Reuter Stokes B10Plus+*
Proportional Counter
GE’s Reuter Stokes business is introducing the B10Plus+ line of neutron detectors. B10Plus+ is a Boron-10 proportional counter that is filled with a small amount of Helium-3 gas. The Helium-3 functions as a proportional gas while providing additional neutron sensitivity. GE’s B10Plus+ detector line provides enhanced neutron sensitivity over standard Boron-10 proportional counters for applications where additional sensitivity is needed. B10Plus+ makes efficient use of the limited remaining Helium-3 in systems where proportional counters are needed. B10Plus+ offers:

- Improved neutron sensitivity over Boron-10 proportional counters (varies based on amount of Helium-3)
- Gamma discrimination comparable to existing Helium-3 detectors
- All the performance benefits of proportional counter technology
- Custom designs for various applications including international safeguards and homeland security
- A safe hazard free detector for easy use and transport

With its legacy dating back to 1956, GE’s Reuter Stokes business has designed and developed an impressive collection of neutron detectors. With over 100,000 detectors in service in a variety of neutron sensing systems around the world, Reuter Stokes detectors are among the most proven and well known in the industry.

**Typical Detector Performance Information**

**Counting plateau:**

Plateau characteristics will vary depending on the amount of $^3\text{He}$ added to the detector. The slope of the plateau is typically <4%/100 volts

**Pulse Height Spectrum:**

The pulse height spectrum exhibits the combined characteristics of a $^3\text{He}$ and $^{10}\text{B}$ reaction. The edge of the $^3\text{He}$ wall effect is a convenient feature to aid in setting the gamma discrimination threshold.
The neutron sensitivity of B10Plus* detectors is dependent on the surface area of the $^{10}$B coating and the amount of $^3$He gas present in the detector. Neutron sensitivities for 0.5 and 1 inch diameter detectors is plotted for several $^3$He gas fill configurations. All sensitivities are reported as measured in an isotropic thermal neutron flux. (Note: “nv” is the abbreviation for “neutrons per centimeter squared per second”)

The gas gain curve for a one inch diameter B10Plus* detector is provided above. The charge output versus voltage is related to the $^3$He full energy peak. As a result the maximum alpha energy edge from the $^{10}$B reaction will be approximately twice the charge indicated above, and the lower edge of the $^3$He wall effect would be approximately one fourth the charge. Gas gain characteristics will vary depending on the detector diameter and $^3$He pressure.
Specifications
Operating voltage – varies based on $^3$He partial pressure
Insulation Resistance at 25°C > 1 X $10^{12}$ ohms
Capacitance – ~ 8 to 12 pf

Materials of Construction
Proportional fill gas – Typically $^3$He + Ar and CO2 (Fill pressures are generally 1 atmosphere or less, depending on the amount of $^3$He added.)
Detector – Stainless Steel or Aluminum
Insulators – Alumina Ceramic
Connector Options:
- ≥ 1 inch in diameter HN connectors are standard, SHV, MHV and wire leads optional. Insulators in the connectors are Teflon (for high radiation applications both Rexolite and alumina Ceramic insulators are available)
- < 1 inch in diameter both SHV and MHV connectors are standard, wire leads are optional. Insulators in these connectors are only offered in Teflon

Sizes:

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<tr>
<th>Diameter</th>
<th>0.5 (12.7)</th>
<th>0.75 (19)</th>
<th>1.0 (25.4)</th>
<th>1.125 (28.9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum active length</td>
<td>“45 (1143)”</td>
<td>“70.5 (1790)”</td>
<td>“70.5 (1790)”</td>
<td>“70.5 (1790)”</td>
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<tr>
<td>Dimensions (mm)</td>
<td>Inches</td>
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Neutron sensitive materials are $^3$He gas and boron enriched in the $^{10}$B isotope.

Typical Maximum Ratings
Voltage: 1500 volts
Temperature: 55°C