



APRIL 10-14 | MINNEAPOLIS, MN

NO-DIG SHOW

2022

LiPAD[®]-100

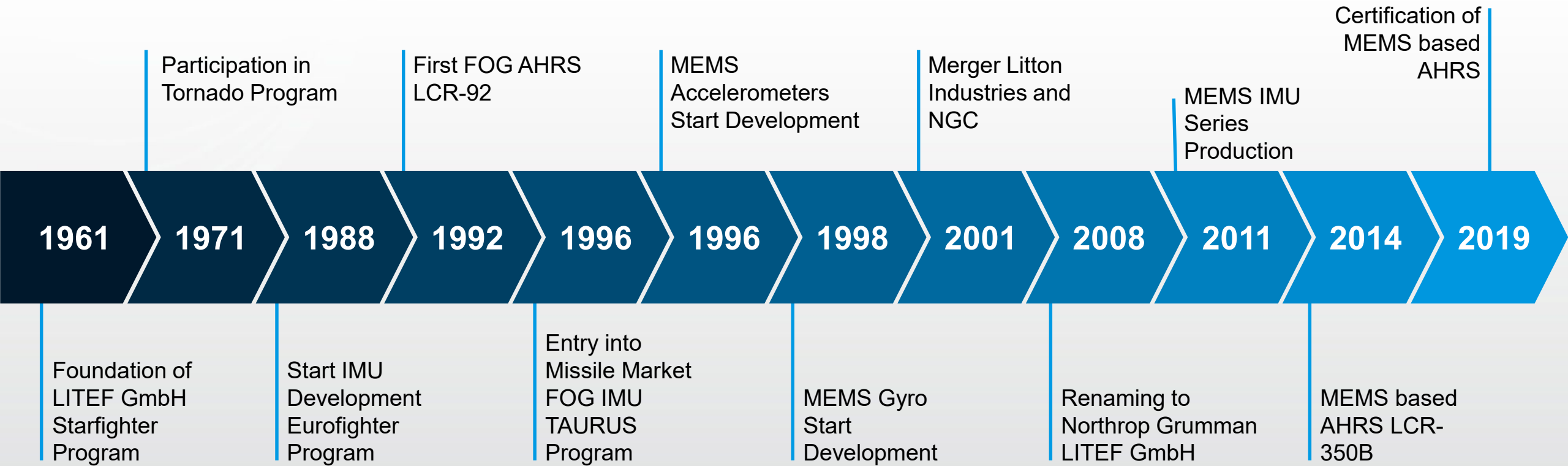
A New Way of Survey



Outline

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

HISTORY: START in 1961



INDUSTRIAL MARKETS

Portable Inertial Measurement Systems



Guided Drilling



Positioning and Navigation



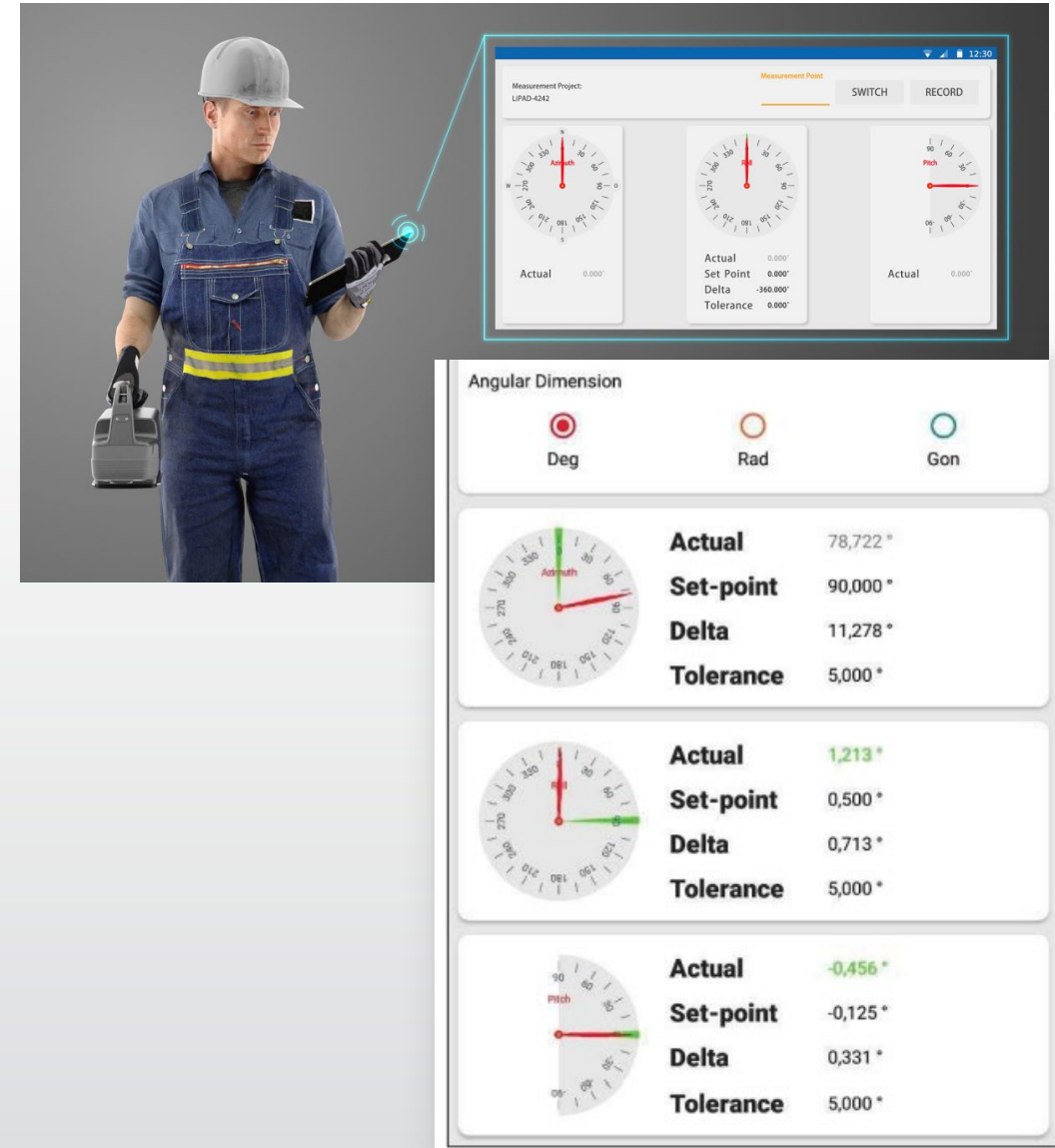
Inertial Sensors

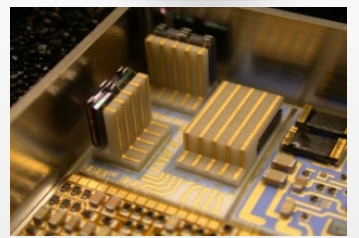
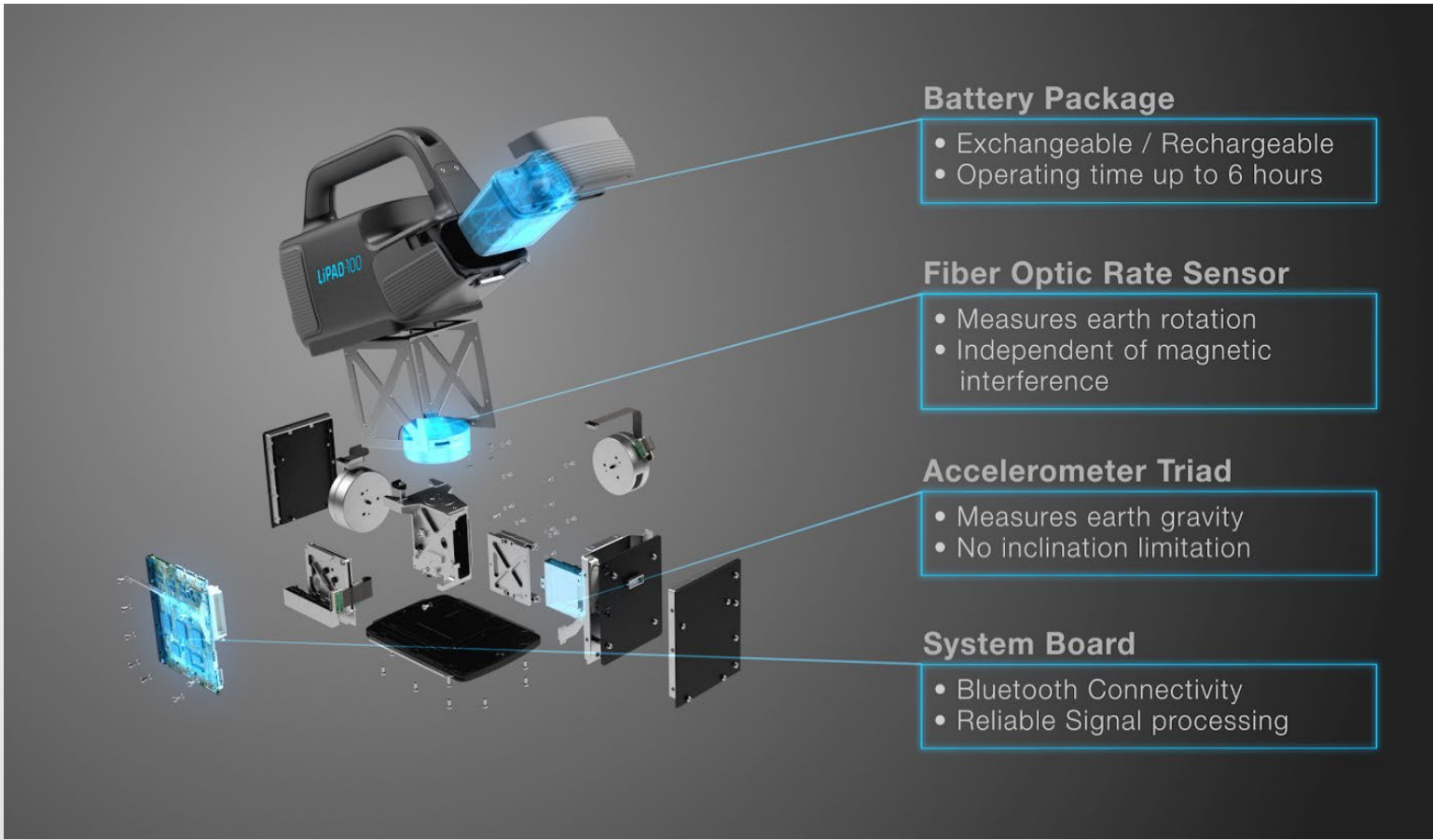


LIPAD[®]-100

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**





LiPAD®-100 works independent of

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

Levelling
 Alignment
 Continuous Measurement

Handheld gyro compassing system - Ready to use in 5 min



Measurement of earth gravity vector (9.81 m/s^2)
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.



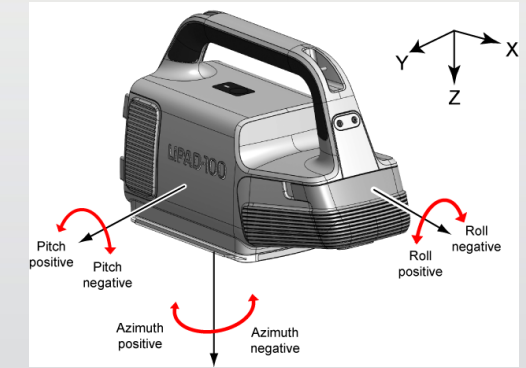
Measurement of earth rotation (15 deg/hr)
Result: Earth rotation axis = Heading to true north

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

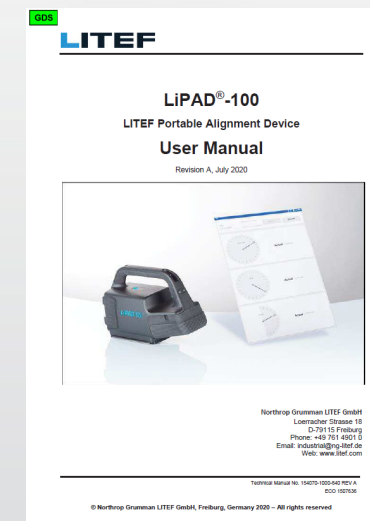
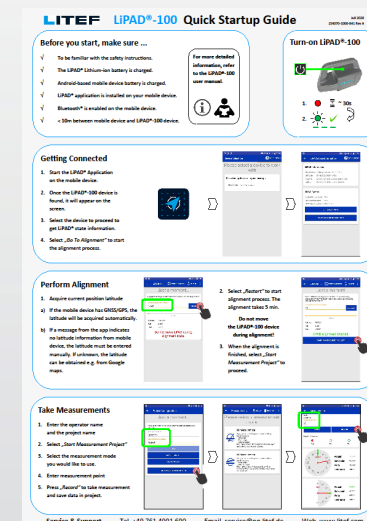
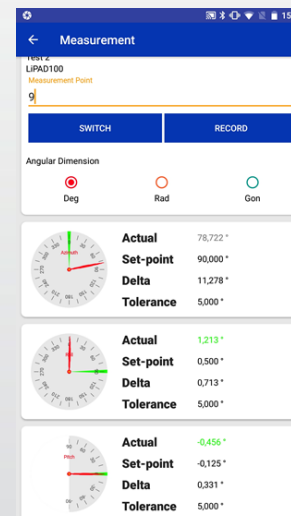
The set includes

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

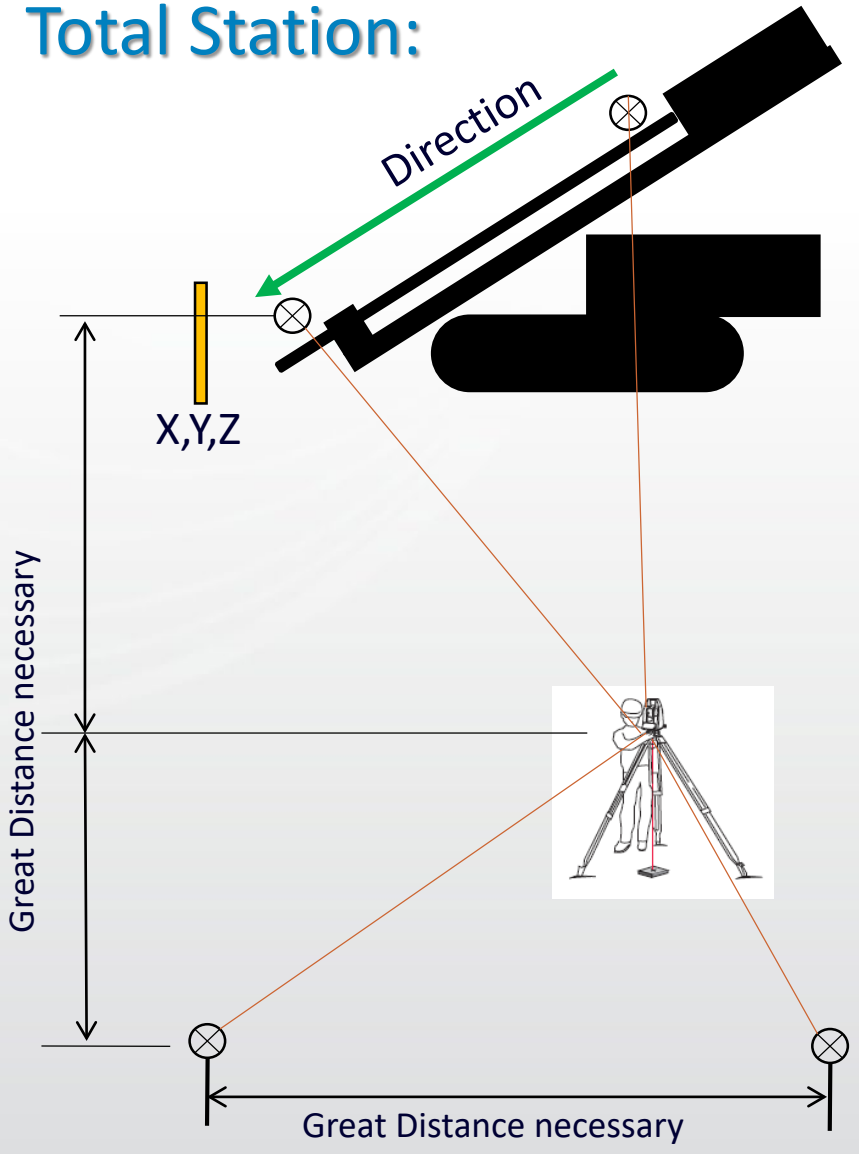
Other QSG and manual languages are available on the customer service portal for download.

The LiPAD-App

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



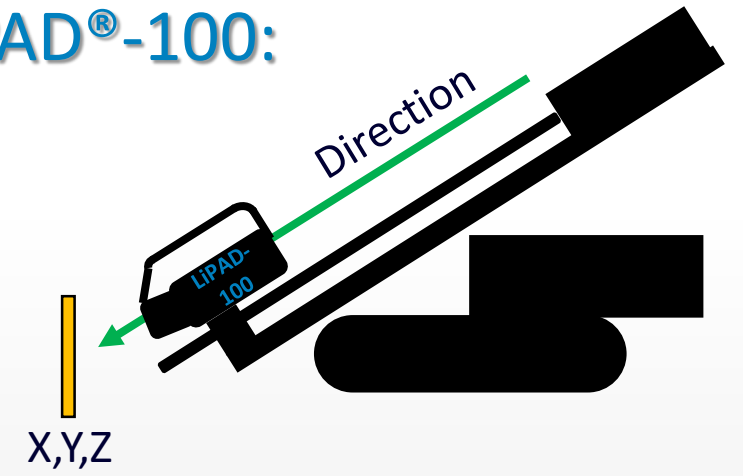
Total Station:



- 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**

LiPAD[®]-100:



- 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

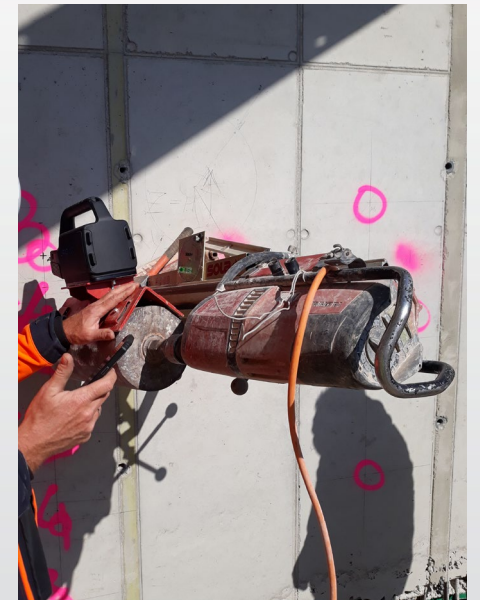
**Process takes max.
 5 minutes
 No surveyor needed**

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

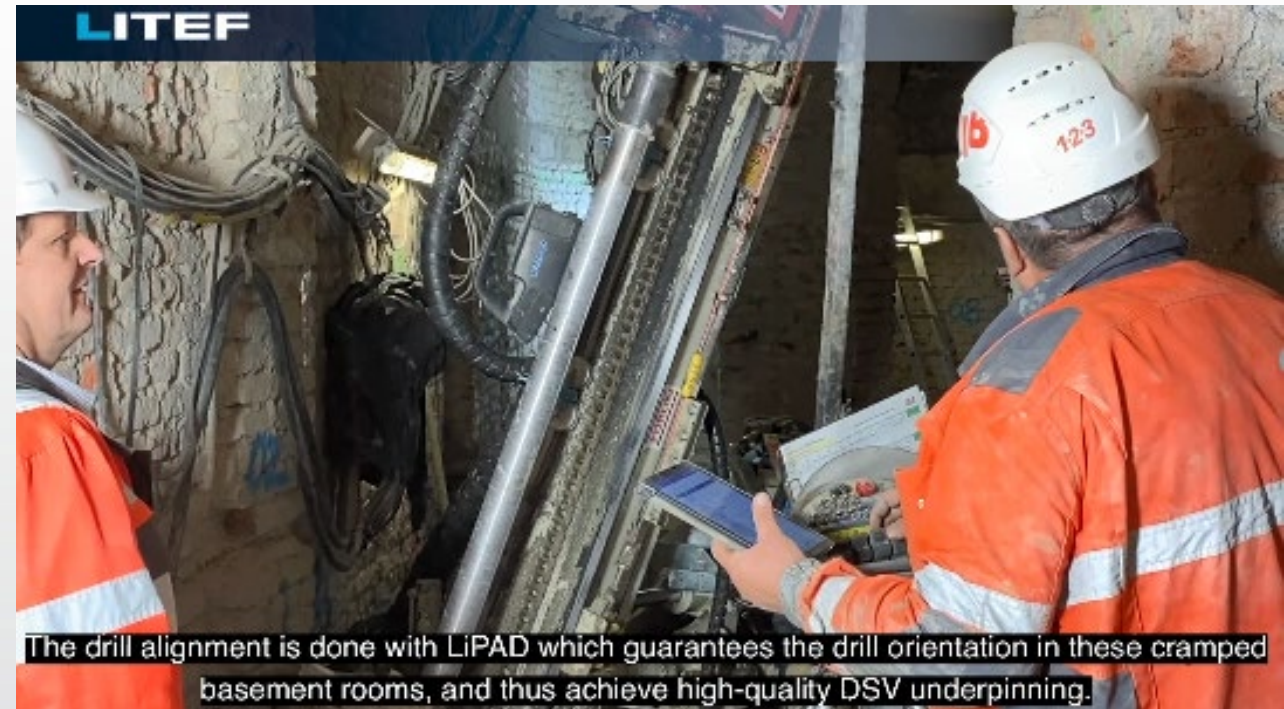
TUNNELING: TBM ALIGNMENT AT STARTER SHAFT

- **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



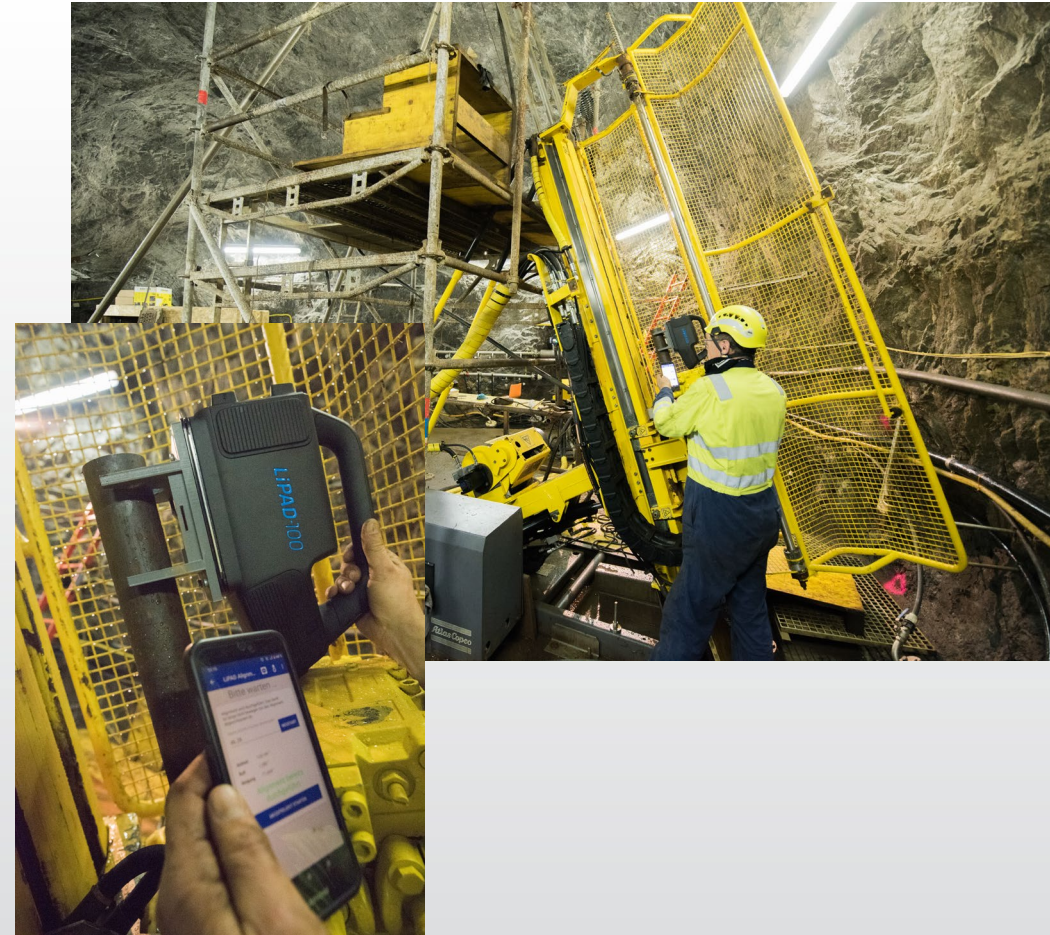
MINING: SURVEY OF AN EXPLORATION DRILL

- **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



-  SAVES TIME
-  SAVES MONEY
-  SAVES (HUMAN) RESOURCES



Questions?



Thank You