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# PIDs für Messinstrumente (PIDINST)

PID-Konsortiumstag 2025  
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# Persistent Identification of Instruments WG (PIDINST)

- Arbeitsgruppe in der Research Data Alliance (RDA)
- Gruppe umfasst etwa 200 Mitglieder (monatl. Treffen)



# Definition (PIDINST WG)

- Instrument = „device used for making measurements, alone or in conjunction with one or more supplementary devices“  
(VIM 2012, zitiert nach [Stocker et al. 2020](#): 1)

# Implementierung durch DataCite

## Introducing DataCite Metadata Schema 4.5



January 24th, 2024

Metadata

Metadata Schema

7 min Read

<https://doi.org/10.5438/jvkk-8198>

## Instrument

**Description:** A device, tool or apparatus used to obtain, measure and/or analyze data.

Example:

```
<resourceType resourceTypeGeneral="Instrument">Reflectometer</resourceType>
```

# Definition (PIDINST WG)

- Instrument = „device used for making measurements, alone or in conjunction with one or more supplementary devices“ (VIM 2012, zitiert nach [Stocker et al. 2020](#): 1)
- „PIDINST chose to address the problem of persistently identifying the devices themselves, the real-world assets with instantaneous capabilities and configurations, rather than the identification of material instrument designs (models)“ ([Stocker et al. 2020](#): 1).
- „Instruments as physical entities“, „instruments instances“, „not to categorize model types in general“ (<https://www.rd-alliance.org/groups/persistent-identification-instruments-wg/work-statement/?sow=169744>)

# Implementierung durch DataCite

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## Instrument

**Description:** A device, tool or apparatus used to obtain, measure and/or analyze data.

**Examples and Usage Notes:** Note that this is meant to be the instrument instance, e.g., the individual physical device, not the digital description or design of an instrument.

Example:

```
<resourceType resourceTypeGeneral="Instrument">Reflectometer</resourceType>
```

# Persistent Identification of Instruments WG (PIDINST)

- Arbeitsgruppe in der Research Data Alliance (RDA)
- [Gruppe](#) umfasst etwa 200 Mitglieder (monatl. Treffen)
- Outputs: [Artikel](#), [White Paper](#), [Metadatenschema](#)



Stocker, M. et al. 2020. Persistent Identification of Instruments. *Data Science Journal*, 19, 18, pp.1-12. DOI: <https://doi.org/10.33844/dsj-2020-018>

## RESEARCH PAPER

### Persistent Identification of Instruments

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Instruments play an essential role in creating research data. Given the importance of instruments and associated metadata to the assessment of data quality and data reuse, globally unique, persistent and resolvable identification of instruments is crucial. The Research Data Alliance Working Group Persistent Identification of Instruments (PIDINST) developed a community-driven solution for persistent identification of instruments which we present and discuss in this paper. Based on an analysis of 10 use cases, PIDINST developed a metadata schema and prototyped schema implementation with DataCite and ePIC as representative persistent identifier infrastructures and with HZB (Helmholtz-Zentrum Berlin für Materialien und Energie) and BODC (British Oceanographic Data Centre) as representative institutional instrument providers. These implementations demonstrate the viability of the proposed solution in practice. Moving forward, PIDINST will further catalyse adoption and consolidate the schema by addressing new stakeholder requirements.

**Keywords:** Persistent Identification; Instruments; Metadata; DOI; Handle



## Metadata Schema for the Persistent Identification of Instruments

RDA Persistent Identification of Instruments WG

28 March 2022

Version	1.0
Date	28 March 2022

## 📄 PIDINST White Paper

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# PIDINST -> DataCite

## Mapping

### Weitere Attribute in DataCite:

Publisher (M): Organisation, die DOI erstellte

PublicationYear (M): Jahr der PID-Vergabe

...

### Resources

The following resources provide you with useful information on how to register and manage instrument PIDs.

- **Comprehensive Summary:** The [PID4NFDI Cookbook](#) is a good starting point to get an overview of instrument PIDs and how to register them.
- **Use-Case reports:** Our use-case reports give insights into how PIDs for instruments are implemented in two real-world examples.
  - Use-case: [DataCite DOIs for instruments at the Helmholtz Zentrum Berlin für Materialien und Energie](#)
  - Use-case: Assigning ePIC PIDs via B2INST for instruments at the NFDI4Earth Sensor Management System *[coming soon]*
- **Recommendations and examples for instrument metadata:** To make optimal use of instrument PIDs, it is crucial to fill in the metadata fields carefully. This is not always easy, especially as there did not exist much guidance on this topic so far.
  - Recommendations: Linking instrument PIDs to other research entities *[coming soon]*
  - Recommendations: Optimal use of DataCite metadata fields for instruments *[coming soon]*

= für Instrumente  
eingeführter relationType

PIDINST Property	DataCite v. 4.5	Comments
Identifier	<a href="#">1. Identifier</a>	
Name	<a href="#">3. Title</a>	May be the title of a dataset, the name of a piece of software or instrument.
Owner	<a href="#">7. Contributor</a> with <a href="#">7.a contributorType</a> :  <a href="#">HostingInstitution</a>	Can be used for the owner of an instrument, i.e. the institution responsible for the management of the instrument. This may include the legal owner, the operator, or an institute providing access to the instrument. Use the contributorType "HostingInstitution". The instrument owner may also be included in <a href="#">4. Publisher</a> . <sup>2</sup>
Manufacturer	<a href="#">2. Creator</a>	The instrument's manufacturer(s) or developer. This may also be the owner for custom-build instruments.
Model	<a href="#">17. Description</a> with <a href="#">17.a descriptionType</a> :  <a href="#">TechnicalInfo</a>	Detailed information associated with an instrument instance, e.g. model (model name and model identifier), instrument type (name and identifier), or measured variable.
Description	<a href="#">17. Description</a> with <a href="#">17.a descriptionType</a> :  <a href="#">Abstract</a>	Technical description of the device and its capabilities.
InstrumentType	<a href="#">17. Description</a> with <a href="#">17.a descriptionType</a> :  <a href="#">TechnicalInfo</a>	
MeasuredVariable	<a href="#">17. Description</a> with <a href="#">17.a descriptionType</a> :  <a href="#">TechnicalInfo</a>	The variable(s) that this instrument measures or observes.
Date	<a href="#">8. Date</a>	Dates relevant to the instrument.
RelatedIdentifier	<a href="#">12. RelatedIdentifier</a>	
relationType	<a href="#">12.b relationType</a>	RelationTypes applicable to instruments.  ...
	<a href="#">Collects, IsCollectedBy</a>	If the instrument has been used to collect data (e.g., to measure a physical quantity in some research activity), Collects may be used to link the instrument to the resulting dataset.
AlternateIdentifier	<a href="#">11. AlternateIdentifier</a>	May be used for the instrument's serial number. Other possible uses include an owner's inventory number or an entry in some instrument database.

# PIDINST -> DataCite

## Mapping

### Weitere Attribute in DataCite:

Publisher (M): Organisation, die DOI erstellte

PublicationYear (M): Jahr der PID-Vergabe

PIDINST Property	DataCite v. 4.5	Comments
Identifier	<a href="#">1. Identifier</a>	
Name	<a href="#">3. Title</a>	May be the title of a dataset, the name of a piece of software or instrument.
Owner	<a href="#">7. Contributor with 7.a contributorType:</a>  <a href="#">HostingInstitution</a>	Can be used for the owner of an instrument, i.e. the institution responsible for the management of the instrument. This may include the legal owner, the operator, or an institute providing access to the instrument. Use the contributorType "HostingInstitution". The instrument owner may also be included in <a href="#">4. Publisher</a> . <sup>2</sup>
Manufacturer	<a href="#">2. Creator</a>	The instrument's manufacturer(s) or developer. This may also be the owner for custom-build instruments.
Model	<a href="#">17. Description with 17.a descriptionType:</a>	Detailed information associated with an instrument instance, e.g. model (model name and model identifier), instrument type ( <i>name and identifier</i> ), or measured variable.



## Resources

The following resources provide you with useful information on how to register and manage instrument PIDs.

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  - Recommendations: Linking instrument PIDs to other research entities *[coming soon]*
  - Recommendations: Optimal use of DataCite metadata fields for instruments *[coming soon]*

	<a href="#">Collects, IsCollectedBy</a>	If the instrument has been used to collect data (e.g., to measure a physical quantity in some research activity), Collects may be used to link the instrument to the resulting dataset.
AlternateIdentifier	<a href="#">11. AlternateIdentifier</a>	May be used for the instrument's serial number. Other possible uses include an owner's inventory number or an entry in some instrument database.

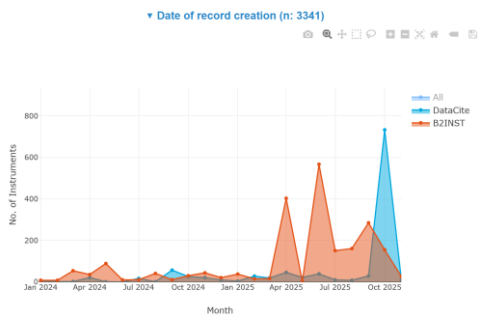
<https://pid.services.base4nfdi.de/services/instruments/>

# Suche nach Instrumenten mit PID

- DataCite oder B2INST:
  - Föderierte Suche (PID4NFDI): <https://search.pidinst.org>
  - Statistiken für alle Instrumente: <https://search.pidinst.org/all>
- Nur DataCite:
  - [DataCite Commons](#)
  - [OpenAlex](#)

(*Instrument* mit anderen *resource types* unter *other* gebündelt)

# Bestandsaufnahme Instrumentenlandschaft

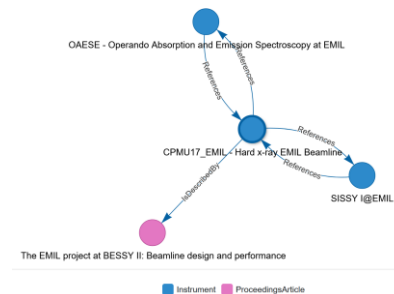


Sukzessive Zunahme  
von PIDs für Instrumente

▼ Data source frequency by PID provider

Data source	DataCite (n)	B2INST (n)
<a href="#">sensors.gtz.de</a>	0	1331
<a href="#">equipment.data.ac.uk</a>	717	0
<a href="#">pid-sms.bodc.uk</a>	0	404
<a href="#">web.app.ufz.de/sms</a>	0	261
<a href="#">sms.atmoshub.kit.edu</a>	0	184
<a href="#">dmr-first.org</a>	135	0
<a href="#">research-repository.uwa.edu.au/en/equipments</a>	70	0
<a href="#">oef.io</a>	70	0
<a href="#">isis.stfc.ac.uk/Pages/instruments.aspx</a>	37	0
<a href="#">helmholtz-berlin.de</a>	24	0
<a href="#">jcu.edu.au/advanced-analytical-centre/analytical-facilities/all-instruments</a>	15	0
<a href="#">eis.dtu.dk/Assets/PublicDivisions.aspx</a>	13	0
<a href="#">profiles.auckland.ac.nz/search?by=text&amp;type=equipment</a>	11	0
<a href="#">researchnow.flinders.edu.au/en/equipments</a>	10	0

Konzentration auf wenige  
Gerätedatenbanken/Repositorien



Beziehungen von  
Instrumenten zu anderen  
Ressourcen selten in  
Metadaten (B2INST: 0%,  
DataCite: <10%)

# Back up

# Konzeptionelle Herausforderungen

„How can a persistent identifier account for changes in instrument configurations or sub-components over time?

At what point do changes in an instrument accumulate to the point that it's a different instrument entirely? (The modern science version of the “Ship of Theseus” paradox, Furner 2009)

What might the implications of these changes be for the persistent identifier that is attached to such an instrument?“

([Mayernik et al. 2024](#): 12)

# PIDINST-Empfehlung zu umgebauten Instrumenten

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PIDINST Property	DataCite v. 4.5	Comments
relationType	<a href="#">12.b relationType</a>	RelationTypes applicable to instruments.
Describes, IsDescribedBy		The linked resource is a document describing the instrument.
IsNewVersionOf, IsPreviousVersionOf		If an instrument is <b>substantially modified</b> , a <b>new DOI</b> may be attributed to the new version. In that case the old and the new DOI should be linked to each other. IsNewVersionOf should be used in the new DOI record to link the old instrument before the modification.
HasPart, IsPartOf		In the case of a complex instrument, having multiple components that may be considered as instruments in their own right, with their own DOIs, these DOIs should be linked. HasPart should be used in the DOI record of the compound instrument to link the components. IsPartOf should be used in the DOI records of the components to link the compound instrument.
HasMetadata, IsMetadataFor		If there is additional metadata describing the instrument, possibly using a community specific metadata standard, that metadata record may be linked using HasMetadata.
Collects, IsCollectedBy		If the instrument has been used to collect data (e.g., to measure a physical quantity in some research activity), Collects may be used to link the instrument to the resulting dataset.

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# PIDINST-Empfehlung zu Granularität

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PIDINST Property	DataCite v. 4.5	Comments
relationType	<a href="#">12.b relationType</a>	RelationTypes applicable to instruments.
	Describes, IsDescribedBy	The linked resource is a document describing the instrument.
	IsNewVersionOf, IsPreviousVersionOf	If an instrument is substantially modified, a new DOI may be attributed to the new version. In that case the old and the new DOI should be linked to each other. IsNewVersionOf should be used in the new DOI record to link the old instrument before the modification.
	HasPart, IsPartOf	In the case of a complex instrument, having <b>multiple components</b> that may be considered as instruments in their own right, with their <b>own DOIs</b> , these DOIs should be linked. HasPart should be used in the DOI record of the compound instrument to link the components. IsPartOf should be used in the DOI records of the components to link the compound instrument.
	HasMetadata, IsMetadataFor	If there is additional metadata describing the instrument, possibly using a community specific metadata standard, that metadata record may be linked using HasMetadata.
	Collects, IsCollectedBy	If the instrument has been used to collect data (e.g., to measure a physical quantity in some research activity), Collects may be used to link the instrument to the resulting dataset.

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# PIDINST-Empfehlung zu Granularität

“Furthermore, in the case of a complex instrument, it can make sense to issue **PIDs for individual components**, such as an individual detector in a larger experimental station. In this case, the relation between the complex instrument and its components should be established by creating links between the respective PIDs.”

# Metadaten-Vollständigkeit (Stand August 2025)

- DataCite Pflichtgrad (Pflichtfeld > empfohlenes Feld > optionales Feld)
- Schwierigkeit/Aufwand des Ausfüllens (high <-> low)
- Anwendbarkeit auf Instrumente (high <-> low)
- Datenquelle (MDS > API > Fabrica) [Scheinkorrelation?]