NUCO V-Band Coupling

Contents

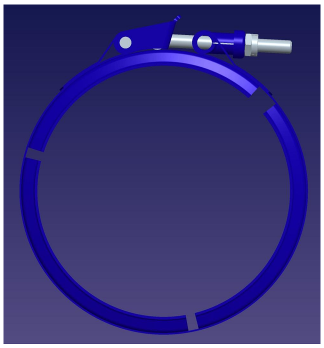
When our customers look for a quick, reliable way to join tubing, pipe, component sections and more, they turn to National Utilities V-Band Clamps. Using the strength of a Band Clamp, and adding the wedging action of V-retainer sections, National Utilities V-Band Clamps create a dependable, economical and easily separable joint. Our commitment to quality and delivery, together with the substantial time savings in assembly and disassembly compared to other joint configurations, make National Utilities Band Clamps a great value to our customers.

For additional information regarding the design, uses, and installation of V-Band Clamps, please refer to SAE standard AIR869B.

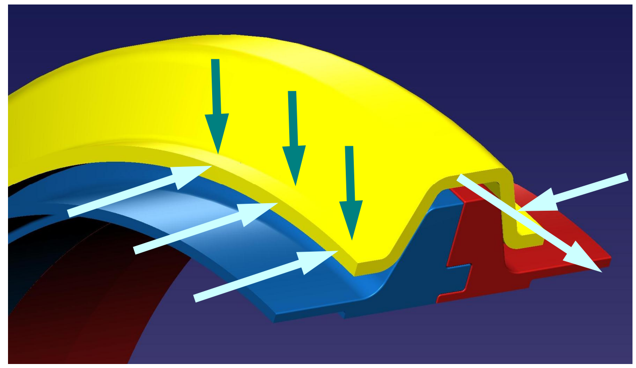
How the V-Band Works

The function of the V-Band Coupling is to draw together the flanges of the components to be joined. This is done by tightening the latch T-Bolt which creates a compressive force by the wedging action of the V-retainer over the two flanges. The interaction of the coupling latch, V-retainer, and the flanges is illustrated below.

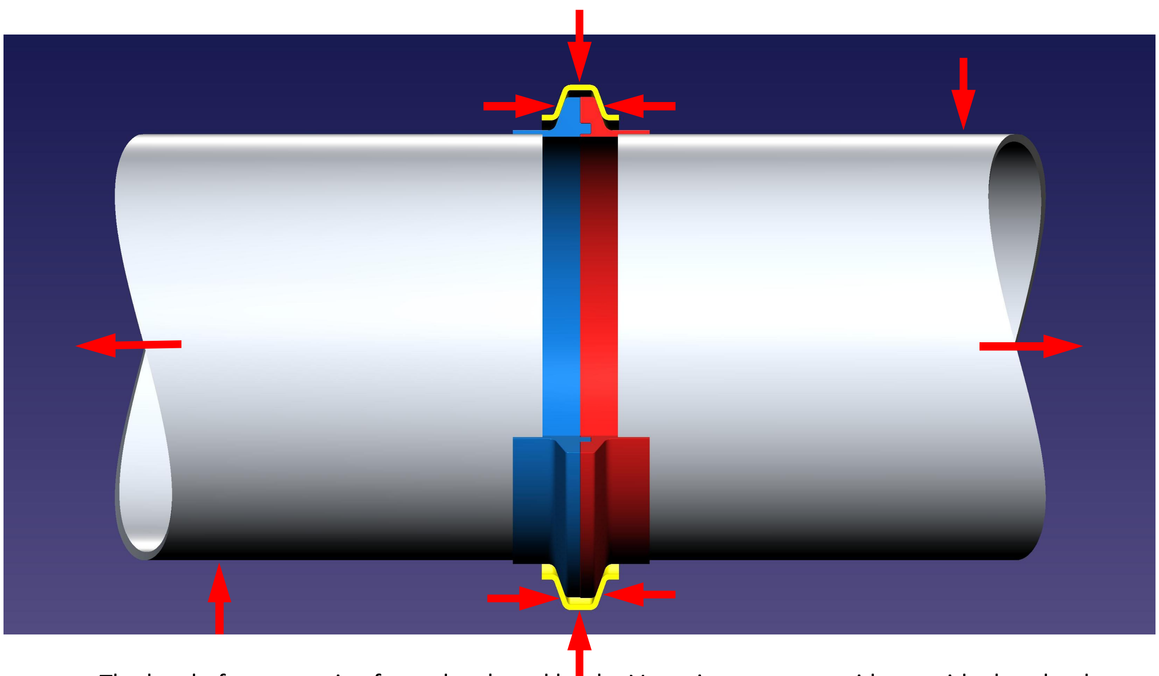
As the latch T-Bolt is tightened, an inward or radial force is created.



The radial load created by band tension is transmitted by the wedging action of the V-retainer as an axial load on the flanges.



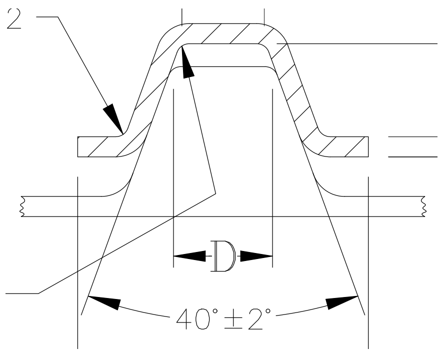
The axial load or compressive force must be great enough to withstand all other in-service load

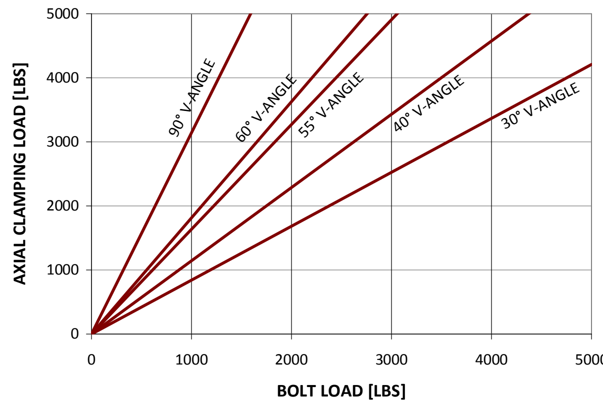


The level of compressive force developed by the V-retainer must provide a residual preload sufficient to maintain the seal and restrain the flanges against any type of bending or pressure loads that the connection may encounter in service. The size of the tubing, the environmental conditions, and the loads to which the connection will be subjected will, naturally, determined the selection of the flange type and the corresponding size and strength of the V-Band coupling land latch.

The recommended practice for selection the optimum combination of elements to provide a light and reliable V-Band Coupling a re covered in detail on the following pages. However, both the NUCO home office staff and our field engineering representatives are ready at all times to provide assistance in making a proper selection.

Selecting the Included V-Angle



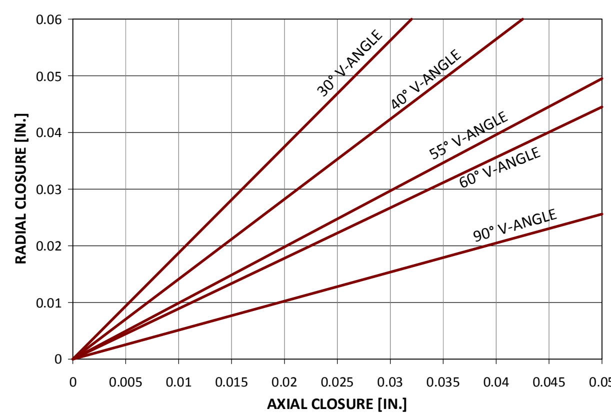


The axial load generated by a given amount of bolt load is illustrated above. While it is necessary to overcome friction during tightening of the V-Band Coupling, after the coupling is tightened friction helps to reduce the bolt load required to keep the flanges from separating.

The accepted industry standard for an included V-angle is 40°. This angle provides an optimum mechanical advantage for drawing the flanges together and retaining them in the proper position to maintain a tight seal.

The mechanical advantage increases as the V-angle becomes larger and decreases as the V-angle becomes smaller. Conversely, with the smaller angle it takes more diametral reduction for the V-retainer to bring the flanges together and increases the amount of circumferential adjustment required to tighten the coupling.

The 40° angle is optimum for most applications as it offers an ideal mix of mechanical advantage and axial closure and it is commonly used in both clamp and flange design. A variety of V-retainers having 30°, 55°, 60°, and even 90° included V-angles are available to accommodate all types of existing flanges.



The relationship between the amount of diametral reduction of the V-retainer and the axial closure of the two flanges for various V-retainer angles is illustrated above.

Selecting the Optimum Number of V-retainer Segments

The optimum number of V-retainer segments in a V-band coupling is determined by the coupling size and by the installation requirements. The following considerations are offered as a guide.

One-Segment Coupling
The continuous one piece V-retainer is normally supplied with tack-on loop ends spot welded to the retainer. The application must allow the coupling to be installed over the tube from an end and is not recommended for other applications because of its rigidity.
[INSERT PHOTO]

Two-Segment Coupling
This coupling provides a single hinging action on installation or removal from the flange joint. In most cases, the two-segment coupling is the most economical to manufacture and is particularly effective for tube diameters over 5.00 inches. The two-segment coupling may also be used for heavy-duty, double-latch applications. This configuration is available with a solid band or tack-on loop ends.
[INSERT PHOTO]

Three-Segment Coupling
The three-segment coupling is the most commonly used. The coupling design provides a double hinging action on installation or removal from the flange joint. For use with conventional or quick disconnect latches only.
[INSERT PHOTO]

Four-Segment Coupling
This coupling is generally selected for large-diameter application where a great amount of hinging action is desired. Can be used with either single or double latches.
[INSERT PHOTO]

Selecting Latch Style

[INSERT PHOTO]
The **conventional latch** uses a captive T-Bolt and Sheetmetal trunnion. Recommended for use on normal permanent and semi-permanent installations.

[INSERT PHOTO]
This **double latch** uses two conventional latches on opposite sides of the coupling. Recommended for use on permanent or semi-permanent installations. This combination of latches on the same coupling provides for more diametral take up and permits more uniform circumferential distribution of band tension. Particularly suited to large-diameter couplings.

[INSERT PHOTO]
The **quick-disconnect latch** uses a quick-disconnect cup and permits latching or unlatching without complete removal of the nut. Used for quick, easy, and frequent installation or removal.

[INSERT PHOTO]
The **combination latch** combines one conventional latch and one quick-disconnect latch on opposite sides of the coupling. The combination of the two latches on the same coupling provides for more diametral take-up and permits more uniform circumferential distribution of band tension. Recommended for used where frequent removal is a requirement and allows disassembly without compete removal of the nut. Particularly suited for large diameter couplings.

[INSERT PHOTO]
The **tack-on latch** replaces the continuous band with “tack-on” band ends spot or fusion welded to the V-retainer. This means that less material is used, so the coupling weighs less. This latch is available on one and two segment-couplings.

With any of the above latches, the standard short loop will automatically be furnished. This loop provides a lighter coupling and, in very small sizes, is the only option available. In later sizes, a longer tangential loop can be furnished.

Specify Nominal Diameter

Tube size, flange type and V-retainer section selected will establish a coupling nominal diameter.

Nominal Diameter = Flange Diameter + 0.124

This gap will ensure proper seating of the v-retainer on the flange and ensure the retainer is offering the maximum axial clamping load possible.

Selecting a T-Bolt and Nut

Standard T-bolts, both alloy and stainless steel (CRES), are forged to meet the requirements of NASM6821.

Material: 8740 alloy bolts per AMS6322, 431 CRES bolts per MIL-S-18732 and A-286 bolts per AMS5731 or AMS5732

Finish: Alloy bolts are cad plated per AMS-QQ-P-416. Cres bolts are passivated only. CRES bolts are automatically furnished when a CRES nut is called out in the part number.

On smaller diameters, T-bolt is curved to facilitate latching.

Unless otherwise specified, a SH nut will be furnished. To avoid galling, CRES nuts are automatically furnished with CRES T-bolts, all other clamp components are furnished in CRES. CRES nuts should be specified for high temperature or corrosive application environments.

Code	Description	Temperature Rating	Material
S	Self-Locking	250°F	Alloy Steel, Cad Plated
SH	Self-Locking	550°F	Alloy Steel, Cad-Plated
R	Self-Locking	550°F	Alloy Steel, Cad-Plated
N	Self-Locking	450°F	A-286 CRES
ST	Self-Locking	800°F	A-286 CRES
M2	Self-Locking	1200°F	A-286 CRES
SS	Self-Locking	800°F	CRES, Silver Plated
DS	Plain Hex, Drilled	800°F	CRES, Silver Plated
M1	Self-Locking	1200°F	CRES, Silver Plated

Nut Torque

An optimum torque value for the T-bolt nut will produce a sufficient degree of tightening of the V-retainer over the flange to accomplish the following:

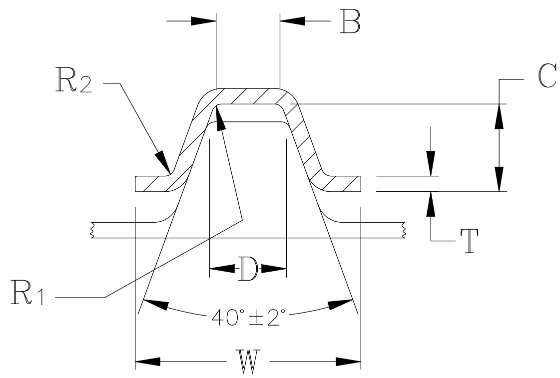
- Overcome inherent friction between the retainer and flanges.
- Properly seal two flanges.
- Provide a sufficient amount of residual compressive load to hold the two flanges together
- Offset the total load to which the joint may be subjected in service.

If all of the above elements are converted to an equivalent axial load, the desired torque level can be established from figures 1 or 2, below, for whatever type of V-band coupling is selected.

Selecting a Cross-Section

The following are a sampling of available retainer sections that are compatible for joining a vast amount of flanges that meet aerospace industry standards. Each section can be formed to an exact nominal diameter. Available retainers are grouped by V-angle and listed by apex ("B" value) width. For sizes and shapes other than what is listed below, contact engineering for a range of possible solutions.

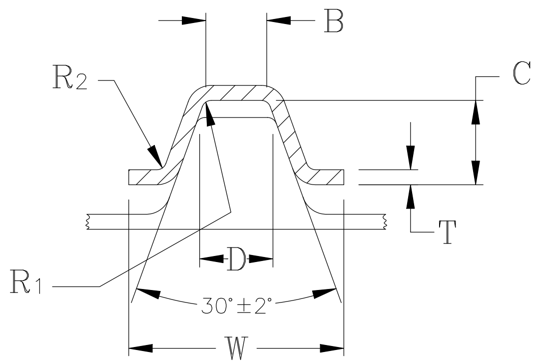
40° V-Angle



RETAINER DASH NO.	B	C	T	W	R1	R2	D @.062 GAP
-13	.152	.190	.050	.50	.040	.040	.197
-2	.156	.218	.032	.50	.032	.032	.201
-54	.156	.218	.050	.50	.032	.032	.201
-57	.156	.281	.032	.56	.032	.032	.201
-88	.156	.218	.040	.65	.032	.032	.201
-8	.181	.281	.040	.62	.032	.032	.226
-10	.181	.281	.090	.88	.062	.062	.226
-16/-430	.181	.281	.080	.75	.060	.060	.226
-18	.181	.281	.050	.66	.040	.050	.226
-45	.181	.294	.090	1.00	.060	.060	.226
-4	.207	.281	.062	.75	.062	.062	.252
-7	.207	.281	.080	.88	.060	.060	.252
-56	.207	.281	.040	.72	.047	.090	.252
-263	.207	.281	.080	.81	.060	.060	.252
-1	.212	.281	.050	.72	.032	.032	.257
-3	.212	.281	.040	.72	.032	.032	.257
-15	.212	.218	.050	.72	.050	.050	.257
-89	.212	.281	.040	.62	.047	.047	.257
-106	.212	.327	.040	.88	.063	.063	.257
-186	.212	.218	.062	.88	.050	.060	.257
-1B	.225	.281	.050	.72	.032	.032	.270
-283	.225	.250	.050	.72	.045	.050	.265
-11	.262	.141	.050	.62	.032	.032	.307
-176	.262	.141	.075	.62	.032	.075	.307
-12	.265	.609	.090	1.34	.062	.125	.310
-91	.270	.225	.050	.72	.050	.050	.315
-64	.320	.250	.062	.77	.060	.060	.365

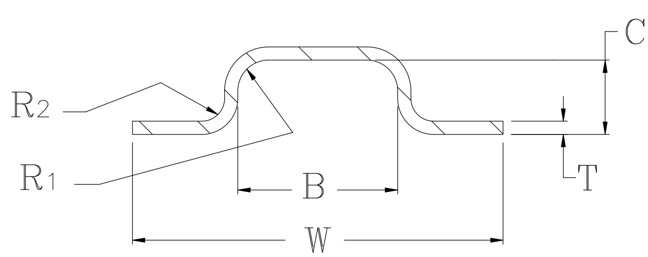
RETAINER DASH NO.	B	C	T	W	R1	R2	D @.062 GAP
-29	.330	.281	.050	.88	.050	.050	.375
-105	.345	.281	.040	.88	.040	.040	.390
-23	.365	.440	.100	1.00	.100	.100	.410
-317	.385	.250	.050	.85	.050	.050	.430
-542	..385	.270	.090	1.12	.062	.062	.435
-9	.400	.281	.050	.91	.050	.050	.445
-246	.400	.281	.100	.91	.110	.065	.445
-101	.403	.240	.062	1.00	.090	.090	.448
-5	.562	.231	.050	1.06	.050	.050	.597

30° V-Angle



RETAINER DASH NO.	B	C	T	W	R1	R2	D @.062 GAP
-36	.304	.296	.062	.88	.062	.062	.337
-37	.431	.375	.040	1.03	.062	.062	.464
-81	.431	.375	.040	.93	.062	.062	.464

180° V-Angle



RETAINER DASH NO.	B	C	T	W	R1	R2
-21	.483	.225	.040	1.12	.093	.069
-71	.483	.225	.040	.75	.093	.069
-73	.483	.225	.040	1.00	.093	.069
-156	.483	.225	.050	.88	.093	.059
-174	1.50	.125	.025	1.88	.025	.025