

## Q4 POLO

- The Little Giant - Spark-OES Metals Analysis

# Q4 POLO - The Little Giant



## Q4 POLO - Little Space, Mighty Performance

In history, it is often the small things or individuals that change the world – people like Marco Polo. He blazed completely new trails, covered huge distances and opened up new possibilities for the world.

In the development of our Q4 POLO, we too have opened up new dimensions, perfected and thought through every last detail. The result is a spark spectrometer that is second to none.

No other system offers better analytical performance in such a small and highly functional package. From very light lithium (Li) to heavy bismuth (Bi), the small Q4 POLO guarantees enormous performance and applications that were previously unthinkable in the compact instrument class.

### Get to know our little Q4 POLO as a true analytical giant!

Just as impressive as the results is the incredible long-term stability of our Q4 POLO. Due to its design, the Q4 POLO has no thermal and contamination drifts. This reduces cleaning, maintenance, and the burden of frequent recalibrations, resulting in stable results – around the clock at a low cost of ownership. Reliable and precise analysis is now possible on every foundry- and production-floor.

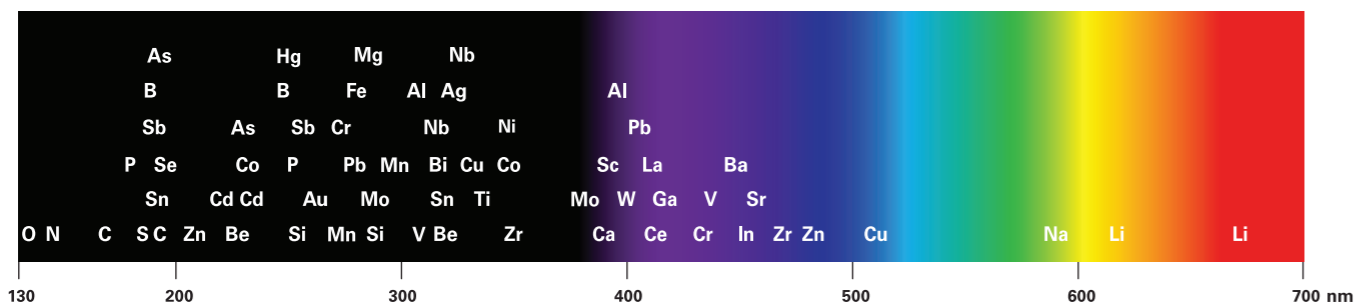


## MultiVision™ and AAC™ detect all elements, stay in focus, and say goodbye to drift

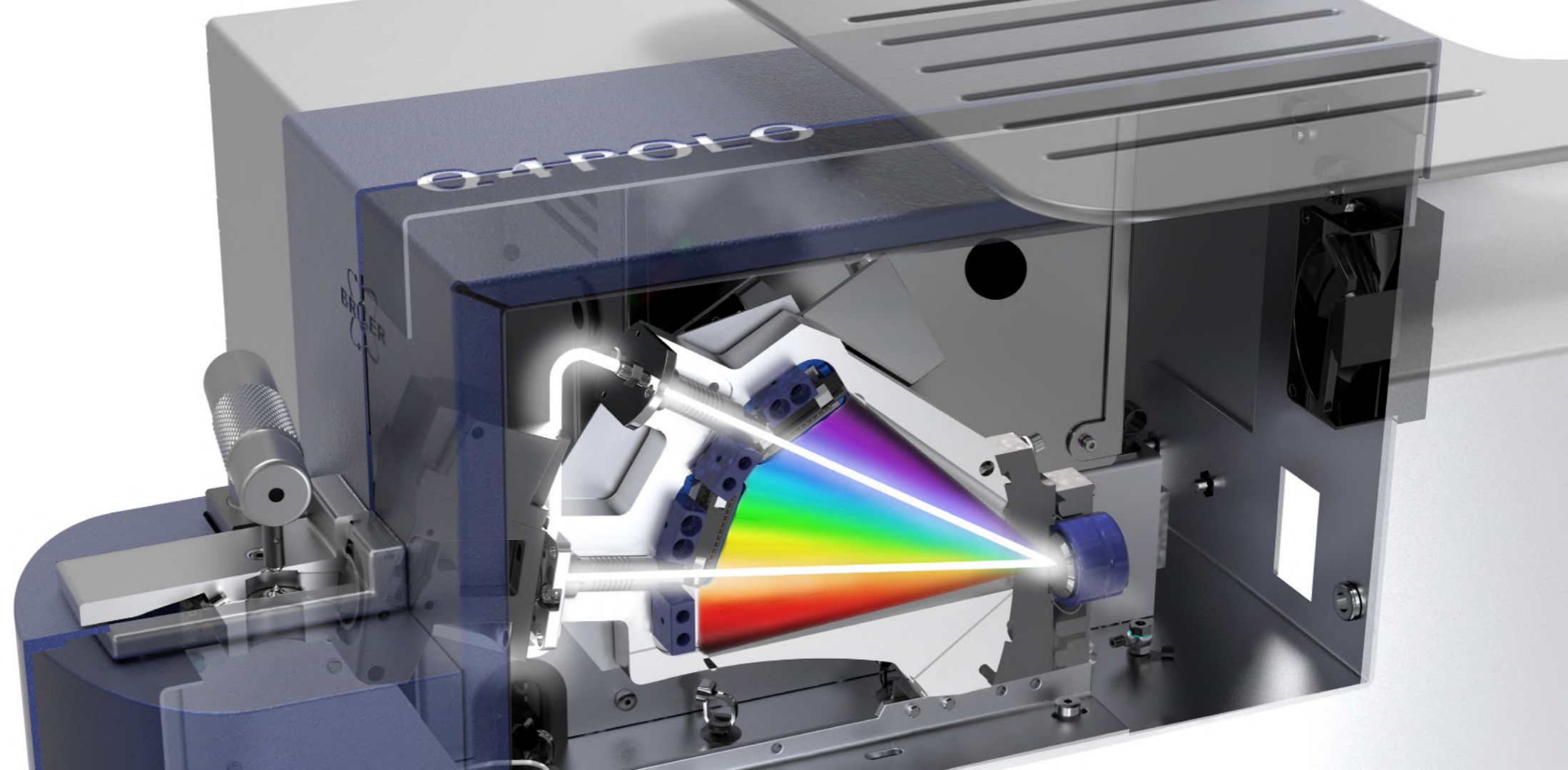
Many elements, especially those of high importance in the iron and steel matrix, have their most efficient emission lines in the far ultraviolet (FUV) region, from 120-200 nm. Radiation below 200 nm is called vacuum UV (VUV) and is attenuated or even blocked by most atmospheric gases. Therefore, any VUV optics requires either a high vacuum or effective purging with an optically transparent and high purity gas such as argon. Traces of contamination, for example, from materials that outgas volatile organic compounds, can immediately affect UV transparency, increase purge gas consumption, and permanently degrade performance over the long term.

This does not happen with our Q4 POLO. Due to the design-related ultimate cleanliness and careful material selection, the argon-purged and volume-optimized optics in the Q4 POLO permanently retain incomparable UV transparency while minimizing argon consumption.

In addition to the optimizations for the short-wavelength range, the Q4 POLO is also ideally suited for the long-wavelength range at the end of the visible spectrum. Thanks to MultiVision™ with two independent beam paths, the optics of the Q4 POLO covers the entire wavelength range from 130-785 nm with good resolution and simultaneous compactness. This means that even the emission lines of alkaline earth elements such as lithium and sodium, which are particularly important for aluminum, are perfectly detected.



Distribution of efficient emission lines within the electromagnetic spectrum for some important elements.



### MultiVision™ – Large element range and superior performance

The optics is the heart of any spectrometer and form the basis for its performance. That is why we paid special attention to this core component in the development of the Q4 POLO and now offer a system with the speed of a sprinter and the endurance of a marathon runner. This does not come by chance:

- The robust optics uses the well-proven Paschen-Runge configuration.
- An optimized holographic flat field grating is integrated together with 4 high-resolution array sensors, in a gas-tight aluminum hollow body.
- Two sequentially switched light paths, with different angles of incidence, unleash the entire applicable wavelength range, without compromising resolution.

### AAC™ – Automatic Ambient Compensation

The optics of the Q4 POLO is equipped with Bruker's patented <sup>1)</sup> concept for self-focusing under temperature variations. The entrance slits of the optics are suspended on appropriately sized compensation tubes made of polymer materials. This compensates for

<sup>1)</sup> US8891082B2, EP2537011B1

different thermal expansion coefficients of the optics materials used. With the AAC, thermal drift is eliminated and the AAC acts like a thermally controlled autofocus that keeps the focal plane and pixel wavelength constant over a wide temperature range of 10 to 45 °C – physically and fully automatically. You don't need air conditioning, active climate control, or drift correction with our Q4 POLO.

These are just a few of many technical features that guarantee the comprehensive availability of emission lines of all relevant elements, from light lithium (Li) to heavy bismuth (Bi), with the best performance. This is the reason why our Q4 POLO stands for outstanding precision, particularly on light elements, excellent results in the challenging analysis of cast iron, reliable analysis of nitrogen at low ppm levels in low alloyed steels, and easy analysis of oxygen in copper.

# ArgonShield™ always clean, always ready to perform

## Optimized plasma views

The unique electromagnetic light junction is a core component of the MultiVision™ optics. The design with electromagnetic drive of two shutters, enables seamless switching between the direct and the fiber optic light path. The shutter of the direct light path offers the additional function of a switchable mask, blocking background radiation within certain measurement sequences to achieve best detection limits.

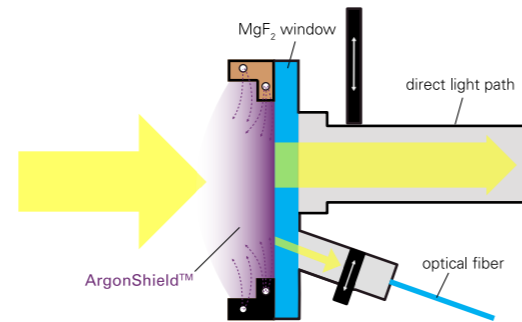
Unlike conventional designs with pneumatic components, which are prone to leakage, the light junction is hermetically sealed, requiring no additional argon gas while preserving the high UV transparency of the optical system.

## ArgonShield™ – stops contamination

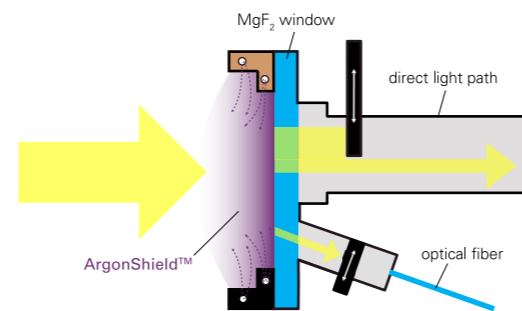
The UV-transparent window is made of magnesium fluoride and is integrated into the light junction for easy maintenance. The argon supply is part of the housing of the light junction, which activates our novel ArgonShield during the measurement. The ArgonShield works like this: a low flow directed away from the window, not only protects the window from contamination effectively, but, in combination with the proven co-axial argon flow in the spark stand, also results in a more effective removal of sample condensate for the spark stand.

## SmartSpark™ – advanced digital spark source

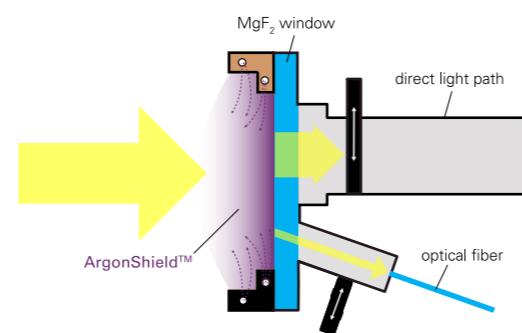
The digital spark source in the Q4 POLO produces ultra-stable sparks with a frequency up to 1000 Hz and variable discharge times down to 2 ms. Discharge shapes are tailored to the most efficient preparation of the sample surface, sample ablation and emission intensities. Matrix-optimized, high energy pre-sparking is applied to homogenize the sample surface, reducing matrix effects and increasing accuracy.



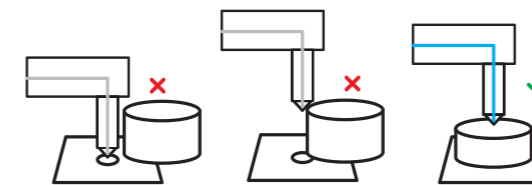
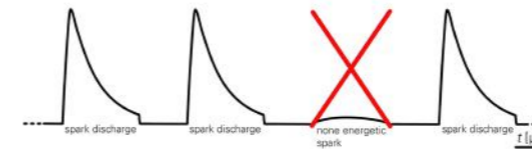
Light junction: direct light path "opened", ArgonShield™ active



Light junction: direct light path "masked", ArgonShield™ active



Light junction: fiber optics light path, ArgonShield™ active



## Active sensing of single discharges

An improved curve during the important plasma ignition phase, and active sensing of single spark discharges to detect non-energetic sparks contribute to improved analytical precision and long-term stability.

## SafetyTip™ – hassle free operation

The insulated SafetyTip on the new sample clamp prevents incorrect sample positioning and ensures safe operation for a wide variety of samples. It has been designed according to the latest German safety standards to provide maximum operational safety without compromising flexibility.

## Solutions for a wide range of sample sizes and forms

A comprehensive set of adapter kits is available for the analysis of small pieces, tubes, wires and sheets. These adapters address specific challenges of an optimal positioning over the electrode, while adjusting tightness to samples of different shapes and sizes.

## Optional multi-purpose tray

The optionally available multi-purpose tray, made of robust stainless steel, serves either as a secure storage for samples or transforms the Q4 POLO into a compact, tidy all-in-one workstation, when operated with a notebook computer.



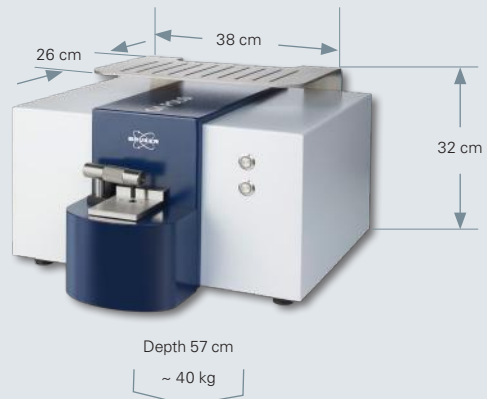
## Overview of Features and Benefits

	Specification	Benefit
<b>Spark Stand</b>	Low maintenance spark stand with co-axial argon flow, accessible from 3 sides	Minimized argon consumption, easy analysis of wires and small pieces, also accepting bulky samples
Sample clamp	80 mm sample height with exchangeable SafetyTip™	Ensures correct sample positioning and safe operation for a wide sample variety
<b>SmartSpark™</b>	Digital spark source for stable spark generation up to 1000 Hz; active sensing of non-energetic discharges	Improved precision and long-term stability with highest operational safety
Optics	$\lambda$ : 130 - 785 nm, argon purged, multiple un-coated linear array detectors with lowest dark current	Access to all elements, low operational costs
Optical Concept	Optimized in Paschen-Runge configuration, with high UV-C transparency and dual light paths	Field-proven robustness and precision with excellent light element performance
<b>MultiVision™</b>	Electromagnetic light junction, switching between two light paths and three alternative plasma views	Compactness with superior optical resolution
<b>AAC™</b> (Bruker Patent <sup>1)</sup> )	Automatic Ambient Compensation keeps the optic focussed, eliminating thermal drifts	Incredible analytical stability, reduced maintenance or recalibration without need for air condition
<b>ArgonShield™</b>	Prevents window contamination during measurements	Permanent transparency with minimized maintenance
<b>Gas Supply with Argon-SaverMode</b>	Argon $\geq$ 99.998 % purity <sup>2)</sup> (Ar 4.8) 3 bar ( $\pm$ 10%) supply pressure Copper tubing (6 mm o.d.) with Swagelok® fitting	Good performance with standard argon purity, dedicated argon saver mode for lowest operational costs
<b>Noise Emission</b>	< 55 dB (A) during measurement <sup>3)</sup>	Enjoy the silence
<b>Software</b>	ELEMENTAL.SUITE V3.2 or higher	Future save, intuitive productivity, optional material database with > 350 k alloys integrated
<b>Electrical Data</b>	100 - 240 VAC ( $\pm$ 10%), 50 - 60 Hz 10 - 16 A (240 V), slow blow fuse 200 VA (max), 20 VA standby, typically: 95 W (@ 230 VAC) during measurement	Compatible with all worldwide power and current configurations

<sup>1)</sup> US8891082B2, EP2537011B1

<sup>2)</sup> Argon 5.0 or purifier recommended for trace nitrogen analysis

<sup>3)</sup> Sample covering hole in sample stage completely



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