



# RITTER MilliGascounter® Type MGC-1



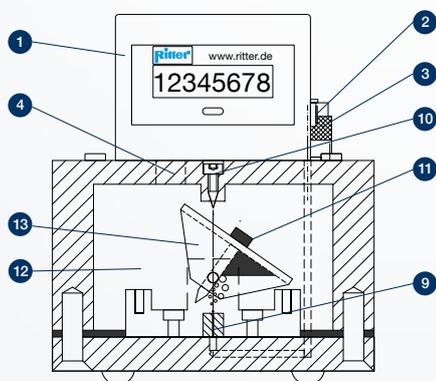
## Models

The MGC is available in the following casing/measurement cell materials:  
(from left to right: **casing material**/measurement cell material) **PMMA**/PVDF, **PVDF**/PVDF, **PVC-red**/ PVC-red.

# The RITTER MilliGascounter® Type MGC-1

## Applications

The MilliGascounter <sup>(1)</sup> (MGC) is designed for the volumetric measurement of the smallest amounts of gas with ultra-low flow rates. It is suitable for measurement of all inert, slightly corrosive gases such as biogas (PMMA model) and aggressive gases (PVDF model). Furthermore, it can be used for volumetric leak detection.



<sup>(1)</sup> Developed at the University of Applied Sciences Hamburg, Prof. Dr. Paul A. Scherer

## Measurement Principle with Schematic

The gas to be measured flows through the gas inlet nozzle <sup>(3)</sup> and micro capillary tube <sup>(9)</sup> within the base plate into the casing of the MGC which is filled with a packing liquid <sup>(12)</sup>. The gas rises as small bubbles through the packing liquid and is collected in the measurement cell <sup>(13)</sup>.

The measurement cell consists of two measuring chambers, which are filled successively by the rising gas bubbles. When a measuring chamber is filled, the buoyancy of the filled chamber causes the measurement cell to tip over abruptly. The second measuring chamber then begins to fill and the first one is emptied at the same time. The tipping of the measurement cell triggers a pulse by means of the permanent magnet <sup>(11)</sup> and the reed contact <sup>(10)</sup> which is registered by the counter unit <sup>(1)</sup>. For external data logging (PC) the switching pulses of the second reed contact can be obtained via the signal output socket <sup>(2)</sup>. The measured gas exhausts through the gas output nozzle <sup>(4)</sup>.

## Advantages compared to other Systems

- > Individual volumetric calibration of each MGC traceable to National Primary Standard
- > Total gas production measured (instead of Methane only)
- > Head space volume of fermentation bottle at measurement start (= air) not erroneously measured as pure methane volume
- > No false readings due to CO<sub>2</sub> absorption by combination of acidulated packing liquid and software correction (more: [www.ritter.de/en/products/milligas-counters](http://www.ritter.de/en/products/milligas-counters))

## Measuring-Range

The minimum flow rate is theoretically zero ltr/h as there are no mechanical limitations with the MGC which would define a minimum flow. However, at such micro flow rates there are external influences becoming evident: temperature and pressure variation, tightness of the hose connection, permeability of the gas inlet hose. Therefore, the minimum flow rate was defined to 1 ml/h. The maximum flow rate is 1.0 ltr/h.

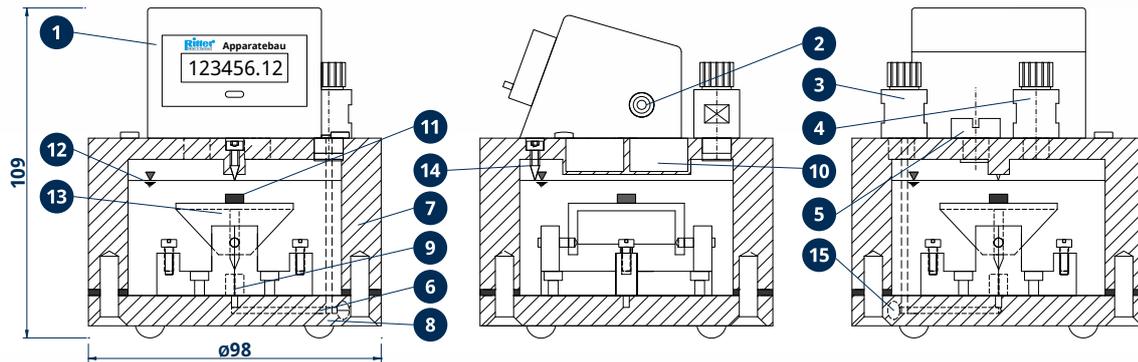
## Performance Specifications

Minimum flow rate $Q_{\min}$	1 ml/h	Measuring accuracy <sup>(2)</sup>	$\pm 3 / \pm 1$ %
Maximum flow rate $Q_{\max}$	1 ltr/h	Display accuracy <sup>(3)</sup>	0.01 ml
Minimum gas inlet pressure	8 mbar	Measurement cell volume, approx.	3 ml
Maximum gas inlet pressure	100 mbar	Packing liquid quantity, approx.	120 ml
Gas inlet pressure at measurement start	8 mbar	Operating temperature <sup>(4)</sup>	+10 ~ +60/+80/+40 °C
		Connection gas in-/outlet	PVDF screw-type tube connection

<sup>(2)</sup> Without / with software »RIGAMO« across the whole measurement range.

<sup>(3)</sup> For display of volume corrected by calibration factor with 2 decimals.

<sup>(4)</sup> Max. Operating temperature for PMMA/PVDF/PVC



- ① Counter unit with LCD display / ② Signal output socket (reed contact) / ③ Gas inlet / ④ Gas outlet
- ⑤ Air-vent screw for filling / ⑥ Gas inlet channel / ⑦ Casing / ⑧ Base plate / ⑨ Micro capillary tube
- ⑩ Two reed contacts / ⑪ Permanent magnet / ⑫ Packing liquid / ⑬ Measurement cell (tilting body) with twin-chambers
- ⑭ Tracing screw for liquid level / ⑮ Inspection screw gas inlet channel

## Display, Signal Output

The volume of the measured gas is displayed on the electronic digital display located on top of the MGC casing. Additionally a floating reed contact can be used as a signal output.

## Accuracy

Because of the physical measurement principle, the measurement error is dependent on the flow rate and it rates  $\pm 3\%$  across the full flow rate range. Each MGC is individually calibrated at the standard flow rate of 0.5 ltr/h so that the measurement error is approx. 0% at this flow rate. At minimum flow rate the measurement error is approximately +3%, at maximum flow rate approximately -3%. The »RIGAMO« software (available as accessory) provides an algorithm which automatically recalculates the actual measurement data into the real volume at the respective actual flow rate on the basis of the calibration curve. **The remaining error is smaller than  $\pm 1\%$  across the full flow rate range.** The volume is measured with a resolution of approximately 3 ml equivalent to the volume of the measurement cell.



## Standard Equipment

- > Electronic counter / display
- > Cleaning rod for micro capillary
- > Signal output (reed contact), floating output, 0.1 sec., max. load 100 V/DC / 0.33 A
- > Twin measuring chamber
- > 200 ml packing liquid
- > 1.5 m connection tubing
- Tube material:
  - PVC with PMMA & PVC casing
  - PTFE with PVDF casing
- > Connection gas in-/outlet: PVDF screw-type tube coupling  $\varnothing 4_1 / 6_0$  mm

## Accessories

- > Software »RIGAMO« for data acquisition by PC
- > Packing liquid: 100 / 500 / 1,000 ml
- > Additional gas connection tubing
- Tube material:
  - PVC with PMMA & PVC casing
  - PTFE with PVDF casing

**Multiple MilliGascounters connected to a Biogas Batch Fermentation System. More info: <https://www.ritterde/en/products/biogas-batch-fermentation-system>**



Dr.-Ing. RITTER Apparatebau  
GmbH & Co. KG  
Coloniastr. 19-23  
D-44892 Bochum  
Germany  
Tel +49-234-92293-0  
Fax +49-234-92293-50  
mailbox@ritter.de  
www.ritter.de



*"Worldwide -  
with the precision  
of the original!"*



»You can reach more than  
75 RITTER distribution partners  
directly through our website!«



[www.ritter.de](http://www.ritter.de)