Doc. no. IR10-OM00002-D

Operation Manual

PRODUCT NAME

Precision Regulator

MODEL/ Series

IR1000
IR1010
IR1020

SMC Corporation

Contents

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.

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.
ISO 4413: Hydraulic fluid power -- General rules relating to systems.
IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)
ISO 10218-1992: Manipulating industrial robots -Safety.
etc.

Caution	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
Warning	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Danger	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

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. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4.Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Safety Instructions

⚠ Caution

1.The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

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 govemed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules goveming that export are known and followed.

Foreword

The IR1000 precision regulator (hereinafter referred to as the “product”) has excellent relief characteristics, and is constructed to always keep a constant pressure even if used with a reverse flow. The product has the following features.

(1) A sensitivity of 0.2%F.S. at max is achieved by the nozzle and flapper design.
(IR1000: F.S. ≒0.2MPa, IR1010: F.S. ≒0.4MPa, IR1020: F.S. ≒0.8MPa)
Note) “F.S.” is the abbreviation of full span.

(2) Various characteristics such as flow rate, pressure characteristics and repeatability are improved compared to general regulators.

(3) Relief characteristics are improved.

(4) The adjustment range is as wide as general regulators, which is 0.01~0.8MPa.
(IR1000 is 0.005MPa~)

1. Specifications

Model	IR1000	IR1010	IR1020
Max. supply pressure	MAX. 1.0MPa		
(Note 1) Min. supply pressure	Setting pressure + 0.05MPa		
Setting pressure	0.005~0.2MPa	0.01~0.4MPa	0.01~0.8MPa
Setting sensitivity	(Note 2) Within 0.2% F.S.		
(Note 3) Repeatability	(Note 2) Within ±0.5% F.S.		
(Note 4) Air consumption	4.4L/min(ANR) or less (at supply pressure of 1.0MPa)		
Ambient and fluid temperature	-5 to 60°C (No freezing)		
Port size	Rc1/8		
Port size of pressure gauge	Rc1/8 [2 places]		
Weight	0.14kg		

(Note1) The specifications are for conditions of no flow at the output side. Be sure to keep the minimum supply pressure (setting pressure + 0.05MPa).

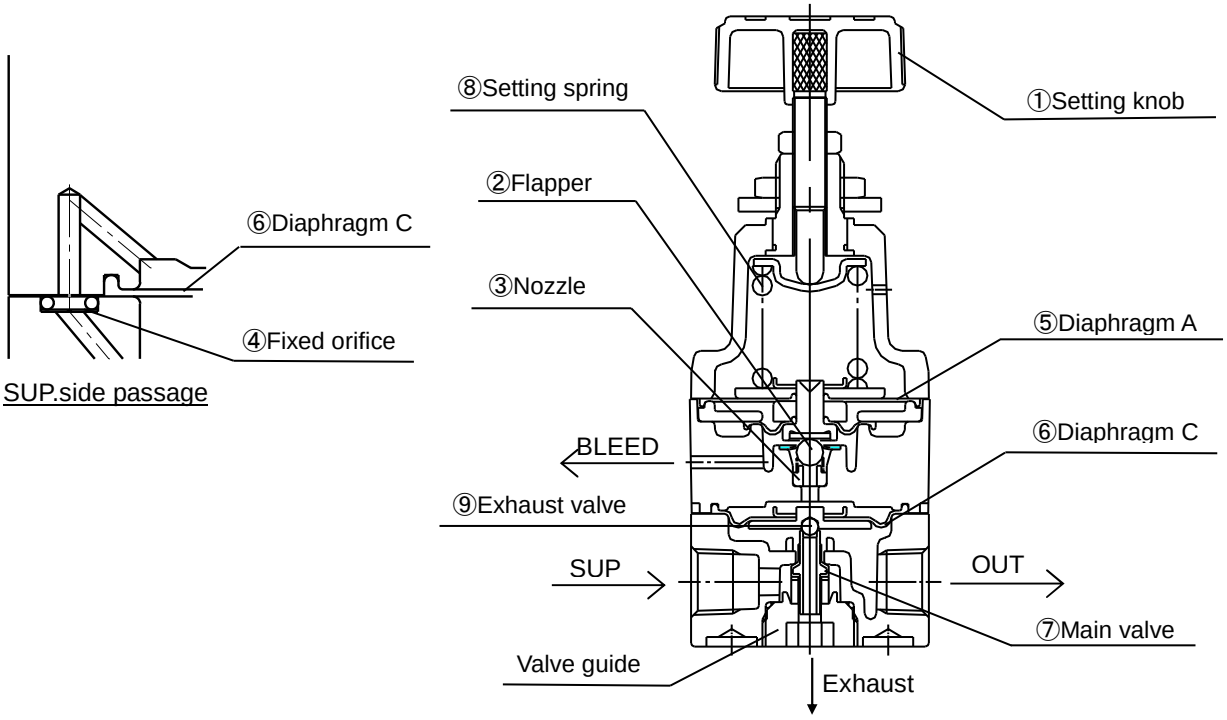
(Note2) The full span means the condition at the maximum set pressure of the product. (F.S. ≒0.2MPa, IR1000)

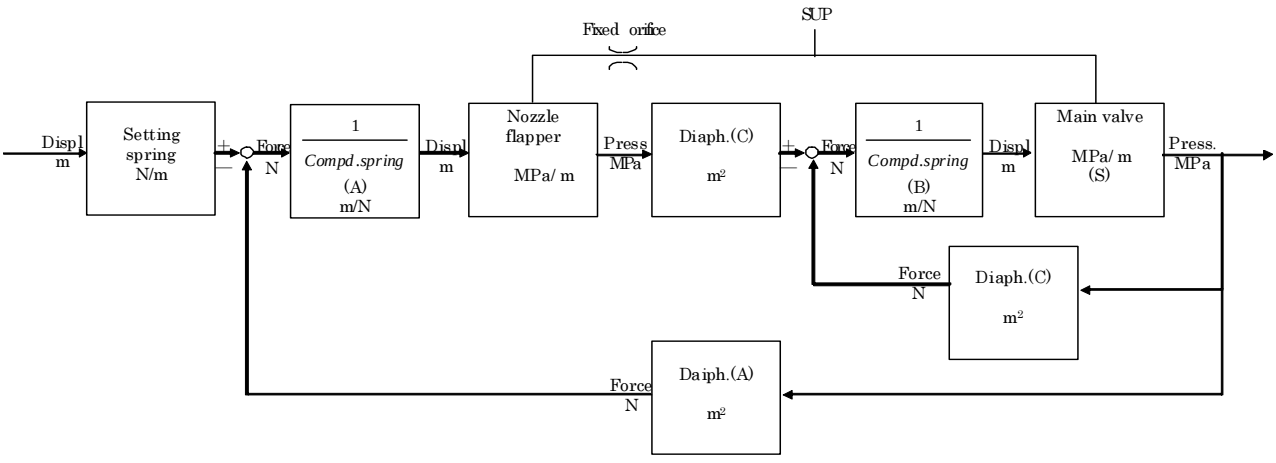
(Note3) Indicatees the set pressure fluctuation of the secondary side for every ON-OFF(excluding the change over time and the temperature)

(Note4) Air is released to atmosphere all the time.

2. Construction and operation principle

When the ①setting knob is turned, the ③nozzle is closed by the ②flapper, allowing the supply air that flows in from the upstream side to pass through the ④fixed orifice. It then acts on ⑥ diaphragm(C) as nozzle back pressure, the ⑦main valve is pushed down by the generated force and the supply pressure flows out to the downstream side. The air pressure that flows in acts on bottom side of ⑥diaphragm(C) and while opposing the force generated by nozzle back pressure, it also acts on ⑤diaphragm(A) opposing the compression force of the ⑧setting spring and becomes the set pressure. When the output pressure raises above the setting pressure, ⑤diaphragm(A) is pushed up which makes the interval between the ②flapper and the ③nozzle widens, the nozzle back pressure drops, the pressure balance of upper/bottom part of ⑥diaphragm(C) is broken. Then as the ⑦main valve closes, the ⑨exhaust valve opens at the same time and the excess pressure from the downstream side is discharged to the atmosphere. In this way fine pressure variations are detected by the nozzle/flapper type pilot mechanism, and precise pressure adjustment is performed.





Block diagram

3. How to order

IR10 ※ 0 – ※ 01 ※※ – ※

Suffix
R:Bracket, Name plate,
Mounting on the opposite side Note1)

Accessories
NIL: None
B: Bracket (P36201023)
G: Pressure gauge Note2) Note3)

Port size
01: 1/8 Note4)

Set pressure
0: 0.005~0.2MPa
1: 0.01~0.4MPa
2: 0.01~0.8MPa

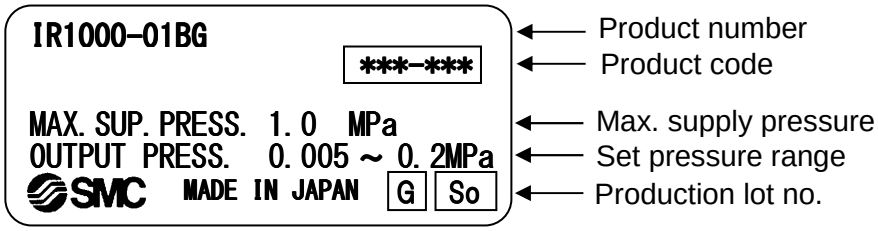
Thread type
NIL:Rc
N:NPT
F:G

Thread type when Rc and F.	Thread type when N.
IR1000 : G33-2-01	G33-P2-N01-X30
IR1010 : G33-4-01	G33-P4-N01-X30
IR1020 : G33-10-01	G33-P10-N01-X30

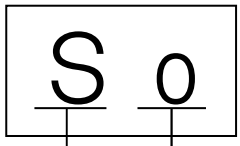
(Note 1) In the standard mounting position, the product name plate is attached to the front and the bracket is mounted to the back when viewed with the SUP side on the left and OUT side on the right.
(Note 2) Accuracy: ±3%F.S.(full span)
(Note 3) The pressure gauge is not attached and becomes bundled shipment.
(Note 4) One type only.

4. Marking on product

・Product name plate



Production lot no.



Year
S:2014
T:2015
U:2016
V:2017
W:2018

Month
o: January
P: February
Q: March
R: April
⋮
Z: December

5. Precautions for handling

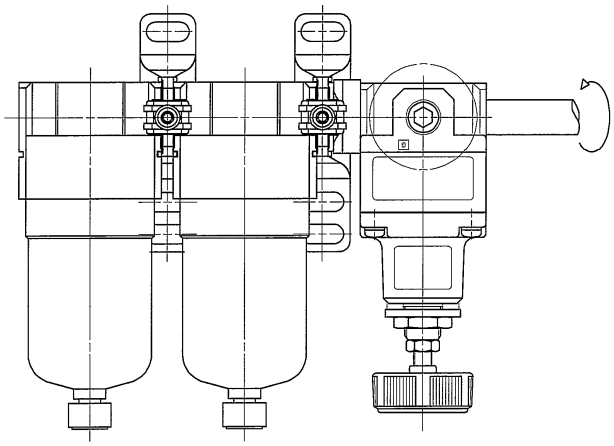
⚠Warning Handling

(1) Connect piping/fittings using the recommended torque while holding the product tightly.
Loose or faulty sealing can occur if tightening torque is insufficient, while damage to the thread can occur if over tightened. If the product is not held while tightening, excessive force will be applied to the product bracket, causing breakage.

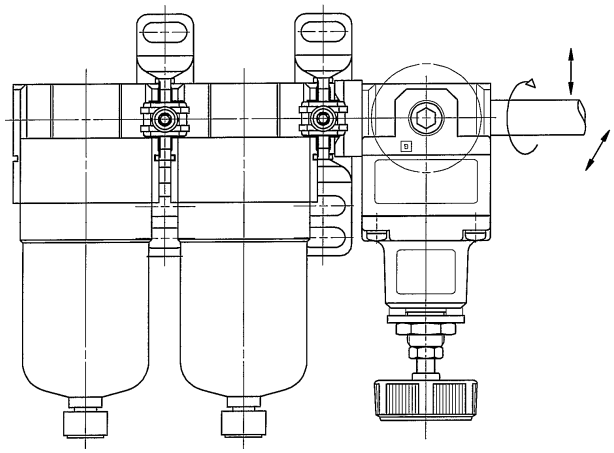
Recommended tightening torque

(N・m)

Thread size	1/8
Torque	7 to 9



(2) Do not apply torsion or bending moment other than the weight of the product itself. The external piping should be supported separately because it may cause breakage.



(3) Non-flexible piping such as steel piping will be subject to excessive moment load and vibration from the piping side, so use a flexible tube for intermediate connection.

(4) If the failure of the product will cause danger in the system, install a safety circuit and configure the system so that danger can be avoided

⚠ Warning — Operating Environment

(1) Do not use in an environment where corrosive gases, chemicals, sea water, water or steam are present.
(2) Shade the sunlight in the place where the product is applied with direct sunshine.
(3) Do not operate in locations subject to vibration or impact.
(4) Do not use in a place where there are heat sources around the product and it can receive radiant heat.

⚠ Warning — Air Supply

(1) The operating fluids must be compressed air. Contact SMC when using the product with other fluids.
(2) If an air filter is not drained, condensate will leak to the secondary side and cause the operation failure of pneumatic equipment. When it is difficult to control drainage, the use of a filter with an auto drain is recommended.
(3) Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or malfunction. If the compressor uses synthetic oil and the oil leaks to the outlet, the resin and seals of pneumatic equipment may be affected depending on the type of synthetic oil or conditions, so installation of a main line filter is recommended.

⚠ Warning — Maintenance

(1) Improper handling of compressed air is dangerous. Therefore, in addition to observing the product specifications, replacement of elements and other maintenance activities should be performed by personnel with sufficient knowledge and experience of pneumatic equipment.
(2) Rubber parts such as O-rings and seals are consumable, and should be checked every year, and replaced every three years.
(3) Remove condensation and clean or replace the element regularly. As a guide, replacement every month or every three months is recommended depending on the operating conditions.
(4) When the valve guide is to be removed (see construction on page 5), reduce the set pressure to 0 and shut off the supply pressure completely beforehand.
(5) If a pressure gauge is to be added, reduce the set pressure to 0 before removing the plug.
(6) When remounting the valve guide after removing it for maintenance, use a tightening torque of no more than 0.6 N·m.
Since the valve guide on this product is made of resin, there is a danger of damage if tightened with a torque exceeding the prescribed valve.

⚠ Caution — Operation

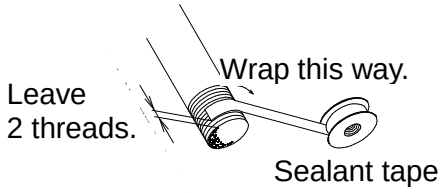
(1) Do not use a precision regulator outside the range of its specifications as this can cause failure.(Refer to specifications.)
(2) When mounting is performed, make connections while confirming port indications.
(3) Screw a panel nut with the recommended proper torque 12.5N·m when mounting onto a panel.
Looseness or faulty sealing will occur if tightening torque is insufficient, while thread damage will result if the torque is excessive.
(4) If a directional switching valve (solenoid valve, mechanical valve, etc.) is mounted on the supply side of the regulator and repeatedly switched ON and OFF, wear of the nozzle/flapper section will be accelerated and a discrepancy in the setting value may occur. Therefore ,avoid using a directional switching valve on the supply side. In the event a directional switching valve will be used, install it on the output side of the regulator.
(5) The accessory pressure gauge is supplied with the regulator in the unassembled status. Before using the regulator, be sure to install the pressure gauge at the gauge port of the regulator. At this time, the recommended tightening torque of the pressure gauge is 7 to 9N·m.
(6) Air is normally released from the bleed hole (the hole on the side of the body's mid-section). This is a necessary consumption of air based on the construction of the precision regulator, and is not an abnormality.
(7) Make sure to tighten the lock nut after pressure adjustment.

⚠ Caution — Air Supply

(1) Condensate and dust caught in the supply pressure line can clog the fixed orifice, which may lead to operation failure. Install a mist separator (SMC AM or AFM series) as well as an air filter (SMC AF series). For the details of compressed air mentioned above, refer to SMC catalog "Compressed Air Purification System".
(2) When a lubricator is used at the supply side, the fixed orifice can clog and cause operation failure. Do not use a lubricator at the supply side. Only install on the output side of the product.

⚠ Caution — Piping

(1) Before piping, perform air blow (flushing) or cleaning to remove any cutting chips, cutting oil, dust, etc. from the piping.
(2) When installing piping or fitting into a port, prevent cutting chips and sealant material from getting inside the piping. If a sealant tape is used, leave 1.5 to 2 threads exposed.



⚠ Caution — Handling

(1) Do not apply force when transferring, mounting and dropping the regulator with a pressure gauge.
This may cause misalignment of the pressure gauge pointer.

6. Warranty

(1) Period: The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.

(2) Scope: 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 SMC product independently, and not to any other damage incurred due to the failure of the product.

(3) Content:

a. We guarantee that the product will operate normally if it is installed under maintenance and control in accordance with the Operation Manual, and operated under the conditions specified in the catalog or contracted separately.

b. We guarantee that the product does not have any defects in components, materials or assembly.

c. We guarantee that the product complies with the outline dimensions provided.

d. The following situations are out of scope of this warranty.

(1) The product was incorrectly installed or connected with other equipment.

(2) The product was under insufficient maintenance and control or incorrectly handled.

(3) The product was operated outside of the specifications.

(4) The product was modified or altered in construction.

(5) The failure was a secondary failure of the product caused by the failure of equipment connected to the product.

(6) The failure was caused by a natural disaster such as an earthquake, typhoon, or flood, or by an accident or fire.

(4) Agreement: If there is any doubt about anything specified in “Scope” and "Content”, it shall be resolved by agreement between the customer and SMC.

7. Troubleshooting

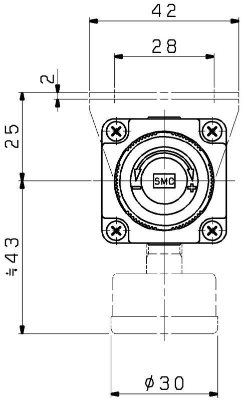
No.	*Trouble*	*Possible cause*		*Countermeasures*
1	The set pressure is decreasing.	Fluctuation of flow rate at the downstream side		Reset the pressure.
				Return the flow rate at the downstream side to the initial rate.
		Clogging of fixed orifice due to moisture, condensation or foreign matter		Install a filter and mist separator and use clean air.
		Leakage due to deterioration of rubber parts	Ozone	Replace with an ozone resistant product (80- series).
			Copper	Change the material of piping, etc. from copper.
			Temperature	Avoid using at high temperature or low temperature.
			Petroleum type oil	Prevent the oil from entering the ambient environment and fluid.
		Frequent switch of on and off at the downstream side		Reset the pressure again.
		The decrease of pressure in the bonnet		Set the pressure in the bonnet, which is a standard pressure, to atmospheric pressure.
2	The set pressure is increased or decreased over time.	Change of the product over time		Reset the pressure again.
3	Response is slow.	Clogging of fixed orifice due to moisture, condensation or foreign matter		Install a filter and mist separator and use a clean air.
		Increased consumed flow rate at the downstream side (due to leakage, etc.)		Eliminate leakage in the piping.
4	The leakage at the EXH port has increased.	Leakage due to deterioration of rubber parts	Ozone	Replace with an ozone resistant product (80- series).
			Copper	Change the material of piping, etc. from copper.
			Temperature	Avoid using at high temperature or low temperature.
			Petroleum type oil	Prevent the oil from entering the ambient environment and fluid.
		Foreign matter stuck to the seating part		Install a filter and mist separator and use clean air.
				Perform flushing by releasing the downstream side to atmosphere, etc.
5	The set pressure changes periodically.	Fluctuation of supply pressure		Install the regulator in front to reduce the fluctuation.
		Change of ambient and fluid temperature		Prevent the effect of temperature change.
6	Pressure does not increase.	Insufficient supply pressure		Increase the supply pressure.
		Clogging of fixed orifice due to moisture, condensation or foreign matter		Install a filter and mist separator and use clean air.
7	Repeatability is poor.	Same as trouble 1.		Refer to problem 1.
		Same as trouble 2.		Refer to problem 2.
8	The product is chattering.	Leakage at the downstream side		Eliminate leakage in the piping.
		Problem with the piping at the downstream side		Chattering occurs depending on the operating conditions. Consult SMC.
9	There is leakage at the places other than the bleed hole and EXH port.	Leakage due to deterioration of rubber parts		Consult SMC.

DWG NO Ⓒ IR10*0-*01**

SPECIFICATIONS

SUPPLY PRESSURE	MAX.1.0MPa
SETTING PRSSURE	MODEL IR1000:0.005~0.2MPa
	MODEL IR1010:0.01~0.4MPa
	MODEL IR1020:0.01~0.8MPa
MINIMUM SUPPLY PRESSURE	(SETTING PRESSURE)+0.05MPa
SENSITIVITY	Less than 0.2%F.S.
REPEATABILITY	Less than ±0.5%F.S.(Note)
AIR CONSUMPTION	Less than 4.4l/min(ANR) [at SUP=1.0MPa]
OPERATING TEMPERATURE	-5~60°C
WEIGHT	0.14kg(WITHOUT ACCESSORY)

(Note)Indicatees the set pressure fluctuation of the secondary side for every ON-OFF (excluding the change over time and the temperature)



Model identification numbering

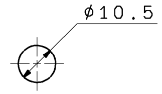
I R 1 0 □ 0 - □ 0 1 □□

Setting pressure
0:0.005~0.2MPa
1:0.01~0.4MPa
2:0.01~0.8MPa

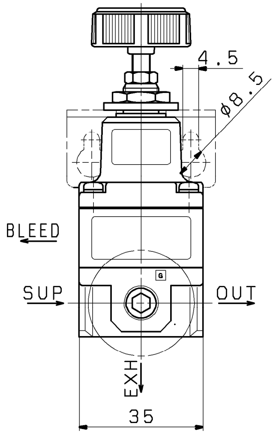
Thread type
Nil:R_c
N:NPT
F:G

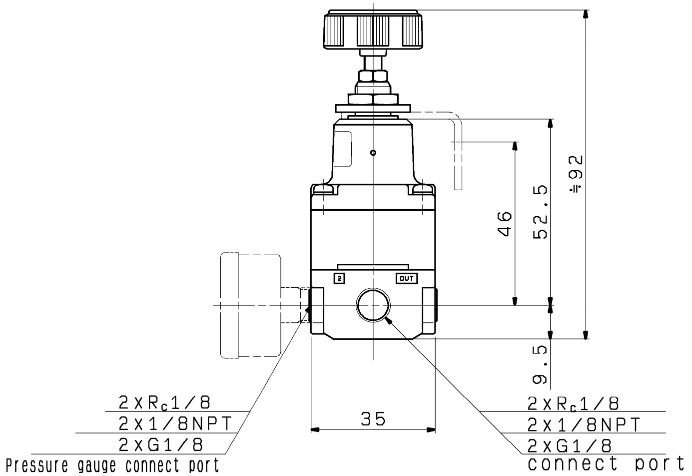
Port size
01:1/8

Accessories
Nil:No accessories
B:With bracket
G:With pressure Gauge



PANEL CUT
Panel board thickness MAX.4





REV	QTY	DESCRIPTION	DATE	PREPARED	REV NO

TOLERANCES JIS B 0405 RANGE(mm)	f ±	m ±	c ±
0.5≦D≦3	0.05	0.1	0.2
3<D≦6	0.05	0.1	0.3
6<D≦30	0.1	0.2	0.5
30<D≦120	0.15	0.3	0.8
120<D≦400	0.2	0.5	1.2
400<D≦1000	0.3	0.8	2
1000<D≦2000	0.5	1.2	3

DRAWN	K.Sugita
DATE	2012-04-20
DESIGNED	T.Shirane
DATE	2012-04-20
CHECKED	
DATE	
APPROVED	T.Uehara
DATE	2012-04-24

FINISH / PAINT / PACKING / MATERIAL / MATERIAL SIZE

SCALE FREE

MODEL / QTY / THIRD ANGLE

DWG NAME PRECISION REGULATOR

DWG NO Ⓒ IR10*0-*01**

REVISION 1

SMC Corporation

DWG NAME / DWG REC / DWG ID

FINISH:表面処理 / PAINT:塗装 / PACKING:包装区分
MATERIAL:材質 / MATERIAL SIZE:材料寸法

A2-V05

SMC

Revision history
A Thread type (NPT,G) addition
B Format change and content review
C Sectional view filter deletion of P.5
D Name plate layout change

SMC Corporation

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