

# MASS-FLOW *Select*

New Mass Flow Meters/Controllers featuring flexibility and cost reduction

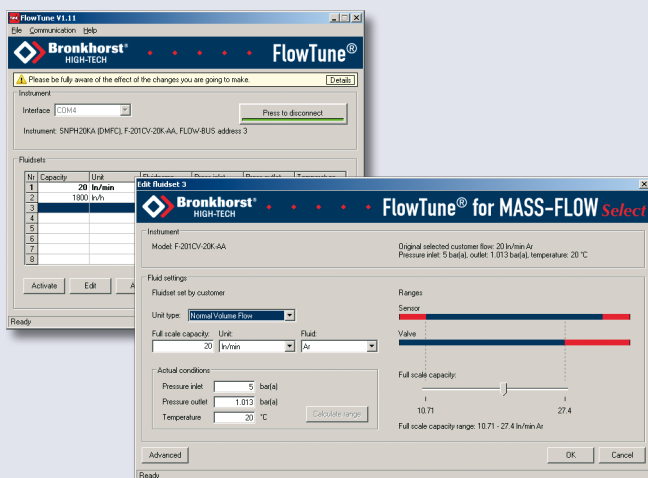


Bronkhorst High-Tech B.V. manufactures the largest variety of thermal Mass Flow Meters and Controllers for gases and liquids available on the market. In this leaflet Bronkhorst present their latest development, the “MASS-FLOW *Select*” Series of Digital Mass Flow Meters and Controllers for Gases. These new instruments offer greater flexibility for user selection of both flow ranges and gas types whilst maintaining their high accuracy with turndown ranges for measurement and control up to 187,5 to 1 !

As a result of the new feature, Original Equipment Manufacturers are able to drastically reduce the variety of spare instruments they keep on stock and thus reduce the cost of ownership. Users of MFC's in pilot plants or laboratories can rescale their instruments on site, saving time and money; substantial costs for mounting and dismantling and also for service and recalibration are no longer

applicable! For the convenience of the user, Bronkhorst High-Tech has developed a free and easy-to-use software tool called “FlowTune”. By hooking up the instrument to the RS232 port of a lap-top and running this freeware configuration tool, the selection of different gas types and flow ranges is as simple as 1, 2, 3.

The instruments with the new “MASS-FLOW *Select*” features, covering flow ranges from 0...0,7 ml<sub>n</sub>/min up to 0...1670 l<sub>n</sub>/min, are available in two configurations. The EL-FLOW *Select* series have a housing designed for laboratory and clean processing conditions, the IN-FLOW *Select* series are of rugged design according to IP65 (dust- and waterproof). The latter are also ATEX Category 3, approved for use in Zone 2 hazardous areas. In addition to the standard analog I/O-signals and the RS232 connection, there is the possibility of integrating an interface board with DeviceNet™, Profibus-DP®, Modbus or FLOW-BUS protocol.



## > Multi Gas / Multi Range features

- ◆ Measurement and control of gas flow ranges from 0-0,7 ml<sub>n</sub>/min up to 0-1670 l<sub>n</sub>/min covered with one product line
- ◆ Rangeability up to 187,5 : 1
- ◆ Flexible, user-programmable ranges and gas types
- ◆ Storage of max. 8 calibration curves
- ◆ Free, easy-to-use configuration software
- ◆ Multi Gas / Multi Range functionality up to 10 bar; pressure rating up to 100 bar
- ◆ High accuracy and repeatability
- ◆ On request, very fast measuring and response times (msec)
- ◆ Analog or digital: RS232, DeviceNet™, Profibus-DP®, Modbus-RTU, FLOW-BUS

## > Model numbers and Air flow ranges

(valid for operating conditions from 0.8 to 10 bar abs and 0 to 70°C)

EL-FLOW <i>Select</i> MFM Model #	EL-FLOW <i>Select</i> MFC Model #	IN-FLOW <i>Select</i> MFM Model #	IN-FLOW <i>Select</i> MFC Model #	Air flow ranges Minimum/Nominal/Maximum
F-110C - 002	F-200CV - 002	F-110CI - 002		Min. 0.014 - 0.7 ml <sub>r</sub> /min Air Nom. 0.014 - 2 ml <sub>r</sub> /min Air Max. 0.014 - 5 ml <sub>r</sub> /min Air
F-110C - 005	F-200CV - 005	F-110CI - 005		Min. 0.06 - 3 ml <sub>r</sub> /min Air Nom. 0.06 - 5 ml <sub>r</sub> /min Air Max. 0.06 - 9 ml <sub>r</sub> /min Air
F-111B - 020	F-201CV - 020	F-111BI - 020	F-201CI - 020	Min. 0.16 - 8 ml <sub>r</sub> /min Air Nom. 0.16 - 20 ml <sub>r</sub> /min Air Max. 0.16 - 30 ml <sub>r</sub> /min Air
F-111B - 050	F-201CV - 050	F-111BI - 050	F-201CI - 050	Min. 0.4 - 20 ml <sub>r</sub> /min Air Nom. 0.4 - 50 ml <sub>r</sub> /min Air Max. 0.4 - 75 ml <sub>r</sub> /min Air
F-111B - 100	F-201CV - 100	F-111BI - 100	F-201CI - 100	Min. 0.8 - 40 ml <sub>r</sub> /min Air Nom. 0.8 - 100 ml <sub>r</sub> /min Air Max. 0.8 - 150 ml <sub>r</sub> /min Air
F-111B - 200	F-201CV - 200	F-111BI - 200	F-201CI - 200	Min. 1.6 - 80 ml <sub>r</sub> /min Air Nom. 1.6 - 200 ml <sub>r</sub> /min Air Max. 1.6 - 300 ml <sub>r</sub> /min Air
F-111B - 500	F-201CV - 500	F-111BI - 500	F-201CI - 500	Min. 4 - 200 ml <sub>r</sub> /min Air Nom. 4 - 500 ml <sub>r</sub> /min Air Max. 4 - 750 ml <sub>r</sub> /min Air
F-111B - 1K0	F-201CV - 1K0	F-111BI - 1K0	F-201CI - 1K0	Min. 8 - 400 ml <sub>r</sub> /min Air Nom. 8 - 1000 ml <sub>r</sub> /min Air Max. 8 - 1500 ml <sub>r</sub> /min Air
F-111B - 2K0	F-201CV - 2K0	F-111BI - 2K0	F-201CI - 2K0	Min. 16 - 800 ml <sub>r</sub> /min Air Nom. 16 - 2000 ml <sub>r</sub> /min Air Max. 16 - 3000 ml <sub>r</sub> /min Air
F-111B - 5K0	F-201CV - 5K0	F-111BI - 5K0	F-201CI - 5K0	Min. 0.04 - 2 l <sub>r</sub> /min Air Nom. 0.04 - 5 l <sub>r</sub> /min Air Max. 0.04 - 7.5 l <sub>r</sub> /min Air
F-111B - 10K	F-201CV - 10K	F-111BI - 10K	F-201CI - 10K	Min. 0.08 - 4 l <sub>r</sub> /min Air Nom. 0.08 - 10 l <sub>r</sub> /min Air Max. 0.08 - 15 l <sub>r</sub> /min Air
F-111B - 20K	F-201CV - 20K	F-111BI - 20K	F-201CI - 20K	Min. 0.16 - 8 l <sub>r</sub> /min Air Nom. 0.16 - 20 l <sub>r</sub> /min Air Max. 0.16 - 25 l <sub>r</sub> /min Air
F-111AC - 50K	F-201AV - 50K	F-111AI - 50K	F-201AI - 50K	Min. 0.4 - 20 l <sub>r</sub> /min Air Nom. 0.4 - 50 l <sub>r</sub> /min Air Max. 0.4 - 75 l <sub>r</sub> /min Air
F-111AC - 70K	F-201AV - 70K	F-111AI - 70K	F-201AI - 70K	Min. 0.6 - 30 l <sub>r</sub> /min Air Nom. 0.6 - 70 l <sub>r</sub> /min Air Max. 0.6 - 100 l <sub>r</sub> /min Air
F-112AC - M10	F-202AV - M10	F-112AI - M10	F-202AI - M10	Min. 0.8 - 40 l <sub>r</sub> /min Air Nom. 0.8 - 100 l <sub>r</sub> /min Air Max. 0.8 - 150 l <sub>r</sub> /min Air
F-112AC - M20	F-202AV - M20	F-112AI - M20	F-202AI - M20	Min. 1.4 - 70 l <sub>r</sub> /min Air Nom. 1.4 - 200 l <sub>r</sub> /min Air Max. 1.4 - 250 l <sub>r</sub> /min Air
F-113AC - M50	F-203AV - M50	F-113AI - M50	F-203AI - M50	Min. 4 - 200 l <sub>r</sub> /min Air Nom. 4 - 500 l <sub>r</sub> /min Air Max. 4 - 750 l <sub>r</sub> /min Air
F-113AC - 1M0	F-203AV - 1M0	F-113AI - 1M0	F-203AI - 1M0	Min. 8 - 400 l <sub>r</sub> /min Air Nom. 8 - 1000 l <sub>r</sub> /min Air Max. 8 - 1670 l <sub>r</sub> /min Air



EL-FLOW *Select* Mass Flow Controller model F-201CV



IN-FLOW *Select* Mass Flow Meter model F-112AI

**> Minimum/Maximum flow ranges for other gases**  
(valid for operating conditions from 0.8 to 10 bar abs and 0 to 70°C)

Min/Max range	Ar	CH <sub>4</sub>	C <sub>2</sub> H <sub>6</sub>	CO	CO <sub>2</sub>	H <sub>2</sub>	He	N <sub>2</sub>	N <sub>2</sub> O	O <sub>2</sub>	
Min	0.02 - 1	0.012 - 0.6	0.008 - 0.4	0.014 - 0.7	0.012 - 0.6	0.014 - 0.7	0.02 - 1	0.014 - 0.7	0.012 - 0.6	0.014 - 0.7	ml <sub>n</sub> /min
Max	0.02 - 6	0.012 - 3.5	0.008 - 2	0.014 - 5	0.012 - 3	0.014 - 5	0.02 - 7	0.014 - 5	0.012 - 3	0.014 - 5	
Min	0.07 - 3.5	0.04 - 2	0.028 - 1.4	0.06 - 3	0.04 - 2	0.06 - 3	0.07 - 3.5	0.06 - 3	0.04 - 2	0.06 - 3	
Max	0.07 - 9.5	0.04 - 5.5	0.028 - 4	0.06 - 9	0.04 - 4.5	0.06 - 7.2	0.07 - 10	0.06 - 9	0.04 - 4.5	0.06 - 9	
Min	0.2 - 10	0.11 - 5.5	0.08 - 4	0.16 - 8	0.14 - 7	0.144 - 7.2	0.2 - 10	0.16 - 8	0.12 - 6	0.16 - 8	
Max	0.2 - 30	0.11 - 18	0.08 - 13	0.16 - 30	0.14 - 16	0.144 - 25	0.2 - 35	0.16 - 30	0.12 - 16	0.16 - 30	
Min	0.54 - 27	0.34 - 17	0.22 - 11	0.4 - 20	0.3 - 15	0.42 - 21	0.56 - 28	0.4 - 20	0.3 - 15	0.4 - 20	
Max	0.54 - 75	0.34 - 47	0.22 - 34	0.4 - 75	0.3 - 39	0.42 - 65	0.56 - 90	0.4 - 75	0.3 - 38	0.4 - 73	
Min	1.12 - 56	0.64 - 32	0.42 - 21	0.8 - 40	0.62 - 31	0.84 - 42	1.12 - 56	0.8 - 40	0.6 - 30	0.8 - 40	
Max	1.12 - 150	0.64 - 95	0.42 - 70	0.8 - 150	0.62 - 79	0.84 - 130	1.12 - 180	0.8 - 150	0.6 - 77	0.8 - 140	
Min	2.4 - 120	1.3 - 65	0.88 - 44	1.6 - 80	1.22 - 61	1.68 - 84	2.4 - 120	1.6 - 80	1.2 - 60	1.6 - 80	
Max	2.4 - 300	1.3 - 190	0.88 - 140	1.6 - 300	1.22 - 150	1.68 - 260	2.4 - 360	1.6 - 300	1.2 - 150	1.6 - 290	
Min	5.4 - 270	3.2 - 160	2.2 - 110	4 - 200	3 - 150	4.2 - 210	5.6 - 280	4 - 200	3 - 150	4 - 200	
Max	5.4 - 750	3.2 - 470	2.2 - 340	4 - 750	3 - 390	4.2 - 650	5.6 - 900	4 - 750	3 - 380	4 - 730	
Min	11.2 - 560	6.4 - 320	4.2 - 210	8 - 400	6.2 - 310	8.4 - 420	11.2 - 560	8 - 400	6 - 300	8 - 400	
Max	11.2 - 1500	6.4 - 950	4.2 - 680	8 - 1500	6.2 - 790	8.4 - 1300	11.2 - 1800	8 - 1500	6 - 770	8 - 1400	
Min	24 - 1200	13 - 650	8.8 - 440	16 - 800	12.2 - 610	16.8 - 840	24 - 1200	16 - 800	12 - 600	16 - 800	
Max	24 - 3000	13 - 1900	8.8 - 1300	16 - 3000	12.2 - 1500	16.8 - 2600	24 - 3600	16 - 3000	12 - 1500	16 - 2900	
Min	0.054 - 2.7	0.032 - 1.6	0.022 - 1.1	0.04 - 2	0.03 - 1.5	0.042 - 2.1	0.056 - 2.8	0.04 - 2	0.03 - 1.5	0.04 - 2	l <sub>n</sub> /min
Max	0.054 - 7.5	0.032 - 4.7	0.022 - 3.3	0.04 - 7.5	0.03 - 3.9	0.042 - 6.5	0.056 - 9	0.04 - 7.5	0.03 - 3.8	0.04 - 7.3	
Min	0.112 - 5.6	0.064 - 3.2	0.042 - 2.1	0.08 - 4	0.062 - 3.1	0.084 - 4.2	0.112 - 5.6	0.08 - 4	0.06 - 3	0.08 - 4	
Max	0.112 - 15	0.064 - 9.5	0.042 - 6.9	0.08 - 15	0.062 - 7.9	0.084 - 13	0.112 - 18	0.08 - 15	0.06 - 7.7	0.08 - 14	
Min	0.2 - 10	0.13 - 6.5	0.088 - 4.4	0.16 - 8	0.122 - 6.1	0.168 - 8.4	0.24 - 12	0.16 - 8	0.12 - 6	0.16 - 8	
Max	0.2 - 25	0.13 - 16	0.088 - 11	0.16 - 25	0.122 - 14	0.168 - 25	0.24 - 30	0.16 - 25	0.12 - 14	0.16 - 25	
Min	0.54 - 27	0.32 - 16	0.22 - 11	0.4 - 20	0.3 - 15	0.42 - 21	0.56 - 28	0.4 - 20	0.3 - 15	0.4 - 20	
Max	0.54 - 75	0.32 - 47	0.22 - 34	0.4 - 75	0.3 - 39	0.42 - 65	0.56 - 90	0.4 - 75	0.3 - 38	0.4 - 73	
Min	0.9 - 45	0.5 - 25	0.4 - 20	0.6 - 30	0.5 - 25	0.6 - 30	0.9 - 45	0.6 - 30	0.5 - 25	0.6 - 30	
Max	0.9 - 100	0.5 - 60	0.4 - 45	0.6 - 100	0.5 - 50	0.6 - 90	0.9 - 125	0.6 - 100	0.5 - 50	0.6 - 90	
Min	1.12 - 56	0.64 - 32	0.42 - 21	0.8 - 40	0.62 - 31	0.84 - 42	1.12 - 56	0.8 - 40	0.6 - 30	0.8 - 40	
Max	1.12 - 150	0.64 - 95	0.42 - 68	0.8 - 150	0.62 - 79	0.84 - 130	1.12 - 180	0.8 - 150	0.6 - 77	0.8 - 140	
Min	2 - 100	1.1 - 55	0.7 - 35	1.4 - 70	1 - 50	1.4 - 70	2 - 100	1.4 - 70	1 - 50	1.4 - 70	
Max	2 - 250	1.1 - 170	0.7 - 120	1.4 - 250	1 - 130	1.4 - 200	2 - 300	1.4 - 250	1 - 130	1.4 - 250	
Min	5.4 - 270	3.2 - 160	2.2 - 110	4 - 200	3 - 150	4.2 - 210	5.6 - 280	4 - 200	3 - 150	4 - 200	
Max	5.4 - 750	3.2 - 470	2.2 - 340	4 - 750	3 - 390	4.2 - 650	5.6 - 900	4 - 750	3 - 380	4 - 730	
Min	11.2 - 560	6.4 - 320	4.2 - 210	8 - 400	6.2 - 310	8.4 - 420	11.2 - 560	8 - 400	6 - 300	8 - 400	
Max	11.2 - 1670	6.4 - 900	4.2 - 750	8 - 1500	6.2 - 850	8.4 - 1350	11.2 - 1850	8 - 1670	6 - 840	8 - 1500	

**> Notes**

- ◆ Multi Gas / Multi Range is optional on the **Select** series and must be requested at the point of ordering
- ◆ Extended rangeability for digital communication only; turndown 50:1 when using analog I/O options
- ◆ The selected orifice of the control valve may limit the rangeability
- ◆ Standard accuracy (based on actual calibration): ±(0,5% RD + 0,1% FS);  
ranges from 0-5 to 0-10 ml<sub>n</sub>/min: ±1% FS; ranges ≤ 0-5 ml<sub>n</sub>/min: ±2% FS
- ◆ Maximum range for gases not mentioned in this list; rule of thumb: nominal range for Air x Conversion Factor;  
e.g. F-111B - 1K0: maximum range for SF<sub>6</sub> = 1000 x 0.27 = 270 ml<sub>n</sub>/min
- ◆ Minimum range for gases not mentioned in this list; rule of thumb: minimum range for Air x Conversion Factor;  
e.g. F-111B - 1K0: minimum range for SF<sub>6</sub> = 400 x 0.27 = 108 ml<sub>n</sub>/min
- ◆ The Conversion Factors for these calculations can be extracted from Fluidat on the Net ([www.fluidat.com](http://www.fluidat.com)): Go to 'Flow calculations' and select "Gas Conversion factor". Select 'Fluid from' and make sure 'Fluid to' is Air. Select the applicable instrument model from the pulldown menu. Then press 'Calculate' and look up the conversion factor from the table.

New digital pc-board with optional add-on interface board to Profibus®, DeviceNet™, Modbus-RTU or FLOW-BUS featuring rotary switches for selecting the node address

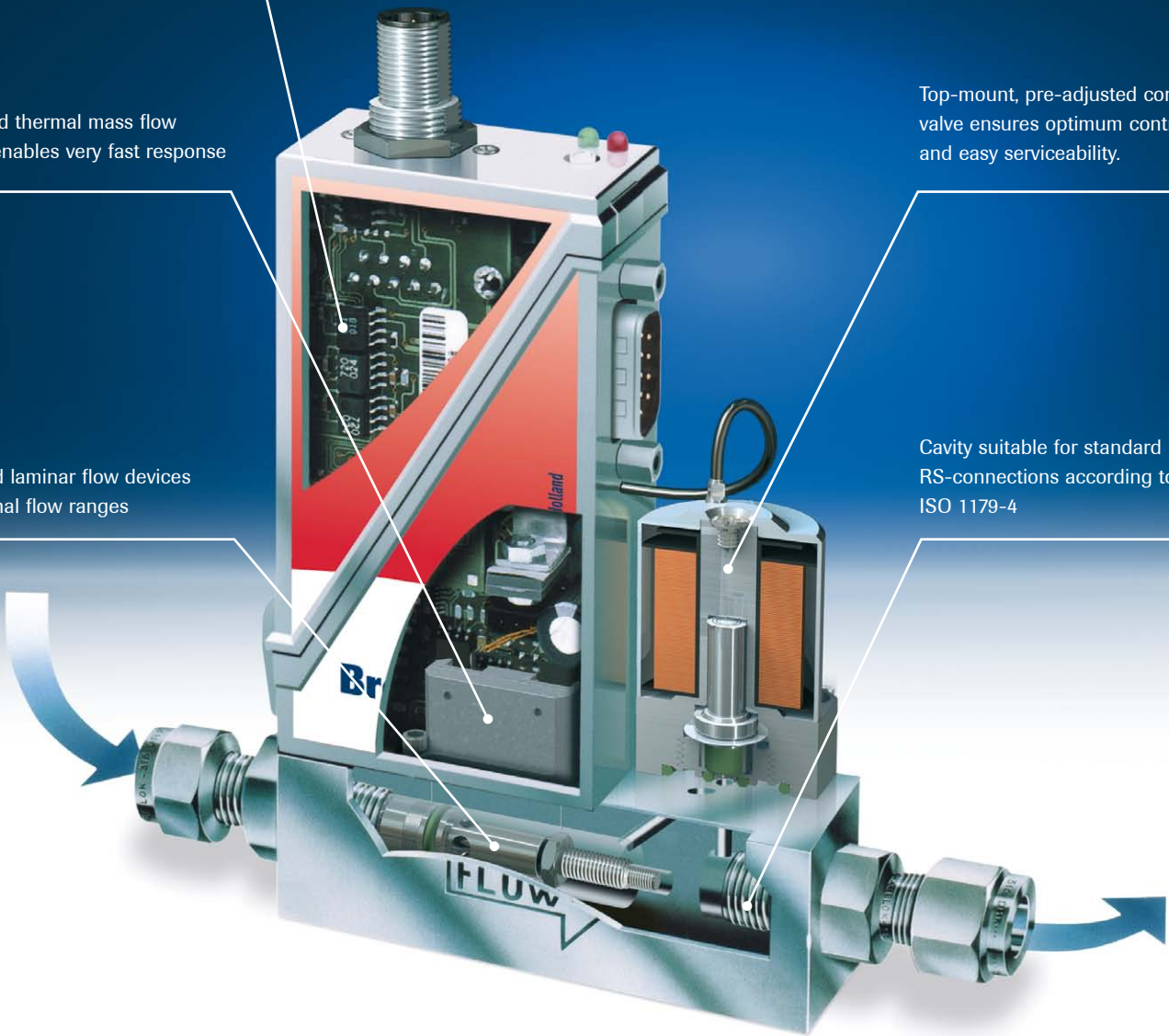
# The advanced technology of MASS-FLOW *Select*

Improved thermal mass flow sensor enables very fast response

Patented laminar flow devices in nominal flow ranges

Top-mount, pre-adjusted control valve ensures optimum control and easy serviceability.

Cavity suitable for standard RS-connections according to ISO 1179-4



**Bronkhorst®**  
HIGH-TECH

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