

The measurement exhaust temperature



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1. Basic of sensoring

1.1. Introduction

Vehicle micro processor controlled systems continually monitor the operating conditions of the car. Through sensors, computers receive vital information about a number of conditions, allowing minor adjustments to be made far more quickly and accurately than mechanical systems. Sensors convert input variables such as temperature, pressure, speed, position and other into either digital or analog electrical signals.

The inductive sensor consists of a bar magnet with a soft magnetic pole pin supporting an induction coil with two connections. When a ferromagnetic ring gear turns past this sensor, it generates a voltage in the coil which is directly proportional to the periodic variation in the magnetic flux. The rotational speed is reflected on a periodic interval between the voltage's zero transition points. The sensor is showed in figure below.



Fig. Thermocopule

Thermocouples rely on Seebeck effect. Although almost any two types of metal can be used to make a thermocouple, a number of standard types are used because they possess predictable output voltages and large temperature gradients. To make accurate measurements, this must be compensated for by using a technique known as cold junction compensation (CJC). In case you are wondering

why connecting a voltmeter to a thermocouple does not make several additional thermocouple junctions (leads connecting to the thermocouple, leads to the meter, inside the meter etc), the law of intermediate metals states that a third metal, inserted between the two dissimilar metals of a thermocouple junction will have no effect provided that the two junctions are at the same temperature.

1.2. Experiment description

Plug multimeter into sensor's wire. Choose properly tools (oscilloscope, probes, clamp, digital multimeter) to fill table and draw chart ($u=f(T)$).

No.	Crankshaft speed [rpm]	u [V]	T [K]
1.	400		
2.	500		
3.	600		
4.	700		
5.	800		
6.	900		
7.	1000		
8.	1100		
9.	1200		
10.	1300		
11.	1400		
12.	1500		

Function $u=f(t)$ (for K-type thermocouple) is showed in the picture presented below.

