



D3.3 Flexible and automated bussing equipment for the string interconnection of flexible BIPV products

T3.4 Flexible and automated bussing equipment for the string
interconnection of flexible IPV products



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Project funded by



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Research and Innovation SERI**

Document control sheet

Project SEAMLESS-PV – Development of advanced manufacturing equipment and processes aimed at the seamless integration of multifunctional PV solutions, enabling the deployment of IPV sectors

Topic identifier	HORIZON-CL5-2022-D3-01-03
Grant Agreement N°	101096126
Coordinator	Fundación Tecnia Research and Innovation
Duration	01/01/2023 – 31/12/2026
Work package	WP3-Highly flexible and automated IPV manufacturing
Work package leader	MASS
Task	T3.4 Flexible and automated bussing equipment for the string interconnection of flexible IPV products
Task leader	MASS

Document title	D3.3_Flexible and automated bussing equipment for the string interconnection of flexible BIPV products
Document Ref	SEAMLESS-PV-D3.3_Flexible and automated bussing equipment for the string interconnection of flexible BIPV products -v01.docx
Lead Beneficiary	MASS
Dissemination level	Public (PU)
Document type	DEM
Authors	Antonio Valor (MASS)
Contributors	-
Reviewer(s)	Daniel Valencia (TEC)
Due date	31/12/2024 (M24)
Submission date	30/10/2025 (M34)

History of versions

Versi on	Date	Author - Beneficiary	Approved by	Comments
v00	27/10/25	Antonio Valor-MASS	Antonio Valor	Final draft. Prepared by MASS
V01	28/10/25		Daniel Valencia	Version reviewed and submitted

Summary of SEAMLESS-PV PROJECT

A novel manufacturing process for integrated photovoltaics

Integrated photovoltaics (IPVs) have demonstrated their success and impact in their use as building-integrated photovoltaics. They are also considered promising in several other sectors. Their adaptation to other industries or devices could offer surprising benefits. Unfortunately, the very need for adaptable IPV solutions hinders their expansion as their current manufacturing processes cannot create IPV solutions customised to each sector. The EU-funded SEAMLESS-PV project aims to tackle this by developing revolutionary tools for photovoltaic manufacturing as well as new IPV products that offer improved efficiency, adaptability and integrability while at the same time showcasing their cost-effectiveness in comparison to competitors.

The title of SEAMLESS-PV project is *“Development of advanced manufacturing equipment and processes aimed at the seamless integration of multifunctional PV solutions, enabling the deployment of IPV sectors”*. SEAMLESS-PV is a Horizon Europe Innovation Action started in January 2023 that will continue through December 2026.

More information can be found at:

<https://www.seamlesspv.eu/>

<https://cordis.europa.eu/project/id/101096126>

EXECUTIVE SUMMARY

This document describes the work carried out within T3.4 Flexible and automated bussing equipment for the string interconnection of flexible IPV products, where MASS has developed a flexible interconnection machine capable of responding to the demanding field of IPV. To this end, with the help of 3S, as the manufacturer of solar panels for BIPV and end user of the machine, and CSEM, it has defined the required specifications set forth in the D3.1, based on which the machine described in this deliverable has been developed.

Acknowledgements

The work described in this publication has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101096126.

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Project partners

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1 INTRODUCTION

1.1 Description of the deliverable content and purpose

MASS has experience in manufacturing interconnection machines for solar panels. Within the SEAMLESS-PV project, the development goes one step further, manufacturing an interconnection machine with extra capacities to what the current market offers.

In this DEMO type deliverable, the machine developed within task T3.4 of the SEAMLESS-PV project is shown graphically.

With this flexible interconnection machine, most of the **non-standard panels** manufactured by the final user, in this case 3S, can be manufactured automatically.

Both process and functionalities of the machines will be described in greater detail in D3.5 (Sensitive document).

1.2 Reference material

Not applicable.

1.3 Relation with other activities in the project

Error! No se encuentra el origen de la referencia. depicts the main links of this deliverable to other activities (work packages, tasks, deliverables, etc.) within SEAMLESS-PV project. The table should be considered along with the current document for further understanding of the deliverable contents and purpose.

Table 1.1 Relation between current deliverable and other activities in the project

Project activity	Relation with current deliverable
T3.1	For the manufacturing of the interconnection machine, the specifications defined in D3.1 have been taken into account.

1.4 List of abbreviations

Table 1.2 List of abbreviations

Acronyms	Meaning
BIPV	Building-integrated photovoltaics
HMI	Human-Machine Interface

2 INTERCONNECTION MACHINE

This machine has been developed to interconnect the strings of non-standard modules, allowing interconnection at any point on the defined surface of 1200 mm x 1650 mm. This is a significant advance with respect to the state of the art, because current machines normally are specific to each type of module, with the welding zones delimited at the ends of the modules to be manufactured.



Figure 2.1: Interconnection machine

From the point of view of the machine's functionality, we can divide it into the following sections:

1. HMI.
2. Cross-connector preparation station.
3. Cross-connector Gripper.
4. Induction soldering.
5. Working tray.

2.1 HMI

This touch screen allows the operator to control the flexibility of the machine. It allows to manage the workstations and define the solar cell matrix to be manufactured.



Figure 2.2: HMI

2.2 Cross-connector preparation station

At this machine workstation, cross-connectors are prepared, allowing cross-connector measurements from 109mm to 500 mm in length and bending at 90° at the ends of different sizes.

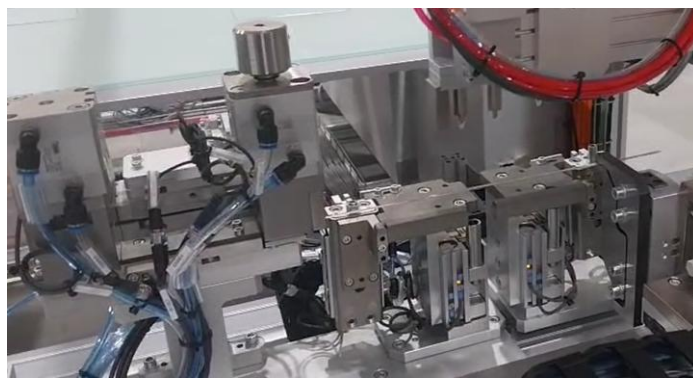
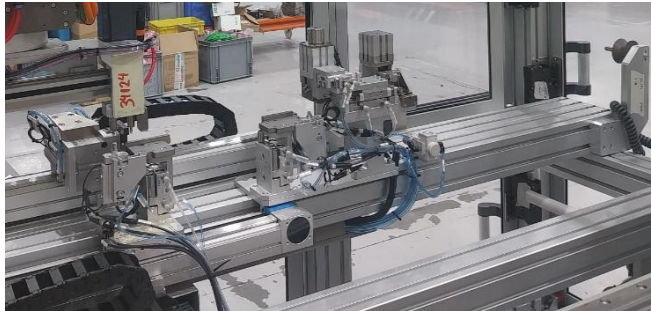


Figure 2.3: Figure Cross-connector preparation station

2.3 Cross-connector gripper

This cross-connector gripper is flexible, allowing it to grip any cross-connector coming from the preparation workstation and position it precisely at any point within the specified work area.



Figure 2.4: Cross-connector gripper

2.4 Induction soldering

Once both the cross-connectors and the strings are in position, the welding of the cross-connector to string busbars is done automatically using induction heating.

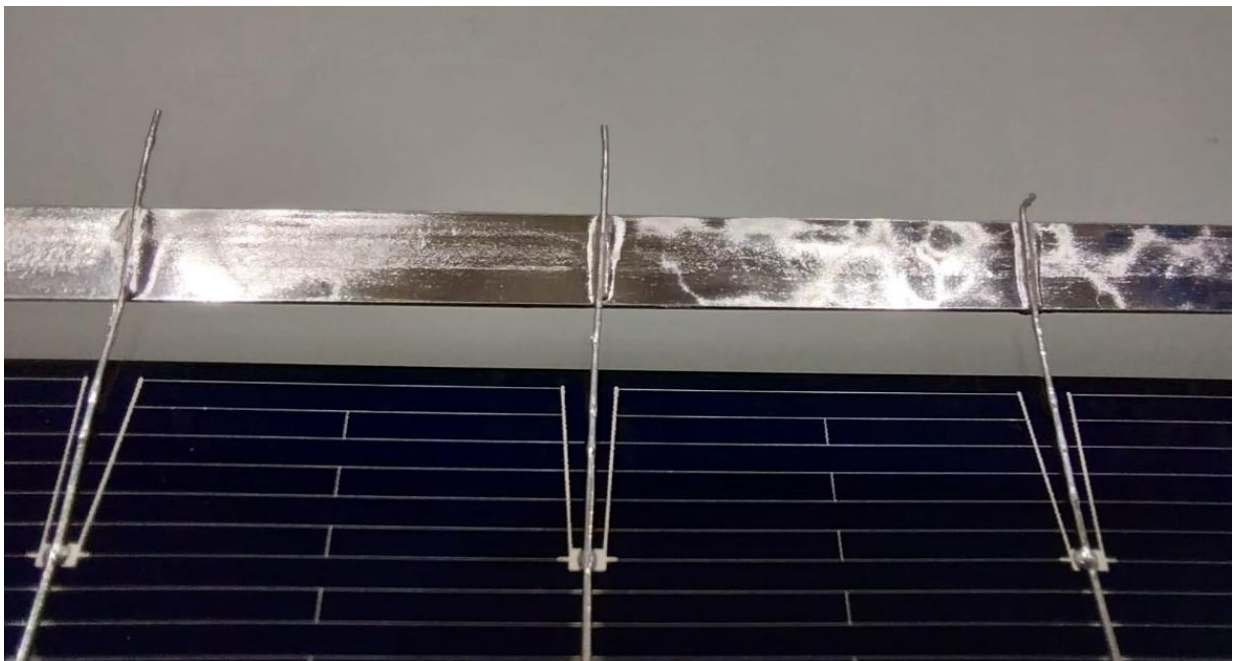
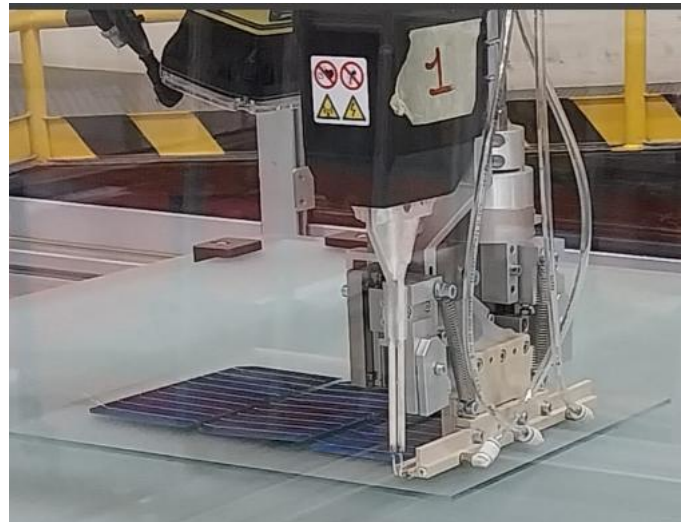


Figure 2.5: Induction soldering

2.5 Working tray

This table defines the working area of the interconnection machine, which is 1200mm x 1650mm. Its main characteristic is that it allows welding operations to be carried out on it at any point within its area.



Figure 2.6: Working tray

3 CONCLUSIONS

By developing the interconnection machine described in this deliverable, a machine capable of meeting the specifications defined in SEAMLESS-PV project is achieved. The main specifications are:

- Working area of 1200mmx1650mm.
- Welding --> Induction welding.
- X and Y free positioning, Angle --> 0°, 90°, or intermediate between 0 – 90 °
- Connector loading accuracy +/- 0.5mm
- Ribbon length accuracy +/- 1mm



Figure 3.1: Welding example



Seamless-PV



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