

## Magnetic Sensor Selection

The following information is supplied for assistance in selecting the proper sensors for your particular applications. One of the fundamental questions to be answered is, "Will there be enough sensor output voltage at the lowest operating speed?"

The sensor output voltage depends on:

- *Surface Speed* - speed target passes pole piece
- *Gap* - distance between target and pole piece
- *Target Size* - geometric relationship of pole piece and target
- *Load Impedance* - connected to sensor

The surface speed of a gear depends upon its diameter and RPM. Surface speed is expressed in terms of inches per second (IPS).

$$\text{Surface Speed (IPS)} = \frac{\text{RPM} \times \text{Outside Dia. (in.)} \times \pi}{60}$$

There is an optimum pitch (or tooth size) to obtain the highest possible output from a sensor, but this is seldom necessary. Figure 4 illustrates the relationship of tooth size and spacing for optimum magnetic sensor output. Using a fine tooth gear, relative to a large pole piece diameter sensor, results in a lower generated voltage because the flux also passes into adjacent teeth, resulting in a lower total flux variation.

The relationship between pole piece diameter and gear pitch and its effect on the output of a sensor is described in Table A.

The load impedance, with relation to the internal impedance of the sensor, dictates the amount of sensor output voltage that will be seen by that load.

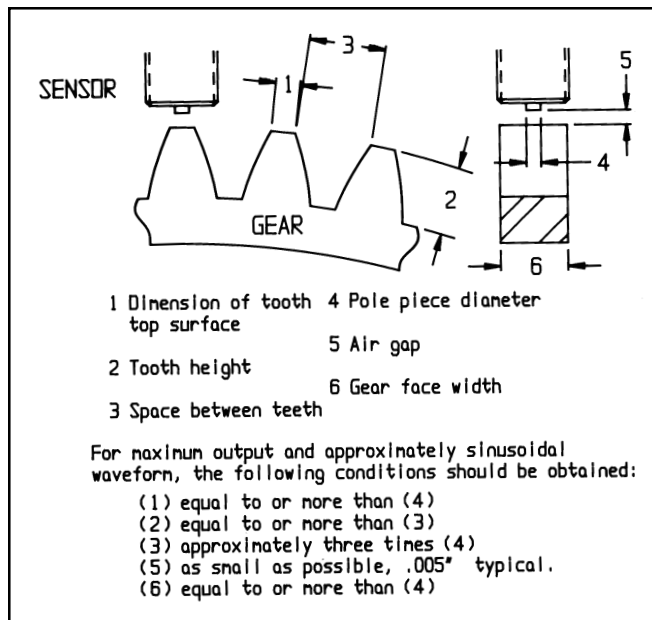
Magnetic sensors are designed with the lowest practical impedance consistent with providing maximum output. The load impedance should be high in relation to the impedance of the sensor to minimize the voltage drop across the coil and to deliver the maximum output to the load.

Most of the output voltages listed in this catalog are based on a load impedance of 100k ohms. To use a generality, the load impedance should be 10 times that of the sensor.

In order to assist you in selecting your sensor, Airpax Instruments has developed an output vs. speed curve for each sensor family. By looking at the application extremes of highest speed/lowest gap and lowest speed/highest gap, the full variation of sensor output can easily be determined. We also specify each family in two ways **Standard** - minimum output voltage at 1000 IPS, 0.005 in. gap. **Guarantee Point** - minimum output voltage at 500 IPS, 0.030 in. gap. Sensors with .187" dia. pole piece are tested with an 8 D.P. gear, 100k ohms load; .106" dia. & smaller pole piece sensors are tested with a 20 D.P. gear, 100k ohms load.

**Table A:** Relative Output Vs. Gear Pitch

Pole Piece Dia. (in)	Gear Pitch						
	8	12	16	20	24	32	48
.187	1.00	0.83	0.33	0.16	—	—	—
.106	1.41	1.41	1.27	1.00	0.70	0.28	0.07
.093	1.25	1.25	1.25	1.00	0.75	0.37	0.12
.062	0.95	1.07	1.00	1.00	0.92	0.90	0.36
.040	1.00	1.00	1.00	1.00	1.00	0.90	0.60



**Figure 4:** Sensor output as a function of gear tooth size.