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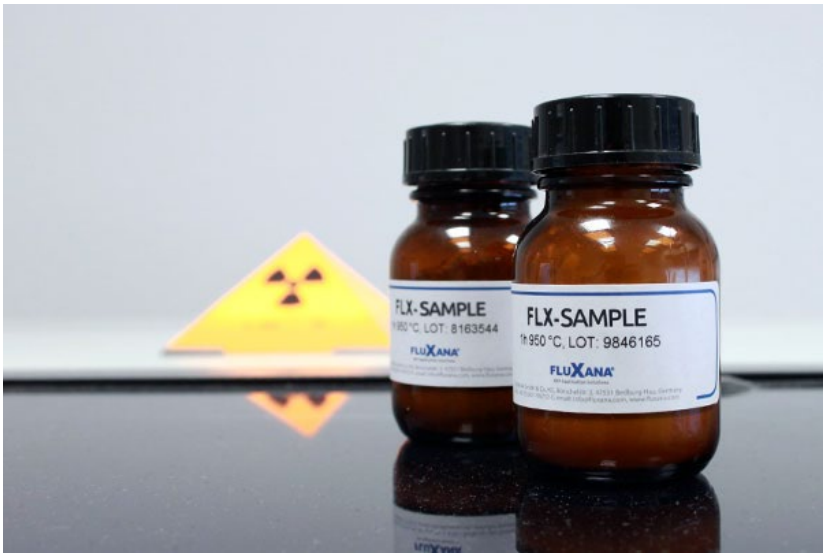
Final Proficiency Test Report for Dolomite (RV-2025-01)

FLX-2004



Bedburg-Hau, February 06th 2025

Coordinator of PT
Charlotte Winkels-Herding

Statistics and Report
Dr. Rainer Schramm

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	Al2O3	CaO	Fe2O3	K2O	MgO	Mn2O3
Unit	%	%	%	%	%	%
No. of laboratories	17	17	17	15	17	12
Mean m	0,640	42,953	0,316	0,119	9,896	0,010
Repoducibility standard deviation s_R	0,039	0,515	0,026	0,026	0,141	0,003
Repeatability standard deviation s_r	0,005	0,028	0,006	0,003	0,025	0,001
Reproducibilty standard deviation s*	0,043	0,547	0,024	0,027	0,107	0,003
Uncertainty U (s*)	0,026	0,332	0,015	0,018	0,065	0,002
Uncertainty U (s_R)	0,024	0,312	0,016	0,017	0,085	0,002
Mean - 2*s_R	0,562	41,924	0,264	0,066	9,614	0,003
Mean + 2*s_R	0,718	43,983	0,368	0,172	10,178	0,016

	P2O5	SiO2	SrO	TiO2	ZnO	LOI
Unit	%	%	%	%	%	%
No. of laboratories	14	17	13	16	11	16
Mean m	0,013	1,708	0,015	0,031	0,007	44,402
Repoducibility standard deviation s_R	0,004	0,046	0,002	0,007	0,002	0,155
Repeatability standard deviation s_r	0,001	0,013	0,001	0,001	0,002	0,026
Reproducibilty standard deviation s*	0,004	0,036	0,002	0,006	0,001	0,164
Uncertainty U (s*)	0,003	0,022	0,001	0,004	0,001	0,102
Uncertainty U (s_R)	0,003	0,028	0,001	0,004	0,002	0,097
Mean - 2*s_R	0,006	1,615	0,011	0,016	0,004	44,093
Mean + 2*s_R	0,020	1,801	0,019	0,045	0,011	44,711

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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Elements marked as (info only)

If the **reproducibility standard deviation s_R** of a mean value is higher than 50% relative of the mean, all statistical data are only shown as information to the participant. In such a case there is no serious assessment of z-scores possible.

	Cr2O3	Na2O	SO3
	info only	info only	info only
Unit	%	%	%
No. of laboratories	7	8	12
Mean m	0,003	0,027	0,038
Repoducibility standard deviation s_R	0,010	0,019	0,024
Repeatability standard deviation s_r	0,010	0,003	0,002
Reproducibilty standard deviation s*	0,005	0,019	0,021
Uncertainty U (s*)	0,005	0,017	0,015
Uncertainty U (s_R)	0,009	0,017	0,017
Mean - 2*s_R	-0,016	-0,011	-0,011
Mean + 2*s_R	0,023	0,064	0,086

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

Bernegger GmH, Österreich	Austria
InterCal Austria GmbH	Austria
VBE Österreich	Austria
LHOIST RECHERCHE ET DEVELOPPEMENT SA	Belgium
BMI - BRAAS GmbH	Germany
Dorfner Analysezentrum und Anlagenplanungsgesellschaft mbH (Anzaplan)	Germany
Euroglas GmbH	Germany
FLUXANA GmbH & Co. KG	Germany
Landesamt für Geologie und Bergbau	Germany
OPTERRA Wössingen GmbH	Germany
THYSSENKRUPP STEEL EUROPE AG	Germany
THYSSENKRUPP STEEL EUROPE AG, Zeche	Germany
Quantum Tech Griechenland (Lafarge holcim aget Heracles milaki plant)	Greece
Riyadh Geotechnique and Foundation (RGF)	Saudi Arabia
D-LAB Degerfors Laboratorium AB	Sweden
LKAB	Sweden
Jura-Cement-Fabriken, Wildegg	Switzerland
Omya International AG	Switzerland

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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

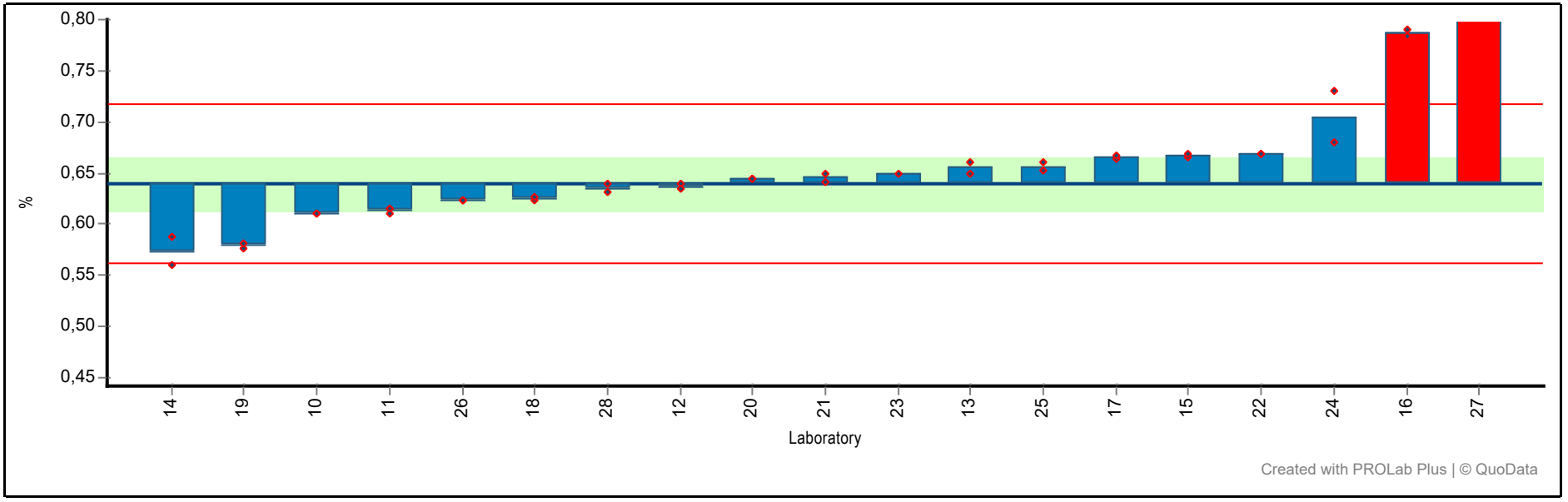
Z-scores with 3 >= $|z|$ >= 2 are highlighted with a yellow color, z-scores with $|z|$ >= 3 are highlighted with a red color.

feedback@fluxana.de

RV_2025_01 Dolomite

Summary results

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,039 %**
Measurand:	**Al2O3**	**Repeat. s.d:**	**0,005 %**
Mean ± U(Mean):	**0,640 ± 0,026 %**	**Range of tolerance:**	**0,562 - 0,718 % (|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	0,610	0,610	0,610	0,000	-0,8	XRF (fusion)	no accredition	
11	0,616	0,611	0,613	0,004	-0,7	XRF (fusion)	ISO 17025	
12	0,639	0,635	0,637	0,003	-0,1	XRF (fusion)	ISO 17025	
13	0,661	0,650	0,655	0,008	0,4	XRF (fusion)	ISO 17025	
14	0,560	0,587	0,574	0,019	-1,7	XRF (fusion)	no accredition	
15	0,665	0,668	0,667	0,002	0,7	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	0,791	0,784	0,788	0,005	3,8	XRF (fusion)	no accredition	
17	0,664	0,667	0,665	0,002	0,7	XRF (fusion)	ISO 17025	
18	0,624	0,627	0,625	0,002	-0,4	XRF (fusion)	no accredition	
19	0,577	0,581	0,579	0,003	-1,6	XRF (fusion)	no accredition	
20	0,644	0,644	0,644	0,000	0,1	XRF (fusion)	ISO 17025	
21	0,650	0,642	0,646	0,006	0,2	XRF (fusion)	no accredition	
22	0,668	0,669	0,669	0,001	0,7	XRF (fusion)	no accredition	
23	0,650		0,650		0,3	XRF (pressed pellet)	no accredition	info only
24	0,730	0,680	0,705	0,035	1,7	XRF (fusion)	no accredition	
25	0,661	0,652	0,657	0,006	0,4	XRF (fusion)	no accredition	
26	0,623	0,623	0,623	0,000	-0,4	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	0,944	0,918	0,931	0,018	7,5	XRF (pressed pellet)	no accredition	info only
28	0,639	0,632	0,635	0,005	-0,1	XRF (fusion)	no accredition	

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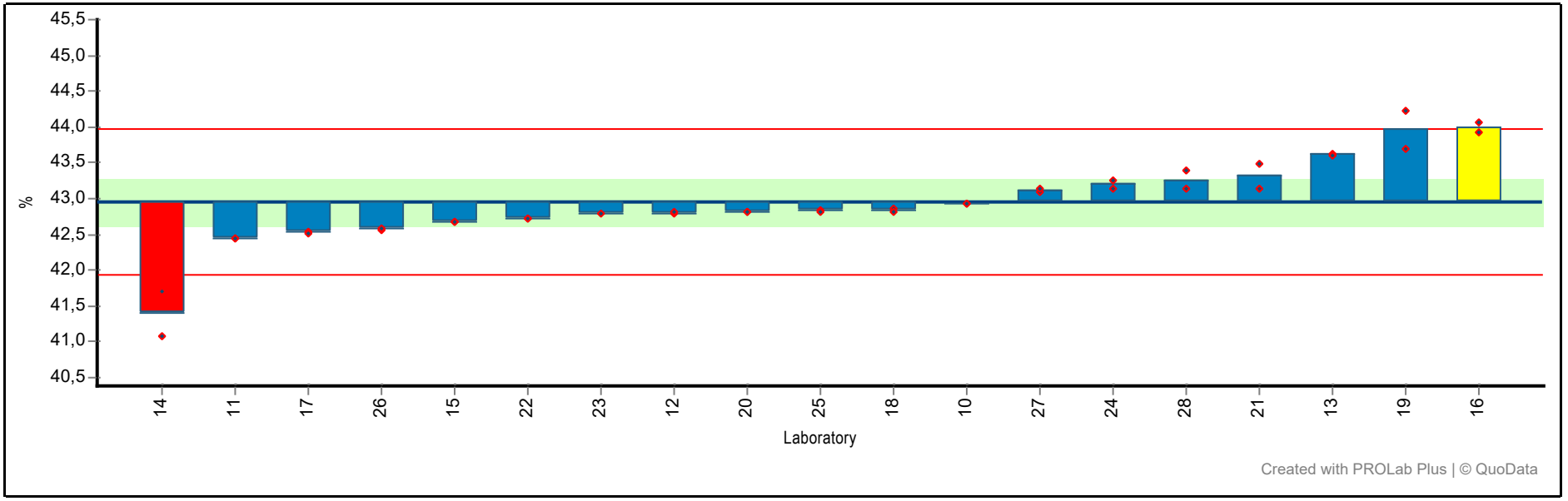
Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,515 %**
Measurand:	**CaO**	**Repeat. s.d:**	**0,028 %**
Mean ± U(Mean):	**42,953 ± 0,332 %**	**Range of tolerance:**	**41,924 - 43,983 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**17**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	42,940	42,940	42,940	0,000	0,0	XRF (fusion)	no accredition	
11	42,448	42,440	42,444	0,006	-1,0	XRF (fusion)	ISO 17025	
12	42,791	42,814	42,802	0,016	-0,3	XRF (fusion)	ISO 17025	
13	43,629	43,602	43,615	0,019	1,3	XRF (fusion)	ISO 17025	
14	41,710	41,087	41,398	0,441	-3,0	XRF (fusion)	no accredition	
15	42,671	42,682	42,677	0,008	-0,5	XRF (fusion)	no accredition	
16	43,929	44,073	44,001	0,102	2,0	XRF (fusion)	no accredition	
17	42,538	42,521	42,529	0,012	-0,8	XRF (fusion)	ISO 17025	

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Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	42,858	42,826	42,842	0,023	-0,2	XRF (fusion)	no accredition	
19	43,703	44,233	43,968	0,375	2,0	XRF (fusion)	no accredition	
20	42,814	42,804	42,809	0,007	-0,3	XRF (fusion)	ISO 17025	
21	43,490	43,140	43,315	0,247	0,7	XRF (fusion)	no accredition	
22	42,711	42,718	42,715	0,005	-0,5	XRF (fusion)	no accredition	
23	42,800		42,800		-0,3	XRF (pressed pellet)	no accredition	info only
24	43,250	43,150	43,200	0,071	0,5	XRF (fusion)	no accredition	
25	42,845	42,823	42,834	0,016	-0,2	XRF (fusion)	no accredition	
26	42,560	42,590	42,575	0,021	-0,7	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	43,086	43,132	43,109	0,033	0,3	XRF (pressed pellet)	no accredition	info only
28	43,142	43,388	43,265	0,174	0,6	XRF (fusion)	no accredition	

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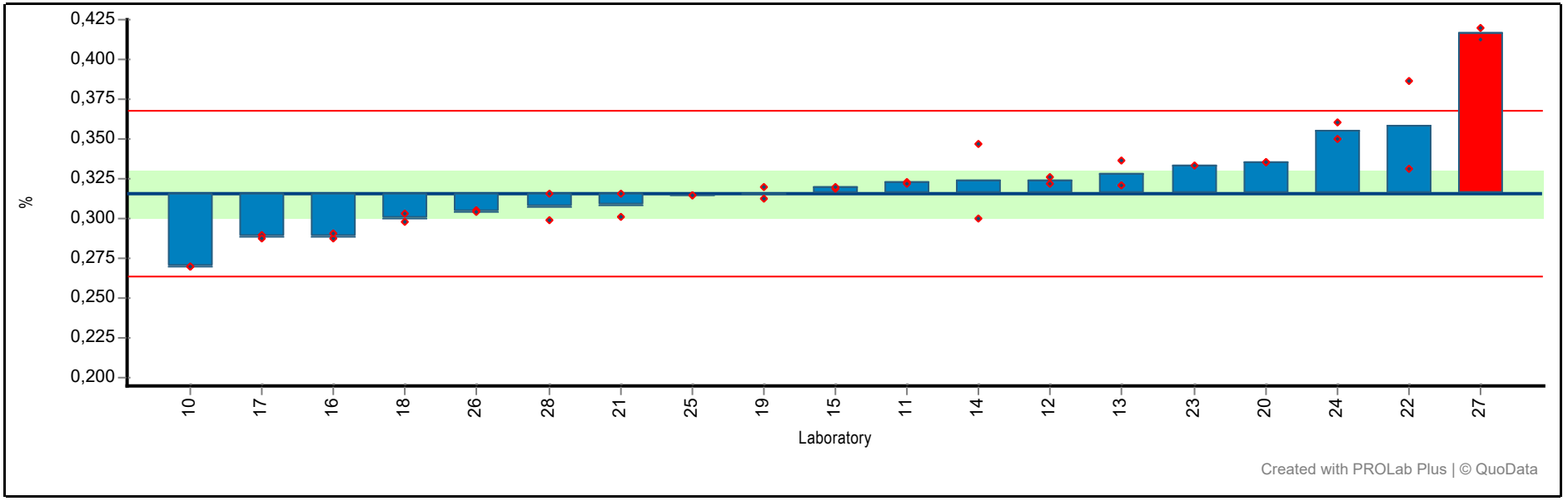
Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,026 %**
Measurand:	**Fe2O3**	**Repeat. s.d:**	**0,006 %**
Mean ± U(Mean):	**0,316 ± 0,015 %**	**Range of tolerance:**	**0,264 - 0,368 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**17**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,270	0,270	0,270	0,000	-1,8	XRF (fusion)	no accredition	
11	0,323	0,322	0,323	0,001	0,3	XRF (fusion)	ISO 17025	
12	0,322	0,326	0,324	0,003	0,3	XRF (fusion)	ISO 17025	
13	0,336	0,321	0,329	0,011	0,5	XRF (fusion)	ISO 17025	
14	0,300	0,347	0,324	0,033	0,3	XRF (fusion)	no accredition	
15	0,319	0,320	0,320	0,001	0,1	XRF (fusion)	no accredition	
16	0,287	0,291	0,289	0,003	-1,0	XRF (fusion)	no accredition	
17	0,290	0,287	0,288	0,002	-1,0	XRF (fusion)	ISO 17025	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,298	0,303	0,300	0,004	-0,6	XRF (fusion)	no accredition	
19	0,312	0,320	0,316	0,006	0,0	XRF (fusion)	no accredition	
20	0,335	0,335	0,335	0,000	0,7	XRF (fusion)	ISO 17025	
21	0,301	0,316	0,308	0,011	-0,3	XRF (fusion)	no accredition	
22	0,386	0,331	0,359	0,039	1,6	XRF (fusion)	no accredition	
23	0,333		0,333		0,7	XRF (pressed pellet)	no accredition	info only
24	0,350	0,360	0,355	0,007	1,5	XRF (fusion)	no accredition	
25	0,315	0,315	0,315	0,000	0,0	XRF (fusion)	no accredition	
26	0,305	0,304	0,304	0,001	-0,4	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	0,420	0,413	0,416	0,005	3,9	XRF (pressed pellet)	no accredition	info only
28	0,316	0,299	0,307	0,012	-0,3	XRF (fusion)	no accredition	

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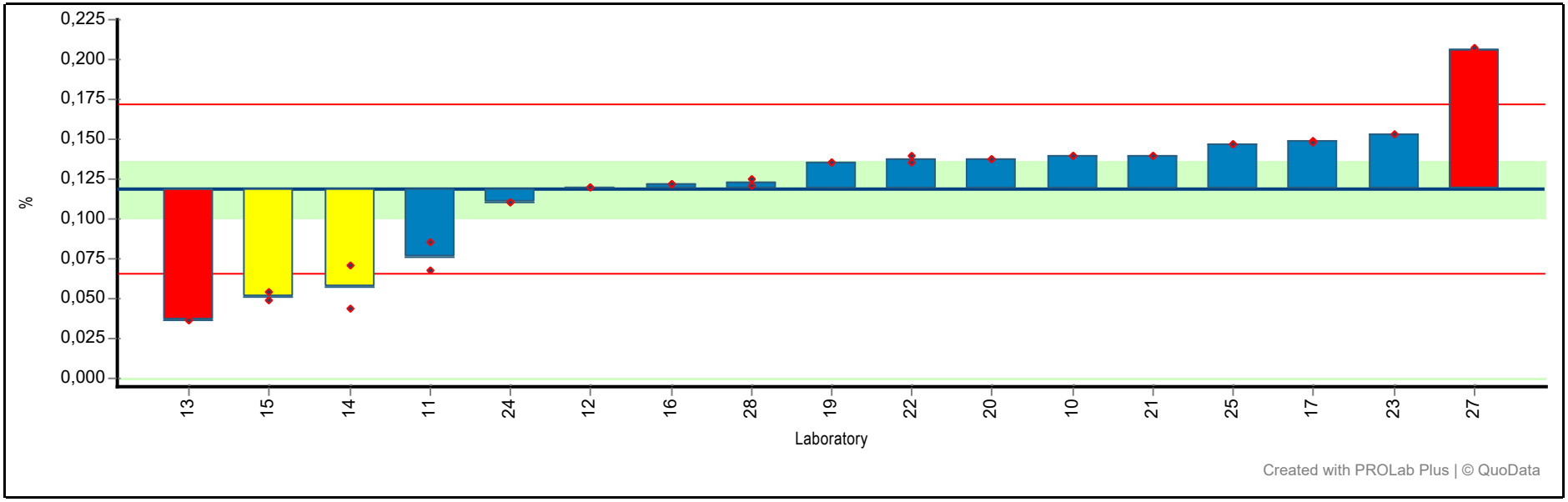
Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,026 %**
Measurand:	**K2O**	**Repeat. s.d:**	**0,003 %**
Mean ± U(Mean):	**0,119 ± 0,018 %**	**Range of tolerance:**	**0,066 - 0,172 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**15**	**Statistical method:**	**Q/Hampel**



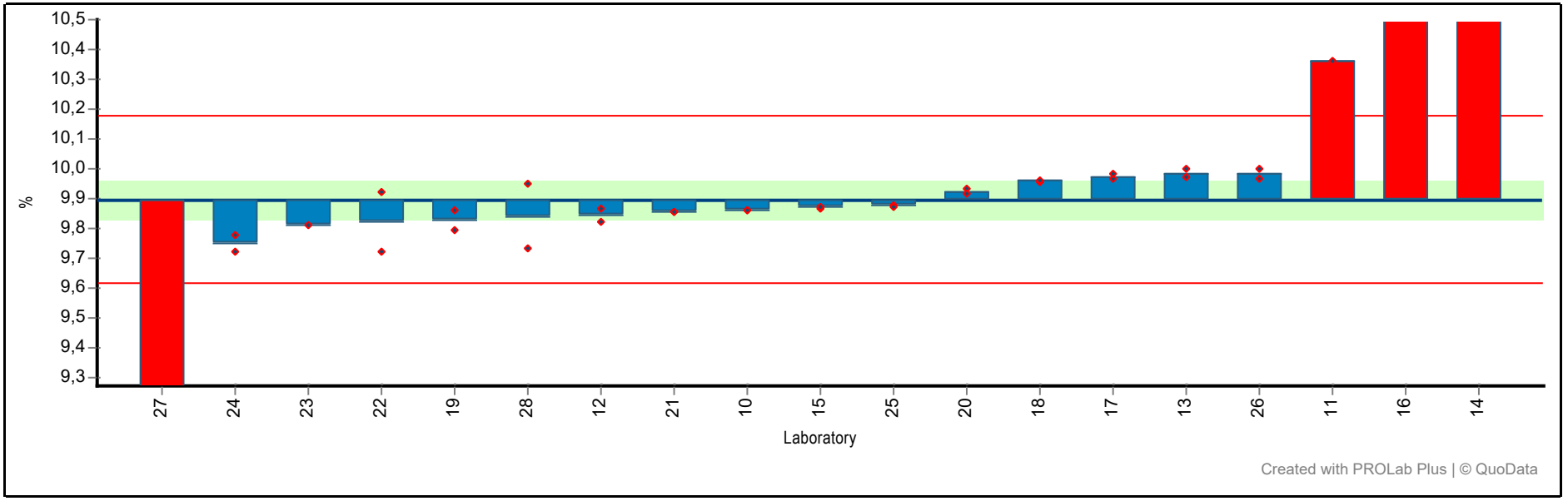
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,140	0,140	0,140	0,000	0,8	XRF (fusion)	no accredition	
11	0,068	0,085	0,077	0,012	-1,6	XRF (fusion)	ISO 17025	
12	0,120	0,120	0,120	0,000	0,1	XRF (fusion)	ISO 17025	
13	0,036	0,036	0,036	0,000	-3,1	XRF (fusion)	ISO 17025	
14	0,071	0,044	0,057	0,019	-2,3	XRF (fusion)	no accredition	
15	0,049	0,054	0,052	0,004	-2,5	XRF (fusion)	no accredition	
16	0,122	0,122	0,122	0,000	0,1	XRF (fusion)	no accredition	
17	0,149	0,148	0,148	0,001	1,1	XRF (fusion)	ISO 17025	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,135	0,135	0,135	0,000	0,6	XRF (fusion)	no accredition	
20	0,138	0,138	0,138	0,000	0,7	XRF (fusion)	ISO 17025	
21	0,140	0,140	0,140	0,000	0,8	XRF (fusion)	no accredition	
22	0,135	0,140	0,138	0,004	0,7	XRF (fusion)	no accredition	
23	0,153		0,153		1,3	XRF (pressed pellet)	no accredition	info only
24	0,110	0,110	0,110	0,000	-0,3	XRF (fusion)	no accredition	
25	0,147	0,147	0,147	0,000	1,1	XRF (fusion)	no accredition	
27	0,206	0,207	0,206	0,001	3,3	XRF (pressed pellet)	no accredition	info only
28	0,121	0,125	0,123	0,003	0,2	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,141 %**
Measurand:	**MgO**	**Repeat. s.d:**	**0,025 %**
Mean ± U(Mean):	**9,896 ± 0,065 %**	**Range of tolerance:**	**9,614 - 10,178 % (|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	9,860	9,860	9,860	0,000	-0,3	XRF (fusion)	no accredition	
11	10,363	10,361	10,362	0,001	3,3	XRF (fusion)	ISO 17025	
12	9,869	9,824	9,846	0,032	-0,4	XRF (fusion)	ISO 17025	
13	9,970	9,998	9,984	0,020	0,6	XRF (fusion)	ISO 17025	
14	11,259	11,853	11,556	0,420	11,8	XRF (fusion)	no accredition	
15	9,869	9,872	9,870	0,002	-0,2	XRF (fusion)	no accredition	
16	10,994	11,013	11,003	0,013	7,9	XRF (fusion)	no accredition	
17	9,964	9,986	9,975	0,016	0,6	XRF (fusion)	ISO 17025	

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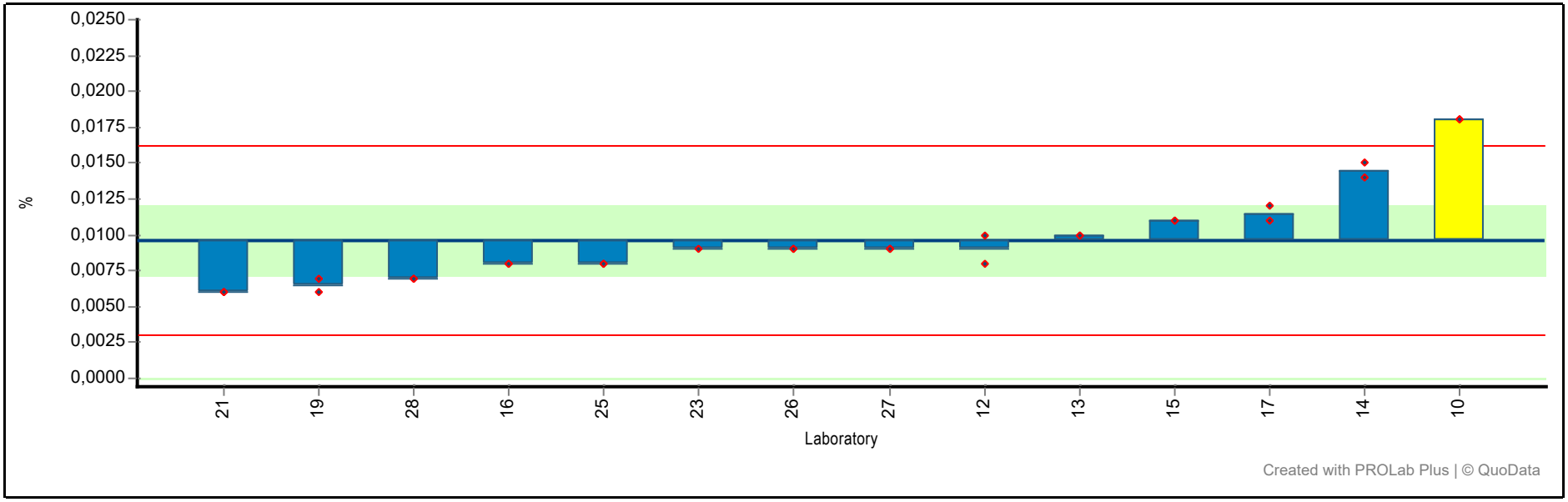
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	9,956	9,961	9,959	0,004	0,4	XRF (fusion)	no accredition	
19	9,863	9,796	9,829	0,047	-0,5	XRF (fusion)	no accredition	
20	9,935	9,915	9,925	0,014	0,2	XRF (fusion)	ISO 17025	
21	9,858	9,856	9,857	0,001	-0,3	XRF (fusion)	no accredition	
22	9,921	9,724	9,822	0,139	-0,5	XRF (fusion)	no accredition	
23	9,810		9,810		-0,6	XRF (pressed pellet)	no accredition	info only
24	9,720	9,780	9,750	0,042	-1,0	XRF (fusion)	no accredition	
25	9,878	9,875	9,877	0,002	-0,1	XRF (fusion)	no accredition	
26	10,002	9,967	9,985	0,025	0,6	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	8,661	8,681	8,671	0,014	-8,7	XRF (pressed pellet)	no accredition	info only
28	9,951	9,731	9,841	0,156	-0,4	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,003 %**
Measurand:	**Mn2O3**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,010 ± 0,002 %**	**Range of tolerance:**	**0,003 - 0,016 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**12**	**Statistical method:**	**Q/Hampel**



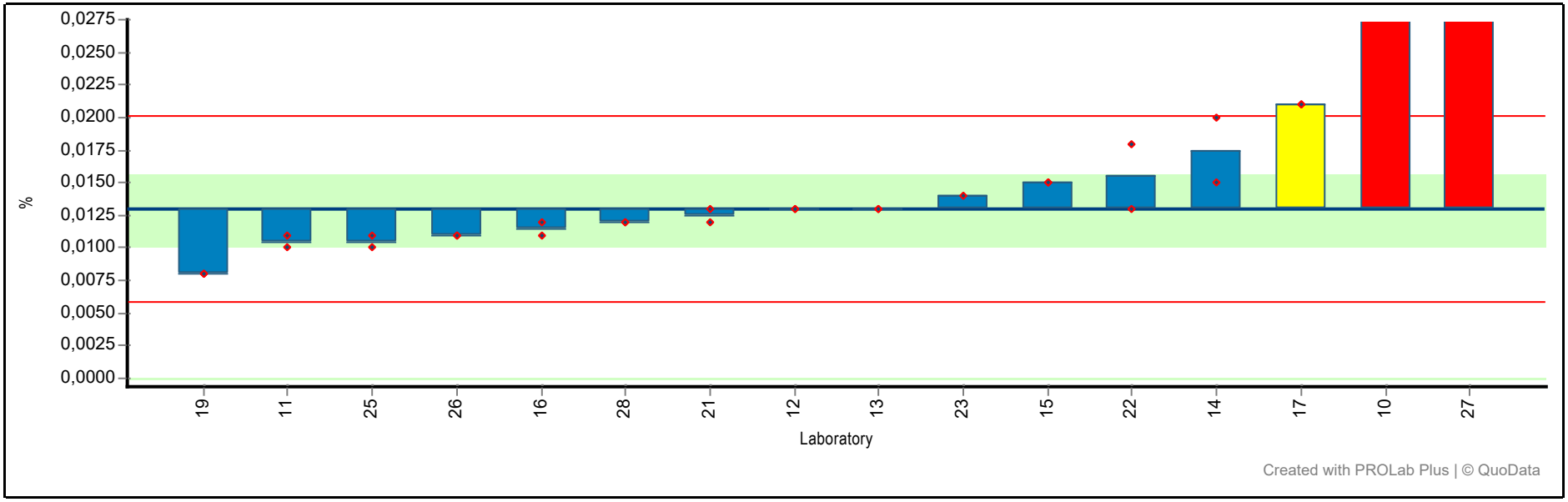
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,018	0,018	0,018	0,000	2,5	XRF (fusion)	no accredition	
12	0,008	0,010	0,009	0,001	-0,2	XRF (fusion)	ISO 17025	
13	0,010	0,010	0,010	0,000	0,1	XRF (fusion)	ISO 17025	
14	0,015	0,014	0,014	0,001	1,5	XRF (fusion)	no accredition	
15	0,011	0,011	0,011	0,000	0,4	XRF (fusion)	no accredition	
16	0,008	0,008	0,008	0,000	-0,5	XRF (fusion)	no accredition	
17	0,011	0,012	0,011	0,001	0,6	XRF (fusion)	ISO 17025	
19	0,006	0,007	0,007	0,001	-0,9	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
21	0,006	0,006	0,006	0,000	-1,1	XRF (fusion)	no accredition	
23	0,009		0,009		-0,2	XRF (pressed pellet)	no accredition	info only
25	0,008	0,008	0,008	0,000	-0,5	XRF (fusion)	no accredition	
26	0,009	0,009	0,009	0,000	-0,2	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	0,009	0,009	0,009	0,000	-0,2	XRF (pressed pellet)	no accredition	info only
28	0,007	0,007	0,007	0,000	-0,8	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,004 %**
Measurand:	**P2O5**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,013 ± 0,003 %**	**Range of tolerance:**	**0,006 - 0,020 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**14**	**Statistical method:**	**Q/Hampel**



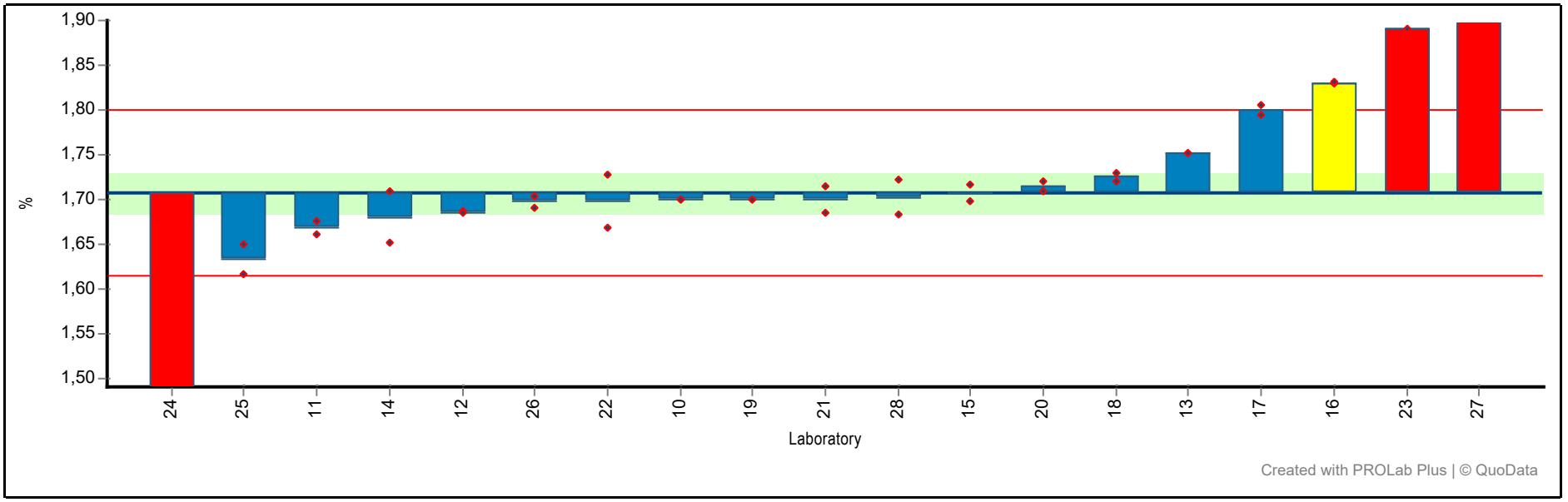
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,030	0,030	0,030	0,000	4,8	XRF (fusion)	no accredition	
11	0,010	0,011	0,010	0,001	-0,7	XRF (fusion)	ISO 17025	
12	0,013	0,013	0,013	0,000	0,0	XRF (fusion)	ISO 17025	
13	0,013	0,013	0,013	0,000	0,0	XRF (fusion)	ISO 17025	
14	0,020	0,015	0,018	0,004	1,3	XRF (fusion)	no accredition	
15	0,015	0,015	0,015	0,000	0,6	XRF (fusion)	no accredition	
16	0,011	0,012	0,011	0,001	-0,4	XRF (fusion)	no accredition	
17	0,021	0,021	0,021	0,000	2,3	XRF (fusion)	ISO 17025	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,008	0,008	0,008	0,000	-1,4	XRF (fusion)	no accredition	
21	0,013	0,012	0,013	0,001	-0,1	XRF (fusion)	no accredition	
22	0,018	0,013	0,015	0,004	0,7	XRF (fusion)	no accredition	
23	0,014		0,014		0,3	XRF (pressed pellet)	no accredition	info only
25	0,011	0,010	0,010	0,001	-0,7	XRF (fusion)	no accredition	
26	0,011	0,011	0,011	0,000	-0,5	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	0,077	0,076	0,076	0,001	17,9	XRF (pressed pellet)	no accredition	info only
28	0,012	0,012	0,012	0,000	-0,3	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,046 %**
Measurand:	**SiO2**	**Repeat. s.d:**	**0,013 %**
Mean ± U(Mean):	**1,708 ± 0,022 %**	**Range of tolerance:**	**1,615 - 1,801 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**17**	**Statistical method:**	**Q/Hampel**



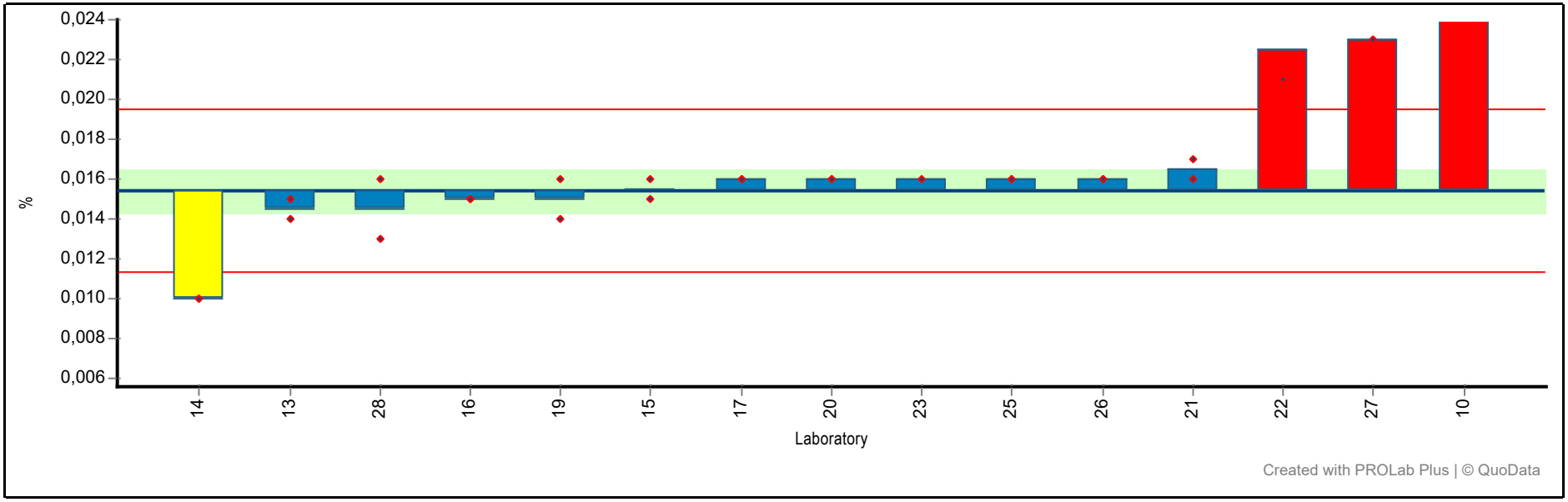
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	1,700	1,700	1,700	0,000	-0,2	XRF (fusion)	no accredition	
11	1,675	1,662	1,668	0,009	-0,8	XRF (fusion)	ISO 17025	
12	1,687	1,685	1,686	0,001	-0,5	XRF (fusion)	ISO 17025	
13	1,751	1,752	1,752	0,001	0,9	XRF (fusion)	ISO 17025	
14	1,651	1,710	1,680	0,042	-0,6	XRF (fusion)	no accredition	
15	1,716	1,699	1,708	0,012	0,0	XRF (fusion)	no accredition	
16	1,829	1,832	1,831	0,002	2,6	XRF (fusion)	no accredition	
17	1,805	1,794	1,800	0,008	2,0	XRF (fusion)	ISO 17025	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	1,721	1,730	1,726	0,006	0,4	XRF (fusion)	no accredition	
19	1,700	1,700	1,700	0,000	-0,2	XRF (fusion)	no accredition	
20	1,720	1,710	1,715	0,007	0,2	XRF (fusion)	ISO 17025	
21	1,715	1,686	1,700	0,021	-0,2	XRF (fusion)	no accredition	
22	1,668	1,728	1,698	0,042	-0,2	XRF (fusion)	no accredition	
23	1,890		1,890		3,9	XRF (pressed pellet)	no accredition	info only
24	1,300	1,400	1,350	0,071	-7,7	XRF (fusion)	no accredition	
25	1,650	1,616	1,633	0,024	-1,6	XRF (fusion)	no accredition	
26	1,704	1,691	1,698	0,009	-0,2	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	2,656	2,733	2,695	0,054	21,2	XRF (pressed pellet)	no accredition	info only
28	1,722	1,683	1,703	0,028	-0,1	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,002 %**
Measurand:	**SrO**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,015 ± 0,001 %**	**Range of tolerance:**	**0,011 - 0,019 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**13**	**Statistical method:**	**Q/Hampel**



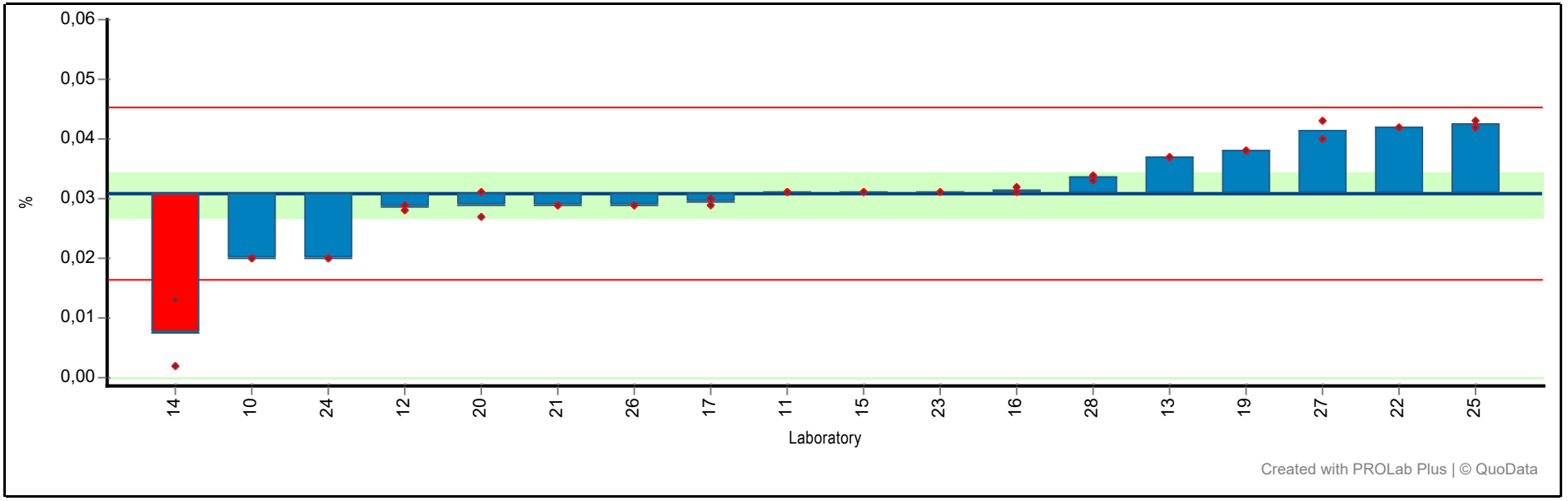
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,110	0,110	0,110	0,000	46,6	XRF (fusion)	no accredition	
13	0,014	0,015	0,014	0,001	-0,4	XRF (fusion)	ISO 17025	
14	0,010	0,010	0,010	0,000	-2,7	XRF (fusion)	no accredition	
15	0,015	0,016	0,015	0,001	0,0	XRF (fusion)	no accredition	
16	0,015	0,015	0,015	0,000	-0,2	XRF (fusion)	no accredition	
17	0,016	0,016	0,016	0,000	0,3	XRF (fusion)	ISO 17025	
19	0,014	0,016	0,015	0,001	-0,2	XRF (fusion)	no accredition	
20	0,016	0,016	0,016	0,000	0,3	XRF (fusion)	ISO 17025	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
21	0,016	0,017	0,017	0,001	0,5	XRF (fusion)	no accredition	
22	0,021	0,024	0,022	0,002	3,5	XRF (fusion)	no accredition	
23	0,016		0,016		0,3	XRF (pressed pellet)	no accredition	info only
25	0,016	0,016	0,016	0,000	0,3	XRF (fusion)	no accredition	
26	0,016	0,016	0,016	0,000	0,3	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	0,023	0,023	0,023	0,000	3,7	XRF (pressed pellet)	no accredition	info only
28	0,016	0,013	0,014	0,002	-0,4	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,007 %**
Measurand:	**TiO2**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,031 ± 0,004 %**	**Range of tolerance:**	**0,016 - 0,045 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**16**	**Statistical method:**	**Q/Hampel**



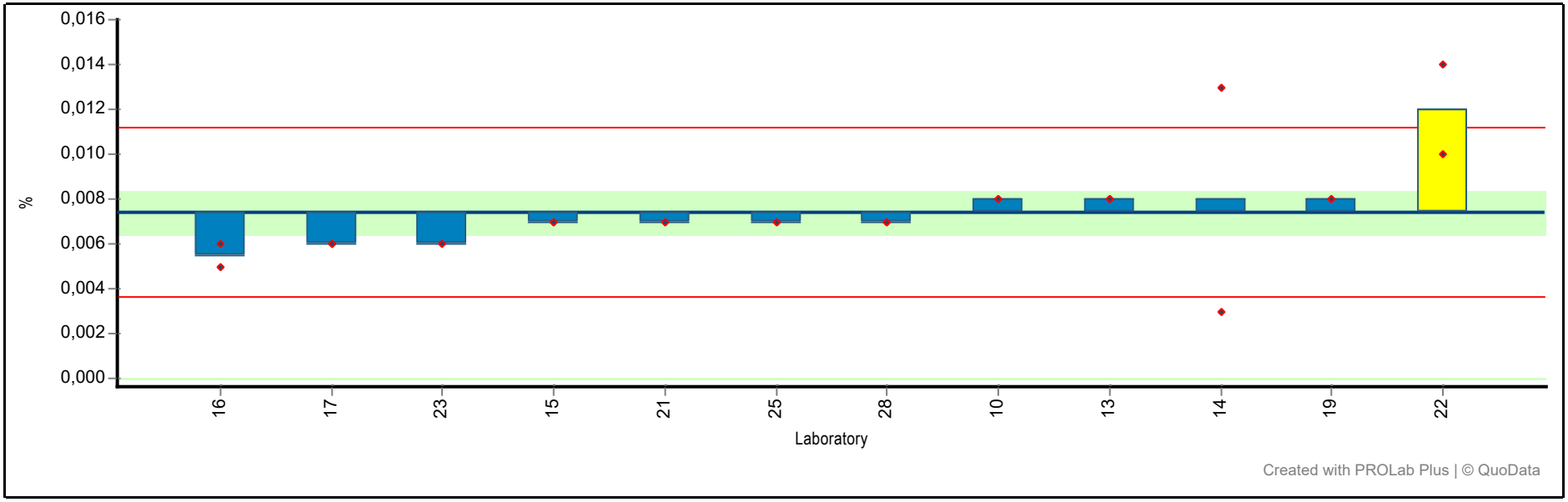
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,020	0,020	0,020	0,000	-1,5	XRF (fusion)	no accredition	
11	0,031	0,031	0,031	0,000	0,0	XRF (fusion)	ISO 17025	
12	0,028	0,029	0,029	0,001	-0,3	XRF (fusion)	ISO 17025	
13	0,037	0,037	0,037	0,000	0,9	XRF (fusion)	ISO 17025	
14	0,002	0,013	0,007	0,008	-3,2	XRF (fusion)	no accredition	
15	0,031	0,031	0,031	0,000	0,0	XRF (fusion)	no accredition	
16	0,032	0,031	0,032	0,001	0,1	XRF (fusion)	no accredition	
17	0,030	0,029	0,029	0,001	-0,2	XRF (fusion)	ISO 17025	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,038	0,038	0,038	0,000	1,0	XRF (fusion)	no accredition	
20	0,027	0,031	0,029	0,003	-0,2	XRF (fusion)	ISO 17025	
21	0,029	0,029	0,029	0,000	-0,2	XRF (fusion)	no accredition	
22		0,042	0,042		1,6	XRF (fusion)	no accredition	
23	0,031		0,031		0,0	XRF (pressed pellet)	no accredition	info only
24	0,020	0,020	0,020	0,000	-1,5	XRF (fusion)	no accredition	
25	0,043	0,042	0,042	0,001	1,6	XRF (fusion)	no accredition	
26	0,029	0,029	0,029	0,000	-0,2	Other Method	ISO 17025	ICP-OES, DIN EN ISO 11885
27	0,040	0,043	0,041	0,002	1,5	XRF (pressed pellet)	no accredition	info only
28	0,034	0,033	0,034	0,001	0,4	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,002 %**
Measurand:	**ZnO**	**Repeat. s.d:**	**0,002 %**
Mean ± U(Mean):	**0,007 ± 0,001 %**	**Range of tolerance:**	**0,004 - 0,011 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**11**	**Statistical method:**	**Q/Hampel**



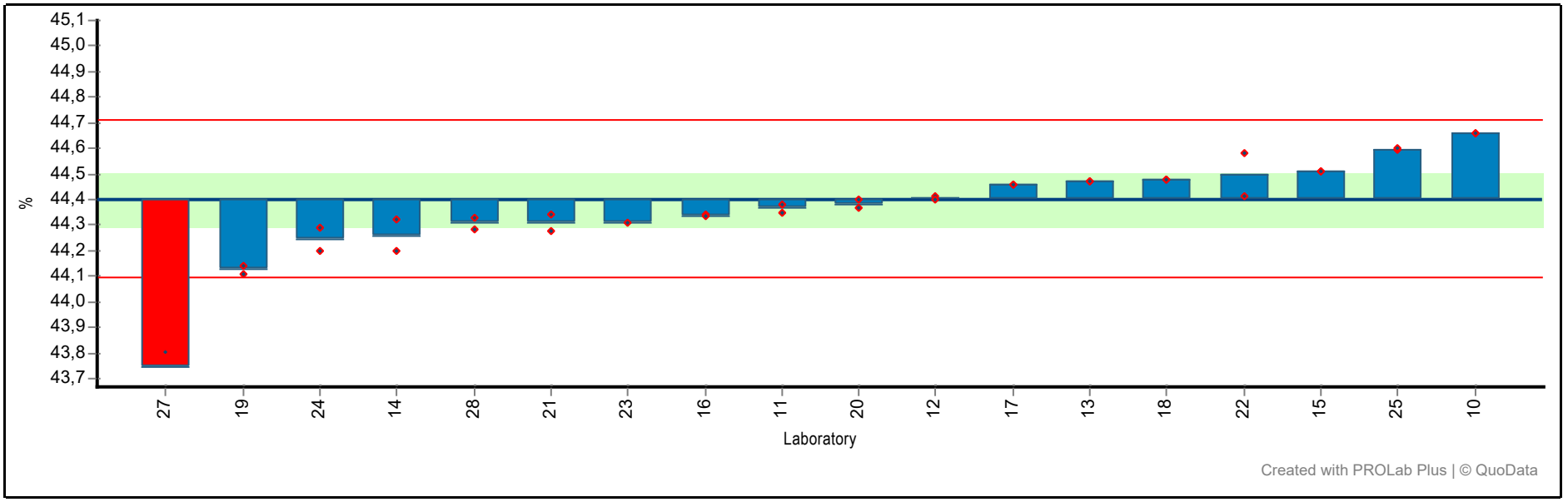
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,008	0,008	0,008	0,000	0,3	XRF (fusion)	no accredition	
13	0,008	0,008	0,008	0,000	0,3	XRF (fusion)	ISO 17025	
14	0,013	0,003	0,008	0,007	0,3	XRF (fusion)	no accredition	
15	0,007	0,007	0,007	0,000	-0,2	XRF (fusion)	no accredition	
16	0,006	0,005	0,005	0,001	-1,0	XRF (fusion)	no accredition	
17	0,006	0,006	0,006	0,000	-0,7	XRF (fusion)	ISO 17025	
19	0,008	0,008	0,008	0,000	0,3	XRF (fusion)	no accredition	
21	0,007	0,007	0,007	0,000	-0,2	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
22	0,010	0,014	0,012	0,003	2,4	XRF (fusion)	no accredition	
23	0,006		0,006		-0,7	XRF (pressed pellet)	no accredition	info only
25	0,007	0,007	0,007	0,000	-0,2	XRF (fusion)	no accredition	
28	0,007	0,007	0,007	0,000	-0,2	XRF (fusion)	no accredition	

RV_2025_01 Dolomite

Sample:	**FLX-2004**	**Reprod. s.d.:**	**0,155 %**
Measurand:	**LOI**	**Repeat. s.d:**	**0,026 %**
Mean ± U(Mean):	**44,402 ± 0,102 %**	**Range of tolerance:**	**44,093 - 44,711 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**16**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	44,660	44,660	44,660	0,000	1,7	Other Method	no accredition	LOI 2h 1050°C
11	44,380	44,350	44,365	0,021	-0,2	Other Method	ISO 17025	LOI 2h 1050°C
12	44,410	44,400	44,405	0,007	0,0	Other Method	no accredition	LOI 2h 1050°C
13	44,470	44,470	44,470	0,000	0,4	Other Method	no accreditation	LOI 2h 1050°C
14	44,322	44,197	44,260	0,088	-0,9	Other Method	no accredition	LOI 2h 1050°C
15	44,510	44,510	44,510	0,000	0,7	Other Method	no accredition	LOI 2h 1050°C
16	44,339	44,333	44,336	0,004	-0,4	Other Method	no accredition	LOI 2h 1050°C
17	44,460	44,460	44,460	0,000	0,4	Other Method	ISO 17025	LOI 2h 1050°C

RV_2025_01 Dolomite

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	44,480	44,480	44,480	0,000	0,5	Other Method	no accredition	LOI 2h 1050°C
19	44,110	44,140	44,125	0,021	-1,8	Other Method	no accredition	Thermogravimetric
20	44,365	44,400	44,383	0,025	-0,1	Other Method	ISO 17025	LOI 2h 1050°C
21	44,340	44,280	44,310	0,042	-0,6	Other Method	no accredition	Thermogravimetric
22	44,410	44,580	44,495	0,120	0,6	Other Method	no accredition	LOI 2h 1050°C
23	44,310		44,310		-0,6	Other Method	no accredition	calculated; info only
24	44,200	44,290	44,245	0,064	-1,0	Other Method	no accredition	LOI 2h 1050°C
25	44,597	44,598	44,597	0,001	1,3	Other Method	no accredition	LOI 2h 1050°C
27	43,801	43,695	43,748	0,075	-4,2	Other Method	no accredition	calculated; info only
28	44,328	44,286	44,307	0,030	-0,6	Other Method	no accredition	LOI 1h 950°C

Ring test RV_2025_01 Dolomite

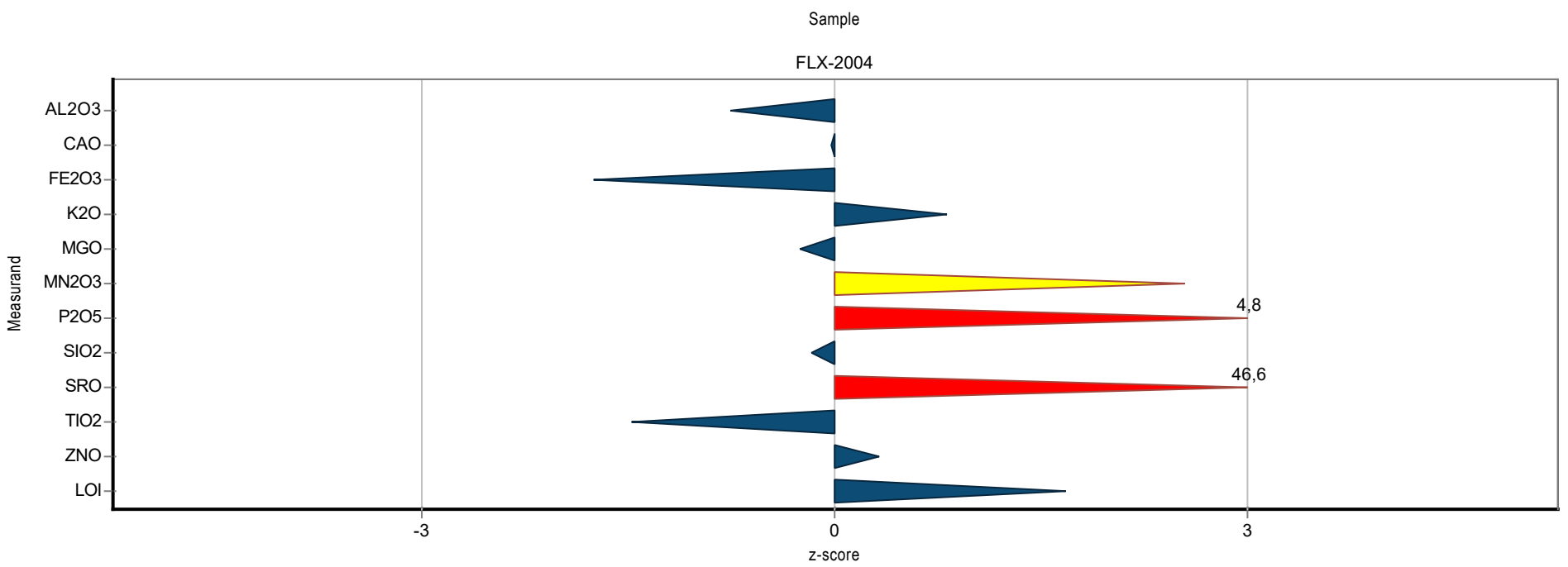
Survey of scores

Lab code	AL2O3	CAO	FE2O3	K2O	MGO	MN2O3	P2O5	SIO2	SRO	TIO2	ZNO	LOI
10	-0,8	0,0	-1,8	0,8	-0,3	2,5	4,8	-0,2	46,6	-1,5	0,3	1,7
11	-0,7	-1,0	0,3	-1,6	3,3		-0,7	-0,8		0,0		-0,2
12	-0,1	-0,3	0,3	0,1	-0,4	-0,2	0,0	-0,5		-0,3		0,0
13	0,4	1,3	0,5	-3,1	0,6	0,1	0,0	0,9	-0,4	0,9	0,3	0,4
14	-1,7	-3,0	0,3	-2,3	11,8	1,5	1,3	-0,6	-2,7	-3,2	0,3	-0,9
15	0,7	-0,5	0,1	-2,5	-0,2	0,4	0,6	0,0	0,0	0,0	-0,2	0,7
16	3,8	2,0	-1,0	0,1	7,9	-0,5	-0,4	2,6	-0,2	0,1	-1,0	-0,4
17	0,7	-0,8	-1,0	1,1	0,6	0,6	2,3	2,0	0,3	-0,2	-0,7	0,4
18	-0,4	-0,2	-0,6		0,4			0,4				0,5
19	-1,6	2,0	0,0	0,6	-0,5	-0,9	-1,4	-0,2	-0,2	1,0	0,3	-1,8
20	0,1	-0,3	0,7	0,7	0,2			0,2	0,3	-0,2		-0,1
21	0,2	0,7	-0,3	0,8	-0,3	-1,1	-0,1	-0,2	0,5	-0,2	-0,2	-0,6
22	0,7	-0,5	1,6	0,7	-0,5		0,7	-0,2	3,5	1,6	2,4	0,6
23	0,3	-0,3	0,7	1,3	-0,6	-0,2	0,3	3,9	0,3	0,0	-0,7	-0,6
24	1,7	0,5	1,5	-0,3	-1,0			-7,7		-1,5		-1,0
25	0,4	-0,2	0,0	1,1	-0,1	-0,5	-0,7	-1,6	0,3	1,6	-0,2	1,3
26	-0,4	-0,7	-0,4		0,6	-0,2	-0,5	-0,2	0,3	-0,2		
27	7,5	0,3	3,9	3,3	-8,7	-0,2	17,9	21,2	3,7	1,5		-4,2
28	-0,1	0,6	-0,3	0,2	-0,4	-0,8	-0,3	-0,1	-0,4	0,4	-0,2	-0,6

RV_2025_01 Dolomite

Laboratory chart of z-scores

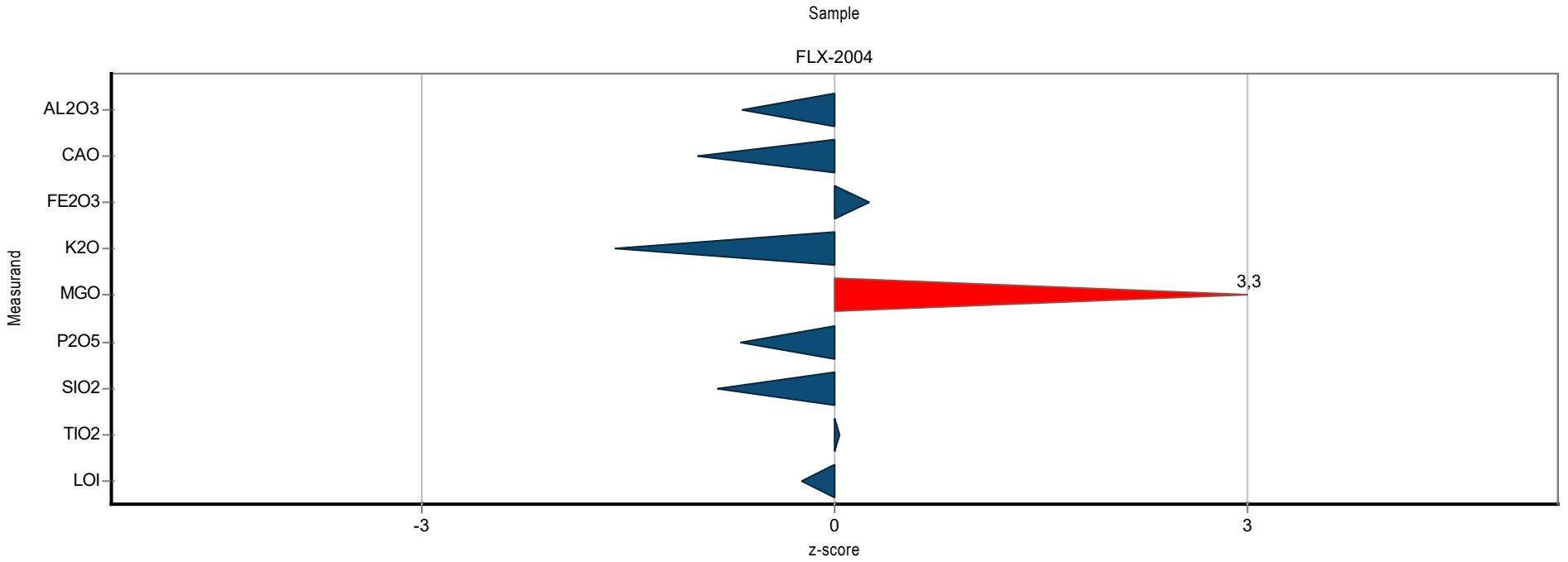
Laboratory: 10



RV_2025_01 Dolomite

Laboratory chart of z-scores

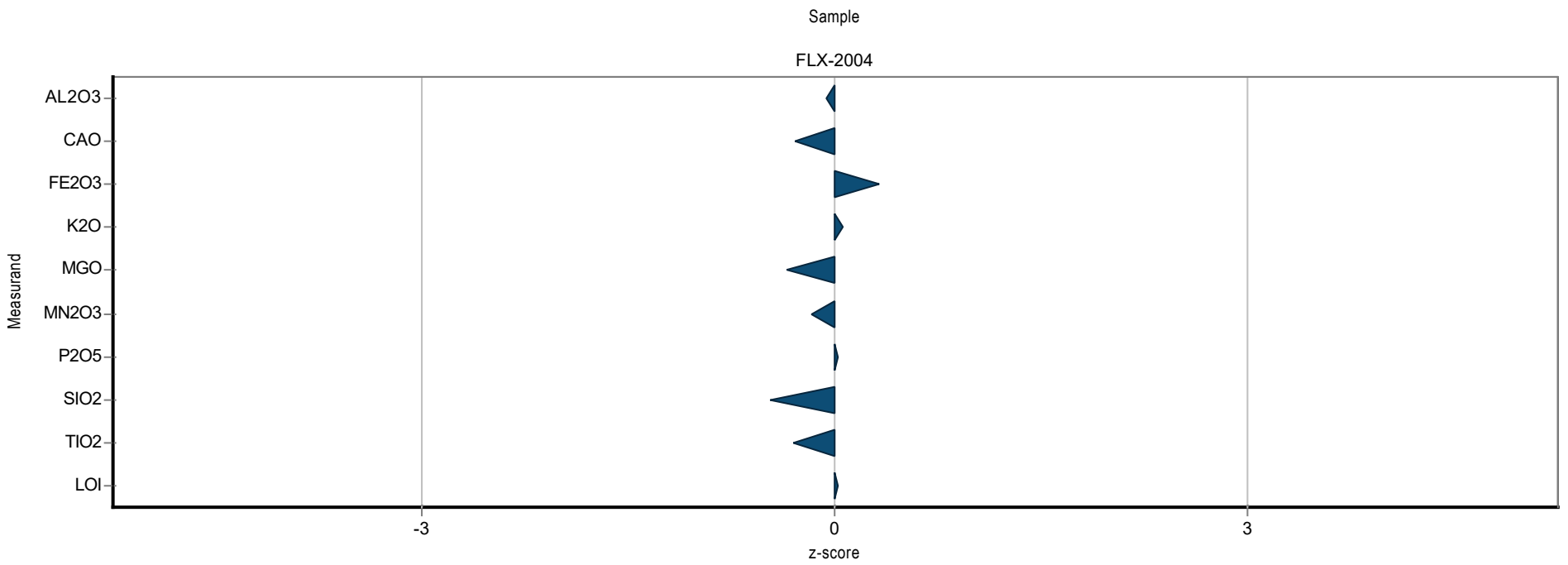
Laboratory: 11



RV_2025_01 Dolomite

Laboratory chart of z-scores

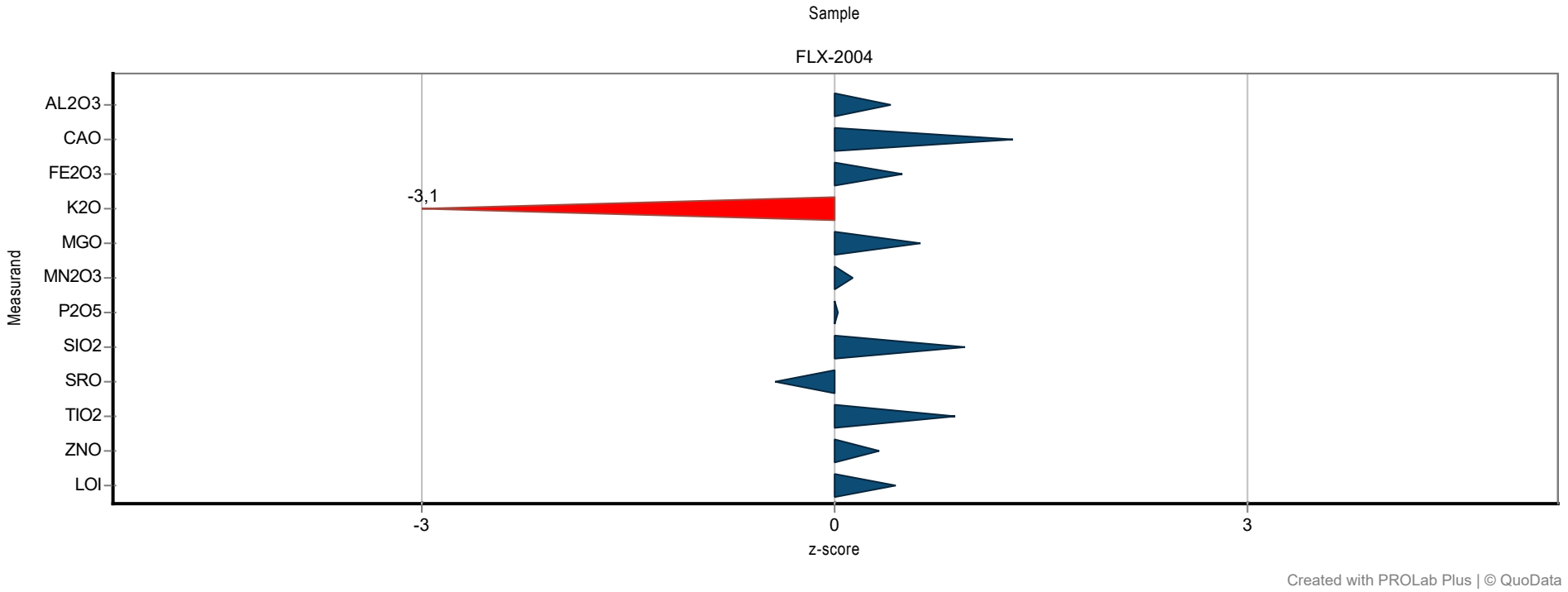
Laboratory: 12



RV_2025_01 Dolomite

Laboratory chart of z-scores

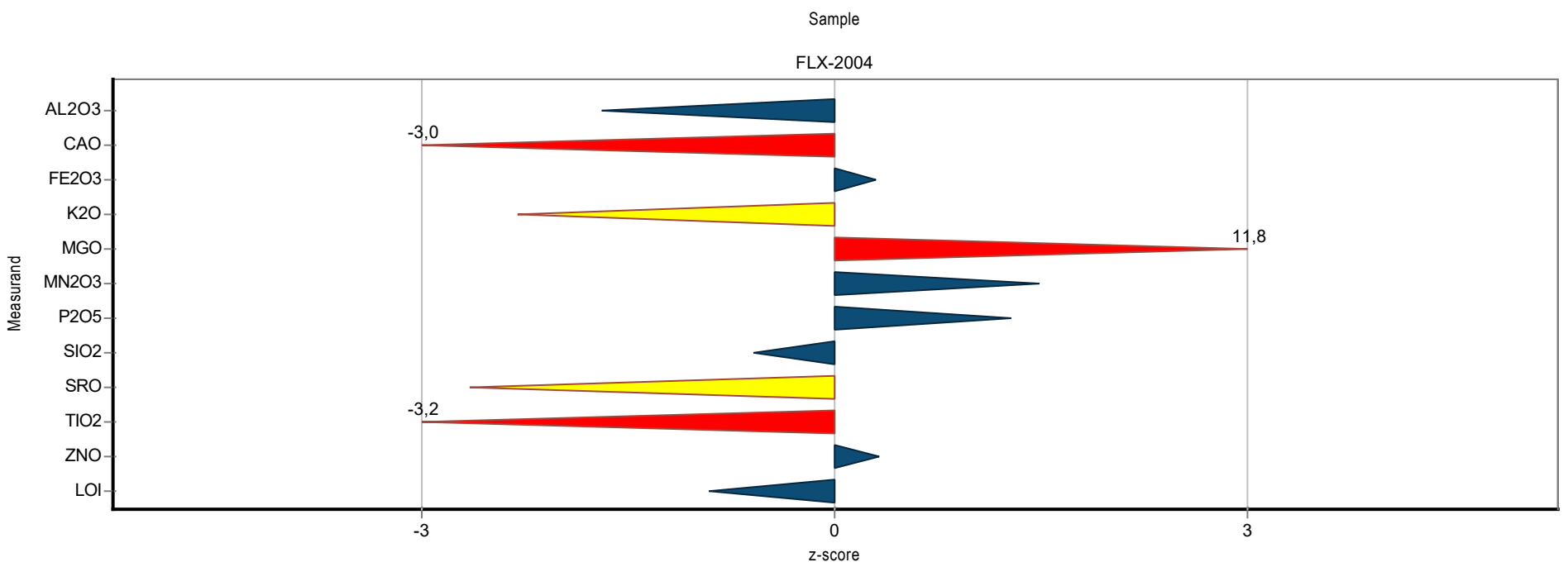
Laboratory: 13



RV_2025_01 Dolomite

Laboratory chart of z-scores

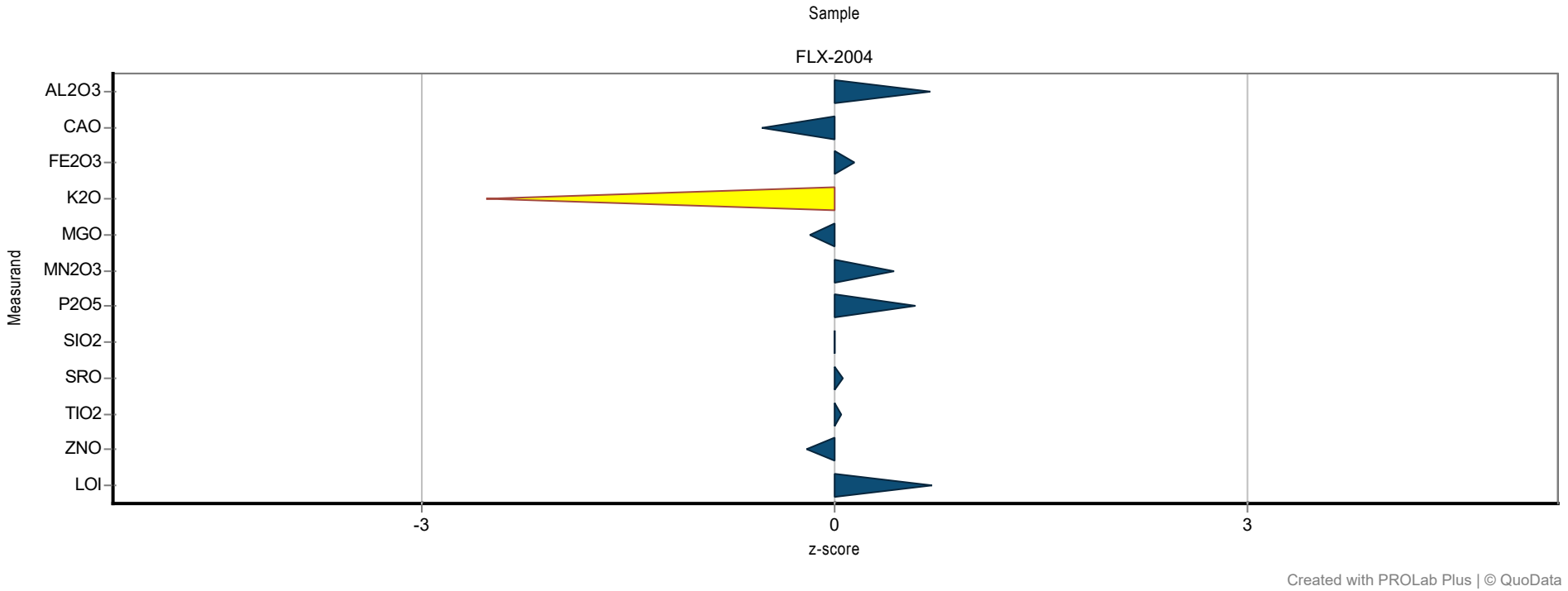
Laboratory: 14



RV_2025_01 Dolomite

Laboratory chart of z-scores

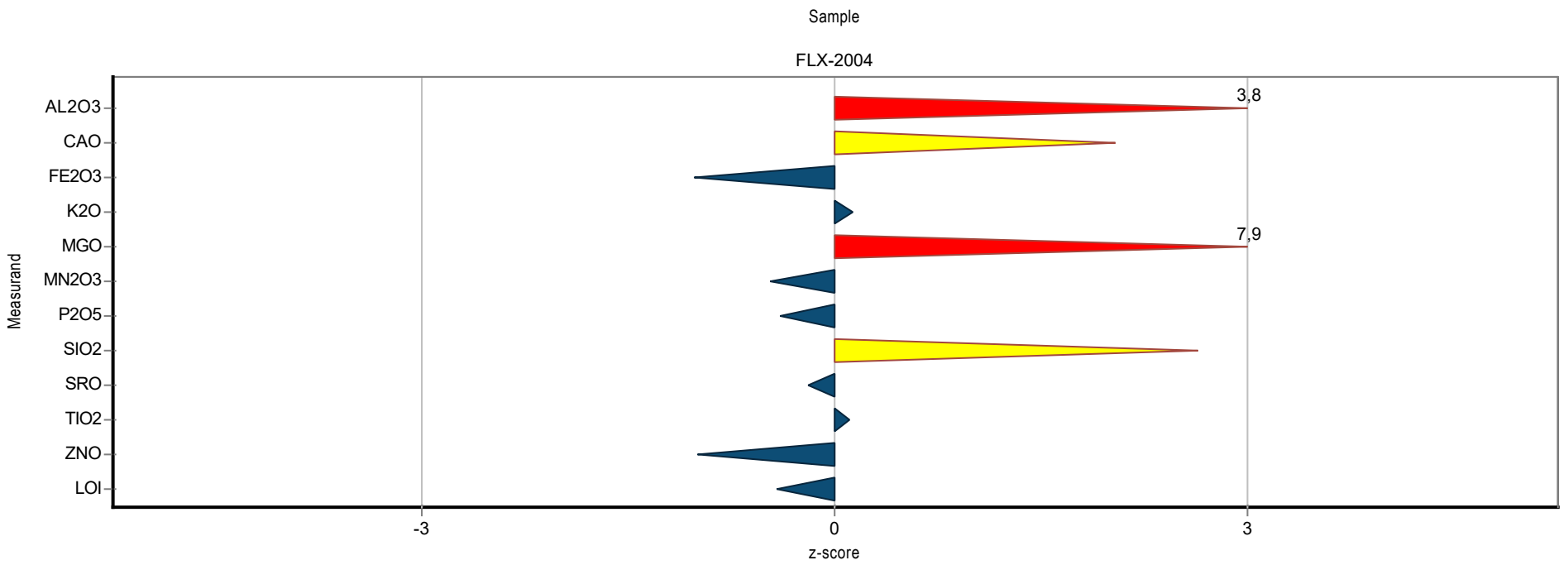
Laboratory: 15



RV_2025_01 Dolomite

Laboratory chart of z-scores

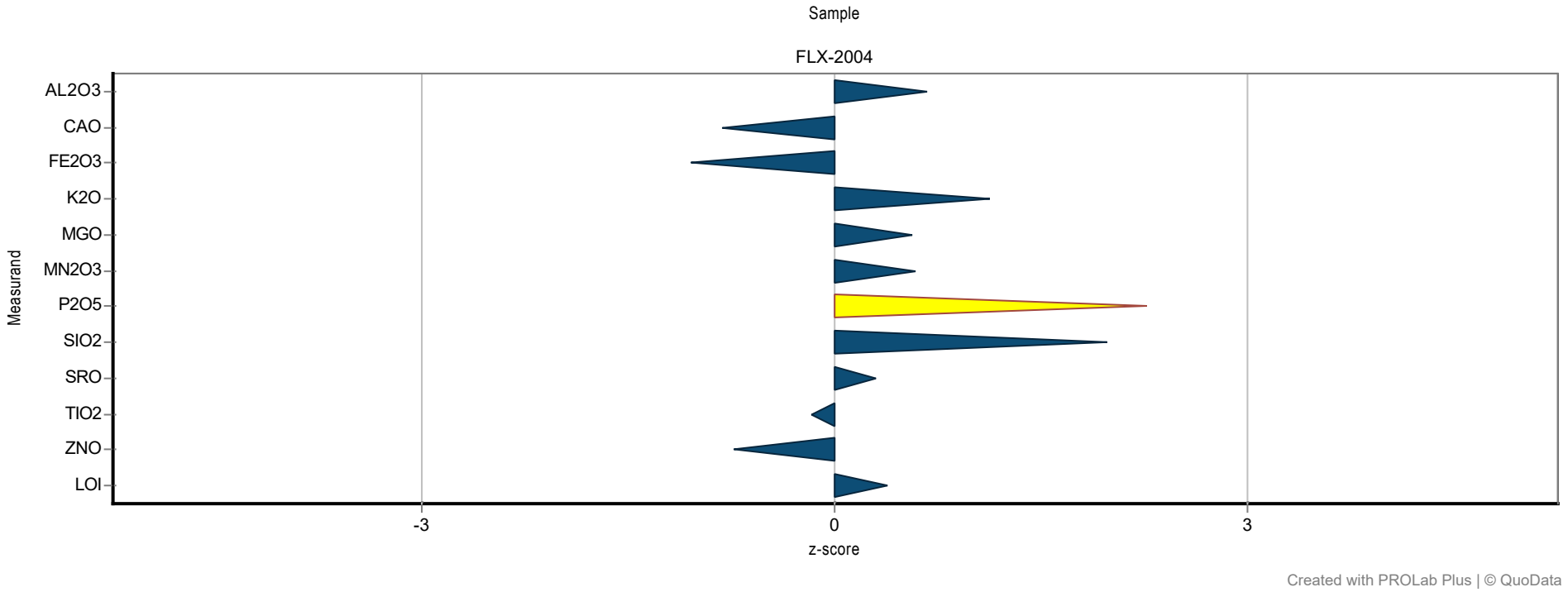
Laboratory: 16



RV_2025_01 Dolomite

Laboratory chart of z-scores

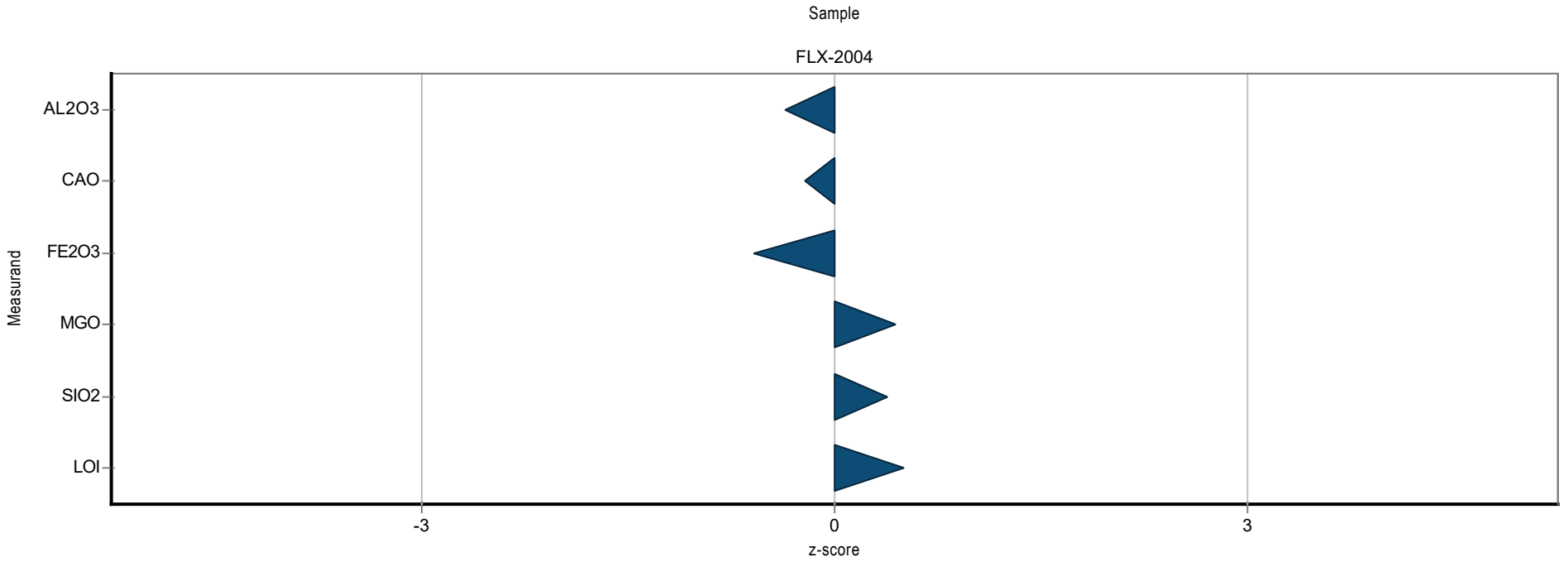
Laboratory: 17



RV_2025_01 Dolomite

Laboratory chart of z-scores

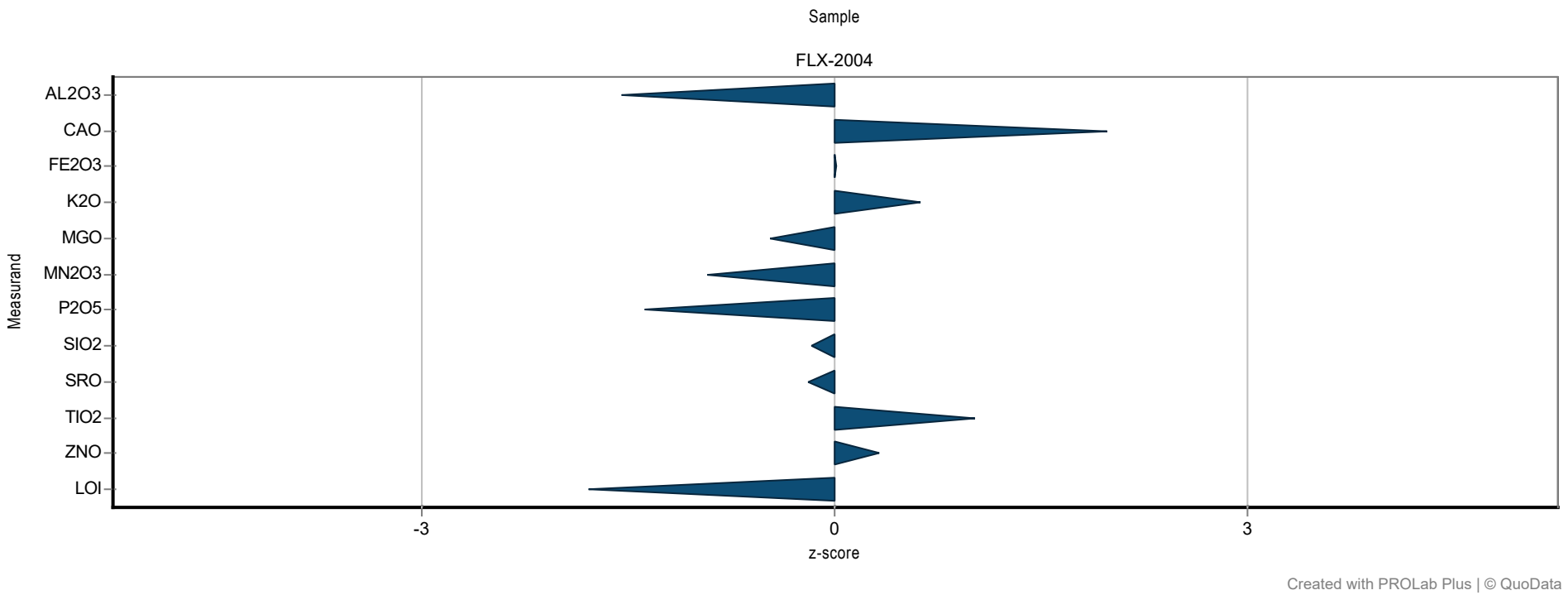
Laboratory: 18



RV_2025_01 Dolomite

Laboratory chart of z-scores

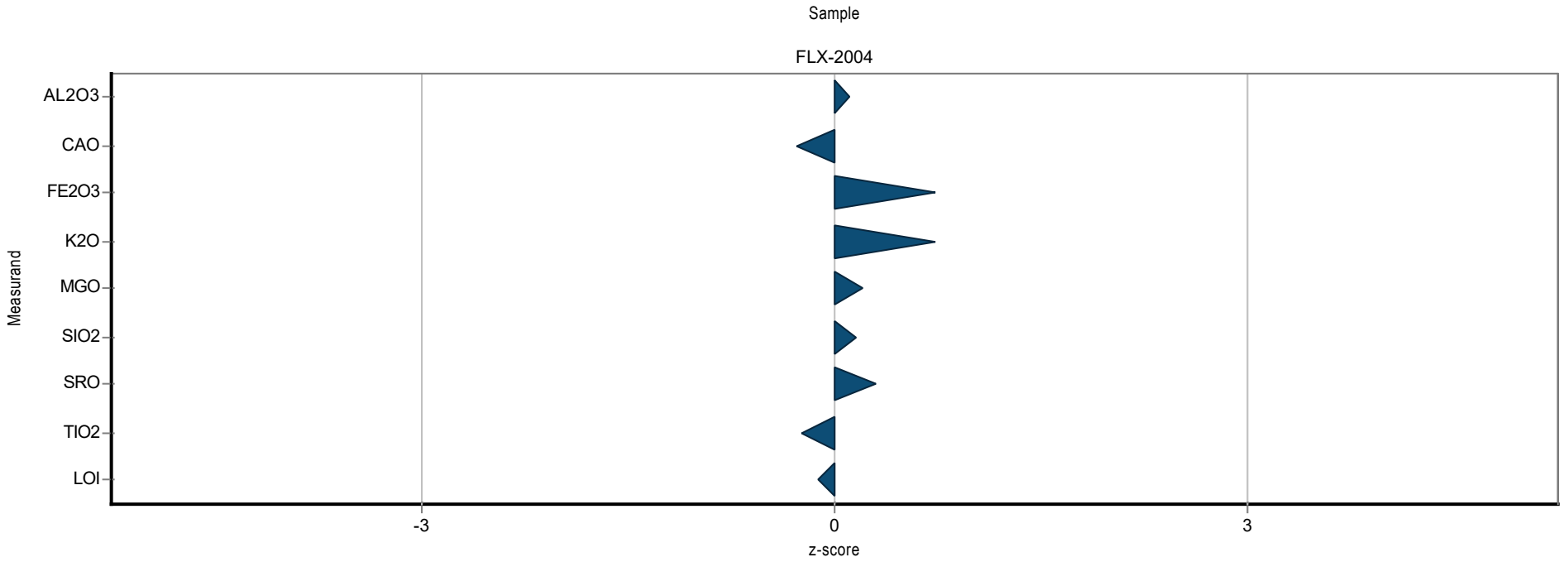
Laboratory: 19



RV_2025_01 Dolomite

Laboratory chart of z-scores

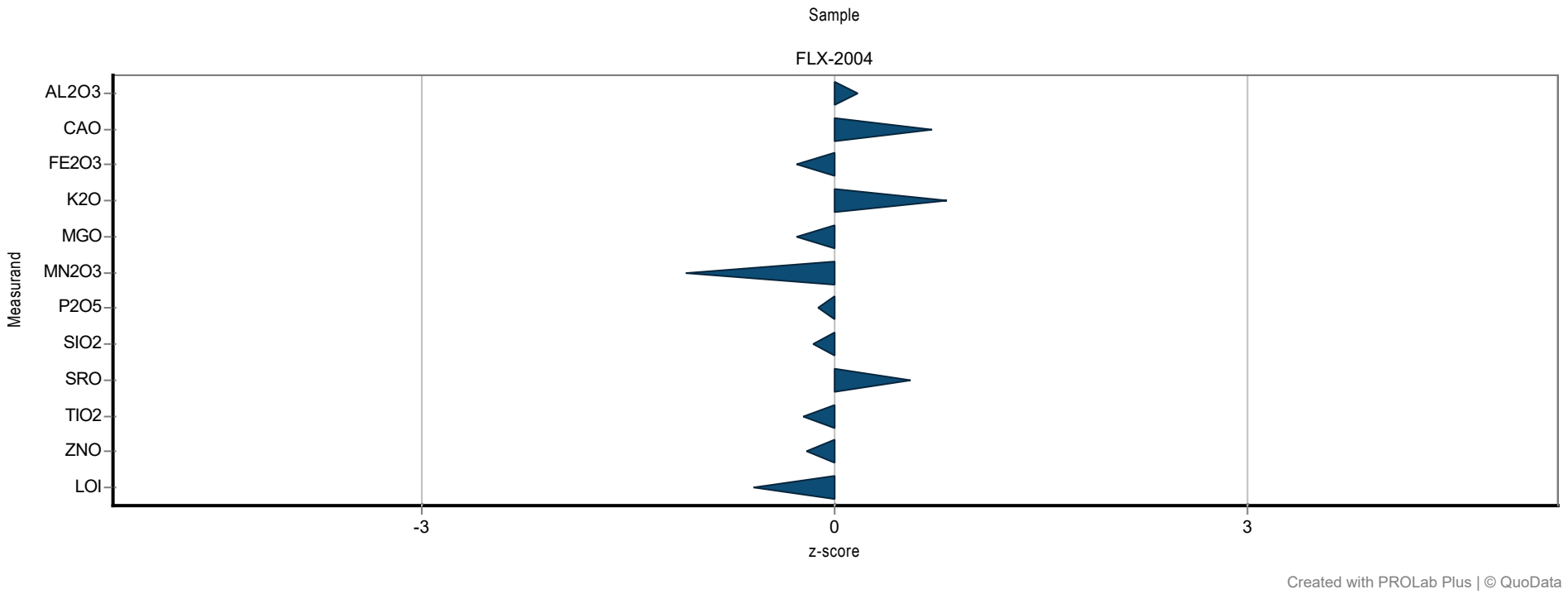
Laboratory: 20



RV_2025_01 Dolomite

Laboratory chart of z-scores

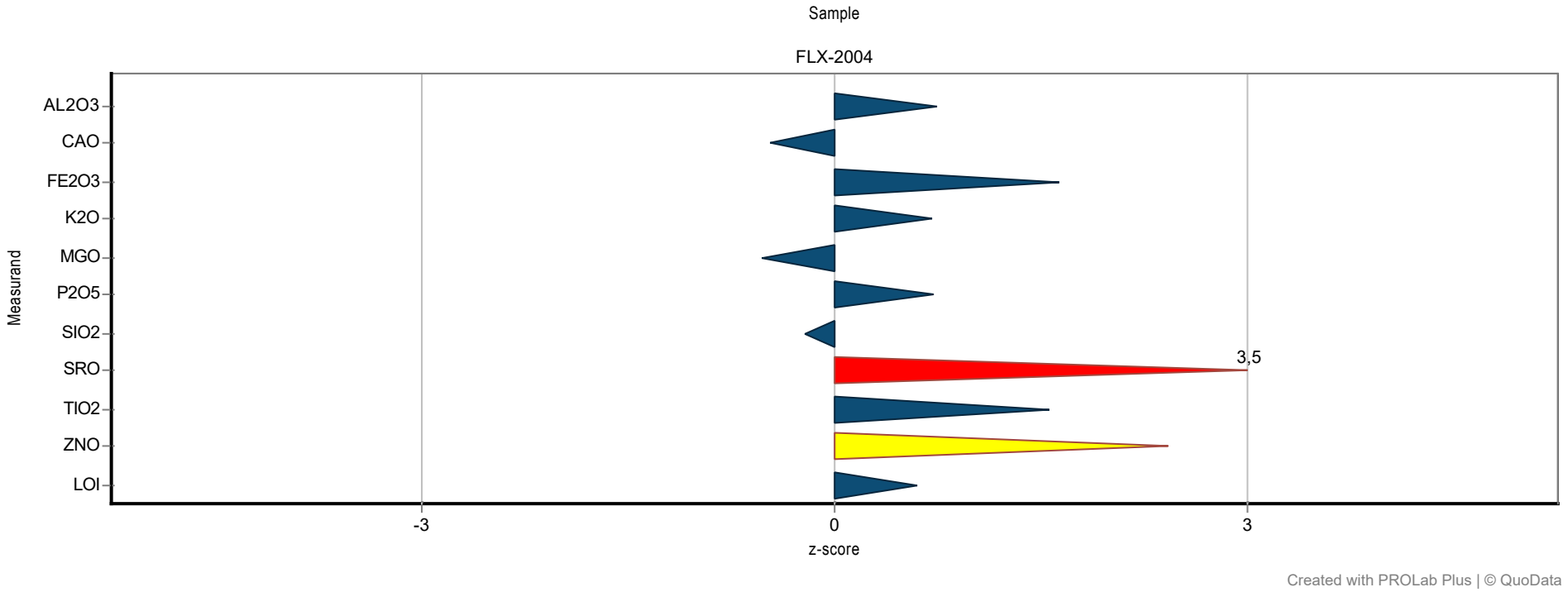
Laboratory: 21



RV_2025_01 Dolomite

Laboratory chart of z-scores

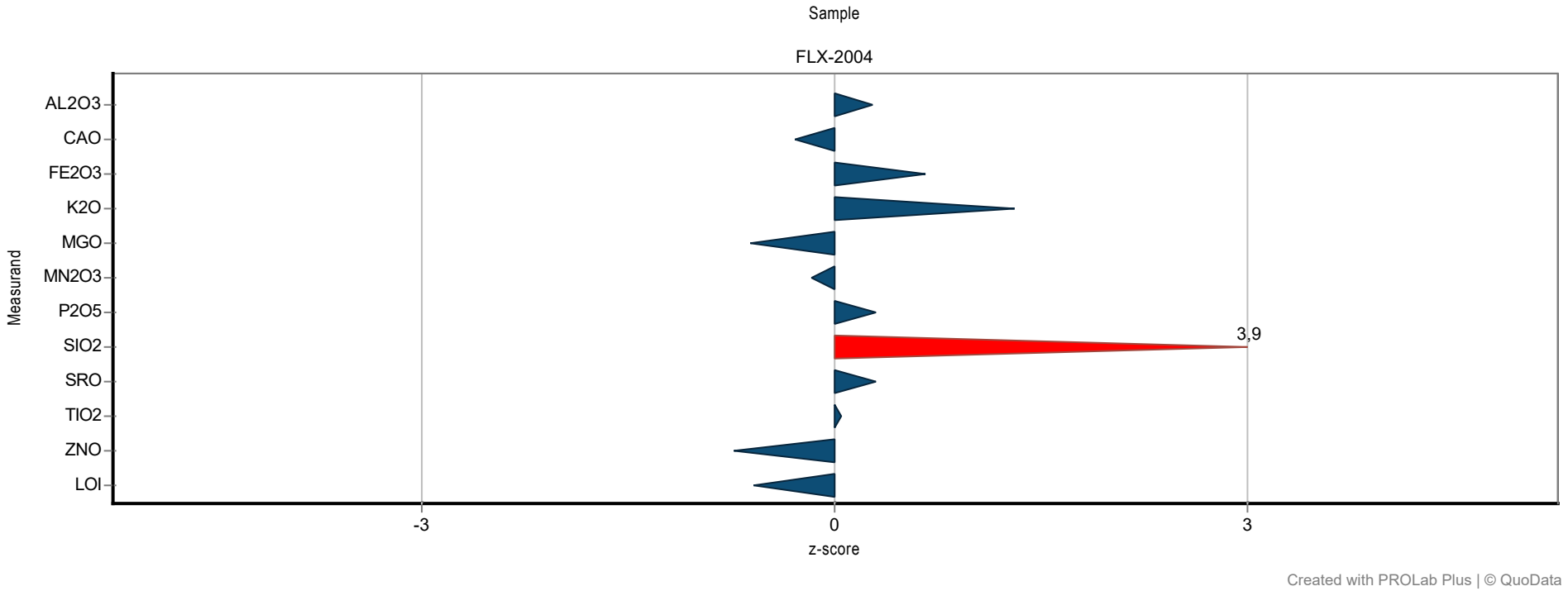
Laboratory: 22



RV_2025_01 Dolomite

Laboratory chart of z-scores

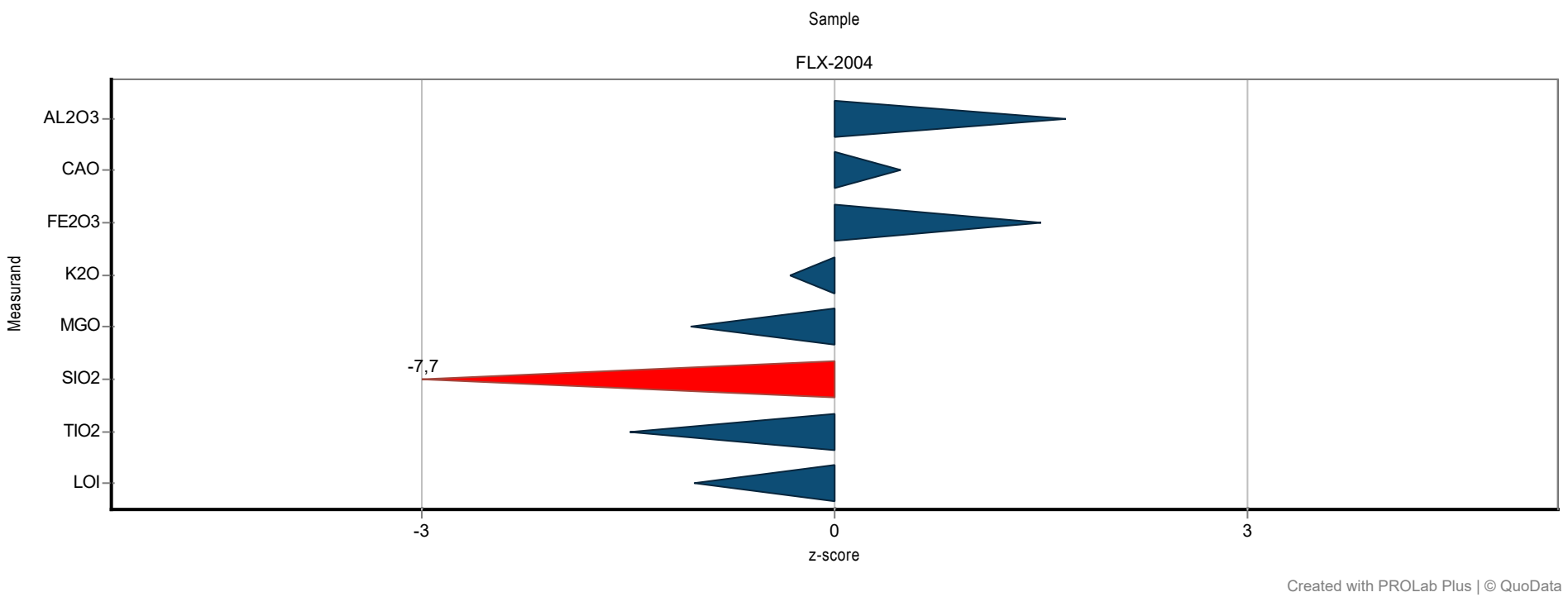
Laboratory: 23



RV_2025_01 Dolomite

Laboratory chart of z-scores

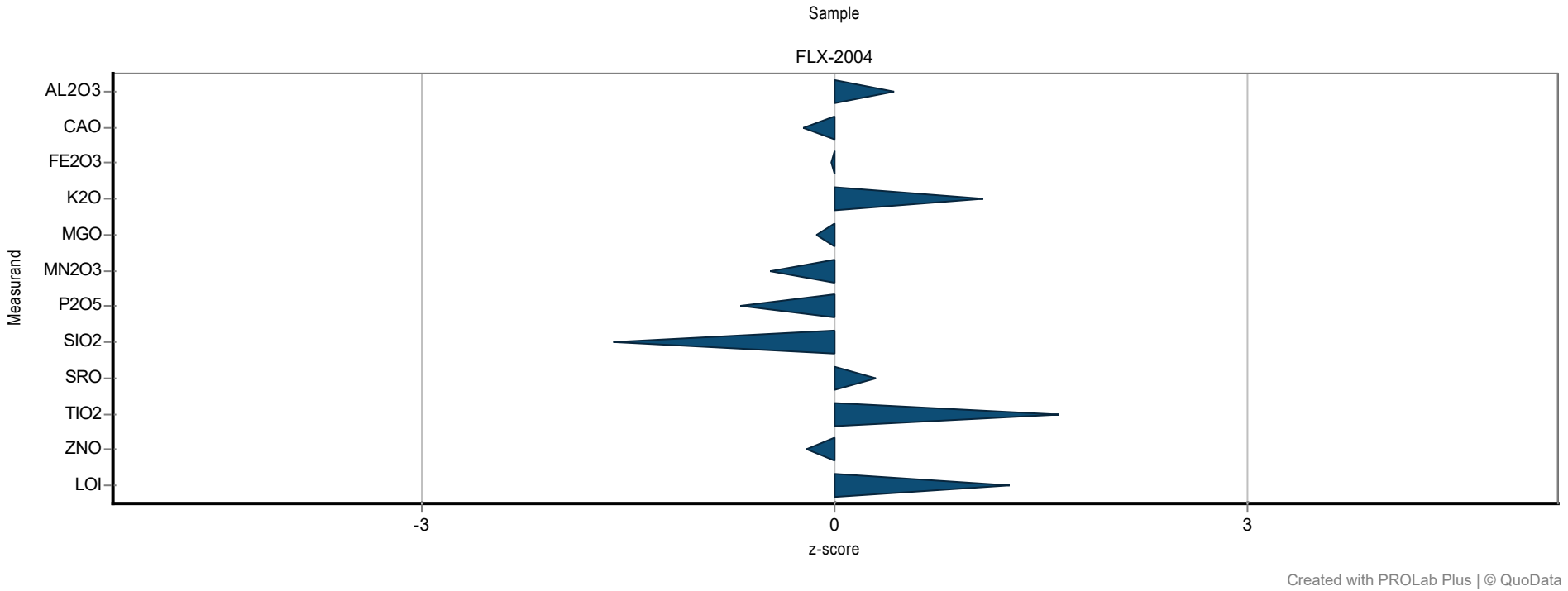
Laboratory: 24



RV_2025_01 Dolomite

Laboratory chart of z-scores

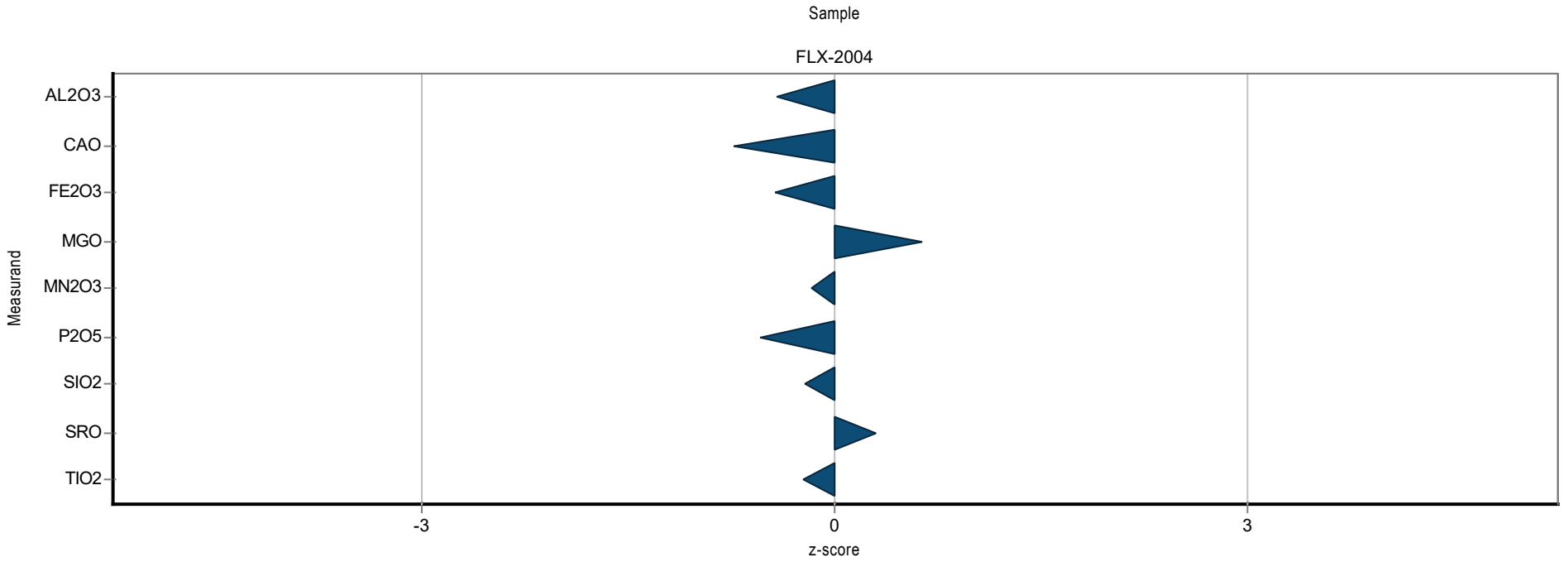
Laboratory: 25



RV_2025_01 Dolomite

Laboratory chart of z-scores

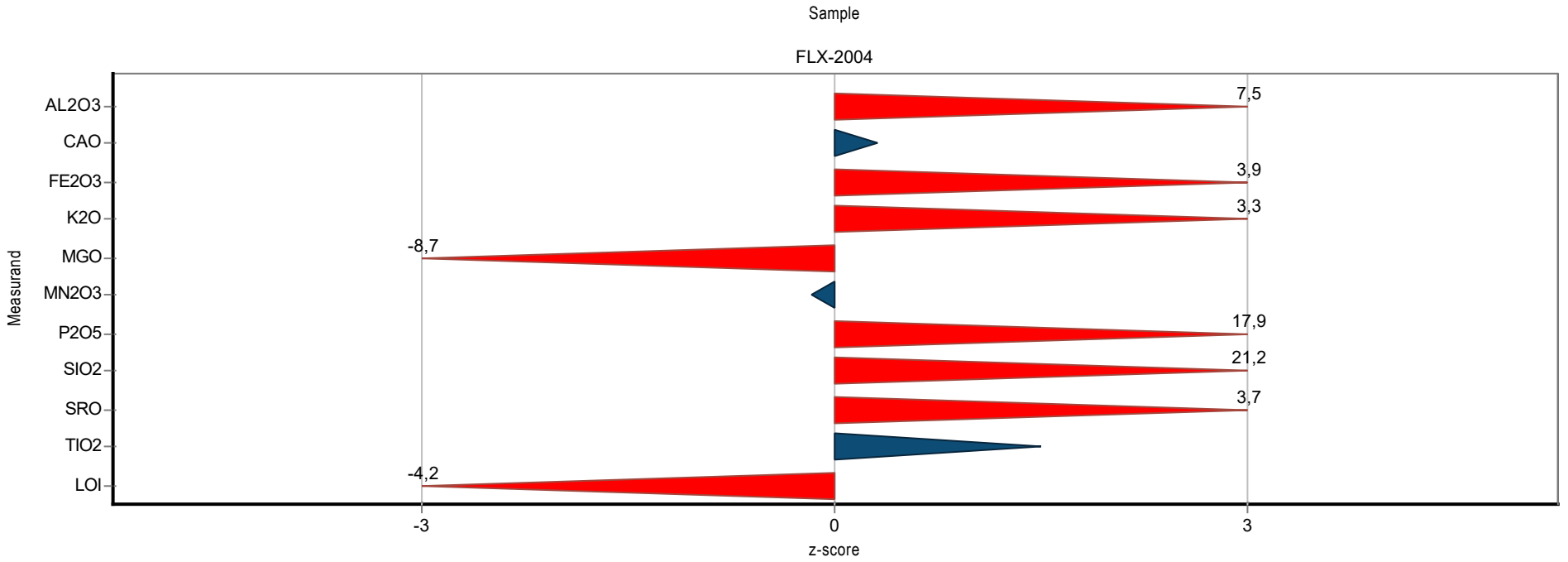
Laboratory: 26



RV_2025_01 Dolomite

Laboratory chart of z-scores

Laboratory: 27



RV_2025_01 Dolomite

Laboratory chart of z-scores

Laboratory: 28