

# Zetium

Polymers edition





For consistent product quality, you need accurate, reproducible elemental analysis of your polymers. The Polymers edition of the Zetium spectrometer provides a flexible, reliable tool for this. You can analyze virgin polymers, recycled plastics, and more – while meeting demanding quality control requirements.

How? Through dedicated solutions, optimized hardware, built-in expertise templates, and internationally renowned ADPOL and TOXEL reference materials. You can even optimize the spectrometer to your budget and performance requirements.

## Elemental innovation

### Continuous development, improved customer experience

Benefit-driven innovation on the Zetium Polymers edition has made it the most powerful multipurpose tool for the analysis of a wide range of polymers, plastics and catalysts.

## Elemental intelligence

### Advanced analytical software for advanced analytical hardware

Now, our SuperQ software is enabling even more technology combinations and analytical possibilities for the Zetium. Its Virtual Analyst also makes setting up and operating the system simpler.

## Elemental technology

### 60 years of experience: The ideal starting point

The Zetium Polymers edition is the next generation in a long line of wavelength-dispersive XRF platforms, including Axios, MagiX, and PW2400. Over the years, we've fine-tuned this proven technology – providing a strong foundation for the Zetium platform.

## Elemental support

### Reliable support – whatever the location

From service and training to laboratory analysis, we support you all the way. With a worldwide network of experienced engineers, plus the industry's largest pool of application scientists, we're always here to help.

# Product consistency, every time

By seamlessly combining our core and innovative technologies, the Zetium Polymers edition delivers unrivaled analytical performance, speed, and robustness.

## Long-term measurements across the power range

The Zetium Polymers edition lets you meet the various requirements of the polymers industry. You can configure it as an economical 1 kW configuration, all the way up to 4 kW – for the fastest results and lowest detection limits. On top of this, direct optical position sensing (DOPS) goniometer technology ensures your results are repeatable and accurate. What's more, unique drift-free SST R-mAX X-ray tubes with ZETA technology eliminate the largest source of instrument drift. The result? Stable calibrations that last for months.

## Faster additives analysis

The Zetium's laterally curved crystals deliver up to 30% more intensity. That means you can achieve critical time savings when analyzing phosphorus- and sulfur-containing stabilizers or antioxidants. Faster processing awaits!

## Control your polymer process

Thanks to meta-analysis using the Zetium's statistical process control (SPC) software, you can report the trending of monitors and quality control samples. You can also configure SPC software to automatically detect outliers, perform fully automated QC sample measurements, and initiate drift corrections. And you can even use SPC to continuously record system performance for ISO-type laboratory accreditation.

## Virtual Analyst: Wave goodbye to guesswork

Analysis is a complex task with many critical choices and variables. SuperQ's Virtual Analyst software can help you make those choices – just like having an application specialist available 24/7. The software actively calculates your ideal measurement conditions, taking into account spectrometer configuration, sample information, line overlaps, required analytical range, detection limits, and precision. No more guesswork!

## Combined technologies, unlimited benefits

The Zetium uses innovative SumXcore technology, where wavelength-dispersive (WDXRF) and energy-dispersive (EDXRF) technologies are combined. This means you can perform sequential and simultaneous analysis on a single platform – for fast, powerful screening. Best of all, you'll get norm compliance for both technologies.

What's more, you can rapidly collect the entire spectrum during routine analysis – so you can quickly detect contaminants during process control.

## Ultra-low level titanium

Sometimes, you need to measure tiny amounts of titanium. That's no problem with the Zetium Polymers edition. Using its SST mAX X-ray tube with chromium anode, you can achieve detection limits of 20 µg/kg or 20 ppb of titanium in polyethylene – in less than two minutes.



## Proven product consistency

Consistent results today build confidence for tomorrow – and reproducible, accurate elemental analysis is essential to building this consistency.

With its ADPOL and TOXEL reference materials, the Zetium Polymers edition helps you ensure this.

The Zetium integrates the revolutionary energy-dispersive (ED) core with wavelength-dispersive (WD) XRF. The result is SumXcore: the Zetium's powerful analytical heart, which delivers unique benefits for polymer applications.

### Reproducibility and proficiency testing

With the Zetium Polymers edition, you can rely on excellent reproducibility – as demonstrated by measurements carried out over a period of 10 days. Table 1 shows this by comparing the theoretical minimum error represented by the counting statistical error (CSE) and the root mean square (RMS) of the reproducibility.

To test its accuracy, we investigated the instrument's performance in an independent ASTM International testing program for the elemental analysis of thermoplastics. We used the standard test method D6247, and tested reproducibility using consecutive intra-day repetitions and inter-day measurements.

Table 1. Reproducibility testing

Element	F	Na	Mg	Al	Si	P	S	Ca	Ti	Cr	Zn
<b>REPRODUCIBILITY (8 measurements carried out over 10 days)</b>											
Mean (mg/kg)	140.4	102.2	101.2	200.5	117.7	28.6	32.5	63.9	18.8	1.88	57.7
RMS (mg/kg)	9.03	2.14	1.56	1.45	1.36	0.28	0.65	0.69	0.45	0.13	0.27
RMS (rel%)	6.43	2.10	1.54	0.72	1.15	0.97	1.99	1.08	2.41	6.72	0.46
<b>ERROR DUE TO COUNTING STATISTICS</b>											
CSE (mg/kg)	6.4	1.2	0.7	1.3	1.1	0.3	0.4	0.5	0.4	0.11	0.2
CSE (rel%)	4.5	1.19	0.68	0.63	0.91	1.05	1.19	0.77	2.1	5.87	0.35

ASTM Proficiency Testing Programs (PTPs) are statistical quality assurance programs that enable labs to assess performance. The data can be compared against other participating laboratories. 32 labs participated, including the global top ten polyolefin producers. We analyzed

two samples of LLDPE and PP in duplicate against a combined ADPOL TOXEL calibration. Table 2 shows the PTP results as Z-scores per element, both for linear low-density polyethylene (LLP) and polypropylene (PP) samples.

Table 2. Accuracy testing

Element	F	Na	Mg	Al	Si	P	S	Ca	Ti	Cr	Zn
<b>LLDPE</b>											
Z score *	-0.2	-0.5	0.7	-0.8	0.3	0.4	-0.4	0.1	0.3	-0.5	-0.6
<b>PP</b>											
Z score *	-0.3	-0.4	0.4	0.3	0.2	0.2	-0.2	-0.2	0.5	-0.3	-0.3

\*Z-score:  $\frac{x - \mu}{\sigma}$  is a measurement of the distance in standard deviations ( $\sigma$ ) of a measurement ( $x$ ) from the mean ( $\mu$ ).

The results clearly show that the Zetium Polymers edition, calibrated with ADPOL and TOXEL, is perfectly in line with the participants of the ASTM proficiency test. Together with the excellent reproducibility, this

independently proven accuracy means you can continue to consistently produce your polymeric materials – with no stress.



## SMART MANAGER, SMART ZETIUM

The distractions and demands of quality control management can make it difficult to get the most out of your instruments. To make it easier, we've connected the Zetium to our Smart Manager platform – making it a Smart Zetium.

### Meet your new trusted team member

This cloud-based 'control room' connects all your Zetium instruments, giving you a clear picture of their performance – wherever they are in the world. So you can keep on top of performance, optimize usage, reduce downtime, and unleash the potential of your data. Just like having a new, trusted member of your team!

### Maximum data security

And rest assured: all your data remains yours, and is only visible to Malvern Panalytical. Smart Manager uses the latest Microsoft Azure cloud technology, ensuring that your data is safe and secure at all times. We don't collect data from your own samples unless you explicitly request it.



## Why choose us?

**When you make the invisible visible,  
the impossible is possible.**

Our analytical systems and services help our customers to create a better world. Through chemical, physical and structural analysis of materials, they improve everything from the energies that power us and the materials we build with, to the medicines that cure us and the foods we enjoy.

We partner with many of the world's biggest companies, universities and research organizations. They value us not only for the power of our solutions, but also for the depth of our expertise, collaboration and integrity.

With over 2200 employees, we serve the world, and we are part of Spectris plc, the world-leading precision measurements group.

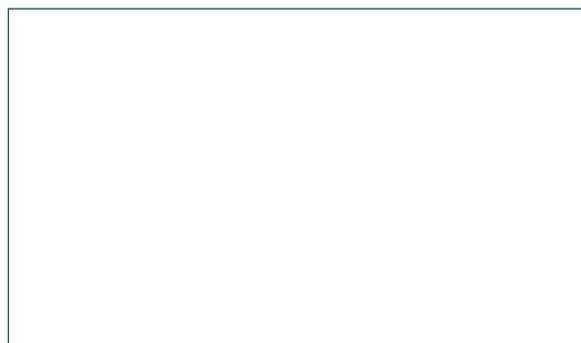
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## Service & Support

Malvern Panalytical provides the global training, service and support you need to continuously drive your analytical processes at the highest level. We help you increase the return on your investment with us, and ensure that as your laboratory and analytical needs grow, we are there to support you.

Our worldwide team of specialists adds value to your business processes by ensuring applications expertise, rapid response and maximum instrument uptime.

- Local and remote support
- Full and flexible range of support agreements
- Compliance and validation support
- Onsite or classroom-based training courses
- e-Learning training courses and web seminars
- Sample and application consultancy



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