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COMPASS 101136940

A data-driven remanufacturing process for sheet metal and thermoplastic composites

Deliverable D1.1 – "Data Management Plan"

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Lead Beneficiary: Profactor

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Dissemination Level		
PU	Public	X
SEN	Sensitive information	

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1. OBJECTIVE

The objective of this deliverable is to describe the collection and use of data in the COMPASS project and in particular how and which data will be made publicly available to other researchers after the end of the project. According to the "Horizon Europe Programme Guide"[1], we distinguish between two types of open access:

- Open access to peer-reviewed scientific publications: Open access is an obligation for scientific publications in Horizon Europe.
- Open access to research data: If data is needed to validate the results presented in a scientific publication, the publication of this data is obligatory. Additional research data may be published on a voluntary basis.

Open access to scientific publications and research data is regulated in article 17 in the Grant Agreement of the COMPASS project.

During the project, data sets mainly will become available related to the two use cases. Apart from that there will also be personal data like contact information that is acquired at conferences and fairs. All these data will be collected on Profactor's file server to make them available for all partners during the project. Special care will be taken in case of personal data, that need to be managed in compliance with the general data protection regulation.

Data that are very interesting for other researchers are the properties such as tensile strength, bending strength or fracture behaviour of the materials made from recycled carbon and glass fibres. To enable further research in this field we follow the FAIR principles[2] (FAIR stands for findable, accessible, interoperable, and reusable). Hence, data, including the necessary meta-data, will be made available online at the end of the project in the "Zenodo research data repository".

Published data will be made available in aggregated form to avoid reverse engineering of information about production processes. For other data, especially CAD data of the parts that were produced, the commercial interests of the industrial partners in the project require that these data do not become available in the public domain.

This document is a living document and will be updated over the course of the project. Whenever new types of data sets are identified, these will be added to create an updated version of the document.

[1] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf (26.7.2022)

[2] Wilkinson, M., Dumontier, M. Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018 (2016). https://doi.org/10.1038/sdata.2016.18 (26.7.2022)

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2. CHANNELS FOR OPEN ACCESS

Data channels for open access will be considered in two different approaches in the COMPASS project. For publication of scientific papers, the focus will be put on conferences and journals that offer open access. For open access data it has to be kept in mind that large storage resources might be required in some cases. The COMPASS project aims at taking advantage of the Zenodo research data repository[3], a collaboration of the OpenAIREplus project for open access repositories, archives and journals and CERN. This data repository provides the possibility to upload research data and make them publicly accessible for download. It will be used for open access in the COMPASS project. The maximum size of a single data set for upload to Zenodo is 50GB. This will be sufficient for the needs of the COMPASS project. All uploads to Zenodo automatically receive a DOI (Digital Object Identifier). The ISO-standardized DOI system is administered by the International DOI Foundation[4] and implements persistent identifiers for electronic documents. Therefore, it will be easy to reference and find data sets of the COMPASS project.

The COMPASS project website will contain links to all COMPASS data sets that are uploaded to Zenodo. This will help researchers from all over the world to get direct access to research data provided by the COMPASS project. However, as maintenance of the project website after the end of the project is not guaranteed over a longer period of time, the website itself will not be the major medium to host open access research data. With an upload of data to the Zenodo portal, accessibility of COMPASS data is well ensured – even long after the end of the COMPASS project.

[3] http://www.zenodo.org (26.7.2022)
[4] http://www.doi.org (26.7.2022)

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3. DATA FORMATS

Initially, data formats used for data representation within the COMPASS project (or at individual project partners) may be proprietary and/or of complex structure. However, when preparing data for open access, the goal is to use standard data formats that are well known and easy to handle. Any data that is present in a highly proprietary complicated format must be converted to easily readable data formats before publication. For example, .png-, .pdf- and .xlsx- files are favoured over complex proprietary binary formats. Every data set that is published will be accompanied by a simple "readme.txt" text file that provides general information about the data as well as a detailed description of the data form.



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4. SOFTWARE AND INTEROPERABILITY

In some cases, it makes sense to provide data with software that is able to load the data and/or process the data in order to make it easier to work with them. From the current status within the project, it is not yet completely clear, how and if such software can be provided with the data. For each data set there will be a decision if and how dedicated software can be provided together with the data set. Preferably, we promote Python as programming language to work with scientific open access data from the COMPASS project. Since Python has become very popular as the language of choice in research, this would make it easy for a large number of researchers to get access to the data and use them.



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5. LICENCES FOR DATA

For open access publication of pure data, the Creative Commons Attribution 4.0 International Public License (IPL)[5] will be considered in the first place. This license essentially provides the right to freely copy and redistribute the material in any medium or format. Re-mixing, transforming, and building upon the material are explicitly permitted. This is granted for any purpose. The licensor cannot revoke these freedoms as long as the license terms are followed.

The use of the IPL is the preferred choice for data publication in the COMPASS project. In specific cases a different license might be considered.

[5] https://creativecommons.org/licenses/by/4.0/legalcode (26.7.2022)

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6. COMPASS DATA SETS

The following list includes the data sets that are expected to be acquired and/or used in the COMPASS project. Each data set is defined by:

- Code: a code consisting of “COMPASS - “and a 4-letter code (e.g. “COMPASS -ABCD”).
- Data set full name: a full name for the data set.
- Responsible beneficiary: the main responsible project partner.
- Description: a general description of the data set.
- Data Format: the expected format of the data.
- Data set size: the expected size of a single data set instance.
- Data sharing: information about whether the data set is confidential (not published) or published under open access criteria.

The subsequent list of data sets defines mainly the type of data. During the lifetime of the project, it is expected that multiple instances for each data set will be acquired. In this case, the specific instances of data sets will additionally be tagged by

- a date when the data set was acquired and
- a textual description of the conditions/environment under which the data were captured or initially generated.

Multiple instances of a single type of data set will be tagged with a running number. For example, data sets for code “SeConRob-ABCD-1”. Additionally, data sets that are uploaded to the Zenodo portal, will receive a unique DOI.

For the data sets listed below the entry, “Data sharing” describes whether data sharing is considered. “Publication” means that the plan is to publish the data set (or at least specific instances). “Confidential” means that the respective data set is not considered for publication.

6.1 Use case: Sheet metal parts re-manufacturing

Code	COMPASS - DEMO
Data set full name	M769-00 - Connector shield sleeve DEMO
Responsible beneficiary	MARK
Description / data type	Data set consists of: • Batch data (Number, date) • Picture of demonstration part • CAD model of demonstration part • Labelled production-drawing with tolerances • Measurement report of production batch • Chemical composition of part (material certificate of raw material) • Reference to IMDS- dataset

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	• FEM- data of final deepdrawn demonstration part (meshed part with local strains)
Data format	*.xlsx; *.txt; *.stp, *.json; *.csv; *.pdf; *.key; *.ans; *.nas; *.dat; *.png
Data set size	several MB
Data sharing	confidential

6.2 Use case: Composite parts re-manufacturing

Code	COMPASS - FLAT
Data set full name	Part-1 Name_Xn (Flat part)
Responsible beneficiary	AITIIP
Description / data type	Data set consists of CAD model of a flattened sheet. Link with the information of the original EoL part. Information regarding layer orientation and potential defects. Heritage from the provided part and data set upstream. Information of potential damages or defect included in the flattening process.
Data format	step. xlsx, pdf, txt
Data set size	Approximately 10GB
Data sharing	confidential

Code	COMPASS - RSHP
Data set full name	Part-1 Name_Xn (reshaped part)
Responsible beneficiary	AITIIP
Description / data type	Data set consists of CAD model of a flattened sheet. Link with the information of the original EoL part and flat part. Information regarding layer orientation and potential defects. Heritage from the provided part and data set upstream. Information of potential damages or defect included in the press forming process. Info recording thermal curve during the reshaping phase. Dimensional report on the final part.
Data format	step. xlsx, pdf, txt
Data set size	Approximately 10GB

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Data sharing	confidential

Code	COMPASS - RDPP
Data set full name	Part-1 Name_Xn (Remanufacturing DPP)
Responsible beneficiary	AITIIP
Description / data type	Data set consisting on raw material consumption size and volume. Remanufactured par size and volume, and estimation of energy consumption during the flattening and reshaping process.
Data format	xlsx, pdf
Data set size	Approximately 2GB
Data sharing	confidential

Code	COMPASS – WASP1
Data set full name	1_Waffle_Sp
Responsible beneficiary	FACC
Description / data type	Data set consists of CAD model, supplier details, material batch info, component data, NDT test data
Data format	xlsx, csv, STP,png
Data set size	Approximately 1GB
Data sharing	confidential

Code	COMPASS – WASP2
Data set full name	2_Waffle_Sp2
Responsible beneficiary	FACC
Description / data type	Data set consists of CAD model, supplier details, material batch info, component data, NDT test data
Data format	xlsx, csv, STP,png
Data set size	Approximately 1GB
Data sharing	confidential

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Code	COMPASS - RRRR
Data set full name	3_rib
Responsible beneficiary	FACC
Description / data type	Data set consists of CAD model, supplier details, material batch info, component data, NDT test data
Data format	xlsx, csv, STP, png
Data set size	Approximately 1GB
Data sharing	confidential

Code	COMPASS - CFQC
Data set full name	Carbon fiber roll 1.0 quality inspection
Responsible beneficiary	Profactor
Description / data type	Quality control of carbon fiber roll • Segmentation masks • Location • Defect types
Data format	Step file, .xlsx file
Data set size	Approximately 20GB and excel sheet 10MB
Data sharing	confidential

6.3 Remanufacturing process planner

Code	COMPASS - CADF
Data set full name	CAD file - finished part cad
Responsible beneficiary	EDAG
Description / data type	The data set consists of the CAD model, which contains the finished component.
Data format	.stp
Data set size	Approximately <250MB (less)
Data sharing	confidential

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Code	COMPASS - CADR
Data set full name	CAD file - raw part cad
Responsible beneficiary	EDAG
Description / data type	The data set consists of the CAD model, which contains the raw data. For sheet metal components, for example, the blank size is shown here.
Data format	.stp
Data set size	Approximately <250MB (less)
Data sharing	confidential

Code	COMPASS - INIT
Data set full name	Meta data – information of initial state of used parts
Responsible beneficiary	EDAG
Description / data type	The data record contains important information on the initially created component. For example, it contains material data such as stresses, modulus of elasticity and wall thicknesses and information on the manufacturing process
Data format	json
Data set size	Approximately <100MB (less)
Data sharing	confidential

Code	COMPASS - PDCT
Data set full name	Meta data – information on predicted usage of parts
Responsible beneficiary	EDAG
Description / data type	The data record contains information from the use of the component. e.g. it contains information on the mileage or operating hours, information on the number of load changes or temperature changes. in short: the stress added after creation.
Data format	json
Data set size	Approximately <100MB (less)
Data sharing	confidential

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6.3 Sheet metal reforming calculator

Code	COMPASS - REFO
Data set full name	Part_Reform_X
Responsible beneficiary	LKR
Description / data type	The data shown refers to a component in its second life cycle (reformed); Data set consists of material and process information; Additional data is obtained via materials characterization; Cutting plan/blank positioning in relation to the original component (.pdf) Degree of pre-deformation and derivation of formability (.png) Heat treatment route applied (.xlsx) Forming parameters applied (e.g. pressing force, lubricant, ambient conditions, etc.) (.xlsx, .json) Component quality (final geometry, final mechanical properties, surface quality, …) (.xlsx, .pdf, .json) Microstructure of the components (.pdf, .jpg, .txt)
Data format	xlsx, pdf, txt, jpg, json
Data set size	Approximately 15 GB
Data sharing	confidential

6.4 Data-driven dismantling

Code	COMPASS - DIAS
Data set full name	AR Dismantling Assistant
Responsible beneficiary	AIT, AELS
Description / data type	Augmented Reality application for AR glasses to support the dismantling process
Data format	.appx/,sln (to deploy on Hololens)
Data set size	Approximately 1GB
Data sharing	confidential

Code	COMPASS - DIGT

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Data set full name	Documented Digital Twin
Responsible beneficiary	Schild & Partner (SuP)
Description / data type	Multidimensional Data for Inspection, Documentation and Object Reconstruction (Documented Digital Twin). The dataset includes a dimensionally accurate textured object (3D), pictures with pose information (2D) and associated textual data, e.g. object description, label data (P/N, Serial) and annotations.
Data format	usdz/obj, jpg/json, ascii
Data set size	50 MB to 1 GB (depending on object size)
Data sharing	confidential

6.5 Digital Product Passport

Code	COMPASS - WASP
Data set full name	Data points for traceability
Responsible beneficiary	Circularise
Description / data type	Data points about product and material properties (to include on DPP draft). Obtained via research and consultation with industry.
Data format	xlsx
Data set size	Approximately 1MB
Data sharing	confidential

Code	COMPASS - PMDI
Data set full name	Product and material data from industry partners
Responsible beneficiary	Circularise
Description / data type	Product and material data from industry partners to be used in the demonstrations via SaaS platform
Data format	JSON
Data set size	10MB
Data sharing	confidential

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Code	COMPASS - SIGN
Data set full name	Personal data collected in the sign-up process
Responsible beneficiary	Circularise
Description / data type	First and last name and professional email are collected for sign-up. GDPR regulation is being applied.
Data format	Auth0
Data set size	10MB
Data sharing	confidential

Code	COMPASS - COMP
Data set full name	Company data
Responsible beneficiary	Circularise
Description / data type	Company details (e.g. name, location, Chamber of Commerce number) are collected for the successful account activation
Data format	JSON
Data set size	10MB
Data sharing	confidential

Code	COMPASS - DPPP
Data set full name	Data Product Passport Platform data
Responsible beneficiary	NLR
Description / data type	(Mainly administrative) data (yet to be determined) to be stored on behalf of the DPP Platform in addition to the data already stored by Circularise and the user data of the users of the platform
Data format	To be determined during the DPP Platform design
Data set size	To be determined during the DPP Platform design
Data sharing	confidential

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6.4 Dissemination activities

Code	COMPASS - PSIG
Data set full name	Personal data collected in the sign-up process
Responsible beneficiary	NSB
Description / data type	First and last name and professional email are collected during dissemination and exploitation activities (workshops, webinars, events). GDPR regulation to be applied.
Data format	XLS
Data set size	1MB
Data sharing	Confidential

Code	COMPASS - COMD
Data set full name	Company Data
Responsible beneficiary	NSB
Description / data type	Company / Organization details (e.g. name, location, Chamber of Commerce number) are collected to finalize market comparison tables and commercial exploitation plans
Data format	XLS
Data set size	1MB
Data sharing	Confidential

Code	COMPASS - PICS
Data set full name	Pictures (photo / video)
Responsible beneficiary	NSB
Description / data type	Visual files of people attending workshops and events organized during the dissemination & exploitation process. GDPR regulation to be applied.
Data format	JPG, PNG, video formats
Data set size	100 MB
Data sharing	Confidential

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7. ALLOCATION OF RESOURCES

The costs of providing FAIR data in the COMPASS project will not be extensive. Due to the use of the Zenodo repository, no additional costs for infrastructure concerning storage and online availability of the data will occur. All partners need to define clear interfaces within the project to prepare the data for easy reuse. If the definition of internal interfaces is done in a good way, this will ease preparations for data publication. We therefore expect that all efforts will be covered by the activities within the individual technical work packages and/or the dissemination work package.

As a coordinator, Profactor will be responsible for keeping an overview and guiding data management across the whole project. However, individual partners are associated to data sets and declared "responsible beneficiary" as specified in the tables above. As such, partners are expected to supervise data acquisition, storage, and documentation for "their" data sets. In case specific versions of data sets that allow interesting (scientific) insights are identified, these will be presented and discussed in the regular telephone conferences or at general meetings. The respective responsible beneficiaries will drive activities for publication of data sets (preparation of scientific publications, upload to online repository, etc.).

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8. DATA SAFETY

Open Data in the COMPASS project will be uploaded to the Zenodo repository. Zenodo stores its data in the CERN Data Center. We consider this a highly trustable host. Loss of data – even in a long-time perspective – is very unlikely.



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9. CONCLUSIONS

Open access is obligatory for scientific publications and corresponding data that is required for validation of these publications. The data management plan for the COMPASS project lists all data sets that are expected to be generated over the duration of the project. A total of 23 types of data sets was identified and a plan for publication is given for each. While the project website will be used to promote publications, the Zenodo repository will be used as the major host for publicly available research data.

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