

DH-50-TE Cooled Multi-alkali Photomultiplier Tube User Notes



Overview

The Bentham DH-50-TE houses an end-window multi-alkali photomultiplier tube (PMT, S20 photocathode) with Peltier-based cooling is provided by the CPS50 unit. Cooling of this PMT reduces the dark current from the hundreds to single picoamperes, improving signal to noise at anode currents of the order of the dark current and extending the spectral range of use from the standard 850nm to 930nm..

The housing is designed for optimal device performance, having:-

- PCB-based dynode chain
- machined insulation to minimise heat-pumping requirements
- mu-metal shield to obviate the effects of extraneous magnetic fields
- fused quartz window
- highly efficient corrugated heat sink to reduce fan noise and allow operation with restricted air flow e.g. inside a sample chamber

This device, as standard, is fitted with a R562MOD PMT, responsive over the spectral range 185-930nm.

Electrical

There are two labelled BNC ports on this device- signal and HV (high voltage). For the former is provided a standard BNC cable; for the latter, a thicker BNC cable with PTFE insert to avoid connecting a high voltage to the signal channel.

The anode current can be measured via a transimpedance amplifier, such as the Bentham 487.

This device requires a high voltage for operation, typically derived from the Bentham 215 module. It is suggested to operate this device at 750V.

It is prime importance to ensure that the current amplifier is not exposed to this high voltage; Bentham recommend operating the device with the photocathode at negative HV, and the anode at ground.

Pin out of the HV port is:- inner pin negative HV, outer ground; pin out of the signal port is:- inner pin cathode, outer anode.

Mechanical

The DH-50-TE is fitted with a quick-change mount and adaptor plate, for mounting to any Bentham monochromator. The dove-tail groove of the DH-50-TE is clamped in place by two side screws.

The fitting of a rubber O-ring around the detector and the adaptor plate should be ensured to prevent light leakage.

PMT Specifications

The PMT specifications are as follow:-

Spectral response:	185-930nm
Peak sensitivity wavelength (typ.):	400 nm
Dark current I_D (typ.)	1pA at 750V and -20°C
Maximum anode current	0.1mA
Dynode chain resistance	Linear: 750kΩ Pulse Counting: 3.92MΩ

Temperature Control

The temperature control of the device is provided by the CPS1M module, which is connected to the housing by a D-connectorised cable.

On the front panel there is a toggle switch and a rotary switch. The toggle permits to go between displaying the actual and target temperature; the rotary switch permits changing the target temperature. This latter switch should be pulled out before rotation, and pushed-in to lock the position.

Thermal Specifications

The thermal specifications of the device are as follow:-

Heat pump	2-stage Peltier with air heat pump
Minimum internal temperature	-20°C
Maximum internal/external ΔT	45°C
Temperature stability	$\pm 0.1^\circ\text{C}$
Cool down time (+20°C to -20°C)	2-3 hours

WEEE statement:

Bentham are fully WEEE compliant, registration number is WEE/CB0003ZR.
Should you need to dispose of our equipment please telephone 0113 385 4352 or 4356, quoting account number 135419.



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