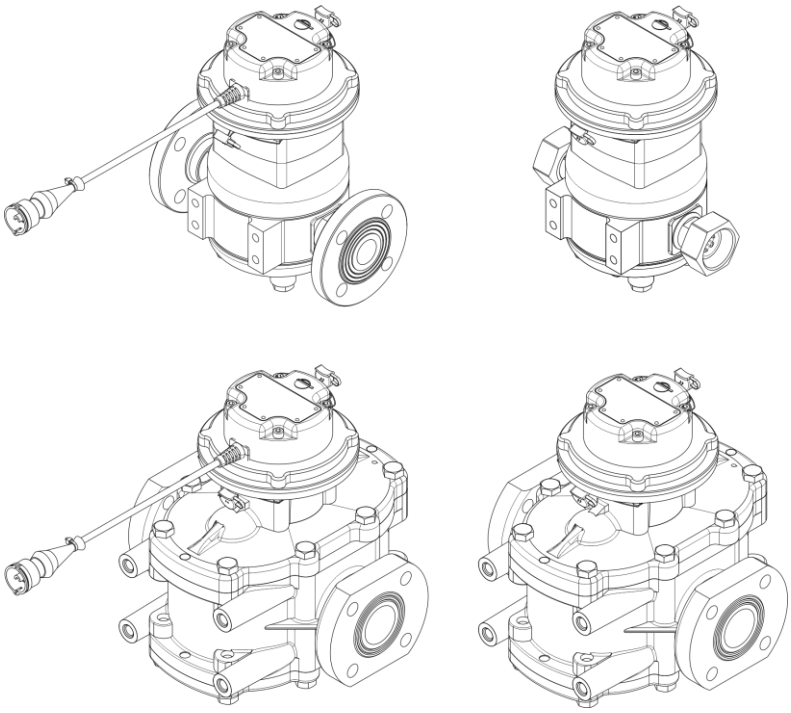
FLOW METERS



DFM Industrial 7/25

OPERATION MANUAL

Version 2.1

TECHNOTON

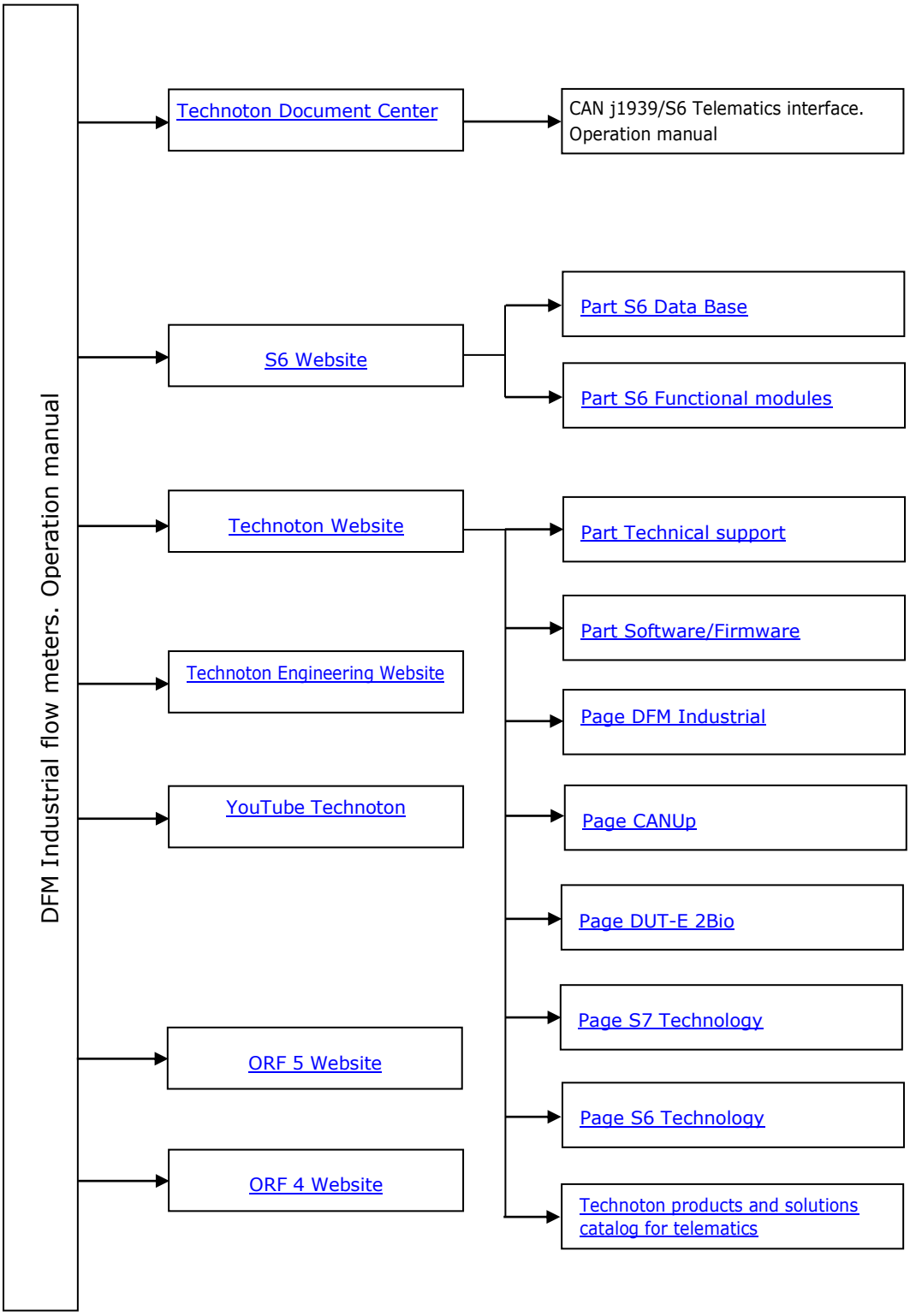
ADVANCED MACHINERY TELEMATICS

Contents

Revision history

Version	Date	Editor	Description of changes
1.0	02.2019	OD	Basic version.
2.0	03.2022	OD	• Improvements of the flow meters design (updated electronic unit, rotating flanges for DFM Industrial 7). • The flow meters specifications updated. • List of output messages is updated; composition of data transferred by the flow meter via CAN j1939/S6 interface is provided. • "Display Industrial" Functional module is introduced. • Settings of the flow meters displayed and/or edited using DFM Industrial (v.1.5) service software during differential measurement are updated: - attenuating buffer; - displaying charts of differential instant consumption and consumption in the feed and reverse lines etc. in one window is added. • Minimal requirements to the PC for work with Service DFM Industrial service software are added. • Procedure for elimination of a possible problem of starting Service DFM Industrial service software in Windows 10 is provided. • Flow meters' model codes are updated. • Changes in the delivery set. • Information on the flow meters testing is updated. • Information on packing is introduced. • Examples of schemes for DFM Industrial CCAN flow meters connection are updated. • Provisions of the procedure for the flow meters recycling are clarified.
2.1	10.2023	OD	Information on resetting clearable Counters of DFM Industrial CCAN flow meters by means of S6 Technology with the help of PGN 63080 command is added.

Structure of external links



Terms and Definitions

IoT Burger is the Technology of creating smart sensors and complex telematics IIoT devices operating in real time with built-in analytic features (further on – IoT Burger). The basis of IoT Burger is the software/hardware core, a set of ready-to-use universal Functional Modules, the database of standartized IoT parameters.

Particular features of IoT Burger:

- Inbuilt analytic features for maximum treatment of signals within the device itself.
- A possibility to design devices with extremely low power consumption.
- Doesn't require programming in the majority of applications, flexible setup.
- Using inexpensive industrially manufactured equipment parts.
- Measurement and treatment of "quick" processes which is impossible to implement using cloud technologies.
- An option of ready Reports delivery to the user avoiding server platforms.
- The inbuilt system of data authenticity assurance (self-diagnostics, authorization, impact control).

The technology provides for the availability of several measurement channels in any device including pre-set analytical treatment (filtration, linearization, thermal compensation) and the controlled error of measurement.
Devices created using IoT Burger may be united to form a wire-connected or wireless connection network. Data may be transmitted to the telematics server, to popular IoT platforms, by SMS, E-mail, to social networks.
At present, 2G/3G/LTE/NB-IoT/Wi-Fi/BLE data transmission standards are used in devices with IoT Burger. The reports transmitted contain data on instant and average values of Parameters, Counters, Events. The flexible system of Reports setup enables the user to select the optimal ratio of the data completeness and the volume of traffic.
DFM Industrial flow meters are designed using IoT Burger Technology.

S7 — Technology designed for wireless collection of data from unattended sensors in systems of industrial and automobile Telematics. S7 Technology is recommended for use in facilities where wiring is impossible or hard to install.
S7 Technology implements Bluetooth 4.X Low Energy (BLE) as a communication channel.
S7 Technology provides ultra-low power consumption and a long period of independent operation for smart sensors and other IoT devices.
On the application level, S7 Technology is fully compatible with S6 Technology which uses cabling.
Advantages of S7 Technology:

- Simple design of data transmission protocol;
- Low power consumption, a potential for fully independent operation of sensors for several years;
- Option of data collection by several data recipients at one time.

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.
DFM Industrial CAN flow meters are designed using S6 Technology.

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).

GNSS (Global Navigation Satellite System) — System for area positioning of an object through satellite signal processing. GNSS is composed of space, ground and user segments. Currently, there are several GNSSs: GPS, GLONASS, Galileo, BeiDou.

Analytical report — report generated in ORF 4 / ORF 5 on vehicle or group of vehicles operation for chosen time period (usually a day, week or month). Can be composed of numbers, tables, charts, mapped route of vehicle, diagrams.

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.

Event — relatively rare and sudden change in SPN. For example, applying the magnetic field to the fuel flow meter in order to falsify indications of the hourly fuel consumption is the "Interference" Event. An Event can have one or several characteristics. Thus, the "Interference" Event has the following characteristics: date/time and duration of the interference.

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.

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

Onboard equipment (OE) — Telematics system elements, directly installed in Vehicle.

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, used for processing and storage of Operational data, formation and transmission of Analytical reports through Internet by request of ORF 4 / ORF 5 users.

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 / ORF 5.

Vehicle an object controlled within Telematics system. Usually Vehicle means a truck, tractor or bus, sometimes a locomotive or river boat. From Telematics system point of view, stationary objects are also considered to be vehicles: diesel gensets, stationary tanks, boilers/burners.

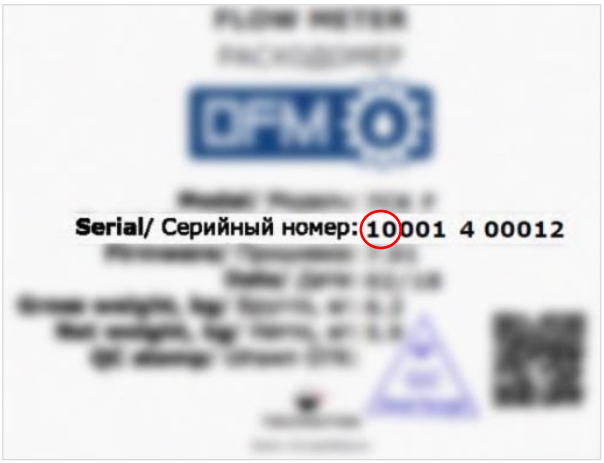
Unit is an element of vehicle on-board equipment compatible with S6 bus, which uses S6 Technology or S7 Technology.

Introduction

The Operation manual contains guidelines and rules which refer to **DFM Industrial flow meters** (hereinafter — DFM Industrial), developed by Technoton company, models codes:

- **01** — for DFM Industrial 7C;
- **10** — for DFM Industrial 7CK;
- **20** — for DFM Industrial 7CCAN;
- **02** — for DFM Industrial 25C;
- **11** — for DFM Industrial 25CK;
- **21** — for DFM Industrial 25CCAN.

The model code of DFM Industrial C/CK/CCAN model code is defined by first two digits of its serial number, which is placed on measurement head or on packaging label:



The manual contains information on design, operation principle, specifications and instructions on installation, use and maintenance of DFM Industrial. Besides, this document defines the procedure for configuration of flow meters.

— high-precision tool for consumption measurement of any non-aggressive fluids in powerful heating and power plants, water transport, petrochemical industry and in public services.

DFM Industrial features:

- compliance with Units, Database and cabling system S6 Technology[1];
- IoT Burger Technology provides internal data processing (Parameter filtration and normalization, Events logging, Counters recording) for easier server operation and data traffic saving;
- high class of accuracy irrespective of kinematic viscosity and temperature of working fluid allows to employ DFM Industrial in systems of oil products commercial accounting;
- may be used for measurement of high-viscosity fluids (fuel oil etc.);
- recording real fluid consumption and operation time of fluid consumer – total and in different consumption modes: "Idle", "Optimal", "Overload", "Tampering" and "Interference";
- setting the boundaries of operation modes for hourly consumption[2];

- resettable Counters of liquid consumption and operation time of flow meter;
- protection against unauthorized interference in operation and data "tampering";
- maximum information richness of output data and high reliability of data transmission over S6 Technology[1];
- unique self-diagnostics feature to monitor the stability and accuracy of data[1];
- configurable feature of fuel thermal expansion compensation[2];
- uniting up to 8 pcs. of fuel flow meters based on S6 Technology to form a single network[1];
- differential measurement or summation of indications of fluid consumption during operation using S6 Technology of up to 4 pairs of flow meters in a single measuring system without their mutual calibration and without using any additional calculator[1];
- installation in the pipeline using flange or thread connection at Customer's choice;
- rotating flange makes it easy to adjust sizes of holes for bolts during the flow meter mounting in fuel systems of sea vessels, railway locomotives and industrial facilities equipment[3];
- electronic part of DFM Industrial can be disconnected without dismounting flow meter from the pipeline;
- straight segments of pipeline are not necessary for flow meter installation;
- accuracy of measurement is not decreasing when flow meter is operated in tough operation conditions;
- minimum fluid flow resistance;
- 100 % of DFM Industrial are calibrated with a certified metrological test rig;
- conformity with European and national standards and directives;
- high-quality technical support and documentation.

[1] For DFM Industrial CCAN models.
[2] For models with interface cable (DFM Industrial CK/CCAN).
[3] Only for DFM Industrial 7 models with flange connection.

See figure 1 for identification codes for DFM Industrial ordering:

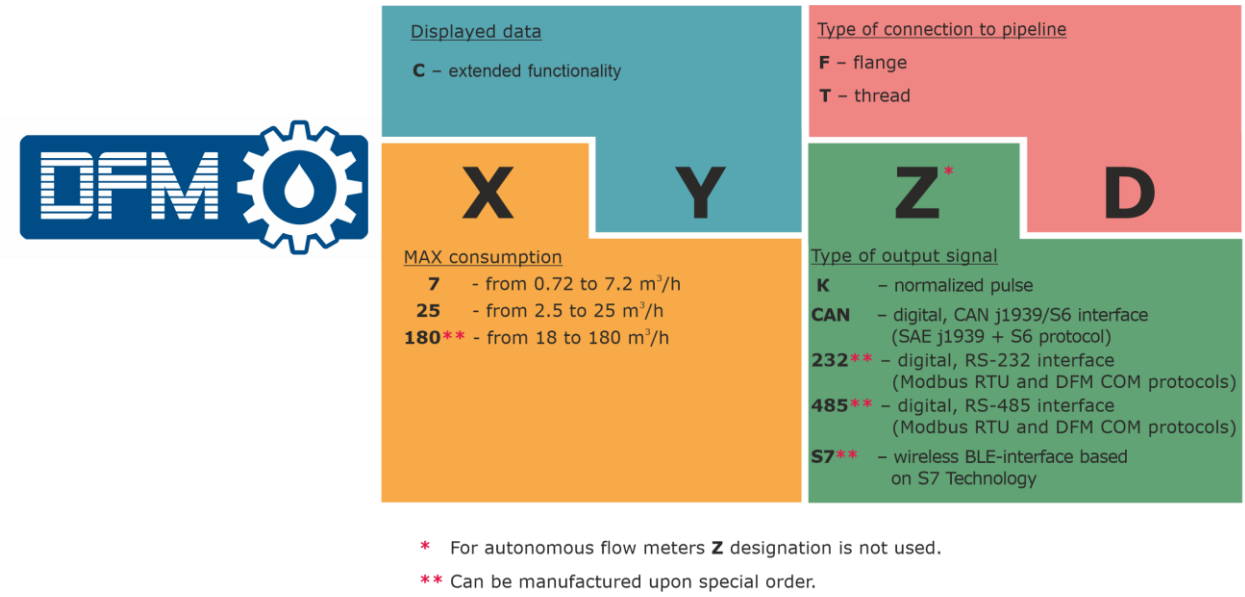


Figure 1 — DFM Industrial order identification codes

Example of DFM Industrial order identification codes:

"DFM Industrial 7C F flow meter",
(max. flow rate — 7.2 m³/h, autonomous with display, with flange connection).

"DFM Industrial 25CK F flow meter",
(max. flow rate — 25 m³/h, with output normalized pulse, with flange connection).

"DFM Industrial 7CCAN T flow meter",
(max. flow rate — 7.2 m³/h, output interface — CAN j1939/S6, with thread connection).

For DFM Industrial with interface cable configuration a service adapter S6 SK is used, which is ordered additionally, and software Service DFM Industrial. You can download and/or update your Service DFM Industrial software at https://www.jv-technoton.com/, in Software/Firmware category.

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

The Manufacturer guarantees DFM Industrial 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 Industrial specifications that do not lead to a deterioration of the consumer qualities without prior customer notice.

1 General information and technical specifications

1.1 Purpose of use and application area

DFM is designed for:

- high-accuracy measurement of volume of fuel, oil products and other non-aggressive fluids consumption;
- monitoring time of operation of fuel/fluid consumer.

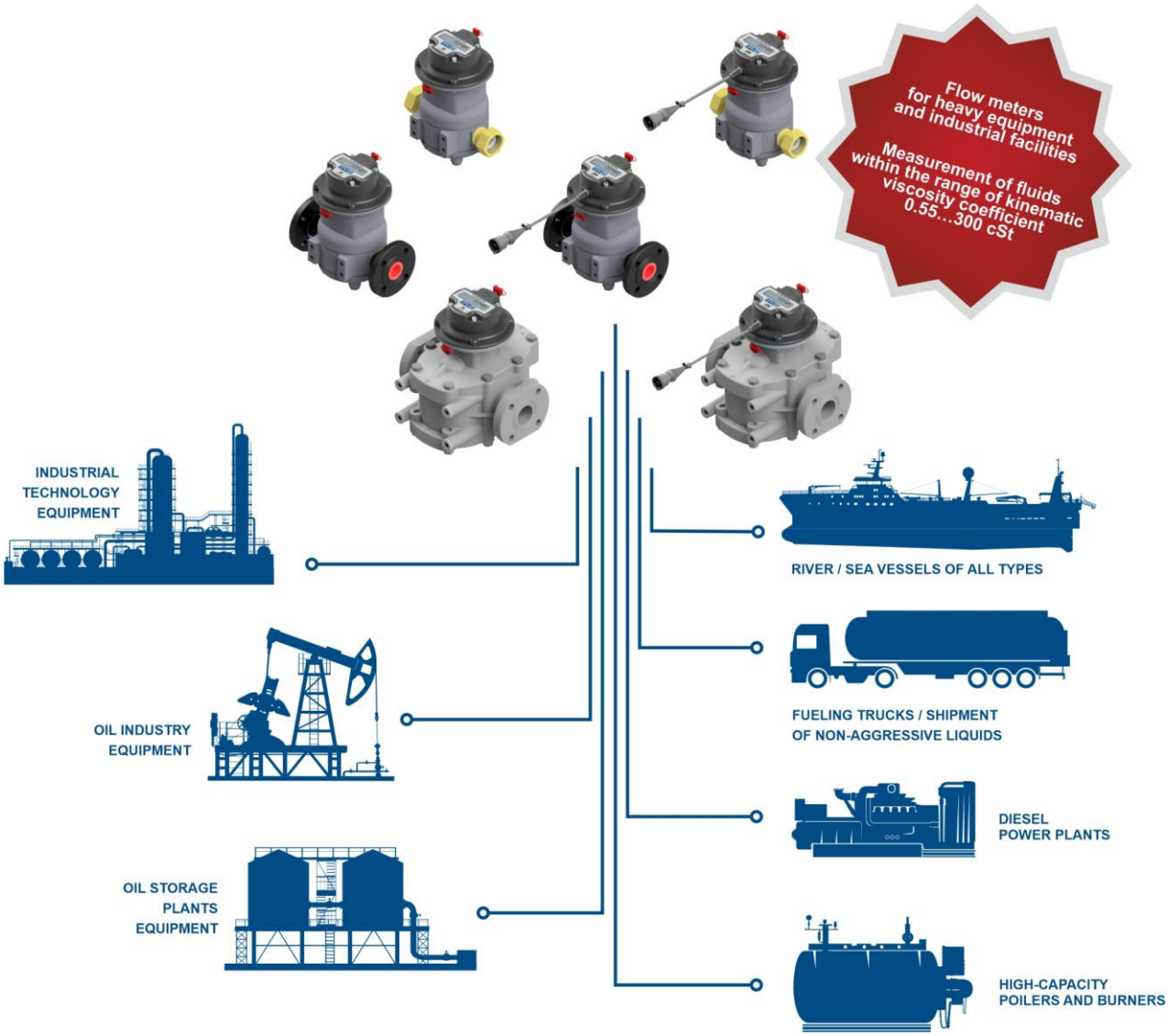


Figure 2 — Purpose of DFM Industrial flow meters

Application areas:

1) Flow meters of DFM Industrial CK/CCAN models can be employed as part of Telematics systems in complex mobile and fixed facilities (fueling trucks, vessels, technology equipment, diesel power plants, oil storage facilities etc.).

A flow meter mounted in a pipeline directly measures hourly (instant) consumption of fuel/fluid passing through it, generates and transmits the output signal to the Telematics terminal.

DFM Industrial **with pulse output** (DFM Industrial CK) enables the user to receive data on actual fluid consumption (total consumption for the period of operation and average consumption per hour).

DFM Industrial **with CAN j1939/S6 interface** (DFM Industrial CCAN) provide real-time control over extended set of information:

- hourly (instant) fluid rate;
- differential/total consumption of fluid for both pipelines*;
- fluid consumption – overall and in different engine operation modes "Idle", "Optimal", "Overload", "Tampering" and "Interference";
- flow meter period of operation — total and in each mode of operation;
- power supply voltage;
- total period of the flow meter operation using the inbuilt battery;
- flow meter's malfunctions;
- evidence of interference to flow meter's operation.

The availability of CAN j1939/S6 interface allows to connect up to 8 pcs. of DFM Industrial CCAN flow meters to the Terminal (e.g. CANUp 27 Telematics gateway) by means of S6 Technology within the single network, together with DUT-E 2Bio CAN fuel level sensors (up to 16 pcs.). This is a convenient solution, for instance, for monitoring fuel dispensing from the tank of a fueling truck (see figure 3)

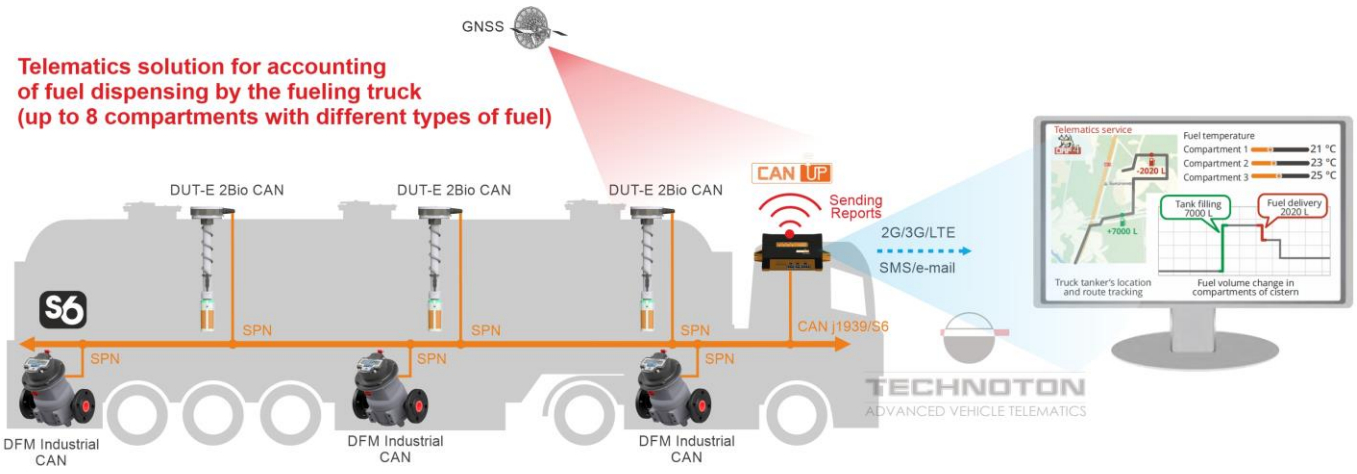


Figure 3 — Example of DFM Industrial CAN flow meters employment in the Telematics system using S6 Technology

* When used a pair of DFM Industrial CCAN.

Terminal unit gathers, registers, stores received signals and transfers them to telematic Server. Software installed on the Server generates Analytical reports, which allow time-related fuel/fluid consumption monitoring via web-browser (see figure 4)

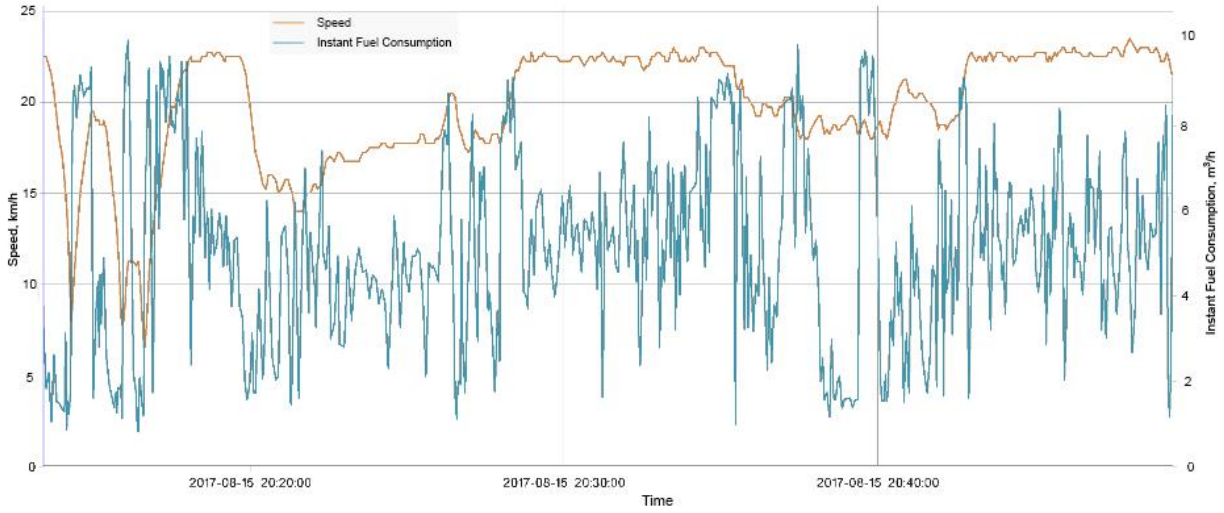


Figure 4 — Example of Analytical report generated in ORF 4 software, based on the DFM Industrial CAN data

2) DFM Industrial C flow meters can be used autonomously (for example, in high-capacity fuel oil poilers and burners) (including those using heating oil), in technology equipment of industrial facilities.

When using **autonomous** flow meters fluid consumption and time of measurement (total and for each mode of consumer equipment operation) is displayed on the built-in LCD display (see figure 5).

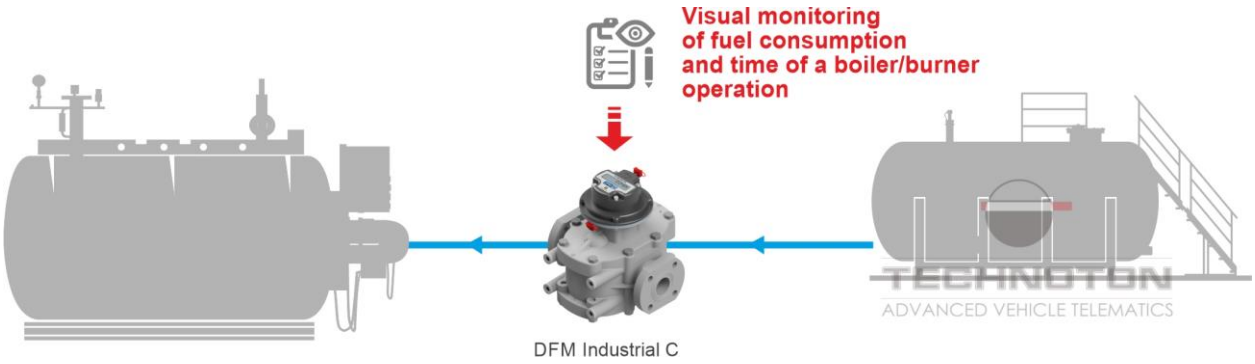


Figure 5 — Example of autonomous DFM Industrial C operation

Use of DFM Industrial provides vehicle owners with the following:

- actual fluid consumption records;
- records of actual time of pumping fluid through the pipeline;
- setting the consumption rate for the fluid pumped through the pipeline;
- fluid (fuel) theft detection and prevention;
- real-time monitoring and fluid (fuel) consumption optimization;
- fuel consumption tests for engines.

1.2 Exterior view and delivery set

1	DFM Industrial flow meter	– 1 pc.;
2	Magnetic key	– 1 pc.;
3	Calibration certificate	– 1 pc.;
4	Specification with a card containing description DFM Industrial of informational screens	– 1 pc.;
5	Signal cable*	– 1 pc.;
6	Fuse with holder (2 A)**	– 1 pc.

Figure 6 — DFM Industrial delivery set

* Delivered with DFM Industrial CK only.
For DFM Industrial CAN S6 SC-CW-700 signal cable (see annex D) is purchased separately.

** Not applicable for autonomous DFM Industrial C.

1.3 DFM Industrial models

DFM Industrial flow meters is represented by the following **models**:

1) By output interface:

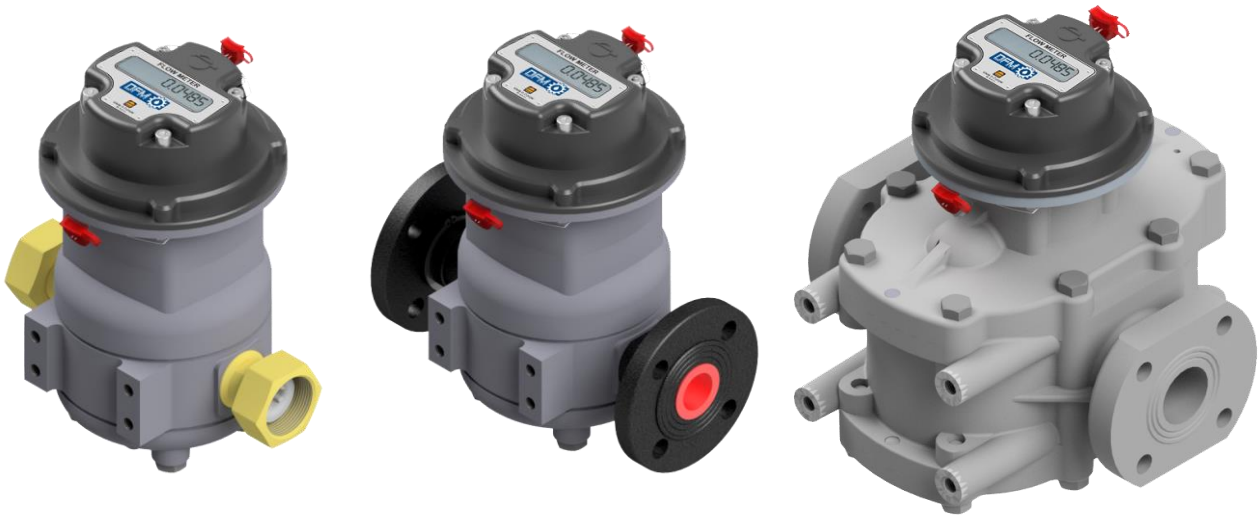
- autonomous flow meters with display;
- flow meters with display and interface cable:
  - with pulse output;
  - with digital CAN j1939/S6 interface.

2) By type of connection to pipeline:

- flange connection — flanges* according to GOST 12815-80, DIN 2501;
- thread connection — female metric thread M42x2 according to GOST 24705-2004, ISO 724:1993.

1.3.1 Autonomous flow meters with display

Autonomous flow meters with display (**DFM Industrial C** models) — are used in organizing fluid (fuel) consumption monitoring system which does not need additional hardware or software (see figure 7).



DFM Industrial 7C T (*thread connection)*

DFM Industrial 7C F (*flange connection)*

DFM Industrial 25C F (*flange connection)*

Figure 7 — Exterior of autonomous flow meters with display

Fluid consumption and consumer operating time data is displayed on the built-in LCD display of DFM Industrial. Monitoring and recording is to be performed visually, copying out the data into a fluid timesheet, by a responsible person.

* Rotating flanges in DFM Industrial 7 F

1.3.2 Flow meters with display and interface cable

Flow meters with display and interface cable (**DFM Industrial CK/CCAN** models) can be used autonomously and as a part of the Telematics system (see figure 8).

Note — Type of output signal of the flow meter is specified on the label of its interface cable.

DFM Industrial 7CK T
DFM Industrial 7CCAN T
(*thread connection)*

DFM Industrial 7CK F
DFM Industrial 7CCAN F
(*flange connection)*

DFM Industrial 25CK F
DFM Industrial 25CCAN F
(*flange connection)*

Figure 8 — Exterior of flow meters with display and interface cable

Fluid consumption and consumer operating time data is displayed on the built-in LCD display. Fluid consumption data is sent to the pulse output as well (**DFM Industrial CK**).

In CAN j1939/S6 digital interface (**DFM Industrial CCAN**) contain fluid consumption data together with Counters values, data on consumer operation modes, flow meter Parameters and malfunctions, Events.

1.4 Measurement range and accuracy

Table 1 — Measurement range and accuracy of DFM Industrial flow meters

Model	Starting flow rate*, m³/h	Minimum flow rate, m³/h	Maximum flow rate, m³/h	Relative accuracy error, %, not more than**
DFM Industrial 7	0.02	0.72	7.2	±0.5
DFM Industrial 25	0.5	2.5	25	

* Minimum threshold flow rate value when the meter starts operating.
The value is indicated for reference only as accuracy is not standardized for operation on the starting flow rate.

** In differential/summarization measurement mode, inaccuracy is not higher than ±1.0 %, (depending on the proportion of fluid consumption in chamber of each flow meter used).

RECOMMENDATION: In case the average flow rate in engine is close to the upper capacity limit of a certain DFM Industrial model it is recommended to use DFM Industrial with a higher measurement range. That will ensure absence of a flow meter's influence on the fluid system as well as longer DFM Industrial operating life.

1.5 Unit structure and operation principle

DFM Industrial consists* of a measuring chamber with oval gears (**1**), measuring "head" (**2**) with a display, the electronic unit and the independent power supply battery which are located inside, two connecting elements to connect it to the pipeline (**3**) (flanges or fittings with a cap nut), the interface cable (**4**) with a connector plug (**5**) and four mounting holes (**6**) (see figure 9).

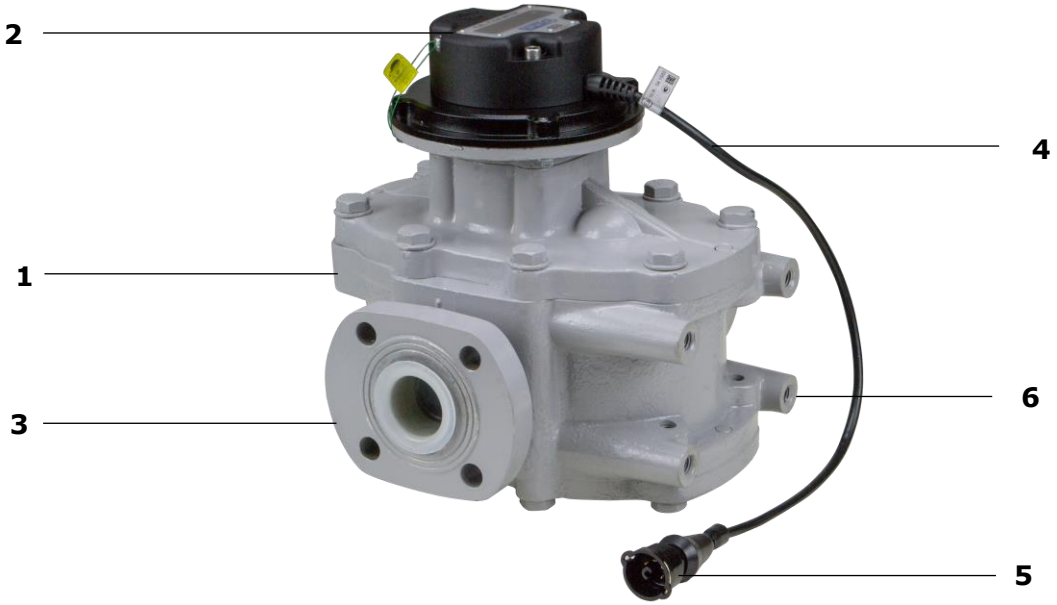


Figure 9 — DFM Industrial components

DFM Industrial belongs to pressure-type volumetric flow meters with oval-shaped gears.

The principle of DFM Industrial operation is based on measurement of fluid volume that passes through its measuring chamber. The incoming flow of fluid into the measuring chamber of the flow meter creates pressure on the oval-shaped toothed gears and makes them spin (see figure 10). Fixed volume of fluid is pushed out of the measuring chamber during one revolution of the gears and the electronic unit of DFM Industrial generates one output pulse. The number of output pulses is in proportion to the volume of fluid passing through the flow meter.

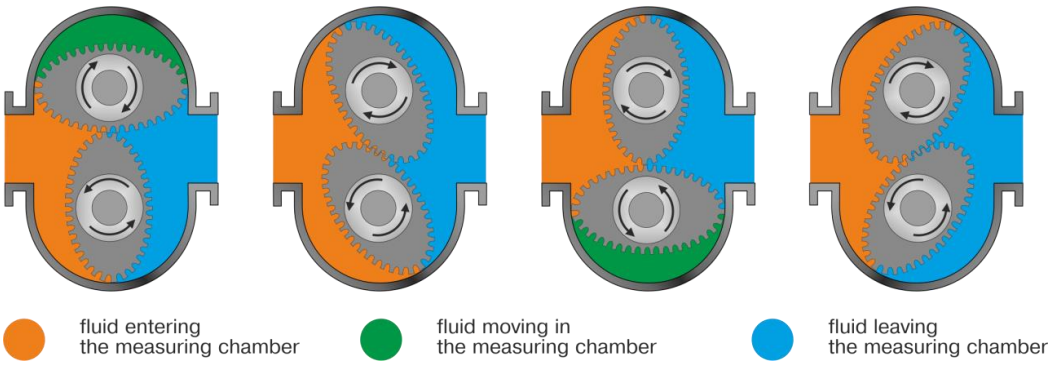


Figure 10 — Diagram of the working fluid passing through the DFM Industrial measuring chamber

* Structure is shown in an instance of DFM Industrial 25CK F.

When DFM Industrial is used within Telematics system, signal cable is connected to an appropriate input of Telematics terminal (tracking device).

Distinctive design features of DFM Industrial flow meters:

- material used for the casing and oval gears — AK9M2 alloy (aluminum, silicon, copper);
- petrol-resistant sealing — rings;
- ball-bearings — bronze-and-graphite;
- no need of straight pipeline sections at the flow meter input and output;
- electronic part of DFM Industrial can be disconnected without dismounting flow meter from the pipeline;
- increased nominal bore for minimum fluid flow hydraulic resistance;
- DFM Industrial sensitivity to hydraulic shocks in pipeline is decrease by improved magnetic scheme and broad configuration options (with service software), also allowing to achieve higher accuracy.

1.6 Technical specifications

1.6.1 Working fluids

DFM Industrial can measure the consumption of any non-aggressive fluids:

- diesel fuel;
- heating oil
- burner oil;
- motor fuel;
- biofuel;
- other types of non-aggressive fluids (hydrocarbon fuels, hydraulic fluids, industrial oils etc.) within the range of kinematic viscosity coefficient **0.55...300 mm²/s (cSt)**.

ATTENTION:
1) In the process of their manufacturing, all DFM Industrial are calibrated for **kerosene** (for **0.55...6.0 mm²/s (cSt)** kinematic viscosity) or **transformer fluid** (for **6...300 mm²/s (cSt)** kinematic viscosity*). Therefore, when you order a flow meter, you should specify the fluid kinematic viscosity coefficient.
2) The working fluid must not contain solid and viscous components that stick to the oval gears; it also should not contain fibrous particles.
3) You need to install a **mud filter** with filter fineness not exceeding **0.1 mm** into the pipeline at a location no farther than **3000 mm** before the flow meter mounting location.

* May be manufactured upon special order.

1.6.2 Main specifications

DFM Industrial may be employed in the sunshade or in premises where the temperature and humidity fluctuations do not differ considerably from the open air space (with no direct sunlight and open-air precipitation).

Flow meters with interface cables (DFM Industrial CK/CCAN models) are powered from the on-board circuit.

Autonomous-type flow meters (DFM Industrial C models) are powered only from the inbuilt battery.

Table 2 — DFM Industrial main specifications

Parameter, measurement units	Value
Working pressure of the measured fluid, MPa	1.6
Pressure loss, MPa, not more than	0.03
Fluid kinematic viscosity of the measured fluid, mm^2/s	0.55…300*
Maximum temperature of working fluid, °C	+90
Supply voltage range, V	10…45
Current consumption at 12/24 V, mA, not more than	50/25
Temperature range for LED display operation, °C	-20…+80
Resistance to mechanical impact	Tolerance to vibration Group #2 according to GOST R 52931-2008 (Frequency 10…55 Hz. Shift amplitude 0.35 mm. Typical location - in industrial facilities, in places subject to vibration from running equipment)
Electromagnetic compatibility of electronic unit**	see annex H
Attachment thread***	M42x2
Ingress protection rating	IP65
Overall dimensions	see annex A
Weight	

* Flow meters for measurement of fluid with kinematic viscosity within the range of 6…300 mm^2/s (cSt) are manufactured upon special order.
** For models DFM Industrial CK/CCAN.
***Valid only for models DFM Industrial 7 T.

1.6.3 Specifications of measuring chambers

Table 3 — Specifications of DFM Industrial measuring chambers

Flow meter capacity model	Nominal diameter (DN), mm	Nominal volume of the measuring chamber, l	Average mean time to failure, with maintenance conducted, h	Full average service life, years
DFM Industrial 7	25	0.1	60 000	10
DFM Industrial 25	40	1.0		

1.6.4 Power supply modes

DFM Industrial flow meters can operate in the following power supply modes:

- **Stand-alone power supply** (**DFM Industrial C** models) — flow meter is powered from the built-in lithium-silicon battery. Estimated DFM Industrial operation time until full battery discharge is not less than 36 months.

- **Combined power supply** (**DFM Industrial CK/CCAN** models) — flow meter is powered from the external power source or built-in battery (in case external power is off). Power supply is switched to stand-alone mode in case of low level of external power supply (less than 8 V).
  Estimated flow meter operation time in this mode is not less than 36 months.

ATTENTION: During the time when power supply from vehicle on-board power network is off DFM Industrial CK/CCAN automatically enable option of data readings recording into internal meter memory. When powered from internal battery this flow meters can display data according to table 5. Data transfer to the output interface starts only when external power supply from vehicle on-board network is provided.

1.6.5 Operation modes

Table 4 — Operation modes of DFM Industrial flow meters

<table>
<tr><th colspan="3">Engine operation</th><th rowspan="2">“Tampering”
$Q>Q_{max}$</th><th rowspan="2">“Interference”
The impact of constant magnetic field</th></tr>
<tr><th colspan="3">Normal consumption
$Q_0<Q\leq Q_{max}$</th></tr>
<tr><td>“Idle”
$Q_0<Q<2.5Q_{min}$</td><td>“Optimal”
$2.5Q_{min}\leq Q<0.75Q_{max}$</td><td>“Overload”
$0.75Q_{max}\leq Q\leq Q_{max}$</td><td colspan="2"></td></tr>
<tr><td colspan="5">Q — instant consumption;
Q_0 — starting flow rate;
Q_{min} — lower limit of the meter capacity range;
Q_{max} — upper limit of the meter capacity range.</td></tr>
</table>

WARNING: Operation mode boundaries of flow meters with pulse output interface can be adjusted via Service DFM Industrial software at **Flowmeter Industrial FM** section (see F.4).

1.6.6 Displayed data

Informational screens of DFM Industrial's display (see table 5) are switched when surface under the display is tapped with a magnetic key (see figure 11).

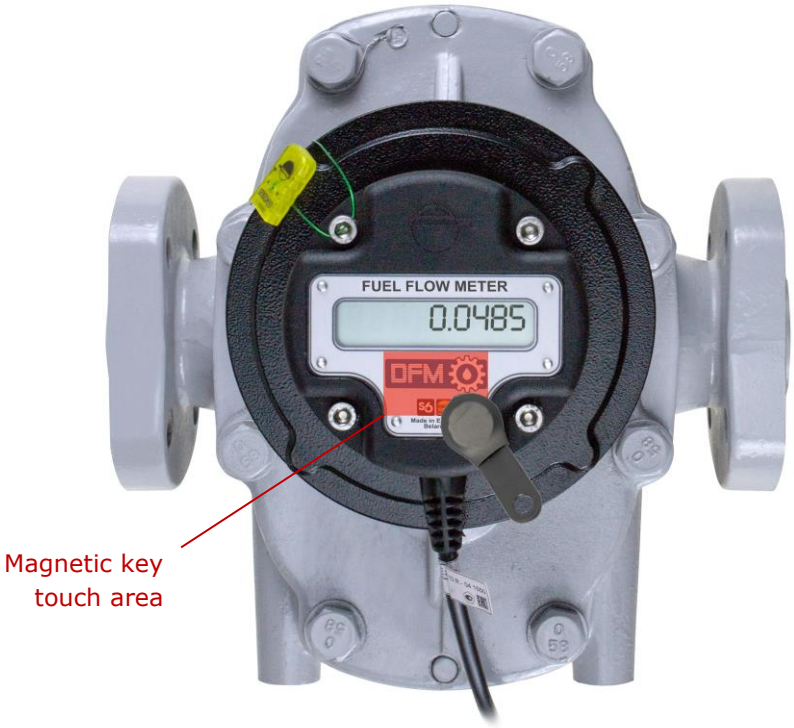


Figure 11 — Switching DFM Industrial display information screens

In order to save the charge of the built-in battery the DFM Industrial display goes to sleep mode one minute after the last touch of the cover by the magnetic key. At the same time dots are shown on the display (see figure 12).

Figure 12 — DFM Industrial display view in sleep mode

When the display is touched by the magnetic key next time, it wakes up and shows data again.

If it is necessary to continuously display the readings on the flow meter's display, uncheck **Enable Sleep mode** box in configurations of **Display Industrial FM** submenu using service software (see F.2). After saving profile changes to the Unit, display of the flow meter will not switch into sleep mode anymore.

Keep in mind, that when "sleep" mode is switched off, current consumption of flow meter is increased. Long-term operation of flow meter from its built-in battery (without external power supply) will lead to shorter lifetime of the battery.

Table 5 — DFM Industrial display information screens

Screen No	Displayed data	Metric System of Measures		US System of Measures	
		Digit capacity	Units	Digit capacity	Units
1	"Total fluid consumption" Counter	0.01	m³	1	gal
2	"Total fluid consumption High resolition" Counter with higher digit capacity	0.00001	m³	0.001	gal
3	"Flow meter operation time" Counter	0.1	h	0.1	h
4	"Flow meter operation time" in "Idle" Mode Counter	0.1	h	0.1	h
5	"Flow meter operation time" in "Optimal" Mode Counter	0.1	h	0.1	h
6	"Flow meter operation time" in "Overload" Mode Counter	0.1	h	0.1	h
7	"Flow meter operation time" in "Tampering" Mode Counter	0.1	h	0.1	h
8	"Flow meter operation time" Counter. Clearable	0.1	h	0.1	h
9	"Total fluid consumption" Counter. Clearable	0.01	m³	1	gal
10	"Total fluid consumption" in "Tampering" Mode Counter	0.01	m³	1	gal
11	"Interference Time" Counter	0.1	h	0.1	h
12	"Instant fluid consumption"	0.01	m³/h	1	gal/h
13*	"Total differential fluid consumption" Counter	0.01	m³	1	gal
14*	"Instant differential fluid consumption"	0.01	m³/h	1	gal/h
15	"Battery Charge in Percentage of the Maximum"	1	%	1	%
16	"Temperature in the Measuring Chamber"	1	°C	1	°F
17	"Firmware Version"	X.X			
* Only for DFM Industrial CCAN models.					

Required system of measurement units can be configured using service software in the corresponding area of **Display Industrial FM** (see F.2) or **Desktop** submenu (see figure 30). After saving profile changes to the Unit, data on the flow meter's display will be displayed in accordance with the specified system.

Screen 1 displays **"Total Fluid Consumption"** Counter value accumulated since DFM Industrial release.

Screen 2 displays **"Total fluid consumption High resolition"** Counter accumulated since DFM Industrial release. Reading accuracy is increased by one decimal.

Screen 3 displays the Counter readings **"Flow Meter Operation Time"** accumulated as the total time of engine operation in all modes including idle run.

Screens 4…6 display the Counters readings of **"Flow Meter Operation Time" in "Idle", "Optimal" and "Overload" Modes"** accumulated by DFM Industrial as a total engine operation time in corresponding modes (see 1.6.5).

Screen 7 displays the Counters readings of **"Flow Meter Operation Time" in "Tampering" Mode** accumulated by DFM Industrial as a total time of engine operation when consumption was higher that maximum possible (see 1.6.7). Value increase of this counter indicates the incorrect installation of the flow meter or possible facts of fluid theft.

Screen 8 displays the Counter readings of **"Flow Meter Operation Time. Clearable"**, which was accumulated as a total time of engine operation in all modes, including idling. Counter data could be reset using service software (only for the models DFM Industrial CK/CCAN) or by applying a magnetic key (3…5) s to a switching zone of DFM Industrial's cap when Screen 8 is active.

Screen 9 displays the Counter readings of **"Total Fluid Consumption. Clearable"**, which was accumulated by DFM Industrial since its production. Counter data could be reset using service software (only for the models DFM Industrial CK/CCAN) or by applying a magnetic key (3…5) s to a switching zone of DFM Industrial's cap when Screen 9 is active.

IMPORTANT: For the models DFM Industrial CCAN, clearable Counters (Screens 8 and 9) can be also reset by sending PGN 63080 command by means of S6 Technology to the respective flow meter (see annex I).

Screen 10 displays the Counter readings of **"Total Fluid Consumption in "Tampering" Mode"** accumulated by DFM Industrial measured as the amount of fluid higher than maximum consumption (see 1.6.7). Value increase of this counter indicates the incorrect installation of the flow meter or possible facts of fluid theft.

Screen 11 displays the Counter readings **"Interference Time"** accumulated by DFM Industrial as the total time of exposure to external factors (strong magnetic field). Increase of the values of this counter may indicate an installation of the flow meter near a source of strong electromagnetic radiation or deliberate attempts to lock the meter (see 1.6.7).

Screen 12 "Instant Fluid Consumption" displays current value of fluid consumption. It can serve for a visual check of device operability and its correct installation.

Screen 13 displays **"Total Differential Fluid Consumption"** Counter value, accumulated in differential mode (see 2.6.8) by DFM Industrial installed in fluid supply line (Master Flow meter), while used in pair with DFM Industrial installed in fluid return line (Slave Flow meter).

Note — When Slave-flow meter is disconnected, Counter increase is paused, and Master-flow meter's display will look like it has switched to "Tampering" mode (see figure 13).

Screen 14 "Instant Differential Fluid Consumption" displays current differential fluid consumption (a difference between fluid consumption in chamber of each flow meter) on display of DFM Industrial installed in fluid supply line and operating in pair with DFM Industrial installed in fluid return line.

Note — If Slave Flow meter is disconnected, current differential fluid consumption will not be displayed. Master Flow meter's display will show screen similar to "Tampering" mode screen (see figure 13).

Screen 15 "Battery Charge in Percentage of the Maximum" displays the value of remaining charge of integrated battery.

Note — When the environment temperature is below 10 °C, displayed value of remaining charge can decrease by (10…30) %.

Screen 16 "Temperature in the Measuring Chamber" displays current temperature value in the measuring chamber of the flow meter.

Screen 17 "Firmware Version" displays the firmware version (X.X) installed on the flow meter.

If necessary, any unused informational screens can be switched off in configuration of **Display Industrial FM** (see F.2) using service software. To do that, in **Enabled screens** area uncheck the boxes near the corresponding screens. After saving the profile changes to the Unit, disabled informational screens will not appear on flow meter's display.

1.6.7 DFM Industrial protection from tampering and intervention

In order to avoid false readings, meter damage or blocking DFM Industrial have the following modes of protection against malicious acts of third parties:

1) "Tampering" Mode is to protect from tampering which has a purpose to increase fluid consumption counters readings (e.g. blowing with air). Tampering usually causes a rapid increase of readings exceeding maximum flow rate limit. DFM Industrial electronics registers this increase and suspends fluid consumption Counters. At the same time "Tampering" Counter is activated. It records volume value that passes through the meter at the increased flow rate.

DFM Industrial displays dashes being in "Tampering" Mode (see figure 13).

Figure 13 — Display view in "Tampering" Mode

The meter will automatically exit "Tampering" Mode in few seconds since back to normal operation conditions.

2) "Interference" Mode is made to protect DFM Industrial from magnetic field impact with the purpose to stop fluid counting or to tamper readings of fluid consumption. When exposed to external magnetic field, DFM Industrial registers an attempt of interference, and as the result increment of all the counters stops, and the time of exposure is recorded in a special "Interference Time" Counter.

DFM Industrial displays vertical strokes in "Interference" Mode (see figure 14).

Figure 14 — Display view in "Interference" Mode

The meter will automatically exit Interference mode in few seconds since back to normal operation conditions.

ATTENTION: Indications of the Counters "Total fluid consumption" in the "Tampering" mode" and "Time of interference" are accumulated and saved in the internal memory of DFM Industrial flow meter throughout the whole period of its service life.
Data on Events during the external power supply of DFM Industrial CK/CCAN is off is recorded into the internal memory and sent to output interface since the power supply is on.

3) "Stand-alone power supply" Mode for models **DFM Industrial CK/CCAN** when external power supply is off. Flow meter is powered by own battery. Embedded battery ensures autonomous functioning within 36 months.

RECOMMENDATION: Sealing all connection in pipeline after DFM Industrial can help consumer owner to reveal unauthorized intervention in pipeline.
Valves, bolts and other elements in Technoton-branded mounting kits for DFM Industrial has special holes for sealing.

1.6.8 Pulse output signal specifications

Flow meters with **normalized pulse output** (**DFM Industrial CK** models) generate a certain number of pulses (**N**) for 1 m^3 of fluid passing through the measuring chamber (see table 6). The value of **N** is specified in the flow meter passport.

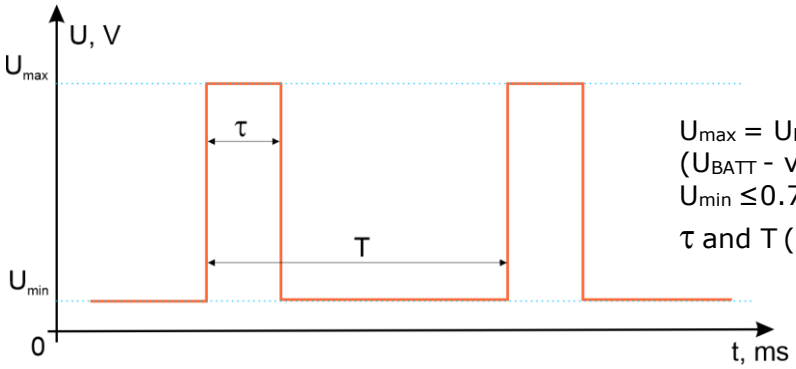


Figure 15 — Pulse output signal shape of DFM Industrial CK models

Table 6 — Parameters of normalized pulse of DFM Industrial CK

Model	Pulse period, T, ms	Pulse duration τ, ms	Pulse value, m^3/pulse
DFM Industrial 7CK	100…10000	0.5·T (if T<1 s) 500 (if T>1 s)	0.00035
DFM Industrial 25CK			0.00125

1.6.9 CAN j1939/S6 digital interface specifications and protocols

Specifications of CAN j1939/S6 **DFM Industrial CCAN** digital interface correspond to S6 Technology.

The user configuration of CAN j1939/S6 interface is conducted via K-Line (ISO 14230) interface using Service DFM Industrial service software (see 2.6.5).

DFM Industrial CCAN flow meters support data transfer via SAE j1939 protocol. The data composition of the flow meters output messages that are transmitted via CAN j1939/S6 interface is provided in annex I.

DFM Industrial CCAN data is sent in automatic transmission mode and by request. Baud rate can be selected out of the following fixed values: 100; 125; 250; 500; 1000 kbit/s (default baud rate 250 kbit/s).

S6 Technology enables to connect at one time up to 8 pcs. of DFM Industrial CCAN flow meters to form a single network. The unique network address (SA) must be specified for each connected flow meter. For each flow meter a unique network address (SA) 111…118 should be specified (by default — 111).

Using PGN 63080 command, you can reset the Counters "Flowmeter Total Hours of Operation. Clearable" (PGN 63217) in the internal memory of DFM Industrial CCAN flow meters via CAN j1939/S6 interface (see annex I for example).

IMPORTANT: The **obligatory condition** for correct data transfer by DFM Industrial CCAN flow meters is the availability of two **120 Ohm** terminal resistors fixed at the ends of CAN 2.0B (SAE j1939) communication line between CAN LOW and CAN HIGH wires.

1.7 DFM Industrial and tracking devices compatibility

In case of operation as part of the Telematics system, DFM Industrial CK/CCAN may be used together with Telematics terminals or other tracking devices whose inputs are compatible with parameters of DFM Industrial output signals, according to 1.6.8 or 1.6.9.

Technoton regularly conducts tests for compatibility and joint accuracy of DFM Industrial with different models of Terminals (vehicle tracking devices).

https://www.jv-technoton.com/ web-page contain a table with up-to-date list of Compatibility declarations of Technoton products and Telematic units of various manufacturers.

Recommendations on connecting and setting up the equipment can be obtained from Technical support of Technoton.

1.8 DFM Industrial selection

IMPORTANT: Final decision on possibility to use particular model of DFM Industrial at a specific facility should be made by installation specialist after inspection of the engine/burner, where flow meter will be installed.

1.8.1 Selection depending on engine power (boiler output capacity)

Table 7 — DFM Industrial selection depending on the power plant capacity (boiler output capacity)

Power plant*, kW	Boiler output*, kW	Recommended model
13 000…25 000	30 000…70 000	**DFM Industrial 7**
45 000…90 000	120 000…250 000	**DFM Industrial 25**
* Data is for reference purpose only. To choose flow meter properly, it is necessary to know maximum and minimum fluid consumption in fluid supply line of consumer.		

1.8.2 Selection depending on fluid flow rate in supply and return lines of the consumer

A pair of DFM Industrial CCAN flow meters connected to form a network by means of CAN j1939/S6 interface (see 2.6.8) may be used for differential measurement of fluid consumption. One of the flow meters is installed into the supply line, while the other one is installed into the return line. The flow meters are selected depending on the range of fluid consumption rate in the respective line (see table 8).

Table 8 — Selection of DFM Industrial depending on fluid flow rate values in supply and return pipelines

Minimum flow rate, m^3/h	Maximum flow rate, m^3/h	Recommended models
0.72	7.2	**DFM Industrial 7**
2.5	25	**DFM Industrial 25**

IMPORTANT:
1) Maximum and minimum fluid flow rate values in supply and return lines of the engine can be found in performance specification of the engine pump.
2) When using differential measurement in the fuel system of the engine with relatively low consumption rate but with great consumption in the supply and return pipelines, the measurement error may increase.
3) The presence of air in the supply or return pipeline is an obstacle for using differential measurement for light oil products (viscosity 0.55…6.0 mm^2/s). A task of removing air from fluid is resolved by installation of **deaeration system (deaerator)**.

2 DFM Industrial installation

ATTENTION:
1) To ensure proper operation of DFM Industrial, it should be mounted, electrically connected and configured by specialist, who finished official technical training and was certified for that.
2) Officials, who carry out installation and operation, are responsibility for proper installation and operation of DFM Industrial from the moment of its purchase.
3) During the installation of DFM Industrial you must strictly follow health and safety rules established at the company, as well as health and safety regulations for the specific facility where DFM Industrial is to be installed.

This section contains general recommendations on DFM Industrial mounting.

2.1 Exterior inspection prior to works start

It is required to conduct DFM Industrial exterior inspection for the presence of the possible defects arisen during transportation, storage or careless use:

FORBIDDEN: To operate a flow meter that has:
1) Visible damages of the meter body, fittings, bracket, display, interface cable and connector.
2) Backlash of component parts or gaps between them.

Contact the supplier if any defects detected.

2.2 Evaluation of the fluid consumer condition

IMPORTANT:
1) Before DFM Industrial installation procedure you should study the technical description of the consumer of the measured fluid which is to be equipped with DFM Industrial (e.g. power plant/boiler/burner etc.), evaluate the condition of its pipelines, electrical system* and draw the conclusion regarding the installation feasibility.
2) Make sure, that specifications of pipeline are within a range of main flow meter specification (fluid kinematic viscosity, consumption rate, pressure, operating temperature, nominal bore (DN)).

The evaluation of the fluid consumer condition generally includes the following sequence of operations:

1) Check the operation of the fluid consumer during (5…10) minutes in the idling mode and (5…10) minutes in the load mode. The flow of fluid in the pipeline must be steady, without any hydraulic shocks.
2) Examine the fluid consumption in the return line (if any). If the fluid rate in the return line is great, the measurement error is growing because the excess of the working fluid is returned into the tank and counted twice by the flow meter.
3) Check pressure in the pipeline with a pressure gauge. Hydraulic resistance of a selected DFM Industrial working at nominal flow rate should not lower the pressure by more than 5 %.
4) Examine all the pipelines for any damages and leakage.
5) Check the reliability of chassis grounding for the equipment on which the flow meter is mounted. Resistance between any point of chassis and the "-" clamp of the external power supply should not exceed 1 Ohm.
6) Check the voltage of the external power supply for the flow meter with a voltmeter. The voltage value should not be beyond the limits set by the operating documentation.
7) Check and eliminate any external electromagnetic interference at the place of installation.

According to the results of the check **Act on examination of the consumer of the fluid which is to be measured** (see annex B).
The customer should eliminate any malfunctions recorded to the Act before DFM Industrial installation.

* It is allowed not to check the electrical system during mounting autonomous flow meters (DFM Industrial C).

2.3 General installation instructions

IMPORTANT:
1) Installation and electrical connection of DFM Industrial is strongly recommended at a positive ambient temperature.
2) For proper selection of installation place, carefully read technical documentation for the machinery unit.

The following is needed for DFM Industrial mounting:

- hand tools (spanner and socket wrench sets, screwdrivers);
- mounting kit including bolt and flange connectors, O-rings, mounting consumables – appropriate materials are purchased separately for each particular installation case, takin in account type and size of tubes, installation and operation conditions;
- pyrometer or contact thermometer (ordered separately);
- glycerin filled manometer (ordered separately);
- mud filter (purchased separately);
- S6 SK service adapter*;
- PC with installed service Software*;
- signal cable (see annex D)*.

The following rules must be observed when DFM Industrial mounting:

1) Flow meter should be installed in an easy accessible place, reachable for data reading from display and technical maintenance of the device.

2) The pipeline must have a nominal diameter (DN) equal to the DN of the flow meter and must be equipped with a shutoff valve that would ensure steady gradual increase of the fluid rate, when the equipment is started.
Before mounting the flow meter, gently close the shutoff valves and make sure there is no pressure in the pipeline using the manometer!

3) Prepare the pipeline and the flow meter mounting location with respect to its length. If needed, add another pipeline section of suitable length.
The supply line must be thoroughly cleaned from scale after welding, from sand, mud and other solid particles that may damage the flow meter!

4) To ensure the declared accuracy of measurement and the convenient measurements reading, we recommend to select the flow meter mounting location, as shown in figure 16.

* In case of mounting flow meters with interface cables (DFM Industrial CK/CCAN).

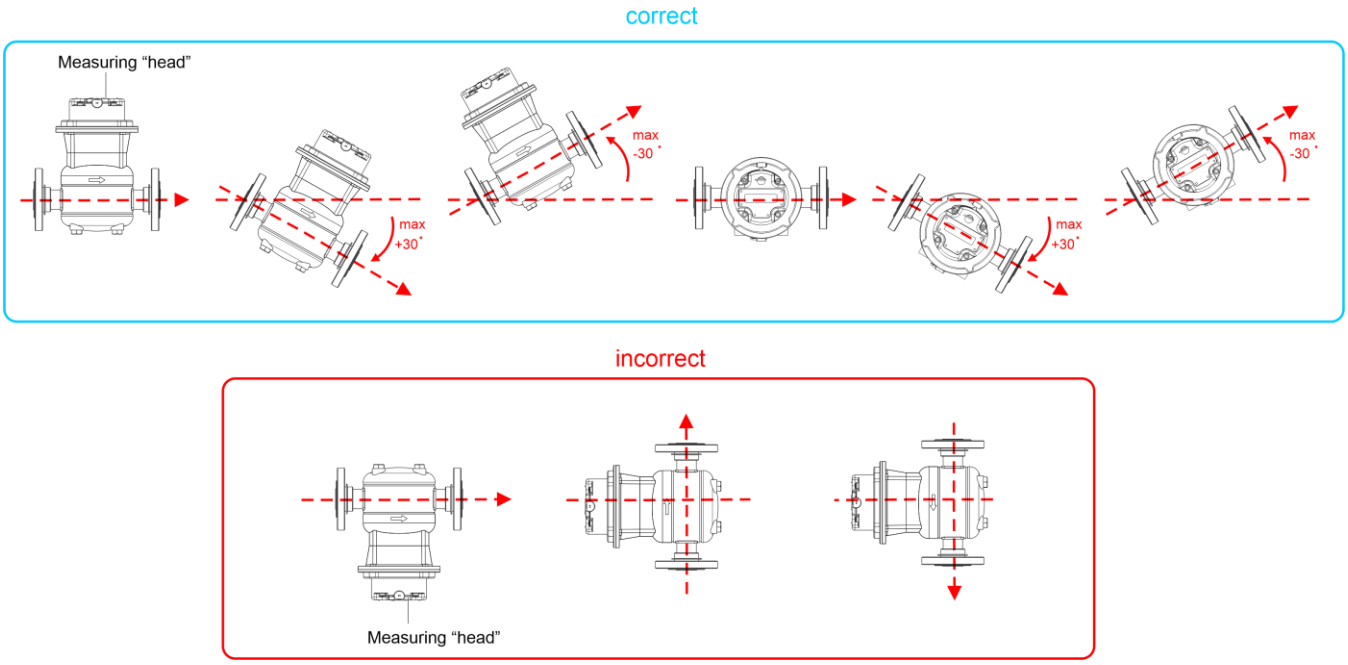


Figure 16 — Operational position of DFM Industrial in the horizontal and vertical planes

5) To avoid damaging the DFM Industrial measuring chamber, be sure to mount the **mud filter** with filter fineness not exceeding **100 micron** at a distance **no more than 300 cm** before the flow meter (see figure 17).

It is not allowed to install DFM Industrial without installing mud filter before it!

If fluid contains mud, it is recommended to use rough filter with magnetic elements.

a) with flange connection *b) with thread connection*

Figure 17 — Rough filter examples

6) Tightening forces of threaded connections when installing flow meter is:

- for M6 thread – 6 N·m;
- for M8 thread – 16 N·m;
- for M12 thread – 47 N·m.

7) In case of taking records of light oil products (viscosity 0.55-6.0 mm^2/s), install a **deaerator** (gas-separator filter) before the flow meter.

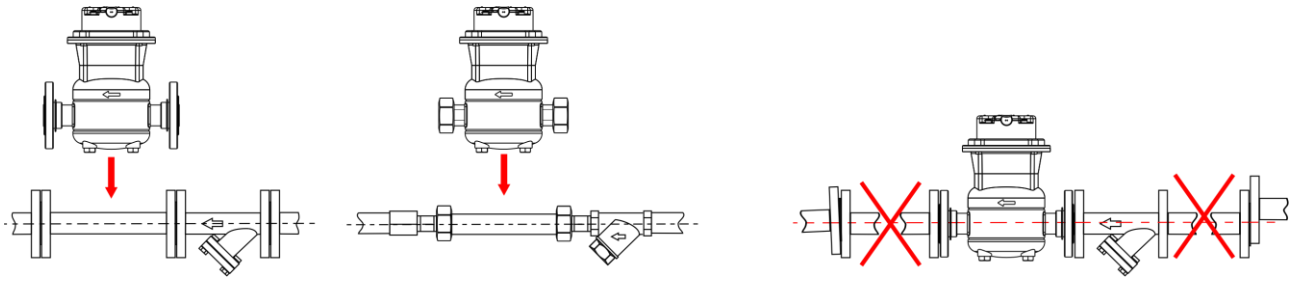
8) DFM Industrial should be installed in a way, that provides fluid flow inside the pipeline will be in the same direction, as the pointing arrow on the body of DFM Industrial.

For proper operation of measuring chamber of DFM Industrial, it is not obligatory to have straight pipeline sections before and after the flow meter.

When connecting flow meter to the pipe line, make sure that flanges and threads clean of mud and dirt.

You should use only new sealing components!

Flanges and threads should be connected precisely, without excessive effort, also make sure they are not skewed (see figure 18).



a) with flange connection *b) with thread connection* *c) skewed pipe line*

Figure 18 — Flow meter installation in pipeline

9) After mounting DFM Industrial, you should verify the pipeline hermeticity and release air from the pipeline.

The measuring chamber of the mounted flow meter must be always filled with working fluid without any air inclusions!

10) Maximum allowed pressure drop after the flow meter is **not more than 0.03 MPa**. If a pressure drop after the flow meter is more than 0.01 MPa, it is recommended to select DFM Industrial of bigger size, which has bigger nominal bore (DN).

11) During the flow meter operation a steady flow of homogeneous fluid must be ensured, with no pulsation, no hydraulic shocks. There should be no pressure leaps and falls exceeding the value of the operation pressure.

To avoid water hammers (hydraulic shocks) in pipeline, valves should be opened and closed smoothly!

ATTENTION:

1) When using DFM Industrial to measure fuel consumption by diesel power plants, it is necessary that only the volume of fuel that is consumed by the power plant (burner) should flow through the flow meter measuring chamber. You may need to modify the return line. For this purpose, use pipes that are similar to those of the standard fuel line.

2) To avoid exceeding the upper limit of DFM Industrial working temperature range, the electronic unit of the mounted flow meter must not have heat sealing.

3) The presence of air in pipeline is an obstacle for measurement for light oil products (viscosity 0.55…6.0 mm2/s). A task of removing air from fluid is resolved by installation of **deaeration system**.

2.4 Example schemes of flow meter installation

1) Using shut-off return valve

One of the features of diesel power units is its uneven fuel consumption. Additionally, water hammers (hydraulic shocks) inside fuel line can add extra inaccuracy. To compensate water hammer effects and to avoid back fuel flow through DFM Industrial, it is necessary to install **return valve** after the flow meter (see figure 19).

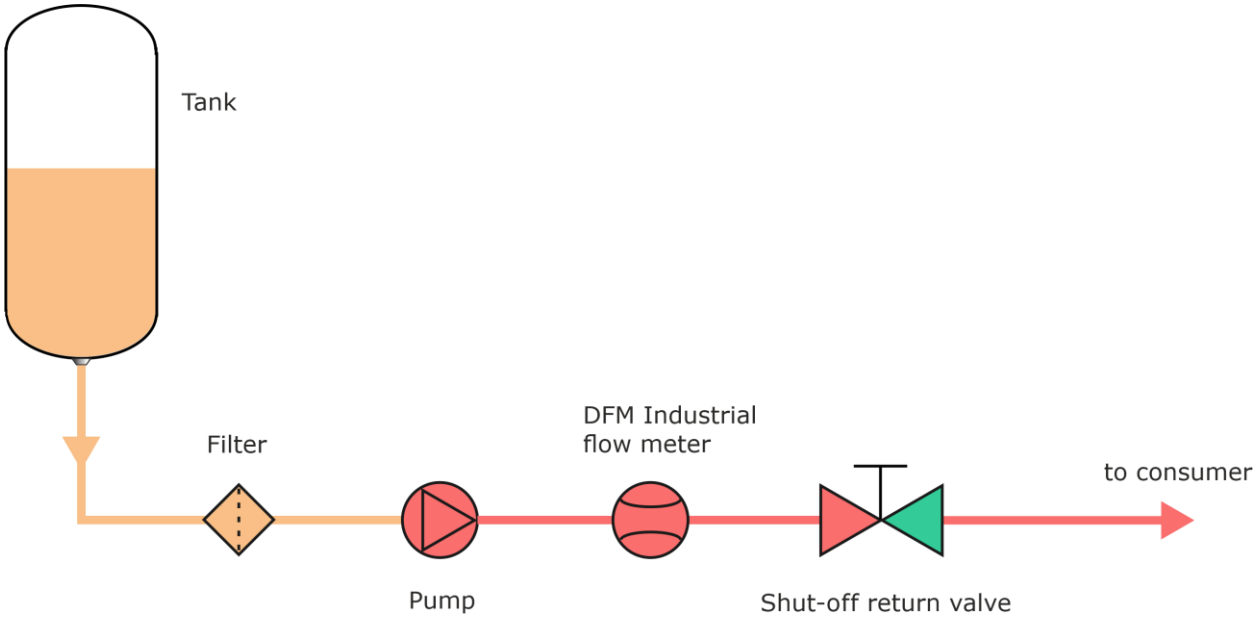


Figure 19 — Using shut-off return valve to increase accuracy and protect DFM Industrial against water hammers

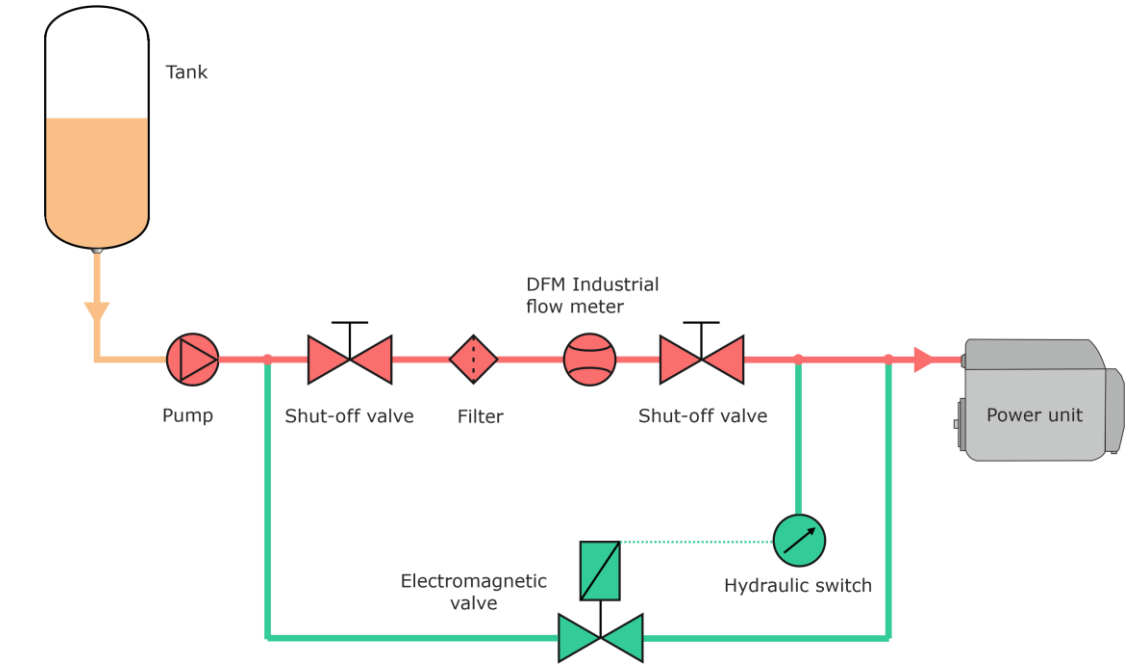
2) Particularities of the flow meters installation layouts in vessels and in industrial technology equipment

When DFM Industrial are mounted on vessels and in industrial technology equipment, it is very important that the measured fluid flow to the consumer should not stop in case of grave clogging of the mud filter or during the flow meter maintenance operations.

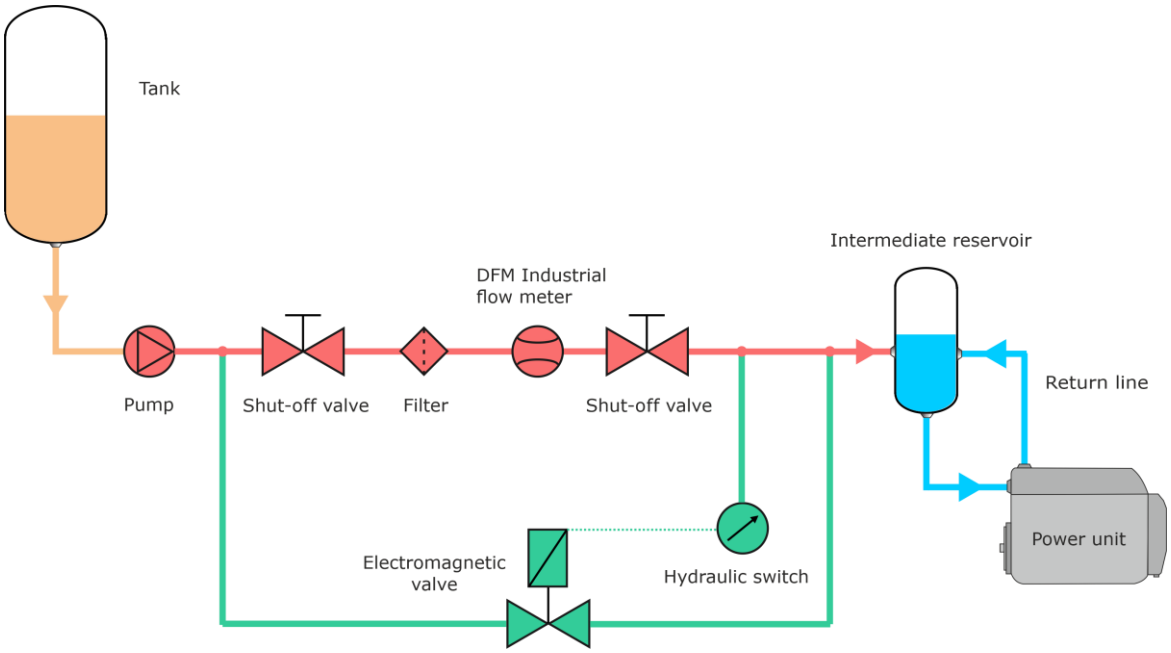
You are to provide an option for temporary switching over the measured fluid (fuel) flow to a bypass line by all means!

When pressure in pipeline drops below specific value, hydraulic switch cuts off fluid supply though main tube and automatically opens electromagnetic valve on bypass tube. From this moment on, the measured fluid volume is fully supplied, but without consumption measurement. In case there are air bubbles in the measured fluid, we recommend to connect the supply and return lines through the **intermediate reservoir** with a system of valves and floats (see figure 20).

If there are several fluid consumers on one facility, you need to install DFM Industrial into the supply system of each individual consumer.



a) standard scheme



b) scheme with intermediate tank

Figure 20 — Examples of DFM Industrial mounting layouts with automatic switching over the supply of the measured fluid to bypass

3) Flow meter installation on suction side

DFM Industrial installation on suction side of system assumes that flow meter will be installed before pump, where fluid flows due to underpressure created by pump.
To implement scheme of installation on suction side, it might be necessary to modify return line of system.

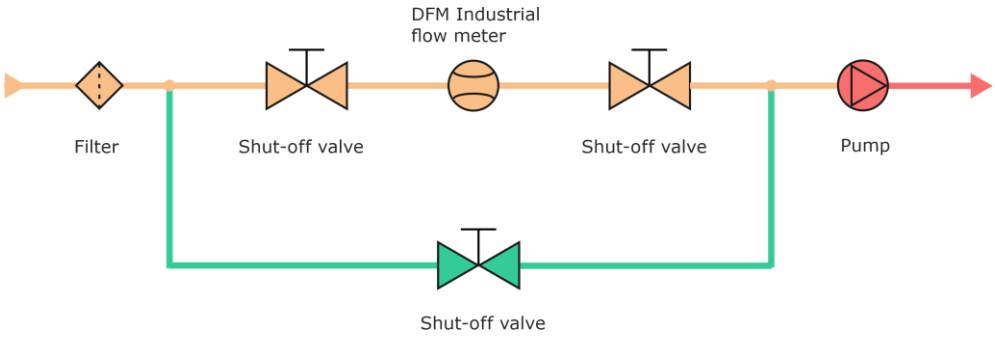


Figure 21 — Example of DFM Industrial installation on suction side, using bypass tube

4) Flow meter installation on pressure side

DFM Industrial installation on pressure side assumes, that flow meter will be installed in system after the pump, where fluid flows due to pressure created by pump.
To implement scheme of installation on pressure side, it might be necessary to modify return line of system.

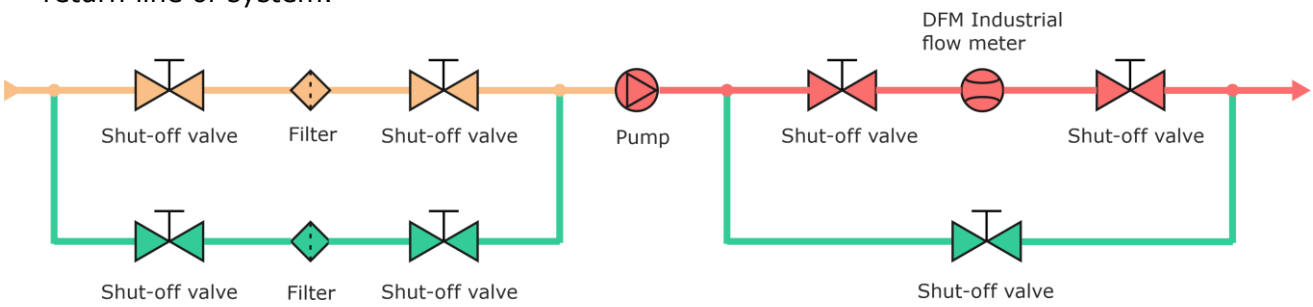


Figure 22 — Example of DFM Industrial installation on pressure side, using bypass tube

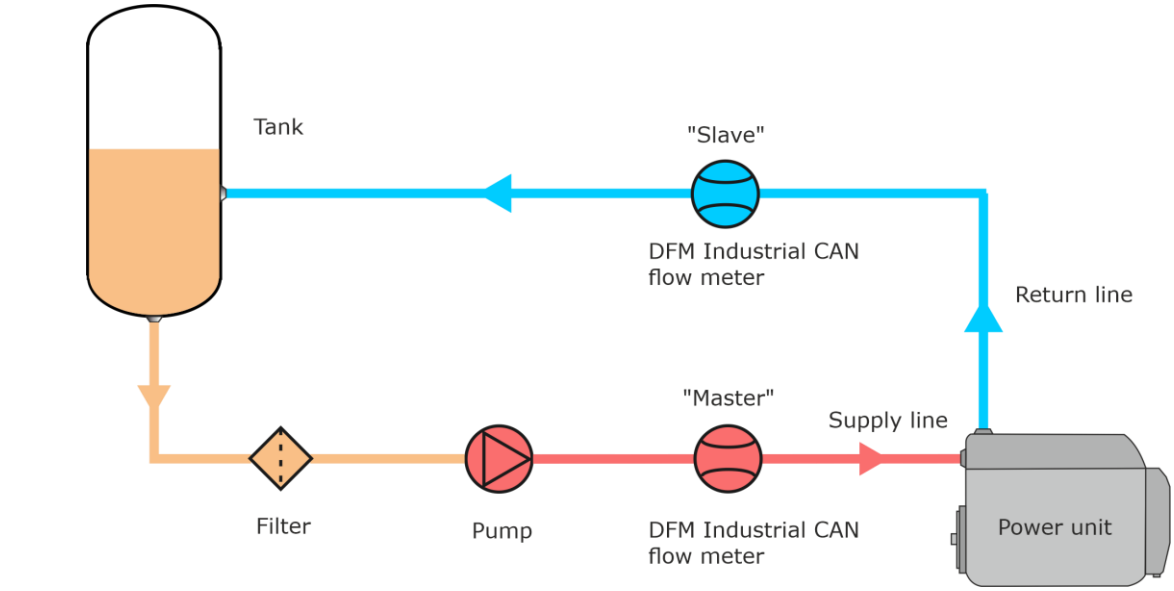
5) Flow meter installation according to "Differential" and "Summarization" schemes

ATTENTION:
1) to use "Differential" and "Summarization" installation schemes you will need to use a pair of **DFM Industrial CAN** flow meters, which are connected with each other using S6 Technology (see 2.6.8).
2) It is allowed to use a pair of flow meters which have different fluid flow rates (e.g. DFM Industrial 25 for supply line and DFM Industrial 7 for return line).

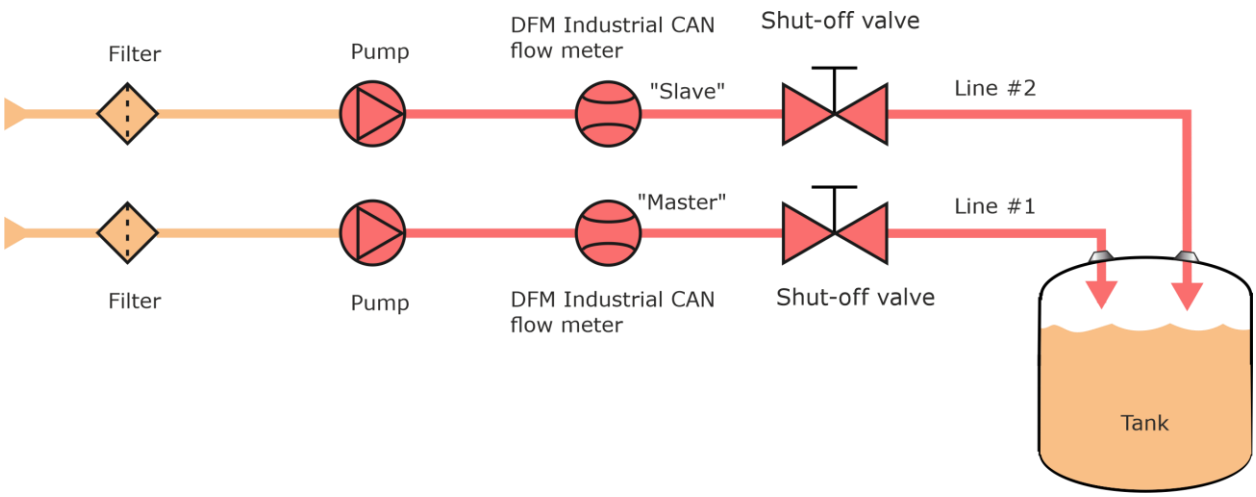
When using "Differential" installation scheme, fluid circulation in system is not changed. The first flow meter (Master) is installed in supply line, the second flow meter (Slave) in return line. Differential consumption is defined as difference between measurements of those two DFM Industrial CAN flow meters (see figure 23 a).

RECOMMENDATION: Do not use "Differential" scheme if pump capacity is much higher than fluid consumption by power unit. In this case the inaccuracy could be higher than acceptable.

DFM Industrial CAN flow meters can be also used to summarize consumption of fluid, which goes through two lines (e.g. when stationary tank is refilled). First flow meter (Master) is installed in line #1, second flow meter (Slave) is installed in line #2. Summarized fluid consumption is defined by aggregation of fluid consumption data from both DFM Industrial CAN flow meters (see figure 23 b).



a) "Differential" installation scheme



b) "Summarization" installation scheme

Figure 23 — Examples of schemes when a pair of DFM Industrial is installed

6) Pipeline ventilation scheme

When cleaning pipeline from mud/dirt with air, it is necessary to ensure that the air will not go through measuring chamber of the flow meter. Before using air, close shut-off valves before and after DFM Industrial. After cleaning the tubes, rinse valves with fluid to remove small pieces of dirt.

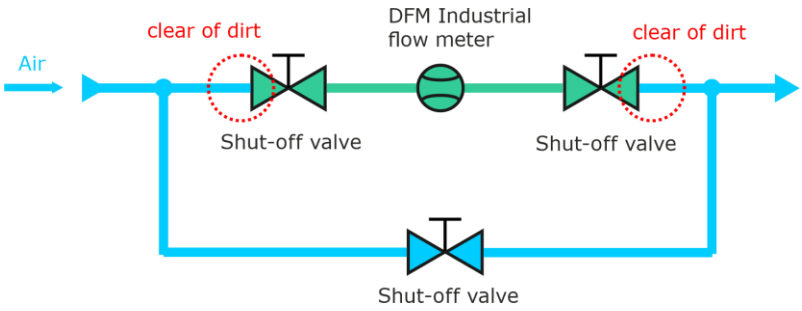


Figure 24 — Scheme of cleaning pipeline with air

7) Fluid dispensing scheme

When dispensing fluid, the valve is installed between flow meter and pipeline outlet. Short segment of pipeline between valve and outlet will provide higher accuracy. Taking in account possible water hammers, open and close valves smoothly.

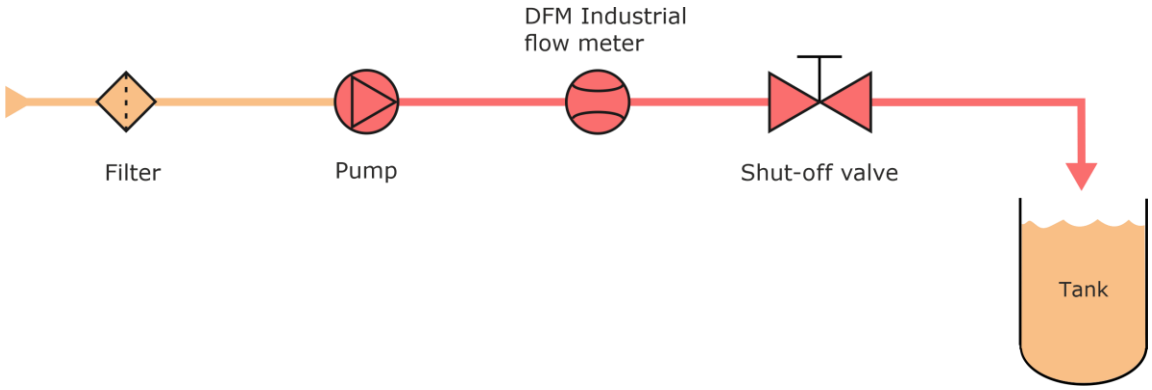


Figure 25 — Fluid dispensing scheme

2.5 Electrical connection

ATTENTION:
1) To ensure proper operation of DFM Industrial, it should be electrically connected by specialist, who finished official technical training and was certified for that.
2) When installing DFM Industrial it is obligatory to follow safety rules on carrying out repair works applicable to the machinery being equipped.

Flow meters with interface cable (**DFM Industrial CK/CCAN**) are supplied with electrical power from external power supply (battery).

IMPORTANT:
1) Before mounting and connecting DFM Industrial switch off power supply electrical circuits of the equipped object. To do this switch off the battery switch or release the terminals of the wires connected to the battery.
2) It is recommended to use **fuses** (supplied within delivery set) when connecting DFM Industrial CK/CCAN to power supply. Nominal fuse current is not more than 2 A.
3) When connecting DFM Industrial to onboard power source it is necessary to connect feed "+" and chassis "-" wires to the same sockets where appropriate wires of recording and display devices (trackers) are connected.
4) Before starting electrical connection of DFM Industrial special attention must be paid to the quality of the chassis ground. Resistance between any point of the chassis and the negative clamp of the battery must not exceed **1 Ohm**.
5) It is **strongly recommended** to lay DFM Industrial connection cable together with standard electrical vehicle wiring with mandatory cable ties fixing of every 50 cm, at a positive ambient temperature (see figure 26).

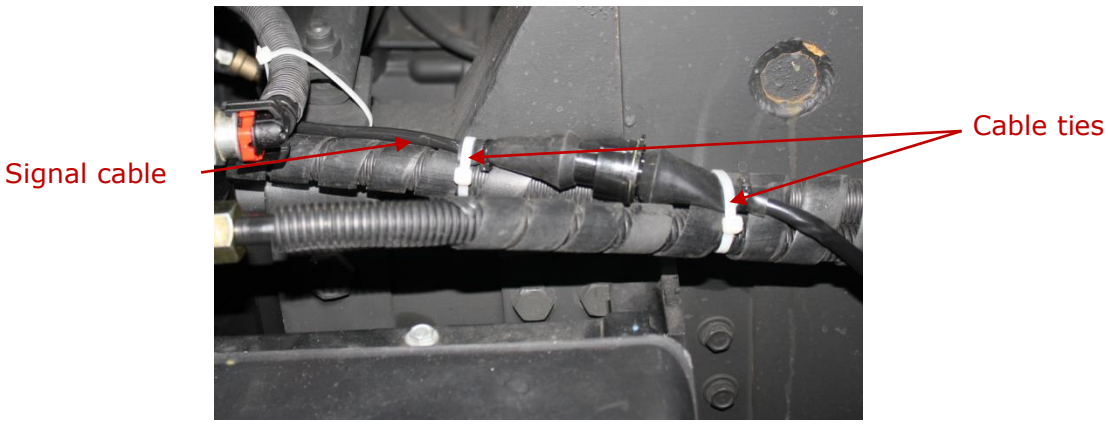


Figure 26 — Laying DFM Industrial CK/CCAN signal cable

Electrical connection of DFM Industrial is carried out by connecting **signal cables** (see table 9) in accordance with pinout and wires designation (see tables 10 and 11).

Quick splice **connectors** (ordered separately) are recommended for electrical connection of power supply wires (see figure 27).

Table 9 — Cables for electrical connection of DFM Industrial with interface cable

View	Component name	Description
	S6 SC-CW-700 (signal cable) (see annex D)	Designed to connect DFM Industrial CCAN to recording and display devices and to external power supply. 7 meters long. Not included into delivery set. Equipped with 2 terminating resistors (120 Ohm). One of the terminal resistors may be disabled, if needed.
	CABLE DFM 98.20.003 (signal cable) (see annex D)	Used for DFM Industrial CK flow meter with pulse output interface connection to telematic terminal (or data logger) and on-board power supply network. Length – 7.5 m. The cable is included in delivery set of DFM Industrial CK with pulse output interface.

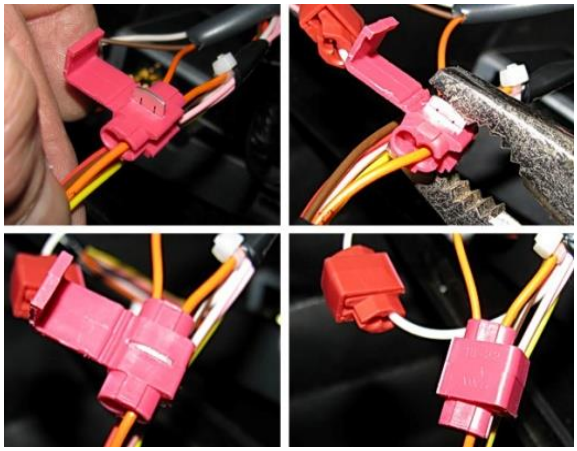


Figure 27 — Wiring connection made with the plastic connectors

Table 10 — Interface cable pinout and wire assignment of DFM Industrial CK

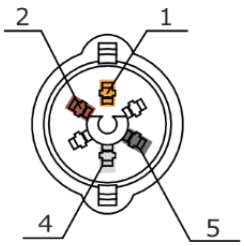
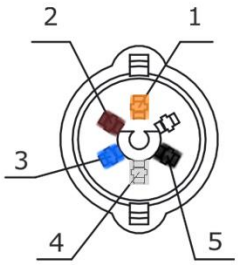
Connector view	Pin number	Wire color		Assignment
	1	Orange		Power supply “+”
	2	Brown		Ground
	4	White		Pulse output (see 1.6.8)
	5	Black		K-Line (ISO 14230)

Table 11 — Interface cable pinout and wire assignment of DFM Industrial CCAN

Connector view	Pin number	Wire color		Assignment
	1	Orange		Power supply “+”
	2	Brown		Ground
	3	Blue		CAN-High (SAE J1939)
	4	White		CAN-Low (SAE J1939)
	5	Black		K-Line (ISO 14230)

Options for connection of DFM Industrial CCAN to tracking devices, with specification of S6 cable system components that need to be ordered, are provided in annex E.

2.6 Flow meters configuration

All DFM Industrial flow meters are calibrated by the Manufacturer and are supplied ready for use.
When DFM Industrial with interface cable (**DFM Industrial CK/CCAN** models) is connected to external device or it is necessary to adjust DFM Industrial parameters to specific operation mode, you can configure it through K-line interface (ISO 14230).
In order to start configuration, it is necessary to connect DFM Industrial to PC via S6 SK service adapter. S6 SK description can be found in Cabling and accessories for Telematics interface CAN j1939/S6 manual.
Before connecting DFM Industrial to PC via service adapter, please download special software from https://www.jv-technoton.com/ (section Software/Firmware) and install it to your PC:

- USB driver;
- Service DFM Industrial.

Note — Installation file name contains: Service_DFM_Industrial_X_X_Setup.exe, where X_X — version of software.

ATTENTION: For work with Service DFM Industrial software, you need a separate PC (desktop or laptop) on which **only** Technoton service Software that meets the following minimal requirements is installed:
- Windows 7/10 operating system of X32/X64 bit depth;
- CPU — Intel Core i3, dual-core, 2.0 GHz;
- RAM — 4 Gb;
- availability of USB 2.0 port;
- display resolution 1366x768.

See annex F for DFM Industrial CK/CCAN settings, displayed and/or made by service software.

2.6.1 Connecting DFM Industrial to PC

ATTENTION: To avoid any service adapter faults in communication between PC and flow meter make sure there are no sources of electromagnetic interference close to the workplace (running electric motors, welding equipment, high-power transformers, power lines, etc.).

Before starting to use service adapter, have a closer look on its elements to detect defects which can occur while service adapter was transported, stored or handled carelessly.

When connecting service adapter to DFM Industrial, which is installed on vehicle, avoid the following: ingress of fuel, oil or moisture to the pins of connector; damage of elements by rotating or heated parts of the facility equipped.

ATTENTION: Prior to connecting DFM Industrial to a PC, it is necessary to turn off electrical circuits of the facility equipped (e.g. when configuring the flow meter mounted on the mobile object) To do this, use the battery switch or remove the battery terminals. When configuring flow meters connected by S6 Technology, power supply of onboard network (battery) can be turned on.

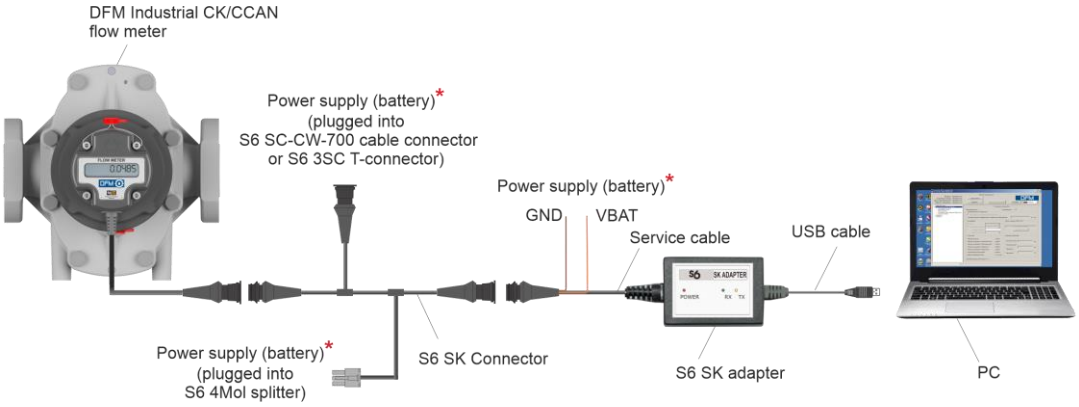
DFM Industrial is connected to the PC in the following order:

1) Connect the adapter to DFM Industrial.
- The connector of the service adapter is to be connected to the flow meter interface cable connector by means of the plug connector which is contained in the S6 SK supplied accessories kit (see figure 28 a).
  Note — During the DFM Industrial configuration you need to provide power supply for the flow meter and the adapter from the battery or from a power source. Power is supplied through one of the free input connectors of the connector or via power supply wires of the adapter service cable.
- During the configuration of DFM Industrial CCAN operating within a network of Units by means of S6 Technology we recommend to connect the adapter service cable connector to the break in S6 cable system, using S6 SK connector, instead of any S6 3SC T-connector. In this case, power supply for the flow meter and adapter is provided through S6 cable system (see figure 28 b).

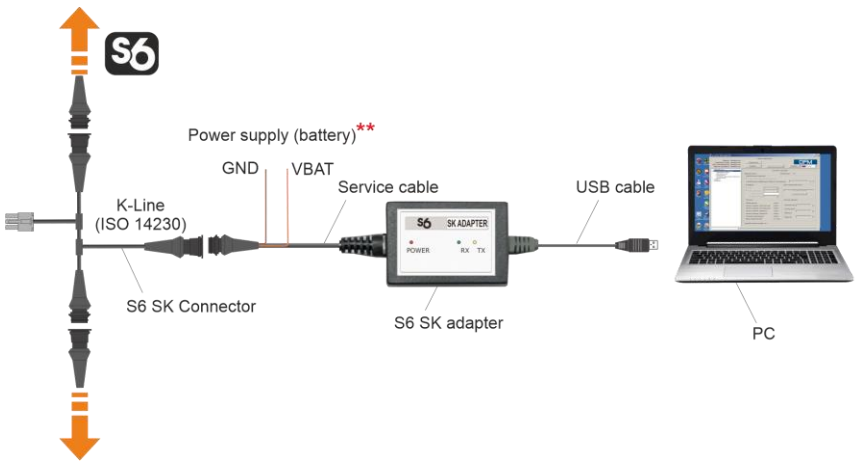
2) Plug the adapter to USB port of PC with the USB cable.
Note – it is allowed to connect adapter to USB-port of your PC after turning on power supply of flow meter and running Service DFM Industrial software.

3) Connect power supply and ground wires to vehicle electrical system or battery.

4) Power on the vehicle (battery).



a) in case of DFM Industrial CK/CCAN configuration outside the network of Units



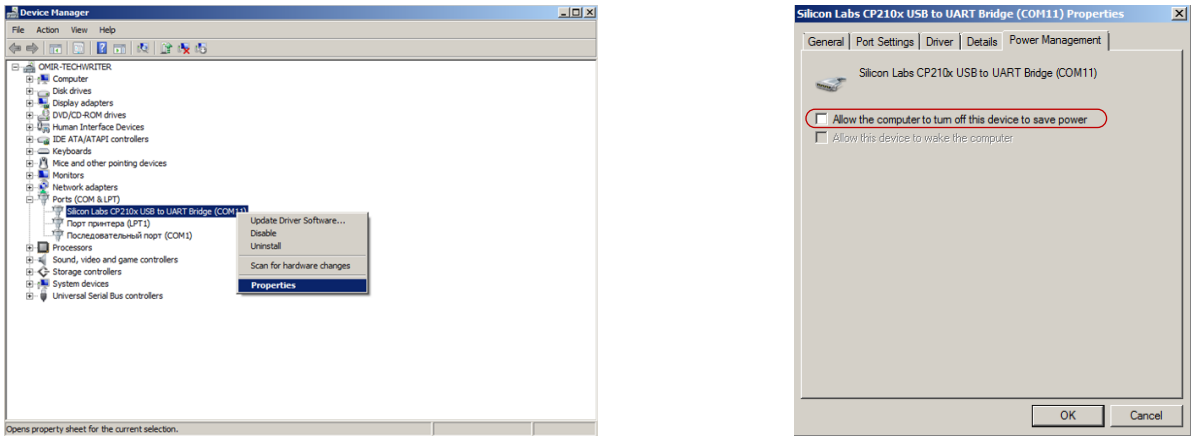
b) in case of DFM Industrial CCAN configuration within the network of Units by means of S6 Technology

Figure 28 — Schemes of DFM Industrial connection to PC

* For connecting power supply (battery) you can choose any of marked places.
** No need to connect. Power supply (battery) is carried out though S6 cabling system.

Windows automatically detects adapter connected to PC's USB port as USB device and enables virtual COM port driver for it. The virtual COM port will be displayed in the list of ports of Windows Device manager (see figure 29 a).

ATENTION: To work with Service DFM Industrial it is recommended:
1) It is recommended to use the same USB port of the PC for adapter connections.
2) Untick power save check box in virtual COM-port properties (see figure 29 b).



a) selecting port properties *b) disabling power save option*

Figure 29 — Virtual COM-port configuration in Device manager

Adapter is ready for operation straight after power supply connection. Check for a description of blinking LED-indicators placed on the top of the adapter in table 12.

Table 12 – LED signal description

LED Indicator			Signal description
Marking	**Status**	**Light color**	
POWER		Red	Power supply is on
	No signal		Power supply is off (or voltage is less than minimum required)
RX		Green	DFM Industrial data is being received
	No signal		No data from DFM Industrial
TX		Yellow	Data is being transmitted to DFM Industrial
	No signal		No data to DFM Industrial

2.6.2 User interface

Service DFM Industrial is launched with a  label which is created during the installation process. Service DFM Industrial user interface consists of **Horizontal menu**, **Vertical menu, Flow meter's ID area** and **Information and configuration area** (see figure 30).

ATTENTION: In case you face problems with starting Service DFM Industrial software in Windows 10, you may need to set starting the software in the mode of compatibility with Windows 7. For this purpose, perform the following operations:
1) Click the right button of the mouse on the service software icon and select its **Properties**.
2) In **Compatibility** tab tick the field **Run this program in compatibility for** (**Compatibility mode** area).
3) Select Windows 7 from the dropdown list of operating systems.

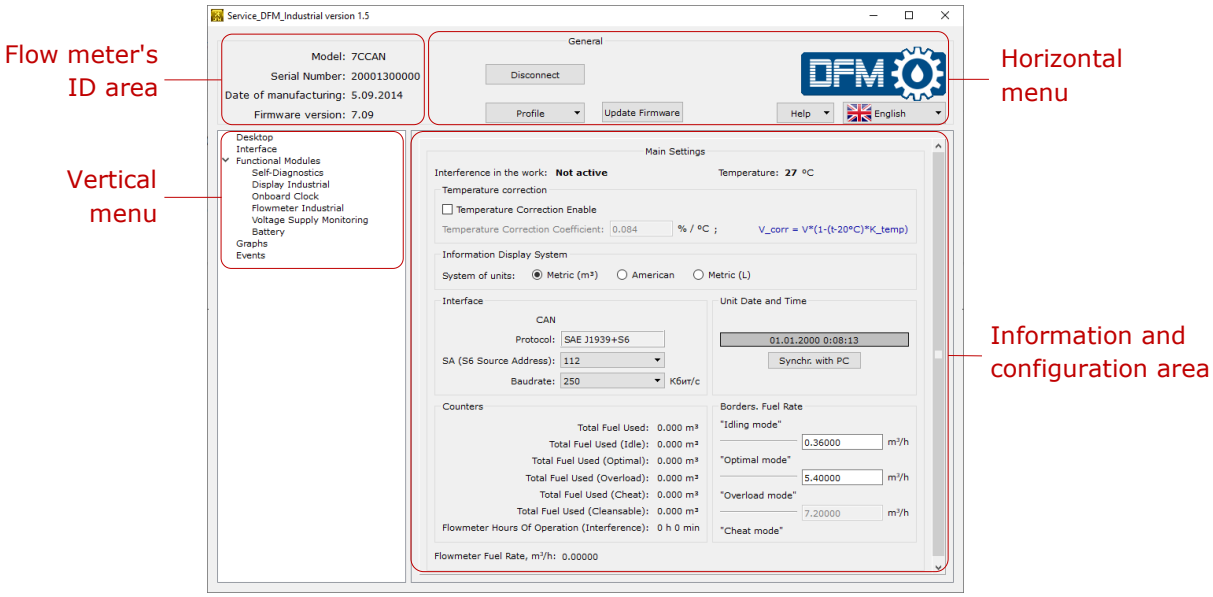


Figure 30 — Service DFM Industrial software interface

ATTENTION: At lower screen resolutions (less than 1024x768) software window is automatically set to full screen. In this case scroll bars are used to display unseen areas.

Flow meter's ID area displays data on model, serial number, production date and firmware version of the connected meter.
Horizontal menu provides following options:

- connection/disconnection of the flow meter;
- meter profile options (loading profile, saving profile, printing profile);
- updating firmware of the meter;
- selection of interface language;
- viewing help file and information about the utility.

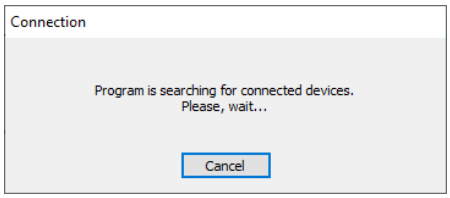
Vertical menu is used for selection of Functional modules (hereinafter FM) of the meter. The actual parameters of FM and settings are displayed at **Information and configuration area**. Connectivity of software with FM is based on PGNs and SPNs (S6 Database) exchange. SPNs of DFM Industrial Functional module which are read and/or edited in **Information and configuration area** are listed in annex F.
Vertical menu also contains entries on real-time diagnostics of measuring chambers and events records.

2.6.3 Authorization

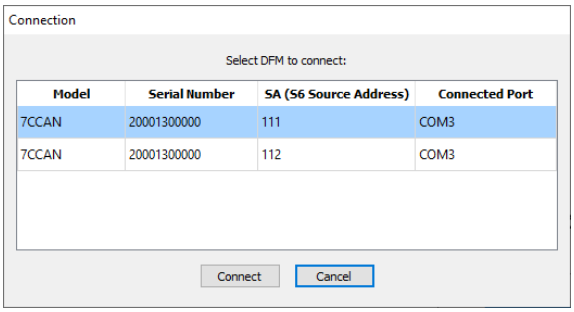
To establish connection with DFM Industrial push Connect at **Horizontal menu**. Service DFM Industrial software will run a search of connected meters.

When you connect service adapter via S6 Technology, which contains more than one Unit, in the **Connection** window from the list choose the unit, that will be used with software and click the button Connect.

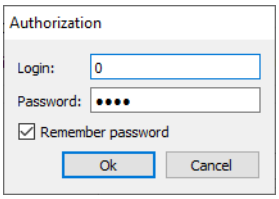
Enter installer's login and password in the fields of **Authorization** window. The default Login is **0**. The default password is **1111**. Tick **Remember password** checkbox to save the password for further launches (see figure 31).



a) search of flow meters connected to the PC



b) selection of the required flow meter for work with the software



c) user authorization

Figure 31 — Establishing connection between PC and DFM Industrial

To recover the password (in case it is lost), you need to place the cursor into the **Login** or the **Password** field of the window **Authorization** and press **Ctrl+F10** key combination.

Service DFM Industrial software will display a code to recover the current password of the Unit (see figure 32). This message is being sent to Technoton technical department by e-mail support@jv-technoton.com Together with password recovery request.

Requirements for password recovery request:

- scan copy of the request signed and sealed by the official representative of the company the flow meter been purchased by should be attached;
- request should contain serial number of the meter;
- email should contain full name and contact e-mail of a person who should receive the recovered password.

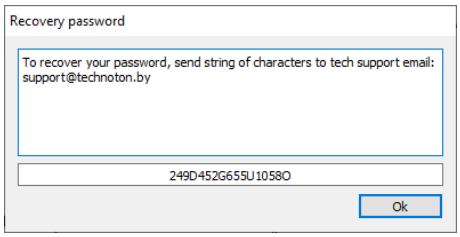
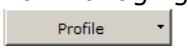


Figure 32 — Generated recovery code window

In case of entering incorrect login/password or in case of wrong connection to PC the software will show an error message.

In case of successful authorization with login and password the software will automatically prompt **Desktop** window (see figure 30), which displays currently connected DFM Industrial's configurations and parameter values of Functional modules (see annex F).

2.6.4 Working with flow meter profile

Profile of DFM Industrial is represented by a set of PGNs (specifications, counters and configuration of Functional modules of DFM Industrial).
For managing DFM Industrial profiles in both meter connected mode and autonomous mode 

button with drop-down list is used (see figure 33). This button is placed at **Horizontal menu** of Service DFM Industrial. Profile can be stored as a file to PC hard drive or loaded into the memory of the meter, or, if needed, printed or saved in pdf file.

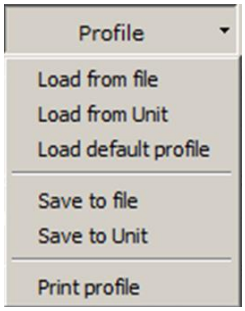
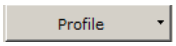


Figure 33 — Profile menu view



menu has following entries:

1) Load profile. Service DFM Industrial has following options of flow meter profile load:

- Load from file — for loading of previously saved profile from the hard drive or removable disk. Select the **DFM_*.prf** file of the flow meter profile in the appeared open window.
- Load from Unit — used for loading profile from the connected flow meter.

ATTENTION: When there is an active connection between DFM Industrial and PC it is possible to load profile from file of only the same interface as connected Unit. Otherwise the warning message will appear.

- Load default profile — is used for loading profile with default factory settings. With this profile it is possible to study utility operation without real DFM Industrial connection. Default profile is stored in **DFM_*_default.prf** file in the folder of Service DFM Industrial.

ATTENTION: In autonomous mode only, default profile or previously saved profile is available for loading.

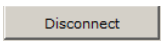
2) Saving profile. Service DFM Industrial has following profile saving options:

- Save to file — for saving profile to the hard drive or removable disk. This option is available only for profile loaded from file or Unit.
  Select the location and give a name to file according to format **DFM_*.prf**.
  Enter a name instead of an asterisk in the template. The prefix **DFM_** and the extension **.prf** will be inserted automatically.

ATTENTION: Saved profile then can be loaded only when DFM Industrial with the corresponding output interface is connected.

* Maximum flow rate and output signal type of corresponding flow meter model is specified (e.g. **7CAN** or **25K** etc.) (see figure 1).

- Save to Unit — is used for saving modified settings into profile of the connected DFM Industrial. It is available only during the time when there is an active connection between PC and DFM Industrial.

  If the modified settings were not saved into Unit and 

button was pressed or Service DFM Industrial window is being closed there will appear a notification. Pressing 

will save all the unsaved parameters and settings into DFM Industrial.

3) Print profile. This window allows selection of the printer and printing settings.
The printed copy will contain flow meter profile data as well as the date when it been printed.

RECOMMENDATION: It is recommended to attach the hardcopy of the profile to the meter's specification to log the history of the settings and configurations.

2.6.5 Configuration for connection to external terminal unit

Flow meters with pulse output signal (**DFM Industrial CK**) does not require any output signal configuration.

Fuel flow meters with CAN j1939/S6 digital interface (**DFM Industrial CCAN)** require output signal configuration to be connected to external terminal unit. Go to **Interface** submenu to configure output signal parameters (see figure 34):

1) In the dropdown list **Protocol, SAE 1939+S6**, fixed data transfer protocol (SPN 521530) is specified.

2) To identify the flow meter within the network of several Units connected by means of S6 Technology, specify the unique flow meter network address from the range of fixed values: **111**; **112**; **113**; **114**; **115**; **116**; **117**; **118** (by default – **111**) from the dropdown list **SA (S6 Source Address)** (SPN 521188).

3) Select Baudrate via CAN j1939/S6 interface from the dropdown list **Baudrate** (SPN 521531), from the range of fixed values: **100**; **125**; **250**; **500**; **1000** kbit/s (by default— **250** kbit/s).

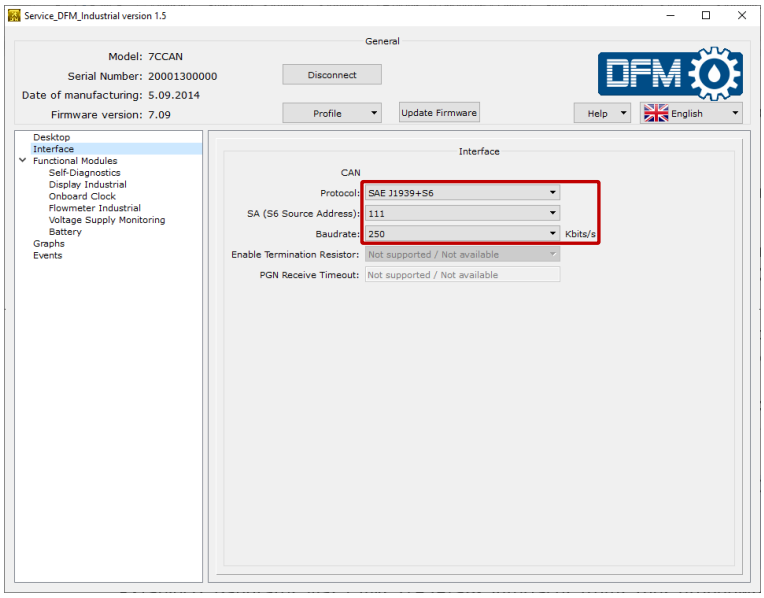


Figure 34 — Configuration of the flow meter connection parameters via CAN j1939/S6 interface

ATTENTION: After editing settings of CAN j1939/S6 interface in **Desktop** submenu, values of the respective settings in **Interface** submenu automatically change accordingly and vice versa.

2.6.6 Operation check

For functioning check of the mounted flow meter, you may use **Graphs** submenu of the service software in which are displayed in real time (see figure 35):

- for a single flow meter:

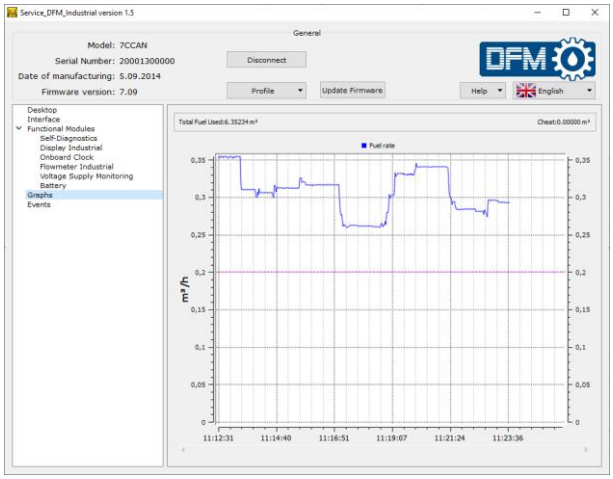
  - graph of hourly (instant) consumption of fluid, which went through the only measuring chamber (blue line) (SPN 521313);
  - current Counters values — total fluid consumption (SPN 521307) and fluid consumption in "Tampering" mode (SPN 521307/9.3).

- for differential measurement:

  - hourly (instant) flow rate graph is displaying fluid flow through measuring chambers of Master flow meter (blue line) and Slave flow meter (red line) (SPN 521313), which are connected to supply and return lines respectively. Additionally, the graph displays differential flow rate (fluid flow through measuring chambers of Master and Slave flow meters) with green line (SPN 521313/2.15) (see 2.6.8).

  - current Counters values — total fluid consumption (SPN 521307/2.15) and fluid consumption in "Tampering" mode (SPN 521307/2.15/9.3) for Master flow meter.

Horizontal pink dotted lines display configured boundaries of operation modes (see 1.6.5). You can change configuration of operation modes boundaries in **Desktop** or **Flowmeter Industrial FM** submenu (see F.4).



a) graph example of one flow meter

b) graph example of differential measurement

Figure 35 — DFM Industrial operation test with Graphs submenu

2.6.7 Configuration for specific operation conditions

For improving accuracy of flow meter readings under specific conditions of operation, it is possible to adjust the following settings using service software, **Flowmeter Industrial FM** or **Desktop** submenu (see F.4 and figures 30, 36):

1) Set up boundaries of operation modes of flow meter, which are used to define current workload of consumer depending on its hourly consumption rate (PGN 63163):

- "Idling mode" – workload less than 10 % of maximal hourly consumption rate;
- "Optimal mode" – workload 10 to 75 % of maximal hourly consumption rate;
- "Overload mode" – workload 75 to 100 % of maximal hourly consumption rate.

In flow meters a user can adjust only "Idle" (SPN 521317/9.0) and «Optimal» (SPN 521317/9.1) modes. Factory-set configuration for "Overload" mode (SPN 521317/9.2) could not be adjusted (see figure 36 a).

3) Turn on temperature correction function, i.e. automatic correction of fuel volume consumption data adjusted to fuel temperature (SPN 521311).
Temperature correction function is used because volume of fuel changes when fuel temperature is going up/down.
After turning on temperature correction function a user can enter temperature correction coefficient of volumetric expansion (coefficient of volumetric expansion of oil products **β** in relation to temperature change by 1 °C) (SPN 521433).
The value of coefficient **β** is selected for the density of the oil product **ρ** at the temperature +20 °C, in accordance with properties of a specific type of fuel being used.

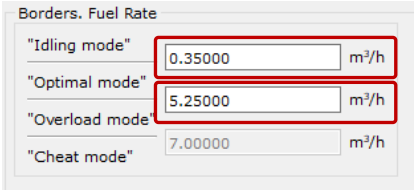
4) Configure consumption correction factor (SPN 521434). This parameter allows increasing accuracy of fluid consumption measurement if a user constantly detects derivation (values are too high/low) of measured consumption related to specific conditions of operation (increased vibration, air presence in pipelines, higher flow in reverse line of nozzles).
For example, if flow meter shows 3 % higher results of measurement, it is necessary to enter consumption correction coefficient equal minus 3 %. If flow meter shows 2 % lower results of measurement, it is necessary to enter consumption correction coefficient equal plus 2 %.

4) Configure system of units, i.e. necessary measurement units for displaying measurement results on the display of DFM Industrial (SPN 521332):

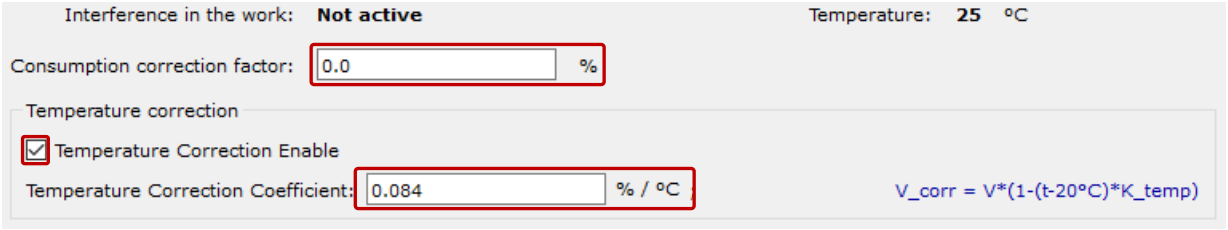
- metric (m^3);
- metric (l);
- US (gallon).

Note – Measurement units systems can also be adjusted in the corresponding area of **Display Industrial FM** (see F.2).

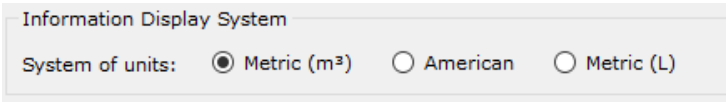
ATTENTION: Keep in mind, that all internal Parameters and Counters of **Flowmeter Industrial FM** always correspond to metric (m^3) system and do not depend on selected measurement units for showing on the display.



a) configuration of limits of the flow meter operation modes for instant consumption



b) configuration of thermal correction and of the correction coefficient of consumption



c) configuration of data presentation on the flow meter display

Figure 36 — Examples of DFM Industrial settings for specific operating conditions

2.6.8 "Differential"/"Summarization" operation mode

ATTENTION: For operation in "Differential"/"Summarization" mode, any pair of DFM Industrial CCAN flow meters is connected using S6 Technology.

Flow meter configuration is carried out in **Flowmeter Industrial FM** submenu (see F.4 and figure 37) (**Differential Operation Mode** area) in the following sequence:

1) In the dropdown list **Operation in Master mode** enable Master mode (SPN 521268) for Master flow meter and make sure that Master mode is off for the Slave flow meter.

IMPORTANT: Any network address from the range of values 111…118 can be specified for the Master flow meter (see 2.6.5).

2) In **Calculation Mode** dropdown list enable mode of counting DFM Industrial CCAN (SPN 521270):

- **Differential** — fluid consumption is calculated as difference in consumption measured by flow meters in the feed and reverse lines (see 2.4, figure 23 a);
- **Summing** — fluid consumption is calculated as a sum of consumption measured by flow meters in the first and the second lines (see 2.4, figure 23 b).

ATTENTION: For differential measurement a Master-flow meter is a flow meter, which is installed in feed line, Slave-flow meter is a flow meter installed in reverse line.
In summarization mode, primary and secondary roles of flow meters are assigned arbitrary.

3) Enter a unique network address in **Slave Device Address** field for Slave-flow meter (SPN 521269). Elected address should not be the same as Master-flow meter has.

4) In **Borders. Differential Fuel Rate** area, define values for differential instant fuel consumption range (PGN 63205) (similar to **Borders. Fuel Rate** configuration, see 2.6.7).

5) If necessary, enter **Differential Fuel Rate Correction Coefficient** (SPN 521271) for Master-flow meter to increase accuracy of measurement (similar to **Consumption correction factor** configuration, see 2.6.7).

6) To increase accuracy of differential measurement for complex objects, which have uneven flow rate in feed and return lines (e.g. fuel pulsation, increased fuel system inertia, waterhammers etc.), **Smoothing Capacity** (smoothing buffer) of Master flow meter can be configured (SPN 521671).
This setting is available only for Service DFM Industrial software version 1.5 and higher.

The value of the attenuating buffer is determined experimentally, from the range of **2…100** conventional units. One conventional unit corresponds to the volume of Master flow meter measuring chamber (see 1.6.3). Thus, the selected value of the attenuating buffer will correspond to conventional volume which is equal to the sum of the measuring chambers' volumes.

In case of even flow rate in feed and reverse lines, it is recommended to enter minimum value of buffer (in majority of cases default value **5** is enough). When unevenness of flow rate in feed and reverse lines is growing, it is recommended to increase value of smoothing buffer.

WARNING: Keep in mind, that increasing smoothing buffer leads to:
1) Values of Counters of differential fuel consumption re-calculated by the Master flow meter may remain unchanged up to several minutes.
2) After fuel supply is stopped, values of Counters in Master flow meter are stabilized not sooner than in 15 seconds.

To get recommendation on configuring smoothing buffer for particular case, contact Technoton technical support team.

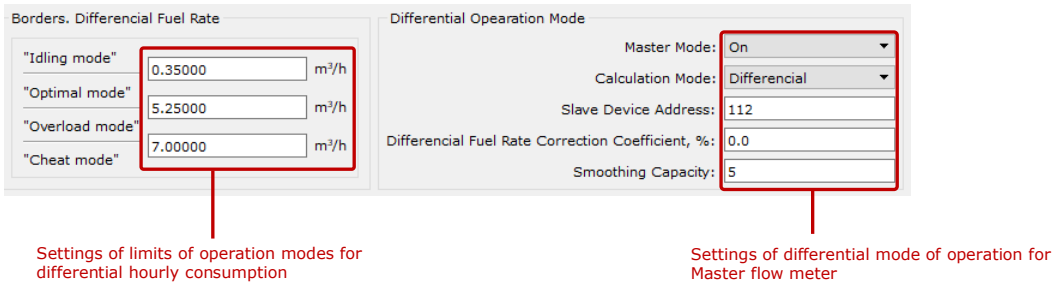


Figure 37 — DFM Industrial CAN settings for the differential mode of operation

IMPORTANT: To operate in "Differential"/"Summarization" mode power supply voltage of flow meters should not drop out of 10…45 V range.

3 Measurement accuracy check

ATTENTION: To determine measurements accuracy of DFM Industrial flow meter mounted on the vehicle it is required to carry out a **test**.
Measurement accuracy check is an obligatory procedure, which defines relative inaccuracy of fluid consumption measurement on equipped facility.

3.1 Test conditions

Tests must be conducted in presence and under control of representatives of all interested parties.

Only people who have studied DFM Industrial and recording devices operational documentation and who have experience with testing equipment are allowed to conduct the tests.

Install the DFM Industrial flow meter and connect it to recording and display devices. Conduct all works in accordance with the installation manuals for flow meters and recording and display devices.

Conditions of the test:

- tests are conducted on properly operating facility (Vehicle);
- the temperature of the fluid measured must be the working temperature; the fluid should not contain any mud or inclusions, the air must be released from the pipeline;
- during the test the pump should run at average capacity;
- duration of the tests — until running out of up to at least 2/3 of the average hourly fuel consumption by the consumer;
- it is not allowed to shut pumping the fluid in the pipeline until the end of the test;
- to measure the volume of fluid in tank during the tests, it is necessary to use the certified measuring instruments (e.g. measuring rod for oil products).

3.2 Conducting the tests

DFM Industrial measurement accuracy check sequence:

1) Measure precise volume of fluid, which is contained in tank 1 on the beginning of procedure ($V_{initial}$) (see figure 38).

2) Switch on the pump and set it to average capacity.

3) Record the time when the test was started.

4) Write down starting value of fluid consumption from DFM Industrial screen (V_0).

5) Pump at least 10 % of tank 1 volume into tank 2. The time of pumping must be at least 1 hour.

6) Switch off the pump.

7) Measure volume of fluid remaining in tank 1 (V_{remain}).

8) Write down final value of fluid consumption (V_1) from DFM Industrial screen.

9) Calculate **real fluid consumption** ($V_m = V_{initial} - V_{remain}$).

10) By difference of initial (V_0) and final (V_1) DFM Industrial readings determine **measured fluid consumption** ($V_{measured}=V_1 - V_0$).

11) Calculate the **relative measurement error of fluid consumption** by the formula:

$$\delta = \frac{V_{measured} - V_m}{V_m} \cdot 100\%$$

where $V_{measured}$ – measured fluid consumption, m^3;

V_m – actual fluid consumption, m^3.

12) Record the result into the protocol. See annex C for protocol template.

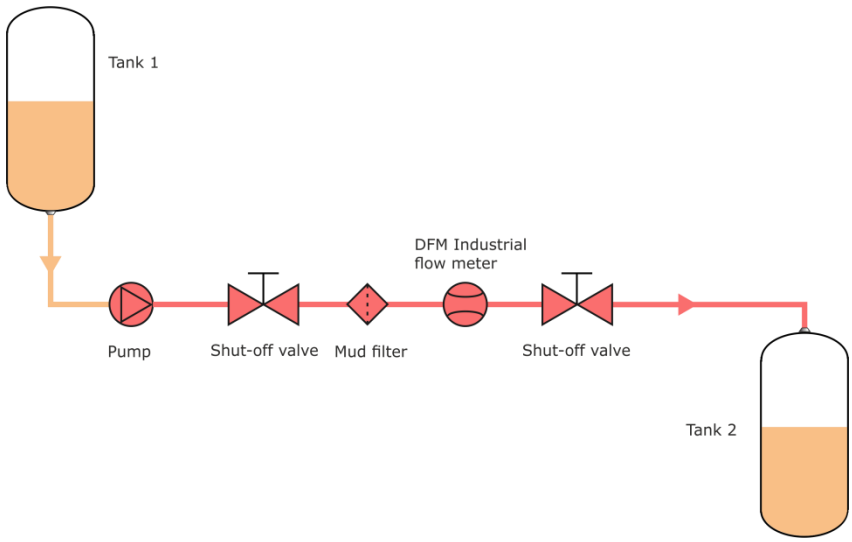


Figure 38 — Example of a scheme for measurement accuracy check

IMPORTANT: When carrying out accuracy test of DFM Industrial flow meter, you can use the values from "Total fuel consumption" Counter (see F.4), at the same time: **keep in mind**, that there is a 12 s time lag in DFM Industrial with display between the moment when values appearing on the display of flow meter and sent to output interface of flow meter.

4 Registered Events control

For monitoring Events recorded by DFM Industrial CK/CCAN and saved in its internal memory, connect the flow meter to the PC (see 2.6.3) and select **Events** submenu in the service software (see figure 39) in which lists of **Important Events** and **Information Events** will be displayed (up to 15 of each type).

1) Important Events:

- flow meter tampering (indicating total tampered volume);
- interference in flow meter operation (indicating total interference time);
- low level of supply voltage (indicating voltage value);
- high level of supply voltage (indicating voltage value).

2) Information Events:

- ignition switched ON;
- ignition switched OFF.

Each event has an indication of event name, date and time of occurrence and additional info (if there any).
Events are displayed in chronological order starting with the oldest. Upon reaching the maximum number of displayed events new events overwrite the previous ones.

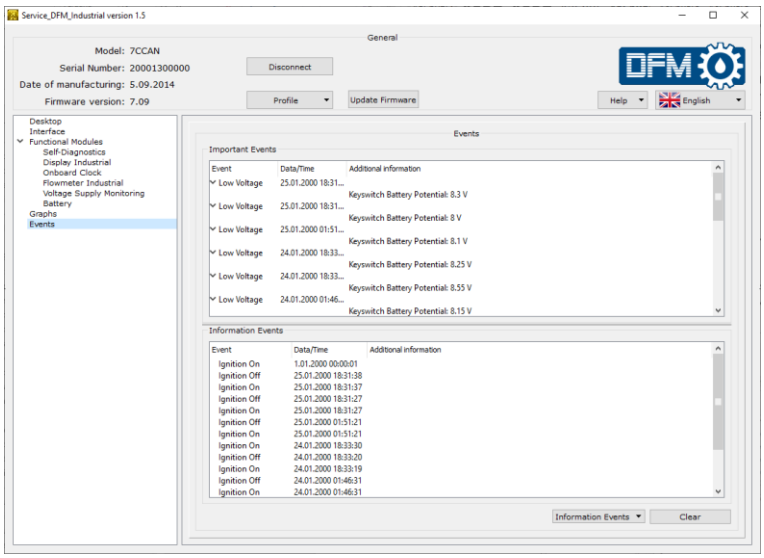


Figure 39 — Browsing through Events registered by DFM Industrial

You can delete all registered Event from DFM Industrial by clicking Clear. Important Events cannot by deleted by use.

5 Diagnostics and troubleshooting

Contact your DFM Industrial supplier in case of malfunction.

DFM Industrial repair works can be carried out only by certified Regional Service Centers (RSC). Full list of service centers can be found at https://jv-technoton.com/.

Limited troubleshooting may be self-conducted (see table 13).

Table 13 — DFM Industrial malfunctions, which can be removed without full dismounting of the device

Malfunction	Model	Possible cause	Troubleshooting
No output signal	**DFM Industrial CK/CCAN**	Incorrect connection to the Terminal	Check DFM Industrial connection to the tracking device/data logger
		Mud filter mounted before the flow meter is clogged with dirt	Wash the filter
Fluid does not flow through the meter	**DFM Industrial C/CK/CCAN**	Filter clogging	Remove and clean the filter
Fluid consumption readings are higher than real consumption rate		Wrong flow meter model selection or error in the mounting scheme	Study the technical documentation of the fluid consumer and check the mounting scheme
		Hydraulic shocks in the pipeline	Install a non-return valve into the pipeline on the meter's outlet side. Check valve's operational performance in case it is already installed.
Working fluid leakage in fittings		Mounting flanges bolts are loose/Sealing damaged/ Fittings are loose	Tighten the bolts/ Replace the sealing/ Tighten the fittings
The oval-shaped gears do not rotate (no specific sound of rotating gears)		The oval-shaped gears wedge up due to solid particles penetration/Fluid rate below minimum	Check the state of the mud filter/Dismantle the measuring chamber and delete any inclusions/Increase the fluid rate

6 Verification

In case of using DFM Industrial flow meter as a measuring tool for commercial accounting of fluid, you may need testing it in the system of national regulation for measuring equipment, in compliance with the legislation of a specific country of the flow meter owner.

7 Maintenance

In order to ensure measurement accuracy, we recommend to conduct external examination and operability check of DFM Industrial no less than once a year.

For correct operation of DFM Industrial, wash the mud filter mounted before the flow meter, from time to time.

In case you are not going to use DFM Industrial for a long time, and in case this flow meter is used for measurement of fuel oil consumption, you need to discharge fuel oil from the section of the pipeline in which the flow meter is mounted (to avoid its stiffening).

When cleaning the flow meter with steam or compressed air during maintenance, you should dismantle it, wash it with spirits or benzine and dry.

IMPORTANT: if you need to install DFM Industrial a second time, **use only new** sealing components.

8 Packaging

DFM Industrial delivery set is placed in a sealed plywood box (see figure 40).

Figure 40 — DFM Industrial 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 DFM Industrial box (see figure 41).

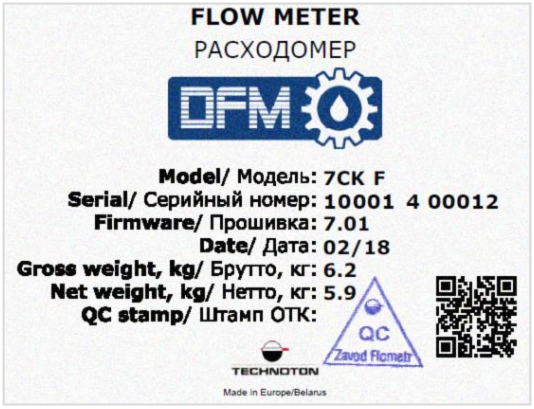


Figure 41 — DFM Industrial packaging label

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

9 Storage

DFM Industrial is recommended to be stored in dry enclosed areas.

DFM Industrial storage is allowed only in original packaging at temperature range from -50 to +40° C and relative humidity up to 100 % at 25° C.

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

DFM Industrial shelf life must not exceed 24 months.

10 Transportation

Transportation of DFM Industrial is recommended in closed transport that provides protection from mechanical damage and precipitation.

When transporting by air, DFM Industrial 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 DFM Industrial should be sealed.

11 Utilization/re-cycling

DFM Industrial does not contain precious metals in amount that should be recorded.

The inbuilt lithium-thionyl chloride battery of DFM Industrial 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 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.

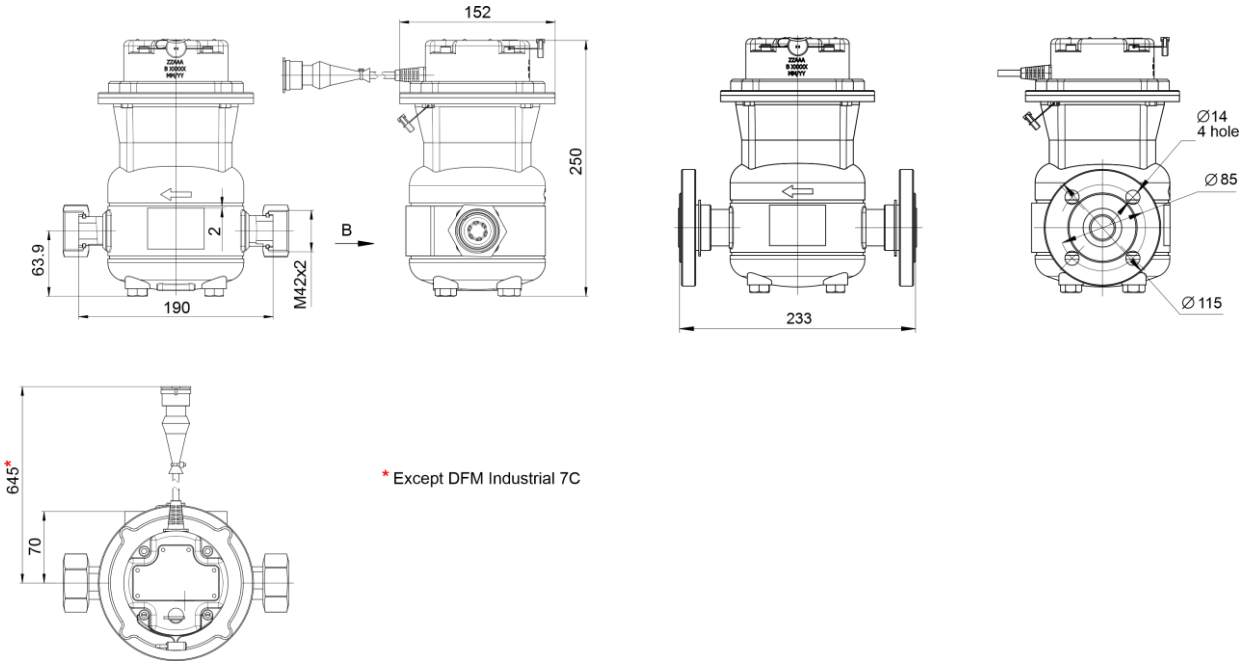
Contacts

Distribution, technical support and service

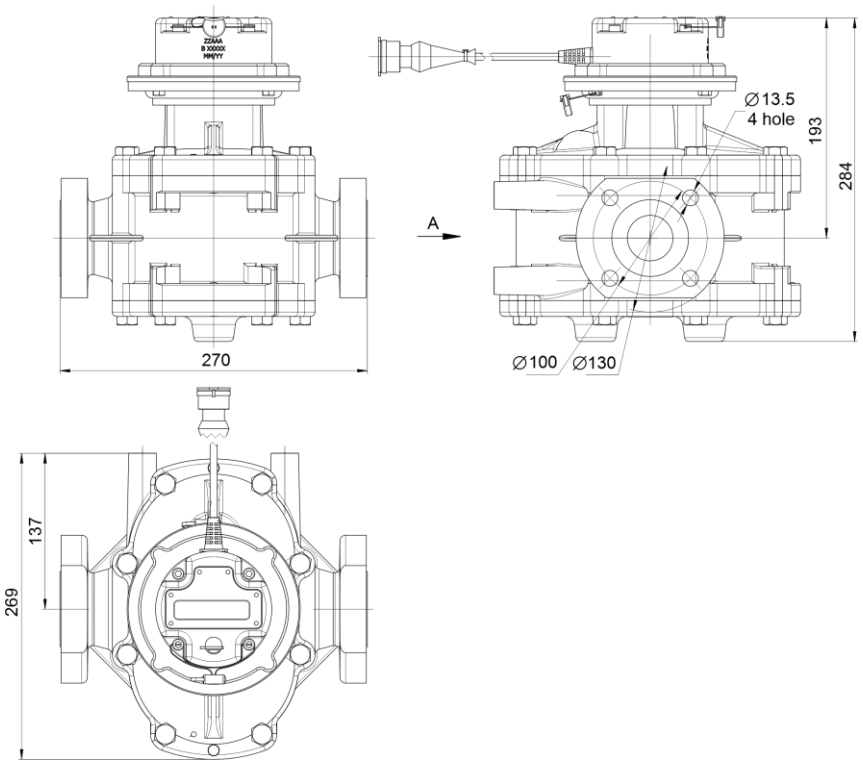
sales@jv-technoton.com

support@jv-technoton.com

Annex A
Overall and mounting dimensions, weight

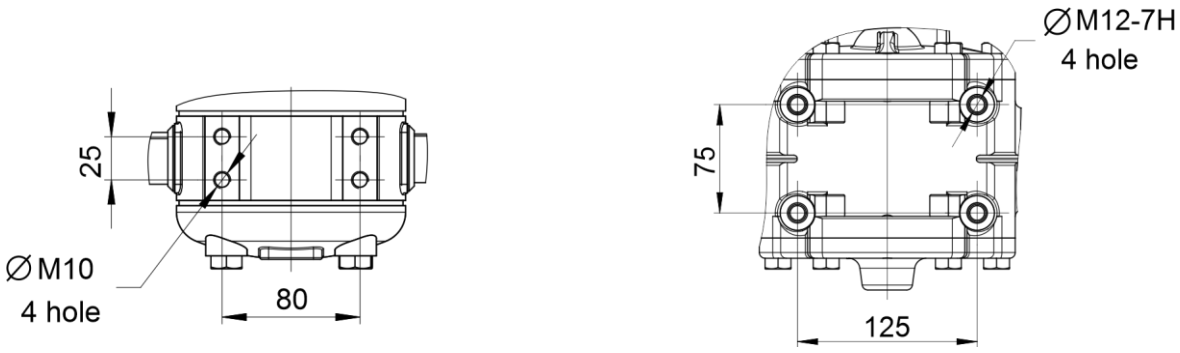


a) DFM Industrial 7



b) DFM Industrial 25

Figure A.1 — Flow meters overall dimensions



a) for DFM Industrial 7 *b) for DFM Industrial 25*

Figure A.2 — Diagram showing mounting holes locations on flow meters

Table A.1 — DFM Industrial weight

Model	Weight, kg, not more than
DFM Industrial 7C F	5.3
DFM Industrial 7C T	4.6
DFM Industrial 7CK F	5.4
DFM Industrial 7CK T	4.7
DFM Industrial 7CCAN F	5.4
DFM Industrial 7CCAN T	4.7
DFM Industrial 25C F	14.5
DFM Industrial 25CK F	14.6
DFM Industrial 25CCAN F	14.6
DFM Industrial 7C F	5.3

Annex B
Act on examination of the consumer of the fluid which is to be measured

_____/ _____ /20____
Date Month Year

We, the undersigned representatives of the Customer
_____,
and representatives of the Contractor
_____,
have conducted fluid consumer (power plant) inspection

Consumer type _____
Brand, model _____
Registration number _____
for conformity to DFM Industrial installation requirements, and have concluded the following:

Requirement	Conforms/ Does not conform	Notes
Hydraulic system hermeticity		Measurement accuracy and DFM Industrial performance is not guaranteed in case of a leakage in the hydraulic system
Hydraulic system pressure		DFM Industrial performance is not guaranteed in case of an insufficient pressure in the hydraulic system
State of return line		Injectors return flow being higher than normal can significantly affect measurement accuracy
Power supply voltage		DFM Industrial performance is not guaranteed in case of insufficient power supply voltage
State of grounding		DFM Industrial performance is not guaranteed in case of significant resistance/oxidation of the switch. Maintenance or replacement is recommended

representative of the CUSTOMER:

_____

name, signature

representative of the CONTRACTOR:

_____

name, signature

Annex C
Template of check test report

_____/ _____ /20___
Date Month Year

Fluid Consumer	
DFM Industrial model, serial number	

Fluid consumption	Actual fluid consumption (measured by the measuring rod) V_m, m^3	
	Fluid consumption measured (According to DFM Industrial reading) $V_{measured}$, m^3	
Relative error of fluid consumption measurement	$\delta = \frac{V_{measured} - V_m}{V_m} \cdot 100\%$	

Resume:

Fluid consumption measurement **corresponds /does not correspond** to the technical specification.

Comments:

_____
_____
_____

representative of the CUSTOMER:

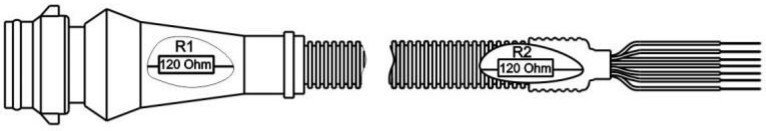
_____
name, signature

representative of the CONTRACTOR:

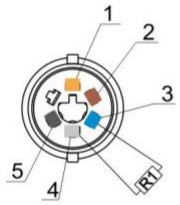
_____
name, signature

Annex D
Pinout signal cables

S6 SC-CW-700 Cable



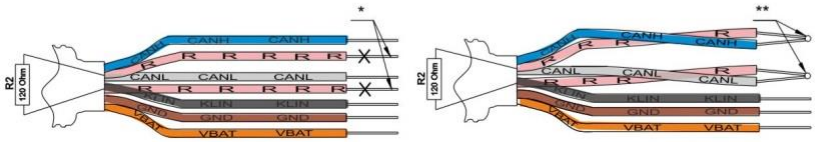
Cable length 700±5 cm.



Pin	Wire color	Circuit
1	orange	VBAT
2	brown	GND
3	blue	CANH
4	white	CANL
5	black	KLIN
6	-	-

Connecting

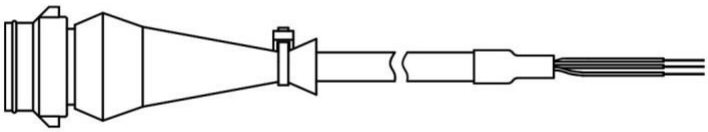
without built-in terminal resistor R2 | with built-in terminal resistor R2



* Do not connect R2 resistor wires (pink, identification mark R), insulate.

** Connect electrically one of the R2 resistor wires (pink, identification mark R) with CANH wire, and the other - with CANL wire.

CABLE DFM.98.20.003 Cable



Cable length 750±5 cm.

Pin	Wire color	Circuit
1	orange	VBAT
2	brown	GND
3	-	-
4	white	imp
5	-	-
6	-	-

Annex E
Examples of connection schemes for DFM Industrial CCAN

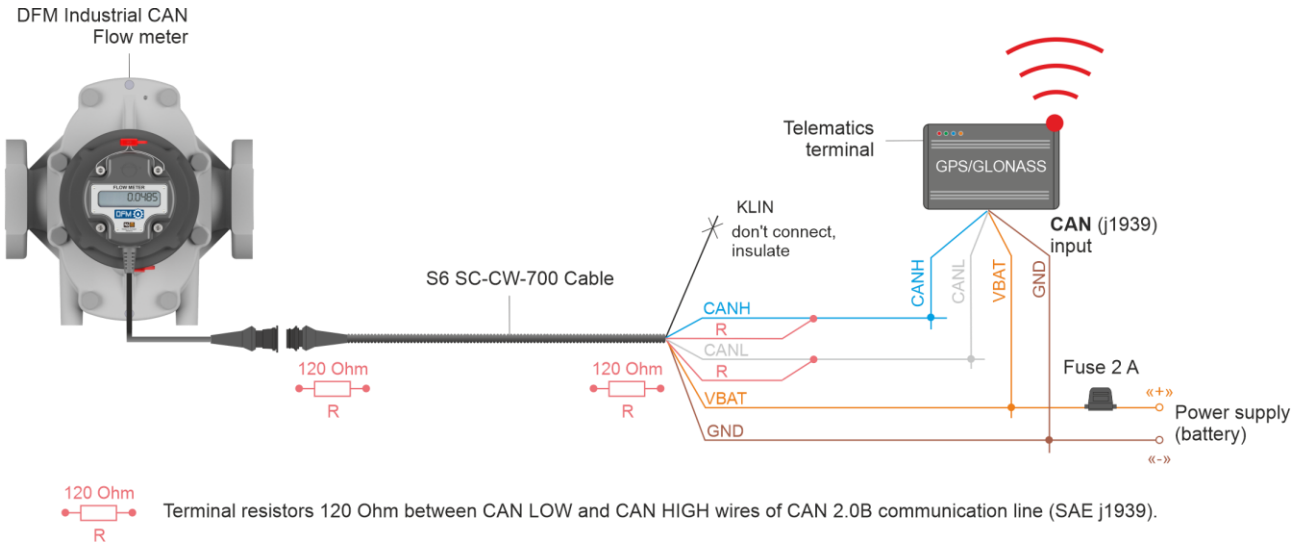


Figure E.1 — Example of DFM Industrial CCAN connection to the Telematics terminal incompatible with S6 cable system

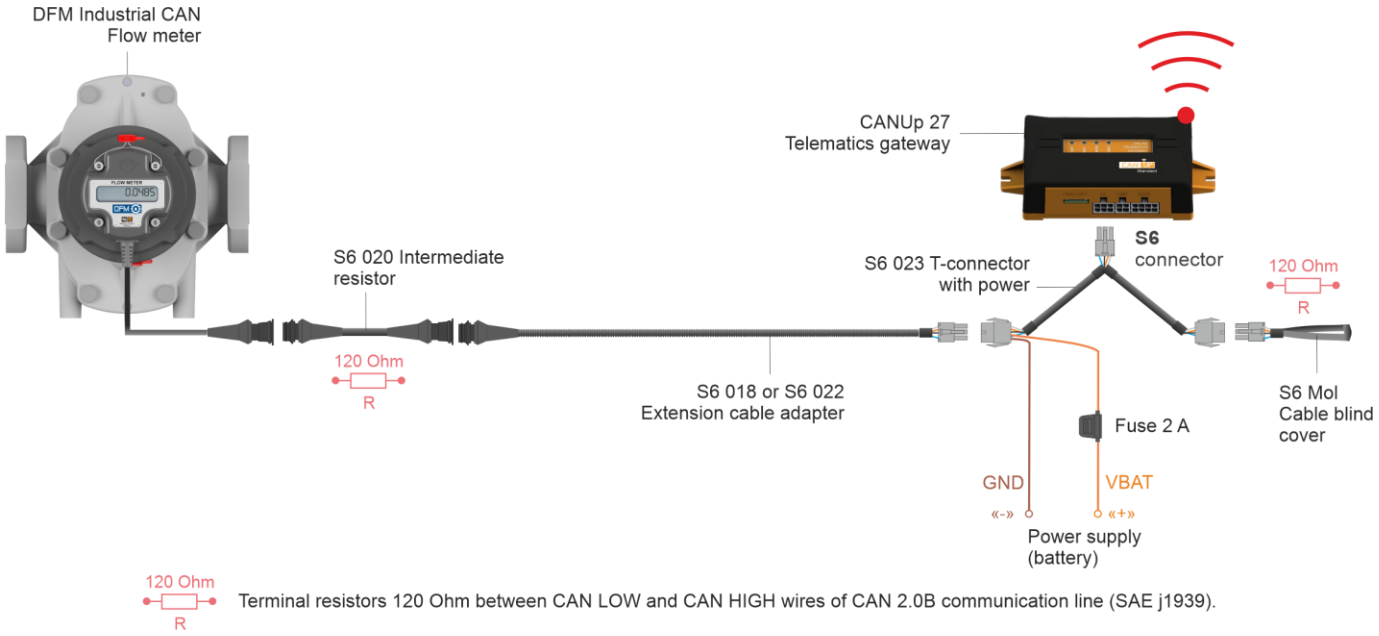


Figure E.2 — Example of DFM Industrial CAN connection to the Telematics terminal which is compatible with S6 cable system

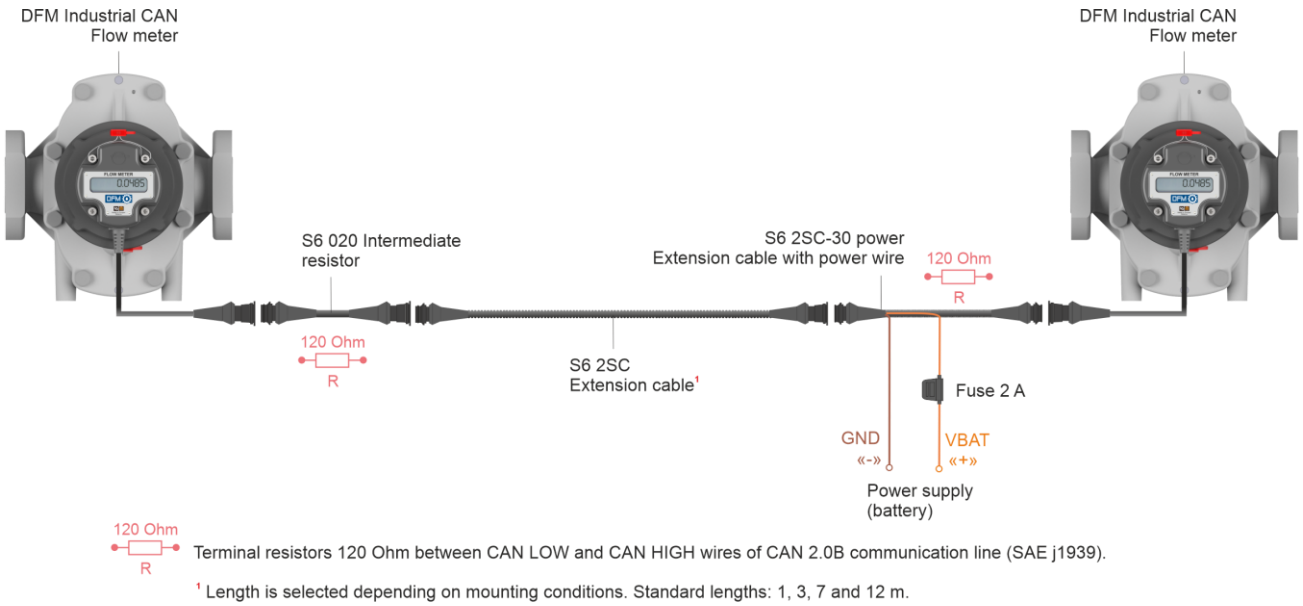


Figure E.3 — Example of independent connection of a pair of DFM Industrial CCAN flow meters for differential measurement/summation of fluid consumption indications

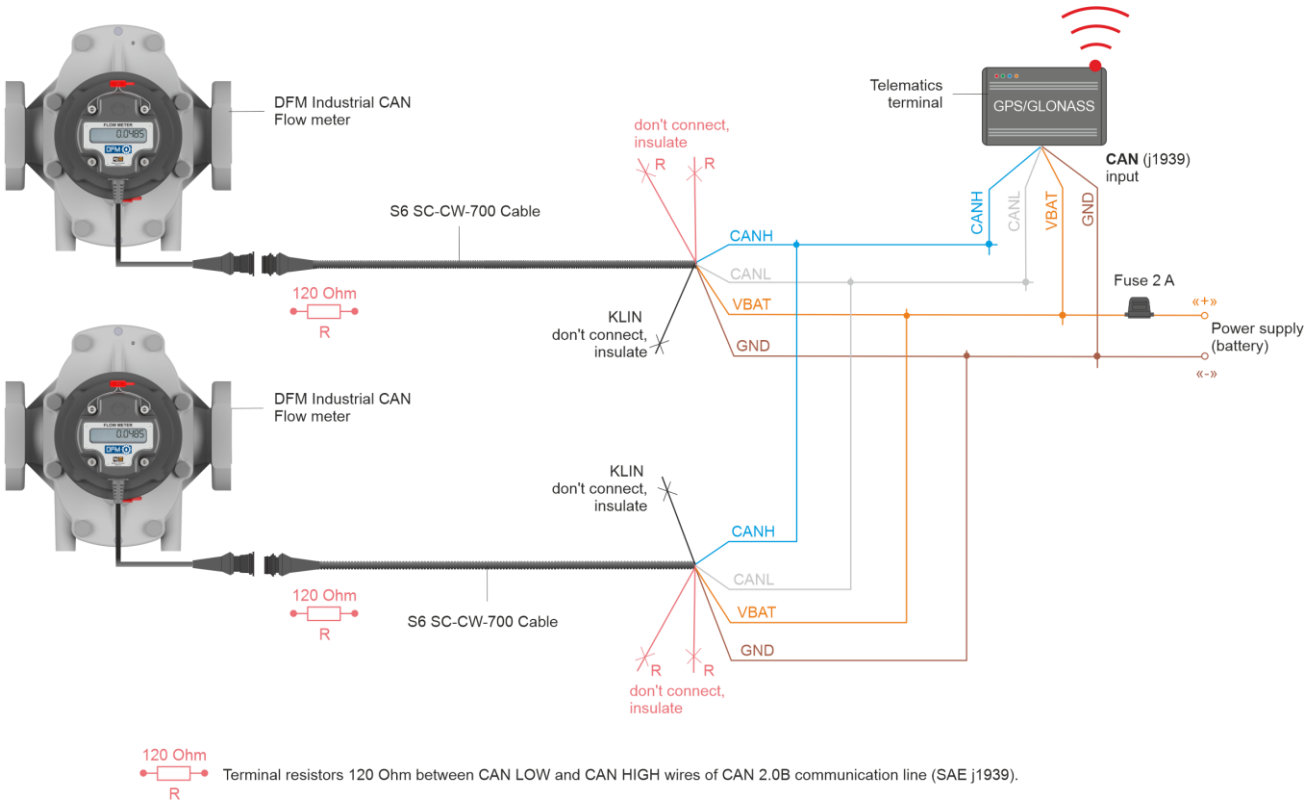


Figure E.4 — Example of connection of a pair of DFM Industrial CCAN flow meters to the Telematics terminal incompatible with S6 cable system, for differential measurement/summation of fluid consumption indications

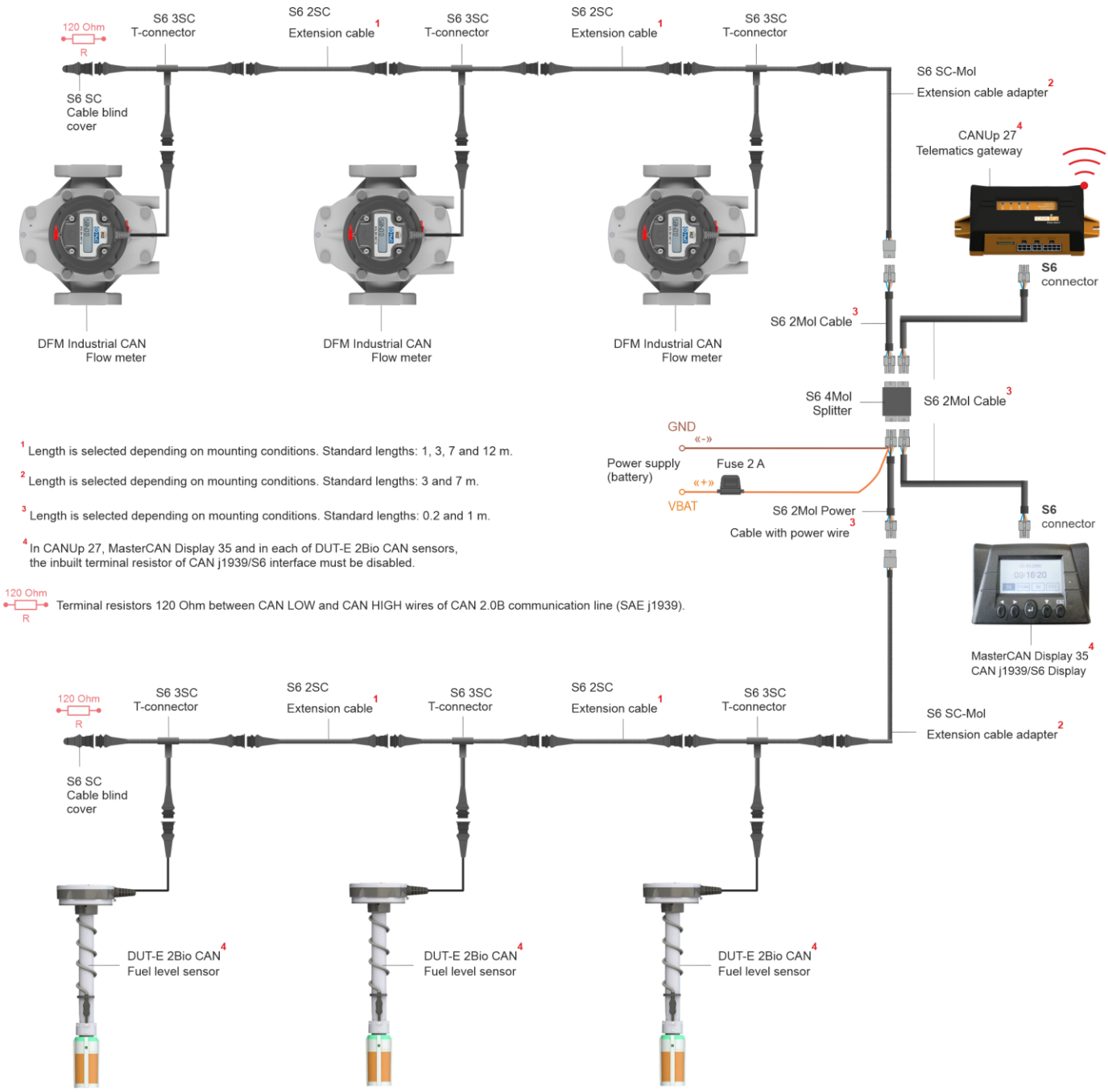


Figure E.5 — Example of connection of several DFM Industrial CCAN flow meters to the Telematics terminal and to CAN-display, together with DUT-E 2Bio CAN fuel level sensors (e.g. for monitoring compartments of a fueling truck tank)

Annex F

SPN of DFM Industrial Functional modules

Hourly (instant) fluid consumption measurement, Counters, Events registration, Parameters configuration and self-diagnostics of DFM Industrial is ensured by coordinated operation of its Functional modules (FM).

SPN format of DFM Industrial FM is in accordance with Data base S6 (DB).

F.1 Self-diagnostics FM

Self-diagnostics FM — designed for user authorization, identification of DFM Industrial passport data, operation time recording and also active malfunctions.

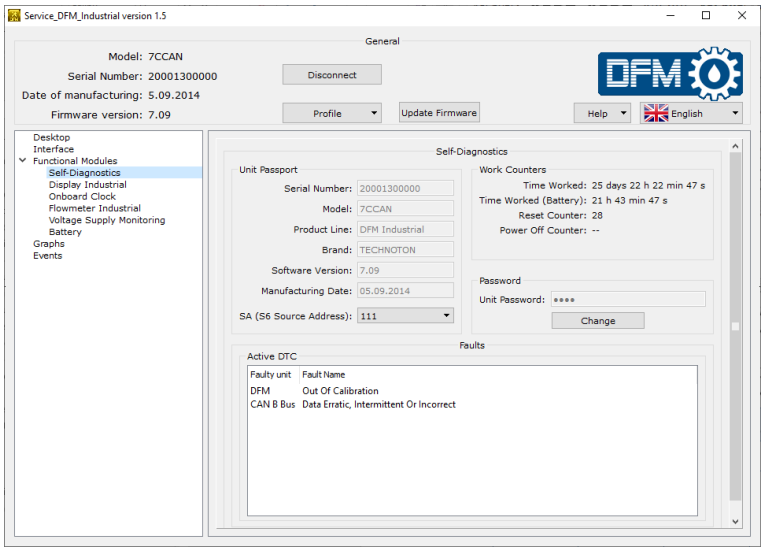


Figure F.1 — Example of the window of settings of Self-diagnostics FM in Service DFM Industrial software

Table F.1 — Self-diagnostics FM. SPN. SPNs, displayed and/or editable in Service DFM Industrial software

SPN	Name	Factory value	Unit of measure	Clarification
Unit passport PGN 62995				
521120	Serial number	On the fact	No	Serial number is a set of numbers that is used for identification of specific DFM Industrial. Serial number DFM Industrial has the following format: AABBB C DDDDD, where: AA – code of DFM Industrial model; BBB – digits that reflect changes product changes; C – Manufacturer code; DDDDD – sequential number. Setting is not available for editing.
521345	Model	On the fact	No	Model – this is version of the sensor inside of DFM Industrial product line. Each model has its own functional and constructive features (see 1.3). Setting is not available for editing.
521123	Line	DFM Industrial	No	Name of the product line. The line represents a group of similar products – fluid flow meters produced under general trademark DFM Industrial. Setting is not available for editing.

SPN	Name	Factory value	Unit of measure	Clarification
521344	Brand	TECHNOTON	No	Name of DFM Industrial Manufacturer. Setting is not available for editing.
521121	Firmware version	On the fact	No	Version of built in Software DFM Industrial. Setting is not available for editing.
521125	Manufacturing date	On the fact	No	Date (day, month, year) of DFM Industrial production. Setting is not available for editing.
521188	S6 address (SA)	111	No	Network DFM Industrial address at Telematics interface CAN j1939/S6. Network address value can be selected by user in range: 111…118.
Unit work Counters PGN 62994				
521116	Unit hours of operation	On the fact	s	Counter of summarized working time of the DFM Industrial since its production moment. The user cannot reset the value of this counter. It can be reset by the Manufacturer or RSC only.
521118	Unit reset counter	On the fact	pc.	Counter of DFM Industrial processor restarts at a time when the power is On or there is an impact of conducted interferences of the vehicle's on-board network. Restarts accounting is carried out since production date of the DFM Industrial. The user cannot reset the value of this counter. It can be reset by the Manufacturer or RSC only.
Passwords PGN 63017				
521593/3.3	Password/ 3.3 Installer	1111	No	Password is entered for user authorization while establishing connection session between flow meter and service Software for configuring the DFM Industrial. Password is a specific combination of four digits. By default, used: Login – 0, password – 1111. User can change password of the DFM Industrial. After entering and confirming the new password is recorded into internal memory of the DFM Industrial.
Active diagnostic trouble codes PGN 65226				
521044	Fault identifier (SID+FMI)	On the fact	No	List of current DFM Industrial malfunctions are displayed at the settings field (in case of its presence — up to 10). For each active malfunction is indicated following: - faulty nod; - malfunction name. This setting allows to monitor DFM Industrial working performance. In case of lack of active malfunctions, the following message is displayed "No malfunctions".
Unit output interface PGN 63168				
521438	Interface Type Mask	On the fact	No	Shows type of connected Unit's interface (CAN/pulse). Depending on interface type, service software loads Unit's Functional modules configurations. Setting is not available for editing.

F.2 Display Industrial FM

Display Industrial FM — designed for selecting measurement unit system of data on DFM Industrial's display, switching ON/OFF Sleep Mode and informational screens.

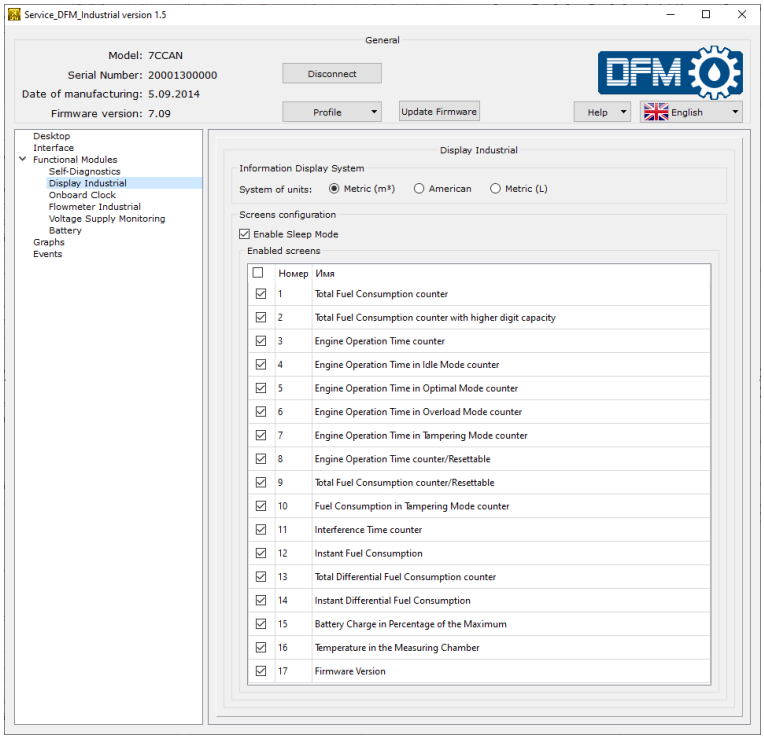


Figure F.2 — Example of the window of settings of Display Industrial FM in Service DFM Industrial software

Table F.2 — Display Industrial FM. SPNs, displayed and/or editable in Service DFM Industrial software

SPN	Name	Factory value	Unit of measure	Clarification
Information Display System PGN 63166				
521332	System Of Units	Metric	m^3	The area for selecting necessary system of showing instant fuel consumption and all fuel consumption Counters (see 1.6.6) on the display flow meter. In DFM Industrial, you can select one of the following display systems: • metric (in m^3); • metric (in liters); • US (gallons).
Screen Configuration PGN 63276				
521455	Sleep Mode	On	No	Field for switching on/off automatic transition of the flow meter to "sleep" mode after 1 min from the moment of last touch of display with magnetic key. When "sleep" mode is turned on, it allows to save the charge of built-in battery of DFM Industrial. For continuous display of data on flow meter's display, "sleep" mode should be switched off. Keep in mind, this operation mode leads to a decrease in of built-in battery's lifetime.
521454	Screens Mask	On	No	Fields of switching on/off any of 17 informational screens of DFM Industrial (see 1.6.6).

F.3 Onboard Clock FM

Onboard Clock FM — designed for generation of signals of time and its transmission to other Functional modules DFM Industrial.

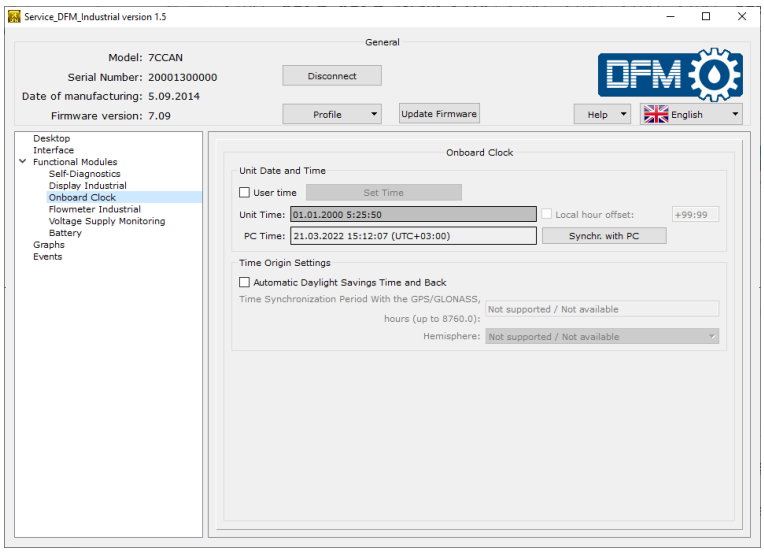


Figure F.3 — Example of the window of settings of Onboard Clock FM in Service DFM Industrial software

Table F.3 —Onboard Clock FM. SPNs, displayed and/or editable in Service DFM Industrial software

SPN	Name	Factory value	Unit of measure	Range	Clarification
Time/Date PGN 65254					
959	Seconds	On the fact	s	0…62.5	Present time — seconds*.
960	Minutes	On the fact	min	0…250	Present time — minutes*.
961	Hours	On the fact	h	0…250	Present time — hours*.
963	Month	On the fact	month	0…250	Present date — month*.
962	Day	On the fact	d	0…62.5	Present date — day*.
964	Year	On the fact	year	1985…2235	Present date — year*.
1601	Local minute offset	0	min	0…59	Time displacement (in minutes) in relation to Coordinated Universal Time that matches with local time (Time zone). It is activated and available for editing when configuring present time manually and when synchronizing time with PC
1602	Local hour offset	+3	h	-24…+24	Time displacement (in hours) in relation to Coordinated Universal Time that matches with local time (Time zone). It is activated and available for editing when configuring present time manually and when synchronizing time with PC
Time origin settings PGN 63011					
521350	Automatic daylight savings time and back	Off	No	On/Off	Daylight saving time automatic adjustment ON/OFF.
* Used during Events registration. Present time is available for user for editing manually or synchronizing of date/time with computer clock. By default, time is set in UTC format (Coordinated Universal Time standard) and displayed according to local displacement.					

F.4 Flowmeter Industrial FM

Flowmeter Industrial FM — is designed to receive data on hourly (instant) fluid consumption, as well as on time of the flow meter operation — total and in each mode of operation.

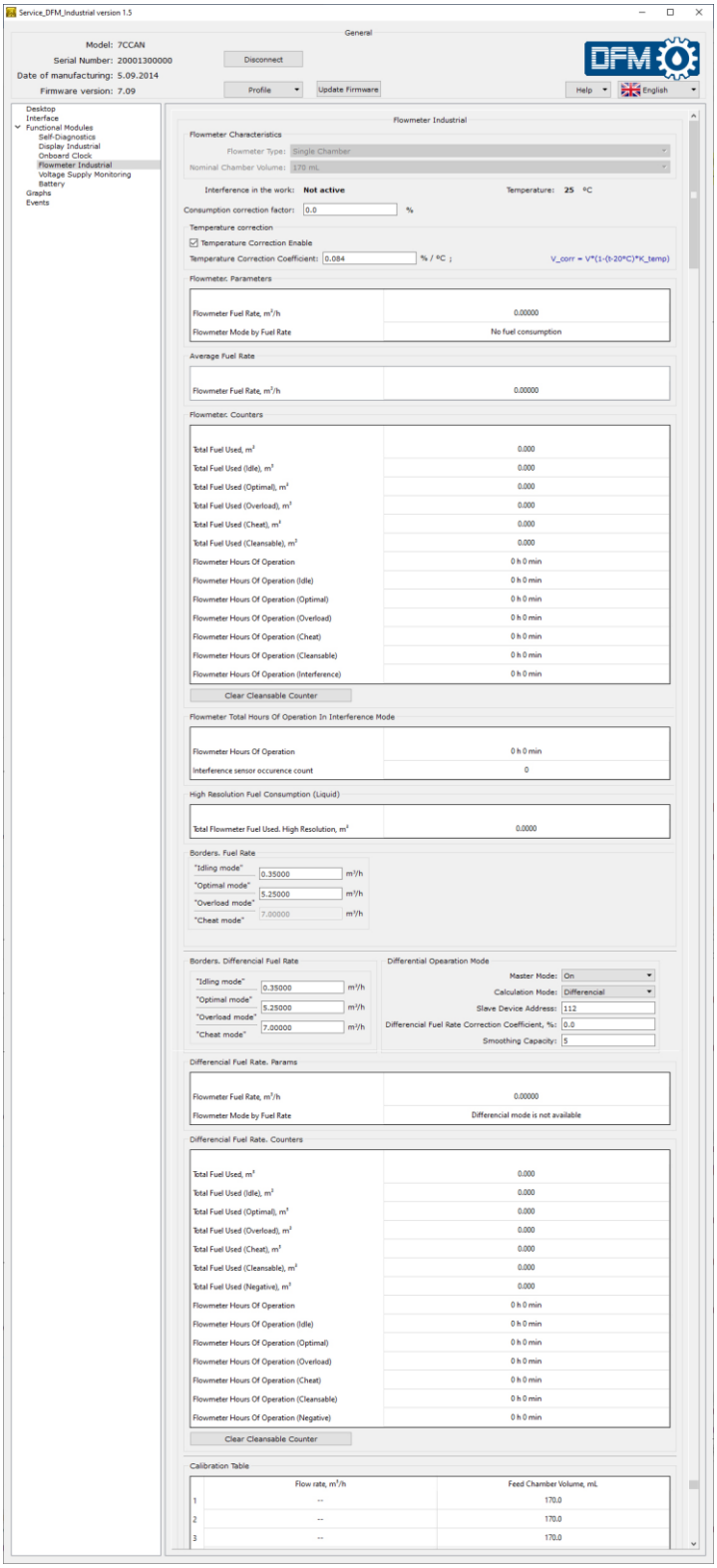


Figure F.4 — Example of the window of settings of Flowmeter Industrial FM in Service DFM Industrial software

Table F.4 — Flowmeter Industrial FM. SPNs, displayed and/or editable in Service DFM Industrial software

SPN	Name	Factory value	Unit of measure	Clarification
Fuel Consumption Factors PGN 63026				
521311	Temperature correction enable	Off	On/Off	Function of automatic volumetric fuel consumption measurement correction depending on fuel temperature, which allows to increase accuracy of DFM Industrial. A use can turn on/off the function.
521433	Temperature correction coefficient	0.084	%/°C	Setting-up coefficient of volumetric expansion of fuel depending on fuel temperature change may increase accuracy of measurements by DFM Industrial. The setting can be adjusted by user only after turning on function of temperature correction (see 2.6.7).
521434	Correction coefficient	0.0	%	Setting-up correction coefficient of consumption may increase accuracy of fuel consumption measurement when constant over/undermeasurement during specific conditions of operation (in case of increased vibration level, presence of air in the system and in case of losses in the reverse pipeline). The setting is available for editing by user (see 2.6.7).
Flowmeter. Parameters PGN 63159				
521313	Engine Fuel Rate	On the fact	m^3/h	Hourly rate consumption of fluid, going through measuring chamber of flow meter.
521181	Engine Mode by Fuel Rate	On the fact	No	Current operation mode of fluid consumer, correspondent to hourly rate of fluid consumption.
Average fuel rate PGN 63162				
521313/2.1	Engine Fuel Rate/ 2.1 Mean	On the fact	m^3/h	Value of instant (hourly) consumption of fluid, which goes through measuring chamber of flow meter, averaged 30 s interval. Using this parameter, it is convenient to monitor instant fluid consumption, in case of unsteady fluid pumping rate in the pipeline.
Flowmeter. Counters PGN 63215				
521307	Total Fuel Used	On the fact	m^3	Counter of total consumption of fluid within the whole range of loads, including "Idle" mode. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/9.0	Total Fuel Used/ 9.0 Idle	On the fact	m^3	Counter of total consumption of fluid in the "Idle" mode of the flow meter operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/9.1	Total Fuel Used/ 9.1 Optimal	On the fact	m^3	Counter of total consumption of fluid in the "Optimal" mode of the flow meter operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/9.2	Total Fuel Used/ 9.2 Overload	On the fact	m^3	Counter of total consumption of fluid in the "Overload" mode of the flow meter operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/9.3	Total Fuel Used/ 9.3 Cheating	On the fact	m^3	Counter of total consumption of fluid exceeding the upper limit for the model of the flow meter installed. Increasing numbers on the Counter can mean either possible pipeline intervention or incorrect installation of flow meter. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/28.0	Total Fuel Used/ 28.0 Clearable	On the fact	m^3	Resettable counter of total consumption of fluid within the whole range of loads, including "Idle" mode. Counter is growing since the moment of previous reset by User. This Counter may be useful for measuring precise portions of fluid.
521171	Flowmeter Hours Of Operation	On the fact	s	Counter of total time of the flow meter operation within the whole range of loads, including operation time in "Idle" mode. The Counter is increasing from the date of flow meter production and cannot be reset by user.

SPN	Name	Factory value	Unit of measure	Clarification
521171/9.0	Flowmeter Hours Of Operation/ 9.0 Idle	On the fact	s	Counter of total time of the flow meter operation in the "Idle" mode of operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/9.1	Flowmeter Hours Of Operation/ 9.1 Optimal	On the fact	s	Counter of total time of the flow meter operation in the "Optimal" mode of operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/9.2	Flowmeter Hours Of Operation/ 9.2 Overload	On the fact	s	Counter of total time of the flow meter operation in the "Overload" mode of operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/9.3	Flowmeter Hours Of Operation/ 9.3 Cheating	On the fact	s	Counter of total time of the flow meter operation during which the upper limit of fluid consumption established for this flow meter model was exceeded. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/28.0	Flowmeter Hours Of Operation/ 28.0 Clearable	On the fact	s	Resettable counter of total time of the flow meter operation within the whole range of loads, including operation time in "Idle" mode. Counter is growing since the moment of previous reset by user. This Counter may be useful for measuring precise portions of fluid.
521171/9.5	Flowmeter Hours Of Operation/ 9.5 Interference	On the fact	s	Counter of total time of external factors impact on the flow meter operation (e.g. strong magnetic field) impeding its operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
Flowmeter. Engine total hours of operation in interference mode PGN 63174				
521171/9.5	Flowmeter Hours Of Operation/ 9.5 Interference	On the fact	s	Counter of total time of external factors impact on the flow meter (e.g. strong magnetic field) impeding its operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521267	Interference sensor occurrence count	On the fact	pcs.	Counter for recording quantity of interference attempts (e.g. with magnetic field), which are aimed to stop flow meter.
High Resolution Fuel Consumption (Liquid) PGN 63222				
521316	High Resolution Engine Trip Fuel	On the fact	m^3	Counter of total consumption of fluid, enhanced accuracy, during one work cycle, i.e. indication increment from the moment the power supply is on and the counter indication reset at the moment the power supply is off. This counter is not implemented in the current software version.
521279	Total Engine Fuel Used. High Resolution	On the fact	m^3	Counter of total consumption of fluid, enhanced accuracy, with indication increment from the moment of manufacturing. The Counter is increasing from the date of flow meter production and cannot be reset by user.
Borders. Fuel Rate PGN 63163				
521317/9.0	Fuel Rate Mode Border/ 9.0 Idle	On the fact	m^3/h	"Idle" operation mode boundary setting – less than 10 % of maximal hourly consumption rate of fluid, going through the measurement chamber of flow meter. The setting is used for defining current consumer operation mode depending on hourly fluid consumption rate. The setting is available for editing by user.
521317/9.1	Fuel Rate Mode Border/ 9.1 Optimal	On the fact	m^3/h	"Optimal" operation mode boundary setting – 10 to 75 % of maximal hourly fluid consumption rate. The setting is used for defining current consumer operation mode depending on hourly fluid consumption rate. The setting is available for editing by user.
521317/9.2	Fuel Rate Mode Border/ 9.2 Overload	On the fact	m^3/h	"Overload" operation mode boundary setting – 75 to 100 % of maximal hourly fluid consumption rate. The setting is used for defining current consumer operation mode depending on hourly fluid consumption rate. Not available for editing by user.

SPN	Name	Factory value	Unit of measure	Clarification
Differential operation mode PGN 63204				
521268	Master Mode	Off	No	Enabling Master mode for Master flow meter (feed line) and disabling Master mode for Slave flow meter (reverse line) of the pair of flow meters used in the differential mode of operation (see 2.6.8).
521270	Calculation Mode	Differential	No	Selecting necessary mode of flow meter: - differential — fluid consumption is calculated as difference of consumption measured by flow meters in the feed and reverse lines; - summation — fluid consumption is calculated as the sum of consumption measured by flow meters in both lines.
521269	Slave Device Address	112	No	Enter a unique network address for Slave-flow meter (from 111…118 range). Elected address should not be the same as Master-flow meter has.
521271	Differential Fuel Rate Correction Coefficient	0.0	No	Setting-up correction coefficient of consumption may increase accuracy of fluid consumption differential measurement when constant over/undermeasurement during specific conditions of operation (in case of increased level of vibration, presence of air in the pipeline and losses in the reverse line) is detected. The setting is available for editing by user
521671	Smoothing Capacity	5	No	Smoothing Capacity (buffer) is used for increasing accuracy of differential measurement in cases of uneven flow rate in feed/reverse lines. Value of smoothing buffer is selected experimentally from 2…100 range. In case of even flow rate in lines it is not recommended to alter value of smoothing buffer (which is"5" by default. When unevenness of flow rate in feed and reverse lines is growing, it is recommended to increase value of smoothing buffer.
Borders. Differential fuel rate PGN 63205				
521317/9.0/2.15	Fuel Rate Mode Border/9.0 Idle/ 2.15 Differential	On the fact	m^3/h	"Idle" operation mode boundary setting – less than 10 % of maximal hourly consumption rate of fluid (differential mode), going through measuring chambers of Master-flow meter (fluid supply line) and Slave-flow meter (fluid return lines). The setting is used for defining current vehicle operation mode depending on hourly fluid consumption rate. The setting is available for editing by user.
521317/9.1/2.15	Fuel Rate Mode Border/ 9.1 Optimal/ 2.15 Differential	On the fact	m^3/h	"Optimal" operation mode boundary setting – 10 to 75 % of maximal hourly fluid consumption rate (differential mode going through measuring chambers of Master-flow meter (fluid supply line) and Slave-flow meter (fluid return lines). The setting is used for defining current vehicle operation mode depending on hourly fluid consumption rate. The setting is available for editing by user.
521317/9.2/2.15	Fuel Rate Mode Border/ 9.2 Overload/ 2.15 Differential	On the fact	m^3/h	"Overload" operation mode boundary setting – 75 to 100 % of maximal hourly fluid consumption rate (differential mode), going through measuring chambers of Master-flow meter (fluid supply line) and Slave-flow meter (fluid return lines). Not available for editing by user.
Differential fuel rate. Params PGN 63196				
521313/2.15	Engine fuel rate/ 2.15 Differential	On the fact	m^3/h	Differential hourly (instant) consumption of fluid passing through the measuring chambers of Master flow meter (feed) and Slave flow meter (reverse).
521181/2.15	Engine mode by fuel rate/ 2.15 Differential	On the fact	No	Current fluid consumer operation mode, corresponding to the value of differential hourly consumption mode.
Differential fuel rate. Counters PGN 63223				
521307/2.15	Total fuel used/ 2.15 Differential	On the fact	m^3	Counter of total differential consumption of fluid within the whole range of loads, including operation time in "Idle" mode. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/9.0/2.15	Total fuel used/ 9.0 Idle / 2.15 Differential	On the fact	m^3	Counter of total differential consumption of fluid in the "Idle" mode of the flow meter operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.

SPN	Name	Factory value	Unit of measure	Clarification
521307/9.1/2.15	Total fuel used/ 9.1 Optimal / 2.15 Differential	On the fact	m^3	Counter of total differential consumption of fluid in the "Optimal" mode of the flow meter operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/9.2/2.15	Total fuel used/ 9.2 Overload/ 2.15 Differential	On the fact	m^3	Counter of total differential consumption of fluid in the "Overload" mode of the flow meter operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/9.3/2.15	Total fuel used/ 9.3 Cheating/ 2.15 Differential	On the fact	m^3	Counter of total differential consumption of fluid exceeding the upper consumption limit established for this flow meter model. Increasing numbers on the Counter can mean either possible pipeline intervention or incorrect installation of flow meter. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521307/28.0/2.15	Total fuel used/ 28.0 Clearable/ 2.15 Differential	On the fact	m^3	Resettable counter of total differential consumption of fluid within the whole range of loads, including "Idle" mode of the flow meter operation. Counter is growing since the moment of previous reset by User. This Counter is useful for precise fluid dosing.
521307/9.4/2.15	Total fuel used/ 9.4 Negative/ 2.15 Differential	On the fact	m^3	Counter of total differential consumption of fluid for cases, when the volume of fluid coming back through the return line exceeds fluid consumption in the supply line. Counter is increasing during differential measurement. Increasing value of negative consumption points on foaming in return line when consumer is working on high RPM. Cause of foaming is air in return fluid line, which appears because of depressurization or special features of consumer's hydraulic system. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/2.15	Engine hours of operation/ 2.15 Differential	On the fact	s	Counter of total time of flow meters measuring chambers operation for supply and return lines in case of differential measurement, within the whole range of loads, including operation time in "Idle" mode. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/9.0/2.15	Engine hours of operation/ 9.0 Idle/ 2.15 Differential	On the fact	s	Counter of total time of flow meters measuring chambers operation for supply and return lines in case of differential measurement in the flow meter "Idle" mode of operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/9.1/2.15	Engine hours of operation/ 9.1 Optimal/ 2.15 Differential	On the fact	s	Counter of total time of flow meters measuring chambers operation for supply and return lines in case of differential measurement in the flow meter "Optimal" mode of operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/9.2/2.15	Engine hours of operation/ 9.2 Overload/ 2.15 Differential	On the fact	s	Counter of total time of flow meters measuring chambers operation for supply and return lines in case of differential measurement in the flow meter "Overload" mode of operation. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/9.3/2.15	Engine hours of operation/ 9.3 Cheating/ 2.15 Differential	On the fact	s	Counter of total time of flow meters measuring chambers operation for supply and return lines in case of differential measurement during which the allowed upper limit of fluid consumption for this flow meter model was exceeded. The Counter is increasing from the date of flow meter production and cannot be reset by user.
521171/28.0/2.15	Engine hours of operation/ 28.0 Clearable/ 2.15 Differential	On the fact	s	Resettable counter of total time of flow meters measuring chambers operation for supply and return lines in case of differential measurement, within the whole range of loads, including operation time in "Idle" mode. Counter is growing since the moment of previous reset by User. This Counter is useful for precise fluid dosing.
521171/9.5/2.15	Engine hours of operation/ 9.5 Interference/ 2.15 Differential	On the fact	s	Counter of total time of external factors impact on the flow meter operation (e.g. strong magnetic field) impeding the flow meter operation during differential measurement. The Counter is increasing from the date of flow meter production and cannot be reset by user.

SPN	Name	Factory value	Unit of measure	Clarification
521171/9.4/2.15	Engine hours of operation/ 9.4 Negative/ 2.15 Differential	On the fact	s	Counter of total time of the flow meter operation for cases, when the volume of fluid coming back through the return line exceeds fluid consumption in the supply line. Counter is increasing during differential measurement. Increasing value of negative consumption points on foaming in return line when consumer is working on high RPM. Cause of foaming is air in return fluid line, which appears because of depressurization or special features of consumer's hydraulic system. The Counter is increasing from the date of flow meter production and cannot be reset by user.
Flowmeter characteristics PGN 63165				
521333	Flowmeter type	On the fact	No	Factory setting of flow meter type: one-chamber or differential. Cannot be modified by user.
521230	Nominal chamber volume	On the fact	ml	Factory setting of measurement chamber nominal volume from range: 5, 12.5, 20, 30, 75, 150 ml. Cannot be modified by user.
Calibration Table. Fuel Rate (DFM Marine) PGN 63231				
521355	Array elements count	10	pcs.	Quantity of points in calibration table made by Manufacturer during calibration process. The setting cannot be altered by user.
521232	Impulse period	On the fact	ms	The period of the output pulse signal (see 1.6.8) is set during the calibration of the flow meter by the manufacturer.
521280	Chamber volume	On the fact	ml	Flow meter's measurement chamber(s) volume (see. 1.6.3). The setting cannot be altered by user.

F.5 Voltage Supply Monitoring FM

Voltage Supply Monitoring FM is designed for monitoring:

- external power supply tension;
- setting upper and lower limits of Unit power supply voltage range;
- Vehicle ignition key status (while using DFM Industrial in a Vehicle).

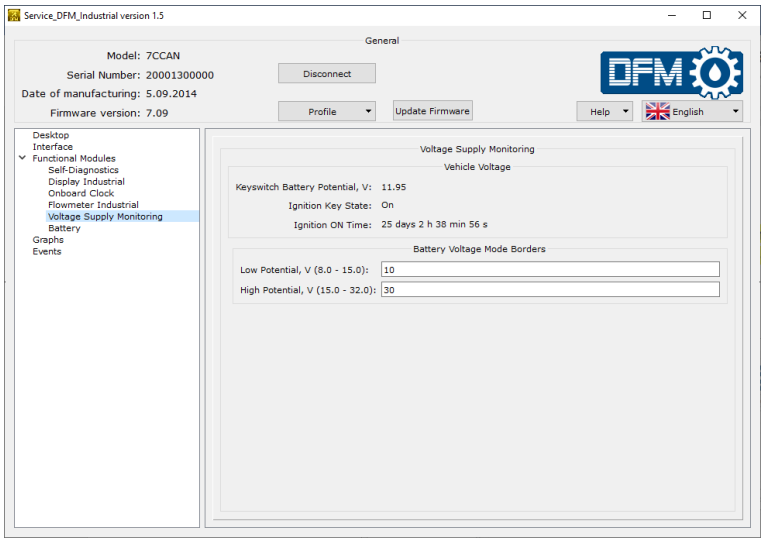


Figure F.5 — Example of the window of settings of Voltage supply monitoring FM in Service DFM Industrial software

Table F.5 — Voltage supply monitoring FM. SPNs, displayed and/or editable in Service DFM Industrial software

SPN	Name	Factory value	Unit of measure	Range	Clarification
Vehicle voltage PGN 62987					
158	Key switch battery potential	On the fact	V	0…3212.75	Setting displays present onboard voltage of ignition key on the Vehicle.
521049	Ignition key state	On the fact	No	On/Off	Setting displays present status of ignition key of the vehicle (On/Off).
521053	Ignition on time	On the fact	s	0…4211080000	Counter of summarized time when the ignition key is On since the moment of DFM Industrial installation on the vehicle. The user cannot reset the value of this counter. It can be reset by the Manufacturer or RSC only.
Battery voltage mode borders PGN 63064					
521391/2.8	Battery voltage mode border/ 2.8 Min	10.0	V	8.0…15.0	Value of the lower level of onboard voltage range of DFM Industrial. This setting is available for editing by user. Set value of the voltage is used as a threshold while registering an important Event “Low level of onboard power supply”.
521391/2.7	Battery voltage mode border/ 2.7 Max	30.0	V	15.0…32.0	Value of the upper level of onboard voltage range of DFM Industrial. This setting is available for editing by user. Set value of the voltage is used as a threshold while registering an important Event “High level of onboard power supply”.

F.6 Battery FM

Battery FM — is designed for monitoring current power supply status of DFM Industrial, inbuilt battery state and total time of the flow meter autonomous power supply.

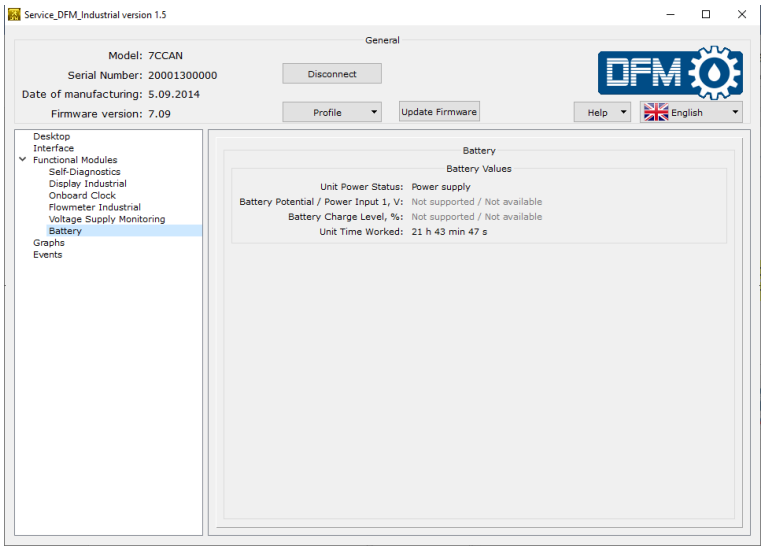


Figure F.6 — Example of the window of settings of Battery FM in Service DFM Industrial software

Table F.6 — Battery FM. SPNs, displayed and/or editable in Service DFM Industrial software

SPN	Name	Factory value	Unit of measure	Clarification
Battery PGN 63086				
521129	Unit power status	On the fact	No	Current power-supply status of DFM Industrial: - powered from embedded power source; - powered from on-board electrical system; - power is off; - power-supply status is not available/not supported by this device. While working with service software, data exchange between PC and flow meter is possible only if flow meter is power-supplied from external source and power-supply status of DFM Industrial will always be displayed as "powered from on-board electrical system".
167	Charging system potential (voltage)	On the fact	V	Current voltage of embedded battery of DFM Industrial. When working with service software, this setting will always be displayed as "not available/not supported by this device".
521061	Battery charge level	On the fact	%	Current charge of embedded battery of DFM Industrial. When working with service software, this setting will always be displayed as "not available/not supported by this device".
521116/16.1	Unit hours of operation/ 16.1 Battery	On the fact	s	Counter of total operation time of DFM Industrial from embedded battery since installation to Vehicle. The Counter cannot be reset by user. Reset is possible in Regional Service Centers.

Detailed parameters description (SPN), structure and content of messages (PGN) of FM DFM Industrial are placed at the following web site https://s6.jv-technoton.com/ (to access S6 DB registration is required)

Annex G
DFM Industrial firmware upgrade

ATTENTION: DFM Industrial firmware (**only possible for models with interface cable**) update should be done **only** for implementation of improvements, recommended by Manufacturer.

To upgrade DFM Industrial firmware the following actions should be made:

1) Connect flow meter to PC with the help of service adapter (see 2.6.1) and establish connection session between DFM Industrial and PC (see 2.6.3).

ATTENTION: When re-uploading firmware, power supply voltage of DFM Industrial should not drop out of 10…45 V range.

2) Press Update firmware button at Service DFM Industrial Software.

3) Choose firmware upgrade file **(*.blf3)** on PC or memory stick.

4) Press Open button, that will start firmware file downloading into DFM Industrial memory.

After firmware file integrity and compatibility check by Service DFM Industrial Software window of firmware uploading into DFM Industrial memory will appear. In case of any errors the Software will send warning message.
To cancel firmware upgrade it is needed to press Stop button.

ATTENTION: To avoid DFM Industrial failure, before the end of the firmware upgrade process **is forbidden:**
- to switch off PC;
- to switch off the power supply for the Unit;
- to disconnect the Unit from the service adapter and the adapter from the PC;
- run any resource-intensive applications on the PC.

Service DFM Industrial Software will display appropriate message and automatically will disconnect DFM Industrial from PC in case the update is successful. DFM Industrial is ready for further operation.

Service DFM Industrial Software will display a new firmware version with the next connection session between PC and DFM Industrial.

In case of any error occur that leaded to the damage of present DFM Industrial firmware check all cables and adapter connections and retry. In this case the internal firmware loader is activated and will try to fix DFM Industrial operation performance. Contact Technoton technical support at support@jv-technoton.com if another try is also unsuccessful.

Annex H
Electromagnetic compatibility specifications

Table H.1 — Protection of power circuits of DFM Industrial against conductive, capacitive and inductive interference as described in ISO 7637-2:2002

Test pulse	Test level	U_S tested level, V for supply voltage	
		12 V	24 V
1	IV	-100	-600
2a	IV	+50	+50
2b	IV	+10	+20
3a	IV	-150	-200
3b	IV	+100	+200
4	IV	-7	-16
5	III	+65	+123

Table H.2 — Protection of signal circuits of DFM Industrial against conductive, capacitive and inductive interference as described in ISO 7637-3:2002

Test pulse	Test level	U_S tested level, V for supply voltage	
		12 V	24 V
Pulse "a" of short duration	IV	-60	-80
Pulse "b" of short duration	IV	+40	+80
Positive pulse of long duration (DCC)	IV	+30	+45
Negative pulse of long duration (DCC)	IV	-30	-45
Positive pulse of long duration (ICC)	IV	+6	+10
Negative pulse of long duration (ICC)	IV	-6	-10

Table H.3— DFM Industrial own radio interference field strength as per UNECE Regulation No.10 (Revision 4)

Tested bandwidth, MHz	Quasi-peak value of field strength of radio interference, dB µV/m		Average value of field strength of radio interference, dB µV/m	
	Horizontal polarization	Vertical polarization	Horizontal polarization	Vertical polarization
30…34	27	25	20	20
34…45	23	21	16	18
45…60	18	18	13	14
60…75	17	16	10	9
75…100	11	13	7	8
100…130	12	14	7	9
130…170	22	16	18	12
170…225	24	18	18	13
225…300	32	24	27	11
300…400	19	21	13	14
400…525	22	24	16	15
525…700	24	27	23	23
700…850	34	32	25	27
850…1000	35	33	27	26

Annex I
Data composition in the flow meters output messages that are transmitted via CAN j1939/S6 interface

Table I.1 — Data composition in DFM Industrial CCAN outgoing messages, that are transmitted via SAE j1939 protocol

Field number	Length	Parameter	Description	Rules of output
Flowmeter Total Hours of Operation PGN 63216 (0xF6F0)				1000 ms
1	4 bytes	SPN 521307	Total Fuel Used	
5	4 bytes	SPN 521171	Flowmeter Hours Of Operation	
Flowmeter. Parameters PGN 63159 (0xF6B7)				1000 ms
1	4 bytes	SPN 521313	Engine Fuel Rate	
5.1	4 bits	SPN 521181	Engine Mode by Fuel Rate	
Flowmeter. Counters PGN 63215 (0xF6EF)				On request
1	4 bytes	SPN 521307	Total Fuel Used	
5	4 bytes	SPN 521307/9.0	Total Fuel Used. Idle	
9	4 bytes	SPN 521307/9.1	Total Fuel Used. Optimal	
13	4 bytes	SPN 521307/9.2	Total Fuel Used. Overload	
17	4 bytes	SPN 521307/9.3	Total Fuel Used. Cheating	
21	4 bytes	SPN 521307/28.0	Total Fuel Used. Clearable	
25	4 bytes	SPN 521171	Flowmeter Hours Of Operation	
29	4 bytes	SPN 521171/9.0	Flowmeter Hours Of Operation. Idle	
33	4 bytes	SPN 521171/9.1	Flowmeter Hours Of Operation. Optimal	
37	4 bytes	SPN 521171/9.2	Flowmeter Hours Of Operation. Overload	
41	4 bytes	SPN 521171/9.3	Flowmeter Hours Of Operation. Cheating	
45	4 bytes	SPN 521171/28.0	Flowmeter Hours Of Operation. Clearable	
49	4 bytes	SPN 521171/9.5	Flowmeter Hours Of Operation. Interference	
High Resolution Fuel Consumption (Liquid) PGN 63222 (0xF6F6)				1000 ms
1	4 bytes	SPN 521316	High Resolution Engine Trip Fuel	
5	4 bytes	SPN 521279	Total Fuel Used. High Resolution	
Average fuel rate PGN 63162 (0xF6BA)				1000 ms
1	4 bytes	SPN 521313/2.1	Engine Fuel Rate. Mean	
Flowmeter Total Hours of Operation (Clearable) PGN 63217 (0xF6F1)				1000 ms
1	4 bytes	SPN 521307/28.0	Total Fuel Used. Clearable	
5	4 bytes	SPN 521171/28.0	Flowmeter Hours Of Operation. Clearable	
Flowmeter Total Hours Of Operation In Idle PGN 63218 (0xF6F2)				1000 ms
1	4 bytes	SPN 521307/9.0	Total Fuel Used. Idle	
5	4 bytes	SPN 521171/9.0	Flowmeter Hours Of Operation. Idle	

Field number	Length	Parameter	Description	Rules of output
Flowmeter Total Hours Of Operation In Optimal Mode PGN 63219 (0xF6F3)				1000 ms
1	4 bytes	SPN 521307/9.1	Total Fuel Used. Optimal	
5	4 bytes	SPN 521171/9.1	Flowmeter Hours Of Operation. Optimal	
Flowmeter Total Hours Of Operation In Overload Mode PGN 63220 (0xF6F4)				1000 ms
1	4 bytes	SPN 521307/9.2	Total Fuel Used. Overload	
5	4 bytes	SPN 521171/9.2	Flowmeter Hours Of Operation. Overload	
Flowmeter Total Hours Of Operation In Cheating Mode PGN 63221 (0xF6F5)				1000 ms
1	4 bytes	SPN 521307/9.3	Total Fuel Used. Cheating	
5	4 bytes	SPN 521171/9.3	Flowmeter Hours Of Operation. Cheating	
Flowmeter. Total Hours Of Operation In Interference Mode PGN 63174 (0xF6C6)				1000 ms
1	4 bytes	SPN 521171/9.5	Flowmeter Hours Of Operation. Interference	
5	4 bytes	SPN 521267	Interference sensor occurrence count	
Differential Fuel Rate. Params PGN 63196 (0xF6DC)				1000 ms
1	4 bytes	SPN 521313/2.15	Engine Fuel Rate. Differential	
5.1	4 bits	SPN 521181/2.15	Engine Mode by Fuel Rate. Differential	
Differencial Fuel Rate. Counters PGN 63223 (0xF6F7)				On request
1	4 bytes	SPN 521307/2.15	Total Fuel Used. Differential	
5	4 bytes	SPN 521307/9.0/2.15	Total Fuel Used. Idle. Differential	
9	4 bytes	SPN 521307/9.1/2.15	Total Fuel Used. Optimal. Differential	
13	4 bytes	SPN 521307/9.2/2.15	Total Fuel Used. Overload. Differential	
17	4 bytes	SPN 521307/9.3/2.15	Total Fuel Used. Cheating. Differential	
21	4 bytes	SPN 521307/28.0/2.15	Total Fuel Used. Clearable. Differential	
25	4 bytes	SPN 521307/9.4/2.15	Total Fuel Used. Negative. Differential	
29	4 bytes	SPN 521171/2.15	Flowmeter Hours Of Operation. Differential	
33	4 bytes	SPN 521171/9.0/2.15	Flowmeter Hours Of Operation. Idle. Differential	
37	4 bytes	SPN 521171/9.1/2.15	Flowmeter Hours Of Operation. Optimal. Differential	
41	4 bytes	SPN 521171/9.2/2.15	Flowmeter Hours Of Operation. Overload. Differential	
45	4 bytes	SPN 521171/9.3/2.15	Flowmeter Hours Of Operation. Cheating. Differential	
49	4 bytes	SPN 521171/28.0/2.15	Flowmeter Hours Of Operation. Clearable. Differential	
53	4 bytes	SPN 521171/9.4/2.15	Flowmeter Hours Of Operation. Negative. Differential	
Flowmeter. Global Counters PGN 63506 (0xF812)				1000 ms
1	4 bytes	SPN 521313	Engine Fuel Rate	
5	4 bytes	SPN 521674	Global Fuel Used	
Flowmeter. Global Counters. Slave PGN 63507 (0xF813)				1000 ms
1	4 bytes	SPN 521313	Engine Fuel Rate	
5	4 bytes	SPN 521674	Global Fuel Used	
Differencial Fuel Rate. Flowmeter Total Hours Of Operation PGN 63224 (0xF6F8)				1000 ms
1	4 bytes	SPN 521307/2.15	Total Fuel Used. Differential	
5	4 bytes	SPN 521171/2.15	Flowmeter Hours Of Operation. Differential	
Differencial Fuel Rate. Flowmeter Total Hours Of Operation (Clearable) PGN 63225 (0xF6F9)				1000 ms
1	4 bytes	SPN 521307/28.0/2.15	Total Fuel Used. Clearable. Differential	
5	4 bytes	SPN 521171/28.0/2.15	Flowmeter Hours Of Operation. Clearable. Differential	

Field number	Length	Parameter	Description	Rules of output
Differencial Fuel Rate. Flowmeter Total Hours Of Operation In Idle PGN 63226 (0xF6FA)				1000 ms
1	4 bytes	SPN 521307/9.0/2.15	Total Fuel Used. Idle. Differential	
5	4 bytes	SPN 521171/9.0/2.15	Flowmeter Hours Of Operation. Idle. Differential	
Differencial Fuel Rate. Flowmeter Total Hours Of Operation In Optimal PGN 63227 (0xF6FB)				1000 ms
1	4 bytes	SPN 521307/9.1/2.15	Total Fuel Used. Optimal. Differential	
5	4 bytes	SPN 521171/9.1/2.15	Flowmeter Hours Of Operation. Optimal. Differential	
Differencial Fuel Rate. Flowmeter Total Hours Of Operation In Overload PGN 63228 (0xF6FC)				1000 ms
1	4 bytes	SPN 521307/9.2/2.15	Total Fuel Used. Overload. Differential	
5	4 bytes	SPN 521171/9.2/2.15	Flowmeter Hours Of Operation. Overload. Differential	
Differencial Fuel Rate. Flowmeter Total Hours Of Operation In Cheating PGN 63229 (0xF6FD)				1000 ms
1	4 bytes	SPN 521307/9.3/2.15	Total Fuel Used. Cheating. Differential	
5	4 bytes	SPN 521171/9.3/2.15	Flowmeter Hours Of Operation. Cheating. Differential	
Differential opearation mode PGN 63204 (0xF6E4)				On request
1.1	2 bits	SPN 521268	Master Mode	
1.3	2 bits	SPN 521270	Calculation Mode	
2	1 byte	SPN 521269	Slave Device Address	
3	2 bytes	SPN 521271	Differencial Fuel Rate Correction Coefficient	
5	1 byte	SPN 521671	Smoothing Capacity	
Borders. Differencial fuel rate PGN 63205 (0xF6E5)				On request
1	4 bytes	SPN 521317/9.0/2.15	Fuel Rate Mode Border. Idle. Differencial	
5	4 bytes	SPN 521317/9.1/2.15	Fuel Rate Mode Border. Optimal. Differencial	
9	4 bytes	SPN 521317/9.2/2.15	Fuel Rate Mode Border. Overload. Differencial	
Differencial Fuel Rate. Flowmeter Total Hours Of Operation In Negative PGN 63230 (0xF6FE)				1000 ms
1	4 bytes	SPN 521307/9.4/2.15	Total Fuel Used. Negative. Differencial	
5	4 bytes	SPN 521171/9.4/2.15	Flowmeter Hours Of Operation. Negative. Differencial	
Fuel consumption factors PGN 63026 (0xF632)				On request
1	2 bytes	SPN 521433	Temperature Correction Coefficient	
3	2 bytes	SPN 521434	Lliquid Consumption Correction Coefficient	
5.1	2 bits	SPN 521311	Temperature Correction Enable	
Calibration Table. Fuel Rate (DFM Marine) PGN 63231 (0xF6FF)				On request
1	1 byte	SPN 521355	Array Elements Count	
2	2 bytes	SPN 521232	Impulse Period	
4	2 bytes	SPN 521280	Chamber Volume	
Request PGN 59904 (0xEA00)				1000 ms
1	3 bytes	SPN 2540	Parameter Group Number (RQST)	
Borders. Fuel rate PGN 63163 (0xF6BB)				On request
1	4 bytes	SPN 521317/9.0	Fuel Rate Mode Border. Idle	
5	4 bytes	SPN 521317/9.1	Fuel Rate Mode Border. Optimal	
9	4 bytes	SPN 521317/9.2	Fuel Rate Mode Border. Overload	
Flowmeter characteristics PGN 63165 (0xF6BD)				On request
1.1	2 bits	SPN 521333	Flowmeter Type	
1.3	4 bits	SPN 521230	Nominal Chamber Volume	

Field number	Length	Parameter	Description	Rules of output
Information display system PGN 63166 (0xF6BE)				On request
1.1	2 bits	SPN 521332	System Of Units	
Vehicle voltage PGN 62987 (0xF60B)				1000 ms
1	3 bytes	SPN 158	Keyswitch Battery Potential	
3.1	2 bits	SPN 521049	Ignition Key State	
4	4 bytes	SPN 521053	Ignition ON Time	
Unit work counters PGN 62994 (0xF612)				On request
1	4 bytes	SPN 521116	Unit Hours Of Operation	
5	4 bytes	SPN 521116/16.1	Unit Hours Of Operation. Battery	
9	4 bytes	SPN 521118	Unit Reset Counter	
13	4 bytes	SPN 521119	Unit Power Off Counter	
Unit passport PGN 62995 (0xF613)				On request
1	16 bytes	SPN 521123	Line	
17	16 bytes	SPN 521344	Mark	
33	16 bytes	SPN 521345	Model	
49	16 bytes	SPN 521120	Serial number	
65	8 bytes	SPN 521121	Firmware version	
73	4 bytes	SPN 521125	Date of production	
77	1 byte	SPN 521188	Address at S6 (SA) bus	
Importnant Events List PGN 63055 (0xF64F)				On request
1	4 bytes	SPN 521166	Event SPN	
5	1728 bytes	SPN 521357	Data	
List Of Informative Events PGN 63056 (0xF650)				On request
1	4 bytes	SPN 521166	Event SPN	
5	1728 bytes	SPN 521357	Data	
Battery voltage mode borders PGN 63064 (0xF658)				On request
1	2 bytes	SPN 521391/2.8	Battery Voltage Mode Border. Min	
3	2 bytes	SPN 521391/2.7	Battery Voltage Mode Border. Max	
Battery PGN 63086 (0xF66E)				5000 ms
1.1	2 bits	SPN 21129	Unit Power Status	
2	2 bytes	SPN 167	Charging System Potential (Voltage)	
4	1 byte	SPN 521061	Battery Charge Level	
5	4 bytes	SPN 521116/16.1	Unit Hours Of Operation. Battery	
Active diagnostic trouble codes PGN 65226 (0xFECA)				1000 ms
3	3 bytes	SPN 521044	Malfunction code (SID+FMI)	
Previously active diagnostic trouble codes PGN 65227 (0xFECB)				On request
3	3 bytes	SPN 521044	Malfunction code (SID+FMI)	
Time/Date PGN 65254 (0xFEE6)				On request
1	1 byte	SPN 959	Seconds	
2	1 byte	SPN 960	Minutes	
3	1 byte	SPN 961	Hours	
4	1 byte	SPN 963	Month	
5	1 byte	SPN 962	Day	
6	1 byte	SPN 964	Year	
7	1 byte	SPN 1601	Time Displacement In Minutes	
8	1 byte	SPN 1602	Time Displacement In Hours	
Time origin settings PGN 63011 (0xF623)				On request
1.1	2 bits	SPN 521350	Automatic Daylight Savings Time and Back	

Field number	Length	Parameter	Description	Rules of output
6	1 byte	SPN 1601	Time Displacement In Minutes	
7	1 byte	SPN 1602	Time Displacement In Hours	
CAN Settings PGN 63054 (0xF64E)				On request
1.1	4 bits	SPN 521530	CAN Protocol Type	
2.1	3 bits	SPN 521531	CAN Baudrate	
2.4	2 bits	SPN 521533	Enable Termination Resistor	
Engine temperature 1 PGN 65262 (0xFEEE)				1000 ms
2	1 byte	SPN 174	Engine Fuel Temperature 1	
Unit Passport Abbreviated PGN 63523 (0xF823)				10000 ms
1	2 bytes	SPN 521716	Unit Firmware Version	
3	2 bytes	SPN 521717	Unit Bootloader Version	
5	2 bytes	SPN 521718	Unit Hardware Version	
High Resolution Fuel Consumption (Liquid) PGN 64777 (0xFD09)				1000 ms
5	4 bytes	SPN 5054	High Resolution Engine Total Fuel Used	
Fuel Economy (Liquid) PGN 65266 (0xFEF2)				100 ms
1	2 bytes	SPN 183	Engine Fuel Rate	
Fuel Consumption (Liquid) PGN 65257 (0xFEE9)				On request
5	4 bytes	SPN 250	Engine Total Fuel Used	

You can reset the Counters "Flowmeter Total Hours of Operation. Clearable" (PGN 63217) that are stored in the internal memory of DFM Industrial CCAN by using S6 Technology. To perform this, you need to send the message "FM Command" (PGN 63080) to the network address of the respective flow meter.

Example: Using CAN j1939/S6 interface, reset the clearable Counters of DFM Industrial CCAN flow meter (network address SA=111) by means of the command from MasterCAN Display 35 display (network address SA=109).

Command structure:

0x18 0x68 0xF6 0x6D 0x50 0x03 0x00 0x6F 0xF1 0xF6 0x00 0x00, where

CAN ID:
0x – prefixes of the hexadecimal number system;
18 – message priority;
68 – Counters reset command (PGN 63080 (0xF668)) (lower byte);
F6 – Counters reset command (PGN 63080 (0xF668)) (high byte);
6D – network address of the command source Unit.

Data Field:
0x – prefixes of the hexadecimal number system;
50 – command code for resetting the clearable Counters (80);
03 – data size (lower byte);
00 – data size (high byte);
6F – network address of the flow meter whose Counters must be reset;
F1 – flow meter clearable Counters (PGN 63217 (0xF6F1)) (lower byte);
F6 – flow meter clearable Counters (PGN 63217 (0xF6F1)) (high byte);
00 – meaningless data;
00 – meaningless data.

Annex J
Videos

1) DFM Marine Fuel Flow Meter video.

Link: https://www.youtube.com/watch?v=9lC4_RzfLik

2) DFM Fuel Flow Meter Installation video (DFM installation on tractor. After pump (pressure side) scheme).

Link: https://www.youtube.com/watch?v=ATscYhBsD3c

3) DFM fuel flow meter operation principle video (fuel flow measurement principle of DFM measuring chamber).

Link: https://www.youtube.com/watch?v=RXjvwyy1zlY

4) Interactive flash animation **Fuel Consumption Monitoring. DFM Fuel Flow Meter**

Link: https://www.youtube.com/watch?v=IOCQCNgGG7Uf

5) Interactive animation video **DFM fuel flow meter: selection of mounting scheme, accessories and mounting kit**

Link: DFM fuel flow meters: selection of installation layout, accessories and mounting kit

6) Check out YouTube channel for other **Technoton videos** at:

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