

APPLICATION NOTE

Differential Measurements with the HE144 Hall sensor

Offset voltage

The offset voltage of a Hall sensor is defined as the output voltage at a magnetic field of 0.0 Tesla. This voltage is only an offset and does not influence magnetic behaviour of the sensors. Typically these values vary between 100 to 200 μV for the HE244 up to 10 mV for the HE144.

Common-mode voltage

The difference between the outputs of a differential Hall sensor at a magnetic field of 0.0 Tesla is zero (except for the offset). Both output voltage are however at 50% of the supply voltage, typically 500 mV for a HE144 at a mA or a HE244 at 2 mA. This voltage is removed by the instrumentation amplifier that can be used to read the sensor outputs. The outputs are also differential.

When large gains are used in the amplification to measure small fields, care must be taken not to saturate the instrumentation amplifier with the offset or common-mode voltage.

Advantage of the Asensor Technology AB HE144 sensor

There is a difference between the Asensor Technology AB sensors and other sensors that give the HE144 type an advantage: all Hall sensors are alike. Meaning they all have the same offset voltage with the same temperature drift. In high precision systems, often differential measurements are made. And exactly there, the HE144 can really make the difference.

The inputs of the sensors can be placed parallel. The outputs can be cross-connected, 3 to 4, 4 to 3. And one sensor must face the other direction. When this is done, the offsets (and its temperature drifts) compensate each other. The output voltages would also compensate each other, but because we let one sensor face the other direction, the voltages are the same. But the offsets are compensated and largely gone.

This means you need only one current source and one instrumentation amplifier.

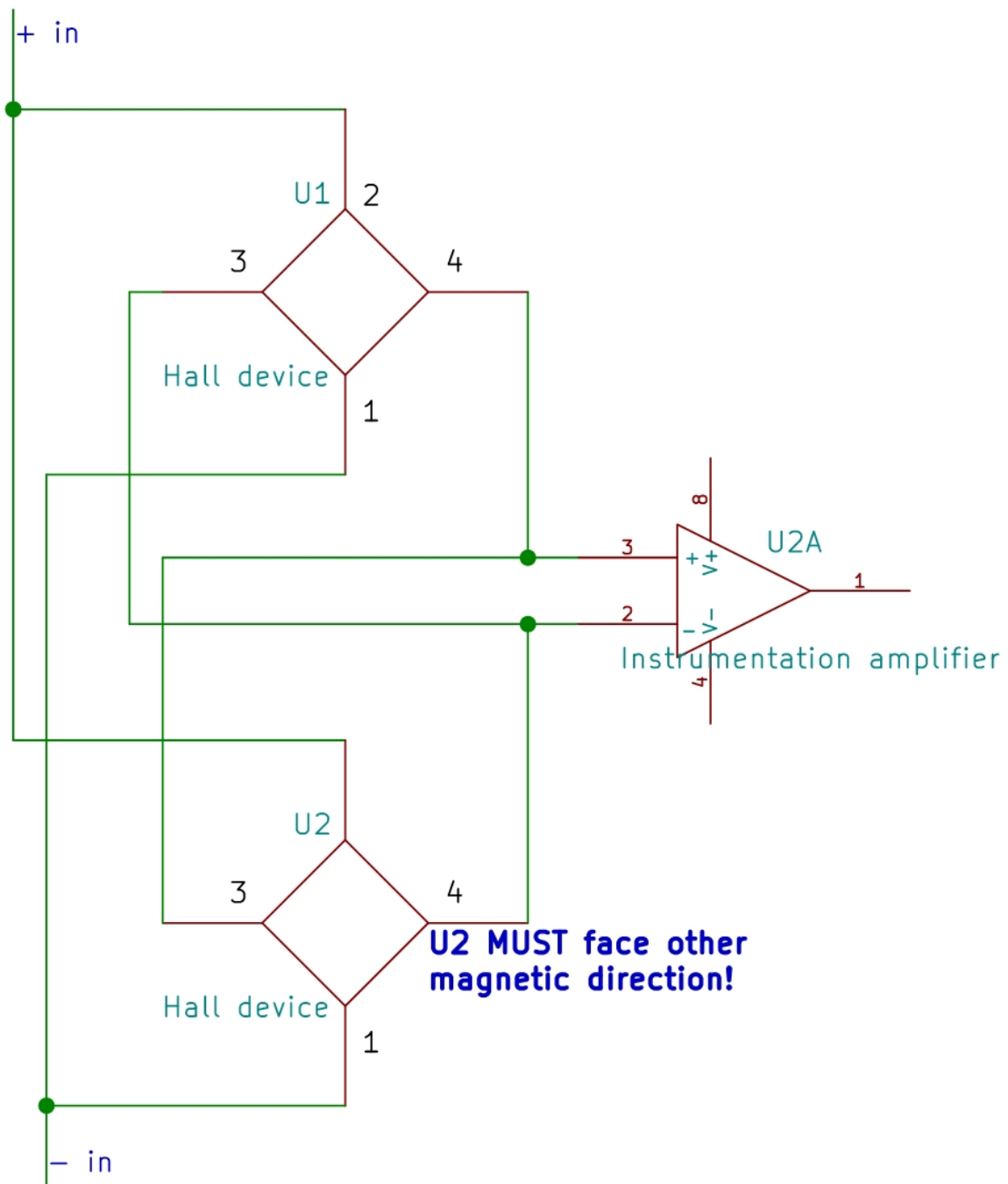
But notice that this removes the offset only, not the common-mode voltage! You still need to take care that you stay within the range of the instrumentation amplifier.

A schematic can be found on next page. We recommend reading our application note on offset correction too.

Current source

It is advised to drive the sensors with a constant current. This is the only correct way to use the sensors as this is what a Hall sensor is based on: current. Of course it is possible to drive the sensors with a voltage for less precise applications. But then the current through the sensor will depend on the sensor resistance, hence temperature. Still however, offsets get compensated with the method presented here.

144 Hall Sensors Application Note



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