

Plug Comparison Chart

Product Source:	DL Hollaender Enterprises, inc.	Expansion Seal Technologies, an EST Group, Inc. Company	TEI Struthers Services, A Babcock Power, Inc. Company	TEI Struthers Services, A Babcock Power, Inc. Company	JNT Technical Services, Inc.	Elliott Tool Technologies, Inc. (representative)
Product Name:	InstaPlug™	Pop-A-Plug®	Explosively Welded Plug	Explosively Expanded Plug	TORQ N'SEAL®	Tapered Plug Tapered Plug and Ring
Approximate Range (inches)	0.030"	0.020"	0.030"	0.030"	0.030"	0.015"-0.030"
Nominal Pressure Rating (psi):	10,000	7,000	10,000	low pressure	6,500	1500 and up
Installation:	1. Clean and prepare receiving surface	1. Clean and prepare receiving surface			1. Clean and prepare receiving surface	1. Clean and prepare receiving surface
For all processes FOLLOW ALL SAFETY PRECAUTIONS OF PRODUCT AND AT INSTALLATION SITE. Identify the leaking tube(s) and prepare tube/tubesheet as indicated for each product	2. Select correctly sized plug with supplied gogo gage and install a swaged plug into hole	2. Select correctly sized plug with supplied gogo gage and install plug into hole			2. Select correctly sized plug with supplied gogo gage and install plug into hole	2. Select correctly sized plug with supplied gogo gage and install plug into hole
	3. Apply heat through supplied heat transfer rod until temperature of plug exceeds transition (approximately 200 F) and memory metal recovery causes fins to seal hole	3. Expand the plug by either hydraulic or manual application means until breakaway shear bar is fractured and serrated sealing rings expand into hole	Installation must be performed by specialized contractor – not plant personnel.	Installation must be performed by specialized contractor – not plant personnel.	3. Apply torque to cam-shaped expander with manual or power torque wrench to preset torque levels	3. Apply repeated impacts to expander with manual or power hammer
	4. Remove heat transfer rod	4. Remove hydraulic actuation or manual jack and related pullrod tooling			4. Remove torque wrench	4. Remove hammer from site
Advantages:	<ul style="list-style-type: none"> • Simple Single part construction provides positive seal unaffected by environment or thermal cycling. • Installation can be performed by plant personnel easily trained and certified in process • Comparatively moderate priced • In-service nature of alloy is to "remember" interference fit in the presence of heat – means plug has ability to recover from installation errors of incomplete sealing. 	<ul style="list-style-type: none"> • Available in a variety of alloys to match tube material • Installation can be performed by plant personnel easily trained and certified in process • Comparatively moderate priced 	<ul style="list-style-type: none"> • Single part nickel only construction provides positive seal unaffected by environment or thermal cycling. • Hole preparation not critical only removal of surface oxides and other contaminants is required * Comparitively high priced 	<ul style="list-style-type: none"> • Variant of explosive process provides a mechanical seal optimized for lower pressure applications and sensitive tubesheets • Hole preparation not critical only removal of surface oxides and other contaminants is required * Comparitively moderate to high priced 	<ul style="list-style-type: none"> • Available in a variety of alloys to match tube material • Installation can be performed by plant personnel easily trained and certified in process • Comparatively moderate priced • Simple, compact installation tooling requires minimal clearance 	<ul style="list-style-type: none"> • Available in a variety of alloys to match tube material • Installation can be performed by plant personnel easily trained and certified in process • Comparatively low priced • Simple installation tooling
Disadvantages:		<ul style="list-style-type: none"> • Multi-part construction can result in thermal cycling failure particularly if installation procedure is not precisely executed • Cannot address peripheral tubes in hemispherical head heaters • Requires clearance space for installation • Tubes adjacent to the division plate may be inaccessible 	<ul style="list-style-type: none"> • Requires licensed installation technician; compliance with explosives transport, handling and storage • Up to five times more expensive than other methods • Cannot be stored in plants because of explosive storage liability • Difficult to remove when retubing 	<ul style="list-style-type: none"> • Requires licensed installation technician; compliance with explosives transport, handling and storage • Up to five times more expensive than other methods • Cannot be stored in plants because of explosive storage liability 	<ul style="list-style-type: none"> • Multi-part construction can result in thermal cycling failure particularly if installation procedure is not precisely executed • Multi-part construction can result in thermal cycling failure 	<ul style="list-style-type: none"> • Tapers inherent in construction can result in thermal cycling failure particularly if installation procedure is not precisely executed • Effectiveness and potential for damage to tubesheet and tubesheet ligaments is highly operator dependent • Far end tube plugging impossible