Metadata Schema for the Description of Research Data Repositories

Version 4.0, August 2023

Authors: Dorothea Strecker[1], Alexandra Axtmann[2], Roland Bertelmann[3], Helena Cousijn[4], Kirsten Elger[5], Lea Maria Ferguson[3], David Fichtmüller[6], Catherine Jones[7], Iris Lindenmann[8], Charlotte Neidiger[2], Thanh Binh Nguyen[2], Jiban K. Pal[9], Heinz Pampel[1,3], Vivien Petras[1], Edeltraud Schnepf[2], Angelika Semrau[2], Robert Ulrich[2], Arne Upmeier[2], Paul Vierkant[4], Hui Wang[10,11], Gabriele Weickert[2], Nina Leonie Weisweiler[3], Sarah C. Williams[12], Michael Witt[13], Sarah J. Wright[14].

[1] Humboldt-Universität zu Berlin, Berlin School of Library and Information Science, Germany
[2] Karlsruhe Institute of Technology (KIT), Germany
[3] Helmholtz Association, Helmholtz Open Science Office, Germany
[4] DataCite - International Data Citation Initiative e.V.
[5] GFZ German Research Centre for Geosciences, Germany
[6] Botanischer Garten und Botanisches Museum Berlin, Germany
[7] Science and Technology Facilities Council, United Kingdom
[8] University of Basel, Switzerland
[9] Indian Statistical Institute (ISI), India
[10] Chinese Academy of Sciences, China
[11] National Science Library, China
[12] University of Illinois Urbana-Champaign, United States
[13] Purdue University, United States
[14] Cornell University, United States

Contact:

info@re3data.org
https://www.re3data.org

Table of Contents

1. Introduction

1.1. re3data

Research data are valuable and ubiquitous. The permanent access to research data is a challenge for all stakeholders in the research community. However, the long-term preservation of and open access to research data offer opportunities for the research community worldwide. A growing number of universities and other research institutions have been building and are maintaining research data repositories (RDR) that provide permanent access to data sets in a trustworthy environment. Due to disciplinary requirements and characteristics of specific types of services, the landscape of research data repositories is very heterogeneous. It is therefore difficult for researchers, funding bodies, publishers, and scholarly institutions to select appropriate repositories for finding, storing, and publishing research data.

re3data is a global registry that covers RDR from all academic disciplines. It presents repositories for the permanent storage of and access to research data sets for researchers, funding bodies, publishers, and scholarly institutions. re3data promotes a culture of sharing, increased access to, and better visibility of research data and other research outputs. re3data is a partner service of DataCite[1], a global not-for-profit organization that is actively involved in several initiatives to improve the availability and citation of research output.

The registry re3data was developed in a research project of the same name that was funded by the German Research Foundation (DFG)[2]. The service went online in the fall of 2012. Project partners were the Berlin School of Library and Information Science at the Humboldt-Universität zu Berlin[3], the Helmholtz Open Science Office of the Helmholtz Association[4], the Library and Information Services department (LIS) of the GFZ German Research Centre for Geosciences[5], and the KIT Library at the Karlsruhe

---

[1] https://datacite.org/

[2] https://www.dfg.de/

[3] https://www.ibi.hu-berlin.de/

[4] https://os.helmholtz.de/

[5] https://bib.telegrafenberg.de/

Institute of Technology (KIT)[6]. In March 2014, re3data merged with Databib, a similar initiative at Purdue University[7], into one service managed under the auspices of DataCite since the end of 2015. The aim of this cooperation was to serve the research community with a single, sustainable registry of RDR that incorporates features of both initiatives.

Further information on re3data and related initiatives can be found in the following publications:

Kindling, M., Pampel, H., van de Sandt, S., Rücknagel, J., Vierkant, P., Kloska, G., Witt, M., Schirmbacher, P., Bertelmann, R., Scholze, F.. (2017). The Landscape of Research Data Repositories in 2015: A re3data Analysis. D-Lib Magazine, 23(3/4). https://doi.org/10.1045/march2017-kindling

Witt, M., Stall, S., Duerr, R., Plante, R., Fenner, M., Dasler, R., Cruse, P., Hou, S., Ulrich, R., & Kinkade, D. (2019). Connecting Researchers to Data Repositories in the Earth, Space, and Environmental Sciences. In P. Manghi, L. Candela, & G. Silvello (Eds.), Digital Libraries: Supporting Open Science (pp. 86–96). Springer. https://doi.org/10.1007/978-3-030-11226-4_7

1.2.   The Metadata Schema

The re3data Metadata Schema contains metadata properties describing a RDR, such as its general scope, content, infrastructure as well as compliance with technical, quality, and metadata standards. The schema includes required metadata properties and optional properties providing additional information. The schema serves the purpose of:

- recommending a standard for describing a RDR;
- providing the basis for interoperability between RDRs, re3data and other infrastructures;
- helping RDRs move towards shared standards and common practices.

---

[6] https://www.bibliothek.kit.edu/
[7] https://www.lib.purdue.edu/

To facilitate refining search results of appropriate RDRs, re3data developed a set of icons. These icons are displayed for a respective entry if a RDR provides important information concerning the repository, e.g., if it acquired a certificate or supports the provision of persistent identifiers.

The initial version 1.0 of the schema was developed and tested on a small sample of RDRs. After version 1.0 of the schema was published in July 2012, a public request for comments was issued. Version 2.0 of the schema considered all responses as well as current developments in the landscape of RDRs, resulting in substantial changes to the structure of the schema. Versions 2.1 and 2.2 introduced minor changes, as well as an outline of the re3data Registration Policy. Version 3.0 included changes of the re3data Registration Policy as well as structural adjustments to better reflect changes within the landscape of RDRs. Following a public request for comments, version 3.1 differentiated certification information and offered the option to create profiles. The current version 4.0 also follows a public request for commons and introduces new elements for expressing relationships between RDRs and funding information, among other changes. An overview on the version history is provided in table 1. Versions 3.1 and 4.0 of the re3data Metadata Schema were released the context of the DFG-funded project re3data COREF[8], in 2021 and 2023 respectively.

Future developments of the schema will also rely on feedback from the RDR community. This open and transparent development process ensures a strong basis for RDR descriptions that are supported by and rooted in the community. re3data appreciates this continuous feedback from the community and invites interested persons and organizations to share ideas for future developments of re3data.

1.3.   re3data Registration Policy

The major purpose of the registry is to improve the discoverability of RDRs. A RDR is a subtype of a sustainable information infrastructure providing long-term storage of and access to research data. Research data are "representations of observations, objects, or other entities used as evidence of phenomena for the purposes of research or scholarship." (p. 28)[9]

---

[8] https://gepris.dfg.de/gepris/projekt/422587133

[9] Borgman, C. L. (2016). *Big data, little data, no data: Scholarship in the networked world*. The MIT Press.

A RDR listed in re3data is either:

- a data provider if it offers research data and its metadata (ideally exposing metadata via interfaces),
  or
- a service provider (e.g., a portal) if it harvests the metadata of research data from data providers as a basis for building value-added services,
  or
- both.

To be registered in re3data, a RDR must comply with a set of minimum requirements. A repository must:

- have a focus on research data;
- be operated by a legal entity with an organizational framework that provides sustainability (e.g., library, university);
- clarify access conditions to the repository and research data;
- and provide terms of use.

1.4.   Research Data Repository Registration Workflow

Anyone can suggest RDRs to be listed in re3data via an application form providing information such as the name and URL of the RDR.[10] This information is reviewed and enhanced by the re3data Editorial Board.[11] Members of the international Editorial Board analyze the RDR's website and describe it based on an indexing handbook. The re3data Editorial Board indexes, reviews and updates the metadata of all RDR registered in re3data. Researchers, research data specialists and librarians from various countries are members of the international Editorial Board. A repository is indexed if the minimum requirements of the re3data Registration Policy are met. Before a new record of a RDR is published in re3data, all gathered information is reviewed by a second editor.

---

[10] https://www.re3data.org/suggest/

[11] https://www.re3data.org/editorialboard

To update a re3data entry, a user can use the web form suggesting additions and/or changes concerning the entry. After a review by the re3data Editorial Board, the entry will be updated. The complete workflow is shown in Figure 1.
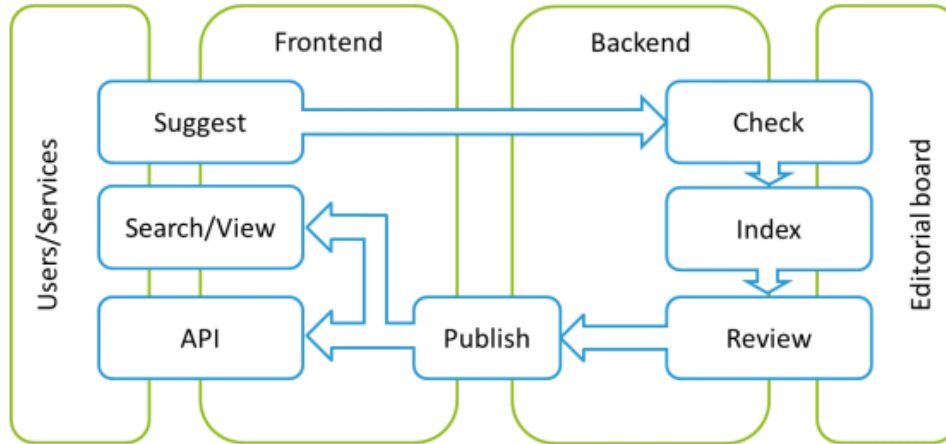

Figure 1: Research Data Repository Registration Workflow of re3data

1.5.   Version History

Version	Date of publication	Summary of changes to prior versions
1.0	July 2012	Initial Document (See: https://doi.org/10.2312/re3.001)
2.0	December 2012	Structural changes, including addition of language attributes, addition of definitions of controlled vocabularies, changes in occurrences (See: https://doi.org/10.2312/re3.002)
2.1	December 2013	Addition and deletion of properties, addition of controlled vocabularies, changes in occurrences and definitions, addition of definitions, change of title (See: https://doi.org/10.2312/re3.004)
2.2	December 2014	Addition of properties, addition of controlled vocabularies, changes and additions of definitions (See: https://doi.org/10.2312/re3.006)
3.0	December 2015	Structural changes, including addition and deletion of controlled vocabularies, changes in occurrences and definitions, addition of new properties, change of title (See: https://doi.org/10.2312/re3.008)
3.1	August 2021	Structural changes, including addition of new properties; changes in occurrences; changes of controlled vocabularies / allowed values (See: http://doi.org/10.48440/re3.010)
4.0	August 2023	Structural changes, including addition and deletion of properties and changes in controlled vocabularies; changes in occurrences and definitions (this document)

1.6.　　　Authors of Previous Versions

Version	Authors
1.0	Paul Vierkant, Shaked Spier, Jessika Rücknagel, Jens Gundlach, David Fichtmüller, Heinz Pampel, Maxi Kindling, Agnes Kirchhoff, Hans-Jürgen Göbelbecker, Jens Klump, Roland Bertelmann, Peter Schirmbacher, Frank Scholze
2.0	Paul Vierkant, Shaked Spier, Jessika Rücknagel, Jens Gundlach, David Fichtmüller, Heinz Pampel, Maxi Kindling, Agnes Kirchhoff, Hans-Jürgen Göbelbecker, Jens Klump, Roland Bertelmann, Peter Schirmbacher, Frank Scholze
2.1	Paul Vierkant, Shaked Spier, Jessika Rücknagel, Heinz Pampel, Jens Gundlach, David Fichtmüller, Maxi Kindling, Agnes Kirchhoff, Hans-Jürgen Goebelbecker, Jens Klump, Gabriele Kloska, Evelyn Reuter, Angelika Semrau, Edeltraud Schnepf, Michael Skarupianski, Roland Bertelmann, Peter Schirmbacher, Frank Scholze, Claudia Kramer
2.2	Paul Vierkant, Shaked Spier, Jessika Rücknagel, Heinz Pampel, Florian Fritze, Jens Gundlach, David Fichtmüller, Maxi Kindling, Agnes Kirchhoff, Hans-Jürgen Goebelbecker, Jens Klump, Gabriele Kloska, Evelyn Reuter, Angelika Semrau, Edeltraut Schnepf, Michael Skarupianski, Roland Bertelmann, Peter Schirmbacher, Frank Scholze, Claudia Kramer, Michael Witt, Claudio Fuchs, Robert Ulrich
3.0	Jessika Rücknagel, Paul Vierkant, Robert Ulrich, Gabriele Kloska, Edeltraud Schnepf, David Fichtmüller, Evelyn Reuter, Angelika Semrau, Maxi Kindling, Heinz Pampel, Michael Witt, Florian Fritze, Stephanie van de Sandt, Jens Klump, Hans-Jürgen Goebelbecker, Michael Skarupianski, Roland Bertelmann, Peter Schirmbacher, Frank Scholze, Claudia Kramer, Claudio Fuchs, Shaked Spier, Agnes Kirchhoff
3.1	Dorothea Strecker, Roland Bertelmann, Helena Cousijn, Kirsten Elger, Lea Maria Ferguson, David Fichtmüller, Hans-Jürgen Goebelbecker, Maxi Kindling, Gabriele Kloska, Thanh Binh Nguyen, Heinz Pampel, Vivien Petras, Rouven Schabinger, Edeltraud Schnepf, Angelika Semrau, Margarita Trofimenko, Robert Ulrich, Arne Upmeier, Paul Vierkant, Nina Leonie Weisweiler, Yi Wang, Michael Witt

2. re3data Metadata Properties

The table below provides a detailed description of the properties that are available to describe a RDR in re3data. The following naming convention has been used for all properties and attributes: properties and attributes begin with a lowercase letter. If the name of the element consists of more than one word, subsequent words begin with capital letters. The column *A/C* indicates whether the property being described is an Attribute (A) or a Child (C) of the preceding property. The column *Occ* (Occurrence) indicates if a property is mandatory or optional, as well as if it can have multiple instances. For example, 1-n means that a property must occur once (1), and may occur multiple times (n). The last column indicates allowed values or other constraints on the

input. If a controlled vocabulary is used, the allowed values are listed and defined in Appendix A.

The primary language for all re3data metadata is English. Repository descriptions in other languages can be added for additional information.

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
1	identifiers	The RDR identifiers provided by re3data (wrapper element).		1	-
1.1	re3data	A unique string to identify the RDR metadata entry. This internal identifier is assigned by re3data.	C	1	Auto-Value Example: r3d100010134
1.2	doi	The Digital Object Identifier (DOI) assigned to the re3data metadata entry of the RDR to make the metadata entries citable.	C	1	Auto-Value Example: https://doi.org/10.17616/R3XS37
2	repositoryName	The full name of the RDR.		1	Example: Access to Archival Databases
2.1	language	The language of the RDR name.	A	1	Controlled vocabulary Allowed values from: ISO-639-3. Example: eng
3	additionalName	The alternative name or acronym for the RDR.		0-n	Example: AAD
3.1	language	The language of the RDR additional name.	A	1	Controlled vocabulary Allowed values from: ISO-639-3. Example: eng
4	repositoryUrl	The URL of the RDR.		1	URL Example: https://www.pangaea.de/
5	repositoryIdentifier	An identifier that refers to the RDR or a record describing the RDR (wrapper element).		0-n	-
5.1	repositoryIdentifierType	The provider of the identifier.	C	1	Example: RRID

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
5.2	repositoryIdentifierValue	A globally unique identifier that refers to the RDR or a record describing the RDR.	C	1	Example: SCR_002760
6	description	A textual description providing additional information about the RDR (first description must be provided in English, descriptions in other languages are optional).		0-n	The format is open (max. 1000 characters).
6.1	language	The language of the RDR description.	A	1	Controlled vocabulary Allowed values from: ISO-639-3. Example: eng
7	repositoryContact	Contact information for the RDR (wrapper element).		0-n	-
7.1	repositoryContactInformation	Email address of the contact or an URL of an online contact form of the RDR.	C	1	Example: info@researchdata.com
7.2	repositoryContactType	Type of contact information.	C	0-1	Example: administrative support
8	type	The type of the RDR.		1-n	Controlled vocabulary Allowed values: disciplinary governmental institutional multidisciplinary project-related other
9	size	The number of items contained in the RDR.		0-1	Example: 5.000 datasets; 30 studies
10	startDate	The date the RDR was launched.		0-1	YYYY or YYYY-MM-DD or any other format described in W3C-DTF (ISO-8601)
11	endDate	The RDR ceased ingesting new research data and/or providing it ; the date may lie in the future if it is expected in advance (wrapper element).		0-1	-
11.1	closed	The date the RDR stopped ingesting new research data to its database. The database and its research data are still available.	C	0-1	YYYY or YYYY-MM-DD or any other format described in W3C-DTF (ISO-8601) or empty value with attribute xsi:nil set to "true"

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
11.2	offline	The date the RDR went offline. The database and/or the website are no longer available.	C	0-1	YYYY or YYYY-MM-DD or any other format described in W3C-DTF (ISO-8601) or empty value with attribute xsi:nil set to "true"
12	relatedRepository	A RDR related to this RDR (wrapper element).		0-n	-
12.1	relatedRepositoryId	The re3data identifier identifying the related RDR.		1	Example: r3d100010134
12.2	relatedRepositoryType	The type of relationship between this RDR and the related RDR.		0-1	Controlled vocabulary Allowed values from: predecessor successor
13	repositoryLanguage	The language of the user interface of the RDR.		1-n	Controlled vocabulary Allowed values from: ISO-639-3. Example: eng
14	subject	The disciplinary focus of the RDR (wrapper element).		1-n	-
14.1	subjectScheme	The subject scheme according to which the subject of the RDR is described.	A	1	Controlled vocabulary Allowed values from: DFG
14.2	subjectId	The ID/notation of the subject classification.	C	1	The format is dependent on the scheme. Example: 11 10101
14.3	subjectName	The subject(s) of the RDR.	C	1	The format is dependent on the scheme. Example: Humanities Prehistory
15	missionStatementUrl	The URL of a mission statement describing the designated community of the RDR.		0-1	URL Example: https://ess-dive.lbl.gov/about/
16	contentType	All types of resources available in the RDR (wrapper element).		0-n	-
16.1	contentTypeScheme	The name and/or URL of the subject scheme or classification code.	A	1	Controlled vocabulary Allowed values from: COAR

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
16.2	contentTypeId	The URI of the content type.	C	1	The format is dependent on the scheme. Example: http://purl.org/coar/resource_type/c_ddb1 http://purl.org/coar/resource_type/c_5ce6 http://purl.org/coar/resource_type/c_18cf
16.3	contentTypeName	The name of the content type.	C	1	The format is dependent on the scheme. Example: dataset software text
17	providerType	The type of provider.		1-2	Controlled vocabulary Allowed values: dataProvider serviceProvider
18	keyword	English keyword(s) describing the subject focus of the RDR.		0-n	Example: environmental science computer science
19	institution	All institutions being responsible for funding, creating and/or running the RDR (wrapper element).		1-n	-
19.1	institutionName	The name of the responsible institution.	C	1	Example: National Institute of General Medical Sciences, U.S. National Institutes of Health
19.1.1	language	The language of the institution name.	A	1	Controlled vocabulary Allowed values from: ISO-639-3. Example: eng
19.2	institutionAdditionalName	The alternative name or acronym for the responsible institution.	C	0-n	Example: NIGMS NIH
19.2.1	language	The language of the institution's additional name.	A	1	Controlled vocabulary Allowed values from: ISO-639-3. Example: eng
19.3	institutionCountry	The location of the responsible institution.	C	1	Controlled vocabulary Allowed values from:

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
					ISO-3166-1 alpha-3. Example: DEU
19.4	responsibilityType	The type of responsibility for each responsible institution.	C	0-n	Controlled vocabulary Allowed values: funding general technical
19.5	institutionType	The type of responsible institution.	C	0-1	Controlled vocabulary Allowed values: commercial non-profit
19.6	institutionUrl	The URL of the responsible institution.	C	0-1	URL Example: http://www.nigms.nih.gov/
19.7	institutionIdentifier	The identifier for the responsible institution (wrapper element).	C	0-n	-
19.7.1	institutionIdentifierType	The provider name of the identifier for the responsible institution.	C	1	Example: ISNI
19.7.2	institutionIdentifierUrl	A globally unique identifier that refers to the responsible institution.	C	1	URL Example: https://isni.org/isni/000000010075 5874
19.8	responsibilityStartDate	The start date of the period of responsibility.	C	0-1	YYYY or YYYY-MM-DD or any other format described in W3C-DTF (ISO-8601)
19.9	responsibilityEndDate	The end date of the period of responsibility.	C	0-1	YYYY or YYYY-MM-DD or any other format described in W3C-DTF (ISO-8601)
20	policy	Policies providing information concerning the usage of the RDR (wrapper element).		0-n	-
20.1	policyName	The name of the policy.	C	1	Example: Data policy of the information system PANGAEA
20.2	policyUrl	The URL of the policy.	C	1	URL Example: https://www.pangaea.de/curator/ files/pangaea-data-policy.pdf
21	fundingInformation	Information on funding for the RDR, current and historic (wrapper element).		0-n	-

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
21.1	funderName	Name of the funder funding the RDR.	C	1	Example: National Science Foundation
21.2	funderIdentifier	Identifier of the funder funding the RDR (wrapper element).	C	0-n	-
21.2.1	funderIdentifierType	Type of identifier identifying the funder.	C	1	Example: Crossref Funder ID
21.2.2	funderIdentifierValue	A globally unique identifier that refers to the funder.	C	1	Example: https://doi.org/10.13039/100000001
21.3	grantIdentifier	Identifier of the grant funding the RDR.	C	0-1	Example: 422587133
22	databaseAccess	The access regulation to the RDR metadata (wrapper element).		1	-
22.1	databaseAccessType	The type of access to the RDR metadata.	C	1	Controlled vocabulary Allowed values: open restricted closed
22.2	databaseAccessRestriction	All existing access restrictions to the RDR (required if restricted is chosen).	C	0-n	Controlled vocabulary Allowed values: feeRequired registration
23	databaseLicense	The license of the RDR metadata (wrapper element).		0-n	-
23.1	databaseLicenseName	The name of the database license.	C	1	Example: CC
23.2	databaseLicenseUrl	The database license URL.	C	1	URL Example: https://creativecommons.org/licenses/
24	dataAccess	The access regulation to the research data sets provided by the RDR (wrapper element).		1-n	-
24.1	dataAccessType	The type of access to research data sets.	C	1	Controlled vocabulary Allowed values: open restricted closed

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
24.2	dataAccessRestriction	All existing access restrictions to the research data sets (required if restricted is chosen).	C	0-n	Controlled vocabulary Allowed values: feeRequired institutional membership registration
25	dataLicense	The license of the research data provided by the RDR (wrapper element).		1-n	-
25.1	dataLicenseName	The name of the data license.	C	1	Example: CC
25.2	dataLicenseUrl	The data license URL.	C	1	URL Example: https://creativecommons.org
26	dataUpload	The regulation for submitting research data to the RDR (wrapper element).		1-n	-
26.1	dataUploadType	The type of the data upload.	C	1	Controlled vocabulary Allowed values: open restricted closed
26.2	dataUploadRestriction	All existing restrictions to the data upload (required if restricted is chosen).	C	0-n	Controlled vocabulary Allowed values: feeRequired institutional membership registration storageLimit
27	dataUploadLicense	The license for data upload (wrapper element).		0-n	-
27.1	dataUploadLicenseName	The name of the data upload license.	C	1	Example: Data Submission
27.2	dataUploadLicenseUrl	Data upload license URL.	C	1	URL Example: https://www.pangaea.de/submit/
28	software	The name of the software that is used to run the RDR.		0-n	Example: DSpace
29	versioning	The RDR supports versioning of research data.		0-1	Controlled vocabulary Allowed values: yes no
30	api	The API supported by the RDR (wrapper element).		0-n	-
30.1	apiType	The type of the API.	C	1	Examples:

re3data Metadata Schema Version 4.0 / August 2023

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
					REST OAI-PMH
30.2	apiUrl	The URL of the API for machine processing of data or metadata.	C	1	Example: https://datadryad.org/api/v2/
30.3	apiDocumentation	A link referring to the API documentation, a website that states its availability and other information for using the API.	C	0-1	Example: https://datadryad.org/api/v2/docs/
31	pidSystem	The persistent identifier system that is used/provided by the RDR for research data.		0-n	Example: DOI
32	citationReference	The citation database covering the RDR.		0-n	Examples: Data citation index SCOPUS
33	metrics	Any service, tool, etc. that is used by the RDR to track, measure, and visualize the usage of provided research data.		0-n	Examples: usage statistics Altmetric
34	citationGuidelineUrl	The URL outlining how to cite research data provided by the RDR.		0-1	Example: https://wiki.pangaea.de/wiki/Citation
35	aidSystem	The author identifier system that is used by the RDR.		0-n	Example: ORCID
36	enhancedPublication	The RDR offers the interlinking between publications and data.		0-1	Controlled vocabulary Allowed values: yes no
37	qualityManagement	Information on quality management at the RDR (wrapper element).		0-1	-
37.1	qualityManagementStatus	Any form of quality management concerning the research data or metadata of the RDR.	C	0-1	Controlled vocabulary Allowed values: yes no
37.2	qualityManagementMeasure	Documents outlining measures the RDR implemented to ensure the quality of research data or metadata (wrapper element).		0-n	-

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
37.2.1	qualityManagementMeasureName	The title of the document outlining quality management measures at the RDR.	C	1	Example: UK Data Archive Quality Control
37.2.2	qualityManagementMeasureUrl	The URL of the document outlining quality management measures at the RDR.	C	1	URL Example: https://www.data-archive.ac.uk/managing-data/digital-curation-and-data-publishing/quality-control/
38	certificate	The certificate, accreditation or standard the RDR complies with (wrapper element).		0-n	-
38.1	certificateName	The name of the certificate.	C	1	Example: CoreTrustSeal
38.2	certificateStartDate	The start date of the certification period or the date the certificate was issued, in case certification does not expire.	C	0-1	YYYY or YYYY-MM-DD or any other format described in W3C-DTF (ISO-8601)
38.3	certificateEndDate	The end date of the certification period.	C	0-1	YYYY or YYYY-MM-DD or any other format described in W3C-DTF (ISO-8601)
38.4	certificateUrl	The URL to a source outlining details of the certification.	C	1	URL Example: https://doi.org/10.5281/zenodo.3638211
38.5	certificateWidget	The URL supporting the display of widgets/badges.	C	0-1	URL Example: https://www.cert.example/badge.jpg
39	profile	The community profile the RDR is associated with: a selection of repositories based on a set of community-developed criteria (wrapper element).		0-n	-
39.1	profileName	The name of the profile the RDR is associated with.	C	1	Example: Enabling FAIR Data (COPDESS/AGU)
39.2	profileUrl	The URL to a source naming the entity creating the profile and outlining the profile / describing the selection criteria.	C	1	URL Example: http://www.copdess.org/enabling-fair-data-project/enabling-fair-data-faqs/

ID	re3data property	Definition	A/C	Occ	Allowed values, examples, other constraints
					https://www.worlddatasystem.org/community/membership/regular-members
40	metadataStandard	The metadata standard the RDR complies with (wrapper element).		0-n	-
40.1	metadataStandardName	The name of the metadata standard.	C	1	Example: DDI - Data Documentation Initiative
40.2	metadataStandardUrl	The URL of the metadata standard.	C	1	URL Example: https://www.ddialliance.org/Specification/
41	syndication	The alerting service the RDR offers (wrapper element).		0-n	-
41.1	syndicationType	The type of the alerting service	C	1	Example: RSS
41.2	syndicationUrl	The URL of the alerting service provided by the RDR.	C	1	Example: https://depositonce.tu-berlin.de/feed/rss_2.0/site
42	remarks	Additional remarks.		0-1	The format is open.
43	entryDate	The date the RDR was first indexed in re3data.		1	YYYY-MM-DD (ISO-8601)
44	lastUpdate	The date the metadata of the RDR was updated.		1	YYYY-MM-DD (ISO-8601)

Appendix

A Attribute Values and Controlled Vocabularies

The following tables list and define the allowed values for controlled vocabularies.

2.1; 3.1; 6.1;19.1.1; 19.2.1 language ; 13 repositoryLanguage

Value	Definition
Example: eng, deu, fra	ISO-639-3; http://www.iso.org/iso/catalogue_detail?csnumber=39534

8 type

Value	Definition
disciplinary	Disciplinary repository (Subject repository): "This is a collection of research outputs with a common link to a particular subject discipline. Subject repositories are likely to cover one broad-based discipline, with contributors from many different institutions supported by a variety of funders; the repositories themselves are likely to be funded from one or more sources within the subject community. Although for some subject repositories the funding may be fragile, if they are of enough importance to the community then funding crises are usually weathered."[12]
governmental	Governmental Repository: This is a collection of outputs from projects and programmes related to governmental institutions. These repositories are likely closed for external contributions. In general the repository is state supported to make governmental output accessible.
multidisciplinary	Multidisciplinary Repository: This is a collection of research outputs serving multidisciplinary needs. These repositories cover several research disciplines. Contributors from many different institutions and communities are likely accepted.
institutional	Institutional Repository: "This is a collection of research outputs with a common link to a particular institution, usually by authorship. These repositories are likely to cover more than one research discipline, to have funders in many if not all the Research Councils and support communities who have different approaches to research dissemination. Whether deposit of content is mandatory is a decision that will be made by each institution. The institutions may have many requirements for the content of the repository, from open access dissemination, through metrics, marketing to strategic planning. It is likely that many of these processes in the past were undertaken through collection of bibliographic information."[13]
project-related	Project-related Repository: This is a collection of research outputs with a specific focus on the research data resulting from particular research projects. All contributions must be linked to the particular project, its mission, etc.

---

[12] Jones, C et al. "Report of the Subject and Institutional Repositories Interactions Study." (2008): p. 5. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.140.7316&rep=rep1&type=pdf retrieved 5 July. 2021.

[13] Jones, C et al. "Report of the Subject and Institutional Repositories Interactions Study." (2008): p. 5

other	Other (Repository Type): A RDR that is neither institutional nor disciplinary, e.g., a funder repository: "This is a collection of research outputs with a common link to one (or more) funder(s). These are likely to cover the funder's remit, which is usually subject-based but can become indistinct at subject boundaries, and will have authors from many institutions. Deposit of content is usually mandatory and can include project-related material, such as completion project reports. The funders will have requirements for the content of the repository, from metrics through to strategic planning."[14]

10 startDate; 11.1 closed; 11.2 offline; 19.8 responsibilityStartDate; 19.9 responsibilityEndDate; 39.2 certificateStartDate; 39.3 certificateEndDate 44 entryDate; 45 lastUpdate

Value	Definition
YYYY or YYYY-MM-DD	ISO-8601; http://www.w3.org/TR/NOTE-datetime

12.2 relatedRepositoryType

Value	Definition
predecessor	A RDR that handed over custody of (parts of) its collection to the RDR.
successor	The RDR that took over custody of (parts of) the collection after the RDR was closed.

14.1 subjectScheme

Value	Definition
DFG	DFG Classification of Subject Area, Review Board, Research Area and Scientific Discipline (using Level 1-4). https://web.archive.org/web/20230601081759/https://www.dfg.de/en/dfg_profile/statutory_bodies/review_boards/subject_areas/ (retrieved 01-06-2023)

16.1 contentTypeScheme

Value	Definition
COAR	COAR Resource Types 3.1 (using dataset with subtypes ; image with subtypes ; software with subtypes ; text without subtypes ; other). https://vocabularies.coar-repositories.org/resource_types/

---

[14] Jones, C et al. "Report of the Subject and Institutional Repositories Interactions Study." (2008): p. 5

16.3 contentTypeName

Value	Definition[15]
dataset	A collection of related facts and data encoded in a defined structure.
aggregated data	Statistics that relate to broad classes, groups, or categories. The data are averaged, totaled, or otherwise derived from individual-level data, and it is no longer possible to distinguish the characteristics of individuals within those classes, groups, or categories.
clinical trial data	Data resulting from a research study in which one or more human subjects are prospectively assigned to one or more interventions (which may include placebo or other control) to evaluate the effects of those interventions on health-related biomedical or behavioral outcomes.
compiled data	Data collected or assembled from multiple, often heterogeneous sources that have one or more reference points in common, and at least one of the sources was originally produced for other purposes. The data are incorporated in a new entity.
encoded data	Qualitative data (textual, video, audio or still-image) originally produced for other purposes into quantitative data (expressed in unit-by-variable matrices) by using coding techniques in accordance with pre-defined categorization schemes.
experimental data	Data resulting from the experimental research method involving the manipulation of some or all of the independent variables included in the hypotheses.
genomic data	Genomic data refers to the genome and DNA data of an organism.
geospatial data	Geospatial data are any type of data with spatial coordinates that allow them to be mapped to the Earth's surface. They can represent physical objects, discrete areas or continuous surfaces.
laboratory notebook	A laboratory notebook is a primary record of research. Researchers use a lab notebook to document their hypotheses, experiments and initial analysis or interpretation of these experiments.
measurement and test data	Data resulting from assessing specific properties (or characteristics) of beings, things, phenomena, (and/ or processes) by applying pre-established standards and/or specialized instruments or techniques.
observational data	Data resulting from observational research, which involves collecting observations as they occur, without attempting to manipulate any of the independent variables.
recorded data	Data registered by mechanical or electronic means, in a form that allows the information to be retrieved and/or reproduced.
simulation data	Data resulting from modeling or imitative representation of real-world processes, events, or systems, often using computer programs.
survey data	Data resulting from a survey, which is defined as an investigation about the characteristics of a given population by means of collecting data from a sample of that population and estimating their characteristics through the systematic use of statistical methodology.
image	A visual representation other than text, including all types of moving image and still image.

---

[15] Definitions are based on COAR Resource Types 3.1.

re3data Metadata Schema Version 4.0 / August 2023

moving image	A moving display, either generated dynamically by a computer program or formed from a series of pre-recorded still images imparting an impression of motion when shown in succession.
still image	A recorded static visual representation.
software	A computer program in source code (text) or compiled form.
research software	Software that is used to generate, process or analyse results that you intend to appear in a publication.
source code	Source code is any collection of code, with or without comments, written using a human-readable programming language, usually as plain text.
text	A resource consisting primarily of words for reading. Examples include books, letters, dissertations, poems, newspapers, articles, archives of mailing lists. Note that facsimiles or images of texts are still of the genre Text.
other	A resource type that is not included in existing terms.

16.2 contentTypeId

Value	Definition
http://purl.org/coar/resource_type/c_ddb1	dataset
http://purl.org/coar/resource_type/ACF7-8YT9	aggregated data
http://purl.org/coar/resource_type/c_cb28	clinical trial data
http://purl.org/coar/resource_type/FXF3-D3G7	compiled data
http://purl.org/coar/resource_type/AM6W-6QAW	encoded data
http://purl.org/coar/resource_type/63NG-B465	experimental data
http://purl.org/coar/resource_type/A8F1-NPV9	genomic data
http://purl.org/coar/resource_type/2H0M-X761	geospatial data
http://purl.org/coar/resource_type/H41Y-FW7B	laboratory notebook
http://purl.org/coar/resource_type/DD58-GFSX	measurement and test data
http://purl.org/coar/resource_type/FF4C-28RK	observational data
http://purl.org/coar/resource_type/CQMR-7K63	recorded data
http://purl.org/coar/resource_type/W2XT-7017	simulation data
http://purl.org/coar/resource_type/NHD0-W6SY	survey data
http://purl.org/coar/resource_type/c_c513	image
http://purl.org/coar/resource_type/c_8a7e	moving image

http://purl.org/coar/resource_type/c_ecc8	still image
http://purl.org/coar/resource_type/c_5ce6	software
http://purl.org/coar/resource_type/c_c950	research software
http://purl.org/coar/resource_type/QH80-2R4E	source code
http://purl.org/coar/resource_type/c_18cf	text
http://purl.org/coar/resource_type/c_1843	other

17 providerType

Value	Definition
dataProvider	A RDR is a data provider if it stores or offers research data and its metadata (ideally exposing metadata via interfaces).
serviceProvider	A RDR is a service provider if it harvests and aggregates the metadata of research data from data providers.

19.3 institutionCountry

Value	Definition
Examples: DEU, GBR, USA	ISO-3166-1 Alpha-3 code ; https://en.wikipedia.org/wiki/ISO_3166-1#Current_codes
AAA	international institutions
EEC	European Union

19.4 responsibilityType

Value	Definition
funding	Funding responsibility refers to the institution that provides funding for the research data repository.
general	General responsibility refers to the institution that is generally responsible for providing services, such as curation, and content of the research data repository.
technical	Technical responsibility refers to the institution that is responsible for the technical matters of the research data repository, e.g. hosting.

19.5 institutionType

Value	Definition
commercial	A commercial institution is an institution that distributes surplus revenues as profit or dividends.
non-profit	The institution does not aim at economic profits but at non-profit (e.g., social, cultural and academic) goals of its members.

22.1 databaseAccessType

Value	Definition
open	There are no or minimal access barriers.
restricted	There are access barriers in place, but users can overcome them.
closed	External users can't overcome access barriers.

22.2 databaseAccessRestriction

Value	Definition
feeRequired	A single or regular payment is required.
registration	A free registration is required.

4.1 dataAccessType

Value	Definition
open	There are no or minimal access barriers.
embargoed	There are access barriers in place, but users can overcome them when data are released after an embargo period.
restricted	There are access barriers in place, but users can overcome them.
closed	External users can't overcome access barriers.

24.2 dataAccessRestriction

Value	Definition
feeRequired	A single or regular payment is required.
institutional membership	Only people associated with a member institution can access the data.
registration	A free registration is required.

26.1 dataUploadType

Value	Definition
open	There are no or minimal access barriers.
restricted	There are access barriers in place, but users can overcome them.
closed	External users can't overcome upload barriers.

26.2 dataUploadRestriction

Value	Definition
feeRequired	A single or regular payment is required.
institutional membership	Only people associated with a member institution can access the data.
registration	A free registration is required.
storageLimit	Only data up to a certain volume can be uploaded and stored.

B Explanation of re3data Access Types

The policies and access control measures of an RDR regulate a number of issues, particularly: Who can access the RDR? Who can download research data and how can the user reuse these research data from the repository? And who is permitted to deposit research data? To describe such access regulations of an RDR, re3data differentiates between three categories representing different levels of access. First, there is the access to the RDR defining who can access the database in general, e.g., searching the repository requires a membership. Second, there is the access to the research data sets in the RDR in particular, e.g., being able to download data from the repository. Third, there is the access to upload and deposit research data sets to the RDR. The access to each level can be open, restricted, and/or closed. Open means that there are no access barriers. Restricted means that external users can overcome access barriers, e.g., by creating a user account. Closed means external users cannot overcome access barriers. Embargoed access means that external users cannot overcome access barriers until the research data are released for open or restricted access. The last stated access type applies only to the level of access to the research data sets.

As shown in the matrix below the access to the RDR is the basic level to define the general framework of access to the actual research data sets, e.g., a research data set in an RDR that is restricted through registration cannot be open but just restricted or even closed; a research data set in a closed RDR which underlies access restrictions that cannot be overcome by external users is neither open nor restricted but only closed. Thus to define the general accessibility of an RDR, the values highlighted in orange are needed (values in braces can occur).

Access (property)	Open Access		Restricted Access		Closed Access
Access to Repository (20.1 databaseAccessType)	open		open or restricted		closed
Access to Data (22.1 dataAccessType)	open (embargoed, restricted, closed)		restricted (embargoed, closed)		closed
Data Upload (24.1 dataUploadType)	open or restricted	closed	open or restricted	closed	-

C Recommendations on Citing Data

Some RDRs offer guidelines on how to cite the research data they provide. If available, a URL to a web page outlining the recommended citation format can be found in the property citationGuidelineUrl. If a repository or journal does not offer specific data citation guidelines, the re3data team recommends using the DataCite citation format.[16] When stating the name of a RDR in a reference, the re3data team recommends referring to the RDR using repositoryName.

---

[16] https://datacite.org/cite-your-data.html

D DFG Classification of Subject Areas

1 Humanities and Social Sciences

        101 Ancient Cultures

                10101 Prehistory and World Archaeology

                10102 Classical Philology

                10103 Ancient History

                10104 Classical Archaeology

                10105 Egyptology and Ancient Near Eastern Studies

        102 History

                10201 Medieval History

                10202 Early Modern History

                10203 Modern and Current History

                10204 History of Science

        103 Art History, Music, Theatre and Media Studies

                10301 Art History

                10302 Musicology

                10303 Theatre and Media Studies

        104 Linguistics

                10401 General and Comparative Linguistics, Typology, Non-European Languages

                10402 Individual Linguistics

                10403 Historical Linguistics

                10404 Applied Linguistics, Experimental Linguistics, Computational Linguistics

        105 Literary Studies

                10501 Medieval German Literature

                10502 Modern German Literature

                10503 European and American Literature

                10504 General and Comparative Literature and Cultural Studies

        106 Social and Cultural Anthropology, Non-European Cultures, Jewish Studies and Religious Studies

                10601 Social and Cultural Anthropology and Ethnology

                10602 Asian Studies

                10603 African, American and Oceania Studies

                10604 Islamic Studies, Arabian Studies, Semitic Studies

                10605 Religious Studies and Jewish Studies

        107 Theology

                10701 Protestant Theology

                10702 Roman Catholic Theology

        108 Philosophy

                10801 History of Philosophy

                10802 Theoretical Philosophy

                10803 Practical Philosophy

        109 Educational Research

                10901 General Education and History of Education

                10902 General and Domain-Specific Teaching and Learning

                10903 Education Systems and Educational Institutions

                10904 Educational Research on Socialisation, Welfare and Professionalism Research

        110 Psychology

                11001 General, Cognitive and Mathematical Psychology

                11002 Biological Psychology and Cognitive Neuroscience

                11003 Developmental and Educational Psychology

                11004 Social Psychology, Industrial and Organisational Psychology

                11005 Differential, Clinical and Medical Psychology, Methodology

        111 Social Sciences

11101 Sociological Theory

11102 Empirical Social Research

11103 Communication Sciences

11104 Political Science

112 Economics

11201 Economic Theory

11202 Economic Policy, Applied Economics

11203 Business Administration

11204 Statistics and Econometrics

11205 Economic and Social History

113 Jurisprudence

11301 Principles of Law and Jurisprudence

11302 Private Law

11303 Public Law

11304 Criminal Law

11305 Criminology

2 Life Sciences

201 Basic Research in Biology and Medicine

20101 Biochemistry

20102 Biophysics

20103 Cell Biology

20104 Structural Biology

20105 General Genetics and Functional Genome Biology

20106 Developmental Biology

20107 Bioinformatics and Theoretical Biology

202 Plant Sciences

20201 Evolution and Systematics of Plants and Fungi

20202 Ecology and Biodiversity of Plants and Ecosystems

20203 Organismic Interactions, Chemical Ecology and Microbiomes of Plant Systems

20204 Plant Physiology

20205 Plant Biochemistry and Biophysics

20206 Plant Cell and Developmental Biology

20207 Plant Genetics

203 Zoology

20301 Systematics and Morphology (Zoology)

20302 Evolution, Anthropology

20303 Ecology and Biodiversity of Animals and Ecosystems, Organismic Interactions

20304 Sensory and Behavioural Biology

20305 Animal Physiology and Biochemistry

20306 Evolutionary Cell and Developmental Biology (Zoology)

204 Microbiology, Virology and Immunology

20401 Metabolism, Biochemistry and Genetics of Microorganisms

20402 Microbial Ecology and Applied Microbiology

20403 Medical Microbiology and Mycology, Hygiene, Molecular Infection Biology

20404 Virology

20405 Immunology

20406 Parasitology and Biology of Tropical Infectious Disease Pathogens

205 Medicine

20501 Epidemiology and Medical Biometry/Statistics

20502 Public Health, Health Services Research, Social Medicine

20503 Human Genetics

20504 Physiology

20505 Nutritional Sciences

20506 Pathology
20507 Medical Informatics and Medical Bioinformatics
20508 Pharmacy
20509 Pharmacology
20510 Toxicology, Occupational Medicine, Clinical Chemistry
20511 Anaesthesiology
20512 Cardiology, Angiology
20513 Pneumology, Thoracic Surgery
20514 Hematology, Oncology
20515 Gastroenterology
20516 Nephrology
20517 Endocrinology, Diabetology, Metabolism
20518 Rheumatology
20519 Dermatology
20520 Pediatric and Adolescent Medicine
20521 Gynaecology and Obstetrics
20522 Clinical Immunology and Allergology
20523 Reproductive Medicine, Urology
20524 Biogerontology and Geriatric Medicine
20525 General and Visceral Surgery
20526 Cardiac and Vascular Surgery
20527 Orthopaedics, Traumatology, Reconstructive Surgery
20528 Dentistry, Oral Surgery
20529 Otolaryngology
20530 Radiology, Nuclear Medicine, Radiotherapy, Radiobiology
20531 Clinical Infectiology and Tropical Medicine
20532 Medical Physics, Biomedical Technology
20533 Anatomy
206 Neurosciences
20601 Developmental Neurobiology
20602 Molecular Biology and Physiology of Neurons and Glial Cells
20603 Experimental and Theoretical Network Neuroscience
20604 Cognitive, Systems and Behavioural Neurobiology
20605 Experimental Models for the Understanding of Nervous System Diseases
20606 Molecular and Cellular Neurology and Neuropathology
20607 Clinical Neurology; Neurosurgery and Neuroradiology
20608 Human Cognitive and Systems Neuroscience
20609 Biological Psychiatry
20610 Clinical Psychiatry, Psychotherapy, Child and Adolescent Psychiatry
20611 Ophthalmology
207 Agriculture, Forestry and Veterinary Medicine
20701 Soil Sciences
20702 Plant Breeding and Plant Pathology
20703 Plant Cultivation, Plant Nutrition, Agricultural Technology
20704 Ecology of Land Use
20705 Agricultural Economics, Agricultural Policy, Agricultural Sociology
20706 Forestry
20707 Animal Breeding, Animal Nutrition, Animal Husbandry
20708 Veterinary Medical Science
3 Natural Sciences
307 Condensed Matter Physics
30701 Experimental Condensed Matter Physics
30702 Theoretical Condensed Matter Physics

308 Optics, Quantum Optics and Physics of Atoms, Molecules and Plasmas
> 30801 Optics, Quantum Optics, Atoms, Molecules, Plasmas

309 Particles, Nuclei and Fields
> 30901 Nuclear and Elementary Particle Physics, Quantum Mechanics, Relativity, Fields

310 Statistical Physics, Soft Matter, Biological Physics, Nonlinear Dynamics
> 31001 Statistical Physics, Soft Matter, Biological Physics, Nonlinear Dynamics

311 Astrophysics and Astronomy
> 31101 Astrophysics and Astronomy

312 Mathematics
> 31201 Mathematics

313 Atmospheric Science, Oceanography and Climate Research
> 31301 Atmospheric Science
> 31302 Oceanography

314 Geology and Palaeontology
> 31401 Geology and Palaeontology

315 Geophysics and Geodesy
> 31501 Geophysics
> 31502 Geodesy, Photogrammetry, Remote Sensing, Geoinformatics, Cartography

316 Mineralogy, Petrology and Geochemistry
> 31601 Mineralogy, Petrology and Geochemistry

317 Geography
> 31701 Physical Geography
> 31702 Human Geography

318 Water Research
> 31801 Hydrogeology, Hydrology, Limnology, Urban Water Management, Water Chemistry, Integrated Water Resources Management

321 Molecular Chemistry
> 32101 Inorganic Molecular Chemistry - Synthesis and Characterisation
> 32102 Organic Molecular Chemistry - Synthesis and Characterisation

322 Chemical Solid State and Surface Research
> 32201 Solid State and Surface Chemistry, Material Synthesis
> 32202 Physical Chemistry of Solids and Surfaces, Material Characterisation

323 Physical Chemistry
> 32301 Physical Chemistry of Molecules, Liquids and Interfaces, Biophysical Chemistry

324 Analytical Chemistry
> 32401 Analytical Chemistry

325 Biological Chemistry and Food Chemistry
> 32501 Biological and Biomimetic Chemistry
> 32502 Food Chemistry

326 Polymer Research
> 32601 Preparatory and Physical Chemistry of Polymers
> 32602 Experimental and Theoretical Physics of Polymers
> 32603 Polymer Materials

327 Theoretical Chemistry
> 32701 Theoretical Chemistry: Electron Structure, Dynamics, Simulation
> 32702 Theoretical Chemistry: Molecules, Materials, Surfaces

4 Engineering Sciences
401 Production Technology
> 40101 Metal-Cutting and Abrasive Manufacturing Engineering
> 40102 Primary Shaping and Reshaping Technology, Additive Manufacturing
> 40103 Joining and Separation Technology
> 40104 Plastics Engineering
> 40105 Production Systems, Operations Management, Quality Management and Factory Planning

40106 Production Automation

402 Mechanics and Constructive Mechanical Engineering

40201 Engineering Design, Machine Elements, Product Development

40202 Mechanics

40203 Lightweight Construction, Textile Technology

40204 Acoustics

403 Process Engineering, Technical Chemistry

40301 Chemical and Thermal Process Engineering

40302 Technical Chemistry

40303 Mechanical Process Engineering

40304 Biological Process Engineering

404 Fluid Mechanics, Technical Thermodynamics and Thermal Energy Engineering

40401 Energy Process Engineering

40402 Technical Thermodynamics

40403 Fluid Mechanics

40404 Hydraulic and Turbo Engines and Piston Engines

405 Materials Engineering

40501 Metallurgical, Thermal and Thermomechanical Treatment of Materials

40502 Materials in Sintering Processes and Generative Manufacturing Processes

40503 Coating and Surface Technology

40504 Mechanical Properties of Metallic Materials and their Microstructural Origins

40505 Glass, Ceramics and Derived Composites

40506 Polymeric and Biogenic Materials and Derived Composites

406 Materials Science

40601 Synthesis and Properties of Functional Materials

40602 Biomaterials

40603 Thermodynamics and Kinetics as well as Properties of Phases and Microstructure of Materials

40604 Computer-Aided Design of Materials and Simulation of Materials Behaviour from Atomic to Microscopic Scale

407 Systems Engineering

40701 Automation, Control Systems, Robotics, Mechatronics, Cyber Physical Systems

40702 Measurement Systems

40703 Microsystems

40704 Traffic and Transport Systems, Intelligent and Automated Traffic

40705 Human Factors, Ergonomics, Human-Machine Systems

40706 Biomedical Systems Technology

408 Electrical Engineering and Information Technology

40801 Electronic Semiconductors, Components, Circuits, Systems

40802 Communications, High-Frequency and Network Technology, Theoretical Electrical Engineering

40803 Electrical Energy Generation, Distribution, Application

409 Computer Science

40901 Theoretical Computer Science

40902 Software Engineering and Programming Languages

40903 Security and Dependability

40904 Operating, Communication, Database and Distributed Systems

40905 Interactive and Intelligent Systems, Image and Language Processing, Computer Graphics and Visualisation

40906 Information Systems, Process and Knowledge Management

40907 Computer Architecture and Embedded Systems

40908 Massively Parallel and Data-Intensive Systems

410 Construction Engineering and Architecture

41001 Architecture, Building and Construction History, Construction Research, Sustainable Building Technology

41002 Urbanism, Spatial Planning, Transportation and Infrastructure Planning, Landscape Planning
41003 Construction Material Sciences, Chemistry, Building Physics
41004 Structural Engineering, Building Informatics and Construction Operation
41005 Applied Mechanics, Statics and Dynamics
41006 Geotechnics, Hydraulic Engineering