

# Air Flow Controller



Applicable fluid **Dry air, N<sub>2</sub>**

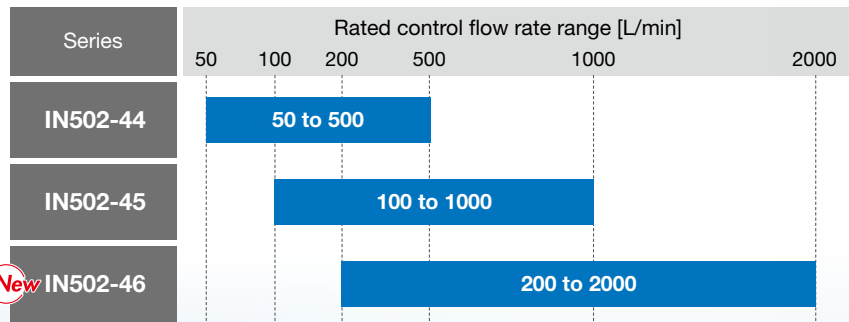
**RoHS**

**New** A rated control flow rate range of 200 to 2000 L/min has been added.

**IP65**

**IO-Link**

## Automatic flow rate adjustment is possible.



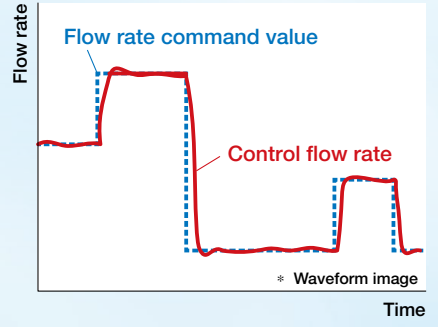
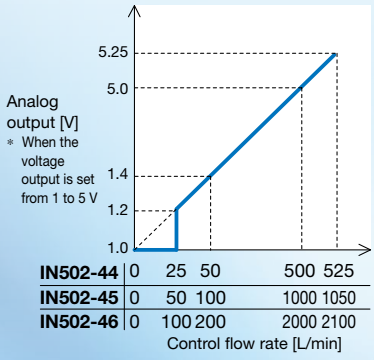
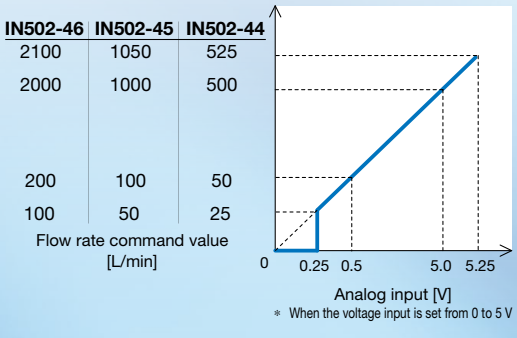
**Control Accuracy**  $\pm 5\%$  F.S.

**Responsiveness** 0.5 s or less

Input signal – Flow rate command value

Control flow rate – Output signal

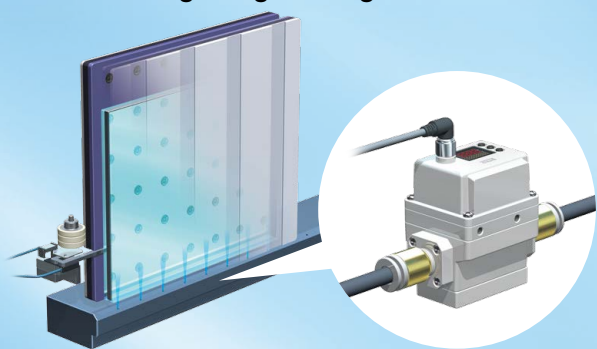
Flow rate control that follows the flow rate command



## Applications

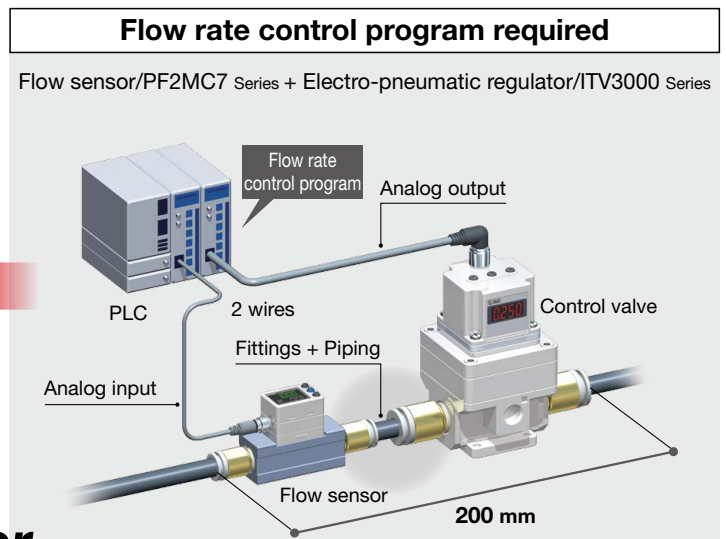
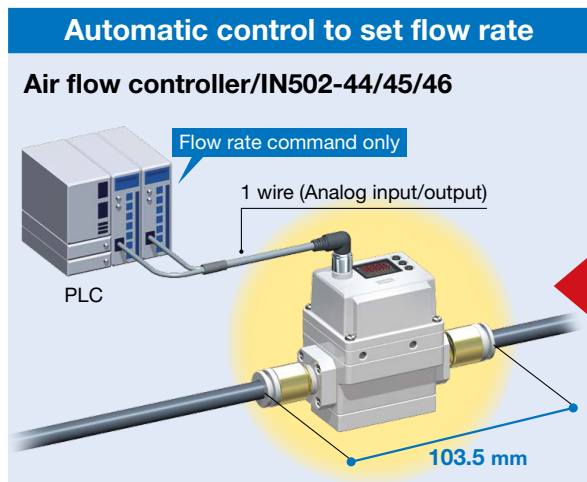
For laminated glass gas filling control

For laminated metal machining unit shielding gas control

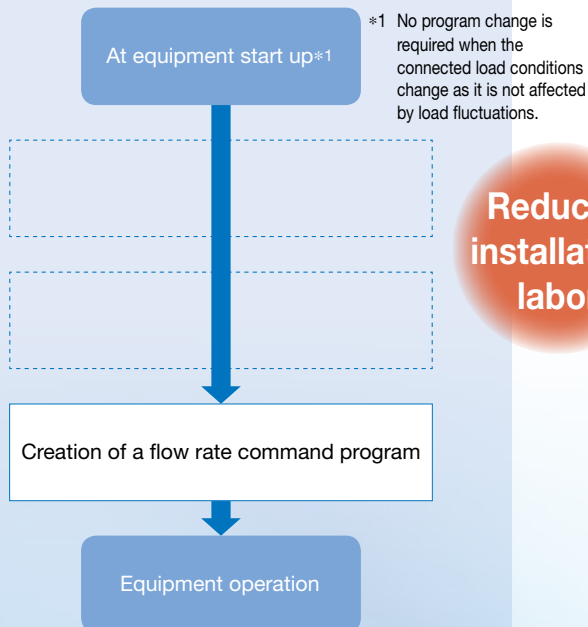


**IN502-44/45/46**

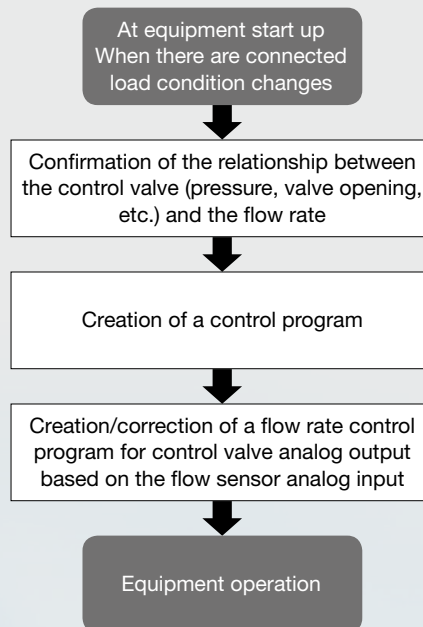
# Space saving/Reduced piping, wiring, and installation labor



## Reduced installation labor



Reduced installation labor



## Reduced effects of load fluctuations

### Changes in connected load conditions

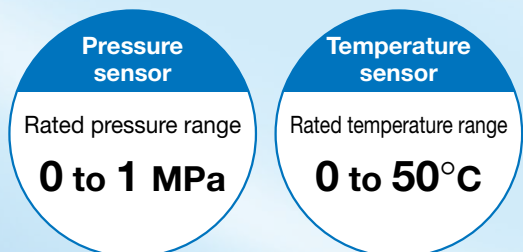
- Control target changes
- Pipe length and pipe bore size changes
- Changes in components, etc.

### The outlet pressure\*1 and fluid temperature\*1 can be measured simultaneously.

\*1 When using IO-Link communication  
\*1 Reference value

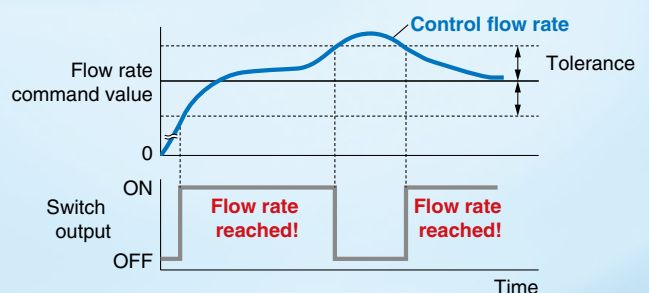
Measurement and output have been made possible by adopting flow rate conversion (differential pressure type) using a pressure sensor and flow rate temperature correction using a temperature sensor.

p. 6



### Notifies when the control flow rate command value has been reached

Switch output is performed when the control flow rate falls within the specified allowance with respect to the flow rate command value in the switch output "tolerance mode." (The factory-set tolerance is  $\pm 2\%$  F.S.)



## 3-screen display



Current control flow rate value (Main screen)

**FLOW CONTROLLER**

Label (Sub screen/Left side)      Value (Sub screen/Right side)

**Visualization of settings**

Flow rate command value	5.00 0
Outlet pressure value	500 KPA
Flow rate bottom value	H.Lo 0
Flow rate peak value	H.Hi 500
Mode display	MODE 5.10

## Various types of grease can be selected.

### Grease compatible with low dew points

Compatible with low dew point air

### White vaseline

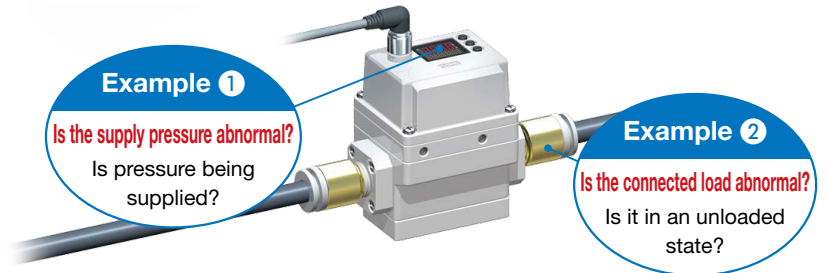
Compatible with paint and other coatings

### Grease for food

Compatible with NSF H1 grade food grade greases

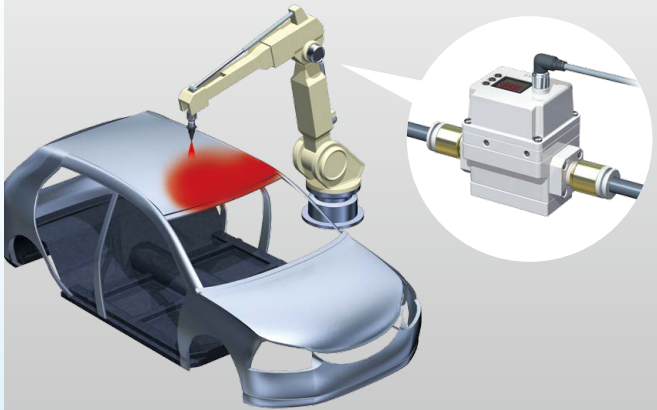
## Various control diagnostics

Control flow rate unreachable	The control flow rate does not reach the flow rate command value.
Load error	The load pressure exceeds the specification range due to the connected load.
Control error	Abnormalities in the product (operation, sensor, etc.)

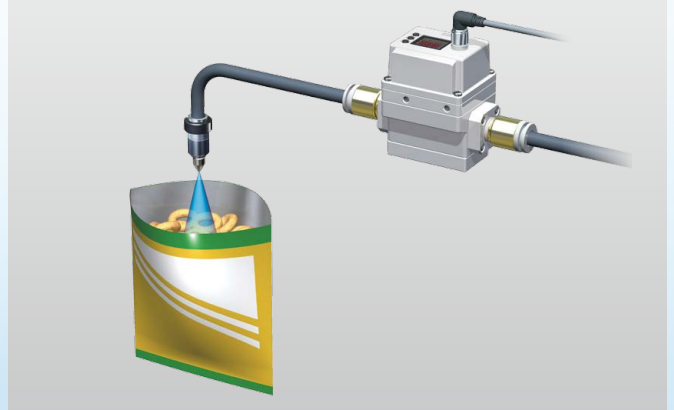


## Applications

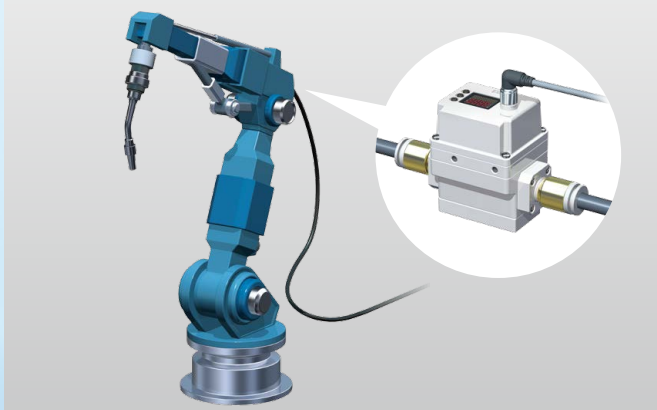
For painting (Control of shaping air/bell rotation control air)



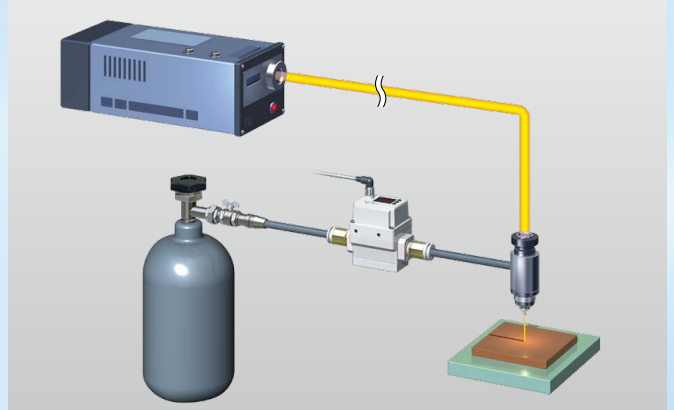
For food packaging (Control of charge gases)

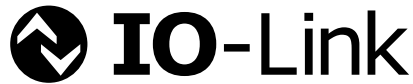


For arc welding (Control of purge air)



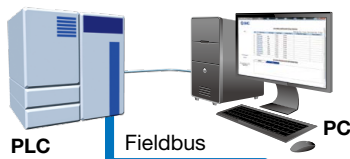
For laser welding (Control of assist gases)





IO-Link is an open communication interface technology between the sensor/ actuator and the I/O terminal that is an international standard, IEC 61131-9.

## Visualization of operation/equipment status Remote monitoring and control by communication



### Configuration File (IODD File\*1)

- Manufacturer
- Product part no.
- Set value

\*1 IODD File

IODD is an abbreviation of IO Device Description. This file is necessary for setting the device and connecting it to a master. Save the IODD file on the PC to be used to set the device prior to use.

### Device settings can be set by the master.

- Threshold value
- Operation mode
- Flow rate command value, etc.

### Read the device data.

- Switch ON/OFF signal and analog data
- Device information: Manufacturer, Product part number, Serial number, etc.
- Normal or abnormal device status
- Cable breakage



IO-Link Master

### Implement diagnostic bits in the process data.

The diagnostic bit in the cyclic process data makes it easy to find problems with the equipment.

It is possible to find problems with the equipment in real time using the cyclic (periodic) data and to monitor such problems in detail with the noncyclic (aperiodic) data.

#### Input process data

Bit offset	Item	Note
0	Flow rate SW	0: OFF 1: ON
8	Flow rate diagnosis	0: Normal 1: HHH
9	Pressure diagnosis	0: Normal 1: HHH/LLL
10	Temperature diagnosis	0: Normal 1: Abnormal
11	Output PD	0: Within range 1: Out of range
13	Fixed output	0: Normally 1: Fixed
14	Error	0: Normal 1: Abnormal
15	System error	0: Normal 1: Abnormal
16 to 31	Measured fluid temperature	Signed 16 bit
32 to 47	Measured outlet pressure	Signed 16 bit
48 to 63	Measured flow rate value	Signed 16 bit

#### Diagnosis items

- Out of rated flow range
- Pressure display out of range
- Abnormal temperature
- Error diagnosis (Over current, Outside of zero-clear range, Flow rate not reached, Load, Control)
- System error diagnosis (Internal malfunction)

Bit offset	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
Item	Measured flow rate value: Signed 16 bit															
Bit offset	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
Item	Measured outlet pressure: Signed 16 bit															
Bit offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Item	Measured fluid temperature: Signed 16 bit															
Bit offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	System error	Error	Fixed output	Reservation	Output PD	Temperature diagnosis	Pressure diagnosis	Flow rate diagnosis	Reservation							Flow rate SW

#### Output process data

Bit offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	Flow rate command value: Signed 16 bit															

### Displays the output communication status and indicates the presence of communication data






#### Operation and Display

Communication with master	IO-Link status indicator light	Status	Screen display*2	Description
Yes	*1	Normal	Operate	MODE oPE Normal communication status (readout of measured value, command) * Output process data valid
			Start up	MODE StE Normal communication status (readout of measured value) * Output process data invalid
			Preoperate	MODE PrE At the start of communication
No	*1 (Flashing)	Abnormal	Er 15 IO-Link version does not match that of the master. The master uses version 1.0. * The applicable IO-Link version is 1.1.	
		Communication disconnection	MODE oPE MODE StE MODE PrE Normal communication was not received for 1 second or longer.	
OFF		SIO mode	MODE Sio	General switch output

\*1 In IO-Link mode, the IO-Link indicator is ON or flashes. \*2 When the sub screen is set to Mode

\* "ModE LoC" is displayed when the data storage lock is enabled. (Except for version mismatch or when in SIO mode)

## Flow Controller Flow Rate Variations

Series	Applicable fluid	Control accuracy	Repeatability	Enclosure	IO-Link compatible	Port size	Rated flow range [L/min]															
							0.1	1	10	25	50	100	200	300	500	1000	2000					
<b>PFCA7</b> 	Dry air N <sub>2</sub> Ar CO <sub>2</sub>	±3% F.S.	±1% F.S.	IP40	●	ø4, ø6, ø8, ø1/4" (Rc, NPT, G) 1/8, 1/4	0.1 10															
							0.2 25															
							0.5 50															
							1 100															
<b>IN502-44/45/46</b>  <p>p. 5</p>	Dry air N <sub>2</sub>	±5% F.S.	±2% F.S. * Includes a control dead band (±1% F.S.)	IP65	●	Rc1/2			50 500		100 1000		200 2000									
<b>PFCQ</b> 	Dry air N <sub>2</sub>	±3% F.S.*1	±1% F.S.	IP40	-	Rc1/2	9 300															

\*1 Operating differential pressure: 0.3 MPa, Temperature: 25°C



# Air Flow Controller

# IN502-44/45/46

## How to Order

IN502-44-1A

### Rated control flow rate range

Symbol	Description
44	50 to 500 L/min
45	100 to 1000 L/min
46	200 to 2000 L/min

### Grease

Symbol	Description
Nil	Grease compatible with low dew points
A	White vaseline
B	Grease for food



### Specifications

Symbol	Input/Output specification*1	Unit specification	Operation at power-off*5
1	Analog voltage input/output*2, *3 + Switch output	SI units only	Flow rate zero
2		With unit selection function	
3	Analog current input/output + Switch output	SI units only	
4		With unit selection function	
5	Analog voltage input/output*2, *3 + IO-Link*4/ Switch output	SI units only	
6		With unit selection function	
7	Analog current input/output + IO-Link*4/ Switch output	SI units only	
8		With unit selection function	
9	Analog voltage input/output*2, *3 + Switch output	SI units only	Flow rate retention
10		With unit selection function	
11	Analog current input/output + Switch output	SI units only	
12		With unit selection function	
13	Analog voltage input/output*2, *3 + IO-Link*4/ Switch output	SI units only	
14		With unit selection function	
15	Analog current input/output + IO-Link*4/ Switch output	SI units only	
16		With unit selection function	

\*1 Analog I/O and switch output are I/O for the control flow rate.

\*2 The analog voltage input can be selected from 0 to 5 or 0 to 10 V.  
The factory setting is 0 to 5 V.

\*3 Either the 1 to 5 or 0 to 10 V button can be pressed to select the analog voltage output.  
The factory setting is 1 to 5 V.

\*4 The analog input cannot be used in IO-Link mode.

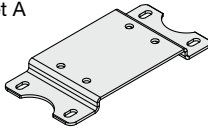
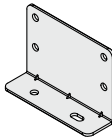
\*5 The operation at power-off, or the operation that is activated when the power supply turns OFF during flow rate control, can be selected via the part number.

Note that when flow rate zero is selected, it is not guaranteed to function as a shut valve. When flow rate retention is selected, it does not guarantee flow rate retention.

### Accessories/Part Nos.

Description	Part no.	Note
Lead wire with M12 connector (Loose wires on 1 side)	EX500-AP010-A	Length: 1 m, Angle
	EX500-AP010-S	Length: 1 m, Straight
	EX500-AP050-A	Length: 5 m, Angle
	EX500-AP050-S	Length: 5 m, Straight
Lead wire with M12 connector (Connectors on both sides)	EX9-AC005-SSPS	Length: 0.5 m, Straight
	EX9-AC010-SSPS	Length: 1 m, Straight
	EX9-AC020-SSPS	Length: 2 m, Straight
	EX9-AC030-SSPS	Length: 3 m, Straight
	EX9-AC050-SSPS	Length: 5 m, Straight
	EX9-AC100-SSPS	Length: 10 m, Straight

\* The lead wire with an M12 connector is not included with the product.  
Please order it separately.

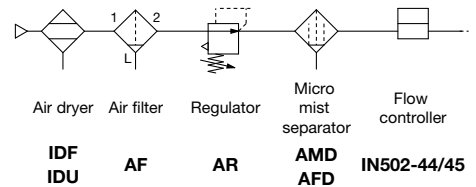
Description	Part no.	Note
Bracket A 	ZS-56-A	With 4 cross recessed round head screws (M5 x 10 L)
Bracket B 	ZS-56-B	With 4 cross recessed round head screws (M5 x 10 L)

## Specifications

Model		IN502-44	IN502-45	IN502-46
Fluid	Applicable fluid*1	Air, Nitrogen*14		
	Fluid temperature range	0 to 50°C		
Flow	Rated control flow rate range	50 to 500 L/min	100 to 1000 L/min	200 to 2000 L/min
	Set control flow rate range*2	25 to 525 L/min	50 to 1050 L/min	100 to 2100 L/min
	Min. set control flow rate unit	1 L/min	1 L/min	2 L/min
Pressure	Operating pressure range	Supply pressure*3: 1.0 MPa or less		
	Load pressure*4	0.1 to 0.6 MPa (100% F.S. at flow rate)		
	Rated measurement pressure range (Outlet pressure)	0.000 to 1.000 MPa		
	Measured pressure range (Outlet pressure)	-0.050 to 1.050 MPa		
	Pressure accuracy (Outlet pressure)	±5% F.S. (Reference value)		
	Proof pressure	1.0 MPa		
Temperature*13	Rated measurement temperature range	0 to 50°C		
	Measured temperature range	-20 to 100°C		
	Temperature accuracy*13	±10% F.S. (Reference value)*15		
Electrical	Power supply voltage	24 VDC ±10%		
	Current consumption*5	0.2 A or less		
	Protection	Power supply polarity protection		
Control	Control accuracy*6, *7	±5% F.S.		
	Flow rate measurement accuracy*8	±3% F.S.		
	Temperature characteristics	±5% F.S. (0 to 50°C, 25°C standard)		
	Pressure characteristics	±5% F.S. (Operating pressure range, reference pressure*9 standard)		
	Settling time	0.5 s or less within ±5% F.S. of flow command (at standard pressure*9)		
Analog output (Control flow rate)	Voltage	Output type: 1 to 5 V, 0 to 10 V selectable		
	Current	Output impedance: Approx. 1 kΩ		
Analog input (Control flow rate) (SIO mode)	Voltage	Input type: 0 to 5 V, 0 to 10 V selectable		
	Current	Input impedance: Approx. 1 MΩ		
Switch output (Control flow rate) (SIO mode)	Output type	Select from NPN or PNP open collector.		
	Output mode	Tolerance, Error output, Output OFF		
	Switch operation	Normal output, Reversed output		
	Max. load current	80 mA		
	Max. applied voltage (NPN only)	30 VDC		
	Internal voltage drop (Residual voltage)	1.5 V or less (at load current of 80 mA)		
Display	Delay time	5 ms or less, variable from 0 to 60 s/0.01 s increments		
	Protection	Over current protection		
	Flow	Reference condition	Select from Standard conditions or Normal conditions.	
		Unit*10	L/min, cfm (ft <sup>3</sup> /min)	
		Display range*2	25 to 525 L/min	50 to 1050 L/min
	Pressure	Min. display unit	1 L/min	2 L/min
		Unit*11	kPa, MPa, kgf/cm <sup>2</sup> , bar, psi	
		Display range	-50 to 1050 kPa	
	Min. display unit	1 kPa		
	Display method	LCD		
Number of screens	3-screen display (Main screen, Sub screen x 2)			
Display color	Main screen: Red/Green, Sub screen: Orange			
Number of display digits	Main screen: 4 digits (7 segments) Sub screen (Left): 4 digits (some digits are 11 segments, 7 segments for others) Sub screen (Right): 5 digits (some digits are 11 segments, 7 segments for others)			
Indicator light	Lights up when switch output is turned ON. OUT1: Orange			
Environmental resistance	Enclosure	IP65		
	Withstand voltage	1000 VAC for 1 min between terminals and housing		
	Insulation resistance	50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing		
	Operating temperature range	Operating: 0 to 50°C, Stored: -10 to 60°C (No condensation)		
Operating humidity range	Operating/Stored: 35 to 85% RH (No condensation)			
Piping	Rc1/2			
Main materials of parts in contact with fluid	Aluminum alloy, POM, Stainless steel 304, Steel, Brass, Si, NBR, HNBR, FKM			
Standards	CE/UKCA marking, UL/CSA			
Weight	Approx. 760 g (Excludes lead wire with M12 connector)			
Communication (IO-Link mode)	IO-Link type	Device		
	IO-Link version	V1.1		
	Communication speed	COM2 (38.4 kbps)		
	Configuration file	IODD file*12		
	Min. cycle time	5.5 ms		
	Process data length	Input Data: 8 bytes, Output Data: 2 bytes		
	On request data communication	Yes		
	Data storage function	Yes		
	Event function	Yes		
Vendor ID	131 (0 x 0083)			

\*1 The air quality grade is JIS B 8392-1:2012 [2:6:3] and ISO 8573-1:2010 [2:6:3].

Example of recommended pneumatic circuit (Compressed air line)



\*2 It changes in conjunction with the setting of the zero cut function. The product's function as a shut valve cannot be guaranteed when the flow rate command value is 0.

\*3 The operating supply pressure range is the pressure range that can be applied to the product inlet side.

\*4 The operating load pressure range is the product outlet pressure range generated by the load connected to the product outlet side.

\*5 When the flow rate command value is 0, the supply current changes momentarily because the internal solenoid valve is driven for 1 s at 30 s intervals.

\*6 Control operation is stopped when the control flow rate is ±1% F.S. of the flow rate command value (control deadband).

\*7 Includes repeatability ±1% F.S. and control deadband ±1% F.S.

\*8 Shows the display accuracy and analog output accuracy in relation to the control flow rate

\*9 Supply pressure: 0.6 MPa, Load pressure: 0.1 MPa (100% F.S. at flow rate)

\*10 Setting is only possible for models with the unit selection function. When there is no unit selection function, L/min is fixed.

\*11 Setting is only possible for models with the unit selection function. Only MPa or kPa is available for models without this function.

\*12 The configuration file can be downloaded from the SMC website.

\*13 Only when IO-Link communication is used

\*14 When using gases other than the applicable fluids (limited to non-corrosive and non-flammable gases), convert them using the following formula.

$$\text{Gas flow rate} = \text{Flow rate with air} \times \sqrt{\frac{1.293}{\text{Gas density}}}$$

### Conversion example

If you want argon gas (1.784 [kg/m<sup>3</sup>] (0°C, 1 atm)) to flow at 300 L/min,

$$300 = \text{Flow rate with air} \times \sqrt{\frac{1.293}{1.784}}$$

The flow rate in the air = 352, so when the flow rate command value is set to 352 L/min, the flow rate of the argon gas is controlled to 300 L/min.

### Caution

The flow rates obtained from the above are for reference only and do not guarantee the product specifications. Gases are exhausted from EXH to the outside of the product by controlled operation. Be sure to use the product safely.

\*15 Errors may occur depending on the ambient temperature. Use this as a guideline.

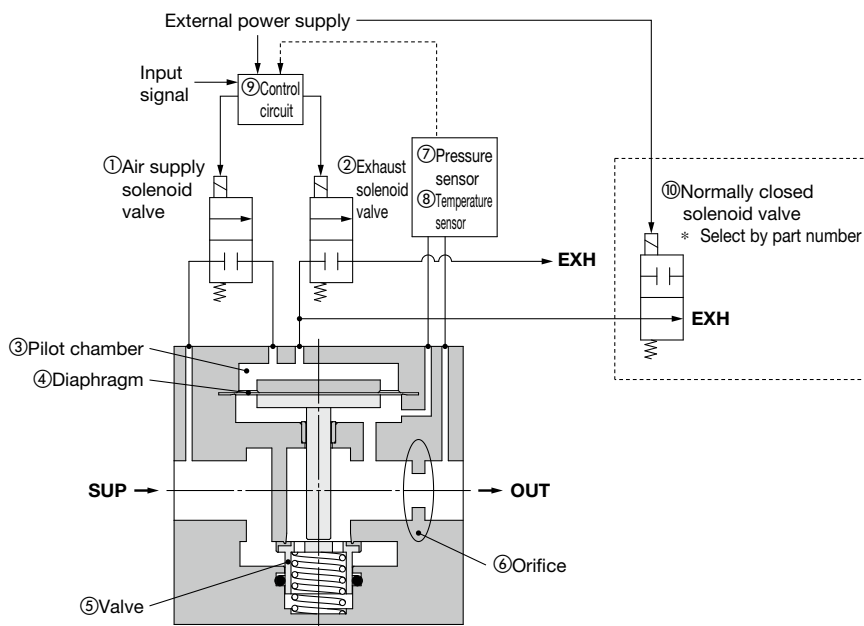
\* Products with tiny scratches, marks, or display color or brightness variations which do not affect the performance of the product are verified as conforming products.

# IN502-44/45/46

## Working Principle

When the input signal increases, the air supply solenoid valve ① turns ON, and the exhaust solenoid valve ② turns OFF. For this reason, the supply pressure passes through the air supply solenoid valve ①, fills the pilot chamber ③, and acts on the top surface of the diaphragm ④. As a result, the valve ⑤ interlocked with the diaphragm ④ opens, and the supply pressure flows out from SUP to OUT. This flow rate, the differential pressure generated at the orifice ⑥ and the outlet pressure, is detected by the pressure sensor ⑦ and fed back to the control circuit ⑨. An arbitrary flow rate can always be obtained by activating the control operation until the flow rate corresponding to the input signal is reached.

If you select the flow rate zero type, the pilot chamber ③ pressure will be exhausted by the action of the normally closed solenoid valve ⑩, and the main valve ⑤ will close resulting in the flow rate dropping to zero, when the external power supply is disconnected.

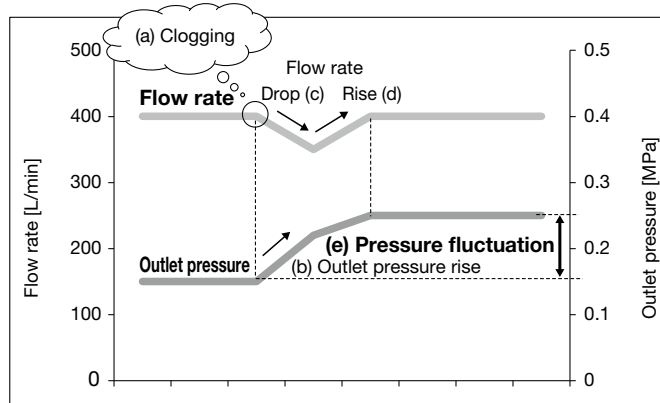
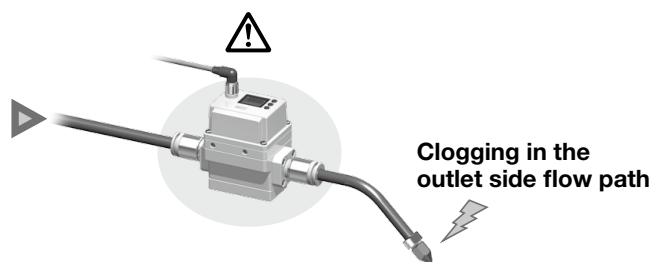


## Flow Rate Conversion Using a Pressure Sensor (Differential pressure type)

When installing a conventional thermal type (thermistor, MEMS type) flow rate sensor for gas, responsiveness, the inlet straight pipe length, and the air quality grade needed to be considered. However, the responsiveness can now be improved by converting the detected pressure into flow rate. And the unique detecting method also has made the sensing section more compact. Since this product detects the outlet pressure, control of the flow rate and monitoring of the pressure status can be performed at the same time to control abnormal values.

### (Example of outlet pressure status monitoring)

- For the detection of clogging in the outlet side flow path
- When clogging occurs in the outlet side flow path (a), the outlet pressure rises (b) and the flow rate decreases temporarily (c), but the change is detected and the product operates to return to the pre-clogging flow rate (d).
- Therefore, clogging in the outlet flow path can be detected by monitoring such pressure fluctuations (e).
- When the blockage is removed, the pressure returns to the initial outlet pressure.



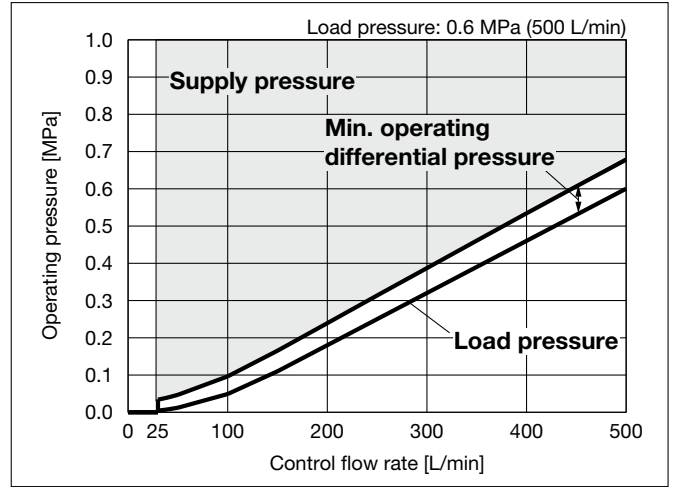
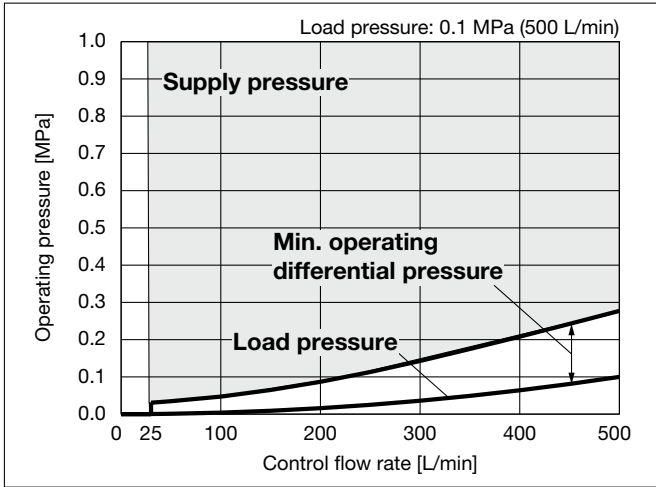
\* If the degree of clogging increases and the set flow rate cannot be reached, an error will occur.



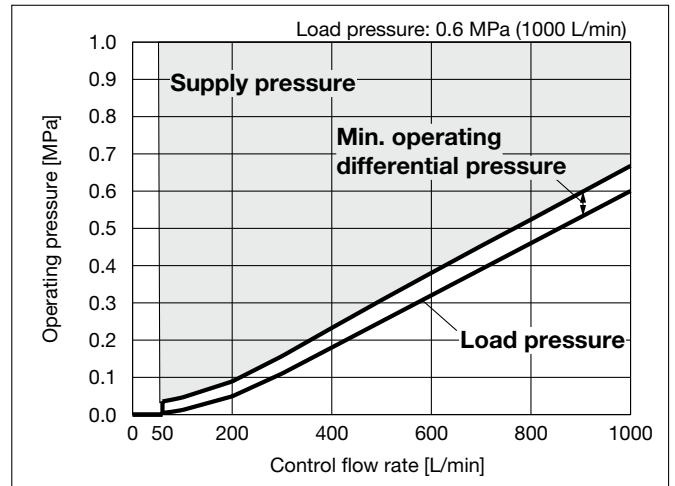
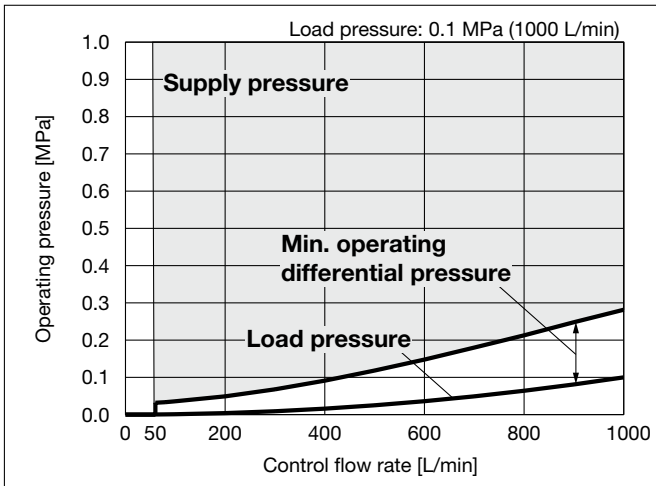
## Relationship Between Operating Pressure and Controllable Flow Rate (Reference data)

The data shows the required operating differential pressure and supply pressure for the load pressure conditions. Refer to the graphs below for selection.

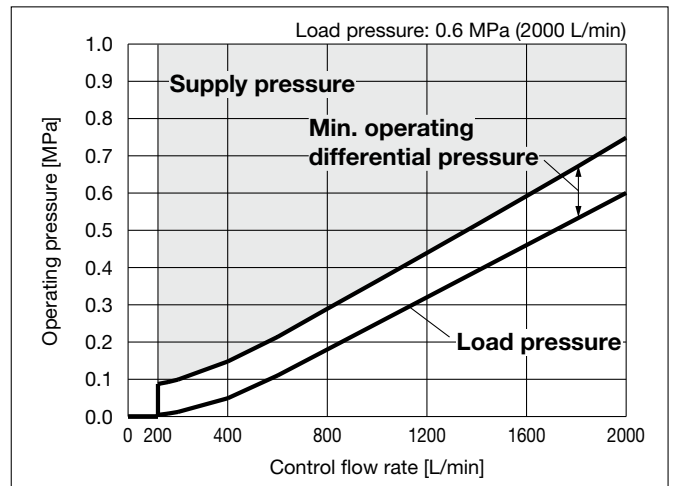
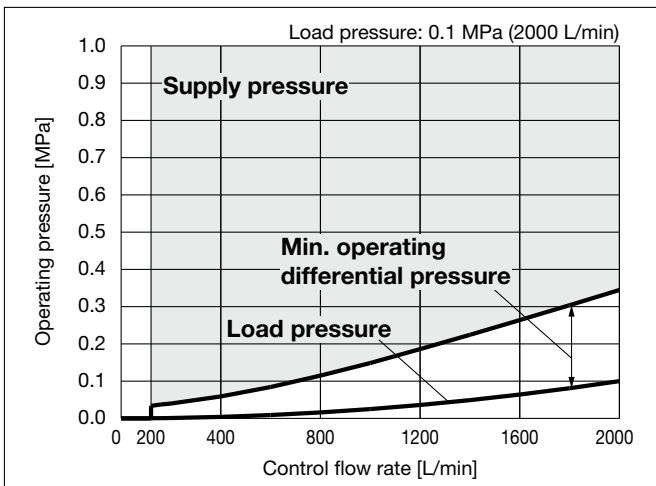
### IN502-44



### IN502-45




### IN502-46



- \* Use the outlet side pressure display value as a guide for the load pressure.
- \* The min. operating differential pressure is the differential pressure between the supply pressure and the load pressure required for control operation.
- \* The flow rate unit reference in the graph is the value under standard conditions.

# IN502-44/45/46

## Internal Circuits and Wiring Examples

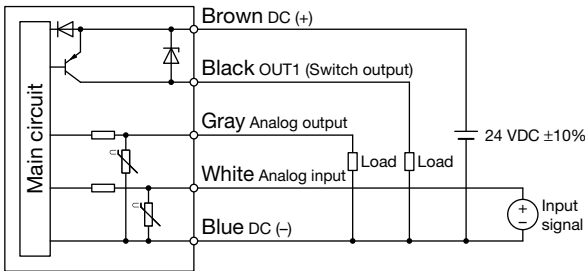
IN502 – 44/45/46 – 

• Output specifications

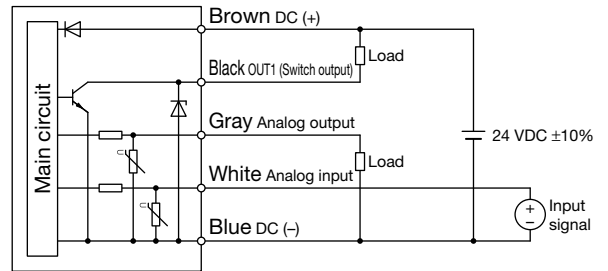
- |   |   |    |    |
|---|---|----|----|
| 1 | 2 | 9  | 10 |
| 3 | 4 | 11 | 12 |

- Analog voltage input/output + Switch output
- Analog current input/output + Switch output

When PNP open collector is selected



When NPN open collector is selected



IN502 – 44/45/46 – 

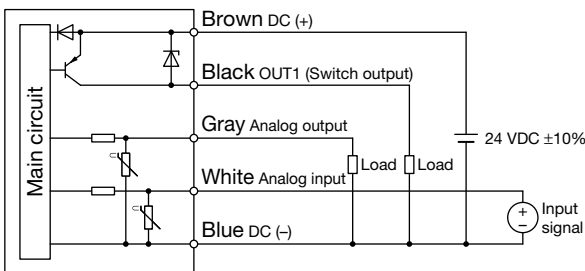
• Output specifications

- |   |   |    |    |
|---|---|----|----|
| 5 | 6 | 13 | 14 |
| 7 | 8 | 15 | 16 |

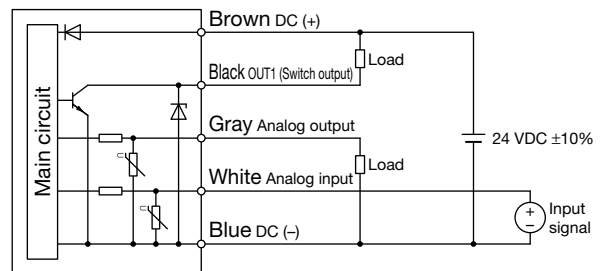
- Analog voltage input/output + IO-Link/Switch output
- Analog current input/output + IO-Link/Switch output

When used as a switch output device

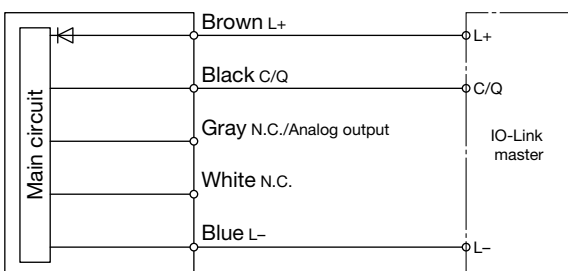
When PNP open collector is selected



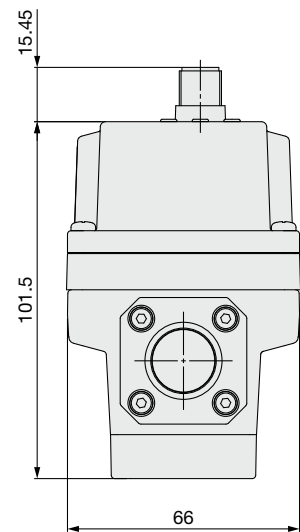
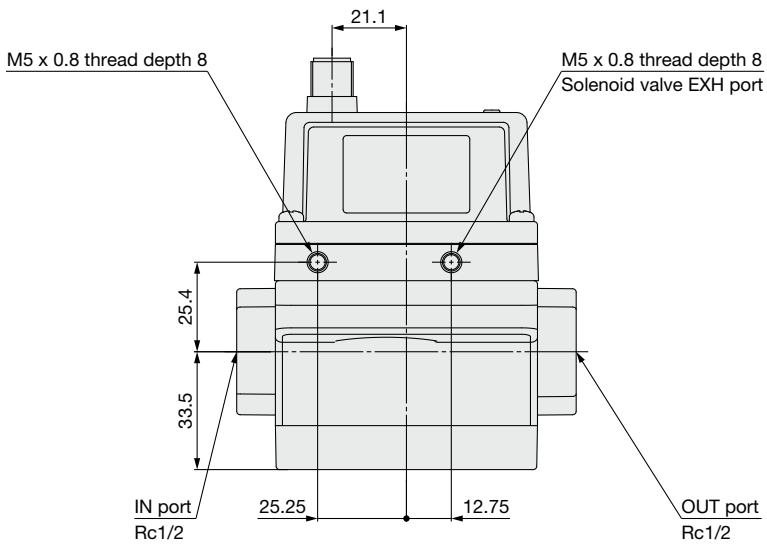
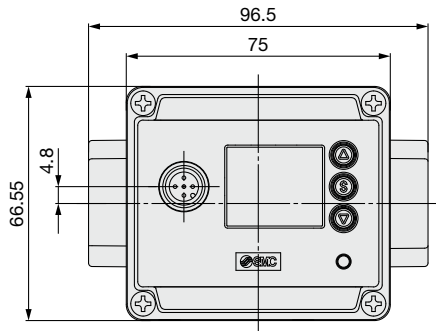
When NPN open collector is selected



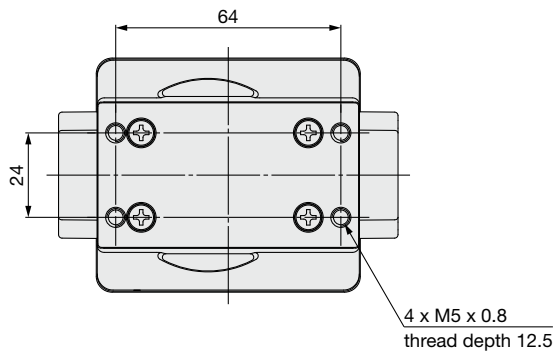
When used as an IO-Link device



## Dimensions



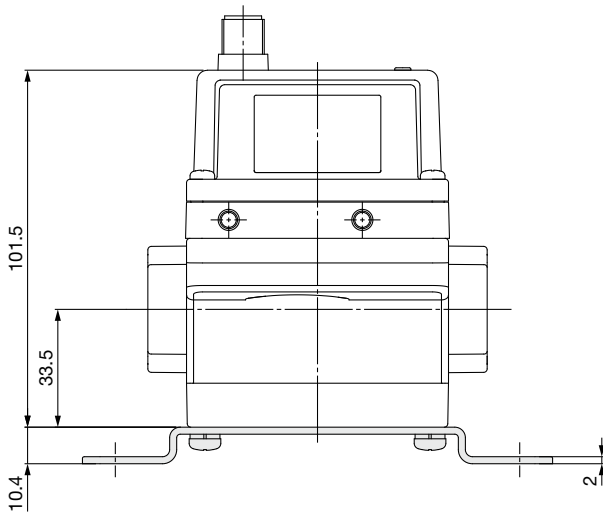
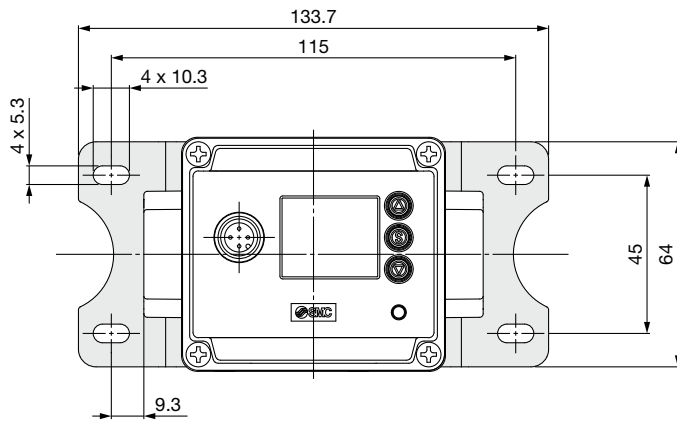
Flow direction



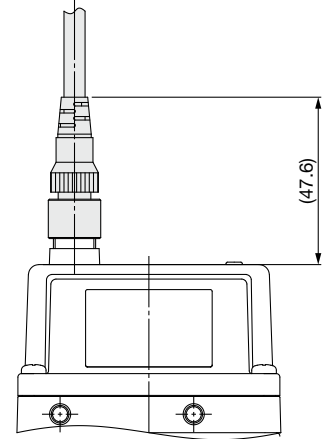
# IN502-44/45/46

## Dimensions with Accessories Mounted

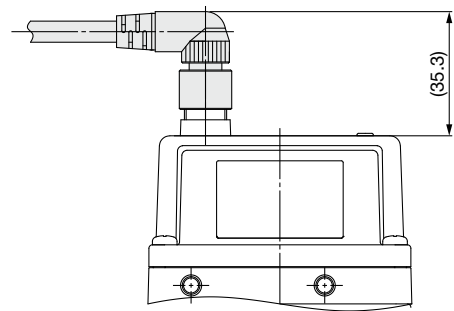
With bracket A mounted  
ZS-56-A



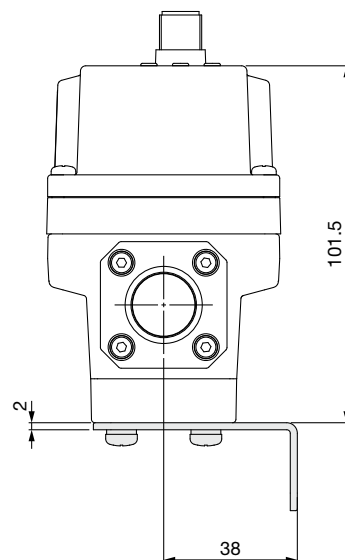
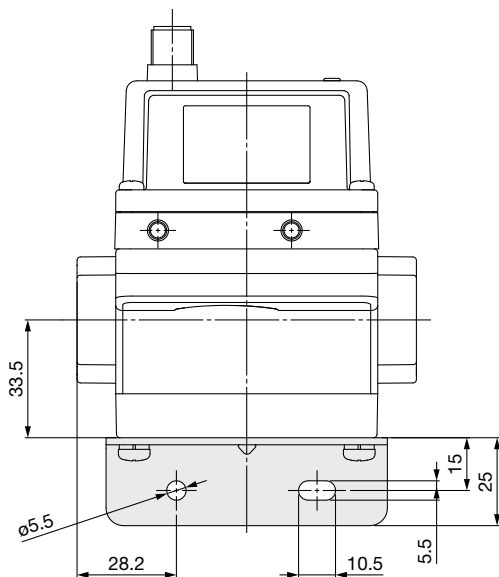
With M12 lead wire with connector mounted  
Straight connector type  
EX500-AP□-S/EX9-AC□-SSPS



Angled connector type  
EX500-AP□-A



With bracket B mounted  
ZS-56-B



# IN502-44/45/46 Accessories

## Lead Wire with M12 Connector (Loose wires on 1 side)

EX500-AP **050** - **S**

• Cable length (L)

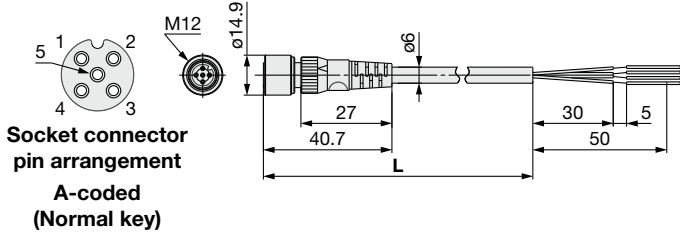
<b>010</b>	1000 mm
<b>050</b>	5000 mm

• Connector specification

<b>S</b>	Straight
<b>A</b>	Angled

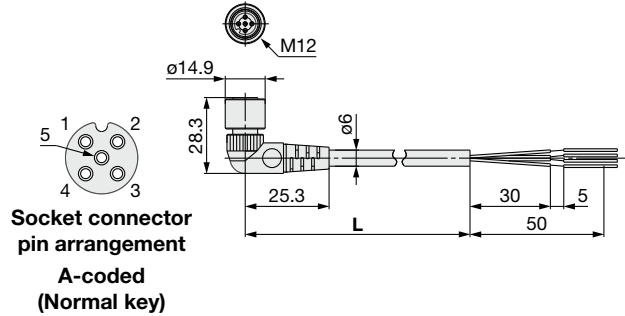


Straight connector type

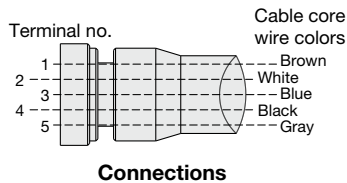


Item	Specifications
<b>Cable O.D.</b>	ø6 mm
<b>Nominal cross section</b>	0.3 mm <sup>2</sup> /AWG22
<b>Wire diameter (Including insulator)</b>	1.5 mm
<b>Min. bending radius</b>	40 mm (Fixed)

Angled connector type



Item	Specifications
<b>Cable O.D.</b>	ø6 mm
<b>Nominal cross section</b>	0.3 mm <sup>2</sup> /AWG22
<b>Wire diameter (Including insulator)</b>	1.5 mm
<b>Min. bending radius</b>	40 mm (Fixed)



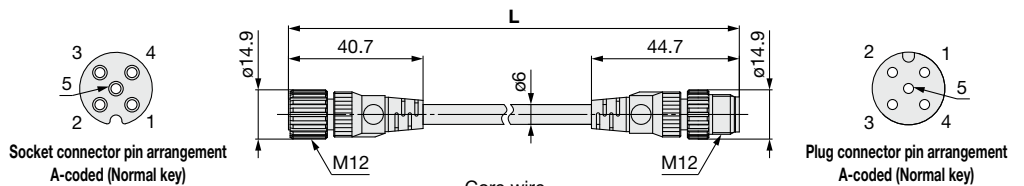
Connections

## Lead Wire with M12 Connector (Connectors on Both Sides)

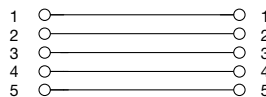
EX9-AC **005** -SSPS (With connectors on both sides (Socket/Plug))

• Cable length (L)

<b>005</b>	500 mm
<b>010</b>	1000 mm
<b>020</b>	2000 mm
<b>030</b>	3000 mm
<b>050</b>	5000 mm
<b>100</b>	10000 mm



Terminal no.



Connections

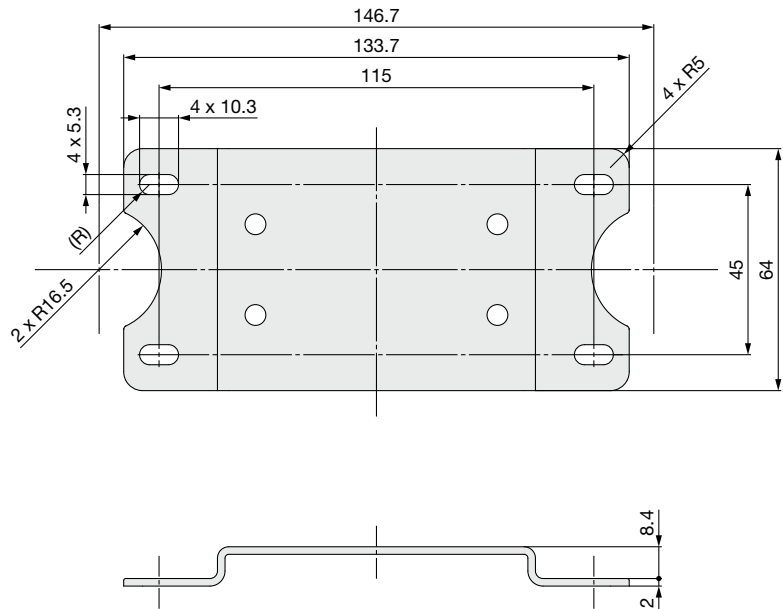
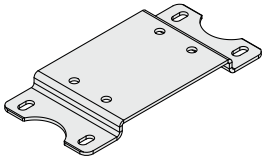
Item	Specifications
<b>Cable O.D.</b>	ø6 mm
<b>Conductor nominal cross section</b>	0.3 mm <sup>2</sup> /AWG22
<b>Wire O.D. (Including conductor)</b>	1.5 mm
<b>Min. bending radius (Fixed)</b>	40 mm

# IN502-44/45/46

## Bracket A

### ZS-56-A

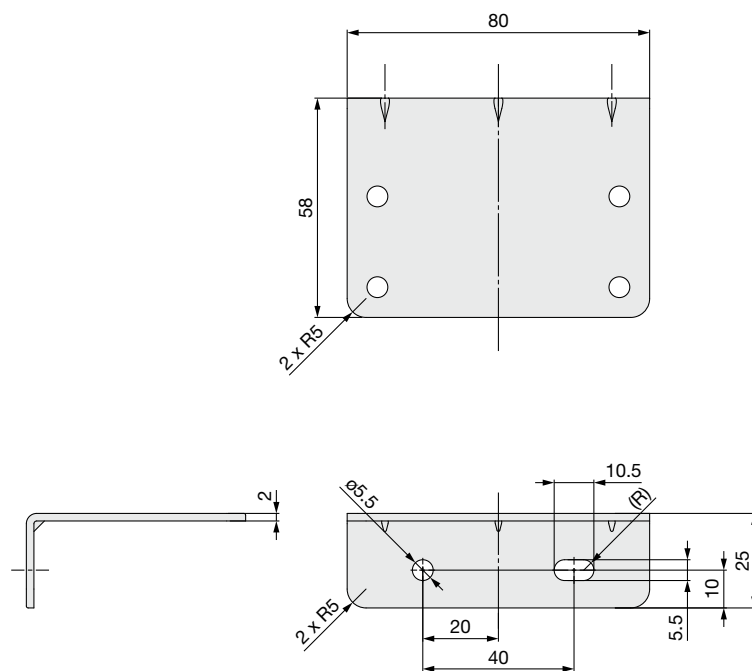
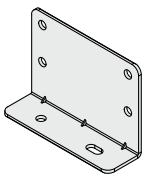
4 cross recessed round head screws (M5 x 10 L) are included.



## Bracket B

### ZS-56-B

4 cross recessed round head screws (M5 x 10 L) are included.





# IN502-44/45/46 / Precautions

Be sure to read this before handling the products.

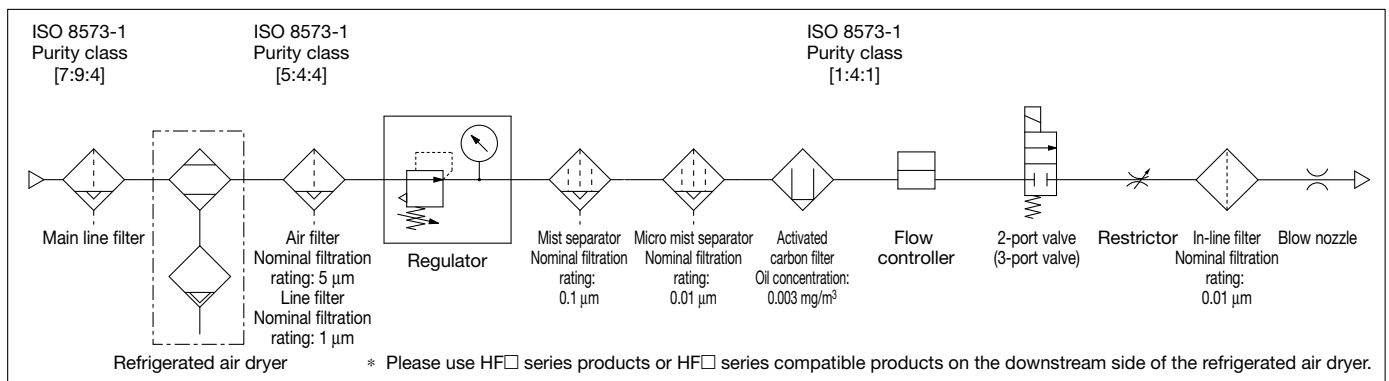
For safety instructions, refer to the “Handling Precautions for SMC Products” and the “Operation Manual” on the SMC website.

## Handling

### Caution

1. When selecting equipment, carefully consider the application, required specifications, and operating conditions (fluid, pressure, flow rate, filtration, and environment), making sure not to exceed the specification range.
2. This product is intended for use in typical manufacturing industry applications. As such, to use the product in applications that may affect the human body directly or indirectly, such as use as a caisson shield, goes against its intended use.
3. When the product is used as an air blower for food, install an appropriate filter to eliminate foreign matter in the compressed air used for air blowing. (Refer to the following example of a pneumatic circuit.)

#### Pneumatic equipment circuit of an air blower for food applications (example)



4. Quality management relating to hygiene for food and medical industry processes is not implemented for this product.

The product is produced on the same line that manufactures other products which use other materials. In rare cases, some residue of these materials may be present.

#### 5. Food Grease used

Fluid contact parts NSF H1 food grade grease

Parts other than fluid contact parts NSF H1 food grade grease or grease which is not NSF H1 grade

6. The grease used for the built-in solenoid valve is not food grade grease.

The solenoid valve exhaust may be discharged from EXH to the outside of the unit. If required, connect a pipe outside the area.


7. Particles are generated from the wear of sliding parts inside the product. When the product is used as an air blower, install an appropriate filter (nominal filtration rating: 0.01 μm) on the outlet of the product to prevent foreign matter from flowing to the downstream side. Be sure to perform regular inspection, element replacement, and maintenance of filters while referring to the operation manual.


8. Flush the piping line before using the product for the first time and after it has been replaced. Also, if piping, etc., is to be connected, flush (air blow) before using the product for the first time in order to reduce the effects of the dust generated from the connection, etc.


Flushing the line is also required to eliminate contamination resulting from the installation of piping lines. Therefore, be sure to flush the line before running the system.

## Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*1), and other safety regulations.

 **Danger :** **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

 **Warning:** **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

 **Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

\*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components  
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components  
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements  
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots etc.

### Warning

#### 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

#### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

#### 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

#### 4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

### Caution

**We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.**

**Use in non-manufacturing industries is not covered.**

Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

### Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

#### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

\*2) **Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

#### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

## Safety Instructions

Be sure to read the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.

**SMC Corporation**