

# Sleeve and Washer Sets

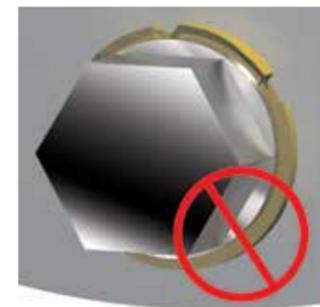


Lamons sleeve and washers sets, when combined with our sealing/isolation gaskets, complete a Flange Isolation Kit. For a successful flange isolation kit, it's critical to use the appropriate material for your application. Compressive strength, flexural strength, and cut through resistance are key material physical properties that should not be over looked.

### Washer Design Specifications:

Available for bolt sizes = 1/2" (12.7mm) to 2 3/4" (69.85mm)

- Steel and Isolation Washers are designed with the same O.D. and I.D.
- Steel and Isolating washers are 1/8" (3.18mm) thick.
- Steel and Isolating washers are designed to fit over isolating sleeve material.



Steel back-up washers need to be supplied with the same O.D. and I.D. as the isolation washer. This graphic illustrates a steel back-up washer and phenolic isolation washer with different O.D and I.D. sizing. The compressive load from the steel back-up washer is not equally distributed over

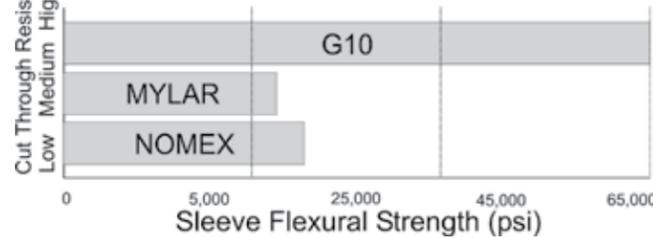
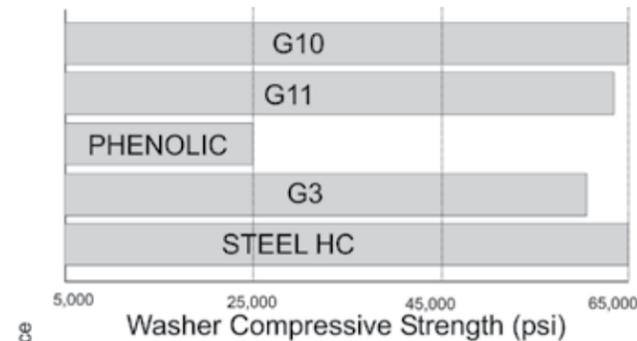
the phenolic washer, causing the phenolic washer to crack. If this occurs, the gasket may not receive proper load and electrical isolation will most likely be lost.



### Single Washer Set (per bolt/stud)

- (1) ea. 1/8" {0.125"} (3.18mm) thick Steel ZP Washers
- (1) ea. 1/8" {0.125"} (3.18mm) thick Isolating Washer
- (1) ea. Isolating Sleeve

"FIK 101": Generally, single washer sets are used for buried applications and may be used to allow the Cathodic Protection (CP) current to reach the nuts and bolts/studs. If desired, the nuts on the opposite side of the cathodically protected flange may be included as part of a Cathodic Protection System.



### Double Washer Set (per bolt/stud)

- (2) ea. 1/8" {0.125"} (3.18mm) thick Steel ZP Washers
- (2) ea. 1/8" {0.125"} (3.18mm) thick Isolating Washers
- (1) ea. Isolating Sleeve

"FIK 101": Generally, double washer sets are used for applications, where added protection is needed against the possibility of "shorting out" the nuts and bolts. For complete electrical isolation, double washer sets isolate the nuts and bolts from both flanges.

# Sleeve and Washer Sets



## Lamons Sleeves - Material Physical Property Specifications

ASTM	Test Method	Mylar	G10	Nomex
D149	Dielectric Strength Volts/Mil Short Time	4,000	750-800	600
D570	Water Absorption (%)	0.80	0.05	7.00
D790	Flexural Strength (psi)	13,000	65,000	18,000
	Cut Through Resistance	Low	High	Low
	Temperature - Operating	-75°F (-59°C) to 302°F (150°C)	Cryogenic to +302°F(+150°C)	-65°F (-54°C) to +450°F (+232°C)

## Lamons Washers - Material Physical Property Specifications

ASTM	Test Method	G10	G11	Phenolic	Steel (HC)	G3
D149	Dielectric Strength Volts/Mil Short Time	750-800	550	500	800	500
D695	Compressive Strength (psi)	65,000	63,000	25,000	65,000	55,000
D570	Water Absorption (%)	0.05	0.10	1.60	N/A	1.00
	Temperature - Operating	Cryogenic to +302°F (+150°C)	-100°F (73°C) to +392°F (+200°C)	-65°F (-54°C) to +220°F (+104°C)	Cryogenic to +356°F (+180°C)	-100°F (-73°C) to +392°F (+200°C)

### Isolating Washers (G10, G11, Phenolic, G3, Steel HC)

Lamons isolating washers are designed/manufactured to have positive isolation characteristics and provide excellent compressive strength.

### Steel Washers/HC Washers

HC - Hardened 1050 steel with proprietary isolation coating has excellent dielectric properties and withstands UV. It's also abrasion resistant and will not break under compressive loads. They combine the technical features of steel into an isolating washer.

### Steel Back-Up Washers/ZP Washers

ZP - Zinc Plated 1050 carbon steel washers are used as our standard steel back-up washer when kitted with retainer washers and isolating sleeve material. **Note:** 304 stainless steel available for special order.

### Sleeve Design Specifications:

- Sleeves are designed to fit over standard bolts and studs for flanges.
- Wall Thickness = 1/32" {0.031"} (0.79mm)
- Wall Thickness Tolerance = 0.015" (0.380mm)
- Available for bolt sizes = 1/2" {0.5"} (12.7mm) to 2-3/4" (69.85mm)
- Sleeve length is designed to pass completely through the isolating washer and halfway through the steel washer for cathodic protection and isolation.

### Isolating Sleeves (G10, Mylar, Nomex®)

Lamons isolating sleeves are designed/manufactured to fit over standard size flange fasteners (bolts/studs) with standard size bolt holes.

### Bulk Sleeve and Washer Material

Lamons will provide washers in bulk quantities of 100. Sleeve material may also be purchased in bulk and is shipped and supplied in the lengths shown in the chart. **Note:** It is suggested that bulk sleeve material be cut in a controlled environment. If cutting in the field, installers should be well versed in determining appropriate sleeve length and have experience with cutting.



HC washer with ZP steel back-up washer bolted to washer test block. Megger isolation test unit confirms full 200G Ohm isolation at 1000V.



Sleeve Material	Length
G-10	4 Feet
Mylar	6 Feet
Nomex®	6 Feet

# Sleeve and Washer Sets



Lamons Standard Packaged Sleeve/Washer Sets. These sets have been selected from specification use and what the industry has installed on a consistent basis over the years for flange isolation and cathodic protection.

Single/Double choice is indicated after Packaged Set choice: **S = Single D = Double**



**E = Economy**  
Mylar Sleeves, Steel ZP Washers and Phenolic Washers (Double Washer Set Shown, Single Washer Sets Also Available)



**V = Value**  
Mylar Sleeves, Steel ZP Washers and G10 Washers (Double Washer Set Shown, Single Washer Sets Also Available)



**S = Standard**  
G10 Sleeves, Steel ZP Washers and G10 Washers (Double Washer Set Shown, Single Washer Sets Also Available)



**Model F = Fire**  
G10 Sleeves, Steel HC Washers and Steel HC Washers (Double Washer Set Shown, Single Washer Sets Also Available)



**T = High Temperature**  
Nomex Sleeves, Steel ZP Washers and G3 Washers (Double Washer Set Shown, Single Washer Sets Also Available)



**Model TF = High Temperature Fire**  
Nomex Sleeves, Steel HC Washers and Steel HC Washers (Double Washer Set Shown, Single Washer Sets Also Available)

**XX = Customer Specified**  
Customer Specified Sleeve and Washer Materials

For more sleeve and washer set combinations, visit [www.lamons.com](http://www.lamons.com)

## Cut-Through Resistance



Cut Through Resistance and Flexural Strength is critical in selecting sleeve material for your flange isolation kit application. As nominal pipe size increases, as well as ANSI or API class, the fasteners (bolts/studs) increase in size and torque is generally higher. Larger and heavier stud bolts with higher torque loads can more easily cut through material during installation. This is more likely to occur if flanges and bolt holes are not in perfect alignment.

Use or specify G10 sleeve material as a standard for all applications. Or consider G10 sleeves for applications of Nominal Pipe Size 12" and larger and ANSI pressure class 600# and higher.

The above graphic shows an example of a Mylar Sleeve being shredded; the bolt threads are cutting through the sleeve while misalignment is cracking the sleeve. Electrical isolation can be lost if your sleeve material does not have excellent cut through resistance. Isolation tests will fail and installation costs will increase significantly.

# Sleeve and Washer Sets



## Full Length Sleeve



A full length sleeve passes entirely through both flanges, the sealing/isolation gasket both isolation washers, and half way through the steel back-up washers on each side.

Tolerance = +/- 0.062"

**Note:** When using mis-matched flanges or flanges with different widths take precise measurements and account for the additional length needed to pass through washer set configuration. If you are unsure of proper length please consult the factory engineering support.

## Bolt/Stud Diameters-Length



Bolts/Studs with smooth shank portions should not have a greater diameter than the maximum diameter of the threads. If this is the case, the sleeve may not fit over the shank portion. The adjacent graphic shows a smooth shank sized to the same diameter as the threads, for a successful installation.



When working with Flange Isolation Kits, the bolt length would be standard length + 0.75". This accommodates for gasket thickness and the use of double washer sets.

## Tighten your flange isolation kit application with Lamons Fasteners.

Lamons manufactures a wide variety of bolts, nuts and studs. Complete your installation and purchasing efforts with a worldwide quality manufacturer. <http://www.lamons.com/products/fasteners.php>



Torque Verification: SPC4 Intelligent Fasteners allow installer to confirm torque for installation and routine maintenance.



Lamons marks fasteners with traceability markings, heat lot numbers.

