

DIN EN ISO 17034:2017



# Certified Reference Material FLX-2003 – Iron Ore Concentrate

### Certified Values

Parameter	Mass fraction in % <sup>1)</sup>	Uncertainty in % <sup>2)</sup>	Traceable to
Al <sub>2</sub> O <sub>3</sub>	0,274	0,032	EURONORM CRM No. 690-1
CaO	0,332	0,034	EURONORM CRM No. 690-1
Fe <sub>2</sub> O <sub>3</sub>	96,11	0,67	EURONORM CRM No. 690-1
MgO	1,279	0,074	EURONORM CRM No. 690-1
Mn <sub>3</sub> O <sub>4</sub>	0,057	0,013	EURONORM CRM No. 690-1
NiO	0,031	0,010	EURONORM CRM No. 690-1
SiO <sub>2</sub>	1,489	0,077	EURONORM CRM No. 690-1
TiO <sub>2</sub>	0,278	0,032	EURONORM CRM No. 690-1
V <sub>2</sub> O <sub>5</sub>	0,223	0,027	EURONORM CRM No. 690-1

Table1) Certified Values

1) Certified value traceable to SI unit kg/kg based on ignited sample ignited material.

2) Total expanded uncertainty  $U_{CRM}$  calculated for a confidence interval of 95% ( $k=2$ ).

The sum of all oxides is **100,17 %**. This includes informational values and excludes LOI.

This certificate is valid, within the uncertainty specified, **until 31.07.2035**, provided the CRM is handled in accordance with instructions given in this certificate. The certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

Bedburg-Hau, **31.07.2025**

**Responsible Reference Materials**

Dr. Rainer Schramm

**Quality Management**

Ch. Winkels-Herding

## Description of the CRM

This reference material is an industrial product and was taken directly from the production stream. The complete batch was sealed into 30 g bottles. This material is normally used as raw material for iron making.

## Intended use

Calibration and control sample for x-ray fluorescence (XRF) analysis.

## Informational Values<sup>3)</sup>

Parameter	Mass Fraction in %	Uncertainty <sup>6)</sup>
<b>Co<sub>3</sub>O<sub>4</sub><sup>4)</sup></b>	0,016	0,003
<b>Cr<sub>2</sub>O<sub>3</sub><sup>4)</sup></b>	0,015	0,005
<b>Fe<sub>2+</sub><sup>5)</sup></b>	22,34	0,38
<b>K<sub>2</sub>O<sup>4)</sup></b>	0,018	0,004
<b>Na<sub>2</sub>O<sup>4)</sup></b>	0,022	0,003
<b>P<sub>2</sub>O<sub>5</sub><sup>4)</sup></b>	0,014	0,002
<b>SO<sub>3</sub><sup>4)</sup></b>	0,013	0,005
<b>ZnO<sup>4)</sup></b>	0,002	0,001
<b>LOI<sup>7)</sup></b>	-2,90	0,03

Table2) Informational Values

3) Values taken from PT FXRV-2024-04.

4) Based on ignited material (1h 950°C).

5) Based on dried material (1h 105 °C).

6) Total expanded uncertainty  $U_{s^*}$  calculated for a confidence interval of 95% ( $k=2$ ).

7) LOI=loss on ignition min. 2 hours at 950°C. Based on original material.

## Instructions for the correct use of the CRM

This material is moisture sensitive. This material has to be ignited for minimum 2 hours at 950°C prior use. The ignition process must result in a constant weight. The ignited material must be stored in a desiccator not longer than 24h, then reignition might be necessary. The minimum sample quantity for analysis should be 0,8 g. For XRF use, ignited samples should be prepared as a fused bead, e.g. in accordance with **ISO 9516-1:2003**.

## Storage Information

The material has to be stored in a dry and clean environment.

## Hazardous situation

For this material an actual MSDS is available.

## Level of homogeneity

In accordance with ISO 33405:2024 a homogeneity study was performed. A one-way ANOVA was used to calculate the batch inhomogeneity.

## Stability

In accordance with ISO 33405:2024 a stability study was performed. As a result, the stability of the material was considered as fit for purpose. The uncertainty of long-term stability was calculated

## Total expanded uncertainty

The total expanded uncertainty  $U_{CRM}$  for a confidence interval of 95% ( $k=2$ ) was calculated by taking into account the uncertainty of characterization  $u_{char}$ , of inhomogeneity  $u_{bb}$  and long-term stability  $u_{lts}$ .

$$U_{CRM} = k \times \sqrt{u_{char}^2 + u_{bb}^2 + u_{lts}^2}$$

## Traceability

All of the certified values derived as part of this testing program have traceability to the reference material stated in table 1.

## Methods used

The analytical work performed to assess this material was carried out by the FLUXANA laboratory, which works according to ISO/IEC 17025:2018.

In accordance with ISO 17034:2017 and ISO 33405:2024, we use the approach stated in ISO 17034:2017 Chapter 7.12.3. d) value transfer from an RM to a closely matched candidate RM performed using a single measurement procedure performed by one laboratory.

An example for this approach is found in ISO 13528:2022 E.5. Using this approach, samples of the test material that is to be the new reference material are tested along with matching and/or synthetic RMs using a suitable method. The assigned values  $X_{CRM}$  and their uncertainties  $U_{CRM}$  are then derived from a calibration against the certified reference values of the compared RMs. Synthetic RMs are made from pure chemicals by weighing.

Measurement method used: XRF with fusion as sample preparation technique.

This certificate is in conformance with ISO 33401:2024.

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