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Deliverable D-43.52: Specification of sample tests on thin sheets and format of data for tests

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Advanced High-Temperature Reactors for Cogeneration of Heat and Electricity R&D

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Summary

This document contains the description of the investigation program on thin sheets (~3mm) of alloy 800H within the work package WP43 "Intermediate Heat Exchanger". The investigation program includes tensile tests at different strain rates, creep tests and relaxation tests for temperatures up to 850°C. The results of these various mechanical tests will be compared with existing data on components with thicker sections (see available data in deliverable D43.51).

Approval

Rev.	Date	First author	SP leader	Project Coordinator
0	month/year	Cédric Feuillette; MPA	D Buckthorpe; AMEC	S Groot; NRG
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Distribution list

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1 Material delivery and specimen machining

A thin sheet of Alloy 800H (2000mm*400mm*4mm) is planned to be delivered by Alpha Laval **during the month of September 2011**. The machining of the specimens will start upon receipt of this thin sheet. For all tests, a common geometry for the probe will be used (see figure 1). The samples will be limited in their thickness to 3 mm. The specimen are planned to be machined **during the month of October 2011**.

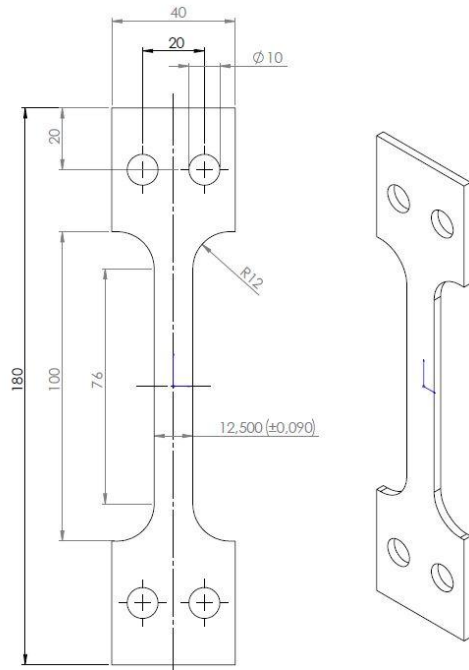


Figure1:Specimen geometry

2 Tensile tests

Tensile tests (see table 1) will be performed on a Zwick machine (see Figure 2) according to the DIN EN ISO 6892-2 Standard. The specimens will be tested **during the month of November 2011**.

Table1: Tensile tests specification

Specimen Nr.	T° (°C)	Strain rate (-/s)
800H-T1	650	$5 \cdot 10^{-4}$
800H-T2	650	$1 \cdot 10^{-4}$
800H-T3	650	$1 \cdot 10^{-5}$
800H-T4	750	$5 \cdot 10^{-4}$
800H-T5	750	$1 \cdot 10^{-4}$
800H-T6	750	$1 \cdot 10^{-5}$
800H-T7	850	$5 \cdot 10^{-4}$
800H-T8	850	$1 \cdot 10^{-4}$
800H-T9	850	$1 \cdot 10^{-5}$



Figure2:Tensile test machine

Detailed results for each test will be reported in a .txt format with the following content:
Time (s), strain (-), technical stress (MPa)

For each test, the following information will also be reported in a common diagram:
Yield strength $R_{p0.2}$ (MPa), Stress at 1% plastic strain R_{p1} (MPa), Tensile strength R_m (MPa), Strain to rupture A (%), Young Modulus E (MPa), Specimen section area (mm^2), Temperature ($^{\circ}C$)

3 Relaxation tests

Relaxation tests (see table 2) will be performed on a Zwick machine (see Figure 2) according to the DIN EN ISO 10319-1 Standard. The loading velocity to reach the required strain level will be fixed at 6%/min. The same probe geometry as in the tensile tests will be used. Investigations are expected to be concluded **at the end of year 2011**.

Table2: Relaxation tests specification

Specimen Nr.	T° ($^{\circ}C$)	Strain (%)	Test Duration (h)
800H-R1	750	0,2	100 to 300
800H-R2	750	0,4	100 to 300
800H-R3	850	0,2	100 to 300
800H-R4	850	0,4	100 to 300

Detailed results for each test will be reported in a .txt format with the following content:
Time (s), technical stress (MPa)

4 Creep tests

Creep tests (see table 3) will be performed on creep test machines (see Figure 3) according to the DIN EN ISO 204 Standard. Long-term specimens (C1, C3 and C6) will be tested as soon as possible (Start in 2011). Middle-term and short-term specimens will then be introduced in 2012. This ensures that results for the deliverable D43.53 “Creep and relaxation tests report” at month 37 (end of 2013) will be produced in time.

Table 3: Creep tests specification

Specimen Nr.	T° ($^{\circ}C$)	Stress (MPa)	Expected duration (h)
800H-C1	650	93	20000
800H-C2	650	106	10000
800H-C3	750	44	20000
800H-C4	750	50	10000
800H-C5	750	75	3000
800H-C6	850	21	20000
800H-C7	850	24	10000
800H-C8	850	40	3000



Figure 3: Creep test machines

Detailed results for each test will be reported in a .txt format with the following content:
Time (s), creep strain (-)