Sintela CO., Ltd.

Design and production of laser measuring systems

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About Us

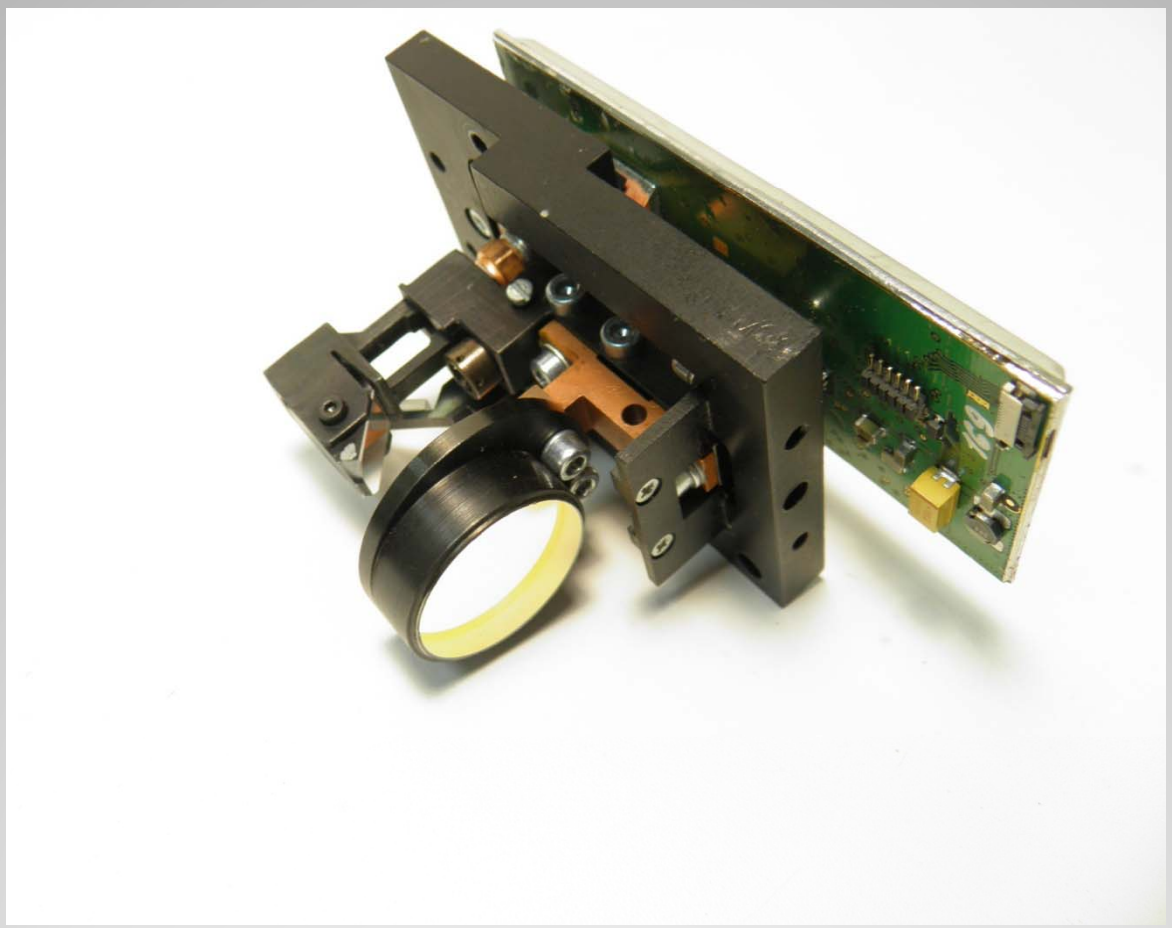
- **Date of foundation** – November 2005. The company was founded by individuals, as the holder of intellectual property rights for the development of "laser rangefinder"
- **Production –**
  - Laser rangefinder's units for geodesic instrument;
  - Perspective development of hand-held laser rangefinder, known as «laser distance meter».
- **The company's clients–**
  - Production Association "Urals Optical and Mechanical Plant" (UOMZ), http://www.uomz.com/eng/index.php
  - Suzhou FOIF Co., Ltd. http://www.foif.com.cn/english/

Production & technologies

- The project is based on development of high-frequency photo detector (PD) for laser rangefinder.
- As known, error of phase distance meter on the optical carrier is inversely proportional to the frequency of amplitude laser radiation modulation. Therefore, if the frequency is higher, then the accuracy distances measurement is higher . But when working on frequencies above 100 MHz the sensitivity decreases, known so far, PD, nullifying the advantages given by using high-frequency modulation.
- The newly developed PD is designed for the registration of optical radiation modulated in amplitude with frequency up to 1 ÷ 2 GHz. without reducing sensitivity. Sensitivity or minimum detection power (NEP), is then equal to 0,3 * E-14 (Vt/Gts1/2), which is close to the theoretical limit of the avalanche photodiode (APD) applied here, at low frequencies. Frequency limit of PD - 1 ÷ 2 GHz is determined by frequency properties of the APD that in turn is determined by the carrier mobility in the depletion layer.
- Thereby, at the present level of development of quantum electronics it's unable to create PD with the better parameters, only possible to repeat that result..
- In the process, it became evident that operating principle of the new PD is closely linked with methods of signal processing, algorithms of calculating distance and views of the function RF modulation of laser radiation. In fact, the samples are no longer any classical phase laser rangefinders (what they thought at the beginning), no pulsed and we can talk about creating a new concept of laser range finder, in which the phase and the pulsed methods are a particular solution.

Brief characteristics of the laser range finder

- Distance Measurement using a prism reflector, reflector and reflectorless mode.
- Automatic determination of the reflectivity of the target type.
- No moving mechanical and optical parts.
- Distance Measurement in the reflectorless mode up to 1000 meters, with Class of laser safety 2 (under standards IEC60825-1 (Laser Class 2)).



Specification

S1000

Laser rangefinder unit for Total Stations Technical specification

***Operating* mode:**

- Automatic
- Reflector sheet
- Long range prism
- Short range prism
- Reflectorless
- Power search
- Laser pointer
- Sleep
- Program
- Calibration
- Frequency control

1. ***Measurement of distances – Automatic mode***

- Applied to all types of reflectors.
- Autodetection of type of a reflectance of a target.
- Min. time of measurement - 1 sec.
- All parameters on range and accuracy correspond to parameters of modes the Prism and Reflectorless, for appropriate types of reflectors (target).
- ***Automatic mode for Reflector sheet:***
- Objective lens ∅45mm
- The coaxial visible red laser 660 nm.
- Class of laser safety 2 under standards IEC 60825-1 (Laser Class 2)
- Display resolution ---------- 0.1 mm
- Max. range ---------- up to 3000 m
- Min. range ---------- 0.1 m
- Systematic error (without calibration on baselines) ---------- +/- 1.0 mm + 1.0 ppm
- rms ---------- 0,1mm…….2.2 mm (a false result will not be permitted)
- (rms software selectable in steps of 0.1 mm)
- Max. measurement time for distance 300 m:
- (Kodak Gray 90%, rms = 0.5 mm) ---------- 3 sec.
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- The systematic error can be reduced by calibration rangefinder within the total station, on the basic lines. In this case, the magnitude of systematic error will be determined by the baselines error.

2. ***Reflector sheet***

- Applied for Reflector sheet.
- Objective lens ∅45mm.
- The coaxial visible red laser 660 nm.
- Class of laser safety 2 under standards IEC 60825-1 (Laser Class 2)
- Display resolution ---------- 0.1 mm
- Max. range ---------- up to 2000 m
- Min. range ---------- 0.1 m
- Systematic error (without calibration on baselines) ---------- +/- 1.0 mm + 1.0 ppm
- rms ---------- 0,1mm…….2.2 mm (a false result will not be permitted)
- (rms software selectable in steps of 0.1 mm)
- Max. measurement time for distance 200 m: ---------- 0.9 sec.
- The systematic error can be reduced by calibration rangefinder within the total station, on the basic lines. In this case, the magnitude of systematic error will be determined by the baselines error.

3. ***Measurement of distances - Long range prism mode***

- Objective lens ∅45mm
- The coaxial visible red laser 660 nm.
- Class of laser safety 1/ Class of laser safety 2, under standards IEC 60825-1
- (Laser Class 1/ Laser Class 2)
- **Reflector: triple prism.**
- The maximum distance (visibility > 30 km) ---------- 30000 m
- The minimum distance ---------- 0.1 m
- Display resolution ---------- 0.1 mm
- Systematic error ---------- +/- 1 mm + 1.0 ppm
- Time of measurements ---------- 0.5 – 3.0 sec
- The measurement method ---------- the coaxial visible red laser

4. ***Measurement of distances - Short range prism mode***

- Objective lens ∅45mm
- The coaxial visible red laser 660 nm.
- Class of laser safety 1, under standards IEC 60825-1(Laser Class 1)
- **Reflector: triple prism.**
- The maximum distance (visibility > 2 km) ---------- 1200 m
- The minimum distance ---------- 0.1 m
- Display resolution ---------- 0.1 mm
- Systematic error ---------- +/- 1 mm + 1.0 ppm
- Time of measurements ---------- 0.5 – 1.5 sec
- The measurement method ---------- the coaxial visible red laser

5. ***Measurement of distances - Reflectorless mode***

- Objective lens ∅45mm
- The coaxial visible red laser 660 nm.
- Class of laser safety 2/2M under standards IEC 60825-1 (Laser Class 2/2M)
- Display resolution ---------- 0.1 mm
- Max. range ---------- up to 2000 m
- Min. range ---------- 0.1 m
- Systematic error ---------- +/- 1.0 mm + 1.0 ppm
- Systematic error for precise measurement ---------- +/- 0.0 mm + 1.0 ppm
- Systematic error for fast measurements ---------- +/- 2.5 mm + 1.0 ppm
- rms ---------- 0,1mm…….2.2 mm (a false result will not be permitted)
- (rms software selectable in steps of 0.1 mm)
- Max time of measurement for distance <30m:
- (Kodak Gray 18%, rms = 1.0 mm) ---------- 2 sec.
- Max. time of measurement for distance 1500 m:
- (visibility > 10 km, rms = 2.2 mm, Kodak Gray 90 %)
- - night and twilight ---------- 5 sec.
- - strong sunlight ---------- 15 sec.
- The systematic error can be reduced by calibration rangefinder within the total station, on the basic lines. In this case, the magnitude of systematic error will be determined by the baselines error.

6. ***Power control of the reflected signal***

- Applied to alignment of the laser beam on the prism reflector, under conditions of
- poor visibility, and for precise pointing of the laser beam to the center of the prism reflector at distances <1500 meters.

7. ***Laser pointer***

- The coaxial visible red laser 660 nm.
- Used for precise alignment of the laser beam on the prism reflector, as well as guidance in reflectorless mode for short distances.
- There are four levels of power: from Class of laser safety 1 up to Class of laser safety 2, under standards IEC 60825-1.

Sleep

Standby command

9. ***Program***

Used to upgrade the device software via the Interface.
(UART, 115 kbps)

10. ***Calibration***

- Used for the calibration EDM on the basic lines, to minimize systematic error.
- Activates access to four Low-level EDM modes.

11. ***Frequency control***

- Amplitude modulation of the laser power of EDM, with the Frequency, for finest measurements - 800 MHz.

12. **Laser dot size (FWHM)**

Distance [m]	Laser dot size, approximately [mm]
30m	13mm x 11 mm
100m	14mm x 14 mm
200m	16mm x 20 mm
400m	30mm x 40 mm

- **Consumed current on 6.2 V:**
- Measuring mode ---------- no more than 290 mA
- Sleep mode + laser pointer ---------- no more than 120 mA
- **Operation temperature: -20℃ ~+50℃**
- **Weight: 0.22 kg**
- **Interface:**
- Communication protocol: Annex 2
- Connector type: - PLL 1.27 6R (bottom PC board)
- POWER (6.0V - 8.4V,2W max)
- GND
- RX (UART,9600bps, No parity, data 8 bit, stop 1bit)
- TX (UART,9600bps, No parity, data 8 bit, stop 1bit)
- CROSS LED+
- CROSS LED-

Total station production FOIF, with rangefinder Sintela