

## Profile LFR-49

### SOLIDX

### ITALY

#### GENERAL INFORMATION

NAME OF THE FACILITY	SOLIDification eXperiment Facility
ACRONYM	SOLIDX
COOLANT(S) OF THE FACILITY	Molten lead
LOCATION (address):	Italian National Agency for New Technologies, Energy and Sustainable Economic Development, C.R. ENEA Brasimone, Italy
OPERATOR	ENEA
CONTACT PERSON (name, address, institute, function, telephone, email):	Ing. Ivan Di Piazza, ENEA UTIS-TCI C.R. Brasimone 40032 Camugnano (Bo) Tel. +39 0534 801 248, Researcher of Thermal Fluid Dynamic and Facility Operation Laboratory <a href="mailto:ivan.dipiazza@enea.it">ivan.dipiazza@enea.it</a>

<b>STATUS OF THE FACILITY</b>	Under Construction
Start of operation (date):	2015

<b>MAIN RESEARCH FIELD(S)</b>	Zero power facility for V&V and licensing purposes
	X Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
	X Thermal-hydraulics
	Coolant chemistry
	Materials
	Systems and components
	Instrumentation & ISI&R

#### TECHNICAL DESCRIPTION

##### Description of the facility

SOLIDX is a stagnant facility operating with pure lead (about 20 litres) as working fluid. It mainly consists of main vessel (S100), in which freezing and de-freezing of the coolant is simulated, a storage vessel (S200) and a fill & drain system (see figure 1). A cross section of the main vessel is reported in figure 2. The main vessel S100 consists of three coaxial tubes (T1, T2, T3) with a length of 350 mm. In the follow the main dimension of the tubes are reported:

Tube	Type	O.D.[mm]	s[mm]	L [mm]
T1	10 inches Sch40	273	9.27	350
T2	14 inches Sch80	355.6	19	350
T3	16 inches Sch40	406.4	12.7	350
<b>Powder gap</b>	-	-	22.3	350

## SOLIDX

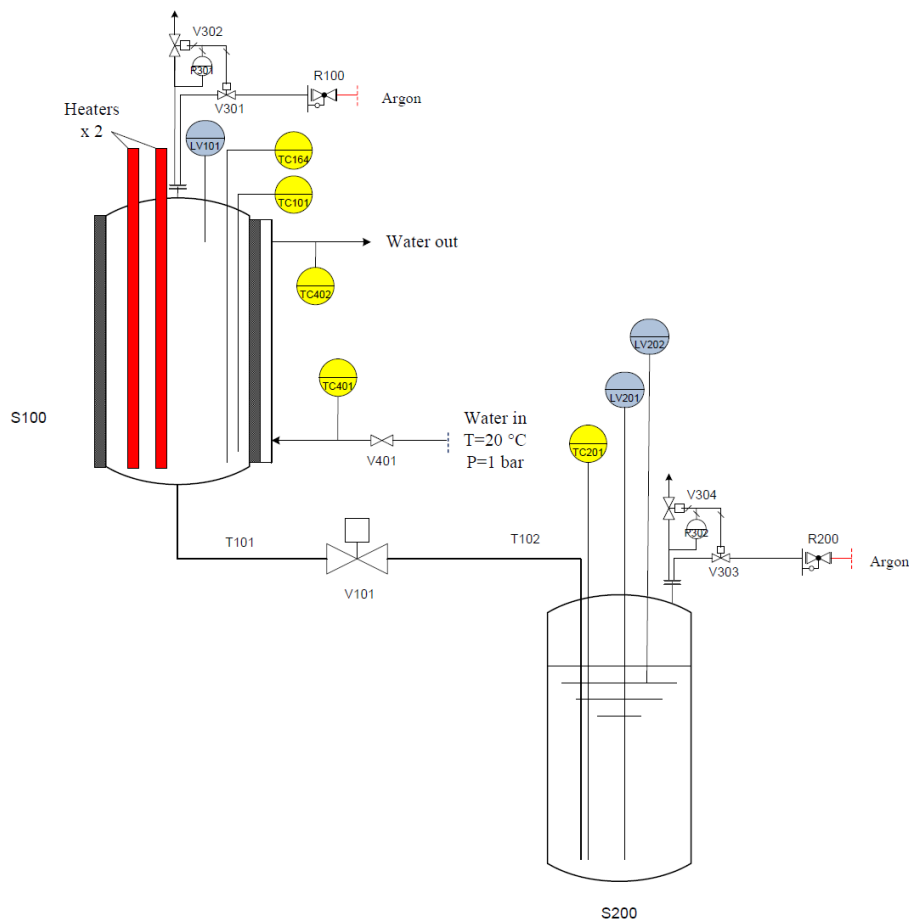


FIG. 1. Piping and Instrumentations Diagram of SOLIDX Facility

The three tubes are closed on the bottom, while on the top a 10" WN 300 lbs flange is foreseen. The upper flange hosts a porthole for the free level visualization during the tests.

In the inner tube (T1) contains the working fluid (pure lead), while the gap between T1 and T2 is filled by conductive powder (AISI 304) allowing to achieve the thermal coupling between the flowing water and the liquid metal with a proper thermal resistance.

The water gap (between T2 and T3) is divided in four sealed volumes, feed independently, allowing to cool asymmetrically the inner pool, increasing the flexibility of the experiments.

On the outer wall of T1 a heating element (300 W) is installed.

Inside the lead pool two heaters are installed, respectively H1 (in axial position) and H2 (at 63.1 mm from the centre). Both have a power of 2500 W, a diameter of 20 mm and an active length of 250 mm.

The use of the heaters, asymmetrically placed in the pool, linked with the water cooling circuit, will allow the run of several freezing and de-freezing experiments.

Aiming to monitor the freezing (and de-freezing), 64 TCs (O.D. 1mm, type K) will be installed in the melt, placed on four bars (16 TCs for each bar) as reported in figure 2.

Three bars will be positioned at 95.4 mm from the centre, while one bar will be placed at 63.6 mm from the centre.

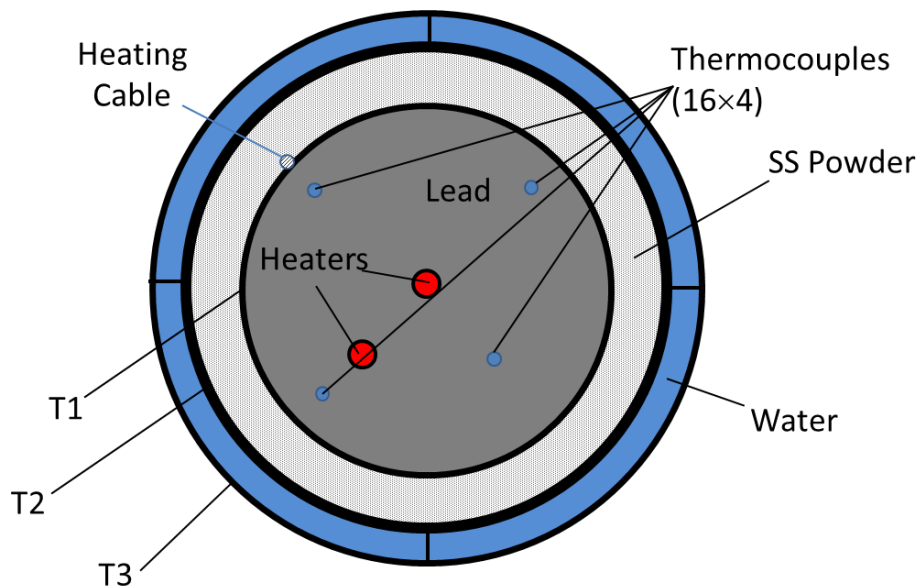


FIG. 2. Cross Section of the main Vessel S100.

### Acceptance of radioactive material

No

### Parameters table

Coolant inventory	Max Lead inventory 200 kg
Power	5.3 kW
Test sections	
S100	<u>Characteristic dimensions</u> Outer diameter: 273 mm Thickness: 9.27 mm Length: 350 mm
	<u>Static/dynamic experiment</u> static
	<u>Temperature range in the test section (Delta T)</u> 500°C trough the FPS
	<u>Operating pressure and design pressure</u> Operating Pressure 0,2 bar (gauge)

	Design pressure 0,5 bar (gauge)
	<u>Flow range (mass, velocity, etc.)</u> static
Coolant chemistry measurement and control (active or not, measured parameters)	None
Instrumentation	Thermocouples

### **COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS**

NONE

### **PLANNED EXPERIMENTS (including time schedule)**

First experimental campaign by 2015

### **TRAINING ACTIVITIES**

Training activities can be agreed with ENEA Brasimone RC for the operation of the experimental campaign under the supervision of ENEA qualified staff.

### **REFERENCES (*specification of availability and language*)**

1. DI PIAZZA I., "Specifica Tecnica per la fornitura e installazione della facility SOLIDX", ENEA report LM-I-S-092, June 2014 (*in Italian*).