MAGICIAN – AUTONOMOUS DEFECTS DETECTION AND REPAIR IN MANUFACTURING

Are you a European start-up or SME?

Are you ready to digitalize your products, get into new markets and expand your market-share?

MAGICIAN can support your development of smart products!

Open call for Application Solution (AS): MAGICIAN offers grants of up to **€200k** as well as technical support for the development of smart applications.

IF YOU ARE:

- ✓ Developing innovative robotic or automation solutions in manufacturing environments.
- ✓ Enhancing production process efficiency by integrating advanced technologies like AI, robotics, and sensor systems to address quality control
- ✓ Interested in using premium resources and competencies to speed up solutions development.
- ✓ Wishing to access a unique european ecosystem composed of leading industrial companies, world-class research organizations, innovation accelerators.

MAGICIAN OFFERS YOU:

- ✓ the opportunities and resources to develop an innovative application/software in domains of advanced robotics, AI-driven defect detection, tactile sensing technologies, vision-based defect detection systems and human-robot collaboration.
- ✓ Access to advanced industrial platforms for defect detection and rework automation, leveraging cutting-edge robotics, AI, and sensor integration technologies.
- ✓ Up to € 200k in funding – representing 70% of your project's declared

budget, reaching 100% if you are a start-up.

✓ Added value to your product, through high-level technical expertise pooled from research centres across europe.

✓ Support for visibility and newtworking by providing targated information to multiple audiences

MAGICIAN IS OPEN TO PROPOSALS INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING FIELDS:

- **AUTOMATION/ EMBEDDED SYSTEMS**
- **ROBOTICS**
- **ARTIFICIAL INTELLIGENCE**
- **MACHINE LEARNING**
- **COMPUTER VISION**
- **SMART MANUFACTURING**

- **SENSOR TECHNOLOGIES**
- **HUMAN-ROBOT COLLABORATION**
- **DATA ANALYTICS**
- **ADAPTIVE PROCESS CONTROL**

Proposals must be submitted by startups or SMEs in Europe, and based in EU member states or countries associated with Horizon Europe, as defined by Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021[1]

If you have a promising innovative idea, we will help you to integrate it within the MAGICIAN ecosystem in tight collaboration with MAGICIAN partnerts **– do not miss this opportunity and apply to the open call to realize your innovative solution!**

Visit Open calls | MAGICIAN and contact the infomail OpenCall@magician-project.eu for promptly assistance you in proposal development.

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[1] Publications Office

Call deadline: 2ⁿᵈ May 2025, 5:00pm (Brussels Time)
Notification to Applicants: 30ᵗʰ june 2025
Call identifier: MAGICIAN01 call
Proposal language: English
Open calls | MAGICIAN **(full call text/proposal guidelines/standard agreement):**
For further information please contact: OpenCall@magician-project.eu

Important MAGICIAN process guidance, rules, offered technologies and platforms can be found at **Resources & Findings | MAGICIAN** in our Guide for Applicants document (see section 2.)

SCOPE of Applications:

F1. PERCEPTION			
Functionality	**Description**	**Technical specification (Existing MAGICIAN functionality)**	**Integration expected from applicants**
(F1.1) Sensors for accurate defect detection and classification	A vision-based defect detection system capable of identify and classify surface imperfections in real-time.	High-resolution cameras AI-powered analysis 5 ms response timing	New solution adding sensing systems (e.g., scanners, lasers, tomography, structured light, microwave imaging), ML algorithms (CNNs, transformers), ultrasonic sensors, photometric sensors, all meant to increase the defect detection precision, robustness and reliability
(F1.2) Polarized camera system	Detects defects using polarized imaging	MAGICIAN current prototype includes: - polarized camera 16mm lens - 6 polarized light - ToF laser range sensors	New modular design, improved power delivery mechanisms, enhanced structural stability and optimized lighting control for polarization-specific imaging.

(F1.3) Increase defect removal and rework abilities	CR's ability to handle material defects through modular and specialised tools.	MAGICIAN current CR - Supports reworking body-in-white for abrasion and removal of excess material. - Equipped with a commercial grinding tool for welding spatters and excess material	A tailored grinding tool for the specific application, with co-design characteristics with robot end-effectors and control algorithms for optimised performance
(F1.4) Annotation Tools for Multi-modal Data	Annotating datasets tool for training defect models	<u>Not implemented yet; solution requested from applicants</u>	New solutions applying semi-automated or AI-assisted annotation frameworks Integrating User-friendly interfaces for annotators
(F1.5) Innovative approaches and architectures for improved defect detection and classification	Defect localisation and characterization through advanced algorithms and architectures	MAGICIAN polarized camera system serves as the current data source for training defect detection models	Machine learning algorithms (e.g., CNNs, transformer architectures) to boost classification accuracy Hybrid methods comprising traditional computer vision techniques, or novel algorithmic strategies
(F1.6) Wearable and innovative tactile systems for capturing expertise in Defect detection and classification	Tactile systems for defect detection and interaction with manufacturing surface inspections.	Device integrating a piezoresistive force sensors and an acceleroemter Tactile features are extracted directly from the force and acceleration data.	AS enabling data acquisition without altering the operator's natural exploration techniques Acquisition of a larger dataset testing and comparing various tatctile sensors (e.g. microphones, bragg fiber, visual-tactlile systems)
F2. HUMAN-ROBOT COLLABORATION			
(F2.1) Human Observation	Modeling human defect correction skills for robots.	Dynamic Motion Primitives (DMPs), capturing and analyzing human motion	New solution implementing DMPs with Riemannian manifolds for high-fidelity behavior replication. New approaches solutions such as

		patterns.during defect-handling tasks	zero-shot learning for a faciliated adaptation to tasks with minimal training.
(F2.2) Human Interface and Interaction	Flexible interfaces for human-robot collaboration	Tablet GUI for defect detection and classification review.	An example are the augmented reality glasses that allows a more intuitive and flexible interaction of the worker with the working piece.
(F2.3) Human worker speaking system	Voice- based human-robot communication	<u>Not implemented yet; solution requested from applicants</u>	New solution enabling spoken commands to adjust defect detection and correction.
(F2.4) Motion Improvements	Increase of flexibility and productivity, and reduce the impact on the working cell	CR and SR fixed on the ground or placed on mechanical slider	Mobile robots carrying the SR/CR robots, soft robotic arms, algorithmic solutions for safe trajectories in the work cell shared space

THROUGH OPEN CALLS, MAGICIAN PROVIDES:

✓ A unique opportunities to collaborate and engage with major experts in AI, robotics, smart manufacturing (...)

✓ Assistance in terms of expertise, know-how, coaching and technologies transfer from our partners through a live/recorded webinar

✓ Access to advanced technologies and industrial platforms developed by MAGICIAN consortium, with which proposed solutions need to be fully compatible (see section 3.7 Guide For Applcants)

MAGICIAN WELCOMES PROPOSALS ADDRESSING SMART APPLICATION TARGETING:

✓ **Perception/Action Systems for Manufacturing**: leveraging advanced perception technologies (e.g., AI-driven vision systems, sensors) for identifying and analyzing defects during production processes. The expected outcome is ensuring high precision and reliability in removing defects and performing surface treatment operations while maintaining production efficiency.

- ✓ **Flexible and customizable robotic systems:** Modular robotic manipulation system technologies that can be quickly adapted to the requirements of different surface defect removal tasks, through agile software and mechatronic nodular and reconfigurable functionalities as well as flexible interfacing enabling the quick integration with third party end-effector tools and perception components.
- ✓ **Planning/High-Level Control for Robotics and Automation**: Developing advanced control systems to manage complex robotic actions. The expected outcome is a solutions focused on efficient task planning for robots that integrate safety mechanisms and ensure compliance with safety standards

THROUGH MAGICIAN APPLICANTS WILL HAVE THE OPPORTUNITY TO COLLABORATE WITH LEADING-EDGE TECHNOLOGIES AND INNOVATION MANAGEMENT EXPERTS

TECHNOLOGY

- *UNITN, ITALIA*
- *ALTINAI, TURKEY*
- *FORTH-ICS, AUSTRIA*
- *HWH, GERMANY*
- *IIT, ITALY*
- *LUND UNIVERSITY, SWEDEN*
- *CENTRO RICERCHE FIAT (CRF), ITALY*
- *PIPPLE, NETHERLANDS*
- *TOFAS, TURKEY*

INNOVATION MANAGEMENT

- *ZABALA INNOVATION CONSULTING, BELGIUM*
- *STEINBEIS INNOVATION (SIG), GERMANY*

Application Solution can run up to **12** months. The expected outcome of your Application Solution is a demonstrator prototype with a high technology readiness level (TRL7). The prototype may also be used as a first-generation product.

MAGICIAN targets 'small' companies (start-ups, small/medium enterprises), including organisations with both, low and high digital maturity.

Interested start-ups, SMEs from EU member states and Horizon Europe associated countries are encouraged to review the offered platforms, technologies and testbeds at Home | MAGICIAN and contact our project members to gather further details. Additionally, a webinar will be organized to present the Open Call, with the recording made available on the MAGICIAN website. A weekly live helpdesk will also be accessible throughout the entire duration of the Open Call.