FLUXANA®
XRF Application Solutions

Final Proficiency Test Report for Clay (RV-2024-03)

FLX-134

Bedburg-Hau, February 06th 2025

Coordinator of PT
Charlotte Winkels-Herding

Statistics and Report
Dr. Rainer Schramm

New issue: Correction of a participant's name

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	Al2O3	BaO	CaO	Fe2O3	K2O	MgO
Unit	%	%	%	%	%	%
No. of laboratories	23	17	20	23	23	21
Mean m	38,483	0,044	0,144	1,198	1,952	0,322
Repoducibility standard deviation s_R	0,384	0,011	0,036	0,043	0,031	0,052
Repeatability standard deviation s_r	0,092	0,001	0,003	0,008	0,010	0,005
Reproducibilty standard deviation s*	0,396	0,010	0,035	0,042	0,032	0,055
Uncertainty U (s*)	0,206	0,006	0,019	0,022	0,017	0,030
Uncertainty U (s_R)	0,200	0,007	0,020	0,022	0,016	0,028
Mean - 2*s_R	37,714	0,023	0,071	1,113	1,891	0,218
Mean + 2*s_R	39,251	0,066	0,217	1,284	2,013	0,425

	Na2O	P2O5	SiO2	TiO2	V2O5	LOI
Unit	%	%	%	%	%	%
No. of laboratories	20	20	23	23	15	23
Mean m	0,184	0,078	56,190	1,027	0,019	14,054
Repoducibility standard deviation s_R	0,041	0,009	0,664	0,020	0,006	0,205
Repeatability standard deviation s_r	0,009	0,002	0,110	0,003	0,001	0,030
Reproducibilty standard deviation s*	0,042	0,010	0,672	0,019	0,007	0,178
Uncertainty U (s*)	0,024	0,006	0,350	0,010	0,004	0,093
Uncertainty U (s_R)	0,023	0,005	0,346	0,010	0,004	0,107
Mean - 2*s_R	0,102	0,059	54,863	0,987	0,006	13,645
Mean + 2*s_R	0,266	0,097	57,517	1,068	0,031	14,463

Mean	**calculated from laboratory means using traceable methods only**
s_R	**Reproducibility standard deviation (based on all measurements)**
s_r	**Repeatability standard deviation (inside the laboratories)**
s*	**Reproducibility standard deviation (based on laboratory means)**
U (s*)	**uncertainty calculated for a confidence interval of P= 95% (k=2)**
U (s_R)	**uncertainty calculated for a confidence interval of P= 95% (k=2)**
Range of tolerance	**Mean ± 2 x s_R ; all labs within this range show satisfactory performance**

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Introduction

FLUXANA GmbH & Co. KG is a company providing services in the field of X-ray fluorescence analysis (XRF).

In 2011, FLUXANA introduced its own quality management.

In 2020 the accreditation of the FLUXANA Laboratory in Bedburg-Hau, Germany, was updated to DIN EN ISO/IEC 17025:2018 and FLUXANA received accreditation as Producer of Reference materials according to DIN EN ISO 17034:2017, as well.

The performance of proficiency tests is not yet accredited. However, the proficiency tests are conducted following the corresponding norms.

Outliers

Outliers in the statistical sense are typically not detected when using robust statistical methods because the robust A+S algorithms were found to work better than the classical approach (which is outlier detection plus arithmetic mean and classical s.d. formula). Obvious blunders are taken out before calculation and will be marked as 'information only'.

Further Information

All laboratory data is listed in the following evaluation report. Additional information about laboratory accreditation and analytical methods used is also provided. Calculation was done only on traceable methods.
Other methods, e.g., XRF using "pressed pellets" as the sample preparation method or XRF with the "standardless analysis" method, which are not traceable can also be used. These values will not be included in the evaluation. They will, however, be shown as 'information only' in the report and laboratory comparison.
The laboratory performance is shown based on z-scores. The diagrams show the laboratory data in comparison with the calculated mean values.

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Participants

ANSTO Minerals	Australia
Queensland University of Technology	Australia
Heidelbergmaterials Antoing cement	Belgium
Neste Oyj	Finland
IC2MP - UMR CNRS 7285- Universite' de Poiters	France
Imerys	France
BMI - BRAAS GmbH	Germany
Dorfner Analysezentrum und Anlagenplanungsgesellschaft mbH (Anzaplan)	Germany
Dyckerhoff gmbH	Germany
FLUXANA GmbH & Co. KG	Germany
Landesamt für Geologie und Bergbau	Germany
OPTERRA Wössingen GmbH	Germany
Portlandzementwerk Wittekind Hugo Miebach Söhne KG	Germany
THYSSENKRUPP STEEL EUROPE AG; Zeche	Germany
Quantum Tech Griechenland (Lafarge holcim aget Heracles milaki plant)	Greece
Ambiente Analisi s.r.l.	Italy
CRH Lab SP z o o	Poland
UIS Analytical Services	South Africa
D-LAB Degerfors Laboratorium AB	Sweden
LKAB	Sweden
Jura-Cement-Fabriken AG, Cornoux	Switzerland
Jura-Cement-Fabriken, Wildegg	Switzerland
Creavit	Turkey
CoorsTek, Inc.	USA

Issued: Correction of an Participant

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Statistical Evaluation used for this PT

Calculation of Mean m

The mean m for all laboratories is calculated using the Hampel estimator (ISO/TS 20612:2007 9.2.3 + ISO 13528 C.5.3.2) based on the laboratory means µ using traceable methods only.

Calculation of reproducibility standard deviation s_R

The reproducibility standard deviation s_R is calculated using the Q-method (ISO/TS 20612:2007 9.2.2 + ISO 13528 C.5.2.2).

Calculation of repeatability standard deviation s_r

The repeatability standard deviation s_r is also calculated using the Q-method (ISO/TS 20612:2007 Annex B).

Calculation of reproducibility standard deviation s*

The reproducibility standard deviation s* is calculated from the laboratory means µ using the Q-method (ISO/TS 20612:2007 9.2.2 + ISO 13258 C.5.2.2).

Calculation of uncertainty U_{s_R} (according to Nordtest TR 537 ed 3.1.)

The **uncertainty U_{s_R}** for a confidence interval of P=95% (k=2) can be calculated from the **reproducibility standard deviation** s_R (factor 1.25 for average median, robust statistics) and the number of participating laboratories p:

$$U_{s_R} = 2 * 1.25 * \frac{s_R}{\sqrt{p}}$$

Calculation of uncertainty U_{s^*} (according to ISO 13528:2022 7.7.7)

The **uncertainty U_{s^*}** for a confidence interval of P=95% (k=2) can be calculated from the **robust standard deviation** s* (factor 1.25 for average median, robust statistics)) and the number of participating laboratories p:

$$U_{s^*} = 2 * 1.25 * \frac{s^*}{\sqrt{p}}$$

The **uncertainty** U_{s^*} only takes the between laboratories uncertainty into account while the **uncertainty** U_{s_R} also includes the within laboratories uncertainty. Therefore U_{s_R} is recommended for use in accredited laboratories.

Laboratory performance

Laboratory proficiency assessment is based on z-scores.
The **z-score** z is calculated from all laboratory means µ:

$$z = \frac{m - \mu}{s_R}$$

m	Mean value for all laboratories (assigned value)
µ	Mean value of individual laboratory
s_R	Reproducibility standard deviation

Assessment on z-scores:

$\|z\|$ <= 2.0	indicates “satisfactory” performance = generates no signal
2.0 < $\|z\|$ < 3.0	indicates “questionable” performance = generates a warning signal
$\|z\|$ >= 3.0	indicates “unsatisfactory” performance = generates an action signal

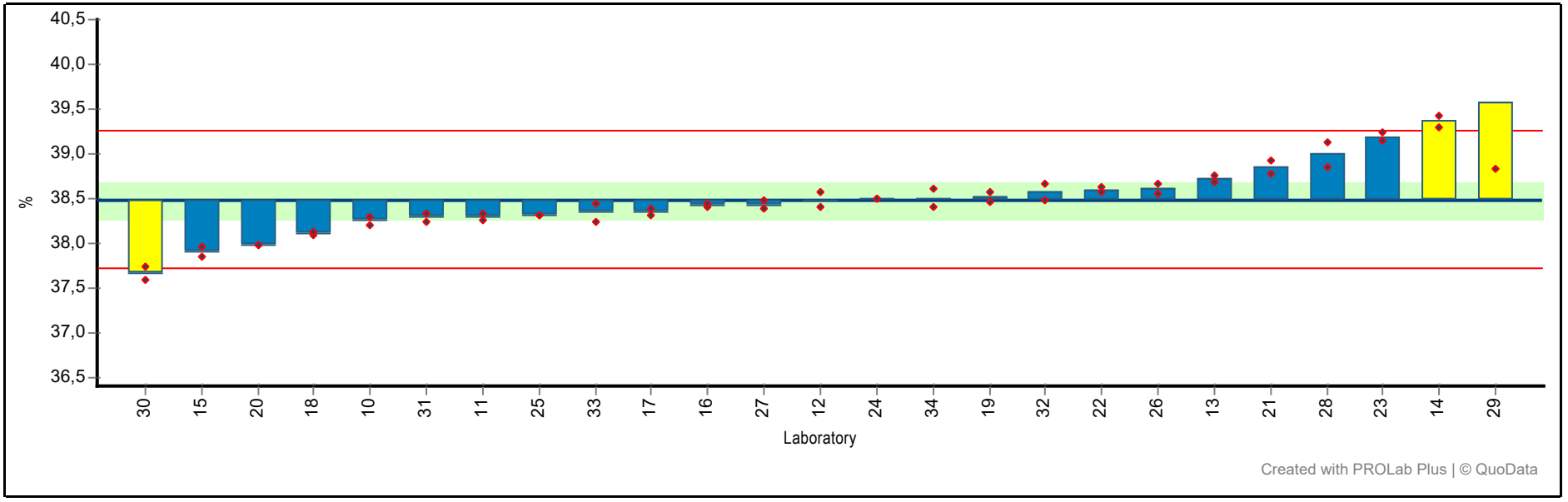
Z-scores with 3 >= $|z|$ >= 2 are highlighted with a yellow color, z-scores with $|z|$ >= 3 are highlighted with a red color.

feedback@fluxana.de

RV_2024_03 Clay

Summary results

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,384 %**
Measurand:	**Al2O3**	**Repeat. s.d:**	**0,092 %**
Mean ± U(Mean):	**38,483 ± 0,206 %**	**Range of tolerance:**	**37,714 - 39,251 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	38,209	38,297	38,253	0,062	-0,6	XRF (fusion)	ISO 17025	
11	38,265	38,338	38,302	0,052	-0,5	XRF (fusion)	no accredition	
12	38,404	38,566	38,485	0,115	0,0	XRF (fusion)	no accredition	
13	38,682	38,756	38,719	0,052	0,6	XRF (pressed pellet)	no accredition	info only
14	39,296	39,428	39,362	0,093	2,3	XRF (fusion)	no accredition	
15	37,965	37,850	37,907	0,081	-1,5	XRF (fusion)	no accredition	

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Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
16	38,403	38,452	38,427	0,035	-0,1	XRF (fusion)	ISO 17025	
17	38,309	38,394	38,352	0,060	-0,3	XRF (fusion)	no accredition	
18	38,090	38,130	38,110	0,028	-1,0	XRF (fusion)	no accredition	
19	38,583	38,457	38,520	0,089	0,1	XRF (fusion)	ISO 17025	
20	37,976	37,978	37,977	0,001	-1,3	XRF (fusion)	no accredition	
21	38,934	38,787	38,861	0,104	1,0	XRF (fusion)	no accredition	
22	38,627	38,575	38,601	0,037	0,3	XRF (fusion)	ISO 17025	
23	39,151	39,233	39,192	0,058	1,8	XRF (fusion)	ISO 17025	
24	38,508	38,495	38,502	0,009	0,0	XRF (fusion)	no accredition	
25	38,306	38,310	38,308	0,003	-0,5	XRF (fusion)	no accredition	
26	38,675	38,552	38,614	0,087	0,3	XRF (fusion)	no accredition	
27	38,477	38,391	38,434	0,061	-0,1	XRF (fusion)	no accredition	
28	38,849	39,133	38,991	0,201	1,3	XRF (fusion)	no accredition	
29	38,829	40,315	39,572	1,051	2,8	XRF (fusion)	no accredition	
30	37,594	37,742	37,668	0,105	-2,1	XRF (fusion)	no accredition	
31	38,332	38,247	38,290	0,060	-0,5	XRF (fusion)	no accredition	
32	38,478	38,671	38,575	0,136	0,2	XRF (fusion)	no accredition	
33	38,444	38,246	38,345	0,140	-0,4	XRF (pressed pellet)	no accredition	info only
34	38,608	38,409	38,508	0,141	0,1	Other Method	no accredition	ICP

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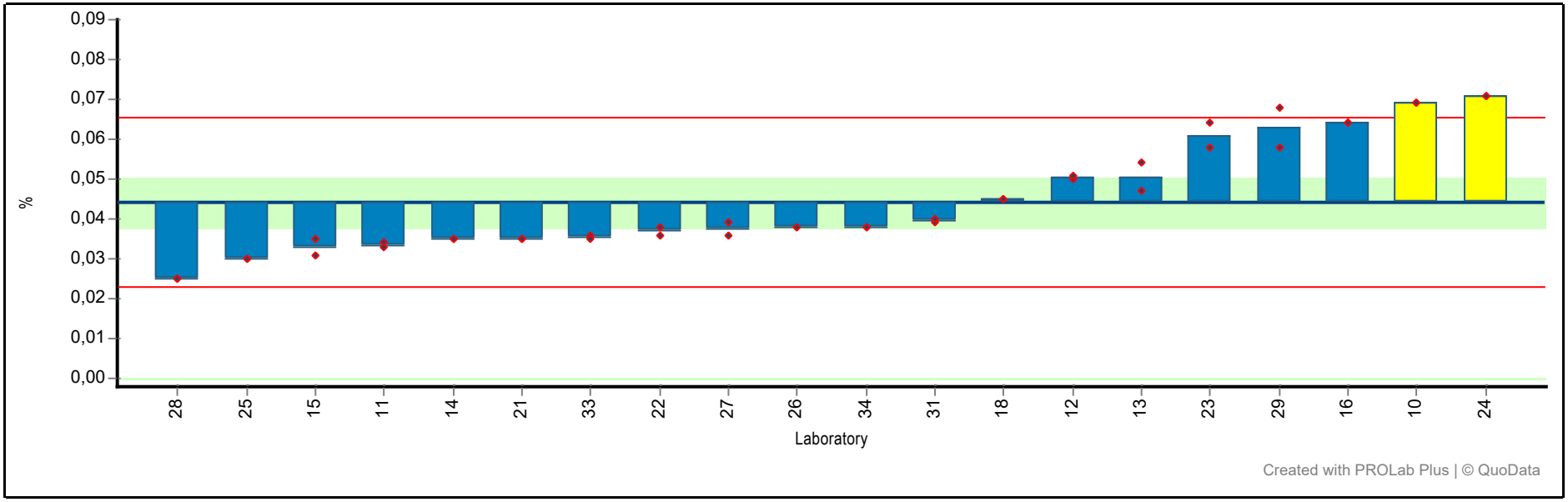
Sample:	**FLX-134**	**Reprod. s.d.:**	**0,011 %**
Measurand:	**BaO**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,044 ± 0,006 %**	**Range of tolerance:**	**0,023 - 0,066 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**17**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,069	0,069	0,069	0,000	2,3	XRF (fusion)	ISO 17025	
11	0,034	0,033	0,034	0,001	-1,0	XRF (fusion)	no accredition	
12	0,050	0,051	0,051	0,001	0,6	XRF (fusion)	no accredition	
13	0,054	0,047	0,051	0,005	0,6	XRF (pressed pellet)	no accredition	info only
14	0,035	0,035	0,035	0,000	-0,9	XRF (fusion)	no accredition	
15	0,031	0,035	0,033	0,003	-1,0	XRF (fusion)	no accredition	
16	0,064	0,064	0,064	0,000	1,9	XRF (fusion)	ISO 17025	
18	0,045	0,045	0,045	0,000	0,1	XRF (fusion)	no accredition	

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Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
21	0,035	0,035	0,035	0,000	-0,9	Other Method	no accredition	ICP
22	0,038	0,036	0,037	0,001	-0,7	XRF (fusion)	ISO 17025	
23	0,058	0,064	0,061	0,004	1,6	XRF (fusion)	ISO 17025	
24	0,071	0,071	0,071	0,000	2,5	XRF (fusion)	no accredition	
25	0,030	0,030	0,030	0,000	-1,3	XRF (pressed pellet)	no accredition	info only
26	0,038	0,038	0,038	0,000	-0,6	Other Method	no accredition	ICP
27	0,039	0,036	0,037	0,002	-0,6	XRF (fusion)	no accredition	
28	0,025	0,025	0,025	0,000	-1,8	XRF (fusion)	no accredition	
29	0,058	0,068	0,063	0,007	1,8	XRF (fusion)	no accredition	
31	0,039	0,040	0,040	0,001	-0,4	XRF (fusion)	no accredition	
33	0,036	0,035	0,036	0,001	-0,8	XRF (pressed pellet)	no accredition	info only
34	0,038	0,038	0,038	0,000	-0,6	Other Method	no accredition	ICP

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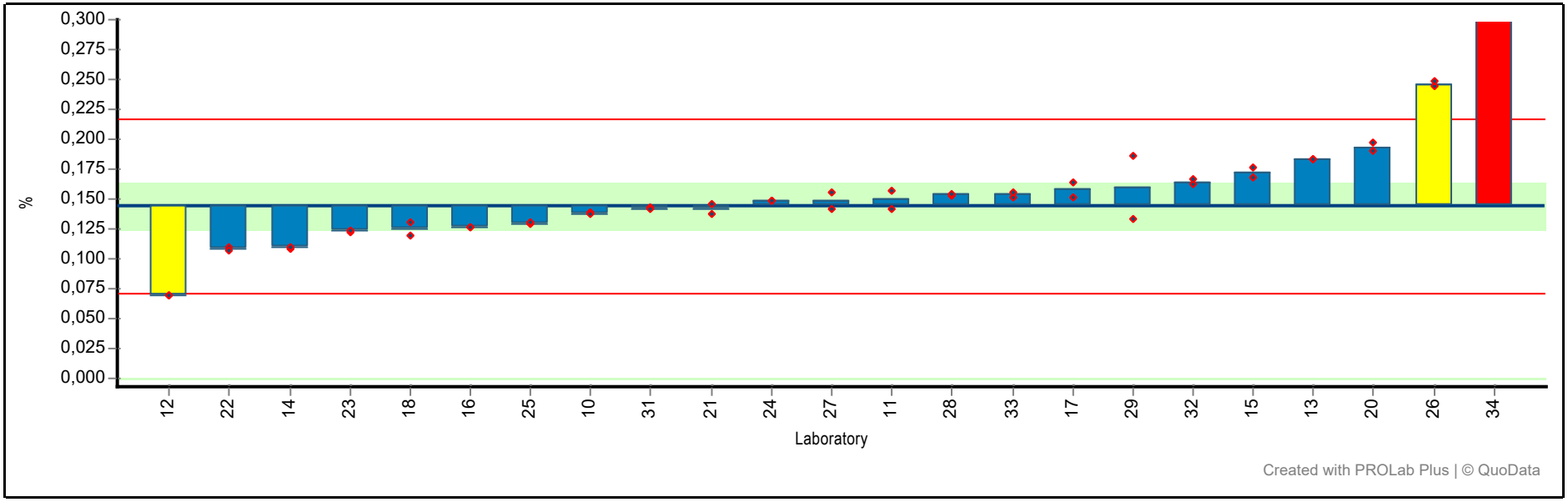
Sample:	**FLX-134**	**Reprod. s.d.:**	**0,036 %**
Measurand:	**CaO**	**Repeat. s.d:**	**0,003 %**
Mean ± U(Mean):	**0,144 ± 0,019 %**	**Range of tolerance:**	**0,071 - 0,217 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,139	0,137	0,138	0,001	-0,2	XRF (fusion)	ISO 17025	
11	0,142	0,157	0,149	0,011	0,1	XRF (fusion)	no accredition	
12	0,070	0,069	0,070	0,001	-2,0	XRF (fusion)	no accredition	
13	0,183	0,183	0,183	0,000	1,1	XRF (pressed pellet)	no accredition	info only
14	0,109	0,110	0,110	0,001	-0,9	XRF (fusion)	no accredition	
15	0,176	0,168	0,172	0,006	0,8	XRF (fusion)	no accredition	
16	0,127	0,127	0,127	0,000	-0,5	XRF (fusion)	ISO 17025	
17	0,164	0,152	0,158	0,008	0,4	XRF (fusion)	no accredition	

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Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,130	0,120	0,125	0,007	-0,5	XRF (fusion)	no accredition	
20	0,197	0,190	0,194	0,005	1,4	XRF (fusion)	no accredition	
21	0,138	0,146	0,142	0,006	-0,1	XRF (fusion)	no accredition	info only
22	0,110	0,107	0,108	0,002	-1,0	XRF (fusion)	ISO 17025	
23	0,122	0,124	0,123	0,001	-0,6	XRF (fusion)	ISO 17025	
24	0,148	0,148	0,148	0,000	0,1	XRF (fusion)	no accredition	
25	0,129	0,130	0,130	0,001	-0,4	XRF (fusion)	no accredition	
26	0,245	0,248	0,246	0,002	2,8	XRF (fusion)	no accredition	
27	0,155	0,142	0,148	0,009	0,1	XRF (fusion)	no accredition	
28	0,153	0,154	0,153	0,001	0,3	XRF (fusion)	no accredition	
29	0,134	0,186	0,160	0,037	0,4	XRF (fusion)	no accredition	
31	0,143	0,141	0,142	0,001	-0,1	XRF (fusion)	no accredition	
32	0,162	0,166	0,164	0,003	0,5	XRF (fusion)	no accredition	
33	0,152	0,155	0,153	0,002	0,3	XRF (pressed pellet)	no accredition	info only
34	0,344	0,334	0,339	0,007	5,4	Other Method	no accredition	ICP

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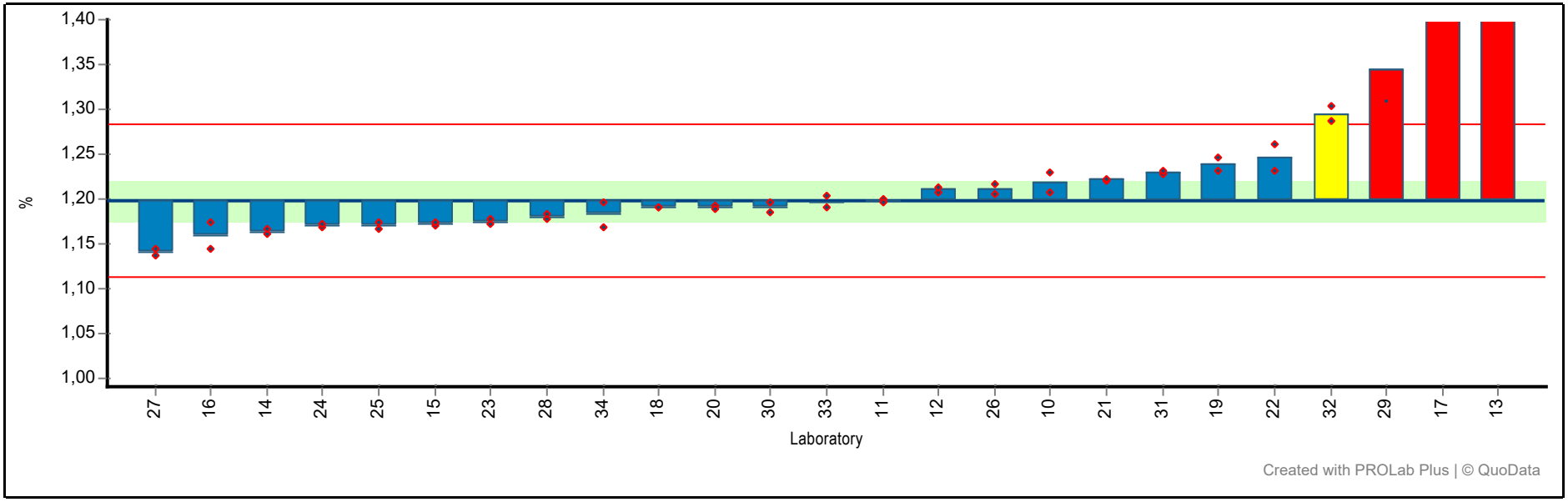
Sample:	**FLX-134**	**Reprod. s.d.:**	**0,043 %**
Measurand:	**Fe2O3**	**Repeat. s.d:**	**0,008 %**
Mean ± U(Mean):	**1,198 ± 0,022 %**	**Range of tolerance:**	**1,113 - 1,284 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	1,207	1,229	1,218	0,016	0,5	XRF (fusion)	ISO 17025	
11	1,200	1,196	1,198	0,003	0,0	XRF (fusion)	no accredition	
12	1,208	1,213	1,211	0,004	0,3	XRF (fusion)	no accredition	
13	1,689	1,673	1,681	0,011	11,3	XRF (pressed pellet)	no accredition	info only
14	1,161	1,166	1,163	0,004	-0,8	XRF (fusion)	no accredition	
15	1,170	1,174	1,172	0,003	-0,6	XRF (fusion)	no accredition	
16	1,174	1,145	1,159	0,021	-0,9	XRF (fusion)	ISO 17025	
17	1,407	1,430	1,418	0,016	5,2	XRF (fusion)	no accredition	

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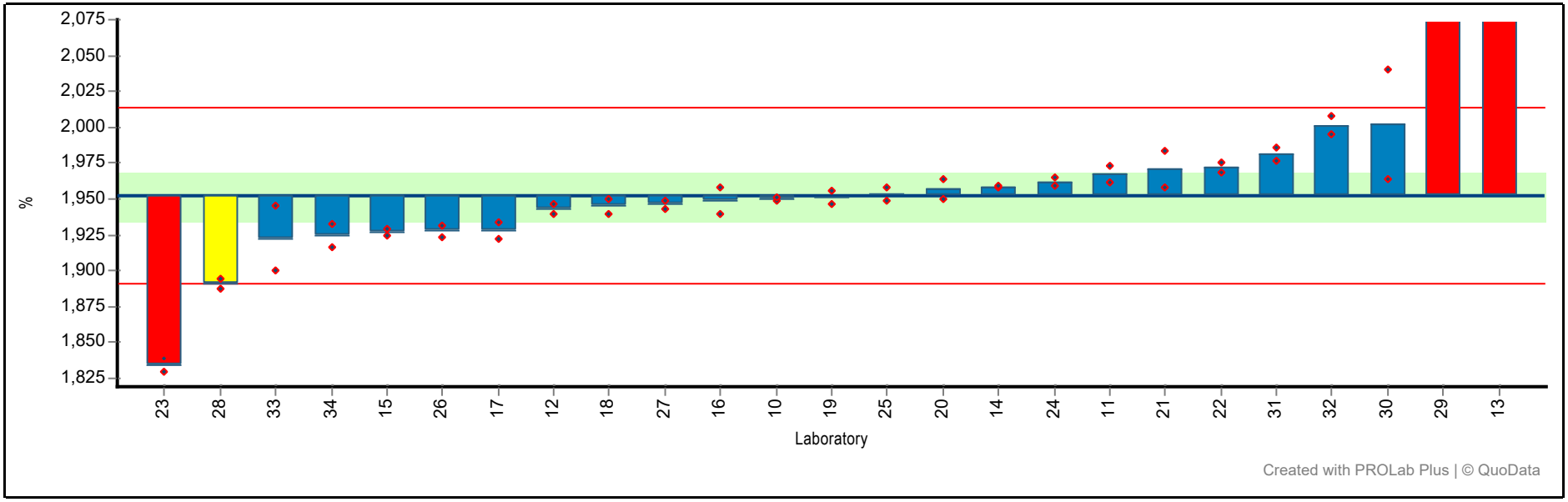
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	1,190	1,190	1,190	0,000	-0,2	XRF (fusion)	no accredition	
19	1,231	1,246	1,239	0,011	0,9	XRF (fusion)	ISO 17025	
20	1,192	1,188	1,190	0,003	-0,2	XRF (fusion)	no accredition	
21	1,221	1,222	1,222	0,001	0,5	XRF (fusion)	no accredition	
22	1,232	1,261	1,246	0,021	1,1	XRF (fusion)	ISO 17025	
23	1,173	1,177	1,175	0,003	-0,5	XRF (fusion)	ISO 17025	
24	1,169	1,172	1,171	0,002	-0,7	XRF (fusion)	no accredition	
25	1,167	1,174	1,171	0,005	-0,7	XRF (fusion)	no accredition	
26	1,216	1,205	1,211	0,008	0,3	XRF (fusion)	no accredition	
27	1,144	1,137	1,140	0,005	-1,4	XRF (fusion)	no accredition	
28	1,177	1,184	1,180	0,005	-0,4	XRF (fusion)	no accredition	
29	1,310	1,379	1,345	0,049	3,4	XRF (fusion)	no accredition	
30	1,185	1,196	1,191	0,008	-0,2	XRF (fusion)	no accredition	
31	1,228	1,231	1,230	0,002	0,7	XRF (fusion)	no accredition	
32	1,287	1,303	1,295	0,011	2,3	XRF (fusion)	no accredition	
33	1,203	1,190	1,196	0,009	0,0	XRF (pressed pellet)	no accredition	info only
34	1,197	1,169	1,183	0,020	-0,4	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,031 %**
Measurand:	**K2O**	**Repeat. s.d:**	**0,010 %**
Mean ± U(Mean):	**1,952 ± 0,017 %**	**Range of tolerance:**	**1,891 - 2,013 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



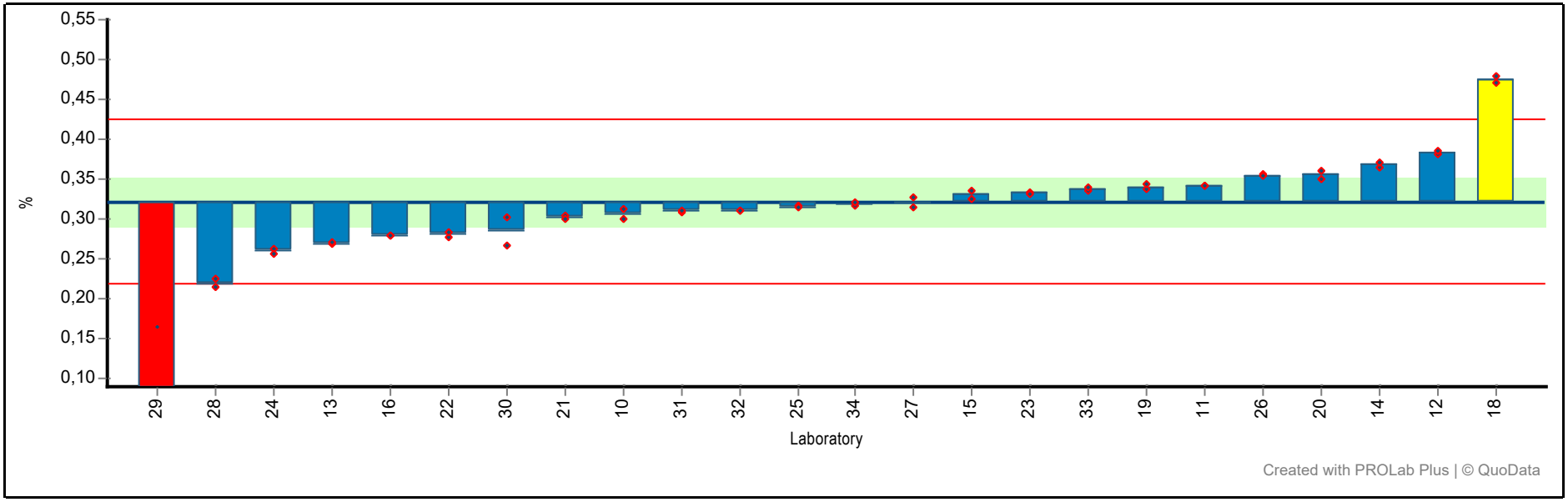
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	1,949	1,951	1,950	0,001	-0,1	XRF (fusion)	ISO 17025	
11	1,973	1,961	1,967	0,008	0,5	XRF (fusion)	no accredition	
12	1,947	1,940	1,944	0,005	-0,3	XRF (fusion)	no accredition	
13	2,641	2,623	2,632	0,013	22,2	XRF (pressed pellet)	no accredition	info only
14	1,958	1,959	1,958	0,001	0,2	XRF (fusion)	no accredition	
15	1,929	1,924	1,926	0,004	-0,8	XRF (fusion)	no accredition	
16	1,940	1,958	1,949	0,013	-0,1	XRF (fusion)	ISO 17025	
17	1,922	1,934	1,928	0,008	-0,8	XRF (fusion)	no accredition	

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	1,950	1,940	1,945	0,007	-0,2	XRF (fusion)	no accredition	
19	1,956	1,946	1,951	0,007	0,0	XRF (fusion)	ISO 17025	
20	1,950	1,964	1,957	0,010	0,2	XRF (fusion)	no accredition	
21	1,983	1,958	1,970	0,018	0,6	XRF (fusion)	no accredition	
22	1,975	1,968	1,972	0,005	0,6	XRF (fusion)	ISO 17025	
23	1,839	1,830	1,835	0,006	-3,8	XRF (fusion)	ISO 17025	
24	1,965	1,959	1,962	0,004	0,3	XRF (fusion)	no accredition	
25	1,958	1,949	1,954	0,006	0,0	XRF (fusion)	no accredition	
26	1,932	1,923	1,927	0,006	-0,8	XRF (fusion)	no accredition	
27	1,943	1,949	1,946	0,004	-0,2	XRF (fusion)	no accredition	
28	1,887	1,894	1,890	0,005	-2,0	XRF (fusion)	no accredition	
29	2,628	2,473	2,550	0,110	19,5	XRF (fusion)	no accredition	
30	1,964	2,040	2,002	0,054	1,6	XRF (fusion)	no accredition	
31	1,986	1,977	1,982	0,006	1,0	XRF (fusion)	no accredition	
32	1,995	2,008	2,002	0,009	1,6	XRF (fusion)	no accredition	
33	1,945	1,900	1,922	0,032	-1,0	XRF (pressed pellet)	no accredition	info only
34	1,917	1,933	1,925	0,011	-0,9	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,052 %**
Measurand:	**MgO**	**Repeat. s.d:**	**0,005 %**
Mean ± U(Mean):	**0,322 ± 0,030 %**	**Range of tolerance:**	**0,218 - 0,425 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**21**	**Statistical method:**	**Q/Hampel**



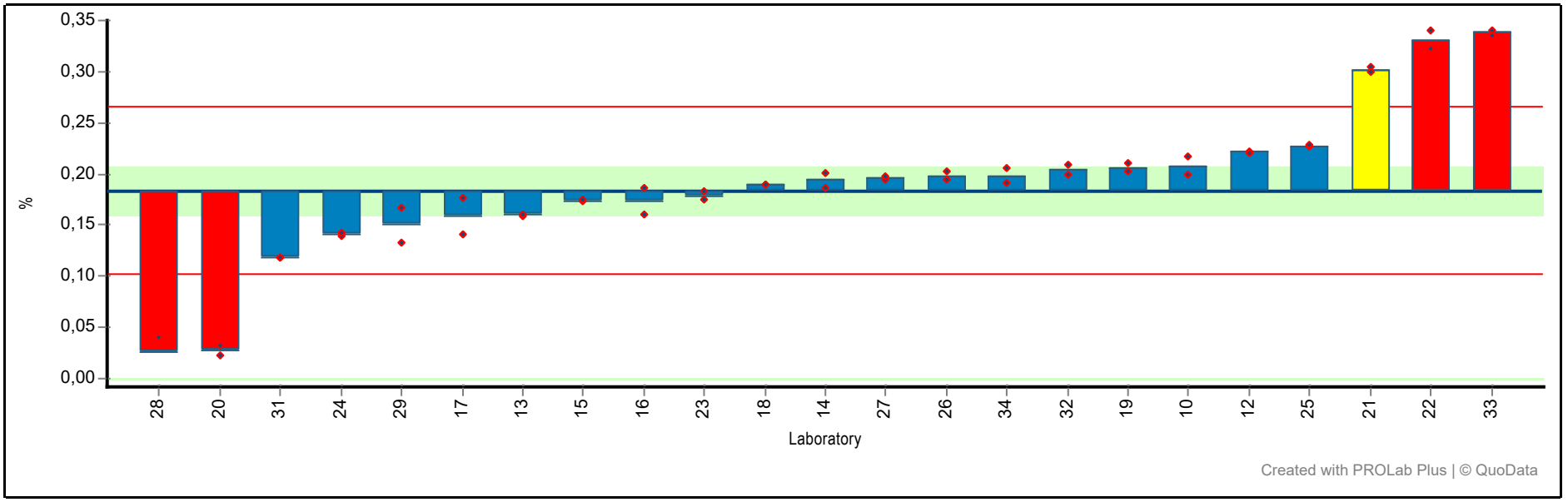
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,313	0,299	0,306	0,010	-0,3	XRF (fusion)	ISO 17025	
11	0,341	0,342	0,342	0,001	0,4	XRF (fusion)	no accredition	
12	0,382	0,386	0,384	0,003	1,2	XRF (fusion)	no accredition	
13	0,268	0,271	0,270	0,002	-1,0	XRF (pressed pellet)	no accredition	info only
14	0,365	0,371	0,368	0,004	0,9	XRF (fusion)	no accredition	
15	0,336	0,325	0,331	0,008	0,2	XRF (fusion)	no accredition	
16	0,280	0,280	0,280	0,000	-0,8	XRF (fusion)	ISO 17025	
18	0,480	0,470	0,475	0,007	3,0	XRF (fusion)	no accredition	

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,337	0,343	0,340	0,004	0,4	XRF (fusion)	ISO 17025	
20	0,360	0,351	0,355	0,006	0,7	XRF (fusion)	no accredition	
21	0,305	0,299	0,302	0,004	-0,4	XRF (fusion)	no accredition	info only
22	0,278	0,283	0,280	0,004	-0,8	XRF (fusion)	ISO 17025	
23	0,334	0,332	0,333	0,001	0,2	XRF (fusion)	ISO 17025	
24	0,262	0,257	0,260	0,004	-1,2	XRF (fusion)	no accredition	
25	0,316	0,314	0,315	0,001	-0,1	XRF (fusion)	no accredition	
26	0,356	0,354	0,355	0,001	0,6	XRF (fusion)	no accredition	
27	0,328	0,315	0,322	0,009	0,0	XRF (fusion)	no accredition	
28	0,224	0,215	0,220	0,006	-2,0	XRF (fusion)	no accredition	
29	0,165	0,010	0,088	0,110	-4,5	XRF (fusion)	no accredition	
30	0,267	0,302	0,284	0,025	-0,7	XRF (fusion)	no accredition	
31	0,309	0,310	0,309	0,001	-0,2	XRF (fusion)	no accredition	
32	0,311	0,311	0,311	0,000	-0,2	XRF (fusion)	no accredition	
33	0,335	0,339	0,337	0,003	0,3	XRF (pressed pellet)	no accredition	info only
34	0,317	0,320	0,319	0,002	-0,1	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,041 %**
Measurand:	**Na2O**	**Repeat. s.d:**	**0,009 %**
Mean ± U(Mean):	**0,184 ± 0,024 %**	**Range of tolerance:**	**0,102 - 0,266 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**



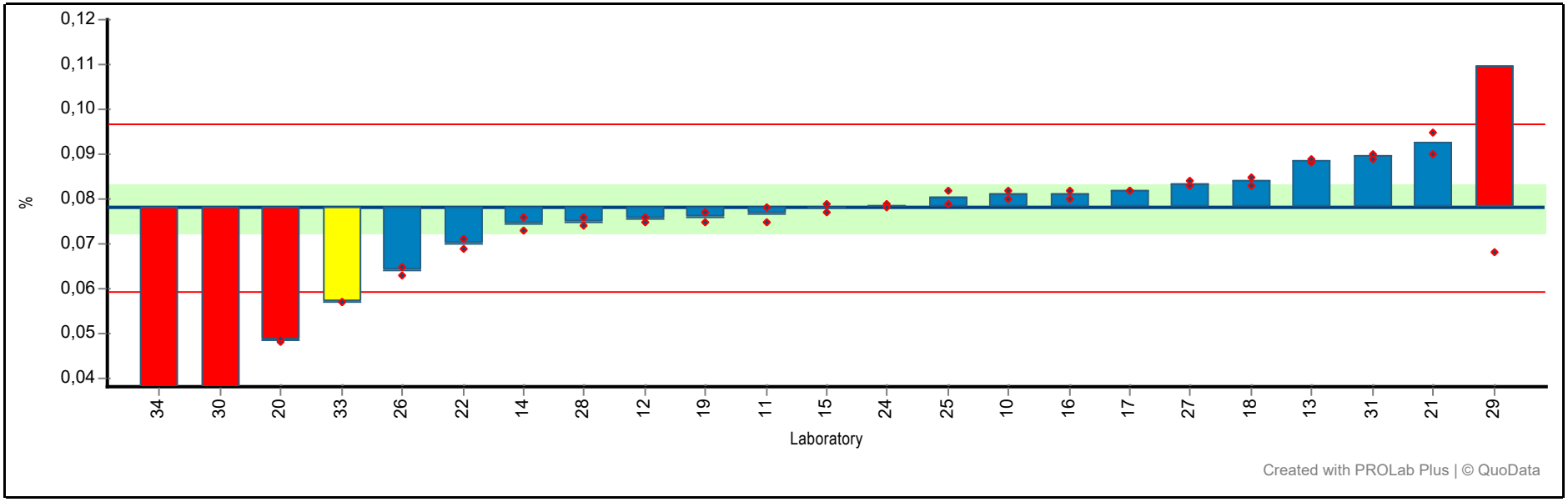
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,217	0,199	0,208	0,013	0,6	XRF (fusion)	ISO 17025	
12	0,222	0,221	0,222	0,001	0,9	XRF (fusion)	no accredition	
13	0,159	0,161	0,160	0,001	-0,6	XRF (pressed pellet)	no accredition	info only
14	0,201	0,187	0,194	0,010	0,2	XRF (fusion)	no accredition	
15	0,173	0,175	0,174	0,001	-0,2	XRF (fusion)	no accredition	
16	0,161	0,187	0,174	0,018	-0,2	XRF (fusion)	ISO 17025	
17	0,176	0,141	0,158	0,025	-0,6	XRF (fusion)	no accredition	
18	0,190	0,190	0,190	0,000	0,2	XRF (fusion)	no accredition	

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,203	0,210	0,207	0,005	0,6	XRF (fusion)	ISO 17025	
20	0,022	0,033	0,028	0,008	-3,8	XRF (fusion)	no accredition	
21	0,305	0,299	0,302	0,004	2,9	XRF (fusion)	no accredition	info only
22	0,322	0,340	0,331	0,013	3,6	XRF (fusion)	ISO 17025	
23	0,183	0,175	0,179	0,006	-0,1	XRF (fusion)	ISO 17025	
24	0,140	0,142	0,141	0,001	-1,0	XRF (fusion)	no accredition	
25	0,227	0,228	0,228	0,001	1,1	XRF (fusion)	no accredition	
26	0,202	0,194	0,198	0,006	0,3	XRF (fusion)	no accredition	
27	0,195	0,198	0,197	0,002	0,3	XRF (fusion)	no accredition	
28	0,040	0,013	0,026	0,019	-3,8	XRF (fusion)	no accredition	
29	0,167	0,133	0,150	0,024	-0,8	XRF (fusion)	no accredition	
30						XRF (fusion)	no accredition	
31	0,118	0,119	0,118	0,001	-1,6	XRF (fusion)	no accredition	
32	0,200	0,209	0,205	0,006	0,5	XRF (fusion)	no accredition	
33	0,341	0,336	0,339	0,004	3,8	XRF (pressed pellet)	no accredition	info only
34	0,191	0,205	0,198	0,010	0,3	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,009 %**
Measurand:	**P2O5**	**Repeat. s.d:**	**0,002 %**
Mean ± U(Mean):	**0,078 ± 0,006 %**	**Range of tolerance:**	**0,059 - 0,097 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**



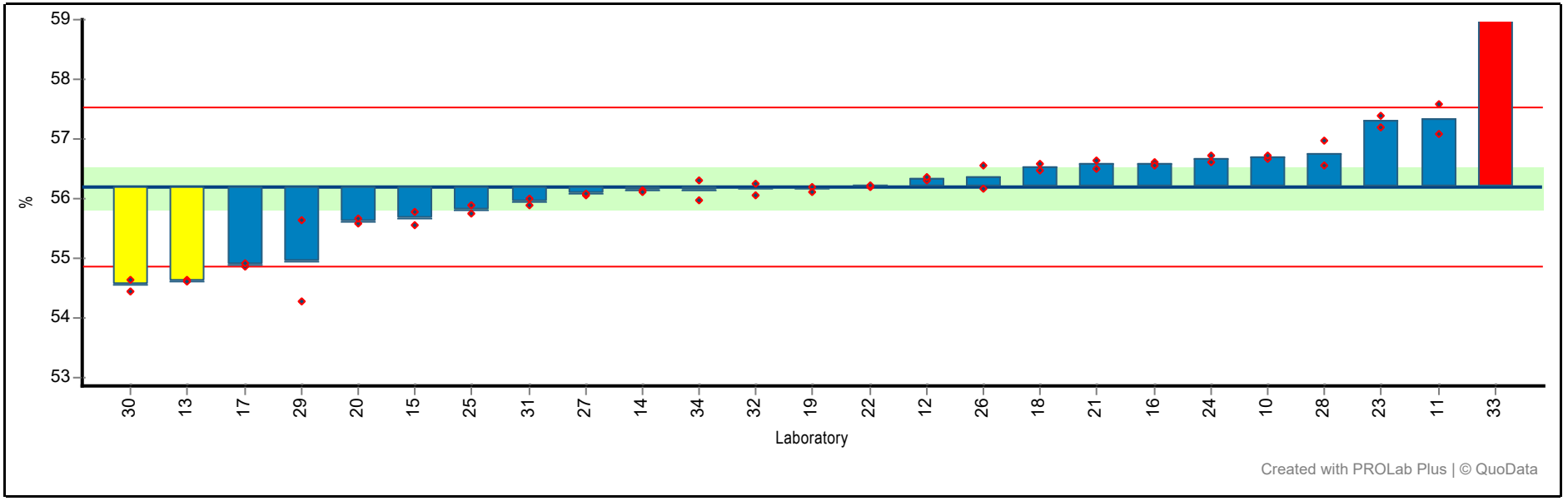
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,082	0,080	0,081	0,001	0,3	XRF (fusion)	ISO 17025	
11	0,078	0,075	0,076	0,002	-0,2	XRF (fusion)	no accredition	
12	0,076	0,075	0,075	0,001	-0,3	XRF (fusion)	no accredition	
13	0,088	0,089	0,088	0,001	1,1	XRF (pressed pellet)	no accredition	info only
14	0,073	0,076	0,074	0,002	-0,4	XRF (fusion)	no accredition	
15	0,079	0,077	0,078	0,001	0,0	XRF (fusion)	no accredition	
16	0,082	0,080	0,081	0,001	0,3	XRF (fusion)	ISO 17025	
17	0,082	0,082	0,082	0,000	0,4	XRF (fusion)	no accredition	

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,083	0,085	0,084	0,001	0,6	XRF (fusion)	no accredition	
19	0,077	0,075	0,076	0,001	-0,2	XRF (fusion)	ISO 17025	
20	0,048	0,049	0,049	0,001	-3,1	XRF (fusion)	no accredition	
21	0,090	0,095	0,092	0,004	1,5	XRF (fusion)	no accredition	info only
22	0,069	0,071	0,070	0,001	-0,8	XRF (fusion)	ISO 17025	
24	0,079	0,078	0,079	0,001	0,1	XRF (fusion)	no accredition	
25	0,082	0,079	0,081	0,002	0,3	XRF (fusion)	no accredition	
26	0,065	0,063	0,064	0,001	-1,5	XRF (fusion)	no accredition	
27	0,083	0,084	0,084	0,001	0,6	XRF (fusion)	no accredition	
28	0,076	0,074	0,075	0,001	-0,3	XRF (fusion)	no accredition	
29	0,151	0,068	0,110	0,059	3,3	XRF (fusion)	no accredition	
30	0,023	0,023	0,023	0,000	-5,8	XRF (fusion)	no accredition	
31	0,090	0,089	0,089	0,001	1,2	XRF (fusion)	no accredition	
33	0,057	0,057	0,057	0,000	-2,2	XRF (pressed pellet)	no accredition	info only
34	0,019	0,022	0,020	0,002	-6,1	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,664 %**
Measurand:	**SiO2**	**Repeat. s.d:**	**0,110 %**
Mean ± U(Mean):	**56,190 ± 0,350 %**	**Range of tolerance:**	**54,863 - 57,517 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



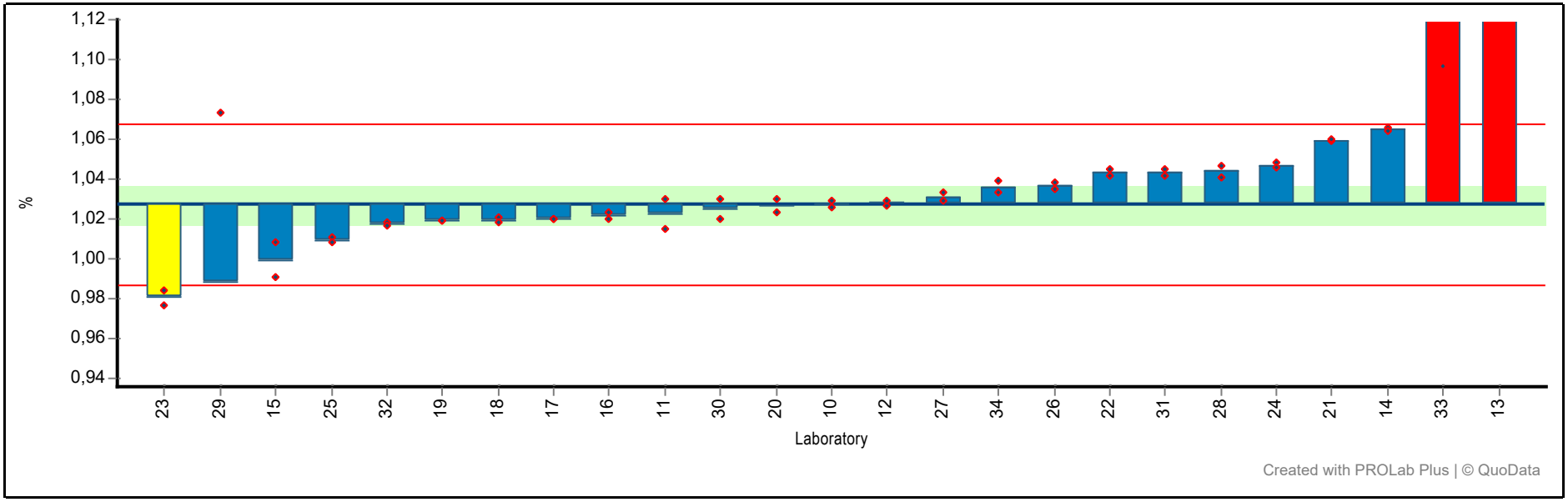
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	56,672	56,714	56,693	0,030	0,8	XRF (fusion)	ISO 17025	
11	57,085	57,592	57,338	0,359	1,7	XRF (fusion)	no accredition	
12	56,307	56,368	56,338	0,043	0,2	XRF (fusion)	no accredition	
13	54,648	54,600	54,624	0,034	-2,4	XRF (pressed pellet)	no accredition	info only
14	56,152	56,099	56,126	0,037	-0,1	XRF (fusion)	no accredition	
15	55,773	55,550	55,662	0,158	-0,8	XRF (fusion)	no accredition	
16	56,607	56,550	56,578	0,040	0,6	XRF (fusion)	ISO 17025	
17	54,850	54,908	54,879	0,041	-2,0	XRF (fusion)	no accredition	

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	56,570	56,470	56,520	0,071	0,5	XRF (fusion)	no accredition	
19	56,207	56,124	56,166	0,059	0,0	XRF (fusion)	ISO 17025	
20	55,574	55,670	55,622	0,068	-0,9	XRF (fusion)	no accredition	
21	56,648	56,504	56,576	0,102	0,6	XRF (fusion)	no accredition	
22	56,206	56,215	56,211	0,006	0,0	XRF (fusion)	ISO 17025	
23	57,188	57,396	57,292	0,147	1,7	XRF (fusion)	ISO 17025	
24	56,718	56,621	56,669	0,069	0,7	XRF (fusion)	no accredition	
25	55,891	55,747	55,819	0,102	-0,6	XRF (fusion)	no accredition	
26	56,557	56,166	56,361	0,276	0,3	XRF (fusion)	no accredition	
27	56,065	56,081	56,073	0,011	-0,2	XRF (fusion)	no accredition	
28	56,567	56,960	56,764	0,278	0,9	XRF (fusion)	no accredition	
29	55,630	54,268	54,949	0,963	-1,9	XRF (fusion)	no accredition	
30	54,450	54,640	54,545	0,134	-2,5	XRF (fusion)	no accredition	
31	56,005	55,900	55,953	0,074	-0,4	XRF (fusion)	no accredition	
32	56,049	56,263	56,156	0,151	-0,1	XRF (fusion)	no accredition	
33	60,152	59,286	59,719	0,612	5,3	XRF (pressed pellet)	no accredition	info only
34	56,293	55,976	56,135	0,224	-0,1	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,020 %**
Measurand:	**TiO2**	**Repeat. s.d:**	**0,003 %**
Mean ± U(Mean):	**1,027 ± 0,010 %**	**Range of tolerance:**	**0,987 - 1,068 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



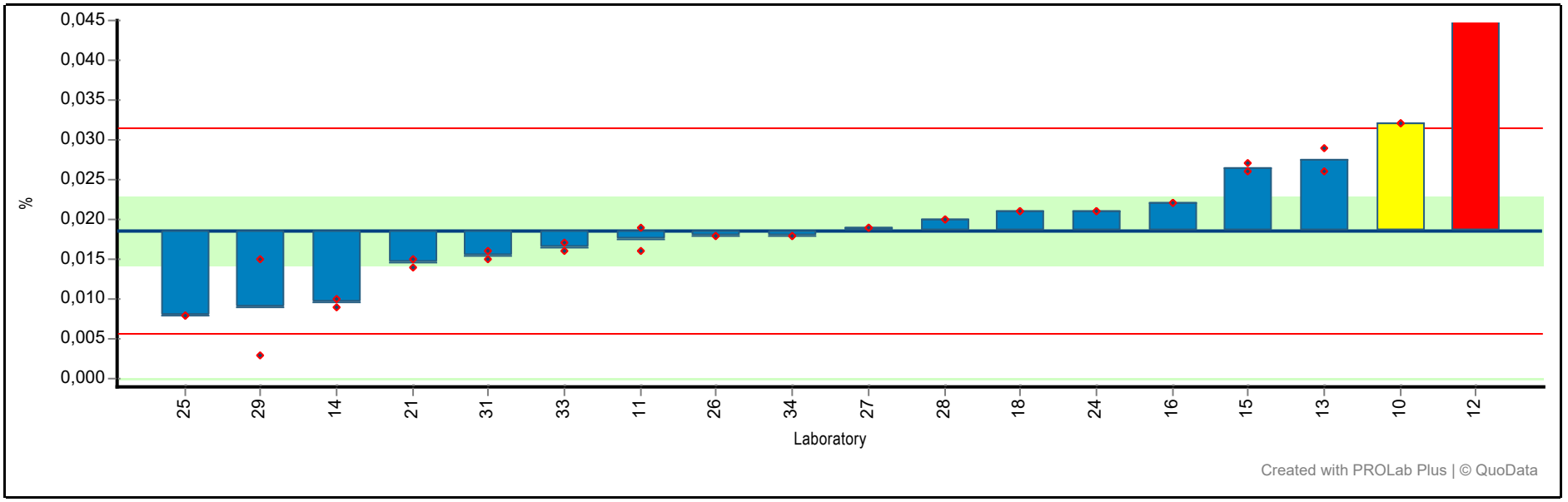
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	1,026	1,029	1,027	0,002	0,0	XRF (fusion)	ISO 17025	
11	1,030	1,015	1,022	0,011	-0,2	XRF (fusion)	no accredition	
12	1,027	1,029	1,028	0,001	0,0	XRF (fusion)	no accredition	
13	1,378	1,366	1,372	0,008	17,0	XRF (pressed pellet)	no accredition	info only
14	1,066	1,064	1,065	0,001	1,9	XRF (fusion)	no accredition	
15	1,008	0,991	1,000	0,012	-1,4	XRF (fusion)	no accredition	
16	1,023	1,020	1,022	0,002	-0,3	XRF (fusion)	ISO 17025	
17	1,020	1,020	1,020	0,000	-0,4	XRF (fusion)	no accredition	

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	1,021	1,018	1,019	0,002	-0,4	XRF (fusion)	no accredition	
19	1,019	1,019	1,019	0,000	-0,4	XRF (fusion)	ISO 17025	
20	1,030	1,023	1,026	0,005	0,0	XRF (fusion)	no accredition	
21	1,059	1,060	1,059	0,001	1,6	XRF (fusion)	no accredition	
22	1,042	1,045	1,043	0,002	0,8	XRF (fusion)	ISO 17025	
23	0,984	0,977	0,980	0,005	-2,3	XRF (fusion)	ISO 17025	
24	1,048	1,046	1,047	0,001	1,0	XRF (fusion)	no accredition	
25	1,011	1,008	1,010	0,002	-0,9	XRF (fusion)	no accredition	
26	1,038	1,035	1,036	0,002	0,5	XRF (fusion)	no accredition	
27	1,033	1,029	1,031	0,003	0,2	XRF (fusion)	no accredition	
28	1,041	1,047	1,044	0,004	0,8	XRF (fusion)	no accredition	
29	0,903	1,073	0,988	0,120	-1,9	XRF (fusion)	no accredition	
30	1,030	1,020	1,025	0,007	-0,1	XRF (fusion)	no accredition	
31	1,045	1,042	1,043	0,002	0,8	XRF (fusion)	no accredition	
32	1,018	1,017	1,018	0,001	-0,5	XRF (fusion)	no accredition	
33	1,144	1,097	1,120	0,033	4,6	XRF (pressed pellet)	no accredition	info only
34	1,039	1,033	1,036	0,004	0,4	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,006 %**
Measurand:	**V2O5**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,019 ± 0,004 %**	**Range of tolerance:**	**0,006 - 0,031 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**15**	**Statistical method:**	**Q/Hampel**



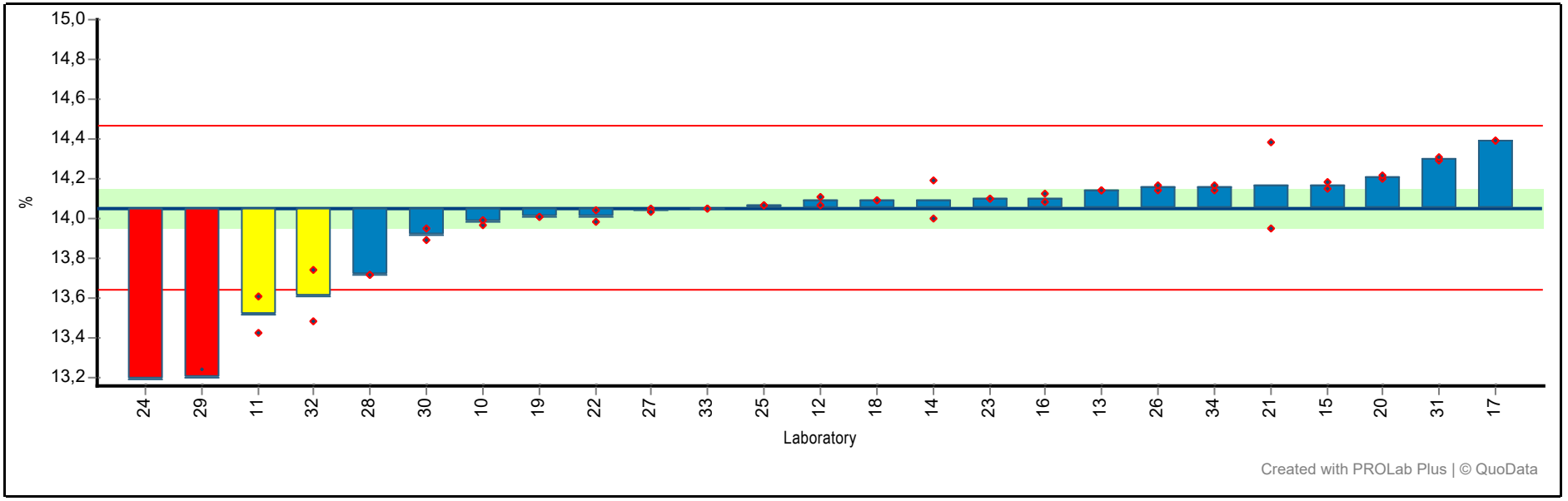
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,032	0,032	0,032	0,000	2,1	XRF (fusion)	ISO 17025	
11	0,019	0,016	0,018	0,002	-0,2	XRF (fusion)	no accredition	
12	0,083	0,084	0,084	0,001	10,1	XRF (fusion)	no accredition	
13	0,026	0,029	0,028	0,002	1,4	XRF (pressed pellet)	no accredition	info only
14	0,010	0,009	0,009	0,001	-1,4	XRF (fusion)	no accredition	
15	0,027	0,026	0,026	0,001	1,2	XRF (fusion)	no accredition	
16	0,022	0,022	0,022	0,000	0,5	XRF (fusion)	ISO 17025	
18	0,021	0,021	0,021	0,000	0,4	XRF (fusion)	no accredition	

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
21	0,014	0,015	0,014	0,001	-0,6	Other Method	no accredition	ICP
24	0,021	0,021	0,021	0,000	0,4	XRF (fusion)	no accredition	
25	0,008	0,008	0,008	0,000	-1,6	XRF (pressed pellet)	no accredition	info only
26	0,018	0,018	0,018	0,000	-0,1	Other Method	no accredition	ICP
27	0,019	0,019	0,019	0,000	0,1	XRF (fusion)	no accredition	
28	0,020	0,020	0,020	0,000	0,2	XRF (fusion)	no accredition	
29	0,015	0,003	0,009	0,008	-1,5	XRF (fusion)	no accredition	
31	0,016	0,015	0,015	0,001	-0,5	XRF (fusion)	no accredition	
33	0,017	0,016	0,017	0,001	-0,3	XRF (pressed pellet)	no accredition	info only
34	0,018	0,018	0,018	0,000	-0,1	Other Method	no accredition	ICP

RV_2024_03 Clay

Sample:	**FLX-134**	**Reprod. s.d.:**	**0,205 %**
Measurand:	**LOI**	**Repeat. s.d:**	**0,030 %**
Mean ± U(Mean):	**14,054 ± 0,093 %**	**Range of tolerance:**	**13,645 - 14,463 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	13,970	13,990	13,980	0,014	-0,4	Other Method	no accredition	LOI 18h
11	13,609	13,421	13,515	0,133	-2,6	Other Method	no accredition	LOI 18h
12	14,070	14,110	14,090	0,028	0,2	Other Method	no accredition	LOI 18h
13	14,138	14,138	14,138	0,000	0,4	Other Method	no accredition	calculated;
14	14,190	14,000	14,095	0,134	0,2	Other Method	no accredition	LOI 18h
15	14,149	14,182	14,165	0,023	0,5	Other Method	no accredition	LOI 18h
16	14,121	14,080	14,101	0,029	0,2	Other Method	ISO 17025	LOI 18h
17	14,390	14,390	14,390	0,000	1,6	Other Method	no accreditation	LOI 18h

RV_2024_03 Clay

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	14,090	14,090	14,090	0,000	0,2	Other Method	no accredition	LOI 18h
19	14,010	14,010	14,010	0,000	-0,2	Other Method	ISO 17025	LOI 18h
20	14,200	14,220	14,210	0,014	0,8	Other Method	no accreditation	LOI 18h
21	14,380	13,950	14,165	0,304	0,5	Other Method	no accredition	LOI 18h
22	14,040	13,980	14,010	0,042	-0,2	Other Method	no accreditation	1000°C,
23	14,100	14,100	14,100	0,000	0,2	Other Method	no accreditation	LOI 18h
24	13,180	13,200	13,190	0,014	-4,2	Other Method	no accredition	LOI 18h
25	14,070	14,070	14,070	0,000	0,1	Other Method	no accredition	LOI 18h
26	14,140	14,170	14,155	0,021	0,5	Other Method	no accredition	LOI 18h
27	14,050	14,030	14,040	0,014	-0,1	Other Method	no accredition	LOI 18h
28	13,714	13,715	13,715	0,001	-1,7	Other Method	no accredition	LOI 18h
29	13,154	13,245	13,200	0,064	-4,2	Other Method	no accredition	LOI 18h
30	13,950	13,890	13,920	0,042	-0,7	Other Method	no accreditation	LOI 18h
31	14,293	14,307	14,300	0,010	1,2	Other Method	no accredition	LOI 18h
32	13,480	13,740	13,610	0,184	-2,2	Other Method	no accredition	LOI 18h
33	14,054	14,054	14,054	0,000	0,0	Other Method	no accredition	calculated;
34	14,140	14,170	14,155	0,021	0,5	Other Method	no accredition	LOI 18h

Ring test RV_2024_03 Clay

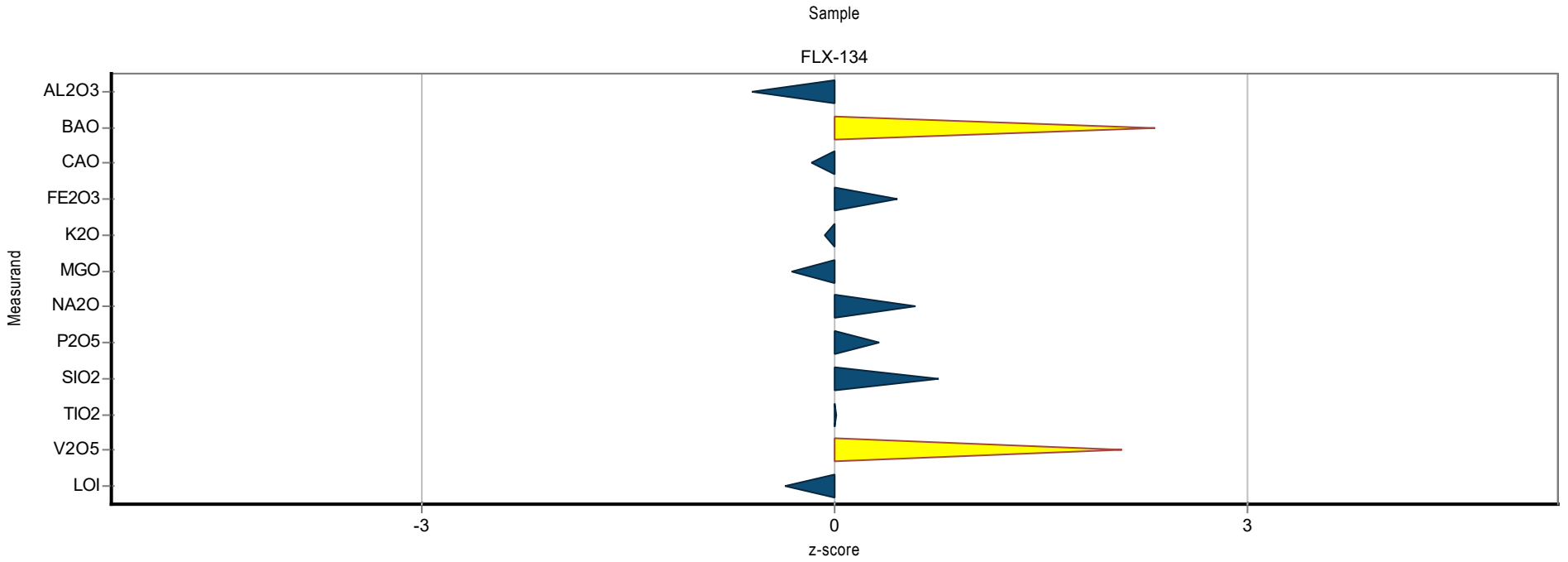
Survey of scores

Lab code	AL2O3	BAO	CAO	FE2O3	K2O	MGO	NA2O	P2O5	SIO2	TIO2	V2O5	LOI
10	-0,6	2,3	-0,2	0,5	-0,1	-0,3	0,6	0,3	0,8	0,0	2,1	-0,4
11	-0,5	-1,0	0,1	0,0	0,5	0,4		-0,2	1,7	-0,2	-0,2	-2,6
12	0,0	0,6	-2,0	0,3	-0,3	1,2	0,9	-0,3	0,2	0,0	10,1	0,2
13	0,6	0,6	1,1	11,3	22,2	-1,0	-0,6	1,1	-2,4	17,0	1,4	0,4
14	2,3	-0,9	-0,9	-0,8	0,2	0,9	0,2	-0,4	-0,1	1,9	-1,4	0,2
15	-1,5	-1,0	0,8	-0,6	-0,8	0,2	-0,2	0,0	-0,8	-1,4	1,2	0,5
16	-0,1	1,9	-0,5	-0,9	-0,1	-0,8	-0,2	0,3	0,6	-0,3	0,5	0,2
17	-0,3		0,4	5,2	-0,8		-0,6	0,4	-2,0	-0,4		1,6
18	-1,0	0,1	-0,5	-0,2	-0,2	3,0	0,2	0,6	0,5	-0,4	0,4	0,2
19	0,1			0,9	0,0	0,4	0,6	-0,2	0,0	-0,4		-0,2
20	-1,3		1,4	-0,2	0,2	0,7	-3,8	-3,1	-0,9	0,0		0,8
21	1,0	-0,9	-0,1	0,5	0,6	-0,4	2,9	1,5	0,6	1,6	-0,6	0,5
22	0,3	-0,7	-1,0	1,1	0,6	-0,8	3,6	-0,8	0,0	0,8		-0,2
23	1,8	1,6	-0,6	-0,5	-3,8	0,2	-0,1		1,7	-2,3		0,2
24	0,0	2,5	0,1	-0,7	0,3	-1,2	-1,0	0,1	0,7	1,0	0,4	-4,2
25	-0,5	-1,3	-0,4	-0,7	0,0	-0,1	1,1	0,3	-0,6	-0,9	-1,6	0,1
26	0,3	-0,6	2,8	0,3	-0,8	0,6	0,3	-1,5	0,3	0,5	-0,1	0,5
27	-0,1	-0,6	0,1	-1,4	-0,2	0,0	0,3	0,6	-0,2	0,2	0,1	-0,1
28	1,3	-1,8	0,3	-0,4	-2,0	-2,0	-3,8	-0,3	0,9	0,8	0,2	-1,7
29	2,8	1,8	0,4	3,4	19,5	-4,5	-0,8	3,3	-1,9	-1,9	-1,5	-4,2
30	-2,1			-0,2	1,6	-0,7		-5,8	-2,5	-0,1		-0,7
31	-0,5	-0,4	-0,1	0,7	1,0	-0,2	-1,6	1,2	-0,4	0,8	-0,5	1,2
32	0,2		0,5	2,3	1,6	-0,2	0,5		-0,1	-0,5		-2,2
33	-0,4	-0,8	0,3	0,0	-1,0	0,3	3,8	-2,2	5,3	4,6	-0,3	0,0
34	0,1	-0,6	5,4	-0,4	-0,9	-0,1	0,3	-6,1	-0,1	0,4	-0,1	0,5

RV_2024_03 Clay

Laboratory chart of z-scores

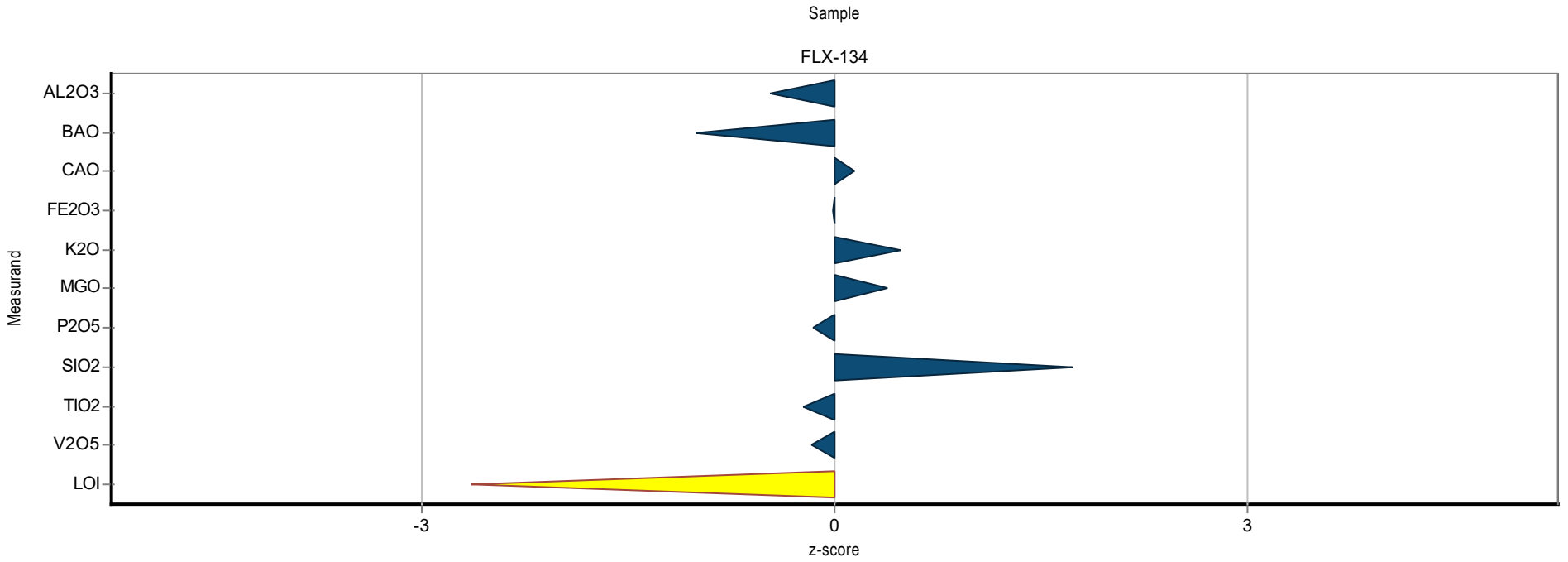
Laboratory: 10



RV_2024_03 Clay

Laboratory chart of z-scores

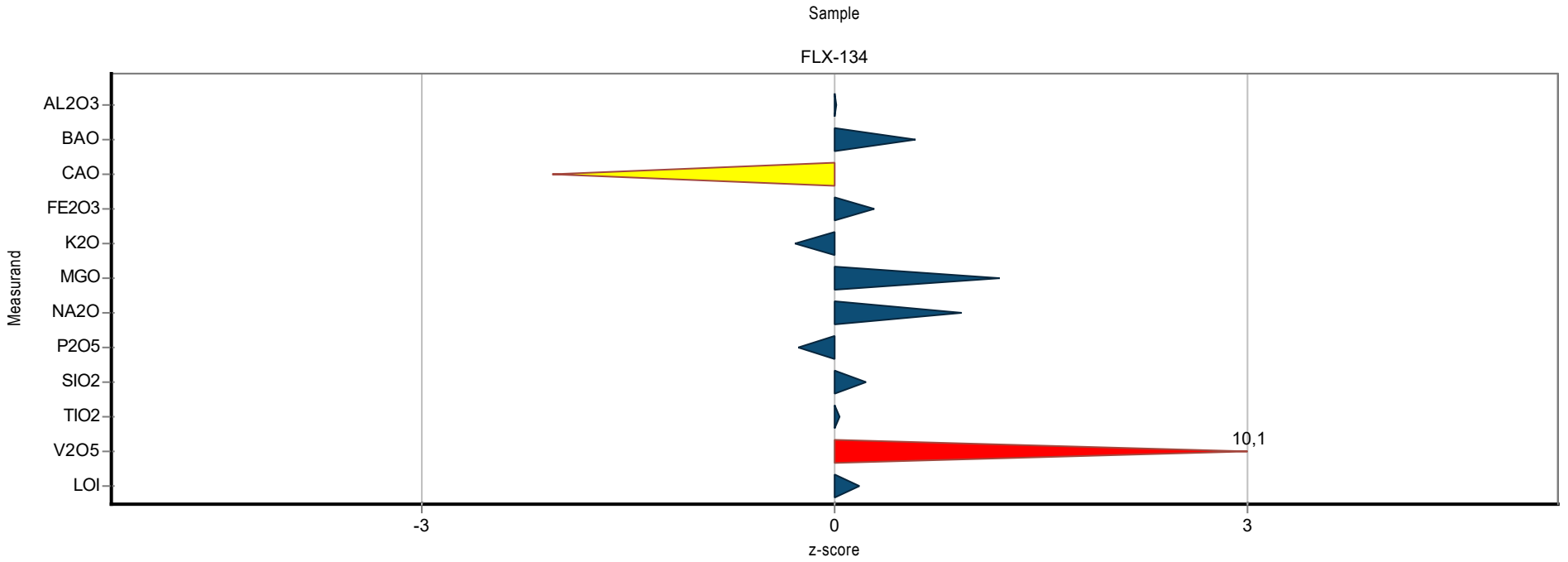
Laboratory: 11



RV_2024_03 Clay

Laboratory chart of z-scores

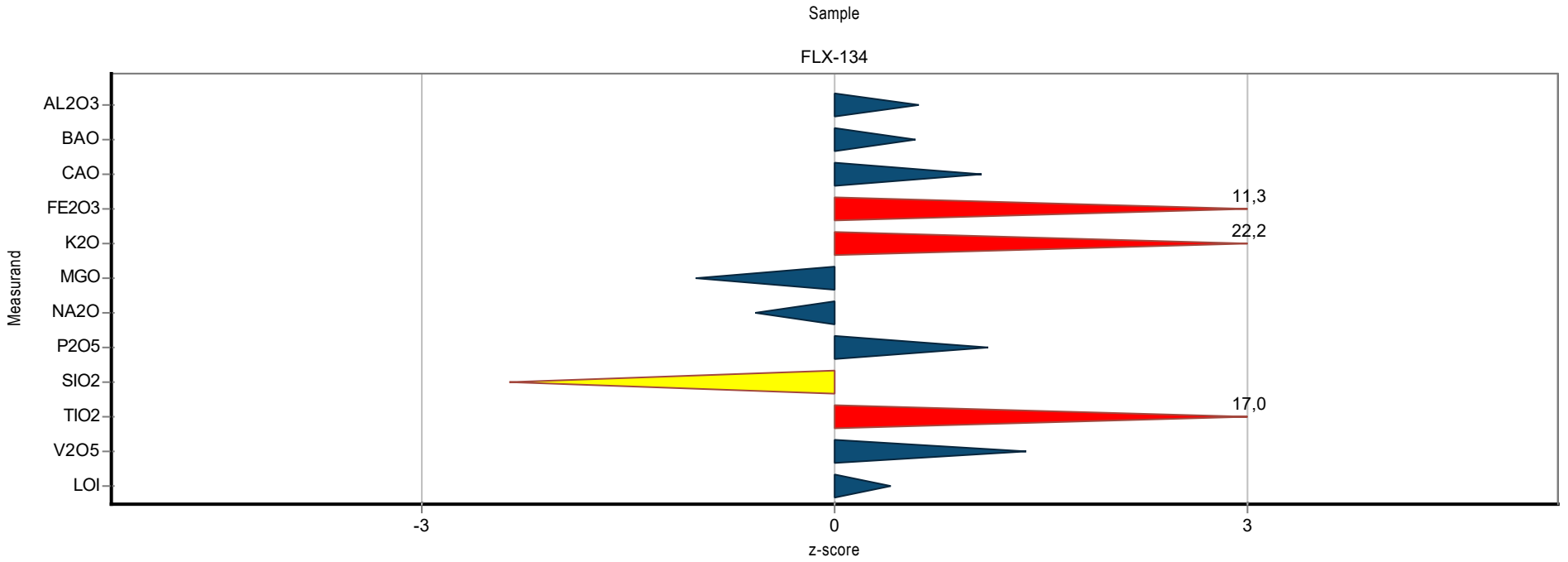
Laboratory: 12



RV_2024_03 Clay

Laboratory chart of z-scores

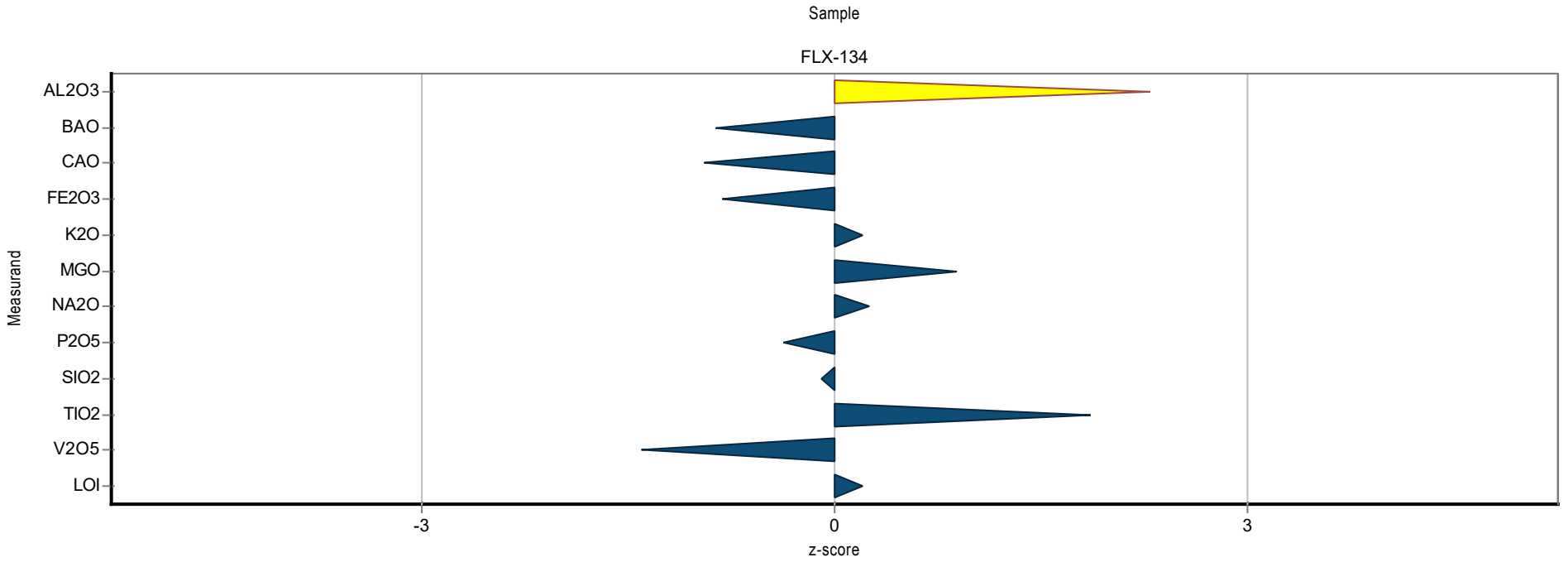
Laboratory: 13



RV_2024_03 Clay

Laboratory chart of z-scores

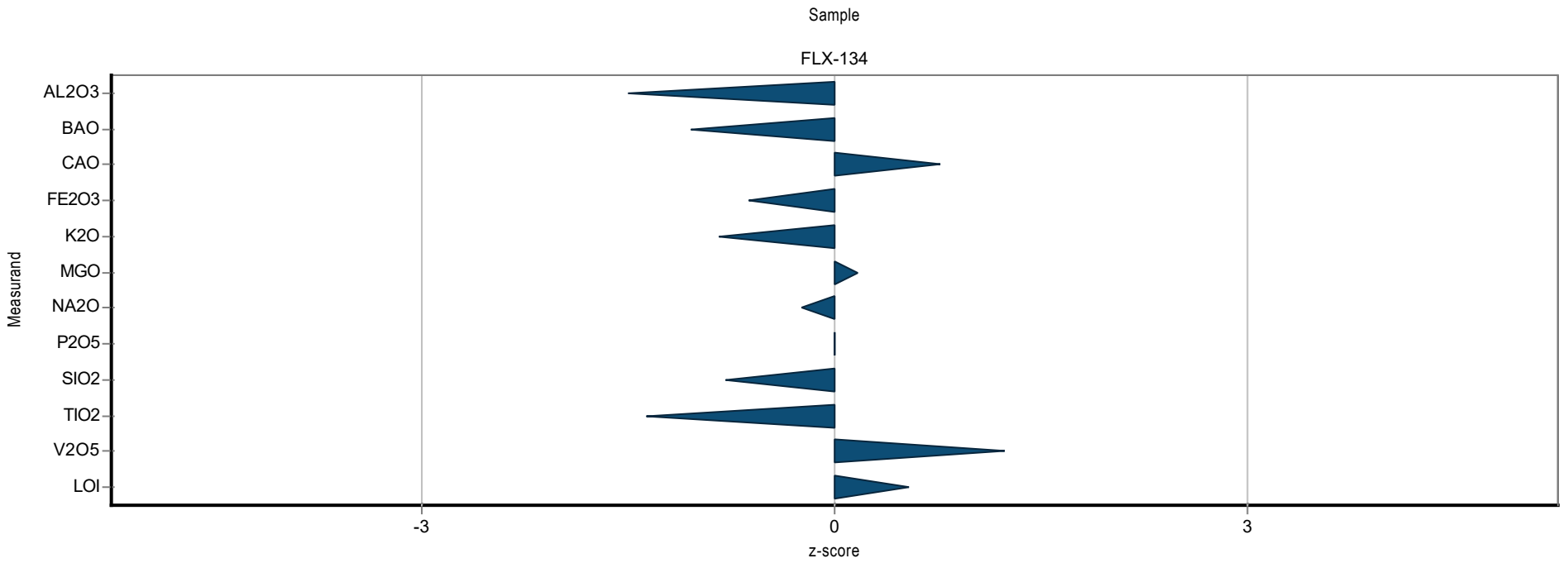
Laboratory: 14



RV_2024_03 Clay

Laboratory chart of z-scores

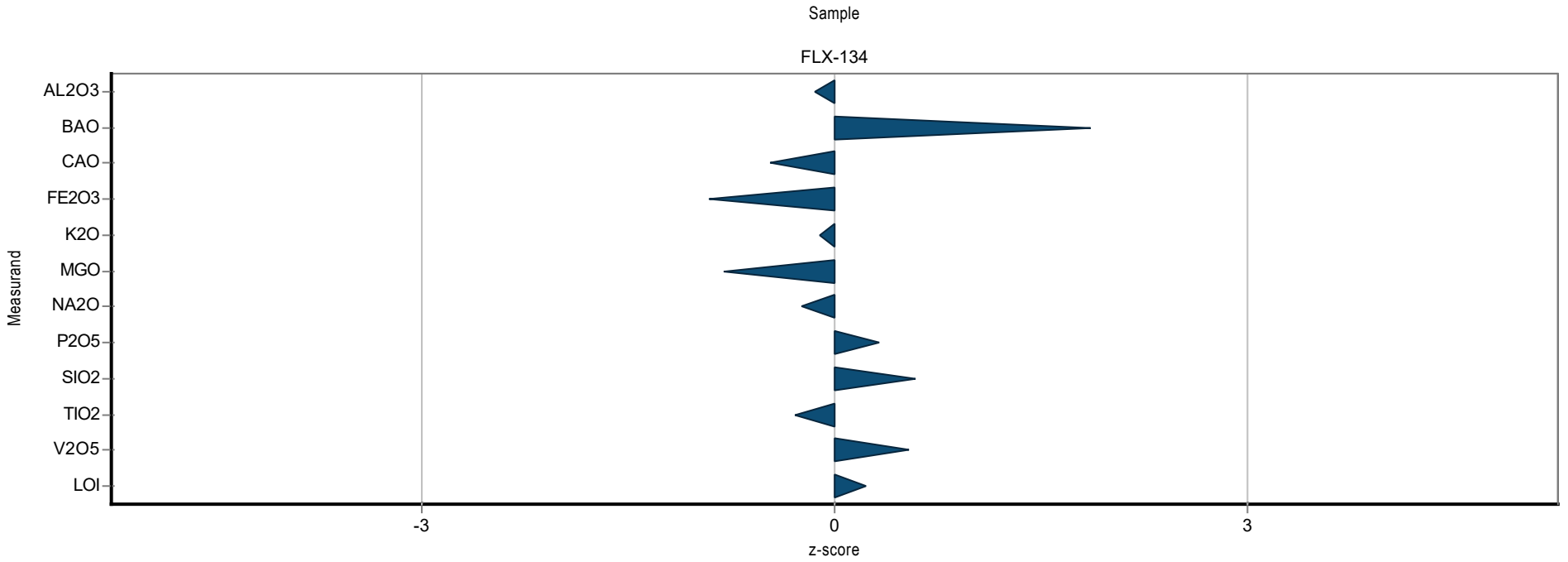
Laboratory: 15



RV_2024_03 Clay

Laboratory chart of z-scores

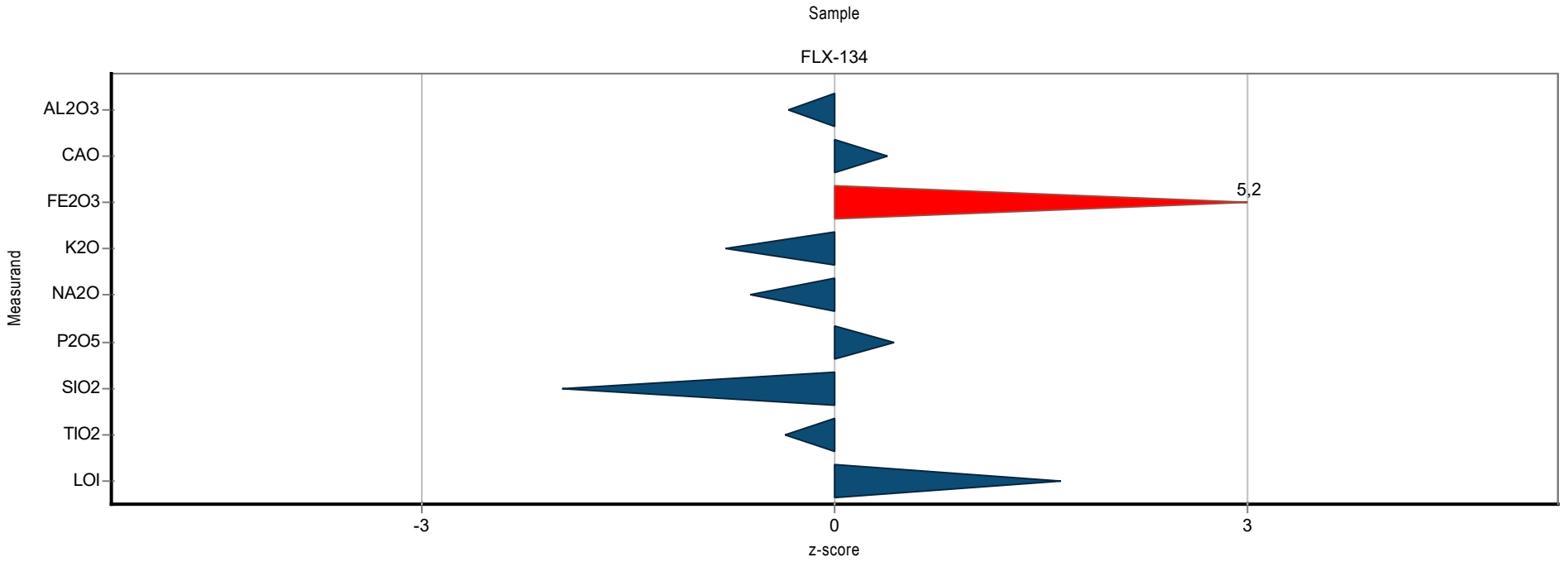
Laboratory: 16



RV_2024_03 Clay

Laboratory chart of z-scores

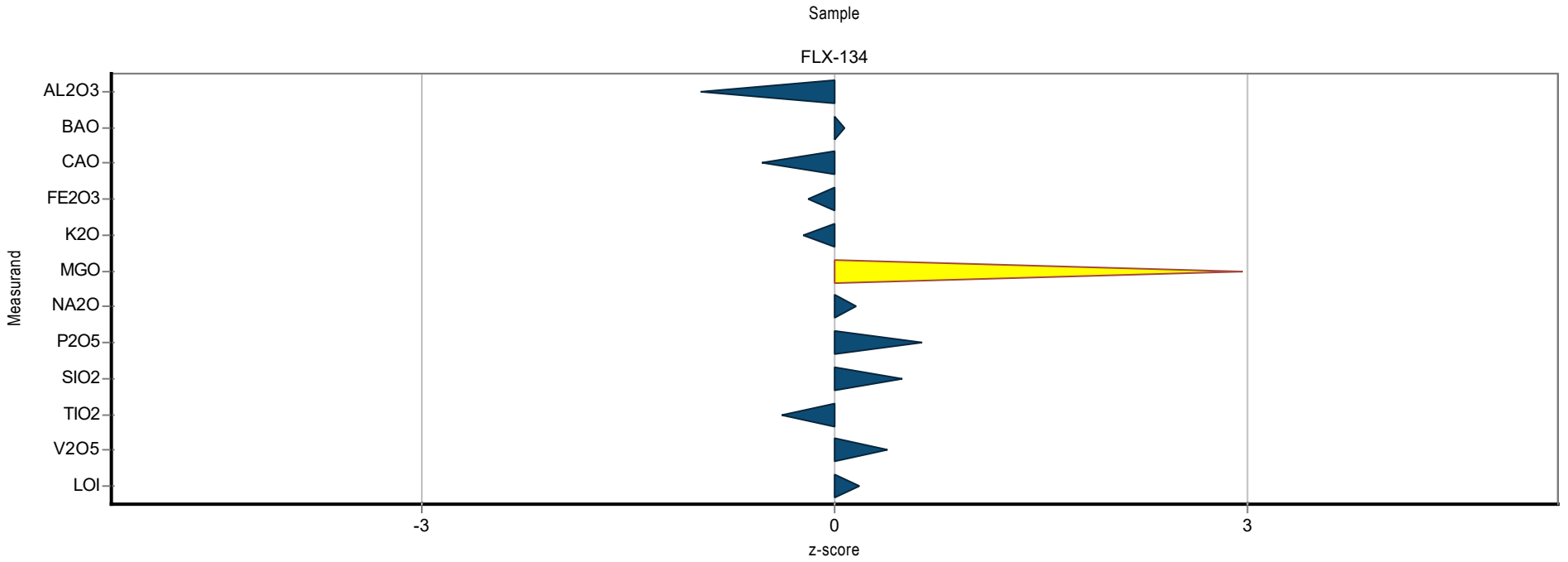
Laboratory: 17



RV_2024_03 Clay

Laboratory chart of z-scores

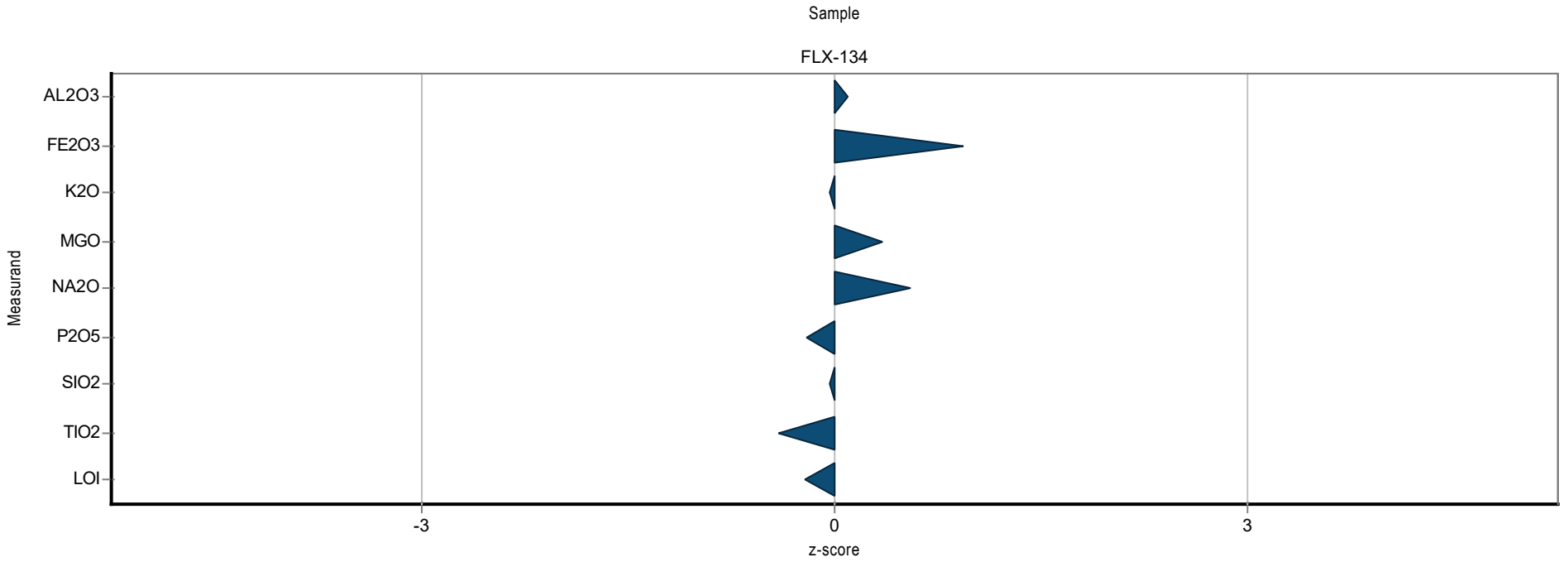
Laboratory: 18



RV_2024_03 Clay

Laboratory chart of z-scores

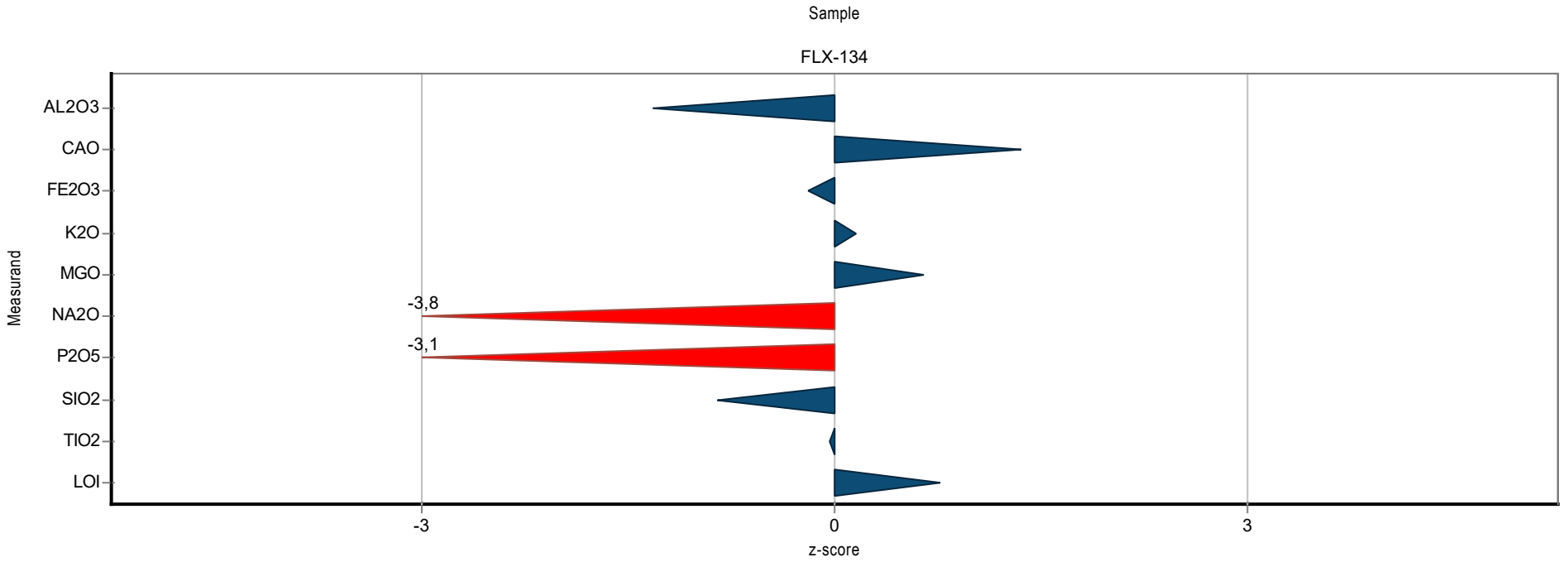
Laboratory: 19



RV_2024_03 Clay

Laboratory chart of z-scores

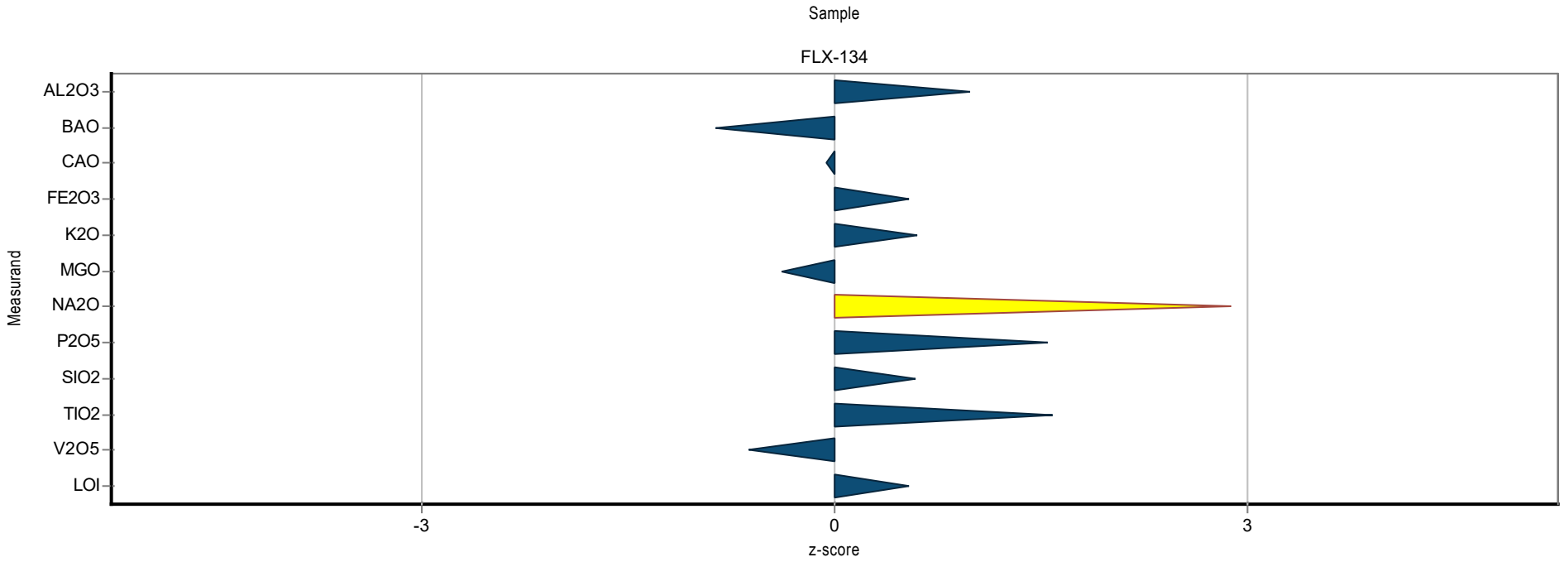
Laboratory: 20



RV_2024_03 Clay

Laboratory chart of z-scores

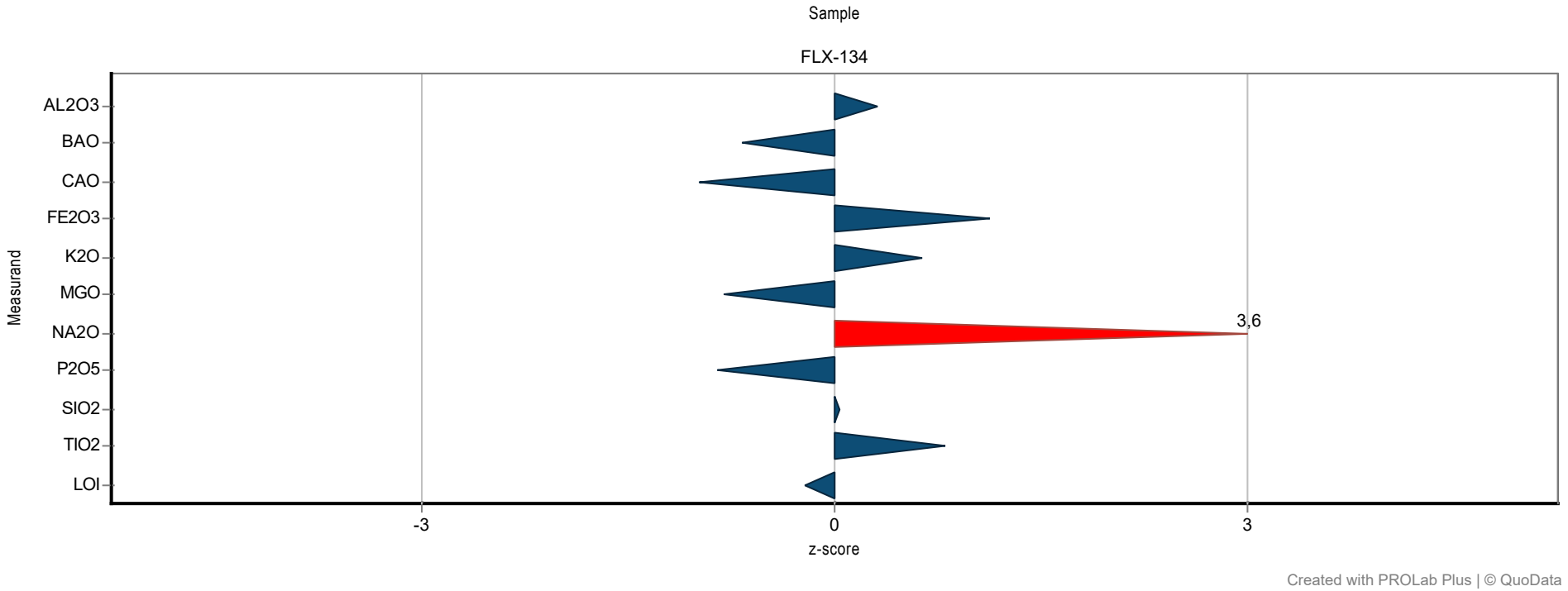
Laboratory: 21



RV_2024_03 Clay

Laboratory chart of z-scores

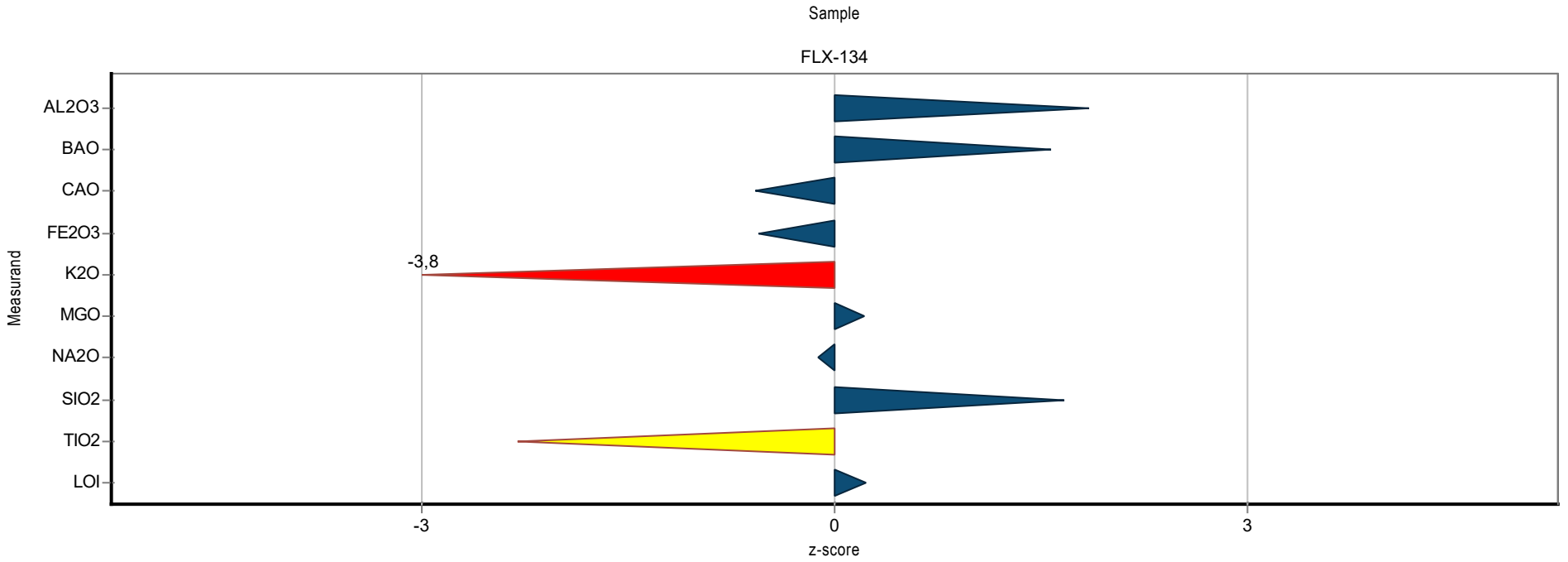
Laboratory: 22



RV_2024_03 Clay

Laboratory chart of z-scores

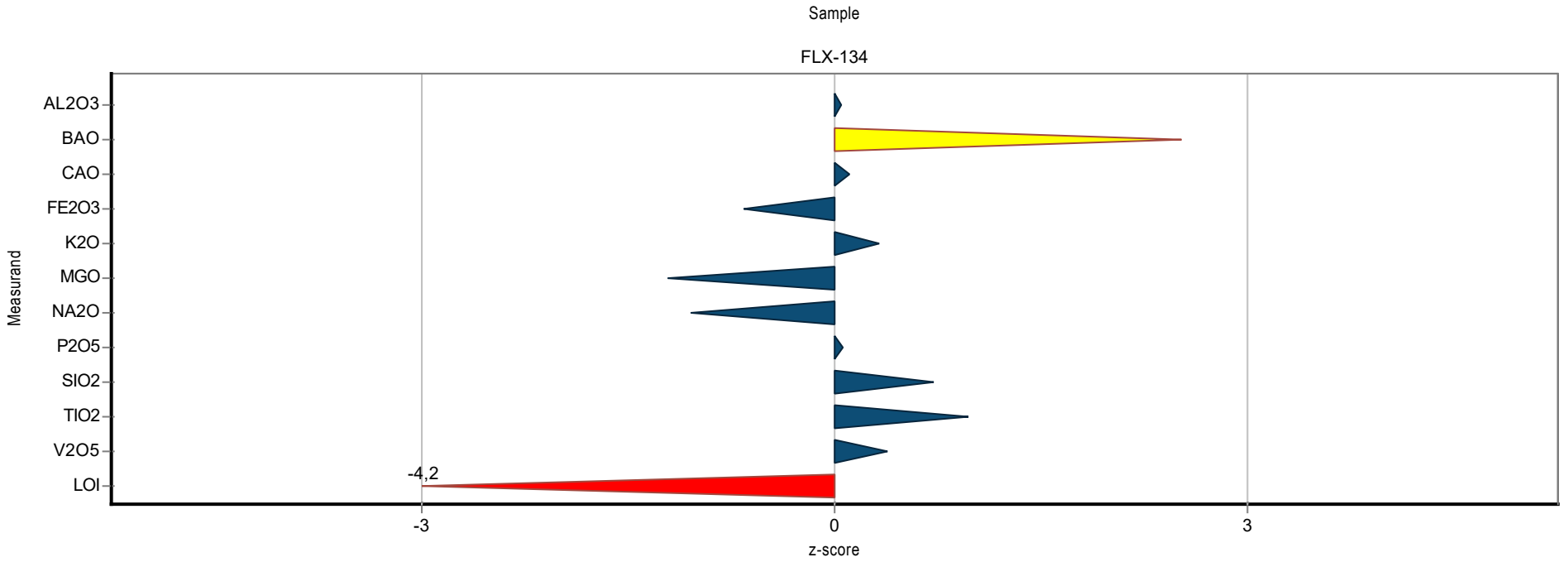
Laboratory: 23



RV_2024_03 Clay

Laboratory chart of z-scores

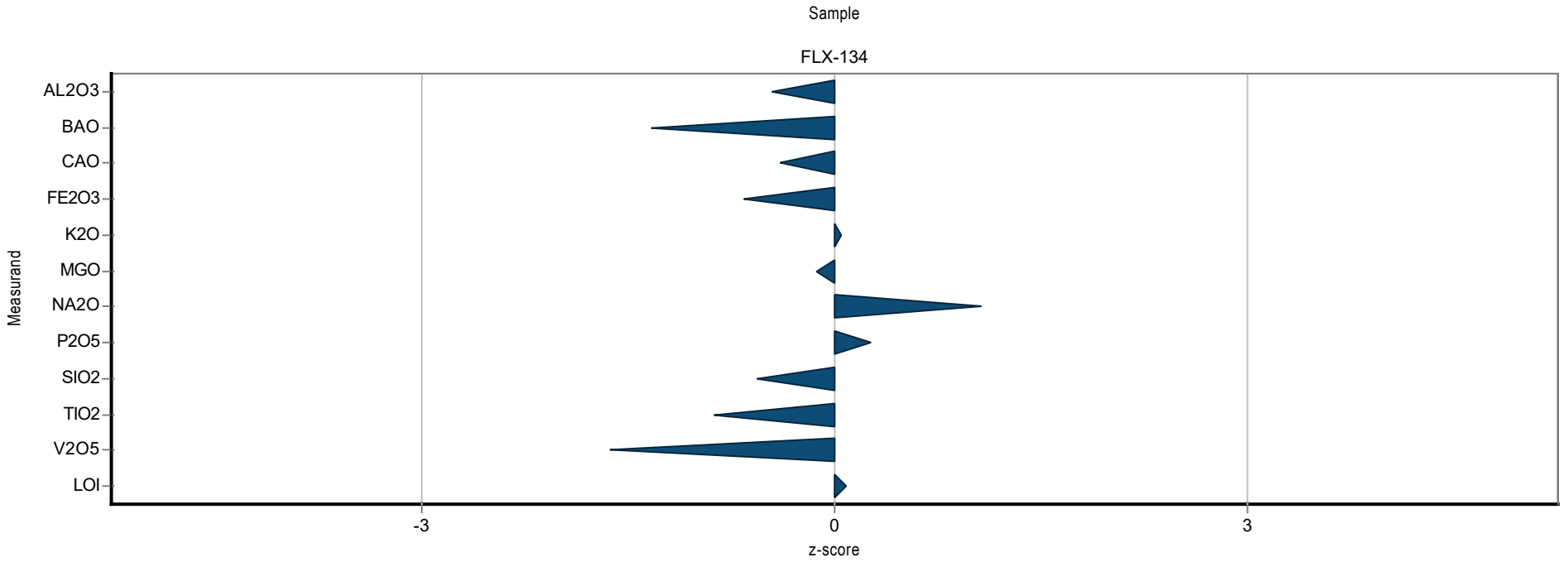
Laboratory: 24



RV_2024_03 Clay

Laboratory chart of z-scores

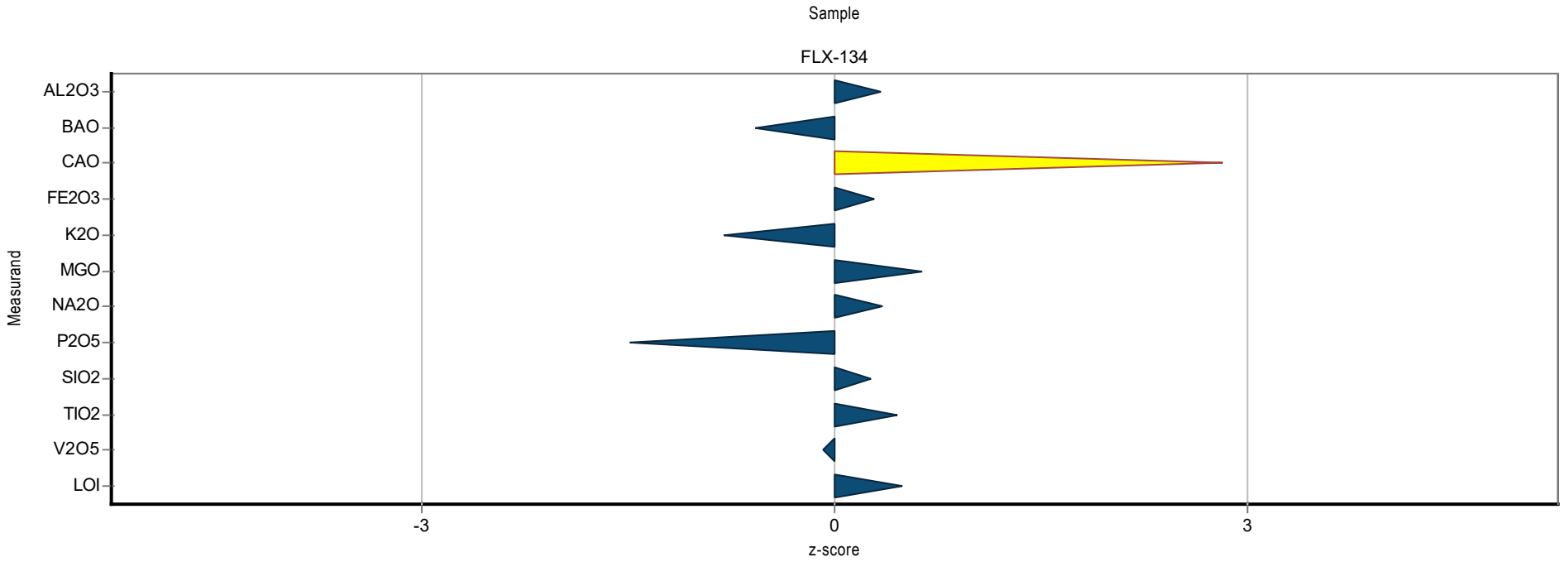
Laboratory: 25



RV_2024_03 Clay

Laboratory chart of z-scores

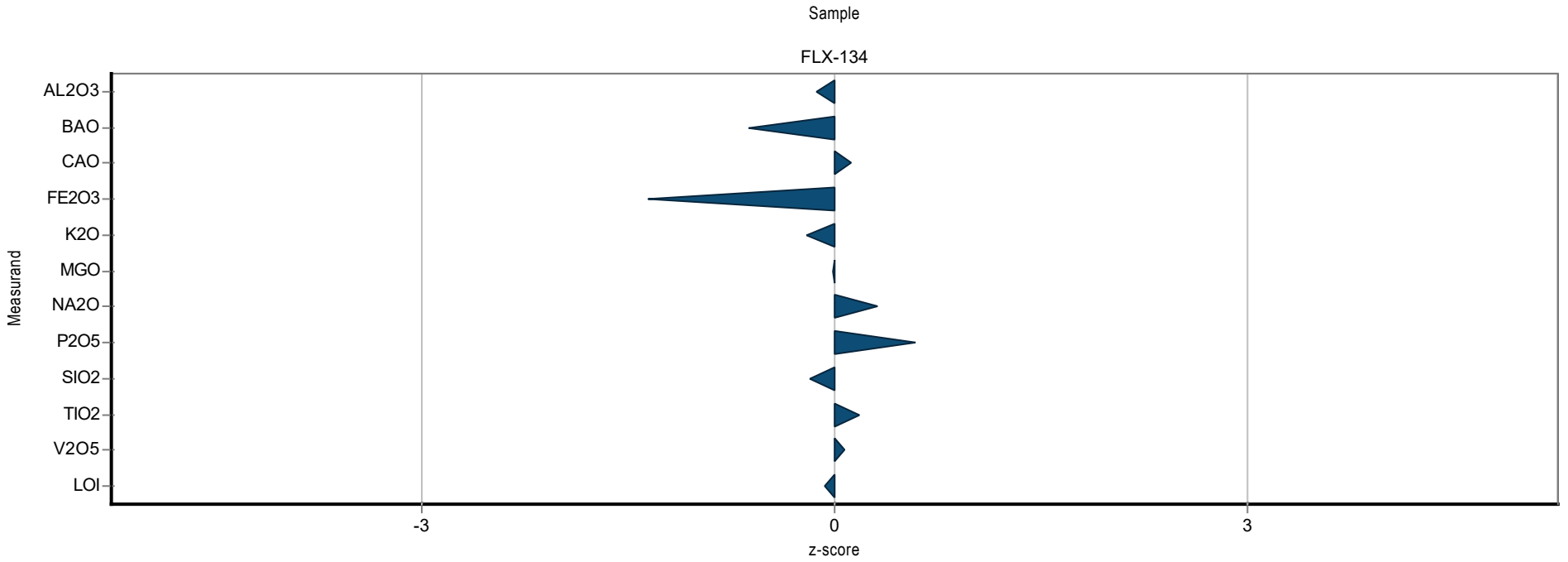
Laboratory: 26



RV_2024_03 Clay

Laboratory chart of z-scores

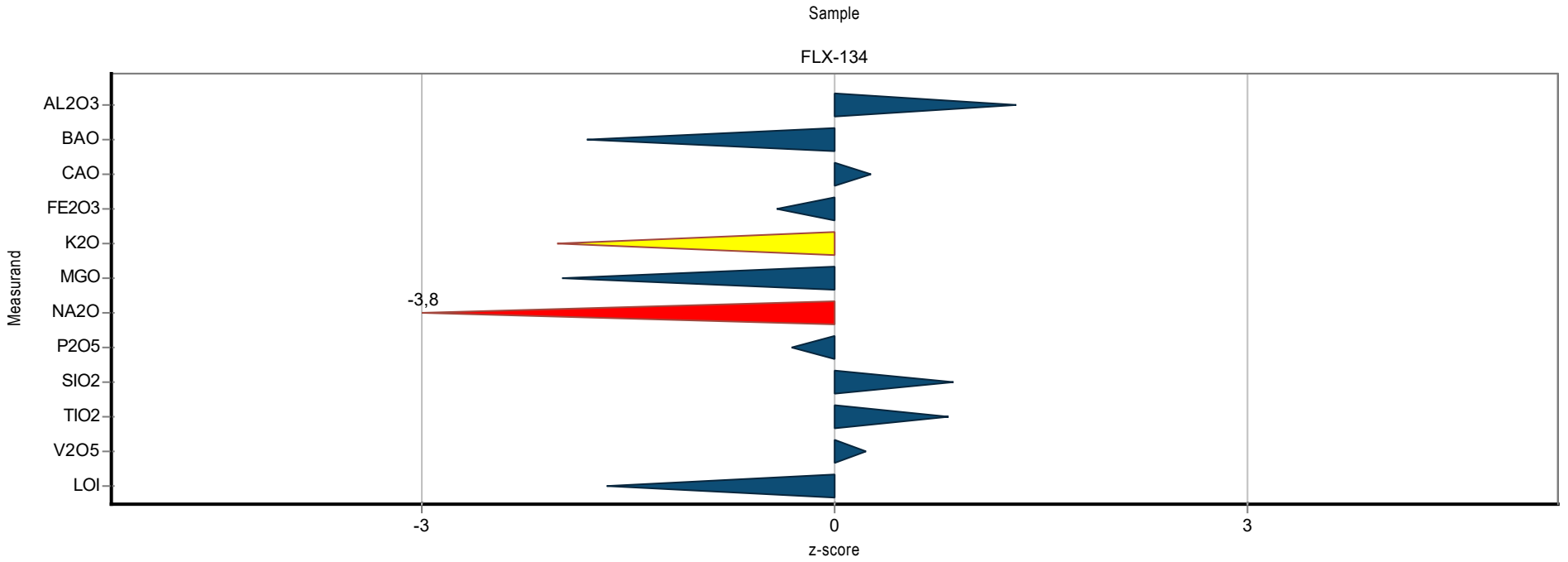
Laboratory: 27



RV_2024_03 Clay

Laboratory chart of z-scores

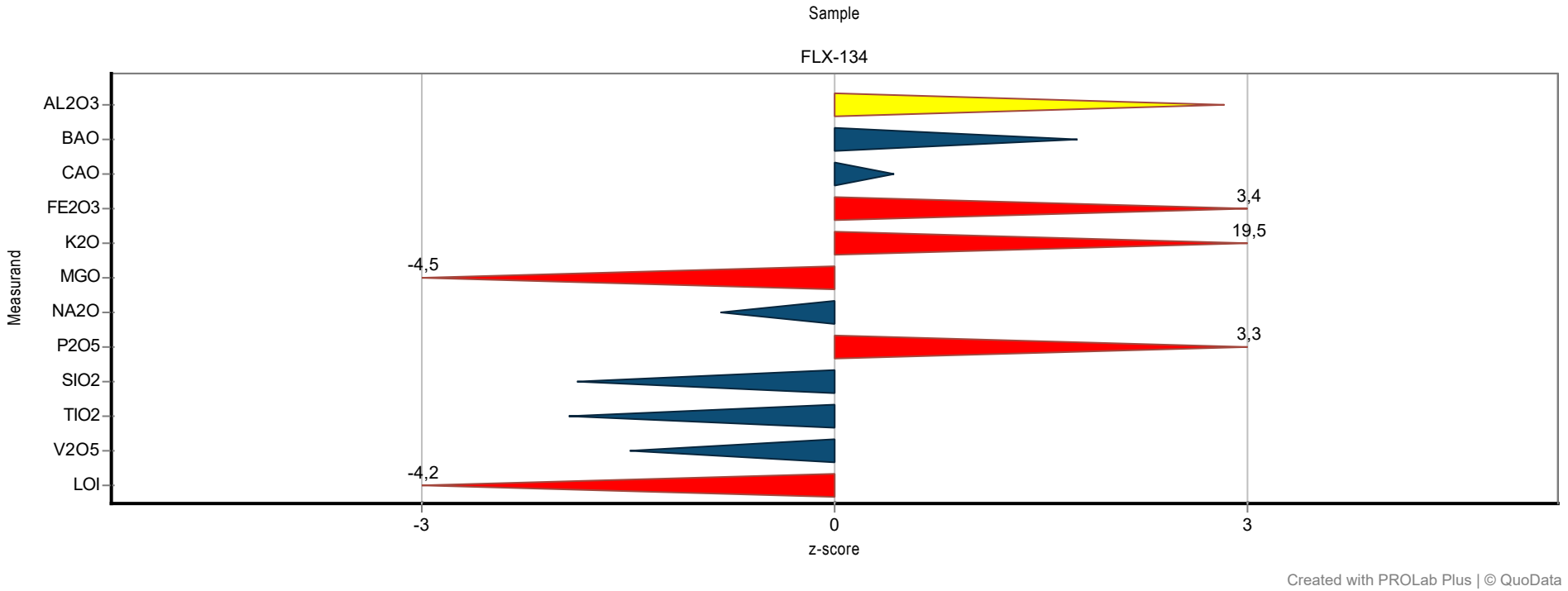
Laboratory: 28



RV_2024_03 Clay

Laboratory chart of z-scores

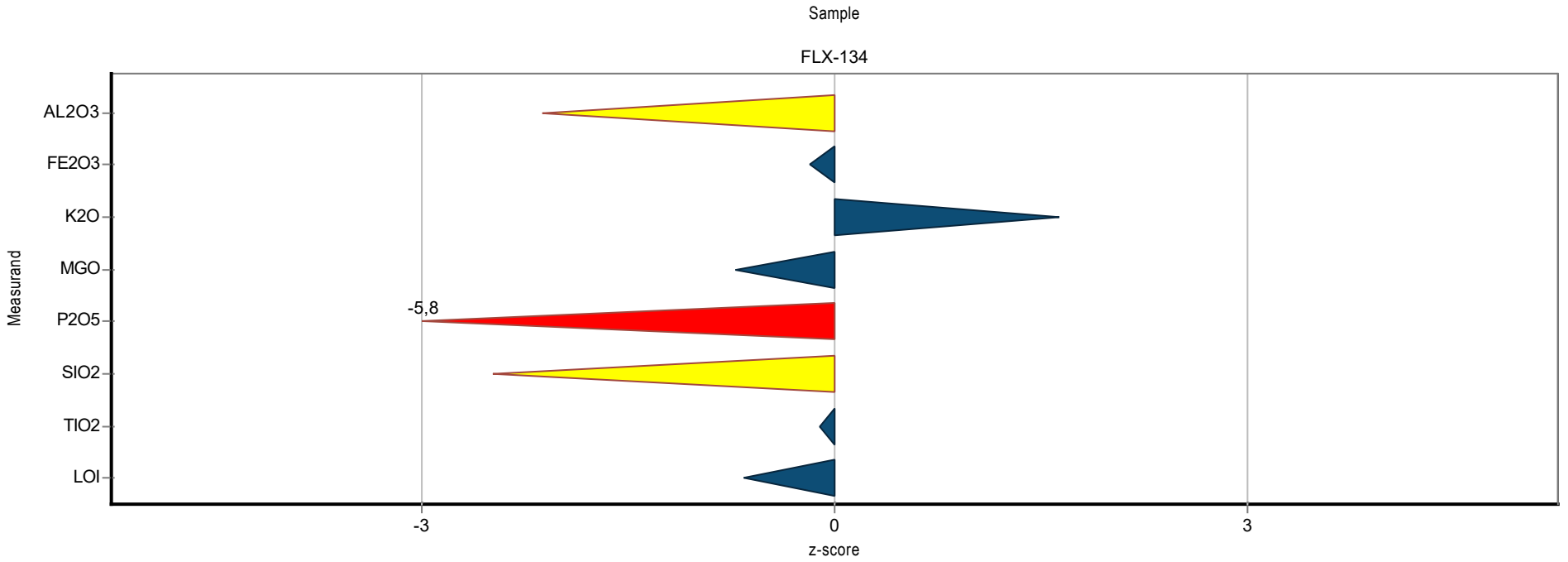
Laboratory: 29



RV_2024_03 Clay

Laboratory chart of z-scores

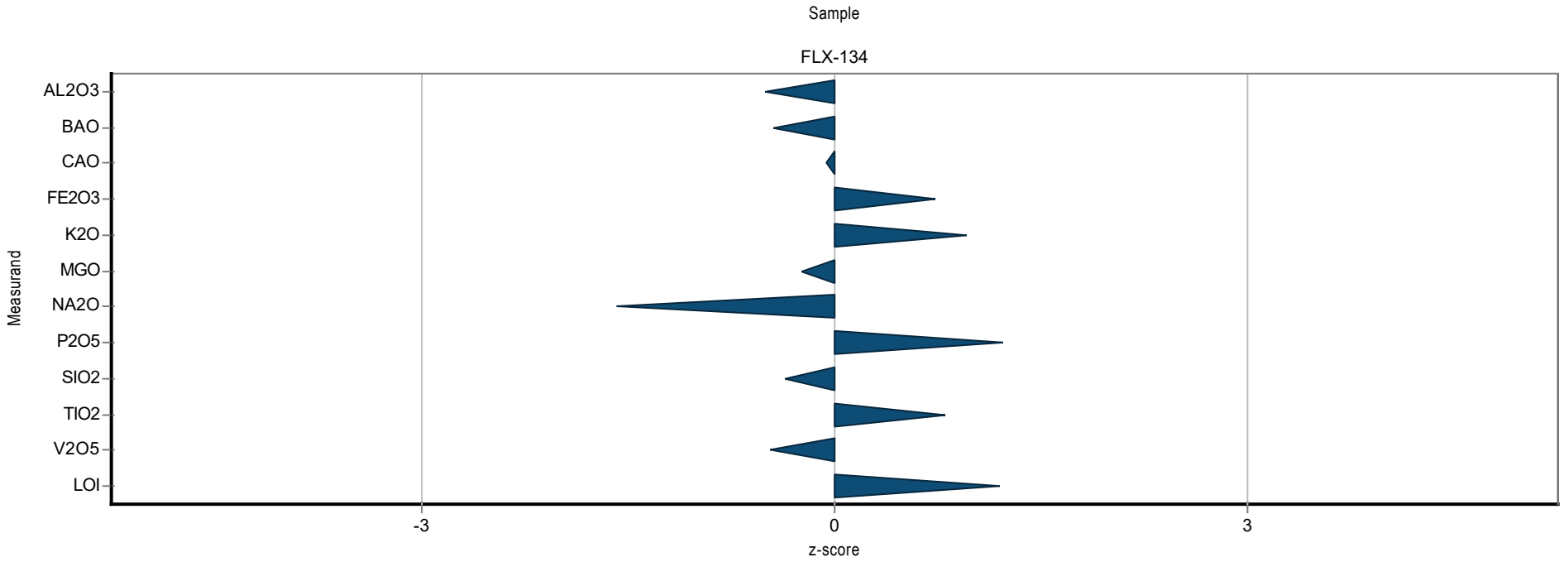
Laboratory: 30



RV_2024_03 Clay

Laboratory chart of z-scores

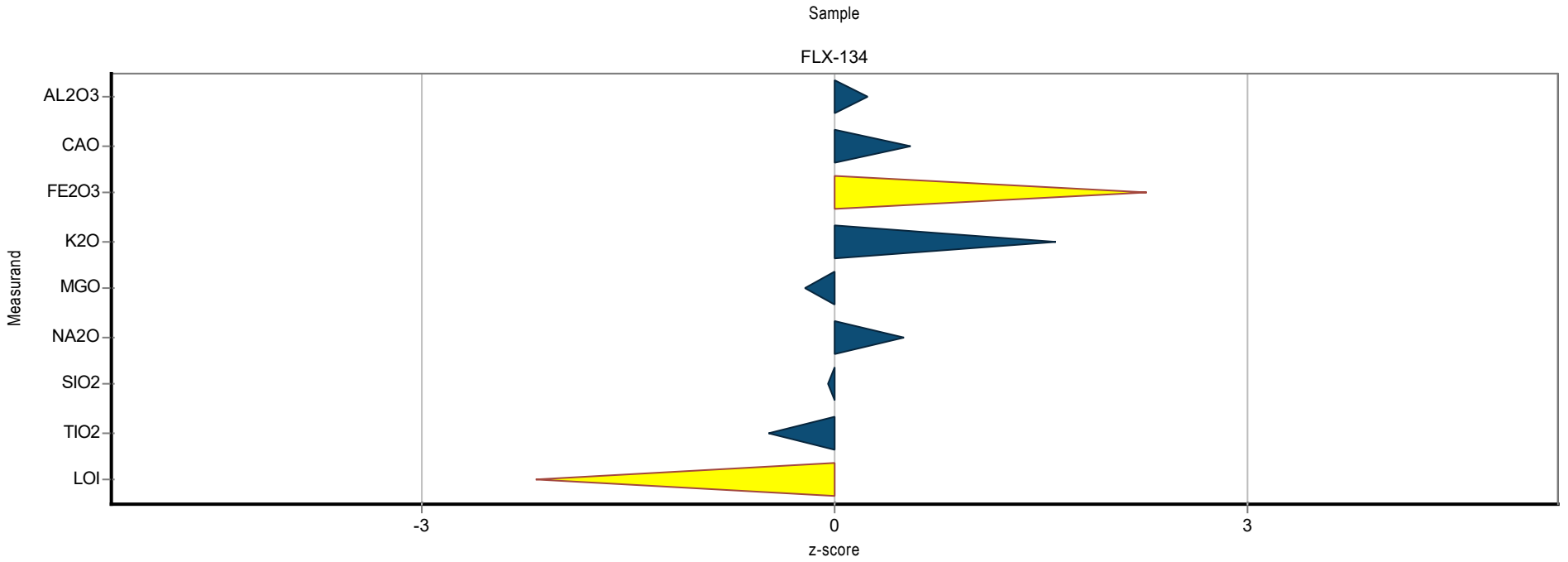
Laboratory: 31



RV_2024_03 Clay

Laboratory chart of z-scores

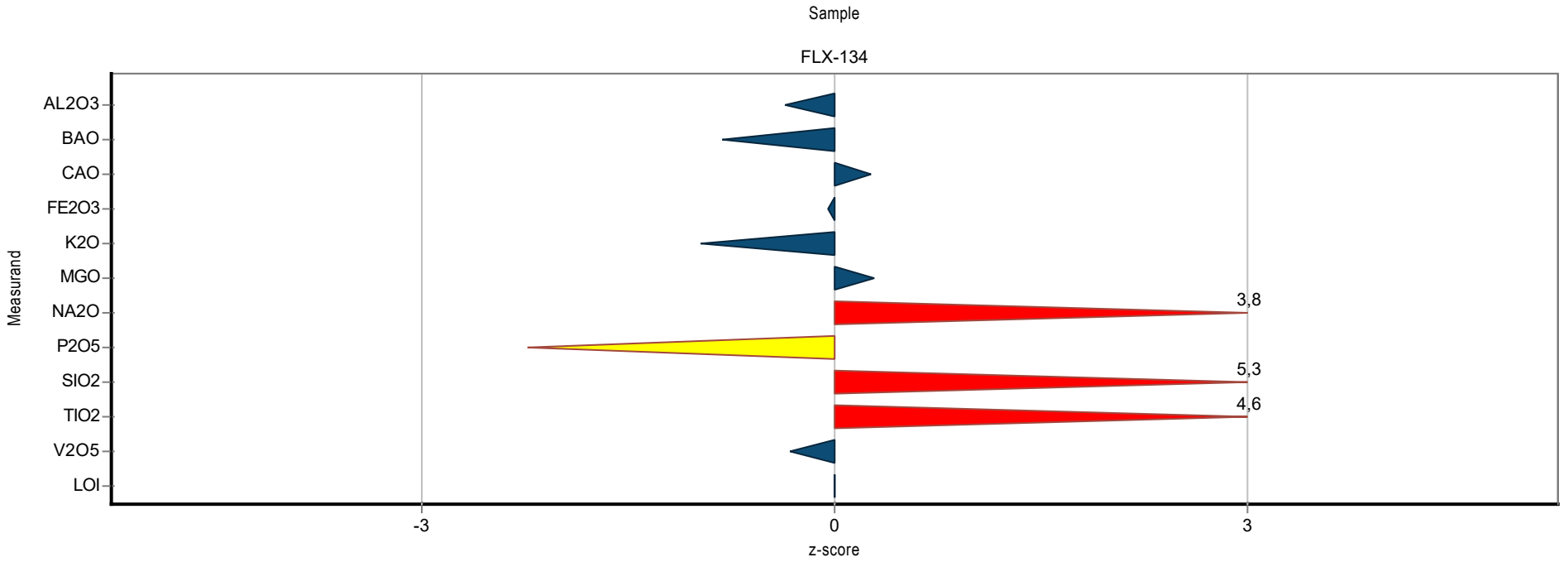
Laboratory: 32



RV_2024_03 Clay

Laboratory chart of z-scores

Laboratory: 33



RV_2024_03 Clay

Laboratory chart of z-scores

Laboratory: 34