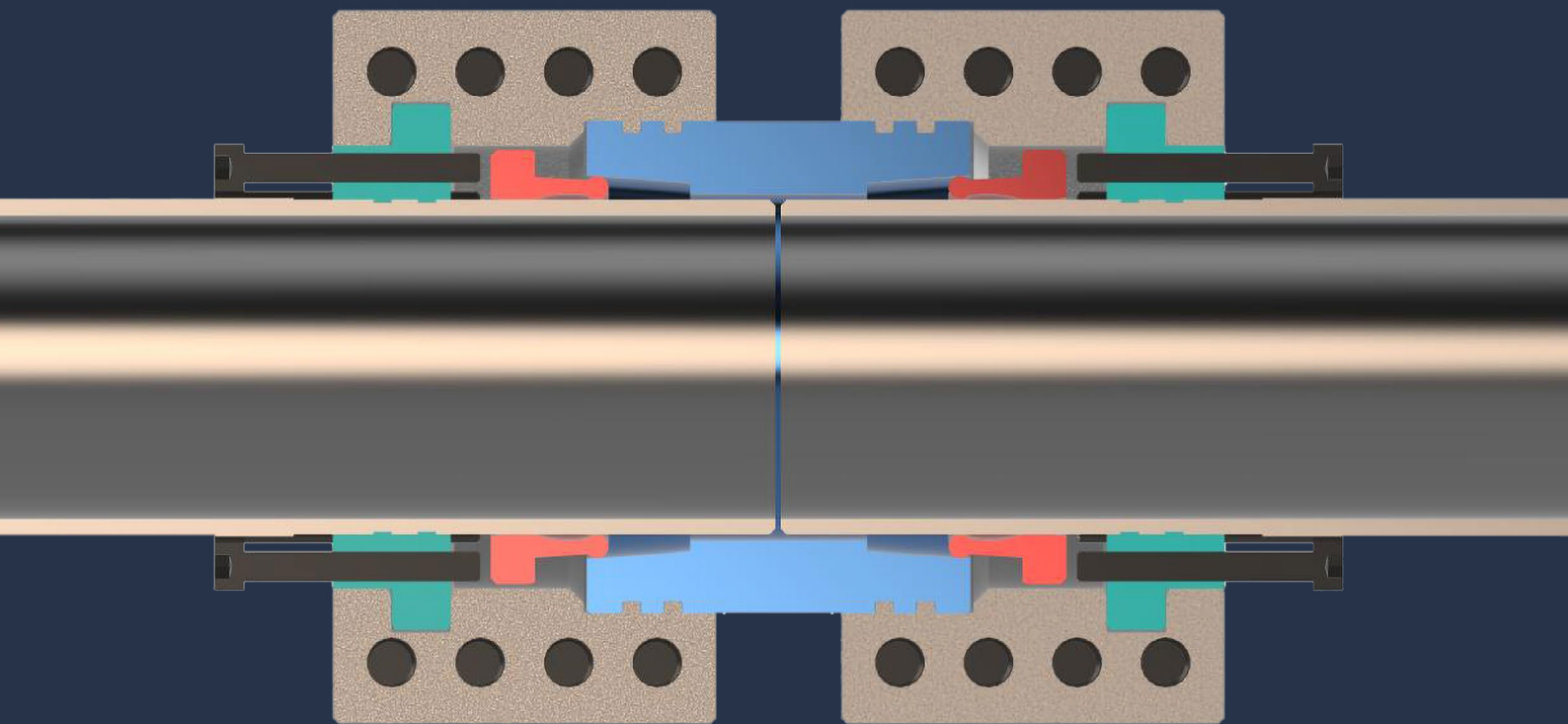


POULTON TECHNOLOGIES

CONNECT AND SEAL

WELDLESS METAL-SEALED MECHANICAL PIPE CONNECTOR



PERMANENT • COLD-WORK • HIGH-PRESSURE

PT1

CONNECT AND SEAL

A HIGH-INTEGRITY PIPE CONNECTOR INSTALLED WITHOUT WELDING OR OTHER HOT WORK

Poulton Technologies developed the **PT1** to meet the industry's need for a high-integrity pipe connector that can be installed in hostile conditions, within limited space and without welding or other hot work. Developed and tested in the UK, the **PT1** has undergone extensive independent testing, supporting Lloyd's Register Type Approval and ABSA CRN 0A25560.2 for the qualified configurations.

The **PT1** incorporates a unique metal-to-metal sealing system that is independent of its mechanical retention system. Separating connecting from sealing prevents external pipeline loads from being transmitted through the seal, helping maintain sealing integrity under axial, bending, torsional and vibration loads.

KEY PRODUCT ATTRIBUTES

- **Unique metal-to-metal seal** — a permanent metallic pressure boundary.
- **High pressure** – 24000 psi
- **Weldless cold-work connection** — no welding or hot work at the connection.
- **Application-specific** — matched to the pipe, pressure, medium and service.
- **Fast and simple installation** — portable machining followed by hand bolted assembly.

THE **PT1** CONNECTOR IS PROTECTED THROUGH A GLOBAL PATENT PORTFOLIO.

Patented in multiple countries, including under US patent number 14/432,955, and European patent number 14766785.1



HOW THE PT1 WORKS

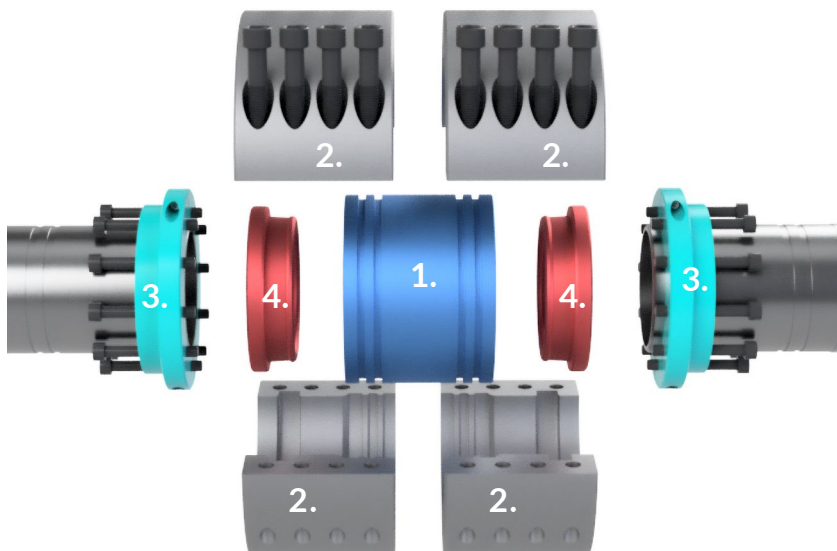
MECHANICAL RETENTION AND PRESSURE SEALING ARE DELIBERATELY SEPARATED

The exploded view shows the four principal connector components. The joining stock, clamps and spigot rings provide the mechanical connection. The independently energised Radial Wedge Seals provide the separate metal-to-metal pressure seal.

FOUR PRINCIPLE COMPONENTS:

1. **JOINING STOCK** A pipe sleeve positioned over the prepared pipe ends; its internal taper forms part of the sealing interface.
2. **CLAMSHELLS** Connect the joining stock to the prepared pipe ends.
3. **SPIGOT RINGS** Fit into the machined grooves and engage with the clamps to provide positive mechanical retention.
4. **RADIAL WEDGE SEALS** Profiled metallic rings energised into the tapered gap to form the independent pressure seal.

The clamp bolts establish the mechanical connection. Separate energisation screws set the metallic seals.



METAL-TO-METAL SEALING

THE RADIAL WEDGE SEAL IS THE CENTRAL PT1 DIFFERENTIATOR

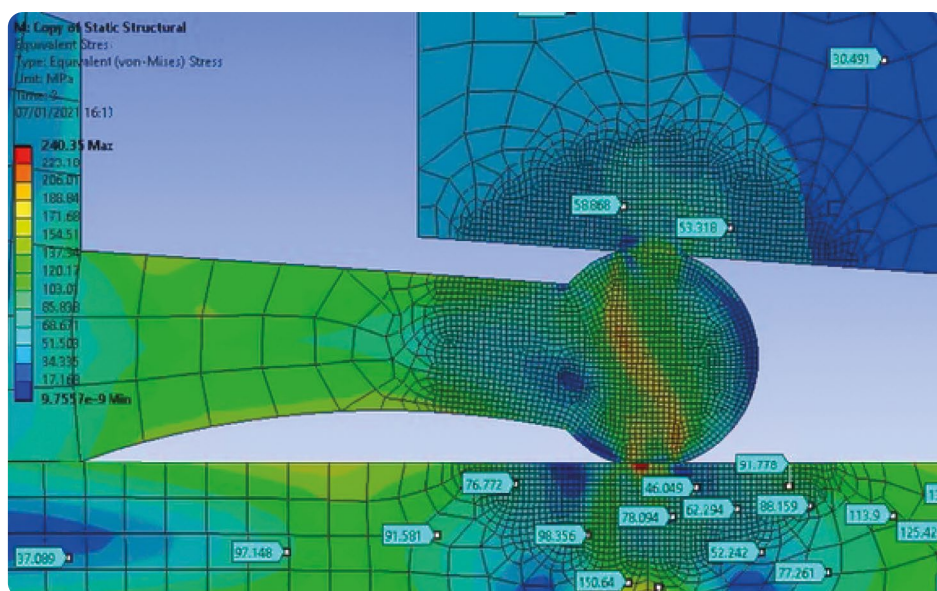
The **PT1** provides proven sealing performance through its proprietary Radial Wedge Seal system. The Radial Wedge Seal is an all-metal seal. Specially profiled seal rings are driven into a tapered annular gap, the gradually narrowing space between the pipe and the joining stock. This controlled geometry generates high localised contact pressures, forming a permanent, high-integrity metal-to-metal seal.

During installation, the seal is plastically set while the pipe remains fully elastic. A wide seal contact band is maintained, with contact stresses exceeding 180 MPa in line with BS 5500 and ASME Section VIII. The compressive forces applied during assembly set the seal and reliably contain operational pressures.

Because mechanical retention and sealing are independent, axial, bending, torsional and vibration loads are carried by the connector structure rather than through the sealing interface.

QUANTIFIED SEALING EVIDENCE:

1. **HELIUM** 3×10^{-10} mbar·L/s, equivalent to approximately one cc over 100 years
2. **FIRE** API 6FB testing completed at 650°C.
3. **PRESSURE** Ultimate burst testing above 24,000 psi.
4. **GAS** Internal gas-pressure bubble testing completed.



WELDLESS COLD-WORK INSTALLATION

A PERMANENT PIPE CONNECTION WITHOUT WELDING.

The **PT1** creates a permanent mechanical pipe connection without welding, flame cutting or any other thermal joining process. Pipe preparation and controlled bolted assembly are completed using portable clamshell lathe and conventional hand tools.

By eliminating welding, the **PT1** avoids the welding-specific controls that often increase permit complexity, shutdown duration and work-area restrictions.

INSTALLATION ADVANTAGES

- **Simplified permitting** — removes welding-related hot-work permit requirements.
- **Reduced downtime** — eliminates welding set-up, welding operations and post-weld activities including X-RAYS.
- **No heat-affected zone** — the pipe is not subjected to welding temperatures, avoiding local metallurgical change.
- **Protects liners and coatings** — no local welding heat is introduced that could damage internal linings or external coating systems.
- **Swift return to service** — portable machining and Hand bolted assembly reduce field installation activity.
- **No welding fire watch or exclusion zone**

CLAMSHELL LATHE



PORTABLE SPLIT-FRAME MACHINING

A portable split-frame clamshell lathe clamps around the existing pipe and machines the specified grooves concentrically for controlled, repeatable preparation in situ.

COLD-WORK PROCESS

The clamshell lathe mechanically machines the grooves without welding, flame cutting or any thermal process. This pipe preparation is **a cold-work solution**.

INDEPENDENT MECHANICAL RETENTION

POSITIVE RETENTION WITHOUT LOADING THE METALLIC SEAL

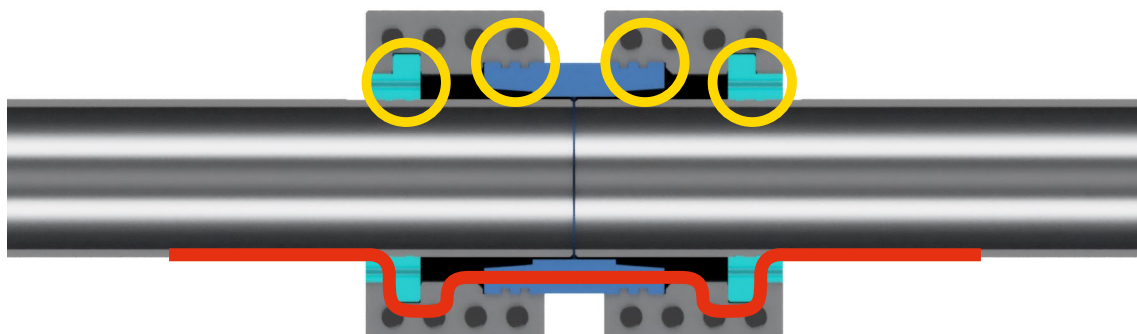
The **PT1** separates the mechanical connection from the Radial Wedge Seal. External forces introduced through the adjoining pipework are carried through the connector structure and directed away from the metallic sealing interface. Axial tension, bending, torsion and vibration therefore do not reduce the contact pressure applied by the seal.

In a conventional flanged connection, the flange bolts must maintain gasket compression while also reacting to external pipe loads. These forces may require additional bolt loading and can reduce the pressure applied to the gasket. The **PT1** overcomes this by providing independent load paths for mechanical retention and sealing.

Controlled tightening of the **PT1** clamping bolts, together with the design of the mechanical retention system, enables the connector to withstand high external loads without transferring them through the Radial Wedge Seal. The metallic seal remains dedicated to maintaining the pressure boundary.

VALIDATED MECHANICAL PERFORMANCE

- **Vibration and fatigue** — tested in accordance with IACS P2 for three million cycles at 10 Hz and 1.5 mm amplitude.
- **Ultimate pull-out** — 1,356 kN, equivalent to 138.3 tonnes.
- **Four-point bend** — tested under combined internal pressure and bending across demanding load cases.
- **External load resistance** — axial, bending, torsional and vibration loads are carried through the connector structure, away from the sealing interface.



PIPE PREPARATION

GROOVE DEPTH IS APPLICATION-SPECIFIC

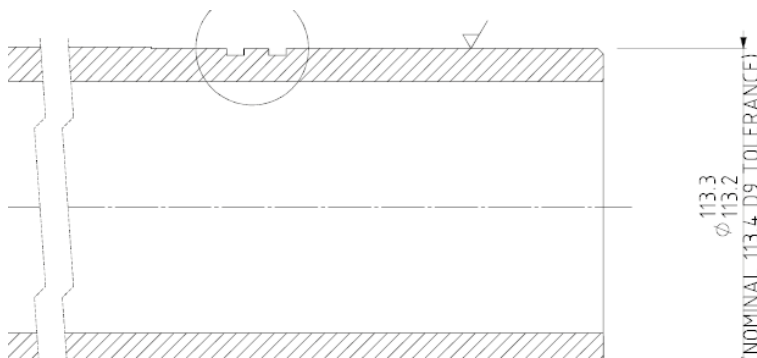
Groove depth is dictated by the operating pressure for the application. The final machining dimensions are confirmed against the pipe outside diameter, wall thickness, material grade and tolerances. This ensures the Spigot Rings achieve the required mechanical engagement within the approved design.

COLD-WORK PROCESS

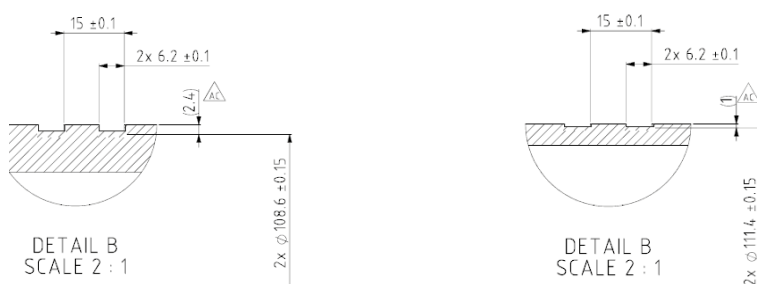
The clamshell lathe mechanically machines the grooves. This pipe preparation is classed as a cold-work process.

CONTROLLED COLD-WORK MACHINING

- **Application-specific groove depth** — dictated by the operating pressure and approved design.
- **Defined dimensions** — based on pipe diameter, wall thickness, material and tolerances.
- **Portable clamshell lathe** — machines the grooves concentrically around the existing pipe.
- **Cold-work solution** — no welding, flame cutting or thermal process is used.



EXAMPLE: 2.4MM GROOVE



APPLICATIONS

MATCHED TO THE APPLICATION—INCLUDING OIL, GAS, HYDROGEN AND SOUR-SERVICE DUTIES

SAFETY, ACCESS AND INSTALLATION ADVANTAGES

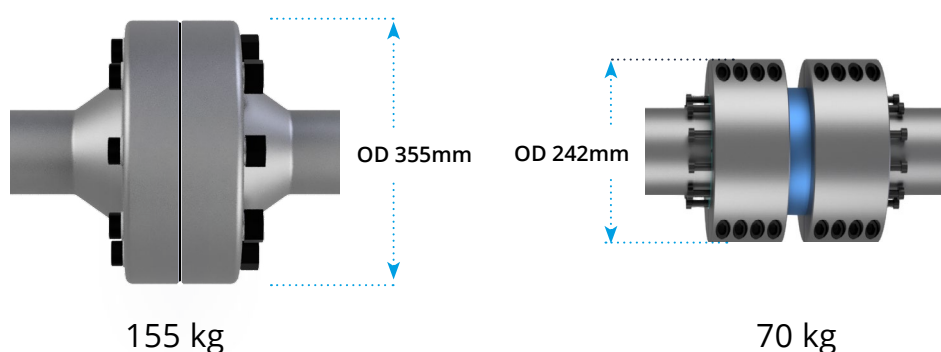
Pipe leakage, tie-in and replacement work can create significant safety, programme and cost challenges. The **PT1** provides a permanent mechanical connection that can be installed without welding or other hot work, making it particularly valuable where access is constrained, shutdown time is limited or specialist welding resources are difficult to mobilise.

DESIGNED FOR DEMANDING ENVIRONMENTS

The **PT1** is not simply a temporary repair. It can be engineered for permanent service in subsea and marine systems, weight-sensitive topsides, land pipelines, process plants, utilities and remote Arctic or desert environments. Its compact envelope also support installations where conventional flanges cannot meet the available space or weight requirements.

SMALLER DIAMETER AND LOWER MASS

For the same pressure class, the **PT1** can be substantially smaller and lighter than a conventional bolted flange connection. The difference becomes more significant as pipe size increases.



4-inch Class 2500 comparison — **PT1** outside diameter 242 mm and mass approximately 70 kg, compared with a flange outside diameter of 355 mm and mass of 155 kg.

8-inch Class 2500 comparison — **PT1** outside diameter 364 mm and mass approximately 150 kg, compared with a fully bolted flange diameter exceeding 533 mm and mass of approximately 650 kg.

APPLICATION RANGE & SYSTEM BENEFITS

MATCHED TO THE PIPE, PRESSURE, MEDIUM AND SERVICE

PRINCIPLE APPLICATIONS

- **Permanent pipe repair, tie-in and new construction** — for planned or urgent pipeline work.
- **Process upgrades and plant modifications** — including replacement spools, elbows and valves.
- **Land pipelines, process plants and utilities** — including water and HVAC connections.
- **Subsea, marine and hydraulic systems** — where access, space or weight is constrained.
- **Lined or coated pipe** — where local welding heat could damage the internal or external protection system.
- **Specialist service** — including oil, gas, hydrogen, ammonia and sour-service duties with application-specific material selection and qualification.

HIGH-INTEGRITY VOC CONTAINMENT

VOC emissions are a significant concern across the energy and process industries. The all-metal Radial Wedge Seal has demonstrated a helium leak rate of 3×10^{-10} mbar-L/s, equivalent to approximately 1 cc of helium over 100 years. This quantified sealing performance supports the prevention of VOC leakage.

REPAIRS AND REPLACEMENT WITHOUT REPEAT WELDING

The **PT1** can be used for individual in-situ repairs and pipe replacement without unnecessary dismantling of the wider pipe network. Once the **PT1** interfaces are established, prepared spool pieces, high-wear sections, elbows and valves can be exchanged through hand bolted disassembly and simple reassembly.

COMPLETE SUBSYSTEMS

Complete pipe subsystems can be designed, built and factory-tested around **PT1** interfaces before being dismantled for controlled assembly on site. This approach reduces field activity and supports planned future replacement of individual components.

ENGINEERED PIPELINE CONFIGURATION

THE PT1 PRINCIPLE CAN BE INCORPORATED INTO APPLICATION-SPECIFIC COMPONENTS

The **PT1** connection principle can be incorporated into engineered piping components while retaining independent mechanical connection and metal-to-metal sealing at each interface.

WELDLESS ELBOW ASSEMBLY

Replaceable high-wear elbow sections can be exchanged without repeated welding at the established **PT1** interfaces.



WELDLESS VALVE CONNECTION

Prepared **PT1** interfaces can simplify valve replacement and reduce subsequent field welding.



REPLACEABLE SPOOLS AND HIGH-WEAR SECTIONS

Removable pipe sections and frequently maintained components can be exchanged using the established connection points.



Concept renderings are illustrative. Final geometry, materials and qualification depend on the application and operating conditions.

ULTIMATE PRESSURE PERFORMANCE

WHEN THE TESTED PIPE END FAILED, THE PT1 REMAINED SEALED

The **PT1** was subjected to an ultimate burst test using Schedule XXS pipe. At 24,360 psi—more than 1,600 bar—the adjoining pipe-end arrangement failed while the connector remained intact and sealed.

HEADLINE RESULTS

- **24,360 psi** — ultimate burst pressure.
- **Pipe-end failure** — the connector continued to seal after failure of the adjoining arrangement.
- **4x design pressure** — minimum proof/burst qualification basis under ASME VIII-1 UG-101.



EXTENSIVE THIRD-PARTY TESTING

PRESSURE, RETENTION, FATIGUE, FIRE, BENDING AND HIGH-INTEGRITY GAS SERVICE

The **PT1** has completed an extensive third-party programme covering pressure integrity, mechanical retention, sealing, fatigue, fire and combined loading. The programme supported Lloyd's Register Type Approval for the qualified range.

ULTIMATE BURST

> 24,000 PSI

IN EXCESS OF 1,600 BAR

Pipe-end failure occurred.
The **PT1** continued to seal.

ULTIMATE PULL-OUT

1,356 kN

EQUIVALENT TO 138.3 TONNES

The test carried the full axial load to pipe failure/pull out.

TEST PROGRAMME

PRESSURE & LEAK TIGHTNESS

- Assembly and proof testing to **1.5 times design pressure**.
- Pull-out testing under internal pressure to at least **4 times design pressure**.
- Internal gas pressure bubble test.
- Helium leak rate of **3×10^{-10} mbar.L/s**, equivalent to approximately 1cc over 100 years.
- Hydrogen pressure test at **840 bar for 60 minutes**, leak-free (special design).

MECHANICAL & ENVIRONMENTAL

- Vibration and fatigue testing at varying amplitudes and frequencies.
- Four-point bend testing under low and high pressure/bend combinations.
- Ultimate burst and ultimate pull-out testing.
- **API 6FB** fire testing at **650°C**.
- This programme also evaluated operational assembly, pressure and sealing integrity.

INDEPENDENT VALIDATION

Lloyd's Register Type Approval

Certificate 16/00039

ABSA CRN 0A25560.2

Registered as non-welded pipe connectors.

Design basis references ASME VIII UG-101, API 5L, ASME B31 piping and pipeline codes, ANSI B16.5 and API 6FB.



INDEPENDENT TESTING AND THIRD-PARTY VALIDATION

A DOCUMENTED PEDIGREE ACROSS PRESSURE, FATIGUE, FIRE AND SPECIALIST SERVICE

The **PT1** has been tested, witnessed, measured and independently reviewed by specialist organisations throughout development and qualification.



TESTING AND VERIFICATION ORGANISATIONS

- TestNet Engineering
- West Technology Vacuum
- Oil States
- BHR Group
- BHDT
- Axis Test Laboratories



APPROVAL, REGISTRATION AND VERIFICATION

- **Lloyd's Register** — Type Approval certificate 16/00039 for the qualified scope.
- **ABSA** — registration authority for CRN 0A25560.2.
- **TÜV** — independent verification of the special high-pressure hydrogen/urea design test.

EVIDENCE COVERED

Burst | Pull-out | Vibration | Fatigue | Four-point bend

Fire | Gas bubble | Helium | Hydrogen



PRESSURE



TEMPERATURE



STRENGTH



RELIABILITY

HYDROGEN, HELIUM & SPECIALIST MEDIA

APPLICATION-SPECIFIC MATERIALS SUPPORTED BY QUANTIFIED EVIDENCE

Connector and Radial Wedge Seal materials can be selected to suit the pipe, pressure, temperature, process medium and service conditions.

HIGH-PRESSURE HYDROGEN AND UREA

A special design was pressurised to 840 bar and held for 60 minutes without leakage. The result was independently verified by TÜV.

HELIUM SEALING PERFORMANCE

Measured leak rate 3×10^{-10} mbar·L/s, equivalent to approximately 1 cc of helium over 100 years

SPECIALIST SERVICE

Materials can be assessed for oil, gas, hydrogen, urea, ammonia, sour service and other specialist duties.

LINED PIPE AND VOC CONTAINMENT

Cold-work installation avoids local welding heat at the connection, while quantified helium performance supports high-integrity VOC containment in appropriately engineered applications.



CANADIAN REGISTRATION NUMBER

REGISTERING FOR PRESSURE PIPING APPLICATIONS IN CANADA

Poulton Technologies is pleased to confirm that the **PT1** weldless mechanical connector range has been accepted for registration in Alberta, Canada.

The registration is supported by comprehensive proof testing and compliance with ASME B31.1 and ASME B31.3, ensuring the **PT1** delivers safe, reliable performance in pressure piping applications across Canada.

	CRN	0A25560.2
	REGISTRATION AUTHORITY	Alberta Boilers Safety Association (ABSA)
	CODES	ASME B31.1 and ASME B31.3
	FITTING TYPE	Non-welded pipe connectors
	SIZES COVERED	4 inch, 6 inch and 8 inch
	PRESSURE CLASSES	ANSI 150 to 2500

ABSA
the pressure equipment safety authority

October 02, 2025

Attention: Jacob Coplestone
POULTON TECHNOLOGIES
HANGAR L6-L7 WROUGHTON AIRFIELD
SWINDON
WILTSHIRE, SN40QZ

9410 - 20 Ave N.W.
Edmonton, Alberta, Canada T6N 0A4
Tel: (780) 437-9100 / Fax: (780) 437-7787

The design submission, Tracking Number 2025-01308, Web Portal Number 2025-S1027, originally received on February 26, 2025 was surveyed and accepted for registration as follows:

CRN : 0A25560.2
Reg Type: NEW DESIGN
Document No. PT1 Weld-less Connector Range 1in n.b As Noted
Fitting type: Non-Welded Pipe Connectors

Accepted on: October 02, 2025
Expiry Date: October 02, 2035

The registration is conditional on your compliance with the following notes:
The code of construction is B31.1 and B31.3.
The registration is approved based on proof tests. The proof tests had been witnessed and signed off by AI.
The vibration fatigue is registered based on test. This doesn't include fatigue due to pressure and thermal loading.

As indicated on AB-41 Statutory Declaration or AB-351 Declaration of Conformity form and submitted documentation, the code of construction are ASME B31.3 and ASME B31.1.

- It is our understanding that the fitting(s), included as the scope of this submission, that is(are) subject to the Safety Codes Act shall comply with the requirements of the indicated Standard or Code of Construction on the identification marking of the fittings.
- This registration is valid only for fittings fabricated at the location(s) covered by the QC certificate attached to the accepted AB-41 Statutory Declaration or AB-351 Declaration of Conformity form.
- This registration is valid only until the indicated expiry date and only if the Manufacturer maintains a valid quality management system approved by an acceptable third-party agency, and maintains a valid Certification of Authorization Permit if required by the jurisdiction where manufacturing takes place, until that date.
- Should the approval of the quality management system lapse before the expiry date indicated above, this registration shall become void.

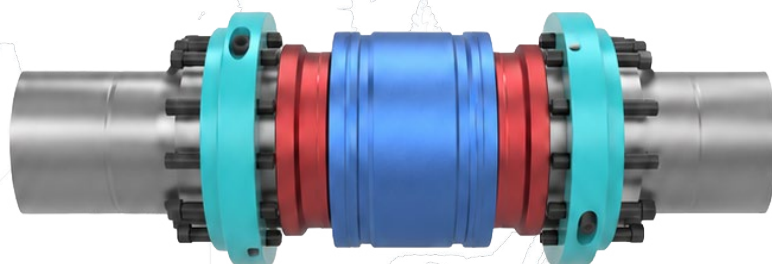
An invoice covering survey and registration fees will be forwarded from our Revenue Accounts.
If you have any questions don't hesitate to contact me by phone at (587) 686-9340 or fax (780) 437-7787 or e-mail Liu@absa.ca.

Sincerely,

LIU, XING, P. Eng.
DOP Cert. No. D00008861

2025-01308

Page 1 of 1



NORTH AMERICAN TECHNICAL SUPPORT AND DISTRIBUTION

Founded in 1981 and based in Canada, Corr Science supplies corrosion, erosion and leak-detection systems together with high-pressure weldless connections for energy and process applications.

Through Poulton Technologies' relationship with Corr Science, North American operators benefit from local technical support, application review and regional commercial engagement.

PARTNER CAPABILITY:



LOCAL TECHNICAL SUPPORT

Responsive expertise for application definition and project delivery.



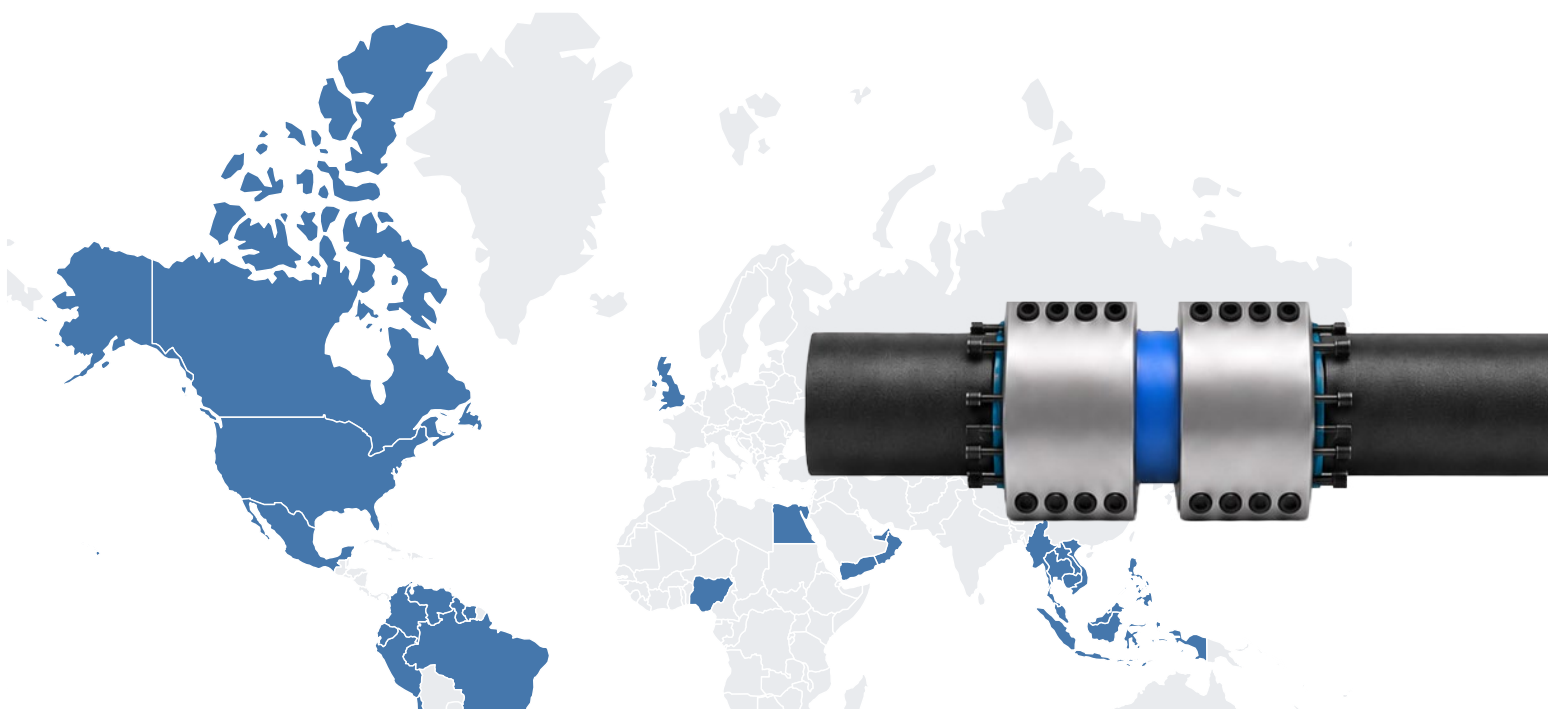
PIPELINE INTEGRITY EXPERTISE

Practical knowledge across pipeline, process and monitoring systems.



NORTH AMERICAN AVAILABILITY

Regional access to support and products.



Schedule of Accreditation

issued by

United Kingdom Accreditation Service

21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

 1042 Accredited to ISO/IEC 17025:2005	Oil States Industries (UK) Ltd Issue No: 021 Issue date: 15 September 2015 <table border="1"> <tr> <td> Test Laboratory Blackness Road Altens Industrial Estate Aberdeen AB12 3LH </td><td> Contact: Mr P F Jaques Tel: +44 (0)1224-290051 Fax: +44 (0)1224-290110 E-Mail: phil.jaques@oilstates-uk.com Website: www.oilstates.com </td></tr> </table> Testing performed at the above address only	Test Laboratory Blackness Road Altens Industrial Estate Aberdeen AB12 3LH	Contact: Mr P F Jaques Tel: +44 (0)1224-290051 Fax: +44 (0)1224-290110 E-Mail: phil.jaques@oilstates-uk.com Website: www.oilstates.com
Test Laboratory Blackness Road Altens Industrial Estate Aberdeen AB12 3LH	Contact: Mr P F Jaques Tel: +44 (0)1224-290051 Fax: +44 (0)1224-290110 E-Mail: phil.jaques@oilstates-uk.com Website: www.oilstates.com		

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
METALS, ALLOYS and METAL PRODUCTS Metal beams and tubular sections Metal valves, tubular sections and flanges, Wellhead equipment, pipeline valves, closures, connectors and swivels	<u>Mechanical Tests</u> Static structural tests to determine yield strength, failure strength and stress-strain response a) Tensile (Forces up to 14,500 kN) b) Compression (Forces up to 10,000 kN) c) Bending (Moment up to 12.2 x 10⁶ Nm) Pressure cycling performance and endurance tests (Hydrostatic up to 340 MPa) (Pneumatic up to 280 MPa) (Temperatures from 213K to 523K)	Documented In-House Methods and customer specified methods Documented In-House Methods based on - API SPEC 6A - 20th edition Oct 2010 ISO 10423:2009 API SPEC 6D - 24th edition April 2008 ISO 14313: 2007 API SPEC 17D - 2nd edition, May 2011



WATCH INSTRUCTIONAL VIDEO

(Launches in browser window. Not available off-line)



POULTON TECHNOLOGIES

CONNECT AND SEAL

PERMANENT METAL-SEALED PIPE CONNECTIONS WITHOUT WELDING

The PT1 is engineered around the pipe, pressure, process medium and service conditions, combining positive mechanical retention with an independently energised metal-to-metal seal.

Poulton Technologies Ltd

Hangar L6 & 7, Wroughton,
Swindon SN4 0QZ, UK



connectandseal.com



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