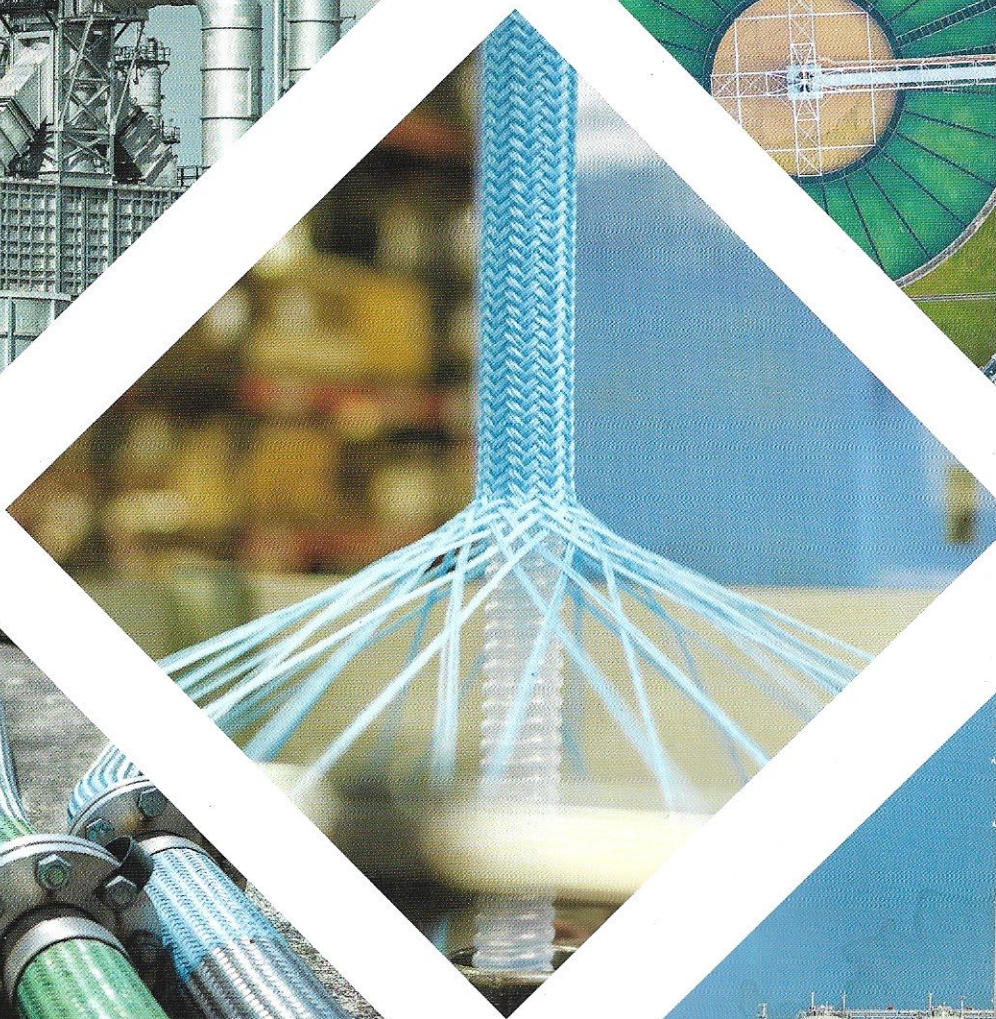
PENFLEX

DEDICATED TO CUSTOMER SERVICE, SUPPORT & SUCCESS



Metal Hose Selection Criteria

The selection of flexible metal hose for a particular application is influenced by six primary considerations:

- Temperature
- Pressure
- Media
- Size
- End Fittings
- Motion

Temperature

The physical properties of any material vary with temperature. While many of the 300 series austenitic stainless steels (including 304L, 316L and 321) can be used at temperatures up to 1500°F, operating temperature limits are also affected by end fittings, the method of welding attachment, working pressure, type of media being conveyed, and the nature of the application, i.e., static or dynamic.

The 300 series is also rated for cryogenic service, capable of operating in applications with liquid helium, the coldest material known with a boiling point of -452°F. At such low temperatures, some material physical properties actually improve.

Pressure

The nominal pressure ratings of flexible metal hose vary according to type, material and size. Specific pressure ratings for each type of hose are found in this catalog. Under actual working conditions, pressure is affected by many other factors such as temperature, vibration, and bending stresses.

Media

The type of media being conveyed is an important consideration in the selection process. Metal hose is subject to corrosion by both the material flowing through it and the outside environment. For almost all applications, a metal hose can be selected that is resistant to the intended media.

To assess an alloy's chemical compatibility, refer to the chart posted on our website:
http://www.penflex.com/corrosion

Size

The size of flexible metal hose is specified by the nominal diameter. The existing piping will normally dictate the size of the metal hose for a particular application. However, flow rate, velocity and pressure drop considerations may also influence the selection of the hose size.

End Fittings

The use of flexible metal hose is complimented by an extensive range of end fittings that are available, including male or female pipe threads, unions, flanges, flared tube fittings and other specially designed connectors. Depending on the type of hose and the alloy, end fittings are attached by welding, silver brazing, soldering and occasionally by mechanical means.

Motion

Flexible metal hose is generally used in four types of applications.

- To correct problems of misalignment
- To provide flexibility in manual handling operations
- To compensate for regular or constant movement
- To absorb vibration

In all types, careful hose selection, design of the assembly and installation are important for optimal service life.

Assembly Installation

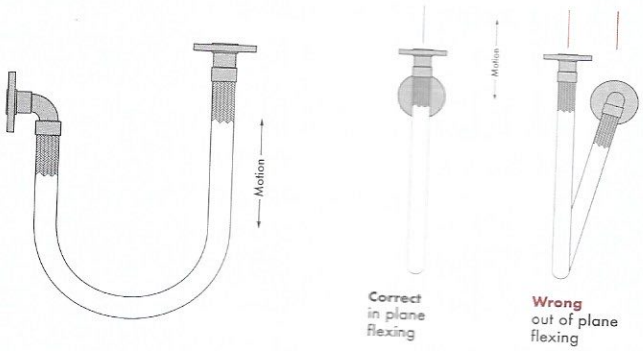
Penflex hose is engineered to provide maximum service life when properly installed. Improper installation, incorrect flexing or careless handling in an application will reduce the effective service life of the hose and cause premature failure of an assembly. The following installation and handling precautions should be observed to achieve optimum performance from hose assemblies.

Avoid torque

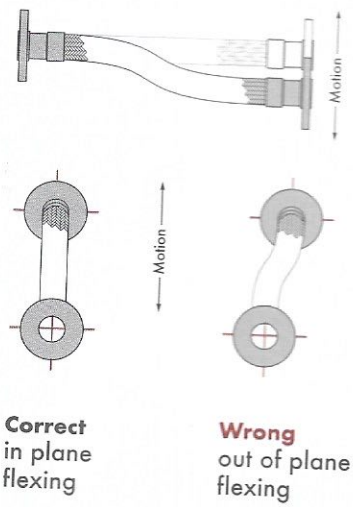
Do not twist the hose assembly during installation when aligning the bolt holes in a flange or in making up pipe threads. The utilization of lap joint flanges or pipe unions will minimize this condition. It is recommended that two wrenches be used in making the union connection; one to prevent the hose from twisting and the other to tighten the coupling.

Prevent Out of Plane Flexing

Prevent out-of-plane flexing in an installation. Always install the hose so that the flexing takes place in only one plane. This plane must be the plane in which the bending occurs.

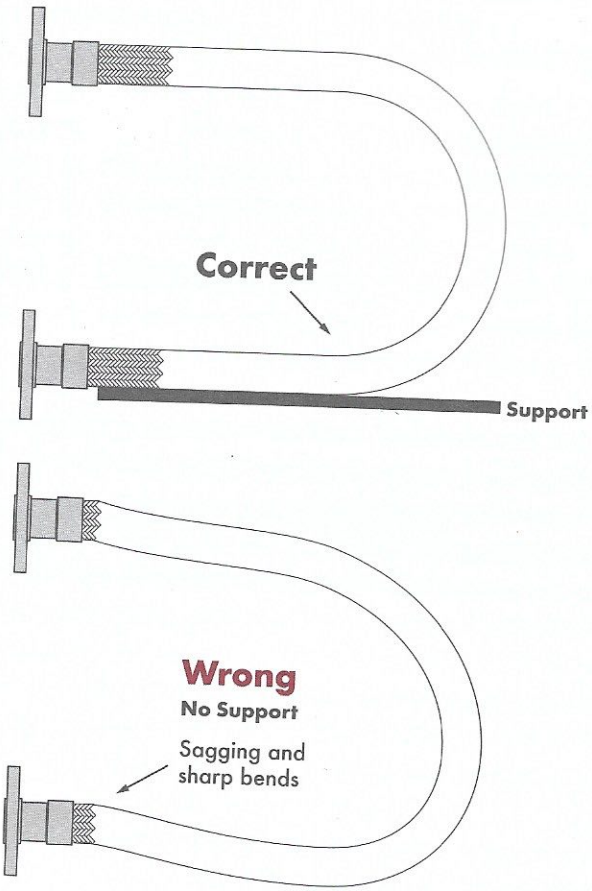


In plane lateral offset installation



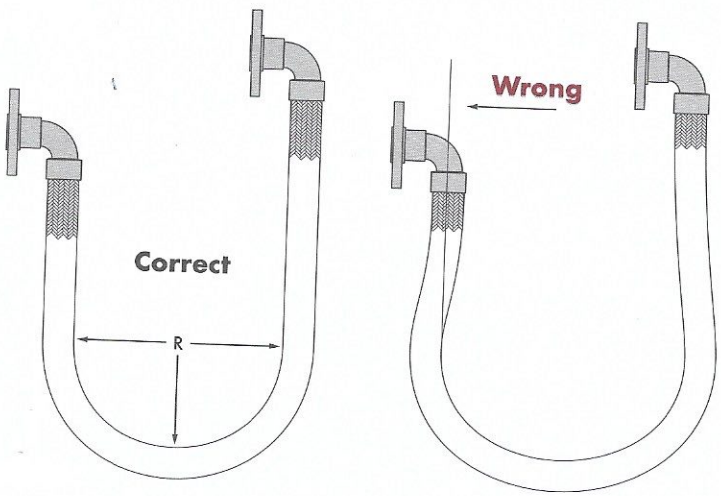
Provide support

When installing the assembly in a horizontal loop, provide support for the arms to prevent the hose from sagging.



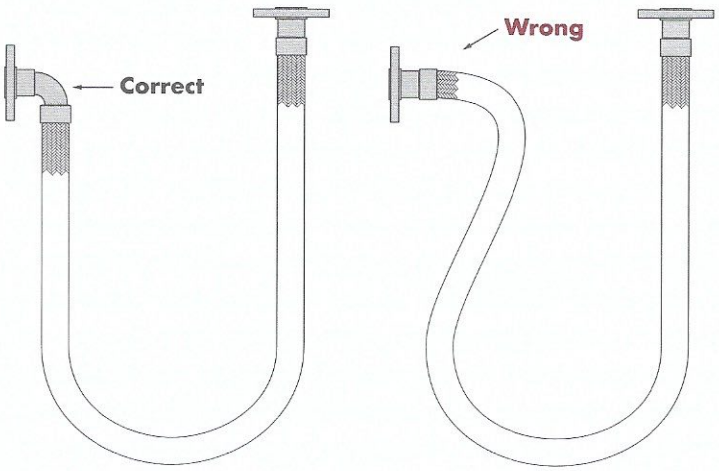
Avoid over bending

The repetitive bending of a hose to a radius smaller than the radius listed in the specification tables will result in premature hose failure. Always provide sufficient length to prevent over bending and to eliminate strain on the hose.



Avoid sharp bends

Utilize sound geometric configurations that avoid sharp bends, especially near the end fittings of the assembly.

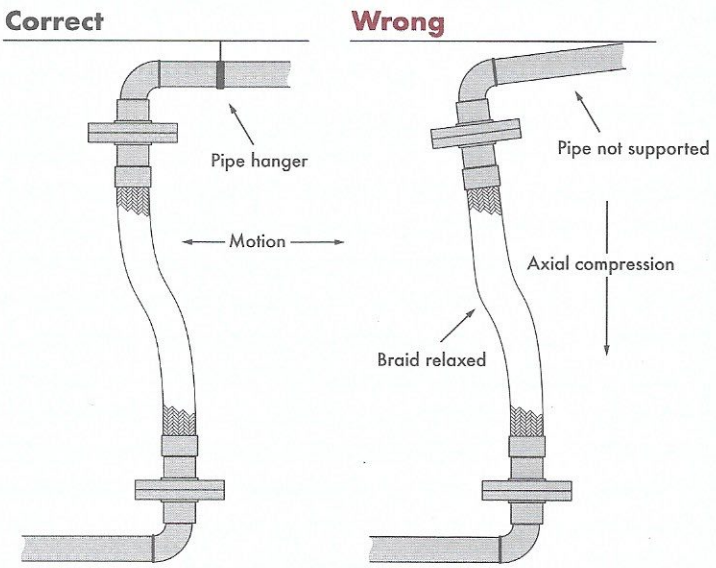


Handle with care

Avoid careless handling of the hose assembly. Always lift or carry assemblies to prevent abrasion damage and store away from areas where they can be subjected to spillage, corrosive fumes or sprays, weld splatter, etc.

Do not extend or compress axially

A piping system which utilizes metal hose to absorb movement must be properly anchored and/or guided. Always support the piping to prevent excessive weight from compressing the hose and relaxing the braid tension.



Maximizing the Safety and Effectiveness of an Assembly

Do...

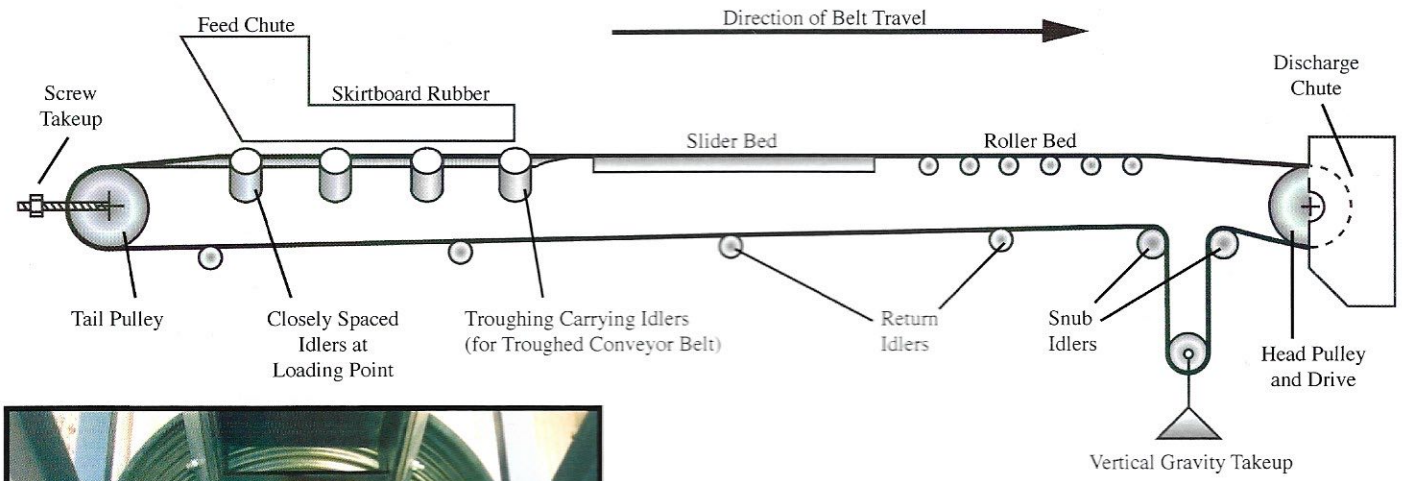
- design assembly to allow a 2" straight run of hose at each end fitting.
- account for ground movement after installation, such as settling or frost heave.
- handle and store assembly carefully prior to installation.
- install assembly so that the bend is as close to the center of the connector as possible.
- observe minimum bend radius as specified by the manufacturer.
- trial-fit threaded connections by hand, unmake, and then make permanent.
- only wrench on the fitting hex flats as provided.
- use pipe wrenches on both mating hexes to avoid twisting the hose.
- keep hose free from all objects and debris.
- install in such a manner that the connector can be removed.
- check for leaks before covering the installation.

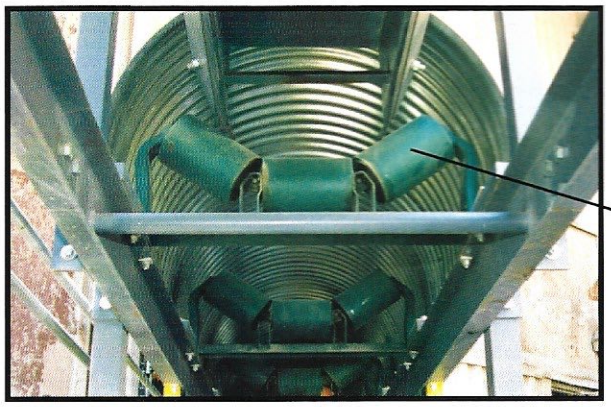
Don't...

- lay the flexible connector on rocks or objects which could puncture it.
- "pre-flex" assembly to limber it up.
- over-bend assembly; a 45°-90° bend should be sufficient for installation.
- twist assembly when aligning the bolt holes in a flange or when making up pipe threads.
- stretch or compress assembly to fit an installation.
- install a flexible connector with bend next to the end fittings.
- apply a wrench to the hose or collar.
- allow other components or equipment to obstruct movement of the hose.
- exceed pressure rating of the assembly.

Conveyor Terms and Definitions

The following schematics with terms and definitions are included here to help enable Beltservice distributors to better discuss their conveyor belt needs with our salespeople so that the right belt is selected for the application.

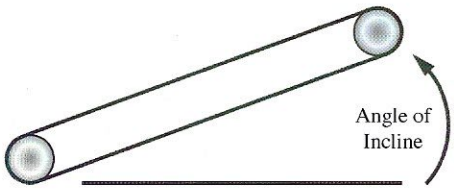




Troughing Idlers
Normally – 20° 35° 45°

CONVEYOR TERMS

Horizontal Conveyor



Incline Conveyor

Angle of Incline

The degree a conveyor is tilted from horizontal.

Return Idler

Idlers used to support the belt as it passes underneath the conveyor structure.

Snub Idler

Idler used to increase the amount of belt in contact with the pulley or to deflect the belt in a different direction. Snubbing a belt near a pulley can increase the effective tension at the pulley.

Drive Pulley

Pulley connected to a power source used to drive conveyor. Usually the drive pulley is the head pulley, but on some kinds of systems, including many package handling conveyors, the drive pulley is located underneath the conveyor.

Roller Bed

Free-wheeling rollers on which the carrying side of the belt rides.

Tail Pulley

Pulley at the beginning of the carrying run of the conveyor. The tail pulley is usually free-wheeling.

Gravity Takeup

Device used to remove slack and stretch in a conveyor belt. A free weight is suspended from a pulley on the return side of the belt. The takeup is free to lower as needed to remove any slack as the belt is operated. The gravity takeup is usually located as close to the drive pulley as possible.

Screw Takeup

Device utilizing a bolt construction used to lengthen the conveyor to remove slack in the conveyor belt. By moving a bolt, the tail pulley is pushed away from the head pulley thus removing slack from the belt.

Troughing Idlers

Grouping of idlers on the carrying side of the conveyor designed to make the conveyor belt curve into a cupped shape, increasing conveyor capacity. Troughing idlers are usually 20°, 35°, or 45°.

Head Pulley

Pulley at discharge end of belt. The head pulley is usually powered by conveyor drive source. Pulley "pulls" belt along the conveyor.

Slider Bed

A smooth, flat surface (usually steel or wood) beneath the carrying side of the belt.

Skirtboard Rubber

Skirtboard rubber is primarily used at the loading point to guide product into the center of the belt and to prevent spillage.

Useful Information

Many considerations of factors determine the selection of the best belt for the job. The following information will aid you in this process. Assistance is available for the asking.

Key to Symbols

C - Center to Center distance (In.)
D - Diameter of Drive Pulley (In.)
d - Diameter of Tail Pulley (In.)
G2 - Load per Hour (Lbs.)
L - Belt Length (In.)
P - Product Weight (Lbs.)
RPM - Revolutions per Minute
S - Speed, Ft. per Minute (FPM)

Belt Length

For a pulley system *with no snub pulley*:

$$L = \left(\frac{D + d}{2} \times 3.1416 \right) + 2C$$

Belt Speed in Feet per Minute

$$S = D \times RPM \times .2618 \times 1.021$$

Maximum Product Weight on Belt at Any One Time

When load is known by *pounds per hour or tons per hour*:

$$P = \frac{G2}{S \times 60 \text{ (minutes)}} \times C \text{ (Ft.)}$$

Fabric Designation

Carcass	U.S.	Metric
Poly/Nylon	PN	EP
Nylon/Nylon	NN	PP
Poly/Poly	PP	EE

Coefficient of Friction (Belt to Slider Bed or Rollers)

Belt	Steel or Aluminum Slider Bed	Metal Rollers
FS Pulley Side	.30 to .35	.05 to .10
Bare Duck or BB Side	.20 to .25	.05 to .10
Cover on Pulley Side	.50 to .55	.05 to .10

Calculating Length of A Roll of Belting

Add together the diameter of the roll and diameter of the hole in inches and divide the result by 2. Multiply by 3.14 and by the number of coils in the roll. This gives the length in inches. Divide by 12, and you will have the approximate number of feet in the roll.

Determining Belt Length When Snub or Takeup Pulleys Are Present

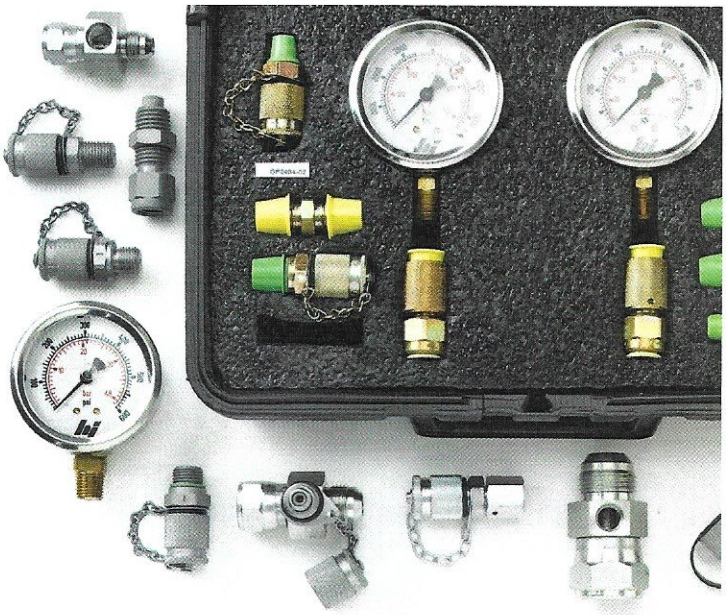
Steel Tape Measurement - STM, also known as the I.C. or inside circumference, is a common method where the takeup is placed in a position that allows for easy installation and adequate takeup. The steel tape is run through the system on the same track the belt would run. Care must be taken to make sure the tape touches all pulleys. The belt may be tracked to one side or removed to accomodate this method as the tape must touch only the pulleys and not the belt for an accurate STM measurement.

Calculating Length of A Roll of Endless Belting

Net Endless Length (NEL) - From an existing belt, this measurement is made by placing the ENDLESS belt to be measured on a table or floor. A mark is made on the cover and corresponding mark on the table or floor. The belt is rolled forward until the mark comes back. Place another corresponding mark on the table or floor. Move the belt aside and measure the distance between the two marks. This measurement represents the NEL measurement or Net Endless Length.

TEST POINTS

For hydraulic systems monitoring, venting, sampling and pressure control

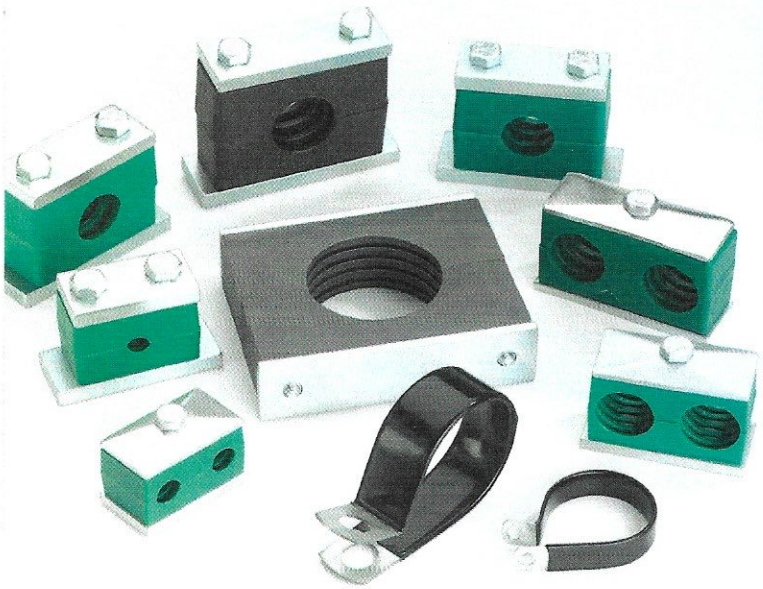


TUBING

Stainess steel tubing in 20' lengths in both seamless and welded styles

FLANGES & ACCESSORIES

4-bolt, split and captive styles



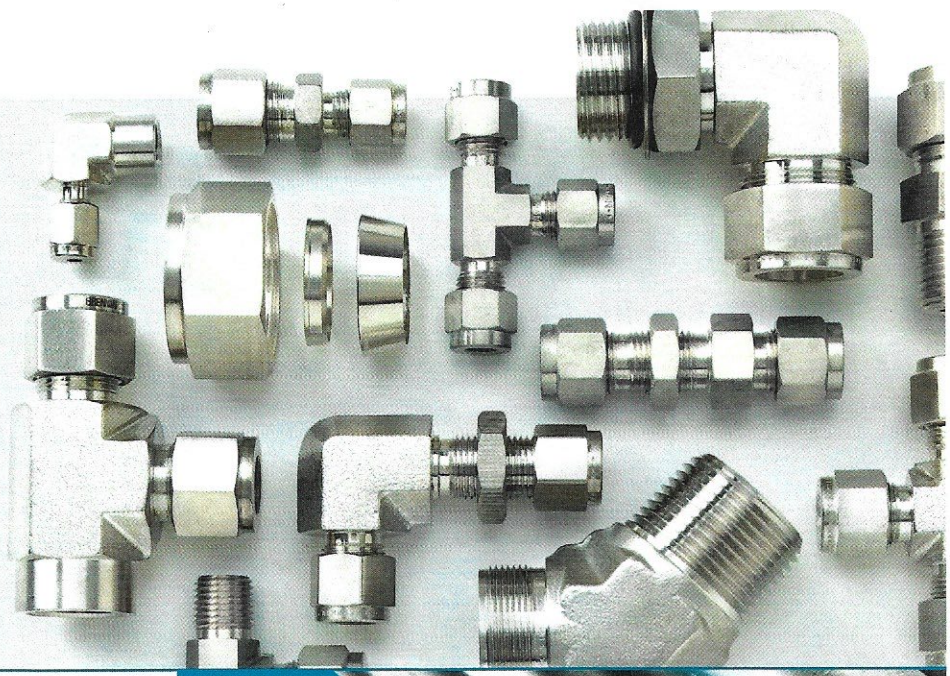
PIPE & TUBE CLAMPS

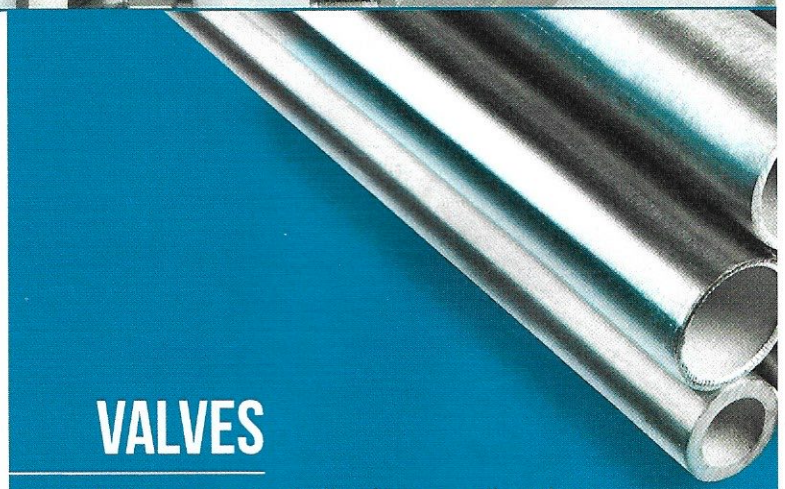
Configurations available for both heavy-duty and standard-duty service

BRENNAN

INSTRUMENTATION TUBE FITTINGS

Single- and double-ferrule styles provide leak-proof seals at all tubing connections



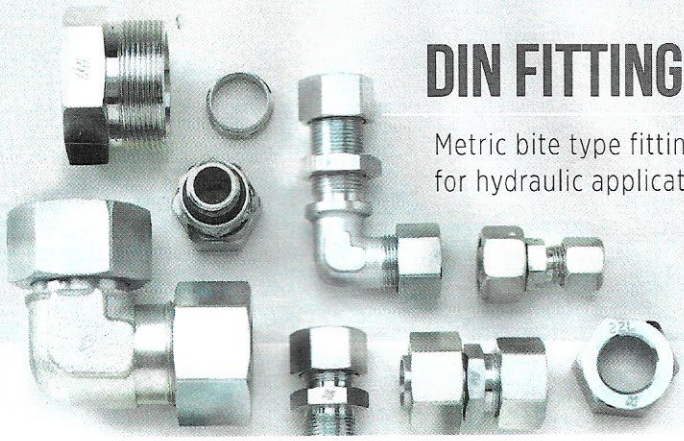


VALVES

Instrumentation ball valves, needle valves, check valves and manifold valves in Stainless Steel, brass and exotic alloys

PUSH-TO-CONNECT

Widely used in printing, packaging and marine applications



DIN FITTINGS

Metric bite type fittings for hydraulic applications

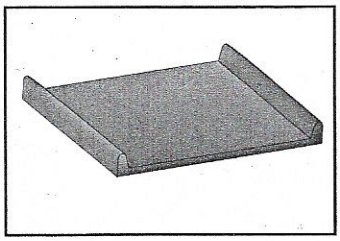
BRENNAN

THREAD CHARTS • JIC – SAE • Metric/International

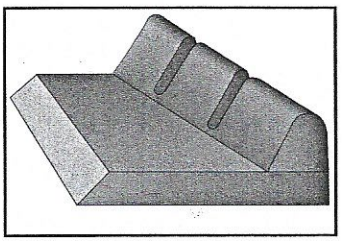
Dash Size	2	3	4	5	6	7	8	10	12	14	16	20	24	32	40	48
Tube O.D.	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1¼	1½	2	2½	3
Hose I.D.	1/8	3/16	1/4	5/16	3/8		1/2	5/8	3/4		1	1¼	1½	2	2½	3
JIC 37-Flare Thread	5/16 - 24	3/8 - 24	7/16 - 20	1/2 - 20	9/16 - 18		3/4 - 16	7/8 - 14	1 1/16 - 12	1 3/16 - 12	1 5/16 - 12	1 5/8 - 12	1 7/8 - 12	2 ½ - 12	3 - 12	3½ - 12
SAE O-Ring Thread	5/16 - 24	3/8 - 24	7/16 - 20	1/2 - 20	9/16 - 18		3/4 - 16	7/8 - 14	1 1/16 - 12	1 3/16 - 12	1 5/16 - 12	1 5/8 - 12	1 7/8 - 12	2 ½ - 12		
NPTF Pipe Thread	1/8 - 27		1/4 - 18		3/8 - 18		1/2 - 14		3/4 - 14		1 - 11½	1¼ - 11½	1½ - 11½	2 - 11½	2½ - 8	3-8
NPSM Swivel Thread	1/8 - 27		1/4 - 18		3/8 - 18		1/2 - 14		3/4 - 14		1 - 11½	1¼ - 11½	1½ - 11½	2 - 11½		
Flat Face Thread			9/16 - 18		11/16 - 16		13/16 - 16	1 - 14	1 3/16 - 12	1 5/16 - 12	1 7/16 - 12	1 11/16 - 12	2 - 12			
Code 61 Flange Head O.D.							1.19		1.50		1.75	2.00	2.38	2.81	3.31	4.00
Code 62 Flange Head O.D.							1.25		1.62		1.88	2.12	2.50	3.12		
British Thread BSPP/BSPT	1/8 - 28		1/4 - 19		3/8 - 19		1/2 - 14		3/4 - 14		1 - 11	1 ¼ - 11	1 ½ - 11			
Copper Nylon Air																
Brake Thread			7/16 - 24		17/32 - 24		11/16 - 20	13/16 - 18	1 - 18							
SAE 45-Flare Thread	5/16 - 24	3/8 - 24	7/16 - 20	1/2 - 20	5/8 - 18	11/16 - 24	3/4 - 16	7/8 - 14	1 1/16 - 14							
Inverted Flare Thread	5/16 - 28	3/8 - 24	7/16 - 24	1/2 - 20	5/8 - 18	11/16 - 18	3/4 - 18	7/8 - 18	1 1/16 - 16							
Compression Thread	5/16 - 24	3/8 - 24	7/16 - 20	1/2 - 20	9/16 - 18	3/4 - 16	1-1 1/1 - 12	1 5/16 - 12	1 5/16 - 12	1 7/8 - 12	2 ½ - 12					
Metric Thread	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**	**26**	**27**	**30**	**33**	**36**	**42**	**48**	
	M 10x1.0	M 12x1.5	M 14x1.5	M 16x1.5	M 18x1.5	M 20x1.5	M 22x1.5	M 24x1.5	M 26x1.5	M 27x2.0	M 30x2.0	M 33x2.0	M 36x2.0	M 42x2.0	M 48x2.0	

FABRICATIONS - FLANGES, V-GUIDES, AND EDGE FINISHES

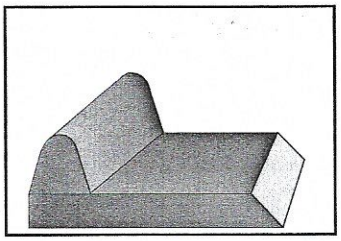
FLANGES



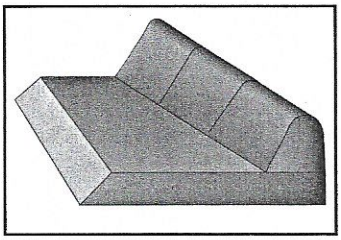
Flanges - Molded
Prevents product spilling off edge of belt. Free-flowing materials are contained without troughing. Flange belts can be made endless or conventionally laced. *Care must be taken to operate flanged belts on the proper diameter pulleys. Consult factory for recommendations.* **Corrugated sidewalls available - see page 30.**



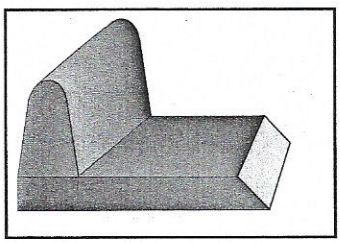
Flanges - Notched
Notching of the flanges enables a flanged belt to operate on smaller diameter pulleys. Also allows the belt to "back flex" in weighing applications.



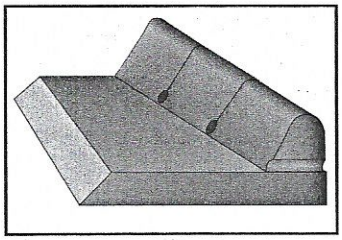
Flanges - Heights Available
1/2", 3/4", 1", 1-1/2", 2"
Styles Available
gumdrop, tapered one side, tapered both sides (all styles not available in all heights) Note: Standard flanges are 60 durometer. 40 durometer is available for special applications where smaller than average pulleys are being used.



Flanges - Siped
Siping of flanges enables a flanged belt to operate on smaller diameter pulleys.

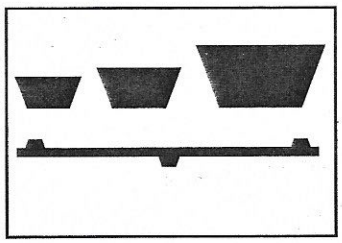


Flanges - Compounds Available
Black SBR
Black Nitrile
White Nitrile
White PVC
Black PVC
White Butyl High Heat
Black Butyl High Heat

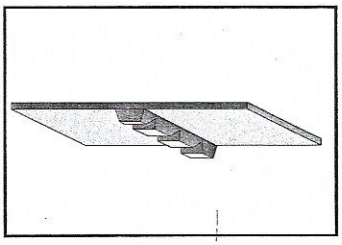


Flanges - Siped and Drilled
Flanges can be siped into relief holes to prevent any further action of slits to propagate into the belt cover.

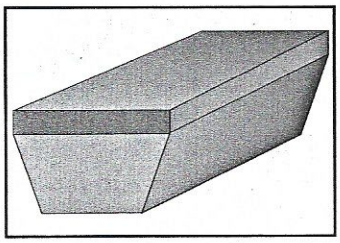
V-GUIDES AND V-BELT BACKING



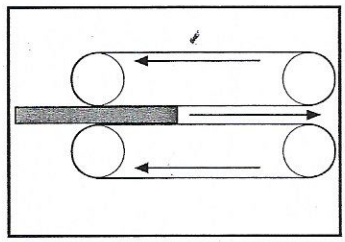
V-Guides
Used wherever conditions create a belt alignment problem. Can be molded to any belt and be made endless if desired. Bonded to cover side for flanges; bonded to underside for guide. Available in **A** (1/2" W x 5/16" H), **B** (5/8" W x 7/16" H), and **C** (7/8" W x 5/8" H) cross sections. Other sizes available.



V-Guides - Notched
Available in A-B-C-D sections, and more. Notching enables a V-guided belt to operate on smaller pulley diameters. The V-guide reduces tracking problems.

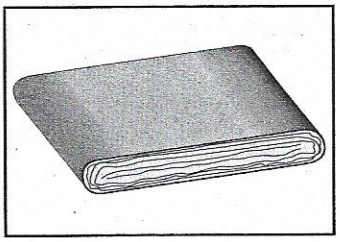


V-Belt Backing
Covers of pure gum, neoprene sheet rubber, urethane, roughtop belt, white non-marking belt, etc. can be bonded to the back of V-belts.

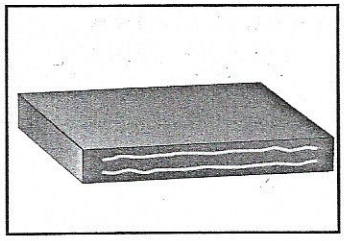


V-Belt Backing
Recommended where V-belts are used as conveyor or in tandem to pull product or cable in sandwich fashion.

EDGE FINISHES



Folded Edges
Premium construction for superior edge wear and carcass protection. Chemicals and bacteria may not attack the interior plies. Folded edges provide a continuous surface from the top of the belt around the edges.



Molded Edges
Rubber edging vulcanized to cut- edge belting. Protects the belt fabric from bacteria and damaging chemicals. Ideal for food-handling applications. Also used for additional protection from edge wear.