

# TestMate Water Sensor (TWS-C-E)

## Description

The TWS-C-E is a water and temperature sensor for the continuous monitoring of ester based fuels (like biodiesel) - accurately, continuously and on line. It measures the water content relative to the saturation concentration (saturation point) and outputs the degree of saturation (saturation level) in the range of 0 to 100% as a 4-20 mA signal. A reading of 0% would indicate the absence of water, while a reading of 100% would indicate that a fluid is saturated with water.

The special capacitance sensor used in the TWS absorbs water molecules from the fluid and changes its capacity value that is directly related to the saturation level in the fluid. An integrated thermoelement on the sensor measures the temperature of the fluid in the range of -13 to 212 F (-25 to 100°C) and outputs it as a 4 to 20 mA signal.



## Installation

The TWS-C can be directly installed into the system with the threaded connection. The recommended mounting position is vertical with the mechanical connection pointing upwards. During installation, attention must be paid concerning a suitable place of mounting in order to have the sensor fully submerged and fluid free-flowing around the sensor. That is why during tank installation only those places should be chosen where there is well known turbulence.

The electrical connection should be carried out by a qualified electrician according to the relevant regulations of the country concerned. The TWS-C-E carries the CE mark. A declaration of conformity is available on request. The relevant EMC standards are: EN 61000-6-1; EN 61000-6-2, EN 61000-6-3, EN 6100-6-4.

The requirements of the standards are fulfilled only if the sensor housing is grounded correctly by qualified personnel. When installing the TWS-C-E into a manifold block, it is sufficient if the block is grounded via the system.

Adherence to the following recommendations will reduce the effect of electromagnetic interference:

- Make inline connections as short as possible.
- Use screened cables (e.g. LIYCY 4x0.5 mm<sup>2</sup>).
- The cable screening must be fitted by qualified personnel subject to the ambient conditions and with the aim of suppressing interference.
- Direct proximity to connecting lines of user units or electrical or electronic units causing interference must be avoided as much as possible.

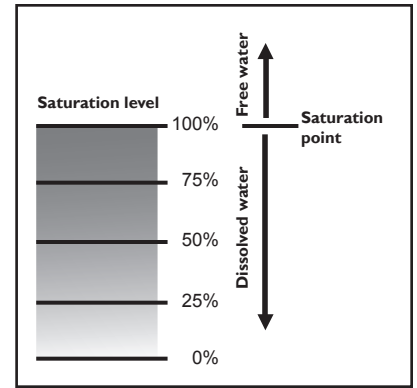
## Functionality

What is the desired saturation level in ester based fuels?

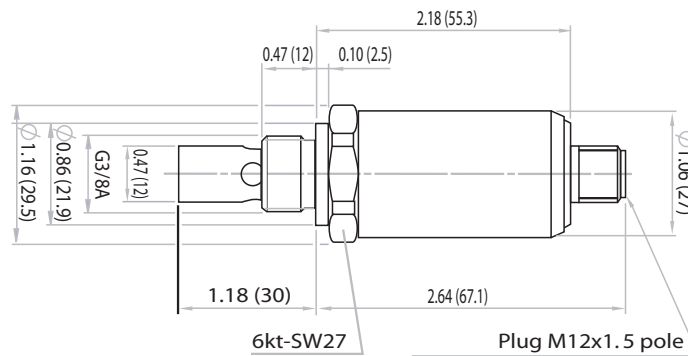
The desired saturation level of moisture in your fuel should be determined by the governing body standard that the fuel will be produced to (such as ASTM D6751 or EN 14214). Downstream moisture ingress points should be taken into consideration when setting this level.

Since the exact saturation level of biodiesel varies based on the feedstock and feedstock blend used and the current temperature, it is recommended that your particular fuel's readings be correlated with a lab by testing for moisture content in ppm using a Karl Fischer titration unit. As a starting point, 0.1% moisture can be interpreted as 1,000 ppm.

If you have any questions regarding technical details or the suitability of the TWS-C-E for your application, please contact our sales/technical department. Interference by anyone other than Schroeder personnel will invalidate all warranty claims.

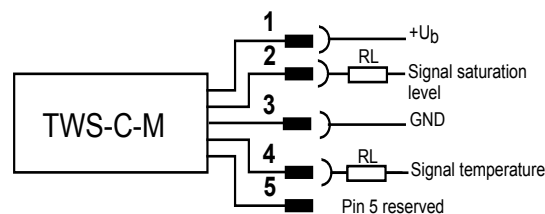


## Dimensions



\* Metric dimensions in ( )

## Circuit Diagram



$$R_{Lmax} = (U_B - 10 \text{ V}) / 20 \text{ mA [k}\Omega\text{]}$$

$$R_{Lmin} = 47 \Omega$$

## Model Code

Build a TWS-C-E part number by choosing a selection from each category:

BOX 1 - 
 BOX 2 - 
 BOX 3 - 
 BOX 4 - 
 BOX 5

**Example:**

	BOX 1	BOX 2	BOX 3	BOX 4	BOX 5	
	TWS	C	E	0	0	= TWSCE00

### BOX 1

Series Type
<b>TWS</b>

### BOX 2

Serial
C = series C

### BOX 3

Type of Medium
M = Mineral Oil
E = esters

### BOX 4

Signal Technology
<b>analog output 1</b>
0 = saturation level signal 4 .. 20 mA

### BOX 5

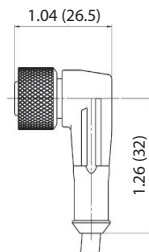
Collar Type
<b>analog output 1</b>
0 = temperature signal 4 .. 20 mA

## Included In Delivery

Sensor  
Manual

## Accessories

**VDP-177** (5 pole) with 5m cable connector M12x1, right angles



## Color Code

Pin 1: Brown  
Pin 2: White  
Pin 3: Blue  
Pin 4: Black  
Pin 5: Grey

## Technical Data

<b>INPUT DATA</b>	
Measuring range (saturation level)	0 ... 100 %
Measuring range (temperature)	-13 ... 212 F / 25 .. +100 °C
Operating pressure	Max. 725 psi, / max. 50 bar
Overload pressure	Max. 9135 psi / max. 630 bar
Parts in contact with media	stainless steel, seal viton or EPDM, ceramic with evaporated metal
<b>OUTPUT DATA</b>	
<i>Humidity measurement</i>	
Output signal (saturation level)	4 .. 20 mA
Calibrated accuracy	≤ ± 2 % FS max.
Accuracy in media measurements	≤ ± 3 % FS typ.
Pressure-dependent	+ 0.02 % FS/bar
<b>OUTPUT DATA</b>	
<i>Temperature measurement</i>	
Output signal (temperature)	4 .. 20 mA
Accuracy	* ± 2% FS max.
<b>AMBIENT CONDITIONS</b>	
Nominal temperature range (saturation level measuring)	32 ... 194 F / 0 .. +90 °C
Ambient temperature range	-40 ... 212 F / -40 .. +100 °C
Fluid temperature range	-40 ... 257 F -40 .. +125 °C
Viscosity range	32 .. 23175 SUS
Flow velocity	< 16 ft/s
Media tolerance	mineral oil based fluids, natural and synthetic esters
CE mark	EN 50081-1, EN 50081-2 EN 50082-1, EN 61000-6-2
Type of Protection acc. DIN 40050	IP 67
<b>OTHER DATA</b>	
Supply voltage	12 .. 32 V DC
Residual ripple supply voltage	≤ 5 %
Mechanical connection	G3/8A DIN 3852
Torque rating	18.5 ft-lbs.
Electrical connection Pin 1: +Ub Pin 2: Signal saturation level Pin 3: 0V / GND Pin 4: Signal temperature Pin 5: not connected	M12x1, 5 pole (DIN VDE 0627)
Reverse polarity protection of the supply voltage, excess voltage, override and short circuit protection	standard

**FS (Full Scale):** relative to the full measuring range