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PowerizeD

Digitalization of Power Electronic Applications within Key Technology Value Chains

Deliverable	**D3.3.4 Summary Report on demonstrators along the value chains of the Use Cases for Industrial Drives**		
Involved WPs	WP3	**Deliverable type**	Public
Project	PowerizeD	**Grant Agreement Number**	101096387
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Contact Person	Joonas Leppänen	**Organisation**	ABB
Phone	--	**E-Mail**	--

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Document history			
V	**Date**	**Author**	**Description**
0.1	22.10.2025	Joonas Leppänen	Initial Version
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1.0	28.11.2025	Ganesh Chandramouli	Reviewed

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1 Publishable summary

The objective of this deliverable is to summarise the demonstrators within the use cases for industrial drives, detailing the main aspects across the value chain. All use cases include a video documenting these features publicly available:

- UC3.1a Prognostics for Industrial Drives (ABB)
- UC3.1b Intelligent Gate Driver for Industrial Inverter (TUDD)
- UC3.1c Improved drivetrain efficiency for Industrial Drives (ABB)
- UC3.2 New hyper-sensorised digital drive (FAGOR)

2 Introduction & Scope

2.1 Purpose and target group

The objective of this deliverable is to list the main aspects of the use cases in the Industrial Drives domain that define the corresponding value chain and link them to the high-level objectives for PowerizeD as applied to WP3.

The scope consists of:

- Brief overview of partner contributions (this document)
- Use case videos highlighting key demonstration activities across the value chain

2.2 Contributions of partners

The following table explains which partner were involved and their activities in their various sections.

TABLE 1: CONTRIBUTIONS BY PARTNERS.

Chapter	Partner	Contribution
All	**ABB**	Editor
3.1	**ABB**, AALTO, AIT, BME, NANOJ, SAL, TUDD	UC3.1a
3.2	**TUDD**, ABB, IFAG, IFI, SAL	UC3.1b
3.3	**ABB**, AALTO, IFAG	UC3.1c
3.4	**FAGOR**, CSIC, PSC	UC3.2

2.3 Relation to other activities in the project

- **Inputs:** Video material from Use case partners collected.
- **Outputs:** Public video for dissemination of project technology demonstrators across the value chain.

3 Summary report on demonstrators along the value chains in the Industrial Drives Use Cases

This chapter presents the demonstration and validation of value chains for each use case in the industrial drives domain. Each use case is covered in its own subchapter. Below is a list of use cases in the Industrial Drives domain.

TABLE 2: LIST OF USE CASES IN THE INDUSTRIAL DRIVES DOMAIN

Domain	Leader	UC	UC Title	UC Leader
Industrial Drives	ABB	UC3.1a	Prognostics for industrial Drives	ABB
		UC3.1b	Intelligent Gate Driver for Industrial Inverter	ABB/TUDD
		UC3.1c	Improved drivetrain efficiency	ABB
		UC3.2	New hyper-sensorised digital drive	FAGOR

3.1 UC3.1a Prognostics for Industrial Drives

ABB has created a video on Prognostics for Industrial Drives UC, featuring a demonstration of ONSENSE technology and its value chain, as well as an AESENSE technology demonstrator.

ABB was the leading partner in preparing the video while contents from various partners are highlighted:

1. **Infineon Technologies (IFAG)** – Supplying the IGBT chips, substrates and baseplates to the research partners.
2. **Nanojoin (NANOJ)** – Developing large area silver and copper sintering capabilities for industrial IGBT modules.
3. **Aalto University (AALTO)** – Developing low-cost alternative with promised performance superior to any soldered or sintered chip back-side attach.
4. **Silicon Austria Labs (SAL)** – Developing double-sided copper sintering technology for IGBT attach.
5. **Infineon Technologies (IFAG)** – Packages the substrates and baseplates returned from NANOJ, AALTO & SAL into a functional IGBT modules.
6. **Dresden University of Technology (TUDD)** – Evaluates the performance of the ONSENSE chip technology on component level in transient thermal measurements.
7. **Budapest University of Technology and Economics (BME)** – Supports in building multi-domain finite element modelling capabilities to construct compact digital twins for lifetime estimation and thermal dimensioning of the IGBT modules.
8. **SAL** – Demonstrates an alternative approach to generate a compact finite element model for the IGBT modules.
9. **Austria Institute of Technology (AIT)** – Improves the remaining useful life models for IGBT modules in collaboration with other partners.
10. **ABB** – Is the use case owner, validating the constructed IGBT module prototypes in their combined power & thermal cycling test setups and benchmarks various third-party technologies. Furthermore, ABB designs and demonstrates the ONSENSE technology in a full industrial inverter level prototype in laboratory environment and validates the robustness of technology in multi-pulse test experiments and leveraging the results of the combined power and thermal cycling tests.

The video is available at: https://demonstrators.powerized.eu

3.2 UC3.1b Intelligent Gate Driver for Industrial Inverter

The video presents the collaborative demonstration of intelligent gate drivers for industrial inverters. It showcases experimental setups integrating new gate driver concepts and sensor technologies to achieve improved current balancing and estimation in both IGBT and SiC modules.

The video was prepared while contents from various partners are highlighted:

1. **ABB** – Provided the industrial inverter module as test platform.
2. **Infineon Technologies** (**IFAG)** – Supplied IGBT modules with integrated shunt resistors.
3. **TUD Dresden University of Technology (TUDD)** – Developed and tested the intelligent gate driver for dv/dt control and current balancing using a controllable voltage source.
4. **Infineon Technologies Italy (IFI)** – Implemented dv/dt control for SiC modules using a gate driver unit with adjustable constant current source.
5. **Silicon Austria Labs (SAL)** – Developed and integrated the novel AMR-based current sensor into an industrial IGBT module.

The video is available at: https://demonstrators.powerized.eu

3.3 UC3.1c Improved drivetrain efficiency for Industrial Drives

ABB released a video on improved drivetrain efficiency for industrial drives, demonstrating a SiC-based inverter for industrial applications and presenting a life cycle assessment (LCA) by AALTO.

The video was prepared while contents from various partners are highlighted:

1. **Infineon Technologies (IFAG)** – Supplying the prototype SiC MOSFET modules for ABB and input data for LCA carried out by AALTO.
2. **Aalto University (AALTO) –** Developed the LCA for framework used to estimate greenhouse gas emissions associated to the manufacturing phase of the power semiconductor modules.
3. **ABB** – Is the use case owner, providing a mission profile related data for use phase energy consumption in the LCA carried out by AALTO.

The video is available at: https://demonstrators.powerized.eu

3.4 UC3.2 New hyper-sensorised digital drive

FAGOR released a video on New hyper-sensorised digital drive, demonstrating an improvement in accuracy and reliability in power drive chain. FAGOR was the leading partner in preparing the video while contents from various partners are highlighted:

1. **Consejo Superior de Investigaciones Cientificas (CSIC)** – A framework for predicting a Remaining Useful life for critical electronic devices.
2. **Power Smart Control (PSC) –** Supplying a Digital Twin Simulator to anticipate potential issues prior to installation.
3. **Fagor Automation S.Coop (FAGOR) –** Is the use case owner, providing a converter demonstrator (based on SiC tech) to adjust bus voltage and an Inverter demonstrator with an improved solution sensing current (based on digitalisation) to increase SNR ratio. Both solutions increase system´s accuracy and reliability.

The video is available at: https://demonstrators.powerized.eu

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