Protect your IP in health technology: Focus on robotics and health appliances

Series protect your IP in

- Protect your IP in quantum technologies: Focus on quantum computing. (20th March 2026)
- Protect your IP in health technology: Focus on robotics and health appliances (24th June 2026)
- Protect your IP in medical technology: Focus on oncology (Tbd July 2026)
- Protect your IP in biotechnology: Focus on water treatment technologies (Tbd October 2026)
- Protect your IP in green technologies: Focus on offshore energy (Tbd Nov/Dec. 2026)

Agenda

- **10.00 Introduction**
- **Francesco Panni,** European Patent Academy, EPO
- **Michele Dubbini**, IP Advisor European IP Helpdesk
- **10.05 Innovation market and trends in robotics and health appliances**
- **Christian Soltmann,** Patent Analyst, Chief Economist Unit, EPO
- **10.25 Patentability issues in Focus on robotics**
- **Vladimir Shmonin,** EPO Examiner
- **10.45 Case Study from HEU funded project: SWAG**
- **Ilaria Pacifico,** Research Manager, IUVO Srl, **Panagiotis Polygerinos**, Associate Professor of Soft Robotics and Mechatronics at HMU, **Ilias Zourantzis**, CTO and Co-Founder of Bendabl
- **11.05 Short Overview of the European IP Helpdesk and EPO Academy services**
- **Francesco Panni,** European Patent Academy, EPO
- **Michele Dubbini**, IP Advisor European IP Helpdesk
- **11.15 Q&A**
- **11.30 End of the Event**

Europäisches Patentamt
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INNOVATION MARKET AND TRENDS IN ROBOTICS AND HEALTH APPLIANCES

OVERVIEW OF THE EPO TECHNOLOGY INSIGHT REPORT ON ASSISTIVE ROBOTICS FOR PEOPLE WITH SPECIAL NEEDS

CHRISTIAN SOLTMANN | PD03 PATENT RESEARCH AND POLICIES | 24 JUNE 2026

OUTLINE

Part I

EPO technology insight reports: Overview

EPO technology insight report on assistive robotics for people with special needs

Part II

The EPO's Observatory on Patents and Technology: Useful services related to health topics

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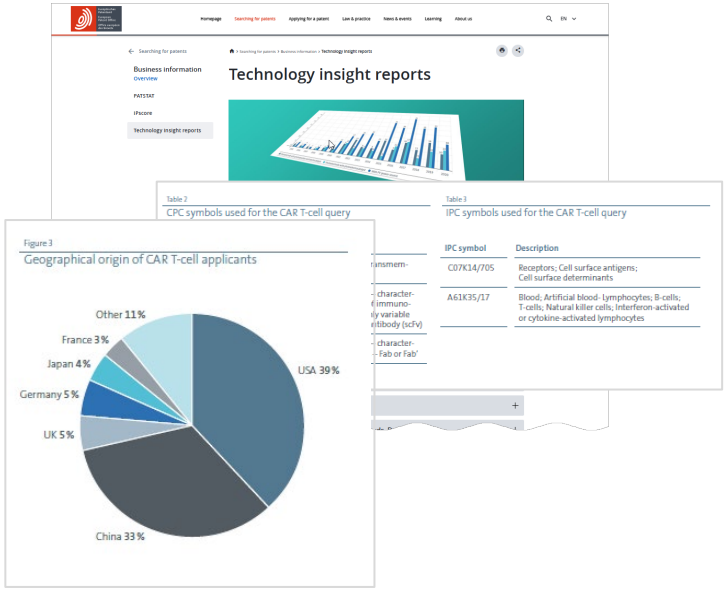
EPO TECHNOLOGY INSIGHT REPORTS

EPO TECHNOLOGY INSIGHT REPORTS

Characteristics

Focus	Newly emerging technologies with high potential
Content	Analysis of filing trends and applicants in the targeted field
Target audience	Researchers, companies, investors, patent professionals



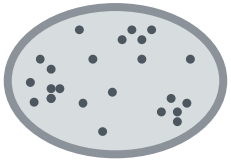
Available at: epo.org/insight-reports

EPO TECHNOLOGY INSIGHT REPORTS: WORKFLOW

1: Basic result set → **2: Analytics** → **3: Further processing** → **4: Dissemination**

Using:

- patent classification codes
- keywords
- applicant and inventor names
- countries of residence
- [...]



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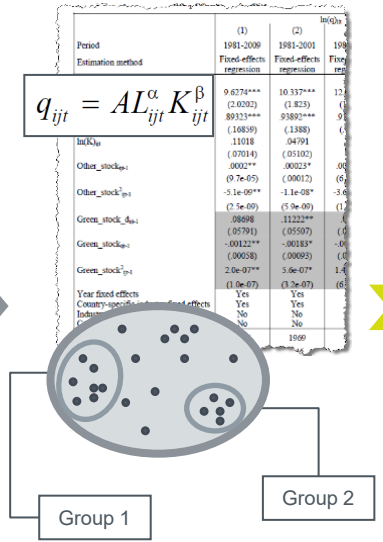
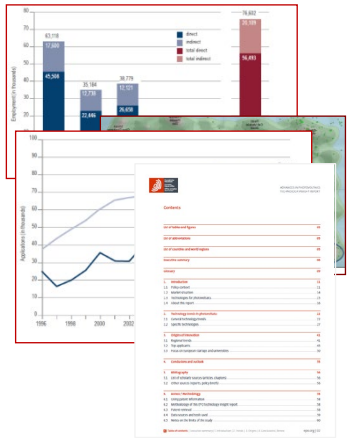
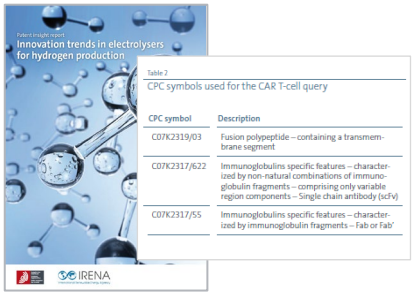


- Further analyses/processing
- Visualisation
- Reporting

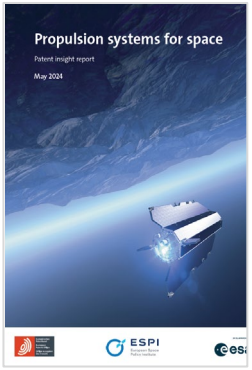


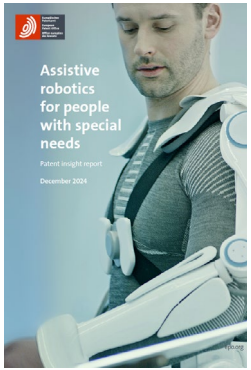
- EPO report
- Supplementary materials
- Promotion campaign
- Online seminars
- Speeches at conferences
- Technical papers

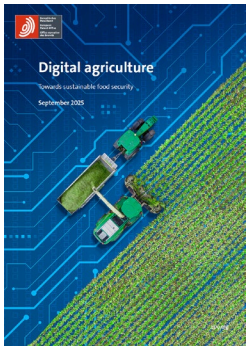


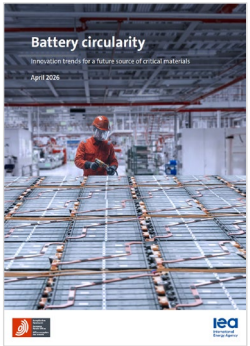
EPO TECHNOLOGY INSIGHT REPORTS: RECENT AND PLANNED ACTIVITIES

Topic	Status
mRNA technologies	Published (2023)
Offshore wind energy production	Published (2023)
Propulsion systems for space	Published (2024)
Assistive robotics for people with special needs	Published (2024)
Plastics in transition	Published (April 2025)
Advances in photovoltaics	Published (July 2025)
Digital agriculture	Published (September 2025)
Battery circularity	Published (April 2026)
AI in medicine	Planned (November 2026)









Available at: epo.org/insight-reports

THE EPO TECHNOLOGY INSIGHT REPORT ON ASSISTIVE ROBOTICS FOR PEOPLE WITH SPECIAL NEEDS

EPO TECHNOLOGY INSIGHT REPORT ON ASSISTIVE ROBOTICS FOR PEOPLE WITH SPECIAL NEEDS

Dynamic sub-field of robotics that focuses on the **development of robotic systems** that help individuals with disabilities and those needing assistance in their **everyday lives.**

Another important area of application of these robotic systems is the **recovery and rehabilitation of individuals** whose condition requires physical assistance.

EPO TECHNOLOGY INSIGHT REPORT ON ASSISTIVE ROBOTICS FOR PEOPLE WITH SPECIAL NEEDS

Distinction between conventional and assistive robotic walking aids:

	Conventional walking aids	Assistive robotic walking aids
Technology	Simple mechanical and often light-weight structures	Rather complex structures with various mechanical and electronic components
Functionality and purpose	Offer support and stability, but users still often need to exert significant physical effort to move Rehabilitation: Help to maintain mobility and independence	Offer active support, and sometimes initiate user movement Rehabilitation: Improve mobility; may be used in targeted therapy to support recovery and muscle formation
Target group	People with a wide range of mobility deficiencies	Mainly people with significant mobility deficiencies (for stroke patients, people with spinal cord injuries, etc.)
Adaptability to user needs	Usually limited to basic adjustments	Highly adaptable to the user's needs, often in real-time
Costs	Rather inexpensive	Often expensive

EPO TECHNOLOGY INSIGHT REPORT ON ASSISTIVE ROBOTICS FOR PEOPLE WITH SPECIAL NEEDS

Insight report covers various technologies related to six different robotic concepts, its characteristics and potential uses

Details available at:
epo.org/insight-assistive-robotics

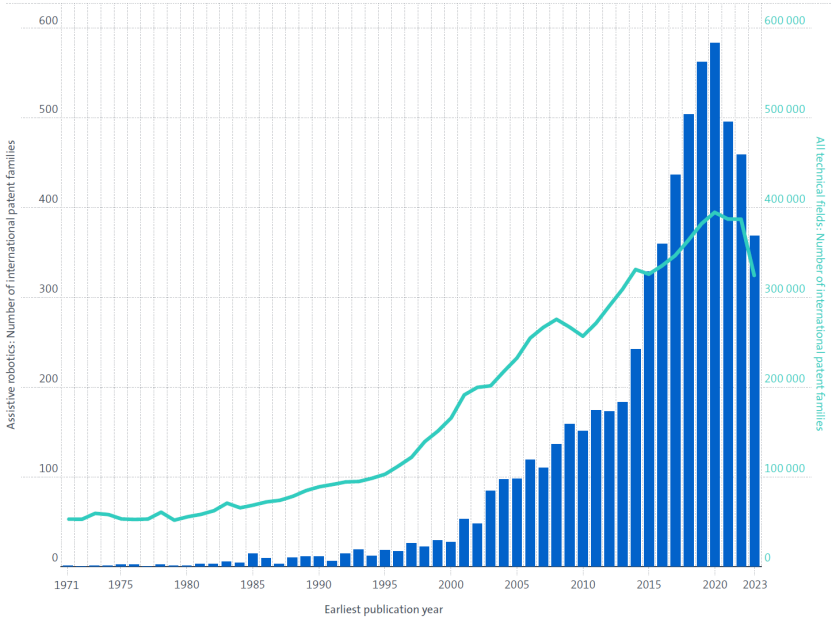
		Purpose		Nature of the needs			Specific target group	
Robotics concept	Types	Rehabilitation	Support in the everyday life	Mobility	Mental health (cognitive, emotional)	Sensorial	Children	Elderly
Cobots		●	●	●		●		●
Therapeutic Robots		●					●	●
Robotic walkers		●	●	●		●	●	●
Assistive exoskeletons	Active exoskeletons for lower limbs	●	●	●			●	●
	Active exoskeletons for upper limbs	●	●					●
	Active exoskeletons for the whole body		●	●				●
Robotic mobile platforms		●	●	●		●		●
Humanoid and pet robots					●	●	●	●

SOME TECHNICAL TERMS IN A NUTSHELL

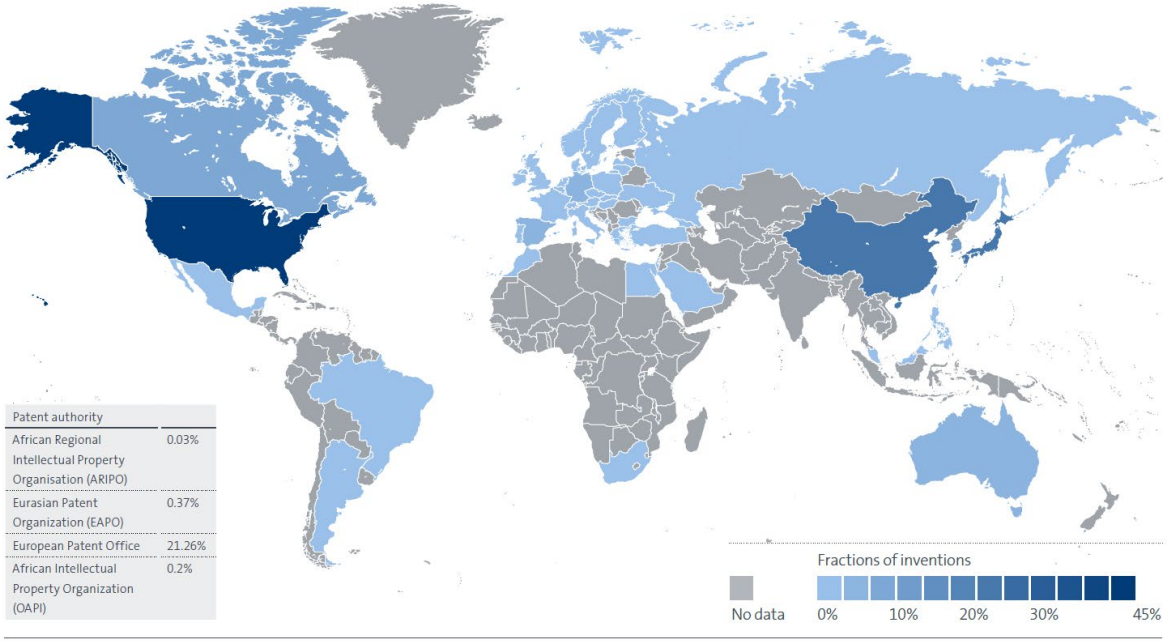
European patent	The European patent system makes it possible to obtain protection in up to 46 countries on the basis of a single application. As of 2023, it is also possible to request unitary effect for a granted European patent.	**Invention**	A practical solution to a (technical) problem. The invention may be a new product, process or apparatus or any new use thereof. To be patentable under the European patent system, an invention must be technical, novel, involve an inventive step (i.e. it must not be obvious to those having ordinary skill in the technical area of the invention), and be considered as susceptible of industrial application.
International patent family (IPF)	A set of applications for the same invention that includes a published international patent application, a published patent application at a regional patent office, or published patent applications at two or more national patent offices.	**Patent**	Legal title giving the patent owner(s) the right, for a limited period of time (usually 20 years as of the date of filing the patent application), to exclude others from using the protected invention in a commercial context without permission in those countries for which the patent has been granted. The protected invention is defined by the claims of the patent.
International patent application	Patent application filed under the Patent Cooperation Treaty (PCT). An international patent application may result in patent protection in more than 150 countries.	**Patent application**	Request for patent protection for an invention filed with the EPO or other patent office.

ASSISTIVE ROBOTICS IN A NUTSHELL: STEEP INCREASE IN INTERNATIONAL PATENT FAMILIES

Number of inventions by earliest publication year in the area of assistive robotics, limited to international patent families (left scale).
For comparison, the chart also shows the development across all technical fields combined (right scale).



ASSISTIVE ROBOTICS IN A NUTSHELL: GEOGRAPHICAL HOTSPOTS



Patent authority	
African Regional Intellectual Property Organisation (ARIPO)	0.03%
Eurasian Patent Organization (EAPO)	0.37%
European Patent Office	21.26%
African Intellectual Property Organization (OAPI)	0.2%

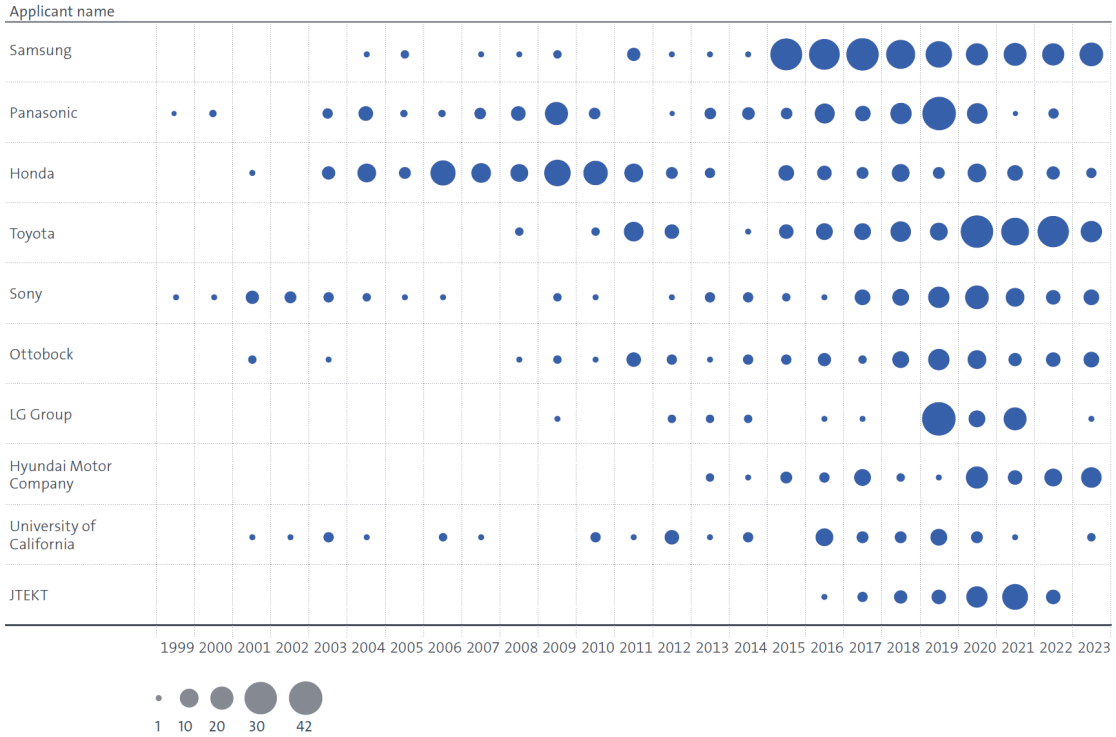
Source: EPO

ASSISTIVE ROBOTICS IN A NUTSHELL: TOP APPLICANTS

Most active applicants in the field of assistive robotics

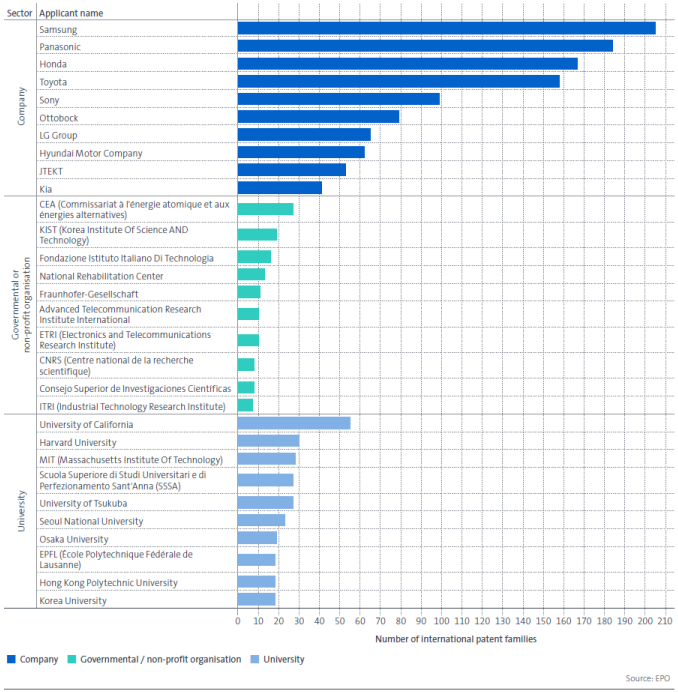
Applicant	Country	Sector	Number of international patent families
Samsung	KR	Company	206
Panasonic	JP	Company	184
Honda	JP	Company	170
Toyota	JP	Company	158
Sony	JP	Company	99
Ottobock	DE	Company	79
LG Group	KR	Company	65
Hyundai Motor Company	KR	Company	62
University of California	US	University	55
JTEKT	JP	Company	53

ASSISTIVE ROBOTICS IN A NUTSHELL: TOP APPLICANTS



ASSISTIVE ROBOTICS IN A NUTSHELL: TOP APPLICANTS

Most active applicants in the field of assistive robotics, with a breakdown according to main sectors to which the applicants belong



SUMMARY OF IMPORTANT RESULTS

- Number of inventions in the field of assistive robotics multiplied over the last decade, with a recent decrease
- Upswing in filing numbers started in the early 2000s
- High proportion of International patent applications, suggesting high economic expectations with regard to the technologies in question
- Most active applicants in the field of assistive robotics are companies and universities from Korea, Japan, Europe and the United States

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THE EPO'S OBSERVATORY ON PATENTS AND TECHNOLOGY:

USEFUL SERVICES RELATED TO HEALTH TOPICS

TRANSFORMING PATENT DATA INTO EVIDENCE-BASED INNOVATION INSIGHTS

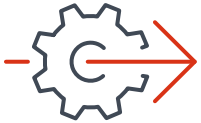
WHAT WE DO

- **Analyse and monitor** technology trends
- **Publish** research and case studies
- **Develop tools** for the innovation ecosystem
- **Reach out to stakeholders** through engagement activities
- **Support EU institutions** with data-driven insights and technology cartographies

PURPOSE AND ADDED VALUE

To support better decisions by revealing innovation trends, anticipating emerging technologies, and strengthening Europe's competitiveness.

FOCUS AREAS OF THE OBSERVATORY



Technologies

Exploring the frontiers of technology, from cancer therapies and clean energy to quantum computing and beyond.

Foresight, policy and funding

Addressing how policies, funding and forward-looking analyses interact with patenting and innovation.

Innovation actors

Supporting inventors, researchers, startups, SMEs and institutions with information and tools to maximise the impact of their work.

COLLABORATION WITH EU INSTITUTIONS

We provide intelligence and support to several European institutions like EIC/ EISMEA, such as:

- **Technology Ownership analysis** based on patent data for **emerging technology** portfolios
- **Operational support to funding Juries**, patentability & technology **pre-evaluation for all requests** reaching jury stage
- In addition, EPO proposes training support in all aspects of patenting and patent-information

Patent cartographies on specific technical fields:

- DNA digital storage
- Health Continuum
- Quantum Computing
- Cancer genomics
- Cell gene therapy
- Advanced Materials (Storage)
- Advanced Materials (Construction)
- Advanced Materials (Sustainable Electronics)
- Hydrogen Technology

Since 2023, the EPO provided its technical support for more than **170 projects**, representing **more than 350 M€** of requested funds by startups

DEEP TECH FINDER dtf.epo.org

Exploring deep technology in Europe • free **digital tool**

Over **13 000** startups and research institutions

68 tech fields	Localise startups in their **technological fields**
15 industry sectors	Combine **business** information with **patent** information
Growth stage	Detect startups in their **development stage**
Funding	Identify **investors** in startups
European patents	Access to patent data on **Espacenet**

Recent releases

- **Mobile app** for iOS and Android
- New filters for **digital agriculture and quantum technologies**
- Top European **public research organisations**

Future releases

- Improved technology exploration

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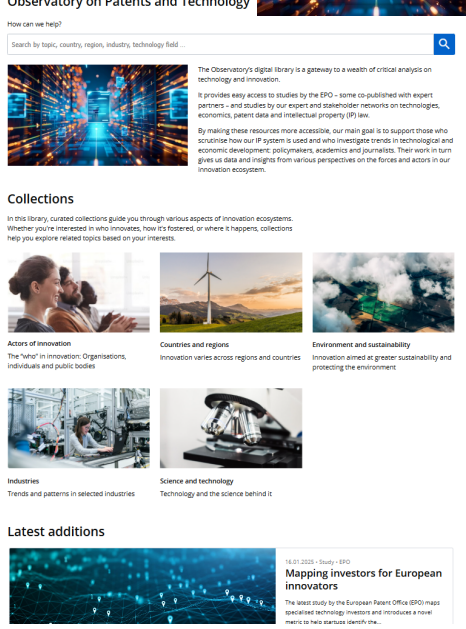

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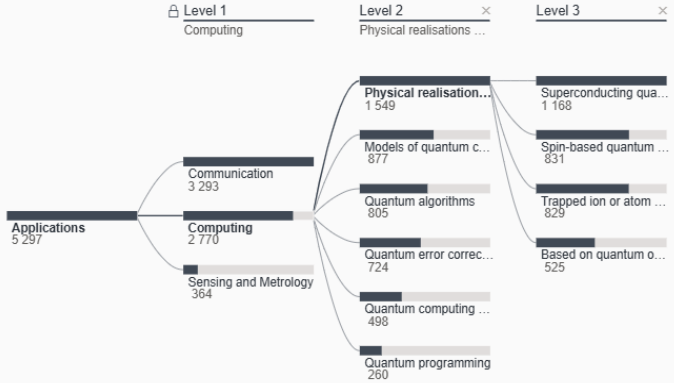
Strategic technology cartographies

Patent applications by technological subfield

Deselect... | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025

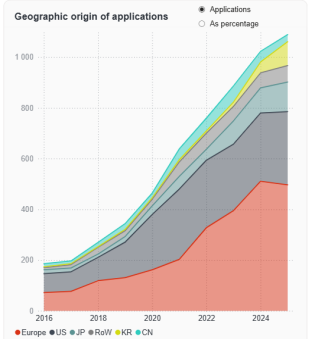
Click any technological subfield to view the number of European patent applications for the years selected.
Scroll down for top applicants, geographical origin including countries of origin and total applications per year.

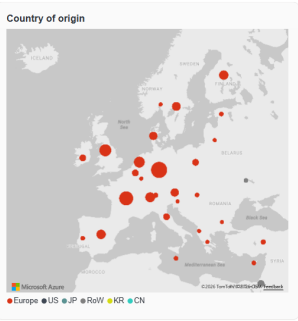


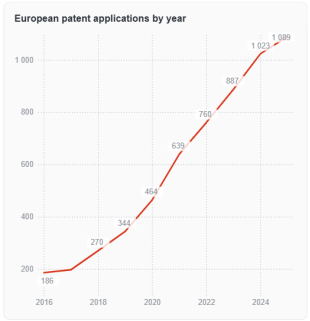
Applications

Start of field

All Quantum







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PATENTABILITY ISSUES IN THE FIELD OF HEALTHCARE ROBOTICS

VLADIMIR SHMONIN | PATENT EXAMINER IN THE FIELD OF HEALTH TECHNOLOGY | DIRECTORATE 1122 | 24.06.2026 | VERSION: 001

AGENDA

1. The three interfaces of a health robot
2. One claim, repaired live: Art. 53(c) EPC and two ways to fix it
3. The AI feature: inventive step and sufficiency
4. Claim language and the most common weak points
5. Practical advice

All claims are fictional and simplified for teaching purposes.

HEALTH ROBOTICS SIT AT A TRIPLE INTERFACE

Machine	**Intelligence**		**Patient**
(e.g. soft) structures	sensor fusion		wearer / patient
actuators	control loop		rehabilitation
sensors	AI / ML model		gait therapy
mechanical safety	prediction		therapy

Different patentability problems can arise at any of the three interfaces:

novelty, inventive step, sufficiency of disclosure **(Art. 54, 56, 83 EPC)**	computer-implemented inventions: **the "two hurdles"**	**Art. 53(c) EPC exception: specific to health technologies**

THE PROJECT ABSTRACT CLAIM (WITH HIDDEN PROBLEMS), REPAIRED LIVE

A **computer-implemented method for rehabilitating a patient having impaired gait**, comprising:
(a) fitting a **soft, lightweight and comfortable smart-fabric exoskeleton garment** to a lower limb of the patient;
(b) acquiring muscle-activity signals and inertial signals from sensors embedded in the garment;
(c) using a **powerful artificial-intelligence model** to predict movement intent and provide **optimal variable stiffness**;
(d) inflating a fabric actuator based on the predicted movement intent to apply assistive torque to a joint; and
(e) thereby **restoring normal gait function and improving rehabilitation in a predictive and immersive manner**.

PITFALL 1 : METHOD OF THERAPY

A … method for rehabilitating a patient… … patient having impaired gait …
… applying assistive torque to a joint …
… restoring normal gait function …

Examiner's verdict:

Excluded under **Art. 53(c) EPC:** method of treatment of the human body by **therapy**

- The claim is directed to treatment of a patient.
- The technology is not excluded; this way of claiming it is.
- One therapeutic step is enough in a multi-step method to get an Art. 53(c) EPC objection.
- Removing "restore gait" will not remove the implicit therapeutic act.

WHY ARE METHODS OF THERAPY EXCLUDED UNDER ART. 53(C) EPC ?

- Purpose: medical practitioners must remain **free to apply the best available treatment** (G 1/07)
- **"Therapy"** includes curing, alleviating or lessening the symptoms of a disorder - including **prophylaxis** (G 1/04)
- Rehabilitation of an impaired gait is normally therapeutic
- **One therapeutic step** is sufficient to exclude an entire multi-step method (G 1/04, G 1/07)
- It is **irrelevant who performs** the method - therapist, patient or the machine itself (it is still excluded)
- A **computer-implemented** version remains excluded - a computer does not change the therapeutic nature (T 1680/08)
- **The technology is not excluded - this way of claiming it is**

FIRST REPAIR ATTEMPT: "METHOD OF OPERATING THE DEVICE"

A method of operating a wearable assistive garment fitted to a user having impaired gait, comprising:
(a) receiving EMG and inertial signals from sensors worn by the user;
(b) predicting an intended joint movement; and
(c) inflating an actuator to apply assistive torque to the user's joint during gait training.

Examiner's verdict:
Still excluded under **Art. 53(c) EPC** (in this example)

Why?

- The claim still describes a closed loop: a signal from the body steers an action applied back to the same body.
- The patient is still present in substance, even if the word "patient" is gone.
- Removing "restore gait" will not remove the implicit therapeutic act.

Note: a device-operation method can be allowable under Art. 53(c) if it has no functional link to treatment.

FIRST WAY TO ADDRESS ART. 53(C) : "A NON-THERAPEUTIC METHOD"

A non-therapeutic method of assisting movement of a wearer during load handling, comprising: receiving EMG and inertial signals; predicting intended joint movement; and inflating the actuator to assist the movement.

Needs basis in the application as filed (Article 123(2) EPC).

- Only allowed if the application as filed supports that (non-therapeutic) use (Art. 123(2) EPC) - separable vs inextricably linked: for example, the original description teaches industrial assistance, ergonomic load handling, sports training, or testing the garment on an able-bodied user.

SECOND WAY TO ADDRESS ART. 53(C) – CHANGE TO A PRODUCT CLAIM

A wearable assistive garment comprising:
(a) a textile support structure wearable around a joint;
(b) an inflatable fabric actuator arranged to generate torque about the joint;
(c) an EMG sensor and an inertial sensor; and
(d) a controller configured to control inflation of the actuator based on sensor signals.

Art. 53(c) EPC problem removed

- Article 53(c) EPC, second sentence: *… this provision shall not apply to products …*

Note: there is no 'second medical use' for devices (only for substances) :

Art. 54(4)/(5) EPC covers only substances and compositions

'an apparatus for use in rehabilitation' ≠ **'Use of the apparatus in rehabilitation'**

AI AS A CLAIM FEATURE: TWO HURDLES AND DISCLOSURE

… a controller configured to predict an intended movement of the user using an artificial-intelligence model and to control inflation of the actuator accordingly.

A GENERIC "AI" FEATURE (BUZZWORD)

1st hurdle	**technical means**	Usually not the issue for a device claim
2nd hurdle	**inventive step**	"Using AI" does not identify the technical contribution
Disclosure	**sufficiency**	What inputs, labels, output and performance are taught?

COMVIK approach (T 641/00; Guidelines G-VII, 5.4): *only features with technical character count for inventive step. A non-technical aim may enter the problem as a given constraint — it cannot supply the inventive step.*

AI: THE SUBSTANTIATED FEATURE

c) a controller configured to:

(i) **predict an onset time** of an intended leg movement by processing the acquired muscle-activity signals with a **trained neural network**; and

(ii) start inflating the actuator **a lead time before the predicted onset time**, the lead time corresponding to an **inflation delay of the actuator**.

- **Concrete technical purpose:** the prediction compensates the actuator's inflation delay - assistance arrives *at* the movement, not after it
- Controlling a physical system on the basis of measurements is a **technical application** of a mathematical method *(Guidelines G-II, 3.3 and 3.3.1)*
- Inventive step may rest on this **specific adaptation** - not on the mere use of a neural network

SUFFICIENCY OF DISCLOSURE FOR MACHINE LEARNING (ART. 83 EPC)

- **T 161/18** - a neural network in a medical device; the application stated only that the network is *trained with patient data*
- Which input data, how obtained and labelled - **not disclosed** → **insufficiency of disclosure (Article 83 EPC)**
- The alleged improvement could then **not support inventive step** either
- **For your applications: describe input features, labelling and data characteristics so that the effect is reproducible**
- The requirement is **reproducibility of the effect** - not publication of the (raw) data set

THE LANGUAGE OF THE CLAIM (ART. 84 EPC)

As found in many first drafts:

A **soft**, **lightweight** and **comfortable** wearable garment made of **high-strength smart** fabric, providing **improved** variable stiffness and a **superior** force-to-weight ratio, wherein a **powerful** AI model assists the user **in a predictive and immersive manner**.

- **Relative terms** define no objective boundary (Guidelines F-IV, 4.6)
- "Assists … in a predictive manner": a **result to be achieved**, not the means (F-IV, 4.10)
- **Parameters** are welcome - together with the **measurement method and conditions** (F-IV, 4.11)
- **Trade marks** do not belong in claims (F-IV, 4.8);
- State **all features essential for the effect** (F-IV, 4.5)

FIVE WEAK POINTS WE OFTEN SEE

1. **Claiming the therapy instead of the technology** - device, program and manufacturing claims remain available (Art. 53(c))
2. **Publishing before filing** - **no general grace period in Europe** (Art. 54(2)): the conference demonstration, the online video, the open-access paper become prior art *against your own application* - **file first, publish after**
3. **Research-paper descriptions** - results and validation, but too little implementation detail to reproduce the invention (Art. 83), especially training data
4. **Proposal vocabulary in the claims** - relative terms, results to be achieved (Art. 84) and no fallback positions for later amendment (Art. 123(2))
5. **Relying on a new medical use of a known device** - purpose-limited protection (Art. 54(4)/(5)) exists **only for substances and compositions**

IS THE EXAMINATION OF AI IN ROBOTICS CHANGING?

- **The legal framework is stable:** the same two hurdles, the same problem-solution approach
- The guidance has been consolidated: dedicated **AI/ML section** in the Guidelines (G-II, 3.3.1); **G 1/19** confirms the established approach for computer-implemented inventions
- Greater weight on **sufficiency for machine learning** (T 161/18 and subsequent case law)
- **AI that controls a physical system is generally on the favourable side of the line - when disclosed and claimed concretely**

PRACTICAL ADVICE

- **File before you publish** - then publish as planned
- Study **granted claims** in your field - free via **Espacenet** (e.g. classes A61H, B25J)
- Search broadly : A61H, B25J, G05B, G06N, G16H, prosthetics, cobots, soft actuators
- Choose claim categories deliberately: device/system, control method, computer-program product, manufacturing method
- Describe AI as engineering: inputs, labels, output, training/calibration and validation metric
- Involve a **professional representative** early

SUMMARY

- Health-robotics inventions meet **three sets of requirements**: the machine, the intelligence, the patient interface
- **Art. 53(c) EPC** excludes treatment methods - **products and manufacturing methods remain available**; the wording decides
- AI features support inventive step when they serve a **concrete technical purpose** and are **sufficiently disclosed**
- Claim language: **precise, measurable, complete** - proposal vocabulary belongs in proposals

Thank you.

LEARNING RESOURCES

JÜRGEN MÜHL, EUROPEAN PATENT ACADEMY, 20 MARCH 2026

THE EUROPEAN PATENT ACADEMY https://www.epo.org/en/learning

- Patent-related education opportunities to stakeholders in Europe and beyond.
- Wide range of audiences: examiners and national patent office staff, patent attorneys and professionals, inventors, businesses, universities, technology transfer centres and anyone interested in patent-related topics
- Areas covered: patent granting, patent information, technology transfer and patent litigation and enforcement.
- Self-paced training courses and learning events.

OUR OFFER

Supporting IP awareness and promoting IP education

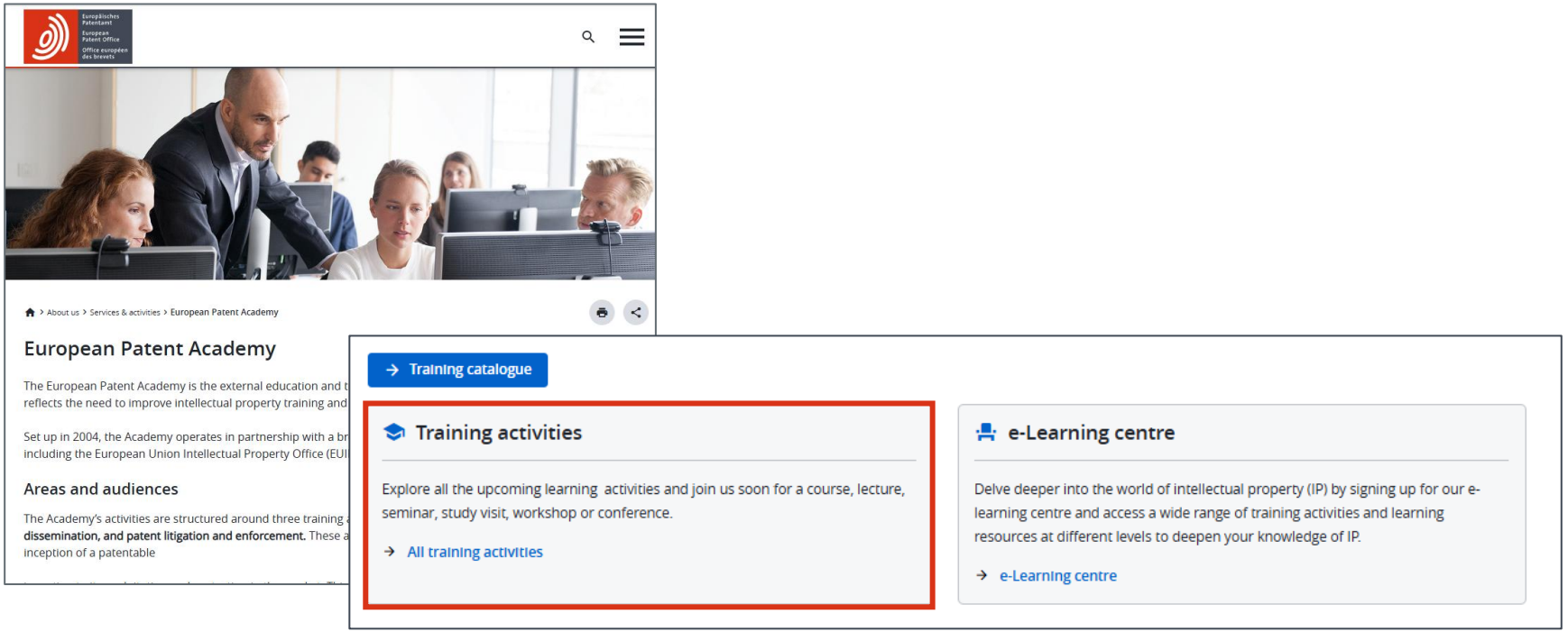
Learning events

Self-paced training

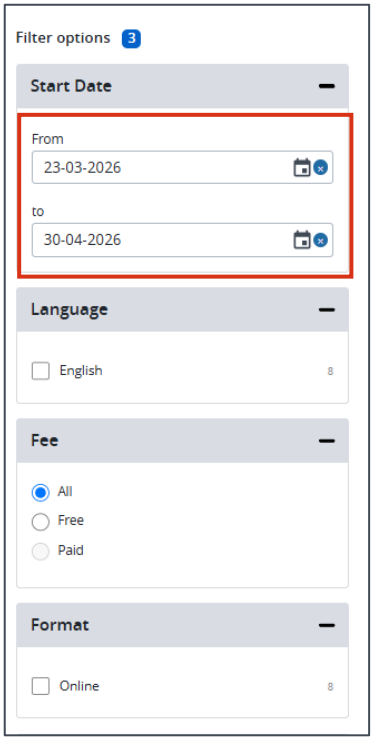
MIPEF – Modular Intellectual Property Education Framework”

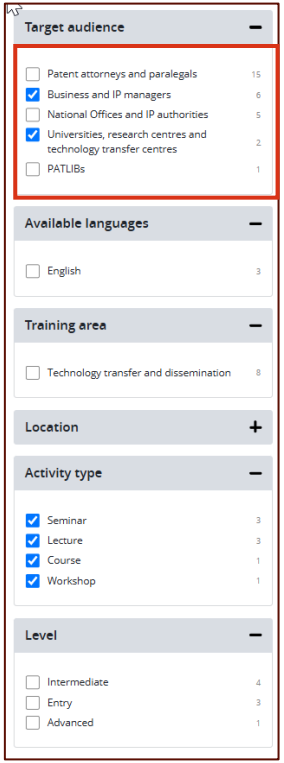
Inspiring inventors talk series

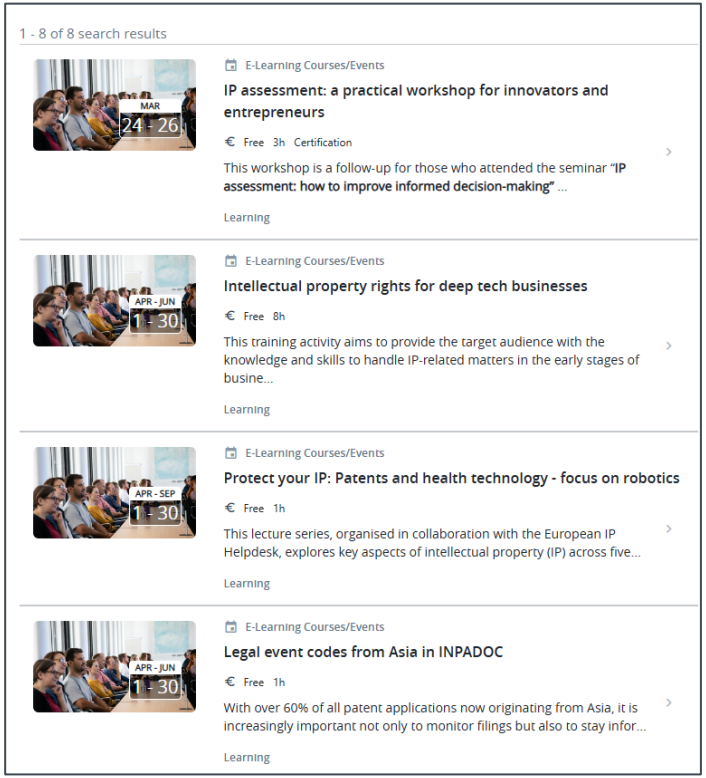
LEARNING EVENTS – SEARCHING FOR UPCOMING SESSIONS



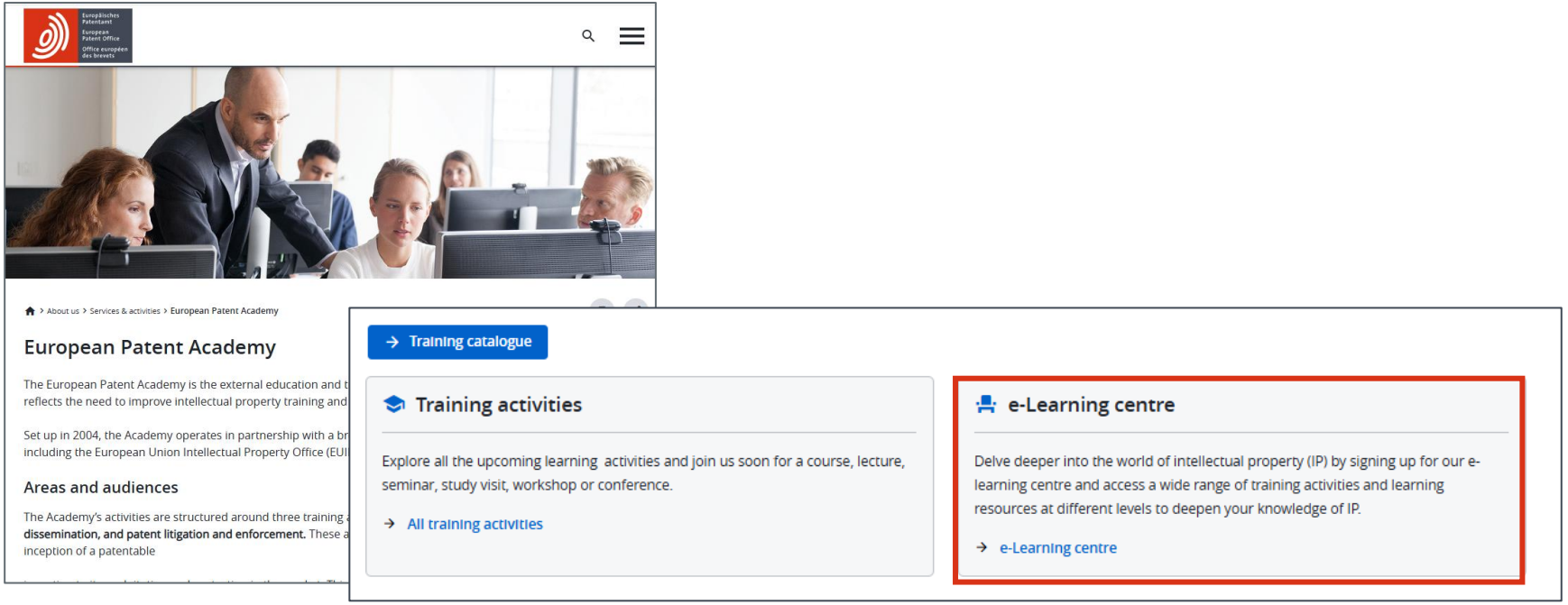
LEARNING EVENTS – SEARCHING FOR UPCOMING SESSIONS



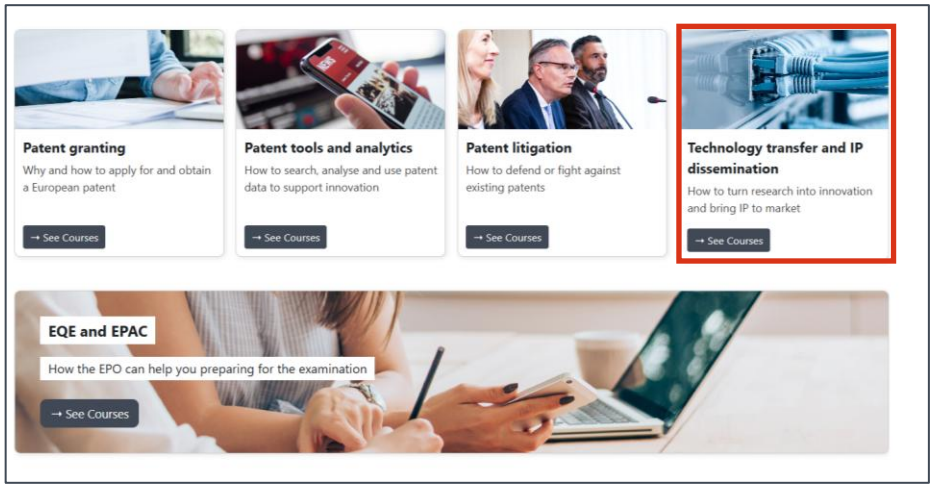




ON-LINE LEARNING RESOURCES: SELF-PACED TRAINING



ON-LINE LEARNING RESOURCES: SELF-PACED TRAINING



IP Assessment: How to improve informed decision-making | BS20-2026

This training focuses on the IP-related challenges and issues that arise during systematic assessment of technologies and patents. It offers effective strategies and introduces the tool, IPscore, that you can use to evaluate your research projects and innovations. It will give you a clearer picture of their commercialization potential and support strategic decision-making by helping you set priorities that save time and resources. The program is designed for R&D project leaders, entrepreneurs, and intrapreneurs; intellectual capital managers in small and medium-sized enterprises (SMEs), start-ups, technology transfer offices and investors.

EPO search tools to improve business decisions I BS01-2026

A seminar demonstrating how to effectively use the EPO's free search tools and the additional features offered by more advanced tools, that are of particular use to business decision makers.

Main subject matter:

- Using Espacenet to filter and analyse search results
- Using PATSTAT for more advanced statistics

Train the Trainer Espacenet | NW02-2025

This course enables you to plan and implement courses on Espacenet and other EPO search tools quickly and in a resource-efficient way. It is based on case studies, two of which you will look at as examples and another three on which you will actually work in hands-on sessions and transform by following the training approach.

How to make best use of the unitary patent system | BS03-2025

This training focuses on the advantages offered by the Unitary Patent system. Exploring how businesses can harness these benefits to protect and monetise their intellectual property paves the way for subsequent trainings featuring selected case studies from different industries. This training may be also of special interest for PATLIB centres.

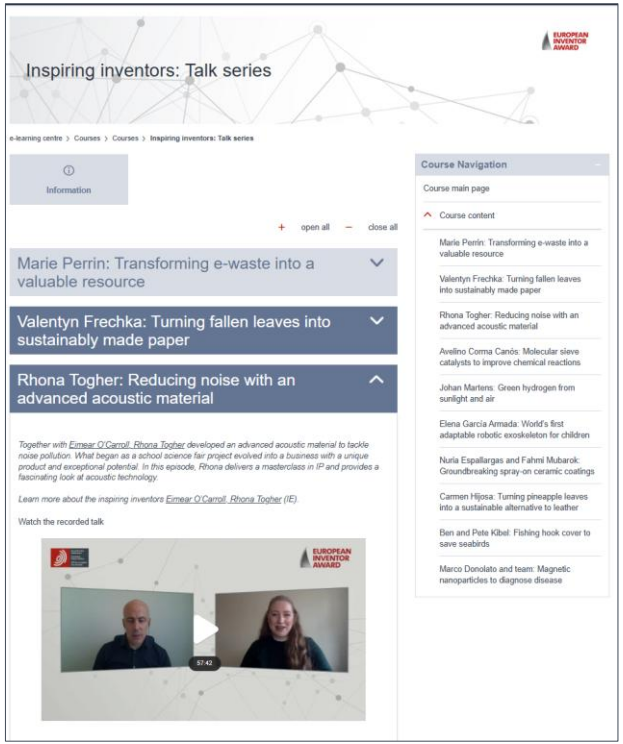
Train the Trainer Espacenet | NW01-2026

This course enables you to plan and implement courses on Espacenet and other EPO search tools quickly and in a resource-efficient way. It is based on case studies, two of which you will look at as examples and another three on which you will actually work in hands-on sessions and transform by following the training approach.

Patenting Innovation (RTTP-recognised) | NV07-2025

Patents are a powerful asset in the toolbox of a technology transfer professional. This two-day interactive course covers how innovative ideas are protected within the patenting system.

INSPIRING INVENTORS TALK SERIES



European Inventor Award finalists share their success stories on patenting and commercialising their inventions

[Course: Inspiring inventors: Talk series | e-learning centre]

Modular IP Education Framework (MIPEF)

Benefits

- Enrich your curriculum with a free of charge and high-quality IP course co-labelled with the European Patent Office
- Integrate a flexible, ready-made offer tailored to Master's and PhD programmes
- Adapt content easily to your academic calendar and specific course needs
- Benefit from expert-led online sessions and engaging, modular formats
- Inspire students with real-world case studies featuring European Inventor Award finalists and winners
- Provide students with the opportunity to earn an EPO certificate and ECTS credits
- Increase career opportunities for students through IP education

MIPEF timeline

- Courses are being offered twice a year with an autumn and a spring edition

Create – Protect – Innovate: Bringing ideas to market

Part 1: Entry level

Module I
Introduction to IP
Module II
Patent essentials
Module III
Introduction to patent information
Module IV
Patent information in practice
Module V
Developing an IP strategy

- Syllabus Entry
- Course Description Entry
- Overview of skills and learning outcomes

Part 2: Advanced level

Module I
Grant of patents
Module II
Enforcement of patents
Module III
Scouting and assessment of technology
Module IV
IP commercialisation
Module V
Use of IPRs

- Syllabus Advanced
- Course Description Advanced

mipef@epo.org

Modular IP Education Framework (website)

EU - Webinar EPO Coop: Protect your IP in health technology: Focus on robotics and health appliances

Soft Wearable Assistive Garments: The EU SWAG Project

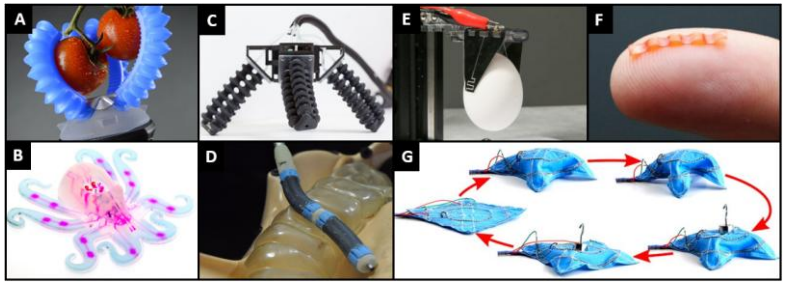
Panagiotis (Panos) Polygerinos, Ph.D.
Associate Professor of Soft Robotics and Mechatronics
Department of Mechanical Engineering
Hellenic Mediterranean University
and
Department of Industrial Design and Production Engineering
University of West Attica

24.06.2026

This project has received funding from the European Union's Horizon Europe programme under Grant Agreement No 101120408

Project Motivation

- **Soft robotics** has become one of the fastest growing fields in robotics over the past decade...



(A) pneumatic grasping without prior knowledge of size and shape (Soft robotics Inc., 2012), (B) robot powered by chemical reactions and microfluidic logic (M. Wehner, 2016), (C) legged robot navigating unstructured terrains (D. Drotman, 2017), (D) stiffness-controllable robot for minimally invasive surgeries (A. Stilli, 2014), (E) gripper uses electroadhesion to grasp (J. Shintake, 2016), (F) light-driven robot mimics caterpillar locomotion (M. Rogóż, 2016), (G) roboticized fabric powered by functional fibers (T. L. Buckner, 2020).

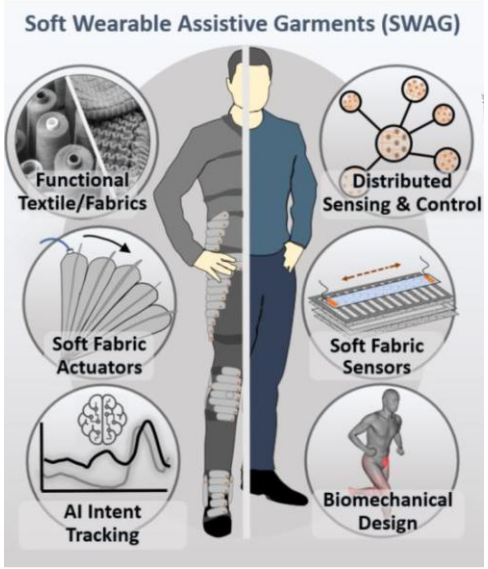
Compared to their rigid counterparts:

- lighter than rigid exoskeletons
- higher variable stiffness and force-to-weight ratios
- centralized weight at center of mass, reducing limb inertia
- soft, compliant drives adapt to joint kinematics
- concealable under clothing, lowering psychological burden

- **Soft exosuits** have valuable applications in industry, the military, healthcare and more, but remain ***a challenging research area*** requiring multidisciplinary expertise in biomechanics, robotics, neuroscience, and ergonomics.

Selection of indicative wearable soft robotic solutions that utilize fluidic and cable driven principles of operation to assist individual biological joints with motion of: (A) the wrist (N. W. Bartlett, 2015), (B) the elbow (T. Noritsugu, 2008), (C) the hand (P. Polygerinos, 2015), and (D-F) the legs (M. Wehner, 2013, K. Subramanyam, 2015, Y.-L. Park, 2014).

Project Ambition



- SWAG aims to be the **first soft exosuit** providing **active** actuation at **all lower body joints** simultaneously: lower back, hip, knee, and ankle.
- SWAG aims to **broaden SWRs' use** across various sectors, aiding users with many daily tasks.
- SWAG's progress will be **validated** through **four** diverse demonstration cases:

- As a motion assistance exosuit for individuals with **mobility impairments**
- In an **occupational enhancement** context
- As **wellness training** gear offering resistive training for athletes.
- As a **haptic feedback** solution integrated with **VR** to deliver an immersive experience.

Project Partners

- 13 Partners
- 7 countries

TECH HIVE LABS

HELLENIC MEDITERRANEAN UNIVERSITY

Roessingh Research and Development

eurecat

University of Hertfordshire

kendabl

TECHNISCHE UNIVERSITÄT MÜNCHEN

Sant'Anna School of Advanced Studies – Pisa

IUVO WEARABLE TECHNOLOGY, UPLIFTED LIFE

UNIVERSITY OF TWENTE.

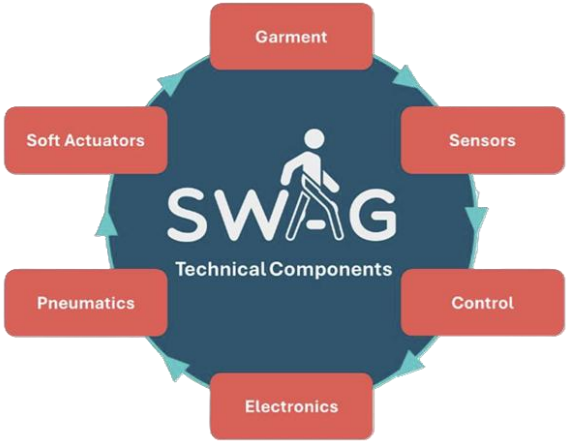
Imperial College London

Jožef Stefan Institute

Brunel University London

Project Specifics

"SWAG will bring together several core technologies to enhance the way soft wearable robots can assist human motion"

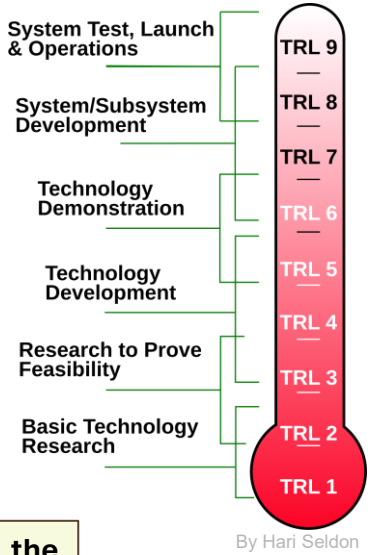


Duration: 48 months (2023-2027)
Started: November 1st, 2023

Total Budget: **6,896,312.50 €**
EU budget: 5,366,195.00 €
Associated Partners Budget: 1,530,117.50 €

Funded by the European Union

- SWAG began at **TRL 2/3**, as some its system modules had never been combined or tested before in soft wearable robotics.
- Partners leverage prior research to develop an integrated prototype, aiming for **TRL 5** validation in relevant environments.



By Hari Seldon

This level of R&D provides opportunitlies for the creation and evaluation of innovative ideas with potential exploitable results...

Exploitation and IAM workflow

From research output to exploitable assets:

01

KER Identification & Tracking

Early flagging of results with exploitation potential; monitored across the reporting period.

02

Structured Partner Input Collection

KER-specific exploitation cards gathered from all contributing partners.

03

Portfolio Review & Structuring

Results grouped into coherent clusters; exploitation routes and protection needs assessed.

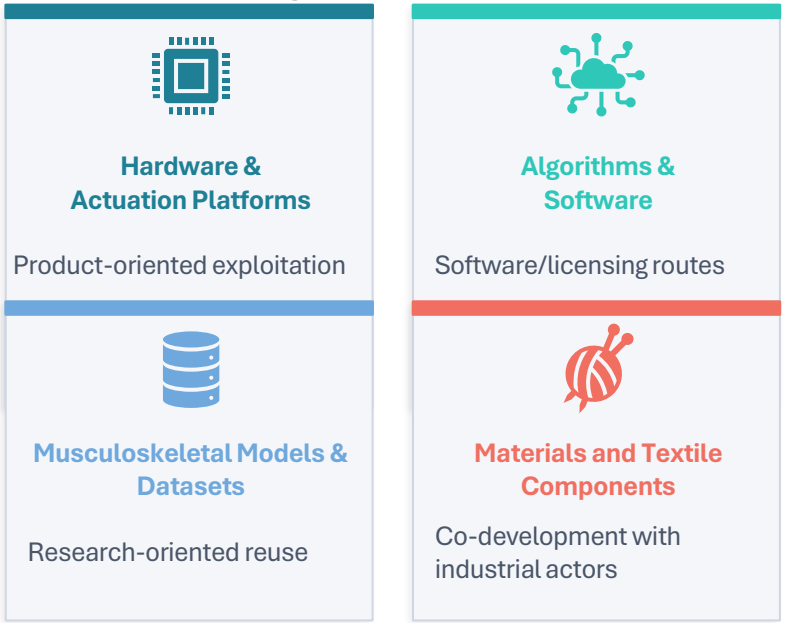
04

Deep-Dive on Most Mature Case

Focused analysis of KER5 via Horizon Results Booster: market, value proposition, IP, business plan.

Managing SWAG results as a portfolio

- The KER portfolio was grouped into four exploitation routes:



Key exploitable results	Work Package
1. Soft wearable actuators	WP4
2. Embedded sensors for soft actuator shape sensing	WP4
3. Smart sensorized textiles	WP4
4. Computational models for soft actuator design	WP4
5. Portable fluidic platform	WP5
6. Miniaturized pumping system for actuator control	WP5
7. Real-time user intent tracking algorithms	WP6
8. Distributed multi-node control algorithms for fluidic platforms	WP6
9. Musculoskeletal Models	WP3
10. Integrated SWAG Solution	WP7
11. Biomechanics Datasets	WP8

Each cluster requires a different approach to timing, ownership, protection, and route to uptake.

Different assets, different protection logics

- IAM activities established a differentiated protection framework

Key exploitable results	Work Package
1. Soft wearable actuators	WP4
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8. Distributed multi-node control algorithms for fluidic platforms	WP6
9. Musculoskeletal Models	WP3
10. Integrated SWAG Solution	WP7
11. Biomechanics Datasets	WP8

From IAM framework to concrete IP case studues

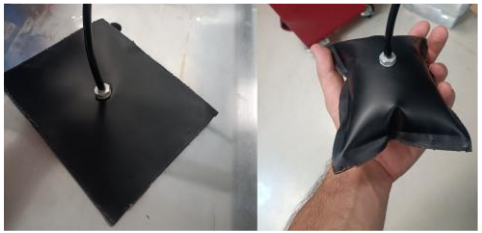
Within SWAG, the exploitation and IAM process helped the consortium identify results where patent-related discussions became particularly relevant.

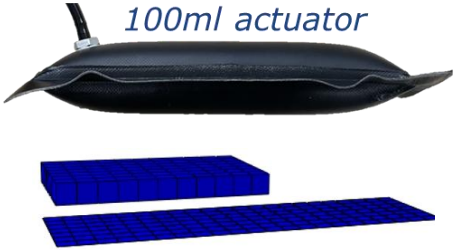
- **KER1 – Soft Wearable Actuators**
- **KER5 – Portable Fluidic Platform (ValVida)**

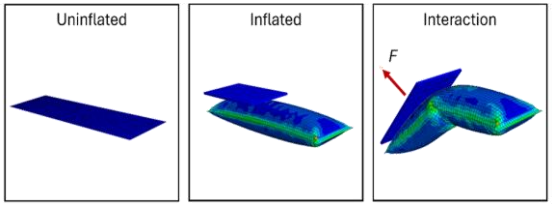
→ Patent-related work is progressing selectively, in line with the portfolio-based IAM approach

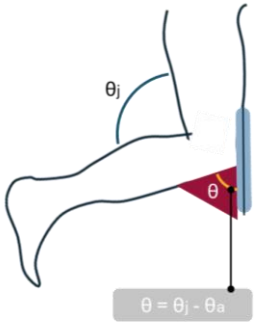
KER 1: Project Specifics

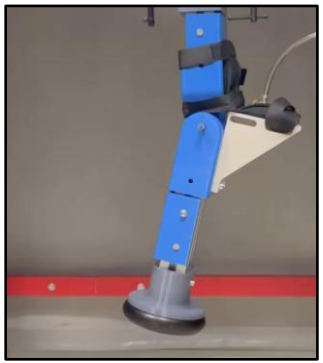
"SWAG will bring together several core technologies to enhance the way soft wearable robots can assist human motion"

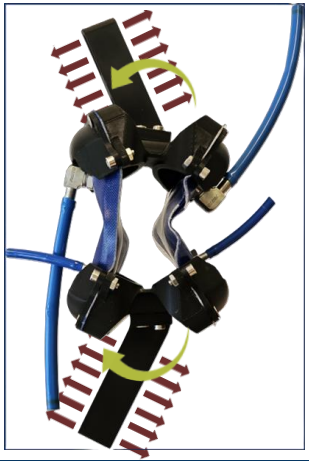




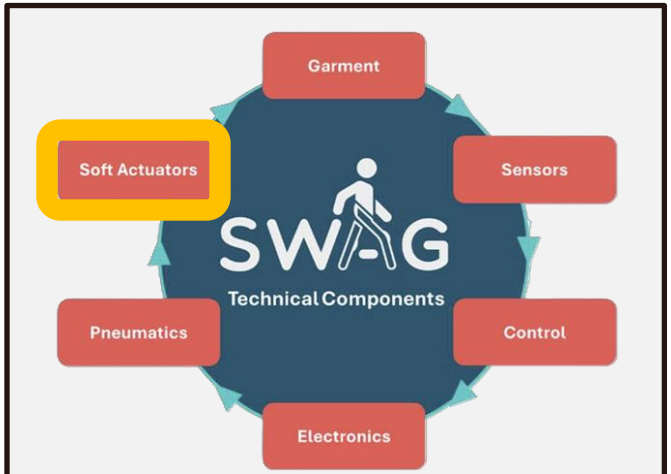








SWAG objectives:



- Create adaptive soft hybrid textile actuators for all lower limb joints.

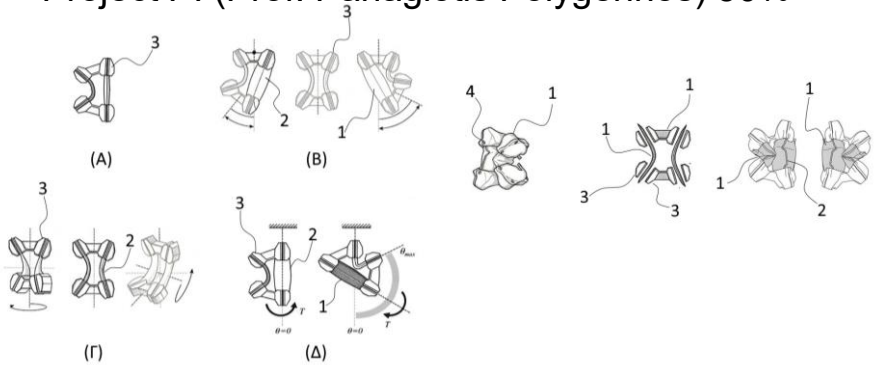
IP protection – KER 1 Soft Actuators

The gap:

- The potential inventive step was identified in the design and utility of the novel soft actuators
- Utilizing the research project outputs a patent application was drafted in collaboration with the Technology Transfer Office of HMU

Inventors:

- PhD student (Mr. Odysseas Simatos) 50%
- Project PI (Prof. Panagiotis Polygerinos) 50%



Synέργεια
ΓΡΑΦΕΙΟ ΜΕΤΑΦΟΡΑΣ ΤΕΧΝΟΛΟΓΙΑΣ ΚΑΙ ΚΑΙΝΟΤΟΜΙΑΣ

ΟΡΓΑΝΙΣΜΟΣ ΒΙΟΜΗΧΑΝΙΚΗΣ ΙΔΙΟΚΤΗΣΙΑΣ

ΑΙΤΗΣΗ ΓΙΑ ΧΟΡΗΓΗΣΗ

ΔΙΠΛΩΜΑ ΕΥΡΕΣΙΤΕΧΝΙΑΣ

Στοιχεία αίτησης :

Αριθμός υπόθεσης : 000017808	Αριθμός υπόθεσης efiling : 118-0005033424
Αριθμός παραλαβής : 2026-02014	Ημερομηνία παραλαβής : 15-05-2026
Αριθμός κατάθεσης : 20260100506	Ημερομηνία κατάθεσης : 15-05-2026

Καταθέτης/ες :

Είδος Προσώπου : EDUCATIONAL_INSTITUTION	
Επωνυμία/Επώνυμο : Ελληνικό Μεσογειακό Πανεπιστήμιο-Ειδικός Λογαριασμός Κονδυλίων Έρευνας	
Όνομα :	Όνομα πατρός :
Διεύθυνση: Εσταυρωμένος	Τ.Κ. : 71410
	Πόλη : Ηράκλειο Κρήτης
	Χώρα : Ελλάδα
ΑΦΜ :	
Τηλέφωνο : 2109358482	Fax/σταθερό :
Email : tto@hmu.gr	Ref No/Κωδικός :

15/05/2026 national patent submission

HELLENIC INDUSTRIAL PROPERTY ORGANISATION

IP protection – Soft Actuators

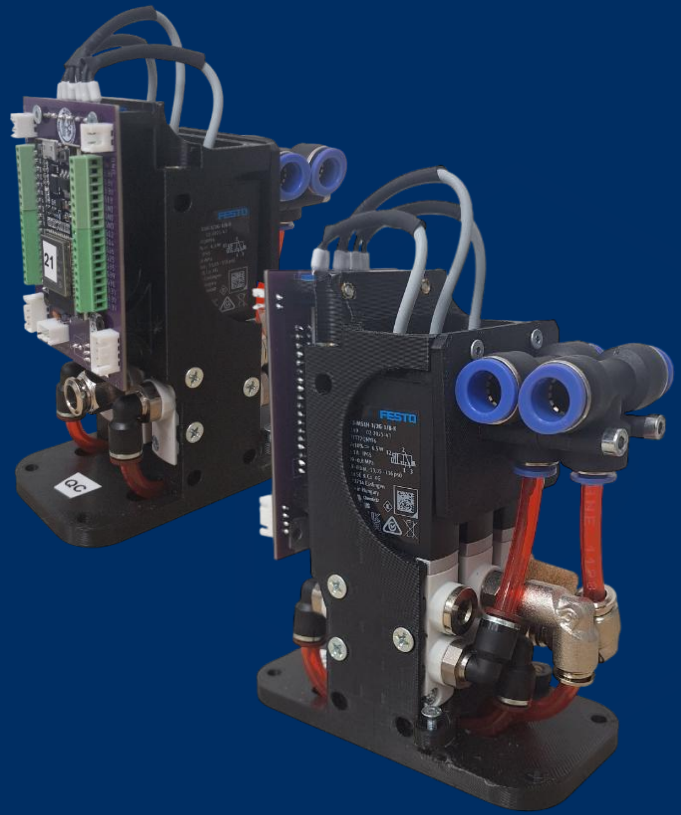
- 15/05/2026 National patent submission HIPO (offers protection in Greece)
- but also provides priority date for a year for filling an EU patent application
- allows for academic publications and conference presentations in the meantime
- this also provides extra time for the University/Inventors to identify potential exploitable pathways
- such protection will also provide a first proof-of-patentability from OBI
- ultimately this offers a first level of protection for the work developed in the project, supports future exploitation opportunities, and makes the technology more attractive for further development or industrial uptake
- Concluding, within a year, if there are identifiable pathways and more confidence about the utility of the technology, an EU patent application will be filled

KER 5 — KEY EXPLOITABLE RESULT

ValVida

A modular pneumatic control system: The high-flow, high-precision driver unit behind SWAG's soft actuation, and our latest patented exploitable result.

Presented by **Ilias Zourantzis** · Bendabl CTO & Co-Founder

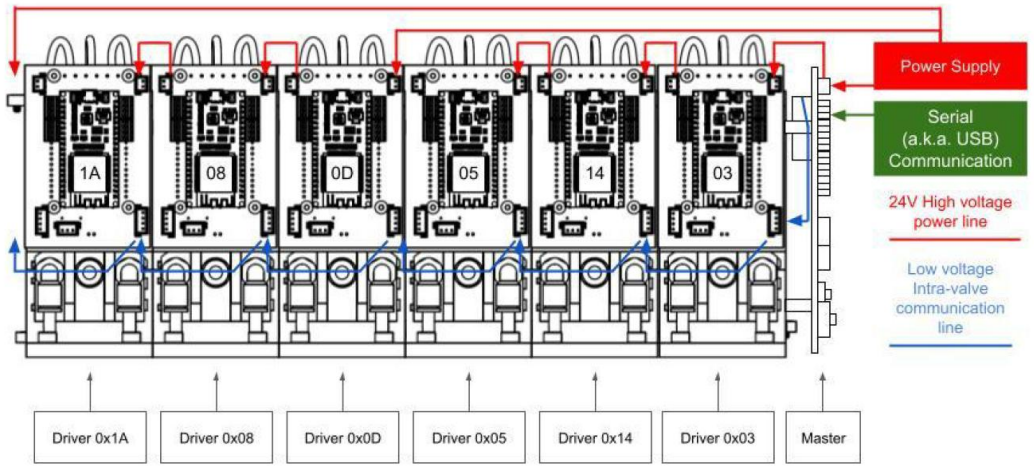


Funded by the European Union under the Horizon Europe programme. Views and opinions expressed are those of the author(s) only.

THE TECHNOLOGY

A distributed pneumatic control platform

One **Master** coordinates up to 24 independent **Driver** cells over a daisy-chained serial bus — each driver brings high-flow valves and a closed-loop controller directly to its actuator.



200 L/min
Nominal valve flow

100 Hz
System refresh rate

<10 ms
Latency · 24 drivers

24 V / 5 V
Dual-rail power bus

4 states
Per-driver flow control

THE CORE INNOVATION

Four-state control with deflation energy re-usage

Three solenoid valves → four pneumatic states

Inflate

`HP → OUT`

High-pressure line to the output

Block

`OUT | sealed`

Output held — pressure maintained

Deflate → atmosphere

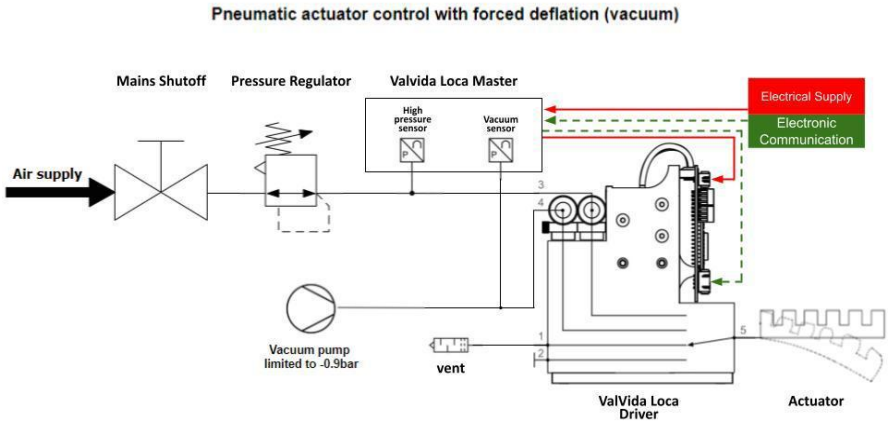
`OUT → ATM`

Free venting · no stored energy used

Deflate → vacuum

`OUT → VAC`

Forced / sub-atmospheric retraction



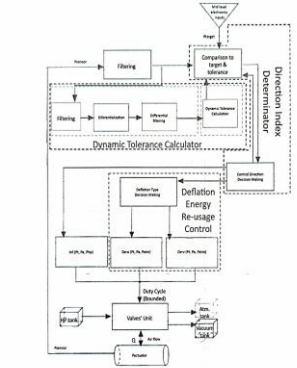
WHAT WAS PATENTABLE

Three inventive steps, twelve claims

01

Distributed localized control

Each driver is an autonomous closed-loop cell that arbitrates its own pressure, offloading real-time control from the master.



Independent claim 1

02

Deflation energy re-usage

Four-state scheme that autonomously chooses atmosphere vs. vacuum on a direction index to harvest energy — the heart of the invention.

Inflate HP → OUT	**Block** OUT | sealed
Deflate → atmosphere Free venting · no stored energy used OUT → ATM	**Deflate → vacuum** OUT → VAC

Claims 2 – 4

03

Robust scalable architecture

Electrically isolated dual-rail daisy-chain (100 Hz, <10 ms ·24) and a hardware failsafe reset forcing safe deflate-to-atmosphere.

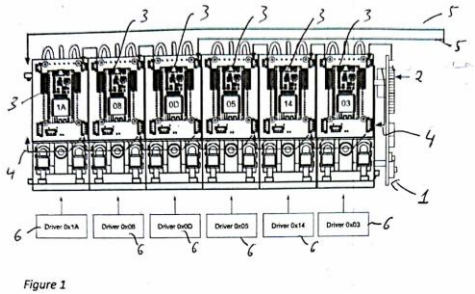


Figure 1

Claims 5 – 9

Method claims 11 – 12 The control method itself is also claimed.

IP PROTECTION

Protected via an international PCT application

A single Patent Cooperation Treaty filing — *"Modular pneumatic control system“*

1

One filing, global priority

Secures a single international priority date across 150+ PCT contracting states.

2

Up to 30 months to decide

Keeps EU, US and Asian national-phase options open while exploitation pathways mature.

3

Early patentability signal

International Search Report gives an independent read before committing to national costs.

4

Publish in the meantime

Frees the team to publish and present at conferences without losing protection.

MARKET REACH

Broad claims, broad markets

PRIMARY MARKETS

Robotics

Explosive actuation & rapid retraction for multi-chambered soft robots that medical pumps can't drive.

Vacuum systems

Precision negative pressure at the suction cup; vacuum drawn only when holding, not releasing.

Industrial automation

Drivers mounted at each piston — no central cabinet, less dead volume, tighter cycle synchronisation.

SECONDARY MARKETS

4D & haptics

Synchronised explosive seat motion for rides & cinema.

Smart hospital beds

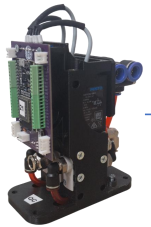
Quiet pressure-cell arrays that prevent bedsores.

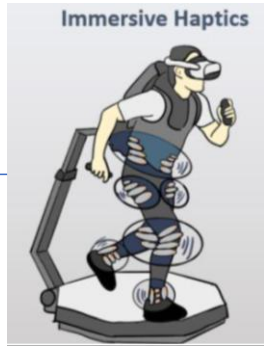
Logistics exoskeletons

High-pressure assist mounted on the suit, untethered.

Fluidic displays

Addressable inflated “pixels” without a tube tangle.





Conclusion - Beyond the visible IP outcome

Patent applications

KER identification
Ownership & contribution mapping

Protection strategy
Dissemination vs confidentiality

Exploitation routes

Market and uptake potential

Thank you for your attention!

www.swag-project.eu

SWAG_project_EU

YouTube @SWAG-project

showcase/swag-robotics

This project has received funding from the European Union's Horizon Europe programme under Grant Agreement No 101120408

LEARNING RESOURCES

JÜRGEN MÜHL, EUROPEAN PATENT ACADEMY, 20 MARCH 2026

THE EUROPEAN PATENT ACADEMY https://www.epo.org/en/learning

- Patent-related education opportunities to stakeholders in Europe and beyond.
- Wide range of audiences: examiners and national patent office staff, patent attorneys and professionals, inventors, businesses, universities, technology transfer centres and anyone interested in patent-related topics
- Areas covered: patent granting, patent information, technology transfer and patent litigation and enforcement.
- Self-paced training courses and learning events.

OUR OFFER

Supporting IP awareness and promoting IP education

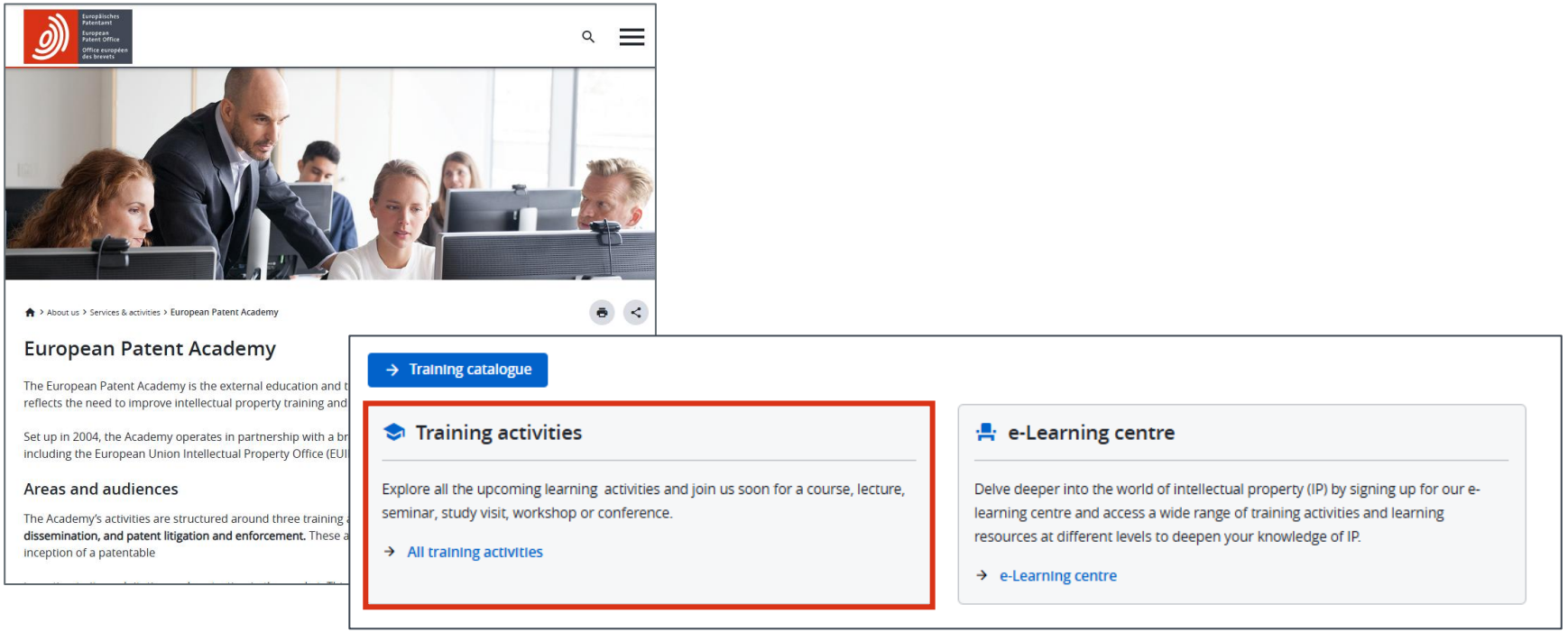
Learning events

Self-paced training

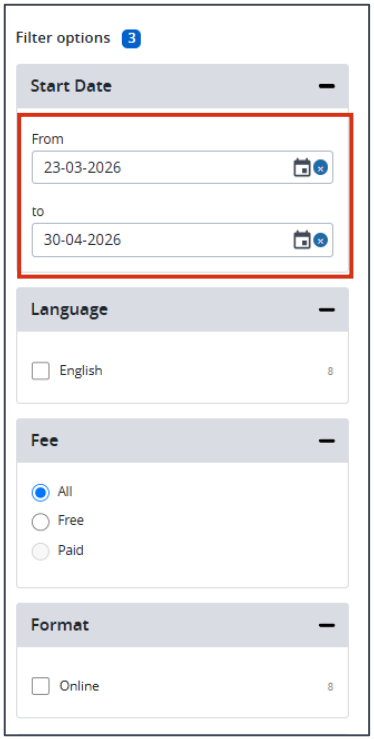
MIPEF – Modular Intellectual Property Education Framework”

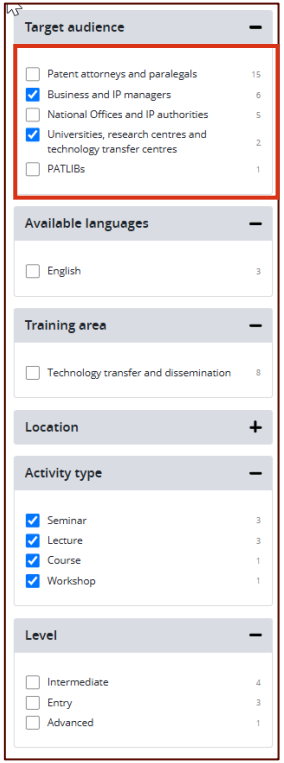
Inspiring inventors talk series

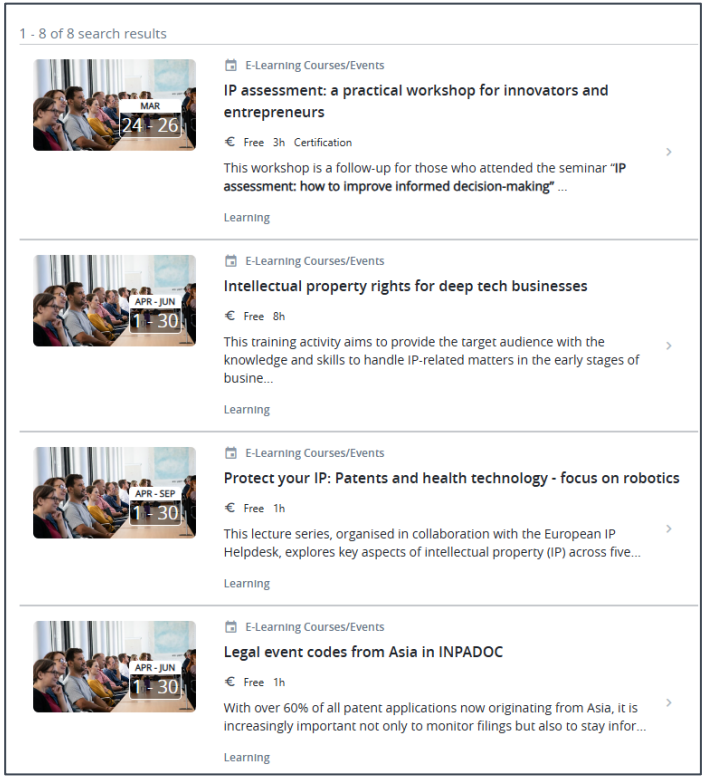
LEARNING EVENTS – SEARCHING FOR UPCOMING SESSIONS



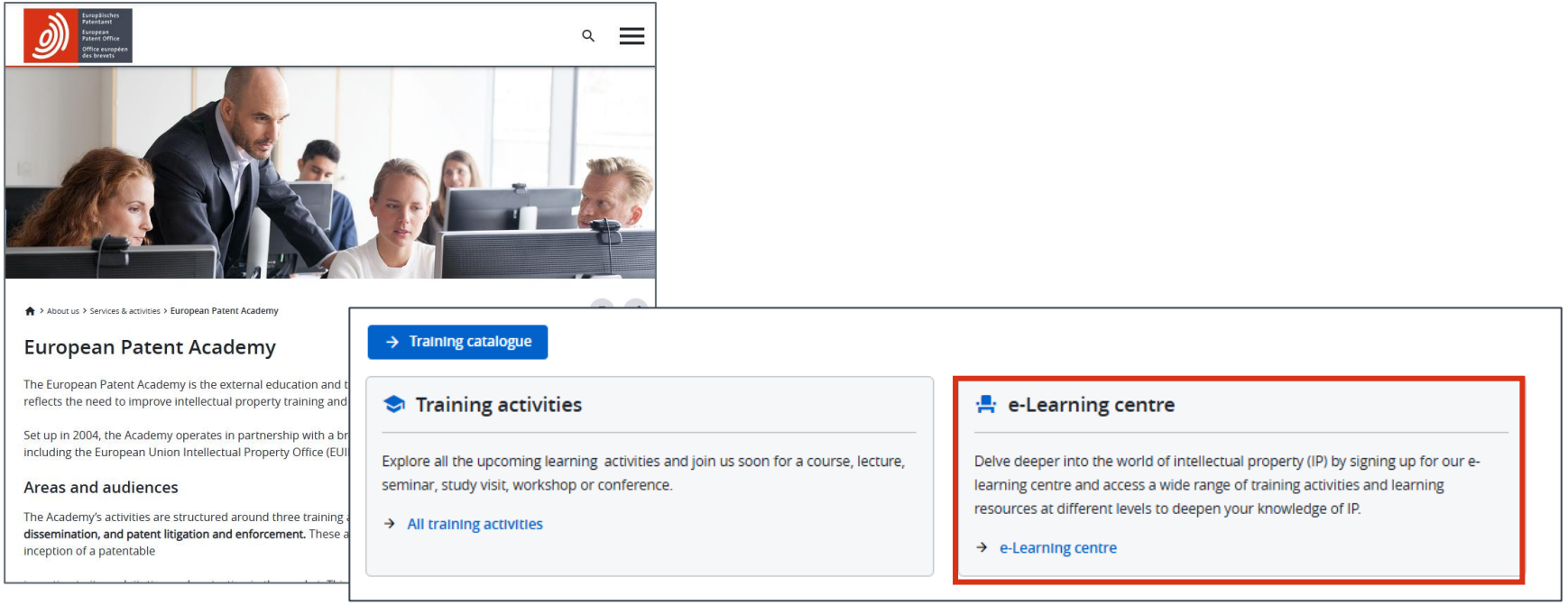
LEARNING EVENTS – SEARCHING FOR UPCOMING SESSIONS



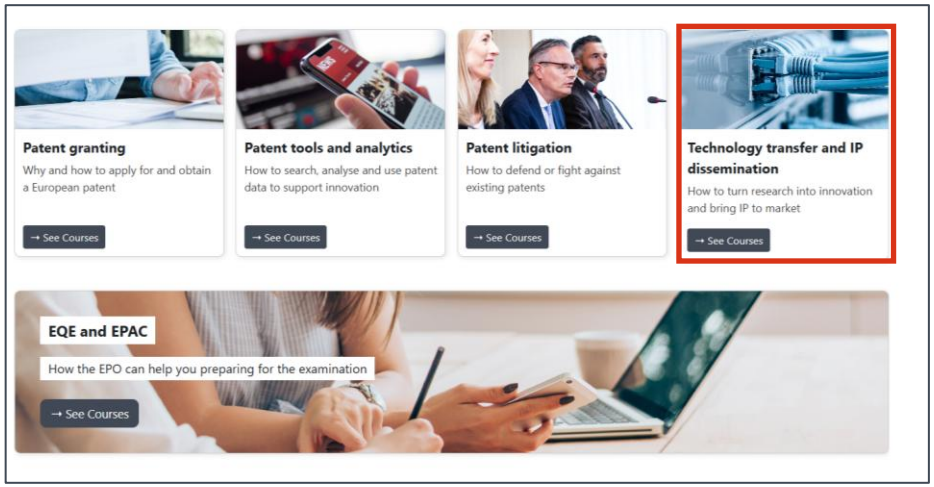




ON-LINE LEARNING RESOURCES: SELF-PACED TRAINING



ON-LINE LEARNING RESOURCES: SELF-PACED TRAINING



IP Assessment: How to improve informed decision-making | BS20-2026

This training focuses on the IP-related challenges and issues that arise during systematic assessment of technologies and patents. It offers effective strategies and introduces the tool, IPscore, that you can use to evaluate your research projects and innovations. It will give you a clearer picture of their commercialization potential and support strategic decision-making by helping you set priorities that save time and resources. The program is designed for R&D project leaders, entrepreneurs, and intrapreneurs; intellectual capital managers in small and medium-sized enterprises (SMEs), start-ups, technology transfer offices and investors.

EPO search tools to improve business decisions I BS01-2026

A seminar demonstrating how to effectively use the EPO's free search tools and the additional features offered by more advanced tools, that are of particular use to business decision makers.

Main subject matter:

- Using Espacenet to filter and analyse search results
- Using PATSTAT for more advanced statistics

Train the Trainer Espacenet | NW02-2025

This course enables you to plan and implement courses on Espacenet and other EPO search tools quickly and in a resource-efficient way. It is based on case studies, two of which you will look at as examples and another three on which you will actually work in hands-on sessions and transform by following the training approach.

How to make best use of the unitary patent system | BS03-2025

This training focuses on the advantages offered by the Unitary Patent system. Exploring how businesses can harness these benefits to protect and monetise their intellectual property paves the way for subsequent trainings featuring selected case studies from different industries. This training may be also of special interest for PATLIB centres.

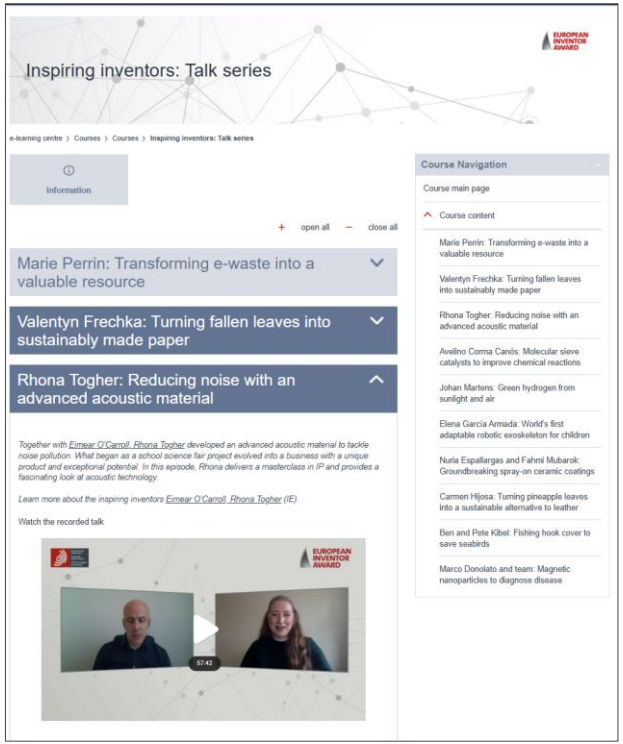
Train the Trainer Espacenet | NW01-2026

This course enables you to plan and implement courses on Espacenet and other EPO search tools quickly and in a resource-efficient way. It is based on case studies, two of which you will look at as examples and another three on which you will actually work in hands-on sessions and transform by following the training approach.

Patenting Innovation (RTTP-recognised) | NV07-2025

Patents are a powerful asset in the toolbox of a technology transfer professional. This two-day interactive course covers how innovative ideas are protected within the patenting system.

INSPIRING INVENTORS TALK SERIES



European Inventor Award finalists share their success stories on patenting and commercialising their inventions

[Course: Inspiring inventors: Talk series | e-learning centre]

Modular IP Education Framework (MIPEF)

Benefits

- Enrich your curriculum with a free of charge and high-quality IP course co-labelled with the European Patent Office
- Integrate a flexible, ready-made offer tailored to Master's and PhD programmes
- Adapt content easily to your academic calendar and specific course needs
- Benefit from expert-led online sessions and engaging, modular formats
- Inspire students with real-world case studies featuring European Inventor Award finalists and winners
- Provide students with the opportunity to earn an EPO certificate and ECTS credits
- Increase career opportunities for students through IP education

MIPEF timeline

- Courses are being offered twice a year with an autumn and a spring edition

Create – Protect – Innovate: Bringing ideas to market

Part 1: Entry level

Module I
Introduction to IP
Module II
Patent essentials
Module III
Introduction to patent information
Module IV
Patent information in practice
Module V
Developing an IP strategy

- Syllabus Entry
- Course Description Entry
- Overview of skills and learning outcomes

Part 2: Advanced level

Module I
Grant of patents
Module II
Enforcement of patents
Module III
Scouting and assessment of technology
Module IV
IP commercialisation
Module V
Use of IPRs

- Syllabus Advanced
- Course Description Advanced

mipef@epo.org

Modular IP Education Framework (website)

European IP Helpdesk

- Service initiative of the European Commission
- Addressing **current and potential beneficiaries of EU-funded projects, researchers and EU SMEs**
- Free-of-charge first-line support on intellectual property (IP)
- Hands-on IP and innovation management support
- International pool of IP experts from various thematic fields
- Unique cooperation scheme with the Enterprise Europe Network: 43 ambassadors from 26 EU countries

Training
free online and on-site sessions

Website
frequent updates from the world of IP and innovation

Helpline
confidential treatment of individual IP questions

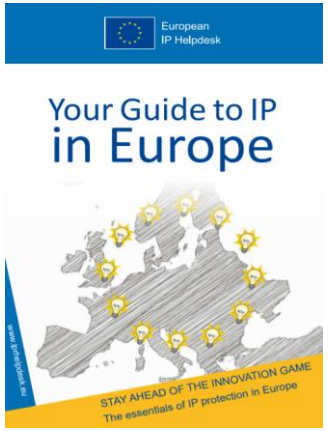
Publications
practical IP knowledge through high-level publications

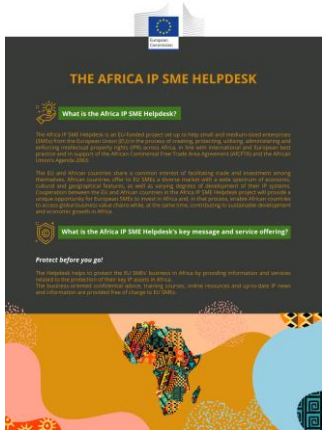
Ambassadors
local IP support throughout Europe

Events
info point at key networking events and conferences

The EC IP Helpdesks

EC IP (SME) Helpdesk Hub – Gateway to Information





- E-learning modules & more
- Guides / Topic, country, sector-specific factsheets / Infographics
- Case studies

Ambassador Scheme

- **Cooperation scheme** with the Enterprise Europe Network (EEN): 43 ambassadors – 26 countries
- **Building IP capacities** among European SMEs
- **Overcoming language barriers**
- Making the topic **more accessible**
- Exchange and feedback from ambassadors on **needs of SMEs**
- Local **awareness** and **training events**

Thank you!

- www.ec.europa.eu/ip-helpdesk

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- training@iprhelpdesk.eu

- Twitter @iprhelpdesk

- LinkedIn /european-ipr-helpdesk