AMPCO®

EXCELLENCE IN ENGINEERED ALLOYS

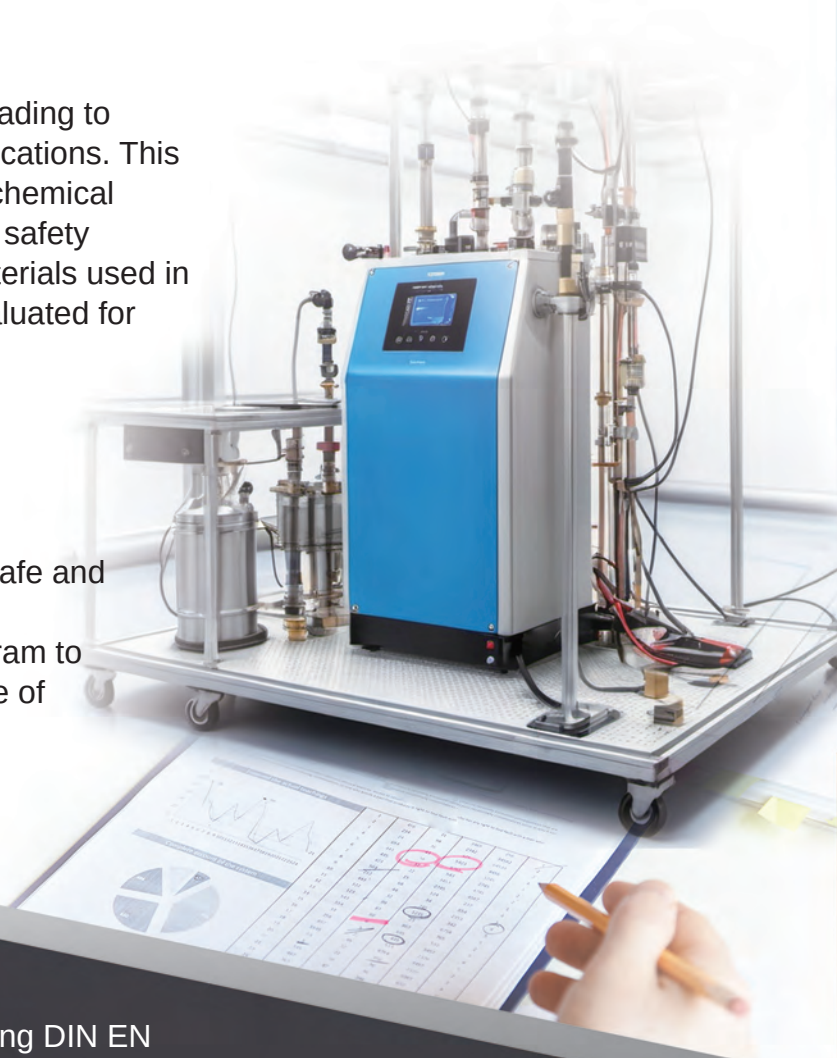
Copper Alloys for Hydrogen Applications

www.ampcometal.com

Ensuring Safety & Reliability in Hydrogen Environments

Introduction

Hydrogen can embrittle metals and alloys[1], leading to delayed, unpredictable failures in critical applications. This risk is well-documented in industries like the chemical sector, where equipment must meet stringent safety standards. To ensure long-term reliability, materials used in hydrogen environments must be carefully evaluated for hydrogen embrittlement resistance.



Testing for Hydrogen Compatibility

AMPCO METAL recognizes the demand for safe and proven materials in hydrogen applications. To address this, we initiated a rigorous test program to assess the hydrogen embrittlement resistance of AMPCOLOY® 83 and AMPCO® 18.

The tests were conducted at the DECHEMA Institute in Frankfurt, Germany[2]. Samples were charged with hydrogen, following DIN EN ISO 17081 and subsequently in-situ tested using the SSRT-test method.

Results: Neither AMPCOLOY® 83 nor AMPCO® 18 exhibited signs of hydrogen embrittlement, confirming their suitability for hydrogen applications.

When Should Hydrogen Embrittlement Testing Be Considered?

Manufacturers supplying components for hydrogen-bearing environments must ensure that their products are resistant to hydrogen embrittlement. Simply selecting a material labelled as "H_2-ready" is not enough. Final products must undergo specific testing to confirm compatibility.

Choosing the Right Material for Your Application

Material modifications, such as heat treatment, forming, or machining, can alter a material's susceptibility to embrittlement. Therefore, testing must be conducted on the final product state, not just the raw material.

AMPCO METAL provides test data under controlled conditions, but it is essential that manufacturers validate final component performance before deployment.

Our technical team is available for further details and specific application advice.

Summary of Findings

AMPCOLOY® 83 (Beryllium Copper)

- Tested in various wrought conditions and strength levels
- Proven non-susceptibility to hydrogen embrittlement up to 1000 MPa yield strength
- Ideal for high-strength applications requiring hydrogen resistance

AMPCO® 18 (Aluminum Bronze)

- Widely used across industries
- Now validated for safe use in hydrogen environments
- Expands its versatility in critical applications

These findings confirm that AMPCO METAL's engineered copper alloys provide a safe, reliable solution for hydrogen applications, ensuring superior durability, performance, and safety.

References:

[1]Hydrogen embrittlement is typically a low or ambient temperature phenomenon (up to ~250°C). At higher temperatures, failure may occur due to different mechanisms. Contact us for more details.

[2]In collaboration with Dechema (DECHEMA-Forschungsinstitut | Theodor-Heuss-Allee 25 | 60486 Frankfurt am Main)

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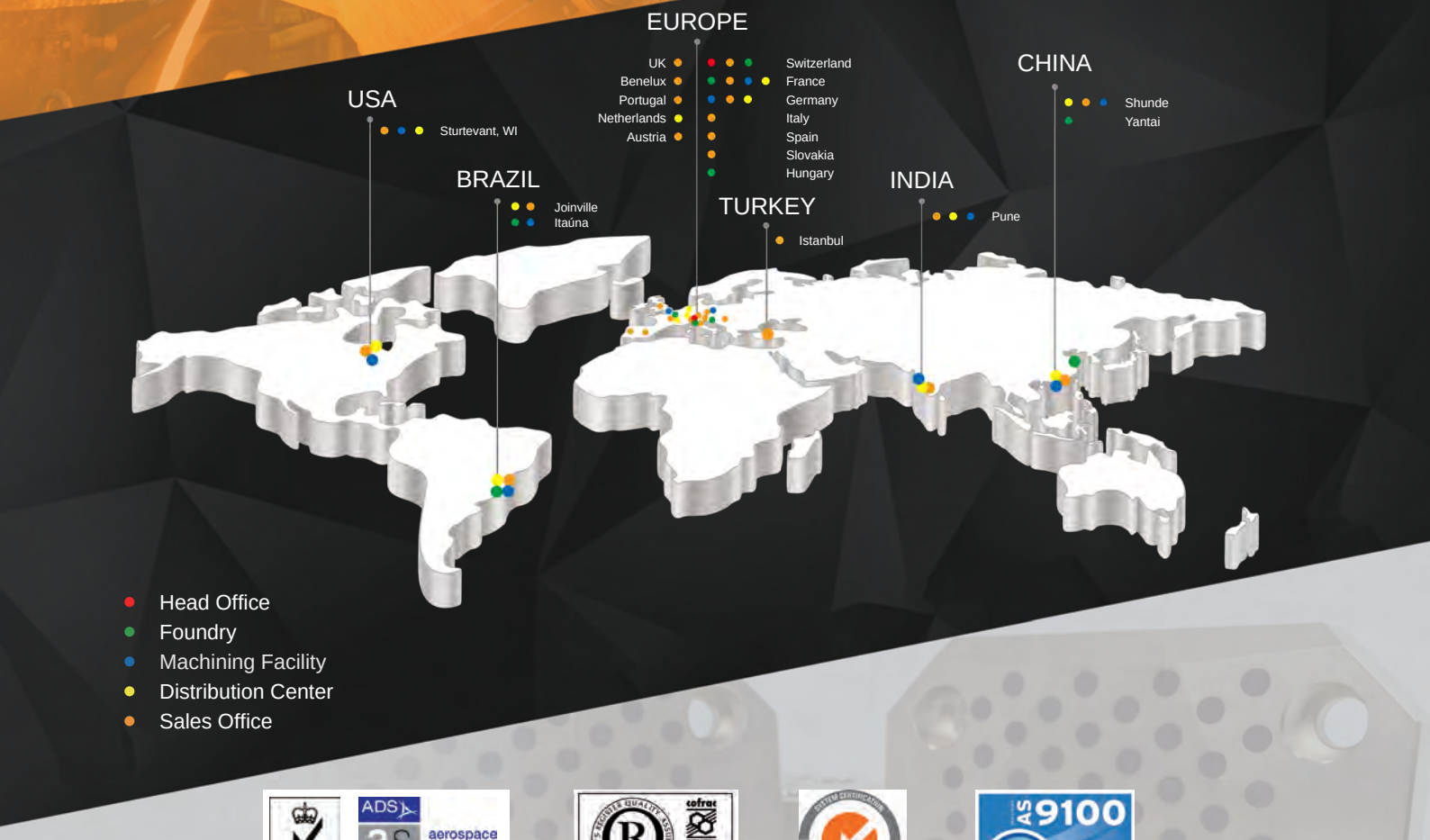

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