General Datasheet Speed Sensors

The speed sensors consist of a metal housing, in which are the elements of the sensors embedded and for some types also the electronic circuits. This construction make them mechanically robust and safe against disturbances from foreign circuits. By using according output levels, shielded cables and plug-connectors the lines have a high noise to signal ration. Each kind of measuring task requires a different measuring principle. For technical data, construction features and dimensions of the housings, please see the specific datasheets.

Inductive Pulse Sensor FGL 1/...

With this type of sensor object like gear wheels, punched discs, pins or integral shafts made of ferromagnetic material can be sensed. They consist of a magnet and a coil winded around an iron rod, there a voltage, which frequency is proportional to the speed is induced by changing the air gap between the object and sensor tip. The output voltage of the inductive sensor is highly dependent on the speed respectively peripheral speed of the ferromagnetic gearwheel, the form of its teeth (module) and the gear to sensor distance. Please note in general, when sensing a speed of 15 rpm on a gear with 60 teeth, module 2, a distance of s = 0.5 mm may not be exceeded. The grear to sensor distance must be reduced at a lower peripheral speed and if the conditions are reversed it can be increased. This relationship can be approximated within the range S = 0.4 ... 1.0 ,, amd < = 2 to 4 by the equiation (1).

For other tooth forms or pins or holes in a sensed shaft, the simplified equation (2) is calid if the dimensions of the teeth, pins or holes are bigger than the corresponding dimensions of a gear wheel with module 4.
For the minmum speed calculated in this way, the signal voltage is approximatedly 0.4 V_{ss}.

n = lower limit of speed measuring range in rpm.
M = module lof the sensed gear wheel.
z = number of teeth on sensed gear wheel
s = distance between pulse sensor and tip of the gear in mm.
d = tip diameter in mm.

$$(1)\quad n \geq \frac{0.8.s}{M^2 . 2} . 10^4$$

$$(2)\quad n \geq \frac{2.s}{2} . 10^3$$

Versions up to approximately 140oC are available.

Inductive Pulse Sensor with Amplifier Type FGL 01406-...

The measuring principle and the marginal conditions are the same as for the pick-ups type FGL 1/... But the sensor type FGL01406-... has a square wave signal output (PNP). The output is safe against wrong polarity and short circuit.

These pick-ups have robust design and therefore they are suitable to be used at combustion engines and machines with high vibration levels.
Approvals from classification societies are available.

Inductive Oscillator Sensor Type FGL 13/...

An oscillator connected with a coil produces an electro-magnetic alternating field, which comes out collimated at the sensor tip. In every metallic, electrical conducting measur4ing object eddy currents are induced, which change the energy status of the oscillator. This change of the level is evaluated by an adjusted trigger level and is available as a switch signal (PNP) via an output.

Special features of these sensors are:
- high working distance (3,2 mm)
- wide operating temperature range (-25 to 100°C)
- robust sleeve made of stainless steel material.

The sensors are used on combustion engines, turbines and machines, which are working under tough conditions.
Approvals from classification societies are available.

Inductive Oscillator Position Sensor IW00015./IW00016./IW00017.

The basic design is similar to the inductive oscillator pulse sensor type FGL 13/.../ But with this sensor the change of the oscillator levels results in an analogue output signal of 4 - 20 mA or 0.5 to 4.5V and not in a switched signal.

The output signal is proportional to a measuring distance of 2 - 6 mm. The sensors are suitable for the distance measurement under rough conditions and have approvals from classification societies.

Oscillator Pulsae Sensor Type FGL 4/1 and FGL 4/1,5-5

These sensors comply with the NAMUR standard respectively DIN 19234. The measuring principle of these sensors is based on the fact that the measured object which can consist of any type of metal, extracts more or less energy from a transistor oscillator, thus bringing about a variation in the current consumption. The required power supply is already built-in the connected instruments manufactured by us. Where connection is to be made to instruments of other makers, the signal output must additionally be connected to a power supply with a no-load voltage U^{o} = +8V ±0,5V and an internal resistance Ri = 1 kΩ.

The output voltage is determined by the sensor to object distance, the form and size of the teeth to be sensed and by the electrical conductivity of its material, but not by the peripheral speed. This permits sensirng at low speeds almost down to zero. The upper frequency limit is dependent on the tooth form (module).

The best distance depends on the senor type and the material to be sensed. For steel, it is about 1,4 and 0,8 mm. Other metals require smaller distances.

Magnetic Field Pulse Sensor FGL 8/1

Sensors of this series require also a measuring object made of ferromagnetic material. In this case not the change of the time period of the magnetic field causes the output voltage, but the magnetic field itself by means of semiconductor components. Very low speeds, near zero can be measured. It is significant for this pick-up that even gear wheels with module 0.7 can be sensed, if the sensor is mounted optimal, The output voltage of the sensor is independent on the speed up to pulse frequencies of about 20 kHz. There is a lower limit frequency of 1 Hz, which is mostly a result of the capacitive input of the connected measuring units.
The following distances between pulse sensor and addendum circle of the to-be-sensed gear wheel should not be passed through:

at module 0.7 s = 0,3 mm
at module 1,0 s = 0,7 mm
at module 1,5 s = 1
at module 2,0 s = 1,25 mm
at module 3,0 s = 1,3 mm

For mounting it is essential that the rectangular active surface of the sensor is in parallel to the tip of the gear. This is given when the line connection of the two markings at the cable end of the sensor is parallel to the axis of the gear wheel. This optimum position can always be obtained with a lead of 1 mm of the sensor thread. For other tooth forms, pins or holes in the shaft to be sensed, a comparison with an involute gearing can help to choose the maximum distance. It is in every case advantageous to shorten the distance. The active surface is sensitive to damages.

Magnetic Field Pulse Sensor with increased EMC resistance Type FGL 020..

Here the same principle is valid as for the series FGL 8/... By additional shield and protection measures this series is suitable for the use on electro motors of track vehicles.

The square wave signal form is available as a push-pull ultimate position.

Sensors for Hazardous Areas FGL0016.. Exi, FGL0116.. Exi and FGL 3/1 Exi

Series FGL0016.. and FGL0116.. work according to the principle of inductive pulse sensors (FGL 1/...). They are approved according to class Eex ib IIC T4.
The series FGL 3/1 Exi belongs to the product line magnetic field pulse sensors (FGL 8/..) The basic data concerning the sensing of the object are the same.

An Exi approval for protection class Eex ib II C T5 is available.
Both series are used for the sensing of gear wheels, pulse discs or cams for e.g. turbines, motors or other machines in hazardous areas.

Turbocharger Speed Sensor FGL 1/16 and FG 20.1...

The sensor FGL 1/16 uses the inductive measuring principle and sense holes or magnets in case where is no radial alignment of the sensor and the turbo-charger shaft. The use depends on the turbo-charger type and manufacturer (e.g. ABB). The sensor FG 20.1... are used where they are mounted radial to the shaft.

They are sensing multipolar magnetic nuts, which are at the sensor tip. There are several models available for different threads. Here it depends also on the turbo-charger type and manufacturer (e.g. ABB). Approvals from the classification societies are available for both series.

For technical data, construction features and dimensions, see them in separate data sheets.