CITADELS

TESTBED DESCRIPTION

Cultivating Industry 5.0 Talents: Academia-industry collaboration and empowerment through accessible DEep technoLogieS

Project acronym:	CITADELS
Project topic:	HORIZON-WIDERA-2024-TALENTS-03-01
Project number:	101217281
Type of action:	HORIZON-CSA
Project starting date:	1 September 2025
Project duration:	48 months
Dissemination level	PU

1 CoboFlex Collaborative Welding Robot Cell

TestBed title	CoboFlex Collaborative Welding Robot Cell

1.1 Short summary

The CoboFlex TestBed represents a flexible and mobile collaborative robotic welding cell designed for small-series production, prototyping, and educational applications. The system integrates a collaborative robot with advanced welding technology, enabling safe human–robot interaction without the need for complex safety fencing. The key technological focus lies in collaborative robotics, adaptive automation, and digital manufacturing, supporting Industry 5.0 principles such as human-centric production, flexibility, and rapid reconfiguration. The system allows intuitive programming, quick deployment, and efficient welding of various workpieces, making it suitable for both industrial and research environments. CoboFlex supports experimentation with welding parameters, process optimisation, and human–robot collaboration workflows. Its modular and mobile design enables easy relocation and integration into different production settings. The TestBed is particularly relevant for SMEs and educational institutions aiming to adopt advanced manufacturing technologies with low entry barriers.	
Principal Investigator Name	Anita Gjerek
Position / institutional role	Director of the Robotics department
Email	For access through CITADELS project please contact Pomurje Technology Park at info@p-tech.si or marko@p-tech.si
Phone No.	+386 2 530 82 00
ORCID persistent identifier (PID)	N/A
TestBed Responsible Name (if different from PI)	N/A
Funding source(s) for TestBed's acquisition	VIRS d.o.o.
Relevant Keywords	Collaborative robotics (cobots), robotic welding, human–robot collaboration (HRC), flexible manufacturing, automation, smart manufacturing

1.2 Hosting Institution

Name of Host Organization	VIRS d.o.o.
Department or Lab	N/A
Name of Building	N/A
Physical Address	Industrijska ulica 4 B, 9220 Lendava, Slovenia
Website Links	https://www.virs.si/en/
Institutional contact name	For access through CITADELS project please contact Pomurje Technology Park
Institutional contact email	info@p-tech.si or marko@p-tech.si

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1.3 Photos/videos

Main photo:

1.4 DeepTech Area and Application Domain

DeepTech Area	Check all that apply	Check ONE main area
Extended Reality	☐	
Robotics	✓	✓
Artificial Intelligence	☐	
Human Machine Interfaces	✓	
Biotechnology	☐	
Other	☐	

The TestBed covers the Robotics domain because it consists of a collaborative robotic welding cell that integrates a cobot with arc welding equipment for automated manufacturing tasks. The system enables programmable welding operations while allowing safe interaction with human operators without conventional safety fencing. It supports flexible deployment, intuitive programming, and rapid adaptation to different workpieces, making it suitable for small-batch production, prototyping, and process optimisation.

Application Domain	Check all that apply
Manufacturing	✓

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Application Domain	Check all that apply
Healthcare 	☐
Logistics 	☐
Agriculture 	☐
Maintenance & inspection 	☐
Other	☐

1.5 Potential Stakeholders and Exploitation Scenarios

Non-academic stakeholders	
Industrial Partners	✓
SMEs	✓
Startups	✓
Government Bodies	☐
Professional Associations	✓
Community	☐
Others 1 (comma-separated)	
Academic stakeholders	
Undergraduate students	✓
MSc students	✓
PhD students	✓
Researchers	✓
Others 2 (comma-separated)	
Other types of stakeholders	
Others 3 (comma-separated)	

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	Check all that apply	Short notes (optional)
Internal academic research	☐	
Collaborative research with external academic partners	✓	
Contract research / Proof-of-Concept for industry	✓	
Pilot / DeepTech Deployment in operational environment	✓	
Training services (courses, workshops, certification)	✓	
Service provision (testing, benchmarking, validation)	✓	
Open access for walk-in users (e.g. open days / hackathons)	☐	
Other (specify): _____		

1.6 Formal Access Conditions

Type of partner asking for access	Type of contractual relationship	Check all that apply
Academic partners	No contract (direct access)	☐
	Direct contract between parties (e.g., research agreement)	✓
	Indirect contract between parties (e.g., project framework)	✓
	Other / Describe	☐
Industrial	No contract (direct access)	☐
	Direct contract between parties (e.g., research agreement)	✓
	Indirect contract between parties (e.g., project framework)	✓
	Other / Describe	☐

Type of prerequisites	Description of prerequisites	Check all that apply
Agreements	Confidentiality agreement for proprietary algorithms	☐
	Data sharing agreement for datasets generated	✓
	IP agreements	✓
	Other / Describe	☐
Insurance	Users must have appropriate liability coverage through their home institution	✓
	Other / Describe	

1.7 Training and Safety

Mandatory technical training	Operator training provided by the system supplier, covering basic operation and programming of the CoboFlex system.

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Recommended technical training	Basic understanding of welding processes (MIG/MAG or TIG), experience in metalworking or manufacturing environments, and general technical literacy. No prior experience in robotics or programming is required.
Mandatory safety requirements	Use of appropriate personal protective equipment (PPE).

1.8 Technical description

Hardware	• Robot: 6 axes, reach: 1418 mm, payload capacity: 10 kg, repeatability: ± 0,04 mm, speed: 250 mm/s (collaborative), 2000 mm/s (non-collaborative)
	• Robot welding torch (MIG/MAG or TIG)
	• Welding power source (Kemppi) (MIG/MAG or TIG – possibility of integrating welding sources from other manufacturers)
	• Welding table (Siegmund)
	• Control panel
	• Robot controller
Software needed to run the TestBed	• Integrated robot control and programming interface for collaborative welding operations.
Standards that apply	• ISO 10218: Safety of industrial robots

1.9 Existing Software Assets (i.e. in GitHub)

Link:	Short description:
N/A	N/A

1.10 TestBed documentation

Type	Short description:	Name and source (link):
Documentation	CoboFlex product webpage	CoboFlex – VIRS official website, https://www.virs.si/en/coboflex
Documentation	CoboFlex brochure	CoboFlex – Brochure, https://www.virs.si/upload/brosure/coboflex-web-en.pdf

1.11 Application cases

Application case:	Short description:	Photo of the Application case
Collaborative robotic welding of metal components	Execution of MIG/MAG or TIG welding using a collaborative robot, enabling precise, repeatable, and flexible welding operations with safe human–robot interaction.	N/A

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Flexible deployment in SMEs and small-batch production	Use of a compact and mobile robotic welding cell that enables fast setup and adaptation to different workpieces, supporting efficient production in small-batch environments.	N/A
Training and skills development in robotic welding	Use of the TestBed for operator training in robot programming and welding processes, supporting hands-on learning and practical skills development.	N/A

Possible TRL application range	TRL4	☐
	TRL5	☐
	TRL6	☐
	TRL7	☐
	TRL8	✓

1.12 Funding source

Funding source acknowledgements
The creation of this TestBed was supported by VIRS d.o.o., Industrijska ulica 4 B, 9220 Lendava, Slovenia.

1.13 Ethical and societal aspects

Ethical and societal aspect:	Short description:
Improved worker safety	The TestBed supports safer welding operations through the use of a collaborative robot aligned with ISO 10218 safety standard. By assigning repetitive and potentially hazardous welding movements to the robotic system, it helps reduce direct operator exposure during welding tasks. The collaborative mode and integrated safety functions support safer human–robot interaction in shared workspaces.
Improved ergonomics and working conditions	The TestBed contributes to better working conditions by reducing physically demanding and repetitive manual welding activities. It supports more ergonomic task allocation between the operator and the robot, where the robot performs repeatable welding motions and the operator focuses on supervision, setup, and quality control. This can reduce strain and improve workplace usability in small-batch production environments.

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Human-centred industrial automation	The TestBed supports accessible and human-centred automation by combining collaborative operation, intuitive use, and operator training. This is particularly relevant for SMEs introducing robotic welding, as it supports workforce upskilling and practical technology adoption in flexible manufacturing environments.

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