

## Fine Level Switch KML Series



Safe operation and easy detection water level setting  
**Pneumatic liquid level sensor**

KML50 Series renewal



# Air system for detecting liquid levels in chemical liquid tanks

Ideal for semiconductor manufacturing and chemical processes with no risk of corrosion or ignition in chemical liquid atmospheres

## Easy corrosion and explosion-proof measures

Only the detection tube is wetted parts, and the body can be installed away from chemical liquids.

## Reduces installation costs

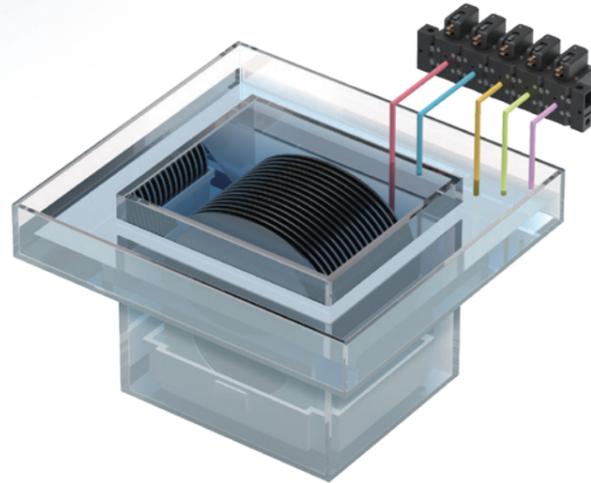
It is not affected by steam, splashing, drops, temperature, or chemical liquids (irritant odor, flammable, corrosive), reduces costs for countermeasures and is easy to install.

## Compact

Does not interfere with the wafer, etc., being carried in and out without occupying space near the tank.

## Maintenance-free

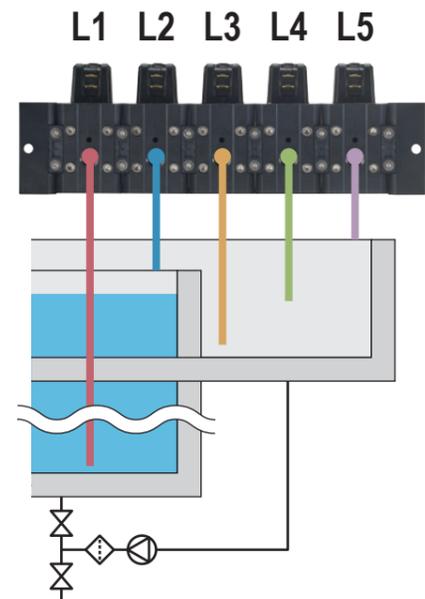
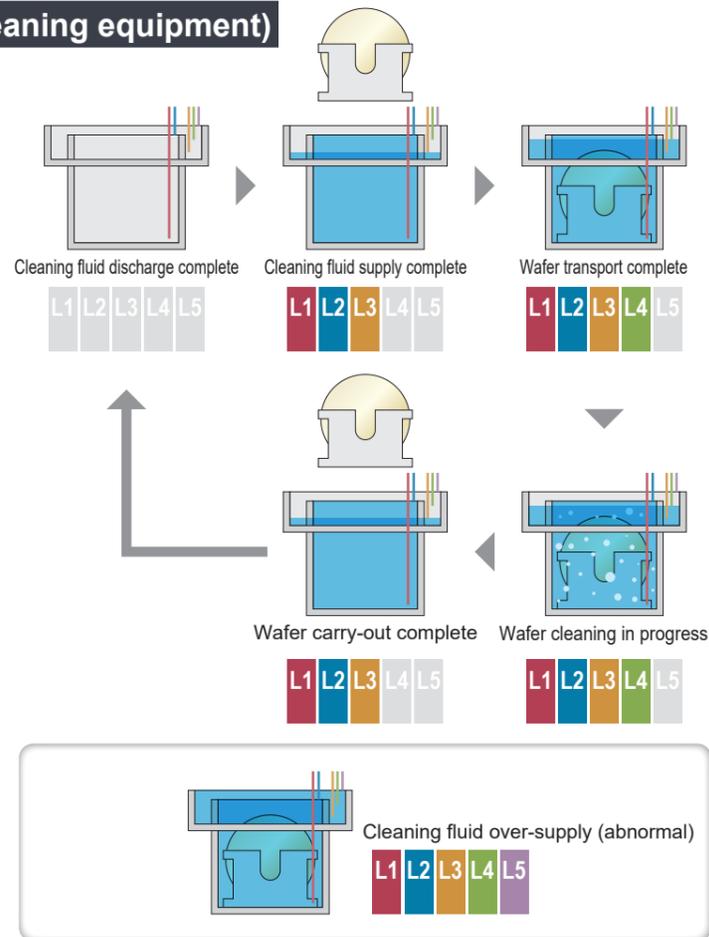
As air is normally released from the detection tube, reverse flow of chemical liquid atmosphere is prevented.



## Application example (wafer cleaning equipment)

Each level switch

Tube end position		Detection purpose	
Outer tank	Upper limit	L5	Cleaning fluid over-supply (abnormal)
	Fixed qty.	L4	Wafer transport complete
	Lower limit	L3	Cleaning fluid supply complete
Inner tank	Upper limit	L2	Wafer carry-out complete
	Lower limit	L1	Cleaning fluid discharge complete



Fine level switch

# KML Series

## KML502

- 1 million cycles guaranteed
- Improved diaphragm durability
- 25% lighter
- RoHS2 compatible



## MKML2(Manifold)

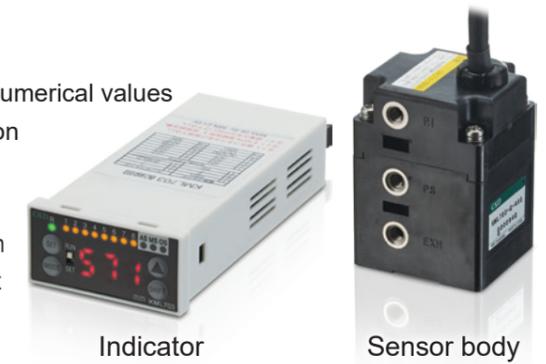
- Supply ports are "freely vertical/ horizontal", reducing plug installation locations (from 7 → 3 locations) and improving workability
- Block connection structure enables change in the station No.



\* Specifications and performance are the same as those of the former KML50 Series products. Single unit mounting dimensions are completely compatible.

## KML703

- Visualization of water depth in tank is possible using numerical values
- Cancels the effect of environmental pressure fluctuation (differential pressure method: D type)
- Up to 8 points can be detected with a single tube
- Remote operation enabled and communication function (RS485) built in
- Separate display and sensor body, taking into account space-saving and robustness

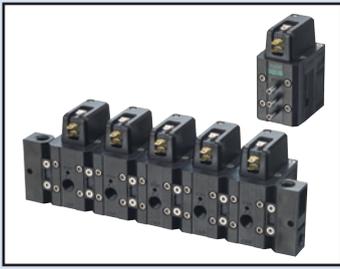


Indicator

Sensor body

## Lineup

Type	Function							Page
	No. of output points	Repeatability	Nozzle Detection pressure	Threshold Setting method	Indicator	Output method	Additional functions	
<b>KML502</b> 	1 points	±1 mm	Liquid surface	Factory-set	None	Reed output	Up to 5 stations Manifold	<b>1</b>
<b>KML60</b> 	4 points	±10 mm	Deepest part of the liquid tank	Arbitrary trimmer adjustment	LED lamp	Proximity NPN output	Manifold with MKML502	<b>5</b>
<b>KML703</b> 	8 points Alarm 1 point	±3 mm	Deepest part of the liquid tank	Display button operation/ RS485 communication	7-segment LED	Proximity NPN output RS485 communication	Environmental pressure correction * D type	<b>9</b>



Fine level switch

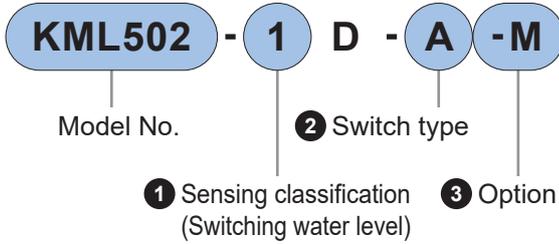
# KML502 Series

Easy-to-install liquid level detector with no setup required



## Model No. Notation Method

● Single unit



### ① Sensing classification (switching water level)

Code	Description
1	8 to 12mm
2	1 to 3mm

Note: Value obtained with water as measured at working pressure 20 kPa (ambient temperature: 24±2°C).

### ③ Option

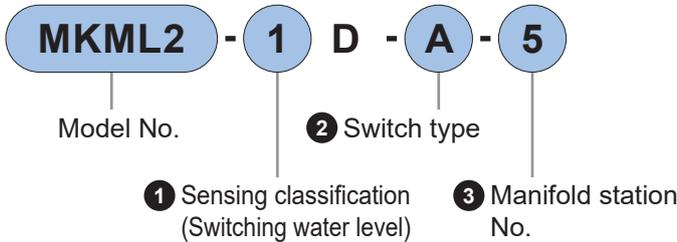
Code	Description
Blank	Single unit
-M	Single unit with manifold plate

Note: The following joiner sets are required to expand the manifold.

### ② Switch type

Code	Description	
A	Micro switch (C contact)	
B	Reed switch (A contact)	
C	Reed switch (B contact)	

● Manifold



### ① Sensing classification (switching water level)

Code	Description
1	8 to 12mm
2	1 to 3mm

Note: Value obtained with water as measured at working pressure 20 kPa (ambient temperature: 24±2°C).

### ③ Manifold station No.

Code	Description
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations

### ② Switch type

Code	Description
A	Micro switch (C contact)
B	Reed switch (A contact)
C	Reed switch (B contact)

● Joiner set

## KML502-JC-SET



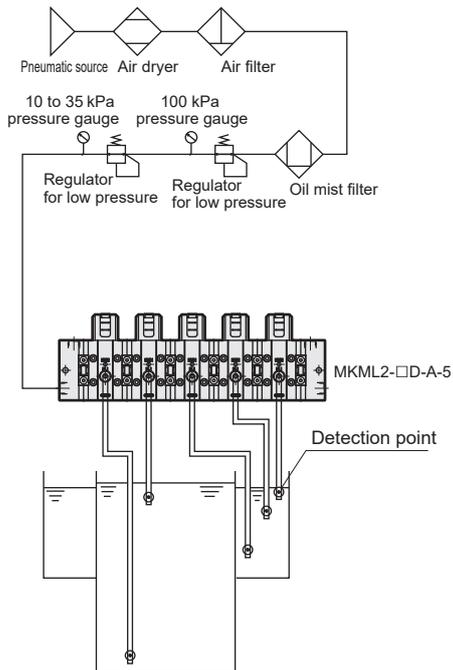
### Specifications

Item		KML502-1D-□	KML502-2D-□
Supply gas	Working fluid	Compressed air/nitrogen gas (*1)	
	Working pressure kPa	15 to 35	10 to 35
	Operating ambient temperature °C	5 to 60	
Ambient temperature °C		5 to 60	
Proof pressure kPa	P.S. port	100	
	P.I. port	10 (1000mm for detection fluid water)	6 (600mm for detection fluid water)
Contact capacity	A type	3A 125/250 VAC resistance load (micro switch)	
	B type, C type	0.25A 100 VDC resistance load (reed switch)	
Switching water level	mm	8 to 12 (*2)	1 to 3 (*2)
Hysteresis	mm	2 (*2)	
Repeatability	mm	±1 (*2)	
Response time	ms	200 or less (working pressure 20 kPa, ambient temperature 24°C, detection tube inner diameter ø4 length 5 m)	
Detection tube bore size	ø mm	4	
Tube length	m	Within 5	
Consumption flow rate	cm <sup>3</sup> /min (ANR)	750 or less (at working pressure 20 kPa)	
Detection flow rate	cm <sup>3</sup> /min (ANR)	45±10 (at working pressure 20 kPa)	
Weight	kg	0.14	

\*1: Use fluid passed through a filter with filtration accuracy within 0.3 μm.

\*2: The above specifications are values obtained at working pressure 20 kPa (ambient temperature: 24±2°C).

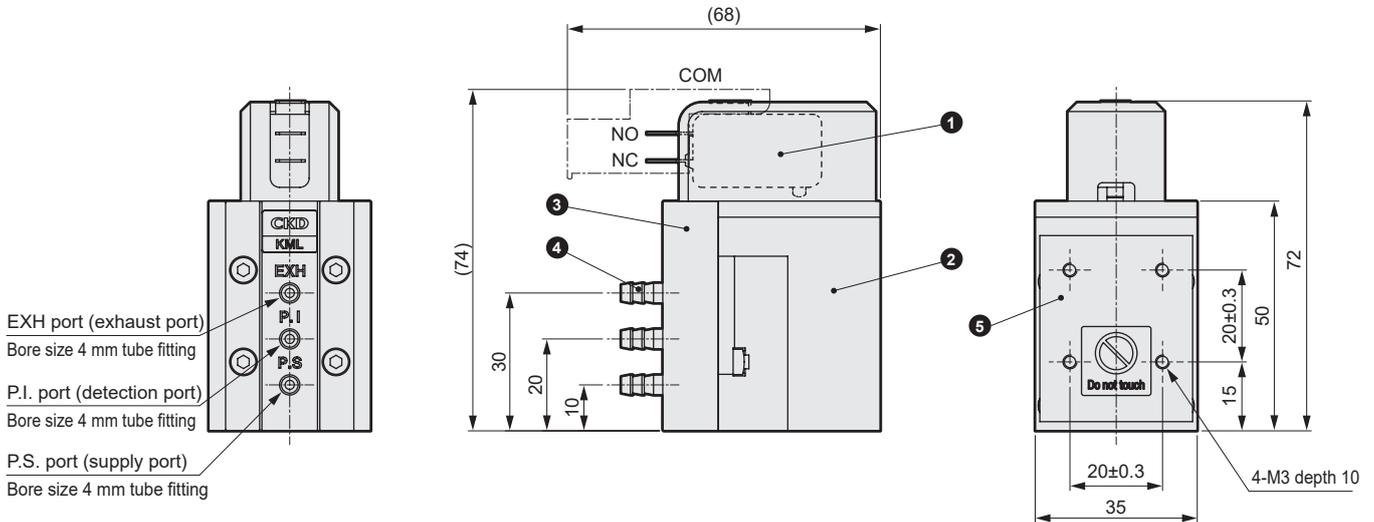
### Piping example



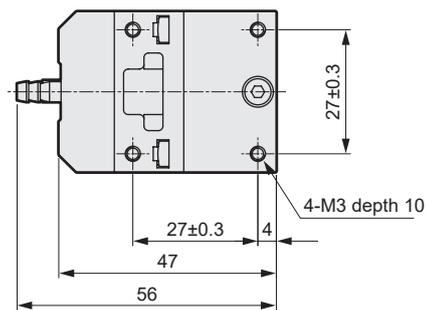
# KML502 Series

## Dimensions and main part material

### ● KML502-□D-A



Part No.	Part name	Material
1	Switch	-
2	Body	PPS
3	Plate	PPS
4	Fitting	Stainless steel
-	Diaphragm	FKM,FFKM
5	Bracket	Stainless Steel

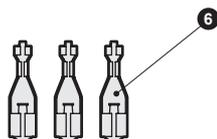
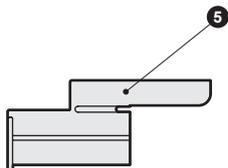


### ● Housing, terminal (attachment)

KML502-□D-A

Housing for Micro Switch: 1 pc.

Receptacle Terminal: 3 pcs.

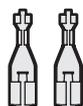


KML502-□D-B

KML502-□D-C

Housing for Reed Switch: 1 pc.

Receptacle Terminal: 2 pcs.



Part No.	Part name	Material
5	Housing	Nylon 66
6	Terminal	Brass, tin plating

Applicable Wire Range: 0.51 to 1.38 mm<sup>2</sup>

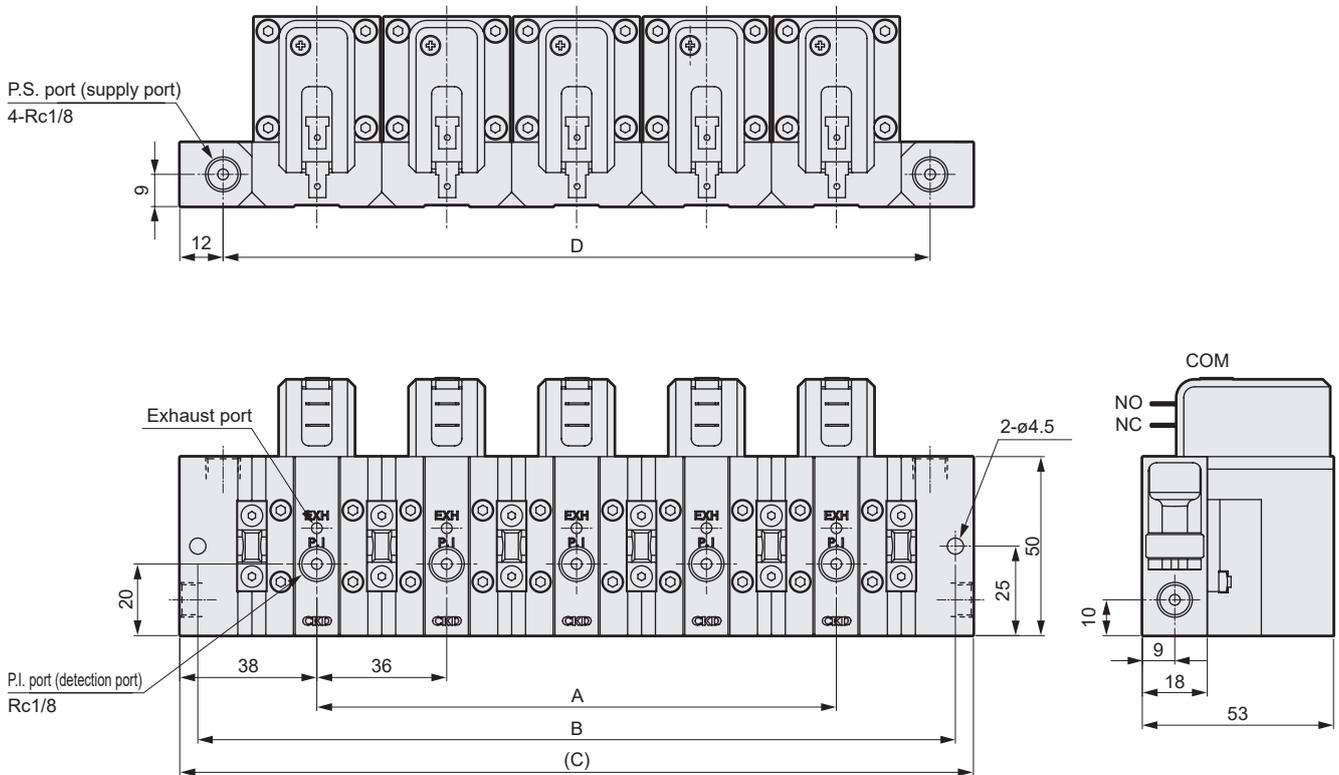
Insulation O.D.: ø1.9 to 3.4

Crimping Tool (Tyco Electronics, Product No.: 91593-1)

Extraction Tool (Tyco Electronics, Product No.: 724659-1)

## Dimensions

● MKML2-□D-A-5 (manifold)



Number of sub-plates	A	B	C	D
1	-	66	76	52
2	36	102	112	88
3	72	138	148	124
4	108	174	184	160
5	144	210	220	196



Fine level switch

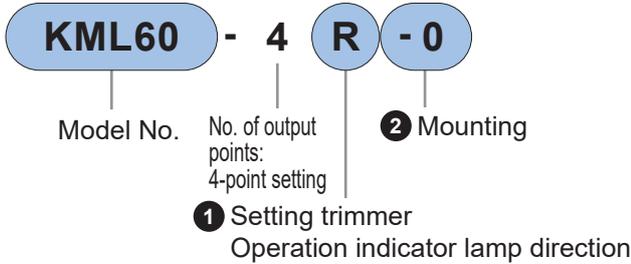
# KML60 Series

Detects liquid level at 4 points using 1 detection tube



## Model No. Notation Method

### ● Single unit



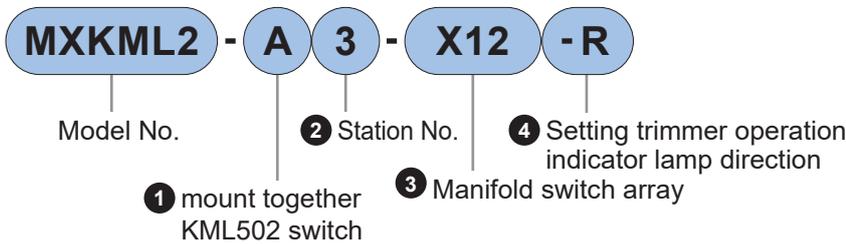
#### ① Setting trimmer operation indicator lamp direction

Code	Description
Blank	P.I. port side
R	P.I. port rear side

#### ② Mounting

Code	Description
Blank	Single unit
-0	Single unit for manifold

### ● Manifold



#### ① KML502 switch types mixed

Code	Description
0	No KML502 combination
A	Micro switch (C contact)
B	Reed switch (A contact)
C	Reed switch (B contact)

#### ② Station No.

Code	Description
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations

#### ③ Manifold switch array \*1, \*2, \*3

Code	Description
X	KML60-4
1	KML502-1D- □ (□=①)
2	KML502-2D- □ (□=①)

#### ④ Setting trimmer operation indicator lamp direction

Code	Description
Blank	P.I. port side
-R	P.I. port rear side

\*1: Specify the switch array on the manifold with an alphanumeric array of X/1/2.

\*2: Specify the array from the left front side of the manifold (P.I. port side).

\*3: Specify with the same number of digits as the number of sub-plate stations specified in "Item ②".

[Example of model No.]

### MXKML2-A3-X12-R

Model: MXKML2

① Mixed KML502 switches: A type

② Station No. 3 stations

③ Manifold switch array: From front left in the order of KML60-4R, KML502-1D-A, KML502-2D-A

④ Setting trimmer operation indicator lamp direction: P.I. port rear side

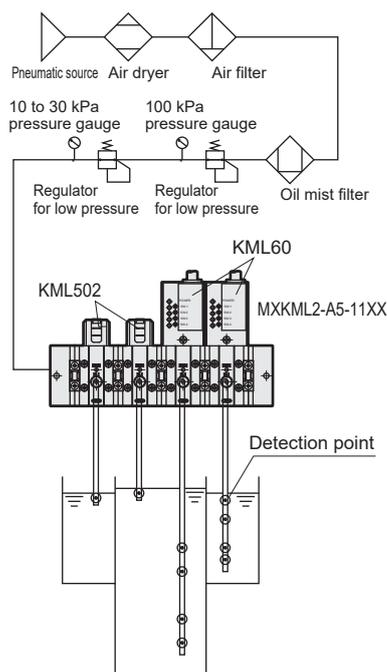
### Specifications

Item		KML60-4
Supply gas	Working fluid	Compressed air/nitrogen gas (*1)
	Working pressure kPa	10 to 30 (when the set water level is 10 to 500 mm and water is used as the detection fluid)
		15 to 30 (when the set water level is 10 to 1,000 mm and water is used as the detection fluid)
Fluid temperature °C	5 to 50	
Ambient temperature	°C	5 to 50
Proof pressure kPa	P.S. port	100
	P.I. port	20 (2000mm when the detection fluid is water)
Switching water level	mm	10 to 1000 (*2)
		User arbitrary setting 4 points
Power supply voltage		12 to 24 VDC ±10% Voltage ripple rate 5% or less
Current consumption	mA	40 or less (when using 24 VDC)
Switch output		NPN open collector 4-point (28 VDC 80mA or less)
Insulation resistance	MΩ	100 or more (500 VDC for 1 minute)
Withstand voltage		Commercial frequency 500 VAC, 1 minute
Repeatability	mm	±10 (10 minutes after power on) (*2)
Hysteresis	mm	4 or less (set water level 10 to 200 mmH <sub>2</sub> O) (*2) 20 or less (set water level 200 to 1000 mmH <sub>2</sub> O) (*2)
Response time	ms	600 or less (working pressure 20kPa, detection tube I.D. ø4 mm, length 5 m)
Temperature characteristics	mm/°C	±1.2
Detection tube bore size	ø mm	4
Detection tube length	m	Within 5
Consumption flow rate cm <sup>3</sup> /min (ANR)		80 or less
Weight	kg	0.23

\*1: Use fluid passed through a filter with a Degree of filtration of 0.3 μm or more.

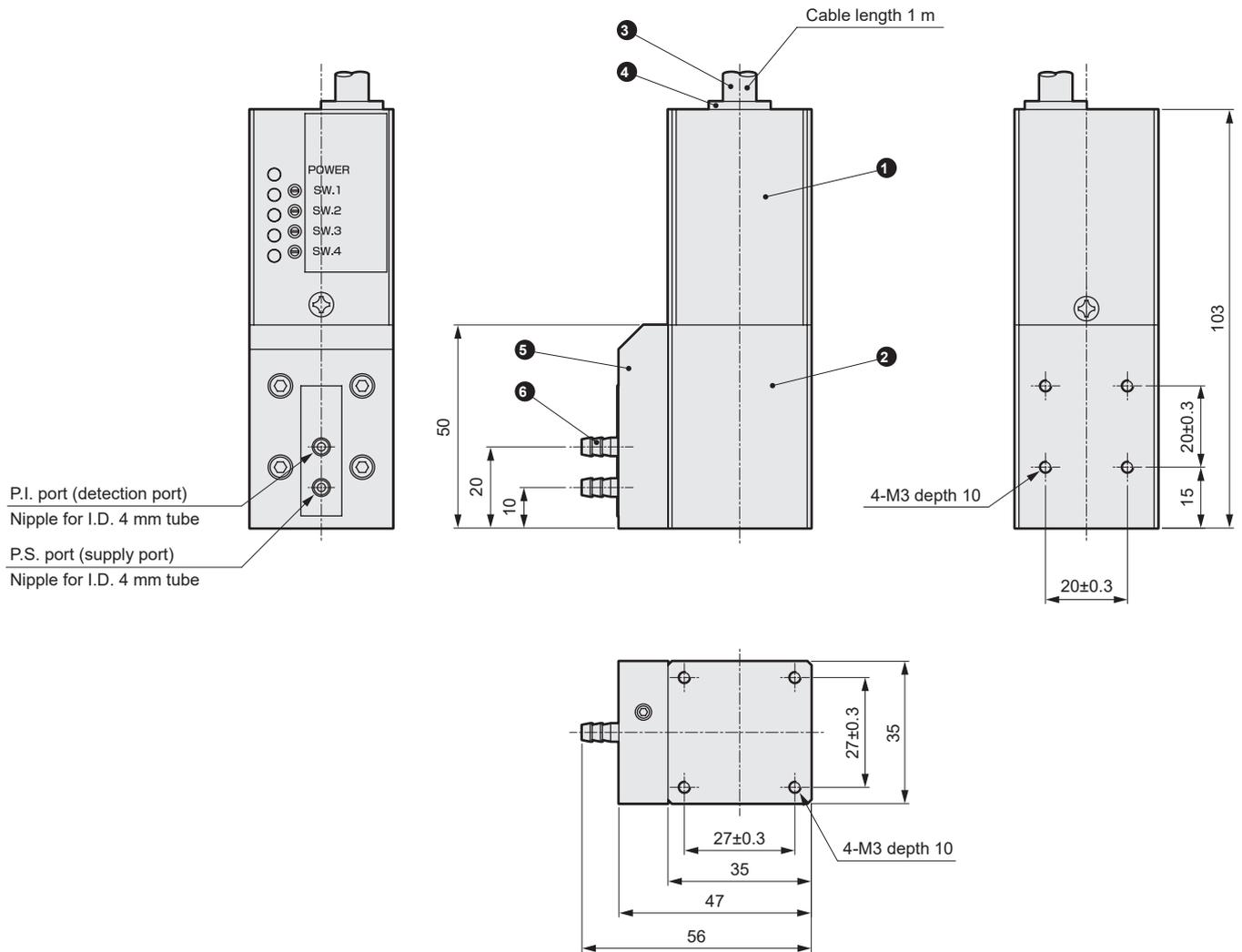
\*2: The above specifications are values obtained at working pressure 20kPa, power supply 24 VDC, and ambient temperature 20°C. The detection fluid is water.

### Piping example



## Dimensions and main part material

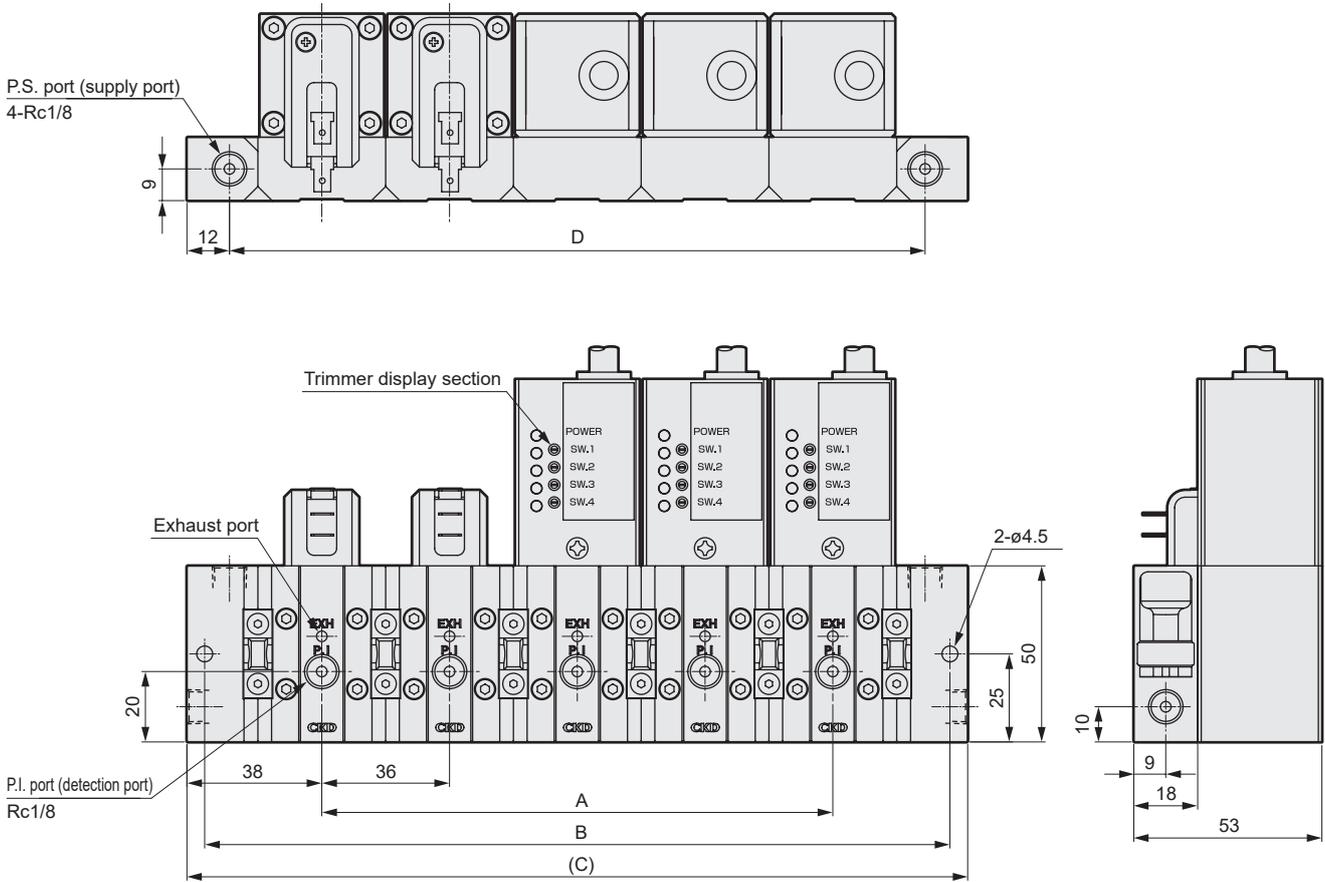
### ● KML60-4



Part No.	Part name	Material
1	Cover	PVC
2	Base	PVC
3	Sensor cable	PVC
4	Bush	Nylon 66
5	Manifold	For KML60: PVC For MXKML2: PPS
6	Nipple	Stainless Steel

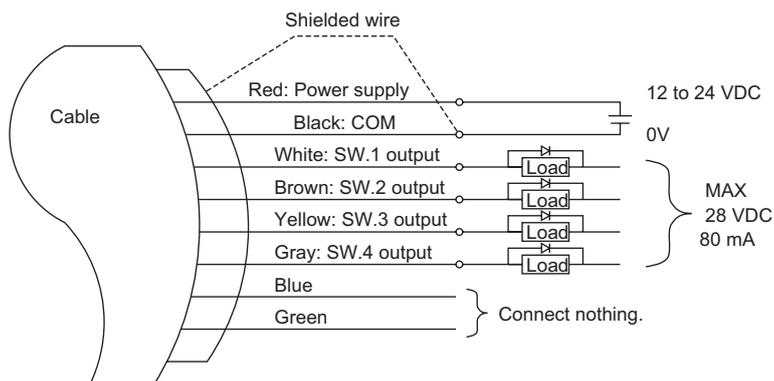
## Dimensions

● MXKML2-A5-□□XXX (manifold)



Number of sub-plates	A	B	C	D
1	-	66	76	52
2	36	102	112	88
3	72	138	148	124
4	108	174	184	160
5	144	210	220	196

## Wiring diagram





Digital fine level switch

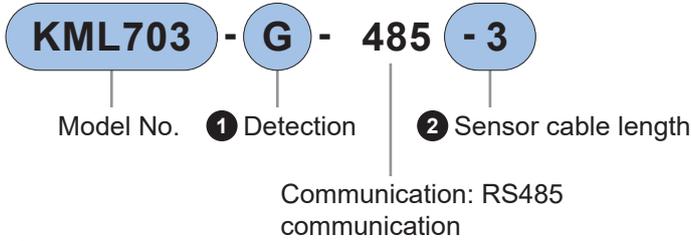
# KML703 Series

Resistant to environmental pressure fluctuation (differential pressure method)  
Remote operation enabled and communication function (RS485) built in



## Model No. Notation Method

● Single unit



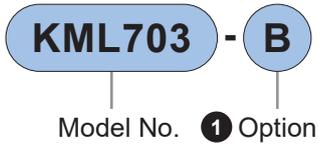
### ① Detection

Code	Description
<b>G</b>	Gauge pressure method
<b>D</b>	Differential pressure method

### ② Sensor cable length

Code	Description
<b>Blank</b>	Sensor cable 5 m
<b>-3</b>	Sensor cable 3 m

● Option



### ① Option

Code	Description
<b>B</b>	Bracket for sensor body
<b>P</b>	Power supply cable (3 m)
<b>O</b>	Output cable (3 m)

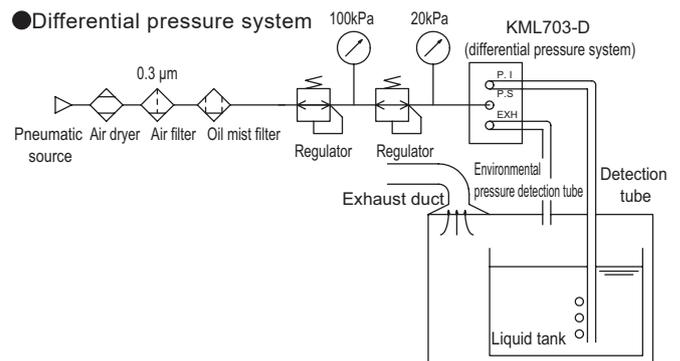
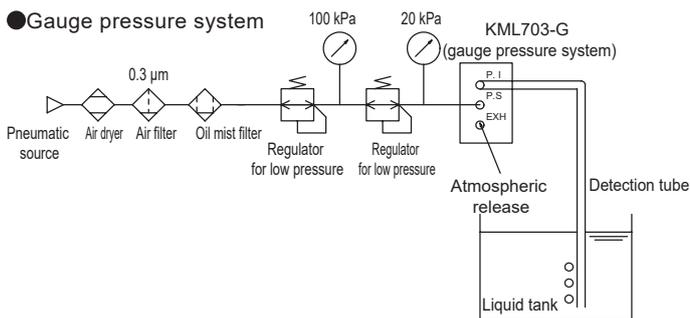
### Specifications

Item		KML703-G-485	KML703-D-485
Detection		Gauge pressure method	Differential pressure method
Supply gas	Working fluid	Compressed air/nitrogen gas (*1)	
	Working pressure kPa	10 to 30	
	Fluid temperature °C	5 to 50	
Ambient temperature °C		5 to 50	
Proof pressure kPa	P.S. port	100	
	P.I. port	10 (1000mm when the detection fluid is water)	
Switching water level	mm	1 to 700 (*2) User free setting 8 points	
Environmental pressure fluctuation	kPa	-	Within ±3 (Confirm that detection tubes are in same pressure environment.)
Consumption flow rate	Ncm <sup>3</sup> /min	70 or less	140 or less
Monitor output		4 to 20 mADC (load resistance: 200 to 550 Ω)	
Power supply voltage		24 VDC ±10%, voltage ripple rate 1% or less	
Current consumption	mA	130 or less (when using 24 VDC)	
Switch output		NPN open collector 8-point (CH1 to CH6 contact a, CH7 to CH8 contact b) (30 VDC 50mA or less)	
Insulation resistance	MΩ	100 or more (500 VDC for 1 minute)	
Withstand voltage		Commercial frequency 500 VAC, 1 minute	
Repeatability	mm	±3 (10 minutes after power on) (*2)	
Hysteresis	mm	1 to 10 setting (*2)	
Response time	ms	600 or less (working pressure 20kPa, detection tube I.D. ø4 mm, length 5 m)	
Temperature characteristics	mm/°C	Within ±1.2 (detection fluid: water)	
Detection tube bore size ø	mm	4	
Detection tube length	m	Within 5	
Weight	kg	0.51	

\*1: Use a filter with a Degree of filtration of 0.3 μm or more.

\*2: The specifications above are based on an operating pressure of 20 kPa, power supply voltage of 24 VDC, ambient temperature of 20°C, detection piping with an I.D. of ø4 and length of 5 m, a specific gravity setting of 1, and a nozzle mounting height of 0. The detection fluid is water.

### Piping example



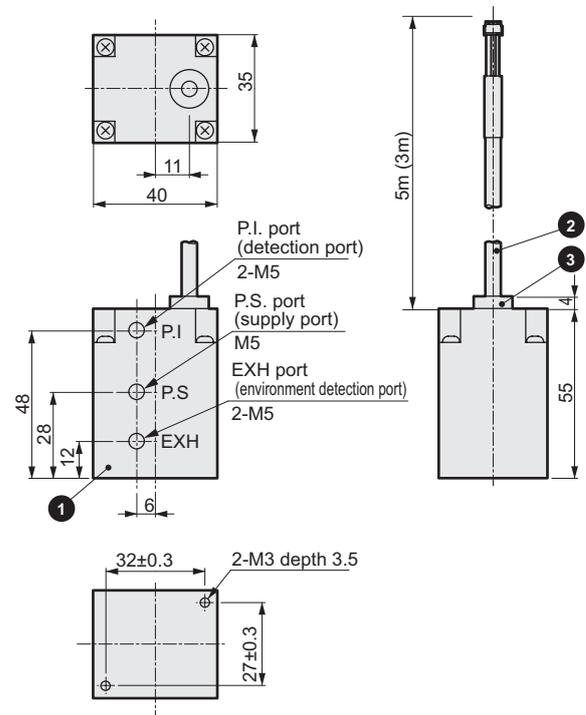
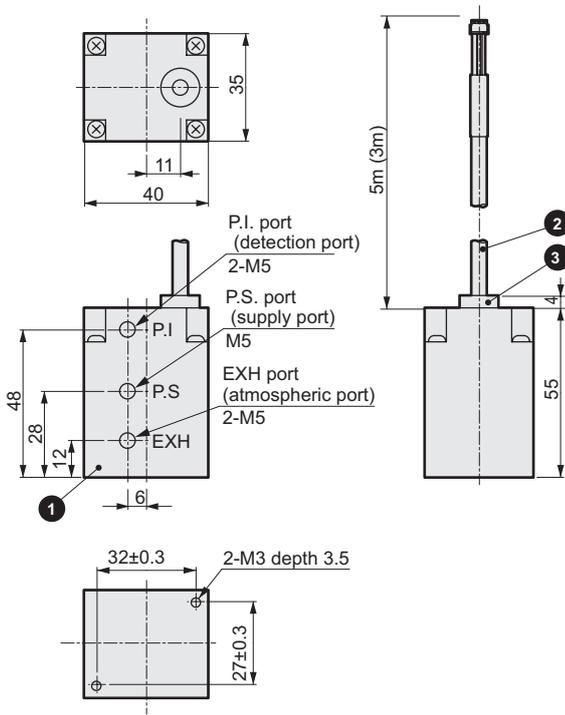
# KML703 Series

## Dimensions and main part material

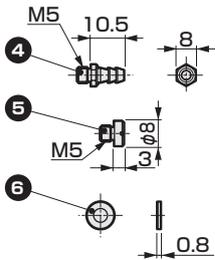
### ● Sensor body

• KML703-G-485

• KML703-D-485



### ● Nipple, plug, gasket (accessory)

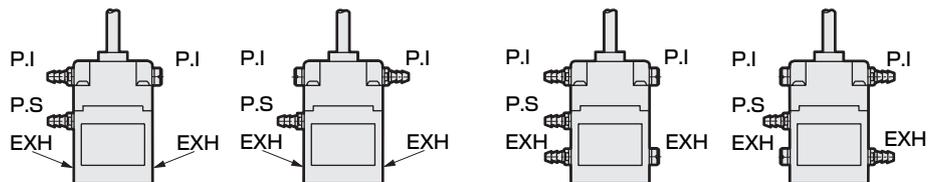


There are two PI and EXH ports on the front and back of this product. For unused ports, install the attached plugs to prevent leakage.

\* With the gauge pressure system, leave the EXH port open and do not attach a plug.

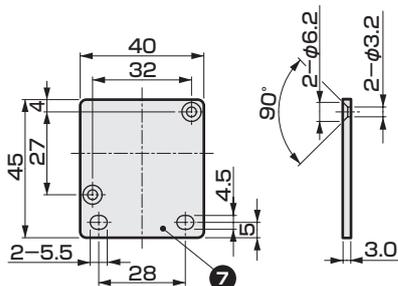
Gauge pressure system

Differential pressure system



### ● Bracket for sensor body (option)

• KML703-B

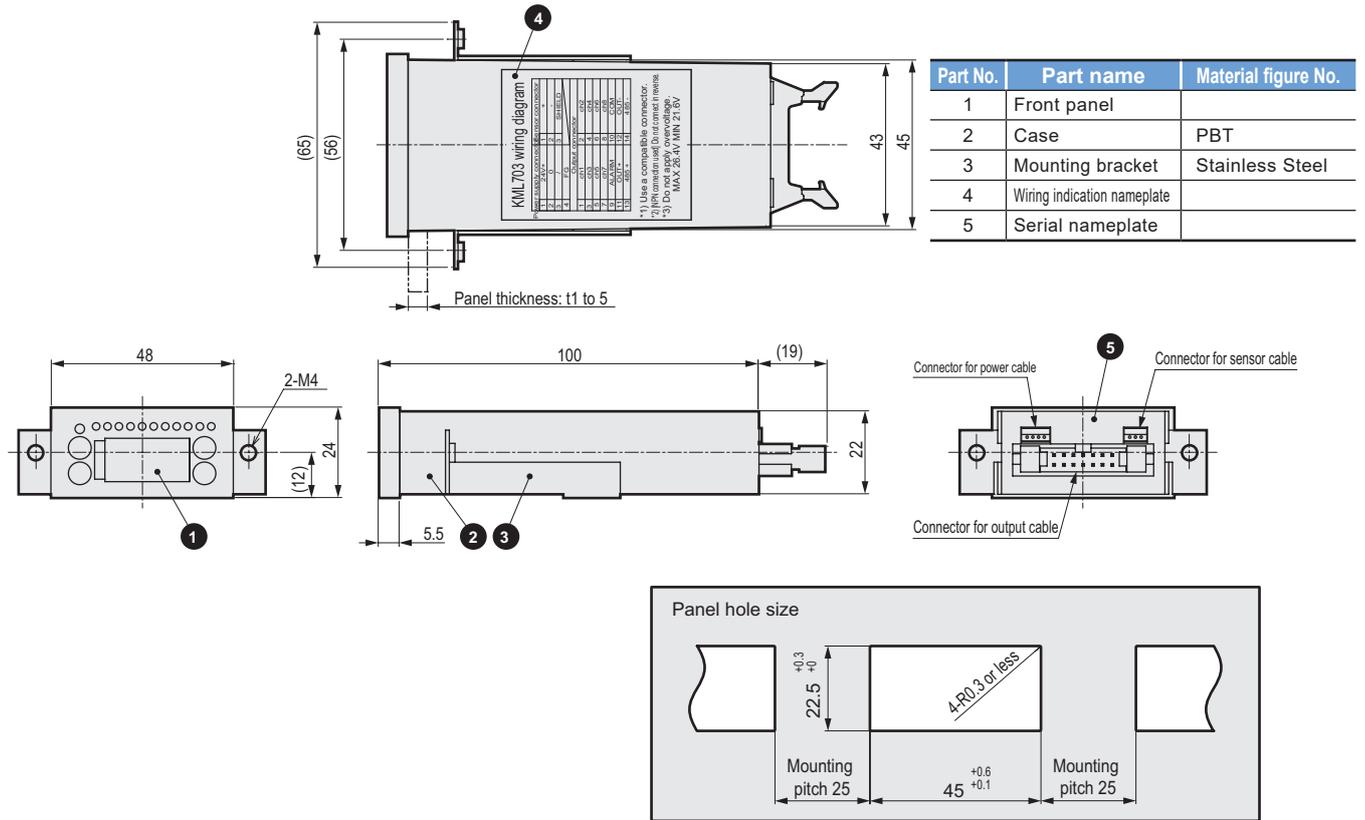


\* For mounting bracket  
Two flat head machine screws included

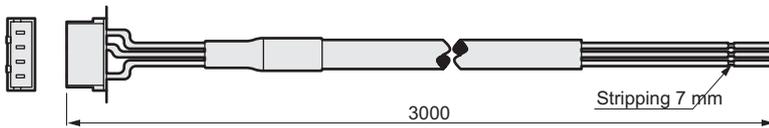
Part No.	Part name	Material
1	Body	PPS
2	Sensor cable	PVC
3	Bush	PA
4	Nipple	Stainless Steel
5	Plug	Stainless Steel
6	Gasket	PTFE
7	Bracket	Stainless Steel

## Dimensions and main part material

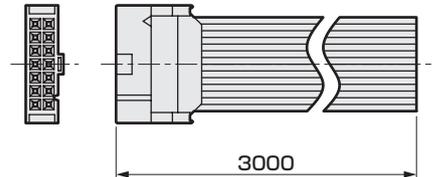
● Indicator



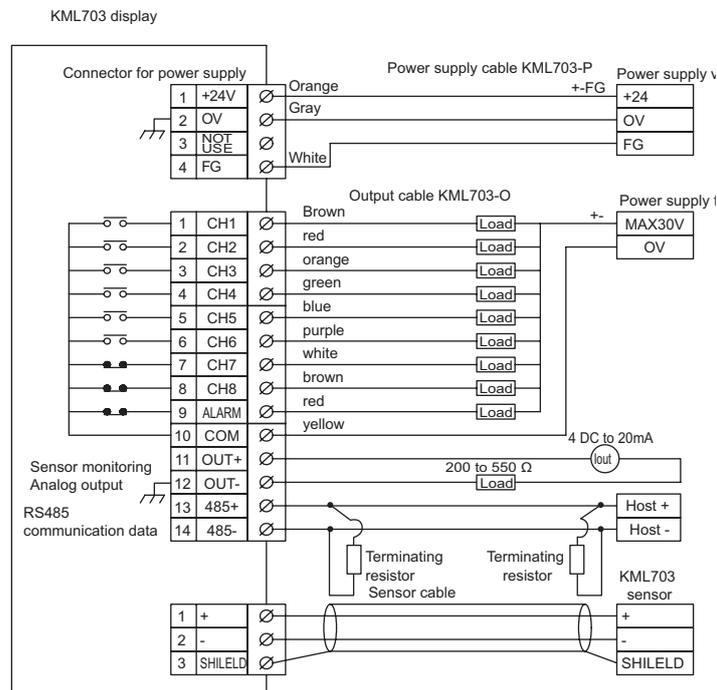
● Power cable (option)  
• KML703-P



● Output cable (option)  
• KML703-O



## Wiring diagram





# Safety Precautions

Be sure to read this section before use.

When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.

It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely.

Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.



## WARNING

- 1** This product is designed and manufactured as a general industrial machine part. It must be handled by an operator having sufficient knowledge and experience.
  - 2** Use this product in accordance with specifications.  
This product must be used within its stated specifications. In addition, never modify or additionally machine this product. This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments. (Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)
    - 1** Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
    - 2** Use for applications where life or assets could be significantly affected, and special safety measures are required.
  - 3** Observe organization standards and regulations, etc., related to the safety of device design and control, etc. ISO4414, JIS B 8370 (Pneumatics fluid power - General rules and safety requirements for systems and their components) JFPS2008 (Principles for pneumatic cylinder selection and use) Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.
  - 4** Do not handle, pipe, or remove devices before confirming safety.
    - 1** Inspect and service the machine and devices after confirming safety of all systems related to this product.
    - 2** Note that there may be hot or charged sections even after operation is stopped.
    - 3** When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility. Discharge any compressed air from the system, and pay attention to possible water leakage and leakage of electricity.
    - 4** When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.
  - 5** Observe warnings and cautions in the following pages to prevent accidents.
- The precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

 **DANGER:** When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning.

 **WARNING:** If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury.

 **CAUTION:** When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. Every item provides important information and must be observed.

## Warranty

- 1** **Warranty period**  
The product specified herein is warranted for one (1) year from the date of delivery to the location specified by the customer.
- 2** **Warranty coverage**  
If the product specified herein fails for reasons attributable to CKD within the warranty period specified above, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge. However, following failures are excluded from this warranty:
  - 1) Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or the Instruction Manual.
  - 2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
  - 3) Failure not caused by the product.
  - 4) Failure caused by use not intended for the product.
  - 5) Failure caused by modifications/alterations or repairs not carried out by CKD.
  - 6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
  - 7) Failure caused by acts of nature and disasters beyond control of CKD.The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.  
Note: For details on the durability and consumable parts, contact your nearest CKD sales office.
- 3** **Compatibility check**  
The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.



Fine System Components

# Safety Precautions

Be sure to read this section before use.

For general precautions for Fine System equipment, refer to the “Wet Fine Equipment General Catalog” (Catalog No. CB-031AA).



## CAUTION

- Install the product at a position higher than the upper limit of the liquid tank to be detected to prevent reverse flow of the detection liquid.
- Install this product in a location that is not exposed to chemical liquid atmospheres.
- Detection in sealed liquid tanks and similar liquid tanks is not possible.
- For the supply gas, use gas that has been filtered for dust and oil by passing it through a submicron filter and micro-coalescer.
- Use a low-pressure regulator with oil-free processing.
- Use a detection tube with an inner diameter of  $\varnothing 4$  mm.
- Do not install anything that will create resistance, such as a throttle, in the middle of the piping.
- Do not stop the supply pressure. The chemical liquid atmosphere may flow back from the detection tube to the sensor and cause adverse effects.
- Do not block the P.I. port, EXT port or its piping. Working pressure is directly applied to the diaphragm for the KML502 Series and to the sensor chip for the KML60/KML703 Series, which may cause damage.

### KML502 Series

- Install with the micro switch and reed switch facing up.

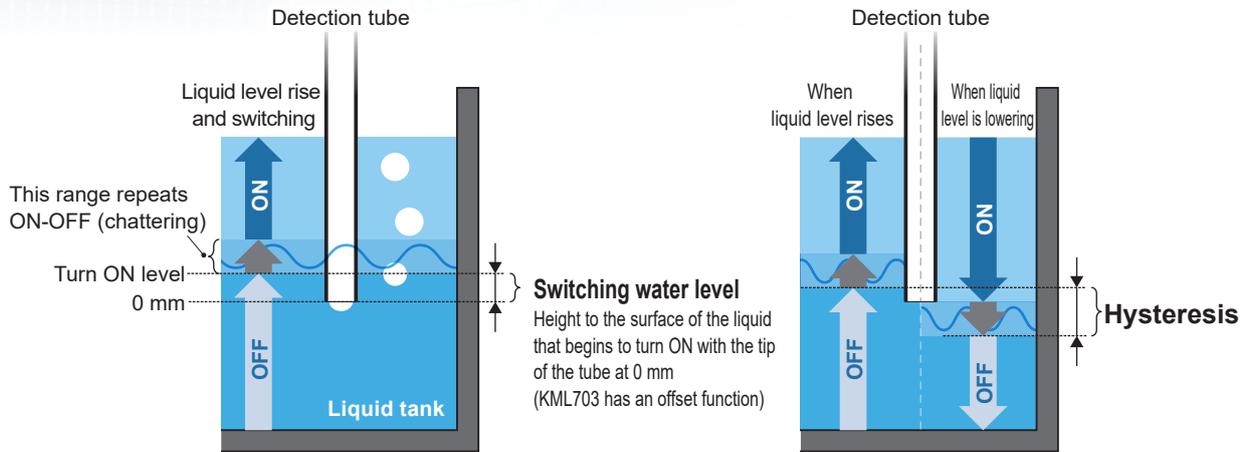
### KML60 Series

- When using a mix manifold MXKML2 with the KML502 Series, refer to the Safety Precautions for the KML502 Series.

### KML703 Series

- When using the differential pressure method, install the cylinder at a position where the ambient pressure is higher than the upper limit of the liquid tank. (0.1 m per 1 kPa environmental pressure is a guideline)

# Glossary



## Repeatability

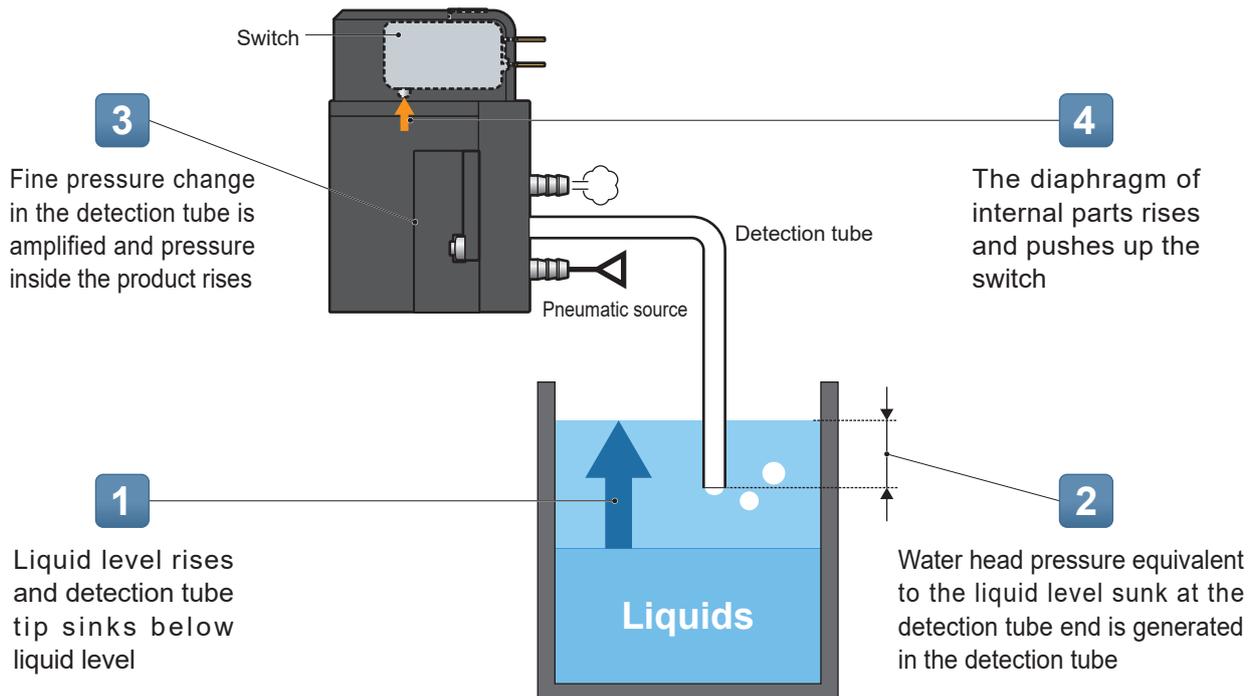
Variation of switching water level when detected continuously under the same conditions

\* The detection tube end is 0 mm.

\* The state before switching (contact point switching) is shown as OFF, and the state after switching is shown as ON.

\* The switching water level is fixed at 1 point for KML502, arbitrarily set at 4 points for KML60, and arbitrarily set at 8 points for KML703.

# Operational principle (example: KML502)







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