

# Technical Note

## R-Series Gate Valve

### Preventing Out-of-Sequence Actuation with Lockout/Tagout and Position Indicators



#### OVERVIEW

The gate valves on subfab roughing pumps are often configured with manual actuators that can be unintentionally opened or closed by the actions of operators or by pump vibration. Should this happen, it will negatively impact the process, resulting in the production of out-of-spec product. Under certain conditions, it can even result in damage to process equipment. An effective solution is needed to prevent unintended valve actuation.

#### INTRODUCTION

The correct sequencing of the opening and closing of the gate valve on the subfab roughing pump is critical for optimal process results. Improper sequencing of this valve can result in significant, rapid, and unwanted changes in process pressure that yield unpredictable process results and gas flow turbulence that produces high defect counts on in-process substrates. Equally important is the pressure shockwave created when a roughing pump gate valve opens at excessively high process pressures or the pressure rise that occurs with an out-of-sequence closure of the gate valve while there is significant gas flow; both can seriously damage delicate and expensive components in the process tool (e.g., pumps, mechanical components, UHV gauges).

These gate valves can be accidentally or mistakenly actuated in various ways. Operating personnel in the subfab may actuate a manually controlled valve, either unintentionally or by mistake. A pneumatic valve can be improperly opened or closed by an incorrect tool command. As well, some users have reported that manual gate valves with rotary wheel actuators can slowly close due to the action of pump vibrations.

Because of these issues, it is important that the gate valves on subfab roughing pumps have a means of mechanically locking the valve in the open or closed position to prevent accidental out-of-sequence activation. Additionally, manual gate valves must be configured so that the valve position cannot drift in high-vibration environments. Finally, both manual and pneumatic gate valves require position indicators that transmit the position of the valve to the user (either plant operators or automated process control systems).

#### PREVENTING UNINTENDED ACTUATION

MKS R-Series Gate Valves are designed for use with roughing pumps. The manual and pneumatic actuators on the R-Series Gate Valve can be configured with lockout/tagout (LOTO) and position indicator options that prevent unintended actuation by either plant operators or automated process control systems. The manual valves are equipped with a linkage system that eliminates any potential for valve position drift due to vibration.

#### SOLUTION

##### Lockout/Tagout

##### Prevents unintended or accidental actuation

- Both manual and pneumatic valves can be physically locked in position (open or closed) using a standard padlock.
- When a command is sent to a pneumatic valve, the LOTO feature prevents actuation.
- Manual valves must have the lock removed by hand before the valve can be actuated.
- LOTO is standard on all R-Series manual gate valves and optional on R-Series pneumatic gate valves.

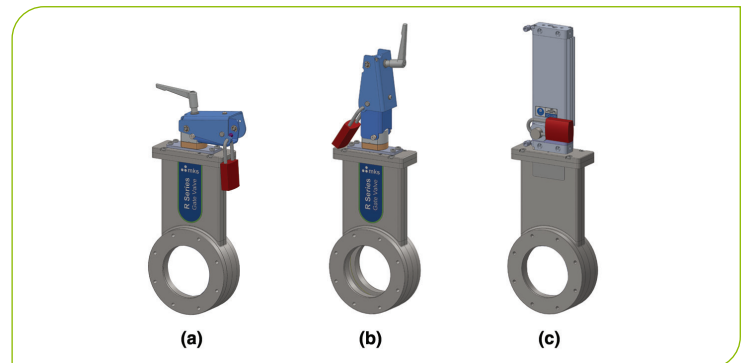


Figure 1

MKS R-Series Gate Valve (a) Manual valve, LOTO closed; (b) Manual valve, LOTO open; (c) Pneumatic valve, LOTO closed. In all cases the lock shown in red must be removed for valve actuation.

##### Valve Linkage System

The MKS R-Series manual gate valves are designed to soft-lock “over the center” when in the open position. This prevents valve closure due to pump vibrations. LOTO can be used as a back-up to ensure that the valve remains in open or closed position.

## Position Indicators

- MKS R-Series Gate Valves offer open/close position indicators for both manual and pneumatic gate valves.
- Position indicators provide immediate visual or electrical indication of the valve position. Any changes in valve position are immediately known to the operator (visual) and the control/interlock system (electrical).

## Pneumatic Valves

Position indicators for pneumatic valves provide an electrical signal that reports the valve position to the automated process control system.

Pneumatic R-Series Gate Valves use two magnetic reed switches that make contact when the valve is in the open or closed position. The user can wire the signal to their control system. The valve is provided with flying leads. There is also a visual LED on the reed switches for visual confirmation of valve position.

## Manual Valves

The position of the LOTO padlock provides a clear indicator of valve position for manual valves.

Manual R-Series Gate Valves use two mechanical switches that make contact when the valve is open or closed. The user can wire the signal from these switches to their control system. The valve is provided with flying leads. There is no LED on the manual valves. The position of the valve is clear from the lever position.

## SUMMARY

Unintentional and accidental gate valve actuation on subfab roughing pumps, whether by operator error or mechanical (i.e., vibration) means, constitutes a serious process and safety problem in most fabs. The lockout/tagout feature of the MKS R-Series Gate Valve prevents unintended or accidental actuation by either operators or system vibration. Additionally, the R-Series Gate Valves combine LOTO with mechanical or electrical valve position indicators that further enhance process reliability and safety.

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Learn more about the [R-Series Gate Valve](#) from MKS.

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