



**INNOVATIVE TECHNOLOGIES
IN GEOPHYSICS, SURVEYING AND DRILLING**

Our partners



— surveying systems based on MEMS solid-state sensors

MAZAC

— drill rig alignment systems



— portable surface and underground drilling rigs

NORTHROP GRUMMAN

GYRO-SERVICES
SWITZERLAND



handheld

— additional equipment and accessories



Products are provided by a network of knowledgeable distributors and are widely used all over the world.

Where it works

Oil & Gas

Mining & Civil

RC Drilling

Diamond Drilling

Underground

Conventional

Pilot holes/Raise bore

Blast holes

Steering to target

Wedge and Motor Orientation

Tunnelling

Directional Drilling



DRILLING

- Mazac Smart Aligner
- LiPAD-100
- Portable Drill Rigs

CORE ORIENTATION

- CorePro

SURVEYING

- TwinGyro & isGyro
- SlimGyro
- BlastGyro
- isCompass
- NorthFinder

PROCESSING & ANALYSIS

- Surveyor
- isAnalysis

MAZAC Smart Aligner

- Portable GPS for survey and alignment
- Instant measurements in real time
- Measure, verify and save data with Android app
- Send reports wirelessly
- Suitable for surface applications

Angle accuracy

Azimuth $\leq 0.5^\circ$, Inclination & roll: $\leq 0.2^\circ$

Position accuracy

30 cm with SBAS

Set up time

< 30 s

Size

483x114x76 mm

Weight

2.3 kg

Battery runtime

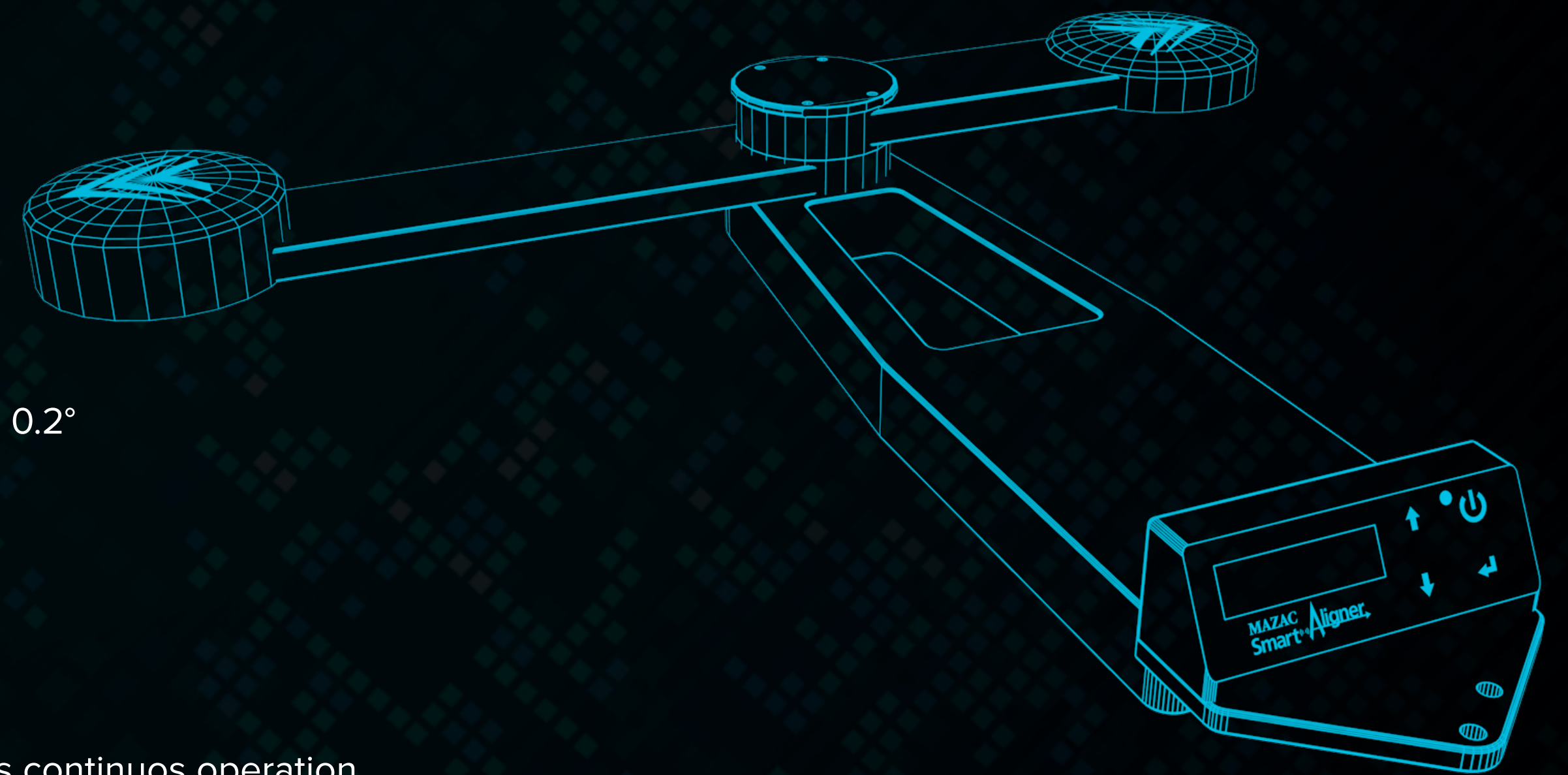
Re-chargeable Li-ion with 10 hours continuous operation.

Operating temperature

-30° C - 70° C

Environmental

Waterproof (NEMA 4X, IP63), shockproof (IEC-68-2-27 / IEC 68-2-6)



LiPAD-100

- Portable gyro compass for survey and alignment
- Based on high performance fiber optic gyroscopes
- Instant measurements in real time
- No inclination limitation
- Suitable for underground applications

Accuracy	Azimuth $\leq 0.35^\circ/\text{Cos}(\text{latitude})$, Inclination & roll: $\leq 0.025^\circ$
Repeatability	Azimuth $\leq 0.15^\circ(1\sigma)$, Inclination & roll: $\leq 0.025^\circ(1\sigma)$
Set up time	5 min stationary
Size	305x158x205 mm
Weight	4.12 kg
Battery runtime	Re-chargeable Li-ion with 6 hours continuous operation.
Operating temperature	-20° C - 65° C
Environmental	Waterproof (IP65), shockproof (20 mg / 20 ms)

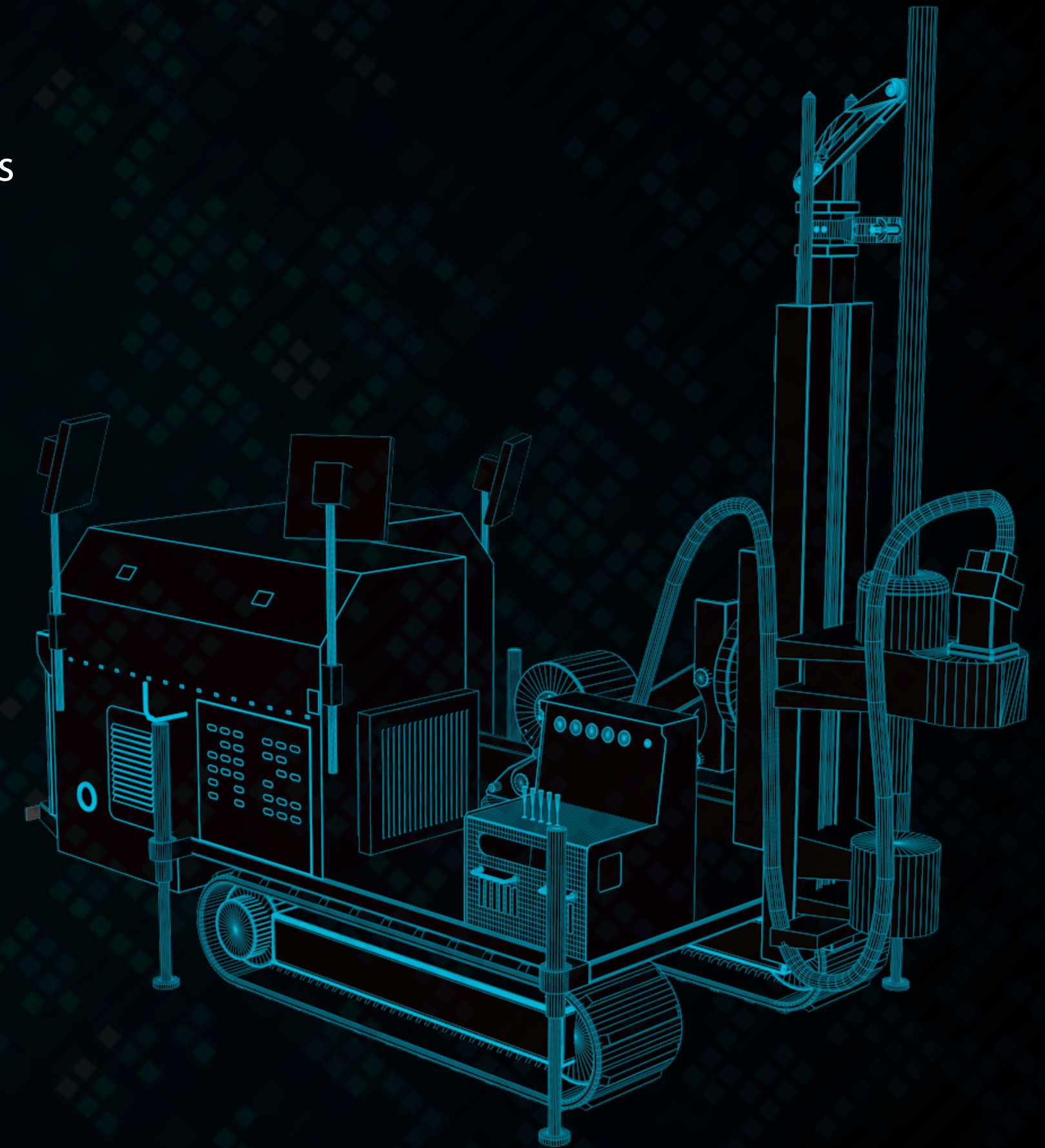




Portable Drill Rigs

Since 1990, Ingetrol Group is a world leader in the development of portable and versatile drilling rigs, having developed more than 450 types of equipment used for various purposes in 43 countries.

- Lightest power packs - 72 hp only 300 kg
- Next generation mud pumps (more flow, higher pressure and lighter weight, triplex ball valve mud pump)
- Special compact geotechnical rigs for soil sampling, tailings evaluation, spt, cpt-u
- Fully remote control track mounted hq core drill for underground exploration
- Special dedicated rigs for geomechanics applications like overcoring, etc
- Drill rods with extra resistance specially for directional drilling applications



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PROCESSING & ANALYSIS

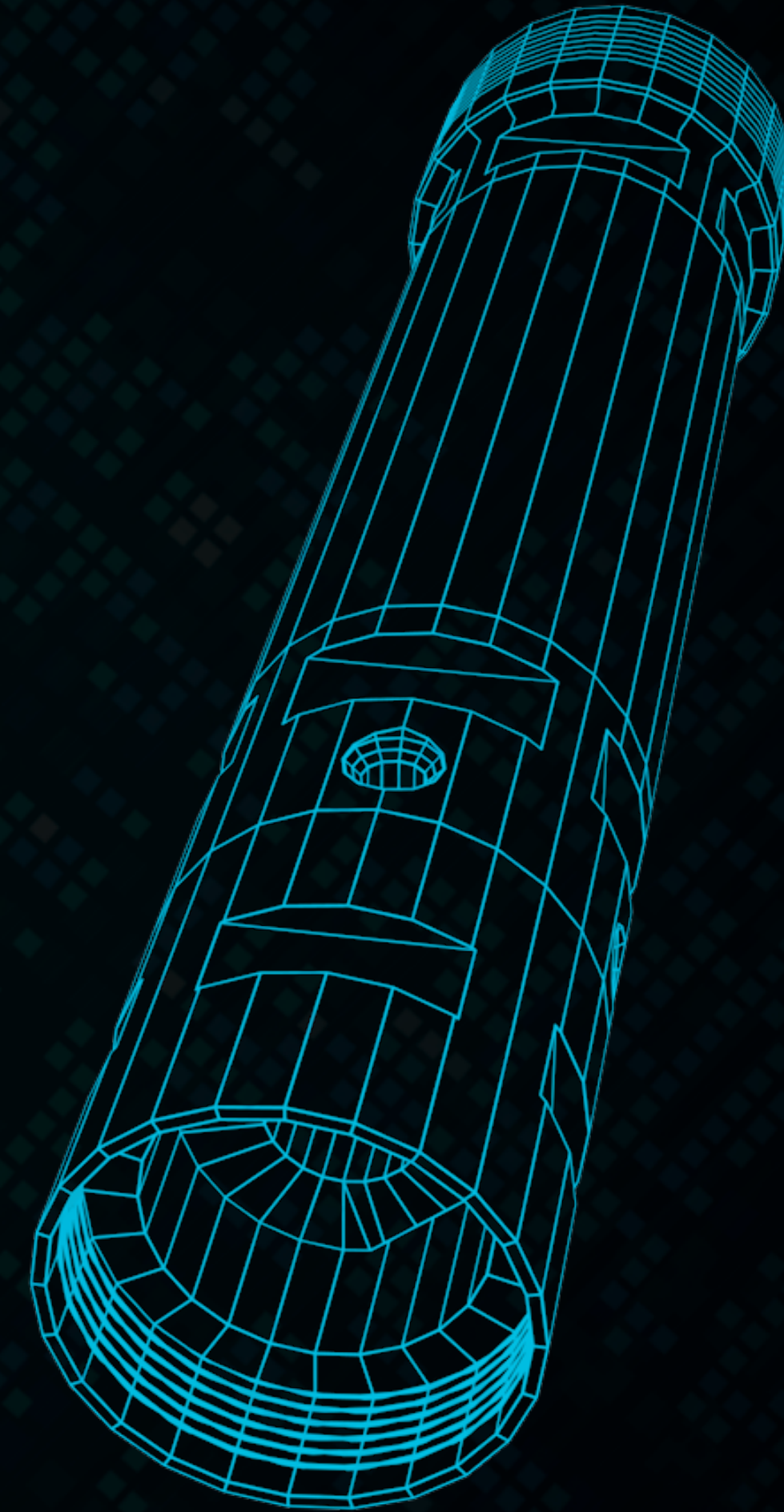
- Surveyor
- isAnalysis



CorePro

- Fully integrated running gear
- Easy switch adapters
- Wireless orientation
- Controlled from your smartphone
- Best core-orientation tool on market

Inclination	0.15°
Inclination range	± 90°
Orientation	0.5°
Orientation range	± 88° inclination
Temperature range	-20° C to +85° C
Diameter	52 mm
Length	340 mm
Weight	2 kg
Battery survey time	3 months



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PROCESSING & ANALYSIS

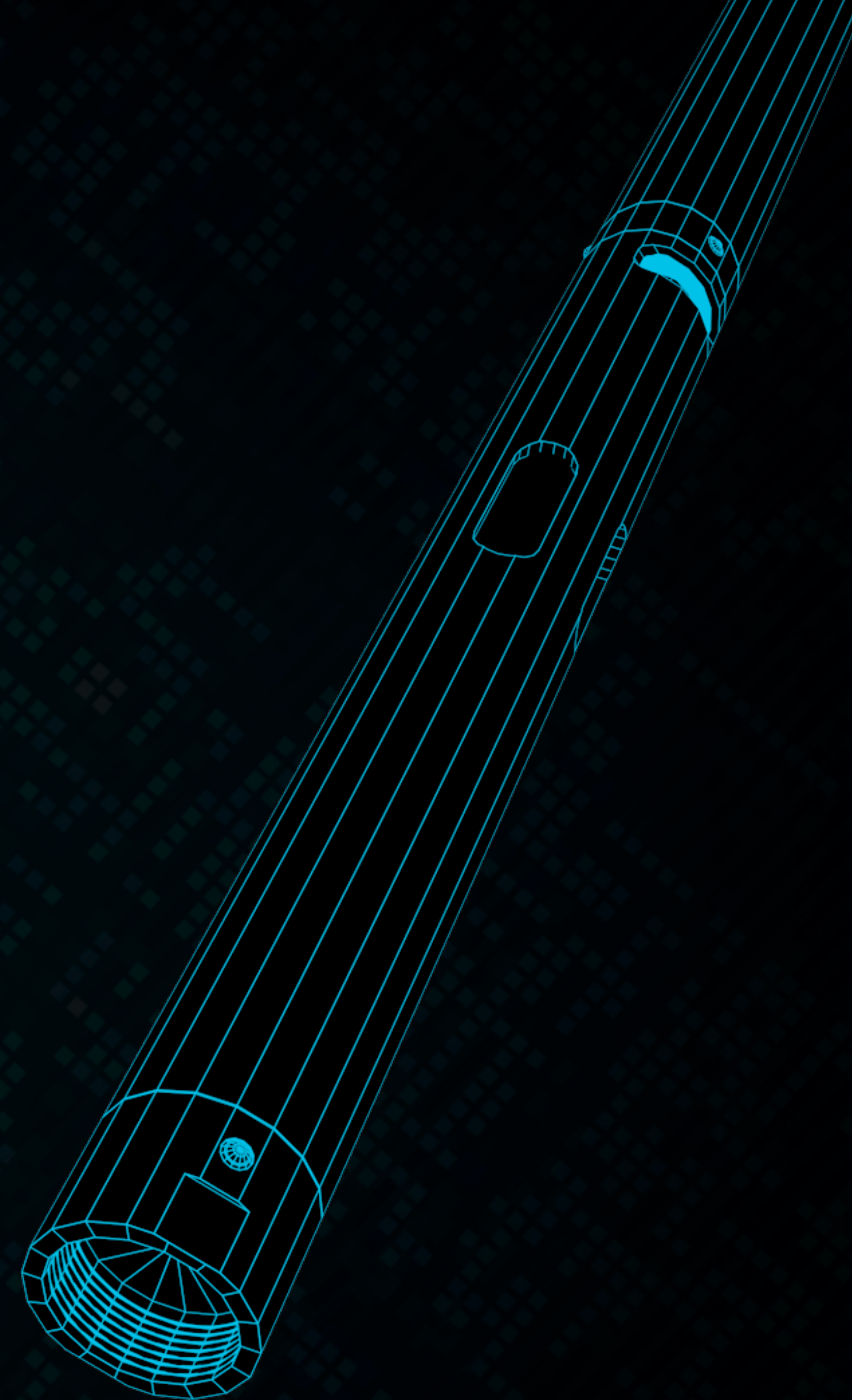
- Surveyor
- isAnalysis



TwinGyro & isGyro

- Two independent surveys in one run
- High rate capability and accuracy
- High speed continuous survey mode
- Low power consumption
- High speed data transfer and processing
- High mechanical reliability and impact resistance
- Continuous and multishot survey modes

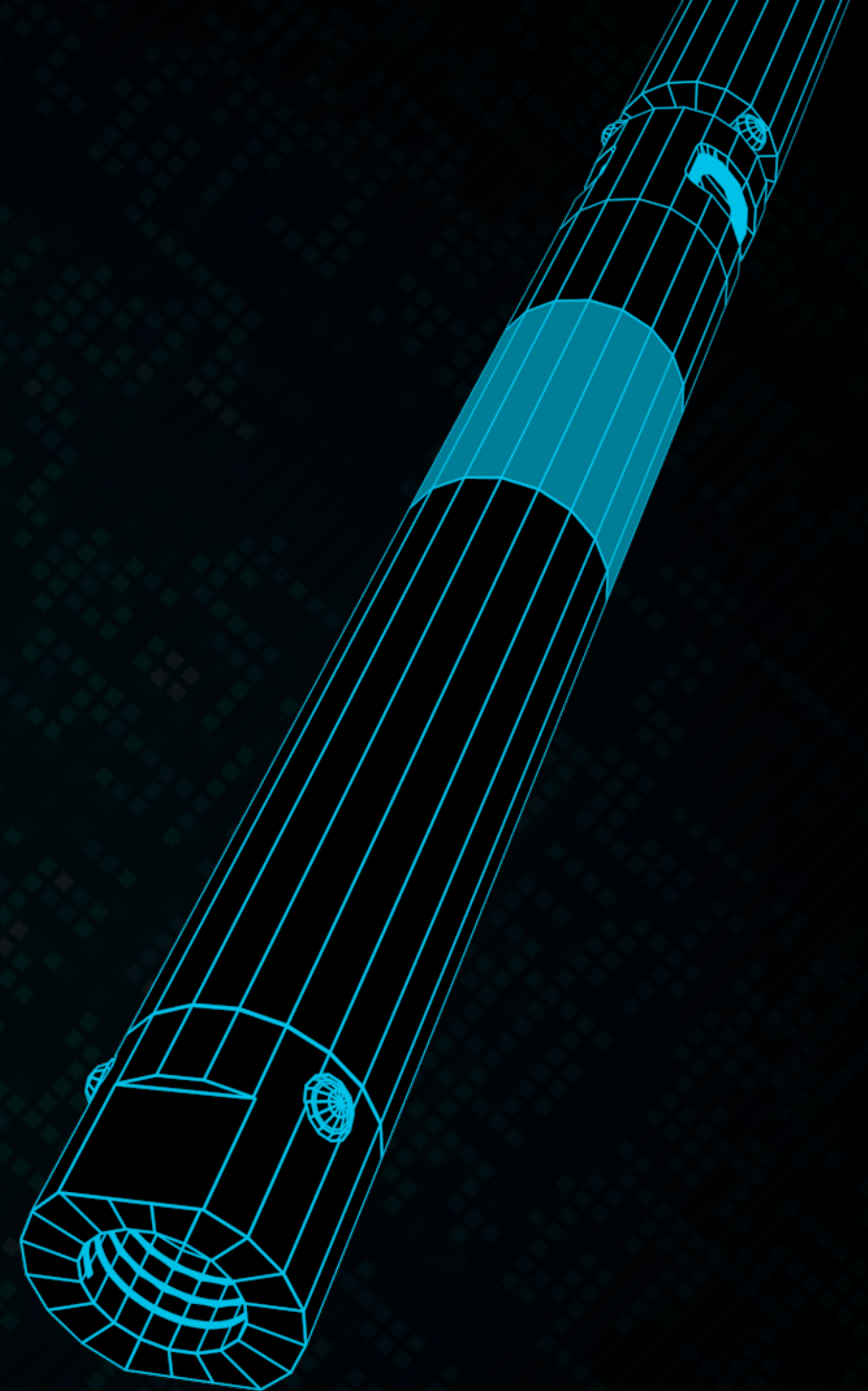
Inclination	$\pm 0.1^\circ$
Gravity highside	$\pm 0.2^\circ$
Gyro toolface	$\pm 0.5^\circ$
Azimuth	$\pm 0.5^\circ$
Position	$< 0.2\%$ (2m/1000m)*
Power consumption	0.4 W (0.2 W in single gyro mode, 5 mW in sleep mode)
Temperature range	-20° C - 80° C
Dimensions	diameter 32 mm, length 378 mm
Running gear	38 mm OD (1.75" heat shield option)
Charge lifetime	100 hours (200 hours in single gyro mode)



SlimGyro

- World's smallest rate gyro
- High rate capability and accuracy
- Low power consumption
- High speed data transfer and processing
- High mechanical reliability and impact resistance
- Continuous and multishot survey modes
- Included in BlastGyro package

Inclination	$\pm 0.1^\circ$
Gravity highside	$\pm 0.2^\circ$
Gyro toolface	$\pm 0.5^\circ$
Azimuth	$\pm 0.5^\circ$
Position	$< 0.2\%$ (2m/1000m)*
Power consumption	0.2 W (7 W in sleep mode)
Temperature range	-20° C – 70° C
Dimensions	Diameter 21.56 mm, length 226 mm
Running gear	26 mm OD (1.20" heat shield option)
Charge lifetime	200 hours





BlastGyro

BlastGyro™ is a unique system designed to efficiently survey production blast holes. The system is based on the world's smallest rate gyro SlimGyro™, as well as its lightweight and compact running gear.

The length of the mounted gyroscope and chassis is 138 cm
Outer diameter - only 26 mm
The total weight of the layout is 4.5 kg

The light weight and compact size of the system allows you to safely insert and remove the gyro from blast holes using a 50 m long fiberglass cable with 11 mm diameter. SlimGyro™ can perform surveys at any angle, and fiberglass cable allows it to move in any direction.

To adapt to different blast hole diameters, the chassis can be equipped with KwikZip plastic centralizers. Different arc lengths allows you to combine them to cover the desired range of diameters.

- 🕒 Plan surveys and establish reference coordinates in the office
- 🕒 When at site, upload data to Surveyor™ for efficient surveying and processing

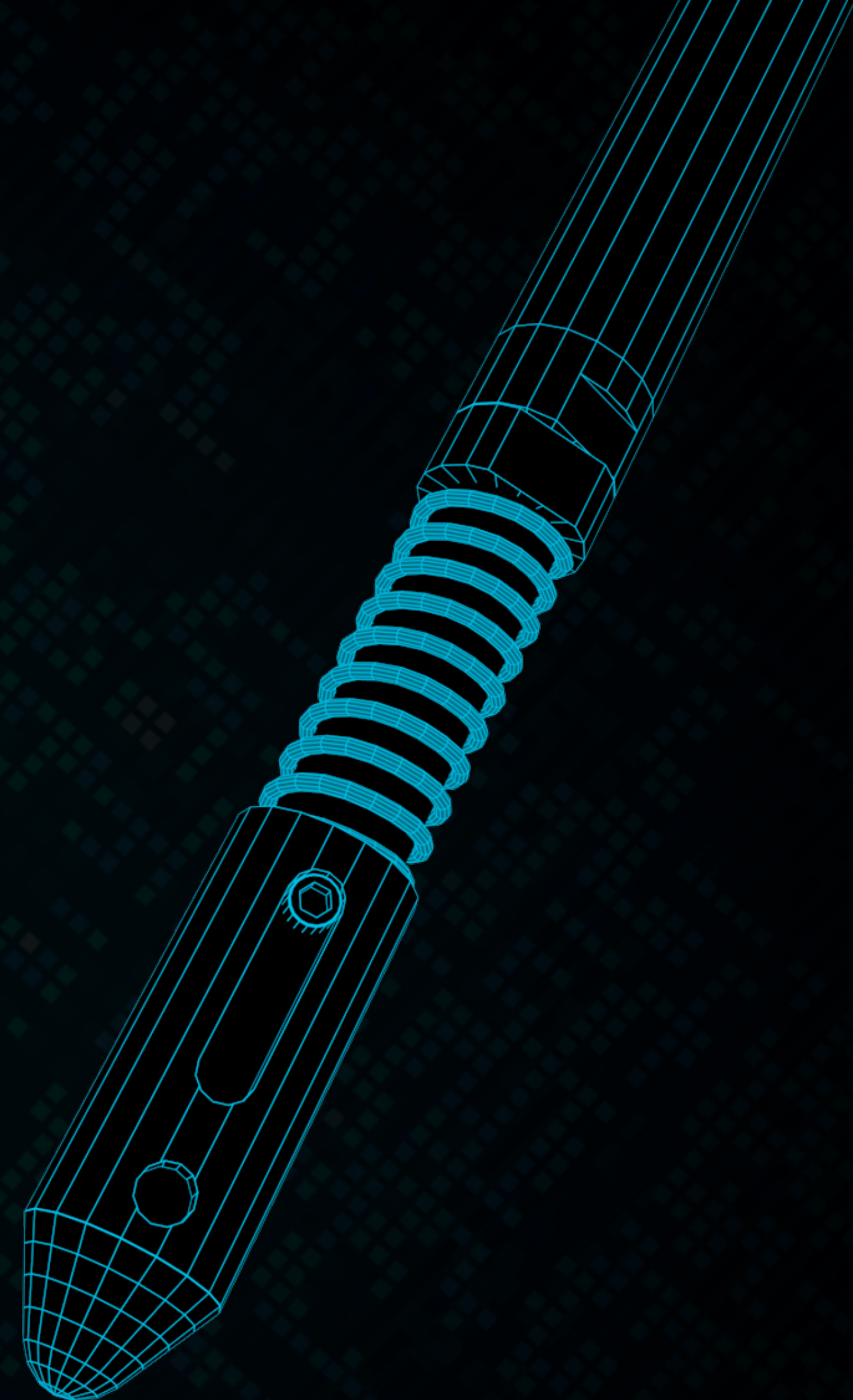




Compass

- Singleshot and multishot modes
- Operation time up to 100 hours
- Landing collar with B, BTW, N, NTW and H adapters
- Delivered with a handheld computer
- Fully integrated 35 mm or 25 mm running gear

Inclination	$\pm 0.15^\circ$
Gravity highside	$\pm 0.20^\circ$
Gyro toolface	$\pm 0.35^\circ$
Azimuth	$\pm 0.35^\circ$
Power consumption	0.2 W
Temperature range	$-20^\circ\text{C} - +70^\circ\text{C}$
Dimensions	diameter 35 mm or 25 mm, length 1210 mm
Charge lifetime	100 hours using 7 cells type C



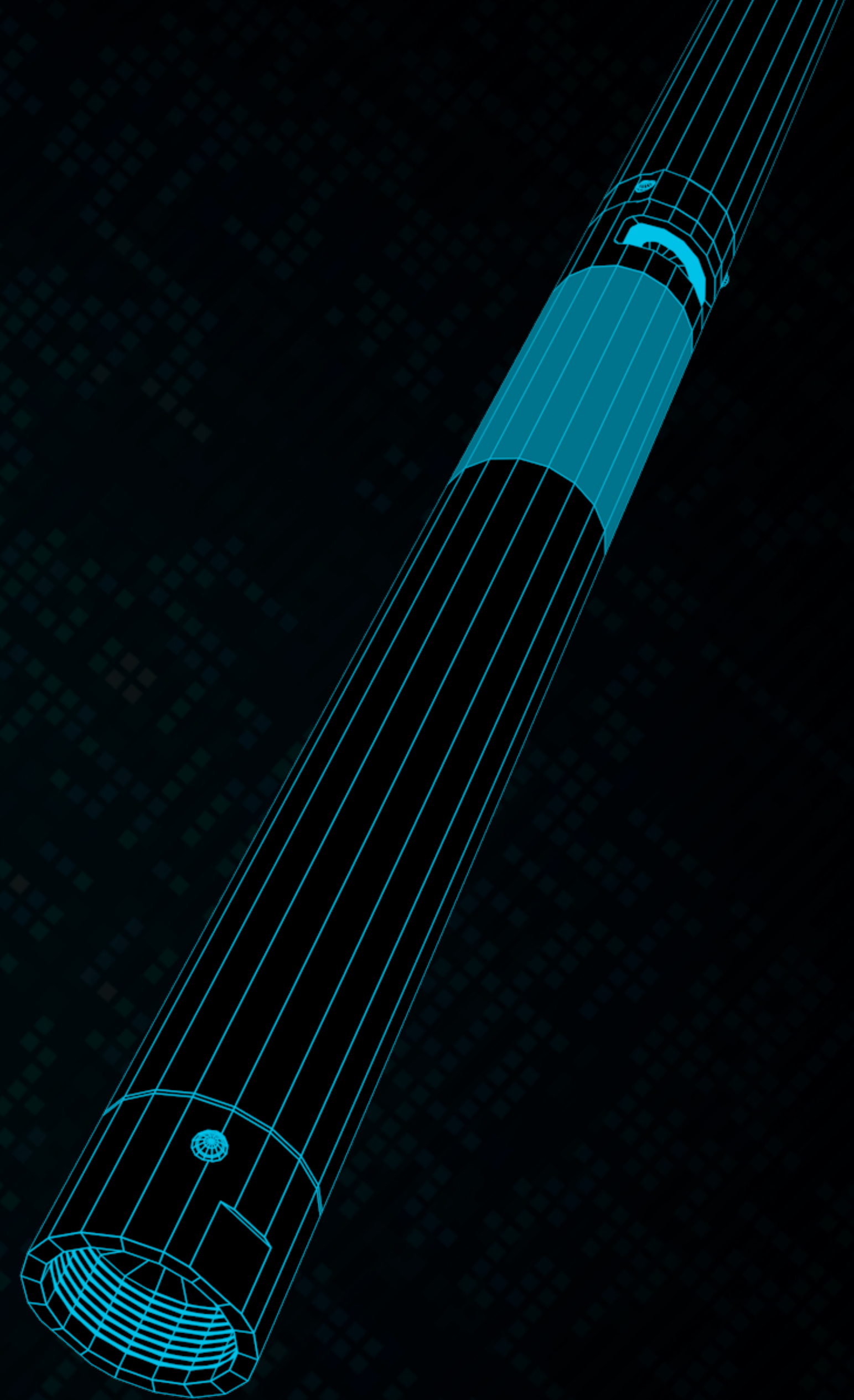


NorthFinder

- True MEMS gyro-compass
- High accuracy
- Low power consumption
- Fast Wi-Fi data transfer
- Intuitive software
- High mechanical reliability and impact resistance

Inclination	$\pm 0.1^\circ$
Gravity highside	$\pm 0.2^\circ$
Gyro toolface	$\pm 2.5^{o*}$
Azimuth	$\pm 2.5^{o*}$
North finding time	< 5 min
Power consumption	1 W
Temperature range	-20° C - 70° C
Dimensions	diameter 32 mm, length 408 mm
Running gear	38 mm OD (1.75" heat shield option)
Charge lifetime	20 hours

* depending on latitude and inclination



DRILLING

- Mazac Smart Aligner
- LiPAD-100
- Portable Drill Rigs

CORE ORIENTATION

- CorePro

SURVEYING


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PROCESSING & ANALYSIS

- Surveyor
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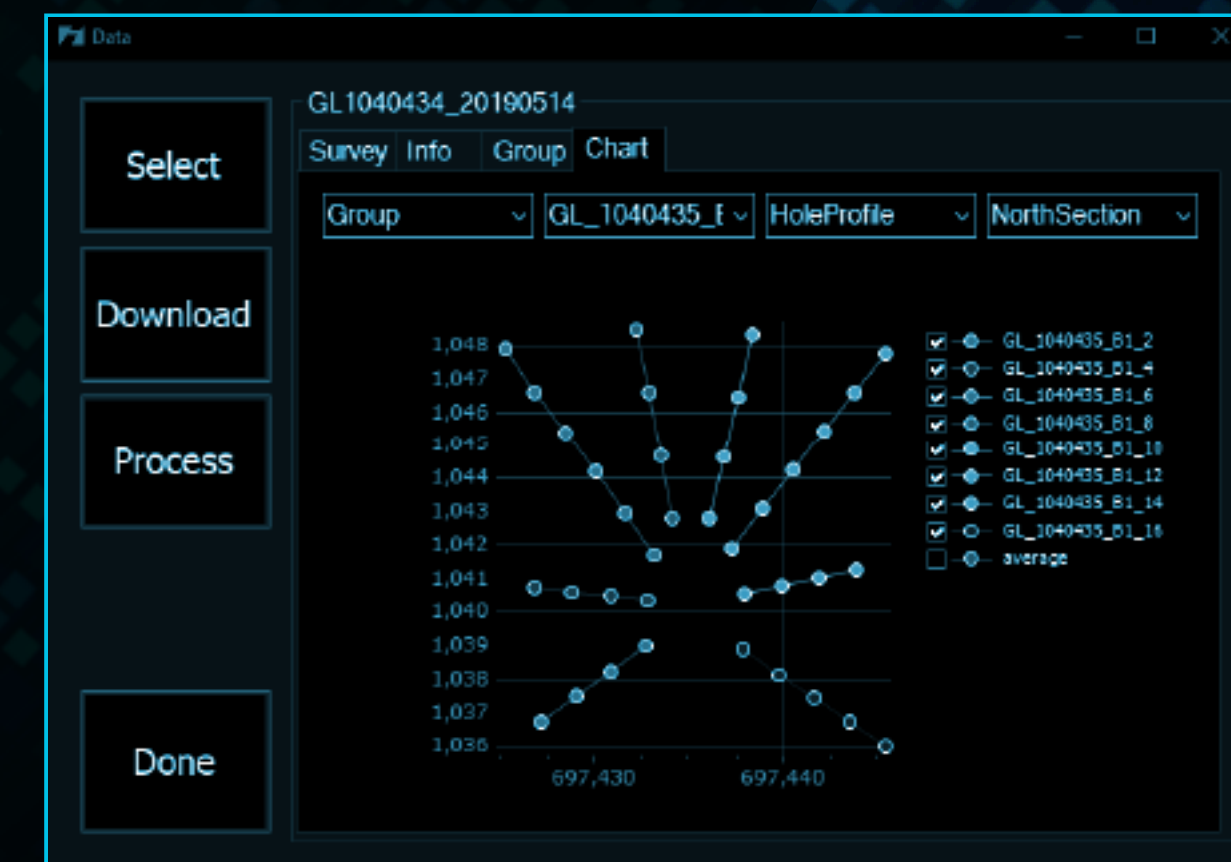
Surveyor

- Latest software from Inertial Sensing
- Works with TwinGyro, SlimGyro and isGyro
- Vertical, inclined, horizontal, ascending studies
- Continuous and traditional multishot surveys
- Reprocessing data to increase resolution
- Data sync feature for cloud solutions

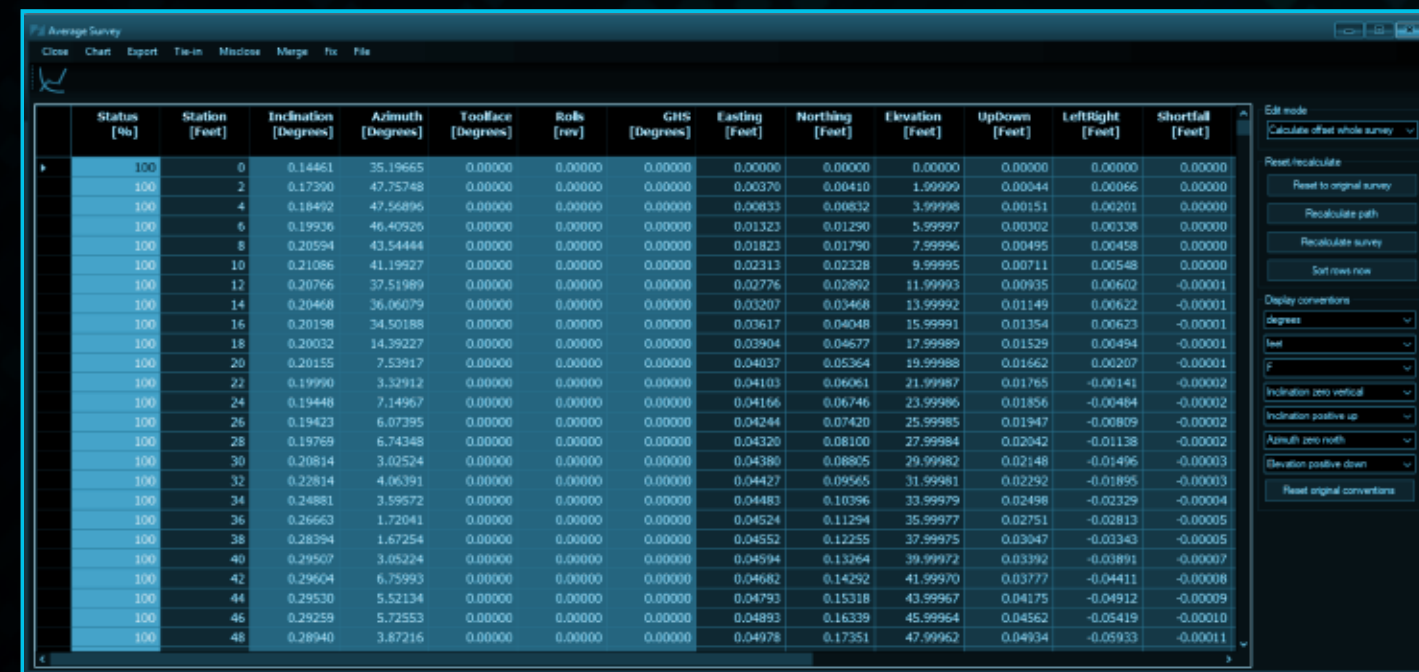


The screenshot shows the Surveyor software interface displaying a data table for Group_20181031_1533. The table has the following columns: Depth, Station, Motion, Inclination, Azimuth, GHS, and ToolFace.

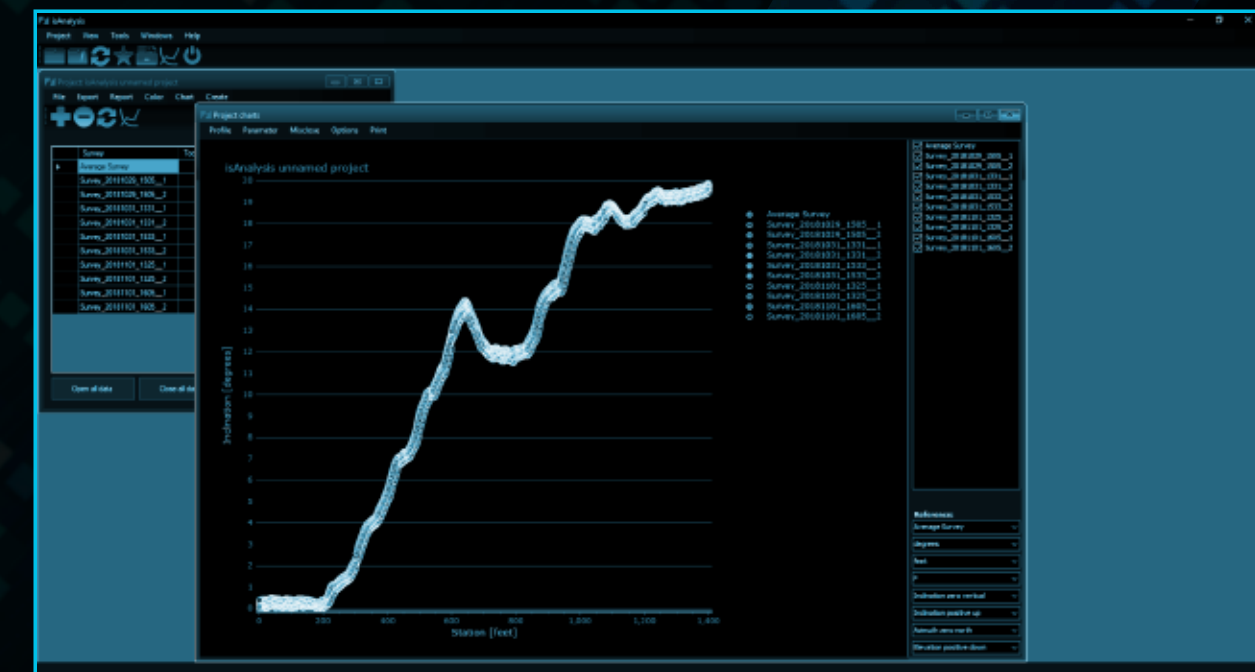
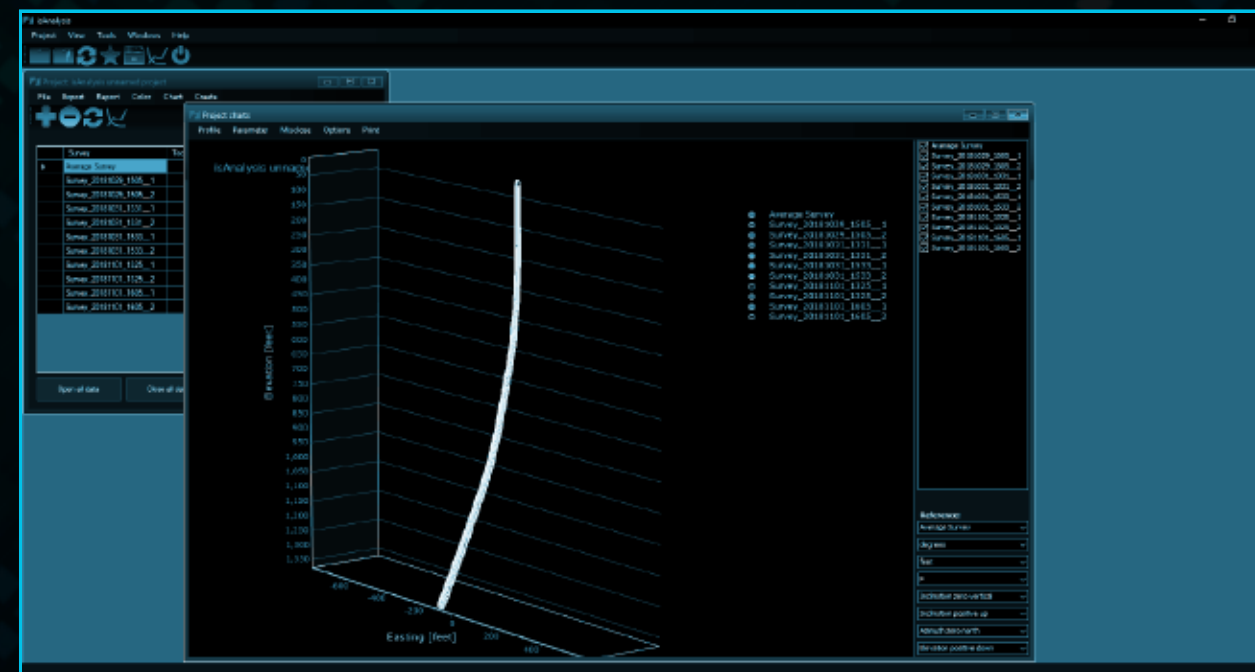
Depth	Station	Motion	Inclination	Azimuth	GHS	ToolFace
0.00	100%	100%	0.04	125.79	234.21	360.00
2.00	CONT	100%	0.15	94.41	265.37	359.78
4.00	CONT	100%	0.17	95.59	265.42	1.02
6.00	CONT	100%	0.17	85.37	275.50	0.86
8.00	CONT	100%	0.15	83.61	276.97	0.58
10.00	CONT	100%	0.15	83.35	275.08	358.42
12.00	CONT	100%	0.16	86.12	273.12	359.24
14.00	CONT	100%	0.14	90.48	268.44	358.92
16.00	CONT	100%	0.14	92.01	264.12	356.13
18.00	CONT	100%	0.12	92.24	262.12	354.35
20.00	CONT	100%	0.11	97.80	254.94	352.74
22.00	CONT	100%	0.08	105.53	246.36	351.89
24.00	CONT	100%	0.09	113.44	236.76	350.20
26.00	CONT	100%	0.11	116.06	233.08	349.14
28.00	CONT	100%	0.11	122.07	224.83	346.90
30.00	CONT	100%	0.09	119.37	223.27	342.63



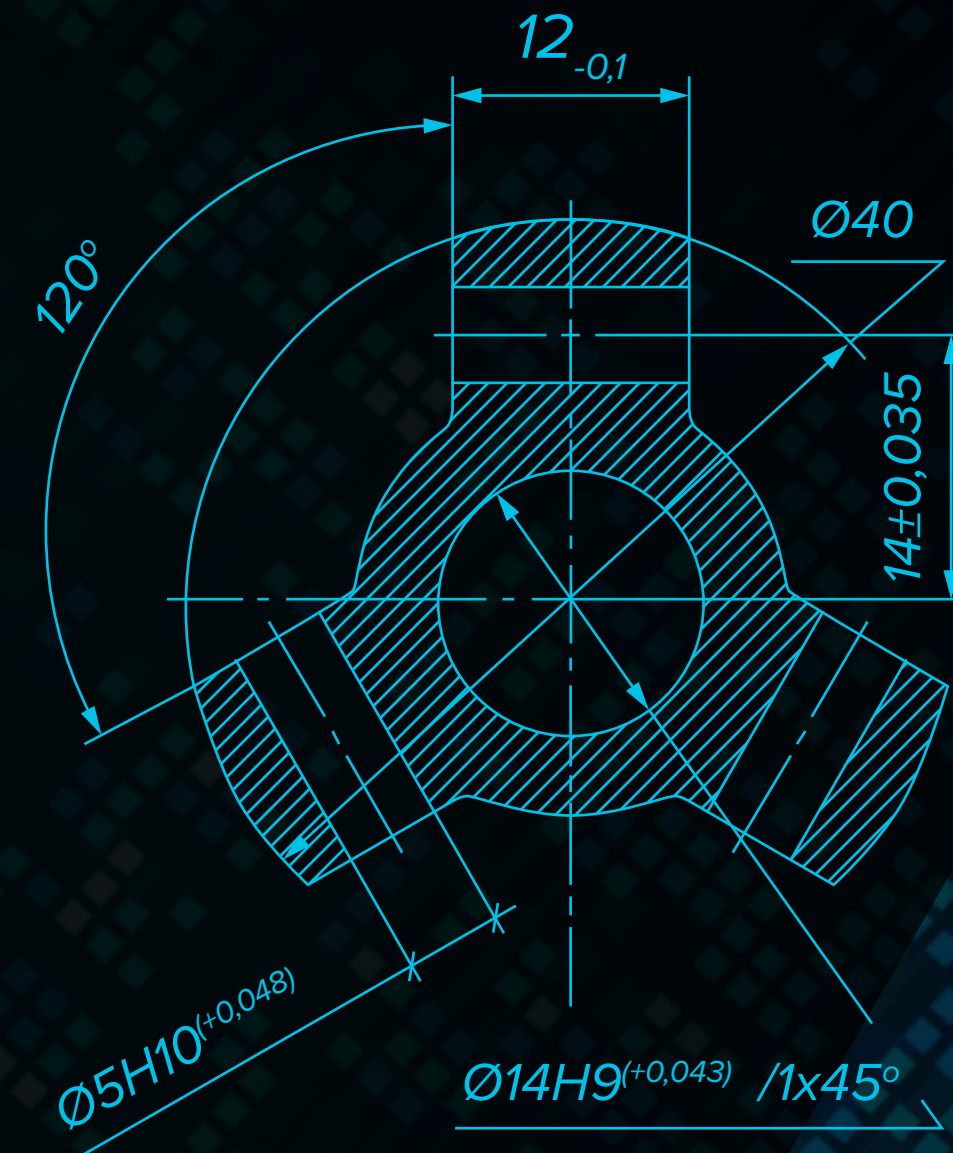
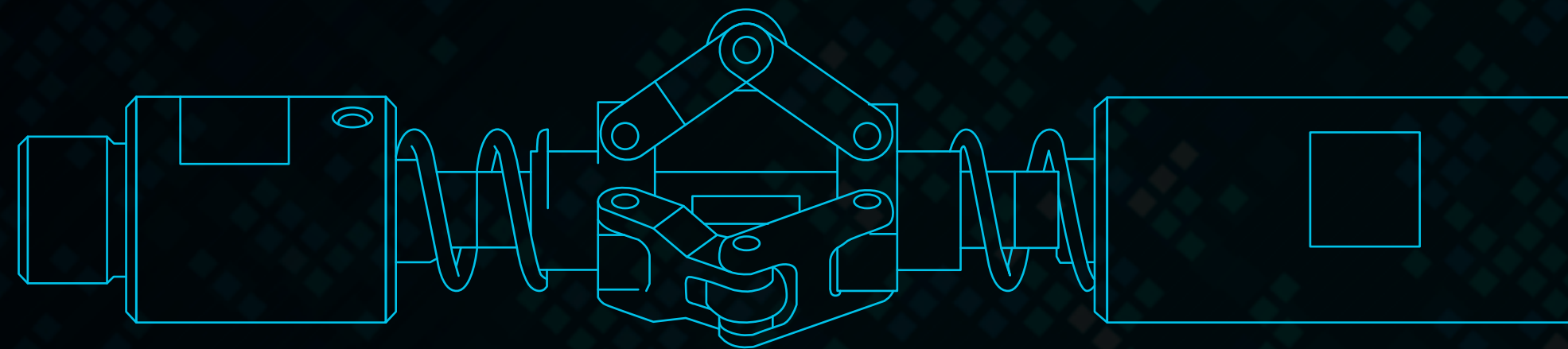
- Editing and exporting research data
- Import and visualize data from survey groups
- Graphs of horizontal and vertical sections
- Bull's Eye and 3D Graphics
- Error analysis
- Linking multilateral boreholes
- Automated reports



Station	Inclusion	Azimuth	Trueface	Roll	GHS	Easting	Northing	Elevation	UpDown	LeftRight	Shortfall
100	0	0.14461	35.19665	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
100	2	0.17290	47.75748	0.00000	0.00000	0.00370	0.00410	1.99999	0.00044	0.00066	0.00000
100	4	0.18492	47.56896	0.00000	0.00000	0.00833	0.00832	3.99998	0.00151	0.00201	0.00000
100	6	0.19926	46.40926	0.00000	0.00000	0.01323	0.01290	5.99997	0.00302	0.00338	0.00000
100	8	0.20594	43.54444	0.00000	0.00000	0.01823	0.01790	7.99996	0.00495	0.00458	0.00000
100	10	0.21086	41.19027	0.00000	0.00000	0.02213	0.02228	9.99995	0.00711	0.00548	0.00000
100	12	0.20766	37.51989	0.00000	0.00000	0.02776	0.02892	11.99993	0.00935	0.00602	-0.00001
100	14	0.20468	36.06079	0.00000	0.00000	0.03207	0.03468	13.99992	0.01149	0.00622	-0.00001
100	16	0.20198	34.50188	0.00000	0.00000	0.03617	0.04048	15.99991	0.01394	0.00623	-0.00001
100	18	0.20032	34.39227	0.00000	0.00000	0.03994	0.04677	17.99989	0.01628	0.00604	-0.00001
100	20	0.20155	7.52917	0.00000	0.00000	0.04037	0.02364	19.99988	0.01662	0.00207	-0.00001
100	22	0.19990	3.32912	0.00000	0.00000	0.04183	0.04061	21.99987	0.01765	-0.00141	-0.00002
100	24	0.19448	7.14967	0.00000	0.00000	0.04166	0.06746	23.99986	0.01856	-0.00484	-0.00002
100	26	0.18423	6.07395	0.00000	0.00000	0.04244	0.07420	25.99985	0.01947	-0.00809	-0.00002
100	28	0.19789	6.74348	0.00000	0.00000	0.04320	0.08100	27.99984	0.02042	-0.01138	-0.00002
100	30	0.20814	3.02524	0.00000	0.00000	0.04386	0.08892	29.99982	0.02148	-0.01496	-0.00003
100	32	0.22814	4.06391	0.00000	0.00000	0.04427	0.09665	31.99981	0.02292	-0.01895	-0.00003
100	34	0.24881	3.99572	0.00000	0.00000	0.04483	0.10396	33.99979	0.02498	-0.02329	-0.00004
100	36	0.26663	1.72041	0.00000	0.00000	0.04524	0.11294	35.99977	0.02751	-0.02813	-0.00005
100	38	0.28394	1.87254	0.00000	0.00000	0.04552	0.12255	37.99975	0.03047	-0.03343	-0.00005
100	40	0.29507	3.05224	0.00000	0.00000	0.04594	0.13294	39.99972	0.03392	-0.03891	-0.00007
100	42	0.29604	6.79993	0.00000	0.00000	0.04682	0.14292	41.99970	0.03777	-0.04411	-0.00008
100	44	0.29530	5.52134	0.00000	0.00000	0.04793	0.15318	43.99967	0.04175	-0.04912	-0.00009
100	46	0.29259	5.72553	0.00000	0.00000	0.04893	0.16339	45.99964	0.04562	-0.05419	-0.00010
100	48	0.28940	3.87216	0.00000	0.00000	0.04978	0.17351	47.99962	0.04934	-0.05933	-0.00011



Personalized solutions



RESEARCH



CONCEPT

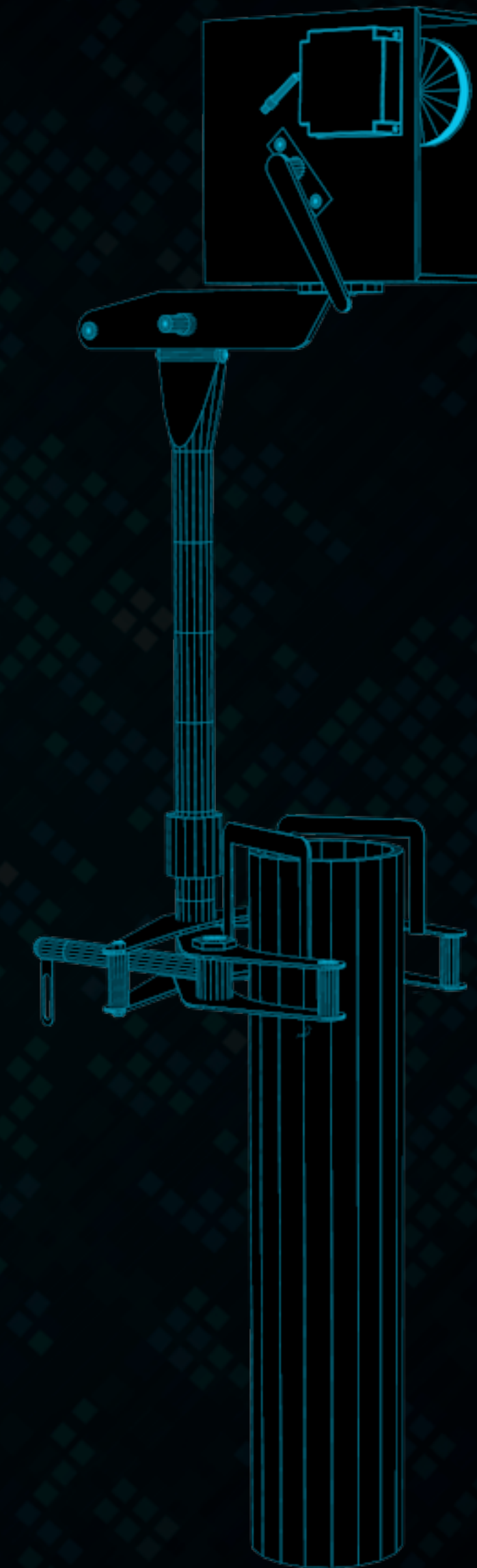


DEPLOY

Wireless Depth Tracker

- Digital Wireless Depth Tracker
- Turn a logging cable into a survey logger
- Durable, reliable, safe and simple
- Long battery life
- Light weight

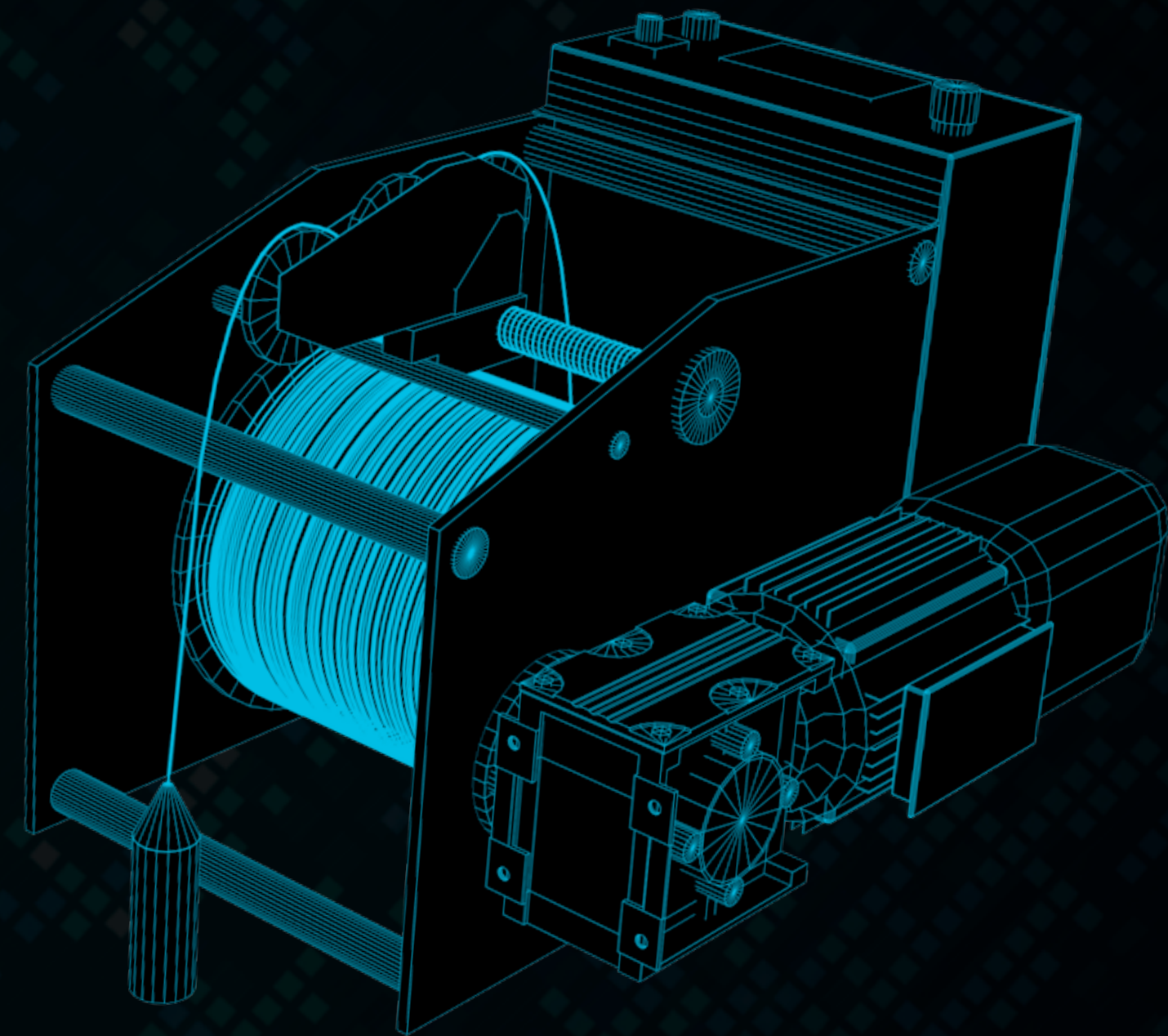
Accuracy	0.1 %
Cable diameter	up to 12 mm
Cable speed	100 m/min
Connection	Bluetooth 4.0
Battery type	Li-Ion with 15 hours of work
Diameter	52 mm
Length	340 mm
Weight	2 kg



ADW winch

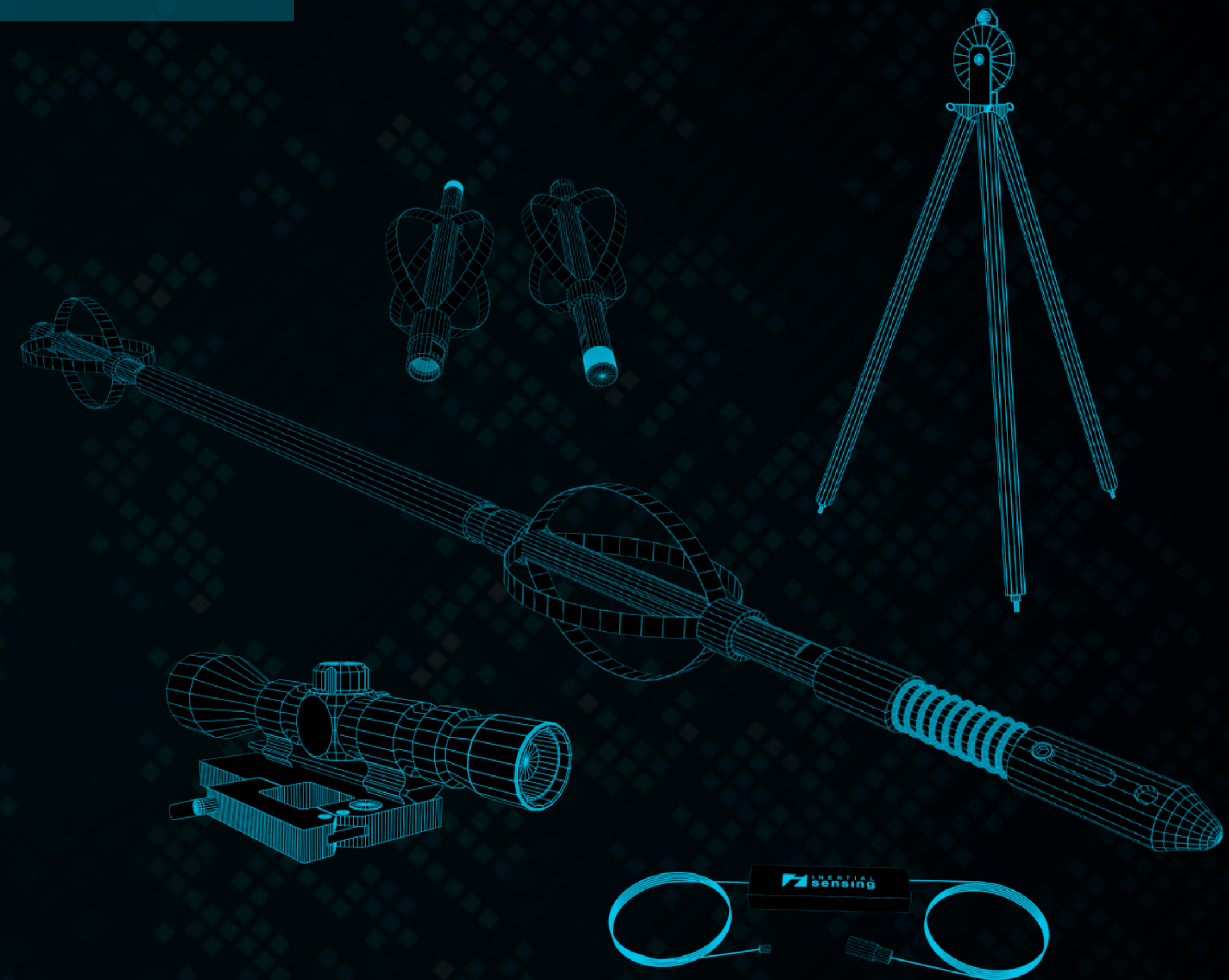
Compact borehole winch designed for work in boreholes up to 800 m deep.

- Helicoidal spindle for automatic laying of cable on drum
- Electronic depth encoder with display
- Frequency controlled async electric motor (0.75 kW)
- Electric motor brake to keep the wireline still at stations
- 800 m of 1/8" stainless steel wire rope
- Interface for continuous gyro surveys (single-conductor cable available on request)



Additional equipment

- 38 mm running gear for isGyro / TwinGyro / NorthFinder
- 26 mm running gear for SlimGyro
- 26 mm and 38 mm centralizers with spring blades
- Rear Alignment Tripod for Smart Aligner
- Aiming device for vertical surveys
- Wired USB Encoder
- Optical designator
- Tripod for vertical well surveys
- Fiberglass Reel



Recommended Equipment Kits

MOST ACCURATE

- TwinGyro + WDT + LiPAD-100
- Two independent surveys in one run
- Surface and underground surveys
- Definition of True North
- Versatile kit
- High Speed Continuous Surveys

BLAST GYRO KIT

- SlimGyro + Fiberglass reel
- Blast hole surveying system
- Adaptive to various diameters

MOST ECONOMIC

- isGyro + WDT + Smart Aligner
- High speed and accuracy
- Surface surveys
- Definition of True North
- Versatile kit
- High Speed Continuous Surveys