



Operation Manual

PRODUCT NAME

VACUUM REGULATOR

MODEL/ Series

I R V 1 0

I R V 1 0 A

I R V 2 0

I R V 2 0 A

SMC Corporation

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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)^{*)}, and other safety regulations.

*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.



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.



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.



Safety Instructions

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.

Introduction

IRV10,10A,20,20A vacuum regulator is an apparatus to adjust vacuum pressure (negative pressure) Arbitrarily by connecting vacuum pump to the port on the VAC. side.

1 .Specifications

Model		IRV10※	IRV20※
Fluid		Air	
Set pressure range ^{Note1)}		-100 to -1.3kPa	
Withstand pressure ^{Note2)}		100 kPa(Except with pressure gauge)	
Knob resolution		0.13kPa or less	
Atmospheric intake consumption ^{Note3)}		0.6L/min(ANR) or less	
Ambient and fluid temperature		5 to 60°C(5 to 50°C in case of with pressure switch)	
VAC side tubing O.D		φ6、φ8	φ6、φ8、φ10
SET side tubing O.D		φ1/4”、φ5/16”	φ1/4”、φ5/16”、φ3/8”
Weight (No accessories)	Standard connections	135g(IRV10-C08)	250g(IRV20-C10)
	Single sided connections	125g(IRV10A-C08)	250g(IRV20A-C10)

(Note1) This varies with pressure on vacuum pump side.

(Note2) For vacuum regulators with a pressure gauge, the pressure gauge will be damaged if positive pressure is supplied. In the event that positive pressure is applied, the vacuum regulator will not be damaged, however, the main valve will open and positive pressure will enter the vacuum pump. This may cause malfunction of the vacuum pump. The vacuum regulator cannot positive pressure.

(Note3) Taking air from atmosphere all the time.

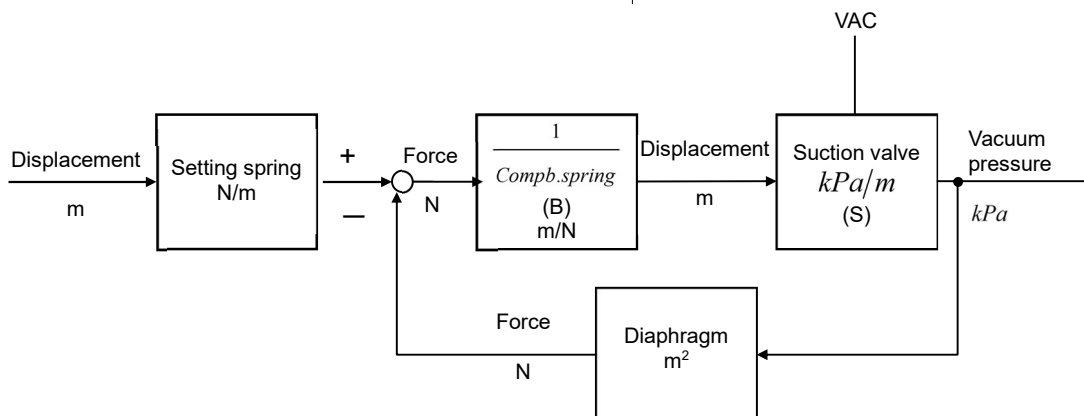
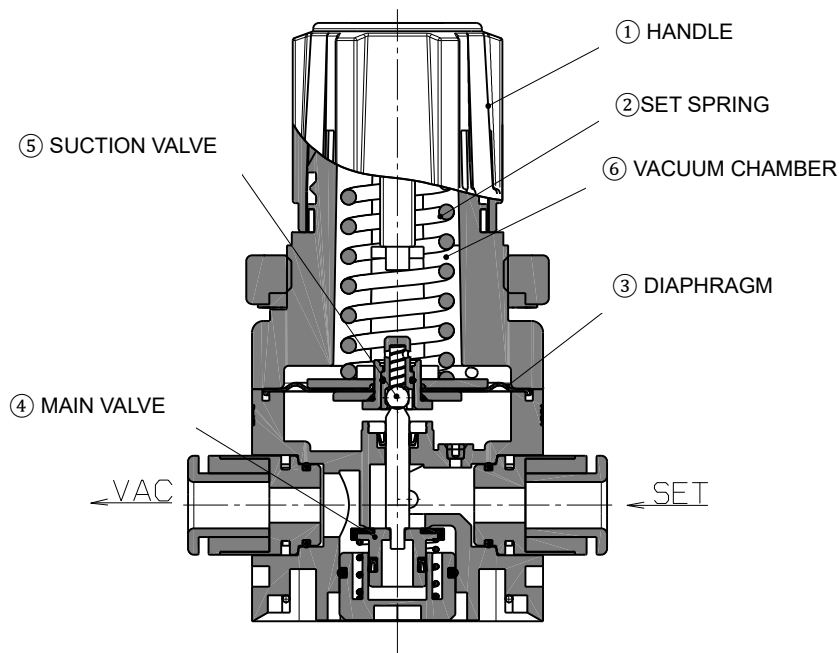
2. Construction and Operating Principle

By turning handle ① clockwise, force of set spring ② pushes down diaphragm ③ and main valve ④ so that VAC. Pressure side and SET. Pressure side are connected, which increases vacuum on SET. Pressure side (become closer to absolute vacuum).

Vacuum pressure on SET. Pressure side passes air pass, goes to vacuum chamber ⑥ and acts on the top of diaphragm ③. This pressure opposes compression force of set spring ② and becomes SET. Pressure.

When vacuum SET. Pressure becomes higher than the set value (closer to absolute vacuum), balance of set spring ② and SET. Pressure in vacuum chamber ⑥ is lost. Because of this, diaphragm ③ is pushed up so that main valve ④ closes and atmosphere suction valve ⑤ opens. Atmosphere flows in SET. Pressure and becomes SET. Pressure when compression force of set Spring ② balances with SET. Pressure.

When vacuum of SET. Pressure becomes lower than the set value (closer to atmospheric pressure), balance of set spring ② and SET. Pressure in vacuum chamber ⑥ is lost, and diaphragm ③ is pushed down. Atmosphere suction valve ⑤ closes and main valve ④ opens, and air is sucked to VAC. Pressure side. It becomes SET. Pressure when compression force of set spring ② balances with SET. Pressure.



Block Diagram

3 .How to Order

【Standard connections】

I R V 20 - ※ C08 ※ ※

Body size

10	The maximum flowing quantity 140l/min(ANR)
20	The maximum flowing quantity 240l/min(ANR)

One-touch fitting

Nil	Straight
L	Elbow

Connection port size

symbol	Port size	IRV10	IRV20
C06	mm	φ6	●
C08		φ8	●
C10		φ10	—
N07	inch	φ1/4"	●
N09		φ5/16"	●
N11		φ3/8"	—

Accessories2

【Accessory is included in the same container】

Nil	No accessory ^(Note1)	
GN	With gauge nut assembly ^(Note2)	
G	With pressure gauge ^(Note3)	
ZN	With digital pressure switch ^(Note3)	NPN open collector 1 outputs
ZP		PNP open collector 1 outputs
ZA		NPN open collector 2 outputs +Copy function
ZB		PNP open collector 2 outputs +Copy function

(Note1) Two plug nut assemblies are mounted on the gauge port.
There is no R1/8 port.

(Note2) One plug nut assembly, one gauge nut assembly (Rc1/8) and two clips are included in the same container.

(Note3) Pressure gauge assembly or digital pressure switch assembly, one plug nut assembly and two clips are included in the same container.

Accessories1

【Accessory is included in the same container】

Nil	No accessory
B	With Bracket
L	With Bottom Bracket

【Single sided connections】

I R V 20 A - ※ C08 ※ ※

Body size

10	The maximum flowing quantity 140l/min(ANR)
20	The maximum flowing quantity 240l/min(ANR)

Single sided connections

One-touch fitting

Nil	Straight
L	Elbow

Connection port size

symbol	Port size	IRV10A	IRV20A
C06	mm	φ6	●
C08		φ8	●
C10		φ10	—
N07	inch	φ1/4"	●
N09		φ5/16"	●
N11		φ3/8"	—

Accessories2

【Accessory is included in the same container】

Nil	No accessory ^(Note1)	
GN	With gauge nut assembly ^(Note2)	
G	With pressure gauge ^(Note3)	
ZN	With digital pressure switch ^(Note3)	NPN open collector 1 outputs
ZP		PNP open collector 1 outputs
ZA		NPN open collector 2 outputs +Copy function
ZB		PNP open collector 2 outputs +Copy function

(Note1) One plug nut assembly is mounted on the gauge port. There is no R1/8 port.

(Note2) One gauge nut assembly (Rc1/8) and one clip are included in the same container.

(Note3) Pressure gauge assembly or digital pressure switch assembly, one clip are included in the same container.

Accessories1

【Accessory is included in the same container】

Nil	No accessory
B	With Bracket
L	With Bottom Bracket

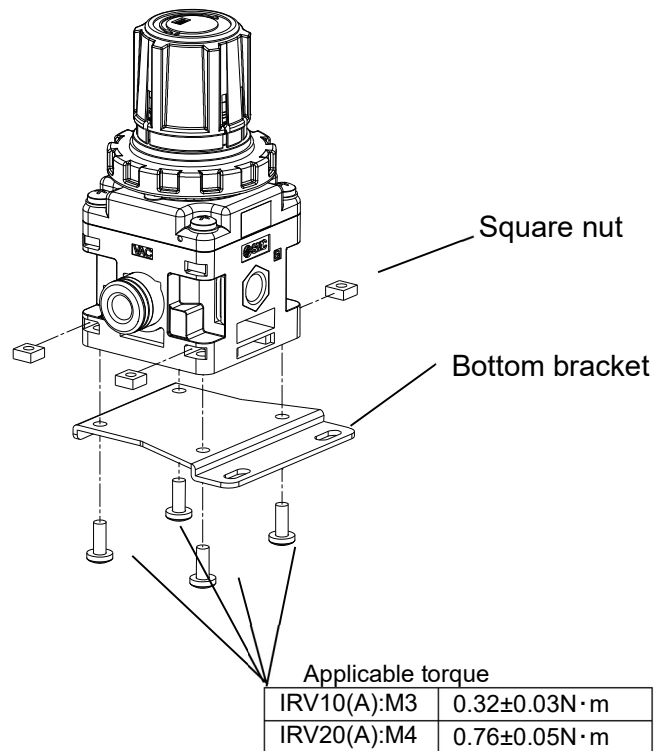
4 .Specific Product Precautions

Warning

Handling

- (1) If a possible danger of system is expected when vacuum pressure is Decreased by service interruption and/or vacuum pump trouble, provide the system with a safety circuit to avoid such a danger.
- (2) If a possible danger of system is expected when vacuum regulator fails, provide the system with a safety circuit to avoid such a danger.
- (3) Keep the specified tightening torque for mounting
Excessive torque can damage the mounting screws and product body.
And insufficient torque can cause the threaded parts to loosen.

Cross recessed round head screw for mounting the bottom bracket



Caution

Handling

- (1) Reduce the set pressure to zero(atmospheric pressure) for removing the plug when additionally mount the pressure gauge ,pressure switch or gauge nut Assembly

For customers purchasing regulator with a pressure gauge, pressure switch or gauge nut Assembly, Please install the attached parts according to the following.

(1)-1 Accessories

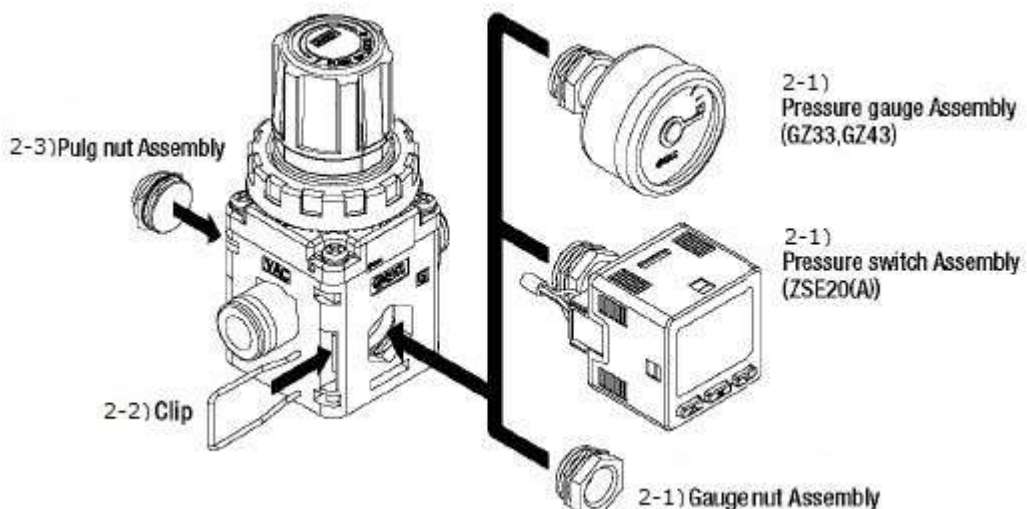
- Pressure gauge, pressure switch or gauge nut Assembly-----1 piece
- Plug nut Assembly -----1 piece
- Clip-----2 piece

Note) For the single sided connections, only 1 clip is provided, and no plug nut Assembly is provided.

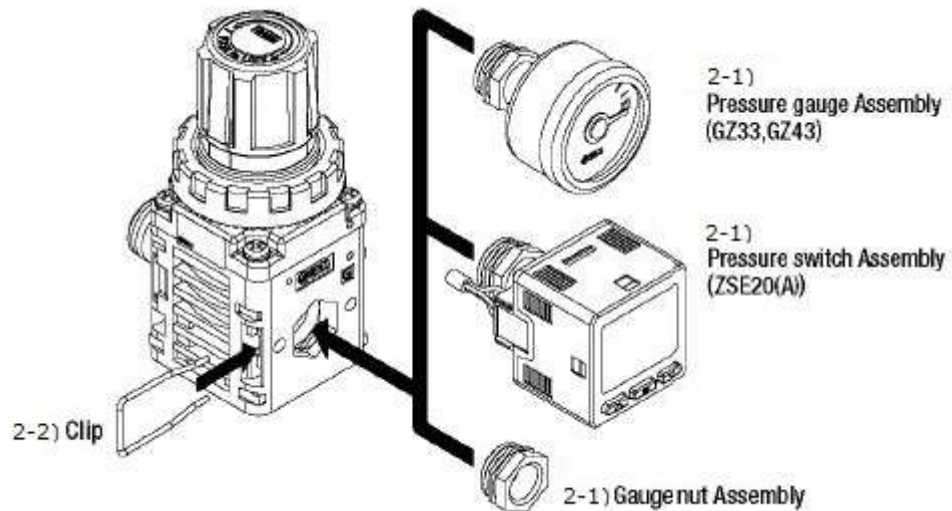
(1)-2 Installation

- 1) Confirm the VAC side and SET side of the product, and insert the pressure gauge, pressure switch or gauge nut Assembly completely (until flush with the product surface) into the preferred hexagon gauge port. For single sided connections, there is only one gauge port.
 - 2) Insert the clip to the left side of the product completely. After insertion, check to ensure the pressure gauge does not come off. This is the end of the mounting procedure for the single sided connections.
 - 3) Insert the plug nut deep into the gauge port on the opposite side of the port worked on in 1 above.
 - 4) Insert the clip into the left side of the product completely as with 2.
- Note) To remove it, be sure to remove the clip straight. The body is made of resin, so never apply torque.

Standard connections



Single sides connections



- (2) Do not remove the screw on the body with negative pressure applied.
- (3) Reduce the set pressure to zero(atmospheric pressure) and shut off the vacuum pump pressure completely for removing the guide for inspection.
- (4) One touch fitting is cassette type for easy replacement. One-touch fitting is set by clip inserted as drawing below. To replace the fitting, remove the clip with flat blade driver. Then, insert one-touch fitting until it contact to the end, and insert the clip to its original position.

Note1) Before replacement, ensure that VAC.SET pressure is not applied and exhaust inside pressure completely. Operation with pressure applied is dangerous.

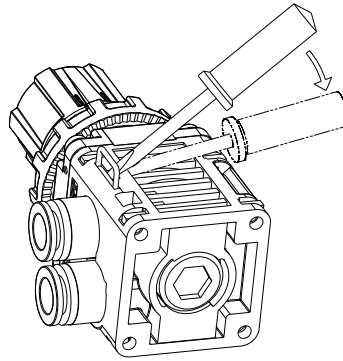
Note2) To pull out the clip, pull it out slowly supporting with hand. The clip may pop out and dangerous if pulling the clip with force.

Note3) After ensuring the replacement part is inserted to the end, insert the clip to the end. If the clip is not inserted completely, it will come off.

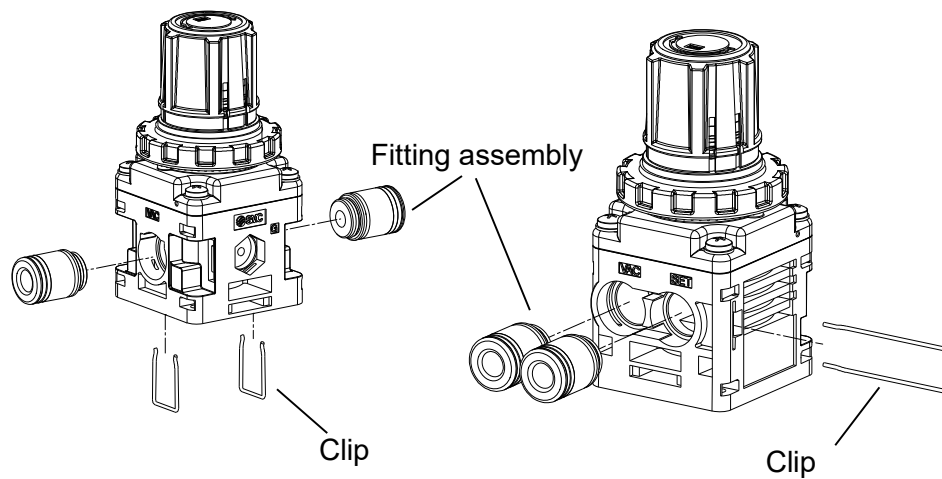
Note4) To insert elbow type one-touch fitting, hold the fitting with hand during inserting the tube. Inserting the tube without holding the body applies excess force to blocks and one-touch fitting and it leads to cause air leakage and damage.

How to pull out the clip

Set the driver tip to the slope of the place where the clip inserted, lift the clip by moving the driver slowly.



Mounting of fitting assembly



Caution

Environment

- (1) Do not use the product in an environment where the product is directly exposed to corrosive gases, chemicals, salt water or steam.
- (2) Do not mount the product in a location where it is subject to strong vibrations and/or shocks.
- (3) Use this vacuum regulator in a location free from dirt since this product sucks atmosphere all the time.
- (4) When the product is directly exposed to sunlight, provide a protective cover.
- (5) When heat source is around the product, shut off radiant heat.

Caution

Vacuum Source

- (1) This vacuum regulator does not control pressure by connecting with the exhaust side of the vacuum pump.
- (2) Note that ejector should not be used as "vacuum source" since its flow rate is less than this vacuum regulator.

Caution

Air

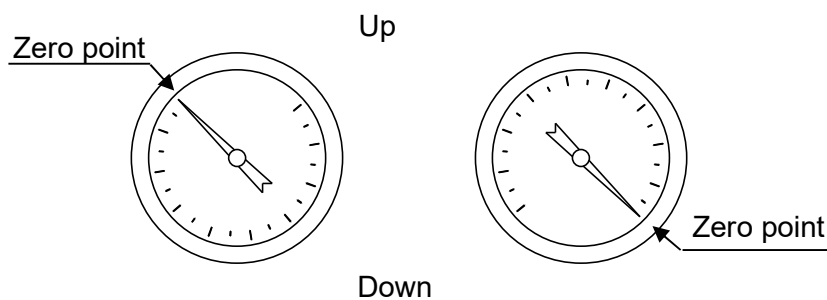
- (1) Do not use air containing chemicals, synthetic oils with organic solvents, Salinity and corrosive gases.

Caution

Operation

- (1) Connect vacuum pump to the port indicated by "VAC"(shown in upper Right of the port).
- (2) Pressure changes "atmospheric pressure→vacuum pressure" by turning the handle clockwise and "vacuum pressure→atmospheric pressure" by turning the handle counterclockwise.
- (3) Pressure cannot be controlled if the air intake hole (hole on the side of the body) is blocked. Do not block the air intake hole by hand or with an object during pressure adjustment.
- (4) To lock the handle after pressure setting, push the handle until orange Mark below is hidden and it clicks. To unlock the handle, pull the handle Until the orange make is seen and it clicks.
- (5) Maximum settable vacuum pressure is affected by the atmospheric pressure where the vacuum regulator is used. Atmospheric pressure varies depending on the altitude and weather. Actual maximum settable vacuum pressure may not reach the value in the specification.
- (6) When vacuum pump capacity is relatively small or piping ID is small, large fluctuation of set pressure (variation range in pressure when flowing from zero) may be the result. In this case, change the vacuum pump or piping diameter. If the vacuum pump may not be replaced, add a tank (capacity of the tank depends on the operating conditions) on VAC side.

- (7) Note that pressure response time after valve (solenoid valve) opening/closing is affected by internal volume of the setting side (including piping volume). In addition, capacity of vacuum pump affects the response time.
- (8) As the vacuum regulator intakes atmospheric pressure all the time, the vacuum pressure cannot be maintained if the vacuum pump or valve is stopped. If vacuum pressure needs to be retained, it is necessary to continuously run the vacuum pump.
- (9) The set pressure may vary depending on the elapsed time and change in ambient temperature after pressure setting. If the setting value varies, adjust with the handle.
- (10) If the directional control valve (solenoid valve, mechanical valve etc.) is mounted and switched ON-OFF repeatedly for a long time, the set pressure may vary. If the setting value varies, adjust with the handle.
- (11) If there is a possibility that the vacuum regulator takes in the dust and water droplets in the ambient environment through the SET port of the vacuum regulator, install a vacuum filter or a vacuum drain separator to avoid the entry of these.
- (12) There may be pulsation or noise depending on the pressure conditions, piping conditions and ambient environment. In this case, it is possible to improve the problem by changing the pressure conditions and piping conditions. If the problem is not improved, contact your SMC sales representative.
- (13) If pressure gauge is used in the direction as Figure 1, it may cause displacement from zero point. Therefore, be sure to use pressure gauge in the Direction as Figure 2

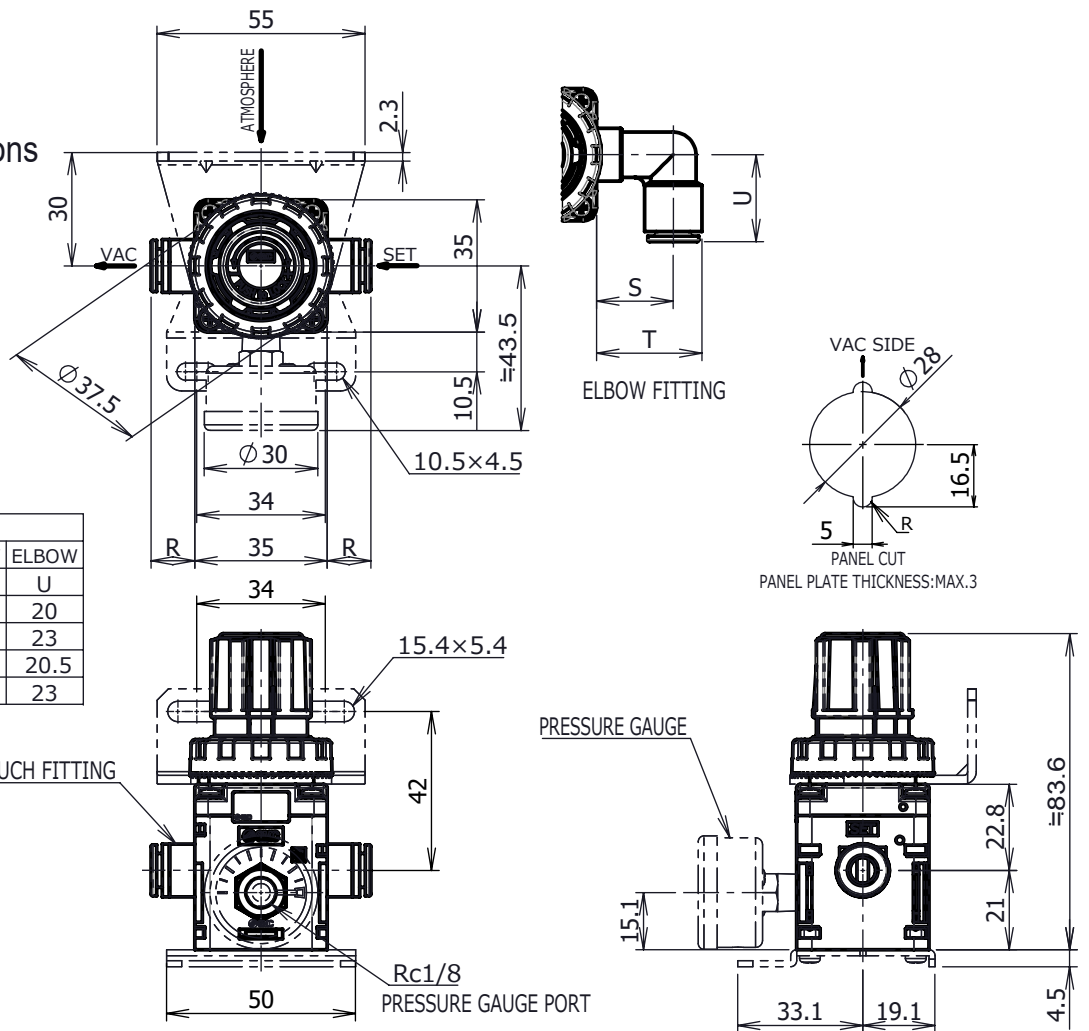


5.Warranty

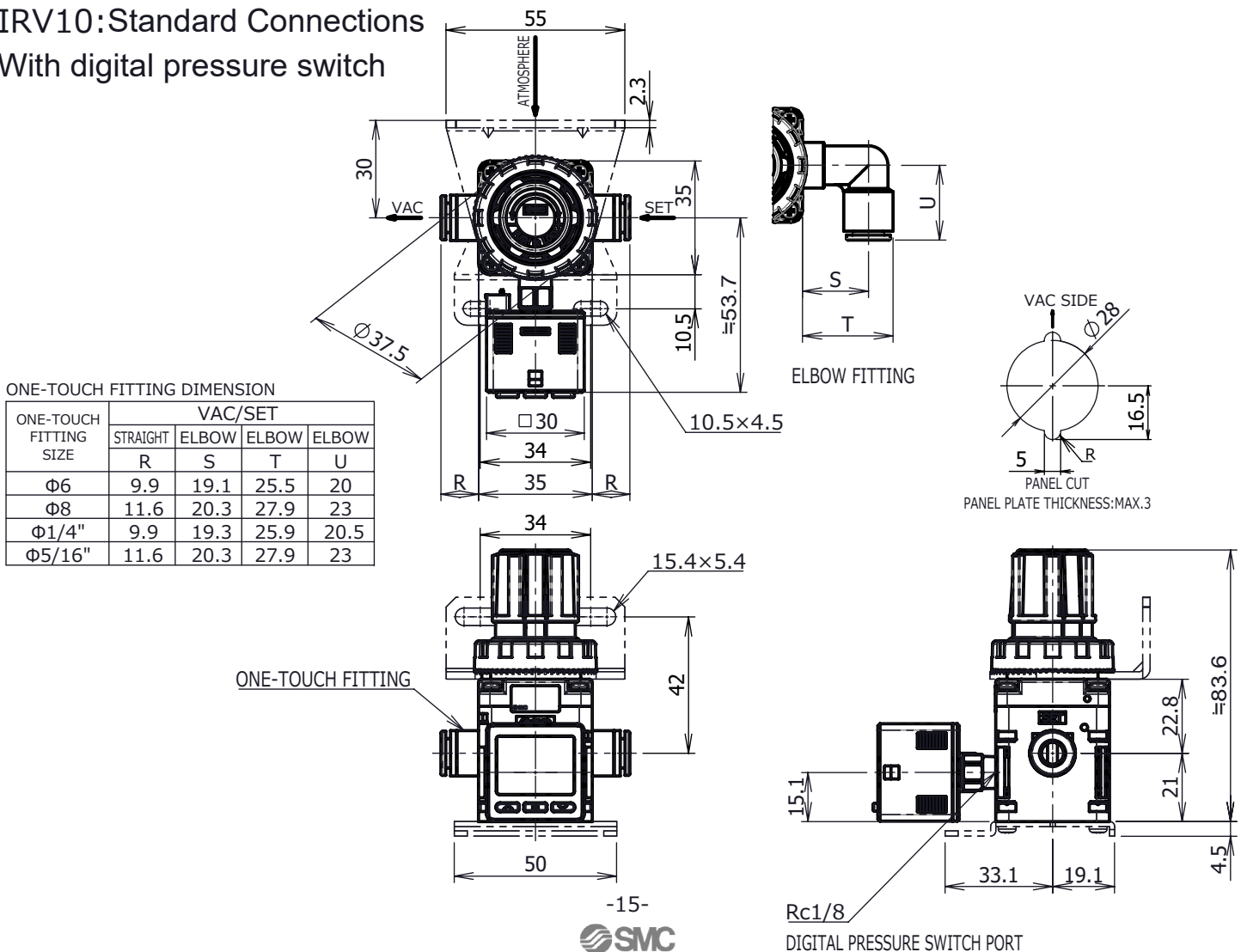
1. Period: 1.5 year after delivery to the customer's specified location or one year after starting operation, whichever comes sooner.
2. Scope: If a failure occurs within the warranty period which is deemed to be SMC's responsibility, we will provide a replacement product as limited warranty. Any loss or damage incurred by the failure is not covered by the warranty."
3. Contents:
 - 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. If there is any doubt about anything specified in "Scope" and "Content", it shall be resolved by agreement between the customer and SMC.

6. Dimensions

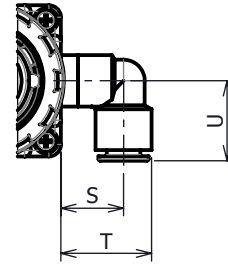
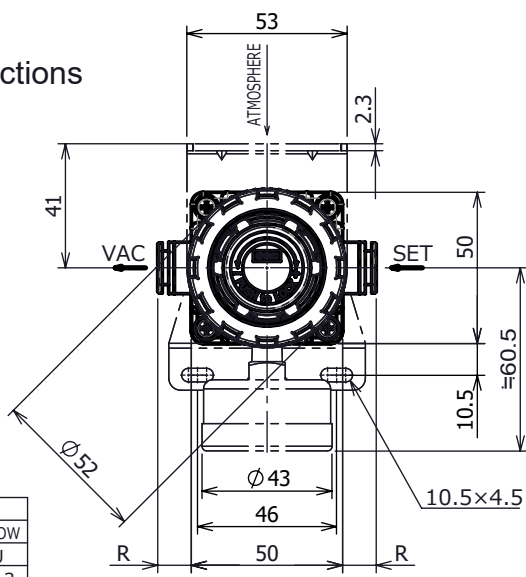
IRV10:Standard Connections



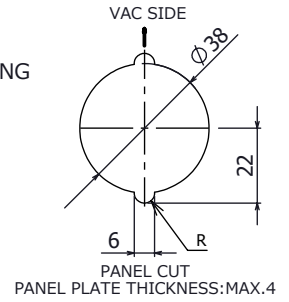
IRV10:Standard Connections With digital pressure switch



IRV20:Standard Connections

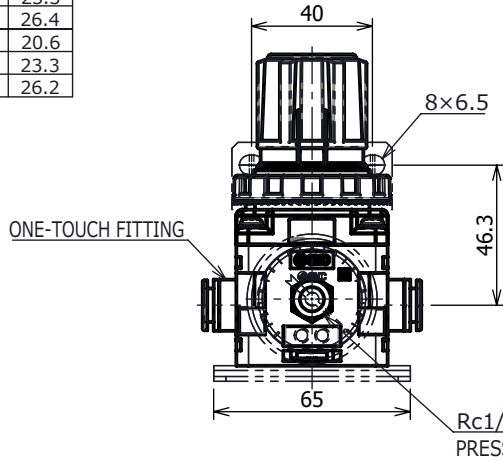


ELBOW FITTING



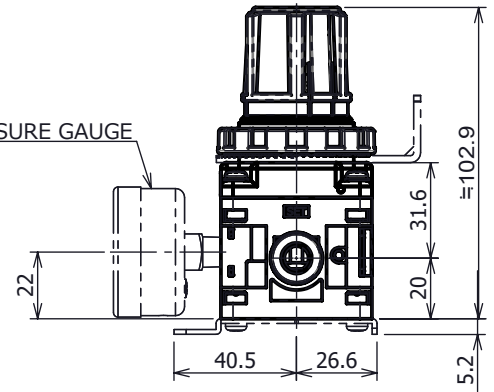
PANEL CUT
PANEL PLATE THICKNESS:MAX.4

ONE-TOUCH FITTING SIZE	VAC/SET			
	STRAIGHT R	ELBOW S	ELBOW T	ELBOW U
Φ6	9.1	18	24.4	20.3
Φ8	10.5	19.2	26.8	23.3
Φ10	11.1	20.7	30	26.4
Φ1/4"	8.8	18.2	24.8	20.6
Φ5/16"	10.5	19.2	26.8	23.3
Φ3/8"	11	20.4	29.4	26.2

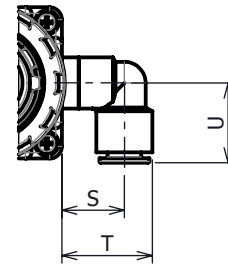
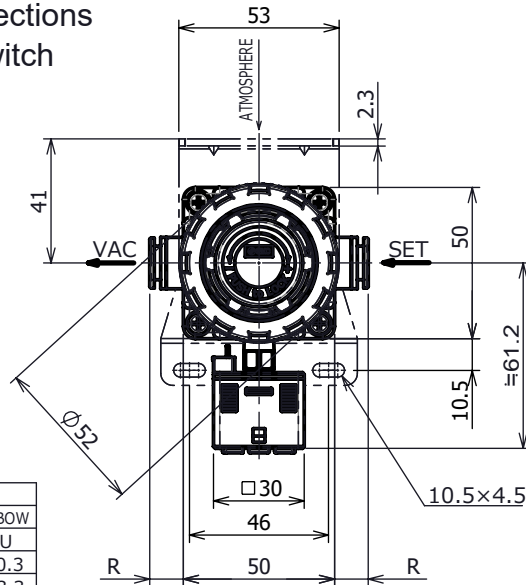


PRESSURE GAUGE

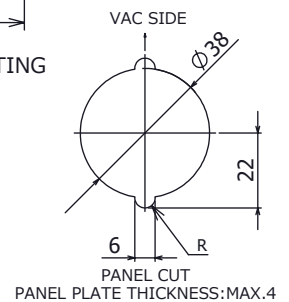
Rc1/8
PRESSURE GAUGE PORT



IRV20:Standard Connections With digital pressure switch

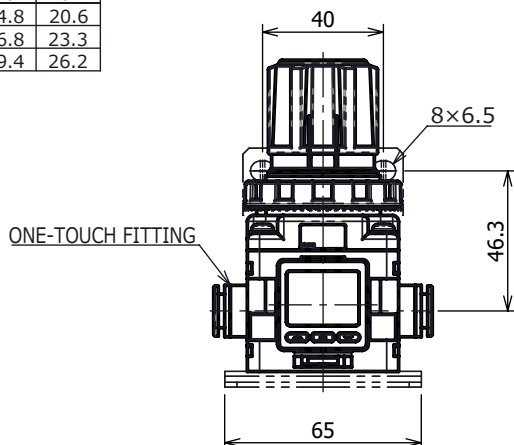


ELBOW FITTING

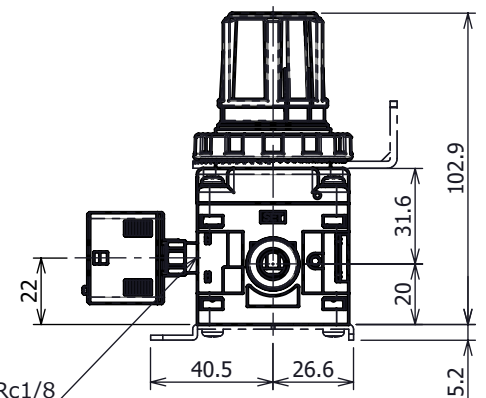


PANEL CUT
PANEL PLATE THICKNESS:MAX.4

ONE-TOUCH FITTING SIZE	VAC/SET			
	STRAIGHT R	ELBOW S	ELBOW T	ELBOW U
Φ6	9.1	18	24.4	20.3
Φ8	10.5	19.2	26.8	23.3
Φ10	11.1	20.7	30	26.4
Φ1/4"	8.8	18.2	24.8	20.6
Φ5/16"	10.5	19.2	26.8	23.3
Φ3/8"	11	20.4	29.4	26.2



Rc1/8
DIGITAL PRESSURE SWITCH PORT



Revision	
A	How to Order display content correction, etc.
B	Safety Instructions revised

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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