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Intercontrôle

Non Destructive Testing

# PROBES DESIGN AND PRODUCTION

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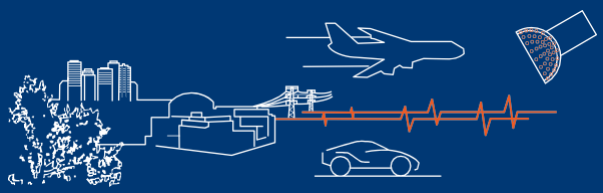
## Technical and Projects Department



Conception et réalisation de sondes


# Design and production of customised ultrasonics (UT) and Eddy current (ET) probes.

**TO REPLY TO YOUR SPECIFICATIONS IN KEEPING WITH STANDARDS**

- Process engineer
- A research office
- Ultrasonic (UT) experts
  Eddy current (ET)experts
- Laboratory technicians
- Ways of characterization and **recipes**

« From need for control to its realization … »

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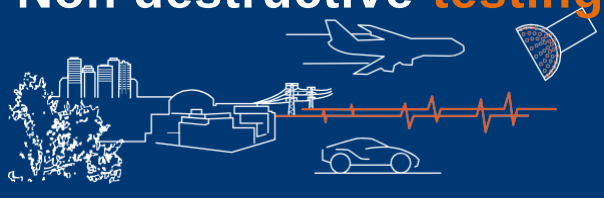

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Probes manufacturing section

# Design and production of ultrasonic (UT) sensor and Eddy current (ET) probes

## Summary




**Probes Section :**

- Experts, engineers and technicians specializing in the manufacture of probes
- IC has been delivering Eddy Current or Ultrasound specific probes for more than 40 years
- IC is able to achieve the manufacturieng and the **recipe** of probes
- IC develops and applies the CND processes of the future

**Applications :**

- Customized specific probes
- Ultrasound and Eddy Current
- Specialists in the manufacture of probes for tube inspections

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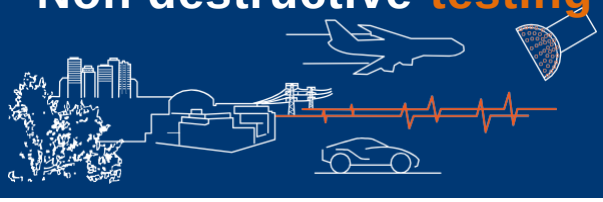
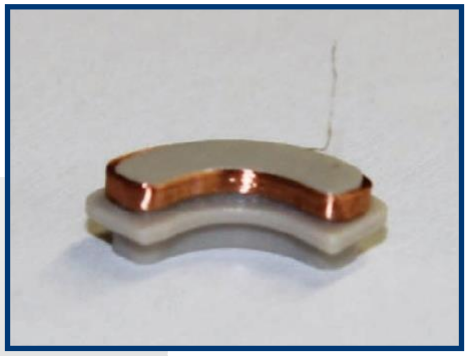


Probes manufacturing section

# Specific Probes

*Single-element ET and UT on demand specific probes*





## Technical interests:

- Functional analysis of customer needs
- Design according to the target application
- Realization of simulations
- Adaptation of the geometry of the probe to the part to be checked
- Manufacture of prototypes and small and medium series

## Applications:

- Detection or characterization of defaults
- Inspection of components with complex geometry / limited access
- Signal / noise ratio optimization

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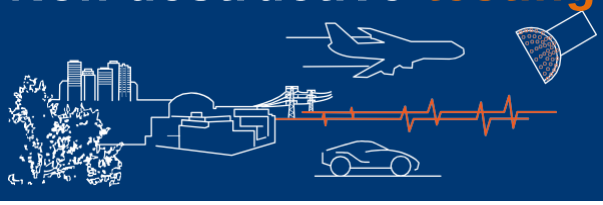
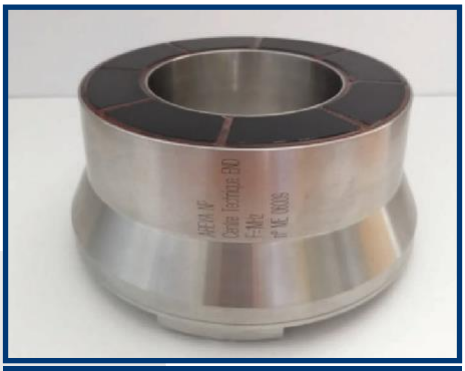


Probes manufacturing section

# Specific Probes

*Single-element ET and UT on demand specific probes*



## Technical interests:

- Identification of gains in terms of productivity and performance of detection and characterization
- Optimization of the number and geometry (formatting) of the elements by simulation
- Expertise in the development of the associated process

## Applications:

- Troubleshooting, characterization and dimensioning in noisy structures
- Inspection of welds of components with complex geometry
- Increase of the inspection productivity

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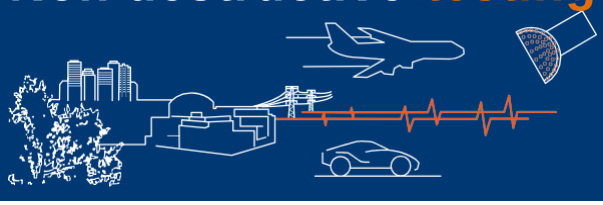
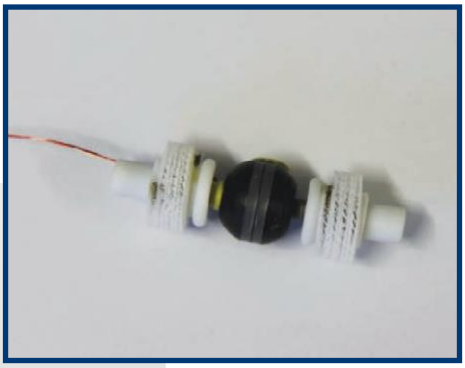
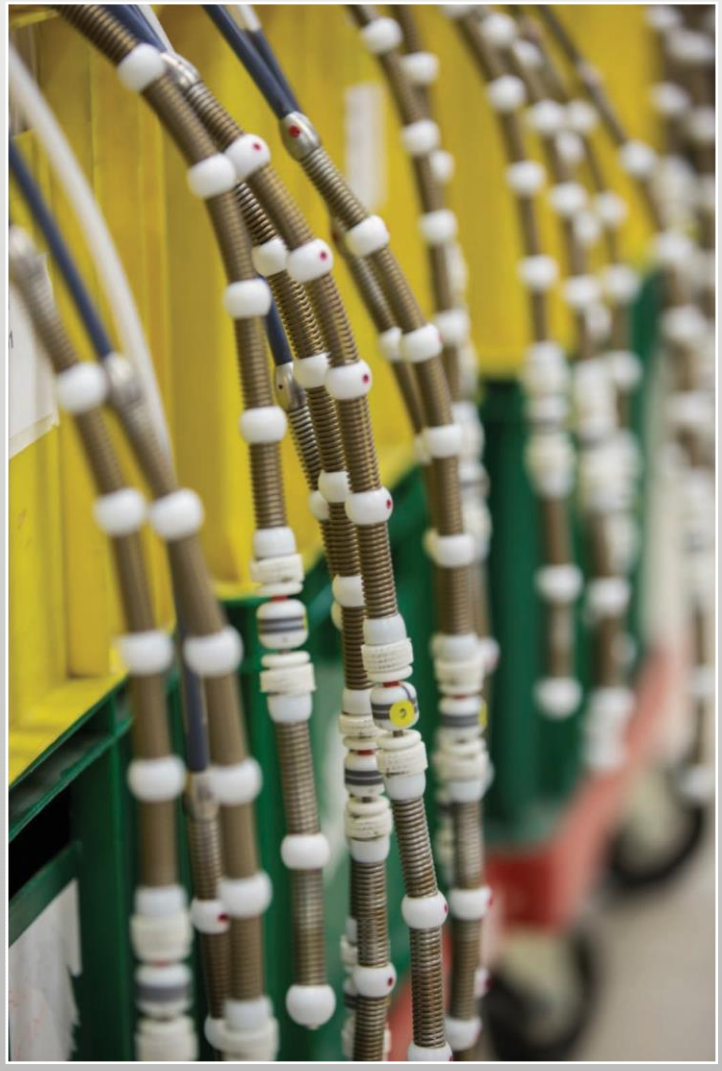


Probes manufacturing section

# Eddy Current (ET) Probes

*Axial Probes*





## Characteristics:

- Flexible or rigid probes
- Cable length up to 36 m
- Different diameters (typically from 14 mm to 18.5 mm)
- Frequency of use from 100 kHz to 500 kHz
- **PMUC** materials

## Applications:

- Tubes inspection from the inside
- Possible utilization of a pulleur-pusher
- Surface and sub-surface defects type detection (cracks of the order of 10 µm)

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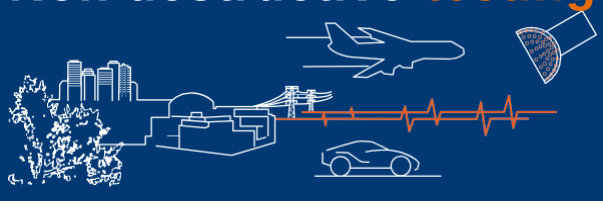
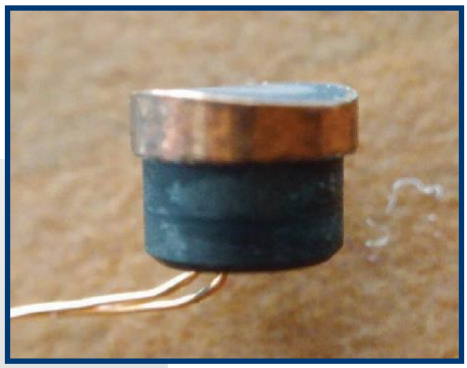


Probes manufacturing section

# Eddy Current (ET) Probes

*Rotating probes*




## Characteristics:

- Longitudinal and transverse inspection
- Tulip centering
- Active shaped surface
- **PMUC** (nuclear) materials
- **Compatible with motorized rotation vectors**

## Applications:

- Tubes inspection from the inside
- Possible utilization of a pulleur-pusher
- Surface and sub-surface defects type detection (cracks of the order of 10 µm)

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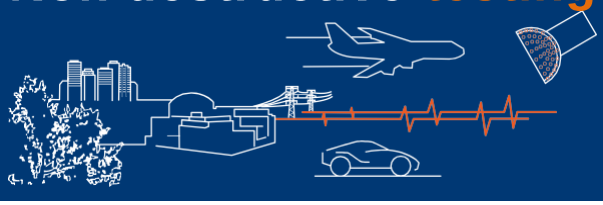
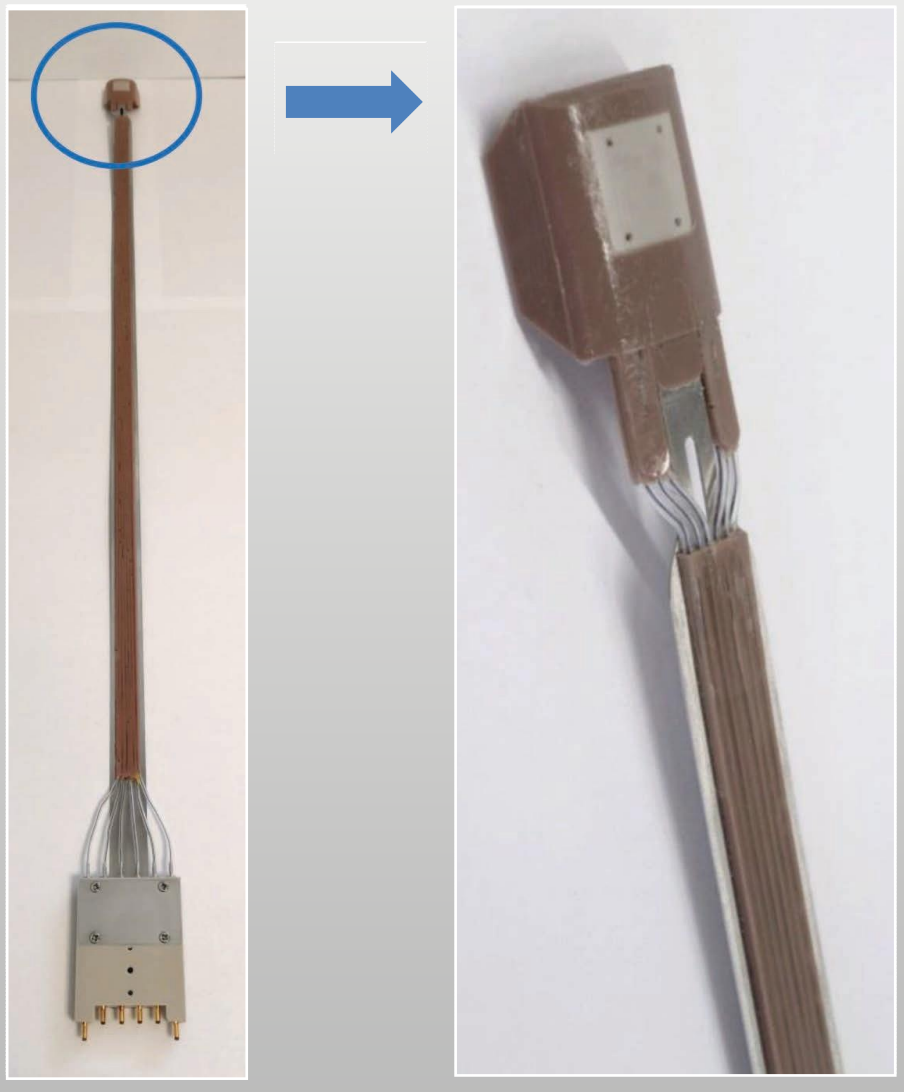


# Eddy Current (ET) Probes

*Sabers probes compatible limited access*



## Characteristics:

- High flexibility of the probe body
- **Système de plaquage par ailettes surmoulées**
- 5 mm probe thickness
- Small coil (2 mm)

## Applications:

- Inspection of flat surfaces and large diameter tubes from the inside with limited access
- Characterization of defects of the order of 20 µm

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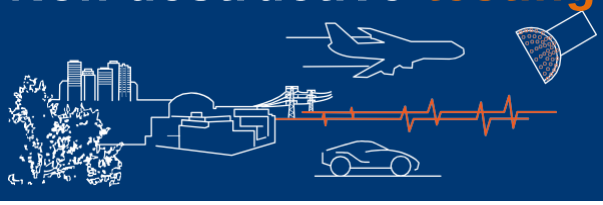
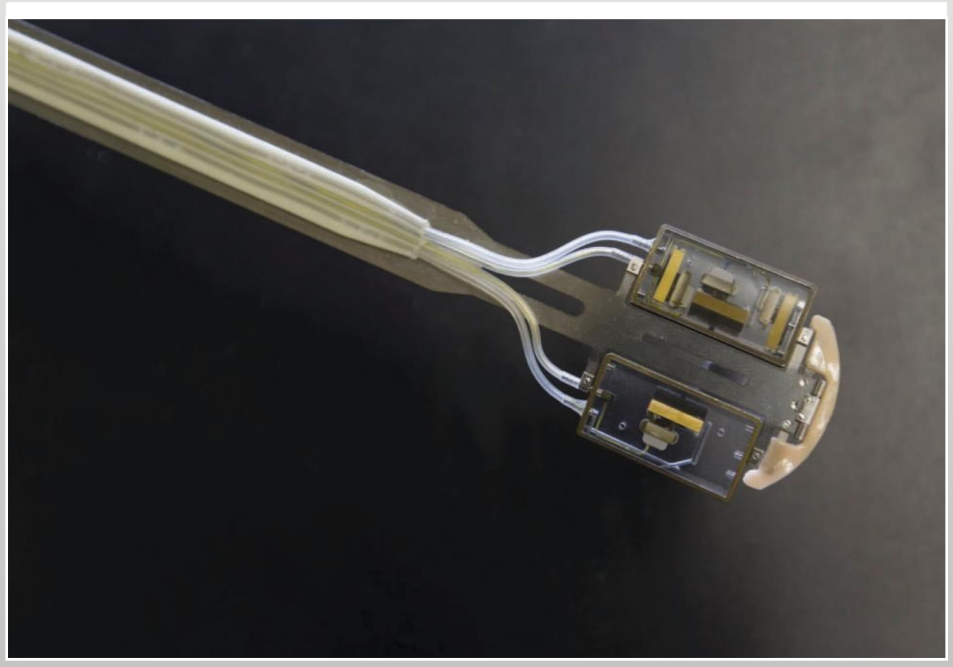


Probes manufacturing section

# Ultrasonic (UT) Probes

*Sabers probes compatible limited access*



## Characteristics:

- High flexibility of the probe body
- limited use of coupling
- Water intake at connector
- Small piezoelectric elements (2 mm x 7 mm bars (barettes))

## Applications:

- Tubes inspection from the inside with limited access
- Characterization of defects of the order of 20 µm

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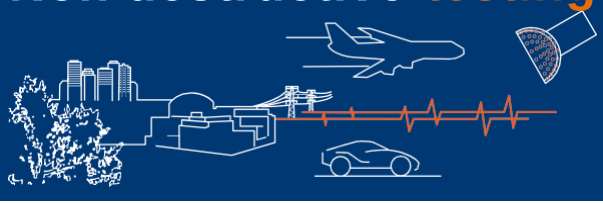
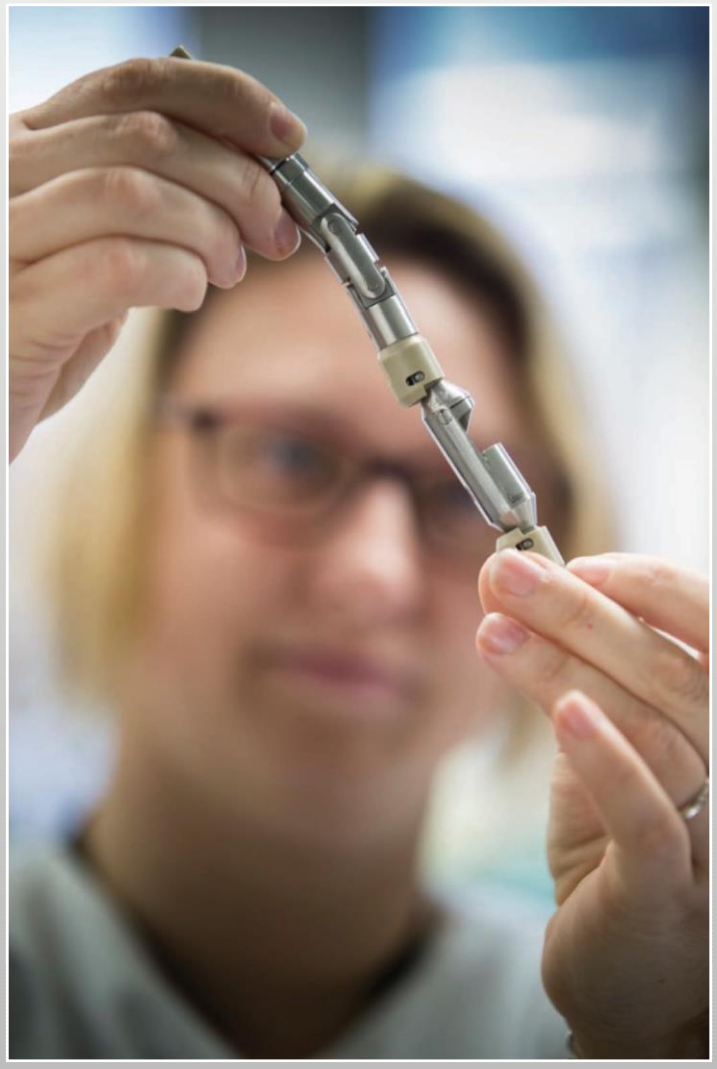
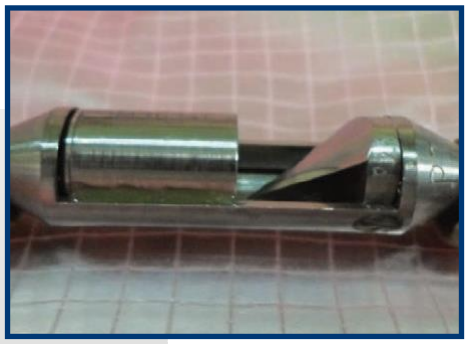


Probes manufacturing section

# Ultrasonic (UT) Probes

*Mirror-focused rotating probes*





## Characteristics:

- Small probe's diameter (about 15 mm)
- OL0° probe of 7 MHz
- Focused mirror
- Gimbal to allow the placement of the probe in the controlled area
- complex mirror surface machining (for adapted focusing)

## Applications:

- Tube volume inspection from the inside
- Motorized drive
- Defects detection and characterization
- Thickness measurement

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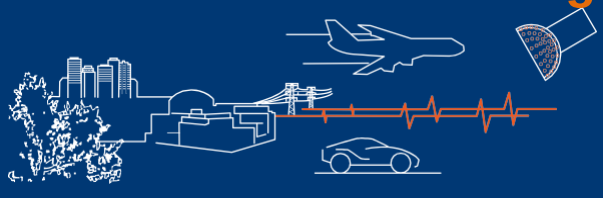
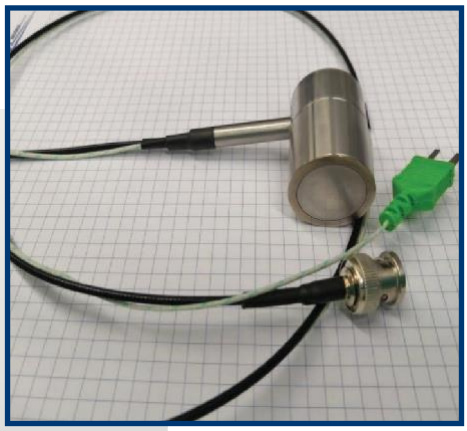


Probes manufacturing section

# Ultrasonic (UT) Probes

*High temperature compatible ultrasonic probes (between 250 ° C and 300 ° C)*

## Characteristics:

- Between 1 and 4 MHz
- Contact inspection (part up to 300 ° C)
- Immersion inspection (continuous temperature at 250 ° C)
- Operation without external cooling

**Applications:**

- Inspection during welding
- Liquid metal immersion inspection
- Corrosion measurement in operation

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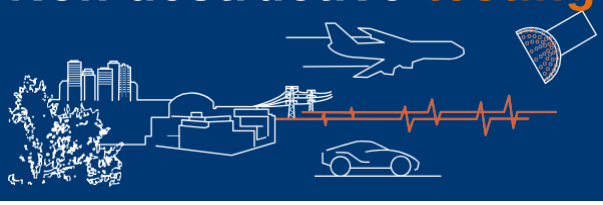

# Ultrasonic (UT) Probes

*Specific rotating TOFD probes*

**Characteristics:**

- Gimbal to ensure the passage of the probe under restrictive conditions
- **Plaquage réalisé par ailettes surmoulées**

**Applications:**

- **Tube volume inspection from the inside**
- Motorized driving
- Defects characterization

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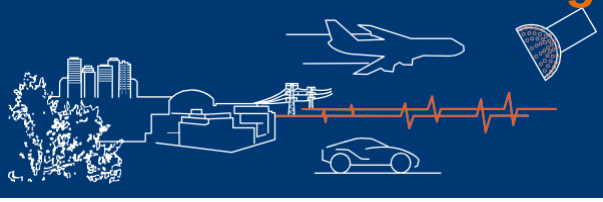
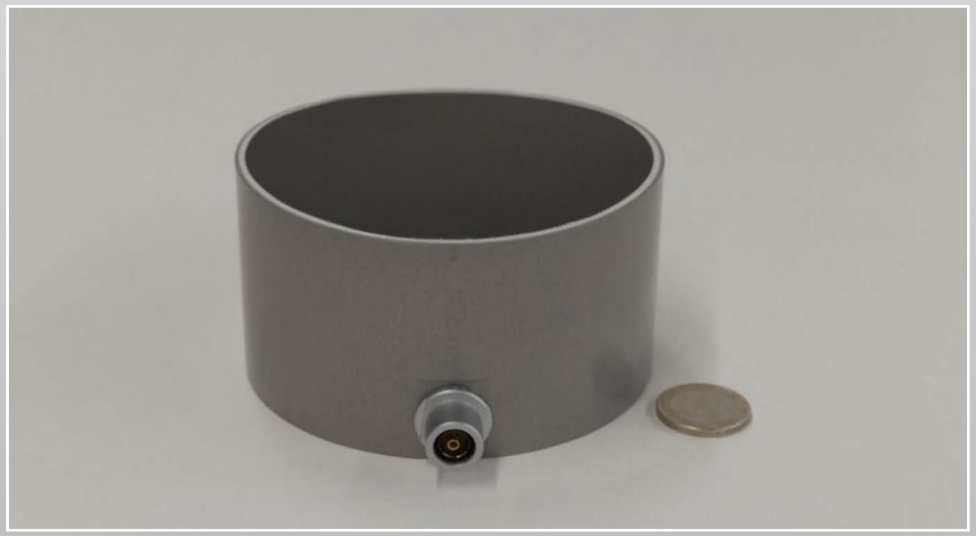
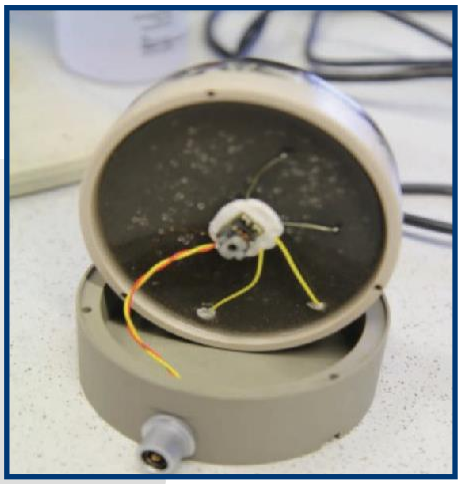


Probes manufacturing section

# Ultrasonic Probes (UT)

*Focused single-item translator*





## Caracteristics :

- Focus on customer demand
- Focus technology by lens or thermoforming piezocomposites
- Frequency of use from 0.5 MHz to 4 MHz
- 20 mm to 120 mm diameter

## Applications :

- Defects caraterization
- Immersion control (maximum pressure: 3 bars)

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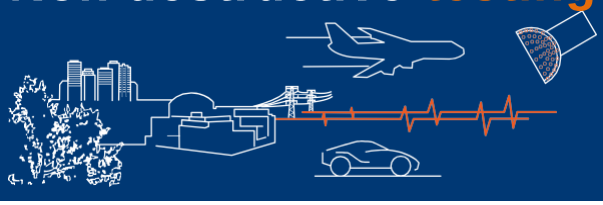
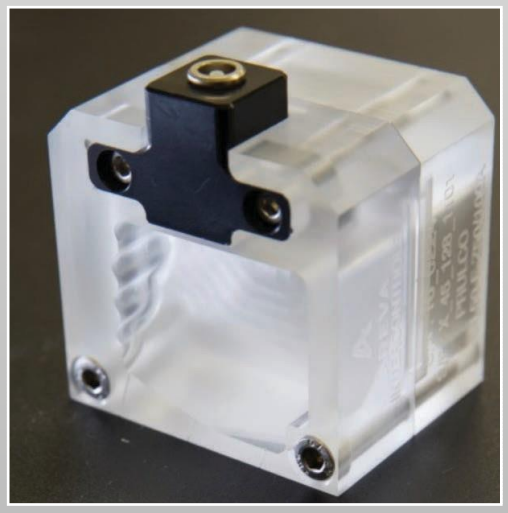


# Technical capacities

*Mechanical design, probes and models*



## Characteristics:

- Probes UT, ETand VT developpement
- Inspection models developpment
- Development of the tools required to manufacture the products

## Applications:

- UT and ET inspection of tubes from the inside and the outside
- Implementation of television inspections
- Detection and characterization of defects

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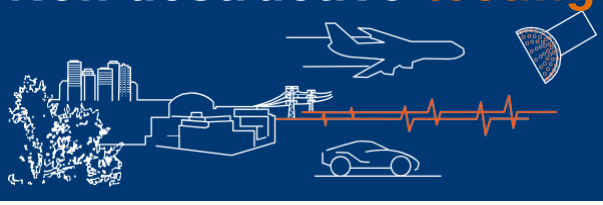
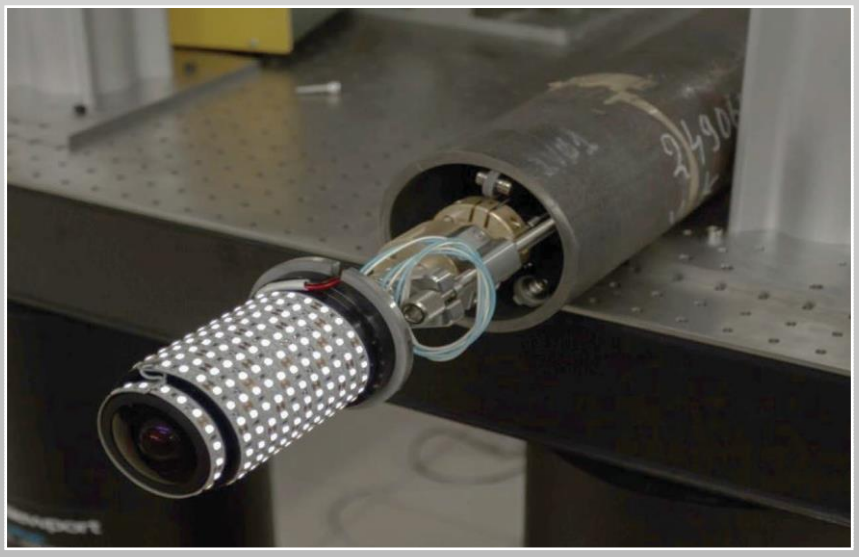
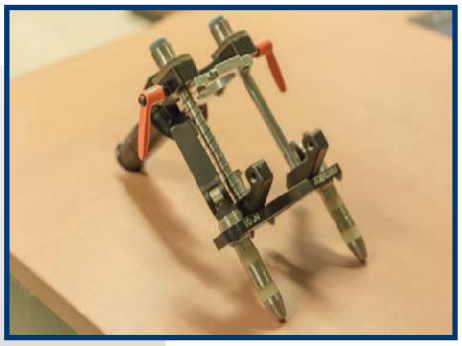
## Non destructive testing



# Technical capacities

*Tooling design (small and medium sizes)*



### Characteristics:

- Small tooling developpment for UT, ET and VT probes
- Manual or semi-automatic utilization
- CE certification

### Applications:

- For single application or for industrial products (medium series)
- Custom-made system according to a customer need

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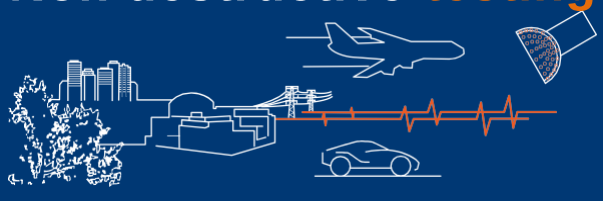

Probes manufacturing section

# Technical capacities

*Manufacturing: Custom connectors*

## Characteristics:

- Qualified personnel for binocular work
- Small welds (0.1 mm)
- Know-how in splices and cables
- Know-how in mounting and adjusting small mechanics

## Applications:

- Cable realization
- Placement of connectors
- Mechanical assembly and adjustment

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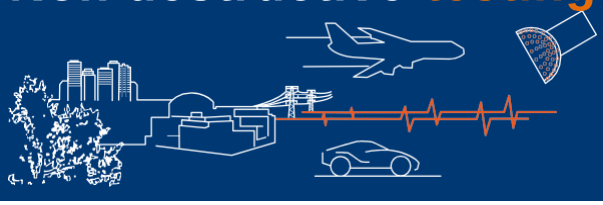
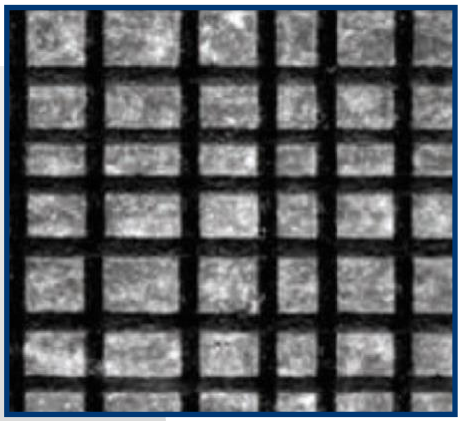
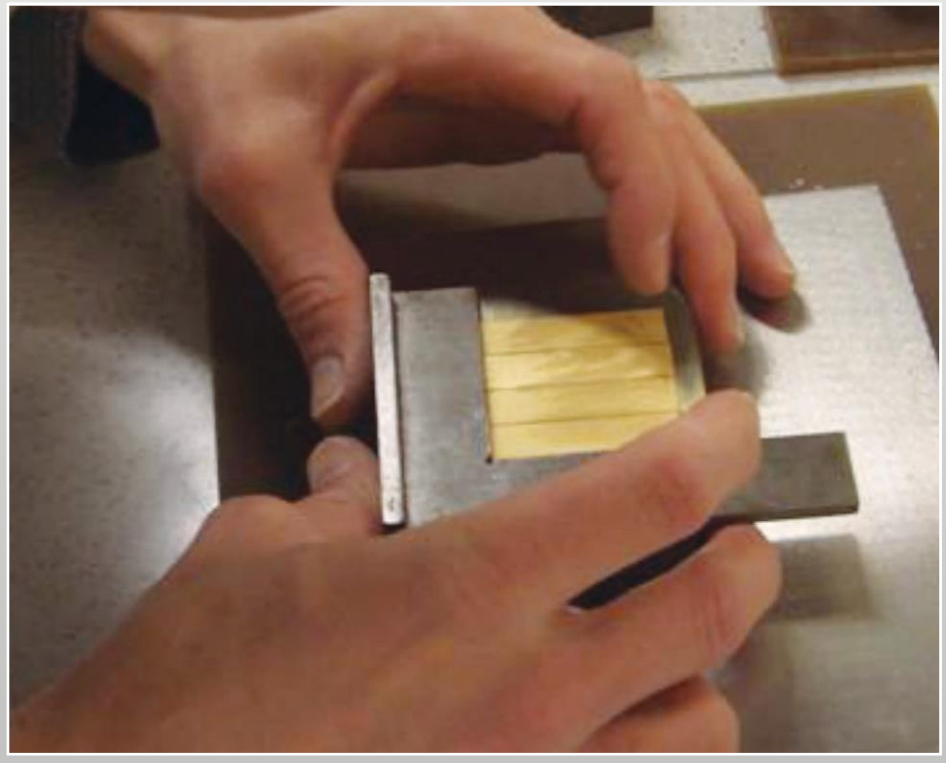


Probes manufacturing section

# Technical capacities

*Manufacturing: UT probes - Realization of piezocomposites*





## Characteristics:

- Repeatability of piezocomposites
- Complete control of the production process
- Piezocomposite cutting according to customer specification

## Applications:

- Custom-made single-element and multi-element ultrasound probes

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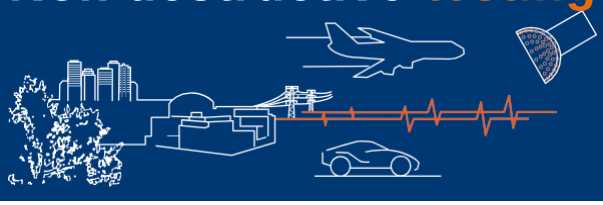
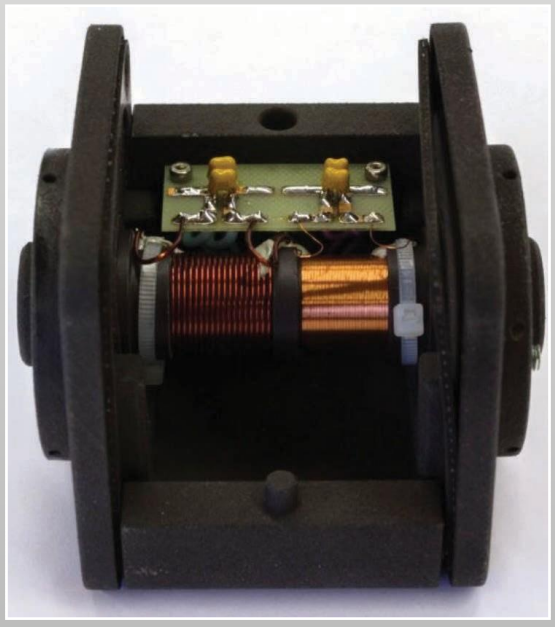


Probes manufacturing section

# Technical capacities

*Manufacturing: ET probes – Advenced winding*



## Characteristics:

- Different cable diameters (from 0.04 mm to 0.8 mm)
- Different forms of coils according to customer needs

## Applications:

- Custom-made monoelement or multielement ET probes
- Coil shape on request

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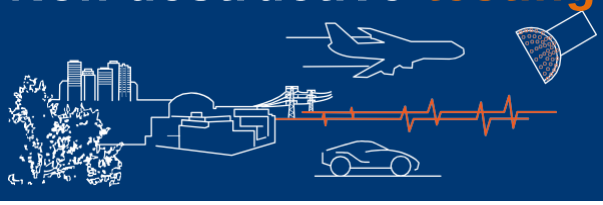
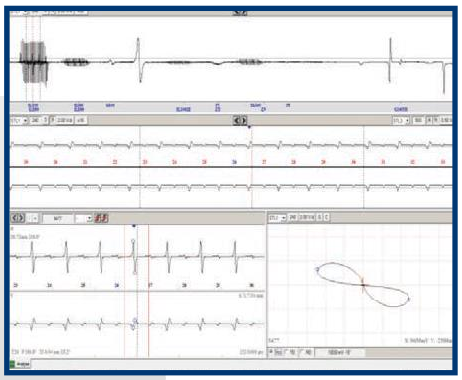


# Technical capacities

*Manufacturing: Recipe and characterization of probes*



### Characteristics:

- Constitution of the acceptance report
- Repeatability and reproducibility tests
- Inspection chain identical to those that used during the utilization of probes

### Applications:

- Creation and storage of Acceptance Minutes
- Testing probes on known defects to ensure proper operation

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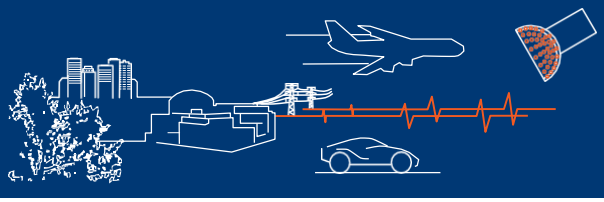

# NOTES

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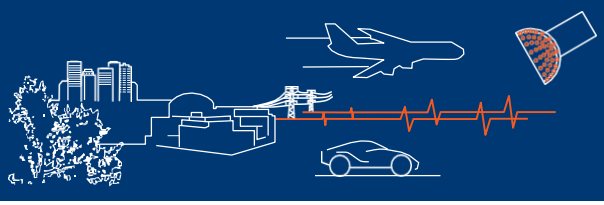

## NOTES

**Framatome is a major international player in the nuclear industry, recognized for its innovative solutions and high value-added technologies for the conception, construction, maintenance and development of the world's nuclear fleet. The company designs and manufactures components, fuel, control systems and offers a full range of services for reactors.**

**Thanks to its 14,000 employees worldwide, Framatome puts its expertise at the service of its customers every day to enable them to improve the safety and performance of their nuclear power plants and to contribute to achieving their economic and societal objectives.**

**Framatome is owned by the EDF group (75.5%), Mitsubishi Heavy Industries (MHI - 19.5%) and Assystem (5%). Intercontrôle is a 100% subsidiary of Framatome.**

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