

Tech Note 33: Bimetallic Corrosion

TN.33

Applicable Products:

- All metal based products, AusPress Drainage & Press-Fit

Related Documents:

- Tech Note TN.04 Insulation & Stainless Steel (Lagging)
- Tech Note TN.20 Brackets & Supports

Different metal types, in contact or downstream the same system, can react in a process known as bimetallic corrosion. Also known as galvanic corrosion or dissimilar metal corrosion, this material process occurs naturally in the presence of moisture (being water flow, condensation or any media acting as an electrolyte). Each metal has a potential and depending on the combination of metals in contact, determines if one is the anode (loses electrons) or cathode (gains electrons). This is a physical process where the anodic material sacrificially corrodes, transferring ions into the electrolyte solution.

Ideally having a single material system is optimum to avoid this reaction entirely but in reality, mixed systems are unavoidable. Understanding the potential of the reaction process to occur in the whole system, from the water supply point to the final outlet, is important to assess and manage the risks involved.

Technical data and interaction classifications are provided on a case-by-case basis exclusively for systems utilising genuine products supplied by AusPress Systems. This document serves as an installation guide only and does not constitute general engineering advice or a system warranty.

Common Situations

Scenarios where the risk of different metals installed may include:

- Structural elements, brackets & channel supports.
- New connections to existing pipework including water mains.
- Bolts and fixings.
- Not-removed temporary items (such as signage or wire).
- Valves, flange connections, caps and other inline items.
- Environmental conditions where exposed to moisture (including rainfall and humidity).

Earthing

Metallic pipework is required to have suitable grounding to earth, checked by a licenced electrician and compliant with Australian Standard AS/NZS 3500. Noting that stainless systems should avoid (and be checked for) stray currents and not used as part of, or joined to, general electrical earthing.

Transport, Storage & Handling Before Installation

Metallic products shall be:

- Protected, with particular attention preventing moisture interaction and/or entrapment within plastic wrapping.
- Isolated from racking, blocking, stacked, or combined with dissimilar metals at all times.
- Kept in a dry, undercover, shaded, well-ventilated storage environment.

Separation Methods

Metal “in contact” means both physical direct contact and also media flow internally where water may act as the bridge between the two different materials.

Type	Method	Examples	Risk Management
Inert Spacer	Separating different metals apart with an inert physical barrier.	Rubber flange gaskets; plastic isolation bolt sleeve kits.	Check chemical and temperature rating of the elastomer; ensure water flow direction rules are strictly maintained.
Thread Wrapping	Isolating opposing threads within a joint profile in wet environments.	Wrapping 3–4 turns of high-density, AS/NZS 4020 certified PTFE tape clockwise.	Do not exceed 4 turns. Over-packing causes severe hoop stress, binding, and fracturing of softer female sockets.
Thread Paste	Deploying a liquid anaerobic sealant to fill thread-valley voids.	Refer to Tech Note TN.18. Potable water safe compounds.	Must be AS/NZS 4020 approved. Use as a thin layer over tape to seal geometry mismatches without adding thickness.
Separation Piece	Inserting an inert intermediate line where media transitions between metals.	>100mm length of non-conductive plastic or compatible copper-alloy pipework.	Ensure intermediate material meets the system’s maximum temperature and pressure limits.
Paint Finish	Coating external metal surfaces to form a physical barrier.	External protective painting or epoxy coatings under bracket supports.	Thickness must be sufficient to resist mechanical wear and vibration over the service life.
Non-Return Valves	Preventing reverse fluid flow between dissimilar metal pipework networks	Inline spring-loaded check valves; Dual-plate non-return valves.	Must be chemically compatible with both metals. Verify elastomer seal compliance with AS/NZS 4020. Requires positive design flow to operate reliably. Stagnant or low-flow conditions can cause failures.

A note on threads: Joining mismatched thread profiles, specifically a Tapered Male thread (BSPT) into a Parallel Female socket (BSPP), presents a mechanical failure risk when mixing stainless steel with copper alloys (brass/bronze). Because the male stainless thread tapers outward, it acts as a structural wedge. Since stainless steel is significantly harder than brass, tightening this joint forces the wedge into the entry threads of the female socket, creating immense stresses to the fittings.

To prevent the female brass component from cracking or splitting under thermal cycling (up to 65°C) or system vibration, installers must strictly adhere to the following field assembly rules:

- Do Not Bottom Out: Threads must never be tightened until they bottom out. Mechanical stop must rely on thread interference, not torque capacity.
- Wrap Limits: Apply a maximum of 3 to 4 turns of approved high-density PTFE tape. Over-wrapping forces the joint open and guarantees material fatigue.
- Hybrid Sealing: Apply 3 wraps of tape followed by a thin smear of AS/NZS 4020 approved liquid compound (per TN.18) to fill the internal geometric gaps between the taper and parallel profiles without requiring destructive wrench torque.

A note on flanges: Consideration is to be made for the fixings of dissimilar flange types and bolt combinations as these too are subject to the same risks (ie galvanised bolts with stainless flange bases). Graphite gaskets are not suitable with stainless!

Metal Interaction Chart

There are many charts available to assess the behaviour of how different metals interact when in contact (such as bolt and flange combinations). The following chart shows common material situations from a water flow (direction) aspect and must be considered. The direction of flow with pipework includes the possibility of material from the upstream pipe material flowing into and contaminating the second downstream pipe material.

As such, ensure the design flow direction is maintained as no flow (still) or negative flow situations may change the suitability. Designs should consider the use of a compatible non-return valve between different materials of pipes to prevent this occurring. Inert separation is still preferred.

		Flow To						
		Stainless 316	CuNi 90/10	Copper	Brass'	Cast Iron & Steel	Galv (Zinc)	Aluminium
Flow From	Stainless 316	A	SEP ²	SEP	SEP	X	X	X
	CuNi 90/10	SEP ²	A ²	SEP ²	ISO ²	X	X	X
	Copper	SEP	ISO ²	A	SEP	X	X	X
	Brass'	SEP	SEP ²	SEP	A	X	X	X
	Cast Iron & Steel	ISO	X	ISO	X	A (X for Steel)	X	X
	Galv (Zinc)	ISO ¹	ISO ²	ISO	ISO	SEP	A	ISO
	Aluminium	ISO	ISO ²	ISO	ISO	ISO	X	A

Notes:

- A= Acceptable for same-metal direct connection. No special isolation or separation material required.
- SEP= Fluid flow with separation required. Dissimilar metals are compatible under continuous positive design flow however, direct metal-to-metal contact (including threads) is not recommended. Threaded joints must use a continuous inert separation layer (eg a suitable high-density PTFE tape and/or WaterMark approved non-hardening anaerobic compound).
- ISO= Full Galvanic Isolation Mandatory: Materials are electrochemically incompatible - components must be physically isolated using an independent dielectric union, an elongated non-conductive spool piece, or rubber gaskets (>100mm isolation distance).
- X= Not compatible.
- 1= Old pipework can have internal debris and material loss making contamination and surface attack possible flowing into stainless pipework. Ensure full flushing and debris are prevented from settling on the stainless surface to avoid internal damage.
- 2= CuNi is not approved for potable water applications.

Further Reading

- The Australian Stainless Steel Development Association (ASSDA) have information at <https://www.assda.asn.au/publications/technical-faqs/galvanicdissimilar-metal-corrosion> and online is a wide range of combination and testing results that may serve for specific scenarios for installers and specifiers to ensure suitability of materials.
- AS 4036 Corrosion of Metals in Sea Water Contact.

Not sure?

Please contact us before installation so we can offer advice and suitability.