

ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/GAC400-EN REV. A

ProKiln GAC400

Probe gas sampling system



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

Measurement made easy

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 GAC400 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 disruptions resulting from a failure to observe these operating instructions and other applicable documents. The manufacturer of this equipment can never be liable for any process disruptions or hazardous or dangerous process conditions as the process responsibility of operation is entirely placed at the process 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 malfunction or a status message, please check whether there actually is an error and whether the system is actually operating out of specifications.

When you notify service...

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

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

This information will enable the service personnel to help you 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:

▲ DANGER

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

⚠ WARNING

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

A CAUTION

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

NOTICE

The signal word 'NOTICE' indicates possible material damage.

Note

'**Note**' indicates useful or important information about 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 explosionhazard 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 informed about risks and safety measures and that they observe the safety instructions in the operating instructions and on the system. 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 sections pertaining to your work. You must have understood these sections.
- Always keep the operating instructions handy nearby 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 these operating instructions may handle the probe gas sampling system.
- The probe gas sampling system may only be used for the 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, use 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 non-approved parts. Specifically, do not change or disable any protective installations.
- Use only original spare parts when replacing defective components.
- The probe gas sampling system may only be operated if maintenance work is performed regularly and expertly.

... 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 handing gases, lubricants, etc. in force in your country are observed.

Procedure in the event of accidents

The probe gas sampling system is designed and built in such a way that personnel can work with it without any risk. Despite all precautions, however, unforeseeable accidents may nevertheless occur in unfavourable circumstances. If cooling water tubes 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 or the entire compressed-air has been evacuated. If the switched-on probe gas sampling system poses a danger, proceed as follows:

Aim	Action
Stop movement of the system	Press the EMERGENCY-STOP switch
	Note: The probe interrupts its
	movement immediately and in any
	position. The probe is only retracted
	out of the rotary kiln after turning the
	service switch to service mode,
	releasing the EMERGENCY-STOP
	switch, and operating the probe
	retractor in manual.
Disconnect the system from the main	Turn off the main and UPS power
and UPS power supplies	switch on the side of the control
	cabinet.
	Turn off the safety breaker on the door
	of the Retractor rear panel to prevent
	all movement of the probe.
Evacuate the compressed-air system	Close the MAIN VALVE on the retractor
	unit or at the source outlet from the 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 seriously 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
- Requirements to be met by personnel on page 12
- Personal safety equipment on page 12
- Protective installations on page 10

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 systemactuated 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:

MARNING

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.

Electrical components

The probe gas sampling system contains electrical and live components.

This means:

Danger of electrocution,

- if covers on control cabinet, terminal box or power connection are open. Connectors in the control cabinet or terminal box may also live parts.
- if the connection between the protective earth connector and a protective earth conductor is not made before all other connections.
- if the protective earth conductor is interrupted inside or outside the probe gas sampling system or the protective earth connector is disconnected.
- if the set operating voltage and mains voltage do not match before switching on.
- if work is performed on the open probe gas sampling system without disconnecting probe gas sampling system from the 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 type and nominal current and/or repaired fuses.

Associated warning sign in this operating instruction:

A DANGER

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:

MARNING

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.

Hot cooling water

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

This means:

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

Associated warning sign in this operating instruction:

A 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.

Anti-freeze in the cooling water

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

 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 antifreeze 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.

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:

MARNING

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

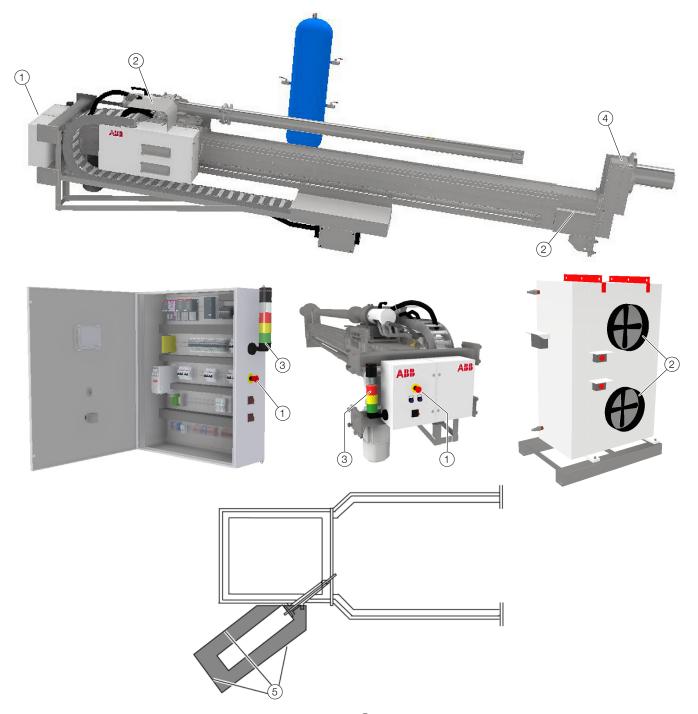
... 2 Safety

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 EMERGENCY-STOP switch
- 2 Covers
- (3) Warning lamps and buzzer (warning tower)

- (4) Flange shutter (optional)
- 5 Protective fence installation with electric lock access

 $\textbf{Figure 1:} \quad \textbf{Probe gas sampling system-location of the protective installations}$

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 gases from the duct opening.
- Closes the kiln's duct opening when the probe is retracted.
- A manual lock ensures that the duct opening is reliably closed when working near the duct opening.

Protective fence installation with electric lock access Location

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

Function

- Prevents anyone from standing near the retractor when probe movement is possible. No probe movement is possible when the protective installation is open.
- When the protective installation is opened during operation, the warning lamps flash, the warning buzzer buzzes and any probe movements or probe cleaning stop until protective installation is closed and cleared by entering service mode.

Additional EMERGENCY-STOP switch

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

The additional EMERGENCY-STOP switch must be installed if the above-described EMERGENCY-STOP switch is difficult to access. The EMERGENCY-STOP switch will be connected into the emergency safety circuit of the control system and work with 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	Unpacking of the system	Trained crane operator/fork-lift driver with experience with lifting apparatus
Mechanical fitter	Mechanical installationMechanical disassembly	Mechanical expert
Electrical fitter	 Electrical installation Electrical disassembly	Electrical expert
Start-up personnel	Putting back into operation	Technician familiar with the processes of cement production and specific work conditions
Operator	Operation	Trained worker
Mechanical maintenance personne	•	Mechanical expert
Electrical maintenance personnel	Maintenance	Electrical expert With experience with controllers
Storage personnel	Correct storagePacking of the system for transport	Trained unskilled worker
Disposal personnel	 Disposal of the probe gas sampling system 	Trained disposal personnel

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 ankles)
- · Safety gloves suitable for mechanical work
- Safety glasses
- · Protective helmet
- If necessary, additional protective equipment if prescribed by the operator

Additional protective equipment

The following additional protective equipment is required 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 rotary kiln

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 supply 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 water 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:

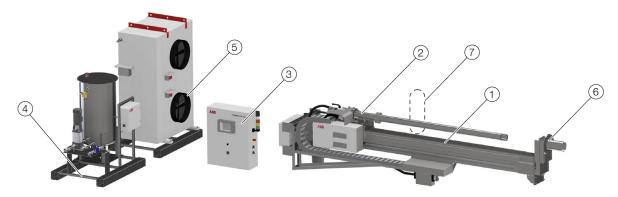


Figure 2: ProKiln GAC400 probe gas sampling system

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

Pos.	Designation	Function
1	Retractor	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	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 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.
- 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 and movement of the	
	probe in and out of the process take place after set	
	intervals (these can be defined using the controller).	
Manual mode	Allows operation of the system in manual mode, required	
	for maintenance, for example. Probe cleaning steps and	
	movements are controlled only manually by the operator.	

... Mode of functioning and operation

Monitoring devices

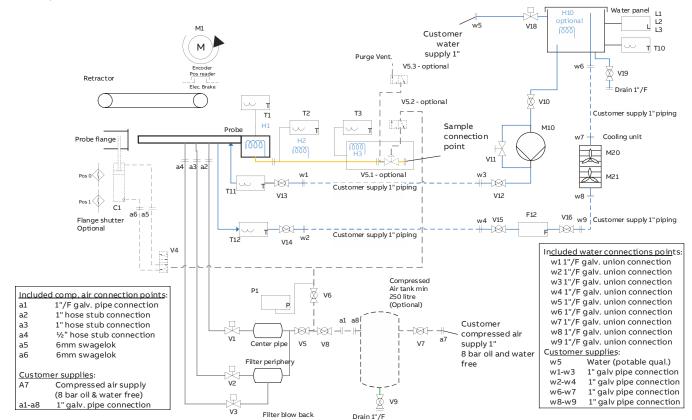


Figure 3: System schematic

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	Protects the probe against overheating Monitors the cooling water pump for adequate pump power	 Triggers the retraction program if minimum cooling water flow is not reached Cooling water pump function check
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
Т3	Heated sample connection point temperature	Protects probe against condensation build-up inside	Locks various follow up functions
T10	Cooling panel water tank temperature	 Monitors the cooling water temperature in the holding tank Monitors the efficiency of the water-cooling unit 	 Turns the water-cooling unit fan on/off Causes a water-cooling alarm to retract the probe Turns the water-cooling unit tank heat on/off (optional)
T11	Probe cooling water flow-in temperature measurement	 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	 Can cause a water-cooling alarm to retract the probe Is used as the off-set temperature from process heat input
M1	Probe position reader	 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 	 Provides the reference point for the encoder Locks various follow up functions Triggers the retraction program if probe travel time or torque is exceeded
Probe flange	Inductive position indicator flange	Ensures the closed flange position is reached	Locks various follow up functions
Pos 0	shutter in closed position		
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 alarm to retract the probe

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.

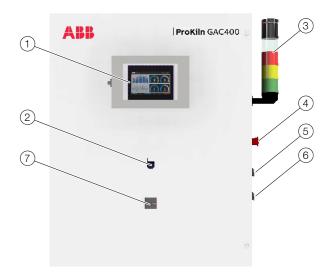


Figure 4: Control cabinet

Pos.	Designation	Function
1)	НМІ (НМІ)	Display and operating unit for monitoring the system; the operation of the panel will be explained in the
		Description of the controller section
2)	Emergency reset	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	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	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	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.

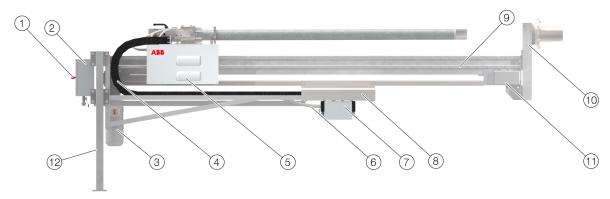


Figure 5: Probe retractor

Pos.	Designation	Function
1	Emergency-Stop switch	Halts all probe movements
		Halts all probe cleaning by air
2	Pneumatic box	Pneumatic components for blow-back of filter
	Terminal box	Electric connections, distributed I/O, power studs, manual operation buttons in/out probe
(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 tubes.
(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 downstream. Heating
		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 function prevents
		condensation from building up.
8	Panel for compressed-air to air blasters and for	Connection point for compressed-air supply for air blasters and for connections to the water-
	water cooling	cooling panel
9	V-Tracks rails for probe buggy	Transport tracks for the probe buggy
10	Shutter (with optional automatic pneumatic or	Closes the kiln duct opening when the probe is retracted.
	manual actuation)	
(11)	Chain tension adjustment	Adjustment of tension on the chain drive
12	Permanent installation legs (Not included in scope	Ensemble of legs to install retractor to the floor.
_	of delivery)	Note: the probe and retractor system is supplied with two temporary legs which are not
		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 tank level alarm
- Water tank temperature too high

... Components

Controls on the probe retractor

There are additional controls on the retractor:

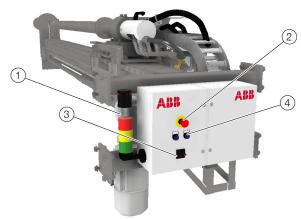


Figure 6: Controls on the probe retractor

Pos.	Designation	Function
1)	Warning tower	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	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	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 preinstalled 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.

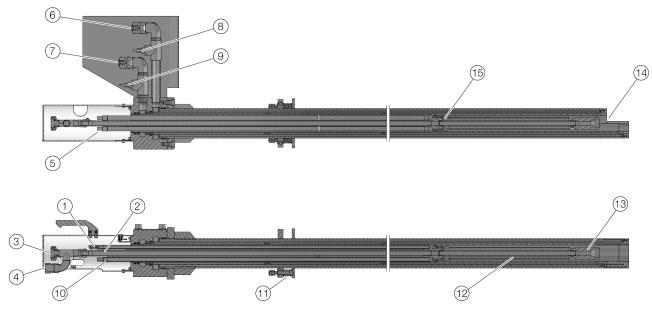


Figure 7: Probe

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 any dismantling
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 sample
		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
(10)	2 x blow-back tubes filter	Connects the internal of filter to blow-back cleaning of filter surface
(11)	Probe closing flange	Flexible closing flange for probe entering the process
(12)	Sample filter	Filter to separate process gas from dust
(13)	Probe tip nozzle	Removes incrustations on the intake opening.
(14)	Sample gas intake opening	Aspirates the process gas from the rotary kiln.
(15)	Filter periphery nozzle	Removes incrustations and dust form the filter surface area.

... Components

Cleaning

Cleaning procedure	Mode of functioning
Cleaning of insertion tube into process	Customer air blaster cleans the insertion tube and removes incrustations
	between probe and insertion tube
Cleaning of the outside of the probe	Material deposits and incrustations on the probe are removed by regularly
	moving the probe in and out using the retractor
Cleaning the probe intake hole by means of centre tube nozzle connected to air	Incrustations on the intake hole are removed by periodical air blaster shooting
blaster	through centre tube nozzle
Cleaning the filter periphery by means of periphery nozzle connected to air	Incrustations and dust on sample area of the filter are removed by periodical air
blaster	blaster shooting through periphery nozzle
Probe filter blow-back	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 I (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

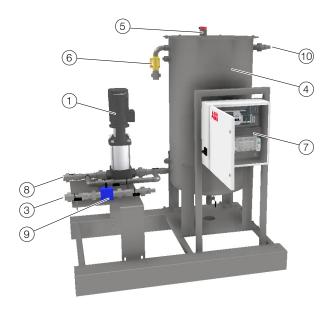


Figure 8: Water panel

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 operation
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 litters.
5)	Level sensor	Detects the water level in the water tank
6)	Solenoid valve	Water refill of tank
7)	Electrical panel	Contain electrical connection and local I/O panel
		Power breakers for pump and cooler fans
3)	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
0	Water forward from cooling panel	Connects 1" hose stub to the heat exchanger

... 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)	 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:

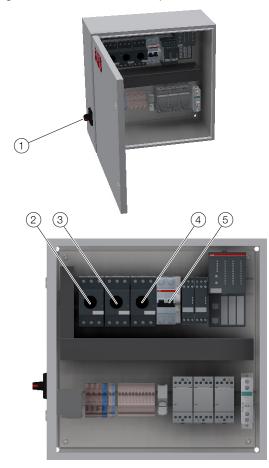


Figure 9: Water panel cabinet

os.	Component	Function
1)	Probe cooling On/Off	Disconnects the power supply to the water and cooling system
2)	Breaker for water pump	Turns off water pump
3)	Breaker for Cooling fan 1	Turns off fan 1
1)	Breaker for Cooling fan 2	Turns off fan 2
5)	Breaker for Tank Heater	Turns of Tank Heater (optional but
		electrically prepared)

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.

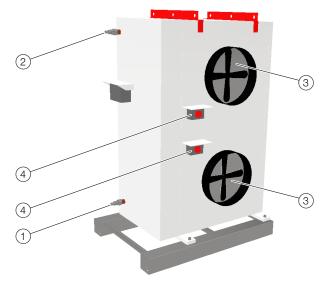


Figure 10: Cooling Panel

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-back and air blaster cleaning of the centre and periphery nozzles in the tip of the probe.

The compressed air system also serves to operate the optional flange shutter.

Requirements

The compressed-air must meet the following minimum requirements:

Category Requirement	
Dew point 0°C (for temperatures below 0°C make sure the	
	compressed-air supply cannot freeze)
Pressure	6-8 bar
Consumption	1 m³/h
Quality	Free of dirt and oil / water droplets

Compressed-air tank

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

The air tank must be equipped with oil and water cleaning devices on the supply side of the tank. The compressed-air supplied to the tank must be based on above specifications. No oil and water cleaning devices must be placed between the compressed-air tank and the compressed-air connection points on the retractor unit as this will reduce the air delivered for probe cleaning by the air blasters.

A locally acquired air tank should be installed in order to meet local standards and legislation.

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 for the operator, away from heat radiation and impact from dust. From the control cabinet there must be a free line of sight to the probe location, so that the operator can see the movements of the retractor while it is being operated from the control cabinet.



Figure 11: Control cabinet

The component layout will depend on the actual configuration as shown in the electrical documentation as build documentation.

Power breakers in the control cabinet

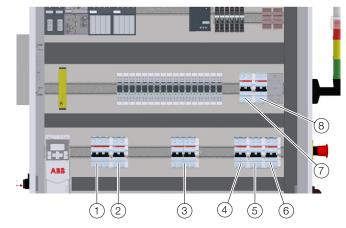


Figure 12: Power breakers in the control cabinet.

Operational handles of the control cabinet

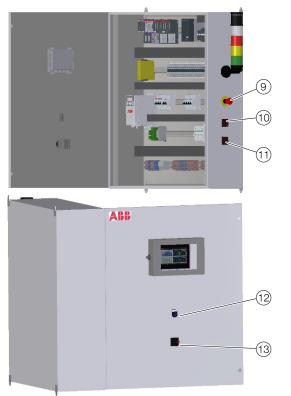


Figure 13: Operational handles of the control cabinet

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 service mode

Alarm/status lights and sound tower



Figure 14: Alarm/status lights and sound tower

Indication	Function	Meaning	
Green	Flashing light	Retractor is locked in safe position	
Green	Constant light	Status of probe gas sampling system in Automatic operation	
Yellow	Flashing light	Status service mode	
Yellow	Constant light	Maintenance request	
Red	Constant light	System alarm and probe retracted from kiln	
White	Flashing light	Warning - Probe and retractor is or will be moving	
Sound	On and off	Warning - Probe and retractor is or will be moving	

Retractor system control cabinet

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

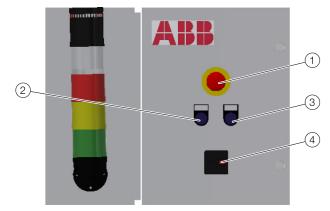


Figure 15: Operational handles of the retractor cabinet

... Control system



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

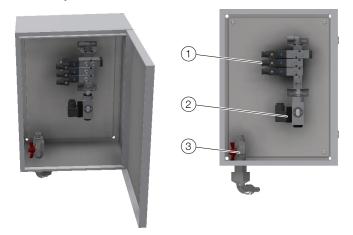


Figure 17: Retractor system pneumatic cabinet

(1) Valve	e manifold	Controls valves for flange shutter, heated shut-off valve and pressure release (if available).
2 Pres	sure alarm	Alarm for low compressed-air pressure
3 Ball	valve	Compressed-air supply

User interfaces

Operation screen

The figure below shows a typical operation screen:

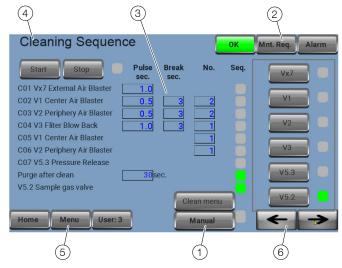


Figure 18: Operation screen

Screen areas

Pos.	Designation	Function	
(1)	Mode	Displays the mode (AUTOMATIC, MANUAL)	
2	System status	Displays the current system status (normal	
		operation, error, maintenance request,	
		maintenance)	
(3)	Display area	Current menu display and input area	
4	Current menu	Menu path display	
(5)	Screen functions	Displays screen functions and submenus	
(6)	Navigation area	Allows the following functions:	
	J	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. They are enabled by entering a username and password at the HMI level, provided that the system user (customer) allows access to it.

Hierarchy of access levels

The password levels are divided as follows:

Menu	Level 0	Level 1	Level 2 –	Level 3
	Any viewer	Plant maintenance team	Trained specialists,	ABB service technicians
			ABB service technicians	
Home	General info	General info	General info	General info
Operation	Displays current measured values, messages	 Operating function for start-up and periodical maintenance Allows checking of control and monitoring functions 	 Operating function for start-up and periodical maintenance Allows checking of control and monitoring functions 	 Operating function for start-up and periodical maintenance Allows checking of control and monitoring functions
Alarms	Displays current measured values, messages	LogbookReset messagesSpecial system information	LogbookReset messages.Special system information	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. Network settings PID Setpoints / Critical setpoints of 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: 0Password: 000000

Level 1: recommended for plant maintenance team

Username: 1Password: 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.

It is recommended that the factory-set passwords be changed by the operator. To change the password, follow these steps: 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.

... Access permissions

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

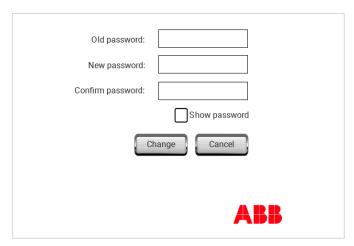


Figure 20: User dialog for changing the password

Default operation parameter settings

Parameter input cooling menu

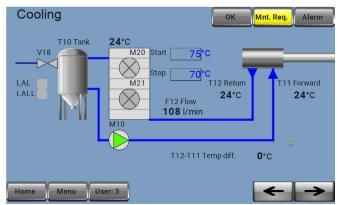


Figure 21: Cooling menu

Parameter input	Function	Default value
Start	Start temperature for hysteresis control of water cooler fan	75 °C (167 °F)
Stop	Stop temperature for hysteresis control of water cooler fan	70 °C (158 °F)
Flow	See Parameter input Alarm setpoint menu on page 33 for alarm limits for water flow OK	80 l/min (21.13 gal US/min)

Parameter input analysis menu



Figure 22: Analysis menu

Parameter input	Function	Default value
Analyse Time	The time for each sampling period	15 min
	before probe cleaning	
Cleaning before	The number of cleanings to take place	10 times
retraction	before the retractor automatically	(Every 2,5 hours)
	retracts the probe from the kiln and	
	inserts it back again	

Parameter input cleaning Sequence menu

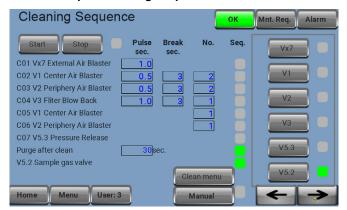


Figure 23: Cleaning Sequence menu

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

Parameter input Probe Position Setup menu

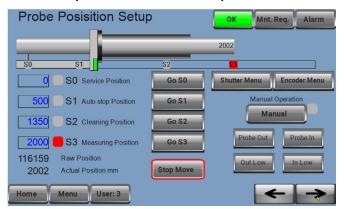


Figure 24: Probe Position Setup menu

Parameter input	Function	Default value
S 0	Service Position (Calibration point) –	0
	Completely retracted, with flange shutte	r
	closed	
S1	Auto Stop Position – Retracted for	500 mm
	inspection, with flange shutter closed	
S 2	Cleaning Position – Probe still inside	1200 mm
	insertion tube	
S 3	Measuring position – Fully inserted to a	2500 mm
	position free from false air from kiln	
	sealing (measurement position)	
Raw position	Read out value from encoder converted	bits
	to actual position below in mm	
Stop Move	Any movement will stop at the location	N/A
	when pushed	
Shutter menu	Shutter manuel Open Shutter closed Shutter opened Close and Reset	N/A
	Operate flange shutter in manual mode	
Encoder menu	Encode Reset	N/A

Tenoder Reset

Will reset the encoder to 0

Probe to be moved to 200 mm
from the control of the

Reset of position control and encoder factor – in manual mode

... Default operation parameter settings

Parameter input M1 Motor Control menu

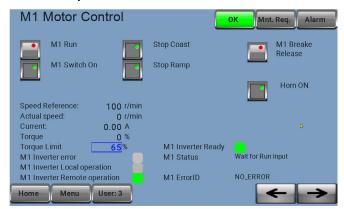


Figure 25: M1 Motor Control menu

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.

Parameter input - PID H1 Probe heater Setup menu

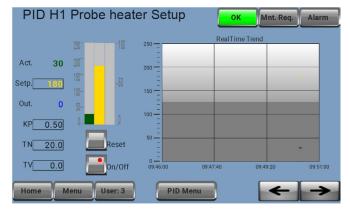


Figure 26: PID H1 Probe heater Setup menu

Parameter input	Function	Default value
Setp.	Temperature set-point of sample tube	180 °C
	inside of the probe	
Reset	Reset to factory setting	
On/Off	Power control for heater	On

Parameter input PID H2 Heated hose setup menu

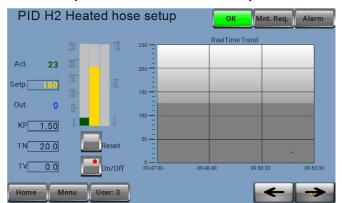


Figure 27: PID H2 Heated hose setup menu

Parameter input	Function	Default value
Setp.	Temperature set-point of heated hose	180 °C
	inside of the retractor	
Reset	Reset to factory settings	
On/Off	Power control for heater	On

Parameter input PID H3 Heated valve setup menu

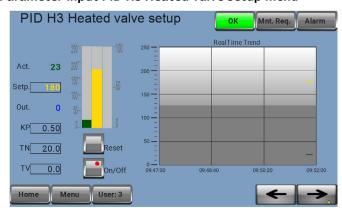


Figure 28: PID H3 Heated valve setup menu

Parameter input	Function	Default value
Setp.	Temperature set-poin of heated shut-	180 °C
	off valve (if available)	
Reset	Reset to factory settings	
On/Off	Power control for heater	On

Parameter input Alarm setpoint menu



Figure 29: Alarm setpoint menu

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

4 Product identification

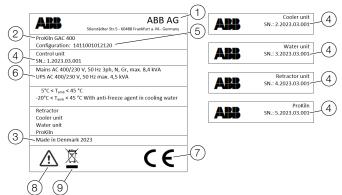
Name plates

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:



- (1) Company name and address
- 2 Product name
- ③ Year and location of manufacture of the system
- (4) Serial no.
- (5) Configuration no.
- 6 General and UPS power supply electrical connections
- 7) CE mark
- 8 Warning triangle acc. to EN 61010 observe instructions
- 9 European Union WEEE sign- do not throw in trash

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 about danger areas.

The warning signs must always be in place and easy to see.

The following figures shows the location of the warning signs on the individual modules:

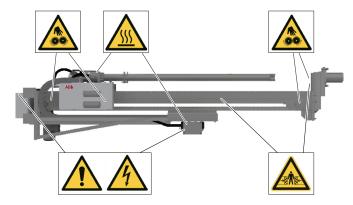


Figure 31: Warning signs on the probe retractor



Figure 32: Warning signs on the control cabinet



Figure 33: Warning signs on the water panel

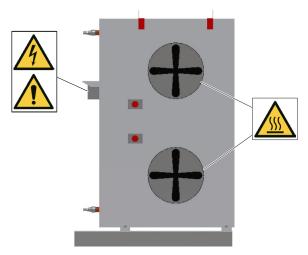


Figure 34: Warning signs on the cooling unit

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 700 to 900 kg • The retractor is delivered with two temporary transportation legs. They are removed when assembled on the location. the probe 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). Transport recommendation: Crane Note: The unpacked retractor must not be transported using a fork-lift truck. Cooling unit 350 kg Only store after draining all water. Lifting gear may only be attached at the designated lifting points (1) (see below). Transport recommendation: Fork-lift truck or crane 250 kg • Only store after draining all water. Water unit Transport recommendation: Fork-lift truck. Control cabinet 75 kg • Lay the control cabinet on its back for transport. Use a suitable transport pallet for transport. Transport recommendation: Fork-lift truck or hand lift (recommended at least 2 persons for hand-lifting) Flange shutter 50 kg • Lay the flange shutter its back for transport. · Use a suitable transport pallet for transport.

Transport recommendation: For-lift truck or hand lift (recommended at least 2 persons for hand-lifting)

... 5 Transport and storage

... Transport

Environmental conditions

Observe the following physical limits when transporting the modules:

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

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 stands in a stable way and cannot fall down.
- Lift system parts off the pallet with a crane, fork-lift truck or hand lift (recommended at least 2 persons for hand-lifting).
 Note: The retractor must not be transported with a fork-lift truck.
- 4. Dispose of packaging material in accordance with the 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 water panel
- Complete electrical documentation in electronic format
- System operating instructions in electronic format
- Also supplies (filter tools, set of O-rings, leakages test plug)
- Electrical documentation and operating instructions in printout 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 +5C°
- Double probe configuration
- Heated sample shut-off valve (attached to retractor frame)
- 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	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 Only store after draining all water out of the internal		
tank	tubes and draining of the tank.	
Control Cabinet	Store on rear side lying on pallet	
Compressed-air tank	• Ensure adequate protection of the attachments.	
(optional)	Only store after draining all water out of the	
	internal tubes.	

Environmental conditions

Observe the following physical limits with regards to storing the various modules:

Module	Environmental conditions for storage
Retractor including	Ambient temperature: +5 °C to +55 °C; after
probe	completely draining all water and drying parts in
	contact with cooling water or condensation: -20 °C to
	+55 °C
	Air humidity: Year-round average max. 75 %, short-
	term max. 95 %, occasional slight condensation is
	permitted
Cooling module and	Ambient temperature: +5 °C to +55 °C; after
water tank	completely draining all water and drying parts in
	contact with cooling water or condensation: -20 °C to
	+55 °C
	Air humidity: Year-round average max. 75 %, short-
	term max. 95 %, occasional slight condensation is
	permitted
Control cabinet	Ambient temperature: -20 °C to +55 °C
	Air humidity: Year-round average max. 75 %, short-
	term max. 95 %, occasional slight condensation is
	permitted
Compressed-air tank	Ambient temperature: +5 °C to +55 °C; after
(optional)	completely draining all water and drying parts in
	contact with cooling water or condensation: -20 °C to
	+55 °C
	Air humidity: Year-round average max. 75 %, short-
	term max. 95 %, occasional slight condensation is
	permitted

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 given to the specific installation instructions describing installation of the various modules in detail.

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

Overview of instruction steps

Proceed as follows to install the complete system:

	_	
Step	Procedure	Detailed instructions in chapter
1	Check place of installation of the	Checking site conditions on
	various modules of the probe gas	page 41
	sampling system.	
2	Install the probe retractor such that	Installing the probe
	personnel are not endangered, and	retractor/flange shutter on
	the system cannot be damaged.	page 42
3	Install control cabinet in a suitable	Installing the control cabinet on
	place.	page 48
4	Install compressed-air supply, install	Installing the compressed-air
	compressed-air tank if necessary.	supply on page 48
5	Install water system and cooling	Installing the water system and
	panel.	cooling panel on page 48
6	Lay and connect cooling water	Installing the water system and
	hoses.	cooling panel on page 48
7	Connect external sample gas line to	Installing the heated sample gas
	retractor.	line to the retractor on page 50
8	Connect internal electric cables.	Connect the internal electrical
		lines on page 53
9	Connect external electric cables.	Connect external electric lines
		on page 54

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)	ОК
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.	
	Environmental condition requirement	
Installation position of probe and probe retractor defined.	Positioning the probe with sufficient space around it for installation of protection 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		

... 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

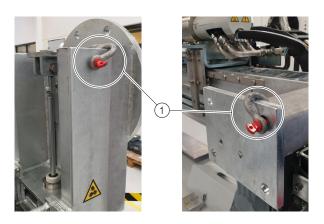
The following requirements must be met in order to install the probe retractor/flange shutter:

- 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.



1 Transport lugs 4×

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.
- 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.

4. Position probe retractor at the designated position and install appropriate support. It is important to get a precise alignment of the retractor angle, both horizontal and vertical, with respect to the insertion tube/flange of the kiln wall.



Installation flanges

Figure 36: Installation flanges on probe retractor

- 5. Connect the appropriate support of the probe retractor and the system. Maximum load per suspension point is 10000 N; ensure even loading of the fastening elements.

 The fastener elements must connect to the square installation flanges (Figure 36, Pos. 1) on each side. The fastener elements can be placed standing on the floor or hanging from the ceiling, whatever is preferable.

 CAUTION! The screw-in transport lugs are for transporting the probe retractor only, but not for permanent suspension. For permanent suspension only use the designated fastening positions.
- 6. Remove lifting gear and support material.
- 7. Check whether probe retractor is fastened stably enough 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.



1 Retractor buggy lock

2 Probe transportation support

Figure 37: Retractor buggy lock and probe transportation support

Adjustment of the retractor

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

... 6 Installation

Installing the probe

How to lift the probe

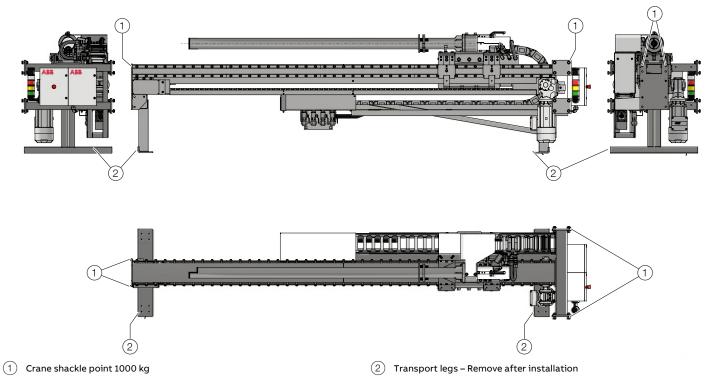


Figure 38: How to lift the probe

Lifting instructions

Use only the included crane shackles for lifting.

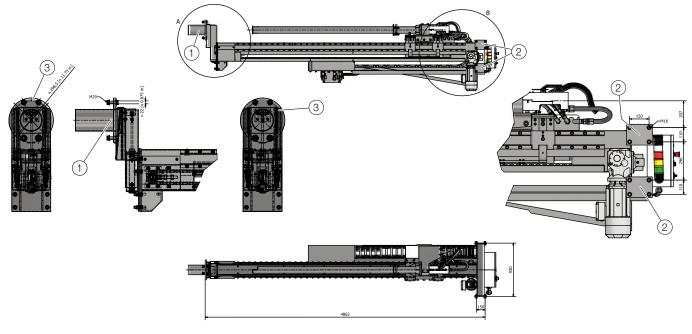
Weight

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 4×, 2× on each side

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

(3) Matching flange > ASME B16.5 Slip-on Welding - Class 150

... 6 Installation

... Installing the probe

How to install the probe

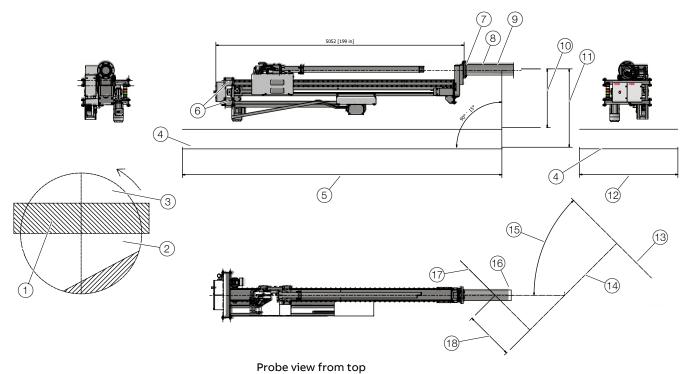


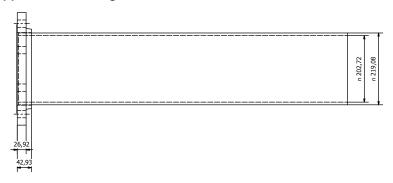
Figure 40: Standard 3 m probe, shown with insertion flange / pipe *

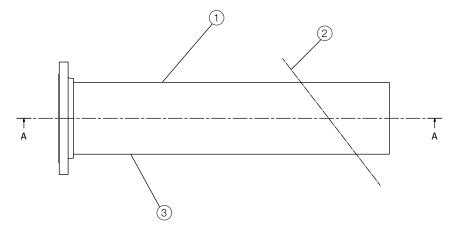
- 1 Typical install area
- 2 No install in bottom 50 % of kiln
- 3 No install in top 25 % of kiln
- (4) Platform floor
- (5) Typical platform length 6500 mm [256 in]
- (6) Backend install flange (floor or roof based)
- (7) ASME B16.5 Slip On Welding Flange Kiln center lineass 150 8" *
- (8) Install flange / pipe to be welded to kiln foot wall
- (9) Installation flange / pipe 8" *

- 10 Min. kiln center line height: 1200 mm [47 in]
- (11) Max. kiln center line height: 1600 mm [63 in]
- (12) Typical Platform width: 2000 mm [79 in]
- (13) Kiln center line
- (14) Kiln sealing
- (15) Angle to kiln center line: 45° (-0° +30°)
- (16) Insertion pipe 8" Sch40 (length to be cut flush with kiln inlet lining) *
- (17) Kiln foot wall
- (18) Example of distance to kiln sealing -should be as short as possible (here: 1000 mm [39 in])

^{*} Customer supply

Customer supplied install flange





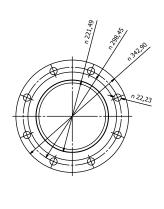


Figure 41: Customer supplied install flange (ASME B16.5 Slip On Welding Flange - Class 150 8")

1 Length of pipe to be determined on site

③ Install flange / pipe to be welded to kiln foot side

2 Pipe to be cut flush with inside kiln lining / bricks

... 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:

- 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.
- 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 cooling panel

Screws required for assembly

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

Requirements

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

- The site conforms to the designated site conditions (criteria see Choosing the place of installation of the peripheral modules)
- The water and cooling system should preferably be installed at the same height level as the probe. Maximum height level from water and cooler unit to retractor is 10m. Maximum 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 plan in the appendix.

Instructions

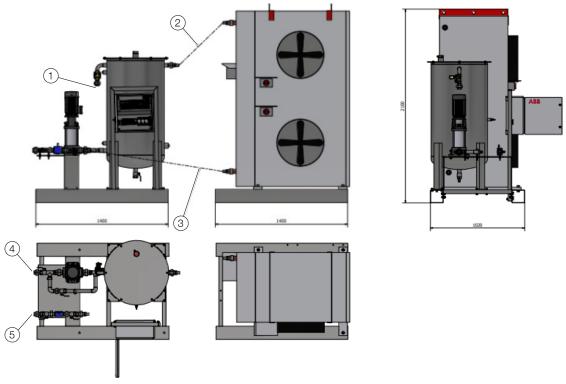
How to install the cooling system:

- 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 or bolts on the ground.
- 2. If placed next to each other (within 1m) use the hose supplied to connect between water unit and cooling unit. If longer distance is required, use minimum 1" piping.
- 3. Attach suitable drain tubes
- 4. After assembling the probe retractor and cooling module, determine the length of the cooling-water hoses.
- 5. Lay and fasten cooling-water hoses along designated path.
- 6. Use minimum 1" piping to connect water system forward-and return-hoses to the retractor connection points.

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
- 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.



- Water refill
- Water from water tank to pump. 1" pipe or hose connection
- Water from probe to water tank. 1" pipe or hose connection
- Figure 42: Water system

- (4) Water forward to probe. 1" pipe.
- (5) Water return from probe. 1" pipe.

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.

This distance is ideal in order to avoid dust and hot space close to the kiln.

- 3. Also take ambient and site conditions into account:
 - · Avoid direct sunshine
 - Prevent cold winter winds
 - If ambient temperature gets below 5°C, use antifreeze and / or a tank heater (optional).

... 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:

 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.

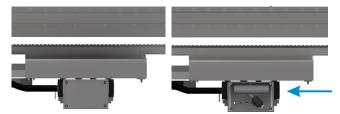


Figure 43: Heated junction box with cover (left) and without cover (right).

- 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:

A DANGER

Powered terminals

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

A DANGER

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 cables

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 internal lines are pre-installed in the probe retractor, Cooling panel and Control Cabinet. All downline connections 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	5G4mm ² or 5 × AWG 11
3 ph N + PE, fuse 20 A,	
Power consumption: 10 kVA	
UPS power supply 230 / 400 VAC	5G2,5mm ² or 5 × AWG 13
3 ph N + PE, fuse 16 A,	
Power consumption: 5 kVA	
Control Unit to Retractor	
Motor retractor (Shielded)	4G1,5 mm 2 shielded or 4 × AWG 15
	shielded
Power supply motor brake	3G1,5 mm ² or 3 × AWG 15
Power supply probe heating, sample	7G1,5 mm ² or 7 × AWG 15
hose, valve heating	
Power supply 24 VDC	7G1,5 mm ² or 7 × AWG 15
Safety signals	7G1,5 mm ² or 7 × AWG 15
Control Unit to Cooling Unit	
Power supply motor	4G1,5 mm ² or 4 × AWG 15
Power supply 24 V DC	5G1,5 mm ² or 5 × AWG 15
Signals to Plant	
Status signals output potential free	25G1,5 mm2 or 25 × AWG 15
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 (Default)
- · Modbus with AO2000 System
- · Others on request

Power supply and signal interfaces diagram see .

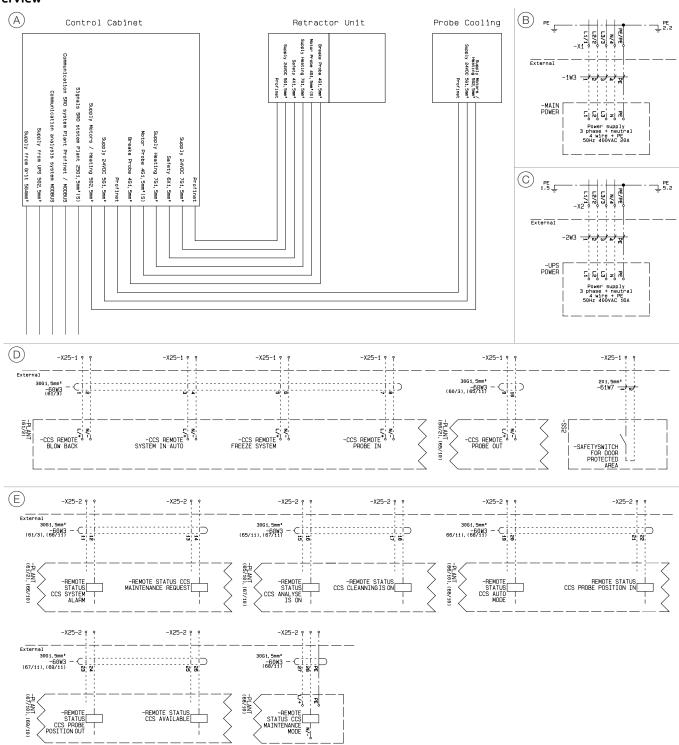
System bus PROFINET®

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) Power supply and cable connections between units
- B General power supply
- C Uninterruptible power supply (UPS)

- Signals from Central Control Room / Analysis system to the ProKiln system
- (E) System Status signals to Central Control Room / Analysis system from the ProKiln system

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 .

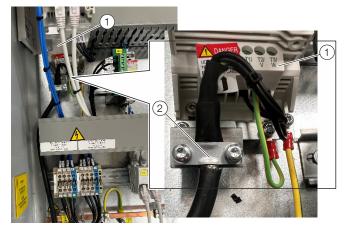
This applies to:

- 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.



- Frequency converter
- (2) Shield terminal

Figure 45: Motor cable shield connection

Requirements

- · See the electrical connection plan on page
- Finalize all internal probe gas sampling system cable connections before connecting external cable 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, ± 10 %, 50 Hz (fuses 3 x 20 A required), 3-phase connection (5 wires, N-conductor necessary) or
 - 230/400 VAC, ± 10 %, 60 Hz (fuses 3 x 20 A required) 3-phase connection (5 wires, N-conductor necessary)
- Power consumption Max. 8,2 kVA

UPS voltage requirements

- 230/400 VAC, ± 10 %, 50 Hz (fuses 3 x 16 A required), 3-phase connection (5 wires, N-conductor necessary) or
 - 230/400 VAC, ± 10 %, 60 Hz (fuses 3 x 16A required), 3-phase connection (5 wires, N-conductor necessary)
- Power consumption Max. 4,5 kVA
- The UPS supply will only be engaged for the period <1 min it takes to retract the probe from the kiln to a safe location 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:

- On the control cabinet:
 Turn off the main power switch.
- 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 50/60Hz (, Pos. (B))
 - UPS supply of 230/400 3ph+N+GRD 50/60Hz (, Pos. ©)
 - Modbus cable for Modbus RTU communication to AO2000-System, if available.
 - Ethernet cable for Modbus TCP or ProfiNet® communication to plant SRO/CCR
 - Potential free contacts for system status communication to plant SRO/CCR (, Pos. (D), (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: 'ELDOCUMENTATION 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:

A DANGER

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 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

A 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.

A 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 antifreeze 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.

A 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.

Overview of instruction steps

Proceed as follows to install the complete system:

Step	Procedure	Detailed instructions in chapter
1	Check installation for proper	Installation check on page 57
	condition.	
2	Fill cooling water and check water	Cooling water on page 58
	tightness of the cooling water	
	circuit.	
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	Checking the direction of rotation
	system on the control cabinet	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	Checking the direction of rotation
	heat exchanger and water pump to	of the heat exchanger on page 65
	correct 3ph power connection if	
	needed.	
7	Check pneumatic system and the	Checking the pneumatic system
	compressed-air switch in the	on page 62
	pneumatic box.	
8	In the control cabinet: check	Checking/correcting operating
	frequency drive has no alarm.	parameters on page 64
9	Check operating parameters of the	Inserting the probe and switching
	probe gas sampling system and	to automatic mode on page 64
	correct if necessary.	
10	Insert the probe for the first time in	ו
	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 these requirements is not met, abort start-up and do not continue until the appropriate conditions have been created.

Check list

The following conditions must be met:

Conditions	ок
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 I 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

- 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
- 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.
- 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 minimum requirements:

Dew point

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

Pressure

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

Consumption

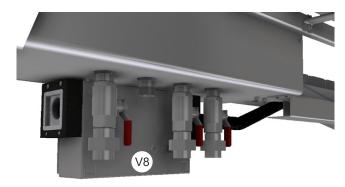
3 m³/h

Quality

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

Turning on compressed-air

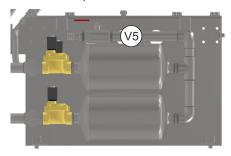
 Open the compressed-air main supply to the probe gas sampling system on valve V8 below the connection panel of the retractor.



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.



4. Make sure no leakage occurs anywhere and close the covers.

Activation of the probe gas sampling system

Requirements

- The connected gas analyser system must be switched on.
 Observe the warm-up time of the gas analyser system according to manufacturer specifications.
- The mechanical locking bar of the shutter (Figure 46, Pos.

 must be removed before inserting the gas sampling probe for the first time.
- The system must not have any visible damage (see also **Environmental conditions** on page 38).
- The customer-side central compressed-air supply is switched on.
- Tools required: Control cabinet key to open the control cabinet.



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

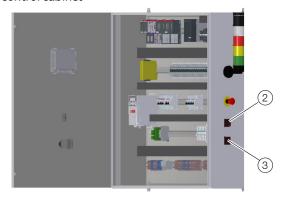
 Turn the safety switch probe 1 to position OFF to prevent any probe movement on the front of the retractor system control cabinet



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)

3. Turn on the power supply for the water system (4) on the side of the side of the water 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 boot.
- 6. Wait for the heaters in the probe H1, sample hose H2 and the hose connection point H3 to reach their operating temperatures.

Reset all alarms and maintenance requests
 Home page ► Alarm Reset
 Push the Emergency Stop Reset (5) on the front of the
 control cabinet



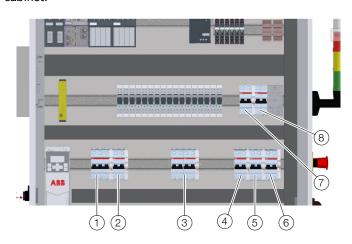
- (5) Emergency Stop Reset
- 6 Operation/Service switch

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

Power breakers in the control cabinet

The illustration below shows the power breakers in the control cabinet.



os.	Component	Rating*
1)	M1 Retractor drive motor	16 A
2)	M1 Retractor position brake	2 A
3)	Water system power supply	10 A
4)	H1 Probe sample tube heater	10 A
5)	H2 Sample hose heater	6 A
6	H3 Heated sample shut-off valve (optional)	6 A
7)	Control cabinet internal power outlet	10 A
8)	Control power supply 24 V DC	10 A

 Listed rating is included as an example as the as build EL-DOCUMENTATION FOR PROBE SYSTEM enclosed with the delivery of the system will have the supplied rating for a specific customer.

... 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.
- Turn off the power supply 1 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!



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 1 for the water system and reset all alarms.
- 5. Re-enter the probe into the process.

Checking the pneumatic system

Requirements

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

Instructions

- 1. Check the compressed-air system with suitable equipment, see **Checking for leaks** on page 108.
- 2. Check the pressure switches alarm point in the pneumatic box for correct settings: 4 bar.



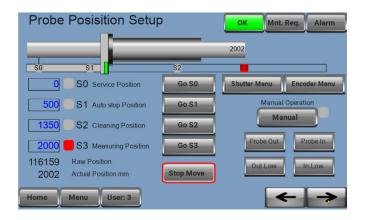
3. Check mark in settings window and adjust with the setting screw on the head of the pressure switch if necessary.

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.

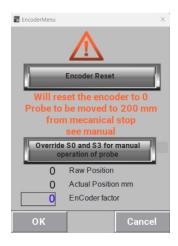
These parameters can be adapted to the conditions at the installation site if necessary. Two menus on the HMI include the parameters possible to change. The frequency converter controls the power for the retractor motor based on direct motor reading and a position encoder inside the motor.



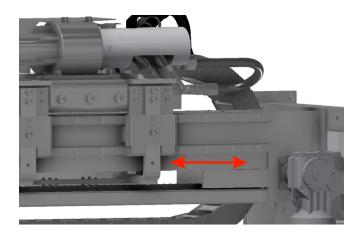
The above menu gives access to position control and position information.

The position and control of the motor is based on a zerocalibration position on the retractor SO 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.



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



The frequency converter provides readings of the 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 of material.



The above menu gives access to motor performance data and overload conditions. Various override functions are available for users with the right access level. Motor status and frequency 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

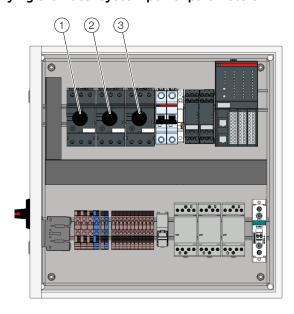
Modifying the controller operating parameters

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 preestablished 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 though the relevant menu pages on the HMI.

Modifying the water system power parameters



Pos.	Component	Function	Default cut off value
1	Breaker for water pump M10	Turns off water pu	ımp 2,7A
2	Breaker for Cooling f	an 1 Turns off fan 1	1,6A
3	Breaker for Cooling f	an 2 Turns off fan 2	1,6A

Inserting the probe and switching 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:

- 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 arrow 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 in order for lock the probe in its position.
- 3. Make sure that no mechanical locking bar (see **Requirements** on page 59, Pos. 1) is attached to the flange shutter, and it is able to open.
- 4. Leave danger area around the retractor, close protective 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 area.
- 7. Check the kiln wall tube for clogging and clean if necessary.

 Note: Inserting the gas sampling probe when the duct opening is clogged can lead to damage to the probe and is therefore not permitted.
 - If cleaning is necessary, go back to step 2 in this procedure. If cleaning is necessary, only trained people in heat protective 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 using the push buttons in "Probe Position Setup" until full penetration 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 $^{\circ}$ 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:

A DANGER

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 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

⚠ 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.

MARNING

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.

A 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.

A 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 antifreeze 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 and inserting the probe manually you can switch it to automatic mode. Automatic mode allows continuous operation of the system for sample gas sampling. Probe cleaning steps take place after defined intervals (these can be set using the controller). Observe all safety instructions in the section **Safety instructions** on page 66 when performing this work.

Requirements

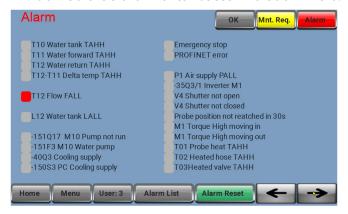
The following conditions must be met for automatic mode:

- Gas sampling probe correctly installed and put into operation.
- The gas sampling probe is inserted into the kiln.

Instructions

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

- 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 screens. The following alarms are relevant which can be seen in the alarm menu:



Observe the following rules in automatic mode

- In case of any alarm, read the message on the HMI and immediately take appropriate action (see Irregularities and corrective action on page 73).
- Check general condition of the system (see Checking site conditions on page 41.)

... 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

 ${\rm SO_2}$ measurements are very useful to monitor re-circulation of volatiles in the kiln system. ABB recommends the measurement of ${\rm SO_2}$ 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 SO_2 dissolves in the condensation, which in turn decreases the SO_2 concentration measured in the analyser.

In the above-mentioned cases, the falsification of results will be even more severe, the lower the concentration of SO_2 is.

Maximum reliability of SO₂ measurement is given,

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

Due to the propensity of rust particles to form incrustations on or inside the probe gas sampling system that may result in absorption of SO_2 , the manufacturer offers no warranty on such measurements.

In order to achieve representative results when measuring SO_2 , follow these steps:

- Make sure there are no cold spots in the probe sample system and gas analyser system that could wash-out the SO₂
- Have a suitable SO₂ analysis setup of continuous gas analysers in optimum operation condition according to manufacturer's specification
- Measure the SO₂ process concentration in the first 1-2 minutes after a probe cleaning (blow-back) has been performed.
- Make a trend curve connecting the measured SO₂ values over time based on the probe cleaning signal.
- Adjust the probe cleaning sequence to shorter intervals if you need to make more frequent SO₂ measurements
- Frequently remove dust, rust and any other materials which could affect the measured SO₂ values.

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 operation and secured against being started up again.

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

- · if the sampling system is visibly seriously damaged,
- · if the sampling system is no longer operational,
- 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	general damage
probe	missing or loose covers
	visible damage to electric cables
	hose and tube leaks
	drive chain:
	 chain tension slack is approx. 1"
	- chain link wear
	• gas sampling probe:
	 signs of wear (e.g. polished metal surfaces)
Cooling system	general damage
	missing or loose covers
	visible damage to electric cables
	hose and tube leaks
	cleanliness of heat exchanger dissipation fins
Control cabinet	general damage
	missing or loose covers
	visible damage to electric cables
	• dripping water or other liquids, internal condensation
Compressed-air	visible damage
tank (optional)	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 protection or an alternative position must be introduced. Contact ABB service for assistance/advice.

Adapting the cleaning procedure of the probe

Cleaning processes

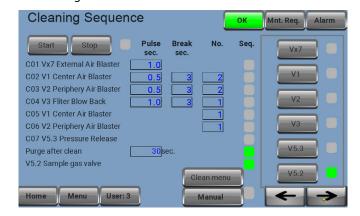
You can start a cleaning process as follows:

- Clean in MANUAL mode (on the HMI at the control cabinet)
- Clean in AUTOMATIC mode (time-controlled)
- Clean in AUTOMATIC mode (remote control via network connection)
- Clean in AUTOMATIC mode (by monitoring vacuum at the gas analyser system, only in combination with AO2000-System)

Clean in MANUAL mode

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

The following buttons are available:



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

... 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	5 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 network connection)

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

Phase	Description
1 Phases 1 to 9 will run as described above, after activation	
	received by the system controller - See the as build EL-
	DOCUMENTATION FOR PROBE SYSTEM enclosed inside the control
	cabinet when supplied

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

Note

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

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

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

This cleaning cycle is repeated up to three times. If this does not remedy the error (i.e., vacuum still exceeds maximum limit), an error message "3x Cleaning Not Successful" at system controller is displayed and the probe gas sampling system switches to error mode, while the probe is retracted out of the kiln. No more cleaning processes and movements will take place after this until the error is handled by maintenance personnel. See Irregularities 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:

- 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 ① 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.

Result:

The gas sampling probe is automatically retracted out of the kiln and enters Manual mode of operation; the controller displays the "manual mode" message.

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 will show the status of the probe gas sampling system in numbers and in graphics. The HMI will have entry point for set points and operational push buttons. Depending on access privileges, 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 menu windows
	Cooling	Cooling setup
	Analyse	Analysis setup
	Cleaning	Cleaning setup
	Air Supply	Blow-back diagram
	Probe position	Probe movement control
	Motor	Motor drive setup and control
	PID H1	Probe heater setup
	PID H2	Sample hose setup
	PID H3	Heated shut-off valve setup
	Maintenance Req.	Overview maintenance requests
	Alarm	Overview alarms
	Alarm List	Active maintenance and alarms
	Alarm setup	Alarm limits setup
	Analogue info	Overview analogue values
	Service DI/DO	Overview digital values
	Network diagnostics	Overview communication
	ProKiln GAC400 PI diagra	am Overview drawing of system
		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 screenUser interface: Operating screen

User interface: Alarm screenUser 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 Service
Whistling noise from compressed-	Compressed-air system leak	See Checking for leaks on page 108
air system		
Probe travel is jerky	Probe buggy rails dirty	Clean rails
	Wrong inclination of probe buggy	Readjust probe buggy inclination using the adjustment
		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	Air bubbles in the cooling-water circuit caused by too high	Check the water flow
cooling-water circuit	temperature	Check if piping has lime deposits limiting the flow. Use lime
		removing liquid in tank, see Cooling module: Checking cooling
		water on page 122
Unusual probe movements (probe	Loose parts	Have trained experts find out the cause
rocks up and down,	Severe soiling of rails	
sways to the sides, jerky travel)		
Compressed-air hose bursts or	Pressure controller defective	Close gate valve in pneumatic box, then wait for all
compressed-air tube cracks	Incorrect pressure set on pressure controller	compressed-air to blow out completely before approaching
		Shut down probe gas sampling system and secure against
		start-up until the cause has been fixed
Cooling-water tube or hose bursts	Mechanical damage to the tube or hose from an outside	Turn off the valves to isolate the leaking section
or cracks	source, or damage caused by too high temperature	Wait until the water has run out before approaching
	(bending, melting, deformation of tubes)	Shut down probe sampling system and secure against 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	Wait until all cooling water has run out before approaching
		Shut down probe sampling system and secure against start-up
		until the cause has been fixed
		Do not begin repair work until it has cooled down
Probe movement blocked	Mechanical damage	Remove the probe form the process
	Incrustation	Press EMERGENCY STOP switch before working on the probe
	Severe soiling of rails	Remove blockage

... 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).



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.

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 at the top right corner of the HMI. It can also be seen that the Alarm originates from a F12 Flow "FALL" (Flow Alarm Low-Low) as indicated with a red marker. See the complete alarm 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 1: Alarm menu - overview table

Alarm – Error	Probable Cause	Measures
T10 Water tank TAHH	Water tank temperature too high, cooler not able to remov	e Check heat exchanger panel and clean cooling surface
	heat input from probe	
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 lime deposits
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 water system control cabinet
-151F3 M10 Water pump	M10 water pump power OFF	Check circuit breaker -151F3 in water system control cabinet
-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 water system
		control cabinet
Emergency Stop	Emergency Stop button has been pushed and not released	Release Emergency switch and push Emergency reset button or
	and reset	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 and
		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 flange
M1 Torque High moving out	Retractor move resistance too high going out of the kiln	Check tracks, chain drive and probe insertion flange
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 for damages
T03 Heated valve TAHH (Option)	Heated valve temperature too high	Check heated valve connection and hose for damages

... 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 for damages
T02 Heated hose TAL	Heated hose temperature low	Check heated hose connection and hose for damages
T03 Heated valve TAH (Option)	Heated valve temperature high	Check heated valve connection and hose for damages
T03 Heated valve TAL (Option)	Heated valve temperature low	Check heated valve connection and hose for damages
T10 Water tank TAL	Water tank temperature low	Check process and ambient temperature and if anti-freeze has
		been added
L11 Water tank LAL	Water tank level low	Check refill valve of potable water to the tank
F12 Water flow FAL	Water flow low	Check water system for leakages and lime deposits
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 cabinet
-35Q3 Fuse M1 motor	Power supply for frequency drive	Check circuit breaker -35Q3 in control cabinet
-35Q19 fuse M1 Break	Power supply for M1 Motor break	Check circuit breaker -35Q19 in control cabinet
-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 cabinet
-46Q3 H2 fuse	Power supply for Heated hose	Check circuit breaker -46Q3 in control cabinet
-47Q3 H3 fuse	Power supply for Heated valve	Check circuit breaker -47Q3 in control cabinet
-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 cooling control cabinet
-153F3 M21 fuse	Power supply for Heat Exchanger Fan M21	Check circuit breaker -153F3 in Water cooling control cabinet
-154Q3 H10 fuse	Power supply for Water Tank Heat H10 (Option)	Check circuit breaker -154Q3 in Water cooling control cabinet

... 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 S0. To make sure that it really has reached its end position and that no subsequent probe movement can be expected, wait for the warning lamps on the retractor terminal box to turn off before performing any corrective action.

Instructions

Proceed as follows to handle any errors:

- Operation/Service Mode -50S15 switch must be is in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

- 3. Retract gas sampling probe out of the kiln.
 - Path: Menu ▶ Probe Position ▶ GO SO
 - **WARNING!** WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.
- 4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 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 also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



 Take required corrective actions to fix the existing errors.
 Depending on the requirement, please refer to correct section of this manual or contact ABB Service in case of doubts.

DANGER! Fixing errors requires special training and involves working on the open and powered-on probe gas sampling system. Therefore, this may only be carried out by qualified and specially trained personnel

9. Unlock EMERGENCY STOP switch -15S7 or -15OS3 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	Inspecti	on / Main	tenance ir	tervals		
		As required	Daily	Weekly	Twice yearly	Yearly	Every two years
Check the system and clean if necessary	Checking the condition of the system, cleaning the system on page 102	•	Х		•	-	
Display and evaluate trend display	Evaluating trend displays on page 104		Х				
Functional test of residual current circuit breaker	Checking the residual current circuit breaker or page 105	າ			Х		
Functional tests of: EMERGENCY STOP switch Warning lamps Warning buzzer	Checking protective installations on page 106					Х	

Probe

Maintenance task	See	Inspecti	on / Main	tenance i	ntervals		
		As required	Daily	Weekly	Twice yearly	Yearly	Every two years
Mechanical cleaning of probe tube and tip	Probe: Removing incrustations on page 112	Х	Х				
Replace intake filter	Probe: Replacing the intake filter on page 115	Х				Х	

... Maintenance schedule

Retractor

Maintenance task	See	Inspection	on / Main	tenance iı	ntervals		
		As required	Daily	Weekly	Twice yearly	Yearly	Every two years
If necessary, remove dust and debris around chain drive	Probe retractor: Checking and tightening the	Х		-	Х	-	
	drive chain on page 117						
Check and if necessary, tighten drive chain	Probe retractor: Checking and tightening the	Х				Х	
	drive chain on page 117						
Check and grease chain drive bearings	Instructions on page 118					Х	
Check and, if necessary, adjust the position of the probe	Probe retractor: Checking and tightening the	Х			Х		
	drive chain on page 117						

Cooling system

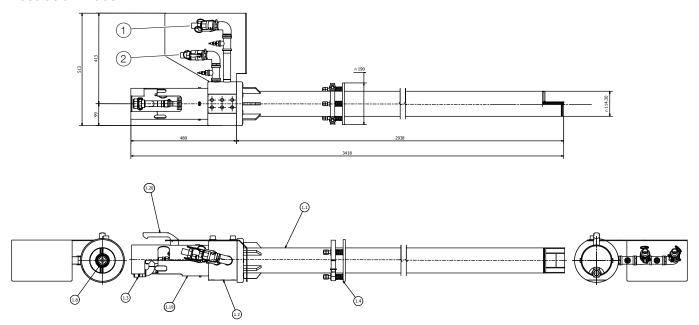
Maintenance task	See	Inspecti	on / Main	tenance i	ntervals		
		As required	Daily	Weekly	Twice yearly	Yearly	Every two years
Check cooling water for deposits in tank	Instructions on page 122	Х			Х		
Check cooling-water system for leaks	Cooling module: Checking cooling water on page 122	Х				Х	
Check that the water flow is sufficient	Cooling module: Checking cooling water on page 122					Х	
Check that heat exchanger dissipation fins are clean		Х			Х		

Pneumatic system

Maintenance task	See	Inspecti	on / Main	tenance i	ntervals		
		As required	Daily	Weekly	Twice yearly	Yearly	Every two years
Check pneumatic-air system for leaks	Checking the pneumatic system on page 62	Х			X		

Equipment layout plan

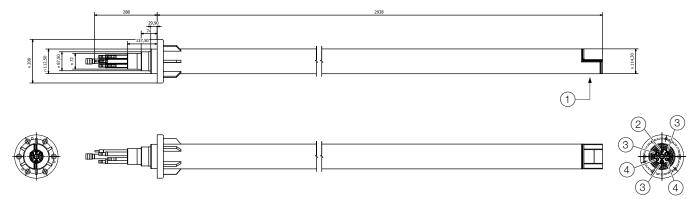
Illustration Probe



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

... Equipment layout plan

Illustration sample end

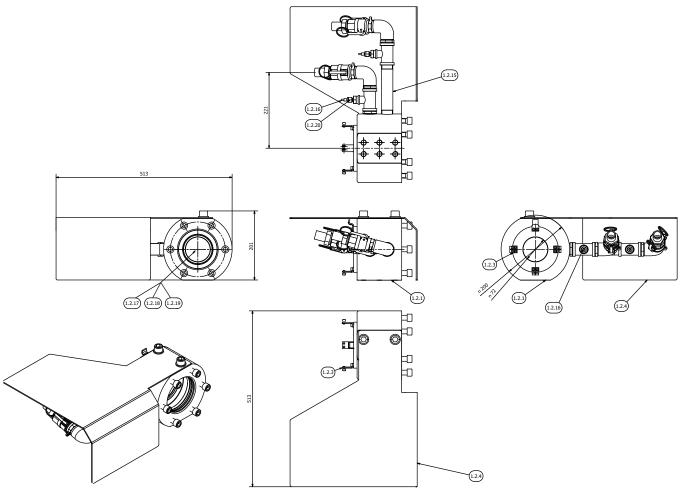


Equipment

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.

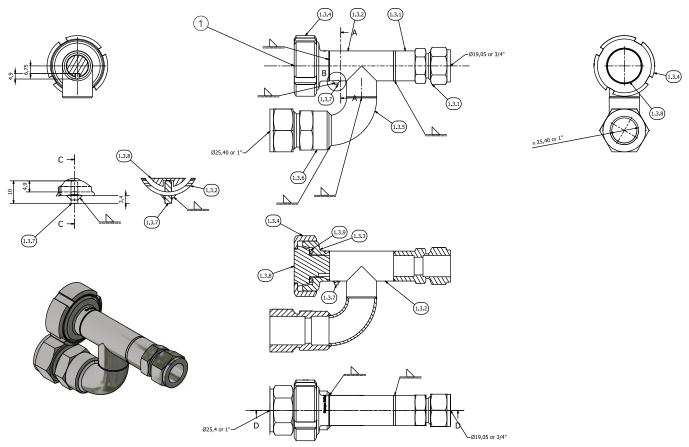
Illustration probe base – water connection flange



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	$1 \times O$ -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

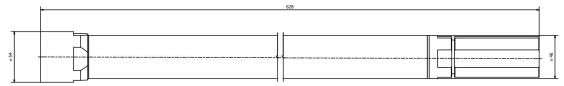
... Equipment layout plan

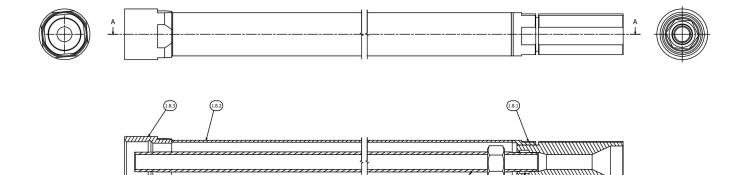
Illustration inspection port - center nozzle air blaster



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

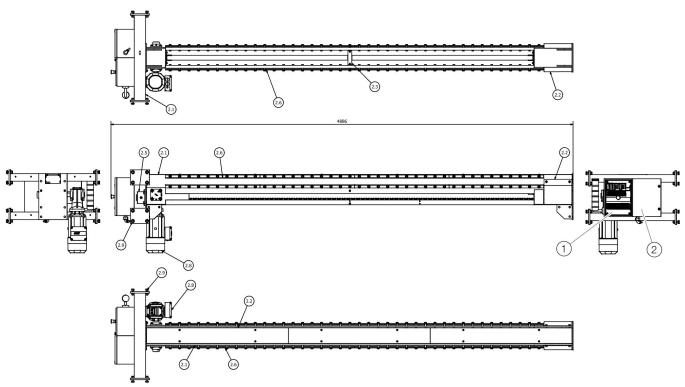




Reference	Designation
1.8.1	Filter female thread, front (D46x25)
1.8.2	Filter body (D46/42x460)
1.8.3	Filter female thread, back (D46x25)
1.8.4	Center nozzle for air blaster (D46x70)
1.8.5	Center tube through filter (1/2")
1.8.6	Hexagon nut (M20)
1.8.7	Filter dust sealing ceramic band

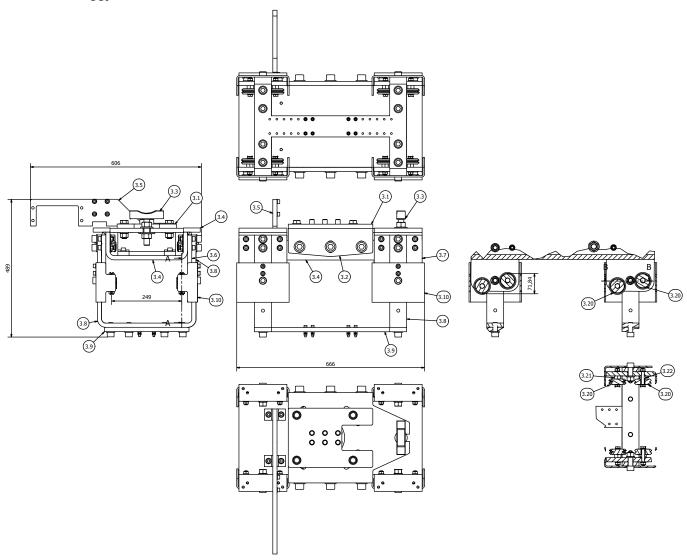
... Equipment layout plan

Illustration retractor



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

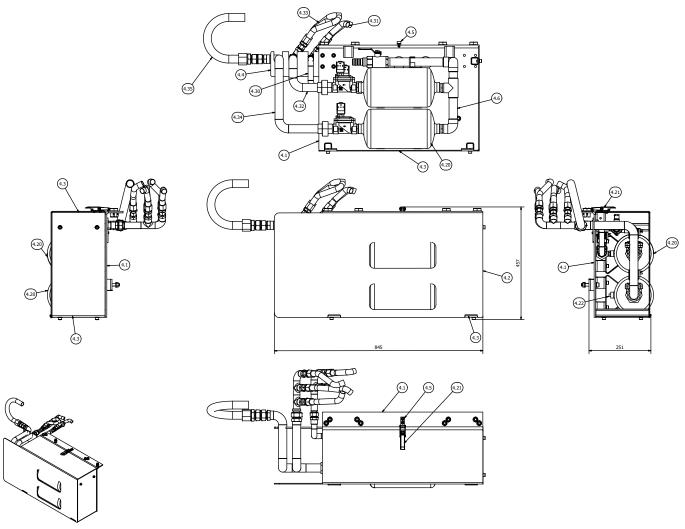
Illustration buggy



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
3.20	V-track wheel
3.21	Conical bushing
3.22	Excentric bushing

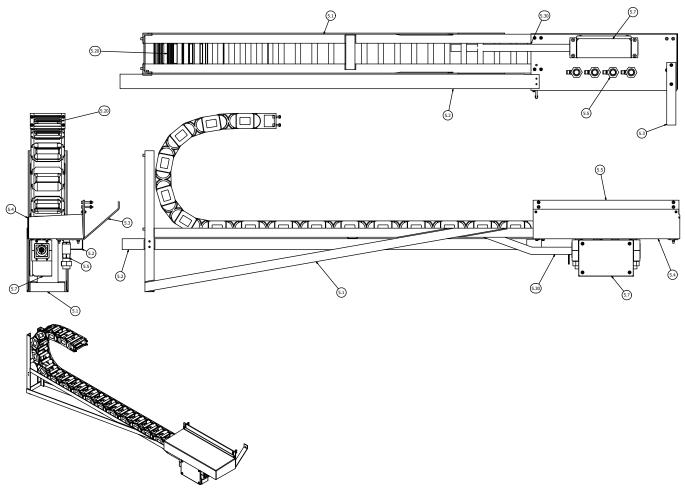
... Equipment layout plan

Illustration blaster panel 01



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 periphery air blaster supply
4.33	Filter periphery air blaster
4.34	Center tube nozzle air blaster supply
4.35	Center tube nozzle air blaster

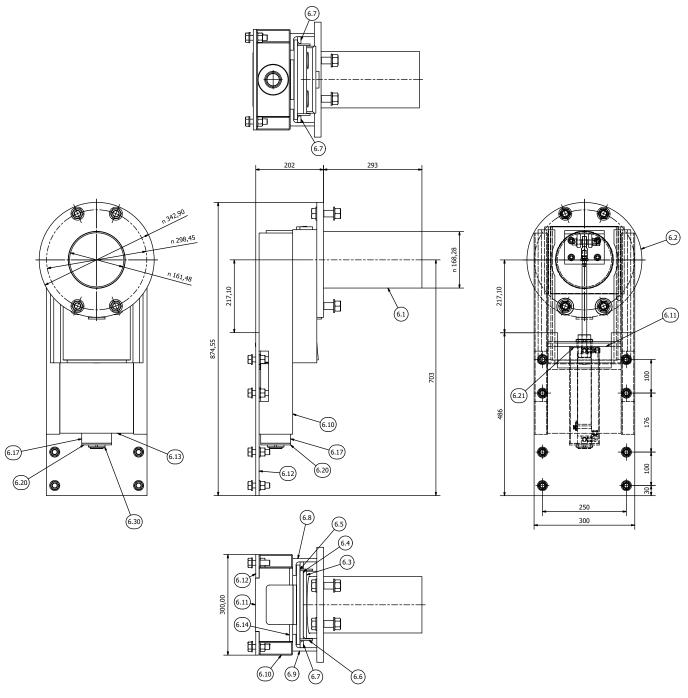
Illustration blaster panel 02



Reference	Designation
5.1	Support Chain
5.2	Cable tray
5.3	Support front
5.4	Base cover
5.5	Connection base with 3 \times 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

... Equipment layout plan

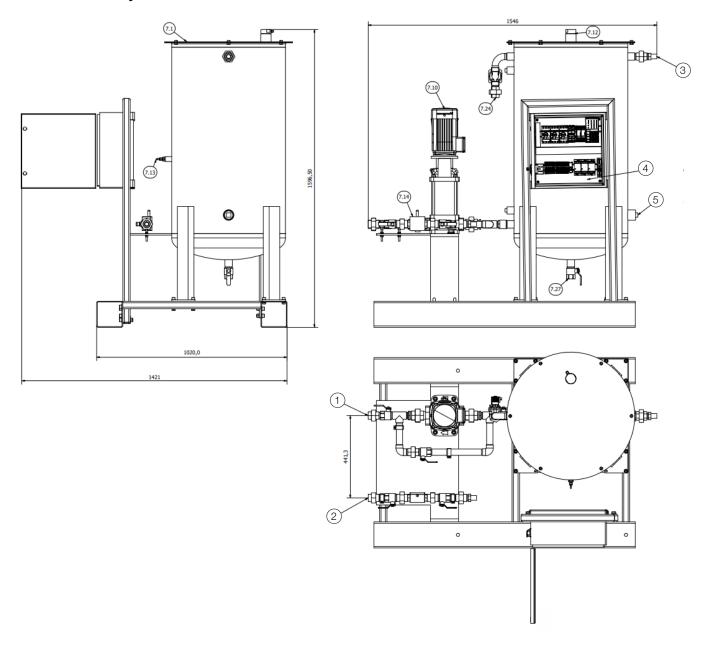
Illustration flange shutter - automatic



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

... Equipment layout plan

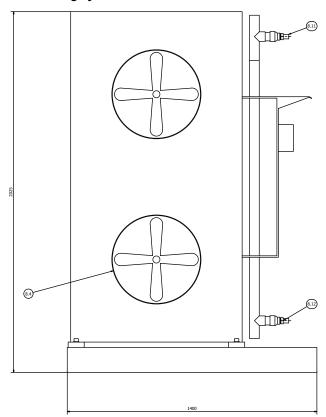
Illustration water system

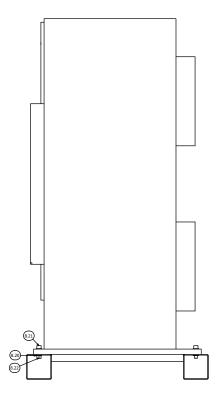


Reference	Designation
1	Water forward / 1" union for min. 1" connection to probe
2	Water return / 1" union for min. 1" connection to probe
3	Water from cooler / 1" hose connection to cooler
4	Control cabinet water system
5	Optional water heater
7.1	Lid water tank
7.10	Water pump
7.12	Level sensor water 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

... Equipment layout plan

Illustration cooling system

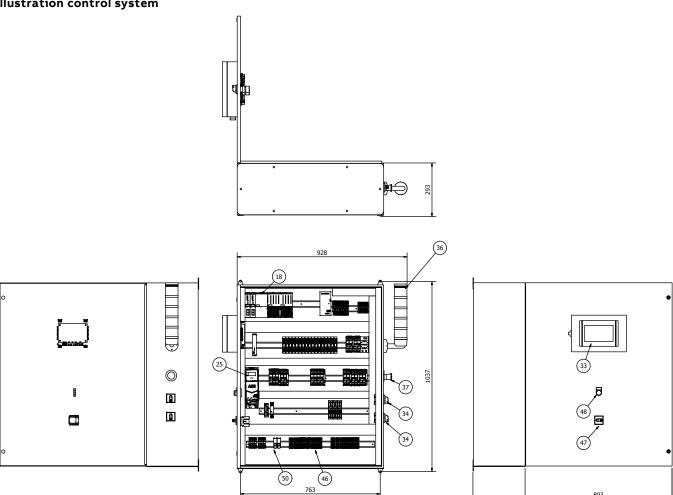




Reference	Designation
8.4	2 x Emergency stop fan motors
8.11	Water to water tank (1" hose connection to water tank)
8.12	Water return from water system
8.20	Plain washers
8.21	Hexagon Socket
8.22	Hexagon nuts

1088

Illustration control system



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

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 maintenance work

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

▲ DANGER

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

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.

A 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.

⚠ CAUTION

Danger of electric shock

Danger of electric shock when working on, and in the near of electric 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

A 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.

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 -15OS3 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:

- Make sure that no-one is standing in the area of probe retractor travel.
- 2. On the control cabinet: Turn Service/Operation mode 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 operation according to the controller program. The service switch will put the system in manual mode.

- 3. Secure the Service Mode switch against unauthorized actuation.
- 4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 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 also be secured with a padlock.



 $\label{lem:Result:} \textbf{Result:} \ \ \textbf{The gas sampling probe will remain in the position it} \\ \ \ \textbf{had before the Emergency Stop was pushed} \ \ .$

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

- 5. Perform maintenance tasks as required, always observing the operation manual.
- Leave danger area around the retractor and close the
 protective installation. Check surroundings and make sure
 that no-one is standing in the area of probe travel before
 proceeding with next step.
- 7. De-actuate the EMERGENCY-STOP switch and turn the Safety switch -101S2 at the probe rear cabinet to OFF
- 8. Push Emergency-Reset button -15SB/-15P12 at the front of the control cabinet to allow movement of the probe.
- 9. Turn Service/Operation mode switch -S50S15 clockwise to the Operation Mode position.
- 10. Re-insert the probe using the HMI at the control cabinet. Path: Home ► Manual ► Start to S3 WARNING! The probe moves into the kiln. Do not stand in the area of travel of the probe or probe buggy.
- 11. When probe has reached sampling position S3 enter Auto Mode operation

Path: Home ► Auto

... Maintenance work

Checking the condition of the system, cleaning the system Safety measures

MARNING

Dangers when checking the condition of the system or cleaning the system.

Always take the following safety measures when performing this work:

- · Wear the general protective equipment.
- Turn the Service Mode switch to Service Mode and secure the service switch against unauthorized switching (with a padlock).
- · Additionally press the EMERGENCY STOP switch.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off and the shutter is closed.
- Do not touch the probe gas sampling system until it has cooled down to 50 °C.
- Do not approach the retracted probe until it has cooled down.
- Always keep the floor around the probe gas sampling system clean and dry.

⚠ WARNING

Dangers when performing any cleaning work.

Always take the following safety measures when performing this work:

- Wear a dust mask when cleaning.
- Wash any dust off the skin immediately with water and soap
- · Ensure adequate ventilation of the workplace.

⚠ WARNING

Dangers when checking and cleaning the probe retractor.

Always take the following safety measures when performing this work:

 If work is unavoidable in the area of the duct opening, lock the shutter before commencing work and wear respiratory protection.

⚠ WARNING

Dangers when checking the duct opening.

Preferably check and clean the duct opening when the rotary kiln is out of operation. If you clean the duct opening 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 feedthrough opening is open as short as possible.

⚠ WARNING

Dangers when checking and cleaning the cooling module Always take the following safety measures when performing this work:

- Do not perform work on the cooling water circuit until the probe gas sampling system has cooled down.
- Avoid contact with the cooling water and the anti-freeze.
- In case of accidental contact of cooling water or antifreeze 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.

Note

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

Introduction

Check the condition of the probe gas sampling system at regular intervals; in the event of safety-relevant defects, inform the responsible maintenance personnel. If you observe any unusual noises, follow the recommendations in **Irregularities and corrective action** on page 73.

If necessary, submit the probe gas sampling system to thorough cleaning. Special attention should be given to the following:

- · dust under covers and in connection boxes
- · excessive dirt on the surface of the modules
- excessive soiling of the rollers and rails in the probe retractor
- heat exchanger cooling fins

Maintenance interval

Daily

Requirements

The following conditions must be met:

- The Service Mode switch is in the Service position, the gas sampling probe is completely retracted from the kiln (see
 Operating the service switch on page 100).
- The Service Mode switch is secured against unauthorized actuation.
- · The probe gas sampling system has cooled down.
- The EMERGENCY STOP switch is pressed.
- The Safety switch at the probe rear cabinet is in OFF position.
- The Safety switch at the probe rear cabinet is secured against unauthorized actuation.

Checking and cleaning the control cabinet:

Perform the following steps for the control cabinet:

- 1. Check general condition of control cabinet with regard to the following:
 - · general damage
 - missing or loose covers
 - visible damage to connection cables any smell, miscolouring or unusual noises
- Check control cabinet for dripping dust, water or other liquids.
- 3. In the event of excessive soiling of the surface of the control cabinet, clean with a soft brush or compressed-air.
- 4. Clean HMI, particularly edge areas, with compressed-air and/or moist cloth.

Checking and cleaning the probe retractor

Perform the following steps for the probe retractor:

- 1. Check general condition of retractor with regard to the following:
 - general damage
 - missing or loose covers
 - · visible damage to connection cables
 - · any smell, mis-colouring, or unusual noises
- 2. Check hoses and tubes for kinks, damages or leaks
- In the event of excessive soiling of the surface of the retractor, clean with a soft brush or compressed-air; treat rollers and rails in the same way. Also, the energy chain containing hoses must be cleaned with compressed-air.
- 4. Check condition of drive chain with regard to the following:
 - chain tension
 - · chain link wear
 - Correct Buggy position: any visible misalignment, strange angles or bends, any screws or fixing points visibly loosened.

- 5. Check air blaster tanks for visible damage or leakage
- 6. Check probe tube for signs of wear, e.g., polished metal surfaces. This applies particularly after start-up, after changing the alignment of the probe, modification of angles, etc. The calciner outlet measuring point is particularly affected. If you observe signs of wear, you must reposition the gas sampling probe in the process gas flow; if you have any questions regarding repositioning the probe, contact ABB Service.

Checking the duct opening

Check the wall tube for clogging and deposits at regular intervals and clean if necessary.

Note

Inserting the gas sampling probe when the wall tube is clogged can lead to damage to the probe. The same applies to reinserting the gas sampling probe after prolonged standstill of the probe gas sampling system.

Checking and cleaning the water system and cooling unit Perform the following steps for the cooling module:

- Check general condition of control cabinet with regard to the following:
 - general damage
 - missing or loose covers
 - · visible damage to connection cables
 - any smell, mis-colouring or unusual noises
- 2. Check hoses and tubes for kinks, damages, or leaks
- 3. In the event of excessive soiling of the surface of the cooling module, or after one week at the latest, clean with a soft brush or compressed-air.
- 4. Clean motor casing with compressed-air.
- 5. Clean cooling fins with dry compressed-air
- 6. Check cooling module environment for any materials that can fly around easily.

... Maintenance work

Evaluating trend displays

Introduction

Irregularities of cooling-water rate and cooling-water temperature may indicate various errors. Common reasons for an increase or drop in measured values may be, for example, inadequate cooling of the heat exchanger or inadequate delivery rate of the cooling-water pump.

Trends are an important basis for understanding process/equipment relation and an important tool when service is offered remotely. The system has a 60-day csv format data recording (Last in, last out) file in the data storage dongle.

Instructions

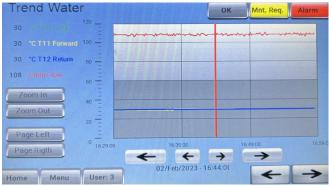
Perform the following steps to evaluate trend displays:

1. Open the wanted trend menu.

Path: Menu ▶ Trend Water

Path: Menu ▶ Trend Heat in

- The Trend Water menu will show the important data connected to the probe cooling.
 - Green T10 tank temperature
 - Yellow T11 water cooling forward
 - · Blue T12 water cooling return
 - Red F12 Water cooling flow

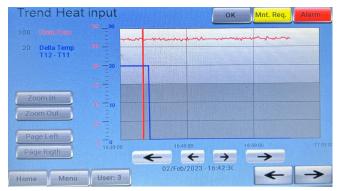


- The system must be able to maintain the water tank temperature below 75°C.
- The water flow must be stable above 90 I/min
- The water-cooling temperature return will change depending on process and if scaling or build-up occurs on the probe.

3. The Trend Heat Input menu will show how much heat is going into the probe. This is done by measuring the temperature difference between T12 water cooling return and T11 water cooling forward. As long as the water-cooling flow F12 is constant the difference will represent the heat input to the probe from the process.

The Heat Input can be used to evaluate how much material is building up around the probe or how fast scaling occurs on the probe surface.

If a build-up of material occurs, it can be seen in a lower Heat Input compared to normal in the entire period the probe is inside the kiln. Often when the probe is retracted, the build-up will be scrapped-off and the probe will be relatively clean. If scaling of material on the probe surface occurs, it can be seen as a high Heat Input right after the probe enters the kiln, and gradually lowering as time passes. Often when the probe is retracted, the scaling will stay on its surface.



If the Heat Input default value set to 25°C (Parameter input Alarm setpoint menu on page 33) continues to raise after the probe enters the kiln, the probe will be automatically retracted.

Retrieving data from the USB data-storage dongle

- 1. Open the control cabinet and find the back side of the HMI.
- 2. Locate the data storage dongle (1) inserted into a USB slot underneath the HMI.



- 3. Remove the dongle and bring to an office computer.
- 4. Download CSV files to a computer for evaluation.
- 5. Re-insert the dongle into the USB slot by reversing the previous steps.

The following data is logged to the USB memory stick of the ProKiln GAC400 system for 60 days:

Title	Comment
T10 Tank temp.	Tank temperature
T11 Forward temp.	Water forward temperature
T12 Return temp.	Water Return temperature
F12 Water flow	Water Flow I/min
ProbePosition	Probe Position in mm
Diff. T12-T11	Delta water temp T12-T11
T01 Actual	T01 H1 actual temperature
T01 Setpoint	T01 H1 Set point
T01 Output	T01 H1 Output
T02 Actual	T02 H2 actual temperature
T02 Setpoint	T02 H2 Set point
T02 Output	T02 H2 Output
T03 Actual	T03 H3 actual temperature
T03 Setpoint	T03 H3 Set point
T03 Output	T03 H3 Output

The system will not record any process data apart from these.

Alarm and event log

Data can only be transferred to ABB Service if the customer removes the USB stick and sends the files to ABB for service review. The customer has full control of the data and must allow it to be transferred to ABB.

Checking the residual current circuit breaker

Introduction

Residual current circuit breakers disconnect the monitored circuit from the remaining grid in the event

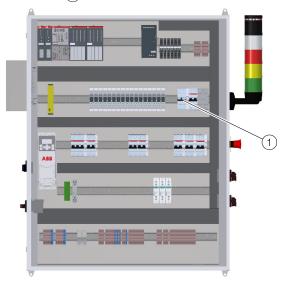
of a certain differential electric current. Test the residual current circuit breaker at regular intervals in order to simulate this error.

Maintenance interval

Every 6 months.

Illustration

The following diagram shows the location of the residual current circuit breaker -5F3 $\widehat{\ \ }$ 1 in the control cabinet.



Requirements

- The service switch is in the ON position; the gas sampling probe is completely retracted from the kiln (see Operating the service switch on page 100).
- Tools required: Control cabinet key to open the control cabinet

Instructions

Perform the following steps for residual current circuit breaker:

- 1. Open the control cabinet.
- 2. Press the test button "T" 1 on the residual current circuit breaker -5F3 to start the self-test (Picture: 2-pole residual current circuit breaker for normal grid).

... Maintenance work



3. Result of function test:

- If the residual current circuit breaker trips, then the residual current circuit breaker is working as intended.
- If the residual current circuit breaker does not trip, then shut down the complete system, secure against start-up, and have it repaired by trained, expert personnel.
- 4. Switch residual current circuit breaker -5F3 back on.

Checking protective installations

Safety measures

⚠ WARNING

Dangers when checking protective installations.

Always take the following safety measures when performing this work:

- · Wear the general protective equipment.
- 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.

Explanation of safety measures: **Safety instructions for maintenance work** on page 98.

Maintenance interval

at least once a year

The EMERGENCY STOP -15S7 and -15OS3 switch should be checked after shutting down the kiln, if possible, as the test procedure disables all monitoring mechanisms.

If it is necessary to check during operation (while the kiln is running), the probe retractor must be located up to maximum one meter from the rear end position (S0) when you actuate the EMERGENCY STOP -15S7 or -150S3 switch. This will prevent uncontrolled heating of the probe tip if an error occurs at the same time, that could leave the probe inside of the kiln.

Requirements

The following conditions must be met:

- The sampling probe is not fully inserted into the kiln (maximum one meter from the rear end position S0).
- Operation/Service Mode -50S15 switch must be in the Operation Mode.

Instructions: checking the EMERGENCY STOP switch
Proceed as follows to check the EMERGENCY STOP switch -15S7
or -150S3 (note: two people should perform this procedure):

- Operation/Service Mode -50S15 switch must be in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

3. Retract gas sampling probe out of the kiln.

Path: Main ▶ Probe Position ▶ Go S0

WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

- While the probe is still moving and approximately one meter before reaching from the rear end position (S0): Press EMERGENCY STOP switch -15S7 or -15OS3.
 - Target requirement: The probe retractor must interrupt movement immediately!
- 5. Unlock EMERGENCY STOP switch -15S7 or -15OS3 by turning the back ring in the direction of the arrow. No movement must be seen.



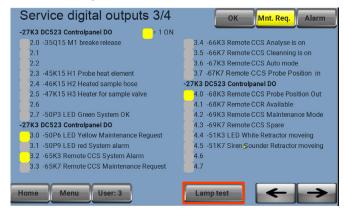
6. Push the blue push button Emergency Reset -15SB/-15P12 to allow new operation of the probe retractor, air blaster and probe blow-back.



- In the event of irregularities, shut down the sampling system, secure against start-up (e.g. with a padlock), and have it repaired by trained, expert personnel. If otherwise, proceed with following steps.
- 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 goes out.
- Switch system to Auto mode on the HMI Path: Home ► Auto
- 10. Switch back Operation/Service Mode -50S15 switch to Operation Mode

Instructions: checking warning lamps and sound buzzer Perform the following steps to check warning lamps -51P15 Buzzer, -51P11 White, -50P9 Red, -50P6 Yellow, -50P3 Green

- The test can be performed during Operation or Service, in Manual or in Auto
- Switch to HMI page system to Path: Menu ► Service Di/DO
 Luse arrow right until page Service digital output 3/4can be seen (see page below).
- 3. Push the Lamp test button



4. After pushing Lamp test button, a new menu will appear. Push one by one each of the corresponding buttons to change status for Horn, White, Red, Yellow, Green and check the result. Each lamp should light-up, and buzzer/horn should sound.



5. When test is completed push the Reset and Close button to finalize the test.

... Maintenance work

Checking for leaks

Safety measures

⚠ WARNING

Dangers when performing maintenance work.

Always take the following safety measures when performing this work:

- Wear a face mask against heat, heat-proof gloves, and protective welder's clothing.
- Operation/Service Mode -50S15 switch must be in the Service Mode (with a padlock).
- Additionally press the EMERGENCY STOP switch.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off and the shutter is closed.
- Do not perform the work until the probe gas sampling system has cooled down.
- Lock the shutter before starting the work, unlock the shutter only after finishing the work.
- Always keep the floor around the probe gas sampling system clean and dry.

Explanation of safety measures: **Safety instructions for maintenance work** on page 98.

Introduction

Sample gas paths, the compressed-air system and cooling-water circuit must be checked for leaks on a regular basis.

Maintenance interval

twice yearly

Or as required in the following cases:

- Sample gas paths: additionally, after opening sample gas lines inside the connected analyser cabinet
- Cooling-water circuit: additionally, when level in the coolingwater tank level drops frequently
- Compressed-air system: additionally, when pressure drops in the compressed-air system without any cleaning process taking place.

Required tools

The following tools are required:

For checking the compressed-air system and cooling-water circuit for leaks:

Soap or leak detection spray for compressed air system

For checking the sample path system

- Silicone plug (included)
- Tool to remove probe end nozzle (included)
- 2-3 m plastic hose with fittings
- Glass/plastic transparent bottle 0,5-1 litre filled with water
- Vacuum pump



- (1) Silicone plug 50 60 mm ø
- 3 Filter and nozzle removal tool
- 2 Filter centre pipe removal tool 30 mm

Figure 53: Required tools

Instructions: checking sample gas paths

The following procedure only works if your gas analyser system is NOT equipped with an air-driven vacuum pump (ejector/eductor).

How to check the sample gas paths in the probe:

- Operation/Service Mode -50S15 switch must be in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

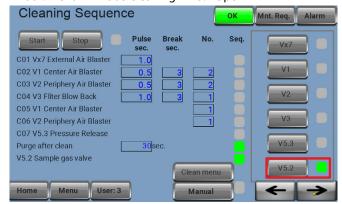
- Retract gas sampling probe out of the kiln.
 Path: Menu ► Probe Position ► GO SO
 WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.
- 4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 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 also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



- Remove probe front nozzle at the end of the probe sample end using the included tool . Follow instructions **Probe:** Replacing the intake filter on page 115.
- 6. Clean the surfaces inside the probe sample inlet with a brush and a cloth, making sure only minimum dust is left.
- 7. Insert included silicone plug tightly/firmly.

8. Open the heated sample shut-off valve V5.2 (if available) in the HMI panel.

Path: Menu ▶ Probe Cleaning ▶ V5.2 Open



Note: If no heated sample shut-off valve is included in the probe sample gas system, skip this section.

- 9. Start the gas pump in the gas analysis system and aspirate gas from the probe. Check manufacturer's manual for instructions on how to operate the sample gas pump.
- 10. Connect a 2-3m plastic hose to the outlet of the gas analysis system.
- 11. Fill a 0,5 1 litre glass/plastic transparent bottle with water
- 12. Stick the end of the 2-3m plastic hose down in the bottle to see the escaping sample gas/air bubbles inside the bottle.
- 13. Wait 2-3 minutes and let the vacuum build up in the probe and sample system. (Note: Vacuum should be approximately -700 to -800mbar).
- 14. Check that there are only none or very few and occasional small bubbles in the water bottle (1 bubble per 5 to 10 seconds or longer). Test can be assumed successful if such condition is met. If test is not successful, find the leakage by checking all connections between sample gas pump and probe.

... Maintenance work

- 15. After successful test:
 - Remove silicone plug and 2-3 m hose.
 - Mount back the probe front nozzle at the end of the probe sample end using the included tool. Follow instructions Probe: Replacing the intake filter on page 115
- 16. Unlock EMERGENCY STOP switch -15S7 or -15OS3 by turning the back ring in the direction of the arrow. No movement must be seen.



17. Push the blue button Emergency Reset -15SB/-15P12 to allow new operation of the probe retractor and air blaster probe blow-back.



18. 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.

- 19. Switch system to Auto mode on the HMI Path: Home ▶ Auto
- 20. Operation/Service Mode -50S15 switch must be switch back to Operation Mode

Instructions: checking the compressed-air system How to check the cooling-water circuit for leaks:

- Operation/Service Mode -50S15 switch must be in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

3. Retract gas sampling probe out of the kiln.

Path: Menu ▶ Probe Position ▶ GO SO

WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 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 also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



- 5. Spray leak detection spray on:
 - Screw connections and connectors
 - Compressed-air tubes

Also listen for audible blowing-off sounds.

- 6. If you locate a leak: replace component and/or ensure adequate sealing.
- 7. Unlock EMERGENCY STOP switch -15S7 or -15OS3 by turning the back ring in the direction of the arrow. No movement must be seen.



8. Push the blue button Emergency Reset -15SB/-15P12 to allow new operation of the probe retractor and air blaster probe blow-back.



- 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.
- 10. Switch system to Auto mode on the HMI Path: Home ► Auto
- 11. Operation/Service Mode -50S15 switch must be switch back to Operation Mode

Instructions: checking the cooling water circuit

How to check the cooling-water circuit for leaks:

- Operation/Service Mode -50S15 switch must be is in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

3. Retract gas sampling probe out of the kiln.

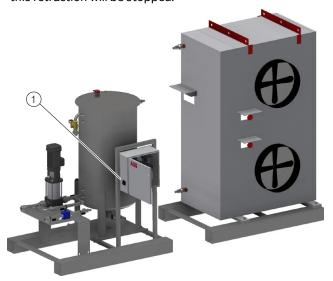
Path: Menu ► Probe Position ► GO SO

WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 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 also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



5. Switch OFF the water pump M10 at the Probe cooling switch -150S3 (1) on the side of the water control cabinet Switching OFF the Probe cooling while the probe is inserted into the process results in retraction of the probe to a safe position to prevent damage. Only if the Emergency-Stop is pushed this retraction will be stopped.



... Maintenance work

- 6. Sight-check the cooling-water circuit.
 - You locate a leak, replace component and/or ensure adequate sealing
- 7. Switch ON the water pump M10 at the Probe cooling switch 150S3 (1) on the side of the water control cabinet.
- 8. Unlock EMERGENCY STOP switch -15S7 or -150S3 by turning the back ring in the direction of the arrow. No movement must be seen.



 Push the blue button Emergency Reset -15SB/-15P12 to allow new operation of the probe retractor and air blaster probe blow-back.



10. 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.

- 11. Switch system to Auto mode on the HMI Path: Home ► Auto
- 12. Operation/Service Mode -50S15 switch must be switch back to Operation Mode

Probe: Removing incrustations

Safety measures

⚠ WARNING

Dangers when performing maintenance work.

Always take the following safety measures when performing this work:

- Wear a face mask against heat, heat-proof gloves, and protective welder's clothing.
- Operation/Service Mode -50S15 switch must be in the Service Mode (with a padlock).
- Additionally press the EMERGENCY STOP switch.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off and the shutter is closed.
- Do not perform the work until the probe gas sampling system has cooled down.
- Lock the shutter before starting the work, unlock the shutter only after finishing the work.
- Always keep the floor around the probe gas sampling system clean and dry.

Explanation of safety measures: **Safety instructions for maintenance work** on page 98.

Maintenance interval

• Weekly (or as required)

Tools required

- Chisel
- Hammer
- · Compressed-air cleaning pistol

Instructions

- Operation/Service Mode -50S15 switch must be in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

3. Retract gas sampling probe out of the kiln.

Path: Menu ▶ Probe Position ▶ GO SO

WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -15OS3 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 also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



- 5. Manually lock the flange shutter.
- 6. Mechanical cleaning outside:

Remove incrustations on the probe tip by hitting them with a chisel. The direction of impact must be parallel to the longitudinal axis of the probe in order to prevent massive damage to the probe. The size of the tool must suit the sampling aperture in order to prevent massive damage. Note: The probe must only be cleaned mechanically. Do not use chemicals (acids, lye, etc.) for cleaning.

7. Cleaning/inspection of center pipe:

Follow opening instructions for Inspection/clean-out through center pipe inspection port on page 114.

Inspection of the center pipe can only be done while the probe is outside of the kiln and never in position S3.

If a clean free view is seen through the center pipe inspection port no further action is needed.

If no clean and free view can be seen, use a pipe connected to compressed air at 1-2 bar to clean it out. Use full protective clothing as hot air and dust can come backwards during cleaning with air.

In severe cases a drill mounted on a long rod and low rotation speed can be used to remove material.

Note: The probe must only be cleaned mechanically. Do not use chemicals (acids, lye, etc.) for cleaning.

- 8. Manually unlock the flange shutter.
- 9. Unlock EMERGENCY STOP switch -15S7 or -15OS3 by turning the back ring in the direction of the arrow. No movement must be seen.



 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

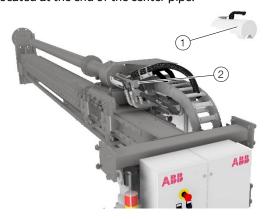
... Maintenance work

Inspection/clean-out through center pipe inspection port

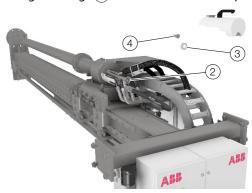
1. The center pipe inspection port is hidden under the probe cover #1 in the back end of the probe.



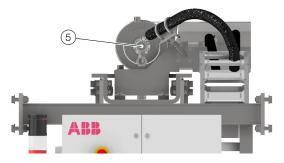
2. Remove cover (1) to access the center pipe inspection port(2) located at the end of the center pipe.



3. Remove the flange of the center pipe inspection port ② by unscrewing the flange ③ in order to remove the port plug ④



4. This will give free access (5) to the full length of the center pipe. Remove O-ring (Green) before any mechanical clean-out is done in order not to damage it.



Probe: Replacing the intake filter

Safety measures

MARNING

Dangers when performing maintenance work.

Always take the following safety measures when performing this work:

- Wear a face mask against heat, heat-proof gloves, and protective welder's clothing.
- Operation/Service Mode -50S15 switch must be in the Service Mode (with a padlock).
- Additionally press the EMERGENCY STOP switch.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off and the shutter is closed.
- Do not perform the work until the probe gas sampling system has cooled down.
- Lock the shutter before starting the work, unlock the shutter only after finishing the work.
- Always keep the floor around the probe gas sampling system clean and dry.

Explanation of safety measures: **Safety instructions for maintenance work** on page 98.

Maintenance interval

once a year or as required

Tools required

- Probe tip air blaster nozzle tool 42mm (Included, see Required tools on page 108)
- Wrench size 30 high head for long M20 (Included, see Required tools on page 108)

Requirements

The following conditions must be met:

- The probe is retracted to maintenance position S0
- Safety switch probe -101S2 in OFF position to prevent any movement of the probe see Safety instructions for maintenance work on page 98
- The EMERGENCY STOP switch is pressed.
- The flange shutter is locked

Instructions

For extensive work on the probe tip (e.g., when replacing the filter), maintenance position S0 provides sufficient working space. Refer to illustrations below for guidance while following the procedure.

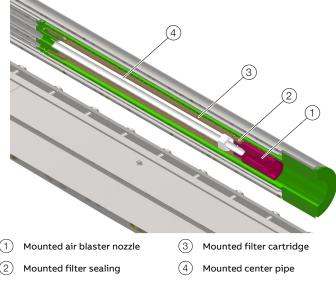
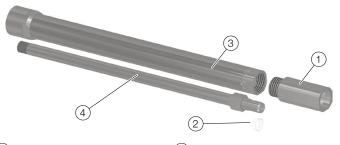


Figure 54: Probe tip sample intake end, assembled



- 1 Unmounted air blaster nozzle
- 3 Unmounted filter cartridge
- (2) Unmounted filter sealing
- 4 Unmounted center pipe

Figure 55: Probe tip sample intake end, disassembled

- Operation/Service Mode -50S15 switch must be in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).
 - Path: Home ► Manual
- 3. Retract gas sampling probe out of the kiln.

Path: Menu ▶ Probe Position ▶ GO SO

WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

... Maintenance work

4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 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 also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



- 5. Manually lock the flange shutter.
- Remove incrustations (see Probe: Removing incrustations on page 112)
- 7. Use the probe tip air blaster nozzle tool 42mm (see **Required tools** on page 108) to unscrew, first the nozzle (1) and then the filter cartridge (3) itself.
- 8. Inspect the filter and clean, if possible, with compressed-air and/or with hot water and soap
- Replace filter if it is not possible to clean anymore due to excessive clogging, or if it looks damaged. Part is available through ABB Service.

10. Replace the filter sealing ② with ceramic string 17cm shown below. Use tape to seal the ends of the string, making installation easier. Install inside the air blaster nozzle ① by twisting it 2,5 – 3 times round inside. Part is available through ABB Service.



- 11. Inspect the air blaster nozzle (1) for wear. Clean if necessary.
- 12. Replace air blaster nozzle 1 if it is not possible to clean anymore, or if it looks damaged. Part is available through ABB Service.
- 13. Use the Wrench size 30 high head (see **Required tools** on page 108) to unscrew center tube (4).
- 14. Inspect the center tube 4 for wear. Clean if necessary. Use tool to center tube (see **Checking for leaks** on page 108).
- 15. Replace center tube (4) if it is not possible to clean anymore, or if it looks damaged. Part is available through ABB Service.
- 16. Assemble the parts inside the probe in the following sequence (4), (3), (2), (1)
- 17. Manually unlock the flange shutter.

18. Unlock EMERGENCY STOP switch -15S7 or -15OS3 by turning the back ring in the direction of the arrow. No movement must be seen.



19. Push the blue button Emergency Reset -15SB/-15P12 to allow new operation of the probe retractor and air blaster probe blow-back.



- 20. 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.

- 21. Switch system to Auto mode on the HMI Path: Home ▶ Auto
- 22. Operation/Service Mode -50S15 switch must be switch back to Operation Mode

Probe retractor: Checking and tightening the drive chain Safety measures

⚠ WARNING

Dangers when performing maintenance work.

Always take the following safety measures when performing this work:

- Wear a face mask against heat, heat-proof gloves, and protective welder's clothing.
- Operation/Service Mode -50S15 switch must be in the Service Mode (with a padlock).
- Additionally press the EMERGENCY STOP switch.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off and the shutter is closed.
- Do not perform the work until the probe gas sampling system has cooled down.
- Lock the shutter before starting the work, unlock the shutter only after finishing the work.
- Always keep the floor around the probe gas sampling system clean and dry.

Explanation of safety measures: **Safety instructions for maintenance work** on page 98.

Introduction

Maintain adequate drive chain tension to prevent damage to the retractor.

Maintenance interval

· monthly or as required

Requirements

The following conditions must be met:

- The probe is retracted to maintenance position S0
- Safety switch probe -101S2 in OFF position to prevent any movement of the probe see Operating the service switch on page 100
- The EMERGENCY STOP switch is pressed.
- · The flange shutter is locked

... Maintenance work

Instructions

How to check drive tension:

- Operation/Service Mode -50S15 switch must be in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

3. Retract gas sampling probe out of the kiln.

Path: Menu ► Probe Position ► GO SO

WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

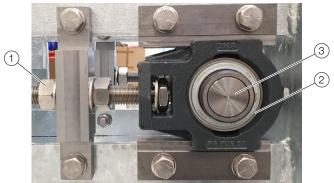
4. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 switch for reasons of safety and turn the Safety switch - 101S2 at the probe rear cabinet to OFF position, to prevent any movement of the probe. This switch can also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



- 5. Manually lock the shutter.
- 6. Check drive chain tension in the middle of the retraction unit, by pulling it vertically with the hand

Target requirement: The upper chain is adequately tensioned when you can pull it vertically approximately. 0,5-1 cm by hand on the middle of the retractor unit.

7. If the chain is too loose or if you can see wear on the chain support: Increase tension with the chain tensioner nuts ① on the front of the retractor, behind the protection plates. By adjusting the nuts ① equally in both sides, the bearing ② and shaft/cogwheel ③ will modify the tension to the chain. Note: Ensure that the drive chain is not adjusted with too much tension. The upper chain is adequately tensioned when you can pull it vertically approximately. 0,5-1 cm by hand.



9. Unlock EMERGENCY STOP switch -15S7 or -15OS3 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. Manually unlock the shutter
- 12. 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.

- 13. Switch system to Auto mode on the HMI Path: Home ► Auto
- 14. Operation/Service Mode -50S15 switch must be switch back to Operation Mode

Probe retractor: Checking and adjusting the position of the probe

Safety measures

⚠ WARNING

Dangers when performing maintenance work.

Always take the following safety measures when performing this work:

- Wear a face mask against heat, heat-proof gloves, and protective welder's clothing.
- Operation/Service Mode -50S15 switch must be in the Service Mode (with a padlock).
- · Additionally press the EMERGENCY STOP switch.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off and the shutter is closed.
- Do not perform the work until the probe gas sampling system has cooled down.
- Lock the shutter before starting the work, unlock the shutter only after finishing the work.
- Always keep the floor around the probe gas sampling system clean and dry.

Explanation of safety measures: **Safety instructions for maintenance work** on page 98.

Maintenance interval

 as required (e.g., after kiln conversion work, civil works, structural changes of kiln inlet area, or process changes)

Instructions: checking the probe tip position and insertion depth

Due to changes entailed by the process or the system, it may be necessary to change the position of the gas sampling probe. Note that the tip of the probe should be maximum 30 cm inside the rotary kiln (beyond the kiln seal) after start-up. The gas sampling probe must not be inserted further than absolutely necessary into the rotary kiln in order to minimize impacts on the unprotected area of the probe caused by the process.

When defining the measuring point, a comparison of the probe insertion depth to the measurement of oxygen must be performed in order to find the best position. This evaluation must be done at a time where the kiln operation is stable and at a normal operation state, i.e., normal cement throughput.

When starting to evaluate the oxygen concentration compared to the depth of the probe, start with the probe only just entering the process with the probe tip. At this point false air from the insertion flange together with the false air from the kiln sealing will result in a high oxygen reading.

Gradually go deeper inside the process in steps of approximately 0,25m. The first couple of steps will not make any defined difference. However, at one point the oxygen will drop. Take a note of this point and then go one or two steps further inside as needed, in order to get a stable oxygen reading. Take note of this point as the S3 measuring point for the retractor.

The typical insertion depth will depend on the amount of false air entering the riser duct from the kiln sealing. It is not normal that the sample end of the probe needs to go all the way inside the kiln. Typically, 1m free, away from any wall surface will be enough.

... Maintenance work

Instructions: checking probe vertical and horizontal position How to check probe position:

- 1. Turn the Safety switch -101S2 at the probe rear cabinet to OFF position, to prevent any movement of the probe. This switch can also be secured with a padlock.
- 2. With the probe inserted, check the distance between the flange and the tube sealing device. Target requirement: The flange must be touching
- If this target requirement is not met, adjust the probe by means of the following actions:
 - Adjust the probe flange (see step 4)
 - Adjust vertical position (see step 5)
 - Adjust horizontal position (see step 5)
- 4. Adjusting the probe flange:
 - Release bolt 1 to enable the probe flange (Green) to move forth or back as required.
 - When the probe is in sample position S3 of the retractor, adjust the probe flange to go firmly against the counter flange (2) on the flange shutter.

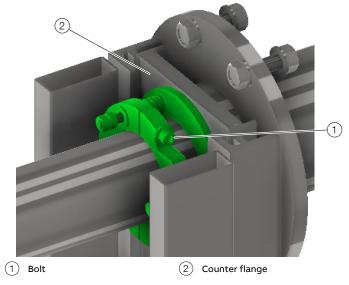
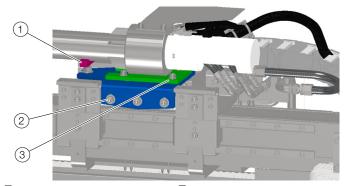


Figure 56: Adjusting the probe flange

- 5. Adjusting the vertical position:
 - Release the support bolt (1) (red) supporting the probe to allow for adjustments
 - Release the 3 adjustment bolts on each side of the retractor buggy base (2) (blue) for height and angle adjustments.
 - Adjust vertical position so that sealing flange is aligned with counter flange.
 - When done tighten the bolts min 90 Nm.
 - Adjust support bolt ① enough so it provides support for the probe.

Adjusting the horizontal position:

- Release the support bolt 1 (red) supporting the probe to allow for adjustments
- Release the 2 adjustment bolts on each side of the Probe Mounting plate (3) (green) for angle adjustments.
- Adjust horizontal position so that sealing flange is aligned with counter flange
- When done tighten the bolts min 90 Nm.
- Adjust support bolt 1 enough so it provides support for the probe.



- 1) Support bolt
- (3) Mounting plate
- 2) Adjustment bolts

Figure 57: Adjusting the vertical and horizontal position of the probe

6. Turn the Safety switch -101S2 to ON, to allow normal operation of the probe.

Instructions: checking probe position and retractor movement How to check probe position:

- Operation/Service Mode -50S15 switch must be in the Service Mode
- 2. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

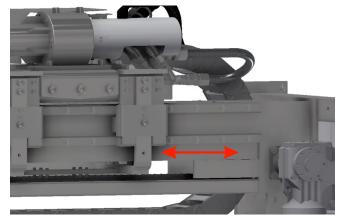
3. Retract gas sampling probe out of the kiln.

Path: Menu ▶ Probe Position ▶ GO SO



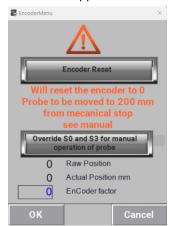
WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

4. With the probe in position S0, check the distance between the back roller wheel and retractor frame, as indicated by the red arrow in the illustration below, to be 200 mm.



If the distance is 200 mm, the system can be set into normal operation. If the distance is not 200 mm, proceed below to step 5.

5. Push the Encoder Menu button on the Probe Position setup page and the below menu appears:



6. Push the button Override S0 and S3 for manual operation of probe. Use the push-buttons Probe In ① and Probe Out ② on the retractor control cabinet to position the probe at the correct length of 200mm. Use a ruler to check the correct length.



- 7. When the probe is positioned at 200mm, push the Encoder Reset button on the Encoder Menu to provide a new raw value for the SO.
- 8. Finalize the reset by confirming the Encoder Reset by pushing the OK button
- 9. Push the Go S3 to insert the probe into the measuring position
- 10. Switch system to Auto mode on the HMI Path: Home ► Auto
- 11. Operation/Service Mode -50S15 must be switched to Operation Mode

Cooling module: Vent the cooling-water circuit

Make sure that there are no air pockets in the probe water cooling tubes, which could prevent sufficient cooling of the probe. Since the water flow given by the pump in the water-cooling system compared to the cross-section of the probe cooling jacket is so high, the water will itself vent out any air pockets outside the probe water cooling tubes, and into the water tank, which is not pressurized. Therefore, no cooling water circuit venting is required.

... Maintenance work

Cooling module: Checking cooling water

Safety measures

MARNING

Dangers when performing maintenance work.

Always take the following safety measures when performing this work:

- Wear a face mask against heat, heat-proof gloves, and protective welder's clothing.
- Operation/Service Mode -50S15 switch must be in the Service Mode (with a padlock).
- Additionally press the EMERGENCY STOP switch.
- Do not enter the danger area around the retractor until it is at standstill and the warning lamps and buzzer are off and the shutter is closed.
- Do not perform the work until the probe gas sampling system has cooled down.
- Lock the shutter before starting the work, unlock the shutter only after finishing the work.
- Always keep the floor around the probe gas sampling system clean and dry.

Explanation of safety measures: **Safety instructions for maintenance work** on page 98.

Cooling module: Checking cooling water

Maintenance interval

- Check cooling water flow rate on a weekly basis.
- Check the Glycol concentration in the water tank if a cold season is upcoming.
- Check the Glycol concentration during a cold season on a monthly basis
- · Check for lime deposits in tubes, tank, and cooler

Cooling-water requirements

The closed open-water circuit is automatically re-filled by a solenoid valve located at the inlet of the water tank. The water tank and tube system must be filled with potable water quality (do not use anti-corrosive). In ambient temperatures below +5°C, add approximately 30% of anti-freeze.

Anti-freeze requirements

If ambient temperatures below 5 °C can be expected, you must add anti-freeze. ABB recommends Glycol as anti-freeze. Anti-freeze with anti-corrosive additive is not permitted.

As an option, the system can include a heater in the water tank to prevent freezing. If a water heater is added glycol will not be required.

Instructions

- During operation, observe cooling waterflow rate and temperature on the controller, at the Trends submenu for cooling.
- Check that water level in tank corresponds with HMI water tank level indication
- 3. Regularly remove any lime or solid deposits at the bottom of the tank by releasing tank bottom valve for a short period to rinse it out.
- 4. In seasons with cold weather check, the Glycol concentration to be at approximately 30%
- 5. If water flow is low (see **Parameter input Alarm setpoint menu** on page 33), immediately remove probe from kiln and proceed to next steps.
- Operation/Service Mode -50S15 switch must be in the Service Mode
- 7. Switch system to manual mode on the HMI (if this has not already been done).

Path: Home ► Manual

8. Retract gas sampling probe out of the kiln.

Path: Menu ► Probe Position ► GO SO

WARNING! The probe moves out of the kiln. Do not stand in the area of travel of the probe or probe buggy until the probe has reached its end position.

9. When working on the retractor and gas sampling probe, additionally actuate the EMERGENCY-STOP -15S7 or -150S3 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 also be secured with a padlock. Additionally, secure that the flange shutter remains closed.



- 10. Stop the water pump on the Water-Cooling Pump ON/OFF switch on the side of the water system control panel and wait a few minutes until stabilization.
- 11. Check for lime deposits in tubes, water tank and cooler
- 12. If lime deposits limiting the flow rate are found, a lime removal must be made.
- 13. Remove all the water in the cooling system by releasing tank bottom valve. If it contains anti-freeze, preferably into a temporary storage tank for reuse afterwards. Rinse cooling system with potable water to remove any last anti-freeze. This is important to avoid any chemical reaction between an anti-freeze liquid and lime-removing liquid.
- 14. Fill approximately 50 litres of water in the water tank. Add lime removal liquid according to suppliers' specification. Do not use any strong acid solution instead of lime removal liquid.
- 15. Rinse the system by starting the water pump on the Water-Cooling Pump ON/OFF switch on the side of the water system control panel. Let flow run for a few minutes.
- 16. When completed, stop the pump and remove all the liquid by releasing the tank bottom valve and disposing of it according to suppliers' specification and local environmental regulations. Rinse the tank and tubes with potable water to remove any lime removal liquid leftovers.
- 17. Refill the water tank with potable water.
- 18. Unlock EMERGENCY STOP switch -15S7 or -15OS3 by turning the back ring in the direction of the arrow. No movement must be seen.



19. Push the blue button Emergency Reset -15SB/-15P12 to allow new operation of the probe retractor and air blaster probe blow-back.



- 20. 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.
- 21. Switch system to Auto mode on the HMI Path: Home ▶ Auto
- 22. Operation/Service Mode -50S15 switch must be switch back to Operation Mode

12 Decommissioning

Safety instructions

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

⚠ 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.

MARNING

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.

A 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 antifreeze 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.

Shutting down the system

Introduction

These instructions describe how to shut down the gas sampling probe. Note that the cooling water should only be drained if the system is shut down for prolonged periods of time or if it is subsequently disassembled. Otherwise, the cooling water can stay in the system.

Requirements

The following conditions must be met:

- The system is switched off at the main switch.
- Central compressed-air supply shut off, gate valve in pneumatic box closed (compressed-air tubes are vented by releasing a manual filter blow back with probe inserted, and gate valve closed).
- · Rotary kiln is shut down.
- · The system has cooled down

Instructions: Shutting down

Perform the following steps to shut down the system:

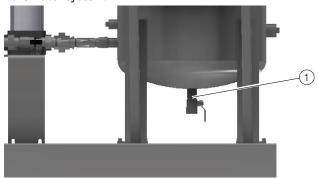
- 1. Secure the closed shutter on the duct flange with a padlock.
- Flush heated sample gas line and sample gas probe with dry, dust-free and oil-free instrument air (flow rate approximately 100 l/h) for approximately 15 minutes. This is to ensure that no condensing, harmful or corrosive gases remain accumulated inside the system.
- Unscrew heated sample gas line screw connection on the analyser cabinet and on the gas sampling probe (both ends of the heated line).
- 4. Clean any residue and incrustations off the probe tip filter and probe tube.

Note: Only clean mechanically. Do not use chemicals (particularly acids and lye) for cleaning.

Instructions: Draining cooling water

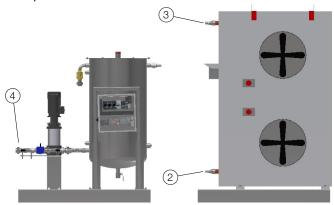
Proceed as follows to drain the cooling water:

1. Open the valve ① at the bottom of the water tank to drain the water system.



Note: If anti-freeze (Glycol) had been mixed, observe disposal regulations in accordance with national legislation.

- 2. Remove hoses between water panel and cooler panel ②③. Apply low pressure compressed-air (1 bar) to the heat exchanger top to force out water from the heat exchanger until no more water comes out.
- 3. Disconnect tube/hose connection for water forward connection at the water panel 4. Apply low pressure (1 bar) compressed-air to the water forward connection to force the water out of the tube going forth and back to the probe and the probe itself until no more water comes out.



13 Dismounting and disposal

Safety instructions

Take into consideration the following safety instructions for all actions related to dismounting and disposal:

⚠ 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.

MARNING

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.

A 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

A 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 antifreeze 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.

A 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.

Disassembling the system

Requirements

The following conditions must be met to disassemble the system:

- System must have been properly shut down (see Shutting down the system on page 124.
- Cooling water must be drained (see Shutting down the system on page 124.
- Probe retractor powered off and unpressurized (by trained personnel).

Instructions

How to disassemble the probe gas sampling system:

- Clean the whole system roughly with compressed-air and/or brush
- 2. Label all connection lines to prevent confusion.
- 3. Detach connection lines.
- 4. Unscrew fastening screws on cooling module and control cabinet and transport modules away. Perform the same steps for the compressed-air tank (if present).
- 5. Suspend probe retractor at its attachment points using suitable lifting gear.
 - **Note:** Pay particular attention to suitable fastening points for the lifting equipment on the system. Observe relevant local regulations.
- 6. Unscrew and remove fastening screws on mounting flange and attachment points.
- 7. Using lifting gear, lower probe retractor until you can screw on the enclosed transport supports.
- 8. Place probe retractor on the temporary mounting legs that had been supplied originally with the system and secure it from falling over. If the original mounting legs are not available anymore, provide temporary support to avoid the retractor motor and valves to touch the ground (they are not designed to support the complete weight of the probe and retractor).

Further procedure

The following table shows further procedure:

If the system	follow the following instructions:
is to be stored for a	Storing the system on page 39
prolonged period of time	
is to be disposed of	Disposing of the system on page 127
is to be relocated	Transport on page 36
is to be unpacked and	Do not transport the probe retractor without
transported to another	transport supports.
place	• Use adequately load-bearing and rigid pallets.
	Use suitably sized transport crates for longer
	distance transports.
	Fasten sampling probe firmly on retractor if it
	is not being dismounted.
	Note: The retractor must not be transported by
	fork-lift truck without suitable additional
	transport packaging
is to be put back into operation	Commissioning on page 56

Disposing of the system

Requirements

The following conditions must be met:

 System was properly shut down and disassembled (see Shutting down the system on page 124, Disassembling the system on page 127).

Disposal rules

- Drain cooling water from the cooling module, as detailed in section **Disassembling the system** on page 127. **Note**: If anti-freeze (Glycol) had been mixed, observe disposal regulations in accordance with national legislation.
- Remove filter elements out of the gas sampling probe.
 Note: Contamination with filter dust can be expected. The safety and disposal regulations apply that also apply to handling and disposal of other filter dusts at the cement works.
- All other components of the probe gas sampling system must be disposed of in accordance with national legislation.

14 Specification

Note

The device data sheet is available in the ABB download area at www.abb.com/analytical.

Dimensions and weights

The following table lists the dimensions and weights of the main modules of the probe gas sampling system:

Unit	HxWxL (mm)	Weight (kg)
Control unit	1000x800x300	75
Probe	400x4500x400	100
Retractor unit	400x4500x400	700
Water panel	1200x800x700	250
Cooling unit	1200x1700x900	300

Sound emissions

The following sound emission may be expected when operating the probe gas sampling system:

Unit	Level
Control unit	approximately. 86 dB(A)
Probe air blaster	approximately. 92 dB(A)
Retractor unit	approximately. 89 dB(A)
Pump unit	approximately. 86 dB(A)
Cooling unit	approximately. 89 dB(A)

15 Additional documents

Note

All documentation, declarations of conformity, and certificates are available in ABB's download area.

www.abb.com/analytical

Trademarks

16 Appendix

Return form

Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.

Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:			
Company:			
Address:			
Contact person:	Telephone:	Telephone:	
Fax:	Email:		
Device details:			
Type:		Serial no.:	
Reason for the return/desc	ription of the defect:		
Was this device used in cor	njunction with substances which pose a threat or ri	sk to health?	
☐ Yes ☐ N			
	nination (please place an X next to the applicable ite	ms):	
☐ biological	corrosive / irritating	combustible (highly / extremely combustible)	
toxic	explosive	other toxic substances	
radioactive			
Which substances have com	ne into contact with the device?		
1.			
2.			
3.			
We hereby state that the de	vices/components shipped have been cleaned and	are free from any dangerous or poisonous substances.	
Town/city, date	Sign	ature and company stamp	

Notes

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ABB Measurement & Analytics

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

For more product information, visit:

www.abb.com/analytical

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