Methanator

Description

The methantor is used with an FID when detection of CO and CO_2 is required.

Methanator Operation

In the methanator CO and CO_2 are catalytically reduced to methane under excess hydrogen, which can be detected in the FID:

$$CO + 3\,H_2 \xrightarrow{Ni} CH_4 + H_2O$$

$$CO2 + 4\,H2 \xrightarrow{Ni} CH4 + 2\,H_2O$$

Other areas of application are the reduction of formic acid and formaldehyde to CH4. This permits quantitative detection of small concentrations in the ppm range.

$$HCOOH + 3\,H_2 \xrightarrow{Ni} CH_4 + 2\,H_2O$$

$$HCOH + 2\,H_2 \xrightarrow{Ni} CH_4 + H_2O$$

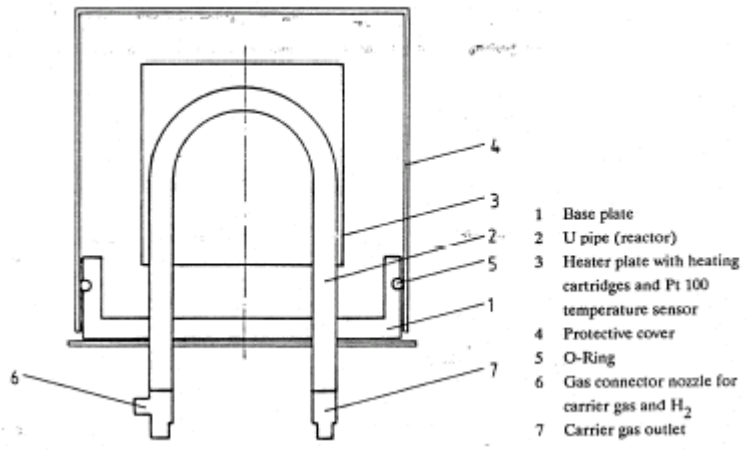
If possible, the samples should not contain any halogenated or sulfurous components.

Operational Note

Hydrocarbons above C8 are partially decomposed through the catalyst. They appear with tailing and too small. The simultaneous detection of higher boiling components and CO/CO2 is therefore not possible.

Hydration Reactor (Methanator)

The hydration reactor consists of a stainless steel U pipe that is filled with a catalyst. A heating plate is plugged on the U pipe. Two heating cartridges and a Pt 100 temperature sensor regulate heating to 400 °C. The U pipe is installed in a base plate airtight. The gas inlets and gas outlets are configured as flame barriers. A protective cover is installed airtight over the base plate. The cover is insulated to prevent the surface temperature from exceeding 180 °C.



In the ex-version the U pipe is encapsulated and pressure proof. The base plate contains a gas connector and exhaust nozzles for purge gas. The gas connector has a pipe, which extends into the purged shaft behind the installation chamber. This pipe is used to hold the connection lines for heating cartridges and temperature sensor. Purge gas flows from the purged shaft into the methanator housing through this pipe and prevents explosive gas from reaching the heater connections.

Technical Data

	Non-Ex-Methanator	Ex-Methanator
max. Operation Temperature	400 °C	400 °C
Heater	2 cartridges 115 V each	2 cartridges 115 V each
Classification	none	EEx dp IIB+H2 T3

DANGER:

If the purge air supply of the chromatograph is interrupted during operation, it is imperative that you keep the door closed for at least 30 minutes until the methanator has cooled down sufficiently. If the door to the electronics section or the cover to the shaft are opened prematurely, explosive gas can enter the methanator and ignite on the heater plate (max. 400 °C)!

1	Base plate
2	U pipe (reactor)
3	Heater plate with heating cartridges and Pt 100 temperature sensor
4	Protective cover
5	O-Ring
6	Gas connector nozzle for _carrier gas and H«SSTI»2«SSNO»
7	Carrier gas outlet

Fig. Methanator for packed columns

Installation Instructions

The methanator is installed on the unheated module slot on the oven. The gas connectors for the reactor extend into the oven chamber. In the PGC 302 Ex a pipe, which extends into the shaft behind the installation chamber, is screwed to the base plate at the purge gas connector. This pipe is used to hold the connection lines for heating cartridges and temperature sensor to the terminal strips in the shaft. The two heating cartridges are switched in series (refer to circuit diagram).

Gas Supply (refer to Fig. 4.1.5)

Use H2 (35 to 45 ml/min) as carrier gas. It is used as reaction gas in the methanator and as combustion gas in the FID. For other carrier gases, the combustion gas must be added via a pressure reducer (impedance class 5) at the methanator inlet.

Combustion air and additive are adjusted the same as with the FID without methanator. The hydrogen inlet on the FID must be sealed with a blind plug.