



Operation Manual

PRODUCT NAME

Compact Guide Cylinder
Heavy Duty Type

MODEL / Series / Product Number

MGPKS

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 and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
etc.



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



Warning

Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Caution

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate 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 catalog 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. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.



Safety Instructions

Caution

SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries.

Use in non-manufacturing industries is not allowed.

Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

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 catalog 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 regulations 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.

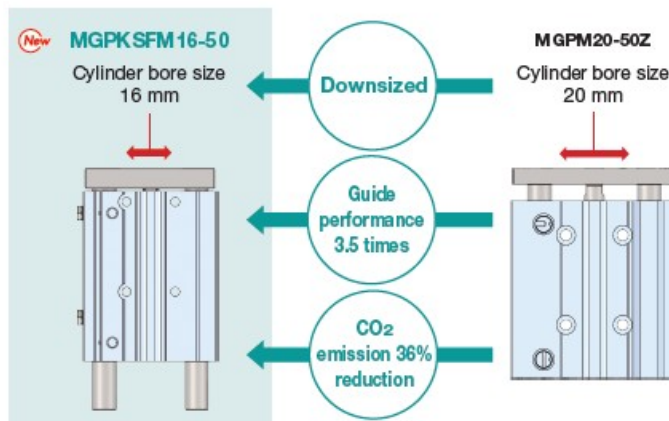
Product features

Downsized

Even with bore size downsized by one,
Guide performance (load mass): max. **3.5 times**
CO₂ emission (air consumption) max. **44% reduction**

Cylinder bore size		MGPKS guide performance	CO ₂ emission (air consumption)
New MGPKS	MGP-Z		
ø12	ø16	Max. 2.9 times*	44% reduction
ø16	ø20	Max. 3.5 times*	36% reduction
ø20	ø25	Max. 3.4 times*	39% reduction
ø25	ø32	Max. 1.3 times*	38% reduction
ø32	ø40	Max. 1.8 times*	38% reduction
ø40	ø50	Max. 1.2 times*	37% reduction
ø50	ø63	Max. 1.9 times*	40% reduction

*1 At a 50 mm stroke *2 At a 200 mm stroke

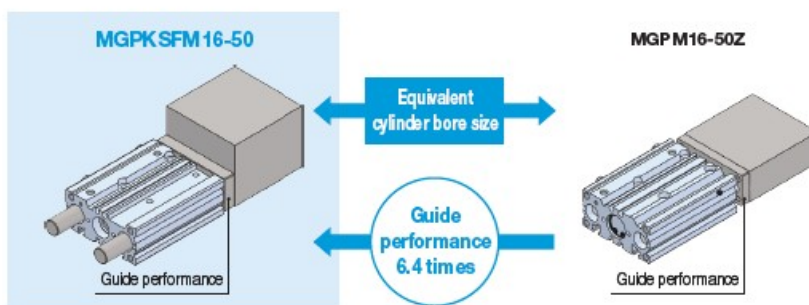


Improved guide performance

With the same cylinder bore size:
Guide performance (load mass): max. **6.4 times**; Eccentric distance: max. **4 times**; Stopper performance: max. **2.1 times**

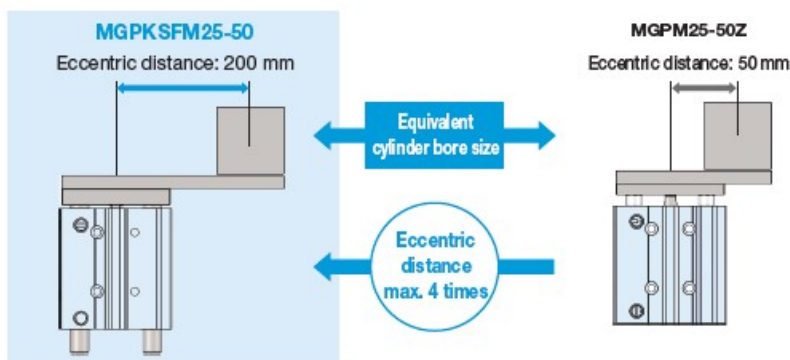
MGPKS Guide Performance

Cylinder bore size	Compared with the MGP-Z
ø12	Max. 5.1 times (compared with a 50 mm stroke)
ø16	Max. 6.4 times (compared with a 50 mm stroke)
ø20	Max. 4.6 times (compared with a 50 mm stroke)
ø25	Max. 5.1 times (compared with a 50 mm stroke)
ø32, ø40	Max. 1.8 times (compared with a 200 mm stroke)
ø50	Max. 1.9 times (compared with a 200 mm stroke)



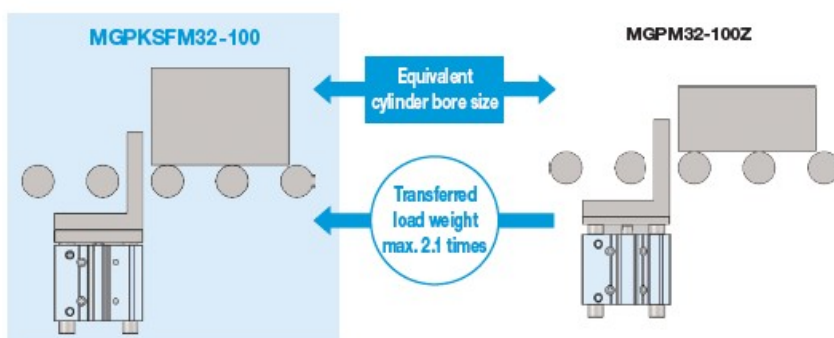
MGPKS Eccentric Distance

Cylinder bore size	Compared with the MGP-Z
ø12	Max. 3.5 times
ø16	Max. 3.5 times
ø20	Max. 3.7 times
ø25	Max. 4.0 times
ø32, ø40	Max. 1.6 times
ø50	Max. 1.6 times

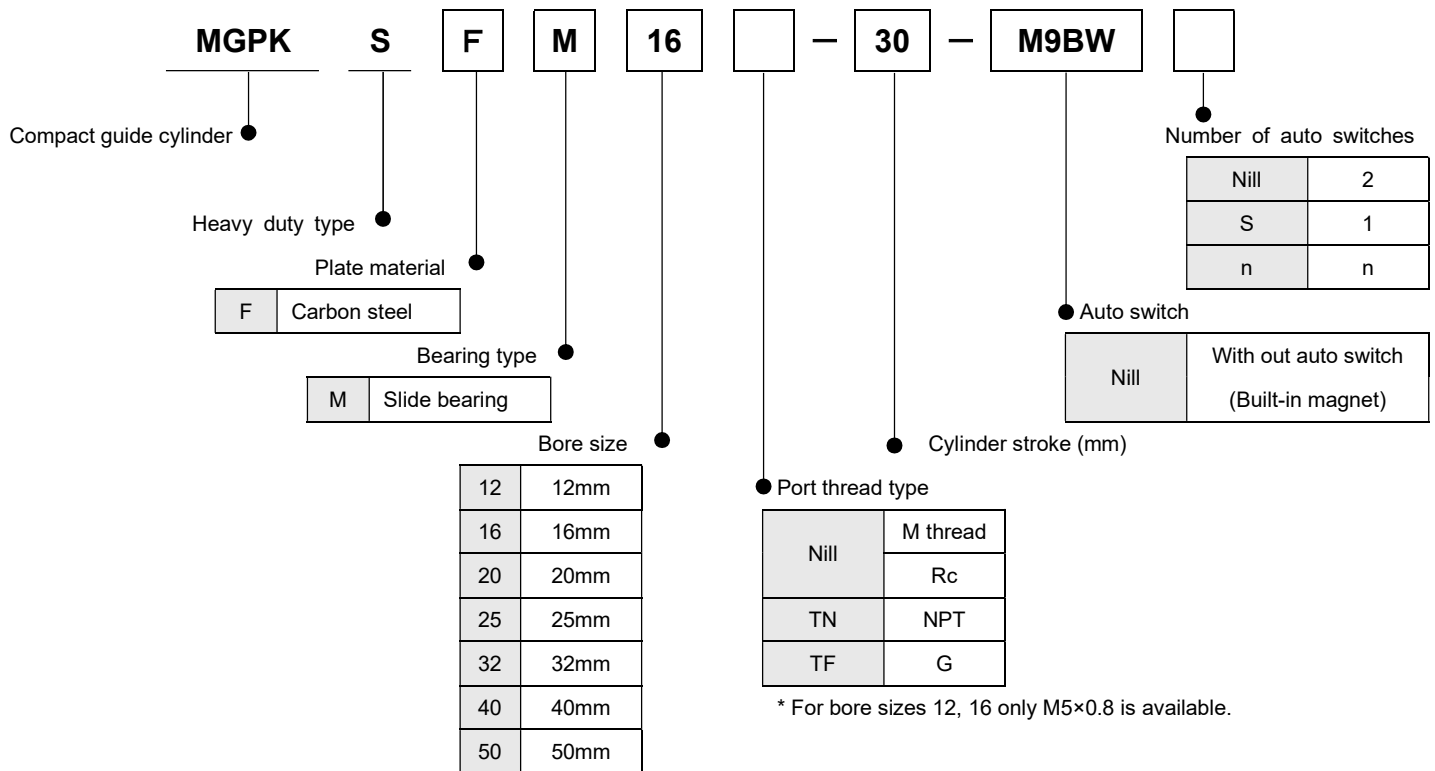


MGPKS Stopper Performance

Cylinder bore size	Compared with the MGP-Z (at a transfer speed of 10 m/min)
ø12	Max. 1.5 times
ø16	Max. 1.8 times
ø20	Max. 1.5 times
ø25	Max. 1.7 times
ø32	Max. 2.1 times
ø40	Max. 1.9 times
ø50	Max. 1.9 times



1. How to Order



2. Model

Model	Cushion	Bearing type	Bore size (mm)
MGPKS□□-□	Rubber bumper	Slide bearing	12,16,20,25,32,40,50

3. Specifications

Model	MGPKS□□-□	
Action	Double acting	
Fluid	Air	
Proof pressure	1.5MPa	
Maximum operating pressure	1.0MPa	
Minimum operating pressure	φ 12, φ 16	φ 20, φ 25, φ 32, φ 40, φ 50
	0.12MPa	0.1MPa
Ambient and fluid temperature	-10~60°C (No freezing)	
Piston speed	50 to 500mm/s	
Cushion	Rubber bumper on both ends	
Lubrication	Not required (Non-lube)	
Stroke length tolerance	+1.5 0 mm	

4. Standard strokes

Model	Bore size (mm)	Standard stroke (mm)
MGPKS□□-□	12,16	10,20,30,40,50,75,100,125,150
	20,25	20,30,40,50,75,100,125,150,175,200
	32,40,50	25,50,75,100,125,150,175,200

5. Intermediate strokes

Description	Spacer installation type	
	Spacers are installed in the standard stroke cylinder. • ϕ 12 to ϕ 32: Available by the 1 mm stroke interval. • ϕ 40, ϕ 50: Available by the 5 mm stroke interval.	
Model no.	Refer to "How to Order" for the standard model numbers.	
Applicable stroke (mm)	ϕ 12, ϕ 16	1 ~ 149
	ϕ 20, ϕ 25, ϕ 32	1 ~ 199
	ϕ 40, ϕ 50	5 ~ 195
Example	Part no.: MGPKSFM16-39 A spacer 1 mm in width is installed in the MGPKSFM16-40. C + stroke dimension is 73 mm.	

6. Weights

(kg)

Bore Size (mm)	Standard stroke (mm)											
	10	20	25	30	40	50	75	100	125	150	175	200
12	0.27	0.31	—	0.36	0.40	0.45	0.56	0.67	0.79	0.90	—	—
16	0.37	0.43	—	0.48	0.54	0.60	0.74	0.88	1.02	1.16	—	—
20	—	0.68	—	0.74	0.81	0.94	1.04	1.20	1.37	1.53	1.70	1.86
25	—	0.95	—	1.03	1.10	1.25	1.35	1.54	1.72	1.90	2.08	2.26
32	—	—	1.58	—	—	1.92	2.00	2.21	2.42	2.63	2.84	3.05
40	—	—	1.90	—	—	2.29	2.38	2.62	2.87	3.11	3.35	3.59
50	—	—	3.29	—	—	3.87	4.01	4.37	4.72	5.08	5.44	5.80

7. Weights of Moving Parts

(kg)

Bore Size (mm)	Standard stroke (mm)											
	10	20	25	30	40	50	75	100	125	150	175	200
12	0.15	0.17	—	0.18	0.20	0.22	0.26	0.30	0.34	0.38	—	—
16	0.22	0.25	—	0.27	0.30	0.33	0.39	0.46	0.52	0.59	—	—
20	—	0.39	—	0.43	0.47	0.52	0.62	0.73	0.83	0.94	1.04	1.15
25	—	0.56	—	0.61	0.66	0.70	0.82	0.94	1.06	1.17	1.29	1.41
32	—	—	1.05	—	—	1.20	1.35	1.50	1.66	1.81	1.96	2.11
40	—	—	1.17	—	—	1.33	1.49	1.65	1.81	1.98	2.14	2.30
50	—	—	2.24	—	—	2.49	2.75	3.00	3.25	3.50	3.76	4.01

8. Allowable Kinetic Energy

A cylinder will be damaged if kinetic energy exceeds the allowable kinetic energy shown in Table 1.

Select a cylinder so that E_k does not exceed the allowable kinetic energy shown in Table 1.

Table.1

Bore Size (mm)	Allowable kinetic energy (J)
12	0.07
16	0.15
20	0.20
25	0.30
32	0.40
40	0.70
50	1.00

The kinetic energy of a load can be found with the following formula.

$$E_k = \frac{M+m}{2} v^2 \quad v = 1.4v_a$$

E_k : Kinetic energy (J)

M : Weight of attached object (kg)

m : Weight of cylinder's moving parts (kg)

v : Maximum speed (m/s)

v_a : Average speed (m/s)

Note1) In the case of horizontal operation, be sure that the load weight does not exceed the allowable lateral load found.

9. Precautions on Selection

Warning

1) Confirm the specifications.

Products represented in this manual are designed only for use in compressed air systems.

Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)

Please contact SMC when using a fluid other than compressed air made by pneumatic equipment.

2) Intermediate stops

When intermediate stopped position is performed with a 3 position closed center type directional control valve, it is difficult to achieve accurate and precise stopped positions due to the compressibility of air.

Furthermore, since valves or cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time.

3) Keep the speed setting within the allowable energy values for the product.

Operation with a load's kinetic energy exceeding the allowable value can lead to damage of the product and cause human injury as well as damage to other equipment and machinery.

4) Provide a shock absorbing mechanism in cases where the product is subjected to kinetic energy exceeding the allowable value.

Operation exceeding the allowable energy can lead to damage of the product and cause human injury as well as damage to other equipment and machinery.

5) Do not give excessive force and vibrations from outside.

This compact cylinder consists of precisely machined parts.

External excessive vibrations may cause air leak, malfunction, parts breakage and deformation, which could result in injury or equipment damage.

6) Consider the load factor.

Consider load factor due to resistance in the output direction when selecting a cylinder.

If the load factor is large, the operating speed can be faster than the control speed of the speed controller (i.e. quick extension). In such cases, increase the operating pressure or change to a cylinder with a larger bore.

10. Precautions on Design

Caution

1) There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc. and changes in forces occur.

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur.

Therefore, the machine should be designed to avoid such dangers.

2) A protective cover is recommended to minimize the risk of personal injury.

If a stationary object and moving parts of a cylinder are in close proximity, personal injury may occur. Design the structure to avoid contact with the human body.

3) Securely tighten all stationary parts and connected parts so that they will not become loose.

When a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

4) A deceleration circuit or shock absorber, etc., may be required.

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact.

Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact.

In this case, the rigidity of the machinery should also be examined.

5) Consider a possible drop in operating pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc.

Therefore, safety equipment should be installed to prevent damage to machinery and human injury.

Suspension mechanisms and lifting devices also require consideration for drop prevention.

6) Consider a possible loss of power source.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

7) Design circuitry to prevent sudden lurching of driven objects.

When a cylinder is driven by an exhaust center type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder.

Therefore, equipment should be selected and circuits designed to prevent sudden lurching because, there is a danger of human injury and/or damage to equipment when this occurs.

8) Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

9) Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation.

When the cylinder has to be reset at the starting position, install manual safety equipment.

10) Do not synchronize cylinders only.

It is possible to synchronize cylinders for short period of time by adjusting them with speed controller.

However, the synchronization could be failed easily due to changes of various conditions.

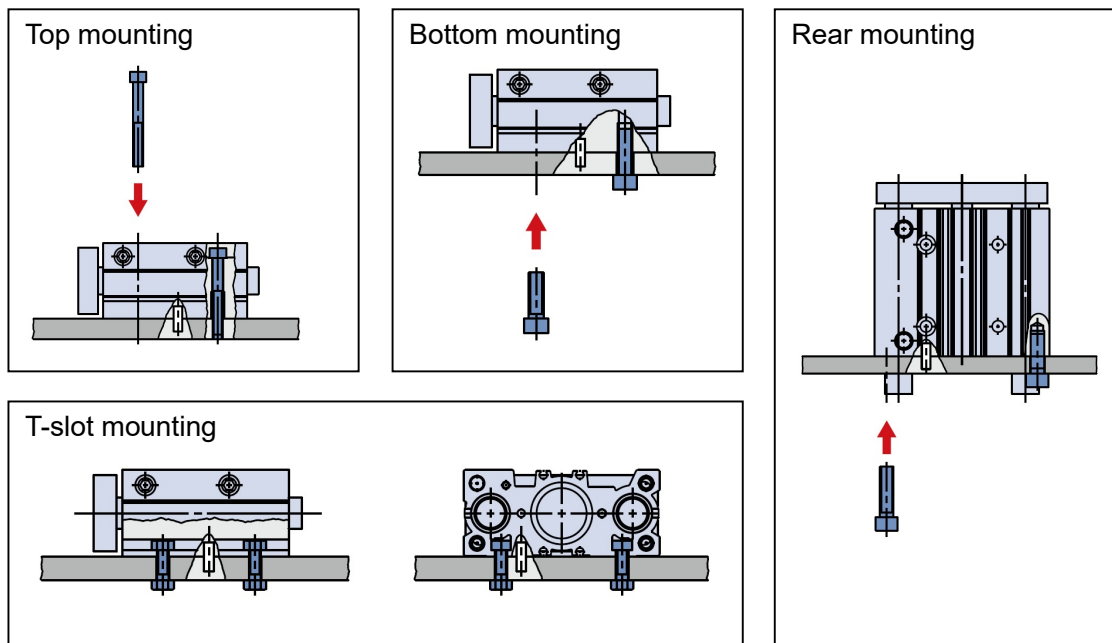
Since cylinders receive excessive force in such a case, do not design circuit synchronizing cylinders only.

11) Adjust cylinder driving speed by means of speed controller.

Gradually increase the speed to the desired level.

11. Mounting Methods

Various mounting methods are available as follows.

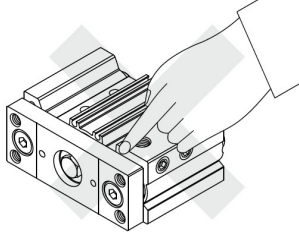


11-1. Cautions on Mounting

Warning

1) Never place your hands or fingers between the plate and the body.

Be very careful to prevent your hands or fingers from getting caught in the gap between the cylinder body and the plate when air is applied.



Caution

1) Use cylinders within the piston speed range.

An orifice is set for this cylinder, but the piston speed may exceed the operating range if the speed controller is not used. If the cylinder is used outside the operating speed range, it may cause damage to the cylinder and shorten the service life. Adjust the speed by installing the speed controller and use the cylinder within the limited range.

2) Pay attention to the operating speed when the product is mounted vertically.

When using the product in the vertical direction, if the load factor is large, the operating speed can be faster than the control speed of the speed controller (i.e. quick extension).

In such cases, it is recommended to use a dual speed controller.

3) Do not scratch or gouge the sliding portion of the piston rod and the guide rod.

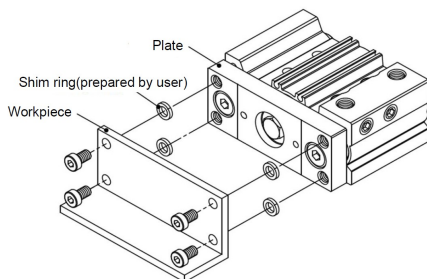
Damaged seals etc. will result in leakage or malfunction.

4) Do not dent or scratch the mounting surface of the body and the plate.

The flatness of the mounting surface may not be maintained, which would cause an increase in sliding resistance.

5) Make sure that the cylinder mounting surface has a flatness of 0.05 mm or less.

If the flatness of the work pieces and brackets mounted on the plate is not appropriate, sliding resistance may increase. If it is difficult to maintain a flatness of 0.05 or less, put a thin shim ring (prepared by user) between the plate and work piece mounting surface to prevent the sliding resistance from increasing.



6) Do not perform additional machining to the product.

Additional machining to the product can result in insufficient strength and cause damage to the product.

This can lead to possible human injury and damage to the surrounding equipment.

7) Do not enlarge the fixed throttle by modifying the pipe connectors.

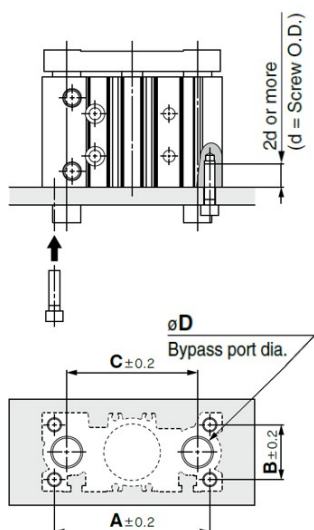
If the hole diameter is enlarged, the product's rotation speed will increase, causing the shock force to increase and damage to the product. As a result, it could pose a hazard to humans and damage the machinery and equipment.

8) Do not use until you can verify that equipment can operate properly.

Verify correct mounting by function and leak tests properly after compressed air and power are connected following mounting or repair.

9) Bottom of cylinder

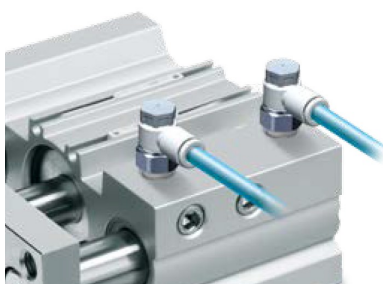
The guide rods protrude from the bottom of the cylinder at the end of the retracting stroke, and therefore, in cases where the cylinder is to be bottom mounted, it is necessary to provide bypass ports in the mounting surface for the guide rods, as well as holes for the hexagon socket head cap screws which are used for mounting. Moreover, in applications where impact occurs from a stopper etc., the mounting screws should be inserted to a depth of 2d or more.



(mm)				
Bore size	A	B	C	D
12	50	18	42	12
16	56	22	46	14
20	72	24	54	16
25	82	30	64	18
32	98	34	78	22
40	106	40	86	22
50	130	46	110	27

12. Piping

This cylinder can do it by changing the position of the plug as the bottom figure from 2 directions of the top pipe and the side pipe.



Top piping



Side piping

12-1. Attention in piping

Warning

1) Use clean air.

If compressed air includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., it can cause damage or malfunction.

Caution

1) Depending on the operating conditions, piping port positions can be changed by using a plug. Do not tighten using an electric screwdriver, pneumatic screwdriver, or other tool that applies impact, as this may damage the threaded part of the body. Be sure to clear any foreign matter adhered to the port the plug was removed from before piping. And, after changing the plug position, be sure to check for air leakage before use.

① M thread

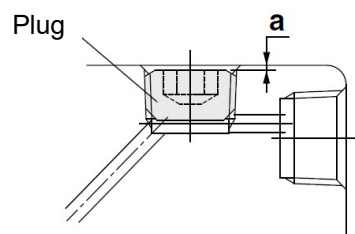
M5 : After tightening by hand, tighten an additional 1/6 to 1/4 turn.

② Tapered thread for Rc port and NPT port

Tighten with the proper tightening torque below. Before tightening, wrap sealant tape around the plug, making sure that the tape does not extend below the plug. In addition, be sure not to tighten the plug beyond the sunk dimension (dimension "a").

* If tightened beyond the indicated dimension "a," the air passage will be blocked, resulting in limited cylinder speed or malfunction.

Connection thread (plug) size	Proper tightening torque (N·m)	a dimension
1/8	7~9	0.5mm or less
1/4	12~14	1mm or less



③ Parallel pipe thread for G port

When tightening the plug, apply a small amount of grease to the female thread or the plug, and then screw in the plug to the end surface of the body (dimension "a" = position "0" in the drawing).

(Management of the indicated tightening torque is not required. Wipe any excess grease coming out from the plug.)

2) Secure dry air.

If moisture enters cylinder, grease inside the cylinder is washed away and air leak and malfunction may occur due to deterioration of lubrication. Install air cleaning equipment such as air dryer and drain catch to secure dry air. Refer to the catalogue, SMC Air Cleaning Equipment.

3) Supply air filtered and regulated down to the specific pressure.

4) Lubrication isn't necessary because it is a lubrication-less type.

The cylinder is lubricated at the factory and can be used without any further lubrication. However, in the event that it will be lubricated, use 1 turbine oil (with no additives) ISO VG32. Stopping lubrication later may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

5) Shorten piping.

Since too long cylinder piping makes volume inside the cylinder < volume inside the tubing, mist from adiabatic expansion is not exhausted to the air and remains in tubing. It accumulates due to repeated operation and then from water drops. As grease inside the cylinder is washed away, lubrication deteriorates and air leak and malfunction may occur. Take the following measures to prevent them.

- ① Make tubing between solenoid valve and cylinder as short as possible so that generated mist is surely exhausted into atmosphere.

Standard length is:

Conversion value for volume inside the cylinder under atmospheric pressure $\times 0.7 \leq$ Volume inside the tubing

- ② Send exhaust pressure directly into atmosphere by attaching speed controller or quick exhaust valve to cylinder.
- ③ Set piping port downwards so that moisture inside the piping does not go back to cylinder easily.

12-2. About the flushing

Caution

1) Get rid of trash in the pipe.

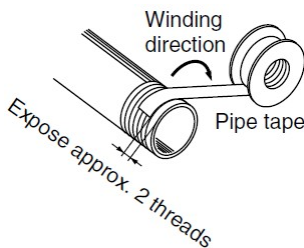
Do flushing or washing fully before the piping, and get rid of cutting chips in side the pipe, cutting oil, trash, and soon because cutting chips left in the pipe, and cutting oil cause air leak and malfunction when they get into the inside of the cylinder.

12-3. About the pipe tape

Caution

1) Prevent tape material from getting in to the pipe.

Prevent cutting chips of the pipe screw and tape material from getting in to the pipe inside when you thrust a pipe and fittings, etc., because tape material causes air leak and malfunction when you get into it in the cylinder from the thing in the pipe when you lay a pipe.



13. Operating Environment

Warning

1) Do not use in environments where there is a danger of corrosion.

Refer to the construction drawings regarding cylinder materials.

2) In dirty areas, such as dusty locations or where water, oil, etc. splash on the equipment, take suitable measures to protect the entire actuator.

Use water resistant cylinders in areas where liquids are scattered.

Caution

1) Use the cylinder within specified temperature range.

This compact cylinder is applicable within the range from -10 to $60\text{ }^{\circ}\text{C}$. Make sure to keep it during operation. In case of immoderate use over the range, extreme wearing due to hardening of packing may result in air leak and lubrication failure as lubrication grease cannot perform fully.

14. Speed Control

Caution

- 1) When speed controller is used for speed adjustment, throttle air supplied to cylinder or exhausted from cylinder. With the former, cylinder operation may become unstable. Normally, double acting cylinder is adjusted in the latter way.

15. Troubleshooting

Nonconformity	Causes	Countermeasures	Remarks
No smooth operation	Lower operating speed than the limit	Consider providing low speed specification.	
	High load factor	Increase Pressure.	
		Use larger cylinder.	
	Meter-in speed controller	Change it to meter-out.	
Air leak Malfunction	High ambient temperature	Use heat resistant cylinder. (Type M only)	As a special order.
	Low ambient temperature	Use cold resistant cylinder. (Available as a special.)	As a special order.
	Soiled cylinder	Put a cover over cylinder.	
	Water from exhaust air of valve	Shorten piping.	
	Vibration	Review where to install the cylinder so as not to receive external force.	
	Splashes of water/coolant	Put a cover over cylinder.	
		Use cylinder improved in water resistant.	As a special order.
	Excessive eccentric load	Check vertical mounting of model selection with catalogue.	
	Excessive lateral load	Check horizontal mounting of model selection with catalogue.	
	Dust	Set a cover over cylinder.	
		Use cylinder with scraper.	As a special order.
Parts breakage Parts deformation	Impact force from high speed operation	Check allowable kinetic energy.	
		Lower speed.	
		Reduce load.	
	Excessive eccentric load	Check vertical mounting of model selection with catalogue.	
	Excessive lateral load	Check horizontal mounting of model selection with catalogue.	

16. How to exchange seals

Caution

Disassemble and assemble the cylinder in clean condition. Wipe it with clean waste.

16-1. How to disassemble

Tools: Snap ring plier for hole, Spanner, Socket wrench (or Air impact wrench).

- 1) Fix the spanner flat of piston rod with a spanner. Loosen the plate set bolt with the socket wrench to remove the guide rod assembly. Or, loosen the plate set bolt with air impact wrench to remove the slide assembly.
- 2) Remove snap ring with snap ring plier to pull out the collar, the piston rod Assembly.

Table.1

Bore size (mm)	Snap ring size	Plate set bolt tightening torque (N·m)
12	RTW-13	1.3
16	RTW-18	3.3
20	RTW-22	5.1
25	RTW-27	8.6
32	RTW-34	21.6
40	RTW-42	21.6
50	RTW-52	43.1

16-2. How to remove seals

- 1) Rod seal

Tools: Precision screw driver etc.

Insert the fine driver to the collar front to pull out the seal like Fig.1.

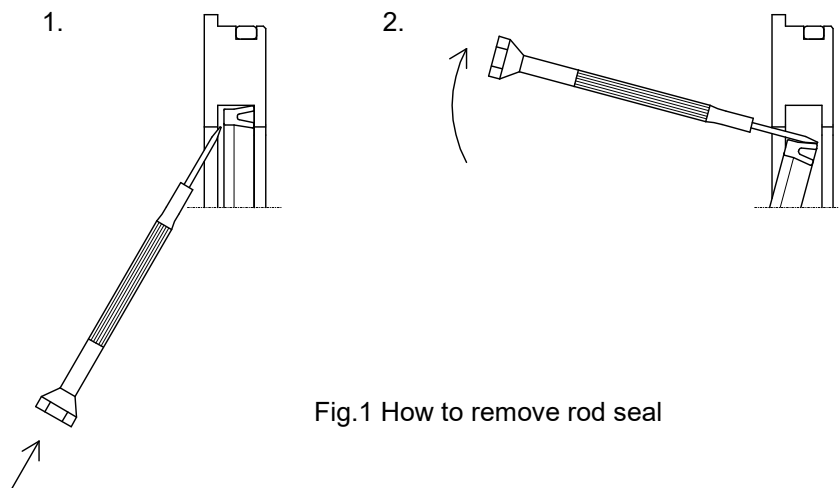


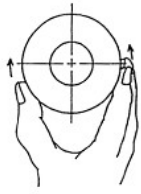
Fig.1 How to remove rod seal

2) Piston seal

First, wipe off the grease around the piston seal. This helps remove of this seal.

As piston seal groove is deep, push the seal holding both sides like Fig.2, and pull out the seal risen from the piston surface.

1.



2.

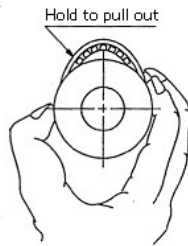


Fig. 2 How to remove piston seal

3) Gasket

Use precision screw driver etc.

16-3. How to apply grease

Use the grease pack use the grease pack: GR-S or lithium soap radical JIS2 corresponding.

1) Rod seal

Apply grease slightly to outer circumference of new seal for replace.

This helps the seal to accustom to the collar. For the grove, fill it with grease.

This is necessary for operation.

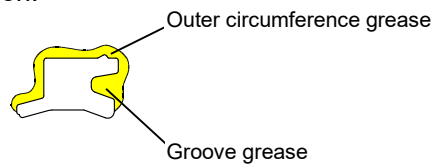


Fig. 3 Rod seal

2) Piston seal

Apply grease to outer/inner circumference of seal slightly and evenly to make mounting this to the piston easier.

3) Gasket

Apply grease slightly. Provide better sealing and stop falling.

16-4. How to assemble

1) Mount seals

① Rod seal

Mind the seal direction. Apply grease all over the seal and inner surface of the bush as Fig.4.

You may use a precision screw driver to apply grease when small bore diameter.

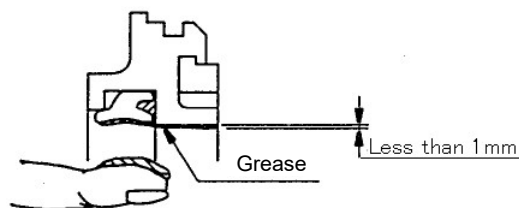


Fig. 4 Rod seal

② Piston seal

Apply grease rubbing to seal groove and outer circumference.

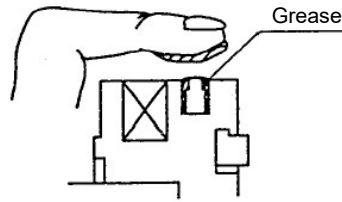


Fig. 5 Piston seal

③ Gasket

Mount to the collar groove and the body groove.

2) Assemble cylinder

Mount parts with reversed order of disassembling.

Assemble order:

Piston rod assembly → Collar → Snap ring	} →	Guide rod assembly
Head cover → Snap ring		

Apply locking glue to the plate set bolt when mounting the guide rod assembly.

And tighten the bolt with tightening torque in table 1.

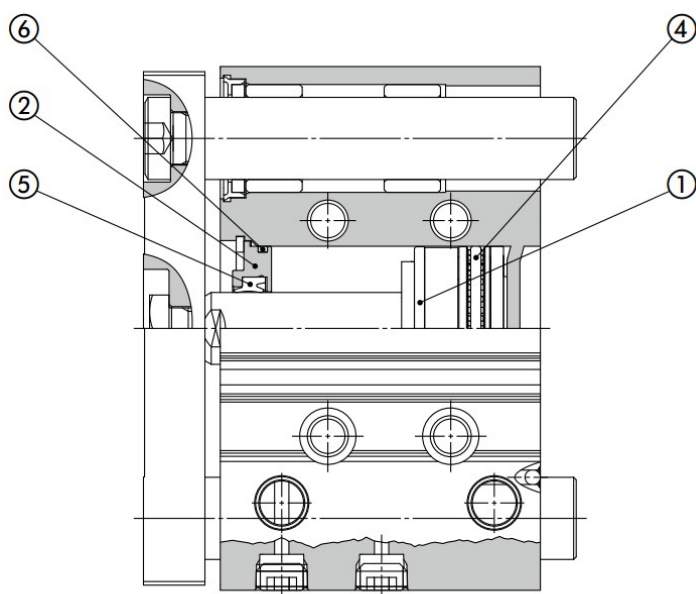
Ensure if the cylinder move smoothly with a hand.

Check the air leakage.

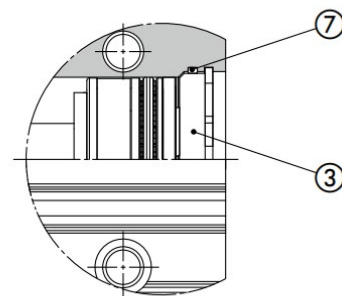
17. Construction

17-1. Basic type

Replacement Parts



ø12 to ø32 (100 mm stroke or less)



ø12 to ø32 (101 mm stroke or more)
ø40, ø50

Component Parts

No.	Description
1	Piston
2	Collar
3	Head cover
4	Piston seal
5	Rod seal
6	Gasket A
7	Gasket B

Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
12	MGPK12-PS	Set of nos. above ④, ⑤, ⑥, ⑦
16	MGPK16-PS	
20	MGPK20-PS	
25	MGPK25-PS	
32	MGPK32-PS	
40	MGPK40-PS	
50	MGPK50-PS	

18. Auto Switch

18-1. Applicable auto switches

Applicable Auto Switches / Refer to the **Web Catalog** for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length [m]				Pre-wired connector	Applicable load			
					DC	AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)					
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○	○	IC circuit	Relay, PLC	
				3-wire (PNP)		12 V		M9PV	M9P	●	●	●	○	○			
	2-wire			12 V		M9BV		M9B	●	●	●	○	○	—			
	3-wire (NPN)			5 V, 12 V		M9NWV		M9NW	●	●	●	○	○	IC circuit			
	3-wire (PNP)			12 V		M9PWV		M9PW	●	●	●	○	○	IC circuit			
	2-wire			12 V		M9BWV		M9BW	●	●	●	○	○	—			
	3-wire (NPN)			5 V, 12 V		M9NAV*1		M9NA*1	○	○	●	○	○	IC circuit			
	3-wire (PNP)			12 V		M9PAV*1		M9PA*1	○	○	●	○	○	IC circuit			
	2-wire			12 V		M9BAV*1		M9BA*1	○	○	●	○	○	—			
	Reed auto switch		—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	●	●	●	○	IC circuit
No						2-wire	24 V	12 V	100 V	A93V	A93	●	●	●	●	○*2	—
					100 V or less				A90V	A90	●	●	●	●	○*2	IC circuit	

*1 Water-resistant type auto switches can be mounted on the above models, but SMC cannot guarantee water resistance.

*2 The load voltage used is 24 VDC.

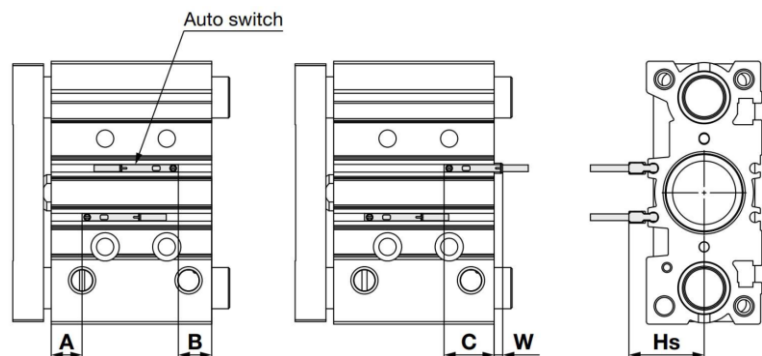
* Lead wire length symbols: 0.5 m.....Nil (Example) M9NW * Auto switches marked with a "○" are produced upon receipt of order.
 1 m.....M (Example) M9NWM
 3 m.....L (Example) M9NWL
 5 m.....Z (Example) M9NWZ

* For details on auto switches with pre-wired connectors, refer to the **Web Catalog**.

* Auto switches are shipped together with the product but do not come assembled.

18-2. Auto switch proper mounting position (detection at stroke end) and its mounting height

D-M9□/M9□V
D-M9□W/M9□WV
D-M9□A/M9□AV
D-A9□/A9□V



Auto Switch Proper Mounting Position

(mm)

Auto switch model	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV								D-A9□ D-A9□V			
	A	B		C		W		A	B		C	
		100mm stroke or less	101mm stroke or more	100mm stroke or less	101mm stroke or more	100mm stroke or less	101mm stroke or more		100mm stroke or less	101mm stroke or more	100mm stroke or less	101mm stroke or more
12	7.5	10	10.5	22	22.5	2	1.5	3.5	6	6.5	26	26.5
16	9	12	12	24	24	—	—	5	8	8	28	28
20	13.5	14.5	15	26.5	27	—	—	9.5	10.5	11	30.5	31
25	11.5	19.5	19	31.5	31	—	—	7.5	15.5	15	35.5	35
32	12	18	18	30	30	—	—	8	14	14	34	34
40	15	23	23	35	35	—	—	11	19	19	39	39
50	14.5	24	24	36	36	—	—	10.5	20	20	40	40

* The value of "W" in the table means the amount of auto switch protrusion from the body end surface.

* Adjust the auto switch after confirming the operating conditions in the actual setting.

Auto Switch Mounting Height (mm)

Auto switch model Bore size	D-M9□V D-M9□WV D-M9□AV	D-A9□V
	Hs	Hs
12	19.7	17.2
16	21.5	19
20	23.2	20.7
25	25.2	22.7
32	29.5	27
40	31.2	28.7
50	34.5	32

18-3. Minimum mountable stroke for a cylinder with auto switch(es)

(mm)

Auto switch model	Number of Auto switches	Bore size						
		Ø12	Ø16	Ø20	Ø25	Ø32	Ø40	Ø50
D-M9□V	1pc	5						
	2pcs	5						
D-M9□	1pc	5 note1)				5		
	2pcs	10 note1)	10					
D-M9□W	1pc	5 note2)						
	2pcs	10 note2)	10					
D-M9□WV D-M9□AV	1pc	5 note2)						
	2pcs	10						
D-M9□A	1pc	5 note2)						
	2pcs	10 note2)						
D-A9□	1pc	5 note1)				5		
	2pcs	10 note1)				10		
D-A9□V	1pc	5						
	2pcs	10						

note1) Confirm that it is possible to secure the minimum bending radius of 10 mm of the auto switch lead wire before use.

note2) Confirm that it is possible to securely set the auto switch(es) within the range of indicator green light ON range before use.

For in-line entry type, also consider note1) shown above.

18-4. Auto switch operating range

(mm)

Auto switch model	Bore size						
	Ø12	Ø16	Ø20	Ø25	Ø32	Ø40	Ø50
D-M9□/M9□V D-M9□W/M9□WV D-M9□A/M9□AV	3.5	3.5	5	5	5.5	6	6
D-A9□/A9□V	7	9	9	9	9.5	9.5	9.5

* Values which include hysteresis are for reference purposes only.

They are not a guarantee (assuming approximately ±30% dispersion) and may change substantially depending on the ambient environment.

18-5. Part number of auto switch mounting bracket

Applicable auto switches	D-M9□/M9□V D-M9□W/M9□WV D-M9□A/M9□AV D-A9□/A9□V	
Bore size (mm)	Ø12 to Ø50	
Auto switch tightening torque	(N · m)	
	Auto switch model	Tightening torque
	D-M9□(V) D-M9□W(V) D-A93	0.05 to 0.15
	D-M9□A(V)	0.05 to 0.10
	D-A9□(V) (without D-A93)	0.10 to 0.20

* For tightening the auto switch mounting screws, use a precision screwdriver with a grip diameter of approximately 5 to 6 mm.

Revision history

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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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