Complete sampling system comprising only three pre-assembled modules

Pre-assembled tubes and bus cables significantly reducing the system installation time

Robust system design

Standardized interfaces to ABB’s and third-party manufacturers’ analyzer systems

Pneumatically driven probe retractor with dust cover and automatic oven flap

Robust, water cooled gas sampling probe types

Probe type H with automatic mechanical cleaning

Automatic probe retraction in case of compressed air or power supply failure

Automatic cyclic cleaning of probe and filter

Closed cooling water circuit with speed-controlled heat exchanger

Continuous monitoring of cooling water pressure, temperature and flow

Control unit with color touch panel featuring comprehensive operation, diagnosis and maintenance capabilities

Graphic trend displays for predictive maintenance purposes

Password-protected menu levels adapted for the needs of different user groups in the cement plant

Various tools for remote operation and remote diagnosis available

User interface in national languages available on request
Application and System Overview

Application
The SCK sampling system is designed for sampling of hot cement flue gas with a high dust load for gas analysis. Usage sites are the rotary cement kiln gas exit and the calciner gas exit in dry process clinker kilns. The system is suitable for applications in rough environmental conditions.

The SCK sampling system is preferably combined with ABB's ACX analyzer system. The combination of SCK with analyzer systems of third-party manufacturers is also possible.

System Overview
The SCK sampling system comprises the following modules:
- Probe retractor with pneumatic motor and chain-driven water-cooled probe type H or type 60S
- Cooling unit with speed-controlled heat exchanger and cooling water circulation pump
- Control unit with industrial controller incl. color touch panel
Retractor

1 Pneumatic box
2 Emergency stop button “Probe action”
3 Pneumatic motor
4 Terminal box for system-internal electric cables connections
5 Heated connection box for sample gas line connection
6 Pneumatically driven oven flap
7 Transport brackets (dismounted at installation site)
8 Gas sampling probe type H (see p. 5) or type 60S (see p. 6)
9 Internal heated sample gas line
10 Flashing lights “Probe action”
11 Cable drag chain
12 Probe cleaning unit

Description
The retractor with its pneumatic chain driver carries the gas sampling probe in a double beam construction. It is used to insert and retract the probe to defined front or rear positions in order to scrape off possible material deposits or encrustations.

The integrated pneumatically driven oven flap closes the sampling opening when the probe is retraced, thus preventing hot and toxic gases to exhaust from the oven and cause damage to man and machinery.

The integrated cable drag chain bundles the tubes and cables for smooth probe movements.

The probe is automatically retracted when
- Cooling water temperature is too high
- Cooling water flow or pressure is too low
- Cooling water circulation pump failure occurs
- Compressed-air failure occurs
- Power supply failure occurs

Technical Data
Double Beam Construction
- Chain drive
- Pneumatic motor
- Probe carrier with installed gas sampling probe
- Pneumatically driven oven flap

Cable Drag Chain
- Cooling water tubes
- Electric cables
- Pneumatic tubes
- Self-regulating heated sample gas line

Pneumatic Box
Pneumatic equipment for compressed-air conditioning and control of:
- Probe movement
- Oven flap opening/closing
- Plunger movement (for probe type H)
- Connection of external compressed air

Terminal Box
Connection of system-internal power supply and signal cables

Heated Connection Box
Connection of an external unheated or heated sample gas line
(see System Technical Data, page 10)

Dimensions
Dimensional drawing see page 12
Standard retractor lengths:
4500 mm for probe length L = 1.5–2.5 m
5500 mm for probe length L = 3.0–3.5 m
Option: Retractor length adjusted to the probe length;
retractor length is approx. probe length L + 2 m.

Weight
Max. 600 kg incl. probe

Mounting
- Hanging mounting
- 6 fixing points, required bearing capacity 10000 N each
Mounting diagram see page 14
Description

The water-cooled gas sampling probe type H is installed in kilns, where extremely hard encrustations are to be expected. By using the probe type H, long measuring periods without interruptions are possible: The pneumatically driven plunger which is welded on the filter tip mechanically breaks the encrustations at the probe gas entry without interruption of the measurement. After a preset number of plunger movements, the probe is automatically retracted. Thereby, possible material deposits are scraped off. After re-insertion filter and tube tip are purged with compressed air. Through the automatic probe movement and purging it is assured that the probe tube is practically free of deposits and the filter is free of dust.

Technical Data

Material
- Cooling tube: EN4541 (ASTM 321)
- Inner gas pipe: EN4436 (ASTM 316)

Probe Length
- L = 1.5 m / 2.0 m / 2.5 m preferably for use at calciner gas exit
- L = 3.0 m / 3.5 m preferably for use at cement kiln gas exit

Weight
- approx. 95 kg for probe length L = 3.0 m
Gas Sampling Probe Type 60S

Description
The water-cooled gas sampling probe type 60S is installed in kilns where less hard encrustations are to be expected.

By using the probe type 60S with two sample gas openings at the side of the probe tip, an effective pre-dedusting of the sample gas is achieved at the tip thus reducing the frequency of the automatic back purging actions.

After a preset number of back purging actions of the filtering unit and the sample pipe, the probe is automatically retracted. Thereby, possible material deposits are scraped off. After re-insertion filter and tube tip are purged with compressed air. Through the automatic probe movement and purging it is assured that the probe tube is practically free of deposits and the filter unit is free of dust.

Technical Data
Material
Cooling tube: EN4541 (ASTM 321)
Inner gas pipe: EN4571 (ASTM 316Ti)

Probe Length
L = 1.5 m / 2.0 m / 2.5 m preferably for use at calciner gas exit
L = 3.0 m / 3.5 m preferably for use at cement kiln gas exit

Weight
approx. 45 kg for probe length L = 3.0 m
Cooling Unit

Description
Due to the prevailing conditions a cooling of the gas sampling probe is mandatory. The cooling unit is used to provide and monitor the cooling water supply. The cooling water circuit is completely closed thus minimizing cooling water consumption and avoiding scaling.

The cooling unit contains the speed-controlled heat exchanger and the cooling water supply pump as well as analog sensors for monitoring the cooling water temperature, flow and pressure.

Technical Data

Cooling Water Circuit
- Capacity (first fill) 50 to 60 l
- Pressure 1 to 2 bar
- Controlled temperature 75 to 85 °C
- Circulation 5 to 6 m³/h
- Drinking water quality, anti-freeze agent necessary at ambient temperature < 0 °C

Cooler Block Material
Copper/brass for corrosion-proof operation

Dimensions
Dimensional drawing see page 13

Weight
approx. 250 kg

Mounting
Ground mounting
Mounting diagram see page 15
**Control Unit**

1. Maintenance switch (lockable)
2. Color touch panel
3. Buzzer
4. Main switches

**Description**

The control unit comprises the control system including the display and operator control unit for monitoring and operating the gas sampling system. Electrical power supply and all signals for the entire gas sampling system are fed-in and distributed in the control unit.

The control program offers different levels which are partly password-protected. Various locking mechanisms prevent possible sampling probe damages caused by erroneous operation or failure of single modules.

**Operation**

Probe movement and cleaning are controlled either in automatic mode or in manual mode. The program sequences are menu-driven and provide:
- Operation (automatic or manual probe retraction/insertion, oven flap opening/closing, probe cleaning, etc.)
- Diagnosis (cooling water parameters, trend displays, status messages, etc.)
- Set-up for process optimization (timers, limit parameters, etc.)
- Login levels to allow authorized access only (operators, technicians, etc.)
- Support via help texts

**Technical Data**

**Modules**
- Industrial controller with display and operator control unit
- Color touch panel with special-hardened glass surface
- Maintenance switch (lockable)
- Buzzer
- Main switches
- Input and output terminals
- Automatic fuses
- Power supply
- Frequency controller

**Material**
- Sheet steel

**Color**
- Light gray (RAL 7035)

**Degree of Protection**
- IP54 to EN 60529

**Dimensions**
- Dimensional drawing see page 13

**Weight**
- approx. 75 kg

**Mounting**
- Wall mounting
- Mounting diagram see page 16
Pneumatic and Piping Diagram

1 Safety relief valve outlet
2 Cooling water inlet
3 Cooling water feed
4 Cooling water return
5 Cooling water tubes
6 Compressed-air supply tube
   (compressed-air supply requirements see page 11)
7 Compressed-air tubes
8 Unheated or heated sample gas line to the analyzer system
   (requirements see page 10)
System Technical Data

Connections

Power Supply
Control Unit
- 230/400 VAC supply lines: 4.0 mm² (AWG10)
- UPS 230 VAC supply lines (Option): 2.5 mm² (AWG12)
Control Unit to Retractor
- 230 VAC supply lines: 1.5 mm² (AWG14)
- 230 VAC supply lines (for probe type 60S): 1.5 mm² (AWG14)
- 24–30 VAC supply lines (for probe type H): 2.5 mm² (AWG12)
- 24 VDC supply lines: 1.0 mm² (AWG18)
Control Unit to Cooling Unit
- 400 VAC supply lines: 1.5 mm² (AWG14)
- 24 VDC supply lines: 1.0 mm² (AWG18)

Signal Interfaces
- Relay contacts (max. load 110 VDC/230 VAC, 1.5 A)
- Profibus DP slave RS485 (optional)
- Modbus (optional, for connection to ACX analyzer system)

Power supply and signal interfaces diagram see page 17

System Bus CANopen
- 2 cables attached to the control unit and to the retractor for connection to the cooling module, length = 15 m each

Compressed-Air Connections (at Retractor)
- Fittings, diameter 18 mm (supplied)

Cooling Water Connections (at Cooling Unit)
- 1" (supplied)

Sample Gas Line to the Analyzer System
- The sampling system can be prepared for connection of an unheated gas sample line or a self-regulating heated sample gas line, depending on application.
- Requirements on a heated sample gas line: No flange connection, outside diameter of isolation 45–48 mm, outside diameter of inner core 6 mm, length of nipple max. 30 mm, temperature-resistant up to 150 °C.

Accessories

Cooling Water Tube
- 25/39x7 mm, length = 30 m (can be cut as required), incl. fittings, weight approx. 40 kg (included in delivery)

Compressed-Air Tube
- PA 18/14x2 mm, length = 25 m, (can be cut as required), incl. fittings (included in delivery of optional compressed-air tank)

Acoustic Emission

Retractor and Cooling Module
- approx. 89 dB(A)

Declaration of Conformity

Electrical Safety
- The regulations of European directive 2006/95/EC for low voltage are complied with.

Electromagnetic Compatibility
- The regulations of European directive 2004/108/EC for EMC are complied with.

Machinery
- The regulations of European directive 2006/42/EC for machinery are complied with.
Requirements at the Installation Site

**Power Supply**

**Operating Voltage**
- 230/400 VAC, ± 10 %, 50 Hz (fuses 3 x 20 A required), 3-phase connection (5 wires, N-conductor necessary)
or
- 230/400 VAC, ± 10 %, 60 Hz (fuses 3 x 20 A required), 3-phase connection (5 wires, N-conductor necessary)
or
- 3 x 208 VAC, ± 10 %, 60 Hz incl. transformer (fuses 3 x 20 A required), 3-phase connection (4 wires)

Other voltages on request

**Power Consumption**
max. 6 kVA

**Option “UPS”**
230 VAC or 120 VAC, ± 10 %, 50 to 60 Hz (fuse 1 x 6 A required)

**Compressed Air Supply**

**Purpose**
For movement and cleaning of the gas sampling probe

**Requirements**
- Compressed air free of dirt, oil and water droplets, 6 bar positive pressure, dried to 5 °C below ambient temperature
- Recommendation: Instrument air (dew point –40 °C)

**Consumption**
approx. 3 m³/h (at standard conditions)

**Emergency Tank**
A compressed-air tank with a capacity of at least 250 l must be installed near the sampling system. This emergency tank is necessary to supply sufficient compressed air for retracting the probe from the kiln in case of a compressed-air or power supply failure. The tank can be provided by the customer or by ABB Analytical.

**Ambient Conditions**

**Ambient Temperature**
+5 to +45 °C, −20 to +45 °C with anti-freeze agent in the cooling water

**Compressed Air Tank (option):** −10 to +50 °C

**Transport and Storage Temperature**
+5 to +55 °C, −20 to +55 °C after draining and drying all parts in contact with cooling water or condensate

**Relative Air Humidity**
≤ 75 % annual average, for a short time up to 95 %, infrequent and slight condensation possible

**Installation Site**
The control unit must be installed at a low-vibration location and protected from direct sunshine, dust and rain.

**Process Gas Conditions**

**Pressure**
≤ 3 kPa related to atmospheric pressure

**Temperature**
max. 1900 °C

**Dust Load**
max. 2000 g/m³

**Gas Velocity at Sampling Point**
max. 20 m/sec

**Cooling Water Supply**

**Purpose**
For cooling of the gas sampling probe

**Requirements**
- Drinking-water quality
- Anti-freeze agent (approx. 20 l, without anticorrosion agent, oil-free) must be added if the ambient temperature is < 0 °C.

**Capacity**
First fill 50 to 60 l at 1 to 2 bar
Retractor: Dimensional Drawing

All dimensions in [mm]

1) Length for 2.5 m retractor for probes 1.5 m, 2.0 m and 2.5 m
2) Length for 3.5 m retractor for probes 3.0 m and 3.5 m

Gas sample probe not mounted!
Retractor: Mounting Diagram

- Bolt circle: 280 mm
- Mounting pipe: Heat resistant steel
- Dimensions: 219.10 x 6.30 mm
- Length: up to 1.5 m (supply by customer)
- Counterflange: Ø 320 mm (supply by customer)

All dimensions in [mm]

- Retractor for max. 2.5 m probe
- Retractor for max. 3.5 m probe

- Load capacity: 10,000 N
- Operating pressure: DN 200, PN 6

acc. EN 2573, DN 200, PN 6
Control Unit: Mounting Diagram

[Diagram showing control unit with dimensions and electrical connections]

All dimensions in [mm]

[Dimensions and labels on the diagram]