



Smart Photoionization Detector Module

PIDS3

User Manual

from software version: 1.02.006

ACI Analytical Control Instruments GmbH
Volmerstraße 9A
D-12489 Berlin
Germany

© ACI Analytical Control Instruments GmbH. All rights reserved.

EU-Konformitätserklärung / EU-Declaration of conformity

Artikelnr. / Part No.: 0003199, 0003198, 0003180, 0003179, 0003178, 0003177,
0003176, 0003143

Name und Anschrift des Herstellers oder seines Bevollmächtigten /
Name and address of the manufacturer or his authorised representative:

Analytical Control Instruments GmbH
Volmerstraße 9A
D-12489 Berlin
Germany

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller. /
This declaration of conformity is issued under the sole responsibility of the manufacturer.

Gegenstand der Erklärung / Object of the declaration:

Smart Photoionisation Module Type: PIDS3-R1-D0-L0-P1-S1-A1
Smart Photoionisation Module Type: PIDS3-R0-D0-L0-P1-S1-A1
Smart Photoionisation Module Type: PIDS3-R2-D0-L0-P1-S0-A1
Smart Photoionisation Module Type: PIDS3-R1-D0-L0-P1-S0-A1
Smart Photoionisation Module Type: PIDS3-R0-D0-L0-P1-S0-A1
Smart Photoionisation Module Type: PIDS3-R2-D0-L0-P0-S0-A1
Smart Photoionisation Module Type: PIDS3-R1-D0-L0-P0-S0-A1
Smart Photoionisation Module Type: PIDS3-R0-D0-L0-P0-S0-A1

Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen
Harmonisierungsrechtsvorschriften der Union / The object of the declaration described above is in
conformity with the relevant Union harmonisation legislation:

EMV-Richtlinie 2014/30/EG - elektromagnetische Verträglichkeit /
EMC-Directive 2014/30/EU - electromagnetic compatibility:

Harmonisierte Normen / harmonized standards:

EN 50270:2015

RoHS-Richtlinie 2011/65/EU - Beschränkung gefährlicher Stoffe in elektrischen und elektronischen
Geräten /

RoHS-Directive 2011/65/EU - restriction of hazardous substances in electrical and electronic
equipment



ACI Analytical Control Instruments GmbH
Dipl.-Ing. Andreas Otto
Managing Director

Berlin, January 2024

Content

1	General.....	6
2	Safety and Usage Instructions	7
2.1	Terms and Symbols	7
2.2	Correct Use	7
2.3	Liability Information.....	8
2.4	Safety and Precautionary Measures to be adopted.....	8
2.5	Permanent Instrument Warranty.....	9
3	Technical data	10
4	Smart Photoionization Detector Modul PIDS3 briefly	11
4.1	Installation.....	12
4.2	Mechanical Installation.....	13
4.3	Electrical Installation.....	14
4.4	Gas supply.....	16
4.4.1	Using the internal optional pump.....	16
4.4.2	Using external pump	17
4.4.3	Using without pump	17
5	Installation hints.....	18
6	Operation	19
6.1	Using the module	19
6.2	Measurement values	21
6.3	Measurement result resolution	21
7	Measurement config.....	23
7.1	Calibration method.....	23
7.2	Gas identification and response factor	23
8	Calibration	24
9	UART Communication	27
9.1	Message frame.....	28
9.1.1	Checksum calculation	29
9.1.2	Message section format.....	30
9.2	Module commands.....	31
9.2.1	Module information commands.....	31
9.2.2	Module control commands	32
9.2.3	Module data commands.....	33

9.2.4	Module Modbus config commands	35
9.2.5	Module current loop config commands	36
9.2.6	Module autostart config commands	36
9.2.7	Module save config data command.....	36
9.2.8	Module relays commands	37
9.2.9	Module alarm commands.....	38
9.2.10	Module lamp commands	37
9.2.11	Module sensor commands	38
10	Modbus Communication.....	39
10.1	Register map	40
10.1.1	Module information register	40
10.1.2	Module measurement values data registers	40
11	Current loop.....	43
11.1	Connection.....	43
11.2	Signals and states.....	44
11.3	Configure measurement range	44
12	Relays	46
12.1	Automatic relay control.....	46
12.1.1	Relay states by device state	46
13	Mechanical Drawing	47
14	Maintenance and Service	47
14.2	How To – Replace the PID lamp/front isolation/sensor block	48
14.3	How To – Clean the PID Lamp.....	50
14.4	Maintenance Intervals	50
15	Ordering information.....	51
15.1	Photoionization Detector Module PIDS3	51
15.2	Type Definition	51
16	Spare parts and Accessories.....	52
17	Contact.....	53

1 General

The company Analytical Control Instruments GmbH (hereinafter the 'manufacturer') provides with the Smart Photoionization Detector Module PIDS3 (hereinafter the 'module') a complete photoionization detector as a closed module.

The module detects volatile organic compounds (VOC) with an ionization potential < 10.6 eV in air*.

Other ionization sources are available.

The ionization source is a high-performance vacuum ultraviolet (VUV) hollow cathode lamp with an energy of 10.6 eV. With its ceramic discharge channel, the stability is improved and a longer service life of up to 15 000 hours and more will be achieved.

With its built-in electronics and microcontroller as well as a combined humidity/temperature sensor, it provides a flexible and easy to use adaptation into your measurement system. The module comes with a built-in linearization and temperature/humidity compensation. Built-in barometric pressure sensors offer later compensation and gas flow monitoring.

The RS485 interface allows additional flexibility to choose the right interface for industrial and laboratory applications. The optional analog 4 ... 20 mA output represents the linearized and compensated concentration value in different scaling.

The module is available in different measurement ranges, with optional included pump and 4 ... 20 mA output and MODBUS.

2 Safety and Usage Instructions

2.1 Terms and Symbols

In this manual, certain common terms and symbols used to warn you of dangers or to give you cautions that are important in avoiding injury or damage. Observe and follow these cautions and regulations to avoid accidents and damage. These terms and symbols explained below.

**DANGER**

Indicates a hazardous situation, which, if not avoided, **WILL** result in death or serious injury.

**WARNING**

Indicates a hazardous situation, which, if not avoided, **COULD** result in death or serious injury.

**CAUTION**

Indicates a hazardous situation, which, if not avoided, **MAY** in minor or moderate injury.

**NOTICE**

Indicates a property damage message.

**Usage**

Indicates a helpful information, hints or recommendation.

2.2 Correct Use

The device is suitable for outdoor and indoor applications that do **not requires explosion protection**, e.g. offshore industry, chemical and petrochemical industry, water and sewage industry. The device comes in a robust enclosure with dust and water protection.

It is imperative that this user manual be read and observed when using the product. In particular, the safety instructions, as well as the information for the use and operation of the product, must be carefully read and observed. Furthermore, the national regulations applicable in the user's country must be considered for a safe use.

**WARNING**

This product is supporting life and health. Inappropriate use, maintenance or servicing may affect the function of the device and thereby seriously compromise the user's life.

Before use, the product operability must be verified. The product must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been made, genuine manufacturer spare parts have not been used.

Alternative use or use outside this specification will be considered as non-compliance. This also applies especially to unauthorized alterations to the product and to commissioning work that has not been carried out by manufacturer or authorized persons.

2.3 Liability Information

The manufacturer accepts no liability in cases where the product has been used inappropriately or not as intended or if seal is broken. The selection and use of the product are the exclusive responsibility of the individual operator. Product liability claims, warranties also as guarantees made by the manufacturer with respect to the product are voided, if it is not used, serviced, or maintained in accordance with the instructions in this manual.

2.4 Safety and Precautionary Measures to be adopted

**WARNING**

The following safety instructions must be observed implicitly. Only in this way can the safety and health of the individual operators, and the correct functioning of the instrument, be guaranteed.

- The device described in this manual must be installed, operated, and maintained in strict accordance with their labels, cautions, instructions, and within the limitations stated.
- The device is designed to detect volatile organic compounds or vapors in air.
- Do not mount the device in direct sunlight as this could cause overheating of the sensor.
- The device must be installed vertical with cable gland and the filter port unit downward to avoid plugging of the gas inlets by particles or liquids.
- The only absolute method to ensure proper overall operation of the device is to check it with a known concentration of the gas for which it has been calibrated. Consequently, calibration checks must be included as part of the routine inspection of the system.
- As with all devices of these types, high levels of, or long exposure to, certain compounds in the tested atmosphere could contaminate the sensor. In atmospheres where the device may be exposed to such materials, calibration must be performed frequently to ensure that the operation is dependable and display indications are accurate.
- Use only genuine manufacturer replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the device, beyond the scope of these maintenance instructions or by anyone other than an authorized manufacturer service personnel, could cause the product to fail to perform as designed.
- The device is designed for applications in hazardous areas under atmospheric conditions.

- Significant dust deposits on the gas inlets will increase the response time of the device. Checks for dust deposits must be done at regular intervals.

2.5 Permanent Instrument Warranty

Warranty

Seller warrants that this product is designed and manufactured to the latest internationally recognized standards by manufacturer under a quality management system that is certified to ISO 9001. As such the manufacturer warrants that this product will be free from defective parts and workmanship and will repair or (at its option) replace any instruments which are or may become defective under proper use within twenty-four [24] months from date of commissioning by an approved manufacturer representative. This warranty does not cover wearing parts, i.e., parts inside the gas way like valves, pumps, lamp and other or damage caused by accident, abuse or abnormal operating conditions.

Defective goods must be returned to manufacturer premises accompanied by a detailed description of any issue. Where return of goods is not practicable manufacturer reserves the right to charge for any site attendance where any fault is not found with the equipment. Manufacturer shall not be liable for any loss or damage whatsoever or howsoever occasioned which may be a direct or indirect result of the use or operation of the Contract Goods by the Buyer or any Party.

This warranty covers instrument and parts sold to the buyer only by authorized distributors, dealers and representatives as appointed by manufacturer. The warranties set out in this clause are not pro rata, i.e. the initial warranty period is not extended by virtue of any works carried out there under.

In no event will manufacturer be liable for any incidental damages, consequential damages, special damages, punitive damages, statutory damages, indirect damages, loss of profits, loss of revenues, or loss of use, even if informed of the possibility of such damages. Manufacturer is liability for any claims arising out of or related to this product will in no case exceed the order value. To the extent permitted by applicable law, these limitations and exclusions will apply regardless of whether liability arises from breach of contract, warranty, tort (including but not limited to negligence), by operation of law, or otherwise.

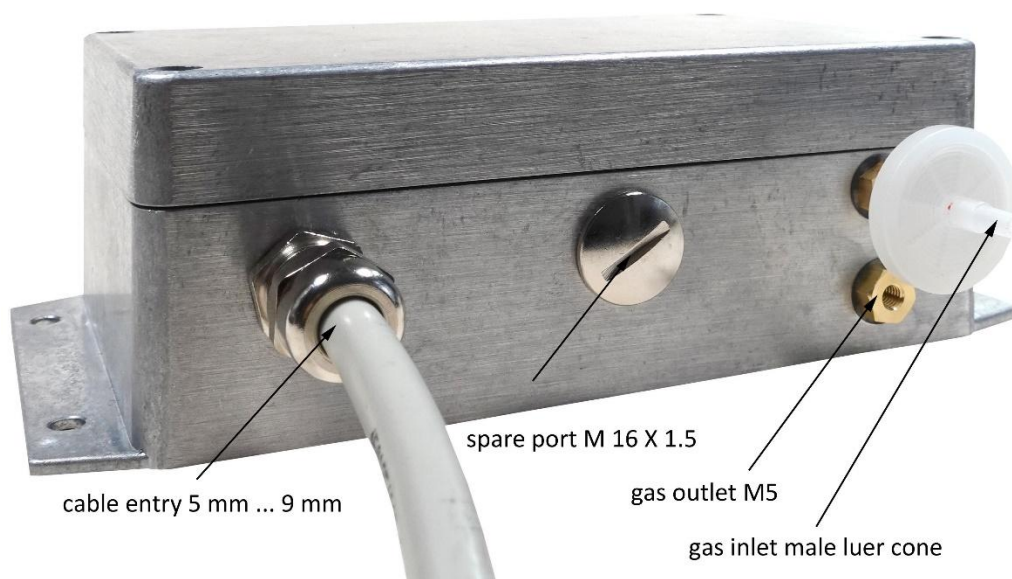
3 Technical data

Detector principle	VUV-Photoionization with 10.6 eV hollow cathode lamp with Ceramic Discharge Channel technology and integrated high voltage supply. (optional 11.8 eV lamp available)
Detection ranges	R0 – 0 ... 2 000 ppm Isobutene * R1 – 0 ... 20 ppm Isobutene * R2 – 0 ... 5 000 ppm Isobutene *
Lower detection limit	R0 – typical 0,050 ppm Isobutene * R1 – typical 0,005 ppm Isobutene * R2 – typical 0,5 ppm Isobutene *
Signal resolution	Dynamic up to 0.01 ppm (R0), 0.5 ppb (R1), 0.1 ppm (R2) or raw precision with 3 digits after the decimal point (5 at low range, 2 at high range)
Response time	T90 < 10 s *
Signal integrity	Up to 100 ppm typical > 98 % * Up to 2 000 ppm typical > 95 % *
Influence of humidity	Humidity and temperature compensation at 0 ... 50 °C and 0 ... 90 % rH residual effect less than < 10 %
Operating conditions	-20 ... +50 °C and 0 ... 90 % rH, non-condensing (-10 ... +50 °C with integrated pump)
Storage conditions	-20 ... +60 °C 0 ... 95 % rH, non-condensing
Gas flow	Required 200 ... 300 ml/min, Sample inlet with dust and water protection filter Optional with integrated pump available
Gas connection	Viton tube 1/8" ID (recommended) Dust and water protection filter required
PID lamp lifetime	10,6 eV: Min. 8 000 hours, typical more than 15 000 hours 11,8 eV: 4 months from date of delivery
Handling	Device configuration via RS485 UART
Digital interface	RS485 (UART or MODBUS) galvanic isolated
Analog interface	Current loop, 4 ... 20 mA (optional) optional 3 SPDT 30 V / 2 A Relays (surge current)
Power supply	10 ... 28 V DC, approx. 1.5 W, recommended 24 V DC
Cable	Cable gland for cable diameter 5 mm ... 9 mm Screw connection inside Conductor cross section solid max. 1.5 mm ² Conductor cross section stranded max. 1.5 mm ²
Calibration	Two-point calibration
Ingress Protection	IP65 enclosure only, IP53 in operation due to gas inlet requirement
Dimension, weight	191 mm x 133 mm x 60 mm (L x W x H), about 1000 g
Warranty	2 years, except for components in gas path and wearing parts

* The indicated values were obtained under standardized conditions with 10.6 eV lamp.
Test gas was Isobutene in synthetic air.

4 Smart Photoionization Detector Modul PIDS3 briefly

The inlet and outlet for gas and the cable gland are located at the following positions.



The sample gas will be conducted through the sample gas inlet. A glass-fiber syringe-filter protects the device against material pollution.

Gas Inlet

Type	male luer
Fit to tube Inner diameter	3.0 mm to 3.5 mm

Gas Outlet

Type	thread hole M5
Fit to connectors with M5 thread	E.g., SMC M5-AU-3



CAUTION

Do not remove the filter for measurement this may damage the instrument.

Gas flow

Minimum	300 ml/min
Maximum	500 ml/min

Cable gland M 16 X 1,5

Minimum outer diameter	5 mm
Maximum outer diameter	9 mm

4.1 Installation

The device should be installed where gas leaks are expected. The installation position depends on the gas density, either in the upper area of the room under the ceiling for gases lighter than air or close to the ground for gases heavier than air. Also, consider how air movement may affect the ability of the device to detect gas. The display on the front of the instrument must always be clearly visible; the view must not be obstructed.

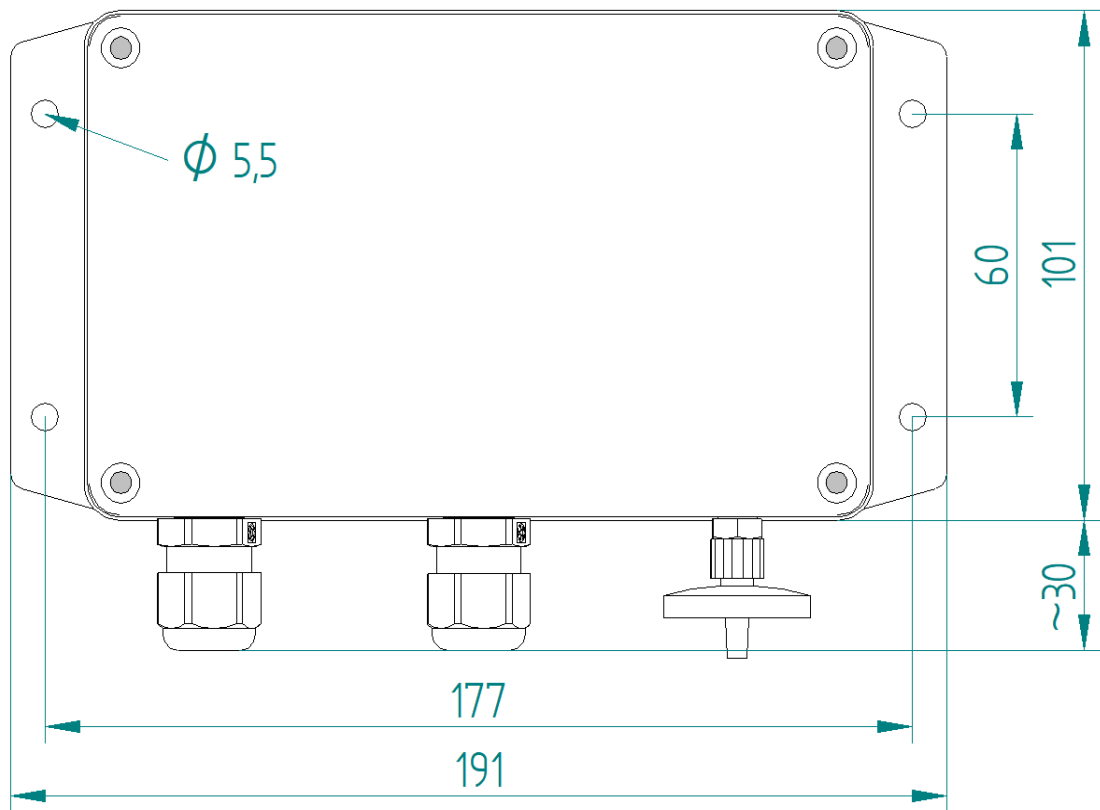


Before beginning the installation, check that the delivered components are complete and correct referring to the shipping documents and the sticker on the shipment carton.



When preparing the assembly, make sure that the mounting arrangement is correct for the device.

4.2 Mechanical Installation



Mounting

The housing of Smart PID module must be mounted at the following positions:

- Indoor, or inside housings with minimum splash water protection – arbitrary orientation.
- In all other cases – cable gland and gas ports downside (IP 54 rating).



The device must be installed vertical with cable glands and filter downward to avoid plugging of the inlets by particles or liquids if can occur.

4.3 Electrical Installation

**WARNING**

The device must be installed only in compliance with the applicable regulations, otherwise the safe operation of the instrument is not guaranteed.

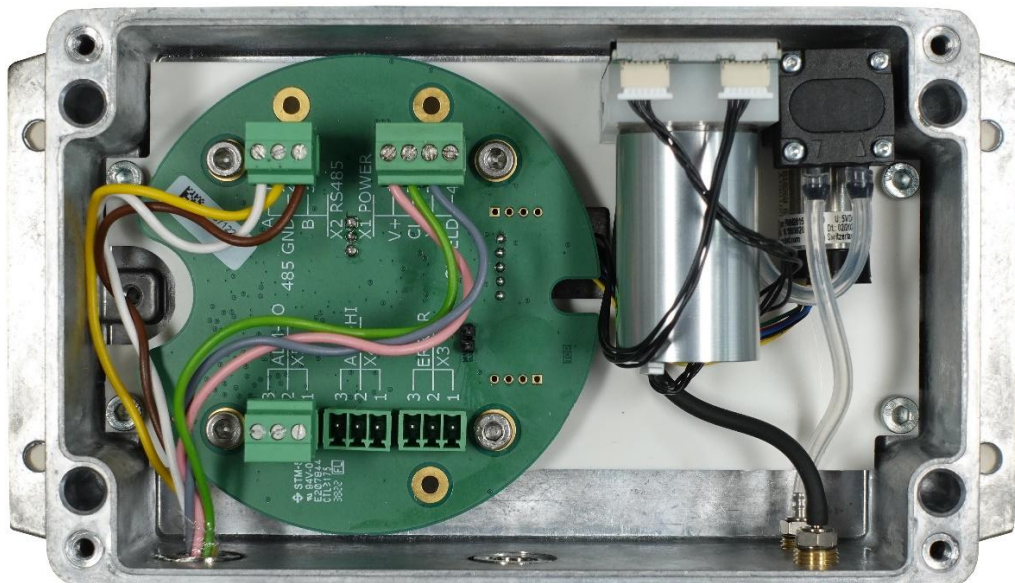
- Shielded cable for measuring devices is recommended.
- All cable shields to be terminated to ground earth at one end only.
- Do not connect to DC power supply network. Recommended, separate power supply.
- Water or impurities can penetrate the instrument through the cable. In hazardous areas, it is recommended to install the cable in a loop just before entry into the instrument or to slightly bend it to prevent water from entering.

**NOTICE**

The power supply is defined as 10 ... 28 VDC.

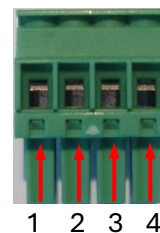
How To – Install Electrical Connection

1. Open the device.
2. Unscrew clamping nut at the cable gland.
3. Put clamping nut on the cable. Prepare cable for installation, enable shield to connect with cable gland.
4. Insert cable for connection into the device.
5. Tighten cable gland clamping nut including shield, check that cable cannot move within the cable gland.
6. Connect cable to the corresponding pin numbers of the terminal.
7. Set up enclosure lid and the screws.



X1 Power

- | | | | |
|---|--------|-------------|--------------------------------------|
| 1 | V+ | 24 VDC | [Positive Supply] |
| 2 | CL | 4 ... 20 mA | [Current Loop Output] |
| 3 | V- | 0 VDC | [Negative Supply] |
| 4 | SHIELD | | [for cable with add. inner shield] |



X2 RS485 (MODBUS)

- | | | |
|---|-----|----------------------------|
| 1 | A | [Non Inverting Terminal] |
| 2 | GND | [Isolated Ground] |
| 3 | B | [Inverting Terminal] |



J1 COMM SELECT

- | | |
|--------------------|--------------------------------|
| Jumper plugged in | [RS485 UART communication] |
| Jumper not plugged | [RS485 MODBUS communication] |

Relays (optional)

X3 ERROR

- | | | |
|---|-----------|--|
| 1 | Relay NC | [Normally Closed De-Energized |
| 2 | Relay COM | Contact] |
| 3 | Relay NO | [Common Contact] |
| | | [Normally Open De-Energized Contact] |



X4 ALARM HIGH

- | | | |
|---|-----------|--|
| 1 | Relay NC | [Normally Closed De-Energized |
| 2 | Relay COM | Contact] |
| 3 | Relay NO | [Common Contact] |
| | | [Normally Open De-Energized Contact] |



X5 ALARM LOW

- | | | |
|---|-----------|--|
| 1 | Relay NC | [Normally Closed De-Energized |
| 2 | Relay COM | Contact] |
| 3 | Relay NO | [Common Contact] |
| | | [Normally Open De-Energized Contact] |



4.4 Gas supply



NOTICE – WATCH THE GAS FLOW

The module requires a uniform gas flow.
Gas must be free of dust and liquids.

Dust and liquids must be kept away from module internal gas paths.

The module comes with an integrated gas flow monitoring. The current gas flow indicator can be read with measurement values of UART command and Modbus data registers.

The module status information contains two flow indications:

- ‘flow low’ - gas flow too low, measurement result integrity loss and module may be damaged
- ‘flow over’ - gas flow too high, measurement result integrity loss

4.4.1 Using the internal optional pump

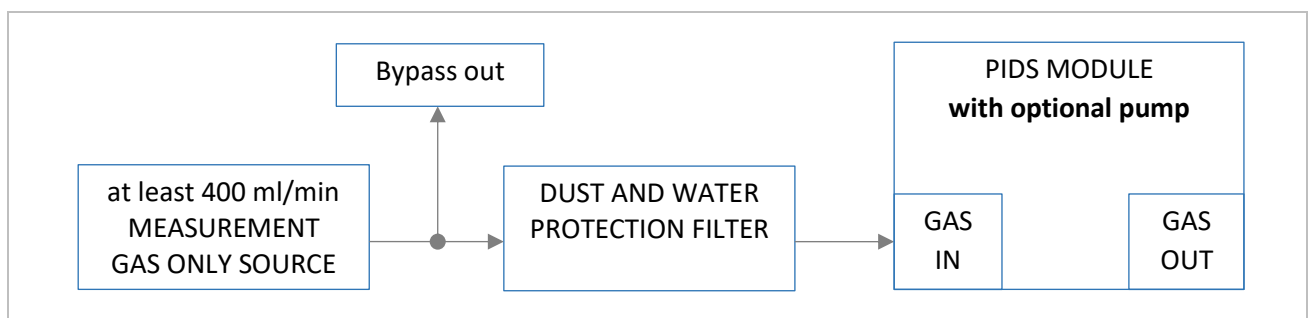
The internal optional pump ensures ambient measurement gas flow through the PID sensor.

For usage of a constant measurement gas source e.g., from a pressure line, the module gas input must be bypassed.



NOTICE – WATCH THE GAS FLOW

Gas input must be nearly having ambient pressure (deviation recommended less than 20 mbar) in pump operation.
Constant flow from active gas source will need a bypass line for surplus measurement gas.
Gas source should support at least 400 ml/min to realize 200 to 300 ml/min flow in module.



Gas flow scheme with internal optional pump and constant flow of measurement gas source at gas input

4.4.2 Using external pump

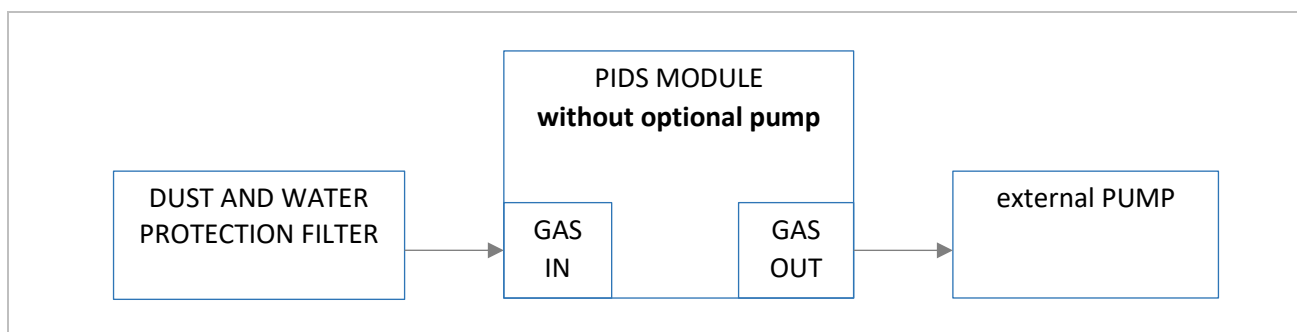


NOTICE – WATCH THE GAS FLOW

Gas must be drawn out of the output in pump operation.

Gas input must be nearly having ambient pressure (deviation recommended less than 20 mbar) in pump operation.

The pump must draw out the gas from the PID module. Thereby gas and particle contamination from pump is prevented.



Gas flow scheme without internal optional pump

4.4.3 Using without pump



NOTICE – WATCH THE GAS FLOW

Constant flow from active gas source will need (depending from pollution of dust and water filter) 20 mbar to max 100 mbar overpressure to realize 200 to 300 ml/min flow through module.



Gas flow scheme with constant flow of measurement gas source at gas input

5 Installation hints



USAGE

The PIDS sensor is sensitive against pollution. Use dust and water filter to protect the gas inlet of the module.



NOTICE – WATCH THE GAS FLOW

The module requires a uniform gas flow.
Do not enter the MEASURE state without appropriate gas flow.



USAGE – PLACE THE MODULES IN A THERMALLY ISOLATED ENVIRONMENT

The PID sensor is sensitive against fast gradients of temperature and humidity. To achieve the best accuracy, it is recommended that the module is placed in a thermal insulated environment.

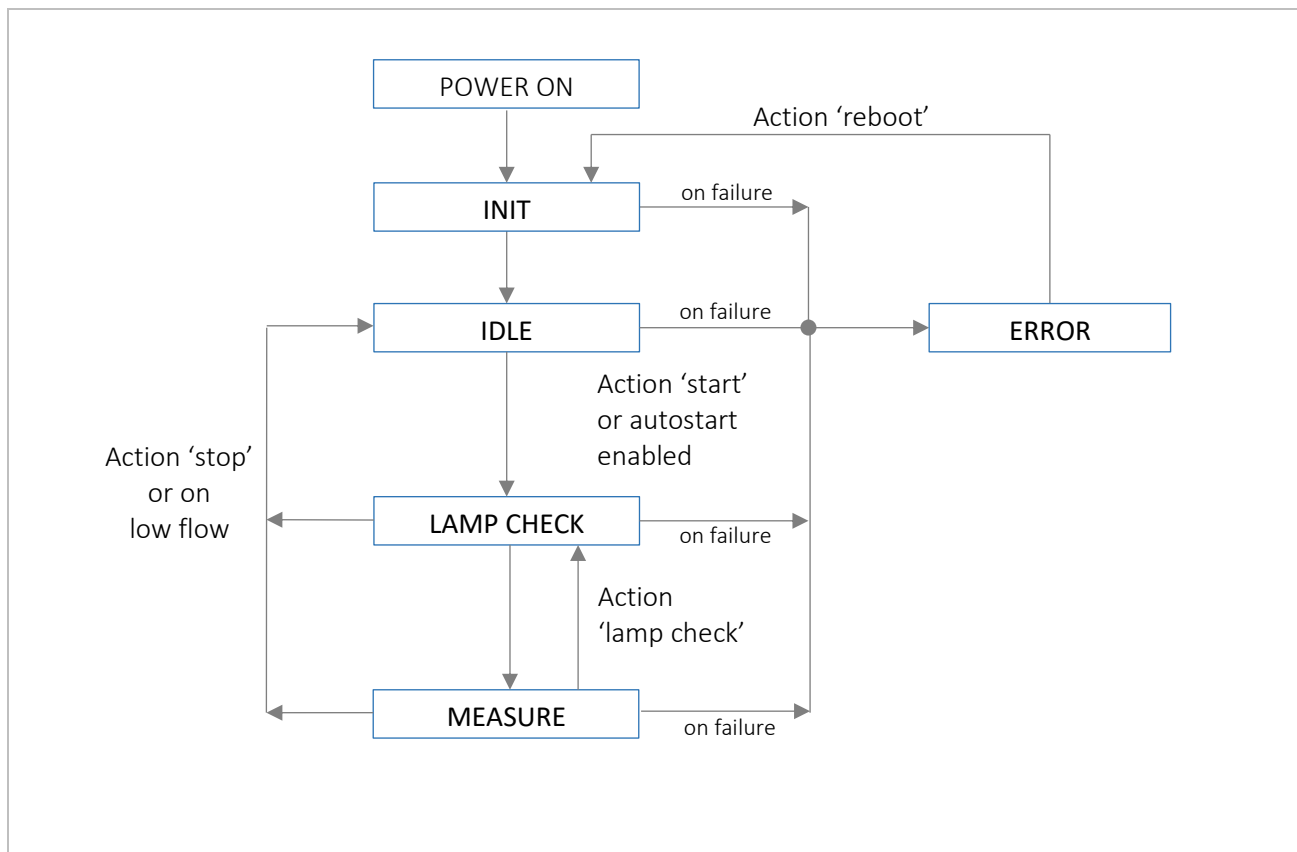


NOTICE

The module contains electronic components, which react sensitively to electrostatic discharge (ESD). Work on or in the unit must be done only by qualified personnel and in full compliance with the appropriate instructions and pertinent regulations.

6 Operation

6.1 Using the module



Operation scheme

After POWER ON the module performs initialization and warmup sequence.

If measurement autostart is enabled the module enters LAMP CHECK state otherwise IDLE state. In IDLE state the module is ready to communicate, the lamp is switched off.

Entering the LAMP CHECK state can be initiated by sending the appropriate commands. Thereby the lamp is switched off and on and is tested. On successful lamp test the MEASURE state is entered.

When in MEASURE state the gas flow indicator value should be around 100 %. When low flow is detected for 60 seconds the module enters IDLE state by itself and switches off the lamp. The lamp check may be repeated at any time by sending the appropriate command.

When in ERROR state the lamp and optional internal pump is switched off. The ERROR state can only be left by switch off or reboot the module by sending the appropriate command.

The procedure step by step:

- check the appropriate gas flow
- power on the module
- wait for IDLE state (Action 'state')
- enter MEASURE state (Action 'start') or when using modbus enable autostart in config
- read the measurement result (Action 'values') and module state (Action 'state')



USAGE – Modbus communication

Using the modbus communication measurement data, status and error information can be read out.

It is necessary to enable the autostart functionality via PC control software or UART command in measurement config.

Action	UART command	Modbus data
start	pids.start	
lamp check	pids.lampcheck	
stop	pids.stop	
values	pids.values	Read measurement data registers
state	pids.state	Read Status register
error	pids.error	Read Error register
reboot	pids.reboot	

In case of ERROR state, the error details can be read out (Action 'error').

6.2 Measurement values

Measurement value	Description
Measurement result	Final calibrated, temperature and humidity compensated measurement result including the measurement config gas response factor in ppm units
Current compensated	Temperature and humidity compensated measurement chamber current in pA units
Temperature	Measurement chamber temperature (may differ from ambient temperature) in °C units
Humidity	Measurement chamber humidity (may differ from ambient humidity due to over temperature) in % rH units
Flow indicator	Measurement chamber gas flow indicator (100 % means approx. 250 ml/min) in % units

6.3 Measurement result resolution

The measurement resolution can be switched between raw precision or recommended dynamic resolution in the measurement config.

The raw precision resolution is the precise measurement result independent on its value in measurement range.

Measurement range Isobutene	Number of digits after the decimal point
0 ... 2000 ppm	3 (100.013 ppm)
0 ... 20 ppm	5 (15.05345 ppm)
0 ... 5000 ppm	2 (4550.37 ppm)

The dynamic resolution is a recommended rounding of measurement result depending on its value in measurement range.

Measurement result Isobutene	Rounded to resolution in 0 ... 2000 ppm range	Rounded to resolution in 0 ... 20 ppm range	Rounded to resolution in 0 ... 5000 ppm range
result < 1 ppm	0.010 ppm	0.00050 ppm	0.10 ppm
result < 2 ppm	0.010 ppm	0.00100 ppm	0.10 ppm
result < 5 ppm	0.010 ppm	0.00200 ppm	0.10 ppm
result < 10 ppm	0.050 ppm	0.00500 ppm	0.50 ppm
result < 20 ppm	0.100 ppm	0.01000 ppm	1.00 ppm
result < 50 ppm	0.500 ppm	0.02000 ppm	2.00 ppm
result < 120 ppm	1.000 ppm	out of range from here	2.00 ppm
result < 200 ppm	2.000 ppm		5.00 ppm
result < 500 ppm	5.000 ppm		5.00 ppm
result < 1000 ppm	10.000 ppm		10.00 ppm
result < 2500 ppm	20.000 ppm		20.00 ppm
result > 2500 ppm	out of range from here		50.00 ppm

The rounding is done on the Isobutene equivalent of measurement result.

The gas response factor of the measurement config is multiplied with the rounded value.

Example:

for 2 000 ppm range device with measurement result Isobutene equivalent of 0.05 ppm

=> with a gas response factor of 0.5 the result will be 0.025 ppm.

7 Measurement config

The module comes with a measurement config for additional measurement information and settings:

- Calibration method
- Gas identification
- Gas response factor
- Dynamic resolution enable

The default values are:

Calibration method	standard
Gas identification	115-11-7 (CAS-Number)
Gas response factor	1.0
Dynamic resolution enable	true

The measurement config data can be read and written with UART command.

The dynamic resolution can be switched to raw precision by setting dynamic resolution enable false.

7.1 Calibration method

The module supports two methods of calibration:

- ‘standard’ calibration with known concentration of ISOBUTENE in air
- ‘extended’ calibration with known concentration or as kind of indicator of VOC components

In ‘standard’ calibration method the span gas sensor current is validated to span gas concentration.

7.2 Gas identification and response factor

The gas identification is the CAS number as text for additional sensor specific information.

The module result calculation is based on ISOBUTENE gas. The gas response factor is a numeric factor applied to the ISOBUTENE gas result.

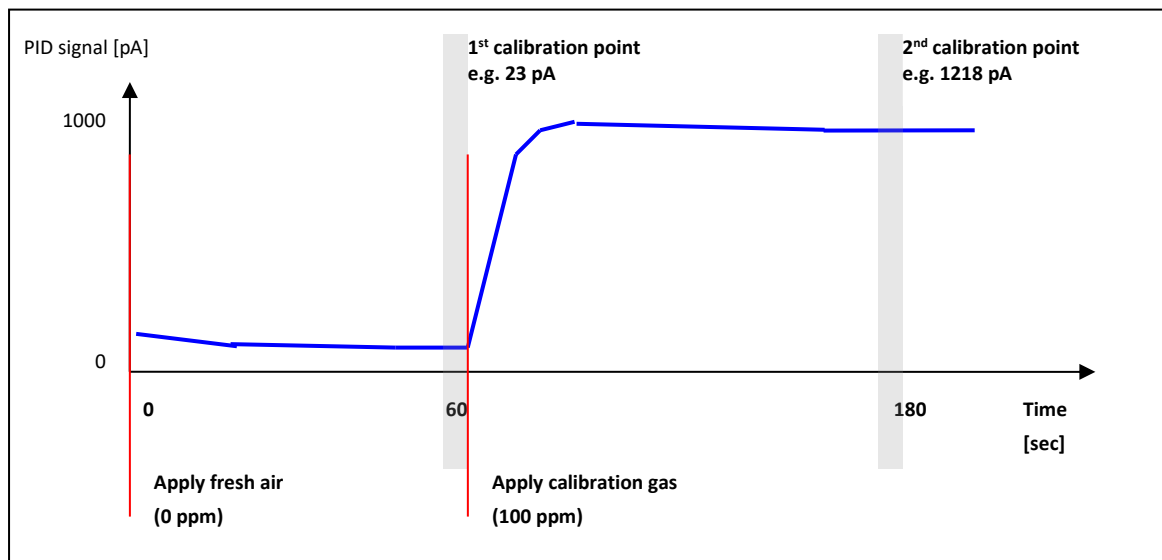
8 Calibration

The calibration must be done at regular intervals in accordance with applicable national and regional regulations. The device must be calibrated after installation.

The module supports a two-point calibration where two gases are required:

- ZERO gas - clean pollution-free air
- SPAN gas - VOC with known concentration (ISOBUTENE for standard calibration method)

Standard calibration gas: 100 ppm isobutene in synthetic air



USAGE – CHOOSE THE RIGHT SPAN GAS CONCENTRATION

To achieve the best accuracy, it is recommended that SPAN gas concentration is in same range as the expected measurement result and fits to detection range of the module.

The procedure step by step:

- Connect and start the measurement on the module as described (Action ‘start’)
- Apply ZERO gas
- Read the measurement values from the module and wait for stabilizing (Action ‘values’)
- Keep the compensated current value for ZERO calibration point
- Apply SPAN gas
- Read the measurement values from the module and wait for stabilizing (Action ‘values’)
- Keep the compensated current and concentration values for SPAN calibration point
- Write the calibration data back to module (Action ‘write’)
- On successful calibration verification save calibration data to module (Action ‘verify’ and Action ‘save’)

The calibration will be done with currently selected calibration method in measurement config. Calibration data values stored separately for 'standard' and 'extended' calibration.



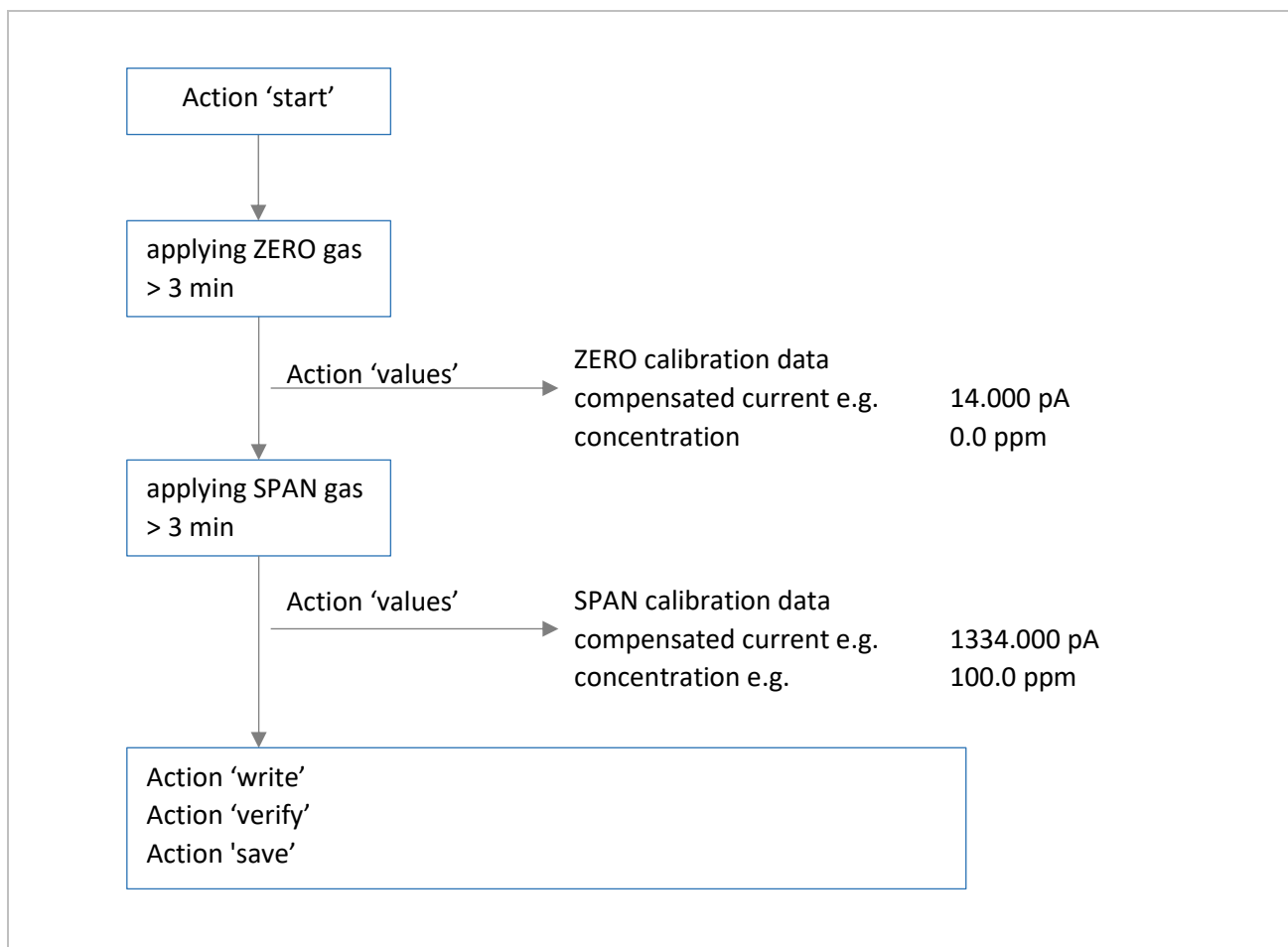
Connect power supply to the device at least one hour before attempting a calibration.

Preparations before Calibration / Calibration Test

To perform a calibration, you need a pressure cylinder of SPAN Gas and / or ZERO Gas, a flow reducer, a tube, and a T-piece. The flow reducer should provide a flow of at least 500 ml/min. The T-piece should be installed between flow reducer and sample port – dust filter. The open tube length on T-piece junction should be 300 – 500 mm. (see following connection scheme for version with pump inside)



For calibration, it is recommended to use the **Calibration Kit** from accessories. (See chapter **Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.**)



Calibration procedure

Action	UART command
start	pids.start
values	pids.values
write	pids.calib
verify	Included in Action 'write' with no error as answer
save	pids.savedata

Invalid calibration values may be caused by:

- MEASURE state not started
- no clean air applied during ZERO calibration step
- no or inappropriate calibration gas applied during SPAN calibration step

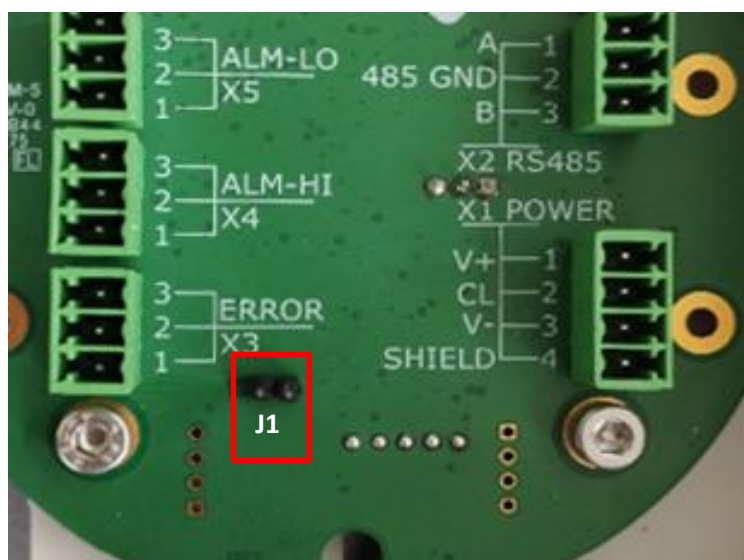
9 UART Communication

The communication is implemented as a standard UART- interface.

UART signal level	RS485 differentials level
UART parameter	115,200 Baud 8 Data; no parity; 1 Stop

The communication is based on a serial interface.

The master controller manages connection and initialization of the data transmission in a master/slave- operation. A transmission is always started by the master. The master after that expects an appropriated response of the slave.



USAGE – COMM SELECT Jumper J1

To use the UART communication the jumper J1 must be plugged in.

9.1 Message frame

Synchronization is implemented by embedding the user data into a transmission frame.

The device address is fixed to 0x00000000.

Message frame						
0	1 ... 8	9	10 ... (n - 10)	(n - 9)	(n - 8) ... (n - 1)	(n)
SOH	ADDR 7 ... 0	SOT	DATA	ETX	CHK 7 ... CHK 0	EOT
0x01	HEX	0x02	command + SPACE + parameter	0x03	HEX	0x04
calculate checksum over this area						

SOH	Start of Header (0x01)	
ADDR	Device address	32 bit HEXSTRING (8 byte)
SOT	Start of Text (0x02)	
DATA	Command + SPACE + parameter	ASCII or UTF-8 encoded
Command	Command part	Max. 32 byte, Min. 1 byte
SPACE	Space character (0x20)	
Parameter	Parameter part	Max. 256 byte
ETX	End of text (0x03)	
CHK	Checksum CRC32	32 bit HEXSTRING (8 byte)
EOT	End of transmission (0x04)	

Example

Command	device?
Address [hex]	00000000
Checksum [hex]	969D9250
Bytes [hex]	01 3030303030303030 02 646576696365 20 3F 03 3936394439323530 04

9.1.1 Checksum calculation

The checksum is calculated over the bytes in message section.

Code example (C#):

```
public static uint Crc32 ( byte[] buffer, uint offset, uint count )
{
    const uint polynomial = 0xEDB88320;
    uint crc = uint.MaxValue;

    for ( uint index = offset; index < offset + count; index++ )
    {
        crc ^= buffer[index];

        for (uint bit = 0; bit < 8; bit++)
        {
            crc = (crc >> 1) ^ (crc & 1) * polynomial;
        }
    }

    return ~crc;
}
```

Code example (C or C++):

```
uint32_t Crc32 ( const void* buffer, uint32_t offset, uint32_t count )
{
    const uint32_t polynomial = 0xEDB88320;
    uint32_t crc = 0xFFFFFFFF;
    uint8_t* src = &((uint8_t*) buffer)[offset];

    while ( count-- )
    {
        crc ^= *src++;

        for ( uint32_t bit = 0; bit < 8; bit++ )
        {
            crc = ( crc >> 1 ) ^ ( crc & 1 ) * polynomial;
        }
    }

    return ~crc;
}
```

9.1.2 Message section format

The message section is formatted as ASCII- text and consists of a command and a parameter.

A space character (SPACE) separates command and parameter. If there are more than one value in the parameter, the values are separated by a semicolon.

[command]	SPACE	[parameter]
[command]	SPACE	[parameter0]; [parameter1]; [parameter2]; ...

Example

- device PIDS3 Device
- pids.values 12.334;35.345;53.47;95.9;956.1;1002.45

9.2 Module commands

Abbreviations	M	Master (microcontroller)
	S	Slave (this module)

9.2.1 Module information commands

Command	device ? device [name]	
Description	Get the type identification string of the module	
Parameter	ident	type identification string
Example	M	device ?
	S	device CPN Sensor Device

Command	device.serialno ? device.serialno [serial]	
Description	Get the serial number of the module	
Parameter	serial	serial number string
Example	M	device.serialno ?
	S	device.serialno A792003460

Command	device.software ? device.software [sw]	
Description	Get software version of the module	
Parameter	sw	Software version string
Example	M	device.software ?
	S	device.software 1.02.030

Command	device.hardware ? device.hardware [hw]	
Description	Get hardware version of the module	
Parameter	hw	Hardware version string
Example	M	device.hardware ?
	S	device.hardware 1.19012.000

Command	device.username ? device.username [name]	
Description	Get or set the user name of the module	
Parameter	name	User name string Maximum length 15 characters ASCII only
Example (get)	M	device.username ?
	S	device.username My Pids
Example (set)	M	device.username Pids 001
	S	device.username Pids 001

9.2.2 Module control commands

Command	pids.start pids.start ok
Description	Starts the measurement and enters LAMP CHECK state.
Parameter	
Example	M pids.start S pids.start ok M pids.start S pids.start error – invalid module status

Command	pids.lampcheck pids.lampcheck ok
Description	Starts the lamp check and enters LAMP CHECK state.
Parameter	
Example	M pids.lampcheck S pids.lampcheck ok M pids.lampcheck S pids.lampcheck error – invalid module status

Command	pids.stop pids.stop ok
Description	Stops the measurement and enters the IDLE state
Parameter	
Example	M pids.stop S pids.stop ok M pids.stop S pids.stop error – invalid module status

Command	pids.reboot pids.reboot ok
Description	Restarts the module and runs the power on initialization
Parameter	
Example	M pids.reboot S pids.reboot ok

Control commands may answer with error message in case of invalid module state, e.g., ERROR state.

9.2.3 Module data commands

Command	pids.values ? pids.values [result];[curr];[temp];[humid];[flow]
Description	Get the measurement values of the module
Parameter	result measurement result in ppm units curr current compensated in pA units (required for calibration) temp temperature in °C units humid humidity in %rH units flow gas flow indicator in % units
Example	M pids.values ? S pids.values 12.334;956.1;35.345;53.47;95.9

Command	pids.state ? pids.state [state]
Description	Get the status information of the module
Parameter	state device state (32bit hexstring)
Example	M pids.state ? S pids.state 00004000

PID state – bit definition

Bit	Meaning	Bit	Meaning
D00	1 = Module concentration under range	D16	1 = Current loop supply voltage low
D01	1 = Module concentration over range	D17	1 = Current loop output high load or open
D02	1 = Module flow low	D18	reserved
D03	1 = Module flow over	D19	reserved
D04	1 = Module input voltage under range	D20	reserved
D05	1 = Module input voltage over range	D21	reserved
D06	reserved	D22	reserved
D07	reserved	D23	reserved
D08	0 = Module calibration method is standard 1 = Module calibration method is extended	D24	reserved
D09	reserved	D25	reserved
D10	reserved	D26	reserved
D11	1 = Module in LAMP CHECK state	D27	reserved
D12	1 = Module in INIT state	D28	reserved
D13	1 = Module in IDLE state	D29	reserved
D14	1 = Module in MEASURE state	D30	reserved
D15	1 = Module in ERROR state	D31	reserved

Multiple state bits can be set at once e.g. the calibration method is extended and module is in measure state will result in an state value of '00004100'.

Command	pids.error ? pids.error [error]
Description	Get the error information of the module
Parameter	state device error (32bit hexstring)
Example	M pids.error ? S pids.error 00000000

PIDS error – bit definition

Bit	Meaning	Bit	Meaning
D00	1 = Sensor error data acquisition	D16	1 = Pump error speed, blocked
D01	1 = Sensor error humidity sensor	D17	1 = Pump error motor current
D02	1 = Sensor error lamp function	D18	1 = Current loop error initialization
D03	1 = Sensor error lamp module control	D19	1 = Current loop error control
D04	1 = Sensor error lamp variant	D20	1 = Relay 'ALM-LO' error switch
D05	1 = Sensor error flow sensor	D21	1 = Relay 'ALM-HI' error switch
D06	1 = Sensor eeprom error checksum	D22	1 = Relay 'ERROR' error switch
D07	1 = Sensor eeprom error read, write	D23	reserved
D08	1 = Sensor unspecified error	D24	reserved
D09	reserved	D25	reserved
D10	1 = Error start sensor	D26	reserved
D11	1 = Error sensor comm timeout	D27	reserved
D12	1 = Error sensor comm message	D28	reserved
D13	1 = Sensor variant not matching	D29	1 = Eeprom error checksum
D14	reserved	D30	1 = Eeprom error read, write
D15	reserved	D31	1 = Error unspecified

Command	pids.measconfig ? pids.measconfig [calmet];[ident];[factor];[dynres]
Description	Get or set the calibration values (save data to store permanently)
Parameter	calmet calibration method text ('standard' or 'extended') ident gas identification text (e.g. '115-11-7'), 1 to 15 characters factor gas response factor (minimum 0.010) dynres dynamic resolution enable ('true' or 'false')
Example (read active)	M pids.measconfig ? S pids.measconfig standard;115-11-7;1.000;true
Example (write) success	M pids.measconfig standard;75-15-0;1.200;false S pids.measconfig ok
Example (write) error here missing ident	M pids.measconfig standard;;1.000;true S pids.measconfig error

Command	pids.calib ? pids.calib [curr1];[curr2];[conc1];[conc2]
Description	Get or set the calibration values (save data to store permanently)
Parameter	curr1 compensated current of ZERO gas point (e.g. 3.850 pA) curr2 compensated current of SPAN gas point (e.g. 978.200 pA) conc1 ZERO gas concentration (0.0 ppm) conc2 SPAN gas concentration (e.g. 100.0 ppm)
Example (read active)	M pids.calib ? S pids.calib 3.850;978.200;0.000;100.000
Example (write) success	M pids.calib 3.850;978.200;0.000;100.000 S pids.calib ok
Example (write) error here curr2 to low	M pids.calib 3.850;28.200;0.000;100.000 S pids.calib error - calibration data invalid

The calibration values will be verified.

If check fails, the module responds with error message 'error - calibration data invalid'.

9.2.4 Module Modbus config commands

Command	pids.modbus.config ? pids.modbus.config [mode];[par];[addr];[baud];[term]
Description	Get or set the module modbus configuration (save data to store permanently)
Parameter	mode Mode ('rtu' or 'ascii') par Parity ('none', 'even', 'odd') addr Slave address in decimal ('1' to '247') baud Baud rate ('115200', '57600', '38400', '19200', '9600') term Termination resistor enable ('true' or 'false')
Example read	M pids.modbus.config ? S pids.modbus.config rtu;none;10;115200;true
Example write	M pids.modbus.config ascii;even;16;19200;false S ok

Note: Additional parameter "parity" available since device version 1.02.006.

9.2.5 Module current loop config commands

Command	pids.currloop.config ? pids.currloop.config [sigmin];[sigmax]	
Description	Get or set the module current loop configuration (save data to store permanently)	
Parameter	sigmin Minimum result Isobutene in ppm units maps to output of 4 mA sigmax Maximum result Isobutene in ppm units maps to output of 20 mA	
Example read	M	pids.currloop.config ?
	S	pids.currloop.config 0.0;2000.0
Example write	M	pids.currloop.config 10.0;1000.0
	S	ok

9.2.6 Module autostart config commands

Command	pids.autostart.enable ? pids.autostart.enable [enable]	
Description	Get or set the module autostart configuration (save data to store permanently)	
Parameter	enable Module autostart enable ('true' or 'false')	
Example read	M	pids.autostart.enable ?
	S	pids.autostart.enable true
Example write	M	pids.autostart.enable false
	S	ok

9.2.7 Module save config data command

Command	pids.savedata pids.savedata ok	
Description	Saved the module data e.g., calibration data	
Parameter		
Example	M	pids.savedata
	S	pids.savedata ok



USAGE – SAVING DATA

Saving data may take about 100 ms.

Consider this period of time in UART communication timeout detection.

9.2.8 Module relays commands

Command	pids.relay.state ? pids.relay.state [D2][D1][D0]	
Description	Get or set the module relays state	
Parameter	D0	State of relay ALM-LO, 0 – de-energized, 1 – energized
	D1	State of relay ALM-HI, 0 – de-energized, 1 – energized
	D2	State of relay ERROR, 0 – de-energized, 1 – energized
Example read	M	pids.relay.state ?
	S	pids.relay.state 000
Example write	M	pids.relay.state 011
set ALM-LO and ALM-HI	S	pids.relay.state 011
Example write erroneous	M	pids.relay.state 011
with relay control 'auto'	S	pids.relay.state error - relay controlled automatically

Command	pids.relay.control ? pids.relay.control [state]	
Description	Get or set the module relays control state (save data to store permanently)	
Parameter	state	State of relay control 'auto' – relays are controlled by device (set alarms and error) 'manual' – relays are controlled by command : pids.relay.state
Example read	M	pids.relay.control ?
	S	pids.relay.control manual
Example write	M	pids.relay.control auto
	S	pids.relay.control auto

9.2.9 Module lamp commands

Command	pids.lampinfo ? pids.lampinfo [serial];[variant];[ontime]	
Description	Get the lamp information values	
Parameter	serial	serial number text of connected lamp
	variant	variant information text of connected lamp
	ontime	on time of connected lamp in hours units
Example	M	pids.lampinfo ?
	S	pids.lampinfo C332003002;106eV;12.500

9.2.10 Module sensor commands

Command	pids.sensorinfo ? pids.sensorinfo [serial];[variant];[cltime]
Description	Get the lamp information values
Parameter	serial serial number text of sensor variant variant information text of sensor cltime runtime since last calibration in hours units
Example	M pids.sensorinfo ? S pids.sensorinfo A792234001;R0-L0;125.400

9.2.11 Module alarm commands

Command	pids.alarm.levels ? pids.alarm.levels [LO];[HI]
Description	Get or set the module relays state (save data to store permanently)
Parameter	LO Level of alarm LO in ppm HI Level of alarm HI in ppm
Example read	M pids.alarm.levels ? S pids.alarm.levels 12.500;80.000
Example write	M pids.alarm.levels 95.000;230.000 S pids.alarm.levels 95.000;230.000
Example write erroneous range	M pids.alarm.levels 95.000;22230.000 S pids.alarm.levels error - Alarm LO maximum 20000.0
Example write erroneous values or order	M pids.alarm.levels 95.000;23.000 S pids.alarm.levels error - Alarm HI must be greater than alarm LO

10 Modbus Communication

The communication is compatible with the Modbus specification.

Signal level	RS485 differentials level
Parameter	115200 Baud, 57600 Baud, 34800 Baud, 19200 Baud, 9600 Baud Modes ASCII and RTU Parity None, Even, Odd (since Version 1.02.006) Device unique address Termination resistor enabling

The default values are:

Baud rate	115200
Mode	RTU
Parity	Even
Gas Device unique address	10
Termination resistor enable	false



USAGE – COMM SELECT Jumper J1

To use the MODBUS communication the jumper J1 must not be plugged.

10.1 Register map

Register 3xxxx – Access via function code 0x04 (read only)

10.1.1 Module information register

Name	Access	Register no	Length	Format
Device identification	RO	30001	32 byte	String
Device serial number	RO	30017	32 byte	String
Measurement config gasname	RO	30033	16 byte	String
Measurement config calibration method	RO	30041	16 byte	String

10.1.2 Module measurement values data registers

Name	Access	Register no	Length	Format
Result in ppm units	RO	30100	4 byte	Floating point value
Temperature in °C units	RO	30102	4 byte	Floating point value
Humidity in %rH units	RO	30104	4 byte	Floating point value
Current compensated in pA units	RO	30106	4 byte	Floating point value
Gas flow indicator in % units	RO	30108	4 byte	Floating point value
Status information	RO	30110	4 byte	Unsigned 32-bit value
Error information	RO	30112	4 byte	Unsigned 32-bit value
Alarm LO level	RO	30114	4 byte	Floating point value
Alarm HI level	RO	30116	4 byte	Floating point value
Measurement config gas response factor	RO	30200	4 byte	Floating point value

PID state – bit definition

Bit	Meaning
D00	1 = Module concentration under range
D01	1 = Module concentration over range
D02	1 = Module flow low
D03	1 = Module flow over
D04	1 = Module input voltage under range
D05	1 = Module input voltage over range
D06	reserved
D07	reserved
D08	0 = Module calibration method is standard 1 = Module calibration method is extended
D09	reserved
D10	reserved
D11	1 = Module in LAMP CHECK state
D12	1 = Module in INIT state
D13	1 = Module in IDLE state
D14	1 = Module in MEASURE state
D15	1 = Module in ERROR state

Bit	Meaning
D16	1 = Current loop supply voltage low
D17	1 = Current loop output high load or open
D18	reserved
D19	reserved
D20	reserved
D21	reserved
D22	reserved
D23	reserved
D24	reserved
D25	reserved
D26	reserved
D27	reserved
D28	reserved
D29	reserved
D30	reserved
D31	reserved

Multiple state bits can be set at once e.g., the calibration method is extended, and module is in measure state will result in a state value of '00004100'.

PIDS error – bit definition

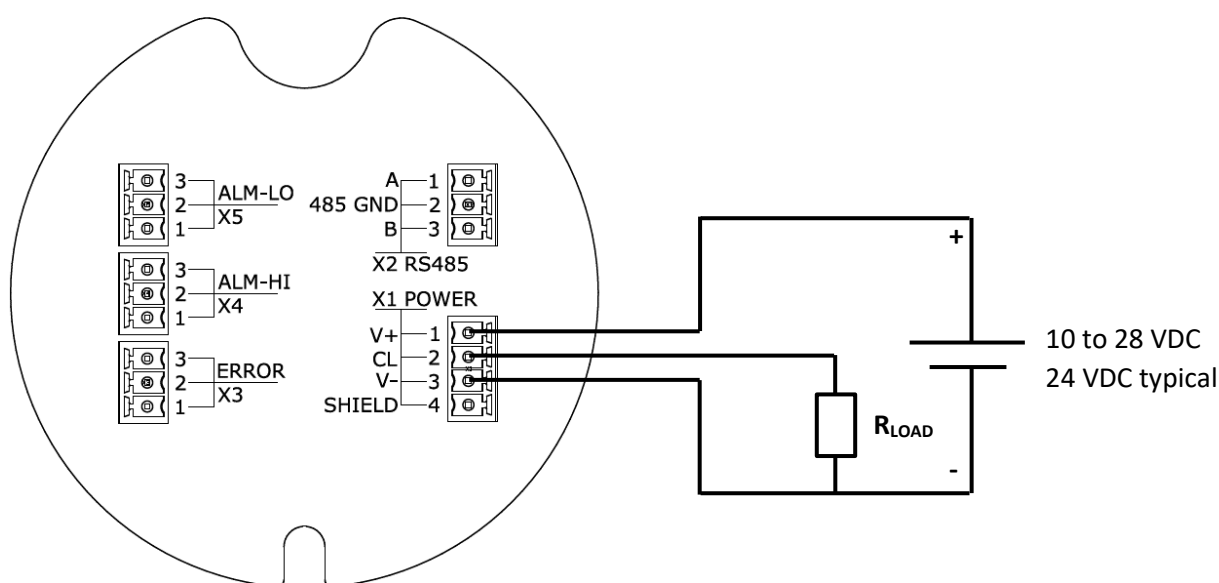
Bit	Meaning
D00	1 = Sensor error data acquisition
D01	1 = Sensor error humidity sensor
D02	1 = Sensor error lamp function
D03	1 = Sensor error lamp module control
D04	1 = Sensor error lamp variant
D05	1 = Sensor error flow sensor
D06	1 = Sensor eeprom error checksum
D07	1 = Sensor eeprom error read, write
D08	1 = Sensor unspecified error
D09	reserved
D10	1 = Error start sensor
D11	1 = Error sensor comm timeout
D12	1 = Error sensor comm message
D13	1 = Sensor variant not matching
D14	reserved
D15	reserved

Bit	Meaning
D16	1 = Pump error speed, blocked
D17	1 = Pump error motor current
D18	1 = Current loop error initialization
D19	1 = Current loop error control
D20	1 = Relay 'ALM-LO' error switch
D21	1 = Relay 'ALM-HI' error switch
D22	1 = Relay 'ERROR' error switch
D23	reserved
D24	reserved
D25	reserved
D26	reserved
D27	reserved
D28	reserved
D29	1 = Eeprom error checksum
D30	1 = Eeprom error read, write
D31	1 = Error unspecified

11 Current loop

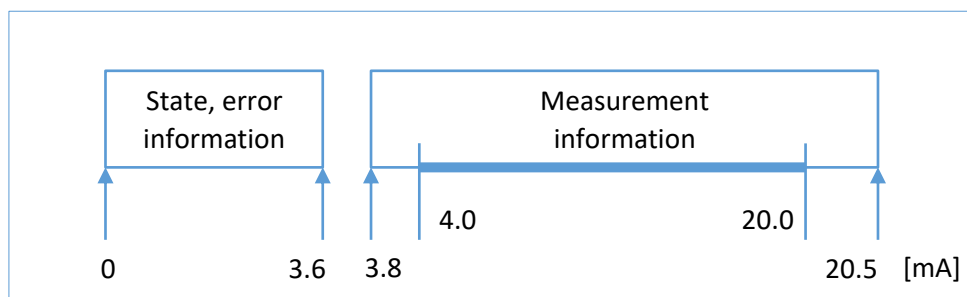
The module is equipped with an analog current loop output, which converts the physical measurement result into an electrical signal. The module provides a current loop output, which operates over the entire supply voltage range. The most common resistor in a 4 ... 20 mA loop is 250 ohms, however, depending on applied supply voltage and cable resistance of the loop the resistance value may be differ.

11.1 Connection



Supply Voltage	Maximum loop resistor (R _{LOAD})
10 VDC	416 Ω
24 VDC	1000 Ω
28 VDC	1160 Ω

11.2 Signals and states



States and signal range definitions

0 mA	Indicates loss of power supply, no instrument connected or broken line
< 3.0 mA	Error signal
3.0 mA	Instrument is in initialization or idle mode
3.6 mA	Lamp check running
3.8 mA	Signal under range
4.0 mA ... 20.0 mA	Valid measurement signal
20.5 mA	Signal over range

Error information

1.0 mA	Error unspecified
2.0 mA	Error PIDS module
2.2 mA	Error PID sensor lamp function
2.4 mA	Error PID sensor or internal comm
2.6 mA	Error pump speed or motor current
2.8 mA	Error relays switching

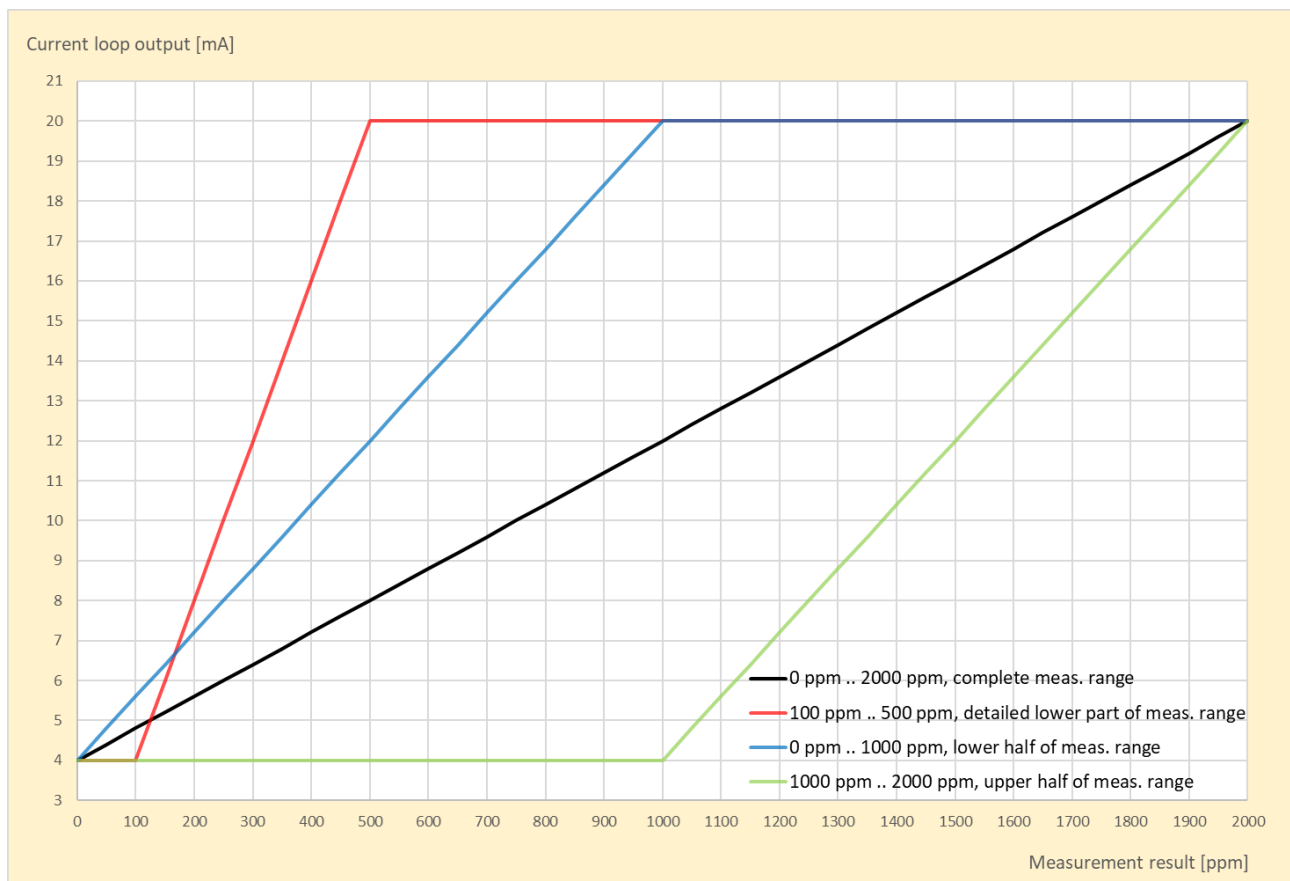
11.3 Configure measurement range

The total analog output current resolution is about 0.36 μ A.

To use the optimal analog resolution the output current and the corresponding result range can be selected.

Therefore the minimum result which maps to 4 mA output current and maximum result which maps to 20 mA can be changed with UART module current loop config commands.

The maximum result can exceed the module measurement range Isobutene equivalent for response factors greater than 1.0. The minimum result must be greater or equal than zero and less then maximum.



Calculation examples for measurement result of 400 ppm:

Minimum result which maps to 4 mA	Maximum result which maps to 20 mA	Output current	Analog output resolution in ppm Isobutene equivalent
0 ppm	2000 ppm	7.2 mA	about 0.046 ppm
100 ppm	500 ppm	16.0 mA	about 0.009 ppm
0 ppm	1000 ppm	10.4 mA	about 0.023 ppm
1000 ppm	2000 ppm	4.0 mA*	about 0.023 ppm

* Minimum result not reached (e.g., 12.0 mA @ 1500 ppm)

12 Relays

The module is equipped with 3 SPDT relays which can be switched manually or are controlled by device.

The relay control can be set to 'auto' or 'manual' by command. To store this setting permanently the save config data command must be sent.

When relay control is set to 'auto' the relay state cannot be set by command.

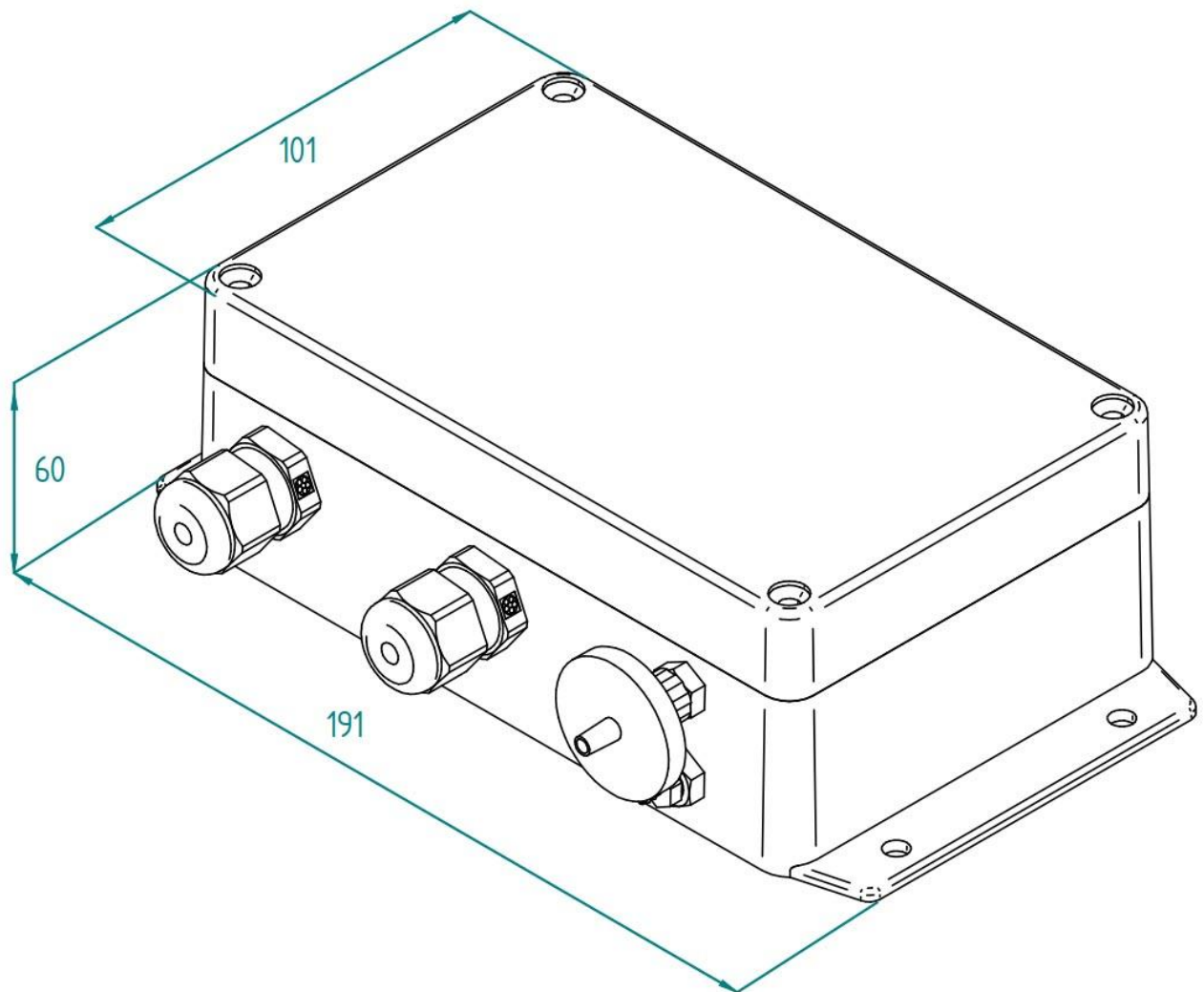
12.1 Automatic relay control

The automatic relay control switches the relays according to device alarm level is exceeded or error condition occurred.

12.1.1 Relay states by device state

State	Relay		
	Alarm LO	Alarm HI	Error
Normal	energized	energized	energized
Alarm LO	De-energized	energized	energized
Alarm HI	De-energized	De-energized	energized
Over range	De-energized	De-energized	energized
Under range	energized	energized	energized
Error	energized	energized	De-energized

13 Mechanical Drawing



14 Maintenance and Service



NOTICE

The module contains electronic components, which react sensitively to electrostatic discharge (ESD). Work on or in the unit must be done only by qualified personal and in full compliance with the appropriate instructions and pertinent regulations.

14.2 How To – Replace the PID lamp/front isolation/sensor block



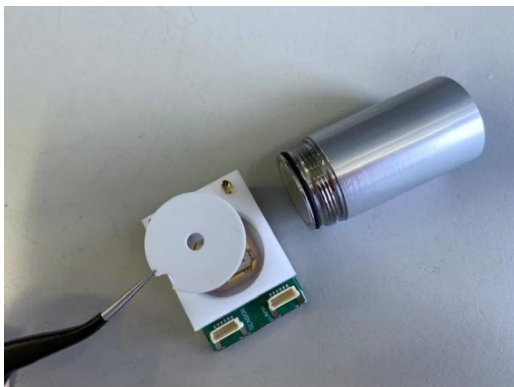
Remove cable

1. Remove the lamp control connector cable from lamp case.



Remove PID lamp

2. unscrew the lamp by a slight left twisting motion



Replace front isolation

3. Remove the old front isolation from the PID sensor block by using a tweezer, at the notch on front isolation border.
4. Place the new front isolation into the PID sensor block and make sure that the curvature shows to the lamp side.

Do not bend or touch the front isolation or measurement chamber with the finger.

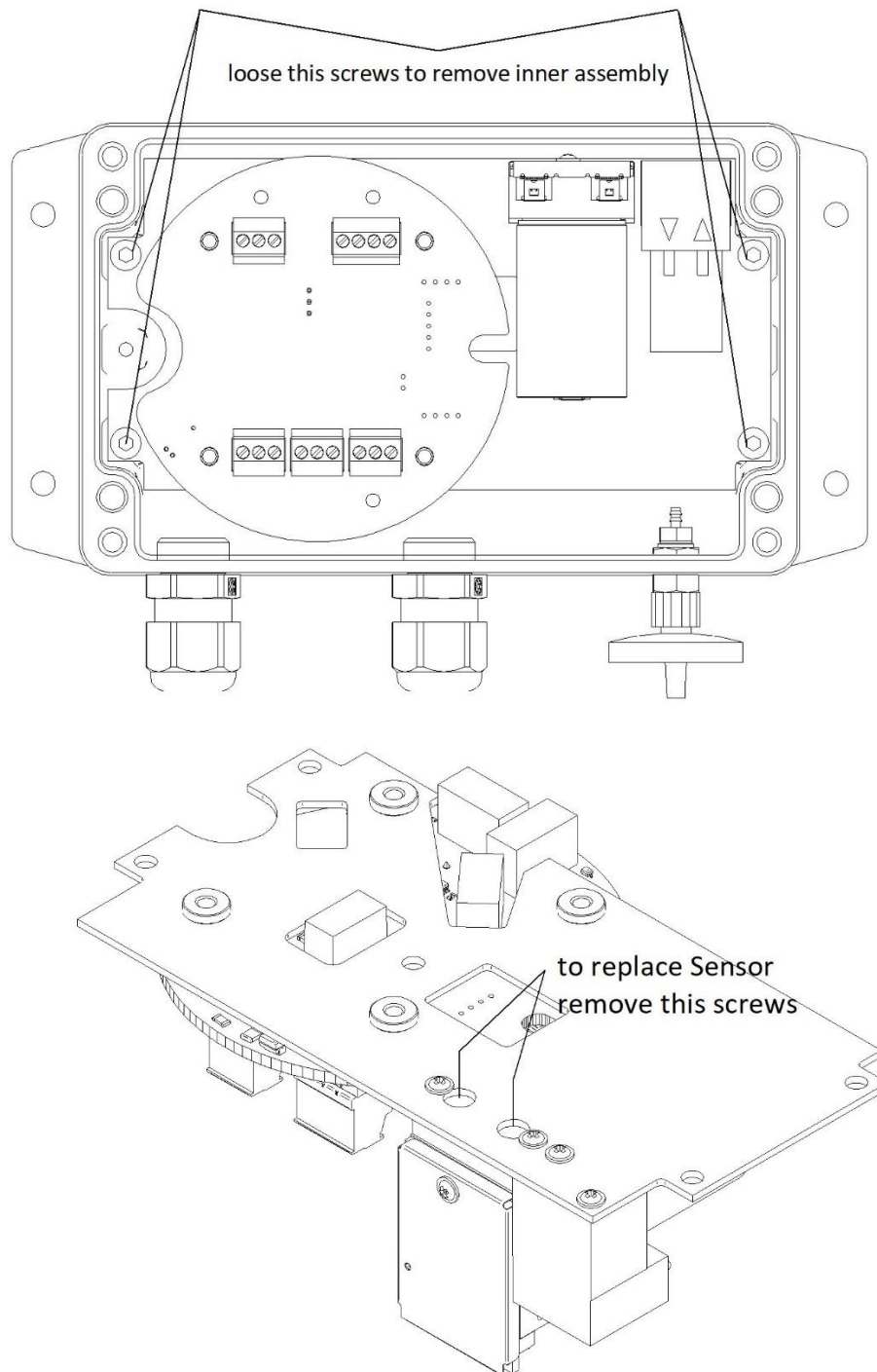


Insert PID lamp

5. Plug the PID lamp with a slight right twisting motion into the PID sensor block. The last turn will be a little tough because the O-ring engages.
6. Connect the lamp control connector cable to the lamp.
7. Calibrate the device after replacing the front isolation or installation of a new PID lamp.

Replace sensor

1. Open device. Remove of inner assembly is necessary.
2. Flip inner device to loosen sensor.
3. Replace sensor.
4. Reassemble in opposite order.



14.3 How To – Clean the PID Lamp

On normal operation over time and for most of VOCs like benzene, toluene, hexane, acetone, and others when concentration does not exceed several tens of ppm, it is not necessary to clean the lamp window.

If PID readings often exceed 100 ppm or other heavy compounds are measured, then it is recommended to clean the lamp window. The interval between cleaning depends on concentration level and is governed by results of checking with use of calibrating SPAN gas.

Cleaning procedure:

1. Remove the PID lamp like described in chapter 14.2.
2. For window cleaning it is recommended to use cotton buds saturated with pure methanol (analytic grade or better). Only wipe with light force onto the lamp window and rub in a circular motion. Repeat this 2-3 times.
3. After cleaning process take short brake of 1 min before the lamp will be installed into PID sensor block.
4. Switching on the device and after 15 min operation, the calibration procedure can be started.



CAUTION

Follow common safety instruction for using methanol



Do not touch the lamp window during installation.

14.4 Maintenance Intervals

The maintenance intervals must be set keeping the environmental conditions in mind (especially in high-polluted environment).

A periodic inspection of the module must be performed at least once a year. The first inspection shall take 3 months after installation.

It is strongly recommended that the maintenance intervals below be respected to guarantee reliable operation.

Part Number	Parts	Maintenance Interval	Comment
0002975	Front isolation	12 months	The front isolation shall be exchanged no later than 1 year after continuous operation.
0002954	10.6 eV Lamp	24 months	Parts shall be exchanged no later than 2 years after continuous operation.
0003023	11.8 eV Lamp	4 months	
0002974	Sensor block	24 months	

15 Ordering information

15.1 Photoionization Detector Module PIDS3

Part Number	Comment	Type
0003143	PIDS3 10.6 eV Std Range with CL, RS485	PIDS3-R0-D0-L0-P0-S0-A1
0003178	PIDS3 10.6 eV Std Range with CL, RS484, Pump	PIDS3-R0-D0-L0-P1-S0-A1
0003176	PIDS3 10.6 eV Low Range with CL, RS485	PIDS3-R1-D0-L0-P0-S0-A1
0003179	PIDS3 10.6 eV Low Range with CL, RS484, Pump	PIDS3-R1-D0-L0-P1-S0-A1
0003177	PIDS3 10.6 eV High Range with CL, RS485	PIDS3-R2-D0-L0-P0-S0-A1
0003180	PIDS3 10.6 eV High Range with CL, RS484, Pump	PIDS3-R2-D0-L0-P1-S0-A1

consist of

Photoionization Sensor Module, PID lamp, Enclosure with cable gland(s) and gas ports, Interface unit, Pump (optional), Inlet filter

15.2 Type Definition

I. - II. - III. - IV. - V. - VI.

PIDS3	-	R0	-	D0	-	L0	-	P0	-	S0	-	A0	
--------------	---	-----------	---	-----------	---	-----------	---	-----------	---	-----------	---	-----------	--

- I. **R0** Detection Range (Standard Range 0 ... 2 000 ppm)
 - R1 Detection Range (Low Range 0 ... 20 ppm)
 - R2 Detection Range (High Range 0 ... 5 000 ppm)
- II. **D0** Digital Interface (RS485 with MODBUS)
 - D1 Future Option
- III. **L0** Lamp (10.6 eV)
 - L1 Lamp (11.8 eV)
- IV. **P0** Pump (Without internal pump)
 - P1 Pump (With internal pump)
- V. **S0** Alarm Relays (Without Relays)
 - S1 Alarm Relays (With Relays)
- VI. **A0** Current Loop (Without 4 ... 20 mA interface)
 - A1 Current Loop (With 4 ... 20 mA interface)

16 Spare parts and Accessories



PIM CPN lamp kit 10.6 eV
Order code **0002954**
PIM CPN lamp kit 11.8 eV
Order code **0003023**



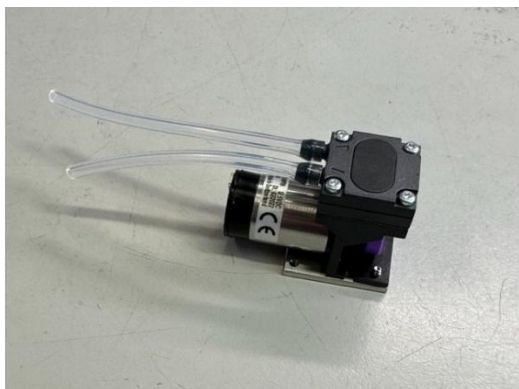
PIDS3 std sensor block kit
Order code **0003194**
PIDS3 low sensor block kit
Order code **0003193**
PIDS3 high sensor block kit
Order code **0003362**



Lamp front isolation pack
Order code **0002975**



Gas inlet filter
Order code **0002591**



PPID standard pump kit
Order code **0003191**

17 Contact

ACI Analytical Control Instruments GmbH
Volmerstraße 9A
D-12489 BERLIN

+49 30 7543 9771 0
www.aci-berlin.de

ACI Analytical Control Instruments GmbH
Volmerstraße 9A
D-12489 Berlin
Germany

© ACI Analytical Control Instruments GmbH. All rights reserved.