

# Safety & Technical Alert

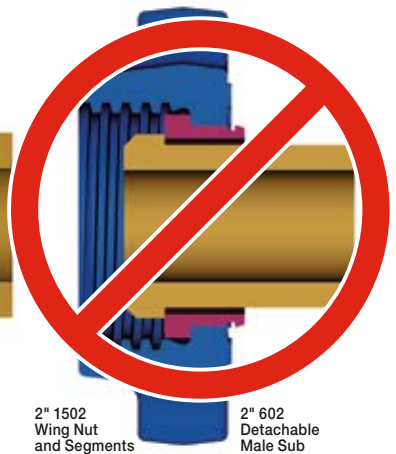
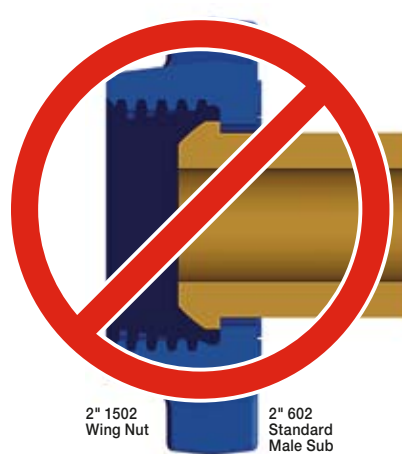
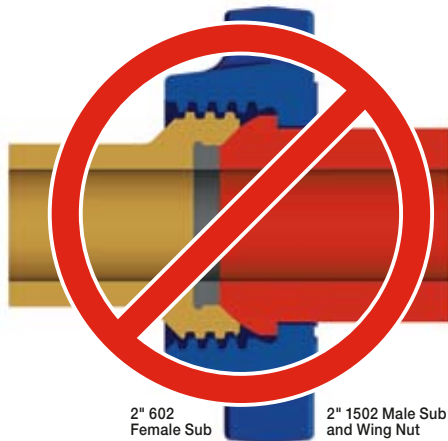
## Avoiding the Dangers of Mismatching Hammer Unions



Hammer Unions, also called Wing Unions, are quick make-up and break-out pipe and fitting connectors that have been used in the oil industry since the early 1930s. The primary components in these connectors are a male sub with a spherical sealing surface, a female sub with external acme threads, and a wing nut with internal acme threads to hold the components together. Depending on size, pressure rating, and style, the assembly may include an elastomeric seal. One variation of these unions employs separate load shoulder pieces called

segments, which are required to install the wing nut over the male sub in some cases.

This bulletin describes general categories of hammer union connection and component mismatches. These mismatch conditions are a result of a failure to positively identify hammer union connections and components. The potential for mismatched hammer union connections and components applies to all manufacturers of hammer union end connections.



### **WARNING**

Never connect products with hammer union end connections that are not positively identified as to the manufacturer<sup>1</sup> and that are not identified to have **identical** union figure number, size, and pressure rating. Mismatched connections may fail under pressure, which can result in serious personal injury, death, and/or property damage.

### **WARNING**

Never assemble any combination of male sub, wing nut, or segments<sup>2</sup> that are not positively identified to assure that union figure number, size, pressure rating, and manufacturer<sup>1</sup> are **identical**. Mismatched components will result in hazardous connections, which may fail under pressure, which can result in serious personal injury, death, and/or property damage.



### **WARNING**

Wing union components that cannot be positively identified with regard to manufacturer<sup>1</sup>, size, figure number, pressure rating, and type of service<sup>3</sup> must never be used. Incorrectly identified components will lead to hazardous assemblies, which can fail under pressure and result in serious personal injury, death, and/or property damage.

## **WARNING**

Never connect products with hammer union end connections that are not positively identified as to the manufacturer<sup>1</sup> and that are not identified to have **identical** union figure number, size, and pressure rating. Mismatched connections may fail under pressure, which can result in serious personal injury, death, and/or property damage.

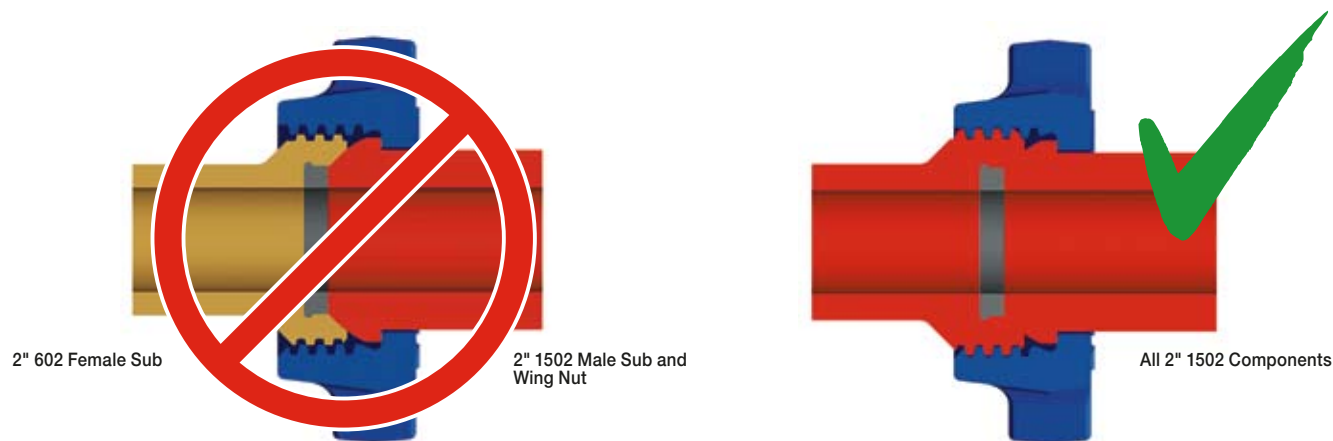
To avoid connecting a wing nut onto an incompatible female sub, users must always assure that these end connections are positively identified with identical size, figure number, and pressure rating.

Following are some categories of potential incorrect hammer union connections that may result in hazardous connections. This list does not include every possible example and is for illustration only. If you have any doubts or questions about whether you are making up correct hammer union connections, never guess or test. Call FMC Fluid Control at the phone numbers provided at the end of this document.

### 1. Connecting those products having end connections of the same size, but different figure number.

An example of this combination is the 2" Figure 602 and the 2" Figure 1502 Union. The threads on the 2" Figure 602 female sub, for instance, will slightly engage the internal threads of the 2" Figure 1502 wing nut, resulting in an incorrect and hazardous connection.

In the illustration below, the incorrect combination on the left shows the slight engagement of the female sub threads and the wing nut threads. This type of combination may, under some circumstances, appear to seal and may hold the desired amount of pressure for a period of time. The combination of 2" Figure 1502 components on the right illustrates the correct combination showing full thread engagement.



Other examples of the category:

- 1-1/2" Figure 600, 602, and 1002 Unions have the same thread.
- 5" Figure 400 and 1002 Unions have the same thread.

### 2. Connecting those products having different pressure ratings and having end connections of the same size and figure number.

Examples of this category:

- Figure 1502 (and under) Standard Service and Sour Gas<sup>3</sup> Unions have the same thread.
- Products with hammer unions attached by pipe threads or welding.

If you have any questions call FMC Fluid Control at the phone numbers provided at the end of this document before making any connections.

**WARNING**

Never assemble any combination of male sub, wing nut, or segments<sup>2</sup> that are not positively identified to assure that union figure number, size, pressure rating, and manufacturer<sup>1</sup> are **identical**. Mismatched components will result in hazardous connections, which may fail under pressure, which can result in serious personal injury, death, and/or property damage.

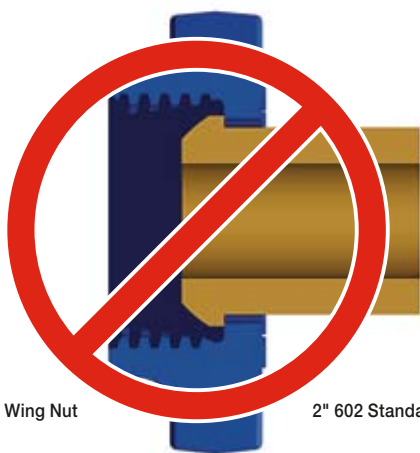
To avoid assembling incompatible wing union components together, users must always assure that the wing nuts, male subs, and segments are positively identified as being of the same size, figure number, pressure rating, and manufacturer.

Following are some categories of potential incompatible male sub, wing nut, and/or segment assemblies. This list does not include every possible example and is for illustration only.

### 3. Assembly of a wing nut of one size and figure number onto the male sub of another size or figure number.

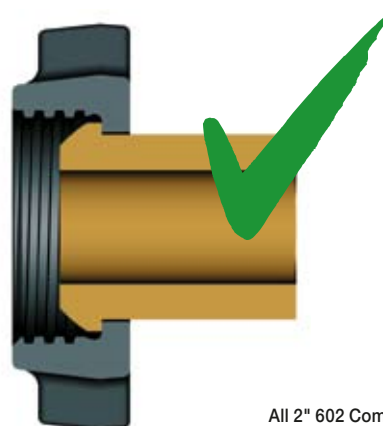
An example of this combination is the assembly of a 2" Figure 602 standard male sub (non-detachable) installed in a 2" Figure 1502 wing nut.

In the illustration on the left below, note the slight amount of engagement of the male sub in the wing nut. When installed on a female sub, this combination may seal and hold the desired amount of pressure for a period of time. Full engagement of the correct combination of components is shown on the right.



2" 1502 Wing Nut

2" 602 Standard Male Sub

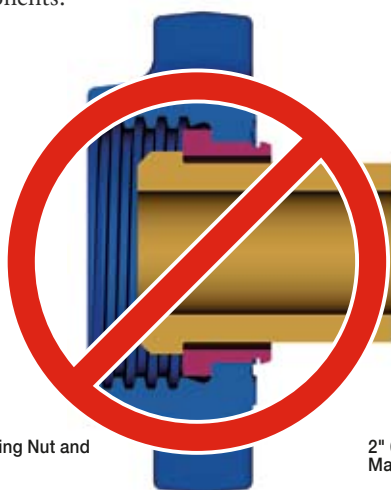


All 2" 602 Components

### 4. Assembly of segments and a nut on an incorrect male sub.

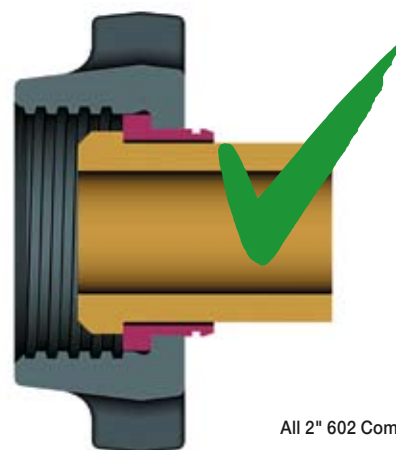
An example of these combinations is a 2" Figure 602 detachable male sub installed in an assembly with a 2" Figure 1502 wing nut and retainer segments.

Since many products are machined integrally with male subs, it is important to make sure that the correct union components are used. The illustration below on the left shows an incorrect assembly of 2" Figure 602 and 2" Figure 1502 components. As has been indicated previously, a combination of this type with a female sub may seal and hold a desired amount of pressure for a period of time. The illustration on the right shows a correct combination of 2" Figure 602 components.



2" 1502 Wing Nut and  
Segments

2" 602 Detachable  
Male Sub



All 2" 602 Components

## **⚠ WARNING**

The misapplication of standard, non-detachable style wing nuts on 2", 3" and 4" figure 602 and 1002 detachable nut connections will result in an unsafe connection leading to separation when under pressure. Failure to avoid this condition may result in death, serious personal injury and severe property damage.

Following is another category of potential wing union mismatch that is possible even using wing union components of the same size, figure number and manufacturer.

## **5. Assembly of Non-detachable Nuts on Detachable Male Subs**

An example of these combinations is a 4" Figure 1002 non-detachable nut installed on a 4" Figure 1002 detachable male sub end.

Over the years, FMC Technologies has added new wing union designs in response to ever changing customer and application requirements. One of the many innovations introduced by FMC Technologies was the detachable nut design wing union in the 1960s. This design was developed for use on other products such as valves, fittings and swivel joints with integrally forged end connections. Since that time, FMC Technologies has provided both standard, non-detachable (or "captured") nut and detachable nut designs for Figure 602, 1002 and 1502 wing unions.

Wing unions (illustrated below on left), which are manufactured with non-detachable nuts, require the nut to be assembled to the male sub end before the subs are assembled by welding or thread make-up to other equipment. The detachable nut wing union design (illustrated below on right) employs a lower profile shoulder on the male sub end and the addition of retainer segments that are inserted between the nut and male sub to retain the nut on the male sub end.

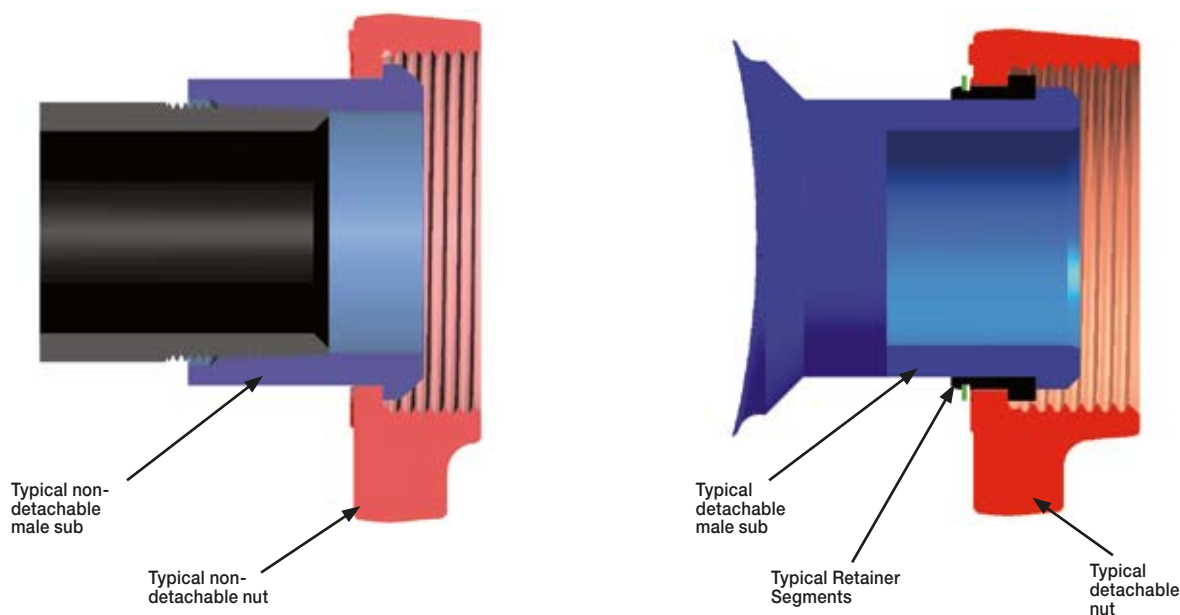
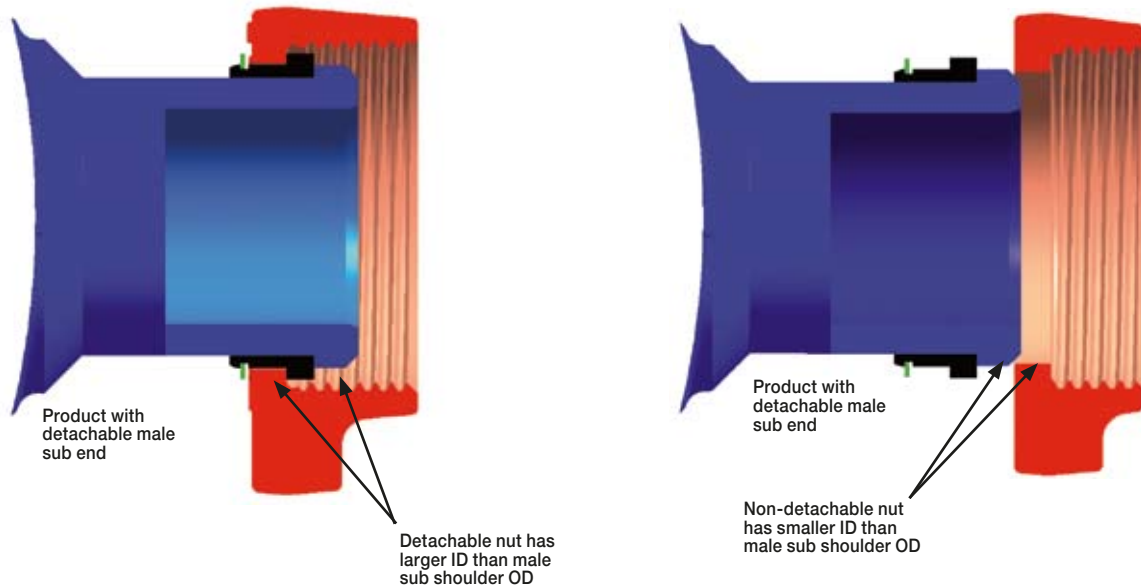


Figure 1502 wing unions employ the same nut on both detachable and non-detachable nut designs. The focus of this alert is on sizes 2", 3" and 4" Figure 602 and 1002 wing unions, which like the figure 1502 wing unions are available in both detachable and non-detachable nut designs. However, unlike the Figure 1502, these sizes of Figure 602 and 1002 employ one wing nut for non-detachable nut connections and another for detachable nut connections.

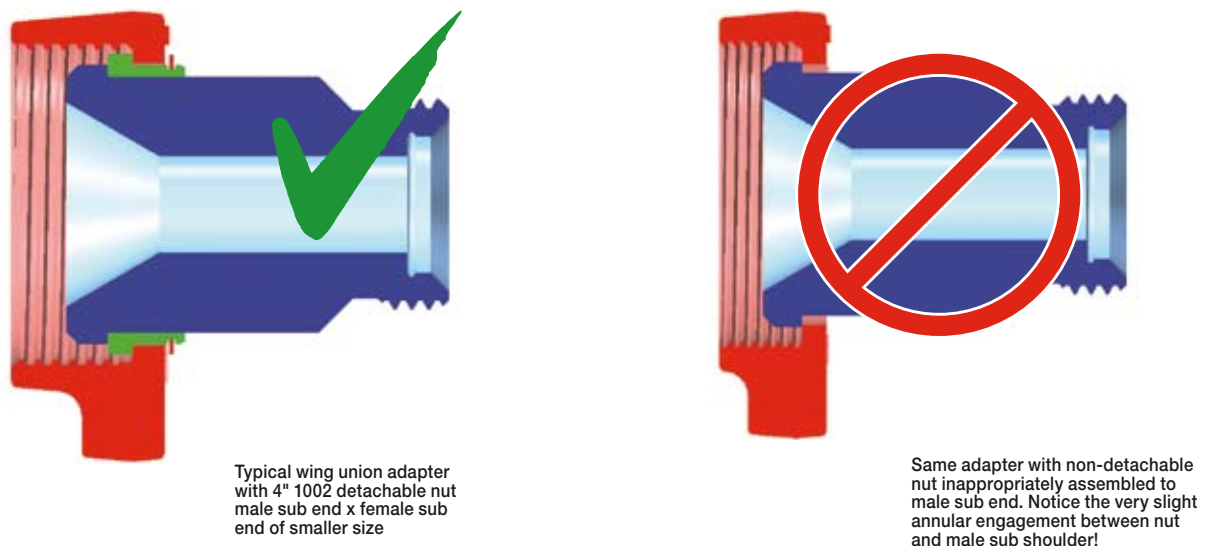
**! WARNING**

The misapplication of standard, non-detachable style wing nuts on 2", 3" and 4" figure 602 and 1002 detachable nut connections will result in an unsafe connection leading to separation when under pressure. Failure to avoid this condition may result in death, serious personal injury and severe property damage.

Normally valves, swivel joints and other service line equipment using integral wing union end connections are constructed such that it would be impossible to capture a non-detachable nut between the male sub shoulder and the rest of the product as shown below.



In some special situations, such as certain wing union adapters and assemblies using threaded or butt weld male subs, it is possible to slip the non-detachable nut from behind a detachable male sub shoulder (see figure below on left). On the 3" and 4" sizes of figure 602 and 1002 wing unions, the annular engagement between the back of the male sub shoulder and inner shoulder of the non-detachable nut engages only slightly - not nearly enough to produce a safe connection (see figure below on right). This condition would result in a connection that could unexpectedly separate under normal operating conditions.



**⚠ WARNING**

The misapplication of standard, non-detachable style wing nuts on 2", 3" and 4" figure 602 and 1002 detachable nut connections will result in an unsafe connection leading to separation when under pressure. Failure to avoid this condition may result in death, serious personal injury and severe property damage.

To avoid the unsafe condition described on the previous page, the user must confirm that the appropriate wing nut is being used for a given end connection. All 3" and 4" figure 1002 and 602 detachable nuts currently manufactured by FMC Technologies have the identifier "DET" forged into the back of detachable nuts (see figure below on left). On these sizes, if this identifier is not present, the nut must not be used on detachable wing union connections. Another obvious indication of inappropriate use of non-detachable nuts on detachable wing union connections of both 3" and 4" figure 602 and 1002 sizes is the excessive amount of play between the inside diameter of the nut shoulder and the outside diameter of the sub behind the male sub shoulder (see figure below on the right). If this condition is ever encountered, the wing union connection must be disassembled and investigated for mismatch of components.



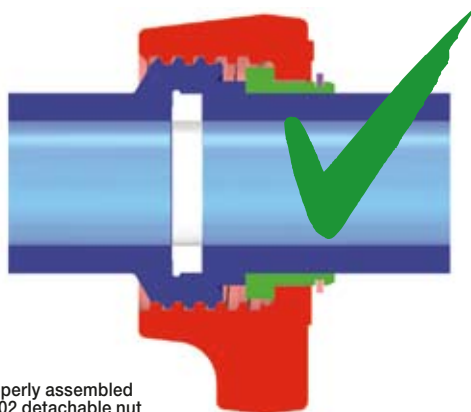
3" 602 detachable nut with "DET" identification.



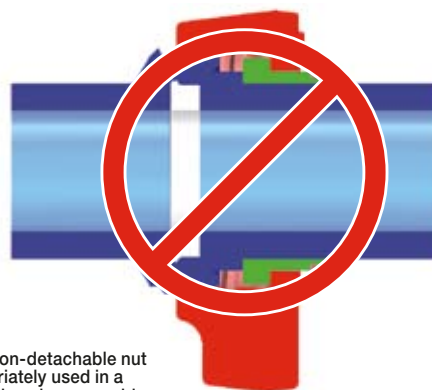
4" 1002 non-detachable nut inappropriately assembled to a detached male sub end. Notice the excessive play between the ID of the nut and male sub OD behind the shoulder.

Unlike the 3" and 4" figure 602 and 1002 wing unions, the 2" size non-detachable nut does not engage the male sub shoulder of a detachable nut connection. However, another issue arises if a non-detachable nut is used on a detachable nut connection. On a properly assembled 2" 602 and 1002 detachable nut wing union connection the nut fully engages the threads of the female sub (see figure below on left). Using the shorter non-detachable, which will appear to properly assemble over the retainer segments of a detachable male sub end connection, results in inadequate engagement of the female sub threads by the nut (see figure below on right).

This unsafe condition can be encountered on any product employing detachable male sub end connections. To avoid this condition, it is important to ensure the correct nut is used. Like the 3" and 4" figure 602 and 1002, the 2" size also has the identifier "DET" forged onto the back of the detachable nut. If the identifier is not present, the nut must not be used on a detachable wing union connection.



A properly assembled 2" 1002 detachable nut wing union connection.



2" 1002 non-detachable nut inappropriately used in a detachable union assembly. Notice the resulting lack of thread engagement with the female sub.

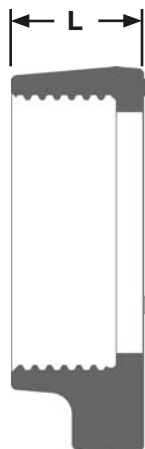


# **! WARNING**

The misapplication of standard, non-detachable style wing nuts on 2", 3" and 4" figure 602 and 1002 detachable nut connections will result in an unsafe connection leading to separation when under pressure. Failure to avoid this condition may result in death, serious personal injury and severe property damage.

Another way to identify detachable and non-detachable nuts for 2", 3" and 4" sizes of figure 602 and 1002 wing unions is by their overall length. The figure below with the accompanying chart shows how the type of nut can be positively identified based on a single measurement.

FMC Technologies strongly recommends that, on locations where both non-detachable and detachable nut designs of the 2", 3" and 4" figure 602 and 1002 wing union connections are potentially deployed, all personnel be made aware of this potential safety issue.



## For Figure Numbers 602 and 1002

Nominal Size of Nut (in)	"L" Dimension		
	Non-detachable Nuts		Detachable Nuts
	Figure 602	Figure 1002	Figure 602 and 1002
2	1.91	1.91	2.56
3	2.06	2.12	2.50
4	2.25	2.38	3.00

# **! WARNING**

Use of non-FMC manufactured parts in FMC Technologies products may result in death, personal injury or property damage. The use of non-FMC parts voids all design, type, case, test and quality approvals by third-party certifying authorities and may void product warranty.

# **! WARNING**

Never assemble wing union components together that are not positively identified as to the manufacturer, service and pressure rating. Failure to do so can result in a connection that may fail under pressure, which can lead to death, serious personal injury and severe property damage.

# **! WARNING**

Do not suspend loads on service lines using wing union connections. Externally applied bending or tensile loads are additive to the loads already induced by internal pressure. Externally applied loads can result in an over-stress condition leading to catastrophic failure. If externally applied loads are to be applied, consult factory for limitations.

Notes:

1. There are many manufacturers of wing union assemblies and components that may represent other possible opportunities for component mismatch unknown to FMC Technologies. Specific questions regarding identification and use of wing union components not manufactured by FMC Technologies must be directed to the appropriate manufacturer.
2. Retainer segments for detachable nut wing union connections manufactured by FMC Technologies come in sets of 3. Never put into service detachable nut wing union connections unless all segments are in place. Markings on FMC Technologies hammer union segments include "FMC", part number, and material reference number. For assistance with positive identification of segments for appropriate use by size and figure number, contact FMC Technologies or your nearest representative.
3. In addition to other identification markings described in this technical alert, components intended for sour gas service are marked "SOUR GAS", "NACE MR0175" or "SG". For SOUR GAS SERVICE, use ONLY those components that are specifically identified as being suitable for this service. Refer to the bulletin NACE MR0175/ISO 15156 (latest edition) published by the National Association of Corrosion Engineers.

## Warnings and Safety Instructions

FMC Technologies cannot anticipate all of the situations a user may encounter while installing and using FMC products. Therefore, the user of FMC products **MUST** know and follow all applicable industry specifications and practices on the safe installation and use of these products. For additional safety information, refer to FMC Technologies product catalogs, product brochures and installation, operating and maintenance manuals, which can be accessed at [www.fmctechnologies.com/fluidcontrol](http://www.fmctechnologies.com/fluidcontrol), or contact FMC Technologies at 800/772-8582.

### **WARNING**

1. **Never mix or assemble components, parts or end connections with different pressure ratings. Mismatched conditions, including but not limited to that of a 2" Figure 1502 male sub end connected to a 2" Figure 602 female sub, may fail under pressure resulting in death, serious personal injury or severe property damage.**
2. **Never use or substitute non FMC components or parts in FMC products or assemblies.**
3. **Never modify or repair FMC products in a manner not specifically directed in instructions published by FMC Technologies.**
4. **Never strike, tighten, loosen or attempt repairs on pressurized components or connections.**
5. **Never exceed the rated working pressure of the product.**
6. **Complete and proper make-up of components and connections is required to attain rated working pressure. Always apply essential care, attention, handling and inspection to threaded components before, during and after make-up.**
7. **Never use severely worn, eroded or corroded products. Contact FMC Technologies for more information on how to identify the limits of erosion and corrosion.**
8. **Never strike wing union nuts having severely flattened and extruded ears. This condition can result in flying debris leading to serious personal injury and must immediately be addressed by either grinding off extruded material or removing the nut from service.**
9. **Always follow safe practices when using products in overhead applications. Products not properly secured could fall.**
  - **Never exceed the load rating of lifting devices on products or lifting equipment.**
  - **Use of FMC products in suspension applications can result in over-stress conditions leading to catastrophic failure. If externally applied loads are anticipated, consult factory.**
10. **Always follow safe practices when manually lifting and carrying products.**
11. **Always Select only appropriate product and materials for the intended service:**
  - **Never expose standard service products to sour gas fluids. (Refer to NACE MR0175). Do not interchange sour gas with standard service components.**
  - **Always use appropriate safety precautions when working with ferrous products in below freezing temperatures. Freezing temperatures lower the impact strength of ferrous materials.**
12. **Always follow manufacturer's instructions and Material Safety Data Sheet directions when using solvents.**
13. **Always make certain that personnel and facilities are protected from residual hazardous fluids before disassembly of any product.**
14. **Whenever leakage is detected from FMC Technologies products, remove them from service immediately to prevent death, serious personal injury, and/or property damage.**

**SAFETY INSTRUCTIONS:** The applications of FMC products are in working environments and systems which must be properly designed and controlled. Safety procedures and policies **MUST** be clearly established by the user and followed. Always use appropriate protective equipment.

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