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| *Tube Turns “W” Series Monolithic Insulated Joints* |
| **Series W insulated joints** are prefabricated one-piece unions of butt-weld forged body construction. IJs protect against corrosion damage by electrically isolating pipeline segments and equipment from stray DC picked-up from adjacent pipelines, electric railway systems, and other nearby sources of DC. **Engineering To Order:** IJs are designed to ASME B31.4 and B41.8 and are **manufactured to any diameter or wall thickness** using ASME/ASTM materials that match the metallurgy and yield strength of your existing pipe. IJs are coated to prevent corrosion, are fully tested electrically, hydrostatically & weld tested and are **through-bored** to allow for the passage of pigs & scrapers. Each IJ is **serialized**, **heat code identified** and **traceable** (MTRs furnished on all pressure retaining components). **IJs are used where*** High pressure gas transmission pipelines
* Liquids pipelines of all types
* To join **pipe ends** of **different yield strengths** and **wall thicknesses**
* Onshore, offshore, buried, aboveground or subsea
* In “sweet” (non-corrosive) or “sour” corrosive applications
* Gas gathering systems; distribution and branch lines
* Installed on inlet and outlet pipes to isolate meters, tanks, pump and compressor stations from the main CP system

**Benefits of Monolithic Construction*** Solid one-piece butt-weld forged body construction
* Simple Installation: one continuous weld on each side of the pipe to install
* Factory assembled (eliminates field assembly)
* **Same metallurgy, yield strength, WT as matching pipe**
* Leak-proof (completely sealed internally and to the external environment)
* **Boltless** monolithic design is maintenance-free (**eliminates bolted connections**)
* **Fully tested** to verify mechanical integrity and electrical resistance (hydrostatically, electrically and weld tested)
* **Coated internally and externally** w/non-conductive **two-part epoxy resin coatings** of different types
* *Engineered to Order*: **custom built** to your specifications: **same metallurgy**, **yield strength**, **WT** as matching pipe
* Hubs of **Dual Certified** or **Triple Certified:** SA105/SA350 LF2 CL1 and ASTM A694-F52; higher yield mat’l available
* Each insulated joint is **traceable,** **serialized and heat code identified**
* **Certified Material Test Reports (MTRs)** furnished on all pressure retaining components
* **Made in the US** with **US sourced materials** at our **ISO Certified** ASME facility in **Louisville, KY**
* **Standard 8-week delivery**

***Design Codes and Standards**** ASME B31.4 Liquid Petroleum Transportation Piping Systems
* ASME B31.8 Gas Transmission and Distribution Piping Systems
* ASME BPVC Sec VIII Div. 1 and 2
* ASME BPVC Sec II Materials
* ASME BPVC Sec V NDE
* ASME Sec IX Welding
* ASTM applicable material standards (A694)
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| ***Sizes/Ratings******Size 2 – 48-inch – ASME CL 150 - 900**** ASME CL150 (**WP = 285 psi**) - hydrostatic test pressure **=** **450 psi** for 15 min **(**1.5x design pressure)
* ASME CL300 (**WP = 740 psi**) - hydrostatic test pressure **= 1125 psi** for 15 min **(**1.5x design pressure)
* ASME CL600 (**WP = 1480 psi**) - hydrostatic test pressure **=** **2225 psi** for 15 min **(1**.5x design pressure)
* ASME CL900 (**WP = 2220 psi**) - hydrostatic test pressure **=** **3350 psi** for 15 min **(1**.5x design pressure)
* **DF = 0.5** is standard (depends on **spec** and **“Location Class”** per B31.4/B31.8)

***Prototype Testing (refer to page 4 of IJ brochure for test results)**** **Prototype tested**: IJs have a resistance to mechanical and thermal stresses that ***exceed the strength of the pipeline***
* **Pressure Fatigue Tested**: subjected to rapid pressure cycles to 2300 psi then hydro tested for mechanical integrity
* **Torsion Tested**: Subjected to a torsional moment enough to produce a stress in the attached X65 pipe of 10% of MSYS
* **Bend Tested**: CL600 IJs subjected to externally applied bending loads while under full rated internal pressure
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| ***Standard Welding Hub Materials: ASTM A694/ASME SA105 or SA106 Gr C 52k min yield)**** **Pipe** (2 – 6 inch) SA 106 Gr C 52,000K min yield strength
* **Forgings** (8-inch +) **A694 F52** ***Dual Certified*** (52,000 min yield strength) and either **SA105** or **SA350LF2 CL1**
	+ Or hubs are ***Triple Certified*** – SA105/SA350LF2 CL1/A694-F52
	+ **When matching higher yield strength pipe**, dia. at weld bevel can be increased to meet piping code requirements such as ASME B31.8 Fig. I5 or higher yield materials can be used; F60, F65, F70
* All material **serialized, heat code identified and traceable**
* **Forged** or **pipe bodies** welded under a **compression load** (design calcs available)
* **Strict limits on Carbon Equivalent** **(%CE)** .045% max or to customer spec
	+ %CEregards how different alloying elements affect the hardness of steel and its weldability
	+ Material chemistry impacts weld quality
 |
| ***Mechanical Leak Test**** Each IJ individually **Hydrostatically Tested to 1.5 x design pressure** (or customer spec)
 |
| ***Electrical testing:**** *Resistance* test (std) – able to withstand an applied voltage of 1000 V DC (std is 25 megohm min resistance)
	+ Most IJs exhibit resistance > 2000 megohms
* *Dielectric Strength* test (std test to meas. **current leakage**): 5kV AC @50 Hz for 1 min. (max leakage 5mA)
	+ A *non-destructive test*; no data on voltage that would cause arcing; safely say it’s > 5,000 VAC
	+ A test to determine “***breakdown voltage***” would be a destructive test
 |
| ***ASME Section IX Welding**** All welding done in-house by company certified welders working to **written welding procedure specifications**
* SMAW, GTAW, GMAW, SAW, ERW
* Full-time welding engineer in-house
* Weld Test report (UT) furnished on yoke closure welds
 |
| **Coating - Non-Conductive Two-Part Bonded Epoxy Resin Coatings** * Each IJ blast cleaned to white metal and coated inside/outside w/2 coats of non-conductive epoxy resin
* Sprayed to within 2” of each weld end
* Internally coated w/ non-conductive epoxy resin to prevent bridging of the insulating gap
* Two-part bonded epoxy coating options:
	+ **Akzo Noble** std two-part non-conductive epoxy coatings inside/outside
	+ **Denso Protal 7200** two-part non-conductive epoxy coatings inside/outside
 |
| ***Data Package Includes:**** **Hydrostatic** **test report** (1.5 x design pressure)
* **Electrical test report** (resistance & withstand)
* **Weld test report** (UT of closure welds/ends)
* **Certified MTRs** for all metallic components
* **Approval Drwg** – when requested (includes SN, Heat #, Size, Class, Materials, Hydrotest pressure, Insulator, Coating)
* **Stress calculations** (when requested)
 |
| ***Insulator (GRE)**** Type **FR-4 (Flame Retardant) H**igh Strength **Glass Reinforced Epoxy Resin Laminate** (GRE)
* **Ultra-strong plastic** – Ultimate Tensile Strength of 45,000 psi (Cast Iron 29K, Cooper 31K, Alum 45K)
* Min electrical strength 15,000 Volts
* The world’s most commonly used electrical insulator
* **Non-hygroscopic**, waterproof (Near zero water absorption)
* Highly **chemically resistant** to a range of hydrocarbons
* Retain its high **mechanical values** and **electrical insulating** qualities in both dry and humid conditions
* ***Dielectric filler material*** *is liquid epoxy fills body cavity voids (data sheet available)*
 |
| ***FKM O-rings (Internal seals) are:**** Dual static, self-energized **FKM/Viton**
* Housed in grooves machined into each weld hub
* Under compression and locked into position to provide a positive pressure seal
* Completely sealed internally and to atmosphere
 |
| ***Marking – Forging and Pipe Traceability**** ***Each IJ marked by low stress steel stencil on outside of yoke:***
* Mfg name
* Serial #
* Size/Pressure Class
* Material Heat #
* Material Heat # also marked on outside of hub
 |
| ***Bore/Beveled Weld Ends:**** All IJs **through-bored** to allow passage of pigs and scrapers
* Weld ends to **match corresponding pipe ends** per API 5L (30 deg), ASME B31.8, B16.25, MSS SP75 or customer spec
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| ***Tube Turns Certifications/ASME Designations Louisville, KY plant:**** ISO Certified 9001-2015 Quality Mgt System
* U Stamp holder
* U2 Stamp holder
* R Stamp holder – NB Cert of Auth for shop/field repair
* Continuous Improvement: Lean Mfg concepts, Six Sigma, PMP
* 10 degreed engineers
* 1 Full time welding engineer
* 1 Full time NB Authorized Inspector
 |
| **US made at our ASME facility in Louisville, KY*** Weld Hubs made with **US sourced** forged carbon steel rolled rings
* Series W complies with “**Buy America**” provisions
* Standard **8-week delivery** after approvals, if required
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