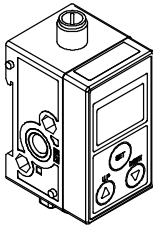




Instruction Manual
3-Colour Digital Gap Checker
ISA3 series



The intended use of the digital gap checker is to measure the distance between the detection surface and the workpiece.

1 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 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: Robotics - Safety requirements - Part 1: Industrial robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

	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

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- This product is class A equipment intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted or radiated disturbances.
- **Do not use fluids containing chemicals or synthetic oils including organic solvents, salt and corrosive gases.** Otherwise product damage, malfunction and failure can result.
- **Writing of input data to the product memory is limited to 1,000,000 times.**
- **Do not short-circuit the load.** If the load is short circuited, the excess current generated may lead to product damage.
- **Do not press the setting buttons with a sharp pointed object.**
- **During any setting, the product will switch the output according to the existing settings until the changes are complete.** Confirm the output has no adverse effect on machinery and equipment before setting. Stop the control system before setting if necessary.
- **Perform settings suitable for the operating conditions.** Incorrect setting can cause operation failure. For details of each setting refer to the Operation manual on the SMC website (URL: <https://www.smcworld.com>).
- **Do not touch the LCD during operation.** The display can vary due to static electricity.
- **Please read and understand before use the precautions for the VX2 series (2 port solenoid valve) and AR20 series (regulator) in the Operation manuals on URL: <https://www.smcworld.com>.**

2 Specifications

2.1 General specifications

Model	ISA3-F	ISA3-G	ISA3-H
Applicable fluid	Dry air (Filtered through a 5 µm filter)		
OUT1 and OUT2 *	Rated distance range	0.01 to 0.03 mm	0.02 to 0.15 mm
	Displayable/Settable range (Distance reference)	0 to 60	10 to 300
	Minimum display resolution (Distance reference)	1	
	Rated pressure range	100 to 200 kPa	
	Displayable range (Pressure value)	-20 to 220 kPa	
	Repeatability	0.005 mm or less	0.010 mm or less
	Temperature characteristics (Reference: 25 °C)	0.010 mm or less	0.015 mm or less
	Hysteresis	0 to variable (Default: 3)	0 to variable (Default: 20)
	Rated pressure range	0 to 200 kPa	
	Setting pressure range	-20 to 220 kPa	
OUT2 *	Minimum display/setting resolution	1 kPa	
	Repeatability	±0.5%F.S. ±1 digit	
	Temperature characteristics (Reference: 25 °C)	±2%F.S.	
	Withstand pressure	600 kPa	
Detection nozzle		φ1.5	
Current flow		5 L/min or less	12 L/min or less
Power supply voltage		24 VDC ±10%, Ripple(p-p) 10% or less (with power supply polarity protection)	
Current consumption		25 mA or less	
Switch output		2 output (NPN or PNP)	
	Max. load current	10 mA	
	Max. applied voltage	26.4 V	
	Residual voltage	1 V or less (at 10 mA)	
	Short circuit protection	Provided	
	Display	2-screen display LCD Main screen: 3-digit, 7-segment 2-colour (Orange/Green) Sub screen: 6-digit, 7-segment 1-colour (White)	
Environment	Enclosure	IP67 equivalent	
	Operating temp. range	Operation: 0 to 50 °C, Stored: -20 to 70 °C (No condensation or freezing)	
	Operating humidity range	Operation/Stored: 35 to 85% RH (No condensation)	
	Withstand voltage	1000 VAC or more (in 50/60 Hz) for 1 minute between terminals and housing	
	Insulation resistance	2 MΩ or more at 500 VDC, between terminals and housing	

2 Specifications (continued)

Model			ISA3-F	ISA3-G	ISA3-H
Piping	Piping option C	Supply port	Rc1/8		
		Detection port	φ4 One-touch fitting	φ6 One-touch fitting	
	Piping option F	Supply port	G1/8 (ISO1179-1)		
		Detection port	G1/8 (ISO1179-1)		
Cable			M12 cable with 4 pin connector, 4 cores, φ4, 5 m Conductor O.D.: 0.72 mm, Insulator O.D.: 1.14 mm		
Weight			113 g (Cable not included, One-touch fitting)		

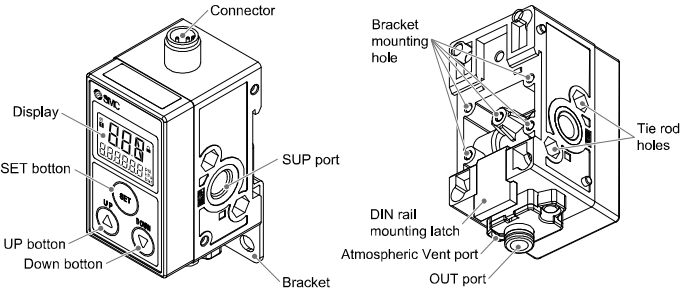
* OUT2 setting available for 2 output type only

Refer to the Operation manual on the SMC website (URL: <https://www.smcworld.com>) for the ISA3 series Digital Gap Checker, AR20 series Regulator and VX series 2 port solenoid valve product specifications.

Warning

Special products might have specifications different from those shown in this section. Contact SMC for specific drawings.

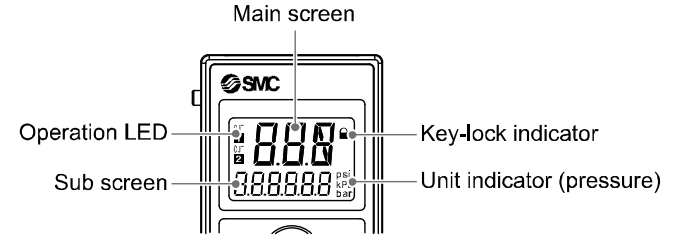
3 Names of Individual parts



Part	Description
Display	See below
UP button	Selects the mode and the display shown on the sub screen, or increases the switch point.
SET button	Press this button to change the mode and to fix the settings.
DOWN button	Selects the mode and the display shown on the sub screen, or decreases the switch point.
Connector	Electrical connection.
SUP port (Supply port)	Port to supply pressure.
Bracket mounting hole	Used to attach the bracket to the product.
Tie rod holes	Used to connect additional products.
OUT port (Detection port)	Port to be connected to the detection nozzle.
Atmospheric vent port	Port to vent exhaust air to the atmosphere.
DIN rail mounting latch	Used to mount the product on a DIN rail.

3 Names of Individual parts (continued)

3.1 Display



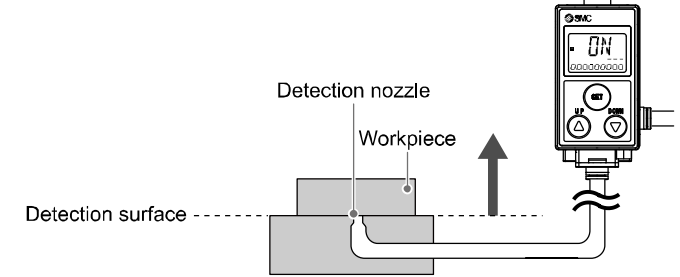
Element	Description
Main display	ON/OFF, display value and error code are displayed. (2 colour display)
Operation LED	Indicates the switch output status. Turns ON (orange) when the switch output is ON.
Sub screen	Level meter, display value, switch point, pressure etc. are displayed.
Key-lock indicator	Turns ON when keys are locked.
Units indicator (pressure)	When pressure is displayed on the sub screen, indicates the pressure units selected.

4 Installation

4.1 Installation

Warning

- **Do not install the product unless the safety instructions have been read and understood.**
- **The product should be installed in a position higher than the detection nozzle.** If the product is positioned lower than the detection nozzle, water or oil may enter the detection port, causing a malfunction or operational failure.



- **Do not use multiple detection nozzles with one product.** Correct measurement may not be possible. If multiple nozzles are to be used, please test them on the actual equipment. It is necessary for the user to verify correct operation.
- **If entry of foreign material to the fluid is possible, install a filter (5 µm or less) or a mist separator on the upstream side.**
- **If compressed air containing condensate is used, install an air dryer or a drain catch before the filter, and perform drainage regularly.** If regular drainage is difficult, the use of a filter with an auto drain is recommended.

4 Installation (continued)

4.2 Environment

Warning

- Do not use in an environment where oil, corrosive gases, chemicals, salt water or steam are present. Even exposure for a short period of time, will have adverse effects including damage, failure, malfunction and hardening of the cable.
- Do not install in a location subject to vibration or impact in excess of the product specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product specification.
- Do not use the product in an environment where the product is constantly exposed to water or oil splashes. Otherwise it can cause failure or malfunction. Take measures such as using a cover.
- Do not use the product in the presence of a magnetic field. Otherwise malfunction can result.
- When the product is contained in a box for use, provide an exhaust port for constant release of pressure to atmosphere. If the pressure in the box is not atmospheric pressure, correct inspection will not be possible and malfunction may result.

4.3 Piping

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- Eliminate any dust left in the piping by air blow before connecting the piping to the product. Otherwise it can cause damage to the product, malfunction or failure.
- Hold the specified part of the body with a spanner. Holding other parts with a spanner will damage the product.
- Perform function and leakage inspection after piping. Safety cannot be assured in the case of unexpected malfunction. Disconnect the power supply and stop the fluid supply if the equipment does not function properly or if there is leakage of fluid.
- Do not use equipment or fittings that may leak or obstruct the air flow between the product and the detection nozzle.

SUP port (supply port)

Use the correct tightening torque. Refer to the following table for the appropriate tightening torque.
Fit the seal plug (supplied with the product) to the unused port.

Product	Thread size	Tightening torque (N•m)
ISA3	Rc1/8 • G1/8	7 to 9
Regulator	Rc1/4 • G1/4	12 to 14

OUT port (detection port)

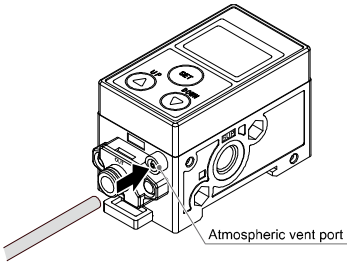
Use the correct tightening torque. Refer to the following table for the appropriate tightening torque.

Product	Thread size	Tightening torque (N•m)
ISA3	Rc1/8 • G1/8	7 to 9

- For ø4 one-touch fitting, use tube with O.D. 4 mm, and I.D. 2.5 mm.
- For ø6 one-touch fitting, use tube with O.D. 6 mm, and I.D. 4 mm.

Atmospheric vent port

- Connect tubing (sold separately) to the atmospheric vent port if there is a possibility that the port could be blocked by water or dust.
- Recommended tube is TU0425 (material: polyurethane, O.D. ø4, I.D. ø2.5) made by SMC.
- The other end of the air tubing should be routed to a safe place to prevent it from being exposed to water or dust.
- Ensure the tubing has no sharp bends.



4 Installation (continued)

4.4 Mounting

Connect the piping before mounting

- If the piping is connected while the product is mounted on a bracket or DIN rail, the bracket or DIN rail might be bent.
- If the piping is connected while the display is held with a vice, the display might be damaged.
- If a tool comes into contact with the boss, it might be broken. Therefore, connect the piping carefully.

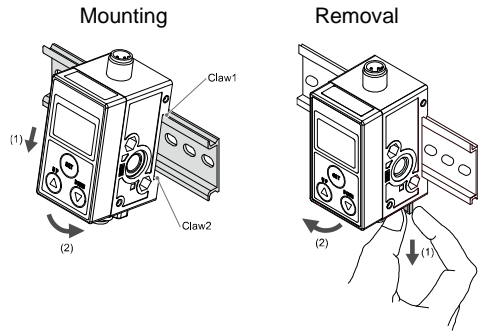
DIN rail

Mounting

- Hook the claw part 1 to the DIN rail.
- Push the claw part 2 down until it clicks.

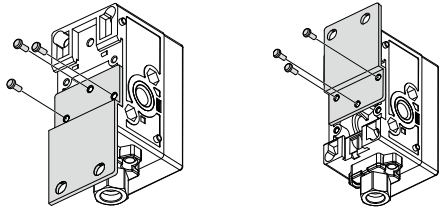
Removal

- Pull the DIN rail mounting latch downward to unlock.
- Pull out the OUT port (detection port) side to remove.

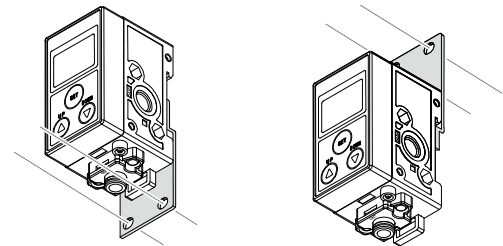


Bracket mounting

- Mount the bracket using the mounting screws provided.
- The tightening torque of the mounting screws is 0.45 N•m ±10%.

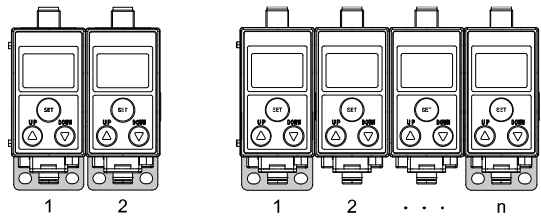


- When the product is mounted using a bracket, fix with M5 screws (2 pcs.) or equivalent.
- The Bracket thickness is approx. 1.6 mm.
- Refer to the bracket dimension drawing for the mounting hole dimensions in the Operation manual on the SMC website (URL: <https://www.smcworld.com>).



Bracket mounting position

For 2 station mounting, mount brackets on the 1st and 2nd station. For more than 2 stations, mount on the 1st and nth station.

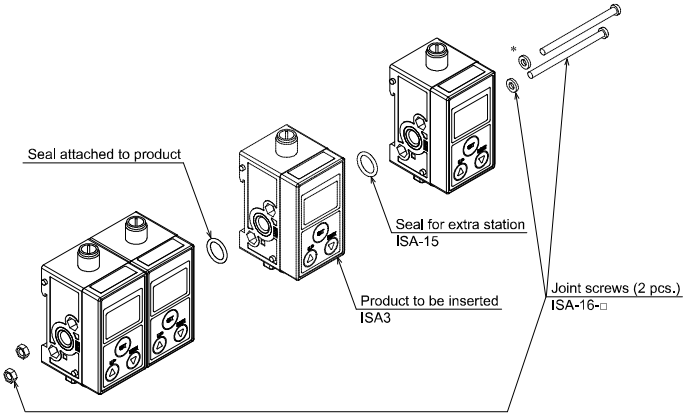


For installation details including VX2 series (2 port solenoid valve) and AR20 series (regulator) refer to the Operation manual on the SMC website (URL: <https://www.smcworld.com>).

4 Installation (continued)

4.5 Mounting procedure to change number of stations

- Remove the joint screws of the product using a screwdriver and separate the product bodies.
- Insert a product and seal (ISA-15) for the extra station between the products to increase the number of stations.
- Remove a product and seal to decrease the number of stations.
- Connect the products using the joint screws, with a tightening torque of 0.75 N•m ±10%.

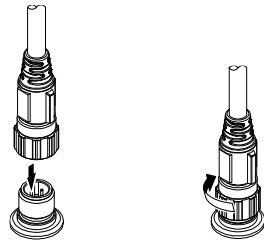


4.6 Wiring

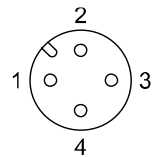
- The product is not immune to lightning strikes. Take measures against lightning strikes in the system.
- Limit of the cable tensile force is 50 N. Do not lift or carry the product by holding the cables.
- If the lead wire can move, fix it near the body of the product.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage. Do not use a cable longer than 10 m. Wire the DC (-) wire (blue) as close as possible to the power supply.

Connector Mounting and Removal

- Align the groove on the cable connector with the key on the body connector, and insert in a straight line.
- Turn the knurled part of the cable connector clockwise by hand.
- Connection is complete when the knurled part is fully tightened. Check that the connection is not loose.



Connector Pin number (cable)

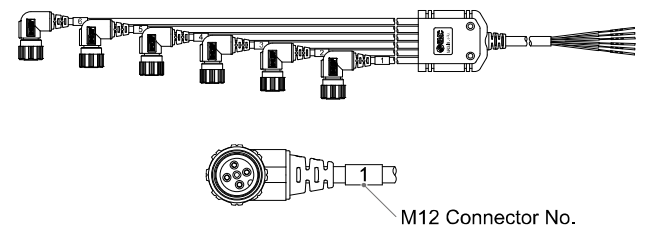


Pin No.	Description	Wire colour
1	DC(+)	Brown
2	OUT2 **	White
3	DC(-)	Blue
4	OUT1	Black

** For 2 output type only (N.C. for 1 output type).

4 Installation (continued)

Centralized lead wire



ISA-19-#

M12 Connector No.	Pin No.	Description	Output lead wire colour	
1	1	DC(+)	Brown *	Black
	2	N.C.	-	
	3	DC(-)	Blue *	
	4	OUT1		
2	1	DC(+)	Brown *	White
	2	N.C.	-	
	3	DC(-)	Blue *	
	4	OUT1		
3	1	DC(+)	Brown *	Grey
	2	N.C.	-	
	3	DC(-)	Blue *	
	4	OUT1		
4	1	DC(+)	Brown *	Orange
	2	N.C.	-	
	3	DC(-)	Blue *	
	4	OUT1		
5	1	DC(+)	Brown *	Red
	2	N.C.	-	
	3	DC(-)	Blue *	
	4	OUT1		
6	1	DC(+)	Brown *	Green
	2	N.C.	-	
	3	DC(-)	Blue *	
	4	OUT1		

*: Brown and blue are connected inside the product.

ISA-21-#

•For 2 to 3 stations

M12 Connector No.	Pin No.	Description	Lead wire colour	(Output wire colour)
1	1	DC(+)	Brown *	Orange
	2	OUT2		
	3	DC(-)	Blue *	Black
	4	OUT1		
2	1	DC(+)	Brown *	Red
	2	OUT2		
	3	DC(-)	Blue *	White
	4	OUT1		
3	1	DC(+)	Brown *	Green
	2	OUT2		
	3	DC(-)	Blue *	Grey
	4	OUT1		

4 Installation (continued)

•For 4 to 6 stations

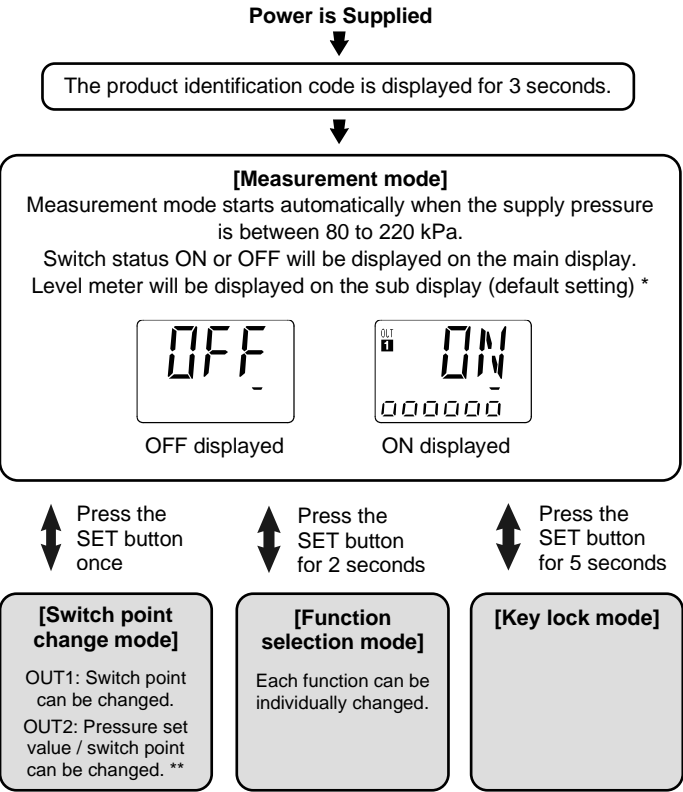
M12 Connector No.	Pin No.	Description	Lead wire colour	(Output wire colour)
1	1	DC(+)	Brown *	Yellow
	2	OUT2		
	3	DC(-)	Blue *	Black
	4	OUT1		
2	1	DC(+)	Brown *	Purple
	2	OUT2		
	3	DC(-)	Blue *	White
	4	OUT1		
3	1	DC(+)	Brown *	Grey/Black
	2	OUT2		
	3	DC(-)	Blue *	Grey
	4	OUT1		
4	1	DC(+)	Brown *	Orange/Black
	2	OUT2		
	3	DC(-)	Blue *	Orange
	4	OUT1		
5	1	DC(+)	Brown *	Red/Black
	2	OUT2		
	3	DC(-)	Blue *	Red
	4	OUT1		
6	1	DC(+)	Brown *	Green/Black
	2	OUT2		
	3	DC(-)	Blue *	Green
	4	OUT1		

*: Brown and blue are connected inside the product.

Caution

- The electrical entry of the centralized lead wire is on the right side. If the supply port on the right side is used, arrange the centralized lead wire so that it does not interfere with the control unit.
- Refer to the VX2 series (2 port solenoid valve) Operation manual on the SMC website (URL: <https://www.smcworld.com>) for wiring details.

5 Settings

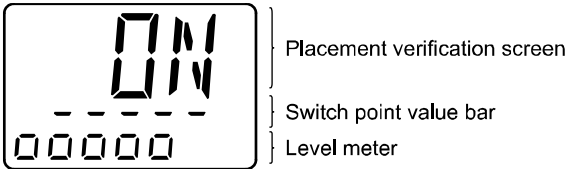


* Parameters other than the level meter can be displayed on the sub display, by selecting the parameter in function selection mode [F10]. Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>).

** OUT2 setting available for 2 output type only

5.1 Measurement mode

- **Placement verification screen (Main display)**
The placement condition is indicated by the switch output status (ON/OFF).

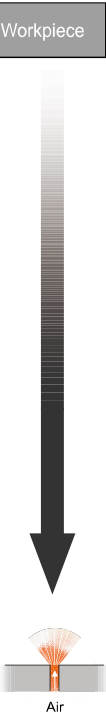







• Level meter (sub display)

Element	Description
Switch point value bar	A bar to indicate the switch point value which has been set, is automatically displayed. Refer to the switch point setting to change the switch point value.
Level meter	The workpiece gap condition approaching the nozzle is indicated by the number of "□" displayed. This display is a reference only. It is not an accurate distance measurement.

5 Settings (continued)

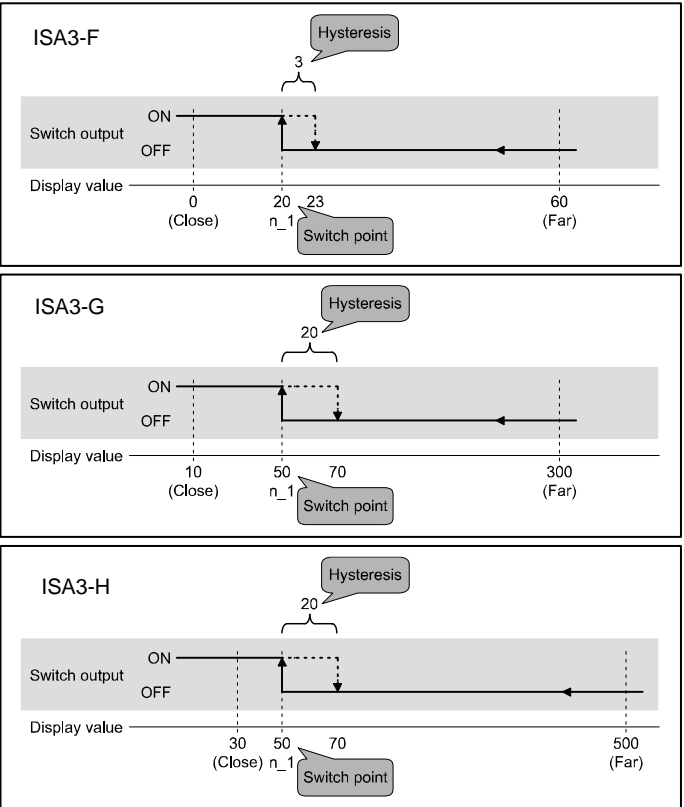
5.2 Relationship between display and placement status

	Display	Placement status	Switch output
 <p>Workpiece</p>	 <p>Level meter "□" is not displayed.</p>	Detection surface and the workpiece are very far apart.	Switch output OFF.
	 <p>Switch point value bar "-" and level meter "□" not close.</p>	Detection surface and the workpiece are too far apart.	Switch output OFF.
	 <p>Switch point value bar "-" and level meter "□" are close.</p>	Detection surface and the workpiece are slightly apart.	Switch output OFF.
	 <p>Level meter "□" has reached switch point value bar "- - -".</p>	Workpiece is placed on the detection surface.	Switch output ON.
	 <p>Level meter "□" reached its maximum</p>	Workpiece in close contact with detection surface.	Switch output ON.
<p>Placement surface (detection nozzle)</p> <p>Air</p>			

5.3 Switch point setting

OUT1: Switch point change mode.
OUT2: Pressure set value / Switch point change mode (2 output type).
To change the hysteresis value refer to Function selection mode.

• Default settings of OUT1

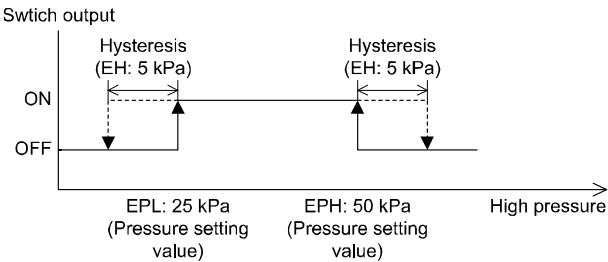


- The switch output turns ON when the display value is less than the switch point (solid line in diagram).
- The switch output turns OFF when the display value is greater than the switch point added to the hysteresis value (dashed line in diagram).

5 Settings (continued)

• Default settings of OUT2 (for 2 output type only)

The default setting is as shown below. It is possible to adjust the pressure setting.
(Output mode: OUT port window comparator mode, Setting of reverse output: normal output)

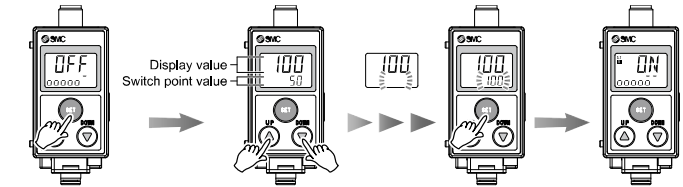


• Preparation before setting

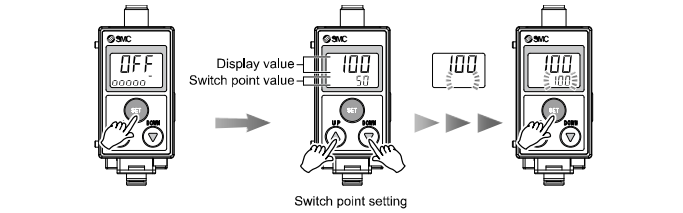
- 1) Supply pressure to the product (100 to 200 kPa).
- 2) Insert an acceptable clearance gauge between the detection surface and the workpiece.
Alternatively, place a sample workpiece (non-defective workpiece) on the detection nozzle.

• Switch Point setting

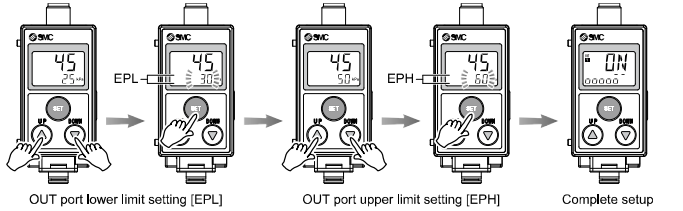
- 1) Press the SET button while in measurement mode. The display value will be displayed on the main display and the switch point of OUT1 in the sub screen.
- 2) Press the UP and DOWN buttons to adjust the switch point value. Pressing the UP and DOWN buttons simultaneously for 1 second minimum, then releasing the buttons when the displayed switch point disappears, will set the switch point to the same as the current display value (snap shot function). Then it is possible to adjust the switch point value by pressing the UP and DOWN buttons.
- 3) Press the SET button to complete the switch point setting. The product will return to measurement mode.



For the 2 output type the product will move to the setting of OUT2 (as shown below).



- 4) Press the UP and DOWN buttons to adjust the set value of OUT2.
* Press [F 2] in function selection mode to change the output mode, normal or reverse output and hysteresis settings.
The (Snap shot function) can be used during the pressure setting.

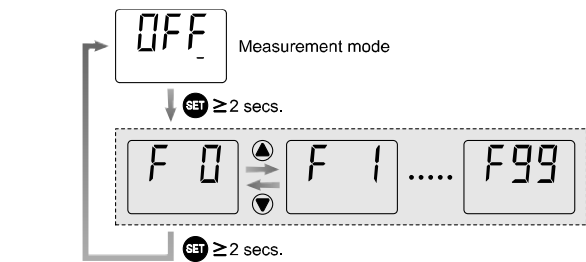


- 5) Press the SET button to complete the setting. The product will return to measurement mode.

6 Function Setting

6.1 Function Selection mode

In measurement mode, press the SET button for 2 seconds or longer to display [F 0]. Select to display the function to be changed. Press the SET button for 2 seconds or longer to return to measurement mode.



- The sub screen will display [the function name] and [set value] alternately.

Refer to the operation manual for further information on the SMC website (URL: <https://www.smcworld.com>) for function settings.

• Table of default settings

Function number	Function	Default setting
F0	Unit selection *	[PA] kPa
F1	OUT1 Switch point	ISA3-F: [20] ISA3-G: [50] ISA3-H: [50]
	OUT1 Hysteresis	ISA3-F: [3] ISA3-G: [20] ISA3-H: [20]
	OUT1 Display colour	[SoG] Green when ON, Orange when OFF
F2 **	OUT2 output mode	oUt2: [Ewin] OUT port side pressure detection, window comparator mode
	OUT2 Reversed output	2ot: [2_P] Normal output
	OUT2 Pressure setting	EPL: [25] kPa EPH: [50] kPa
	OUT2 Hysteresis	EH: [5] kPa
	OUT2 Response time	rES: [1000]
F6	Display value compensation	[0.0] Compensation value: 0.0
F10	Sub display	[LEvEL] Level meter
F80	Display OFF mode	[on] Normal operation mode
F81	Security code	[oFF] Security code OFF
F90	Set all functions	[oFF] Set all functions OFF.
F98	Forced Output	[normAL] Normal output
F99	Reset to default	[oFF] Not reset to default

* Available only for models with units selection function

** [F 2] OUT2 setting available for 2 output type only (the 1 output type product displays [- - -]).

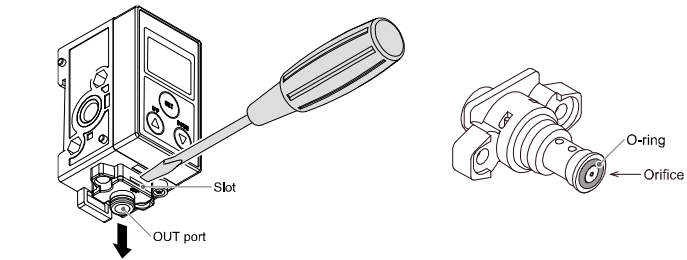
7 Maintenance

7.1 General Maintenance

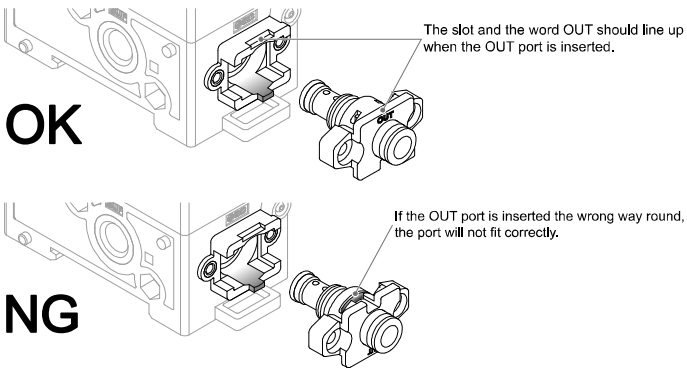
- ⚠ Caution
- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
 - If handled improperly, compressed air can be dangerous.
 - Maintenance of pneumatic systems should be performed only by qualified personnel.
 - Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
 - After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
 - If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
 - **Do not make any modification to the product.**
 - **Do not disassemble the product, unless required by installation or maintenance instructions.**
 - **Drain the system regularly**
If condensate enters the secondary side, it may cause malfunction of pneumatic equipment

7.2 Nozzle Cleaning

- The OUT port orifice can be removed for cleaning by removing the retaining screw.
- Flush inside the orifice with air or wipe off foreign matter with a soft clean cloth. Correct detection may not be possible if the orifice is dirty or scratched.
- 1) Remove the screw (2 pcs.) at the side of the OUT port.
 - 2) Remove the OUT port with a flat head screw driver as shown in the figure below. Take care to keep the direction of removal straight.
 - 3) Remove the O-ring from the orifice for cleaning.



- 4) Clean the orifice.
- 5) Place the O ring back into the orifice.
- 6) Ensure correct orientation of the OUT port and insert straight into the body.
- 7) Tighten the screws on the OUT port side. Tightening torque must be: 0.3 N•m.



8 How to Order

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for How to order information.

9 Troubleshooting

9.1 Error Indication

Main display	Error Name	Description	Measures
- - -	Supply pressure error	Supply pressure is not in the range 80 to 220 kPa. Measurement is not possible.	Supply 100 to 200 kPa within the rated pressure range.
- - -	Display value outside of the displayable range (Switch point setting mode)	The workpiece is outside of the displayable range.	Move the workpiece closer to the detection nozzle.
Er 1	OUT1 over current error	The switch output (OUT1) load current has exceeded 80 mA.	Turn the power OFF and remove the cause of the over current.
Er 2 **	OUT2 over current error	The switch output (OUT2) load current has exceeded 80 mA.	Turn the power OFF and remove the cause of the over current.
Er 3	Zero clear error	Zero clear was not performed at atmospheric pressure. (Pressure outside of ±14 kPa was supplied).	Perform zero clear at atmospheric pressure.
Er 0	System error	An internal data error has occurred.	Turn the power OFF and turn it ON again.
Er 4			
Er 9			

Sub screen	Error Name	Description	Measures
HHH	Supply pressure error. (when pressure is displayed on the sub screen)	Pressure exceeding 220 kPa is supplied.	Keep the supply pressure within the display range of -20 to 220 kPa.
LLL		Vacuum pressure (-20 kPa or less) is supplied.	

** For 2 output type only

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for more troubleshooting information.

10 Outline dimensions

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for outline dimensions

11 Limitations of Use

14.1 Limited warranty and Disclaimer/Compliance Requirements
Refer to Handling Precautions for SMC Products.

12 Product disposal

This product should not be disposed of as municipal waste. Check your local regulations and guidelines to dispose of this product correctly, in order to reduce the impact on human health and the environment.

13 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor / importer.

SMC Corporation

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
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