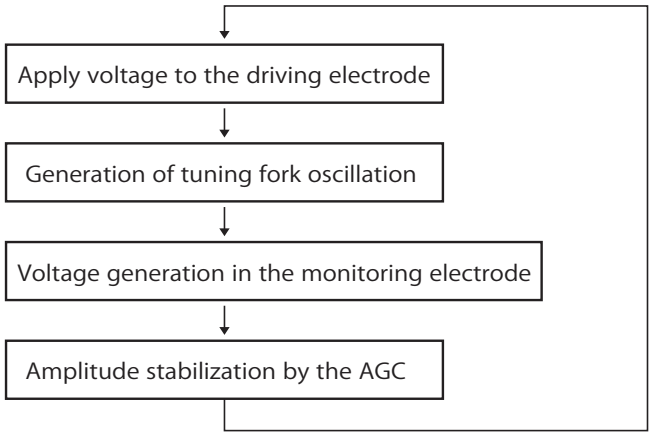
■ Operating principle

- This is a sensor to detect the revolution speed w (° / s) of objects
- The sensing element is the bimorph quartz tuning fork and MEMS silicone based tuning fork
- The control circuit consists of (1) Driving Circuit and (2) Detecting Circuit

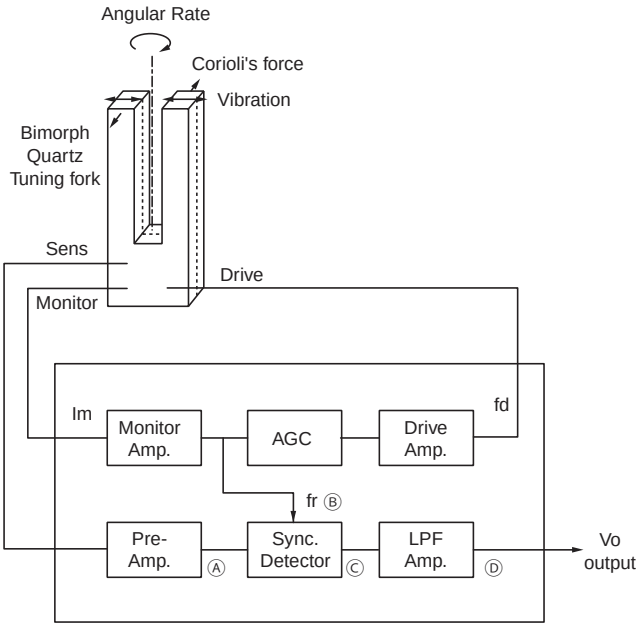
(1)Driving Circuit

It generates the particular frequency of the tuning fork through the following oscillation loop. In order to stabilize the sensitivity, the amplitude is controlled by the AGC

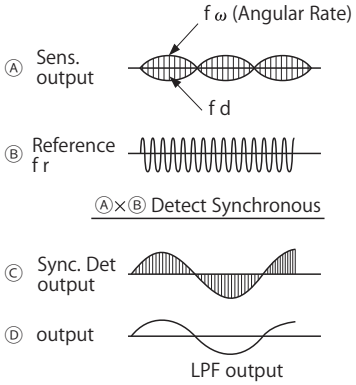


(2)Detection Circuit

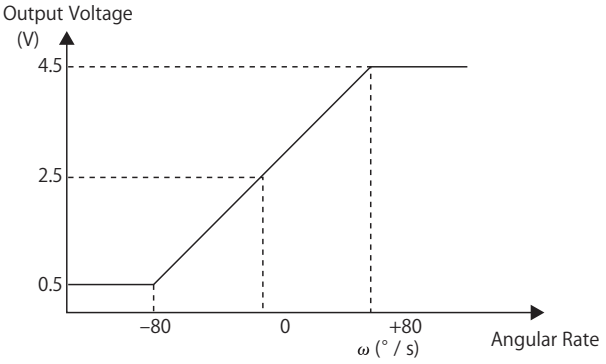
Applying angular rate to the sensor, the tines of tuning fork are twisted by CORIOLIS force and generate waves as shown in Fig 1 below. This is equivalent to the signal which is amplitude - modulated by the angular rate signal fω, using the driving frequency fd as the carrier waves. Thus the angular rate signal is extracted by the synchronized detection using driving frequency fr as base signal



[Signal Procesing]



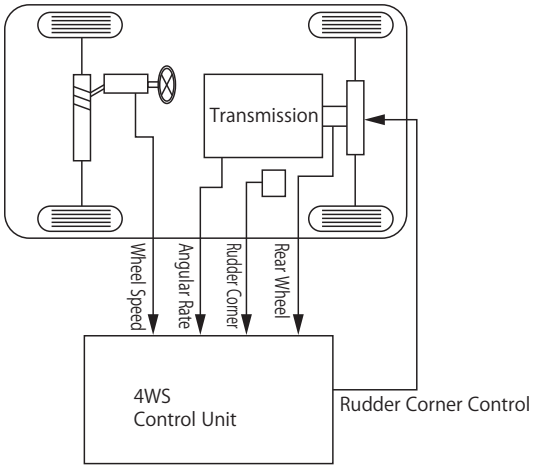
[Output Characteristic]



The maximum and minimum outputs, and the maximum detection angular rate vary with applications.

■ An Example of Applications

(Automobile 4 WS Controls)



- In some applications such as automobiles, power source lines may pick up inrush surges, a protection circuit shall be built in the control circuit
- If it is used in the conditions of a wide temperature range and the zero-point drift is not negligible, the drift correction by the digital filter (LPF) shall be executed

■ Explanation of terms

- CORIOLIS force

  In a rotating coordinate system (the angular rate: ω), when a object moving at a certain speed, apparent force generated at right angle against the moving direction.

  It can be expressed by the formula,

  $$\text{CORIOLIS force} = 2 \cdot \omega \cdot v \cdot \omega$$

  Where, m : the mass of the rotating object
  v : the velocity of the object
  ω : the angular rate in the rotating coordinate system
- Zero point voltage

  The output voltage at zero angular rate (static condition)
- Response Time

  The delay time of the output signal of Gyro Sensor against the input angular rate signal

■ Explanation of part numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	W	T	S								
Product Code				Type	Custom Code					Reference	

5th	Type
8	for car navigation etc.
6	for rollover detection Type