브이시스

VSYS

# VFx3000A SERIES

## MASS FLOW CONTROLLER / METER


2017. 1

Ver 1.0

# WARRANTY

(주)브이시스에서 생산하는 Mass Flow Controller / Meter의
보증수리기간은 구매 후부터 1년이다. 단, 사용자의 부주의로나 과실로 인한
고장일 경우 보증수리기간에 관계없이 유상 수리를 원칙으로 한다.

사용자는 제품의 하자나 동작상의 이상을 발견시
임의로 제품을 분해 할 수 없으며, 임의로 제품을 분해 할 경우
보증수리기간에 관계없이 수리가 거절 될 수 있으므로 반드시
당사에 연락 하여 적절한 조취를 받도록 해야 한다.

제품에 대한 최신 정보 및 자료들은 당사의 웹페이지를 통해 제공 받을 수 있다.

*본 매뉴얼의 보다 나은 개선을 위해 사용자에게 통지 없이 변경 및 수정 될 수 있다.

# 1. Introduction / General Information

## Description

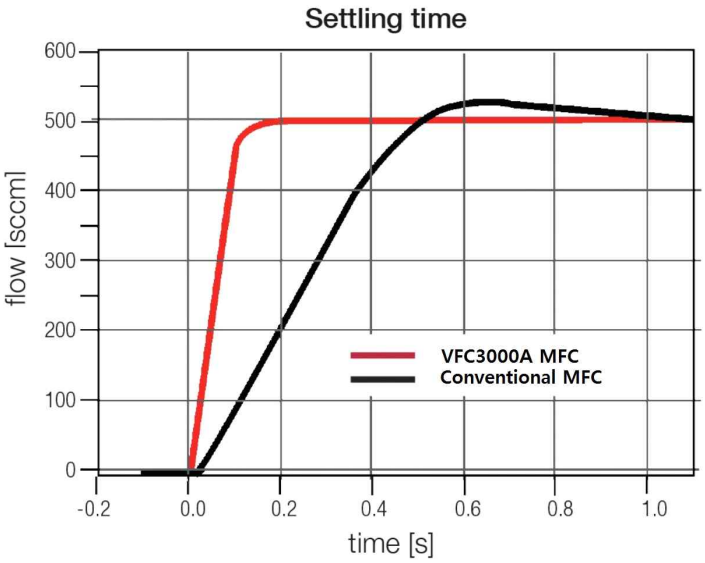
VFC3000A 시리즈의 MASS FLOW CONTROLLER 및 METER (MFC 및 MFM) 는 아날로그 타입의 모델로서 0 ~ 5V 의 입출력 신호를 이용하여 Gas 의 유량을 일정하고 정확하게 흐르게 하는 장치이며 일반적으로 SCCM 혹은 SLM 단위를 많이 사용한다. (Standard Cubic Centimeter per Minutes 혹은 Standard Liter per Minute)

VFC3000A 시리즈의 MFC / MFM 는 MEMS 기술을 사용한 제품으로 전통적 방식의 MFC 보다 정확도와 응답성에 있어서 월등히 빠른 응답성과 정확성 그리고 재현성을 갖으며 입력단의 압력 변화에 큰 영향을 받지 않는 특성을 가지고 있다.

VFC3000A 시리즈는 헬륨, 수소, 산소, 질소, 아르곤, 에어, 이산화탄소 등과 같은 불황성 가스에 적용 할 수 있으며 부식 및 독가스에는 사용 할 수 없으며, 현재 적용 가능한 유량은 최대 15,000 SCCM(질소기준) 이다.

VFC3000A 시리즈 MFC 및 MFM 은 자사가 생산하는 RA312, VC412, UC216, RF100과 같은 컨트롤러를 이용하여 보다 쉽게 사용 할 수 있으며 I/O 커넥션은 9PIN DSUB MALE TYPE 이며 FITTING은 1/4 swagelok 또는 1/4 VCR MALE을 선택 할 수 있고 VITON SEAL이 기본으로 사용된다.

## Key fuatures



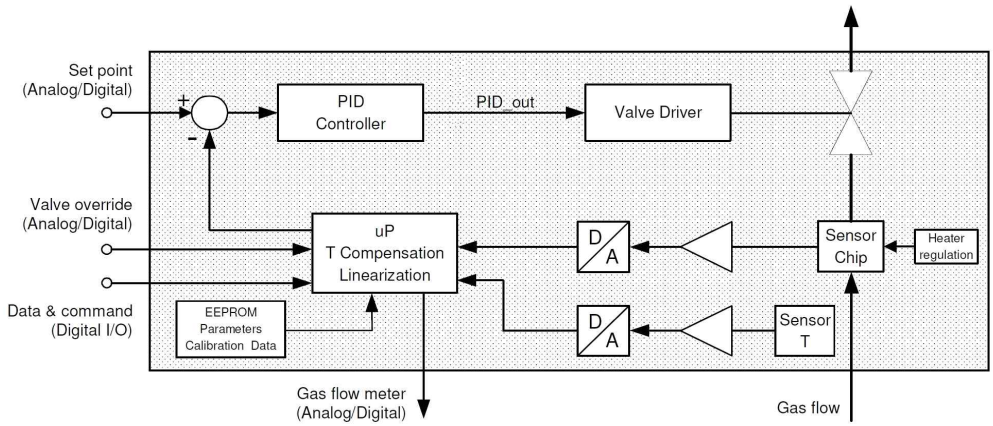

- MEMS based technology
- High accuracy and stability
- Ultra fast response time
- Fast acting solenoid valve
- Digitally calibrated
- Temperature compensated
- Exceptional long term behavior
- 24V single supply (15VDC ~ 28VDC)
- RoHS compliant

**<Figure 1> Ultra Fast Settling Time**

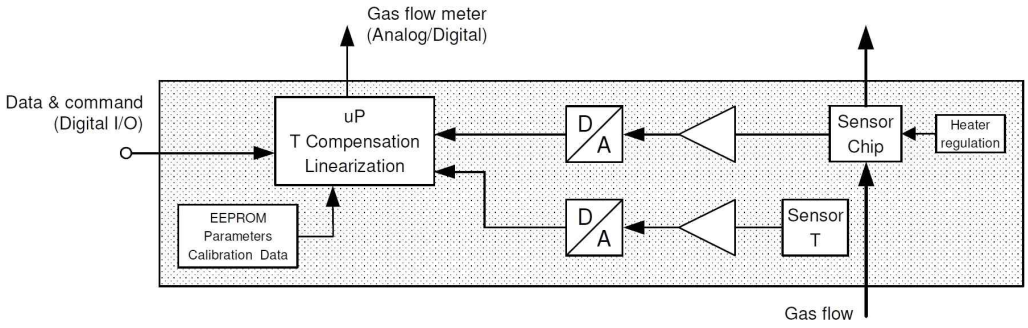
## Main applications

- Single and multiple gas metering/control
- Analytical instruments
- Gas chromatography
- Thin-film process control
- Bioreactor controls
- Gas generators
- Thermal analysis
- Leak testing
- Gas mixing
- Calibration equipment
- Medical equipment
- Fuel cell

## MFC & MFM Block Diagram




**<Figure 2> MFC Block Diagram**




**<Figure 3> MFM Block Diagram**

# 2. Specifications

## Hardware specifications

**Important:** The specification applies for the VFC3000A Series MFC/MFM calibrated in vertical position with Nitrogen N2 to the following conditions: 25°C, 3 barg (inlet: 4 bar absolute, outlet: atmospheric pressure). If not specified, figures apply to both MFM / MFC.

## Gas flow

| **Parameter** | **Unit** | **Value / Range** |
|---|---|---|
| Flow range | sccm* | 0 –- 50 / 0 –- 250 / 0 –- 3000 |
| Gases | - | N2, Air, O2, CO2, Ar, He, CO, CH4, C2H2, C2H4, C2H6, C4H10 ... Clean, dry, non-corrosive gases, other gases upon request |
| Flow accuracy | | |
| 50 ~ 3000 sccm F.S. | % F.S.** | ± 0.2 for range 0 - 10% F.S. |
| | % O.R. | ± 1.0 for range 10 - 100% F.S. |
| Other temperature % F.S. | | ± 0.5 for range 0 - 10% F.S. |
| 0……50 °C, 1 bar | % O.R. | ± 2.0 for range 10 - 100% F.S. |
| Other range | | |
| Temperature coefficient | - | Temperature effects included in the accuracy spec. |
| Resolution | % F.S. | 0.01 |
| Settling time*** | ms | < 150 |
| Repeatability | % F.S | ± 0.15 |
| Turn down ratio | | > 1000 |
| Long term stability | %F.S./year | < ± 0.25 |
| Pressure operating range | barg | 0…9 (actual value depends on valve size) |
| Pressure coefficient | % O.R. / bar | ± 0.2 |
| Maximum allowed flow | | |
| up to 50 sccm F.S sccm | | 1000 |
| 250 sccm F.S. | sccm | 2000 |
| 3000 sccm F.S. | sccm | 10000 |
| Leak tightness external | mbar l/s | < 1x10-9 He |
| External offset zeroing**** | % | < ± 2 of the F.S. value |
| Position sensitivity - | | Standard calibration position is vertical. Other position can generate offset, see installation instructions |

* sccm: standard cubic centimeter per minute (0 °C and 1013 mbar absolute)

** % F.S.: Percent Full Scale, % O.R.: Percent Of Rate.

*** The time to reach ±2% of the set point within the range 10-100% F.S.

**** Due to the extreme sensitivity of the device, be sure no flow occurs when zeroing. External zeroing is characterized for N2 and Air, 25°C, 4 bara inlet pressure. For other gases and conditions contact us.

## Environmental conditions

| Parameter | Unit | Value / Range |
|---|---|---|
| Operating temperature | °C | 0……50 |
| Operating ext. humidity | RH% | 0…95, non-condensing conditions |
| Storage temperature | °C | -20……80 |

## Electrical characteristics

| Parameter | Unit | Value / Range |
|---|---|---|
| Voltage supply DC | | |
| Nominal | V | 15 ~ 28 ±10% (24VDC recommend) |
| Ripple | mV | < 50 |
| Current supply DC, typical | mA | < 150 |
| Max. current supply DC | mA | < 200 |
| Start-up time | s | 3 |
| Warm-up time | | |
| Deviation < ±0.1% F.S. | s | 15 |
| For optimum accuracy | min | 15 |
| Analog output | | |
| Resistive loads | kΩ | > 2 |
| Capacitive loads | pF | < 200 |
| Overload protection | | |
| Set point input | - | DC protected up to supply voltage, ESD protected |
| gas flow output | - | ESD protected |

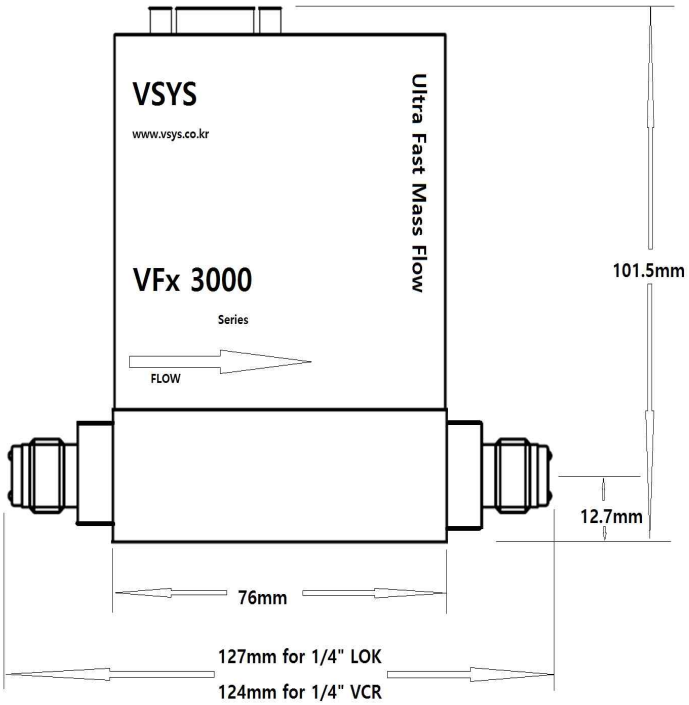
## Communication Interface

| Parameter | Unit | Value / Range |
|---|---|---|
| Analog Input5 | | |
| Set point | V | 0 ~ 5 |
| Valve override* | V | 0 / 5 (close / fully open in purge mode) |
| Cut off limit | V | 1% F.S. (active on request at factory level) |
| Analog Output | | |
| Gas flow | V | 0 ~ 5 |

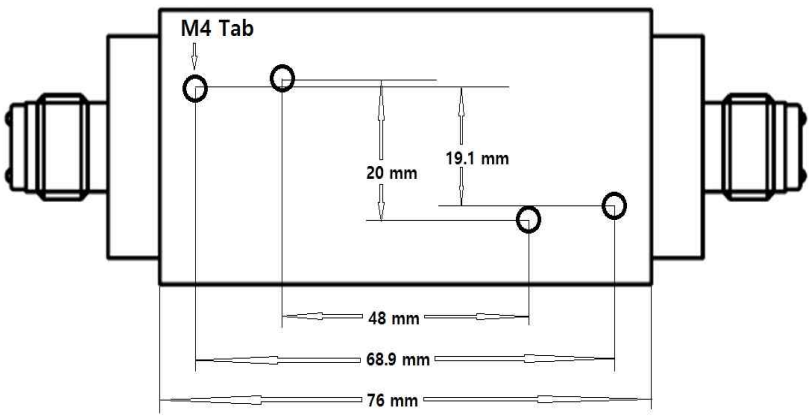
*Valve override analog input when forced to 0V (close) or 5V (purge mode) overrides the set point (analog / digital).

# 3. Mechanical Characteristics

**Dimensions and Drawing**




**<Figure 4> MFC Front**




**<Figure 5> MFC Bottom**

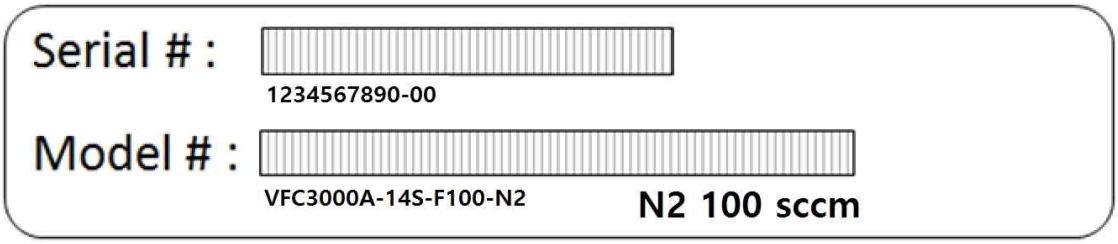
## User interface pin assignment

| Pin No | I/O Type | Description |
|---|---|---|
| 1 | Analog In | Valve Override |
| 2 | Analog Out | Flow Signal Value |
| 3 | Power | +24 VDC Supply |
| 4 | Power | Power Ground |
| 5 | Not Use | No Connection |
| 6 | Analog In | Flow Set-point |
| 7 | Analog | Signal Ground |
| 8 | Analog | Signal Ground |
| 9 | Not Use | No Connection |
| **9PIN DSUB MALE CONNECTOR** | | |

**<Table 1> DSUB 9P Pinmap**

# 4. Label & Ordering Code

## Model & Serial Number




**<Figure 6> Label**

라벨은 제품의 앞면에 부착되어 있으며, Model Number, Serial Number 등이 기록되어 있습니다.
*라벨의 표기는 사양에 따라 다를 수 있습니다..

**※당사에 문의할 때 제품의 Model & Serial Number가 반드시 필요합니다.**

## VFC3000A-14S-F100-N2

VFC - Nomally Closed MFC
VFM - No Valve MFM
3000A- MAX 3000 sccm Analog Type
3000D2- MAX 3000 sccm Digital Type RS232
3000D4- MAX 3000 sccm Digital Type RS485
14S - 1/4" Swagelok tube
83S - 3/8: Swagelok tube
14V - 1/4" VCR MALE
12V - 1/2" VCR MALE
F100 - 100 sccm Fullscale Range
F3.0L - 3000 sccm Fullscale Range
N2 - Calibrated gas

# 5. Safety, Materials, Notice, Certifications

## Product damage

- Read all instructions carefully before using the device.
- The MFM anemometric mass flow sensors are not designed to sense liquid flow and damage will result if liquid is passed through the sensor.
- The sensor is not suited for measuring aggressive or corrosive gases. Use only non-corrosive, dry, clean gases. Gas loaded with particles can eventually clog the sensor.
- The appliance must not be used in damp or wet surroundings.
- Use only accessories that are indicated in the instructions for use or are recommended by the manufacturer.
- Failure to comply with these instructions could result in product damage.

## Danger of life

- These sensors employ a heated element.
- The heated element is above the ambient temperature. The sensor must not be used with flammable or explosive gases or mixtures.
- Unprofessional gas handling can cause injury or death. The use of mass flow meters should only be performed by qualified personnel.
- Do not use this product as safety or emergency stop device or in any other application where failure of the product could result in personal injury or death.

## Flow channel and wetted materials

| **Parameter** | **Unit** | **Value / Range** |
|---|---|---|
| Flow channel | - | Aluminum channel |
| Wetted materials | - | Aluminum, Silicon, Silicon nitride, Gold, Silicon dieattach, Epoxy, Stainless steel, Brass, VitonTM |
| Inlet filter | - | None, an external inlet filter (5-200 µm) is recommended |
| Fluidic connections | - | See mechanical interface |

## Important notice / Disclaimer

The information furnished by VSYS is believed to be correct and accurate. However, VSYS shall not be held liable to recipient or any third party of any damages, including but not limited to personal injury, property damage, loss of profits, loss of use, interrupt of business or indirect, special incidental or consequential damages, of any kind, in connection with or arising out of the furnishing, performance or use of technical data herein. No obligation or liability to recipient or any third party shall arise or flow out of VSYS rendering of technical or other services.

## Certifications

VSYS Process Technologies is an ISO 9001:2008 certified company.

## Customer Support

제품의 유지보수나 수리는 ㈜브이시스 에서만 가능합니다.
사용 중에 문제가 발생시 ㈜브이시스에 연락하시면 적절한 조치를 받으실 수 있습니다.

## 7. Conversion Factors for Common Gases

| | | | |
|---|---|---|---|
| Nitrogen | He | He | 8.319 |
| Nitrogen | Hydrogen | H2 | 7.18 |
| Nitrogen | Air | Air | 1.001 |
| Nitrogen | Argon | Ar | 0.962 |
| Nitrogen | Carbon dioxide | CO2 | 0.511 |
| Nitrogen | Oxygen | O2 | 1.01 |
| Nitrogen | Carbon monoxide | CO | 1.02 |
| Nitrogen | Methane | CH4 | 1.07 |
| Nitrogen | Acetylene | C2H2 | 0.8 |
| Nitrogen | Ethylene | C2H4 | 1.11 |
| Nitrogen | Ethane | C2H6 | 0.44 |
| Nitrogen | Butane | C4H10 | 0.387 |

*Other Gases contact us

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