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Sustainable Photovoltaics Integration in buildings and Infrastructure for multiple applications



SPHINX - Deliverable report

D4.4 – Production Data Collection



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Deliverable summary

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Document history

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0.1	2026-04-18	Torsten Rößler (Fraunhofer ISE)	Initial draft, Etway / Voltec / Freesuns data integrated
0.2	2026-04-22	Torsten Rößler (Fraunhofer ISE)	Figures renumbered to eight, Voltec separated, Freesuns grade labels reworked
0.3	2026-04-23	Torsten Rößler (Fraunhofer ISE)	BOM, WP6 handover mapping, product comparison, Public Summary and Conclusion added
0.7	2026-04-23	Torsten Rößler (Fraunhofer ISE)	Results chapter restructured into per-product subsections (Etway, Voltec, Freesuns), stringer-throughput section moved to end of Results
0.8	2026-04-24	Torsten Rößler (Fraunhofer ISE)	Figure numbering aligned with text order; stringer singulation-loss fraction restored; overview-table formatting harmonised; status updated to Draft 0.8
0.9	2026-04-25	Torsten Rößler (Fraunhofer ISE)	Stringer-throughput section (3.1.5) added: Etway, Voltec and Freesuns campaigns aggregated; Table 7 + Table 8 (per-hour throughput) inserted.
0.10	2026-04-25	Torsten Rößler (Fraunhofer ISE)	Etway/Voltec stringer protocols verified; matrix-count parser corrected; figures rendered in Fraunhofer ISE plot style.
0.20	2026-04-26	Torsten Rößler (Fraunhofer ISE)	Captions converted to SEQ fields with auto-numbering; List of Figures and List of Tables added; cross-references updated.
0.27	2026-04-26	Torsten Rößler (Fraunhofer ISE)	Sections 5 (Risks) and 6 (Deviations) completed; Risk register caption added.
0.29	2026-04-27	Torsten Rößler (Fraunhofer ISE)	Editorial pass: methodology clarifications, hedging on overstated claims, Conclusion restructured, language tightened.
0.30	2026-04-27	Torsten Rößler (Fraunhofer ISE)	Final editorial pass: LoF/LoT repair, methodology sentence relocated, Risk wording on Founex follow-up, Contribution chapters expanded, Public Summary differentiated, references extended.
0.35	2026-04-27	Torsten Rößler (Fraunhofer ISE)	Final fix pass: repaired list entries, updated host/shingle efficiency baseline to 23.4 % / 23.4 %, corrected HELIUP section reference and minor consistency fixes.
1.0	2026-04-29	Mehdi Sahli (VOL)	Final Review and approval
Final	2026-04-30	Anna Molinari (UNR)	Layout check, Quality assurance and review tables completed

Public Summary

This deliverable summarises the production data collected for the photovoltaic products developed in the SPHINX project. The main purpose of this work is to document how the different module and tile concepts perform when they are transferred from prototype development into pilot production. The collected data provide a common production baseline for quality assessment, process improvement, reliability testing, cost analysis and life-cycle assessment.

Within SPHINX, four product families are addressed: photovoltaic noise-barrier modules, semi-transparent carport modules, building-integrated solar roof tiles and lightweight photovoltaic modules. In the reporting period covered by this deliverable, three of these product families were produced and analysed: the Etway noise-barrier modules, the Voltec carport modules and the Freesuns solar roof tiles. The HELIUP STYKON lightweight module was not produced on the Fraunhofer ISE pilot line during the project. This was due to the technical challenges already documented in D3.3 and because no suitable installation site became available during the project period. The collected production data include electrical performance after production, production yield, material-related information, process throughput and quality indicators. These data make it possible to assess whether the production process is reproducible, where losses or deviations occur, and which process steps should be improved in future production runs. They also provide the required input for the economic and environmental assessment in WP6, including cost calculation and life-cycle assessment.

The Etway noise-barrier mini-module series reached its expected power level of about 130 W, with no module falling below the defined production-yield limit. The Voltec carport demonstrator modules showed consistent electrical performance across the four produced modules, with an average power of about 303 W. The Freesuns dataset covers 4,716 solar roof tiles from five demonstrator sites and shows stable production behaviour for most sites, with high shares of top-grade tiles; the lower Grade-A share at Founex is documented as a follow-up item.

Overall, the collected data show that the three produced SPHINX product families can be manufactured with traceable and reproducible production data. The dataset establishes the production reference for the reliability tests in WP5 and provides the basis for the cost and life-cycle assessments in WP6. The main follow-up items are the Etway low-power outliers, the Founex Grade-A deviation and the Shirkan robot/singulation losses as the main process-improvement lever.

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Project partners:

#	Partner short name	Partner Full Name
1	VOL	VOLTEC SOLAR
2	ETW	ETWAY S.R.L.
3	HLP	HELIUP
4	M10	M10 INDUSTRIES AG
5	UNR	UNIRESEARCH BV
6	Fraunhofer	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
7	ICARES	ICARES CONSULTING
7.1	BI	BECQUEREL INSTITUTE FRANCE
7.2	BIE	BECQUEREL INSTITUTE SPAIN
8	CEA	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
9	FSUNS	Freesuns SA
10	CSEM	CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT
11	EPFL	ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE
12	SOP	SOPREMA

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