



Mechanical testing that proves integrity

A concise guide to verified material performance for critical oil & gas instrumentation

In critical service, the certificate is part of the product

Oil & gas instrumentation is exposed to sour gas, cryogenic temperatures, chlorides, pressure cycles, and fabrication risk.

3 alloy families

5 critical mechanical tests

1 traceable verification chain

Testing converts material assumptions into documented evidence.



Three alloy families. Three distinct proof requirements.

ALLOY FAMILY	WHAT MAKES IT VALUABLE	WHAT DEMANDS ATTENTION
Austenitic stainless steels	Cryogenic toughness and high ductility	Cold work can raise hardness beyond sour-service limits
Duplex & Super Duplex steels	High strength and chloride stress-corrosion resistance	Thermal history can damage low-temperature toughness
Nickel alloys	Severe-service resistance in aggressive media	Correct alloy identity and heat-treatment condition must be verified

The same certificate result does not carry the same meaning across every alloy family.



Material selection starts with measurable performance

MATERIAL	YIELD MIN.	TENSILE MIN.	ELONGATION MIN.
316L	170 MPa	485 MPa	40%
Duplex 2205	450 MPa	655 MPa	25%
Super Duplex 2507	550 MPa	795 MPa	15%
Alloy 625, Grade 1	414 MPa	827 MPa	30%

Values vary by product form, thickness, heat-treatment grade, and governing project specification.

Tensile test results underpin pressure-retaining design assumptions.



Five tests. One assurance system.

TEST	WHAT IT PROVES	WHERE IT MATTERS MOST
Tensile	Strength basis for design allowables	Pressure-retaining materials
Elongation	Ductility under overload and fabrication stress	Cold-work and embrittlement review
Hardness	Material condition and sour-service control	Welds and heat-affected zones
Guided bend	Weld-joint soundness and ductility	Welding procedure qualification
Charpy V-notch impact	Toughness at the minimum design temperature	Duplex and low-temperature service

Together, the five tests expose risks that visual inspection cannot.

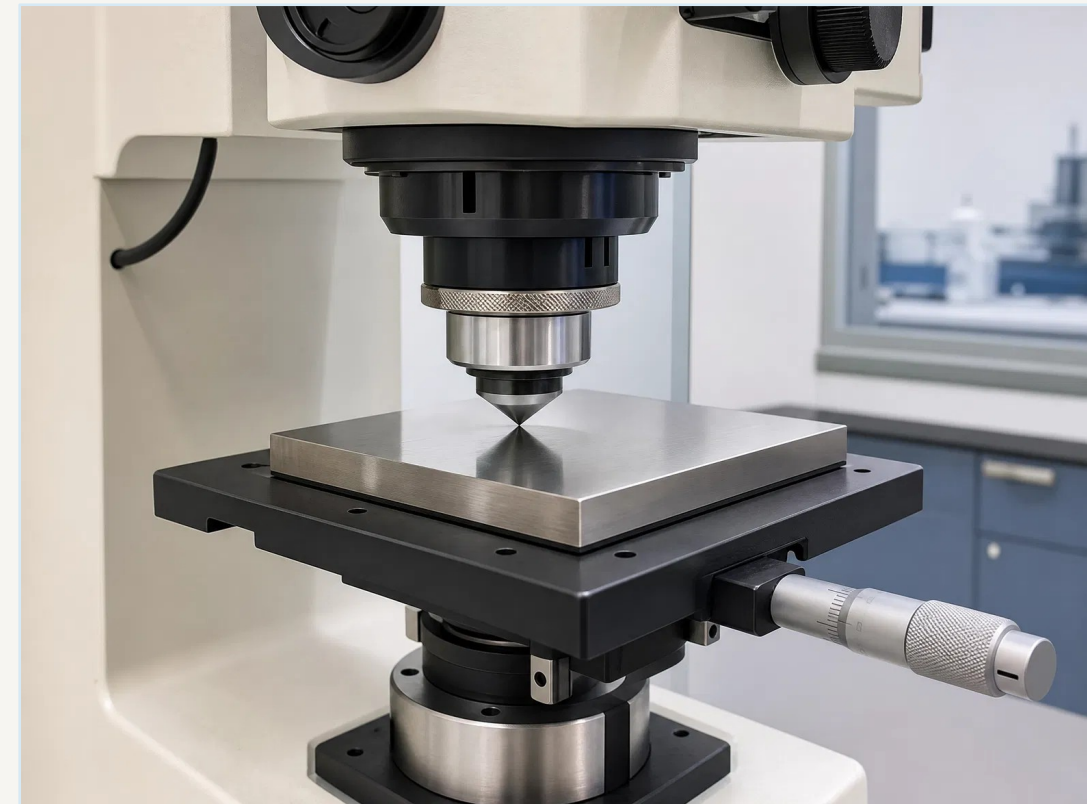
Hardness is a small test with major consequences

22 HRC

Common solution-annealed austenitic sour-service ceiling cited for H₂S service, subject to applicable standards and project restrictions.

≤ 28 HRC

Typical Duplex reference limit, with controlled ferrite content, subject to ISO 15156-3 tables and project specification.



Illustrative hardness indentation testing.

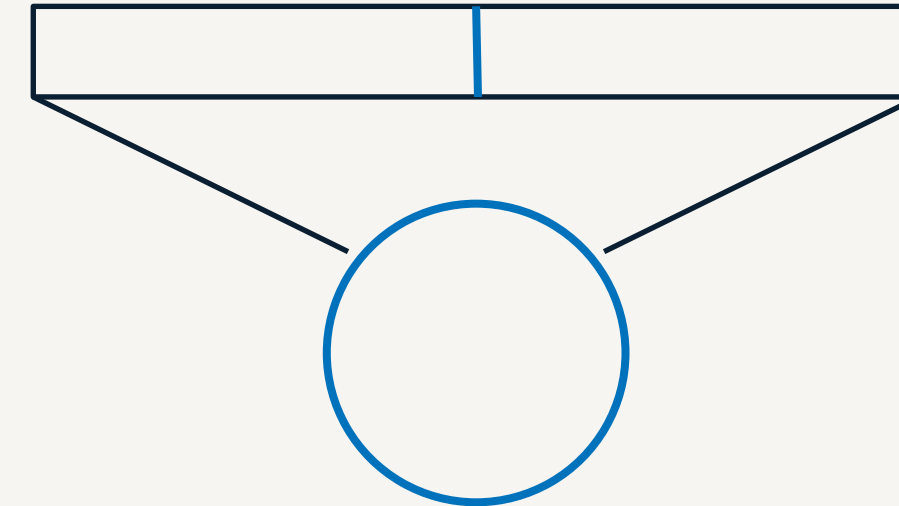
Critical acceptance must include base metal, weld metal, and the heat-affected zone.

A weld must survive more than inspection

Guided bend testing proves ductility across weld metal, fusion line, and the heat-affected zone. It tests the joint as a system rather than viewing one discontinuity in isolation.

3.2 mm

Typical ASME IX QW-163 open-defect acceptance criterion.



Mandrel / bend fixture

Face bend — cap
fusion

Root bend — root
fusion

Side bend — full
section

Confirm the governing code edition, project specification, and applicable acceptance criteria before final inspection.

Bend testing demonstrates how a welded joint behaves as one system.

Duplex requires its own verification logic

MICROSTRUCTURE

Duplex stainless steels contain a roughly balanced austenite–ferrite microstructure. The dual-phase lattice provides high strength and chloride stress-corrosion resistance; the ferrite-bearing structure also creates a genuine low-temperature toughness transition.

THERMAL HISTORY

Thermal history is critical. Sigma phase or alpha-prime embrittlement can reduce impact toughness even where tensile results remain acceptable.

ISO 17781:2017

Where required, ISO 17781:2017 provides microstructure-quality testing for solution-annealed duplex components and as-welded fabrication welds, including checks for deleterious intermetallic phases and precipitates.



Charpy V-notch specimens — illustrative test artefact.

–46 °C

Charpy V-notch reference temperature commonly specified for duplex components in oil & gas projects.

Sources: Globe United FZE Mechanical Testing Guide; ISO 17781:2017

Duplex integrity depends on both impact toughness and controlled microstructure.



Traceability converts results into confidence

A credible QA system links material evidence to the finished component.

VERIFICATION LAYER	ROLE IN THE ASSURANCE CHAIN
EN 10204 certification	Documents test results and material identity
PMI	Verifies alloy chemistry and grade sorting
Corrosion screening	Confirms heat-treatment quality where specified
Ferrite measurement	Controls duplex parent metal and weld condition
NDE and hardness surveys	Reviews fabrication integrity and sour-service risk
Heat-number traceability	Connects raw material certificate to marked, tagged product

A document package is valuable only when every result remains traceable to the product delivered.

Verification is built into Globe United delivery

For pressure-retaining materials and critical service, Globe United's stated verification commitment includes:

- Full EN 10204 3.1 certification, with 3.2 available on request or where project specification requires it.
- Material verification against NACE MR0175 / ISO 15156 where sour service applies.
- ASME IX qualified welding procedures, including guided bend testing and hardness surveys where service demands them.
- Charpy V-notch testing at -46°C for duplex components and at project minimum design metal temperature where specified.
- Heat-number traceability from raw-material certificate to the marked, tagged, delivered product.

The certificate is the evidence behind product integrity.



Specify with confidence

Discuss material selection, mechanical testing, and project-specific certification with Globe United's applications engineering team.

Globe United FZE

SAIF Zone, Sharjah, UAE

info@globeunitedae.com

www.globeunitedae.com

+971 50 330 1384