ND&M

Neutron Detectors and more ...

NEUTRON-HANDMONITOR

Operating Instructions

THE ND&M HAND-HELD NEUTRON MONITOR (HANDMONITOR)

The Handmonitor consists of the image intensifier head and the handle. The image intensifier head, on its beam side, contains a neutron scintillator, followed by a proximity focused image intensifier that amplifies the weak light flashes of the scintillator onto the exit window. The handle contains the high voltage supply and the batteries.
The neutron scintillator is protected by a neutron-transparent aluminum window. The light output of the scintillator is transmitted without loss of spatial resolution by means of a fiber optical coupler (faceplate) to the vacuum side of a photocathode evaporated directly onto the backside of the faceplate. The resulting photoelectrons are accelerated into a two-stage microchannel plate. Here, the electrons are multiplied by continuos dynodes similar to those in a conventional photomultiplier. The emerging electron avalanche is further accelerated into the imaging phosphor, where it produces an easily visible flash of light.
The high voltages required by the image intensifier (-200V, 1200V, 7kV) are generated by circuitry in the handle. The handle also holds one 9V battery, a step-up-converter for optimal extension of battery life time, a power switch, and a connector for an external power supply. An additional switch serves to select the amplification gains on three levels. A 1/4" thread is incorporated into the base of the handle for mounting of the monitor on a standard photo tripod.

CAUTIONARY NOTES

The Handmonitor will activate in the neutron beam. The decay time of the main component of this activation is in the range of several minutes. It is therefore necessary to have the device checked by your radiation safety officer after using it in a high neutron flux. The Handmonitor should be treated as a radioactive sample until its activation has decayed below locally defined levels.
Caution! High voltages of up to 7kV are generated internally. The device should only be opened by qualified personnel and after consultation with the manufacturer. Remove batteries and disconnect the external power supply before opening the device. Operation of an opened Handmonitor will damage the image intensifier.

WARRANTY CONDITIONS

The warranty period is 6 months after delivery date. Full replacement upon failure due to defects in the manufacture or to deficiencies of material during first 10h. Credit (prorata replacement) upon failure within 6 months.
Improper treatment may irreversibly deteriorate the properties of the image intensifier. Excluded from warranty are all defects caused by breakage, influence of excessive doses of irradiation, shipping damage, electrical or mechanical overloading, inexpert opening of the housing, or burn marks of bright objects.
The life time of the image intensifier ends when the light amplification has decreased to one half of its initial value. At normal operating conditions a life time of more than 1000 hours can be guaranteed, though if used as a neutron detector in low neutron fluxes a substantially longer life time can be expected.

OPERATING INSTRUCTIONS

The device is intended for the visualization of neutron beams, the monitoring of neutron shielding and as a mobile detector in the alignment of neutron optical components. As the device is conceived as a hand-held monitor, operators must pay particular attention to their protection. Particular attention must be given to stray radiation originating from the monitor in a neutron beam.

POWER SWITCH:

The power switch in the handle of the device is for turning on and off while operating from its internal battery. When power is supplied externally, the power switch is bypassed.

CHANGE OF BATTERIES:

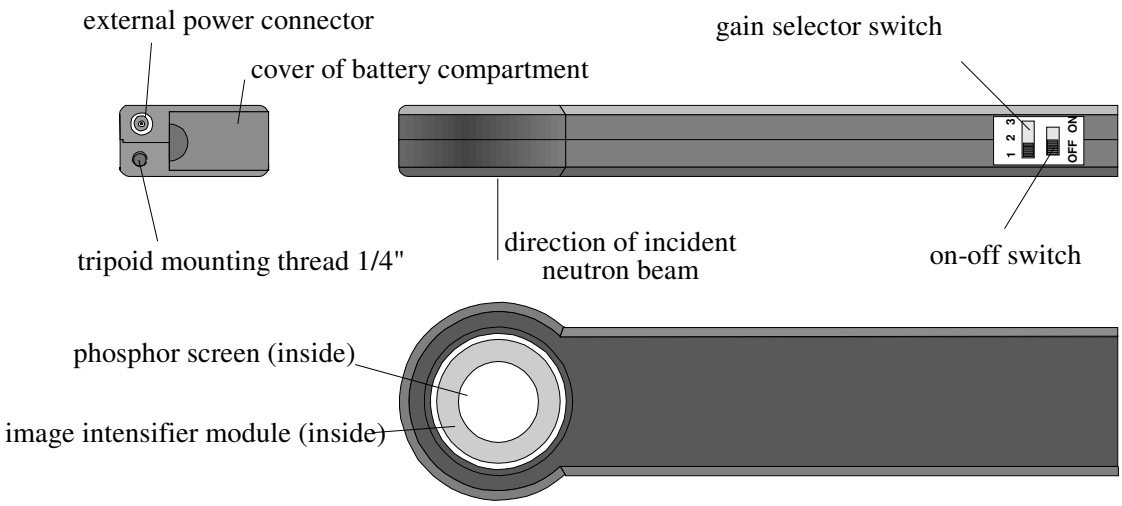
Before changing the battery the power must be turned off using the power switch incorporated in the handle. The battery is located in the bottom compartment of the handle, which becomes accessible by pushing its cover outwards. One 9V battery is required. **Use only alkaline type**. It must be inserted with its negative pole facing outwards, as shown on a sticker in the battery compartment. Close the cover while pressing the battery gently against its spring loaded receptacle.

IMAGE AMPLIFICATION SELECTOR:

The brightness of the amplified neutron image can be adjusted to three levels by means of a sliding switch. Positions 1 to 3 correspond to increasing image amplification. The amplification may be changed at any time during operation. Note that the life time of the image intensifier is longest when the device is operated at low levels of amplification.

EXTERNAL POWER SUPPLY:

The Handmonitor can be operated using the external power supply (cf. to technical specifications), that plugs into the coaxial connector at the base of the handle. When power is supplied externally, the on-off switch is bypassed. This power connector will also connect the monitor to an optional remote CCD readout box.



TECHNICAL SPECIFICATIONS

Sensitive area:	40 mm diameter
Scintillator:	NE426 (ZnS(Ag) + ^{6}LiF + Binder)
Weight (without battery):	450 g
Image intensifier:	proximity focused, two-stage MCP
Light amplification:	max. approx. 30000 lm/lm
Linear dimensions:	81 x 23 x 247 mm^3
Housing Material:	AlMg4.5Mn
Efficiency:	approx. 12 % for thermal neutrons
Spatial resolution	< 0.2 mm, (40µm with readout box + AFG)
External power supply:	9..12 VDC, max. 150 mA
Battery type:	9 V Block, **Alkaline** (MN1604 or 6LR61)
Battery life time:	approx. 6 h
Phosphor:	P20
Tripod mounting thread:	1/4 ´´
Connector for external power supply:	LEMO, coaxial (center pin positive)
operating conditions:	20..40 °C, 0..40 % rel. humidity

Ser. no.: _____