

## 5.3.01-01 Hall effect in p-germanium



## What you can learn about ...

- Semiconductor
- Band theory
- Forbidden zone
- Intrinsic conductivity
- Extrinsic conductivity
- Valence band
- Conduction band
- Lorentz force
- Magnetic resistance
- Mobility
- Conductivity
- Band spacing
- Hall coefficient

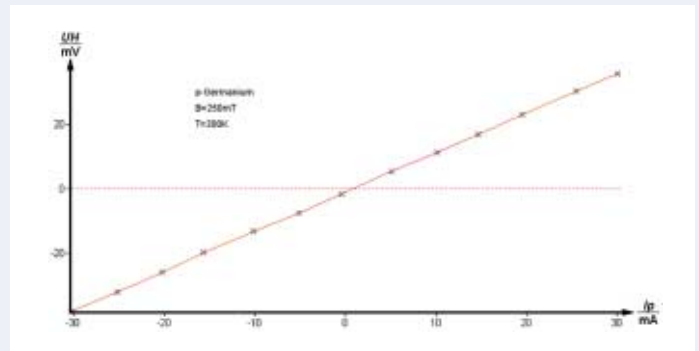
## Principle:

The resistivity and Hall voltage of a rectangular germanium sample are measured as a function of temperature and magnetic field. The band spacing, the specific conductivity, the type of charge carrier and the mobility of the charge carriers are determined from the measurements.

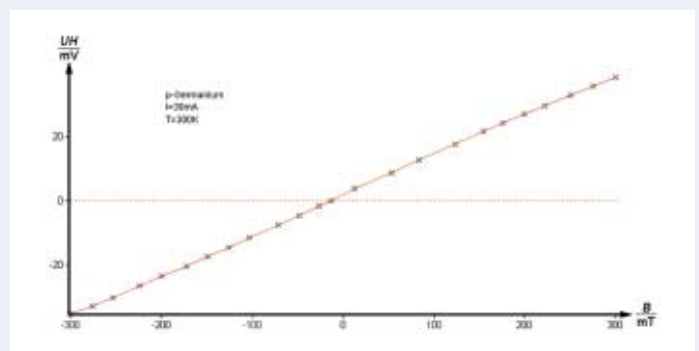
## What you need:

Hall effect module,	11801.00	1
Hall effect, p-Ge, carrier board	11805.01	1
Coil, 600 turns	06514.01	2
Iron core, U-shaped, laminated	06501.00	1
Pole pieces, plane, 30×30×48 mm, 2	06489.00	1
Hall probe, tangential, prot. cap	13610.02	1
Power supply 0-12 V DC/6 V, 12 V AC	13505.93	1
Tripod base -PASS-	02002.55	1
Support rod -PASS-, square, $l = 250$ mm	02025.55	1
Right angle clamp -PASS-	02040.55	1
Connecting cord, $l = 100$ mm, red	07359.01	1
Connecting cord, $l = 100$ mm, blue	07359.04	1
Connecting cord, $l = 500$ mm, red	07361.01	2
Connecting cord, $l = 500$ mm, blue	07361.04	1
Connecting cord, $l = 500$ mm, black	07361.05	2
Teslameter, digital	13610.93	1
Digital multimeter	07134.00	1

**Complete Equipment Set, Manual on CD-ROM included**  
**Hall effect in p-germanium P2530101**



Hall voltage as a function of current.



Hall voltage as a function of magnetic induction.

## Tasks:

- The Hall voltage is measured at room temperature and constant magnetic field as a function of the control current and plotted on a graph (measurement without compensation for defect voltage).
- The voltage across the sample is measured at room temperature and constant control current as a function of the magnetic induction  $B$ .
- The voltage across the sample is measured at constant control current as a function of the temperature. The band spacing of germanium is calculated from the measurements.
- The Hall voltage  $U_H$  is measured as a function of the magnetic induction  $B$ , at room temperature. The sign of the charge carriers and the Hall constant  $R_H$  together with the Hall mobility  $\mu_H$  and the carrier concentration  $p$  are calculated from the measurements.
- The Hall voltage  $U_H$  is measured as a function of temperature at constant magnetic induction  $B$  and the values are plotted on a graph.