HORIBA

New

Digital Mass Flow Controller

SEC-N100

Digital/Analog model

SEC-N102

Device Net model

DeviceNet™

SEC-N104

PROFIBUS model

DC24V drive, current or voltage control model

PROFI BUS

SEC-N106

High accuracy
±1.0% S.P.

High-speed response
1 second response at any setpoint

Flexible
Muti-gas,Multi-range

HORIBA STEC, Co., Ltd.

Based on technologies developed in fields at the cutting edge, we offer various models that meet customer needs

Gases are used for various purposes in wide industries: ranging from the research and manufacture of solar panels and fuel cells, the subjects of much attention as new sources of energy, to the research and manufacture of semiconductors, liquid crystal panels, and LEDs in the electronics industry. In this way gases support the development of society.

HORIBASTEC leads the world in the development of advanced mass flow technology. Our products offer reliable, state of the art solutions for the semiconductor manufacturing and related industries.

Digital Mass Flow Controller

SEC-N100

HORIBA STEC offers a full lineup to meet your requirements.

Select transmission mode	Select power supply	Models
Digital communication ▶RS485 F-NET Protocol **Analog communication** ▶0～5VDC	**±15VDC** HORIBA STEC'S lineup includes power supply PE series.	**SEC-N102** series 
DeviceNet communication	**Conforming to ODVA standards**	**SEC-N104** series 
PROFIBUS communication **Analog communication** ▶0 to 5VDC, 0 to 10VDC 4 to 20mA	**24VDC(13 to 32VDC)**	**SEC-N106** series 

Model range covers flows up to 200slm (N_2 equivalent)

Flow rate range is controlled from 2% of full-scale flow rate.

model	flow rate range (full-scale) 10SCCM – 10SLM	20SLM – 50SLM	100SLM	200SLM
SEC-N102 series	SEC-N112	SEC-N122	SEC-N132	SEC-N142
SEC-N104 series	SEC-N114	SEC-N124	SEC-N134	SEC-N144
SEC-N106 series	SEC-N116	SEC-N126	SEC-N136	SEC-N146

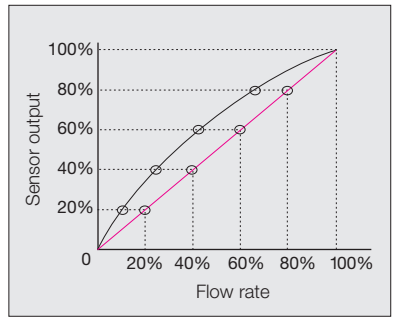
【High accuracy】

High S.P. accuracy

MFC' s linearity is compensated by polynomial approximated curve. This achieves high accuracy for all flow control ranges. For the purpose of advancement of actual gas accuracy, the calibration data of various process gases are measured by HORIBA STEC standard gas measurement system.

Accuracy	±1.0% S.P.	: 30–100% F.S.
	±0.3% F.S.	: ≤30% F.S.

(SEC-N110/N120)

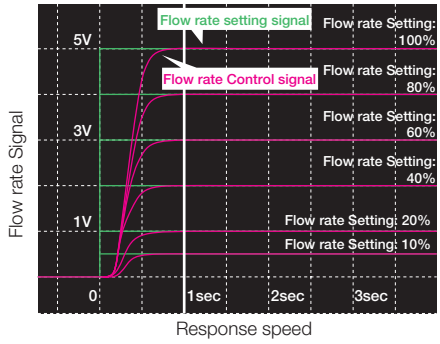


$$y=ax^5+bx^4+cx^3+dx^2+ex+f$$

【High-speed response throughout the flow rate range】

New variable PID algorithm: 1 second high-speed response

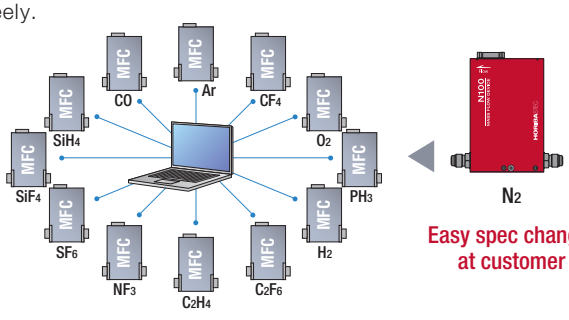
SEC-N100 series is installed with the latest "Variable PID system", which can achieve 1 second response to all setting points. Variable PID is continuously changing depending on setting flow points, this allows the PID factor to be optimized when you change full scale flow and gas.



【Multi-gas, multi-range solution】

Exclusive software allows the user to alter specification easily

The latest multi-gas, multi-range system has made it possible for the user to change the type of gas or full-scale flow rate freely.



Exclusive software, Configuration software

SEC-N100 series offers multi-gas, multi-range functionality, thanks to its configuration software. This software makes it possible to select MR/MG numbers simply by entering the type of gas being used and the flow rate range, and also features a handy N_2 gas conversion feature for flow rate measurements using N_2 gas during receipt inspections. To ensure that the software is used without error, HORIBA STEC offers software operation seminars, please contact your HORIBA STEC representative.

Suitable for multiple type of gas

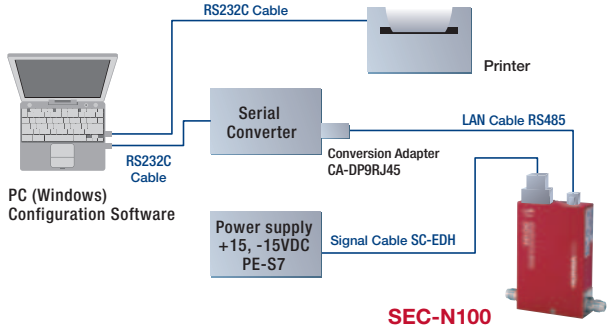
Freely change type of gas

Example : SEC-N100 MR•MG-02 — N_2 100 SCCM ▶ Ar 110 SCCM

Suitable of multiple ranges

Freely change the full-scale flow rate control range.

Example : SEC-N100 MR•MG-04 — N_2 1000 SCCM (Flow rate control range 20～1000 SCCM) ▶ N_2 250 SCCM (Flow rate control range 5～250 SCCM)



Product specifications

▶Common specifications

Mass Flow controller model	SEC-N112MGM SEC-N114MGM SEC-N116MGM	SEC-N112MGR SEC-N114MGR SEC-N116MGR	SEC-N122MGM SEC-N124MGM SEC-N126MGM	SEC-N122MGR SEC-N124MGR SEC-N126MGR	SEC-N132MGM SEC-N134MGM SEC-N136MGM	SEC-N132MGR SEC-N134MGR SEC-N136MGR	SEC-N142MGM SEC-N144MGM SEC-N146MGM	SEC-N142MGR SEC-N144MGR SEC-N146MGR
Mass Flow meter model	SEF-N112MGM SEF-N114MGM SEF-N116MGM	SEF-N112MGR SEF-N114MGR SEF-N116MGR	SEF-N122MGM SEF-N124MGM SEF-N126MGM	SEF-N122MGR SEF-N124MGR SEF-N126MGR	SEF-N132MGM SEF-N134MGM SEF-N136MGM	SEF-N132MGR SEF-N134MGR SEF-N136MGR	SEF-N142MGM SEF-N144MGM SEF-N146MGM	SEF-N142MGR SEF-N144MGR SEF-N146MGR
Full-scale flow rate (N_2 conversion flow rate)	R01 : 10SCCM R1.5: 17.5SCCM 01 : 30SCCM 1.5 : 55SCCM 02 : 100SCCM 2.5 : 175SCCM 03 : 300SCCM 3.5 : 550SCCM 04 : 1SLM 4.5 : 1.75SLM 05 : 3SLM 5.5 : 5.5SLM 06 : 10SLM		6.5: 22SLM 07 : 30SLM 08 : 50SLM		09: 100SLM		10 : 200SLM	
Valve type	C: Normally closed				C: Normally closed / O: Normally open			
Flow rate at fully closed control valve	≤2% F.S.							
Flow rate control range	2-100% of F.S.							
Flow rate measuring range (SEF)	0-100% of F.S.							
Accuracy *1	±1.0% S.P. (Flow rate > 30% F.S.) ±0.3% F.S. (Flow rate ≤ 30% F.S.)				±1.0% S.P. (Flow rate > 35% F.S.) ±0.35% F.S. (Flow rate ≤ 35% F.S.)			
Operating temperature	5 to 50°C (recommended temperature range: 15 to 45°C)							
Response	≤1 second: Over full flow rate range							
Linearity	≤±0.5% F.S.							
Repeatability	≤±0.2% F.S.							
Operating differential pressure	50 to 300kPa (d) MR. MG-5.5, 06:100 to 300kPa (d)		200 to 300kPa (d)		100 to 300kPa (d)		200 to 300kPa (d)	
Operating differential pressure (SEF)	≤300kPa (d)							
MAX.Operating pressure	450kPa (d)							
Pressure resistance	1000kPa (d)							
Leak integrity *2	≤5x10^{-12}Pa•m^3/s (He)	≤1x10^{-10}Pa•m^3/s (He)	≤5x10^{-12}Pa•m^3/s (He)	≤1x10^{-10}Pa•m^3/s (He)	≤5x10^{-12}Pa•m^3/s (He)	≤1x10^{-10}Pa•m^3/s (He)	≤5x10^{-12}Pa•m^3/s (He)	≤1x10^{-10}Pa•m^3/s (He)
Wetted materials	SUS316L PTFE magnetic stainless	SUS316L PTFE magnetic stainless Viton®	SUS316L PTFE magnetic stainless	SUS316L PTFE magnetic stainless Viton®	SUS316L	SUS316L Viton®	SUS316L	SUS316L Viton®
Standard fitting	1/4 inch VCR equivalent				1/2 VCR equivalent			
Mounting orientation	Free							

*1 Guarantee temperature of flow rate accuracy is based on SEMI standards E56-1296. This is accuracy for full-scale point of MR.MG number.

*2 Per SEMI standards E16-90

* SCCM, SLM are numbers that represents flow rate (mL/min, L/min, at 0°C101.3 kPa)

▶Communication/power supply

Digital/Analog communication model

SEC-N102 series

Mass Flow controller model	SEC-N112MGM	SEC-N112MGR	SEC-N122MGM	SEC-N122MGR	SEC-N132MGM	SEC-N132MGR	SEC-N142MGM	SEC-N142MGR
Mass Flow meter model	SEF-N112MGM	SEF-N112MGR	SEF-N122MGM	SEF-N122MGR	SEF-N132MGM	SEF-N132MGR	SEF-N142MGM	SEF-N142MGR
Flow rate setting signal	0.1 to 5 VDC (2% to F.S.); Input impedance 1MΩ or higher							
Flow rate output signal	0 to 5 VDC (0% to F.S.); Minimum load resistance 2kΩ							
Digital interface	With address function: RS-485 (transmission speed 38400bps) F-NET Protocol							
Power supply	+15V±5% 150mA -15V±5% 200mA		+15V±5% 150mA -15V±5% 250mA		+15V±5% 150mA -15V±5% 150mA			

DeviceNet™ communication model

SEC-N104 series

Mass Flow controller model	SEC-N114MGM	SEC-N114MGR	SEC-N124MGM	SEC-N124MGR	SEC-N134MGM	SEC-N134MGR	SEC-N144MGM	SEC-N144MGR
Mass Flow meter model	SEF-N114MGM	SEF-N114MGR	SEF-N124MGM	SEF-N124MGR	SEF-N134MGM	SEF-N134MGR	SEF-N144MGM	SEF-N144MGR
Digital interface	DeviceNet™ Protocol							
Power supply	Comforming to ODVA standards, DC24V 7.0VA				Comforming to ODVA standards, DC24V 4.0VA			

PROFIBUS communication/Analog communication

SEC-N106 series

Mass Flow controller model	SEC-N116MGM	SEC-N116MGR	SEC-N126MGM	SEC-N126MGR	SEC-N136MGM	SEC-N136MGR	SEC-N146MGM	SEC-N146MGR
Mass Flow meter model	SEF-N116MGM	SEF-N116MGR	SEF-N126MGM	SEF-N126MGR	SEF-N136MGM	SEF-N136MGR	SEF-N146MGM	SEF-N146MGR
Flow rate setting signal	0.1 to 5VDC/0.2 to 10VDC/4.32 to 20mA (2% to F.S.)							
Flow rate output signal	0 to 5 VDC/0 to 10VDC/4 to 20mA (0% to F.S.)							
Digital interface	PROFIBUS-DP Protocol							
Power supply	24VDC (13 to 32VDC) 7.5VA				24VDC (13 to 32VDC) 4.5VA			

▶Selecting a model

	model					specification								
SEC-N1	1	2	MG	M	C	T	1			MR.MG-04	1SLM	4CR	L	N_2
SEC-N1	3	4	MG	R	O	S	1	3		MR.MG-09	100SLM	8CR	G	Ar
Ⓐ	Ⓑ	Ⓒ		Ⓓ	Ⓔ	Ⓕ		Ⓖ	Ⓗ	Ⓘ	Ⓙ	Ⓚ	Ⓛ	Ⓜ

Ⓐ Model
SEC-N1: Mass flow controller
SEF-N1: Mass flow meter

Ⓑ Full-scale flow rate
1: 10 SLM (N_2 equivalent flow rate)
2: 50 SLM (N_2 equivalent flow rate)
3: 100 SLM (N_2 equivalent flow rate)
4: 200 SLM (N_2 equivalent flow rate)

Ⓒ Transmission mode
2: Digital communication (RS-485/F-net Protocol), Analog communication (voltage signal)
4: DeviceNet™
6: PROFIBUS communication , Analog communication (voltage signal/current signal)

Ⓓ Seal
M : Metal seal
R : Rubber seal

Ⓔ Valve type
Blank: for SEF
C : normally close
O : normally open: applicable with SEC-N130, SEC-N140

Ⓕ Connector position
T: Top of case (standard)
S: Side of case (applicable with SEC-N104)

Ⓖ DeviceNet output range
Blank : not a DeviceNet model
1 : DeviceNet model
: Full-scale flow rate output 100% F.S.
3 : DeviceNet model
: Full-scale flow rate output 133% F.S.
5 : DeviceNet model
: Full-scale flow rate output 133.329% F.S.

Ⓗ PROFIBUS communication: voltage/current select (compatible with SEC-N106)
Blank : not a PROFIBUS communication
1 : setting/output signal 0~5 VDC
2 : setting/output signal 0~10 VDC
3 : setting/output signal 4~20mA

Ⓘ Multi-range, multi-gas (MR, MG) numbers
Please specify MR, MG numbers.
For details, please see the specifications below.

Ⓙ Full-scale flow rate
Please specify full-scale flow rate.

Ⓚ Joint
4CR: 1/4 VCR male type fitting (applicable with SEC-N110 and SEC-N120)
8CR: 1/2 VCR male type fitting (applicable with SEC-N130 and SEC-N140)

Ⓛ Face to face distance
L : 124mm
(1/4 VCR male type fitting. applicable with SEC-N110 and SEC-N120)
S : 132mm
(1/2 VCR male type fitting. applicable with SEC-N130 and SEC-N140)
J : 150.4mm
(1/2 VCR male type fitting. applicable with SEC-N130 and SEC-N140)
G : 177mm
(1/2 VCR male type fitting. applicable with SEC-N130 and SEC-N140)

Ⓜ Types of gas
Blank : type of gas is not specified by MR,MG compatibility gas name.
ex.N_2 : gas being used

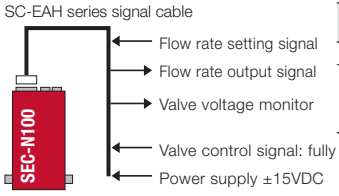
▶Gas and full-scale flow rate table (e.g.)

type of gas / MR.MG number	N_2	Ar	H_2	He	CO_2	CH_4
SEC-N110						
R01	3-10	4-11	—	4-12	3-8	2-7
R1.5						
01	10-30	11-35	8-30	10-38	7-25	6-22
1.5						
02	25-100	35-110	25-100	33-120	21-83	19-75
2.5						
03	75-300	110-350	75-300	99-380	64-250	57-220
3.5						
04	250-1000	350-1100	250-1000	330-1300	210-830	190-750
4.5						
05	750-3000	1100-3500	750-3000	1100-4100	610-2400	590-2300
5.5						
06	2500-10000	3500-11000	2500-10000	3900-13000	2000-8000	2000-7800
SEC-N120						
6.5						
07	10000-30000	10000-30000	10000-30000	12000-30000	7300-21000	5800-22000
08	30000-50000	30000-50000	30000-50000	30000-50000	21000-35000	—
SEC-N130						
09	50000-100000	—	—	—	35000-75000	—
SEC-N140						
10	100000-200000	—	—	—	—	—

Connector examples

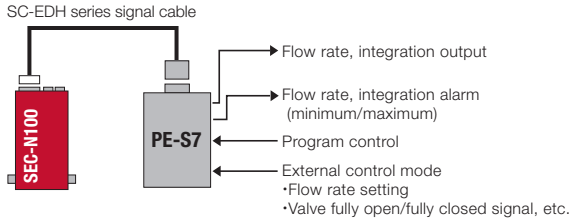
Analog communication

Using an external power source and control signal



model	flow rate signal	flow rate output signal
SEC-N102	0.1～5VDC	0～5VDC
SEC-N106	0.1～5VDC	0～5VDC
	0.2～10VDC	0～10VDC
	4.32～20mA	4～20mA

Using various functional power control unit, PE-S7



SEC-N102 Analog connector

Pin No.	name of signnal	
1	Compulsory valve open/close signal	*1
2	Flow rate output signal 0 to 5V DC(minimum load resistance 2kΩ)	
3	Power supply : +15V DC	
4	Power supply : common	*2
5	Power supply : -15V DC	
6	Flow rate setting signal : 0 to 5V DC (input impedance 1MΩ or higher)	*1
7	Signal : common	*2
8	Signal : common	*2
9	Valve position monitoring	

Connector used: D-subminiature 9-contact-pin (with M3 fastening screws)

*1 SEF series is N.C.

*2 The pin No.4 common power source and pin No.7 common signal should be connected at the GND side of power supply for preventing change of common voltage by valve power supply.
No.7 and No.8 common signal are connected inside.

SEC-N106 Analog connector

Pin No.	name of signnal	
1	Compulsory valve open/close signal	*1
2	Flow rate output signal	
3	Power supply (13 to 32VDC)	*2
4	Signal : Common	
5	Power supply : common (0VDC)	*2
6	Flow rate setting signal	*1
7	Flow rate output signal :common	
8	Flow rate setting signal :common	
9	Valve position monitoring	

Connector used: D-subminiature 9-contact-pin (with #4-40 UNC inch screws)

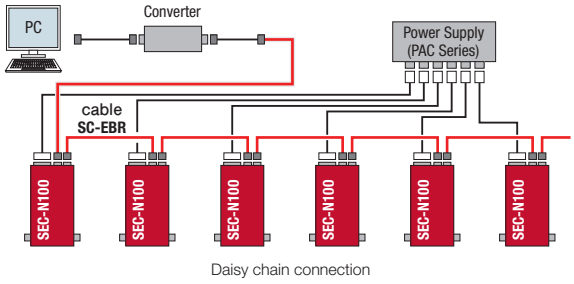
*1 SEF series is N.C.

*2 Power circuit and input-output adapter are isolated.

* Impedance of flow rate setting signal input
0 to 5VDC, 0 to10 VDC: 1MΩ, 4 to 20mA: 250Ω

Load resistance of flow rate output signal
0 to 5 VDC: Minimum load resistance 2kΩ, 0 to10VDC: minimum load resistance: 5kΩ
4 to 20 mA : Maximum load resistance 250Ω

Digital communication

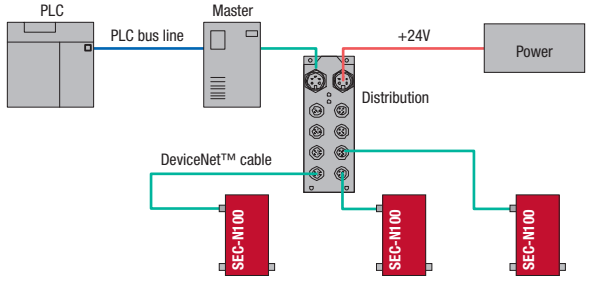


RS485 digital communication

Pin No.	name of signnal
1	Digital signal : common
2	Digital signal : common
3	N.C.
4	Serial output (-)
5	Serial output (+)
6	N.C.
7	N.C.
8	N.C.

Connector used: RJ45 connector

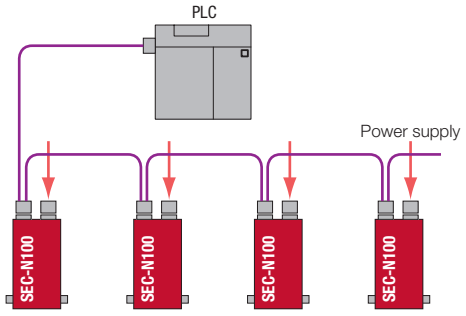
DeviceNet™communication



DeviceNet™communication

DeviceNet™ is an open and global field network that was developed by the ODVA (Open DeviceNet™ Vendor Association, Inc.) as a unique means for supporting standardization worldwide. The ODVA offers EDS (Electronic Data Sheet) specifications, which are designed to allow shared operability and programming on a multi-vendor environment. The ODVA also carries out conformance testing. Device that have passed the ODVA's conformance testing can display the DeviceNet logo.

PROFIBUS communication



PROFIBUS communication

PROFIBUS is an open field bus that is certified IEC61158. It is composed of PROFIBUS-DP for factory automation and PROFIBUS PA for process automation. PROFIBUS Organization supports standardization worldwide.

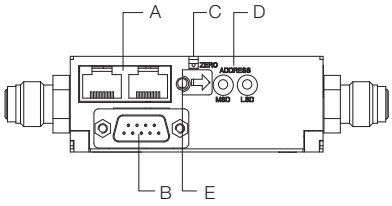
PROFIBUS communication connector

Pin No.	name of signal
1	N.C.
2	N.C.
3	RXD/TXD-P
4	CNTR-P
5	Digital ground
6	V.P.
7	N.C.
8	RXD/TXD-N
9	N.C.

Connector used:
D-subminiature 9-contact-socket connector
(with #4-40 UNC inch screws)

▶Digital/Analog model

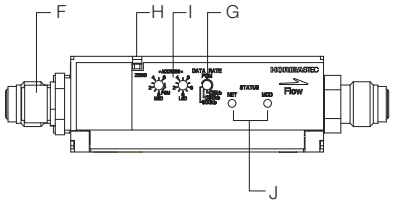
SEC-N102



Code	Name	Account
A	Digital transmission connector	RS-485 communication. Daisy chain connection is available
B	Analog connector	Provision of power supply. For analog transmission
C	ZERO adjust switch	Switch for correcting ZERO-point
D	Address setting switch	It is possible to set in the range of 0×01 to 0×99
E	Indicator LED	While analog communication, green lights turns on. (When alarm and correct ZERO-point, red lights turn on)

▶DeviceNet™ model

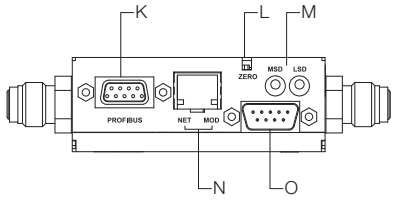
SEC-N104



Code	Name	Account
F	DeviceNet™connector	For DeviceNet™ communication. Shield Micro-connector
G	Transmission setting switch	Transmission speed setting
H	ZERO adjust switch	Switch for correcting ZERO-point
I	Address setting switch	It is possible to set in the range of 00 to 63.
J	Indicator LED	NET: it represents condition of network. MOD: it represents conditon of node.

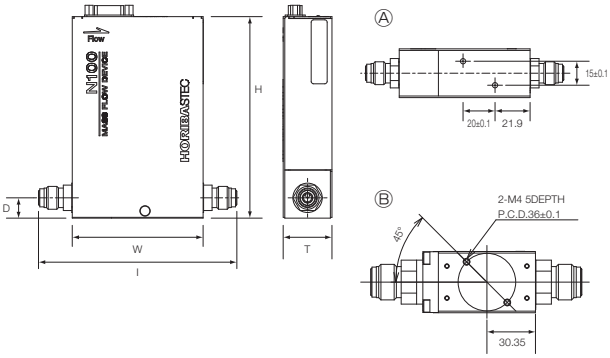
▶PROFIBUS /Analog model

SEC-N106



Code	Name	Account
K	PROFIBUS Connector	For PROFIBUS communication
L	ZERO adjust switch	Switch for correcting ZERO-point
M	Address setting switch	It is possible to set in the range of 0×01 to 0×7D
N	Indicator LED	NET: it represents condition of network. MOD: it represents conditon of node.
O	Analog connector	Provision of power supply. For analog communication

▶External dimensions



model	H	T	W	I		D	position of fastened screws
				1/4VCR type	1/2VCR type		
SEC-N112	126±1	30.5±0.5	81.8	124±1 (4CRL)	—	12.7	See left diagram Ⓐ
SEC-N122							
SEC-N132	139±1	38.3±0.5	70.4	—	132(8CRS) 150.4(8CRJ) 177(8CRG)	18.5	See left diagram Ⓑ
SEC-N142							
SEC-N114	126±1	30.5±0.5	81.8	124±1 (4CRL)	—	12.7	See left diagram Ⓐ
SEC-N124							
SEC-N134	150±1	38.3±0.5	70.4	—	132(8CRS) 150.4(8CRJ) 177(8CRG)	18.5	See left diagram Ⓑ
SEC-N144							
SEC-N116	136±1	30.5±0.5	81.8	124±1 (4CRL)	—	12.7	See left diagram Ⓐ
SEC-N126							
SEC-N136	136±1	38.3±0.5	70.4	—	132(8CRS) 150.4(8CRJ) 177(8CRG)	18.5	See left diagram Ⓑ
SEC-N146							

(Unit:mm)

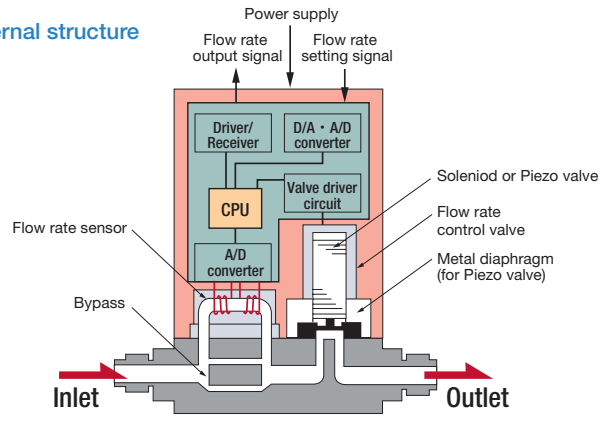
▶Structure and operating principles

The general structure of the SEC-N100 series of mass flow controller is shown in the diagram to the right. These mass flow controllers have flow rate measurement section that includes a sensor, bypass, flow rate control valve, and special circuitry. A CPU is part of the circuitry, which makes it both multi-functional and highly efficient.

The gas is input from an inlet joint, and is divided so that it flows over both the flow rate sensor and a bypass. The sensor measures the mass flow rate of the gas, and the flow rate control valve modifies the flow rate so that the difference between the measured flow rate and the flow rate received from the external flow rate setting signal is 0 (zero).

The units feature a loop circuit, so even if there is a secondary pressure change or ambient temperature change that could affect the supply pressure of the introduced gas, the flow rate is instantaneously corrected, which ensures stable flow rate control.

Internal structure



Multifunctional controller

PE-S7

The PE-S7, which comes with a program setting function, a preset function, and an integration function, is a RoHS-compliant multifunctional controller. Its front control panel offers improved ease of use.

■Specifications

●Multi-range solution ● flow rate setting function/6 presets ● program control function ● flow rate display ● integration flow rate alarm function, external output: open connector ● soft-start function, soft-start: ≤6 second, slow-start: ≤1200 second ● flow rate output signal: 0 to 5VDC external control function, flow rate setting signal input, flow rate control valve signal input: fully open/ fully closed ● power supply input: AC100V to 240V, 50/60Hz 30VA MAX ● dimensions: 48(W)x192(H)x190(D) mm (except projection portion) ● conforming to CE marking, EMC, FCC, and PSE. RoHS compliant ● conforming to digital/ analog transmission model

Dedicated power supply

PE series

The PE series provides a power supply to drive mass flow controllers/meters and auto pressure regulator with a reference voltage of 5 VDC for analog control. A model supporting current control (4–20mA), a model with a flow rate alarm output, and a model that can drive more than one unit (4 or 6units) are also available. All the models comply with the CE marking safety standard, the EMC Directive, the FCC, the Electrical Appliance and Material Safety Act, and the RoHS Directive so as to protect the environment.

▶Standard model PE-20 series

Conforming to digital/analog transmission

Power supply input:AC100~240V 50/60Hz
1 unit drive PE-21 (30VA MAX)
4 units drive PE-24 (90VA MAX)
9 units drive PE-26 (140VA MAX)

▶Alarm model PE-30A series

- It is impossible to set two-volume flow rate alarm into each power equipment.
  Alarm setting is held by volume of the main unit carrying.
- Digital/analog solutions

Power source: AC100~ 340V 50/60Hz

1 unit driving	PE-31A (30VA MAX)
4 units driving	PE-34A (90VA MAX)
6 units driving	PE-36A (140VA MAX)

▶Current control model PE-30S series

- Current control: 4 to 20 mA. Analog signal enable to long-distance control.
- It is impossible to set two-volume flow rate alarm into each power equipment.
  Alarm setting is held by volume of the main unit carrying.
- Digital/analog solutions

Power source: AC100~ 340V 50/60Hz

1 unit driving	PE-31 S (30 VA MAX)
4 units driving	PE-34 S (90VA MAX)

We perform a change of components used and production technique for production improvement at any time.

HORIBASTEC
HORIBA STEC, Co., Ltd.
http://www.horiba-stec.jp/e.

Please read the operation manual before using this product to ensure safe and proper handling of the product.

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