EXERCISES – Sensor specifications.

1.- Analyze the specifications of commercial sensors and identify the following features (some of them may not be explicitly specified):

1) Measurand (magnitude to be measured). Input range.
2) Features of the output electrical signal (analog, digital, frequency, voltage, resistance…). Output range.
3) Mechanical features (size, weight, wires).
4) Electrical connections (power supply if needed, input and output impedance)
5) Static performance:
    a. Nominal static calibration curve: offset and sensitivity.
    b. Resolution and threshold.
    c. Linearity-hysteresis-repeatability
6) Dynamic performance:
    a. Time-domain specifications: time constant, response time, rise time, settling time.
    b. Frequency-domain specifications: bandwidth, resonance frequency, useful frequency range.
7) Environmental characteristics: temperature, pressure, acceleration effects
8) Reliability characteristics: stability, operating life, cycling life.

2.- Compare the following sensors: Honeywell-SCC100A, Motorola- MPX2100A, Motorota-MPX2300DT1 in terms of:

1) Input range.
2) Nominal calibration curve (in the reference conditions) and when all of them are powered with Vs=5 Vdc. Indicate in both cases the output range.
3) Error due to a temperature variation between 5 and 40ºC.

3.- Evaluate the performance of **thermistor 103AT** in the temperature range between 35 and 42 ºC.

1) Define the nominal calibration curve of the resistance.
2) What´s the uncertainty in the value of the resistance (ΔR) due to the R_{25} and B tolerances?
3) Evaluate the linearity error (in 37ºC and worst case) by considering:
    a. End-point linearity.
    b. Least-squares linearity.
    c. Point based linearity. Best linearity around 37ºC.
4) To perform measurements as fast as possible, which one of the 103AT thermistors would you choose? Why?