



The  
Bruker Elemental  
**Q8** Magellan and Coronado  
Automation-System

# Optical Emission Spectroscopy (OES) Product Line



Elemental analysis for quality and process control in all fields of metal production and processing

## Q8 OES Spectrometer

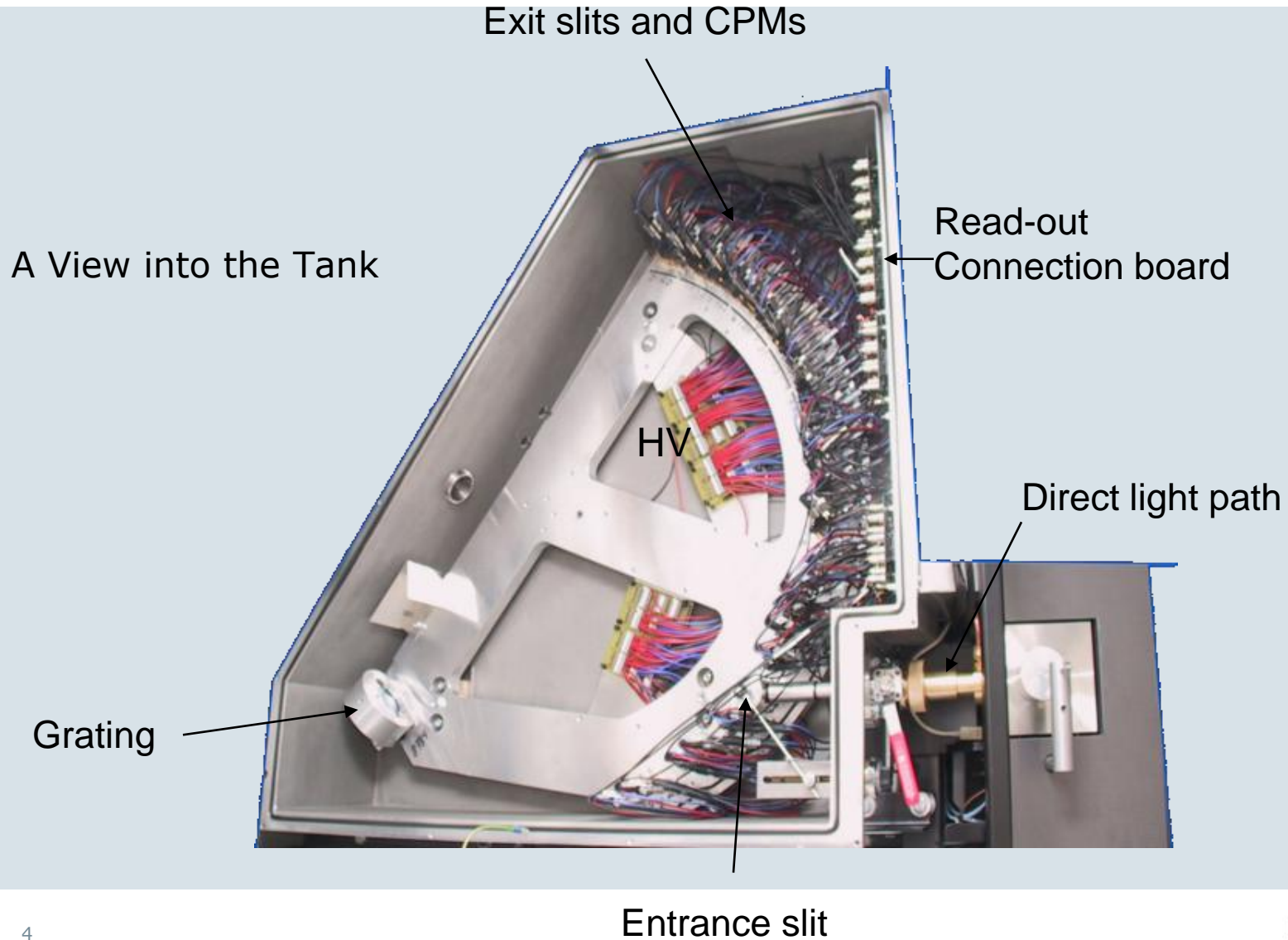


**Q8** MAGELLAN Spectrometer with high resolution  
750 mm optical system  
Channel Photomultiplier  
Time resolved single spark evaluation for  
all analytical channels

QMatrix Software Package with extensions:  
QAI – Automation Interface  
Automatic averaging  
Argon monitoring  
Vacuum monitoring

DIA Software Package with:  
SQL database for analysis  
Data transmission to host systems  
Quality database

# Q8 OES Spectrometer



# Channel Photomultiplier

Cooperation with Perkin Elmer Optoelectronics

Only used in demanding applications  
compact size

Highest sensitivity

High dynamic range

High amplification

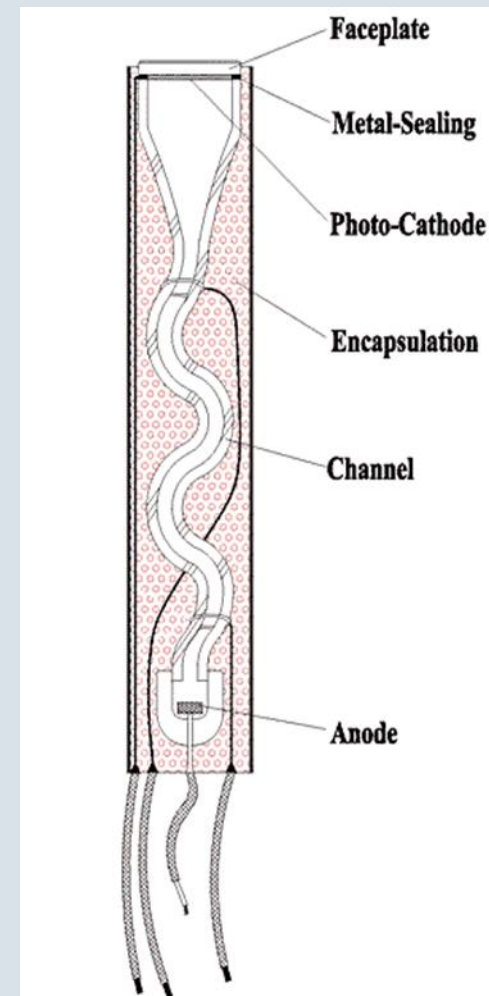
Extremely low dark current counts

Spectral range:

UV – VIS – NIR, 110-850 nm

= improved stability,

very good BEC/LOD low costs

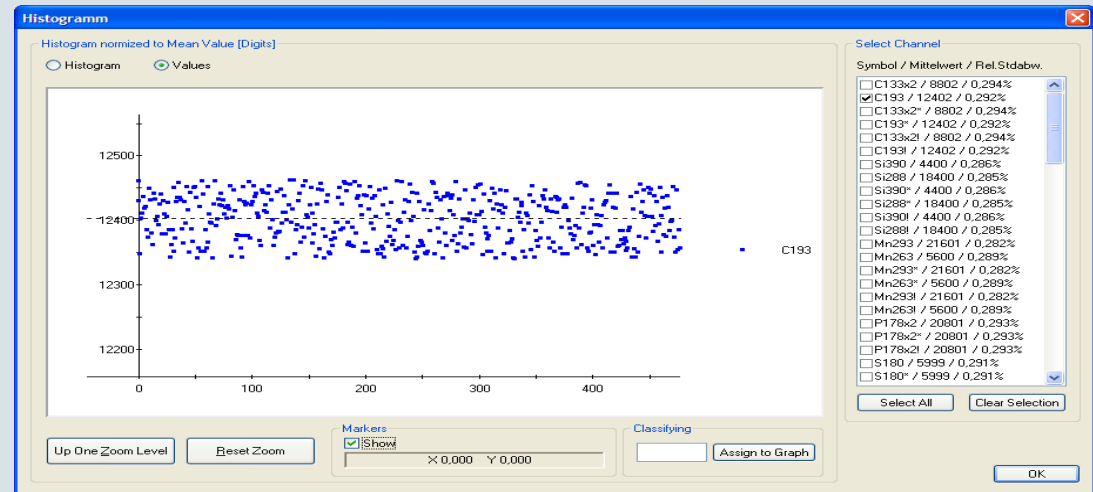


# Q8 OES Spectrometer



Read-out system for SSE and TRS

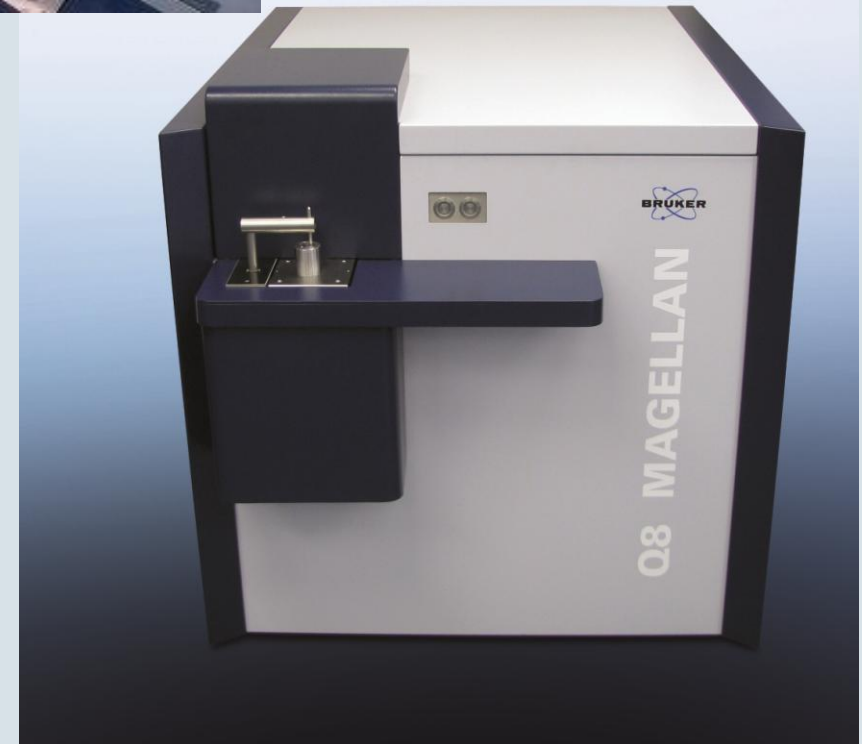
Multi-tasking real-time processor  
Single spark detection  
Time-resolved spectroscopy  
(Delay/Gate may be set freely  
for all channels in 1  $\mu$ s-steps)  
Single Spark- Ratios



# Benefits of Instrument Design



Easy access for maintenance  
Cable pass-thru for screen,  
keyboard and mouse  
Improved Positions for PC and  
WashBottle



# Spark Stand For Routine Operation



Pneumatic sample holder

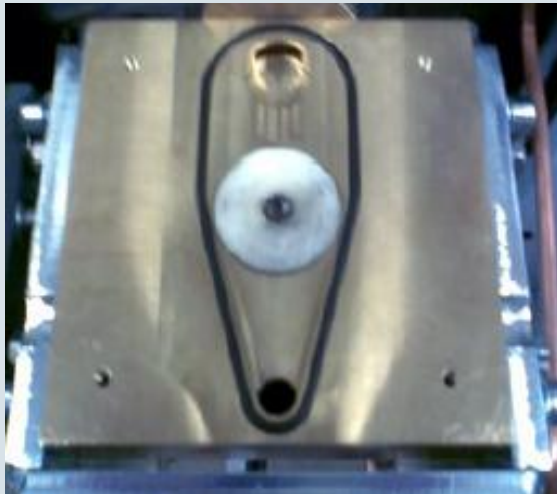
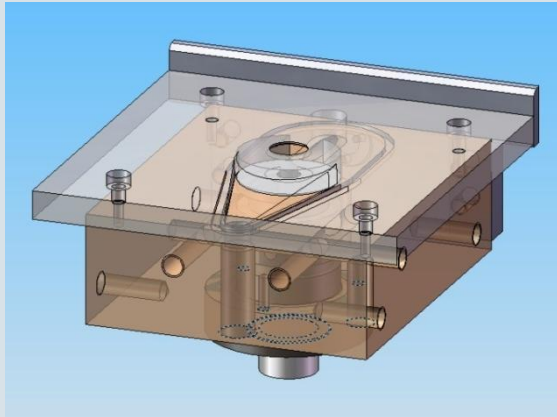
Self-centering plate

Optimised argon flow = reduced consumption,  
minimized pollution (Ar-Stop & self-cleaning)

Prepared for automated Sample manipulation

One-Button Analysis enables simple and  
failsafe operation with increased sample  
throughput.

# Optimized Spark Stand



Co-axial argon flow

Reduction of specific argon consumption

Ideal for small samples, wires, etc.

High stability with extended cleaning intervals

Specially suitable for „soft“ matrices with a lot of condensate

# New Optical Concept

Paschen Runge Mounting

Vacuum System

750mm focal length

2400 holographic grating – Optimised for all Wavelength

Single-optic

## **New features:**

Extended Rowland segment

No refractors

New exit slits

Pre-set line positions

# Vacuum Optic

Simple to Control (Pirani) for best transparency

Stable Profile since independent from atmospheric pressure and temperature controlled

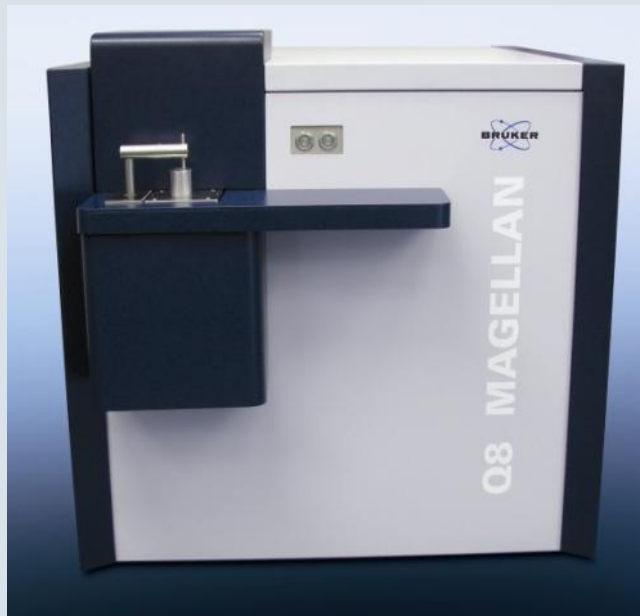
No problems with fine dust or contamination through argon purging

Oil-/maintenance-free vacuum technology with Turbo-Molecular-Pump avoids oil back diffusion

Simple cleaning of the window without affecting the transmission



# System Thermal Conditioning



Improve configuration of the Internal Air-con & vacuum system to better control the profiling of each channels.

Improve long term stability

# Digital Plasma Generator

- Fully digital plasma generator
- Variable discharge curves & duration
- Variable Frequencies up to 1000 Hz
- Delay & Gating
- All parameters may be optimised for each channel individually
- Innovative Pulse Width Modulation (PWM)
- High excitation power (peak current) suitable for all matrices
- High plasma stability
- Data stream from 500 kHz to 1 MHz
- Maintenance free



# Read-Out System

## PCI-DAQ Board

Realtime, multi-tasking processor  
Up to 128 channels simultaneously  
Extremely Low Noise Level



# Technologies Belong Together

All properties together allow the optimisation of the analytical process and use of new analytical technologies like

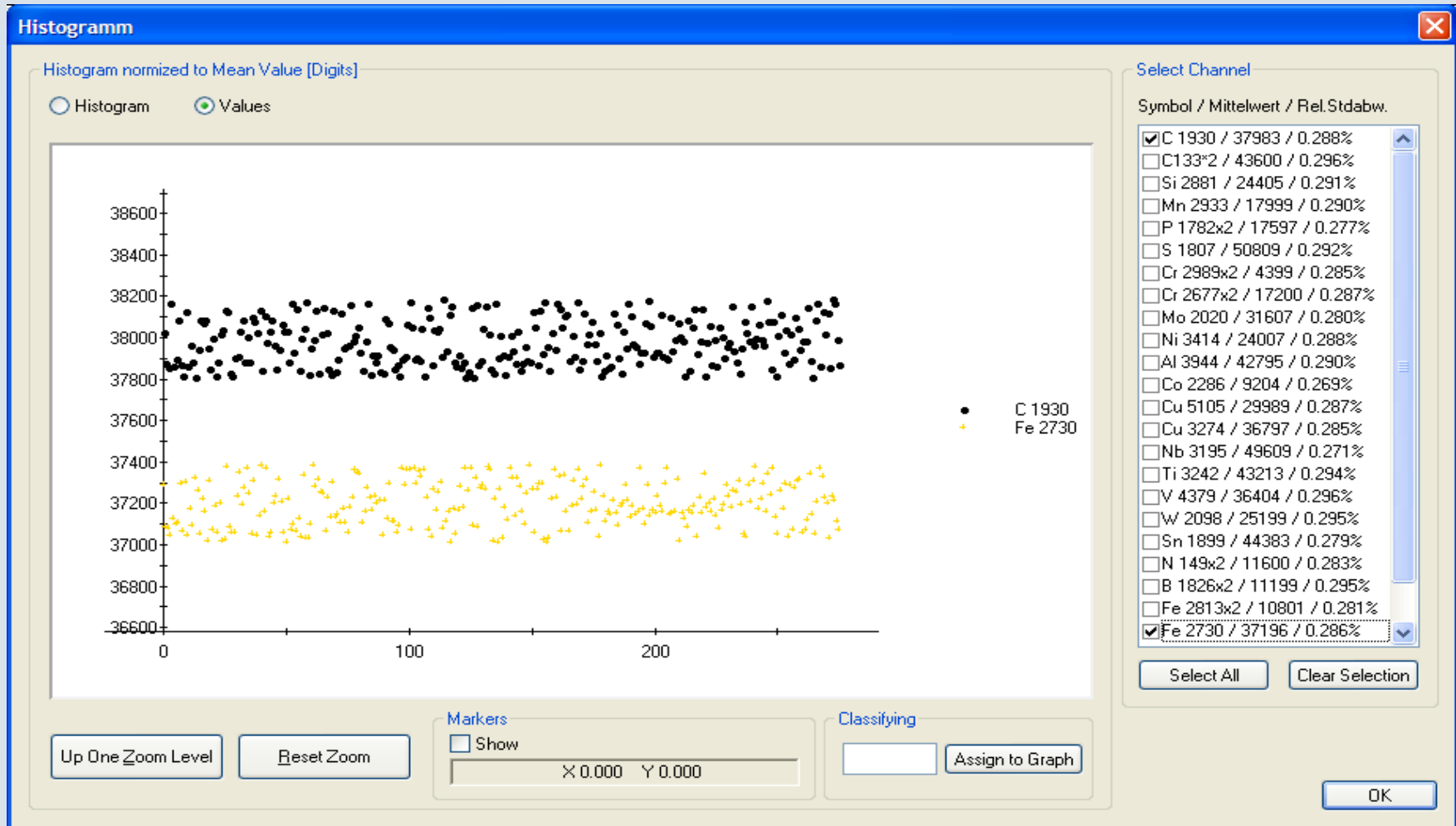
Time-resolved spectroscopy (TRS) and

Single-Spark Detection (SSD)

This is a standard in Magellan for

**ALL** channels at **ALL** parameter combinations, no compromise.

# Single Spark Visualization



# Improved Software with Hard Facts



Spectrometer Software: QMatrix, Regression Software: QMatrixReg;  
Software SQL-Analyses-database Data communication

QMatrix

Methode Analyse Bearbeiten Ansicht Standardisierung Kalibration Extras Hilfe

Konzentrationen

Proben Identifikation

ID-3:						ID-4:				
	- C	Si	+ Mn	- P	} S	Cr	Mo	Ni	Al	B
	%	%	%	%	%	%	%	%	%	%
1	0,107	2,127	4,949	0,086	0,148	1,756	<0.0	1,858	7,104	<0.0
2	0,107	2,127	4,949	0,086	0,148	1,756	<0.0	1,858	7,104	<0.0
3	0,107	2,127	4,949	0,086	0,148	1,756	<0.0	1,858	7,104	<0.0
4										
5										
↑	3,80	3,00	1,200	0,600	0,120					
∅	<b>0,107</b>	<b>2,127</b>	<b>4,949</b>	<b>0,086</b>	<b>0,148</b>	<b>1,756</b>		<b>1,858</b>	<b>7,104</b>	
↓	2,40	2,00	0,300	0,100						
	Co	Cu	Nb	Sn	Ti	V	W	N	Mg	Zn
	%	%	%	%	%	%	%	%	%	%
1	2,346	14,67	1,043	11,33	5,409	3,980	0,864	<0.0	1,113	1,318
2	2,346	14,67	1,043	11,33	5,409	3,980	0,864	<0.0	1,113	1,318
3	2,346	14,67	1,043	11,33	5,409	3,980	0,864	<0.0	1,113	1,318
4										
5										
↑										
∅	<b>2,346</b>	<b>14,67</b>	<b>1,043</b>	<b>11,33</b>	<b>5,409</b>	<b>3,980</b>	<b>0,864</b>		<b>1,113</b>	<b>1,318</b>
↓										
	Fe									
	%									
1	52,98									
2	52,98									
3	52,98									
4										
5										

Start der nächsten Messung oder Analyse abschliessen?

Blende: 0 | Verbindung: ONLINE | L | Fe02-8k |

Start | Windows Explorer | Dia2000se | Microsoft PowerPoint ... | QMatrix | DE | 00:07

# QMatrix – Main Features



Simple Handling

Keyboard Operation supported

Automatic Average

Statistics

User-defined ID fields

Multi-tasking

Quality Control

Quality Identification

E-Mail Output

Printing & Export to Excel

Various calculation modes

Single-Spark Display

User Authorisation

Type standardisation

Display Setup

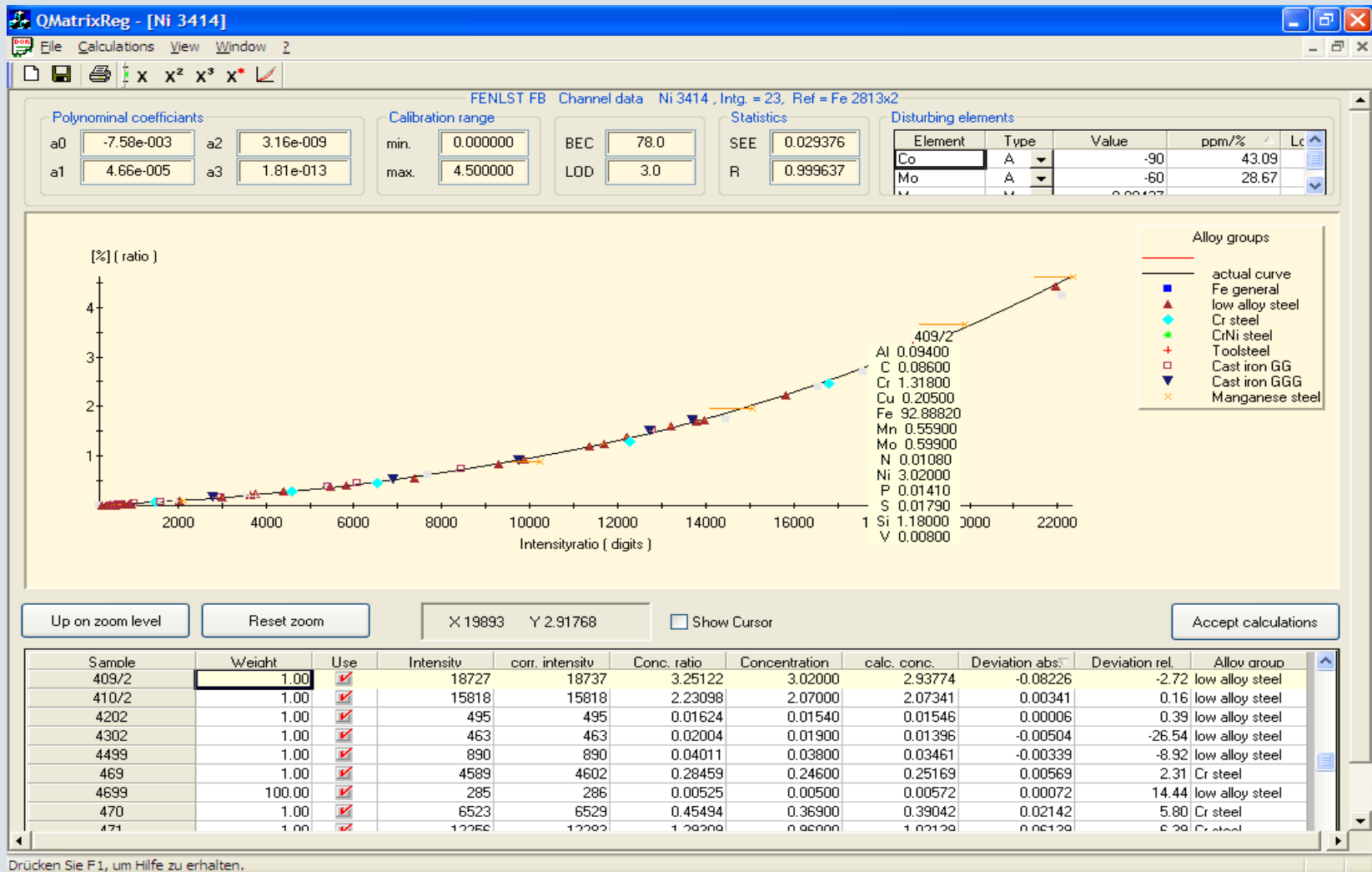
Unit conversion

Ar switch off

Icon for status of sample clamp and measurement

Progress bar for measurement

# QMatrixReg: Calibration Software



# SQL Analyses Database



Powerful SQL database

Provides Basic file management for Qmatrix

Edit secured with AuditTrail

Flexible Data Retrieval

Export to Word & Excel

# Analyses Management



DIA 2000 SE - Analyses management system [ Quantron / Basic ]

File Edit View Formats Extras Basic files Configuration Help

Files Print Statistics Export Filter View Details Login Help Home Web

Standard RG-DN400 Start

Date	Time	Sample	Quality	Program	Si	Mn	C	P	S	Cr	Mo	Ni	Al	Mg	Sn	N	V
02.11.2000	08:02:42	34941	RG-DN400	FE-21	1,7076	0,3623	3,5700	0,0779	0,0077	0,0320	0,00558	0,0241	0,00953	0,0292	0,00244	0,00649	0,018
02.11.2000	08:02:42	34941	RG-DN400	FE-21	1,7076	0,3623	3,5700	0,0779	0,0077	0,0320	0,00558	0,0241	0,00953	0,0292	0,00244	0,00649	0,018
14.08.1997	08:02:34	34941	RG-DN400	FE-21	1,7119	0,3621	3,5848	0,0794	0,0080	0,0326	0,00556	0,0247	0,00874	0,0299	0,00268	0,00768	0,018
14.08.1997	08:02:31	34941	RG-DN400	FE-21	1,7032	0,3625	3,5453	0,0765									
14.08.1997	07:50:38	34940	RG-DN400	FE-21	1,7035	0,3661	3,0100	0,0709									
14.08.1997	07:50:34	34940	RG-DN400	FE-21	1,6987	0,3667	3,5670	0,0707									
13.08.1997	09:59:44	34873	RG-DN400	FE-21	1,8157	0,3461	3,5082	0,0652									
13.08.1997	09:59:40	34873	RG-DN400	FE-21	1,8260	0,3428	3,5627	0,0683									
13.08.1997	09:48:55	34872	RG-DN400	FE-21	1,7998	0,3492	3,5733	0,0728									
13.08.1997	09:48:43	34872	RG-DN400	FE-21	1,8100	0,3512	3,5915	0,0741									
13.08.1997	09:48:39	34872	RG-DN400	FE-21	1,7895	0,3473	3,5552	0,0715									
13.08.1997	09:36:55	34871	RG-DN400	FE-21	1,7676	0,3529	3,6960	0,0611									
13.08.1997	09:36:44	34871	RG-DN400	FE-21	1,7676	0,3529	3,6960	0,0611									
13.08.1997	09:20:23	34870	RG-DN400	FE-21	1,8025	0,3583	3,6581	0,0683									
13.08.1997	09:20:14	34870	RG-DN400	FE-21	1,8025	0,3583	3,6581	0,0683									
13.08.1997	09:08:46	34869	RG-DN400	FE-21	1,7311	0,3491	3,6185	0,0713									
13.08.1997	09:08:38	34869	RG-DN400	FE-21	1,7330	0,3518	3,6937	0,0713									
13.08.1997	09:08:27	34869	RG-DN400	FE-21	1,7293	0,3464	3,5433	0,0712									
13.08.1997	08:48:29	34868	RG-DN400	FE-21	1,8060	0,3862	3,5390	0,0815									
13.08.1997	08:48:22	34868	RG-DN400	FE-21	1,7998	0,3901	3,5780	0,0792									
13.08.1997	08:48:19	34868	RG-DN400	FE-21	1,8122	0,3824	3,5001	0,0837									
13.08.1997	08:34:30	34867	RG-DN400	FE-21	1,7739	0,3898	3,5043	0,0832									
13.08.1997	08:34:21	34867	RG-DN400	FE-21	1,7786	0,3899	3,5502	0,0866									
13.08.1997	08:33:33	34867	RG-DN400	FE-21	1,7692	0,3897	3,4584	0,0797									
13.08.1997	08:20:39	34866	RG-DN400	FE-21	1,8193	0,3780	3,5087	0,0823									

139 1 &Marked analyses KUNZ Basic

**Detail of analysis**

Name	Value					
Date	14.08.1997					
Time	08:02:34					
Sample-Nr.	34941					
Quality	RG-DN400					
QualityVersion	1					
QualityOK	T					
Operator						
Validation						
Customer						
Remark	1 2					
Instrument	QM					
Method	FE-21					
Status	Concentr.					
Type	Single measurement					
MERGE_T	S					

FE-21						
	Si	Mn	P	S	Cr	
ext Max	0,1800	0,6000	0,0350	0,0350		
int Max	0,1800	0,6000	0,0350	0,0350		
	3,59	1,71	0,362	0,0794	0,00800	0,0326
int Min	0,1200	0,3000				
ext Min	0,1200	0,3000				
Ni Mo V Cu Sn As						
ext Max						
int Max						
	0,0247	0,00556	0,0181	0,0163	0,00268	0,00265
int Min						
ext Min						

Sb Bi B Pb N TiO2						
ext Max						
int Max						
	0,00259	0,00153		0,00088	0,00768	4,18
int Min						
ext Min						
C_eq C8 FMG HB Rm						
ext Max						
int Max						
	4,18	28,68				
int Min						
ext Min						

Print Close



**Bruker Elemental**  
**Q8 CORONADO**

# Q8 CORONADO – System Components



## Compact Design

Few required space because of integration of electrical and pneumatic installations without external cabinets

Small-sized footprint (appr. 3 x 1 m)

Suitable for installation in laboratory container

Expandability for additional system components by using profile system

## High Performance

Sample Throughput

Operational availability

# Q8 CORONADO – System Components



## Usage of industrial standard components

Data interfaces using Ethernet and TCP/IP

Robot interface using USB

Standard Computer Hardware

## Environment & Supply

Preferred air-conditioned, clean environment

Vibration-isolating ground plate for OES spectrometer and robot

Compressed air 6 bar oilfree

Argon 5.0

Electrical power 3 x 400V / N / PE 50 Hz

# Q8 CORONADO – System Components

## Sample Entry

### Sample-ID Terminal with Touch-Screen



Robust Touch Panel IPC

12,1 Inch TFT 800x600

Analog resistiv Touch

IP 65 front-side

Windows CE 5.0

Replaceable display protection film

No rotating parts (e.g. harddisk)



# Q8 CORONADO – System Components

## Sample Entry



### Sample Entry Slide

- For manual sample input
- Customized on sample geometry, prevention of incorrect sample placements
- Simple operation
- Ensures safety of operator



### Options

- Automatic sample entry with external transport systems
- Sample entry magazine

# Q8 CORONADO – System Components

## Sample preparation Belt Grinding Machine

Short-time grinding with extremely high power

No cooling of sample with additional cooling medium required

Robust construction

Easy belt changing because of upper belt guide

Belt changing during automatic operation possible,

no system downtime

Cast iron application:

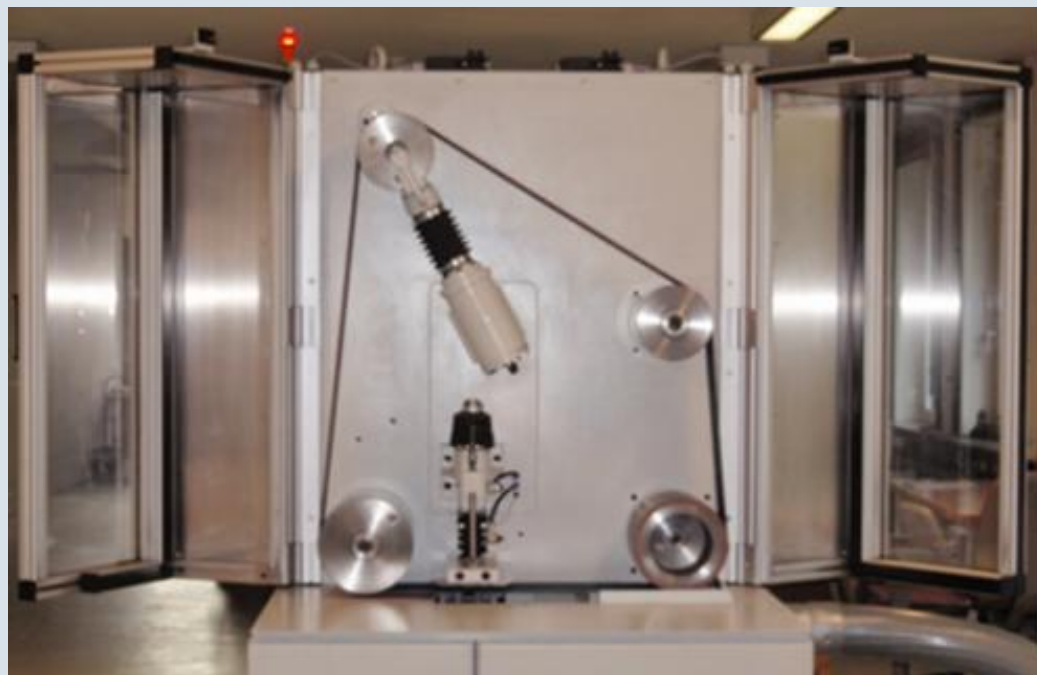
Preparation time is 15 to 18 seconds incl. sample handling

Belt lifetime appr. 350 samples with 0,3mm removal each

Sample temperature  $<65^{\circ}\text{C}$

Grinding belt with graining 40 or 50

Belt dimensions 150 x 3000 mm



## Q8 CORONADO – System Components

### Sample preparation Exhauster with Filter



Protection against dust exposure  
Compact, space-saving and vibration-isolated

Vibrating unit with clean unloading of chips in drawer, can be equipped with electrical motor

Air flow rate 840 m<sup>3</sup>/h  
Optional noise insulation available

# Q8 CORONADO – System Components

## Sample preparation Milling Machine



Fully automatic milling machine for the preparation of ferrous and non ferrous metals for Optical Emission and Roentgen Fluorescence Spectrometry.

The erosion can be defined more precisely.

The sample clamp is integrated into a special handling system.

The spindles are provided with exchangeable cutting plates.

For control and standardization samples special consumption optimized milling parameters are used.

# Q8 CORONADO – System Components

## Sparkstand Automat

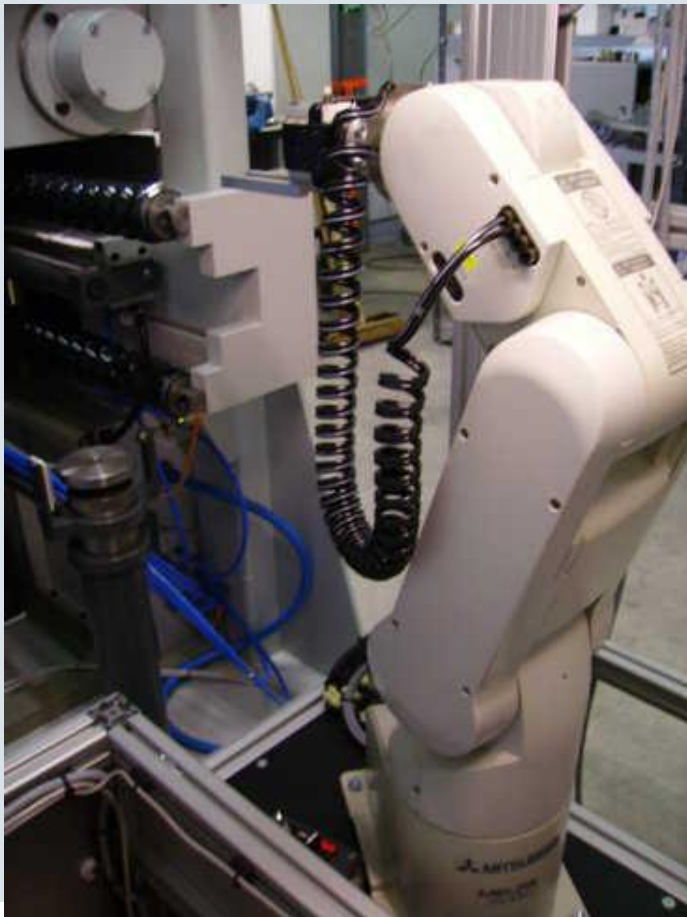


### Tasks

- Cleaning the electrode
  - Cleaning the sparkstand plate
  - Holding down the sample during sparking
  - Sealing the sparkstand hole against contamination with air
- 
- Works with compressed air
  - Can be used in manual operation as well
  - Power supply is independent from robot cell

# Q8 CORONADO – System Components

## Robot



5 axis articulated arm robot with  
pneumatic hand  
Payload max. 2kg  
Reach 410mm  
Repeatability +/- 0,02mm  
Max. speed 2,2 m/s

# Q8 CORONADO – System Components

## Sample Archive

Selective output of production samples in box or on sequential slide

Boxes removable

Optional sample output to external transport system



# Q8 CORONADO – System Components

## Sample Rack



Storage for OES system samples

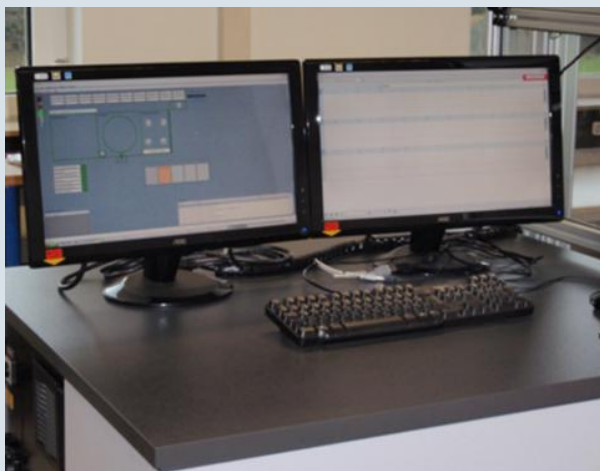
Parkpositions for production samples with low priority

Freely assignable

30 Positions (customized)

# Q8 CORONADO – System Components

## System PC



Two displays

Standard PC System Windows 7™

UPS protects the PC against power failure and line surge,  
avoids loss of data

Ethernet Switch



USB 2.0 Hub

Adjustable overpressure in PC Box  
for cooling and against contamination

# Q8 CORONADO – System Components

## Safety Concept



Access control with security doors equipped with electrical sensors

Door switches directly affect robot controller

Emergency-Stop security relays with Category 4

Opening the grinding belt housing does not lead to downtime of the rest of the system

Maintenance-accessibility to OES spectrometer has been considered

# Q8 CORONADO – Functions

## Sample Shapes



Production samples

Customer specific  
Preferred cylindric  
Height > 10mm  
Flash- and Stub-free



System samples

Cylindric  
Diameter 35-50mm  
Height 20-55mm



## Q8 CORONADO – Functions

### Analysis of Production Samples

- Guided registration (identification) of production samples at the ID-Terminal
- Sample input on sample entry slide
- Parking the sample in sample rack if it has low priority
- Sample preparation with belt grinding or milling machine
- Analysis with OES Spectrometer including positioning the sample for sparks
- Storage of analysis results in SQL database
- Transmission of analysis results to customer's host system
- Output the measured sample into the sample archive

## Q8 CORONADO – Functions

### Monitoring the Analytical Performance

- Automatic measurement of control samples to detect instrument drift in OES Spektrometer
- Automatic measurement of standardization samples to standardize recalibrate) the instrument
- Storage of standardization analysis results in SQL database
- Optimized sample preparation to save expensive reference sample material

## Q8 CORONADO – Software

- Designed for Q8 CORONADO
- Simple and comfortable operation
- All important system informations shown on one screen
- System configuration separated from run-time software
- Workflows and individual configuration using sample-ID masks
- Interoperation with MS Outlook to schedule system tasks like control sample measurement, standardization, maintenance, operator advices, etc.
- Scalable and extendable with optional und alternative system components

## Q8 CORONADO – Software



- Developed for Windows XP / 7
- Implementation on Microsoft .NET Framework 2.0 with C#
- Ergonomic user interface
- Modern, modular software architecture

# Q8 CORONADO – Software QMation – IDTerminal



Proben ID Terminal

Listen Aktualisieren

ID	Proben-Nr.:	Werkstoff	Status
▶ 169	64344466		New

Info

Neue Probe

START

Löschen

Gemessene Proben:

ID	Probe	G	Status	Start
▶ 168	64325865		Done	24.10.2006 12:01:36
167	64251 7		Done	20.10.2006 13:59:26
166	6425166		Done	20.10.2006 11:52:06
165	64251 5		Done	20.10.2006 11:49:59
164	64251 4		Done	20.10.2006 11:40:13
163	64251 3		Done	20.10.2006 11:37:29
162	64251 2		Done	20.10.2006 11:32:16

ID: 1 - SERVER: Running - CLIENT: Connected - SYSTEM: ON,Ready

# Q8 CORONADO – Software

## QMation – IDTerminal



- Guided registration (identification) of production samples
- Plausibility check of user input
- Individual, customized procedure for entering a sample identification,
- Display of current system state
- Display of last entered samples
- Reception of sample identification from customers system

- Control of workflows for production samples
  - Definition of workflow parameters for production samples take place by using sample-ID masks.  
Sample workflow parameters are:
    - Sample preparation parameters
    - Measurement parameters for OES Spectrometer
    - Parameters for electrode cleaning
    - Parameters for sample labeling (option)
    - Archive position for sample output
    - Sample priority
  - Sample handling at sparkstand to position the sample between sparks
  - Monitors automatic averaging
  - Archiving the sample (optional with labeling)
  - Park production samples having low priority

- Monitoring analytical performance (self-control)
  - Scheduled measurement of control samples
  - Scheduled or required standardization of the OES spectrometer:
    - Standardization with all standardization samples
    - Partial standardization for time-optimized standardization after control measurements
    - Type standardization
  - Scheduling with MS Outlook

- Usage of process rules
  - Examples:
    - Locking the system for production samples during standardization
    - Automatic standardization (partial oder full) after failed control measurement
    - Start conditions for parked production samples
    - Locking the system for production samples after failed standardization

- Alarm system & diagnostics
  - System event logfile
  - Sending of system messages & diagnostic data by e-mail
  - System monitor for external PC's (under development)
  
- Time-scheduled tasks
  - Scheduling tasks with MS Outlook for:
  - Control sample measurements
  - Standardizations
  - Locking the system for specified period of time
  - Maintenance rates by pop-up window
  - Operator advices by pop-up window

# Q8 CORONADO – Software QMation



- Human Machine Interface (HMI)
  - Sample tracking
  - State indication of each system component
  - Start options for control measurements and standardizations
  - Diagnosis in case of errors
  - Online view on state of sample
  - Online display of important system parameters
  - Online display of system logfile
  - Online display of time-scheduled tasks
  - Locking the system for production samples
  - Online display of current allocation in sample rack

# Q8 CORONADO – Software QMation



**Probenposition: SAMPLEPOS\_M1\_10**

Optionen:

Probe wurde manuell vorbereitet

Probe soll vor der nächsten Analyse vorbereitet werden

Proben-ID: **K 1 - RG14/10B**

Probenposition: **SAMPLEPOS\_M1\_10**

Probenform: **Round 37**

Uhrzeit	Bedeutung	Priorität
09.04.2010 11:02:30.000	Erkennung des Gerätes	128 (0)
09.04.2010 11:07:27.907	Analyse einer Kontrollprobe ohne Fehler beendet	CTRL_1_4541
09.04.2010 11:08:49.902	Vorbereitung des Gerätes	CTRL_1_4541
09.04.2010 11:08:49.407	Analyse einer Kontrollprobe ohne Fehler beendet	004 (0)
09.04.2010 11:09:19.829	Druckluft auf	
09.04.2010 11:09:19.234	Druckluft zu niedrig	

# Q8 CORONADO – Software QMation SysManager



- Configuration manager for the Q8 CORONADO
- Parameters for workflow of Production Samples and Standardisation Samples
- Positioning of the Spark Positions
- Parameter for Sample preparation
- Parameter for Sparkstand Automat

# Q8 CORONADO – Performance Production Sample Throughput



## ■ Typical Time for a cast iron production sample on Grinding Machine:

Handling:	(Sample Input, Robot Handling)	13s
Preparation:	(Grinder Handling), Grinding Time about 3 sec.	17s
Handling:	(Robot, Grinding Machine to Sparkstand)	11s
Analysis:	(2 sparks incl. Sparkstand Cleaning)	75s
Handling:	(Robot, Sample to Archiv)	6s
Total:		122s

-> 116s until mean-value out of two sparks

# Q8 CORONADO – Performance Processing Time Standardization



- Measured times for standardization with 3 samples:
  - Best case, no sample preparation required:  
**4 Minutes 20 Seconds**
  - Worst case, all samples must be prepared:  
**5 Minutes 20 Seconds**

# Q8 CORONADO Laboratory Version with Grinding Machine



# Q8 CORONADO Container Version with Milling Machine



# Q8 CORONADO – System Components Options



- Container
- Sample labeling
- Sample surface check with camera
- Sample entry magazine
- Measurement of radioactivity

# Q8 CORONADO – Option Container



# Q8 CORONADO



9000 Series printer offer the best balance between performance and flexibility in there segment for an easy integration in all Manufacturing environments. Their state-of-the-art design requires minimal attention and provides high quality coding.The continuous inkjet technology prints the best before dates,Logos, alphanumeric text and 1D and 2D barcodes for different Industries



E8 i52 - Dot peen marking machine designed to be integrated into production line, user-friendly software enables easy creation of texts and graphic symbols and entering marking parameters such as: XY axis positioning, impact force, height and width of characters, resolution between dots etc.

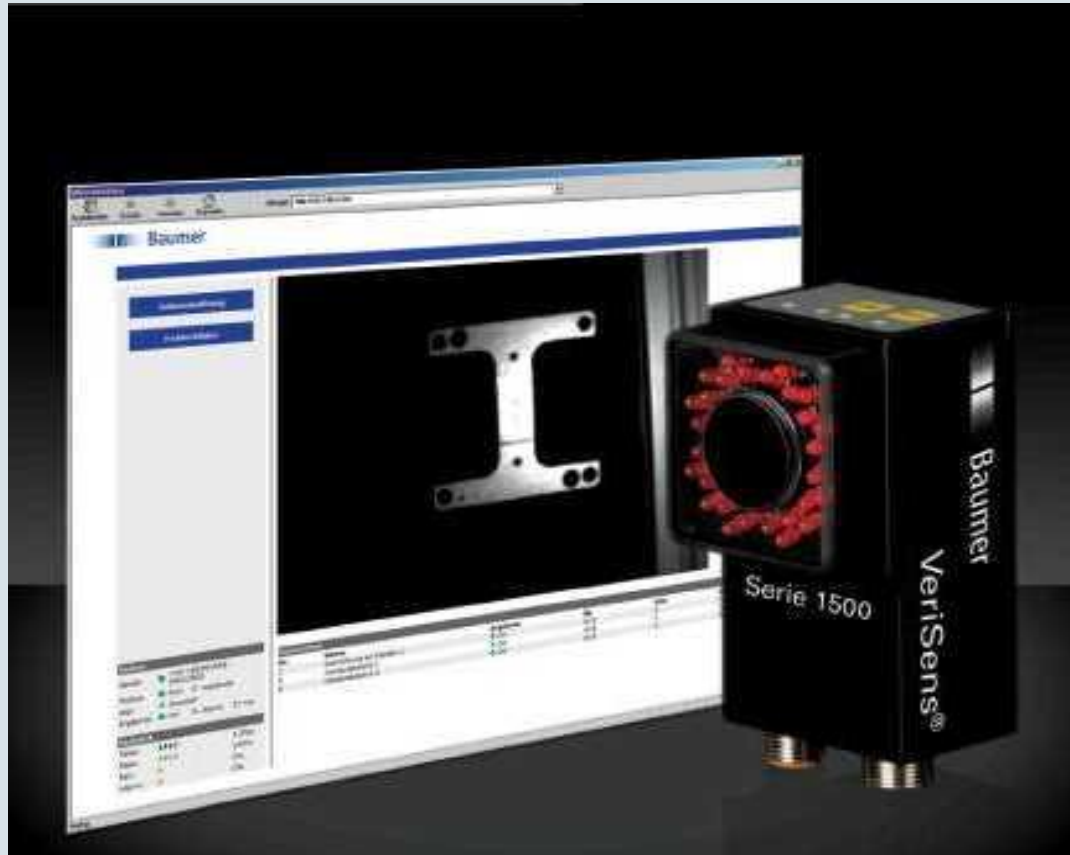


This printer has the following features:

The print head block can be opened providing smooth loading of media and ribbon.

Various kinds of media can be used as the media sensors can be moved from the centre to the left edge of the media. When the optional interface board is installed, Web functions such as remote maintenance and other advanced network features are available.

# Q8 CORONADO Option Sample surface check with camera



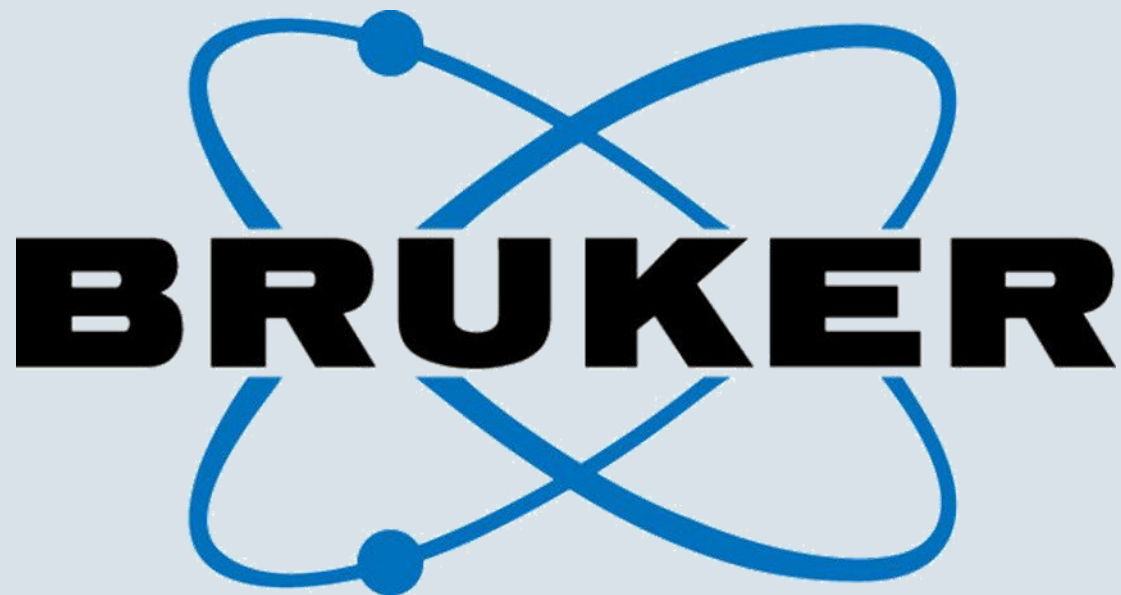
## Functions

Position Regulation

- \*Brightness Sensors
- \*Contrast Sensors
- \*Surface Sensors
- \*Distance Sensors
- \*Point Sensors
- \*Edge Sensors
- \*Circle Sensors
- \*Contoure Sensors
- \*Muster Sensors
- \*Object Sensors



Thank You for Your Attention !



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