

Instruction Manual

Digital Mass Flow Controller

MD500 Series (Digital)



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Instruction

The MD-SERIES of Line Tech Mass Flow Controller (MFC) is a device designed for accurately measuring and controlling flow rates of gases. This manual is intended to provide the user with all the information to install successfully.

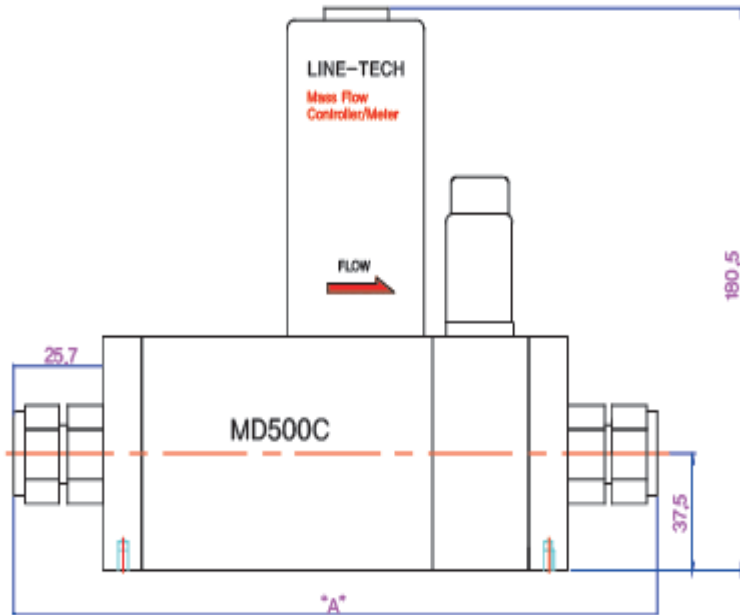
Description

The Line Tech of Mass Flow Controller is used widely in the Semiconductor industry as well as many other gas control system.

Mass Flow Controller is classified into three parts. (Body, P.C.B, Control valve)

This harmony produces stable gas flow of rate as well readjusting gas pressure continuously.

Dimension & Specification (MD500 Series)



Connection	"A" Dimension(mm)
1/2" SW	246.1
3/4" SW	246.2
1" SW	254.6

► Standard Ranges

300 ~ 1000 slpm (N2 Base)

► Repeatability

±0.25%

► Supply Power

+15Vdc or +24Vdc , 350 mA

► Max Operating Temperature

0 ~ 50°C

► Control Range

3 ~ 100%

► Communication

RS-485

► Response Time

Less than 3 seconds response to within 3% of Full Scale

► Accuracy

±0.25% of F.S

► In/Out Signal

0 ~ 5Vdc or 4 ~ 20 mA

► Max Operating Pressure

< 15 barG

► Leak Rate

1×10^{-9} atm.cc/sec

► Electrical Connection

15 Pin D-Connector

Features

- ▶ Accurate at Low Flow
- ▶ Compact Connection
- ▶ High Corrosion Resistance
- ▶ Excellent Long-Term Stability
- ▶ Wide Pressure Range Available
- ▶ Fast response
- ▶ Removable Highly Stable Sensor
- ▶ Excellent Linearity
- ▶ Modular Design

Installation

The M-Series of Line Tech inlet and outlet connection standard is V.C.R and S.W.G type.

Install the equipment with consideration to the given structure and strength condition.

Be sure to clean the inside of pipe line by blowing high-pressured gas before connecting to MFC.

※ Cautions When Installing ※

- ▶ Check gas flow direction.
- ▶ When using corrosive or inflammable gas, completely rid the system of moisture or leakage with N₂ gas before the usage.
- ▶ Do not install the equipment in the presence of possible mechanical damage or vibration.

Electric Connection - Voltage

PIN NO	Function	Color	PIN CONNECTION	
			MFC	MFM
1	Command Ground	Green	⊙	⊙
2	0~5Vdc Flow Signal Output	Brown	●	●
3	Not Used	×		
4	4~20mA Flow Signal Output	Black		
5	+15 or +24Vdc Power Supply	Red	●	●
6	Not Used	×		
7	4~20mA Flow Command Input	Gray		
8	0~5Vdc Flow Command Input	Yellow	●	
9	Power Ground	White	⊙	⊙
10	Signal Output Ground	Blue	⊙	⊙
11	+5Vdc Reference Output	×		
12	Valve Override	×		
13	Not Used			
14	RS 485 -		★	★
15	RS 485 +		★	★

- Digital Communication : [PIN14,15]

RS-485 Communication

Baud rate : 38400bps

Date : 8Bit

Stop Bite : 1Bit

Parity : None

Electric Connection - Current

PIN NO	Function	Color	PIN CONNECTION	
			MFC	MFM
1	Command Ground	Green	⊙	⊙
2	0~5Vdc Flow Signal Output	Brown	●	●
3	Not Used	×		
4	4~20mA Flow Signal Output	Black		
5	+15 or +24Vdc Power Supply	Red	●	●
6	Not Used	×		
7	4~20mA Flow Command Input	Gray		
8	0~5Vdc Flow Command Input	Yellow	●	
9	Power Ground	White	⊙	⊙
10	Signal Output Ground	Blue	⊙	⊙
11	+5Vdc Reference Output	×		
12	Valve Override	×		
13	Not Used			
14	RS 485 -		★	★
15	RS 485 +		★	★

- Digital Communication : [PIN14,15]

RS-485 Communication

Baud rate : 38400bps

Data : 8Bit

Stop Bite : 1Bit

Parity : None

Operation

◉ Warm up time ◉

- 1) After installing, warm up equipment for 30 minutes to stabilize the temperature of the sensor.
- 2) Before supplying gas, adjust the zero point to less than 0.2%
- 3) Supply gas.
- 4) Check for any leakage.
- 5) Operate.

◉ Setting up the Zero Point ◉

- ▶ The Zero Point may change depending on the surrounding's temperature installation structure.
- ▶ Approximately 30 minutes after supplying power, when installed according to the correct environment and application conditions, set up the final Zero Point.

Use of the Conversion Tables

If a mass flow controller is operated on a gas other than the gas it was calibrated with, a scale shift will occur in the relationship between the output signal and the mass flow rate. This is due to the difference in heat capacities between the two gases. This scale shift can be approximated by using the ratio of the molar specific heat of the two gases or sensor conversion factors.

$$\text{Actual gas flow rate} = \text{Output reading} \times \frac{\text{factor of the new gas}}{\text{factor of the calibrated gas}}$$

ex) The controller is calibrated for nitrogen

The desired gas is Carbon dioxide

The Output reading is 75 sccm when carbon dioxide is flowing

Then $75 \times 0.74 = 55.50$ sccm

In order to calculate the conversion factor for a gas mixture, the following formula should be used.

$$\begin{array}{l} \text{Sensor} \\ \text{Conversion Factor} \\ \text{for Mixture} \end{array} = \frac{100}{\frac{P1}{\text{sensor conversion factor 1}} + \frac{P2}{\text{sensor conversion factor 2}} + \dots + \frac{Pn}{\text{sensor conversion factor n}}}$$

P1 = percentage (%) of gas 1 (by volume)

P2 = percentage (%) of gas 2 (by volume)

Pn = percentage (%) of gas n (by volume)

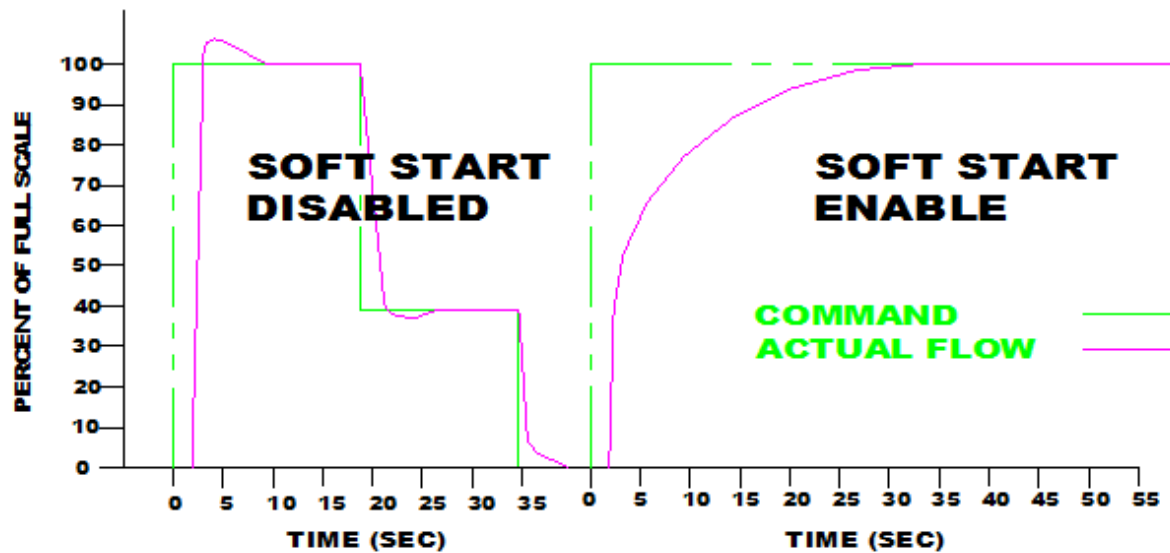
ex) The desired gas is 20% helium(He) and 80% Chlorine(Cl₂) by volume.

The desired full scale flow rate of mixture is 20 slpm.

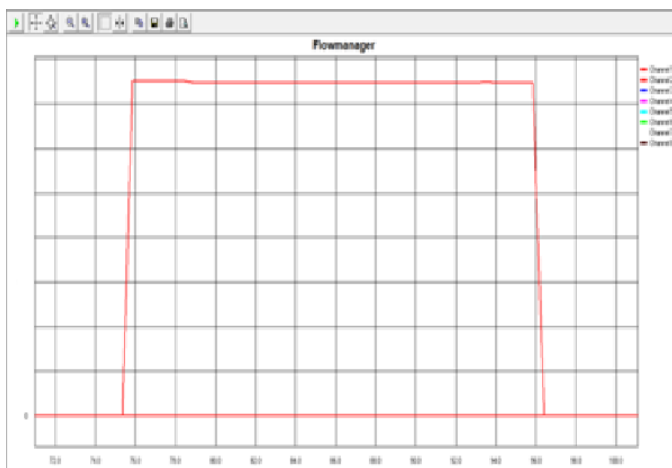
$$\begin{array}{l} \text{Sensor} \\ \text{Conversion Factor} \\ \text{for Mixture} \end{array} = \frac{100}{\frac{20}{1.39} + \frac{80}{0.88}} = 0.950$$

Then, air equivalent flow = $20/0.903=22.15$ slpm Air

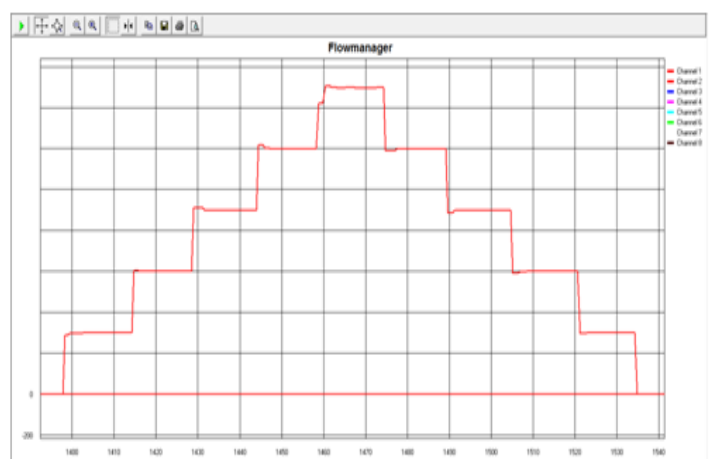
Set point step and soft start



Response Time



<Low to Max to Low>



<Step up & down>