

DATA QUALITY RATING (DQR) **GUIDANCE**

Released April 2026
Released Version: 1.0





Introduction

Purpose of this Document

The purpose of this document is to provide practical guidance on Data Quality Rating (DQR) for input data that is used for PCF calculation according to the Catena-X PCF Rulebook Version 4. The DQR is a key figure that is used to evaluate the quality of the input data to finally obtain an assessment of the quality of the resulting PCF.

This document describes the application of this logic by means of concrete examples.

The rules as per Catena-X Rulebook Version 4 (section 7.2.5) always apply. This document provides practical additional guidance and explanations. The examples shown are for illustrative purposes only.

Background: Types of Data Sources

The data that is used in PCF calculation comes from different sources, which can be differentiated into three basic types.

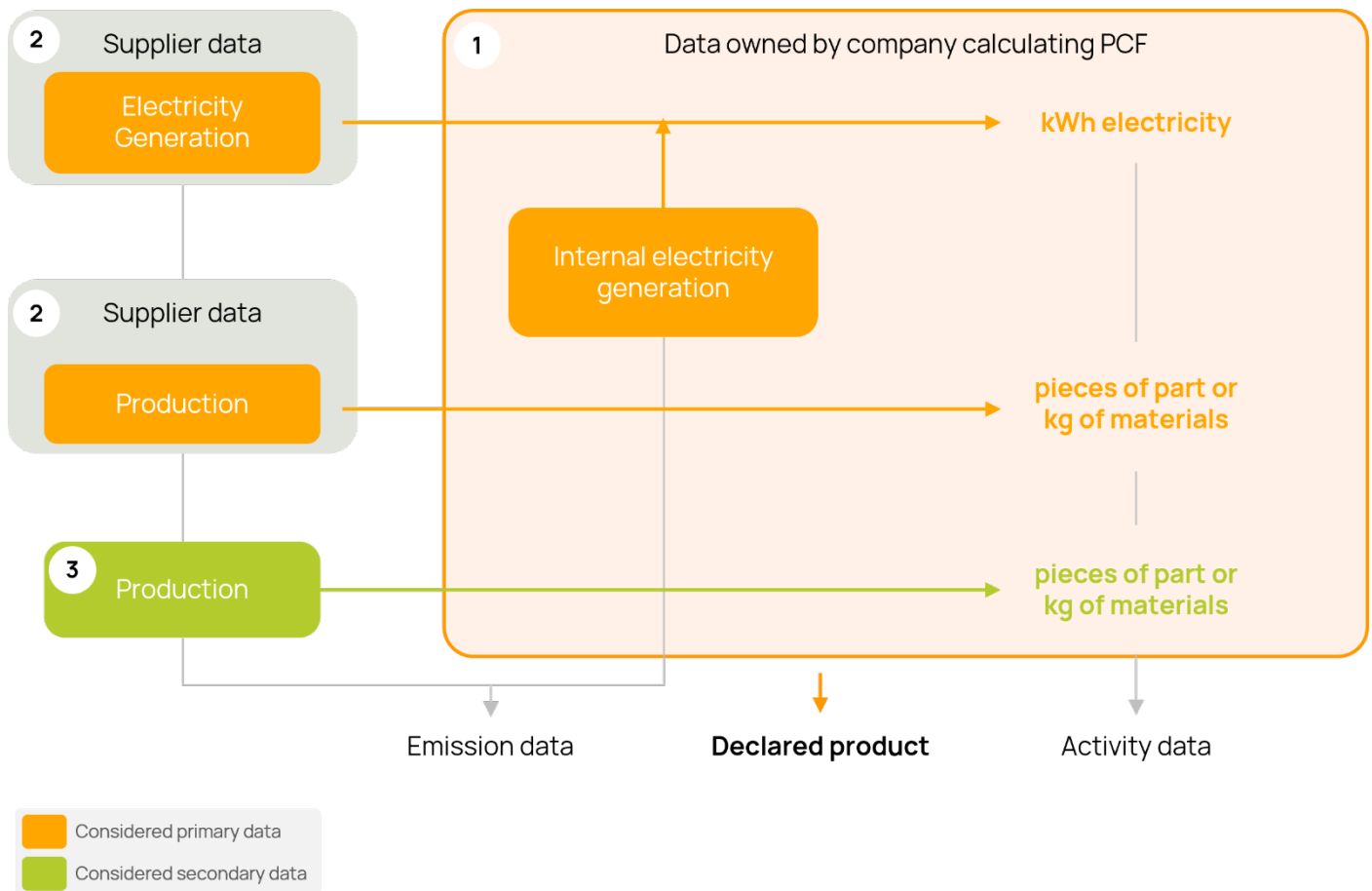


Figure 1: Data sources for PCF calculation

1. Primary data owned by the company calculating PCF, i.e., data on processes run by the company.
Examples:
 - Electricity | activity data: 10 kWh/product
 - Wastewater | activity data: 0.5 l/product
 - Component 1 | activity data: 1 piece/product
 - Component 2 | activity data: 1 piece/product
2. Primary data of third parties in the supply chain, i.e., data on processes not run by the company, but data received from its suppliers.
Examples:
 - Electricity | emission factor: 0.03 kg CO₂e/kWh (e.g., provided by electricity supplier)
 - Component 1 | emission factor: 7.0 kg CO₂e/product (e.g., provided by Supplier 1)
3. Secondary data sources, i.e., the process is not run by the company, and no data is received from its suppliers.
Examples:
 - Wastewater | emission factor: 0.25 CO₂e/l
 - Component 2 | emission factor: 5.0 kg CO₂e/product



Data Quality Assessment: Basics

Before we demonstrate the application of the DQR using examples, here is a brief recap of the basics. (Catena-X PCF Rulebook Version 4 - Chapter 7.2.5.1)

Indicators and Categories

Quality levels are expressed for three data quality indicators:

- TeR: Technological Representativeness - the degree to which the data reflects the actual technology(ies) used in the process.
- GeR: Geographical Representativeness - the degree to which the data reflects actual geographic location of the processes within the inventory boundary (e.g., country or site)
- TiR: Temporal Representativeness - the degree to which the data reflects the actual time (e.g., year) or age of the process

The quality levels are expressed in five categories from 1 (best) to 5 (worst).

Note: If no DQR is reported, the values representing the lowest data quality as per the sample scoring criteria are propagated by default. So, a level 5 rating has either the meaning of the lowest data quality or that no data quality rating has been reported.

Assessment

Using data quality ratings companies shall assess

- activity data,
- emission factors, and/or
- direct emissions data.

Both primary and secondary data must be assessed.

Notes for additional guidance:

For secondary data, the Data Quality Rating (DQR) from the original database shall not be used directly. Instead, the DQR must be re-evaluated to reflect how well the dataset represents the geographical, temporal and technological characteristics of the actual supply chain.

TiR (Temporal representativeness): Secondary datasets from databases that undergo an annual review can be handled as TiR = 3 (to account for statistical time-lag also for electricity data). Datasets where this annual review is not taking place have to be evaluated in detail separately.

Additionally, for secondary data, particularly data provided by industry associations and incorporated into commercial secondary LCA databases, when assessing Time/Temporal Representativeness (TiR), "Reference Period End" should be assumed to be equal to the "reference year".

Exemplary Data Quality Rating Assessment

An exemplary DQR assessment and respective explanations can be found in Table 1. The example shown could, for example, represent the calculation and data quality rating assessment of a steel frame with add-on parts. Components 1 and 2 as well as the steel alloy are purchased and processed into the finished electronics component.

Table 1: Data Quality Rating Assessment sample

PCF	Item	Activity Data			Emission Data			Impact [kg CO ₂ e]	Contribution	DQR (overall)
		Detail	Source	DQR	Detail	Source	DQR			
Gate-to-Gate/Core (reporting company)	Direct emissions	0.25 kg CO ₂ e	Company database	1, 1, 1	0.25 kg CO ₂ e	Calculated	1, 1, 1	0.25	0.60%	1, 1, 1
	Waste & wastewater	0.5 l		1, 1, 1	0.25 kg CO ₂ e/l	Secondary database	4, 3, 3	0.125	0.30%	4, 3, 3
	Heat	1 kWh		1, 1, 1	0.15 kg CO ₂ e/kWh	Supplier	1, 1, 1	0.15	0.40%	1, 1, 1
	Electricity	10 kWh		1, 1, 1	0.03 kg CO ₂ e/kWh	Supplier	1, 1, 1	0.3	0.7%	1, 1, 1
	Consumables (e.g. lubricants)	0.01 l	...	1, 1, 1	0.50 kg CO ₂ e/l	Secondary database	4, 3, 3	0.005	0.01%	4, 3, 3
Supply Chain	steel alloy	7.1 kg	BoM	1, 1, 1	3.90 kg CO ₂ e/kg	Secondary database	4, 5, 3	27.70	68.3%	4, 5, 3
	component 1	1 piece	BoM	1, 1, 1	7.00 kg CO ₂ e/piece	Detailed modeling	3, 3, 2	7	17.3%	3, 3, 2
	component 2	1 piece	BoM	1, 1, 1	5.00 kg CO ₂ e/piece	Supplier	5, 5, 5	5.00	12.3%	5, 5, 5
Total								40.52	100.00%	3.9, 4.6, 3.0

Explanation and guidance for table 1 based on data sources

Activity Data:

1) Activity Data

DQR (1,1,1), as:

- TeR: Dataset based on data reflecting the exact technology employed (TeR) → plant-specific data
- TiR: Difference between "Reference Period End" of the dataset and "Date of Issue" of the PCF is ≤ 1 year → current data
- GeR: Dataset based on data reflecting the country subdivision in which the product has been manufactured → plant-specific

Emission Data:

2) Calculated Data

DQR 1,1,1, as:

- TeR: Directly calculated from measured data → plant-specific data
- TiR: Difference between "Reference Period End" of the dataset and "Date of Issue" of the PCF is ≤ 1 year → current data
- GeR: Dataset based on data reflecting the country subdivision in which the product has been manufactured → plant-specific

3) Supplier Data

DQR 1, 1, 1, as:

- TeR: Reported from Supplier: Dataset based on data reflecting the exact technology employed → plant-specific data
- TiR: Reported from Supplier: Difference between "Reference Period End" of the dataset and "Date of Issue" of the PCF is ≤ 1 year → current data
- GeR: Reported from Supplier Dataset based on data reflecting the country subdivision in which the product has been manufactured → plant-specific

4) Supplier Data

DQR 5,5,5, as:

- TeR: No information provided from supplier → Worst estimate to be considered
- TiR: No information provided from supplier → Worst estimate to be considered
- GeR: No information provided from supplier → Worst estimate to be considered

5) Secondary Database

DQR 4,3,3, as:

- TeR: Data reflecting a technological proxy → Secondary database provides data on technology mixes
- TiR: Difference between "Reference Period End" of the dataset and "Date of Issue" of the PCF is > 1 year → Default value for annually updated datasets
- GeR: Dataset based on data pertaining to the geographical region → regional averages considered

6) Secondary Database

DQR 4,5,3, as:

- TeR: Data reflecting a technological proxy → Secondary database provides data on technology mixes
- TiR: Dataset has not undergone annual update, but is association data from 2021
- GeR: Dataset based on data pertaining to the geographical region → regional averages considered

7) Detailed Modeling

DQR 3,3,2, as:

- TeR: Supply chain modeling conducted → Technical average assumed, as secondary database provides data on technology mixes
- TiR: Supply chain modeling conducted → Default value for annually updated datasets
- GeR: Supply chain modeling conducted → Regional averages of supply-chain considered

Guidelines for the calculation of the PCF for electronic components are available via [this link](#) and in [the appendix](#). The document provides definitions and recommended guidelines for conducting the Data Quality Assessment (DQA), with a particular focus on Technological Representativeness (TeR) in PCF calculations for electronic components.

REFERENCES

Catena-X e.V. (2025). *DQR synthesis table*. Retrieved from [https://catena-x.academy/index.php?gf-download=2025%2F10%2FTeR Table PCF Electronics v2.0.pdf&form-id=1&field-id=5&hash=096a2a158aa1e63506617dd0299b18aba1fa2a1418d940a255b1560a7d8f3679](https://catena-x.academy/index.php?gf-download=2025%2F10%2FTeR+Table+PCF+Electronics+v2.0.pdf&form-id=1&field-id=5&hash=096a2a158aa1e63506617dd0299b18aba1fa2a1418d940a255b1560a7d8f3679)

Catena-X PCF Rulebook Version 4 - Chapter 7.2.5.1. (n.d.). Retrieved from https://catenax-ev.github.io/assets/files/CX-NFR-PCF-Rulebook_v.4.0-760ee9e1d078f76317dc8e91f785d183.pdf

ANNEX

Documents

Catena-X PCF Rulebook

<https://catenax-ev.github.io/docs/next/non-functional/overview>

Catena-X and TfS PCF Verification Framework

<https://catenax-ev.github.io/docs/next/non-functional/overview>

Guidelines for the calculation of the PCF for electronic components – TeR Matrix Data Quality Assessment

[Download-Link in Catena-X Campus Library](#)

Additional sources of information

Catena-X Library

<https://catenax-ev.github.io/>

Catena-X Campus

<https://catena-x.academy/de/>

TeR Matrix Data Quality Assessment for electronics (See next page)

https://catena-x.academy/index.php?qf-download=2025%2F10%2FTeR_Table_PCF_Electronics_v2.0.pdf&form-id=1&field-id=5&hash=096a2a158aa1e63506617dd0299b18aba1fa2a1418d940a255b1560a7d8f3679

Table 2: TeR Matrix Data Quality Assessment for electronics (Catena-X e.V., 2025)

Technology Representativeness	PCF input data	Product					
		Bare PCB	Active components (e.g. analogue and digital semiconductors)	Passive components (e.g. resistors, capacitors, inductors, magnets)	Connectors & Cables	PCBA (only the population of the bare PCB: soldering, mounting, screwing, potting)	
TeR 1 (Method A & B)	Direct BOM (aka: upstream materials,	evaluated for the specific PCB types (FR4, HDI, AlCore) and tied to key PCF drivers (Layers, surface		Amount of material evaluated for the specific component listing the exact material used, avoiding broad material categories (e.g. mono-crystalline Silicon carbide rather than Silicon)		Evaluated with specific materials, components and subparts (Exact Direct BOM required)	
	Indirect BOM, including packaging for transport (aka: Consumables and their waste treatment required for the assembly of component but not part of the component)	Consumption of auxiliary materials (e.g. chemicals, etching materials, sealing polymers, solvents, cleaning agents) specific per PCB type, allocation probably via surface & number of layers, or time spent on each individual material-consuming process.		evaluated for the specific component category (purpose + node type and size + package) and allocated according to metrics such as WaferArea.MaskLayer (Front End) or weight / #pin of this product package (Back End)	evaluated for the specific component category (purpose + package + size) and allocated according to metrics such as body size and surface size and treatment, geometry of multi materials or other rationals that differentiate consumption per product;	Consumption of auxiliary materials specific per final product, allocated based on metrics such as size/weight, assembly time or other rationals that differentiate consumption per product Indirect BOM examples : oils, solvent, packaging, ...	
	Material/component/part Emission factor or PCF	from company's supply chain with TeR=1 per single upstream material/component/part					
	Process Intensity (energy measurement, direct emissions, chemicals ...)	For the specific PCB type in the manufacturing plant, allocated according the same metrics as indirect BOM	kWh Electricity, Direct emissions including F-gas measured for the specific component category and allocated according to same metrics as indirect BOM	need to follow the same allocation logic and rational as indirect BOM			
	Electricity Emission Factor	specific to the manufacturing line of the product					
	Transportation (contracted or operated by declarant)	Generic position not electronic specific: Reference CX-Rulebook Chapter 5.2.1					
TeR 2 (Method A, B, C & E)	Direct BOM	Exact Direct BOM or BOM of a similar product in case the exact BOM is not yet established					
	Indirect BOM, including packaging for transport	evaluated averaging several close PCB types (eg. FR4 & HDI) but tied to key PCF drivers (eg. layers, surface yield)	evaluated from broad component category from the company's portfolio (Diodes, MCU, ...) and allocated according to metrics such as WaferArea.MaskLayer (Front End) or weight / #pin of this product package (Back End)	evaluated for the specific component or similar category (same purpose, same package & same size) and allocated according to metrics such as body size and surface size and treatment, geometry of multi materials or other rationals that differentiate. It can be averaged if various sites produce with same technology	consumption of auxiliary materials specific per final cable/connector group being similar in size or dimension, e.g. allocation of oils , solvents, etc. per similar cable/connccetor type, size, assembly time or other rationals that differentiate consumption per product	consumption of auxiliary materials specific per final PCBA group being similar in size or complexity, e.g allocation of oils , solvents, etc. per similar PCBA type, size, assembly time or other rationals that differentiate consumption per product	
	Material/component/part Emission factor or PCF	from company's supply chain with weighted average TeR<=2 per single upstream material/component/part					
	Process Intensity (energy measurement, direct emissions, chemicals ...)	Special care is recommended on Copper Clad Laminate (CCL) & Prepreg (PP) contribution		based on specific location and manufacturing technology; average accross similar sites and products with same technology is possible			
	Process Intensity (energy measurement, direct emissions, chemicals ...)	averaging several close PCB types (eg. FR4 & HDI)	Corporate process intensity (kWh Electricity, Direct emissions including F-gas) derivated from close component category or from another production line allocated according to same metrics as BOM	need to follow the same allocation logic and rational as indirect BOM, e.g. take primary data with measurement of kWh Electricity, Direct emissions (petrol, fuel, ..) used during the process derivated from close component category or from another production line			
	Electricity Emission Factor	specific to the company and to the manufacturing country					
Transportation (contracted or operated by declarant)	Generic position not electronic specific: Reference CX-Rulebook Chapter 5.2.1						
TeR 3 (Method B, C, D, E & F)		Emission factor or PCF from a database providing evaluation for the specific PCB type (FR4, HDI, FPC...) and layercount of the product.	Emission factor or PCF from a database providing evaluations by component purpose/family & technology, fitted to the specific component evaluated through a recognized scaling rule/tool.		Emission factor or PCF from a database providing evaluations for a component having the same purpose and features, fitted to the specific component evaluated through a recognized scaling rule/tool.		
		OR primary evaluation relying on TeR>2 (e.g. Material EF from another supplier, alternative etching process, approx. BOM)					
TeR 4 (Method B, C, D, E & F)		Emission factor or PCF from a database providing evaluation not specific to the exact PCB type (FR4, HDI, FPC...) or layercount of the product	Emission factor or PCF from a database providing evaluation by component family, but not allowing to match the real component's purpose or specificities. (broad categories or no scaling rule applied)		Emission factor or PCF from a database providing evaluation for component of the same category, but not allowing to match the real component's purpose or features. (broad categories or no scaling rule applied)		
		Some primary evaluations may end up with a TeR=4 if their underlying assumptions are not enough technology representative					
TeR 5		If none of the conditions above is met, then TeR = 5					

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