Instruction Manual

CALIBRATION UNIT

ASGU-370P

Symbol image

HORIBA
Explore the future
3430 Tulln, Kaplanstraße 5
Tel. +43 2272 65225 office@horiba.at

12.07.2021

This manual contains all the necessary information for safe and proper use of calibration units of type ASGU-370P. To avoid errors and dangers this manual is to be read and considered.

Using the instruction manual

The calibration units of type ASGU-370P are available in many different configurations or can be upgraded later with individual modules. Therefore, this manual may contain information which do not apply for the existing device or are applied accordingly. Chapters for which this is mentioned include the following information immediately after the title.

Indication! Apply the information in this chapter according to the stage of the existing device.

Symbol explanation

There are used symbols in this manual which refer to danger or important references. Therefore, the meaning of the symbols should be memorised.

Danger! This symbol refers to danger, ordinance and prohibition to avoid personal or material damage.

Warning against electric energy! Note that work must only be carried out by trained electricians which know the danger of electric current.

Indication! Attention is brought to advice on the handling and economic use of equipment.

Environment! Need for separate collection for WEEE.

Table of contents

Appendix A

Device - Datasheet, Flow schematic, Wiring diagram

Table of figures

You have ...

... technical questions or problems?

Please contact:

HORIBA GmbH
Kaplanstraße 5
A - 3430 Tulln

Phone: +43 2272 65225-0
Fax: +43 2272 65230
mail: office@horiba.at

1. Introduction and operating principle

1.1. Determinated use

This calibration unit is designed for the dynamic and continual manufacture of zero and span gas to perform all ongoing quality control procedures according EN 14211, EN 14212, EN 14625 and EN 14626.

1.2. Description of functions

The various tests of immission analyzers cover the zero point and one or more measurement values (= spanpoints) in the measuring range. This results in three states for the calibration unit.

- *Purge* Stand by operation of the calibration unit.
  The analyzer is in measure operation. No gas is used from the calibration unit.

- *Zerogas* At this state, zero air is released to the analyzer at the calibration gas outlet.
  Zero check or zero adjustment can be performed for the analyzer.

- *Spangas* Spangas is available at the calibration gas outlet.
  The check of the measuring value on the analyzer according to the selected test can be performed.
  The spangas can be generated in various ways. The following options are available:
  - Permeation
  - Dilution of cylinder gas
  - Gas phase titration
  - UV radiation

Your device includes one or more modules depending on the actual stage. Each module uses one of the mentioned above possibility to produce spangas. Modules can be present multiple or work together in combination. Therefore, your device is a multi component calibration unit.
You can find the actual stage of your device in the flow schematic, the wiring diagram and the Device datasheet. These documents are in the appendix for this manual.

The calibration unit use zero air produced by an external zero gas generator. If this zero air is not free of CO, a built-in scrubber reduces the CO to offer dilution gas for the CO module. The amount of air is controlled to an adjustable value. The adjustment of the flow rates is conducted by the use of digital thermal mass flow controllers.

Indication! When setting the flow rates, care must be taken to ensure that the analyzers have access to sufficient quantities of zero air and span gas. The minimum flow setting is taken to be the setting at which a minimum flow (approx. 100ml/min) can be detected at the bypass with a rotameter when the analyzer is connected.

1.2.1. Module Permeation

A Permeation tube filled with pressurized liquefied gas is placed in a block heated to a temperature of 50°C (permeation oven). At this high temperature the component diffused in the gaseous state through a membrane out of the tube. Provided the temperature remains constant, the amount of gas diffused out of the tube also remains constant. The released component is mixed with zero air flowing past the tube. In this way, the degree of concentration of the span gas can be changed by altering the rate of flow of the zero air.

Purge: In this state a minimum flow (purging air) through the permeation ovens is maintained to prevent an increase in harmful substances in the chamber where the permeation tube is placed. The purging air is removed through the purge outlet at the rear of the device.

Zerogas: The permeation oven is purged continuously and the purging air is removed through the purge outlet at the rear of the device.

Spangas: Use of the gas from the tube to produce spangas.

Calculation of the concentration

$$\text{Concentration } [\mu g/m^3] = \frac{\text{Permeation rate [ng/min]}}{\text{Flow rate [l/min]}}$$

Permeation rate ..... according to the certification of the tube, ascertain value respectively in case of an uncertified tube.

Flow rate ..... Amount of zero air who pass the mass flow controller.

1.2.2. Module dilution without purge flow of the gas cylinder

Gas from a gas cylinder is diluted with zero air to concentrations suitable for the actual application. A continuous cylinder flow is not necessary, because the cylinder flow rate at state spangas is high enough to obtain a stable spangas concentration very fast, or an uncritical cylinder gas is diluted. The degree of concentration of spangas can be changed by altering the rates of flow of the cylinder gas or of the zero air.

Purge: No flow of zero air or cylinder gas.

Zerogas: Still no flow of the cylinder gas.

Spangas: The cylinder gas is lead to the zero gas flow and diluted in this way.

Calculation of the concentration

$$\text{Concentration [ppm]} = \frac{\text{Cylinder concentration [ppm]} \times \text{Cylinder flow rate [l/min]}}{\text{Total flow rate [l/min]}}$$

Cylinder concentration ..... according to cylinder certificate

Cylinder flow rate ..... flow rate through the mass flow controller for the gas cylinder

Total flow rate ..... zero air through the mass flow controller for dilution air + cylinder flow rate

1.2.3. Module dilution with purge flow of the gas cylinder

Gas from a gas cylinder is diluted with zero air to concentrations suitable for the actual application. A continuous cylinder flow must be maintained, because the cylinder flow rate at state spangas is very small and the rise time to obtain a stable spangas concentration would be too long. A second reason for purge of the cylinder is the high reactivity and instability of the cylinder gas component. The degree of concentration of spangas can be changed by altering the rates of flow of the cylinder gas or of the zero air.

Purge: A small flow during the passage from the cylinders to the calibration unit is maintained. The cylinder gas is removed through the fitting purge outlet at the rear of the device.

Zerogas: The tubes from the gas cylinder to the calibration unit continue to be purged. The cylinder gas is removed through the purge outlet at the rear of the device.

Spangas: The cylinder gas is lead to the zero gas flow and diluted in this way.

Calculation of the concentration

$$\text{Concentration [ppm]} = \frac{\text{Cylinder concentration [ppm]} \times \text{Cylinder flow rate [l/min]}}{\text{Total flow rate [l/min]}}$$

Cylinder concentration ..... according to cylinder certificate

Cylinder flow rate ..... flow rate through the mass flow controller for the gas cylinder

Total flow rate ..... zero air through the mass flow controller for dilution air + cylinder flow rate

1.2.4. Module Gas phase titration

Gas phase titration (GPT) is based on a module for NO dilution. The gas phase titration module is an extension of the dilution module. Hereby NO is converted to NO_2 by using ozone. The ozone is obtained by exposing air to UV light. The lamp required for this purpose is placed in an oven heated to a temperature of 70°C (O_3 oven). The air passes through a glass tube past the source of UV, where a portion of oxygen is oxidised into O_3. In an addition mixing chamber the reaction of NO with O_3 for producing NO_2 is done. The system controls the lamp intensity and the result of changes in the intensity are different NO_2 concentrations.

Purge: The functionality in this state is the same as for the module dilution with purge flow of the gas cylinder. The UV lamp is switched off.

Zerogas: The functionality in this state is the same as for the module dilution with purge flow of the gas cylinder. The UV lamp is switched off.

Spangas NO: The functionality in this state is the same as for the module dilution with purge flow of the gas cylinder. The UV lamp is switched off.

Spangas GPT: Basically the functionality in this state is the same as for the module dilution with purge flow of the gas cylinder. In addition the UV lamp is switched on.

Calculation of the converter efficiency

If the flow rates for dilution air and cylinder gas in the state spangas GPT and spangas NO are the same, then also the NOx concentrations of the produced calibration gas are equal in both states. This fact is the base to determine the converter efficiency. It is not necessary to know the ratio of NO and NO_2 of the produced NOx calibration gas.

The efficiency can be calculated by using this formula.

$$E\text{conv} = \left(1 - \frac{(\text{NOx})_{\text{NO}} - (\text{NOx})_{\text{GPT}}}{(\text{NO})_{\text{NO}} - (\text{NO})_{\text{GPT}}}\right) \text{ x } 100\%$$

$(\text{NOx})_{\text{NO}}$ ..... Measured NOx concentration at state spangas NO

$(\text{NOx})_{\text{GPT}}$ ..... Measured NOx concentration at state spangas GPT

$(\text{NO})_{\text{NO}}$ ..... Measured NO concentration at state spangas NO

$(\text{NO})_{\text{GPT}}$ ..... Measured NO concentration at state spangas GPT

1.2.5. Module dilution of a mix gas cylinder

A gas cylinder for dilution can contain a number of components. So it is possible to supply several analyzers by only one module. The type of dilution module can be with (chapter 1.2.3) or without (chapter 1.2.2) purge flow of the gas cylinder.

The functionality in state Purge, Zerogas and Spangas is the same as described in the chapter for the used type of dilution module.

Calculation of the concentration

The same formula is used for all components which are inside the cylinder.

$$\text{Concentration [ppm]} = \frac{\text{Cylinder concentration [ppm]} \times \text{Cylinder flow rate [l/min]}}{\text{Total flow rate [l/min]}}$$

Cylinder concentration ..... according to cylinder certificate

Cylinder flow rate ..... flow rate through the mass flow controller for the gas cylinder

Total flow rate ..... zero air through the mass flow controller for dilution air + cylinder flow rate

Indication! When setting the flow rates, care must be taken. The sum of the flows of the connected analyzers, which suck spangas at the same time by this module, must be less than the offered amount. Therefore, it can be necessary to check the analyzers not in parallel, but one after another.

1.2.6. Module UV Radiation

The ozone is obtained by exposing air to UV light. The lamp required for this purpose is placed in an oven heated to a temperature of 70°C (O_3 oven). The air passes through a glass tube past the source of UV, where a portion of oxygen is oxidised into O_3. The degree of concentration of span gas can be changed by altering the zero air flow rate.

Purge: No flow of zero air. The UV lamp is switched off.

Zerogas: The UV lamp is switched on. The oven will be purged with a small amount of zero air. This purging air is removed through the fitting purge outlet at the rear of the device.

Spangas: The UV lamp is switched on. The zero air which passes the mass flow controller is splitted. One portion is lead to the oven to produce ozone. After the oven the partial flows are recombined.

Calculation of the concentration

$$\text{Concentration [ppb]} = \frac{\text{Concentration at 1l/min [ppb]}}{\text{Flow rate [l/min]}}$$

Concentration at 1 l/min..... ascertain value. To ascertain this value, the calibration unit must be measured using a correctly set analyzer.

Flow rate ..... amount of zero air through the mass flow controller

1.3. Unit of concentration

The unit for the calculated concentration is selectable. According to the selection, a factor is used to recalculate the concentration into the correct unit.

$$\text{Factor} = \frac{\text{molar volume [m³]}}{\text{molar weight } [\mu g]}$$

Factor..... conversion factor between mass per units volume and the volume ratio

molar volume ..... volume of the ideal gas in dependence of reference temperature and reference pressure
22,41383 m³ (0°C, 1013,25mbar)
24,05497 m³ (20°C, 1013,25mbar)

molar weight ..... physical constant of the component

Thereby the following formulas are valid to indicate the concentrations in the desired unit.

$$\text{Concentration [ppm]} = \text{Concentration [mg/m³]}\ x\ Factor$$

$$\text{Concentration [mg/m³]} = \text{Concentration [ppm]}\ x\ \frac{1}{Factor}$$

2. Transport, storage, installation, start-up procedure

2.1. Transport and storage

Indication! Apply the information in this chapter according to the stage of the existing device.

- On transportation and storage the turned off device the permeation tube has to be removed from the permeation oven.
- The device, and special the electric equipment in the device, has to be protected against humidity.
- Should the calibration unit be stored long term or not used for a long period of time, it should be protected from getting dirty. Otherwise, malfunction can occur in addition caused by dirt e.g. in the thermal mass flow controllers.

2.2. Environmental conditions

The calibration unit has to be used only in well ventilated area. The mounting place should not have hard vibrations. The room temperature should be between 5 and 35°C. Otherwise the room must be climatized.

The installation environment must meet overvoltage category II and pollution level 2.

2.3. Installation

Indication! Apply the information in this chapter according to the stage of the existing device.

After locating the device on its place, the gas- and electrical connections are done according to the description below. Take care to avoid angle of the cables and tubes.
For the main power supply the power cable which is part of delivery has to be used.

Danger! The exhaust gas at the Purge Outlet and Bypass connections has to be carried off to open air by use of tubes.

Danger! Basically the analyzers expect the offered gas not pressurized. Make sure of an external bypass connector if the calibration unit do not have an internal Bypass (refer to the flow schematic). The external bypass can be inside the analyzer, or in the tube between calibration unit and analyzer by use of a T-fitting.

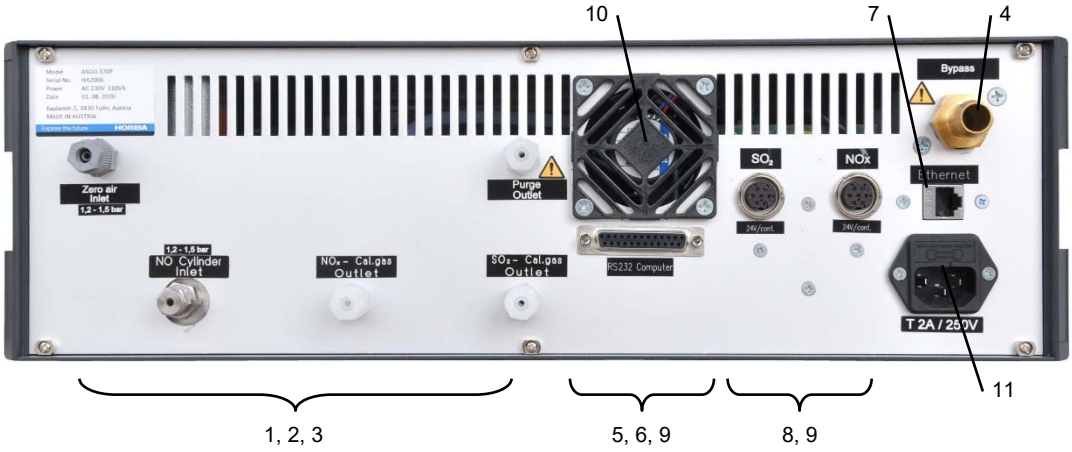


Fig. 1: Rear (symbol image)

1..... Gas inlets — Fittings to connect the external zero air generator and the gas cylinders according to the labels. Refer to the labels for the settings of the inlet pressure.

2..... Gas outlets — Fittings to connect the analyzers according to the labels.

3..... Purge Outlet — Fitting PVDF for 6/4 mm Teflon tube to discharge the purge flow.

Danger! The exhaust gas at the Purge Outlet connection has to be carried off to open air by use of a tube.

4..... Bypass — Fitting for tube with 13mm diameter to discharge the overflow of zero and span gases.

Danger! The exhaust gas at the Bypass connection has to be carried off to open air by use of a tube.

5..... Serial computer port — 25-pin SUB-D socket to connect a computer for operate the calibration unit with the extended Bayern-Hessen protocol. For the pinning of the socket refer to item 3.3. The protocol description is included in the software manual.

6..... Serial analyzer port — Option Datalogger function: 9-pin SUB-D socket to connect an analyzer for data logger functionality. Bayern-Hessen protocol is used for this communication. For the pinning of the socket refer to item 3.5.1. The description for datalogger functionality is included in the software manual.

7..... Ethernet port — 10/100 Mbps port to operate the calibration unit with the extended Bayern-Hessen protocol or the remote software. This port is also used for the CF-card access. The port and protocol description is included in the software manual.

8..... Remote control — 7-pin Socket for connection to the analyzers according to the labels. Pinning see item 3.2.

9..... Alarm, Status contact — Option: Socket to offer Alarm contact outputs to a datalogger. Status contacts for other purposes are also possible. For pinning refer to item 3.5.2

10..... Fan — To remove the waste heat from inside of the unit.

Indication! For free air convection there must be no obstacle at a distance of less than 20 cm behind the fan.

11..... Power socket — Socket with integrated filter to connect the power supply of 230V / 50Hz. The socket also includes the main fuse for the device. For the capacity of the fuse refer to the label on the device.

2.4. Start-up procedure

Indication! Apply the information in this chapter according to the stage of the existing device.

1. Turn on the external zero air generator if necessary and adjust the pressure to 1,2 – 1,5 bar rel.
2. Evacuate the pressure regulators and the tubing between gas cylinders and the calibration unit if needed.
3. Turn on the gas cylinders and adjust the pressure regulators according to the labels on the device or the details in the flow schematic.

   Indication! If a new gas cylinder is used or after the gas cylinder has been changed to a new one, the device should work some days in state purge to get a stable calibration gas before it is used for test of analyzers.

4. Mount the permeation tube. Refer to item 4.6 and 4.7.

   Indication! After mounting the permeation tube, the device should work in purge state for some days to get constant span gas values from the permeation systems.

5. Turn on the calibration unit with the power switch.

3. Equipment operation

Indication! Apply the information in this chapter according to the stage of the existing device.

3.1. Manual operation

Fig. 2: Front (symbol image)

1.....Power switch	Switch to turn the device on and off
2.....Power / Alarm lamp	LED, illuminated green when device is ON and illuminated red in case of an active alarm condition
3.....Touch screen	Display with touch panel to operate the software of the device

For the manual switching between the operational states the touch screen on the front is used. Therefore, the calibration unit must work in Local mode. For more detailed information refer to the operation manual of the software.

When the ASGU-370 is without display, the manual operation is only possible with the remote software. This remote software is included on the Samba server. As an option an additional LED is available. It is illuminated green if the ASGU-370 is in state Zerogas, Pulse Purge, Spangas or GPT.

3.2. Remote control by the analyzer

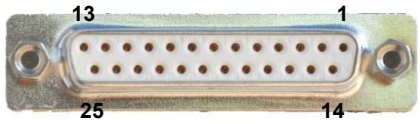
The command to change over into state zero or span can also be given by the respective analyzer. For this purpose, the calibration unit must work in mode Remote PIO. The change-over is activated by a potential free contact or +24V DC applied between common and the respective pin. Please refer to the label on the device or the technical data in appendix A for the actual setting. Fig. 3 together with the function table explains the pinning and the functionality of the socket.

Fig. 3: Remote control socket

Pin	Function
3	Zero
4	Span
5	Option for module NOx: GPT1
6	Option for module NOx: GPT2
7	Common

3.3. Operation via serial RS232 computer port

This device can be operated on the serial port with the Bayern-Hessen protocol. Therefore, the calibration unit must work in mode Remote SIO. For more detailed information about port settings and the protocol refer to the operation manual of the software.
The hardware connection is made from the 25-pin SUB-D socket to the computer. For the pining of the socket refer to Fig. 4.



Pin	Signal
2	Transmit Data (TxD)
3	Receive Data (RxD)
7	Signal Ground (SGND)

Fig. 4: 25-pin. SUB-D socket

Configuration parameters like Baud rate as well as specific parameters concerning the transfer protocol must be set in a way that they correspond with the settings of the connected computer.

3.4. Operation via the Ethernet port

Using the Ethernet port, the calibration unit can be operated in 2 different ways.

3.4.1. Bayern-Hessen via Ethernet

Any software, who transmit data in blocks by use of UDP can be used to send the Bayern-Hessen string. The calibration unit must work in mode Remote NET. Precondition for a functioning data transmission is the correspondence of communication parameters such as IP address and port number between the calibration unit and the software application of the connected computer which is used for the transmission. The Port is set to 40002. For more detailed information refer to the operation manual of the software.

3.4.2. Remote software

The remote software works like a mirror of the calibration unit screen. It copies the content of the screen to an external computer. By doing this, operate the device is the same than the manual operation. The remote software is included in delivery.

One more task of the Ethernet port is to enable communication between calibration unit and analyzer to use the internal datalogger. For more detailed information refer to the operation manual of the software.

3.5. Data logger function

For communication between calibration unit and analyzer to use the internal datalogger 2 different possibilities to connect the devices are available.

3.5.1. Data logging via serial RS232 analyzer port

On the serial analyzer port the data transmission uses the Gesytec-(Bayern/Hessen) protocol. For more detailed information about port settings and the protocol refer to the operation manual of the software.
The hardware connection is made from the 9-pin SUB-D plug to the analyzer. For the pining of the plug refer to Fig. 5.

Fig. 5: 9-pin. SUB-D plug

Pin	Signal
2	Transmit Data (TxD)
3	Receive Data (RxD)
5	Signal Ground (SGND)

Configuration parameters like Baud rate as well as specific parameters concerning the transfer protocol must be set in a way that they correspond with the settings of the connected analyzer.

3.5.2. Data logging via Ethernet port

On this port the data transmission uses the HORIBA AP-370 protocol or the Thermo c-link protocol respectively. For more detailed information about port settings and the protocol refer to the operation manual of the software.

3.6. Alarms, Status contact

The software compares continuously the actual flow rates and the oven temperatures with the setpoints. If the deviation between these parameters is higher than an adjustable tolerance limit a contact will be closed to signalize the alarm condition.

In some automatic measuring systems, the calibration unit should cover control tasks for further devices in the measuring station. Contacts can be offered for this purpose. One possible status contact indicates the information about the state of the calibration unit.

The alarm- or status contacts are realized at a 5-pin socket on the device rear. Fig. 6 together with the function table explains the pinning and the functionality of the socket. Please refer to the label on the device rear or the technical data in appendix A for the valid function table of the present calibration unit.

Fig. 6: Socket Alarm/Status

Alarm contact

Pin	Type of alarm
2	Temperature
4	Flow rate
3	Common

Status contact, single

Pin	Function
1-2	Zerogas or Spangas
3, 4, 5	not used

Status contact, dual

Pin	Function
1-2	Zerogas or Spangas
4-5	Zerogas or Spangas

4. Maintenance

Indication! Apply the information in this chapter according to the stage of the existing device.

4.1. Maintenance interval

The following table shows the parts which are subject to maintenance, and the associated intervals.

Part	option	criterion	implementation	interval	section
0,3µ Filter (Fx)	zero air cleaning	strong surface contamination	replace the filter	control once a year	4.3
DFU Filter (Fx)	zero air cleaning	strong surface contamination	replace the filter	control once a year	4.4
CO Scrubber (SCR1)	CO module	filling consumed	replace filling	3 years	4.5
Permeation oven (OVx)	Permeation module	span gas concentration is going down	replace permeation tube	depends on the type of the tube	4.6
Permeation oven for BTX (OVx)	BTX Permeation module	span gas concentration is going down	replace permeation tube	depends on the type of the tube	4.7
2µm sinter metal filter	Prefilter for MFC's	surface contamination on filter element	replace filter element	control once a year	appen-dix-A

4.2. Open the housing

Warning against electric energy! Disconnect the device from the mains supply before open the case to execute maintenance works.

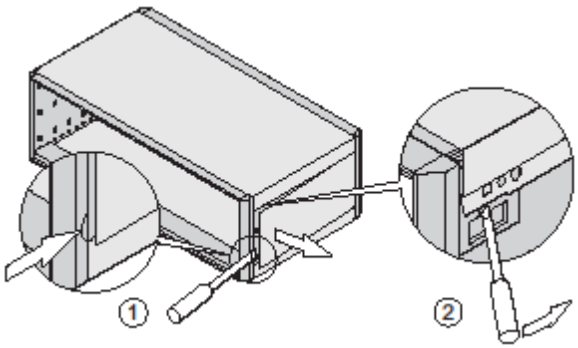


Fig. 7: Equipment housing

Procedure

1. Turn off the calibration unit. Disconnect main plug.
2. Left and right closing plate, if available, is only pinned. Push out from the holder with suitable tool. Refer to Fig. 7, drawing 1.
3. Upper and lower casing cover are only pinned. Push cover on all corners out of the locking with a suitable tool. Refer to Fig. 7, drawing 2.
4. Softly lift the cover to make the grounding connector approachable.
5. Disconnect the grounding cable from the grounding connector and remove the cover.

4.3. Replacing the 0,3µ filter (Fx)

Procedure

1. Switch off the calibration unit. Pull out the power plug.
2. Open the housing (Refer to item 4.2).
3. Disconnect the tube from the filter.
4. Loosen the fastening screw from the plate and remove the filter.
5. Insert a new filter and fit with the fastening screw to the plate.
6. Fit hose.

4.4. Swap DFU inline filter (Fx)

Procedure

1. Switch off the calibration unit. Pull out the power plug.
2. Open the housing (Refer to item 4.2).
3. Pull tube connections from the filters. Remove the filter.
4. Insert the new filter and fit the tube connections again.

4.5. Replace filling of the CO Scrubber

There is a flow trough the CO scrubber only in the states Zerogas and Spangas of the CO Module. The lifetime of the filling depends on the duration and frequency of these states.

Procedure

1. Switch off the calibration unit. Pull out the power plug.
2. Open the housing (Refer to item 4.2).
3. Loose the inlet and outlet fitting of the cartridge.
4. Remove the cartridge from the mounting clip.
5. Hold cartridge vertical. Release cap on the side of the spring by turning it counter clockwise and open the cartridge.
6. Remove spring, sieve and filter and drain the cartridge.
7. Refill the cartridge as far as the spring is compressed approximately to its half length at the closed cartridge (approx. 50ml).
8. Clean the packing in the cap.
9. Insert filter, sieve and spring and close the cap.
10. Fix the cartridge in the mounting clip.
11. Connect the inlet and outlet fitting.

4.6. Replace permeation tube

The useful lifetime of the tube depends on the type of the tube and the permeation rate.

Danger! When exchange the tube harmful gases will be released. This work has to be done only in well ventilated area.

Danger! Hazard of burn of the skin.
In operation the oven is heated up to 50°C. For protection against burn of skin use suitable tolls or protective gloves.

Procedure

1. Switch off the calibration unit. Pull out the power plug.
2. Open the case. Refer to item 4.2.
3. Loose 4 screws on the top of the permeation oven. Lift the cap.
4. Remove the tube with suitable tools. Storage the tube at a well ventilated area to cool down.
5. Take a new tube out of the package.

Danger! Take care for the notice on the package.

6. Remove the shrink tube from the neck.
7. of the permeation tube and write down the parameters from the shrink tube directly on the permeation tube by using a permanent marker.
8. Fit the permeation tube into the oven.
9. Grease the O-ring in the cap with silicon grease.
10. Close the oven and fix the cap with the screws.

Indication! After mounting the permeation tube, the device should operate in purging stage for some days to get a constant span gas value from the permeation system.

11. Dispose the old tube. Take care for the notice at the packing.

4.7. Replace permeation tubes BTX

The useful lifetime of the tubes depends on the type of the tube and the permeation rate.

Danger! When exchange the tube harmful gases will be released. This work has to be done only in well ventilated area.

Danger! Hazard of burn of the skin.
In operation the oven is heated up to 50°C. For protection against burn of skin use suitable tolls or protective gloves.

Procedure

1. Switch off the calibration unit. Pull out the power plug.
2. Open the case. Refer to item 4.2.
3. Loose 4 screws on the top of the heated block of the BTX permeation oven. Lift the cap.
4. Loose the cap on the inlet and outlet of the glass chamber and disconnect the teflon tubes.

Indication! Inside of the glass chamber there is a thin glass pipe at the gas inlet. Be carefully for the next steps not to damage this pipe.

5. Lift the glass chamber out of the heated block.
6. Lift the upper part from the lower part of the glass chamber.
7. Remove the tubes. Storage the tubes at a well ventilated area to cool down.
8. Take the new tubes out of the package.

Danger! Take care for the notice on the package.

9. Fit the permeation tubes in
10. to the glass chamber and join the upper and lower part of the chamber.
11. Fit the glass chamber into the heated block. Take care that the thin glass pipe is on the gas inlet of the oven.
12. Connect the teflon tube on the gas inlet and outlet and screw the caps.

13. Close the oven and fix the cap with the 4 screws.

Indication! After mounting the permeation tube, the device should operate in purging stage for some days to get a constant span gas value from the permeation system.

14. Dispose the old tube. Take care for the notice at the packing.

4.8. Replace sintered metal filter element 2µm

As an option prefilter for the thermal mass flow controllers are mounted in the tubing. For the explanation to replace the filter element refer to the specific description for your device in appendix A.

5. Shut down

Indication! Apply the information in this chapter according to the stage of the existing device.

If the device is shut down for less than approx. 10 minutes no action is necessary.

For longer shut down periods than approx. 15 minutes or missing zero air supply remove the permeation tubes from the oven to avoid pollution caused by very high concentration in the oven.

Turn off the external zero gas supply and the gas cylinders and turn off the device with the power switch.

5.1. Disposal note

The product must not be disposed of with household waste. Dispose of the device and the parts installed in it in accordance with the regulations. This saves natural resources and protects health and the environment from the effects of dangerous substances. Ask your authorized dealer about possible disposal methods.

Gas cylinders

Gas cylinders built into the device are considered problematic substances. These are to be expanded and treated in accordance with the nationally applicable regulations for problematic substances.

Permeation tubes

Permeation tubes can contain toxic substances and must be removed. Disposal instructions can be found in the packaging text. Disposal must be carried out in accordance with the national regulations for this product.

Device

The device must be properly disposed of in accordance with the directive 2012/19/EC on waste electrical and electronic equipment (WEEE) and / or directive 2006/66/EC with amending directive 2008/12/EG on batteries and accumulators as well as used batteries and accumulators.

6. Technical Data

6.1. Technical data ASGU-370P

Power supply	:	230 V AC ± 10 % / 50Hz
Power consumption	:	see Device-Datasheet in appendix A
Place of use	:	indoor
Installation environment	:	overvoltage category II pollution level 2
Altitude of use	:	max. 2000 m
Ambient temperature	:	5 - 35 °C
Ambient humidity	:	max. 75% rel.
Ambient pressure	:	75 – 106 kPa
Accuracy of temperature controller	:	± 0,1 °C
Expansion stage	:	see Device-Datasheet in appendix A
Pressure gas inputs	:	see flow schematic in appendix A
Dimensional gas connections	:	By default, for Teflon tube 6/4mm or stainless stell 1/8” for cylinder input. For special solutions see flow schematic in appendix A
Sensible range of setting of flow rate	:	maximum gas consumption of the analyser to full scale value of the flow controller for Zerogas MFC. 20% - 100% full scale for Cylindergas MFC.
Reference values of displayed flows	:	20°C / 1013,25 mbar
Span gas repeatability	:	better ± 1%
Span gas linearity	:	better ± 2% (minimum flow ≥20% f.s.)
Remote operation	:	B/H Protocol via RS232 or Ethernet Remote Software via Ethernet
Remote control signal	:	see Device-Datasheet in appendix A
Dimensions WxDxH	:	19”, 570mm, 3HE
Weight	:	see Device-Datasheet in appendix A

6.2. Technical data thermal mass flow controllers

Range	:	see Device-Datasheet in appendix A
Reference temperature/pressure	:	0 °C / 1013,25 mbar
Output signal	:	digital RS232, analog 0-10V
Accuracy	:	± 0,5% of actual value plus ± 0,1% f.s.
Repeatability	:	± 0,2% of rate
Pressure coefficient	:	< 0,1% / bar
Temperature coefficient	:	< 0,05% / °C