# Automotive Sensor Products

## Water in Fuel Sensor

*Figure 1: Water in Fuel Sensor*

## Features

- Resistance measurement for fluid applications
- Robust, simple, cost effective design
- Works with different fluid parameters
- Wide voltage supply range: 5 V to 36 V
- DC or AC measurement method can be used
- Integrated self test
- Choice of connectors and terminals

## Benefits

- Suitable for low pressure and high pressure systems
- Operating temperature range: -40°C to +135°C

## Applications

- Diesel filters
- Fuel tank systems

## General Description

The purpose of the sensor is to detect the presence of water in diesel fuel. The sensor is mounted inside of the fuel filter and has two main output signal stages, low level and high level, which identify the presence and absence of water. The output signal level is changed when water reaches a defined water level in the fuel filter.

## Operation

### Basic Principle

The operation of the sensor is based on the resistive measurement method. Water is detected because it has a lower resistance than diesel fuel. Measurement of fluid resistance is performed between the two electrodes (for sensor options with two electrodes), or between an electrode and a ground (for option with single electrode).

### Packaging Options

Custom packaging can be provided to meet any need, please contact Littelfuse Engineering for details.

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## Operation

**Current**
DC or AC methods can be used.
*DC method:* Using this method, the continuous direct voltage is applied between the electrodes (or the electrode and the ground) and the direct current is flowing in the presence of the conductive fluid.
*AC method:* Using this method, the switched polarity voltage is applied between the electrodes and the alternating current is flowing in the presence of the conductive fluid. Alternating current helps to avoid deposits and corrosion on electrodes.

**Hysteresis**
Signal bouncing during the transition is avoided by using a hysteresis that can be adjusted during the design phase.

**Additional Functions**
The sensor may have additional optional functions: overcurrent protection, delay time for switching from water to fuel and from fuel to water, self-diagnostic function.
Self-test function identifies functionality of the sensor (in absence of water) during the start of vehicle.
The output signal is changed to level identifying presence of water for short time, which can be adjustable, and returns back to output level identifying absence of water.

**Block Diagram**
The simplified block diagram of the sensor circuit is shown below.

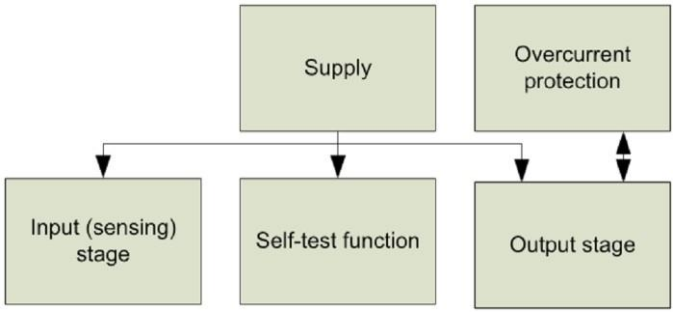


*Figure 2: System Block Diagram*

## Possible Modifications

**Output Signal Level Range**
- Presence of water – high level
- Presence of water – low level

**Output Load Type**
- Lamp
- ECU with pull-up/pull-down resistor
- LED

**Measurement Type**
- DC
- AC

## Functional Characteristics

| Parameter | Comments | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Power Requirements | | | | | |
| Supply Voltage | 12V system, operating voltage range | 6 | - | 16 | V |
| Supply Voltage | 24V system, operating voltage range | 18 | - | 36 | V |
| Supply Voltage | 5V, 12V, 24V system, operating voltage range | 5 | - | 36 | V |
| Switching Resistance | | | | | |
| Water Resistance | can be adjusted to customer needs | | ≤ 190 | | kΩ |
| Fuel Resistance | can be adjusted to customer needs | | ≥ 350 | | kΩ |
| Temperature Range | | | | | |
| Operating Temperature Range | | -40 | - | 125 | °C |
| Short Term Operation Temperature | | | | 135 | °C |
| Timing | | | | | |
| Self-test Duration | can be adjusted to customer needs | 1 | - | 3 | s |
| Delay Time, switching between stages | can be adjusted to customer needs | 0.5 | - | 2 | s |
| Operating Conditions | | | | | |
| Working Pressure | Suitable for low pressure and high pressure systems | | | | |

## Littelfuse

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