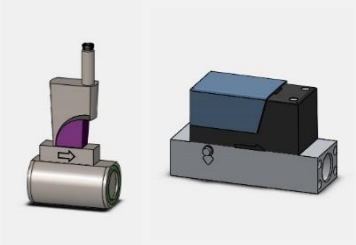
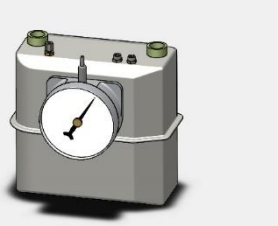
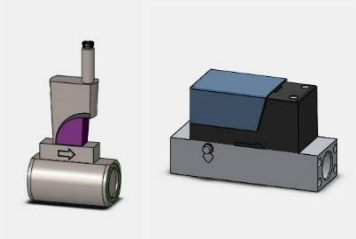
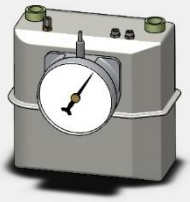
Gas flow rate instruments comparison

Microplan offers several high quality gas flow rate measurement instruments to be included with test benches. The most popular instruments are as follows:

a) Burkert - Models 8006 or 8746
b) Bronkhorst - Models F103 or F106
c) Elster - Model G4/10

The following table details the features that distinguish the Bronkhorst-Burkert thermal mass flow meters from Elster volumetric flow meters.

#	*FAQ*	***Bronkhorst-Burkert*** 	***Elster*** 
1	What physical quantity is the instrument sensitive to?	Mass flow rate	Volume
		Both Burkert and Bronkhorst instruments directly read the mass of the gas that flows through them.	On the contrary, Elster meter reads the volume of the gas flowing through it.
2	What does the electric output of the instrument represent?	Volume rate in normal units	Volume, by pulses
		The mass instruments produce an output signal which represents the volume of the gas expressed in normal units (1013 mbar, 0°C). Their internal board in fact converts the mass into volume.	The Elster counter, on the contrary, is equipped with an encoder that converts the turns of the internal chambers of the counter in pulses, with a predefined rate: for example, 3600 pulses per turn, which means 360 pulses per liter. The volume passed from a moment t1 to a moment t2 is obtained by the number of pulses produced in that time interval.
3	How to obtain the standard flow rate from the output?	Conversion from normal to standard units	Dividing the volume by a period of time
		In the case of mass flow meters the gas flow rate in standard units (1013 mbar, 15°C) can simply be obtained by calculation from the normal flow rate represented by their output signal.	In the volumetric counters, the flow rate is obtained during a certain period by dividing the volume by the time.

#	FAQ	Bronkhorst-Burkert	Elster
			
4	Is the obtained standard flow rate instantaneous or averaged?	Instantaneous	Averaged
		By its nature, the signal produced from mass flow meters represents an instant flow rate.	On the contrary, the flow rate calculated from gas counters is an averaged value, that represents the average flow rate during the measurement period.
5	Is the measurement in standard units sensitive to the gas pressure?	No	Yes, it needs to be corrected accordingly.
6	Is the measurement in standard units sensitive to the gas temperature?	No	Yes, it needs to be corrected accordingly.
7	Is the measurement in standard units sensitive to the atmospheric pressure?	No	Yes, it needs to be corrected accordingly.
		The mass flow meters don't require corrections for environmental conditions to provide the flow rate in standard units.	The volumetric counters, on the contrary, must convert the gas volume, under test conditions, to standard conditions. Additional measurement of gas pressure, gas temperature and barometric pressure are required.
8	Is the measurement influenced by the composition of the gas?	Yes	No
		Mass flow meters are calibrated on a specific gas, therefore calculations to convert mass flow rate into normal units are based on the gas properties. If a different gas is used, at the same flow rate, the output signal deviates. This deviation must be taken in account in the measurement, which is not always possible.	The output signal of Volumetric counters are not influenced by the variable gas properties usually provided by gas networks, provided that the correction to standard units (lines 5,6,7) is applied. The gas density must only be considered in extreme, uncommon cases.
9	What's the typical application on test benches?	Production (end of line)	Laboratory (certification)

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		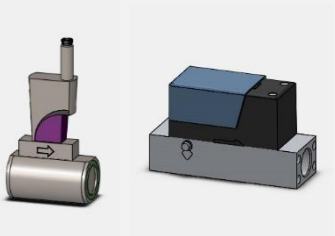	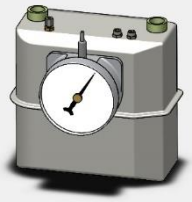
		Instantaneous gas flow rate measurement makes the mass flow meters popular in production (end-of-line) benches. Sensitivity to minor changes in gas properties (line 8) is typically considered to be acceptable, being compatible with the accuracy requested in the end-of-line tests.	The volumetric counters are preferred on laboratory benches, because most of the standards for certification require to take in account the gas volume, instead of the gas flow rate. However, volumetric counters can replace mass flow meters in production benches when there is significant variation in the properties in the gas supply (line 8) or a large range of heat input is required (line 10). The contrary is not usual: mass flow meters are never used on certification benches. However, they are used on R&D benches, to allow the customer tests in transitory conditions.
10	What are typical measuring ranges?	0.5-5 nm^3/h	40-10000 l/h
		Mass flow meters have a typical rangeability of 1:50, from minimum to maximum flow rate. Volumetric counters usually have a much larger rangeability, which can be 1:1500 or more. For this reason, in test benches needing a large range of heat input, sometimes volumetric counters are used despite their limits in the instant flow rate measurement (lines 4, 5, 6, and 7).	
11	What is the typical accuracy declared by the manufacturer?	+/-1 (Bronkhorst) or +/-2% (Burkert) of the read value	+/- 1% of the read value