
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 35 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.

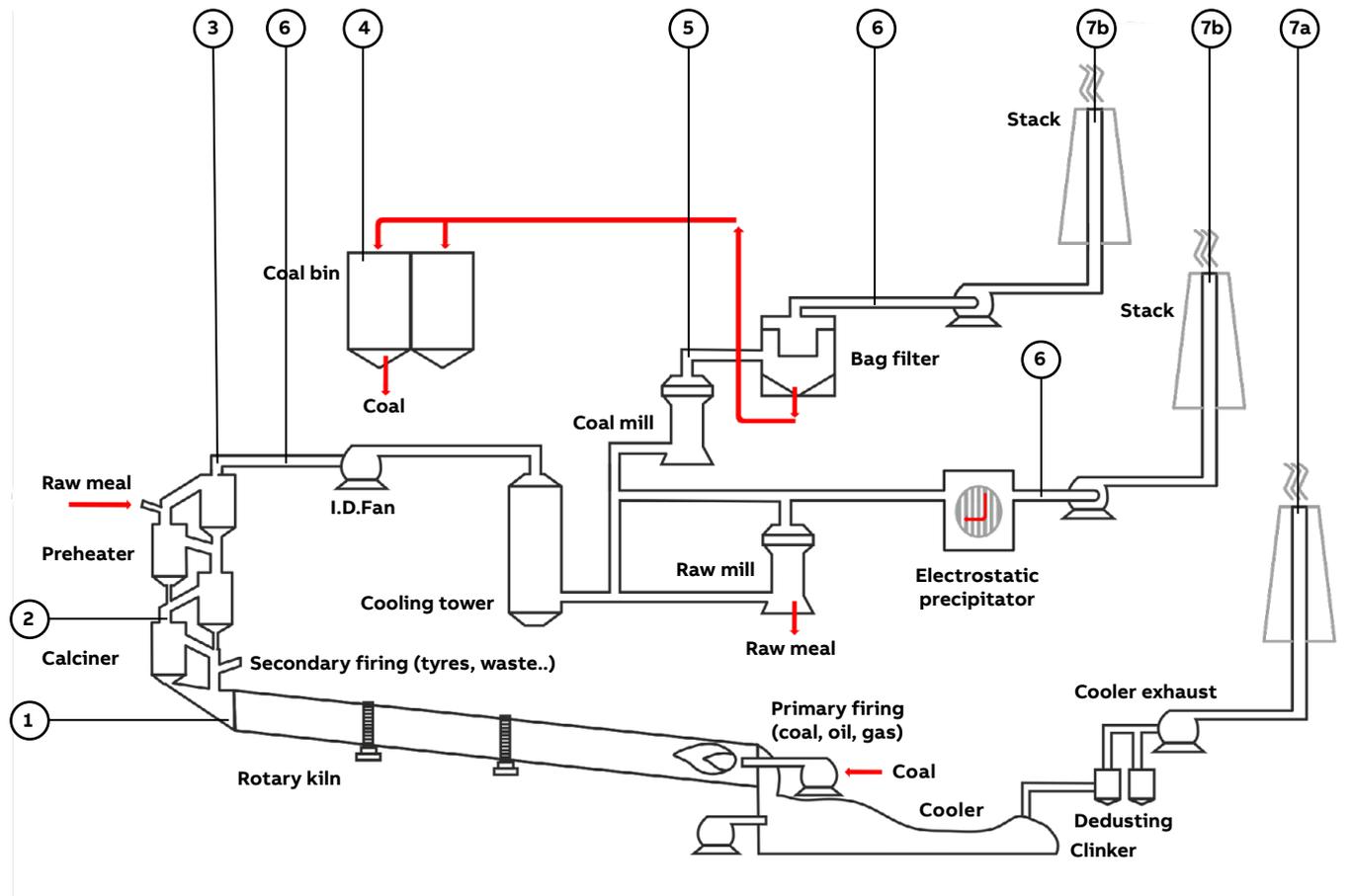
ProKiln is the system designed for the sampling of hot cement flue gas at kiln gas exit. In presence of hard encrustations, the ProKiln allows the operator to save significant time for maintenance due to an exclusive probe design that breaks encrustations by powerful air blasts. Thus lowering the maintenance costs while increasing the data availability and production quality.

The AO2000 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"> • Optimization of primary firing • Lower fuel consumption • Maintain clinker quality 	CO, O ₂ , NO, CO ₂ , CH ₄ , SO ₂	AO2000 System + ProKiln	Uras, Limas, Magnos
2	Calciner	<ul style="list-style-type: none"> • Optimization of secondary firing • Lower fuel consumption 	CO, O ₂	AO2000 System + ProKiln	Uras, Magnos
3	Preheater	<ul style="list-style-type: none"> • Safety measurement • Prevention of explosion in ESP • Control of false air in preheater 	CO, O ₂	AO2000 System, LS25	Uras, Magnos
4	Coal bin	<ul style="list-style-type: none"> • Safety measurement • Prevention of smoldering (monitor of air entrance) 	CO, (O ₂)	AO2000 System, LS25	Uras, Magnos
5	Coal mill	<ul style="list-style-type: none"> • Safety measurement • Prevention of smoldering (monitor of air entrance) 	CO, O ₂	AO2000 System	Uras, Magnos
6	DeNOx	<ul style="list-style-type: none"> • NH₃ measurement 	NH ₃	LS25	
7a	Stack	<ul style="list-style-type: none"> • Emission monitoring 	CO, O ₂	AO2000 System	Uras, Magnos
7b	Stack	<ul style="list-style-type: none"> • Emission monitoring 	CO, NOx, SO ₂ , O ₂ , CO ₂ , HCl, VOC, HF	ACF5000 AO2000 System + LS25	Uras, Limas, Magnos

ProKiln – the gas sampling system

The next generation is powerful!

Cement production is highly energy intensive and worldwide producers are continuously seeking ways to increase their use of alternative fuels to reduce the impact on the environment and increase process efficiency.

According to CEMBUREAU it is possible to use up to 95% alternative fuels. This presents new challenges for the critical measurements at the kiln inlet, i.e. probe blockages, increased maintenance efforts and low availability.

01 ProKiln



To meet the changing process conditions, ABB and FLO2R have joined forces to offer a premium product that supports cement plants in achieving their objectives. With 60 years combined experience, the 4th generation kiln inlet solution of ABB has been developed.

ProKiln consists of a:

- retraction unit with an electrical motor and chain-driven water-cooled probe
- cooling unit with a heat exchanger and cooling water circulation pump
- control unit with industrial controller including color touch panel

The unique features of ProKiln are:

- Powerful cleaning with 2 air blasters
- Filter in the tip of the probe ensuring no mix of sample and dust
- Limiting direct dust flow based on tip shield
- Innovative and unique nozzle design
- Thoughtful design allows an easy manual cleaning
- No moving parts
- User-friendly operation via touch panel
- Combinable with AO2000 system and 3rd party analyzers
- Available as single and double probe configuration

Evaluation by a major global cement producer

“Powerful cleaning by air blasters is a well-known cleaning method in the cement industry. Using it in gas analysis probes significantly reduces the risk and complexity of time-consuming maintenance activities compared to other cleaning methods.”

“The high-powered air blaster in combination with a sample filter in the tip of the probe optimizes the availability of the gas analysis system.”

Major global cement producer

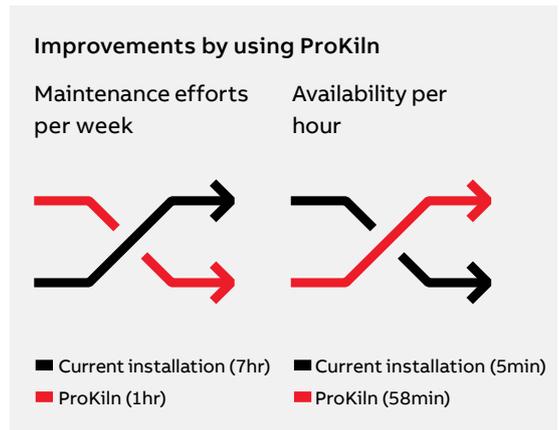
- 04 Center pipe allows easy manual cleaning
- 05 Unique nozzle design of ProKiln

ProKiln has been put through its paces during a trial at a plant of the world’s largest cement producer. The test ran for 6 months at a plant that uses more than 80% alternative fuels. The reduced maintenance efforts and the increased availability convinced the customer to replace the current installation with ProKiln.

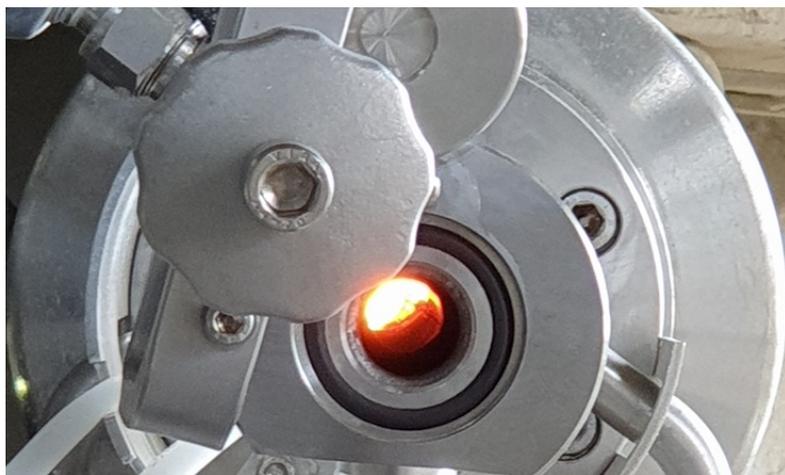
With more than 60 years experience in the field of cement ABB proves to be the right partner with a compelling solution for current challenges to support cement plants on their journey to

- maximize throughput
- ensure high-quality cement
- prevent kiln downtime
- reduce operating costs

In addition to ProKiln, ABB offers Probe 60s. A solution predominantly used for plants with less challenging applications.



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 (O₂), 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 (O₂), 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



AO2000 System cold/dry extractive system

Complete. Configurable. Consistent.

—
03 AO2000 System
cold/dry extractive
solution for emissions
and process monitoring

AO2000 System 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.

AO2000 System is suitable for non water-soluble components – typically NO, NO₂, NOX, CO, CO₂, SO₂, CH₄, O₂, VOC.

AO2000 System 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

AO2000 System 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



Did you know?

The AO2000 System can also integrate other suppliers signals for example, dust, p, T, V and mercury to transmit to DCS or DAHS

AO2000 System Fast

The unique tailored solution for safety measurement on the ESP

01 T_{90} system time for CO

AO2000 System Fast is the specially designed 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.

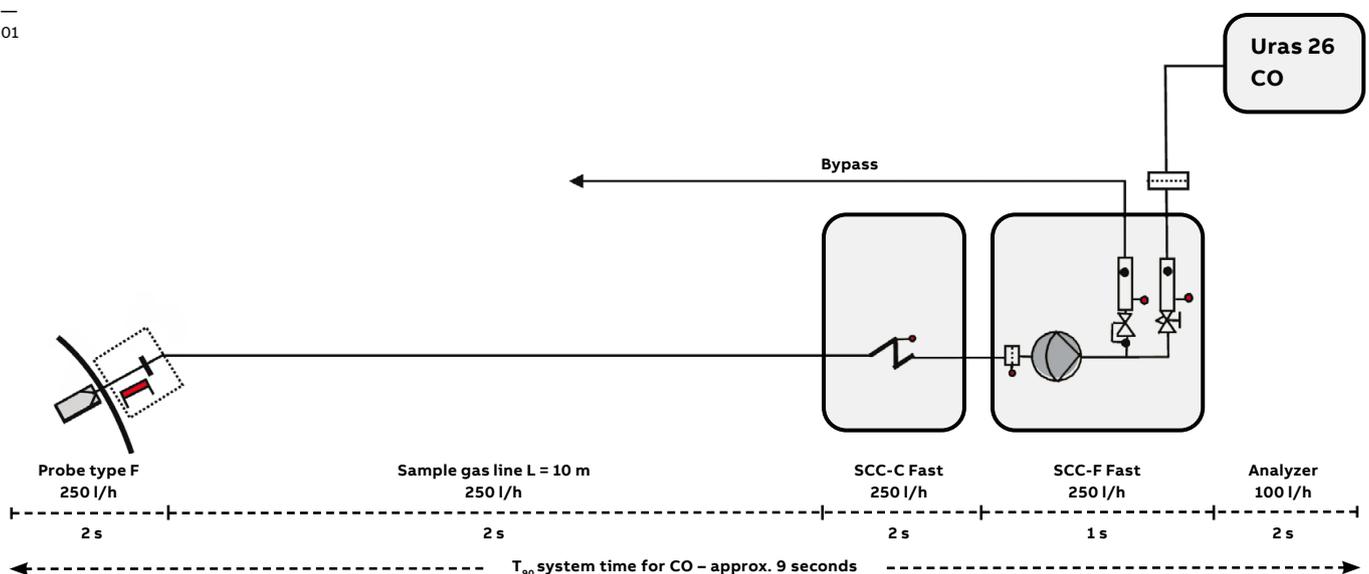
Why not sample directly in front of the ESP?

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 AO2000-System 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



ACF5000 hot/wet extractive system

The new benchmark in FTIR based CEMS

—
ACF5000 hot/wet
system for emissions
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 longest 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 ZrO₂ 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

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ACF5000 is suitable for all components, including water soluble – typically NO, NO₂, N₂O, NH₃, SO₂, HCl, CO, CO₂, CH₄, H₂O, HF, O₂, 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

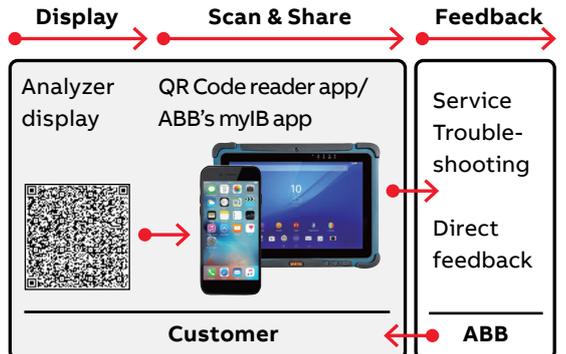
The Dynamic QR Code is available for the product lines AO2000, ACF5000 and AO2000 as well as EL3000 and EL3060. For already installed base, upgrade options are available. Please contact your local ABB representative for more details.

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 Measurement & Analytics

For your local ABB contact, visit:
abb.com/contacts

For more product information, visit:
abb.com/analytical

