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POWER PLANTS



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INDUSTRY  
& MANUFACTURING

V3H14C

# TRITIUM AND CARBON-14 SAMPLERS



## MAIN ADVANTAGES

- Easy, fast and secure replacement of sampling bottles
- Mechanically-resistant sampling bottles
- Silica gel-like absorption medium (longer sampling time/higher amount of sample, compared to liquid absorption media)
- Parallel arrangement of sampling lines for more accurate differential evaluation and distinction of inorganic and organic forms
- Wide range and high accuracy of flow rate adjustment
- Measurement of the humidity downstream of the tritium sampling bottles
- Remote checking and control from the host system
- Proportional sampling relative to flow in the ventilation stack enables calculation of the amount of released 3H and 14C

## PURPOSE

The V3H14C is designed for  $^3\text{H}$  and  $^{14}\text{C}$  sampling from the air.

Basic absorption media are silica gel for sampling  $^3\text{H}$  and sodium hydroxide (NaOH) for sampling  $^{14}\text{C}$ .

Sampler includes two separate sampling lines for the sampling of different  $^3\text{H}$  and  $^{14}\text{C}$  forms. In the common intake section, there is an aerosol filter, a mass-flow meter, and pressure, temperature and relative humidity sensors. The first line includes a pump, a catalyst furnace, and sampling bottles containing silica gel. Also pressure, temperature and relative humidity sensors, an overflow trap bottle, and the sampling bottles containing NaOH. This line is designed for sampling  $^3\text{H}$  and  $^{14}\text{C}$  in all forms including

$\text{H}_2$ , CO and  $\text{C}_x\text{H}_x$ . The catalyst furnace temperature is adjustable in a broad range with high accuracy and is permanently measured and checked.

The second line is similar, but does not include the catalyst furnace. It is designed for  $^3\text{H}$  and  $^{14}\text{C}$  sampling, exclusively in the inorganic forms of  $\text{H}_2\text{O}$  and  $\text{CO}_2$ .

Within one sampling line,  $^3\text{H}$  sampling precedes the  $^{14}\text{C}$  sampling, and the sorption medium of  $^{14}\text{C}$  is thus protected against humidity. Downstream of the  $^3\text{H}$  sampling and upstream of the  $^{14}\text{C}$  sampling the humidity is measured, which enables a check of the efficiency of water sampling by the silica gel.

The sorbents are filled into glass sampling bottles and the bottles are screwed into the holder in the laboratory; for safety reasons only assembled bottle arrays are handled at the sampler's location. During normal operation, the sorbent should be normally exchanged on a weekly basis.

The air flow may be constant, or it may be adjusted proportionally to the value present at the equipment control input. It is adjustable in each sampling line separately. The set flow rate influences the duration of the sampling campaign. The flow through the individual lines may be limited by the parameters of the sorbent, and by the catalyst filling.

On the graphic display, it is possible to read the total amount of sampled air, current flow rate through the sampling lines, time of operation and all monitored values, such as temperature, pressure, and humidity in the line, and the temperature of the catalyst.

The samples are used for subsequent laboratory analysis. Activities of samples, resulting from the analysis, serve for the calculation of total releases of  $^3\text{H}$  and  $^{14}\text{C}$ . By comparing the difference in both samples, it is possible to determine the total released amount of all forms - the inorganic and organic forms of 3H and 14C.

# V3H14C

# TRITIUM AND CARBON-14 SAMPLER

## SPECIFICATION

Flow rate through one sampling channel	50 – 500 ml/min
Uncertainty of measured flow rate	max. $\pm 5\%$
Volume of sampling bottles in one bottle array	3 × 250 ml
Silica gel size (grain)	3 – 6 mm
weight (dry)	3 × 170 g in one bottle array
Sodium hydroxide solution concentration	3 mol/l
volume	≤ 600 ml in one bottle array
Collection efficiency	
H <sub>2</sub> O in silica gel	95 % $\pm 5\%$
CO <sub>2</sub> in NaOH	99 % $\pm 1\%$
Sorption capacity in one sampling bottle array (maximum, declared for specified efficiency)	
silica gel	30 g
NaOH	18,5 g
Volume of overflow trap bottle	500 ml
Catalyst temperature	from 250 to 550 °C
Power supply	100 – 240 V AC
Power consumption	
models with catalyst	max. 140 W
models without catalyst	max. 25 W
Operation temperature range	from 5 to 40 °C
Dimensions (W x H x D)	
V3H14C, V3H14Cs, V3H, V3Hs	620 × 805 × 265 mm
V3Ha	464 × 558 × 261 mm
Weight	
V3H14C, V3H14Cs, V3H, V3Hs	43 kg
V3Ha	13 kg
Interface	RS-485/ RS-232
Sampled air Temperature	from 5 to 40 °C
Sampled air Pressure	from 96 to 106 kPa
Sampled air Relative Humidity	max. 80%, non-condensing

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## TYPES OF SAMPLERS

Model	Sampling lines	Catalyst	Collection	Differential sampler
V3H14C	2	YES	organic and inorganic forms $^3\text{H}$ and $^{14}\text{C}$	YES
V3H14Cs	1	YES	organic and inorganic forms $^3\text{H}$ and $^{14}\text{C}$	NO
V3H	2	YES	organic and inorganic forms $^3\text{H}$	YES
V3Hs	1	YES	organic and inorganic forms $^3\text{H}$	NO
V3Ha	1	NO	inorganic forms $^3\text{H}$	NO

## OPTIONAL ACCESSORIES

53-A-000010 Software application for remote control

LDL-01 Local Data Logger for V3H14C

50-A-0011203 Transport box for sampling bottles in the holders

## RELATED PRODUCTS

DJ-500 Desorption unit



PC remote control screen V3H14C



DJ-500 Desorption Unit

V3H14C

# TRITIUM AND CARBON-14 SAMPLER



Assembled bottle array  
for silica gel



Assembled bottle array  
for NaOH solution



Transport box for sampling bottles  
in the holders



Insertion of the holder with  
sampling bottles with silica gel