HORIBA Precision Instruments

DIGITAL MASS FLOW CONTROLLER

HORIBA

S600 Series

About Our Company

HORIBA is a long established and reliable provider of high end analytical and control solutions.

The HORIBA Group of worldwide companies provides an extensive array of instruments and systems for applications ranging from automotive R&D, process and environmental monitoring, in-vitro medical diagnostics, semiconductor manufacturing and metrology to a broad range of scientific R&D and QC measurements. Proven quality and trustworthy performance have established widespread confidence in the HORIBA brand.

HORIBA has many branches worldwide offering support to our customers when and wherever they need it. Most of HORIBA's support centers have clean rooms, which is something HORIBA is proud of. With our global network HORIBA is able to offer a fast and tailored aftercare service for all our customers whenever they need it and in an appropriate environment. Take a look at our Global Support Network pages to see where our support centers are.

HORIBA STEC

HORIBA STEC renowned in the semiconductor industry. Setting the global standard for semiconductor, offers a wide range of products to suit a variety of different industries.

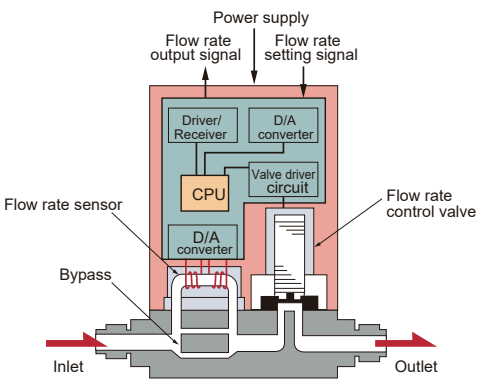
HORIBA Precision Instruments

HORIBA Precision Instruments is a subsidiary of HORIBA STEC, established in Beijing China in January 2011. HORIBA Precision Instruments develop and manufacture Mass Flow Controller.

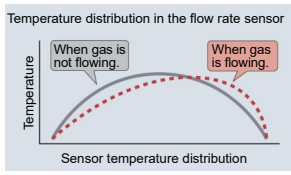
What's Mass Flow Controller?

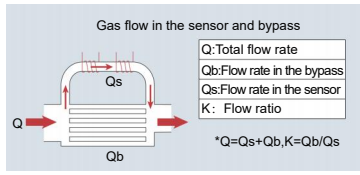
A mass flow controller automatically controls the flow rate of gas according to a set flow rate sent as an electric signal, without being affected by use conditions or changes in gas pressure. Flow rates can be roughly classified into two types : volumetric flow and mass flow. A volumetric flow measurement is affected by ambient temperature and pressure. To see the true flow, the pressure and temperature conditions need to be measured and include in a calculation. Mass flow, on the other hand, measures the mass of a fluid so is influenced much less by temperature and pressure conditions, therefore providing much more accurate and stable flow measurement and control. Our mass flow controllers are used in a wide range of industrial fields as indispensable equipment when accurate control of flow rates is required or an automated production line is built.

Structure



Operating principles





1.The gas, which enters from the inlet, first splits to flow past the sensor or through the bypass.
2. At the senor, the mass flow rate is detected as a proportional change in temperature and converted by the bridge circuits to an electrical signal.
3. This signal passes through the amplification and correction circuits, and is output as a linear voltage between 0 to 5V. At the same time, it is also sent to the comparison control circuits.
4.The comparison control circuit compares the flow rate setting signal and and the actual flow rate setting signal from the sensor and sends a difference signal to the valve driving circuit.
5.The flow rate control valve moves as appropriate to make the difference between the reguired flow set point and flow output signals approach zero. In other words, the unit controls the flow so that it is always at the set flow rate.

Product Features

S600 series are hybrid Mass Flow Controller of HORIBA STEC (Japan) technology and HORIBA Precision Instruments (China) production. The S600 Mass Flow Controller adopts HORIBA STEC (Japan) technology and is manufactured by HORIBA Precision Instruments (China).
These MFC follow fluid technology and quality that HORIBA STEC has developed for half century, which are able to support full customer satisfaction and reliability in a wide range of industries.

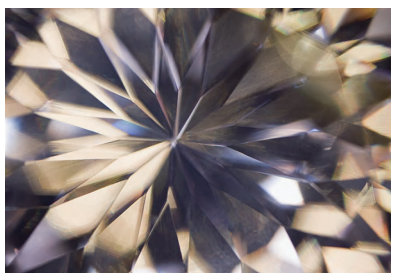
- High accuracy / Fast response
- Various communication
- Designed by HORIBA STEC
- Core parts are made in Japan

HORIBA Flow Control

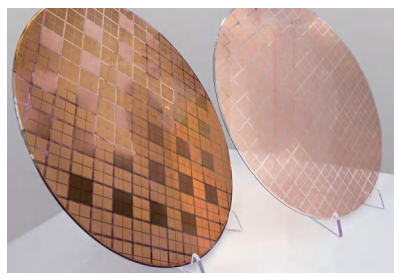
All important parts and technology are imported from HORIBA STEC.

Product Application

- PV：LPCVD/PECVD/ALD
- Fiber： MCVD/VAD/OVD
- Bioreactor / Pharmaceutical: process control of reactor gases for fermentation, bioreactor gas management.



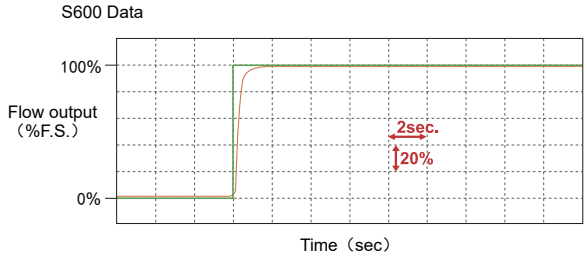
- LGD：MPCVD
- Furnace: flame / burner control, gas mixing and blending.
- Automotive: emissions testing, emission monitoring, measuring compressed air.



- Vacuum coating: process control for thin film deposition process.
- Heat treatment: burner control, welding.
- Analytical / Gas analyzers: analytical sampling, gas sample preparation and measurement, verifying flow and pressure for multiple gases flowing to and from gas chromatographs.

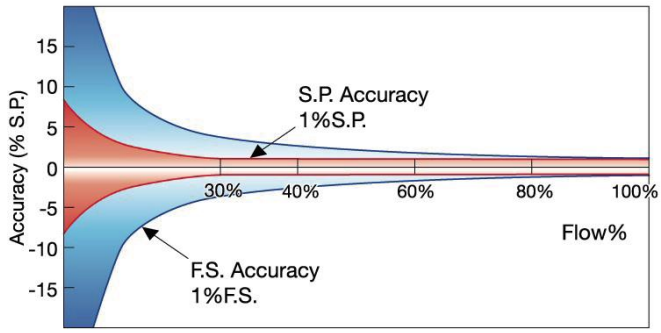
Performance data

The response time of the S600 series is less than 1.5 seconds.



Performance Data

S600 series have S.P. accuracy.



Multiple Choice

- Communication options: Analog and digital
- Power supply options: DC24V and ±15V
- Seal options: Rubber and Metal

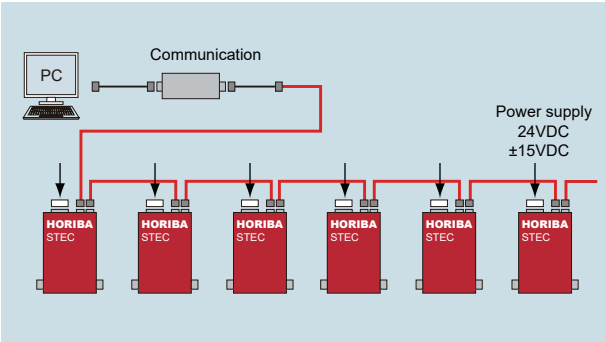
Model	Communi-cation	Flow rate / Power supply / Seal											
		10SCCM-50SLM				100SLM-200SLM				300SLM-500SLM			
		24VDC		±15V		24VDC		±15V		24VDC		±15V	
		Rubber	Metal	Rubber	Metal	Rubber	Metal	Rubber	Metal	Rubber	Metal	Rubber	Metal
S600	RS485	BR222	BM222	BR212	BM212	CR222	—	CR212	—	DR222	—	DR212	—
	PROFIBUS	BR226	BM226	—	—	CR226	—	—	—	—	—	—	—
	EtherCAT	BR527X	BM527X	—	—	CR527X	—	—	—	DR527X	—	—	—
	DeviceNet	BR624	BM624	—	—	CR624	—	—	—	DR624	—	—	—

Analog signal

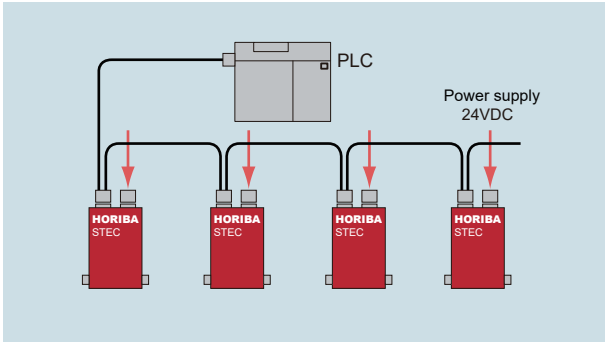
- S600（RS485,PROFIBUS)output：0-5V

Product Features

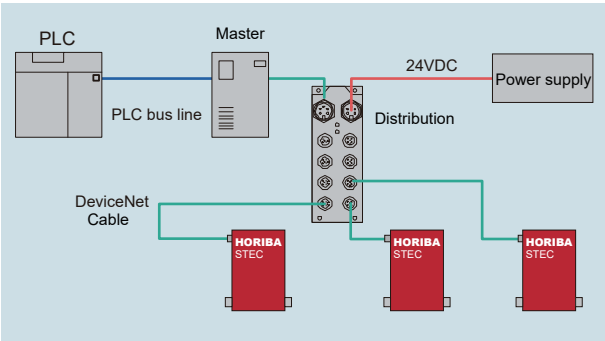
RS485



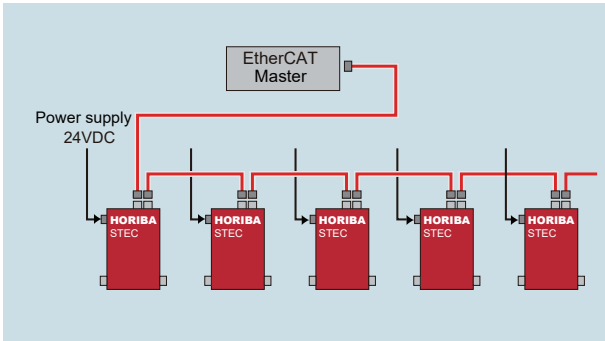
PROFIBUS



DeviceNet



EtherCAT



S600 Series

Model selection

1	2	3	4	5	6
Model	Flow rate（N2）	Seal	Connector	Power	Communication
MFC:S600 MFM:S600M	B:10SCCM～50SLM C:100SLM～200SLM D:300SLM～500SLM	R:Rubber M:Metal	2:Dsub9Pin Male 5:M8 Connector (EtherCAT) 6:M12 Connector (DeviceNet)	1:±15V 2:24V	2:0-5V/RS485 4:DeviceNet 6:0-5V/PROFIBUS 7:EtherCAT

7	8	9
Gas	Full-scale flow rate	Fittings
N2 O2 NH3 ……	(10,20,30,50,100,200,300,500)SCCM (1,2,3,5,10,20,30,50)SLM (100,150,200)SLM (300,400,500)SLM	4IS: 1/4 inch Swagelok 4CR: 1/4 inch VCR 6IS: 3/8 inch Swagelok 8CR: 1/2 inch VCR

Example

1	2	3	4	5	6	7	8	9
S600	B	R	226			N_2	100SCCM	4CR

RS485 Specifications

Series	S600						
Model	BR212 / BM212　BR222 / BM222			CR212 / CR222			DR212 / DR222
Full-scale of flow rate *1	10SCCM≤x≤5SLM	5SLM< x≤30SLM	30SLM<x≤50SLM	100 SLM	150 SLM	200 SLM	300SLM ≤ x ≤ 500SLM
Valve model	NC						
Flow rate control range	2～100% of F.S.						
Response *2,*4	≤1.5sec (F.S.) *≤1.0sec (Typical)						≤2.0 sec (F.S.)
Accuracy *2,*3	±1.0%S.P. (30%F.S.<) ±0.3%F.S. (≤30%F.S.)						±1.5%S.P. (30%F.S.<) ±0.45%F.S. (≤30%F.S.)
Linearity *2	±0.5% F.S.						
Repeatability *2	±0.2% F.S.						
Operating differential pressure *5,*6	50～300kPa(D)	100～300kPa(D)	200～300kPa(D)	100～300kPa(D)	150～300kPa(D)	200～300kPa(D)	150～300kPa(D)
Max. operating pressure *6	450kPa (G)			300kPa (G)			
Pressure resistance *6	1MPa (G)						
Operating temperature	5℃～45℃ (recommended temperature range:15～35℃)						
External leak rate	BR212 / BR222：1×10^{-10} Pa•m^3/s (He) or less BM212 / BM222：1×10^{-11} Pa•m^3/s (He) or less			1×10^{-8} Pa•m^3/s (He) or less			
Flow rate setting signal	0.1～5VDC (2～100%F.S.)						
Flow rate output signal	0～5VDC (0～100%F.S.)						
Digital interface	RS485 F-Net protocol						
Power supply	+15VDC ±5% 250mA -15VDC ±5% 150mA						+15VDC ±5% 300mA -15VDC ±5% 300mA
	+24VDC ±4VDC 6.7VA						+24VDC ±4VDC 10VA
Wetted materials	BR212 / BR222 : SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber BM212 / BM222 : SUS316L, PTFE, Magnetic stainless steel			SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber			
Standard fitting	Swagelok 1/4inch equivalent : 127mm VCR 1/4inch equivalent : 124mm			Swagelok 3/8inch equivalent : 181mm VCR 1/2inch equivalent : 180mm			Swagelok 3/8inch equivalent : 183mm VCR 1/2inch equivalent : 182mm

*1：SCCM and SLM are units used to represent gas flow rates in milliliters per minute (mL/min., 0°C 1013hPa) and liters per minute (L/min., 0°C 1013hPa), respectively.
*2：Accuracy, linearity, repeatability and response are guaranteed in the calibration gas (N2) under our measurement condition.
*3：Accuracy is guaranteed at 23±2℃.
*4：Response time means the time that flow rate settles in ±2% F.S. of the set point. Response time is guaranteed at 23±2℃.
*5：(D)：Differential Pressure, (G)：Gauge Pressure.
*6：Operating pressure may vary depending on specification.

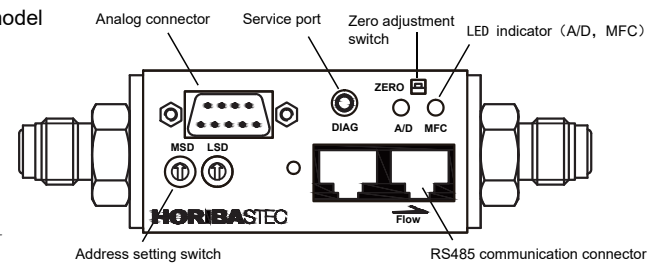
Digital communication

RS485（F-Net Protocol）digital communication

Modular jack connector (RJ45 connector)	
Pin.No.	Signal Name
1	Digital signal common
2	Digital signal common
3	NC *1
4	RS485 Serial (-) *2
5	RS485 Serial (+) *2
6	NC *1
7	NC *1
8	NC *1

*1：Do not connect anyting here.
*2：No termination resistor is installed in the product. When terminating, connect a resistor of 120 [Ω] ± 1 [%] between RS485 Serial(+)and(-).

Digital model



Electrical connection

D-subminiature 9 pin Female with #4-40 UNC inch screw

±15VDC power supply	
Pin.No.	Signal Name
1	Valve overide open/close signal *1
2	Analog flow rate output signal:0 - 5VDC *2
3	Power supply input(+15VDC, 250mA)
4	Power common *4
5	Power supply input(-15VDC, 150mA)
6	Analog flow rate setting signal:0.1 to 5VDC *3
7	Signal common *4
8	Signal common *4
9	NC *5

*1：+15VDC input : OPEN, -15VDC input : CLOSE, Input impedance: minimum 100kΩ
*2：Minimum load resistance: 2kΩ
*3：Input impedance: minimum 1MΩ.
*4：Pin No.4, Pin No.7 and Pin No.8 are connected inside the product. In order to prevent signal noise on the performance of the system, connect the power common and the signal common separately. Furthermore, do not connect the power common and the signal common outside the product.
*5：Check point in the factory, do not connect.

D-subminiature 9 pin Female with #4-40 UNC inch screw

24VDC power supply	
Pin.No.	Signal Name
1	Valve overide open/close signal *1
2	Analog flow rate output signal : 0 - 5VDC *2
3	Power supply input(20V～28V)
4	Power common *5
5	NC *4
6	Analog flow rate setting signal : 0.1 to 5VDC *3
7	Signal common *5
8	NC *4
9	NC *4

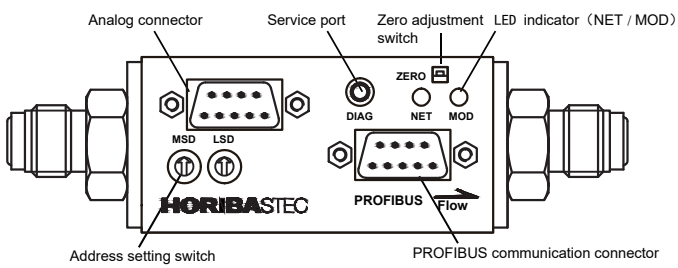
*1：13～32V: OPEN, GND～-15V: CLOSE, Input impedance: minimum 100kΩ
*2：Minimum load resistance: 2kΩ
*3：Input impedance: minimum 1MΩ.
*4：Check point in the factory, do not connect.
*5：Pin No.4 and Pin No.7 are connected inside the product. In order to prevent signal noise on the performance of the system, connect the power common and the signal common separately. Furthermore, do not connect the power common and the signal common outside the product.

PROFIBUS Specifications

Series	S600					
Model	BR226 / BM226			CR226		
Full-scale of flow rate *1	10SCCM≤x≤5SLM	5SLM< x≤ 30SLM	30SLM<x≤50SLM	100SLM	150SLM	200SLM
Valve model	NC					
Flow rate control range	2～100% of F.S.					
Response *2,*4	≤1.5sec (F.S.) *≤1.0sec (Typical)					
Accuracy *2,*3	±1.0%S.P.（30% F.S.<），±0.3%F.S.（≤30% F.S.）					
Linearity *2	±0.5% F.S.					
Repeatability *2	±0.2% F.S.					
Operating differential pressure *5,*6	50～300kPa(D)	100～300kPa(D)	200～300kPa(D)	100～300kPa(D)	150～300kPa(D)	200～300kPa(D)
Max. operating pressure *6	450kPa (G)			300kPa (G)		
Pressure resistance *6	1MPa (G)					
Operating temperature	5℃～45℃ (recommended temperature range:15～35℃)					
External leak rate	BR226：1×10^{-10} Pa•m^3/s (He) or less BM226：1×10^{-11} Pa•m^3/s (He) or less			1×10^{-8} Pa•m^3/s (He) or less		
Flow rate setting signal	0.1～5VDC (2～100%F.S.)					
Flow rate output signal	0～5VDC (0～100%F.S.)					
Digital interface	PROFIBUS DP-V0 slave					
Power supply	+24VDC ±4VDC					
Power consumption	6.9VA					
Wetted materials	BR226：SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber BM226：SUS316L, PTFE, Magnetic stainless steel			SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber		
Standard fitting	Swagelok 1/4inch equivalent：127mm VCR 1/4inch equivalent：124mm			Swagelok 3/8inch equivalent：181mm VCR 1/2inch equivalent：180mm		

*1：SCCM and SLM are units used to represent gas flow rates in milliliters per minute (mL/min., 0°C 1013.25hPa) and liters per minute (L/min., 0°C 1013.25hPa), respectively.
*2：Accuracy, linearity, repeatability and response are guaranteed in the calibration gas (N2) under our measurement condition.
*3：Accuracy is guaranteed at 23±2˚C.
*4：Response time means the time that flow rate settles in ±2% F.S. of the set point. Response time is guaranteed at 23±2˚C.
*5：(D)：Differential Pressure, (G)：Gauge Pressure.
*6：Operating pressure may vary depending on specification.

Digital model



Digital communication

PROFIBUS™ communication Cnnector
D-subminiature 9 pin Female with #4-40 UNC inch screw

Pin.No.	Signal Name
1	NC *2
2	NC *2
3	RXD/TXD-P
4	CNTR-P
5	Digital signal ground
6	VP (+5V) *1
7	NC *2
8	RXD/TXD-N
9	NC *2

*1： This pin is designed only to provide +5V supply to terminations on the PROFIBUS bus line.
*2： N.C.: No connection (Do not connect anything here.)
* Use the specified cables and connectors in the PROFIBUS specification.
* No termination resistor is installed in the product.

Electrical connection

D-subminiature 9 pin Female with #4-40 UNC inch screw

Pin.No.	Signal Name
1	Valve overide open/close signal *1
2	Analog flow rate output signall : 0 to 5VDC *2
3	Power supply input(20V～28V)
4	Power common *5
5	NC *1
6	Analog flow rate setting signal : 0.1 to 5VDC *3
7	Signal common
8	NC *1
9	NC *1

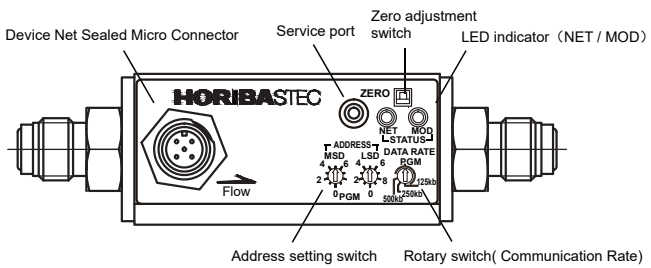
*1： 13～32V: OPEN, GND～-15V: CLOSE, Input impedance: minimum 100kΩ
*2： Minimum load resistance: 2kΩ
*3： Input impedance: minimum 1MΩ.
*4： Check point in the factory, do not connect.
*5： Pin No.4 and Pin No.7 are connected inside the product. In order to prevent signal noise on the performance of the system, connect the power common and the signal common separately. Furthermore, do not connect the power common and the signal common outside the product.

DeviceNet Specifications

Series	S600						
Model	BR624 / BM624			CR624			DR624
Full-scale of flow rate *1	10SCCM≤x≤5SLM	5SLM< x≤30SLM	30SLM< x≤50SLM	100SLM	150SLM	200SLM	300SLM≤x≤500SLM
Valve model	NC						
Flow rate control range	2～100% of F.S.						
Response *2,*4	≤1.5sec (F.S.) *≤1.0sec (Typical)						≤2.0sec（F.S.）
Accuracy *2,*3	±1.0%S.P. （30% F.S.〈）, ±0.3%F.S. （≤30% F.S.）						±1.5%S.P.（30% F.S.〈）±0.45%F.S.（≤30% F.S.）
Linearity *2	±0.5% F.S.						
Repeatability *2	±0.2% F.S.						
Operating differential pressure *5,*6	50～300kPa(D)	100～300kPa(D)	200～300kPa(D)	100～300kPa(D)	150～300kPa(D)	200～300kPa(D)	150～300kPa(D)
Max. operating pressure *6	450kPa (G)			300kPa (G)			
Pressure resistance *6	1MPa (G)						
Operating temperature	5℃～45℃ (recommended temperature range:15～35℃)						
External leak rate	BR624：1×10^{-10} Pa•m^3/s (He)or less BM624：1×10^{-11} Pa•m^3/s (He)or less			1×10^{-8} Pa•m^3/s (He)or less			
Digital interface	DeviceNet						
Power supply	Compliant with ODVA specifications						
Power consumption	+24VDC, 5.5VA						+24VDC, 10VA
Wetted materials	BR624 : SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber BM624 : SUS316L, PTFE, Magnetic stainless steel			SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber			
Standard fitting	Swagelok 1/4 inch equivalent: 127mm VCR 1/4 inch equivalent: 124mm			Swagelok 3/8 inch equivalent: 181mm VCR 1/2 inch equivalent: 180mm			Swagelok 3/8 inch equivalent: 183mm VCR 1/2 inch equivalent: 182mm

*1：SCCM and SLM are units used to represent gas flow rates in milliliters per minute (mL/min., 0°C 1013hPa) and liters per minute (L/min., 0°C 1013hPa), respectively.
*2：Accuracy, linearity, repeatability and response are guaranteed in the calibration gas (N2) under our measurement condition.
*3：Accuracy is guaranteed at 23±2˚C.
*4：Response time means the time that flow rate settles in ±2% F.S. of the set point. Response time is guaranteed at 23±2˚C.
*5：(D)：Differential Pressure, (G)：Gauge Pressure.
*6：Operating pressure may vary depending on specification.

Digital model

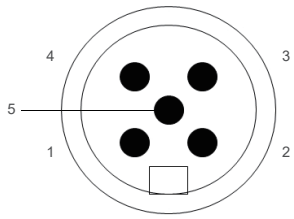


Electrical connection

Shield type-connector

Pin.No.	Signal name
1	DRAIN
2	V+
3	V-
4	CAN_H
5	CAN_L

DeviceNet Connector

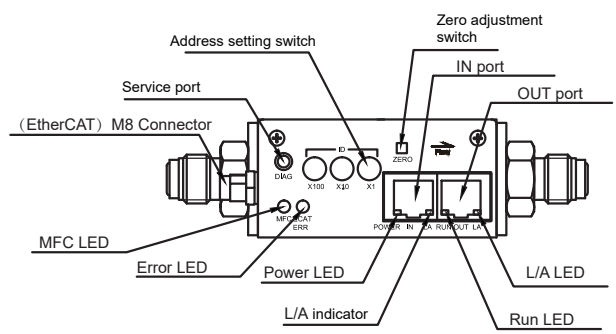


EtherCAT Specifications

Series	S600						
Model	BR527X / BM527X			CR527X			DR527X
Full-scale of flow rate *1	10SCCM≤x≤5SLM	5SLM<x≤30SLM	30SLM<x≤50SLM	100 SLM	150 SLM	200 SLM	300SLM ≤ x ≤ 500SLM
Valve model	NC						
Flow rate control range	2～100% of F.S.						
Response *2,*4	≤1.5sec (F.S.) *≤1.0sec (Typical)						≤2. 0sec (F.S.)
Accuracy *2,*3	±1.0%S.P. (30%F.S.<) ±0.3%F.S. (≤30%F.S.)						±1.5%S.P. (30%F.S.<) ±0.45%F.S. (≤30%F.S.)
Linearity *2	±0.5% F.S.						
Repeatability *2	±0.2% F.S.						
Operating differential pressure *5,*6	50～300kPa(D)	100～300kPa(D)	200～300kPa(D)	100～300kPa(D)	150～300kPa(D)	200～300kPa(D)	150～300kPa(D)
Max. operating pressure *6	450kPa (G)			300kPa (G)			300kPa (G)
Pressure resistance *6	1MPa (G)						
Operating temperature	5℃～45℃ (recommended temperature range:15～35℃)						
External leak rate	BR527X: 1×10^{-10} Pa•m ^{3}/s (He) or less BM527X: 1×10^{-11} Pa•m^3/s (He) or less			1×10^{-8}Pa•m ^{3}/s (He) or less			
Digital interface	EtherCAT						
Power supply	+24VDC (18～28VDC)						
Power consumption	6VA						10VA
Wetted materials	BR527X: SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber BM527X: SUS316L, PTFE, Magnetic stainless steel			SUS316L, PTFE, Magnetic stainless steel, Fluoro rubber			
Standard fitting	Swagelok 1/4 inch equivalent: 127mm VCR 1/4 inch equivalent: 124mm			Swagelok 3/8 inch equivalent: 181mm VCR 1/2 inch equivalent: 180mm			Swagelok 3/8 inch equivalent: 183mm VCR 1/2 inch equivalent: 182mm

*1：SCCM and SLM are units used to represent gas flow rates in milliliters per minute (mL/min., 0°C 1013hPa) and liters per minute (L/min., 0°C 1013hPa), respectively.
*2：Accuracy, linearity, repeatability and response are guaranteed in the calibration gas (N2) under our measurement condition.
*3：Accuracy is guaranteed at 23±2℃.
*4：Response time means the time that flow rate settles in ±2% F.S. of the set point. Response time is guaranteed at 23±2℃.
*5：(D)：Differential Pressure, (G)：Gauge Pressure.
*6：Operating pressure may vary depending on specification.

Digital model



Digital communication

EtherCAT digital communication
(RJ45 connector)

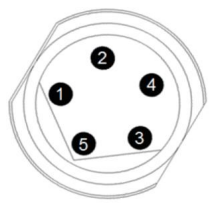
Pin.No.	Signal name
1	Transmit +
2	Transmit -
3	Receive +
4	NC
5	NC
6	Receive -
7	NC
8	NC

Power supply connector

M8 connector (EtherCAT)

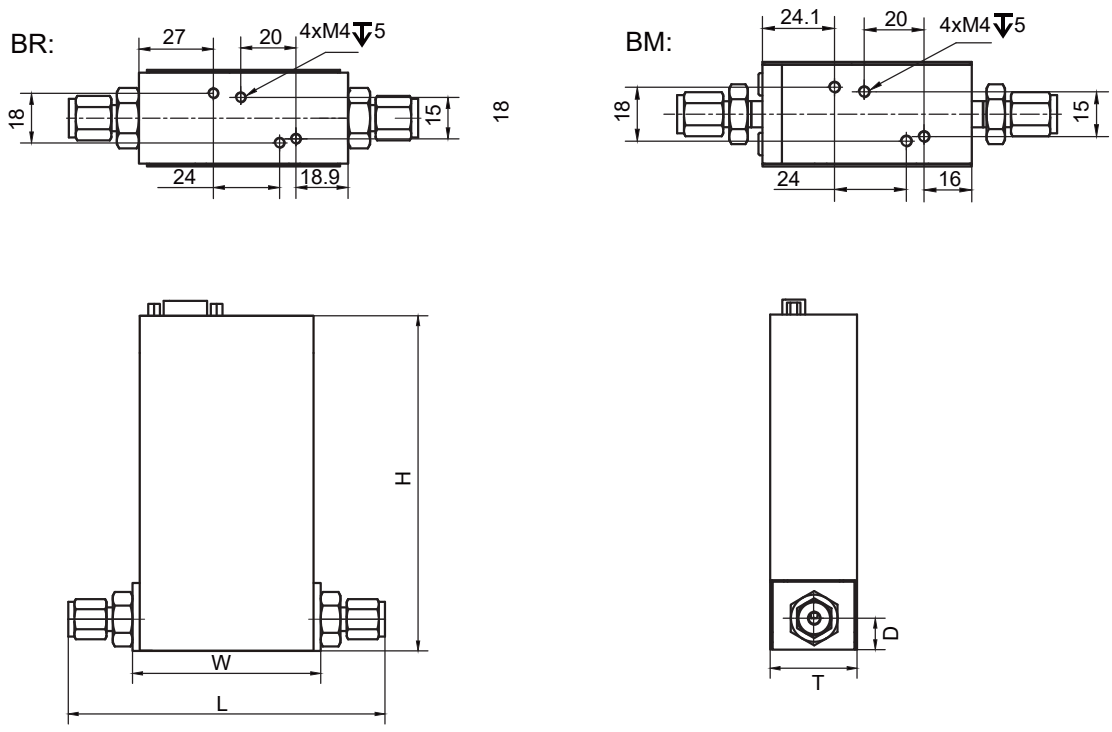
Pin.No.	Signal name
1	V+
2	NC
3	V- Power Common
4	NC
5	NC

M8 connector



External dimensions

BM/BR 212/222/226/624/527X



BM/BR 212/222/226/624

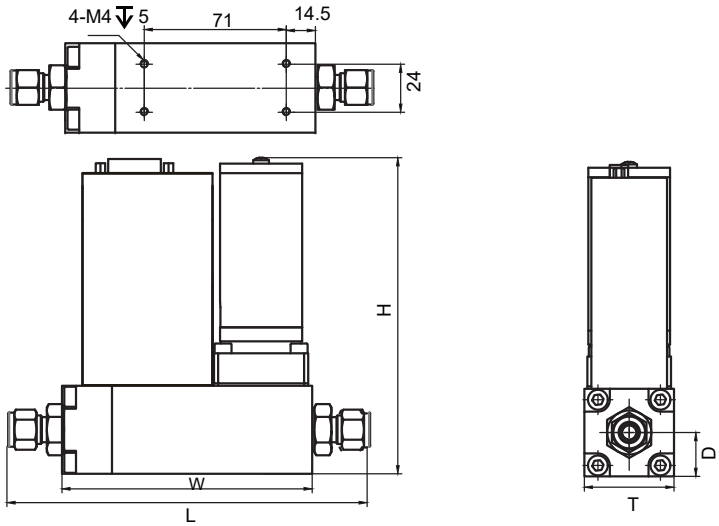
Product	Fitting	L	W	T	H	D
S600-BR212 / 222	4IS: 1/4 inch Swagelok	127	76	35	135	12.7
	4CR: 1/4 inch VCR	124	76	35	135	12.7
S600-BM212 / 222	4IS: 1/4 inch Swagelok	127	70	35	135	12.7
	4CR: 1/4 inch VCR	124	70	35	135	12.7
S600-BR226	4IS: 1/4 inch Swagelok	127	76	35	135	12.7
	4CR: 1/4 inch VCR	124	76	35	135	12.7
S600-BM226	4IS: 1/4 inch Swagelok	127	70	35	135	12.7
	4CR: 1/4 inch VCR	124	70	35	135	12.7
S600-BR624	4IS: 1/4 inch Swagelok	127	76	35	126	12.7
	4CR: 1/4 inch VCR	124	76	35	126	12.7
S600-BM624	4IS: 1/4 inch Swagelok	127	70	35	126	12.7
	4CR: 1/4 inch VCR	124	70	35	126	12.7

BM/BR 527X

Product	Fitting	L	W	T	H	D
S600-BR527X	4IS: 1/4 inch Swagelok	127	76	31.6	132	12.75
	4CR: 1/4 inch VCR	124	76	31.6	132	12.75
S600-BM527X	4IS: 1/4 inch Swagelok	127	76	31.6	132	12.75
	4CR: 1/4 inch VCR	124	76	31.6	132	12.75

External dimensions

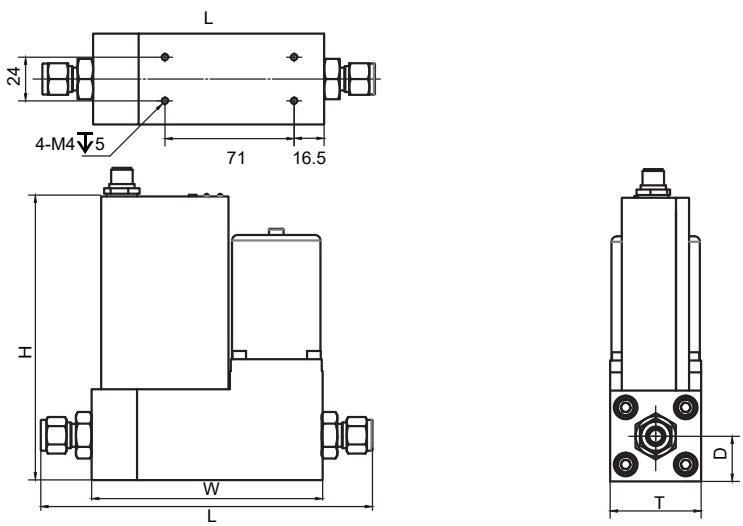
CR 212/222/226/624/527X



CR 212/222/226/624/527X

Product	Fitting	L	W	T	H	D
S600-CR212/222/226	6IS: 3/8 inch Swagelok	181	125	45	158	22
	8CR: 1/2 inch VCR	180	125	45	158	22
S600-CR624/527X	6IS: 3/8 inch Swagelok	181	125	45	158	22
	8CR: 1/2 inch VCR	180	125	45	158	22

DR 212/222/624/527X



DR 212/222/624/527X

Product	Fitting	L	W	T	H	D
S600-DR212/D222	6IS: 3/8 inch Swagelok	183	127	50	156	25
	8CR: 1/2 inch VCR	182	127	50	156	25
S600-DR624/527X	6IS: 3/8 inch Swagelok	183	127	50	156	25
	8CR: 1/2 inch VCR	182	127	50	156	25

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