Introduction

A dry-reed switch can be defined as an assembly that contains two ferromagnetic NiFe contact blades, hermetically sealed in a glass envelope and filled with an inert gas. The inert gas atmosphere protects the contact resistance of the reed switch, which is one of its most important electrical performance characteristics. The inert atmosphere is maintained by the integrity of the critical glass-to-metal seal of the switch. This seal is defined as a “residual stress seal,” which means that the seal is sensitive to handling. When properly made, this seal with maintain the inert gas atmosphere of the reed switch for a minimum of thirty (30) years. However, improper handling of the switch and the application of excessive mechanical force during modification of the switch leads may result in a loss of the seal hermeticity. If damage is caused, it might be immediately visible as a glass crack in the seal area with or without the evidence of chipped glass particles. Or a latent defect may be created that will deteriorate the seal hermeticity over time due to the residual stress of the seal being altered through the improper application of a mechanical force. Once the seal integrity is compromised, atmospheric oxygen and other contaminants will degrade the contact resistance and the life expectancy of the switch will be severely impacted.

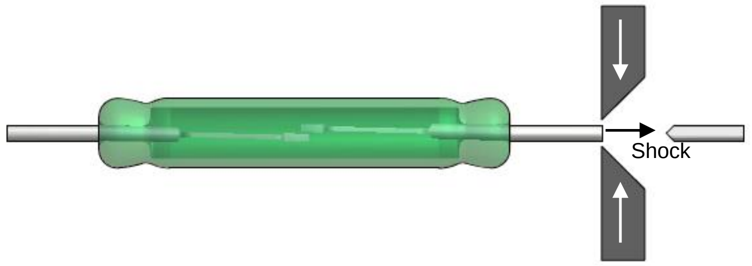
Switch Lead Modification Recommendations

It is recommended that the lead bend of switches be no less than 1.0 mm from the glass seal to prevent cracking of the seal or destruction of the residual stress within the seal. For applications requiring the bending, cutting or modification of the switch leads, it is advisable to contact Comus Technology BV to achieve an optimal solution.

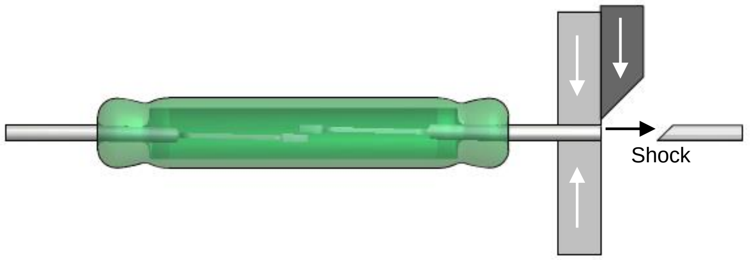
Achieving an Optimized Switch Modification

The glass seal has a very high resistance to pressure, but a low resistance to pull forces. The ability of the seal to properly withstand a switch lead modification is dependent on several factors: the relation of the wire-to-glass dimensions, the length of the seal, the pull force or type of modification to be performed, and the distance and direction of the mechanical force in relation to the seal itself. Therefore, the proper support and clamping of the leads is necessary to avoid damage to the seal. Even then, the plastic deformation strain of the NiFe lead wires can be transmitted through the clamping area and into the seal. Depending on the combination of the force and the distance of the clamping area to the seal, damage may still result.

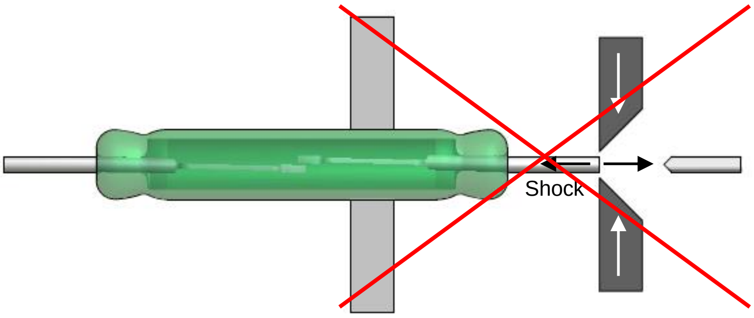
In the following figures, a cutting example is given.



Above an example of lead modification without any clamping of the switch. While in this case, it is impossible to build up stresses where small dimensions and tight tolerances are required, this is not a practical method.

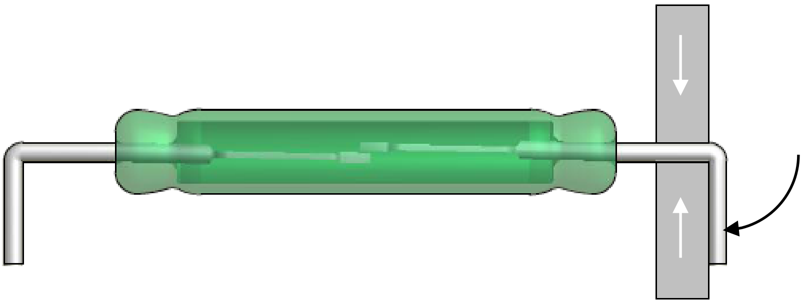


Above an example of a properly clamped lead to avoid improper stresses.

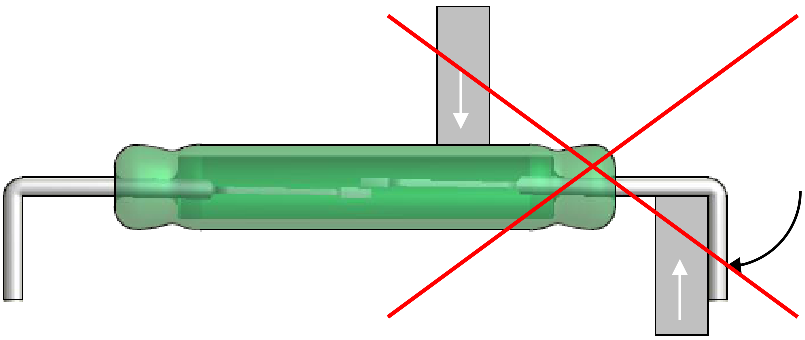


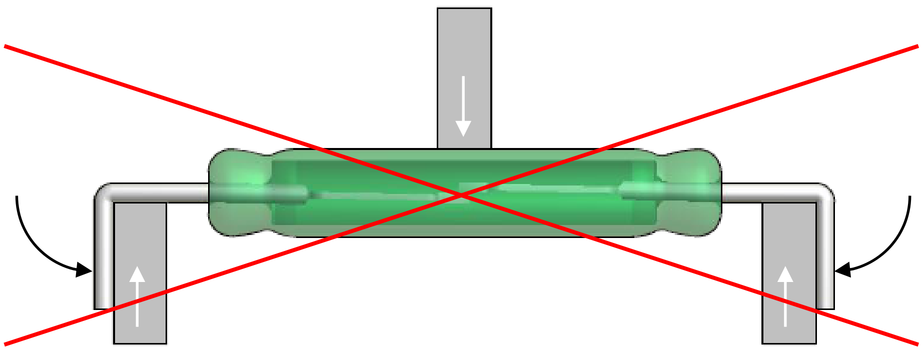
Above demonstrates the creation of a stress component in the direction of the seal, which is the result of clamping the glass body. This is an unacceptable method of modification.

In the following figures, a bending example is given.



The Figures above and below illustrate bending of the leads. Improper lead bending can be even worse than only cutting. The risk of plastic deformation strain in the NiFe wire leads is very high. Thus, supporting or clamping the lead wire is necessary to avoid damage of the glass seal.





Any form of bending, cutting or modification of the switch leads requires appropriate tooling and fixturing to minimize the introduction of mechanical stress on the glass seal area. Many years of experience has proven that switch damage can be avoided when lead modification is required by proper fixturing and the avoidance of any modification less than 1mm from the glass seal.