LINTEC

Mass Flow Controller for DeviceNet™ Instruction Manual

MC-5000L Series

Safety Precautions

⚠ **WARNING** **Incorrect handling may cause death or injury**

(1) Before connecting the fittings, check that no damage or defects are found on the fittings. Make connections properly and make sure that a leak test is conducted before actual operation to prevent fluid from leaking into the atmosphere (Hereinafter, the fluid used is referred as "gas" or "fluid").
(2) **DO NOT** apply any corrosive fluid to materials exposed to gas. Corrosion may cause gas to leak into the atmosphere.
(3) This device is not designed as an explosion proof structure. **DO NOT** use this device in a place where explosion-proof structures are required. Doing so may cause fire or explosion.

⚠ **CAUTION** **Incorrect handling may lead to medium or slight injury or may cause damage to, or loss of, facilities or equipment**

(1) Observe the precautions listed in the WARNING (above).
(2) Strictly observe the electrical specifications. Not doing so may cause fire, damage to sensors or malfunction.
(3) This device is not designed to be waterproof. **DO NOT** locate this device outdoors or in a place where it may be splashed with water. Doing so may cause fire, trouble, or malfunction of the device.
(4) **DO NOT** modify this device. It may cause fire or other problems.
(5) This device is not designed to handle hot swap. Please avoid attaching and removing the power supply connector and interface connector with the power switched on. Attachment and/or removal with the power on may result in failure of the device.
(6) This device is a precious device, please handle it carefully. Dropping down or handling it carelessly will cause damage. Please use assist instrument while moving or setting the device.
(7) Regular maintenance is recommended for steady use of this device (Recommended proofreading frequency is once a year).

1. Introduction

This manual explains basic operation of the MC-5000L series (Hereinafter referred as "MFC"). MFC is equipped with a network interface, and can be operated by connecting to a network environment of DeviceNet ™.
Since MFC is a slave device, please prepare a master device of DeviceNet ™ network interface.
The device profile follows the MFC profile in ODVA specification.
Please go through the ODVA specification and device profile manual of MC-5000L for proper use.

2. Summary

The MFC is high performance mass flow controller for gas using thermal flow sensor and high response piezoelectric valve. In the MFC model, MO type and MC type are available depending on the kind of valve operation mode. Also, MFC interface employs Device Net™ network, so MFC is compatible with other makers.
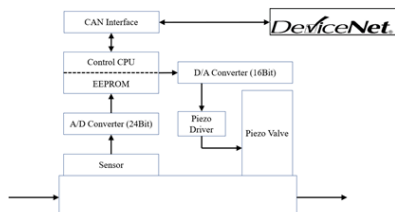
3. Features

The MFC is the following features.
(1) LINTEC's proprietary ambient temperature compensation type flow sensor is carried.
· Low sensor temperature, long-time steady monitor, and few problems such as degradation of gas to be monitored.
· The effect of ambient temperature is less because the sensor temperature is kept at the ambient temperature.
· Steady temperature distribution of sensor and high-speed response.
(2) Digital computing system with microprocessor and high-resolution A/D, D/A converter is carried.
· High functionality.
· By setting of device number (address), multiple devices can be controlled through a single interface.
· Many additional are provided as standard, e.g., totalizer function, zero adjust, ramping function.
(3) MFC employs DeviceNet™ network protocol.
(4) Small dead space structure using a diaphragm valve.
(5) Single power supply 11 to 25VDC.
(6) Superior corrosion resistant sealing materials make maintenance easy. Metal seals (Au).
(7) Particle-free structure.
(8) By using a metal case and various types of filters, steady operation can achieve even in an environment of high-frequency noise and stationary magnetic field.
(9) Based on RoHS.

4. Structure

The MFC consists of sensors, bypass, valves, and a microcomputer for signal processing. A digital PID feedback control system controls the valve action so that flow rate output from the sensor agrees with flow rate setting value.

5. Specification / Dimensions

(1) Specification

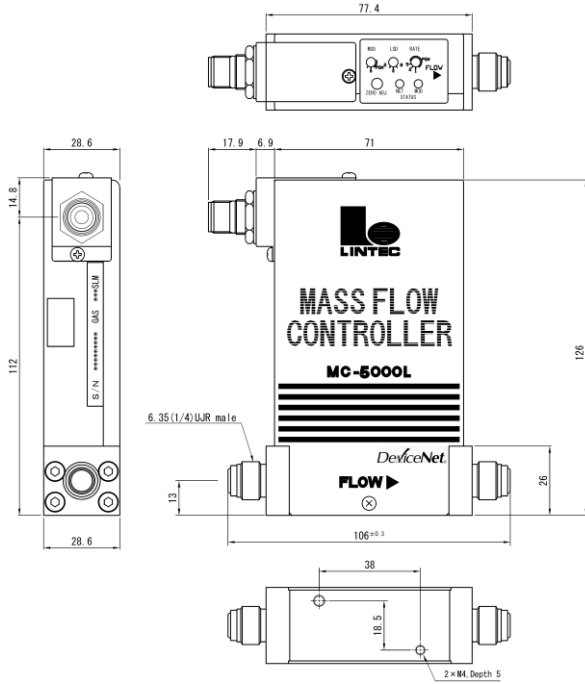| Name	Mass Flow Controller		
Model	MC-5100L	MC-5200L	MC-5250L
Flow rate range (N2 conversion)	10SCCM to 5 SLM	~20SLM	~50SLM
Valve operation mode	Normally open / Normally closed		
Surface treatment	Precision polishing		
Minimum controllable flow rate	2%F.S.		
Accuracy	100%F.S. to 10%F.S.　±1.0%S.P. 10%F.S. to 2%F.S.　±0.1%F.S.		
Repeatability	±0.2%F.S.		
Response time	1 second (Typical)		
Operating differential pressure	50 to 300kPa	Normally open 50 to 300kPa (~10SLM) 100 to 300kPa (10 to 20SLM) Normally closed 100 to 300kPa (~10SLM) 200 to 300kPa (10 to 20SLM)	100 to 300kPa (~30SLM) 150 to 300kPa (~50SLM)
Maximum operating pressure (Note1)	300kPa(G)		
Withstanding pressure	1MPa(G)		
Operating temperature & Humidity	5 to 50℃·0 to 80%RH (Condensation should be avoided)		
Storage temperature & Humidity	0 to 60℃·0 to 80%RH (Condensation should be avoided)		
Leak integrity	Less than 1×10^{-11} Pa · m³/sec (He)		
Mounting direction	Free		
Wetted materials	Stainless steel 316L, PCTFE, PTFE, Au		
Seal Materials	Au		
Actuator	Piezoelectric actuator		
Fittings	6.35VCR (106mm, 124mm) 1.125 W-Seal 79.8mm, 1.125 W-Seal 92mm		
Power supply	11 to 25VDC (5VA max.)		
Digital interface	DeviceNet™		
Optional	B: Liquefied gas, G: Minimum control flow rate 0.5%F.S. E: Small Range Control 1 to 10SCCM in nitrogen J: Valve is closed at below 2% setting, M: Applied to ClF3		
Weight	Approx. 1kg		

Name	Mass Flow Controller	
Model	MC-5460L	MC-5470L
Flow rate range (N2 conversion)	~150 SLM	~200SLM
Valve operation mode	Normally closed	
Surface treatment	Precision polishing	
Minimum controllable flow rate	2%F.S.	
Accuracy	100%F.S. to 35%F.S. ±1.0%S.P. 35%F.S. to 2%F.S. ±0.35%F.S.	1.0%F.S.
Repeatability	±0.5%F.S.	
Response time	1 second (Typical)	
Operating differential pressure	250 to 500kPa	350 to 500kPa
Maximum operating pressure (Note1)	500kPa(G)	
Withstanding pressure	1MPa(G)	
Operating temperature & Humidity	5 to 50℃·0 to 80%RH (Condensation should be avoided)	
Storage temperature & Humidity	0 to 60℃·0 to 80%RH (Condensation should be avoided)	
Leak integrity	Less than 1×10^{-11} Pa · m³/sec (He)	
Mounting direction	Free	
Wetted materials	Stainless steel 304, Stainless steel 316L, Teflon, Viton, Au	
Seal Materials	Au	
Actuator	Piezoelectric actuator	
Fittings	6.35UJR156mm, 9.52UJR163.4mm	
Power supply	11 to 25VDC (5VA max.)	
Digital interface	DeviceNet™	
Optional	J: Valve is closed at below 2% setting	
Weight	Approx. 1.4kg	

Note1)There is a possibility that the gas does not flow in case of the gas pressure of more than 490kPa was used on the MC-5250L- MO /NO.
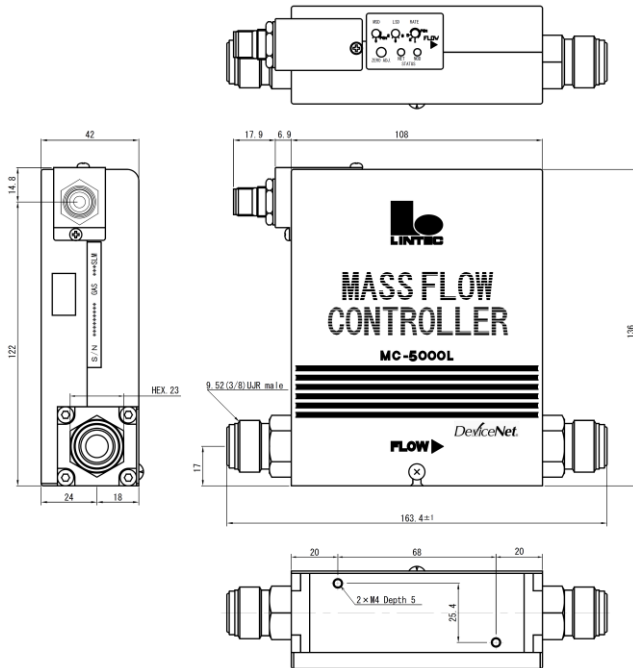· Connect the MFC to the frame ground.

(2) Dimensions
MC-5100L, MC-5200L, MC-5250L

MC-5460L, MC-5470L

6. Ordering information

$$\underline{\text{MC-510*L}} - \underline{\text{MO}} - \underline{\text{4JR1}} \; \underline{\text{AA0A0}} - \underline{\text{dd}} - \underline{\text{ee}} - \underline{\text{ff}}$$
$$\quad\;[1]\qquad\quad [2]\quad\;\;[3]\quad\;\;[4]\qquad [5]\quad [6]\quad [7]$$

[1] Series model   MC: Mass Flow Controller Series
  MC-5100L, MC-5200L, MC-5250L, MC-5460L, MC-5470L
  * Power connector orientation 0: Side direction, 1: Upper direction

[2] Valve mode
  MO: Normally open (Precision polishing)
  MC: Normally close (Precision polishing)

[3] Fitting size
  4VR1:6.35VCR106, 4VR2:6.35VCR124, 4SWL:6.35SWL
  SPW3: Surface mount 1.1.25W-Seal 79.8mm,   SPW4: Surface mount 1.125W-Seal 92mm
  6JR3: 9.52UJR163.4mm,   4JR4: 6.35UJR156mm (Applied to MC-5460L and MC-5470L)
  ※ Please consult for more information.

[4] Optional
  B: Applied to liquefied gas,   E: Small Range Control (1 to 4SCCM in nitrogen)
  G: Wide Range specifications (Control range 0.5 to 100 %F.S.)
  J: Valve is closed at below 2% setting,   M: Applied to ClF3
  ※ Default setting is labeled "AA0A0". Please consult for more information.
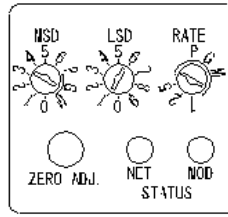
[5] Gas type

[6] Full scale flow rate

[7] Flow rate unit
  SCCM (0 ℃ standard), SLM (0 ℃ standard)

7. Connection
(1) DeviceNet™ connector: Pin type micro connector (IEC60947-5-2)

Pin No.	Signal name	Function
1	Drain	Shield
2	V+	Power supply 11 to 25VDC (+)
3	V-	Power supply (-)
4	CAN_H	CAN interface HI
5	CAN_L	CAN interface LO

(2) Rotary switch, LED (on top of the MFC housing)

NET	Network Status	Network Status LED
MOD	Module Status	Module Status LED
ZERO ADJ.	Zero Adjustment	Zero Adjustment button

Display	Name	Description	Default
MSD LSD	Node Address	Decimal setting: MSD: a digit in tens place LSD: a digit in ones place The setting number above 64 will be Software Set Mode.	63
RATE	Data Rate	Baud rate switch 1: 125 kbps 2: 250 kbps 5: 500 kbps Otherwise: Software set mode	5

8. Operation
Procedure
1) This product is packed in a clean room before shipment. Please break the seals in a clean room after taking it out of its box.
2) Check the gas type and flow rate, and check the direction of the gas flow and the MFC before installation.
3) Check for gas leaks from the tubing with a helium (He) leak detector.
4) Prepare a master for DeviceNet™ and connect specified power, cable and connector.
5) Connect to the network.
6) Turn on power supply and let the equipment warm up for at least 5 minutes (Recommended time: 30min).
7) Please power on the MFC for 30 mins, then conduct zero-point adjustment **without gas flowing** by pressing button on the top of device or software.
8) Device starts controlling flow after inputting setting value by software and introducing gas with the specific pressure.
9) Complete shut off cannot be achieved with the mass flow controller. If complete shut off is desired, a shut-off valve should be installed.
10) When a highly reactive gas is used, thoroughly purge all foreign matter from the tubing and the MFC before operation.
11) When contaminated gas is used, install a filter at the equipment inlet.

9. Product warranty
(1) Period
  This product is guaranteed for a period of 1 year from date of shipment. Defects are repaired according to the following regulations.
(2) Scope
  Warranty coverage is restricted to this product only. Any other damage caused by this product is not covered.
(3) Disclaimer facts
  The following repairs are not covered by the warranty:
    1) Failure caused by by-product of fluid used.
    2) Failure caused by misuse (including careless operation) or incorrect repair or modification.
    3) Failure caused by dropping after purchasing.
    4) Failure caused by a natural disasters.
  Even if the warranty period is still in effect, the following items may not be repaired.
    1) When the kind of fluid used in the product is unclear.
    2) The product is returned with fluid remaining inside and safety cannot be confirmed.

The MFC is a precision instrument. Control may become unstable if electric noise, temperature change of fluid, pulsation of fluid pressure etc. occurs. Please be forewarned.
This instruction manual is subject to revision without notice.