2018
2022

# INESC MN

## R&D ACTIVITIES AND NUMBERS

www.inesc-mn.pt

Leading edge R&D in strategic technological areas of **micro- and nanotechnologies.**

**INESC MN** - MICROSISTEMAS E NANOTECNOLOGIAS | RUA ALVES REDOL 9, 1000-029 LISBOA, PORTUGAL

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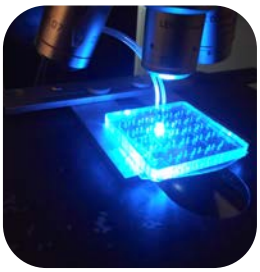
# ABOUT US

INESC Microsistemas e Nanotecnologias is a private, non-profit R&D Institute created in January 2002, from the former Solid State Technology group of INESC. Since January 2020, INESC MN belongs to the Associated Laboratory - Institute for Health and Bioeconomy - i4HB - to work in the emerging fields of Nanotechnology and BioNanotechnology.

INESC MN is dedicated to leading edge research and development in strategic technological areas of micro- and nanotechnologies and the application of these technologies to electronic, biological and biomedical devices. Research work shares the laboratories and class 100/10 Clean Room facilities used for student training. An important part of INESC MN's mission is to provide advanced training at Master, PhD and post-doctoral levels, acting as a bridge between the Instituto Superior Tecnico (IST, Universidade de Lisboa) and industrial partners worldwide. INESC MN also offers transfer of technology to both Portuguese and international industries through collaborative research, contract research, prototyping and consulting.

On November 2022 INESC MN was recognized as **Center of Technology and Innovation (CTI)** by the Portuguese Innovation Agency (ANI), by fostering the collaboration between academia and industry and by contributing with high-qualified human resources, promoting scientific employment and dissemination of knowledge.

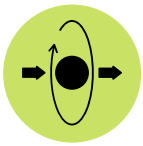
CTI

ACTIVITIES

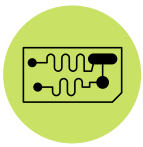
- Research & Development
- Innovation, Technology Transfer & Services
- Advanced Training and Education

# RESEARCH AREAS

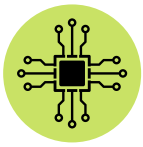
## ADVANCED SENSORS AND MICROSYSTEM INTEGRATION



Spintronics & Biosensors



MEMS and BioMEMS



Advanced Circuits & Interfaces for Sensors

## ADVANCED FUNCTIONAL MATERIALS AND DEVICES

Wide Bandgap Semiconductors

Organic Electronics

Multimode Photonics

Materials Simulations

# 6 HUMAN RESOURCES

Between 2018-2022, the annual number of **researchers holding a PhD** at INESC MN varied between **13 and 17**. During this period several European projects as well as the Infrastructure project funded PhD contracts to work in these projects.
Average annual number of PhD students (including PhD students who are being co-supervised at INESC MN) was 20 but are expected to increase as the new groups start to grow.

Within FCT projects, there is budget to hire recent graduates with master's degree to work as researchers in the projects. These researchers are hired through open recruitment calls. INESC MN currently have 6 permanent cleanroom technical staff. Three of these general process engineers are responsible for the different microfabrication processes and the other 3 are associated to large industry contracts.

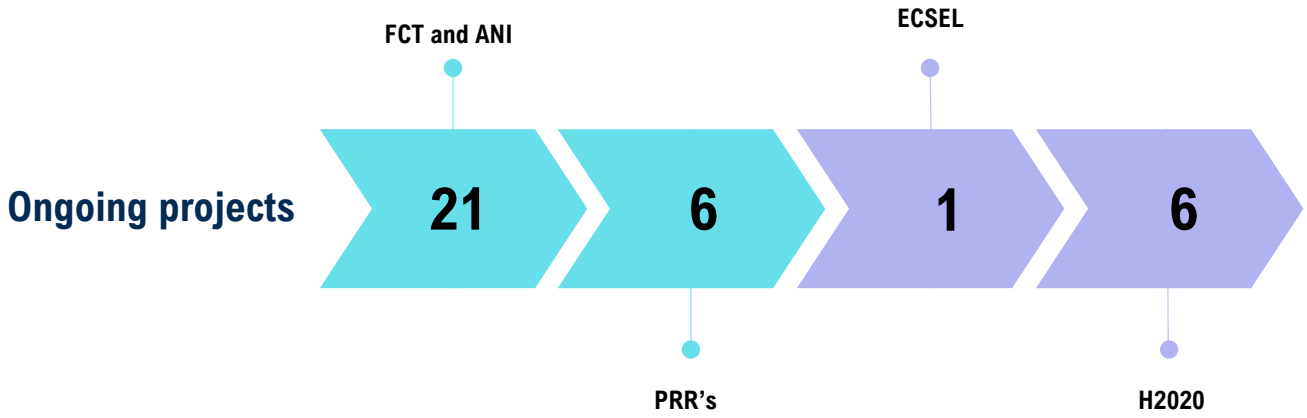
| | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| **Researchers - PhDs** | 13 | 17 | 17 | 12 | 13 |
| **Research Assistents (contracted)** | 0 | 5 | 4 | 3 | 4 |
| **Research Fellows (grants)** | 6 | 0 | 0 | 0 | 10 |
| **PhD students** | 23 | 27 | 26 | 23 | 24 |
| **Masters students** | 10 | 9 | 17 | 16 | 19 |
| **Cleanroom Engineers** | 3 | 3 | 6 | 4 | 6 |
| **Administrative Staff** | 2 | 2 | 2 | 2 | 2 |

# FUNDING AND PROJECTS



Funding sources are divided into:

| K€ | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|
| **› National funding** | | | | |
| • FCT - Portuguese Roadmap of Research Infrastructures (RNIE) | 679 | 165 | 22 | 0 |
| • FCT Multi-annual financing for Research Unit | 159 | 135 | 169 | 165 |
| • FCT competitive projects | 536 | 318 | 366 | 305 |
| • FCT funding for PhD researcher contract | 94 | 96 | 92 | 35 |
| • Other Portuguese funding (mainly ANI) | 127 | 63 | 0 | 517 |
| **› European Framework Programme** | | | | |
| • H2020 Projects<br>• Horizon Europe programmes | 393 | 704 | 488 | 152 |
| **› Services and Contacts** | | | | |
| • Industry contracts an technical services provision | | | | |
| ◦ Portuguese Private Sector | 27 | 3 | 38 | 3 |
| ◦ International Private Sector | 200 | 290 | 169 | 280 |
| • Service to academic and Research Centers | | | | |
| ◦ Portuguese | 16 | 12 | 10 | 10 |
| ◦ International | 76 | 29 | 126 | 40 |



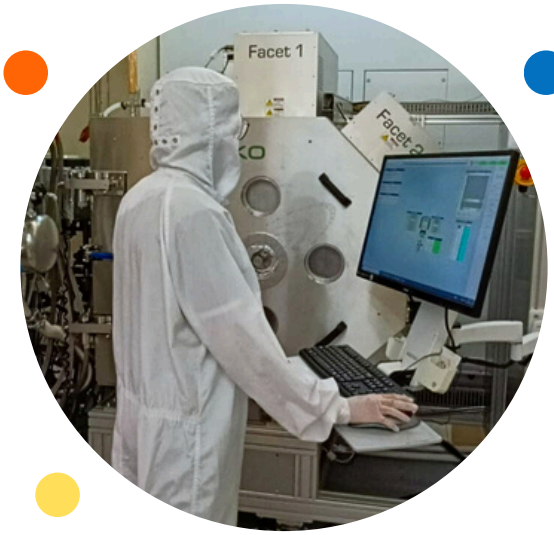
# LABORATORY INFRASTRUCTURE



INESC MN has a **Class 10/100 Cleanroom** (~200 m2) with a Class 10.000 grey area (~200 m2) for support and laboratorial equipment.
The Cleanroom is the main infrastructure at INESC MN that ties together all the various activities. The original cleanroom was built in the early 1990's working with 150 mm silicon wafers and a 1.2-micron 2 metal level, CMOS backend technology. Since then, the cleanroom has been upgraded to allow nanolithography (RAITH 150 e-beam, acquired 2006) and 200 mm wafer processing (Oxford PECVD, SPTS ICP etching and Nordiko 8800 sputtering tools acquired in 2018/2019).
INESC MN also has an additional 170 m2 of laboratory space for materials and device characterization as well as microfluidic processing.

**Lithography**

**Microfluidics & Biolaboratory**




**Film Deposition**

**Microfabrication & Characterization**

**Etching**

- Photolithography - Heidelberg 2.0 DWL
- Mask Aligner 6'' - SUSS Microtec MA6 Gen2
- Mask aligner 4'' - Kub-2 UV
- Electron Beam Lithography - Raith 150 System
- PR Coater/Developer Track - SVG track
- Spin Coater -Laurell

- Ion Beam Deposition - N3600, N3000
- Magnetron sputtering system - Alcatel
- PECVD - Oxford PlasmaPro 100
- PECVD - Aixtron Black Magic 2''
- Magnetron Sputtering System - UHV-I
- RF Sputtering System - UHV-II
- Magnetron & RF Sputtering - N8800, N7000, N2000

- Etch System - SPTS Omega ICP
- Ion Beam Milling - N3600, N3000
- Plasma Etcher System - LAM Research Rainbow

- Grinder/Polisher - Bruehler EcoMet 250
- Automatic dicing saw - Disco DAD 321
- Extrusion based 3D printing – FDM system
- Magnetic annealing setup
- Milling - MiniTech and Supertech 3D CNC System
- Plasma Cleaner - PDC-002CE Harrick Plasma
- UVO-cleaner - Model 144AX series, Jelight
- Vapor Prime Oven - Yield Engineering YES 15 HMDS
- Wire Bonding Systems - Kulicke & Soffa/ ASM AB559A auto
- Wet Benches
- Profilometer - Dektak-XT Advanced System
- Spectral Ellipsometer – SEMILAB
- ElectroMagnetic characterization: VSM Microsense, Wafer prober 200mm, Noise spectral, several R(H) setups

- MEMERT Ovens
- Oxygen Plasma Cleaner - Harrick Plasma
- Incubator - Scientific Heratherm
- pH meter - Mettler Toledo
- Syringe pumps (microfluidics, high pressure, double direction)
- Corona BD-20 discharge system, Electro-Technic

# PUBLICATIONS & SCIENTIFIC OUTPUT

(2018 - 2022)



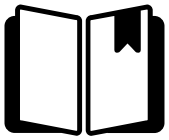
**160**

International Peer Reviewed Journals

**51**

Conference Proceedings

**10**



Book Chapters

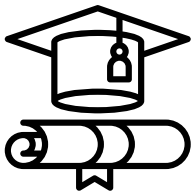
**16**


PhD Theses

**13**

Licenciatura/ BSc theses

**61**



Master's theses

**78**

Invited Talks

**6**

Patents

**17**

Normalization documents

**3**

Software & Code Development

# 10 NETWORKS

PT

Portuguese Research Infrastructure Network, within the **Micro&NanoLab@PT**.

EU

**Spintronic Factory**
More than 40 EU industrial and academic partners with activities on magnetics.

PT

**Center of Technology and Innovation (CTI)**
INESC MN was designated a CTI to promote technology transfer and innovation to Industry.

EU

**Microfluidics Association**
Promotes the development of the Microfluidics Industry supply chain.

PT

**Battery Cluster Portugal:**
Promotes synergies between academic, research, and industrial institutions in Portugal in the entire battery-related value chain.

PT

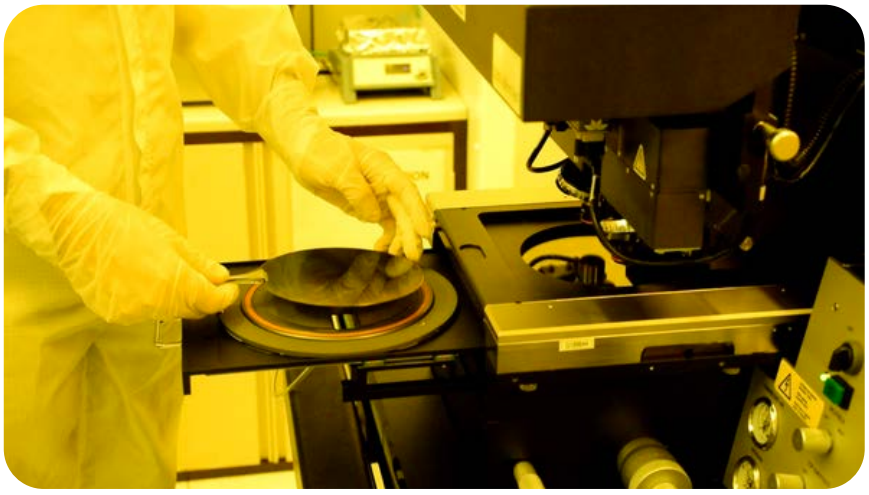
**Health Cluster Portugal**
Network of Portuguese stakeholders working in Health-related areas of research and innovation.

## MICROFABRICATION & PROTOTYPING SERVICES

- Contract research and development;
- Collaborative research within a joint National or European project;
- Individual services according to the client's needs.

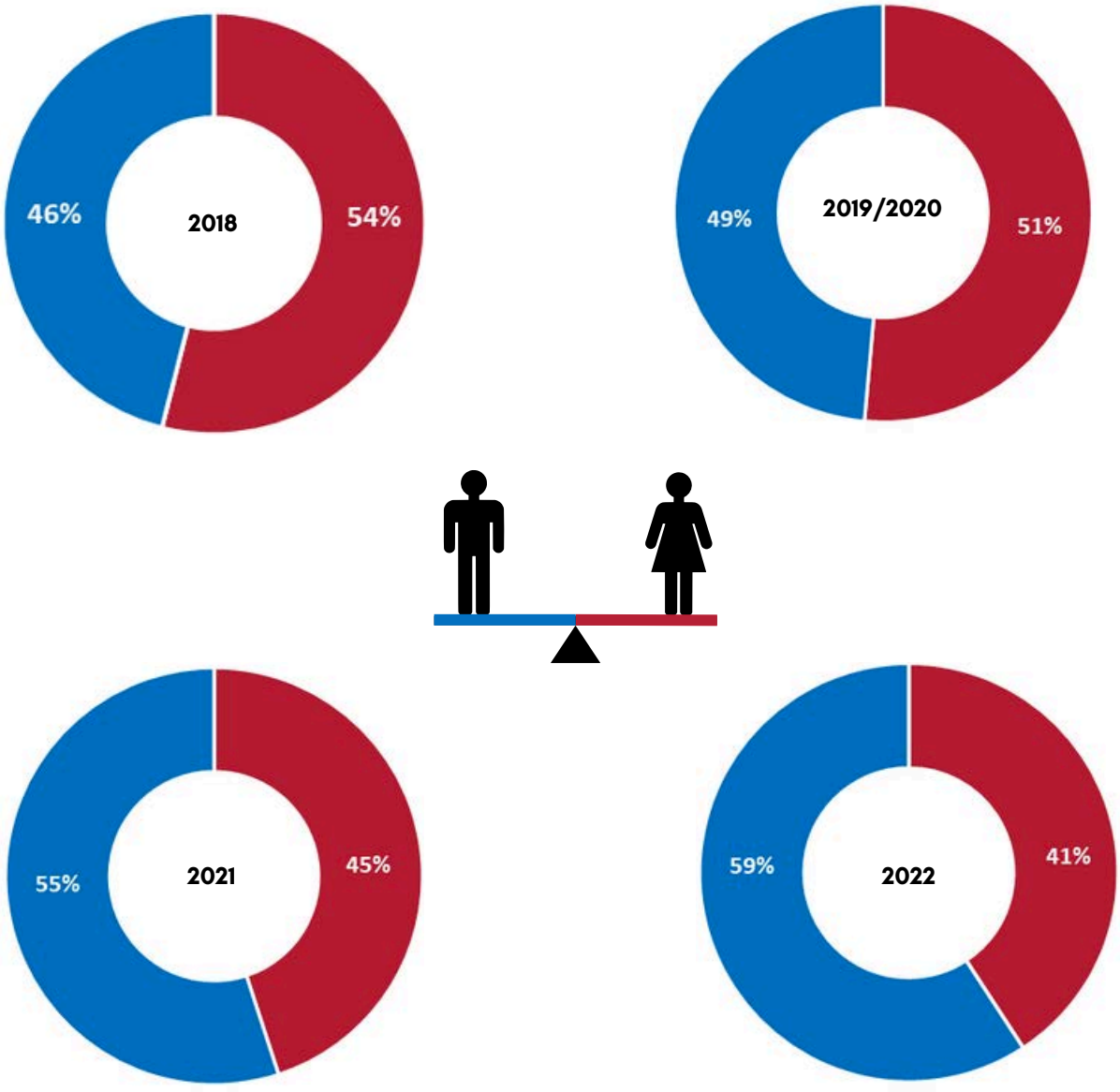
## INNOVATION SERVICES

- Development and prototyping of materials, devices or systems;
- Cleanroom microfabrication or nanofabrication processes;
- Consulting on materials and device design;
- Training of personnel in micro and nanofabrication and microfluidic devices;
- Small series production of prototype chips.



# 12 GENDER EQUALITY

A INESC MN elaborated its first Gender Equality and Diversity Plan at the end of 2021 and created a Committee, led by researcher Katharina Lorenz and with members from different profiles of INESC MN staff, on the beginning of 2022.




PICTURE TAKEN ON OCTOBER 2023

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