



FLASH-COMP

D8.2 – Standardization Roadmap

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Executive summary

This deliverable presents the FLASH-COMP Standardization Roadmap, developed to support the exploitation and long-term industrial uptake of the project's results in advanced composite manufacturing. The roadmap provides a structured pathway towards future pre-standardization and standardization activities by analysing the current standardization landscape, identifying gaps between existing standards and project innovations, and defining priority areas for future contributions.

A SoA review of relevant European and international standards, technical committees, and ongoing standardization initiatives was conducted, covering domains such as composite manufacturing, non-destructive testing, industrial interoperability, digital twins, artificial intelligence, and sustainability. Building on this analysis, the project identified key standardization needs, particularly in the areas of hybrid digital twin interoperability, zero-defect manufacturing concepts, and in-process quality monitoring. Based on these findings, a roadmap was established that defines priority standardization topics, relevant target committees, and recommended engagement actions to facilitate future contributions to CEN and ISO activities and support the development of pre-standardization outputs.

Key Achievements:

Defined Objectives	Achievements
Perform a SoA analysis of relevant standardization activities and standards	Identification and assessment of relevant CEN, ISO, IEC and ISO/IEC JTC committees, together with applicable standards and work programmes.
Identify standardization gaps and project needs	Definition of priority gaps related to hybrid twin interoperability, zero-defect manufacturing terminology, and in-process quality monitoring.
Develop a standardization roadmap	Establishment of priority standardization areas, engagement routes, stakeholder map, and staged action plan for future contributions.
Promote liaison with relevant standardization bodies	Identification of target Technical Committees and corresponding National Standardization Bodies as the recommended channels for future engagement.

Challenges Faced:

- Rapidly evolving standardization activities in the fields of digital twins, industrial interoperability and artificial intelligence.
- Limited maturity of standardization frameworks addressing hybrid twins and in-process quality control in manufacturing environments.
- Dependence on post-project commitment from individual partners to actively participate in standardization activities and committee work.

Conclusion:

The roadmap demonstrates that FLASH-COMP is positioned primarily as a contributor to emerging standardization topics rather than as a developer of new standards. While established standards in composites, non-destructive testing and environmental assessment provide a solid foundation for the project, significant opportunities remain in the areas of industrial interoperability, hybrid digital twins and zero-defect manufacturing terminology. The roadmap therefore provides a practical and realistic path for future engagement with relevant CEN and ISO structures, enabling the project's results to contribute to future pre-standardization activities and potentially to future European and international standards.



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List of abbreviations

Abbreviation	Explanation
AI	Artificial intelligence
BIM	Building information modelling
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
DSS	Decision support system
EN	European Standard
ER	Expected result
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
JTC	Joint technical committee
KER	Key exploitable result
LCA	Life cycle assessment
MB	Member body (national standardisation organisation)
NDT	Non-destructive testing
NSB	National standardisation body
SC	Subcommittee
SDO	Standards developing organisation
SoA	State of the art
TC	Technical committee
WG	Working group
WP	Work package
ZDM	Zero-defect manufacturing



1. Introduction and Scope

1.1. Purpose and scope of the deliverable

FLASH-COMP develops a human-centred solution able to detect defects in the production of composite parts at an early stage and to decide whether a corrective action is needed. The project combines non-destructive inspection and monitoring tools that extract key process parameters, an on-line estimation of defect severity, a decision support system and an interoperable software platform for data sharing. The solution is validated in a testbed and in two industrial use cases. The objective behind all of this is to reduce the waste generated in composite manufacturing by moving quality control inside the production process rather than after it.

Results of this kind touch standardisation in two different ways. On one side the project uses standards: test methods for composites, non-destructive testing practice, life cycle assessment, environmental management. On the other side the project produces results that could, in principle, feed into standardisation: a vocabulary for describing defects and their severity in a zero-defect production setting, and a way of making process data, models and twins interoperable across the tools of different suppliers. The purpose of this deliverable is to say clearly which of these directions is worth pursuing, with whom, and in what order.

The deliverable describes the standardisation environment around the project results and the gaps found in it (Section 2). It identifies the priority areas for FLASH-COMP, maps the actors involved and sets out how the project and its partners intend to engage with them (Section 3). It sets out an action plan over three time horizons and explains how the roadmap will be kept up to date after the project ends (Section 4). Annex I lists the committees and reference standards identified during the work, and Annex II summarises the support received from the HSbooster.eu Standardisation Service.

1.2. Methodology

The first step was a state-of-the-art analysis. Starting from the topics declared in the proposal, a list of standards developing organisations and technical committees was compiled at European and international level, together with the standards that appeared to be most closely related to the project. Both official standards, published by CEN, ISO and IEC, and industry standards were considered.

The second step was a needs and gap analysis. Rather than starting from the standards, this step started from the project: which results are candidates for standardisation at all, and what would a partner need from a standard in order to use or to sell those results. The identified needs were then compared with the standards found in the first step, at the level of scope and work programme.

The third step was the external review. The project applied to the HSbooster.eu Standardisation Service and was assigned an expert, Knut Jetlund of the Norwegian Mapping Authority, who has long experience in ISO/TC 211, ISO/TC 204 and the Open Geospatial Consortium. The service was delivered through three meetings, on 27 September, 30 October and 16 December 2024, on the basis of the public deliverables of the project and of the draft state-of-the-art analysis. The expert reviewed the list of committees, proposed changes to it, and recommended a two-stage way of working: first define the standardisation needs and look for standards from there, then build the roadmap around the committees that remain. That recommendation is reflected in the structure of Sections 2 to 4.



2. Current Standardization Landscape (Gap Analysis)

The screening was carried out at two levels. At European level the CEN catalogue and the work programmes of the candidate technical committees were examined first. At international level the corresponding ISO and IEC committees were examined, together with the joint ISO/IEC committee on information technology.

The first list of committees, prepared in the early phase of the project, was broader than the final one and contained a few attributions that did not hold up. It was revised during the HSbooster.eu service, with some committees reclassified, some removed and a few added. What follows is the revised picture. The tables give the scope of each committee, what was observed about its activity, and an indication of how relevant it is to FLASH-COMP. The relevance column is a judgement of the project, not of the committees.

Table 1. CEN technical committees screened during the analysis

Committee	Scope	Observations	Relevance
CEN/TC 249	Plastics, including composites, reinforcements and preregs through SC 2	Active committee with a large work programme, including several EN ISO items. Its ISO counterpart is ISO/TC 61, with subcommittees dedicated to composites and to test methods.	Medium
CEN/TC 138	Non-destructive testing	Work programme dominated by EN ISO items with few own projects, which suggests that the substantive work sits in ISO/TC 135.	Medium
CEN/TC 442	Building information modelling; WG 9 addresses digital twins for the built environment	WG 9 states explicitly that digital twins applied to other industries, such as aerospace, automotive or machinery, are out of scope. Of interest for how the subject is being framed, but not a target for the project.	Low
CEN/TC 310	Advanced manufacturing technologies and their applications	Work programme composed of EN ISO items only, with no evident own activity. Its ISO counterpart is ISO/TC 299 on robotics.	Low

At international level the picture is different. The committees dealing with composites and with non-destructive testing are mature and productive, and the project is essentially a user of what they publish. The committees dealing with industrial data, with the integration of devices into enterprise systems and with artificial intelligence are the ones where the subjects of FLASH-COMP are still being defined, and they are where any contribution from the project would have to go.



Table 2. ISO and IEC technical committees screened during the analysis

Committee	Scope	Observations	Relevance
ISO/TC 61/SC 13	Composites and reinforcement fibres	Publishes the test methods used on composite materials and parts, for example ISO 14126 on compressive properties. Reference point for the terminology of materials and for validation of the project measurements.	Medium
ISO/TC 135	Non-destructive testing	Counterpart of CEN/TC 138 and the place where NDT methods and personnel qualification are standardised. Relevant as a source of practice for the inspection tools, less so as a destination for project input.	Medium
ISO/TC 184/SC 4	Industrial data	Natural home for the representation and exchange of product and process data. The most likely destination for anything the project may contribute on data interoperability.	High
ISO/TC 184/SC 5	Interoperability, integration and architectures for enterprise systems and automation applications in industrial environments	Covers integration architectures and the vocabulary that goes with them. Identified as a target already in the application to HSbooster.eu and confirmed during the service.	High
IEC/TC 65 and SC 65B, SC 65E	Industrial-process measurement, control and automation; measurement and control devices; devices and integration in enterprise systems	Relevant to the sensing and control side of the solution and to the description of devices within enterprise systems. Engagement here would be driven by the technology suppliers rather than by the project.	Medium
ISO/IEC JTC 1/SC 42	Artificial intelligence	The reference committee for AI terminology, data quality for machine learning and trustworthiness. Relevant to the severity estimation and decision support components, and a possible route for the hybrid twin discussion.	High
ISO/IEC JTC 1/SC 7	Software and systems engineering	Of interest for the software platform and its documentation, mainly as a source of requirements rather than as a target for contribution.	Low



Committee	Scope	Observations	Relevance
ISO/TC 207/SC 1 and SC 5	Environmental management systems; life cycle assessment	ISO 14001 and ISO 14044 are used as the framework for the environmental assessment of the solution. The project is a user of these standards and does not foresee contributing to them.	Medium
ISO/TC 299	Robotics	Counterpart of CEN/TC 310. Examined and set aside, since the project does not address robot safety or robot performance.	Low

The analysis also looked for business consortia or industry alliances working on the same topics and did not find any of high relevance. In this field the industry takes part in the official committees instead of writing its own specifications. The faster route through a consortium is therefore not available, and any contribution from the project has to follow the timescales of CEN, ISO or IEC. Three gaps were identified. They are based on the scope and the work programme of the committees. The first gap is about hybrid twins. Existing standards and ongoing work deal with digital twins, that is, a model of an asset or of a process fed with data coming from it. FLASH-COMP uses physics-based simulation together with data-driven models, to estimate the severity of a defect while the part is being produced. No standard was found covering this combination, neither for the vocabulary nor for the interfaces needed to exchange information with the rest of the production system. The committees where this topic would fit are ISO/TC 184/SC 4 and SC 5, plus ISO/IEC JTC 1/SC 42 for the data-driven part. At European level the main structured work on digital twins is in CEN/TC 442/WG 9, which excludes industrial applications from its scope. The second gap is about terminology for zero-defect manufacturing. Terms such as defect, anomaly, severity, in-process inspection and corrective action are used in the project and in the literature with meanings that are similar but not the same. There is no common vocabulary that a supplier and a customer can use to agree on what an on-line severity estimation should give. The third gap is about measurements taken during production and used for control. The standards on composites and on non-destructive testing describe tests made on specimens or on finished parts, in controlled conditions and by qualified personnel. The project takes measurements during the process, with the intention of acting on them before the part is finished.



3. Priority Standardization Areas for FLASH-COMP, Stakeholder Mapping and Engagement Strategy

The first priority area is terminology for zero-defect manufacturing. The contribution foreseen is a short document with the terms used in the project, their definitions and how they relate to the definitions already published. It would be offered as input to the committee that works on vocabulary for enterprise integration and automation. The document is useful also outside the committee, because the partners can use it when they present the results to customers. The cost is low, the risk of duplicating existing work is low, and the material needed is already in the project documents. The second priority area is interoperability for digital and hybrid twins. Here the contribution foreseen is a position paper on what a hybrid twin needs in order to be interoperable in a production environment, based on what was built and tested in the project. The natural destination is ISO/TC 184/SC 4 and SC 5, with a possible second route through ISO/IEC JTC 1/SC 42 for the data-driven part. This contribution depends on the technology partners, because the content is their work and the interest in standardizing it is theirs. There are then three secondary areas. Composite test methods and non-destructive testing are used by the project and stay relevant for the partners who will bring the inspection tools to the market; here the action is only to follow the revisions. Environmental management and life cycle assessment give the framework for the environmental assessment of the solution, and again the project is a user. Software and systems engineering standards concern the documentation of the platform and are managed by the partner responsible for it.

Table 3. Priority standardisation areas and target committees

Area	Target committees	Intended mode	Priority
Terminology for zero-defect manufacturing	ISO/TC 184/SC 5, with ISO/IEC JTC 1/SC 42 for terms related to machine learning	Written input	High
Interoperability of digital and hybrid twins	ISO/TC 184/SC 4 and SC 5; ISO/IEC JTC 1/SC 42	Follow the work, then written input if a suitable work item is open	High
In-process and in-line inspection of composite parts	ISO/TC 135; CEN/TC 138	Use and follow	Medium
Composite materials and test methods	ISO/TC 61/SC 13; CEN/TC 249/SC 2	Use and follow	Medium
Devices and their integration in enterprise systems	IEC/TC 65, SC 65B, SC 65E	Follow, at the initiative of the technology suppliers	Medium
Environmental management and life cycle assessment	ISO/TC 207/SC 1 and SC 5	Use	Low
Software and systems engineering	ISO/IEC JTC 1/SC 7	Use	Low



Stakeholder mapping

The actors that matter for this roadmap fall into four groups. The first group is the consortium itself, and within it the distinction between the technology partners, who own the results that could be standardised, and the industrial partners, who are the users of those results and therefore the ones whose requirements give the standardisation argument its weight. The research and technology organisations sit in between and are usually the ones with existing contacts in the committees.

The second group is the standardisation system itself: the technical committees and their working groups, their secretariats and convenors, and the participants already present in them, who in this field include the industry. Access to this group does not normally happen directly. It happens through the third group, the national standardisation bodies, which are the member bodies of CEN and ISO and which mirror the international committees with national committees. An organisation that wants to follow or influence the work of ISO/TC 184/SC 4 does so by joining the corresponding national mirror committee of its own country. For the countries represented in the consortium this means, for example, UNI in Italy, UNE in Spain, IPQ in Portugal and AFNOR in France. Whether a mirror committee exists for each of the committees identified here has to be checked country by country, and that check is one of the actions in Section 4.

The fourth group is made up of the support instruments. HSbooster.eu provided the expert support summarised in Annex II, maintains a training academy with free material and can reimburse the fees for a limited number of standards. Other initiatives active in the same space, such as StandICT.eu, offer support to individual experts who want to participate in standardisation activities. These instruments do not produce standards, but they lower the cost of the first steps, which is exactly where a project like this one tends to stop.

Table 4. Stakeholder map and route of engagement

Stakeholder	Role in the roadmap	How the project engages
Technology partners of the consortium	Own the results that are candidates for standardisation and would carry any written contribution	Through the exploitation activities of WP8 and the key exploitable results; each partner decides on its own participation
Industrial partners and end users	Provide the requirements that justify a standardisation argument, and are the first users of a common vocabulary	Through the use case activities and through the review of the terminology note
Research and technology organisations in the consortium	Hold existing contacts with committees and mirror committees and can act as a bridge	Directly, using the contacts they already have
National standardisation bodies (for example UNI, UNE, IPQ, AFNOR)	Give access to the international committees through national mirror committees, and can advise on the right entry point	Contact by the partner established in the country concerned
Technical committees and their working groups	Decide what is standardised and on what timescale	Indirectly, through the national mirror committees; direct contact with a secretariat only to ask about ongoing work



Stakeholder	Role in the roadmap	How the project engages
HSbooster.eu and similar support instruments	Provide expert advice, training material and reimbursement of standards fees	Request to the service; the support received is summarised in Annex II
Other EU-funded projects on zero-defect manufacturing and digital twins	Possible allies for a shared contribution, and a source of information on what is already being proposed	Through the clustering and dissemination activities of WP8

Engagement strategy

The project will not seek to open a new work item, and it will not commit its partners to membership of a committee. What it will do is prepare the ground so that a partner who decides to engage finds the work already done: the committee identified, the relevant standards read, the national mirror committee known, and the contribution drafted.

In practice this means a sequence of steps rather than a single decision. The first step is to obtain access to a small number of standards, taking advantage of the reimbursement offered by HSbooster.eu, and to read them against the project results. The second step is to establish, for each priority committee, whether a national mirror committee exists in the countries of the partners concerned and what the conditions of participation are. The third step is to contact the mirror committee or the committee secretariat, present the project results and ask whether there is interest and whether a suitable work item is open or planned. Only after that does it make sense to decide whether to submit a written contribution, and who should submit it.

Capacity building runs alongside this sequence, because the main obstacle to participation in standardisation is usually not unwillingness but unfamiliarity. The HSbooster.eu training academy was recommended to the partners, in particular the beginner modules on the role of standardisation in research and on quality infrastructure, and the intermediate modules on how to find a standard and how to take part in its development. The CEN-CENELEC Guide 39 on the role of standards in supporting technology transfer was also circulated as reference reading.

A roadmap of this kind can be written, submitted and then have no effect on the standardisation community, which was identified as a risk at the start of the task. The mitigation adopted was to keep the ambition proportionate to what the partners are prepared to do, to involve a national standardisation body from the beginning, and to route the actions through the exploitation activities, where there is a commercial reason to carry them out. Whether that mitigation is sufficient will be visible in the twelve months after the end of the project.



4. Future Action Plan and Maintenance Strategy

The action plan is organised over three horizons. The short term covers the closing phase of the project and the months immediately after it, and contains the actions that can be completed with what the project has now. The medium term covers roughly the following one to three years, and contains the actions that depend on a partner deciding to engage. The long term covers what would happen if that engagement takes hold, and is stated as a possibility rather than as a plan.

Table 5. Standardisation action plan

Action	Horizon	Expected owner	Notes
Request access to up to three standards through HSbooster.eu and read them against the project results	Short	Task 8.4 leader with the technology partners	Priority on the ISO/TC 184/SC 4 standards on industrial data and on the terminology documents of SC 5
Draft the terminology note on zero-defect manufacturing based on the project documents	Short	Task 8.4 leader, reviewed by the technical work package leaders	Low cost and independent of any decision to join a committee
Check, country by country, whether national mirror committees exist for the priority committees and what participation requires	Short	Each partner with its own national standardisation body	UNI is the first point of contact for the Italian partners
Circulate this roadmap to the partners together with the HSbooster.eu material and Guide 39	Short	Task 8.4 leader within the WP8 dissemination activities	Keeps the roadmap available to the people who will decide on exploitation
Link the roadmap to the key exploitable results, so that each result has a standardisation position	Short	Exploitation activities of WP8	Makes the standardisation argument visible where investment decisions are taken
Contact the secretariats or the mirror committees of ISO/TC 184/SC 4 and SC 5 to present the results and ask about ongoing work	Medium	Technology partners, supported by their national standardisation body	The outcome of this contact determines whether a written contribution is worth preparing
Submit the terminology note as written input to the relevant committee	Medium	The partner that joins the mirror committee	Depends on the previous action; a contribution can normally be submitted only through a national delegation
Prepare and submit a position paper on interoperability of hybrid twins	Medium	Technology partners	Depends on a suitable work item being open or planned
Follow the work of ISO/IEC JTC 1/SC 42 on AI terminology and data quality and report anything that affects the project results	Medium	The partners responsible for the severity estimation and	Can be done as an observer, at low cost



Action	Horizon	Expected owner	Notes
		the decision support system	
Keep track of revisions of the composites and non-destructive testing standards used by the project	Medium	The partners bringing the inspection tools to market	Routine monitoring, part of normal product management
Nominate an expert to a national mirror committee of one of the priority committees	Long	One or more technology partners	Requires a commitment of time over several years and is a decision for the organisation, not for the project
Contribute to a new or revised work item covering hybrid twins or in-process quality control	Long	Whichever partner is by then active in the committee	Possible outcome rather than a planned action
Look for a joint contribution with other projects working on zero-defect manufacturing or digital twins	Long	Any partner active in the relevant community	A shared contribution carries more weight than a single project

Maintenance strategy

A roadmap written at the end of a project becomes obsolete quickly unless someone keeps it. There is no dedicated funding for this after the end of FLASH-COMP, and any maintenance arrangement that assumes otherwise would not survive contact with reality. The arrangement proposed here is therefore deliberately light.

The document remains available as a public deliverable, which means that partners and third parties can retrieve it without asking anyone. Within the consortium, the roadmap is attached to the exploitation activities rather than kept as a document of its own, so that it is looked at when the key exploitable results are reviewed. MADE, as leader of the standardisation task, keeps the working copy of the committee list and the notes behind it, and remains available to the partners as a point of contact on standardisation questions after the end of the project.



5. Conclusion

The standardisation environment around FLASH-COMP is discontinuous. On the materials side, in composites and in non-destructive testing, the committees are mature and productive and the project is a user of what they publish. On the side of industrial data, twins and artificial intelligence, which is where the results of the project are most distinctive, the subjects are still being defined. That is where a contribution is possible, and it is also where the timescales are least predictable.

Three gaps were identified. The clearest one concerns hybrid twins: the existing work addresses digital twins, and nothing was found covering the combination of physics-based and data-driven models that the project uses, or the interfaces such a combination would need. The second concerns the vocabulary of zero-defect manufacturing, where terms are used with meanings that are close but not aligned. The third concerns measurements taken during production and used for control, where the existing standards assume tests on specimens or finished parts.

The project has chosen a level of engagement that matches what its partners can realistically sustain. FLASH-COMP will not propose new standards. It will follow a small number of committees, offer written input on terminology and on hybrid twin interoperability, and use the national member bodies as the route of access.

What determines whether this roadmap has any effect is what happens in the year after the project closes, and it will be decided by the partners with a commercial interest in the results rather than by the consortium as such.



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- [11] ISO 14044, Environmental management. Life cycle assessment. Requirements and guidelines.
- [12] ISO 14126, Fibre-reinforced plastic composites. Determination of compressive properties in the in-plane direction.
- [13] ISO 1628-1, Plastics. Determination of the viscosity of polymers in dilute solution using capillary viscometers. Part 1: General principles.



Annex I. Identified committees and reference standards

The table below consolidates the committees and reference standards identified during the state-of-the-art analysis and revised during the HSbooster.eu service. It is reported in full, including the entries that were examined and set aside, so that a reader can see what was considered and not only what was retained.

Table 6. Consolidated list of identified committees and reference standards

Level	Committee	Subject	Outcome of the assessment
CEN	CEN/TC 249 and SC 2	Plastics; composites, reinforcements and prepregs	Retained as a source of standards. Substantive work partly in ISO/TC 61.
CEN	CEN/TC 138	Non-destructive testing	Retained as a source of standards. Work programme dominated by EN ISO items.
CEN	CEN/TC 442 and WG 9	Building information modelling; digital twins for the built environment	Set aside. WG 9 excludes digital twins outside the built environment.
CEN	CEN/TC 310	Advanced manufacturing technologies and their applications	Set aside. No evident own activity.
ISO	ISO/TC 61 and SC 13	Plastics; composites and reinforcement fibres	Retained as a source of standards and terminology.
ISO	ISO/TC 135	Non-destructive testing	Retained as a source of standards and practice.
ISO	ISO/TC 184/SC 4	Industrial data	Priority committee for data interoperability.
ISO	ISO/TC 184/SC 5	Interoperability, integration and architectures for enterprise systems and automation applications	Priority committee for terminology and integration architectures.
ISO	ISO/TC 207/SC 1	Environmental management systems; ISO 14001	Retained as a framework used by the project.
ISO	ISO/TC 207/SC 5	Life cycle assessment; ISO 14044	Retained as a framework used by the project.
ISO	ISO/TC 299	Robotics	Set aside. Outside the subject of the project.
ISO/IEC	ISO/IEC JTC 1/SC 42	Artificial intelligence	Priority committee for AI terminology and data quality.
ISO/IEC	ISO/IEC JTC 1/SC 7	Software and systems engineering	Retained at low priority, for the software platform.
IEC	IEC/TC 65	Industrial-process measurement, control and automation	Retained. Engagement would come from the technology suppliers.
IEC	IEC/SC 65B	Measurement and control devices	Retained at medium priority.
IEC	IEC/SC 65E	Devices and integration in enterprise systems	Retained at medium priority.



Level	Committee	Subject	Outcome of the assessment
Standards	ISO 14126	Compressive properties of fibre-reinforced plastic composites, developed by ISO/TC 61/SC 13	Used by the project.
Standards	ISO 1628-1	Viscosity of polymers in dilute solution, developed by ISO/TC 61/SC 5	Examined as an example of the test method standards in the field.
Standards	ISO 14001 and ISO 14044	Environmental management and life cycle assessment	Used by the project for the environmental assessment.



Annex II. Support received from the HSbooster.eu Standardisation Service

HSbooster.eu is a Horizon Europe initiative that provides projects with expert support on standardisation, free of charge, over a delivery period of about three months. The service works through a small number of meetings with an assigned expert: an introductory meeting in which the project explains its objectives and the expert presents the field, one or two intermediate meetings with advice on concrete actions, and a final meeting with a written report and suggested future actions. The service can also give access to published standards, reimbursing the fees for up to three of them, and can help with access to a standardisation committee through the national mirror committees.

FLASH-COMP applied to the service in order to obtain an independent review of its state-of-the-art analysis, including the committees identified at European and international level, help in identifying gaps in the existing standards, and advice on how to establish contact with the relevant technical committees. The project was assigned Knut Jetlund of the Norwegian Mapping Authority, who has worked with standards for two decades in ISO/TC 211, ISO/TC 204 and the Open Geospatial Consortium and is convenor of two ISO groups.

The service was delivered through three meetings. In the first, on 27 September 2024, the project was presented, with its two main topics of zero waste and data interoperability, and the expert introduced the service, the training academy, the difference between official and industry standards and the importance of not duplicating standards that already exist. The project undertook to provide its public deliverables and the draft state-of-the-art analysis.

The second meeting, on 30 October 2024, was devoted to the findings from the deliverables provided and from the state-of-the-art analysis. Three points from that discussion shaped this deliverable. The first is the clarification that the standardisation roadmap announced in D8.1 as ER10 would be delivered at the end of the project. The second is the identification of the two topics that the project would consider for standardisation, namely terminology for zero-defect manufacturing and interoperability for twins, with the observation that the existing standards address digital twins and not hybrid ones. The third is the clarification of the level of involvement foreseen: following the committees rather than proposing standards, at partner level rather than project level, possibly with white papers or general input. The expert also reported that he had reviewed the identified committees and proposed changes in a separate document, and asked whether any relevant business consortium existed in this field; none was found.

The final meeting took place on 16 December 2024 and closed the service with the expert's recommendations.

The recommendation on how to proceed was set out in two stages. The first stage is to define the standardisation needs of the project before looking at standards, that is, to determine where standardisation could support the project and which project results could be a subject for standardisation, and only then to search for standards in those areas. The search should start from the CEN committees, checking published standards and work programmes, and move to ISO where the work programme consists mostly of EN ISO items, since this indicates that the substantive work is taking place in ISO. The comparison between the project results and the identified standards should then be made at a high level, highlighting where the existing standards appear inadequate or missing.



The second stage is the roadmap itself: a timeline with the key milestones for standardisation activities, including any documents that could be offered as input, and a set of specific actions. For this project those actions were listed as identifying the committees and standards that matter most, gaining access to the relevant published standards, studying them in detail, defining the gaps and suggesting improvements, identifying key contacts within the committees, checking whether national mirror committees exist at the national standardisation bodies of the partners, reaching out to those bodies and committees, and potentially joining relevant standardisation activities as experts. Section 4 of this deliverable follows that list.

The expert also recommended the HSbooster.eu training material, in particular the beginner modules on the role of standardisation in research and innovation and on quality infrastructure, and the intermediate modules on finding standards and taking part in their development, together with CEN-CENELEC Guide 39 on the role of standards in supporting technology transfer. The premium service offered by HSbooster.eu was not recommended for FLASH-COMP, given that the project intends to follow the standardisation activities of its individual partners rather than to initiate standardisation activities of its own.