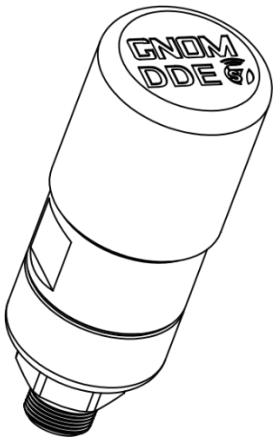
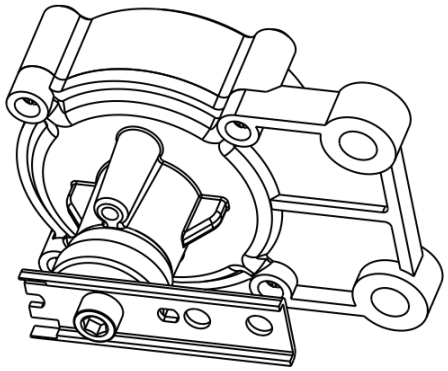
AXLE LOAD SENSORS





GNOM DDE S7 GNOM DP S7

OPERATION MANUAL

Version 2.2

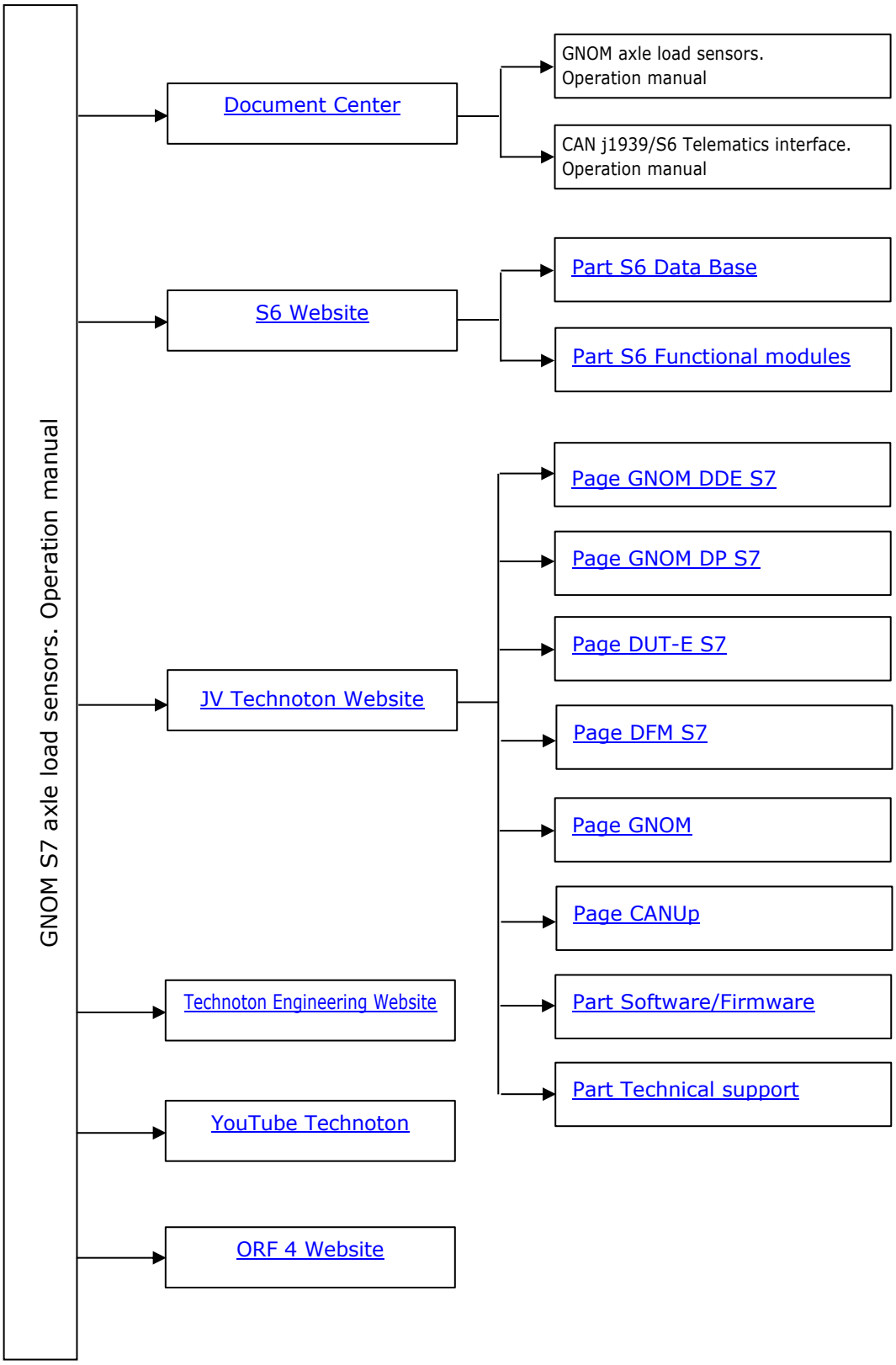
TECHNOTON
ADVANCED VEHICLE TELEMATICS

Contents

Revision history

Version	Date	Editor	Description of changes
1.0	06.2019	OD	Basic version.
2.0	01.2020	OD	Additions: • Description of GNOM DP S7 displacement sensor is added. • Information on the new Axle Load Monitor application (instead of Service S7 GNOM service mobile application) which is designed to display GNOM S7 readings using Android-based devices. • Description of GNOM MK DP 1-axle mounting kit for two-axial Vehicles with leaf-spring suspension. • Information on compatibility with receiving devices.
2.1	11.2021	OD	• The description of Axle Load Monitor mobile app in this operation manual is not actual anymore.
2.2	11.2025	OD	• Clarifications have been introduced regarding the autonomous operating time of GNOM S7 wireless sensors powered by the built-in battery. • For GNOM DDE S7 and GNOM DP S7, the enclosure protection rating is set to IP65/67 (IEC 60529:2013).

Structure of external links



Terms and Definitions

S7 — Technology for wireless collection of data from autonomous sensors used in industrial and automotive telematics systems. S7 Technology is recommended for use on objects, were cabling is difficult or impossible.
S7 Technology uses Bluetooth 4.X Low Energy (BLE) as a communication channel. S7 Technology ensures very low power consumption and long autonomous lifetime of smart sensors and other IoT devices.
Data transfer protocol of S7 Technology has transport layer (identical for all devices) and application layer (different for each product line of sensors). At the application layer, S7 Technology is fully compatible with wired S6 Technology.
Advantages of S7 Technology:

- ease of implementation of data transfer protocol;
- low energy consumption, ability of sensors to operate for several years in a fully autonomous mode;
- ability to collect data from multiple receivers simultaneously.

GNOM S7 axle load sensors are based on S7 Technology.

S6 is the Technology of combining smart sensors and other IoT devices within one wire network for monitoring of complex stationary and mobile objects: vehicles, locomotives, smart homes, technological equipment etc. The Technology is based and expands SAE J1939 automotive standards.
Information on cabling system, service adapter and S6 software refer to CAN j1939/S6 Operation manual.

PGN (Parameter Group Number) — is a combined group of S6 parameters, which has common name and number. Functional modules (FM) of the Unit can have input/output PGNs and setup PGNs.

SPN (Suspect Parameter Number) — informational unit of S6. Each SPN has determined name, number, extension, data type and numerical value. The following types of SPN exist: Parameters, Counters, Events. SPN can have a qualifier which allows qualification of parameter's value (e.g. – Onboard power supply limit/Minimum).

Onboard reports (the Reports) — information about Vehicle which is returned to a user of Telematics system in accordance with inputted criteria. The Reports are generated by a terminal unit both periodically (Periodic reports) and on Event occurrence (Event report).
Parameter — time-varying or space characteristic of the Vehicle (SPN value). For example, speed, fuel volume in the tank, hourly fuel consumption, coordinates. Parameter is usually displayed in the form of graph, or averaged data.

Server (AVL Server) — hardware-software complex of Telematics service ORF 4, used for processing and storage of Operational data, formation and transmission of Analytical reports through Internet by request of ORF 4 users.

Event — relatively rare and sudden change in SPN. Sharp increase in axle load is "Load" Event. This Event may have one or more characteristics. So, the "Load" Event has the following characteristics: date/time, "axle load at the beginning of loading", "axle load at the end of loading", "cargo weight" etc. When the Event occurs, a terminal unit registers the time of occurrence, which is later mentioned in a report on the Event. Thus, the Event is always attached to exact time and place of occurrence.

Counter — cumulative numerical characteristics of Parameter. Counter is represented by a number, which can only grow in time. Examples of Counters: fuel consumption, engine operation time, total distance and other.

Telematics terminal (Tracking device, Telematics unit) is a unit of Telematics system used for reading the signals of Vehicle standard and additional sensors, getting location data and transmitting the data to the Server.

Telematics system — complex solution for vehicle monitoring in real time and trip analysis. The main monitored characteristics of the vehicle: Route, Fuel consumption, Working time, technical integrity, Safety. In includes On-board report, Communication channels, Telematics service ORF 4.

Vehicle is an object controlled by the Vehicle Tracking System. This is generally a truck, a bus or a tractor, sometimes a locomotive, a ship, a utility vehicle. From the point of view of Vehicle Tracking System, static equipment such as diesel generators, heating boilers, burners, and so on are considered vehicles.

Function module (FM) unit-embedded component of hardware and software combination, executing a group of special functions. Uses input/output PGNs and settings PGNs.

Unit is an element of vehicle on-board equipment compatible with S6 bus, which uses S6 Technology or S7 Technology.

Information regarding the change in the usage policy of mobile applications for monitoring readings from wireless S7 Technology Units

As of **April 1, 2024, the subscription fee** for all Technoton mobile applications **has been abolished**:

- Fuel Tanks Monitor
- Fuel Rate Monitor
- Axle Load Monitor

All these applications are available for **free** installation on your mobile devices and full use of their features.

Any information related to the subscription fees for mobile applications provided in this document below is now outdated.

Introduction

The Operation manual contains guidelines and rules which refer to **GNOM S7 axle load sensors** (hereinafter GNOM S7), models codes: **05** (for GNOM DDE S7) and **06** (for GNOM DP S7), developed by Technoton.
The model code of GNOM S7 is identified by the 3^{d} and 4th digits of its serial number which is placed on the casing and on the packaging label (see figure 1).

a) for GNOM DDE S7

b) for GNOM DP S7

Figure 1 — Finding out model code

This document contains: information on design, operation principle, specifications of GNOM S7, recommendations on installation and operation.

GNOM S7 are wireless sensors for monitoring the Vehicle axle load (cargo weight), which can be used within transport Telematics systems or independently.

GNOM S7 sensors are presented with the following models:

- GNOM S7 DDE — is a wireless pressure sensor designed for axle load monitoring systems in vehicles equipped with air suspension.
- GNOM S7 DP — is a wireless position sensor designed for axle load monitoring systems in vehicles equipped with leaf spring suspension.

Besides their employment in Vehicles, GNOM S7 sensors are allowed to be used in wireless networks of intellectual sensors of the Internet of things (IoT), in lines of industrial automation, in Smart House systems etc.

GNOM S7 key features:

- wireless transmission of data using S7 Technology via **Bluetooth Low Energy** channel simultaneously to many receiving devices (Android-based smartphones/tablets, the Telematics terminal, the display in the driver's cabin);
- operation in the «advertising» mode (BLE-radio) — continuous transmission of measurement results, with no need of integration with receiving devices;
- ultra-low power consumption ensures autonomous operation of the sensor for up to 5 years from the built-in battery, without using any external power sources;
- mounting on any Vehicles equipped with air* suspension and leaf spring suspension**;
- increased wear resistance due to absence of friction elements;
- no signal cable– quick installation without a need of electrical connection;
- no signal cable — explosive and fire safety of the sensor is ensured without using additional modules of explosion protection;
- no signal cable – increase resistance to sabotage;
- function of digital self-diagnostics for sensor quality control;
- elaborate and high-quality mounting kit accessories;
- high quality technical support and documentation;
- conformity with European and national automotive standards.

To receive GNOM S7 indications by means of S7 Technology with a smartphone/tablet based on Android 5.X and higher operating system (further on — Android device) **Axle Load Monitor**, whose functionality allows to exercise:

- Monitoring of current Parameters of:
  - Vehicle axle load;
  - compressed air pressure in the compressed air system*;
  - deviation angle of the sensor pivot lever**;
  - Vehicle loading mode "Empty"/"Optimal"/"Maximal"/"Overload");
  - ambient temperature;
- Creation of the measuring system calibration table and its recording into the memory of the Android device;
- Monitoring axle load readings of up to 10 GNOM S7 sensors of any models at one time, with displaying the total value of the Vehicle axle load;
- Receiving the sensor ID data (serial number, model, firmware version, MAC-address of the BLE-module);
- Monitoring the received signal strength indicator (RSSI) and the time of the latest message received from the sensor;
- Monitoring the sensor current operational mode ("Operational"/"Manufacturing");
- Monitoring the sensor malfunctions;
- Recording (logging) current values of:
  - axle load;
  - pressure of compressed air in the compressed air system*;
  - deviation angle of the sensor pivot lever**;
  - ambient temperature;
- - Performing operations with the sensor Profile.

The user may download the Axle Load Monitor application from Google Play (rearch request "Technoton") and subscribe to it.

ATTENTION: The description of **Axle Load Monitor** mobile app in this operation manual is not actual anymore. A separate manual was introduced for **Axle Load Monitor** app. Please, refer to Technoton Document Center, where the up-to-date version is available.

* For GNOM DDE S7.
** For GNOM DP S7.

ATTENTION: It is strongly recommended to follow strictly the instructions of the present Manual when using GNOM S7.

The Manufacturer guarantees GNOM compliance with the requirements of technical regulations subject to the conditions of storage, transportation and operation set out in this Manual.

ATTENTION: Manufacturer reserves the right to modify GNOM specifications that do not lead to a deterioration of the consumer qualities without prior customer notice.

1 General information and technical specifications of GNOM S7

1.1 Purpose of use, operation principle and application area

are used for:

- measuring the Vehicle axle load or its cargo weight (see figure 2);
- measuring the pressure of compressed air in the compressed air system (only GNOM DDE S7);
- measuring the sensor pivot lever deviation angle (only GNOM DP S7);
- defining the mode of loading the Vehicle;
- measuring ambient temperature;
- wireless transfer of data using S7 Technology.

Figure 2 — Purpose of GNOM S7

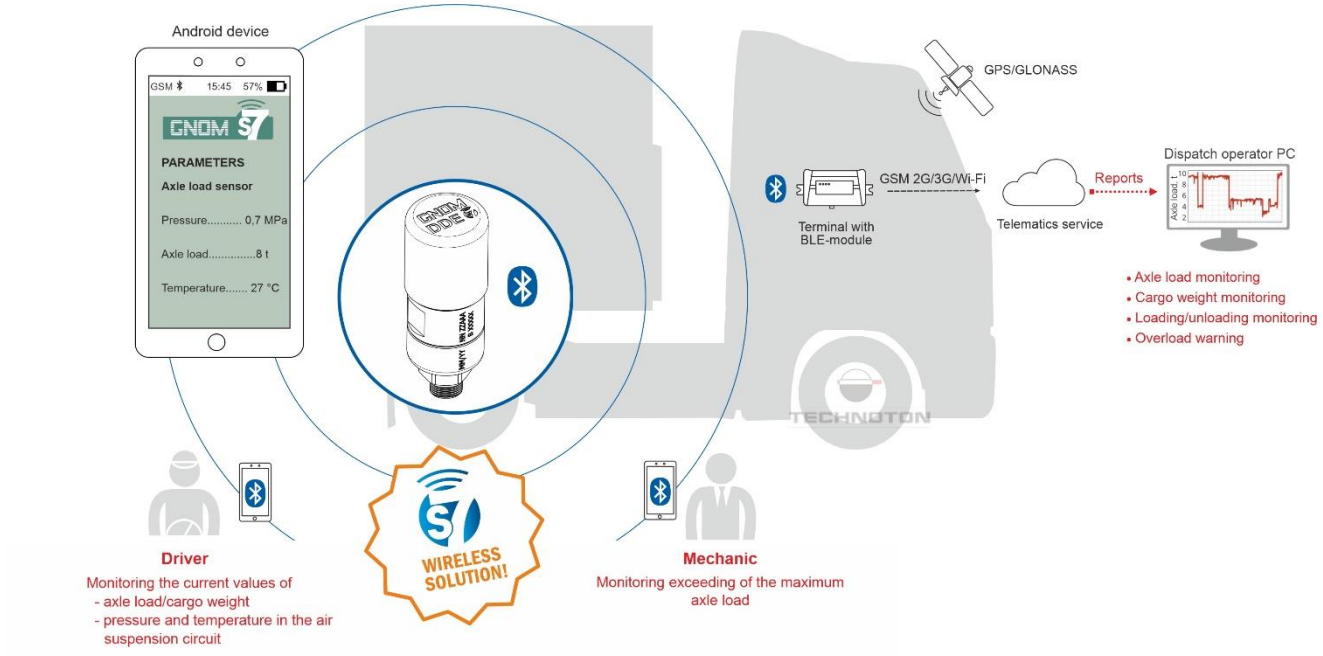
Depending on the sensor model, **the principle of its operation** is as follows:

- GNOM DDE S7 is installed in the Vehicle air suspension circuit. Sensor measures the pressure of compressed air in suspension circuit of the vehicle. Pressure depends on the weight of the load.
- GNOM DP S7 is mounted on the Vehicle frame and is joined with the loaded axle with a system of levers. Sensor measures the distance between the frame and the axle which depends on the weight of the load.

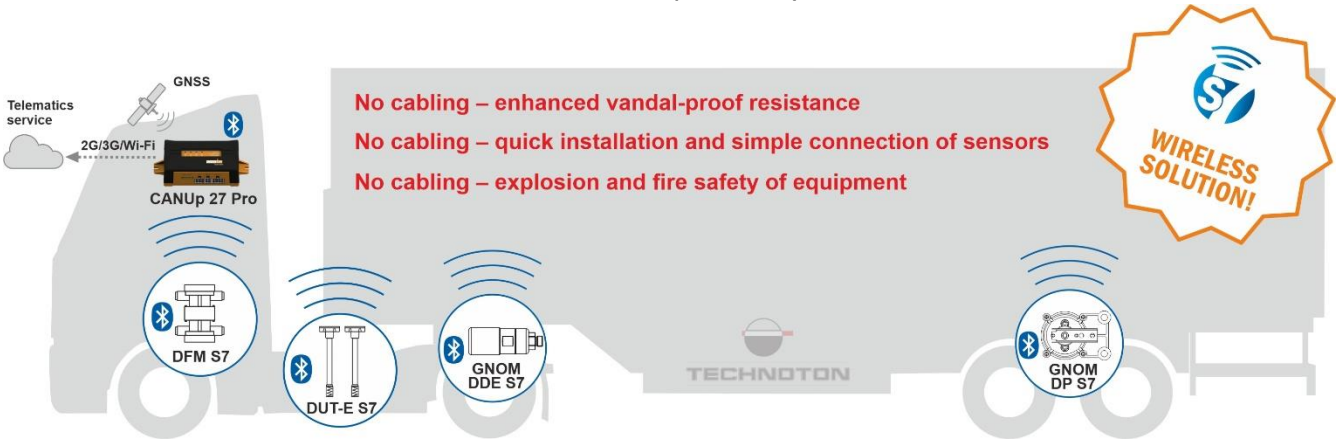
GNOM S7 has an inbuilt Bluetooth Low Energy module (BLE-module) which, due to a special data transmission algorithm, enables the flow meter operation with ultra-low power consumption. The BLE-module transmitter switches on automatically once in 5 s to transmit the current indications. This operating mode allows the sensor to function completely autonomously for up to 5 years, without using any external power sources, powered solely by the built-in battery.

Data from GNOM S7 can be received at a distance of up to 45 meters by unlimited number of various receiving devices (Telematics units, Android-smartphones/tablets etc.), which are equipped with Bluetooth 4.X module.

Application area: GNOM S7 may be employed for monitoring the vehicle axle load within the transport Telematics system (including the mode of operation without using the services of the Server) and/or for independent operation (see figure 3 a).



a) example of wireless monitoring the vehicle axle load within the Telematics system and independently



b) example of axle load monitoring during the comprehensive monitoring of the vehicle performance parameters by means of S7 Technology

Figure 3 — Application areas of GNOM S7 sensors

Due to the availability of the inbuilt BLE-module, up to 4 pieces of GNOM S7 axles load sensors and other wireless Units — DUT-E S7 fuel level sensors (up to 8 pcs), DFM S7 fuel flow meters (up to 8 pcs) can operate together at one time by means of S7 Technology with CANUp 27 Pro Telematics gateway for comprehensive monitoring the Vehicle performance Parameters (see figure 3 b).

RECOMMENDATION: The highest accuracy of data display during the comprehensive monitoring of the Vehicle Parameters is ensured by ORF 4 Telematics service.

The employment of GNOM S7 within the transport Telematics system provides the Vehicle owner convenience in analyzing the shipment process (see figure 4) and ensures:

- monitoring the axle load/weight of the shipped cargo;
- optimal vehicle loading;
- conscientious work of the driver and elimination of any underhand cargo transportation;
- monitoring of weight, place and time of loading/unloading Events;
- elimination of penalties for exceeding axle load limitations.

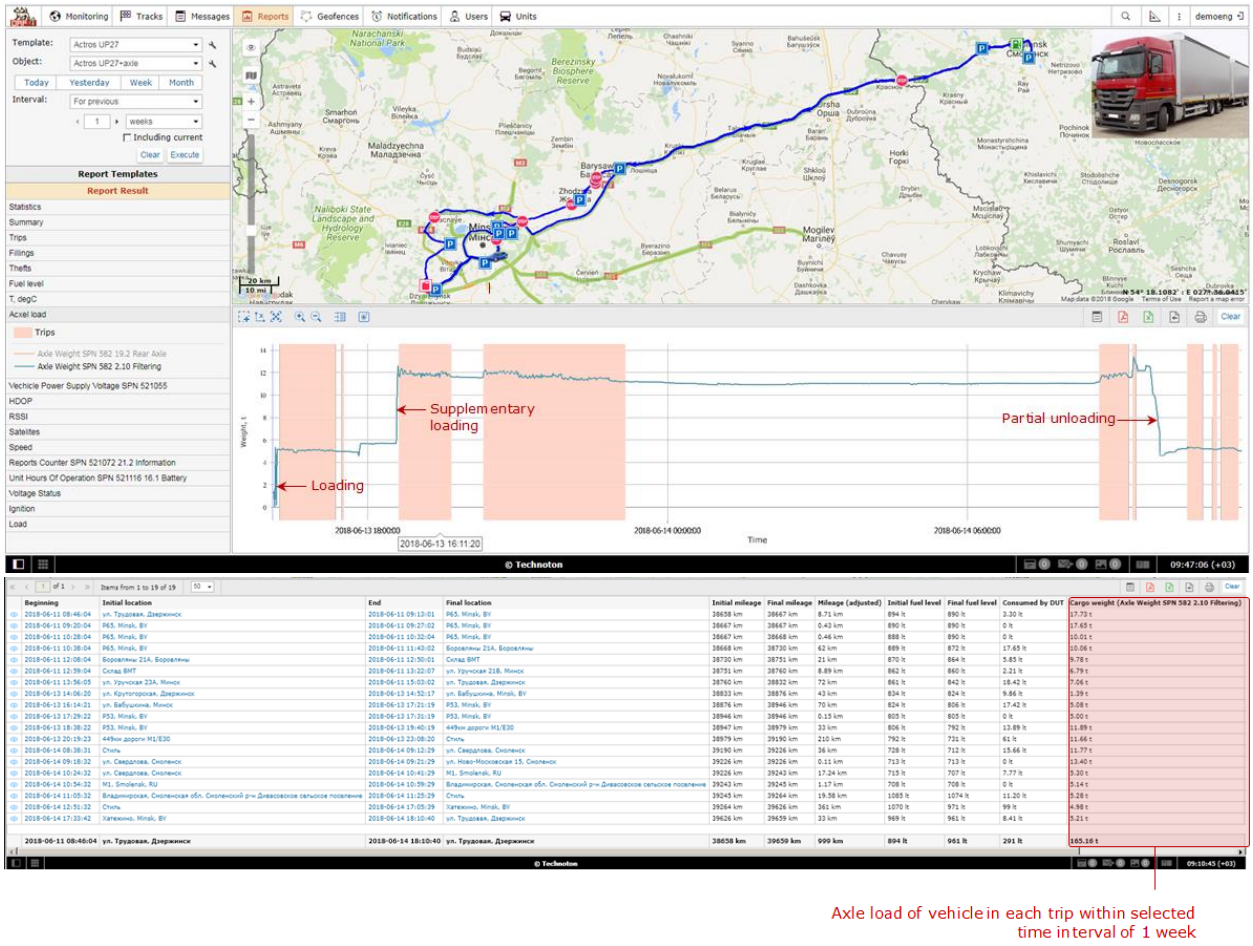
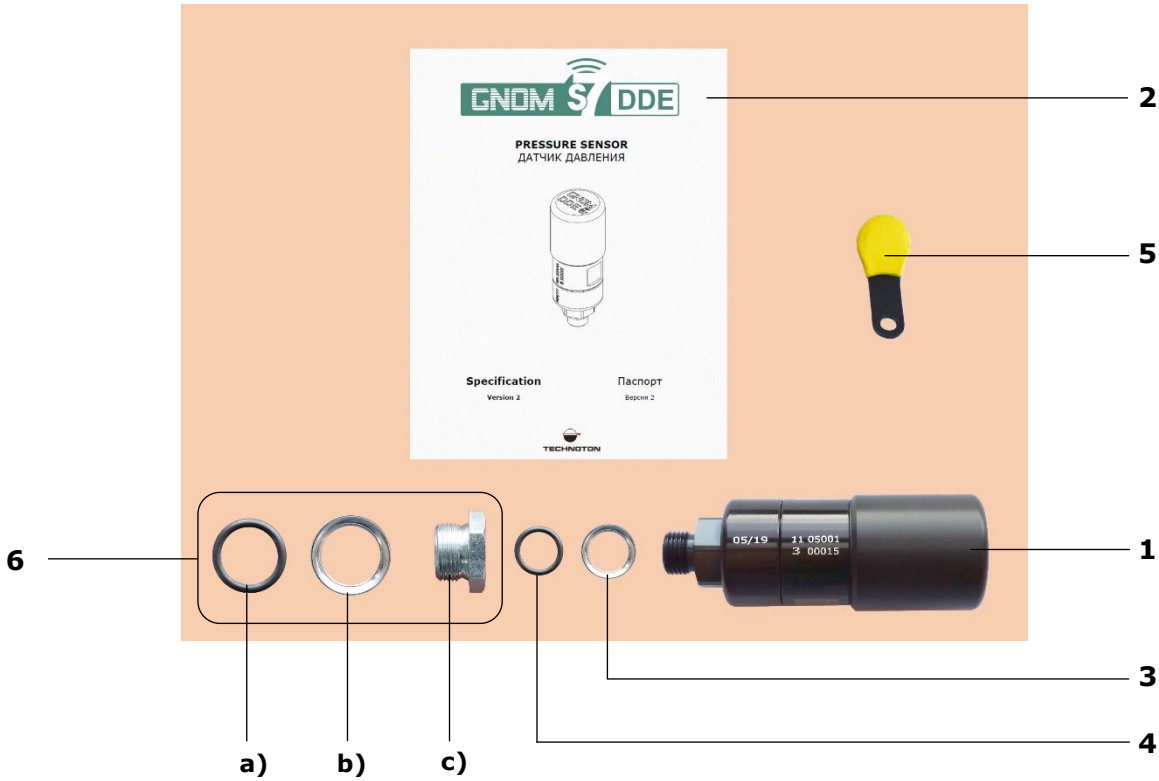


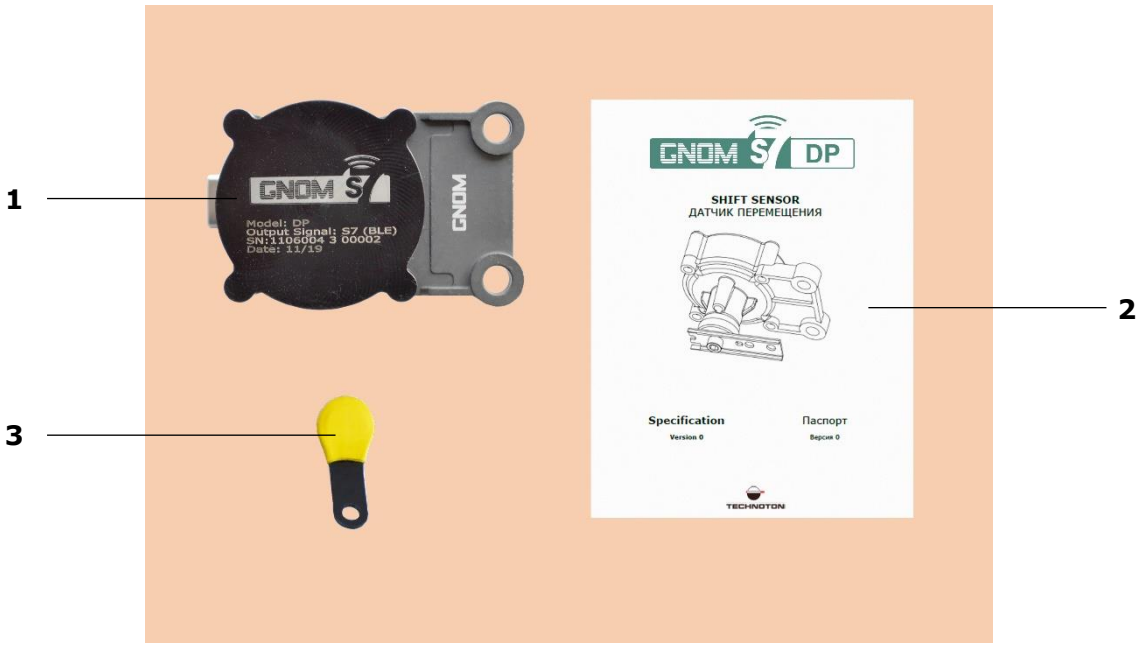
Figure 4 — Example of analysis of ORF 4 Analytical report created based on CANUp 27 Pro Onboard reports and data from GNOM S7

1.2 Exterior view and delivery set



1	GNOM DDE S7 pressure sensor	– 1 pc.;
2	Specification	– 1 pc.;
3	Washer	– 1 pc.;
4	Sealing rubber ring	– 1 pc.;
5	Magnetic key	– 1 pc.;
6	Mounting kit GNOM MK DDE1 (1 pc.) including:	
	a) sealing rubber ring	– 1 pc.;
	b) washer	– 1 pc.;
	c) adapter nut	– 1 pc.

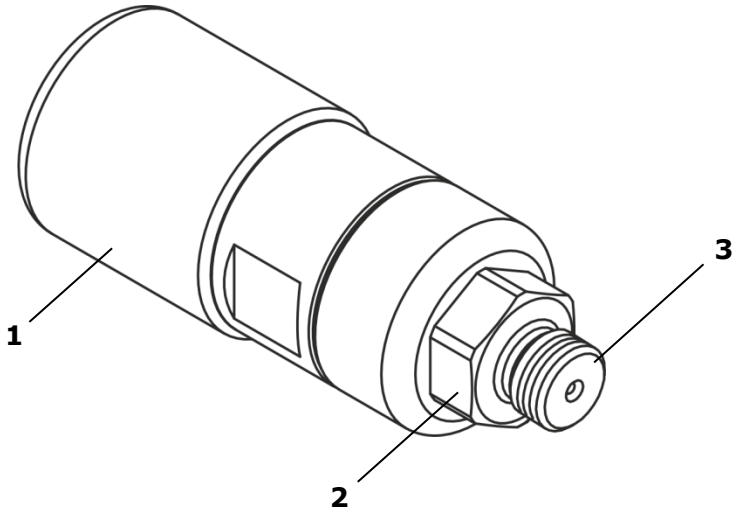
Figure 5 — GNOM DDE S7 delivery set



1 GNOM DP S7 position sensor – 1 pc.;
2 Specification – 1 pc.;
3 Magnetic key – 1 pc.

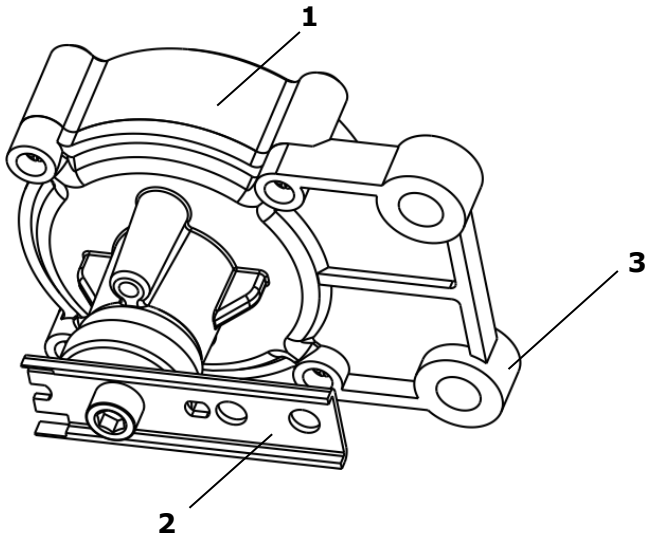
Figure 6 — GNOM DP S7 delivery set

1.3 Design



1 – sensor casing inside which there are: the electronic measuring unit, the piezoresistive pressure transducer, BLE-module for wireless data transmission by means of S7 Technology and the internal battery power source;
2 – fixing nut for mounting the sensor in the vehicle air suspension;
3 – input fitting with male connecting thread through which the compressed air from the air suspension is input to the sensor.

Figure 7 — Components of GNOM DDE S7



1 – Sensor casing inside which there are: the electronic measuring unit, the magnetoresistive transducer of the pivot lever deviation angle;
2 – BLE-module for wireless data transmission by means of S7 Technology and the internal battery power source;
3 – pivot lever;
4 – mounting bracket.

Figure 8 — Components of GNOM DP S7

1.4 Technical specifications

Powered of GNOM S7 only by the built-in battery.

GNOM S7 can be used in the conditions of temperate and cold climate.

For resistance to mechanical impact GNOM S7 is shake and shockproof.

1.4.1 Main specifications

Table 1 — GNOM S7 main specifications

Parameter, measuring unit	Value	
	GNOM S7 DDE	GNOM S7 DP
Method of pressure measurement	Piezoresistive	—
Pressure measurement range, MPa	0.1…1.4	—
Allowed tolerance of reducial error of pressure measurement, %, not more than	±1.0	—
Principle of measurement of angular deviation	—	Magnetoresistive
Range of measurement of the lever turning angle, º	—	0…360
Absolute error of measurement of the lever turning angle, º, not more than	—	±2
Wireless data transfer interface	Bluetooth 4.1	
Transmitter power (Tx Power), dBm	+4	
Maximum distance between sensor and receiving device, m	15 (in case there are metal partitions) 45 (in conditions of direct visibility)	
Data transfer interval, s	5	
Sensor autonomous operating time from the built-in battery, years	up to 5*	
Ambient operation temperature range, °C	-40…+80	
Certificates of BLE module electromagnetic compatibility	CE FCC and IC (see annex C), TELEC BQE	
Enclosure protection rating against the ingress of dust and moisture	IP 65/67 (IEC 60529:2013)	
Connection thread	M16x1.5 M22x1.5**	—
Weight, g, not more than	0.2	0.3
Overall dimensions, mm, not more than	see 1.4.4	

* At a constant ambient temperature of +20 °C.
Under real operating conditions, when the temperature fluctuates, the sensor's autonomous operating time may be reduced, but it is guaranteed to be at least 2 years.

** Using the adapter nut from the mounting kit GNOM MK DDE1.

1.4.2 Data transmission protocol

GNOM S7 provides wireless data transmission using S7 Technology without establishment of connection with the receiving device and without the acknowledgement of data reception. The data in the form of Advertising packets are transmitted automatically with 5 s periodicity in the continuous data transfer mode. The structure of the data packet transmitted by GNOM S7 is provided in figure 9.

Service field (AD0) (permanent values)			**Data field (AD1)** (variable values)					
Data length (AD Length) (1 byte)	**Data type (AD Type)** (1 byte)	**Data (Data)** (1 byte)	**Data length (AD Length)** (1 byte)	**Data type (AD Type)** (1 byte)	**Company identifier (Company ID)** (2 bytes)	**Unit firmware version (Soft Ver)** (1 byte)	**PGN number (PGN)** (2 bytes)	**PGN data (PGN Data)** (0…21 bytes)
0x02	0x01	0x06	0xXX	0xFF	0xFFFF	0xXX	0xXXXX	…

Figure 9 — Structure of GNOM S7 data packet

1) The application layer of the output message protocol of GNOM DDE S7 conforms with S6 Database (see table 2).

Table 2 — Data composition of GNOM DDE S7 output message

Field number	Length	Parameter	Name
Axle load sensor PGN 63285 (0xF735)			
1	2 bytes	SPN 521511	Suspension air pressure, kPa
2	1 byte	SPN 521513	Suspension air temperature, °C
3	4 bytes	SPN 521488	Unit DTCs mask (see table 3)
4	2 bytes	SPN 5347*	Lateral acceleration extended range, m/s^2
5	2 bytes	SPN 5348*	Longitudinal acceleration extended range, m/s^2
6	2 bytes	SPN 5349*	Vertical acceleration extended range, m/s^2
7	8 bytes	-	Reserve
* Currently in development.			

Table 3 — Numerical values of GNOM DDE S7 malfunction mask

Numerical value	Malfunction name
1024	Low battery charge (<10 %)
33554432	Accelerometer. The system does not respond or is not configured.
67108864	Pressure sensor. The system does not respond or is not configured.
268435456	Temperature sensor. The system does not respond or is not configured.
16777216	The device is operating in the manufacturing mode*.
* This value does not indicate any sensor malfunction, but shows that its BLE-module is operating in the "Manufacturing" mode.	

SPN values of the sensor output message may be calculated according to the formula (1) using attributes from table 4.

Parameter value = SPN content · Factor (Resolution) + Offset (1)

Table 4 — Attributes for calculating current values of GNOM DDE S7 parameters

Parameter	Factor (Resolution)	Offset
SPN 521511	0.1	0 kPa
SPN 521513	1	-40 °C
SPN 5347	0.01	-320 m/s²
SPN 5348	0.01	-320 m/s²
SPN 5349	0.01	-320 m/s²

2) The application layer of the output message protocol of GNOM DP S7 conforms with S6 Database (see table 5).

Table 5 — Data composition of GNOM DP S7 output message

Field number	Length	Parameter	Name
Position sensor PGN 63304 (0xF748)			
1	2 bytes	SPN 521469	Angle, deg
2	1 byte	SPN 521457	Temperature, °C
3	4 bytes	SPN 521488	Unit DTCs mask (see table 6)
7	14 bytes	-	Reserve

Table 6 — Numerical values of GNOM DP S7 malfunction mask

Numerical value	Malfunction name
268435456	Temperature sensor. The system does not respond or is not configured
536870912	Position sensor. No data or incorrect data

SPN values of the GNOM DP S7 output message may be calculated according to the formula (1) using attributes from table 7.

Table 7 — Attributes for calculating current values of GNOM DP S7 parameters

Parameter	Factor (Resolution)	Offset
SPN 521469	0.1	0 deg
SPN 521457	1	-50 °C

1.4.3 Compatibility with receiving devices

GNOM S7 may be employed together with receiving devices (Android-based smartphones/ tablets, Telematics terminals or other tracking devices) that have Bluetooth, version 4.X and higher.

Technoton on a regular basis conducts compatibility and mutual accuracy tests of the equipment manufactured; these tests are conducted with different models of Telematics terminals.

The table containing the up-to-date list of Declarations of compatibility of Telematics terminals from different manufacturers with GNOM S7 sensors and other equipment manufactured by Technoton is provided at https://www.jv-technoton.com/.

Recommendations on wireless connection of GNOM S7 to Telematics terminals can be obtained upon request at Technoton technical support service by e-mail: support@jv-technoton.com.

RECOMMENDATION: The best compatibility with GNOM S7 wireless sensors during its operation using S7 Technology is provided by CANUp 27 Pro Telematics gateway. The procedure for connection of wireless Units to the Gateway please, see in CANUp 27 Operation Manual.

1.4.4 Overall dimensions

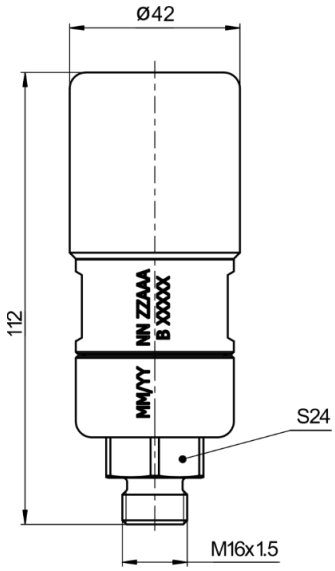


Figure 10 — GNOM DDE S7 overall dimensions

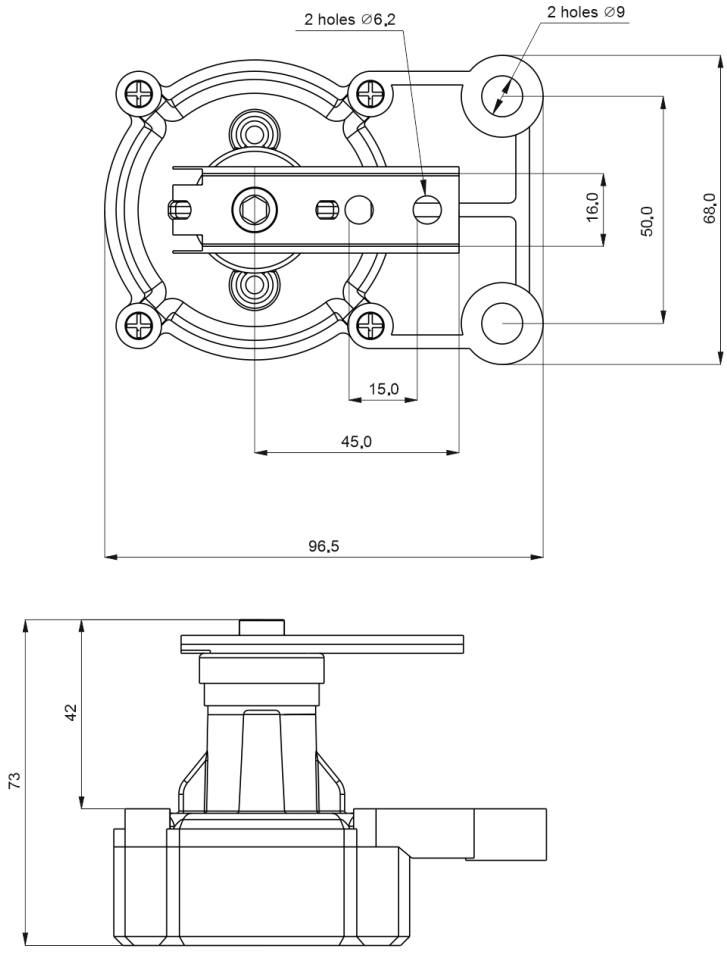


Figure 11 — GNOM DP S7 overall dimensions

2 Mounting

This section contains general recommendations on GNOM S7 sensors mounting.

ATTENTION: For GNOM S7 correct operation its mounting and configuration should be carried out by certified specialists who have passed corporate technical training. Strictly follow safety rules of automobile repair works as well as local safety rules of the customer company when mounting sensors.

2.1 Exterior inspection prior to works start

It is necessary to conduct GNOM S7 exterior inspection for the presence of the possible defects arisen during transportation, storage or careless use.

Contact the product supplier if there any defects.

2.2 Vehicle state evaluation

You should evaluate Vehicle technical condition and make a conclusion about the possibility of GNOM S7 sensor mounting before starting any works.

During the evaluation of the Vehicle state you need:

- inspection of vehicle air suspension circuit for damages and leakage of compressed air (when mounting GNOM DDE S7);
- Checking the technical condition of the vehicle leaf spring suspension elements for absence of faults and defects ((when mounting GNOM DP S7).

In case the Vehicle does not meet the requirements specified above, its owner is to eliminate all the faults before GNOM S7 mounting operations.

2.3 GNOM DDE S7 Mounting

2.3.1 General instructions

To mount GNOM DDE S7 on a vehicle, you need:

- GNOM DDE S7 pressure sensor;
- mounting kit: GNOM MK DDE1 (included into the delivery set) or GNOM MK DDE2 (to be purchased separately);
- automobile hand tool kit (sets of spanners, screwdrivers, etc.).

ATTENTION — WORK WITH HIGH PRESSURE!

1) Mounting of GNOM DDE S7 should be performed by the personnel authorized to perform any operations on the equipment with high pressure.

2) Strictly follow safety rules of automotive repair works as well as local safety rules of the customer company when mounting GNOM DDE S7.

3) Before GNOM DDE S7 mounting operations you should set the Vehicle air suspension into the service mode and **release pressure in the compressed air system!**

2.3.2 Rules for installation works

Follow the **rules** for works on pneumatic equipment when mounting GNOM DDE S7:

- Pipelines having cracks, tears, dents and thread defects are not allowed for mounting.
- Do not tighten any bolts, nuts, or other connection elements that are under pressure.
- Do not bend the pipeline or other elements of the air suspension system.
- Make sure the internal area of the pneumatic lines is clean when mounting pipelines.
- Pipelines fastening must be reliable, stress-free, and must have a margin to compensate temperature length changes.
- The maximum tightening torque of plastic air supply pipelines is 60 N▪m.

2.3.3 Selecting the mounting location and mounting scheme

Depending on the design particularities of air suspensions of different Vehicles and access for mounting operations, the following GNOM DDE S7 mounting locations and options of mounting schemes are possible:

1) The simplest way is to mount the sensor **in the standard hole of the air supply line in the Vehicle air suspension cushion pad**. The sensor is to be mounted here instead of the plug bolt (see figure 12) with M16x1.5 thread or by means of adapter nut M22x1.5 from GNOM MK DDE1 mounting kit (see delivery set), **according to Mounting scheme 1** (see figure 13).

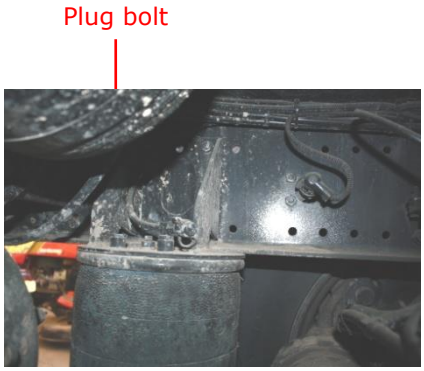


Figure 12 — Example of GNOM DDE S7 mounting location in the Vehicle air suspension cushion pad

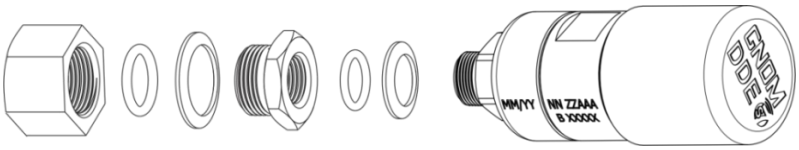


Figure 13 — Procedure for GNOM DDE S7 mounting, according to Mounting scheme 1

2) In case of using a fitting connector (T-connector/splitter) from GNOM MK DDE2 mounting kit, any convenient location in the place where **the air supply lines of the Vehicle air suspension are connected** is suitable

You may mount the sensor **into the cut of the Vehicle suspension air supply line** using a pipe Ø=8 mm, in accordance with **Mounting scheme 3** (see figure 14).

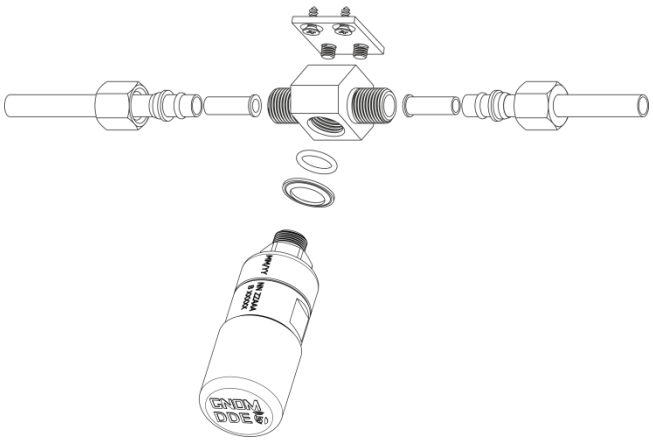


Figure 14 — Procedure for GNOM DDE S7 mounting, according to Mounting scheme 3

3) You may mount the sensor **in the mounting location of the pipe Ø=8 mm**, in accordance with **Mounting scheme 4** (see figure 15).

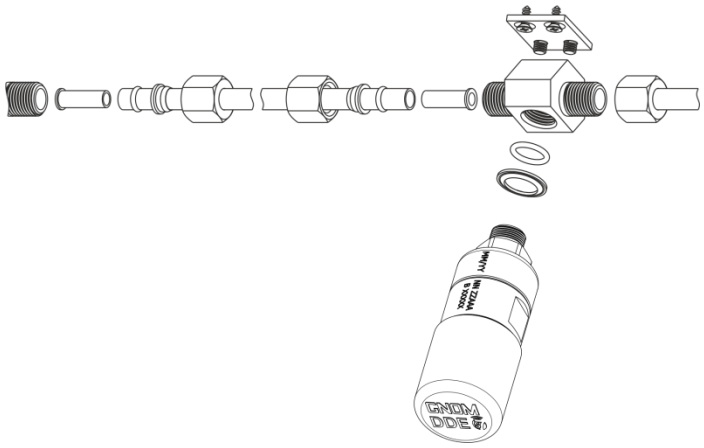


Figure 15 — Procedure for GNOM DDE S7 mounting, according to Mounting scheme 4

4) You may mount GNOM DDE S7 into the hole M22x1.5, with the extension of the compressed air system, in accordance with **Mounting scheme 2** (see figure 16).

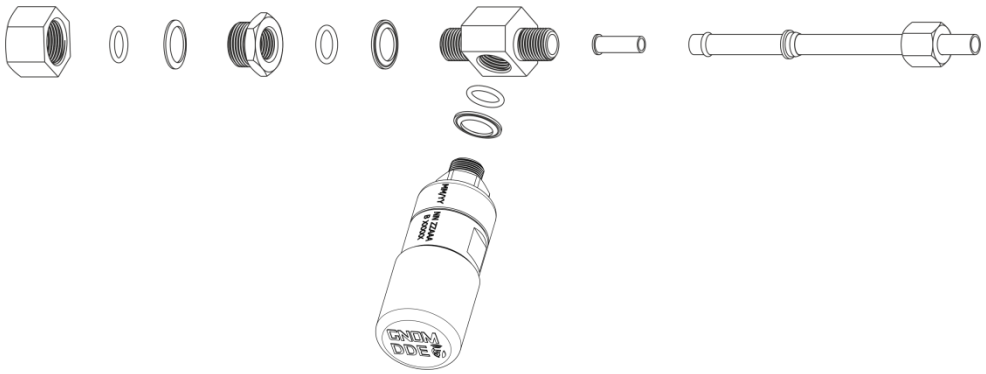


Figure 16 — Procedure for GNOM DDE S7 mounting, according to Mounting scheme 2

Photos showing examples of mounting GNOM axle load sensors can be found at https://www.jv-technoton.com/, section Gallery of Mounting Technoton Equipment.

2.4 GNOM DP S7 Mounting

2.4.1 General instructions

ATTENTION:
Strictly follow safety rules of automotive repair works as well as local safety rules of the customer company when mounting GNOM DP S7.

To mount GNOM DP S7 on a vehicle, you need:

- GNOM DP S7 position sensor;
- mounting kit (to be purchased separately):
  - GNOM MK DP universal — for mounting the sensor on three-axial Vehicles;
  - GNOM MK DP 1-axle — for mounting the sensor on two-axial Vehicles;
- additional mounting brackets for sensor and elements for mounting kit (see figure 17) **manufactured from steel no less than 4 mm thick,** in accordance with schematic drawings made by the installer personnel;
- automobile hand tool kit (sets of spanners, screwdrivers, etc.);
- tape measure.

Figure 17 — Examples of additional mounting brackets for sensor and elements of mounting kit

IMPORTANT:
1) When fixing additional mounting brackets on the Vehicle chassis, **it is forbidden to drill the Vehicle frame and components of the transmission mechanism!**
2) Spot weld is allowed for fixing the mounting brackets, in case there are no suitable standard holes and locations allowing to fix the mounting plates with bolts.

2.4.2 Selection of mounting location and procedure for the sensor mounting

ATTENTION: A decision regarding GNOM DP S7 mounting location and mounting scheme to be used is taken by the installer personnel based on the particularities of the specific Vehicle suspension design.

1) The location for mounting GNOM DP S7 sensor is to be selected along the Vehicle lengthway symmetry line, between the wheels of the axle which is to be monitored, in the centre of the Vehicle frame cross bar (see figure 18).

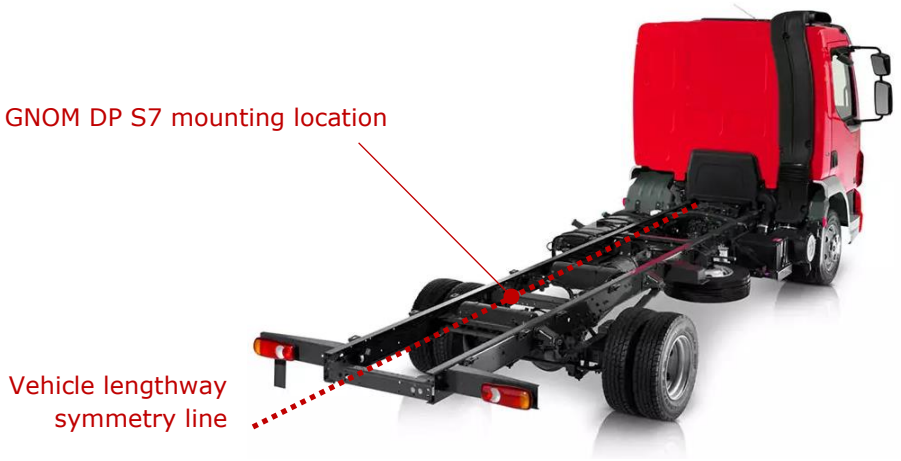


Figure 18 — Selection for GNOM DP S7 mounting location for monitoring the Vehicle axle load

GNOM DP S7 mounting location on the Vehicle frame must be as close as possible to the Vehicle frame which is to be monitored so as to ensure the correct mounting of the elastic element, lever and rod of mounting kit.
All the mounting kit components mentioned must be in the same plane and have no bends.
The mounting location of the elastic element on the Vehicle axle must be as close as possible to the Vehicle lengthway symmetry line. This will reduce the impact of the Vehicle rolls and variations of suspension travel on the sensor operation, in case any of the Vehicle wheels runs into a road surface warp (see figure 19).

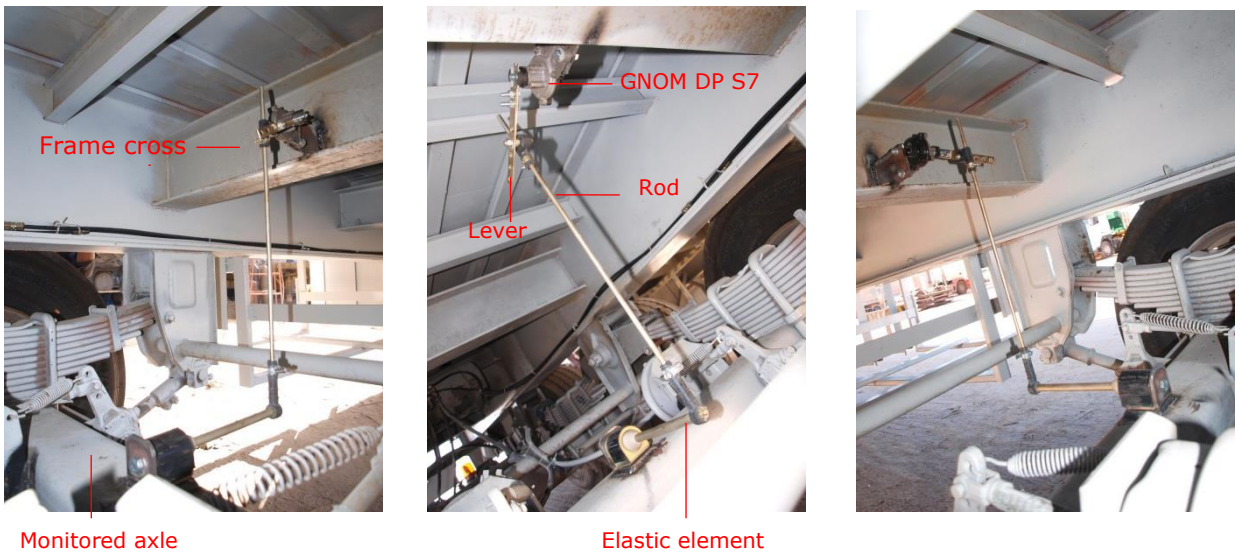


Figure 19 — Example of GNOM DP S7 mounting location to monitor the semitrailer axle load

2) The lever length (**L**) and the rod length (**H**) from mounting kit are selected experimentally, specifically on the Vehicle to be equipped. The range of changing the angle of rotation of the lever of the mounted GNOM DP S7 must be within the entire Vehicle suspension travel (**Δ**) (see figure 20).

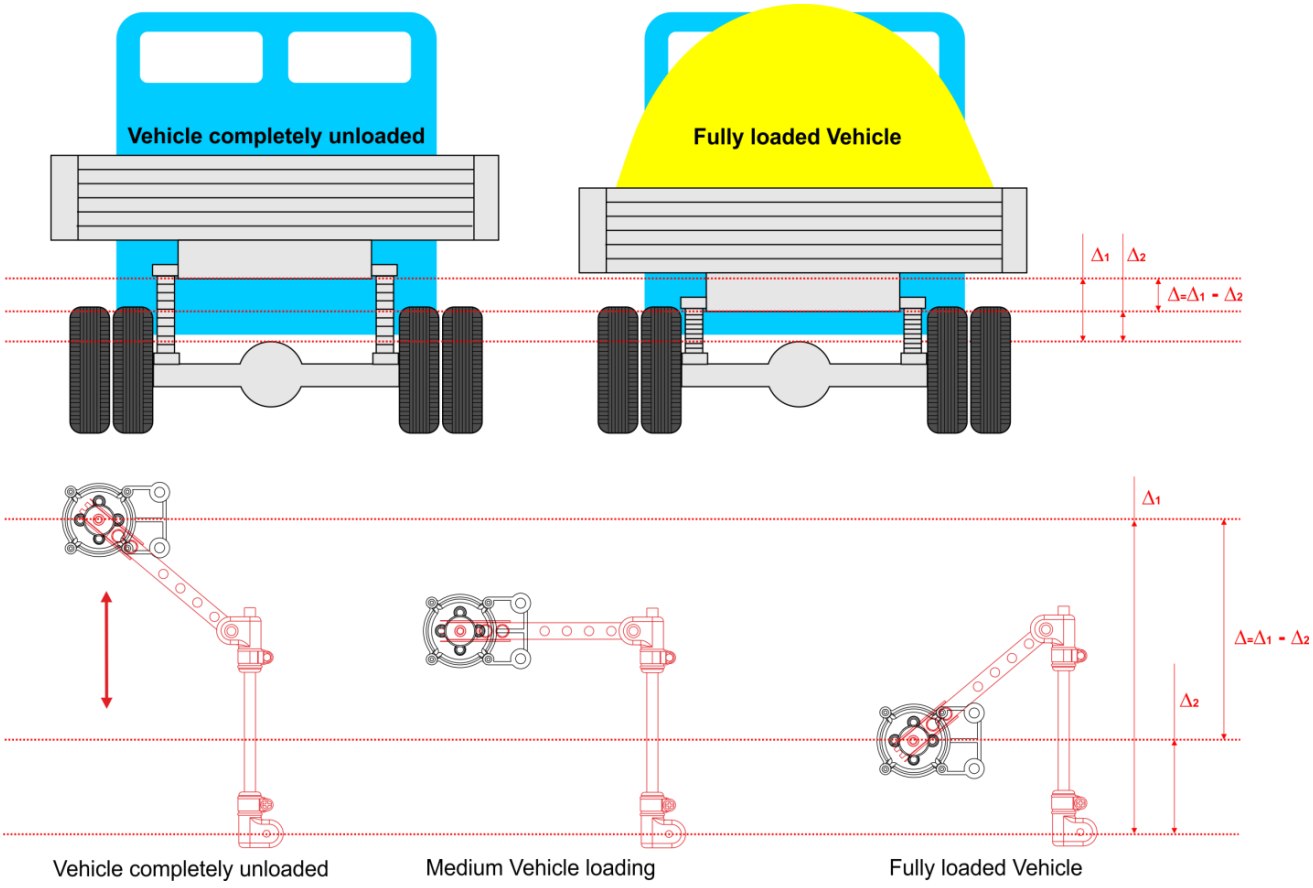


Figure 20 — Defining the Vehicle suspension travel

Initial adjustment of the rod height (**H**) and the lever length (**L**) (see figure 21) should be performed on a completely unloaded Vehicle.

The length of the lever (**L**) can be calculated according to the formula (1)

$$L = 0.8 \cdot \Delta \text{ mm} \quad (1)$$

where **Δ=Δ1-Δ2**, mm — suspension travel defined according to the following values measured with a tape measure:

Δ1, mm – distance from the frame to the monitored axle measured on the completely unloaded Vehicle;

Δ2, mm – distance from the frame to the monitored axle measured on the maximally loaded Vehicle, mm.

You are to perform the final adjustment of the rod height (**H**) and the lever length (**L**) on the maximally loaded Vehicle. To accomplish this, fix the rod coupling with clamps, check the lever position and, if needed, slightly adjust the rod height (**H**) and the lever length (**L**).

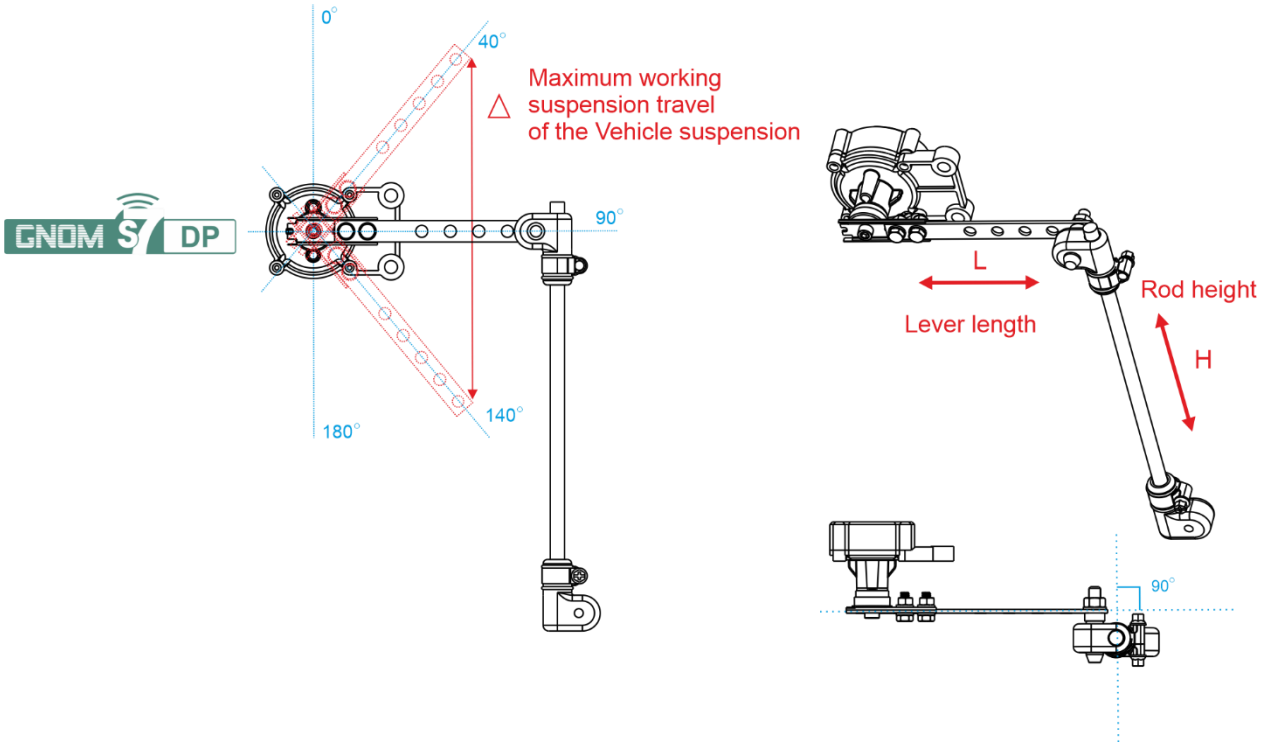


Figure 21 — Adjusting mounting kit rod and lever for sensor mounting

WARNING: Avoid mechanical deformation (bending) of sensor pivoted lever and mounting kit lever and rod when mounting GNOM DP S7.

2.4.3 Stages of mounting the sensor according to the typical scheme for a two-axial Vehicle

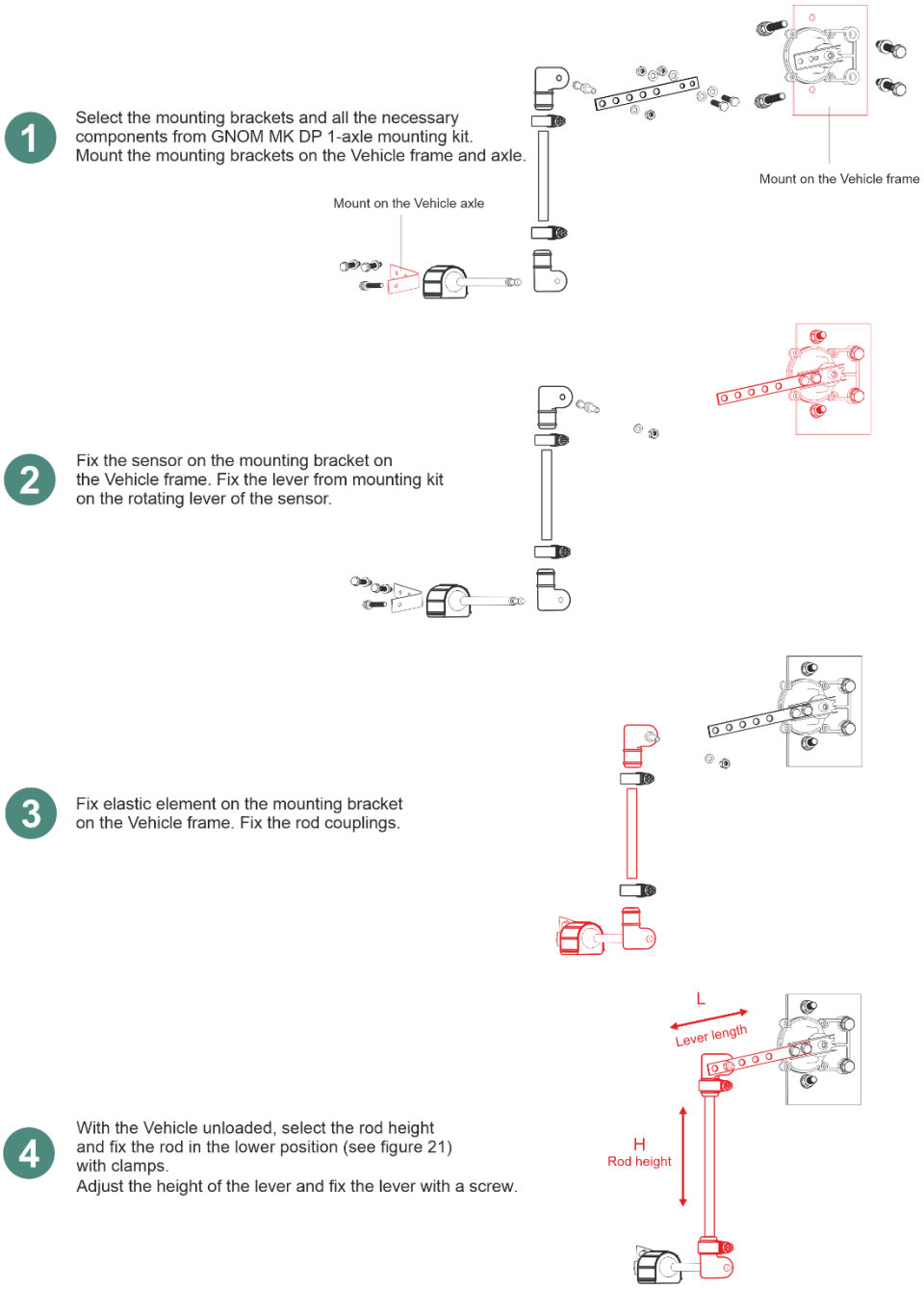


Figure 22 — Stages of mounting GNOM DP S7 according to the typical scheme for a two-axial Vehicle

RECOMMENDATIONS:

1) The mounting bracket for the elastic element from GNOM MK DP 1-axle mounting kit can be screwed to the Vehicle rear axle using standard bolts.

2) The mounting bracket for the sensor can be welded to the Vehicle frame using spot welding.

3) To eliminate the sensor lever throwing over 180°, in case the monitored axle of the Vehicle runs into road bumps, you may use the mounting bracket with limiters of the sensor lever turning angle.

2.4.4 Stages of mounting the sensor according to the typical scheme for a three-axial Vehicle

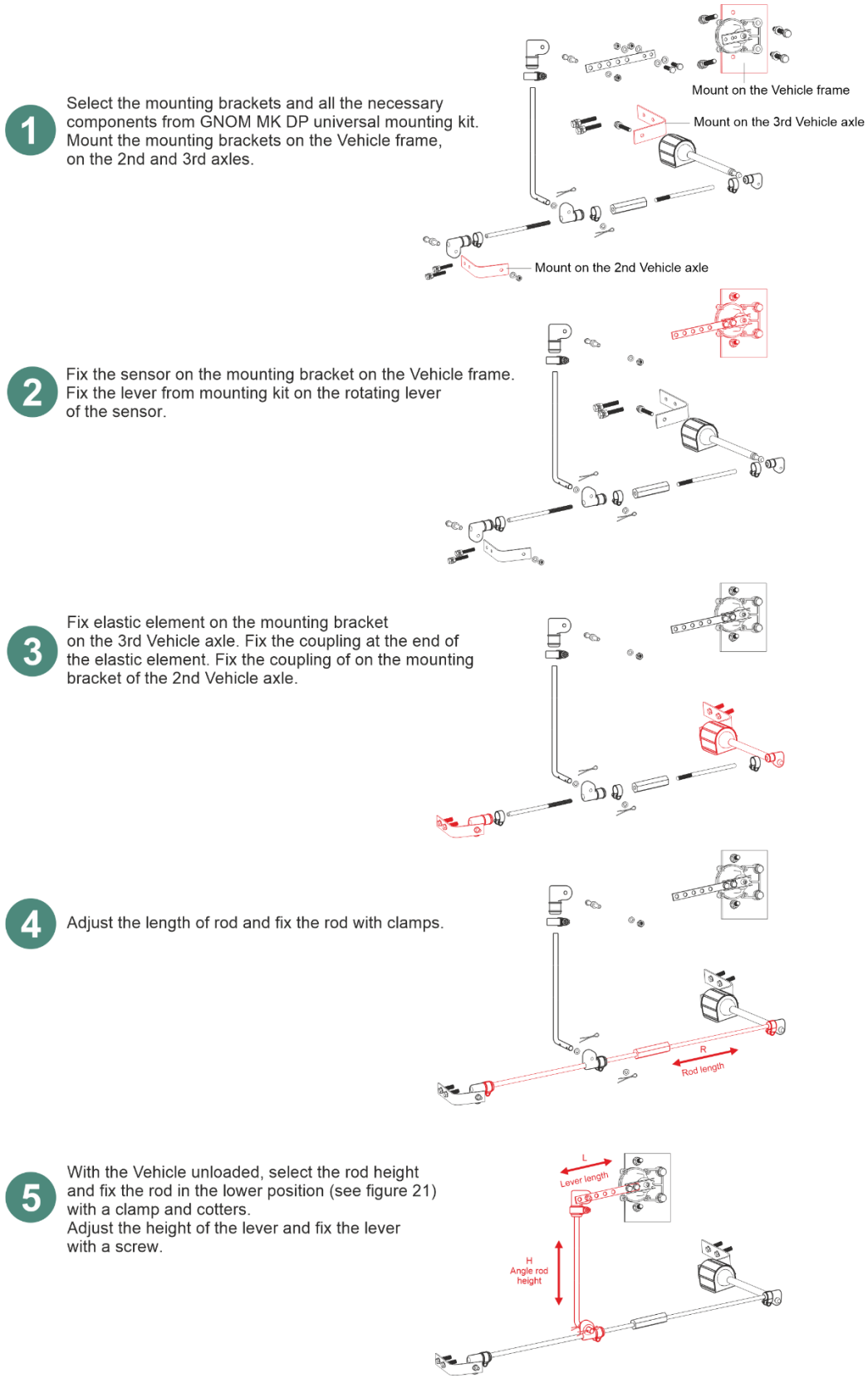


Figure 23 — Stages of mounting GNOM DP S7 according to the typical scheme for a three-axial Vehicle

RECOMMENDATIONS:

1) The mounting brackets for fixing the rods from the GNOM MK DP universal mounting kit can be screwed to the axles of the rear bogie using standard bolts.

2) The mounting bracket for GNOM DP S7 sensor can be mounted using manufacturing holes in the Vehicle frame between the axles of the rear bogie. In case the manufacturing holes are missing in the Vehicle frame, the mounting bracket must be welded in the same place with spot welding.

Photos showing examples of mounting GNOM axle load sensors can be found at https://www.jv-technoton.com/, section Gallery of Mounting Technoton Equipment.

2.5 Wireless transfer of the sensor indications to the Android device

For wireless monitoring of GNOM S7 by means of S7 Technology, first, download the **Axle Load Monitor** on your smartphone/tablet from Google Play (search request "Technoton") and subscribe to it.

IMPORTANT:
1) To eliminate connection failures between the GNOM S7 and the Android device, you need to make sure that there are no sources of electromagnetic interference near your working place (radio telephones, video signal transmission units and other wireless devices operating within 2.4 or 5.0 GHz frequency bands, as well as running electric motors, powerful transformers and switching equipment, welding equipment, high-voltage lines etc).
2) The maximum allowed distance between the GNOM DP S7 and the Android device depends on the quality of the Bluetooth connection of the Android device. To assure the stable data transmission, it is recommended that this distance should not exceed 15 m.

ATTENTION: The description of **Axle Load Monitor** mobile app in this operation manual is not actual anymore. A separate manual was introduced for **Axle Load Monitor** app. Please, refer to Technoton Document Center, where the up-to-date version is available.

2.5.1 BLE-module activation

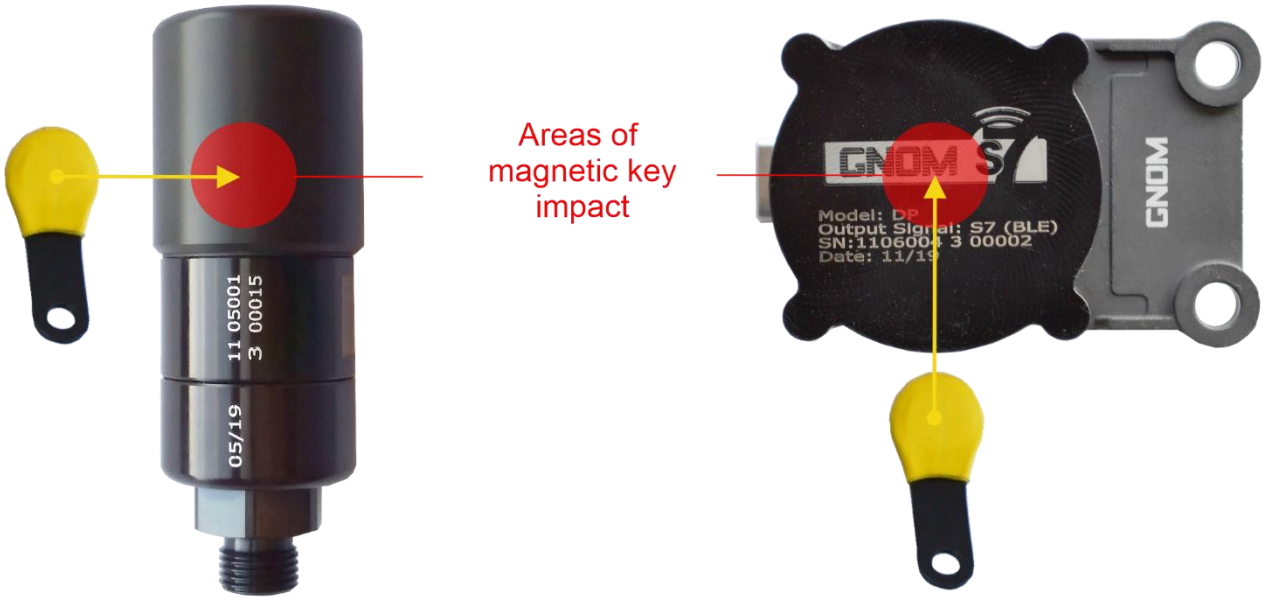
WARNING: The transfer of GNOM S7 indications to the Android device is possible only after activation of the sensor BLE-module!

GNOM S7 has the following modes of operation determined by the status of its BLE-module:

- **"Storage"** — the sensor is in this mode from the moment it is manufactured. The BLE-module of GNOM S7 is disabled, no data transmission at all.

- **"Manufacturing"** — in this mode, the BLE-module of GNOM S7 is activated for data transmission only for the period of the sensor testing or checking its operability with Axle Load Monitor application.
  To activate this mode, you should apply the magnetic key from the delivery set to the corresponding place of the sensor casing for **2...7 s** (see figure 24). After **8 h** or after another touching the indicated place with the magnetic key, the BLE-module of GNOM S7 will switch back into the inactive state.

- **"Operating"** — this mode is activated after mounting GNOM S7 on the Vehicle. In "Operating" mode, BLE-module of sensor becomes active for the remaining lifetime of the sensor without possibility of switching to any other mode. GNOM S7 is ready to transmit data by means of S7 Technology throughout its service life.
  To activate the "Operating" mode, you should apply the magnetic key for **30...40 s** to the place on the sensor casing indicated in figure 24.



a) for GNOM DDE S7 *b) for GNOM DP S7*

Figure 24 — Activation of GNOM S7 BLE-module

2.5.2 Establishment of communication between the sensor and the Android device

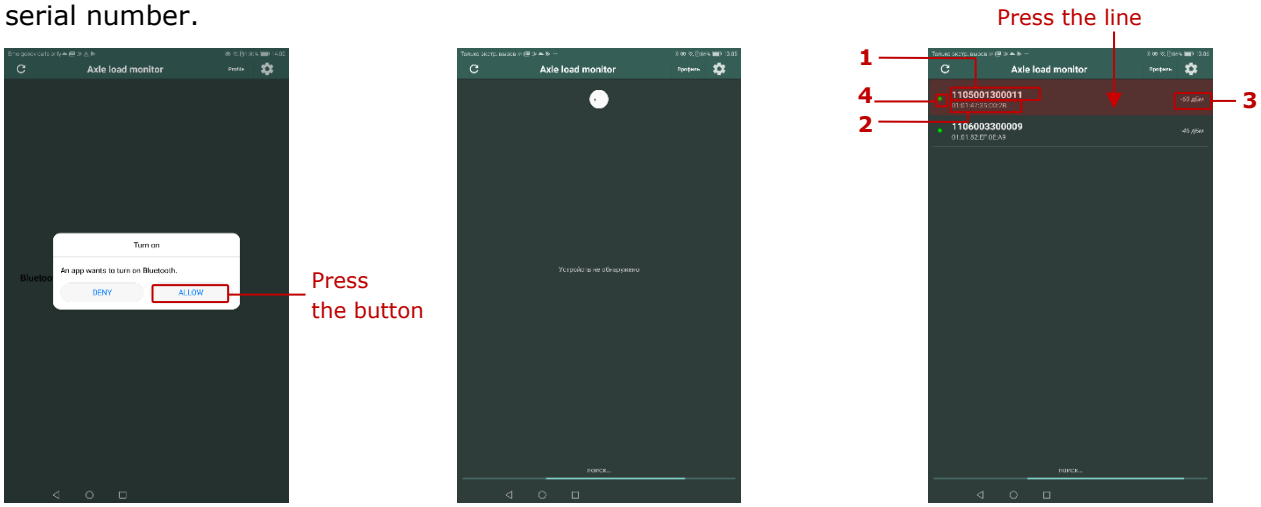
Launch the Axle Load Monitor mobile application with  icon from the main menu of the Android device.

From the moment of BLE-module activation (enabling "Operating"/"Manufacturing" mode) GNOM S7 is ready to operate in mobile application.

Right after it is launched, the Axle Load Monitor will offer to allow enabling the Bluetooth of the Android device (see figure 25 a). After the Bluetooth is enabled, it will search and identify active GNOM S7 (see figure 25 b). Each sensor detected is automatically entered by the application into the list of accessible devices; the following data are being displayed (see figure 25 c):

- serial number **(1)**;
- MAC-address of the BLE-module **(2)**;
- received signal strength indicator (RSSI) **(3)**;
- time the latest message was received **(4)**.

To select the required sensor from the list of accessible devices, press the line containing its serial number.



a) offer to allow the Bluetooth connection

b) search for available devices

c) selecting the sensor from the list of accessible devices for monitoring its readings

Figure 25 — Establishment of connection between GNOM and the Android device with Axle Load Monitor application

During GNOM S7 operation, signals of indicator time of receiving last message from the sensor on the Android device should be displayed in Axle Load Monitor app (see table 8).

Table 8 — Values of signals of time indicator of receiving last message from GNOM S7

Signal type	Signal color	Signal values
	Green	Less than 20 s passed after receiving last message from the sensor
	Yellow	20…40 s passed after receiving last message from the sensor
	Orange	40…60 s passed after receiving last message from the sensor
	Red	More than 60 s passed after receiving last message from the sensor

2.5.3 Interface of Axle Load Monitor application

The interface of Axle Load Monitor application consists of **Information and Configuration Area** and **Tools Panel** (see figure 26).

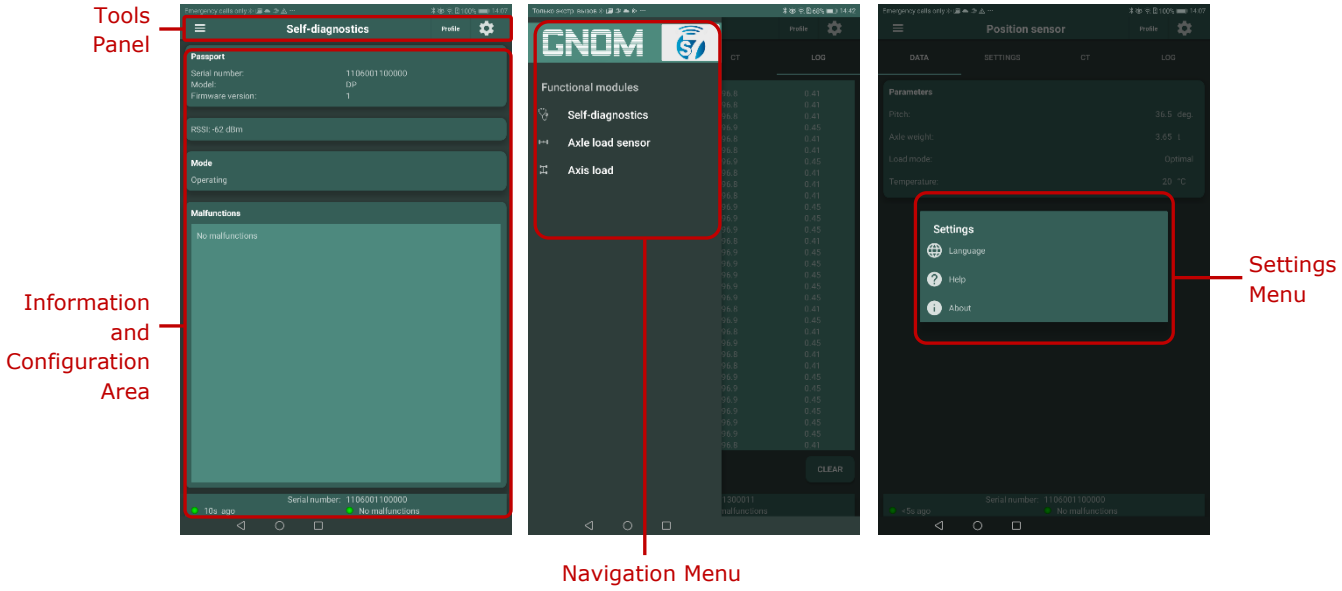
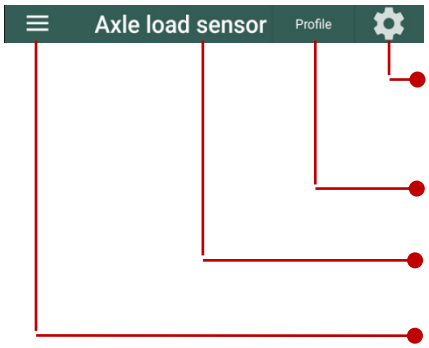


Figure 26 — Interface of Axle Load Monitor application

In the **Information and Configuration** area current parameters and settings of the sensor Functional modules (FM) are displayed.

In the **Tools Panel** area there are the following elements for use during work with mobile application:



- icon to display the **Settings Menu** (selection of the interface language, help and software information);
- button to select operations with the sensor profile;
- name of selected FM of the sensor;
- icon to display the **Navigation Menu** (selecting FM of the sensor, monitoring the axles load indications, drawing the calibration table, malfunction diagnostics etc.).

When working with GNOM S7 Axle Load Monitor mobile app operates with data (PGN and SPN) from S6 databases.

2.5.4 Operations with the sensor profile

Profile is a set of PGN (passport/specification data and configuration of GNOM S7 Functional modules).

To perform any operations with the GNOM S7 profile, the menu **Profile** is used which is opened by pressing the appropriate button on the **Tools Panel** (see figure 27).

The **Profile** menu contains the following options for operations with the sensor profile:

- Load from file — is used to load the profile saved in the memory of the Android device before. In the window where the file is to be loaded you need to find and select the Profile file (**GNOM_S7_*.prf**);
- Save to file — is used to save the changed settings of the profile in the Android device memory;
- Load default profile — is used for loading a profile with standard settings.

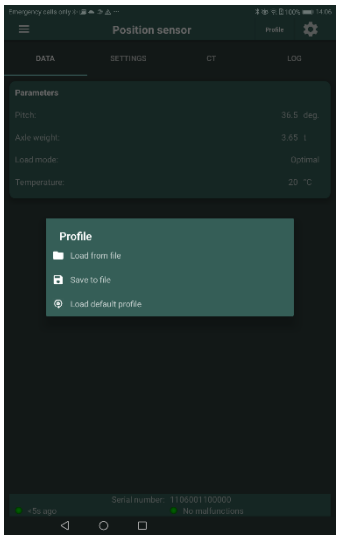


Figure 27 — View of the Profile menu of Axle Load Monitor mobile application

IMPORTANT: All configuration changes made in Axle Load Monitor app are not stored in the sensor, but in memory of Android device. Configuration changes are saved in a file, placed in folder, where mobile application is installed: **\Axle Load Monitor\GNOM_S7_*.prf7**.

Note — If needed, you may save the sensor profile file with the file name which is different from the file name assigned by default. However, in this case, the Axle Load Monitor application will not be able to find automatically the required profile, when the communication with the sensor is established.

* Sensor serial number.

2.5.5 Measuring system calibration

IMPORTANT: For correct monitoring of GNOM S7 sensors readings using the Android device, the **measuring system calibration** procedure before use is obligatory!

In the process of the calibration procedure the calibration table is created for each mounted GNOM S7 sensor. The calibration table determines the dependence of air pressure in the air suspension circuit (measured by GNOM DDE S7) or the lever angular deviation (measured by GNOM DP S7) on various values of the axle load (cargo weight).

Using the calibration table saved in the memory of the Android device, the Axle Load Monitor application calculates the current axle load value (cargo weight).

Depending on the aims of monitoring, the following types of calibration are carried out:

1) "Monitoring the load on the Vehicle axles" — each monitored axle of the Vehicle is weighed separately (irrespective of the number of GNOM S7 sensors installed) and the dependence of indications of each GNOM S7 sensor on different values of the axles load is determined.
Special scales for weighing each axle of a vehicle are used to determine values of the axles load in points of the calibration table.
2) "Monitoring the Vehicle weight" — the dependence of GNOM S7 readings on various values of the Vehicle weight is defined. In order to define the Vehicle weight in points of the calibration table, special scales for vehicles are used; the entire Vehicle climbs on the platform for weighing.
To enhance the accuracy of the cargo weight measurement, we recommend to install two GNOM S7 sensors on one Vehicle: for the road train — on the rear axle (bogie) of the tractor truck and on the axle (bogie) of the semi-trailer. For a standard truck — on the front and on the far rear axles. The process of calibration is identical for each of the monitored axles.

IMPORTANT: During the calibration of the measuring system you must:
1) Load the Vehicle while bearing in mind general health and safety regulations, as well as rules for loading/unloading, locating, and fixing cargo on the platform that are established at a particular road transport company.
2) Discrete cargo must be located "front-back" along the Vehicle platform spreading it as evenly as possible all along the platform. During the weighing of the cargo, the most accurate data can be obtained with bulk or liquid cargo.

You can conduct the calibration using one of the following methods:

1) Loading of given weights (pieces of known weight)

Load weight is calculated according to formula (2)

Load weight = Total weight of loaded pieces (2)

2) Weighing with axle weighing scales

- the most loaded axle of loaded vehicle with unknown weight;

With such calibration the system won't be able to process load weight

- the whole vehicle loaded with unknown weight;

Load weight is calculated according to formula (3)

Load weight = Weight of fully loaded vehicle – Weight of empty vehicle (3)

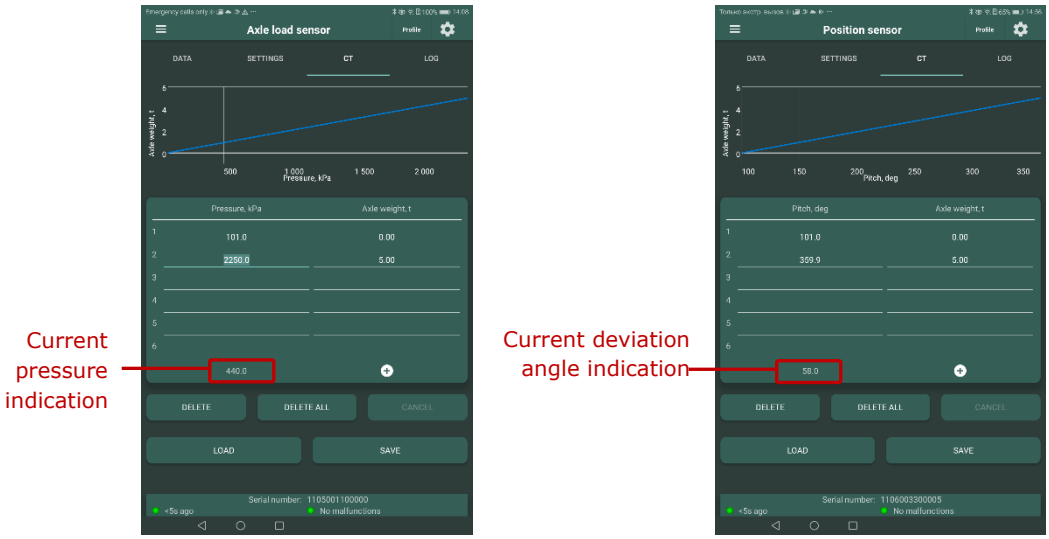
The calibration table is created and saved in the memory of a specific Android device in the Axle Load Monitor application (**Axle load sensor FM** submenu (for GNOM DDE S7) or **Position sensor FM** submenu (for GNOM DP S7), **CT** tab) (see figure 28).

ATTENTION: In case of replacing old Android device, it is necessary to copy profile of particular sensor into memory of new Android device (see 2.5.4) or repeat the calibration procedure of the measuring system.

Select the required GNOM S7 from the list of accessible devices (see 2.5.2).
Calibration points are entered in the form of a table of correspondence of current pressure indications in the Vehicle air suspension circuit (**Pressure, kPa** column for GNOM DDE S7) or the deviation angle (**Pitch, deg** column for GNOM DP S7) to the Vehicle axle load (**Axle weight, t** column).

- To add lines into the calibration table, press ⊕ button. In case of loading additional cargo into the Vehicle platform, the current value of the sensor readings will be displayed on the left of this button. When the button is pressed, this value is automatically entered into the next line.
- New entries are automatically sorted from low to high pressure value. To delete an entry highlight it and click DELETE button.
  Button DELETE ALL is used for deleting all entries of calibration table.
- Clicking SAVE button will allow saving the table as a ***.ttr7** file in memory of Android device.
- To load previously saved table from file click LOAD button (for example, in case of replacement of fuel level sensor).
- As soon as the creation of the calibration table is completed, save the changes of the sensor profile in the Android device memory.
- The calibration of the measuring system is completed.

ATTENTION:
1) The points of the calibration table are to be selected within the range from the minimal axle load (unloaded Vehicle) to the maximum possible (maximally loaded Vehicle).
2) The number of calibration points is in proportion to the axle load measurement accuracy. The recommended number of the calibration points — 2…6. You can enter **up to 30 points** at a maximum in the Axle Load Monitor application. The calibration table should contain at least two points: "completely unloaded Vehicle" and "maximally loaded Vehicle".
3) The maximum possible axle load value in the calibration point is **655 metric tons**.
4) In the process of entering the calibration points, it should be borne in mind that the Axle Load Monitor application displays data with the time lag **no less than 10 s.**



a) for GNOM DDE S7 *b) for GNOM DP S7*

Figure 28 — Example of creating a calibration table in the mobile Axle Load Monitor application

IMPORTANT: While using GNOM S7 as part of the Telematics system, the axle load is calculated by the software of the Server (e.g. ORF 4). In this case, all points of the created calibration table must be entered into the respective settings of the Server software, in accordance with its operation documentation.

2.5.6 Adaptation of indications for specific conditions of exploitation

To monitor the current loading status of the Vehicle, in order to detect its overload/underload, you may specify limits of the Vehicle loading modes in the Axle Load Monitor application. These loading modes are determined by the application, depending on the axles load indications (cargo weight).
In order to specify the limits of the loading modes, select the required GNOM S7 sensor from the list of accessible devices (see 2.5.2).

IMPORTANT: Monitoring the Vehicle loading modes is possible only after recording of the calibration table into the profile of the selected GNOM S7 sensor (see 2.5.5).

In the corresponding fields of the **Settings** tab (see figure 29), (**Axle load sensor FM** submenu (for GNOM DDE S7) or **Position sensor FM** submenu (for GNOM DP S7), enter the limit values of the Vehicle axle load (cargo weight) between the following loading modes:

- "Empty"/"Optimal";
- "Optimal"/"Maximal";
- "Maximal"/"Overload".

Values of axle load (cargo weight) for respective modes of loading, as applied to a specific Vehicle, may be defined by experience or may be found in the Vehicle operation documentation.

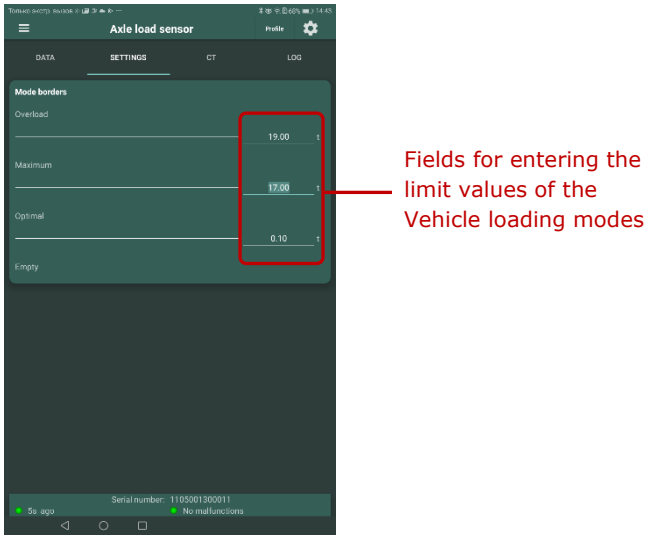
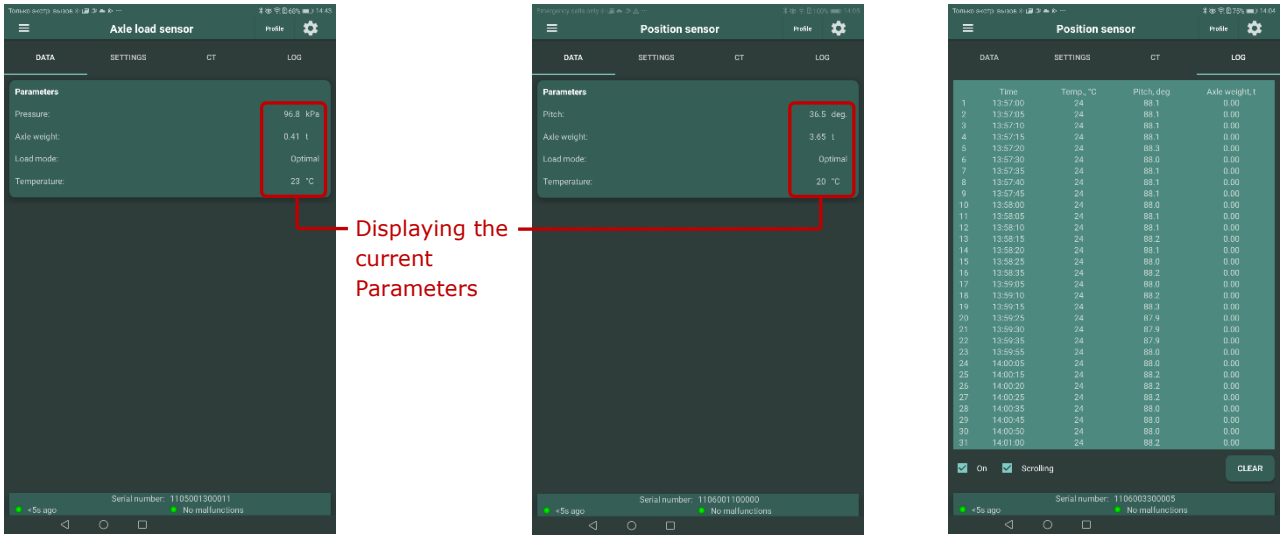


Figure 29 — Example of setting limits for the Vehicle loading modes in the Axle Load Monitor mobile application

2.6 Monitoring of indications using Axle Load Monitor application

To monitor the current sensor indications using the Axle Load Monitor application, select the required sensor from the list of accessible devices (see 2.5.2) and open **Data** tab (**Axle load sensor FM** submenu (for GNOM DDE S7) or **Position sensor FM** submenu (for GNOM DP S7) (see figure 30 a, b).

IMPORTANT: Monitoring GNOM S7 readings using the Axle Load Monitor application is possible only after recording the calibration table into the profile of the selected sensor (see 2.5.5).



a) example for GNOM DDE S7 *b) example for GNOM DP S7* *c) example of logging current Parameters*

Figure 30 — Monitoring the sensors indications in the Axle Load Monitor application

With the Axle Load Monitor application, the user can monitor in real time current values of the following Parameters on the display of the Android device:

- compressed air pressure in the compressed air system (only for GNOM DDE S7);
- angular deviation of the sensor rocking lever (only for GNOM DP S7);
- Vehicle axle load or Vehicle weight (depending on the type of calibration);
- Vehicle loading mode "Empty"/"Optimal"/"Maximal"/"Overload");
- ambient temperature.

For the purpose of the sensors readings analysis, you may activate the registration (logging) of current Parameters values measured by the sensor in the field **On**, **Log** tab (**Axle load sensor FM** submenu (for GNOM DDE S7) or **Position sensor FM** submenu (for GNOM DP S7)) (see figure 30 c) with their recording in the log file **(*.txt)**.

The maximum number of control points displayed — 200. The number of points recorded in the log file — not limited.

Scrolling field serves to display each new line of Parameters added in the lower portion of the **Log** tab.

CLEAR button serves to clear the list of all control points registered during logging.

The recorded log files are automatically placed into the installation folder of the application, in the memory of the Android device (**\Axle Load Monitor\Log**). The log file name is generated automatically and contains the sensor serial number, the current date and time of starting the data recording.

Besides monitoring readings of the main sensor (i.e. GNOM S7 with which the connection is established, in accordance with 2.5.2), you may create the list of additional sensors for monitoring indications in the window of the **Axis load FM** (up to 9 available GNOM S7 of any model). This feature contained in the Axle Load Monitor application is of importance, in case several sensors of different models are installed on one Vehicle (GNOM DDE S7 and GNOM DP S7).

For each sensor, the following Parameters are displayed in the list of additional sensors (see figure 31 a):

- Serial number;
- Profile file name;
- Time of the latest message reception;
- Axle load.

In the lower portion of the window of **Axis load FM** the axle load indication of the main sensor is displayed, as well as total axle load indications of the main and all additional sensors.

The menu which is opened by pressing the line with the number of the required sensor is dedicated for operations with the additional sensor. Using this menu, you may replace or rename the profile of the selected sensor or delete the sensor from the list (see figure 31 b).

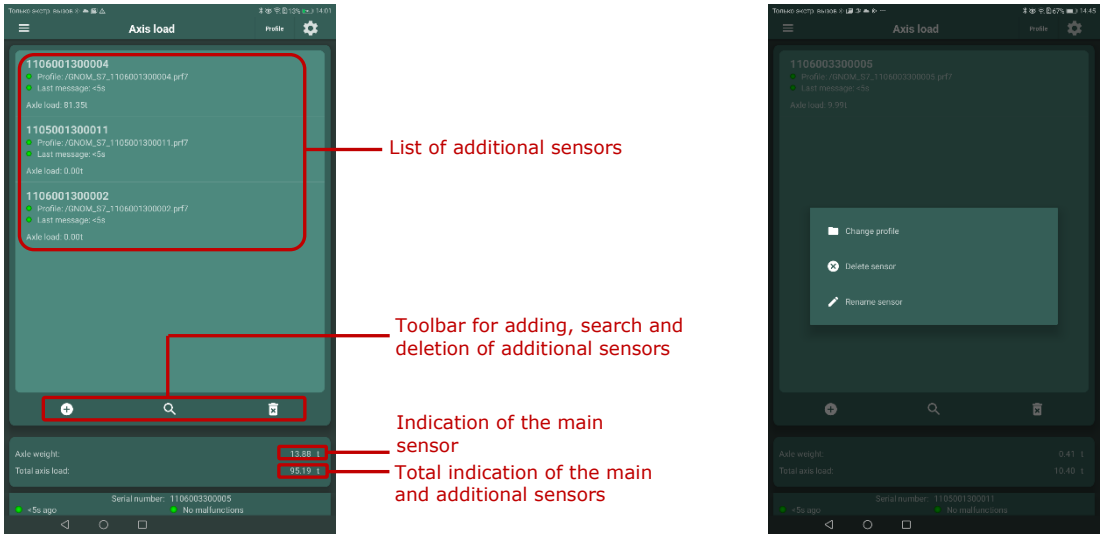
IMPORTANT: Requirements for correct monitoring of indications:

1) The corresponding calibration table must be recorded into the profile of each sensor (see 2.5.5).

2) The profiles files must be saved in the memory of the Android device, in the folder for installation of the Axle Load Monitor application.

3) The profiles files cannot be saved under the name which is different from the file name assigned by default, because in this case, the Axle Load Monitor application cannot automatically find the needed profile during the connection with the sensor.

4) In order to use the created list of additional sensors in the future, you need to save the modified profile of the main sensor.



a) example of displaying the indication in the window of Axis load FM

b) menu for operations with the additional sensor

Figure 31 — Monitoring indications of several sensors at one time in the Axle Load Monitor mobile application

2.7 Sensor operation accuracy check

To estimate the accuracy of operation of GNOM S7 sensor mounted on the vehicle, we recommend to conduct **a control test** the aim of which is to determine the reducial error of the Vehicle axle load measurement.
To estimate the accuracy of axle load measurement, we recommend to use the method of weighing the Vehicle most loaded axle which is loaded with cargo of unknown weight; it should be weighed with truck weighing scales.

The procedure includes the following steps for unknown weight calibration:

1) Load the Vehicle with a cargo (not less than 1/2 of maximum load capacity). The load should be evenly distributed along the vehicle body.
2) Put the most loaded axle on the scales and record the value into report.
3) Unload the vehicle partially (not less than 1/4 of maximum load capacity).
4) Put the most loaded axle on the scales and record the value into report.
5) Load the previously unloaded cargo back to the Vehicle.
6) Put the most loaded axle on the scales and record the value into report.
7) Calculate and record accuracy error values for loaded and unloaded Vehicle into report.

See annex B for a template of check test report and accuracy error calculation formulae.

2.8 Malfunction diagnostics

For quality control of GNOM S7 operation, the indicator of the sensor active malfunctions is permanently displayed in the bottom right portion of the window of the Axle Load Monitor application (see table 9).

Table 9 — Meaning of signals of active malfunctions indicator of GNOM S7

Signal type	Signal color	Signal values
	Green	No active malfunctions detected
	Red	Active malfunctions are detected (see table 3 (for GNOM DDE S7) or table 6 (for GNOM DP S7))

In case there are active malfunctions in the sensor, the malfunction name is displayed in the field **Malfunctions** (**Self-diagnostics FM** submenu). In case there are no active malfunctions, "No malfunctions" message is displayed (see figure 32).

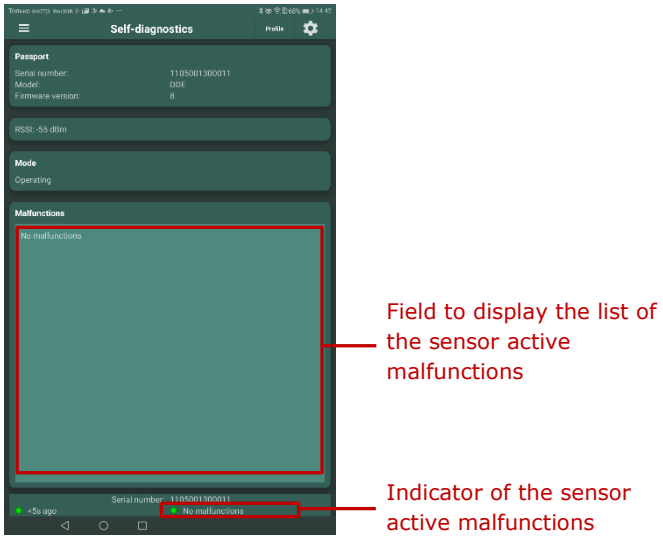


Figure 32 — GNOM S7 quality control in the Axle Load Monitor application

3 Accessories

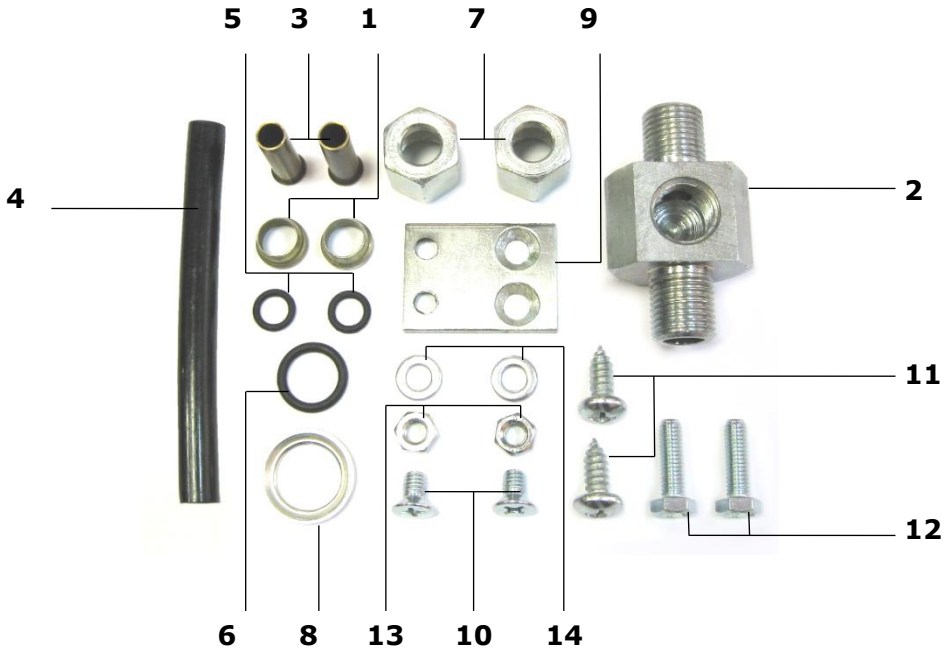
JV Technoton offers to purchase **high quality accessories** for mounting GNOM S7 sensors.

3.1 Mounting kit GNOM MK DDE2

GNOM MK DDE2 mounting kit is designed to mount GNOM DDE S7 sensor in the Vehicle air suspension circuit, in accordance with **mounting schemes 2/3/4** (see 2.3.3).

GNOM MK DDE2 (see figure 33) contains only high-quality components specially designed for use in Vehicle air suspension system.

ATTENTION: Manufacturer reserves the right to change the set of GNOM MK DDE2 and replace the components with equivalent without prior customer notice.



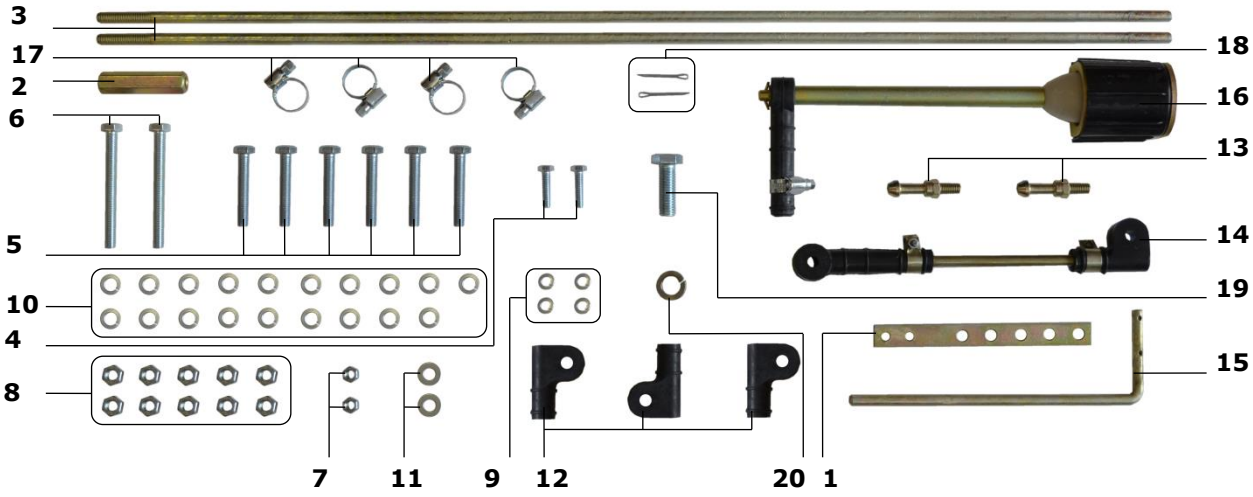
1	Conical sleeve	- 2 pcs.;
2	Fitting adapter (T splitter)	- 1 pc.;
3	Nipple	- 2 pcs.;
4	Pipeline Ø=8 mm	- 1 pc.;
5	O-ring	- 2 pcs.;
6	O-ring	- 1 pc.;
7	Swivel nut	- 2 pcs.;
8	Washer 16	- 1 pc.;
9	Mounting bracket	- 1 pc.;
10	Screw M6x8	- 2 pcs.;
11	Self-tapping screw 6.3x13	- 2 pcs.;
12	Bolt M6x20	- 2 pcs.;
13	Nut M6	- 2 pcs.;
14	Washer M6	- 2 pcs.

Figure 33 — Mounting kit GNOM MK DDE2

3.2 Mounting kit GNOM MK DP universal

Mounting kit **GNOM MK DP universal** (hereinafter GNOM MK DP universal) is used for GNOM DP S7 mounting on three–axial Vehicles with leaf spring suspension. See figure 34 for GNOM MK DP universal contents.

GNOM MK DP universal contains only high-quality components designed for mounting on Vehicles.



1	Lever	- 1 pc.;
2	Sleeve	- 1 pc.;
3	Rod	- 2 pcs.;
4	Bolt M6x25	- 2 pcs.;
5	Bolt M8x50	- 6 pcs.;
6	Bolt M8x80	- 2 pcs.;
7	Nut M6	- 2 pcs.;
8	Nut M8	- 10 pcs.;
9	Spring washer M6	- 4 pcs.;
10	Spring washer M8	- 19 pcs.;
11	Washer M8	- 2 pcs.;
12	Rod coupling	- 3 pcs.;
13	Pivot bolt	- 2 pcs.;
14	Regulator rod	- 1 pc.;
15	Angular regulator rod	- 1 pc.;
16	Elastic element	- 1 pc.;
17	Clamp	- 4 pcs.;
18	Cotter	- 2 pcs.;
19	Bolt M12x35	- 1 pc.;
20	Spring washer M12	- 1 pc.

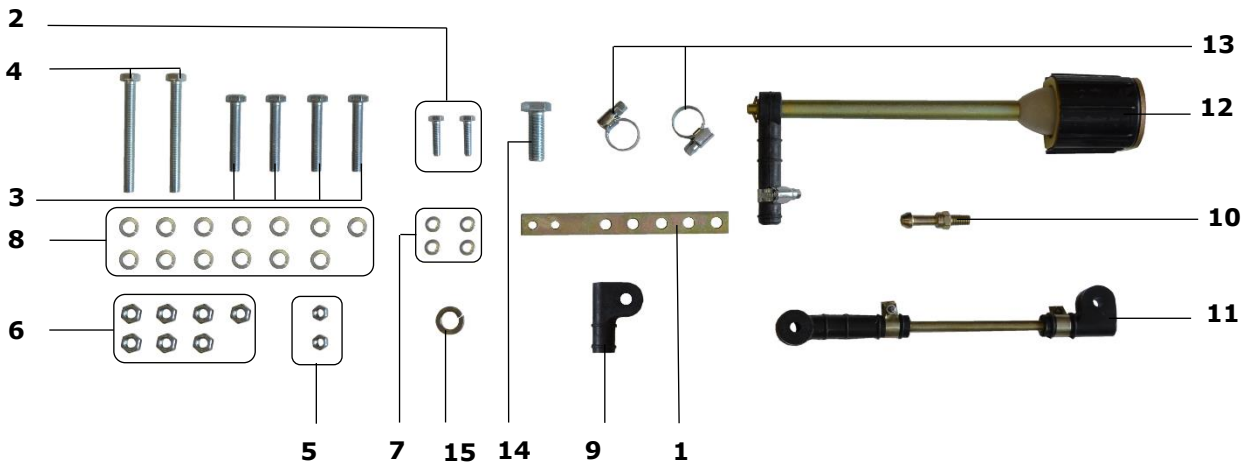
Figure 34 — Mounting kit GNOM MK DP universal contents

ATTENTION: Manufacturer reserves the right to change the set of GNOM MK DP universal and replace the components with equivalent without prior customer notice.

3.3 Mounting kit GNOM MK DP 1-axle

Mounting kit **GNOM MK DP universal** (hereinafter GNOM MK DP 1-axle) is used for GNOM DP S7 mounting on two–axial Vehicles with leaf spring suspension. See figure 35 for GNOM MK DP 1-axle contents.

GNOM MK DP 1-axle contains only high-quality components designed for mounting on Vehicles.



1	Lever	- 1 pc.;
2	Bolt M6x25	- 2 pcs.;
3	Bolt M8x50	- 4 pcs.;
4	Bolt M8x80	- 2 pcs.;
5	Nut M6	- 2 pcs.;
6	Nut M8	- 7 pcs.;
7	Spring washer M6	- 4 pcs.;
8	Spring washer M8	- 13 pcs.;
9	Rod coupling	- 1 pc.;
10	Pivot bolt	- 1 pc.;
11	Regulator rod	- 1 pc.;
12	Elastic element	- 1 pc.;
13	Clamp	- 2 pcs.;
14	Bolt M12x35	- 1 pc.;
15	Spring washer M12	- 1 pc.

Figure 35 — Mounting kit GNOM MK DP 1-axle contents

ATTENTION: Manufacturer reserves the right to change the set of GNOM MK DP 1-axle and replace the components with equivalent without prior customer notice.

4 Packaging

GNOM S7 delivery sets come in cardboard boxes of the following shape (see figure 36).

a) GNOM DDE S7 *b) GNOM DP S7*

Figure 36 — Sensors packaging

Label sticker with information on the product name, serial number, firmware version, manufacture date, weight as well as Quality Control seal and QR code is stuck on two sides of the GNOM S7 box (see figure 37).

a) GNOM DDE S7 *b) GNOM DP S7*

Figure 37 — Packaging label

Note — Label design and contents can be modified by the Manufacturer.

5 Storage

GNOM S7 is recommended to be stored in dry enclosed areas.

GNOM S7 storage is allowed only in original packaging at the temperature range from +10 to +30 °C and relative humidity from 45 % to 75 % at +25 °C.

Do not store GNOM S7 in the same room with substances that cause metal corrosion and/or contain aggressive impurities.

GNOM S7 shelf life must not exceed 24 months.

6 Transportation

Transportation of GNOM S7 is recommended in closed transport that provides protection for GNOM S7 from mechanical damage and precipitation.

When transporting by air, GNOM S7 must be stored in heated pressurized compartments.

Air environment in transportation compartments should not contain acid, alkaline and other aggressive impurities.

Shipping containers with packed GNOM S7 sensors should be sealed.

7 Utilization/re-cycling

GNOM S7 does not contain precious metals in amount that should be recorded.

The inbuilt lithium-thionyl chloride battery of GNOM S7 contains harmful substances and components that are hazardous to human health and environment.

Battery must not be disposed of together with general domestic waste.
The Buyer is responsible for the disposal of battery by means of its delivery to the special hazardous waste collecting center; this will ensure safety for human health and environment.

Technoton bears no responsibility for any non-compliance with the above disposal and recycling requirements for battery.

Contacts

Distribution, technical support and service

sales@jv-technoton.com

support@jv-technoton.com

Annex A
Cargo weight monitoring

Fleet operator can monitor carried cargo weight of vehicles equipped with axle load sensors.

Mounting sensor on each axle of the vehicle is not always possible from technical point of view and is not economically feasible. Front axle load which is created by the weight of the driver's cabin and Vehicle engine is insignificant comparing with rear axle (rear bogie) load created by the weight of the vehicle body (loading platform) and carried cargo. That is why a single sensor should be mounted on **the most loaded axle.**

The most loaded axle of two-axial vehicles is the rear one. The rear bogie is most loaded on three-axial vehicles (see figure A.1).

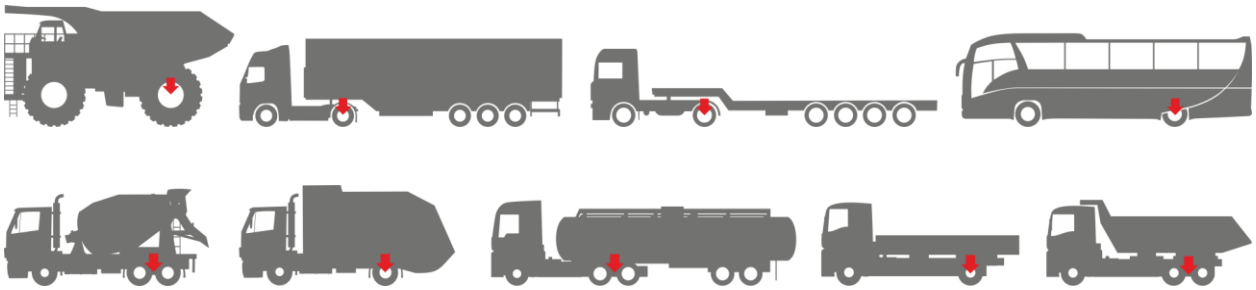


Figure A.1 — Most loaded axle of various Vehicles

Processing the axle load data the Server can estimate approximate cargo weight for different types of Vehicles (see tables A.1 and A.2).

Table A.1 — Cargo weight estimation for two-axial truck with three-axial semitrailer by truck rear axle load value

Axle load*, tons	**Approximate cargo weight**, tons**	**Note**
Less than 2	—	Wrong calibration
2.3		Semitrailer unhitched
4	0	Semitrailer hitched
6	9.0…9.5	
8	18…19	
10	27…28	

* This chart compiled for MAZ 5440 truck. These characteristics may differ for other Vehicles.

** If the vehicle has isolated suspension circuits for left and right sides, then specified values will be valid only for a uniform distribution of load across the vehicle body.

Table A.2 — Carried load weight estimation for three-axial dump truck by rear bogie load value

Rear bogie load, tons	Approximate cargo weight, tons
Less than 7	0
10	3.5…4.0
13	6.5…7.0
16	9.5…10.0
19	13.0…13.5
22	16.5…17.0
25	19.5…20.0

Performing calibration procedure with the loads of given weight (see 2.5.5) provides much more accurate characteristics of axle (rear bogie) load versus carried load weight.

Annex B

Template of check test report

Report on axle load measurement accuracy test

Date _____

GNOM DDE S7 serial number	
Vehicle type, model, registration number	

Axle load on the fully loaded vehicle	According to truck scales indication M_{loaded}, tons	
Axle load on unloaded vehicle	According to truck scales indication M_{scales}, tons	
	According to the Android device indication $M_{Android}$, tons	
Accuracy error of axle load measurement of unloaded vehicle	Absolute $\Delta = M_{Android} - M_{scales}$, tons	
	Reduced to the axle load of the loaded Vehicle $\delta = \frac{M_{Android} - M_{scales}}{M_{loaded}} \cdot 100$, %	
Axle load on loaded vehicle	According to truck scales indication M_{scales}, tons	
	According to the Android device indication $M_{Android}$, tons	
Accuracy error of axle load measurement of loaded vehicle	Absolute $\Delta = M_{Android} - M_{scales}$, tons	
	Reduced to the axle load of the loaded Vehicle $\delta = \frac{M_{Android} - M_{scales}}{M_{loaded}} \cdot 100$, %	

Resume:

The results of axle load measurement **match/do not match** specifications.

Comments: _____

_____

Representative of the CUSTOMER _____/_____/

Representative of the CONTRACTOR _____/_____/

Annex C
Electromagnetic compatibility of BLE-module of GNOM S7

BLE-module installed in GNOM S7 is certified and found to comply with:

- FCC Rules Part 15 (marking on sensor — Contains FCC ID: S9NSPBTLERF);
- IC Rules, RSS-210 (marking on sensor — Contains IC: 8976C-SPBTLERF).

WARNING: Any changes or modifications of BLE-module, which are not approved by the party responsible for compliance with FCC and IC certificates, may deprive the user of the sensor of the right to operate it.

1) BLE-module complies with the restrictions for Class B digital device in accordance with Part 15 of the FCC Rules and RSS-210 of the IC Rules.

These restrictions are used for providing protection from harmful interference when operating in residential premises. BLE-module generates and can transmit/receive radio frequency energy. If it is not installed and is not used in accordance with the instructions, it may cause harmful interference to radio communication. There is no guarantee that interference will not occur in a particular installation. If BLE-module creates harmful interference to the reception of radio or television signals, what can be determined by turning BLE-module on and off, it is recommend for a user to try to eliminate the interference in one or more of the following ways:

- change the direction or location of the receiving antenna;
- increase the distance between the equipment and the receiver;
- plug the equipment into an outlet on a circuit different from that to which receiver is connected;
- contact the dealer or an experienced radio / television technician for a help.

2) BLE-module complies with the restrictions for Class A digital device in accordance with Part 15 of the FCC Rules and RSS-210 of the IC Rules.

These restrictions are designed to provide reasonable protection against harmful interference when the BLE-module is operated in a commercial environment. BLE-module generates and can transmit / receive radio frequency energy. If it is not installed and is not used in accordance with the instructions, it may cause harmful interference to radio communication. Operation of BLE-module in a residential area may cause harmful interference in which case the user will be required to correct the interference at his own expense.

Annex D
Videography

1) Video "GNOM DP S7 axle load sensors, diving basics"

A common thing for Technoton technicians is to conduct "survival" experiments on our telematics hardware. We conducted an experiment on a new axle load sensor GNOM DP S7. In the morning we had put the sensor into the water, and in the afternoon get the sensor out of the water and checked out water impermeability — after 7 hours spent in the water, GNOM DP S7 worked as if nothing had happened! The sensor still showed the correct angles and temperature.

https://www.youtube.com/watch?v=27VpRVeGpIU

2) Video "GNOM DP S7 axle load sensor: game of ice"

We conducted another experiment: sent the sensor for 3 days to the freezer! When GNOM S7 sensor was pulled out, it showed -23 °C, and continued to display correct data values.

https://www.youtube.com/watch?v=hRnEOcNWJlE

3) Video "Axle load monitoring for leaf spring suspension. Demo stand"

https://www.youtube.com/watch?v=ZEPp5FCZcBY

4) Video "Axle load monitoring for air suspension. Demo stand"

https://www.youtube.com/watch?v=eUsBp1qRhwY

5) Animation "GNOM DP position sensors. Mounting and application".

The animation shows sensor mounting schemes for biaxial and threeaxial vehicles as well as instance of the diagrams built on sensor data in vehicle monitoring system.

https://www.youtube.com/watch?v=9njffVByJoq

6) Other JV Technoton **videos** are on the YouTube channel which is regularly updated:

https://www.youtube.com/channel/UCq7EF3DHrgl7fOWB2ynsR-A