



Installation & Maintenance Manual

Trimmer Auto Switch (Solid State)

Series D-M9K / D-F7K / D-Y7K (Sensor unit)

D-RNK / D-RPK (Amp unit)

1 Safety Instructions

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger", followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

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.

This product is class A equipment that is intended for use in an industrial environment.

There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

Warning

- Do not disassemble, modify (including changing the printed circuit board) or repair.**
An injury or failure can result.
- Do not operate the product outside of the specifications.**
Fire, malfunction, or damage to the product can result.
Verify the specifications before use.
- Do not operate in an atmosphere containing flammable or explosive gases.**
Fire or an explosion can result.
This product is not designed to be explosion proof.
- If using the product in an interlocking circuit:**
 - Provide a double interlocking system, for example a mechanical system.
 - Check the product regularly for proper operation.
Otherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:**
 - Turn off the power supply.
 - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.
Otherwise an injury can result.

1 Safety Instructions (continued)

Caution

- Do not touch terminals and connectors while the power is ON.**
Otherwise electric shock, malfunction or damage to the product can result.
- After completing maintenance, perform appropriate functional checks.**
Stop operation if the equipment does not function correctly.
Safety cannot be assured in the case of unexpected malfunction.
Perform periodic maintenance checks as follows.
 - 1) Securely tighten the product mounting screws.
If the screws have become loose and the required mounting position has been lost, re-adjust the product to the correct mounting position and re-tighten the screws.
 - 2) Check that there is no damage to the cable.
If damage to the cable is found, replace the product, or repair the cable, to avoid faulty insulation.
 - 3) Check the detecting position setting.
Confirm that the product ON/OFF position is at the centre of the operating range (green light range).
If the product operates with a red light ON at the ON/OFF position, the mounting position is not correct. Re-adjust the product to the optimum position at the centre of the operating range.
Some actuator and cylinder series have their own setting methods. In such cases, follow the instructions given.

- Check the wiring**
Incorrect wiring or short circuit of load may damage the product.

NOTE
Refer to the operation manual on the SMC website
(URL <http://www.smcworld.com>).

2 Specifications

Specification for sensor unit			
Model	D-M9K	D-F7K	D-Y7K
Mounting	Direct mount into round groove	Rail mounting	Direct mount into square groove
Applicable amplifier unit	D-RNK, D-RPK		
Insulation resistance	50 MΩ or more under the test voltage 500 VDC (between case and cable)		
Withstand voltage	1000 VAC 1 min (between case and cable)		
Ambient temperature	-10 to 60 °C		
Enclosure	IP67		
Weight	55 g (including connector)	58 g (including connector)	
Standards	CE		

Oil proof cabtyre cable (sensor unit and amplifier unit)

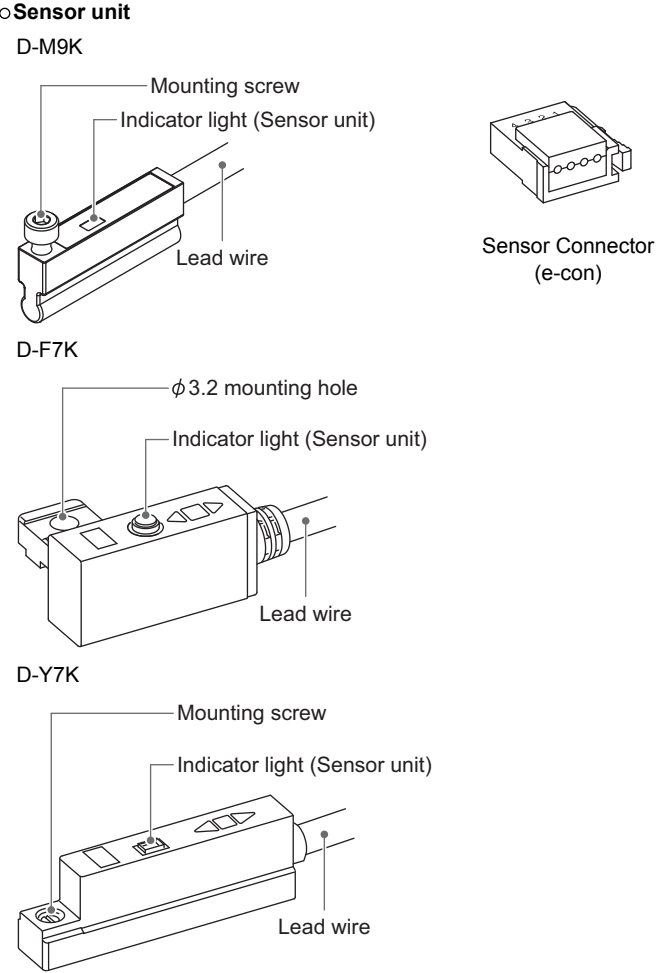
Sheath	Outside diameter	ø3.5 mm
Insulator	Colours	Brown, Blue, Black, White
	Outside diameter	ø1 mm
Conductor	Nominal cross section area	AWG26
	Wire diameter	ø0.08 mm
Minimum bending radius (Reference value)		21 mm

2 Specifications (continued)

Specification for amplifier unit		
Model	D-RNK	D-RPK
Applicable load	Relay / PLC	
Voltage output	12 to 24 VDC	
Current output	40 mA or less	
Output type	NPN2 output	PNP2 output
Load voltage	28 V or less	-
Load current	80 mA or less / 1 output	
Internal voltage drop	1.5 V or less	
Leakage current	100 μA or less / 1 output	
Response time	1 ms or less	
Insulation resistance	50 MΩ or more under the test voltage 500 VDC (between case and cable)	
Withstand voltage	1000 VAC 1min (between case and cable)	
Ambient temperature	-10 to 60 °C	
Enclosure	IP40	
Weight	70 g	
Standards	CE	

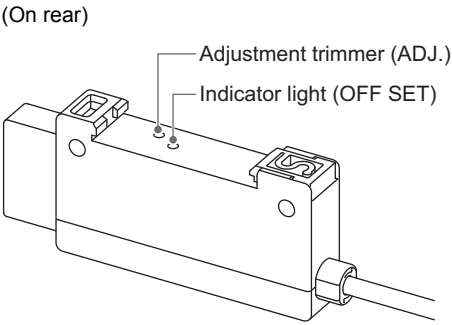
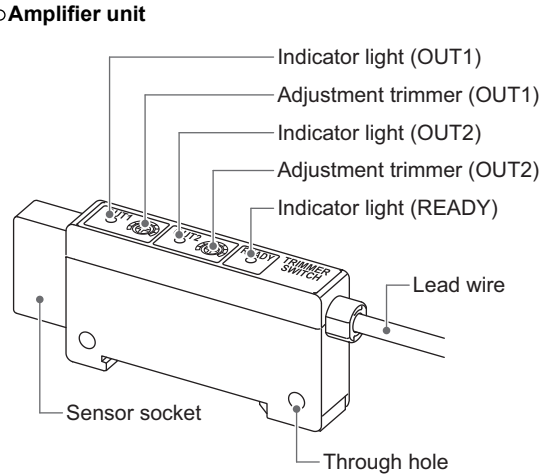
Refer to the operation manual on the SMC website
(URL <http://www.smcworld.com>).

3 Summary of Product parts



3 Summary of Product parts (continued)

Element	Description
Mounting screw	Screw for securing the sensor unit in the groove in the actuator.
ø3.2 mounting hole	Hole for mounting the product to the actuator rail. (Use the mounting bracket included with the actuator)
Indicator light (Sensor unit)	The indicator is ON in red or green when the sensor unit detects the magnetic field.
Lead wire	Lead wire for power supply and outputs. (3 m)
Sensor Connector (e-con)	Sensor Connector supplied loose with the product (but shipped together).



Element	Description
Indicator light (OUT1)	Indicates the output status of OUT1. Light is ON (Green) when the output is ON.
Adjustment trimmer (OUT1)	Adjusts the detection range of OUT1.
Indicator light (OUT2)	Indicates the output status of OUT2. Light is ON (Orange) when the output is ON.
Adjustment trimmer (OUT2)	Adjusts the detection range of OUT2.
Indicator light (READY)	The indicator light is ON (Red) when the sensor unit detects the magnetic field. The detection ranges of OUT1 and OUT2 should be adjusted when this light is ON.
Lead wire	Lead wire for power supply and outputs. (3 m)
Through hole	Used for direct mounting.
Sensor socket	For connecting the sensor connector.
Adjustment trimmer (ADJ.)	This is used when the sensor unit is connected for the first time. Refer to Offset adjustment for details.
Indicator light (OFF SET)	The indicator light is ON (Red) when the adjustment is completed.

4 Installation

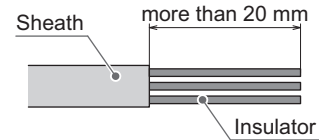
■Wiring

- Connections should only be made with the power supply turned OFF.
- Use separate routes for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
- Ensure that the FG terminal is connected to ground when using a commercially available switch-mode power supply. When a switch-mode power supply is connected to the product, switching noise will be superimposed and the product specification can no longer be met. This can be prevented by inserting a noise filter, such as a line noise filter and ferrite core, between the switch-mode power supply and the product, or by using a series power supply instead of a switch-mode power supply.

○Connecting the wiring

Attaching the sensor connector to the sensor wire

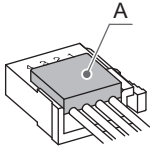
- Strip the sensor wire as shown.
- Do not cut the insulator.



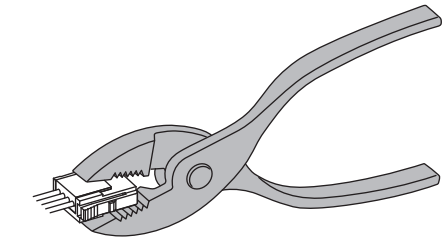
- Insert the corresponding wire colour shown in the table into the pin number printed on the sensor connector, to the bottom.

Pin number on connector	Wire colour	Contents
1	Black	SOUT1
2	Blue	GND
3	White	SOUT2
4	Brown	Vsw

- Check that the above preparation has been performed correctly, then part A shown should be pressed in by hand to make temporary connection.



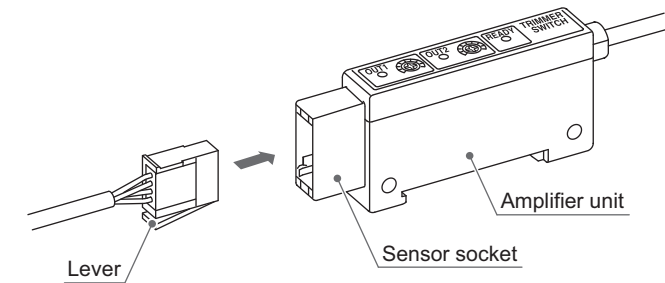
- Part A should then be pressed in using a suitable tool, such as pliers.



- The sensor connector cannot be re-used once it has been fully crimped.
- In cases of connection failure such as incorrect order of wires or incomplete insertion, please use the new connector (ZS-28-C-1).

○Installation / Removal of the sensor connector to the amplifier unit

- When connecting the connector, insert it straight into the sensor socket until connector clicks.
- When removing the connector, press down the lever to release the hook from the sensor socket and pull the connector straight out.

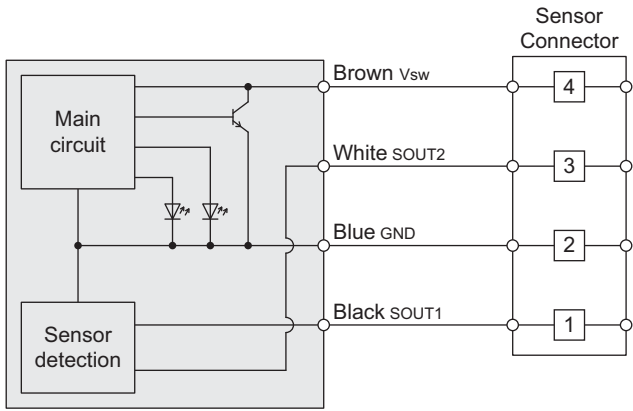


4 Installation (continued)

■Internal circuit

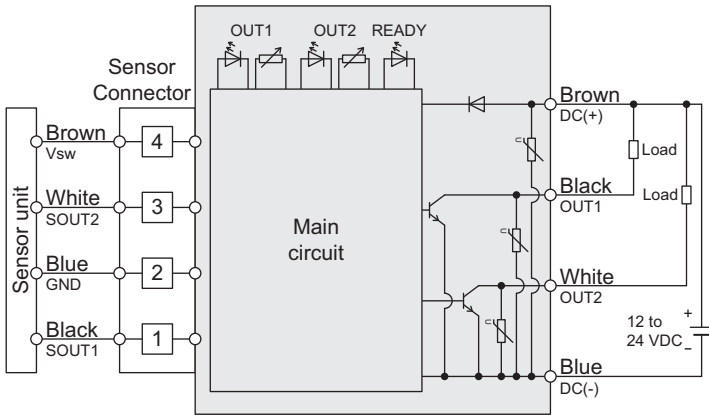
○Sensor unit internal circuit

D-M9K / D-□7K

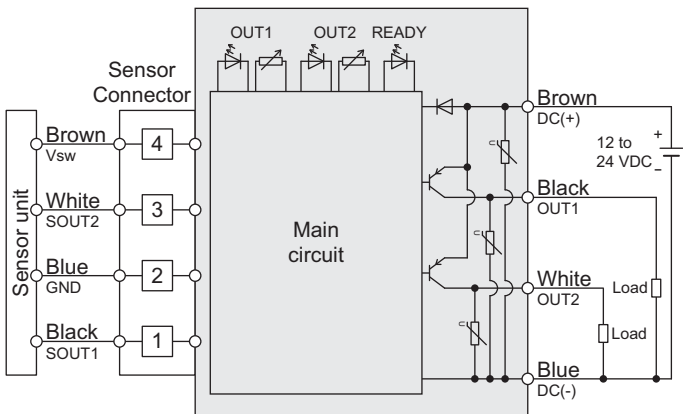


○Amplifier unit internal circuit

NPN (2 output) type
D-RNK:
Max. load current: 80 mA
Max. applied voltage: 28 V
Internal voltage drop: 1.5 V or less



PNP (2 output) type
D-RPK:
Max. load current: 80 mA
Internal voltage drop: 1.5 V or less

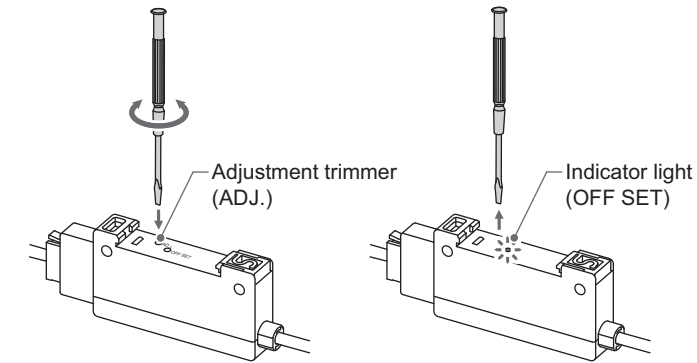


4 Installation (continued)

■Offset adjustment

[Note] When the sensor unit is mounted to the actuator, remove the sensor unit from the actuator so that no magnetic field is present. Keep the sensor unit away from any magnetic field as far as possible because the sensor may detect a magnetic field even when the operation light is not ON.

- (1) Connect the sensor unit to the amplifier unit, and connect the amplifier unit wiring to the power supply.
- (2) Insert a small flat blade screwdriver into the adjustment trimmer (ADJ.) to turn the trimmer clockwise or counterclockwise. Be careful where the screwdriver is inserted. Inserting the screwdriver into the indicator light (OFF SET) may damage the light. Rotation torque applied to the adjustment trimmer must be 20 mNm or less. Effective rotation is 12 turns. The adjustment trimmer does not have any rotational stop. If the desired adjustment is not made by rotating in one direction, then try the other direction.
- (3) When the indicator light (OFF SET) is red, adjustment is complete.



Offset Adjustment

- Offset adjustment is the optimization of the electrical reference point of the sensor.
- Without offset adjustment, ON/OFF of the output signal cannot be operated correctly.
- When the sensor unit is used for the first time, always perform offset adjustment.
- After the adjustment, further adjustment is not necessary unless the sensor unit is replaced.

4 Installation (continued)

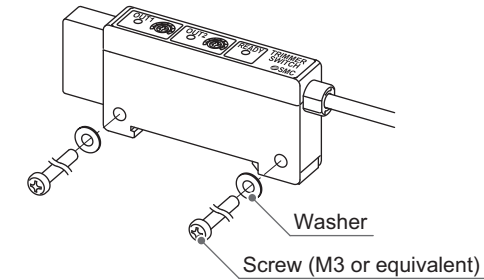
■Installation

○Installation of the amplifier unit

- Perform offset adjustment before the installation of the amplifier unit.

○Direct installation

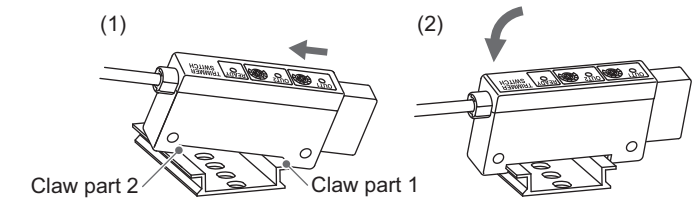
- For direct mounting, use M3 screws (2 pcs.) or equivalent.
- The tightening torque of the screw is 0.5 to 0.7 Nm.
- Mount the product on a flat and even surface. Mounting on an uneven surface can damage the case.
- Screws and washers should be prepared by the user.



○Installation of DIN rail

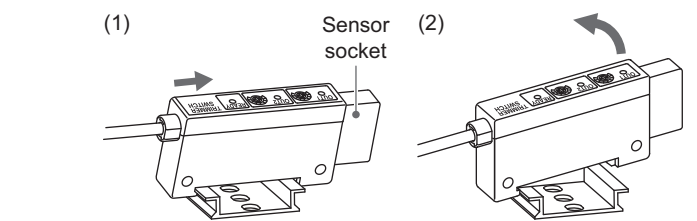
Mounting

- (1) Hook the claw part 1 to the DIN rail (width 35 mm).
- (2) Push the claw part 2 down until it clicks.



Removal

- (1) Push the body towards the sensor socket end.
- (2) Pull the sensor socket end upwards.

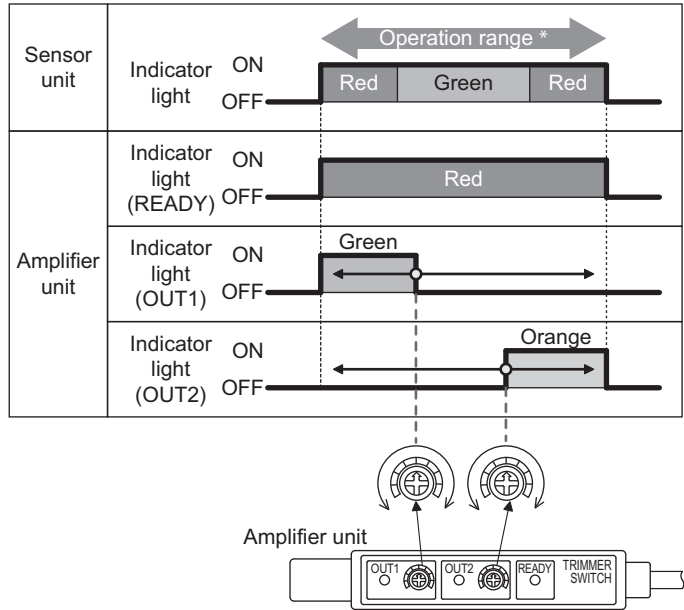


*: We recommend using an end plate when mounting onto DIN rail. Refer to DIN rail end plate manufacturers for further details.

5 Settings

Setting using the Adjustment trimmer.
"How to mount" depends on the actuator type and tube I.D.. Please refer to the actuator catalogue.

The size of the work piece (correct, too small, too large, or no work piece) can be verified by varying the detection range of OUT1 and OUT2 within the operation range using the adjustment trimmer. (See below)



※: As for standard products, the operation range depends on the actuator and tube I.D.. It cannot be varied.

- The rotating torque of adjustment trimmer is 2 to 20 mNm. Maximum value is 260 degrees. Make adjustment within the specification range.
- The scale of the trimmer does not show the operation range. Please use this as a guide for setting.

<<Cautions when designing>>

- For setting, do not move the actuator by hand. Use air to start the actuator.
- Detection range may vary depending on the air supply pressure, variation of the ambient magnetic field, or the presence of any magnetic material.
- Minimum detection width is 0.5 mm. This product is not applicable when the size difference of the work piece is less than 0.5 mm in stroke direction.
- This product is not suitable for work pieces with unstable shapes such as rubber parts.

5 Settings (continued)

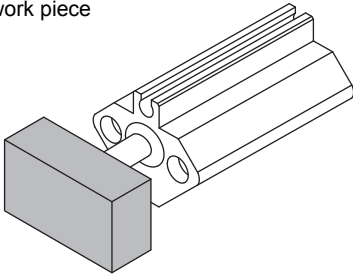
Setting procedure 1

This is an example of setting.
Perform the setting and operation check with actual equipment.

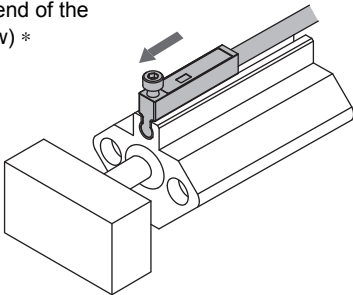
<<Verify 4 work pieces below using Air Gripper (CQ2 series)>>

[A]	Work piece size is correct
[B]	Work piece is too thick
[C]	Work piece is too thin
[D]	No work piece

(1) Push the thickest conformant work piece by supplying air.

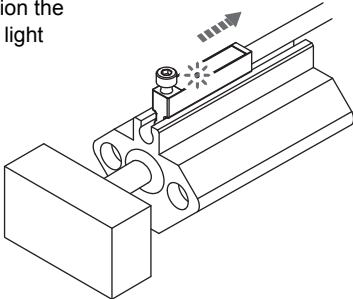


(2) Insert the sensor unit until the end of the mounting groove. (Figure below) *

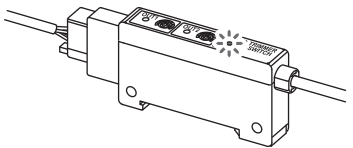


※: The relationship between OUT1 and OUT2 is reversed if the mounting direction is opposite. Detection range may change. Operation check with actual equipment should be performed as the location of OUT1 and OUT2 is reversed depending on the cylinder structure.

(3) Pull back the sensor unit. Position the sensor unit where the indicator light changes from red to green.



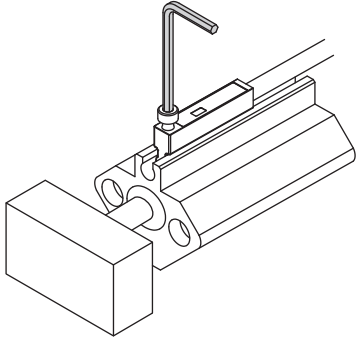
(4) Make sure that the indicator light at the amplifier unit (READY) is ON.



5 Settings (continued)

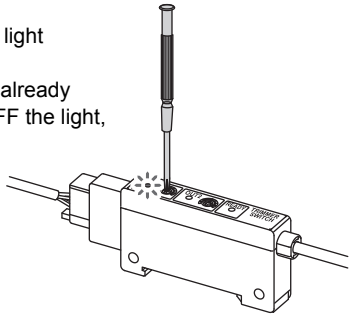
(5) Fix the sensor unit with the mounting screw or a mounting bracket. Refer to the table below for the tightening torque.

Model	Mounting	Mounting tool	Tightening torque
D-M9K	Hexagon socket head cap screw (M2.5 x 12 L)	Hexagon wrench (width across flats: 2 mm)	0.1 to 0.2 Nm
D-F7K	Mounting bracket + Mounting screw (M3)	Phillips head screwdriver	0.5 to 0.7 Nm
D-Y7K	Mounting screw (M2.5 x 4 L)	Watchmakers flat blade screwdriver	0.05 to 0.1 Nm

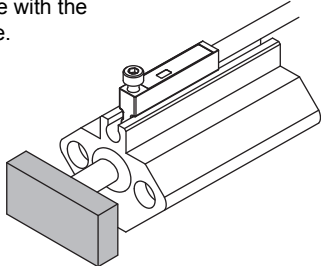


※: "How to mount" depends on the actuator type and tube I.D.. Please refer to the actuator catalogue.

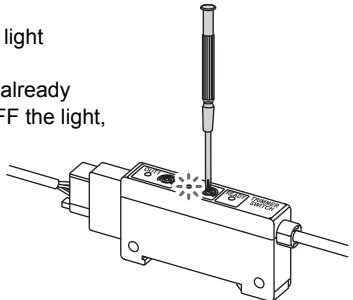
(6) Turn the adjustment trimmer (OUT1) with a screwdriver. Stop turning the screwdriver when the indicator light (OUT1) is ON. (If the indicator light (OUT1) is already ON, turn the trimmer to turn OFF the light, then adjust the trimmer).



(7) Replace the pushed work piece with the thinnest conformant work piece.



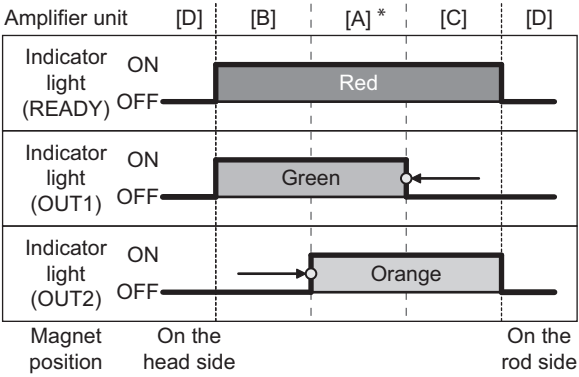
(8) Turn the adjustment trimmer (OUT2) with a screwdriver. Stop turning the screwdriver when the indicator light (OUT2) is ON. (If the indicator light (OUT2) is already ON, turn the trimmer to turn OFF the light, then adjust the trimmer).



5 Settings (continued)

Verification of the work piece

		OUT1 output (Detects the upper limit of the work piece)	OUT2 output (Detects the lower limit of the work piece)
[A]	Work piece size is correct (Conformant range)	ON (Work piece is thinner than the upper limit. Conformance)	ON (Work piece is thicker than the lower limit. Conformance)
	Work piece is too thin	ON (Work piece is thinner than the upper limit. Conformance)	OFF (Work piece is thinner than the lower limit. Non-conformance)
	Work piece is too thick	OFF (Work piece is thicker than the upper limit. Non-conformance)	ON (Work piece is thicker than the lower limit. Conformance)
	No work piece	OFF (Work piece is thicker than the upper limit. Non-conformance)	OFF (Work piece is thinner than the lower limit. Non-conformance)



※: The width for [A] should be 0.5 mm or longer in the stroke direction.

5 Settings (continued)

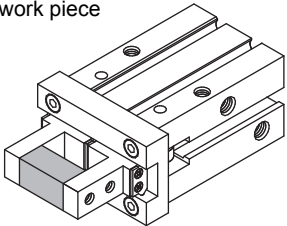
Setting procedure 2

This is an example of setting.
Perform the setting and operation check with actual equipment.

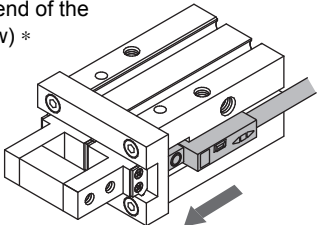
<<Verify 4 work pieces below using Air Gripper (MHZ2 series)>>

[A]	Work piece size is correct
[B]	Work piece size is too small
[C]	Work piece size is too large
[D]	No work piece

(1) Hold the minimum conformant work piece by supplying air.

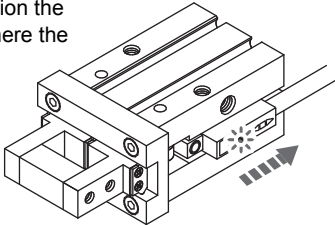


(2) Insert the sensor unit until the end of the mounting groove. (Figure below) *

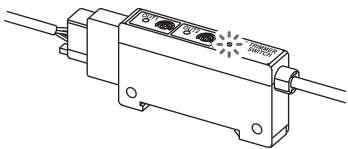


*: The relationship between OUT1 and OUT2 is reversed if the mounting direction is opposite. Detection range may change. Operation check with actual equipment should be performed as the location of OUT1 and OUT2 is reversed depending on the air gripper structure.

(3) Pull back the sensor unit. Position the sensor unit within the range where the sensor indicator light is green.



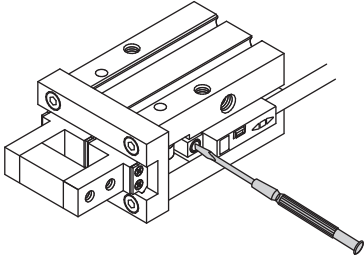
(4) Make sure that the indicator light at the amplifier unit (READY) is ON.



5 Settings (continued)

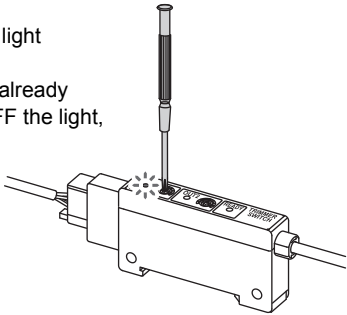
(5) Fix the sensor unit with the mounting screw or a mounting bracket. Refer to the table below for the tightening torque.

Model	Mounting	Mounting tool	Tightening torque
D-Y7K	Mounting screw (M2.5 x 4 L)	Watchmakers flat blade screwdriver	0.05 to 0.1 N m
D-M9K	Hexagon socket head cap screw (M2.5 x 12 L)	Hexagon wrench (width across flats: 2 mm)	0.1 to 0.2 N m
D-F7K	Mounting bracket + Mounting screw (M3)	Phillips head screwdriver	0.5 to 0.7 N m

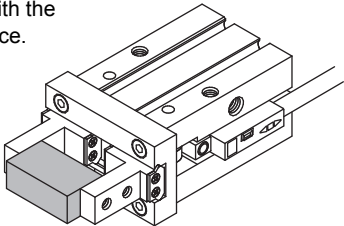


*: "How to mount" depends on the actuator type and tube I.D.. Please refer to the actuator catalogue.

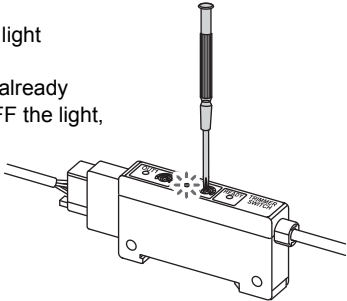
(6) Turn the adjustment trimmer (OUT1) with a screwdriver. Stop turning the screwdriver when the indicator light (OUT1) is ON. (If the indicator light (OUT1) is already ON, turn the trimmer to turn OFF the light, then adjust the trimmer).



(7) Replace the held work piece with the maximum conformant work piece.



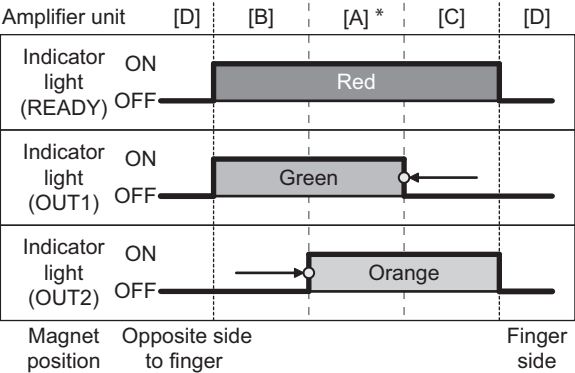
(8) Turn the adjustment trimmer (OUT2) with a screwdriver. Stop turning the screwdriver when the indicator light (OUT2) is ON. (If the indicator light (OUT2) is already ON, turn the trimmer to turn OFF the light, then adjust the trimmer).



5 Settings (continued)

Verification of the work piece

		OUT1 output (Detects the lower limit of the work piece)	OUT2 output (Detects the upper limit of the work piece)
[A]	Work piece size is correct (Conformant range)	ON (Work piece is larger than the lower limit. Conformance)	ON (Work piece is smaller than the upper limit. Conformance)
	Work piece size is too large	ON (Work piece is larger than the lower limit. Conformance)	OFF (Work piece is larger than the upper limit. Non-conformance)
	Work piece size is too small	OFF (Work piece is smaller than the lower limit. Non-conformance)	ON (Work piece is smaller than the upper limit. Conformance)
	No work piece	OFF (Work piece is smaller than the lower limit. Non-conformance)	OFF (Work piece is larger than the upper limit. Non-conformance)



*: The width for [A] should be 0.5 mm or longer in the stroke direction.

6 How to Order

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>).

7 Outline Dimensions (mm)

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>).

8 Maintenance

How to reset the product after a power cut or when the power has been unexpectedly removed

Regarding set up, contents of the program may be maintained by customer's application systems. Be sure to confirm safety when returning operation of the actuator because it could have been stopped in an unstable condition.

Perform the following maintenance regularly to avoid possible danger due to unexpected product malfunction.

- Make sure that the Adjustment trimmer of the amplifier unit is set in the correct setting position.
- Check if the mounting bracket or mounting screws are loose. If the mounting bracket or mounting screws are loose, tighten them using the appropriate tightening torque.
- Make sure that the lead wire is not damaged. Broken lead wire may lead to insulation failure. Repair the lead wire or replace the product.

9 Troubleshooting

Refer to the operation manual on the SMC website (URL <http://www.smcworld.com>).

10 Contacts

AUSTRIA	(43) 2262 62280-0	LATVIA	(371) 781 77 00
BELGIUM	(32) 3 355 1464	LITHUANIA	(370) 5 264 8126
BULGARIA	(359) 2 974 4492	NETHERLANDS	(31) 20 531 8888
CZECH REP.	(420) 541 424 611	NORWAY	(47) 67 12 90 20
DENMARK	(45) 7025 2900	POLAND	(48) 22 211 9600
ESTONIA	(372) 651 0370	PORTUGAL	(351) 21 471 1880
FINLAND	(358) 207 513513	ROMANIA	(40) 21 320 5111
FRANCE	(33) 1 6476 1000	SLOVAKIA	(421) 2 444 56725
GERMANY	(49) 6103 4020	SLOVENIA	(386) 73 885 412
GREECE	(30) 210 271 7265	SPAIN	(34) 945 184 100
HUNGARY	(36) 23 511 390	SWEDEN	(46) 8 603 1200
IRELAND	(353) 1 403 9000	SWITZERLAND	(41) 52 396 3131
ITALY	(39) 02 92711	UNITED KINGDOM	(44) 1908 563888

SMC Corporation

URL <http://www.smcworld.com> (Global) <http://www.smceu.com> (Europe)

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