

ProKiln GAC400

Probe gas sampling system

Sampling system for dry
sampling at rotary cement
exit and calciner gas exit

Measurement made easily

ProKiln GAC400

Introduction

The ProKiln sampling system is especially designed for analysis in hot cement flue gases with high content of dust and aggressive gas components. The system is made by cement specialists for use in the rough environment of a cement plant.

The ProKiln sampling system is preferably combined with ABB's AO2000 System. However, the ProKiln sampling system is built to be self-supporting which allows it to easily be connected and retrofitted to any existing well-functioning gas analysis system or other third-part suppliers solution.

The system controller interface offers a large variety of industry leading communication options together with conventional terminal based digital and analogue status signals.

Additional Information

Additional documentation on ProKiln is available for download free of charge at www.abb.com/analytical. Alternatively simply scan this code:

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1 General

About these operating instructions

Scope and purpose

These operating instructions apply to the ABB ProKiln GAC400 Probe gas sampling system for gas sampling at rotary cement kiln inlet, riser duct and calciner gas exit.

These operating instructions are intended to give all personnel handling the probe gas sampling system the information required to perform the following tasks correctly and safely:

- Transport at the company (for first-time delivery, relocation, storage, putting back into operation)
- Set-up, unpacking and connection
- Start-up
- Operation
- Diagnostics and troubleshooting
- Maintenance
- Shutting down, disassembly, putting back into operation, storage, and disposal

Target group

These operating instructions are intended for the following groups:

- Process engineers and design engineers (for preparation of the installation site)
- Transporter
- Assembly personnel
- Start-up personnel
- Operating personnel
- Maintenance personnel
- Storage personnel
- Disposal personnel

Illustrations in the operating instructions

The illustrations in the operating instructions do not always depict the actual layout of a probe gas sampling system as delivered. Therefore, the drawings in the supplied system documentation are always authoritative.

Failure to observe the operating instructions

Failing to observe the information in this document can lead to a risk of damage to property, injuries or even death. In order to ensure safety, all personnel handling the probe gas sampling system must have read and understood the following sections of this document before commencing any work:

- The section Safety on page 4.
- The sections describing the work to be performed.

Liability

The manufacturer is not liable for damage and/or injury resulting from a failure to observe these operating instructions and other applicable documents. The manufacturer and its equipment can never be liable for any process damage or injury under hazardous or dangerous process conditions as the responsibility of operation is entirely placed on the operator's overall evaluation.

Notifying service

Who should you contact for further help?

Please contact your local service representative.

For emergencies, please contact ABB Service:

Telephone: +49-(0)180-5-222 580

Fax: +49-(0)621-381 931 29031

E-mail: de-support-analytical@abb.com

Before you notify service...

Before you notify service because of a malfunctioning status message, please check whether there actually is a problem and whether the system is actually operating out of order.

When you notify service...

When you notify service because of a malfunctioning status message, have the following information available:

- The serial number of the system, you can find it on the nameplate,
- An exact description of the problem or status message text or number.

This information will enable the service personnel to solve the problem quickly.

2 Safety

General information and instructions

These instructions are an important part of the product and must be retained for future reference.

Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.

For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer. The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.

Modifications and repairs to the product may only be performed if expressly permitted by these instructions.

Information and symbols on the product must be observed.

These may not be removed and must be fully legible at all times.

The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

Warnings

The warnings in these instructions are structured as follows:

The signal word 'DANGER' indicates an imminent danger to life or health. Failure to observe this information will result in severe injury.

WARNING

The signal word 'WARNING' indicates an imminent danger to property. Failure to observe this information may result in severe injury.

CAUTION

The signal word 'CAUTION' indicates an imminent danger to the environment. Failure to observe this information may result in moderate injury.

NOTICE

The signal word 'NOTICE' indicates possible damage to the product.

Note

'Note' indicates useful or important information for the safe use of the product.

Intended use

The probe gas sampling system is used to continuously monitor process gas in cement production:

- at primary firing at the kiln inlet of the rotary kiln
- at secondary firing at the process gas outlet of the calciner

Analysis of the sample gas is performed by means of a suitable continuous gas analyser system, for example the AO2000-System, AO2000 Series or EL3000 Series from ABB AG, or any existing well-functioning gas analysis system or other third-party supplier's solution.

The continuous gas analyser system technology can be based on cold/dry or hot/wet.

Improper use

The probe gas sampling system may not be used:

- to sample mixtures of gas/air or gas/oxygen that are capable of ignition during normal service.
- to sample flammable gas which may form an explosive mixture in combination with air or oxygen.
- in a potentially explosive atmosphere or in explosion-hazard areas.
- to sample extremely toxic or extremely corrosive gases.
- in process temperatures above 1400 °C (2552 °F).
- in process dust loads higher than 2000 g/m³ (2 oz/in³).
- in condensing process conditions.

Further actions that may cause damage to the ProKiln system or lead to hazardous situations:

- Forcing the ProKiln probe into the kiln while the flange into the kiln is completely blocked.
- Forcing the use of the air blasters when the probe is not in a safe position inside the kiln.

The restrictions of the gas analysis system have to be checked separately.

Basic safety rules

Target group for these rules

These rules are intended for all persons handling the probe gas sampling system in any situation.

Purpose of these rules

The purpose of these rules is to ensure that all persons handling the probe gas sampling system are thoroughly aware of the risks and safety measures and that they observe the instructions in the operating instructions and the safety instructions. Failing to observe these rules can lead to a risk of damage to property, injuries or even death.

Handling the operating instructions

Observe the following rules:

- Completely read through the Safety section and the operating instructions pertaining to your work. You must have understood the instructions and sections.
- Always keep the operating instructions handy for the probe gas sampling system for reference.
- Pass on the operating instructions if the probe gas sampling system is re-sold.

Handling the probe gas sampling system

Observe the following rules:

- Only persons fulfilling the requirements specified in the operating instructions may handle the probe gas sampling system.
- The probe gas sampling system may only be used for its intended purpose. Never use the probe gas sampling system for any other purposes, even if they appear reasonable.
- Take all safety measures specified in these operating instructions and on the system. Specifically, wear the prescribed personal safety equipment.
- Only work in the designated work areas.
- Do not make any modifications to the probe gas sampling system, e.g. by removing parts or attaching parts. Specifically, do not change or disable safety installations.
- Use only original spare parts when replacing components.
- The probe gas sampling system may only be used when maintenance work is performed regularly.

... 2 Safety

... Basic safety rules

Operator's obligations towards personnel

The operator must ensure:

- that personnel meet the requirements for their tasks.
- that personnel are provided with the personal safety equipment specified in these operating instructions and, if necessary, additional safety equipment against risks posed by the installation site, e.g. by noise.
- that personnel are provided with maintenance equipment in order to secure the service switch, e.g. padlocks.
- that the system has protection against restarting the power supply in order to ensure that the system is powered off when the main switch is switched off to prevent unauthorized activation of the power supply.
- that personnel have read and understood these operating instructions before they handle the probe gas sampling system.
- that personnel are regularly and recurrently instructed about the risks and safety measures when handling the probe gas sampling system.
- that the work areas of the probe gas sampling system are adequately aired and illuminated.
- that the safety regulations in force in your country are observed.
- that the safety regulations pertaining to setting up and operating electrical equipment in force in your country are observed.
- that the safety regulations pertaining to handling gases, lubricants, etc. in force in your country are observed.

Procedure in the event of accidents

The probe gas sampling system is designed and constructed in a way that personnel can work with it without any major precautions, however, unforeseeable accidents can occur in unfavourable circumstances. If cooling water or compressed-air tubes burst, shut down the probe gas sampling system and secure it against being switched on again.

If errors are detected, shut down the system and secure it against being switched on again. Before approaching the probe gas sampling system, wait until the entire cooling water and the entire compressed-air has been evacuated. If the probe gas sampling system poses a danger, proceed as follows:

Aim	Action
Stop movement of the system	Press the EMERGENCY STOP button. Note: The probe gas sampling system must be moved into the retracted position. The emergency stop button is located out of the rotation range of the retractor. The service switch must be switched off, releasing the emergency stop switch, and the emergency stop retractor in manual mode must be activated.
Disconnect the system from the main power supply and UPS power supplies	Turn off the main power supply switch on the main power supply cabinet. Turn off the service switch of the Retractor unit to stop all movement of the Retractor unit.
Evacuate the compressed-air system	Close the MAIN AIR inlet valve at the unit or at the compressed-air tank (if available).

If risk-free operation is no longer possible

If it can be assumed that safe operation is no longer possible, the probe gas sampling system must be taken out of operation and secured against being started up again. It can be assumed that safe operation is no longer possible:

- If the probe gas sampling system is visibly severely damaged
- If the probe gas sampling system no longer works
- After prolonged storage under adverse conditions
- After severe transport stress

Further information

See the following sections:

- Intended use on page 5
- Overview of dangers on page 7

Overview of dangers

Introduction

The probe gas sampling system is designed such that the operator is protected against all dangers that can be reasonably avoided by means of design. Due to the purpose of the probe gas sampling system, however, there are nevertheless residual risks that require precautions. The following section gives information about the nature of these residual risks and their effects.

Moving gas sampling probe

The probe moves in and out automatically. Expect a system-actuated movement of the gas sampling probe at any time. The gas sampling probe not only performs individual extension and retraction movements, but also performs combined processes involving successive extension and retraction movements.

This means:

- Risk of injury due to automatic extension and retraction movements of the gas sampling probe if anyone is standing in the retractor's area of travel.
- Danger of toxic, harmful gases when the shutter is open.

The above risks are valid if working inside the danger area around the probe, all movement of the probe is stopped if the safety device that permits access to the danger area is activated. The safety device could be e.g., a locked gate, fence or barrier that leads to the probe gas sampling system area.

Associated warning sign in this operating instruction:

WARNING

Gas sampling probe movements

Risk of crushing around the retractor due to gas sampling probe movements.

- Before commencement any work on the probe gas sampling system, turn the Safety switch to "Off" and secure the service switch against unauthorized switching (with a padlock).
- Additionally press the EMERGENCY-STOP switch before working on the retractor or probe.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off.
- Never stand in the danger area around the retractor when the protective installation is closed.
- When the warning lamps light up or the warning buzzer buzzes, leave the danger area around the probe retractor immediately as the probe is about to move at any moment.
- Press the EMERGENCY-STOP switch immediately if anyone is still in the danger area around the retractor after the

Electrical components

The probe gas sampling system contains electrical components.

This means:

Danger of electrocution,

- if covers on control cabinet, terminal box or probe connection are open. Connectors in the control cabinet terminal box may also live parts.
- if the connection between the protective earth conductor and a protective earth conductor is not made correctly or connections.
- if the protective earth conductor is interrupted outside the probe gas sampling system or the protective earth connector is disconnected.
- if the set operating voltage and mains voltage differ before switching on.
- if work is performed on the open probe gas sampling system without disconnecting probe gas sampling system from power supply.
- due to charged capacitors in the probe gas sampling system even if probe gas sampling system has been disconnected from all sources of power.
- due to fuses that do not match the specified nominal current and/or repaired fuses.

Associated warning sign in this operating instruction:

Danger to life due to live parts!

- Only specialized electrical personnel may work on the electrical system.
- Disconnect the probe gas sampling system from the power supply before working on the electrical components.
- Observe national regulations pertaining to electrical equipment.

... 2 Safety

... Overview of dangers

Hot surfaces

During operation of the probe gas sampling system surfaces and parts get hot.

This means:

- Danger of burning due to hot surfaces during and after operation of the system.

Associated warning sign in this operating instruction:

WARNING

Hot surfaces

Danger of burning due to hot surfaces during and after operation of the probe gas sampling system.

- Do not touch the probe gas sampling system during and after operation.
- Do not touch the probe gas sampling system until it has cooled down to 50 °C. Specifically, do not touch:
 - the cooling module, the heated sample gas line
 - the connection box for the heated sample gas line on the retractor
 - the hot sampling filter
 - the entire probe
 - the metal structure of the retractor
 - the shutter of the duct opening
- If it is unavoidable to touch hot components, wear a face mask against heat, heat-proof gloves and protective welder's clothing.

Harmful gases at the duct opening

When the shutter is open, gases flow out of the rotary kiln duct opening that may be harmful to health.

This means:

- Danger of poisoning due to harmful gases.
- Danger of burning due to jets of flame at the duct opening.

Associated warning sign in this operating instruction:

WARNING

Hot surfaces, hot gases, jet flames

Risk of burning due to jet flames and hot gases at the uncovered duct opening when the rotary kiln is in operation.

- Preferably install or remove the probe when the rotary kiln is out of operation.
- If you install or remove the probe when the rotary kiln is in operation:
 - Wear a face mask against heat, heat-proof gloves and protective welder's clothing and respiratory protection

Hot cooling water

During operation of the probe gas sampling system cooling water in the cooling system gets very hot.

This means:

- Danger of scalding in the event of contact with hot cooling water.
- Danger of burning in the event of contact with hot water tubes.

Associated warning sign in this operating instruction:

CAUTION

Hot cooling water

Danger of injury to skin and eyes in the event of contact with hot cooling water

- Avoid contact with the cooling water as it is very hot.
- In case of accidental contact with hot cooling water, wash off immediately with cold water.
- Contact medical specialist according to local regulations.
- If hot cooling water gets in the eyes despite wearing protective glasses, rinse them thoroughly under cold running water, holding the eyelids open. Contact medical specialist according to local regulations.

Anti-freeze in the cooling water

The cooling system can contain cooling water with anti-freeze in regions experiencing below freezing point temperatures.

This means:

- Danger of injury to skin and eyes in the event of contact with anti-freeze.

Associated warning sign in this operating instruction:

CAUTION

Harmful anti-freeze

Danger of injury to skin and eyes in the event of contact with cooling water or anti-freeze.

- Avoid contact with the cooling water and the anti-freeze.
- In case of accidental contact of cooling water or anti-freeze with skin, wash off the skin immediately with plenty of water and soap. Contact medical specialist according to local regulations.
- If cooling water or anti-freeze gets in the eyes despite wearing protective glasses, rinse them thoroughly under cold running water, holding the eyelids open. Contact medical specialist according to local regulations.
- Observe instructions in the anti-freeze manufacturer's safety data sheet.

Compressed-air in the pneumatic system

The pneumatic system contains compressed-air.

This means:

- Danger of eye injuries if compressed-air escapes, e.g., if compressed-air tubes burst, when opening screw connections or inadvertently opening compressed-air tubes with no additional connector.

Associated warning sign in this operating instruction:

WARNING

Pressurized system dangers

Risk of injury in the area of the probe gas sampling system due to pressurized pneumatic system.

- All pneumatic equipment connected must be fulfilling local standards for safety and usage.
- Periodic inspection/approval of installation according to local standard.
- Any damage to a pneumatic equipment will require a replacement in order not to compromise safety integrity

... 2 Safety

Protective installations

Introduction

The probe gas sampling system is fitted with protective installations to protect the operator. All protective installations must be in place and operational during operation. The protective installations must not be disabled and must be checked for proper functioning at regular intervals.

The illustration below shows the location of the protective installations on the probe gas sampling system.

1

2

2

3

1

3

1

EMERGENCY-STOP switch

Location

- Rear end of the retractor
- Right side of control cabinet

Function

Interrupts movement of the gas sampling probe and blow-back of the probe. The gas sampling probe can only move again when the EMERGENCY-STOP switch is unlocked and reset by pressing the service switch.

Covers

Location

- Retractor
- Cooling module

Function

Protection from inserting hand into the system.

Warning lamps and buzzer (warning tower)

Location

- Retractor terminal
- Control cabinet

Function

Warning about probe movement. The warning lamps flash in the following situations:

- Automatic mode: approximately 10 seconds before probe movement
- Manual mode: immediately after pressing the "Retract probe" button
- Error: immediately before probe retraction

Flange shutter (optional)

Location

On the duct opening of the rotary kiln

Function

- Protects from jet flames, hot material, and the duct opening.
- Closes the kiln's duct opening when the retracted.
- A manual lock ensures that the duct opening is closed when working near the duct opening.

Protective fence installation with electric lock

Location

Protective fence installation with electric lock (protective fence or gate installation is the responsibility of the operator)

Function

- Prevents anyone from standing near the probe movement is possible. No probe movement is possible when the protective installation is closed.
- When the protective installation is open for operation, the warning lamps flash, the warning buzzer buzzes and any probe movements or probe retraction until protective installation is closed and the system enters service mode.

Additional EMERGENCY-STOP switch

A customer supplied EMERGENCY-STOP switch can be added additionally by the operator. This input to the control system has the same function as the enclosed EMERGENCY-STOP switch described above.

The additional EMERGENCY-STOP switch must be connected to the above-described EMERGENCY-STOP switch input. The EMERGENCY-STOP switch will be connected to the emergency safety circuit of the control system and will have the same effect as the two integrated EMERGENCY-STOP switches.

... 2 Safety

Requirements to be met by personnel

Personnel qualifications

Personnel handling the probe gas sampling system must meet the following requirements:

Personnel	Task	Required qualification
Transporter	• Transport in the company	Trained crane operator/fork-lift driver with experience with lifting apparatus
	• Unpacking of the system	
Mechanical fitter	• Mechanical installation	Mechanical expert
	• Mechanical disassembly	
Electrical fitter	• Electrical installation	Electrical expert
	• Electrical disassembly	
Start-up personnel	• Initial start-up	Technician familiar with the processes of cement production and specific work conditions
	• Putting back into operation	
Operator	Operation	Trained worker
Mechanical maintenance personnel	• On mechanical parts:	Mechanical expert
	• Maintenance	
	• Troubleshooting	
	• Maintenance	
Electrical maintenance personnel	• Shutting down	Electrical expert With experience with controllers
	• On mechanical parts:	
	• Maintenance	
	• Troubleshooting	
Storage personnel	• Maintenance	Trained unskilled worker
	• Shutting down	
	• Correct storage	
Disposal personnel	• Packing of the system for transport	Trained disposal personnel
	• Disposal of the probe gas sampling system	

Personal safety equipment

General protective equipment

The following general protective equipment must be worn when performing any work in the area of the probe gas sampling system:

- Closed overalls with long trousers and long sleeves
- Safety shoes (preferably boots covering a minimum of the ankle)
- Safety gloves suitable for mechanical work
- Safety glasses
- Protective helmet
- If necessary, additional protective equipment as required by the operator

Additional protective equipment

The following additional protective equipment must be worn when performing maintenance work:

- Dust mask
- Face mask against heat
- Heat-proof gloves and protective welder's clothing
- Respiratory protection against toxic gases from the probe gas

Warranty provisions

Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is operator's sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be).

Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Software downloads

By visiting the web page indicated below, you will find notifications about newly found software vulnerabilities and options to download the latest software. It is recommended that you visit this web page regularly:

www.abb.com/cybersecurity

Manufacturer's address

ABB AG
Measurement & Analytics
Stierstädter Str. 5
60488 Frankfurt am Main
Germany
Tel: +49 69 7930-4666
Email: cga@de.abb.com

Service address

If the information in this Operating Instruction does not cover a particular situation, ABB Service will be pleased to provide additional information as required.
Please contact your local service representative.

Customer service center
Tel: 0180 5 222 580
Email: automation.service@de.abb.com

3 Design and function

Overview

The sampling system serves the purpose of continuous sampling of process gas at the measuring point, i.e. at the kiln inlet of the rotary kiln or at the gas outlet of the calciner.

The probe forms a unit with the probe retractor. This integrates a recirculating water-cooling circuit with a non-pressurized buffer tank and a heat exchanger (cooling module).

The retractor and probe can be controlled from the HMI on the control cabinet. The sample gas is filtered in the probe tip and conducted into the sample gas line. Any further conditioning of the analysis gas takes place in external equipment (not part of the probe sampling system).

The following figure shows a general overview of the ProKiln GAC400 probe gas sampling system:

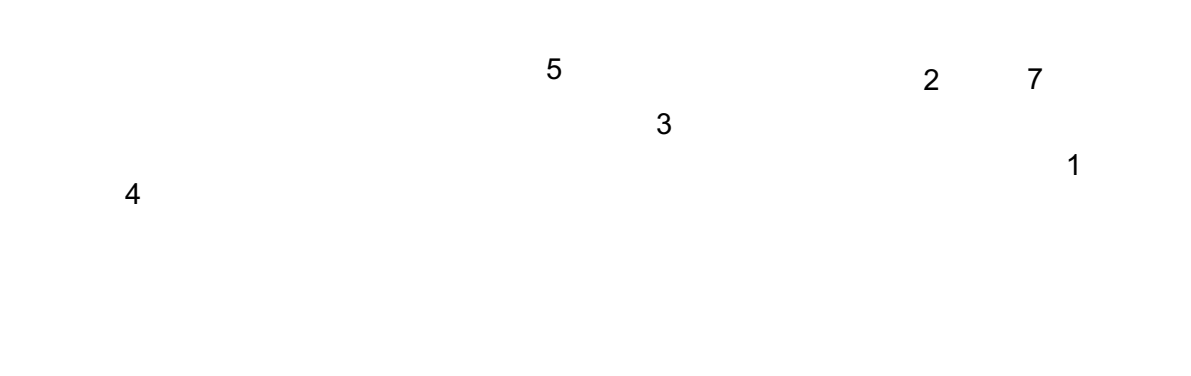


Figure 2: ProKiln GAC400 probe gas sampling system

The individual modules of the probe gas sampling system have the following functions:

Pos.	Designation	Function
1	Retractor	<ul style="list-style-type: none">• Mechanical movement of the probe• Automatic removal of the probe when malfunctions occur
2	Probe	Sampling of sample gas from the process
3	Control cabinet	<ul style="list-style-type: none">• Operation of equipment• Control and monitoring• Error display and communication
4	Water panel	Circulate cooling media (water) through the probe
5	Cooling unit	Remove process heat from cooling media
6	Flange shutter (Option)	Entry flange shutter device
7	270 l Air tank CE (Option)	Air tank

Mode of functioning and operation

Modes of functioning

The following process takes place in order to sample gas during cement production:

1. General power and UPS power is turned on.
2. Water panel and water cooling of the probe turned on.
3. Electrical heating for probe and sample hose is turned on.
4. Compressed-air (oil and water free) is turned on.
5. All unit and maintenance alarms need to be cleared before system can enter operation.
6. The system must initially be started in manual mode.
7. The probe is inserted into the rotary kiln.
8. The system is then able to get switched into automatic mode.
9. The probe gas sampling system will run the sequence of gas sampling and probe cleaning based on set intervals.
10. The probe gas sampling system will run the sequence of moving the probe in and out of the process based on set intervals.
11. The system is switched to manual mode in case of specific malfunctions or by operator decision.
12. The probe is retracted from the rotary kiln and the flange shutter is closed.

Modes of operation

The following operating modes are possible:

Mode	Description
Automatic mode	Allows continuous operation of the system for gas sampling. Probe cleaning steps are performed automatically. Probe is moved in and out of the process at set intervals (these can be defined by the operator).
Manual mode	Allows operation of the system in manual mode for maintenance, for example. Probe movements are controlled only manually.

... 3 Design and function

... Mode of functioning and operation

Monitoring devices

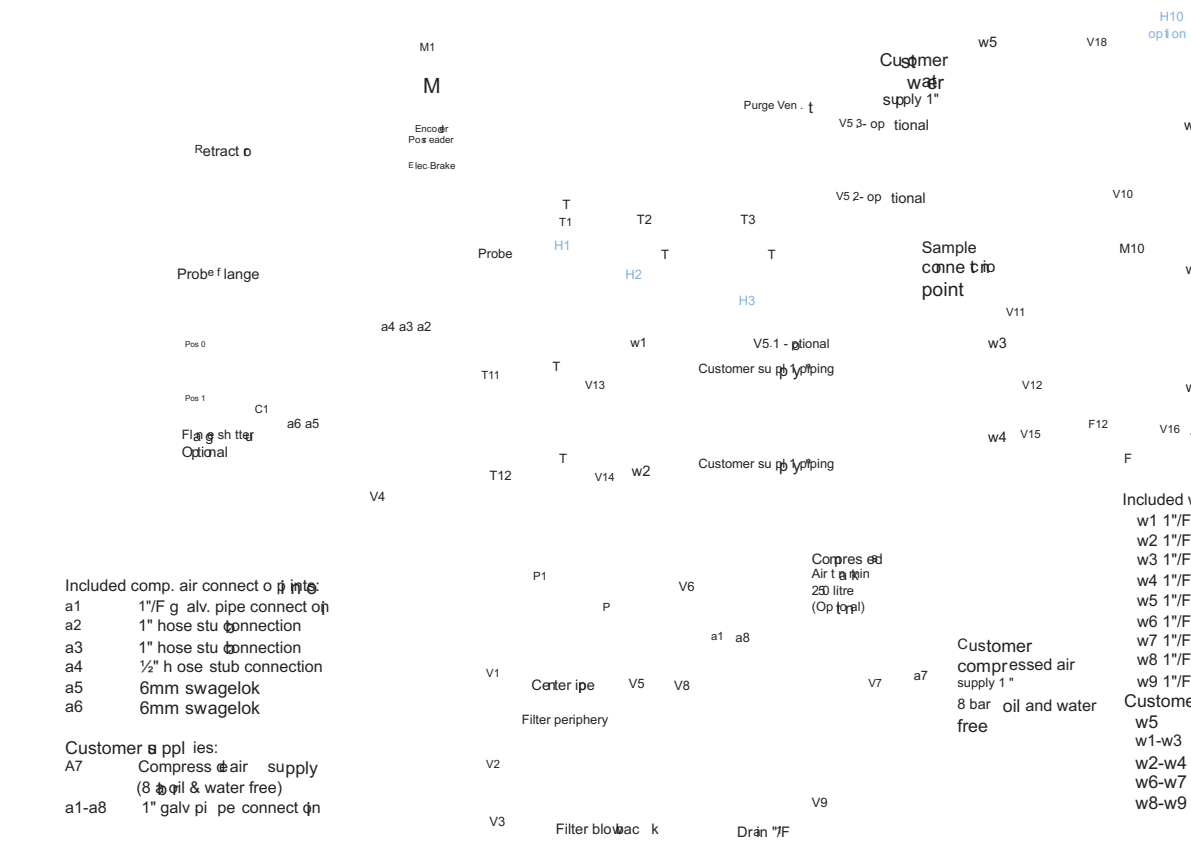


Figure 3: System schematic

Refer to table on next page for further explanations.

The process is monitored by the following devices (see Figure 3 for a detailed drawing):

Monitoring position	Monitoring device	Purpose	Function
F12	Cooling water flow measurements	<ul style="list-style-type: none"> Protects the probe against overheating Monitors the cooling water pump for adequate pump power 	<ul style="list-style-type: none"> Triggers the retraction if cooling water flow is not adequate Cooling water pump failure
P1	Pressure switch	Ensures adequate compressed-air reserve	Locks various follow up functions
T1	Probe sample tube temperature	Protects probe against condensation build-up inside	Locks various follow up functions
T2	Probe sample hose temperature	Protects probe against condensation build-up inside	Locks various follow up functions
T3	Heated sample connection point temperature	Protects probe against condensation build-up inside	Locks various follow up functions
T10	Cooling panel water tank temperature	<ul style="list-style-type: none"> Monitors the cooling water temperature in the holding tank Monitors the efficiency of the water-cooling unit 	<ul style="list-style-type: none"> Turns the water-cooling unit on/off Causes a water-cooling unit failure if probe Turns the water-cooling unit on/off (optional)
T11	Probe cooling water flow-in temperature measurement	<ul style="list-style-type: none"> Is part of monitoring the process heat input to the probe Protects the probe against overheating 	Is used as base temperature for process heat input
T12	Probe cooling water flow-out temperature measurement	Is part of monitoring the process heat input to the probe	<ul style="list-style-type: none"> Can cause a water-cooling unit failure if probe Is used as the off-set for process heat input
M1	Probe position reader	<ul style="list-style-type: none"> Calibration zero point for encoder position Ensures that rear safe end position is reached Monitors the probe position Monitoring of probe travel time Monitor Motor torque 	<ul style="list-style-type: none"> Provides the reference position Locks various follow up functions Triggers the retraction if time or torque is exceeded
Probe flange Pos 0	Inductive position indicator flange shutter in closed position	Ensures the closed flange position is reached	Locks various follow up functions
Probe flange Pos 1	Inductive position indicator flange shutter in open position	Ensures the open flange position is reached	Locks various follow up functions
L1	Capacitive water tank level full	Monitors when the water tank full level is reached	Turns the water refill valve off
L2	Capacitive water tank level low	Monitors when the water tank low level is reached	Turns the water refill valve on
L3	Capacitive water tank level alarm	Monitors when the water tank alarm level is reached	Causes a water-cooling unit failure

... 3 Design and function

Components

Control cabinet

The control cabinet is the central control point of the sampling system. The electric power supply and signals for the entire sampling system are connected and distributed here. It is containing the display and operating unit for monitoring and operating the system. The control program is equipped with various locking mechanisms that prevent damage to the probe due to incorrect operation or failure of individual modules. If all locking conditions are not met, operation is not possible. This safeguard is only overridden by personnel safety measures.

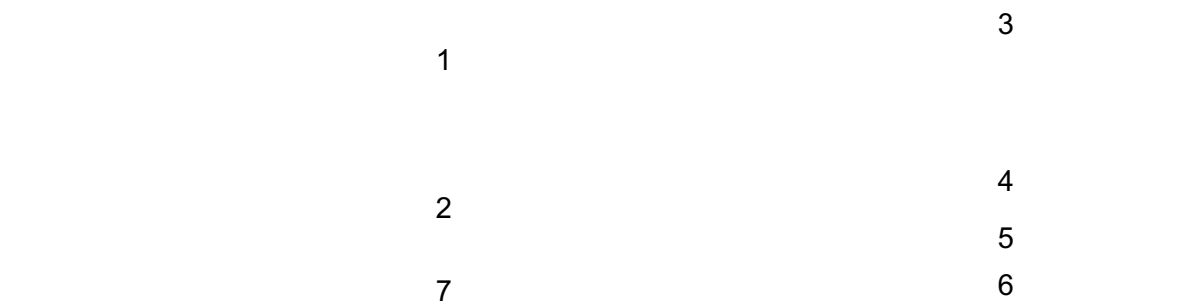


Figure 4: Control cabinet

Pos.	Designation	Function
1	HMI (HMI)	Display and operating unit for monitoring the system; the operation of the panel will be explained in the next chapter. Description of the controller section
2	Emergency reset	<ul style="list-style-type: none"> Reset of Emergency Stop after it has been released Indication that Emergency Stop is pushed (Blue – constant) Indication that Emergency Stop has been pushed, then released, but not yet reset (Blue – flashing)
3	Warning tower	<ul style="list-style-type: none"> Audible warning prior and during movement of probe Flashlight warning prior and during movement of probe (White - flashing) Indication of system alarm (Red - constant) Indication of system maintenance request (Yellow - constant) Indication of system in Service Mode (Yellow – flashing) Indication of system in operation (Green - constant) Indication of probe in locked position (Green – flashing)
4	Emergency-Stop switch	<ul style="list-style-type: none"> Halts all probe movements Halts all probe cleaning by air
5	Main switch UPS power supply	Switches uninterruptible power supply on and off
6	Main switch general power supply	Switches power supply on and off
7	Operation/Service Mode switch	<ul style="list-style-type: none"> Puts the system into operation mode Puts the system into service mode

Probe retractor

The probe retractor moves the probe, which can be up to 3500 mm long. The movement is carried out by an electrical chain drive. The retractor is emergency-supported by uninterruptible power supply (UPS). It is recommended that the UPS is provided from the site according to local regulations.

Figure 5: Probe retractor

Pos.	Designation	Function
1	Emergency-Stop switch	<ul style="list-style-type: none">• Halts all probe movements• Halts all probe cleaning by air
2	Pneumatic box Terminal box	<ul style="list-style-type: none">• Pneumatic components for blow-back of filter• Electric connections, distributed I/O, power studs, manual operation buttons in
3	Electrical motor with encoder and brake	Ensures movement and position of the probe retractor.
4	Energy chain	Guides pneumatic lines, electrical cables, heated sample gas line and cooling water
5	Air blaster panel	Air blasters for cleaning probe tip, filter blowback and filter periphery
6	Heated sample gas line	Transports the sample gas from the probe to the external gas analysis system down the function prevents condensation from building up.
7	Heated connection box for external heated hose	Connection point for heated hose leading to external gas analysis system. Heating condensation from building up.
8	Panel for compressed-air to air blasters and for water cooling	Connection point for compressed-air supply for air blasters and for connections to cooling panel
9	V-Tracks rails for probe buggy	Transport tracks for the probe buggy
0	Shutter (with optional automatic pneumatic or manual actuation)	Closes the kiln duct opening when the probe is retracted.
k	Chain tension adjustment	Adjustment of tension on the chain drive
l	Permanent installation legs (Not included in scope of delivery)	<ul style="list-style-type: none">• Ensemble of legs to install retractor to the floor.• Note: the probe and retractor system is supplied with two temporary legs which designed for permanent mounting.

Retraction in the event of malfunction

The probe is automatically retracted if any of the following malfunctions occur:

- Cooling water temperature too high
- Cooling water flow rate too low
- Cooling water differential temperature too high
- Circulation pump failure
- UPS Power supply interrupted
- Water level too high

... 3 Design and function

... Components

Controls on the probe retractor
There are additional controls on the retractor:

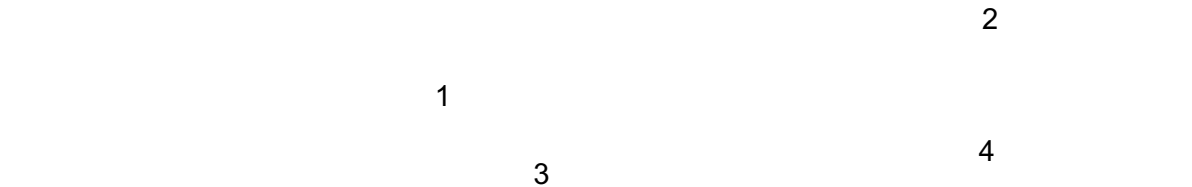


Figure 6: Controls on the probe retractor

Pos.	Designation	Function
1	Warning tower	<ul style="list-style-type: none">• Audible warning prior and during movement of probe• Flashlight warning prior and during movement of probe (White)• Indication of system alarm (Red)• Indication of system maintenance request (Yellow)• Indication of system in operation (Green)
2	Emergency stop	<ul style="list-style-type: none">• Halts all probe movements• Halts all probe cleaning by air
3	Manual push buttons in and out	Manual operation of probe movement only active if the probe is in manual operation
4	Safety breaker	<ul style="list-style-type: none">• Safety breaker for probe motor• When off, the main power to the motor is off and the probe is not able to move

Flange Shutter

To protect people and equipment from process over-pressure exposure and to limit false ambient air to enter the process, the flange opening is closed by a shutter when the probe is retracted to its service position.

The flange shutter does not close during regular retraction / extension for cleaning the outside of the probe. The shutter is moved either by an automatic pneumatic drive flange shutter (optional) or by manual actuation.

Supply lines

The pneumatic/electric supply is connected at a central transition point. All required internal line connections are included and pre-installed in the probe retractor. Connection cables between units are not supplied with the system.

Probe

The probe is used to continuously sample the gas from the process.

Figure 7: Probe

Pos.	Component	Function
1	Sample tube	Transports the sample gas through the probe to the gas outlet.
2	Sample tube heater	Heats the sample tube in order to make it temperature independent from probe cooling temperature
3	Inspection and maintenance entrance	Provides easy access and inspection through the entire length of the probe without the need for disassembly
4	Centre tube air blaster connection	Connects the centre tube nozzle to one air blaster for powerful cleaning of probe tip
5	3 x periphery tubes air blaster connections	Connects the periphery filter cleaning nozzle to one air blaster for powerful cleaning of filter surface area
6	Water cooling forward	Connects the probe to the cooling panel
7	Water cooling return	Connects the probe to the cooling panel
8	Water temperature sensor forward	Measures the water temperature as it enters the probe
9	Water temperature sensor return	Measures the water temperature as it exits the probe
0	2 x blow-back tubes filter	Connects the internal of filter to blow-back cleaning of filter surface
k	Probe closing flange	Flexible closing flange for probe entering the process
l	Sample filter	Filter to separate process gas from dust
m	Probe tip nozzle	Removes incrustations on the intake opening.
n	Sample gas intake opening	Aspirates the process gas from the rotary kiln.
o	Filter periphery nozzle	Removes incrustations and dust from the filter surface area.

... 3 Design and function

... Components

Cleaning

Cleaning procedure

Cleaning of insertion tube into process

Cleaning of the outside of the probe

Cleaning the probe intake hole by means of centre tube nozzle connected to air blaster

Cleaning the filter periphery by means of periphery nozzle connected to air blaster

Probe filter blow-back

Mode of functioning

Customer air blaster cleans the insertion tube and removes deposits between probe and insertion tube

Material deposits and incrustations on the probe are removed by moving the probe in and out using the retractor

Incrustations on the intake hole are removed by periodical cleaning through centre tube nozzle

Incrustations and dust on sample area of the filter are removed by air blaster shooting through periphery nozzle

Filter in probe tube is cleaned periodically with compressed air

Water Panel

The probe is made from high temperature resistant steel but, because of the extreme high temperature of a kiln inlet, it needs a cooling system to sustain the operation.

The probe water panel serves to provide and monitor the cooling water supply. The water panel contains the water circulation pump which circulates the cooling water in a pressure-open system operating at ambient pressure level. A 300 l (approx. 80 gal US) water tank serves as both a water and temperature buffer for the water-cooling system.

The water panel can be installed directly connected to the cooling panel or it can be installed within a maximum distance of 5 m (16 ft 5 in) to the cooling panel.

The completely open system monitors the following parameters:

- Water pump operation
- Water tank temperature
- Water tank water levels
- Cooling water flow rate

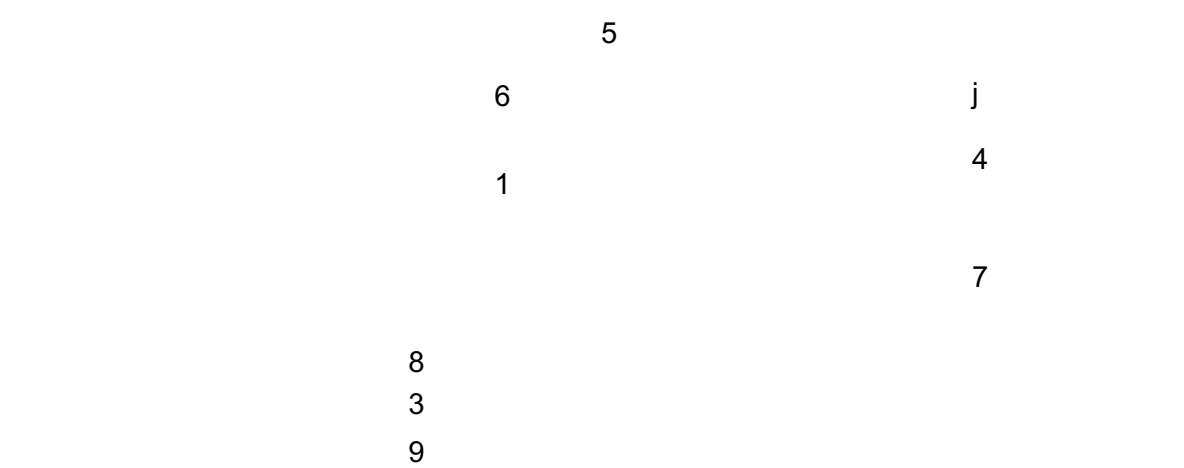


Figure 8: Water panel

Pos.	Component	Function
1	Water pump	Re-circulate the cooling water
2	Temperature sensor (not shown in picture)	Measures the temperature in the water tank which controls the heat exchanger fan
3	Water-return from probe	Water from probe 1" union connects to the heat exchanger by a 1" hose
4	Water tank	Holding tank for water and temperature buffer for cooling system. Volume 300 litres
5	Level sensor	Detects the water level in the water tank
6	Solenoid valve	Water refill of tank
7	Electrical panel	<ul style="list-style-type: none">• Contain electrical connection and local I/O panel• Power breakers for pump and cooler fans
8	Water forward to probe	Outlet union 1" for water cooling of probe
9	Water flow meter	Measures the water flow as it returns from the probe and continues to the heat exchanger

... 3 Design and function

... Components

Cooling water circuit regulation

The open cooling-water circuit must be connected to a potable water outlet (requirements: see Installing the water system and cooling panel on page 48). The circulation pump transports at least 6 m³/h (1585 gal US/h) through the probe cooling jacket. The resistance thermometer is installed in the cooling water tank and signals to the water temperature controller.

The water flows through the heat exchanger where a fan is operated to control the required cooling of the water based on the water tank temperature. The flow rate is monitored as the water returns from the probe in order to validate the actual flow which has been cooling the probe. Monitoring is performed on the HMI on the control cabinet.

Requirements for the water supply

The water supply must meet the following minimum requirements:

Category	Requirement
Consumption	0 to 2 m³/year (0 to 528.35 gal US/year)
Quality	Potable water (do not use anti-corrosive), do not use demineralized water
Ambient temp. below 0 °C (32 °F)	<ul style="list-style-type: none">· Glycol as anti-freeze. Anti-freeze with anti-corrosive additive is not permitted.· Option for water tank heater

Water panel cabinet

The figure below shows the water panel cabinet:



Figure 9: Water panel cabinet

Pos.	Component	Function
1	Probe cooling On/Off	Disconnects the water and cooling
2	Breaker for water pump	Turns off water p
3	Breaker for Cooling fan 1	Turns off fan 1
4	Breaker for Cooling fan 2	Turns off fan 2
5	Breaker for Tank Heater	Turns of Tank He electrically prep

Cooling panel

The probe cooling panel serves to cool the water supply. The cooling panel contains the air-to-water heat exchanger. The cooling panel can be installed directly connected to the water panel or it can be installed within maximum 5 meters to the water panel.



Figure 10: Cooling Panel

Pos.	Component	Function
1	Water inlet from probe	Cools down hot water from probe
2	Water outlet to tank	Provides cool water to tank/probe
3	Electrical fan	Air-to-water heat exchanger
4	Emergency stop	Turns off fan

Transformer – power supply (optional)

The system is not supplied with a customized transformer. If a transformer is required to meet the probe gas sampling system power specifications it should be acquired locally in order to meet local standards and legislation.

Compressed-air system

The compressed-air is used for probe filter blow- blaster cleaning of the centre and periphery nozzle the probe.
The compressed air system also serves to operate the flange shutter.

Requirements

The compressed-air must meet the following requirements:

Category	Requirement
Dew point	0°C (for temperatures below 0°C the compressed-air supply cannot freeze)
Pressure	6-8 bar
Consumption	1 m ³ /h
Quality	Free of dirt and oil / water droplets

Compressed-air tank

A dedicated air tank of minimum 250 l is required. It must have a 1" connection for air supply and 1" connections for the retraction unit. The air tank must be placed as close as possible to the retractor unit as possible, taking site conditions and heat radiation into account.

The air tank must be equipped with oil and water separator devices on the supply side of the tank. The compressed air supplied to the tank must be based on above specifications. The oil and water cleaning devices must be placed between the compressed-air tank and the compressed-air supply on the retractor unit as this will reduce the air delivered to the probe cleaning by the air blasters.

A locally acquired air tank should be installed in accordance with local standards and legislation.

... 3 Design and function

Control system

Introduction

The control system is the interface to the ProKiln GAC400 system for the plant control system and for the probe operators. The control system contains an electronic controller with all the necessary input and output (I/O) connections required.

The control system contains all the needed software to operate the complete system as well as the proprietary programming to secure the best and safest operation of the system.

The control system of the ProKiln GAC400 has a layout based on distributed I/O configuration connected via ProfiNet to the various units. Each unit of the complete system (control cabinet, retractor, and water unit) contains distributed I/O's that report to the central processing unit located in the control cabinet.

To access the control system, operators will use the Human Machine Interface (HMI) located on the front of the control cabinet.

If the ProKiln GAC400 is connected to an ABB AO2000-System gas analysis system, a Modbus RTU serial connection is also included and will exchange information between both parts in a preconfigured setup.

The plant control system and any non-ABB gas analysis system can also access the control system information via digital potential-free I/O's.

Control cabinet

The control cabinet must be placed in a safe location, away from operator, away from heat radiation and impact. In the vicinity of the control cabinet there must be a free line of sight to the probe location, so that the operator can see the retractor while it is being operated from the control cabinet.

Figure 11: Control cabinet

The component layout will depend on the actual installation shown in the electrical documentation as built.

Power breakers in the control cabinet

Operational handles of the control cabinet

Alarm/status lights and sound tower

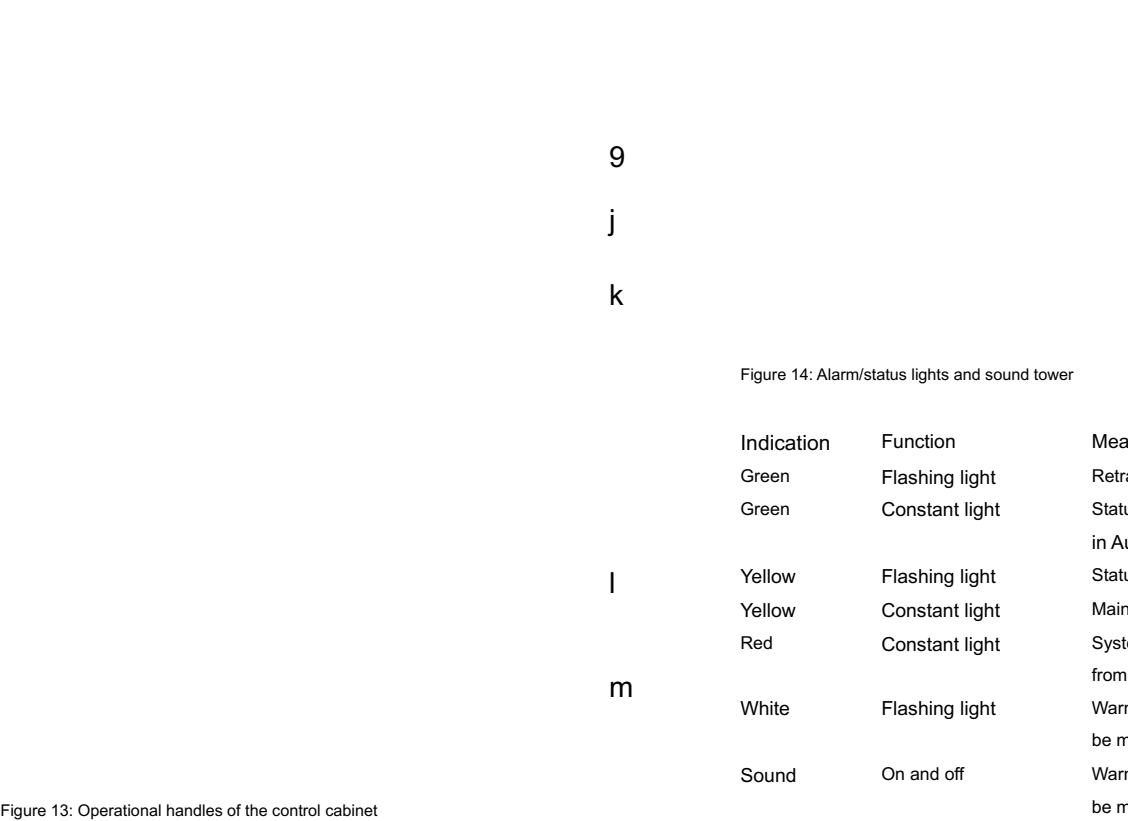


Figure 14: Alarm/status lights and sound tower

Indication	Function	Meaning
Green	Flashing light	Retractor is moving
Green	Constant light	Status of probe in Automatic mode
Yellow	Flashing light	Status service
Yellow	Constant light	Maintenance
Red	Constant light	System alarm from kiln
White	Flashing light	Warning - Probe moving
Sound	On and off	Warning - Probe moving

Pos.	Component	Function
1	M1 motor	Retractor drive
2	M1 motor brake	Retractor position brake
3	Water system power supply	Power distribution to water system
4	H1 Probe heater	Probe sample tube heater
5	H2 Sample hose heater	Sample hose heater in retractor
6	H3 Heated sample shut-off valve (optional)	Heater for heated shut-off valve (optional)
7	Power outlet	Control cabinet internal power outlet
8	Power supply 24VDC	Control power supply
9	Emergency stop	Stops all movements and air blaster blow-back of probe
10	UPS Main switch	Master turn-off UPS for system
11	Main Switch	Master turn-off general power supply for system
12	Emergency reset	Reset button after the Emergency Stop has been pushed
13	Operation/Service mode	Switch between normal operation and

Retractor system control cabinet

The retractor has its own control cabinet with various components. The cabinet is permanently fixed to the retractor and contains an electrical section (left side) and a pneumatical section (right side). A light and sound tower is affixed to this cabinet, which replicates the indication light and sound tower of the control cabinet. Manual operations and movements of the probe can be done from this cabinet while the system is in manual mode.

... 3 Design and function

... Control system

User interfaces

Operation screen

The figure below shows a typical operation screen

4 3

7 5 6

Figure 16: Retractor system control cabinet

Pos.	Component	Function
1	Emergency Stop	Stops all movements and air blaster blow-back of probe
2	Probe In	Will move the probe in if system is in manual mode
3	Probe out	Will move the probe out if system is in manual mode
4	Safety switch probe	Will prevent all probe movements by shutting down power to the motor
5	Distributed I/O's	PLC I/O's
6	Breakers	Solid state relays
7	Terminals	Wire connecting point

Retractor pneumatic cabinet

1

2

3

Figure 17: Retractor system pneumatic cabinet

Pos.	Component	Function
------	-----------	----------

5 1

Figure 18: Operation screen

Screen areas

Pos.	Designation	Function
1	Mode	Displays the mode (AUTO)
2	System status	Displays the current system operation, error, maintenance (maintenance)
3	Display area	Current menu display and
4	Current menu	Menu path display
5	Screen functions	Displays screen functions
6	Navigation area	Allows the following functions: <ul style="list-style-type: none">· jump to following menu· jump to main menu· jump to previous menu· Change user

Access permissions

Password entry

The system controller has several access levels. by entering a username and password at the HM that the system user (customer) allows access to

Hierarchy of access levels

The password levels are divided as follows:

Menu	Level 0 Any viewer	Level 1 Plant maintenance team	Level 2 – Trained specialists, ABB service technicians	Level 3 ABB service technicians
Home	General info	General info	General info	General info
Operation	Displays current measured values, messages	<ul style="list-style-type: none">Operating function for start-up and periodical maintenanceAllows checking of control and monitoring functions	<ul style="list-style-type: none">Operating function for start-up and periodical maintenanceAllows checking of control and monitoring functions	<ul style="list-style-type: none">Operating function for start-up and periodical maintenanceAllows checking of control and monitoring functions
Alarms	Displays current measured values, messages	<ul style="list-style-type: none">LogbookReset messagesSpecial system information	<ul style="list-style-type: none">LogbookReset messages.Special system information	<ul style="list-style-type: none">LogbookReset messages.Special system information
Trends	Displays current measured values, messages	Trend displays of internal measured quantities.	Trend displays of internal measured quantities.	Trend displays of internal measured quantities.
Setup		Setup for system optimization, limits, etc.	Access permissions Setup for system optimization, limits, etc. Edit tolerance, ranges.	Access permissions Setup for system optimization, limits, etc. Edit tolerance, ranges. Network settings PID Setpoints / Control alarms, etc.

Important information about passwords Level 2 and 3
With the use of Level 2 or Level 3 passwords it is possible to configure parameters that may result in functional impairment of the system. Changes in these access areas should only be performed by experienced, skilled personnel with proper certification. Always be extremely careful to whom you disclose these passwords.

Access passwords supplied with the system

The following passwords are stored in the system controller after production in the factory:

Level 0: default level, for any viewer

- Username: 0
- Password: 000000

Level 1: recommended for plant maintenance team

- Username: 1
- Password: 471100

Level 2: recommended for ABB-trained specialists or ABB service technicians

- Username: 2
- Password: 081500

Level 3: only available for ABB service technicians. The user (customer) has to previously allow access to the HMI in order to input this password.

On the Home screen, push the [USER] key for more than 2 seconds, a dialog will open where you can select 'Log out' or 'change password':

Figure 19: User dialog for 'log out' and 'password change'

By selecting 'Log out', the current user will be logged out and the system will be set to user 0.

... 3 Design and function

... Access permissions

By selecting 'change password' the following dialog will pop-up and a new password can be created.

Figure 20: User dialog for changing the password

Default operation parameters

Parameter input cooling menu

Figure 21: Cooling menu

Parameter input	Function
Start	Start temperature for hysteresis control of water cooler fan
Stop	Stop temperature for hysteresis control of water cooler fan
Flow	See Parameter input Alarm setpoint menu on page 33 for alarm limits for water flow OK

Parameter input analysis menu

Figure 22: Analysis menu

Parameter input	Function
Analyse Time	The time for each sampling period before probe cleaning
Cleaning before retraction	The number of cleanings to take place before the retractor automatically retracts the probe from the kiln and inserts it back again

Parameter input cleaning Sequence menu

Figure 23: Cleaning Sequence menu

Parameter input	Function	Default value
C01 Vx7	Plant's external Air blaster (Potential-free signal to plant is available)	1 sec
C02 V1	Centre Air blaster - blow-back in probe front nozzle	0,2 sec, 2 sec, 3 sec
C03 V2	Periphery Air blaster – blow-back around filter surface	0,2 sec, 2 sec, 3 sec
C04 V3	Filter blow-back – blow-back inside filter and out	1 sec, 2 sec, 3 sec
C05 V1	Centre Air blaster – number of blasts	2
C06 V2	Periphery Air blaster – Number of blasts	2
C07 V5.3	Pressure release (Option) – Release time by safety valve after blow-back of probe	2 sec
Purge after cleaning	Purge after cleaning of probe to remove false air from sample line (Depending on sample line length on site)	30 sec
V5.2 sample gas valve (optional)	Open heated sample shut-off valve to allow process gas to flow to gas analysis system downstream (if available)	Not configurable
Cleaning menu		Na.

Override cleaning in manual mode

Parameter input Probe Position Setup menu

Figure 24: Probe Position Setup menu

Parameter input	Function
S0	Service Position (Calibration point) Completely retracted, with flange shutter closed
S1	Auto Stop Position – Retracted for inspection, with flange shutter closed
S2	Cleaning Position – Probe still inside insertion tube
S3	Measuring position – Fully inserted position free from false air from kiln sealing (measurement position)
Raw position	Read out value from encoder converted to actual position below in mm
Stop Move	Any movement will stop at the location when pushed
Shutter menu	
	Operate flange shutter in manual mode
Encoder menu	

Reset of position control and encoder factor – in manual mode

... 3 Design and function

... Default operation parameter settings

Parameter input M1 Motor Control menu

Parameter input PID H2 Heated hose setup menu

Figure 25: M1 Motor Control menu

Parameter input	Function	Default value
Torque limit	Protective limit for motor and gear	65%
M1 Run	Motor run	Status of motor
M1 Switch On	Operation allowed	The motor can run
Stop Coast	Stop at retracted position	On
Stop Ramp	Run direct speed control	On
M1 Break release	Release the brake to move buggy	Off
Horn On	The horn will sound during movement of probe	On
Failure sec.	Maximum time allowed for the probe to move	60 sec.

Figure 27: PID H2 Heated hose setup menu

Parameter input	Function
Setp.	Temperature set-point of heated hose inside of the retractor
Reset	Reset to factory settings
On/Off	Power control for heater

Parameter input PID H3 Heated valve setup menu

Parameter input - PID H1 Probe heater Setup menu

Figure 28: PID H3 Heated valve setup menu

Parameter input	Function
Setp.	Temperature set-poin of heated shut off valve (if available)
Reset	Reset to factory settings
On/Off	Power control for heater

Figure 26: PID H1 Probe heater Setup menu

Parameter input	Function	Default value
Setp.	Temperature set-point of sample tube inside of the probe	180 °C
Reset	Reset to factory setting	

Parameter input Alarm setpoint menu

Figure 29: Alarm setpoint menu

Parameter input	Function	Default value
T01 TAH	Heated probe temperature high maintenance request	200 °C
T01 TAL	Heated probe temperature low maintenance request	170 °C
T02 TAH	Heated hose temperature high maintenance request	190 °C
T02 TAL	Heated hose temperature low maintenance request	150 °C
T03 TAH	Heated shut-off valve temperature high maintenance request	190 °C
T03 TAL	Heated shut-off valve temperature low maintenance request	150 °C
T10 TAAH	Water tank temperature high-high alarm	80 °C
T10 TAL	Water tank temperature low maintenance request	5 °C
T11 TAAH	Water temperature high-high forward cooling water flow alarm	80 °C
T12 TAAH	Water temperature high-high return cooling water flow alarm	90 °C
F12 FAL	Water flow return low maintenance request	80 l/m
F12 FALL	Water flow return low-low alarm	60 l/m
T12-T11 TAAH	Temperature difference (forward-return) high-high alarm	25 °C

4 Product identification

Name plates

Note
The name plates displayed are examples. The device identification plates affixed to the device can differ from this representation.

The probe gas sampling system can be unambiguously identified by means of the specifications on the nameplate. The nameplate is located in the inside of the control cabinet, on the internal side of the door.

The nameplate is laid out as follows:

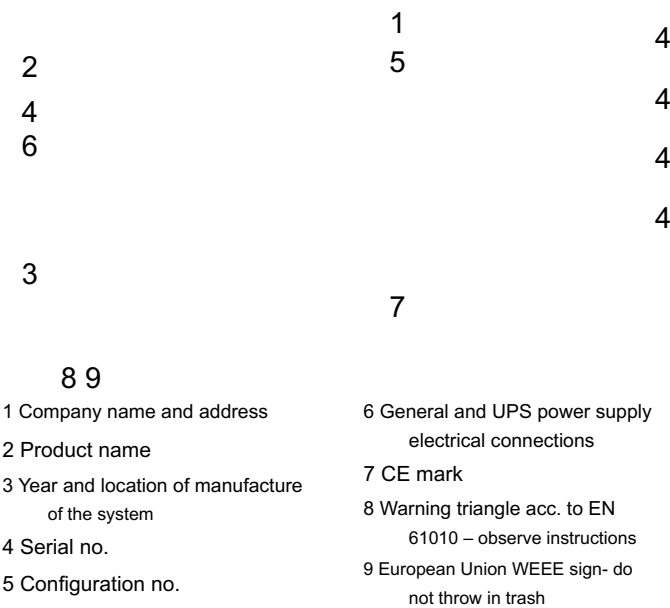


Figure 30: Nameplate (example)

Note
Products that are marked with the adjacent symbol may not be disposed of as unsorted municipal waste (domestic waste). They should be disposed of through separate collection of electric and electronic devices.

Warning signs on the system

Meaning of the warning signs
Warning signs on the gas sampling probe warn areas. The warning signs must always be in place and

The following figures shows the location of the w the individual modules:

Figure 31: Warning signs on the probe retractor

Figure 32: Warning signs on the control cabinet

Figure 33: Warning signs on the water panel

Figure 34: Warning signs on the cooling unit

The warning signs have the following meaning:

Warning sign	Meaning
	Warns about probe movements. Also means read manual. Retractor movement can be expected during operation. Do not stand in the area of travel of the probe or probe buggy until the probe is completely inserted or retracted and the warning lamps are switched off.
	Warns about current-carrying parts. There is a risk of electrocution by current-carrying parts. This also applies when the main switch is turned off. Particular danger areas are: Open cabinets, wiring between main power terminals and main switch, frequency converter wiring
	Warns about hot surfaces. A risk of hot surfaces can be expected during operation. Particular danger areas are all cooling water tubes, water panel, cooling panel, the heated sample gas line, the connection box for the heated sample gas line on the probe retractor, the heated sampling filter, the entire gas sampling probe, the metal structure of the probe retractor (particularly in the area of the mounting flange), the shutter on the duct opening.
	Warning about mechanical moving parts. Moving mechanical parts behind protective covers possessing a risk of damage to hands and fingers.
	Warning – Crushing by moving parts. Pay attention when working inside the danger area of the Retractor as there is a risk of being caught between moving parts. Before work insure to lock the safety switch for the probe motor.

5 Transport and storage

Safety instructions

Take into consideration the following safety instructions for all actions related to transport and storage:

WARNING

Mechanical, thermal and material dangers

Risk of injury in the area of the probe gas sampling system

due to moving or falling parts, anti-freeze, lubricating oil.

- Wear general personal protective equipment:
- Closed overalls with long trousers and long sleeves
- Safety shoes (preferably boots covering ankles)
- Safety gloves suitable for mechanical work Safety glasses
- Protective helmet
- If necessary, additional protective equipment if prescribed by the operator.

WARNING

Heavy transport units

Danger of crushing when lifting or lowering the transport unit

- Only appropriately trained personnel may transport the transport units and only with the aid of the recommended transport equipment.
- Do not stand under suspended loads.
- Follow the transport instructions in these operating instructions carefully.

Transport

General remarks regarding transport

During transport make sure that the transport packaging is not damaged or removed. Observe the below-mentioned temperature and humidity limits during transport.

In the event of transport damage attributable to improper handling, instigate damage assessment by the carrier (rail, post office, and forwarder) within seven days. Make sure that none of the enclosed accessories are lost during unpacking. Store the screws in case the unit needs to be transported again in the future.

Transport with crane

The retractor including the probe weighs 700–900 kg depending on the length of the retractor and type of probe. A crane and suitable transport equipment is required for transport and unpacking.

Transporting the modules

Observe the following instructions with regards to transporting the modules:

Module	Weight	Transport condition
Retractor unit including the probe	700 to 900 kg •	<div>The retractor is delivered with two temporary transportation legs. They are removed when assembled</div> <div><ul style="list-style-type: none">• During storage, support the tip of the assembled probe.• Only store after draining all water.• Lifting gear may only be attached at the designated attachment points 1 (4 lifting lugs included, see below)</div>
Cooling unit	350 kg	<div>Transport recommendation: Crane</div> <div>Note: The unpacked retractor must not be transported using a fork-lift truck.</div> <div><ul style="list-style-type: none">• Only store after draining all water.• Lifting gear may only be attached at the designated lifting points 1 (see below).</div>
Water unit	250 kg	<div>Transport recommendation: Fork-lift truck or crane</div> <div><ul style="list-style-type: none">• Only store after draining all water.</div>
Control cabinet	75 kg	<div>Transport recommendation: Fork-lift truck.</div> <div><ul style="list-style-type: none">• Lay the control cabinet on its back for transport.• Use a suitable transport pallet for transport.</div>
Flange shutter	50 kg	<div>Transport recommendation: Fork-lift truck or hand lift (recommended at least 2 persons for hand-lifting)</div> <div><ul style="list-style-type: none">• Lay the flange shutter its back for transport.• Use a suitable transport pallet for transport.</div> <div>Transport recommendation: For-lift truck or hand lift (recommended at least 2 persons for hand-lifting)</div>

... 5 Transport and storage

... Transport

Environmental conditions

Observe the following physical limits when transporting the modules:

Module	Environmental conditions for transport
Retractor unit including the probe	<p>Ambient temperature: +5 °C to +45 °C, after completely draining all water and drying parts in contact with cooling water or condensation: -20 °C to +45 °C</p> <p>Air humidity: Year-round average max. 75 %, short-term max. 95 %, occasional slight condensation is permitted</p>
Cooling unit	<p>Ambient temperature: +5 °C to +55 °C, after completely draining all water and drying parts in contact with cooling water or condensation: -20 °C to +55 °C</p> <p>Air humidity: Year-round average max. 75 %, short-term max. 95 %, occasional slight condensation is permitted</p>
Water unit	<p>Ambient temperature: +5 °C to +45 °C, after completely draining all water and drying parts in contact with cooling water or condensation: -20 °C to +45 °C</p> <p>Air humidity: Year-round average max. 75 %, short-term max. 95 %, occasional slight condensation is permitted</p>
Control cabinet	<p>Ambient temperature: -20 °C to +45 °C</p> <p>Air humidity: Year-round average max. 75 %, short-term max. 95 %, occasional slight condensation is permitted</p>
Flange shutter	<p>Ambient temperature: -20 °C to +55 °C</p> <p>Air humidity: Year-round average max. 75 %, short-term max. 95 %, occasional slight condensation is permitted</p>

Unpacking the system

Instructions

Perform the following steps to unpack the system:

1. Remove outer packaging:
 - Transport crate
 - Tensioning straps
 - Cardboard, films, and wooden parts
2. Undo fasteners holding the system parts on the pallet. Before doing it, take care that the equipment is in a stable way and cannot fall down.
3. Lift system parts off the pallet with a crane, for example, a hand lift (recommended at least 2 persons). Note: The retractor must not be transported on a truck.
4. Dispose of packaging material in accordance with national regulations.
5. Transport system parts to the place of installation.

Scope of delivery

Scope of delivery (standard)

The following components are delivered as standard:

- Probe retractor including probe
- Control cabinet
- Water panel
- Cooling panel with 1" hoses for connection to cooling water
- Complete electrical documentation in electronic form
- System operating instructions in electronic form
- Also supplies (filter tools, set of O-rings, leak detector)
- Electrical documentation and operating instructions for the out version placed in door of control cabinet

Scope of delivery (optional)

The following optional components may be included in the scope of delivery:

- Automatic flange shutter
- Water tank heater for ambient temperature below 5 °C
- Double probe configuration
- Heated sample shut-off valve (attached to the probe)
- Air tank 270 L CE approved

Storing the system

General storage information

Store in a place protected from the weather. Observe the designated storage temperatures and humidity. The transport packing, if present, should not be removed during storage. In the event that the probe gas sampling system is temporarily shut down, ensure suitable wrapping.

Storing the various modules

Observe the following instructions with regard to storing the various modules:

Module	Storage conditions
Retractor including probe •	<ul style="list-style-type: none"> During storage, support the tip of the assembled gas sampling probe. It is possible to use the probe support that was originally sent with the system upon purchase (if still available). Only store after draining all water out of the internal tubes.
Cooling module and water tank	Only store after draining all water out of the internal tubes and draining of the tank.
Control Cabinet	Store on rear side lying on pallet
Compressed-air tank (optional)	<ul style="list-style-type: none"> Ensure adequate protection of the attachments. Only store after draining all water out of the internal tubes.

Environmental conditions

Observe the following physical limits with regard to the various modules:

Module	Environmental conditions
Retractor including probe	<p>Ambient temperature: +5 °C to +55 °C, completely draining all water out of the internal tubes and contact with cooling water or cooling tank.</p> <p>Air humidity: Year-round average max. 95 %, occasional condensation not permitted</p>
Cooling module and water tank	<p>Ambient temperature: +5 °C to +55 °C, completely draining all water out of the internal tubes and contact with cooling water or cooling tank.</p> <p>Air humidity: Year-round average max. 95 %, occasional condensation not permitted</p>
Control cabinet	<p>Ambient temperature: -20 °C to +55 °C</p> <p>Air humidity: Year-round average max. 95 %, occasional condensation not permitted</p>
Compressed-air tank (optional)	<p>Ambient temperature: +5 °C to +55 °C, completely draining all water out of the internal tubes and contact with cooling water or cooling tank.</p> <p>Air humidity: Year-round average max. 95 %, occasional condensation not permitted</p>

6 Installation

Safety instructions

Take into consideration the following safety instructions for all actions related to installation:

WARNING

- Mechanical, thermal and material dangers
- Risk of injury in the area of the probe gas sampling system due to moving or falling parts, anti-freeze, lubricating oil.
- Wear general personal protective equipment:
 - Closed overalls with long trousers and long sleeves
 - Safety shoes (preferably boots covering ankles)
 - Safety gloves suitable for mechanical work Safety glasses
 - Protective helmet
 - If necessary, additional protective equipment if prescribed by the operator.

WARNING

- Heavy transport units
- Danger of crushing when lifting or lowering the transport unit
- Only appropriately trained personnel may transport the transport units and only with the aid of the recommended transport equipment.
 - Do not stand under suspended loads.
 - Follow the transport instructions in these operating instructions carefully.

WARNING

- Hot surfaces, hot gases, jet flames
- Risk of burning due to jet flames and hot gases at the uncovered duct opening when the rotary kiln is in operation.
- Preferably install or remove the probe when the rotary kiln is out of operation.
 - If you install or remove the probe when the rotary kiln is in operation:
 - Wear a face mask against heat, heat-proof gloves and protective welder's clothing and respiratory protection against toxic gases.
 - Keep the time in which the duct opening is open as short as possible.

Introduction

This section contains a list of tasks to be performed when installing the probe gas sampling system. Links are provided to specific installation instructions describing installation of various modules in detail.

It is recommended to have initial start-up of the probe gas sampling system performed by the manufacturer's qualified personnel or by the supplier.

Overview of instruction steps

Proceed as follows to install the complete system:

Step	Procedure	Details
1	Check place of installation of the various modules of the probe gas sampling system.	Check installation page 4
2	Install the probe retractor such that personnel are not endangered, and the system cannot be damaged.	Install retractor page 4
3	Install control cabinet in a suitable place.	Install control cabinet page 4
4	Install compressed-air supply, install compressed-air tank if necessary.	Install compressed-air supply
5	Install water system and cooling panel.	Install water system and cooling panel
6	Lay and connect cooling water hoses.	Install cooling water hoses
7	Connect external sample gas line to retractor.	Install external sample gas line to retractor
8	Connect internal electric cables.	Connect internal electric lines
9	Connect external electric cables.	Connect external electric lines on page 5

Checking site conditions

The purpose of this task is to check whether the probe gas sampling system site is correctly prepared.

Instructions

How to check site conditions:

1. Using the checklist, check whether the site conditions for the various modules of the probe gas sampling system are fulfilled and that preparations for installation have been completed
2. Only continue with installation of the probe gas sampling system once all conditions have been met.

Site conditions checklist

The following conditions must be met:

Conditions	Description (for illustration see How to install the probe on page 46)
General rules regarding choice of installation site were observed, environmental conditions taken into account.	General rules regarding choosing the place of installation of the peripheral modules.
Installation position of probe and probe retractor defined.	Environmental condition requirement Positioning the probe with sufficient space around it for installation of peripheral barrier
There is a suitable position to install the control cabinet with an unobstructed view of the probe retractor. No direct heat radiation or dust influx must be present.	Choosing the place of installation of the control cabinet
Position to set up the cooling module defined. No direct heat radiation or dust influx must be present.	Choosing the place of installation of the cooling module
If a compressed-air tank is required: position to set up the compressed-air tank defined. No direct heat radiation or dust influx must be present.	Choosing the place of installation of the compressed-air tank
A suspension device for the probe retractor has been prepared and holes drilled for installation of the other modules	Fastening elements and attachment points
Kiln inlet wall tube and mounting flange manufactured and installed.	Creating the wall tube with mounting flange Installing the wall tube
The power and compressed-air supply conform to the requirements of the probe gas sampling system	Power and compressed-air supply requirements
Air cannon, if present, is integrated into the probe gas sampling system control system only.	Integrating the air cannon into the control system
The danger area around the probe retractor is protected by a protective installation.	Creating the base area for the retractor Creating the protective installation around the retractor
Heated sample line between retractor and analysis system is protected against thermal damages	A safe path must be provided giving the shortest possible distance

... 6 Installation

Installing the probe retractor/flange shutter

Screws required for assembly

4 + 4 + 4 suspension bolts, diameter 16 mm, material round steel S235JR (St37)

Requirements

The following requirements must be met in order to install the probe retractor/flange shutter:

- The site conforms to the designated site conditions (criteria see Choosing the place of installation of the peripheral modules).
- 4 fastening points are present to affix the probe retractor.
- The probe retractor and flange shutter is unpacked.

Instructions

How to install the probe retractor:

1. Set up probe retractor at the place of installation.

4. Position probe retractor at the designated place. If necessary, install appropriate support. It is important to ensure the correct alignment of the retractor angle, both horizontally and vertically with respect to the insertion tube/flange of the kiln.

1

1

1 Installation flanges

Figure 36: Installation flanges on probe retractor

1 Transport lugs 4x

Figure 35: Transport lugs

2. Suspend probe retractor on transport

lugs (Figure 35, Pos. 1) using suitable lifting gear. The attachment points are in the front on the flange shutter and in the back on the retractor mounting flanges.

Note: Pay particular attention to suitable fastening points of the lifting equipment. Observe relevant local regulations.

3. Lift probe retractor together with flange shutter and position in front of insertion tube/flange of the kiln wall.

Remove the two mounted transport legs.

Note: Store the transport legs for any future transport.

5. Connect the appropriate support of the probe retractor to the system. Maximum load per suspension point must be observed to ensure even loading of the fastening elements. The fastener elements must connect to the suspension points on the installation flanges (Figure 36, Pos. 1). The fastener elements can be placed standing on the ground, hanging from the ceiling, whatever is preferred. **CAUTION!** The screw-in transport lugs are only for the probe retractor only, but not for permanent suspension. For permanent suspension only use the other fastener elements.
6. Remove lifting gear and support material.
7. Check whether probe retractor is fastened correctly and adjusted to local conditions.

8. Remove retractor buggy lock (, Pos. 1) and probe transportation support (, Pos. 2).

Note

Do not throw away the probe transportation support, as it can be used as a tool in case the probe needs to be removed from the buggy for maintenance activities.

Adjustment of the retractor

After completing all installation tasks and start-up, it may be necessary to change the position of the probe to optimize penetration and retraction inside the rotary kiln.

1

2

1 Retractor buggy lock

2 Probe transportation support

Figure 37: Retractor buggy lock and probe transportation support

... 6 Installation

Installing the probe

How to lift the probe

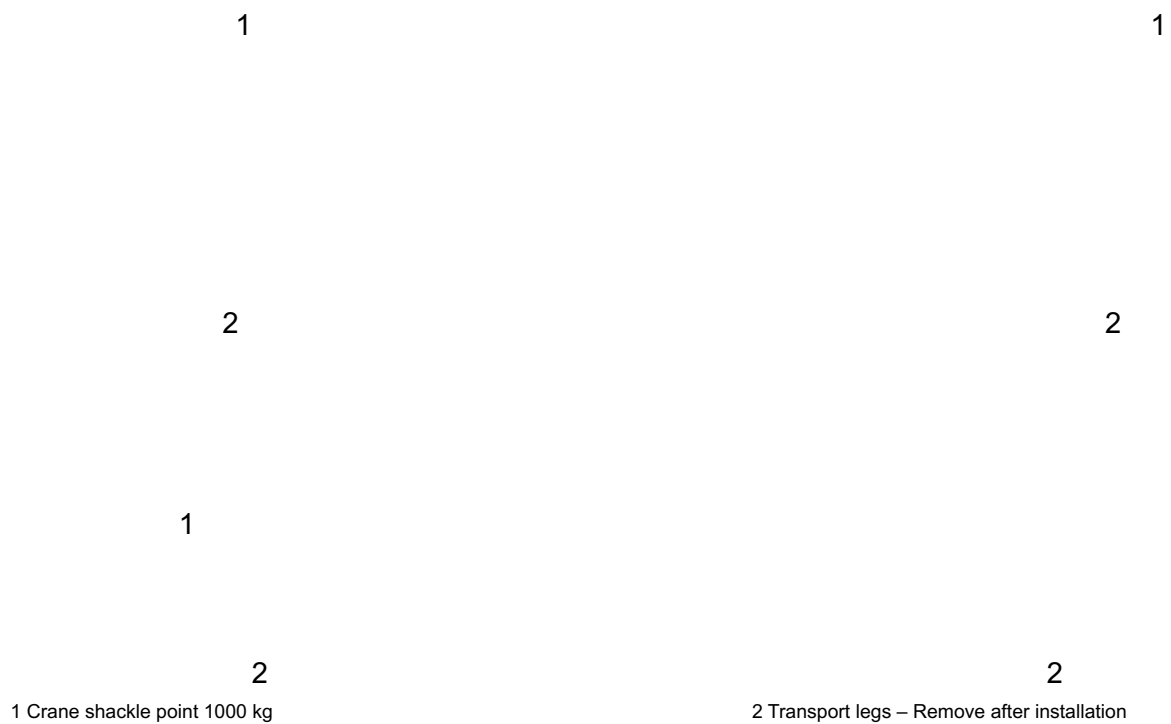


Figure 38: How to lift the probe

Lifting instructions

Use only the included crane shackles for lifting.

Weight

1200 kg

Note

- Figure 38 is shown without flange shutter – to be installed on kiln wall prior to retractor/probe.
- Figure 38 is shown with transport legs front and back (To be removed after usage/install).

Installation flanges / points on the retractor / flange shutter

1 Process flange at the flange shutter

2 Installation flanges 4x, 2x on each side

3 Matching flange > ASME B16.5 Slip-on Welding - Class

Figure 39: Standard 3 m probe, shown without insertion flange / pipe

... 6 Installation

... Installing the probe

How to install the probe

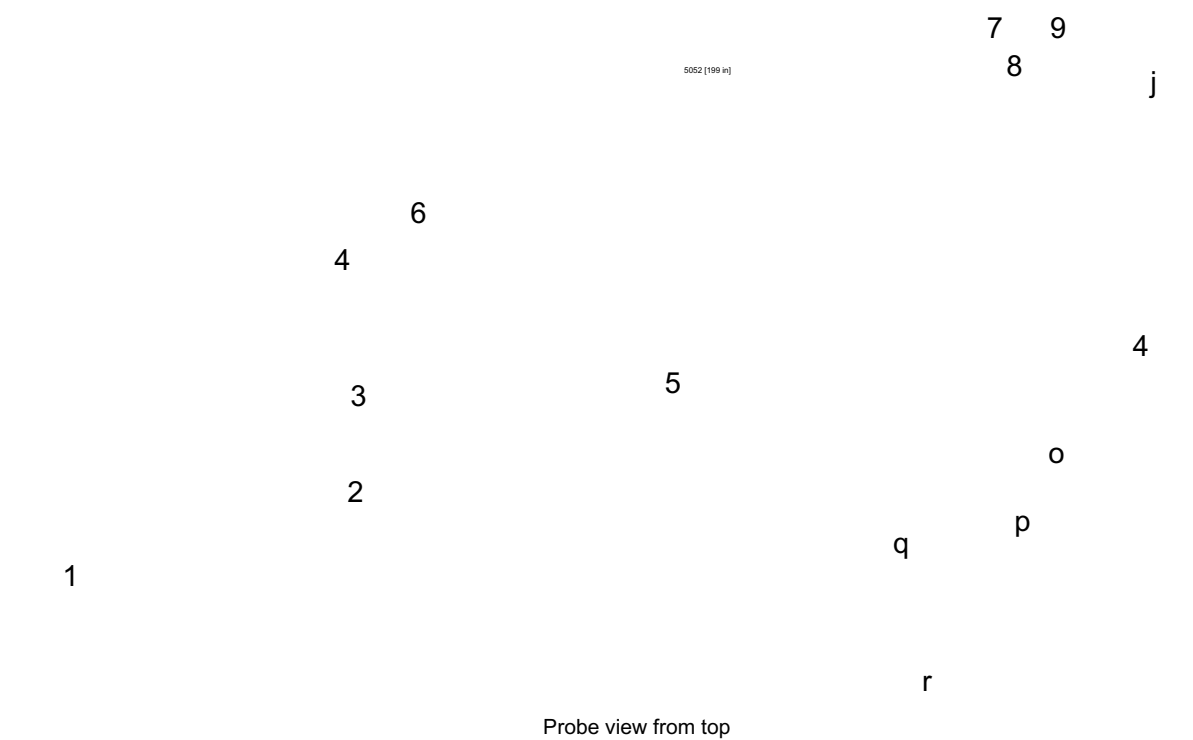


Figure 40: Standard 3 m probe, shown with insertion flange / pipe *

- 1 Typical install area
- 2 No install in bottom 50 % of kiln
- 3 No install in top 25 % of kiln
- 4 Platform floor
- 5 Typical platform length 6500 mm [256 in]
- 6 Backend install flange (floor or roof based)
- 7 ASME B16.5 Slip On Welding Flange - Kiln center line
- 8 Install flange / pipe to be welded to kiln foot wall
- 9 Installation flange / pipe 8" *

- 0 Min. kiln center line height: 1200 mm [47 in]
- k Max. kiln center line height: 1600 mm [63 in]
- l Typical Platform width: 2000 mm [79 in]
- m Kiln center line
- n Kiln sealing
- o Angle to kiln center line: 45° (-0° +30°)
- p Insertion pipe 8" Sch40 (length to be cut flush with kiln)
- q Kiln foot wall
- r Example of distance to kiln sealing -should be as short as 1000 mm [39 in])

* Customer supply

Customer supplied install flange

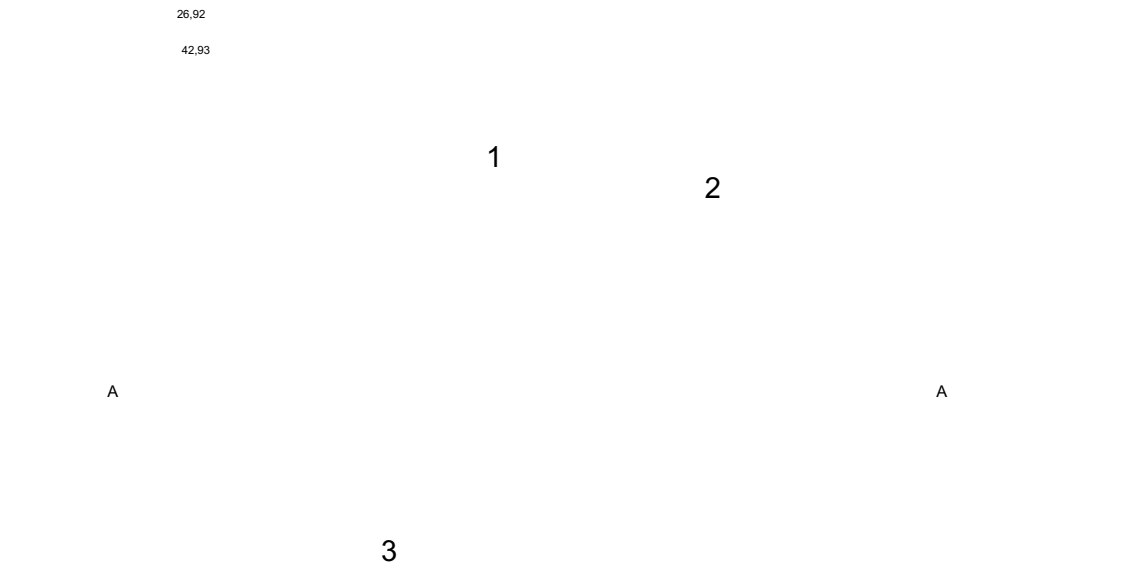


Figure 41: Customer supplied install flange (ASME B16.5 Slip On Welding Flange - Class 150 8")

- 1 Length of pipe to be determined on site
- 2 Pipe to be cut flush with inside kiln lining / bricks
- 3 Install flange / pipe to be welded to kiln foot side

... 6 Installation

Installing the compressed-air supply

Requirements

- A minimum 270 litres air tank must be connected to the probe gas sampling system. The air tank is an optional part of the standard supply.
- The following conditions must be met:
 - Only an air tank and connection piping complying with local standards and regulations for compressed-air installations must be used.
 - Compressed-air conforms to the required quality of compressed-air, see Air supply on page 58.

Instructions

Take the following steps to install the compressed-air supply:

1. Fasten compressed-air tank in suitable position as close to the retractor unit as possible. The air tank must be protected against heat radiation or any area of elevated temperature.
2. Pneumatically connect compressed-air tank directly to the probe gas sampling system via minimum 1" piping.

Installing the control cabinet

Required for mounting of control cabinet

See the as build EL-DOCUMENTATION FOR PROBE SYSTEM enclosed inside the control cabinet when supplied.

Screws required for assembly

4 galvanized steel screws (or stainless material) M10 or bolts M10

Instructions

How to install the control cabinet:

Fasten control cabinet in suitable position (see Choosing the place of installation of the control cabinet) with 4 assembly screws or bolts.

Installing the water system and panel

Screws required for assembly

4 + 4 galvanized steel screws (or stainless material) M16

Requirements

The following requirements must be met in order to install the cooling module:

- The site conforms to the designated site (see Choosing the place of installation of the modules)
- The water and cooling system should preferably be installed at the same height level as the probe. Maximum horizontal distance from water and cooler unit to retractor is 10m. Horizontal distance is 20m.
- Fastening points are present to affix the cooling module.
- The cooling module is unpacked.

Position of the connections

The location of the connections tags on the various modules can be found in the pneumatic/hydraulic interface appendix.

Instructions

How to install the cooling system:

1. Fasten water and cooling module in suitable position, preferably next to each other (see Choosing the place of installation of the cooling module), with screws to the ground.
2. If placed next to each other (within 1m) use the provided piping to connect between water unit and cooling unit. If a longer distance is required, use minimum 1" piping.
3. Attach suitable drain tubes
4. After assembling the probe retractor and cooler, determine the length of the cooling-water hoses.
5. Lay and fasten cooling-water hoses along the ground.
6. Use minimum 1" piping to connect water supply and return-hoses to the retractor connections.

Installing the cooling water hoses

Cooling water tubes or hoses are not supplied together with the system and are to be sourced locally according to local regulations. Note the following recommendations when sourcing the tubes:

- Preferably use tubes made of galvanized steel or high-pressure, high-temperature flexible hoses. Do not use copper tubes, as this could lead to galvanic corrosion.
- Install cooling-water tubes to avoid any damage caused by working in the proximity of the probe gas sampling system.
- Install tubes on trays or in tube conduits if possible, for further protection.
- Notice the minimum and maximum operational temperature allowed for the tubes and consult with tube manufacturer in case of doubt.
- Only use hoses in areas where no heat or mechanical wear occurs.
- 1" hoses between Water panel and Cooling panel are included for install next to each other. If distance is larger than the length of the hoses 1", tubing as described above is used.

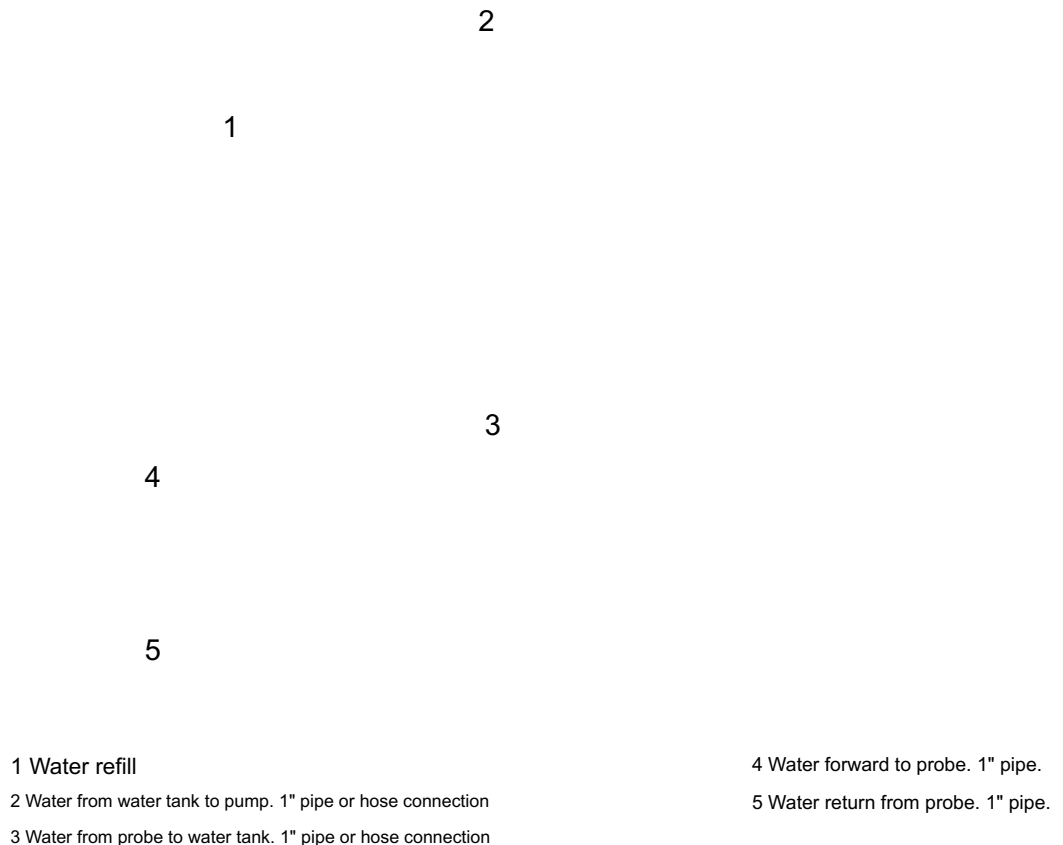


Figure 42: Water system

Recommendations

1. The distance between the water system and the cooling unit should be minimized.
Ideal distance: 0,5 - 1 m.
2. The distance between the water system and the probe retractor should be minimized.
Ideal distance: 10 - 20 m.

... 6 Installation

Installing the heated sample gas line to the retractor

Recommendations

It is recommended to use a heated sample gas line with a holding temperature of 180°C to connect the probe gas sampling system to the gas analyser system, such as model TBL01-S from ABB AG. Other models are possible to use, as long as they comply with pneumatic connection size, electric connections, power supply and temperature requirements.

Note

The heated sample gas line between the retractor and the gas analyzer system is not part of this supply. It must be sourced locally or from the gas analyzer system manufacturer.

Instructions

How to connect the heated sample gas line to the gas analyser system:

1. Insert the heated sample gas line through the side of the junction box and fix it with the supplied holder. The figure below shows the heated junction box with cover (left) and without cover (right). Heated sample gas line must be installed through the right side were indicated by the arrow.

Figure 43: Heated junction box with cover (left) and without cover (right).

2. Connect the heated sample gas line to the probe gas sampling system using the supplied Swagelok® 6/4mm tube fitting.
3. Connect the other end of the heated sample gas line to the gas analyser system by following the specific instructions supplied by the heated sample gas line manufacturer.

Observe the following general rules:

- Install heated sample gas line separately from other lines.
- When laying the heated sample gas line, avoid tight curves, bending or crossing other lines.
- Avoid any naked tubing to be exposed to ambient conditions in order to avoid condensation of corrosive gases travelling through the heated sample gas line.

7 Electrical connections

Safety instructions

Take into consideration the following safety instructions for all actions related to electrical connections:

Powered terminals

Terminal row for main Power and UPS power are still powered when mains and UPS circuit breakers are switched off.

Danger to life due to live parts!

- Only specialized electrical personnel may work on the electrical system.
- Disconnect the probe gas sampling system from the power supply before working on the electrical components.
- Observe national regulations pertaining to electrical equipment.

WARNING

Mechanical, thermal and material dangers

Risk of injury in the area of the probe gas sampling system due to moving or falling parts, anti-freeze, lubricating oil.

- Wear general personal protective equipment:
- Closed overalls with long trousers and long sleeves
- Safety shoes (preferably boots covering ankles)
- Safety gloves suitable for mechanical work Safety glasses
- Protective helmet
- If necessary, additional protective equipment if prescribed by the operator.

Connecting internal electric

Position of the connections

The location of the electric connections on the valve can be found in the electrical connection plan enclosed in the control cabinet when supplied.

All required internal lines are pre-installed in the Cooling panel and Control Cabinet. All downline cables are installed via the central connection point to the electrical terminal boxes.

Cable specification

Cable specifications

Control Unit

Main power supply 230/400 V AC 5G4mm² or 5G6mm²
3 ph N + PE, fuse 20 A,

Power consumption: 10 kVA

UPS power supply 230 / 400 VAC 5G2,5mm² or 5G4mm²
3 ph N + PE, fuse 16 A,

Power consumption: 5 kVA

Control Unit to Retractor

Motor retractor (Shielded) 4G1,5 mm² shielded

Power supply motor brake 3G1,5 mm² or 4G1,5 mm²

Power supply probe heating, sample hose, valve heating 7G1,5 mm² or 8G1,5 mm²

Power supply 24 VDC 7G1,5 mm² or 8G1,5 mm²

Safety signals 7G1,5 mm² or 8G1,5 mm²

Control Unit to Cooling Unit

Power supply motor 4G1,5 mm² or 5G1,5 mm²

Power supply 24 V DC 5G1,5 mm² or 6G1,5 mm²

Signals to Plant

Status signals output potential free 25G1,5 mm² or 25G2,5 mm²

I/O's Status and alarms / Remote /

Control input signals

Modbus to AO2000 System

Signal interfaces

- Potential free I/O's for status and alarms
- Modbus with AO2000 System
- Others on request

Power supply and signal interfaces diagram see page 10

System bus PROFINET®

Cables to be attached from the control cabinet to the retractor and to the cooling unit on site.

... 7 Electrical connections

... Connecting internal electric cables

Overview

A

B

C

D

E

Connect the internal electrical lines

Proceed as follows to connect internal electric lines with all cables according to flammability acc. EN60332-1-2/-2-2, VW1, FT1:

1. Turn off the general power
2. Turn off the UPS power supply
3. On the control cabinet: Turn off the main power switch.
4. On the control cabinet: Turn off the UPS power switch.
5. Install internal lines in accordance with the electrical connection plan. For an overview see .

This applies to:

- 230/400 V AC cable to the probe cooling.
- 24 VDC cable to the probe cooling system
- ProfiNet® shielded bus cable from to the probe cooling system
- 230/400 VAC cable between water and cooler panel for heat exchanger fan motor
- 230 VAC cable to probe retractor for brake probe
- 230 VAC cable to the retractor unit heating
- 24 VDC cable for safety installations
- 24 VDC cable to the retractor unit
- ProfiNet® bus cable from to the retractor

Neighbouring metallic parts such as gratings, fences, railings must also be grounded.

6. 230/400 VAC shielded cable from the Control Cabinet to the Retractor motor.

- Shielded motor cable: Connect the shield directly to the shield terminal 2 below the frequency converter 1 , not to the cable gland.
Run the cable separately in the control cabinet, not together with the other lines in the cable duct.
Remove terminal blocks.
Connect to motor.

1

1

2

Requirements

- See the electrical connection plan on page
- Finalize all internal probe gas sampling system connections before connecting external connections and power supply

... 7 Electrical connections

Connecting external electric cables

Using the Ethernet interface

The control unit, HMI and frequency controller of the probe gas sampling system are equipped with Ethernet interfaces. These interfaces are intended solely for service purposes. Any other use is not allowed.

NOTICE

Impairment of the system function

When using the Ethernet interface, external influences through the network connection can disturb the time characteristics of the control program and thus of the complete probe gas sampling system.

- Parametrization and modification of the network settings is only possible with the use of Level 3 password and intended only for service technicians.

Position of the connections

The location of the electric connections on the various modules can be found in the electrical connection plan enclosed inside the control cabinet when supplied.

All required lines are pre-installed in the probe retractor area. All downline connections are installed via the central connection point to the electrical terminal box.

General requirements

Refer to the documentation enclosed with the delivery of the system: 'EL-DOCUMENTATION FOR PROBE SYSTEM'.

The following conditions must be met before connecting the power supply lines:

- Check that the voltage setting of the ProKiln system matches the mains voltage.
- Make sure the power supply leads have an adequately dimensioned protective device (circuit breaker).

General voltage requirements

- 230/400 VAC, $\pm 10\%$, 50 Hz (fuses 3 x 20 A required), 3-phase connection (5 wires, N-conductor necessary)
or
230/400 VAC, $\pm 10\%$, 60 Hz (fuses 3 x 20 A required) 3-phase connection (5 wires, N-conductor necessary)
- Power consumption Max. 8,2 kVA

UPS voltage requirements

- 230/400 VAC, $\pm 10\%$, 50 Hz (fuses 3 x 16 A required) connection (5 wires, N-conductor necessary)
or
230/400 VAC, $\pm 10\%$, 60 Hz (fuses 3 x 16 A required) connection (5 wires, N-conductor necessary)
- Power consumption Max. 4,5 kVA
- The UPS supply will only be engaged for the time it takes to retract the probe from the kiln to a safe state in the event of a power failure to the general power supply.

Interface relays

- Potential free output relays: 24VDC, 250V/8A
- Input active 24VDC from customer control system to interface relay

Connect external electric lines

Proceed as follows to connect external electric lines:

1. On the control cabinet:
Turn off the main power switch.
2. On the control cabinet:
Turn off the UPS power switch.
3. Affix ground cable to ground bolt of control cabinet, water panel, cooling panel and probe retractor.
4. Install external electric lines in accordance with the specifications of the electrical connection plan. This applies to:
 - Supply of 230/400 3ph+N+GRD 50/60 Hz
 - UPS supply of 230/400 3ph+N+GRD 50/60 Hz (Pos. C)
 - Modbus cable for Modbus RTU communication to plant AO2000-System, if available.
 - Ethernet cable for Modbus TCP or Profibus DP communication to plant SRO/CCR or Profibus DP communication to plant SRO/CCR (, Pos. D)
 - Potential free contacts for system communication to plant SRO/CCR (, Pos. E)

Connection for protective installation

The probe gas sampling system is fitted with an electric signal input that integrates an external protective installation to secure the danger area around the retractor. The protective installation should be supplied locally and could consist, as an example, of a door leading to the probe or a fence surrounding it.

Connect the appropriate output of the protective installation signal to the input 'protective installation', as shown in the documentation enclosed with the delivery of the system: 'EL-DOCUMENTATION FOR PROBE SYSTEM'.

In general, the signal from the protective installation should work as follows:

- Protective installation signal = 0 (contact open from device), probe retracts out of the and flange shutter closes.
- Protective installation = 1 (contact closed from device), probe works normally.

Connection option for air cannon

In order to prevent dangers caused by a blast of air from an external air cannon in or close to the area of the wall tube, the air cannon must be integrated into the probe gas sampling system control system. The control cabinet is fitted with an air cannon connector to make sure the safe operation is granted.

Connect the external air cannon control-signal, to the input 'air cannon', as shown in the documentation enclosed with the delivery of the system: 'EL-DOCUMENTATION FOR PROBE SYSTEM'.

In general, the signal to the air cannon works as follows:

- Air cannon = 0 (contact open at ProKiln contact terminal), external air cannon is deactivated, only with probe in retracted position.
- Air cannon = 1 (contact closed at ProKiln contact terminal), external air cannon is activated, only with probe in inserted position S3.

8 Commissioning

Safety instructions

Take into consideration the following safety instructions for all actions related to electrical connections:

Danger to life due to live parts!

- Only specialized electrical personnel may work on the electrical system.
- Disconnect the probe gas sampling system from the power supply before working on the electrical components.
- Observe national regulations pertaining to electrical equipment.

WARNING

Mechanical, thermal and material dangers

Risk of injury in the area of the probe gas sampling system due to moving or falling parts, anti-freeze, lubricating oil.

- Wear general personal protective equipment:
- Closed overalls with long trousers and long sleeves
- Safety shoes (preferably boots covering ankles)
- Safety gloves suitable for mechanical work Safety glasses
- Protective helmet
- If necessary, additional protective equipment if prescribed by the operator.

WARNING

Gas sampling probe movements

Risk of crushing around the retractor due to gas sampling probe movements.

- Before commencement any work on the probe gas sampling system, turn the Safety switch to "Off" and secure the service switch against unauthorized switching (with a padlock).
- Additionally press the EMERGENCY-STOP switch before working on the retractor or probe.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off.
- Never stand in the danger area around the retractor when the protective installation is closed.
- When the warning lamps light up or the warning buzzer buzzes, leave the danger area around the probe retractor immediately as the probe is about to move at any moment.
- Press the EMERGENCY-STOP switch immediately if anyone is still in the danger area around the retractor after the warning lamps light up or the warning buzzer buzzes.

WARNING

Pressurized system dangers

Risk of injury in the area of the probe gas sampling system due to pressurized pneumatic system.

- All pneumatic equipment connected must comply with local standards for safety and usage.
- Periodic inspection/approval of installation according to local standard.
- Any damage to a pneumatic equipment will require replacement in order not to compromise safety.

CAUTION

Slippery floor

Risk of falling on slippery floor due to escaped cooling water and lubricating oil or dirt.

- Always keep the floor around the probe gas sampling system clean and dry.

CAUTION

Harmful anti-freeze

Danger of injury to skin and eyes in the event of contact with cooling water or anti-freeze.

- Avoid contact with the cooling water and the anti-freeze.
- In case of accidental contact of cooling water or anti-freeze with skin, wash off the skin immediately with plenty of water and soap. Contact medical specialist according to local regulations.
- If cooling water or anti-freeze gets in the eyes, immediately remove protective glasses, rinse them thoroughly with plenty of water, holding the eyelids open. Contact medical specialist according to local regulations.
- Observe instructions in the anti-freeze manufacturer's safety data sheet.

CAUTION

Hot cooling water

Danger of injury to skin and eyes in the event of contact with hot cooling water

- Avoid contact with the cooling water as it is hot.
- In case of accidental contact with hot cooling water, wash off immediately with cold water.
- Contact medical specialist according to local regulations.
- If hot cooling water gets in the eyes despite wearing protective glasses, rinse them thoroughly under cold water, holding the eyelids open. Contact medical specialist according to local regulations.

Overview of instruction steps

Proceed as follows to install the complete system:

Step	Procedure	Detailed instructions in chapter
1	Check installation for proper condition.	Installation check on page 57
2	Fill cooling water and check water tightness of the cooling water circuit.	Cooling water on page 58
3	Check compressed-air supply	Activation of the probe gas sampling system on page 59 and Air supply on page 58
4	Switch on the probe gas sampling system on the control cabinet	Checking the direction of rotation of the heat exchanger on page 65
5	Switch on the cooling system	Checking the pneumatic system on page 62
6	Check direction of rotation of the heat exchanger and water pump to correct 3ph power connection if needed.	Checking the direction of rotation of the heat exchanger on page 65
7	Check pneumatic system and the compressed-air switch in the pneumatic box.	Checking the pneumatic system on page 62
8	In the control cabinet: check frequency drive has no alarm.	Checking/correcting operating parameters on page 64
9	Check operating parameters of the probe gas sampling system and correct if necessary.	Inserting the probe and switching to automatic mode on page 64
10	Insert the probe for the first time in manual operation mode in steps of 0,5m every 5 minutes until full penetration depth inside the kiln is reached.	

Installation check

Introduction

Check the installation for correct condition before start-up. The following section describes this procedure. If one of the requirements is not met, abort start-up and do not proceed until the appropriate conditions have been created.

Check list

The following conditions must be met:

Conditions

- No visible damage to the modules.
- Stable fastening of the modules checked.
- Connection and laying of electric all lines checked.
- Connection and laying of pneumatic lines checked.
- Connection and laying of cooling-water lines checked.
- Protective perimeter around probe installed.

... 8 Commissioning

Cooling water

Requirements

The closed cooling-water circuit must be filled with approximately 350 l of potable water. The water is filled in the tank automatically by the re-fill valve on the side of the tank. Water refill of the tank is automatically controlled during normal operation.

Ensuring anti-freeze protection

If ambient temperatures fall below +5 °C use approximately 33% of anti-freeze depending on manufacturer specification in relation to wanted temperature protection. ABB recommends Glycol as anti-freeze. Anti-freeze with anti-corrosive additive is not permitted. A tank heater is provided as an option to lower the risk of damage to the cooling system during cold weather.

Instructions

1. Remove the probe from the hot process to the service position S2 in manual operation
2. Close the water supply of potable water to the water tank
3. Open the water tank top cover to a side to allow anti-freeze to be filled in tank
4. Release approximately 33% of the water tank capacity
5. Add the 33% of anti-freeze to the water tank
6. Close the water tank top cover
7. Open the water supply of cooling water to the tank
8. Check cooling water circuit for leaks. Remedy any leaks before continuing with start-up.
9. Reset and make sure that all alarms and maintenance requests are cleared
10. Introduce the probe to measuring position S3 and enter probe gas sampling system into Automatic Mode

Air supply

Requirements

The compressed-air must meet the following requirements:

Dew point

0°C (below 0°C make sure that the compressed air cannot freeze).

Pressure

Minimum 5 bar
Maximum 8 bar
Default operating pressure at 6 bar

Consumption

3 m³/h

Quality

The compressed-air must be free of dirt and droplets. Check the quality of the compressed air at the connection to the customer-side compressed air using a white cloth. If you observe any oil, moisture or impurities, abort start-up and do not continue until residues have been permanently eliminated.

Turning on compressed-air

1. Open the compressed-air main supply to the probe gas sampling system on valve V8 below the connection panel of the retractor.

2. Open the compressed-air pneumatic control supply to the retractor on valve V6 at the rear panel of the retractor.

3. Open the compressed-air supply to the blaster panel on valve V5 located behind the protection cover of the blaster panel.

Activation of the probe gas sampling system

Requirements

- The connected gas analyser system must be operational. Observe the warm-up time of the gas analyser according to manufacturer specifications.
- The mechanical locking bar of the shutter (Figure 46) must be removed before inserting the gas probe for the first time.
- The system must not have any visible damage. See Environmental conditions on page 38.
- The customer-side central compressed-air supply must be on.
- Tools required: Control cabinet key to open the control cabinet.

1

1 Mechanical locking bar

Figure 46: Removing the mechanical locking bar of the shutter

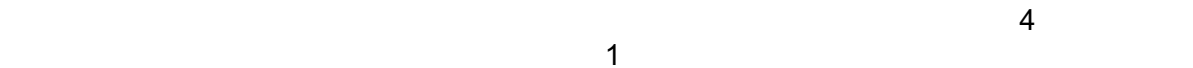
... 8 Commissioning

... Activation of the probe gas sampling system

Switching on the probe gas sampling system

1. Turn the safety switch probe 1 to position OFF to prevent any probe movement on the front of the retractor system control cabinet

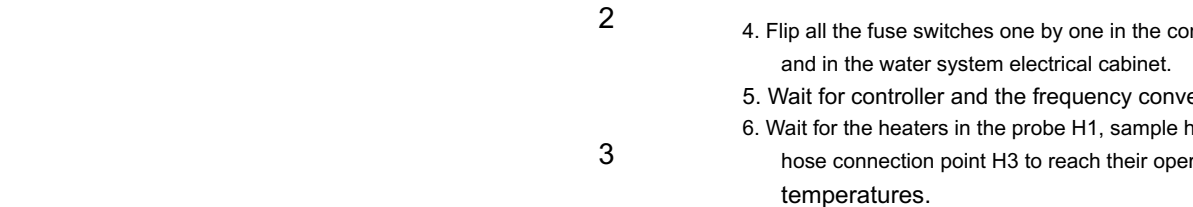
3. Turn on the power supply for the water system side of the side of the water system electrical cabinet



1 Safety switch probe

Figure 47: Retractor control cabinet

2. Turn on the general power supply 2 and the UPS power supply 3 for the probe gas sampling system on the side of the control cabinet



2 General power supply

3 UPS power supply

Figure 48: Control cabinet (retractor system electrical cabinet)

4 Water system power switch

Figure 49: Water system electrical cabinet

4. Flip all the fuse switches one by one in the control cabinet and in the water system electrical cabinet.
5. Wait for controller and the frequency converter to start.
6. Wait for the heaters in the probe H1, sample hose connection point H3 to reach their operating temperatures.

7. Reset all alarms and maintenance requests
- Home page ► Alarm Reset
- Push the Emergency Stop Reset 5 on the front of the control cabinet
- Turn the Operation/Service switch 6 to Operation Mode

Power breakers in the control cabinet

The illustration below shows the power breakers cabinet.



Figure 50: Control cabinet

8. Perform the following checks to ensure smooth operation of the probe gas sampling system before inserting the probe for the first time:
- After switching on: Working on the cooling module on page 62
 - Checking the pneumatic system on page 62
 - Starting frequency converter and adapting control parameters on page 63
 - Checking/correcting operating parameters on page 64

Pos.	Component
1	M1 Retractor drive motor
2	M1 Retractor position brake
3	Water system power supply
4	H1 Probe sample tube heater
5	H2 Sample hose heater
6	H3 Heated sample shut-off valve (optional)
7	Control cabinet internal power outlet
8	Control power supply 24 V DC
* Listed rating is included as an example as the as build EL-DOCUMENTATION FOR PROBE SYSTEM enclosed with system will have the supplied rating for a specific cust	


... 8 Commissioning

Working on the cooling module

Requirements

- The service switch is in the ON position, the gas sampling probe is retracted from the kiln.
- Tools required: Control cabinet key to open the control cabinet

Instructions

1. Remove the probe from the process to position S0, S1 or S2.
2. Turn off the power supply  for the water system on the side of the water system electrical cabinet. This will allow work on the system as the water flow and pressure is stopped and the heat input from the process is removed.

Note: Wait until the temperature of the cooling water is below 40 °C Before starting to work on the system!

1

Checking the pneumatic system

Requirements


The Operation/Service switch is in the Service position, the gas sampling probe is retracted from the kiln.

Instructions

1. Check the compressed-air system with suit (see Checking for leaks on page 108).
2. Check the pressure switches alarm point in the control cabinet for correct settings: 4 bar.

3. Check mark in settings window and adjust screw on the head of the pressure switch if necessary.

Figure 51: Water system

3. After work is completed check of any leakages before returning the probe to the process.
4. Turn on the power supply  for the water system and reset all alarms.
5. Re-enter the probe into the process.

Starting frequency converter and adapting control parameters

Introduction

The frequency converter ABB model ACS380 controls the retractor motor. In order to ensure correct speed and movement, the controller will set the default control parameters.

These parameters can be adapted to the conditions at the installation site if necessary. Two menus on the HMI include the parameters possible to change. The frequency converter controls the power for the retractor motor based on direct motor reading and a position encoder inside the motor.

To reset the encoder zero-calibration point S0 the probe must be moved in manual mode to the "correct" S0 position located 200 mm from the mechanical stop as seen in the illustration (red arrow).

The above menu gives access to position control and position information.

The position and control of the motor is based on a zero-calibration position on the retractor S0 and the integrated position encoder inside the motor. The length of the probe and the retractor are used to define the various positions needed in order for the probe to enter the kiln in the most favourable way.

By selecting the Encoder Menu button, a window will pop-up with a warning, because the override functions available in this section change the factory configuration of the drive.

The frequency converter provides readings on motor performance. These data are used to protect the motor from overloading and to secure that the probe does not get stuck inside the kiln by excessive incrustations or build-up.

The above menu gives access to motor performance and overload conditions. Various override functions are available for users with the right access level. Motor status and drive error messages can be read.

Refer to the ACS380 manual for further information on operating the frequency converter.

... 8 Commissioning

Checking/correcting operating parameters

Modifying the controller operating parameters

The probe gas sampling system control system has factory settings that can be modified to specific system conditions at start-up. It is possible to edit alarm limits within a pre-established range in order to provide for specific system conditions.

Limited configuration serves to protect the probe retractor against harmful or contradictory settings.

A list of operating parameters can be found in Default operating parameter settings, see Default operation parameter settings on page 30. It is possible to display the operating parameters on the control cabinet HMI by scrolling through the relevant menu pages on the HMI.

Modifying the water system power parameters

1 2 3

Pos.	Component	Function	Default cut off value
1	Breaker for water pump M10	Turns off water pump 2,7A	
2	Breaker for Cooling fan 1 M20	Turns off fan 1	1,6A
3	Breaker for Cooling fan 2 M21	Turns off fan 2	1,6A

Inserting the probe and switch to automatic mode

Requirements

The following conditions must be met:

Turn the Safety switch to "Off" position, the gas sampling probe is retracted from the kiln (see Operating the service switch on page 100).

Instructions

Proceed as follows:

1. Check that the water flow in the water-cooling system is correct (see Default operation parameter settings on page 30).
The rotor of the water pump must run according to the indication on unit. If necessary, adjust the direction of rotation by changing the power phase position.
2. Make sure the safety switch is in "OFF" position and lock the probe in its position.
3. Make sure that no mechanical locking bar (see page 59, Pos. 1) is attached to the flange shutter. It is able to open.
4. Leave danger area around the retractor, clear the installation and turn service switch to "ON" position.
5. Turn the system into manual on the HMI.
6. Open the flange shutter from the HMI for visual inspection while standing outside the protective installation.
7. Check the kiln wall tube for clogging and clean it.
Note: Inserting the gas sampling probe when the opening is clogged can lead to damage to the probe, therefore not permitted.
If cleaning is necessary, go back to step 2 in the instructions.
If cleaning is necessary, only trained people with the appropriate equipment must perform this task.
8. Insert the probe for the first time into the kiln in manual operation mode in steps of 0,5 m every 5 minutes. Push buttons in "Probe Position Setup" until the desired depth is reached (position S3). Low motor speed is achieved by using the "In Low" button, while normal motor speed is achieved by using the "Probe In" button.

9. Observe the following:

- horizontal and vertical alignment of the gas sampling probe in relation to the opening in the mounting flange
- stability of the probe retractor fastening elements
- unobstructed mobility of all cable and hose connections
- even movement of the probe buggy

10. Wait for cooling water to heat up to see that the cooling system is performing correctly.

After inserting the probe, the complete system is ready to sample because the probe is equipped with internal electrical heating of the gas-conducting tube.

11. Switch the gas sampling probe to automatic mode using the HMI Home page.

Result

The sampling system is thus in automatic mode and monitors itself.

Checking the direction of rotation of the heat exchanger

After first insertion with the water temperature up at normal (70 to 75 °C), check the direction of rotation of the fans at the heat exchanger of the water cooler:

The rotor of the two fan motors must turn according to the arrow on the unit. If necessary, adjust the direction of rotation by shifting position of two of the phase on the power supply.

9 Operation

Safety instructions

Take into consideration the following safety instructions for all actions related to operation:

Danger to life due to live parts!

- Only specialized electrical personnel may work on the electrical system.
- Disconnect the probe gas sampling system from the power supply before working on the electrical components.
- Observe national regulations pertaining to electrical equipment.

WARNING

Mechanical, thermal and material dangers

Risk of injury in the area of the probe gas sampling system due to moving or falling parts, anti-freeze, lubricating oil.

- Wear general personal protective equipment:
- Closed overalls with long trousers and long sleeves
- Safety shoes (preferably boots covering ankles)
- Safety gloves suitable for mechanical work Safety glasses
- Protective helmet
- If necessary, additional protective equipment if prescribed by the operator.

WARNING

Gas sampling probe movements

Risk of crushing around the retractor due to gas sampling probe movements.

- Before commencement any work on the probe gas sampling system, turn the Safety switch to "Off" and secure the service switch against unauthorized switching (with a padlock).
- Additionally press the EMERGENCY-STOP switch before working on the retractor or probe.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off.
- Never stand in the danger area around the retractor when the protective installation is closed.
- When the warning lamps light up or the warning buzzer buzzes, leave the danger area around the probe retractor immediately as the probe is about to move at any moment.
- Press the EMERGENCY-STOP switch immediately if anyone is still in the danger area around the retractor after the warning lamps light up or the warning buzzer buzzes.

WARNING

Pressurized system dangers

Risk of injury in the area of the probe gas sampling system due to pressurized pneumatic system.

- All pneumatic equipment connected must comply with safety standards for safety and usage.
- Periodic inspection/approval of installation according to local standard.
- Any damage to a pneumatic equipment will require replacement in order not to compromise safety.

WARNING

Hot surfaces

Danger of burning due to hot surfaces during a operation of the probe gas sampling system.

- Do not touch the probe gas sampling system components after operation.
- Do not touch the probe gas sampling system components cooled down to 50 °C. Specifically, do not touch:
 - the cooling module, the heated sample container
 - the connection box for the heated sample container
 - the retractor
 - the hot sampling filter
 - the entire probe
 - the metal structure of the retractor
 - the shutter of the duct opening
- If it is unavoidable to touch hot components, wear a protective mask against heat, heat-proof gloves and protective clothing.

WARNING

Falling or spalling hot material

Danger of burning due to material falling or spalling from the retracted probe.

- Never enter the danger area around the retractor during operation.
- Do not approach the retracted probe until a warning signal resting on the probe has cooled down.
- If it is unavoidable to approach the hot probe, wear a protective mask against heat, heat-proof gloves and protective clothing.

WARNING

Harmful gases, jet flames

Danger due to harmful gases and jet flames in the area of the duct opening while the probe is moving in or out of the duct.

- Never enter the danger area around the retractor during operation.

CAUTION

Slippery floor

Risk of falling on slippery floor due to escaped or spilled cooling water and lubricating oil or dirt.

- Always keep the floor around the probe gas sampling system clean and dry.

CAUTION

Harmful anti-freeze

Danger of injury to skin and eyes in the event of contact with cooling water or anti-freeze.

- Avoid contact with the cooling water and the anti-freeze.
- In case of accidental contact of cooling water or anti-freeze with skin, wash off the skin immediately with water and soap. Contact medical specialist according to local regulations.
- If cooling water or anti-freeze gets in the eyes despite protective glasses, rinse them thoroughly under running water, holding the eyelids open. Contact medical specialist according to local regulations.
- Observe instructions in the anti-freeze manufacturer's safety data sheet.

CAUTION

Hot cooling water

Danger of injury to skin and eyes in the event of contact with hot cooling water

- Avoid contact with the cooling water as it is hot.
- In case of accidental contact with hot cooling water wash off immediately with cold water.
- Contact medical specialist according to local regulations.
- If hot cooling water gets in the eyes despite protective glasses, rinse them thoroughly under cold running water, holding the eyelids open. Contact medical specialist according to local regulations.

Monitoring automatic mode

Introduction

After starting up the probe gas sampling system, if you switch the probe manually you can switch it to automatic mode. Automatic mode allows continuous operation of the probe for sample gas sampling. Probe cleaning steps take place at defined intervals (these can be set using the controller). Observe all safety instructions in the section "Safety" on page 66 when performing this work.

Requirements

The following conditions must be met for automatic operation:

- Gas sampling probe correctly installed and secured for operation.
- The gas sampling probe is inserted into the sample gas.

Instructions

How to monitor the probe gas sampling system in automatic mode:

1. In controller: switch the probe to automatic mode (if this has not already been done).
Path: Home ► Automatic on / off
2. In controller: monitor operation of the probe gas sampling system in the diagnostic screen. If any alarms are relevant which can be seen in the

Observe the following rules in automatic mode:

- In case of any alarm, read the message on the diagnostic screen and immediately take appropriate action (see "Troubleshooting" on page 73).
- Check general condition of the system (see "Safety" on page 66).

... 9 Operation

... Monitoring automatic mode

Power failure

Failure of the general mains power leads to immediate retraction of the gas sampling probe out of the kiln. After switching the power supply back on, the display and operating unit boots and the sampling system switches to manual mode.

To resume normal measuring operation, you must manually insert the gas sampling probe into the kiln and then switch to automatic mode (see Commissioning on page 56).

Damage

The probe (probe tube and filter) may get damaged in the following situations:

- if raw material falls on the probe
- if too much material adheres to the probe tube (excessive build-up)
- if tire parts or bullets hit the probe tube
- Kiln rotation caused mechanical impact from material or kiln lining
- if red-hot material flows over the probe
- if aggressive combustion residues condense on the probe tube and filter material
- if the probe tube material is worn-out by high flue gas speeds (particularly critical at flue gas speeds > 20 m/s)

Note

The manufacturer offers no warranty for such damage.

Special considerations for SO₂ measurement

SO₂ measurements are very useful to monitor re-circulation of volatiles in the kiln system. ABB recommends the measurement of SO₂ with a suitable continuous gas analyser, in order to increase kiln performance and reduce lining wear inside of it.

The following problems may occur when measuring SO₂:

- if the gas sampling hole on the tip of the probe clogs up with combustion particles, an increasing amount of SO₂ is absorbed,
- if a layer of rust particles builds up on the filter unit, SO₂ will also be absorbed as the sample gas travels to the analyser,
- if the sample gas condenses in the sample gas tube, part of the SO₂ dissolves in the condensation, which in turn decreases the SO₂ concentration measured in the analyser.

In the above-mentioned cases, the falsification of results will be even more severe, the lower the concentration of SO₂ is.

Maximum reliability of SO₂ measurement is

- when the gas sampling hole on the probe is completely open (i.e., not clogged up with particles)
- immediately after blow-back.

Due to the propensity of rust particles to form inside or inside the probe gas sampling system that may lead to absorption of SO₂, the manufacturer offers no measurements.

In order to achieve representative results when measuring SO₂, follow these steps:

- Make sure there are no cold spots in the probe gas sampling system and gas analyser system that could lead to SO₂ absorption
- Have a suitable SO₂ analysis setup of continuous analysers in optimum operation conditions according to manufacturer's specification
- Measure the SO₂ process concentration immediately 10 minutes after a probe cleaning (blow-back) has been performed.
- Make a trend curve connecting the measured SO₂ concentration over time based on the probe cleaning sequence
- Adjust the probe cleaning sequence to suit the conditions you need to make more frequent SO₂ measurements
- Frequently remove dust, rust and any other particles which could affect the measured SO₂

If safe operation is no longer possible

If it can be assumed that safe operation is no longer possible, the probe gas sampling system must be taken out of service and secured against being started up again.

It can be assumed that safe operation is no longer possible if:

- if the sampling system is visibly seriously damaged
- if the sampling system is no longer operating
- after prolonged storage under adverse conditions
- after severe transport stress.

Checking general condition

Condition of the probe sampling system

When the probe sampling system is in operation, monitor the general condition of the system on a daily basis:

Module	Check general condition of retractor with regard to
Retractor including probe	<ul style="list-style-type: none"> • general damage • missing or loose covers • visible damage to electric cables • hose and tube leaks • drive chain: <ul style="list-style-type: none"> – chain tension slack is approx. 1" – chain link wear • gas sampling probe: <ul style="list-style-type: none"> – signs of wear (e.g. polished metal surfaces)
Cooling system	<ul style="list-style-type: none"> • general damage • missing or loose covers • visible damage to electric cables • hose and tube leaks • cleanliness of heat exchanger dissipation fins
Control cabinet	<ul style="list-style-type: none"> • general damage • missing or loose covers • visible damage to electric cables • dripping water or other liquids, internal condensation
Compressed-air tank (optional)	<ul style="list-style-type: none"> • visible damage • air leakage

If there are any defects that impact safety, inform the responsible maintenance personnel. If cleaning is necessary, follow the instructions in Checking the condition of the system, cleaning the system on page 102

Checking the duct opening/process flange

Check the duct opening for clogging at regular intervals and clean if necessary.

Note

Inserting the gas sampling probe when the duct opening is clogged can lead to damage to the probe. The same applies to re-inserting the gas sampling probe after prolonged standstill of the sampling system.

Special case: Calciner gas outlet

Because of the greater flow speeds in this process, after start-up the gas sampling probe must be checked frequently for wear at the calciner gas outlet measuring point. If distinct signs of wear are visible after a short time, check the installation position of the gas sampling probe and correct it if necessary. Failing to observe this can lead to severe damage or total loss of the gas sampling probe. In the event of significant wear, special

Adapting the cleaning procedure to the probe

Cleaning processes

You can start a cleaning process as follows:

- Clean in MANUAL mode (on the HMI at the control cabinet)
- Clean in AUTOMATIC mode (time-controlled cleaning)
- Clean in AUTOMATIC mode (remote control via RS485 connection)
- Clean in AUTOMATIC mode (by monitoring via the analyser system, only in combination with the analyser system)

Clean in MANUAL mode

In MANUAL mode you can start the cleaning process via the cleaning dialog (Menu ► Cleaning).

The following buttons are available:

Button	Procedure
Start	The cleaning sequence as defined on this page will start.
Stop	The cleaning sequence will stop.
Vx7	Will initiate customer's external Air blaster air gun cleaning.
V1	Will initiate probe centre-nozzle cleaning by probe.
V2	Will initiate probe filter periphery cleaning by probe.
V3	Will initiate probe filter blow-back cleaning by probe.
V5.3	Will initiate probe pressure release valve in s (if available).
V5.2	Will initiate opening of heated sample shut-off valve.

... 9 Operation

... Adapting the cleaning procedure of the probe

Clean in AUTOMATIC mode (time-controlled)

Clean in AUTOMATIC mode (time-controlled) will run as follows, according to factory configuration:

Phase	Description (Default settings shown)
1	The heated sample shut-off valve closes to protect the gas analysis system (if available)
2	The customer's air cannon is activated to clean out the area where the probe enters the process
3	The probe centre-nozzle air blaster activates according to settings (3 blasts)
4	The probe filter periphery air blaster activates according to settings (2 blasts)
5	The probe filter blow-back activates according to settings (3 blow-backs)
6	The probe centre-nozzle air blaster activates according to settings (1 blast)
7	The probe filter periphery air blaster activates according to settings (1 blast)
8	The probe pressure-release valve activates according to settings to release potential overpressure in a blocked sample heated line (if available)
9	The heated sample shut-off valve opens to allow flow of measuring gas towards the gas analysis system (if available)

The complete cleaning cycle in automatic mode is composed of the following 2 processes that will run sequentially at specific time-intervals that can be configured in the operation panel:

Process	Description
1	Phases 1 to 9 will run as described above
2	Probe moves out to position S2 inside the insertion tube to scrape off any adhering material, then goes back to measuring position S3. The probe never leaves the insertion tube so as to prevent any dust to be blown outside of the process.

Clean in AUTOMATIC mode (remote control via connection)

Clean in AUTOMATIC mode (remote control via connection) will run as follows:

Phase	Description
1	Phases 1 to 9 will run as described above, after a signal is received by the system controller - See the as built documentation DOCUMENTATION FOR PROBE SYSTEM enclosed with the cabinet when supplied..

Clean in AUTOMATIC mode (by monitoring vacuum gas analyzer system)

Note

Clean in AUTOMATIC mode (by monitoring vacuum gas analyzer system) is only possible in combination with the AO2000-System.

Clean in AUTOMATIC mode (by monitoring vacuum gas analyzer system) will run as follows:

Phase	Description
1	If an ABB AO2000-System is connected via Modbus to the ProKiln GAC400, it will send a signal to the system controller if the sample vacuum pressure exceeds the maximum value set in the gas analysis system (this is a symptom of clogging)
2	Phases 1 to 9 will run as described above

This cleaning cycle is repeated up to three times to remedy the error (i.e., vacuum still exceeds maximum value). If the error message "3x Cleaning Not Successful" at S3 is displayed and the probe gas sampling system remains in error mode, while the probe is retracted out of the process, the cleaning processes and movements will take place until the error is handled by maintenance personnel. See the error and corrective action on page 73 for further details.

Using the EMERGENCY-STOP switch

Introduction

The EMERGENCY STOP switch is used to interrupt probe movement and probe Air blaster cleaning immediately in the event of danger to personnel. Actuating the switch disables all mechanisms serving to protect the gas sampling probe.


The gas sampling probe interrupts its movement and probe Air blaster cleaning immediately and in any position.

The probe is only retracted out of the rotary kiln after pressing the Emergency Stop reset switch on the front of the control cabinet.

Instructions

What to do after pressing the EMERGENCY STOP switch:

1. Remove danger only if this does not represent a subsequent danger to the person performing the action. Please refer to local emergency procedures if personnel need to be medically attended. Only after this, continue with next steps.
2. Make sure that:
 - the danger cannot occur again
 - no-one is standing in the area of probe retractor travel
3. Unlock the EMERGENCY STOP switch by turning the back ring in the direction of the arrow.

4. Actuate EMERGENCY Reset button  on the front of the control cabinet (showing a solid blue light when EMERGENCY STOP has been or is active).

WARNING

Actuating the Service Mode switch moves the probe out of the kiln.

- Do not stand in the area of travel of the probe buggy until the probe has reached its end position and the warning signal goes out.

Human Machine Interface (HMI)

Overview

The Human Machine Interface (HMI) is the access point for information and control of the probe gas sampling system. The HMI is connected directly to the control system and displays the status of the probe gas sampling system in numbers and graphics. The HMI will have entry point for set points and operational push buttons. Depending on access level, various screens and options will be available.

Figure 52: HMI on the front of the control cabinet

Menu structure

The following table depicts the menu structure. Only the first two of a maximum of four menu levels are shown.

Menu structure	Description
Home	Start menu
Menu	Overview of the system
Cooling	Cooling setup
Analyse	Analysis setup
Cleaning	Cleaning setup
Air Supply	Blow-back control
Probe position	Probe movement
Motor	Motor drive setup
PID H1	Probe heater H1
PID H2	Sample hose heater
PID H3	Heated shut-off valve
Maintenance Req.	Overview maintenance
Alarm	Overview alarm
Alarm List	Active maintenance
Alarm setup	Alarm limits setup
Analogue info	Overview analogue
Service DI/DO	Overview digital
Network diagnostics	Overview communication
ProKiln GAC400 PI diagram	Overview drawing
Configuration	configuration

... 9 Operation

... Human Machine Interface (HMI)

Functions of HMI main menus

The following table outlines the functions of the main menus:

Menu	Functions
Home	Front screen displays current measured values, basic information, and access to menu points
Operation	Operating functions for start-up, maintenance, etc.
Alarms	Displays current measured values, alarm and maintenance request, alarm history and alarm acknowledgement, messages, and system information, etc.
Trends	Trend curves
Setup	Setup for system optimization (limits, etc.), access permissions, editing tolerance ranges, network settings, etc.

Login

Authentication is performed on the Login User screen. Without user authorization, the operator can only access the dialogs in the Alarm and Trend menu. For an overview of access permissions in the various areas of the control system, please refer to the section on Access permissions.

Navigation

The user navigates the interface at the bottom of the screen. The Menu button goes back to the Home menu; the Back button jumps to the previous menu. The Alarm button shows the logbook containing all error messages, and historical messages.

Data entry

The menus of the operating software may contain pop-up dialogs with user prompts. Following modes of data entry are possible:

- Selection menus, e.g., to select a username
- On/off buttons, e.g., to open and close the shutter
- Pop-up input panel (on-screen keyboard alphanumeric), e.g., to enter the username
- Pop-up input panel (on-screen keyboard numeric), e.g., to enter the password

Screens

The following list indicates the four basic screen types of the control system:

- User interface: Home screen
- User interface: Operating screen
- User interface: Alarm screen
- User interface: Trend screen
- User interface: Setup screen

10 Diagnosis / error messages

Automatic processes

If an error occurs, the system triggers automatic processes to protect the gas sampling probe.

Phase 1

If the probe gas sampling system detects an alarm the probe is retracted out of the kiln.

WARNING! – Probe movement. Do not stand in the area of travel of the probe or probe buggy.

Phase 2

The probe goes into manual mode

Result: Because the gas sampling probe is in manual mode the probe will no longer move in on its own.

Phase 3

If the probe gas sampling system detects a Maintenance request, the probe continues to operate.

Note

In the event of danger to personnel, you can interrupt these automatic processes by pressing the EMERGENCY-STOP switch.

Irregularities and corrective action

Observation	Possible cause	Measures
Untypical running noise	Heat exchanger defective Motor M1 for retractor defective	Inform internal maintenance department or ABB Serv
Whistling noise from compressed-air system	Compressed-air system leak	See Checking for leaks on page 108
Probe travel is jerky	<ul style="list-style-type: none"> Probe buggy rails dirty Wrong inclination of probe buggy 	<ul style="list-style-type: none"> Clean rails Readjust probe buggy inclination using the screws, see Probe retractor: Checking and adjusting the position of the probe on page 118.
Probe not centred in kiln aperture	Incorrect probe alignment/positioning	Realign probe
Untypical or gurgling noises in the cooling-water circuit	Air bubbles in the cooling-water circuit caused by too high temperature	<ul style="list-style-type: none"> Check the water flow Check if piping has lime deposits limiting flow. If necessary, remove lime by removing liquid in tank, see Cooling mode: Removing liquid from the tank on page 122
Unusual probe movements (probe rocks up and down, sways to the sides, jerky travel)	<ul style="list-style-type: none"> Loose parts Severe soiling of rails 	Have trained experts find out the cause
Compressed-air hose bursts or compressed-air tube cracks	<ul style="list-style-type: none"> Pressure controller defective Incorrect pressure set on pressure controller 	<ul style="list-style-type: none"> Close gate valve in pneumatic box, then blow out completely with compressed-air to blow out completely Shut down probe gas sampling system and start-up until the cause has been fixed
Cooling-water tube or hose bursts or cracks	Mechanical damage to the tube or hose from an outside source, or damage caused by too high temperature (bending, melting, deformation of tubes)	<ul style="list-style-type: none"> Turn off the valves to isolate the leaking area Wait until the water has run out before repair work Shut down probe sampling system and start-up until the cause has been fixed Do not begin repair work until it has cooled down
Probe or heat exchanger cracks	Mechanical damage and thermal stress	<ul style="list-style-type: none"> Wait until all cooling water has run out before repair work Shut down probe sampling system and start-up until the cause has been fixed Do not begin repair work until it has cooled down
Probe movement blocked	<ul style="list-style-type: none"> Mechanical damage 	<ul style="list-style-type: none"> Remove the probe from the process

... 10 Diagnosis / error messages

HMI error displays

The HMI on the front of the control cabinet displays error status. All error messages do not appear directly on the HMI's Home menu but are rather shown on the Alarm and Maintenance Request menus. An Alarm Active list is also available. Errors are stored in the Alarm history.

An indication at the top right corner as a push button is always shown in all menus, so that the user can quickly access the Maintenance Request (yellow) or Alarm menus (red).

Example 1: Alarm menu

This example shows the Alarm menu. In this example, there is an indication of a Red Alarm and a Yellow Maintenance Request in the top right corner of the HMI. It can also be seen that the alarm originates from a F12 Flow "FALL" (Flow Alarm Low). The alarm is indicated with a red marker. See the complete alarm history for further examples.

The illustration above shows the Menu page with error indication at the top right corner (in this example there are no active alarms, therefore the system is in normal state).

In general, the following approach is used:

H: high limit alarm

HH: too high limit alarm (high-high)

L: low limit alarm

LL: too low limit alarm (low-low)

Example 1: Alarm menu - overview table

Alarm – Error	Probable Cause	Measures
T10 Water tank TAHH	Water tank temperature too high, cooler not able to remove heat input from probe	Check heat exchanger panel and clean oil
T11 Water forward TAHH	Water temperature forward too high	Check water tank temperature and heat exchanger
T12 Water return TAHH	Water temperature return from probe too high	Check the water flow rate
T12-T11 Delta temp. TAHH	Water temperature difference between forward and return too high	Check the water flow rate
F12 Flow FALL	Water flow too low	Check water system for leakages and limit flow
L12 Water tank LALL	Water tank level too low	Check refill valve of potable water to the tank
-151Q17 M10 Pump not run	M10 water pump turned OFF	Check water pump switch -150S3 on side of control cabinet
-151F3 M10 Water pump	M10 water pump power OFF	Check circuit breaker -151F3 in water system
-40Q3 Cooling supply	Power on water system	Check circuit breaker -40Q3 in control cabinet
-150S3 PC cooling supply	M10 water pump turned OFF	Check water pump switch -150S3 on side of control cabinet
Emergency Stop	Emergency Stop button has been pushed and not released and reset	Release Emergency switch and push Emergency Stop button in front of control cabinet
PROFINET® error	Communication between units	Check serial connections
P1 Air supply PALL	Compressed-air supply pressure too low	Check compressed-air supply and pressure
-35Q3/1 Inverter M1	Frequency controller OFF	Check circuit/motor breaker -35Q3/10 in control cabinet
V4 Shutter not closed	Flange shutter not closed	Clean shutter flange and check compressed-air supply inductive contact
Probe position not reached in 30s	Too slow movement of retractor/probe	Contact ABB Service for evaluation of installation
M1 Torque High moving in	Retractor move resistance too high going into the kiln	Check tracks, chain drive and probe insertion
M1 Torque High moving out	Retractor move resistance too high going out of the kiln	Check tracks, chain drive and probe insertion
T01 Probe heat TAHH	Probe sample tube heating temperature too high	Check process and water temperature
T02 Heated hose TAHH	Heated hose temperature too high	Check heated hose connection and hose temperature
T03 Heated valve TAHH (Option)	Heated valve temperature too high	Check heated valve connection and hose temperature

... 10 Diagnosis / error messages

... HMI error displays

Example 2: Maintenance Request menu

This example shows the Maintenance Request menu. In this example there is an indication of a Yellow Maintenance Request at the top right corner of the HMI, plus a green OK indication showing that the system is still operating. It can also be seen that the Alarm originates from a -101S2 safety switch as indicated with a yellow marker. See the complete maintenance request list below for further examples.

In general, the following approach is used:

H: high limit alarm

HH: too high limit alarm (high-high)

L: low limit alarm

LL: too low limit alarm (low-low)

Example 2: Maintenance Request menu - overview table

Maintenance request - Error	Probable Cause	Measures
T01 Probe Heat TAH	Probe sample tube heating temperature high	Check process and water temperature
T01 Probe Heat TAL	Probe sample tube heating temperature low	Check process and water temperature
T02 Heated hose TAH	Heated hose temperature high	Check heated hose connection and hose
T02 Heated hose TAL	Heated hose temperature low	Check heated hose connection and hose
T03 Heated valve TAH (Option)	Heated valve temperature high	Check heated valve connection and hose
T03 Heated valve TAL (Option)	Heated valve temperature low	Check heated valve connection and hose
T10 Water tank TAL	Water tank temperature low	Check process and ambient temperature been added
L11 Water tank LAL	Water tank level low	Check refill valve of potable water to the t
F12 Water flow FAL	Water flow low	Check water system for leakages and lim
T01 Ai Error	Probe sample tube temperature sensor error	Check cable connection
T02 Ai Error	Heated hose temperature sensor error	Check cable connection
T03 Ai Error	Heated valve temperature sensor error	Check cable connection
T10 Ai Error	Water tank temperature sensor error	Check cable connection
T11 Ai Error	Water temperature forward temperature sensor error	Check cable connection
T12 Ai Error	Water temperature return temperature sensor error	Check cable connection
F12 Ai Error	Flow sensor error	Check cable connection
-1S3 Main supply	General power OFF	Check Main switch -1S3 in control cabine
-35Q3 Fuse M1 motor	Power supply for frequency drive	Check circuit breaker -35Q3 in control ca
-35Q19 fuse M1 Break	Power supply for M1 Motor break	Check circuit breaker -35Q19 in control c
-10T8 24V CC	Fuse for control cabinet 24VDC	Check fuse -10T8 in control cabinet
-10T2 24V Emergency stop	Fuse for emergency power 24VDC	Check fuse -10T2 in control cabinet
-10T14 24V Retractor	Fuse for retractor power 24VDC	Check fuse -10T14 in control cabinet
-11T12 24V PC	Fuse for probe cooling power 24VDC	Check fuse -11T12 in control cabinet
-50S15 Service Mode	Switch for Service/Operation Mode	Shift to Operation mode
-45Q3 H1 fuse	Power supply for Probe heating	Check circuit breaker -45Q3 in control cal
-46Q3 H2 fuse	Power supply for Heated hose	Check circuit breaker -46Q3 in control cal
-47Q3 H3 fuse	Power supply for Heated valve	Check circuit breaker -47Q3 in control cal
-101S2 M1 safety switch	Switch for Probe Safety ON/OFF	Shift to ON
-152F3 M20 fuse	Power supply for Heat Exchanger Fan M20	Check circuit breaker -152F3 in Water co
-153F3 M21 fuse	Power supply for Heat Exchanger Fan M21	Check circuit breaker -153F3 in Water co
-154Q3 H10 fuse	Power supply for Water Tank Heat H10 (Option)	Check circuit breaker -154Q3 in Water co

... 10 Diagnosis / error messages

... HMI error displays

Alarm History and Active Alarms

The HMI also provides the possibility to show a list of active alarms and past (historical) alarms.

To access the active alarms list, press the push button Alarm List. By pushing the Alarm Reset button (see below example), it is possible to acknowledge and clear the alarms which are not active at the moment.

To access the historical alarm menu, press the push button Alarm History. Here it is possible to see all past alarms (not active, already acknowledged) as well as current active alarms.

Red: Alarm active, not acknowledged
 Black: Alarm active, acknowledged
 Purple: Alarm not active, acknowledged

Handling error messages

Requirements

In the event of an Alarm, the probe is automatically retracted out of the kiln until the probe reaches its safe end position. After the alarm has been acknowledged, make sure that it really has reached its end position. Only when the alarm has been acknowledged, subsequent probe movement can be expected, with the exception of the warning lamps on the retractor terminal box to turn on. After the alarm has been acknowledged, performing any corrective action.

Instructions

Proceed as follows to handle any errors:

1. Operation/Service Mode -50S15 switch must be in Service Mode
2. Switch system to manual mode on the HMI (if already been done).
Path: Home ► Manual
3. Retract gas sampling probe out of the kiln.
Path: Menu ► Probe Position ► GO S0
WARNING! WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or until the probe has reached its end position.
4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP switch for reasons of safety and turn the Safety switch 101S2 at the probe rear cabinet to OFF position to prevent any movement of the probe. This switch can be secured with a padlock. Additionally, secure that the fan remains closed.

5. Take required corrective actions to fix the error.
Depending on the requirement, please refer to the Troubleshooting section of this manual or contact ABB Service for further doubts.
DANGER! Fixing errors requires special training. Only personnel working on the open and powered-on probe system. Therefore, this may only be carried out by qualified and specially trained personnel

9. Unlock EMERGENCY STOP switch -15S7 or -150S3 by turning the back ring in the direction of the arrow. No movement must be seen.
10. Push the blue button Emergency Reset -15SB/-15P12 to allow new operation of the probe retractor and air blaster probe blow-back.
11. Insert gas sampling probe into the kiln.
Path: Main ► Probe Position ► Go S3
WARNING! Gas sampling probe moves into the kiln. Do not stand in the area of travel of the gas sampling probe or probe buggy until the probe is completely inserted into the kiln and the warning lamps/sounds go out.
12. Switch system to Auto mode on the HMI
Path: Home ► Auto
13. Operation/Service Mode -50S15 switch must be switch back to Operation Mode

11 Maintenance

Introduction

This section gives an overview of maintenance work to be performed at regular intervals. The tasks described here require special training and under some circumstances involve working on control cabinet open and powered on. They must therefore only be carried out by qualified and specially trained persons. If it can be assumed that safe operation is no longer possible, the probe gas sampling system must be taken out of operation and secured against being started up again unintentionally.

It can be assumed that safe operation is no longer possible:

- if the probe gas sampling system is visibly damaged,
- if a check reveals problems,
- if the probe gas sampling system no longer works,
- after prolonged storage in adverse conditions,
- after severe transport stress.

It is recommended to have the probe gas sampling system maintained by the ABB representative responsible for you.

Safety instructions for maintenance work

For safety instructions regarding maintenance work, go to section Safety instructions for maintenance work on page 98.

Service switch

When performing maintenance work on the probe gas sampling system, the Operation mode/Service mode switch must be in the Service mode position and the Safety switch must be in OFF position, with a few exceptions (for example, when checking the EMERGENCY STOP switch). See Instructions: checking the EMERGENCY STOP switch on page 106.

Unintentional restart

You can secure the work conditions on the system with a padlock into the EMERGENCY STOP switch to prevent unintentionally restarting the probe gas sampling system.

Maintenance schedule

The following tables show the maintenance intervals within which to perform maintenance work, with a link to the relevant instructions:

General tasks

Maintenance task	See...	Inspection / Maintenance interval	
Check the system and clean if necessary	Checking the condition of the system, cleaning the system on page 102	X	
Display and evaluate trend display	On page 104 trend displays	X	
Functional test of residual current circuit breaker	On page 105 checking the residual current circuit breaker		
Functional tests of:	On page 106 protective installations		
• EMERGENCY STOP switch			
• Warning lamps			
• Warning buzzer			

Probe

Maintenance task	See...	Inspection / Maintenance interval	
Mechanical cleaning of probe tube and tip	On page 112 removing incrustations	X	X
Replace intake filter	On page 115 replacing the intake filter	X	

... 11 Maintenance

... Maintenance schedule

Retractor

Maintenance task	See...	Inspection / Maintenance interval
------------------	--------	-----------------------------------

If necessary, remove dust and debris around chain drive	Probe retractor: Checking and tightening the drive chain on page 117	X
Check and if necessary, tighten drive chain	Probe retractor: Checking and tightening the drive chain on page 117	X
Check and grease chain drive bearings	on page 118	
Check and, if necessary, adjust the position of the probe	Probe retractor: Checking and tightening the drive chain on page 117	X

Cooling system

Maintenance task	See...	Inspection / Maintenance interval
------------------	--------	-----------------------------------

Check cooling water for deposits in tank	on page 122	X
Check cooling-water system for leaks	Cooling module: Checking cooling water on page 122	X
Check that the water flow is sufficient	Cooling module: Checking cooling water on page 122	
Check that heat exchanger dissipation fins are clean		X

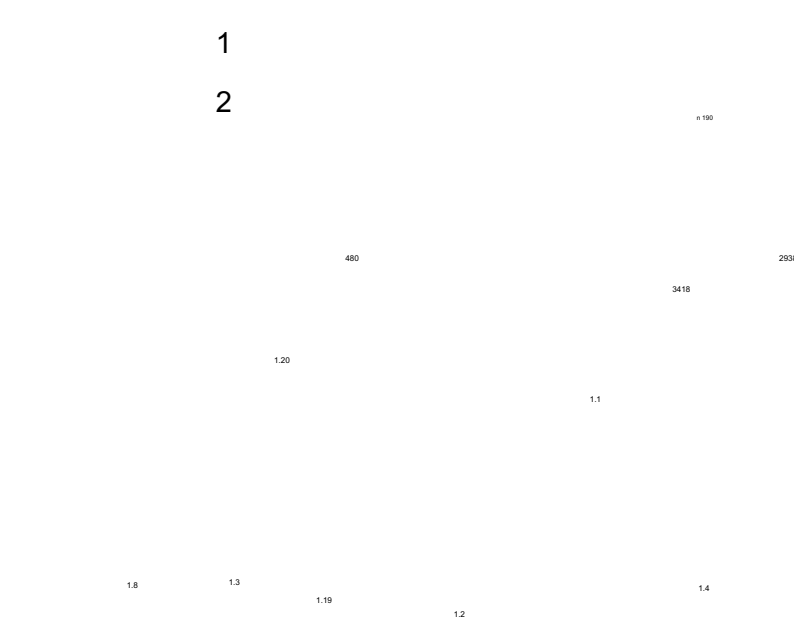
Pneumatic system

Maintenance task	See...	Inspection / Maintenance interval
------------------	--------	-----------------------------------

Check pneumatic-air system for leaks	Checking the pneumatic system on page 62	X
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Equipment layout plan

Illustration Probe



Equipment

Pos.	Designation
1	Water forward / Water inlet for cooling flow
2	Water return / Water outlet for cooling flow
1.1	Probe core
1.2	Probe base
1.3	Inspection port/centre air blaster connection
1.4	Flange seal adjustable
1.8	Probe tip filter cartridge and center air blaster nozzle
1.19	Cover assembly, lower section
1.20	Cover assembly, upper section with handle

... 11 Maintenance

... Equipment layout plan

Illustration sample end



Equipment

Reference	Designation
1	Process flow direction
2	Sample connection (heated sample tube connected to filter)
3	Periphery air blaster (3 x tube connection to filter periphery air blaster)
4	Filter blow-back (2 x tube connected inside filter for blow-back)

Note: Probe sample end default length: 3000 mm.

Illustration probe base – water connection flange

1.2.15

1.2.16

1.2.20

513

1.2.3

1.2.17 1.2.18 1.2.19

1.2.1

1.2.1

1.2.16

1.2.3

1.2.4

Equipment

Reference	Designation
1.2.1	Probe base
1.2.3	Cover rail
1.2.4	Probe cover_B
1.2.15	Pipe cooling
1.2.16	2 x pt100 sensor for water cooling temperatures
1.2.17	2 x O-ring inner tube cooling jacket (O-ring OD72/ID84 Ø=6 Viton)
1.2.18	1 x O-ring middle tube water separator (O-ring OD96/ID88 Ø=4 Viton)
1.2.19	2 x O-ring outer tube cooling jacket (O-ring OD122/ID112Øt=5 Viton)
1.2.20	Swagelok (R) fitting for Pt100

... 11 Maintenance

... Equipment layout plan

Illustration inspection port - center nozzle air blaster

Equipment

Reference	Designation
1	Inspection and clean-out entrance
1.3.	1 x O-ring for inspection port
1.3.1	Swagelok straight connector, 3/4", SS-1210-1-12W-BT
1.3.2	Swagelok tee, welded, 3/4"
1.3.3	Dacapo DN20 union, DJ10343000
1.3.4	Dacapo DN20 union, DN30252725
1.3.5	Straight angle 90°, 3/4", welded
1.3.6	Swagelok straight connector, 1", SS-1610-6-16W
1.3.7	Center pipe tap, 4x20
1.3.8	Center pipe cover plug, 36x62
1.3.9	Dacapo sealing, Viton, DIN 11851

Illustration filter cartridge with center nozzle for air blaster

Equipment

Reference	Designation
1.8.1	Filter female thread, front (D46x25)
1.8.2	Filter body (D46/42x460)
1.8.3	Filter female thread, back (D46x25)
1.8.4	Center nozzle for air blaster (D46x70)
1.8.5	Center tube through filter (1/2")
1.8.6	Hexagon nut (M20)
1.8.7	Filter dust sealing ceramic band

... 11 Maintenance

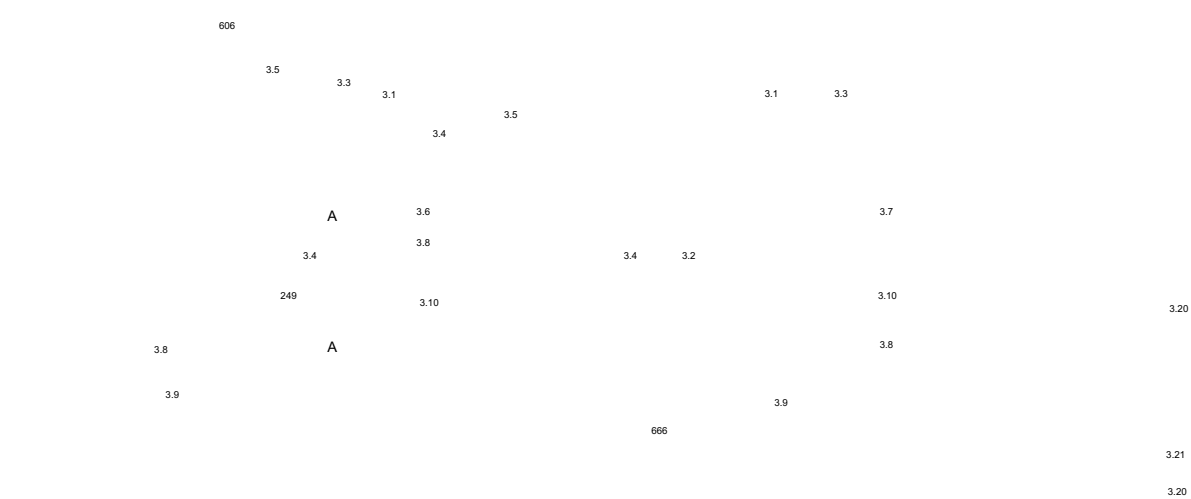
... Equipment layout plan

Illustration retractor

Equipment

Reference	Designation
1	Control cabinet / retractor control components
2	Pneumatic cabinet / valves and pressure switch
2.1	Center beam
2.2	Covers
2.3	Chain support low
2.4	Chain support high
2.5	Retractor torque arm
2.6	Drive parts
2.8	Retractor motor with brake and encoder
2.9	Bolts and nuts

Illustration buggy



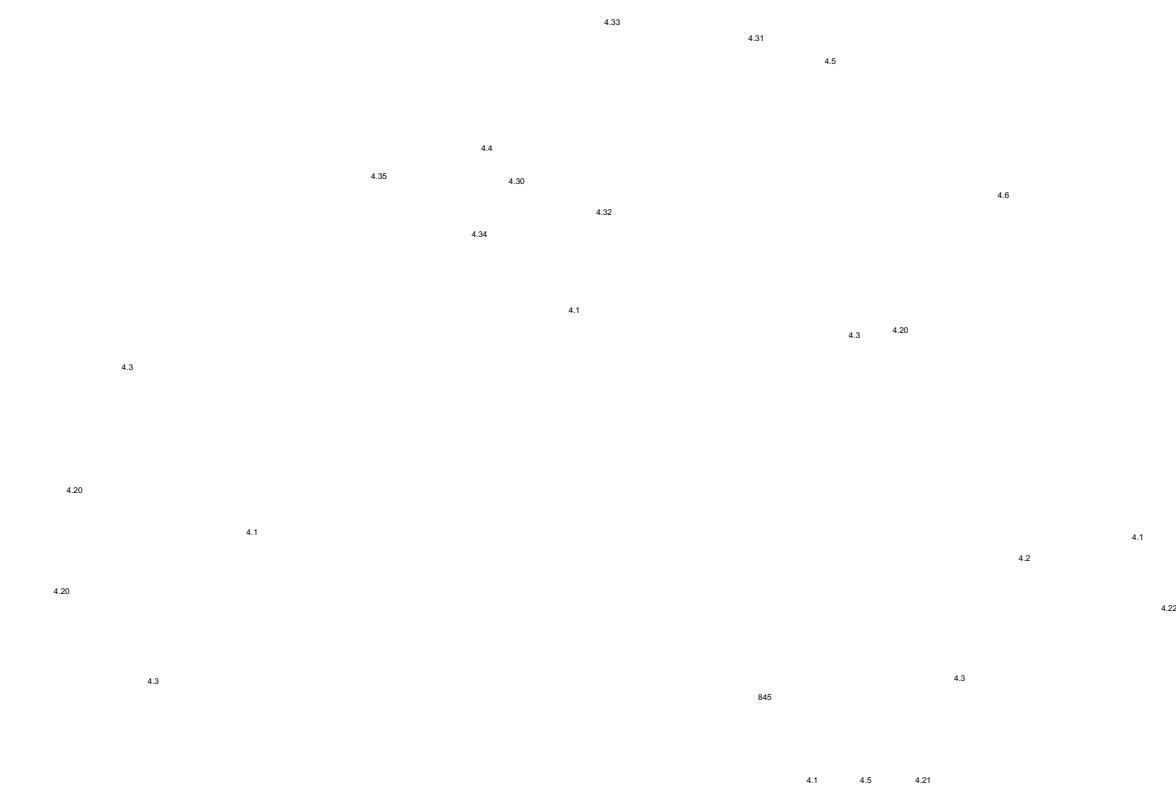
Equipment

Reference	Designation
3.1	Base plate
3.2	Frame top_B
3.3	Support Probe
3.4	Buggy frame
3.5	Rail attachment
3.6	Wheel plate L_B
3.7	Wheel plate R_B
3.8	Buggy beam
3.9	Chain anker_B
3.10	Wheel protection_B

... 11 Maintenance

... Equipment layout plan

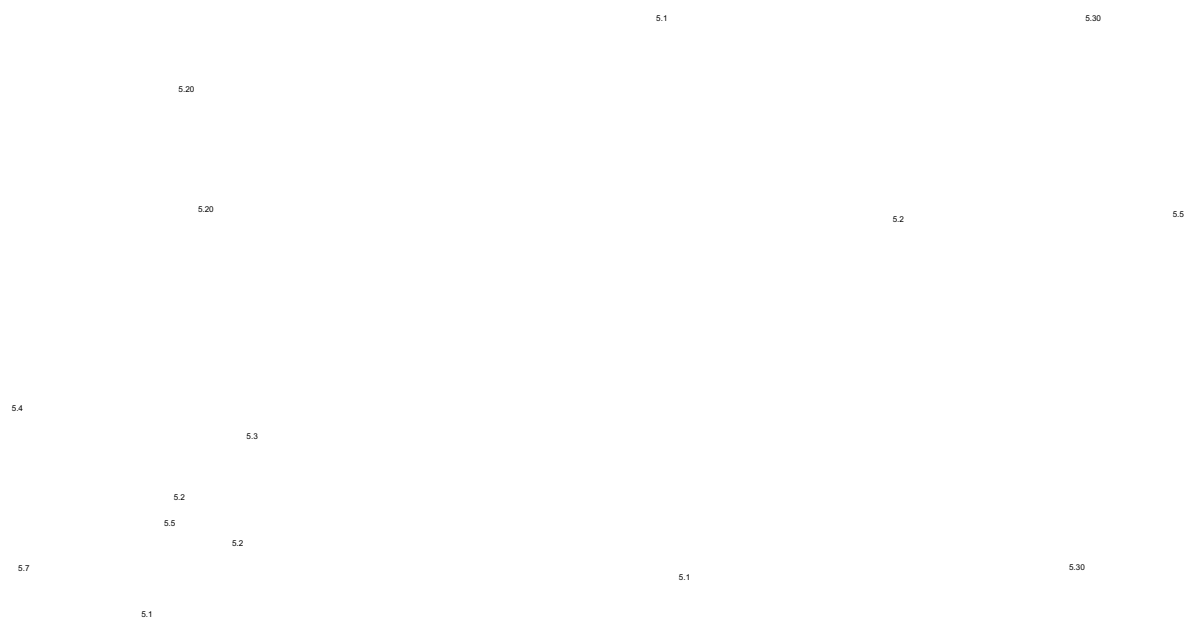
Illustration blaster panel 01



Equipment

Reference	Designation
4.1	Blaster panel base
4.2	Blaster cover
4.3	Blaster cover bottom
4.4	Blaster fixture
4.5	Blaster cover lock
4.6	Blaster tank air supply with ball valves (valves not shown in drawing)
4.20	Accumulator tank, 5L (2x)
4.21	Lock handle
4.22	3/8" blinding plugs (2x)
4.30	Filter blow-back supply
4.31	Filter blow-back
4.32	Filter blow-back
4.33	Filter blow-back
4.34	Filter blow-back
4.35	Filter blow-back
4.36	Filter blow-back
4.37	Filter blow-back
4.38	Filter blow-back
4.39	Filter blow-back
4.40	Filter blow-back
4.41	Filter blow-back
4.42	Filter blow-back
4.43	Filter blow-back
4.44	Filter blow-back
4.45	Filter blow-back
4.46	Filter blow-back
4.47	Filter blow-back
4.48	Filter blow-back
4.49	Filter blow-back
4.50	Filter blow-back
4.51	Filter blow-back
4.52	Filter blow-back
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4.88	Filter blow-back
4.89	Filter blow-back
4.90	Filter blow-back
4.91	Filter blow-back
4.92	Filter blow-back
4.93	Filter blow-back
4.94	Filter blow-back
4.95	Filter blow-back
4.96	Filter blow-back
4.97	Filter blow-back
4.98	Filter blow-back
4.99	Filter blow-back
5.00	Filter blow-back

Illustration blaster panel 02



Equipment

Reference	Designation
5.1	Support Chain
5.2	Cable tray
5.3	Support front
5.4	Base cover
5.5	Connection base with 3 × 1" unions for compressed air and cooling water
5.7	Heated valve box (option), connection box to heated sample gas line
5.20	Power chain
5.30	Heated hose end

... 11 Maintenance

... Equipment layout plan

Illustration flange shutter - automatic

6.7

6.7

202

293

6.1

6.21

6.10

6.17

6.13

6.17

6.20

6.12

6.20

6.30

6.8

6.5

250

300

6.4

6.3

6.12

6.11

6.14

6.10

6.9

6.7

6.6

Equipment

Reference	Designation
6.1	Pipe 6" Sch 10S x 350 EN 10025-2
6.2	Shutter flange ASME B16.5, slip-on welding, Class 150 8" EN 1.0044
6.3	Shutter seal
6.4	Flange front cut
6.5	Flange front stear
6.6	Shutter sides
6.7	Shutter stear
6.8	shutter rail L
6.9	shutter rail R
6.10	Shutter connect
6.11	Shutter cyl lid
6.12	Front flange
6.13	Shutter heat cover
6.14	Shutter cyl mount
6.15	Shutter cyl top
6.16	Shutter cyl fast
6.17	SHUTTER PROTECT
6.18	Shutter mount
6.19	DIST
6.20	Shutter cyl tbot
6.21	Shutter ring
6.30	Air Cylinder

... 11 Maintenance

... Equipment layout plan

Illustration water system

1

2

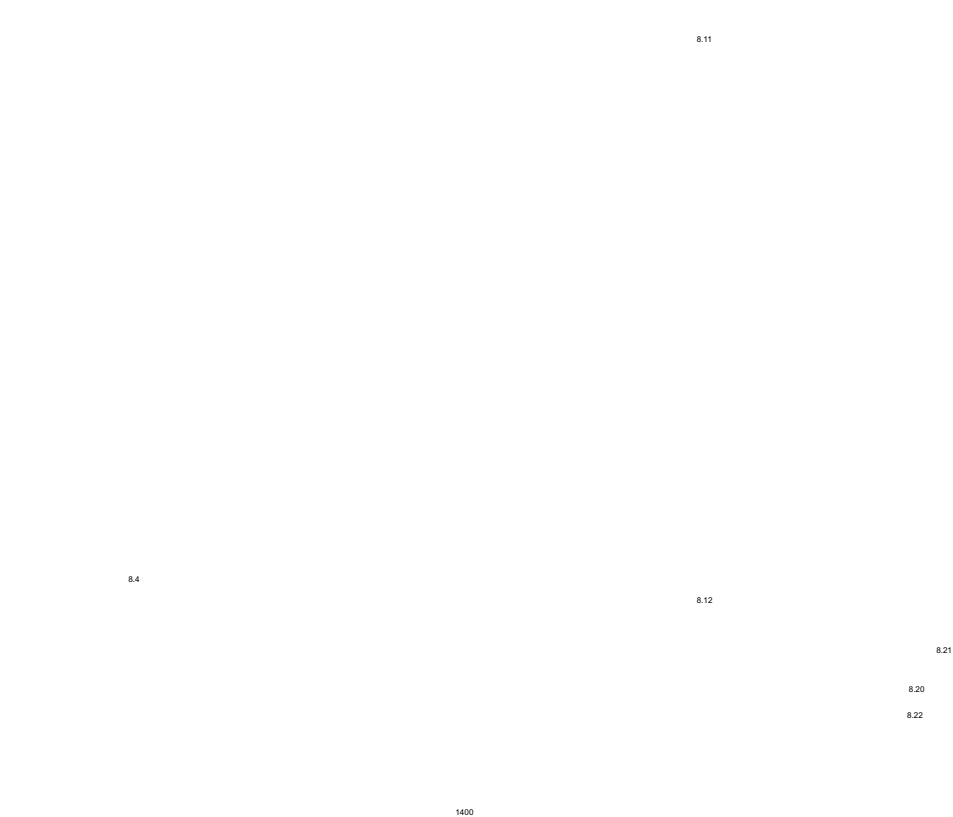
Equipment

Reference	Designation
1	Water forward / 1" union for min. 1" connection to probe
2	Water return / 1" union for min. 1" connection to probe
3	Water from cooler / 1" hose connection to cooler
4	Control cabinet water system
5	Optional water heater
7.1	Lid water tank
7.10	Water pump
7.12	Level sensor water tank
7.13	Water tank temperature
7.14	Water flow sensor
7.24	1" union for refill valve with potable water
7.27	Rinse valve for water tank

... 11 Maintenance

... Equipment layout plan

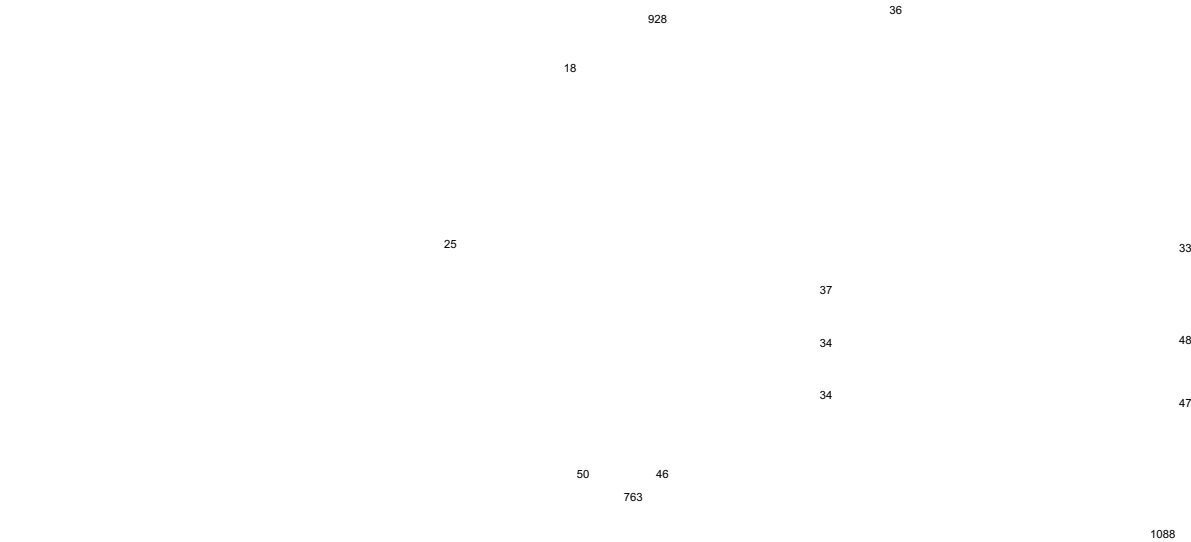
Illustration cooling system



Equipment

Reference	Designation
8.4	2 x Emergency stop fan motors
8.11	Water to water tank (1" hose connection to water tank)
8.12	Water return from water system
8.20	Plain washers
8.21	Hexagon Socket
8.22	Hexagon nuts

Illustration control system



Equipment

Reference	Designation
18	Controller CPU
25	Frequency drive for retractor motor
33	HMI panel for control
34	General and UPS power
36	Warning signal tower
37	Emergency stop
46	Connections to probe retractor and cooling panel
47	Operation/Service mode
48	Emergency Stop reset
50	Ethernet connection

... 11 Maintenance

Acquiring spare parts and wear parts

To order spare parts or to order service, please contact your local ABB service partner or:

ABB AG

Service Analysentechnik – Parts & Repair

Stierstädter Straße 5

60488 Frankfurt

Germany

Phone: +49 69 7930-4591

Email: repair-analytical@de.abb.com

Safety instructions for main

Take into consideration the following safety instructions related to maintenance:

Danger to life due to live parts!

- Only specialized electrical personnel may work on the electrical system.
- Disconnect the probe gas sampling system from the power supply before working on the electrical components.
- Observe national regulations pertaining to safety equipment.

WARNING

Mechanical, thermal and material dangers

Risk of injury in the area of the probe gas sampling system due to moving or falling parts, anti-freeze

- Wear general personal protective equipment
- Closed overalls with long trousers and long sleeves
- Safety shoes (preferably boots covering the ankles)
- Safety gloves suitable for mechanical work
- Protective helmet
- If necessary, additional protective equipment as required by the operator.

WARNING

Gas sampling probe movements

Risk of crushing around the retractor due to gas sampling probe movements.

- Before commencement any work on the probe gas sampling system, turn the Safety switch to the "STOP" position and secure the service switch against unauthorized operation (with a padlock).
- Additionally press the EMERGENCY-STOP button before working on the retractor or probe.
- Do not enter the danger area around the retractor when it is at standstill and the warning lamps and buzzer are activated.
- Never stand in the danger area around the retractor when the protective installation is closed.
- When the warning lamps light up or the warning buzzer buzzes, leave the danger area around the retractor immediately as the probe is about to move.
- Press the EMERGENCY-STOP switch immediately when the probe is still in the danger area around the retractor or when the warning lamps light up or the warning buzzer buzzes.

WARNING

Heavy transport units

Danger of crushing when lifting or lowering the transport unit

- Only appropriately trained personnel may transport the transport units and only with the aid of the recommended transport equipment.
- Do not stand under suspended loads.
- Follow the transport instructions in these operating instructions carefully.

WARNING

Hot surfaces

Danger of burning due to hot surfaces during and after operation of the probe gas sampling system.

- Do not touch the probe gas sampling system during and after operation.
- Do not touch the probe gas sampling system until it has cooled down to 50 °C. Specifically, do not touch:
 - the cooling module, the heated sample gas line
 - the connection box for the heated sample gas line on the retractor
 - the hot sampling filter
 - the entire probe
 - the metal structure of the retractor
 - the shutter of the duct opening
- If it is unavoidable to touch hot components, wear a face mask against heat, heat-proof gloves and protective welder's clothing.

WARNING

Falling or spalling hot material

Danger of burning due to material falling or spalling off the retracted probe.

- Never enter the danger area around the retractor during operation.
- Do not approach the retracted probe until any material resting on the probe has cooled down.
- If it is unavoidable to approach the hot probe, wear a face mask against heat, heat-proof gloves and protective welder's clothing.

WARNING

Harmful gases, jet flames

Danger due to harmful gases and jet flames in the area of the duct opening while the probe is moving in or out

- Never enter the danger area around the retractor during operation.

CAUTION

Hot cooling water

Danger of injury to skin and eyes in the event of contact with hot cooling water

- Avoid contact with the cooling water as it is extremely hot.
- In case of accidental contact with hot cooling water, rinse off immediately with cold water.
- Contact medical specialist according to local regulations.
- If hot cooling water gets in the eyes despite wearing safety glasses, rinse them thoroughly under cold running water, holding the eyelids open. Contact medical specialist according to local regulations.

CAUTION

Danger of electric shock

Danger of electric shock when working on, and near, electrical components

- Only specialized electrical personnel may work on the electrical system.
- Disconnect the probe gas sampling system from the power supply before working on the electrical components.
- Observe national regulations pertaining to electrical equipment.

CAUTION

Harmful dusts

Danger due to harmful dusts when cleaning the probe gas sampling system

- Wear a dust mask when cleaning.
- Wash any dust off the skin immediately with water and soap

CAUTION

Slippery floor

Risk of falling on slippery floor due to escaped cooling water and lubricating oil or dirt.

- Always keep the floor around the probe gas sampling system clean and dry.

... 11 Maintenance

Maintenance work

Operating the service switch

Safety measures

WARNING

Dangers when operating the service switch.

Always take the following safety measures when performing this work:

- Wear the general protective equipment.
- Before commencing any work on the probe gas sampling system, turn the Service Switch -50S15 to Service Mode and secure the service switch against unauthorized switching (with a padlock).
- Additionally secure against any unplanned probe movement by switching the Safety Switch -101S2 to OFF position at the probe rear cabinet.
- Additionally press the EMERGENCY-STOP -15S7 or -150S3 switch before working on the retractor or probe.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off.
- Never stand in the danger area around the retractor when the protective installation is closed.
- When the warning lamps light up or the warning buzzer buzzes, leave the danger area around the probe retractor immediately as the probe is about to move at any moment.
- Press the EMERGENCY-STOP switch immediately if anyone is still in the danger area around the retractor after the warning lamps light up or the warning buzzer buzzes.

Note

For an explanation of the safety measures see Safety instructions for maintenance work on page 98.

Introduction

The service switch puts the system into service mode. If work described in the following maintenance instructions must be performed in service mode, proceed as follows.

Requirements

The service switch is in the OFF position.

Instructions

How to put the system in service mode:

1. Make sure that no-one is standing in the area of retractor travel.
2. On the control cabinet: Turn Service/Operation Switch -50S15 counter-clockwise to the Service Mode position.

Info! Actuating the service switch will not cause any movement of the probe as it will continue its movement according to the controller program. The service switch only puts the system in manual mode.

3. Secure the Service Mode switch against unauthorized actuation.
4. When working on the retractor and gas sampling system additionally actuate the EMERGENCY-STOP switch for reasons of safety and turn the Safety Switch -101S2 at the probe rear cabinet to OFF position to prevent any movement of the probe. This switch can be secured with a padlock.

Result: The gas sampling probe will remain in its position had before the Emergency Stop was pushed.

Info! If the probe is left inside of the kiln during maintenance work for prolonged time, there is risk of overheat and excessive build-up of material and failure of the probe. If it is expected that maintenance work will be performed, it is recommended to take the probe out of the kiln starting with the work.