

10. MECHANICAL PROPERTIES LABORATORY

Name of the infrastructure	Mechanical properties laboratory
Location of infrastructure (town, country)	Madrid, Spain
Web site address	http://rdgroups.ciemat.es/web/materiales/mechanical-properties-laboratory
Legal name of organization operating the infrastructure	CIEMAT, Centro de Investigaciones Energéticas Medioambientales y Tecnológicas
Location of organization (town, country)	Madrid, Spain
Key Accelerator Research Area(s)	creep, tensile, small punch, charpy, hardness, fatigue, toughness
General description of the infrastructure	<p>This facility is composed by the following infrastructures:</p> <p>1: Creep test:</p> <ul style="list-style-type: none"> - The creep test is performed using a tensile specimen to which a constant stress and temperature are applied. The test is recorded on a graph of deformation as a function of time. <p>2: Tensile test, toughness, fatigue crack growth, etc...:</p> <ul style="list-style-type: none"> - The Laboratory consists of two MTS-810 servo-hydraulic machines for carrying out tensile, toughness, crack growth, etc. tests. by using standard and miniature specimens according to ASTM & ISO test standards. <p>3, Small punch test:</p> <ul style="list-style-type: none"> - Use of small punch test as a screening method. - EN10371:2021: Metallic materials - Small punch test method. - Temperature range from -180 ° C to 500 ° C. <p>4, Small punch creep test:</p> <ul style="list-style-type: none"> - Use of small punch test as a screening method. - EN10371:2021: Metallic materials - Small punch test method. - The ovens have a temperature of up to 900 ° C. <p>5, Impact test:</p> <ul style="list-style-type: none"> - Two pendulums (Wolpert Impact test 300 J and 25 J) for carrying out impact tests with a standard specimen and an undersized specimen (KLST). <p>6, Durometer:</p> <ul style="list-style-type: none"> - Hardness machine (Akashi Seisakusho AVK-All) is used to perform Vickers hardness test according with the standard ASTM E-92. <p>7, Nanoindentation test:</p> <ul style="list-style-type: none"> - The MTS XP Nanoindenter is an accurate instrument for nanomechanical testing. Electromagnetic actuation allows unparalleled dynamic range in force and displacement and measurement of deformation over six orders of magnitude (from nanometers to millimetres). <p>8, Radiactive facility:</p> <ul style="list-style-type: none"> - Mechanical characterization of irradiated steels (tensile, toughness, impact tests, etc.). <p>9, Metrology laboratory:</p> <ul style="list-style-type: none"> - Profiles projector - Roughness Gauge and Profilometer - Balances - Thermobalance - Dimensional control tools: dial gauges, gauges, micrometres, rulers, etc.
Already existing or planned	Facility in user operation since 1970
Unique features	Facility for mechanical properties testing in radioactive installation.
Present situation/future changes/expected lifetime	In operation for several years. No large change presently planned.
Accelerator infrastructure or component test infrastructure	Component test infrastructure
Shared facility/infrastructure	Infrastructure dedicated to R&D and projects
Main user community	Nuclear Materials and Metallic Materials for Energy Sector.
Open for external users	Yes
If open to external users: Modality of access to the infrastructure (access unit)	Contracts or agreements for services (research and development and innovation activities)
Number of access units available for external users	Depending on the availability of the part of the installation needed

If open to external users: Support offered by the organization operating the infrastructure	Support will be provided by CIEMAT, at a cost: manpower for preparing the tests, assembly, running of the installation, fluids and electricity... In any case, the presence of some users will be requested at some points
Review procedure for requested access	Either after discussion with CIEMAT, or in the frame of an international contract, European or else
How to apply	By contracting the Division leader at CIEMAT
Can the infrastructure be made available?	Yes
If YES, fraction of time that could be made available (%)	Depending on the internal projects going on, and on the facility needed, a priori around 20 %
Number of FTEs operating the infrastructure	3
Contact details (name, Institute, email,)	Marta Serrano García Head of Materials for Energy Interest Division Avenida Complutense, 40 28040, Madrid marta.serrano@ciemat.es Tel.: +34 91 346 6030
if available: costing model (how is the annual operating cost calculated)	If service is delivered to internal CIEMAT clients, costs are calculated on a basis of an all-in fee package. Special conditions may be applicable for tests performed in the frame of approved official cooperation agreements.

Pictures



Fig. 18. Creep tests under aggressive environment



Fig. 19. Crack growth rate measurements under creep-fatigue conditions