

## Glossary

### A

#### Adapter

A type of fitting which provides a method of joining two components of differing thread types or systems.

#### Analytical column

A long narrow tube packed or coated with one of many available chemically diverse compounds that can separate the components in a sample according to their boiling point, polarity, molecular size, or combination thereof. A column of some kind is used with most chromatographic techniques.

### B

#### Backflush

The use of valving to reverse the flow through a column in order to “backflush” or purge heavier components from the column. See application demonstrating backflush.

#### Biocompatibility

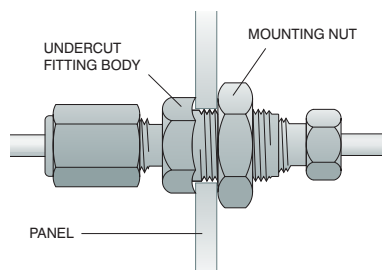
Defines the materials used in a system (i.e. fittings, tubing, and valves) that do not change the bioactivity of the biological substances that come into contact with the surface of these materials. Note that in chromatographic systems, the tubing and column (frits, packing material and wall) contribute over 99% of the surface area and the valves and fittings are insignificant.

#### Bore

The diameter of the orifice through the fitting. See capillary bore, through-type bore, and large bore.

#### Bulkhead fitting

A type of fitting in which the fitting body is inserted through an instrument panel or mounting bracket, to which it is affixed with a mounting nut. The Valco fitting body is uniquely undercut so that it “bites” into the panel when the mounting nut is tightened, eliminating the need for a lock washer.



#### Butt connection

A type of connection in which the two tube ends are directly and squarely in contact, usually effected with a through-type union. Typically used with fused silica connections, or small bore metal tubing.

### C

#### Cap

A cap is used to dead-end a piece of tubing with a nut and ferrule attached.

#### Capillary bore

The smallest available standard orifice in a given fitting design (usually 0.25 mm). Typically denoted by suffix “C” in the product number.

#### Collapsible ferrule

A one-piece ferrule engineered to collapse as it is tightened. The collapse takes place in two very narrow areas, and results in a very effective seal with virtually no distortion of the tubing ID and no dead volume. \*Patent No. 6,575,501

#### Compression fitting

A style of fitting in which a threaded nut compresses a tapered ferrule onto tubing as the nut is tightened. Valco metal ferrules cut a ring into the tubing wall while polymer types rely on surface compression to form a seal and hold the tube by friction.

#### Connecting volume

The volume between two or more connections. This may be cleanly swept, thus not contributing to peak distortion, or may be “dead volume” such as that found in fittings with larger bores than the connecting tubing.

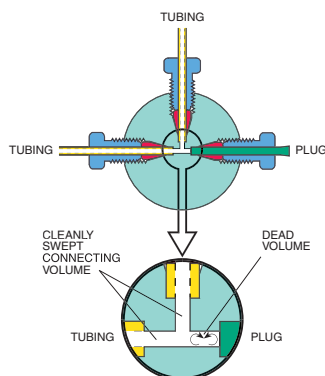
#### Cross

A type of distribution fitting which connects four pieces of tubing, arranging them in the pattern of a cross.

### D

#### Dead volume

Any volume which a component introduces to a system that is not cleanly swept and relies on diffusion to clear the space. See connecting volume.



#### Detail

See fitting detail.

**Distribution fitting**

A generic term for tees, crosses, and manifolds, used to provide multiple access points to “distribute” a gas or liquid through a system. CAUTION! Using a distribution fitting in reverse to merge multiple streams may create dead volume. Special manifolds are available for this application.

**F****Female Nut**

A type of compression fitting in which the nut has female threads.

**FIA**

Flow Injection Analysis. A simple and versatile analytical technique for automating wet chemical analyses based on the manipulation of a sample zone formed from the injection of the sample into a continuous stream of fluid used as a carrier.

**Ferrule**

One of the components of a compression fitting; the conical piece of metal or plastic that compresses onto the tube as it is forced into a tapered seat. Valco metal ferrules are unique in that they attach to and seal at the tube by cutting a shallow ring into it, instead of by actually swaging it. This is preferable since it introduces no flow restriction.

**Filter**

A type of union or reducing union which traps the particulates in a stream. The filtering element is typically a mesh screen or sintered frit.

**Fingertight Fitting**

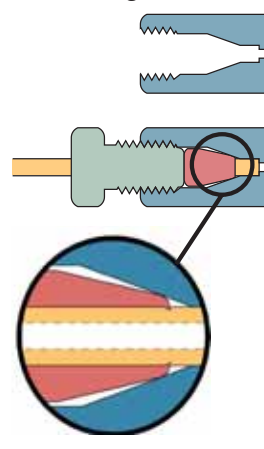
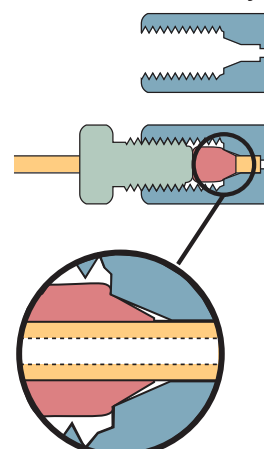
A fingertight fitting is a knurled or winged the nut which is hand tightened to compress the ferrule. Note: Polymer type ferrules rely on surface compression to form a seal and hold the tube by friction.

**Fitting**

A One-Piece combination of ferrule and nut with male threads.

**Fitting detail**

A fitting detail has the thread to accept the nut, a tapered ferrule seat and a pilot for the tube, thus the counterpart where the nut, ferrule and tube make the seal and are held in place. The Valco fitting details have the perfect shape, with a smooth transition from the ferrule seat into the cylindrical and threaded part. Many other fitting details are poor in design where the ferrule is forced in a too shallow ferrule seat. The result is a “knicked” ferrule which cannot apply its sealing force anymore to the front of the ferrule.

**Valco Design****Other Style****Flanged fitting**

A type of fitting used with fluoropolymer tubing (PTFE, FEP) in which a flange is made at the tube end. Connections are made at the flange either by compressing the flange into a flat detail (typically 1/4”-28 threaded) or by butting two flanges together. A special flanging tool forms the flanges.

**Flangeless fitting**

Similar in application to the flanged fitting, but the flange is not required. A ferrule system (collapsible ferrule or inverted ferrule) is used which grips/compresses the tube. This fitting type can be used with virtually any polymeric tubing since the tube end does not have to be formed, but simply square cut. Typically used in 1/4”-28 threaded fittings, it is usually interchangeable with flanged fittings.

**Frit**

A filter element typically made of stainless, Hastelloy, Titanium, or polymers, usually 0.75 mm or 1 mm thick. Frits may provide better filtration than screens, but because they are thicker there is greater mixing potential, and they typically result in increased pressure drop.

**G****GC**

Gas Chromatography. An analytical method incorporating an injection system, analytical column, controlled temperature zone, and detector. An inert carrier gas moves the sample through the column, which separates the sample components into discrete bands which are measured as they pass through the detector.

**Guard column**

A column used in series between the injector and analytical column to prevent certain types of components from entering the analytical column.

## H

### HPLC

High Performance Liquid Chromatography. An analytical system consisting of an injector, pump, analytical column, and detector. Using a liquid mobile phase, the sample is pumped through the column, where it is separated into discrete sample component bands which are detected and measured as the bands elute from the column.

## I

### ID

Internal diameter.

### Inert

Technically, unreactive with other substances; however, in the instrumentation field, “inert” is a relative term. Often polymers are termed inert but are soluble in some fluids and can react with some compounds.

## L

### LC

Liquid Chromatography. Any of a variety of low to medium pressure techniques which use a liquid mobile phase as the carrier to move sample. Similar to HPLC.

### Large bore

A bore that is larger than the standard for a given fitting; a fitting ordered with a large bore will have a larger flow orifice than the standard or capillary bore fitting of the same design.

### Luer adapter

An adapter that connects a tapered luer fitting (square nib) of a syringe to a tube or tube fitting.

## M

### Male Nut

A type of compression fitting in which the nut has male threads.

### Make up

The point at which a ferrule, nut, and tube are assembled in the fashion which will effect a leak-free seal. In most compression fittings, that is accomplished by compressing the tube with the small end of the ferrule. With Valco metal ferrules, the ferrule usually makes up on the tube by cutting a shallow ring in it.

### Manifold

A type of distribution fitting in which a single source is directed to multiple outlets, or vice versa. Caution! Using a common distribution fitting in reverse to merge multiple streams may create dead volume. Special manifolds are available for this application.

### Microbore column

A liquid chromatography column of narrow bore (typically 2 mm or less) for improved resolution.

## N

### Nanovolume

Nanovolume fittings and valves are designed for minimum system volume, have typically bores of 100  $\mu\text{m}$  and are used in applications with extreme low flows e.g. 200 nL/min.

### NPT

National Pipe Thread; a standardized tapered pipe fitting. See pipe thread.

### Nut

The tensioning component of a compression fitting. As the threaded nut is tightened into the fitting detail, it pushes the ferrule forward into the tapered ferrule seat, causing it to make up on the tube.

## O

### OD

Outside diameter.

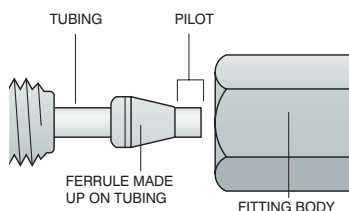
### One Piece Fingertight

A one-piece fingertight fitting is a knurled or winged nut with integrated ferrule. It is convenient to use since the ferrule is retrieved together with the nut from a port. Note: Polymer type ferrules rely on surface compression to form a seal and hold the tube by friction.

## P

### Pilot

The tubing which extends beyond a ferrule in a made-up Fitting. See also “Pilot depth”, and “Zero dead volume” below.



### Pilot depth

The length of the tubing diameter cavity beyond the tapered ferrule seat within a fitting detail. Valco fitting pilot depths are tightly controlled which allows interchanging of components without the risk of leaks or dead volume.

### Pipe thread

The external or internal threads of a fitting designed to effect a metal-to-metal seal on the conical thread faces. This type of fitting does not “bottom out” in the detail. Typically used with Teflon tape or other compound to

lubricate the threads; however, since the diffusion rate of air components through the Teflon tape is considerable, pipe fittings should not be used in systems where leakage rates are critical.

#### Plug

A plug is used to block a fitting detail in a union, Tee, cross or valve.

### S

#### Screen

A replaceable filter element generally made of Type 316 stainless steel, usually 0.003" thick. Screens clog less frequently than frits but they are less effective filters. Because they are thinner there is less hold-up volume and thus less mixing.

#### Port

The connection, orifice, seal, or septum, etc. through which sample, mobile phase or eluents may be added or withdrawn.

### R

#### reducing ferrule

A ferrule which allows a smaller tube to be used in a fitting detail designed for a larger tube. Caution should be taken if standard reducing ferrules without integral pilots are used, since dead volume may be created in the fitting pilot depth.

#### reducing union

A fitting which joins two tubes of different ODs. The bore of the fitting should typically match the ID of the smaller tube.

### T

#### Tee

A type of distribution fitting which connects three pieces of tubing, arranging them in the pattern of a "T".

#### Through-type bore

A bore which is slightly larger than the OD of the tubing which is used with the given fitting. A union with a through-type bore allows the tube ends to butt directly together, or for one tube to run completely through the fitting. Denoted by suffix "T" in the product number. In order to assure correct pilot lengths, we recommend that ferrules be made up on the tubing in a standard union.

### U

#### Union

A fitting for connecting two pieces of tubing of the same OD, or different OD's (see reducing Union).

**Female Union** – A type of compression fitting in which the fitting body has female threads. Also referred to as internal union.

**Male Union** – A type of compression fitting in which the fitting body has male threads. Also referred to as external union.

#### Unswept volume

The volume of any portion of a fitting which is in the flow-path but which is a different diameter than the primary flow orifice through the tubing/fitting assembly, or any area not directly swept by the fluid flow. This can also be known as "dead volume" if it is very poorly swept.

### W

#### Wetted surfaces

The surfaces which are contacted by the sample stream.

### Y

#### Y

A type of distribution fitting which connects three pieces of tubing, arranging them in the pattern of a "Y". Occasionally referred to as a "wye".

### Z

#### ZDV

Zero dead volume. See definition below.

#### Zero dead volume (ZDV)

Describes a connection which does not add volume to the system beyond what an extension of tubing would in its place.

