



# Operation Manual

## PRODUCT NAME

*E/P Regulator  
(PROFIBUS DP type)*

## MODEL/ Series/ Product Number

*ITV1000/2000/3000/2090-PR\* Series*

Install and operate the product only after reading the Operation Manual carefully and understanding its contents.

Specifically, read the safety instructions carefully.

Keep this operation manual available whenever necessary.

# SMC Corporation

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# E/P Regulator 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.



# E/P Regulator 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.

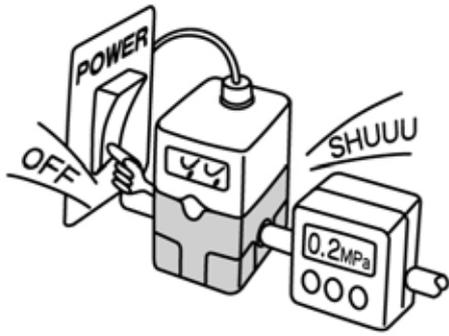
### **Compliance Requirements**

#### **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.**

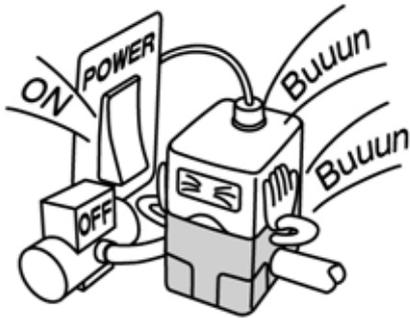
#### **2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.**

## Handling precautions

### ! Caution

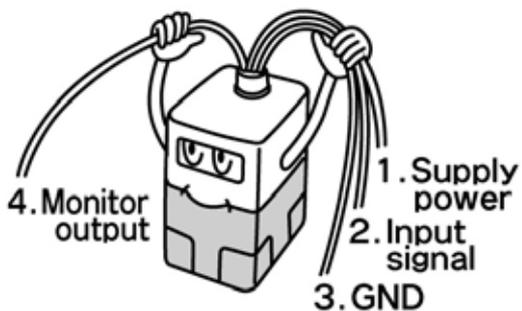


If the power supply to this product is turned off due to a power failure during normal operation, the output on the secondary side will be held and air will flow continuously.



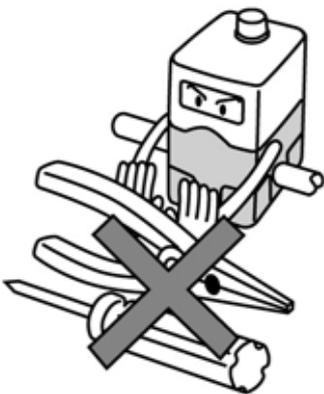
If supply pressure to this product is interrupted or shut off, while the power is still on, the internal solenoid valve will continue to operate and a humming noise will be generated.

Turn off the power supply when supply pressure is interrupted or shut off, since the life of the product may be shortened.



The optional cable connector is a 4 wire type.

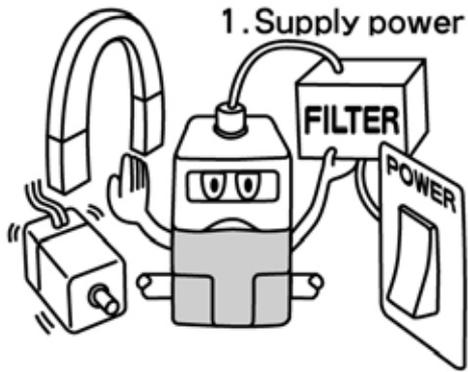
When the monitor output (switch output) is not being used, prevent the unused wires from touching the other wires, as a malfunction could occur.



This product is adjusted to specification at the time of shipment from the factory.

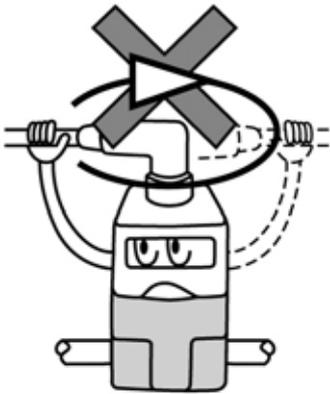
Avoid careless disassembly or removal of parts, as this can lead to malfunction.

## ! Caution



Take the following steps to avoid malfunction due to noise.

1. Install a line filter etc. to the AC power line to reduce / eliminate power supply noise.
2. Avoid malfunction due to noise by installing this product and its wiring away from strong electric fields, such as those of motors and power cables, etc.
3. Be sure to implement protective measures against load surge for inductive loads (solenoid valves, relays etc.).
4. Turn off the power supply before inserting or removing the connector.



Please note that the right angled cable connector does not rotate and is limited to only one entry direction.

# Wiring method and LED indication

## ! CAUTION

Proceed carefully, as incorrect wiring can cause damage.

Use a DC power supply with sufficient capacity and a low ripple.

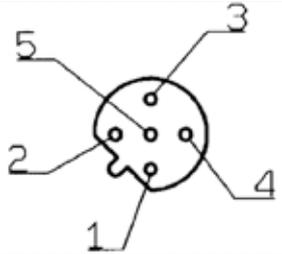
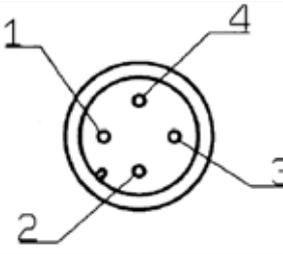
Example: Class 2 voltage source. UL1310 compliant.

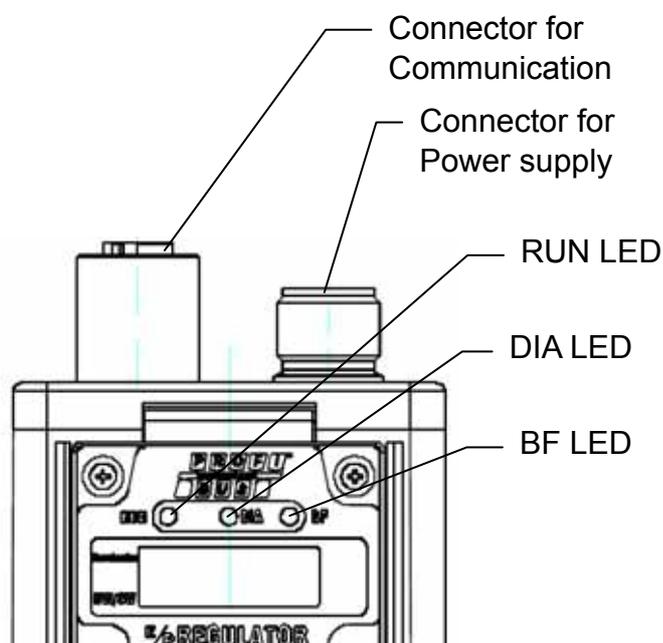
Turn off the power supply to remove and insert the connector.

Never rotate the right angled type connector as it is not designed to rotate.

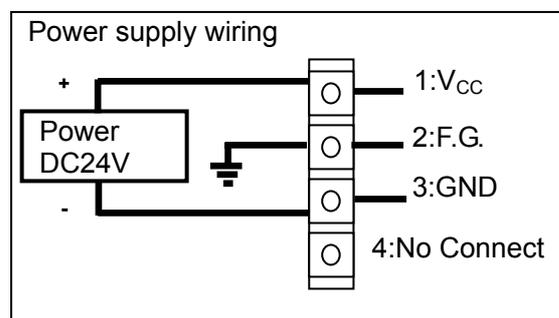
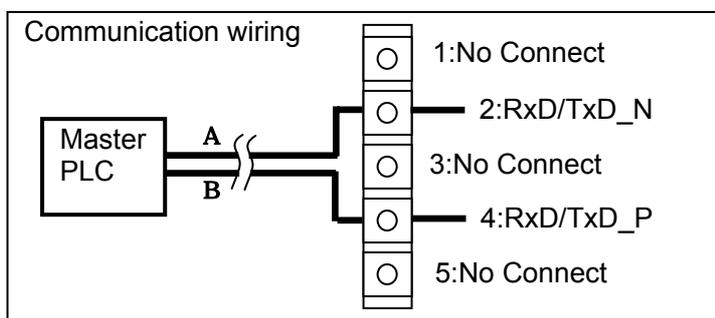
For communication master (PLC), we recommend using a product for PROFIBUS DP communication with SELV circuit which is compliant to IEC 60950-1, electrical safety standard.

The communications cable recommends the use of our company PCA-1557691(PLUG).

Connector for Communication	Connector for Power supply
M12 5PIN Connector ( SOCKET )	M12 4PIN Connector ( PLUG )
	
1.No Connect	1.Vcc
2.RxD/TxD-N	2.F.G.
3.No Connect	3.GND
4.RxD/TxD-P	4.No Connect
5.No Connect	



## ■ Connection to external equipment

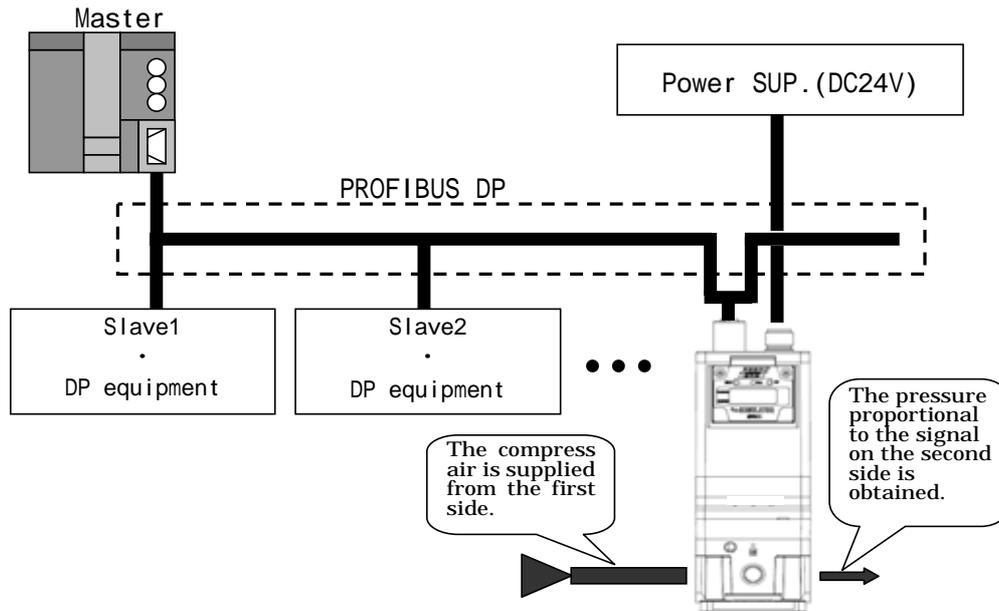


## LED INDICATION

Item	Turning ON	Turning OFF
RUN	Power ON ( green )	Power OFF
DIA	Diagnostic error ( red )	Normal
BF	Communication error ( red )	Normal

## System configuration

This product is connected to the field bus (PROFIBUS DP) as a slave.



< Example of system configuration >

## Communication specification

Item	Specifications	Remarks
Protocol	PROFIBUS DP	
Version	DP-V0	
Baud rate <sup>Note</sup>	9.6k/19.2k/45.45k/93.75k/ 187.5k/500k/1.5M/3M/6M/12M bps	Setting by master
GSD File	GSD(SMC_1412.GSD)	
Occupied area	IN	16bit(2Byte)
	OUT	16bit(2Byte)
	DIAG	56bit(7Byte)
Communication data resolution	12bit (4096 resolution)	
Output pressure condition at communication error	Clear (Output pressure become zero.)	
Address setting	Switch/ Software setting	Refer P8
Terminator	Built in (switch setting)	Refer P8

Note) Baud rate relates to communication distance.

## Setting of dipswitch

### ! CAUTION

Turn off the power supply while setting the switch.

If there is foreign matter or water droplets around the switch cover, clean it off before opening the cover.

Refer to the drawing below for the setting at the time of shipment from the factory. Confirm the condition of switches before use and reset if necessary.

#### ■Setting procedure

Loosen the screws of the switch cover.

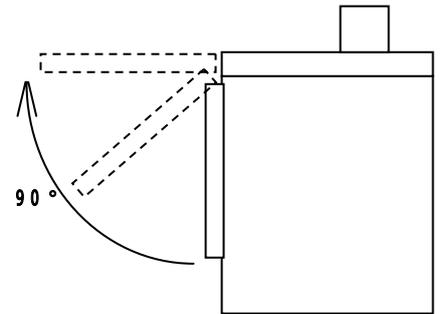
Open the cover from the bottom upwards.

(See drawing)

Set switches according to the following procedure.

After setting the switch, tighten the switch cover in the reverse order of the above procedure.

(Tightening torque 0.6 to 0.8Nm)



#### ■Selection of ADDRESS setting mode

Node address of the product can be set by software mode (SW) and hardware mode (HW).

When software mode is selected, the node address

is set by the communication master. Setting range is 1 to 125.

The device supports "Set\_Slave\_Address\_Supp" function. But the "no further changed allowed" function is not included.

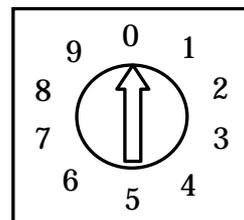
Refer to setting procedure below when hardware mode is selected (condition at the time of shipment : The switch is installed on the left HW)



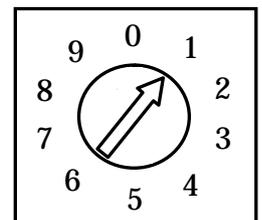
#### ■ADDRESS set switch

Hardware mode can set node address by the switch on the right.

- Address setting range is 01 to 99.
- Setting at the time of shipment is 01.



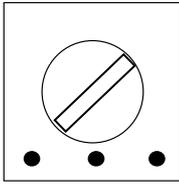
x 10



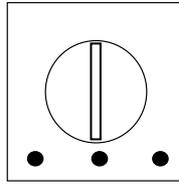
x 1

## ■Setting the terminator

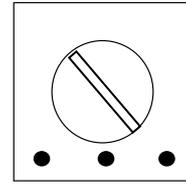
Set PROFIBUS communication line terminator.



With Terminator (at shipping)



Without terminator



Without terminator

- When the product is connected to the terminal of PROFIBUS communication line, be sure to set it to “with terminator”.

## Pressure setting and output monitoring

Pressure setting can be done by sending input data using 12bit as F.S. to the electro-pneumatic regulator through the master PLC (e.g. entering a target value to the output word data area).

Set Date	0000h	0FFFh	$[(a / \text{F.S.}) \times 4095]_{\text{HEX}}$
Output pressure	$0\% \times \text{F.S.}$	$100\% \times \text{F.S.}$	a

EX.) To set pressure at 0.3MPa by ITV2030(for 0.5MPa type)

$$(0.3\text{MPa}/0.5\text{MPa}) \times 4095 = 2457 \text{ ( DEC ) } = 999 \text{ ( HEX )}$$

Pressure of 0.3MPa is set by sending input data of “999” to the electro-pneumatic regulator through the master PLC.

## Communication data allocation

<p>Target value (O area)</p> <p>(note)</p>	<p>Set target value (from PLC to ITV) Resolution : 12bit (100%F.S.), Occupied byte : 2 Byte</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">*</td> <td style="border: 1px solid black; width: 100px; text-align: center;">Target value (Lower 12 bits)</td> </tr> <tr> <td style="text-align: center;">b15</td> <td></td> <td></td> <td style="text-align: center;">b11</td> <td style="text-align: center;">b0</td> </tr> </table> </div>	0	0	0	*	Target value (Lower 12 bits)	b15			b11	b0						
0	0	0	*	Target value (Lower 12 bits)													
b15			b11	b0													
<p>Output pressure (I area)</p> <p>(note)</p>	<p>Monitor the output pressure. (from ITV to PLC) Resolution : 12bit (100%F.S.), Occupied byte : 2 Byte</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">*</td> <td style="border: 1px solid black; width: 100px; text-align: center;">Output pressure (Lower 12 bits)</td> </tr> <tr> <td style="text-align: center;">b15</td> <td></td> <td></td> <td style="text-align: center;">b11</td> <td style="text-align: center;">b0</td> </tr> </table> </div>	0	0	0	*	Output pressure (Lower 12 bits)	b15			b11	b0						
0	0	0	*	Output pressure (Lower 12 bits)													
b15			b11	b0													
<p>Diagnosis(DIAG)</p>	<p>Monitor the product error. 7 bytes are occupied for external diagnosis data. Allocate data below to 7<sup>th</sup> byte as a diagnosis.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> <td style="border: 1px solid black; width: 20px; text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">b7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">b0</td> </tr> </table> </div> <p>Internal diagnostic error      0: No error      1: Error Over range error                0: No error      1: Error</p>	0	0	0	0	0	0	0	0	b7							b0
0	0	0	0	0	0	0	0										
b7							b0										

(note) The I/O data occupies 2bytes (16bit) respectively.

The pressure is set (output) or is monitored (input) by the data of [b<sub>15</sub>,...b<sub>1</sub>,b<sub>0</sub>].

Subordinate position 12bit [b<sub>11</sub>...b<sub>0</sub>] corresponds to 100%FS of pressure.

The pressure setting is assumed that data 1332h of 120%FS is a limit value.

The accuracy guarantee is to 100%FS.

It might response to PLC a very high numerical value such as FFFFh in around outlet pressure 0. It is because of recognition that pressure is a minus side due to the error, and this is not a failure. (The response data from 8000h to FFFFh shows a minus side.)

## Maintenance and inspection

- Turn off the power supply, stop the supplied air, exhaust the residual compressed air and verify the release of air before performing maintenance.
- Foreign matter caught in the inlet of piping or exhaust may interfere with normal operation. Periodic cleaning is necessary.
- Do not use solvents such as benzene, thinner etc. to clean the product including the switch cover. Use a soft cloth to remove stains.

Refer to the SMC website (URL <http://www.smcworld.com>) for more information about troubleshooting.

This operation manual refers to all standard types and is partially applicable to special models.

Revision history

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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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