

Moisture Control Tube

IDK Series

Prevents condensation in piping

for small cylinders/air grippers.

Diffuses water vapor in the piping to the outside!

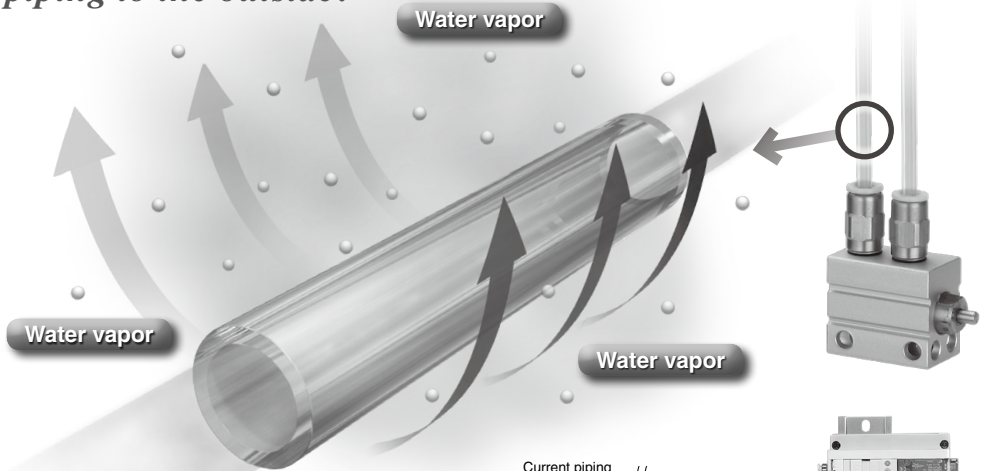
Linear shape

Suitable for applications where cylinders do not rotate.



Coil shape

Reduces tube buckling of moving part.



Additional power supply and works are not necessary!

All you have to do is install the moisture control tube!!

No condensation



Moisture control tube

Condensation generated



General tube

Operating a small cylinder, air gripper, or air operated valve, etc. which has a small volume may cause condensation of water in the area near the actuator due to the volume ratio of the actuator volume and the operating piping volume.

Prevents condensation issue with pneumatic equipment.

If condensation occurs...

Grease deteriorates or is washed away.

Operation failure

Shorter life

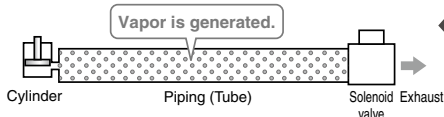
Air quality affects the operation and the life of the equipment in a pneumatic system, so dehumidified air is necessary. In particular, if small actuators are continuously operated at high frequency, condensation may be generated even with dehumidified air, due to the characteristics of the system. The moisture control tube prevents condensation from being formed by diffusing water vapor generated in the piping to the outside before the water vapor is condensed.

Supply

The mechanism of condensation in small actuators

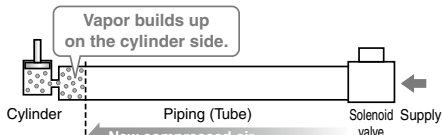
Exhaust

- ① The temperature in the piping rapidly drops due to adiabatic expansion.
- ② If the temperature in the piping becomes lower than the dew point of the compressed air, vapor will be generated.
- ③ The vapor cannot be exhausted (cannot be pushed out) as the volume of the actuator is small.



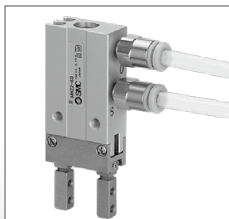
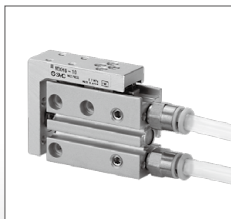
Supply

Residual vapor is pressed by compressed air and accumulates in the area near the actuator.

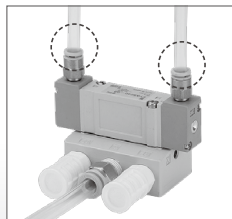


Equipment in which condensation is a possibility

Small diameter cylinders/air grippers



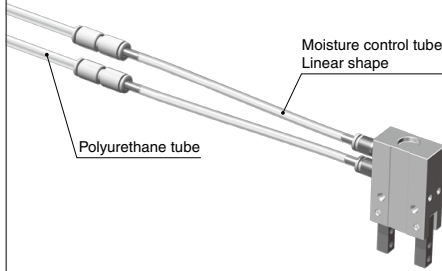
Air operated valves (Pilot port)



**Additional power supply and works are not necessary!
Just by installing the moisture control tube prevents condensation.**

Linear shape

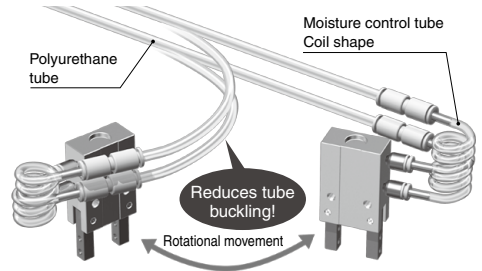
Suitable for applications where cylinders do not rotate.



Model		Tube O.D.	Tube effective length	
			100	200
IDK02		ø2		
IDK04		ø4		
IDK06		ø6		

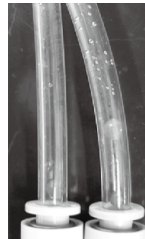
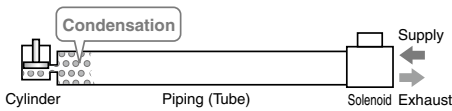
Coil shape

Since other tubes with a small bending radius are used on moving parts, the buckling trouble of the moisture control tubes can be reduced.

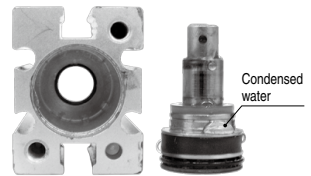


Model		Tube O.D.	Tube effective length	
			100	200
IDK04		ø4		
IDK06		ø6		

The accumulated vapor is liquefied (condensed) due to repeated supply/exhaust.



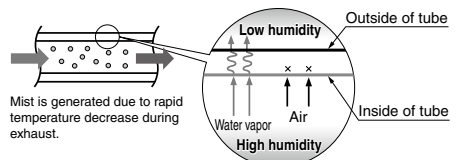
Water droplets



Grease deteriorates or is washed away.

Operating principle of moisture control tube

This moisture control tube has characteristics to balance the humidity inside the tube with that outside the tube. If the humidity inside the tube differs from that outside the tube, the moisture control tube penetrates the water vapor from the higher humidity side to the lower humidity side. The moisture control tube penetrates only the water vapor and rarely penetrates the air. The humidity inside the tube is put in the high humidity status due to the mist generated every exhaust, causing dew condensation. The moisture control tube penetrates the generated mist from the inside of the tube with a high humidity to its outside with a low humidity to prevent accumulation of water vapor and dew condensation inside the tube.



The water vapor is generated and it moves from the inside of the tube with a high humidity to its outside with a low humidity.

Moisture Control Tube

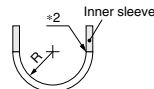
IDK Series

Specifications (Linear Shape)



Model	IDK02	IDK04	IDK06
Fluid ^{Note 1)}	Compressed air		
Max. operating pressure	0.7 MPa		
Operating temperature	0 to 60°C (No freezing)		
Operating environment ^{Note 2)}	Indoors, where product is not exposed to water (0 to 40°C, 0 to 75%RH)		
Min. bending radius ^{Note 2)} [mm]	10	20	40
Quantity of moisture control tubes	2 pcs.		
Color	Transparent (Color will change to brown over time, but the functions are not affected.)		
Applicable fittings ^{Note 4)}	KQ2		
Material	Fluoropolymer		

- Note 1) Use the moisture control tube in a compressed air line with a refrigerated air dryer and a mist separator installed upstream. The condensation prevention performance may be lowered depending on the quality of the supply compressed air (oil, dew point).
- Note 2) Use in a low-humidity environment. If the ambient humidity is higher, condensation prevention may not occur. Note 3) The minimum bending radius is the radius at which the tube breaks or flattens at a temperature of 20°C. In actual applications, the tube and inner sleeve should be used in a manner in which breakage, flattening, etc., does not occur.
- Note 4) The inner sleeve is already mounted and cannot be removed. If the inner sleeve happens to come off, re-insert it before mounting the fitting.
- Note 5) Do not cut the tube.



How to Order

IDK **02** - **100**

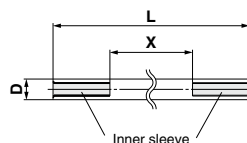
Tube O.D.

Symbol	O.D.
02	2 mm
04	4 mm
06	6 mm

Tube nominal length

Symbol	Nominal length
100	100 mm
200	200 mm

Dimensions



Model	O.D. x I.D. D	Unit: mm	
		Nominal length X	Full length L
IDK02-100	2 x 1.2	100	120
IDK02-200		200	220
IDK04-100	4 x 2.5	100	140
IDK04-200		200	240
IDK06-100	6 x 4	100	140
IDK06-200		200	240

Note) Dimensions at 40% relative humidity. Dimensions may change if the relative humidity changes.

Made to Order

If you require the moisture control tube with a nominal length not listed in the above table, please contact SMC.

Specifications (Coil Shape)



Model	IDK04-□-C1	IDK06-□-C1
Fluid ^{Note 1)}	Compressed air	
Max. operating pressure	0.7 MPa	
Fluid temperature	0 to 60°C (No freezing)	
Operating environment ^{Note 2)}	Indoors, where product is not exposed to water (0 to 40°C, 0 to 75%RH)	
Quantity of moisture control tubes	2 pcs.	
Color	Transparent (Color will change to brown over time, but the functions are not affected.)	
Applicable fittings ^{Note 3)}	KQ2	
Material	Fluoropolymer	

Note 1) Use the moisture control tube in a compressed air line with a refrigerated air dryer and a mist separator installed upstream. The condensation prevention performance may be lowered depending on the quality of the supply compressed air (oil, dew point).
 Note 2) Use in a low-humidity environment. If the ambient humidity is higher, condensation prevention may not occur.
 Note 3) The inner sleeve is already mounted and cannot be removed.
 If the inner sleeve happens to come off, re-insert it before mounting the fitting.

How to Order

IDK 04 - 100 - C1

Tube O.D. ●

Symbol	O.D.
04	4 mm
06	6 mm

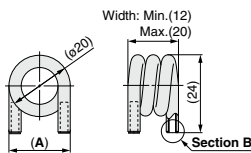
● Tube nominal length

Symbol	Nominal length
100	100 mm
200	200 mm

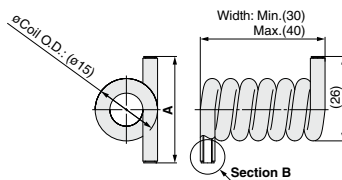
Note) Part number for a set of 2 tubes

Dimensions (per tube)

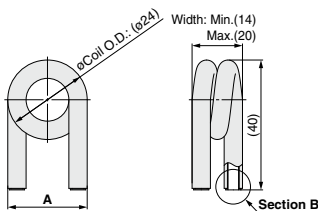
IDK04-100-C1



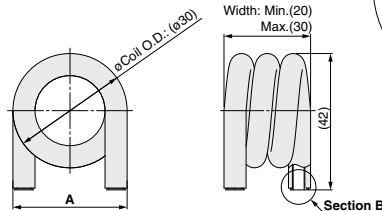
IDK04-200-C1



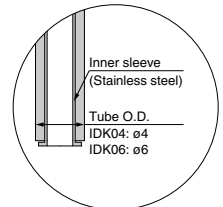
IDK06-100-C1



IDK06-200-C1



Section B details



* Due to the material, the above dimensions may vary depending on the environment (temperature, humidity) including the spread of dimension A.

IDK Series

Table for Quick Selection

Refer to pages 260 and 261 for details of Model Selection.



Basic conditions for selection

- Supply air pressure: 0.5 MPa
- Supply air dew point: -20°C (Atmospheric pressure dew point)
- Ambient environment: Ambient temperature 25°C, Ambient humidity 40%
- * If your operating conditions are different from these basic conditions, correct them based on "Model Selection".

Single Piston

Actuator size		Piping condition		Recommended model					
Bore size [mm]	Stroke [mm]	Tube length [m]	Tube O.D. 2 mm		Tube O.D. 4 mm		Tube O.D. 6 mm		
			IDK02-100	IDK02-200	IDK04-100 (-C1)	IDK04-200 (-C1)	IDK06-100 (-C1)	IDK06-200 (-C1)	
2.5	All strokes	5	●	—	—	●	—	●	
		10	●	—	—	●	—	●	
4	All strokes	5	●	—	—	●	—	●	
		10	●	—	—	●	—	●	
6	Less than 10	5	●	—	—	●	—	●	
		10	●	—	—	●	—	●	
	10 or more	5	●	—	●	—	—	●	
		10	●	—	—	●	—	●	
8	Less than 10	5	●	—	●	—	—	●	
		10	●	—	—	●	—	●	
	10 or more	5	●	—	●	—	●	—	
		10	●	—	—	●	—	●	
10	Less than 10	5	●	—	●	—	—	●	
		10	●	—	—	●	—	●	
	10 or more	5	●	—	●	—	●	—	
		10	●	—	—	●	—	●	
16 (15)	Less than 10	5	●	—	●	—	—	●	
		10	●	—	—	●	—	●	
	10 or more	5	●	—	●	—	●	—	
		10	●	—	—	●	—	●	
20	Less than 10	5	●	—	●	—	—	●	
		10	●	—	—	●	—	●	
	10 or more	5	●	—	●	—	●	—	
		10	●	—	—	●	—	●	



Dual Piston

Series	Actuator size		Piping condition		Recommended model					
	Bore size [mm]	Stroke [mm]	Tube length [m]	Tube O.D. 2 mm		Tube O.D. 4 mm		Tube O.D. 6 mm		
				IDK02-100	IDK02-200	IDK04-100 (-C1)	IDK04-200 (-C1)	IDK06-100 (-C1)	IDK06-200 (-C1)	
CXWM, CXWL (CXW□-25 or less)	10	25	5	—	—	—	—	—	—	
			10	—	—	—	—	●	—	
MXQ	6	10	5	●	—	●	—	—	●	
			10	●	—	●	—	—	●	
	Size larger than those above	5	●	—	●	—	—	—		
		10	●	—	●	—	—	—		
CXS, CXSJ	6	10	5	●	—	●	—	—	●	
			10	●	—	●	—	—	●	
	Size larger than those above	5	●	—	●	—	—	—		
		10	●	—	●	—	—	—		

Note) If the piping is longer than the above tube length, the IDK□-200 may be necessary.



Basic conditions for selection

- Supply air pressure: 0.5 MPa
- Supply air dew point: -20°C (Atmospheric pressure dew point)
- Ambient environment: Ambient temperature 25°C, Ambient humidity 40%
- * If your operating conditions are different from these basic conditions, correct them based on "Model Selection".

Air Gripper

Series	Bore size [mm]	Piping condition Tube length [m]	Recommended model					
			Tube O.D. 2 mm		Tube O.D. 4 mm		Tube O.D. 6 mm	
			IDK02-100	IDK02-200	IDK04-100 (-C1)	IDK04-200 (-C1)	IDK06-100 (-C1)	IDK06-200 (-C1)
MHZA2, MHZAJ2	6	5	●	—	●	—	—	●
		10	●	—	●	—	—	●
MHZ2, MHZJ2	6	5	●	—	●	—	●	—
		10	●	—	●	—	—	●
MHC2	6	5	●	—	●	—	—	●
		10	●	—	—	●	—	●
MHCA2	6	5	●	—	—	●	—	●
		10	●	—	—	●	—	●
MHCM2	7	5	●	—	—	●	—	●
		10	●	—	—	●	—	●
Air gripper with bore size larger than those above		—	—	—	●	—	—	●



Rotary Actuator

Series	Vane type	Size	Rotating angle	Piping condition Tube length [m]	Recommended model					
					Tube O.D. 2 mm		Tube O.D. 4 mm		Tube O.D. 6 mm	
					IDK02-100	IDK02-200	IDK04-100 (-C1)	IDK04-200 (-C1)	IDK06-100 (-C1)	IDK06-200 (-C1)
CRB□ CRBU2	Single	10	90	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
			180	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
			270	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
	Double	10	90	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
			100	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
MSU□	Single	1	90	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
			180	5	—	—	—	—	●	—
				10	—	—	●	—	●	—
			90	5	—	—	—	—	●	—
				10	—	—	●	—	●	—
	Double	1	90	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
			180	5	—	—	—	—	●	—
				10	—	—	●	—	●	—
CRQ2	—	10	90	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
			180	5	—	—	—	—	●	—
				10	—	—	●	—	●	—
			90	5	—	—	—	—	●	—
				10	—	—	●	—	●	—
MSQ□	—	90	1	5	—	—	●	—	●	—
				10	—	—	●	—	●	—
			2	5	—	—	—	—	●	—
				10	—	—	●	—	●	—
			3	5	—	—	—	—	●	—
				10	—	—	●	—	●	—

Note) If the piping is longer than the above tube length, the IDK□-200 may be necessary.

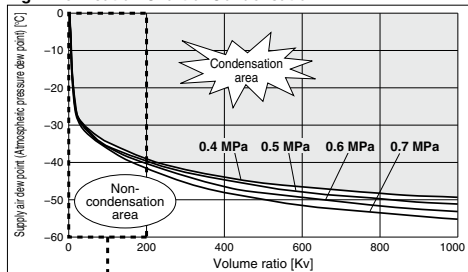
IDK Series Model Selection

Selection Procedure

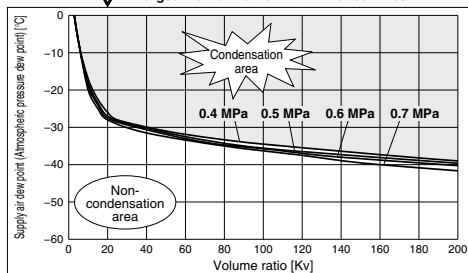
1 Check the presence of condensation.

(1) The presence of condensation can be verified by the dew point and Kv value (the volume ratio of tube and actuator) of the supply air.

Fig. 1 Verification Chart of Condensation



Enlarged View of Portion Within Dotted Lines



Calculation method of volume ratio (Kv value)

Calculate the piping volume V_t and the actuator volume V_c and substitute them into equation ① below.

$$Kv = \frac{V_t}{V_c} \dots \textcircled{1}$$

V_t : Piping volume [mm³]
 V_c : Actuator volume [mm³]

$$V_t = \frac{\pi d^2 l}{4}$$

V_t : Piping volume [mm³] [can be selected from piping volume chart in Fig. 2.]

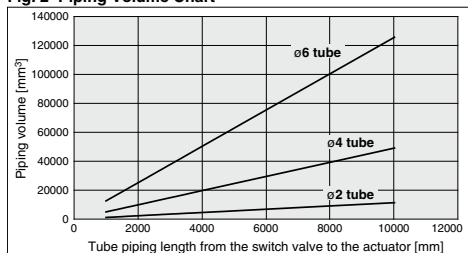
d : Tube I.D. [mm]
 l : Tube length [mm]

* Tube length means the tube piping length from the switch valve (e.g. solenoid valve) to the actuator.

$$V_c = \frac{\pi D^2 s}{4}$$

V_c : Actuator volume [mm³]
 D : Bore size [mm]
 s : Stroke [mm]

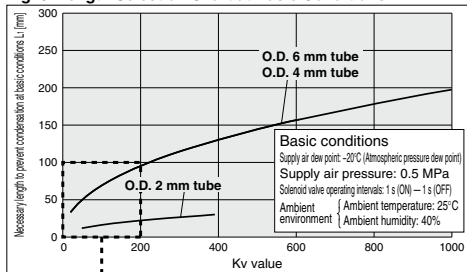
Fig. 2 Piping Volume Chart



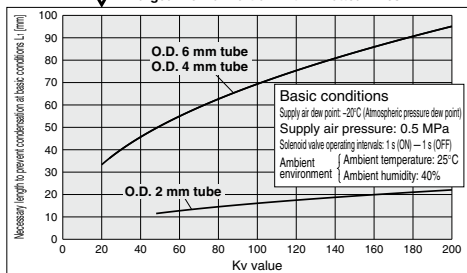
2 Select the length of moisture control tube for the condensation area.

(1) Find L_1 , the necessary length to prevent condensation at basic conditions corresponding to the Kv value, from the length selection chart at basic conditions.

Fig. 3 Length Selection Chart at Basic Conditions



Enlarged View of Portion Within Dotted Lines



(2) If your operating conditions are different from these basic conditions, apply a correction factor.

Necessary length to prevent condensation L
= Necessary length to prevent condensation at basic conditions $L_1 \times C_1 \times C_2 \times C_3$

Correction Factor C1 for Supply Air Dew Point

Supply air dew point [°C]	Correction factor C1
-10	2
-20	1
-30	0.5
-40	0.25

Correction Factor C2 for Ambient Environment

Relative humidity	Temperature			
	10°C	25°C	40°C	60°C
20%	0.2	0.4	0.6	0.8
40%	0.5	1.0	1.3	1.8
60%	1.0	1.7	2.8	3.7
75%	2.1	4.0	5.9	7.8

Correction Factor C3 for Supply Air Pressure

Supply pressure [MPa]	Correction factor C3
0.3	0.4
0.4	0.7
0.5	1
0.6	1.25
0.7	1.6

(3) Based on the calculated L value, select the IDK□-100 or IDK□-200.

* If the L value is 200 or larger, a fitting should be connected to the IDK□-100 and IDK□-200 before use.

Selection Example

Circuit conditions

- Actuator : CUJB4-6D
- Bore size **D**: 4 mm
- Stroke **s**: 6 mm
- Tube size : O.D. 6 mm x I.D. (Tube I.D. **d**) 4 mm
- Tube piping length **l**: 5 m
- Supply air pressure : 0.3 MPa
- Supply air dew point : -20°C (Atmospheric pressure dew point)
- Ambient environment : Ambient temperature 25°C, Ambient humidity 60%

1 Check the presence of condensation.

Check the presence of condensation.

(1) Calculation method of volume ratio (Kv value)

$$Vt = \frac{\pi d^2 l}{4} = \frac{\pi \times 4^2 \times 5000}{4} = 62800 \text{ mm}^3$$

$$Vc = \frac{\pi D^2 s}{4} = \frac{\pi \times 4^2 \times 6}{4} = 75 \text{ mm}^3$$

$$Kv = \frac{Vt}{Vc} = 837$$

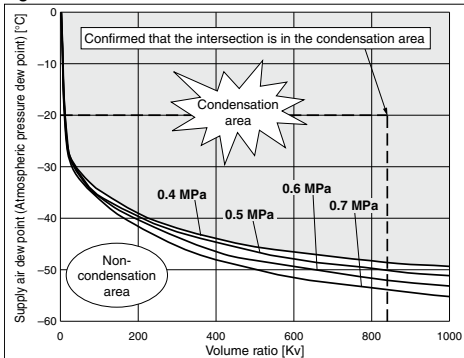
Note) For dual piston cylinder, the volume ratio will be 1/2 of the volume ratio calculated above.

Verify the presence of condensation.

(2) Refer to the verification chart of condensation.

Check whether the volume ratio [Kv] and the supply air dew point intersect in the condensation area. With the conditions above, they intersect in the condensation area, meaning **condensation will occur**.

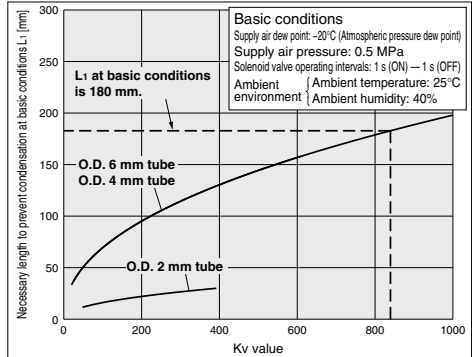
Fig.1 Verification Chart of Condensation



2 Select the length of moisture control tube.

(1) Find L1, the necessary length to prevent condensation at basic conditions, from the length selection chart at basic conditions and Kv value.

Fig. 2 Length Selection Chart at Basic Conditions



(2) If your operating conditions are different from these basic conditions, apply a correction factor.

Necessary length to prevent condensation L

$$= \text{Necessary length to prevent condensation at basic conditions } L_1 \times C_1 \times C_2 \times C_3$$

In the example circuit, the conditions which are different from the basic conditions are:

- Supply air dew point: -20°C (Atmospheric pressure dew point)
- Supply air pressure: 0.3 MPa
- Ambient environment: 25°C, 60%
- * Basic conditions
- Supply air dew point: -20°C (Atmospheric pressure dew point)
- Supply air pressure: 0.5 MPa
- Ambient environment: 25°C, 40%

(a) Find the correction factors.

- Supply air dew point correction factor **C1 = 1**
- Ambient environment correction factor **C2 = 1.7**
- Supply air pressure correction factor **C3 = 0.4**

(b) Find the necessary effective length after correction.

$$\text{Necessary length to prevent condensation } L = 180 \times 1 \times 1.7 \times 0.4 = 120 \text{ mm}$$

(3) Therefore, the moisture control tube **IDK06-200** with effective length 20 cm should be used.



IDK Series

Specific Product Precautions 1

Be sure to read this before handling the products. For safety instructions and air preparation equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: <https://www.smcworld.com>

Design

⚠ Caution

1. Use the moisture control tube without lubrication.
2. Do not cover the moisture control tube or use in an enclosed space. Water vapor escapes outside of the moisture control tube.
Covering the moisture control tube will reduce the performance and condensation cannot be prevented.
3. The exterior dimensions will change depending on the temperature and humidity.
If the product is left in an environment which exceeds the specifications of 40°C and 75% RH relative humidity, the outer diameter will increase and it will become difficult to insert and remove it from the One-touch fitting.
In such cases, please refrain from inserting and removing the product with force. Perform insertion and removal in a location with a lower temperature and lower humidity.
4. As the product is used to prevent condensation during use, the outer diameter of the tubing will increase and it may become difficult to remove it from the One-touch fitting. In such cases, wait for a short while after operation has been stopped before removing the tubing.
5. The color of the moisture control tube will turn to brown over time due to reaction with organic substances in the air. This does not affect the performance or strength.
6. Do not wipe or clean the product with alcohol. Only air blow should be performed.
7. The moisture control tube is assumed to be used for static piping.
If the tube moves, for example in a flexible moving tube, it may become worn, elongated or torn due to tensile forces, or disconnected from the fitting. Ensure the tube is in a static condition at all times before using.

Operating Environment

⚠ Caution

1. The moisture control tube is for indoor use. It cannot be used under water or where it is exposed to water.
2. Do not use this product in locations where there are problems with static electricity.
3. Do not use this product in locations where spatter is generated.
4. Do not use in an environment where the product is directly exposed to cutting oil, lubricant, coolant oil, etc.

Operating Environment

⚠ Caution

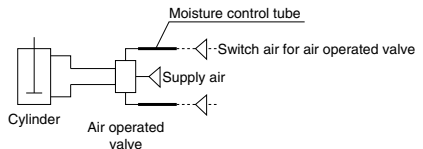
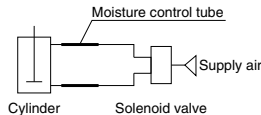
5. Do not use in environments where foreign matter may stick to the product or get mixed in the product's interior.
6. Avoid high temperature and humidity in the operating environment. They will reduce the performance of the tube and condensation may be generated.

Mounting/Piping

⚠ Caution

1. Do not use the moisture control tubes bundled together. Otherwise, the performance may be decreased.
2. Connect the tube directly to the fitting of the actuator or air operated valve.
If the tube is connected to other places, condensation will not be prevented and vapor will be generated.

Mounting position



3. Clean the tube and actuator by air blowing to eliminate moisture before connecting them to the circuit with condensation.
When condensation is being generated in the tubing of an actuator, it is possible that all the required grease has been washed away. Make sure to mount the moisture control tube after adding grease to the actuator.
4. Mount the tube with minimum bending radius or more. Be careful not to bend or flatten the tube even if the bending radius is more than the minimum value. The moisture control tube is not suitable for the place where the product slides in high frequency.
Do not stretch or shake this product when using.
5. When connecting this product to a fitting, hold the tube and slowly push the tube straight (0 to 5°) into the fitting until it stops. Pull the tube back gently to make sure that it is connected firmly. If the tube is not installed correctly, it may cause air leaks, or the tube may be disconnected.
As a guide, connect the tube to the fitting until the inner sleeve is not visible from the fitting.



IDK Series Specific Product Precautions 2

Be sure to read this before handling the products. For safety instructions and air preparation equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: <https://www.smcworld.com>

Mounting/Piping

⚠ Caution

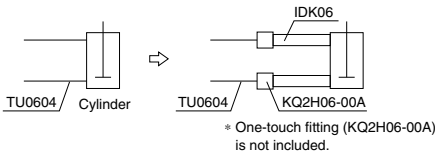
6. Install a refrigerated air dryer and a mist separator in the upstream compressed air line. The condensation prevention performance may be lowered depending on the quality of the supply compressed air (oil, dew point).

Recommended Model

Description	Model
Refrigerated air dryer	IDF/IDU
Mist separator	AM/AFM

7. Select the moisture control tube with the same diameter as the tube connected.

Example) TU0604 → IDK06-□00



8. Do not cut this product or use it without the inner sleeve. The inner sleeve cannot be removed. If the inner sleeve comes off, re-insert the inner sleeve into the tube again before mounting it to the fitting.
9. The only fittings this product can be used with are the KQ2 and KJ series One-touch fittings and their corresponding equipment (speed controllers, rotary One-touch fittings, etc.) Other fittings cannot be used.

Others

⚠ Caution

1. The moisture control tube is a product to prevent condensation of actuating parts such as small actuators and air operated valves. If you wish to use the product for any other application, please contact SMC.
2. Store the moisture control tube without unpacking. After unpacking the product, store it at a temperature of 40°C or less and relative humidity of 75% or less.
3. When the moisture control tube (coil shape) is stored or used for long periods, the dimensions and shape may change. Note that the shape of this product tends to change easily, particularly in high temperature and humidity environments.