NAVTELECOM
TELEMATICS SYSTEMS

# DATASHEET

## GPS/GLONASS TRACKING EQUIPMENT

## SIGNAL

## S-4651E, S-4651E-M, S-4651SA, S-4651SA-M, S-4653E, S-4653E-M, S-4653SA, S-4653SA-M


**Moscow, Russia**
**2022**

## Purpose of the system

SIGNAL S-4651x-(M) and S-4653x-(M) (hereinafter referred to as the SIGNAL) manufactured by Navtelecom LLC are GNSS based vehicle tracking system with cellular data transmission.

SIGNAL system is designed for:

- vehicle monitoring: location, track, mileage, fuel consumption, engine hours;
- processing and transmitting of data to the server from devices such as tachograph, tire pressure monitoring system, CAN bus adapter, refrigerator controller, RFID tag reader, passenger flow counters;
- reading of the parameters from CAN bus, processing and transmitting it to the server;
- monitoring the temperature using temperature sensors;
- monitoring and controlling of current situation in the vehicle using connected camera;
- driving style determination (EcoDriving);
- accident detection in accordance with acceleration thresholds or Addiction Severity Index (ASI);
- emergency informing about vehicle hijacking;
- emergency informing about attacks on the driver or passengers and other accidents;
- remote control of connected devices and vehicle systems, such as a siren, engine and door lock system, etc.
- two-way communication with the vehicle driver;
- automatically informing of passengers about stops (entrances and exits from geofences) using the information board and loadspeaker.

You can find more detailed information about SIGNAL devices on the website www.navtelecom.ru on the Equipment tab.

## Standard Delivery Kit

| # | Item description | Quantity, pcs |
|---|---|---|
| 1 | SIGNAL device unit | 1 |
| 2 | GLONASS/GPS-antenna | 1 |
| 3 | GSM-antenna | 1 |
| 4 | Fuse 1A | 2 |
| 5 | Fuse holder | 1 |
| 6 | Microfit-14 connector with power wires | 1 |
| 7 | Microfit-6 connector | 1 |
| 8 | Microfit-4 connector | 1 |
| 9 | Set of 10 connection wires | 1 |
| 10 | Datasheet | 1 (optional) |
| 11 | MiniUSB cable | 1 (optional) |
| 12 | Individual package | 1 (optional) |

# Technical Specifications

| GSM/GPRS/Bluetooth | | | | |
|---|---|---|---|---|
| | | | **S-4651x-(M)*** | **S-4653x-(M)*** |
| Frequency bands | LTE (4G) | **SA** | LTE-FDD B1/B3/B5/B7/B8/B28 | |
| | | **E** | LTE-FDD B1/B3/B7/B8/B20 | |
| | WCDMA (3G) | **SA** | BAND1/BAND5 | |
| | | **E** | BAND1/BAND8 | |
| | GSM (2G) | **SA** | - | |
| | | **E** | 900/1800 MHz | |
| Category | | | CAT1 | |
| IP-stacks | | | TCP, UDP | |
| Transmitting power | | | LTE power class: 3 (0,25 W).<br><br>UMTS power class:<br>- WCDMA: 3 (0,25 W).<br><br>EDGE power class (only for S-4651E-(M) and S-4653E-(M)):<br>- EGSM900: E2 (0,5 W);<br>- DCS1800: E1 (0,4 W).<br><br>GSM/GPRS power class (only for S-4651E-(M) and S-4653E-(M)):<br>- EGSM900: 4 (2 W);<br>- DCS1800: 1 (1 W). | |
| Max data downlink/uplink transfer (LTE), Mbps | | | 5 / 10 | |
| Max data downlink/uplink transfer (WCDMA), Kbps | | | 384 / 384 | |
| Max data downlink/uplink transfer (GPRS/EDGE), Kbps | | | 236,8 / 236,8<br>only in S-4651E-(M) | |
| Number of SIM cards | | | 2 | 2 |
| SIM card holder #1 | | | external with ejector (Molex), miniSIM | external with ejector (Molex), miniSIM |
| SIM card holder #2 | | | internal, nanoSIM | internal, nanoSIM |
| eSIM[1] | | | 2 | 2 |
| Bluetooth | | | yes, v.4.0 | yes, v.4.0 |
| | | | | |
| **GNSS** | | | | |
| Supported navigation systems | | | GLONASS/GPS/Beidou | GLONASS/GPS/Beidou |
| Receiver type | | | tracking: 33, acquisition: 99 | tracking: 33, acquisition: 99 |
| Sensitivity (in laboratory conditions) | | | tracking: -165 dBm<br>cold start: -148 dBm | tracking: -165 dBm<br>cold start: -148 dBm |
| Time-To-First-Fix (for GPS and GLONASS systems with a signal of -130 dBm) | | | cold start: <35 s<br>warm start: <30 s<br>hot start: <1 s | cold start: <35 s<br>warm start: <30 s<br>hot start: <1 s |
| Accuracy (50% CEP, 24 hours in static mode, with signal levels -130 dBm), m | | | 2.5 (horizontal position), 5 (vertical position) | 2.5 (horizontal position), 5 (vertical position) |
| Speed accuracy, m/s | | | 0,1 | 0,1 |
| Receiver update rate, Hz | | | 1 | 1 |
| | | | | |
| **Power Supply** | | | | |
| Supply voltage, V[2] | | | 9,5…47 | 9,5…47 |
| Overvoltage protection up to 200 V | | | yes | yes |
| Current consumption at 12 V voltage in operating mode on average, mA | | | 80 | 80 |
| Current consumption at 12 V voltage with turned off GLONASS and GSM modules, no more than, mA | | | 30 | 30 |
| Maximum current consumption at 12 V voltage in operating mode with charged battery[3], no more than, | | | 200 | 200 |

| | | |
|---|---|---|
| mA | | |
| Reverse polarity protection | yes | yes |
| Backup battery[4] | Li-Po 3,7 V, at least 800 mAh | Li-Po 3,7 V, at least 800 mAh |
| Battery protection from recharge, full discharge, short circuit[5] | yes | yes |
| Maximum time of device operation from a fully charged battery with data transfer via GSM/UMTS channel once per minute, not less than, h | 6 | 6 |
| Full charge time of the battery, not more than, h | 5 | 5 |
| Battery of the RTC clock and the navigation module | yes | yes |
| RTC keeping time and ephemerides retention time (when the power is off and the backup is discharged), at least, days | 5 | 5 |
| Battery charging with USB | yes | yes |
| | | |
| **Inputs** | | |
| Inputs protection from power surges, V | up to 200 | up to 200 |
| Total number of universal (analog, digital, pulse, frequency) inputs | 6 | 6 |
| Number of pulse-frequency inputs used for frequency fuel level sensors connection or for rectangular pulses calculation | up to 6 (of the total number) | up to 6 (of the total number) |
| Impulse inputs voltage range, Hz | 1 – 3000 | 1 – 3000 |
| Number of analog inputs, configured as digital | up to 6 (of the total number) | up to 6 (of the total number) |
| Analog inputs voltage range, V | 0…31 | 0…31 |
| Built-in pull-up resistor for digital inputs | yes | yes |
| Inputs protection from power surges, V | up to 200 | up to 200 |
| | | |
| **Outputs** | | |
| Digital outputs | 4 | 4 |
| Maximum current, mA | 500 | 500 |
| Maximum voltage, V | 48 | 48 |
| | | |
| **Interfaces** | | |
| USB interface | yes | yes |
| RS-485 interface | yes | yes |
| RS-232 interface | yes | no |
| CAN interface | 1 | 2 |
| 1-Wire interface | yes | yes |
| | | |
| **Device memory** | | |
| Memory capacity, Mb | 8 | 8 |
| Number of records in the memory (buffer type) with a packet size not less than 127 bytes | up to 51700 | up to 51700 |
| Period of data recording in the internal storage device, s | 1 — 3600 and/or upon the event | 1 — 3600 and/or upon the event |
| MicroSD card support (up to 32 Gb) | yes | yes |
| Telemetry record to microSD card | yes | yes |
| Number of records on the microSD card | no less than 2 000 000 per 1 Gb | no less than 2 000 000 per 1 Gb |
| **Accelerometer** | | |
| Accelerometer | yes | yes |
| Maximum allowable shock overload, g | +/-24 | +/-24 |
| Accelerometer accuracy (in the range of +/-24g less than %) | 0,5 | 0,5 |
| Accelerometer calibration | yes | yes |

| | | |
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| **Setup and Management** | | |
| USB interface for configuration, management and data transfer | yes | yes |
| Configuration and management of the device with NTC Configurator program | yes | yes |
| Configuration and management of the device via SMS and Internet channels | yes | yes |
| Automatic firmware update | yes | yes |
| OTA firmware update | yes | yes |
| Tone control and GPRS, SMS and DTMF control | yes | yes |
| | | |
| **Data transmission** | | |
| GSM, SMS, GPRS data transferring | yes | yes |
| Optional selection of transmitted parameters to save traffic | yes | yes |
| Sending information in roaming only about the current state with the following unloading of data to the server in the home network | yes | yes |
| Setting the roaming priority operator list | yes | yes |
| Automatic detection of operator settings based on SIM card data | yes | yes |
| EGTS protocol support | yes | yes |
| FLEX, FLEX 2.0, FLEX 3.0 protocols support | yes | yes |
| Number of servers (IP addresses) to which data can be transmitted | yes | yes |
| Resending telemetry for the period to the server by SMS or Internet command | 3 | 3 |
| User and debug logs for GSM, GPS and interfaces | yes | yes |
| TCP and UDP transport protocols support | yes | yes |
| Number of phone numbers for SMS notification | yes | yes |
| GSM, SMS, GPRS data transferring | 5 | 5 |
| | | |
| **Functionality** | | |
| EcoDriving | yes | yes |
| Towing detection | yes | yes |
| Accident detection in accordance with acceleration thresholds or Addiction Severity Index (ASI) | yes | yes |
| Generating and sending accident profile to the server | yes | yes |
| Immobilizer function using Proximity card driver identification system and 1-Wire interface | yes | yes |
| Energy saving mode | yes | yes |
| Device operation on the timer or by the calendar | yes | yes |
| Security modes | yes | yes |
| GSM jammer detector | yes | yes |
| GNSS jammer detector | yes | yes |
| Sending SMS about speeding event | yes | yes |
| Determining the engine operation time and calculating engine hours by the external voltage level | yes | yes |
| Selection of sensors used to calculate engine hours | yes | yes |
| Tachometer with engine speed calculation | yes | yes |
| Providing LBS information from the three nearest cell towers | yes | yes |
| AES128 data encryption | yes | yes |
| Mileage algorithm based on terrain | yes | yes |
| Selection of sensors involved in coordinate processing | yes | yes |
| Setting the degree of data averaging for the fuel | yes | yes |

| | | |
|---|---|---|
| sensors | | |
| Stopping work with fuel sensors under specified conditions (decrease in external voltage, turn off the ignition, engine shutdown) | yes | yes |
| Setting output operating mode (permanent, single, periodic) | yes | yes |
| Digital fuel level sensors connection by RS-232 interface | yes | yes[6] |
| Number of connected fuel sensors via RS-485 interface, no more than | 16 | 16 |
| Calibration of the fuel sensor in the device | yes | yes |
| Simultaneous operation with two different devices on the digital interface (not all combinations of devices are allowed) | yes | yes |
| MODBUS RTU protocol support | yes | yes |
| Operation with RFID readers Escort Radius, ADM20, Mielta and LLS-compatible | yes | yes |
| Output of NMEA data to the digital interface | yes | yes (on RS-485) |
| CAN interface with J1939 standard | yes | yes |
| CAN interface with other protocols support by decoding files | yes | yes |
| Parsing CAN parameters by user settings | yes | yes |
| J1708 protocol support via RS-485 interface | yes | yes |
| CAN-LOG and CAN-FMS adapters support[6] | yes | yes[6] |
| DTA-CAN CAN adapter support | yes | yes |
| Support of wireless headset for two-way communication with the driver | yes | yes |
| Bluetooth connection of up to 4 wireless fuel level sensor (ESCORT TD-BLE, TECHNOTON DUT-E, GL-TV) | yes | yes |
| Bluetooth connection of up to 4 wireless temperature and humidity sensors (ADM31, ESCORT TL-BLE) | yes | yes |
| Bluetooth connection of ADM32 wireless tilt angel sensor | yes | yes |
| Bluetooth connection of TECHNOTON GNOM DDE wireless axle load sensor | yes | yes |
| Bluetooth connection of TECHNOTON DFM wireless fuel level sensor | yes | yes |
| Bluetooth connection of ELM327 diagnostic adapter | Yes | yes |
| Transparent mode[7] | yes | yes |
| Unloading of ddd-files from Shtrikh, Mercuriy, VDO Continental, Atol tachographs[8] | yes | yes |
| Sending events on changing the tachograph status | yes | yes |
| Working with driver display DV-01 | yes | yes |
| Displaying text messages received from the server or via SMS on the driver display | yes | yes |
| Autoinformer function | yes | yes |
| Working with electronic display ITLINE and INTEGRAL | yes | yes |
| Displaying information about the current route, current and next stops on the driver display | yes | yes |
| Speed limiting in geofences | yes | yes |
| Displaying information about speed mode and warnings about speeding on the driver display | yes | yes |
| Displaying information about the amount of fuel in liters from the fuel sensor on the driver display | yes | yes |
| Working with passenger flow counters PP-01 and Avtokonduktor | yes | yes |
| Camera connection support, sending pictures to server by server request | yes | yes |

| | | |
|---|---|---|
| Working with TPMS Pressure Pro, TPMS 6-13 (from Parkmaster), B-Tag (from Bridgestone), TM508T22U and TD 18, 20, 21 | yes | yes[6] |
| Working with breathalyzer Alcogran AM-525 | yes | yes[6] |
| Interface for connecting digital temperature sensors | 1-Wire | 1-Wire |
| Number of connected digital temperature sensors, no more than | 8 | 8 |
| Generating events on temperature decrease/increase | yes | yes |
| Reading TouchMemory key codes via 1-Wire bus and identifying drivers | yes | yes |
| Maximum number of TouchMemory key codes stored in the device memory without SD card | 510 | 510 |
| Connecting microphone and speaker for hands-free communication with the driver and microphone listening | yes | yes |
| Resistance and power of the connected speaker | 4 ohm - 1.5 to 5 W<br>8 ohm - 1.0 to 3 W | 4 ohm - 1.5 to 5 W<br>8 ohm - 1.0 to 3 W |
| | | |
| **Environmental Specifications** | | |
| Ingress Protection Rating | IP54 | IP54 |
| Storage temperature with battery[9], °C | 0 … +40 | 0 … +40 |
| Storage temperature without battery, °C | -40 … +85 | -40 … +85 |
| Operating temperature with battery[10], °C | -20 … +60 | -20 … +60 |
| Operating temperature without battery, °C | -40 … +85 | -40 … +85 |
| Battery charge temperature, °C | 0 … +50 | 0 … +50 |
| Maximum operating humidity at 35 °C, % | 95 | 95 |
| Maximum allowable shock overload, g | 24 | 24 |
| External GLONASS/GPS and GSM antennas | yes | yes |
| Interface for connection to computer | miniUSB | miniUSB |
| Connectors for GLONASS /GPS and GSM antennas | SMA | SMA |
| Interface connectors | Microfit-14, Microfit-6, Microfit-4 | Microfit-14, Microfit-6, Microfit-4 |
| Housing material | ABS plastic | ABS plastic |
| Tamper button | yes (only in S-2651-M) | yes (only in S-2653-M) |
| Dimensions with connectors, mm | 105x78x20,5 | 105x78x20,5 |
| Weight, kg | 0,103 | 0,103 |

*[*] - "x" symbol in the modification of the devices indicates the region for which it is intended:*
*A - equipment for North America.*
*SA - equipment for the countries of South America.*
*E - equipment for European countries.*
*The above regions are indicated conditionally. Devices can be operated in other regions with condition that the ranges of cellular networks correspond to the ranges of the transmitter.*
*[1] Optional.*
*[2] When the maximum operating voltage is exceeded, power protection is activated. In this case, device continues to work from backup battery (if any).*
*[3] Working with GPRS in poor communication conditions, the peak (~10ms) consumption of the device can exceed 500 mA.*
*[4] Attention! Lithium polymer battery (Li-Po) is used in the device. The following rules must be observed during its operation: do not heat, keep away from heat sources, do not throw the battery into fire, do not expose to direct sunlight. Do not operate the device powered by a lithium-polymer (Li-Po) battery in conditions of high humidity, at high and low ambient temperatures. Operation is permitted under conditions specified by the manufacturer. Do not impact, deform, disassemble, close contacts.*
*[5] Battery protection function blocks the charge at low temperatures and at temperatures above +50 °C.*
*[6] Only when using an RS-232/RS-485 interface converter.*
*[7] To connect SIGNAL devices to Atol Drive 5 tachographs, an additional UART/RS-232 converter is required.*
*[8] Mode in which information received via the RS-232 and RS-485 interfaces is not processed by the device, but buffered and transmitted to the server as "yes".*
*[9] When the device is stored and used outside the specified temperatures, it is recommended to turn it off and remove the battery from the device to avoid damage to the battery and to the device.*

*[10] When working with a device with backup battery outside the temperatures in the Environmental Specifications section, it may lead to irreversible change in the properties of the Li-Po battery, decrease in capacity, current output, etc.*

*You can find more detailed technical information in the Operations manual for the SIGNAL device.*

## Warranty

The manufacturer guarantees the compliance of the SIGNAL product with the requirements of the technical specifications TU 26.30.50-002-82520404-2010 (identical to 4372-002-82520404-2010) subject to the consumer observing the storage, transportation, installation and operation rules established by the current set of operational documentation. The device enclosure has a dustproof and a dropproof execution of IP54 type according to the system of classification of the enclosure protection levels of electrical equipment from the penetration of solid objects and water.

The warranty period for the product is 3 years. The warranty for the built-in accumulator and the battery is provided separately and amounted to 1 year. The warranty starts on the date of sale.

During the warranty period, the manufacturing company undertakes to carry out a free repair of the SIGNAL device, subject to the customer complies with the rules of transportation, storage, installation and operation.

The present warranty is valid only upon presentation of complete, correct and legibly filled passport (showing serial number, name, date of sale of the SIGNAL product, presence of the trade organization seal, signature of the buyer about the familiarity with the warranty terms and the operating rules) with the SIGNAL product itself.

The manufacturing company shall not guarantee the software and the hardware compatibility of the SIGNAL product with software and equipment not included in the delivery set, except as specified in the Operating manual.

The manufacturing company is not liable for the possible material, moral and other damage, suffered by the owner of the SIGNAL product and/or the third-party as a result of the violation of requirements of the Operating manual during use, storage or transportation of the product.

Rubbing marks and other minor damages to the SIGNAL product surfaces that do not affect its technical characteristics and that were appeared as a result of its normal use do not result in loss of the right to warranty services. The life of the equipment with the exception of the built-in accumulator and batteries is 10 years.

*The present guarantee does not apply to:*

- documentation and packaging materials supplied with the SIGNAL product;
- modernization of the SIGNAL product.

*This warranty does not cover following cases:*

- defects of the SIGNAL device are caused by the violation of rules for its operation, storage or transportation;
- defects of the SIGNAL device are caused by the direct or indirect effects of mechanical forces, chemical, thermal or physical effects, radiation, aggressive or neutral liquids, gases or other factors, toxic or biological environments and any other effects of artificial or natural origin of a destructive nature;
- repair, maintenance or upgrading of the SIGNAL device was made by persons non-authorized by the manufacturer;
- defects of the SIGNAL device are caused by the force majeure circumstances which the manufacturing company could not foresee, control and prevent;
- if there are no or damaged warranty seals or stickers set up in the SIGNAL product by the manufacturing company or the service center authorized by the manufacturing company;
- defects of the SIGNAL device are caused by its joint use with an equipment or a software that are not included in the delivery set, unless otherwise specified in the Operating manual;
- defects of the SIGNAL device are caused by its operation as part of a set of defective equipment.