

Please read the following information on the general handling precautions carefully before placing orders for the products.

Following information is prepared based on a risk assessment for KONAN solenoid valves for general fluids, represented by MAGFLOW series products (hereinafter referred to as MAGFLOW solenoid valves or solenoid valves). Please read through the information carefully, because it describes important matters indispensable to secure safety to human body and safe and trouble-free operations of systems.

Safety Precautions

References:

JIS B9702: Safety of machinery-principles of risk assessment
JIS B8570: Pneumatic fluid power-general rules relating to systems

Warning

MAGFLOW solenoid valves are the control valves to increase/decrease fluid pressure, shut down or switch the flow of fluid to the intake or exhaust direction, etc. based on electrical inputs. These control valves are used widely in general systems that use various kinds of fluid. When using MAGFLOW solenoid valves, take notice particularly on the following items.

① Selecting models of MAGFLOW solenoid valve

1.1 Fluids applicable to MAGFLOW solenoid valve

When kinds of applicable fluid are designated in the specifications of solenoid valve, no other fluids may be used. When selecting a solenoid valve, take note also on the following matters.

- High pressure gas
Every solenoid valve used at a gas pressure of 1 MPa or higher is subject to the High Pressure Gas Security Law in Japan. As MAGFLOW solenoid valves do not meet the Law they cannot be used in this range. The Law does not apply when a fluid is supplied from an air or nitrogen gas compressor under the pressure not exceeding 5 MPa.
Note:It is not exempted from the application of the Law when a fluid is supplied from a transportable container.

- Materials
Materials of solenoid valve vary depending on the kind of fluid. Select materials of the main body (metal) and the seal from the guide for material selection in the catalogue. When your fluid is not found in the catalogue or if you may have any question, inquire to our Sales Department.
Note:You may not use the solenoid valves without confirming the compatibility with applications.

- Fluid temperature
Select a solenoid valve of which the insulation class of coil and the maximum fluid temperature relative to the ambient temperature do not exceed the specifications shown in the explanation of terminology in the catalogue.

- Fluid viscosity
When applicable fluid viscosity is not specified, the solenoid valve may be used when it is less than 65 mm²/s (cSt). Depending on the kind of fluid, this value may be exceeded in a low temperature range. In such occasion, it is necessary to maintain temperatures using a heater, or the like.

- Dangerous fluid
When handling any toxic, flammable or other hazardous fluid, select a solenoid valve of which the leakage (internal, external) falls within the permissible values. Amounts of leakage are found in the catalogue or the instruction manual. If you may have any question, contact our Sales Department.
When using any gas other than air in an enclosed room, even if the gas is not toxic, sufficient care must be taken on the risk of suffocation.

- Corrosive gas
When the fluid contains gases such as SO₂, H₂S, Cl₂, NO₂, etc. which could corrode metals, it could cause stress corrosion cracks not only on the surface but also internally. The solenoid valve cannot be used for such fluid.

- Contaminant particles
When solid particles, oil particles of higher viscosity, or the like, are contained in the fluid, it could cause wear, malfunction or leakage on the solenoid valve. The solenoid valve cannot be used for such fluid unless it is filtered sufficiently. When employing a filter, prepare a filter having the nominal filtration rating of less than 150µm, and install it at the inlet side of the solenoid valve.

- Oil inhibiting treatment and lubrication
When it matters the contamination of fluid by the lubrication oil used on the solenoid valve, the solenoid valves may be processed with the oil inhibiting treatment (oil removal). For further details, contact our Sales Department.
In case when using without lubrication a solenoid valve for gas, which needs lubrication owing to its construction, it may increase the divergence of oil like mist or evaporation of oil in a highly dry gas (highly dry air with the dew point at lower than -40°C,

or other), resulting in an early shortage of lubrication. In such occasion, the situation may be improved by using a kind of grease, which is adapted to highly dry applications. Consult our Sales Department for further details.

- Drain
Solenoid valves for steam or pneumatic pressure may not operate properly where a profuse drain may accumulate within the circuit. The solenoid valves cannot be used at such places. It is recommended to use them at places where there is no accumulation of drain or where drain can be separated or discharged securely by means of a drain trap or auto drain.
In case of solenoid valve for steam, it is desirable to take measures such as the low temperature steam purge, etc. in order to short cut the temperature rising time of solenoid valve. When air is supplied from a compressor, the air is in high temperature so that it is likely to generate drain if air is cooled at a far end. It becomes necessary to provide an after-cooler or air dryer at the exit of compressor in order to remove water or moisture effectively.
- Water hammer
Where excessive surges of pressure, like the water hammer, occur, the solenoid valve may be damaged or its life could be reduced. The solenoid valve cannot be used where pressure surges occur frequently.
It is necessary to install an accumulator such as a water hammer arrestor, etc. to eliminate the pressure surge.

- Safety of solenoid valve
Sources of risk on a system are found not only on the devices in use but also in the operating conditions or system configuration. When selecting a model of solenoid valve, it is necessary to take into consideration not only the device as a separate unit but also the safety in all circumstances, including the installation, adjustment, regular operation, trouble, disposal, or other.

- Application as an emergency shut-off valve
Magflow solenoid valve is not designed as a valve to secure safety as required for an emergency shut-off valve, or the like. It cannot be used as an emergency shut-off valve.
- Sealing of pressure
Since the solenoid valve is designed to allow some leakage in use, it cannot be used to such applications as an installation on a pressure vessel, including vacuum, which needs to maintain the pressure at a constant level for an extended period of time.

- Safety of electrical section
The solenoid valve switches its functions using a solenoid (electromagnet). When selecting a model and electrical options for the solenoid, it is necessary to take into consideration the following matters same as other electrical devices.

- Dustproof/waterproof – Classes for waterproof, or other, are marked in accordance with JIS C0920.
- Sudden interruption of power supply (Power failure, emergency stop)
- Voltage fluctuation on the power supply section and intrusion of electric surge
- Leakage current at the time of PLC (sequencer) output OFF
MAGFLOW solenoid valves are not adapted to the following conditions, which are peculiar to the installation site. It should be refrained from the use under these conditions or provide a power distribution system provided with safety measures.

- Influence of external magnetic field
- Bypassed electric current from related control circuits
- Induction voltage caused by thunderbolt

- Pilot type solenoid valve
Pilot type solenoid valves on which the main valve is switched with the output pressure from a small pilot solenoid valve are used generally because it can be operated with a small size device

should be taken to assure the safety in all aspects of maintenance work.

- Communication
When conducting any work as a group, every member must be informed clearly at such occasions as the shut down of power supply, completion of residual pressure discharge, resumption of power or air supply.

④ Place to use the solenoid valve

When installing a solenoid valve at any of the following places, some special adaptations are necessary in terms not only of the compliance to the functional specifications but also to laws or regulations. If you have any question, consult our Sales Department at the phase of planning.

- Special application conditions not referred to in the catalogue
- When any material risks are foreseen to people, assets, environment, or other
Example:Explosive atmosphere²⁾, nuclear engineering facilities, vehicle, medical equipment, equipment related to the Occupational Health and Safety Law or the High Pressure Gas Security Law, etc.

Note2:Various explosion-proof solenoid valves are available from our products line for applications in general gas explosion inflicting atmosphere.

periodically check the tightened sections to avoid loosening or deform of screws, and retighten as required.

- Handling during installation
Do not stand on the solenoid valve or the piping, or hook the wires on the devices used for the work during installation.

- Atmosphere
Take care of the atmosphere at the installation place. Avoid places where it is exposed to rain, wind, direct sunlight, salt damage, corrosive gas, chemicals, organic solvent, steam, etc. We have some anticorrosion measures for certain kinds of atmosphere. Consult our Sales Department for details.

- Operating temperature
Restrict the ambient temperature and the fluid temperature within the specified operating temperature ranges. Special attention is called for regarding the following cases.

- Life of coil varies depending on the thermal deterioration of insulation. High temperature environment and continued operations with power on should be avoided as much as possible.
- Application under low temperatures
Where the temperatures drop to 5°C or under with possible freezing, use insulation materials and a heater. For the details of optimum ranges of ambient and fluid temperatures, refer to the catalogue.
- When using the pneumatic pressure, air temperatures may rise considerably at the vicinity of air compressor, causing the thermal deterioration on the solenoid valve packing or troubles owing to difference of the thermal expansion between parts.

- Modification
Do not modify in any event the solenoid valve because it could cause risks that cannot be foreseen during designing.

- Stop of pneumatic cylinder on the way by the solenoid valve
Since minute leaks are permissible at the sealed sections in the solenoid valve and the cylinder, it is difficult to stop the cylinder on the way for a long time. If it is indispensable, a mechanical retaining device like a brake, lock or latch should be installed.

- Spray lubrication by a lubricator
When started to use a solenoid valve with the lubrication specification, continue the lubrication.

- Types of lubricant
1) Use JIS K 2213 Turbine oil VG32 or VG46 as the lubricant for the lubricator.
2) Check the lubrication quantity by the lubricator by the number of oil drops. One drop is about 0.03 cm³. Standard quantity is 1.5 - 2.5 drops per 1m³ of air.
3) When solenoid valves of respective specifications have been disassembled and inspected, assemble the parts after applying specified greases. Consult our Sales Department for any

and small power. Since these valves cannot operate unless there is a differential pressure larger than certain level between the entrance and exit ports, it is recommended to select a direct-acting type solenoid valve when it is necessary to control a minute pressure.

In case of 3-port solenoid valve, since it cannot operate unless there is a differential pressure larger than certain level between the entrance and exit ports, the backpressure at the exhaust port affects its operation. Although there is no problem if the backpressure is in the size that could occur at the silencer of exhaust port, it is prohibited to choke the passage of exhaust flow too much or connect a long pipe to the exhaust port. Details on the influence of backpressure are described in individual manuals. If there is any question, consult our Sales Department.

- Reverse flow
Install a solenoid valve in accordance with the direction indicated with arrow at the JIS's graphic symbol in the catalogue or manual. Operations of the solenoid valve cannot be guaranteed when it is used under the condition of backpressure or reverse flow. There is no problem with a slow reverse flow as experienced during maintenance or when the pump or compressor is stopped.

A failure may occur if the valve body stays at an intermediate position when resuming operation after a stop under an abnormal condition. When a reverse flow occurs at the stop or if there is any question concerning the start after an abnormal stop, consult our Sales Department.

- Manual operation
When a solenoid valve allows a manual operation and has a lock for operating position, make sure to release the lock after the manual operation.

② Installing Magflow solenoid valve

Although the solenoid valve is an accurate operating device, there are great varieties in the purpose of use, operating conditions and environment. It makes us difficult to presume all of related risks (causes) at the stage of designing. Depending on situations, the solenoid valve may lose its functions or capacities earlier than the maintenance and inspection intervals as designated by us. In order to avoid such situations, install the solenoid valves as described below.

- Space
Select a place convenient for installation or maintenance. Since many solenoid valves are retrofitted to the main equipment, consideration for their maintenance is likely sacrificed. Make sure to secure a sufficient space to assure the safety.

- Check method after installation
When driving an actuator like pneumatic cylinder with a solenoid valve, start the actuator with a small load and under slow speed condition, after installing the equipment and pipes, and then bring it gradually to the rated operating condition while checking movements of solenoid valve and actuator to see if there is any abnormality or air leakage.

- Sudden projection of pneumatic cylinder
After the installation or maintenance, confirm that the cylinder is at the same position as the control (target) position of solenoid valve, before recharging air. If they are not matched, the pneumatic cylinder may move suddenly toward the control position. In order to prevent the risk of unmatched positioning, it is recommended to install a slow start valve at the IN side of solenoid valve.

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Note:In relation to the paragraph 2.4 below, when installing a slow start valve at the IN side of pilot solenoid valve, adjust the bypass valve of slow start valve in such a manner that the minimum differential working pressure of solenoid valve is maintained. If the bypass valve is choked too much, the supply pressure to the pilot of solenoid valve becomes smaller than the minimum differential working pressure and, as a result, it could malfunction the solenoid valve.

- Securing the pilot pressure
Install the pilot solenoid valve, taking care of the following points.
1) Adjust the inlet pressure of solenoid valve at higher than the lower limit of working pressure. When the allowance at the air source is limited, particularly, it may go below the lower limit value of working pressure owing to the fluctuation of pressure during operation.
2) When a very long pipe is connected to the IN side of solenoid valve or when using a pipe of which diameter is smaller than

questions concerning the type of grease. Solenoid valves, which are fabricated with the oil inhibition specification, cannot be disassembled for inspection. If it is necessary to disassemble, ask for the inspection and service of solenoid valve to our Sales department.

Reference Control of pneumatic system

- Sequence control
Sequence control of an actuator assembled with a solenoid valve that uses compressed air should be performed as follows as much as possible.

- Move to next step after detecting the position.
- Apply the interlock on the electric circuit of solenoid valve, which controls any actuator other than the one that is used for the present step.

- Power failure or fault on air source
1) When the solenoid valve has been stopped by the emergency stop on the way of sequence as a result of power failure or interruption of power supply, select the normal (pause) position of solenoid valve in such a way that the cylinder for the present step stops or goes to the safe position.

- When the solenoid valve has stopped on the way of sequence, if it is dangerous to restart from the position, return it to the start position orderly by operating the actuators individually. Further, indicate the reset procedure clearly.
- When the solenoid valve has stopped on the way, if air in the piping is bled, the cylinder may drop by the gravity or start to move suddenly when the air supply is resumed, resulting in physical or mechanical damage. Make sure to return to the start position first and then bleed air.

- Give an allowance to the air tank capacity such that, even if the air source has failed on the way of cycle, remaining work can be completed.

Warning Exhaust of residual pressure

On a circuit incorporating a check valve and a pilot check valve, it may fall in the state that air is charged. When any risk by the residual pressure is suspected, provide a residual pressure relief valve at the corresponding position to release the pressure individually or provide an indicator for warning of residual pressure. On the circuit diagram of such system, indicate that there is a manual valve for the residual pressure exhaust valve.

Reference Circuit and piping

- Pressure drop
If a pneumatic device has a long pipe at the terminal or inlet of factory piping, necessary pressure may not be supplied to the device as a result of pressure drop on the pipe. It is necessary to secure a proper supply pressure to the device by producing a proper design of piping at the phase of planning or providing an auxiliary air tank, if the solenoid valve operates intermittently.

- Air filtering
Remove solid contaminants from the air supplied to the solenoid valve by feeding the air through a filter with the nominal filtration rating of 40µm or under. Cool the air sufficiently to remove drain or oil in the state of liquid through a filter or drain separator. If the packing or other parts are exposed to contaminated and high temperature compressed air, the life of product could be reduced extremely as a result of deterioration.
Steam generated by a boiler contains a lot of drain. Always install a drain trap.

- Piping work
1) Select pipe materials depending on the fluid, and make sure to remove burrs produced by the thread cutting. When using the air pressure, always use white (galvanized) steel pipes.

- Blow with air (flushing) or cleanse the inside of pipes to remove dust, moisture or oil before connecting them.
- When wrapping the seal tape around the seal of threaded end of pipe, wrap the tape leaving 1.5 - 2 threads from the end of thread by 2 to 3 turns in the direction opposite to the screwing direction for the air pressure or 4 to 5 turns for the oil pressure.
- When screwing a pipe or joint in the solenoid valve, tighten it with a wrench of adequate size as much as no fluid will leak from the threaded section. Avoid tightening it forcibly. Otherwise, it may crack the pipe connecting port of solenoid valve or cause a leakage or malfunction by the contamination with torn chips of sealing material.

- When screwing in a pipe, joint, or other, screw in by 4 to 5 threads for 6A - 25A (Rc1/8 - Rc1). It is recommended to practice the wrapping with the seal tape and screwing in procedure before the actual work.
- Fix the solenoid valve (large one, particularly) with a special

the port, the inlet pressure drops as a result of pressure drop associated with the flow.

Note:When ending the work after feeding a given volume of air, it is effective to install an auxiliary tank next to the inlet port for the prevention of pressure drop. Install a pressure gauge at the vicinity to confirm that the inlet pressure did not drop.

- Indication
When installing a solenoid valve where it is impossible to see the nameplate, provide a substituting indication where it can be seen easily.

- Using a solenoid valve for extended period of time
After operating the solenoid valve for a long time, the solenoid becomes very hot as much as it cannot be touched by hand as the temperature on the coil rises. This is normal for a solenoid valve. Avoid touching it carelessly after operating for an extended period of time because it could burn the hand.

- Residual pressure
Even after shutting down the power supply to the system or solenoid valve, the fluid pressure or fluid may not be discharged from the system. Since the residual pressure could cause unexpected movements of cylinder, sufficient care must be taken on the risk of bursting residual pressure even during the installation, in addition to other risks.

- Exhaust
When discharging the fluid from the exit or exhaust port of solenoid valve, a jet with the velocity of sound at the maximum could blow out. The jet causes hazard by noise or other physical injuries by the jet itself and fragments or dust dispersed by the jet. Where someone may approach the exit or exhaust port, make sure to install a silencer in order to suppress noise and control the fluid.

- Training
When installing a system or conducting the maintenance services as referred to below, only personnel who have sufficient experience and knowledge must be allowed performing the job. (We provide some training courses for handling pneumatic devices.) If there is any question, consult our Sales Department.

③ Maintenance of Magflow solenoid valve

Maintenance should be performed as described below. If any individual manual is necessary, consult our Sales Department.

- Daily inspection
1) When the fluid is compressed air, the condensed water (drain) in the system could disrupt the operation of solenoid valve because the water contains impurities in the piping. Install a filter at the IN side and drain the water once every day.
2) While the equipment is operating, check visually the solenoid valve for any abnormality or any abnormal operating sound by hearing. If necessary, while the flow of fluid is stopped, inspect screws on the solenoid valve for looseness. If any internal or external leakage is observed from the exit, exhaust port or pipe joints, conduct the periodic inspection and repair as required.
3) With solenoid valves for high temperature fluids like steam, etc., the main body of solenoid valve also becomes extremely hot. If touched carelessly, burns could result. While the equipment is running, observe the solenoid valve for any abnormality in appearance visually or abnormal operating sound by hearing. If necessary, while the flow of fluid is stopped and after confirming that the valve cooled down sufficiently, inspect screws on the solenoid valve for looseness. If any internal or external leakage is observed from the exit, exhaust port or pipe joints, conduct the periodic inspection and repair as required.

- Periodic inspection
Perform the following periodic inspection once every half or full year.
1) After shutting down the power supply and the pressure source, disassemble the solenoid valve. Carefully inspect respective parts, record if any abnormality is discovered and repair them as required.
2) During the periodic inspection at the second year, disassemble and inspect the product. Repair necessary sections. Solenoid assembly, coil, packing and some other parts need to replace periodically. Replace components of which lives have expired. Even if it is less than 2 years, if the solenoid valve has run out the durable operation cycles¹⁾, which are specified for individual solenoid valves, disassemble, inspect and replace parts as required.

Note1: [Example of the durable operation cycles at laboratory]
YS30, YS33 Series :2 million cycles
YS20, YS21 Series (20A or under) :1 million cycles
YS20, YS21 Series (20A or over) :0.5 million cycles

The cycles listed above are obtained under the test conditions specified by us. For parts like diaphragm, etc., users are encouraged to determine optimum inspection intervals depending

support because it is insufficient to support with the piping only. For a smaller solenoid valve connected to steel pipes may be supported with the piping but the pipes should be supported securely with pipe clamps, or the like, at positions closer to the valve.

Caution Electric circuit and wiring work

- Confirm that the voltage values and the alternate current (AC)/ direct current (DC) are matched between the power supply and the solenoid valve.
- When a TRIAC is used at the AC output of PLC (sequencer), the leak current at the time of OFF may influence the operations of solenoid or indicator lamp. In such occasion, contact the PLC maker or our Sales Department by presenting the output specification of PLC to inquire for a method to reduce leak current.
- Electromagnetic induction surges produced at the cut OFF of power supply to the solenoid extremely reduce the life of contactors, etc. on the electric circuit. For our solenoid valves without the surge absorber, install a surge absorber, or include the surge absorber in your required specifications when placing your order.
- When lead wires are connected to the solenoid valve, support the lead wires after giving some allowance in the length and connect using appropriate connecting terminals. When using conduit tubes, connect wires with care not to exert an external force to the housing, support the conduit tube at a position close to the valve to protect the threaded section of conduit tube on the housing from external force.

Caution Special solenoid valves

When you need any solenoid valve of special specifications, consult our Sales Department by presenting the operating conditions.

When the fluid does not allow the contamination of flow passage with oil, we can fabricate the inside of solenoid valve with the oil inhibiting specification. If there are any other special requirements on the solenoid valve, consult our Sales Department.

- Fluid not included in the guide for selection
- Applications in a high/low temperature environment or high heat radiation environment
- Applications where there are problems related to ozone or salt damage
- Explosive atmosphere

Warning Disposal

- Dispose the solenoid valves without incineration. If they are thrown into fire, they may explode or generate toxic gases.
- When disposing solenoid valves after sorting, sort the parts based on the materials as listed in the catalogue or instruction manual. The solenoid valve does not contain any materials not classified as general industrial waste.

Users Instructions

This section provides general precautions concerning the solenoid valve and equipment on which the solenoid valve is assembled. It is indispensable to observe them as well in order to assure a sufficient safety.

Caution Transportation

- Weight
For the safety of operators, use appropriate tools and machinery positively, without relying solely on the human power, when carrying a heavy large size solenoid valve or solenoid valve unit. Weight of solenoid valve is found in the catalogue and the design documentation. On the contrary, small size solenoid valves are so fragile that they may be damaged by excessive human power if due cares are neglected. It is strictly prohibited to carry a solenoid valve by holding the lead wires.

- Dropping
When loading, unloading or moving around a solenoid valve, take care to hold securely not to drop it.

Caution Storing

- Storage during transport
When installing a solenoid valve at a place exposed to rain or wind or in an inferior atmosphere, deliver it to the site just before the installation. When it is obliged to store for some time at the installation site, do not unpack the contents and cover the package with a sheet, or the like.

- Storing place
Store the solenoid valve as follows to protect it from contamination or deterioration of materials.
1) Avoid a place exposed to high temperatures or humidity, and select a clean place free from dust.
2) When storing a solenoid valve as a spare component for more than a year, store it in the shipping package or after providing equivalent protection.
3) When it has been stored for more than a year, the packings may be stuck due to lack of lubrication. Practice a running in before using it.
4) As the storage period extends, the packings are likely to receive the permanent deform, dimensional change or deterioration. It is necessary to check the operating condition of solenoid valve occasionally and, if any abnormal condition is observed, it should be disassembled, inspected. Replace any deformed or deteriorated parts.

Warning Installation environment

- Vibration, impacts
1) Install a solenoid valve separated from sections subject to excessive impacts or vibration by hoses or pipes. However, if an unnecessarily long pipe is connected at the exit side, it affects the system's response adversely.
2) When it is forced to install the solenoid valve at a place receiving excessive impacts or vibration, install it by way of a damping pad, or the like. Also apply a locking means to mounting screws to fix/tighten them securely. After starting operations,

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