



LABORATORY TEST, ANALYSIS AND EXAMINATION

ENVIRONMENT & SUSTAINABILITY

Marine

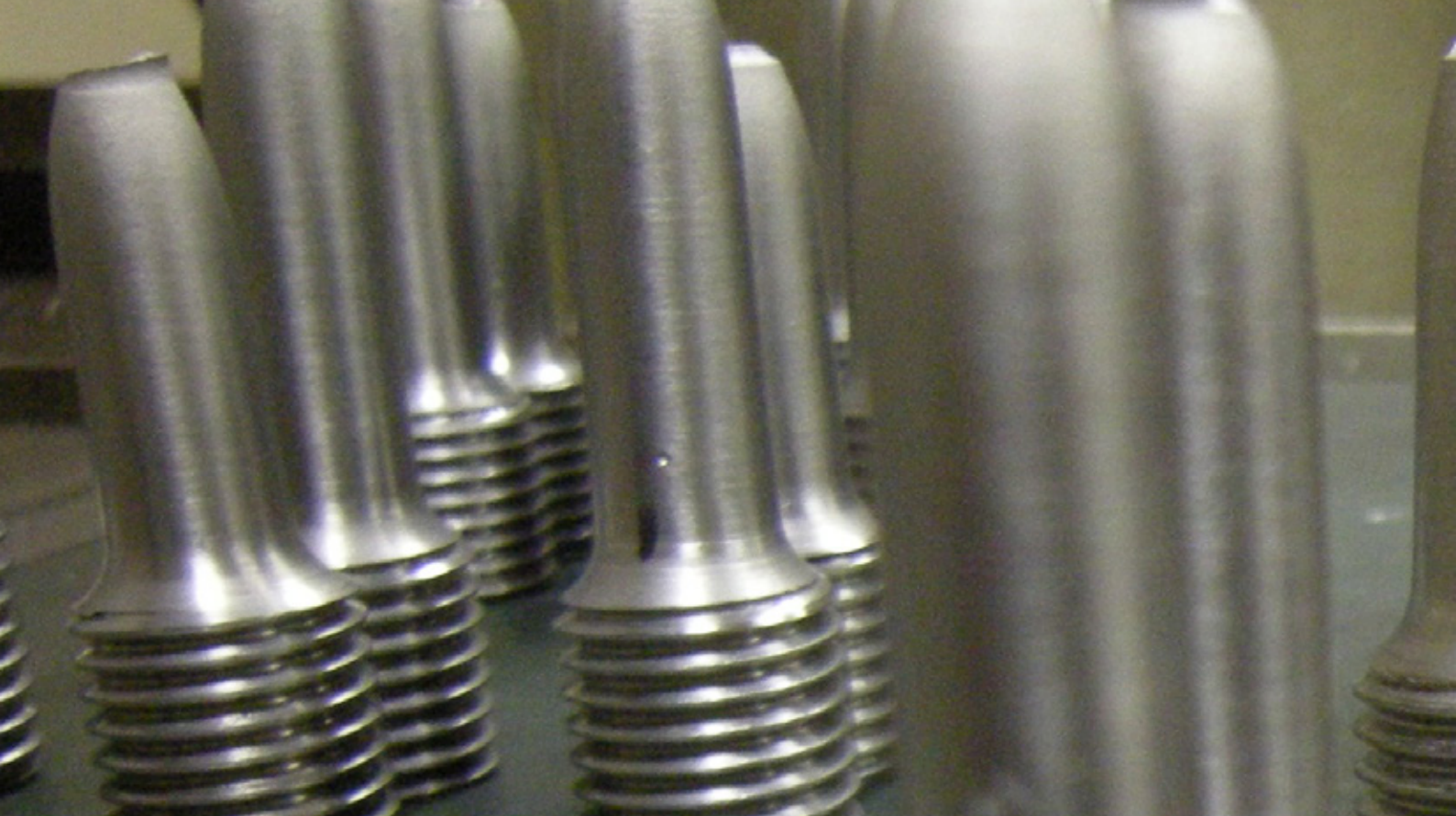
Energy

Business Assurance

Transport & Infrastructures

IFIs, Banks and Investors

INNOVATION



COMPANY PROFILE

RINA SERVICES S.p.A. is the **RINA Group company active** in classification, certification, inspection and testing services.

RINA is a multi-national Group which offers verification, certification, conformity assessment, marine classification, environmental enhancement, product testing, site and vendor supervision, training and engineering consultancy across a wide range of industries and services. RINA operates through a network of companies covering **Marine, Energy, Infrastructures & Construction, Transport & Logistics, Food & Agriculture, Environment & Sustainability, Finance & Public Institutions and Business Governance**. With a turnover of over 330 million Euros in 2014, over 2,750 employees, and 163 offices in 60 countries worldwide, RINA is recognized as an authoritative member of key **international** organizations and an important contributor to the development of new legislative standards.

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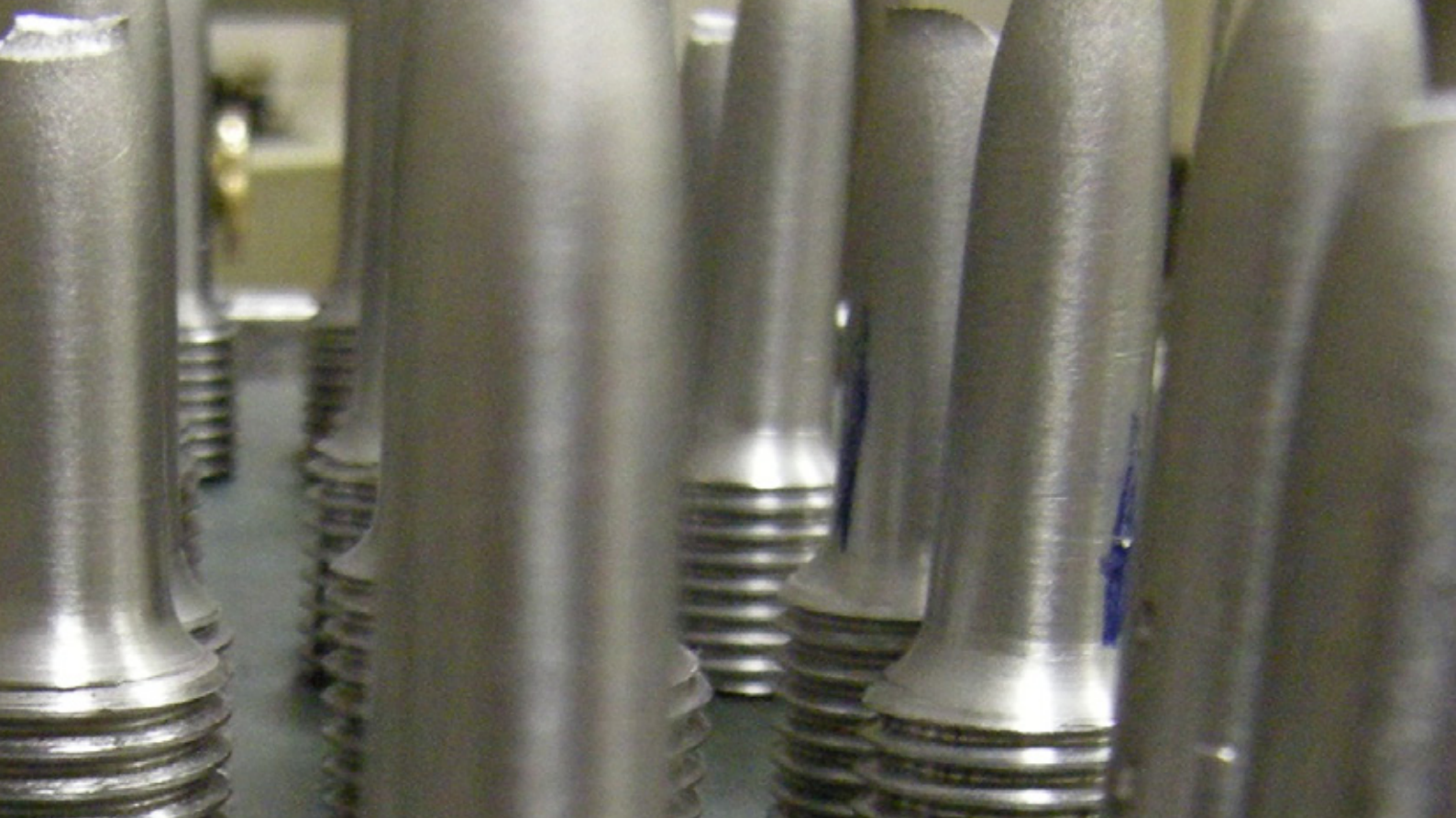
STUDIO SPERIMENTALE METALSIDERURGICO SSM S.R.L.

The **Studio Sperimentale Metalsiderurgico** is a laboratory specialised in testing control of materials, recognised by Italian and foreign inspection bodies to undertake destructive and non destructive tests and investigations of materials.

Since 1978, it has been carrying out activities on behalf of the mechanical, naval, petrochemical and energy industries.

Research and quality control activities are being continuously developed and are supported by an efficient company organisation, qualified personnel and equipment according to standards.

SSM is accredited by ACCREDIA for the tests in the "List of laboratory tests". Accreditation is formal recognition of the laboratory's compliance with system requirements for all testing activities as well as of the technical competency in relation to the accredited tests.



LABORATORY FOR SPECIMENS

The **Studio Sperimentale Metalsiderurgico** has a mechanical workshop of around 500 square metres with all the equipment needed to prepare metal or non metal specimens. The available machinery is both traditional (saws, milling cutters, lathes, etc.) and numeric control machining centres. The integrated machining process enables specimens to be obtained which have the dimensional tolerances required by the reference standards.

Mechanical tests

The mechanical test laboratory covers an area of around 150 square metres and has the equipment to carry out hot tensile tests and tensile tests at ambient temperature, compression tests, impact tests at ambient temperature up to -196°C , Brinell Vickers, Rockwell B and C, hardness tests and bend tests.

The main reference standards relevant to the above-mentioned tests are given in the last page.

Metallography

The metallographic laboratory can take and prepare macrographic specimens to assess any defects in the various types of welding.

It is possible to identify structures and phases consisting of both base material and welding through micrographic examinations (from 100x to 1000x). Corrosion tests can be performed at the laboratory in accordance with various standards (ASTM G28; ASTM G48; ASTM E 262 etc.).

Failure analysis

Failure analysis of industrial components through chemical, metallographic and microscopic analyses, able to define failure surfaces, fracture mechanics and any pre-existing defects in the materials used.

Chemical Analyses

The chemical laboratory is equipped to carry out analyses on massive metal samples and on chip and powder specimens. The instruments available enable different families of materials to be characterised, such as stainless steels and other steels, copper alloys, aluminium and nickel, etc.

Analyses of carbon and sulphur can also be made by combustion analyser.

The laboratory can also perform chemical analyses at client premises using a portable quantometer.

Non destructive testing

The laboratory has its own qualified personnel (II and III level according to EN 473/ISO 9712/SNT-TC-1A) for the following test methods:

- visual
- magnetic
- liquid penetrant
- ultrasonic
- radiographic.



LABORATORY ACTIVITIES

These tests can be carried out at the laboratory or at the client's premises.

Welding

The laboratory has a complete welding station with wire, electrode, tig and a submerged arc welding plants.

Qualified personnel can carry out tests on weld materials, both steel and aluminium.

At the request of the client, it is possible to organise at the laboratory, qualification of welders (EN 287-1; EN 9606-2; ASME code Section IX/ AWS D1.1) and welding procedures (UNI EN ISO 15614-1 - 8; ASME code Section IX/AWS D1.1) in conjunction with various authorised bodies.

Heat treatments

The laboratory has 4 furnaces with automatic temperature control for the heat treatment of material specimens prior to working of the specimens for the mechanical tests.

Heat treatments up to a temperature of 1100°C can be performed. The recording of the heat cycles is attached to the test reports.

The SSM Laboratory offers a wide range of mechanical tests and chemical analyses on various materials, including steel, metal alloys, composite materials and polymeric materials in compliance with Italian (UNI), European (EN) and international (ISO, ASTM, ASME etc.) standards.

The Laboratory also has a section dedicated to non destructive testing, such as ultrasonic, magnetic, liquid penetrant and radiographic.

Through an agreement with RINA S.p.A., it can organise theoretical-practical courses on the various non destructive testing techniques.



TEST AND ANALYSIS PERFORMED IN SSM LABORATORY

Mechanical Test on metallic material	Standard applied (last revision)
Brinell hardness Test	UNI EN ISO 6506-1; ASTM E10
Vickers hardness Test	UNI EN ISO 6507-1
Rockwell B and C hardness Test	UNI EN ISO 6508-1; ASTM E18
Nick break test	API 1104: Section 5.6.3.1, 5.6.3.2, 5.6.3.3
Tensile test	UNI EN ISO 6892-1; ASTM A 20/A20M; A 370; ASME IX: QW-151.3,QW-462.1(d),QW-152,QW-153.1; API 5L; RINA Rules: 2014 Pt D. CH. 1, Sect. 2, RINA Rules: Pt D. Ch. 5, Sect. 4, Fig. 12; UNI EN 485-1
Tensile test Z axis	EN 10164; UNI EN ISO 6892; ASTM A 770
Tensile test up to 1200°C	UNI EN ISO 6892-2; ASTM E 21
Tensile test full pipe specimen	ASTM A 37; ASME IX QW-151.4,QW-462.1(e),QW-152,QW-153.1
Bend test	UNI EN ISO 7438; EN ISO 5173; ASME IX QW-161,QW-462.2,QW-162,QW-163,QW-466.1,QW-466.2; API 1104 Section 5.6.4.1, 5.6.4.2, 5.6.4.3, AWS D1.1
KV Impact test	ASME IX: QW-171; ASTM A 370; AWS B4.0; EN ISO 148-1
KCU Impact test	EN ISO 148-1
Widening test on nuts	UNI EN ISO 10484
Ring-expanding test on tubes	UNI EN ISO 8495
Tensile test on cladding specimen	Raccolta S ISPESL
Mechanical Test on composite material	Standard applied (last revision)
Tensile test	UNI EN ISO 527-4; ISO 13953 Type A; ASTM D 638
Flexural test	UNI EN ISO 14125; ASTM D 790
Compression test	ASTM D 695
Interlaminar shear test	ASTM D 3846; UNI EN ISO 14130
Shear test on sandwich panel	ASTM C 273
Glass content	UNI EN ISO 1172
Mechanical Test on plastic material	Standard applied (last revision)
Tensile test	UNI EN 12814-2; ISO 6259-3; ISO 13953
Bend test	UNI EN 12814-1
Crushing decohesion test	ISO 13955
Decohesion test	ISO 13954
Tear test on saddle assembly	ISO 13956
Welder qualification	UNI 9737; UNI EN 13067
Welding Procedure Qualification	UNI/TS 11508
Corrosion Test	Standard applied (last revision)
	ASTM G28 A/B; ASTM G48 A/B; ASTM A 262 pratica A/B/C/E/F; ASTM A923 A/C; UNI EN ISO 3651-1; UNI EN ISO 365-2
Chemical Analysis	Standard applied (last revision)
CarbonSteel, Stainless Steel, Copper alloy, aluminium alloy, nickel alloy	OES Method, AAS e XRF
Carbon and Sulphur analysis	ASTM E415; ASTM E1086; ASTM E1085; ASTM E572
	ASTM E 1019
Metallographic examination	Standard applied (last revision)
Metallographic replica	UNI 6327; UNI 9993
Macrographic examination	UNI EN ISO 17639; ASME IX QW-462.4, QW-183 AWS D1.1
Micrographic examination	UNI EN ISO 17639
Ferrite check with Point Counting	ASTM A 562
Ferrite check with ferritoscope	ASTM A 799
Grain dimension verification	ASTM E112; UNI EN ISO 643
Inclusion check	ASTM E45; UNI 3244
Banding verification	UNI 8449; ASTM E 1268-1
Graphite classification	UNI EN ISO 945-1 + EC 1; UNI EN ISO 945
Cladding and oxide thickness	UNI EN ISO 1463
Measurement of thickness of hardened surface	UNI 11153
Determination of depth of decarburization	UNI EN ISO 3887
NDT examination	Standard applied (last revision)
Visual Examination	UNI EN ISO 17637; ASME sect. V art 9
Dye penetrant test	UNI EN ISO 3452 parte1; ASME E 165; ASME sect. V art 6
Magnetoscopic examination	UNI EN ISO 17638; ASME sect. V art 7
Ultrasonic examination	UNI EN ISO 17640; ASME sect. V art 4 e 5
Radiographic examination	UNI EN ISO 17636-1; ASME sect. V art 2



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