

# IN-LINE

## Filters for Mass Flow Meters / Controllers

### > General

Inherent to its construction, a thermal mass flow meter or controller for gases is sensitive to contamination. To increase the MTBF (Mean Time Between Failure) it is important to make sure that the gas entering the instrument to clean. The IN-LINE Filter Assembly, screwed into the inlet of the instrument, provides this service. It contains a 316L sintered metal filter cartridge that is suitable for general purpose filtration and can be cleaned with a suitable solvent. If the gas contains a large particulate content, we advise the use of a pre-filter.

### > Selection

- ◆ Choose a low-flow or medium-flow style filter for instruments with 1/4" female thread at the inlet; the high-flow filter is suitable for mounting into instruments with 1/2" female thread.
- ◆ In principle select finest porosity with low  $\Delta P$ ; preferable  $\Delta P$  not higher than 250 to 500 mbar, and porosity not bigger than 5  $\mu\text{m}$ .

### > Material of construction

Housing: AISI 316

O-rings: Viton; optional EPDM and FFKM (Kalrez).

### > Pressure drop

The approximate pressure drop across a filter assembly can be calculated as follows:



#### Example:

Flow 80 l<sub>v</sub>/min air, pressure 5 bara, filter selected: M-422-17 (5  $\mu\text{m}$ ).

At  $P_1 = 1$  bara,  $\Delta P$  across filter = 389 mbar (see graph).

At  $P_1 = 5$  bara,  $\Delta P = \frac{389}{5} = 78$  mbar.

For other gases than air the pressure drop is difficult to calculate, because the total pressure drop is built up from both laminar and turbulent pressure losses; therefore contact factory regarding exact pressure losses, if so required.

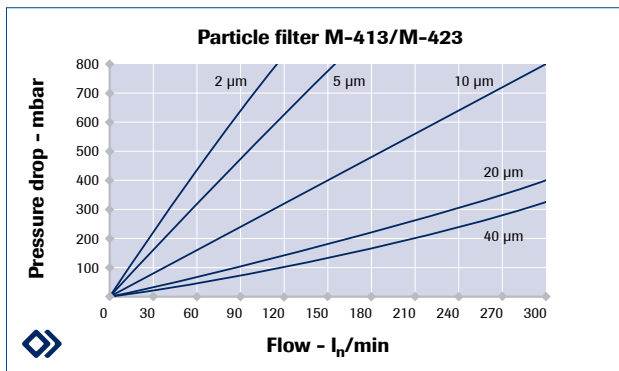
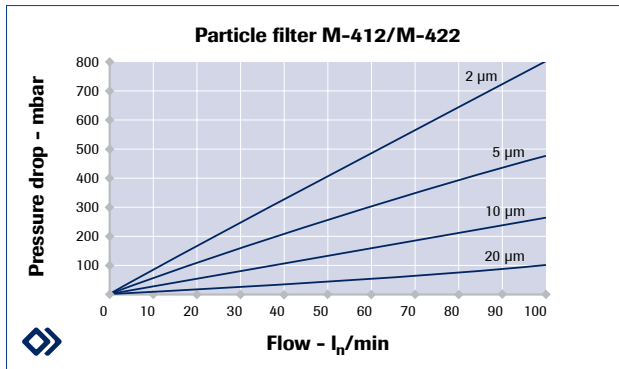
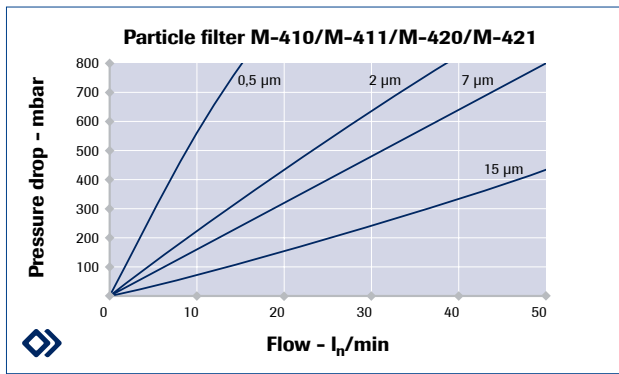
Style	Model no.	Average porosity	Type / area	Connections in / out
Ultra-low-flow	M-410-13/M-420-13	0,5 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/8" female / 1/8" male
	M-410-16/M-420-16	2 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/8" female / 1/8" male
	M-410-18/M-420-18	7 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/8" female / 1/8" male
	M-410-20/M-420-20	15 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/8" female / 1/8" male
Low-flow	M-411-13/M-421-13	0,5 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/4" female / 1/4" male
	M-411-16/M-421-16	2 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/4" female / 1/4" male
	M-411-18/M-421-18	7 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/4" female / 1/4" male
	M-411-20/M-421-20	15 $\mu\text{m}$	316L / 2,5 cm <sup>2</sup>	1/4" female / 1/4" male
Medium-flow	M-412-16/M-422-16	2 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/4" female / 1/4" male
	M-412-17/M-422-17	5 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/4" female / 1/4" male
	M-412-19/M-422-19	10 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/4" female / 1/4" male
	M-412-21/M-422-21	20 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/4" female / 1/4" male
High-flow	M-413-16/M-423-16	2 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/2" female / 1/2" male
	M-413-17/M-423-17	5 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/2" female / 1/2" male
	M-413-19/M-423-19	10 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/2" female / 1/2" male
	M-413-21/M-423-21	20 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/2" female / 1/2" male
	M-413-22/M-423-22	40 $\mu\text{m}$	316L / 5 cm <sup>2</sup>	1/2" female / 1/2" male



**Bronkhorst®**

## > Pressure drop

(Air at 1 bar, 20 °C, pressure vs. flow)

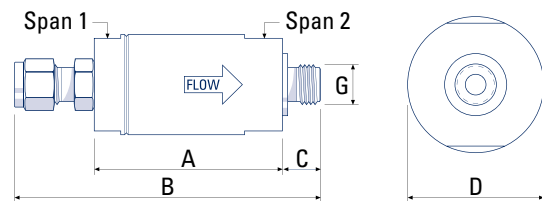


## > Model number identification

**M** - **4NN** - **NN** - **NO** - **A**

Option	Description
<b>Pressure rating</b>	
1	100 bar
2	200 bar
<b>Filter housing</b>	
0	Ultra-low-flow
1	Low-flow
2	Medium-flow
3	High-flow
<b>Filter cartridge</b>	
13	0,5 micron sintered metal
16	2 micron sintered metal
17	5 micron sintered metal
18	7 micron sintered metal
19	10 micron sintered metal
20	15 micron sintered metal
21	20 micron sintered metal
22	40 micron sintered metal
<b>Inlet adaptor</b>	
00	none
10	1/8" OD compression type
20	1/4" OD compression type
30	6 mm OD compression type
40	12 mm OD compression type
50	1/2" OD compression type
60	20 mm OD compression type
80	1/4" Face seal male
90	other
<b>Seals</b>	
E	EPDM
F	FFKM (Kalrez)
V	Viton (factory standard)

## > Dimensions



Model	A	B	C	D	G	Span 1	Span 2
M-410/M-420	53	89	10	ø 24	1/8"	20	20
M-411/M-421	53	91	10	ø 24	1/4"	20	20
M-412/M-422	70	106	10	ø 35	1/4"	30	32
M-413/M-423	80	129	14	ø 35	1/2"	30	32

Dimensions in mm. Technical specifications and dimensions subject to change without notice.

