

# 29 mm (1.13") photomultiplier

## 9924B series data sheet

### 1 description

The 9924B is a 29 mm (1.13") diameter, end window photomultiplier with enhanced green sensitive bialkali photocathode and 11 high gain, high stability, SbCs dynodes of box and grid design. The 9924QB is a variant for applications requiring uv sensitivity.

### 2 applications

- wide range of applications
- x-ray & gamma-ray spectroscopy
- photon counting of bio- and chemi-luminescent samples

### 3 features

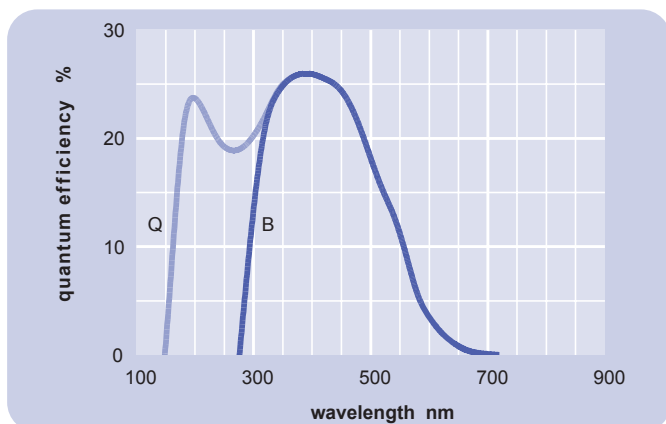
- high gain
- low operating voltage
- good SER

### 4 window characteristics

|                            | 9924B<br>borosilicate | 9924QB*<br>fused silica |
|----------------------------|-----------------------|-------------------------|
| spectral range**(nm)       | 280 - 680             | 160 - 680               |
| refractive index ( $n_d$ ) | 1.49                  | 1.46                    |
| radiopurity:               |                       |                         |
| K (ppm)                    | 300                   | <10                     |
| Th (ppb)                   | 250                   | <10                     |
| U (ppb)                    | 100                   | <10                     |

\* note that the sidewall of the envelope contains graded seals of high K content  
\*\* wavelength range over which quantum efficiency exceeds 1 % of peak

### 5 typical spectral response curves

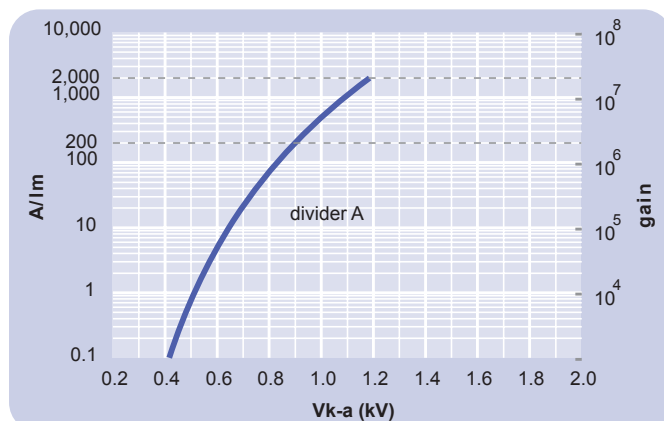


### 6 characteristics

|                                                                         | unit                              | min | typ       | max  |
|-------------------------------------------------------------------------|-----------------------------------|-----|-----------|------|
| <b>photocathode: bialkali</b>                                           |                                   |     |           |      |
| active diameter                                                         | mm                                |     | 25        |      |
| quantum efficiency at peak                                              | %                                 |     | 26        |      |
| luminous sensitivity                                                    | $\mu\text{A/lm}$                  |     | 95        |      |
| with CB filter                                                          |                                   | 8   | 12        |      |
| with CR filter                                                          |                                   |     | 7.5       |      |
| <b>dynodes: 11BGSbCs</b>                                                |                                   |     |           |      |
| <b>anode sensitivity in divider A:</b>                                  |                                   |     |           |      |
| nominal anode sensitivity                                               | $\text{A/lm}$                     |     | 200       |      |
| max. rated anode sensitivity                                            | $\text{A/lm}$                     |     | 2000      |      |
| overall V for nominal $\text{A/lm}$                                     | V                                 |     | 900       | 1050 |
| overall V for max. rated $\text{A/lm}$                                  | V                                 |     | 1200      |      |
| gain at nominal $\text{A/lm}$                                           | $\times 10^6$                     |     | 2         |      |
| <b>dark current at 20 °C:</b>                                           |                                   |     |           |      |
| dc at nominal $\text{A/lm}$                                             | nA                                |     | 0.2       | 5    |
| dc at max. rated $\text{A/lm}$                                          | nA                                |     | 2         |      |
| dark count rate                                                         | $\text{s}^{-1}$                   |     | 200       |      |
| <b>pulsed linearity (-5% deviation):</b>                                |                                   |     |           |      |
| divider A                                                               | mA                                |     | 0.1       |      |
| <b>rate effect ( <math>I_a</math> for <math>\Delta g/g=1\%</math>):</b> | $\mu\text{A}$                     |     | 20        |      |
| <b>magnetic field sensitivity:</b>                                      |                                   |     |           |      |
| the field for which the output decreases by 50 %                        |                                   |     |           |      |
| most sensitive direction                                                | $T \times 10^{-4}$                |     | 2         |      |
| <b>temperature coefficient:</b>                                         | $\% \text{ } ^\circ\text{C}^{-1}$ |     | $\pm 0.5$ |      |
| <b>timing:</b>                                                          |                                   |     |           |      |
| single electron rise time                                               | ns                                |     | 15        |      |
| single electron (fwhm)                                                  | ns                                |     | 30        |      |
| transit time                                                            | ns                                |     | 85        |      |
| <b>weight:</b>                                                          | g                                 |     | 55        |      |
| <b>maximum ratings:</b>                                                 |                                   |     |           |      |
| anode current                                                           | $\mu\text{A}$                     |     |           | 100  |
| cathode current                                                         | nA                                |     |           | 25   |
| gain                                                                    | $\times 10^6$                     |     |           | 21   |
| sensitivity                                                             | $\text{A/lm}$                     |     |           | 2000 |
| temperature                                                             | $^\circ\text{C}$                  | -30 |           | 60   |
| V (k-a) <sup>(1)</sup>                                                  | V                                 |     |           | 2000 |
| V (k-d1)                                                                | V                                 |     |           | 300  |
| V (d-d) <sup>(2)</sup>                                                  | V                                 |     |           | 300  |
| ambient pressure (absolute)                                             | kPa                               |     |           | 202  |

<sup>(1)</sup> subject to not exceeding max. rated sensitivity <sup>(2)</sup> subject to not exceeding max rated V(k-a)

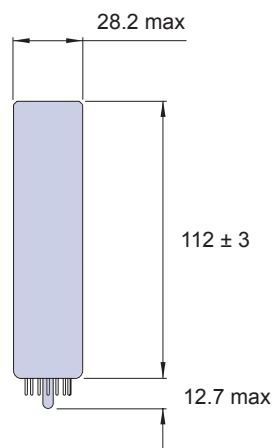
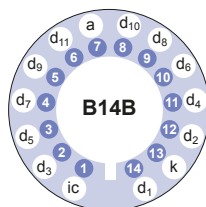
### 7 typical voltage gain characteristics



**8 voltage divider distribution**

| k | d <sub>1</sub> | d <sub>2</sub> | ..... | d <sub>8</sub> | d <sub>9</sub> | d <sub>10</sub> | d <sub>11</sub> | a |          |
|---|----------------|----------------|-------|----------------|----------------|-----------------|-----------------|---|----------|
| A | 150V           | R              | ..... | R              | R              | R               | 2R              | R | Standard |

Characteristics contained in this data sheet refer to divider A unless stated otherwise.

**9 external dimensions mm****10 base configuration (viewed from below)**

'ic' indicates an internal connection

Our range of B14B sockets, available for this series, includes versions with or without a mounting flange, and versions with contacts for mounting directly onto printed circuit boards.

**11 ordering information**

The 9924B meets the specification given in this data sheet. You may order **variants** by adding a suffix to the type number. You may also order **options** by adding a suffix to the type number. You may order product with **specification options** by discussing your requirements with us. If your selection option is for one-off order, then the product will be referred to as 9924A. For a repeat order, ET Enterprises will give the product a two digit suffix after the letter B, for example B21. This identifies your specific requirement.

**9924****window variants**

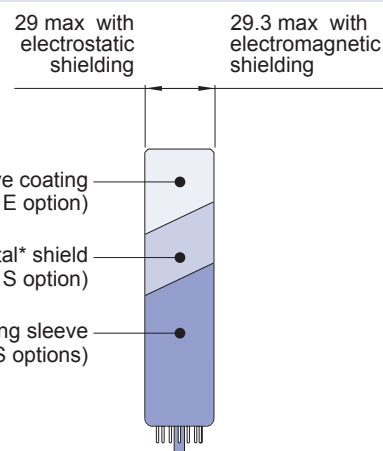
**Q** fused silica

**options**

**E** electrostatic shielding  
see drawing below  
**S** electromagnetic shielding  
see drawing below  
**M** supplied with spectral  
response calibration

**specification options**

**B** as given in data sheet  
**A** single order to  
selected specification  
**Bnn** repeat order to  
selected specification



\*mumetal is a registered trademark of Magnetic Shield Corporation

**12 voltage dividers**

The standard voltage dividers available for these pmts are tabulated below:

|       | k    | d <sub>1</sub> | d <sub>2</sub> | ..... | d <sub>7</sub> | d <sub>8</sub> | d <sub>9</sub> | d <sub>10</sub> | d <sub>11</sub> | a |
|-------|------|----------------|----------------|-------|----------------|----------------|----------------|-----------------|-----------------|---|
| C637E | 2R   | R              | .....          |       | R              | R              | R              | 2R              | R               |   |
| C737G | 150V | R              | .....          |       | R              | R              | R              | 2R              | R               |   |

R = 330 kΩ

**ET Enterprises Limited**  
45 Riverside Way  
Uxbridge UB8 2YF  
United Kingdom  
tel: +44 (0) 1895 200880  
fax: +44 (0) 1895 270873  
e-mail: sales@et-enterprises.com  
web site: www.et-enterprises.com

**ADIT Electron Tubes**  
300 Crane Street  
Sweetwater TX 79556 USA  
tel: (325) 235 1418  
toll free: (800) 399 4557  
fax: (325) 235 2872  
e-mail: sales@electron tubes.com  
web site: www.electrontubes.com

choose accessories for this pmt on our website

**an ISO 9001 and ISO 14001 registered company**

The company reserves the right to modify these designs and specifications without notice. Developmental devices are intended for evaluation and no obligation is assumed for future manufacture. While every effort is made to ensure accuracy of published information the company cannot be held responsible for errors or consequences arising therefrom.

**ET Enterprises**  
electron tubes

© ET Enterprises Ltd, 2014  
DS\_ 9924B Issue 6 (26/02/14)