ACF-NT, ACF-NT V0309

Multicomponent Analyzer Systems for Emission and Process Monitoring

Installation Instructions

42/23-571 EN Rev. 6

Power and productivity
for a better world™

Contents

Foreword

The Content of this Manual

This manual contains all the information you will need to safely and efficiently install the ACF-NT Analyzer System.

This manual contains information on all the functional units in the analyzer system. Your analyzer system as delivered may differ from the version described in this documentation.

System Documentation

The system documentation consists of a set of drawings individually prepared for each analyzer system as delivered. It includes the following plans:

- Layout Plan
- Piping Plan
- Wiring Plan
- Terminal Plan
- Connection Plan

The system documentation is supplied as part of the analyzer system.

Supplementary Documentation

Title	Publication No.
Specification Sheet	10/23-8.11 EN
Operator's Manual	42/23-572 EN

Information on the Internet

Information on ABB Analytical products and services is available on the Internet at "http://www.abb.com/analytical".

Service Contact

If the information in this manual does not cover a particular situation, ABB Service is prepared to supply additional information as needed.

Please contact your local service representative. For emergencies, please contact

ABB Service
Telephone: +49-(0)180-5-222580, Telefax: +49-(0)621-38193129031,
E-mail: automation.service@de.abb.com

Symbols and Type Format in this Manual

indicates safety information to be heeded during analyzer system operation in order to avoid risks to the user.

identifies specific information on operation of the analyzer system as well as on the use of this manual.

1, ***2***, ***3***, … identifies reference numbers in figures.

Important Safety Information

Intended Conditions of Use

The analyzer system is designed for continuous measurement of concentrations of specific components in gases or vapor. Any other application is not compliant with the specified use. Observation of this manual is also part of the specified use.

The analyzer system must not be used to measure flammable gases or combustible gas/air or gas/oxygen mixtures. The analyzer system must not be installed in hazardous locations.

The analyzer system interior remains free of explosive atmosphere during normal operation. Therefore, the integration of explosion protection measures inside the analyzer system is not required.

Requirements for Safe Operation

In order to operate in a safe and efficient manner, the analyzer system should be properly handled and stored, correctly installed and set-up, properly operated and carefully maintained.

Personnel Qualifications

Only persons familiar with the installation, set-up, operation and maintenance of comparable analyzer systems and certified as being capable of such work should work on the system.

Special Information and Precautions

These include
- The content of this manual.
- The safety labels affixed to the analyzer system.
- The applicable safety precautions for installing and operating electrical devices
- Safety precautions for working with gases, acids, condensates, etc.

Safety Labels Affixed to the Analyzer System

Observe the safety labels affixed to the analyzer system:

Consult Documentation!

Hot Surface! (Temperature > 60 °C)

Risk of Electric Shock!

National Regulations

The regulations, standards and guidelines cited in this manual are applicable in the Federal Republic of Germany. The applicable national regulations should be followed when the analyzer system is used in other countries.

Analyzer System Safety and Safe Operation

The analyzer system is designed and tested in accordance with EN 61010 Part 1/ IEC 1010-1, “Safety Provisions for Electrical Measuring, Control, Regulation and Laboratory Instruments” and has been shipped ready for safe operation.

To maintain this condition and to assure safe operation, read and follow the safety information identified with the symbol ⚠ in this manual. Failure to do so can put persons at risk and can damage the analyzer system as well as other systems and instruments.

Safety Tips for Handling Electronic Measurement Devices

Protective Lead Connection

The protective lead should be attached to the protective lead connector before any other connection is made.

Risks of a Disconnected Protective Lead

The analyzer system can be hazardous if the protective lead is interrupted inside or outside the system or if the protective lead is disconnected.

Correct Operating Voltage

Be sure the analyzer system voltage setting matches the line voltage before connecting the power supply.

Risks Involved in Opening the Covers

Current-bearing components can be exposed when covers or parts are removed, even if this can be done without tools. Current can be present at some connection points.

Risks Involved in Working with an Open Analyzer System

The analyzer system must be disconnected from all power sources before being opened for any work. All work on an analyzer system that is open and connected to power should only be performed by trained personnel who are familiar with the risks involved.

Charged Capacitors

The capacitors in the analyzer system can retain their charge even when it is disconnected from all power sources.

Use of Proper Fuses

Only fuses of the specified type and rated current should be used as replacements. Never use patched fuses. Do not short-circuit the fuse holder contacts.

When safe operation can no longer be assured …

If it is apparent that safe operation is no longer possible, the analyzer system should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:

- If the analyzer system is visibly damaged
- If the analyzer system no longer operates
- after prolonged storage under adverse conditions
- after severe transport stresses

Safety Tips for Handling the FTIR Spectrometer

Electrical Safety

The FTIR Spectrometer consists of an exposed metal chassis that is connected directly to earth via a power supply cord and is therefore classified as “Safety Class I” equipment.

WARNING!

When used to analyze flammable gases, the equipment is subject to acceptance by the local inspection authorities having jurisdiction.

For continued fire protection use specified line fuse only. Disconnect power cord before replacing fuse.

To avoid electrical shock, the power cord protective conductor must be connected to earth.

To avoid electrical shock, do not operate this equipment if it bears any sign of damage to any portion of its exterior surface.

Do not expose this equipment to any source of excessive moisture.

Do not use this equipment in an explosive atmosphere.

Laser and High Voltage

Under normal operating conditions, the FTIR spectrometer can be operated in complete safety (Class 1 Laser Product – see rating plate).

Do not open the spectrometer enclosure during normal operation – no user-serviceable parts inside.

However, since the instrument contains a laser and uses high voltages (accessible only when the spectrometer enclosure is open), observe the following warnings.

WARNING!

The enclosure of the spectrometer is to be opened only by authorized ABB Service Personnel.

Opening the enclosure may result in exposure to laser radiation and high voltages.

Laser type:	**He-Ne Laser**	**Class 3B as per IEC-60825-1** **Class 111a as per 21 CFR 1040.10**
Output power:	**max. 3.2 mW**	
Wavelength:	**632.8 nm**	

Avoid eye exposure to direct to direct or mirrored laser radiation. It is recommended to wear laser safety goggles when working on the open spectrometer.

High voltage is present at the red wire connected to the laser tube inside the enclosure.

The voltage is approximately 7 kV at startup, and between 1200 V and 1400 V under normal operating conditions.

Because of the capacitors in the laser power supply, the high voltage may be present even when the power is off.

Safety Tips for Handling the Analyzer System

CAUTION!

Do not open any gas paths in the analyzer system or in the integrated analyzers. Doing so will damage gas path seal integrity.

If system-internal gas paths are opened, a seal integrity check must be performed with a leak detector (thermal conductivity) when the device is reassembled.

Additional Safety Tips for Handling the Analyzer System with Integrated VOC Analyzer

CAUTION!

Do not open the combustion gas path in the analyzer system and particularly in the integrated VOC analyzer. Doing so will damage the combustion gas path seal integrity.

If the system-internal combustion gas path is opened, a seal integrity check must be performed with a leak detector (thermal conductivity) when the device is reassembled.

The bulkhead connector with integrated flow limiter for connection of the combustion gas line is a safety relevant part. It must not be removed, modified or replaced!

It is recommended to check regularly the seal integrity of the combustion gas line outside the analyzer system.

WARNING!

Combustion gas flowing out of leaks in the gas paths can cause fire and explosions (even outside the analyzer system itself).

Safety Tips for Handling Harmful Gases

WARNING!

Some of the gases measured with the analyzer system are harmful to health.

Therefore, the sample gas must not escape from the gas path during normal operation and maintenance works.

A seal integrity check of the analyzer system has to be performed at regular intervals.

The diluted exhaust gas must be drained out of the installation room of the analyzer cabinet.

Chapter 1 Installation Preparation

Installation Site Requirements

Short Gas Paths

The analyzer cabinet should be installed as close as possible to the sampling site. A short sample gas line results in brief lead times. The sample gas line length is limited to 60 meters with 230 VAC power supply and to 40 meters with 120 VAC power supply on account of pressure drop build-up in the line and the required electrical fusing. The air purifier and the test gas cylinders should be installed as close as possible to the analyzer cabinet.

Protection from Adverse Conditions

Protect the analyzer cabinet against
- Water spray
- Contact with chemicals
- Strong sunlight and heat radiation
- Strong air currents
- Heavy dust
- Corrosive atmospheres
- Vibration

Environmental Conditions

The analyzer cabinet is intended for indoor use only.

• Ambient temperature for storage and shipping	–25 to +65 °C
• Ambient temperature during operation	
• In air conditioned rooms	+20 to +25 °C
• With air conditioning unit (optional)	+5 to +40 °C
• Relative humidity during operation	
• Year-round average	max. 75 %
• Short-term	max. 95 %
• Occasional slight condensation is permitted, provided the analyzer system is turned on and the FTIR spectrometer is purged	

It is mandatory that the analyzer cabinet or the FTIR spectrometer is hermetically sealed during storage and shipping!

Installation Location Altitude

The maximum installation altitude is 800 m above sea level (for sample gas line length with probe = 10 m).

Remark: The minimum inlet pressure at the analyzer cabinet is defined to 900 hPa. This results in a maximum altitude above 800 m; however, the pressure drop along the probe (15 hPa for a new, dust-free probe) and the heated line must be considered. Higher altitudes would result in no gas flow through the system. Lowering the pressure set points of the ACF-NT is not allowed as this directly reduces the sensitivity of the FTIR spectrometer. Thus, the measurement accuracy according to QAL1 and QAL2 for components with low concentrations cannot be warranted.

Continued on next page

Space Requirement

• Right side	1 m	for gas lines, air purifier and air conditioning unit (optional)
• Left side	0.5 m	for electrical lines
• Front	1 m	to open the door (hinged at left)
• Top	0.5 m	with air conditioning unit (optional) to prevent heat buildup

Floor

The installation site floor must be plane and capable of supporting the cabinet's weight (approx. 300 kg).

Gas Supply Requirements

	Characteristic	Inlet Pressure	Flow
Analyzer System			
Sample gas [6]	Temperature controlled at 180 ± 2 °C by means of the heated sample gas line	p_{abs} = 900 to 1100 hPa (0.9 to 1.1 bar)	approx. 250 l/h
Instrument air [2]	Based on ISO 8573-1 Class 2 (max. particle size 1 µm, max. particle density 1 mg/m³, max. oil content 0.1 mg/m³, max. pressure dew point –20 °C)	p_e = 5000 to 7000 hPa (5.0 to 7.0 bar)	approx. 1700 l/h for FTIR and approx. 1500 l/h for VOC
FTIR Analyzer			
Zero gas for the FTIR spectrometer	Clean air from air purifier	p_e = 1100 ± 100 hPa (1.1 ± 0.1 bar)	500 l/h
Span gas for the FTIR spectrometer [4]	Measurement component in N_2 70 to 80 % of measuring range (accuracy ±2 %)	p_e = 1100 ± 100 hPa (1.1 ± 0.1 bar)	500 l/h
VOC Analyzer [1]			
Combustion gas [3]	H_2, quality 5.0	p_e = 1200 ± 100 hPa (1.2 ± 0.1 bar)	approx. 3 l/h
Zero gas	N_2, quality 5.0 or zero gas for the oxygen analyzer	p_e = 1100 ± 100 hPa (1.1 ± 0.1 bar)	120 l/h
Span gas [5]	n-Propane C_3H_8 in N_2 70 to 80 % of measuring range (accuracy ±2 %)	p_e = 1000 ± 100 hPa (1.0 ± 0.1 bar)	80 to 120 l/h
O_2 Analyzer [1]			
Zero gas	1 to 4 vol% O_2 in N_2 (accuracy ± 2 %)	p_e = 1100 ± 100 hPa (1.1 ± 0.1 bar)	500 l/h
Span gas	Clean air from the air purifier (20.96 vol% O_2)	p_e = 1100 ± 100 hPa (1.1 ± 0.1 bar)	500 l/h

1) Option

2) Provide a pressure gauge and a shut-off valve.

3) Recommendation: Provide two 40 l cylinders and a switchover station.
Note: For safety reasons, a flow limiter is integrated in the bulkhead connector provided for connection of the combustion gas line to limit the combustion gas flow to 10 l/h.

4) H_2O, HCl, HF and NH_3 test gases for calibration are produced with a vapor generator by vaporizing either distilled water or HCl, HF or NH_3 solutions with known concentrations.

5) As the VOC analyzer only measures the number of carbons the concentration of the span gas has to be calculated from ppm or mg/m³ C_nH_m to ppm or mg/m³ C

6) For information regarding sample components and measuring ranges refer to ACF-NT operator's manual, "Operating Specifications" section in the Appendix

Definition

$p_e = p_{abs} - p_{amb}$
with p_e = positive pressure, p_{abs} = absolute pressure, p_{amb} = atmospheric pressure

Power Supply Requirements

Power Supply

Voltage	Fuse (external)	Power consumption
230/400 V AC or 120/208 V AC, ± 10 %, 48 to 62 Hz	3 x 20 A or 3 x 25 A	approx. 2400 VA on activation, approx. 1800 VA in operation + approx. 600 VA for heated probe tube + approx. 250 VA for heated filter + approx. 90 VA/m for heated sample gas line + approx. 1400 VA for air conditioning unit

Uninterruptible Power Supply

Voltage	Fuse (external)	Power consumption
230/120 V AC, 48 to 62 Hz	20 A	approx. 600 VA (included in above values)

Service Socket

230 V AC or 120 V AC, 48 to 62 Hz, max. 5 A.
The service socket is located in the cabinet light (–E02).

Fuses

	Function	Rated Value
–F10	Power supply – residual current-operated circuit breakers	30 A/30 mA
–F10.1	UPS – residual current-operated circuit breakers	25 A/30 mA
–F01	Fan or Air condition (optional)	2 A or 16 A
–F02	Cabinet light, socket	6 A
–F03	Heated probe tube type 42	6 A
–F04	Heated filter unit type PFE2	2 A (230 V) 6 A (120 V)
–F05	Heated sample gas line	16 A (230 V) 20 A (120 V)
–F06	RGM11 module, FTIR spectrometer/heated sampling cell	6 A (230 V) 10 A (120 V)
–F07	MultiFID14 module, catalyst	6 A
–F08	FTIR purge gas generator, FTIR spectrometer, flow monitor, system controller, PC FTIR, power supply 24 V/5 A	16 A
–F09	Sample probe cleaning	6 A
–F11 –F12 –F13	Temperature controller	T 2 A

CAUTION!

High leakage current: 6 mA!

Analyzer System Features Relevant for Installation

Dimensions

see “Layout Plan” in the system documentation

Weights

Analyzer cabinet		approx. 300 kg
Probe tube type 40 (unheated)	500 mm	1 kg
	1000 mm	2 kg
	1500 mm	3 kg
	2000 mm	4 kg
	2500 mm	5 kg
Probe tube type 42 (heated)	1000 mm	8 kg
	1500 mm	10 kg
	2000 mm	12 kg
Filter unit heated with protective case type PFE2		20 kg
Sample gas line heated type TBL01		1 kg/m
Compressed air station		15 kg
FTIR purge gas generator		12 kg
PC (FTIR controller)		12 kg

Sound Level

Fan 50/60 Hz	52/57 dB
Air condition	64 dB

Items Delivered

Standard Equipment

Qty	Description
1	Analyzer cabinet with all modules installed
1	Air purifier
1	FTIR controller
1 set	System documentation

Additional Items Delivered Per Order

Qty	Description
1	Gas sampling probe Type 40 (unheated) or Type 42 (heated)
1	Heated filter unit Type PFE2
1	Heated sample gas line Type TBL01

Materials Needed for Installation (not supplied)

Gas Sampling

- Wall tube with mounting flange (DN 65, PN 6, Type B to DIN 2573)

Gas Lines

• Instrument air	1 Tube/compressed air pipe, 6 mm O.D. for compressed air line (with pressure gauge and shut-off valve)
	2 Tubes/compressed air pipes, 6 mm O.D. for the analyzer cabinet – air purifier connection
• Combustion gas for the VOC analyzer	1 Purified stainless steel pipe (SS316), 6 mm O.D.
	1 Two-stage pressure reducer (pure gas version) with flow limiter
• Test gas	3 PTFE pipes 4/6x1 mm
	1 T-piece for PTFE pipe 4/6x1 mm when zero gas for O_2 analyzer and for VOC analyzer is in one bottle
• Purge gas to probe	1 PTFE tube 4/6x1 mm, length approx. the same as sample gas line
• Exhaust	1 Pipe, 12 mm O.D.

Drain Line

• Air conditioning unit (Option)	1 Tube, 9 mm I.D., max. 14 mm O.D.

Input Wiring

- Input wiring
  - 5 x 6 mm^2 (5 x AWG 8)
  - If applicable, uninterruptible power supply wiring 3 x 2.5 mm^2 (3 x AWG 14)
- Cables to connect the analyzer cabinet to the heated gas sampling probe, filter and sample gas line (if applicable, in a heat-resistant version; note the power requirements of these components)
- Grounding cable with cross section ≥ 10 mm^2 (≥ AWG 8)

Signal Leads

- Shielded cable for analog outputs (current outputs)
- Cable for digital outputs
- Cable for data lines (Modbus, Profibus, Ethernet, modem)
- Cable for the Pt-100 resistance thermometers of the heated components

When selecting conductor materials, follow all applicable national safety regulations for the installation and operation of electrical devices.

Mounting

- Screws and nuts to secure the analyzer cabinet to the floor (recommendation).

Chapter 2 Analyzer System Installation

Installing the Analyzer System

- We recommend having the analyzer system installed by ABB.
- When installing the analyzer system, in addition to this manual, comply with the information contained in the system documentation, as well as the operator's manuals, technical bulletins and specification sheets for the individual devices and components.
- If there is shipping damage which points to improper handling file a damage claim with the shipper (railway, mail or freight carrier) within seven days.
- Make sure the enclosed accessories are not lost (see the "Items Delivered" section, Page 14).
- Keep the packaging material for future shipping needs.

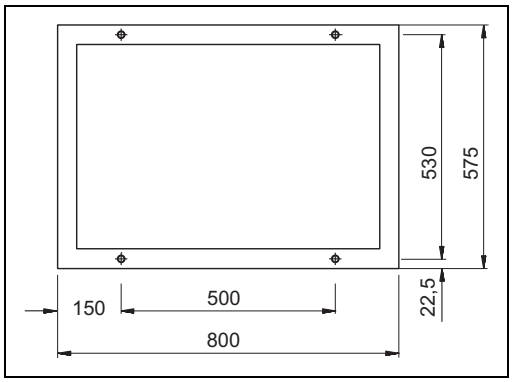
Installation – Overview

Step	Action	Page
1	Install the foundation	17
2	Unpack the analyzer cabinet	17
3	Set up the analyzer cabinet	17
4	Install the gas sampling probe and filter unit	18
5	Install the sample gas line	20
6	Install the instrument air supply	21
7	Set up the test gas cylinders	21
8	Connect the gas lines	21
9	Connect the electrical leads	23

Installing the Analyzer Cabinet

Installing the Foundation

- Installation site requirements, see page 9
- Follow the “Layout Plan” in the system documentation.
- Concrete receptacle with cast-in M10 bolts or base iron frame with bores or grating (see the illustration)

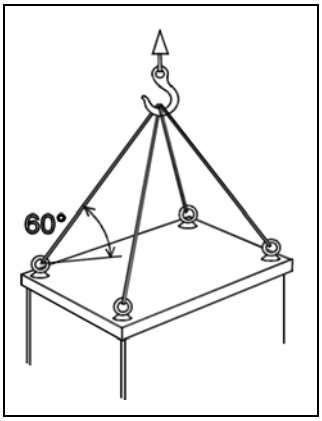


CAUTION!

The analyzer cabinet weighs approx. 300 kg. A crane with a suitable support device is required for unpacking and handling.

Use the handling lugs provided to connect any lift cables to the analyzer cabinet.

The lift cable must be long enough to have an angle of at least 60° relative to the top of the cabinet when under tension (see the illustration). If this is not done the analyzer cabinet can be warped.



Unpacking the Analyzer Cabinet

- Remove the analyzer cabinet from the shipping box.

  Do not remove the plastic sheet in which the analyzer cabinet is wrapped. Unpacking a cold analyzer cabinet can lead to condensation that will damage the hygroscopic optical components of the built-in spectrometer.

- Remove the plastic sheet only once the analyzer cabinet is at room temperature. This takes at least 24 hours.

Setting Up the Analyzer Cabinet

- Installation site requirements, see page 9
- Material required, see page 15
- Follow the “Layout Plan” in the system documentation.
- Ground by means of the central grounding screw, route the grounding cable (≥ 10 mm^2) through the M16 cable gland provided in the left wall of the cabinet.

Installing the Gas Sampling Probe and Filter Unit

Choosing the Extraction Point

- The extraction point must be suitable for extracting a representative specimen flow.
- The probe tube must be easily accessible to allow maintenance work to be performed.
- Protect the filter unit FE2 against direct heat radiation, rain, draught and extreme contamination. If necessary, protect the filter unit with a protective box.

In the case of emission measuring devices the responsible technical inspection association specifies the extraction point.

Installing the Gas Sampling Probe and Filter Unit

- Follow the “Piping Plan” in the system documentation.
- Install the wall tube with mounting flange (DN 65, PN 6, type B according to DIN 2573) at the extraction point in such a way that the probe tube can be easily installed and removed.
- Minimum distance x of the mounting flange from the wall as a function of the installation angle α (see Figure 1):

Installation angle α in °	10	15	20	25	30	35
Minimum distance x in mm	229	248	268	287	307	324

- Align the boreholes of the mounting flange in relation to the flow direction of the process gas.
- Mount the gas sampling probe and filter unit:

  The weight of the pre-assembled probe tube with filter unit amounts to approx. 20–32 kg! Two persons are needed for transportation and mounting!

  - Probe tube type 40 (see Figure 2): Insert the pre-assembled probe with filter unit into the wall tube and screw the flange of the filter unit to the mounting flange.
  - Heated probe tube type 42 (see Figure 3): Insert the probe tube into the wall tube and screw it to the mounting flange. Mount the filter unit to the flange and fasten it.
- Connect the electrical leads of the gas sampling probe and the filter unit following the “Wiring Plan” and “Terminal Plan” in the system documentation.

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Figure 1

Mounting of Probe Protective Case with PFE2 Filter Unit

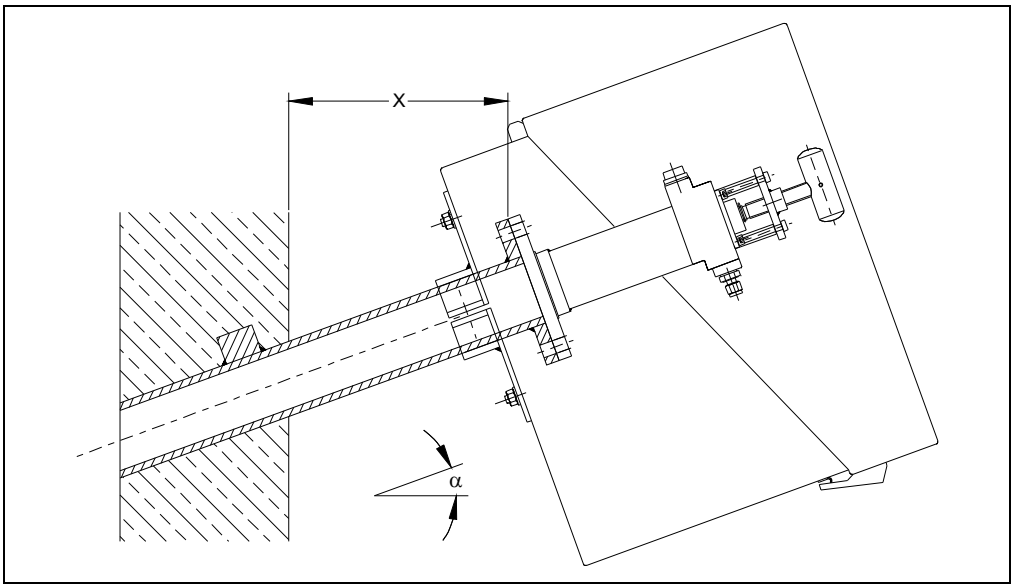


Figure 2

Probe Tube Type 40

L1 = Length of the probe tube (dimensions in mm)

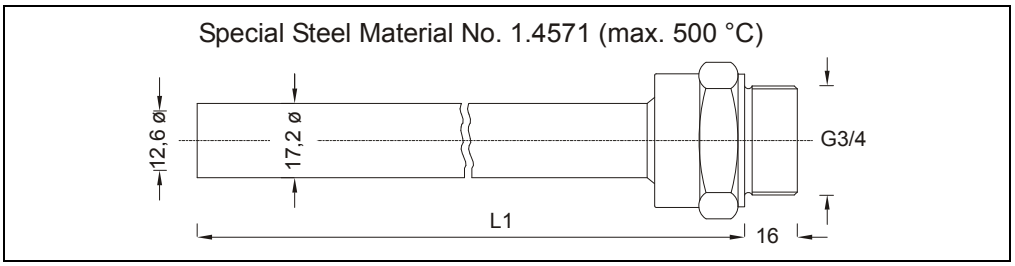
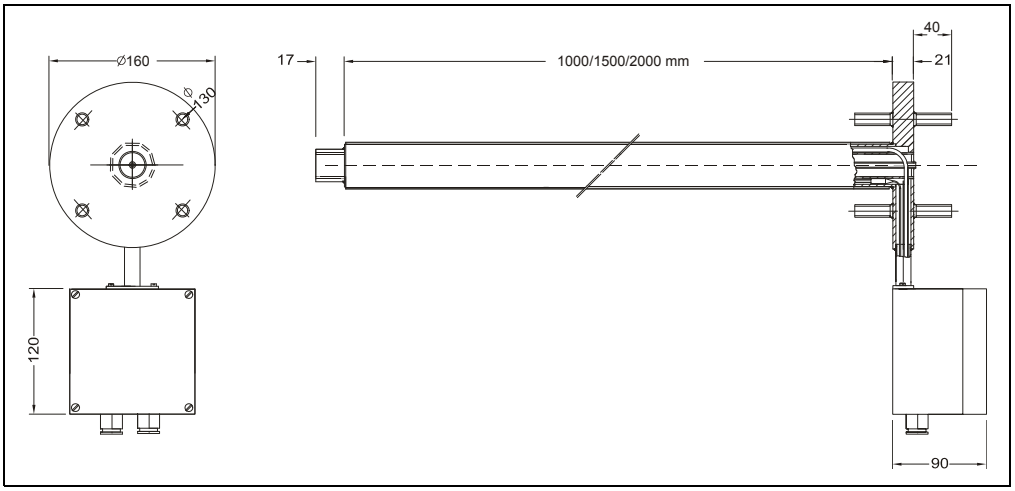


Figure 3

Probe Tube Type 42

(dimensions in mm)



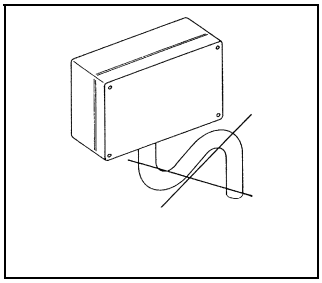
Installing the Sample Gas Line

Installing the Sample Gas Line

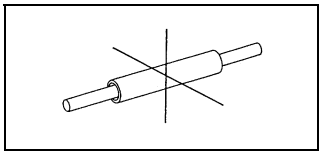
- Follow the “Piping Plan” in the system documentation.
- Connect the sample gas line to the gas sampling probe.

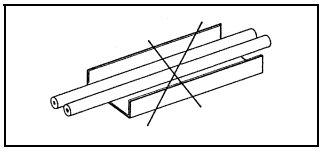
  ⚠ When a VOC analyzer is installed in the analyzer system no fat or grease should be used during installation of the sample gas line. Otherwise the measurement values would drift for a prolonged period of time.

- The sample gas line from the gas sampling probe to the analyzer cabinet should be sloped and, if possible, run along a separate route. Make sure to prevent the formation of water pockets, especially at the sampling point.

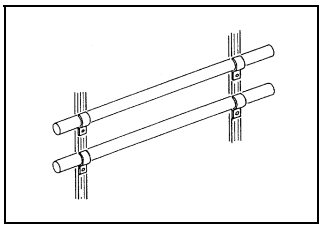


- Route the sample gas line so as to avoid sharp bends, kinks or crossings with other lines. The minimum bending radius is 100 mm.
- The heated sample gas line
  - should never be run through walls where there is a possibility of subsequent closure with sealing compound – this can damage the sample gas line;
  - should not be run in a conduit;
  - should not be located together with other gas or electrical lines in a cable run – especially not in an enclosed cable run.





- Fasten the sample gas line to free-running C-shaped profiles by means of BBS hose clamps with mating piece. Do not tighten too much.



- Route the sample gas line through the opening provided in the right wall of the cabinet.

  ⚠ Do not yet connect the sample gas line to the sample conditioning block! This will be done by the ABB personnel during commissioning. However, connect at first a sufficiently long PTFE pipe (approx. 0.5 m) to the sample conditioning block in order to guarantee that after switching on the FTIR spectrometer ambient air is sucked in from outside of the analyzer cabinet.

- Connect the electrical leads of the sample gas line following the “Wiring Plan” and “Terminal Plan” in the system documentation.

Installing the Instrument Air and Test Gas Supply

Installing the Instrument Air Supply

- Instrument air requirements, see page 11
- Material required, see page 15
- Follow the “Piping Plan” in the system documentation.
- Install the air purifier near the analyzer cabinet.
- Connect the air purifier power supply to the receptacle provided in the right wall of the cabinet.
- Connect the instrument air supply system and the instrument air lines to and from the air purifier to the bulkhead connectors provided for this purpose on the right wall of the cabinet.
- Install a shutoff valve with a p_e = 4.5-7 bar pressure gauge in the instrument air supply system.

Setting Up the Test Gas Cylinders

- Follow the “Piping Plan” in the system documentation.
- Fit the test gas cylinders with pressure reducers and place them near the analyzer cabinet.
- Comply with permissible ambient temperatures and the warning labels on the pressure reducers.

Connecting the Gas Lines

- Material required, see page 15
- Follow the “Piping Plan” in the system documentation.
- Pay special attention to complete cleanliness when connecting the gas lines. Gas inlets, outlets, fittings, tubes and pipes must be free of dust and grease.
- Heat the gas lines if there is a danger of frost.
- The ports (bulkhead connectors) for the gas lines are on the right wall of the cabinet. Be sure to use a backup wrench when tightening the bulkhead connectors.

Test Gas

- Connect the test gas lines. Short test gas lines result in short lag times.

Combustion Gas for the VOC analyzer

- Clean the combustion gas line: Pump cleaning agent (alkaline cleaner, solvent, stainless steel pickling fluid) through the tube. Purge tube thoroughly with distilled water. Purge tube for several hours at a temperature above 100 °C with synthetic air or nitrogen (10 to 20 l/h). Close off tube ends.
- Connect the combustion gas line: Connect two-stage pressure-reducing valve (for ultra-pure gases) with flow limiter to the combustion gas cylinder. Connect combustion gas line to the combustion gas inlet bulkhead connector.
  Note: For safety reasons, a flow limiter is integrated in this bulkhead connector to limit the combustion gas flow to 10 l/h.
- Check combustion gas line seal integrity: Adjust the high-pressure stage of the pressure-reducing valve of the combustion gas cylinder to p_e = 1200 ± 100 hPa (1.2 ± 0.1 bar) and purge the combustion gas line. Check seal integrity of the combustion gas line with a leak detector (measuring principle: thermal conductivity). Close combustion gas cylinder.

Continued on next page

Exhaust Gas

- Connect the exhaust gas line (using the shortest possible line with an I.D. ≥ 8 mm). Allow the exhaust air to pass freely and do not install reduction sections or shutoff valves. Note: The diameter of the exhaust gas line should be widened at the shortest possible distance behind the cabinet to prevent any backpressure due to long line length.
- Provide a separation for air and condensate after the exhaust. Due to the principle of the gas transportation the sample gas is diluted after measurement with the instrument air by a ratio of approx. 1:5. In spite of this condensation occurs when the water dew point of the mixture reaches the ambient temperature.
- Do not connect the exhaust gas line with the drain line of the air conditioning unit. Due to diffusion aggressive gases could damage the air conditioning unit.

Purge Gas (Probe)

- Connect the purge gas line to the gas sampling probe. The purge gas line can run along the same route as the sample gas line.

WARNING!

Some of the gases measured with the analyzer system are harmful to health.

Therefore, the sample gas must not escape from the gas path during normal operation and maintenance works.

A seal integrity check of the analyzer system has to be performed at regular intervals.

The diluted exhaust gas must be drained out of the installation room of the analyzer cabinet.

Connecting the Electrical Leads

Connecting the Electrical Leads

- Material required, see page 15
- Follow the “Layout Plan”, “Wiring Plan” and “Terminal Plan” in the system documentation.
- The cable glands for the electrical lines are on the left wall of the cabinet.
- When routing the electrical lines, follow all applicable national safety regulations for the installation and operation of electrical devices.

Connecting the Signal Leads

- Route the signal leads separately from the power supply lines.
- Locate the analog and digital signal lines separately from each other.
- Carefully plan the arrangement of signal leads in the cables as well as the use of openings for cable connectors.
- Connect the signal leads to the terminal strips on the rear wall of the cabinet.
- Cable shielding should be connected according to local regulations. Differences in potential and signal interference must be taken into consideration.

Connecting the Input Wiring

⚠ High leakage current: 6 mA!

- Power supply requirements, see page 12
- Before connecting the power supply, make sure the analyzer system voltage is set to match the line voltage.
- The protective lead connector and protective lead should be connected before any other connection is made. The analyzer system can be hazardous if the protective lead is interrupted inside or outside the system or if the protective lead is disconnected.
- Connect the input wiring of the analyzer cabinet and the heated sample components (temperature-resistant as needed) to the terminal strips on the left wall of the cabinet.
- Connect the Pt-100 resistance thermometer leads to the terminal strips on the rear wall of the cabinet.

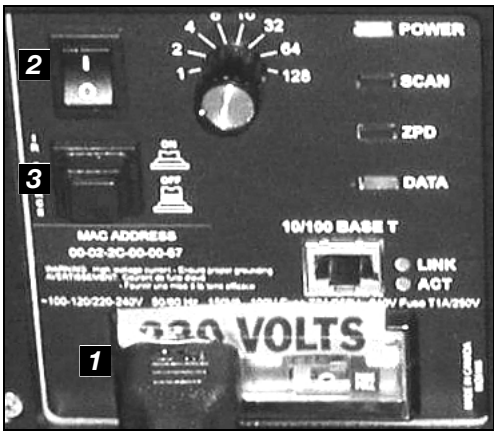
Preliminary Power Supply for the FTIR Spectrometer and the IR Source

⚠ During the period of time between installation and commissioning, the FTIR spectrometer and the IR source must be powered on.

1 Connect a power supply cable to the receptacle of the FTIR spectrometer.

2 Switch on the FTIR spectrometer.

3 Switch on the IR source.



Analyzer System Components

Your analyzer system as delivered may differ from the version described in this section and shown in the following plans.

Sample Gas Intake

- Probe tube made of stainless steel, unheated (Type 40) or heated (Type 42)
- Filter, heated (Type PFE2) with check valve, with backflush (on request)
- Sample gas line, heated (Type TBL01)

Sample Gas Preparation

- Sample conditioning block, heated with
  - Stainless steel micro filter
  - Air injector
- Aspirator pump module with
  - Automatic purge gas and test gas control
- Flow, pressure and temperature sensors

Air Purifier

- Zero gas for spectrometer and oxygen analyzer
- Purge gas for the spectrometer and entire sampling system

Analyzers

- FTIR spectrometer with heated sample cell
- Oxygen analyzer (ZrO_2 detector, optional)
- VOC analyzer (Flame ionization detector, optional)

Control, Operation and Display

- Display/control unit in the analyzer cabinet door
- Advance Optima system controller
- FTIR controller
- Control of air injector and oxygen and VOC analyzers
- Interfaces
  - Measured values and status signals (analog and digital outputs or Modbus)
  - Remote control and diagnostics (Modem and/or Ethernet)

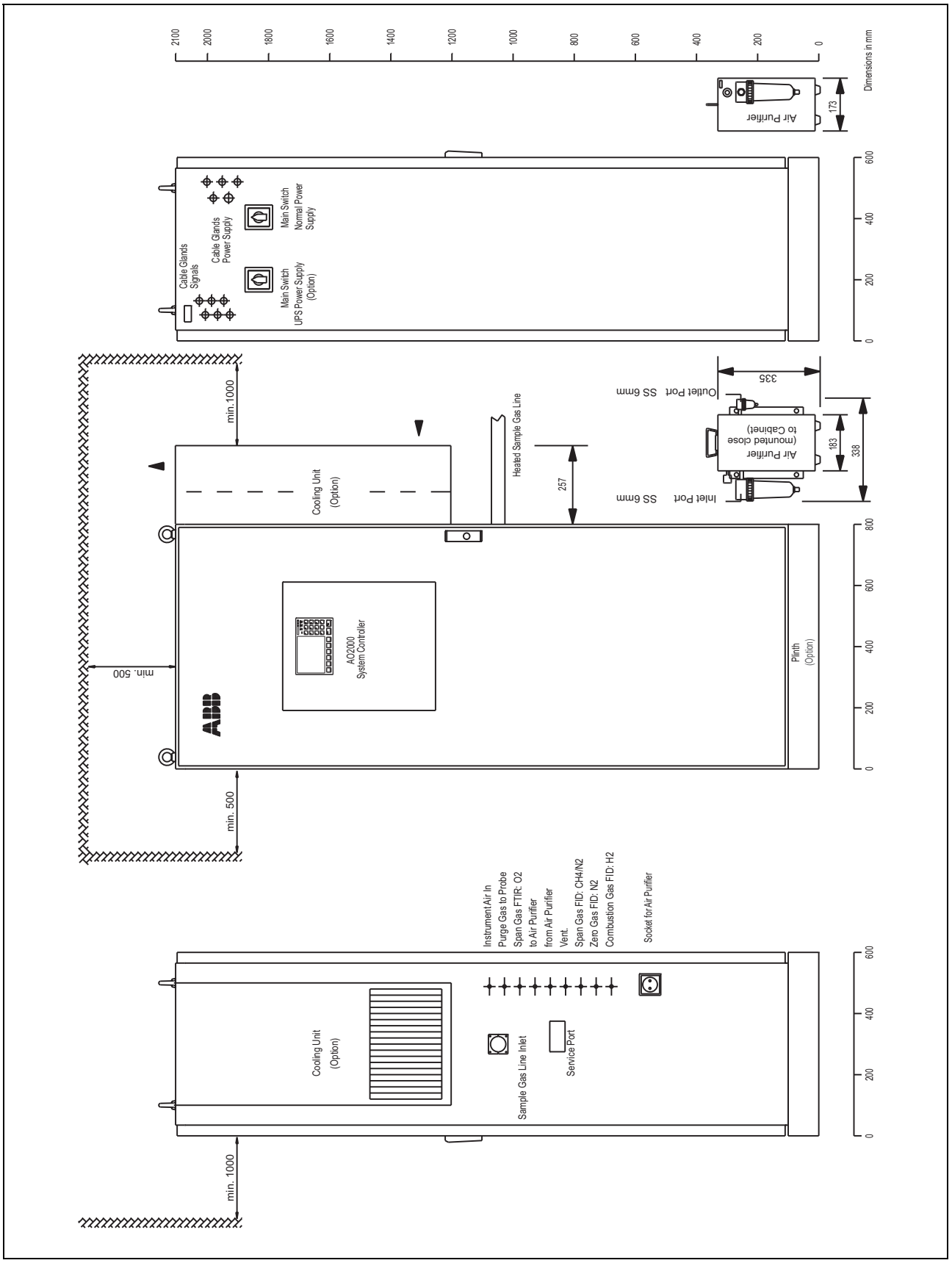
System Design for Measurement of HF

Type designation: ACF-NT V0309

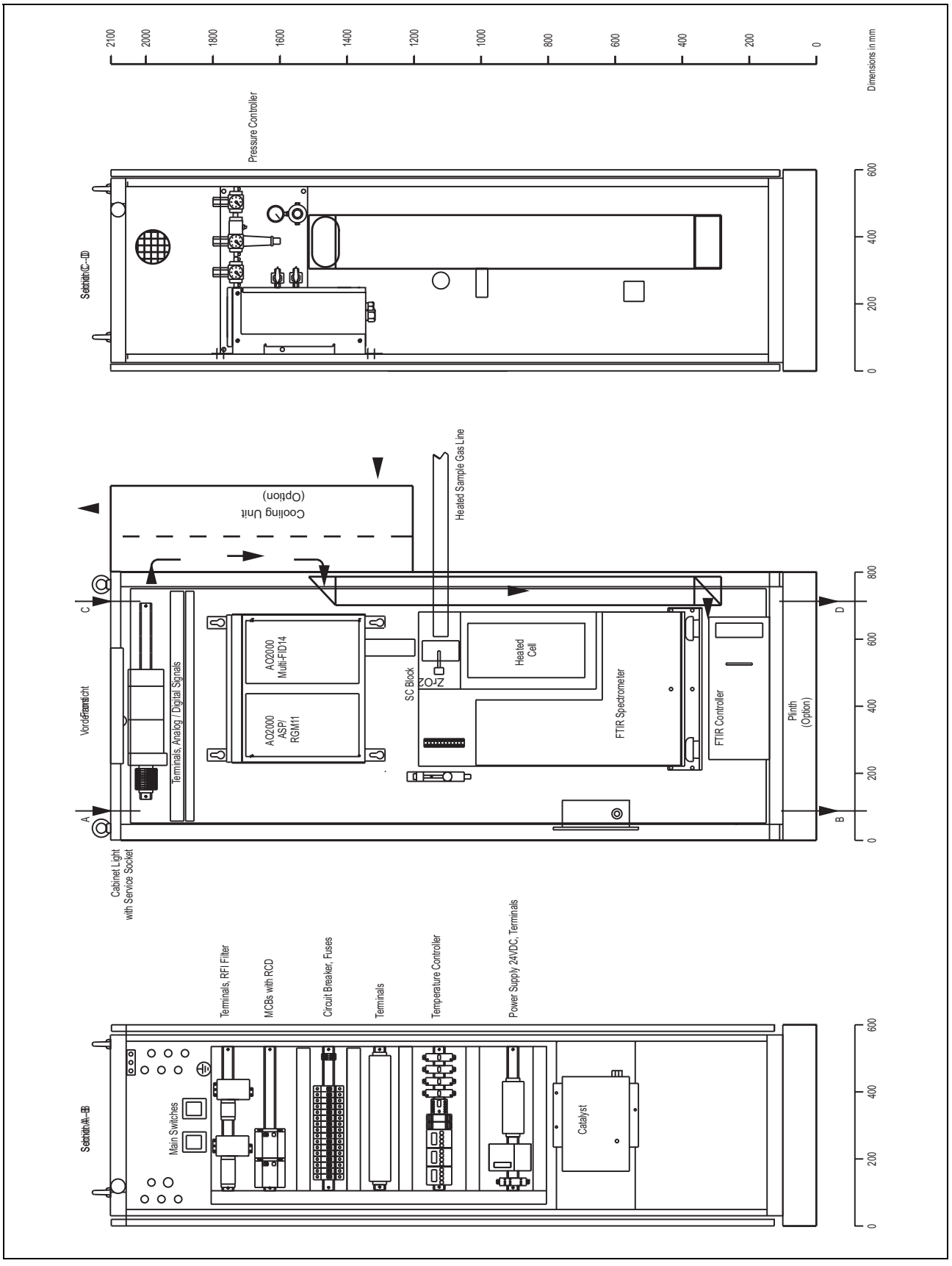
The analyzer system is equipped with a cooling unit which ensures the reliable operation of the analyzer in a temperature range from 20 °C to 25 °C. The cooling device guarantees these conditions in an ambient temperature range between +5 °C and +40 °C.

The analyzer system must be operated with the following software versions:
- FTIR Controller: Windows® XP Professional operating system
- FTSW 100: Software version 2.61
- AO2000 System Controller: Software version 3.0.6

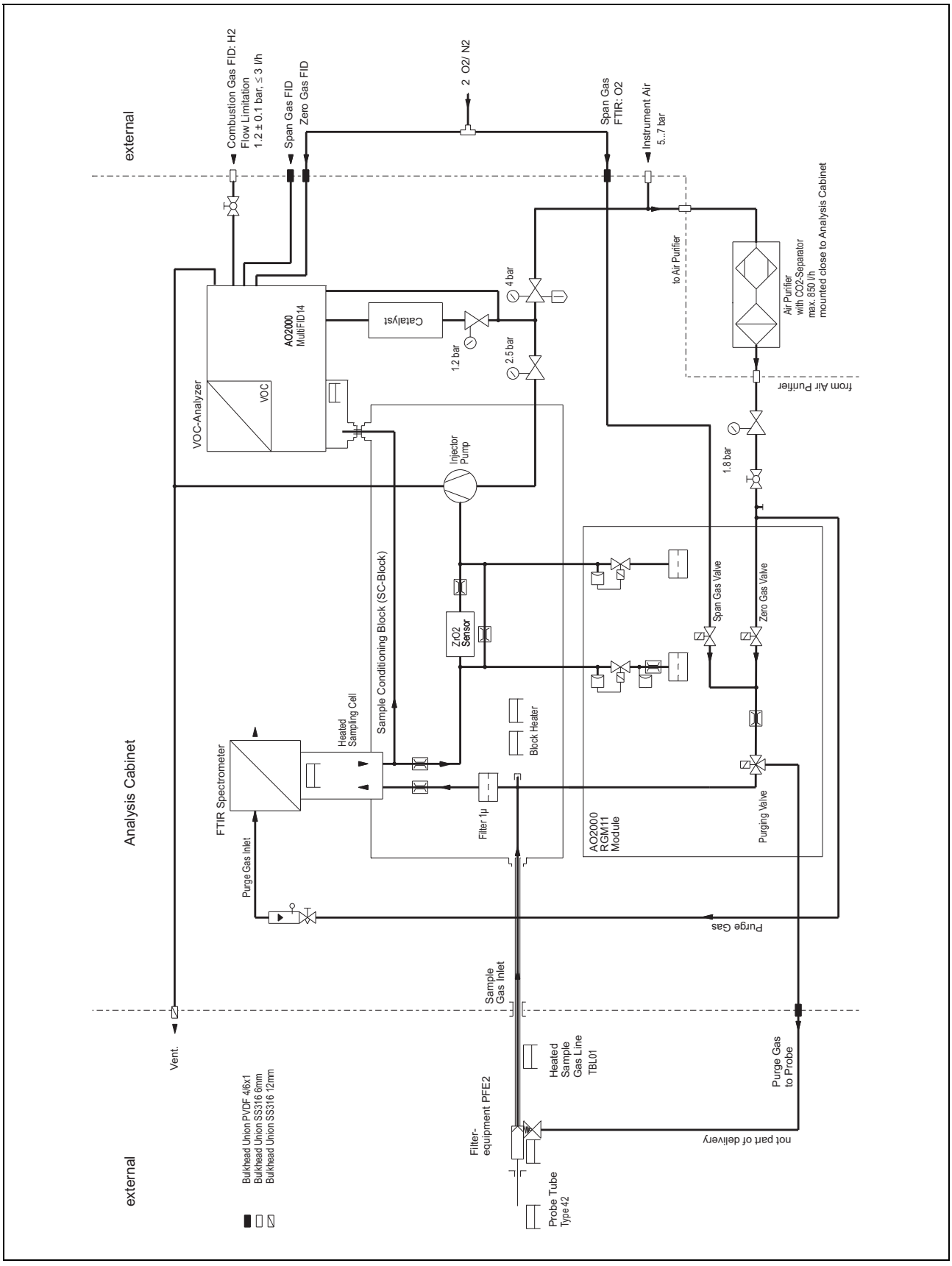
Layout Plan: Exterior View



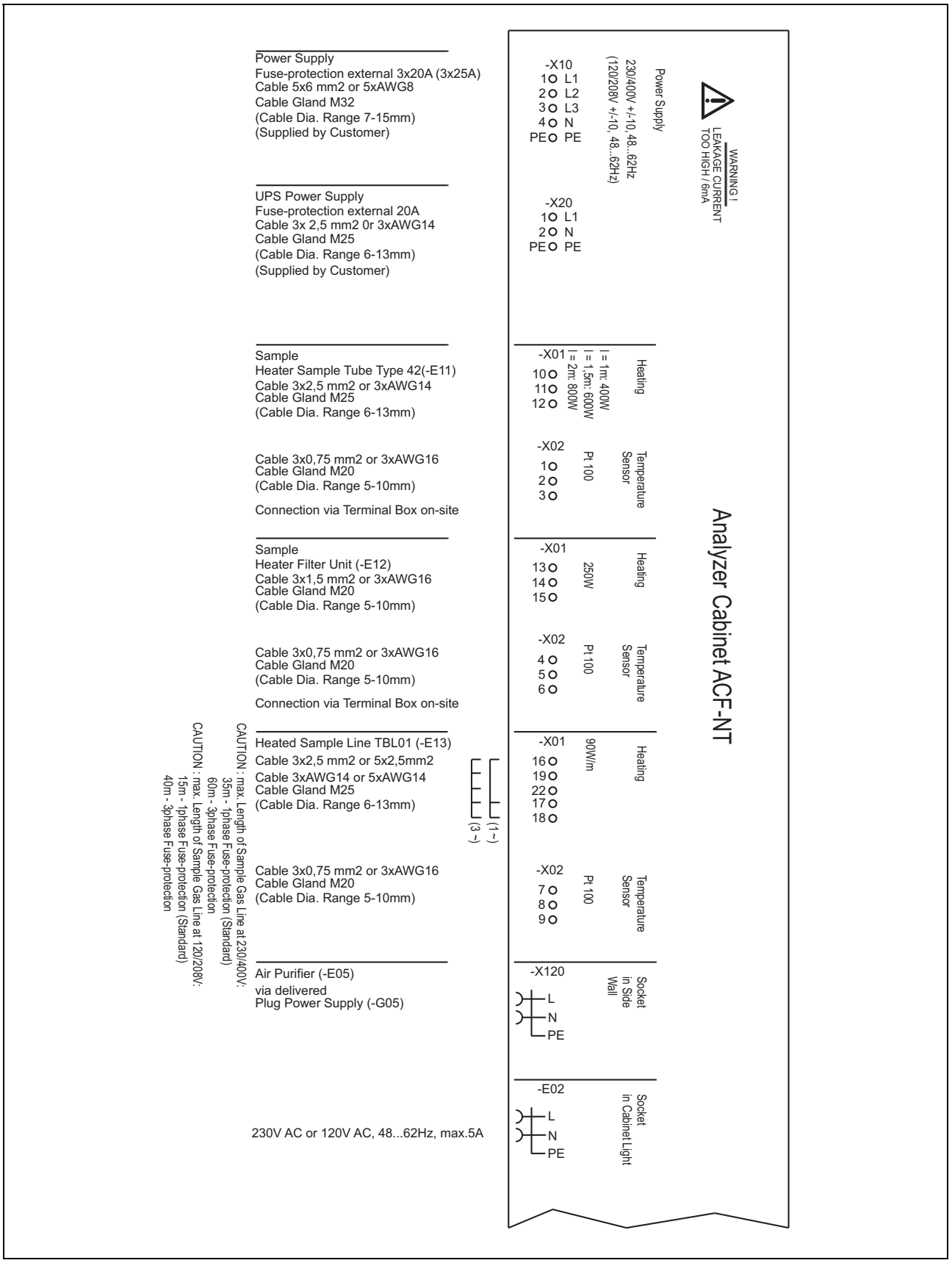
Layout Plan: Interior View



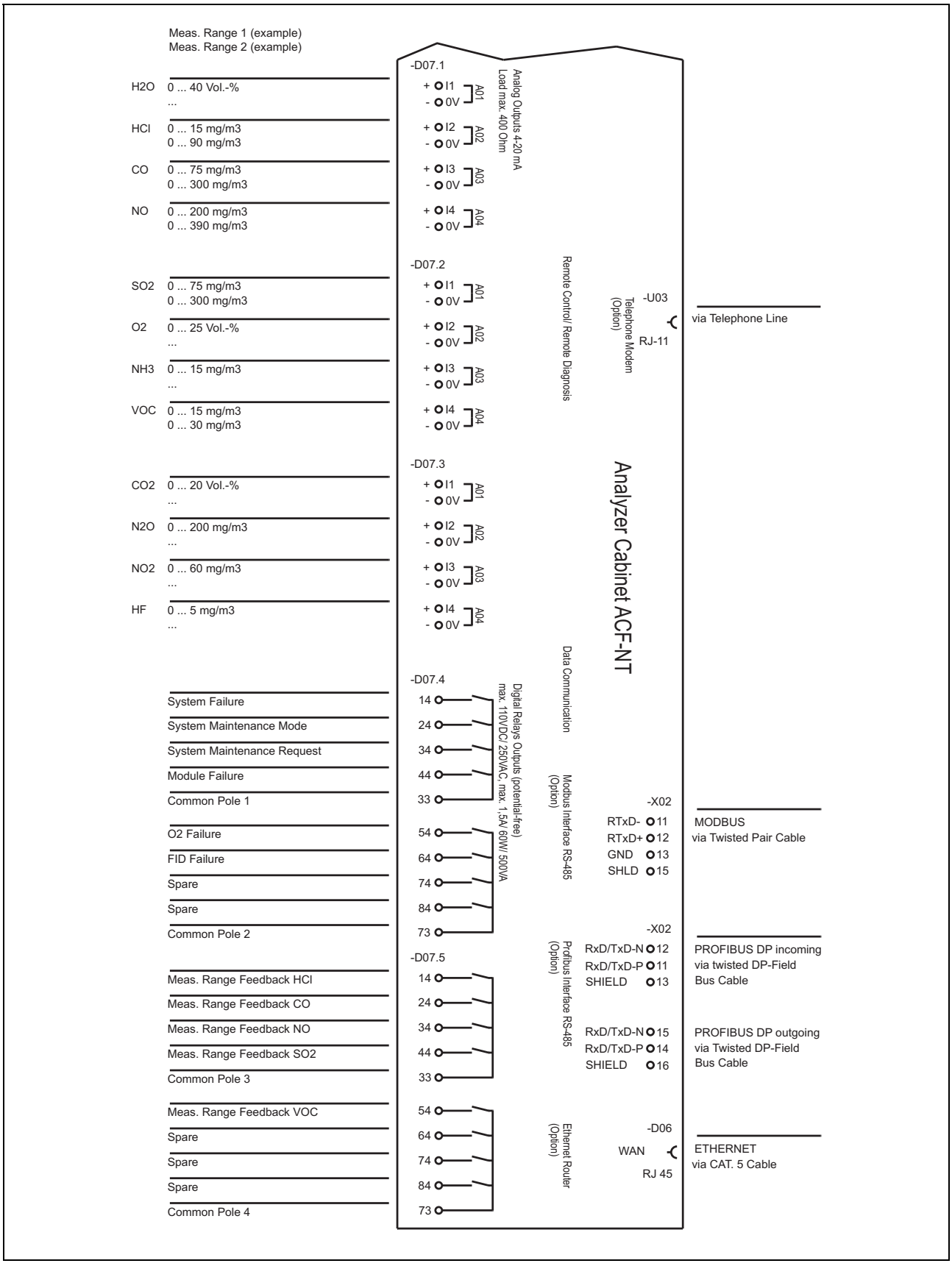
Piping Plan


external
Combustion Gas FID: H2
Flow Limitation
1..2 ± 0.1 bar, ≤ 3 l/h
Span Gas FID
Zero Gas FID
2 O2/ N2
Span Gas
FTIR: O2
Instrument Air
5..7 bar
to Air Purifier
Air Purifier
with CO2-Separator
max. 850 l/h
mounted close to Analysis Cabinet
from Air Purifier
4 bar
2.5 bar
1.2 bar
AO2000
MultiFID14
Catalyst
VOC-Analyzer
VOC
Injector
Pump
1.8 bar
Analysis Cabinet
Sample Conditioning Block (SC-Block)
ZrO2
Sensor
Span Gas Valve
Zero Gas Valve
Heated
Sampling Cell
Block Heater
FTIR Spectrometer
Filter 1µ
AO2000
RGM11
Module
Purging Valve
Purge Gas Inlet
Purge Gas
Sample
Gas Inlet
Vent.
Heated
Sample
Gas Line
TBL01
Purge Gas
to Probe
Filter-
equipment PFE2
not part of delivery
Probe Tube
Type 42
external
Bulkhead Union PVDF 4/6x1
Bulkhead Union SS316 6mm
Bulkhead Union SS316 12mm

Connection Plan: Power Supply



Connection Plan: Signal Leads



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