

# PAUL-GOTHE-GmbH Bochum

Wittener Straße 82  
D-44789 Bochum



## Manual for

for carrying rack 22.0K-1

The carrying rack consists of a drying tower (Art.-No.: 16.011), a flow meter (Art.-No.: 19.3), a gas meter (Art.-No.: 21.02) and a pulsation damper (Art.-No.: 17.17).

### Construction:

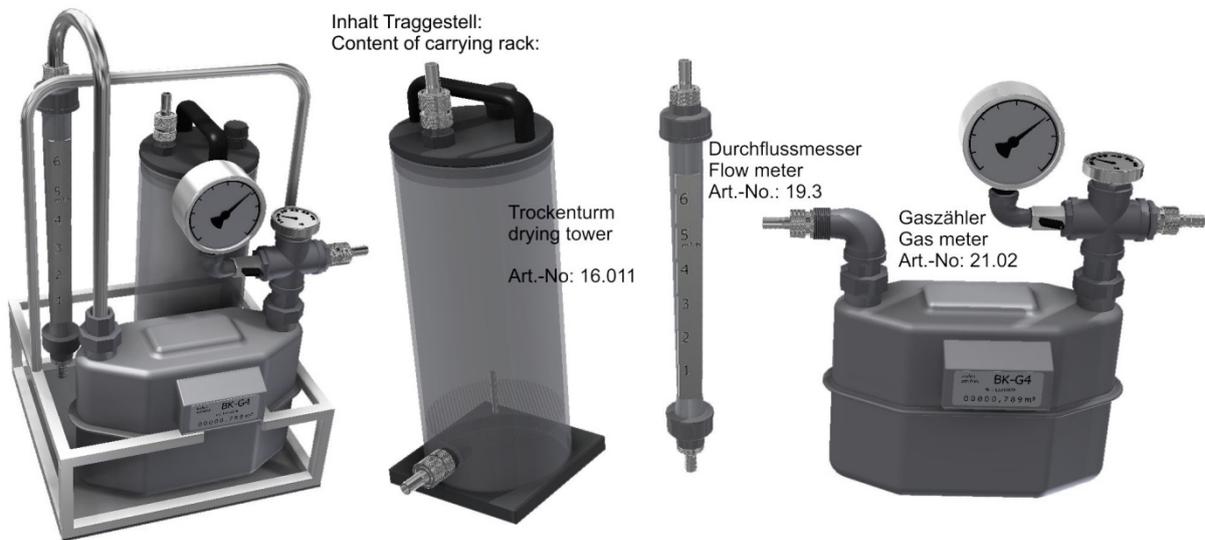
In connection with our gas-tight suction pump, the flow meter and the gas meter can be connected free of vacuum at the output of the pump. This way makes the sampling easier, because the gas meter has no changes in pressure during the sampling because of the pressure drop from the dust filter. Otherwise you must read constantly gas meter indicator and the vacuum for the calculation of the sampling volume. In addition, in this case the gas meter should be calibrated at the different vacuums. The attached calibration certificate is valid only for pressure free operation of the gas meter.

Nevertheless is at the gas meter one vacuum gauge. This pressure gauge is for the case that the pump loses its gas-tight condition due to the long life. If the wrong air rate from the pump increase to more as 2%, the pump must be mounted at the outlet of the gas meter and then you need the vacuum gauge. Use our support to get back the pump in a gas tight condition.

Important information for measurement of the sampling volume can you find at guideline VDI 2066 or EN 13284-1.

### Function of the pulsation damper:

Both, membrane and carbon vane pumps generate pulsation, which affects a flow meter, so that the float body indicates an incorrect value. Through intensive research, we have developed a pulsation damper (no filter!) which eliminate these problems. This damper should not be change in shape and arrangement! The hose from the pulsation damper must connect to the flow meter input. With a suction hose must connect the pump output with the quick coupling from the pulsation damper. The hose between the pump and the pulsation damper should not be less than 2 meters.



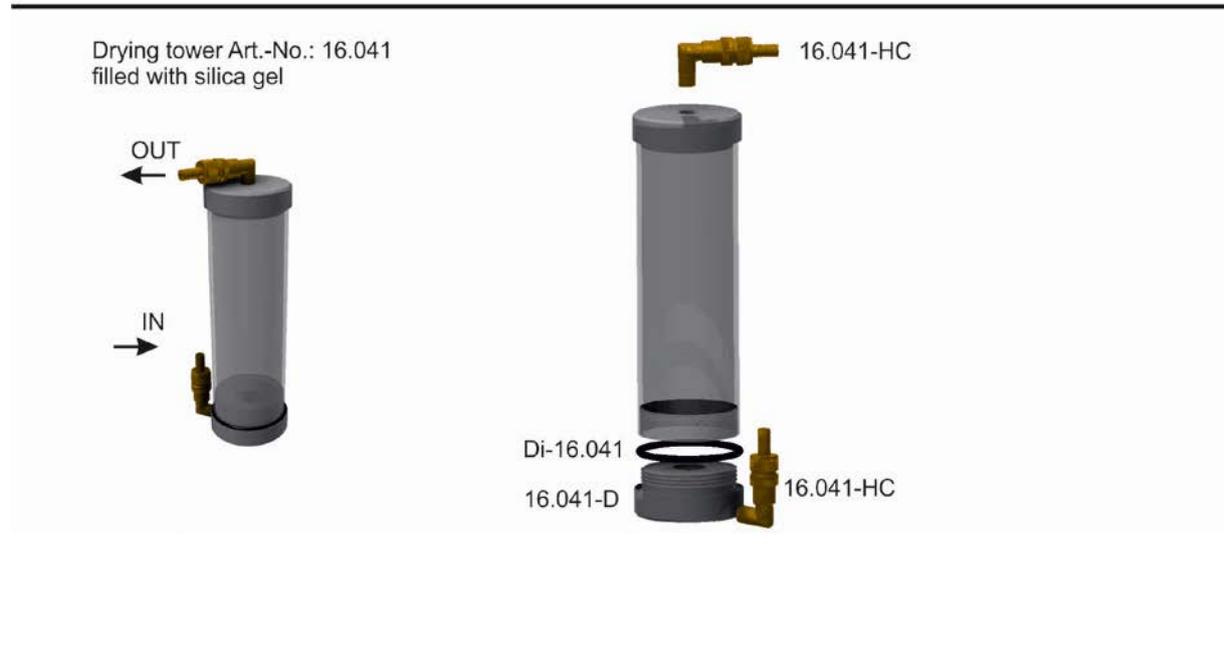
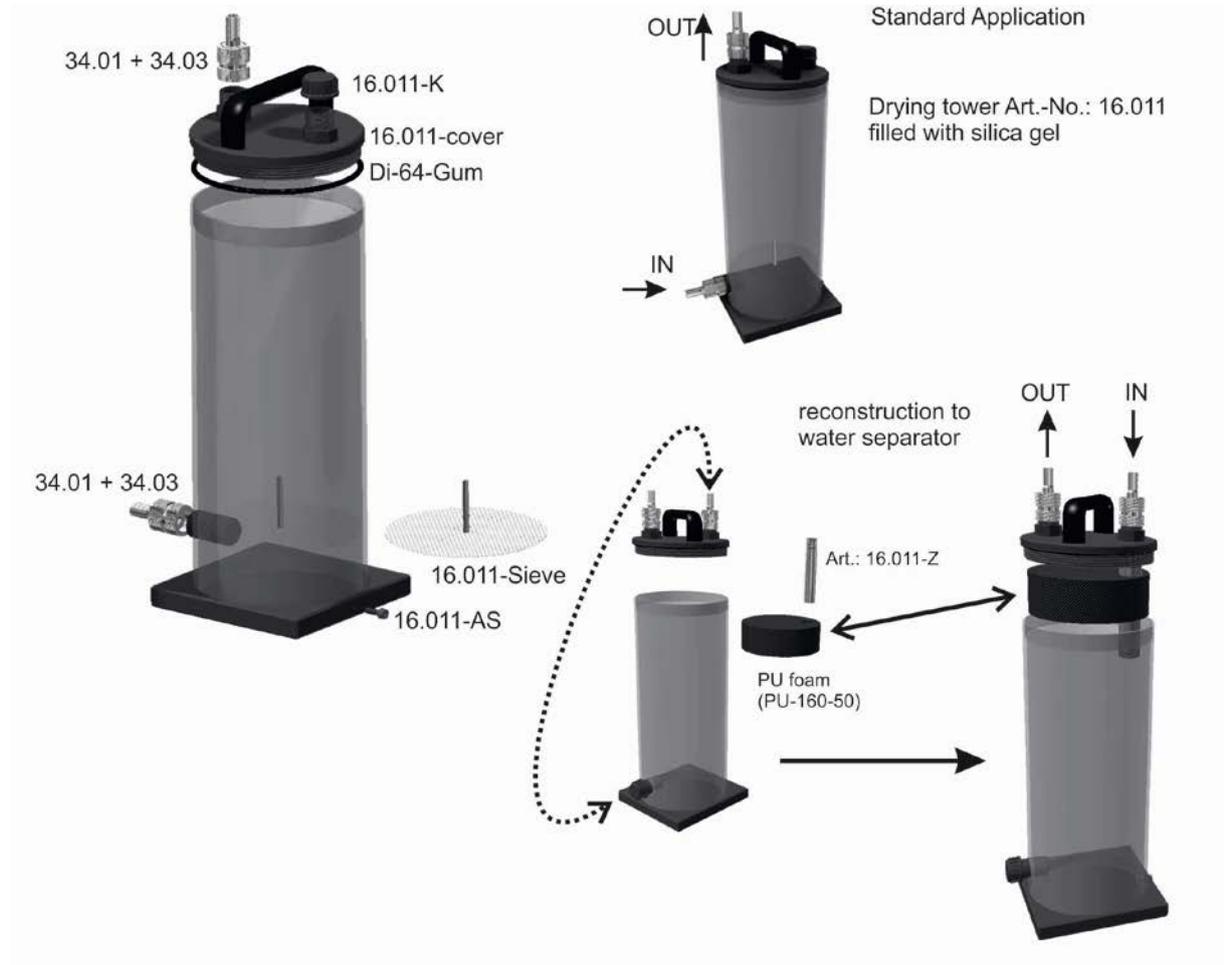
### We recommend the following structure:

Exit suction tube – drying tower – gas tight pump – pulsation damper – flow meter – gas meter





### Manual for drying tower





## Manual for flowmeter

The flowmeter should use always in a upright position and without high pressure or vacuum.

The indicated value must corrected by correction factors.

More information and the Declaration of Conformity can be found at service and support.

Reading of the flowmeter: read the measured value at the top edge of the float.

$$Volume(gasmeter) = scale(rotameter) \cdot K_{\delta} \cdot K_t \cdot K_p$$

$$scale(rotameter) = \frac{volume(gasmeter)}{K_{\delta} \cdot K_t \cdot K_p}$$

$$K_{\delta} = \sqrt{\frac{\delta_E}{\delta_B}}, \quad K_t = \sqrt{\frac{293}{(273+t)}}, \quad K_p = \sqrt{\frac{p}{1000}}$$

$\delta_B$ : gas density NPT [kg/m<sup>3</sup>]  
 $\delta_E$ : calibrate density NPT [kg/m<sup>3</sup>]  
b: atmospheric pressure [mbar]  
p: operating pressure [mbar]  
 $p_N$ : NPT-pressure (1013 mbar)  
T: NPT temperature (273 K)  
t: operating temperature [°C]

Respect: Disturbances in the ad (dead loss) can happen through pumps in front of the flowmeter (rotary vane- and membrane-pumps). To avoid this, use a pulsation dumper in front of the flowmeter! Calibrate the flowmeter with the gas meter.

Working medium:

Inert and corrosive gas which have no negative impact on the physical and chemical properties of the tube , float, seal and union materials.

Operating pressure: tubes with plastic unions: 10 bar.

Accuracy class: 4 according to VDE/VDI 3513, part 2,  $\pm 1\%$  from final value and  $\pm 3\%$  from measured value.

# PAUL-GOTHE-GmbH Bochum

Wittener Straße 82  
D-44789 Bochum



## Manual for gas meter

Gas meter is resistant and durable finish (interior parts out of plastic). Our recommendation: Place the drying tower in front of the gas meter so that dry air flows in. Let ~ 500 l of dry and clean air flow through the gas meter and vacuum pump after the measurement. Operating temperature: -20 to 60°C, limits of calibration errors: from 0,2 Qmax: 1.5 %,

For determination of the volume must be recorded the temperature on the gas meter. If the gas meter operated under vacuum, then the vacuum has to be noted too. When operating in vacuum the supplied calibration certificate is not valid.

Calculation of the NPT Volume:

$$V_{NPT, \text{gasmeter}, \text{dry}} = V_{\text{gasmeter}, \text{dry}, p, t} \cdot \frac{(b - p_{\text{gasmeter}}) \cdot T_{NPT}}{p_{NPT} \cdot (T_{NPT} + t)}$$

Conversion gas volume:

$$V_{\text{Gasmeter}} = V_{\text{duct}} \frac{100 - f_{\text{duct}} T_{\text{gasmeterKelvin}} P_{\text{duct}}}{100 - f_{\text{gasmeter}} T_{\text{ductl(Kelvin)}} P_{\text{gasmeter}}}$$

V: Volumetric gas flow in m<sup>3</sup>/h

f: Humidity in percent

T: Temperature in Kelvin

p: absolute pressure in mbar

