



Operation Manual

PRODUCT NAME

**Compact Low Friction Cylinder
Metal Seal Type**

MODEL / Series / Product Number

**MQ Series
(MQQ10~40/MQM6~25/MQP4~20)**

SMC Corporation

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Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.”

They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1), and other safety regulations.

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.

ISO 4413: Hydraulic fluid power -- General rules relating to systems.

IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)

ISO 10218-1992: Manipulating industrial robots -Safety.

etc.



Caution

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



Warning

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



Danger

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

Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest 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. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



Safety Instructions

Caution

1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility,

a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers

noted in the specified 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 regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.



Actuator Precautions①

Be sure to read before handling.

Design



WARNING

1. There is a possibility of dangerous sudden action by air cylinders if sliding parts of machinery are twisted due to external forces,etc.

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 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 a cylinder 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 speeds or the load is heavy, a cylinder's cushion will not be sufficient to absorb the shock. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the shock. 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 dropping if there is 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.

Measure 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 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 speeds 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.



Actuator Precautions②

Be sure to read before handling.

Selection



WARNING

1. Check the specifications.

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use under these conditions.

2. Intermediate stops.

When intermediate stopping of a cylinder piston in is the intermediate position by a directional control valve with 3-position closed center, the position cannot be retained for a long time due to the metal seal construction.



CAUTION

1. Operate the piston within a range such that collision damage will not occur at the end of the stroke.

2. When controlling cylinder output, do not install speed controller etc in the check circuit. If so, cylinder internal pressure decreases, and controlling is not available.

Be sure to control the operation by pressure control.

Mounting



CAUTION

1. Make sure to connect the rod and the load so that their axial center and movement directions match.

If they do not match, stress could be applied to the rod and the tube, causing the inner surface of the tube, the bushing, the rod surface, and the seals to wear and to become damaged.

2. When an external guide is used, connect the external slider and the load in such a way that there is no interference at any point within the stroke.

3. Do not scratch or gouge the sliding portion of the cylinder tube or the piston rod by striking it with an object, or squeezing it.

The tube bore is manufactured under precise tolerances. Thus, even a slight deformation could lead to a malfunction. Furthermore, any scratches or gouges on the sliding portion of the piston rod could damage the seals, which could lead to air leakage.

4. Prevent the rotating parts from seizing.

Apply grease to the rotating parts (such as the pin) to prevent them from seizing.

5. Do not use until you verify that the equipment can operate properly.

After mounting, repair or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak inspections.

6. Instruction manual.

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.

Keep the instruction manual where it can be referred to as needed.



Actuator Precautions③

Be sure to read before handling.

Piping



CAUTION

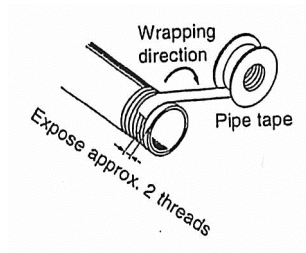
1.Preparation before piping.

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove cutting chips, oil and other debris from inside the pipe.

2. Wrapping of sealant tape.

When connecting pipes and fittings, etc., be certain that cutting chips from the pipe threads and sealing material do not get inside the piping.

Also, when sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the pipe/fitting.



Lubrication



CAUTION

1.Lubricating the lube style cylinder

Do not lubricate for low speed operation and output control. If lubricated, sliding resistance may change due to oil viscosity and surface tension etc. Also, when using solenoid valve for the cylinder operation, use metal seal type. If rubber seal type is used, the grease on the main valve is scattered and that may increase the sliding resistance. Though lubrication is not needed for the high speed operation, use turbine oil class 1 (no additives) ISO VG32. (Spindle and machine oil is not available)

Air Supply



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.Install air filters.

Install air filters at the upstream side of valves. The filtration degree should be $5 \mu\text{m}$ or less.

In addition, in case of low speed operation and output controlling, use clean air (atmospheric pressure dew point temperature shall be -10 degree or less), and also the use of mist separator AM series (filtration degree $0.3 \mu\text{m}$ or less) or AM + AMD μ series (filtration degree $0.01 \mu\text{m}$ or less) is recommended.



Actuator Precautions④

Be sure to read before handling.

2.Install an air dryer,after cooler,etc.

Air that includes excessive condensate may cause malfunction or valves and other pneumatic equipment.To prevent this,install an air dryer,after cooler,etc.

3.Use the product within the specified range of fluid and ambient temperature.

Take measures to prevent freezing,since moisture in circuits will be frozen under 5°C,and this may cause damage to seals and lead to malfunction.

Refer to SMC's "Air Cleaning Equipment" catalog for further details on compressed air quality.

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. Do not use in the dusty place or where subject to water and oil droplet.

Maintenance



WARNING

1.Maintenance should be done according to the procedures indicated in the operating manual.

If handled improperly,malfunction and damage of machinery or equipment may occur.

2.Machine maintenance,and supply and exhaust of compressed air.

When machinery is serviced,first check measures to prevent dropping of driven objects and run-away of equipment,etc.Then compressed air from the system.

When machinery is restarted,check that operation is normal with actuators in the proper positions.



CAUTION

1.Drain flushing

Remove condensate from air filters regularly.



MQQ/MQM Series Specific Product Precautions 1

Be sure to read this before handling the products.

Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.

Operation

Caution

1. When mounting, thoroughly flush out the connector piping and be sure that dirt and chips, etc., do not get inside the cylinder.
2. Install an air filter with a filtration degree of 5 μm or less on the air supply. Furthermore, when controlling for low speed or controlled output, use clean air (atmospheric pressure dew point temperature of -10°C). Installation of a mist separator (filtration degree 0.3 μm or less) is also recommended.
3. Use a metal seal type when using solenoid valves for cylinder actuation. If a rubber seal type is used, there may be an increase in operating resistance due to grease sprayed from the main valve.
4. Operate so that the load applied to the piston rod is normally in the axial direction.

In the event that a lateral load is unavoidable, do not exceed the range of the allowable lateral load at the rod end (refer to pages 340 and 341). (Use outside of the operating limits may cause an adverse effect on the life of the unit through problems such as looseness in the guide unit and a loss of precision.)

5. Take care not to scratch or gouge the sliding portion of the rod. This may cause malfunction or shorten the unit's life.
6. When attaching a work piece to the end of the rod, move the rod to the fully retracted position and use the wrench flats at the end of the rod. Fasten the work piece without applying a large amount of torque to the rod.
There are no wrench flats at the end of the rod in the MQM series, so use the attached rod end nut.
7. Be certain to connect a load so that the rod axis is aligned with the load and its direction of movement.
Especially when a cylinder rod is connected directly to a guide function (such as bearings, etc.) on the equipment side, the following is likely to occur. Either an offset load will occur and the sliding resistance will not be stable or galling will occur on the metal seal parts. Therefore, be sure to use a floating joint or a spherical joint.
8. When a piston rod is driven with a circuit from an external force such as force, control, tension control, etc., a stick-slip phenomenon will likely occur and sliding resistance will not be stable if the amount of displacement is 0.05 mm or less.
9. When it is used in locations where a constant vibration is applied, such as a polishing machine, etc., consult with us.

Disassembly

Caution

1. The component parts of the metal seal cylinder are manufactured to precision tolerances, and therefore cannot be disassembled.

Lubrication

Caution

1. Lubrication of non-lube type cylinder

Do not apply lubrication when controlling for low speed or controlled output. If lubrication is applied, there may be changes in operating resistance due to factors such as the viscosity and surface tension of the oil. Also, use a metal seal type when using solenoid valves for cylinder actuation. If a rubber seal type is used, there may be an increase in operating resistance due to grease sprayed from the main valve.

Lubrication is also unnecessary for high speed actuation, but in the event that lubrication is applied, use turbine oil class 1 (with no additives) ISO VG32. (Do not use spindle oil or machine oil.)



MQQ/MQM Series Specific Product Precautions 2

Be sure to read this before handling the products.

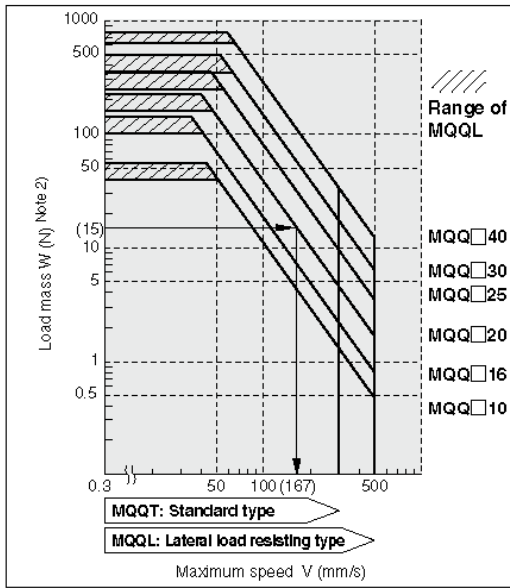
Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.

Selection

MQQ series

Caution Operating Speed

Load Mass and Maximum Speed: MQQT/MQQL



Example)
Driving a load of 15(N) using the **MQQ□20** with a maximum speed of 167 (mm/sec)

Lateral load resisting type: **MQQ□**

Bore size (mm)	Allowable kinetic energy (J)
10	0.006
16	0.010
20	0.022
25	0.044
30	0.080
40	0.160

Note 1) When a load is attached to the rod end, adjust the speed so that the maximum speed is no more than that shown in the graph for the corresponding load mass.

Note 2) The mass of cylinder's moving parts is included in the load mass. (See the graph on the right.)

Moving Parts Mass

MQQ□□ Moving Parts Mass

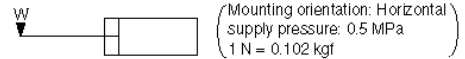
Bore size (mm)	MQQT□□ Moving parts mass (g)	MQQL□□ Moving parts mass (g)
10	Mass = 8.9 + (3.1 x (stroke/10))	Mass = 16.7 + (3.1 x (stroke/10))
16	Mass = 22.9 + (4.0 x (stroke/10))	Mass = 34.9 + (4.0 x (stroke/10))
20	Mass = 34.8 + (6.6 x (stroke/10))	Mass = 57.9 + (6.6 x (stroke/10))
25	Mass = 66.9 + (8.8 x (stroke/10))	Mass = 97.7 + (8.8 x (stroke/10))
30	Mass = 115.0 + (15.8 x (stroke/10))	Mass = 190.2 + (15.8 x (stroke/10))
40	Mass = 182.2 + (15.8 x (stroke/10))	Mass = 257.4 + (15.8 x (stroke/10))

Note) For the rod side flange type, add 10 mm to the stroke length of the MQQ□F

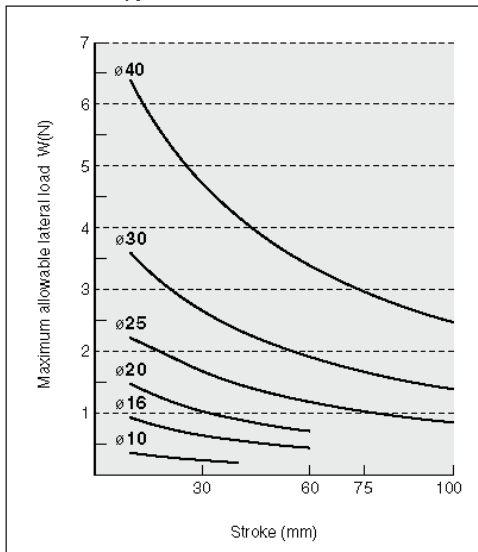
$$\text{Kinetic energy } E \text{ (J)} = \frac{(m1 + m2) V^2}{2}$$

m1 : Mass of cylinder movable parts kg
m2 : Load mass kg
V : Piston speed m/s

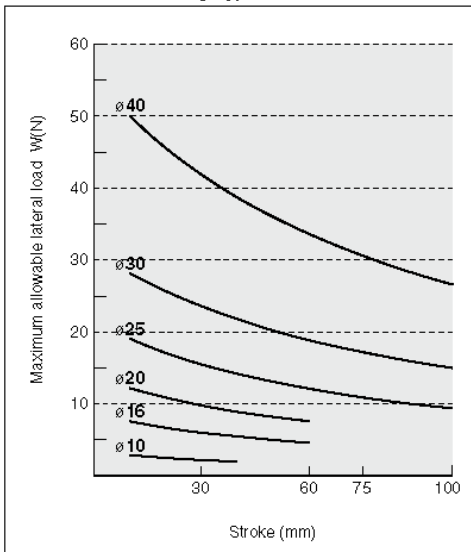
Allowable Lateral Load at Rod End



Standard Type: MQQT□



Lateral Load Resisting Type: MQQLB/Built-in Ball Bushing



Note 1) The indicated allowable lateral load at the rod end is for the rod end female thread.

Note 2) The allowable lateral load varies depending on the size of a load (the distance to the load's center of gravity). Please contact SMC for further details.



MQQ/MQM Series Specific Product Precautions 3

Be sure to read this before handling the products.

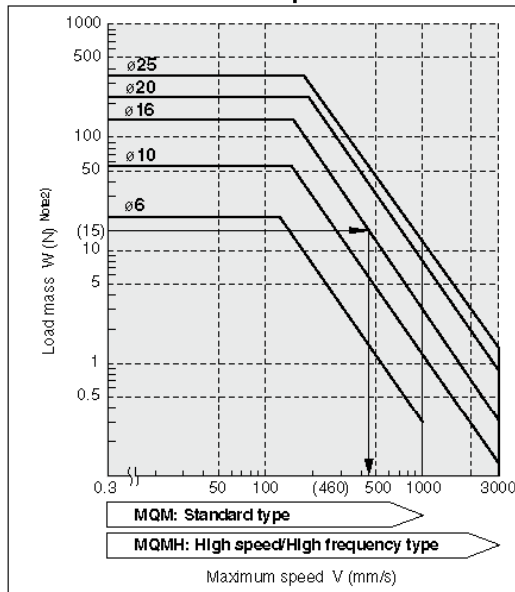
Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.

Selection

MQM series

⚠ Caution Operating Speed

Load Mass and Maximum Speed: MQML/MQML□□H



Example)
Driving a load of 15(N) using the **MQM16** with a maximum speed of 460 (mm/sec)

Lateral load resisting type: MQML/MQML□□H

Bore size (mm)	Allowable kinetic energy (J)
6	0.015
10	0.059
16	0.161
20	0.386
25	0.597

Note 1) When a load is attached to the rod end, adjust the speed so that the maximum speed is no more than that shown in the graph for the corresponding load mass.
Note 2) The mass of cylinder's moving parts is included in the load mass. (See the graph on the right.)

Moving Parts Mass

MQM Moving Parts Mass

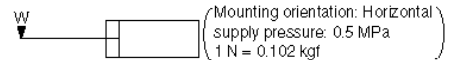
Bore size (mm)	Moving parts mass (g)
6	Mass = 8.2 + {1.6 x (stroke/15)}
10	Mass = 12.0 + {1.6 x (stroke/15)}
16	Mass = 28.6 + {2.2 x (stroke/15)}
20	Mass = 72.0 + {6.4 x (stroke/15)}
25	Mass = 117.6 + {9.2 x (stroke/15)}

Note) Rod end nut is not included in the moving parts mass.

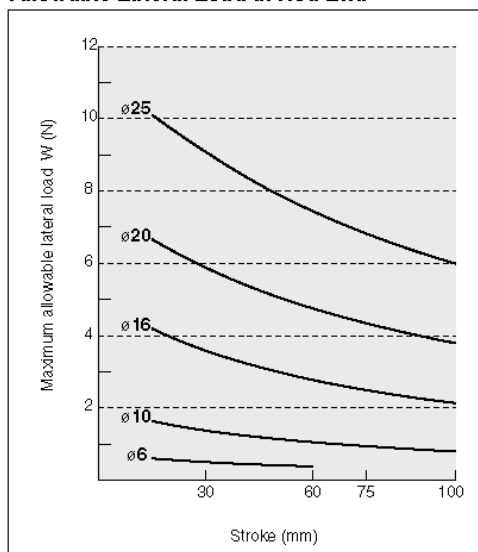
$$\text{Kinetic energy } E \text{ (J)} = \frac{(m1 + m2) V^2}{2}$$

m1 : Mass of cylinder movable parts kg
m2 : Load mass kg
V : Piston speed m/s

Allowable Lateral Load at Rod End



Allowable Lateral Load at Rod End



Note 1) The allowable lateral load varies depending on the size of a load (the distance to the load's center of gravity). Please contact SMC for further details.



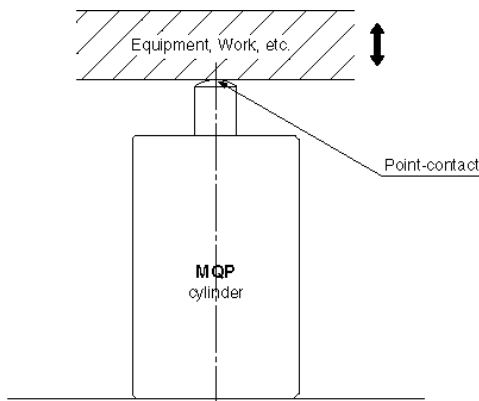
MQP Series Specific Product Precautions

Be sure to read this before handling the products.

Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.

Operation

1. When mounting, thoroughly flush out the connector piping and be sure that dirt and chips, etc., do not get inside the cylinder.
2. Install an air filter with a nominal filtration degree of 5 μm or less on the air supply. Furthermore, when controlling for low speed or controlled output, use clean air (atmospheric pressure dew point temperature of -10°C or less). Installation of a mist separator (nominal filtration degree 0.3 μm or less) is also recommended.
3. Use a metal seal type when using solenoid valves for cylinder actuation. If a rubber seal type is used, there may be an increase in operating resistance due to grease sprayed from the main valve.
4. This cylinder cannot be used at the end of its stroke. Use it with an intermediate stroke of 10 mm.
5. The rod end should not come in direct contact with an equipment or workpiece. Also, make sure that the opposite side of the rod end is flat to make point-contact with the spherical surface of the rod end.



The material of the cylinder rod is heat-treated stainless steel (HRC60). The roughness of the spherical contact of the attaching part (Equipment, Work, etc) should be Rz6.3 and the material should be HB100 or greater (Aluminum material: 2000 line or 7000 line or equivalent) When higher precision or longer service life is required, we recommend using a heat-treated material + flat polished machined material (Rz0.8)

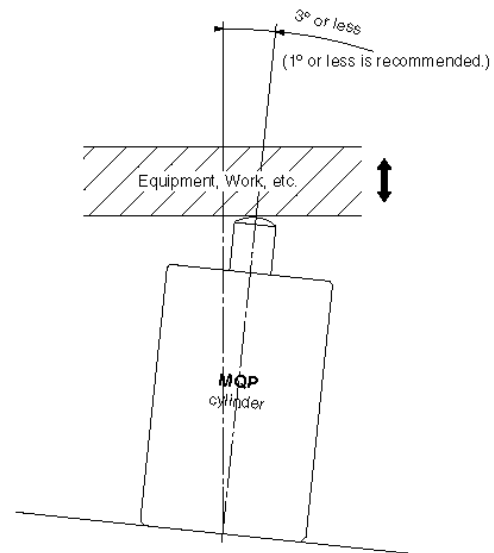
Also, although applying grease on the spherical contact parts will make the operation more smooth and reduce the abrasion, use caution to prevent any grease from being applied to the cylinder's sliding surface.

Operation

6. When connecting, be sure to align the rod axis with the load and the direction of movement.

The allowable angle of the cylinder's mounting surface in an equipment should be 3° or less.

(1° or less is recommended.) When not properly aligned, a lateral load will likely be applied to the rod and the spherical surface will likely skid. This will result in a reduction or dispersion of thrust and likely a malfunction.



Disassembly

1. The component parts of the metal seal cylinder are manufactured to precision tolerances, and therefore cannot be disassembled.

Lubrication

1. Lubrication of non-lube type cylinder

Do not apply lubrication when controlling for low speed or controlled output. If lubrication is applied, there may be changes in operating resistance due to factors such as the viscosity and surface tension of the oil. Also, use a metal seal type when using solenoid valves for cylinder actuation. If a rubber seal type is used, there may be an increase in operating resistance due to grease sprayed from the main valve.

Lubrication is also unnecessary for high speed actuation, but in the event that lubrication is applied, use turbine oil class 1 (with no additives) ISO VG32. (Do not use spindle oil or machine oil.)

Metal Seal

Compact Low Friction Cylinder

MQQ Series

ø10, ø16, ø20, ø25, ø30, ø40

RoHS

How to Order

MQQ T B 10 - 10 D

Compact low friction specification

Type	
T	Standard type
L	Lateral load resisting type (Built-in ball bushing)

Mounting

B	Through hole & Double end tapped (Standard)
L	Foot type
F	Rod side flange type
G	Head side flange type
D (Note)	Double clevis type

Note) Available with the MQQL□ only.
* Mounting brackets are included when shipped, but unassembled.

Bore size

10	10 mm
16	16 mm
20	20 mm
25	25 mm
30	30 mm
40	40 mm

Body option

Nil	Standard (Rod end female thread)
M (Note)	Rod end male thread

Note) A rod end thread adapter is attached.
* A rod end thread adapter is shipped being assembled.

Action

D	Double acting
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Cylinder stroke

Bore size (mm)	Standard stroke (mm)
10	10, 20, 30, 40
16	10, 20, 30, 40, 50, 60
20	10, 20, 30, 40, 50, 60
25	10, 20, 30, 40, 50, 75, 100
30	10, 20, 30, 40, 50, 75, 100
40	10, 20, 30, 40, 50, 75, 100

* Strokes are available in 1 mm increments by installing a spacer in standard stroke cylinders.
Example: MQQT B10-15D
(5 mm width spacer is installed in MQQT B10-20D to adjust the stroke.)

Port thread type

Nil	M thread	ø10 to ø20
	Rc	
TN	NPT	ø25 to ø40
TF	G	

* The MQQ series is not auto switch capable.

Mounting Bracket Part No.

Bore size (mm)	Foot Note 1)	Flange	Double clevis	Rod end thread adapter (with nut)
10	CQS-L016	CQS-F016	CQS-D016	MQ10-M
16	CQS-L020	CQS-F020	CQS-D020	MQ16-M
20	CQS-L025	CQS-F025	CQS-D025	MQ20-M
25	MQ-L032	MQ-F032	MQ-D032	MQ25-M
30	MQ-L040	MQ-F040	MQ-D040	MQ28-M
40	CQ-L050	CQ-F050	MQ-D050	

Note 1) When ordering a foot bracket, order 2 pcs. for each cylinder.

Note 2) The following parts are included with a bracket respectively.

Foot, Flange Body mounting bolts
Double clevis Clevis pin, C type retaining ring for shaft, Body mounting bolts

Compact Low Friction Cylinder Metal Seal **MQQ Series**

Specifications: Standard Type/MQQT



Bore size (mm)		10	16	20	25	30	40
Seal construction		Metal seal					
Action		Double acting, Single rod					
Fluid		Air					
Proof pressure		1.05 MPa					
Maximum operating pressure		0.5 MPa					
Minimum operating pressure <small>Note 1)</small>		0.005 MPa					
Ambient and fluid temperature		-10 to 80°C					
Cushion		Rubber bumper (Standard)					
Lubrication <small>Note 2)</small>		Not required (Non-lube)					
Rod end thread		Female thread					
Stroke length tolerance		+1.0 0					
Piston speed <small>Note 3)</small>		0.3 to 300 mm/s (Refer to page 340.)					
Total leakage <small>Note 4)</small>	Supply pressure 0.1 MPa	150 cm ³ /min	200 cm ³ /min	300 cm ³ /min	400 cm ³ /min	1600 cm ³ /min	4000 cm ³ /min
	Supply pressure 0.3 MPa	800 cm ³ /min	1000 cm ³ /min	1200 cm ³ /min	1600 cm ³ /min	1600 cm ³ /min	1600 cm ³ /min
	Supply pressure 0.5 MPa	1500 cm ³ /min	2000 cm ³ /min	3000 cm ³ /min	4000 cm ³ /min	4000 cm ³ /min	4000 cm ³ /min

Note 1) Value when horizontal. (Use clean, dry, and nonfreezing air) However, as the stroke increases, it will likely be affected by the mass of its moving parts and the pressure will likely increase by approx. 0.003 to 0.005 MPa due to an offset load from the mass of the rod.

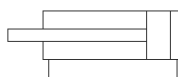
Note 2) Refer to precautions on page 339 regarding lubrication. This product uses turbine oil as an initial lubricant. Lubricant may seep out of the rod or the piping port.

Note 3) Control low speed actuation with differential pressure and a speed controller, etc. (Refer to recommended circuit examples on page 319 for further details.)

Note 4) The values are only for reference and are not guaranteed.

Symbol

Double acting, Single rod



Specifications: Lateral Load Resisting Type/MQQL

Bore size (mm)		10	16	20	25	30	40
Seal construction		Metal seal					
Action		Double acting, Single rod					
Fluid		Air					
Proof pressure		1.05 MPa					
Maximum operating pressure		0.7 MPa					
Minimum operating pressure <small>Note 1)</small>		0.005 MPa					
Ambient and fluid temperature		-10 to 80°C					
Cushion		Rubber bumper (Standard)					
Lubrication <small>Note 2)</small>		Not required (Non-lube)					
Rod end thread		Female thread					
Stroke length tolerance		+1.0 0					
Piston speed <small>Note 3)</small>		0.5 to 500 mm/s (Refer to page 340.)					
Total leakage <small>Note 4)</small>	Supply pressure 0.1 MPa	150 cm ³ /min	200 cm ³ /min	300 cm ³ /min	400 cm ³ /min	1600 cm ³ /min	4000 cm ³ /min
	Supply pressure 0.3 MPa	800 cm ³ /min	1000 cm ³ /min	1200 cm ³ /min	1600 cm ³ /min	1600 cm ³ /min	1600 cm ³ /min
	Supply pressure 0.5 MPa	1500 cm ³ /min	2000 cm ³ /min	3000 cm ³ /min	4000 cm ³ /min	4000 cm ³ /min	4000 cm ³ /min

Note 1) Value when horizontal. (Use clean, dry, and nonfreezing air) However, as the stroke increases, it will likely be affected by the mass of its moving parts and the pressure will likely increase by approx. 0.003 to 0.005 MPa due to an offset load from the mass of the rod.

Note 2) Refer to precautions on page 339 regarding lubrication. This product uses turbine oil as an initial lubricant. Lubricant may seep out of the rod or the piping port.

Note 3) Control low speed actuation with differential pressure and a speed controller, etc. (Refer to recommended circuit examples on page 319 for further details.)

Note 4) The values are only for reference and are not guaranteed.

Weight: Standard Type/MQQT

Unit: g

Bore size (mm)	Cylinder stroke (mm)							
	10	20	30	40	50	60	75	100
10	94	118	142	166	—	—	—	—
16	166	206	246	286	326	366	—	—
20	228	290	352	414	476	538	—	—
25	395	487	579	671	763	—	993	1223
30	479	567	655	743	831	—	1052	1272
40	728	846	964	1082	1200	—	1495	1790

Weight: Lateral Load Resisting Type/MQQL (Built-in Ball Bushing)

Unit: g

Bore size (mm)	Cylinder stroke (mm)							
	10	20	30	40	50	60	75	100
10	148	172	196	220	—	—	—	—
16	284	324	364	404	444	484	—	—
20	383	445	507	569	631	693	—	—
25	552	644	736	828	920	—	1150	1380
30	911	999	1087	1175	1263	—	1485	1705
40	1337	1455	1573	1691	1809	—	2104	2399

* Refer to page 340 for moving parts mass.

Theoretical Output (Guide)



Unit: N

Bore size (mm)	Rod size (mm)	Direction	Piston area (mm ²)	Operating pressure (MPa)						
				0.1	0.2	0.3	0.4	0.5	0.6	0.7
10	6	IN	50.3	5.0	10.1	15.1	20.1	25.2	30.2	35.2
		OUT	78.5	7.9	15.7	23.6	31.4	39.3	47.1	55.0
16 (15.8)	8	IN	145.8	14.9	29.2	43.7	58.3	72.9	87.5	102.1
		OUT	196.1	19.6	39.2	58.9	78.4	98.1	117.7	137.3
20	10	IN	235.6	23.6	47.1	70.7	94.2	117.8	141.4	164.9
		OUT	314.2	31.4	62.8	94.3	125.7	157.1	188.5	219.9
25	12	IN	377.8	37.8	75.6	113.3	151.1	188.9	226.7	262.5
		OUT	490.9	49.1	98.2	147.3	196.4	245.5	294.5	343.6
30	16	IN	505.8	50.6	101.2	151.8	202.4	253.0	303.6	354.2
		OUT	706.9	70.7	141.4	212.1	282.8	353.5	424.2	494.9
40	20	IN	1055.6	105.6	211.2	316.8	422.4	528.0	633.6	739.2
		OUT	1256.6	125.7	251.4	377.1	502.8	628.5	754.2	879.9

Metal Seal

Lateral Load Resisting Low Friction Cylinder **MQM Series**

ø6, ø10, ø16, ø20, ø25



How to Order

MQML B 10 - 15 D

Lateral load resisting low friction specification

Type

L	Lateral load resisting type (Built-in ball bushing)
----------	-----------------------------------------------------

Mounting

B	Basic type
L	Foot type
F	Rod side flange type
G	Head side flange type (Except for ø6)
C <small>Note 1)</small>	Single clevis type (Non-integrated type)
D <small>Note 2)</small>	Double clevis type

Note 1) Bore size: 20, 25 mm only
* Mounting brackets are included when shipped, but unassembled. (Except for clevis type.)
Note 2) ø6, ø10, ø16 Integrated type
 ø20, ø25 Non-integrated type

Bore size

6	6 mm
10	10 mm
16	16 mm
20	20 mm
25	25 mm

Action

D	Double acting
----------	---------------

Cylinder stroke

Bore size (mm)	Standard stroke (mm)
6	15, 30, 45, 60
10	15, 30, 45, 60, 75, 100
16	15, 30, 45, 60, 75, 100
20	15, 30, 45, 60, 75, 100
25	15, 30, 45, 60, 75, 100

* Strokes are available in 1mm increments by installing spacers in standard stroke cylinders.
 Example: MQMLB10-20D
 (10 mm width spacer is installed in MQMLB10-30D to adjust the stroke.)

Function

Nil	Standard type
H <small>Note)</small>	High speed/High frequency type (Without fixed orifice)

Note) Except for 6 mm bore size.

Port thread type

Nil	M thread	ø6 to ø16
	Rc	
TN	NPT	ø20, ø25
TF	G	

* The MQM series is not auto switch capable.

Mounting Type/Accessories

Mounting bracket		B : Basic	L : Foot	F : Rod side flange	G : Head side flange	C : Single clevis	D : Double clevis	Note
Standard	Mounting nut <small>Note 1)</small>	● (1 pc.)	● (2 pcs.)	● (1 pc.)	● (1 pc.)	— <small>Note 1)</small>	— <small>Note 2)</small>	
	Rod end nut	●	●	●	●	●	●	
	Clevis pin	—	—	—	—	—	●	
Option	T-bracket	—	—	—	—	—	●	With pin

Note 1) Mounting nut is not included with the integrated devis, single clevis and double devis types.

Note 2) Pin and retaining ring are packed with the double clevis type.

Mounting Bracket Part No.

Bore size (mm)	Foot <small>Note 1)</small>	Flange	Single clevis	Double clevis (with pin) <small>Note 2)</small>	T-bracket <small>Note 3)</small>
6	CJK-L016B	CJK-F016B	—	—	CJ-T010B
10	MQM-L010		—	—	
16	MQM-L016	CLJ-F016B	—	—	CJ-T016B
20	CM-L020B	CM-F020B	CM-C020B	CM-D020B	—
25	CM-L032B	CM-F032B	CM-C032B	CM-D032B	—

Note 1-1) Bore size 6 mm:

1 foot bracket is included.

When ordering foot brackets, order 1 piece per a cylinder unit.

Note 1-2) Bore size other than 6 mm (10, 16, 20 and 25 mm) (Same as CM series):

2 foot brackets and 1 mounting nut (1 set) are used for a cylinder unit.

When ordering foot brackets, order 2 pieces per a cylinder unit (shipped as a set).

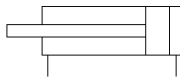
Note 2) Clevis pin and retaining ring are included in package.

Note 3) T-bracket is applicable to the double devis type (D).

MQM Series



Symbol
Double acting, Single rod



Specifications

Bore size (mm)		6	10	16	20	25
Seal construction		Metal seal				
Action		Double acting, Single rod				
Fluid		Air				
Proof pressure		1.05 MPa				
Maximum operating pressure		0.7 MPa				
Minimum operating pressure ^{Note 1)}	Standard type	0.02MPa	0.005 MPa			
	H (High speed/High frequency type)	—	0.01 MPa			
Ambient and fluid temperature		-10 to 80°C				
Cushion		Rubber bumper (Standard)				
Lubrication ^{Note 2)}		Not required (Non-lube)				
Stroke length tolerance		+1.0 0				
Piston speed ^{Note 3)}	Standard type	0.5 to 1000 mm/s (Refer to page 341.)				
	H (High speed/High frequency type)	—	5 to 3000 mm/s (Refer to page 341.)			
Total leakage ^{Note 4)}	Supply pressure 0.1 MPa	150 cm ³ /min	250 cm ³ /min	300 cm ³ /min	300 cm ³ /min	300 cm ³ /min
	Supply pressure 0.3 MPa	800 cm ³ /min	1000 cm ³ /min	1200 cm ³ /min	1200 cm ³ /min	1200 cm ³ /min
	Supply pressure 0.5 MPa	1500 cm ³ /min	2500 cm ³ /min	3000 cm ³ /min	3000 cm ³ /min	3000 cm ³ /min

Note 1) Value when horizontal. (Use clean, dry, and nonfreezing air) However, as the stroke increases, it will likely be affected by the mass of its moving parts and the pressure will likely increase by approx. 0.003 to 0.005 MPa due to an offset load from the mass of the rod.

Note 2) Refer to precautions on page 339 regarding lubrication. This product uses turbine oil (standard type) or lithium soap based grease (high speed/high frequency type) as an initial lubricant. Lubricant may seep out of the rod or the piping port.

Note 3) Control low speed actuation with differential pressure and a speed controller, etc. (Refer to recommended circuit examples on page 319 for further details.)

Note 4) The values are only for reference and are not guaranteed.

Weight: Standard Type, High Speed/High Frequency Type

Bore size (mm)	Cylinder stroke (mm)						Unit: g
	15	30	45	60	75	100	
6	52.5	60.7	68.9	77.1	—	—	
10	92.4	102.7	113.0	123.3	133.6	143.9	
16	152.4	175.2	198.0	220.8	243.6	266.4	
20	349.8	392.6	435.4	478.2	521.0	563.8	
25	460.8	510.0	559.2	608.4	657.6	706.8	

* Refer to page 341 for moving parts mass.

Theoretical Output (Guide)

Bore size (mm)	Rod size (mm)	Direction	Piston area (mm ²)	Operating pressure (MPa)							Unit: N
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	
6	4	IN	15.7	1.6	3.2	4.7	6.3	7.9	9.4	11.0	
		OUT	28.3	2.8	5.7	8.5	11.3	14.2	17.0	19.8	
10	4	IN	66.0	6.6	13.2	19.8	26.4	33.0	39.6	46.2	
		OUT	78.5	7.9	15.7	23.6	31.4	39.3	47.1	55.0	
16 (15.8)	5	IN	176.4	17.6	35.3	52.9	70.6	88.2	105.8	123.5	
		OUT	196.1	19.6	39.2	58.9	78.4	98.1	117.8	137.3	
20	8	IN	263.9	26.4	52.8	79.2	105.6	132.0	158.3	184.7	
		OUT	314.2	31.4	62.8	94.3	125.7	157.1	188.5	219.9	
25	10	IN	412.3	41.2	82.5	123.7	164.9	206.2	247.4	288.6	
		OUT	490.9	49.1	98.2	147.3	196.4	245.5	294.5	343.6	

Metal Seal

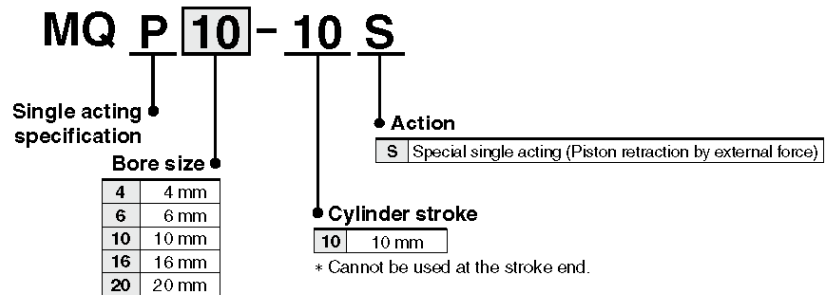
Low Friction Cylinder (Single Acting)

MQP Series

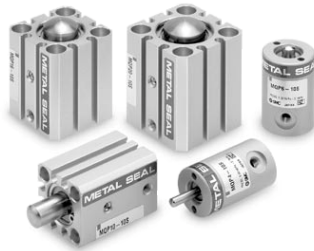
ø4, ø6, ø10, ø16, ø20



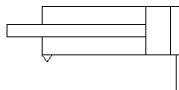
How to Order



* The MQP series is not auto switch capable.



Symbol
Single acting (Pressing force)



Specifications

Bore size (mm)		4	6	10	16	20
Seal construction		Metal seal				
Action		Special single acting (Piston retraction by external force)				
Proof pressure		1.05 MPa				
Maximum operating pressure		0.7 MPa				
Minimum operating pressure ^{Note 1)}		0.001 MPa				
Ambient and fluid temperature		+5 to +80°C				
Lubrication ^{Note 2)}		Not required (Non-lube)				
Stroke length tolerance		+1,0 0				
Total ^{Note 3)} leakage	Supply pressure 0.1 MPa	100 cm ³ /min				
	Supply pressure 0.3 MPa	500 cm ³ /min				
	Supply pressure 0.5 MPa	1000 cm ³ /min				

Note 1) Excluding the mass of moving parts.

Note 2) Refer to precautions on page 344 regarding lubrication. This product uses turbine oil as an initial lubricant. Lubricant may seep out of the rod or the piping port.

Note 3) The values are only for reference and are not guaranteed.

Moving Parts and Total Mass

Unit: g

Bore size (mm)	Moving parts mass	Total mass
4	4	43
6	8	55
10	24	96
16	62	161
20	103	239

Theoretical Output (Guide)

Unit: N

Bore size (mm)	Piston area (mm ²)	Operating pressure (MPa)						
		0.1	0.2	0.3	0.4	0.5	0.6	0.7
4	12.6	1.3	2.6	3.9	5.2	6.5	7.8	9.1
6	28.3	2.8	5.6	8.4	11.2	14.0	16.8	19.6
10	78.5	7.9	15.7	23.6	31.4	39.3	47.1	55.0
16	201.1	20.1	40.2	60.3	80.4	100.6	120.7	140.8
20	314.2	31.4	62.8	94.3	125.7	157.1	188.5	219.9

Troubleshooting

Phenomenon	When failure occurred on the metal seal cylinder, check the failure and causes in this table, and take the appropriate countermeasures.	Cause	Countermeasures
Operation failure (Galling) Cylinder does not operate smoothly. Output decreases.. Does not operate.		1) Run out of oil on the sliding part - Oil is washed away due to liquid intrusion such as drain. - Lubrication is stopped during the operation. - Used in the environment where some liquid splashes.	Replace cylinder.
		2) Misalignment between work (work guide axis) and cylinder axis	Adjust alignment. - Make sure that cylinder operates properly without supplying air to the cylinder. Also, consider using floating joint or spherical joint. (P5 Precautions)
		3) Piston rod deformation - Misalignment between cylinder and load. - Lateral load exceeding allowable range is applied. - Exceeded allowable kinetic energy. - When mounting load, constrained force is applied.	Replace cylinder.
		4) Air shortage - Decreased source pressure. - Deviation from regulator setting value. - Piping clogging and the leakage.	Supply the appropriate pressure.
		5) Low speed operation	Use within the specifications. (MQQ P10 specifications) (MQM P12 specifications)
		6) Lack of cylinder thrust	Increase the operating pressure or change the cylinder to the one with larger I.D. - Since there is mechanism resistance and resistance generated by mounting, load rate should be considered.
		7) Non-conformance of system construction	Use proper size piping, fitting directional control valve, speed controller etc.
		8) Equipment trouble and failure except cylinder. - Directional control valve failure. - Improper adjustment of speed controller. - Speed controller failure. - Piping clogging. - Filter clogging etc.	Investigate the target system in order.

Phenomenon	Cause	Countermeasures
Unstable thrust accuracy Compared with the setting pressure, cylinder thrust is unstable.	1) Intrusion of foreign substances from the air source.	Clean the air source. (P5 Precautions)
	2) Selection of the actuation valve	Use metal seal type actuation valve. - In case of rubber seal type, the sliding resistance may increase due to grease splash on the main valve. (P5 Precaution)
	3) Lateral load	Use within the allowable lateral load range. (MQQ P6 Allowable lateral load) (MQM P7 Allowable lateral load)
	4) Misalignment between work (work guide axis) and cylinder axis	Adjust alignment. - Adjust alignment. - Make sure that cylinder operates properly without supplying air to the cylinder. Also, consider using floating joint or spherical joint. (P5 Precautions)
	5) Restriction circuit control with speed controller etc.	Control by controlling pressure. - Since the cylinder internal pressure decreases in the restriction circuit, the control is not available.
Breakage Components breakage	1) High speed operation	Adjust speed with speed controller and use within the specifications. (MQQ P10 specifications) (MQM P12 Specifications)
	2) Overload	Use within the allowable kinetic energy. (MQQ P6 Operating speed) (MQM P7 Operating speed)
	3) Lateral load	Use within the allowable lateral load. (MQQ P6 Allowable lateral load.) (MQM P7 Allowable lateral load.)
	4) Influence of abnormal external force	Deformation and breakage of cylinder causes mechanism interference, eccentric load and overload. Get rid of these causes.

Revision history	
A:	Creating a new chart by changing Specifications.

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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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