Poochaosamingpai OB	Topographical Survey	1-3-73 Rai	SamrongTai, Prapadang, Samutprakarn	Arcadia (Thailand) Co., Ltd.
32	1929	Sammakorn NualChan	Topographical Survey	32-3-65 Rai	Nualchan38, Bungkum, Bkk.	Sammakorn PLC.
33	1930	Bang Chak Service Station, Sukhumvit101/2	Topographical Survey	1-1-17 Rai	Bangna, Bkk.	Bang Chak Corp. PLC.
34	1931	Shell NTI Srinakarin OB (Opp.Gallonthong) car tent B	Topographical Survey	2-0-8.7 Rai	SamrongNua, Muang Samutprakarn	Arcadia (Thailand) Co., Ltd.
35	1932	BG Float Glass Factory	Topographical Survey	51-1-94 Rai	Malaiman Rd., Tabluang, Nakornpatom	BG Float Glass Co., Ltd.
36	1933	Bang Chak Service Station, Bangna-Trad KM.27	Topographical Survey	9-0-19 Rai	Tepratana Rd., Bangbor, Samutprakarn	Bang Chak Corp. PLC.
37	1934	Shell WANNASUK ROONGROENG LP. (BRANCH 1)	Topographical Survey	13-4-4.4 Rai	Paholyothin, Tanyaburi, Patumthani	Arcadia (Thailand) Co., Ltd.
38	1935	Shell NTI Tiwanon IB	Topographical Survey	1-1-81 Rai	Banmai, Pakkred, Nonthaburi	Arcadia (Thailand) Co., Ltd.
39	1936	Shell Rattanakosin IB - Plot 8	Topographical Survey	4-0-69.4 Rai	Tarang, Bangkhen, Bkk.	Arcadia (Thailand) Co., Ltd.
40	1937	Wastewater Pipeline, Ladkrabang IE.	Topographical Survey	2,813.86 เมตร	Chalongkrung Rd., Ladkrabang, Bkk.	S. Napa (Thailand) Co., Ltd.
41	1932	BG Float Glass Factory	Bathemetric Survey	5 Rai	Malaiman Rd., Tabluang, Nakornpatom	BG Float Glass Co., Ltd.
42	1938	SalaTumsop Land	Topographical Survey	30-1-03.52 Rai	Taweewattana, Bkk.	คุณธนบูลย์ อัศวณิชชากร
43	1840	Bang Chak Service Station, ByPass Phuket KM..4+700	Topographical Survey	3-2-17.5 Rai	RR # 4024, Rusada, Muang Phuket	Bang Chak Corp. PLC.
44	1939	Shell Saraburi OB to BKK Plot-5	Topographical Survey	12-3-23 Rai	Huaysai, Nongkae, Saraburi	Arcadia (Thailand) Co., Ltd.
45	1840	Shell NTI Thepprasit OB to HW 3	Topographical Survey	3-2-01 Rai	Nongprue, Banglamung, Chonburi	Arcadia (Thailand) Co., Ltd.
46	1941	Pirom	Construction Survey	2-3-93.6 Rai	Tedsaban1 , Samkok, Patumthani	J & N Estate Co., Ltd.
47	1942	Multipurpose Bldg. in AOT Suvarnaphumi Airport	Topographical Survey	1-1-16 Rai	Nongprue, Bangplee, Samutprakarn	Gateway Architect Co., Ltd.
48	1943	Rajpruex Mall	Topographical Survey	22-3-16.6 Rai	Bagramad, Talingchan, Bkk.	คุณธนบูลย์ อัศวณิชชากร

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
49	1944	1000_PTTEP_Corporate	Topographical Survey	30-3-71.73 Rai	Map Ta Phut Sub-District, Muang Rayong	PTTEP Corporate
50	1945	AVN Motor Works Factory	Topographical Survey	2-0-16 Rai	KLong1, Klonhluang, Patumthani	AVN Motor Works Co., Ltd.
51	1946	Bangpleeyai Land	Topographical Survey	9-0-0 Rai	BangpleeYai, Bangplee, Samutprakarn	Bang Chak Corp. PLC.
52	1947	Shell 10042199-CO POOTHONG PHANGNGA	Topographical Survey	4-0-96 Rai	TamNampud, Muang PhangNga	Arcadia (Thailand) Co., Ltd.
53	1948	Shell NTI HW3 OB Darasamut Opposite Chonsin B1	Topographical Survey	2-0-02 Rai	Bangpra, Siracha, Chonburi	Arcadia (Thailand) Co., Ltd.
54	1836	Baan K.Peat	Cadastral Survey	0-0-50 Rai	PracharadBampen6, Huaykwang, Bkk.	NA LAAN STUDIO
55	1705	Wastewater Treatment Plant Ph.2, AOT Don Muang	Setting Out Survey	3 Rai	Choedwuttakas Rd., DonMuang, Bkk.	บจก. ส. นภา (ประเทศไทย)
56	1949	Shell NTI_Soonthonkosa IB	Topographical Survey	2-0-95.28 Rai	Soontornkosa Rd., KLongToey, Bkk.	Arcadia (Thailand) Co., Ltd.
57	1950	Shell NTI HW 3466 Ban Kao - Amata OB - Plot 7	Topographical Survey	5-0-72 Rai	Bankao, PanTong, Chonburi	Arcadia (Thailand) Co., Ltd.
58	1951	Shell NTI Kingkaew OB	Topographical Survey	4-0-0 Rai	Rajataewa, Bangplee, Samutprakarn	Arcadia (Thailand) Co., Ltd.
59	1952	I-Sukhumvit	Topographical Survey	0-3-67.46 Rai	BangChak, Prakanong, Bkk.	บจก. เอ็นเอ็น โฮม ลีฟวิ่ง
60	1953	Preserve Food Specialty Factory	Topographical Survey	48-3-47 Rai	Kokkam, Muang Samutsakorn	บจก. พรีเซิร์ฟ ฟู้ด สเปเชียลตี้
61	1955	Shell KDR 10042004 Sor.Kobkia Service ltd., Part	Topographical Survey	4-0-0 Rai	Suwansorn Rd., Wangkrajome, Nakornnayok	Arcadia (Thailand) Co., Ltd.
62	1956	Shell NTI HW#3466 Ban Gao Amata OB to HW 3-Plot 5	Topographical Survey	4-2-42 Rai	Bankao, PanTong, Chonburi	Arcadia (Thailand) Co., Ltd.
63	1957	Residential House	As-Built Drawing	0-0-70 Rai	Ramindra61, Bangkhen, Bkk.	คุณจริชนัดถ์ สุขพรรณพิมพ์
64	1958	HW 2 Sida OB to Khon Kaen - Plot 2	Topographical Survey	3-2-00 Rai	SamMUang, Sida, Nakornratchasima	Arcadia (Thailand) Co., Ltd.
65	1959	Oil and Gas Pipeline, GTP, M3 & MOGE	Consultancy	1 Year	Myanmar	PTTEP Int'l
66	1960	Bang Chak Service Station, Sukapiban5	Topographical Survey	8-3-56.5 Rai	OrNgoen, Saimai, Bkk.	Bang Chak Corp. PLC.
67	1961	Residential House	Topographical Survey	0-1-34 Rai	Jaransanitwong 32, Bangkoknoi, Bkk.	คุณนวภัค ผลกานนท์
68	0917	Coal Stock, Nadi	Inventory Survey	10,000 Ton	Nadi, Samutsakorn	Asia Green Energy PCL
69	1868	Coal Stock (Unique Mining Service)	Inventory Survey	30,000 Ton	NakornLuang, Ayudhaya	Asia Green Energy PCL
70	1872	Coal Stock (New Yard)	Inventory Survey	200,000 Ton	NakornLuang, Ayudhaya	Asia Green Energy PCL
71	1271	Coal Stock (Exist'g Yard)	Inventory Survey	350,000 Ton	NakornLuang, Ayudhaya	Asia Green Energy PCL
72	1962	New Fuji Hotel	As-Built Drawing	5-SC Bldg.	Surawong Road, BangRak, Bkk.	Marutaya Realestate (Thailand) Co., Ltd.

LIST OF SOME PROJECTS UNDERTAKEN IN 2018 YEAR

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
1	1505	PTTEP Onshore Survey Services	Topographical Survey	3 Years	S1, Suphanburi, Konkaen, Udonthani	PTTEP PCL
2	1801	Shell NTI KhonKaen OB to Korat (Plot3)	Topographical Survey	5-0-0 Rai	ถนนมิตรภาพ (ทล.2) ตำบลท่าพระ อำเภอเมืองขอนแก่น จังหวัดขอนแก่น	Arcadia (Thailand) Co., Ltd.
3	1802	RAnIndra 40 Land	Cadastral Survey	8-2-4.10 Rai	ซอยรามอินทรา 40 ถนนนวลจันทร์ แขวงคลองกุ่ม เขตบึงกุ่ม กรุงเทพมหานคร	นางปิยวรรณ เชื้อชวลิต
4	1803	ที่ดินซอยนวมินทร์ 111	Cadastral Survey	1-3-77.9 Rai	ซอยนวมินทร์111 แยก 4-2 แขวงคลองกุ่ม เขตบึงกุ่ม กรุงเทพ	นายเอกสิทธิ์ เจริญอาภรณ์วัฒนา
5	1761	Relocate 2017	Survey&Drawings	50 STA	Central & Eastern Region	BB Technology Co., Ltd.
6	1804	NW_EVP_CI_NEW BUILD 2018	Survey&Drawings	50 STA	Central & Eastern Region	BB Technology Co., Ltd.
7	1805	โรงงานมุ่งมั่นวัฒนา คลอง9	Topographical Survey	7-2-85.1 Rai	ทางหลวงชนบท ปท. 3028 หมู่ที่ 1 ตำบลลำลูกกา อำเภอลำลูกกา จังหวัดปทุมธา	บริษัท มุ่งมั่นวัฒนา จำกัด (สำนักงานใหญ่)
8	1806	ILM ชัยพฤกษ์	Topographical Survey	5-0-44.9 Rai	ถนนราชพฤกษ์ ตำบลบางพลับ อำเภอปากเกร็ด จังหวัดนนทบุรี	บริษัท อินเด็กซ์ ลิฟวิ่งมอลล์ จำกัด
9	1807	MRTA_Purple-South Line	Topographical Survey	15 กม.	ช่วงเตาปูน-ราษฎร์บูรณะ กรุงเทพมหานคร	CH. Karnchang PCL.
10	1808	Nong Chok Land	Topographical Survey	1-3-72.5 Rai	หมู่ 8 แขวงหนองจอก เขตหนองจอก กรุงเทพมหานคร	บริษัท ณวรางค์ แอสเซท จำกัด
11	1809	Bang Son Land	Cadastral Survey	0-3-39 Rai	ตำบลบางซ่อน อำเภอบางซื่อ กรุงเทพฯ	บริษัท เดอะเพรคทิเคิลโซลูชั่น จำกัด
12	1810	M Project	Topographical Survey	1-0-46.7 Rai	ถนนสุขุมวิท แขวงพระโขนงเหนือ เขตวัฒนา กรุงเทพมหานคร	Magnollia Qulity Development Corp.
13	1811	ก่อสร้างอาคารที่พักอาศัยของทหารผ่านศึก	Topographical Survey	12-1-70 Rai	ถนนรามอินทรา แขวงอนุสาวรีย์ เขตบางเขน กรุงเทพมหานคร	บริษัท เกทเวย์ อาร์คิเท็ค จำกัด
14	1812	Surat OB After Cenrtal - Additional Plot 2	Topographical Survey	4-0-0 Rai	ตำบลวัดประดู่ อำเภอเมืองสุราษฎร์ธานี จังหวัดสุราษฎร์ธานี	Arcadia (Thailand) Co., Ltd.
15	1813	Kaew Shop	Topographical Survey	14-2-71.98 Rai	794/12-13 หมู่ 2 ตำบลท่าม่วง อำเภอท่าม่วง จังหวัดกาญจนบุรี 71110	บริษัท เอสซีเอส โกลบอล เทรดดิ้ง จำกัด
16	1814	Shell NTI Kho Hin Sorn IB- Plot 1	Topographical Survey	5-0-0 Rai	ตำบลโคกไทย อำเภอศรีมโหสถ จังหวัดปราจีนบุรี	Arcadia (Thailand) Co., Ltd.
17	1815	Baan SamPatu	Topographical Survey	1-1-16.10 Rai	ซอยเพชรบุรี 47 แยก 4 แขวงบางกะปิ เขตห้วยขวาง กรุงเทพมหานคร	คุณสาวิตรี หาญสงคราม
18	1816	Shell Borom IB Phuttamonthon Sai 4	Topographical Survey	4-0-0 Rai	ถนนบรมราชชนนี แขวงศาลาธรรมสพน์ เขตทวีวัฒนา กรุงเทพมหานคร	Arcadia (Thailand) Co., Ltd.
19	1817	Shell NTI Banglamung OB to Motorway 7	Topographical Survey	6-3-38.3 Rai	ถนนสุขุมวิท ตำบลนาเกลือ อำเภอบางละมุง จังหวัดชลบุรี	Arcadia (Thailand) Co., Ltd.
20	1818	Minburi Land	Cadastral Survey	6-0-82 Rai	ตำบลทรายกองดิน อำเภอมีนบุรี กรุงเทพน	คุณสุวินัย สุวรรณหิรัญกุง
21	1819	Shell Shell NTI Lumlooka OB - Plot 19	Topographical Survey	4-1-93.4	ถนนลำลูกกา ตำบลบึงลาดสวาย อำเภอลำลูกกา จังหวัดปทุมธานี	Arcadia (Thailand) Co., Ltd.
22	1647	Muang Jang Land	Topographical Survey	43-3-57.95 Rai	ตำบลเมืองจัง อำเภอเมืองน่าน จังหวัดน่าน	คุณ พิศิษฐ์ ปัทมสัตยาสนธิ
23	1820	IF1818-Cha-Am Residence	Topo & As-Built	16-0-67.81 Rai	เลขที่ 264 ซอยร่วมจิต ตำบลชะอำ อำเภอชะอำ จังหวัดเพชรบุรี	คุณถวิดา พิชเยนทรโยธิน
24	1821	Shell NTI Surat Bangkung OB (Thai Watsadu)	Topographical Survey	4-0-2.4 Rai	401 ตำบลท่าทองใหม่ อำเภอกาญจนดิษฐ์ จังหวัดสุราษฎร์ธานี	Arcadia (Thailand) Co., Ltd.
25	1822	SMK_BKP	Cadastral Survey	12 Plots	ซอย110และ112 ถนนรามคำแหง แขวงสะพานสูง เขตสะพานสูง กรุงเทพฯ	บริษัท สัมมากร จำกัด (มหาชน)
26	1823	Shell NTI Khon Kaen IB to Town Plot3	Topographical Survey	5-0-0 Rai	ถนนมิตรภาพ (ทล.2) ตำบลท่าพระ อำเภอเมืองขอนแก่น จังหวัดขอนแก่น	Arcadia (Thailand) Co., Ltd.

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
27	1824	Shell NTI Kanchanaphisek to Samkhok Part1	Topographical Survey	5-2-69.7 Rai	ตำบลบางกระบือ อำเภอสามโคก จังหวัดปทุมธานี	Arcadia (Thailand) Co., Ltd.
28	1825	ChaRoen Nakorn Land	Topographical Survey	1-2-76.25 Rai	ซอยเจริญนคร 58 ถนนเจริญนคร แขวงสำเหร่ เขตธนบุรี กรุงเทพมหานคร 10600	บริษัท ณวรางค์ แอสเซท จำกัด
29	1826	Aluminiam Factory	As-Built Drawing	3- 2- 32.33 Rai	หมู่ที่20 ถนนนวนคร 5/4 ตำบลคลองหนึ่ง อำเภอคลองหลวง จังหวัดปทุมธานี	บริษัท โกลด์สตาร์เมททอล จำกัด
30	1827	Seagate Technology, Theparuk Plant	Topographical Survey	45-3-00 Rai	1627 Moo7, Teparuk Road, Tumbol Teparuk, Amphoe Mueang Samutprak	Seagate Technology (Thailand) Co., Ltd.
31	1828	Shell Shell NTI Rattanakosin OB	Topographical Survey	3-1-92 Rai	ถนนเทพรักษ์ แขวงท่าแร้งเขต บางเขน กรุงเทพมหานคร	Arcadia (Thailand) Co., Ltd.
32	1829	Rayong to Suttahip (Ban Chang) – Plot 3	Topographical Survey	2-3-90.4 Rai	ถนนสุขุมวิท ตำบลบ้านฉาง อำเภอบ้านฉาง จังหวัดระยอง	Arcadia (Thailand) Co., Ltd.
33	1830	Bang Bua Thonf Land	Topographical Survey	26-1-88.33 Rai	ถนนรัตนาธิเบศร์ ตำบลเสาธงหิน อำเภอบางใหญ่ จังหวัดนนทบุรี	บริษัท เกรทแลนด์ ดีเวลลอปเม้นท์ จำกัด
34	1831	Shell Shell NTI HW 331 Between HW 332	Topographical Survey	5-0-0 Rai	ถนนสายสัตหีบ-ฉะเชิงเทรา (ทล.331) ตำบลพลูตาหลวง อำเภอสัตหีบ จังหวัดชล	Arcadia (Thailand) Co., Ltd.
35	1832	MRT_ORANGE_WEST LINE	Topographical Survey	11 Km.	Bangkok, THAILAND.	CH. Karnchang PCL.
36	1833	Pattanakrit Oil	Topographical Survey	2-0-8.90 Rai	ถนนกาญจนาภิเษก แขวงบางไผ่ เขตบางแค กรุงเทพมหานคร	Arcadia (Thailand) Co., Ltd.
37	1834	RAMA 3 Thapra-Opposite Sasi Service Brl	Topographical Survey	2-3-58 Rai	ถนนรัชดาภิเษก แขวงบุคคโล เขตธนบุรี กรุงเทพมหานคร	Arcadia (Thailand) Co., Ltd.
38	1835	Shell Shell NTI Chachoengsao OB	Topographical Survey	6-0-0 Rai	ถนนสุวินทวงศ์ ตำบลวังตะเคียน อำเภอเมืองฉะเชิงเทรา จังหวัดฉะเชิงเทรา	Arcadia (Thailand) Co., Ltd.
39	1836	Baan K.Peat	Topographical Survey	0-0-75.4 Rai	ถนนประชาราษฎร์บำเพ็ญ 6 แขวงห้วยขวาง เขตห้วยขวาง กรุงเทพมหานคร	บริษัท ยีลด์ โกลบอล จำกัด
40	1837	Shell Choke Satien, Serviced Station	Topographical Survey	5 Rai	ถนนสุพรรณบุรี-ชัยนาท ตำบลบ้านกล้วย อำเภอเมืองชัยนาท จังหวัดชัยนาท	Arcadia (Thailand) Co., Ltd.
41	1838	Shell Bang Na Km 6.5	Topographical Survey	5 Rai	ถนนเทพรัตน ตำบลบางแก้ว อำเภอบางพลี จังหวัดสมุทรปราการ	Arcadia (Thailand) Co., Ltd.
42	1839	Shell NTI_Phuket Bypass OB (Adhoc Plot)	Topographical Survey	3-2-76 Rai	ถนนเฉลิมพระเกียรติ (บายพาส) ตำบลรัษฎา อำเภอเมืองภูเก็ต จังหวัดภูเก็ต	Arcadia (Thailand) Co., Ltd.
43	1840	Bang Chak, Serviced Station	Topographical Survey	5 Rai	ทางหลวงแผ่นดินหมายเลข 4024 ตำบลรัษฎา อำเภอเมืองภูเก็ต จังหวัดภูเก็ต	Bang Chak Corp. PLC.
44	1841	Sammakorn Place (Renovate Hospital Area)	Topographical Survey	7-1-83.61 Rai	ถนนรามคำแหง แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร 10240	Pure Sammakorn Development Co., Ltd.
45	1842	Shell Shell NTI_Phuket Bypass IB (Additional A)	Topographical Survey	3-1-50 Rai	ถนนเฉลิมพระเกียรติ (บายพาส) ตำบลเกาะแก้ว อำเภอเมืองภูเก็ต จังหวัดภูเก็ต	Arcadia (Thailand) Co., Ltd.
46	1843	The Wish @ Pa Klok	Topographical Survey	46-1-11.7 Rai	ซอยประเสริฐ ตำบลป่าคลอก อำเภอถลาง จังหวัดภูเก็ต	Patara Group
47	1844	Shell NTI Chachonegsao (Bangnatrad - Motorway)	Topographical Survey	5-0-0 Rai	ถนนเทพรัตน ตำบลบางสมัคร อำเภอบางปะกง จังหวัดฉะเชิงเทรา	Arcadia (Thailand) Co., Ltd.
48	1845	IF 1828 : PETCHBURI 11 HOTEL	Topographical Survey	1-1-78.87 Rai	เลขที่ 7 ซอยเพชรบุรี11 แขวงพญาไท เขตราชเทวี กรุงเทพมหานคร	Wanna Assets Co., Ltd.
49	1846	Shell NTI Motorway 3 & 7 to Phanat Nikom - Plot 1	Topographical Survey	5-0-0 Rai	ถนนศุขประยูร ตำบลหนองตำลึง อำเภอพานทอง จังหวัดชลบุรี	Arcadia (Thailand) Co., Ltd.
50	1847	Shell NTI Suwinthawong IB - Plot 2	Topographical Survey	4-0-0 Rai	ถนนสุวินทวงศ์ แขวงลำผักชี เขตหนองจอก กรุงเทพมหานคร	Arcadia (Thailand) Co., Ltd.
51	1848	Crown Bevcan Nongkae	Topographical Survey	16-1-72.94 Rai	Kokyae Sub-District, Nong Kae District, Saraburi, THAILAND.	CHO RUNGLERT GROUP CO., LTD.
52	1849	Nawamin Shopping Mall	Topographical Survey	6-1-42.05 Rai	ซอยนวมินทร์ 70 แขวงคลองกุ่ม เขตบึงกุ่ม กรุงเทพมหานคร 10230	Open Space Design Co., Ltd.
53	1850	Shell NTI Hatyai to Airport	Topographical Survey	4-0-0 Rai	ถนนสนามบิน ตำบลควนลัง อำเภอหาดใหญ่ จังหวัดสงขลา	Arcadia (Thailand) Co., Ltd.
54	1851	Shell NTI Rayong OB to Klang	Topographical Survey	5-0-0 Rai	ถนนสุขุมวิท ตำบลตะพง อำเภอเมืองระยอง จังหวัดระยอง	Arcadia (Thailand) Co., Ltd.

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
55	1852	รพ.ศัลยกรรมเสิริ	Topographical Survey	1-1-97.98	ถนนพระรามที่ 3 แขวงบางโคล่ เขตบางคอแหลม กรุงเทพมหานคร	บริษัท ศรัณย์การแพทย์ จำกัด
56	1853	MEA	GNSS Static Survey	5 กม.	กรุงเทพมหานคร	PJ SURVEY AND CONSTRUCTION CO., LTD.
57	1854	Shell NTI Borom IB Phuttamonthon Sai4	Topographical Survey	5-2-87.5 Rai	ถนนบรมราชชนนี แขวงศาลาธรรมสพน์ เขตทวีวัฒนา กรุงเทพมหานคร	Arcadia (Thailand) Co., Ltd.
58	1763-1	Shell NTI Lumlooka IB (Plot3)	Topographical Survey	3-3-0 Rai	(ถนนลำลูกกา) ตำบลบึงคำพร้อย อำเภอลำลูกกา จังหวัดปทุมธานี	Arcadia (Thailand) Co., Ltd.
59	1855	Shell NTI Kanchanapisek IB After Central Westgate	Topographical Survey	5-0-80.6 Rai	(ถนนกาญจนาภิเษก) ตำบลบางม่วง อำเภอบางใหญ่ จังหวัดนนทบุรี	Arcadia (Thailand) Co., Ltd.
60	1653-1	Happy Ville, Don Muang	Setting Out Survey	5 Rai	ถนนเทิดราชัน 13 แขวงสีกัน เขตดอนเมือง กรุงเทพ	Nirun Plaza Co., Ltd.
61	1856	Shell NTI HW 3574 Eastern Seaboard OB to HW 331	Topographical Survey	5 Rai	ตำบลเขาคันทรง อำเภอศรีราชา จังหวัดชลบุรี	Arcadia (Thailand) Co., Ltd.
62	1857	Advertising Board along BTS Route	Topographical Survey	5 Sta	กรุงเทพมหานคร	BB Technology Co.,Ltd.
63	1858	Shell NTI Nakhon-In After Kanchanpisek-Adhoc Plot	Topographical Survey	2-0-55.4 Rai	ตำบลบางไผ่ อำเภอบางใหญ่ จังหวัดนนทบุรี	Arcadia (Thailand) Co., Ltd.
64	1859	10041885_THAT PETROLEUM CO LTD (HO)	Topographical Survey	3-2-92 Rai	ตำบลท่ามะขาม อำเภอเมือง จังหวัดกาญจนบุรี	Arcadia (Thailand) Co., Ltd.
65	1860	Sammakorn BangKapi, Lake 1	Topographical Survey	35-0-78 Rai	ซอยรามคำแหง 112 แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร	Sammakorn PLC.
66	1861	Shell_SURAKUL SERVICE LP. (BRANCH 1)	Topographical Survey	2-0-89.6 Rai	ตำบลชะอำ อำเภอชะอำ จังหวัดเพชรบุรี	Arcadia (Thailand) Co., Ltd.
67	1862	Eastern Economic Corridor of Innovation	Topographical Survey	43-3-62 Rai	Payupnai SubDistrict, WangChan District, Rayong Province, THAILAND	PTT PLC.
68	1736-1	Shell NTI Lumlooka IB (Plot3)	Topographical Survey	3-3-0 Rai	(ถนนลำลูกกา) ตำบลบึงคำพร้อย อำเภอลำลูกกา จังหวัดปทุมธานี	Arcadia (Thailand) Co., Ltd.
69	1863	Shell NTI HW43 Hadvai OB to Chana – Plot	Topographical Survey	4-2-29 Rai	ตำบลนาหม่อม อำเภอนาหม่อม จังหวัดสงขลา	Arcadia (Thailand) Co., Ltd.
70	1864	KBLC 3 Project	Topographical Survey	19-3-75 Rai	KM19 Theparuk Road, Yaek Klong5, Samutprakarn, THAILAND.	Kerry Logistics (Bangna) Limited.
71	1865	Condo ถนนพระราม9 ซอย 55 และซอย 57	Topographical Survey	3-2-10.2 Rai	แขวงสวนหลวง เขตสวนหลวง กรุงเทพมหานคร	คุณพิมพ์พัณ หงส์ปาน
72	1866	Mayfari Garden & Garden Grove	Topographical Survey	1 Rai	59 ถนนสุขุมวิท 16 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร	บริษัท ภัทรา จำกัด
73	1867	Coal Stock, Lucky	Inventory Survey	20,000 Ton	8/1 หมู่ 1 ตำบลแม่ลา อำเภอนครหลวง จังหวัดอยุธยา	Asia Green Energy PCL
74	1868	Coal Stock, Uique Mining	Inventory Survey	60,000 Ton	8/1 หมู่ 1 ตำบลแม่ลา อำเภอนครหลวง จังหวัดอยุธยา	Asia Green Energy PCL
75	1869	V T MOVE Building	As-Built Drawing	2-SC-House	30/1 หมู่ที่ 14 ตำบลบางครุ อำเภอพระประแดง จังหวัดสมุทรปราการ	VT Move & Service Co., Ltd.
76	1870	NTS Suksawat IB After HW 9	Topographical Survey	1-2-09 Rai	ตำบลบางพึ่ง อำเภอพระประแดง จังหวัดสมุทรปราการ	Arcadia (Thailand) Co., Ltd.
77	1871	Shell NTI Chaiyapruek OB	Topographical Survey	2-1-36.3 Rai	ตำบลคลองพระอุดม อำเภอปากเกร็ด จังหวัดนนทบุรี	Arcadia (Thailand) Co., Ltd.
78	0917	Coal Stock, Nadi	Inventory Survey	10,000 Ton	Nadi, Samutsakorn	Asia Green Energy PCL
79	1271	Coal Stock (Exist'g Yard)	Inventory Survey	350,000 Ton	NakornLuang, Ayudhaya	Asia Green Energy PCL
80	1872	Coal Stock (New Yard)	Inventory Survey	100,000 Ton	NakornLuang, Ayudhaya	Asia Green Energy PCL
81	1873	Bang Chak, Ladkrabang	Topographical Survey	4-1-63.6 Rai	ถนนลาดกระบัง แขวงลาดกระบัง เขตลาดกระบัง กรุงเทพมหานคร	Bang Chak Corp. PLC.
82	1874	Shell_GALLONTONG SERVICE CO., LTD.	Topographical Survey	3-0-34.5 Rai	ถนนศรีนครินทร์ ตำบลบางเมือง อำเภอเมือง จังหวัดสมุทรปราการ	Arcadia (Thailand) Co., Ltd.

LIST OF SOME PROJECTS UNDERTAKEN IN 2017 YEAR

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
1	1505	PTTEP Onshore Survey Services	Topographical Survey	3 Year	S1, Suphanburi, Konkaen, Udonthani	PTTEP PCL
2	1701	Sammakorn Avenue Suvanabhumi	Topographical Survey	30 Rai	Ladkrabang, Bangkok	Sammakorn PCL
3	1615	Rangsit Pharmaceutical Plant (Phase II)	Topo & Soil Test	63 Rai	Thanyaburi, Pathumthani	Arcadia (Thailand) Co., Ltd.
5	1657	Dtac, NW Evolution_New Build2017	Survey&Drawings	18 Sites	Central & Eastern Region	BB Technology Co.,Ltd.
6	1704	Shell_MontianRungRueng	Topographical Survey	5 Rai	Bangplee, Samutprakarn	Arcadia (Thailand) Co., Ltd.
8	1657	Dtac, NW Evolution_New Build2017	Survey & Drawing	49 Sites	Central / Eastern Region	BB Technology Co.,Ltd.
9	1702	T &T Blind Office Building	Setting Out Survey	586 Points	Bangplee Yai, Samutprakarn	บจก. แดง มิลลิเทค
10	1703	Sukhumvit 69 Godown	Topo & As-Built	800 m^2	Sukhumvit69, Wattana, Bkk.	บจก. สตูดิโอเมค
11	1622	Grand Town 2	Topo & Volume	33-2-53 Rai	Bung, Siracha, Chonburi	Patara Group
13	1704	Shell, AOT	Topographical Survey	5 Rai	Nongprue, BangPlee, Samutprakarn	Arcadia (Thailand) Co., Ltd.
15	1705	Waste water treatment plant, AOT	Topographical Survey	3 Rai	Sigun, DonMuang, Bkk.	S.NAPA THAILAND CO., LTD.
17	1706	HW#345	Topographical Survey	27 Rai	Bangkuwat, Muang Patumtjani	The Walk
18	1707	2 Storey Residential House	Setting Out Survey	200 Points	ArinAmarin, BangkokNoi, Bkk.	คุณสุมาลี เหลืองภัทรเมธี
19	1708	Baan Taksin	Topographical Survey	2 Rai	Bookalo, Thonburi, Bkk.	คุณวรวุฒิ เอื้ออารีมิตร
20	1709	Suvarnbhumi Klong8	Topographical Survey	30 Rai	Bangpla, BangPlee, Samutprakarn	คุณสมพงษ์ ชลคดีดำรงกุล
21	1710	Yannix	Cadastral Survey	4 Rai	Takam, BangkunTian, Bkk.	Yannix Thailand Co., Ltd.
22	1711	Ploenchit Building	Topographical Survey	6-0-28 Rai	Ploenchit Road, Lumpini, Pathumwan, Ban	Raimon Land Public Company Limited
23	1712	KrungThepKreeTha Land	Topographical Survey	1 Rai	KrunthepKreeta8, SuanLuang, Bkk.	คุณสุทธิเดช เหลืองทองคำ
24	1713	Provincial Water Authority, PWA	Topographical Survey	3 Rai	PongnNGam, MaeSai, Chiangrai	Team Cosulting
25	1714	Bann SookSomboon	Cadastral Survey	167 m^2	RanIndra, Kannayao, Bkk.	คุณจิตพร พิริยะอนนท์ โทร. 062 597 8959

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
26	1715	BaanNa Land	Cadastral Survey	16-3-62 Rai	BanNa, KaoChamao, Rayong	นายภูเมธ จิววรภัทร โทร. 098 568 2595
27	1716	Shell,NTI Chonburi Laemchabang	Topographical Survey	7-0-83 Rai	Nonhkam, SiRacha, Chonburi	Arcadia (Thailand) Co., Ltd.
28	1717	Pracha U-Thit Land	Topographical Survey	44-3-92 Rai	PrachaU-Thit Rd., WangtongLang, Bkk.	บจก. อรรถเดหพัฒน์
29	1718	Wat PoEn Land	Topographical Survey	1 Rai	Yannawa, Bkk.	Punjapol Property Group
30	1719	True Cellular Tower, Prue Kra Tiam B Well Location, S1	Survey&Drawings	1 No.	BANGRAKAM, PHITSANULOK	True Connect Co., Ltd.
31	1720	KlongKum Land	Cadastral Survey	0-2-21 Rai	Klongkum, Bungkum, Bkk	คุณสมบูณ์
32	1721	Hua Mak Land	Cadastral Survey	0-2-00	HuaMark, Bangapi, Bkk.	นายพิพัฒน์
33	1722	Hua Mak Land	Cadastral Survey	0-2-00	HuaMark, Bangapi, Bkk.	นายพิพัฒน์
34	1723	Hua Mak Land	Cadastral Survey	0-2-00	HuaMark, Bangapi, Bkk.	นายพิพัฒน์
35	1724	NTS ESSO Nikom 304	Topographical Survey	3-1-50.7 Rai	HW # 3079 , Si Mahapot, Prachinburi	Arcadia (Thailand) Ltd.
36	1725	Saimai Land	Cadastral Survey	0-0-99.9 Rai	SaiMAi, BangKunTian, Bkk	คุณจรรยพร
37	1726	WangNoi Beverage	Topographical Survey	5 Rai	Lamsai, WangNoi, Ayudhaya	S napa Co., Ltd.
38	1727	SUKHUMVIT 26	Topographical Survey	1-3-37 Rai	KLONGTON, KLONGTOEY, BKK.	RAIMON LAND PCL
39	1728	Showroom and Serviced Center	Piling	5 Rai	Muang Surat Thani	บริษัท พรีเมจ ออโตโมบิล จำกัด
40	1729	Hua Mak Land	Cadastral Survey	0-1-17 Rai	HuaMark, Bangapi, Bkk.	คุณนิภา
41	1730	Hua Mak Land	Cadastral Survey	0-1-17 Rai	HuaMark, Bangapi, Bkk.	คุณนิภา
42	1731	Kannayao Land	Cadastral Survey	25 Rai	Kannayao, Bkk	Regent Technology Co., Ltd.
43	1732	PrachasongKrau Land	Cadastral Survey	0-1-13.2 Rai	Din Dang, Bkk	คุณสุวิทย์
44	1733	Baan K.Jenny	Topographical Survey	3-3-33.5 Rai	Phayathai, Bkk.	PornCharoen Yotha Co., Ltd.
46	1735	Shell Shell NTI Nikom 304 (Praphrom)	As-Built Drawing	5 Rai	Tha Toom, Sri Mahaphot, Prachinburi	Arcadia (Thailand) Co., Ltd.
47	1736	Shell Shell NTI Nikom 304 (Nikom Entrance)	Topographical Survey	5 Rai	Tha Toom, Sri Mahaphot, Prachinburi	Arcadia (Thailand) Co., Ltd.

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
48	1737	Shell NTI Bypass Motorway 7	Topographical Survey	5Rai	Nong Kang Kog, Amphur Mueng, Chonbu	Arcadia (Thailand) Co., Ltd.
49	1738	Chivasai Resort	Topographical Survey	20 Rai	HinLekFai, Hua Hin, Prajuabkirikant	บจก.เอ็ม.เค.พี.ซี.คอร์เปอร์เรชั่น จำกัด
50	1653	Happy Ville DonMuang	Topographical Survey	20 Rai	Toedrachan13, DonMuang, Bkk.	Nirun Plaza Co., Ltd.
51	1739	Paolo Hospital	Topographical Survey	5-0-00 Rai	BanfgSue, Bkk.	Pholo Mwdic Co., Ltd.
52	1740	KrungThon Land	As-Built Drawing	2 Rai	KlongTonsai, Klongsan, Bkk.	บริษัท เอดีซี-เจวี 11 จำกัด
53	1741	Shell NTI Plangyao (Plot 5)	Topographical Survey	6-2-99 Rai	HW#304, Samednue, Chachooenggsao	Arcadia (Thailand) Co., Ltd.
54	1743	โรงเรียนสองภาษาลาดพร้าว	Cadastral Survey	7-1-34 Rai	Ladprao126, WangThongLang, Bkk.	บมจ.โรงพยาบาลลาดพร้าว
55	1744	Amata Factory	Construction Survey	1 Rai	Amata IE. (Ph. 9), Panthong, Chonburi	S&S Pattarachard Co., Ltd.
56	1745	Ideo Sathorn Project	Topographical Survey	2-0-00 Rai	Sathorn Soi 12, Bkk.	Raimon Land Public Company Limited.
57	1746	Shell NTI Suksawat IB Before HW9 (Plot4)	Topographical Survey	4-0-0 Rai	Phra Samut Chedi District, Samut Prakan	Arcadia (Thailand) Co., Ltd.
58	1747	KlongKum Land	Topographical Survey	0-1-16 Rai	Klongkum, Bungkum, Bkk.	น.ส.ภัคภร จารุกิจกุล
59	1748	BangBor Land	Cadastral Survey	5 Rai	BnagBor, Samutprakarn	บจก.ยูเซ็น โลจิสติกส์ (ประเทศไทย)
60	1749	RAMA2 After Kanchanapisek Plot 3	Topographical Survey	5 Rai	ถนนพระราม 2 แขวงท่าข้าม เขตบางขุนเทียน ก	Arcadia (Thailand) Co., Ltd.
61	1750	Koasarn Chabad House	Topographical Survey	1 Rai	ถนนข้าวสาร แขวงบางลำภู เขตพระนคร กรุงเท	STIID CO.,LTD
62	1751	ที่ดินหัวหมาก	Cadastral Survey	2-1-61.4 Rai	ตำบลหัวหมาก อำเภอบางกะปิ กรุงเทพมหานค	Sureetriboon Holding Co., Ltd.
63	1751	ที่ดินหัวหมาก	Cadastral Survey	2-1-61.4 Rai	ตำบลหัวหมาก อำเภอบางกะปิ กรุงเทพมหานค	Sureetriboon Holding Co., Ltd.
64	1752	สัมมากร-บางนา-ราม2	Topographical Survey	60-1-12 Rai	แขวงดอกไม้ เขตประเวศ กรุงเทพฯ 10290	บมจ.สัมมากร สนง.ใหญ่
65	1764	ที่ดินสามเสนใน	Topographical Survey	3-3-33.50 Rai	แขวงสามเสนใน เขตพญาไทย กรุงเทพฯ	บริษัท พรเจริญโยธา จำกัด
66	1749	RAMA2 After Kanchanapisek Plot 3	Topographical Survey	5 Rai	ถนนพระราม 2 แขวงท่าข้าม เขตบางขุนเทียน ก	Arcadia (Thailand) Co., Ltd.
67	1740	Ideo S8	Topographical Survey	2 Rai	ถนนกรุงธนบุรี แขวงคลองต้นไทร เขตคลองสา	บริษัท เอดีซี-เจวี 11 จำกัด
68	1753	Shell NTI Surat OB After Center	Topographical Survey	4-2-61.8 Rai	อำเภอเมือง จังหวัดสุราษฎร์ธานี	Arcadia (Thailand) Co., Ltd.

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
69	1754	Venice Hotel	Topographical Survey	6 Rai	ซอยเจริญนคร 35 ถนนเจริญนคร กรุงเทพมหานค	บจก.เวนิสโฮเต็ล
70	1755	A_Project	Topographical Survey	2-3 Rai	Lang Suan, Patumwan, Bkk.	บจก.แมกโนเลีย ควอลิตี้ ดีเวลอปเม้นท์ คอร์ปอเรชั่น
72	1363	Craft Ploenchit	Construction Survey	1 Rai	Lumpini, Patumwan, Bkk.	Punjapol Property Group
73	1756	Wat ThepChalermSomboonTum	Topographical Survey	9-2-38 Rai	หมู่ 3 ตำบลคลองโยง อำเภอพุทธมณฑล จังหว	สำนักงานพระพุทธศาสนาจังหวัดนครปฐม
75	1757	Sai Kong Din Land	Cadastral Survey	2-3-70 Rai	ตำบลทรายกองดิน อำเภอมีนบุรี (เมือง) กรุงเท	คุณบัฑิต นิธิอุทัย
76	1758	Hua Mark Land	Cadastral Survey	0-0-68 Rai	HuaMark 20, Bangapi, Bkk.	คุณกิตติ หารพักดีนิยม
77	1759	Shell NTI Nong Kai IB (Plot1)	Topographical Survey	7-3-93.5 Rai	ถนนมิตรภาพ ต.มีชัย อ.เมือง จ.หนองคาย	Arcadia (Thailand) Co., Ltd.
78	1760	Klong Toey Land	Topographical Survey	17-0-09 Rai	ตำบลคลองเตย อำเภอพระโขนง กรุงเทพฯ	บริษัท อรรถกระวี จำกัด
79	1762	Shell NTI Suwintawong	Topographical Survey	8-0-0 Rai	ถนนสุวินทวงศ์ (304) แขวงแสนแสบ เขตมีนบุรี	Arcadia (Thailand) Co., Ltd.
80	1763	Shell NTI Lumlooka IB Plot 3	Topographical Survey	7-2-30 Rai	ถนนลำลูกกา ตำบลบึงคำพร้อย อำเภอลำลูกก	Arcadia (Thailand) Co., Ltd.
81	1764	Shell NTI Kallapapruek OB	Topographical Survey	3-3-11 Rai	ตำบลบางแค อำเภอภาษีเจริญ กรุงเทพมหานค	Arcadia (Thailand) Co., Ltd.
82	1765	Shell NTI chonburi OB to Motorway Khao Lham	Topographical Survey	5 Rai	ถนนข้าวหลาม ตำบลเหมือง อำเภอเมือง จังหว	Arcadia (Thailand) Co., Ltd.
83	1766	Shell NTI HW331 Gateway	Topographical Survey	9-2-78 Rai	Chachoengsao-Suttahip rd., Plaeng Yao ,	Arcadia (Thailand) Co., Ltd.
84	1767	Sammakorn Minburi 1	Topographical Survey	50 Rai	ซอยสามวา เขตคลองสามวา กรุงเทพมหานคร	บมจ.สัมมากร สนง.ใหญ่
85	1768	Shell NTI Lumlooka IB Plot 5	Topographical Survey	5-2-11 Rai	Phahon Yothin road, Sub-district Chompoo	Arcadia (Thailand) Co., Ltd.
86	1769	Shell KDR Thongphachara HW11	Topographical Survey	3-3-41 Rai	Lampang-Chiangmai road, Hong Chat, La	Arcadia (Thailand) Co., Ltd.
87	1770	SongWad Hotel	Topo+As built Survey	2-3-88 Rai	ซอยทรงวาด-ท่าเรือราชวงศ์กรุงเทพมหานคร	PURE ARCHITECT CO., LTD.
88	0971	Asia Coal Stock, Nadee	Inventory Survey	10,000 Ton	Nadi, Samutsakorn	Asia Green Public Company Limited
89	1271	Asia Coal Stock Nakhon Luang, New Yard	Inventory Survey	300,000 Ton	NakornLuang, Ayudhaya	Asia Green Public Company Limited

LIST OF SOME PROJECTS UNDERTAKEN IN 2016 YEAR

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
1	1505	PTTEP Onshore Survey Services	Topographical Survey	3+1 Year	S1, Suphanburi ,Konkaen, Udonthani	PTTEP PCL
2	1225	Mitr Phu Viang Sugar Plant	Topographical Survey	65 Rai	Nongrue, Konkaen	Mitr Phol Sugar Group
3	1603	Honda Showroom PTT Gas Station&PTT	Topographical Survey	84-0-00	Muang, Samutprakarn	Arcadia (Thailand) Ltd.
4	1607	The City Rama5-Rachapruex2	Settlement	60 No.	Bang Krouy, Nonthaburi	Bann Chareon Construction Co., Ltd.
5	1613	BangMuang Municipality Office	Topo & Soil Test	2-0-41.32 Rai	Bang Yai, Nonthaburi	Gateway Architect Co., Ltd.
6	1615	Rangsit Pharmaceutical Plant (Phase II)	Topo & Soil Test	64 Rai	Thanyaburi, Pathumthani	Arcadia (Thailand) Co., Ltd.
7	1617	Sammakorn Bangapi Village	Topographical Survey	32 Rai	Sapansung, Bangkok	Sammakorn PLC.
8	1623	Bann Suriyasai	Topo&As Built	1-0-82.01Rai	Bangrak, Bangkok	Food of Asia
9	1625	Shell-NTI-Nakornchaisri Service Station	Topographical Survey	5-1-88.8Rai	Nakornchaisri, Nakornpathom	Arcadia (Thailand) Ltd.
10	1627	Shell-NTI-Kanchanpisek Bangbon	Topographical Survey	4-1-36.2Rai	BangBon, Bangkok	Arcadia (Thailand) Ltd.
11	1630	Plum Condo-ChokChai4	Topographical Survey	4-1-87.6Rai	Ladprao, Bangkok	Pruksa Group
12	1634	Aurora Condominium	As-Built Drawing	0-3-61.45Rai	Bang Lamung, Chonburi, THAILAND.	DJP Land and House Company Limited
13	1639	Water Supply, Northern IE (Lamphun)	Topographical Survey	43-0-69.385	Northen IE (Lamphun)	S napa Co., Ltd.
14	1640	Shell-NTI-Maptaphut Service Station	Topographical Survey	3-3-94.3Rai	MabTaput, Rayong	Arcadia (Thailand) Ltd.
15	1642	Shell-NTI-Khao Hin Sorn Service Station	Topographical Survey	4-3-94.9Rai	Panomsarakram, Chachoengsao	Arcadia (Thailand) Ltd.
16	1643	Shell-NTI-Wangnoi Service Station	Topographical Survey	4-3-96.9Rai	WangNoi, Ayudhaya	Arcadia (Thailand) Ltd.
17	1647	Muang Chang Land	Topographical Survey	66-0-26Rai	Muang, Nan	Index Living Co., Ltd.
18	1652	Shell-KDR-Thanapakorn	Topographical Survey	5-2-38.3 Rai	Sampran, Nakornpathom	Arcadia (Thailand) Ltd.
19	1653	Happy Ville DonMuang	Pile Location	201 No.	DonMuang, Bangkok	Nirun Plaza Co., Ltd.
20	1645	Shell-KDR-Sirichai Suwintawong	Cadastral Survey	2.5 Rai	Nong Chok, Bkk.	Arcadia (Thailand) Ltd.
21	1654	Maestro 19	Topographical Survey	5.5 Rai	DinDaeng, Bangkok	Major Development Estate Co., Ltd.
22	1655	Shell-NTI-Chonburi Patty Sattahip	Topographical Survey	5 Rai	Banglamung, Chonburi	Arcadia (Thailand) Ltd.
23	1656	Prime Nature Villa	Cadastral Survey	4 Rai	Bangplee, Samutprakarn	Prime Nature Villa Corporation
24	0917	Nadi Coal Stock	Inventory Survey	10,000 Ton	Nadi, Samutsakorn	Asia Green Energy PCL
25	1271	NakornLuang Coal Stock	Inventory Survey	300,000 Ton	NakornLuang, Ayudhaya	Asia Green Energy PCL

LIST OF SOME PROJECTS UNDERTAKEN IN 2015 YEAR

Item	Job No.	Project Name	Type of Work	QTY.	Location	Customer Name
1	1202	Siracha Biomass Stock	Inventory Survey	12,335 Ton	Siracha, Chonburi	Asia Biomass Co., Ltd.
2	1502	GULF MP	BH Stake Out	13 No.	Eastern Seaboard, Rayong	KEC
3	1503	TOYOTA BUZZ CHAINAT	Topographical Survey	12 Rai	Muang, Chainat	KEC
4	1505	PTTEP Onshore Survey Services	Topographical Survey	3+1 Year	S1, Suphanburi ,Konkaen, Udonthani	PTTEP PCL
5	1506	Metro Apartment	Topo & As-Built	1.5 Rai	Huay Kwang, Bangkok	Boon Venture Co., Ltd.
6	1509	BFKT	Survey&Drawings		Central&Eastern Region	BB Technology Co.,Ltd.
7	1510	Millennium Auto HadYai	Topographical Survey	10 Rai	Hadyai, Songkla	Millennium Auto
8	1514	New build 2015 (Share)	Survey&Drawings	30 Sites	Central&Eastern Region	BB Technology Co.,Ltd.
9	1516	BCP AOT Fuel Service Station Project	Topographical Survey	3 Rai	BangPlee, Samutprakarn	Bangchak Petroleum PCL
10	1519	Bang Pa Han Land	Topographical Survey	169 rai	Bang Pa Han, Ayudhaya	K.Kachonpomg
11	1520	Dtac, Re_Locate_2015	Survey&Drawings		Central&Eastern Region	BB Technology Co.,Ltd.
12	1522	BAAN-CHAYADA-BANGPLEE	Pile location survey	624 No.	BangPlee, Samutprakarn	Swan Estate Co., Ltd.
13	1523	US EMBASSY (UDON THANI COMPOUND UPGRADE)	Topo & As-Built	3 Rai	Muang, Udon Thani	ERGO Co., Ltd.
14	1524	Land Mark Waterfront Development	Topographical Survey	2 Rai	Satorn, Bangkok	BCEG Thai Intl. Co., Ltd.
15	1526	Sukhumvit36 Condominium	Topographical Survey	1 Rai	KlongToey, Bangkok	Ayutt and Associate Design
16	1529	Plum Premium Paholyothin 89	Topographical Survey	22 Rai	Tanyaburi, Patumthani	Pruksa Group
17	1532	Plum ChaengWattana	Topographical Survey	39 Rai	Laksi, Bangkok	Pruksa Group
18	1534	Charan 83/1 Hotel	Topo & As-Built	55 Sq.Wah	Bangplad, Bangkok	CNS Land Co., Ltd.
19	1536	Ladawan Sinakarin Village	Topographical Survey	1 Rai	BangPlee, Samutprakarn	Ladawan Corporation
20	1538	Plum Ramkhamhaeng	Topographical Survey	10 Rai	Suan Luang, Bangkok	Pruksa Group
21	1541	Uawithya Saraburi Site	Cadastral Survey	5 Rai	Muang, Saraburi	Uawithya Machinery Co.,Ltd.
22	1542	Mercury Tower	Boundary Survey	3 Rai	Patumwan, Bangkok	SCCP Reats Co., Ltd.
23	1543	Exchange Tower	Boundary Survey	4 Rai	KlongToey, Bangkok	SCCP Reats Co., Ltd.
24	0917	Nadi Coal Stock	Inventory Survey	6,043 Ton	Nadi, Samutsakorn	Asia Green Energy PCL
25	1271	NakornLuang Coal Stock	Inventory Survey	387,667 Ton	NakornLuang, Ayudhaya	Asia Green Energy PCL

PART 4 TOOL AND INSTRUMENTS

List of Instruments and Tools **Last Upate: Dec, 2019**

ITEMS	INSTRUMENTS AND TOOLS	QTY. (SET)	REMARKS
1	**"DJI Phantom 3Advanced " Unmanned Aerial Vehicle, UAV (Drone)**	1	
2	**GNSS RECIEVER UNIT**	**10**	
2.1	"Leica System1200" Geodetic GNSS Reciever S/N: 459486,188600, 454561	3	
2.2	"Leica GS10" Geodetic GNSS Reciever S/N: 1530761	1	
2.3	"Leica GS15" Geodetic GNSS Reciever S/N: 1500337	1	
2.4	"GARMIN GPS 12" Personal Navigator GPS	1	Standby
2.5	"GARMIN eTrex" Personal Navigator GPS	4	
3	**TOTAL STATION WITH REC INSTRUMENTS**	**6**	
3.1	Total Station "Wild TC 1000" S/N 343673 (Set 3)	1	
3.2	Total Station "Wild TC 1610" S/N 370846 (Set 4)	1	Standby
3.3	1.3 Total Station "Wild TC 1010" S/N 368298 (Set 5)	1	Standby
3.4	Total Station "Leica TCRA 1102 PLUS" S/N 619338 (Set 6)+ PC Card	1	
3.5	Total Station "Leica T 1010" S/N 367898 (Set 7)	1	
3.6	Total Station "Leica TCRA 1201 R300" S/N 211320 (Set 8)+ CF Card	1	
3.7	Total Station "Leica TS06+" S/N 1382160+ Thumb Drive	1	
3.8	Total Station "Leica TS06+" S/N 1382161 + Thumb Drive	1	
3.9	Rec- Module "Wild GRM 10"	4	
3.10	"Wild GIF10" Universal Data Recorder	1	
3.11	"Wild GIF12" Universal Data Recorder	2	
3.12	Remote Control Surveying RCS1100	1	
4	**THEODOLITE**	**2**	
4.1	" Wild T1" FNr. No. 327345 (Set 1)	1	Standby
4.2	" Wild T1" FNr. No. 232428 (Set 2)	1	Standby
5	**ELECTRONIC DISTANCE MEASUREMENTS (E.D.M.)**	**2**	
5.1	"Wild DI 1600" No. 83726 (Set 1)	1	
5.2	"Wild DI 1600" No. 16221 (Set 2)	1	Standby
6	**TARGET SET**		
6.1	Single Prism Reflector	5	
6.2	Pole Prism Reflector	6	
6.3	Mini Pole Prism Reflector	4	
6.4	360 Prism GRZ4	1	
7	**LEVEL**	**4**	
7.1	"Wild NA28" S/N 556505	1	
7.2	"Wild NA1" S/N 507975	1	
7.3	"Wild NAK1" S/N 342694	1	
7.4	" Leica" Sprinter Electronic Level 200M S/N 2001610	1	
8	**STAFF**	**8**	
8.1	Leveling Staffs	6	
8.2	"Leica" 5 Meters Barcode Staff	2	
9	**ROTARY DRILLING MACHIN**	**3**	
9.1	"HILTI" TE5A S/N 20161505	1	
9.2	"HILTI" TE2A S/N 8211194	1	
9.3	"HILTI" TE2A22 S/N 230112	1	
10	**COMMUNICATION EQUIPMENT**	**15**	
10.1	"Motorola" Commander245, CP246 Walkie - Talkie	15	
11	**Laser Range Finder**	**2**	
11.1	"Leica" Disto D510	1	
11.2	"Hilti" PD42	1	
12	**DIGITAL CAMERA**	**5**	
12.1	SONY	1	
12.2	CANON	4	
13	**LIGHT VEHICLE**	**8**	
13.1	"TOYOTA Hylux Vigo" DOUBLE CAB PICK-UP CAR, 2500 CC.	7	ID No. 13-19
13.2	"TOYOTA Hiace" VAN, 3000 CC.	1	ID No. 20
14	**OFFICE DEVICE**		
14.1	Desktop PC	30	
14.2	Laptop PC	8	
14.3	'Hewlett Packard" Color LaserJet 3550	1	
14.4	'Hewlett Packard" Design JET 511 42" Plotter	1	
14.5	"Fuji Xerox" DocuCentre-VI C3370 Print/Copy/Scan Machine	1	HQR
14.6	"Fuji Xerox" DocuCentre-V C2275 Print/Copy/Scan Machine	1	LKU
14.7	"SHARP" NX-A260 Facimile Machine	1	

dji PHANTOM 3 ADVANCED UAV (DRONE)

Leica GS15 Geodetic GNSS

Leica GS10 Geodetic GNSS

Leica System 1200 Geodetic GNSS

Leica Flexline TS06+
Total Station

Leica TCRA 1201 Robotic
Total Station

Leica TCRA 1102+ Robotic
Total Station

Leica TC1610
Total Station

Leica TC1000
Total Station

Leica T1010 & DI1600 Distomat
Total Station

Leica Sprinter 200 M Digital Level with Barcode Staff

Leica NA3003 Digital Precise Level with Invar Barcode Staff

"Leica" Disto D510 Range Finder

HILTI TE 2-A Cordless Heavy Duty Hammer Drill

Surveyor Van

DJI PHANTOM 3 ADVANCED SPECS

AIRCRAFT

Weight (Battery & Propellers Included)	1280 g
Diagonal Size (Propellers Excluded)	350 mm
Max Ascent Speed	5 m/s
Max Descent Speed	3 m/s
Max Speed	16 m/s (ATTI mode)
Max Tilt Angle	35°
Max Angular Speed	150°/s
Max Service Ceiling Above Sea Level	19685 feet (6000

CAMERA

Sensor	1/2.3” CMOS Effective pixels: 12.4 M (total pixels: 12.76 M)
Lens	FOV 94° 20 mm (35 mm format equivalent) f/2.8 focus at ∞
ISO Range	100-3200 (video) 100-1600 (photo)
Electronic Shutter	8 - 1/8000 s

	m)
Max Flight Time	Approx. 23 minutes
Operating Temperature Range	32° to 104°F (0° to 40°C)
Satellite Positioning Systems	GPS/GLONASS
Hover Accuracy Range	Vertical: ±0.1 m (with Vision Positioning) ±0.5 m (with GPS Positioning) Horizontal: ±0.3 m (with Vision Positioning) ±1.5 m (with GPS Positioning)

Speed	
Image Size	4000×3000
Still Photography Modes	Single Shot Burst Shooting: 3/5/7 frames Auto Exposure Bracketing (AEB): 3/5 bracketed frames at 0.7 EV Bias Timelapse
Video Recording Modes	2.7K: 2704 x1520p 24/25/30 (29.97) FHD: 1920x1080p 24/25/30/48/50/60 HD: 1280x720p 24/25/30/48/50/60
Max Video Bitrate	40 Mbps
Supported File Systems	FAT32 (≤32 GB); exFAT (>32 GB)
Photo	JPEG, DNG (RAW)
Video	MP4, MOV (MPEG-4 AVC/H.264)
Supported SD Cards	Micro SD Max capacity: 64 GB Class 10 or UHS-1 rating required
Operating Temperature Range	32° to 104°F (0° to 40°C)

GIMBAL

Stabilization	3-axis (pitch, roll, yaw)
Controllable Range	Pitch: -90° to +30°

VISION SYSTEM

Vision System	Downward Vision System
Velocity Range	≤8 m/s (2 m above ground)

Max Controllable Angular Speed	Pitch: 90°/s
Angular Control Accuracy	±0.02°

Altitude Range	30 - 300 cm
Operating Range	50 - 300 cm
Operating Environment	Surface with clear pattern and adequate lighting (lux>15)

REMOTE CONTROLLER

Operating Frequency	2.400 - 2.483 GHz
Max Transmission Distance	FCC Compliant: 3.1 mi (5 km) CE Compliant: 2.2 mi (3.5 km) (Unobstructed, free of interfere
Operating Temperature Range	32° to 104°F (0° to 40°C)
Battery	6000 mAh LiPo 2S
Transmitter Power (EIRP)	FCC: 20 dBm CE: 16 dBm MIC: 16 dBm
Operating Current/Voltage	1.2 A@7.4 V
Video Output Port	USB
Mobile Device Holder	Tablets and smart phones

INTELLIGENT FLIGHT BATTERY

Capacity	4480 mAh
Voltage	15.2 V
Battery Type	LiPo 4S
Energy	68 Wh
Net Weight	365 g
Charging Temperature Range	41° to 104°F (5° to 40°C)
Max Charging Power	100 W

CHARGER

Voltage	17.4 V
Rated Power	57 W

APP / LIVE VIEW

Mobile App	DJI GO
Live View Working Frequency	2.4 GHz ISM
Live View Quality	720P @ 30fps
Latency	220ms (depending on conditions and mobile device)
Required Operating Systems	iOS 8.0 or later Android 4.1.2 or later
Recommended Devices	ios: iPhone 5s, iPhone 6, iPhone 6 Plus, iPhone 6s, iPhone 6s Plus, iPod touch 6, iPad Pro, iPad Air, iPad Air Wi-Fi + Cellular, iPad mini 2, iPad mini 2 Wi-Fi + Cellular, iPad Air 2, iPad Air 2 Wi-Fi + Cellular, iPad mini 3, iPad mini 3 Wi-Fi + Cellular, iPad mini 4, and iPad mini 4 Wi-Fi + Cellular. This app is optimized for iPhone 5s, iPhone 6, iPhone 6 Plus, iPhone 6s and iPhone 6s Plus. Android: Samsung tabs 705c, Samsung S6, Samsung S5, Samsung NOTE4, Samsung NOTE3, Google Nexus 9, Google Nexus 7 II, Ascend Mate7, Huawei Mate 8, Nubia Z7 mini, SONY Xperia Z3, MI 3, MI PAD *Support for additional Android devices available as testing and development continues.

Leica GPS1200+ Series
Technical Data

GNSS
future proof

- when it has to be **right**

Leica Geosystems

GPS1200+ Technical Data

For reference station products please refer to the technical data for GRX1200+ series receivers (746097)

Summary Description

	GX1230+ GNSS / ATX1230+ GNSS	GX1220+ GNSS	GX1230+	GX1220+	GX1210+
Receiver type	Triple-frequency, GPS/GLONASS/Galileo/ Compass[1)], geodetic, real-time RTK receiver	Triple-frequency, GPS/GLONASS/Galileo/ Compass[1)], geodetic receiver	Dual-frequency, GPS only, geodetic, real-time RTK receiver, upgradable to GNSS version	Dual-frequency, GPS only, geodetic receiver, upgradable to GNSS version	Single-frequency, GPS only, survey receiver
Summary of measuring, modes and applications	Static, rapid static, kinematic, On the fly L1/L2/L5 E1/E5a/E5b/Alt-BOC, Compass[1)], code, phase Real-time RTK Post processing DGPS/RTCM standard Survey, geodetic and real-time RTK applications	Static, rapid static, kinematic, On the fly L1/L2/L5 E1/E5a/E5b/Alt-BOC, Compass[1)], code, phase Post processing DGPS/RTCM optional Survey and geodetic applications	Static, rapid static, kinematic, On the fly L1 + L2, code, phase Real-time RTK Post processing DGPS/RTCM standard Survey, geodetic and real-time RTK applications	Static, rapid static, kinematic, On the fly L1 + L2, code, phase Post processing DGPS/RTCM optional Survey and geodetic applications	Static, kinematic L1, code, phase DGPS/RTCM optional Survey and GIS applications
Upgrade to GX1230+ GNSS	-	Yes	Yes	Yes	Yes

System Components

Receiver

	GX1230+ GNSS / GX1220+ GNSS / ATX1230+ GNSS	GX1230+	GX1220+	GX1210+
Receiver technology	SmartTrack+ is built on SmartTrack technology and enhanced for all GNSS signals.	SmartTrack – patented. Discrete elliptical filters. Fast acquisition. Strong signal. Low noise. Excellent tracking, even to low satellites and in adverse conditions. Interference resistant.		
L5 enabled	Yes	No	No	No
Galileo enabled	Yes	No	No	No
L5 and Galileo ready	Yes	No	No	No
No. of channels	120 channels L1/L2/L5 GPS L1/L2 GLONASS E1/E5a/E5b/Alt-BOC Galileo Compass, 4 SBAS ⇨ GX1220+ GNSS (with DGPS option)	16 L1 + 16 L2 GPS 4 SBAS	16 L1 + 16 L2 GPS 4 SBAS (with DGPS option)	16 L1 4 SBAS (with DGPS option)
L1 measurements (GPS)	Carrier phase full wave length, C/A narrow code	Carrier phase full wave length, C/A narrow code	Carrier phase full wave length, C/A narrow code	Carrier phase full wave length, C/A narrow code
L2 measurements (GPS)	Carrier phase full wave length with C-code and P-code (AS off) or P-code aided under AS, Equal performance with AS off or on	Carrier phase full wave length with C-code and P-code (AS off) or P-code aided under AS, Equal performance with AS off or on	Carrier phase full wave length with C-code and P-code (AS off) or P-code aided under AS, Equal performance with AS off or on	No
L5 measurements (GPS)	Carrier phase full wave length, Code	No	No	No

[1)] The Compass signal is not finalized, although, test signals have been tracked with GPS1200+ receivers in a test environment. As changes in the signal structure may still occur, Leica Geosystems cannot guarantee full Compass compatibility.

L1 measurements (GLONASS)	Carrier phase full wave length, C/A narrow code	No	No	No
L2 measurements (GLONASS)	Carrier phase full wave length, P narrow code	No	No	No
E1/E5a/E5b measurements (Galileo)	Carrier phase full wave length, Code	No	No	No
Alt-BOC measurements (Galileo)	Carrier phase full wave length and code using Alt-BOC	No	No	No
Independent measurements	Fully independent code and phase measurements of all frequences	Fully independent L1 and L2 code and phase measurements	Fully independent L1 and L2 code and phase measurements	Fully independent L1 code and phase measurements
Time to first phase measurement after switching ON	Typically 30 secs	Typically 30 secs	Typically 30 secs	Typically 30 secs

Receiver Housing

	ATX1230+ GNSS	GX1230+ GNSS / GX1220+ GNSS / GX1230+ / GX1220+ / GX1210+
LED status indicators	3: for power, tracking, Bluetooth	3: for power, tracking, memory
Ports	1 RS232 clip-on port, 1 USB/RS232 port 1 Bluetooth port	4 RS232 port 1 Power only port 1 TNC port for antenna 1 PPS, 2 Event port optional
Supply voltage Power consumption	Nominal 12V DC Range 10.5-28V DC Typically 1.8W, 150mA	Nominal 12V DC Range 10.5-28V DC Typically 3.2W, 270mA
Dimensions	186mm x 89mm	0.212m x 0.166m x 0.079m (The dimensions are given for the housing without the sockets)
Weight, receiver only	1.12kg	1.2kg

GNSS Antennas

	GX1230+ GNSS / GX1220+ GNSS	GX1220+ / GX1230+	GX1210+
Standard survey antenna	**AX1203+ GNSS, L1/L2/L5 GPS GLONASS/Galileo/Compass SmartTrack+**	**AX1203+ GNSS, L1/L2/L5 GPS GLONASS/Galileo/Compass SmartTrack+**	**AX1201, L1 SmartTrack**
Groundplane Dimensions (diameter x height) Weight Gain	Built-in groundplane 170mm x 62mm 0.44kg 29±3 dbi	Built-in groundplane 170mm x 62mm 0.44kg 29±3 dbi	Built-in groundplane 170mm x 62mm 0.44kg typically 27 dbi
Choke-ring antenna	**AR25 choke-ring GPS/GLONASS Galileo/Compass**	**AT504 GG choke-ring, L1/L2 GPS/GLONASS**	**No**
Design Protection radome Dimensions: diameter x ht Weight Gain	Dorne Margolin, JPL design. optional 380mm x 200mm (antenna) 7.6kg (antenna) typically 40 dbi	Dorne Margolin, JPL design. optional 380mm x 140mm (antenna) 4.3kg (antenna) typically 27 dbi	

SmartAntenna

	ATX1230+ GNSS
Standard survey antenna	**ATX1230+ GNSS L1/L2/L5 GPS GLONASS/Galileo/ Compass SmartTrack+**
Groundplane	Built-in groundplane
Dimensions (diameter x height)	186mm x 89mm
Weight	1,12kg
Gain	typically 27 dbi

Controller

	for sensors: ATX1230+ GNSS GX1230+ GNSS / GX1230+ GX1220+ GNSS / GX1220+ GX1210+
Type	RX1210T (with touch screen) for GX1200+ Series RX1250 (with touch screen), RX1250c (with touch screen and colour display) for ATX1230+ GNSS
Display	¼ VGA, optional monochrome or colour, graphics capable, illumination
Character Set	Maximum 256 characters, extended ASCII characters set
Touch screen (RX1210T only)	Toughened film on glass
Keyboard	Full alphanumeric (62 keys), 12 function keys, 6 user-definable keys, illumination
Controller Weights	RX1210 0.48kg RX1250 0.75kg incl. GEB211 internal Battery
Total Weights of System	SmartRover 2.74kg (all on the pole) GX1200+ Rover 4.15kg (all on the pole) GX1200+ Rover 1.80kg (weight of pole for Minipack setup)

Measurement Precision and Position Accuracies

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
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 required are dependent upon various factors including number of satellites, geometry, ionospheric conditions, multipath etc. GPS and GLONASS can increase performance and accuracy by up to 30% relative to GPS only. A full Galileo and GPS L5 constellation will further increase measurement performance and accuracy. The following accuracies, given as **r**oot **m**ean **s**quare, are based on measurements processed using LGO and on real-time measurements.		

Code and Phase Measurement Precision (irrespective whether AS off/on)

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
Carrier phase on L1	0.2mm rms	0.2mm rms	0.2mm rms
Carrier phase on L2	0.2mm rms	0.2mm rms	
Carrier phase on L5	*		
Carrier phase on E1/E5a/E5b	*		
Carrier phase on Alt-BOC	*		
Code (pseudorange) on L1	2cm rms	2cm rms	2cm rms
Code (pseudorange) on L2	2cm rms	2cm rms	
Code (pseudorange) on L5	*		
Code (pseudorange) on E1/E5a/E5b	*		
Code (pseudorange) Alt-BOC	*		

* values to be expected similar to L1. Final values will be determined after initial operational capability (IOC) has been reached.

Accuracy (rms) with post processing

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
	With Leica Geo Office L1/L2 processing software. GLONASS processing option also needed to process GLONASS data	With Leica Geo Office L1/L2 processing software GLONASS processing option also needed to process GLONASS data	With Leica Geo Office L1 processing software
Static (phase), long lines, long observations, choke ring antenna	Horizontal: 3mm + 0.5ppm Vertical: 6mm + 0.5ppm	Horizontal: 3mm + 0.5ppm Vertical: 6mm + 0.5ppm	Not applicable
Static and rapid static (phase) with standard antenna)	Horizontal: 5mm + 0.5ppm Vertical: 10mm + 0.5ppm	Horizontal: 5mm + 0.5ppm Vertical: 10mm + 0.5ppm	Horizontal: 5mm + 0.5ppm Vertical: 10mm + 0.5ppm
Kinematic (phase), in moving mode after initialization	Horizontal: 10mm + 1ppm Vertical: 20mm + 1ppm	Horizontal: 10mm + 1ppm Vertical: 20mm + 1ppm	
Code only	Typically 25cm	Typically 25cm	Typically 25cm

Accuracy (rms) with real-time/RTK

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
RTK capability	Yes, standard	No	No
Rapid static (phase), Static mode after initialization (compliance with ISO17123-8)	Horiz: 5mm + 0.5ppm Vertical: 10mm + 0.5ppm		
Kinematic (phase), moving mode after initialization	Horiz: 10mm + 1ppm Vertical: 20mm + 1ppm		
Code only	Typically 25cm		

Accuracy (rms) with DGPS/RTCM

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
	DGPS/RTCM standard	DGPS/RTCM optional	DGPS/RTCM optional
DGPS/RTCM	Typically 25cm (rms)	Typically 25cm (rms)	Typically 25cm (rms)

Accuracy (rms) in single receiver navigation mode

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
Navigation accuracy	5–10m rms for each coordinate	5–10m rms for each coordinate	5–10m rms for each coordinate
Degradation effect	Degradation possible due to SA	Degradation possible due to SA	Degradation possible due to SA

On-the-Fly (OTF) initialisation

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
OTF Capability	Real time and post processing	Post processing only	No OTF
Reliability of OTF initialisation	Better than 99.99%	Not applicable	Not applicable
Time for OTF initialisation	Typically 8secs, with 5 or more satellites on L1 and L2	Not applicable	Not applicable
OTF Range* *Assuming reliable data-link is available in RTK case	Typically up to 40km in normal conditions Up to 50km in favorable conditions	Not applicable	Not applicable

Position update and latency

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
	RTK and DGPS standard	DGPS optional	DGPS optional
Position update rate	Selectable: 0.05 sec (20Hz) to 60 secs	Selectable: 0.05 sec (20Hz) to 60 secs	Selectable: 0.05 sec (20Hz) to 60 secs
Position latency	0.03 sec or less	0.03 sec or less	0.03 sec or less

Real-time RTK and DGPS/RTCM Data Formats

	ATX1230+ GNSS GX1230+ GNSS / GX1230+	GX1220+ GNSS / GX1220+	GX1210+
	Real-time RTK standard DGPS/RTCM standard	DGPS/RTCM optional	DGPS/RTCM optional
RTK Data Formats for data transmission and reception	Leica proprietary formats (Leica, Leica 4G) CMR, CMR+		
RTCM Format for data transmission and reception	RTCM Versions 2.x supporting messages 1,2,3,9,18,19,20,21,22,23,24 And RTCM Version 3.x	RTCM Versions 2.x supporting messages 1,2,3,9	RTCM Versions 2.x supporting messages 1,2,3,9
Simultaneous transmissions	2 real time output interfaces via independent ports, providing identical or different RTK/RTCM formats		

Data recording

Recording rate	Selectable from 0.05 to 300 s
Standard medium	CompactFlash cards: 64MB, 256MB, 1GB
Optional medium	Internal memory for receiver: 256MB
Data capacity:	64 MB is typically sufficient for about GPS only (8 satellites) ■ 500h L1+L2 data logging at 15 s rate ■ 2000h L1+L2 data logging at 60 s rate ■ 90'000 real-time points with codes GPS+GLONASS (8+4 satellites) ■ 340h data logging at 15 s rate ■ 1360h data logging at 60 s rate ■ 90´000 real-time points with codes

Power supply for GX1200+ receivers

Internal battery	GEB221 rechargeable Li-Ion battery 4.4Ah/7.4V, 2 batteries fit into receiver
Operation time	2 GEB221 power GX1200 receiver plus antenna plus RX1200 Controller for about 17h
Weight, GEB221 battery	0.2kg
External battery, optional	GEB171 9Ah/12V NiMh battery
Operation time	1 GEB171 powers GX1200 receivers plus antenna plus RX1200 Controller for about 30h

Power supply for SmartRovers

Internal battery	GEB211 rechargeable Li-Ion battery 2.2Ah/7.4V, 1 battery fits into ATX1230+ GNSS and 1 battery fits into RX1250/RX1250c
Operation time	1 GEB211 powers ATX1230+ GNSS for about 6h 1 GEB211 powers RX1250 for about 13h 1 GEB211 powers RX1250c for about 12h
Weight, GEB211 battery	0.11kg

Operation of GX1200+ receivers with and without controller

Manual operation with RX1210 Controller	Standard method. Receiver control, operation, data input, survey-data acquisition, information display via controller
Automatic operation without Controller	Automatic on switching on. Modes and parameters for receiver operation, measuring, recording, transmission etc preset using controller
LED	3 LED's indicate power, tracking, memory
Manual operation with RX1250 Controller	As an alternative the controller RX1250 in Terminal Mode can be used for manual operation of the sensor in exactly the same way as the RX1210

Operation of SmartRovers with and without controller

An RX1250/RX1250c Controller is always required to operate an ATX1230+ GNSS

Navigation mode

Navigation	Full navigation information in position and stakeout displays Position, course, speed, bearing and distance to waypoint

Environmental specifications

Receivers	**Valid for GX1210+, GX1220+, GX1220+ GNSS, GX1230+, GX1230+ GNSS, ATX1230+ GNSS**
Temperature, operating	-40°C to +65°C* Compliance with ISO9022-10-08, ISO9022-11-special and MIL-STD-810F Method 502.4-II, MIL-STD-810F Method 501.4-II *Bluetooth: -30°C to +60°

Temperature, storage	-40°C to +80°C Compliance with ISO9022-10-08, ISO9022-11-special and MIL-STD-810F Method 502.4-I, MIL-STD-810F Method 501.4-I
Humidity	Up to 100%* Compliance with ISO9022-13-06, ISO9022-12-04 and MIL-STD-810F Method 507.4-I * The effects of condensation are to be effectively counteracted by periodically drying out the product
Protection against Water, Sand and Dust	IP67 Protection against blowing rain Waterproof to temporary submersion into water (maximum depth of 1m) Dust-tight, protection against blowing dust Compliance with IP67 according IEC60529 and MIL-STD-810F Method 506.4-I, MIL-STD-810F Method 510.4-I, MIL-STD-810F Method 512.4-I
Drops	Withstands 1m drop onto hard surfaces
Vibration	Withstands vibrations during operation on large civil construction machines Compliance with ISO9022-36-08 and MIL-STD-810F Method 514.5-Cat24
Functional Shock	No loss of lock to satellite signal when used on a pole set-up and submitted to pole bumps up to 150mm

GNSS Antennas	**Valid for AX1201, AX1203+ GNSS** For AT504 GG and AR25 please refer to the technical data for GRX1200+ series receivers (746097)
Temperature, operating	-40°C to +70°C Compliance with ISO9022-10-08, ISO9022-11-05 and MIL-STD-810F Method 502.4-II, MIL-STD-810F Method 501.4-II
Temperature, storage	-55°C to +85°C Compliance with ISO9022-10-09, ISO9022-11-06 and MIL-STD-810F Method 502.4-I, MIL-STD-810F Method 501.4-I
Humidity	Up to 100%* Compliance with ISO9022-13-06, ISO9022-12-04 and MIL-STD-810F Method 507.4-I * The effects of condensation are to be effectively counteracted by periodically drying out the product
Protection against Water, Sand and Dust	IP66, IP67 Protection against water jets Protection against blowing rain Waterproof to temporary submersion into water (maximum depth of 1m) Dust-tight, protection against blowing dust Compliance with IP66 and IP67 according IEC60529 and MIL-STD-810F Method 506.4-I, MIL-STD-810F Method 510.4-I, MIL-STD-810F Method 512.4-I
Drops	Withstands 1.5m drop onto hard surfaces
Vibration	Withstands vibrations during operation on large civil construction machines Compliance with ISO9022-36-08 and MIL-STD-810F Method 514.5-Cat24
Functional Shock	No loss of lock to satellite signal when used on a pole set-up and submitted to pole bumps up to 150mm
Topple over pole	Survives topple over from a 2m survey pole onto hard wood on a concrete floor

Controller	**Valid for RX1210T and RX1250, RX1250c controllers**
Temperature, operating	-30°C to +65°C Compliance with ISO9022-10-06, ISO9022-11-special and MIL-STD-810F Method 502.4-II, MIL-STD-810F Method 501.4-II RX1250c (-30°C to +50°C)
Temperature, storage	-40°C to +80°C Compliance with ISO9022-10-08, ISO9022-11-special and MIL-STD-810F Method 502.4-I, MIL-STD-810F Method 501.4-I
Humidity	Up to 100%* Compliance with ISO9022-13-06, ISO9022-12-04 and MIL-STD-810F Method 507.4-I * The effects of condensation are to be effectively counteracted by periodically drying out the product

Protection against Water, Sand and Dust	IP67 Protection against blowing rain Waterproof to temporary submersion into water (maximum depth of 1m) Dust-tight, protection against blowing dust Compliance with IP67 according IEC60529 and MIL-STD-810F Method 506.4-I, MIL-STD-810F Method 510.4-I, MIL-STD-810F Method 512.4-I
Drops	Withstands 1.5m drop onto hard surfaces
Vibration	Withstands vibrations during operation on large civil construction machines Compliance with ISO9022-36-08 and MIL-STD-810F Method 514.5-Cat24

Communication Module	**Valid for all Leica GFU based communication modules**
Humidity	Up to 100%* Compliance with ISO9022-13-06, ISO9022-12-04 * The effects of condensation are to be effectively counteracted by periodically drying out the product
Protection against Water, Sand and Dust	IP67 Protection against blowing rain Waterproof to temporary submersion into water (maximum depth of 1m) Dust-tight, protection against blowing dust Compliance with IP67 according IEC60529 and MIL-STD-810F Method 506.4-I, MIL-STD-810F Method 510.4-I, MIL-STD-810F Method 512.4-I
Drops	Withstands 1.5m drop onto hard surfaces
Vibration	Withstands vibrations during operation on large civil construction machines Compliance with ISO9022-36-08

NMEA output

	NMEA Data output format, internationally standardized format for data and position output, For real-time/RTK, DGPS, navigation positions,
NMEA sentences	NMEA 0183 V2.20 and Leica proprietary

OWI interface

Leica proprietary Outside World Interface, enables full remote control of GPS receivers by PC, PDA

Protocol Versions	Binary or ASCII

Data links

Support of various Radio modems and GSM/UMTS/CDMA cellular mobile phones for RTK, DGPS or remote control operation modes

No. of simultaneous data links	Up to two data links can be attached simultaneously using Leica GFU housing, plus two generic data links, to be used with different sensor interfaces. Or up to four generic data links can be attached simultaneously.
Radio modem	Any suitable radio modem with RS232 interface and operating in transparent mode
Recommended radio modems	Satelline 3AS integrated into Leica GFU housing Pacific Crest PDL receive-only integrated into Leica GFU housing
GSM/UMTS phone modem	Any suitable model
Recommended GSM phone	Siemens MC75 mobile phone integrated into Leica GFU housing, 850, 900, 1800, 1900 MHz.
Recommended CDMA phone	Multitech MTMMC CDMA phone integrated into Leica GFU housing, 800, 1900 MHz.
Landline phone modem	Any suitable model

Coordinate systems

	Management of ellipsoids, projections, geoid models, transformation parameters
Ellipsoids	All common ellipsoids User-definable ellipsoids
Map projections User definable and country specific	Mercator Transverse Mercator UTM Oblique Mercator Lambert (1 and 2 standard parallels) Soldner Cassini Polar Stereographic Double Stereographic RSO (rectified skewed orthomorphic projection) Other country-specific projections
Geoid model	Upload geoid model from LGO
Transformation in receiver	Classical 7-parameter 3-D Helmert One step and two step (direct WGS84 to grid)

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.
Status information:	Current position, satellite status, logging status, real-time status, battery and memory status
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 measuring 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 code or free code by entering a alphanumeric or a numeric quick code from user defined codelist
SmartCodes:	Recording a measurement with a point, line or area code by selecting a box to which a code is assigned
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
Field to Office:	Remote transfer of objects and files to and from the instrument (field) to the office via the internet, and vice versa, using the common File Transfer Protocol (FTP)

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 Direct onboard export to DXF and LandXML files

Standard application programs

Survey: Measuring points, lines and areas with codes and offsets

- Auto Points:
  High-speed surveying for mass data acquisition by automatically logging points at a given time interval, minimum distance difference or minimum height difference

- Hidden Point:
  The coordinates of inaccessible points can be calculated by
  - measuring distances and/or azimuth to the inaccessible point using a hidden point measurement device such as the Leica Disto or any other suitable laser range finder or by using a conventional tape
  - manually occupying auxiliary points
  - computing bearings from previously occupied points

Determine Coordinate System:

GPS 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 3 D (Helmert transformation)

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, offsetpoints 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

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 ist 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
- Grid staking 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
- Staking relative to a polyline which was imported from a DXF file or manually created

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 measure point to the plane

DTM Stakeout:

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

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

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

Leica Geo Office Software

Description

Easy, fast and comprehensive, automated suite of programs for TPS, GPS and Level data. View and manage TPS, GPS and Level data in an integrated way. Process independently or combine data – including post processing and support of real-time GPS 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 GPS, TPS and level data, based on Windows standards. An embedded help system includes tutorials with additional information.
Runs on Windows™ 2000, XP and Vista 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.

COGO:

Computation of coordinates of points using inverse, traverse, intersection, line and arc calculations and area divisions. Select points graphically and create 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 GPS receivers, total stations and also for digital levels.

GPS 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® 1 GHz processor or higher 512 MB RAM or more Microsoft® Windows™ 2000, XP or Vista Microsoft® Internet Explorer 5.5 or higher

Whether you want to survey a parcel of land or a construction site, a facade or indoors to create as-built plans or carry out high-precision measurements of bridge and tunnel constructions – Leica Geosystems' surveying instruments provide the right solution for all measuring tasks.

The System 1200 Series instruments as well as the software are designed to meet the daily challenges of modern surveying. They all have outstanding, easy to read and user-friendly interfaces. Their straightforward menu structures, their clearly outlined scope of functions and high technology perfectly mate GNSS and TPS applications in the field. Whether you use the advantages of both technologies combined or each separately – due to the exceptional flexibility of Leica Geosystems instruments, reliable and productive surveying is assured.

When it has to be right.

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Leica Geosystems AG
Switzerland
www.leica-geosystems.com

- when it has to be **right**

Leica Geosystems

Leica GRX1200 Series
Technical Data

GNSS
future proof

- when it has to be **right**

Leica
Geosystems

GRX1200 Series Technical Data

Summary Description

	GRX1200 Lite	GRX1200 Classic	GRX1200 Pro	GRX1200 GG Pro
Continuously Operating Reference Station (CORS)	•	•	•	•
GPS	•	•	•	
GNSS				•
Survey, geodetic, real-Time, GIS and Monitoring applications	•	•	•	•
Dual-frequency L1 + L2	•	•	•	•
Phase and code measurements	•	•	•	•
Post processing		•	•	•
Real-time RTK reference standard	•*	•	•	•
DGPS/RTCM reference standard		•	•	•
Internal raw data logging		•	•	•
Raw data streaming	•	•	•	•
Advanced input/output ports (Event, PPS, Oscillator)			•	•
LAN/WAN enabled.			•	•

* exclusively for SmartStation

For GPS System 1200 field and rover receiver and office software technical data, please refer to LEICA GPS1200 series Technical Data sheet (Art.-No. 738817en)

System Components

Receiver

	GRX1200 Lite/Classic GRX1200 Pro	GRX1200 GG Pro
Receiver technology	SmartTrack - patented. Discrete elliptical filters. Fast acquisition. Strong signal. Low noise. Excellent tracking, even for low satellites and in adverse conditions. Interference resistant. Multipath mitigation.	SmartTrack+ is built on SmartTrack technology and enhanced for GNSS signals. Includes discrete elliptical filters. Fast acquisition. Strong signal. Low noise. Excellent tracking, even for low satellites and in adverse conditions. Interference resistant. Multipath mitigation.
No. of channels	12 L1 + 12 L2 2 SBAS (GRX Pro only)	72 channels - 14L1 + 14L2 GPS - 12L1 + 12L2 GLONASS - 2 SBAS
L1 measurements (GPS)	Carrier phase full wave length C/A narrow code	Carrier phase full wave length C/A narrow code

	GRX1200 Lite/Classic GRX1200 Pro	GRX1200 GG Pro
L2 measurements (GPS)	Carrier phase full wave length, AS off or on. P2 code / P-code aided under AS. Equal performance with AS off or on	Carrier phase full wavelength with C code and AS off or on P2 code Equal performance with AS off or on
L1 measurements (GLONASS):	No	Carrier phase full wavelength C/A narrow code
L2 measurements (GLONASS):	No	Carrier phase full wavelength P narrow code
Future Signals	GRX1200 Pro and GRX1200 GG Pro are designed to support the future planned third GPS civil (L5) and the planned GALILEO E1 and E5 signals, via a planned hardware upgrade	
Independent measurements	Fully independent L1 and L2 code and phase measurements	
Internal Oscillator	Aligned to GPS time within 10 nanoseconds	
High frequency SNR	Option to output Signal-to-Noise values in LB2 raw data with true 20Hz	
Time to first phase measurement after switching ON	Typically 30 secs	
LED status indicators	3: for power, tracking, recording/memory	

	GRX1200 Lite/Classic	GRX1200 Pro	GRX1200 GG Pro
Ports			
- Serial RS232	4x LEMO-1, 8-pin, 115'200 baud	4x LEMO-1, 8-pin, 115'200 baud	
- Power Input	2x External LEMO-1, 5-pin / 1x Internal	2x External LEMO-1, 5-pin / 1x Internal	
- Antenna	1x TNC	1x TNC	
- PPS output		1x LEMO ERN.0S.250.CTL	
- Event input		1x LEMO HGP.00.250.CTL	
- External frequency		1x 24QMA-50-2-3/133, 5/10 Mhz	
- Ethernet		1x rugged RJ45, 10Mbit, 3 configurable IP ports and http, https, ftp	
Supply voltage	Nominal 12V DC, range 10.5-28V DC	Nominal 12V DC, range 10.5-28V DC	
Power consumption	3.8W typically, 320mA	4.0W typically, 320mA	3.6W typically, 320mA
Weight, receiver only	1.20kg	1.25kg	
Dimensions (without sockets):	length x width x thickness: 0.212m x 0.166m x 0.079m		

Antennas

Standard geodetic antenna	**AX1202 GG, L1/L2 GPS/GLONASS SmartTrack+**
Groundplane	Built-in groundplane
Dimensions (diameter x height)	170mm x 62mm
Weight	0.44kg
Supply voltage	Pre-amp: 4.75-15VDC, 50mA max.
Gain	29 ± 3 dBi
Phase centre stability	< 1mm
Choke-ring geodetic antenna	**AT504 GG choke ring, L1/L2 GPS/GLONASS microstrip**
Design	Dorne & Margolin L1/L2 antenna element with gold anodized choke ring ground plane. Complies with IGS type 'T' antenna, JPL design.
Protection radome	optional
Dimensions (diameter x height)	380mm x 140mm (antenna)
Weight	4.3kg (antenna)

Supply voltage	Pre-amp: 4.5 - 18.0VDC, 50mA max
Gain	29 ± 3 dBi
Noise Figure	3 dBi max.
BW, -3 dBi	23 MHz min.
BW, -30 dBi	100 MHz max.
Phase centre stability	< 1mm
Choke-ring geodetic antenna	**AT504 choke-ring, L1/L2 GPS microstrip**
Design	Dorne & Margolin L1/L2 antenna element with gold anodized choke ring ground plane. Complies with IGS type 'T' antenna, JPL design.
Protection radome	optional
Dimensions (diameter x height)	380mm x 140mm (antenna)
Weight	4.3kg (antenna)
Supply voltage	Pre-amp: 3.75 - 30VDC, 50mA max.
Gain	typically 27 dBi
Noise Figure	3 dBi max.
BW, -3 dBi	30 MHz min.
BW, -30 dBi	80 MHz max.
Phase centre stability	< 1mm

Controller (optional)

Type	RX1210, RX1210T (with touch screen)
Display	¼ VGA, monochrome, graphics capable, illumination
Character Set	Maximum 256 characters, extended ASCII characters set
Touch screen (RX1210T only)	Toughened film on glass
Keyboard	Full alphanumeric (62 keys), 12 function keys, 6 user-definable keys, illumination
Weight	0.48kg

Measurement Precision and Position Accuracies

Important Note	Measurement precision and accuracy in position and 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 measurements processed using LGO and on real-time measurements.

Code and Phase Measurement Precision (irrespective whether AS off/on)

Carrier phase on L1 / L2	0.2mm rms	/	0.2mm rms
Code (pseudorange) on L1 / L2	2cm rms	/	2cm rms

Accuracy (rms) with post processing

	With LEICA Geo Office L1/L2 processing software GLONASS option needed to process GLONASS data	
Static (phase), choke ring antenna long lines, long observation time	Horizontal:	3mm + 0.5ppm
	Vertical:	6mm + 0.5ppm
Static and rapid static (phase)	Horizontal:	5mm + 0.5ppm

with standard antenna	Vertical:	10mm + 0.5ppm
Code only	Typically	25cm

Accuracy (rms) in single receiver navigation mode

Navigation accuracy	5–10m rms for each coordinate
Degradation effect	Degradation possible due to SA

Position update and latency

Position update rate	Selectable: 0.05 sec (20Hz) to 60 secs
Position latency	0.03 sec or less

PPS output

PPS output	For GRX1200 Pro/GRX1200 GG Pro
Characteristics	
Peak	3.3 V= High
Impedance	50 Ω
Pulse length	1ms
Leading edge	Coinciding with the beginning of each epoch.
Positive/negative edge	Selectable via RX1200 or web interface
Cable connectivity:	
Matched with an appropriate impedance of	50 Ω
Socket:	LEMO ERN.OS.250.CTL

Event input	For GRX1200 Pro/GRX1200 GG Pro
Pulse type	TTL, positive or negative going pulse
Pulse length	125 ns at minimum
Voltage	TTL level, ~ 5V, min. 3.3V
Pin definition	Centre = signal, Case = ground
Socket	LEMO HGP.00.250.CTL

Power supply

	Up to two external power sources can be connected simultaneously. It is possible to configure one as the primary power input and the other as backup power source. An internal plug-in battery can be used for temporary set ups.
External power supply unit	Power-supply unit for GPS receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 12VDC. Ideal for continuous receiver operation.
External battery	GEB171 rechargeable 8Ah/12V NiCd battery
Operation time	1 GEB171 powers receiver plus antenna for about 25hrs
Internal battery	GEB221 rechargeable Li-Ion battery 3.8Ah/7.2V, 1 battery fits into receiver
Operation time	1 GEB221 powers receiver plus antenna for about 8 hrs
Weight, GEB221 battery	0.2kg

Receiver Control & Operation

Receiver operation

Web interface	Standard method of receiver configuration, operation and status display.
Operation using OWI	Receiver control, operation, data input, survey-data acquisition, information display via remote SW application using OWI command control, e.g with Leica GPS Spider.
Built-In Status LED's	3 LED's indicate power, tracking, recording/memory
RX1210 & RX1220 Controller	Can be used for initial receiver configuration and status information display With the campaign option, GRX1200 Classic and Pro instruments can be used for field campaigns. The instruments can be fully operated with a RX1210 controller for static raw data logging.
Startup configurator	Initial configuration and query of settings using a simple ASCII text file on the CF card
FTP Server	Access to receiver memory with FTP

Internet connectivity

Web interface ports	Web interface for remote configuration, operation and status displays. Supports http and https ▪ Ethernet port ▪ Serial Port (PPP) ▪ Simultaneous access over Ethernet port is fully supported
Security	Access restrictions configurable in User Management component: • Viewers (status only) • Users (configuration and status) • Administrators SSL encryption
E-Mail:	Sending of message log in scheduled intervals over email. Ethernet and PPP connection to the internet is supported
FTP Push (optional):	Automated FTP Push of raw data and/or RINEX files to a remote FTP server. Ethernet and PPP connection to the internet is supported
RTK Multiplexing	Option to allow RTK data streaming direct from the sensor, via TCPIP, for up to 20 clients
DynDNS	Allows receiver addressing with dynamic IP address through a static host name. Requires registration with a DynDNS service

OWI interface

Protocol Versions	Leica proprietary Outside World Interface - OWI – for receiver control commands from PC etc, for receiver configuration, control and status, e.g. using Leica GPS Spider Binary or ASCII
OWI interface ports	▪ All serial ports ▪ Ethernet port Simultaneous access, control and message output using these ports is fully supported

Startup configurator

Set and query	Initial configuration and query of serial ports settings, Ethernet port and address settings using a simple ASCII text file on the CF card Serial port settings PPP on RX port Ethernet settings Web Server settings DynDNS settings
Query	MAC address

Receiver operation and receiver types

	GRX1200 Lite	GRX1200 Classic	GRX1200 Pro	GRX1200 GG Pro
Web interface over ethernet			•	•
Web interface over serial cable (PPP)	•	•	•	•
OWI interface (e.g. GPS Spider)	•	•	•	•
RX1210 & RX1220 Controller	•	•	•	•
Startup configurator	•	•	•	•
FTP Server			•	•

Transmitted Real-time RTK and DGPS/RTCM Data Formats

	GRX1200 Lite	GRX1200 Classic	GRX1200 Pro	GRX1200 GG Pro
Leica	•*	•	•	•
CMR/CMR+		•	•	•
RTCM versions 2.x, Message types 1, 2, 3, 9,18, 19, 20, 21, 22, 23, 24		•	•	•
RTCM versions 3.0, 3.1		•	•	•
Simultaneous transmissions: 2 real time output interfaces via independent ports, providing identical or different RTK/RTCM formats	•	•	•	•
Time Slicing: Up to four time slots supported	•	•	•	•
NTRIP Server: Direct data streaming to NTRIP Caster			•	•

* exclusively for SmartStation

Transmitted NMEA Data Formats

	GRX1200 Lite	GRX1200 Classic	GRX1200 Pro	GRX1200 GG Pro
NMEA 0183 V2.20 and Leica proprietary	•	•	•	•
Simultaneous transmissions: 2 NMEA output interfaces via independent ports, providing identical or different NMEA messages	•	•	•	•

Transmitted GNSS Data Formats

	GRX1200 Lite	GRX1200 Classic	GRX1200 Pro	GRX1200 GG Pro
Leica binary (LB2)	•	•	•	•
BINEX records 0x00, 0x01, 0x7d, 0x7e, 0x7f	•	•	•	•
Simultaneous transmissions: as many raw data outputs as ports available, providing identical or different raw data output	•	•	•	•

Data links

	Support of various Radio modems and GSM/GPRS/CDMA cellular mobile phones for RTK, DGPS or remote control operation modes
No. of simultaneous data links	Up to two data links can be attached simultaneously using Leica GFU housing, plus two generic data links, to be used with different sensor interfaces. Or up to four generic data links can be attached simultaneously.
Radio modem	Any suitable radio modem with RS232 interface and operating in transparent mode
Recommended radio modems	Satelline 3AS integrated into Leica GFU housing
GSM phone modem	Any suitable model
Recommended GSM/GPRS phone	Siemens MC45 or MC75 mobile phone integrated into Leica GFU housing
Recommended CDMA phone	Multitech MTMMC mobile phone integrated into Leica GFU housing
Landline phone modem	Any suitable model

Data logging

	GRX1200 Lite	GRX1200 Classic	GRX1200 Pro	GRX1200 GG Pro
Primary raw data logging		•	•	•
Ring buffer raw data logging		•	•	•
RINEX v2.11 primary data logging		•	•*	•*
RINEX v2.11 ring buffer data logging		•	•*	•*

*optional

Recording rate	Selectable from 0.05 to 300 secs
Standard medium	CompactFlash cards: 64MB, 256MB, 1GB
Data capacity:	1 GB is sufficient for ▪ 1152hrs GPS L1 + L2 data logging at 1 sec rate ▪ 17600hrs GPS L1+L2 data logging at 15 sec rate
RINEX Conversion	RINEX conversion available as standard and compressed Hatanaka or zip

Environmental specifications

Receivers	
Temperature, operating	-40°C to +65°C Compliance with ISO9022-10-08, ISO9022-11-special and MIL-STD-810F, Method 502.4-II, MIL-STD-810F, Method 501.4-II
Temperature, storage	-40°C to +80°C Compliance with ISO9022-10-08, ISO9022-11-special and MIL-STD-810F, Method 502.4-I, MIL-STD-810F, Method 501.4-I

Humidity	Up to 100%* Compliance with ISO9022-13-06, ISO9022-12-04 and MIL-STD-810F Method 507.4-I * The effects of condensation are to be effectively counteracted by periodically drying out the product
Protection against Water, Sand and Dust	IP67 Protection against blowing rain Waterproof to temporary submersion into water (maximum depth of 1m) Dust-tight, protection against blowing dust Compliance with IP67 according IEC60529 and MIL-STD-810F Method 506.4-I, MIL-STD-810F Method 510.4-I, MIL-STD-810F Method 512.4-I
Drops Vibration	Withstands 1m drop onto hard surfaces Compliance with ISO9022-36-08 and MIL-STD-810F Method 514.5-Cat24
GPS Antennas	**Valid for AX1201, AX1202 GG**
Temperature, operating	-40°C to +70°C Compliance with ISO9022-10-08, ISO9022-11-05 and MIL-STD-810F, Method 502.4-II, MIL-STD-810F, Method 501.4-II
Temperature, storage	-55°C to +85°C Compliance with ISO9022-10-08, ISO9022-11-06 and MIL-STD-810F, Method 502.4-II, MIL-STD-810F, Method 501.4-II
Humidity	Up to 100%* Compliance with ISO9022-13-06, ISO9022-12-04 and MIL-STD-810F Method 507.4-I * The effects of condensation are to be effectively counteracted by periodically drying out the product
Protection against Water, Sand and Dust	IP66 Protection against water jets IP67 Protection against blowing rain Waterproof to temporary submersion into water (maximum depth of 1m) Dust-tight, protection against blowing dust Compliance with IP66 and IP67 according IEC60529 and MIL-STD-810F Method 506.4-I, MIL-STD-810F Method 510.4-I, MIL-STD-810F Method 512.4-I
Drops Vibration	Withstands 1.5m drop onto hard surfaces Withstands vibrations during operation on large civil construction machines Compliance with ISO9022-36-08 and MIL-STD-810F Method 514.5-Cat24
Functional Shock	No loss of lock to satellite signal when used on a pole set-up and submitted to pole bumps up to 150mm
Topple over pole	Survives topple over from a 2m survey pole onto hard wood on a concrete floor

	Valid for AT504 GG & AT504
Temperature, operating	-40°C to +70°C Compliance with ISO9022-10-08, ISO9022-11-05 and MIL-STD-810F, Method 502.4-II, MIL-STD-810F, Method 501.4-II
Temperature, storage	-40°C to +70°C Compliance with ISO9022-10-08, ISO9022-11-06 and MIL-STD-810F, Method 502.4-I, MIL-STD-810F, Method 501.4-I
Humidity	Up to 92%* Compliance with ISO9022-12-04 and MIL-STD-810F Method 507.4-I * The effects of condensation are to be effectively counteracted by periodically drying out the product
Protection against Water, Sand and Dust	IP67 Protection against blowing rain Waterproof to temporary submersion into water (maximum depth of 1m) Dust-tight, protection against blowing dust Compliance with IP67 according IEC60529

Leica GPS Spider – Reference Station software

For Leica GPS Spider Reference Station software description and technical specifications please refer to the Leica GPS Spider software brochure (Art.-No. 745970en)

Whether providing corrections from just a single reference station, or an extensive range of services from a nationwide RTK network – innovative reference station solutions from Leica Geosystems offer tailor-made yet scalable systems, designed for minimum operator interaction whilst providing maximum user benefit. In full compliance with international standards, Leica's proven and reliable solutions are based on the latest technology.

Precision, value, and service from Leica Geosystems.
When it has to be right.

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- when it has to be **right**

Leica Geosystems

Leica Viva GS10
Data sheet

Engaging software

The Leica Viva GNSS GS10 receiver is accompanied with the revolutionary Captivate software, turning complex data into the most realistic and workable 3D models. With easy-to-use apps and familiar touch technology, all forms of measured and design data can be viewed in all dimensions. Leica Captivate spans industries and applications with little more than a simple swipe, regardless of whether you work with GNSS, total stations or both.

Infinitely bridging the field to the office

Leica Infinity imports and combines data from your GNSS, total station and level instruments for one final and accurate result. Processing has never been made easier when all your instruments work in tandem to produce precise and actionable information.

ACC»

Customer care only a click away

Through Active Customer Care (ACC), a global network of experienced professionals is only a click away to expertly guide you through any problem. Eliminate delays with superior technical service, finish jobs faster with excellent consultancy support, and avoid costly site revisits with online service to send and receive data directly from the field. Control your costs with a tailored Customer Care Package, giving you peace of mind you're covered anywhere, anytime.

- when it has to be **right**

Leica Geosystems

Leica Viva GS10

GNSS TECHNOLOGY		
Self-learning GNSS	Leica RTKplus SmartLink (worldwide correction service) SmartLink fill (worldwide correction service)	Adaptive on-the-fly satellite selection Remote precise point positioning (3 cm 2D)[1] Initial convergance to full accuracy 20 - 40 min, Re-convergance < 1 min Bridging of RTK outages up to 10 min (3 cm 2D)[1]
Leica SmartCheck	Continuous check of RTK solution	Reliability 99.99%
Signal tracking		GPS (L1, L2, L2C, L5), Glonass (L1, L2), BeiDou (B1, B2, B3[2]), Galileo (E1, E5a, E5b, Alt-BOC, E6[2]), QZSS[3], SBAS (WAAS, EGNOS, MSAS, GAGAN), L-band
Number of channels		555 (more signals, fast acquisition, high sensitivity)
GNSS antenna	Standard or Choke-ring	Leica AS10 / AS05 or Leica AR10 / AR20 / AR25
MEASUREMENT PERFORMANCE & ACCURACY[1]		
Time for initialisation		Typically 4 s
Real-time kinematic (Compliant to ISO17123-8 standard)	Single baseline Network RTK	Hz 8 mm + 1 ppm / V 15 mm + 1 ppm Hz 8 mm + 0.5 ppm / V 15 mm + 0.5 ppm
Post processing	Static (phase) with long observations Static and rapid static (phase)	Hz 3 mm + 0.1 ppm / V 3.5 mm + 0.4 ppm Hz 3 mm + 0.5 ppm / V 5 mm + 0.5 ppm
Code differential	DGPS / RTCM	Typically 25 cm
COMMUNICATIONS		
Communication ports	Lemo Bluetooth®	1 x USB and 2 x RS232 serial and Power Bluetooth® v2.00 + EDR, class 2
Communication protocols	RTK data protocols NMEA output Network RTK	Leica, Leica 4G, CMR, CMR+, RTCM 2.2, 2.3, 3.0, 3.1, 3.2 MSM NMEA 0183 V 4.00 and Leica proprietary VRS, FKP, iMAX, MAC (RTCM SC 104)
External data links	Up to 3 simultaneously	GSM / GPRS / UMTS / CDMA / VHF / UHF (up to 28800 bps over air) modem Phone / Radio modem in Leica GFU housing (IP67)
GENERAL		
Field controller and software	Leica Captivate software Leica SmartWorx Viva software	Leica CS20 field controller, Leica CS35 tablet Leica CS10 and CS15 field controller
User interface	Buttons and LEDs Web server	On / Off and Function button, 8 status LEDs Full status information and configuration options
Data recording	Storage Data type and recording rate	Removable SD card, 8 GB Leica GNSS raw data and RINEX data up to 20 Hz
Power management	Internal power supply External power supply Operation time[4]	2 exchangeable Li-Ion batteries (6 Ah / 7.4 V) Nominal 12 V DC, range 10.5 - 28 V DC 15h receiving (Rx) data with UHF radio, 13 h transmitting data with UHF radio (1W), 14 h Rx / Tx data with phone modem
Weight and Dimensions	Weight Dimensions	1.20 kg (GS10) / 5.40 kg standard RTK rover setup using pole and backpack 212 mm x 166 mm x 79 mm
Environmental	Temperature Drop Proof against water, sand and dust Vibration Humidity Functional shock	-40 to 65°C operating, -40 to 80°C storage Withstands topple over from a 2m survey pole onto hard surfaces IP68 (IEC60529 / MIL STD 810G 506.5 I / MIL STD 810G 510.5 I / MIL STD 810G 512.5 I) Withstands strong vibration (ISO9022-36-08 / MIL STD 810G 514.6 Cat.24) 100% (ISO9022-13-06 / ISO9022-12-04 / MIL STD 810G 507.5 I) 40 g / 15 to 23 msec (MIL STD 810G 516.6 I)

LEICA VIVA GS10 - GNSS RECEIVER	Basic	Performance	Unlimited
SUPPORTED GNSS SYSTEMS			
Multi-frequency	•	✔	✔
GPS / GLONASS / Galileo / BeiDou	✔ / • / • / •	✔ / • / • / •	✔ / ✔ / ✔ / ✔
RTK PERFORMANCE			
DGPS/RTCM. RTK Unlimited, Network RTK	•	✔	✔
SmartLink fill / SmartLink	• / •	• / •	✔ / •
POSITION UPDATE & DATA RECORDING			
5 Hz / 20 Hz positioning	✔ / •	✔ / ✔	✔ / ✔
Raw data / RINEX data logging / NMEA out	✔ / • / •	✔ / • / •	✔ / ✔ / ✔
ADDITIONAL FEATURES			
RTK reference station functionality	•	✔	✔

✔ Standard • Optional

[1] Measurement precision, accuracy, reliability and time for initialisation are dependent upon various factors including number of satellites, observation time, atmospheric conditions, multipath etc. Figures quoted assume normal to favourable conditions. A full BeiDou and Galileo constellation will further increase measurement performance and accuracy.

[2] Believe to comply, but subject to availability of BeiDou ICD and Galileo commercial service definition. BeiDou B3 and Galileo E6 will be provided through future firmware upgrade.

[3] Support of QZSS is incorporated and will be provided through future firmware upgrade when QZSS will be operational.

[4] Might vary with temperature, age of battery, transmit power of data link device.

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- when it has to be **right**

Leica Geosystems

Leica Viva GS15
Data sheet

Engaging software

The Leica Viva GS15 GNSS smart antenna is accompanied with the revolutionary Captivate software, turning complex data into the most realistic and workable 3D models. With easy-to-use apps and familiar touch technology, all forms of measured and design data can be viewed in all dimensions. Leica Captivate spans industries and applications with little more than a simple swipe, regardless of whether you work with GNSS, total stations or both.

Infinitely bridging the field to the office

Leica Infinity imports and combines data from your GNSS, total station and level instruments for one final and accurate result. Processing has never been made easier when all your instruments work in tandem to produce precise and actionable information.

ACC»

Customer care only a click away

Through Active Customer Care (ACC), a global network of experienced professionals is only a click away to expertly guide you through any problem. Eliminate delays with superior technical service, finish jobs faster with excellent consultancy support, and avoid costly site revisits with online service to send and receive data directly from the field. Control your costs with a tailored Customer Care Package, giving you peace of mind you're covered anywhere, anytime.

- when it has to be **right**

Leica Geosystems

Leica Viva GS15

GNSS TECHNOLOGY		
Self-learning GNSS	Leica RTKplus SmartLink (worldwide correction service) SmartLink fill (worldwide correction service)	Adaptive on-the-fly satellite selection Remote precise point positioning (3 cm 2D)[1] Initial convergance to full accuracy 20 - 40 min, Re-convergance < 1 min Bridging of RTK outages up to 10 min (3 cm 2D)[1]
Leica SmartCheck	Continuous check of RTK solution	Reliability 99.99%
Signal tracking		GPS (L1, L2, L2C, L5), Glonass (L1, L2, L3[2]), BeiDou (B1, B2, B3[2]), Galileo (E1, E5a, E5b, Alt-BOC, E6[2]), QZSS[3], NavIC L5[3], SBAS (WAAS, EGNOS, MSAS, GAGAN), L-band
Number of channels		555 (more signals, fast acquisition, high sensitivity)
MEASUREMENT PERFORMANCE & ACCURACY[1]		
Time for initialisation		Typically 4 s
Real-time kinematic (Compliant to ISO17123-8 standard)	Single baseline Network RTK	Hz 8 mm + 1 ppm / V 15 mm + 1 ppm Hz 8 mm + 0.5 ppm / V 15 mm + 0.5 ppm
Post processing	Static (phase) with long observations Static and rapid static (phase)	Hz 3 mm + 0.1 ppm / V 3.5 mm + 0.4 ppm Hz 3 mm + 0.5 ppm / V 5 mm + 0.5 ppm
Code differential	DGPS / RTCM	Typically 25 cm
COMMUNICATIONS		
Communication ports	Lemo Bluetooth®	USB and RS232 serial Bluetooth® v2.00 + EDR, class 2
Communication protocols	RTK data protocols NMEA output Network RTK	Leica, Leica 4G, CMR, CMR+, RTCM 2.2, 2.3, 3.0, 3.1, 3.2 MSM NMEA 0183 V 4.00 and Leica proprietary VRS, FKP, iMAX, MAC (RTCM SC 104)
Built-in data links	3.5G phone modem Radio modem	Fully integrated, internal or external antenna Fully integrated, receive and transmit, internal or external antenna 403 - 470 MHz, 1 W output power, up to 28800 bps over air
External data links		GSM / GPRS / UMTS / CDMA and UHF / VHF modem
GENERAL		
Field controller and software	Leica Captivate software Leica SmartWorx Viva software	Leica CS20 field controller, Leica CS35 tablet Leica CS10 and CS15 field controller
User interface	Buttons and LEDs Web server	On / Off and Function button, 8 status LEDs Full status information and configuration options
Data recording	Storage Data type and recording rate	Removable SD card, 8 GB Leica GNSS raw data and RINEX data up to 20 Hz
Power management	Internal power supply External power supply Operation time[4]	2 exchangeable Li-Ion batteries (2.6 Ah / 7.4 V) Nominal 12 V DC, range 10.5 - 28 V DC 10 h receiving (Rx) data with internal radio, 9 h transmitting (Tx) data with internal radio, 7.5 h Rx / Tx data with internal phone modem
Weight and Dimensions	Weight Diameter x Height	1.34 kg (GS15) / 3.30 kg standard RTK rover setup on pole 196 mm x 198 mm
Environmental	Temperature Drop Proof against water, sand and dust Vibration Humidity Functional shock	-40 to 65°C operating, -40 to 80°C storage Withstands topple over from a 2m survey pole onto hard surfaces IP68 (IEC60529 / MIL STD 810G 506.5 I / MIL STD 810G 510.5 I / MIL STD 810G 512.5 I) Withstands strong vibration (ISO9022-36-08 / MIL STD 810G 514.6 Cat.24) 100% (ISO9022-13-06 / ISO9022-12-04 / MIL STD 810G 507.5 I) 40 g / 15 to 23 msec (MIL STD 810G 516.6 I)

LEICA VIVA GS15 - GNSS SMARTANTENNA	Basic	Performance	Unlimited
SUPPORTED GNSS SYSTEMS			
Multi-frequency	•	✔	✔
GPS / GLONASS / Galileo / BeiDou	✔ / • / • / •	✔ / • / •/ •	✔ / ✔ / ✔ / ✔
RTK PERFORMANCE			
DGPS/RTCM. RTK Unlimited, Network RTK	•	✔	✔
SmartLink fill / SmartLink	• / •	• / •	✔ / •
POSITION UPDATE & DATA RECORDING			
5 Hz / 20 Hz positioning	✔ / •	✔ / ✔	✔ / ✔
Raw data / RINEX data logging / NMEA out	✔ / • / •	✔ / • / •	✔ / ✔ / ✔
ADDITIONAL FEATURES			
RTK reference station functionality	•	✔	✔

✔ Standard • Optional

[1] Measurement precision, accuracy, reliability and time for initialisation are dependent upon various factors including number of satellites, observation time, atmospheric conditions, multipath etc. Figures quoted assume normal to favourable conditions. A full BeiDou and Galileo constellation will further increase measurement performance and accuracy.

[2] Believe to comply, but subject to availability of BeiDou ICD and Galileo commercial service definition. Glonass L3, BeiDou B3 and Galileo E6 will be provided through future firmware upgrade.

[3] Support of QZSS / NavIC L5 is incorporated and will be provided through future firmware upgrade.

[4] Might vary with temperature, age of battery, transmit power of data link device.

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Leica Geosystems

Leica FlexLine TS06plus

Top Precision meets High Efficiency

- when it has to be **right**

Leica Geosystems

The First Plus:
Original Leica Geosystems Quality

For most, "quality" is relative. Not so at Leica Geosystems. To ensure our instruments meet the highest precision and quality requirements, we manufacture them in state-of-the-art facilities around the world. Swiss technology combines with exceptional craftsmanship to provide best-in-class devices. And this quality also applies to all of our procedures – moving Leica Geosystems towards business excellence to meet our customers' needs and expectations in every way. The Leica FlexLine TS06plus Manual Total Station is ideal for many daily surveying tasks, especially for mid- to high-accuracy applications. Banking on the heritage of the previous Leica TS06 model, the most successful of the Leica FlexLine Series, the Leica FlexLine TS06plus is the newest ultimate Total Station.

Welcome to the world of Leica Geosystems. Welcome to a world of people, technologies, services and devices, that you can completely rely on.

ACTIVE customer care

my world @Leica Geosystems

The Third Plus:
Top Precision, Speed and Efficiency

The claim "easy to operate" seems to be everywhere. Whether this promise can be kept only becomes apparent in the practice. Because professional measurement experts were involved in its development, the Total Station Leica FlexLine TS06plus allows you to work quickly and effectively right from the first day.

Electronic Distance Measurement:
Wherever high-distance measurement accuracy is required, you can face the challenge of this demanding task with the TS06plus. It provides the most accurate Electronic Distance Measurement.

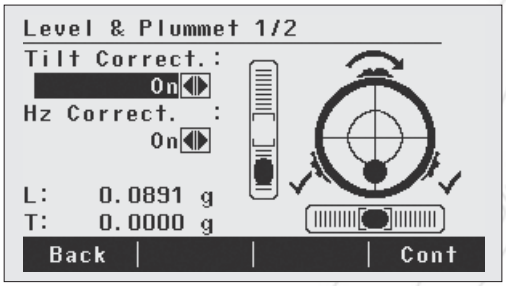
Prism Mode
- Precision+ (1.5 mm + 2 ppm)
- Speed (1 second)

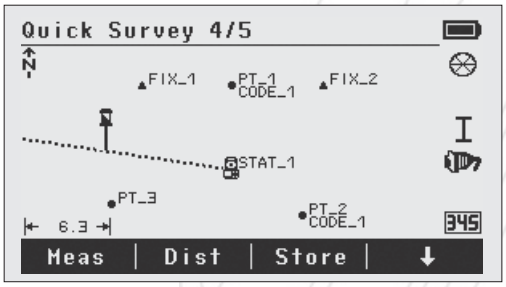
Non-Prism Mode
- Precision (2 mm + 2 ppm)
- PinPoint EDM with coaxial, small laser pointer and measurement beam for accurate aiming and measuring
- Fewer set-ups required, because targets on which it is not possible to set up a reflector can be measured using reflectorless measurement up to 1.000

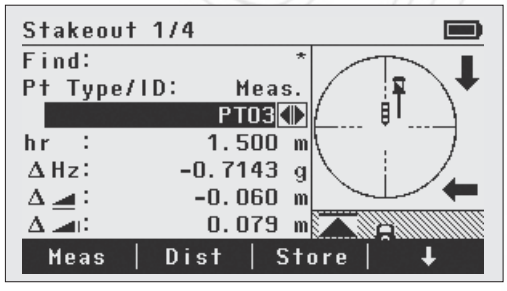
The Leica FlexLine TS06plus Communication Side Cover enables cable-free connection to any data collector via Bluetooth, for example the field-controllers Leica Viva CS10 or Leica Viva CS15 with SmartWorks Viva software. The USB-stick enables the flexible transfer of such data as GSI, DXF, ASCII, LandXML and CSV.

Built-in user friendliness: The full alpha-numerical keyboard.
The Leica TS06plus standard built-in alpha-numerical keyboard enables fast and easy entry of numbers, letters and special characters, e.g. for coding. It increases the work speed while at the same time reducing possible sources of error.

FlexField plus Onboard Software: Easy to use due to it's graphical guidance and intuitive workflows.







Leica Geosystems – mySecurity
mySecurity gives you total peace of mind. If your instrument is ever stolen, a locking mechanism is available to ensure that the device is disabled and can no longer be used.

Leica FlexLine Plus
Proven Specifications, Reliable Instruments

Leica FlexLine TS06plus specifications:

Angle Measurement (Hz, V)		
Accuracy [1]	1" (0.3 mgon) / 2" (0.6 mgon) 3" (1 mgon) / 5" (1.5 mgon) 7" (2 mgon)	✓
Method	Absolute, continuous, diametrical: at all models	✓
Display resolution	0.1" / 0.1 mgon / 0.01 mil	✓
Compensation	Quadruple Axis Compensation: at all models	✓
Compensator Setting Accuracy	0.5" / 0.5" / 1" / 1.5" / 2"	✓
Distance Measurement with Reflector		
Range [2] Round prism (Leica GPR1)	3.500 m	✓
Range [2] Reflective tape (60 mm x 60 mm)	>500 m [9] >1000 m [10]	✓
Range [2] Prism-Long (Leica GPR1, R500/R1000)	>10.000 m	✓
Accuracy [3]	Precise+: 1.5 mm + 2.0 ppm Precise Fast: 2.0 mm + 2.0 ppm Tracking: 3.0 mm + 2.0 ppm	✓
Typical Measurement time [4]	1.0 s	✓
Distance Measurement without Reflector [8]		
Range [5] PinPoint R500 / R1000	 › 500 m / › 1000 m	✓o
Accuracy [3] [6]	2 mm + 2 ppm	✓
Laser dot size	At 30 m: approx. 7 x 10 mm At 50 m: approx. 8 x 20 mm	✓
Data storage / Communication		
Internal memory	Max.: 100'000 fixpoints, Max.: 60'000 measurements	✓
Interfaces	– Serial (Baudrate up to 115'200) – USB Type A and mini B, – Bluetooth® Wireless, class 1, 150 m – › 1000 m (with TCPS29)	✓ ✓ ✓ o
Data formats	GSI / DXF / LandXML / CSV / user definable ASCII formats	✓
Guide Light (EGL)		
Working Range (average atmospheric conditions)	5 m – 150 m	o
Positioning accuracy	5 cm at 100 m	o

Telescope		
Magnification	30 x	✓
Resolving power	3"	✓
Field of View	1° 30' (1.66 gon) 2.7 m at 100 m	✓
Focusing range	1.7 m to infinity	✓
Reticle	Illuminated, 10 brightness levels	✓
Keyboard and Display		
Keyboard and Display	Full Alpha-numerical keyboard with high resolution Black & White display, Graphics, 160 x 288 pixels, display illuminated, 5 brightness levels	✓
Position	Face I, Face II	✓o
Operating System		
Windows CE	5.0 Core	✓
Laserplummet		
Type	Laser point, 5 brightness levels	✓
Centering accuracy	1.5 mm at 1.5 m Instrument height	✓
Battery		
Type	Lithium-Ion	✓
Operating time [7]	approx. 30 hours	✓
Weight		
Total station including GEB211 and tribrach	5.1 kg	✓
Environmental		
Temperature range (operation)	–20° C to +50° C (–4° F to +122° F)	✓
	Arctic Version –35° C to 50° C (–31° F to +122° F)	o
Dust / Water (IEC 60529) Humidity	IP55, 95%, non condensing	✓
Leica FlexField plus Onboard Sofware		
Included Application Programs: Survey incl. Map View; Stake Out; Station Setup including: Resection, Local Resection, Helmert Re-section, Orientation (Angles & Coordinates), Height Transfer; Area (Plan & Surface); DTM Volume calculation; Tie Distance (MLM); Remote Height; Hidden Point; Backsight Check; Offset; Reference Line; Reference Arc; Reference Plane; Road 2D; COGO		✓
Extra Application Programs: Road 3D, Traverse		o
Theft protection		
mySecurity, PIN/PUK Code		✓✓

Model Comparison: Configurations & Options of Manual Total Stations

	TS02plus	TS06plus	TS09plus	Viva TS11
1" angular accuracy	–	o	o	o
Enhanced measurement accuracy to prism	1.5 mm + 2 ppm	1.5 mm + 2 ppm	1.5 mm + 2 ppm	1.0 mm + 1.5 ppm
Reflectorless measurement range	500 m option	500 m included/1000 m option	500 m included/1000 m option	500 m included/1000 m option
Display with graphics and display illumination	Black & White high resolution	Black & White high resolution	Q-VGA Color & Touch	Full-VGA Color & Touch
Full alpha-numerical keyboard with function keys	–	✓	✓	✓
Second Keyboard	o	o	o	o
Keyboard illumination	–	–	✓	✓
Electronic Guide Light	–	o	✓	✓
USB Type A and mini B	–	✓	✓	✓
Bluetooth® Wireless	–	✓	✓	✓
SD Card	–	–	–	✓
Imaging capability	–	–	–	o
Smart Station GNSS capability	–	–	–	o
Onboard software (package content)	FlexField plus (standard)	FlexField plus (advanced)	FlexField plus (full)	SmartWorx Viva (pro)

Legend:

1) Standard deviation ISO-17123-3
2) Overcast, no haze, visibility about 40 km; no heat shimmer.
3) Standard deviation ISO-17123-4
4) Prism Precise Fast mode
5) Under optimal conditions on Kodak Grey Card (90% reflective). Maximum range varies with atmospheric conditions, target reflectivity and surface structure.
6) Range › 500m 4mm+2ppm
7) Single Measurement every 30 second at 25° C. Battery time may be shorter if battery is not new. Internal battery GEB222.
8) Reflectorless measurement time may vary according to measuring objects, observation situations and environmental conditions.
9) with R500 option using Non-prism mode
10) with R1000 option using Non-prism mode

✓ Included
o Option
– Not available

The Second Plus:
Real Features, True Benefits

USB Stick
- For fast and easy transfer of data

Wireless Bluetooth
- For cable-free connection to data logger

PinPoint EDM
- The most precise in its class (1.5 mm + 2 ppm)
- Extremely fast (1 second)
- > 1.000 meters without prism
- Coaxial laser pointer and measurement beam

Electronic Guide Light
- For faster stake-out

Alpha-numerical keyboard
- Fast and error-free input

FlexField plus
- Modern and intuitive on-board software for higher productivity

Large high-resolution display
- At-a-glance viewing on the largest high-resolution display in its class

Useful tools
- A range of tools, such as a trigger key and laser plummet, speed up your work

Arctic version
- For use at –35°C (–31°F)

mySecurity
- Unique cloud-based protection against theft

Scan the code to play the videos!

Whether you want to survey a parcel of land or objects on a construction site, determine measured points on facades or in rooms, gather the coordinates of a bridge or a tunnel – Leica Geosystems' total stations provide the right solution for every application.
They unite reliable results with easy operation and user-friendly applications. Our total stations are designed to meet your specific requirements. Modern technology enables you to work fast and productively, thanks to the straightforward and clearly structured range of functions.

– when it has to be right.

Swiss Technology by Leica Geosystems

TQM ISO 9001 / ISO 14001

Total Quality Management – our commitment to total customer satisfaction.

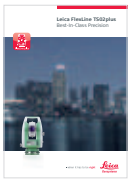
Distance meter:
(PinPoint R500 / R1000):
Laser class 3R in accordance with IEC 60825-1 resp. EN 60825-1

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

Distance meter:
(Prism Mode)
Laser class 1 in accordance with IEC 60825-1 resp. EN 60825-1

Guide light (EGL):
LED class 1 in accordance with IEC 60825-1 resp. EN 60825-1

Cover picture: Dubai City Skyline



FlexLine TS02plus
Brochure

FlexLine TS09plus
Brochure

FlexField plus & FlexOffice
Brochure

Viva TS11
Brochure

Original Accessories
Brochure

Please visit www.leica-geosystems.com for detailed information about Leica FlexLine plus and more documents.

Leica Geosystems AG
Heerbrugg, Switzerland

www.leica-geosystems.com

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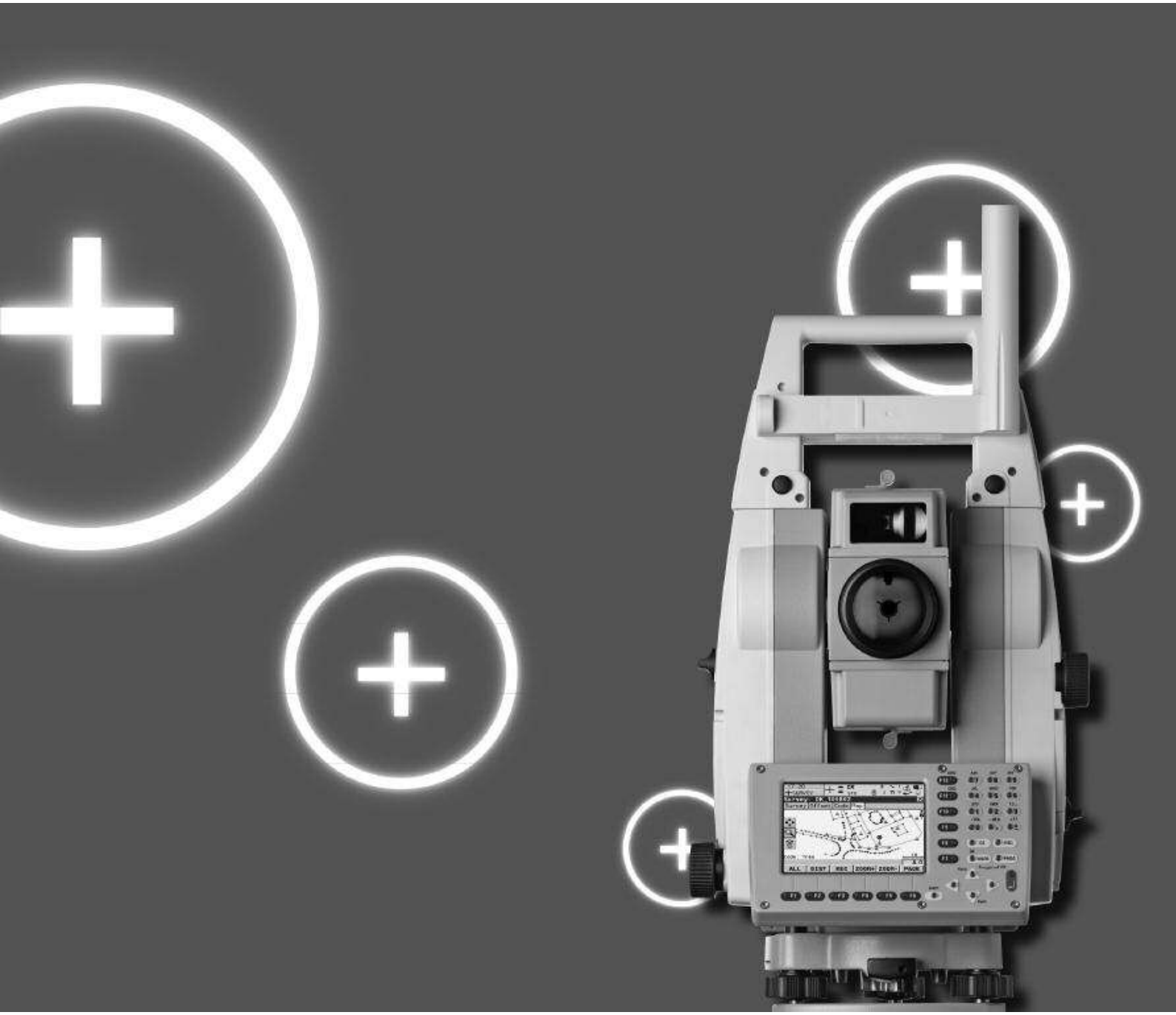
Leica Geosystems

Leica TPS1200+ Series
Technical Data



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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.

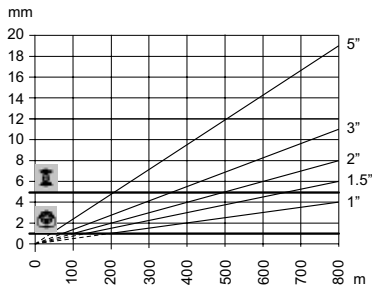
Range

	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

Whether you want to survey a parcel of land or a construction site, a facade or indoors to create as-built plans or carry out high-precision measurements of bridge and tunnel constructions – Leica Geosystems' surveying instruments provide the right solution for all measuring tasks.

The System 1200 Series instruments as well as the software are designed to meet the daily challenges of modern surveying. They all have outstanding, easy to read and user-friendly interfaces. Their straightforward menu structures, their clearly outlined scope of functions and high technology perfectly mate GNSS and TPS applications in the field. Whether you use the advantages of both technologies combined or each separately – due to the exceptional flexibility of Leica Geosystems instruments, reliable and productive surveying is assured.

When it has to be right.

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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.

Distance meter (Prism), ATR and PowerSearch:
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

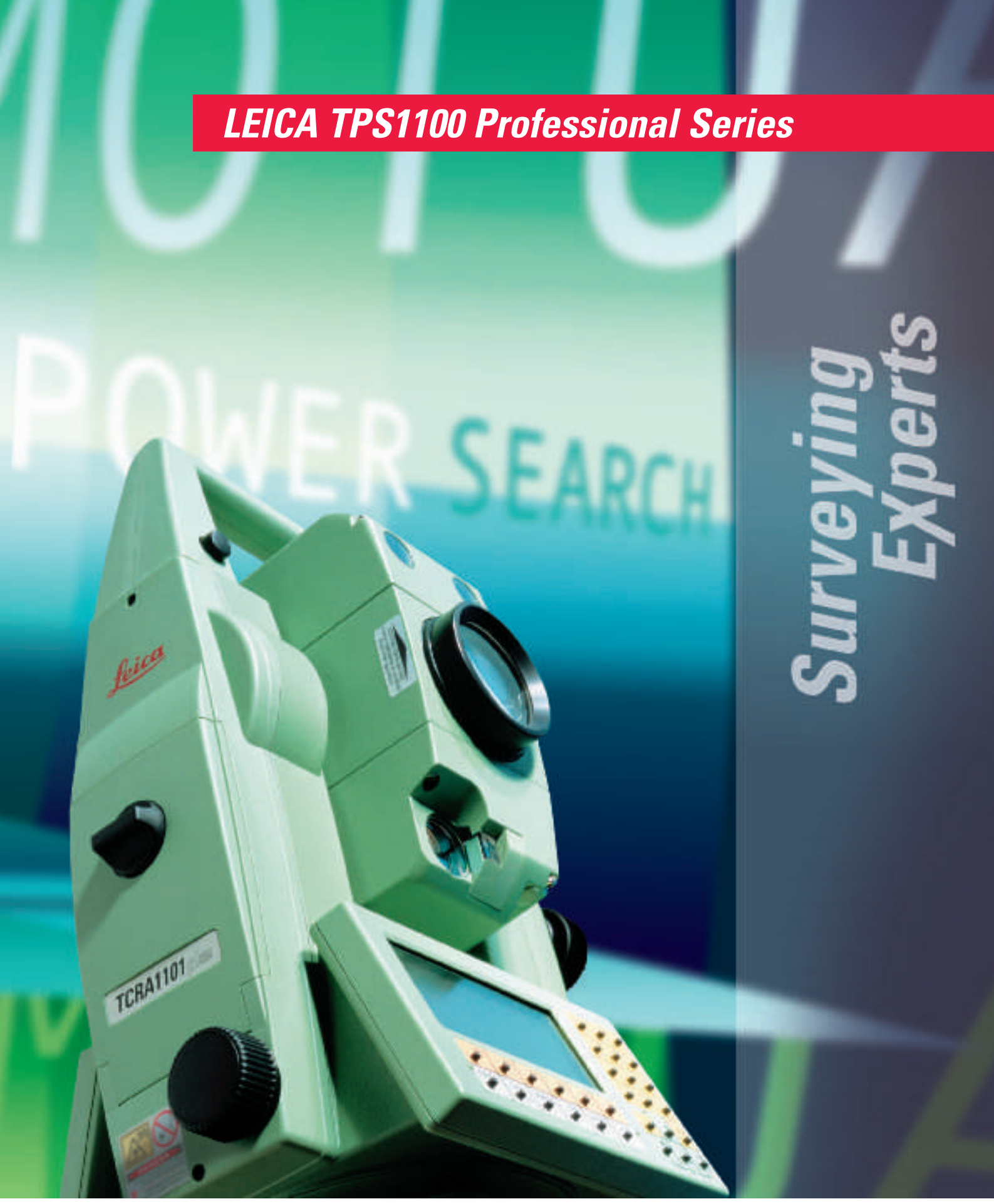
Distance meter (Non-Prism):
Laser class 3R in accordance with IEC 60825-1 resp. EN 60825-1

Leica Geosystems AG
Heerbrugg, Switzerland
www.leica-geosystems.com

- when it has to be **right**

Leica Geosystems

LEICA TPS1100 Professional Series



High-End Surveying
Precise, Fast and Intelligent

Leica Geosystems

TPS1100 Professional Series –
More time for the essentials.

Automated, practical programs are the main features of the TPS1100 Professional Series. A suite of modern functions will make your work more productive, more precise and more flexible.

Sophisticated functions for demanding users

The TPS1100 Professional Series was designed to provide practical solutions to make surveying processes simple, efficient and productive. The TPS1100 Professional Series includes a wide variety of practical, automated functions to achieve the highest degree of efficiency within the shortest period.

One of the many examples is the ATR, the Automatic Target Recognition. With ATR, the instrument fine to points targets by itself. Manual targeting is no longer required. Surveys are made faster and easier, leaving more time to carefully record all significant data.

Flexible in everyday applications

TPS1100 Professional Series high-end surveying instruments offer a high degree of flexibility. The easy-to-read, simple user interface and professional programming environment invite you to configure the instrument to meet your individual requirement and personal preferences. The modular system assures a large variety of available models and options to meet the varying demands and requirements.

Software for efficient data acquisition

Information technologies and surveying are growing closer together. This is evident in the range of software available for the TPS1100 Professional Series. The software programs are tailored to acquire and process data with the instrument and then to transfer the data from the instrument to a computer.

Leica's proven know-how

All the quality and performance that made the previous Leica total stations so successful are included in the new TPS1100 Professional Series. Plus the latest technological developments: light weight design, easy-to-use interface and the highest quality at an excellent price/performance ratio.

Why professionals choose TPS1100.

EGL guide light to help stay on line

Integrated EDM means quick and precise distance measurements

High productivity with Automatic Target Recognition (ATR)

PowerSearch finds prisms at the press of a button

Endless tangent drives

Easy-to-read display with large LCD graphic screen and color-coded alphanumeric keyboard

RCS1100 remote survey controller with integrated radiomodem: No cables!

Easy centering over the ground point with the integrated laser plummet

Unique 360° reflector does not have to be aligned with the instrument reflectors.

Modular battery concept economical camcorder batteries

Develop your own applications with the GeoBasic programming environment.

Leica Survey Office, the user-friendly program enables you to create code lists and coordinate files, exchange data and install software.

Record and store data with the PCMCIA-memory card that can also be used with Leica GPS and DNA instruments.

The RCS1100 remote control lets you operate from the target point.

Optimal performance for every application with the extensive range of accessories.

Automatic Target Recognition (ATR) – measure without fine pointing and focusing

Have you thought about how much time you lose by manual pointing and focusing? ATR measures twice as many points with the same time as manual methods.

This is how it works:

After roughly pointing to the reflector and triggering a measurement, the instrument moves the telescope automatically to the center of the reflector and then makes the measurement.

Ideal for:

Stake out, topography, free stationing, traversing, sets of angles, and monitoring.

Efficient and relaxed

ATR attains a high degree of efficiency with the increase in measuring speed. Fine pointing and focusing is no longer required which makes for relaxed working procedures. ATR assures constant precision – under any condition and independent of the surveyor.

Automatic Target Tracking –
measure with record setting speed

Mass point surveys are very time consuming if every point has to be targeted and recorded individually. ATR does all of that for you and records all measured data, point-by-point, just press the button.

This is how it works:

After the first targeting, the instrument tracks the reflector automatically – even if there are brief interruptions of the line-of-sight. Intelligent software routines assure reliable tracking – even under light reflected from third sources.

Ideal for:

Topographic surveys, stake-out, modeling digital landscapes or acquiring data for GIS systems.

Continuous and quick

With ATR, fine pointing is no longer required and even rough targeting is not needed. With the 360° reflector even aligning the reflector to the instrument is not required. By using distance tracking, measured values are recorded without interrupting target tracking – just press the button.

RCS1100 remote control –
measure from the target point

How practical when you can measure from the target point! With RCS you can record information and perform surveying tasks on your own.

This is how it works:

In radio mode, the instrument transfers its data to the RCS1100 remote control, which has the identical keyboard and display as the instrument. In this way all instrument functions can be remotely controlled.

Ideal for:

One-man operation, topographic mass-point surveys with coding and stakeout.

Quick and efficient one-man operation

The RCS1100 lets you work from the target point. Everything you do at the instrument can also be done from the target point. Intelligent search functions such as defining a work area, controls by joystick or compass, predicting the 3D path of the reflector accelerate working from the reflector.

PowerSearch finds prisms – just press the button

Find prisms with just a press on the button and save valuable time. Never before have you been ready to measure this quickly.

This is how it works:

In PowerSearch mode, the instrument rotates around its standing axis and sends out a vertical laser signal swath. As soon as it finds a prism, the instrument stops rotating and automatically targets the prism.

Ideal for:

Topographic mass-point surveys in difficult areas. Robotic surveys with the RCS1100 remote control, machine guidance.

Immediately ready to measure

PowerSearch finds your prism quickly. Just press the button and you are ready to measure even after tracking was interrupted. Continue to use the accessories you already have – no special prisms are required. In one-man operation, PowerSearch saves time and effort.

Reflectorless distance measurement – measure directly to the target

It's often very difficult to precisely measure an inaccessible target. With reflectorless distance measurements, you can quickly measure to the target – with just a press on the button and without any complicated measuring programs.

This is how it works:

Using the phase measuring method, the instrument sends out a concentrated, visible laser that clearly marks the target and determines the distance with a high degree of accuracy.

Ideal for:

Measuring inaccessible objects, house corners, facades and interiors. With motorized drive, surfaces can be scanned or profiles can be measured.

Reflectorless and precise

Reflectorless distance measurement lets you measure over obstacles in your daily work. Just measure directly to the object and achieve reliable and accurate results.

Distance meter (IR), ATR and PowerSearch:

Laser class 1 acc.
IEC 60825-1 resp. EN 60825-1
Laser class I acc.
FDA 21CFR Ch. I §1040

EGL:

LED class 1 acc.
IEC 60625-1 resp. EN 60825-1.

Distance meter (RL, standard range) and laser plummet:

Laser class 2 acc.
IEC 60825-1 resp. EN 60825-1
Laser class II acc.
FDA 21CFR Ch. I §1040

Distance meter (RL, extended range):

Laser class 3R acc.
IEC 60825-1 resp. EN 60825-1
Laser class IIIa acc.
FDA 21CFR Ch. I §1040

TPS1100 software package – higher performance and productivity with the appropriate software

Standard

- Free stationing
- Orientation / Height transfer
- Resection
- Stake out
- Tie distance
- Remote height

TPS Advanced

- Reference line
- COGO
- Sets of Angles
- Area
- Traverse
- Local resection

TPS Expert

- Reference Line
- COGO
- Sets of Angles
- Area
- Traverse
- Local resection
- AutoRecord
- Hidden Point
- Reference plane
- Face Scan
- DTM stake out

Auxiliary programs

- Road Plus
- Monitoring

TQM
ISO 9001 / ISO 14001

Total Quality Management is our commitment to total customer satisfaction

For more information about our TQM program, ask your local Leica Geosystems agent.

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TPS1100 Professional Series – Technical data

Define your requirements

Overview of the models and options	TC	TCR	TCRM+	TCA+	TCRA+	TCRA+ Power Search
Angle measurement	●	●	●	●	●	●
Distance measurement (IR)	●	●	●	●	●	●
Reflectorless and Long Range distance measurement (RL)	~	●	●	~	●	●
Motorized			●	●	●	●
Automatic Target Recognition (ATR)			~	●	●	●
PowerSearch (PS)				~	~	●
Electronic Guide Light (EGL)	❍	❍	❍	●	●	●
Remote Control RCS1100	❍	❍	❍	❍	❍	❍

● Standard ❍ Optional ~ Retrofit possible – Option: standard range + plus

Angle measurement

Accuracy	**Type 1101**	**Type 1102**	**Type 1103**	**Type 1105**
Hz, V (ISO 17123-3):	1.5″ (0.5 mgon)	2″ (0.6 mgon)	3″ (1 mgon)	5″ (1.5 mgon)
Display resolution:	1″ (0.1 mgon)	1″ (0.1 mgon)	1″ (0.5 mgon)	1″ (0.5 mgon)
Method	absolute, continuous, diametric			

Distance measurement (IR)

Range (average atmospheric conditions)	
Round prism (GPR1):	3000m / 9,800 ft
360° reflector (GRZ4):	1500m / 4,900 ft
Mini prism:	1200m / 3,900 ft
Reflective tape (60 mm x 60 mm):	250 m / 820 ft
Shortest measurable distance:	0.2 m to round prism (GPR1) / 1.5 m to a 360° reflector
Accuracy (ISO 17123-4) / Measuring time	
Standard mode:	2 mm + 2 ppm / 1.0 sec
Fast mode:	5 mm + 2 ppm / 0.5 sec
Tracking mode:	5 mm + 2 ppm / 0.3 sec
Fast mode tracking:	10 mm + 2 ppm / < 0.15 sec
Display resolution:	1 mm
Method	Principle of phase measurement (coaxial, invisible infrared laser)

Reflectorless and Long Range distance measurement (RL)

Range (average atmospheric conditions)	
Reflectorless (extended range):	170 m / 550 ft (Kodak Gray Card, white side)
Reflectorless (standard range):	80 m / 260 ft (Codak Gray Card, white side)
Shortest measurable distance:	1.5 m
Long Range on to round prism (GPR1):	1000 m – 5000 m
Accuracy (ISO 17123-4) / Measuring Time	
Reflectorless (standard mode):	3 mm + 2 ppm / typ. 3–6 sec, max. 12 sec
Reflectorless (tracking mode):	10 mm + 2 ppm / typ. 3–6 sec, max. 12 sec
Laser dot size:	5 mm + 2 ppm / typ. 2.5 sec, max. 8 sec
Laser dot size	
At 50 m:	approx. 10 mm x 20 mm
At 100 m:	approx. 15 mm x 30 mm
At 200 m:	approx. 30 mm x 60 mm
Method	Principle of phase measurement (coaxial, visible red laser)

Motorized (M)

Maximum speed	
Rotating speed:	50 gon / sec (45 deg / sec)

Automatic Target Recognition (ATR)

Range ATR mode / LOCK mode (average atmospheric conditions)	
Round prism (GPR1):	1000 m / 800 m (3300 ft / 2600 ft)
360° reflector (GRZ4):	600 m / 500 m (1900 ft / 1600 ft)
Mini prism:	500 m / 400 m (1600 ft / 1300 ft)
Reflective tape (60 mm x 60 mm):	65 m / -- (200 ft / --)
Shortest measurable distance:	1.5 m to 360° reflector (GRZ4)
Accuracy / Measuring Time	
Distances < 300 m:	3 mm / 3 sec
Distances > 300 m:	1.5″, 2″, 3″, 5″ (equivalent type) / 3–4 sec
Maximum speed (LOCK mode)	
Tangential (standard mode):	25 m / sec at 100 m
Tangential (tracking mode):	18 m / sec at 100 m
Radial (tracking mode):	4 m / sec
Method	Digital image processing (laser beam)

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PowerSearch (PS)

Range (average atmospheric conditions)	
Round prism (GPR1):	200 m / 650 ft
360° reflector (GRZ4):	200 m / 650 ft (optimal when aligned with the instrument)
Mini prism:	100 m / 330 ft
Shortest measurable distance:	5 m / 15 ft
Search Time	
Typical time to find prism:	< 10 sec
Maximum speed	
Rotating speed:	50 gon / sec (45 deg / sec)
Method	Digital signal processing (laser swath)

Electronic Guide Light (EGL)

Range (average atmospheric condition)	
Work range:	5 m – 150 m / 15 ft – 500 ft
Accuracy	
Positioning accuracy:	5 cm to 100 m

Remote Control RCS1100

Method	Datalink via integrated radio modem
Control unit	
Display:	8 lines with 32 characters 256*64 pixels, graphic LCD
Keyboard:	30 keys (6 function keys, 12 alphanumeric keys)
Interface:	RS232
Battery	
Type:	Nickel Metal Hydride (NiMH)
Voltage:	6 V
Capacity (GEB111):	1.8 Ah
Weight	
RCS1100:	0.77 kg / 1.7 lb
Battery (GEB111):	02. kg / 0.45 lb
Reflector pole adapter:	0.18 kg / 0.4 lb
Working environment	
Working temperature range:	–20°C to +50°C / –4°F to +122°F
Storage temperature range:	–40°C to + 70°C / –40°F to +158°F
Dust/water (IEC 60529):	IP54
Humidity:	max. 95% non-condensing

General data TPS1100

Compensator	**Type 1101**	**Type 1102**	**Type 1103**	**Type 1105**
Setting range:	4′ (0.07 gon)	4′ (0.07 gon)	4′ (0.07 gon)	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			
Level	**Type 1101**	**Type 1102**	**Type 1103**	**Type 1105**
Sensitivity of circular level:	6′ / 2 mm	6′ / 2 mm	6′ / 2 mm	6′ / 2 mm
Display resolution electronic level:	1″ (0.1 mgon)	1″ (0.1 mgon)	1″ (0.5 mgon)	1″ (0.5 mgon)
Telescope				
Magnification:	30x			
Free aperture of objective:	40 mm			
Field of view:	1°30′ (1.66 gon) / 2.7 m at 100 m			
Focussing:	1.7 m to infinite			
Control unit				
Display:	8 lines with 32 characters 256*64 pixels, graphic LCD			
Keyboard:	30 keys (6 function keys, 12 alphanumeric keys)			
Angle display:	360°′ ″, 360° (decimal), 400 gon, 6400 mil, V%			
Distance display:	Meter, Int. Ft, Int. Ft/Inch, US Ft, US Ft/Inch			
Number of Displays:	1 / 2 (optional)			
Data storage				
Memory card:	PCMCIA ATA Flash (16 MB) / PCMCIA SRAM (512 KB, 2 MB)			
Number of data files:	18000 / 2 MB			
Interface:	RS232			
Laser plummet				
Accuracy:	Deviation from the plumb line 1.5 mm (2 sigma) at 1.5 m			
Point diameter:	2.5 mm at 1.5 m			
Endless drive				
Number of drives Hz / V:	1 / 1			
Steps:	infinite			
Battery				
Type:	Nickel Metal Hydride (NiMH)			
Voltage:	6 V			
Capacity (GEB121):	3.6 Ah			
Number of measurements:	400 – 600			
Weight				
Instrument:	4.7 – 4.9 kg (10.4 –10.8 lbs)			
Battery (GEB121):	0.4 kg (0.8 lbs)			
Tribrach (GDF121):	0.8 kg (1.7 lbs)			
Working environment				
Working temperature range:	–20°C to +50°C / –4°F to +122°F			
Storage temperature range:	–40°C to +70°C / –40°F to +158°F			
Dust/water (IEC 60529):	IP54			
Humidity:	max. 95% non-condensing			

Distance meter (IR), ATR and PowerSearch:
Laser class 1 acc.
IEC 60825-1 resp. EN 60825-1
Laser class I acc.
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Distance meter (RL, standard range) and laser plummet:
Laser class 2 acc.
IEC 60825-1 resp. EN 60825-1
Laser class II acc.
FDA 21CFR Ch. I §1040

Distance meter (RL, extended range):
Laser class 3R acc.
IEC 60825-1 resp. EN 60825-1
Laser class IIIa acc.
FDA 21CFR Ch. I §1040

EGL:
LED class 1 acc.
IEC 60625-1 resp. EN 60825-1

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WILD DI 1600

HIGH-ACCURACY MEDIUM-RANGE EDM

WILD LEITZ

WILD T1610 • TC1610

Systematic performance

Two versions
- Modular: WILD T1610
- Integrated: WILD TC1610

High precision
- Angle measurement: 1.5" / 0.5 mgon
- Distance measurement: 2 mm + 2 ppm with 2.5 km range (1 prism) for TC1610

Clear operational concept
- Combined menu technique and direct function keys ensure perfect user guidance

Keyboard and display
- In both telescope positions
- Illuminated 4-line matrix display
- Numeric and alphanumeric input options

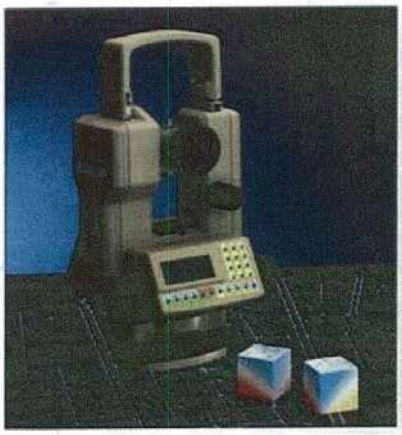
Plug-in data recording module
- WILD REC module for 2000 data blocks

Large program library
- Input of coordinates
- Determining station coordinates
- Orientation of horizontal circle
- Free-station survey
- Height transfer
- Setting out
- Tie dimensions
- Individual coding

Configuration of program sequences
- Flexibly-designed programs, matched to application
- Programs can be loaded and erased
- Large-capacity software memory

Code functions
- Flexible and freely programmable
- Input and display possible in your own language

Fully compatible with existing accessories



Leica V.I.P. survey system

Leica

TACHYMAT™ Wild TC1000·TC1600

ELECTRONIC TOTAL STATIONS WITH REC MODULE

WILD TC1000 AND TC1600: TECHNICAL DATA

Angle measurement	continuous absolute encoder
Updates	0.1 s to 0.3 s
Units	360° sexagesimal 360° decimal 400 gon 6400 mil

	TC1600	TC1000
Smallest unit displayed	1", 0.0001", 0.0001 gon, 0.001 mil	1", 0.0005", 0.001 gon, 0.01 mil

Standard deviation	Hz 1.5" (0.0005 gon) 3" (0.001 gon)
to DIN 18723	V: 1.5" (0.0005 gon) 3" (0.001 gon)
(mean of pointing in both telescope positions)	

Automatic index	pendulum compensator
Working range	±5' (±0.1 gon)
Setting accuracy	±1" (±0.0003 gon)
Telescope	coaxial, erect image
Magnification with standard eyepiece	30×
Objective aperture	42 mm
Shortest focusing distance	1.7 m
Field of view at 1000 m	27 m
Focusing	coarse and fine
Tilting range	fully transiting
Displays	2 LCDs both faces, each display with sign, 8 figures, decimal point, flags and symbols to guide users
Keyboard	weatherproof, 14 multiple-function keys
Contact pressure	30 g
Distance measurement	
Standard deviation	
Normal measurement	3 mm + 2 ppm, time needed 5 s
Repeat measurement	3 mm + 2 ppm, time needed 5 s
Tracking	5 mm + 2 ppm, time needed 1 s to 2 s
Signal attenuation	automatic
Breaks in beam	result not affected

Range — **TC1000 and TC1600**

Number of Wild circular prisms	Atmospheric conditions: poor[1]	average[2]	excellent[3]
1	1.0 km	2.0 km	2.5 km
3	1.2 km	2.8 km	3.5 km
7	1.4 km	3.5 km	4.5 km
11	1.6 km	4.0 km	5.5 km

[1] Strong haze, visibility about 1 km, or strong sunlight, severe heat shimmer.
[2] Light haze, visibility about 25 km, or moderate sunlight, slight heat shimmer.
[3] Overcast, no haze, visibility about 40 km, no heat shimmer.

Carrier wave	0.850 µm infra-red
Scale correction	−999 ppm to +999 ppm, 1 ppm steps
Prism constant	−999 mm to +999 mm, 1 mm steps
Automatic corrections	Eccentricity of Hz and V circles (TC1600 only) Horizontal-collimation error Vertical-index error Earth curvature and refraction
Two models	2 keyboards, displays both faces or keyboard and displays face I, slot for REC module face 2
Data	displayed in pairs (see page 5)
Data recording	REC module • CMOS memory • Capacity 16 kbyte or about 500 data blocks • Dimensions 74 mm × 60 mm × 10 mm (3" × 2⅜" × ⅜") • Weight 70 g (2 oz) or GRE 3/GRF 4 data terminal

Power supply	12 V DC
Power consumption	
Angle measurement only	about 0.06 A (excluding backlight to display)
incl. distance measurement	about 0.4 A
Automatic power-off	about 3 minutes after last keyboard input
Plug-in battery GEB77	12 V, 0.45 Ah, NiCd, rechargeable
Fuse	2 A microfuse with 2 contact pins
Weight	0.2 kg (0.45 lb)
Small battery GEB70	12 V, 2 Ah, NiCd, rechargeable
Fuses	FST 5020, T 2.5 A, 5 × 20
Weight	0.9 kg (2 lb)
Large battery GEB71	12 V, 7 Ah, NiCd, rechargeable
Fuses	FST 5020, T 2.5 A, 5 × 20
Weight	3.0 kg (6.6 lb)

Operating life of batteries (between charges)

	GEB77	GEB70	GEB71
Approximate number of angle and distance measurements	250	1000	3500

Battery chargers	
GKL12	for GEB77 and GEB70
GKL34	for GEB71
Hight of tilting axis above tribrach dish	196 mm (as T2, T1000, T1600, T2000)
Levels (sensitivity per 2 mm)	
Spherical level in tribrach	8' /2 mm
Tubular level in theodolite	30" /2 mm
Optical plummet (in tribrach)	Focusable
Magnification	2×
Focus	fully adjustable
Temperature range	
Measurement	−20°C to +50°C (−4°F to +122°F)
Storage	−40°C to +70°C (−40°F to +158°F)
Weight	
Instrument without tribrach or battery	5.5 kg (12 lb)
GEB77 plug-in battery	0.2 kg (7 oz)
GDF22 tribrach	0.9 kg (2 lb)
Case	3.9 kg (8.6 lb)

WILD LEITZ

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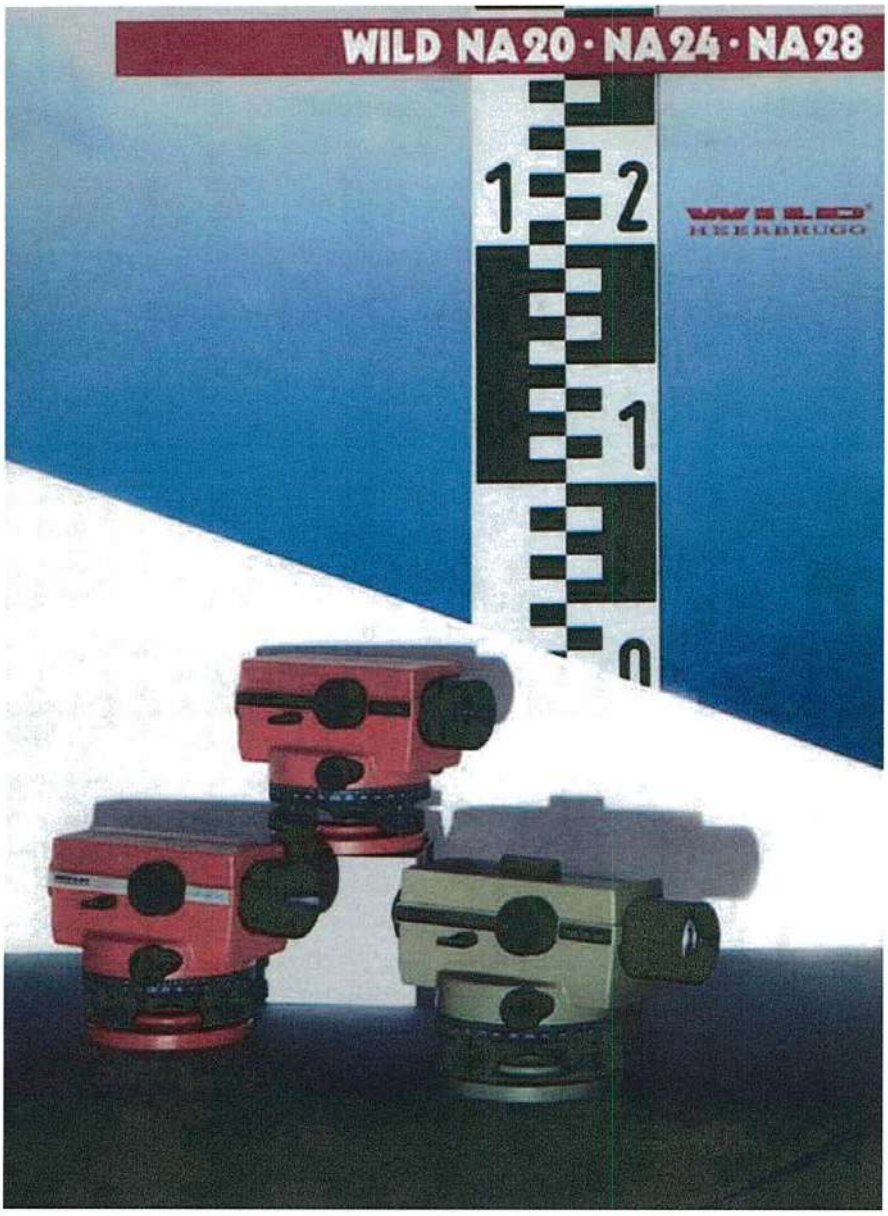

NAOVARAT SURVEYING CO., LTD

TECHNICAL DATA

TECHNICAL DATA	NA 20		NA 24		NA 28	
Standard deviation						
For 1 km/1 mile double-run levelling	2.5 mm	0.010 ft	2.0 mm	0.008 ft	1.5 mm	0.006 ft
With parallel-plate micrometer	not applicable		not applicable		0.7 mm	0.003 ft
Telescope	erect image		erect image		erect image	
Magnification	20×		24×		28×	
Clear objective aperture	30 mm	1.18 in	36 mm	1.42 in	40 mm	1.57 in
Field of view at 100 m/100 ft	4.2 m	4.2 ft	3.5 m	3.5 ft	3.0 m	3.0 ft
Shortest focusing distance:						
Objective to target	0.40 m	1.3 ft	0.40 m	1.3 ft	0.61 m	2.0 ft
Axis to target	0.50 m	1.6 ft	0.50 m	1.6 ft	0.71 m	2.3 ft
Multiplication factor	100		100		100	
Additive constant	0		0		0	
Gas-filled	No		Yes		Yes	
Working range of compensator	~30'		~30'		~30'	
Setting accuracy	±0.8"		±0.8"		±0.5"	
Sensitivity of circular bubble	8' per 2 mm		8' per 2 mm		8' per 2 mm	
Circle	400 gon or	360°	400 gon or	360°	400 gon or	360°
Diameter	108 mm	4.25 in	108 mm	4.25 in	108 mm	4.25 in
Graduation interval	1 gon or	1°	1 gon or	1°	1 gon or	1°
Reading by estimation	0.1 gon or	0.1°	0.1 gon or	0.1°	0.1 gon or	0.1°

EQUIPMENT

Stock No.		kg	lb
	Wild automatic level, in container with tools, rain/dust cover		
437 067	NA 20, 360°	1.6	3.5
437 068	NA 20, 400 gon	1.6	3.5
437 063	NA 24, 360°	1.7	3.7
437 064	NA 24, 400 gon	1.7	3.7
437 006	NA 28, 360°	1.8	4.0
437 007	NA 28, 400 gon	1.8	4.0
	Container	0.8	1.8
	Tripods, telescopic, cover for head, with Allen key		
399 244	GST05, pre-covered wood	5.2	11.4
405 421	GST05L, aluminium alloy	5.0	11.0
	Tripod accessories		
404 247	Carrying strap for tripods GST05 and GST05L		
	Miscellaneous		
296 633	Plumb bob, fits in instrument container		
397 774	Universal stand GST9 (see brochure G1 438e)		
332 200	Tripod base GST4		

Stock No.		kg	lb
	Levelling staffs		
	Levelling staffs, plastic facing, folding, circular bubble, erect numbers		
196 702	GNLE3, 3 m long, cm-graduation	4.3	9.5
196 704	GNLE4, 4 m long, cm-graduation	5.4	11.9
196 708	GNLE12, 12 ft long, 0.01 ft-graduation	5.0	11.0
335 565	Sectional staff GSLE4: four 1 m aluminium-alloy slot-together sections, cm-graduation, erect numbers, transport bag, two base plates, two circular bubbles	3.8	8.4
394 781	Sectional staff GSLE3: three 1 m aluminium-alloy slot-together sections, cm-graduation, erect numbers, transport bag, one base plate, one circular bubble	3.0	6.6
	Accessories for NA 28		
	Parallel-plate micrometer GPM4, in case		
370 443	Measuring range 10 mm, interval 0.2 mm		
370 444	Measuring range 0.5 in, interval 0.01 in		
370 445	Measuring range 0.02 ft, interval 0.001 ft		
366 540	Objective pentaprism, 90°, in container		
	Short-focus lens, in container		
217 892	Lens GVO3, 0.84 m–0.44 m (2.76 ft–1.44 ft)		

WILD HEERBRUGG

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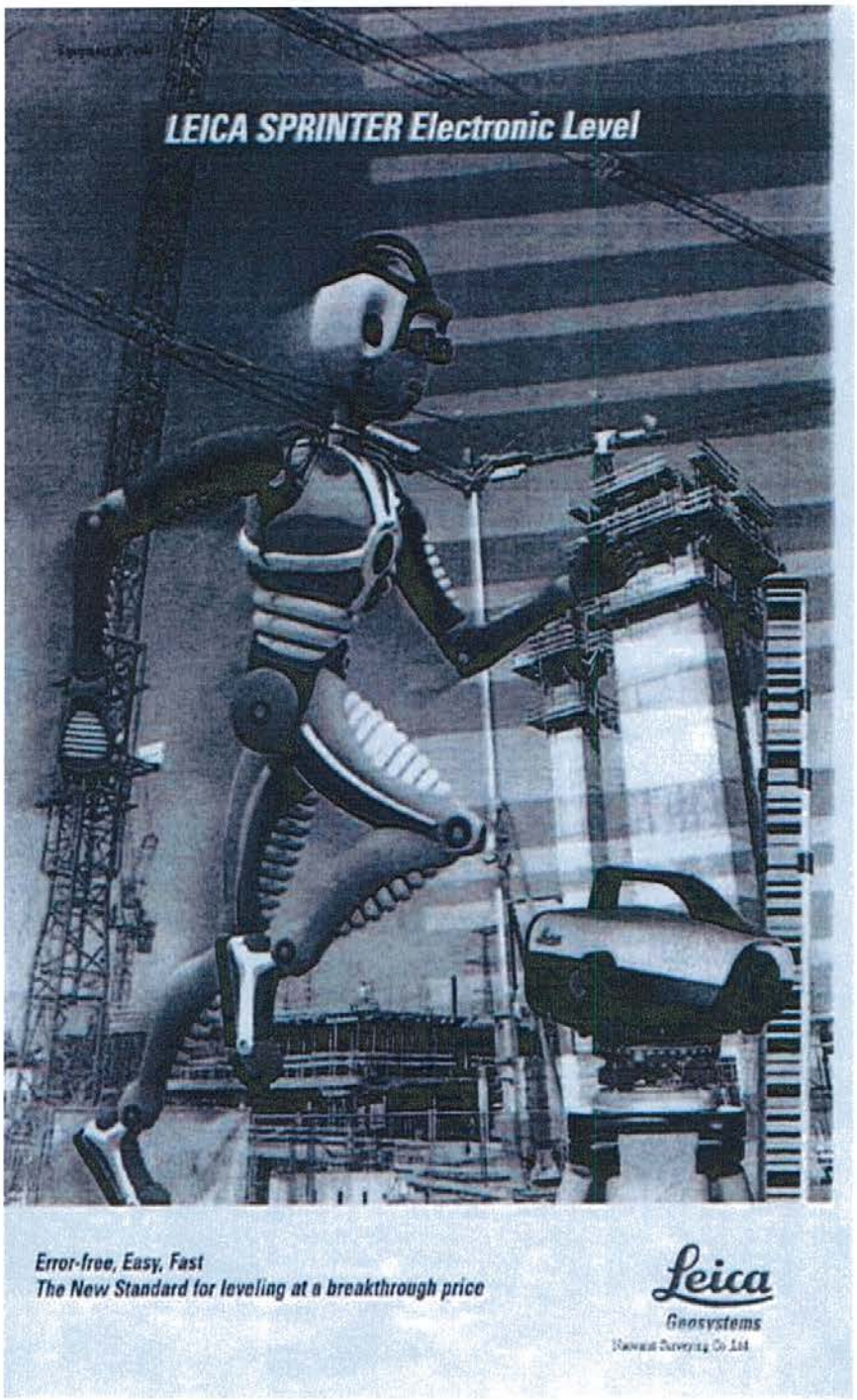
LEICA SPRINTER Electronic Level
Error-free, Easy, Fast
The New Standard for leveling at a breakthrough price
Leica
Geosystems

Leica SPRINTER Electronic Levels

Accelerate your Leveling Productivity in:

- Building Construction
- Road Construction
- Civil Engineering
- Topography and Cadastral Applications
- Agriculture
- Architecture
- Landscaping
- Dimensional control
- Mining and Quarrying
- Tunneling
- Anywhere else you need to level error free and fast

Added value Functions, such as

- Continuous tracking mode
- Inverse Staff measuring mode
- Onboard adjustment program
- Auto Off Power saving mode
- Alpha/numeric input function

SPRINTER 100

Standard deviation 2.0mm, electronic level, with user manual, 4 pcs AA dry cells and container

Order No: 738 932

SPRINTER 100M

same as 100, incl. RS232 interface & internal memory

Order No: 738 933

SPRINTER 200

1.5mm, electronic level, with user manual, 4 pcs AA dry cells and container

Order No: 741 867

SPRINTER 200M

same as 200, incl. RS232 interface & internal memory

Order No: 741 868

INDEX

GPS eTrex

The world's smallet, go-anywhere GPS

With eTrex™ from GERMIN by your side, you can take on the big wide world without looking back. Because when it's time to return to camp or find the dock, eTrax will take you there.

This smart little handheld is the bast of GARMIN GPS in a sleek, waterproof case.

Operating buttons on both sides allow more room for the display screen on the front.

Simple menus and logical operations make it easy to mark your position under any conditions. For your next adventure on land or sea, pack light.

eTrex™ specifications

Navigation features

Waypoints/icons:	500 with name and graphic symbol
Tracks:	Automatic track log; 10 saved tracks let you retrace your path in both directions
Route:	1 reversible route with up to 50 waypoints
Trip computer:	Current speed, average speed, time of sunrise/sunset, resetable maximum speed, trip timer and trip distance
Map datums:	More than 100
Position format:	Lat/Lon UTM/UPS, Maidenhead, MGRS and other grids

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GPS performance

Receiver:	Differential-ready, 12 parallel channel GPS receiver continuously tracks and uses up to 12 satellites to compute and update your position
Acquisition Times:	
Warm:	Approximately 15 seconds
Cold:	Approximately 45 seconds
AutoLocate™:	Approximately 5 minutes
UpdateRate:	1/second, continnuous
Accuracy:	
Position:	15 meters (49 feet) RMS*
Velocity:	0.1 knot RMS steady state
Dynamics:	6g's
Interfaces:	RS-232 with NMEA 0183, RTCM 104 DGPS data format and proprietary GARMIN
Antenna:	Built-in patch

SOIL TEST TOOLS & EQUIPMENTS