GeoMax Zenith60 GNSS smart antenna

Product Presentation, Sept 2021

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Internal Product Announcement

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- Product Description
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GEOMAX

01

Product Description

Zenith60
Product description

Technical highlights

- IMU Calibration free
- Init. time typ. 4s
- LTE 4G
- WLAN
- QR Code
- Resistant to electromagnetic field
- IP68
- Hotswap Batteries
- Increased Operating Time
- Compact Design
- Reliability 99.99%
- Tilt up to 60°
- Magnesium housing
- PPP

Zenith60
Product description

Technical highlights

- Calibration free IMU technology incorporated
- Resistant to electromagnetic fields
- Tilt up to 60deg
- Magnesium housing
- 4G/LTE support
- Hot swappable batteries
- Increased operating time
- L-band: Terrastar-C Pro correction service
- Improved initialisation time
- Reliability 99.99%
- No extra GSM antenna necessary
- QR Code supported
- High quality components from strong and well-known suppliers and partners: Hexagon, Novatel, Lemo, SATEL

Zenith60
Product description

VARIANTS	4G LTE	UHF	TILT COMPENSATION
GeoMax Zenith60 LTE	■	-	-
GeoMax Zenith60 LTE-UHF	■	■	-
GeoMax Zenith60 LTE-IMU	■	-	■
GeoMax Zenith60 LTE-UHF-IMU	■	■	■

LTE

LTE-UHF

LTE-IMU

LTE-IMU-UHF

Zenith60
Calibration free IMU technology

The Zenith60 has an integrated Inertial Measurement Unit (IMU) that is used in combination with GNSS measurements.

Zenith60
Calibration free IMU technology

This technology has several **advantages:**

- There is **no need to calibrate** the sensor.
- The pole can be **tilted up to 60°.** To ensure high accuracy measurements, it is recommended that the pole is tilted no more than 30°.
- Precondition for performing tilt compensated measurements is the initializing of the IMU. To initialize the IMU, move the Zenith60 around by taking a few steps or shaking the antenna back and forth.
- **Resistance to electromagnetic fields**

Zenith60
How does IMU work

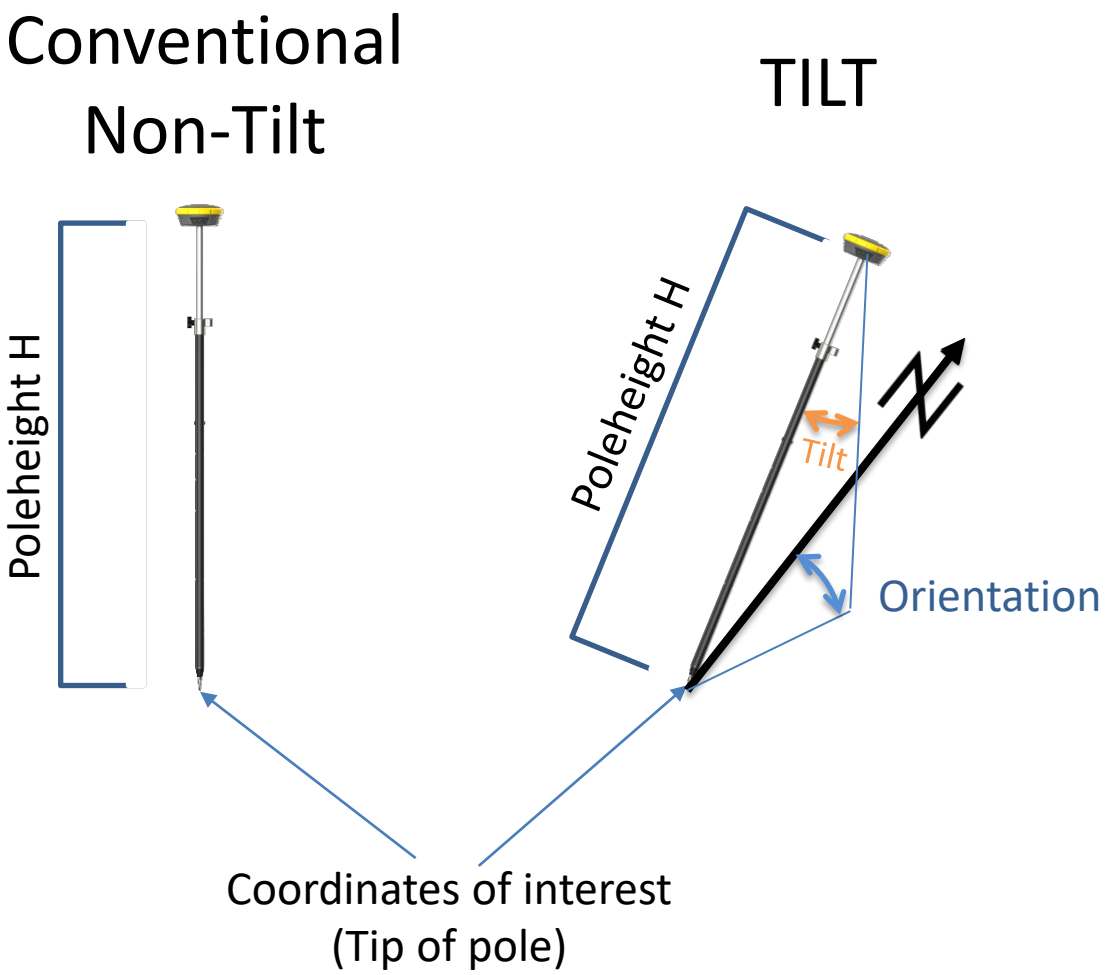
IMU = **I**nertial **M**easurement **U**nit.

The position of the pole tip of a tilted GNSS antenna can be calculated by compensating the error caused by the inclination. To do this, the length of the pole, the tilt angle and the orientation of the tilt (e.g., relative to north) must be known.

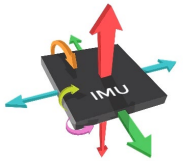
An IMU built into the GNSS device measures the angle, and the person using the GNSS must pre-define the length of the pole in the software. The IMU consists of accelerometers and gyroscopes and our IMU technology uses a customized inertial navigation system integrated with GNSS to determine the amount of tilt.

By coupling the IMU with GNSS, the measurement is insensitive to interference from electromagnetic fields, eliminates the need for on-site calibrations and enables measurements with a strong inclination of the pole. All this was impossible or cumbersome with the old method of determining the orientation of the tilt relative to north with-an electronic compass.

Zenith60
How does IMU work



- Tilt direction is required
- Initial position projected along the pole
- Knowing tilt angle, tilt direction and the pole length gives the correct position of the point on the ground

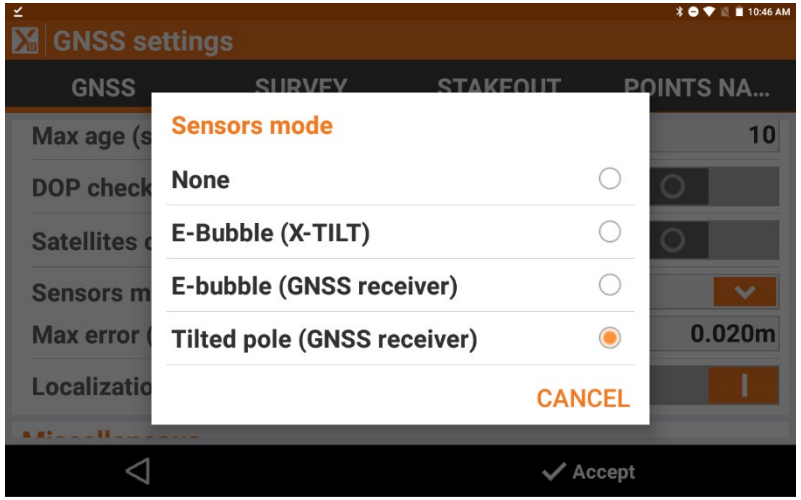


Zenith60
IMU and X-PAD Ultimate

Turning on tilt capability in X-PAD Ultimate

In X-PAD Ultimate, select one of the measuring apps -Survey or Stake out - and follow these steps

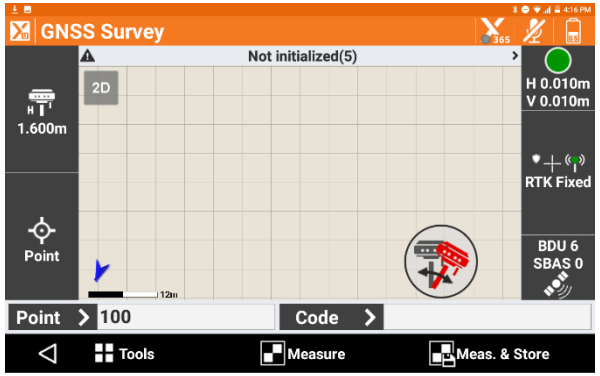
Tools > Survey Setup > Tilted Pole (GNSS receiver)



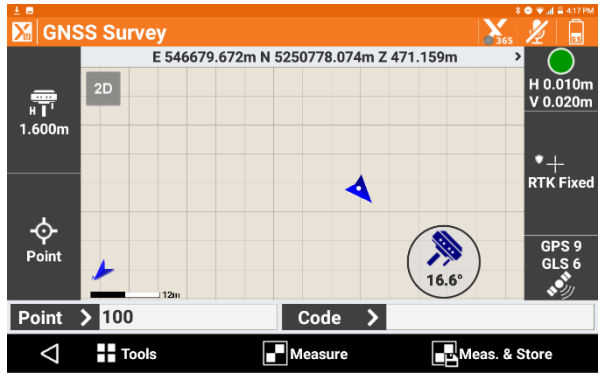
Zenith60
IMU and X-PAD Ultimate

How to see if your Instrument has initialized and is ready for tilt measurements?

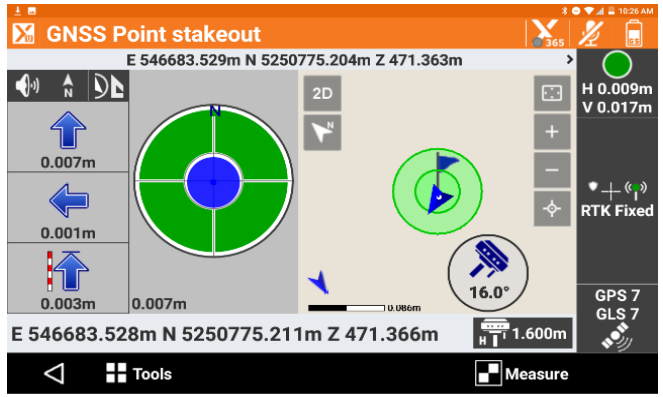
Before initialization



After initialization
→ Ready for tilt measurements



Stake out using tilt (example)



Zenith60
IMU and X-PAD Ultimate

How to see if your Instrument has initialised and is ready for tilt measurements?

The tilt initialisation symbol (red) appears when tilt compensation is activated but not yet initialized, which is necessary to get high accuracy. Measurements cannot be taken yet.

To initialise tilt compensation, move the antenna around by walking or rock the antenna back and forth. During the initialisation process, the progress bar icon appears. It indicates that tilt is being initialised.

Once the tilt compensation is initialised and good GNSS accuracy has been achieved, the icon turns blue, and the current tilt value appears. This means measurements can now be performed.

If the IMU calculation fails during initialisation, the tilt symbol indicates a failure

Zenith60
State-of-the-art Measurement Engine

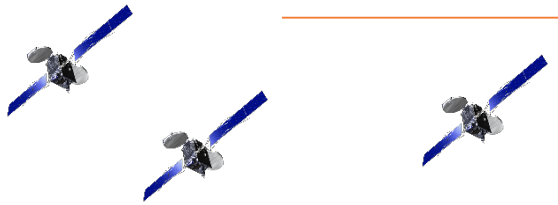
Equipped with the renowned NovAtel OEM719 Measurement Engine (ME), the Zenith60 supports all current and future satellite systems.

- GPS & Glonass & BeiDou & Galileo
- NavIC (India)
- QZSS (Japan)
- SBAS (EGNOS; WAAS, MSAS, GAGAN)

Also, future frequencies, such as **Glonass L3**, **Galileo E6**, or **QZSS L6** are supported.

Due to its **multi-constellation** and **multi-frequency** capability the Zenith60 is guaranteed to be future proof and provides maximum flexibility.

Zenith60
Satellite system update



Satellite System	Coverage	Status	Total Satellites in constellation	Comment
GPS	Global	Fully operational	32	
GLONASS	Global	Fully operational	26	
BeiDou	Global	Fully operational	38	
Galileo	Global	In development	30	• 18 useable • 8 under testing • 4 more planned until end of 2019
QZSS	Regional	In development	7	• 4 useable • 3 more until 2020
IRNSS/NavIC	Regional	In development	7	

Zenith60
Highest quality positioning

Zenith60 provides a short time to fix, combined with high availability and highest reliability. This increases your efficiency and flexibility when performing even high-precision tasks..

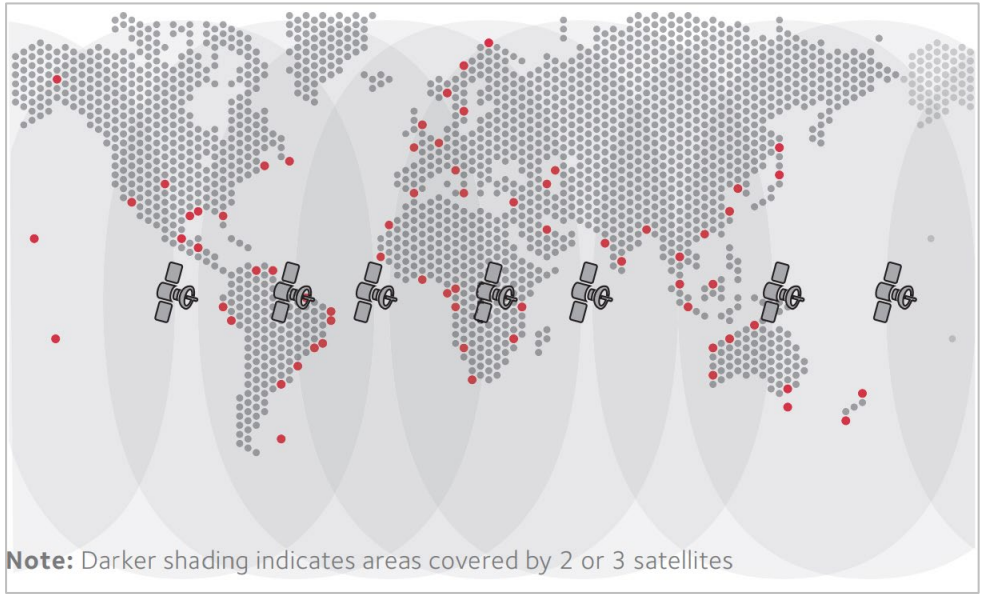
Hexagon’s TerraStar Precise Point Positioning (PPP) C-Pro service provides correction data at centimetre level quality all around the globe. This service significantly enhances your productivity, when working in remote areas without GSM coverage or where no reference data is available at all.

Also, no need to worry about reference frames anymore. The PPP position is provided within the coordinate system. The configuration and use of the TerraStar C-Pro Service is fully supported within the X-PAD Ultimate field software.

TerraStar

TerraStar, a Hexagon company, is a global leader in satellite-based correction services for land and near-shore applications and owns, operates, maintains and controls its global network of over **100 GNSS reference stations**.

- **3 Network Control Centers**, geographically separated
- Corrections provided by the network are broadcast via **seven geostationary satellites** to the user-equipment.
- Corrections data transmitted over a minimum of **3 beams** directly to end user
- Scalable solutions and flexible subscription durations
- **24/7/365**, all weather, correction services
- Various service levels at different performance levels are available. With its OEM7 Measurement Engine, Zenith60 classifies for "TerraStar C-Pro", providing highest accuracy



Note: Darker shading indicates areas covered by 2 or 3 satellites

Service Levels

Performance	TerraStar-L[1]	TerraStar-C[2]	TerraStar-C PRO
Horizontal Accuracy[3]	40 cm (RMS) 50 cm (95%)	4 cm (RMS) 5 cm (95%)	2.5 cm (RMS) 3 cm (95%)
Vertical Accuracy[3]	60 cm (RMS)	6.5 cm (RMS)	5 cm (RMS)
Convergence Time[4]	< 5 min	30-45 min	< 18 min
Supported GNSS	GPS/GLO	GPS/GLO	GPS/GLO/GAL/BDS
Supported Platform	OEM7, OEM6	OEM6	OEM7

HEXAGON
POSITIONING INTELLIGENCE

NovAtel

TERRASTAR

Zenith60
Productivity results from performance

- Calibration-free tilt technology
- Fast initialization time of less than 5 seconds
- Highest reliability of 99.99%
- Increased operating time
- QR – iConnect
- Hot swappable batteries
- Operational in tough environmental conditions

This is making the Zenith60 the perfect instrument to get the job done in the field – reliably and on time

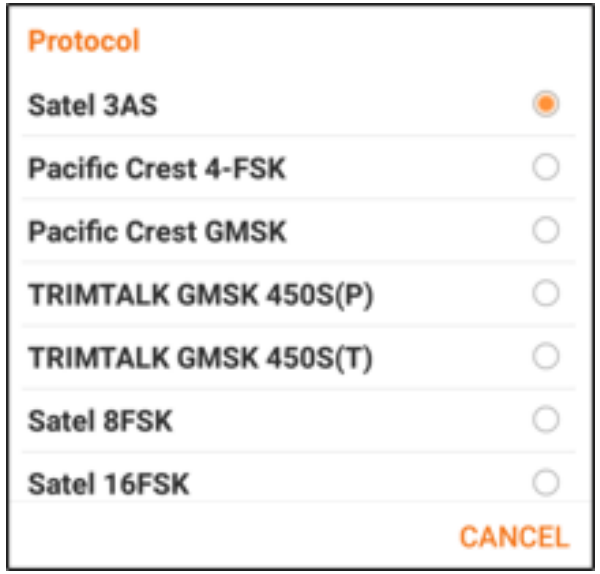
Zenith60
Superior UHF radio

Zenith60 incorporates a SATEL radio module for base-rover setups. SATEL, based in Finland, is one of the world's leading experts and innovator in independent radio networking technology and convinces by its high reliability, maximum receive-/ transmit performance and unmatched compatibility with UHF, built in 3rd party equipment.

The built-in SATEL TR4+ is an exceptional UHF radio, supporting the most established protocols on the market.

Key characteristics:

- 14 programmable frequencies
- Support of 7 protocols for maximum flexibility
  - SATEL 3AS
  - SATEL 8 FSK
  - SATEL 16 FSK
  - PCC-4FSK
  - PCC-GMSK
  - TrimTalk (T)
  - TrimTalk (P)



Zenith60
Connectivity and Communication

Port for

- External radio
- UHF antenna
- External power
- Serial connectivity (RS232)
- USB connectivity
- MicroSD Card
- SIM Card

+

Internal 8GB memory

Zenith60
Environmental protection – works when you do

Designed for working in rough environments:

- IP68 (IEC 60529)
  Withstands powerful jets (IPx6) and temporarily immersion under water (IPx8).
  Fully dust tight (IP6X).

- Mechanical stress resistant according to ISO 9022-36-05

- Withstands a 2 meter drop on hard surface.

- Operating temperature -40 to +65 deg

- Magnesium housing

Zenith60
QR-iConnect

The GeoMax-unique QR-iConnect functionality allows you to scan the QR code, printed on the bottom of the Zenith60, with your field controller. The X-PAD Ultimate field software then immediately connects to the device.

The Zenith60 completes the GNSS family containing this feature. All GeoMax GNSS devices are now supporting QR-iConnect.

Time consuming tasks, like waiting for the Bluetooth search, scrolling an extensive device list and selection of it are now a thing of the past – just scan and connect.

Zenith60
Renowned partners

SATEL

GeoMax, together with Novatel and Terrastar, are full members of the renowned Swedish Hexagon group.

Being part of the Hexagon group, GeoMax can exploit synergies by using Hexagon technology and manufacturing know-how. Working with premium suppliers such as LEMO and SATEL enables GeoMax to offer products of the highest performance and quality.

Zenith60
Product description

RECEIVER SPECIFICATIONS

Reliability	99.99%
Measurement Engine	NovAtel OEM7, 555 channels, multi-frequency, multi-constellation
GPS tracking	L1 C/A, L1C, L2C, L2P, L5
GLONASS tracking	L1 C/A, L2 C/A, L2P, L3*
BeiDou tracking	B1I, B1C, B2I, B2a, B2b, B3I
Galileo tracking	E1, E5a, E5b, AltBOC, E6*
QZSS tracking	L1 C/A, L1C, L2C, L5, L6*
NavIC	L5**
SBAS (EGNOS, WAAS, MSAS, GAGAN)	L1, L5
Precise Point Positioning (PPP)	TerraStar C Pro, L-Band (opt)
Positioning rate	5Hz, 20Hz (opt)
Time for Initialisation	Typically 4s

QUALITY MODE

RTK modes	Selectable; ExtraSafe, Standard
Tilt Compensation	Calibration-free, Resistant to magnetic interferences

COMMUNICATION

4G LTE module	QUECTEL EG25-G LTE FDD, LTE TDD, UMTS, GSM
RTK data protocols	RTCM 2.1, 2.3, 3.0, 3.1, 3.2, 3.3, 3.4, CMR, CMR+, RTCA, NOVATELX
NMEA Output	NMEA v3.1, NMEA v4.1
UHF radio module	SATEL TR4+, 500mW, 1000mW transceiver, 403–473 MHz; (opt)
Bluetooth®	2.1 +EDR, V5.0 QR-iConnect functionality
WLAN	802.11 a/ac/b/g/n Hotspot / client mode
TNC connector	UHF antenna
Communication port	USB, serial & power

RECEIVER ACCURACY & PERFORMANCE ***

RTK	Hz: 8 mm ± 1 ppm (rms) V: 15 mm ± 1 ppm (rms)
Network RTK	Hz: 8 mm ± 0.5 ppm (rms) V: 15 mm ± 0.5 ppm (rms)
Static	Hz: 3 mm ± 0.5 ppm (rms) V: 5 mm ± 0.5 ppm (rms)
Static long	Hz: 3 mm + 0.1 ppm (rms) V: 3.5 mm + 0.4 ppm (rms)
Code differential	Hz: 0.25 m (rms) V: 0.50 m (rsm)

PHYSICAL SPECIFICATIONS

Dimensions	Height 75 mm, ø 166.8 mm
Weight	1.14 kg without batteries
Operating temp.	–40°C to 65°C
Environmental protection	IP68 (IEC 60529) Withstands powerful jets and temp. immersion under water MIL-STD-810G 1 506.6 & 1 512.6 Fully dust tight MIL-STD-810G 1 510.6
Humidity	MIL-STD-810H 1 507.6
Vibration	Mechanical stress resistant according to ISO 9022-36-05
Shock	Withstands 2 m drop onto hard surface

INTERFACES

Keyboard	On/off button
LED status indicators	Position, RTK, Power, Bluetooth®
Data recording	Dual; microSD card and 8 GB internal memory
GSM/TCP/IP	Removable SIM card

POWER SUPPLY

Two internal batteries	Hot-swappable, Li-Ion 3.4 Ah / 7.2 V
Operating time	12.5 h in static / 11 h in rover mode
External power	9 V to 28 V, LEMO® plug

*GLONASS L3, Galileo E6, and QZSS L6 will be provided with future firmware upgrade.
**Support of NavIC is incorporated and will be provided through future firmware upgrade.
*** Measurement accuracy and reliability are dependent on various factors including satellite geometry, obstructions, observation time, ionospheric conditions, multipath, etc.

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02

Value proposition

Zenith60 & X-PAD Value Proposition

Pains

- Less accuracy/losing time because of inability to properly survey inaccessible points
- Losing time with calibration
- Uncertainty about raliability of measurement because of electro magnetic interferences
- Uncertainty about surveying with GSM because 2G and 3G networks are being phased-out
- Forced to pay for solutions with featuress that are not needed

Features

- IMU technology
  - Measure inaccessible points and speed up your work
  - No on-site calibration needed - simply rock antenna back and forth to enable tilt feature
  - Electro magnetic resistance
- 4G LTE module onboard
- NovAtel measurement engine
- SATEL UHF Radio
- With or without tilt capability and/or UHF module

Benefits

- Flexibility to survey everywhere
- Saving time
- Peace of mind thanks to reliable measurements
- Confidence that Zenith60 is future-proof in terms of GSM technology.
- Using technology from renowned partners adding confidence in reliability and quality of product.
- Flexibility to choose tailored solution

Zenith60 & X-PAD Value Proposition

Pains

- Uncertainty about what to expect in terms of costs after purchasing software because of maintenance
- Complicated software that takes a long time to get acquainted with and exploit the full potential
- Losing time when going back and forth between office and field because of missing points etc.
- Losing time and money because the latest data is not available to everybody

Features

- X-SHIELD – SW maintenance, license transfer, support at no cost
- First Android field software no drivers, easy configuration, optimised for tablets etc.)
- CAD function included to prepare and adjust your data in the field
- Direct data exchange and data storage with X-PAD 365 to access them from everywhere

Benefits

- Certainty that there will never be additional costs for software maintenance
- No time loss to learn how to use software → profit from all the benefits and features SW provides
- Smoother workflow, flexibility to make design changes any time

Zenith60 & X-PAD Value Proposition

Pains	Features	Benefits
• Losing productivity because software that is not tailored to needs and works with outdated technology over time • Losing time and money when purchasing new field controller • Forced to pay for solutions with featuress that are not needed	• X-PERT service – to access regular software improvements based on customer feedbacks • Work with GeoMax field controllers or BYOD • Choose between tailored field software versions for construction and surveying in construction	• Work efficiently with modern software that provides advantages of latest technology • Saving time and money while working with already familiar field controller • Flexibility to choose tailored solution

Zenith60
Value proposition

Solution – Zenith60 and X-PAD Ultimate field software

+

X-PAD Ultimate field software

03

Relative Positioning

Zenith60
Relative Positioning

VARIANTS	4G LTE	UHF	TILT COMPENSATION
GeoMax Zenith60 LTE	■	-	-
GeoMax Zenith60 LTE-UHF	■	■	-
GeoMax Zenith60 LTE-IMU	■	-	■
GeoMax Zenith60 LTE-UHF-IMU	■	■	■

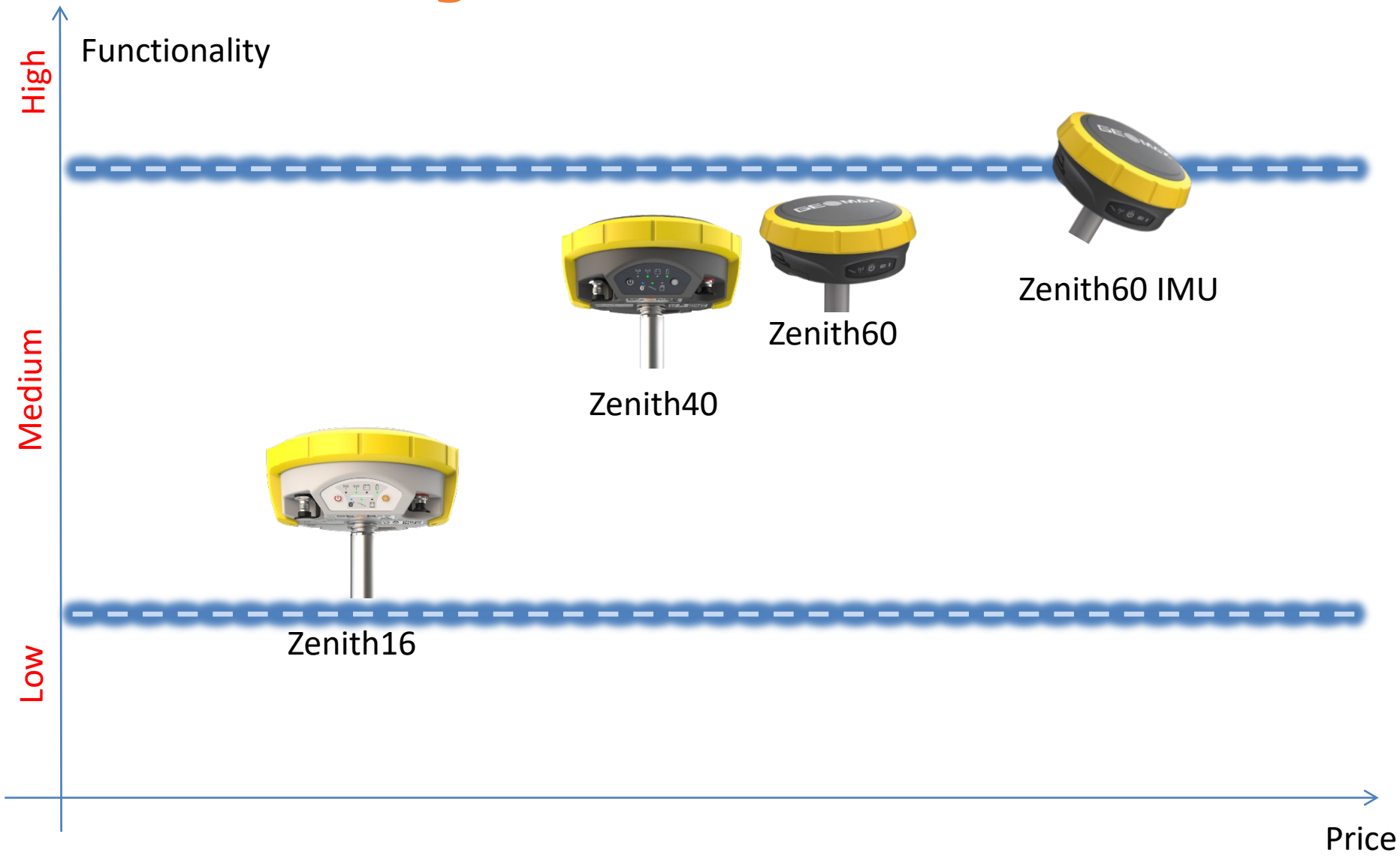
LTE

LTE-UHF

LTE-IMU

LTE-IMU-UHF

Zenith60
Relative Positioning

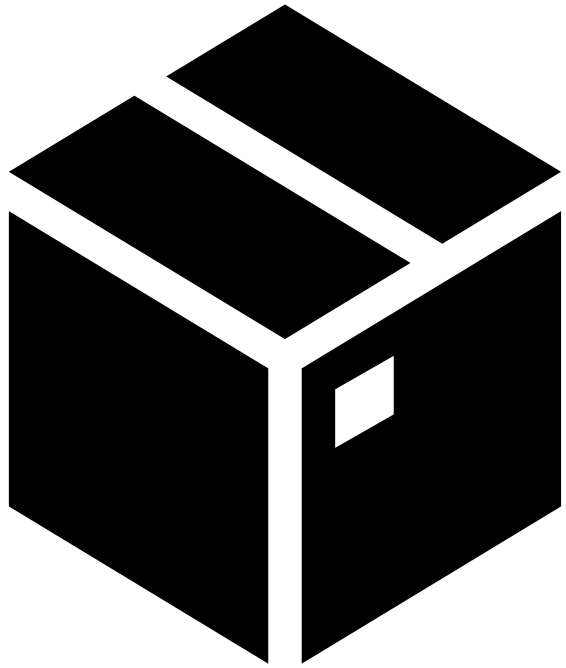


Zenith16/40/60 – Relative Positioning
All at a glance

	Zenith16	Zenith40	Zenith60
NovAtel Board	OEM7500		OEM719
Channels	181		555
GPS	L1/L2		L1/L2/L5
GLONASS	L1/L2		L1/L2/L3
Galileo	Opt; E1/E5		E1/E5/E6
BeiDou	Opt; B1/B2		B1/B2/B3
QZSS	Opt; L1/L2		L1/L2/L5/L6
Multi-frequency	Included		Included
20 Hz Pos. output	No		Optional
Static Hz/V Accuracy [mm+ ppm]	5+0.5 / 10+0.5		3+0.5 / 5+0.5
Static Long Hz/V Accuracy [mm+ ppm]	3+0.1 / 3.5+0.4		3+0.1 / 3.5+0.4
Kinematic Hz/V Accuracy [mm+ ppm]	10+1 / 20+1		8+1 / 15+1
Kinematic Hz/V Network Accuracy [mm+ ppm]	10+0.5 / 20+0.5		8+0.5 / 15+0.5
RTK Engine	GeoMax Q-Lock Plus	GeoMax Q-Lock Plus	NovAtel AdVance
Reliability	99.9%	99.99%	99.99%
Precise Point Positioning (PPP)	No	Yes	Yes
UHF/ Radio	SATEL	SATEL	SATEL
GSM-connectivity	Via Controller	Inbuilt 3.75G	Inbuilt 4G
WLAN	No	No	Yes
QR-connect	Yes	Yes	Yes
User Interface	App	App	Web
Configuration - external SW	• Zenith Manager • X-PAD Fieldsoftware	• Zenith Manager • X-PAD Fieldsoftware	• WebUI • X-PAD Ultimate Fieldsoftware
Data storage	microSD	microSD	Internal; microSD
“Tilt” support	-	-	IMU model
DYN-DNS	-	-	Yes
Operating Time [h] static/rover	7/7	7/6	12.5/11
Environmental Specifications	IP68	IP68	IP68
Extended Warranty	Yes	Yes	Yes

04

Packages



Zenith60 Packages

6017290 Zenith60 **LTE** Flexible Rover Set, multi-constellation
Zenith60 GNSS multi frequency smart antenna including multi- constellation support (GPS, GLO, GAL, BEI, QZSS), 5Hz Positioning rate with internal 4G LTE.
ZPC200, Telescopic pole
-

6017291 Zenith60 **LTE-UHF** Flexible Rover Set, multi-constellation
Zenith60 GNSS multi frequency smart antenna including multi- constellation support (GPS, GLO, GAL, BEI, QZSS) with internal 4G LTE, 5Hz Positioning rate, Satel UHF radio.
ZPC200, Telescopic pole
ZRA101, UHF antenna, 435-470 MHz OR ZRA101, UHF antenna, 400-435 MHz

6017292 Zenith60 **LTE-IMU** Flexible Rover Set, multi-constellation
Zenith60 GNSS multi frequency smart antenna including multi- constellation support (GPS, GLO, GAL, BEI, QZSS) with internal 4G GSM, 5Hz Positioning rate and IMU functionality (Tilt and Go, Calibration free).
ZPC200, Telescopic pole
-

6017293 Zenith60 **LTE-UHF-IMU** Flexible Rover Set, multi-constellation
Zenith60 GNSS multi frequency smart antenna including multi- constellation support (GPS, GLO, GAL, BEI, QZSS) with internal 4G GSM, 5Hz Positioning rate, Satel UHF radio and IMU functionality (Tilt and Go, calibration free).
ZPC200, Telescopic pole
ZRA101, UHF antenna, 435-470 MHz OR ZRA101, UHF antenna, 400-435 MHz

Note:
All packages include

- hard container
- charger
- 2x batteries
- USB cable
- Quick Guide
- microSD card
- USB Stick containing UM

Zenith60
New Accessories

Article #	Description
949046	ZCT206 Zenith60 GNSS Container
949046	ZCH701 Charger for ZBA700

Zenith60
Standard Accessories

Article #	Description
852445	ZBA700 Smart Battery
855818	ZMS108 USB Memory Stick 8GB
950673	ZMC05 Micro SD card 16GB
789349	ZPC200 GNSS telescopic pole
832482	Y-Cable R232 to USB &7 pin Lemo Zenith35/60
760266	ZDC202, Radio antenna cable
789348	ZDC220, RS232 Lemo Kabel 5 Pin
792382	ZDC221, Cable for Satel EASyPro radio
867538	ZHM1 UHF Antenna arm
760259	ZRA100,Gainflex UHF antenna, 400-435 MHz
766906	ZRA101,Gainflex UHF antenna, 435-470 MHz

05

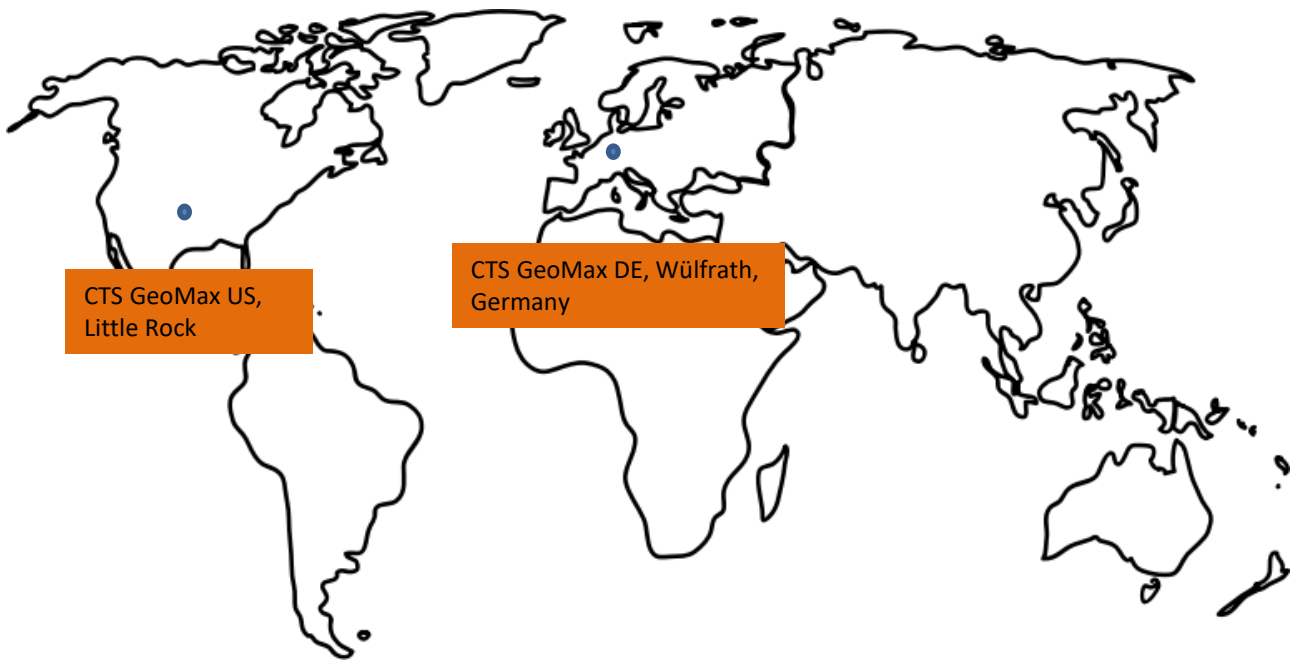
Services

Zenith60 Services

	Zenith60 Extended Warranty
5310980	1 yr Zenith60 Extended Warranty
5310981	2 yr Zenith60 Extended Warranty
5310983	3 yr Zenith60 Extended Warranty *
5310984	4 yr Zenith60 Extended Warranty *
5310982	1yr Add. Zenith60 Extended Warranty

* Only available for tenders and special orders

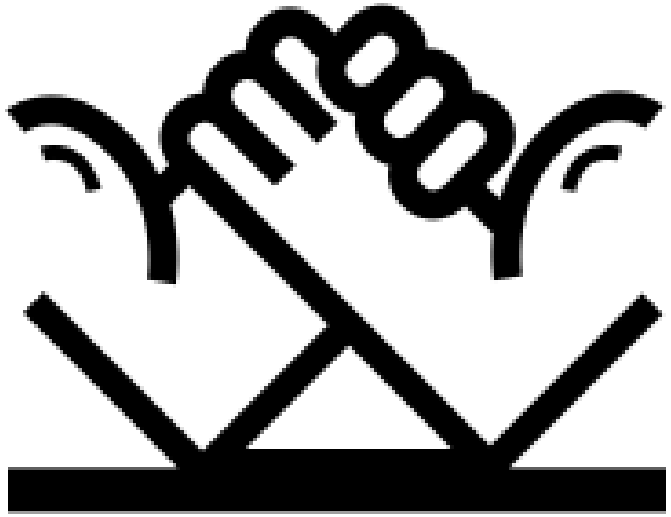
Zenith60
Service Concept



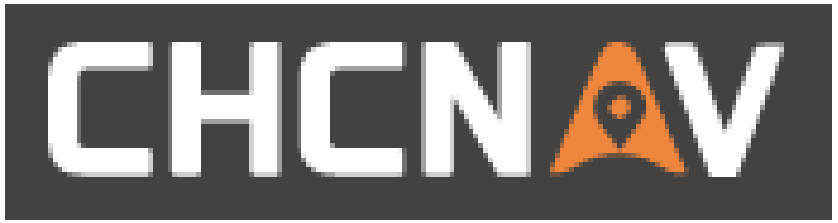
Service Level Definition	Service Content	Who
"Service basic"	Cleaning of equipment and container, checking accessories, Field-Adjustments	All Dealers
Service Level 1	New SP > inspection, minor HW upgrade, SW upgrade, low level maintenance	Service Partner level 1 (SP1): contract signed, training planned, workshop in place
Service Level 2	not planable services (repair, failure analysis)	Service Partner level 2 (SP2): Training done & tools in place
Service Level 3	Factory services, dedicated Service centre tasks. (high investment in tools / infrastructure involved)	CTS

06

Differential Positioning



Zenith60
Differential Positioning



Absolute positioning GNSS products TILT

Only looking at the hardware specs, the Zenith60 is placed in a highly competitive field, since some of the competition products are containing very similar components. The Zenith60 has still some advantages as it offers better specifiactions e.g. IP- rating, initialisation time, etc. The greatest advantages can be exploited when using the Zenith60 as a whole solution together with X-PAD Ultimate.

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Positioning & Messaging

Zenith60
Net take-away

Zenith60 and X-PAD

The calibration-free and electromagnetic resistant GeoMax Zenith60 smart antenna combined with the intuitive and modern X-PAD field software is a user-friendly solution helps me save time and gain confidence to get the job done easily and with reliable and accurate results. The GeoMax team accompanies me beyond the purchase and ensures that I can call on the necessary support at any time.

Zenith60
Positioning Statement

Zenith60 and X-PAD

For all workforce in charge of surveying tasks in construction (mature markets) and surveyors in emerging markets, the Zenith60 upper midrange GNSS with X-PAD field software is a user-friendly and flexible solution to get the job done in the field – reliably and on time. The software is developed based on constant customer feedback and perfectly tailored to exploit the maximum potential of Zenith60

Zenith60
Elevator Pitch

Zenith60 and X-PAD

The Zenith60 is a calibration-free tilt GNSS smart antenna that incorporates state-of-the-art technology and is perfectly embedded in the versatile GeoMax products and services.

The antenna reaches its maximum performance when combined with the GeoMax field controllers and X-PAD Ultimate field software. The intuitive workflow of quick familiarisation and maximum flexibility. After purchasing the software, there are no additional costs for maintenance as this service is free of charge.

Additionally, automatic backups that are part of the X-PAD 365 service ensure that your data is always securely stored in the File Manager and accessible anytime, anywhere.

The antenna's tilt capability makes every survey more convenient and faster, hence more productive and efficient. Thanks to the integrated calibration-free IMU technology, you can save time. The Zenith60's resistance to magnetic fields gives you peace of mind, knowing that you can rely on your data.

All these benefits are bringing efficiency and productivity to the next level.

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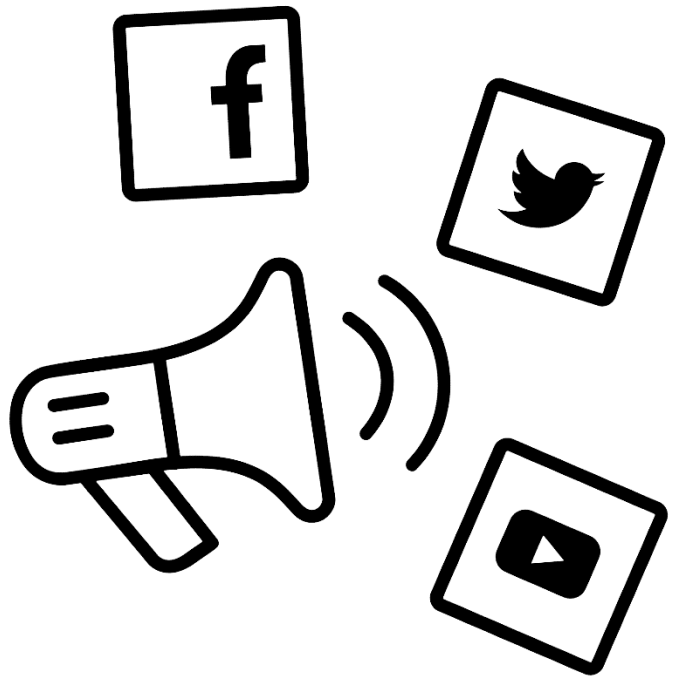
Marketing Material



Zenith60
Marketing Material

Marketing Assets

Available at PA:

- Key Visual
- Application Image
- Renderings
- Product Presentation
- Product Page on Website
- Datasheet
- Family Brochure
- Poster

Will be provided after PR:

- Print and online advertising templates for dealers

Thank You