# Smart Photoionization Detector Module

# PIDS3

## User Manual

from software version: 1.01.002

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# 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

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 of 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.

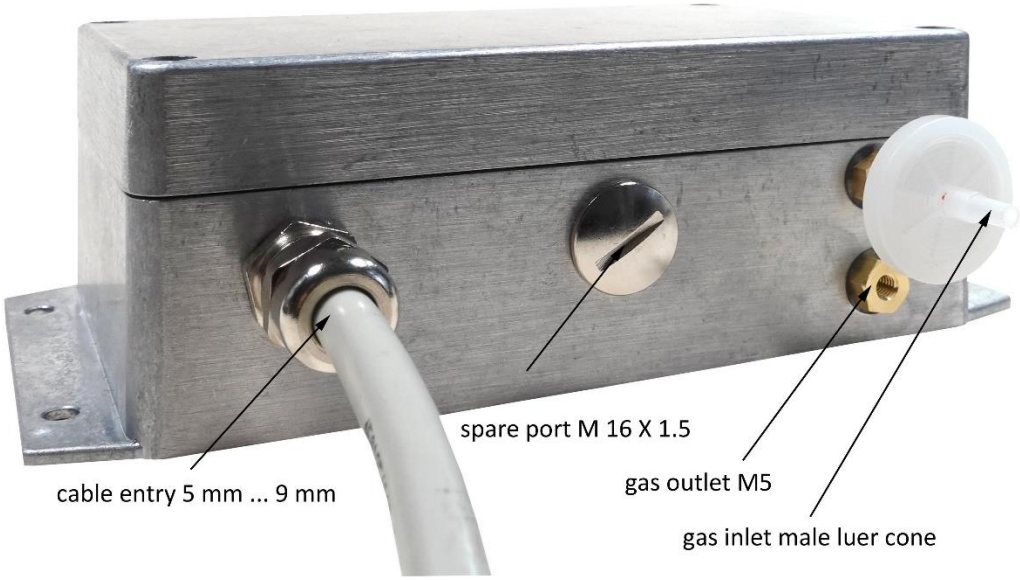
# 3 Technical data

| | |
|---|---|
| Detector principle | VUV-Photoionization with 10.6 eV hollow cathode lamp<br>with Ceramic Discharge Channel technology and integrated high voltage supply. (optional 11.8 eV lamp available) |
| Detection ranges | R0 – 0 ... 2 000 ppm Isobutene *<br>R1 – 0 ... 20 ppm Isobutene *<br>R2 – 0 ... 5 000 ppm Isobutene * |
| Lower detection limit | R0 – typical 0,050 ppm Isobutene *<br>R1 – typical 0,005 ppm Isobutene *<br>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 % *<br>Up to 2 000 ppm typical > 95 % * |
| Influence of humidity | Humidity and temperature compensation at 0 ... 50 °C and 0 ... 90 % rH<br>residual effect less than < 10 % |
| Operating conditions | -20 ... +50 °C and 0 ... 90 % rH, non-condensing<br>(-10 ... +50 °C with integrated pump) |
| Storage conditions | -20 ... +60 °C 0 ... 95 % rH, non-condensing |
| Gas flow | Required 200 ... 300 ml/min,<br>Sample inlet with dust and water protection filter<br>Optional with integrated pump available |
| Gas connection | Viton tube 1/8” ID (recommended)<br>Dust and water protection filter required |
| PID lamp lifetime | 10,6 eV: Min. 8 000 hours, typical more than 15 000 hours<br>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)<br>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<br>Screw connection inside<br>Conductor cross section solid max. 1.5 $mm^2$<br>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 |

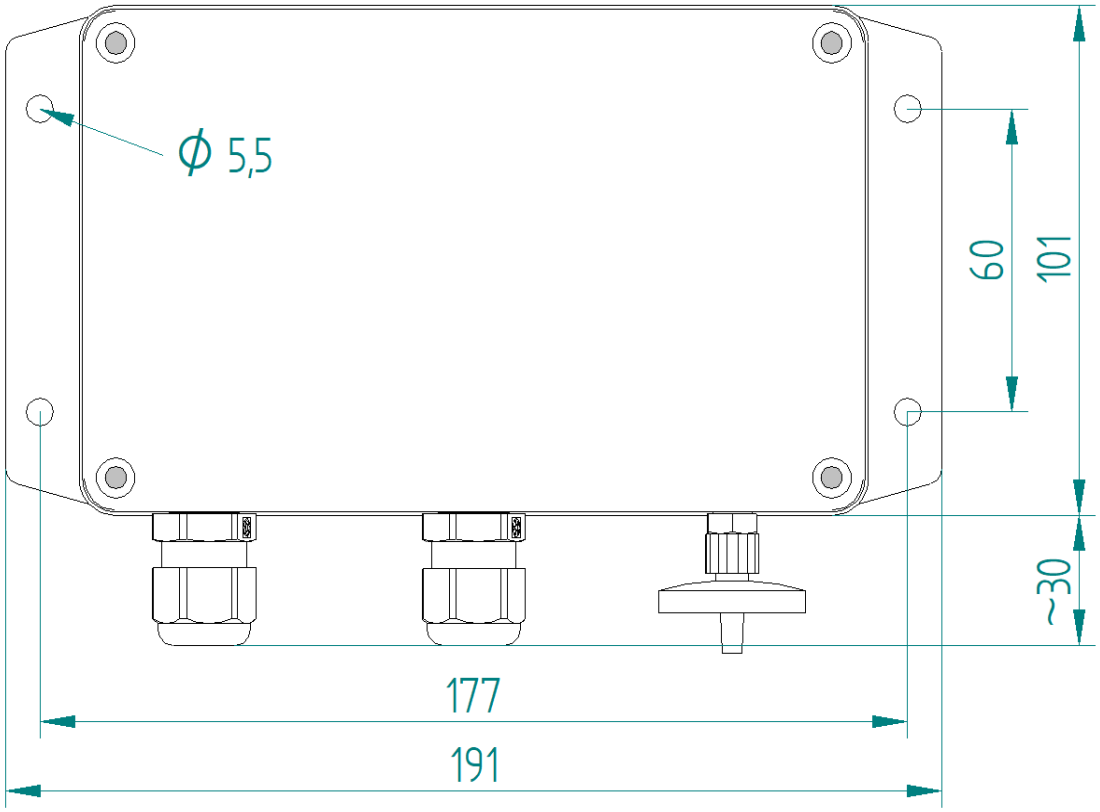
## 4.1 Installation

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

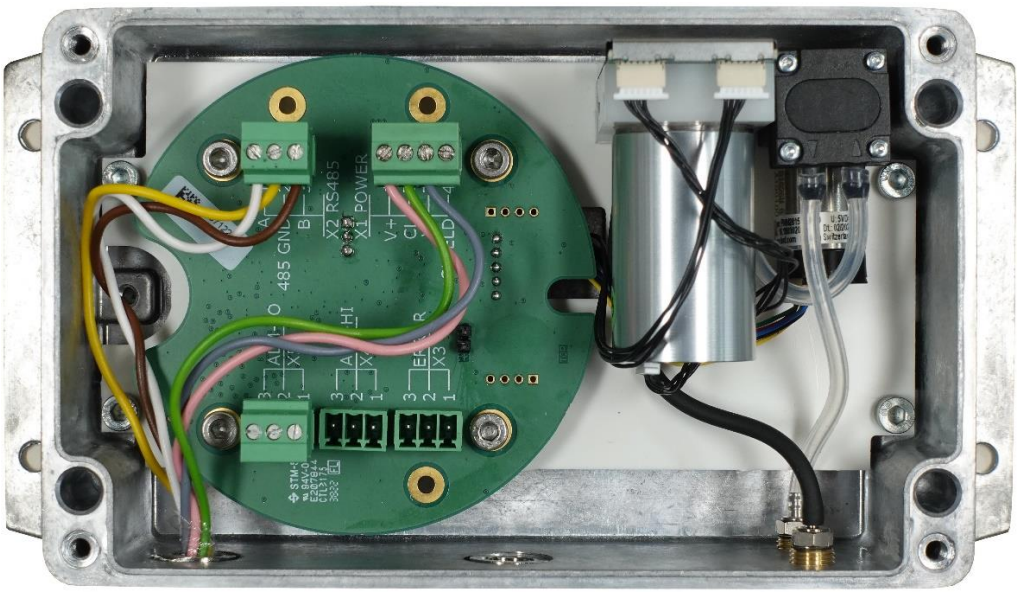
**WARNING**
The device must be installed only in compliance with the applicable regulations, otherwise the safe operation of the instrument is not guaranteed.

- 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.

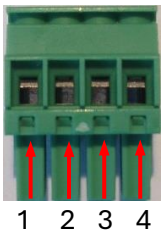
**NOTICE**
The power supply is defined as 10 ... 28 VDC.

**How To – Install Electrical Connection**

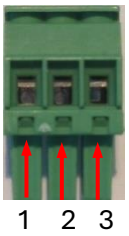
1. Open the device.
2. Unscrew clamping nut at the cable gland.
3. Put clamping nut on the cable. Prepare cable for installation, enable shield to connect with cable gland.
4. Insert cable for connection into the device.
5. Tighten cable gland clamping nut including shield, check that cable cannot move 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 ] |



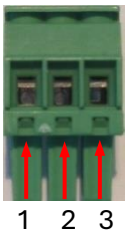

| **X2** | **RS485 (MODBUS)** | |
|---|---|---|
| 1 | A | [ Non Inverting Terminal ] |
| 2 | GND | [ Isolated Ground ] |
| 3 | B | [ Inverting Terminal ] |



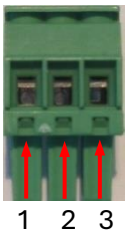

| **J1** | **COMM SELECT** | |
|---|---|---|
| | Jumper plugged in | [ RS485 UART communication ] |
| | Jumper not plugged | [ RS485 MODBUS communication ] |

Relays (optional)

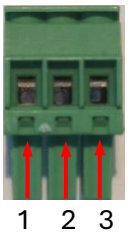
| **X3** | **ERROR** | |
|---|---|---|
| 1 | Relay NC | [ Normally Closed De-Energized Contact ] |
| 2 | Relay COM | [ Common Contact ] |
| 3 | Relay NO | [ Normally Open De-Energized Contact ] |




| **X4** | **ALARM HIGH** | |
|---|---|---|
| 1 | Relay NC | [ Normally Closed De-Energized Contact ] |
| 2 | Relay COM | [ Common Contact ] |
| 3 | Relay NO | [ Normally Open De-Energized Contact ] |




| **X5** | **ALARM LOW** | |
|---|---|---|
| 1 | Relay NC | [ Normally Closed De-Energized Contact ] |
| 2 | Relay COM | [ Common Contact ] |
| 3 | Relay NO | [ 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:

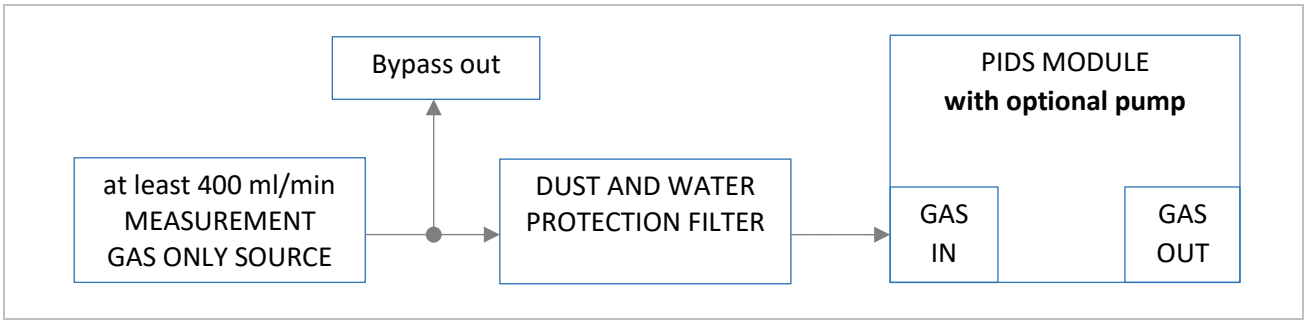
- 'flow low' - gas flow too low, measurement result integrity loss and module may be damaged
- 'flow over' - gas flow too high, measurement result integrity loss

### 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.

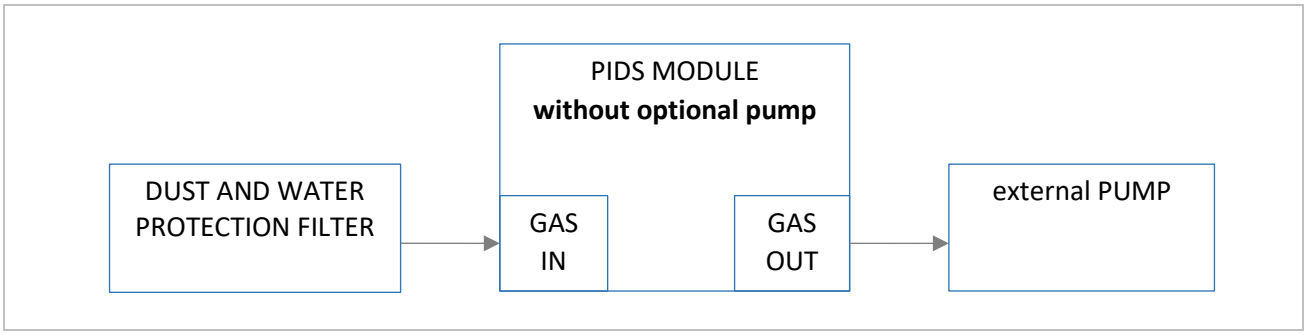



*Gas flow scheme with internal optional pump and constant flow of measurement gas source at gas input*

### 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.

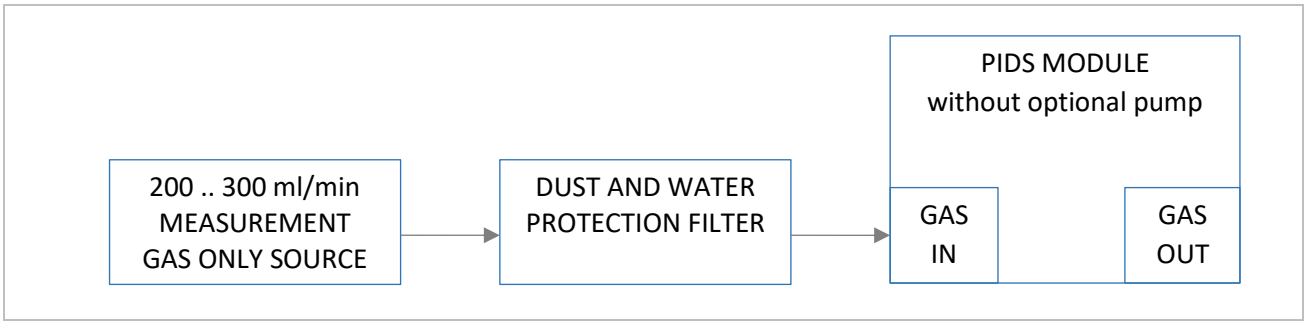
The pump must draw out the gas from the PID module. Thereby gas and particle contamination from pump is prevented.




*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.

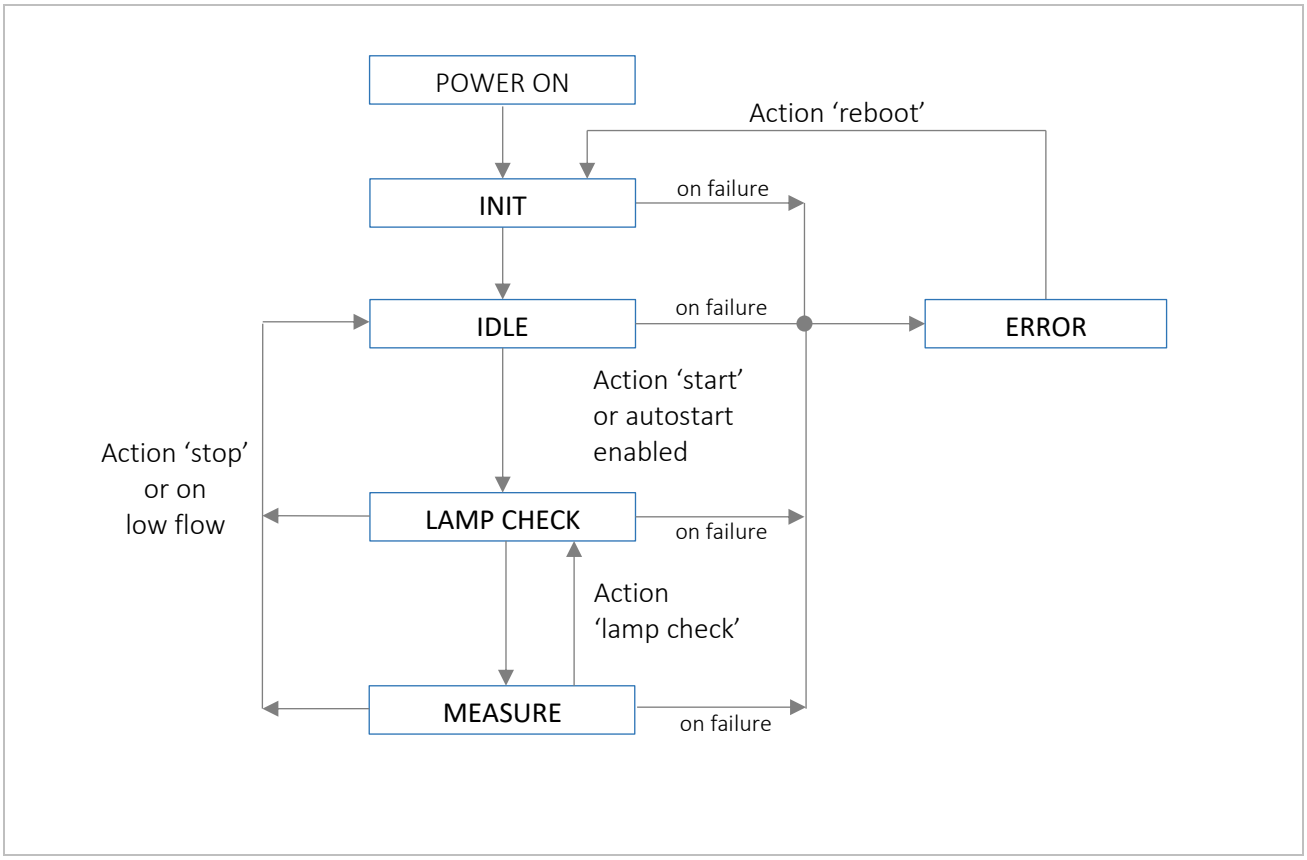
NOTICE – WATCH THE GAS FLOW
The module requires a uniform gas flow.
Do not enter the MEASURE state without appropriate gas flow.

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 place 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 personal 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 MEAUSRE 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<br>in ppm units |
| Current compensated | Temperature and humidity compensated measurement chamber current<br>in pA units |
| Temperature | Measurement chamber temperature (may differ from ambient temperature)<br>in °C units |
| Humidity | Measurement chamber humidity (may differ from ambient humidity due to over temperature)<br>in % rH units |
| Flow indicator | Measurement chamber gas flow indicator (100 % means approx. 250 ml/min)<br>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.

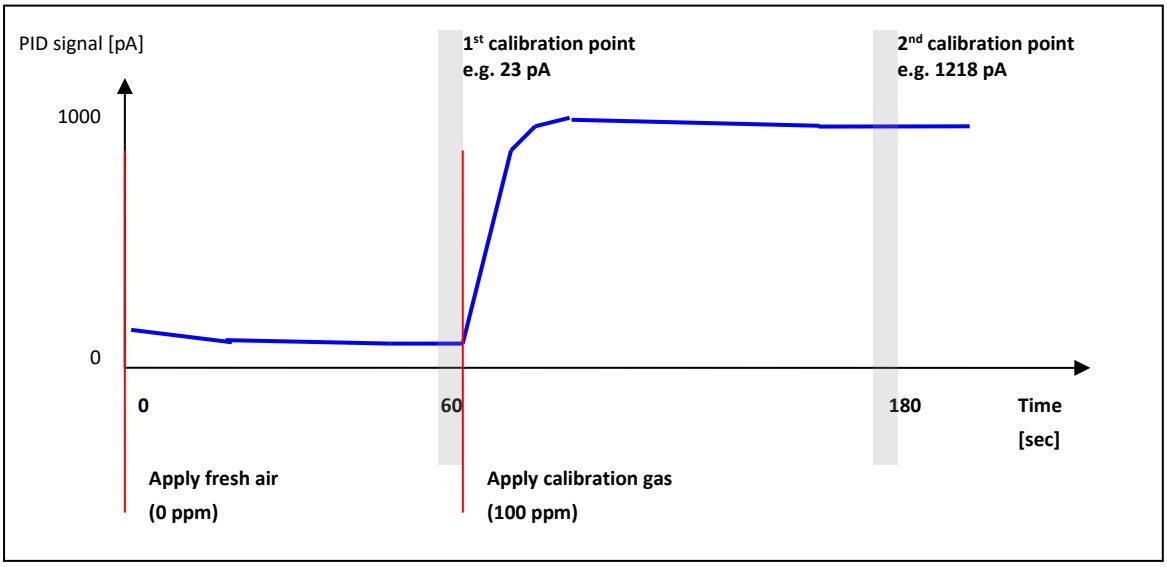
# 8 Calibration

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’)

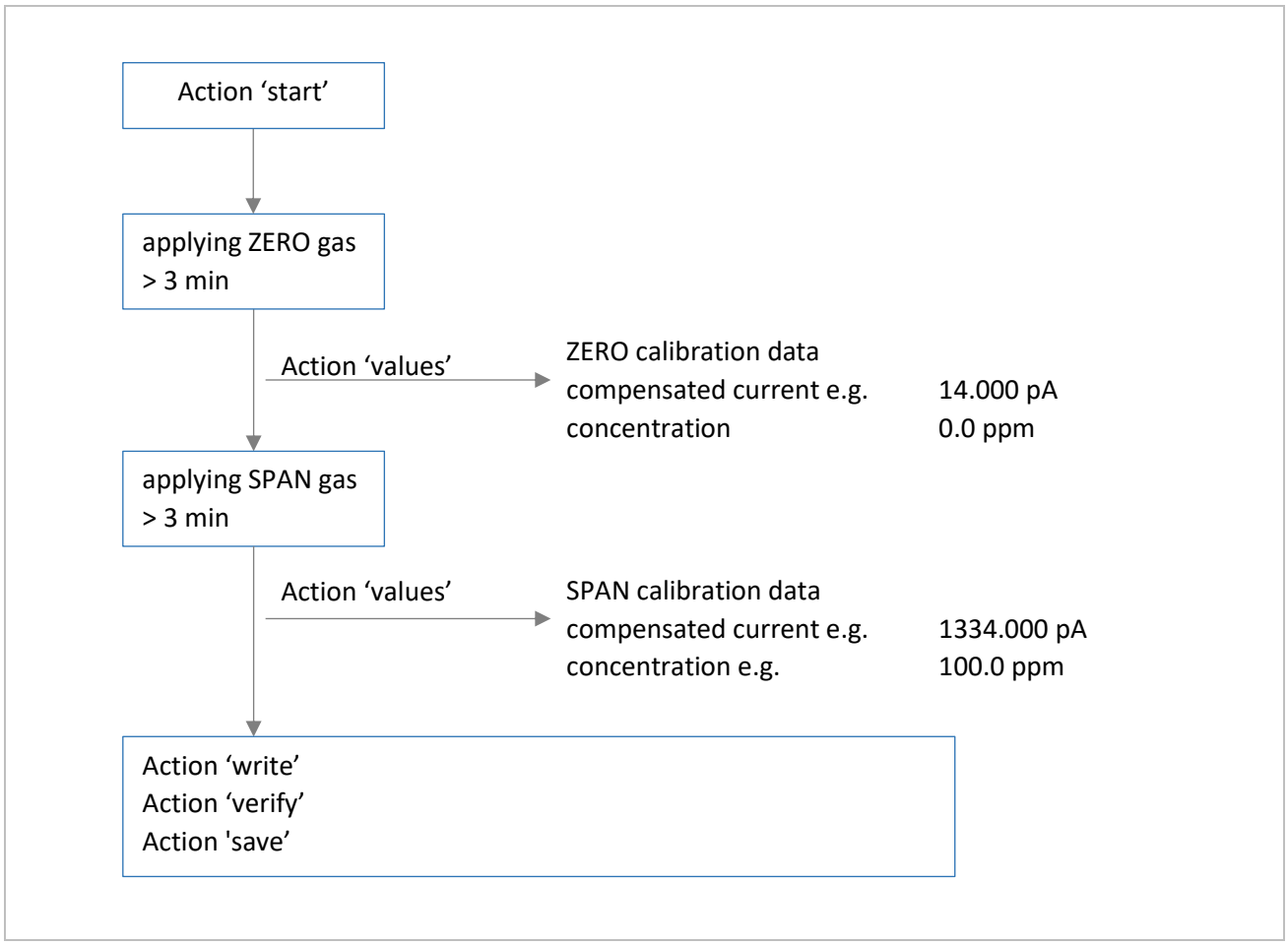
The calibration will be done with currently selected calibration method in measurement config. Calibration data values stored separately for ‘standard’ and ‘extended’ calibration.

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

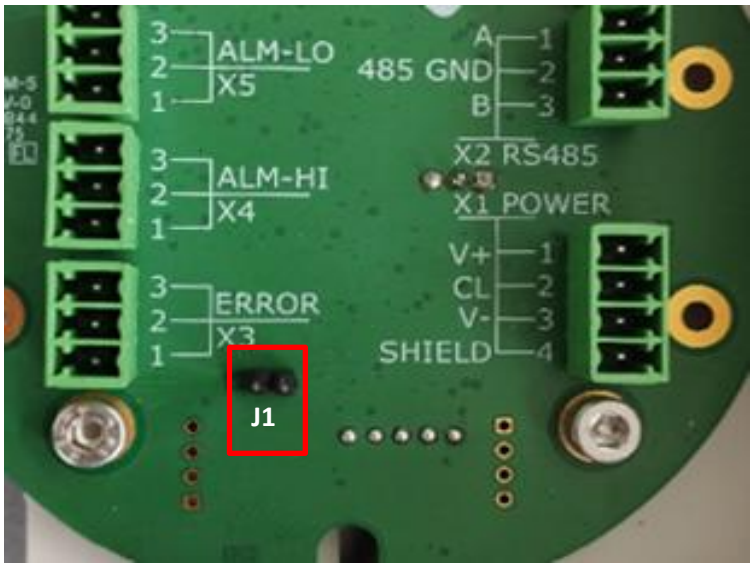
# 9 UART Communication

The communication is implemented as a standard UART- interface.

| | |
|---|---|
| UART signal level | RS485 differentials level |
| UART parameter | 115,200 Baud<br>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 ?**<br>**device [name]** |
|---|---|
| Description | Get the type identification string of the module |
| Parameter | ident type identification string |
| Example | M device ?<br>S device CPN Sensor Device |

| Command | **device.serialno ?**<br>**device.serialno [serial]** |
|---|---|
| Description | Get the serial number of the module |
| Parameter | serial serial number string |
| Example | M device.serialno ?<br>S device.serialno A792003460 |

| Command | **device.software ?**<br>**device.software [sw]** |
|---|---|
| Description | Get software version of the module |
| Parameter | sw Software version string |
| Example | M device.software ?<br>S device.software 1.02.030 |

| Command | **device.hardware ?**<br>**device.hardware [hw]** |
|---|---|
| Description | Get hardware version of the module |
| Parameter | hw Hardware version string |
| Example | M device.hardware ?<br>S device.hardware 1.19012.000 |

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

### 9.2.2 Module control commands

| Command | **pids.start**<br>**pids.start ok** |
|---|---|
| Description | Starts the measurement and enters LAMP CHECK state. |
| Parameter | |
| Example | M pids.start<br>S pids.start ok<br>M pids.start<br>S pids.start error – invalid module status |

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

| Command | **pids.stop**<br>**pids.stop ok** |
|---|---|
| Description | Stops the measurement and enters the IDLE state |
| Parameter | |
| Example | M pids.stop<br>S pids.stop ok<br>M pids.stop<br>S pids.stop error – invalid module status |

| Command | **pids.reboot**<br>**pids.reboot ok** |
|---|---|
| Description | Restarts the module and runs the power on initialization |
| Parameter | |
| Example | M pids.reboot<br>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 ?**<br>**pids.values [result];[curr];[temp];[humid];[flow]** |
|---|---|
| Description | Get the measurement values of the module |
| Parameter | result measurement result in ppm units<br>curr current compensated in pA units (required for calibration)<br>temp temperature in °C units<br>humid humidity in %rH units<br>flow gas flow indicator in % units |
| Example | M pids.values ?<br>S pids.values 12.334;956.1;35.345;53.47;95.9 |

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

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<br>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 an state value of ‘00004100’.

| Command | **pids.error ?**<br>**pids.error [error]** |
|---|---|
| Description | Get the error information of the module |
| Parameter | state device error (32bit hexstring) |
| Example | M pid.error ?<br>S pid.error 00000000 |

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 |

| Command | **pids.measconfig ?**<br>**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’)<br>ident gas identification text (e.g. ‘115-11-7’), 1 to 15 characters<br>factor gas response factor (minimum 0.010)<br>dynres dynamic resolution enable (‘true’ or ‘false’) |
| Example (read active) | M pids.measconfig ?<br>S pids.measconfig standard;115-11-7;1.000;true |
| Example (write) success | M pids.measconfig standard;75-15-0;1.200;false<br>S pids.measconfig ok |
| Example (write) error<br>here missing ident | M pids.measconfig standard;;1.000;true<br>S pids.measconfig error |

| Command | **pids.calib ?**<br>**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)<br>curr2 compensated current of SPAN gas point (e.g. 978.200 pA)<br>conc1 ZERO gas concentration (0.0 ppm)<br>conc2 SPAN gas concentration (e.g. 100.0 ppm) |
| Example (read active) | M pids.calib ?<br>S pids.calib 3.850;978.200;0.000;100.000 |
| Example (write) success | M pids.calib 3.850;928.200;0.000;100.000<br>S pids.calib ok |
| Example (write) error<br>here curr2 to low | M pids.calib 3.850;28.200;0.000;100.000<br>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 ?**<br>**pids.modbus.config [mode];[addr];[baud];[term]** |
|---|---|
| Description | Get or set the module modbus configuration (save data to store permanently) |
| Parameter | mode Modbus mode (‘rtu’ or ‘ascii’)<br>addr Modbus slave address in decimal ( ‘1’ to ‘247’ )<br>baud Modbus baud rate ( ‘115200’, ‘57600’, ‘38400’, ‘19200’, ‘9600’ )<br>term Modbus termination enable ( ‘true’, ‘false’ ) |
| Example read | M pids.modbus.config ?<br>S pids.modbus.config rtu;10;115200;true |
| Example write | M pids.modbus.config ascii;16;19200;false<br>S ok |

### 9.2.5 Module current loop config commands

| Command | **pids.currloop.config ?**<br>**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<br>sigmax Maximum result Isobutene in ppm units maps to output of 20 mA |
| Example read | M pids.currloop.config ?<br>S pids.currloop.config 0.0;2000.0 |
| Example write | M pids.currloop.config 10.0;1000.0<br>S ok |

### 9.2.6 Module autostart config commands

| Command | **pids.autostart.enable ?**<br>**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 ?<br>S pids.autostart.enable true |
| Example write | M pids.autostart.enable false<br>S ok |

### 9.2.7 Module save config data command

| Command | **pids.savedata**<br>**pids.savedata ok** |
|---|---|
| Description | Saved the module data e.g., calibration data |
| Parameter | |
| Example | M pids.savedata<br>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 ?**<br>**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<br>D1 State of relay ALM-HI, 0 – de-energized, 1 – energized<br>D2 State of relay ERROR, 0 – de-energized, 1 – energized |
| Example read | M pids.relay.state ?<br>S pids.relay.state 000 |
| Example write<br>set ALM-LO and ALM-HI | M pids.relay.state 011<br>S pids.relay.state 011 |

### 9.2.9 Module lamp commands

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

### 9.2.10 Module sensor commands

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

# 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<br>Modes ASCII and RTU<br>Device unique address<br>Termination resistor enabling |

For both modes, ASCII and RTU, the EVEN parity is used.

The default values are:

| | |
|---|---|
| Baud rate | 115200 |
| Mode | RTU |
| 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 |
| | | | | |
| 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<br>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

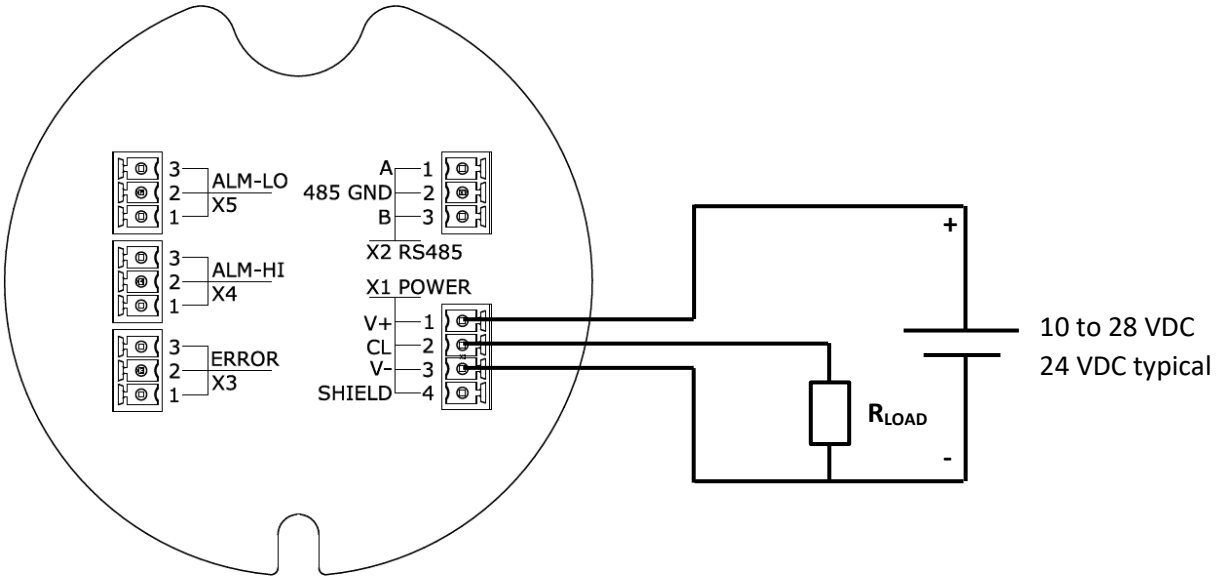
| Bit | Meaning |
|---|---|
| D00 | 1 = Sensor error data acquisition |
| D01 | 1 = Sensor error humidity sensor |
| D02 | 1 = Sensor error lamp function |
| D03 | 1 = Sensor error lamp module control |
| D04 | 1 = Sensor error lamp variant |
| D05 | 1 = Sensor error flow sensor |
| D06 | 1 = Sensor 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

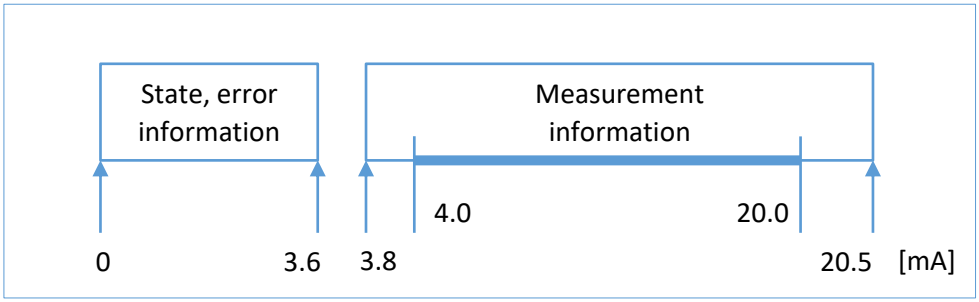
The module is equipped with an analog current loop output, which converts the physical measurement result into an electrical signal. The module provides a current loop output, which operates over the entire supply voltage range. The most common resistor in a 4 ... 20 mA loop is 250 ohms, however, depending 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 |

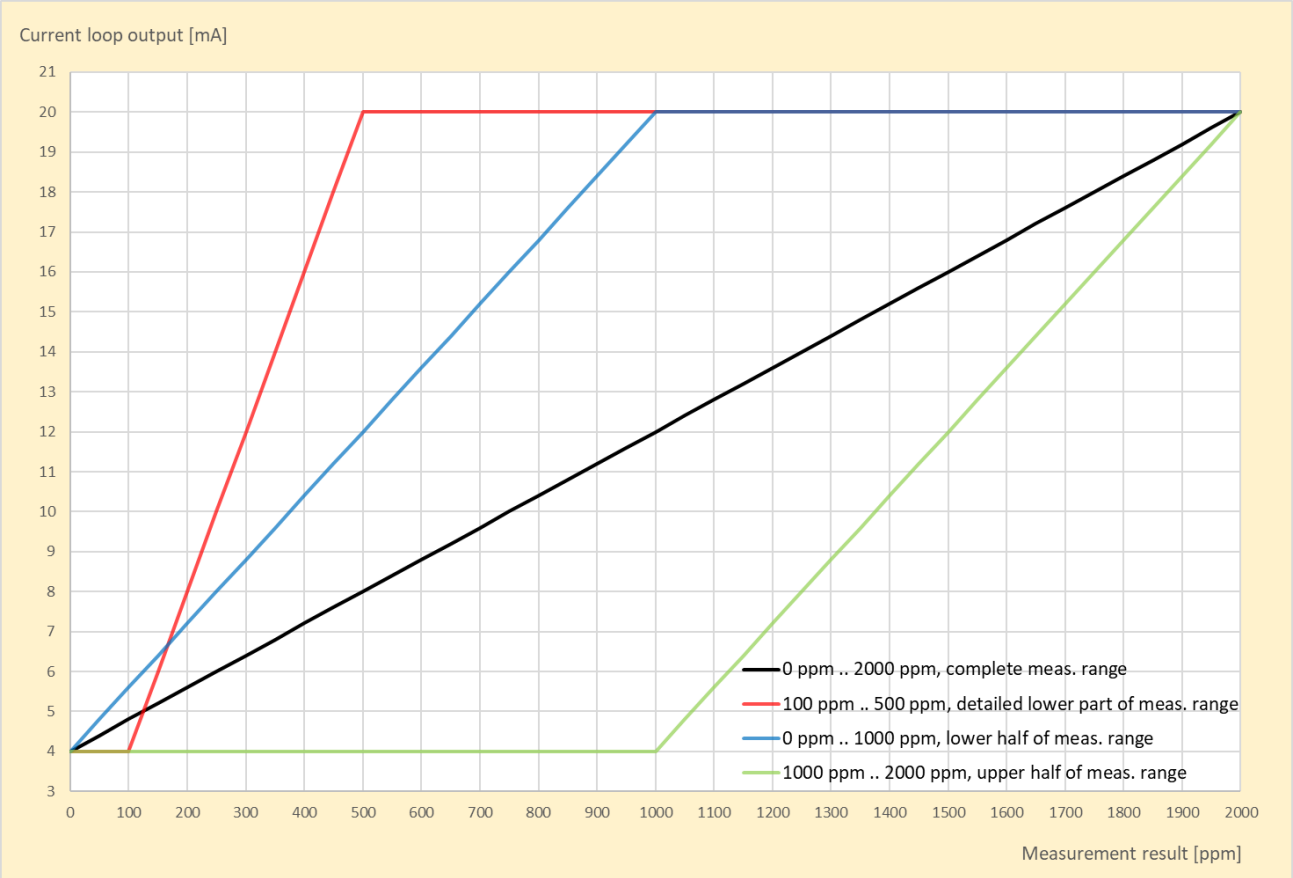
Error information

| | |
|---|---|
| 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 Configurate measurement range

The total analog output current resolution is about 0.36 µA.
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.

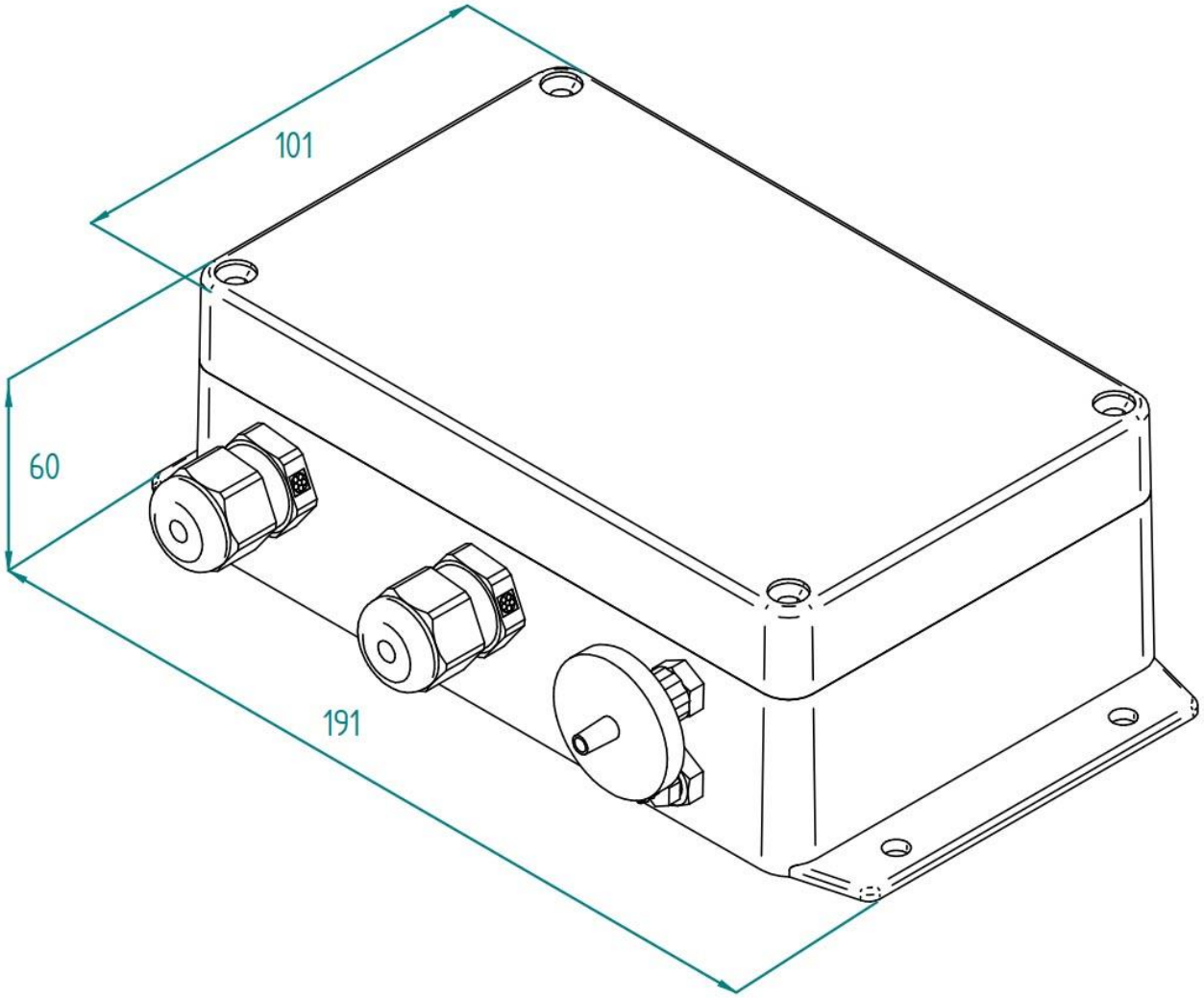



Calculation examples for measurement result of 400 ppm:

| **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 Mechanical Drawing



# 13 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.

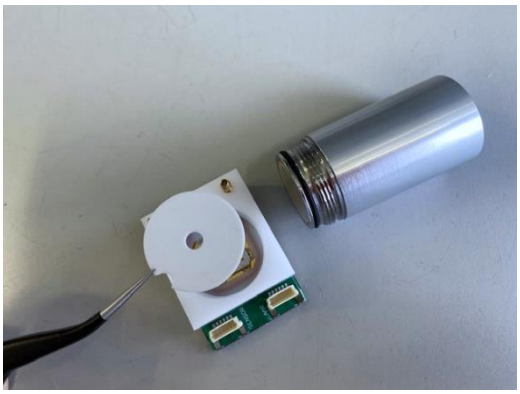
## 13.2 How To – Replace the PID lamp/front isolation/sensor block

**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.

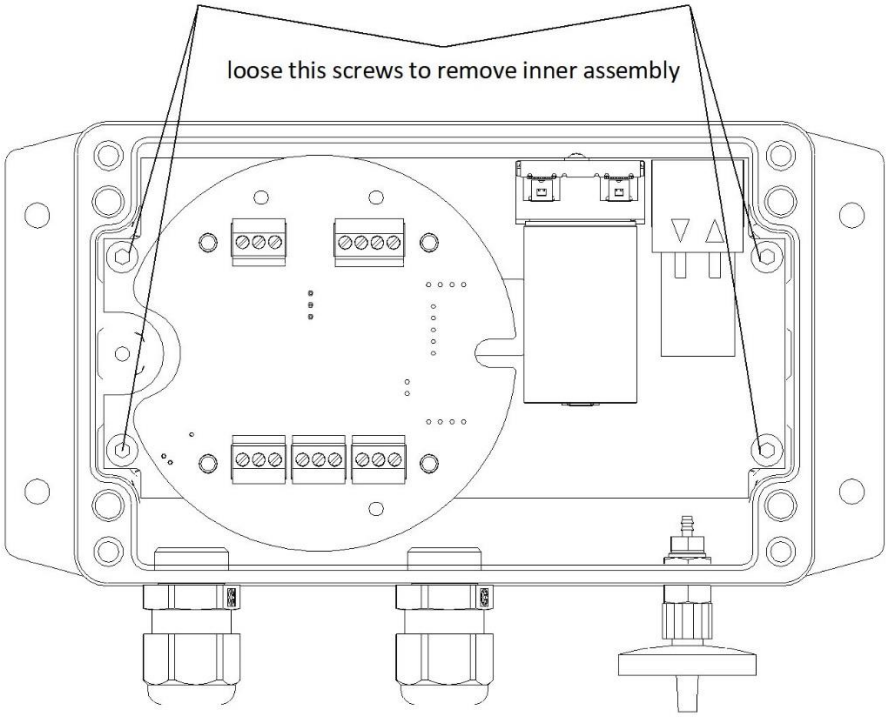
**Replace sensor**

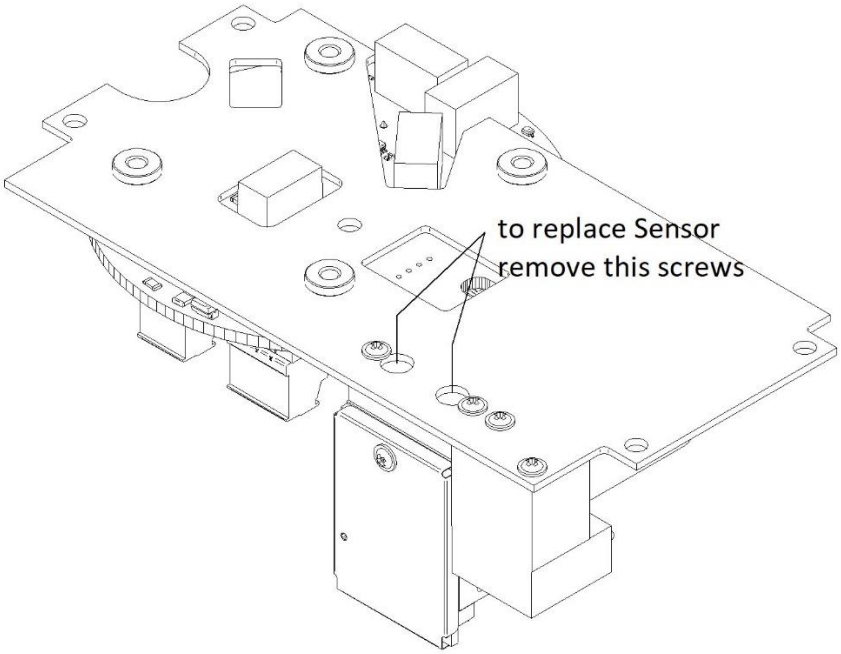
1. Open device. Remove of inner assembly is necessary.

2. Flip inner device to loosen sensor.

3. Replace sensor.

4. Reassemble in opposite order.



## 13.3 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 13.2.
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.

## 13.4 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 | |

# 14 Ordering information

## 14.1 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

## 14.2 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) |

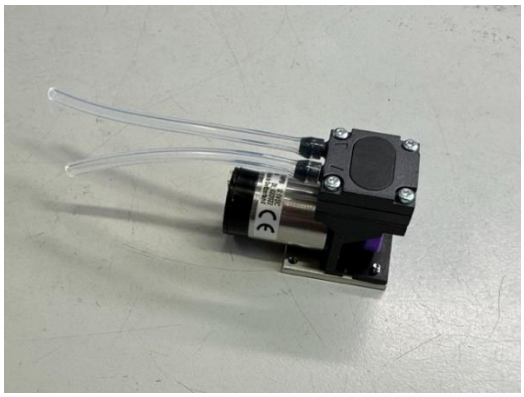
# 15 Spare parts and Accessories

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**

Lamp front isolation pack
Order code **0002975**

Gas inlet filter
Order code **0002591**



PPID standard pump kit
Order code **0003191**

# 16 Contact

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