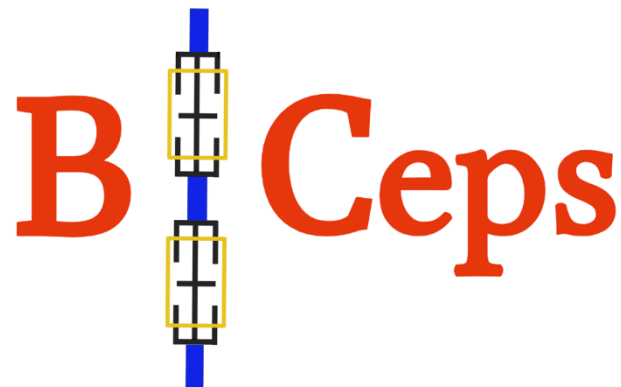




D1.4 Data Management

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ABBREVIATION GLOSSARY

Abbreviation	Extended definition
CA	Consortium Agreement
DoA	Description of Action
EC	European Commission
EISMEA	European Innovation Council and SMEs Executive Agency
GA	Grant Agreement
MB	Management Board
IP	Intellectual Property
PC	Project Coordinator
TL	Task Leader
WP	Work Package
WPL	Work Package Leader
KPI	Key Performance Indicator
OA	Open Access
R&I	Research and Innovation
TA	Target Audience
DMP	Data Management Plan
CDE	Communication, Dissemination and Exploitation

1 INTRODUCTION

The Data Management Plan (DMP) for the BiCeps project outlines a comprehensive and systematic approach to managing the data generated throughout the project's lifecycle. This document provides a detailed description of the types of data to be produced, methodologies for data collection, generation, processing, and management, as well as strategies for ensuring data quality, accessibility, and long-term preservation.

BiCeps will generate a diverse range of data from both experimental and computational activities. Experimental data will include microscopy images, spectroscopy spectra, mechanical and performance testing results, thermal, electric and magnetic analysis data. Computational data will encompass modelling files, simulation outputs, and analytical datasets. All data will be carefully curated, documented using standardized metadata, and stored in institutional, secure, reliable repositories to ensure data integrity, traceability, and accessibility with routine backups and access controls to safeguard confidentiality and data integrity.

In alignment with the FAIR (Findable, Accessible, Interoperable, and Reusable) principles, the project will adopt robust metadata schemas and data documentation practices to maximize the reusability and discoverability of the data. BiCeps is committed to the principles of open science. To this end, research data will be made openly available through trusted repositories such as Zenodo run by CERN under OpenAIRE compliance and visibility, whenever feasible. Certain datasets may be subject to temporary embargos or access restrictions to protect intellectual property, commercialization, and publication priorities. The project will implement mechanisms to minimize such restrictions and ensure timely data sharing.

Ensuring data security and regulatory compliance is a central priority. BiCeps will adhere to internationally recognized data security good practices, employ encryption and secure transfer protocols, and conduct regular controls. Additionally, all activities involving personal data will comply with the General Data Protection Regulation (GDPR) and relevant ethical guidelines.

The DMP is a living document that will be periodically updated to reflect new datasets, changes in project direction, policy developments, or evolving best practices. It serves as a dynamic tool for ensuring responsible data stewardship throughout the project.

2 DOCUMENT STRUCTURE

The DMP is structured in accordance with the Horizon Europe guidelines. It includes the following sections:

Data Management - clearly defined roles and responsibilities to ensure that all data-related activities are systematically coordinated, monitored, and implemented.

Data Summary – a description of the data types, sources, and expected volumes.

FAIR Data – measures to ensure that data is findable, accessible, interoperable, and reusable.

Data Security – procedures for data storage, backup, and access control, including measures for secure handling of sensitive data.

Ethics and Legal Compliance – consideration of GDPR, consent, licensing, and ethical standards.

This DMP reflects BiCeps strong commitment to responsible research data management and to contributing high-quality, openly accessible data to the broader scientific community.

3 BiCEPS DATA MANAGEMENT

3.1 ABOUT DATA MANAGEMENT

The DMP is designed to ensure that all data produced are carefully curated, securely stored, and made accessible to support future research and innovation. BiCeps is committed to maintaining a living DMP that is regularly updated throughout the project lifecycle (update 1 in M30 and update 2 in M48).

BiCeps data management policy addresses aspects at both administrative and technical levels. This includes protocols for data and metadata collection, procedures for handling personal and sensitive data in compliance with GDPR, repository infrastructure requirements, and adherence to OpenAIRE interoperability standards.

The BiCeps DMP follows the Horizon Europe DMP template and reflects the status of data collection, processing, and generation within the project. It specifies whether and how the data will be shared and/or made openly available, and the mechanisms for data curation and preservation. As a public document, the DMP will be accessible on the official BiCeps project website to ensure transparency, accessibility, and alignment with open science practices.

3.2 ROLES AND RESPONSIBILITIES

Effective data management within BiCeps relies on clearly defined roles and responsibilities to ensure that all data-related activities are systematically coordinated, monitored, and implemented in alignment with the DMP. The key roles and their associated responsibilities are outlined below.

Project Data Manager

The Brno University of Technology (BUT), as the Project Coordinator, will act as the Project Data Manager and will oversee the overall coordination and implementation of the DMP. Key responsibilities include:

- Developing the DMP in collaboration with technical partners.
- Ensuring compliance with the project's data management policy across all work packages.
- Coordinating data collection, storage, and publication procedures.
- Monitoring data management activities, setting internal deadlines, and issuing reminders to Work Package (WP) Data Managers.
- Providing guidance and solutions to resolve data management challenges.
- Leading the preparation and regular updates of the DMP deliverable.
- Create, operate and control a secure, access-controlled Network Attached Storage (NAS) server for safe data storage and share at BUT informatic infrastructure.

Work Package (WP) Data Managers

Each WP Leader, or the designated lead, will serve as the Data Manager for their respective institution and WP, with responsibilities including:

- Overseeing data management at the institutional level and ensuring compliance with the project's DMP and Horizon Europe requirements.
- Implementing the data management policy within their WP.
- Ensuring that data management aligns with the project's research objectives and legal obligations.
- Monitoring and ensuring timely data collection, storage, and publication.
- Ensuring that open results are properly deposited and linked with the BiCeps project in OpenAIRE-compliant repositories like Zenodo.
- Coordinating with the Project Data Manager to resolve data-related issues.
- Reviewing and approving revisions to the DMP.
- Supporting the selection of appropriate publication pathways (e.g., gold open access).
- Providing guidance on the publication of scientific outputs and ensuring compliance with Horizon Europe open access mandates.
- Ensuring that research publications and associated datasets are deposited in relevant repositories and correctly linked to the project.
- Monitoring embargo periods and sending reminders to partners.
- Ensuring that metadata related to publications is made available via the R&I Participant Portal and trusted repository (e.g., Zenodo).

Project Team Members

All members of BiCeps consortium share responsibility for the proper handling of research data. This includes:

- Collecting, processing, and documenting data in accordance with established protocols.
- Ensuring the quality, accuracy, and integrity of datasets.
- Adhering to the project's data management policies and FAIR principles.
- Communicating with partners to gather missing information or clarify data management procedures.
- Contributing to the preparation and review of the DMP deliverables.
- Providing tailored support and guidance on publishing open data.
- Ensuring that open research outputs are deposited in the designated default or a complementary OpenAIRE-compliant repository.

By assigning specific roles and delineating responsibilities, BiCeps ensures a consistent and transparent approach to data management, enabling the production of high-quality, reusable data and facilitating open access to research outputs in accordance with Horizon Europe guidelines.

4 DATA SUMMARY

BiCeps will generate a wide range of data derived from both experimental and computational research activities. These data are essential for achieving the project's scientific objectives and will be managed in accordance with the principles of open science and FAIR data management.

4.1 TYPES OF DATA GENERATED

Experimental Data

1. **Microscopy Images:** High-resolution images acquired via electron (SEM, TEM), optical, and fluorescence microscopy, used to examine the microstructure and morphology of materials. These will be stored in formats such as JPEG, TIFF, and proprietary software-specific formats.
2. **Spectroscopy Spectra:** Data from X-ray diffraction (XRD), Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), energy dispersive spectroscopy (EDS), electron backscatter diffraction (EBSD), and Fourier-transform infrared spectroscopy (FTIR), providing insights into the chemical composition and structure of the materials. Stored in XML, RAW, and CSV formats.
3. **Mechanical Testing Data:** Results from tensile, compression, bending, fatigue, hardness, fracture toughness tests, and performance experiments. Recorded in Excel spreadsheets and CSV/JSON formats.
4. **Thermal Analysis Data:** Outputs from differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and mass spectroscopy (MS), used to assess

thermal stability and decomposition behaviour. Stored in Excel and dedicated analysis software formats.

5. **Electromagnetic Data:** Results from resistivity, impedance, dielectric spectroscopy, ferroelectric hysteresis, magnetometry, and piezoelectricity. Stored in Excel, RAW, DAT, TXT, XML, and dedicated analysis software formats.

Computational Data

1. **Modelling Files:** Input and output files from simulations using tools like finite element analysis (FEA), molecular dynamics (MD), and thermodynamic models. Stored in formats including INP (Abaqus), GRO, and XTC (GROMACS), among others.
2. **Simulation Results:** Numerical outputs from simulations such as stress-strain curves, energy distributions, stress distributions, displacements, deformation seed, and output force. Stored in HDF5, CSV, and software-specific formats.
3. **3D models:** 3D objects generated by computer aided design will be storage as STL, OBJ, and software-specific formats.

Analytical Data

1. **Processed Data:** Data derived from raw experimental and computational sources, including calculated parameters and summarized results. Stored as Excel, CSV, and PDF files.
2. **Statistical Analysis:** Data from statistical validation and hypothesis testing, saved in SPSS, R script files, and Excel.

Documentation and Metadata

1. **Standard Operating Procedures (SOPs):** Detailed documentation of experimental methods, simulation protocols, and data workflows. Formats include Word, PDF, and HTML.
2. **Metadata:** Descriptive information accompanying each dataset, including details on experimental conditions, simulation parameters, provenance, and quality metrics. Stored in JSON, XML, and CSV formats.

4.2 DATA FORMAT AND SCALE

BiCeps anticipates generating substantial volumes of data in diverse formats and scales. The table below summarize the key data types and estimated volumes.

Data Type	Estimated Quantity	File Size Range
Microscopy Images	~10,000 images	1 MB – 100 MB per file
Spectroscopy Spectra	~500 files	10 MB – 200 MB
Mechanical Testing Data	~200 datasets	1 MB – 50 MB

Thermal Analysis Data	~100 datasets	1 MB – 20 MB
Modelling Files	~2,000 files	10 MB – 500 MB
3D Models	~500 files	100 MB - 200 MB
Simulation Results	~1,000 datasets	100 MB – 2 GB
Processed Data	~500 datasets	1 MB – 50 MB
Statistical Analysis	~300 datasets	1 MB – 10 MB
SOP Documents	~100 documents	100 KB – 10 MB
Metadata Files	One per primary dataset	10 KB – 1 MB

4.3 DATA STORAGE

Over the course of the project, the total volume of data generated is expected to reach several terabytes (TB). All data will be stored on institutional secure, access-controlled servers, including the NAS device of the High-Performance Materials and Coatings for the Industry research group at BUT, with regular automated backups to ensure integrity and long-term availability.

Open data will be made accessible through repositories compliant with OpenAIRE standards, such as Zenodo, ensuring discoverability and reuse by the broader scientific community. Clear data sharing policies will be implemented to maximize openness while safeguarding intellectual property rights and protecting sensitive information.

4.4 DATA MANAGEMENT

Data management will include the following practices.

- **Documentation and Metadata:** Every dataset will be accompanied by rich metadata to ensure discoverability, interpretability, and reuse.
- **Quality Assurance:** Regular validation and internal control will be performed to maintain data consistency and reliability.
- **Access and Sharing:** The project will promote open access in line with FAIR principles. Where necessary, temporary embargoes may be applied to protect intellectual property, commercialization, and support publication strategies. These will be minimized and lifted as appropriate.

By adhering to these practices, BiCeps will ensure that the data it generates are of high quality, well-documented, securely stored, and broadly reusable. This supports not only BiCeps research objectives but also the broader goals of transparency, collaboration, and innovation in materials science and additive manufacturing.

5 FAIR DATA

5.1 ENSURING DATA FINDABILITY, INCLUDING THE PROVISION OF COMPREHENSIVE METADATA

To ensure that data generated by BiCeps is easily discoverable and accessible, the project will adhere to rigorous metadata standards and implement robust data documentation practices. The following strategies will be adopted.

Metadata Standards

All datasets will be accompanied by comprehensive metadata, compliant with established standards appropriate to the type and domain of data collected. Key metadata standards include:

- **Dublin Core:** Utilized for general data description, including elements such as title, creator, subject, description, publisher, contributor, date, type, format, identifier, source, language, relation, coverage, and rights.
- **DataCite:** Adopted to support dataset citation and to enable linkage between datasets and scholarly publications.

Core Metadata Elements

Each dataset will include the following metadata components:

- **Dataset Title:** A descriptive and concise title accurately reflecting the dataset content.
- **Authors/Creators:** Names and institutional affiliations of the dataset creators.
- **Abstract/Description:** A summary outlining the purpose of data collection, methodology, and relevant contextual information.
- **Keywords:** Terms facilitating dataset indexing, retrieval, and thematic classification.
- **Date of Collection:** Timeframe during which data was collected or generated.
- **Geographic Location:** The physical location of data collection, if applicable.
- **Methodology:** Detailed description of the experimental or computational methods used.
- **Data Format:** Specifications of file formats and any required software or tools.
- **Access Conditions:** Information regarding access rights, including any applicable restrictions or licenses.
- **Related Publications:** Citations to any scholarly work describing or utilizing the dataset.

Naming Conventions

All datasets and files will follow consistent and clear naming conventions, incorporating elements such as the project acronym, data type, collection date, and version number to ensure traceability and clarity.

Version Control

Each dataset will include version identifiers to document updates and revisions. This will enable users to reference the most current version while preserving access to earlier iterations.

Data Cataloguing

Datasets will be catalogued in a centralized repository (e.g., Zenodo) with complete metadata records. The catalogue will be searchable and will facilitate data discovery for researchers and stakeholders.

Persistent Identifiers

Each dataset will be assigned a persistent identifier (e.g. Digital Object Identifiers (DOIs)) to ensure stable and long-term citation and access. Repositories such as Zenodo will be used to support DOI assignment.

Repository Interoperability

Metadata will be structured to ensure compatibility with major repositories and indexing services, including OpenAIRE and DataCite, thereby enhancing visibility, interoperability, and discoverability of the data.

5.2 ENSURING OPEN ACCESSIBILITY OF DATA TO THE PUBLIC AND SCIENTIFIC COMMUNITY

BiCeps is firmly committed to making all generated data openly accessible to the scientific community and relevant stakeholders. Data will be as open as possible (ensuring reproducibility and reusability) and as closed as necessary (allowing protection of results for commercialization during and after BiCeps). The approach is aligned with the principles of open science and adheres to the FAIR data management guidelines. The strategies to ensure open access are as follows.

Open Access to Scientific Publications

In accordance with the Horizon Europe requirements, all beneficiaries must provide open access to peer-reviewed scientific publications resulting from project activities. BiCeps will fulfil this obligation through two primary routes:

Gold Open Access: Publications will be submitted to open-access journals where articles are freely available upon publication. The project will cover article processing charges (APCs) where applicable.

Green Open Access (Self-Archiving): Authors will deposit a copy of the accepted manuscript in a trusted repository (e.g., institutional repository, Zenodo) to ensure free public access. Any embargo periods will be kept to a minimum, as permitted by the publisher's policies.

Open Access to Research Data

BiCeps will ensure open access to research data in accordance with the Horizon Europe Open Research Data Pilot. The main measures include:

Data Deposition: All datasets will be deposited in reliable, OpenAIRE-compliant repositories such as Zenodo. These platforms ensure long-term data preservation and discoverability.

Accessibility: Data will be made available at no cost, with clearly defined terms of use. Where necessary, access restrictions will be implemented to safeguard sensitive data, intellectual property, ongoing research, or commercialization.

Metadata and Documentation: Each dataset will be accompanied by detailed metadata and documentation to provide context and enable effective reuse.

Licensing: Data will be shared under open licences, such as Creative Commons (e.g., CC BY or CC0), enabling broad reuse while ensuring proper attribution.

Data Accessibility and Supporting Tools

The following tools will be implemented for data accessibility and support data shearing:

Data Formats: To promote interoperability, data will be shared in widely adopted, non-proprietary formats such as CSV, JSON, XML, PDF, among others.

Access Platforms: BiCeps website and associated repositories will serve as primary access points, offering search and download functionalities.

Supporting Tools: Information will be provided regarding the software and tools required to access, process, and interpret the data, including download links, user manuals, and technical documentation.

Addressing Accessibility Challenges

Sensitive Data: In cases where datasets include personal or sensitive information, measures will be taken to anonymize the data or implement controlled access protocols in accordance with GDPR and other applicable regulations.

Embargo Periods: To protect intellectual property, support pending publications and commercialization, some datasets may be subject to temporary embargoes. The reasons and duration of such embargoes will be clearly communicated, and open access will be granted as soon as feasible.

5.3 ENSURING DATA INTEROPERABILITY

To ensure that data generated by BiCeps can be seamlessly integrated with other datasets and used across various platforms, BiCeps will implement a set of strategies to promote data interoperability. These efforts aim to facilitate data exchange and reuse across disciplines, institutions, and systems, thereby supporting broader scientific collaboration and innovation.

Use of Standardized Formats and Protocols

BiCeps will adopt widely accepted, non-proprietary data formats and communication protocols to ensure compatibility with diverse software tools and infrastructures. Key practices include:

Data Formats: Utilization of interoperable formats such as CSV, JSON, XML, HDF5, PDF, and TIFF to store different types of data. These formats are widely supported and enable efficient data exchange across systems.

Metadata Standards: Use of established metadata schemas including Dublin Core and DataCite, which ensure that metadata is structured consistently and can be easily interpreted and harvested by external systems.

Controlled Vocabularies and Ontologies

To ensure terminological consistency and enhance the semantic clarity of the data, BiCeps will adopt controlled vocabularies and domain-specific ontologies:

Domain-Specific Ontologies: Implementation of ontologies relevant to materials science and computational modelling to accurately annotate datasets.

Controlled Vocabularies: Use of standardized terms for describing materials, experimental methods, instrumentation, and analytical procedures to ensure uniform interpretation of data.

Adherence to Interoperability Standards

BiCeps will comply with internationally recognized standards to maximize interoperability and alignment with broader data infrastructures:

OpenAIRE Guidelines: Conformance with OpenAIRE interoperability guidelines to ensure datasets can be indexed and harvested effectively by OpenAIRE services.

Research Data Alliance (RDA) Recommendations: Adoption of best practices from the RDA to support robust and scalable data sharing across disciplines.

Semantic Interoperability

Beyond structural compatibility, BiCeps aims to achieve semantic interoperability by implementing measures that ensure shared meaning across datasets:

Rich Metadata Descriptions: Provision of comprehensive metadata that includes contextual and methodological information to enhance interpretability.

Persistent Identifiers: Use of persistent identifiers such as DOIs to establish unambiguous links between datasets, publications, software, and other research outputs, thus enabling a navigable and interconnected research ecosystem.

Data Documentation and Provenance

BiCeps will maintain detailed documentation and provenance records to provide transparency and traceability:

Data Provenance: Thorough recording of data origins, collection methodologies, processing workflows, and any transformations applied to the data.

User Documentation: Development of user guides and technical documentation to support data discovery, access, and reuse by both internal and external users.

Interoperable Data Repositories

The project will deposit datasets in repositories that are designed to support interoperability and integration:

Standard Protocol Support: Repositories will implement protocols such as OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) to facilitate metadata harvesting and federation.

Cross-Repository Discovery: Support for cross-platform search functionality, allowing users to locate related datasets stored in different repositories.

5.4 MAXIMIZING THE REUSABILITY OF PROJECT DATA

To ensure that the data generated by BiCeps is effectively reused by the scientific community and other stakeholders, a comprehensive strategy will be implemented. These measures align with the FAIR principles and aim to support sustainable and responsible data sharing.

Licensing and Usage Rights

Open Licensing: All datasets will be released under permissive open licenses such as Creative Commons CC BY or CC0, enabling unrestricted access, use, and redistribution with appropriate attribution.

Clearly Defined Terms of Use: Each dataset will include clearly articulated terms and conditions to ensure users fully understand their rights and responsibilities regarding data reuse.

Comprehensive Documentation

Rich Metadata: Each dataset will be accompanied by detailed metadata, documenting the context, methodology, data structure, and processing steps involved in its creation.

User Support Materials: User guides, technical documentation, and FAQs will be provided to facilitate data discovery, interpretation, and reuse by a wide range of users.

Ensuring Data Quality and Integrity

Quality Assurance Measures: Robust validation procedures and regular controls will be conducted to ensure the accuracy, completeness, and reliability of the data.

Version Control: A formal versioning system will be employed to record updates and changes to datasets, ensuring traceability and consistent access to the most current and relevant versions.

Long-term Preservation

Trusted Repositories: Data will be archived in certified, long-term repositories such as Zenodo, ensuring secure preservation and broad accessibility.

Retention Policy: In line with institutional and international best practices, datasets will be retained for a minimum of 10 years following BiCeps conclusion.

Enhancing Discoverability

Indexing and Cataloguing: All datasets will be indexed in publicly searchable catalogues and repositories, enhancing their visibility and discoverability across research domains.

Persistent Identifiers: DOIs or other persistent identifiers will be assigned to all datasets to support stable citation, long-term access, and proper attribution.

Community Engagement

Collaboration and Feedback: BiCeps will foster interaction with the broader scientific community through workshops, open forums, and stakeholder consultations, encouraging feedback on data usability and facilitating best practices in reuse.

Dissemination and Outreach: The project will actively promote dataset reuse via its website, open-access publications, presentations, and targeted communication channels.

6 DATA SECURITY

Ensuring the security of data generated by BiCeps is of utmost importance. BiCeps will implement robust data protection measures to safeguard the confidentiality, integrity, and availability of all datasets. These efforts will align with internationally recognized standards and best practices in information security management.

6.1 ADHERENCE TO FORMAL INFORMATION AND DATA SECURITY STANDARDS

BiCeps will align with the following best practices for information and data security.

- **ISO/IEC 27001 Compliance:** BiCeps will follow the ISO/IEC 27001 standard for information security management systems (ISMS), providing a systematic framework for managing sensitive data and minimizing risks.
- **Access Control:** Role-based access permissions will be implemented to ensure that only authorized individuals can access sensitive or restricted datasets.
- **Data Encryption:** Strong encryption protocols will be applied to secure data both during transmission and while at rest.
- **Secure Storage Infrastructure:** All data will be stored on secure institutional servers with comprehensive physical and digital safeguards, including redundant systems and continuous monitoring. The main storage server will be the NAS device of the High-Performance Materials and Coatings for the Industry research group at BUT.
- **Regular Security Controls:** Periodic security assessments, including penetration testing and vulnerability scanning, will be conducted to detect and address potential threats proactively.

6.2 MAIN RISKS TO DATA SECURITY AND MITIGATION MEASURES

Risk mitigation measures according to the type of risk are provided below.

1. Data Loss

- **Risk:** Loss of data due to accidental deletion, hardware failure, or natural disasters.
- **Mitigation:** Implementation of automated, routine backups and redundant storage solutions to support full data recovery.

2. Unauthorized Access

- **Risk:** Access by unauthorized individuals leading to potential misuse or breaches.
- **Mitigation:** Enforcement of strict role-based access controls and the application of end-to-end encryption protocols.

3. Data Corruption

- **Risk:** Corruption caused by software bugs, malware infections, or hardware malfunctions.
- **Mitigation:** Regular integrity checks, use of reliable storage infrastructure, and deployment of up-to-date antivirus and anti-malware software.

4. Data Breaches

- **Risk:** Cyberattacks such as phishing, hacking, or ransomware may compromise system integrity.
- **Mitigation:** Deployment of firewalls, intrusion detection/prevention systems (IDS/IPS), and regular updates to security software. Security policies will be reviewed and controlled periodically.

5. Insider Threats

- **Risk:** Malicious or negligent actions by individuals within the project team or partner institutions.
- **Mitigation:** Ongoing training for all personnel, strict access control policies, and regular monitoring of data access logs to detect unusual behaviour.

6.3 DATA ANONYMIZATION AND GDPR COMPLIANCE

- **Anonymization:** Any sensitive or personal data will undergo anonymization to ensure that individuals cannot be identified, directly or indirectly, from the information provided.
- **Compliance with GDPR:** All data collection, storage, and processing activities will be fully compliant with the GDPR, safeguarding personal data and individual privacy rights.

6.4 INCIDENT RESPONSE AND TRAINING

- **Incident Response Plan:** BiCeps will establish clear procedures for handling data breaches, including rapid containment, impact assessment, notification, and recovery actions.
- **Training and Awareness:** All project personnel will receive training on data security, including secure data handling practices, GDPR compliance, and response protocols for data incidents.

7 ETHICAL ASPECTS

BiCeps is firmly committed to conducting research in an ethical manner, ensuring full compliance with all applicable regulations and guidelines. In particular, the project will adhere to the GDPR to safeguard personal data and uphold privacy rights. Personal data will be processed lawfully, fairly, and transparently, with informed consent obtained whenever necessary.

BiCeps complies with the Charter of Fundamental Rights of the European Union. The research objectives, activities and methodologies described in the Grant Agreement, Description of Action and Implementation Plan are not prohibited in the European Union, do not involve human beings, personal data collection, and the use of local resources. There are no risks to researchers and staff caused by the research, and all the activities will be conducted attached to the good laboratory practices. Moreover, no negative consequences or significant harm are expected.

Data collection will be limited strictly to what is necessary to achieve the project's objectives, and all data will be used exclusively for specified, explicit purposes. The principles of data minimization will be rigorously applied, and if acquired any personal data will be anonymized or pseudonymized to enhance privacy protection. Robust data security measures will be implemented to prevent unauthorized access, and data subjects will be fully informed of their rights, including the rights to access, rectify, and erase their personal data.

7.1 ALIGNMENT WITH THE GDPR

BiCeps research activities do not involve human beings and personal data collection. However, if needed, BiCeps will strictly comply with the GDPR to safeguard personal data and privacy. Personal data will be processed lawfully, fairly, and transparently. Informed consent will be obtained from data subjects where necessary, ensuring they understand how their data will be used. BiCeps will adhere to data minimization principles, collecting only data essential to achieving its objectives.

Data will be anonymized or pseudonymized to protect individual privacy. Robust data security measures including encryption and access controls will be enforced to prevent

unauthorized access. Data subjects will be informed of their rights under the GDPR, including rights to access, rectify, and erase their personal data.

The project will ensure full compliance with all relevant GDPR principles, including purpose limitation, data minimization, accuracy, storage limitation, integrity and confidentiality, and accountability.

7.2 LAWFULNESS, FAIRNESS, AND TRANSPARENCY

BiCeps is committed to processing personal data in a lawful, fair, and transparent manner in accordance with the GDPR. This commitment encompasses the following practices:

- **Lawfulness:** All processing of personal data will be based on valid legal grounds as stipulated by the GDPR. This includes obtaining explicit consent from data subjects when required and ensuring that data processing is necessary for the project's execution.
- **Fairness:** Personal data will be handled in a way that is fair to data subjects, providing transparency about how their data is collected, used, and shared. The project will avoid any practices that could mislead or cause harm to data subjects.
- **Transparency:** BiCeps will maintain openness regarding its data processing activities. If exist, data subjects will be clearly informed about the purposes of data collection, the types of data collected, the intended use of the data, and the parties with whom the data may be shared. This information will be communicated in a clear and accessible manner.

By adhering to these principles, BiCeps ensures responsible handling of personal data, thereby maintaining trust and ensuring compliance with GDPR requirements.

7.3 PURPOSE LIMITATION

BiCeps will strictly adhere to the principle of purpose limitation, ensuring that personal data is collected and processed solely for specified, explicit, and legitimate purposes. Key practices include:

- **Specified Purposes:** Only if needed personal data will be collected only for clearly defined and legitimate research objectives related to the project. These purposes will be communicated transparently to data subjects at the time of data collection.
- **Restriction of Use:** Data will be used exclusively for the purposes for which it was originally collected. Further processing that is incompatible with these purposes will only occur with additional, explicit consent from the data subjects.
- **Transparency:** Data subjects will be fully informed about the specific purposes of data collection and processing, ensuring transparency and compliance with GDPR requirements.

By adhering to these practices, BiCeps guarantees the appropriate and responsible use of personal data, thereby maintaining trust and ensuring regulatory compliance.

7.4 DATA MINIMIZATION

Biceps research activities do not involve human beings and personal data collection. Unnecessary data collection will be avoided, and any data deemed non-essential will be securely deleted or anonymized. Regular reviews will be conducted to ensure that all retained data remains relevant and necessary.

Accuracy

If necessary, BiCeps will ensure that personal data is accurate and kept up to date. Periodic verification of data accuracy will be performed, and any identified inaccuracies will be promptly corrected. Data subjects will have the right to request rectifications to ensure their data remains accurate and reliable.

Storage Limitation

Personal data will be retained only for as long as necessary to achieve BiCeps objectives. Once data is no longer required, it will be securely deleted or anonymized. Data retention periods will be explicitly defined and regularly reviewed to maintain compliance with GDPR and project-specific requirements.

Integrity and Confidentiality

BiCeps will implement robust measures to safeguard the integrity and confidentiality of personal data. These measures include encryption, secure storage solutions, and strict access controls to prevent unauthorized access, alteration, or loss of data. Regular security controls and compliance assessments will be conducted to uphold high standards of data protection.

Accountability

Accountability will be ensured through the implementation and thorough documentation of all data protection measures within BiCeps.

Project Management Board will regularly review data processing activities to verify ongoing compliance with GDPR and other relevant regulations. Any data breaches or compliance concerns will be addressed promptly.

Furthermore, all team members will receive comprehensive training on data protection principles and best practices.

8 FINAL CONSIDERATIONS

This DMP is a living document that will be regularly reviewed and updated to incorporate new data, changes in project policies, and evolving external requirements. By maintaining a dynamic and adaptive approach to data management, BiCeps aims to advance the field of material science and additive manufacturing, promote a culture of open science, and support the ongoing and future research endeavours of the scientific community.

In summary, BiCeps commitment to rigorous data management underscores its dedication to generating high-quality, reliable data that drives innovation and collaboration. Through careful planning and diligent implementation of data management strategies, the project will ensure that its data remains valuable, secure, and accessible for the long term.