

## ACX

Analyzer Systems for Emission Monitoring, Cement Applications and Process Measurement

### Data Sheet

10/23-8.80 EN May 2007

- **Applications:**
  - Emission monitoring using performance-tested analyzers
  - Process control in cement rotary kilns and calciners
  - Process control in rotary kilns with wet process
  - Safety relevant measurement and emission monitoring in cement plants
  - Coal bin and coal mill monitoring in cement plants
  - Process measurement of non-toxic and non-flammable gases
- **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 gases**
- **Use of the AO2000 analyzer modules:**
  - Uras26 infrared photometer
  - Limas11 UV process photometer
  - 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



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## Description

### 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 for use in facilities requiring authorization acc. to the Directives 2001/80/EC and 2000/76/EG. 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 safety-relevant measurement 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 °C)

Calciner (T < 900 °C)

Wet kiln gas outlet (T < 300 °C)

Electrostatic filter preheater – Safety-relevant measurement  
( $t_{90} < 10$  sec or  $t_{90} = 10-30$  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 flue gas, waste 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.

The analyzer system consists of the following functional groups and modules:

### 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 cooler SCC-C
- Sample gas feed unit SCC-F
- 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 O<sub>2</sub> 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

## 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 a 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 **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.

As an option for emission monitoring applications, calibration in line with the EPA directives can be carried with test gas infeed at the sampling probe.

For all other measurement tasks, the test gas is fed in upstream the sample gas cooler if applicable.

## Automatic Filter/Probe Back-purging

The filter units are available with the “back-purging” function. Compressed air is used to periodically clean the filter units including the probe tubes with the effect that the units can be used for several months without the need for manual cleaning.

## Options

Double measuring point switch-over

Output of measured values and status signals via Modbus (standard) or Profibus-DP (option); 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

# 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> ) |   |
| NOx              | 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, corrosive associated gases:

Probe tube type 42 (heated), lengths 1000/1500/2000 mm

– Sampling temp. > 200 °C, non-corrosive associated gases:

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

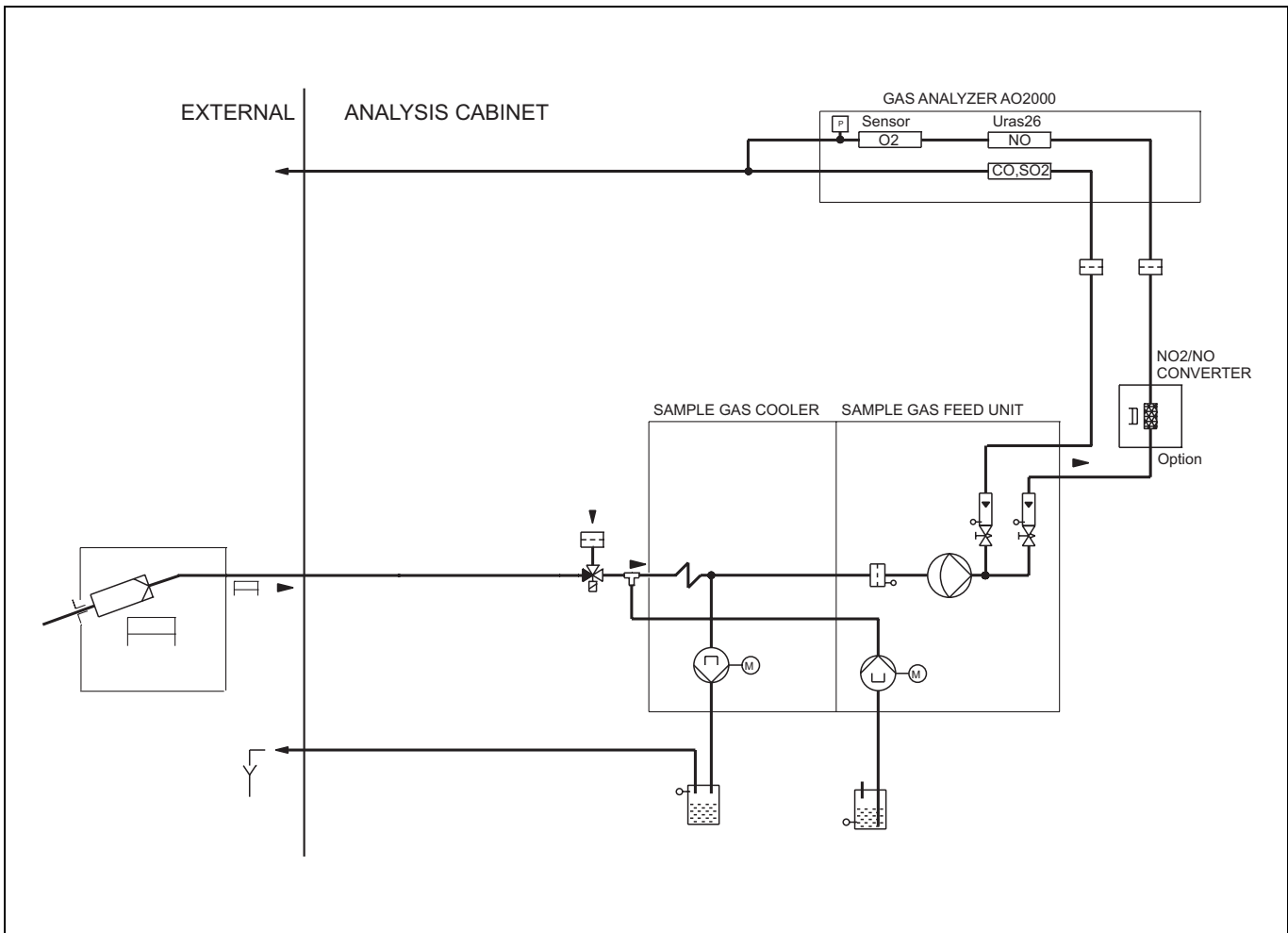
Heated sample gas line type TBL01-S with regulated heating, temperature 200 °C, heat output approx. 90 W/m,

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                  |  |
| NO <sub>x</sub> | 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

See separate data sheet

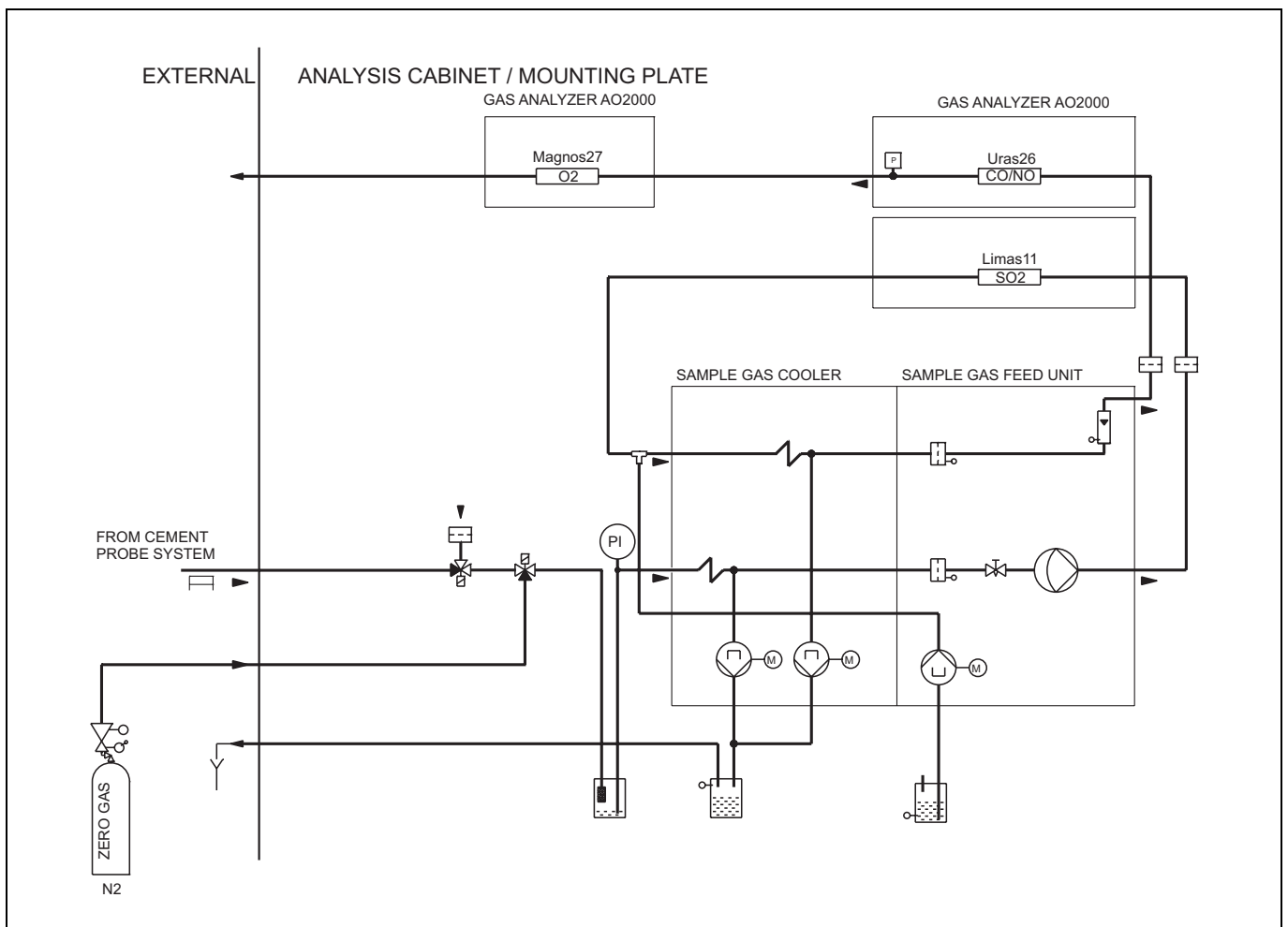
Sampling Probes

See separate data sheet

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-C, 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  $p_{abs} = 850\text{--}1100$  hPa (= 0.85–1.1 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

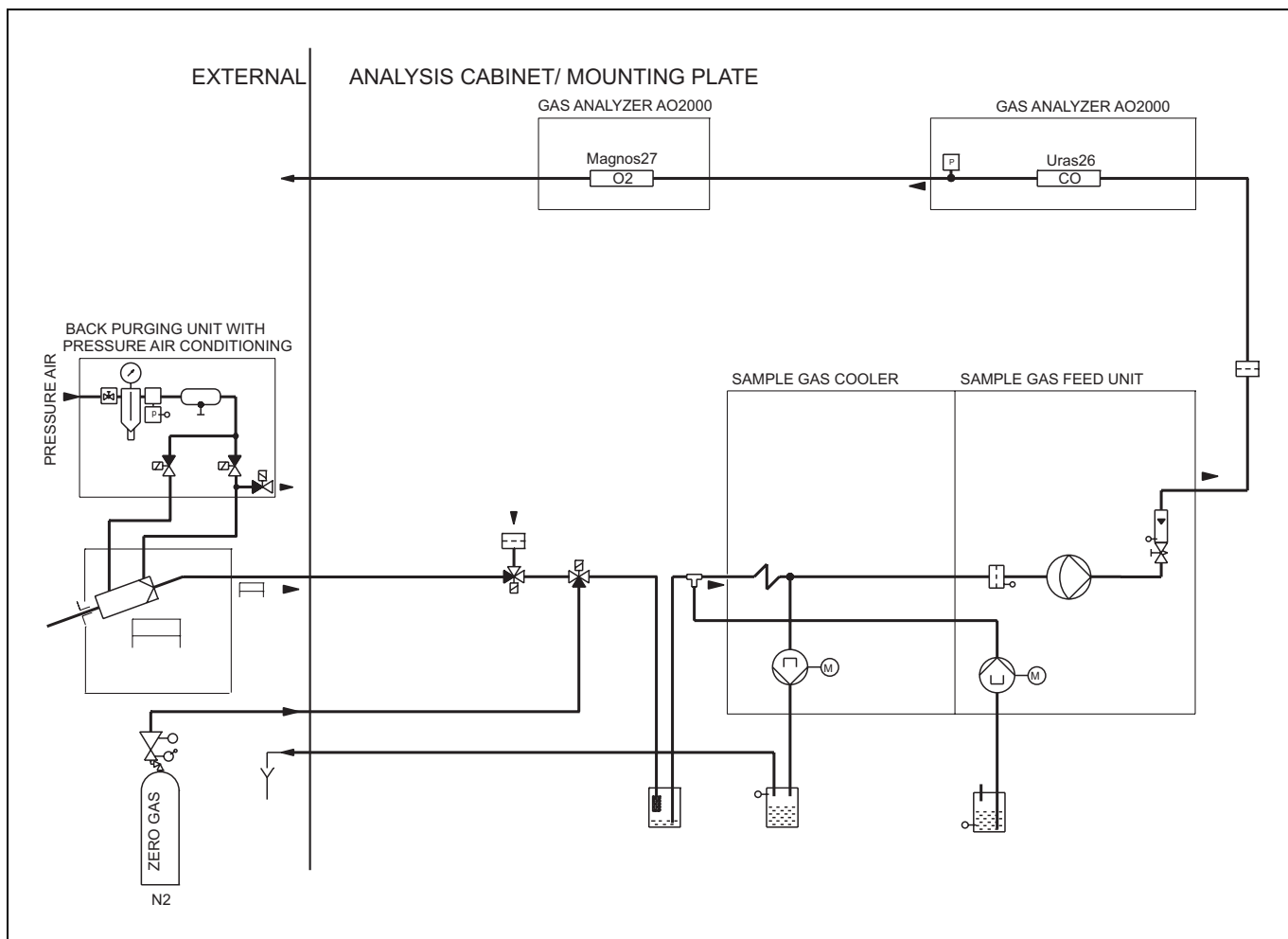
### Back-purging (two-stage)

Option with high visible emission concentration in the sample gas (> 3 g/m<sup>3</sup>)  
For information on compressed-air supply see page 12

### 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 °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 °C,  
 Sampling pressure  $p_{abs} = 850\text{--}1100$  hPa (= 0.85–1.1 bar),  
 Flow rate < 250 l/h without or 60 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)

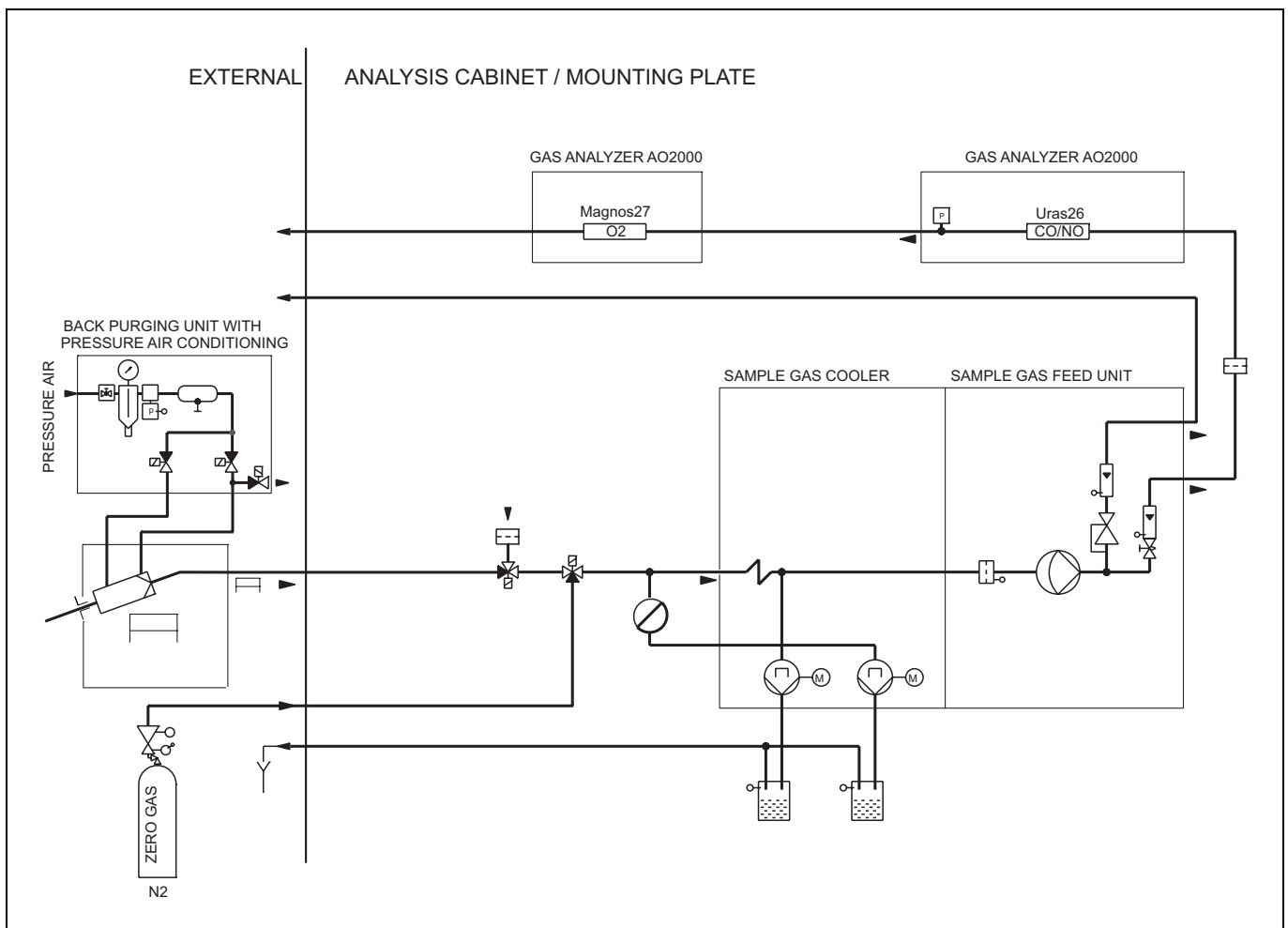
Option with high visible emission concentration in the sample gas (> 3 g/m<sup>3</sup>)

For information on compressed-air supply see page 12

### Sample Gas Line

- Ambient temperature > 0 °C without sample components SO<sub>2</sub> and NO: Unheated sample gas line (PTFE), recommended 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 100 °C, recommended length max. 10 m

## Gas Flow Plan



# Cement Applications – Electrostatic Filter Preheater (Safety-relevant measurement)

## 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 |

## Gas Sampling

### Sample Gas Inlet Conditions

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

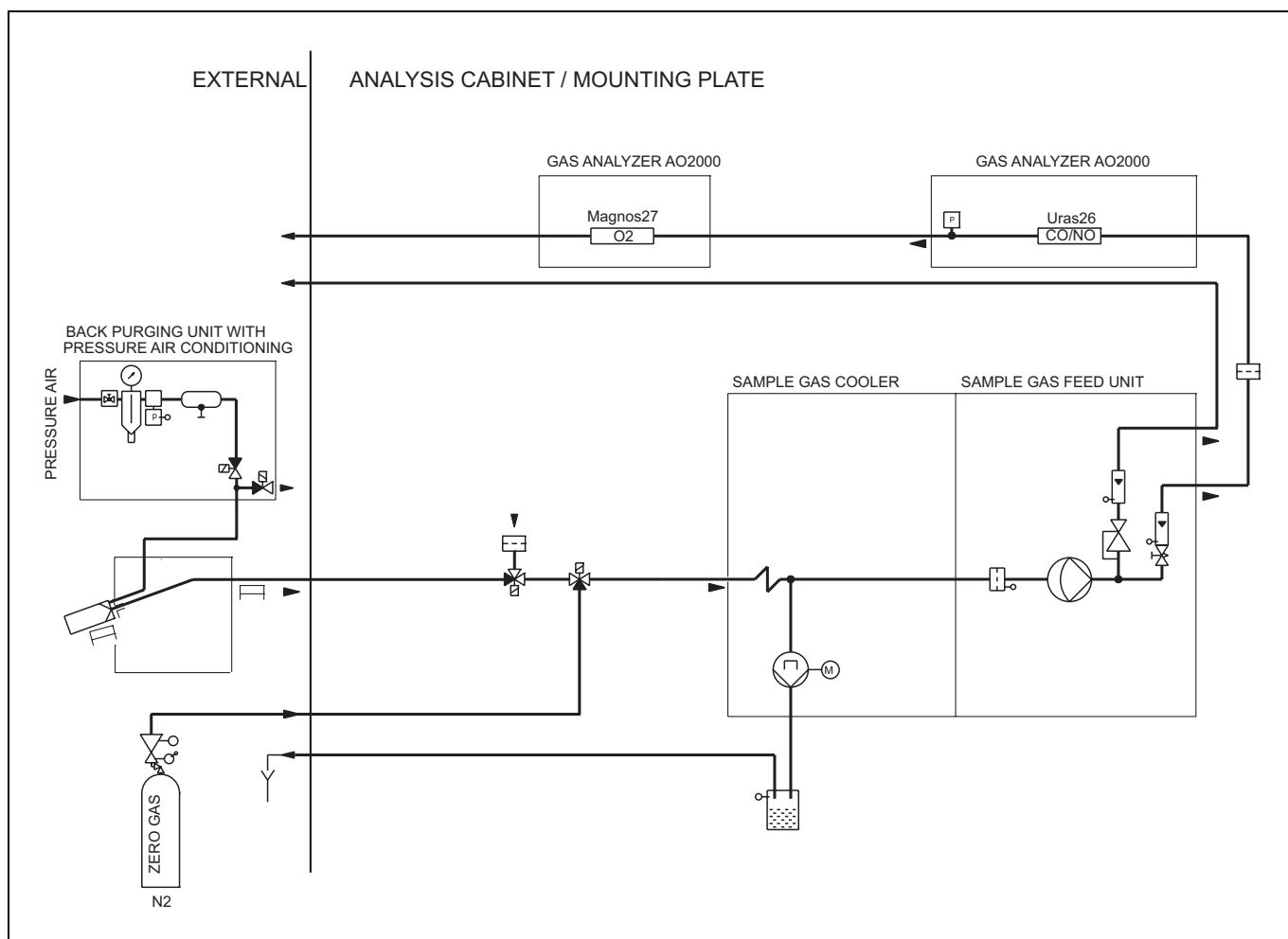
### Sampling Probe

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 12

### 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  $p_{abs} = 850\text{--}1100$  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

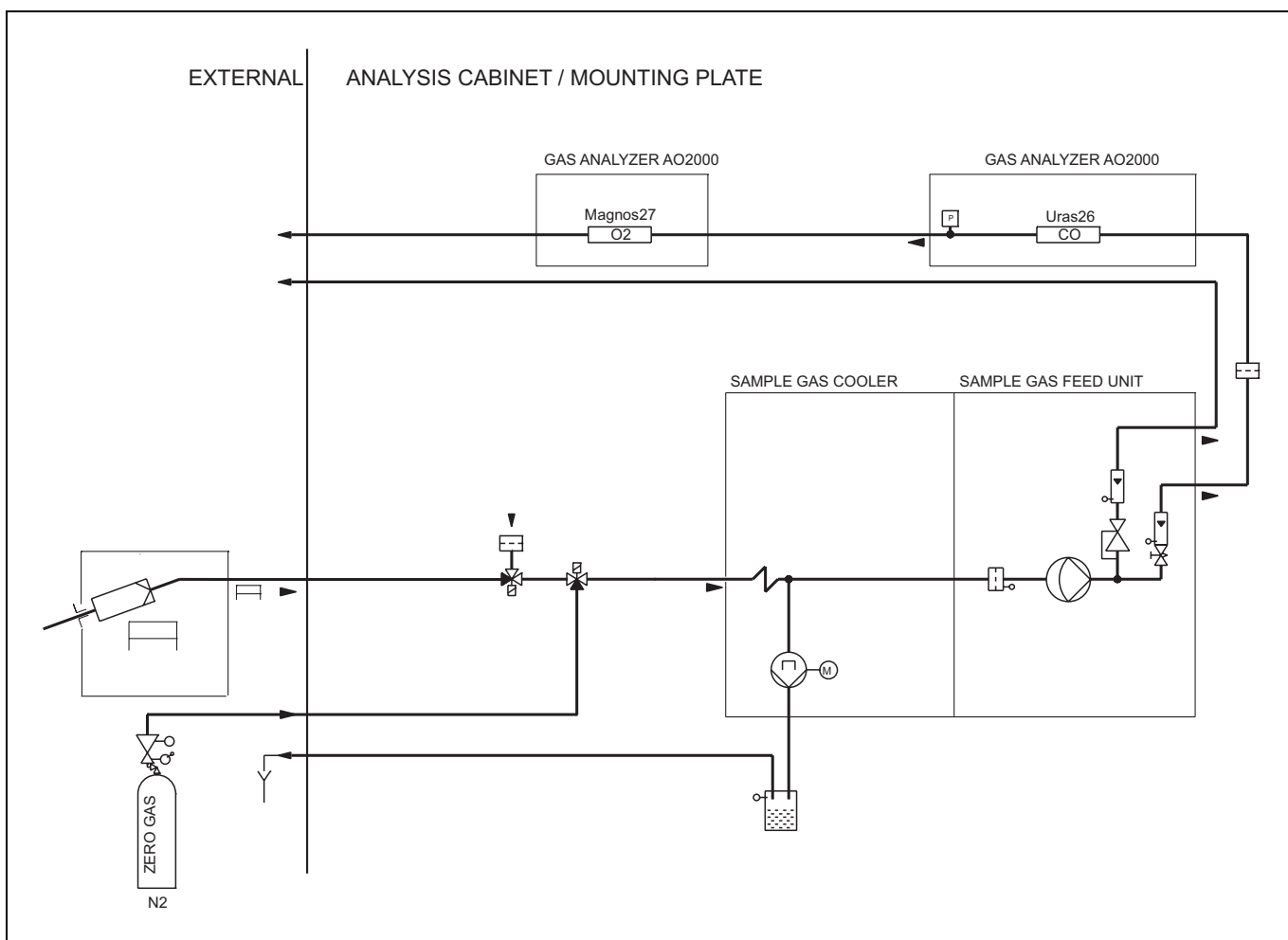
### Filter Unit

Filter unit type PFE3 with self-regulating or regulated heating

### 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, corrosive associated gases: Probe tube type 42 (heated), lengths 1000/1500/2000 mm
- Sampling temp. > 200 °C, non-corrosive associated gases: 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)

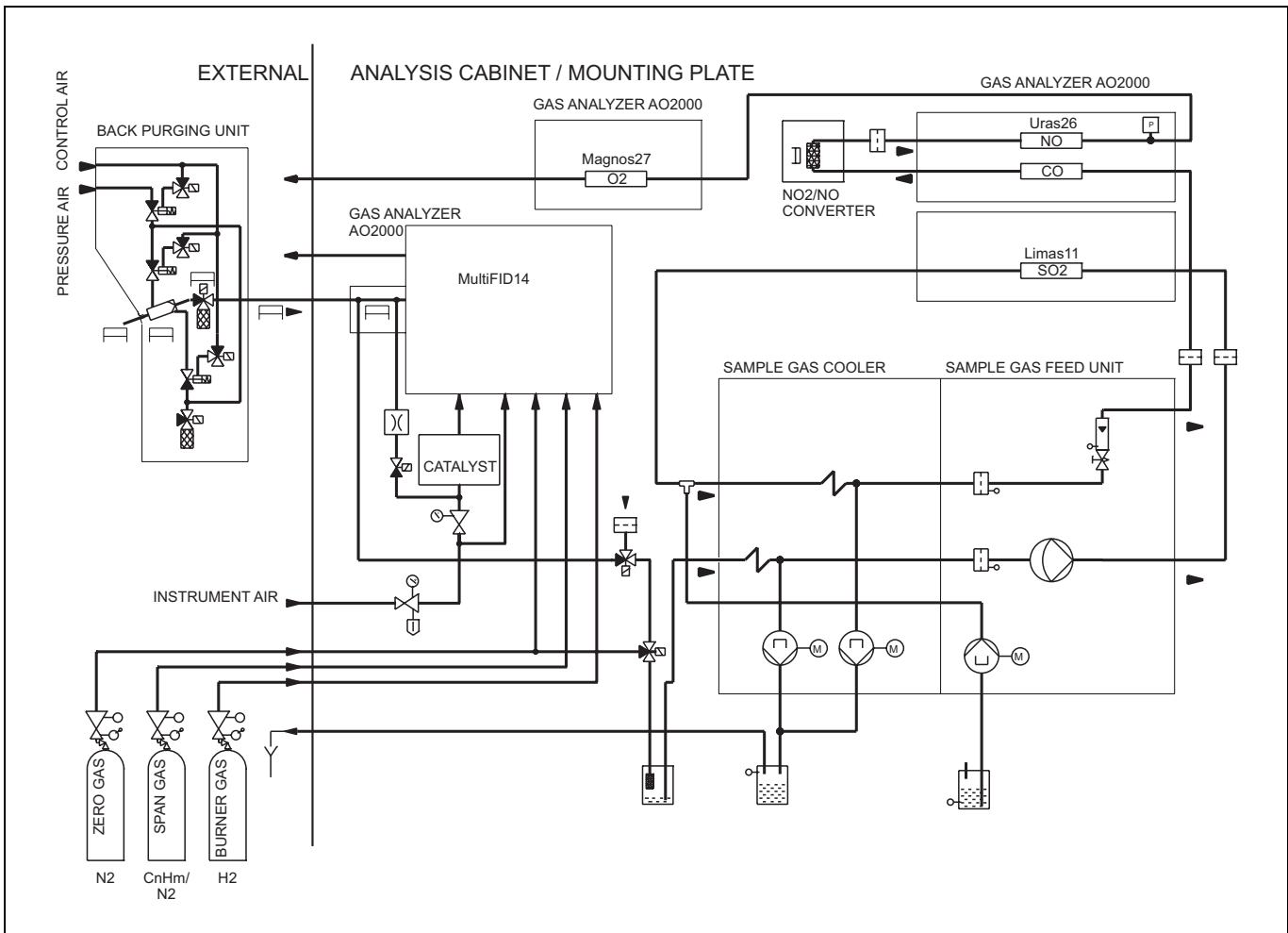
Option with high visible emission concentration in the sample gas (> 3 g/m<sup>3</sup>)  
For information on compressed-air supply see page 12

## 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



# 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, 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 13–16

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 drawing on page 18

Mounting plate: 699 x 1896 x 350 mm

Electrical distribution cabinet: 580 x 1400 x 300 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 Ω

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

See connection drawings on pages 20–22

## Gas Connections

### Gas Connection of Sample Gas Line

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

Conduit for heated line Ø 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 12

### Test Gas Infeed in Accordance with EPA

(Only for emission monitoring applications)

Test gas infeed at the sampling probe or upstream the sample gas cooler: Connection of three test gas cylinders, with solenoid valves, flow controller and needle valve

### Measuring Point Switch-Over

(Not for version with AO2000-MultiFID14)

Double measuring point switch-over upstream the sample gas cooler with change-over valve, additional temperature controllers for heated sampling probe and heated sample gas line

# General Data

## 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

## Power Supply

### Operating Voltage

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

### Power Consumption

|                                     |        |
|-------------------------------------|--------|
| Basic version                       | 1000 W |
| Additional power consumption by:    |        |
| 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

## Installation Site

### Ambient Temperature

|                                  |               |
|----------------------------------|---------------|
| in operation:                    |               |
| Mounting plate                   | 0 to +35 °C   |
| Sheet steel version with fan     | 0 to +35 °C   |
| with cooling unit                | 0 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 draining and 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 is only suitable for installation indoors; an air-conditioned room is recommended. The glass-fiber version is suitable for installation outdoors and indoors; a weather protection roof must be provided. Installation location altitude max. 2000 m above sea level

## 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  $\mu\text{m}$ , flange DN 65, PN 6, form B to DIN 2527, holes at 45°, 135°, 225°, 315°

## 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  $< 3\text{ °C}$ ), oil and dust-free; max. 6 bar for back-purging; required air flow rate approx. 100 Nm<sup>3</sup>/h

### 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

## 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

## 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  $p_e = 4000 \pm 500\text{ hPa}$ , 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  $p_e = 1200 \pm 100\text{ hPa}$ , flow  $< 40\text{ l/h}$

### Burner Gas

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

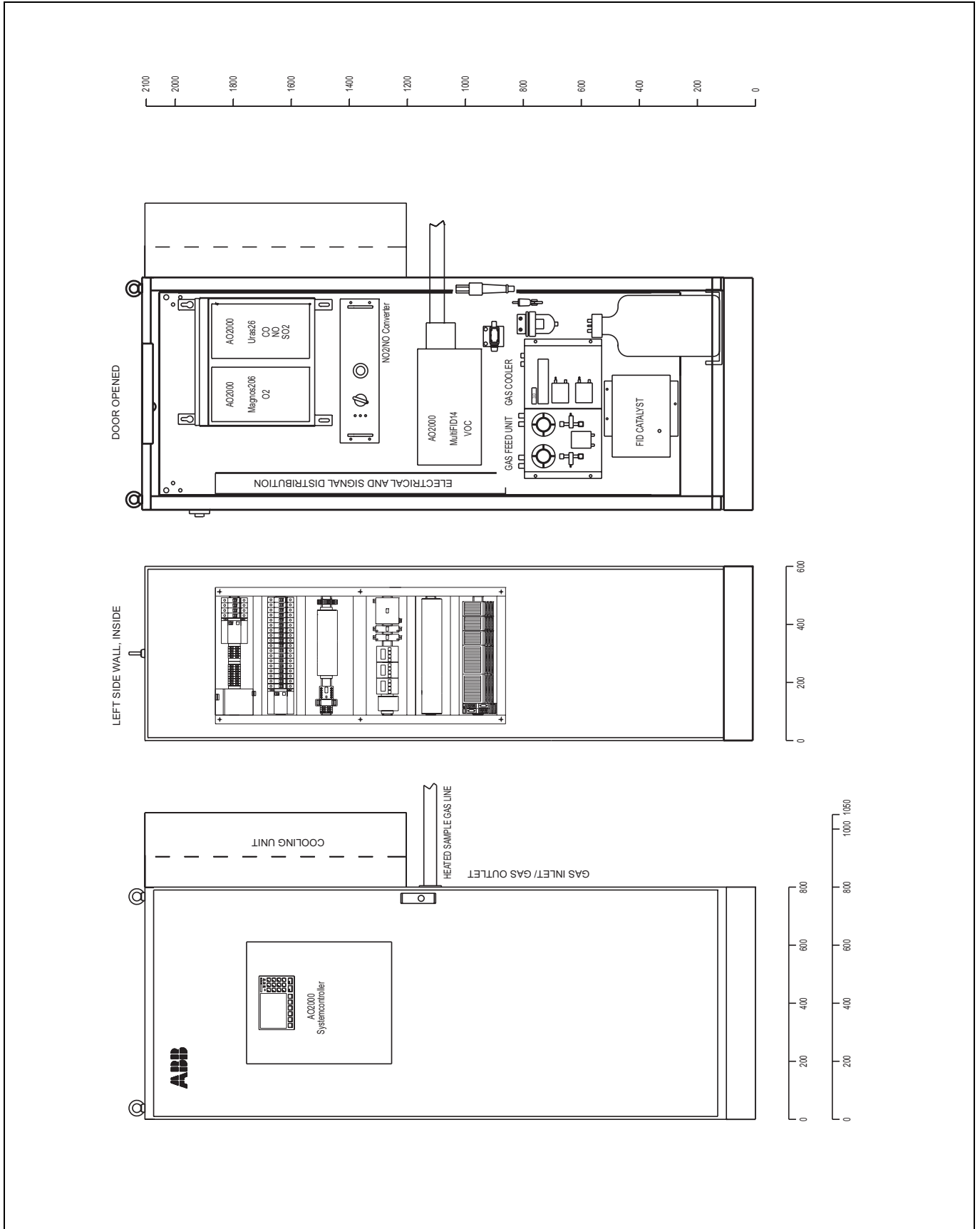
### Zero Reference Gas

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

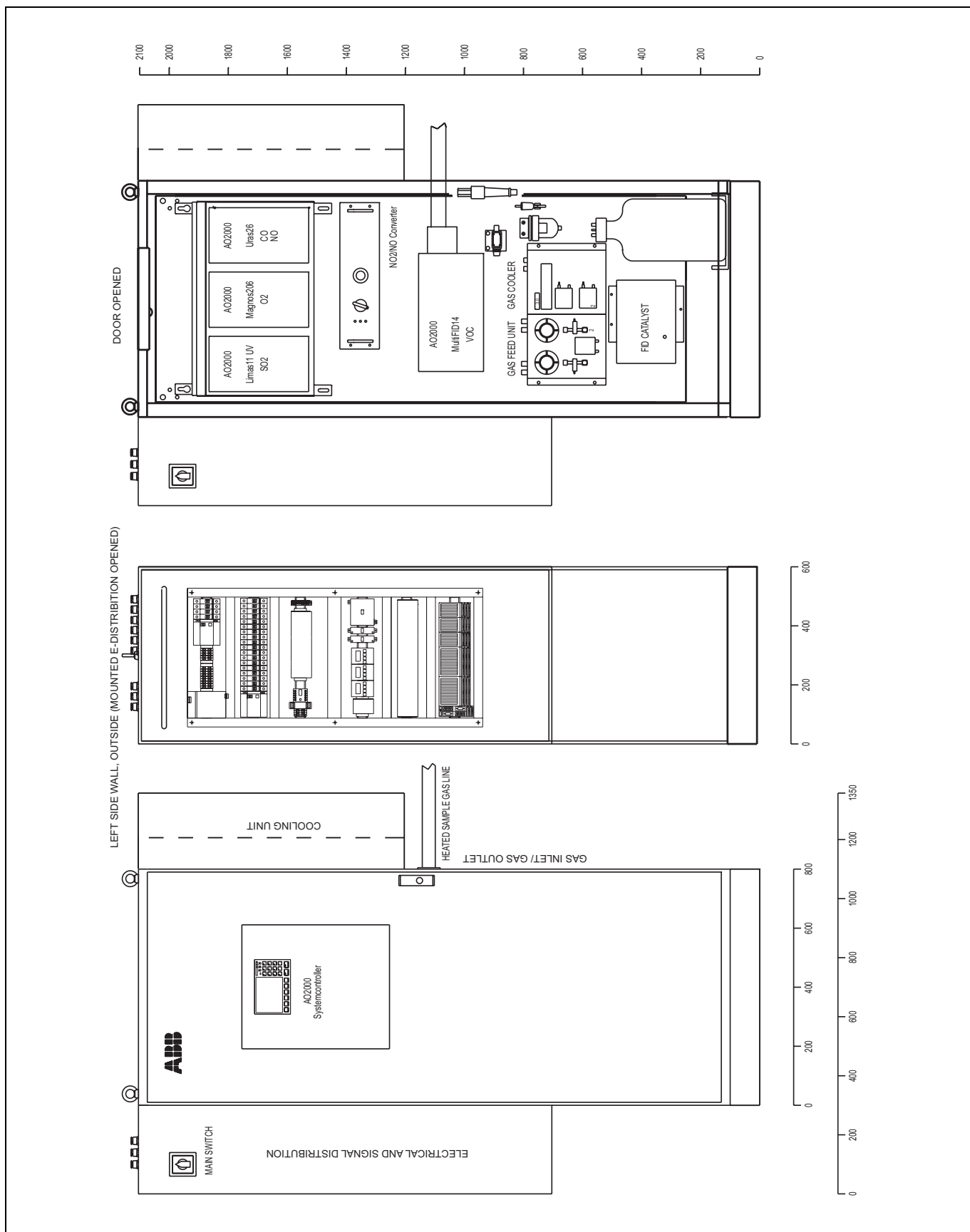
### Span Gas

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

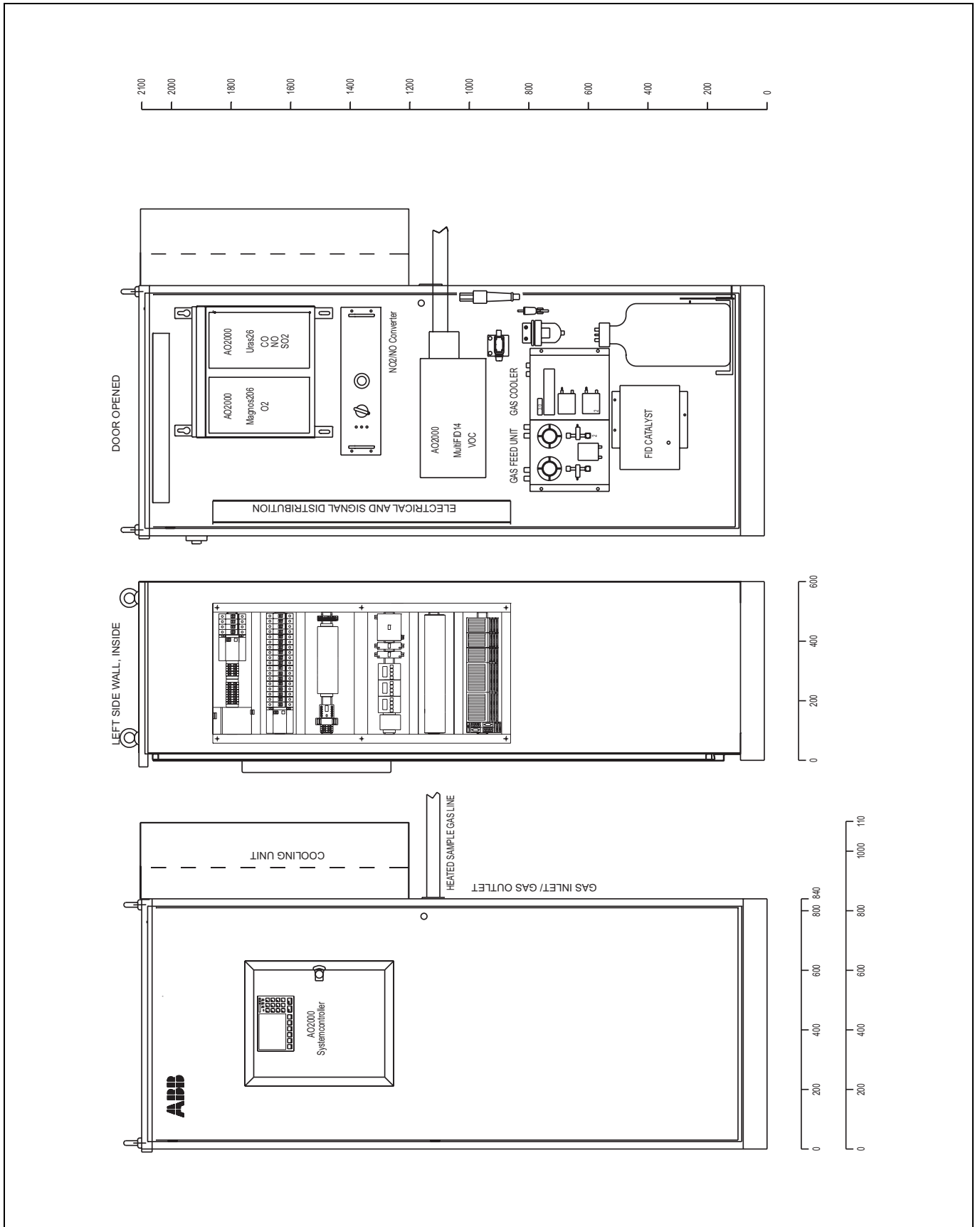
# Dimensional and Layout Diagram Sheet Steel Cabinet



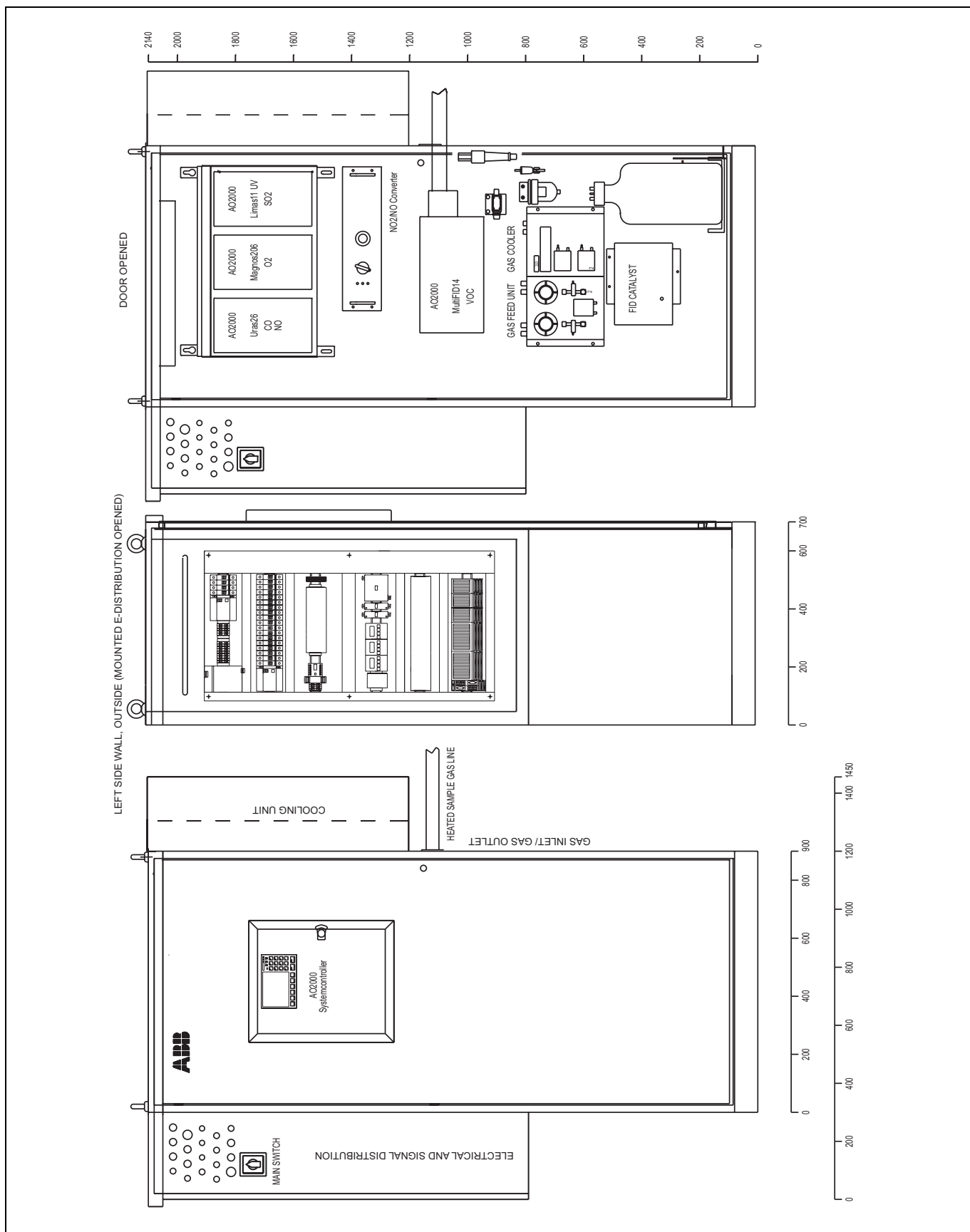
# Dimensional and Layout Diagram Sheet Steel Cabinet with Sep. Electr. Distr.



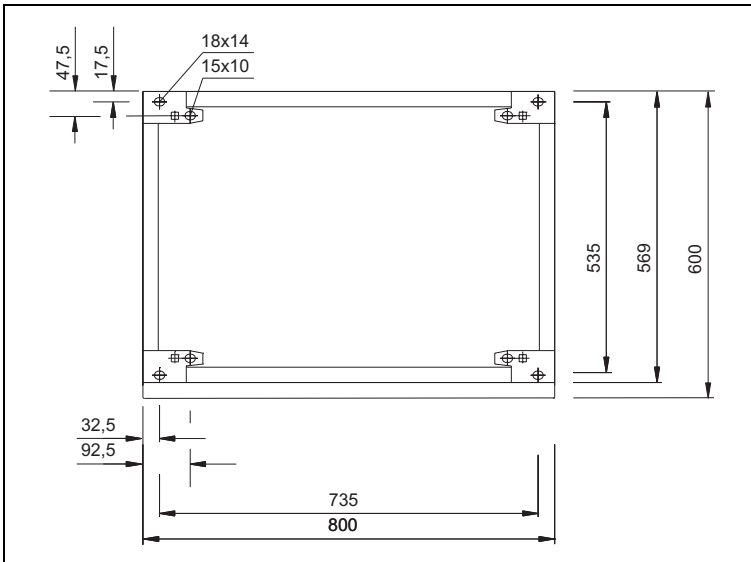
# Dimensional and Layout Diagram GRP Cabinet



# Dimensional and Layout Diagram GRP Cabinet with Sep. Electr. Distribution

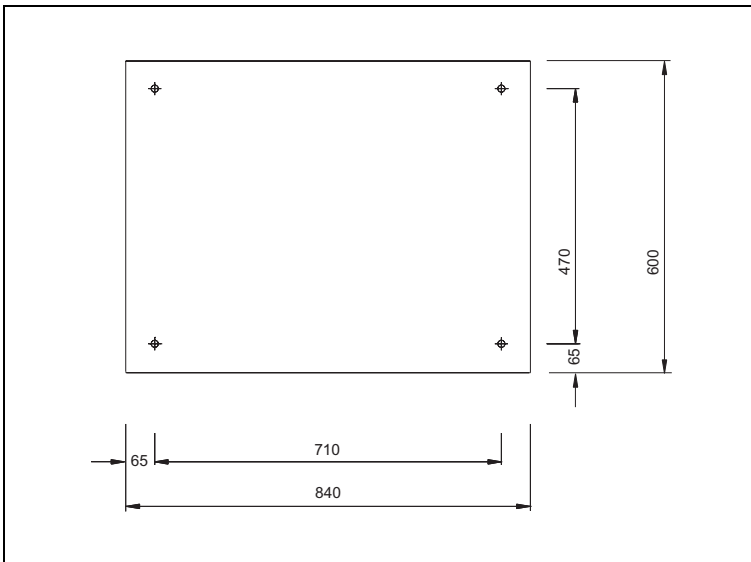


# Fixing Holes Sheet Steel Cabinet and GRP Cabinet



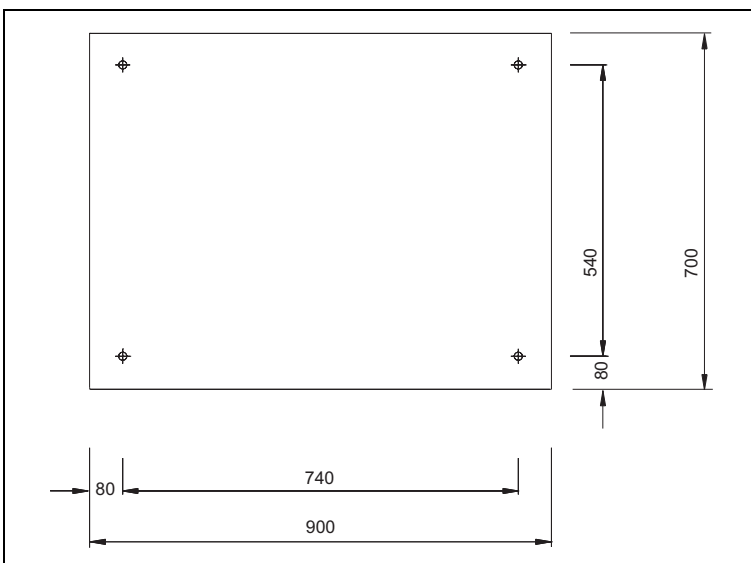
## Sheet Steel Cabinet

Base, fixing screws up to  $\varnothing$  10 mm



## GRP Cabinet, Width 840 mm

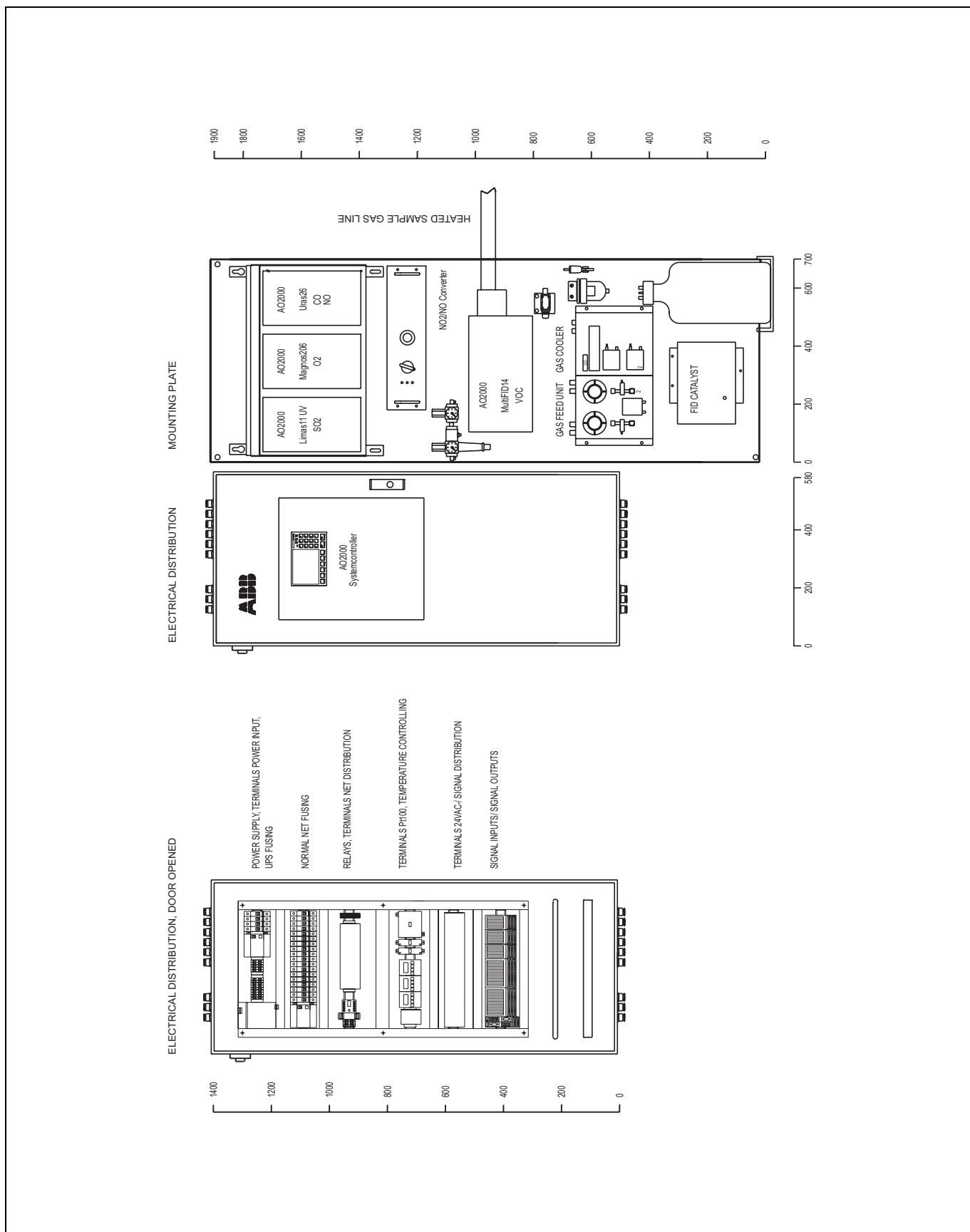
Holes for floor mounting, fixing screws up to  $\varnothing$  12 mm



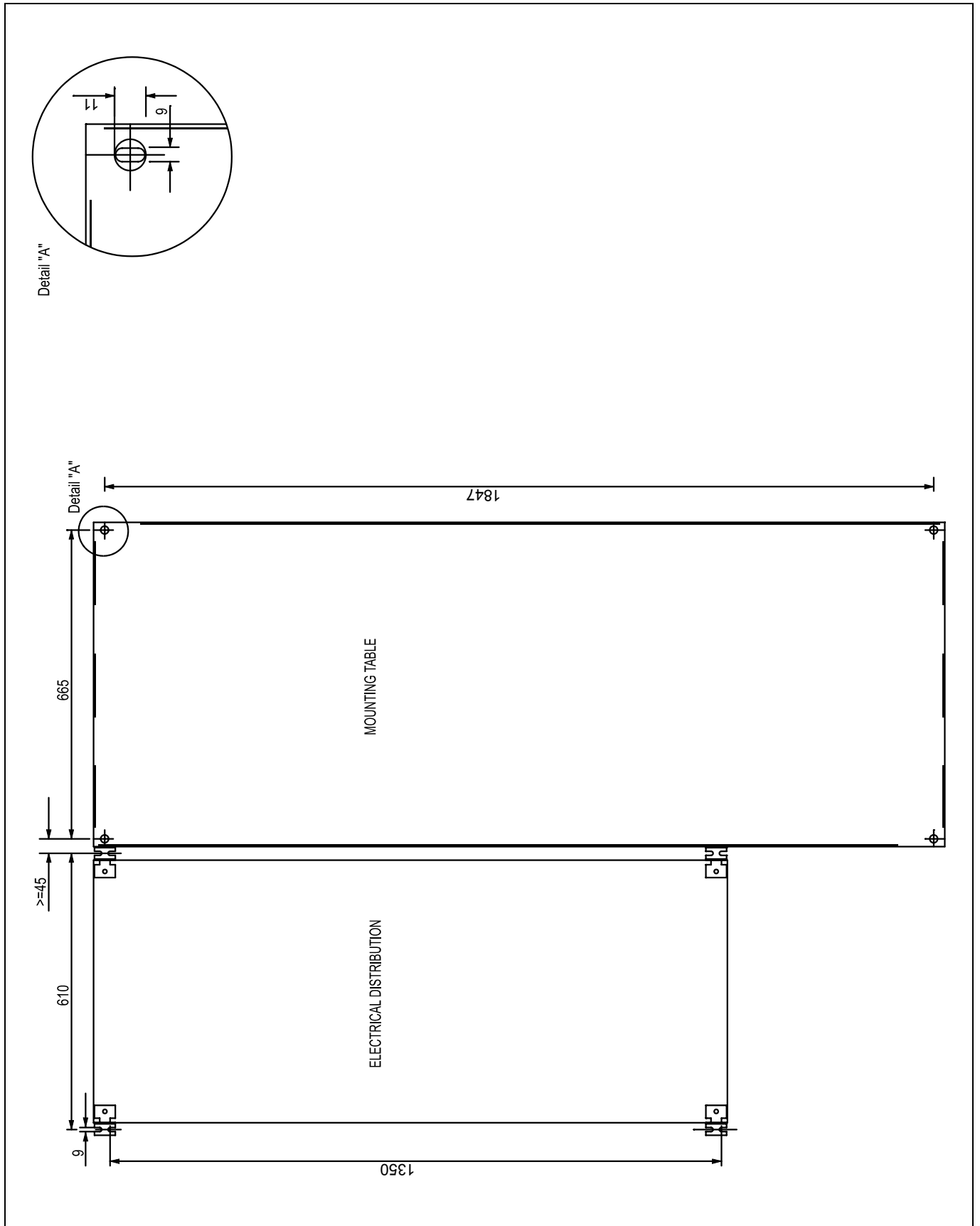
## GRP Cabinet, Width 900 mm

Holes for floor mounting, fixing screws up to  $\varnothing$  12 mm

# Dimensional and Layout Diagram Mounting Plate and Electr. Distr. Cabinet



# Fixing Holes Mounting Plate and Electrical Distribution Cabinet



# Electrical Connections (Cabinet/Electrical Distribution)

POWER SUPPLY (BY CUSTOMER)  
 FUSE-PROTECTION EXT. 3x20A (3x25A)  
 CABLE 5x6 mm<sup>2</sup> or 5xAWG8  
 CABLE GLAND M32  
 (CABLE DIA. RANGE 7-15mm)

UPS POWER SUPPLY (BY CUSTOMER)  
 FUSE-PROTECTION EXTERNAL 20A  
 CABLE 3x 2.5 mm<sup>2</sup> or 3xAWG10  
 CABLE GLAND M25  
 (CABLE DIA. RANGE 6-13mm)

SAMPLE PROBE (-E14/-E15)  
 HEATER SAMPLE TUBE TYPE 42  
 CABLE 3x2,5 mm<sup>2</sup> or 3xAWG14  
 CABLE GLAND M25  
 (CABLE DIA. RANGE 6-13mm)

CABLE 3x0,75 mm<sup>2</sup> or 3xAWG18  
 CABLE GLAND M20  
 (CABLE DIA. RANGE 5-10mm)

CONNECTION VIA TERMINAL BOX  
 ON-SITE

SAMPLE PROBE  
 HEATER FILTER UNIT PFE3 (-E12)  
 CABLE 3x1,5 mm<sup>2</sup> or 3xAWG16  
 CABLE GLAND M20  
 (CABLE DIA. RANGE 5-10mm)

CABLE 3x0,75 mm<sup>2</sup> or 3xAWG18  
 CABLE GLAND M20  
 (CABLE DIA. RANGE 5-10mm)

CONNECTION VIA TERMINAL BOX  
 ON-SITE

HEATED SAMPLE LINE TBL01 (-E13)  
 CABLE 3x2,5 mm<sup>2</sup> or 5x2,5mm<sup>2</sup>  
 CABLE 3xAWG12 or 5xAWG12  
 CABLE GLAND M25  
 (CABLE DIA. RANGE 6-13mm)

CABLE 3x0,75 mm<sup>2</sup> or 3xAWG18  
 CABLE GLAND M20  
 (CABLE DIA. RANGE 5-10mm)

SAMPLE PROBE  
 SOLENOID VALVES BACK PURGING  
 (-Y11/-Y12)  
 CABLE 4x1,5 mm<sup>2</sup> or 4xAWG16  
 CABLE GLAND M25  
 (CABLE DIA. RANGE 6-13mm)

CONNECTION VIA TERMINAL BOX  
 ON-SITE

-X10 POWER SUPPLY  
 L1 ○ 230/400V +/-10%, 48...62Hz  
 L2 ○ (120/208V +/-10%, 48...62Hz)  
 L3 ○  
 N ○  
 PEO ○

-X20  
 L1 ○  
 L2 ○  
 PEO ○

-X01 HEATING  
 7 ○ I = 1.0 m: 400 W  
 8 ○ I = 1.5 m: 600 W  
 9 ○ I = 2.0 m: 800 W

-X02 TEMPERATURE  
 1 ○ SENSOR Pt 100  
 2 ○  
 3 ○

-X01 HEATING  
 10 ○ 250 W  
 11 ○  
 12 ○

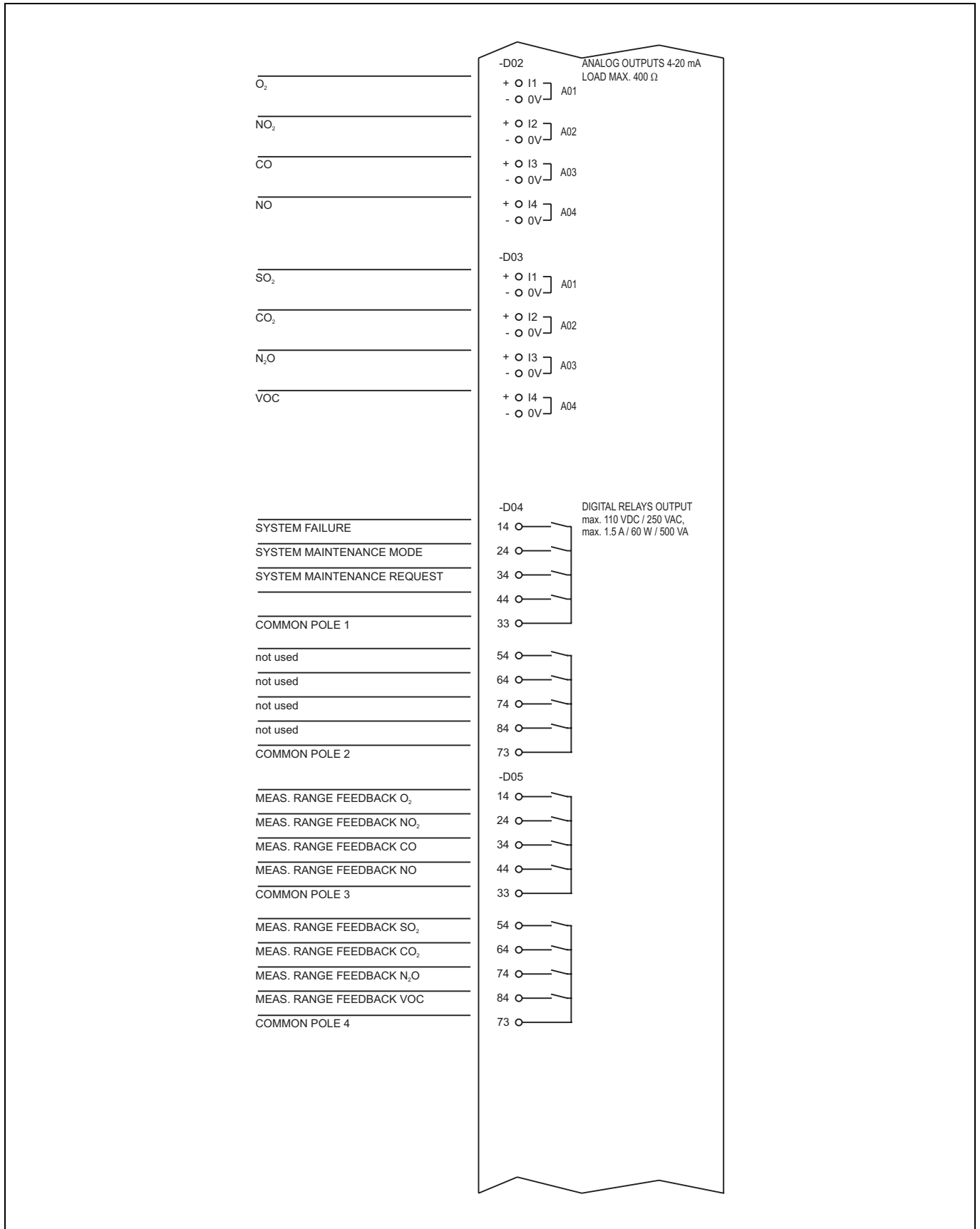
-X02 TEMPERATURE  
 4 ○ SENSOR Pt 100  
 5 ○  
 6 ○

-X01 HEATING  
 20 ○ 90 W/m  
 21 ○ max. Length at 230/400V:  
 35 m 1phase Fuse-protection (Standard)  
 22 ○ 60 m 3phase Fuse-protection  
 23 ○ max. Length at 120/208V:  
 15 m 1phase Fuse-protection (Standard)  
 24 ○ 40 m 3phase Fuse-protection

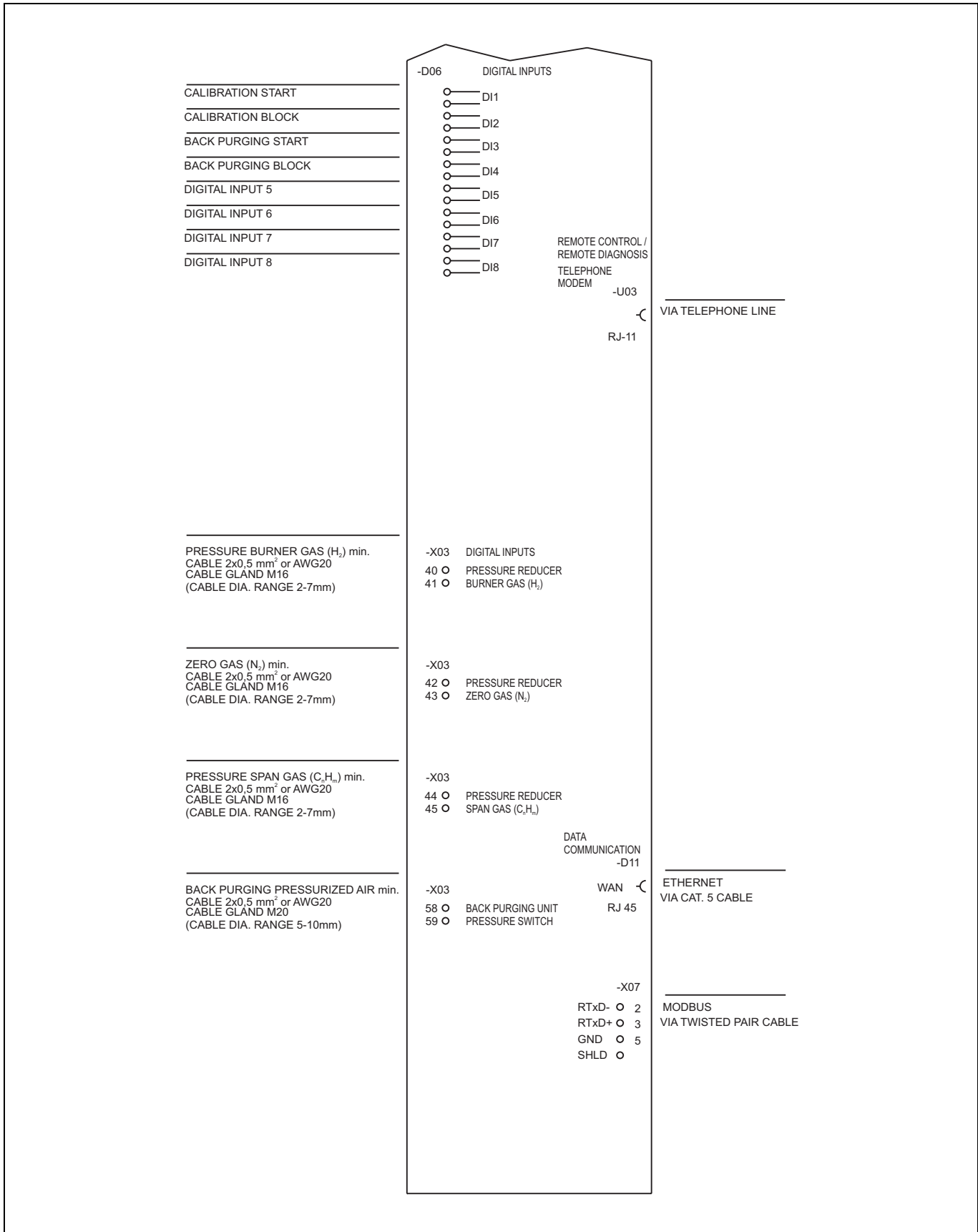
-X02 TEMPERATURE  
 7 ○ SENSOR Pt 100  
 8 ○  
 9 ○

-X01 BACK PURGING UNIT  
 16 ○ 70 VA  
 17 ○  
 18 ○  
 19 ○

# Electrical Connections (Cabinet/Electrical Distribution)



# Electrical Connections (Cabinet/Electrical Distribution)





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