



AREVA NP

Research and Testing Capabilities of AREVA NP

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AREVA PROPRIETARY

AREVA NP Technical Centers - A ^{top}powerful Laboratory to Support the Nuclear Industry

- ▶ **Unique thermal-hydraulic and component testing platforms**
- ▶ **ISO 17025:2005 accredited test and inspection body**
- ▶ **Wide range of measurement and test capabilities**

Measurements	Range
Temperature	0°C - 1000°C (32-1832 °F)
Pressure	10 Pa - 40 MPa (0.0015-5800 psi)
Volume flow rate	0.1 l/h - 1.500 m³/h (0.0004-6600 gpm)
Mass flow rate	0.1 kg/h - 4.000 kg/s (up to 8818 lb/s)
Force	1 N - 10.000 kN
Momentum	up to 50.000 Nm
Distance	1µm - 10 m
Velocity	1 mm/s - 100 m/s
Acceleration	0.5 - 1.000 g
Current	1 mA - 85.000 A
Voltage	1 mV - 4 kV
Electrical power	up to 20 MW

International Laboratory Accreditation
Cooperation; world-wide cross
acceptance

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AREVA Technical Centers - A Powerful Laboratory to Support the Nuclear Industry

Key test facilities provide a wide variety of specialized tests for validation of reactor system and component performance:

- ▶ **KOPRA** – Multifunction component test facility (fuel assemblies, CRDMs, valves)
- ▶ **BENSON** – High-pressure thermal-hydraulic testing of separate effects, single- and two-phase flow applications
- ▶ **PKL** – Large scale test facility of a PWR primary loop with secondary side and auxiliary systems and full control room for operator training
- ▶ **KATHY** – Multifunction thermal-hydraulic test loop
- ▶ **GAP/VPE** – Large valve and high-pressure test facility for safety relief valves and main steam isolation valves
- ▶ **INKA** – Test facility for Integral BWR and System tests

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KOPRA: CRD Shaft Support and CRAGT Alignment Test

Model of a 160 MWt NuScale Power Module



CRD shaft prototype with a length of >600 inches

▶ Main test objectives:

1. Demonstrate ability for CRD shaft function with support configuration
2. Quantify amount of misalignment of support configuration before extending drop duration limits
3. Determination of integral SCRAM time

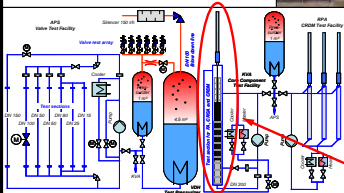
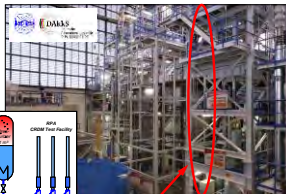
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CRD Shaft Support and CRAGT Alignment Test KOPRA – Component Test Facility

- ▶ Four test loops for PWR operating conditions
- ▶ Testing and qualification of nuclear components e.g. : CRDMs, fuel assemblies, valves and safety valves



Cold test with a total height of 73 ft. attached to KOPRA platform (test objectives 1 and 2)

Hot test inside Core Component Test Facility (test objective 3)

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CRD Shaft Support Alignment Test (Cold Test) - Test Setup



CRD shaft supports (view from above)



Assembling of CRAGT

Cold test set-up with consisting of:

- ▶ CRD shaft Supports
- ▶ CRAGT with confinement and Fuel assembly with fuel assembly channel

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INKA Integral System Test Facility

The only test facility that combines:

- ▶ Large component and volume scaling
- ▶ Large power supply for full power, long-duration testing
- ▶ Integral accident simulation and passive safety features testing

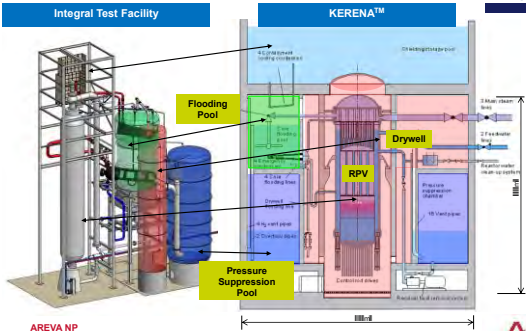
Facility	Drywell	Wetwell	RPV pressure	Power Supply
INKA	420 m ³ 14 832 ft ³	300 m ³ 10 694 ft ³	160 bar 2 320 psi	22 MW
PANDA	198 m ³ 6992 ft ³	234 m ³ 8263 ft ³	10 bar 145 psi	1.5 MW
PUMA	14 m ³ 494 ft ³	18 m ³ 635 ft ³	10.3 bar 150 psi	0.5 MW
Tiger	30 m ³ 1060 ft ³	-	? ?	? ?
THAI	60 m ³ 2119 ft ³	-	14 bar	1.5 MW
APEX	No Containment		32 bar	1 MW

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INKA Facility



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INKA Test Facility Setup

Volumes

- ◆ Flooding Pool Vessel:
219 m³ (7 734 ft³)
- ◆ Press. Suppression Pool Vessel:
350 m³ (12 360 ft³)
- ◆ Drywell Vessel:
188 m³ (6 640 ft³)
- ◆ GAP/Reactor Pressure Vessel:
125 m³ (4 414 ft³)

Scaling

- ◆ Heights: 1:1
- ◆ Components 1:1
 - EC and CCC: 1 out of 4
 - Vent pipe: 1 out of 16
- ◆ Volumes: 1:24
 - GAP/RPV 1:6.3

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Integral Test Loop Karlstein (INKA)

View from West

Shielding/Storage Pool Vessel

View from East

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Contact AREVA NP

► For additional information and inquiries about your research and testing needs:

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