



Operation Manual

PRODUCT NAME

Cylinder Speed Checker (Request for Special)

For pneumatic cylinder with built-in magnet (round groove)

MODEL / Series / Product Number

IN574-95 (Speed + Cycle time + Count)

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) *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 catalogue 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 catalogue.
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.

Caution

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 catalogue 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

○ Follow the instructions given below for selection and handling.

● Product Handling

- This product is a tool to simply measure the speed of a pneumatic cylinder, cycle time, and number of operations per minute. The accuracy of the measurement is not guaranteed.
- It is the responsibility of customer to verify the product alone and as part of a system and to determine the applicability of the product.
- Handle with care.

● Warning

- This product uses AA batteries (1.5 V) only. Do not use any other voltage as this may cause failure.
- Before mounting the sensor to the cylinder, stop the operation of the device to avoid injury.
- Do not use the product if there is smoke or a strange smell.
- Do not handle with wet hands. Avoid getting the product wet.
- In case of a malfunction, stop using immediately.
- This product is a piece of precision equipment. Do not disassemble or modify the product.

● Precautions

- Do not insert wires or metal objects into any holes or gaps. This may cause electric shock, failure or fire due to short-circuit.
- SMC will not be held responsible for any equipment problem or failure due to the measurement results of this product.
- Avoid repeatedly bending or stretching the lead wire. This may break the wire.

● Speed measurement

- This product uses the magnetic field of the pneumatic cylinder piston (with built-in magnet) to measure the time taken for the piston to pass two magnetic sensors, and converts the time into the speed of the cylinder.
- The speed that is displayed is the speed close to the sensor. This is the average speed between two sensors (approx. 3.7 mm). The speed during acceleration is the average speed.

The speed results may vary depending on the conditions below.

- Individual variation between cylinders with built-in magnet.
- Magnetic characteristics due to cylinder bore size.
- Variation due to the magnetic field around the cylinder.
- Individual variation between sensors.
- Variation due to temperature change.

● Cycle time and count measurement

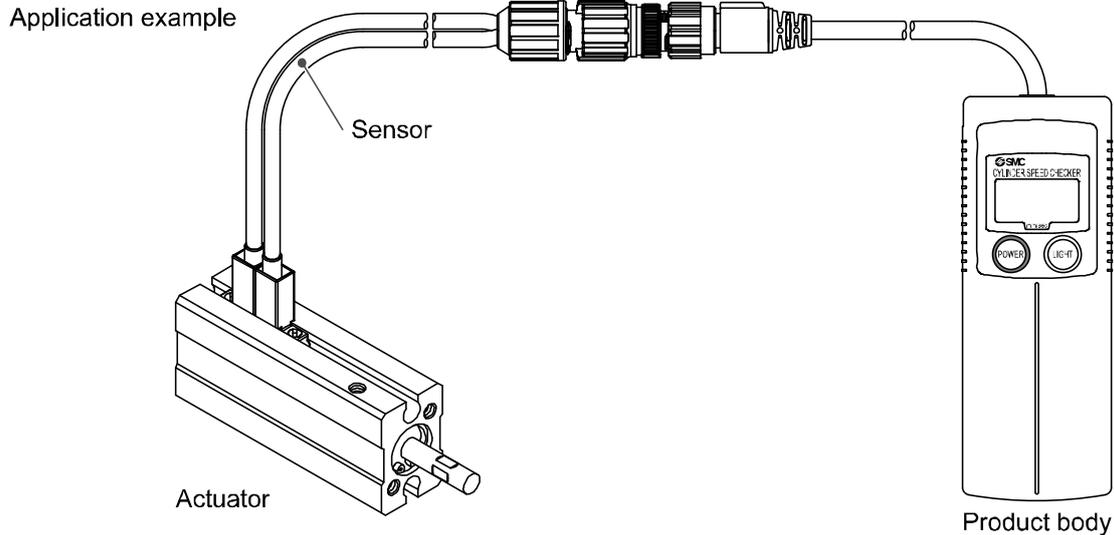
- For measurement of cycle time or count, the supplied sensor cannot be used. An Auto switch must be purchased separately.
- A 3-wire NPN type Auto switch is suitable for the measurement of cycle time or count.

Product Outline

Quick and easy measurement of speed, cycle time and count is possible by mounting the sensor to the Auto switch groove of the product.

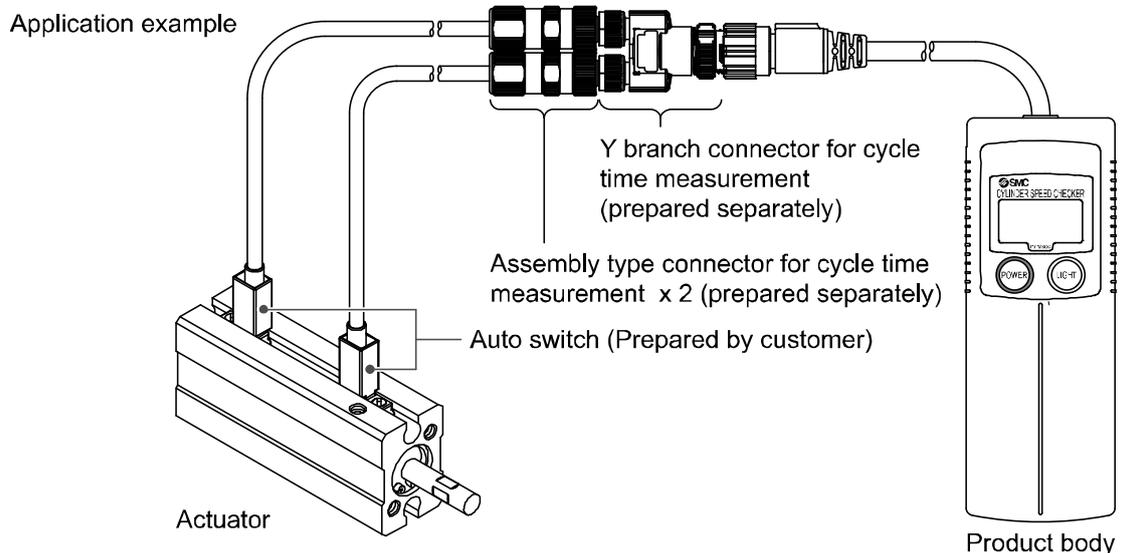
•Speed measurement

Quick and easy measurement of speed is possible by mounting the sensor to the Auto switch groove of the cylinder.



•Cycle time and count measurement

The travel time from the rod retracted end to extended end (measurement of the cycle time) and the cylinder operation cycle per minute (measurement of the count) can be measured by operating the cylinder with two Auto switches (SMC 3-wire NPN type) installed to the Auto switch groove.



Caution

An Auto switch is not included when the cycle time or count is measured.
A 3-wire NPN type auto switch is suitable for the measurement of cycle time or count.
Auto switches and connectors to measure the cycle time or count must be separately purchased.
(See page 6)

Model Indication and How to Order

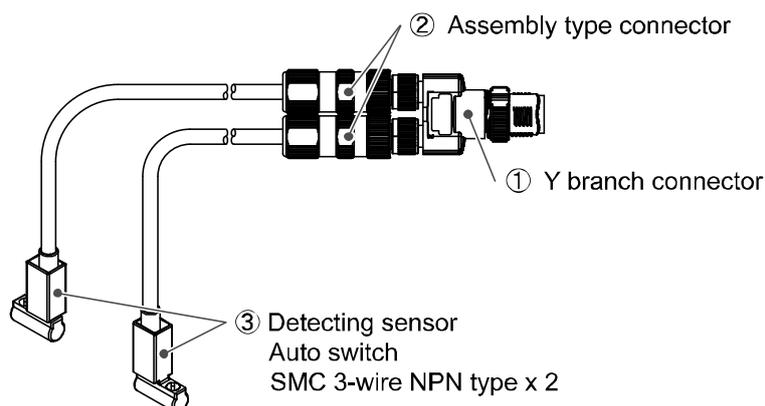
•Cylinder speed checker

IN574-95 (Speed meter body + Sensor: For speed measurement)

└ IN574-73 (Sensor: For speed measurement)

•For cycle time and count measurement

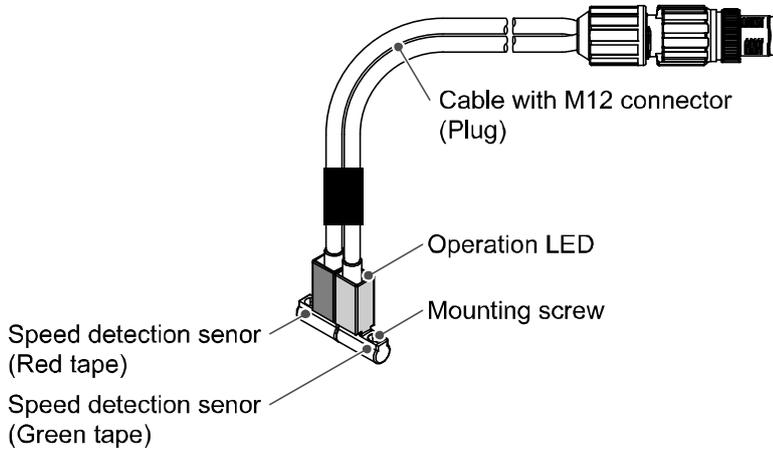
Select the connector for the measurement of cycle time and count



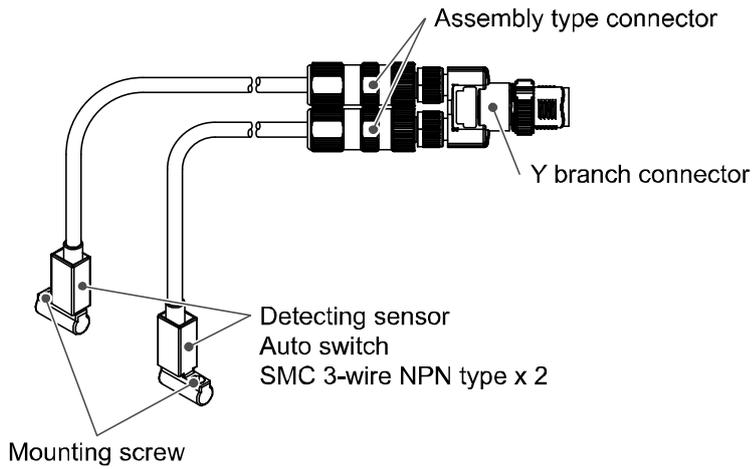
No.	Name	Product No.	Remarks
①	Y branch connector (For M8) 	PCA-1557798	Two Auto switches with M8 connector can be connected.
	Y branch connector (For M12) 	PCA-1557785	Two Auto switches with M12 connector can be connected.
②	Assembly type connector (For M8) 	PCA-1557730	Mount to the end of the Auto switch lead wire. Used with PCA-1557798.
	Assembly type connector (For M12) 	PCA-1557743	Mount to the end of the Auto switch lead wire. Used with PCA-1557785.
③	Detecting sensor Auto switch SMC 3-wire NPN type	D-* D-*PC	Please refer to the page 26 for details of the Auto switch specification. Refer to the SMC web site (URL http://www.smcworld.com) about the Auto switch.

Summary of Product parts

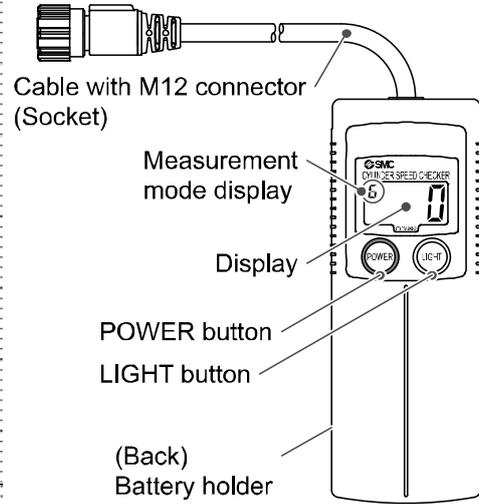
•Sensor (For speed measurement) [IN574-73]



•Sensor (For cycle time and count measurement) [Prepared by customer. (See page 6)]



•Speed checker body



•Sensor (For speed measurement) [IN574-73]

Name	Explanation
Speed detecting sensor	Consists of two Auto switches (D-F8N).
Operation LED	The sensor turns ON (Red) when the magnetic field is detected.
Mounting screw	Slotted set screw for mounting the sensor to the round groove in the cylinder.
Cable with M12 connector (Plug)	For connecting to the M12 connector (socket) on the unit.

•Sensor (For cycle time and count measurement)

Name	Explanation
Detecting sensor	Please refer to the page 26 for details of the Auto switch specification. SMC 3-wire NPN Auto switch can be used. (Prepared separately)
Operation LED	The sensor turns ON when the magnetic field is detected.
Mounting screw	Slotted set screw for mounting the sensor to the round groove in the cylinder.
Assembled type connector	Mount to the end of the detection sensor (Auto switch) lead wire. Two types below are available. PCA-1557730 (For M8) PCA-1557743 (For M12)
Y branch connector	Two Auto switches with M8 connector or M12 can be connected. Two types below are available. PCA1557798 (For M8) PCA1557785 (For M12)

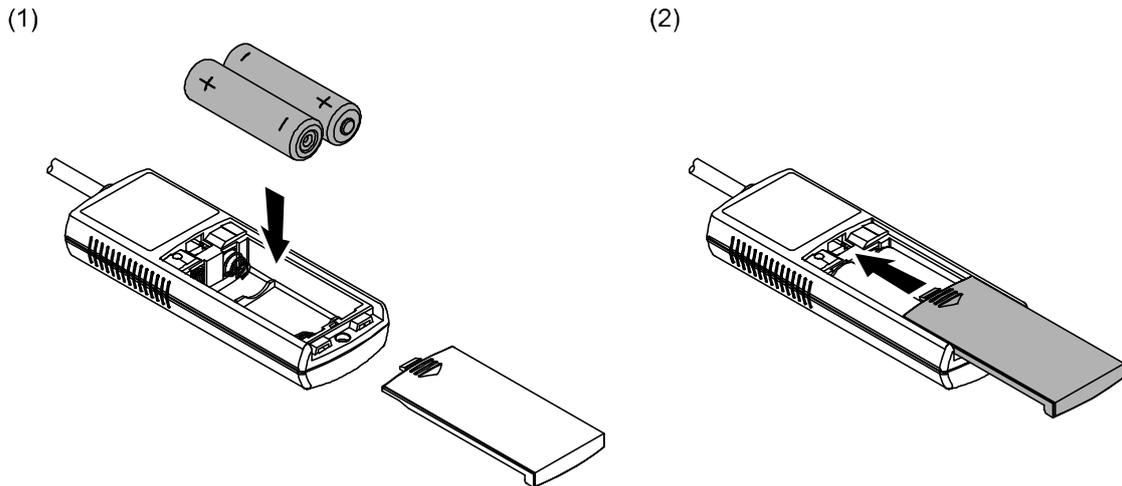
•Speed checker body

Name	Explanation	
POWER button	Toggles the power ON/OFF to the measurement mode (speed/cycle time/count).	
LIGHT button	Toggles back light ON/OFF. Used to change the mode to measurement mode (Normal Mode/Average Mode).	
Measurement mode display	Speed mode	S (Speed) is displayed during speed mode.
	Cycle Time mode	t (time) will be displayed during cycle time mode.
	Count mode	C (Count) will be displayed during count measurement mode.
Display	Speed mode	Displays the operation speed of the cylinder. (Unit: mm/sec.)
	Cycle Time mode	Cycle time of the cylinder will be displayed. (Unit: sec.)
	Count mode	Displays the operation times of the cylinder. (Unit: stroke)
Battery holder	Two AA batteries (1.5 V) are used. (Battery is purchased separately)	
Cable with M12 connector (Socket)	For connecting to the M12 connector (plug) on the sensor.	

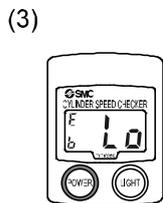
Wiring

■ Installing the batteries

- (1) Slide the lid at the rear of the unit. Insert the batteries.
Applicable battery is "AA battery (1.5 V)"
Batteries are not included. Prepared by the user.
Make sure the polarity is correct when inserting the batteries.
- (2) Close the lid after inserting the batteries.



- (3) When the product is used and the battery is consumed, low residual battery error will be displayed.
Replace the batteries.



■Wiring

•Connection of M8/M12 connector

- (1) Tighten by rotating the knurled part of the connector of the body. Connection is complete when the knurled part is fully tightened.
- (2) Check that the connection is not loose.

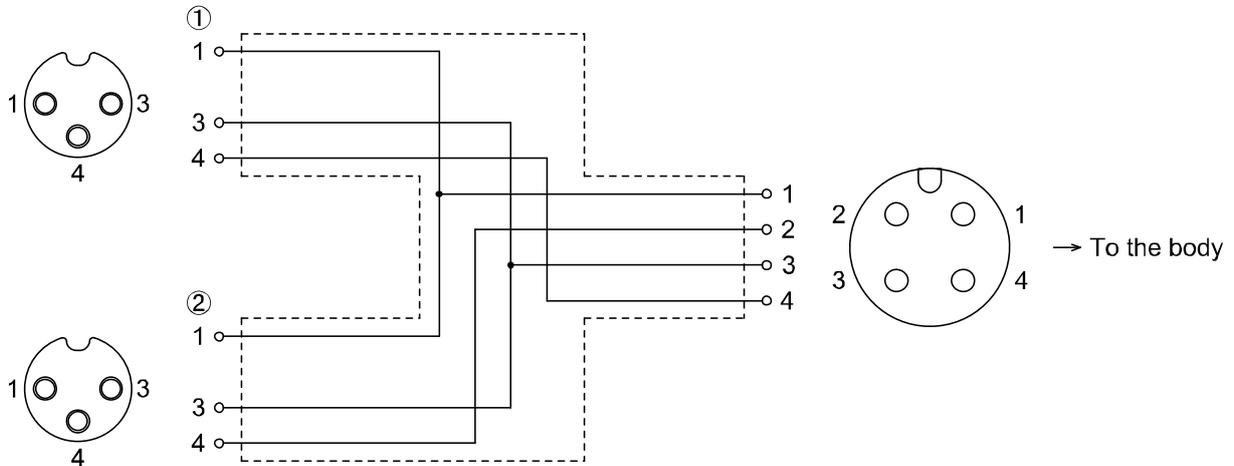
•Connecting the Auto switch and the assembly connector

Refer to "Assembly Procedure" attached to the assembly type connector for wiring of PCA-1557730 (connector for M8) or PCA-1557743 (connector for M12).

Connect the lead wire which color is specified by the connector.

Internal circuit when Y branch connector is used

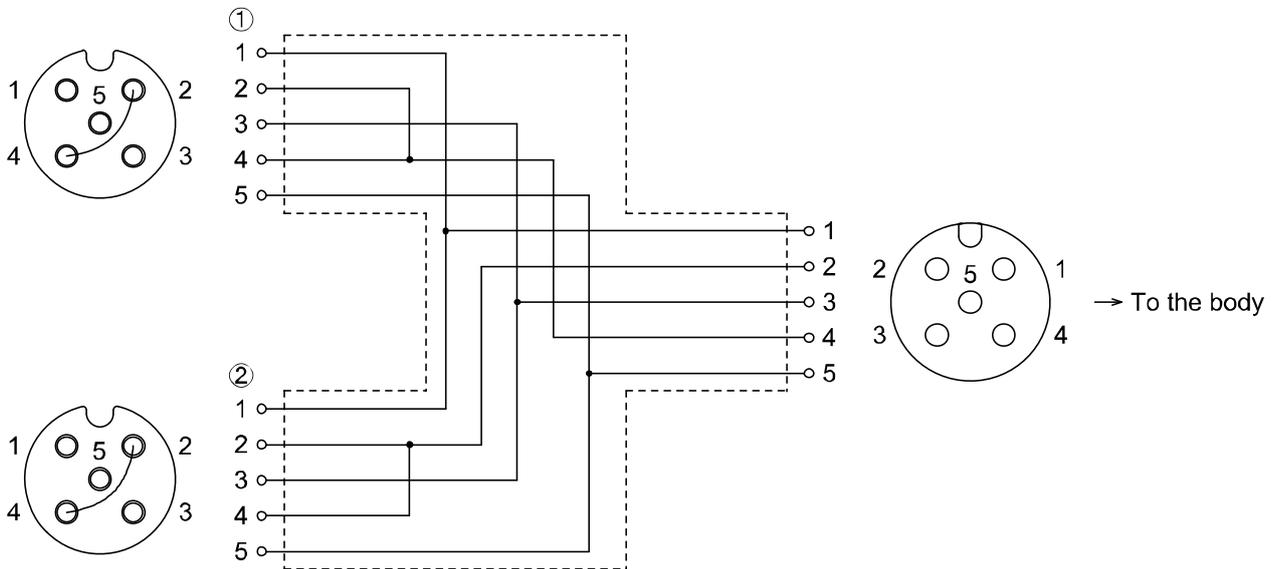
PCA-1557798



Pin No.	Meaning
1	+15 V
2	-
3	GND
4	Sensor input

Pin No.	Meaning
1	+15 V
2	Sensor input ②
3	GND
4	Sensor input ①

PCA-1557785



Pin No.	Meaning
1	+15 V
2	Sensor input
3	GND
4	Sensor input
5	Unused

Pin No.	Meaning
1	+15 V
2	Sensor input ②
3	GND
4	Sensor input ①
5	Unused

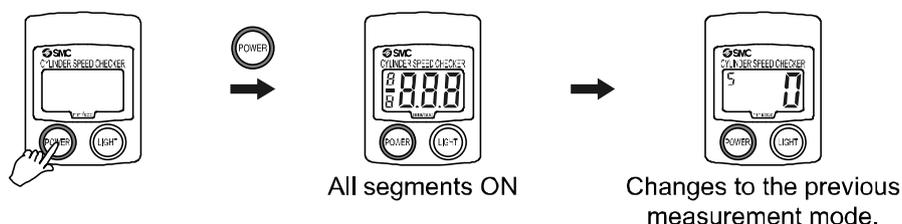
Operation details

■ Power ON

The power turns ON when the  button is pressed.

All segments will light up for 1 second when the power supply turns ON. The device will then be in its previous mode of operation.

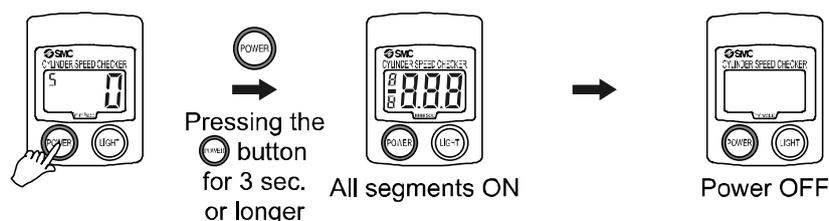
*: Default mode at the time of shipment from the factory is "Speed measurement mode".



■ Power OFF (Auto Power Off function)

The power turns OFF when the  button is held for 3 seconds or longer.

If no buttons are pressed for 15 minutes, the power will turn OFF automatically. (Auto Power Off function)



*: Auto Power Off is disabled during measurement.

■ Toggling the back light

When the power is ON and the back light is OFF, the back light is turned ON by pressing the  button for 5 seconds or longer.

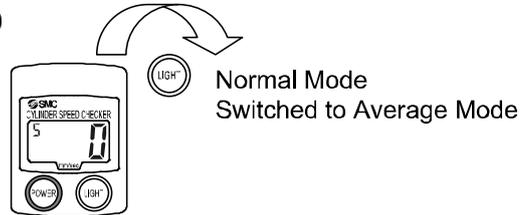
When the power is ON and the back light is ON, the back light is turned OFF by pressing the  button for 5 seconds or longer.

■ Basic operation

Cylinder speed, cycle time and operation cycle per minute can be measured by changing the mode of this product. Refer to the following for the operation method in detail.

Speed measurement mode (mm/sec.)

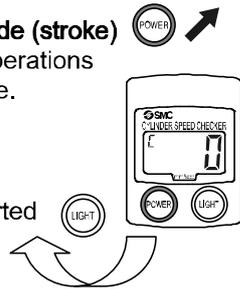
Measure the cylinder speed.
(See page 16)



Count measurement mode (stroke)

Counts the number of operations
of the cylinder per minute.
(See page 23)

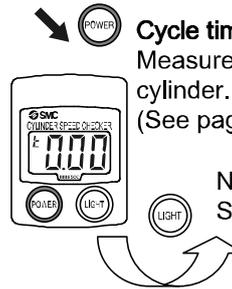
Count ready
Measurement started



Cycle time measurement mode (sec.)

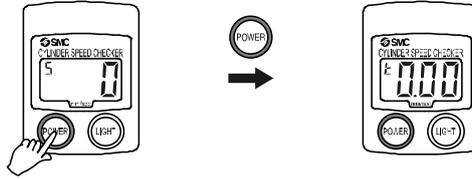
Measure the cycle time of the
cylinder.
(See page 20)

Normal Mode
Switched to Average Mode

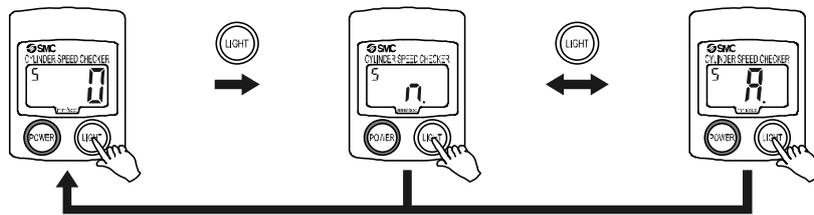


■ Measurement mode change

Change to "Cycle time measurement mode" by pressing  button during "Speed measurement mode".

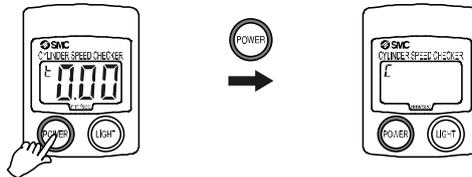


Measurement mode (Normal Mode/Average Mode) can be changed by pressing  button during "Speed measurement mode".

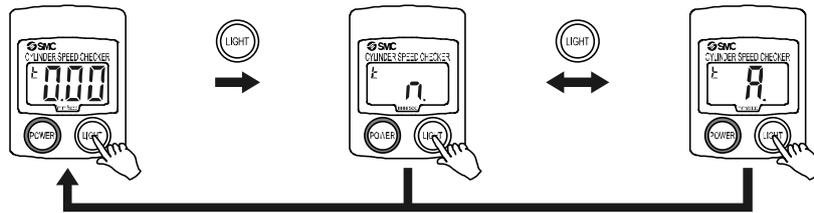


Changes to the measurement mode in 2 seconds after selecting the measurement mode.

Change to "Count measurement mode" by pressing the  button during "Cycle time measurement mode"

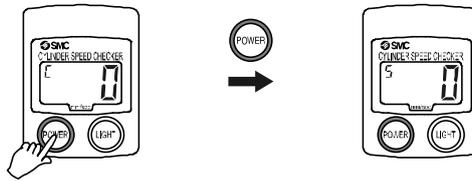


Measurement mode (Normal Mode/Average Mode) can be changed by pressing  button during "Cycle time measurement mode".

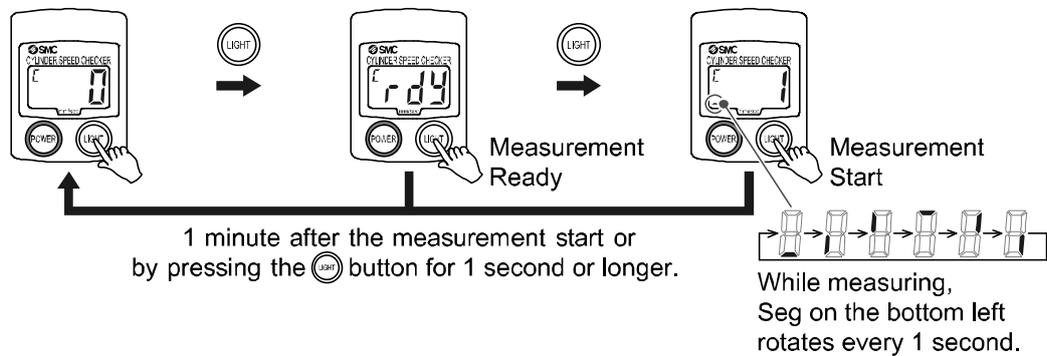


Changes to the measurement mode in 2 seconds after selecting the measurement mode.

Change to "Speed measurement mode" by pressing the  button during "Count measurement mode".



Change to "Speed measurement mode" by pressing the  button during "Measurement Ready state".
Start the measurement by pressing the  button during the measurement ready condition.
The measurement finishes either 1 minute after the measurement start or by pressing the  button for 1 second or longer.



Speed measurement

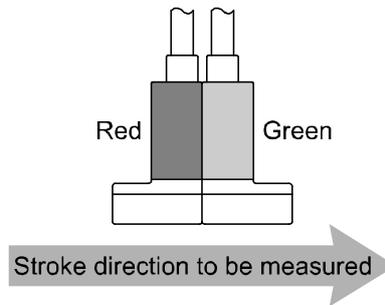
■ Installation

The Measurement value is signed (-) to distinguish between the extension and retraction of the cylinder.

Mounting as the figure below: *

Extension (Stroke direction): Positive direction

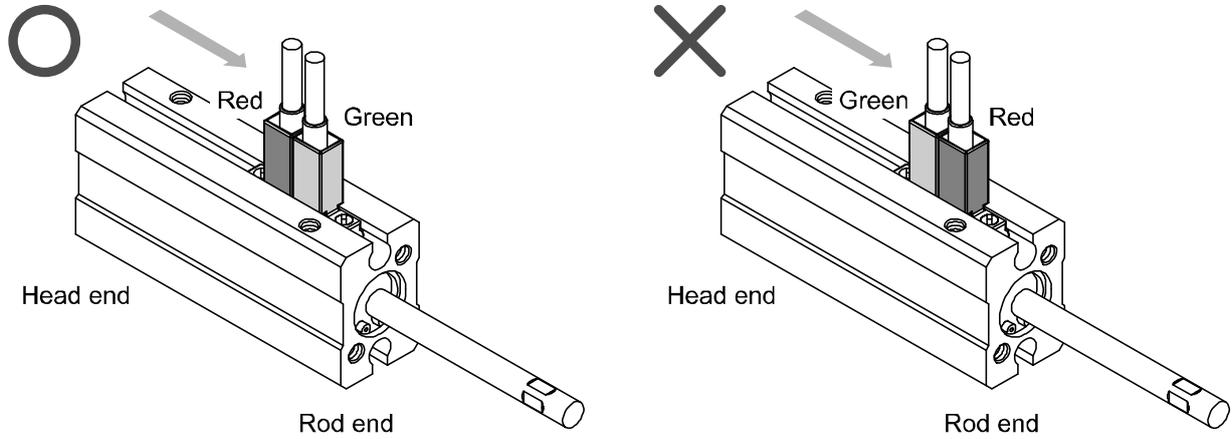
Retraction (Reverse stroke direction): Reverse direction is signified with a (-) value



*: Although it is possible to measure when the sensor is mounted in reversed direction, the displayed direction will be reversed.

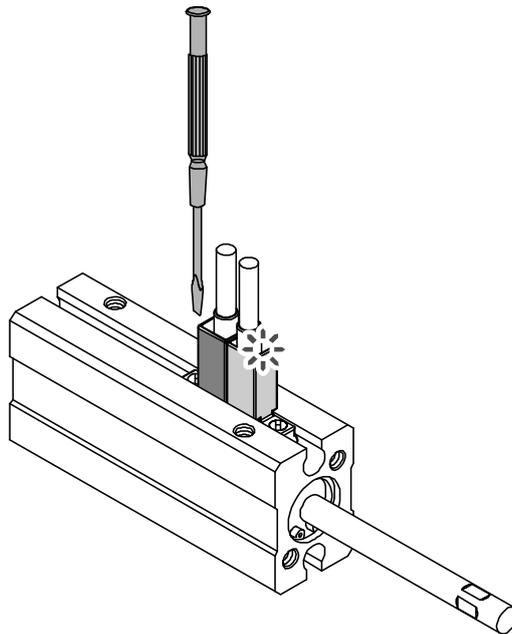
○ Installation to measure the speed of extended end of the rod

(1) Fully extend the rod, and slide the sensor from the head end.



It's not possible to measure correctly, when the sensor is installed. (Above figure)

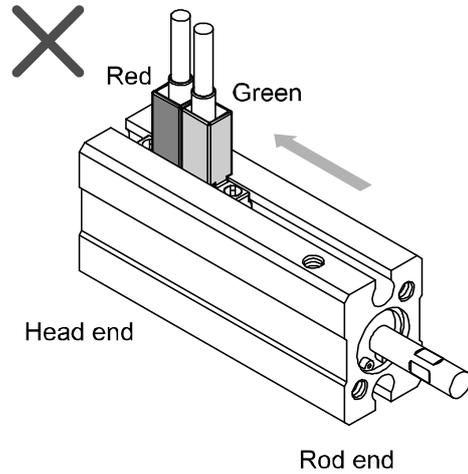
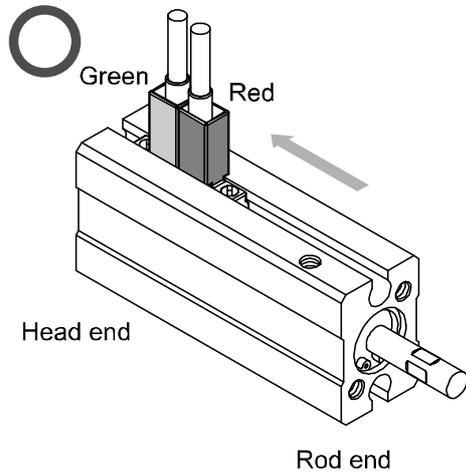
(2) Stop the rod when the green LED turns ON, and fix the sensor with the mounting screws.
Tightening torque is 0.1 to 0.2 Nm.



*: When the sensor is installed (Above figure), the speed from Rod to Head may not be displayed depending on the kind of Cylinders.

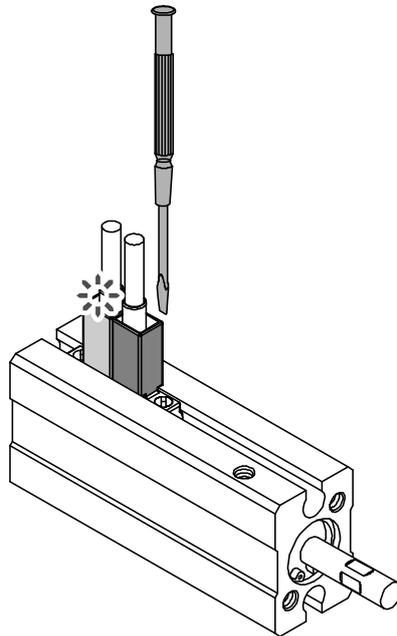
○ Installation to measure the speed of the retracted end to the head

(1) Fully retract the rod to the head, and slide the sensor from the rod.



It's not possible to measure correctly, when the sensor is installed. (Above figure)

(2) Stop the rod when the green LED turns ON, and fix the sensor with the mounting screws.
Tightening torque is 0.1 to 0.2 Nm.



*: When the sensor is installed (Above figure), the speed from Head to Rod may not be displayed depending on the kind of Cylinders.

■ How to measure

Operate the cylinder. The operation speed of the cylinder will be displayed.

Measurement mode (Normal Mode/Average Mode) can be changed by pressing the  button.

[Normal Mode]

- Parameter value.
- "HHH (-HHH)" will be displayed when parameter value exceeds the measurement range.
- When the value is less than the minimum resolution for display (1 mm/sec.), "LLL (-LLL)" will be displayed.

[Average Mode]

- Displays the average of the past 16 measurements. The initial measurement value is applied to all the previous 16 measurements for the calculation.
- Display is fixed to "HHH (-HHH)" when the average value of the past 16 measurements exceeds the measurement range.
- When the value becomes less than the minimum resolution (1 mm/sec.) during the past 16 measurements, the display will be fixed to "LLL (-LLL)".
- Until the mode is changed, the display "HHH (-HHH)" or "LLL (-LLL)" will be fixed.



Examples of measured value display

Cycle time measurement

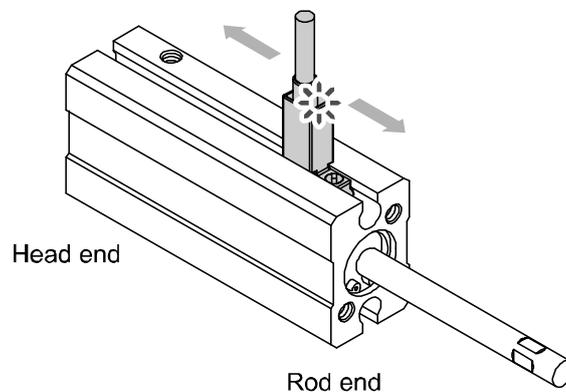
■ Installation

- This product can measure the travel time (cycle time) which is the time from the retracted end of the rod to the extended end.
- Mount the Auto switch so that the switch output is detected when the rod is in the extended end or retracted end.
- Measurement at the intermediate position of the stroke is not possible.
- Auto switches are swappable. Both can be mounted to the rod or head.

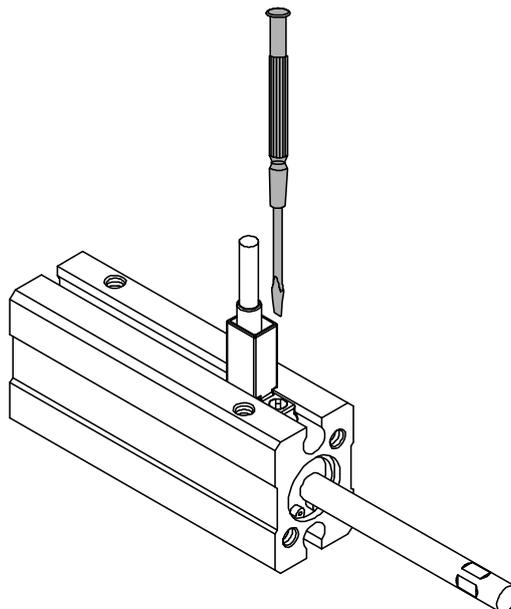
*(swappable)
*: Like the speed measurement mode, cylinder travel direction is signed. For the measurement of the retraction, the value is displayed with (-).

Installation example

- (1) Supply air to the cylinder to fully extend the rod and to keep it staying there.
- (2) Adjust the Auto switch position so that the cylinder magnet comes to the center of the Auto switch operation range.

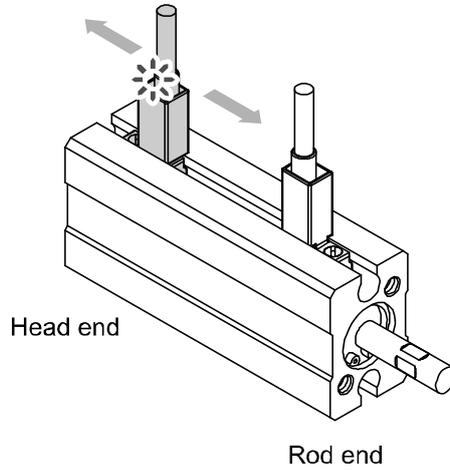


- (3) Fix with mounting screws.
For the tightening torque, refer to the Auto switch operation manual.



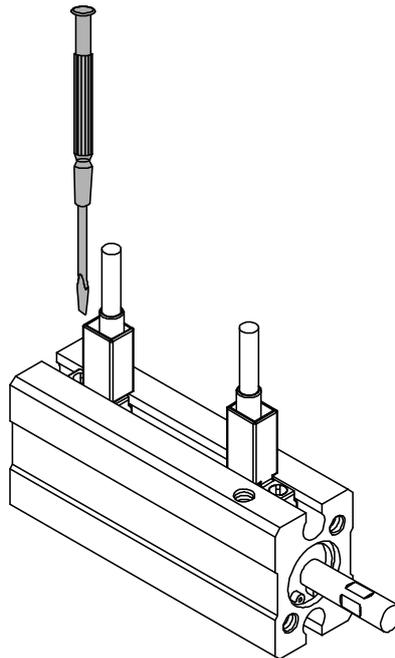
(4) Fully retract the rod to the head

(5) Adjust the other Auto switch position so that the cylinder magnet comes to the center the Auto switch operation range.



(6) Fix with mounting screws.

For the tightening torque, refer to the Auto switch operation manual.



■ How to measure

Operate the cylinder. Display the cycle time of the cylinder

Measurement mode (Normal Mode/Average Mode) can be changed by pressing  button.

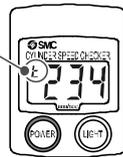
[Normal Mode]

- The last measurement value is displayed.
- "HHH (-HHH)" will be displayed when the parameter value exceeds the measurement range.
- When the value is less than the minimum resolution for display (0.01 sec.), the product rounds the value and "0.00" will be displayed.

[Average Mode]

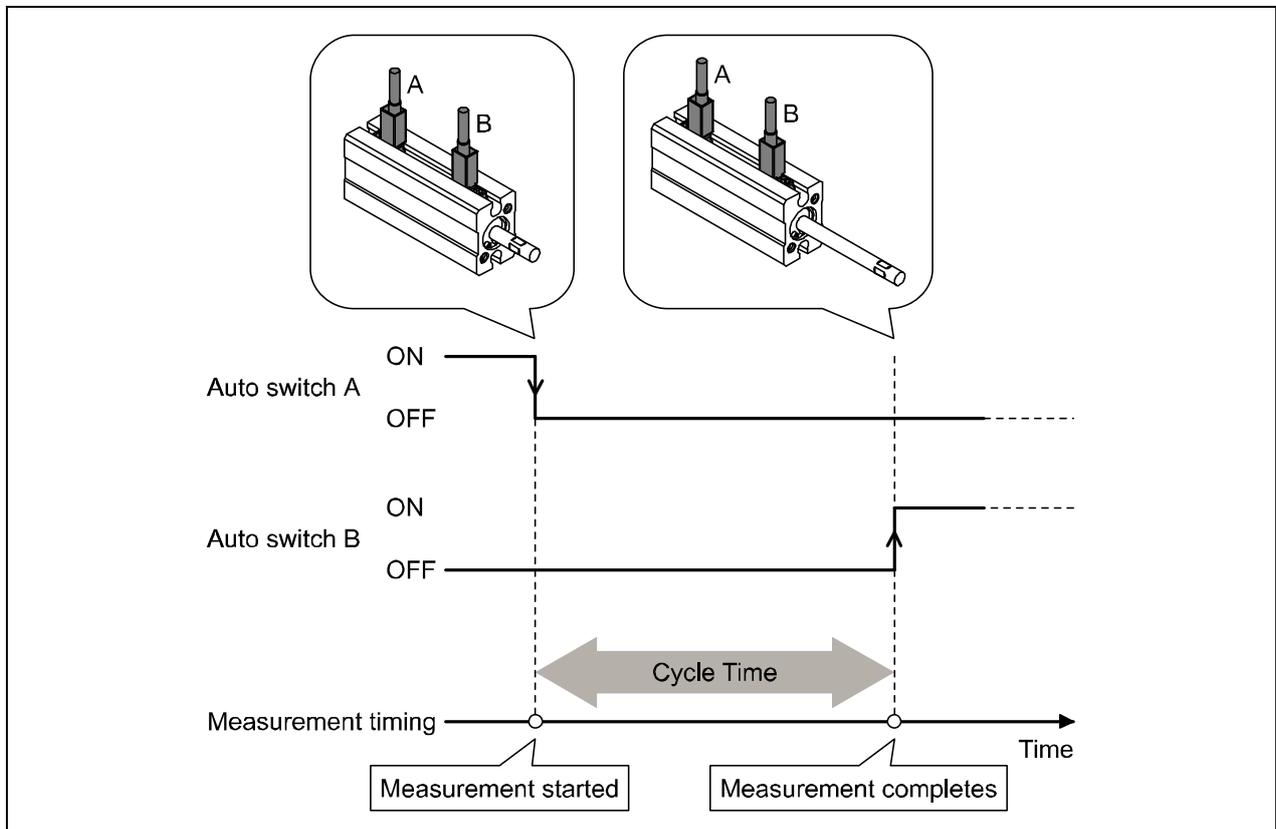
- Displays the average of past 16 measurements. The initial measurement value is applied to all previous 16 measurements for the calculation.
- Display is fixed to "HHH (-HHH)" when the average value of past 16 measurements exceeds the measurement range.
- When the value becomes less than the minimum resolution (0.01 sec.) during the past 16 measurements, the product rounds the value to zero and calculates the average value.
- Until the mode is changed, the display "HHH (-HHH)" will be fixed.

"t" flashes during the measurement.



Examples of measured value display

Timing chart (when the rod extends)



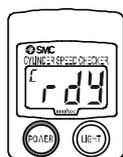
Count measurement

■ Installation

- Count the operation time of the cylinder per minute.
- Refer to the installation method for the measurement of cycle time.

■ How to measure

- (1) Changes the measurement ready condition by pressing the  button.
- (2) Start the measurement by pressing the  button during the measurement ready condition.
- (3) The measurement finishes either 1 minute after the measurement start or by pressing the  button for 1 second or longer.

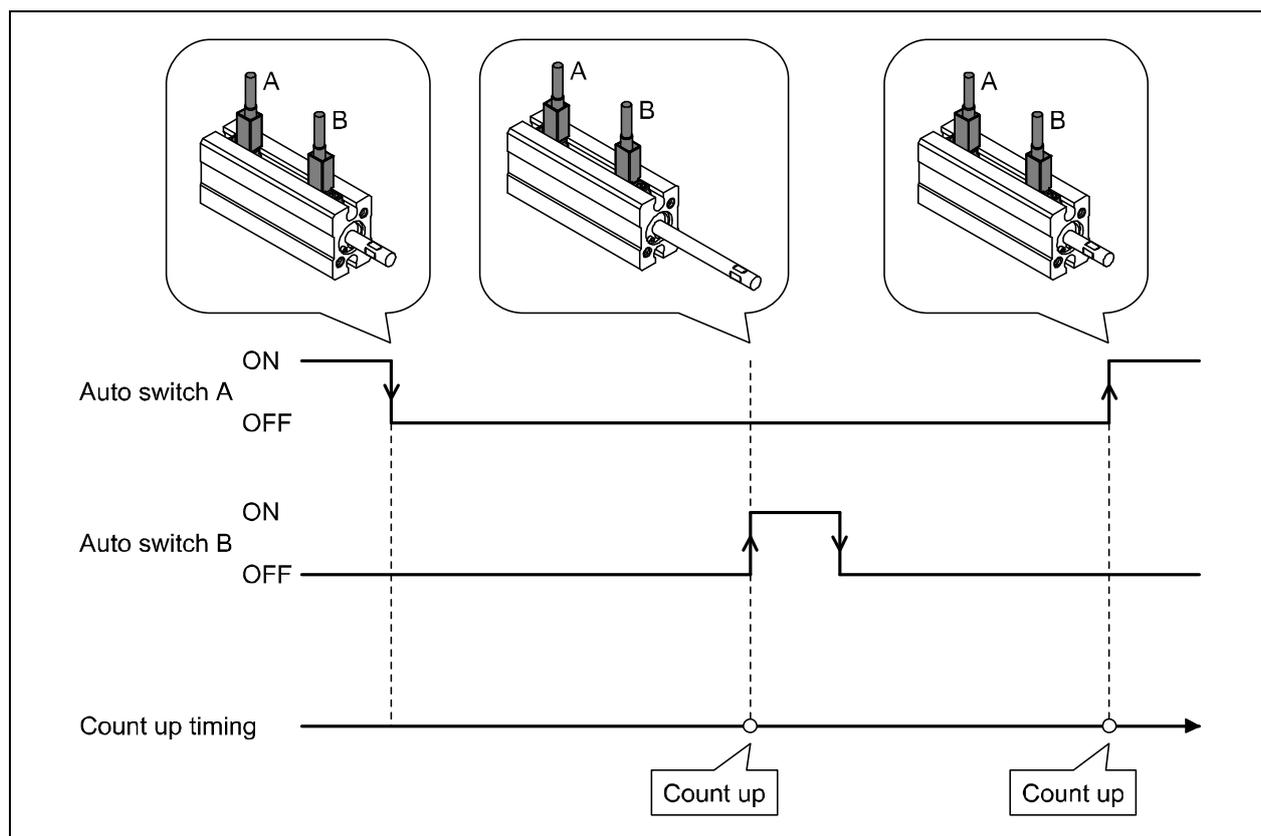


Measurement is ready



Examples of measured value display

Timing chart



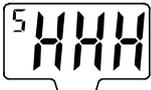
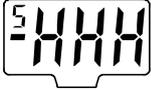
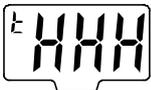
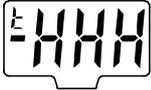
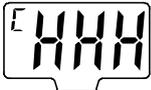
Troubleshooting

■ Cross-reference for troubleshooting

If the product does not operate properly, please check the following points.

Problem	Possible causes	Countermeasures
The display is blank	The batteries are low.	Replace the batteries. (See page 9)
	Incorrect polarity of batteries.	Install the batteries correctly. (See page 9)
Display is not updated.	Defective wiring.	Check and correct the wiring. (See page 10, 11) Turn on the power supply when the wiring is correct.
	Installation position is not correct.	Install correctly. (See page 16, 20)
	Rod is obstructed during mid-stroke due to foreign matter.	Eliminate the cause of obstruction.
The sensor operation LED does not turn ON.	The batteries are low.	Replace the batteries. (See page 9)
	Product failure.	Replace the product. (Please contact SMC Sales.)
Display light failure Speed is not what is desired	Parameter setting is incorrect.	Set the correct parameter for the measurement. (See page 14)
	Installation position is not correct.	Install correctly. (See page 16, 20)

■ Error display

Problems	Error Indication	Meaning	Measures
Residual batteries low		Batteries are low.	Replace the batteries.
Excessive speed Inadequate speed	 	[At Normal Mode] The display range has been exceeded (-1999 to 1999 mm/sec.) [At Average Mode] One or more of the previous 16 measurement values fell outside the display range (-1999 to 1999).	[At Normal Mode] Operate within the display range.
	 	[At Normal Mode] Less than the minimum resolution (1 mm/sec.). [Average Mode] One or more of the previous 16 measurement values was below the minimum resolution display range (1 mm/sec.)	[At Average Mode] Operate within the display range. Change the measurement mode to reset the display value.
Cycle Time	 	[At Normal Mode] The display range has been exceeded (-999 to 999 mm/sec.) [At Average Mode] One or more of the previous 16 measurement values fell outside the display range (-999 to 999).	[At Normal Mode] Operate within the display range. [At Average Mode] Operate within the display range. Change the measurement mode to reset the display value.
	Count		Exceeded Count upper limit (999)

Specification

■ Specifications

Item	Speed measurement mode	Cycle time measurement mode	Count measurement mode
Power supply voltage	1.5 VDC AA alkaline battery x 2 * ¹		
Sensor	Auto switch (Specially machined) * ²	Applicable SMC 3-wire NPN Auto switch x 2 * ³ Power supply voltage: 14 V or less Output type: NPN open collector ON voltage: 2 V or less OFF current: 100 μA or less	
Measurement accuracy	±20% or less * ⁵	±0.2 sec. or less * ⁵	-
Display range	-1999 to 1999 mm/sec.	-999.9 to 999.9 sec.	0 to 999 stroke
Min. display unit	1 mm/sec.	0.01 sec. (0.00 to 99.99 sec., 0.00 to -99.99 sec.) 0.1 sec. (100.0 to 999.9 sec., -100.0 to -999.9 sec.)	1 stroke
Ambient temperature range	Operation: 0 to 40 °C, Storage: -10 to 60 °C (No condensation)		
Weight	Sensor: 25 g, Unit: 65 g (Batteries excluded)		
Battery life	15 hours or longer continuous operation * ⁴		
Enclosure rating	IP40		
Standards	CE RoHS		

*1: AA alkaline battery is not included. Prepared by the user.

*2: For speed measurement mode, use the sensors supplied. (Do not use any other sensor.)

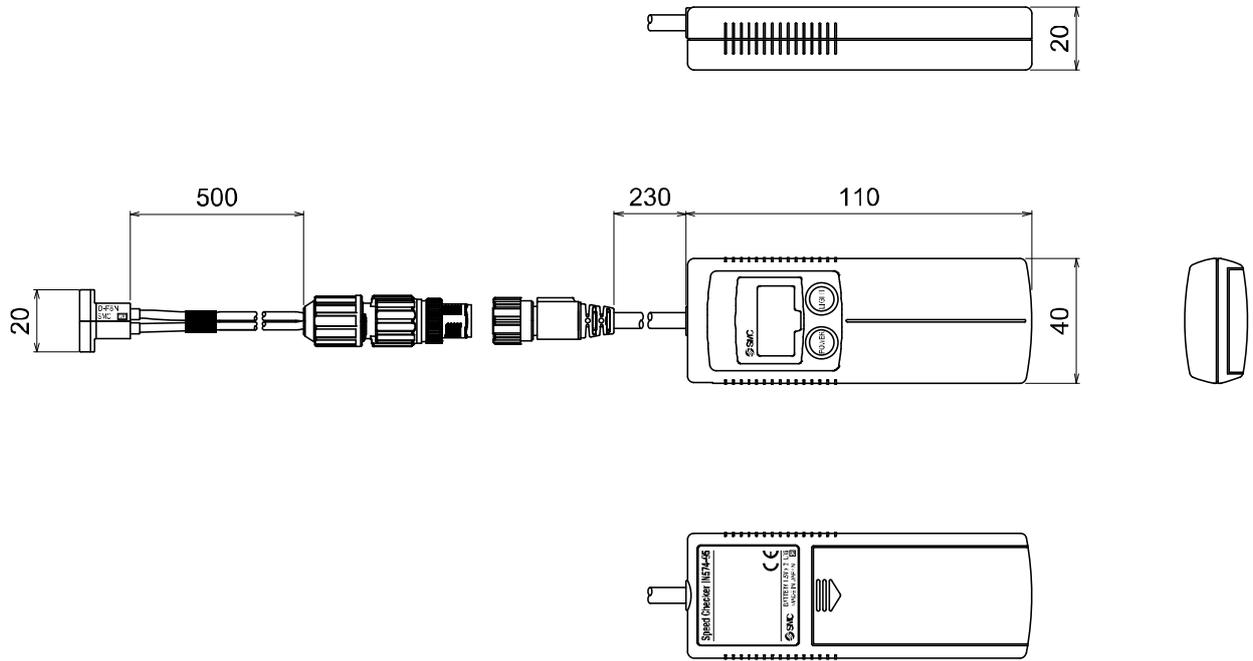
*3: For cycle time measurement mode, supplied sensor cannot be used (Auto switch is not included and must be purchased).

Auto switch (SMC 3-wire NPN Auto switch) and connectors are purchased separately.

*4: Battery life depends on the operating environment.

*5: The specification may change substantially depending on the ambient environment.

■ Dimensions



Revision history

A: Contents revised in several places.

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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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