ANALYTICAL CONTROL INSTRUMENTS GMBH

Laboratory Photo Ionization Detector – LAB PID

User Manual

Rev.1.10

Table of Contents

KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY

Hersteller /
Manufacturer

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

Die Analytical Control Instruments GmbH bescheinigt die Konformität für das Produkt / The Analytical Control Instruments GmbH declares conformity of the product:

Typ / Type	Artikelnummer / Part No.	Bezeichnung / Product name
LAB PID	**0002287**	**Laboratory PID**

mit den folgenden Bestimmungen / with applicable regulations:

EMV Richtlinie /
EMV Directive **2004/108/EG**

Niederspannungsrichtlinie /
Low Voltage Directive **2006/95/EG**

Die Konformität wird nachgewiesen durch die Einhaltung harmonisierter Normen / Conformity is proven by compliance with harmonized standards:

Sicherheit / Safety:

EN 61010-1:2010

Elektromagnetische Verträglichkeit / Electromagnetic compatibility:

EN 61326-1:2013
Störaussendung / Emission: Klasse / Class B
Störfestigkeit / Immunity: Tabelle / Table 2

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R&D Instruments

Berlin July 2013

1. Introduction

Applications for the LAB PID

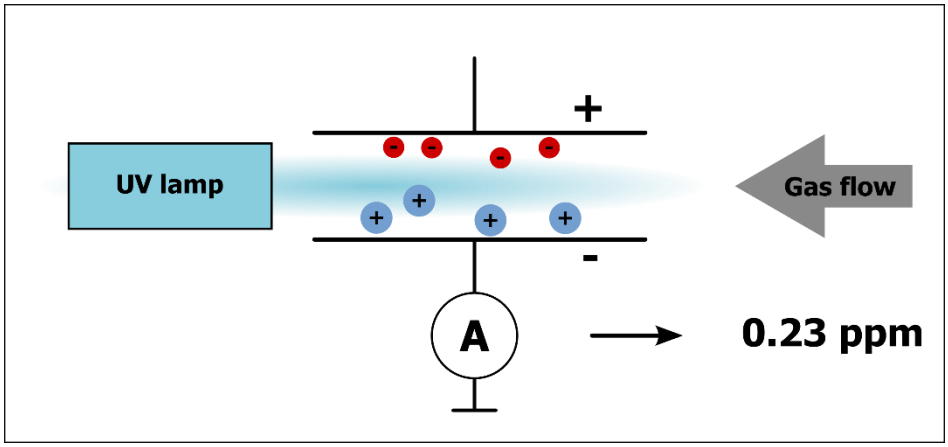
The LAB PID is an instrument for detecting and monitoring volatile organic compounds (VOC's) in gases. The used sensor operates on the photo ionization detector (PID) technology.

Typical gases are

- Isobutene
- Benzene
- Acetone

Photo ionization working principal

The LAB PID working principle based on the molecular photo effect. That means all vaporous organic compounds give up an electron if they hit by a photon with higher energy then the minimum ionization energy of the molecule. As a result of this ionization the molecules are not longer neutral and begin to drift to the negative electrode of the applied electrical field. Once arrived on the negative charged sense electrode the gas ions capture an electron from the electrode and produce so a current which is being measured. The produced free electrons drift in the opposite direction and being captured by the bias electrode. The ions and electrons drift make closed circuit where the measurement current begins to flow.



Under assumption of a constant photon flow and a constant gas flow the measured current is direct proportional to the gas concentration.

2. Warnings

- Please carefully read this user manual before operating and servicing the LAB PID.
- For safety reasons, the LAB PID must only be operated and serviced by qualified personnel.

The device contains high voltage converter. It is strongly recommended to disconnect the device from the power supply before you disassemble the device.

The device contains electrostatic discharge sensitive parts!

3. Features

Detector principle	VUV- Photoionization with 10.6 eV hollow cathode lamp with Ceramic Discharge Channel
Detection range	0 … 2 000 ppm Isobutene *
Display range	0 … 20 000 ppm, depending on response factor of detected substance
Lower detection limit	Typical 10 ppb *
Display resolution	Dynamic up to 0.01 ppm
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 % FS
Operating conditions	0 … 40 °C 0 … 90 % rH, non-condensing
Storage conditions	-20 … 60 °C 0 … 95 % rH, non-condensing
Gas sampling	Integrated diaphragm pump (about 300 ml/min) Sample inlet with dust and water protection filter
PID lamp life time	Min. 8 000 hours, typical more than 15 000 h
Signalisation	Leds at the front to indicate various operating conditions
Display	Full graphic color display, 3.5 inch TFT with 320 x 240 pixel
Program functions	Continuous or cyclical measuring, limit value monitoring by optical and acoustic alarm, two-point calibration, self-testing, data storage
User Interface	Intuitive graphical menu navigation via cursor or touchscreen, multilingual
Languages	English, German
Memory	More than 50 000 measurement data with time, temperature and humidity

Power supply	100 … 260 VAC/50 … 60 Hz
Power consumption	≤ 5 W
Relays	3 x SPDT 30 V / 2 A
Analog output	Current loop, 4 … 20 mA
Digital interface	USB, RS232, RS485 (MODBUS)
Calibration	Automatically two point calibration Zero gas via activated char coal filter, span gas via sample inlet
Response factors	Selectable built-in response factors
Dimension, weight	310 mm x 244 mm x 130 mm (L x W x H), approx.: 3 kg
Ingress Protection	IP30
Warranty	2 years, except for components in gas path and wearing parts
Approvals	EMC directive 2004/108/EC, Low voltage directive 2006/95/EC

* The indicated values were obtained under standardized conditions. Test gas was isobutene in synthetic air.

4. Putting the LAB PID into Operation

4.1. Unpacking the LAB PID

When unpack the LAB PID proceed as follows:

- Remove the LAB PID from its packaging
- Check that the delivery is complete using the accessory list
- Carefully check the LAB PID for any damage
- If there is damage, immediately contact the carrier service

4.2. Setting up the LAB PID

When set up the LAB PID please note the following:

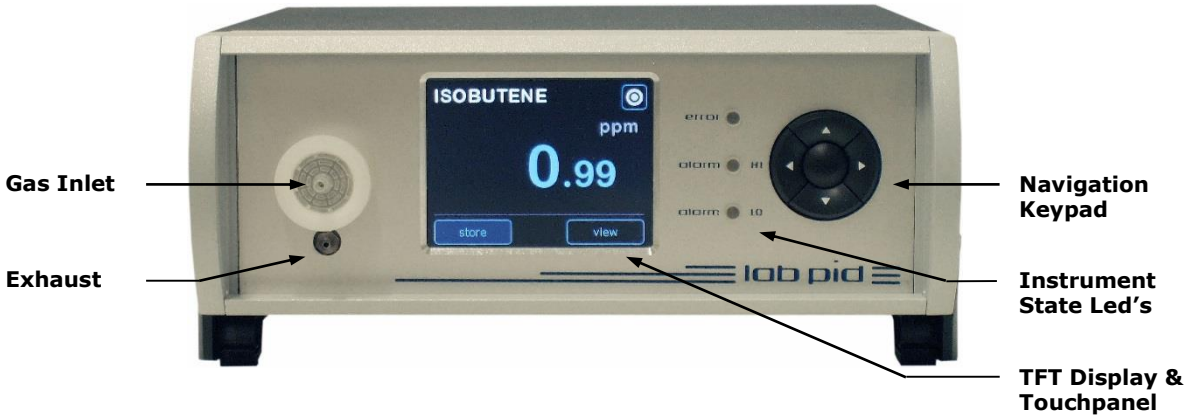
- Must be assembled on a firm, level surface only
- Plug-tip in front can be used to lift up the display front
- Protection film from the screen glass can be carefully removed if necessary

NOTE:

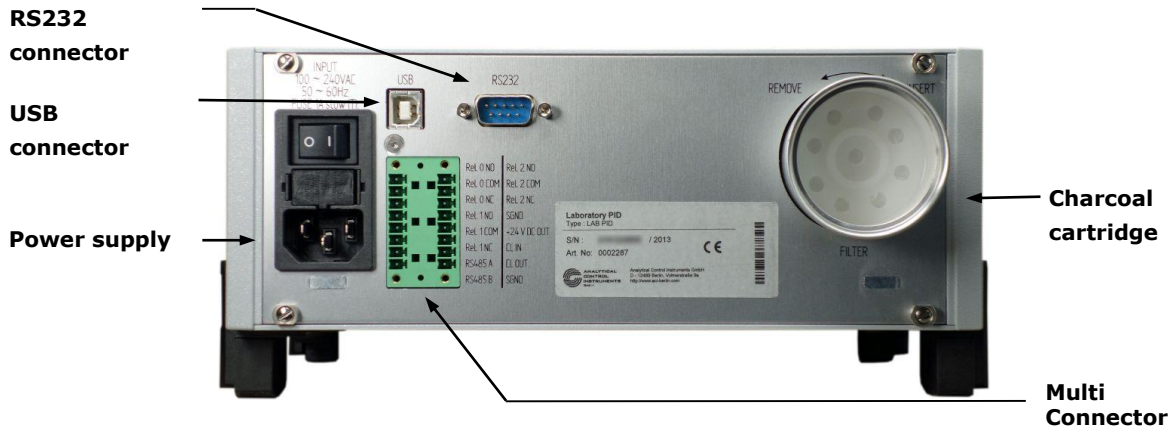
- Avoid placing the instrument in a location subject to high humidity, direct sunlight, extreme temperatures, heavy dust or mechanical vibration.
- Do not place heavy objects on top of the instrument.

4.3. Connections and Control elements

Front view



Rear view



4.4. Starting the instrument

The LAB PID meets the requirements for safety (DIN EN 61010-1), which means all metal parts that can be touched or accessed without removing the enclosure are connected to the protective ground of the power supply network.

Before putting the LAB PID into operation, make the following checks:

- Remove the sealing on the back of the charcoal cartridge
- Ensure that the Charcoal cartridge is installed correctly and free of obstructions
- Ensure that the Gas inlet syringe filter is installed correctly

To start the LAB PID proceed as follows:

- Connect the AC line power cord to power supply on the rear
- Switch on the AC line power supply on the rear

Behavior during Instrument startup:

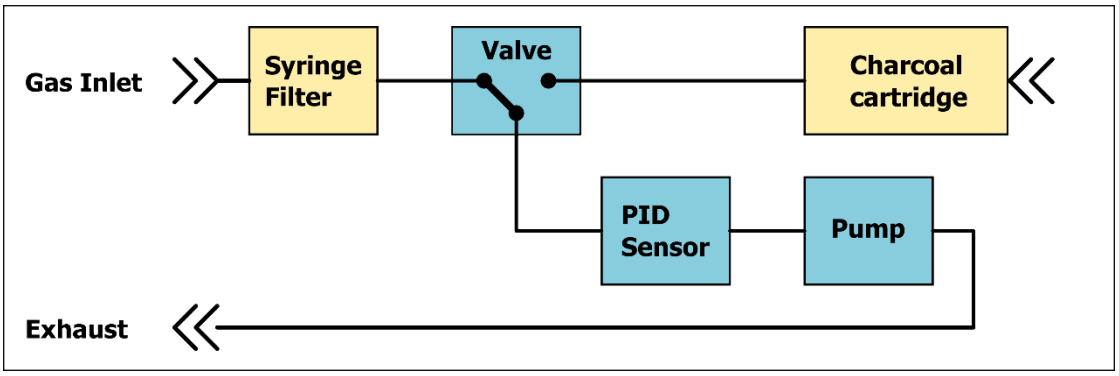
- The three LED's on the instrument's front panel comes on
- The "lab pid - dcm system" symbol appears on the screen and LED's are off
- User specific information are shown and both yellow LED's will flash
- Self diagnostic sequence is running
- Measurements starts after startup is completed

CAUTION:
Never run the instrument without:

- Gas inlet syringe filter
- Charcoal cartridge

4.5. Gas scheme and connections

4.5.1. Internal gas block scheme



4.5.2. Front panel gas connections

Gas Inlet

- Apply the gas to measure
- Special glass syringe filter protects the instrument against material pollution
- Luer-male

Exhaust

- Connect exhaust tubing

4.5.3. Rear panel gas connections

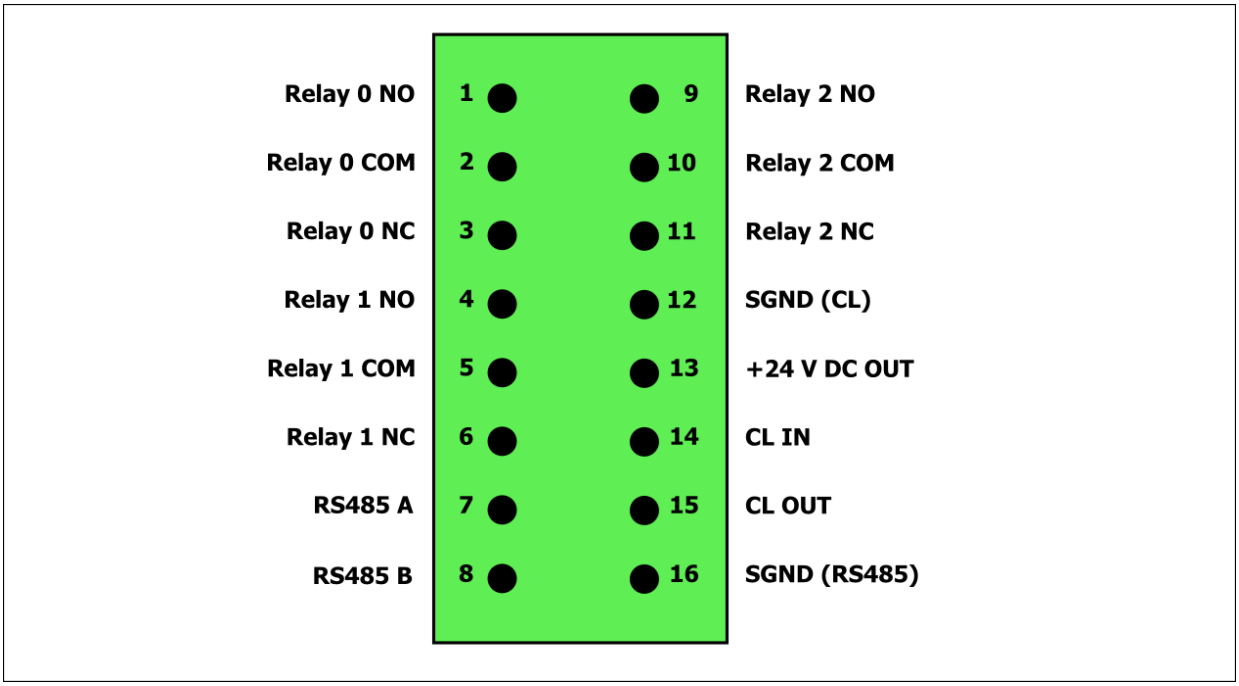
Charcoal cartridge

- Removes all particles of VOC's
- Required for "Interval measurement" and "Automatic calibration method"
- Is screwed and can easily be replaced if necessary

4.6. Multi Connector

The LAB PID supports the following digital and analogue interfaces at the rear panel:

- 3 Relays SPDT 30 V /2 A max.
- Current loop (4..20 mA)
- RS485

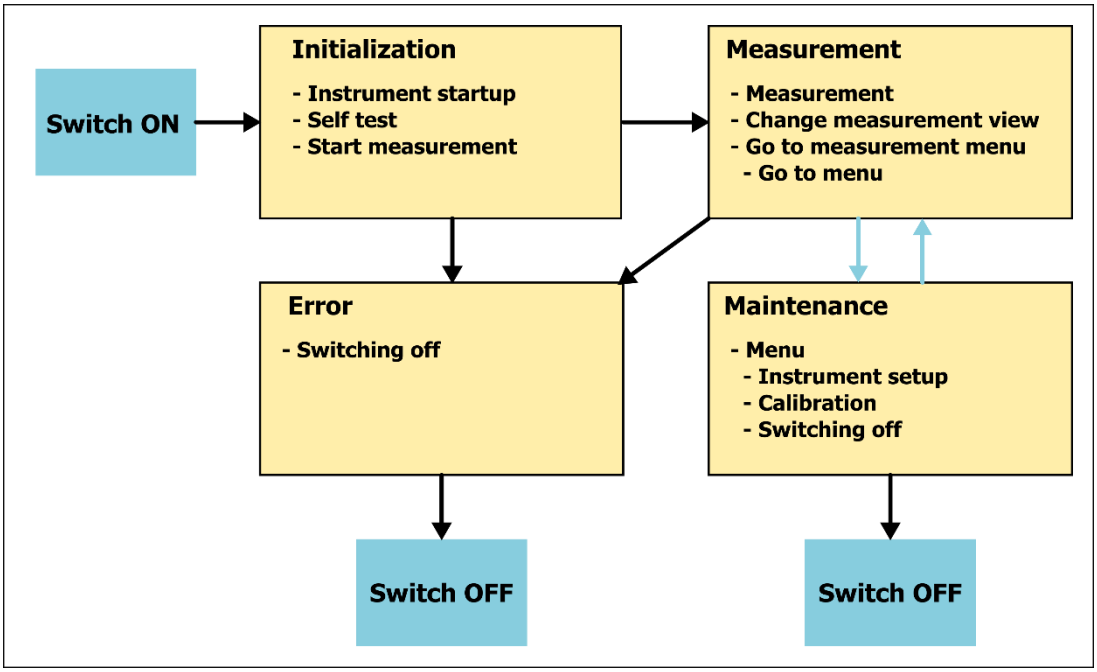


Pin	Connection	Description
1	Relay 0 NO	Relay 0 Normal Open
2	Relay 0 COM	Relay 0 Common Ground
3	Relay 0 NC	Relay 0 Normal Closed
4	Relay 1 NO	Relay 1 Normal Open
5	Relay 1 COM	Relay 1 Common Ground
6	Relay 1 NC	Relay 1 Normal Closed
9	Relay 2 NO	Relay 2 Normal Open
10	Relay 2 COM	Relay 2 Common Ground
11	Relay 2 NC	Relay 2 Normal Closed
7	RS485 A	RS485 positive line
8	RS485 B	RS485 negative line
12	SGND (CL)	Signal Ground for current loop
13	+24 V DC OUT	Supply Voltage output 24 V DC (max. 0,17 A)
14	CL IN	Current Loop driving voltage input (6 V DC to 40 V DC)
15	CL OUT	Current Loop output
16	SGND (RS485)	Signal Ground for RS485 (galvanic isolated)

For maximum ratings see section 18.1.

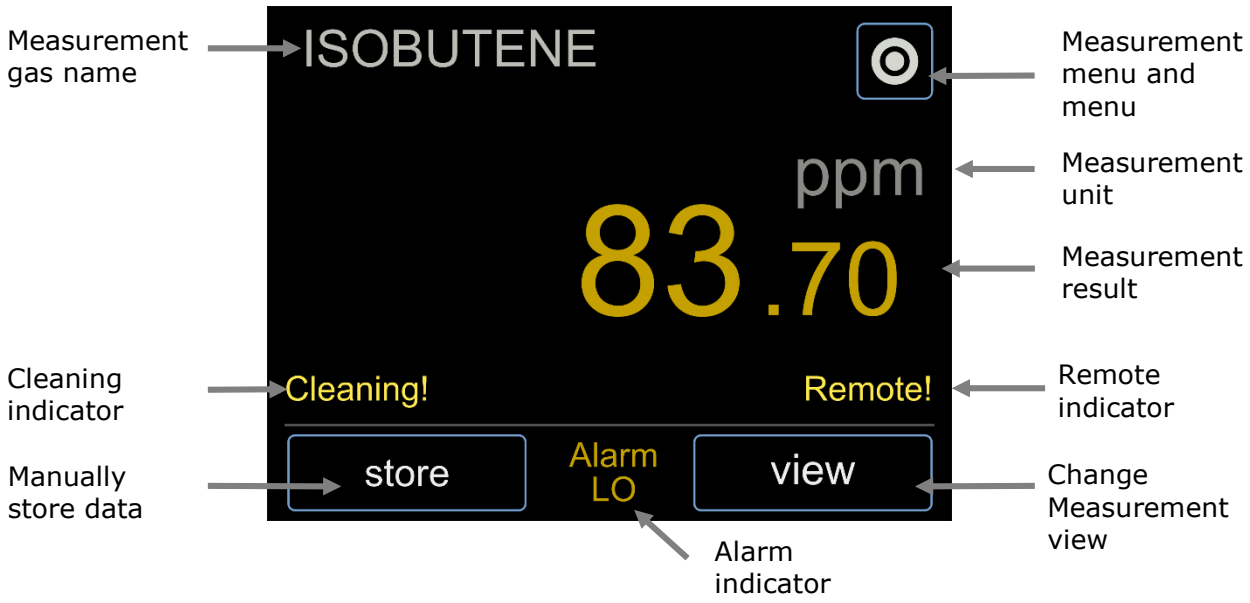
5. User Interface

5.1. Instrument states and Interaction flow



5.2. Measurement display

After switching on and successful initialization, the instrument enters the measurement.



Measurement result

- Last measured PID sensor value including response factor for standard calibration
- Last measured PID sensor value for custom calibration

Measurement view selectable between

- Large displayed numerical value of last measured result
- Line graph of measured results from a selectable time in a selectable scale

Measurement gas name

- Response factor display value when using standard calibration
- 'Custom Gas' display when using custom calibration

Measurement unit

The unit of the measurement result.

Alarm indicator

The indication of an alarm if an alarm level or the over range level is exceeded.

Cleaning indicator

Instrument currently probing gas from the Filter inlet for cleaning or sampling is enabled.

Remote indicator

Instrument is currently remote controlled.

NOTE:

Do not touch the screen with sharp object.

Change time span and value range for measurement graph:

Measurement display -> Measurement menu -> Graph setup

Leaving measurement and entering menu:

Measurement display -> Measurement menu -> 'menu'

5.3. Measurement result resolution

According to the value of the measurement result the display value is rounded.

Measurement result	Displayed resolution
result < 10ppm	0,01ppm
result < 100ppm	0,10ppm
result < 200ppm	1,00ppm
result < 500ppm	5,00ppm
result > 500ppm	10,00ppm

5.4. Switching OFF

To switch off the LAB PID proceed as follows:

1. Switch off the instrument in menu
2. Switch off the AC line power supply at the rear panel

Switch off instrument in menu:

Measurement display -> Measurement menu -> menu -> 'switch off'

NOTE:

To avoid data loss, switch off the instrument in menu before switching off the power supply.

6. Measurement

The LAB PID supports different types of measurement.

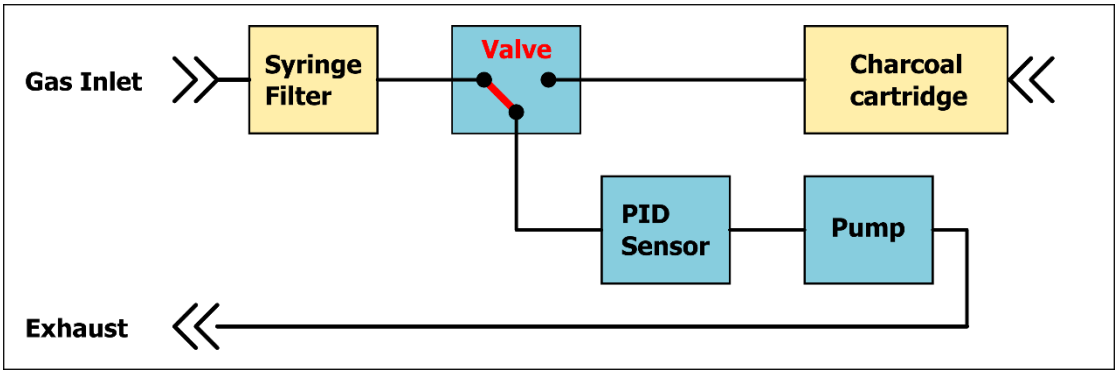
6.1. Sampling mode and Cleaning mode

Parts of the photo ionization detector which are directly contacted to high VOC contaminated measurement gas can be polluted.

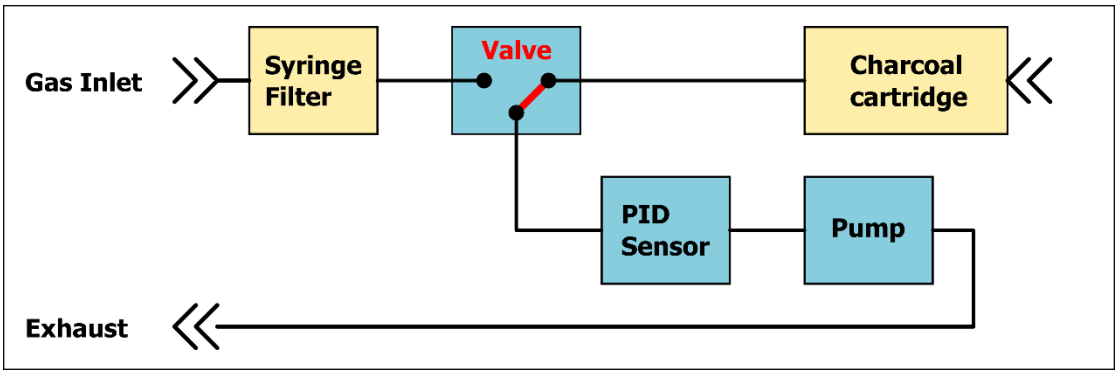
The LAB PID has a solution that allows flushing the complete gas way with VOC free gas.

- Sampling mode: gas is taken from Gas inlet
- Cleaning mode: gas is taken from Charcoal cartridge

Sampling mode: valve is set to Gas inlet

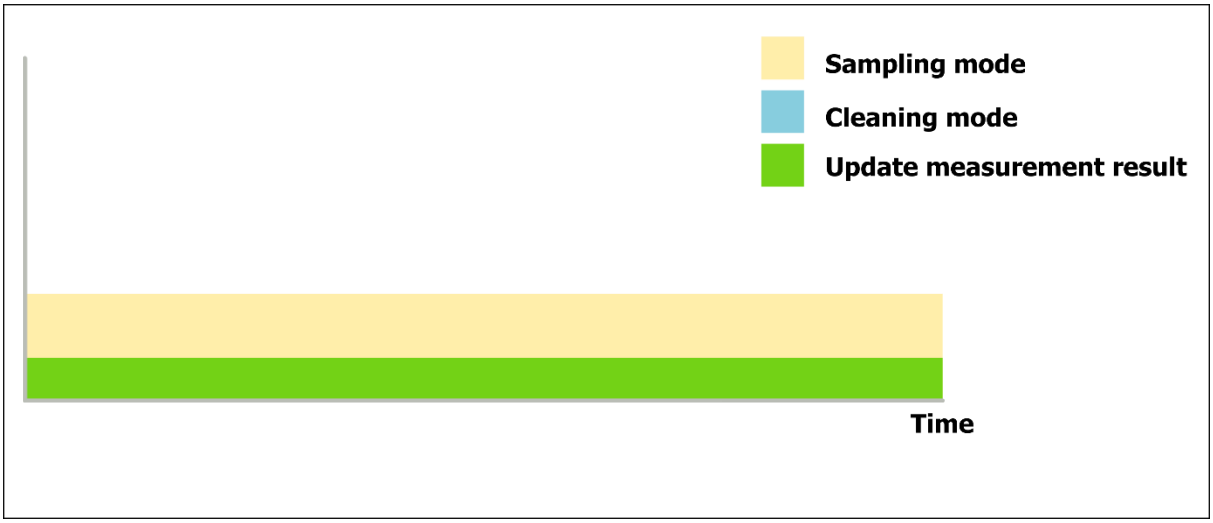


Cleaning mode: valve is set to Charcoal cartridge



6.2. Continues measurement type

The LAB PID continuously measuring in sampling mode.

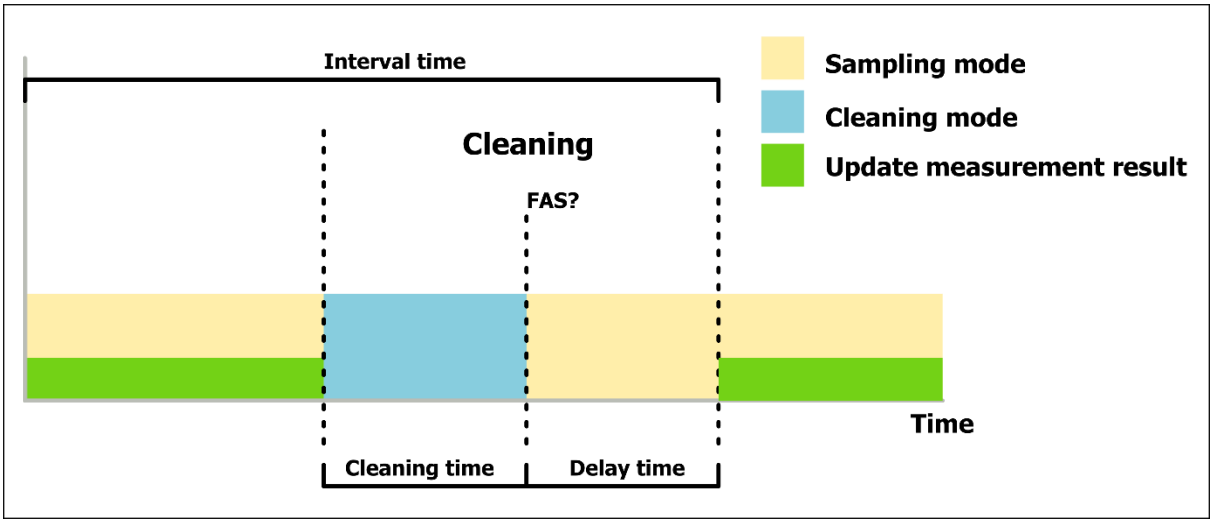


Enable continues measurement:

Menu -> Measurement setup -> Measurement type

6.3. Interval measurement type

The LAB PID switches automatically between sampling and cleaning mode.

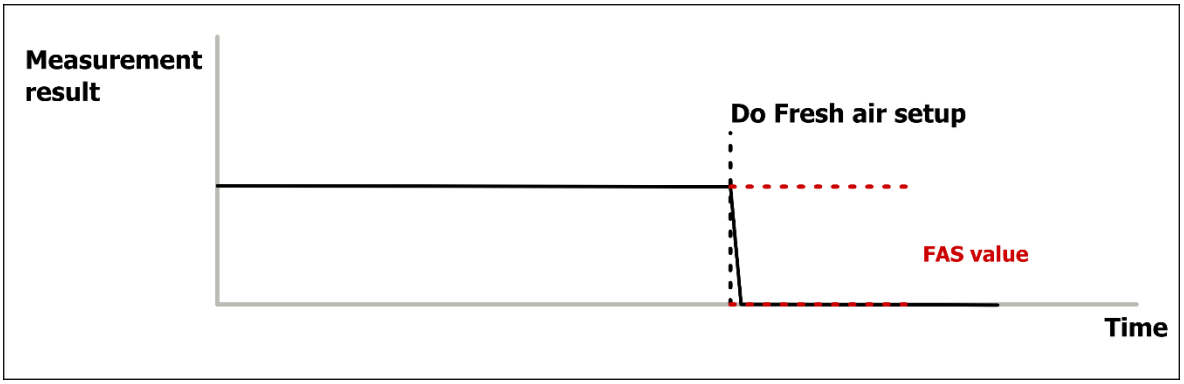


Enable interval measurement and set parameters:

Menu -> Measurement setup -> Measurement type

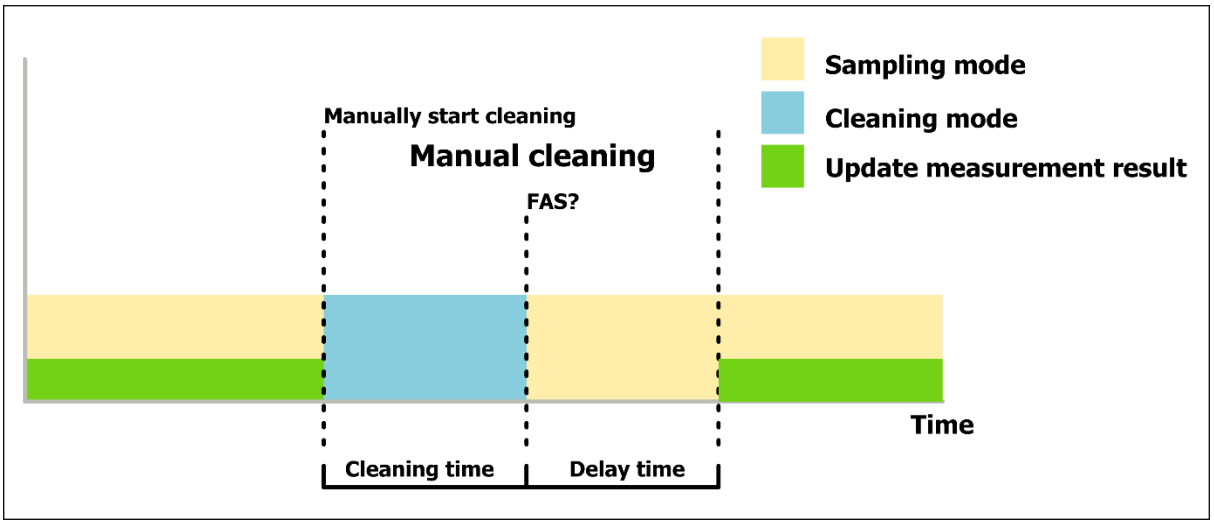
FAS

The FAS (Fresh air setup) is a setup of the measurement zero result. The measurement result is reduced by the FAS value.



6.4. Manual Cleaning

Manually switch instrument to cleaning mode and return after a selectable time to sampling mode.



Start manual Cleaning:

Measurement display -> Measurement menu -> Manual cleaning

7. PID Sensor Calibration

The LAB PID provides calibration using two-point-calibration method with two different gases.

- Zero gas without any components of VOC's
- Span gas with a known concentration of Isobutene

Start PID sensor calibration:
Menu -> Measurement setup -> Calibration -> Calibrate sensor

It is recommended to calibrate with a concentration which is in the last third of the expected signal range. You can select and adjust the desired concentration of span gas during the intuitively guide through the calibration.

7.1. Calibration method

The calibration supports two methods of applying the calibration gases.

Manual calibration method

- Zero gas and Span gas is taken from the Gas inlet
- During the calibration the user will be prompted to apply the correct gas to Gas inlet

Automatic calibration method

- Zero gas is taken from Charcoal cartridge
- Span gas is taken from Gas inlet
- Switching between Charcoal cartridge and Gas inlet is done automatically

7.2. Calibration data set

The LAB PID supports two calibration data sets for standard span gas Isobutene and a customer defined span gas.

Standard calibration set

- Span gas is Isobutene
- Response factors are used

Custom calibration set

- Span gas is custom defined
- Response factors are NOT used

Choose a calibration data set:

Menu -> Measurement setup -> Calibration -> Choose calibration data

7.3. Possible calibration Errors

Zero gas calibration error

- Charcoal filter is contaminated for automatic calibration method
- Zero gas with some components of VOC's is used for manual calibration method

Span gas calibration error

- Span gas bottle not attached or not opened
- Span gas concentration does not match the concentration in span gas bottle
- PID sensor lamp is contaminated

8. Response Factor

The response factor is the ratio between the instrument response of the actual measured gas and the standard calibration span gas Isobutene.

Generally the response factor depends on gas, environment condition (temperature, humidity, pressure) and the specific instruments behavior.

For simplifying the use of response factor average values from standard tables are used in a build in response list. (see "LAB PID.Responselist.BuildIn 1.01.pdf")

Additional a user response list with up to 25 response factors can be used. The user response list can be created, edited and added to instrument by LAB PID Control program on our PC.

The currently used response factor is shown in the measurement gas name on the measurement display.

Example for Response factor:

The applied gas is 75 ppm Benzene.
The instrument response for Benzene is more than for Isobutene.

Result for Isobutene	:	approx. 136 ppm
Response Factor	:	x 0,55 (Ratio of Benzene to Isobutene)
Result for Benzene	:	75 ppm (136 ppm x 0,55)

As a factory default a list of various response factors is included in the LAB PID.

Change current Response factor:

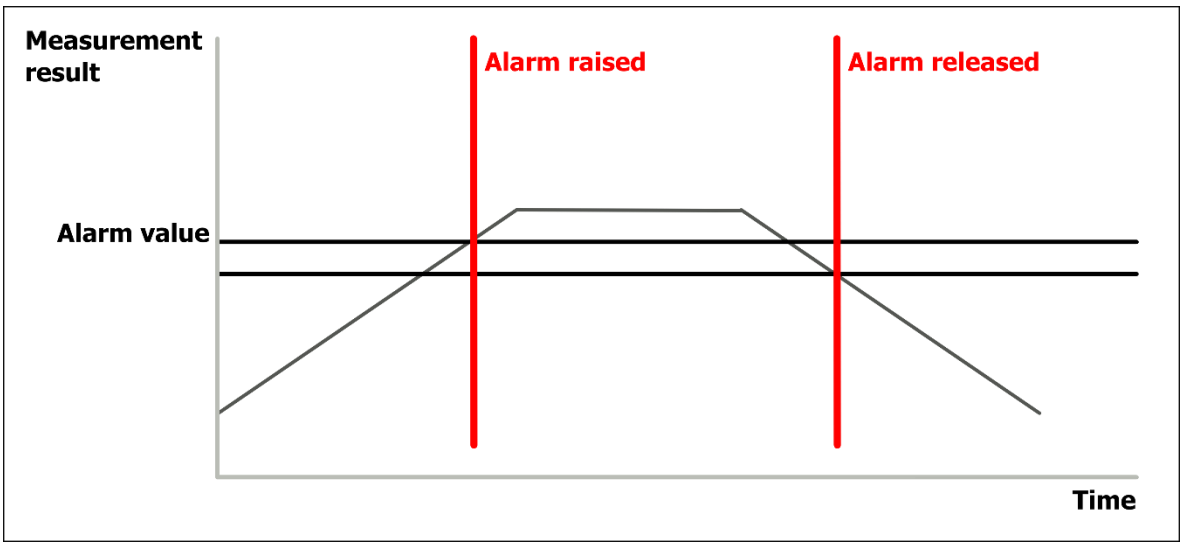
Menu -> Measurement setup -> Response factors -> Choose Response factor

NOTE:

Check alarm values to fit new Response factor if changed.

9. Alarms

The LAB PID supports 3 independent alarms. An alarm is raised if the associated value is exceeded by the measurement result. It is released if the measurement result falls below the associated value minus the half of measurement result resolution.



	Alarm value	Enabling	Signalization
Alarm LO	Settable Min.: 1,0 ppm Max.: 2.000 ppm	Can be disabled	LED 'alarm LO' is lighten up Alarm sound Assigned to Relay 0
Alarm HI	Settable Min.: 1,0 ppm Max.: 2.000 ppm	Can be disabled	LED 'alarm HI' is lighten up Alarm sound Assigned to Relay 1
Over range	Fixed to 2.050 ppm	Always enabled	LED 'alarm LO' is lighten up LED 'alarm HI' is lighten up Alarm sound Assigned to Relay 0 and 1

Change alarm values:

Menu -> Measurement setup -> Alarms

Note:

It is recommended to set 'alarm HI' higher than 'alarm LO'.

10. Current Loop

The LAB PID is equipped with an analog current output. The measurement result is mapped from a selectable signal range to a selectable current output range.

10.1. Output range

The output current can be set to the following ranges:

- 0 mA to 5 mA
- 0 mA to 20 mA
- 4 mA to 20 mA

Output range: 4 mA to 20 mA

Only for output range of 4 mA to 20 mA the LAB PID instrument state is mapped to fixed values.

Instrument state	Current loop output
Initialization	1 mA
Measurement	4 mA to 20 mA
Maintenance	2 mA
Error	22 mA

Change output range:

Menu -> Instrument setup -> Interface setup -> Current loop

10.2. Signal range

The current loop output is mapped to the following ranges of measurement result:

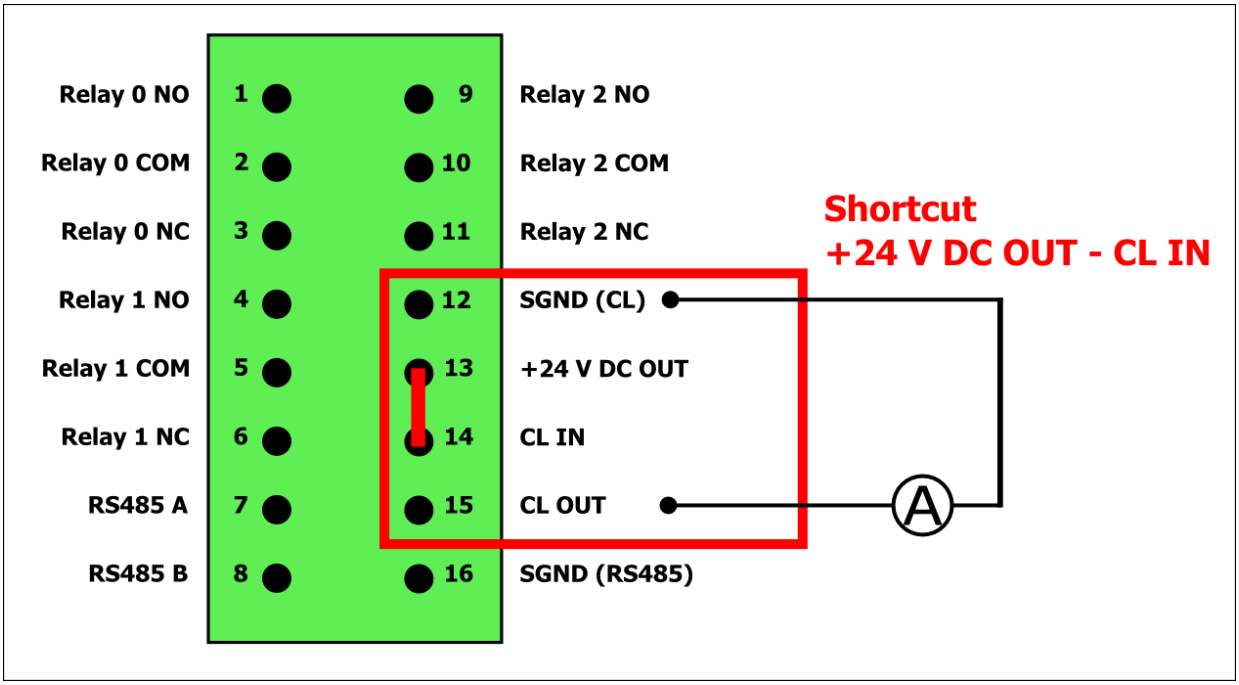
- 0 ppm to 10 ppm
- 0 ppm to 20 ppm
- 0 ppm to 50 ppm
- 0 ppm to 100 ppm
- 0 ppm to 200 ppm
- 0 ppm to 500 ppm
- 0 ppm to 1.000 ppm
- 0 ppm to 2.000 ppm

Change signal range:

Menu -> Instrument setup -> Interface setup -> Current loop

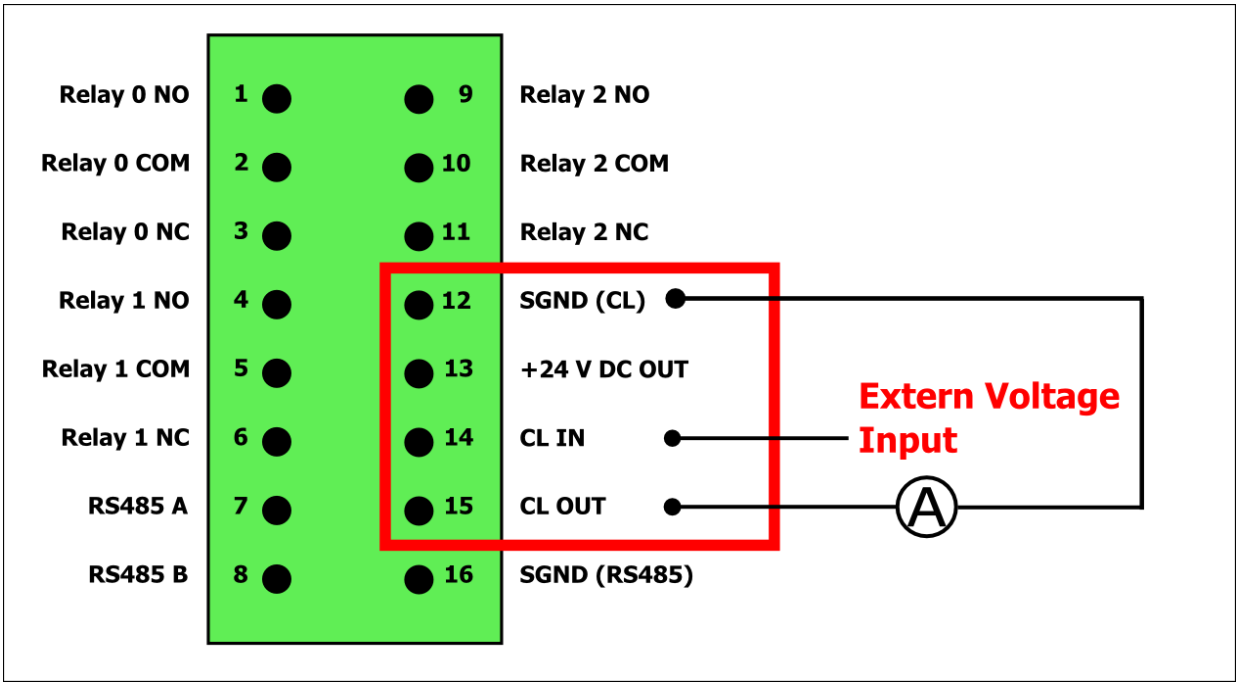
10.3. Connection scheme for Active Mode

- Current loop is powered by the LAB PID internal voltage with 24 V DC
- This mode is used by short cutting pin 13 and pin 14 on Multi Connector



10.4. Connection scheme for Passive Mode

- Current loop is powered by external voltage source
- This mode recommends a minimum external voltage of 6 V DC (max. 40 V DC)



10.5. Maximum loop resistance

The maximum resistance of the current loop is depending on the applied extern supply voltage.

Extern supply voltage	Maximum loop resistance	Extern supply voltage	Maximum loop resistance
6 V	255 Ω	15 V	663 Ω
8 V	345 Ω	20 V	890 Ω
10 V	436 Ω	24 V	1.072 Ω
12 V	527 Ω	40 V	1.800 Ω

11. Relays

The LAB PID comes with 3 relay outputs to signalize an alarm or device fault nearby with signal devices like flash light or horns up to 30 V with 2 A. All three relay outputs are Single Pole Double Throw (SPDT).

11.1. Relay Events

The LAB PID relays are fixed assigned to an event e.g. alarm or error.

	Event
Relay 0	Alarm LO Over range
Relay 1	Alarm HI Over range
Relay 2	Error

11.2. Relay configuration

A relay can be configured to:

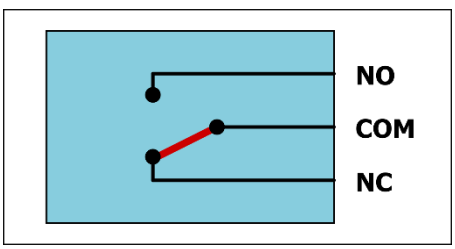
- NO - COM contacted on Event raised otherwise NC - COM
- NC - COM contacted on Event raised otherwise NO - COM

Change relay configuration:

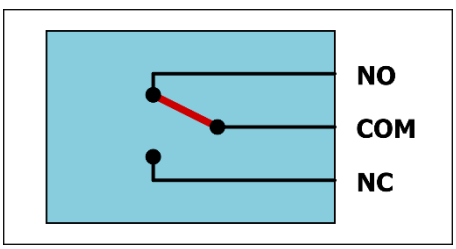
Menu -> Instrument setup -> Interface setup -> Relays

A relay can be NO - COM or NC – COM contacted.

Relay is NC – COM



Relay is NO - COM



Note:

Instrument settings will be assumed after leaving setup mode.

12. Data and Event logging

The LAB PID comes with a memory for logging measurement data and event data.

12.1. Measurement data logging

- Automatic storing of measurement data at selectable interval time
- Manually storing of measurement data in measurement
- With a logging interval time of 1 second the measurement data of more than 1 day can be stored

Content of a measurement data set

- Date and time of storing
- Measurement result
- Response factor

Enable and change automatic data logging intervals:
Menu -> Data & Event logging -> Data logging setup

View logged data:
Menu -> Data & Event logging -> View data storage

The complete data log or parts of it can be read out to our PC with LAB PID Control program.

NOTE:
To read out logged data set the communication interface to Uart.

The logged data can be cleared manually. A default of instrument settings will NOT clear data log.

Clear logged data:
Menu -> Data & Event logging -> Clear data storage

12.2. Event data logging

The LAB PID comes with an event logging feature.

The following events are stored:

- Switching on the instrument
- Changing an alarm value
- Raising and releasing of alarms
- Changing the current response factor
- Calibration completion or error during calibration
- Changing current loop output and signal range
- Clearing data storage
- Changing relay configurations
- Changing the communication settings
- Errors occurred

View logged events:

Menu -> Data & Event logging -> View event storage

13. Communication

The LAB PID provides three digital communication interfaces. Only one is working and can be configured by user.

13.1. USB Interface

The USB interface on the rear plane of the LAB PID provides a standard communication for most desktop applications.

Change USB settings:

Menu -> Instrument setup -> Interface setup -> Communication

The communication is stopped by changing the settings in this menu.
It is started again with the old or new settings on entering this menu.

13.2. RS232 Interface

The RS232 interface on the rear plane of the LAB PID provides a standard communication for most desktop applications.

The following settings are supported:

- Uart
    - select baud rate
- Stream
    - select baud rate
    - select stream interval time

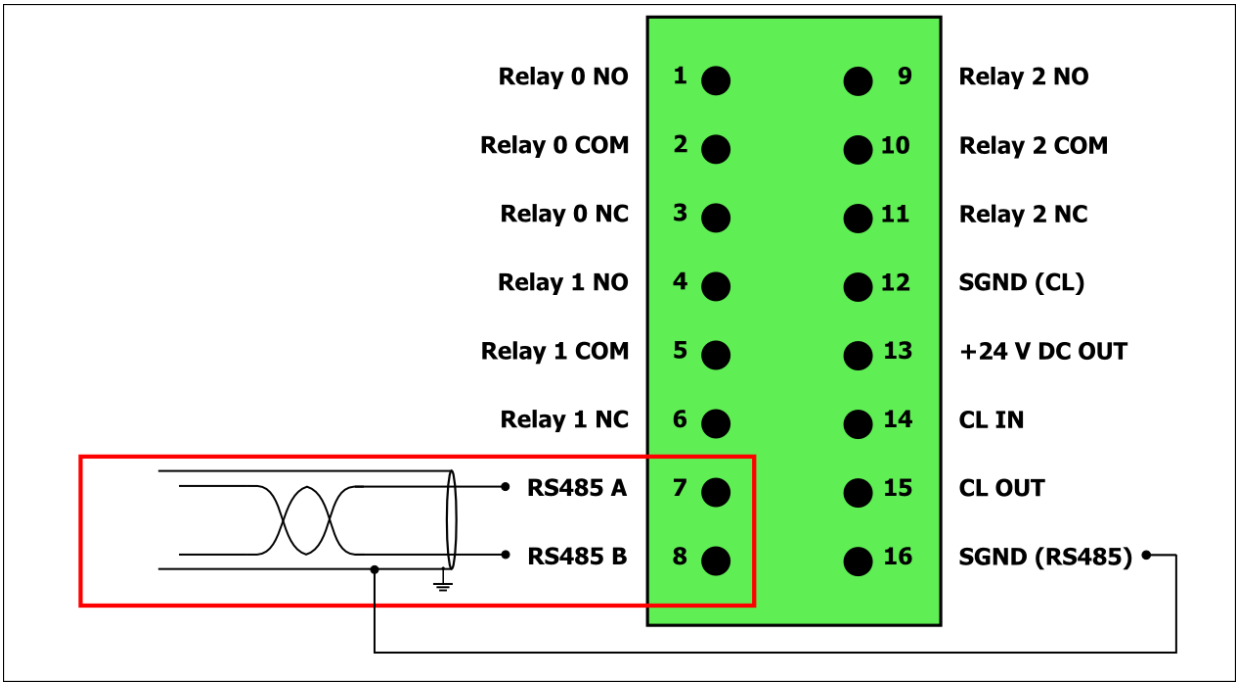
Change RS232 settings:

Menu -> Instrument setup -> Interface setup -> Communication

The communication is stopped by changing the settings in this menu.
It is started again with the old or new settings on entering this menu.

13.3. RS485 Interface

The RS485 interface on the Multi Connector is a standard communication for most industrial applications.



The following settings are supported:

- Modbus
  - select instrument slave address
  - select baud rate
  - select enabling of Termination
- Uart
  - select baud rate
  - select enabling of Termination
- Stream
  - select baud rate
  - select stream interval time
  - select enabling of Termination

Change RS485 settings:

Menu -> Instrument setup -> Interface setup ->Communication

The communication is stopped by changing the settings in this menu.

It is started again with the old or new settings on entering this menu.

Termination

The RS485 interface comes with a build in termination. The last device in an RS485 bus chain must be terminated.

13.4. Uart

The Uart protocol is build up of a LAB PID specific communication frame and a set of commands.

For further information of Uart specification and commands see latest version of document: "LAB PID.User Uart Specification".

13.5. Modbus

The Modbus protocol unique device slave address can be selected from 1 to 127.

For further information of Modbus specification and registers see latest version of document: "LAB PID.User Modbus Specification".

13.6. Stream

The stream is a periodically output of measurement data composed of ASCII characters. The interval of output period can be set from 1 second to 1 hour.

Serial stream data

Value	Unit	Output format
Date and Time	n.a.	yyyy-MM-dd HH:mm:ss
Measurement result	ppm	floating point with 3 decimals
Response factor	n.a.	floating point with 3 decimals
FAS value	ppm	floating point with 3 decimals
Alarm LO value	ppm	floating point with 3 decimals
Alarm HI value	ppm	floating point with 3 decimals
Over range value	ppm	floating point with 3 decimals

The values are separated to each other by a semicolon.

A single stream is ended by a CR (0Dh) and LF (0Ah).

Example of stream output

2011-10-11 14:36:29;0.043;0.550;0.000;20.000;50.000;2050.000[CR][LF]

14. User information

The LAB PID can be personalized with the following user specific information:

- Name
- Department
- Location

Change user information:

Menu -> Instrument setup -> User information

The user information is available:

- On display at startup of instrument
- Via Uart protocol command (see section 13.4)
- Via Modbus protocol register (see section 13.5)

15. Remote control

The LAB PID can be set to remote control to disable the instrument control of:

- Relays
- Gas input

With remote control enabled the relays and gas input can be switched via commands in Uart communication. For further information of Uart specification and commands see latest version of document: "LAB PID.User Uart Specification".

If gas input is remotely set to filter input, the Cleaning indicator on measurement display will appear.

Enable or disable remote control in measurement menu:

Measurement display -> Measurement menu -> Remote control

NOTE:

- Enabling remote control disables setting of relays states and gas input controlled by instrument (Relay alarm signalization, Cleaning).
- Menu cannot be entered and manual cleaning cannot be started with remote control enabled.

16. Factory Settings

	Default value	
Alarms	Alarm LO	Value is 20 ppm and alarm is enabled
	Alarm HI	Value is 50 ppm and alarm is enabled
Relay configuration	Relay 0	NO - COM on Alarm LO and Over range
	Relay 1	NO - COM on alarm HI and Over range
	Relay 2	NO - COM on Error
Calibration	Standard	Default calibration values
	Custom	Default calibration values
	Data set	Standard calibration
Current loop	Output range	4 mA to 20 mA
	Output signal	0 ppm to 100 ppm
Measurement type	Continues	enabled
	Interval	disabled
	Interval time	30 min
	Cleaning time	1 min
	FAS	disabled
Data logging	Function	disabled
	Interval	60 sec
Response factor	Response	ISOBUTENE
	Response list	Build in available Response factors see: "LAB PID.Responselist.BuildIn 1.01.pdf"
USB	Function	UART
Enabled	Baud rate	460800
RS232	Function	UART
Disabled	Baud rate	115200
	Stream interval	60 sec
RS485	Function	UART
Disabled	Baud rate	115200
	Termination	enabled
	Modbus	Slave address : 10
	Stream interval	60 sec
User information	Name	empty entry
	Department	empty entry
	Location	empty entry

Set settings to factory default:

Menu -> Tools -> Default settings

Note:

You have to calibrate the instrument after executing this function.

17. Maintenance and Service

CAUTION:

For safety reasons this equipment must be maintenances and serviced by qualified personnel only. Read and understand user manual completely before maintenance or servicing.

17.1. Replacement of Charcoal cartridge

The charcoal cartridge is contaminated and must be replaced if:

- Zero gas calibration error during automatic calibration
- FAS value limit exceeds

Assembling/ Disassembling:

- Switch off the instrument
- Unscrew the old charcoal cartridge anti-clockwise and pull it out
- Push in the new charcoal cartridge and tightly screw in clockwise
  (The sealing at the thread of charcoal cartridge will be broken by screwing in)
- Remove the sealing at the inlet of charcoal cartridge on the rear of instrument

NOTE:

The charcoal cartridge seal is broken after installation! Keep in mind that impurities can contaminate the charcoal cartridge.

NOTE:

You have to calibrate the instrument after replacing the filter cartridge.

17.2. Replacement of Gas Inlet syringe filter

The gas inlet glass syringe filter must be replaced:

- On high material pollution
- After contact to a liquid

Assembling/ Disassembling:

- Switch off the instrument
- Unscrew the old glass syringe filter anti-clockwise and pull it out
- Tightly screw in the new glass syringe filter clockwise

18. Operating conditions

18.1. Power supply

	Minimum	Maximum
Input voltage	100 VAC	240 VAC
Input frequency	50 Hz	60 Hz

18.2. Multi Connector

	Minimum	Maximum
Relays NO	0 V / 0 A	30 V / 2 A
Relays COM	0 V / 0 A	30 V / 2 A
Relays NC	0 V / 0 A	30 V / 2 A
VCC CL	6 VDC	40 VDC

18.3. Gas connections

	Minimum	Maximum
Gas inlet pressure drop	0 mbar	20 mbar
Exhaust pressure load	0 mbar	20 mbar

19. Abbreviations

ADC	Analog Digital Converter
ASCII	American Standard Code for Information Interchange
CAS	Chemical Abstracts Service
LED	Light Emitting Diode
PID	Photo Ionization Detector
PPM	Part Per Million
LAB PID	Laboratory Photo Ionization Detector
SPDT	Single Pole Double Throw
UV	Ultra Violate
VOC	Volatile Organic Compound
FAS	Filter Air Setup
CR	Carriage return
LF	Line feed

20. Warranty

The General Terms and Conditions of ACI GmbH shall apply.

21. Contact Information

If there is a need to contact the factory, please send your enquiries to:

Analytical Control Instruments GmbH (ACI GmbH)

Volmerstraße 9A

12489 Berlin

Germany

Tel: +49 30 63925466

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Email: vertrieb-labpid@aci-berlin.de

Website: www.aci-berlin.com

22. Spare Part List and Accessories

Part Number	Description
0002181	LAB PID Lamp 10.6 eV
0002182	LAB PID Charcoal cartridge
0002184	LAB PID Glass Syringe Filter

24. Warranty statement

The LAB PID is designed and manufactured to the latest internationally recognized standards by Analytical Control Instruments GmbH under a Quality Management system that is certified to ISO 9001. As such the Analytical Control Instruments GmbH warrants this product against defective parts and workmanship and will repair or (at its option) replace any instruments which are or may become defective under proper use within 24 months from date of commissioning by an approved Analytical Control Instruments GmbH representative. This warranty does not cover parts that are inside the gas flow (valve, pump, sensor, lamp) or damage caused by accident, abuse or abnormal operating conditions.

Defective goods must be returned to Analytical Control Instruments GmbH premises accompanied by a detailed description of any issue. Where return of goods is not practicable Analytical Control Instruments GmbH reserves the right to charge for any site attendance where any fault is not found with the equipment. Analytical Control Instruments GmbH 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 Analytical Control Instruments GmbH. 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 Analytical Control Instruments GmbH 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. Analytical Control Instruments GmbH 's 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.