

LiPAD®-100

A New Way of Survey



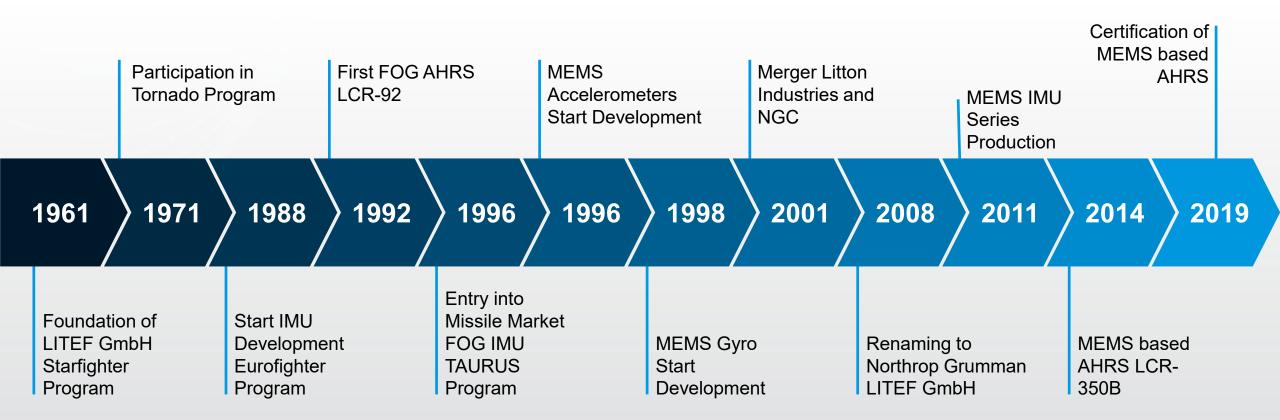


Outline

- Product History
- LiPAD[®]-100 Description
- Operation
- Comparison to Other Survey Techniques
- Applications
- Conclusions



HISTORY: START in 1961



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INDUSTRIAL MARKETS

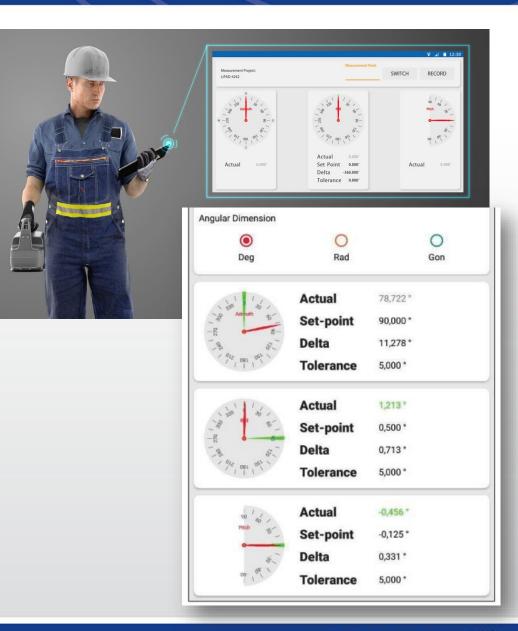




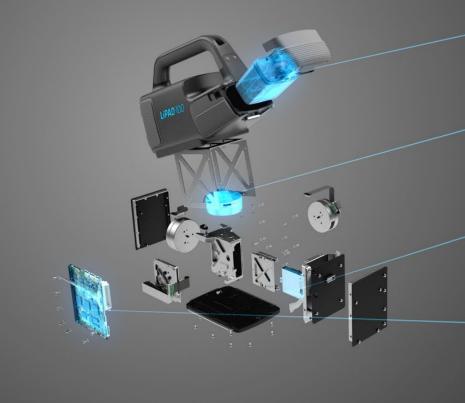
LIPAD®-100

Portable Alignment Device

- Contains inertial sensors, that measure Roll, Pitch and North heading direction and shows them in real-time
- Every movement of the LiPAD[®]-100 is immediately captured and exact angles are displayed "live" in the app of a compatible Android device
- Single operator without special skills manages measurement
- Series of measurements, which normally take days, are made in a few hours using LiPAD[®]-100
- Fast Efficient Reliable







Battery Package

Exchangeable / RechargeableOperating time up to 6 hours

Fiber Optic Rate Sensor

- Measures earth rotation
- Independent of magnetic interference

Accelerometer Triad

- Measures earth gravity
- No inclination limitation

System Board

Bluetooth Connectivity
Reliable Signal processing







LiPAD[®]-100 works independent of

- Temperature variation
- Vibration
- Magnetic interference
- GPS/GNSS access



Alignment

Measuremen

Continuous

Handheld gyro compassing system - Ready to use in 5 min Levelling

Measurement of earth gravity vector (9.81 m/s²) **Result:** Pitch + Roll

With the help of 3 accelerometers the direction of gravity (which actually is an acceleration in the direction of the center of the earth) is measured.



Measurement of earth rotation (15 deg/hr) **Result:** Earth rotation axis = Heading to true north

With the help of 3 fiber optic gyroscopes, the axis of the earth's rotation is measured. Or, finding the azimuth orientation by measuring the earth rotation

Based on inertial data of the system, the change of the angles pitch, roll, and heading are calculated and shown.

Inertial = No outside information required sensors only measure external forces or accelerations









LIPAD[®]-100 SCOPE OF SUPPLY

The set includes

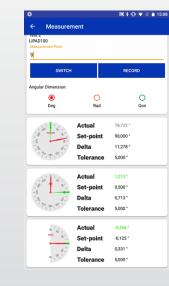
- LiPAD-100 Gyrocompass
- 2 rechargeable batteries (UL certified)
- Battery charger
- Rugged transport box
- Quick-Startup-Guide in English language
- User Manual in English language

Other QSG and manual languages are available on the customer service portal for download.

The LiPAD-App

- Is available for download in the Google Play Store.
- Runs on Tablets with Android system
- Is available in various languages







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Before you start, make sur √ To be familiar with the safety inst √ The LPAD* Lithium-ion battery is:	uctions.	For more de information, to the LIPAD	refer A-100	
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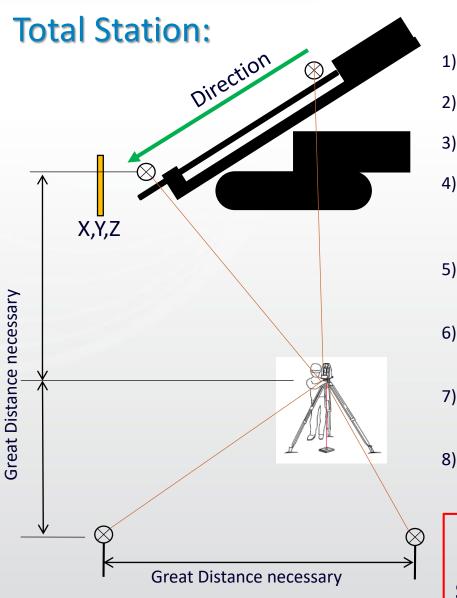
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LiPAD[®]-100 LITEF Portable Alignment Device User Manual



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Terretory Manual No. 154075-1000-AD RPV A
Technical Manual No. 154070-1000-640 MEV A PCO 1502576
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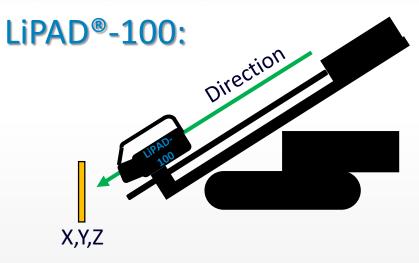


1) Surveyor marks starting point

2) Drill-Rig is positioned

- 3) Surveyor sets up the total station
- 4) Surveyor measures position of the total station relative to the reference points
- 5) Surveyor installs prisms on the drill rig
- 6) Surveyor measures position of prisms on drill rig
- 7) Surveyor calculates the direction of drill rig
- 8) Step 6) and 7) need to be repeated until final direction is set

Process takes at least 15 minutes Surveyor needed on site



1) Surveyor marks starting point

2) Drill-Rig is positioned

3) LiPAD-100 is placed on drill rig

4) LiPAD-100 shows direction in real time which allows direct adjustment

Process takes max. 5 minutes No surveyor needed

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LIPAD®-100 SAVES MONEY

Example:

Construction Project with 50 drillings for anchor drilling

	Surveyor	LiPAD-100
Surveyor cost to mark the starting reference points - including mobilization fee	\$500	\$500
Surveyor cost (@ \$100 / hr) to align one hole @ 15 minutes per hole + rig operator wait time of 15 minutes (@ \$75 / hour) x (50 holes)	15 min x 50 = 12.5 hr 12.5 hr x \$175/hr = \$2,188	Surveyor not required LiPAD mounted to drill mast
Drill rig operator cost using LiPAD app to align one hole + travel time @ 5 min / hole x (50) holes – No Surveyor		5 min x 50 = 4.2 hr 4.2 hr x \$75 = \$315
Surveyor cost (@ \$100 / hr) during drill-rig travel to next hole @ 5 min per hole + Surveyor wait time during drilling @ 15 minutes per hole x (50) holes	20 min x 50 = 16.7 hr 16.7 hr x \$100/hr = \$1,670	Surveyor not required No wait time
Cost for equipment rental for 16.7 hr = 2 days (Assumes all site equipment rental cost = \$1,000 / day)	2 days @\$1,000/d = \$2,000	Lower Equipment Rental Cost
Total Cost for the Construction Project	\$6,358	\$815





... it has never been easier to control a large number of boreholes

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TUNNELING: TBM ALIGNMENT AT STARTER SHAFT

- Customer: SAK, St. Louis, USA
- Task

Before the installation of the TBM navigation system, the TBM needs to be aligned at the shaft bottom to minimize the handling of large and heavy machine sections.

Solution

With LiPAD[®]-100 the time required for the alignment process was drastically reduced.



DEEP FOUNDATION: ORIENTATION OF NUMEROUS INJECTION DRILLS

- Customer: Züblin Spezialtiefbau
- Task:
 - Strengthen the foundation of the historic theatre of the city of Augsburg
 - Several hundred injection drill holes in the basement of the building
 - The drill holes are orientated in various different angles
 - Alignment with a total station is not possible



- Solution
 - LiPAD[®]-100 allows a fast and accurate alignment of the drill rig

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MINING: SURVEY OF AN EXPLORATION DRILL

Customer: Xploration Products, Sweden

Task

The trajectory of a mineral exploration drill had to be measured using a survey tool from Inertial Sensing, Sweden. The initial direction of the hole had to be measured

Solution

With LiPAD[®]-100 the initial orientation of the survey tool could easily be measured.





MINING: SURVEY OF SEVERAL EXPLORATION DRILLS

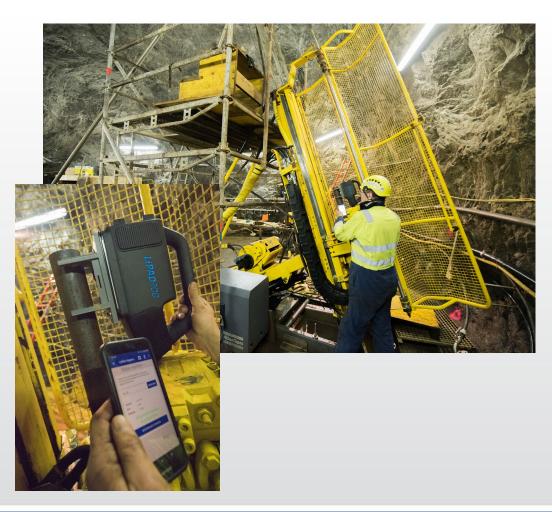
- Customer: Terratec Geophysical Services, Germany
- Task

In an underground mine several exploration drills have been performed. The customer had to resurvey these and measure the trajectory. The starting direction of the drill could not be measured with an total station due to very tight space conditions.

Solution

With LiPAD[®]-100 the initial orientation of the survey tool could easily be measured saving time and with a high precision.

Even a systematic failure in the mine grid was found.





LIPAD[®]-100: ADVANTAGES AT A GLANCE







Questions?



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Thank You

