



SKPOS[®]

Slovak real-time positioning service - a multifunctional tool for precise object and phenomena positioning



WHAT IS **SKPOS** AND HOW DOES IT WORK?

Slovak real-time positioning service is a multifunctional tool for precise object and phenomena positioning by global navigational satellite systems

The service enables to the users to work on-line or in post-processing way in mandatory geodetic reference systems ETRS89 and S-JTSK

SKPOS is available to its users nonstop with 99% level of availability on whole territory of Slovakia in an open standardized format through the Internet connection

SKPOS infrastructure consists of network of equally distributed reference stations, National Service Centre and private virtual network

SKPOS is based on the EUPOS standards and it is fully compatible with them

The data from reference stations are in real-time sent to the National Service Centre where they are collected and via advanced algorithm processed to special format called corrections. Computed corrections are in real-time distributed to registered users in order to improve their accuracy to the level of 2-4 cm

10 years

of continuous operation

+1 200

active users

+50

reference stations

100%

EUPoS compatibility



REFERENCE STATIONS NETWORK

The network of SKPOS reference stations consists of the reference stations located on the territory of Slovakia and of the reference stations located in adjacent foreign countries

Physical geodetic points, on which antennas of SKPOS receivers are mounted, make up the reference stations network of global navigation satellite systems, the essential part forms the highest class of geodetic control points, i.e. the A class of the National Spatial Network

Positions of the coordinates of reference stations are computed using the scientific GNSS software

Reference stations located on the territory of Slovakia are connected to the National Levelling Network by precise levelling

Most of SKPOS reference stations antennas have precise position parameters and phase centre variations determined by individual absolute robotic calibration



NATIONAL SERVICE CENTRE

National Service Centre is located at the Geodetic and Cartographic Institute in Bratislava and provides all activities connected with its routine operation and development:

- administration and monitoring of reference stations
- data collection and back-up
- supervision of the running of the control software that provides generation of corrections for individual services
- registration of the users
- monitoring of the quality of provided services

National Service Centre is equipped with control and processing software that manages the satellites observations from the SKPOS reference stations network and generates corrections for real-time users or data for users equipped with post-processing software



VIRTUAL PRIVATE NETWORK

Virtual private network serves for data transmissions from the permanent reference stations to the National Service Centre and for the remote communication with receivers

The management, the development and the modernization of the network is provided by the contract between the Geodesy, Cartography and Cadastre Authority of the Slovak Republic and the Slovanet company

Unlimited data flow is guaranteed with the highest priority with maximum delays up to 150 ms on separate data channels



SKPOS[®]

SKPOS_dm

differential corrections
for code measurements

SKPOS_cm

differential corrections
for phase measurements

SKPOS_mm

postprocessing of
code and phase
measurements

PRODUCTS AND SERVICES

SKPOS users can choose from three basic services: SKPOS_dm, SKPOS_cm and SKPOS_mm, which differ from each other by the accuracy and form of the data provided

SKPOS_dm

The service provides differential corrections for real-time code measurements (DGNSS or DGPS) in the virtual reference station (VRS) concept. To use this service it is enough to have a simple and relatively inexpensive GNSS receiver allowing only code measurements, which is able to receive real-time DGNSS corrections. The service delivers decimetre-level accuracy. Correction format RTCM 2.1 and RTCM 2.3. The service is typically used in transport, vehicle navigation and in a various fields of geographic information systems (e.g. GIS mapping)



SKPOS_cm

The service provides differential corrections for real-time phase measurements (RTK/RTN) in the virtual reference station (VRS) concept. To use this service a dual-frequency GNSS receiver is necessary, which is able to process RTK corrections in one of RTCM 2.3, RTCM 3.1, RTCM 3.2, CMRx, CMR+ formats. The service delivers 2-4 cm-level accuracy. The service can be used in geodesy, in cadastre, in precise agriculture or in mechanisms guiding

SKPOS_mm

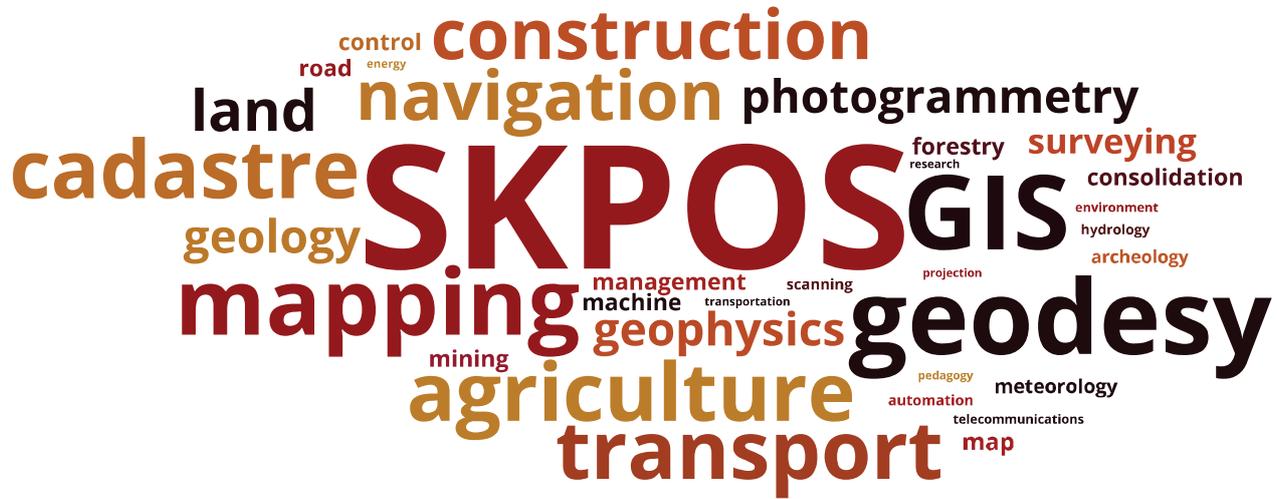
The service provides an access to data for phase and code measurement post-processing in the virtual reference station (VRS) concept or from the SKPOS station. Data are accessible to users for an entered time interval in RINEX or T02 standard formats through SKPOS data-shop after registration via the SKPOS portal



Product	SKPOS_dm	SKPOS_cm	SKPOS_mm
Data access	Real-time NTRIP protocol 195.28.70.16:2101	Real-time NTRIP protocol 195.28.70.16:2101	Post-procesing Online shop skposOnlineObchod.gku.sk
Data format	RTCM 2.1 RTCM 2.3	RTCM 2.3, CMRx, CMR+ RTCM 3.1, RTCM 3.2	RINEX 2.11, RINEX 3.0 T02
Concept	Virtual reference station	Virtual reference station	Virtual reference station SKPOS station
Accuracy	0.3 - 1 m	2 - 4 cm	mm - cm
Interval of a record	1 s	1 s	1 - x s
Typical use	GIS, navigation, transport	geodesy, cadastre	very precise measurements
Reference system	ETRS89 (ETRF2000) S-JTSK (JTSK03)	ETRS89 (ETRF2000) S-JTSK (JTSK03)	ETRS89 (ETRF2000)
Subservice	SKPOS_DM_SVK SKPOS_DM_SVK_23	SKPOS_CM_23 SKPOS_CM_31 SKPOS_CM_32 SKPOS_CM_CMRx SKPOS_CM_CMRplus	
Price	GKÚ price list www.gku.sk	GKÚ price list www.gku.sk	GKÚ price list www.gku.sk



SKPOS FIELDS OF USE

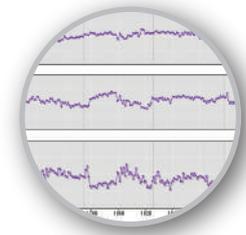


QUALITY MONITORING

Quality and availability monitoring of SKPOS is carried out continuously by National Service Centre using the control software, processing software or various applications.

Continuous monitoring of the SKPOS is carried out at four levels, namely:

- monitoring of the network integrity
- monitoring of the network solution quality
- monitoring of service availability, corrections data flow, delay and their content
- analysis of the time series of topocentric coordinates of the SKPOS reference stations



SKPOS hardware infrastructure consists of two independent environments linked together by load balancer, which automatically redirects users requests to particular set of servers. In case the production environment is not available, users are automatically redirected to the backup server

In case the power supply interruption, SKPOS datacenter is protected by UPS and motor-generator

In case the power supply interruption on SKPOS permanent reference station site, receivers are protected by UPS as well



WHAT IS NEEDED FOR WORK WITH **SKPOS**?

For real-time

GNSS receiver with ability to work with network RTK (RTN) method

Mobile internet connection (GSM/GPRS/3G/...)

Data reception using NTRIP protocol and support of some of RTCM 2.1, RTCM 2.3, RTCM 3.1, RTCM 3.2, CMRx, CMR+ formats

Transmitting position in the NMEA GGA string

For post-processing

GNSS receiver with ability to work in static mode

Software for GNSS baselines processing and adjustment

GNSS observations suitable for post-processing are provided in RINEX and T02 format via SKPOS online datashop

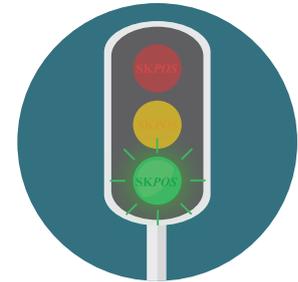
HOW TO USE **SKPOS** CORRECTLY?

Check your GNSS receiver before the measurement as follows:

- check the project settings in the receiver
- check the connection to SKPOS (login and password)
- check the transmitting of position in NMEA GGA string to SKPOS control software
- check the transformation parameters for transformation between ETRS89 and national reference coordinates system

Every GNSS measurement is affected by systematic errors of the environment which can decreased the accuracy of the coordinate determination. The biggest undesired influences of GNSS measurement are:

- signal blocking (obstacles)
- multipath
- ionosphere effects
- troposphere effects



HOW TO BECOME A USER OF **SKPOS**?



Step 1



Web form completion on www.skpos.gku.sk/register/

Step 2



Processing and acceptance of the order
Issuing the electronic version of the invoice

Step 3



Payment

Step 4



Payment identification
New user activation

DICTIONARY

GNSS

any of, or some combination of, the operational spaceborne radionavigation systems, at this time being Navstar GPS, GLONASS, Beidou, Galileo, QZSS, SBAS, and/or IRNSS

RTK

a differential GNSS positioning method that uses CORS and the rover. Method can provides 20-40 mm accuracy using real-time data distributed from CORS to the rover

RTN

a differential GNSS positioning method that uses network of CORS and the rover. Method can provides 20-40 mm accuracy using real-time data distributed from control software processes network of CORS to the rover via the Internet

DGNSS

GNSS positioning method to improve GNSS accuracy that uses pseudorange errors at a known location to improve the measurements made by other GNSS receivers within the same general geographic area

Static method

precise geodetic GNSS positioning method when GNSS antenna during the measurement is in stationary position relatively to the earth

Post-processing

the processing of satellite code and phase data by special software after it is collected, in order to eliminate error

Rover

any mobile GNSS receiver that is used to collect or update data in the field, typically at an unknown location

Reference station

GNSS receiver placed at a known point on a jobsite that tracks the same satellites as an rover, and provides a real-time differential correction message stream through radio or the Internet to the rover, to obtain centimeter level positions on a continuous real-time basis. A reference station can also be a part of a network, or a location at which GNSS observations are collected over a period of time, for subsequent postprocessing to obtain the most accurate position for the location

Network solution corrections

GNSS data streamed through radio or the Internet to the rover, generated by the control software which processes network of CORS. Format of corrections depends on RTN method

RTCM message

international message format standard for differential positioning in real time developed by Radio Technical Commission for Maritime Services

RINEX

receiver independent standardized exchange ASCII format representation of GNSS data and metadata

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