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| *Tube Turns “W” Series Monolithic Insulated Joints* |
| Tube Turns insulated joints are prefabricated, one-piece unions of butt-weld, forged body construction used to **electrically isolate and protect pipe work** and associated equipment from corrosion damage caused by stray electrical currents and unwanted electrical potentials that come to the pipeline from overhead power lines, parallel pipelines and other sources.  IJs prevent metal to metal contact across the joint; and this protection is **long term** and **maintenance-free**. Custom built to your specifications, IJs are **manufactured to** **any diameter or wall thickness** and are **through-bored** to allow for the passage of pigs and scrapers; and each IJ is **serialized**, **heat code identified** and **traceable**.  **IJs are used where:**   * Designed for use with almost any fluid: oil, gas, water * Onshore, offshore, buried, aboveground or subsea; in “sweet” (non-corrosive) or “sour” corrosive applications * High pressure gas transmission service * Gas gathering systems * Liquid pipelines of all types * Gas distribution and branch lines * Anywhere the pipeline enters or exits the ground * 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:** ASTM A694-F52/ASME SA105 or SA350 LF2 CL1; higher yield mat’l available * Each insulated joint is **traceable,** **serialized and heat code identified** * **Certified Material Test Reports (MTRs)** furnished on all pressure containing metallic components * **Made in the US** 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) |
| ***Sizes/Ratings***  ***Size 2 – 42-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 torsional moment sufficient 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 |
| ***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   + 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) * **Design 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 # * 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 ASME B16.25, ASME B31.8, API 5L or customer spec |
| **US made at our ASME facility in Louisville, KY**   * Made with US steel; Complies with “**Buy America**” provisions * Standard **8-week delivery** after approvals, if required |
| ***Tube Turns Certifications/ASME Designations Louisville, KY plant:***   * ISO Certified 9001-2015 * U Stamp holder – Manufacture of Pressure Vessels at our ASME facility in Louisville, KY * U2 Stamp holder - Manufacture of Pressure Vessels at our ASME facility in Louisville, KY * R Stamp holder – NB Cert of Auth for shop/field repair * Pressure Equipment Directive – European pressure vessel design code * Continuous Improvement: Lean Mfg concepts, Six Sigma, PMP * 10 degreed engineers * Full time welding engineer * Full time NB Authorized Inspector |