




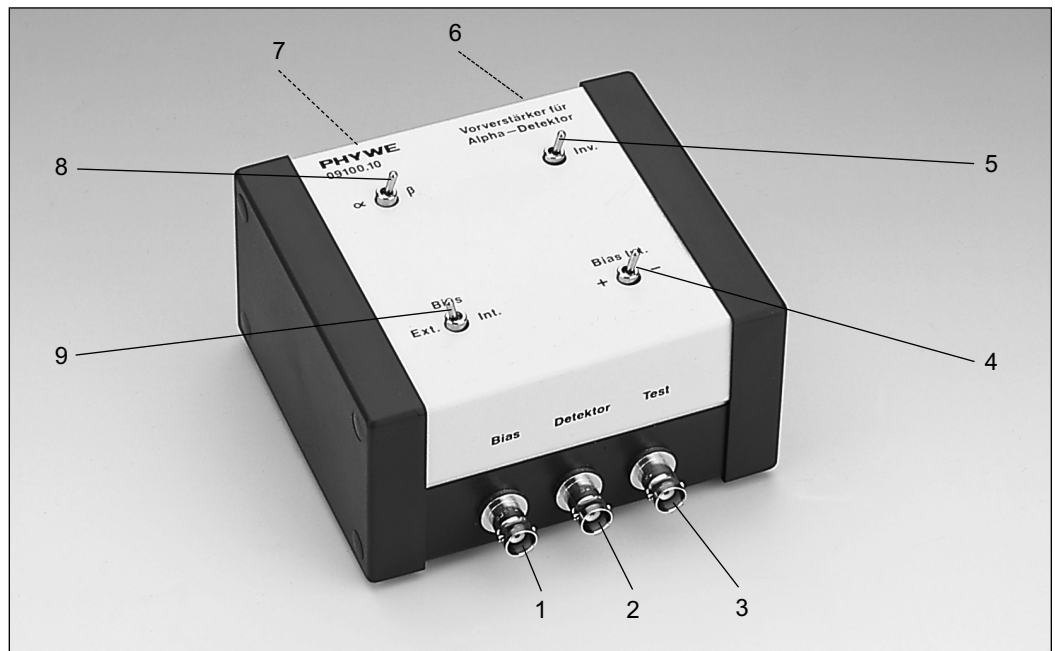
Pre-amplifier for alpha detector

09100.10

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 The unit complies with the corresponding EC guidelines.



Operating instructions

Fig. 1: Pre-amplifier for alpha detector 09100.10.

1 SAFETY PRECAUTIONS



- Carefully read these operating instructions before operating this instrument. This is necessary to avoid damage to it, as well as for user-safety.
- Only use the instrument in dry rooms in which there is no risk of explosion.
- Do not start up this instrument in case of visible signs of damage to it.
- Only use the instrument for the purpose for which it was designed.

2 PURPOSE AND DESCRIPTION

The pre-amplifier for alpha detector is required for the correct use of the α detector 09100.00. It amplifies the charge pulses emitted by the α detector and converts them to voltage pulses. The peak value of these pulses is strictly proportional to the charge of the pulses transmitted by the α detector.

For α spectroscopy, the pulse amplitude analyser 13725.93 is connected after the pre-amplifier, as it can supply the voltages of ± 12 V required by the α pre-amplifier. The α pre-amplifier converts this to an adequate 12 V continuous voltage for the operation of α detectors. If the detector must be run with higher voltage in order to increase its energy resolution, this may be taken for example from the -100 V output of the pulse amplitude analyser, and be transmitted to the α detector over the pre-amplifier.

The pre-amplifier is specially adapted to the α detector 09100.00; it can, however, be used also with other surface

barrier layer counters, which require a positive operating voltage. Other evaluating units may be used too. The polarity of the output pulses can be inverted in order to obtain high flexibility.

3 FUNCTIONAL AND OPERATING ELEMENTS

The unit has the following functional and operating elements, see fig. 1:

- 1 BNC socket "Bias" to provide an external "bias" voltage.
- 2 BNC socket "Detector" for the connection of the α detector.
- 3 BNC socket "Test" input for test pulses. This input is coupled by a 1 pF capacitor to the charge sensitive amplifier input and is connected to ground over 100 Ohm. A voltage square wave signal of known amplitude on this test input generates defined charge pulses in the amplifier input. These can be used e.g. to calibrate the conversion efficiency of a particle detector. Comparing the resulting signal output pulse height of the detector with the pulse height produced by a defined amount of charge yields the amount of charge per keV particle energy the detector produces.
- 4 Function switch "Bias Int. +/-" to select the polarity of the detector operating voltage generated in the pre-amplifier (12 V).
- 5 Function switch "Inv." to select the polarity of the output pulses. At setting "Inv.", the output pulses are negative, otherwise they are positive.

- 6 *BNC socket "Output"*
to connect pulse amplitude analyser 13725.93.
- 7 *Function switch (5 poles/240°)*
to supply the 12 V operating voltage for the amplifier over the connecting cable.
Assignment of pins, clockwise (looking from above):
1 not used
2 -12 V
3 \perp
4 +12 V
5 not used
- 8 *Function switch " α/β "*
to select the adequate amplification when counting α or β particles.
- 9 *Function switch "Bias Ext./Int."*
at setting "Ext", the voltage supplied to input socket 1 is supplied to the detector connected to socket 2. At setting "Int.", a voltage of 12 V is applied to socket 2, the polarity of which is selected with function switch 4.

A 1 m long connecting cable is supplied with pre-amplifier 09100.10, which has 5 pole plug sockets in 240° disposition at both ends.

4 HANDLING

4.1 Preparation

The pre-amplifier is connected by means of the cable to the corresponding socket of pulse amplitude analyser 13725.93. Before connecting the α detector with a BNC cable as short as possible to "Detector" socket 2, make sure the unit acting as a power supply is not yet switched on. If the detector is to be operated with another bias voltage than 12 V, socket "Bias" 1 must be connected by means of a BNC cable to an adequate continuous voltage source (max. 100 V), e.g. to pulse amplitude analyser 13725.93. In order to make sure that the voltage applied to the "Bias" socket goes on to the α detector, function switch "Bias Ext./Int." 9 must be set to "Ext." Switch "Bias Int. +/-" 4 has no effect when switch 9 is set to "Ext."

The BNC socket "Output" 6 is connected to the input of the evaluation unit, e.g. pulse amplitude analyser 13725.93 or pulse rate meter 13622.93. The connected cables may not be longer than 2 m.

The polarity of the voltage pulses given by the α pre-amplifier is selected with switch "Inv.", according to the respective input characteristics of the connected evaluation unit. The pulse amplitude analyser processes negative pulses, in this case, switch 5 must always be set to "Inv."

The α pre-amplifier is now ready for use.

4.2 Start up

Before starting the α pre-amplifier by switching on the unit used as a power supply, it must be made sure that when switch "Bias Ext./Int." 9 is set to "Int.", polarity switch 4 is set to the correct position. An RC-module in the pre-amplifier assures that the operating voltage of the α detector is transmitted with a lag of 5 seconds. This lag is also effective when an exterior operating voltage is applied for the α detector, with function switch "Bias Ext./Int." set to "Ext.". Switch " α/β " 8 is set to " α " for the examination of α particles.

Due to their smaller ionising power as compared to α particles, β particles generated far smaller charge pulses in the α detector than α particles. The amplification factor of the α pre-amplifier is increased by setting " α/β " switch 8 to " β ". At

this setting, the amplification of the output pulses is about 10 times higher than at setting " α ".

5 NOTES ON OPERATION

This high-quality instrument fulfills all of the technical requirements that are compiled in current EC guidelines. The characteristics of this product qualify it for the CE mark.

This instrument is only to be put into operation under specialist supervision in a controlled electromagnetic environment in research, educational and training facilities (schools, universities, institutes and laboratories). This means that in such an environment, no mobile phones etc. are to be used in the immediate vicinity. The individual connecting leads are each not to be longer than 2 m.

The instrument can be so influenced by electrostatic charges and other electromagnetic phenomena that it no longer functions within the given technical specifications. The following measures reduce or do away with disturbances: Avoid fitted carpets; ensure potential equalization; carry out experiments on a conductive, earthed surface, use screened cables, do not operate high-frequency emitters (radios, mobile phones) in the immediate vicinity.

6 TECHNICAL SPECIFICATIONS

$$\text{Amplification}^* \frac{U_a}{Q_e} \quad \text{approx. } 10^{12} \frac{\text{V}}{\text{A} \cdot \text{s}}$$

| | |
|--|--------------------------|
| Output pulses for 5,486-MeV- α -particles | approx. 0.25 V |
| Operating voltage | ± 12 V |
| Interior detector voltage (polarity can be selected) | 12 V |
| Maximum external detector bias voltage | 100 V |
| Housing dimensions (mm) | 127 × 65 × 112 (W, H, D) |
| Weight | approx. 0.75 kg |

* U_a = peak value of the output impulse
 Q_e = total charge of the input impulse

7 EXPERIMENTAL LITERATURE

Handbook Laboratory Experiments Physics 16502.32

8 LIST OF EQUIPMENT

| | |
|---|----------|
| Alpha-detektor | 09100.00 |
| Pulse height analyzer | 13725.93 |
| Container f. nuclear physic experiments | 09103.00 |
| Annular diaphragm with gold foil for Rutherford experiment | 09103.02 |
| Annular diaphragm with aluminium foil for Rutherford experiment | 09103.03 |
| xyt recorder | 11416.97 |

9 GUARANTEE

We guarantee the instrument supplied by us for a period of 24 months within the EU, or for 12 months outside of the EU. This guarantee does not cover natural wear nor damage resulting from improper handling.

The manufacturer can only be held responsible for the function and technical safety characteristics of the instrument, when maintenance, repairs and changes to the instrument are only carried out by the manufacturer or by personnel who have been explicitly authorized by him to do so.

10 WASTE DISPOSAL

The packaging consists predominately of environmental compatible materials that can be passed on for disposal by the local recycling service.



Should you no longer require this product, do not dispose of it with the household refuse. Please return it to the address below for proper waste disposal.

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