



Application Note PE003

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1 Linearity Curve

1.1 Explanation

Most of the magnetic field probes of Projekt Elektronik Mess- und Regelungstechnik GmbH use a hall element as field sensitive component. In contrast to an ideal sensor, these hall elements show a number of different deviations. If the error of offset and scale are corrected, there is still a remaining error because the correlation between magnetic flux and output signal of the sensor is no linear function and therefore can only be approximated linear.

We try to compensate the error of the hall element as good as possible. The linearity curves plotted by us exhibit the remaining error according to the measured field.

The non-linearity is the dominant part in errors which have to be taken into account when measuring with our probes. This means that with repeated measurement of the same field, the error in the absolute value may be e.g. 0.2 % while the difference between the single measured values shows a much smaller variation.

In addition the hall elements have a temperature dependency. Therefore the non-linearity can be plotted at increased and decreased probe temperature.

At the following pages we have collected some typical linearity curves of our probes.



Linearity Curves

2 Typical Linearity Curves

2.1 AS-Active-Probe AS-HAP

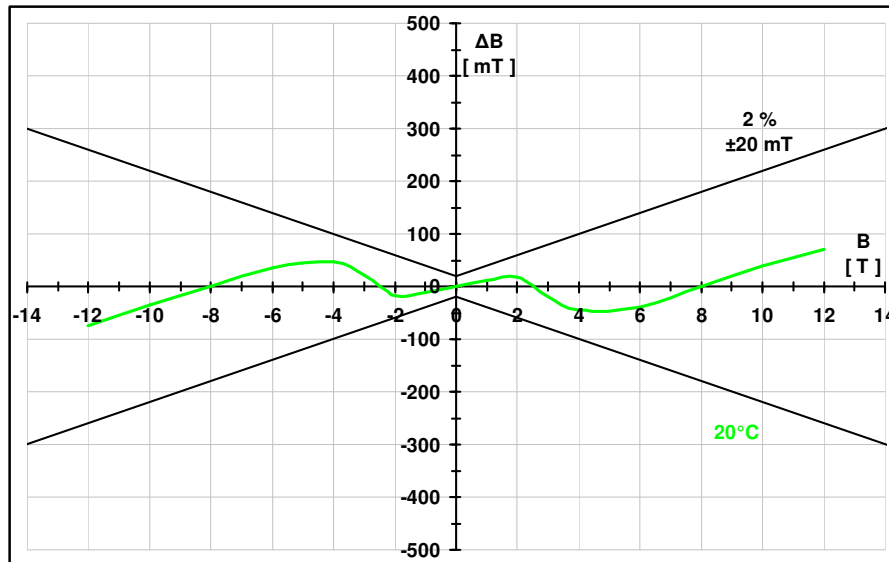


Figure 1: typical non-linearity of AS-HAP

2.2 AS-Active-Probe AS-NTM

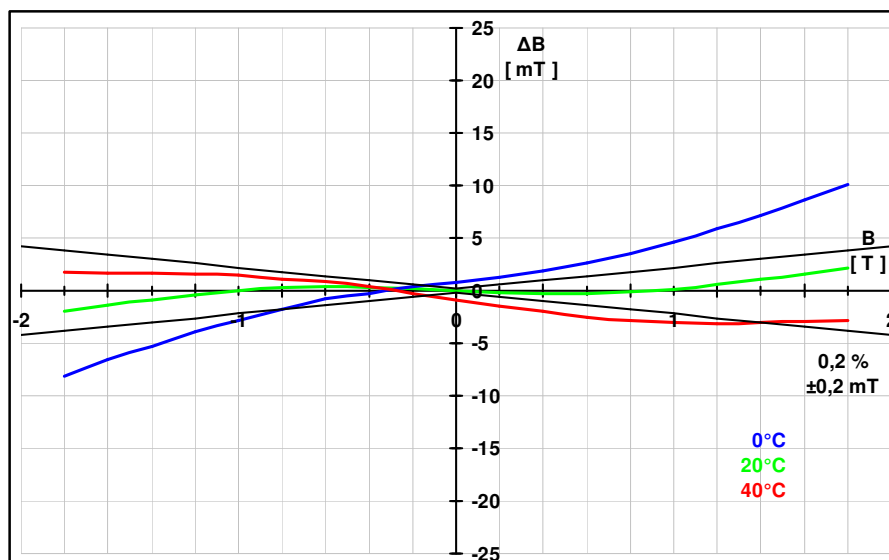


Figure 2: typical non-linearity and temperature drift of AS-NTM



Linearity Curves

2.3 AS-Active-Probe AS-NTM-2

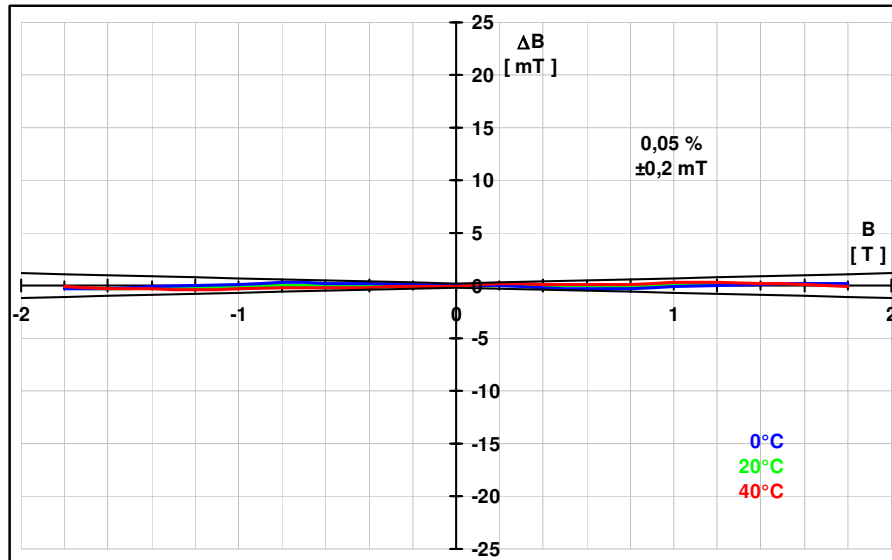


Figure 3: typical non-linearity and temperature drift of AS-NTM-2

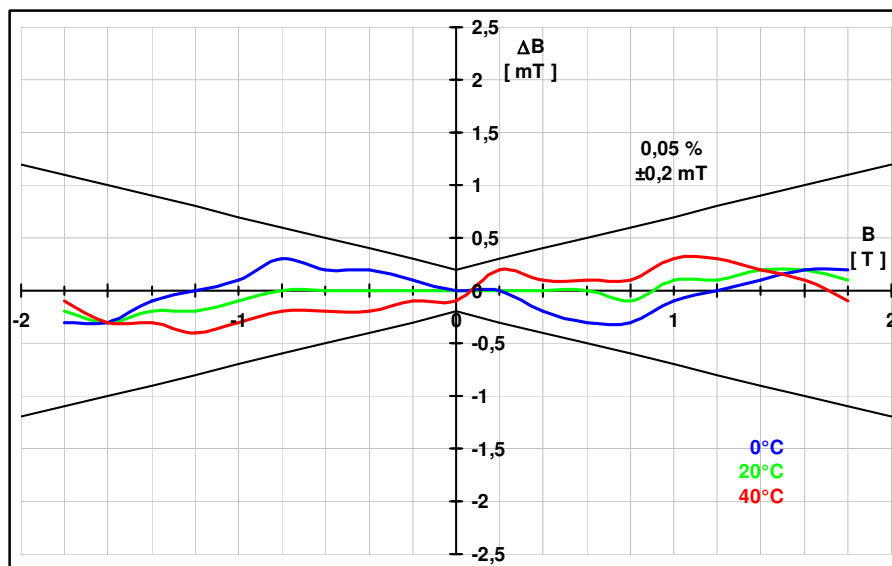


Figure 4: typical non-linearity and temperature drift of AS-NTM-2 – enlarged by factor 10



Linearity Curves

2.4 AS-Active-Probe AS-NAP

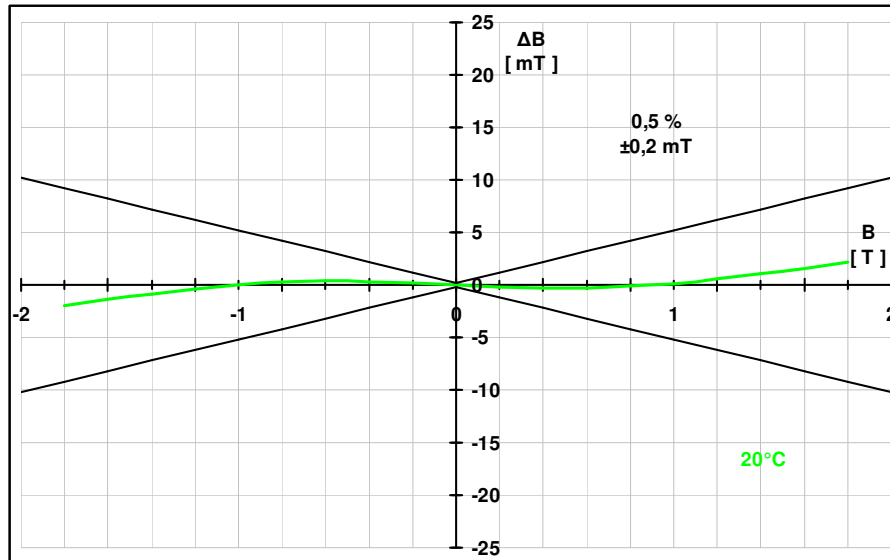


Figure 5: typical non-linearity of AS-NAP

2.5 AS-Active-Probes AS-NTP-Flex, AS-NCu-Wire

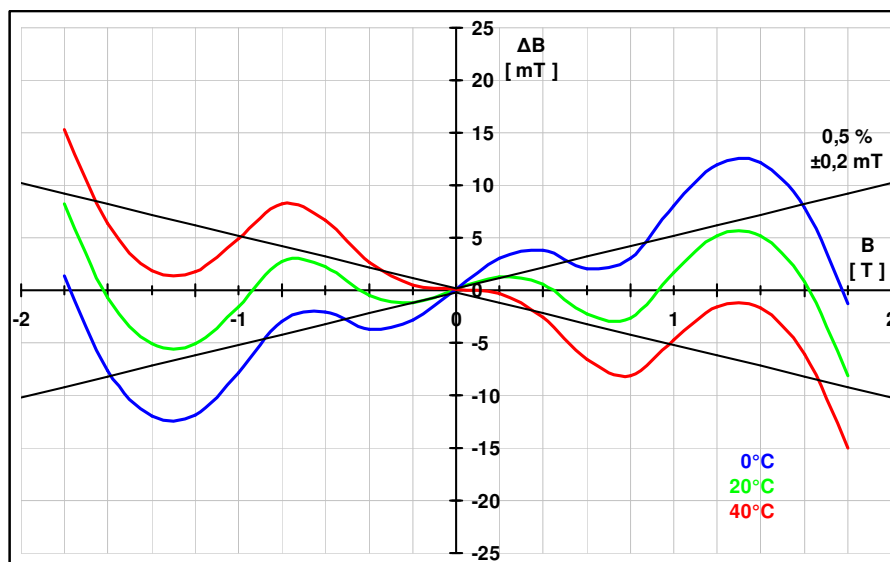


Figure 6: typical non-linearity and temperature drift of AS-NTP-Flex, AS-NCu-Wire



Linearity Curves

2.6 AS-Active-Probe AS-NTP-Hot-05

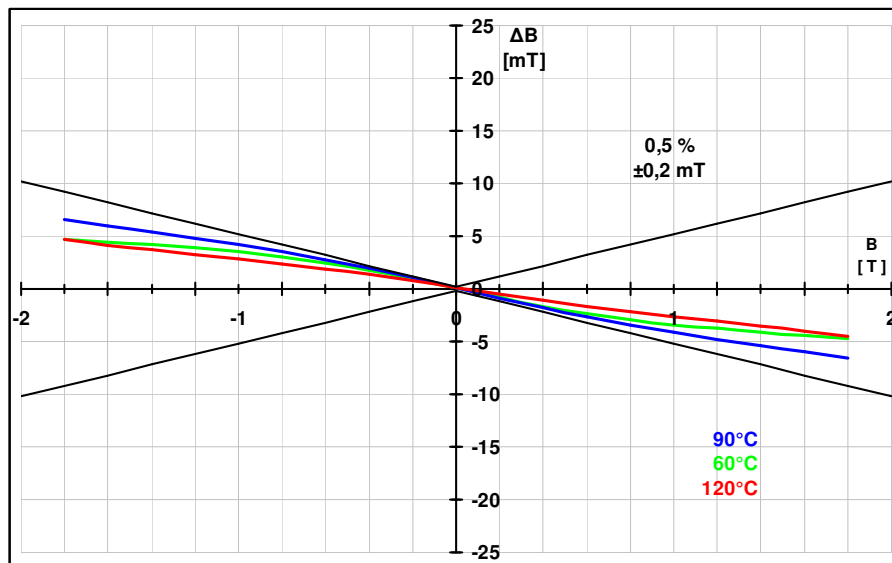
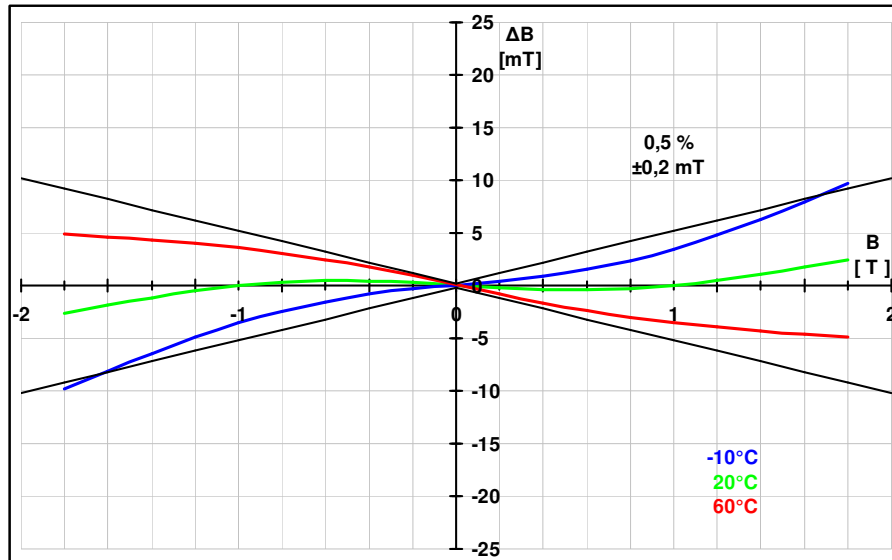


Figure 7: typical non-linearity and temperature drift of AS-NTP-Hot-05



Linearity Curves

2.7 AS-Active-Probe AS-LTM

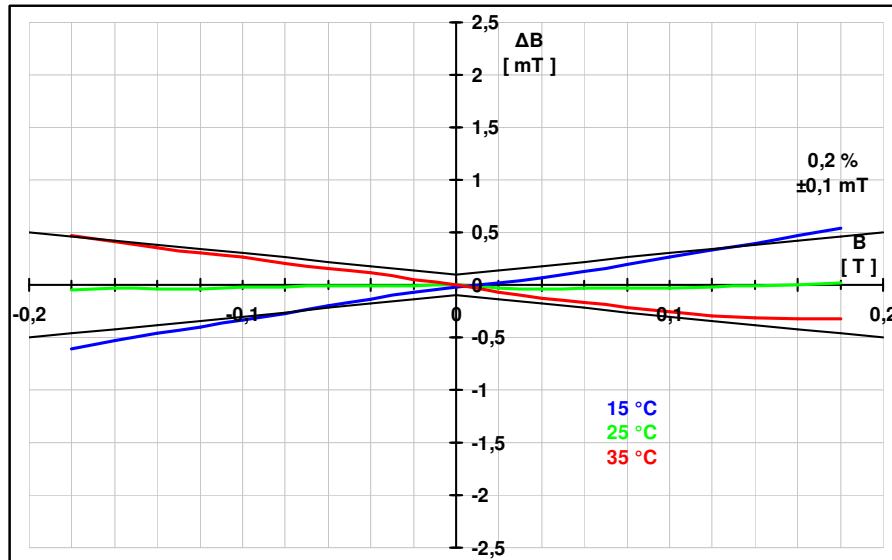


Figure 8: typical non-linearity and temperature drift of AS-LTM

2.8 AS-Active-Probe AS-LAP

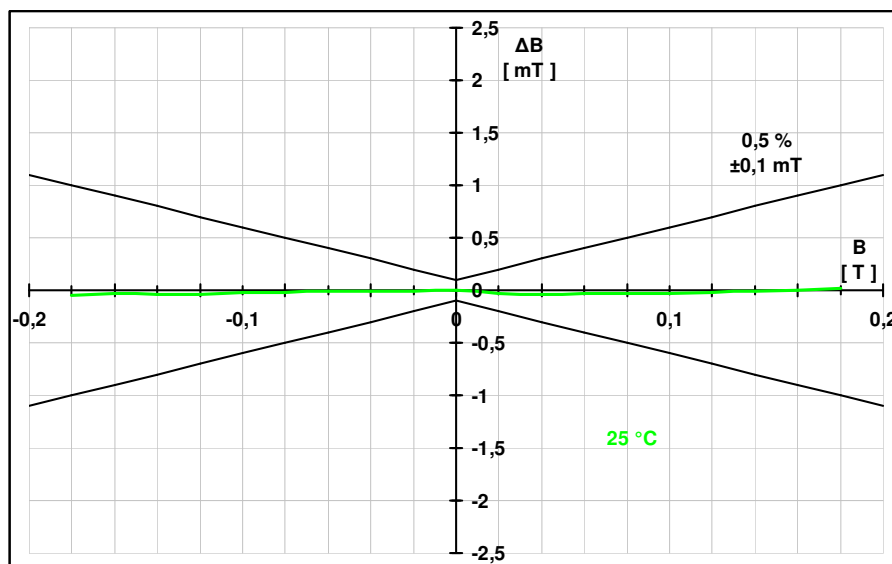


Figure 9: typical non-linearity of AS-LAP



Linearity Curves

2.9 AS-Active-Probes AS-UAP GEO-X, AS-UAP Lot

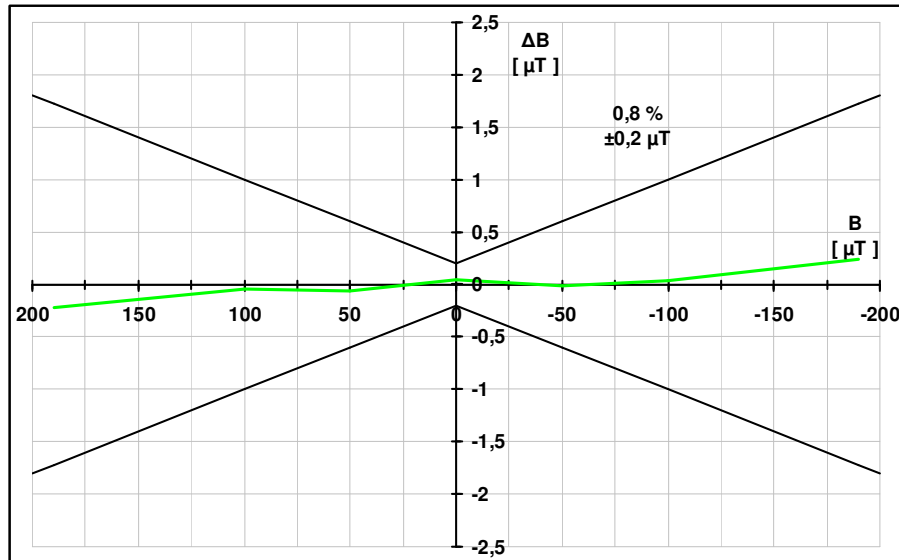


Figure 10: typical non-linearity of AS-UAP GEO-X, AS-UAP Lot



Linearity Curves

2.10 Precision Teslameter FM 3002

The non-linearity in the curves shown above is small enough for most measuring tasks. For high precision demands we have developed our Precision Teslameter FM 3002. To achieve the desired measuring precision of $<0.01\%$ and a temperature coefficient of <5 ppm significant more complex correction work has to be done than what is necessary at the AS-Active-Probes. At our high-precision desk-top units correction is done with reference to non-linearity and also with reference to temperature drift.

The following diagram shows the result after all corrections have been done. It shall be noted that the y-axis isn't divided in mT any longer but in μT .

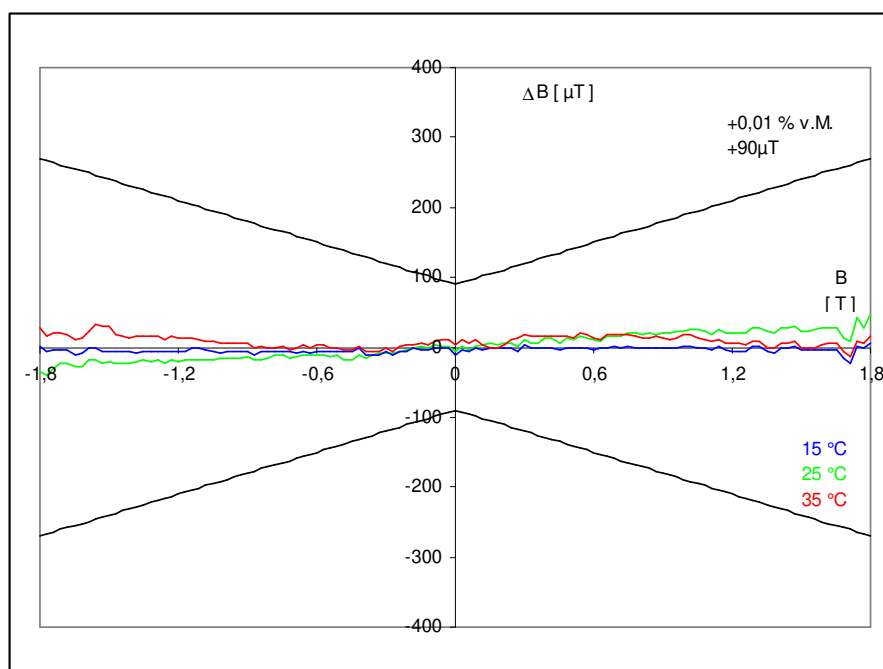


Figure 11: typical non-linearity and temperature drift of Precision Teslameter FM 3002