DFM FUEL FLOW METERS

DFM i fuel consumption indicator

SK DFM service kit

OPERATION MANUAL
(includes Service DFM and Service S6 DFM software manuals)

Version 5.0

[Company logos and certificates]
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Terms and Definitions

GPS is a US-made satellite geographical positioning system. Signals from GPS satellites enable the Customer’s GPS receiver to calculate its current geographical coordinates, speed and its travel direction.

GLONASS is a Russian-made navigation system. Its basic difference from the GPS system is that the orbital rotation of GLONASS satellites is not synchronous with the rotation of the Earth and this provides for their greater stability.

CAN (Controller Area Network) is a digital bus-type interface that complies with ISO 11898-1:2003 International Standard. Various high-level protocols such as J1939, CANopen, DeviceNet, CAN Kingdom etc. may be used to transmit data. CAN bus is designed to integrate various electronic control units and sensors into a single network both in industrial automation systems and in the automobile industry. Vehicle CAN bus is widely used to obtain vehicle operation data in GPS/GLONASS vehicle tracking systems.

K-Line is a diagnostic interface for data exchange between electronic control units (ECU) and diagnostic port of the vehicle. Is used in ISO 9141 and ISO 14230 protocols which are the part of OBD-II standard. According to ISO 9141 protocol L-Line is used to send requests to ECU and K-Line is used to receive diagnostic data from ECU. According to ISO 14230 protocol L-Line is not used while K-Line works for both directions (sending requests and receiving data from ECU). K-Line is as well used for configuration of DUT-E AF and DUT-E CAN fuel level sensors, DFM fuel flow meters and other telematics hardware.

Modbus is an open communication protocol built on master-slave architecture. Is widely used for communication between electronic devices. Can be used for data transmission through serial RS-232, RS-485, RS-422 interfaces and TCP/IP networks.

PGN (Parameter Group Number) parameter group number that determines the contents of particular CAN bus message according to SAE J1939. PGN acronym is used for identification of CAN bus messages.
S6 is the vehicle onboard data bus developed by TECHNOTON to enable integrating the GPS/GLONASS-based vehicle monitoring system into the vehicle electrical equipment. It comprises a set of cables, interfaces and protocols. Physically, it is implemented on the basis of CAN 2.0B (ISO 11898-1:2003) and K-Line (ISO 9141). S6 bus data exchange protocol complies with SAE J1939 International Standard.

To get more details on S6 telematics bus visit http://s6.jv-technoton.com.

SPN (Suspect Parameter Number) is the number of particular parameter of CAN bus message according to SAE J1939. Each SPN has its determined name, number of data bytes, type of data, numerical value. SPN acronym is used for identification of parameters of CAN bus messages.

Protocol is a set of logic-level conventions that enables to establish a connection and carry out data exchange between two or more devices connected to this network. These conventions establish a uniform method of data transmission and elimination of errors.

Tracking device is an element of the vehicle tracking system performing the functions of reading data from standard and additional sensors mounted on the vehicle by the manufacturer, reception of signals of coordinates from navigation satellites and transmission of data to the Service Server.

Transport telematics (Vehicle telematics) is a satellite vehicle monitoring based on GPS/GLONASS navigation systems and technologies and hardware of cellular and/or radio communication and digital maps. It is used for optimization of logistics and in automated fleet operation systems.

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) is a built-in hardware and software part of the devices which does not have its own housing (for example a part of a tracking device or DFM fuel flow meter with digital output interface)

S6 Unit is an element of vehicle on-board equipment compatible with S6 bus.
Introduction

The Operation Manual contains guidelines and rules which refer to **DFM fuel flow meters** (hereinafter **DFM**), **SK DFM service kit** (hereinafter **SK DFM**) and **DFM i fuel consumption indicator** (hereinafter **DFM i**), developed by JV **Technoton**, Minsk, Belarus.

The manual contains information on design, operation principle, specifications and instructions on installation, use and maintenance of DFM and DFM i. The manual defines SK DFM connection and usage guidelines as well as Service DFM utility (version 4.0 and higher) and Service S6 DFM utility (version 1.4 and higher) installation and use.

DFM is a precise tool for fuel consumption measurement. DFM can be used independently and as a part of GPS/GLONASS vehicle tracking system.

DFM i records and displays data received from the fuel flow meter with pulse output.

SK DFM provides connection of DFM (DFM i) and PC for configuration and troubleshooting.

**DFM features:**

- conformity with European and national automotive standards and directives;
- protected from unauthorized tampering and "cheating"*;
- engine working time tracking separately for different operation modes;
- maximum information richness of output data**;
- high reliability of data transmission over digital interfaces **;
- unique self-diagnostics feature to monitor the stability and accuracy of data**;
- possibility of integration into on-board telematics bus of vehicles ***;
- built-in mud filter;
- minimum fluid flow resistance;
- 100 % of DFM are verified with a certified metrological test rig;
- full set of high-quality mounting accessories;
- great operating experience;
- high-quality technical support;
- affordable price.


** DFM A232/C232/D232/A485/C485/D485/ACAN/CCAN/DCAN.

*** DFM ACAN/CCAN/DCAN.
See Figure 1 for identification codes for DFM ordering:

**Figure 1 — DFM order identification codes**

**Example of DFM order identification codes:**

**“DFM 50B fuel flow meter”,**
(max. flow rate 50 l/h; model with display).

**“DFM 100AK fuel flow meter”,**
(max. flow rate 100 l/h; no display; normalized pulse output).

**“DFM 500C232 fuel flow meter”,**
(max. flow rate 500 l/h; built-in display; RS-232 output).
SK DFM service kit is required for configuration of DFM AK/A232/A485/ACAN/CK/C232/C485/CCAN/D/D232/D485/DCAN series and DFM i. Service kit is optional and ordered separately.

**ATTENTION:** It is strongly recommended to follow strictly the instructions of the present Manual when using, mounting or maintaining DFM, DFM i and SK DFM.

The Manufacturer guarantees DFM 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 DFM specifications that do not lead to a deterioration of the consumer qualities without prior customer notice.
1 DFM general information and technical specifications

1.1 Purpose of use and application area

DFM fuel flow meters are designed to measure fuel consumption of vehicles and stationary objects.

**Figure 2 — DFM application**

**Application area** — DFM fuel flow meters are used both autonomously and in GPS/GLONASS vehicle monitoring and fuel consumption control systems (see Figure 3).

*a) in GPS/GLONASS vehicle monitoring and fuel consumption control system*
DFM Fuel Flow Meters
Operation Manual. Version 5.0

DFM general information and technical specifications / Purpose of use and application area

Figure 3 — DFM application

DFM are mounted into fuel supply line of the vehicle engine. DFM measure actual (instant) fuel consumption rate and generates an output signal to forward it to a vehicle tracking device (see Figure 3 a).

Tracking device records and processes DFM data for further transmission to the telematics server. Server software processes and analyzes the received data to generate analytical reports for a selected period of time.

DFM with pulse output provide data on fuel volume actually consumed by vehicle engine (total fuel consumption and average hourly consumption).

See Figure 4 for an example of instant fuel consumption diagram built on DFM data.

* Only for DFM ACAN/CCAN/DCAN.
DFM with digital output interface besides total and instant fuel consumption rate provide real-time data on the following parameters:

- engine operation time — total and in each operation mode;
- fuel consumption — total and in each operation mode;
- flow meter specification data – serial number, production date, total operation time and operation time while powered from built-in battery;
- malfunctions;
- attempts of unauthorized impact on flow meter operation.

Using J1939 output protocol makes possible DFM CAN operation as a part of telematics bus together with DUT-E CAN fuel level sensors and other factory-built or additional equipment (see Figure 3 b). Tracking device with a single CAN interface port can receive data from up to 8 DUT-E CAN sensors and up to 4 DFM CAN meters. This feature makes possible monitoring of vehicle engine as well as engines of vehicle additional equipment.

Use of DFM provides vehicle owners with the following:

- actual fuel consumption records;
- registration of machinery working time;
- normalizing of fuel consumption quotas;
- fuel theft detection and prevention;
- real-time monitoring and fuel consumption optimization;
- fuel consumption tests for engines.

Figure 4 — Instant fuel consumption diagram built on DFM data
1.2 Exterior view and delivery set

DFM delivery set includes (see Figure 5):

1. DFM fuel flow meter - 1 pc
2. iButton key* - 1 pc
3. 7.5m connection cable ** - 1 pc
4. Verification certificate - 1 pc
5. Specification - 1 pc

* for DFM meters with built-in display
** for DFM meters with pulse interface output. Cable for DFM with RS-232, RS-485 and CAN 2.0B digital interfaces ordered separately (see Table 21).

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