

---

ABB MEASUREMENT & ANALYTICS

# Gas analysis in cement industry

Continuous monitoring to optimize productivity, safety and sustainability



# Expertise in process and emission monitoring

## Gas analyzer systems at a glance



With 30 years of experience and more than 600 kilns systems supplied worldwide, ABB is the market leader in cement plants providing state-of-the-art gas analyzers.

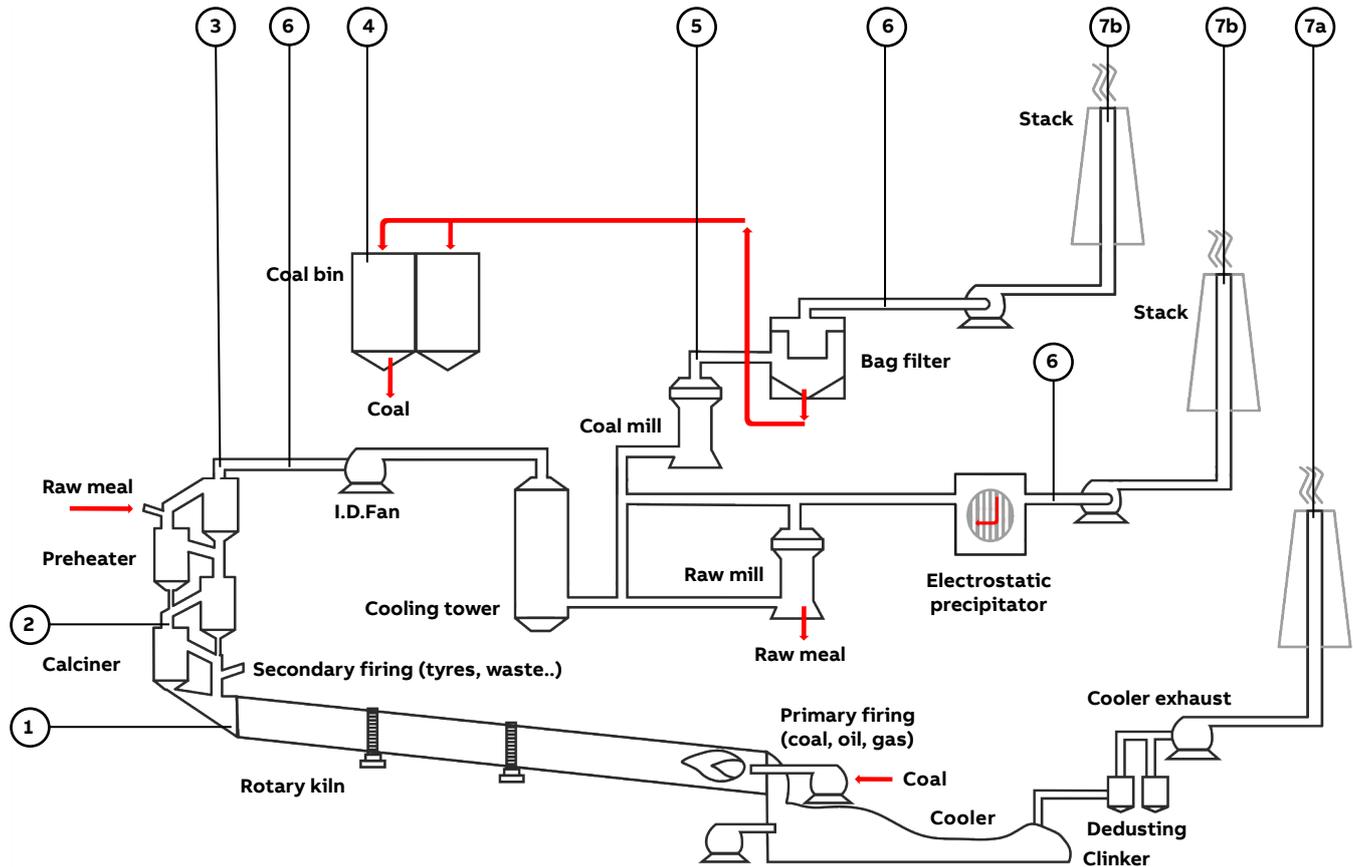
SCK is the system designed for the sampling of hot cement flue gas at kiln gas exit. In presence of hard encrustations the probe H allows the operator to save significant time for maintenance due to an exclusive plunger design that mechanically breaks encrustations without sampling interruption. Thus lowering the maintenance costs while increasing the data availability and production quality.

The ACX analyzer system is tailored to the different cement applications. It ensures effective monitoring on the primary and secondary combustion, validates the clinker quality, minimizes the fuel costs through optimized combustion control and support a safe operation.

ACF5000 is the only truly integrated and fully certified CEM system offering high performances, extensive communication capabilities as well as the longest maintenance interval in the market.

# Overview

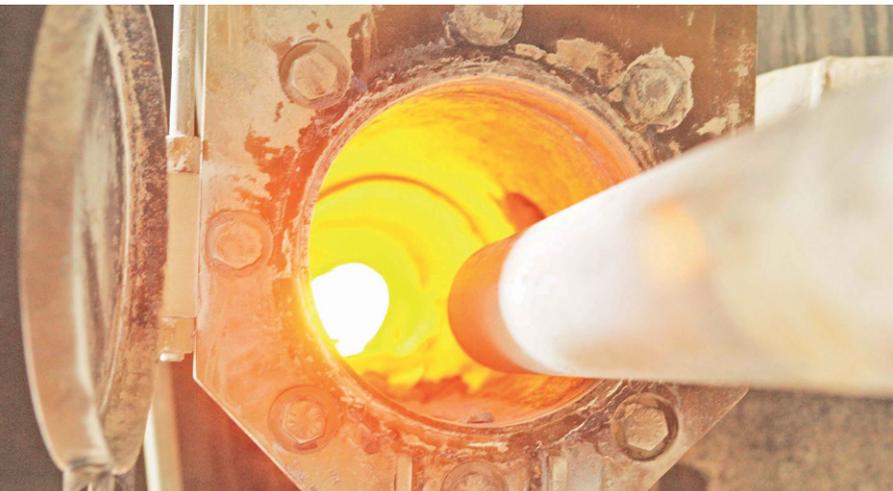
## Gas analysis in the cement industry



Measuring point	Application	Measuring task	Measuring components	Solution	Analyzers
1	Kiln gas outlet	<ul style="list-style-type: none"> <li>• Optimization of primary firing</li> <li>• Lower fuel consumption</li> <li>• Maintain clinker quality</li> </ul>	CO, O <sub>2</sub> , NO, CO <sub>2</sub> , CH <sub>4</sub> , SO <sub>2</sub>	ACX + SCK	Uras, Limas, Magnos
2	Calciner	<ul style="list-style-type: none"> <li>• Optimization of secondary firing</li> <li>• Lower fuel consumption</li> </ul>	CO, O <sub>2</sub>	ACX ACX + SCK	Uras, Magnos
3	Preheater	<ul style="list-style-type: none"> <li>• Safety measurement</li> <li>• Prevention of explosion in ESP</li> <li>• Control of false air in preheater</li> </ul>	CO, O <sub>2</sub>	ACX, LS25	Uras, Magnos
4	Coal bin	<ul style="list-style-type: none"> <li>• Safety measurement</li> <li>• Prevention of smoldering (monitor of air entrance)</li> </ul>	CO, (O <sub>2</sub> )	ACX, LS25	Uras, Magnos
5	Coal mill	<ul style="list-style-type: none"> <li>• Safety measurement</li> <li>• Prevention of smoldering (monitor of air entrance)</li> </ul>	CO, O <sub>2</sub>	ACX	Uras, Magnos
6	DeNOx	<ul style="list-style-type: none"> <li>• NH<sub>3</sub> measurement</li> </ul>	NH <sub>3</sub>	LS4000	
7a	Stack	<ul style="list-style-type: none"> <li>• Emission monitoring</li> </ul>	CO, O <sub>2</sub>	ACX	Uras, Magnos
7b	Stack	<ul style="list-style-type: none"> <li>• Emission monitoring</li> </ul>	CO, NOx, SO <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> , HCl, VOC, HF	ACF ACX + LS25	Uras, Limas, Magnos

# SCK – the gas sampling system for cement kiln and calciner

## Safety and reliability at work



- 01 Probe retractor
- 02 Cooling unit
- 03 Control unit

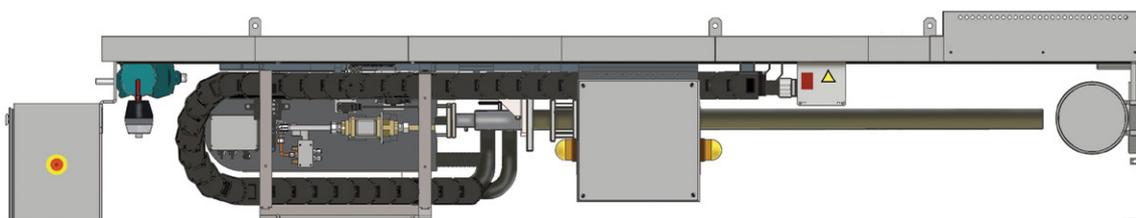
SCK the solution designed for the sampling of hot cement flue gas with a high dust load for gas analysis in rough and harsh conditions.

**The SCK sampling system comprises the following modules**

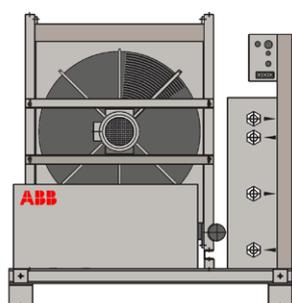
- Probe retractor with pneumatic motor and chain-driven water-cooled probe type 60S or type H
- Cooling unit with speed-controlled heat exchanger and cooling water circulation pump
- Control unit with industrial controller including color touch panel

**SCK benefits**

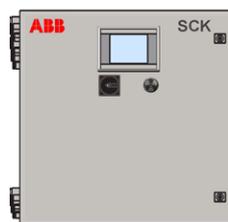
- Experience gained by more than 600 installations worldwide
- Easy installation – delivered as three premounted functional units
- Easy systems to ACX or third party analyzer systems
- Pneumatically driven retractor for safe sampling
  - Automatically driven oven flap for your safety
  - Automatic cyclic cleaning of probe and filter
- The only manufacturer offering two different types of water-cooled probes
- All under control – user-friendly operation, diagnosis and maintenance
  - Touch panel operation with trend display and configurable alarm limits
  - Predictive maintenance
  - Remote access



—  
01



—  
02



—  
03

# Probe 60S and probe H for kiln exhaust gas sampling

## It's expensive, not to have them

—  
04 Red-hot retracted probe  
—  
05 Probe H with plunger

ABB is the only supplier on the market that offers two different water-cooled probes. Probe 60S has an optimized design of sampling openings to minimize clogging filters. Probe H with its unique plunger design is preferred where extremely hard encrustations are to be expected.

### The challenge and the solution

Typically strong encrustations require cleaning the probe manually on a regular basis.

That results in:

- Interruption of valid measuring values
- Effort for maintenance work

The right solution in these cases is the probe H. It has an exclusive design with a built-in plunger which automatically and mechanically breaks the extreme hard encrustations at the tip of the probe.

### The advantages

The key advantages related to this special design are that the plunger automatic movement set the tip of the probe free of encrustations while continuing sampling the gas and measuring.

That means:

- Without extraction of the probe
- Without loss of valid data
- Without maintenance efforts

—  
04



—  
05



# AO2000 and EL3000 series

## Proven and reliable continuous gas analyzers

—  
01 Advance Optima  
series modular con-  
tinuous gas analyzer  
—

02 EasyLine series  
gas analyzers

The modular gas analyzers AO2000 combine advanced technologies with more than 80 years of experience in process and environmental gas analysis. They are the innovative solution for the demands of today and the challenges of tomorrow. The AO2000 series can be used in almost every form of production and has proven itself in the toughest processing environments.

### AO2000 key features

- Multi-analyzer systems with up to four fully combinable analyzer modules like Uras (NDIR), Limas (NDUV), Magnos (O<sub>2</sub>), Caldos (TCD) and Fidas (FID)
- Up to six measuring components
- Validation/calibration with proven calibration cells without test gas to save money for maintenance
- Full compliance with international environmental directives
- In-built PLC functionality with Function Block programming
- Analog I/O, digital I/O
- Unlimited communication over Ethernet or Modbus or PROFIBUS
- Free PC HMI simulation running over Ethernet
- Analyze IT Explorer: remote maintenance software
- Ex versions available



EL3000 is both a powerful and affordable series of instruments for the monitoring of gas concentrations in numerous applications. EL3000 is based on the proven and reliable analyzer technology of ABB for extractive continuous gas analysis.

### EL3000 key features

- Uras (NDIR), Limas (NDUV), Magnos (O<sub>2</sub>), Caldos (TCD) and Fidas (FID)
- Combine two analyzers in one enclosure for an excellent price-performance ratio
- Up to five measuring components in one unit
- Calibration with proven calibration cells without test gas to save money for maintenance
- Full compliance with international environmental directives
- Analog outputs, digital I/O, Modbus, PROFIBUS
- Ex versions available
- Asian languages available



# ACX cold/dry extractive system

## Complete. Configurable. Consistent.

—  
03 ACX cold/dry system  
for emissions and  
process monitoring

ACX is a pre-engineered system solution for continuous gas analysis, including everything from probe, sample lines and sample conditioning to reliable and certified analyzers of the Advance Optima series.

The system can be operated from a keypad and display in the front door without opening the shelter. The system is available with various options to be tailored to your measuring tasks; it is especially designed for easy service and maintenance.

ACX is suitable for non water-soluble components – typically NO, NO<sub>2</sub>, NOX, CO, CO<sub>2</sub>, SO<sub>2</sub>, CH<sub>4</sub>, O<sub>2</sub>, VOC.

### ACX offers

- Certified analyzers with proven measuring technology: infrared/UV photometer, paramagnetic oxygen analyzer, electrochemical oxygen sensor, FID analyzer
- Up to six measuring components, in up to four analyzers with corresponding sample conditioning
- Convenient and easy external operation
- Communication interfaces: Modbus, Profibus or Ethernet to connect to a PC or process control system
- Integrated self-monitoring functions and easy remote service & maintenance
- Free licensed Analyze IT Explorer software for asset management and worldwide access for remote maintenance via Ethernet

### ACX benefits

**Complete.** From sampling to measurement.

- World leading AO2000 series analyzers
- Physically and digitally integrated sample handling
- Three customer-friendly configurations

**Configurable.** Tailored to your needs.

- Pre-engineered for known applications
- Adaptable to even the most challenging applications
- Automated generation of system drawings

**Consistent.** The quality you expect.

- Produced in Germany
- Easy operation via front door
- Familiar and service-friendly internal layout



—  
03

### Did you know?

The ACX system can also integrate other suppliers signals for example, dust, p, T, V̇ and mercury to transmit to DCS or DAHS

# ACX Fast

## The unique tailored solution for safety measurement on the ESP

01  $T_{90}$  system time for CO

ACX Fast is the specially designed ACX system for the CO monitoring before the electrostatic precipitator (ESP) in a cement plant. With a very short response time it allows a safe burning process control, fewer shutdowns of the ESP and lower environmental impact.

### When does it get dangerous in an ESP?

Dust particles get loaded in the electric field of the ESP and separated. ESP acts as a source of ignition at high CO levels. In practice, explosions may occur when CO is in the range of 8 to 12 Vol% and  $O_2 > 6$  Vol%.

### Where is the best sampling point?

- The gas analysis must be done before the process gas has reached the ESP
- The ultimate gas sampling point for the ESP is at the top of the preheater tower (preheater gas exit)

### Why is it so important to sample at the top of preheater?

The CO concentration at the top of the preheater is the same as the concentration entering the ESP. This allows the gas analysis an additional measuring time before the process gas reaches the ESP.

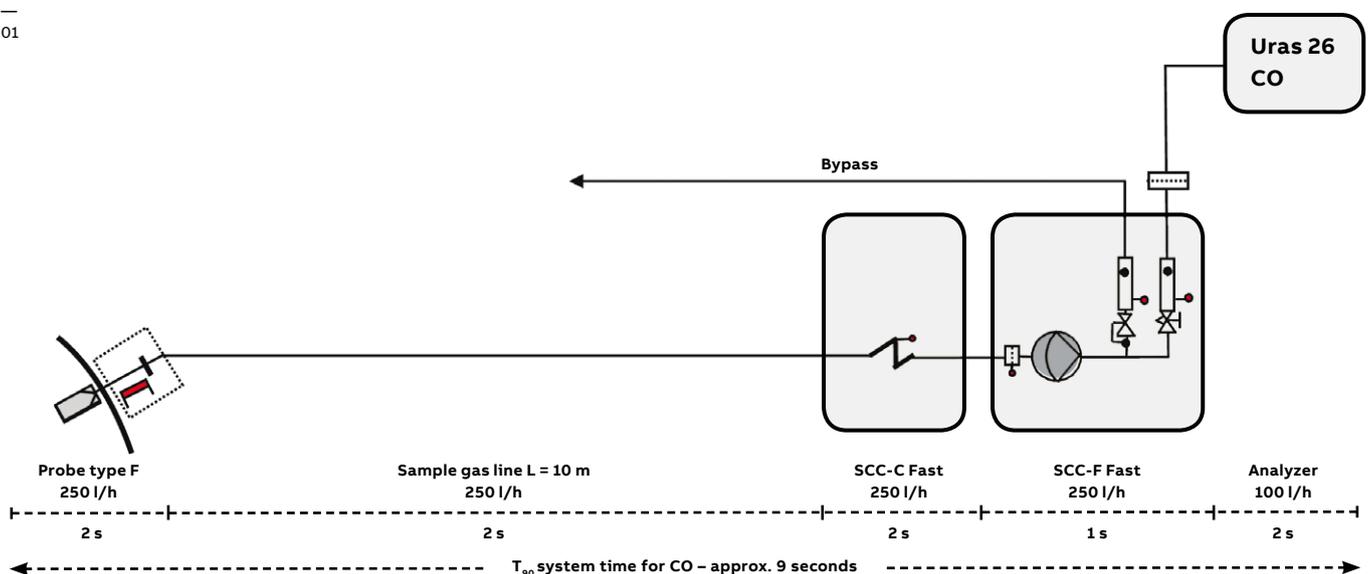
### Why not sample directly in front of the ESP?

The high process gas velocity (around 12 m/s) requires a sampling point up-stream of the ESP, otherwise the high CO concentration reaches the ESP before the gas analysis has taken place. Even with a short  $T_{90}$  time (2 to 3 s) a gas sampling directly in front of the ESP is therefore not appropriate. In order to achieve a very short response time for the complete system, ABB has developed the ACX Fast extractive gas analysis system.

### System performances and advantages

- System  $T_{90}$  time for CO is less than 10 s
- CO trigger level could be set higher
- Sampling interruption only due to automatic back purge and weekly calibration
- With the dual switching configuration there are no sampling interruptions during automatic back purge

01



# ACF hot/wet extractive system

## The new benchmark in FTIR based CEMS

—  
02 ACF hot/wet system  
for emission and  
process monitoring

ACF5000 is a fully certified analyzer system to accurately monitor the composition of exhaust gases.

- A completely pre-engineered CEM system for easy operation
- With lowest maintenance interval in the market
- Worldwide certified support

### ACF5000 offers

- Measurement of 15 gas components
- Hot/wet extractive measurement
- Powerful FTIR technology
- Proven FID and ZrO<sub>2</sub> sensors to measure the unburned hydrocarbons and the oxygen content
- Completely pre-engineered system with a compact and modular design
- Communication, control and maintenance via fieldbus and Ethernet/TCP or modem
- Technical drawings available on the day of quoting

### International certifications

- TÜV certification according to the German and European requirements, EU Directives 2010/75/EN and EN 14181
- MCERTS certified in Great Britain
- Compliant to US and Canadian EPA requirements

—  
ACF5000 is suitable for all components, including water soluble – typically NO, NO<sub>2</sub>, N<sub>2</sub>O, NH<sub>3</sub>, SO<sub>2</sub>, HCl, CO, CO<sub>2</sub>, CH<sub>4</sub>, H<sub>2</sub>O, HF, O<sub>2</sub>, VOC.

### ACF5000 benefits

#### Reliable

- More than 25 years experience with FTIR spectrometers in gas analysis and more than 1600 installations worldwide
- Fully compliant to European and international legislations
- Worldwide support through certified service engineers

#### Flexible

- Ready for operation – only electrical power supply and instrument air are needed
- Easy adding of further measuring components – no additional hardware
- Extra gas port to connect other analyzers – no need for a separate probe

#### Profitable

- Saving time and money with automatic validation through built-in validation cell without test gas
- Best maintenance interval in the market
- Maintenance-free sample transportation through aspirator pump
- Cost reduction for routine maintenance through remote control and diagnosis



# Dynamic QR Code

## Communication made easy

— 01 Dynamic QR Code on analyzer display  
 — 02 Workflow Dynamic QR Code

ABB's Dynamic QR Code is a unique feature to display dynamically generated QR codes on the analyzer display for easy communication.

In addition to static information for system identification, it contains also dynamic information on system configuration and analyzer health status. In combination with mobile devices, the Dynamic QR Code represents an innovative way of customer's communication which allows, for instance, improved case-specific support by ABB resulting in an increased availability of analyzer assets. It is compatible with standard QR code reader applications as well as ABB's application "my Installed Base (myIB)".

**Generally applicable for all installations across all industries, especially interesting for**

- Measurements with high availability requirements (for example CEMS)
- Remote installations
- Installations with constraint remote access due to information security guidelines

**High simplicity:**

**standardized, platform-independent**

- Easy handling, reliable data transfer
- No additional hardware or working steps required
- Simple access to relevant data
- Standardized output and data handling

**Increased availability:**

**case-specific information and individual support**

- Faster communication enabled by complete information package
- Faster resolving time due to case-specific service recommendations and better preparation of service calls

**Improved installed base management**

- Simplified product registration & better data quality of installed base
- Complete product history

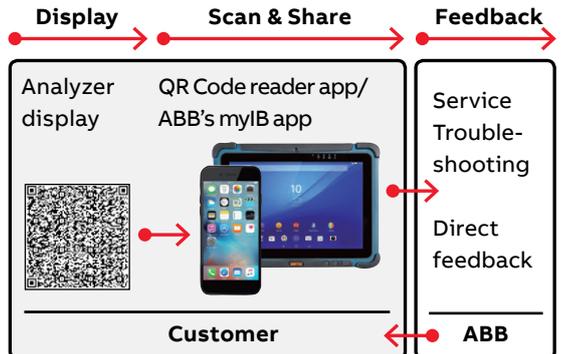
The Dynamic QR Code is available for the product lines AO2000, ACF5000 and ACX as well as EL3000 and EL3060. For already installed base, upgrade options are available. Please contact your local ABB representative for more details.

For further information, refer to operating instructions.

01



02



# The added value

## What you can expect from a market leader

As one of the world's leading suppliers of analyzer technology, we offer our customers additional benefits and services other manufacturers can not provide. With the added values ABB Analytical helps to improve performance and reliability at work.

### **Best choice of analyzers tailored to your needs**

We offer the broadest selection of measuring principles under one roof. All types of analyzers share a common operation to reduce the need for training and spare parts.

### **Certified sales and service partners wherever you are**

Our "Manufacturer Certified Service" program involves more than 300 service specialists with many years of experience and comprehensive know-how working for our clients on-site worldwide. Our engineers are your professional partners dedicated to finding the best solutions for your measuring tasks. They regularly undergo manufacturer training and certification.

### **Long-term security in your investment**

Our comprehensive and transparent life cycle plan for each of our products covers the service of spare parts and service support for their entire lifetime. Our products are extendable with upgrade programs keeping them technologically up-to-date at all times.

### **Most powerful software solutions**

Full remote control and maintenance access to the system inside a protected network and quality monitoring (QAL3) are available for ABB analyzers. Integrated controllers with PLC functionality provide monitoring while controlling the measurement from sample taking right up to analysis.

### **Unique time and cost saving calibration concepts**

ABB has 30 years of unrivalled experience in producing gas-filled calibration cells, allowing internal calibration without test gas cylinders for photometers. Single-point calibration with ambient air as the standard gas is also possible.

### **Unrivalled options for connectivity**

ABB gas analyzers and systems excel in Ethernet networkabilities and Modbus or PROFIBUS interfaces. This enables the analyzer data to be easily read, archived and visualized on a PC, PLC or process control system.

### **Assured quality through independent certification**

ABB provides all major international certificates for CEMS, hazardous area installations, metrological approvals, electrical safety and quality and environmental management.



—

**ABB Limited**

**Measurement & Analytics**

Howard Road, St. Neots

Cambridgeshire, PE19 8EU, UK

Tel: +44 870 600 6122

Fax: +44 1480 213 339

Email: [enquiries.mp.uk@gb.abb.com](mailto:enquiries.mp.uk@gb.abb.com)

**ABB Inc.**

**Measurement & Analytics**

125 E. County Line Road

Warminster, PA 18974, USA

Tel: +1 215 674 6000

Fax: +1 215 674 7183

**ABB Automation GmbH**

**Measurement & Analytics**

Stierstaedter Str. 5

60488 Frankfurt am Main, Germany

Tel: +49 69 7930-4566

Email: [cga@de.abb.com](mailto:cga@de.abb.com)

**[abb.com/analytical](http://abb.com/analytical)**

