Geodetic Monitoring System
Equipment List

- when it has to be **right**

Leica Geosystems

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1. GeoMoS Modules

GeoMoS - Geodetic Monitoring System Applications:

Landslide monitoring and dangerous slopes
Open pit mines
Settlement Areas
Dams
Bridges
High rise buildings
Large structures
Tunnels
Volcanoes
Automatic Surveys

GeoMoS comprises four main modules: GeoMoS Professional, GeoMoS Lite, GeoMoS Remote and GeoMoS Analyzer.

724 933	GeoMoS Demo Version.
724 934	GeoMoS Lite (without GeoMos Analyzer).
723 357	GeoMoS Professional (max. 3 Sensoren, incl. GeoMoS Analyzer).
723 366	GeoMoS Analyzer.
724 935	GeoMoS Remote (for Remote configuration of multiple GeoMoS Professional incl. Analyzer).

1.1 GeoMoS Demo

Note: GeoMoS Demo is only for demonstration purposes to sell the product. GeoMoS Demo is not for commercial sale. GeoMoS Demo as the same functionality as GeoMoS Professional but cannot be used for permanent monitoring (automatic measurement will only run for a limited time).

If GeoMoS Demo is ordered, a software protection key has to be ordered also.

1.2 GeoMoS Lite

Measurement collection
3 sensor connections
Basic calculations
Different sensor types (TPS, GPS, Meteo sensors, geotechnical sensor etc)
Event scheduling
Control groups (free station, meteo, orientation, Vz correction)
MSDE database included
GeoMoS Analyzer is not included

Note: GeoMoS Lite is software to collect and store data in a database without visualization. MSDE (Microsoft Developer Engine) is included in GeoMoS Professional. If the customer wants to use one of the GeoMoS Professional Options he needs to upgrade to GeoMoS Professional, where GeoMoS Analyzer is included. GeoMoS Remote cannot be used with GeoMoS Lite. GeoMoS Analyzer will not run on the same PC as GeoMoS Lite.

If GeoMoS Lite is ordered, a software protection key has to be ordered also.

1.3 GeoMoS Professional

Measurement collection
3 sensor connections
Calculations (e.g. displacement, velocity, 3-dimensional)
Different sensor types (TPS, GPS, Meteo sensors, geotechnical sensor etc)
Event scheduling
Control groups (free station, meteo, orientation, Vz correction)
MSDE database included
GeoMoS Analyzer included

Note: GeoMoS Professional is the monitoring software for the normal use of the customer. The customer can collect, store and visualize data. It also has the possibility to add additional options. MSDE (Microsoft Developer Engine) is included in GeoMoS Professional.

A number of options are available for use together with GeoMoS Professional:

723 358	GeoMoS Professional Option 1 (large database support e.g. SQL-Server).
723 360	GeoMoS Professional Option 2 (> 3 sensors).
723 361	GeoMoS Professional Option 3 (Message system e.g. E-mail, Command).

If GeoMoS Professional is ordered, a software protection key has to be ordered also.

1.3.1 GeoMoS Professional Option 1

Large databases are supported. The large database (SQL Server) has to be ordered separately.
The MSDE database that is included with GeoMoS Lite and GeoMoS Professional is limited with 2 GB and limited for multi user access
Enables more sophisticated backups of the database
Needed if multiple GeoMoS Analyzer are to be used

Note: The large database is needed, when the monitoring project requires the collection of large amounts of data and/or over long periods.

1.3.2 GeoMoS Professional Option 2

More than 3 sensor connections
The maximum number of entries in the Sensor Manager is increased from 3 to 10. Note that it is possible to connect multiple geotechnical sensors to one COM port if the driver supports a bus system connection.

Note: If the customer wants to use more than 3 sensors this option is needed. It does not matter which type of sensors are used.

1.3.3 GeoMoS Professional Option 3

Message system for E-mail, SMS, SQL database query, run application/command line, digitial output
SMS only for Siemens MC45 GSM Modul 733278 or a product with the same GMS standard

Note: This option is needed if the messages from GeoMoS Professional should also trigger events such as sending an e-mail or SMS, setting a digital output or running an external program.

1.4 GeoMoS Analyzer

Graphical and numerical visualization of results
Editing functionality
Post-processing
Import/Export of data
Graphic views (Time-line, Vector, Velocity)

To order an additional GeoMoS Analyzer the following is required:

The customer has already ordered GeoMoS Professional or GeoMoS Lite. GeoMoS Analyzer will be installed on another computer. On the computer with GeoMoS Analyzer, SQL Client has to be installed. The Analyzer remotely accesses the Monitoring System (GeoMoS Professional or GeoMoS Lite).

Note: For online analysis using GeoMoS Analyzer at a remote location there needs to be continual connection between GeoMoS Professional/GeoMoS Lite and GeoMoS Analyzer computers. GeoMoS Analyzer cannot run on the same PC as GeoMoS Lite.

If GeoMoS Analyzer is ordered, a software protection key has to be ordered also.

1.5 GeoMoS Remote

Remote control of one GeoMoS Professional (not including connection of sensors).
Graphical and numerical visualization of results
Editing functionality
Post-processing
Import/Export of data
Graphic views (Time-line, Vector, Velocity)

To order an additional GeoMoS Remote the following is required:

The customer has already ordered GeoMoS Professional. GeoMoS Remote will be installed on another computer.
On the computer with GeoMoS Remote, SQL Client has to be installed. GeoMoS Remote remotely accesses the Monitoring System (GeoMoS Professional).

Note: For online analysis and status/configuration using GeoMoS Remote at a remote location there needs to be continual connection between GeoMoS Professional and GeoMoS Remote computers. Various TCP/IP ports must be open so Analyzer will not work if either the local PC or a remote PC has an active firewall. Certain DCOM security settings must be modified to run GeoMoS Remote with MS Windows XP. GeoMoS Remote cannot run on the same PC as GeoMoS Professional or GeoMoS Lite.

If GeoMoS Remote is ordered, a software protection key has to be ordered also.

2. GeoMoS Maintenance Contracts

2.1 Software Support

A powerful and competent worldwide service and support network backs up LEICA GeoMoS. Service and support contracts provide you access to a world-class support & service infrastructure and ensure your systems are being kept up to date.

883 16	One year Software Support Contract for LEICA GeoMoS **Lite** 1.60.
883 17	One year Software Support Contract for LEICA GeoMoS **Professional** 1.60.
883 23	One year Software Support Contract for LEICA GeoMoS **Analyzer** 1.60.
883 24	One year Software Support Contract for LEICA GeoMoS **Remote** 1.60.

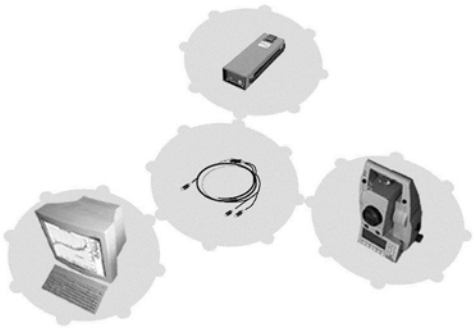
2.2 Other Services

The following services are available on request at daily rates.

Training at customer site
Installation support
Customizing

3. Monitoring systems

3.1 GeoMoS Professional with one sensor (TPS)

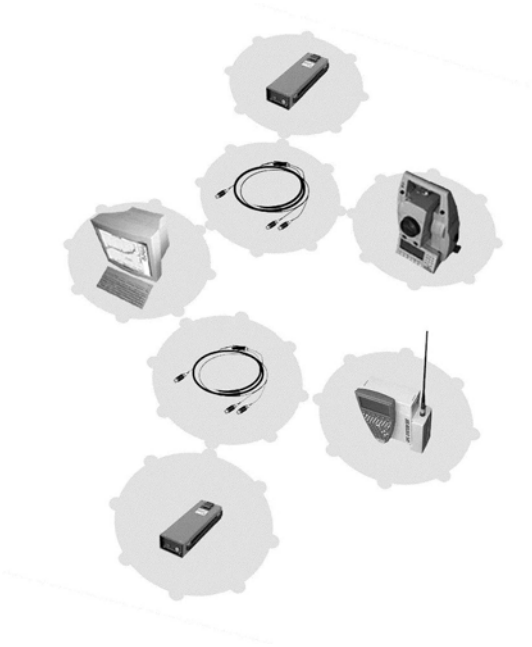


Essential Items:

	PC, Measurement hut, pillars and monumentation
723 357	GeoMoS Professional (max. 3 sensors, incl. GeoMoS Analyzer)
664 662	TPS Sensor (TCA 2003) Important: order accessories separately
734 698	GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.
439 038	GEV71, 4.0m car battery cable, connects Y-Cable to 12V external power supply
744 793	Switchbox with cable 2.0m for TPS/1000/ 1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring) Power Supply for TPS
667 726	Meteo Sensor Important: order accessories such as mounting, shelter and cables separately

• Regional and local Leica support specialists will help you selecting the optimal equipment configuration.

3.2 GeoMoS Professional with two sensors (TPS and GPS)



Essential Items:

	PC, Measurement hut, pillars and monumentation
723 357	GeoMoS Professional (max. 3 sensors, incl. GeoMoS Analyzer)
664 662	TPS Sensor (TCA 2003) Important: order accessories separately
733 245	GPS Sensor (GX1230, Geodetic GPS Dual Frequency RTK Receiver) Important: order accessories separately
733 252	AX1202, Dual Frequency Antenna for GX1220 / GX1230 and GRX1200 Receivers.
560 130	1.8 m connection cable (battery) Cable to computer
734 698	GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.
439 038	GEV71, 4.0m car battery cable, connects Y-Cable to 12V external power supply
744 793	Switchbox with cable 2.0m for TPS/1000/ 1100/1200 and GeoMoS. Supports cold boot for TPS (important 24/7 hours/day monitoring) Power Supply for TPS Power Supply for GPS
667 726	Meteo Sensor Important: order accessories such as mounting, shelter and cables separately

Note: If you connect more then one GPS to GeoMoS to use the GPS sensors for monitoring we recommend GPS connection to the Leica Spider software. GeoMoS supports an interface to Leica GPS Spider v2.0 software (order GPS Spider and accessories separately)

• Regional and local Leica support specialists will help you selecting the optimal equipment configuration.

4. TPS Sensors

4.1 Supported Sensors

Leica TPS 1000 Series
Leica TPS 1100 Series
Leica TPS 1200 Series

Note: Only automated TPS can be used with GeoMoS. Instruments with ATR are recommended.

TCA2003 and TCA1800 instruments are recommended.

664 662	TCA2003, 0.5"(0.15mgon) automatic precision total station, with laser plummet, 2 control panels, accessories, user manual and container.
667 016	TCA1800, 1"(0.3mgon) automatic total station with laser plummet, 2 control panels, accessories, user manual and container.

Extended Warranty Contracts

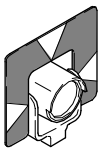
All extended warranty list prices are dealer net prices, i.e. no discount is given for extended warranty articles. Warranty extensions have to be ordered before factory warranty or previous extended warranty is terminated. The maximum warranty extension is 3 years.

895 36	1 year TPS2000 Extended Warranty TCA
893 18	1 year RCS1100 Extended Warranty

4.2 Supported Reflectors

The number of prisms needed is dependent on the project.

Circular reflector



641 617	Circular prism GPR121 PRO, with holder and target plate

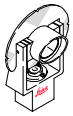
Monitoring prisms

726 295	GPR112 Monitoring-Mining Prism, with M8 internal threat in the back for direct mounting and 5/8" adapter.
726 296	GHT112 Mounting set for GPR112 with M8 and 5/8" internal thread adapters, suitable for direct fixing systems on nearly every surface, prism is adjustable and fixable in two axes.
727 406	GDZ112, rain shelter for Monitoring Mining Prism GPR112. Full availability of the prism even in rainy conditions. The rain shelter protects the prism front against rain drops and dust which is washed out from of the air by rain.

Precision reflector

555 631 Single-prism precision reflector GPH1P.

Mini prism for short distances



641 762 Mini prism GMP104, with L-bar, for fixed installations.

360° Reflectors

667 399 GRZ121 360° Reflector PRO.

4.3 Tribrachs

667 304 Tribrach GDF121 PRO, without optical plummet, pale green.

4.4 Other TPS Accessories

For additional information see:

740 623 Leica System 2000 Brochure.
738 605 Leica TPS1200 Series Equipment List

• Regional and local Leica support specialists will help you selecting the optimal equipment configuration.

5. GPS Sensors

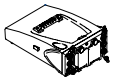
5.1 Supported Sensors

Leica GPS System 500
Leica GPS System 1200
Leica GMX902

For details see Equipments lists System 500/1200 and Equipment list for GPS Networks and Reference Stations.

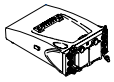
Note: The particular of model of that GPS that is recommended depends on how the sensor connection is made to GeoMoS. If the GPS is to be directly connected to GeoMoS (computation done on the sensor), RTK rover GPS must be used. If the position computation is to be done by Leica GPS Spider (recommended) then reference station GPS should be used.

5.1.1 GPS Sensors for Direct Connection to GeoMoS (RTK GPS)

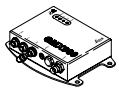


733 245	GX1230, Geodetic GPS Dual Frequency RTK Receiver.

5.1.2 GPS Sensors for Connection via GPS Spider (Reference Station GPS)



744 589	GRX1200 Lite, Permanent GPS Reference Station Receiver for RTK with TX1200 total stations with ATX1230 smart antenna.
733 246	GRX1200 Classic, Permanent GPS Reference Station Receiver.
733 248	GRX1200 Pro, Permament GPS Reference Receiver, Professional, with Event Input, PPS Output, Extern. Oscillator Input and Ethernet connectivitiy.



748 877	GMX902, GPS Dual Frequency Receiver for Monitoring Applications.

5.2 Antennas

733 252	AX1202, Dual Frequency Antenna for GX1220 / GX1230, GRX1200 and GMX902 Receivers.
667 132	AT504, dual-frequency choke-ring antenna for GPS receivers. Dorne Margolin, JPL design. Conforms to IGS 'type T' specification for GPS antennas.
667 140	GVP601, Weather-protection radome for AT504 choke ring antenna.

5.3 GPS Accessories

For detailed description and article numbers see Equipment lists for System 1200 and Equipment list for GPS Networks and Reference Stations.

5.4 GPS Spider

All active Positioning Products and Post Processing Products configured in GPS Spider with the Send To option set to GeoMoS can be used in GeoMoS. Thus many GPS sensors maybe connected using a single entry in the GeoMoS Sensor Manager.

5.4.1 Required Options for Real Time Monitoring

740 244	Leica GPS Spider, GPS Reference Station Software, general license, with documentation. Supports full receiver control and configuration, manual downloads and firmware upgrade. Not protected.
744 912	GPS Spider, Positioning Site license. Required for each GPS site/sensor that shall be used for the GPS Spider position processing. A minimum of two (2) of these licenses is needed for positioning.

5.4.2 Required Options for Real Time and Post Processed Monitoring

740 244	Leica GPS Spider, GPS Reference Station Software, general license, with documentation. Supports full receiver control and configuration, manual downloads and firmware upgrade. Not protected.
744 912	GPS Spider, Positioning Site license. Required for each GPS site/sensor that shall be used for the GPS Spider position processing. A minimum of two (2) of these licenses is needed for positioning.
744 904	GPS Spider, File Products Service (FPS) option. Provides automated data download and management for multiple sites with automated RINEX conversion, quality control, event logging, FTP transfer for distributing GPS Spider product files on the Internet. Option includes one (1) site/sensor license. For more site/sensor licenses for a GPS Spider FPS, order one or more "GPS Spider, FPS Additional Site License" as required.
734 613	GPS Spider, FPS Additional Site License. Required for each GPS site/sensor that shall be used with GPS Spider File Product Service in addition to the default one (1) site/sensor, which is included as standard.

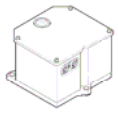
For additional information see:

745 972	Equipment list “For GPS Networks and Reference Stations”

6. Other Sensors

6.1 Inclination Sensors

The Nivel20 and Nivel200 (available November 2005) are a series of highly precise inclination sensors from Leica Geosystems. The following instruments are supported.



576 198	NIVEL210, inclination sensor with RS232 interface
576 199	NIVEL220, inclination sensor with RS485 interface

Other accessories

Inclination Sensors need to have mounting, shelters and cables.

Refer to “7.3 Communication and power cable between Nivel210 and GPS1200” to connect a GPS1200 sensor directly.

For additional information see:

749 597	"Leica Nivel210 and Nivel220 sensors Equipment List"

6.2 Meteo Sensors

667 726	STS DTM meteo sensor, combined pressure and temperature sensor, 2.0m cable with Lemo 1
409 684	1.9m Y-shaped connection cable, GEV58, Theodolite or DISTOMAT with Leica Modem / Datarecorder and External battery, Lemo 1 (male) to Lemo 0 (male)

Continuous 12V Power supply
A permanent 12V power supply is needed for a Meteo sensor.
Refer to "9.1 Continuous 12V Power supply for sensors".

Cables
To connect a permanent 12V power supply to Meteo Sensor.

439 038	4.0m Connection cable, GEV71, 12V to LEMO-1 (female)

To connect a Meteo Sensor to a computer.

707 525	Lemo Canon converter 30°, for PC, LEMO-0 (male). Adapter cable

Mounting
Meteo Sensors need to have mountings and shelters.

7. Cables

7.1 Power Cables

A permanent power supply is needed during the measurements.

439 038	GEV71, 4m car battery cable, connects GPS receiver to 12V car battery.
560 130	GEV97, 1.8m power cable, connects external battery GEB171 to GPS1200 receiver.
734 698	GEV187, Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.
722 411	Cable with protection fuse to connect 12V power supply to GPS receiver.

7.2 Communication Cables

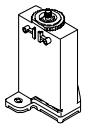
The communication between sensor and PC has to be permanently connected during the measurements.

409 684	1.9m Y-shaped connection cable, GEV58, Theodolite or DISTOMAT with Leica Modem / Datarecorder and External battery, Lemo 1 (male) to Lemo 0 (male)
733 280	GEV160, 2.8m Data transfer cable. Connects GPS1200 receiver Ports 1, 2 and 3, RX1220 or GMX902 to PC for data transfer, firmware upload etc. Lemo to 9 pin RS232 serial connector.

7.3 Communication / power cable between Nivel210 sensors and GPS1200

749 916	1.8m communication and power cable, GEV209, Nivel210 to GPS1200

8. Mobile Phones and Accessories



733 278	GFU17, Housing with Siemens MC45 mobile phone (900, 1800, 1900 MHz).
667 237	Antenna for 900/1800 MHz mobile network.
733 297	GEV171, 1.8m cable to program, the Satelline 3AS radio modem inside the GFU14 housing. Also used to connect GFU17 to PC.

9. Power supply

The PC and the sensors need to have a power supply. It depends on the project which power supply will be the best. An external battery could be used depending on the frequency of the measurements and of the accessibility of the measurement station to change batteries.

Note: The PC needs to have a permanent power supply. The power supply depends on the country where it is used.

9.1 Continuous 12V Power supply for sensors

A permanent 12V power supply is needed for sensors

722 409	Power supply unit, for indoor use only, input 100V-240VAC 50-60HZ, output 12VDC, cable with 5-pin Lemo. Standard mains/line cable select from following list.

Select power cords for 12V power supply unit 722 409:

731 772	Power Cord for Dual Bay Charger GKL24 or Power supply unit, US-Version.
731 773	Power Cord for Dual Bay Charger GKL24 or Power supply unit, EU-Version.
734 232	Power Cord for Dual Bay Charger GKL24 or Power supply unit, UK-Version.
734 233	Power Cord for Dual Bay Charger GKL24 or Power supply unit, AUS-Version.
738 586	Power Cord for Dual Bay Charger GKL24 or Power supply unit, CH-Version.

10. Switchbox

Essential tool for permanent monitoring, supports cold boot for TPS

744 793	Switchbox with a 2.0m cable for TPS1000/ TPS 1100/ TPS 1200 and GeoMoS.

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- when it has to be **right**

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