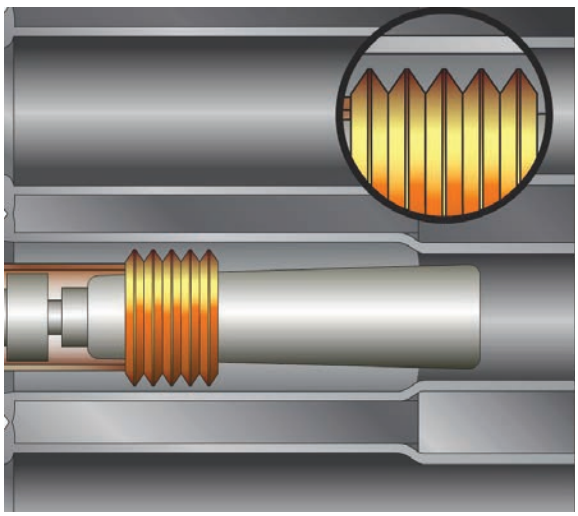
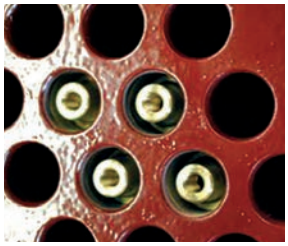
CURTISS-WRIGHT

EST Group





Heat Exchanger Tube Plugging and Testing Equipment

Pop-A-Plug® Tube Plugging System
Installation Equipment
Tube Stabilizers
G-Series Tube Testing Guns

EST GROUP

Established in 1968 and headquartered in Hatfield Pennsylvania USA, Curtiss-Wright EST Group specializes in the development, manufacture and marketing of highly-engineered products and repair services for shell and tube heat exchangers, condensers, coolers and chillers. Our best known product, Pop-A-Plug® Tube Plugs are the industry's leading technology for plugging leaking and/or degraded heat exchanger tubes.

EST Group provides a full range of turnkey field services, including heat exchanger tube testing, tube inspection, mechanical tube cleaning, tube sleeving or lining, tube plugging, tube pulling and partial retubing operations, as well as on-site training for all EST Group products.

Core products include:

- **Pop-A-Plug® Tube Plugging System** - for preparing and plugging leaking and/or degraded heat exchanger tubes. Suitable for service in operating pressures to 7,000 PsiG (480 BarG) without welding or explosives
- **Pop-A-Plug® Tube Stabilizers** - for stabilizing fractured or severed heat exchanger tubes
- **G-Series Tube Testing Guns** - for identifying and locating leaking heat exchanger tubes and tube-to-tubesheet joints

EST Group serves the power generation; petrochemical and refining; fine chemical and pharmaceutical; shipbuilding; oil and gas production; and engineering and construction industries worldwide.

Curtiss-Wright has a long history of solving tough problems that begins with a passion for understanding customer needs. Add to that unparalleled technical expertise, the highest standards of quality and a long heritage of innovative thinking. For nearly a century Curtiss-Wright's Industrial Division has been doing things the Wright way.

Heat Exchanger Tube Plugging and Testing Equipment

Pop-A-Plug® CPI/Perma Tube Plugs

Resistant to thermal cycling and able to provide a seal that's helium-leak tight, the Pop-A-Plug® CPI/Perma Tube Plug is the safe, effective, and reliable solution for heat exchanger tube leaks. Rated to 1000 PsiG (68.9 BarG), the Pop-A-Plug® CPI/Perma Tube Plugging System takes seconds to install and its broad expansion range fits multiple gauges. Fewer plugs are required, reducing inventory and costs. Controlled and repeatable installation minimizes installer fatigue and protects against damage to tubesheet ligaments and adjacent tubesheet joints, extending the life of heat exchangers and reducing costs for retubing. Kits include ten (10) plugs and one (1) Go/No-Go Gage.

Pressure Rating
1000 Psig (68.9 BarG)
Higher pressures available upon request

Size Range
0.472" to 2.067" (11.99mm - 52.5mm) Tube I.D.
Larger/smaller sizes available upon request

Available Materials*
Brass, Carbon Steel, 316 Stainless Steel, 304 Stainless Steel, 4142 Alloy, 70/30 CuNi, 90/10 CuNi, Monel, Duplex 2205, Chromoly Grade 11, Chromoly Grade 22, Titanium

Features
- Helium leak tight seal to 1 x 10^{-6} cc/sec
- Plug material matches tube material preventing thermal expansion and contraction issues and/or undesirable galvanic interaction
- Metal to metal seal will not leak or degrade like elastomer plugs
- Accommodates Through-The-Tube Plugging™ applications
- Lowest lifecycle cost compared to alternative tube plugging methods
- Readily available from stock with 24/7 emergency manufacturing capability

Pop-A-Plug® P2 High Pressure Tube Plugs

When pressures reach supercritical levels, there's nothing like the Pop-A-Plug® P2 Tube Plugging System. A proven long-term performer in fossil and nuclear stations, Pop-A-Plug® P2 Tube Plugs feature patented internally serrated rings designed to maintain a leak-tight seal under extreme thermal and pressure cycling. The Pop-A-Plug® P2 Tube Plugging System reduces downtime, eliminates welding and explosives, and will not damage your tubes, tubejoints or tubesheet. Kits include ten (10) plugs, one (1) tube preparation brush, and one (1) Go/No-Go Gage.

Pressure Rating
Up to 7000 PsiG (483 BarG)
Higher pressures available upon request

Size Range
0.400" to 1.460" (10.16mm to 37.08mm) Tube I.D.
Larger/smaller sizes available upon request

Available Materials*
Brass, Carbon Steel, 316 Stainless Steel, 304 Stainless Steel, 4142 Alloy, 70/30 CuNi, 90/10 CuNi, Monel, Duplex 2205, Chromoly Grade 11, Chromoly Grade 22, Titanium

Features
- Helium leak tight seal to 1 x 10^{-10} cc/sec
- Unique engineered breakaway controls the installation force preventing damage to the tube, tubesheet, and surrounding tubes
- Ideal for use in applications with coated tubes and tubesheet
- Readily available from stock with 24/7 emergency manufacturing capability

*Additional Materials available upon request including: Chromoly F5 & F9, AL6XN, SS 317L/321/347, SS 400 Series Alloys, SS 904L, SS 254 SMO, SS 20CB3/Alloy 20, Super Duplex SS, Inconel Alloys, Incoloy Alloys, Hastelloy Alloys, Nickel 200/201, Zirconium, Carbon Steel A350 LF2

Ram Packages

Small and Large Ram Packages are designed to hydraulically install Pop-A-Plug® Tube Plugs in seconds. The rams are compact, lightweight and easy to use. Install Pop-A-Plug® Tube Plugs quickly, safely and easily. Ram packages include a hydraulic ram, pump, pressure gauge, high pressure hose and metal storage tool box.

Required for Tube Plug Installation

Size Range
Small installs tube plugs 0.400” to 1.336”
(10.16mm to 33.93mm)

Large installs tube plugs 1.180” to 2.067”
(30mm - 52.5mm)

Components Included
Air Activated Hydraulic Pump, 10ft (3 meters) of Hydraulic Hose with Quick Connects, Pressure Gauge, Cable Assembly, Ram Head, and Metal Toolbox

Features
- No welding or hotwork required for installation
- Repeatable installation designed to minimize operator fatigue
- Operates on an air supply of 40 to 125 PsiG (2.7-8.6 BarG)
- Controlled, repeatable installation reduces operator fatigue
- Electric & Battery Operated Ram Packages also available

Close Quarters Ram

Install Pop-A-Plug® Tube Plugs even when there’s minimal clearance around the tube end. Ideal for tubes in the outermost row of closed head feedwater heaters or for tubes adjacent to a pass partition or divider plate.

Required for Tube Plug Installation when Limited Clearance is a Concern

Size Range
Installs tube plugs 0.400” to 1.336”
(10.16mm to 33.93mm)

Standard Material
Zinc Plated Carbon Steel

Features
- Easily installs plugs in tubes adjacent to a pass partition or divider plate
- Available individually or as a kit that includes Air Activated Hydraulic Pump, 10ft of Hydraulic Hose with Quick Connects, Pressure Gauge, Cable Assembly, Ram Head, and Metal Toolbox

Manual Installation Tool

Providing reliable installation in situations where air or electricity are not available. Each Manual Installation Tool comes complete with a Pull Rod and Positioner to install the size and style Pop-A-Plug® Tube Plug identified in the tool’s model number. The Manual Installation Tool can be used with manual wrenches or sockets, as well as with electric or pneumatic impact wrenches.

Required for Tube Plug Installation when Air or Electricity are not Available

Size Range
Installs tube plugs 0.400” - 1.60” (10.16mm to 40.64mm)

Standard Material
Zinc Plated Carbon Steel

Features
- Provides fast, reliable installation where air or electricity are not available
- The standard body accepts all pull rods and positioners
- The locating pin acts as a reaction arm to prevent the body from spinning as the hex nut is being tightened

Pull Rod Assemblies

Used in combination with Pop-A-Plug® Tube Plugging System Ram Packages to install Pop-A-Plug® Heat Exchanger Tube Plugs. EST Group maintains a significant inventory of Pull Rod assemblies, Channel Head assemblies and extensions for both near end and Through-The-Tube Plugging™ in Shell and Tube Heat Exchangers.

Required for Tube Plug Installation

Size Range
Pull Rod and Channel Head Pull Rod Assemblies available for all Tube Plug sizes.

Extensions available in 1ft (30cm), 2ft (60cm), 4ft (120cm), and 6ft (180cm) lengths.

Standard Material
Zinc Plated Carbon Steel

Features
- Assembly consists of a size specific Plug Positioner, Pull Rod, Rod and Tube Positioner, Knurled Nut, and Safety Hex Nut
- Hydraulic Ram Safety Cable designed to be installed between the Knurled Nut and Safety Hex Nut

Tube Preparation Brushes

Tube preparation is vital to successful tube plugging. EST Group's full complement of unique heat exchanger tube brushes deliver fast, consistent tube preparation. Tube brushes size the tube I.D., make it round, quickly remove surface defects that can cause leaks and provide a roughened surface. This improves the Pop-A-Plug® Tube Plug pressure holding capability and leak tight integrity.

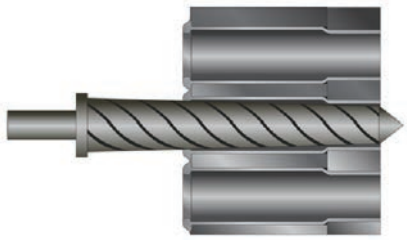
Required for Tube Plug Installation

Size Range
Available for tube sizes from 0.400" to 2.067 (10.16mm to 52.5mm) in increments of 0.020" (0.508mm).

Brush Kits are available for CPI/Perma Tube Plugs that contain multiple brushes to cover the size range of the Tube Plug.

Standard Material
Zinc Plated Carbon Steel. Nylon Coated Bristles on sizes above 1" (25.4mm)

Features
- High and Low Tensile Brushes available based on tube material
- Modified threaded brushes are compatible with Channel Head Pull Rod Assemblies
- Channel Head extensions available in 1ft (30cm), 2ft (60cm), 4ft (120cm), and 6ft (180cm) lengths



Tapered Reamers

A critical step when weld droop obstructs a tube opening and prevents proper measurement of tube I.D. Tapered design allows for precise removal of weld droop or other obstructions when fitted into a hand-held power drill. Offered in various sizes for use with both Pop-A-Plug® CPI/Perma and Pop-A-Plug® P2 Tube Plugs.

Required for Removing Weld Obstruction

Size Range
Available for Tube Plug sizes from 0.400" to 0.979" (10.16mm to 24.86mm).

Extensions available in 1ft (30cm), 2ft (60cm), 4ft (120cm), and 6ft (180cm) lengths.

Standard Material
Hardened Alloy Steel

Features
- Removes weld droop to prevent incorrect sizing for Pop-A-Plug® Tube Plugs
- Compatible with a standard hand-held power drill
- In most cases, weld droop can be removed in 15 - 30 seconds

Plug Removal Tool

Quickly and easily remove installed Pop-A-Plug® Tube Plugs with the dual functioning Removal Tool. Features a nose piece that threads into the pin of an installed plug, enabling the pin to be separated from the ring. The tool retains the pin while a serrated spear grabs the ring's I.D. An integral slide hammer pulls out the ring and pin in one operation. Also available in extended models.

Required for Tube Plug Removal / Retubing

Size Range
Available for tube plug sizes from 0.400" to 1.180" (10.16mm to 29.97mm).

Extensions available in 1ft (30cm), 2ft (60cm), 4ft (120cm), and 6ft (180cm) lengths.

Standard Material
Zinc Plated Carbon Steel Slide Hammer and Pull Rod, Hardened Alloy Steel Tapered Spear

Features
- Can be operated manually with the slide hammer or hydraulically with the Small Ram Kit
- Plugs can quickly and easily be removed for retubing or to bring heat exchanger tubes back into service

Tube Stabilizers

Effectively stabilizes weakened or fractured heat exchanger and condenser tubes. Ideal for any type of shell and tube heat exchanger from high pressure feed-water heaters to surface condensers. Available in either rod or cable type configuration. Available in any length. The unique Anchoring System eliminates cable or rod migration and ensures that fractured tubes are securely supported untill retubing or sleeving can be performed.

Required to Reinforce Fractured Tubes

Size Range
Sizes to fit tubes ranging from 0.501" to 0.960" I.D. (12.73mm to 24.38mm)

Standard Material
Stainless Steel

Features
- Bullet or wedge style tip configurations
- Stepped anchor diameter allows it to fit in unrolled section of tubes
- Installs using standard Pop-A-Plug® Ram packages
- Anchors are easily removable for retubing or repair

G-150 Tube Testing Guns

Designed to pneumatically test individual heat exchanger tubes for leaks. Either the entire tube bundle or an isolated number of tubes in the bundle can be tested using standard plant compressed air supply. G-150 Tube Testing Gun Sets include one G-150 Air Injection Gun and one G-150 Tube Plugging Gun. Replacement Seal and Washer sets, Channel Head Extensions, and Digital Pressure Gauges are also available.

Operating Pressure
Standard plant compressed air supply
40 - 125 PsiG (2.7 - 8.5 BarG)

Size Range
G-150 - 0.28" to 1.23" (7.1mm to 31.2mm)
G-150A - tube I.D. sizes up to 2.50" (63.5mm)

Standard Seal Material
Neoprene

Features
- The G-150 Air Injection and Plugging Guns weigh less than 2.1 lbs. (0.953 kg) each
- Interchangeable seal and washer sets are size specific per tube I.D.
- Ergonomic slide activated air injection valve handle
- Fluoroelastomer seal material is also available

G-250 Vacuum Tube Testing Gun

Designed to quickly seal off and evacuate individual heat exchanger tubes to test for leakage. G-250 gun set is supplied with a Vacuum Test Gun, Plugging Tool, and two sizes of interchangeable Conical Seal and Washer Sets in a compact toolbox. Machined from high strength aluminum alloy reducing fatigue associated with using heavier testing equipment.

Operating Pressure
Standard plant compressed air supply
40 - 125 PsiG (2.7 - 8.5 BarG)

Size Range
0.28" to 1.45" (7.1mm to 36.8mm)
Optional Seal Sets are available to 2.50" (63.5mm)

Standard Seal Material
Neoprene

Features
- Each G-250 set weighs less than 2.5 lbs. (1.1kg)
- Replacement Seal and Washer Sets, Channel Head Extensions and Digital Pressure Gauges are available

G-650 Joint Testing Gun

Designed to quickly test expanded tube-to-tubesheet joints for leakage. Ideal for heat exchanger manufacturers or companies performing retubing operations. The G-650 gun seals the tube I.D. and the tubesheet face, then evacuates the tube end at the joint. A loss of vacuum indicates a leaky tube joint. Digital Pressure Gauges also available.

Operating Pressure
Standard plant compressed air supply
40 - 125 PsiG (2.7 - 8.5 BarG)

Size Range
G-650 - 3/8" to 1¼" (9.5mm to 31.75mm)
G-650A - 1½" to 2½" (38.1mm to 63.5mm)

Standard Seal Material
Neoprene

Features
- A highly efficient venturi typically creates 21 to 24 in-Hg (707 to 808 mBar) vacuum on an inlet air supply of 100 psi (6.8 Bar) and 10 SCFM (283 l/min)

G-450 Tube Testing Gun

Designed to allow testing of straight tube heat exchangers when access is restricted to one end of the tube. Ideal for testing tubes in floating head heat exchanger applications with the tube bundles in place. The G-450 gun utilizes standard plant compressed air supplies. Digital Pressure Gauges are also available.

Operating Pressure
Standard plant compressed air supply
40 - 125 PsiG (2.7 - 8.5 BarG)

Size Range
0.50" to 1.23" (12.7mm to 31.2mm)

Standard Seal Material
Neoprene

Features
- Interchangeable Support Rod, Tube Extension Assemblies and Seal & Washer Sets

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