

METAL SEALED

Digital Mass Flow / Pressure Meters and Controllers

數位式質量與壓力量測 / 控制器

> 介紹

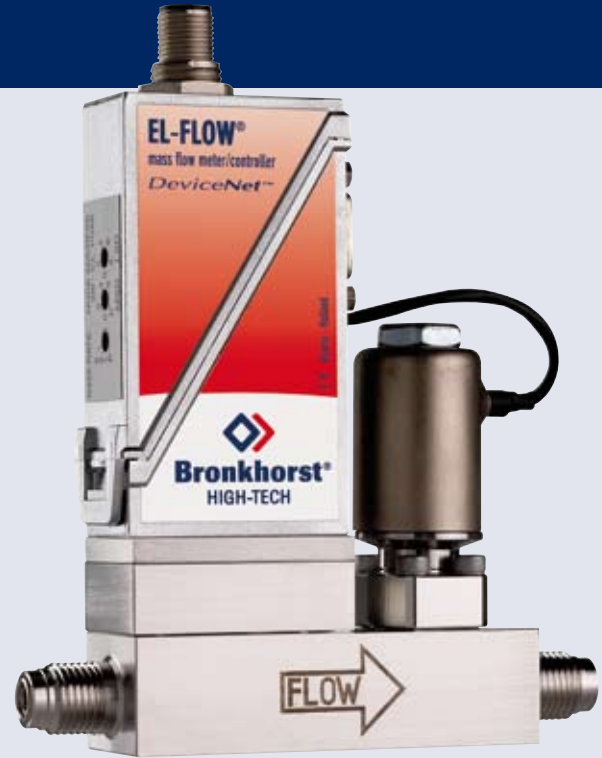
Bronkhorst High-Tech B.V. 公司，產品之熱質式流量計/控制器和電子壓力控制器為歐洲市場的領導者，在設計於製造精確和可靠的測量和控制設備，具有多年的經驗。Bronkhorst High-Tech B.V. 提供多樣式與種類儀器，許多創新性的解決方案，應用在許多不同的領域中。該儀器適用在各種樣式的客戶的規範與使用其中包括實驗室、工業環境、危險區域、半導體或分析儀等。

> 金屬密封接頭

自1989年以來Bronkhorst High-Tech製造金屬密封質量流量和壓力量測/控制器，尤其是為了滿足半導體市場，以及其他高純氣體應用程式的要求。該儀器具高表面品質，確保長期洩漏的金屬對金屬密封件與模組化結構。金屬密封質量流量計/控制器可以提供從0.1...5 sccm開始到0.6...100 slm 100 slm 的量流範圍(N₂)或更高的要求。金屬密封壓力量流/控制器可在從0.1...5 psi 到18...900 psi (a)或(g)。

> 數位化控制

如今的儀器都配備一個數位的電路板，提供高精度、優秀的溫度穩定性和快速回應(沉降時間t₉₈到500毫秒)。數位主要電路板包含所有所需的測量和控制的一般功能。最新的EL-FLOW[®]設計成功能多氣/多範圍的功能(OEM-)客戶提供最佳的靈活性和生產效率。為方便Bronkhorst客戶，提供免費和簡便易用的配置軟體工具。除了標準的RS232輸出，該儀器還提供類比的I/O。此外，可選一個擴充介面，如DeviceNet[™]，Profibus-DP[®]，Modbus-RTU或FLOW-BUS通訊協定。



> 一般特性

- ◆ 專利的金屬對金屬密封結構確保長期無洩漏接合(到大壓力)
- ◆ 快速的反應時間與優秀的可重複性
- ◆ 流量範圍從0.1...5 sccm到0.6...100 slm N₂eq(或更高要求)
- ◆ 多種氣體/多範圍功能
- ◆ 選項中針對低壓損或真空應用特殊用途
- ◆ 壓力範圍從0.1...5到18...900psi
- ◆ 選項中有金屬表面接合(c-seal / w-seal) 符合RoHS 須求

> 數位化特性

- ◆ 數位介面有RS232+DeviceNet[™]，Profibus-DP[®]，Modbus-RTU或FLOW-BUS slave;
- ◆ 具旋轉開關，設定節點位址和資料傳輸率
- ◆ 高精度，± 0.8% RD + ± 0.2 %FS
- ◆ 內儲存8組校準曲線
- ◆ 報警和計數器功能
- ◆ 單電源供電：+15 +24 Vdc

> 技術規範

MASS FLOW measurement / control system

Accuracy (incl. linearity)	: standard: $\pm 0.8\%$ Rd plus $\pm 0.2\%$ FS;
(based on actual calibration)	optional: $\pm 0.5\%$ Rd plus $\pm 0.1\%$ FS;
Turndown	: 1 : 50 (in digital mode up to 1 : 187.5)
Repeatability	: $< 0.2\%$ Rd
Settling time (controller)	: 1...2 seconds typical above 5% FS;
	option: down to 500 msec
Control stability	: $< \pm 0.1\%$ FS (typical for 1 slm N ₂)
Max. operating pressure	: 1500 psig
Temperature sensitivity	: zero: $< 0.05\%$ FS/°C;
	span: $< 0.05\%$ Rd/°C
Pressure sensitivity	: 0.1%/bar typical N ₂ , 0.01%/bar typical H ₂
Warm-up time	: 30 min. for optimum accuracy
	2 min for accuracy $\pm 2\%$ FS

PRESSURE measurement / control system

Accuracy (incl. linearity)	: $\pm 0.5\%$ of full scale (FS)
Pressure rangeability	: Measurement: 1 : 50 (2...100%)
	Control (with flow range 1 : 50)
	P-602CM 1 : 20, P-702CM 1 : 5
Repeatability	: $< 0.1\%$ FS
Response time sensor	: < 0.1 second
Control stability	: $< \pm 0.1\%$ FS (typical for 1 slm N ₂
	at specified process volume)
Temperature sensitivity	: 0.1% FS/°C

General performance

Operating temperature	: -10...+70°C
Leak integrity(outboard)	: $< 2 \times 10^{-11}$ Pa.m ³ /s He
Leak-by through closed valve	: $< 10^{-5}$ Pa.m ³ /s He
Attitude sensitivity	: may be mounted in any position



EL-PRESS model TA-702CM Metal Sealed
Pressure Controller with downport connections

Mechanical parts

Material (wetted parts)	: stainless steel 316L or comparable
Surface quality (wetted parts)	: Ra = 0,8 μ m typical
Process connections	: 1/4" face seal male or topmount (c-seal/w-seal)
Outer seals	: metal-to-metal (no rings)
Valve seat (controllers)	: Viton®; options: EPDM, FFKM (Kalrez)
Ingress protection (housing)	: IP40; optional IP65

Electrical properties

Power supply	: +15...24 Vdc
Power consumption	: meter: 70 mA;
	controller: max. 320 mA;
	add 50 mA for Profibus, if applicable
Analog output/command	: 0...5 (10) Vdc or 0 (4)...20 mA (sourcing output)
Digital communication	: standard: RS232
	options: Profibus-DP®, DeviceNet™,
	Modbus-RTU, FLOW-BUS
Electrical connection	
Analog/RS232	: 9-pin D-connector (male);
Profibus-DP®	: bus: 9-pin D-connector (female);
	power: 9-pin D-connector (male);
DeviceNet™	: 5-pin M12-connector (male);
Modbus-RTU/FLOW-BUS	: RJ45 modular jack

Notes:

- Mass flow units sccm and slm refer to 0°C (32°F) and 1013 mbar (14.7 psi)
- Technical specifications subject to change without notice.

> 型號與流量範圍

Mass Flow Meters (MFM); ranges based on N₂

Model	min. flow	max. flow
F-111CM / TA-111CM	0.1...5 sccm	0.6...100 slm

Mass Flow Controllers (MFC)

Model	min. flow	max. flow
F-201CM / TA-201CM ¹⁾	0.2...10 sccm	0.6...100 slm

Electronic Pressure Transducers (EPT)

Model	min. pressure	max. pressure
P-502CM / TA-502CM	0.1...5 psi ²⁾	18...900 psi ²⁾

Electronic Pressure Controllers (EPC)

Models	min. pressure	max. pressure
P-602CM / TA-602CM ¹⁾ (forward pressure control)	0.1...5 psi ²⁾	18...900 psi ²⁾
P-702CM / TA-702CM ¹⁾ (back pressure control)	0.1...5 psi ²⁾	18...900 psi ²⁾

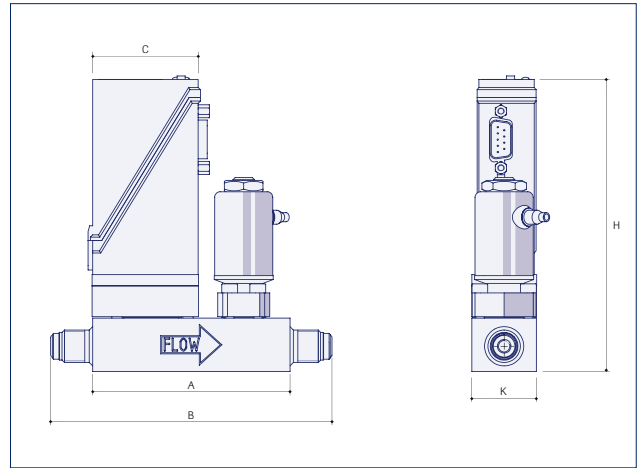
¹⁾ Kv-max = 6,6 x 10⁻²

²⁾ Absolute or relative (gauge)

> 實際應用

這兩種質量流量計/控制器和壓力量測/控制器可應用於眾多的製程，如在製造的氣體成分的化學氣相沉積及物理氣相沉積，光纖玻璃塗料，LED生產、真空技術和太陽能發電光電流)元素製造和也在半導體流程如離子注入，蝕刻過程和原子層沉積(醛固酮)中應用。具體過程氣體的化學特性，取決於設備製造商對潔所需淨度的級別，通常密封裝置偏好於使用金屬密封的方式。Bronkhorst有著多年的經驗，提供精確的和可靠的儀器，鑒於唯一的金屬對金屬密封件是為滿足苛刻的高純度的應用程式須求，並具有良好的重接功能。

> 尺寸與重量



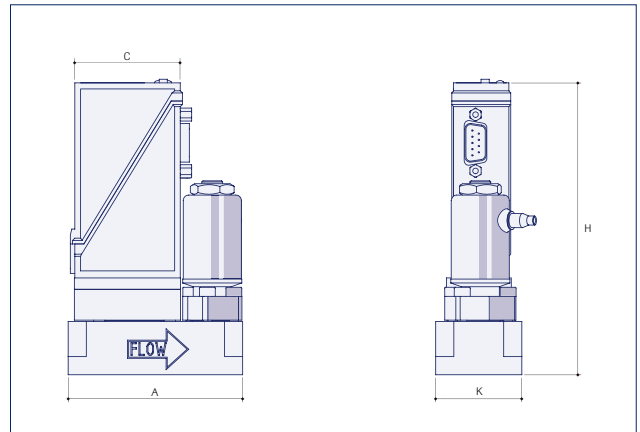
Mass Flow and Pressure Meters / Controllers – 1/4" VCR

Model	A	B	C	H	K	Weight (kg)
F-111CM MFM	87	124	47	129	29	0,6
P-502CM EPT	87	124	47	129	29	0,6
F-201CM MFC	87	124	47	129	29	0,7
P-602CM EPC	87	124	47	129	29	0,7
P-702CM EPC	87	124	47	129	29	0,7

Dimensions in mm.



EL-FLOW® model F-111CM
Metal Sealed Mass Flow Meter



Mass Flow and Pressure Meters / Controllers – Downport

Model	A	C	H	K	Weight (kg)
TA-111CM MFM	77	47	129	38	0,6
TA-502CM EPT	77	47	129	38	0,6
TA-201CM MFC	77	47	129	38	0,7
TA-602CM EPC	77	47	129	38	0,7
TA-702CM EPC	77	47	129	38	0,7

Dimensions in mm.

> 壓力量測/控制器型號

PRESSURE Meters/Controllers

AA-NNNAA - NNNA - A A A - NN - A

Base model	
P-502CM	Pressure Meter - 1/4" VCR
TA-502CM	Pressure Meter - downport
P-602CM	Forward Pressure Controller - 1/4" VCR
TA-602CM	Forward Pressure Controller - downport
P-702CM	Back Pressure Controller - 1/4" VCR
TA-702CM	Back Pressure Controller - downport

Sensor code	
Factory selected	

Communication (I/O)	
A	RS232 + analog (n/c control)
B	RS232 + analog (n/o control)
D	RS232 + DeviceNet™ (n/c control)
E	RS232 + DeviceNet™ (n/o control)
M	RS232 + Modbus-RTU (n/c control)
N	RS232 + Modbus-RTU (n/o control)
P	RS232 + Profibus-DP® (n/c control)
Q	RS232 + Profibus-DP® (n/o control)
R	RS232 + FLOW-BUS (n/c control)
S	RS232 + FLOW-BUS (n/o control)

Analog output	
A	0...5 Vdc
B	0...10 Vdc
F	0...20 mA sourcing
G	4...20 mA sourcing

Supply voltage	
B	+24 Vdc (DeviceNet™)
D	+15...24 Vdc (analog, FLOW-BUS, Profibus, Modbus)

Connections (in/out)	
88	1/4" Face Seal male
DD	Downport

Valve seals	
V	Viton (factory standard)
E	EPDM
K	Kalrez (FFKM)



> 質量流量量測/控制器型號

MASS FLOW Meters/Controllers

AA-NNNAA - NNNA - A A A - NN - A

Base model	
F-111CM	Mass Flow Meter - 1/4" VCR
TA-111CM	Mass Flow Meter - downport
F-201CM	Mass Flow Controller - 1/4" VCR
TA-201CM	Mass Flow Controller - downport

Sensor code	
Factory selected	

Communication (I/O)	
A	RS232 + analog (n/c control)
B	RS232 + analog (n/o control)
D	RS232 + DeviceNet™ (n/c control)
E	RS232 + DeviceNet™ (n/o control)
M	RS232 + Modbus-RTU (n/c control)
N	RS232 + Modbus-RTU (n/o control)
P	RS232 + Profibus-DP® (n/c control)
Q	RS232 + Profibus-DP® (n/o control)
R	RS232 + FLOW-BUS (n/c control)
S	RS232 + FLOW-BUS (n/o control)

Analog output	
A	0...5 Vdc
B	0...10 Vdc
F	0...20 mA sourcing
G	4...20 mA sourcing

Supply voltage	
B	+24 Vdc (DeviceNet™)
D	+15...24 Vdc (analog, FLOW-BUS, Profibus, Modbus)

Connections (in/out)	
88	1/4" Face Seal male
DD	Downport

Valve seals	
V	Viton (factory standard)
E	EPDM
K	Kalrez (FFKM)



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