

Product Information flowtronic Systems



Introduction

flowtronic systems made by GREGORY Technology in Germany are developed for fuel consumption measurement of internal combustion engines (for gasoline, diesel, bio and alcohol based fuel types).

They are suited for use with for example motor bikes, passenger cars, busses, trucks, specialized vehicles and boats. The devices can be used mobile in vehicles as also stationary at the test bench.

Due to easy operation, robust and durable construction, high measuring accuracy and unique quality the *flowtronic* systems suit many kinds of liquid fuel consumption measurement.

flowtronic fuel consumption test equipment is (formerly as a Swiss product) in worldwide operation for more than 30 years. GREGORY Technology in Germany has taken over the complete product line for several years and is doing continuous development as well as production and service.

Requirements on Testing Equipment for Fuel Consumption

Constantly increasing requirements of the exhaust quality (reduction of pollutants in the exhaust gas in accordance with the valid standards), rising engine performance with continuous engine size, the continuous modernization of the fuel supply systems etc. make always new demands against the measuring technology.

With many engine types the fuel supply system does not only provide fuel for combustion.

The overall system functionality consists of fuel supply to the engine and the surplus fuel return back to the tank as well as a constant fuel circulation for cooling of the fuel supply components located close to the engine. Additionally the operation pressures for fuel supply and return are conditioned.

Further components in the fuel supply system make for example additional fuel volume during the starting phase of the engine and/or with beginning of a full load phase of the engine available at short notice.

Beyond that a counter-pressure can exist in the return flow to the tank, which is necessary for the function of the common rail injectors.

The increasing operating pressures in common rail systems make even larger cooling performance necessary, which is made available by a higher fuel circulation in the fuel system system.

After installation the appropriate measurement equipment must reproduce the conditions of the original fuel supply system.

Variants of Fuel Supply Systems

Systems for the fuel supply differ in some fundamental characteristics:

1. system with just fuel supply from tank to engine, or
2. extended system with fuel supply to engine and fuel return to tank
3. location of the low pressure fuel supply pump, either close to/within the tank (over pressure within the fuel supply to the engine), or
4. low pressure fuel supply pump at the engine (under pressure within the fuel supply to the engine)
5. operational pressure (not within the high pressure area), usually up to 5 bar

Extended Conditions of Fuel Supply Systems

Particularly in systems with common rail the fuel pressure within the return from engine to tank must be considered, so that the function is guaranteed also after the installation of a fuel consumption measuring system.

For this application particularly the *flowtronic* system FCS3 is suitable. Hereby the pressures can be conditioned statically within the fuel supply to the engine and separately from each other within the fuel return.

Basic Principles of the Fuel Consumption Measurement

The base for correct fuel consumption measurement is a sensor which is suitable to this specific application.

Additionally the correct installation of the sensor into the existing fuel supply system is very important with regard to correct measurement results.

The sensor's measuring range must cover the range between low idle mode (typically 0,1l/h) up to the maximum engine load condition (depending on the engine power up to 100l/h or even more).

The *flowtronic* sensor module is based on a four piston counter. The fuel flow which is driving the pistons generates a rotation that is detected by a high resolution rotation sensor.

Special requirements are to be considered with fuel systems having a fuel supply to the engine as well as a return to the tank.

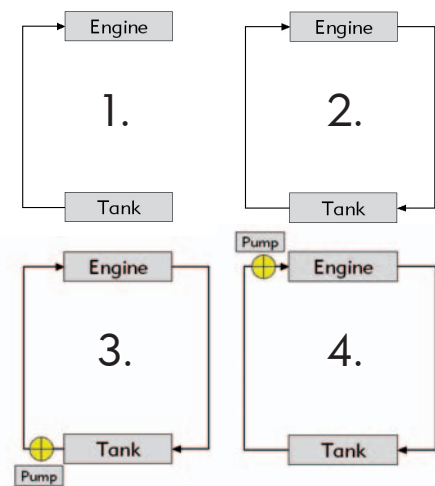
With these fuel supply systems considerably more fuel than really used by the engine circulates within the system. This circulation takes over a cooling function in addition to the fuel supply to the engine.

Just installing a fuel consumption sensor within the fuel supply to engine and keeping the original fuel return back to the tank would generate completely wrong measurement results for this type of fuel supply system.

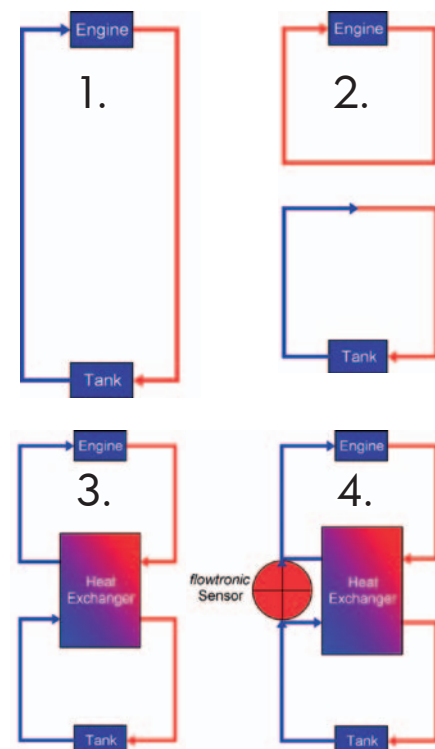
The solution is offered by *flowtronic* systems with heat exchanger. The original configuration (1) of the fuel system is modified by the *flowtronic* system which divides the fuel system into two fuel circuits (2). These circuits are the engine related circuit and separate from this the tank related circuit. The cooling function is guaranteed by a heat exchanger between both circuits. (3)

The fuel volume used by the engine can only flow over the *flowtronic* sensor which is located between both circuits. This ensures that only the actual fuel consumption and not the entire circulation is measured by the sensor. (4)

Images 1-4



Original Configuration and System Installation



Sensor S8005C



flowtronic Sensor S8005C

The compact model S8005C is the universal flow sensor to be used for many engine types with fuel supply from tank to engine, but without fuel return back to tank. (Image 1, Page 3)

The simple and quick installation can be executed for example within the engine compartment. Self closing quick-lock couplings support the fast installation and handling. Leakage free quick lock couplings for clean operation are available upon request.

Heat Exchanger HE8005



Heat Exchanger HE8005 as an Extension to the S8005C Sensor

For engines with fuel supply from tank to engine and fuel return back to tank the heat exchanger HE8005 is required. (Image 2, Page 3) With the HE8005 the original fuel supply system can be split up into two separate fuel circuits. These are an engine related fuel circuit and separate from this a tank related fuel circuit. The heat exchanger provides the cooling functionality between the two circuits.

This prevents from gas bubbles as an effect of too high fuel temperature within the engine related fuel circuit.

This *flowtronic* system, which is based on several modules like sensor, heat exchanger and if required pressure regulator, can be used with many engines with fuel supply pump located at the tank or at the engine. The provided fuel circulation rate is max. 150...170l/h.

The optional fuel pressure regulator can be used for manual pressure control within the fuel supply to the engine. A return pressure control is not available for that system.

System FCS-D-150



System FCS-D-150

The basic system within the FCS-D product line offers an optimum value for price level. It is designed for smaller engines (diesel) having the low pressure fuel supply pump located at the engine (under pressure fuel supply). It provides a fuel circulation of up to 130...150l/h.

Furthermore this system includes a built-in heat exchanger and can have one optional thermocouple for fuel temperature measurement.

The connection into the existing fuel supply system is carried out via just four self closing quick lock couplings. Adapters for fast and easy connection to the fuel tubes of the original fuel supply system are included to the scope of delivery.

The FCS-D-150 is designed for operation with 12V DC.

Systems FCS-D-190, FCS-D-380, FCS-D-570, FCS-D-700

These systems are designed for diesel engines having the low pressure fuel supply pump located at the engine (under pressure fuel supply).

Several types with different maximum fuel circulation rates are available due to the flexible system design.

The smallest version FCS-D-190 can be used for small and medium truck engines.

The larger systems are suitable for large and very large engines with up to 700...780l/h fuel circulation.

These units include a built-in heat exchanger and can have a maximum of two optional thermocouples for fuel temperature measurement.

The connection into the existing fuel supply system is carried out via just four self closing and leakage free quick lock couplings. Adapters for fast and easy connection to the fuel tubes of the original fuel supply system are included to the scope of delivery.

The integrated system control electronics provides a system status display with LEDs, protection against excess voltage, wrong power supply polarity, exceeding operational temperature, protective switch for integrated fuel pumps and quick shutoff for example in case of a vehicle accident. Therewith this product family has a high product safety.

The systems of this series are designed for operation with 24V DC only.

FCS3 Systems

The FCS3 product line features maximum flexibility and easy handling.

The outstanding built-in switching to adapt the system to the original configuration of the fuel supply pump(s) supports an easy and fast adaptation into the existing fuel supply system. Herewith the system can be connected easily and user friendly via just four quick lock couplings independent from the position of the low pressure fuel supply pump which is located at the engine or at the tank.

Additionally the FCS3 series includes separate fuel pressure conditioning for fuel supply to and fuel return from the engine. Therewith these units are suitable for many engines with a fuel circulation of up to 190 or 300l/h.

As an integrated system, the FCS3 models include all function modules like the sensor unit, heat exchanger, fuel pumps, pressure regulators etc. into a single housing. They can have up to four optional thermocouples for fuel temperature measurement and one sensor for fuel pressure measurement.

The integrated system control electronics provides a system status display with LEDs, protection against excess voltage, wrong power supply polarity, exceeding operational temperature, protective switch for integrated fuel pumps and quick shutoff for example in case of a vehicle accident. Therewith the FCS3 product line has a high product safety.

The FCS3 systems are designed for operation with 12V DC.

System FCS-D-190, 380, 570, 700



System FCS-3-190, 250



	S8005C	S8005C+ HE8005	FCS-D-150	FCS-D-190	FCS-D-380	FCS-D-570	FCS-D-700	FCS-3-190	FCS-3-250	
Type of fuel supply system	feed in-line only	Pump@Tank Pump@Engine	Pump@Engine					Pump@Tank Pump@Engine with return line pressure regulation		
Location of low pressure fuel supply pump	at engine or at tank manually configurable		at engine					at engine or at tank built-in switch over		
Inner diameter (mm) of engine fuel tube	≤ 12		≤ 16	≤ 20	≤ 20	≤ 25	≤ 25	≤ 14 ≤ 20*		
Nominal width of couplings	NW 5.8		NW 9.5	NW10FF		NW16FF		NW 6.3FF NW 10.0FF		
Quick lock couplings	self closing		self closing	self closing and leakage free						
Pressure conditioning	-	for fuel supply to engine only, option	-					for fuel supply to engine and separated for fuel return from engine		
Measuring range	0,1-240l/h									
Fuel circulation rate max.	-	150...170l/h	130... 150l/h	170... 190l/h	340... 380l/h	520... 580l/h	700... 780l/h	170... 190l/h	250... 300l/h	
Permitted fuel types	gasoline, diesel, bio and alcohol based fuel		diesel, optionally gasoline, bio and alcohol based fuel					gasoline, diesel, bio and alcohol based fuel		
Fuel temperature sensors	max. 2, option	-	1, option	max 2 , option				max. 4, option		
Fuel pressure sensors	external, option	max. 1 internal, option	external, option						max. 1 internal, option	
Power supply	12 V DC			24 V DC				12 V DC/ 24V DC (NW10.0FF, inner diameter =20)		

* for FCS-3-190 or -250 with quick lock couplings NW 10.0FF

Signal Electronics

For system operation one out of the two available signal electronics SE8005D or S8005AD is generally required. The *flowtronic* systems cannot be operated without signal electronics.

Both models differ in their technical features.

S8005AD

The signal electronic S8005AD is used to adapt the *flowtronic* system to an existing, external data acquisition system.

Signal outputs for fuel volume (TTL) and flow rate (analogue) are available as well as a LEDs for monitoring the system status.

S8005AD



SE8005D

Much more functionality is provided by the model SE8005D with integrated system software and a monochrome LC touch screen monitor for data display and operation.

This powerful signal electronic completes a *flowtronic* system to a fuel consumption measuring system with display, and data export to an external notebook/PC. An external printer (available as option) generates data print outs immediately after ending a fuel consumption test.

For distance related fuel consumption measurement (l/100lm or km/l) the SE8005 signal electronic includes a signal input (TTL) for an external distance sensor (for example optional GPS module or non contact speed sensor).

Signal outputs for fuel volume (TTL) and flow rate (analogue) are available as well as a LEDs for monitoring the system status.

A robust and adjustable suction holder with quick lock adapter is available for mounting the signal electronic to the vehicle's front window (option).

SE8005D



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Accessories

In general, *flowtronic* systems are offered as complete systems. This helps our customers to have systems which is ready for immediate operation.

External Printer PC-1070



Display SE8005D



Software flowProArchive



Tube Sets and Tube Adapters

Tube sets are available for fast system installation into the existing engine fuel supply system. They are available in different lengths and material (Viton® and polyamide).

Tube adapters with various diameters help to adapt the *flowtronic* systems to existing fuel tubes.

Case for Transport and Storage

Robust and fuel resistant plastic carrying cases with aluminium profiles and plastic edge protection are available for all *flowtronic* systems. The components are held in fuel resistant, high-quality closed porous foam inserts.

The additional inner aluminium case for the signal electronic, cables and electric accessories offers an increased protection against soiling by small remains of fuel.

The larger carrying cases include a built-in trolley for easy handling.

Company Profile GREGORY Technology GmbH

The company GREGORY Technology GmbH exists since 1996 as a sales enterprise for automotive testing technology and as a manufacturer of systems for fuel consumption measurement. Coworkers of GREGORY Technology have 20 years experience within the range of automotive testing equipment.

GREGORY Technology supplies *flowtronic* systems world-wide for mobile and stationary applications.

The use of most modern CAD and ERP software, competent and reliable manufacturing and service partner as well as experienced coworkers form the basis for the high-quality and successful *flowtronic* products.

At the same time the medium-size engineering enterprise GREGORY Technology has a high measure of flexibility and can react fast to the requirements of the market and its customers.

Special solutions are generally fast realizable by modular construction and manufacturing methods.

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Tube Set



Carrying Case



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