

Technical Data:

Display:	Scale -10 ... 0 ... +10, -3 ... 0 ... +3 linear, center-zero, mirror scale, Scale arc length: approx. 86 mm
Zero correction:	Adjusting screw for mechanical zero-point correction
Measuring device:	Moving-coil system
Accuracy:	$\pm 2\%$ (DC), $\pm 3\%$ (AC)
Use position:	horizontal or slightly inclined
Measuring ranges:	DC: 10 μ A, 30 μ A, 100 μ A, 300 μ A, 1 mA, 3 mA, 10 mA, 30 mA, 100 mA, 300 mA, 1 A, 3 A, 10 A
Max. input voltage:	30V _{rms}
Category:	CAT 0
Internal consumption:	100mW at final value plus voltage drop at the fuse (max 500mV at 10A)
Power supply:	4 x AA 1,5-V mignon cells (alkaline recommended)
Case:	Plastic, ABS
Dimensions:	approx. 140 x 200 x 100 mm
Weight:	approx. 633 g

Make sure that the device does not fall. If this does happen, bring the device to a proper inspection or repair by authorized specialists.

If unexpected problems occur during installation or operation of the device, switch off the device and contact the specialist dealer.

Do not expose the device to dripping or splashing water.

This device may only be operated by qualified persons or by persons who have been instructed in its use.

NTL

**P3220-1G
Galvanometer SE**



This student meter is suitable for measuring bipolar direct currents in the range between about $\pm 1\mu$ A and ± 10 A .



- 1 Scale -10 ... 0 ... +10, linear, to use for zero-point middle measurements (e.g. Induction)
- 2 Pointer
- 3 Arc scale "BAT" to control the battery capacity
- 4 Mirror scale for exact determination of measured values
- 5 Operating mode switch: OFF, DC, Battery Check
- 6 4-mm-Safety socket "COM" (black) - Common zero point
- 7 4-mm-Safety socket "A" (red) for current measurements, Positive pole (all measuring ranges under 3 A)
- 8 4-mm-Safety socket "10 A" (red) for current measurements from 3 - 10 A, Positive pole
- 9 Step switch for measuring range selection: 10 μ A, 30 μ A, 100 μ A, 300 μ A, 1 mA, 3 mA, 10 mA, 30 mA, 100 mA, 300 mA, 1 A, 3 A
- 10 Adjusting screw for mechanical zero point correction
- 11 Overload indicator

The device is designed as a CAT 0 device for student experiments. Voltages above 30V_{rms} must not be connected under any circumstances! Pupils should not be allowed to connect to the mains voltage!

The device is permanently protected in all areas against input voltages smaller than 30V_{rms} geschützt. Applying higher voltages is not in accordance with the intended use and can damage the device.

If the rear panel of the instrument is opened for battery replacement, the test leads must be disconnected and the instrument switched off.

For connection, 4 mm laboratory cables with a fixed protective collar are recommended. This not only prevents body contact with electrical voltage, but also short-circuits the current to be measured.

If currents greater than 5 A are measured, the use of 2.5mm² laboratory cables is recommended both for safety and to avoid excessive voltage drops.

The current measurement in the 10 A range is independent of the selected measuring range. Simultaneous application of currents to the 10 A and the A socket is pointless and must be avoided.

Experience shows that the battery life depends on the power-off discipline:

-> If the device is actually switched off, the battery life in normal school usage is almost equal to the storage life.

-> If the device is placed in storage in "DC" or "BATT" position, the battery life is approximately 3 to 6 months.

Basically, new alkaline cells should be used.

For safety reasons, the batteries should be visually inspected every 6 months to detect leaks in good time. Due to the spatial distance of the batteries to the circuit board in this device, the risk of consequential damage due to leaking batteries is lower than usual.

The use of accumulators is not recommended. In principle, operation is possible, but accumulators have a significantly higher self-discharge and also a much higher price, which is not justified for sporadic use.

Overload protection

The device is protected against overload in all areas by a ceramic fuse element. This behaves like a super slow-blow fuse and opens the circuit if the current is too high. However, this not only protects the measuring device, but also disables the driving circuit if necessary! As long as the measuring device is high impedance, the red LED "Over" lights up to indicate the error. In this case, the driving circuit must be taken out of service immediately. Then correct the circuit or select the correct measuring range, let the measuring device cool down for one minute until the LED goes out and measure again

The maximum guaranteed holding current is 4 A at 20 °C and 3.32 A at +40 °C. Continuous measurements > 4 A are therefore not possible. At 20 °C and 8 A the unit interrupts the measurement within about 30 seconds, at 20 A within about 4 - 12 seconds. The maximum voltage is 30V_{rms}. The short-term maximum current is 100 A.

Electrostatic and cleaning

The measuring unit is antistatically coated. As is usual for instruments in plastic housings, cleaning must only be carried out with a damp cloth. Household glass cleaners are also permissible, but please do not spray them on the instrument, but on the cloth. Extreme soiling can be removed with isopropanol. Aggressive chemicals (e.g. acetone) as well as scouring agents can permanently damage the device and should therefore be kept away. The use of grease-dissolving substances such as benzene can detach the antistatic coating of the measuring mechanism. The device is then practically unusable.