Doc. No MQR****-OML0002-A .

Operation Manual

PRODUCT NAME

Low Torque Metal Seal Type Rotary Joint

MODEL / Series / Product Number

MQR Series

SMC Corporation

Contents

Metal Seal Type

Low Torque Rotary Joint

MQR Series

RoHS

1 circuit, 2 circuits, 4 circuits, 8 circuits, 12 circuits, 16 circuits

How to Order

MQR [F] [4] – [M5]

Low torque rotary joint (Metal seal type)

Options

Nil	Standard
F Note)	Flange

Note: No flange type in 1 circuit system

Number of circuits

1	1 circuit
2	2 circuits
4	4 circuits
8	8 circuits
12	12 circuits
16	16 circuits

Connection diameter

M5	M5 x 0.8

Options/Mounting Bracket

Number of circuits	Flange part number
2 circuits	MQR2-F
4 circuits	MQR4-F
8 circuits	MQR8-F
12 circuits	MQR12-F
16 circuits	MQR16-F

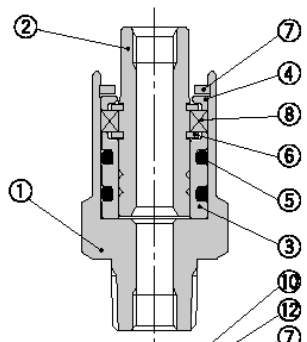
Specifications

Model		MQR1-M5	MQR2-M5	MQR4-M5	MQR8-M5	MQR12-M5	MQR16-M5
Number of circuits (Number of ports)		1	2	4	8	12	16
Fluid		Air					
Seal structure		Metal seal					
Guide structure		Bearing supported	Bearing supported at both ends				
Port size		Male R 1/8	M5 x 0.8				
		Female M5 x 0.8					
Flow rate characteristics	C	0.50 [dm³/(s·bar)]					
	b	0.40					
	Cv	0.17					
Lubrication		Not required					
Min. operating pressure		–100 kPa					
Max. operating pressure		1.0 MPa					
Ambient temperature and operating fluid temperature Note 1)		–10 to 80°C					
Maximum start-up rotation torque Note 2)		0.003 N·m or less	0.03 N·m or less	0.05 N·m or less	0.10 N·m or less	0.20 N·m or less	0.50 N·m or less
Allowable rotation number Note 5)		3000 min⁻¹ (rpm) or less Note 3)	2000 min⁻¹ (rpm) or less	1500 min⁻¹ (rpm) or less	900 min⁻¹ (rpm) or less	600 min⁻¹ (rpm) or less	200 min⁻¹ (rpm) or less
Allowable radial load (allowable coupling axis reaction) Note 4)		1 N or less	15 N or less	30 N or less	40 N or less	50 N or less	50 N or less
Allowable axial load							
Weight		0.025 kg	0.16 kg	0.39 kg	0.76 kg	1.26 kg	2.80 kg

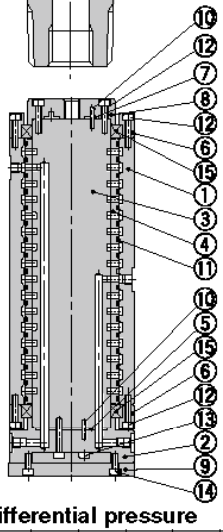
Note 1) The temperature 80°C includes temperature rise during rotation.
Note 2) The start-up torque does not change with the supply pressure or with non-use (remains within the maximum start-up rotation torque), but it does change with the rotation number. (Refer to page 450).
Note 3) If using at a speed above 600 min⁻¹ (r.p.m.), ensure rotation is in the direction in which the joint is fastened.
Note 4) Rubber / resin couplings are recommended due to their excellent absorption of off center, shocks, and vibrations.
Note 5) min⁻¹: Number of rotations per 1 minute

Construction

MQR1-M5



MQR2 to 16-M5



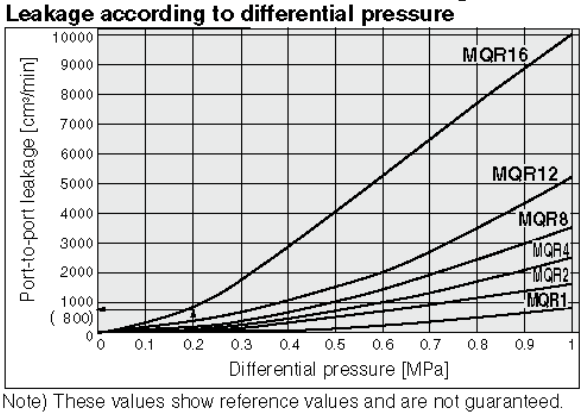
Component Parts/(MQR1 - M5, 1 circuit)

No.	Name	Material	Remarks
1	Body	Stainless steel	
2	Spool	Special stainless steel	
3	Sleeve	Special stainless steel	
4	Plate	Aluminium	
5	O-ring	H-NBR	
6	Retaining ring	Carbon steel	
7	Retaining ring	Carbon steel	
8	Radial bearing		

Component Parts/(MQR2 to 16 - M5, 2 to 16 circuits)

No.	Name	Material	Remarks
1	Body	Aluminum	
2	Adapter plate	Aluminum	
3	Spool	Special stainless steel	
4	Sleeve	Special stainless steel	
5	Gasket	H-NBR	
6	Bearing holder	Stainless steel	16 circuits only
7	Gasket	H-NBR	16 circuits only
8	Plate	Aluminum	16 circuits only
9	Flange	Aluminum	
10	Parallel pin	Carbon steel	Except for 2 circuits
11	O-ring	H-NBR	
12	Bolt	Carbon steel	16 circuits only
13	Bolt	Carbon steel	
14	Bolt	Carbon steel	
15	Radial bearing	—	

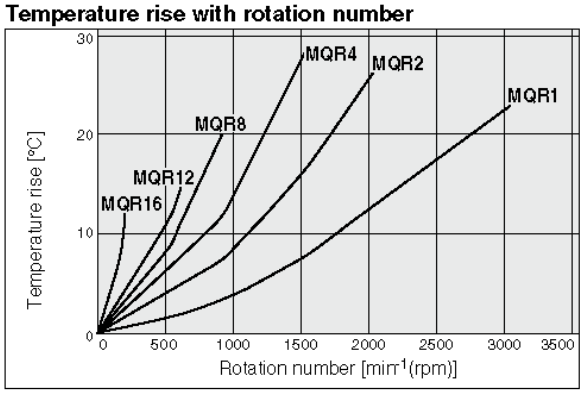
Leakage according to differential pressure



Note) These values show reference values and are not guaranteed.

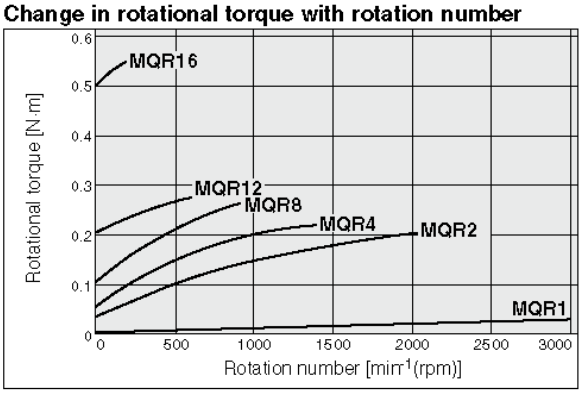
e.g.: If adjacent ports are connected to vacuum pressure of -0.1 MPa and positive pressure of 0.1 MPa in MQR16, then differential pressure is 0.2 MPa, and leakage is 800 (cm³/min).

Temperature rise with rotation number



Note: Value when no pressure applied. Temperature rise is reduced by supply of air.
Note: These values show reference values and are not guaranteed.

Change in rotational torque with rotation number

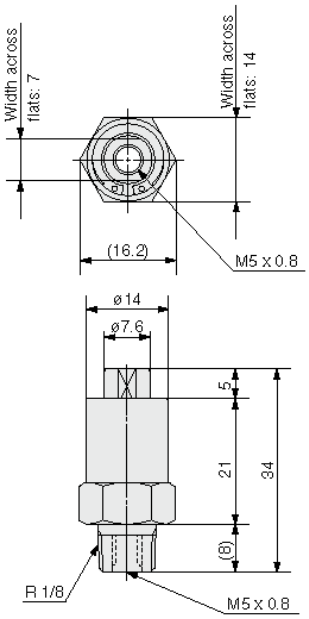


Note) These values show reference values and are not guaranteed.

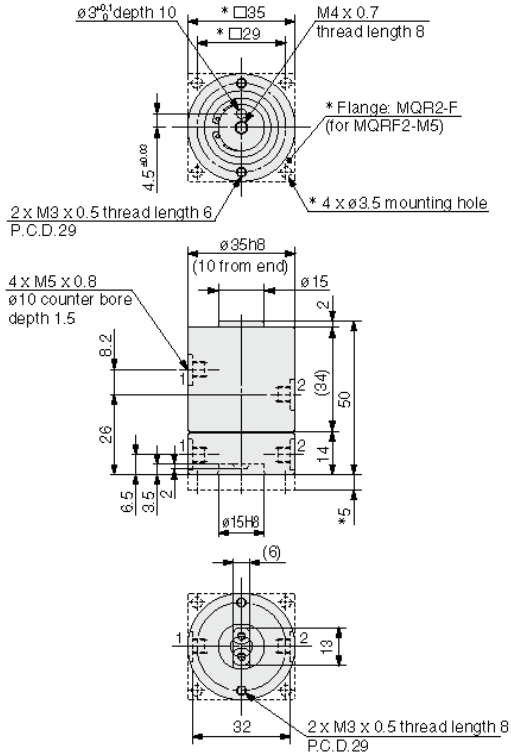
Dimensions: Standard Type/Flange Type

* Symbol indicates flange dimensions

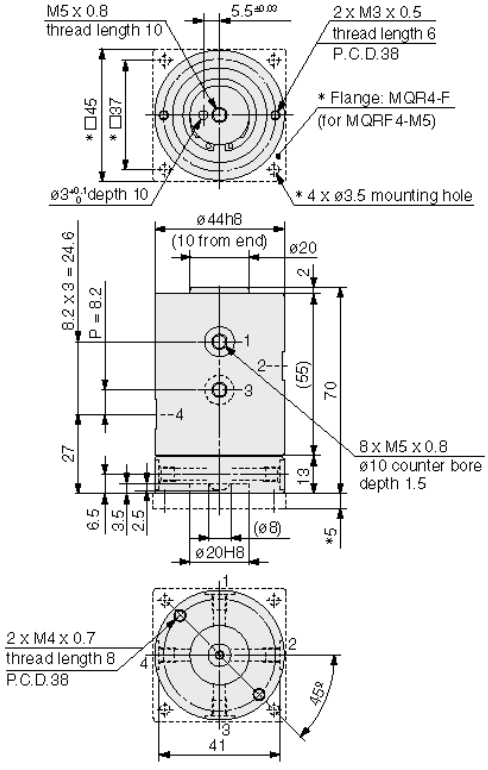
MQR1-M5



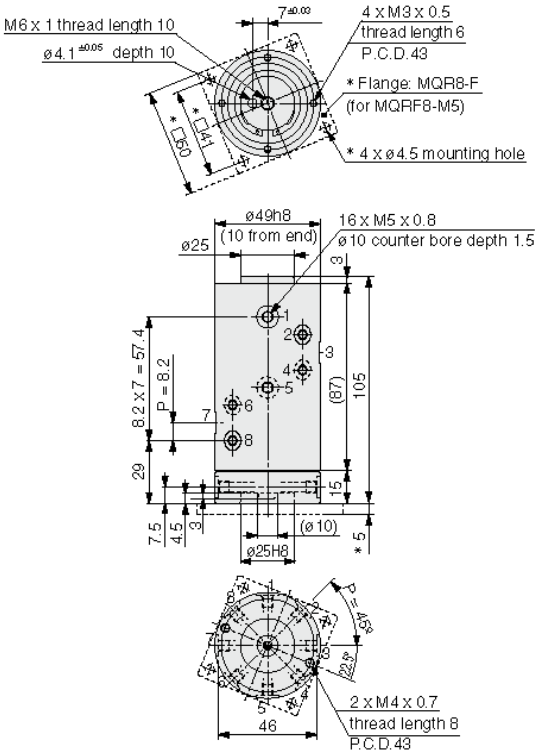
MQR2-M5



MQR4-M5



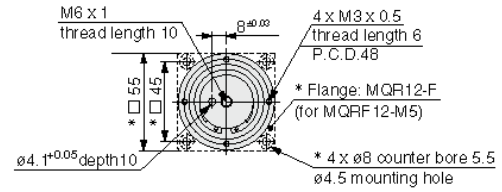
MQR8-M5

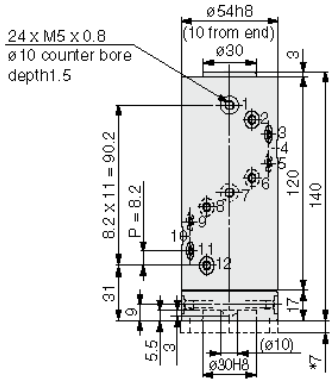


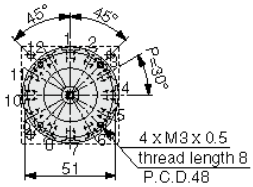
Dimensions: Standard Type/Flange Type

∗ Symbol indicates flange dimensions

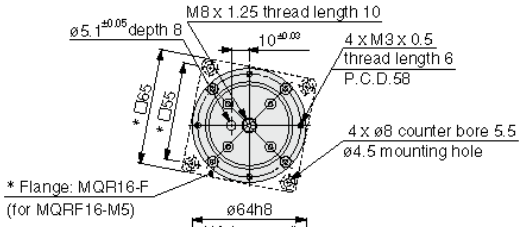
MQR12-M5

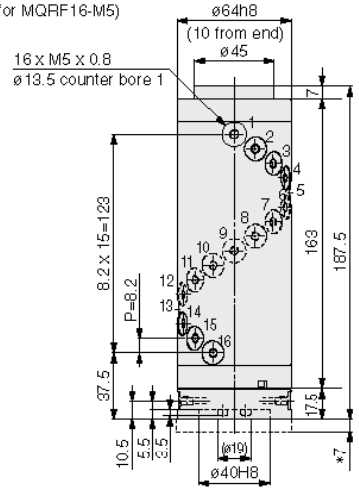


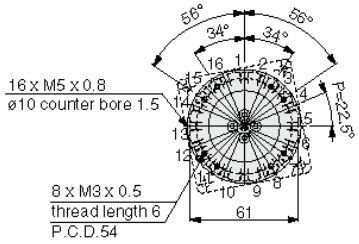




MQR16-M5

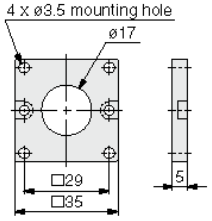




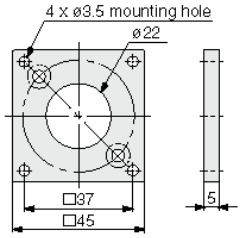


Mounting Bracket/Flange

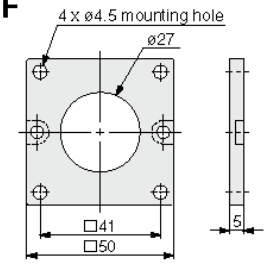
MQR2-F



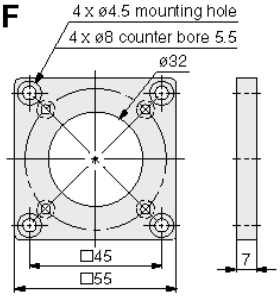
MQR4-F



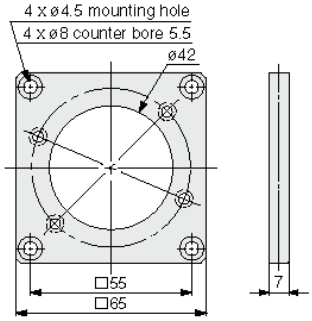
MQR8-F



MQR12-F



MQR16-F



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 govemed 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 goveming that export are known and followed.**

MQR Series
Rotary Joint/Precautions 1

Be sure to read this before handling the products.

Design

⚠ Warning

1. **A protective cover is recommended to minimize the risk of human injury.**
   If a moving part poses a risk of human injury and/or damage to machinery/equipment, then a structure which prevents direct contact with that part should be adopted.
2. **Securely tighten all stationary parts and connected parts so that they will not become loose.**
   Secure fastening is particularly important when the rotary joint has a high operating frequency.
3. **Provide safety devices in drive circuit.**
   Collisions, or foreign material introduced by the air source, may cause scuffing or burning of rotating parts, which in turn leads to increased rotational torque. Install safety devices in the drive circuit accordingly.
4. **Pressure**
   Air leakage occurs in these products. They cannot be used for pressure holding in pressure vessels, etc.
5. **Do not use in an emergency shutdown air circuit.**
   These products are not designed for use in a safety circuit performing emergency shutdown. Other reliable safety protection means should be adopted for such systems.
6. **Ensure room for maintenance.**
   Leave sufficient space for maintenance work.
7. **Releasing residual pressure.**
   Provide a residual pressure release function in order to carry out maintenance work.
8. **Using vacuum supply.**
   When using a vacuum air supply, install a suction filter, or equivalent, to prevent infiltration of dirt and foreign material via the absorption pad or exhaust port.

Selection

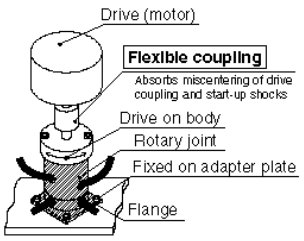
⚠ Warning

1. **Confirm 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 in these conditions. (Refer to specifications.)
2. **Do not use for power transmission.**
   These products are not designed to be used as bearings for transmitting power from a drive source, such as a motor. Such use may lead to rotation faults, or damage.

Mounting

⚠ Warning

1. **Prevent impacts on shaft when drive source is started.**
   If excessive offset load is applied to the product, it may cause malfunction, breakdown, or personal injury or damage to machinery and equipment. Use a flexible coupling as illustrated below, to avoid direct radial load or axial load on the shaft. A rubber/resin coupling is recommended, due to its excellent absorption of off cente, shocks, and rvibrations. Please consult the coupling manufacturer to discuss the detailed operating conditions.



2. **Do not make additions to this product.**
   Any additions made to this product will weaken it and may cause product failure, leading to human injury and/or damage to machinery/equipment.
3. **Allow freedom of movement when securing the shaft.**
   If you do not allow some freedom of movement when fixing the shaft, then any eccentricity will cause abnormal wear, leading to malfunction, breakdown, and possible human injury and/or damage to machinery/equipment.
4. **When the top is fixed, install a relief port (ø1 or more).**
   This product leaks air to the outside. When the top is made airtight, an excessively large load may occur. This may lead to malfunction.

⚠ Caution

1. **Confirm the model and size before installation. Check that there are no scratches, impact marks, cracks, or the like, on the product.**
2. **When connecting tubes, take account of variations in pressure according to tube length.**
3. **Do not wipe model designation on nameplate with organic solvents, etc.**
   This will cause designation to disappear.
4. **Do not knock rotary shaft when main unit is fixed, or knock main unit when rotary shaft is fixed.**
   This may bend the rotary shaft and cause damage to the bearings. The rotary shaft should be fixed when attaching a load, etc. to it.

MQR Series
Rotary Joint/Precautions 2

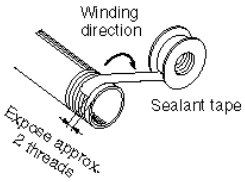
Be sure to read this before handling the products.

Piping

⚠ Caution

1. Preparation before piping.
Before piping is connected, it should be thoroughly blown out with air (flushed), to remove chips, cutting oil and other debris from inside the piping.

2. Winding of sealant tape.
When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealant material do not get inside the piping. Also, when sealant tape is used, leave approximately 2 thread ridges exposed at the end of the threads.



3. Screw tightening and tightening torque.
Use the tightening torques in the table below, when screwing a fitting onto a piping port. Particular attention is required in the case of MQR1 (1 circuit), as this joint supports the piping.

Tightening Torque for Piping

Connecting threads	Suitable tightening torque
M5	1.5 to 2 N·m
Rc 1/8	7 to 9 N·m

* Comments

Fastening M5 thread fittings

Tighten manually, and then tighten a further quarter-turn using the fastening tool. If using miniature fittings, tighten manually, and then tighten a further quarter-turn using the fastening tool. If there are two gaskets, such as a universal elbow or universal tee, the final tightening should be doubled to a half-turn.

Note: Over-tightening of fittings may cause fracturing of the thread sections or deformation of the gaskets, leading to air leaks. If the fittings are under-tightened, the loosening of thread and air leaks may occur.

Lubrication

⚠ Caution

1. Lubrication

1. Due to the initial lubricant provided, the product can be used without lubrication.
2. Do not lubricate if using the product at low torque. Lubrication may cause an increase in the rotational torque, due to the viscosity and surface tension of the oil.
3. In the event that lubrication is applied, use turbine oil class 1 (without additives) ISO VG32.

Refer to the brands of each turbine oil class 1 (without additives) ISO VG32 manufacturer shown below.

Air Supply

⚠ Warning

1. Use clean air.
Do not use compressed air containing chemicals, synthetic oils containing organic solvents, salts, or corrosive gases, etc., as these can cause damage or malfunction.

⚠ Caution

1. Use the product within the range of specifications for fluid and ambient temperature.
Take measures to prevent freezing when used at 5°C or less, since moisture in circuits can freeze, causing malfunction.

2. Install air filters.
Install air filters near valves on their upstream side. The filtration degree should be 5 μm or less. Furthermore, when using at low friction, it is also recommended to use clean air (atmospheric pressure dew point temperature of −10°C) and install mist separator AM series (filtration degree 0.3 μm or less) or AM + AMD series (filtration degree 0.01 μm or less).

3. Install an after-cooler, air dryer or water separator (Drain Catch), etc.
Air containing excessive drainage can cause malfunction of valves and other pneumatic equipment. To prevent this, install an after-cooler, air dryer or water separator, etc.

Refer to the 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 rotary joint materials.

2. Do not use in dusty locations or where water, oil, etc., will splash on the equipment.

Maintenance

⚠ Warning

1. Perform maintenance according to the procedures indicated in the operation manual.
If handled improperly, malfunction and damage of machinery or equipment may occur.

2. During maintenance, do not perform any disassembly or assembly whilst the air supply is connected.

⚠ Caution

1. Drain flushing
Remove condensate from air filters at regular intervals.

Disassembly

⚠ Caution

1. The component parts of these products are manufactured to precision tolerances, and therefore cannot be disassembled.

MQR Series
Specific Product Precautions 1

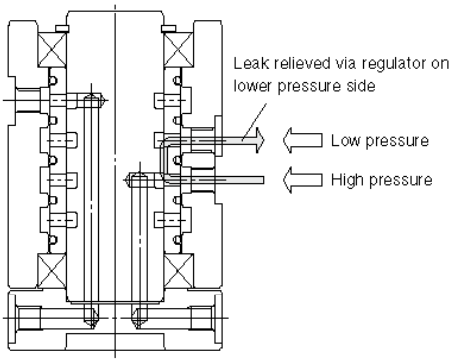
Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions.

Operation

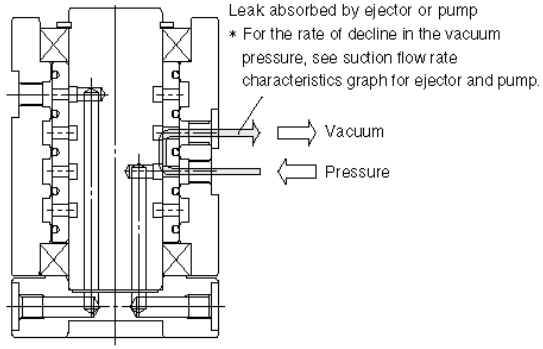
⚠ Caution

1. The metal seal structure means that port-to-port leaking occurs. Therefore, please note the following points when using different pressures at neighbouring ports.

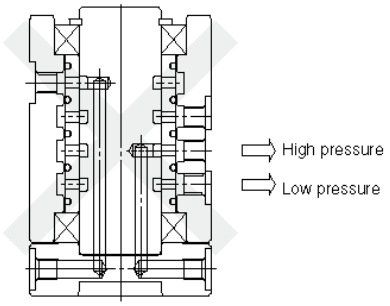
When using different pressures at normal pressure
Use relieving type regulators.
Leaks between ports are to be exhausted via the relief port of the regulator on the lower pressure side.



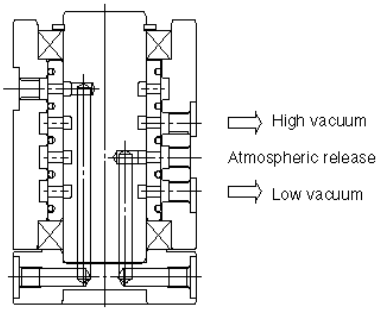
When combination of vacuum and normal pressures
When using a compact vacuum ejector (suction flow rate approx. 10 L/min), the vacuum pressure drop is several kPa or so, depending on the supply source characteristics and the piping conditions. For more details, please refer to the flow rate characteristics graph provided in the vacuum pump catalogue, operation manual, etc.



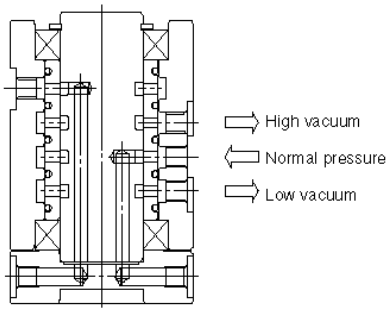
Using different pressures in vacuum
As neither the ejector nor the vacuum pump has a relief function, pressure interference may occur. Install an atmospheric release port (blanking port) or normal pressure circuit between the pressure ports having different vacuum pressures.



* If neighbouring ports are used at different vacuum pressures, the vacuum pressure on the lower vacuum side will increase and hence it cannot be used.



Using atmospheric release port



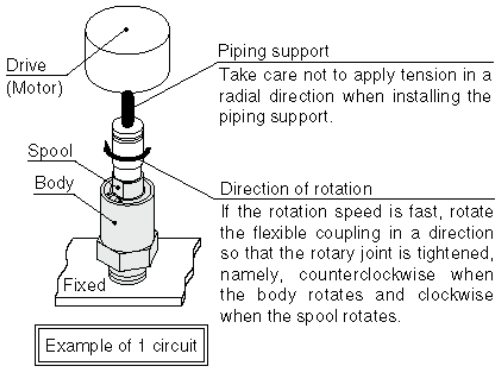
Using normal pressure port

* If using two or more ports at different vacuum pressures, an atmospheric release port or a normal pressure supply should be provided between the ports.

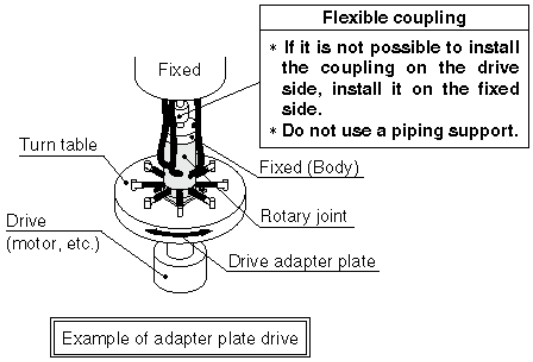
MQR Series
Specific Product Precautions 2

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions.

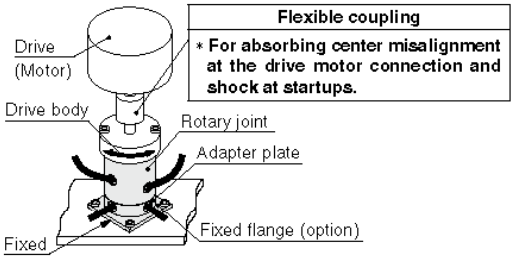
Mounting



Example of 1 circuit



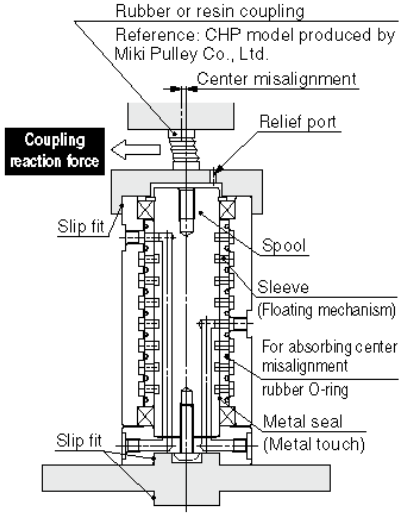
Example of adapter plate drive



Example of body drive

⚠ Caution

1. **Although the center misalignment of the drive shaft and fixed shaft is different due to the flexible coupling type and size, keep adjustments to 0.3 mm or less as a guide.**
   Do not use piping support for 2 or more circuits. If used for 2 or more circuits, excessive radial load may occur momentarily (particularly at the start) due to piping tension and deflection, and it may cause excessive abrasion.
2. **This product has a floating mechanism on the sleeve in order to keep the surface pressure of the metal seal part at a lower level even when rotating with the accumulated center misalignment of parts. If instantaneous shock occurs when starting and stopping rotation, the surface pressure may rise without working the floating mechanism and excessive abrasion may occur. Flexible coupling should be installed at the drive motor connection in order to protect the rotary joint from direct shocks. The recommended coupling is made by rubber or resin. These are excellent in center misalignment and adsorption of impact and vibration.**
   (Reference coupling: Bellow Flex (Plastic bellows coupling) CHP model produced by Miki Pulley Co., Ltd.)
   For applicable reaction force of the coupling, refer to specifications on page 449.
   Select coupling with twice the safety factor against the value supplied by the coupling maker as the reaction force may be applied as a drive load especially with intermittent operation.
3. **When the rotary joint is secured, align the drive shaft and the fixed shaft using the slip fit of the body adapter plate. Using the slip fit facilitates alignment of the axes. Relief port over ø1 should be installed when securing the top side. Since this product has slight air leakage, offset load may occur if sealing top side when mounting, and excessive abrasion may occur. Prevent the spool portion on the top side from coming into contact with the fixed portion of the equipment.**



Reference coupling/Bellow Flex (Plastic bellows coupling) CHP Model produced by Miki Pulley Co., Ltd.

Rotary joint type	MQR2	MQR4	MQR8	MQR12	MQR16
Coupling part no.	CHP-20	CHP-20	CHP-20 CHP-26	CHP-26 CHP-34	CHP-34

Troubleshooting

Phenomenon	Refer phenomenon below for failure occurs to the rotary joint	Cause	Countermeasures
Rotation failure (Galling)	Not rotate Not rotate smoothly Noise is made during rotation	**1) Galling of the sliding part due to the impact when operation source starts or stops**	Replace the rotary joint, To provide flexibility and to absorb shocks, Install rubber or resin coupling which has better performance in absorbing center misalignment, shocks and vibrations. Adjust center misalignment between the drive and fixed axes within allowable center misalignment of the coupling. (See P.7,10 Precautions)
		2) Galling of sliding part due to lateral load.	Replace the rotary joint. Keep the lateral load within allowable radial load. (P.2 Specification)
		3) Galling of sliding part due to the rotation impact of power transmission.	Replace the rotary joint. This rotary joint can not be used as a bearing for transmitting power from a drive source such as a motor. (P.7 Precaution)
Air leakage	Air leakage to naighoring port more than allowable lekage(P3).	**1) Galling of sliding part Increased rotation resistance. This leads to wear out fixed O ring due to sleeve rotating.**	Replace the rotary joint. Refer “Rotation failure” above.
		2) Galling of sliding part increased rotation resistance. This applies excess load to gasket, and gasket is displaced.	Replace the rotary joint. Refer “Rotation failure” above.
Breakage	Parallell pin of adapter plate is damaged	**2) Failure due to excess load and the rotation impact of power transmission.**	Replace the rotary joint. This rotary joint can not be used as a bearing for transmitting power from a drive source such as a motor. (P.7 Precaution)
		2) Failure due to excess load caused by galling of sliding part.	Replace the rotary joint. Refer “Rotation failure” above.

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

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