CKD Corporation

SM-8159-A

INSTRUCTION MANUAL

CARTRIDGE CYLINDER

CAT Series

Please read this instruction manual carefully before using this product, particularly the section describing safety.

Retain this instruction manual with the product for further consultation whenever necessary.

For Safety Use

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, read this instruction manual carefully for proper operation.

Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ Precautions

- Before performing an overhaul inspection on the actuator, deactivate residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- To prevent an electric shock, do not touch the electric wiring connections (exposed live parts) of the actuator equipped with a solenoid valve or switch.
  Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.

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CAT Series
Cartridge Cylinder
Manual No. SM-8159-A

NOTE : Letters & figures enclosed within Gothic style bracket (examples such as [C2-4PP07] · [V2-503-B] etc.) are editorial symbols being unrelated with contents of the book.

1. PRODUCTS

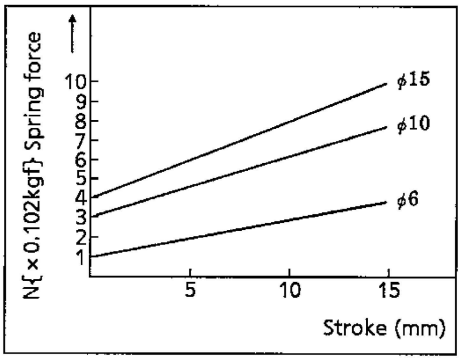
1.1 Specifications

Model code / Item	CAT $^{N}_{O}$-6	CAT $^{N}_{O}$-10	CAT $^{N}_{O}$-15
Type of Function	Single acting (Spring return type)		
Service Media	Compressed air		
Max. working pressure MPa {kgf/cm²}	0.7 {7.1}		
Min. working pressure MPa {kgf/cm²}	0.2 {2.0}	0.15 {1.5}	
Granted withstanding pressure MPa {kgf/cm²}	1.05 {10.7}		
Ambient temperature °C	−10~60 (Not to be frozen)		
Tube bore mm	6	10	15
Connecting port diam.	M5	M5	M5
Workingpiston speed mm/s	50~500		
Cushion	No cushion		
Mounting type	N : Panel mounting O : Built-in		

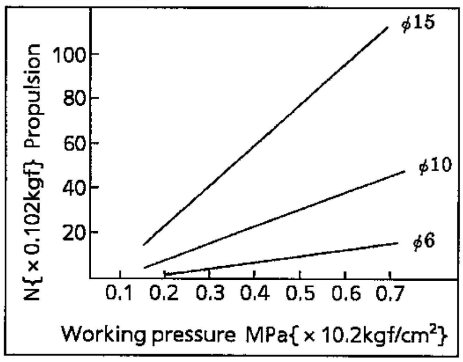
Stroke

Tube bore (mm)	Standard stroke (mm)
ϕ6	5 · 10 · 15
ϕ10	
ϕ15	

Tension of Piston spring
(Propulsion force to retracting stroke)



Theoretical Propulsion
(Advancing stroke)



Refer to above table when there is a load during piston retracting stroke.

1.2 Cylinder mass

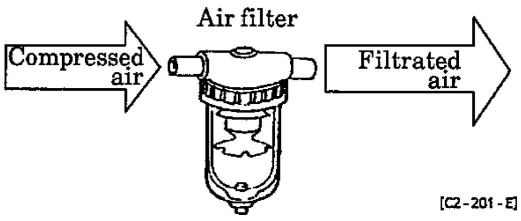
(Unit : g)

Stroke / Tube bore (mm)	5	10	15
ϕ6	18.0	21.0	23.0
ϕ10	43.5	50.0	56.0
ϕ15	100.0	114.5	128.0

2. CAUTION

2.1 Fluid

1) Use the compressed air, filtrated and dehumidified. Carefully select a filter of an adequate filtration rate (5μm or lower preferred), flow rate and its mounting location (as closest to directional control valve as possible).

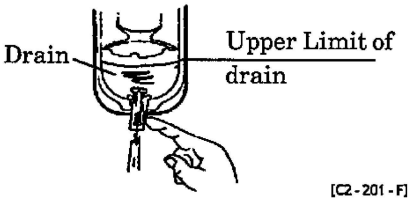


[C2-201-E]

2) Be sure to drain out the accumulation in filter periodically before the level exceeds the mark line.

3) Note that the intrusion of carbide of compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of solenoid valve and cylinder. Be sure to carry out thorough inspection and maintenance of compressor.

4) This Cylinder does not require lubrication. It is recommended, however, to use Turbine oil Class 1, ISO VG32 as lubricant if lubrication is preferred.



[C2-201-F]

3. OPERATION

1) Keep operating cylinder within the pressure range shown in the table below. Stability of stroke motion may be hindered with pressure less than low limitation. Never intend to operate it with pressure exceeding the max. limitation.

Table 1

	Minimum working pressur	Maximum working pressure
CAT $^{N}_{O}$ -6	0.2Mpa {2.0kgf/cm^2}	0.7Mpa {7.0kgf/cm^2}
CAT $^{N}_{O}$ $^{-10}_{-15}$	0.15MPa {1.5kgf/cm^2}	0.7Mpa {7.1kgf/cm^2}

2) The most preferable range of ambient temperature is 5~60°C.
Take some measure of freezing prevention to eliminate functional trouble of cylinder due to freezing of humidity within compressed air when operating it with the temperature below 5°C.
- FREEZING PREVENTION

(a) Remove humidity within the compressed air.
(Recommended : Refrigerator type dryer or Drypack dryer
(b) Lower freezing point by mixing antifreezor.
(Recommended : Ethylene Glycol)
(c) Provide heating or insulating device of component and piping to keep the system above freezing point.

3) Avoid fixing excessive load to piston rod.
Excessive inertia energy may cause damage to piston rod.

4) Avoid fixing transverse load to piston rod. Excessive wear of rod cover or damage to rod may be caused.

5) It is able to regulate speed by squeezing volume of compressed air at Supply port (meter -in type) but unable to expect stable speed control.

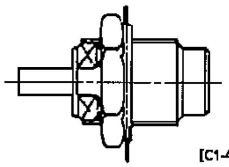
6) Except the case of simple advancing rod with no load, speed controlling facility should be used. Otherwise cylinder speed may become out of control and shock energy may cause the damage to cylinder.

7) Install speed controller either directly to the cylinder or as near location to it as possible.

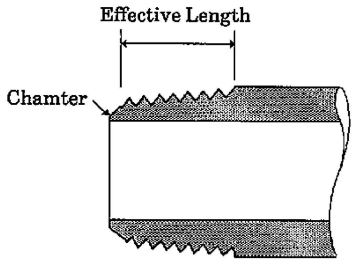
4. INSTALLATION

4.1 Piping

1) Use attached Clamp nipple (FCS6-M5 ; Orifice diam. ϕ0.8mm) exclusively when using CAT-N type. Otherwise malfunction or damage to cylinder may be caused.
2) As for cylinder applicable clamp nipple, it is recommended to adopt CKD product, part No.F-1506 (O.D.6mm, I.D.4mm)
3) Avoid seal of seal washer overriding the 2-pair flats for spanner when using CAT-O type as it may cause air leakage.

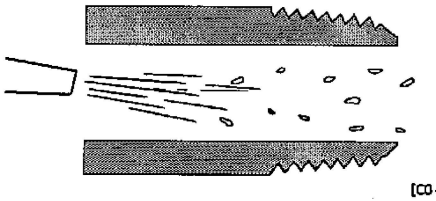

[C1-408-A]

4) For piping beyond the filter, use pipes that hardly get corroded such as galvanized pipes, nylon tubes, rubber tubes, etc.
5) Install filter preferably adjacent upper-stream to solenoid valve for eliminating rust, foreign substance and drain in the pipe.
6) Strictly observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.

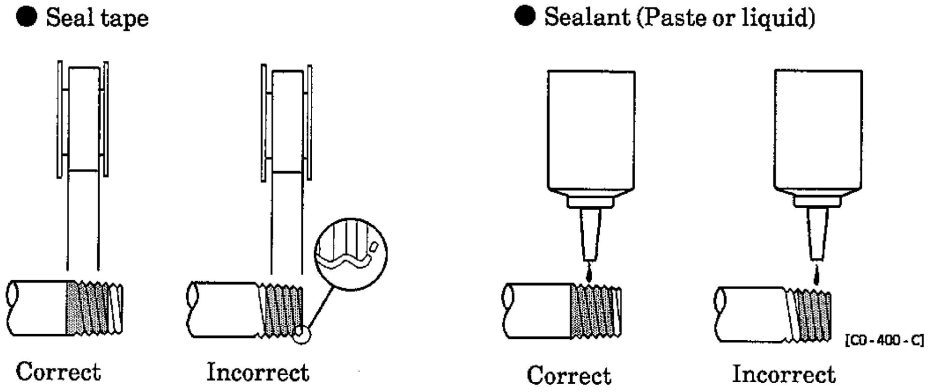


[C0-400-A]

7) Flush air into the pipe to blow out foreign substances and chips before piping.


[C0-400-B]

8) Refrain applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

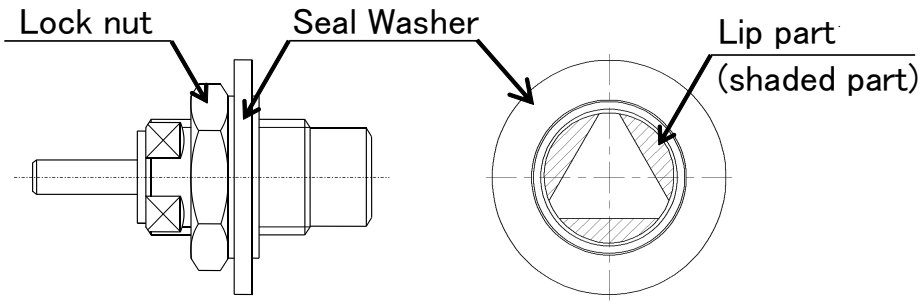


4.2 Installation

1) The cylinder servicable range of ambient temperature is −10~+60°C, but the most preferable range is 5~60°C.
2) Tighten a lock nut according to the torque values of the following at the case of Built-in type (CAT-O).

Model code	Tightening torque (N·m)	
	Minimum	Maximum
CAT-O-6	20	25
CAT-O-10	102	127
CAT-O-15	157	196

3) Assemble the seal washer while turning it along the thread when using the CAT-O type.
If you push it in and assemble it, the lip part will be damaged and it may cause air leakage.



5. MAINTENANCE

5.1 Periodic Inspection

1) In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.
2) Inspection items
   ⓐ Check the slackening of cylinder mounting nuts.
   ⓑ Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.
   ⓒ Check to see that the cylinder operates smoothly.
   ⓓ Check any remarkable change of the piston speed and cycle time.
   ⓔ Check for internal and/or external leakage.
   ⓕ Check the piston rod for flaw (scratch) and deformation.
   ⓖ Check the stroke for any abnormality.
   See 5-2,"Trouble shooting", should there be any trouble found, also carry out additional tightening if bolts, nuts, etc.are slackened.

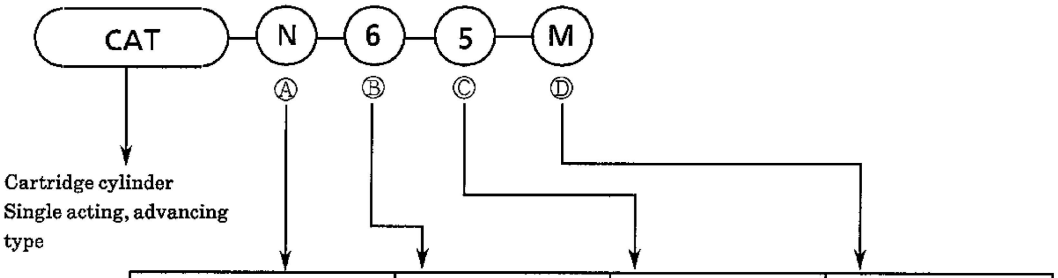
   Note : Being a caulked type cylinder is unable to be over-hauled: hence, replace the cylinder in its entirety if duly trouble occurs to the cylinder itself.

5.2 Trouble Shooting

Troubles	Causes	Countermeasure
Does not operate	No pressure or inadequate pressure	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve	Correct the control circuit.
	Improper or misalignment of installation	Correct the installation state and/or change the supporting system.
	Broken piston packing	Replace the cylinder ※ Due to
Does not function smoothly	Speed is below the low speed limit	Limit the load variation.
	Improper or misalignment of installation	Correct the installation state and /or change the supporting system.
	Exertion of transverse (lateral) load	Install a guide. Revise the installation state and/or change the supporting system.
	Excessive load	Increase the pressure itself and/or the inner diameter of the tube.
Breakage and/or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load. Install an external cushion mecanism.
	Exertion of transverse load	Install a guide. Reverse the installation state and/or change the supporting system.

※ Note : Being caulked type, cylinder is unable to be disassembled. Replace the cylinder in its entirety, should there be any packing damage occur.

6. MODEL CODING



Ⓐ Mounting type		Ⓑ Tuber bore (mm)		Ⓒ Standard stroke		Ⓓ Nose of Piston rod	
N	Panel mounting	6	ϕ6	5	5mm	M	with thread
O	Built-in	10	ϕ10	10	10mm	F	without thread
		15	ϕ15	15	15mm		