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 iBOTone® Collaborative Welding Robot

TestBed title	iBOTone® Collaborative Welding Robot

1.1 Short summary

The iBOTone® Collaborative Welding Robot is a collaborative robotic system designed to support experimentation, validation, and deployment of automated welding processes while maintaining human supervision and control. It enables intuitive programming through manual guidance, allowing users with limited experience to perform welding tasks after minimal training. The system achieves repeatability of ±0.02 mm and operates reliably in industrial environments due to its IP66 protection level. Designed as an integrated, CE-certified robotic cell (ABICELL®), it supports consistent welding quality and simplified system setup. The TestBed provides a controlled and accessible environment for training, process validation, and Proof-of-Concept activities in robotic welding and automation. It supports DeepTech applications in digital manufacturing and aligns with Industry 5.0 principles by enabling safe and supervised human–robot collaboration.	
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ORCID persistent identifier (PID)	N/A
TestBed Responsible Name (if different from PI)	N/A
Funding source(s) for TestBed's acquisition	ABICOR BINZEL Varilna Tehnika d.o.o.
Relevant Keywords	Collaborative robotics, robotic welding, human–robot collaboration, welding automation, digital manufacturing, smart manufacturing systems

1.2 Hosting Institution

Name of Host Organization	ABICOR BINZEL Varilna Tehnika d.o.o.
Department or Lab	N/A
Name of Building	Pomurje Technology Park
Physical Address	Plese 9 A 9000 Murska Sobota
Website Links	https://binzel-abicor.com/SI/slv/
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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 iBOTone® TestBed operates within the domain of collaborative robotics in smart manufacturing environments. It demonstrates applications where humans and robots work side by side to perform high-quality welding processes in a safe and controlled manner. The system enables intuitive programming through manual guidance and integrated software, allowing operators with limited experience to perform automated welding tasks. This supports wider accessibility of advanced robotic technologies in industrial settings. The TestBed supports digitalised production processes and data-driven optimisation of welding operations. It aligns with Industry 5.0 principles by enabling safe and supervised human–robot collaboration, improving ergonomics, flexibility, and process efficiency in manufacturing environments.

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Application Domain	Check all that apply
Manufacturing 	✓
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	

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Others 3 (comma-separated)	

	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	☐

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1.7 Training and Safety

Mandatory technical training	All users must complete a short safety and operational briefing prior to use, covering welding process safety and collaborative robot operation. Users are required to operate the system under supervision and in accordance with established safety protocols. Where applicable, confidentiality or data-sharing agreements (e.g., NDAs) are arranged to protect partner information.
Recommended technical training	N/A
Mandatory safety requirements	Safety is a critical component of the TestBed's operation and is ensured through clearly defined safety procedures and user requirements. All users must follow safety procedures for collaborative welding, including the use of certified personal protective equipment (PPE). The robot cell integrates built-in safety features such as emergency stop functions, interlocked doors, and visual warning systems. Operation is performed under supervision and in accordance with established safety protocols. The system is designed in accordance with applicable safety requirements for collaborative robotic systems, including ISO 12100, ISO 10218-1, and CE machinery requirements.

1.8 Technical description

Hardware	• iBOTone® Collaborative Welding Robot: 6-axis collaborative robot designed for automated welding with high precision (±0.02 mm repeatability) and intuitive operation.
	• Teaching handle: Enables manual guidance and intuitive programming of welding paths, supporting use by non-expert operators.
	• Welding torch: Integrated smart welding torch for controlled and consistent welding operations.
	• Power source: Welding power source up to 500 A, supporting a range of welding applications and materials.
	• Control cabinet: Integrated system for robot control, process management, and parameter configuration.
	• ABICELL® enclosure: CE-certified robotic cell ensuring safe operation and human–robot collaboration.
	• Robot design: IP66-rated system suitable for operation in demanding industrial environments.
	• Material compatibility: Suitable for welding steel, stainless steel, and aluminium parts in small and large production series.
Software needed to run the TestBed	• Integrated robot control software: Supports programming, operation, and monitoring of welding processes through an intuitive user interface.

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Standards that apply	•The system is designed in accordance with applicable safety standards for collaborative robotic systems, including ISO 10218-1 and ISO/TS 15066, as well as the EU Machinery Directive 2006/42/EC and CE-certified ABICELL® enclosure requirements. In addition, operation complies with relevant occupational health and safety regulations for welding processes and human–robot interaction, ensuring safe and reliable operation in industrial environments.

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):
Product page with documentation	Product page	Welding cobot iBOTone®, https://www.binzel-abicor.com/US/eng/products/collaborative-welding/welding-cobot-ibotone

1.11 Application cases

Application case:	Short description:	Photo of the Application case
Collaborative robot training and operation	Hands-on training in collaborative robot use, including intuitive programming through manual guidance and safe human–robot interaction.	N/A
Proof-of-Concept demonstrations	Validation of robotic welding processes and evaluation of automation feasibility in controlled environments.	N/A
Process optimisation studies	Experimental testing and optimisation of welding parameters, including analysis of welding performance and repeatability.	N/A
Small-batch and custom production	Application of robotic welding in flexible manufacturing scenarios, including small-series production and custom parts.	N/A
Educational and academic use	Use of the TestBed in student projects focused on collaborative robotics, human–robot interaction, and digital manufacturing.	N/A

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

1.12 Funding source

Funding source acknowledgements
ABICOR BINZEL Varilna Tehnika d.o.o.

1.13 Ethical and societal aspects

Ethical and societal aspect:	Short description:
Societal aspect	From a societal perspective, the TestBed supports safer operation of welding processes by combining automation with supervised human involvement. The system enables controlled interaction between the operator and the robot, contributing to improved working conditions.
Ethical aspect	From an ethical perspective, no personal or sensitive data are processed during normal operation. Any media used for training purposes are recorded only with prior participant consent and in accordance with applicable data protection principles.

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