Bruker Quantron

Application Note No. 1/2006

Analysis of Iron & Steel with Q8 Magellan

The main features of Q8 Magellan:

- Low Total Cost of Ownership
- Top Analytical Performance
- Low Maintenance Time & Costs
- Powerful, yet easy software

„A spark spectrometer using components of the latest generation, representing state-of-the art technology." This vision has become reality with Bruker Quantron's Q8 Magellan. From digital spark generator, innovative CPM detectors, real-time read-out system, to true Windows-XP compliant software this instrument introduces all the features that up to now were only available in selected high-end instruments, and even then often only as additional options.

Its rugged, compact design—available for seated or standup operation—makes it suitable not only for laboratory use but also to be placed on the shopfloor. An integrated air-con system ensures high thermo-stability even in hot and humid environments when necessary.

The single-optic system caters all channels within an enlarged vacuum chamber, thus, ensuring best transparency and independence from atmospheric influences. The optional turbo-molecular pump ensures a high quality vacuum with oil-free technology. Without the need to use oil-absorbing filters, back-diffusion of oil belongs to the past. Maintenance work is drastically reduced: self-cleaning spark stand, long-lasting electrode, argon stop function help to save time and cost.

Making Q8 Magellan an even better value for money product with low total cost of ownership !

Q8 Magellan: the new name in the world of stationary spark emission spectrometers.

Pioneering CPM technology for OES

While CCD detectors are today's choice for mobile and low-end spectrometers, photomultiplier tubes (PMT) remain the first choice for high-performing instruments.

Now Q8 Magellan is the first spark spectrometer using channel photomultiplier technology (CPM). These detectors work with the sample principle as classic photomultiplier tubes, yet offer some significant advantages:

- higher multiplication factor
- lower dark current
- highest sensitivity
- compact, rugged design
- wide wavelength coverage

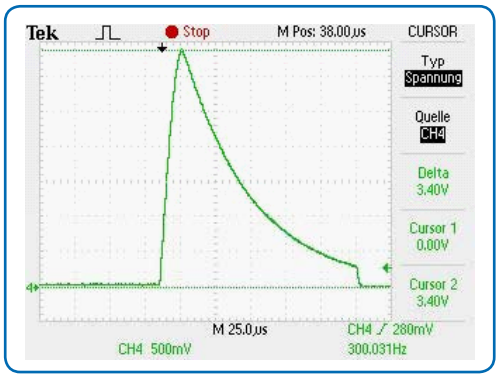
Small & robust, but highly sensitive: the Channel Photomultiplier (CPM) of Q8 Magellan.

But, to fully utilise these advantages and also maintain a stable life characteristic, a specially adapted read-out system is required. Bruker Quantron's read-out system with a multi-tasking realtime processor is able to read dark currents as low as 10-13 A and detect single sparks even at a frequency of 1 kHz and in up to 128 channels simultaneously! This makes it unique in the business !
To achieve these capabilities Bruker Quantron's read-out system was developed in close cooperation with the development team of the detector manufacturer Perkin Elmer Optoelectronics. Long-term tests have proven the high reliability and long lifetime of this detector.

QDS — Digital Source

A powerful, stable spark generator is the key to reliable analytical results. Exciting different elements at their best potential improves the analytical performance. A source generator that can create different current curves for different elements and controls the lifecycle of a spark from ignition to its death in close to realtime is the optimum solution.

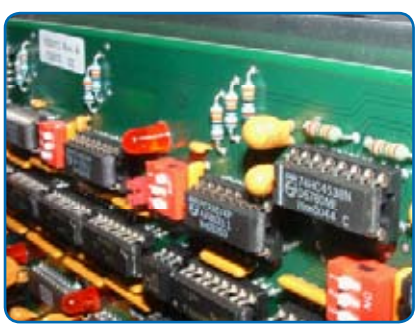
Bruker Quantron's Digital Source (QDS) is the perfection of this demanding task. Using latest electronic components, it is now possible to ignite a spark, achieve the peak current at any defined time without backdrops, and control it over its lifespan in realtime. Peak currents may be as high as 200 A, frequencies can be up to 1000 Hz. Any free shape of discharge curve can be designed or selected from the database. Different curves may even be used in one measurement.



Any free design of discharge curve can be selected from a library or created by an experienced operator.

Read-out in real-time

The read-out system of Q8 Magellan collects each single spark intensity and transfers it to the DAQ-PCI Master board in the PC. Each board supports 8 or 16 channels in close to realtime, designed not to „drop" any spark even at frequencies of up to 1000 Hz !
Setup allows for up to four delay and gate times per channel to optimise the signal/background ratio. This results in drastically improved LODs. Thus, time-resolved spectroscopy has reached a new level with the new read-out in combination with the CPM technology.
Single-spark evaluation (SSE) for all channels as a standard also allows for further applications like bad sample detection, determination of soluble/insoluble concentration, single-spark ratios, 3s bad discharge elimination, reduction of spectral interferences, ...



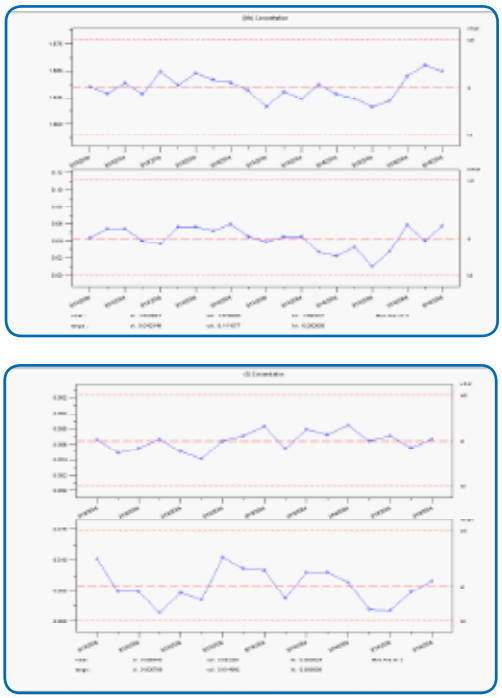
Data acquisition technology at its best !
High-speed collection and communication with broad bandwidth

Long Term Stability

Not only short-term repeatability but especially long-term stability is of utmost importance for today's applications. Magellan offers major improvements also in this field. Tests with setup samples run over eight consecutive days without standardisation document the high reliability that users can rely on for routine operation.

The SPC charts shown on the right were created with Q8 Magellan's optional database software. The two elements are shown as examples, Manganese on top, below Sulphur. Each chart displays a moving average curve, indicating a trend, if present, and below the r-chart to evaluate the range or spread.
In no case did any of the observed twelve elements violate the control limits. A trend or tendency could not be detected.

For alloyed elements the standard deviation is below two-times the short-term stability which is remarkably good.



Measurements over a couple of days show significantly low deviations. Charts of Q8 Magellans database software show moving averages and ranges of Manganese and Sulphur.

Q8 Magellan's typical precision (Fe)

Below some typical performance data for some elements of interest in iron base at different concentration levels in percent. The given data are absolute standard deviations in ppm.
The list is a first compilation of Performance data and consequently somewhat incomplete. Please consult your Bruker Quantron representative for an update.

Elem.	LOD	0.005%	0.01%	0.05%	0.1%	0.3%	0.6%	1%	2%	3%	4%	15%	25%
C	2.1	1.6	2.2	5	8	23	30	50	96	128			
Si	2.5	1.7	2	3	3.5	11	21	34	70				
Mn	0.2	0.6	0.9	3	7	16	24	27	36	58	76		
P	0.9	0.7	4	6	11	24							
S	1.6	1.7	3	9	18								
Cr	0.5	1.7	2	6	9	17	24	34	63	90	104	360	
Mo	4.6	1.8	1.8	7	9	12	32	50	68	86	105		
Ni	0.7	1.8	1.8	2	5	12	67	69	73	98	108	425	857
Al	0.8	3	7	9	15	36	57						
Cu	0.3	0.4	0.6	2	5	18	21	58					
Nb	1.9	4	6	12	14	21	28	56					
V	2.6	0.7	0.9	2	3	13	25						
N	2.8	3	4	5	13	25							

Remarks:
Standard Deviations (1 sigma) are given in ppm. LODs given are typical values, guaranteed values will be higher.
The given performances only apply for homogeneous samples (CRM or SUS), appropriately prepared. Data are only valid for single-matrix instruments. Due to different line selections in multi-matrix applications, performance may vary.
All data were collected on standard production instruments.

Profile

Bruker Quantron GmbH — experienced experts have established this spectrometer company dedicated to develop and manufacture premium spectrometers.

With the all new stationary spark spectrometer Q8 Magellan a new era in spark emission spectrometry has begun. Its many unique features make it the first choice for laboratories and quality departments in the metal producing and metal processing industries around the world.

Only latest technologies are used in this instrument. Every unit is built and calibrated according to customer specification and, thus, is a unique solution for the specific requirements of our clients.

Contact Bruker Quantron directly or address your local authorised distributor to learn more about the new possibilities that Q8 Magellan has to offer.

Visit us in the Web:
www.bruker-quantron.com

Lean Production is your advantage

At Bruker Quantron we follow a lean production concept. This modern principle of running an enterprise is well executed in the automotive industry. At Bruker Quantron, too, we believe in the many advantages that this has to offer:

Concentrating on our core competences we develop spectrometers, manufacture optical systems, calibrate instruments, and provide installation services, technical and application support for our customers.

Mechanical workmanship, production of electronic boards, packing and shipping of instruments is not our business and here we rely on competent and flexible partners.
Inviting these partners already during the development of an instrument is one of the keys to successful, reliable products.

The results are high product quality, everybody involved is expert in his field; low production costs; reduced delivery times; small and flexible group at Bruker Quantron itself.

Concentrating all our efforts on analytical solutions for our customers !

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