

# **JRC-IET activities in support of engineering materials data preservation and reuse**

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JRC Institute for Energy and Transport**



- JRC Institute for Energy and Transport
  - Information systems
- Energy research data
  - ODIN Portal
- Engineering materials data
  - MatDB
  - Challenges
  - Data standards
  - Data publication



JRC Institute for Energy and Transport in The Netherlands / Italy hosts a wide range of information systems in support of European policies.

- Technology trends
  - SET-Plan
- Modelling
  - Smart grids
- Operational data
  - NPPs
  - Hydrogen
- Human resources data
  - Nuclear
- Research data
  - Hydrogen
  - Engineering materials



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## SETIS

### Strategic Energy Technologies Information System

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Welcome to **SETIS** - Towards a low-carbon future



**The Information System for Strategic Energy Technology**

The European Strategic Energy Technology (SET)-Plan aims to transform energy production and use in the EU with the goal of worldwide leadership in the energy technological solutions delivering EU 2020 and 2050 targets towards a low-carbon Europe.

innovative research, effective strategic planning and an emphasis on appropriate action.

- Advanced Fossil Fuel Production
- Biofuels
- Bioenergy
- Cogeneration of Heat and Power
- Carbon Capture and Storage
- Concentrated Solar Power
- Electricity Storage in the Power Sector
- Energy Intensive Industries
- Fuel Cells and Hydrogen
- Geothermal Power
- Hydropower
- Nuclear Fission Power
- Nuclear Fusion Power
- Marine Energy
- Road Transport Efficiency
- Smart Electricity Grids
- Solar Heating and Cooling
- Solar Photovoltaic
- Wind Energy

SETIS highlights



► **Assessing the technological possibilities and economic value of electricity storage**

07/11/2013

Spurred by a renewed interest in power storage, several recommendations in a recently published report on how to improve assessing the economic value of storing electricity. Drafted in cooperation with the R&D Department of Electricité de France (EDF), it presents an overview of the current research on the economic drivers or barriers for electricity storage.

**SETIS**  
Information For Decision-making

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## Data Gathering And Processing

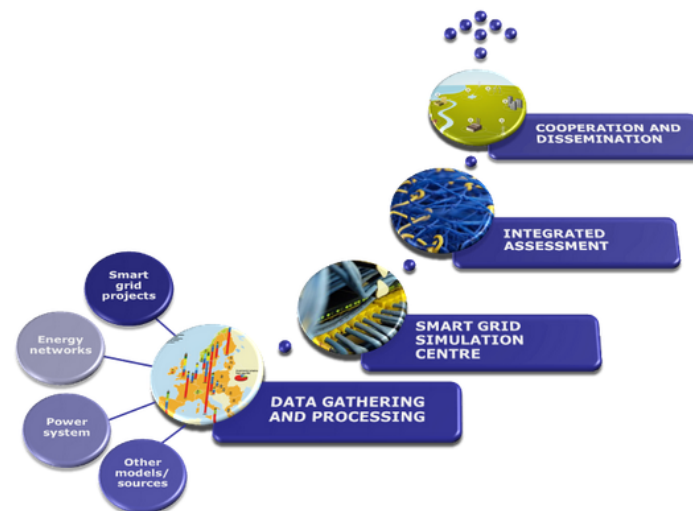
The first pillar of our activities is Data Gathering And Processing.

[\(go to second pillar\)](#)

We perform data collection on power systems and smart grid projects in order to update the JRC's European power system database and smart grid inventory. We constantly maintain and expand extensive European databases including commercial and proprietary data.

Here below you can learn about some crucial examples:

- We implemented a European-wide electricity grid model including more than 10,000 elements (nodes and lines) of Europe's transmission grid, starting from data from the European Transmission System Operators, which was complemented by other datasets from the European power system. More information [here](#).
- We built and are maintaining the most comprehensive inventory of Smart Grid projects in Europe. The 2012 catalogue features almost 300 Smart Grid projects scattered across Europe. Project results provide information about how Smart Grids can help integrate more renewables, accommodate electric vehicles, give more control to consumers over their energy consumption, avoid blackouts and restore power quickly when outages occur. More information [here](#).





## JOINT RESEARCH CENTRE

### Institute for Energy and Transport (IET)

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#### Learning from Others

In the European Union, a regional network has been established to enhance nuclear safety through improvement of the use of lessons learned from Operating Experience. This network's hub is located at the European Commission Joint Research Centre (JRC) in Petten, the Netherlands.

This organisation is known as the European Clearinghouse on Operating Experience Feedback for Nuclear Power Plants. The 'Clearinghouse' is comprised of dedicated staff from JRC and member states that have joined the organisation. Membership is mainly composed of nuclear safety regulatory authorities and their Technical Support Organizations within the EU region.

 Search News, Nuclear events, Nuclear stations, Documents...

SEARCH

#### The 'Clearinghouse' objectives

The overall objectives of the European Network on Operational Experience Feedback for Nuclear Power Plants are to facilitate efficient sharing and implementation of operational experience feedback to improve the safety of Nuclear Power Plants, in particular:

#### Do you know the 'Clearinghouse' tasks?

1. Fostering the collection of operating experience from European nuclear regulators or operators, assessing the potential value of lessons learned, and ensuring that events relevant for the global OEF are reported systematically and in consistent manner to the IRS system operated by NEA/IAEA.



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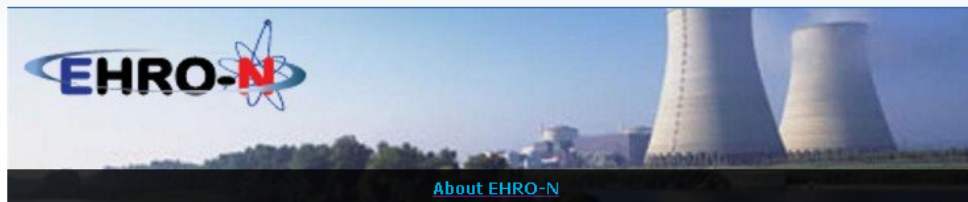
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Institute for Energy and Transport (IET)

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### European Human Resources Observatory for the Nuclear Energy Sector



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#### Latest EHRO-N News

[The European Forum to discuss Nuclear Technology Issues, Opportunities & Challenges](#)

Training course: 11 May, 2014 to 15 May 2014

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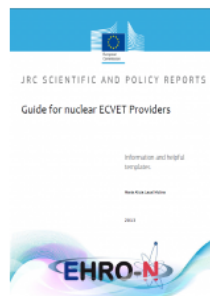
#### EHRO-N Member Login

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► [Register](#)

#### External News

► [IAEA Delivers Final Report on Remediation in Fukushima to Japan](#)  
24 January, 2014 - 07:47

### Guide for nuclear ECVET Providers



In 2010, the Institute for Energy and Transport of the European Commission's Joint Research Centre started supporting the implementation of the European Credit Vocational Education and Training system

(ECVET) in the nuclear energy sector. This report provides a wide range of supporting information for the

### Current use of ECVET in the nuclear industry sector of the EU-28



This study was carried out from July-September 2013 in order to analyse the current use of the European Credit system for Vocational Education and Training (ECVET) in the nuclear energy sector in the European Union Member States. ECVET aims to create a strong and efficient link between the Education and Training 2020 Strategy and the European Employment Strategy by facilitating processes for the validation, transfer and accumulation of learning outcomes into the corresponding practices.



## JOINT RESEARCH CENTRE

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Document Databases

Engineering Databases

Product Information

### ODIN

#### Online Data & Information Network for Energy

ODIN is the Online Data & Information Network of the Institute for Energy and Transport provided by the European Commission Joint Research Centre (JRC) to the European research community. It contains engineering databases and document management sites and other information related to European research in the area of nuclear and conventional energy.

All ODIN applications and databases require you to login. If you do not have an account yet, select 'Register' from the top-right corner and fill-in the required details. You will then have immediate access to the public areas of ODIN.

Important: because of known issues with certain browsers it is recommended that you access the online data retrieval tools using an up to date version of Mozilla Firefox, Google Chrome, Microsoft Internet Explorer or Apple Safari. Your browser will also need to be enabled for Cookies and JavaScript. Certain pages require Adobe Flash to be present. To install this click on the link here: [Get Flash](#). If you experience any problems entering, browsing the data or any other difficulties don't hesitate to send an E-mail to [ODIN web administrator](#).

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Last update: 4 February 2013 | [Top](#)

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Forgotten Password






The ODIN Portal is designed to manage European research data in the domains of nuclear, conventional, and renewable energies.

- Support the research process
  - Enable effective exchange of information
  - Provide analysis and evaluation options
  - Deliver innovative services
- Preserving the research investment
  - Preserve the significant financial investments
- Enable reuse of data
  - Validation
  - Reuse beyond the scope in which the data were produced
  - Codes and standards development



ODIN hosts a collection of online scientific databases organized into three categories, namely engineering data, documents and product information.



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European Commission > JRC > IET > ODIN > Engineering Databases

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Document Databases

**Engineering Databases**

- Mat-Database
- Hiad-Database
- Nesshy-Database
- HTR-Fuel-Database
- HTR-Graphite-Database

Product Information

## Engineering Databases

This is information about databases related to engineering tasks. If you click the Subcategory links, you will directly be connected to the database you have choosen. A new window will open.

### Mat-Database

The Materials Database (MatDB) is oriented to international material standards and recommendations. It covers mechanical and thermo-physical properties data of engineering alloys at low, elevated and high temperatures for base materials and joints and includes irradiation materials testing in the field of fusion and fission, tests on thermal barrier coating for gas turbines and mechanical properties testing on a corroded specimen.»

### Hiad-Database


The Hydrogen Incident and Accident Database (Hiad-DB) is a European knowledge base and reporting regime to assist industry and authorities in better understanding the relevance of hydrogen-related incidents and accidents as well as the safety actions taken.»

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My Profile

In the engineering category, MatDB is an engineering alloys database that contains experimental data coming mainly from European R&D projects.



**MatDB**  
Material Test Database

Disclaimer

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.....  
**MatDB**  
.....

.....[Data Content](#).....

.....[Data Retrieval](#).....

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.....**Product Information**.....

.....**Setup options**.....

**MatDB online**

**Data Content**  
Data Content is a directory of the MatDB, which displays basic characteristics for each material test stored in the database and the relevant access conditions (i.e. whether the entry is publicly accessible or confidential). You can search the directory by *Test Type*, *Material* or *Source*.

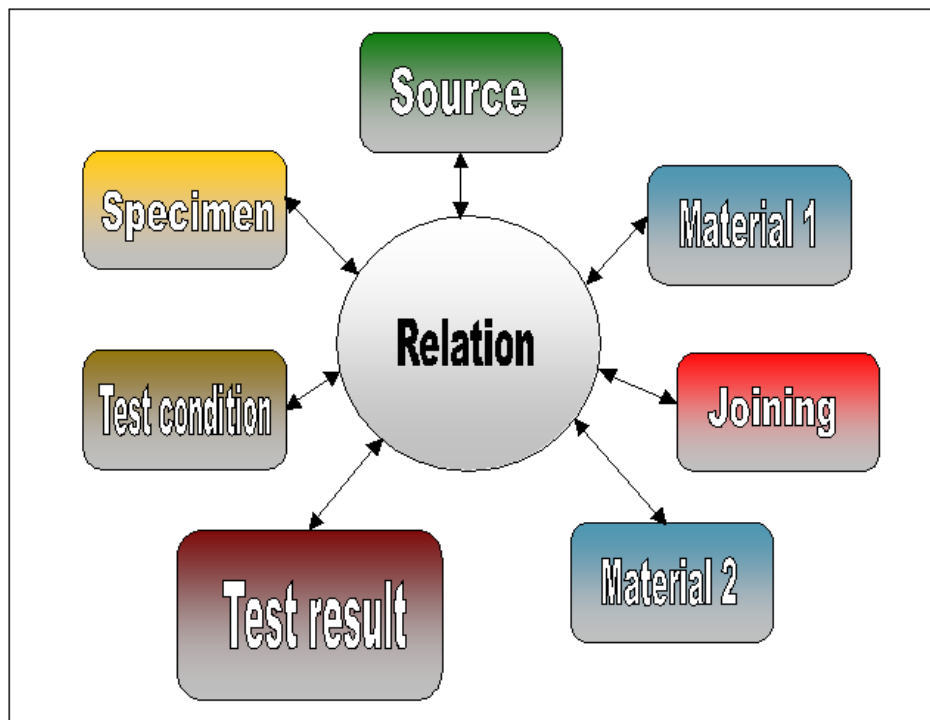
**Data Retrieval**  
Data Retrieval allows you to select and view MatDB data and run the associated analysis routines. You can only retrieve data, which is public for non-commercial use or for which you have specific access rights.

**Data Entry**  
Data Entry allows you to enter and manage your test data in MatDB. If you want to enter data to Mat-DB, please contact the **database administrator**.

MatDB manages mechanical and physical properties data generated according to European and international testing standards.

MECHANICAL PROPERTIES	IRRADIATION
CRACK GROWTH & FRACTURE	Irradiation creep
Creep crack growth	Swelling
Cyclic creep crack growth	In-pile relaxation
Fatigue crack growth	TENSILE
Fracture toughness	Compression
Impact	Multiaxial tensile
CREEP	Uniaxial tensile
Cyclic creep	Small punch tensile
Multiaxial creep	THERMO-PHYSICAL PROPERTIES
Torsional creep	Density
Uniaxial creep	Electrical resistivity
Small punch creep	Emissivity
RELAXATION	Linear thermal expansion
Multiaxial relaxation	Poisson's ratio
Uniaxial relaxation	Specific heat
FATIGUE	Shear modulus
High cycle fatigue	Thermal conductivity
Low cycle fatigue (load control)	Thermal diffusivity
Low cycle fatigue (strain control)	Young's modulus
Thermal fatigue	CORROSION
Thermo-mechanical fatigue	High temperature corrosion
Creep-fatigue interaction	Complex test

The data model on which MatDB is based on a de facto standard established in collaboration national laboratories in the US and Japan.



## Material entity

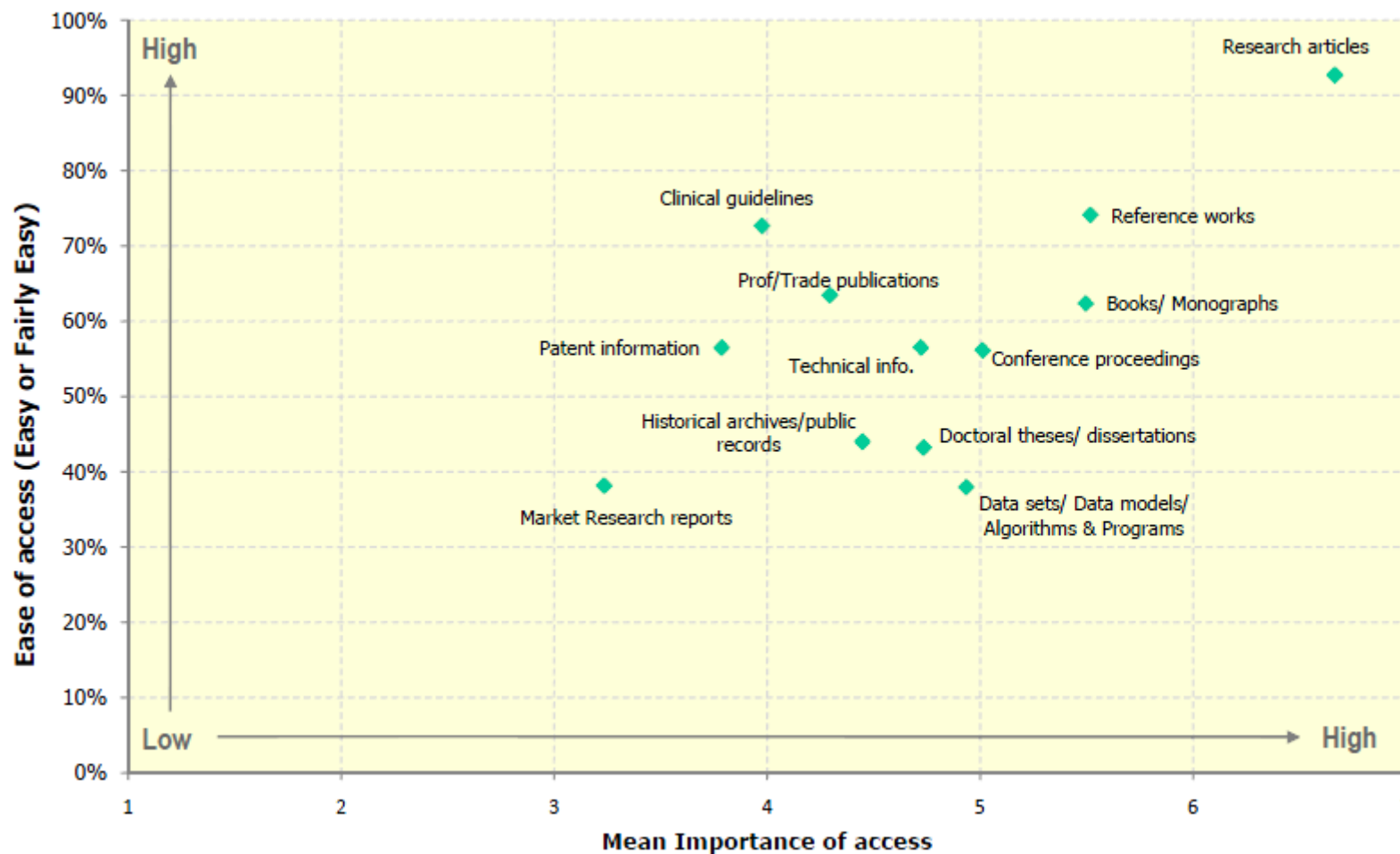
Chemical composition
Designation & production
Characterisation
Isotropic grain size
Duplex grain size
Directionally solidified grain size
Hardness
Microstructure
Phase
Physical constants
Thermo-mechanical heat treatment
Customer internals



The engineering materials industrial and research communities face various data management challenges.

- Data preservation
  - Additional overheads
  - Projects aim to develop new knowledge
- Data transfer
  - Wide-ranging end-user requirements
  - Diverse range of electronic systems
  - Different data sources
- Data sharing
  - Research data has intellectual value
  - Research data has commercial value

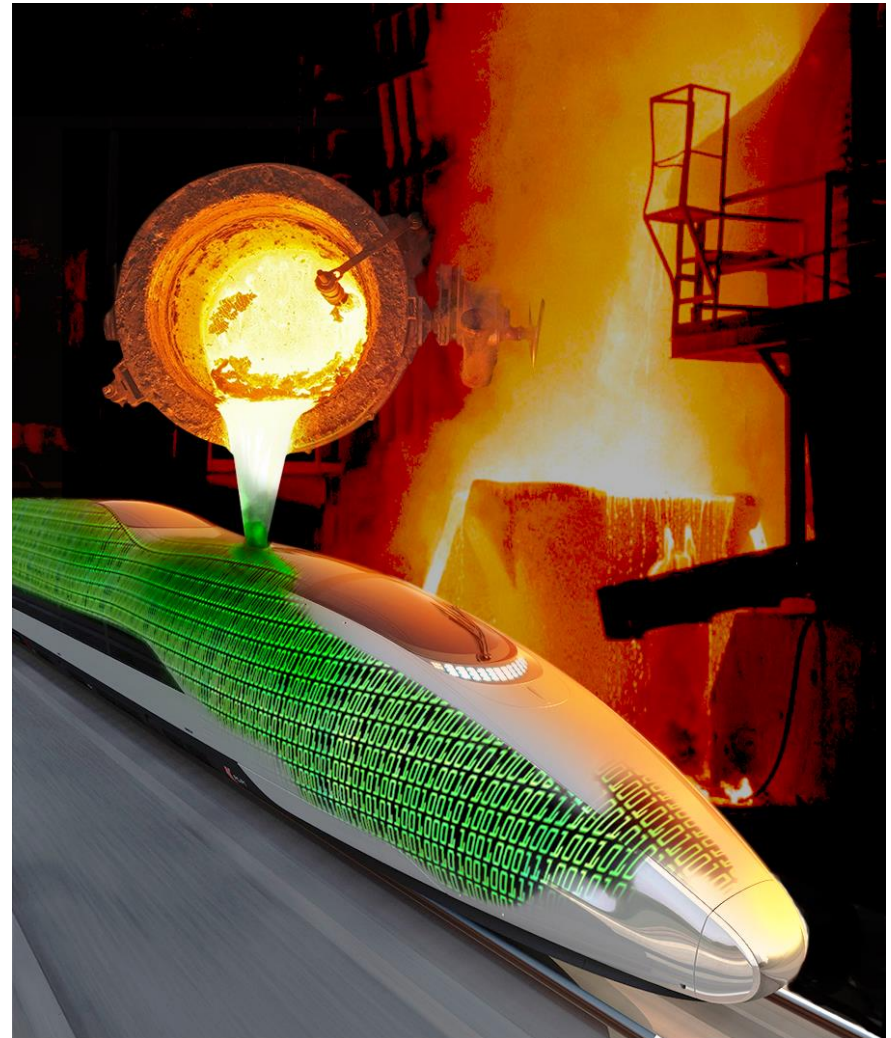
# Access vs Importance



Source: PRC (2010) Access vs. Importance ([http://www.publishingresearch.net/documents/PRCAccessvsImportanceGlobalNov2010\\_000.pdf](http://www.publishingresearch.net/documents/PRCAccessvsImportanceGlobalNov2010_000.pdf))

JRC IET supports the development of standards for materials data.

- CEN Workshops on ICT Standards for engineering materials data
- CEN/WS ELSSI-EMD
  - Ontologies and schemas for engineering materials test data
- CEN/WS SERES
  - Ontologies and schemas for engineering materials data
  - Transition to electronic reporting in the engineering sector
- MatDB is enabled for the ELSSI-EMD technologies







MatDB has recently been enabled to support data citation using DataCite DOIs.

- Data citation is integrated into the data entry workflow
  - DOIs can be requested for any validated data set
  - DOIs are automatically minted using the DataCite API (Web Service)
- Data citation respects different access management levels
  - Open access
  - Registered access
  - Restricted
- Data citation promotes data sharing
  - Researchers are acknowledged in derivative works
  - Industrial organizations may gain a commercial advantage
- Data citation promotes European research and innovation
  - Contributes to the generation of new knowledge
  - Guards against redundancy



## JOINT RESEARCH CENTRE

Institute for Energy and Transport (IET)

Citation Gülgimen, B;Haehner, P;Hurst, R.;De Haan F.;Ramos, C.C; Mendes, J. (2014): Test data for small punch creep on material P91 at 600 Celsius, version 1.0, European Commission JRC Institute for Energy and Transport, [Dataset], <http://dx.doi.org/10.5290/410048>

Version **1.0: 09-01-2014** ▼

Meta Data	Source Details	Material Details	Test Conditions	Specimen Details	Test Details	Curve Details
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### DOI Metadata:

<b>Identifier</b>	<a href="http://dx.doi.org/10.5290/410048">http://dx.doi.org/10.5290/410048</a>
<b>Creators</b>	Gülgimen, B;Haehner, P;Hurst, R.;De Haan F.;Ramos, C.C; Mendes, J.
<b>Creator organization</b>	EC - JRC Petten, Institute for Energy and Transport
<b>Title</b>	Test data for small punch creep on material P91 at 600 Celsius
<b>Publisher</b>	European Commission JRC Institute for Energy and Transport
<b>Publication year</b>	2014
<b>Subject</b>	Elevated temperature material properties
<b>Project Leader</b>	Gülgimen, B; Haehner, P
<b>Date issued</b>	2014-1-9
<b>Resource type</b>	Dataset
<b>Resource subtype</b>	Test data
<b>Format</b>	text/plain
<b>Language</b>	en

**Thank  
You** *Mahalo*  
*Kiitos*  
*Tack*  
*Grazie*  
*Obrigado* **Thanks**  
*Takk* **Gracias** **Merci**