

## ACX

Analyzer Systems for Emission Monitoring, Cement Applications and Process Measurement

### Data Sheet

10/23-8.80 EN July 2009

- **Applications:**
  - Emission monitoring using performance-tested analyzers
  - Process control in cement rotary kilns and calciners
  - Process control in rotary kilns with wet process
  - CO monitoring and emission monitoring in cement plants
  - Coal bin and coal mill monitoring in cement plants
  - Process measurement of non-toxic and non-flammable gases
- **CSA approval for "General Purpose" use**
- **Continuous determination of the concentration of max. six sample components, e.g. CO, NO, SO<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub> and VOC**
- **Automatic calibration normally with air and integrated calibration cells, i.e. without use of test gas bottles**
- **Use of the AO2000 analyzer modules:**
  - Uras26 or Limas11 UV photometers
  - Magnos206 or Magnos27 oxygen analyzers or electrochemical oxygen sensor
  - MultiFID14 flame ionization detector
- **Complete analyzer system**
  - with gas sampling, sample conditioning and gas analyzer
  - incl. system control and self-monitoring
  - in sheet steel or glass-fiber cabinet or on mounting plate
  - for installation in non-hazardous area
- **Options:**
  - Dual Sampling for simultaneous measurement at two different sampling locations
  - Dual Switching for measurement at two sampling locations or for uninterrupted measurement at one sample location for CO monitoring



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### Note

The gas flow plans and arrangement drawings depicted in this data sheet are examples and generally show versions of the analyzer system which are equipped with all options. Normally, the delivered version of the analyzer system will differ from these illustrations. The complete set of system drawings is available on request.

### Applications

The analyzer systems of the ACX series are used for the continuous and quantitative detection of gas concentrations for emission measurement. They are equipped with analyzers which are qualified according to the approval criteria of EN 15267 for use in incinerators requiring authorization acc. to the Directives 2001/80/EC and 2000/76/EG. The requirements based on QAL1 according to EN 14181 and EN ISO 14956 are fulfilled. For further information on the analyzers please refer to the “Advance Optima AO2000 Series Continuous Gas Analyzers” data sheet.

Another range of application of the analyzer systems is the continuous detection of the gas concentration in cement plants during the primary combustion in rotary kilns and during the secondary combustion at the gas outlet of the calciner. In addition, the analyzer systems are suitable for CO monitoring and emission monitoring tasks in cement plants as well as for process gas monitoring in rotary kilns with wet process.

Moreover, the analyzer systems can also be used for general purpose process measurement tasks.

### System Variants

#### Emission Monitoring

- General emission measurement – Small measuring ranges

#### Cement Applications

- Kiln outlet or calciner outlet ( $T > 900\text{ }^{\circ}\text{C}$ )
- Calciner ( $T < 900\text{ }^{\circ}\text{C}$ )
- Wet kiln gas outlet ( $T < 300\text{ }^{\circ}\text{C}$ )
- Preheater/CO monitoring of ESP (system T90 time  $t_{90} < 10\text{ sec}$  or  $t_{90} = 20\text{--}30\text{ sec}$ )
- Coal bin, coal mill

#### Process Measurement

- General purpose process measurement

# Description

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## System Design

The analyzer modules of the AO2000 series used depend on the sample components, measuring ranges and application and enable the selective determination of the proportion by weight (in mg/m<sup>3</sup>) or the proportion by volume (in ppm or in % Vol.) of the sample components in the waste gas, flue gas or process gas.

The effects of ambient temperature, air pressure and associated gas components are compensated for by suitable measures.

The analyzer system is either installed on a mounting plate or in a cabinet of sheet steel or – for use in severe environmental conditions – of glass fiber reinforced plastic.

### Gas Sampling

- Probe tube types 40, 40W, 42 or probe 2
- Filter unit PFE2 or PFE3 with optional filter/probe back-purging facility
- Heated or unheated sample gas lines

The analyzer system is also available

- Prepared for integration of sampling probe, filter unit and sample gas line or
- Without sampling probe, filter unit and sample gas line.

### Sample Conditioning

- Sample gas feed unit SCC-F
- Sample gas cooler SCC-C
- Condensate drainage
- NO<sub>2</sub>/NO converter SCC-K

### Gas Analysis

AO2000 series analyzer modules, installed in a wall-mount housing:

- Uras26 infrared analyzer
- Limas11 UV process photometer
- Magnos206 oxygen analyzer
- Magnos27 oxygen analyzer
- Electrochemical oxygen sensor
- MultiFID14 flame ionization detector

### Display and Control

Display and control unit and electronics module in the door of the analyzer cabinet or of the separate electrical distribution

### Data Transmission

Modbus interface for transmission of measured values and status signals as well as analog input, digital input and digital output signals

## Calibration

With a few exceptions, no test gases are required for the regular calibration of the analyzer modules.

The analyzer modules **Uras26** and **Limas11 UV** are calibrated at the zero point using ambient air, which must be free of sample components. The air is drawn in by the integrated pump by switching over a solenoid valve and conducted through the sample gas cooler. It is thereby guaranteed that the same gas conditions (humidity) are present during the calibration and during the measurement. The solenoid valve is controlled by the electronics module.

Gas-filled calibration cells are inserted into the optical beam path for the end-point calibration of the analyzer modules. Cleaned ambient air with constant moisture content continues to flow through the sample cell during the calibration.

The calibration cells are tested using test gases from gas cylinders during the recommended annual functional test by the ABB after sales service. These test gases are fed in upstream of the cooler.

The calibration of the oxygen analyzer module **Magnos206** and the electrochemical **O<sub>2</sub> sensor** takes place as single-point calibration with the oxygen concentration of atmospheric air (20.9 % Vol.).

If the analyzer module **Magnos27** is used for oxygen measurement, a zero reference gas (N<sub>2</sub> gas cylinder with pressure reduction valve) is also required. The automatic calibration of this analyzer module is possible by means of a further solenoid valve.

The analyzer module **MultiFID14** for the VOC measurement is calibrated using conventional test gases.

## Options

- Transmission of measured values and status signals via Profibus-DP; as an additional option via Ethernet or via analog and digital outputs
- Remote operation and remote diagnosis as a result of the networkability (Ethernet) of the AO2000 series gas analyzer
- Maintenance on request through self-monitoring
- External signals of components such as dust, volume flow, absolute pressure and temperature can be integrated
- Back-purging: Automatic periodic cleaning of filter units and probe tubes with compressed air
- Dual sampling: Simultaneous measurement at two different sampling locations
- Dual switching: Alternating measurement at two sampling locations or uninterrupted measurement at one sampling location for preheater/CO monitoring of ESP
- Test gas infeed at the sampling probe for calibration according to EPA directives for emission monitoring applications
- Test gas infeed upstream the sample gas cooler
- Sampling system for coal bins and coal mills in the version for use in zone 21 and 22 hazardous areas (on inquiry)

# General Emission Monitoring – Small Measuring Ranges

## Sample Components and Measuring Ranges

|                  | Recommended Measuring Ranges                              | Analyzers                                 |
|------------------|-----------------------------------------------------------|-------------------------------------------|
| CO               | 0–125 mg/m <sup>3</sup><br>(max. 625 mg/m <sup>3</sup> )  | AO2000-Uras26                             |
| SO <sub>2</sub>  | 0–450 mg/m <sup>3</sup><br>(max. 2250 mg/m <sup>3</sup> ) |                                           |
| NO               | 0–196 mg/m <sup>3</sup><br>(max. 1000 mg/m <sup>3</sup> ) |                                           |
| NO <sub>x</sub>  | 0–300 mg/m <sup>3</sup><br>(max. 1500 mg/m <sup>3</sup> ) | with NO <sub>2</sub> /NO converter        |
| N <sub>2</sub> O | 0–100 mg/m <sup>3</sup><br>(max. 500 mg/m <sup>3</sup> )  |                                           |
| SO <sub>2</sub>  | 0–75 mg/m <sup>3</sup><br>(max. 375 mg/m <sup>3</sup> )   | AO2000-Limas11 UV                         |
| NO               | 0–33.5 mg/m <sup>3</sup><br>(max. 200 mg/m <sup>3</sup> ) |                                           |
| NO <sub>2</sub>  | 0–250 mg/m <sup>3</sup><br>(0–1000 mg/m <sup>3</sup> )    |                                           |
| O <sub>2</sub>   | 0–10/25 Vol.-%                                            | AO2000-Magnos206 or O <sub>2</sub> sensor |

Max. 6 sample components are possible.

## Gas Sampling

### Sample Gas Inlet Conditions

Sampling temperature max. 500 °C,  
Sampling pressure  $p_{abs} = 850\text{--}1100$  hPa (= 0.85–1.1 bar),  
Flow rate < 250 l/h  
The sample gas may not be flammable or potentially explosive.

### Sampling Probes

- Sampling temp. < 200 °C, low water or acid dew point:  
Probe tube type 42 (heated), lengths 1000/1500/2000 mm
- Sampling temp. > 200 °C:  
Probe tube type 40, W-Nr. 1.4571, lengths 500/1000/1500 mm

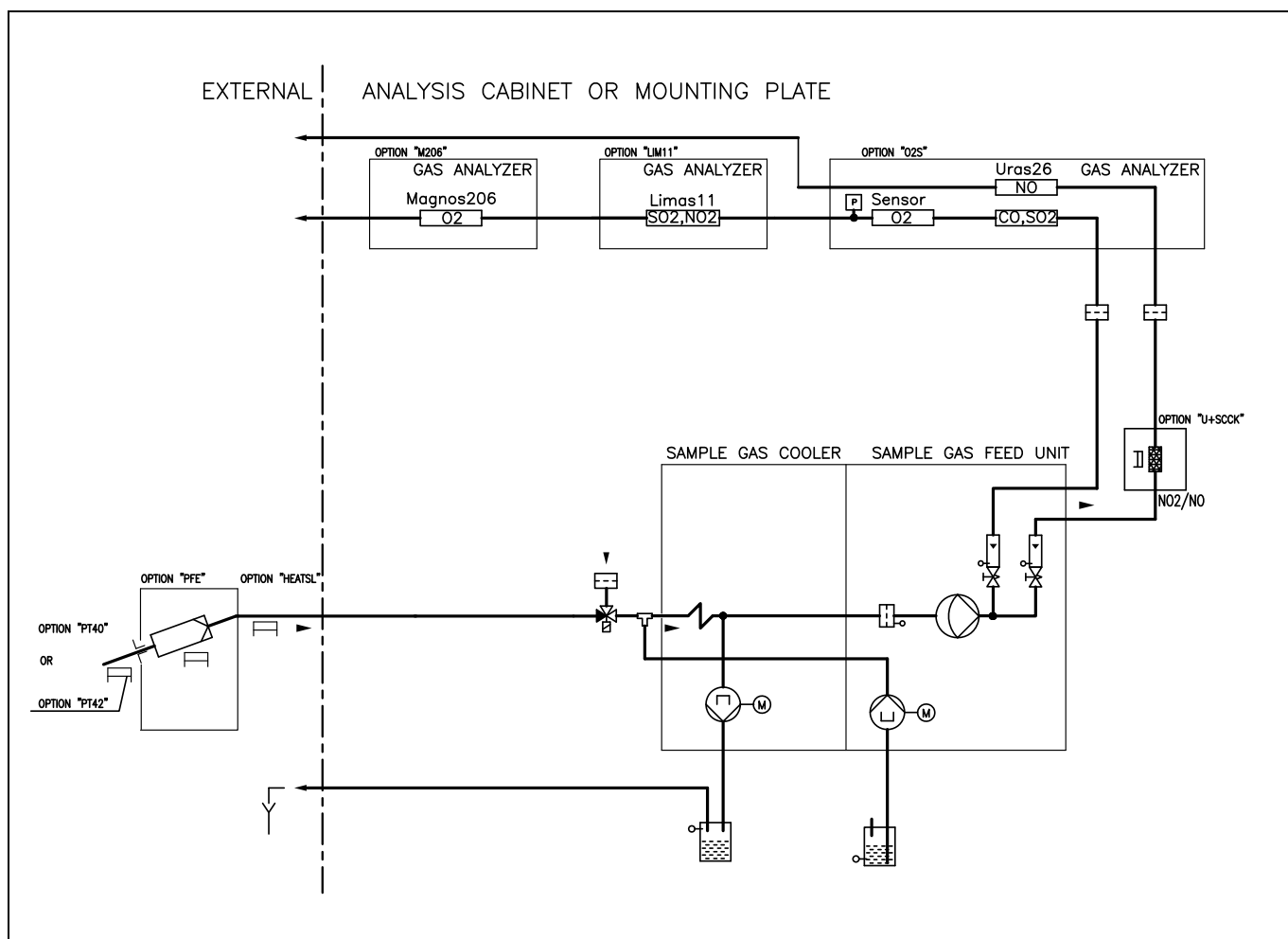
### Filter Unit

Filter unit type PFE2 or PFE3 with regulated heating

### Sample Gas Line

Heated sample gas line type TBL01-S with regulated heating,  
temperature 200 °C, heat output approx. 90 W/m,  
Power supply 3-phase single-phase  
230/400 VAC length max. 60 m length max. 35 m  
120/208 VAC length max. 40 m length max. 15 m

## Gas Flow Plan



# Cement Applications – Kiln Outlet or Calciner Outlet ( $T > 900\text{ }^{\circ}\text{C}$ )

## Sample Components and Measuring Ranges

|                 | Measuring Ranges                 | Analyzers                                |
|-----------------|----------------------------------|------------------------------------------|
| CO              | 0–0.5/3 Vol.-%                   | AO2000-Uras26                            |
| NO              | 0–2000/5000 ppm                  | with NO <sub>2</sub> /NO converter       |
| NO <sub>x</sub> | 0–2000/5000 ppm                  |                                          |
| CO <sub>2</sub> | 0–40 Vol.-%                      | AO2000-Limas11 UV with quartz cell       |
| CH <sub>4</sub> | 0–1000/5000 ppm                  |                                          |
| SO <sub>2</sub> | 0–5000/10000/<br>20000/40000 ppm | AO2000-Magnos27 or O <sub>2</sub> sensor |
| O <sub>2</sub>  | 0–10/25 Vol.-%                   |                                          |

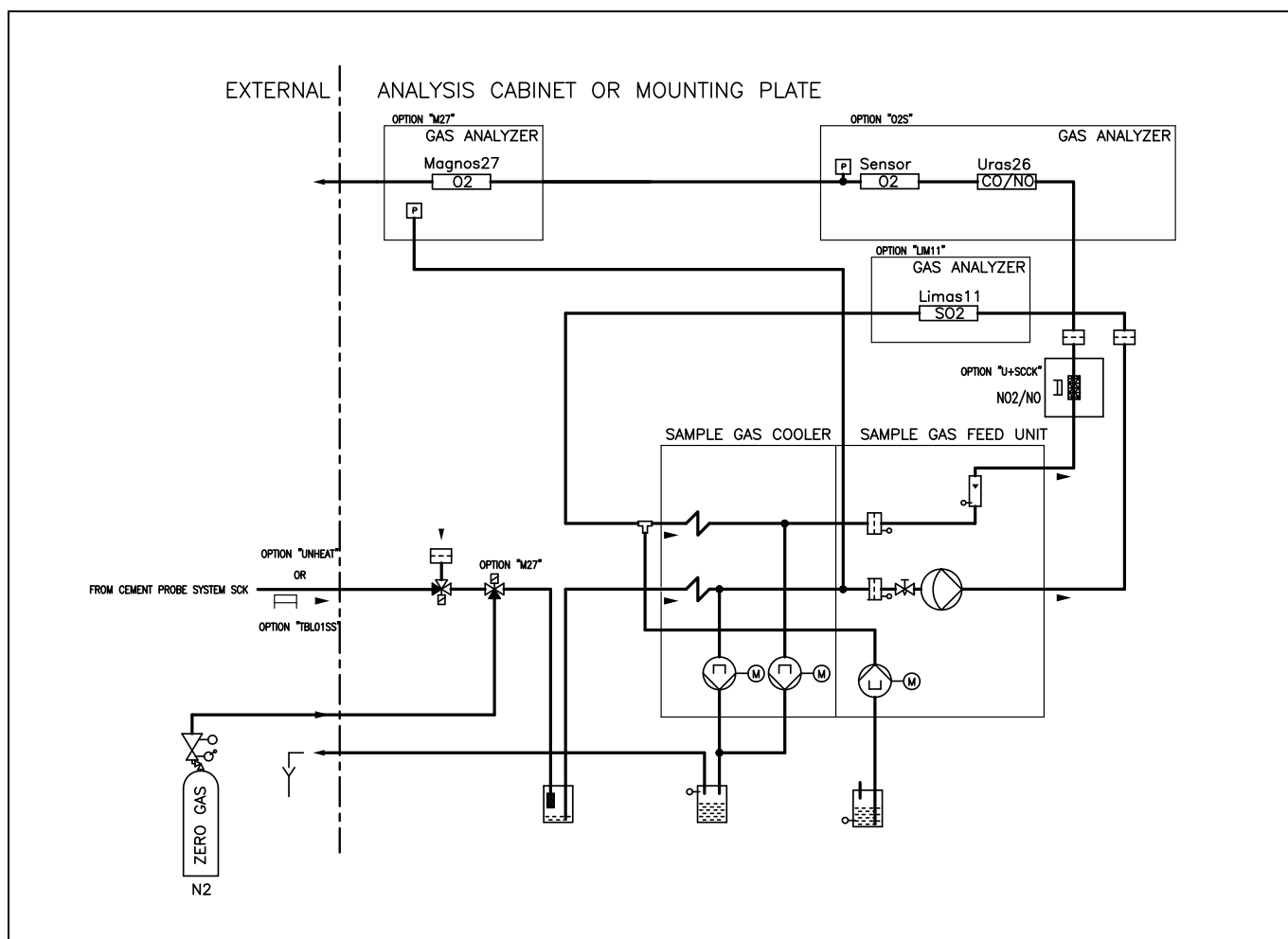
## Gas Sampling

ABB is offering the sampling system SCK for gas sampling at the kiln outlet or calciner outlet. Please refer to the SCK data sheet for information about sample gas inlet conditions and selection of the sampling probe (publication no. 10/23-8.81 EN).

### Sample Gas Line

- Ambient temperature  $> 0\text{ }^{\circ}\text{C}$  without sample components SO<sub>2</sub> and NO: Unheated sample gas line (PTFE), recommended length max. 20 m
- Ambient temperature  $> 0\text{ }^{\circ}\text{C}$  with sample components SO<sub>2</sub> and NO or ambient temperature  $< 0\text{ }^{\circ}\text{C}$ : Heated sample gas line type TBL01-S, self-regulating, temperature 100  $^{\circ}\text{C}$ , recommended length max. 20 m

## Gas Flow Plan



# Cement Applications – Calciner (T < 900 °C)

## Sample Components and Measuring Ranges

|                 | Measuring Ranges                 | Analyzers                                |
|-----------------|----------------------------------|------------------------------------------|
| CO              | 0–0.5/3 Vol.-%                   | AO2000-Uras26                            |
| NO              | 0–2000/5000 ppm                  |                                          |
| NOx             | 0–2000/5000 ppm                  | with NO <sub>2</sub> /NO converter       |
| CO <sub>2</sub> | 0–40 Vol.-%                      |                                          |
| CH <sub>4</sub> | 0–1000/5000 ppm                  |                                          |
| SO <sub>2</sub> | 0–5000/10000/<br>20000/40000 ppm | AO2000-Limas11 UV with quartz cell       |
| O <sub>2</sub>  | 0–10/25 Vol.-%                   | AO2000-Magnos27 or O <sub>2</sub> sensor |

## Gas Sampling

### Sample Gas Inlet Conditions

Sampling temperature max. 900 °C,  
Sampling pressure  $p_{abs} = 850\text{--}1100\text{ hPa}$  ( $\approx 0.85\text{--}1.1\text{ bar}$ ),  
Flow rate < 125 l/h  
The sample gas may not be flammable or potentially explosive.

### Sampling Probe

Probe tube type 40, material no. 1.4893, lengths 500/1000 mm

### Filter Unit

Filter unit type PFE3 with regulated heating

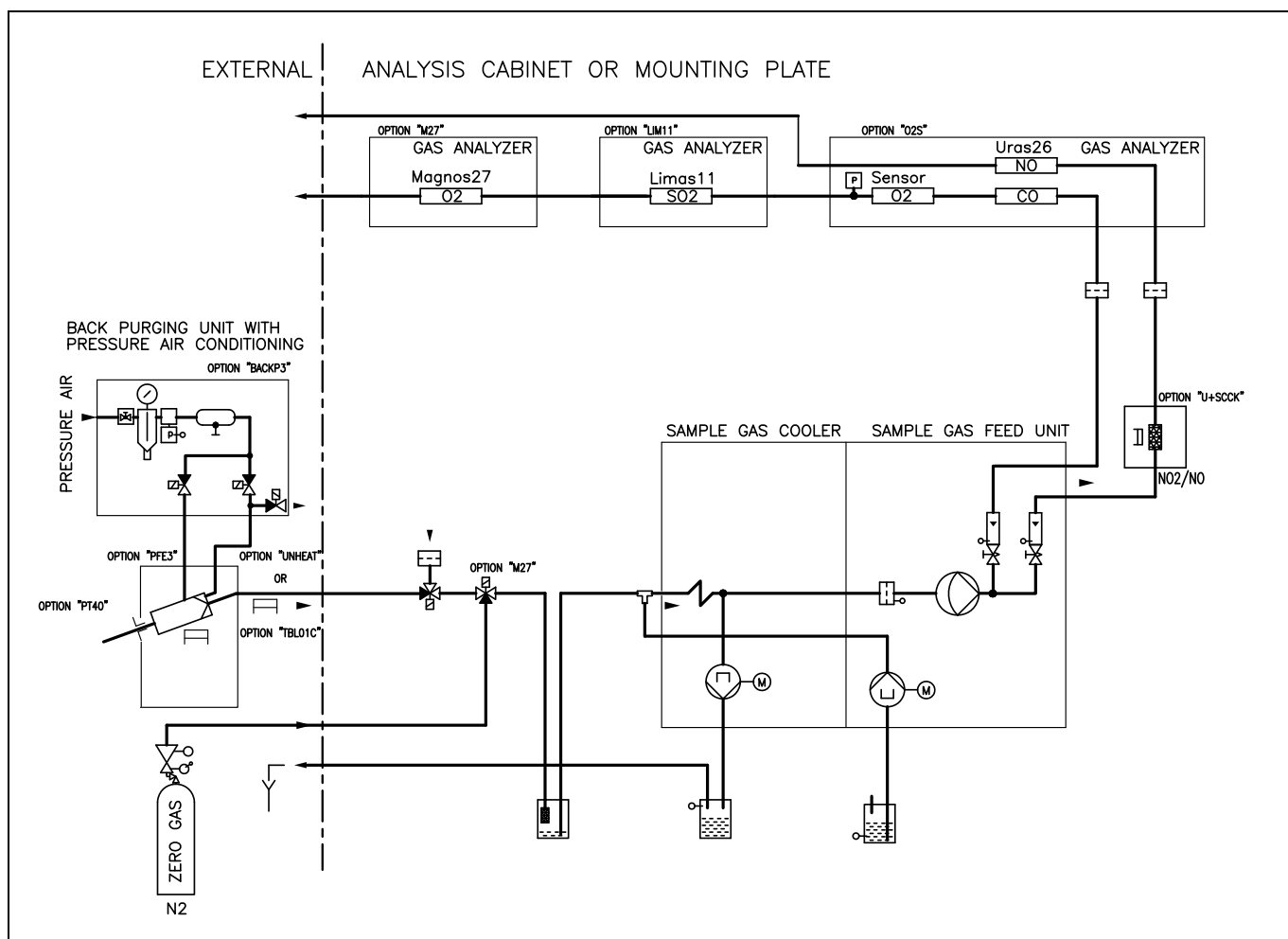
### Back-purging (two-stage)

Option with high visible emission concentration in the sample gas (> 3 g/m<sup>3</sup>)  
For information on compressed-air supply see page 15

### Sample Gas Line

- Ambient temperature > 0 °C without sample components SO<sub>2</sub> and NO: Unheated sample gas line (PTFE), recommended length max. 20 m
- Ambient temperature > 0 °C with sample components SO<sub>2</sub> and NO or ambient temperature < 0 °C: Heated sample gas line type TBL01-C, self-regulating, temperature 100 °C, recommended length max. 20 m

## Gas Flow Plan



# Cement Applications – Wet Kiln Gas Outlet ( $T < 300\text{ }^{\circ}\text{C}$ )

## Sample Components and Measuring Ranges

|                 | Measuring Ranges                 | Analyzers                                |
|-----------------|----------------------------------|------------------------------------------|
| CO              | 0–0.5/3 Vol.-%                   | AO2000-Uras26                            |
| SO <sub>2</sub> | 0–500 ppm                        |                                          |
| NO              | 0–2000/5000 ppm                  |                                          |
| CO <sub>2</sub> | 0–40 Vol.-%                      |                                          |
| SO <sub>2</sub> | 0–5000/10000/<br>20000/40000 ppm | AO2000-Limas11 UV with quartz cell       |
| O <sub>2</sub>  | 0–10/25 Vol.-%                   | AO2000-Magnos27 or O <sub>2</sub> sensor |

## Gas Sampling

### Sample Gas Inlet Conditions

Sampling temperature max.  $300\text{ }^{\circ}\text{C}$ ,  
Sampling pressure  $p_{\text{abs}} = 850\text{--}1100\text{ hPa}$  ( $= 0.85\text{--}1.1\text{ bar}$ ),  
Flow rate  $< 250\text{ l/h}$  without or  $60\text{ l/h}$  with SO<sub>2</sub> measurement  
The sample gas may not be flammable or potentially explosive.

### Sampling Probe

Probe tube type 40W, material no. 1.4571, with unregulated partial heating, lengths 3500/4000/4500 mm, Installation vertically in the smoke chamber

### Filter Unit

Filter unit type PFE3 with regulated heating

### Back-purging (two-stage)

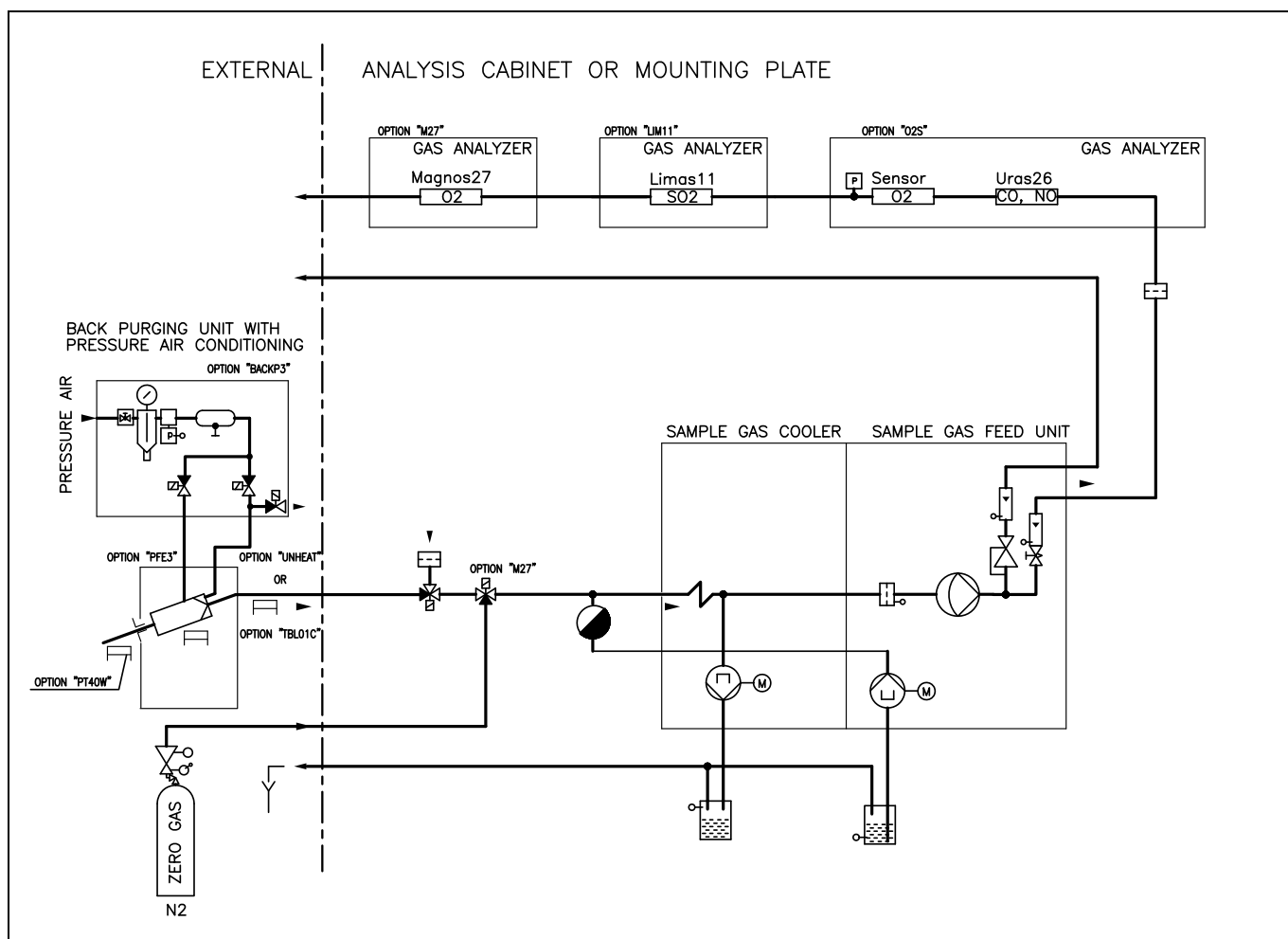
Option with high visible emission concentration in the sample gas ( $> 3\text{ g/m}^3$ )

For information on compressed-air supply see page 15

### Sample Gas Line

- Ambient temperature  $> 0\text{ }^{\circ}\text{C}$  without sample components SO<sub>2</sub> and NO: Unheated sample gas line (PTFE), recommended length max. 10 m
- Ambient temperature  $> 0\text{ }^{\circ}\text{C}$  with sample components SO<sub>2</sub> and NO or ambient temperature  $< 0\text{ }^{\circ}\text{C}$ : Heated sample gas line type TBL01-C, self-regulating, temperature  $100\text{ }^{\circ}\text{C}$ , recommended length max. 10 m

## Gas Flow Plan



# Cement Applications – Preheater/CO monitoring of ESP

## Sample Components and Measuring Ranges

|                 | Measuring Ranges | Analyzers                                |
|-----------------|------------------|------------------------------------------|
| CO              | 0–0.5/3 Vol.-%   | AO2000-Uras26                            |
| NO              | 0–2000 ppm       |                                          |
| SO <sub>2</sub> | 0–500 ppm        |                                          |
| O <sub>2</sub>  | 0–10/25 Vol.-%   | AO2000-Magnos27 or O <sub>2</sub> sensor |

## System Version “ACX Fast”

The system version “ACX Fast” is intended for fast measurement at preheater/CO monitoring of ESP. By use of the probe F and a max. 10 m long sample gas line as well as special versions of the sample gas cooler and the sample gas feed unit, a system T90 time of  $t_{90} \leq 10$  s can be achieved for the sample component CO. This system version is offered for other applications on request.

## Gas Sampling

### Sample Gas Inlet Conditions

Sampling temperature max. 450 °C,  
Sampling pressure  $p_{abs} = 850\text{--}1100$  hPa (= 0.85–1.1 bar),  
Flow rate < 250 l/h, < 300 l/h for ACX Fast  
The sample gas may not be flammable or potentially explosive.

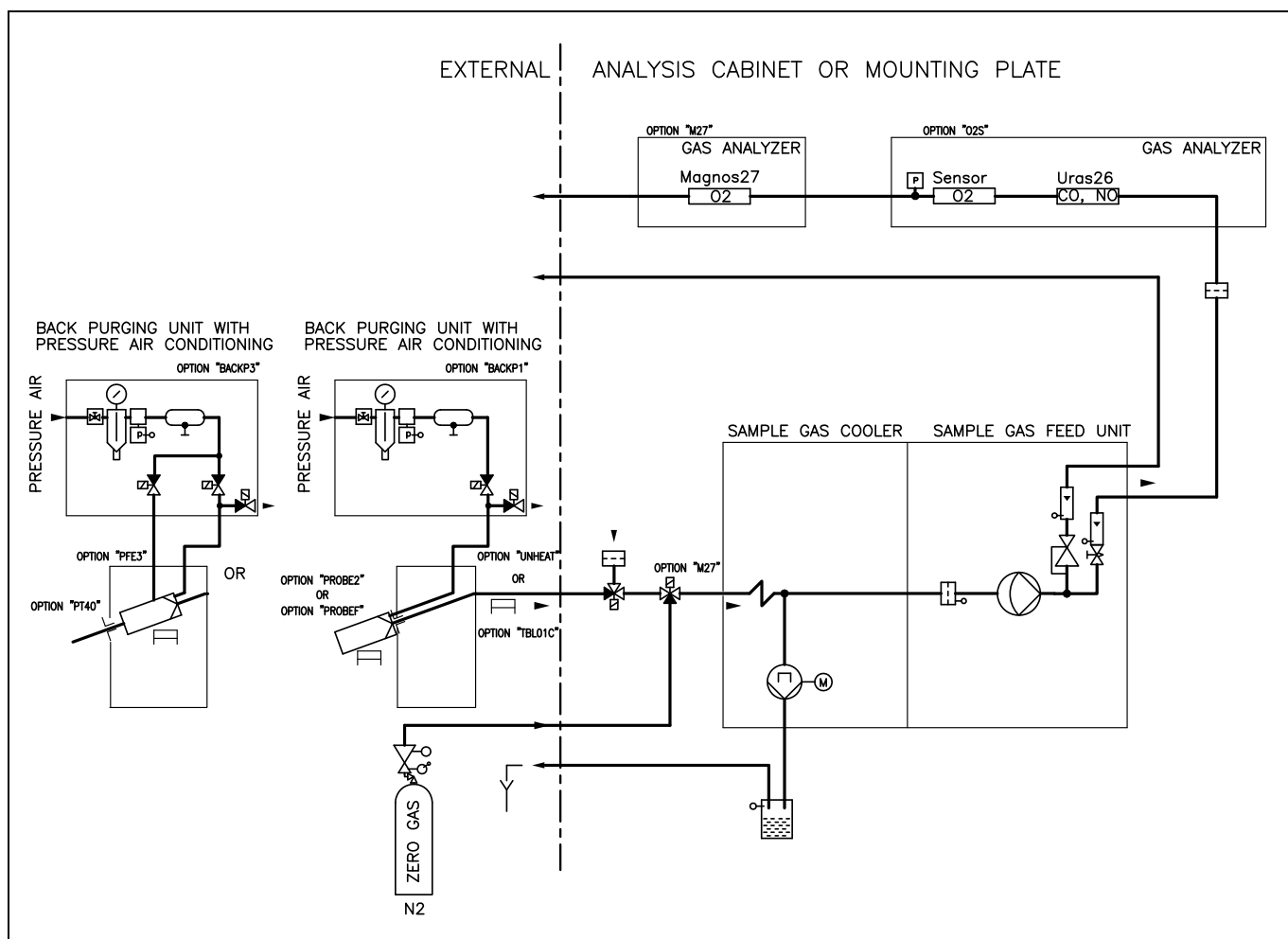
### Sampling Probe

Probe 2 or Probe F partially heated, length 1200 mm, without or with one-stage purging facility and compressed-air conditioning.  
Probe tube type 40, W-Nr. 1.4571, lengths 500/1000/1500 mm,  
filter unit type PFE3 with regulated heating, without or with two-stage purging facility.  
For information on compressed-air supply see page 15

### Sample Gas Line

- Ambient temperature > 0 °C without sample components SO<sub>2</sub> and NO: Unheated sample gas line (PTFE), length max. 10 m
- Ambient temperature > 0 °C with sample components SO<sub>2</sub> and NO or ambient temperature < 0 °C: Heated sample gas line type TBL01-C, self-regulating, temperature 120 °C, length max. 10 m

## Gas Flow Plan



# Cement Applications – Coal Bin, Coal Mill

## Sample Components and Measuring Ranges

|                | Measuring Ranges | Analyzers                                |
|----------------|------------------|------------------------------------------|
| CO             | 0–5000/10000 ppm | AO2000-Uras26                            |
| O <sub>2</sub> | 0–10/25 Vol.-%   | AO2000-Magnos27 or O <sub>2</sub> sensor |

## Gas Sampling

### Sample Gas Inlet Conditions

Sampling temperature max. 500 °C,  
Sampling pressure  $p_{abs} = 850\text{--}1100\text{ hPa}$  (= 0.85–1.1 bar),  
Flow rate < 250 l/h  
The sample gas may not be flammable or potentially explosive.

### Sampling Probe

Probe tube type 40, W-Nr. 1.4571, lengths 500/1000/1500 mm

### Filter Unit

Filter unit type PFE3 with regulated heating

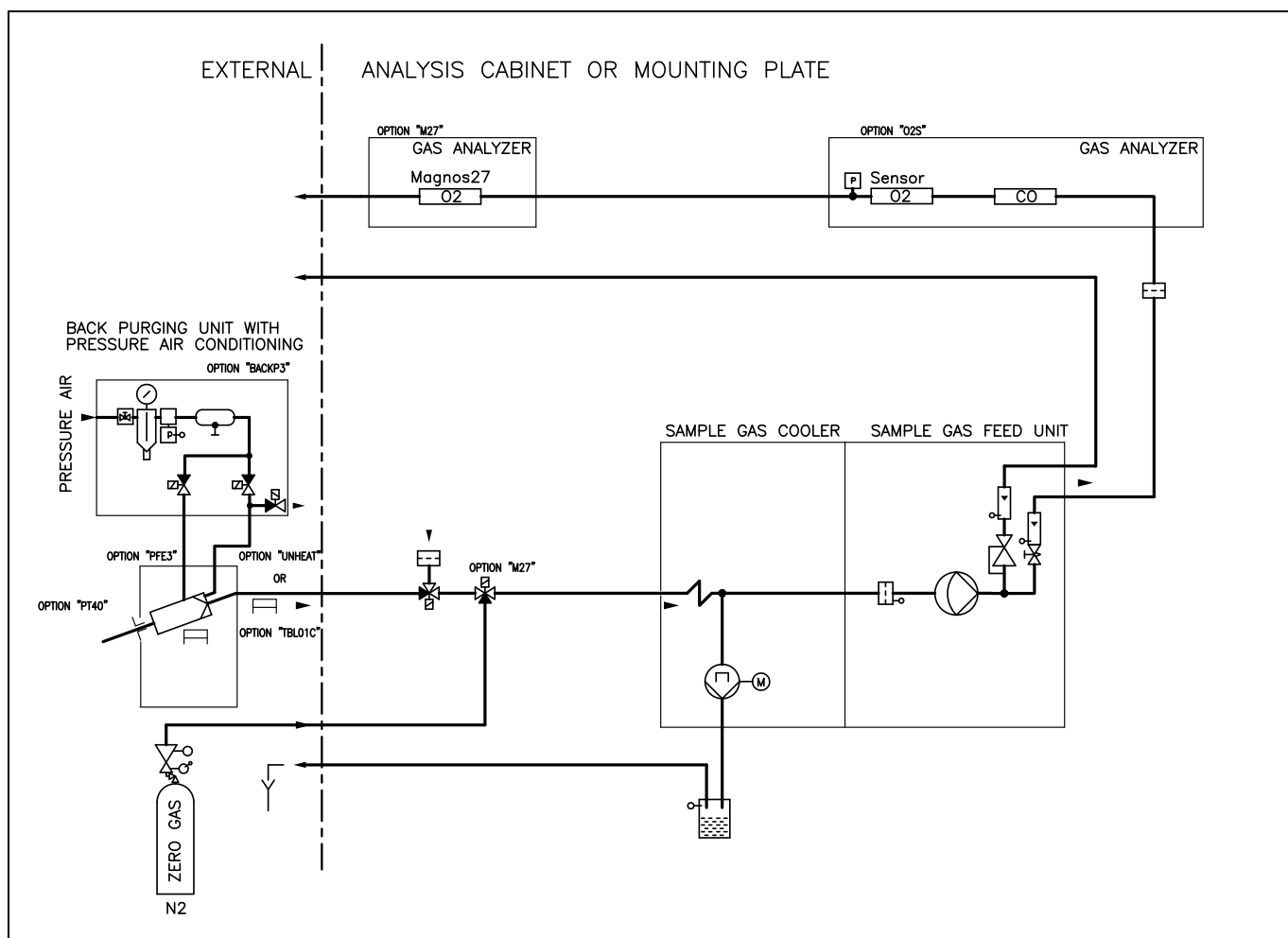
### Back-purging (two-stage)

With compressed-air conditioning; for information on compressed-air supply see page 15

### Sample Gas Line

- Ambient temperature > 0 °C: Unheated sample gas line (PTFE), recommended length max. 20 m
- Ambient temperature < 0 °C: Heated sample gas line type TBL01-C, self-regulating, temperature 100 °C, recommended length max. 20 m

## Gas Flow Plan



# General Purpose Process Measurement

## Analyzers and Sample Components

The following AO2000 series analyzer modules are used:

- Uras26 for the measurement of CO, SO<sub>2</sub>, NO, NO<sub>x</sub> (with NO<sub>2</sub>/NO converter), CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>;
- Limas11 UV for the measurement of SO<sub>2</sub>, NO<sub>2</sub>, NO;
- Magnos206, Magnos27 and oxygen sensor for the measurement of O<sub>2</sub>;
- Flame ionization detector MultiFID14 for the measurement of VOC.

The analyzer modules are built-in into a wall-mount housing.

Important note: The completed Measuring Point Data Sheet for the desired application is a pre-requisite for an offer/order to be examined and processed fully.

## Gas Sampling

Sample Gas Inlet Conditions

Sampling temperature max. 500 °C,

Sampling pressure  $p_{abs} = 850\text{--}1100$  hPa (= 0.85–1.1 bar),

Flow rate < 250 l/h

The sample gas may not be flammable or potentially explosive.

## Sampling Probes

- Sampling temp. < 200 °C, low water or acid dew point:  
Probe tube type 42 (heated), lengths 1000/1500/2000 mm
- Sampling temp. > 200 °C:  
Probe tube type 40, W-Nr. 1.4571, lengths 500/1000/1500 mm

## Filter Unit

Filter unit type PFE2 or PFE3 with unregulated or regulated heating

## Back-purging (two-stage)

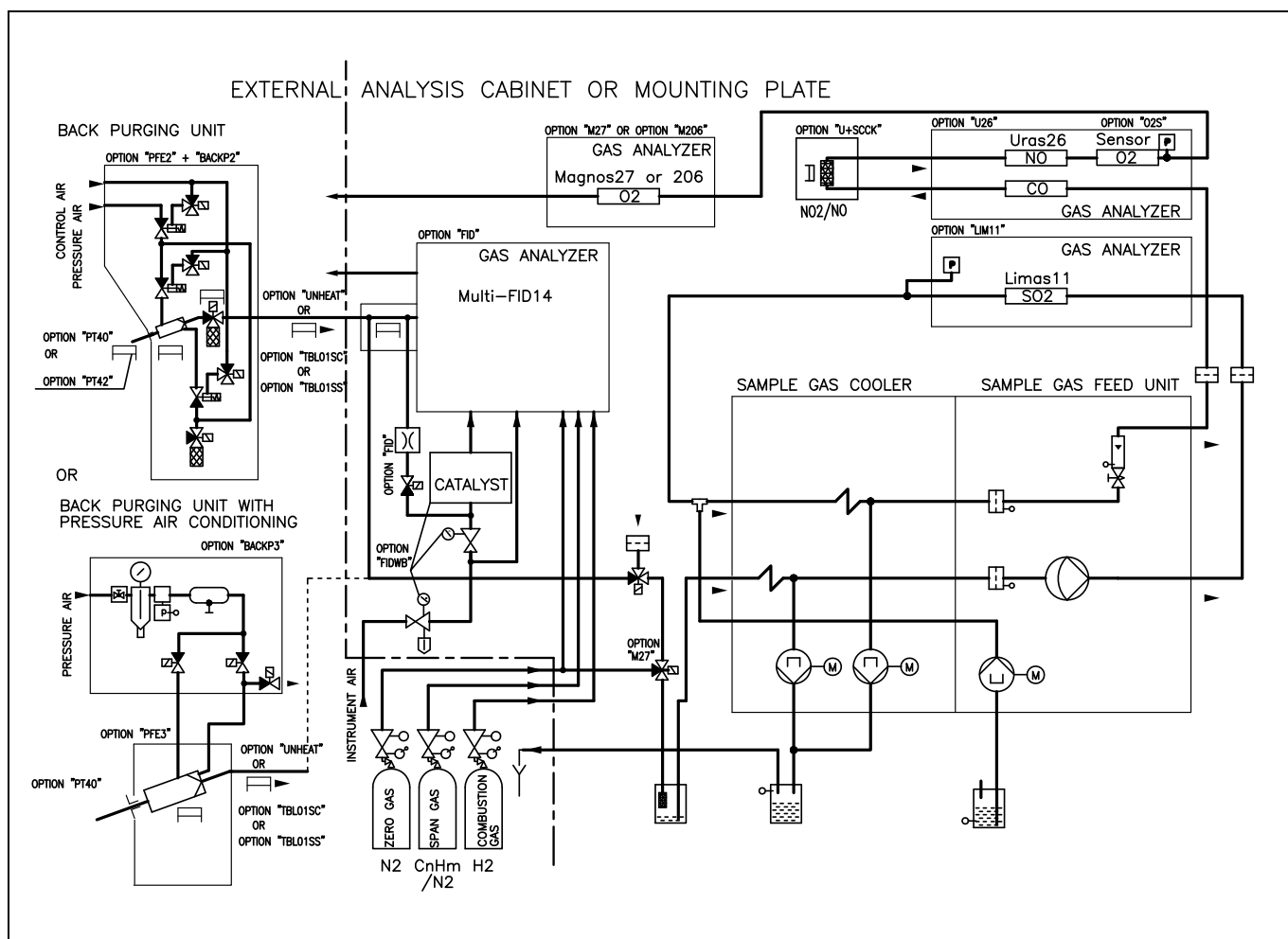
Option with high visible emission concentration in the sample gas (> 3 g/m<sup>3</sup>)

For information on compressed-air supply see page 15

## Sample Gas Line

- Heated sample gas line type TBL01-S with regulated heating, temperature 200 °C, heating power approx. 90 W/m, length dependent on the type of power supply:  
Power supply      3-phase      single-phase  
230/400 V AC      max. 60 m      max. 35 m  
115/200 V AC      max. 40 m      max. 15 m
- Heated sample gas line type TBL01-S with self-regulating heating, temperature 100 °C, heating power approx. 30 W/m, length max. 60 m
- Unheated sample gas line (PTFE), length max. 25 m

## Gas Flow Plan



# Test Gas Infeed at the Sampling Probe/Upstream of the Sample Gas Cooler

## Test Gas Infeed at the Sampling Probe

In the version for emission monitoring pursuant to the directives of the US American Environmental Protection Agency EPA, the analyzer system is calibrated or validated by feeding in the test gases at the sampling probe (option). The requisite solenoid valves are installed in the analyzer cabinet and on the mounting plate.

Automatic calibration or validation is either cyclically time-controlled or started manually on the display and operator control unit of the analyzer system. The cycle times are pre-set ex works; they can be customized to local requirements. The solenoid valves can also be individually activated on the display and operator control unit.

A maximum of three test gas cylinders can be connected. A constant test gas flow is ensured by means of a flow controller and a needle valve.

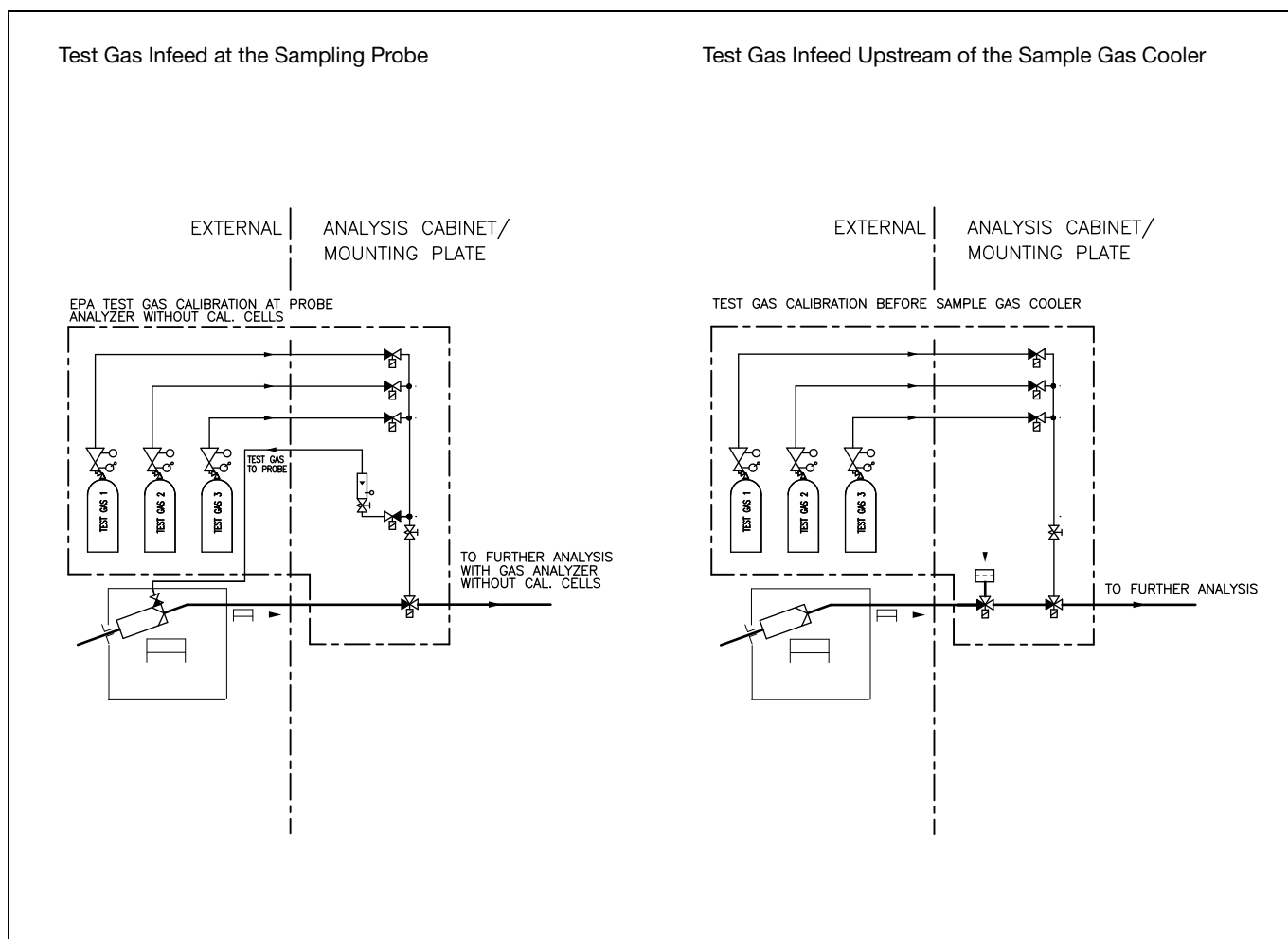
Calibration or validation for inspection purposes can also be performed without using test gas provided that all the analyzers in the analyzer system have been equipped with calibration cells or specified for single-point calibration.

## Test Gas Infeed Upstream of the Sample Gas Cooler

The option "Test gas infeed upstream of the sample gas cooler" can be used for emission monitoring if test gases and sample gas are required at the inlet of the analyzer system under identical conditions.

The prerequisite is that the analyzers have not been equipped with calibration cells and are not specified for single-point calibration.

## Gas Flow Plans



# Dual Sampling

## Description

Simultaneous measurement at two different sampling points is possible with the Dual Sampling option.

Two sample gas feed paths run in parallel from the gas sampling to the gas analysis. Two sampling probes with a filter unit and two sample gas lines are used. In the analyzer system, the modules for conditioning the sample gas and the gas analyzers are equipped with two separate gas feed paths in each case. Only the sample components CO and NO with or without O<sub>2</sub> can be measured in each case.

## Back-Purging

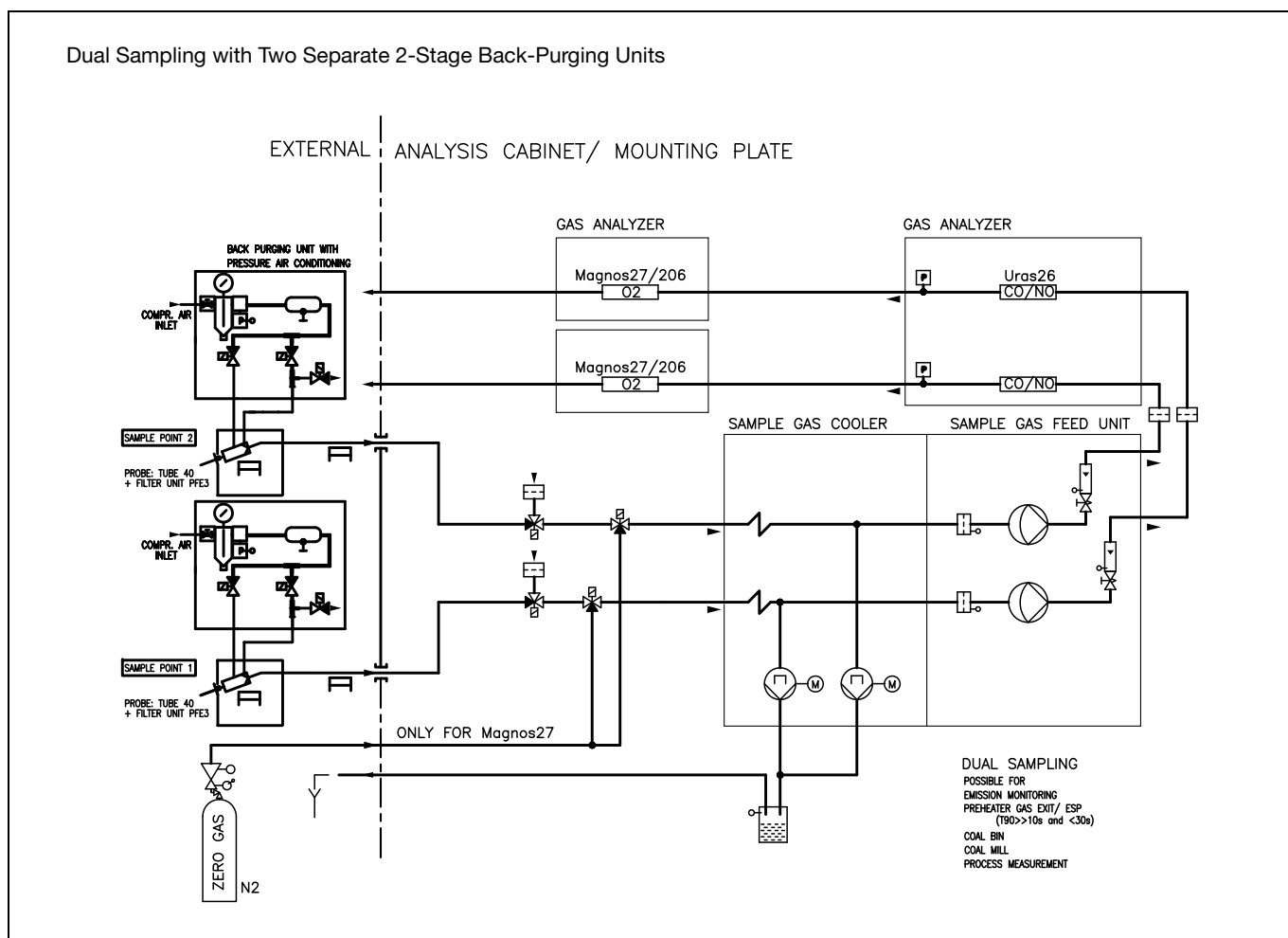
The automatic filter/probe back-purging (option) is normally executed with two separate back-purging units. If a shared back-purging unit is used for two sampling points, these may not be more than 6 m away from the installation site of the back-purging unit.

The back-purging is carried out simultaneously in both sampling systems. The measuring operation is interrupted during back-purging and calibration.

## System Variants

- Emission monitoring, general  
Test gas infeed at the sampling probe and upstream of the sample gas cooler not possible; not with filter unit PFE2 and probe tube type 42
- Preheater/CO monitoring of ESP ( $t_{90} = 20\text{--}30\text{ s}$ )  
Filter unit PFE3 and probe tube type 40 only with automatic two-stage back-purging
- Coal bin, coal mill
- Process measurements, general  
Not with analyzer module MultiFID14

## Gas Flow Plan



# Dual Switching

## Description

Alternating measurement at two sampling locations is possible with the Dual Switching option.

### Measurement at Two Different Sampling Points

Measurement is only performed at the sampling point connected to the gas analyzer. The inactive sample gas feed path is operated in the pre-sampling mode by means of a separate pump, so that the sample gas is immediately available at the gas analyzer after switchover. Probe cleaning by means of the periodic filter/probe back-purging (option) is only carried out in the inactive sample gas feed path. The measuring operation is interrupted during calibration.

### Measurement at the Same Sampling Point

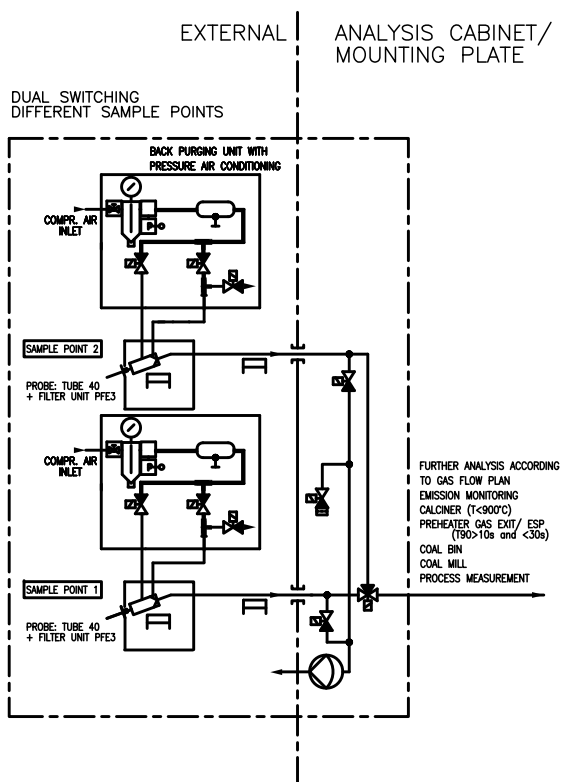
For the CO monitoring of electrostatic filters with a high visible emission load, a sampling location can be equipped with two sampling probes. Uninterrupted measurement is guaranteed by switching between the two probes, also if one of the probes is being cleaned by means of the periodic filter/probe back-purging (option). The measuring operation is only interrupted during calibration.

## System Variants

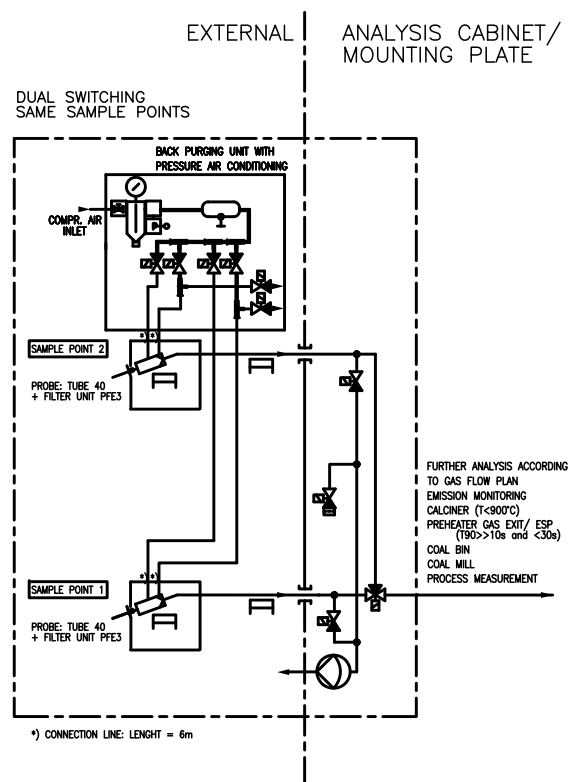
- Emission monitoring, general  
Test gas infeed at the sampling probe and upstream of the sample gas cooler not possible; not with filter unit PFE2 and probe tube type 42
- Calciner ( $T < 900\text{ }^{\circ}\text{C}$ )  
Only with automatic back-purging
- Preheater/CO monitoring of ESP ( $t_{90} = 20\text{--}30\text{ s}$ )  
Filter unit PFE3 and probe tube type 40 only with automatic two-stage back-purging
- Preheater/CO monitoring of ESP (ACX Fast,  $t_{90} < 10\text{ s}$ )  
Only for measurement at the same sampling point; only with automatic one-stage back-purging
- Coal bin, coal mill
- Process measurements, general  
Not with analyzer module MultiFID14

## Gas Flow Plans

Two Different Sampling Points  
Each with 2-Stage Back-Purging Unit



One Sampling Point  
with 2-Stage Back-Purging Unit



# General Data

---

## Analyzer System in the Cabinet

### Design

Cabinet of sheet steel or glass fiber reinforced plastic (GRP), front door (hinged on the left) with integrated display and operator control unit, GRP cabinet with protective window in front of display and operator control unit, mounting plate on the rear panel of the cabinet, electrical distribution cabinet (option) mounted on the left, cooling unit (option) mounted on the right

### Color

Light gray (RAL 7035)

### Degree of Protection

IP54 to EN 60529

### Dimensions (W x H x D)

See dimensional drawings on pages 16 and 18

Design of sheet steel: 800 x 2100 x 600 mm

Design of GRP: 840 x 2100 x 600 mm

Design of GRP with Uras26, Magnos206/Magnos27

and Limas11 UV: 900 x 2140 x 700 mm

with cooling unit: in each case W + 250 mm

with electrical distribution cabinet: in each case W + 300 mm

### Weight

Design of sheet steel: max. 430 kg

Design of GRP: max. 370 kg

## Analyzer System on Mounting Plate

### Design

Sheet steel, galvanized; electrical distribution in separate sheet steel cabinet with integrated display and operator control unit

### Degree of Protection

Mounting plate: IP20

Electrical distribution: IP54 to EN 60529

### Dimensions (W x H x D)

See dimensional drawings on pages 20 and 21

Mounting plate: 699 x 1896 x 350 mm

Electrical distribution cabinet: 580 x 1400 x 300 mm

Distance between mounting plate and electrical distribution cabinet: max. 100 mm

### Weight

Mounting plate: max. 170 kg

Electrical distribution cabinet: max. 65 kg

## Measuring and Status Signals

### Measuring Signals

1 output signal for each sample component

### Status Signals

Digital outputs for

- “Failure”
- “Maintenance request”
- “Maintenance mode” (maintenance/calibration)

The status signals are generated during the automatic self-monitoring, if applicable, coupled with a safety shut-down of the sample gas pump. Each status message is shown in the display in plain language, entered in the logbook and assigned to one of the three status signals.

## Interfaces

### Modbus (Standard)

Transmission of measured values and status signals as well as analog input, digital input and digital output signals to host systems, e.g. standard Windows applications via M-DDE server; Modbus slave protocol in the RTU (Remote Terminal Unit) mode via the RS485 interface

### Profibus (Option)

Integration of the analyzer system in Profibus networks for the transmission of measured values and status signals as well as analog input, digital input and digital output signals via the RS485 interface (not in conjunction with Modbus interface)

### Ethernet (Option)

Data transmission (via router) or remote operation, TCP/IP protocol

### Current Outputs, Digital Outputs and Inputs (Option)

Analog outputs: 0/4–20 mA, max. working resistance 400  $\Omega$

Digital outputs: Floating contacts, max. 250 V AC, 1.5 A, 500 VA

Digital inputs: Floating contacts, 24 VDC supply from the system

## Electrical Connections

### Connections

on terminal strip

Power supply: max. 10 mm<sup>2</sup>/AWG 6

Signal lines, power supply of the heated sampling modules: max. 2.5 mm<sup>2</sup>/AWG 10

## Gas Connections

### Gas Connection of Sample Gas Line

Screw connection for hose 4/6 x 1 mm, unheated;

Conduit for heated line  $\varnothing$  48 mm

### Gas Connections for Version with AO2000-MultiFID14

- Heated sample gas line: flange for heated sample gas inlet of the MultiFID14
- Combustion gas (hydrogen): bulkhead fitting for stainless steel tube 4/6 x 1 mm
- Instrument air: bulkhead fitting for stainless steel tube 4/6 x 1 mm or compressed-air hose
- Test gases, sample gas outlet, condensate venting: bulkhead fitting for hose 4/6 x 1 mm
- Waste gas outlet MultiFID14: bulkhead fitting for stainless steel tube, 12 mm

Gas supply requirements see page 15

## Sample Gas Filtering

### Filter Unit

Filter unit type PFE2 or PFE3 with regulated or unregulated heating in a stainless steel protective box, filter fineness 0.3  $\mu$ m, flange DN 65, PN 6, form B to DIN 2527, holes at 45°, 135°, 225°, 315°

# General Data

## Sample Gas Feed-In and Conditioning

### Sample Gas Cooler

Type SCC-C with glass heat exchanger, automatic condensate drainage and monitoring, safety shutdown of the sample gas pump in the case of condensate breakthrough; condensate collecting bottle with level monitoring

### Sample Gas Feed Unit

Type SCC-F with diaphragm pump, condensate monitor and flow monitor with needle valve

## Electrical Safety

The regulations of European directive 73/23/EC for low voltage are complied with.

## Electromagnetic Compatibility

The regulations of European directive 89/336/EC for EMC are complied with.

## CSA Approval

The analysis system in the 120/208 VAC version is certified for use in general purpose environment, evidenced by full compliance with standards CAN/CSA-C22.2 No. 61010-1-04 and No. 61010-2-010-04 and UL Std. No. 61010-1 (2<sup>nd</sup> Edition).

## Power Supply

### Operating Voltage

230/400 VAC or 120/208 VAC,  $\pm 10\%$ , 48–62 Hz

### Power Consumption

|                                               |        |
|-----------------------------------------------|--------|
| Basic version                                 | 1000 W |
| Cooling unit                                  | 940 W  |
| Analyzer module MultiFID14                    | 285 W  |
| NO <sub>2</sub> /NO converter SCC-K           | 350 W  |
| Heated sampling filter PFE2, PFE3             | 250 W  |
| Probe 2, partially heated                     | 225 W  |
| Heated probe tube type 42                     | 800 W  |
| Heated sample gas line TBL01 regulated 180 °C | 90 W/m |
| self regulating 100 °C                        | 35 W/m |
| self regulating 30 °C                         | 15 W/m |

Prepared for Uninterruptible Power Supply (UPS)  
400 W

## Compressed-Air Supply for Filter/Probe Back-Purging

### Automatic One-Stage or Two-Stage Back-Purging Facility

Requirements of the compressed-air supply: dry (dew point < 3 °C), oil and dust-free; max. 6 bar for back-purging; required air flow rate approx. 100 Nm<sup>3</sup>/h  
See dimensional drawing on page 22

### Compressed-Air Conditioning

(Option, not for AO2000-MultiFID14)

Sheet-steel protective cabinet with shut-off valve, pressure reduction valve 6 bar, solenoid valves for back-purging, pressure regulator and 5 l compressed-air tank for effective pressure pulses also with lower air flow rate

## Supply Gases for AO2000-MultiFID14

### Instrument Air

Quality in accordance with ISO 8573-1 Class 2 (particle size max. 1  $\mu\text{m}$ , number density max. 1 mg/m<sup>3</sup>, oil content max. 0.1 mg/m<sup>3</sup>, pressure dew point at least 10 °C below the lowest expected ambient temperature),  
Inlet pressure  $p_e = 4000 \pm 500$  hPa,  
Typical flow approx. 1500 l/h (1200 l/h for integrated air jet injector and approx. 300 l/h for case purging), maximum approx. 2300 l/h (1800 l/h + 500 l/h)

### Burner Air

Synthetic air or catalytically cleaned air with an org. C content of < 1% of the span  
Inlet pressure  $p_e = 1200 \pm 100$  hPa, flow < 40 l/h

### Burner Gas

Hydrogen (H<sub>2</sub>), Quality 5.0  
Inlet pressure  $p_e = 1200 \pm 100$  hPa, flow  $\leq 3$  l/h  
A flow limiter must be provided at the hydrogen supply.

### Zero Reference Gas

Depending on the application, nitrogen (N<sub>2</sub>), Quality 5.0, or synthetic air or catalytically cleaned air  
Inlet pressure  $p_e = 1000 \pm 100$  hPa, flow 130–250 l/h

### Span Gas

Depending on the application, sample component or substitute gas component in N<sub>2</sub> or air  
Inlet pressure  $p_e = 1000 \pm 100$  hPa, flow 130–250 l/h

## Installation Site

### Ambient Temperature

|                                               |               |
|-----------------------------------------------|---------------|
| in operation:                                 |               |
| Mounting plate                                | +5 to +35 °C  |
| Sheet steel version with fan                  | +5 to +35 °C  |
| with cooling unit                             | +5 to +50 °C  |
| Glass-fiber version with fan                  | -20 to +35 °C |
| with fan and cooling unit                     | -20 to +50 °C |
| for storage and transport:                    | +2 to +60 °C  |
| after drying parts in contact with condensate | -25 to +60 °C |

### Relative Humidity

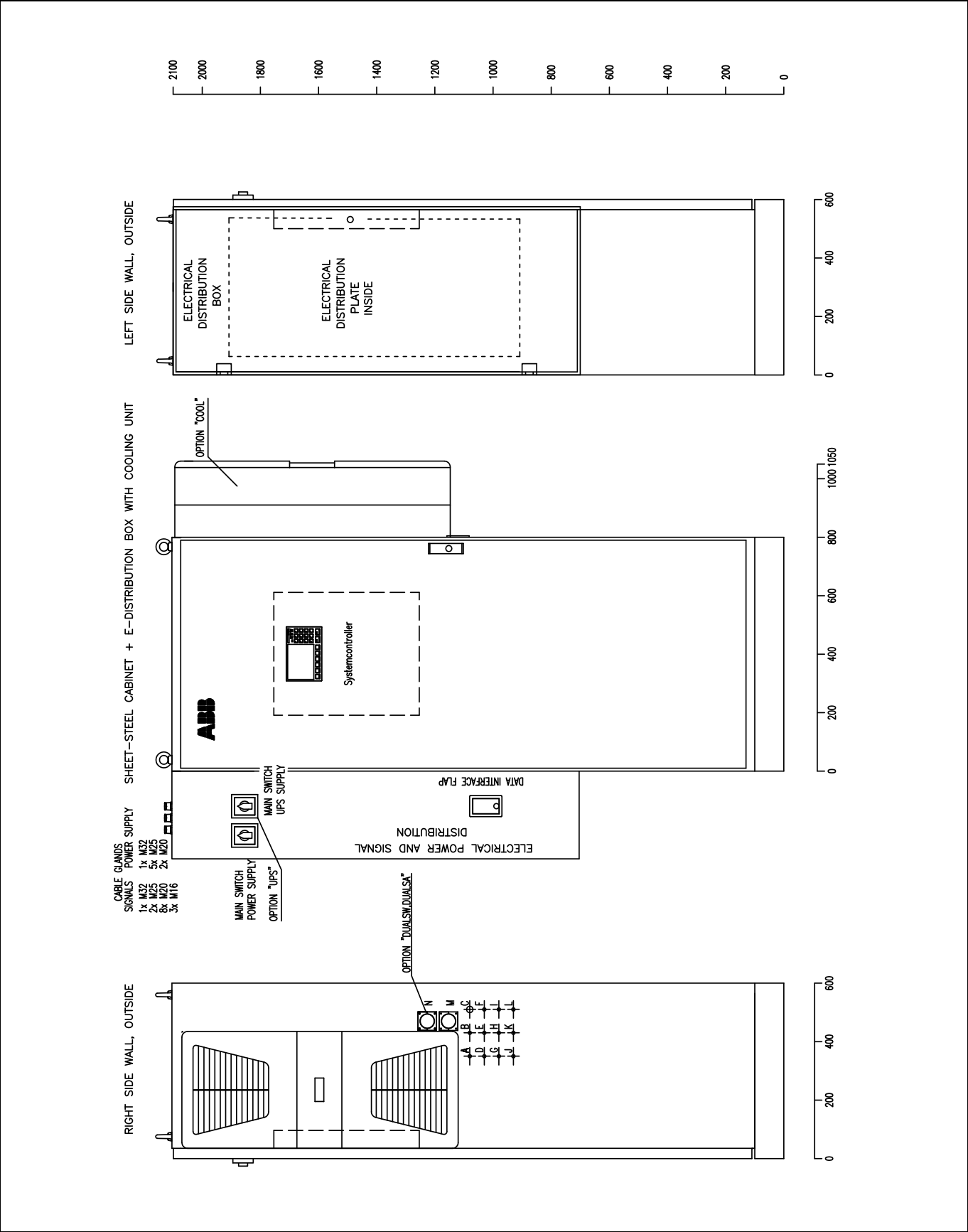
$\leq 75\%$  annual average, for a short time up to 95 %, infrequent and slight condensation possible

### Installation Location

The analyzer system must be installed at a vibration-free location and be protected from heavy dust contamination, direct thermal radiation and a corrosive atmosphere. See the dimensional drawings for minimum distance on the right and left.

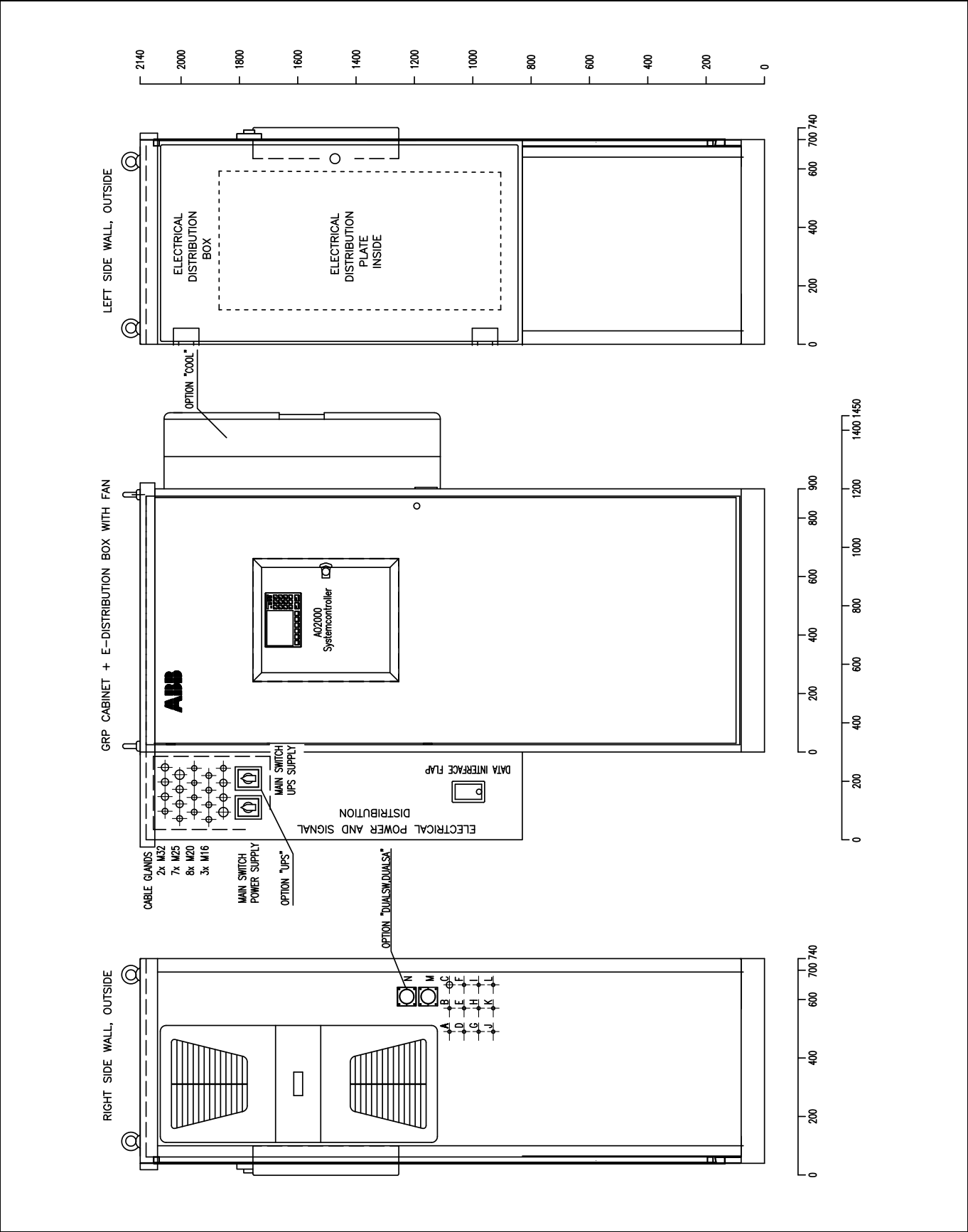
The sheet steel version and the mounting plate are only suitable for installation indoors; an air-conditioned room is recommended. The glass-fiber version is suitable for installation outdoors (not for version with CSA approval) and indoors; a weather protection roof must be provided.  
Installation location altitude max. 2000 m above sea level

Sheet Steel Cabinet: Exterior View

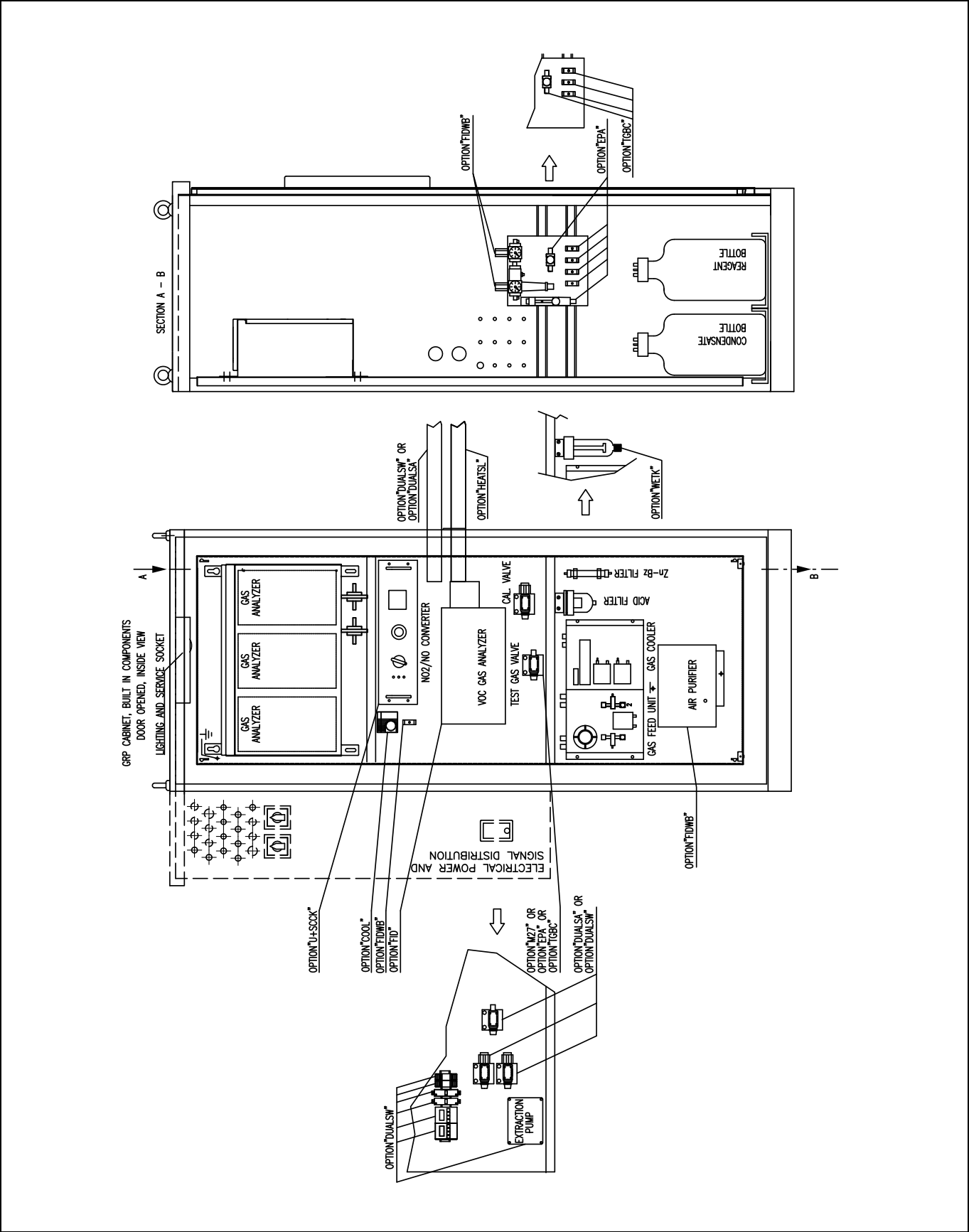


[illegible]

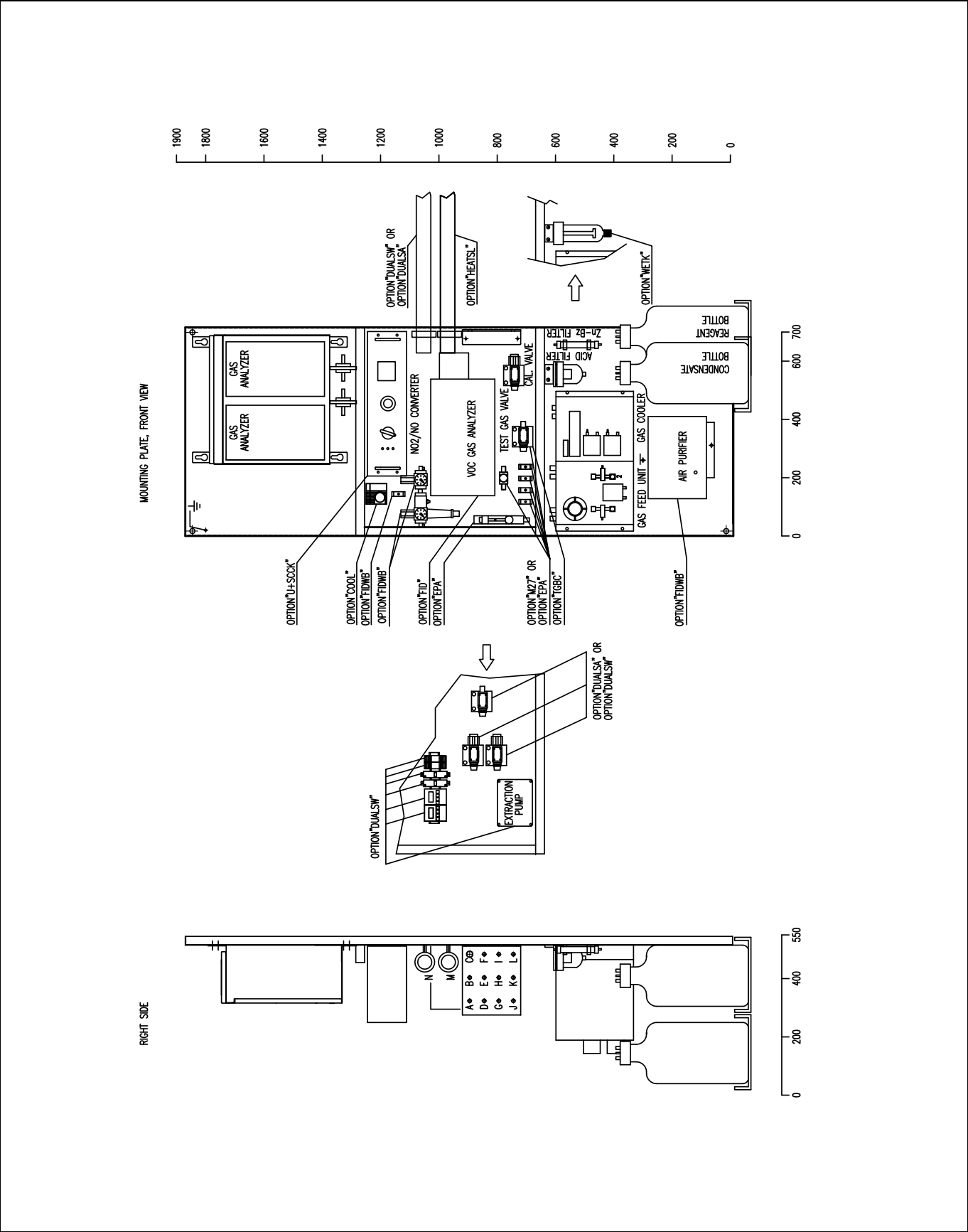
# GRP Cabinet: Exterior View



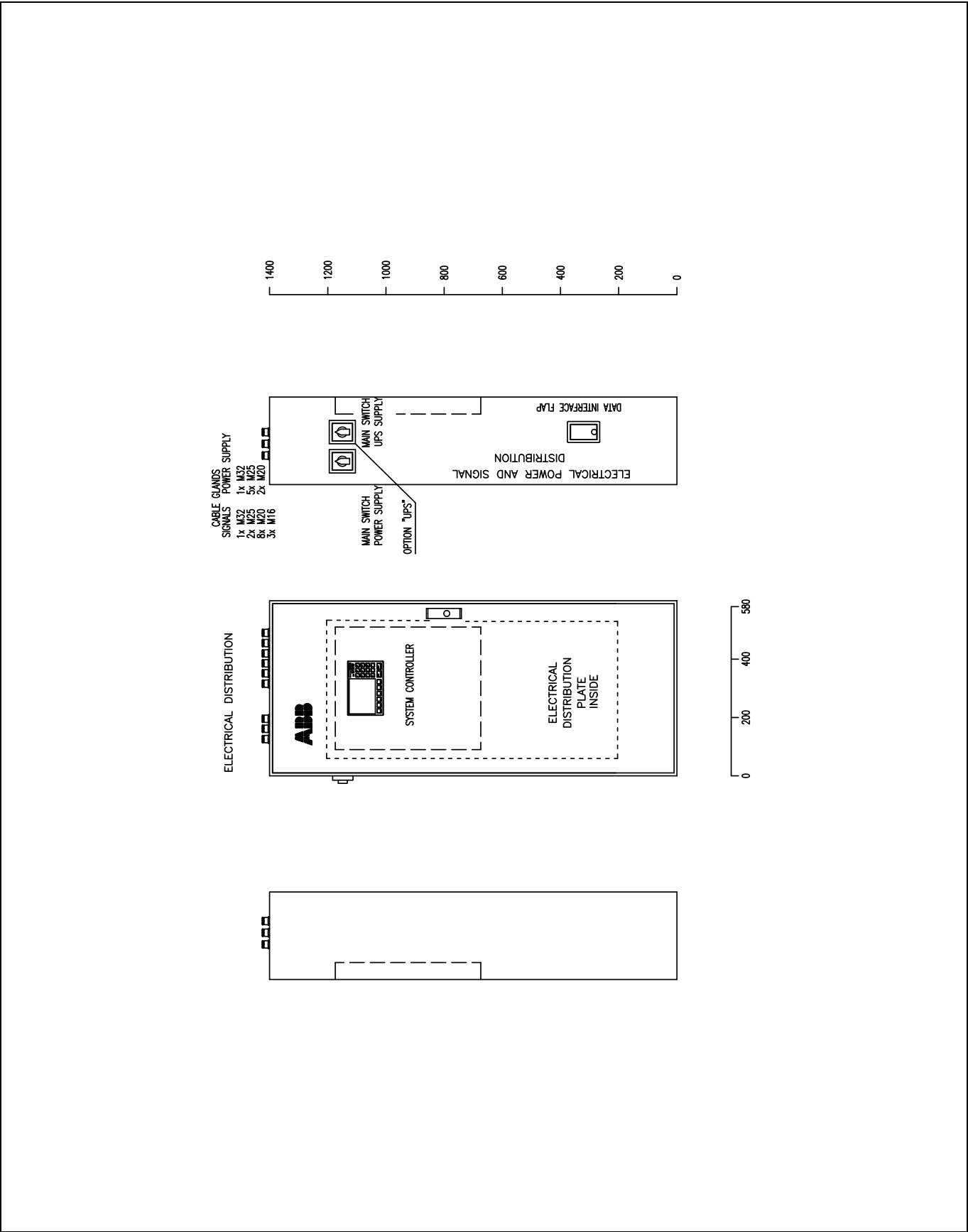
# GRP Cabinet: Interior View



Mounting Plate: View

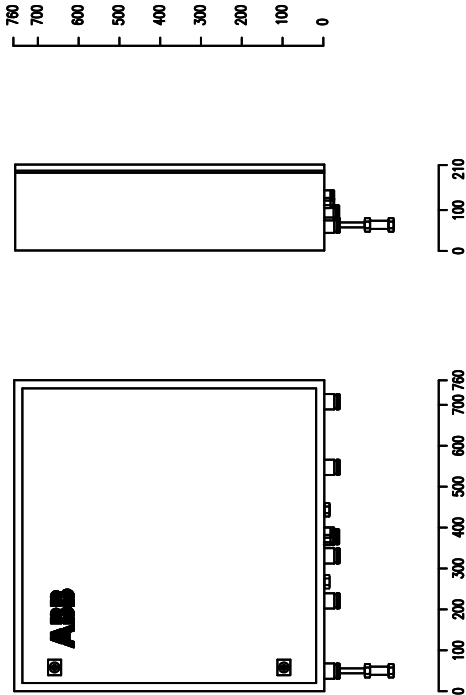


# Electrical Distribution Cabinet: Exterior View

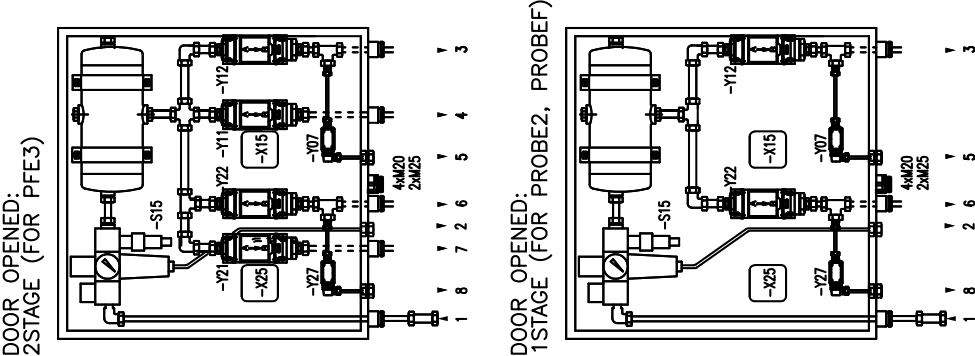


Back-Purging Unit: Exterior and Interior View

BACK PURGE UNIT FOR 2 SAMPLE POINTS



SHEET STEEL CABINET, RAL 7035, IP54



- OPTION "CSA"  
"CSA" - Vers.  
DN 3/4"  
DN 1/4"
- CE - Vers.  
DN 18mm  
DN 6mm  
DN 18mm\*)  
DN 18mm\*)  
DN 6mm  
DN 18mm\*)  
DN 18mm\*)  
DN 6mm  
DN 1/4"
- 1 = COMPRESSED AIR INLET  
2 = CONDENSATE OUTLET  
3 = PURGING AIR OUTLET PROBE FILTER PROBE 1  
4 = PURGING AIR OUTLET PROBE FILTER PROBE 2  
5 = PURGING AIR OUTLET PROBE FILTER PROBE 1  
6 = PURGING AIR OUTLET PROBE FILTER PROBE 2  
7 = PURGING AIR OUTLET PROBE FILTER PROBE 1  
8 = PURGING AIR OUTLET PROBE FILTER PROBE 2
- STEEL  
PVDF  
STEEL  
STEEL  
STEEL  
PVDF  
STEEL  
STEEL  
PVDF
- OPTION "CSA"  
"CSA" - Vers.  
DN 3/4"  
DN 1/4"
- CE - Vers.  
DN 18mm  
DN 6mm  
DN 18mm\*)  
DN 18mm\*)  
DN 6mm  
DN 18mm\*)  
DN 18mm\*)  
DN 6mm  
DN 1/4"
- 1 = COMPRESSED AIR INLET  
2 = CONDENSATE OUTLET  
3 = PURGING AIR OUTLET PROBE FILTER PROBE 1  
4 = PURGING AIR OUTLET PROBE FILTER PROBE 2  
5 = PURGING AIR OUTLET PROBE FILTER PROBE 1  
6 = PURGING AIR OUTLET PROBE FILTER PROBE 2  
7 = PURGING AIR OUTLET PROBE FILTER PROBE 1  
8 = PURGING AIR OUTLET PROBE FILTER PROBE 2
- STEEL  
PVDF  
STEEL  
STEEL  
STEEL  
PVDF  
STEEL  
STEEL  
PVDF
- S15 = SETTING: 3.8bar LOWER SWITCHING POINT
- \*) USE DELIVERED STEEL COATED PTFE HOSES WITH 18mm SS CONNECTOR (LENGTH 6m)



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**ABB Automation GmbH**

Analytical  
Stierstaedter Strasse 5  
60488 Frankfurt am Main  
Germany  
Phone: +49 69 7930-40  
Fax: +49 69 7930-4566  
E-Mail: [analytical-mkt.deapr@de.abb.com](mailto:analytical-mkt.deapr@de.abb.com)

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