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## SELECTION GUIDE: Quick-Disconnect Couplers & Plugs

### History and Development of Quick-Disconnect Pneumatic Couplers and Plugs

**Military Standard Quick-Disconnect Coupler and Plug Design:** During World War II, an easy-to-operate quick coupler design was adopted by the military to replace a difficult-to-connect pneumatic coupler design. The coupler design simply connected using a sleeve that was pulled back when connecting or disconnecting an air hose. These pneumatic quick couplings are commonly called Industrial Interchange because couplers and plugs from different manufacturers of this design adopted by the military would interchange with each other. This became the military standard MIL-C-410, which covered 1/4 in. and 1/2 in. sizes only, though U.S. coupler manufacturers also produced 3/8 in. and 3/4 in. sizes. (source: NFPA Recommended Standard NFPA/T3.20.14-1989 [R2004])

**NFPA:** The National Fluid Power Association (NFPA) standard only covers the dimensions of the Industrial plugs (1/4", 3/8", 1/2", and 3/4") and has no reference to the coupling or to pressure ratings or test methods. Its scope statement includes plugs with a maximum working pressure of 16 bar (232 psi), borrowed from the ISO standard. The working pressure of 232 psi is consistent with this ISO standard. This standard includes the Class A (1/4 inch) and Class C (1/2 inch) plugs described in MIL-C-4109. (source: NFPA/T3.20.14-1989 [R2004])

**ANSI:** In June of 1980, The American National Standards Institute approved ANSI/B93.51M, a new documentation of test conditions and procedures for testing quick action couplings. This standard incorporated the National Fluid Power Association recommended standard for the dimensions of identical coupling halves, male or female coupling halves, and coupling assemblies used in pneumatic fluid power systems, including only quick action couplings that are connected and disconnected by a linear or rotary motion. (source: Extracted from American National Standard Pneumatic fluid power – Quick action couplings – Test conditions and procedures. ANSI/B93. 51M-1980.)

**ISO Standard:** In 1988, the International Organization for Standards approved a standard for a pneumatic coupling nearly identical to the U.S. Industrial design in the military standard. The ISO standard concerned the "Industrial Interchange" design dimensions, including testing and performance criteria, and covered all four of the popular sizes. The military standard covered only two of the four popular sizes. (source: NFPA Recommended Standard NFPA/T3.20.14-1989 (R2004) First edition 16 March 1989)

**Why are there different shapes?** While the patent was still in effect for the Industrial interchange plug design, other U.S. manufacturers developed coupler and plug designs trying to capture a share of the quick-disconnect coupler market. Four major design types appeared: Industrial / Milton; Automotive; ARO; and Lincoln. Automotive is sometimes referred to as Tru-Flate or Parker / Tru-Flate. Additionally, Milton, Hansen, and Parker offer other interchanges, adding to the confusion when trying to identify interchange types by using manufacturer names.

**There is no advantage of one type shape over another:** Three of the coupler and plug types dominate the quick-disconnect field: Industrial, Automotive, and ARO. Normally, the different types do not interconnect, but couplers and plugs from each manufacturer with the same interchange type and body size can be used together regardless of thread sizes and hose barb size. Various bands and rings have been used in an attempt to distinguish coupler types, but coupler markings are inconsistent, and nothing makes the plugs really stand out to tell one type from another. Industrial is by far the most popular interchange, followed by Automotive, with ARO taking a small portion, and the Lincoln configuration taking an even smaller portion of the market.

#### Sleeve Coupler styles:

- **SNAP-RING style couplers** – a coupler with a sleeve held on simply by a snap-ring. This design suited industrial practices during and immediately after the war: easy-to-machine and assemble with hand labor. Big disadvantage: when hoses are dragged over surfaces, the coupler sleeve can pull back releasing the plug. Additionally, as the exposed sleeve edge wears, it will let the snap ring dislodge more easily; the coupler can fall apart, and release the plug spontaneously.
- **SLEEVE style couplers (positive-stop or dead-end)** – The Amflo design with an immovable end surface to protect the sleeve from being pushed back and disconnected inadvertently. Once manufacturing techniques came of age in the sixties, the more-complicated sleeve coupler could be machined and assembled by automated machinery, speeding up the manufacturing process of a really better coupler design.

#### Universal Couplers:

To the untrained eye, all three commonly used coupler types look the same; they are hard to match, and hard to tell apart. About fifteen years ago, a coupler design was developed that would engage all three of the different interchanges – these are Universal or Combo couplers. Mostly created for the do-it-yourselfer rather than for industrial or professional use, the design was an attempt to make plug and coupler matching easy. Because all three of the common plug shapes will insert and connect into the same bore and against the same seal, Universal couplers have a greater tendency to leak than dedicated types, especially with side pressure on the connection. Even without the need to tell the plugs apart, identifying Universal couplers among other couplers is complicated, and isn't foolproof.



## THE EVOLUTION OF QUICK-DISCONNECT COUPLERS & PLUGS → ColorConnex®:

Legacy Manufacturing devised this unique system to color-match couplers to plugs among the most common standard pneumatic interchanges, eliminating confusion among types. It also solves the problem of potentially crossing and contaminating different air lines. ColorConnex® makes Universal couplers obsolete!

By using color to dedicate different air lines, a lubricated line will never be used for a dry line application as long as your couplers and plugs match. For different pressures with specific equipment, ColorConnex® makes them easy to identify, and prevent connecting sensitive air equipment to air lines that serve higher pressure equipment and tools. Zinc-plated steel coupler bodies with color-coded, hard-anodized aluminum sleeves, color-matched to high-strength, hard-anodized aluminum plugs. ColorConnex® couplers are sleeve-style couplers that won't disconnect when hoses are on the floor.

ColorConnex® for high CFM: available in 3/8" plugs and couplers in two interchanges and two colors: black and gold.

Legacy-designed ColorConnex® plugs in the Industrial interchange are dimensioned per the NFPA standard: "Quick-action plug dimensions conform to ANSI/(NFPA) T3.20.14, Pneumatic quick-action couplings - Plug dimensions."

ColorConnex® - easy to match, easy to identify, easy to re-order!

Coupler and plug interchange is simplified: With ColorConnex®, the interchange type and body size follow the colors - making it easy to match the right plug to the right coupler, without confusion - the colors connect - ColorConnex®!



**Red = 1/4 in. Industrial = Type D**

**Blue = 1/4 in. Automotive = Type C**

**Green = 1/4 in. ARO = Type B**

**Black = 3/8 in. Automotive = Type G**

**Gold = 3/8 in. ARO = Type J**

## COUPLER AND PLUG MATERIALS

### Brass

- good corrosion resistance
- low wear resistance
- more expensive raw material than steel
- easier to machine than steel
- heavy

### Zinc-plated steel

- fair corrosion resistance
- high wear resistance
- raw material cost is low
- weight similar to brass
- harder to machine than brass

### Zinc-plated steel bodies with aluminum sleeves

- economical steel base material
- high wear resistance
- fair corrosion resistance of zinc-plated steel
- high corrosion-resistance of hardened aluminum
- weight savings vs. all-steel or all-brass

### Nickel-plated steel

- high wear resistance of steel
- more expensive than zinc-plating,
- excellent resistance to wide variety of chemicals and corrosive atmospheres

### Nickel-Plated Brass

- improved corrosion resistance vs. unplated brass
- improved wear-resistance vs. unplated brass
- more expensive than unplated brass

### Stainless steel

- excellent corrosion resistance
- high wear resistance
- most expensive coupler material
- most difficult coupler material to machine

### Hard-anodized Color-coded Aluminum Plugs

- high corrosion-resistance
- toughness of hardened aluminum
- lightest weight plug material
- color-coding to match coupler color-coding



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## SELECTION GUIDE: Quick-Disconnect Couplers & Plugs

### Coupler Style

Interchange

Body Size

Flow Capacity\*

Maximum Inlet Pressure

Thread Size

Base Material

Plating or Finish

Connection Type

**Snap-Ring Style Sleeve Couplers:** Early Sleeve design style w/o end stop--can accidentally disengage when pulled across uneven surfaces--Sleeve edge is not protected from impact--Coupler is more subject to wear. Can subject plug end to dangerous hose whipping when released under pressure. Industrial Interchange couplers meet dimensional and interchangeability requirements of MIL-C-4109F.



**Snap-Ring Coupler**  
Must pull back sleeve to engage & disengage plug. Less air flow than later improved designs. ( Female coupler shown )

Industrial	1/4 in. →	30 SCFM	300 psi	1/4 in. FNPT 1/4 in. MNPT 3/8 in. FNPT 3/8 in. MNPT 1/2 in. FNPT 1/2 in. MNPT 1/4 in. barb 3/8 in. barb	Steel →	Zinc-plated	4-ball
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**Oversized Snap-Ring Coupler**  
Large body coupler with larger grip, easy to grip with gloves. Must pull back sleeve to engage & disengage plug. Less air flow than later improved designs. ( Hose barb coupler shown )

Industrial	1/4 in. →	30 SCFM	300 psi	1/4 in. FNPT 1/4 in. MNPT 3/8 in. FNPT 3/8 in. MNPT 1/2 in. FNPT 1/2 in. MNPT 1/4 in. barb 3/8 in. barb	Steel →	Zinc-plated	4-ball
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**Sleeve Coupler ( End-stop style ):** Newer, improved sleeve design with positive end-stop. Sleeve is protected against accidental disengagement and premature sleeve wear. Can subject plug end to dangerous hose whipping when released under pressure. Industrial Interchange couplers meet dimensional and interchangeability requirements of MIL-C-4109F.



**Sleeve Coupler**  
Pull-back sleeve to engage and disengage plug ( Female coupler shown )

Industrial	1/4 in. →	35 SCFM	300 PSI	1/4 in. FNPT 1/4 in. MNPT 3/8 in. FNPT 3/8 in. MNPT 1/2 in. FNPT 1/2 in. MNPT 3/4 in. FNPT 3/4 in. MNPT 1/4 in. barb 3/8 in. barb 1/2 in. barb 1/4 in. push-on hose barb	Brass	Zinc-plated	1/4 in. 4-ball
Automotive	3/8 in. →	60 SCFM			Steel →		3/8 in. 6-ball
ARO	1/2 in. →	( pending )			304 Stainless Steel		1/2 in. 6-ball



**ColorConnex® Sleeve Coupler**  
Pull-back sleeve to engage & disengage plug. Color-Coded plugs and couplers simplify connecting air lines, and simplify finding replacements. ( Female coupler shown )

Industrial	1/4 in. →	35 SCFM	300 PSI	1/4 in. FNPT 1/4 in. MNPT 3/8 in. FNPT 3/8 in. MNPT	Aluminum Sleeve →	Color-Coded Hard-Anodized	1/4 in. - 4-ball
Automotive	3/8 in. →	60 SCFM			Steel Body →	Zinc-plated	3/8 in. - 6-ball

\* SCFM = Standard Cubic Feet per Minute

# Coupler Style

Interchange

Body Size

Flow Capacity\*

Maximum Inlet Pressure




Thread Size

Base Material


Plating or Finish

Connection Type

**Push-To-Connect Couplers:** Push plug in to engage without pulling back sleeve, pull sleeve back to release plug. Can subject plug end to dangerous hose whipping when released under pressure. Industrial couplers meet dimensional and interchangeability requirements of MIL-C-4109F.

 <p><b>Dedicated Interchange Push-to-Connect Couplers</b> Types that fit standard interchange plugs, as listed. Insert plug without pulling sleeve back. ( Female coupler shown )</p>	<p>Industrial Automotive</p>	<p>1/4 in. → 3/8 in. → 1/2 in. →</p>	<p>35 SCFM 60 SCFM ( pending )</p>	<p>300 psi</p>	<p>1/4 in. FNPT 3/8 in. FNPT 3/8 in. MNPT 1/2 in. FNPT 1/2 in. MNPT</p>	<p>Brass Steel → 304 Stainless Steel</p>	<p>Zinc-plated</p>	<p>4-ball 6-ball 6-ball</p>
 <p><b>Universal or Combo Couplers</b> This push- to-connect coupler accepts <b>all three</b> most popular interchanges of plug: Industrial, Automotive, and ARO. ( Male coupler shown ) <b>Universal coupler style is most likely to leak with side pressure.</b></p>	<p>all Industrial Automotive ARO</p>	<p>1/4 in. → 3/8 in. →</p>	<p>35 SCFM → 60 SCFM →</p>	<p>300 psi 400 psi (S.S.)</p>	<p>1/4 in. FNPT 3/8 in. FNPT 3/8 in. MNPT 1/2 in. FNPT 1/2 in. MNPT</p>	<p>Brass Steel → 304 Stainless Steel</p>	<p>Zinc-plated</p>	<p>1/4 in. / 4-ball 3/8 in. / 4-ball 3/8 in. S.S. / 8-ball</p>
 <p><b>High-Flow Couplers - Push-to-Connect --</b> Insert plug without pulling back sleeve. 40% more SCFM airflow than standard couplers (Male coupler shown)</p>	<p>Asian style high-flow</p>	<p>1/4 in. 1/2 in.</p>	<p>( pending )</p>	<p>400 psi</p>	<p>1/4 in. FNPT 1/4 in. MNPT 3/8 in. FNPT 1/2 in. FNPT 1/4 in. barb 3/8 in. barb 1/2 in. barb</p>	<p>304 Stainless Steel</p>		<p>1/4 in. / 6-ball 1/2 in. / 8-ball</p>

**Safety-Vent Couplers:** Connect and disconnect at zero pressure - Plug is locked into coupler before air is turned on -- when disconnecting, air pressure is safely released before plug can be disconnected. Eliminates dangerous hose whipping.

 <p><b>Safety-Vent Couplers:</b> High flow capacity with low connect and disconnect force. Plug inserts under zero pressure, and two-stage release means plug won't disconnect until pressure is safely released. Pin connection type is smooth, but exerts more wear on plugs, can rock from side to side.</p>	<p>Industrial</p>	<p>1/4 in. →</p>	<p>32 SCFM →</p>	<p>174 psi →</p>	<p>1/4 in. FNPT 1/4 in. MNPT</p>	<p>Steel sleeve → Brass Body →</p>	<p>Zinc-plated Nickel-plated</p>	<p>2-pin</p>
	<p>Industrial</p>	<p>3/8 in. → 1/2 in. →</p>	<p>83 SCFM → 132 SCFM →</p>	<p>232 psi → 232 psi →</p>	<p>3/8 in. FNPT 3/8 in. MNPT 1/2 in. FNPT</p>	<p>Steel →</p>	<p>Zinc-plated</p>	<p>4-ball / 4-ball secondary</p>



1/4 in. LINCOLN Type A



1/4 in. ARO Type B



1/4 in. AUTOMOTIVE Type C



1/4 in. INDUSTRIAL Type D



3/8 in. AUTOMOTIVE Type G



3/8 in. ARO Type J



Asian Style High-Flow 1/4 in. & 1/2 in.





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### MORE COUPLER AND PLUG INFORMATION:

**Coupling size** is the common industry designation, not the actual measured size. Coupling size is generally determined by measuring the plug that fits into the bore of the coupler. There are three commonly used sizes: 1/4-inch, 3/8-inch, and 1/2-inch, referred to as “Body” size or “Series”, not the thread or barb size.

**Higher air flow couplers and plugs** – To satisfy the need for greater airflow use by larger tools and equipment, 3/8-inch and 1/2-inch versions of the basic interchanges carry high air volume with higher pressures.

**Specialty Hi-flow Couplers** – For the paint gun industry, as tools became more sophisticated and lighter, special hi-flow couplers and plugs were developed with improvements for increased airflow with lighter weight than existing larger body couplers and plugs. The “American” type Hi-flow coupler and plug resulted. These were followed by “European” and “Asian” versions, that mostly came into the United States on imported machinery and equipment, which gradually increased demand. To support these, the industrial-supply market yet again added more coupler and plug types.

**Push-to-connect couplers** – offer easy, one-hand connections, and engage standard plugs. To connect, just push the plug into the coupler until it clicks, without pulling back on the coupler sleeve. To disconnect, slide the sleeve forward until the plug ejects. Care must be taken to control the hose under pressure as it is disconnected.

**Safety-Vent Quick Couplers** – A design that safely vents air pressure before disconnect to eliminate dangerous hose whipping, and dangerous release of high pressure air. Typically used where OSHA restrictions are in place, or anywhere the safe release of pressurized air is desired.

**Swivel plugs and inline couplings** – Plugs and inline couplings that are designed with an integral swivel to eliminate hose kinking and hose wear, as well as unnecessary wrist strain. Allows a full 360° rotation which keeps the tool and hose from working against one another, reducing operator frustration and fatigue.

**Push-On Hose Barbs** – These couplers and plugs have a plastic ring on the hose barb, and are for use with push-on hose only. To install, just push the fitting firmly into the hose with a steady force until the plastic ring completely covers the hose end. Unlike standard hose barbs, no crimped ferrule or clamps are necessary. For low pressure, push-on hose only; NOT for use with standard hose.

### TERMS TO KNOW:

**NPT** = National Pipe Tapered threads: threads for connections where pressure-tight joints are made on threads utilizing a thread sealant, such as PTFE thread tape. Pipe size (NPT) is an accepted industry designation, not the actual measured size.

**SCFM:** Standard Cubic Feet per Minute = airflow rate, measured under standard conditions, through the coupler, plug, etc.

**SCFM vs. Working pressure:** SCFM is the air flow rate through the system. Working pressure is the static force per unit of area that the air exerts, usually measured in PSI (Pounds per Square Inch), measured under standard conditions.

**Snubber hose:** A short hose with swivel end and / or ball-swivel ends, used for connecting tools to an air line. The swivel or ball ends allow hose end fittings to move more freely, which improves ergonomics, lessens operator fatigue from tool handling, and reduces strain and bending wear on the hose.

**Working pressure of hose vs. burst pressure:** The working pressure of a hose is the maximum pressure the hose should see while in service. This includes any spikes in system air pressure that may occur during operation, such as happens when equipment being used on the same system is started and stopped. The burst pressure of a hose is the value at which a brand new piece of hose will fail during a one-time pressure test at standard conditions.

**WARNING:** Couplers and plugs are NOT intended for use on hydraulic or water systems, life support systems, or any use with liquids or gases other than normal shop compressed air.

**WARNING:** Air supply system components should be regularly inspected for wear and damage. Worn and damaged components should be replaced for safety and system efficiency.

**WARNING:** Not suited for use with food and beverage air supply systems.

**WARNING:** Couplers, plugs, and related fittings are NOT intended for use on breathing air supply hoses or on life support devices.

**WARNING:** It is the responsibility of the user to determine the suitability of quick-disconnect fittings for the intended use, and that fittings are installed and used in a safe manner.

**WARNING:** Do not exceed the maximum pressure (psi) of any component of an air supply system.

**Note:** All Legacy couplers use Buna-N seals, except 304 stainless steel couplers, which use HNBR seals.