

Instruction Manual

CALIBRATION UNIT

AFCU-360 RC



Symbol image

This manual contains all the necessary information for safe and proper use of calibration units of type AFCU-360RC. To avoid errors and dangers this manual is to be read and considered.

Using the instruction manual

The calibration units of type ASGU-360RC 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 refer 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.

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1. Introduction

The span gas generator unit AFCU-360 RC is developed for the daily function control in ambient air monitoring station. With a repeatability of 3 % - the unit is not suitable to be used to calibrate the analyzer. For calibration special transferstandards have to be used.

1.1. Calibration Setpoint

Normal procedure:

This unit is used as function control. Therefore we recommend the following steps:

- 1) Calibration of the analyzer with external calibration units
- 2) Measurement of the actual span gas concentration generated by the AFCU-360 RC
- 3) Use these values as setpoint values for future function controls.

Every day the Data Acquisition System (DAS) will start a function control cycle of every analyzer e.g. 12 min. Zero, 12 min. Span.

The DAS will collect the actual zero and span value and compare it with the setpoint-values. If the deviation of the zero value is more than 2 % of range or the deviation of the span value is more than 10 % of the setpoint → an additional calibration of the analyzers with transferstandards have to be done to check the reason of the deviation.

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 have 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.

2.3. Installation



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

After locate the device on its place the gas- and electrical connections are done according the description below. Take care to avoid angle of the cables and tubes.



Danger! The exhaust gas at the Purge Outlet and Bypass connections have 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.

2.4. Start up procedure

- Make sure that all gas and electrical connections are made.
- Turn on the gas cylinder, adjust the pressure to 0,8-1,0 bar rel. and open, if existing, the needle valve on the pressure regulator for the cylinder.
- Turn on the compressor and adjust the pressure for the AFCU to 0,8-1 bar rel.
- Before using the device for making function control it should work at least 1 day after start up to get a stable calibration gas.

2.5. Shut down procedure

- Turn off the zero gas and cylinder gas supply.

3. Operating principle

3.1. Dilution– Span Gas Generator

Principle

- Dilution of a gas cylinder (e.g. SO₂/NO/CO/CH₄/CO₂)
- Dilution rate according the “cylinder flow / total flow” calculation from the Data sheet
- Span gas concentration: refer to item 5.1

Attention:

There is one dilution channel for more analyzers. Take care that the flow rate for the analyzers is enough. Respectively take care that the function control of this analyzers is not executed at the same time.

3.2. O₃ – Span Gas Generator

Principle

- Production of O₃-Span gas by UV-radiation
- Span gas concentration: refer to item 5.2

O₃ oven

- Temperature: 70°C
- PID-temperature controller with PT100 sensor (controlled by the O₃ analyzer)
- Accuracy: ±0,1°C

4. Description of functions

Three operating modes are possible.

Purge – Zero - Span

Purge: Stand by operation. No flow inside the system.

Zero: In this operating mode the analyzer is supplied with zero air from the calibration gas outlet for zero point check.-The ZERO-LED is lighting. The tube from the gas cylinder to the calibration unit is purged.

Span: In this operating mode the analyzer is supplied with calibration gas from the calibration gas outlet for span-check.-The SPAN-LED is lighting.

4.1. Dilution channel

Purge: No solenoid valve active. No flow of zero air and cylinder gas possible.

Zero: Zero gas will flow to the Calibration gas outlet. If CO is used, the internal CO-scrubber SCR 1 produces zero gas without CO. If CO₂ is used Synthetic air or a external CO₂-scrubber (soda lime) produces zero gas without CO₂. The flow is controlled by capillary CAP1 and pressure regulator PR1 (see gas flow chart). At the same time gas from the gas cylinder will flow to the purge outlet in order to purge the line. The flow is controlled by capillary CAP2 and pressure regulator PR2.

Span: The flow of the gas cylinder is mixed to the zero flow in order to generate span-gas for the calibration outlet.

4.2. O₃ – UV radiation channel

Purge: No solenoid valve active. No flow possible. The O₃ oven is heated up to 70°C , the UV lamp is switched off.

Zero: The valve SV4 is active now. Zero gas will flow to the O₃ Cal. gas outlet. The flow is controlled by capillary CAP3 and pressure regulator PR1

Span: Same as Zero. Now the UV lamp in the O₃ oven is switched on and radiates the zero gas to generate O₃. The O₃ concentration can be controlled by adjusting the current of the UV lamp with the potentiometer positioned on the high voltage board.

5. Calculation of the concentration (theoretical)

5.1. Dilution channel

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

Cylinder concentration According to cylinder certificate

Cylinder flow rate Cylinder gas flow rate (ref. to item 9)

Total flow rate Total of dilution air (ref. to item 9) and cylinder flow rate

5.2. O₃ – UV radiation channel

No possibility to calculate the concentration.

6. Equipment View

6.1. Front view



Fig. 1: Front (symbol image)

- 1.....Mode LED's
- 2.....Zero Air Outlet

Indicates the operation mode
 Option: Quick connector B for Teflon tube 4/6 mm to supply the Transferstandards with Zero - Gas

6.2. Rear view

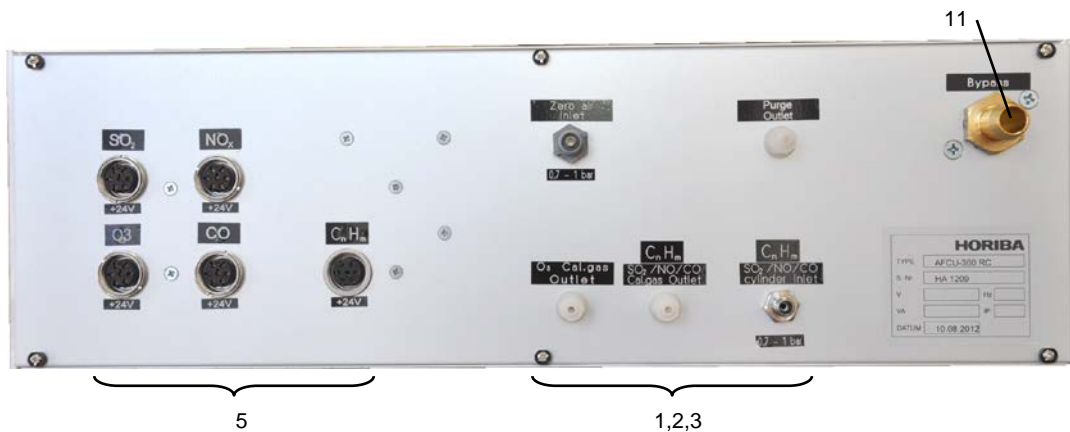


Fig. 2: Rear (symbol image)

- 1.....Gas inlets
- 2.....Gas outlets
- 3.....Purge Outlet
- 4.....Bypass
- 5..... Remote control

Fittings to connect the external zero air generator and the gas cylinders according the labels. Refer to the labels for the settings of the inlet pressure.
 Fittings to connect the analyzers according the labels.
 Fitting PVDF for 6/4 mm Teflon tube to discharge the purge flow
 Fitting for tube with 13mm diameter to discharge the overflow of zero and span gases
 7-pin Socket for connection to the analyzers

7. Power supply and remote control

7.1. Dilution-channel

The solenoid valves are switched with 24 VDC from the analyzers. Therefore the analyzers are connected to the AFCU-360RC with following connector.

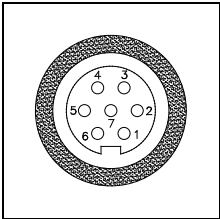


Fig. 3: Remote control socket

pin	Function
1	
2	
3	Zero
4	Span
5	
6	
7	Common

7.2. O₃-channel

The solenoid valve and the UV lamp are switched with 24 VDC from the analyzer. Additionally the O₃ oven is heated and the temperature is controlled by the O₃ analyzer. Therefore the analyzer is connected to the AFCU-360 with following connector.

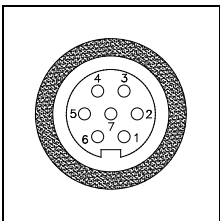


Fig. 4: Remote control socket

pin	Function
1	Temp. sensor PT100
2	Temp. sensor PT100
3	Zero
4	Span
5	Heater
6	Heater
7	Common

8. Maintenance

8.1. Assembly

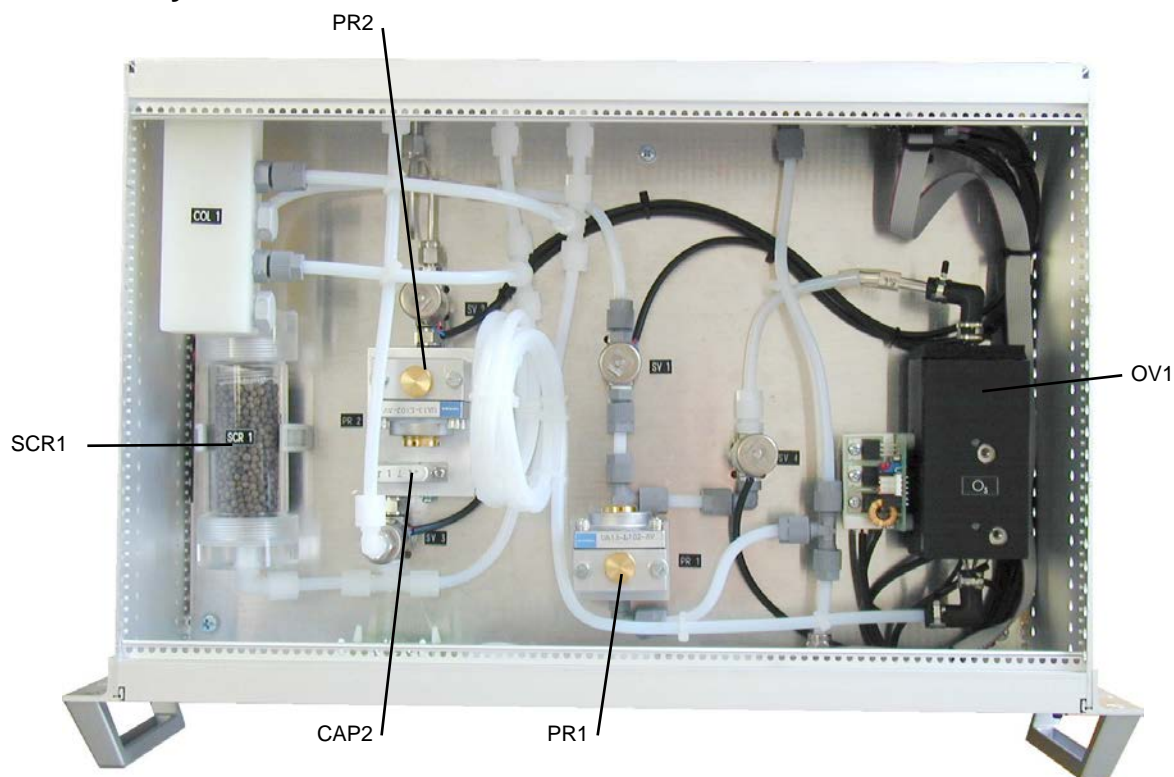


Fig. 5: Assembly (Symbol image)

8.2. Maintenance interval

The table below shows the parts which have to be serviced and the belonging interval.

part	criteria	action	item	interval
SCR1	filling consumed	replace	9.3	3 years

8.3. Replace filling of the CO Scrubber

Procedure

1. Open the top cover.
2. Loose the inlet and outlet fitting of the cartridge.
3. Remove the cartridge from the mounting clip.
4. Hold cartridge vertical. Release cap on the side of the spring by turning it counter clockwise and open the cartridge.
5. Remove spring, sieve and filter and drain the cartridge.
6. Refill the cartridge as far as the spring is compressed approximately to it's halfe length at the closed cartridge (approx. 70ml).
7. Clean the packing in the cap.

8. Insert filter, sieve and spring and close the cap.
9. Fix the cartridge in the mounting clip.
10. Connect the inlet and outlet fitting.

9. 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.

10. Regulations

EU regulations

Conformable standards

This equipment conforms to the following standards:



EMC:

Safety:

RoHS:

EN 61326-1

Class B, Industrial electromagnetic environment

EN 61010-1

EN 50581

9. Industrial monitoring and control instruments

Installation environment

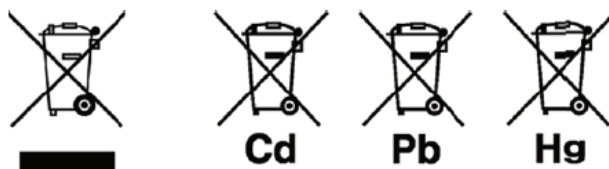
This product is designed for the following environment.

- Overvoltage category II
- Pollution degree 2

Information on disposal of electrical and electronic equipment and disposal of batteries and accumulators

The crossed out wheeled bin symbol with underbar shown on the product or accompanying documents indicates the product requires appropriate treatment, collection and recycle for waste electrical and electronic equipment (WEEE) under the Directive 2012/19/EU, and/or waste batteries and accumulators under the Directive 2006/66/EC in the European Union. The symbol might be put with one of the chemical symbols below. In this case, it satisfies the requirements of the Directive 2006/66/EC for the object chemical.

This product should not be disposed of as unsorted household waste. Your correct disposal of WEEE, waste batteries and accumulators will contribute to reducing wasteful consumption of natural resources, and protecting human health and the environment from potential negative effects caused by hazardous substance in products. Contact your supplier for information on applicable disposal methods.



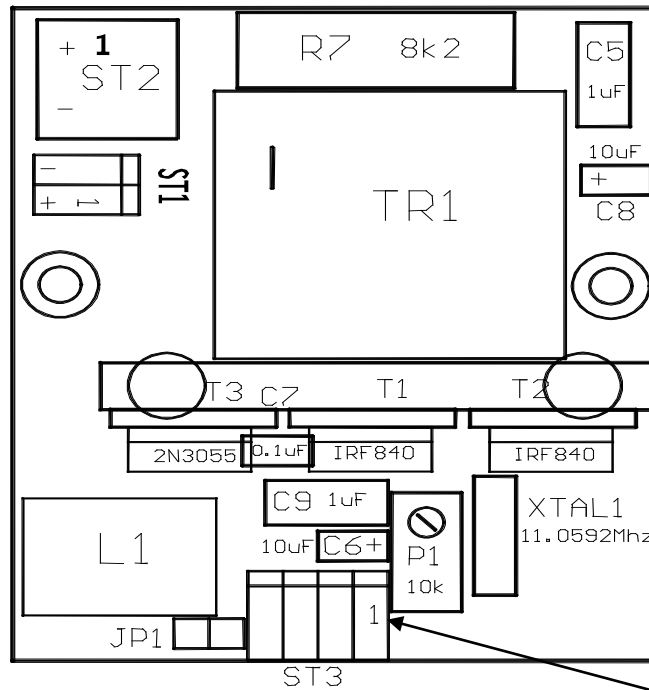
11. Technical Data

Developed and produced	:	Austria
Gas flow controlled	:	by high precise pressure regulator and capillaries
Power Supply	:	from the analyzers
Zero gas supply	:	by central Zero-Gas generator
Ambient temperature	:	5 - 35 °C
Calibration gas accuracy	:	± 3% repeatability
Flow rate	:	see Test Report
Dilution rate	:	cylinder flow / total flow
Fittings	:	for teflon tube 6/4mm 1/8" for cylinder gas inlet tube with inner diameter = 13 mm for bypass
Dimension WxDxH	:	430 W x 132,4 H x 315 D mm
Weight	:	see Test Report

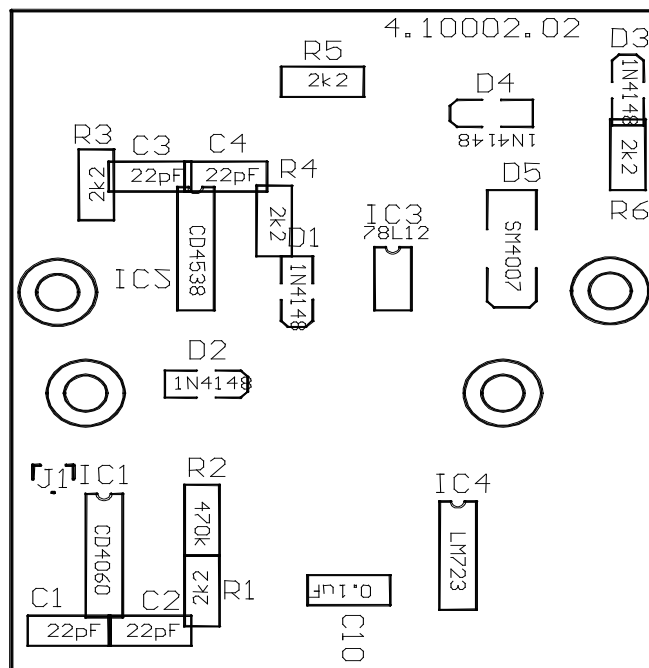
11.1. Technical Documentation HV Board

HV Board

4.10002.02



HG Lamp intensity



Pining and Jumper Setting

HV Board 4.10002.02

ST1 (power supply)

Pin	function
1	+24V
2	Gnd

ST2 (HG Lamp)

Pin	function
1	+ HG Lamp
2	- HG Lamp

ST3 (External intensity regulator)

Pin	function
1	Poti V_{Ref}
2	Poti V_{Gnd}
3	n.c.
4	Poti V_{Adj}

JP1 (int./ext. intensity regulator)

Pos.	function
closed	intensity adjusted with P1
open	intensity adjusted with external potentiometer