



## BRIEF INFORMATION

### OPS+T (oil pressure and temperature sensor)

- Continuous measurement of the oil pressure
- Continuous measurement of the oil temperature
- Rugged and reliable design

## PRODUCT FEATURES

### Application

The oil pressure and temperature sensor OPS+T is used to measure the absolute oil pressure and the oil temperature directly in the main oil channel behind the oil filter.

It uses the pressure value to properly control mechanical or electrical oil pumps. This lowers the CO<sub>2</sub> emissions and reduces the fuel consumption.

The use of the multi-chip module means it can be utilised in tough environments.

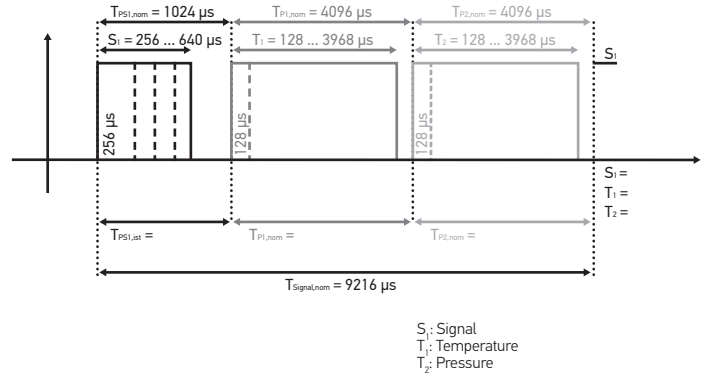
### Design and function

The OPS+T is based on a multi-chip module (MCM), consisting a piezo-resistive cell for measuring the absolute pressure as well as an ASIC for the digital evaluation and further processing of the information. The oil temperature can also be established using a diode which is integrated in the MCM. The PWM output signal is used to transmit both the oil pressure as well as the oil temperature. The engine control unit (ECU) evaluates the PWM output signal from the sensor. The patented technology guarantees leak tightness in view of oils.

# OUTPUT SIGNAL

## General information for evaluating the PWM communication:

Due to the setting precision of the oscillator and its temperature dependency, the length of a PWM frame is subject to a maximum tolerance of  $\pm 10\%$ . Serious hardware errors in the program sequence of the ASIC cancel the PWM communication and can be detected on the control unit by a permanent high level.



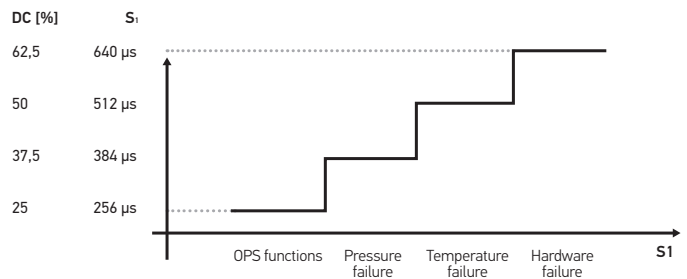
### S1: Diagnosis signal

DC = 0,25 ( $S_1 = 256 \mu s \pm 25 \mu s$ ) => OPS functional state

DC = 0,375 ( $S_1 = 384 \mu s \pm 25 \mu s$ ) => Pressure failure

DC = 0,5 ( $S_1 = 512 \mu s \pm 25 \mu s$ ) => Temperature failure

DC = 0,625 ( $S_1 = 640 \mu s \pm 25 \mu s$ ) => Hardware failure

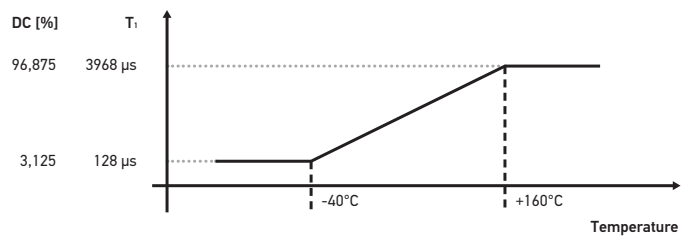


### T1: Temperature evaluation

96.9% of the PWM blocking period  $T_1$  (3968  $\mu s$ ) corresponds to the highest point of the measuring range of 160°C.

3.1% of the PWM blocking period  $T_1$  (128  $\mu s$ ) corresponds to the lowest point of the measuring range of -40°C.

$$T_{1|\mu s} = 19.2 \frac{\mu s}{^\circ C} \cdot \text{Temp} + 896 \mu s$$

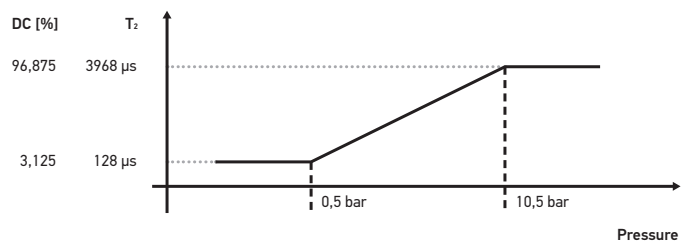


### T2: Pressure evaluation (T2 Level)

96.9% of the PWM blocking period  $T_2$  (3968  $\mu s$ ) corresponds to the highest point of the measuring range of 10.5 bar.

3.1% of the PWM blocking period  $T_2$  (128  $\mu s$ ) corresponds to the lowest point of the measuring range of 0.5 bar.

$$T_{2|\mu s} = 384 \frac{\mu s}{\text{bar}} \cdot \text{Pressure} - 64 \mu s$$



### ECU calculation

$$\text{Temperature} = \left( \frac{4096 \mu s}{T_{P1,est|\mu s}} \cdot T_{1|\mu s} - 128 \mu s \right) \cdot \frac{1}{19.2} \frac{^\circ C}{\mu s} - 40^\circ C$$

$$\text{Pressure} = \left( \frac{4096 \mu s}{T_{P1,est|\mu s}} \cdot T_{2|\mu s} - 128 \mu s \right) \cdot \frac{1}{384} \frac{\text{bar}}{\mu s} + 0,5 \text{ bar}$$

$$\text{Diagnostics} = \left( \frac{1024 \mu s}{T_{PS1,est|\mu s}} \cdot S_{1|\mu s} \right)$$

# TECHNICAL DETAILS

## Technical specifications

Temperature range	-40°C to 150°C
Max. temperature	160°C (max. 100 h)
Supply voltage	4.75 to 5.25 V
Output signal	PWM
Response time	2 ms
Sampling frequency	< 3 kHz
Max. operating pressure	40 bar
Overpressure	60 bar
Pressure measurement range	0.5 to 10.5 bar
Temperature measuring range	-40°C to 160°C
Protection class	IP69K

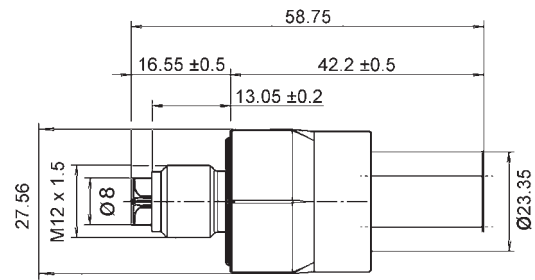
## Tolerance band for pressure measurement

Temperature	0.50–3.00 bar	3.00–5.50 bar	5.50–10.50 bar
70–160°C	+/- 0,15 bar	+/- 0,20 bar	+/- 0,30 bar
20–70°C	+/- 0,15 bar	+/- 0,20 bar	+/- 0,30 bar
0–20°C	+/- 0,20 bar	+/- 0,25 bar	+/- 0,35 bar
-40–0°C	+/- 0,40 bar	+/- 0,40 bar	+/- 0,50 bar

## Tolerance band for temperature measurement

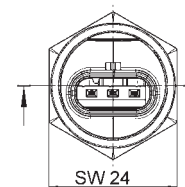
Temperature	Accuracy
135–160°C	+/- 1 K
20–135°C	+/- 2 K
-40–20°C	+/- 3 K

## Technical drawing



## Pin assignment

Pin 1	Supply
Pin 2	Ground
Pin 3	Output




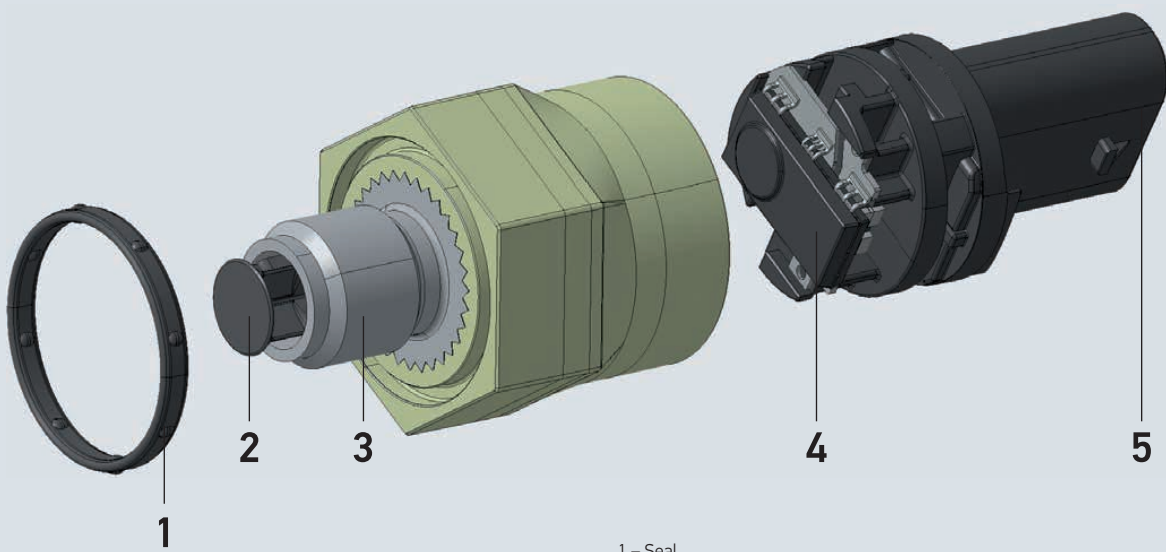
**HELLA KGaA Hueck & Co.**

Rixbecker Straße 75  
59552 Lippstadt, Germany  
Tel.: +49 2941 38-0  
Fax: +49 2941 38-7133  
Internet: www.hella.com

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## RANGE OVERVIEW

Product image	Part number	Description	Packaging unit
	6PR 010 378-107	Oil pressure and temperature sensor	90 units



- 1 – Seal
- 2 – Diffusor
- 3 – Thread
- 4 – Electronics with multi-chip module
- 5 – Plug