Magnetic Field Sensor, Tangential 1000558

Instruction Sheet

10/15 Hh

1. Safety instructions

- To avoid permanent damage to the Hall sensor in the sensor probe tip, do not subject it to any mechanical pressure!
- Do not bend the sensor probe tip!
- Only use the magnetic field sensor for educational purposes!

It is not suitable for safety-related applications!

2. Description

Sensor box with attached sensor probe, 140 mm long, 8 mm wide and 1.2 mm thick, for the measurement of magnetic flux density *B*.

At the tip of the probe there is a Hall sensor with an active area of about 0.5 mm², which produces a steady output signal that is ratiometric (i.e., proportional to the operating voltage).

Three buttons allow one to choose between measurement ranges of 2 mT, 20 mT or 100 mT, with a locking facility. The current setting of the measurement range is shown visually by a light-emitting diode on the left of the relevant button.

The stand clamping rod can be adjusted to hold the sensor in the desired position and orientation in the magnetic field that is being measured.

3. Equipment supplied

1 sensor box with permanently attached probe
1 miniDIN 8-pin connecting cable, 60 cm
1 clamping rod, length 120 mm
1 instruction sheet for 1000558

4. Technical data

Measurement ranges:	2 mT, 20 mT, 100 mT
Sensor type:	Linear Hall-effect sensor
Sensitivity:	Typically 1.3 mV / 100 µT
Nonlinearity:	Max. ± 2.5% of the total measurement range
Bandwidth:	1.5 kHz

5. Operation

- Hold the sensor box by hand in the magnetic field to be measured, or use the clamping rod to position it as required in the experimental setup.
- Set the tangential orientation of the sensor element as required and measure the magnetic field.
- Read the magnetic flux density value on the display of the 3B NET*log*™.

The sensor box is designed to be recognised automatically by the 3B NET*log*™.

Switching between the different measurement ranges is recognised by the 3B NET*log*™ and taken into account.

5.1 Zero calibration for the sensor box

(as of 3B NET*log*™ firmware version 3.27)

- Hold down the 2 mT range button for slightly longer than 2 s, then release it.

Zero calibration occurs automatically. Successful calibration is indicated when the the LED on the left next to the 2 mT range button flashes several times and is followed by a bleep from the 3B NET*log*™ unit.

The pointer of the 3B NET*log*™ display is then updated ("Refresh") and the zero pointer is indicated on the row corresponding to the chosen sensor input.

If necessary, the zero calibration procedure should be repeated between successive measurements.

6. Experimental applications

Magnetic fields of permanent magnets and coils

Plotting the lines of the earth's magnetic field

7. Sample experiment

Measurement of the flux density and induced voltage for a bar magnet moved rapidly inside a coil

Equipment needed:

1 3B NET*log*™ @230 V	1000540
or	
1 3B NET*log*™ @115 V	1000539
1 3B NET*lab*™	1000544
1 magnetic field sensor, tangential	1000558
1 coil D with 600 taps	1000988
1 cylindrical bar magnet 200x10	1003112
1 Pair of Safety Experiment Leads	1017718

- Set up the experiment as shown in Fig. 1.
- On the 3B NET*lab*™, open the application (template) for the "Magnetic field sensor, tangential" experiment.
- Taking the round bar magnet in one hand, push it into the coil.
- On the 3B NET*lab*™ start the recording of the experimental curve.
- Withdraw the round bar magnet quickly from the coil.
- Interpret the experimental curve (Fig. 2):

When the flux density changes there is an induced voltage.

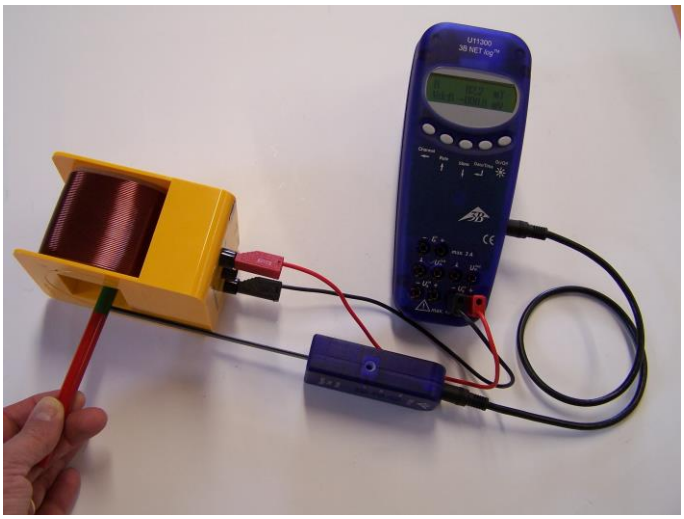

Fig. 1 Measurement of the relationship between the flux density (analogue input A) and the induced voltage (analogue input B) when a bar magnet is moved rapidly in a coil

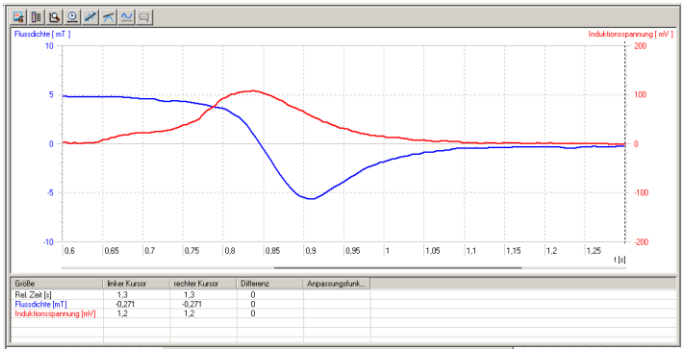

Fig. 2 Display on the monitor screen of the 3B NETlab™ showing the relationship between the flux density (blue curve) and the induced voltage (red curve) for a bar magnet moved rapidly in a coil