

MASS FLOW CONTROLLER / METER
S48(M)-CR series

CODE: CI300006C

1. SPECIFICATIONS

Series	S48(MFC) / S48M(MFM)		
	CR211		CR221
Full-scale flow range *1	100SLM	150SLM	200SLM
Valve type (S48)	NC: Closed on power not supply (Normally closed)		
Flow rate control range (S48)	2~100%F.S.		
Flow measurement range (S48M)	0~100%F.S.		
Response *2,*3	≤ 1.0 sec (T98)		
Accuracy *2	± 1.0% F.S.		
Linearity *2	± 0.5% F.S.		
Repeatability *2	± 0.2% F.S.		
Differential pressure (S48) *4,*5	100~300kPa(D)	150~300kPa(D)	200~300kPa(D)
MAX.Operating pressure *4	300kPa (G)		
Pressure resistance *4	1MPa (G)		
Operation temperature	5°C~50°C (recommended temperature range: 15~35°C)		
leak integrity	CR211/221: 1×10^{-8} Pa·m ³ /s (He)		
Flow rate set signal (2~100% F.S.)	0.1~5V DC : Input impedance >1MΩ	0.1~5V / 1.08~5V / 0.2~10V DC : Input impedance >1MΩ 4.32~20mA : Input resistance 250Ω	
Flow rate output signal(0~100%F.S.)	0~5V DC : Maximum load current 3mA	0~5V or 1~5V or 0~10V DC : Maximum load current 3mA 4~20mA : Load resistance <250Ω	
Power supply	+15VDC±5% 150mA -15VDC±5% 150mA	+24VDC(13~32VDC) 4.7VA	
Wetted materials	CR211/CR221 : SUS316L, PTFE, Magnetic stainless steel, Fluororubber		
Standard fitting	3/8inch Swagelok: 181mm : 1/2inch VCR: 180mm		

*1: SCCM, SLM is a symbol of gas flow rate (ml/min, l/min: 0°C, 1013hpa(1atm))

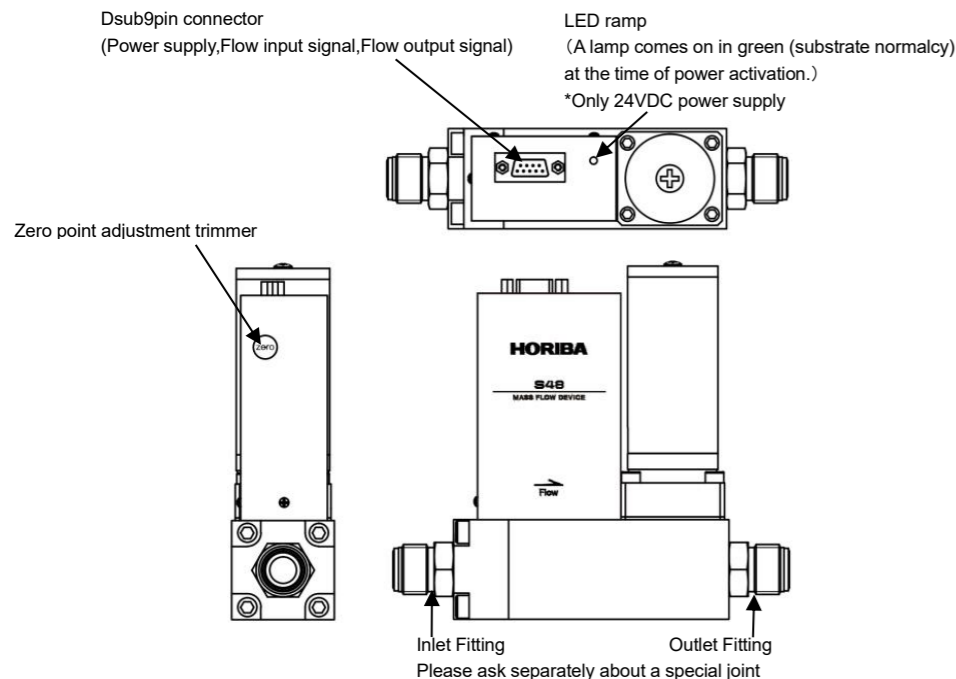
*2: Accuracy, linearity, repetition reproducibility and response are the guarantees to proofreading gas (N2) and a specified flow rate range.

*3: Response time is the time it takes for a flow output signal to arrive and stabilize within the setpoint ±2% F.S. range during a rising response.

*4: (D) means differential pressure, (G) means gauge pressure.

*5: The operation differential pressure may differ depending on the specifications.

2. NAME



3. ELECTRICAL CONNECTION

Use connector: D-subminiature9 compact pin-connector (#4-40 UNC inch screw thread type)

* Please keep in mind that screw threads differ by M3 engagement screw type.

3-1-1) ±15V SPEC

PIN No.	Signal Name
1	Valve override open/close signal * 1. * 2
2	Flow rate output signal
3	Power supply input [+15VDC] (capacity: 150mA)
4	Power common
5	Power supply input [-15VDC] (capacity: 150mA)
6	Flow rate setting signal * 3
7	Signal common
8	Signal common
9	N.C.

*1. For Mass Flow Meter is N.C.

*2. +15VDC input : OPEN, -15VDC input : CLOSE.

It becomes control mode when not inputted ±15V.

*3. Input impedance is more than 1MΩ.

Inside the S48, the power supply COM is connected to the signal COM.

The various signals of the S48 are controlled using the signal COM as the reference.

In order to prevent the common voltage variation by valve driving current, the power supply of Pin No.4 and Signal common of Pin No.7 need to be connected toward GND side of an electric supply source

If the connection is incorrect, there is possibility that MFC does not work properly.

It is connected inside MFC signal common of Pin No.7 and Pin No.8

N.C.: Non connection.

3-1-2) Connection with an electric system

Please wire electric system connection according to the connector connection table.

±15VDC power spec: Direct-current electricity

+15V±5% 150mA

-15V±5% 150mA

3-2-1) +24V SPEC

PIN No.	Signal Name
1	Valve override open/close signal * 1. * 2
2	Flow rate output signal * 3
3	Power supply input [+24VDC]
4	Power common
5	N.C.
6	Flow rate setting signal * 4
7	Signal common
8	Signal common
9	N.C.

*1. For Mass Flow Meter is N.C.

*2. 15~24V input valve forcible opening.

0~15V input valve forcible closing.

*3. Maximum load Resistance less than 250Ω (4~20mA).

*4. Input impedance is 1MΩ (0~5V/1~5V/0~10V).

Inside the S48, the power supply COM is not connected to the signal COM.

The various signals of the S48 are controlled using the signal COM as the reference.

In order to prevent the common voltage variation by valve driving current, the power supply of Pin No.4 and Signal common of Pin No.7 need to be connected toward GND side of an electric supply source

If the connection is incorrect, there is possibility that MFC does not work properly.

It is connected inside MFC signal common of Pin No.7 and Pin No.8

N.C.: Non connection.

3-2-2) Connection with an electric system

Please wire electric system connection according to the connector connection table.

+24VDC power spec: Direct-current electricity

+24V±5% 200mA

4. CAUTION AND REMINDERS

- Be sure that all piping is properly tightened with no leaks and completely purged. Insufficient purging may cause troubles such as particulate contamination, clogging, throughput decreasing, etc.
- Warm-up
After plugging in the power, keep it without airflow for more than 5 minutes (recommendation 30 minutes). Even when it has no warm-up, trouble is not in operation, but flow accuracy worsens.
- Zero point adjustment
When you use a zero compensation function, please do not put pressure on the inside of a main part. The right zero point compensation is not performed.

Moreover, in consideration of the stability of a sensor, after at least 1 minute or more passes after a gas stop, I recommend using a zero compensation function.

The function to adjust a zero point automatically is attached to this product.

When 0VDC is inputted into a flow rate set signal for more than about 4 minutes, a zero point is automatically adjusted to zero.

- Please use a gas filter, in order to remove the particle and impurities which flow into this equipment from the upper stream of piping.
- Storage temperature is 0~80°C. Please avoid preservation in the temperature span exceeding this temperature. Moreover, please do not let me dew. There is possibility of breakage.
- Since there is fear of an electric shock, please do not open a case.
- An analog flow signal may be transitionally outputted in the range of power supply voltage. When you use an analog flow signal, be careful of the input electric strength of equipment.
- If ON/OFF is repeated for a power supply for a short time, it may have bad influences, such as malfunction. Please use 3 seconds or more during the OFF of a power supply. Moreover, since extraction and insertion of the state where only some of power supplies and signals were impressed, or connector may cause failure, please avoid it.
- Please do not put power or excessive pressure with a main part and a cable impossible for.
- At our company, a flow value is converted into 25°C, 1013 hPa (1atm) or 0°C, and 1013 hPa (1atm), and is proofread. "CCM", "LM", "SCCM", and "SLM" are the signs by which the flow (ml/min, l/min) of the gas in the following state is denoted, respectively.
CCM, LM : 25°C, 1013hPa(1atm)
SCCM, SLM : 0°C, 1013hPa(1atm)
- contact us if using the product with gases other than those labeled on the backside of the product and the calibration gas (N2).
- handling the product should be careful. Holding the case part of the product may cause falling and damage to the product, therefore be sure to hold the block part of the product when carrying.
- The control valve installed in the product is not designed to provide complete shut-off. It is recommended to install separate shut-off valves if required.
- Please keep in mind that the gas more than F.S. flows when a control valve is made full open or failure occurs by a certain cause.

This instruction manual is subject to alteration without a notice.

5. PRODUCT WARRANTY

1) Period

The product is warranted for one (2) year (parts and labor) from date of shipment. Repair will be provided free of charge during this period if the products is returned to HORIBA STEC or authorized service representative with a description of the problem.

HORIBA STEC is not responsible for damage due to customer neglect or improper operation of this product.

2) Scope

Warranty coverage is restricted to this product only. HORIBA STEC is not responsible for damage to other components due to improper operation of this product

3) Warranty

Replacement parts are warranted for ninety (90) days or the remainder of the warranty period (whichever is longer).

4) HORIBA STEC is not responsible for damage due to:

- Natural disasters
- Miss-operation or abuse of this product
- Operation or storage in an unsuitable environment Operation outside of the rated specifications
- Unauthorized alterations or retrofits to this product.

Repair expense with / without charge is to be determined as examination and / or disassembly of the returned

Examples for out of scope of responsibility by HORIBA STEC:

*In case of use of high reaction gas, dogging due to incomplete purge or leakage, etc., in gas line.

*Contamination or clogging by dust or mist, etc.


Repair expense with/without charge is to be determined as examination and/or disassembly of the returned products

5) For questions of service please contact.

Japan:
HORIBA STEC CO., LTD
11-5, Hokodate-cho, Kamitoba, Minami-ku, Kyoto, 601-8116 Japan
<http://www.horiba-stec.jp/>

Manufacturer:
HORIBA Precision Instruments (Beijing) Co., Ltd.
Building 1, No.3 Xixing Road, Houshayu Town, Shunyi District, Beijing 101318 China
TEL: +86 10 84929402/9404/9453
FAX: +86 10 84927216
E-MAIL: sales@horibaprecision.com
<http://www.horibaprecision.com>

Appendix 1: China RoHS

Meaning of Marking 标识的意义	
	本标记适用于中华人民共和国销售电器电子产品，标记中央的数字表示环境保护使用期限的年数。(不是表示产品质量保证期间。) 只要遵守这个产品有关的安全和使用注意事项，从制造日开始算起在这个年限内，不会给环境污染、人体和财产带来严重的影响。请不要随意废弃本电器电子产品。
	This marking is applied to electric and electronic products sold in the People's Republic of China. The figure at the center of the marking indicates the environmental protection use period in years. (It does not indicate a product guarantee period.) It guarantees that the product will not cause environment pollution nor serious influence on human body and property within the period of the indicated years which is counted from the date of manufacture as far as the safety and usage precautions for the product are observed. Do not throw away this product without any good reason.
	本マークは、中華人民共和国で販売される電気電子製品に適用され、マークの中央の数字は環境保護使用期限の年数を意味します(製品の品質保証期間を示すものではありません)。この製品に関する安全や使用上の注意を守り頂く限り、製造日から起算するこの年限内では、環境汚染や人体や財産に深刻な影響を及ぼすことはありません。本製品をみだりに廃棄しないでください。

Name and amount of hazardous substance used in a product 产品中有害物质的名称以及含量		有害物质 Hazardous substance					
部件名称 Unit name							
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent chromium (Cr (VI))	多溴联苯 Polybromo- biphenyl (PBB)	多溴二苯醚 Polybromo- diphenyl ether (PBDE)	
外壳 Case	○	○	○	○	○	○	
机械零部件 Machine parts	X	○	○	○	○	○	
电路板 Printed board	X	○	○	○	○	○	
本表格依据 SJ/T 11364 的规定编制。 This form is prepared in accordance with SJ / T 11364. ○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。 Denotes that the amount of the hazardous substance contained in all of the homogeneous materials used in the component is below the limit on the acceptable amount stipulated in the GB/T 26572. ×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。 Denotes that the amount of the hazardous substance contained in any of the homogeneous materials used in the component is above the limit on the acceptable amount stipulated in the GB/T 26572.							

Appendix 2 : CE Marking Directive & UKCA Marking Regulations

This document is attached in compliance with revisions in the CE Marking Directive or UKCA Marking Regulations. All HORIBA Precision Instruments products exported to Europe are accompanied by this document. Please note that the document is not valid outside Europe.

[CE Marking]

Manufacturer information

Name: HORIBA Precision Instruments (Beijing) Co.,Ltd.
Address: Building 1, No.3 Xixing Road, Houshayu Town, Shunyi District, Beijing 101318 China

Authorized agent information

Name: HORIBA Europe GmbH
Address: Hans-Mess-Str.6, D-61440 Oberursel, Germany

Importer to UK.

Name: HORIBA UK Limited
Address: Kyoto Close, Moulton Park, Northampton, NN3 6FL, UK

[UKCA Marking]

Manufacturer information

Name: HORIBA Precision Instruments (Beijing) Co.,Ltd.
Address: Building 1, No.3 Xixing Road, Houshayu Town, Shunyi District, Beijing 101318 China

Authorized agent information

Name: HORIBA UK Limited
Address: Kyoto Close, Moulton Park, Northampton, NN3 6FL, UK

Appendix 3:Electromagnetic Compatibility

This equipment conforms to the following directives / regulations and standards as to the electromagnetic compatibility.

Directive	Standards
The EMC Directive 2014/30/EU	EN IEC 61326-1:2021 Class A, Industrial electromagnetic environment


This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.


Regulations	Standards
The EMC Regulations	BS EN IEC 61326-1:2021 Class A, Industrial electromagnetic environment


This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

법률	표준
전파법	KS C 9610-6-2 KS C 9811 Class A


이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Note
Safety information is provided below.
 Do not remove model case. Removing it may cause electric shock or product failure.

Hinweis
Die Sicherheitshinweise sind unten angegeben.
 Das Gehäuse des Modells nicht abnehmen. Das Abnehmen des Gehäuses kann zu einem Stromschlag oder Produktversagen führen.

Remarque
Les informations de sécurité sont fournies ci-dessous.
 Ne pas retirer le boîtier du modèle. Le retirer pourrait provoquer une décharge électrique ou une défaillance du produit.

注意
记载如下安全信息。
 存在触电和故障的风险，请不要打开外壳。

메모
안전 정보는 아래에 제공됩니다.
 모델 케이스를 제거하지 마십시오. 제거하면 감전이나 제품 고장의 원인이 됩니다.

WHAT IS MASS FLOW CONTROLLER(METER)?

This product is a heat type mass flow meter controller, it reads the difference in temperature of the self-heating heater wound around the downstream capillary tube, and a top detects mass.

This difference in temperature is in correlation to the mass flow rate of gas, and is outputting that temperature change as an electrical signal.

In the field for which precise and advanced control of flow (measurement), such as environmental observation, vacuum sputtering, and an analytical instrument, is needed, the use of the mass flow controller is used abundantly.

This S48 series is the product developed at the Horiba Precision Instruments based on the technology of Horiba STEC.

Mass Flow Controller is a mass flow rate controller, MFC is called below.

Mass Flow Meter is a mass flow meter, and MFM is called below.

HOW TO OPERATE MFC (MFM)

1.MFC(MFM) is connected to piping.



Please check that the gas introduced into piping has stopped. Please check the joint specification on the piping side before connection.

In addition, the joints of an entrance and an exit are an equivalent for 1/2 inch VCR An equivalent for swagelock and equivalent for the male joint of 3/8inch swagelock are a standard. (Customer specification) Please be careful not to forget to attach gasket in the case of VCR equivalent joint connection and a front and a back ferrule in the case of swagelock, and inch equivalent joint connection. It becomes a cause of leak.

Swagelock, inch equivalent joint

VCR equivalent joint



We recommend carrying out a leak check after connecting MFC(MFM) to piping. Please check that there is no leak after inputting a flow rate set signal into MFC(MFM) The arrow indicated on this product case is gas flow. If it makes a mistake in a direction and is connected to piping, the valve in MFC (MFM)is opened fully and an output value shows the minus value more than a full scale.

2. Power supply is supplied to MFC (MFM).

The MFC (MFM) operates by inputting a drive power supply from the exterior.

We are allowed to prepare both the types of ±15VDC and a +24VDC power supply for S48 series.

(Customer specification)

Please input a power supply according to specification.

* Please check power supply specification (±15VDC or +24VDC) by Page.1 connector connection about a drive power supply.

*Please ask distributor in case of someone who wish the power supply only for MFC (MFM)

【How to recognize power supply specification (nameplate)】

About the power supply specification of a main part, since it indicated to the name card of a MFC case, please confirm there.

3. Flow rate set signal is set to MFC.

In order to make MFC control, a gas mass flow flow rate set signal is needed in addition to power activation.

Please put in a flow rate set signal according to the flow of use.

We are allowed to prepare 0~5VDC, 1~5VDC, and 0~~10VDC specification for S48 series.

(Customer specification)

Please input a flow rate set signal according to specification.

*Please check detail specification by Page.1 connector connection about a flow rate set power supply.

Example: In the case of use of N2 100sccm

Flow rate set signal 0-5V

Flow rate set signal 1-5V

0V set — 0sccm

1.0V set — 0sccm

1V set — 20sccm

1.8V set — 20sccm

2V set — 40sccm

2.6V set — 40sccm

3V set — 60sccm

3.4V set — 60sccm

4V set — 80sccm

4.2V set — 80sccm

5V set — 100sccm

5.0V set — 100sccm

4.Valve fully shut-off function

When the voltage is set to "0" (below 50mV), the S48 control valve is fully closed

When the set voltage is above 100mV, the control is turned on again. (at 0~5VDC).

*Entry of PIN No. 1 takes precedence.

CONVERSION FACTOR

MFC (MFM) is carrying out modulating flow in N2.

The flow ratio of notation gas and calibration gas (calibration gas) is called C.F.

It is the C.F. value defined at our company.

Please inform a store of the gas which does not have a statement in below separately in the case of use.

Reference: The calculation method in case gas other than the gas of the present specification is passed

* When used by other gas, a flow can be calculatively computed by calculation.

Since we have defined pressure and the valve factor in MFC for every indication gas, in use,

I cannot do product guarantee by other gas.

Gas set flow rate × Adjustment gas(C.F.) ÷ Use gas(C.F.) = Use gas

Example 1

When H2 is flowed to N2 MFC (100 sccm F.S.)

In case of FS flow rate set 100 sccm + 1×1.4 = 140 sccm

In case of changing 50% flow rate set

Example 2

When N2 is flowed to O2 MFC (300 sccm F.S.)

300 sccm + 0.98 × 1.0 = 306 sccm

GAS	C.F
Air	1.000
Ar	1.418
CF4	0.427
CH4	0.753
CHF3	0.511
C2H4	0.589
C2H6	0.500
C2F6	0.248
C3H6	0.410
C3H8	0.343
i-C4H8	0.300
n-C4H10	0.260
i-C4H10	0.260
CO	1.000
CO2	0.735
O2	0.838
H2	1.012
HCl	0.994
He	1.415
Kr	1.370
N2	1.000
NF3	0.510
NO	0.980
N2O	0.709
Ne	1.413
O2	0.980
SiH4	0.602
SF6	0.266
SO2	0.683
Xe	1.363

ABOUT THE PHENOMENON OF FAILURE AND FACTOR

Since a representation example is raised to below, please refer to it.

1.【Condition】While the flow output signal has been 0 (VDC), it does not change to gas flowing.

【Cause 1】Valves (stop valve etc.) of the MFC upper stream and the lower stream are closed.

【Check 1】Please check whether the valve currently installed in the MFC upper stream and the lower stream has Closed.

【Cause 2】MFC valve Close

【Check 2】Please check valve opening and closing.

Please check whether the valve compulsion Close signal is contained in Pin.1 of a connector.

【Cause 3】Flow rate set signal is not inputted.

【Check 3】Please check whether the flow rate set signal is inputted.

【Cause 4】Inlet pressure is lower than a rated value.

【Check 4】Please check inlet pressure.

【Cause 5】Jam of the gas filter with which it is equipped on piping

【Check 5】Please exchange gas filters.

2.【Condition】Zero point cannot be adjusted.

The auto zero point adjustment function attaches this MFC as a standard.

If the state where the input was carried out for 0VDC to the flow rate set signal continues for more than about 4 minutes,

a zero point will be adjusted automatically.

【Cause 1】It is over the zero point adjustment standard.

【Check 1】When a more than 120mV zero point is worn in the total, an auto zero function will not work.

Since it can be considered an MFC board or the abnormalities in a sensor, please return the goods to a store.

【Cause 2】Power supply for MFC has broken.

【Check 2】Power supply for MFC has broken, or if unstable, zero point adjustment may not be effective.

Please give me for a check whether drive voltage and a flow rate set signal (0) are inputted.

【Cause 3】Disconnection of a cable

【Check 3】Please check an electrical connection with a tester whether cable is disconnected or not.

3.【Condition】Flow output is not stable

【Cause 1】Poor grand grounding

【Check 1】Please check whether the ground has grounded.

【Cause 2】The input mistake of a drive power supply and a flow rate set signal

【Check 2】Please check that the flow output is measurable by the regular output pin by which the drive power supply and the flow rate set signal are inputted into the regular pin.

【Cause 3】Noise influence

【Check 3】According to usage environment, there is a possibility that the noise has occurred from MFC peripheral equipment. Please improve a noise source, when the noise has ridden on the flow flow output signal.

【Cause 4】Valve jam in MFC

【Check 4】A control flow may not be stabilized when the valve in MFC is choked up by mixing of a foreign substance etc. A valve may be made full open (it is a valve compulsion Open signal input to Pin1), and it may return to normal by disposal of purging a foreign substance.

4.【Condition】Valve in MFC is internal leak.

* Although it is a valve control-of-flow valve of MFC and the shut-off guarantee of gas is not offered, even if it carries out OV input of the flow rate set signal of MFC, when the flow more than the minimum flow guaranteed performance flows, there is a possibility that the MFC valve is leaking (internal leak).

【Cause 1】The flow rate set signal is not inputted 0V.

【Check 1】Please check whether any numerical values other than flow rate set signal 0 are inputted.

When the flow rate set signal is inputted, MFC will be in a control state.

【Cause 2】Compulsive Close signal is not inputted.

【Check 2】Please check whether any numerical values other than a compulsive closing signal are inputted.

When the flow rate set signal is inputted, MFC will be in a control state.

【Cause 3】Pressure is large

【Check 3】Used exceeding regular pressure, the flow more than the minimum flow guaranteed performance may flow.

【Cause 4】Valve contamination

【Check 4】Control flow may not be stabilized when the valve in MFC is choked up by mixing of a foreign substance etc.

A valve may be made full open (it is a valve compulsion Open signal input to Pin1),

and it may return to normal by disposal of purging a foreign substance.

【Cause 5】Zero point gap

【Check 5】Zero point is over the auto zero point adjustment rated value.