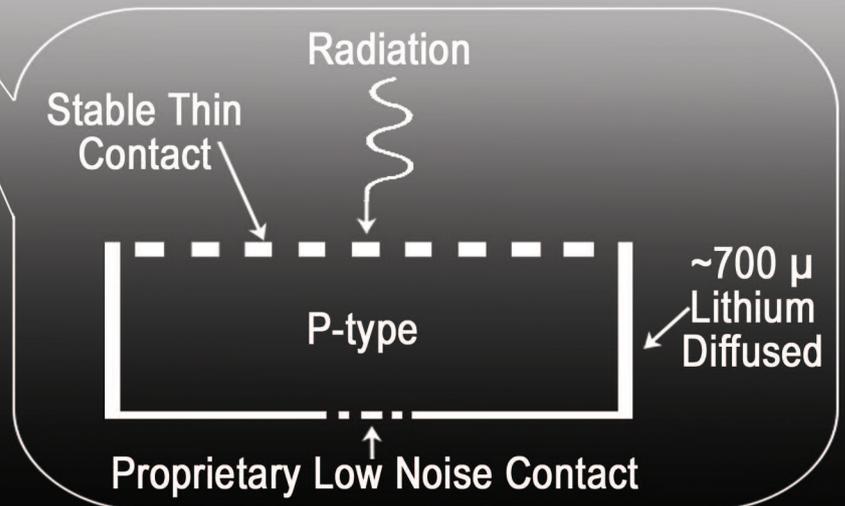
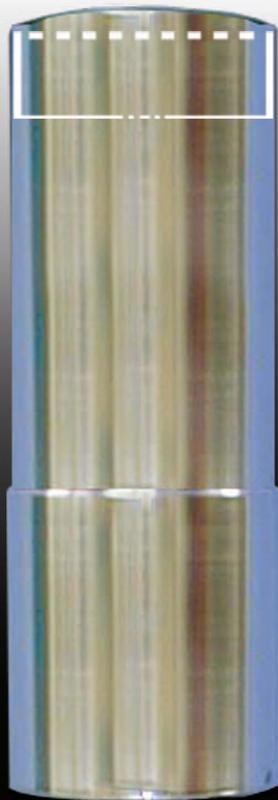


ORTEC[®]

AMETEK[®]

PROFILE "SP" Series

P-type Semi-planar HPGe Detectors



Premium Resolution Solutions

for a Wide Range of Energy Applications

PROFILE "SP" Series

Premium resolution is a crucial requirement to optimize sample identification which improves the accuracy of your results. PROFILE "SP" Series High Purity Germanium (HPGe) detectors offer **UNMATCHED RESOLUTION** to meet this requirement for a wide range of energies between 3 keV and 3 MeV.

The ORTEC PROFILE Series of P-type HPGe detectors match the crystal dimensions to your application for optimal counting geometry and results. The "SP" Series are semi-planar crystals that incorporate a stable, thin front contact which provides excellent gamma transmission for energies as low as 3 keV and warm storage capability. In addition to these features, the "SP" Series offers a proprietary back contact that provides premium low and medium energy resolution performance.

PROFILE-SP Series detectors are designed for use in low count-rate applications.

| Benefits | Features |
|---|--|
| <ul style="list-style-type: none"> • Maximized counting efficiency – lower counting time and lower Minimum Detectable Activity | <ul style="list-style-type: none"> • Thin front contact • Maximized crystal diameter within the endcap |
| <ul style="list-style-type: none"> • Ultimate wide energy nuclide identification – premium resolution with extended lower energy range operations down to 3 keV | <ul style="list-style-type: none"> • Low noise back contact • Thin front contact • P-type detectors with semi-planar crystal geometry |
| <ul style="list-style-type: none"> • Simplified handling and lower storage costs without loss of detector efficiency – warm storage capability | <ul style="list-style-type: none"> • Stable contact (no "dead layer" growth at room temperature). |

PROFILE SP Series detectors employ "over-square" (diameter > length) semi-planar crystals. Compared to other semi-planar HPGe detectors, the low noise contact of the PROFILE "SP" minimizes capacitance improving energy resolution at lower energies, while supporting resolution at the higher energies. The detector's larger surface area improves low to medium energy efficiency when used for samples such as:

- Point sources on-encap
- Filter paper or large surface area samples on-encap
- Samples presented in bottles and pots on-encap
- Bio-assay applications (e.g., lung monitoring)
- Waste drums or Safeguards monitoring

For a given relative (IEEE) efficiency, PROFILE Series detectors represent the "best use" of germanium material producing the maximum absolute counting efficiency for all geometries.

Efficiency performance advantages associated with a thin, stable front contact and a semi-planar P-type HPGe crystal geometry are described in the PROFILE "S" and "C" Series brochure.

Figure 1 highlights the difference between the PROFILE "S" Series core-hole type contact and the PROFILE "SP" Series proprietary low noise contact. Reduction in capacitance of the back contact dramatically improves resolution at low energies.

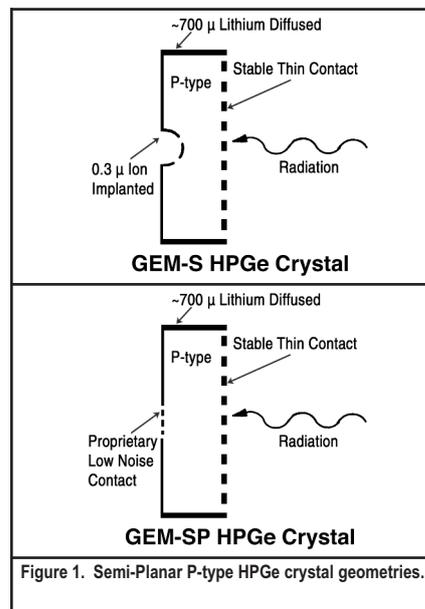


Figure 1. Semi-Planar P-type HPGe crystal geometries.

PROFILE "SP" Series

The significant resolution improvement using a point source of ^{55}Fe positioned 25 cm away from the front of the endcap is illustrated in Figure 2. The full width half max (FWHM) resolution at 5.9 keV energy of the SP8530 is 25% lower as compared to the same diameter and thickness S8530 detector. The 5.9 and 6.5 keV peaks measured with the SP8530 detector (shown in blue) have better separation than those measured with the S8530 (shown in red).

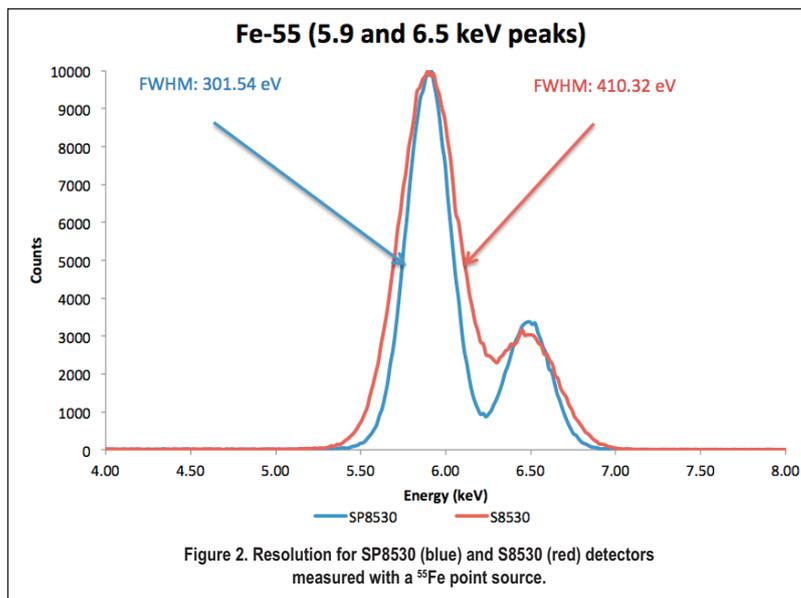
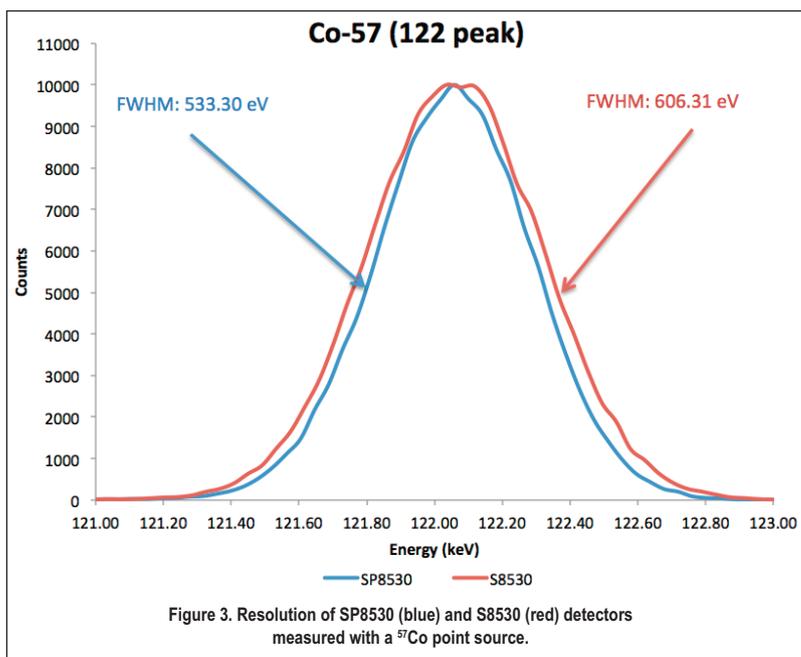
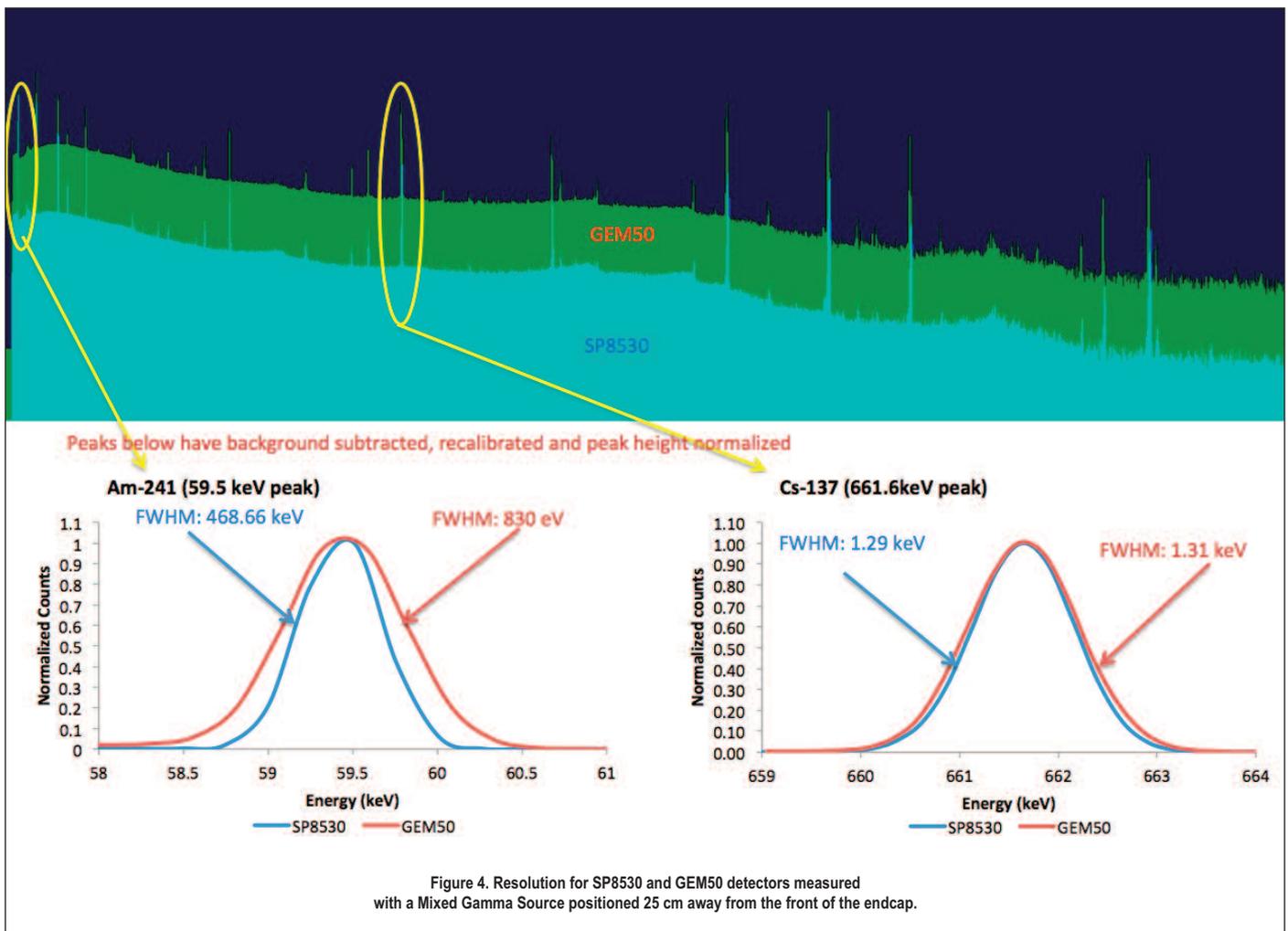


Figure 3 shows improvement in resolution for a ^{57}Co point source positioned 25 cm from the front of the detector endcap for a PROFILE SP8530 compared to an S-series semi-planar detector. Resolution of the SP8530 is 10% better at 122 keV.

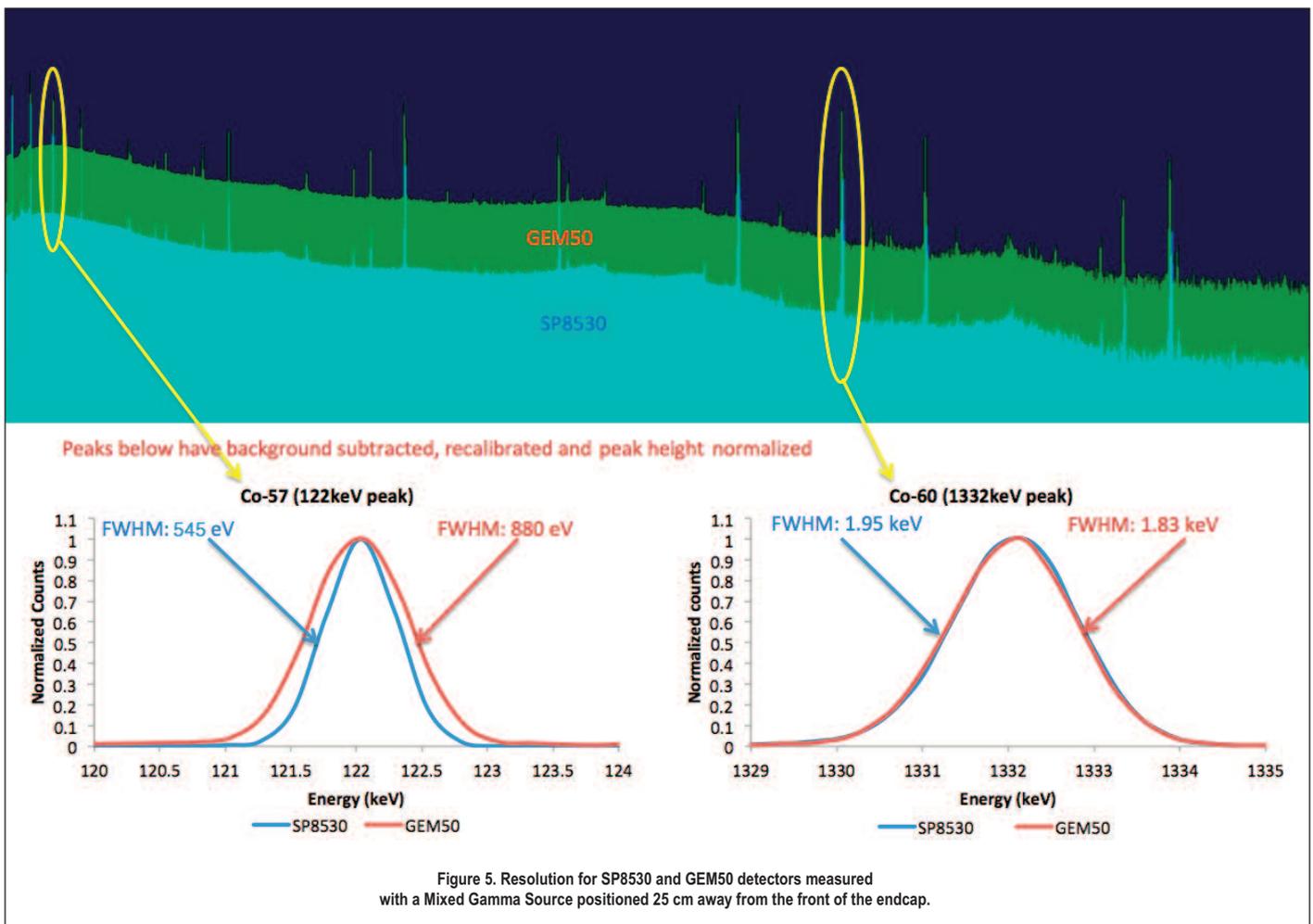


PROFILE "SP" Series



The improvement is even more dramatic when comparing an SP Series detector to a conventional P-type detector. Figures 4 and 5 display spectra for a mixed gamma source for a PROFILE SP8530 and a GEM 50. Both the SP8530 and GEM50 detectors have relative efficiency specifications of 50%. The resolution of the SP8530, however, is 45% better at 60 keV and is 30% better at 122 keV. At 662 keV, energy resolution performance of the SP8530 is less than 5% better than the GEM50. At 1332 keV, energy resolution performance of the SP8530 and GEM50 detector is very similar.

PROFILE "SP" Series



Better resolution performance of PROFILE "SP" Series detectors translates into an improved Peak to Background ratio, which in turn implies lowered Minimum Detectable Activity (MDA) and/or shorter counting times.

The premium resolution advantage is also vital for applications using multi-nuclide (multi-peak) identification. Better resolution lowers the number of overlapping peaks and enhances the performance of peak locate algorithms, which leads to fewer false positives.

PROFILE "SP" Series

General Guidelines for Choosing a Profile SP Detector

For a close or on-endcap sample, the detector diameter should exceed the sample diameter by 20% or more. Beyond 30% the gain in efficiency is small. In addition, if the detector diameter exceeds the sample diameter by 20% or more, errors due to irreproducibility of the sample position will be minimal.

If budget constraints must be considered, first select the largest diameter in comparison with the optimum diameter. Selection of a deeper detector will further increase the absolute efficiency, specifically at higher energies.

Table 1. HPGe Detector Selection Guide for Various Counting Geometries Relative to Energies of Interest

| Overall Guidelines on the Choice of High Purity Germanium (HPGe) Detector | | | | | | |
|---|------------------|-----------------------|--------------------------|-----------------------|-----------------------|-----------------------|
| Source Energy | Marinelli Beaker | | Near or Far Point Source | | Large Surface Area | |
| Preference | Efficiency | Resolution | Efficiency | Resolution | Efficiency | Resolution |
| 3 to 3000 | GMX | PROFILE C | PROFILE S or SP | PROFILE S or SP | PROFILE S or SP | PROFILE S or SP |
| 3 to 10000 | GMX | PROFILE C | PROFILE C | PROFILE C | PROFILE C | PROFILE S or SP |
| 20 to 3000 | GMX | PROFILE M | PROFILE F | PROFILE F | PROFILE F | PROFILE F |
| 50 to 5000 | GEM | GEM | GEM | GEM or PROFILE F | GEM or PROFILE F | PROFILE F |
| 20 to above 10000 | GMX70 or larger | PROFILE C70 or larger | PROFILE C70 or larger | PROFILE C70 or larger | PROFILE C70 or larger | PROFILE C70 or larger |
| above 5000 | GEM70 or larger | GEM70 or larger | GEM70 or larger | GEM70 or larger | GEM70 or larger | GEM70 or larger |
| Neutron Damage | GMX | GMX | GMX | GMX | GMX | GMX |
| High Count Rate | small GEM or GMX | small GEM or GMX | small GEM | small PROFILE F or S | small PROFILE F or S | small PROFILE F or S |

Table 2. PROFILE SP Series GEM Detector Specifications

| Model No. | Crystal Dimension | | Energy Resolution (FWHM) | | | | Peak Shape | | P:C Warranted | Guaranteed Relative Efficiency% | Endcap Diameter (mm) |
|---------------|----------------------------|-----------------------|--------------------------------------|--------------------------|-------------------------|---------------------------|---------------------|----------------------|---------------|---------------------------------|----------------------|
| | Actual Diameter (+0/-2 mm) | Actual Length Minimum | @5.9 keV Warranted (eV) [§] | @14.4 keV Warranted (eV) | @122 keV Warranted (eV) | @1.33 MeV Warranted (keV) | FW.1M/ FWHM Typical | FW.02M/ FWHM Typical | | | |
| GEM-SP5020P4 | 50 | 20 | 300 | 350 | 585 | 1.8 | 1.90 | 2.55 | 35 | 7 | 70 |
| GEM-SP5825P4 | 58 | 25 | 340 | 375 | 585 | 1.8 | 1.90 | 2.65 | 35 | 15 | 70 |
| GEM-SP7025P4 | 70 | 25 | 380 | 400 | 585 | 1.8 | 1.95 | 2.75 | 40 | 20 | 83 |
| GEM-SP8530P4 | 85 | 30 | 400 | 425 | 630 | 1.9 | 2.00 | 2.90 | 55 | 50 | 108 |
| GEM-SP9430P4 | 94 | 30 | 425 | 450 | 630 | 1.9 | 2.00 | 2.90 | 65 | 65 | 108 |
| GEM-SP10530P4 | 105 | 30 | 450 | 475 | 630 | 2.0 | 2.00 | 2.90 | 65 | 80 | 121 |

Notes

- 1) FWHM = Full Width at Half Maximum; FW.1M = Full Width at One-Tenth Maximum; FW.02M = Full Width at One-Fiftieth Maximum; total system resolution for a source at 1000 counts/s measured in accordance with ANSI/IEEE Std. 325-1996, using ORTEC standard electronics.
- 2) Measured at optimum analog or equivalent digital shaping time using ORTEC electronics.
- 3) The proprietary front contact employed in the SP Series detectors offer exceptionally high transmission at energies below 40 keV. Warm storage will not degrade the transmission efficiency of the front contact.
- 4) PROFILE SP detectors come with a standard Carbon Fiber window. For improved performance between 3 and 5 keV select the Beryllium window option.
- §) 5.9 specification only applies with -RB, -B, LB-C, and XLB-C options.

PROFILE “SP” Series

Detector Options

- Harsh Environment Option (-HE)
- Beryllium Window Options (-B)
- Remote Preamplifier Option (-HJ)
- Low-Background Carbon Fiber Endcap Options (-RB, -LB-C, and -XLB-C)
- SMART-1 Option (-SMP)
- See the PROFILE detector configuration guide for more detail.

Ordering Information

See the PROFILE Detector Configuration Guide for complete ordering information.

PROFILE "SP" Series

Specifications subject to change
070223

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www.ortec-online.com

Tel. (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
801 South Illinois Ave., Oak Ridge, TN 37830 U.S.A.
For International Office Locations, Visit Our Website

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