Overview

The function of the SIPROCESS UV600 gas analyzer is based on UV resonance absorption spectrometry. It also is used to measure very low NO, NO2,SO2$_{or H2}$S concentrations in gases.

Benefits

- For NO, NO_2, SO_2: Very low cross-sensitivity with other gases

- All modules are thermostatically-controlled, and thus independent of the ambient temperature

- Simultaneous measurement of NO and NO_2 with subsequent calculation of total. Therefore neither an NO_2 converter nor a CLD analyzer is required.

- Measurement in the UV range:
  - No cross-sensitivity with H_2O and CO_2
  - Very low SO_2 and NO measuring ranges possible

- UV resonance absorption spectrometry:
  - Measurement of very low NO concentrations
  - Very low cross-sensitivity possible

- Very long service life of UV lamp (usually 2 years)

- Low drifts and high stability thanks to four-channel measuring method with double generation of quotient

- True reference measurement for low-drift, stable results

- Interface for remote monitoring in networks and linking to process control systems

- Optional calibration unit
  - Filter wheel with calibration cells which can be automatically swung into the optical path
  - Low consumption of calibration gas
  - Manual or automatic calibration possible

Application

Emission measurements

- Measurement of low NO concentrations in power plants or gas turbines

- Monitoring of NOx in denitrification plants by direct measurement of NO and NO_2 as well as summation to NOx in the analyzer

- Efficient measurement in desulfurization plants

- Monitoring of very small SO_2 and NO concentrations

- Emission measurements in the paper and cellulose industries

Process monitoring

- Measurement of SO_2 in process gases in the paper and petrochemical industries

- Optimization of NOx emissions in exhaust gas in the automotive industry

H_2S measurement

- In typical emission applications

- Taking account of possible cross-sensitivities (e.g. from mercaptan)

# Extractive continuous process gas analytics
SIPROCESS UV600

Design

- 19" rack unit with 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Internal gas paths: hose made of FKM (VitonTM) or pipe made of PTFE or stainless steel
- Gas connections for sample gas inlet and outlet and for reference gas: Fittings, pipe diameter of 6 mm or ¼"

Display and operator panel

- Large LCD panel for simultaneous display of measured value and device status
- Sensor buttons with context-based button functions
- Display protected by glass pane
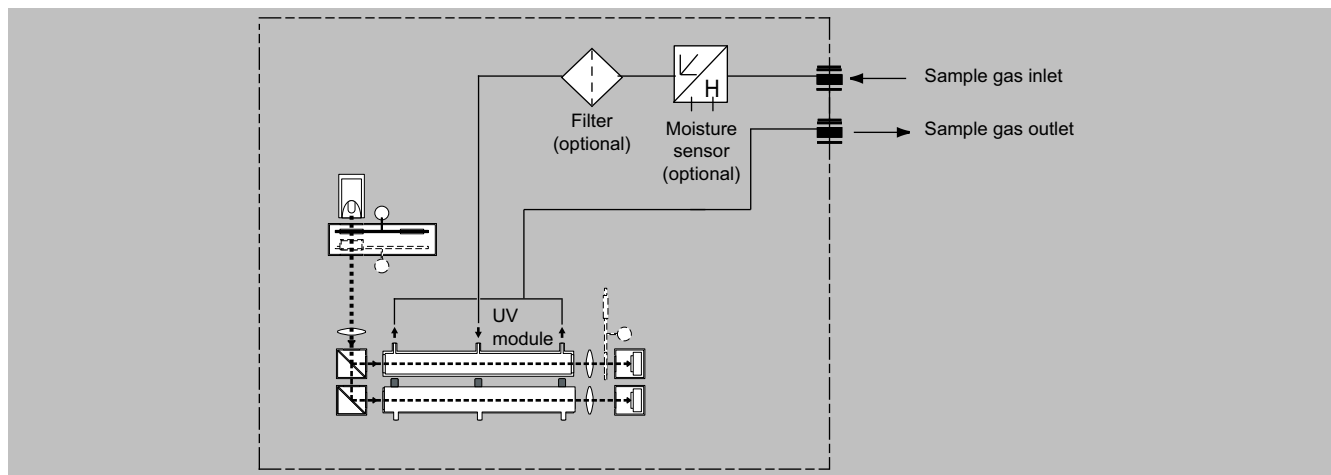- Contrast of the LCD display can be adjusted
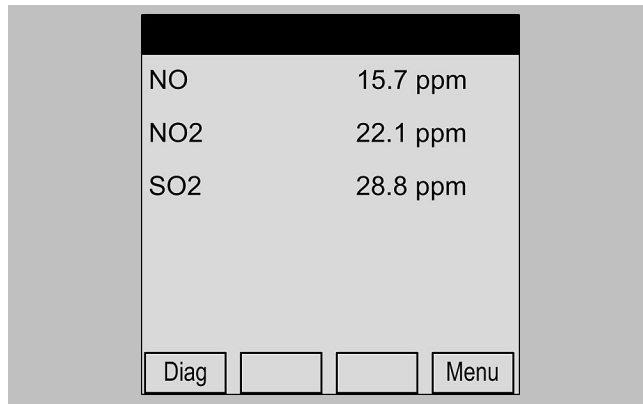
SIPROCESS UV600, display and control panel

Inputs and outputs

- 2 configurable analog inputs

Gas flow chart

SIPROCESS UV600, gas flow chart

- 4 configurable analog outputs
- 8 digital inputs
- 8 digital outputs

Communication
Connection via SIPROCESS UV600-specific software tool

Materials wetted by sample gas

Component	Material
Analyzer unit (sample chamber)	Aluminum or stainless steel mat. no. 1.4404 [1], epoxy resin
Optical window	CaF$_2$ or quartz[1], epoxy resin
Gas path, gaskets	FKM (Viton), PTFE, stainless steel mat. no. 1.4571[1]
Chamber	Aluminum or stainless steel[1]
Gas inlet/outlet	PVDF, stainless steel, mat. no. 1.4401[1]
Moisture sensor	Stainless steel mat. no. 1.4571, platinum, epoxy resin
Diaphragm pump	
• Central body	PVDF
• Diaphragm	FKM (Viton), EPDM

[1] Depending on the version

Mode of operation
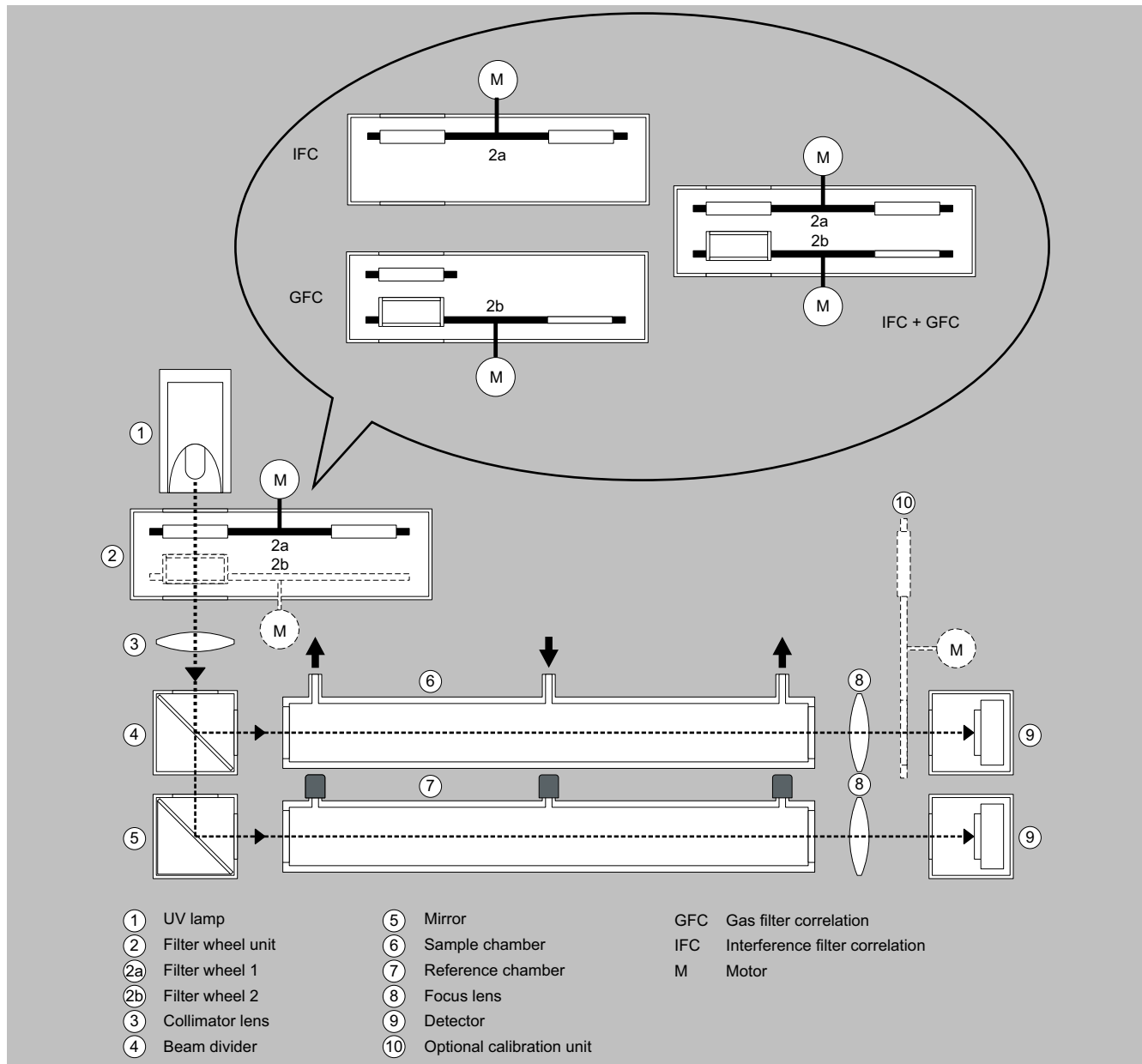
SIPROCESS UV600, operating principle

The measuring principle of the SIPROCESS UV600 is based on the molecule-specific absorption of gases in the ultraviolet wavelength range. Radiation of a wavelength appropriate to the measurement is passed through the sample, and the selective absorption which is proportional to the concentration of the measured component is determined.

Measuring method

An electrode-less discharge lamp (1) emits broadband in the ultraviolet spectral range. A filter wheel unit (2) generates the ultraviolet radiation suitable for the respective measured component. Either interference filter correlation (IFC) or gas filter correlation (GFC), or a combination of the two methods, can be used for this purpose.

Interference filter correlation (IFC)

The sample and reference radiations are generated alternately with two different interference filters being swung into the beam path (filter wheel 2a).

Gas filter correlation (GFC)

Especially when NO is the measured component, the reference radiation is generated by swinging in a gas filter which is filled with the associated gas (filter wheel 2b).

IFC and GFC

The two filter wheels are combined in order to measure NO in combination with other measured components.

Extractive continuous process gas analytics
SIPROCESS UV600

Mode of operation (continued)

Design of the UV analyzer module

After passing through the filter unit, the beam is directed via a lens (3), a beam divider (4) and a mirror (4) into the sample chamber (6) and reference chamber (7).

The sample beam passes through the sample chamber (6), into which sample gas flows, and its intensity is weakened in line with the concentration of the measured component. The reference beam is directed via a mirror (5) into the reference chamber (7). This is filled with a neutral gas.

The detectors (9) receive the sample and reference beams in succession. These measured signals are amplified and evaluated using electronics.

The measuring system is temperature-controlled to minimize external temperature influences.

The physical state of the measuring system is recorded simultaneously through time-shifted detection of the reference beam, and compensated if necessary.

A quotient is generated for each detector from the determined signal values, and the ratio of these quotients determined. This double generation of quotients means that symmetrical signal drifts are compensated in the best possible manner in addition to proportional signal drifts.

Note

The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.

Additional measures depending on the application must be taken when introducing gases with flammable components at concentrations above the lower explosive limit (LEL). Please contact the technical department in such cases.

Function

Signal connections

The SIPROCESS UV600 is supplied as standard with one or (optionally) two input/output modules. The logic function of the signal connections can be configured individually with the service and maintenance software specific to SIPROCESS UV600.

The signal connections are available at terminal strips X3, X4, X5 and X7 on the 12-pin plug connectors of the input/output modules. The scope of delivery includes the corresponding counterparts (plug connectors) with screw terminals.

Inputs and outputs

Characteristics of the digital inputs:

- Floating optocouplers with common reference potential (DIC)

- Switching range 14 ... 42 V DC (external control voltage)

- The digital inputs can be operated either with positive or negative voltage

- With inverted switching logic, the logic function of the control input is active if no current is flowing through the control input

- Maximum voltage ± 50 V

Characteristics of the digital outputs:

- Floating relay changeover contacts

- 1-pole changeover switch, three connections

- Maximum voltage ± 50 V

- Connect inductive loads (e.g. relays, solenoid valves etc.) via spark-quenching diodes only

- Maximum load rating (standard): Max. 30 V AC, max. 48 V DC, max. 500 mA.

Characteristics of the analog inputs:

- The input signal is an analog current signal (standard 0 ... 20 mA, maximum 30 mA)

- The signal current must be provided by an external current source

- Load (internal resistance) of analog input: 10 Ω

- Reference potential GND (see figure, analog inputs)

- Overcurrent protection: ± 1 000 mA

- Maximum voltage: ± 50 V

Characteristics of the analog outputs:

- Analog outputs are floating (electrically isolated) and provide a load-independent current signal

- Signal range 0 ... 24 mA

- Residual ripple 0.02 mA

- Resolution 0.1%

- Accuracy 0.25% of measuring range end value

- Maximum load 500 Ω

- Maximum voltage ± 50 V

- Adjustable start or error state

Note for electrical isolation:

The electrical isolation is canceled if the negative poles of the analog outputs are connected to GND.

Function (continued)

Note

For all graphical representations of connections and pin assignments, see "Circuit diagrams".

Extractive continuous process gas analytics
SIPROCESS UV600

Selection and ordering data

SIPROCESS UV600 gas analyzer, incl. gas module and barometric pressure compensation			Article No. 7MB2621- ● ● ● ● ● - 0 ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Enclosure, version and gas paths, 19" rack unit for installation in cabinets												
Gas connections: Diameter	*Gas connections: Material*	*Gas paths: Material*										
6 mm pipe	PVDF	Hose / Viton	0									
6 mm pipe	Swagelok	PTFE	1									
6 mm pipe	Swagelok	Stainless steel, with pipes	2									
¼" pipe	Swagelok	Stainless steel, with pipes	3									
1st UV measured component												
Measured component	**Smallest/largest measuring range**	**Corresponds to**										
NO	0 ... 10 / 0 ... 300 ppmv	0 ... 15 / 0 ... 450 mg/m³		A	A							
	0 ... 20 / 0 ... 400 ppmv	0 ... 25 / 0 ... 500 mg/m³		A	B							
	0 ... 25 / 0 ... 500 ppmv	0 ... 35 / 0 ... 700 mg/m³		A	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 70 / 0 ... 1 250 mg/m³		A	D							
NO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 ... 20 / 0 ... 600 mg/m³ [1]		B	A							
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m³		B	B							
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m³		B	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m³		B	D							
SO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 ... 25 / 0 ... 750 mg/m³ [1]		C	A							
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m³		C	B							
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m³		C	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m³		C	D							
H_2S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m³		D	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m³		D	D							
2nd UV measured component												
Measured component	**Smallest/largest measuring range**	**Corresponds to**										
Without						0	0					
NO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 ... 20 / 0 ... 600 mg/m³ [1]				2	1					
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m³				2	2					
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m³				2	3					
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m³				2	4					
SO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 ... 25 / 0 ... 750 mg/m³ [1]				3	1					
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m³				3	2					
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m³				3	3					
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m³				3	4					
H_2S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m³				4	3					
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m³				4	4					
3rd UV measured component												
Measured component	**Smallest/largest measuring range**	**Corresponds to**										
Without								X	X			
SO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 ... 25 / 0 ... 750 mg/m³ [1]						C	A			
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m³						C	B			
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m³						C	C			
	0 ... 50 / 0 ... 1000 ppmv	0 ... 130 / 0 ... 2 600 mg/m³						C	D			
H_2S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m³						D	C			
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m³						D	D			
Language of the operating software												
German										0		
English										1		
French										2		
Spanish										3		
Italian										4		

[1] Smallest measuring range 0 ... 10 ppmv requires daily calibration and thermostatically controlled environment (± 2 °C) Use of an additional calibration unit (B11, B12 or B13) recommended. Two measured value outputs are required on the I/O module for this measuring range switchover. A maximum of 4 measured value outputs are available per I/O module. For versions with 3 sample gas components - including more than 1 component with measuring range 0 ... 10/0 ... 300 vpm - a second I/O module (option: A13) is required!

■ Selection and ordering data (continued)

Options	Order code
Add "-**Z**" to article number and then add order code.	
Second I/O module	**A13**
Calibration unit for 1st sample gas component	**B11**
Calibration unit for 1st and 2nd sample gas component	**B12**
Calibration unit for all 3 sample gas components	**B13**
Flow monitor	**C11**

Options	Order code
Humidity monitor	**C12**
Pressure sensor (sample gas)	**C14**
Internal sample gas pump	**C15**
Special setting (only in conjunction with an application no., e.g. special measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
Prepared for QAL1, standard measured-value output in mg/m³	**Y17**

Spare parts

Recommended spare parts for preventive maintenance	2 years (unit)	5 years (unit)	Article No.
Safety filter FI64	1	2	A5E03707235
Power supply units, 24 V DC, 10 A	-	1	A5E03707236
Distribution board	-	1	A5E03707240
FKM hose d = 3/5, length = 1 m	2	5	A5E03707757
MEDL UV lamp with heater	-	1 … 2	A5E03707918
Motor flange 3	-	1	A5E03707919
Motor flange 2	-	1	A5E03707920
Gas filter with holder, for measurement of NO	1	2	A5E03707921
SIPROCESS UV600 chamber H = 300 mm, aluminum	-	1	A5E03707925
Calibration chamber with holder for NO	-	1	A5E03707941
Calibration chamber with holder for SO_2 and H_2S	-	1	A5E03707942
Calibration chamber with holder for NO_2	-	1	A5E03707943
Heater with 380 mm long cable, for SIPROCESS UV600: MEDL, chamber, motor flange	1	2	A5E03707968
Moisture sensor	1	2	A5E41110446
Spare parts set - pressure sensor with gasket and O-ring	-	1	A5E03707970
Flow sensor with temperature sensor	1	2	A5E03707971
Diaphragm pump type 123, 24 V DC / 50 Hz	-	1	A5E03707986
Diaphragm assembly, EPDM for types 110-125	1	2	A5E03707987
O-ring for gas pump suspension	1	2	A5E03707988

Extractive continuous process gas analytics
SIPROCESS UV600

Technical specifications

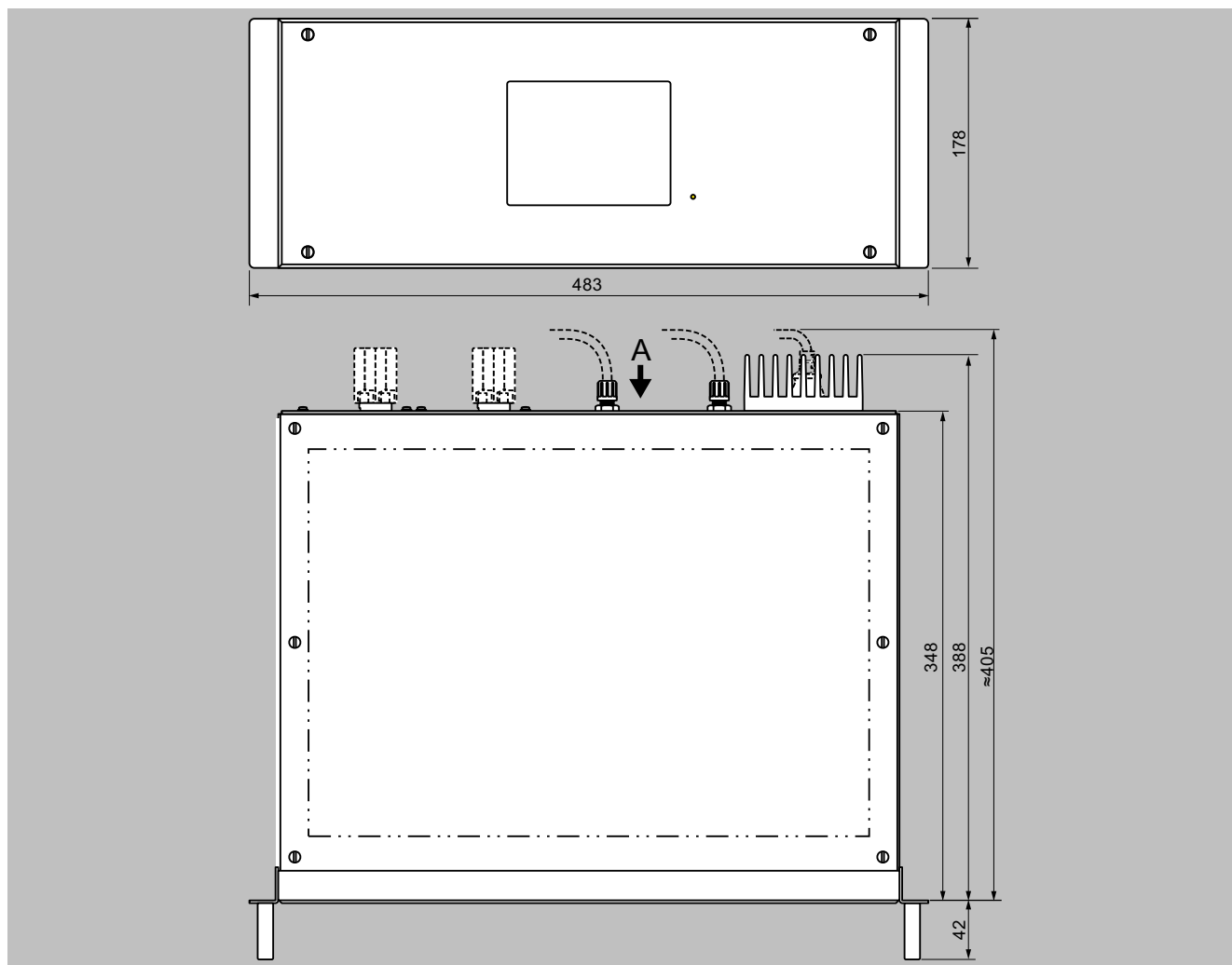| SIPROCESS UV600	
General information	
Measuring ranges	3, automatic measurement range switchover
Detection limit (2σ)	< 1% of measuring span
Smallest possible measuring span	Dependent on order configuration NO: 0 ... 10 / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm NO$_2$: 0 ... 10[1] / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm SO$_2$: 0 ... 10[1] / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm H$_2$S: 0 ... 25 / 0 ... 50 vpm
Largest possible measuring span	Dependent on order configuration NO, NO$_2$, SO$_2$: 0 ... 300 to 0 ... 1 000 vpm H$_2$S: 0 ... 500 to 0 ... 1 000 vpm
UV lamp	
• Design	EDL, electrodeless discharge lamp
• Service life	≈ 2 years (17 500 h)
Conformity	CE mark
Design, enclosure	
Degree of protection	IP40
Weight	approx. 17 kg
Requirements of location of use	
Location of use	Within closed building
Air pressure in the environment	700 ... 1 200 hPa
Relative humidity	10 ... 95%, non-condensing
Permissible contamination	Pollution degree 1
Maximum geographic altitude of location of use	2 500 m above sea level
Permissible ambient temperature	
• Operation	+5 ... +45 °C (41 ... 113 °F)
• Transport and storage	-10 ... +70 °C (14 ... 158 °F)
Service position	Front wall, vertical, max. ± 15° angle for each spatial axis (maximum permissible inclination of the base surface during operation with constant service position)
Permissible vibration/shock	
• Vibration displacement	0.035 mm (in the range 5 ... 59 Hz)
• Amplitude of the starting acceleration	5 m/s² (in the range 59 ... 160 Hz)
Electrical characteristics	
Line voltage (optional, see nameplate)	93 ... 132 V AC, 186 ... 264 V AC
Line frequency (AC)	47 ... 63 Hz
Permissible overvoltages (transient surges in the power supply network)	Up to overvoltage category II in accordance with IEC 60364-4-443
Power consumption	Approx. 50 VA, max. 300 VA
EMC interference immunity (electromagnetic compatibility)	In accordance with EN 61326-1, EN 61326-2-1, EN 61000-6-2, EN 61000-6-4 and EU Directive 2004/108/EC. In the case of electromagnetic radiation in the frequency range from 750 MHz ± 20 MHz, increased measuring errors can occur with small measuring ranges
Electrical safety	In accordance with EN 61010-1
Internal line fuses	
• Primary	6.3 A, not replaceable
• Secondary	8 A
Gas inlet conditions	
Permissible sample gas pressure	Relative to ambient/atmospheric air pressure: -200 ... +300 hPa (-0.2 ... +0.3 bar)
Sample gas flow	20 ... 120 l/h (333 ... 2 000 ml/min)
Sample gas temperature	5 ... 55 °C
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Reference point drift	< ±1%/week of respective measuring span
Zero point drift	

Technical specifications (continued)

SIPROCESS UV600	
• Standard measuring ranges	< ± 1%/week of respective measuring span
• Small measuring ranges (≤ 2x smallest measuring range)	< ± 2%/week of respective measuring span
• Measured components NO, NO$_2$, SO$_2$	< ±1%/day of respective measuring span
Repeatability	< ± 1% of respective measuring span
Linearity error	< ± 1% of respective measuring span
Electrical inputs and outputs	
Analog output	4, 0 ... 24 mA; floating (galvanically isolated), residual ripple 0.02 mA, resolution 0.1% (20 µA), max. output load 500 Ω, max. voltage ± 50 V
Relay outputs	8, with changeover contacts, max. voltage ± 50 V load rating: Max. 30 V AC / max. 48 V DC / max. 500 mA
Analog inputs	2, 0 ... 20 mA, reference potential GND, max. signal strength 30 mA, max. overcurrent protection ±1 A, max. voltage ± 50 V
Digital inputs	8, switching range 14 ... 42 V (external control voltage), max. voltage ± 50 V
Serial interface	RS 485, Ethernet (LAN)

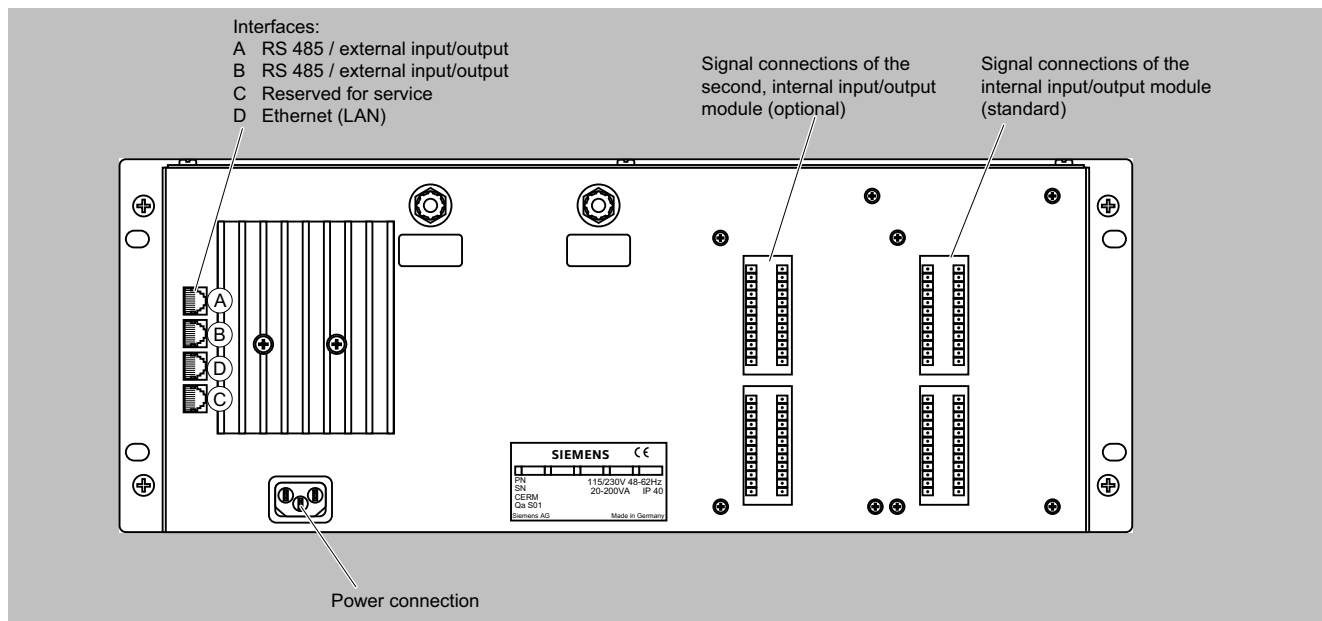[1] Only with daily recalibration and air-conditioned environment (+/- 2 °C)

Dimensional drawings

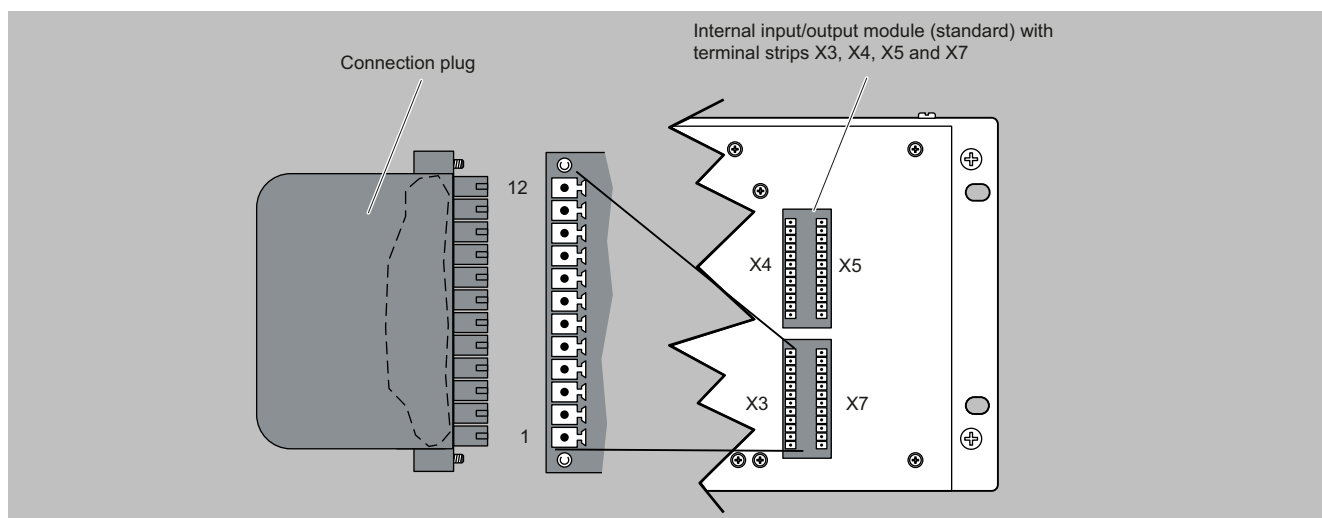SIPROCESS UV600, 19" rack unit, dimensions in mm

Extractive continuous process gas analytics
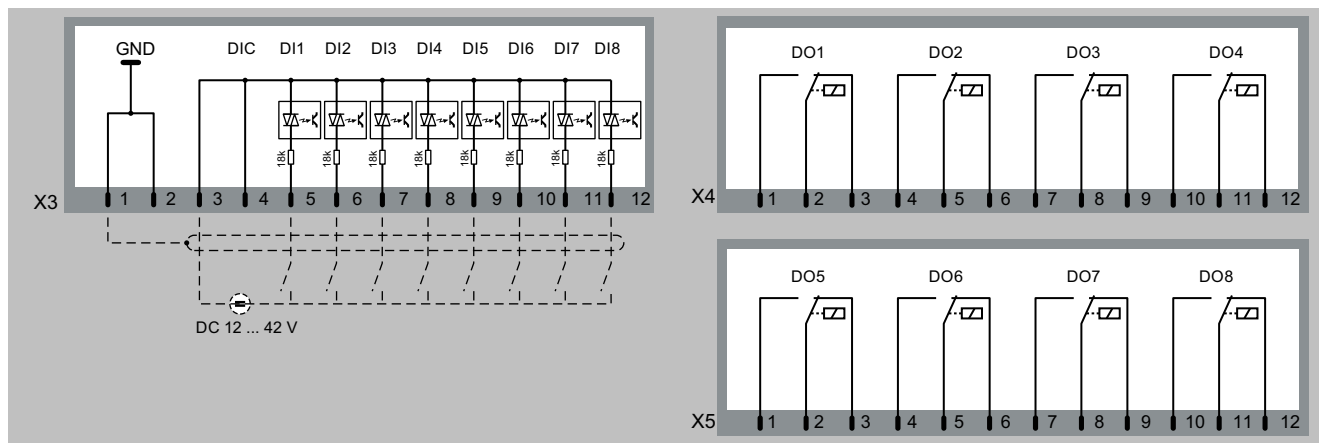## SIPROCESS UV600

Circuit diagrams

Interfaces:
A   RS 485 / external input/output
B   RS 485 / external input/output
C   Reserved for service
D   Ethernet (LAN)

Signal connections of the second, internal input/output module (optional)

Signal connections of the internal input/output module (standard)

Power connection

SIPROCESS UV600, gas connections and electrical connections

Internal input/output module (standard) with terminal strips X3, X4, X5 and X7
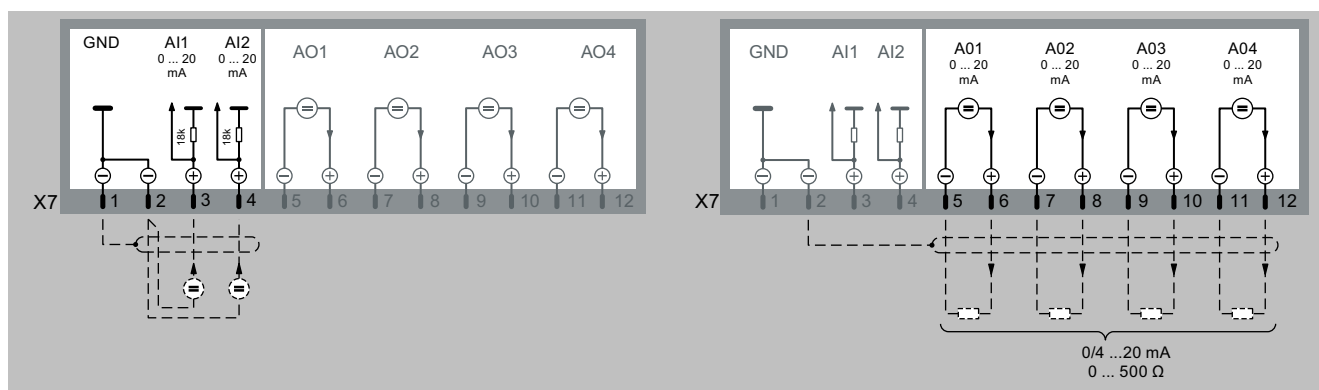
Connection plug

SIPROCESS UV600, signal connections and plug connectors

■ **Circuit diagrams** (continued)

SIPROCESS UV600, pin assignments of digital inputs X3 (DI1 to DI8) and digital outputs X4 (DO1 to DO4) and X5 (DO5 to DO8)

SIPROCESS UV600, pin assignment of the analog inputs X7 (AI1 and AI2) and analog outputs X7 (AO1 to AO4)