FLUXANA®
XRF Application Solutions

FXRV-2024-02

Final Proficiency Test Report for cement

FLX-1005

Bedburg-Hau, June 11th 2024

Correction: September 2024
New issue February 2025: Correction of the presentation of summary results.

Coordinator of PT
Charlotte Winkels-Herding

Statistics and Report
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	Al2O3	CaO	Cr2O3	Fe2O3	K2O	MgO	Mn2O3	Na2O
Unit	%	%	%	%	%	%	%	%
No. of laboratories	22	22	16	22	22	22	22	19
Mean m	8,551	50,130	0,008	3,034	2,354	1,276	0,136	1,004
Repoducibility standard deviation s_R	0,176	0,303	0,003	0,059	0,060	0,054	0,008	0,062
Repeatability standard deviation s_r	0,022	0,063	0,001	0,013	0,012	0,006	0,001	0,012
Robust standard deviation s*	0,179	0,302	0,003	0,053	0,065	0,056	0,008	0,067
Uncertainty U (s*)	0,096	0,161	0,002	0,028	0,034	0,030	0,004	0,038
Uncertainty U (s_R)	0,094	0,161	0,002	0,031	0,032	0,029	0,004	0,036
Mean - 2*s_R	8,199	49,524	0,001	2,916	2,234	1,169	0,119	0,881
Mean + 2*s_R	8,903	50,736	0,015	3,153	2,473	1,384	0,153	1,127

	P2O5	SiO2	SO3	SrO	TiO2	ZnO	LOI	Cl
Unit	%	%	%	%	%	%	%	%
No. of laboratories	22	22	22	20	22	20	23	10
Mean m	0,126	29,820	2,962	0,156	0,358	0,018	3,703	0,072
Repoducibility standard deviation s_R	0,006	0,401	0,108	0,008	0,008	0,002	0,134	0,007
Repeatability standard deviation s_r	0,002	0,076	0,012	0,002	0,003	0,001	0,012	0,001
Robust standard deviation s*	0,006	0,388	0,102	0,006	0,008	0,002	0,141	0,007
Uncertainty U (s*)	0,003	0,207	0,055	0,004	0,004	0,001	0,074	0,006
Uncertainty U (s_R)	0,003	0,214	0,058	0,004	0,004	0,001	0,070	0,006
Mean - 2*s_R	0,115	29,018	2,745	0,140	0,342	0,014	3,436	0,057
Mean + 2*s_R	0,138	30,621	3,178	0,172	0,375	0,022	3,970	0,086

All values are in mass % and are based on ignited sample material, except for Cl values are based on dried sample material.

Mean	**calculated from laboratory means using traceable methods only**
s_R	**Reproducibility standard deviation**
s_r	**Repeatability standard deviation**
s*	**Robust standard deviation**
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

TBS - Technische Behandlungssysteme GmbH / Bernegger GmbH	Austria
Rio Tinto Aluminium/ARDC	Canada
Zibo Refratechnik Refractories Co.,Ltd.	China
Lafarge Ciments Martres-Tolosane	France
BMI - BRAAS GmbH	Germany
Chemische Fabrik Budenheim KG	Germany
Daimler AG	Germany
Dorfner Analysezentrum und Anlagenplanungsgesellschaft mbH (Anzaplan)	Germany
Dyckerhoff GmbH	Germany
FLUXANA GmbH & Co. KG	Germany
Gebrüder Pfeiffer SE	Germany
OPTERRA Wössingen GmbH	Germany
Rigaku Europe SE	Germany
Schwenk Zement KG	Germany
Technische Universität München - TUM	Germany
THYSSENKRUPP STEEL EUROPE AG, Zeche Katharina	Germany
The standards institution of israel	Israel
SGS Nederland B.V.	Netherlands
TATA STEEL BV	Netherlands
Moravacem d.o.o	Serbia
LKAB	Sweden
Jura-Cement-Fabriken AG	Switzerland
CAT-COLACEM	Tunesia

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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) 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 9.2.3).

Calculation of repeatability standard deviation s_r

The repeatability standard deviation s_r is also calculated using the Q-method.

Calculation of robust standard deviation s*

The robust standard deviation s* is calculated from the laboratory means µ using the Q-method.

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)

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:

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

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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

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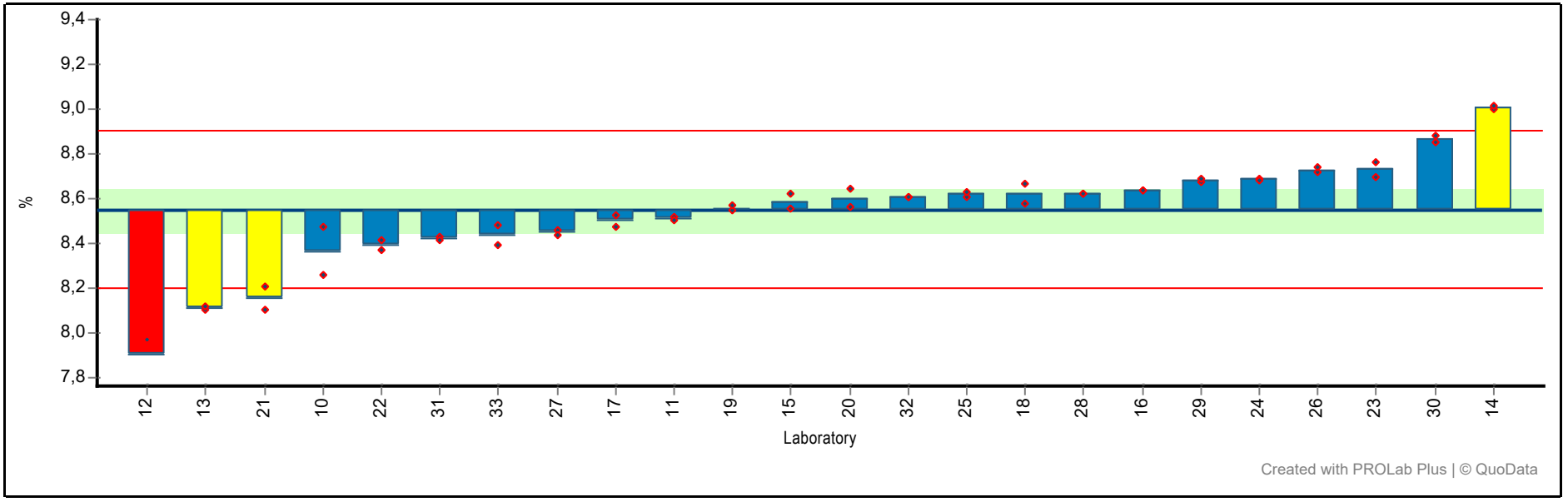
Summary results

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,176 %**
Measurand:	**Al2O3**	**Repeat. s.d:**	**0,022 %**
Mean ± U(Mean):	**8,551 ± 0,096 %**	**Range of tolerance:**	**8,199 - 8,903 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	8,471	8,259	8,365	0,150	-1,1	XRF (fusion)	no accredition	
11	8,520	8,505	8,512	0,011	-0,2	XRF (fusion)	no accredition	
12	7,840	7,970	7,905	0,092	-3,7	XRF (fusion)	ISO 17025	
13	8,101	8,117	8,109	0,011	-2,5	XRF (fusion)	no accredition	
14	8,999	9,015	9,007	0,011	2,6	XRF (fusion)	no accredition	
15	8,556	8,621	8,588	0,046	0,2	XRF (fusion)	no accredition	

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Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
16	8,637	8,635	8,636	0,001	0,5	XRF (fusion)	no accredition	
17	8,476	8,529	8,503	0,037	-0,3	XRF (fusion)	no accredition	
18	8,578	8,663	8,620	0,060	0,4	XRF (fusion)	ISO 17025	
19	8,545	8,573	8,559	0,020	0,0	XRF (fusion)	no accredition	
20	8,560	8,647	8,604	0,062	0,3	XRF (fusion)	no accredition	ISO 12677
21	8,204	8,103	8,154	0,071	-2,3	Other Method	no accredition	DIN EN 196-2
22	8,372	8,413	8,393	0,029	-0,9	Other Method	no accredition	DIN EN ISO 16976
23	8,765	8,696	8,730	0,049	1,0	XRF (fusion)	ISO 17025	
24	8,689	8,685	8,687	0,003	0,8	XRF (fusion)	no accredition	
25	8,610	8,630	8,620	0,014	0,4	XRF (fusion)	no accredition	
26	8,717	8,739	8,728	0,016	1,0	XRF (fusion)	no accredition	
27	8,459	8,439	8,449	0,014	-0,6	XRF (fusion)	no accredition	
28	8,622	8,623	8,622	0,001	0,4	XRF (fusion)	no accredition	
29	8,675	8,688	8,681	0,009	0,7	XRF (fusion)	ISO 17025	
30	8,849	8,882	8,866	0,023	1,8	XRF (fusion)	no accredition	Info only
31	8,428	8,417	8,422	0,008	-0,7	XRF (fusion)	no accredition	
32	8,609	8,609	8,609	0,000	0,3	XRF (fusion)	ISO 17025	
33	8,481	8,392	8,436	0,063	-0,7	XRF (pressed pellet)	no accredition	Info only

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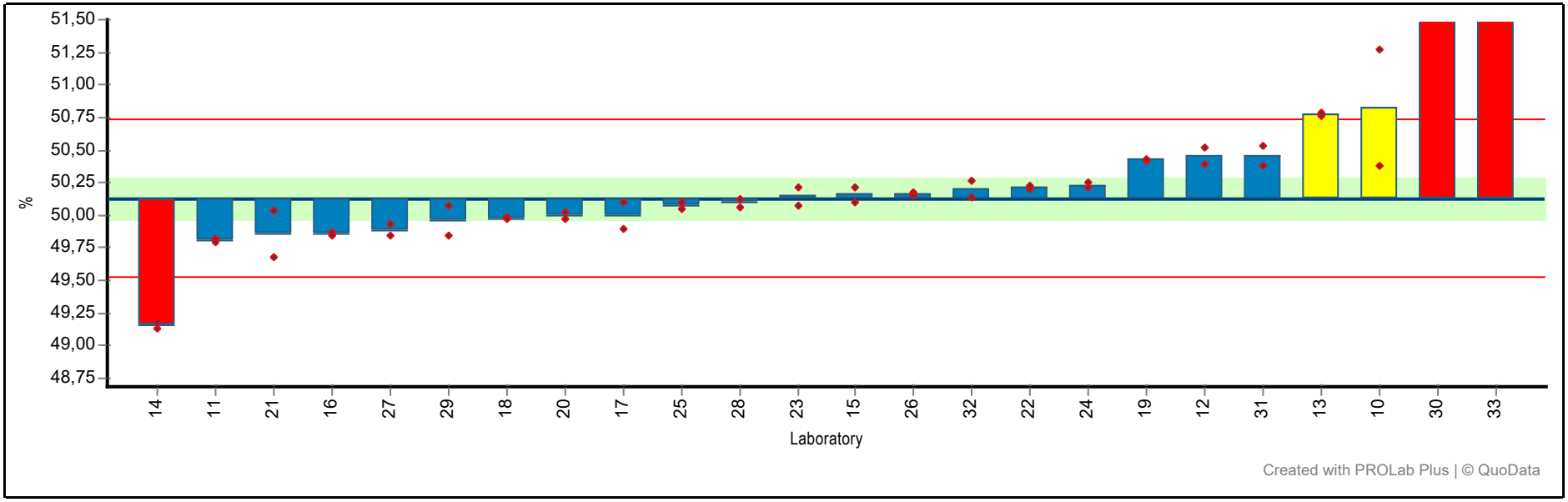
Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,303 %**
Measurand:	**CaO**	**Repeat. s.d:**	**0,063 %**
Mean ± U(Mean):	**50,130 ± 0,161 %**	**Range of tolerance:**	**49,524 - 50,736 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	50,386	51,265	50,826	0,622	2,3	XRF (fusion)	no accredition	
11	49,820	49,800	49,810	0,014	-1,1	XRF (fusion)	no accredition	
12	50,390	50,520	50,455	0,092	1,1	XRF (fusion)	ISO 17025	
13	50,756	50,785	50,770	0,021	2,1	XRF (fusion)	no accredition	
14	49,132	49,184	49,158	0,037	-3,2	XRF (fusion)	no accredition	
15	50,211	50,104	50,157	0,076	0,1	XRF (fusion)	no accredition	
16	49,868	49,850	49,859	0,013	-0,9	XRF (fusion)	no accredition	
17	49,901	50,098	49,999	0,139	-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	49,979	49,971	49,975	0,006	-0,5	XRF (fusion)	ISO 17025	
19	50,418	50,433	50,425	0,011	1,0	XRF (fusion)	no accredition	
20	50,026	49,966	49,996	0,042	-0,4	XRF (fusion)	no accredition	ISO 12677
21	50,036	49,677	49,856	0,254	-0,9	Other Method	no accredition	DIN EN 196-2
22	50,202	50,221	50,212	0,013	0,3	Other Method	no accredition	DIN EN ISO 16976
23	50,071	50,218	50,145	0,104	0,0	XRF (fusion)	ISO 17025	
24	50,209	50,250	50,230	0,029	0,3	XRF (fusion)	no accredition	
25	50,050	50,100	50,075	0,035	-0,2	XRF (fusion)	no accredition	
26	50,174	50,149	50,162	0,018	0,1	XRF (fusion)	no accredition	
27	49,840	49,930	49,885	0,064	-0,8	XRF (fusion)	no accredition	
28	50,124	50,063	50,094	0,043	-0,1	XRF (fusion)	no accredition	
29	49,845	50,072	49,959	0,161	-0,6	XRF (fusion)	ISO 17025	
30	51,865	52,137	52,001	0,192	6,2	XRF (fusion)	no accredition	Info only
31	50,385	50,533	50,459	0,105	1,1	XRF (fusion)	no accredition	
32	50,144	50,267	50,206	0,087	0,2	XRF (fusion)	ISO 17025	
33	52,137	52,437	52,287	0,212	7,1	XRF (pressed pellet)	no accredition	Info only

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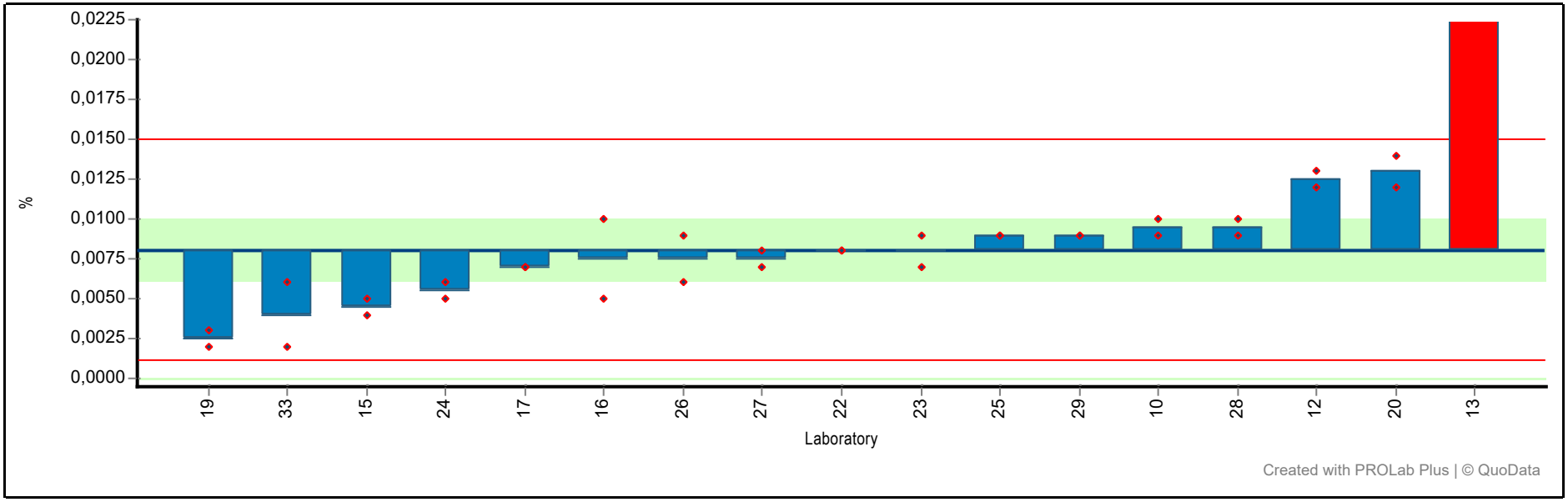
Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,003 %**
Measurand:	**Cr2O3**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,008 ± 0,002 %**	**Range of tolerance:**	**0,001 - 0,015 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**16**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,009	0,010	0,009	0,001	0,4	XRF (fusion)	no accredition	
11	<0,002	<0,002	<0,002			XRF (fusion)	no accredition	Info only
12	0,013	0,012	0,013	0,001	1,3	XRF (fusion)	ISO 17025	
13	0,432	0,429	0,430	0,002	121,4	XRF (fusion)	no accredition	
14	<0,010	<0,010	<0,010			XRF (fusion)	no accredition	Info only
15	0,004	0,005	0,005	0,001	-1,0	XRF (fusion)	no accredition	
16	0,010	0,005	0,007	0,004	-0,2	XRF (fusion)	no accredition	
17	0,007	0,007	0,007	0,000	-0,3	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	<0,020	<0,020	<0,020			XRF (fusion)	ISO 17025	Info only
19	0,003	0,002	0,003	0,001	-1,6	XRF (fusion)	no accredition	
20	0,012	0,014	0,013	0,001	1,4	XRF (fusion)	no accredition	ISO 12677
22	0,008	0,008	0,008	0,000	0,0	Other Method	no accredition	DIN EN ISO 16976
23	0,007	0,009	0,008	0,001	0,0	XRF (fusion)	ISO 17025	
24	0,006	0,005	0,005	0,001	-0,7	XRF (fusion)	no accredition	
25	0,009	0,009	0,009	0,000	0,3	XRF (fusion)	no accredition	
26	0,006	0,009	0,007	0,002	-0,2	XRF (fusion)	no accredition	
27	0,007	0,008	0,007	0,001	-0,2	XRF (fusion)	no accredition	
28	0,009	0,010	0,009	0,001	0,4	XRF (fusion)	no accredition	
29	0,009	0,009	0,009	0,000	0,3	XRF (fusion)	ISO 17025	
33	0,002	0,006	0,004	0,003	-1,2	XRF (pressed pellet)	no accredition	Info only

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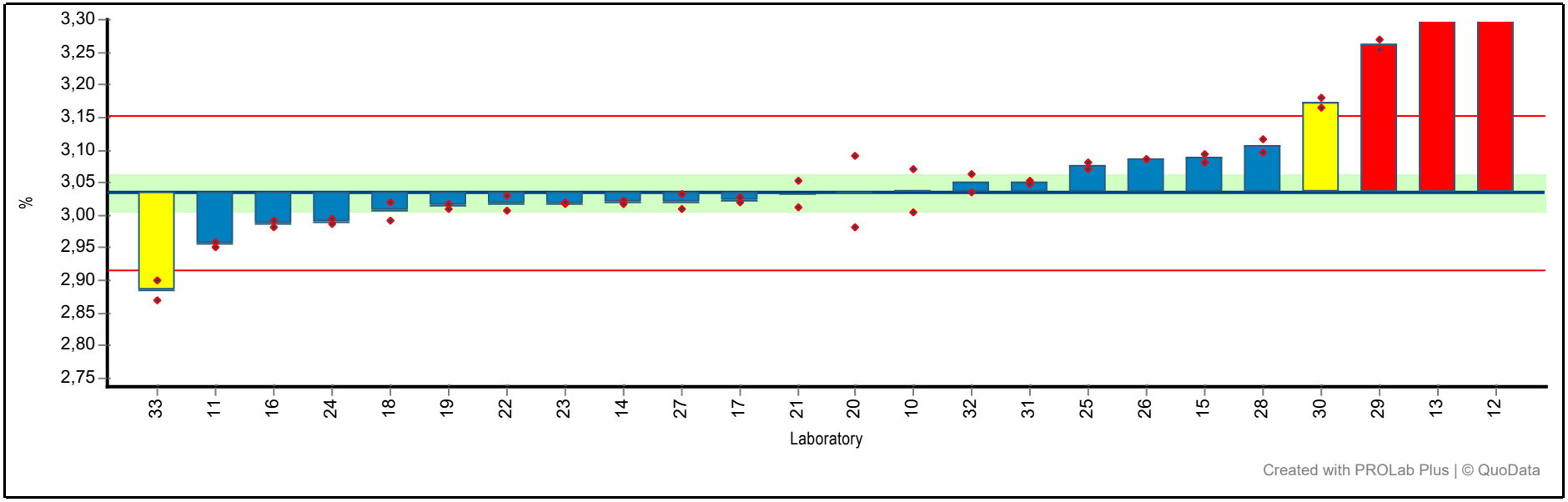
Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,059 %**
Measurand:	**Fe2O3**	**Repeat. s.d:**	**0,013 %**
Mean ± U(Mean):	**3,034 ± 0,028 %**	**Range of tolerance:**	**2,916 - 3,153 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	3,004	3,071	3,038	0,047	0,1	XRF (fusion)	no accredition	
11	2,950	2,960	2,955	0,007	-1,3	XRF (fusion)	no accredition	
12	5,260	5,280	5,270	0,014	37,6	XRF (fusion)	ISO 17025	
13	3,642	3,650	3,646	0,006	10,3	XRF (fusion)	no accredition	
14	3,022	3,017	3,019	0,004	-0,3	XRF (fusion)	no accredition	
15	3,094	3,081	3,087	0,009	0,9	XRF (fusion)	no accredition	
16	2,992	2,982	2,987	0,007	-0,8	XRF (fusion)	no accredition	
17	3,019	3,027	3,023	0,006	-0,2	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	2,993	3,019	3,006	0,018	-0,5	XRF (fusion)	ISO 17025	
19	3,010	3,018	3,014	0,006	-0,3	XRF (fusion)	no accredition	
20	3,091	2,981	3,036	0,078	0,0	XRF (fusion)	no accredition	ISO 12677
21	3,053	3,013	3,033	0,028	0,0	Other Method	no accredition	DIN EN 196-2
22	3,007	3,030	3,018	0,016	-0,3	Other Method	no accredition	DIN EN ISO 16976
23	3,018	3,019	3,018	0,001	-0,3	XRF (fusion)	ISO 17025	
24	2,986	2,995	2,990	0,006	-0,7	XRF (fusion)	no accredition	
25	3,070	3,080	3,075	0,007	0,7	XRF (fusion)	no accredition	
26	3,085	3,085	3,085	0,000	0,8	XRF (fusion)	no accredition	
27	3,010	3,032	3,021	0,016	-0,2	XRF (fusion)	no accredition	
28	3,117	3,096	3,107	0,015	1,2	XRF (fusion)	no accredition	
29	3,269	3,255	3,262	0,010	3,8	XRF (fusion)	ISO 17025	
30	3,164	3,181	3,173	0,012	2,3	XRF (fusion)	no accredition	Info only
31	3,054	3,049	3,051	0,004	0,3	XRF (fusion)	no accredition	
32	3,036	3,064	3,050	0,020	0,3	XRF (fusion)	ISO 17025	
33	2,901	2,869	2,885	0,023	-2,5	XRF (pressed pellet)	no accredition	Info only

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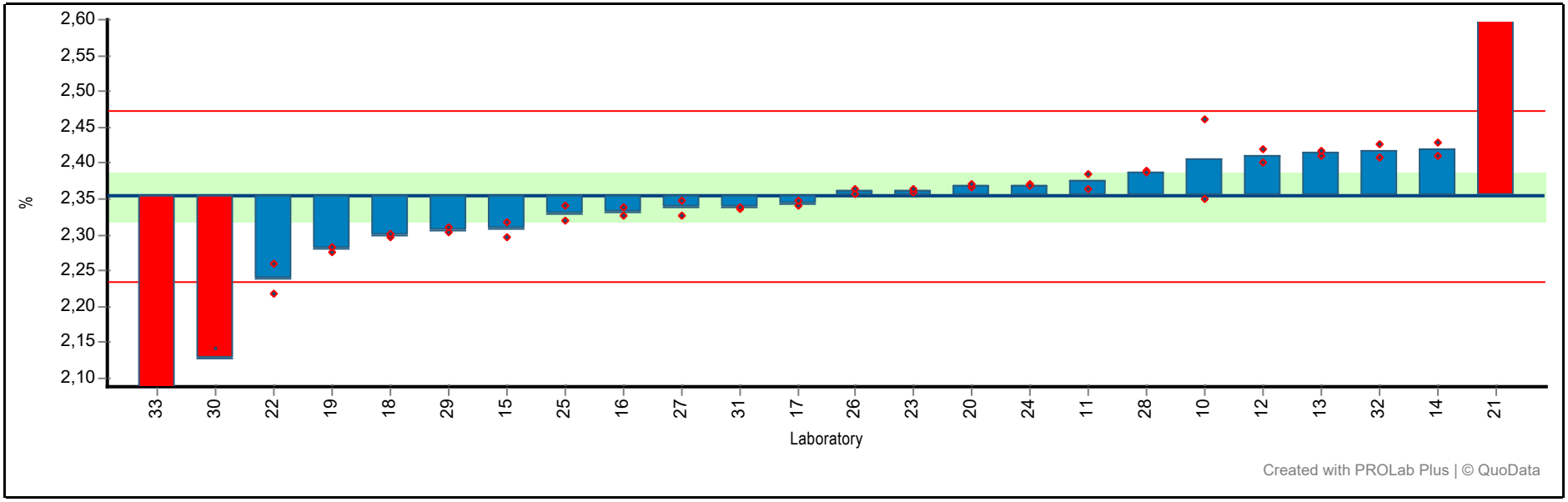
Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,060 %**
Measurand:	**K2O**	**Repeat. s.d:**	**0,012 %**
Mean ± U(Mean):	**2,354 ± 0,034 %**	**Range of tolerance:**	**2,234 - 2,473 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	2,349	2,460	2,405	0,078	0,9	XRF (fusion)	no accredition	
11	2,365	2,385	2,375	0,014	0,4	XRF (fusion)	no accredition	
12	2,400	2,420	2,410	0,014	0,9	XRF (fusion)	ISO 17025	
13	2,411	2,417	2,414	0,004	1,0	XRF (fusion)	no accredition	
14	2,410	2,428	2,419	0,013	1,1	XRF (fusion)	no accredition	
15	2,297	2,318	2,308	0,015	-0,8	XRF (fusion)	no accredition	
16	2,338	2,326	2,332	0,008	-0,4	XRF (fusion)	no accredition	
17	2,340	2,347	2,343	0,005	-0,2	XRF (fusion)	no accredition	

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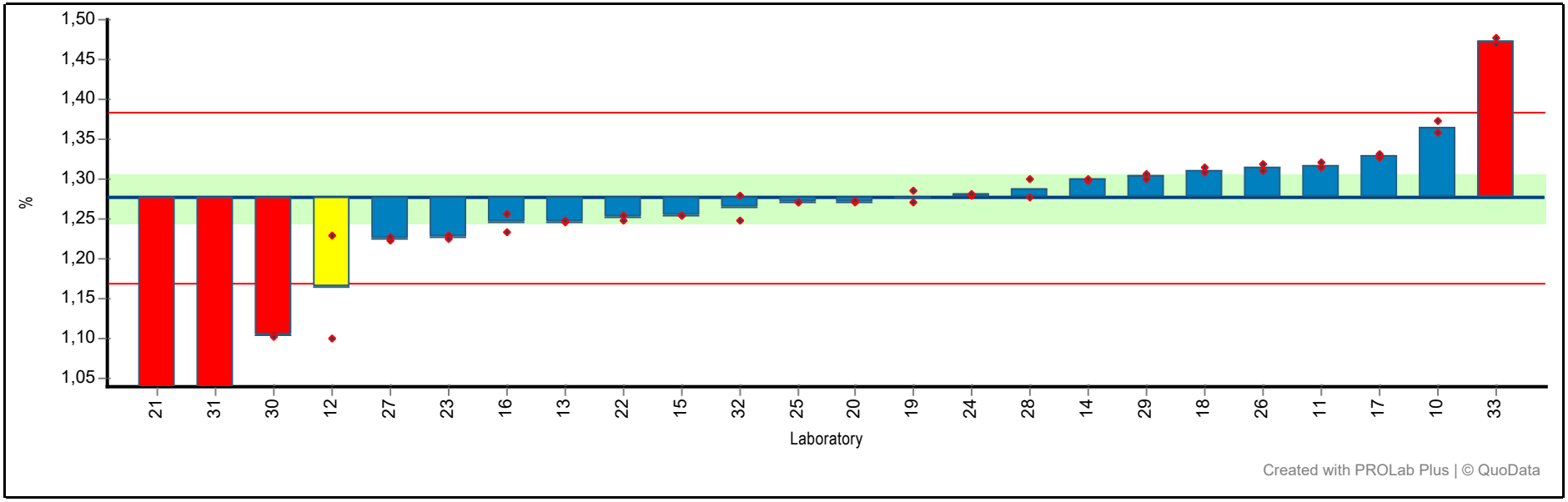
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	2,297	2,301	2,299	0,003	-0,9	XRF (fusion)	ISO 17025	
19	2,277	2,284	2,280	0,005	-1,2	XRF (fusion)	no accredition	
20	2,366	2,371	2,369	0,004	0,2	XRF (fusion)	no accredition	ISO 12677
21	2,648	2,607	2,628	0,029	4,6	Other Method	no accredition	DIN EN 196-2
22	2,217	2,259	2,238	0,030	-1,9	Other Method	no accredition	DIN EN ISO 16976
23	2,360	2,365	2,362	0,004	0,1	XRF (fusion)	ISO 17025	
24	2,370	2,368	2,369	0,001	0,3	XRF (fusion)	no accredition	
25	2,320	2,340	2,330	0,014	-0,4	XRF (fusion)	no accredition	
26	2,364	2,357	2,361	0,005	0,1	XRF (fusion)	no accredition	
27	2,347	2,328	2,337	0,013	-0,3	XRF (fusion)	no accredition	
28	2,389	2,386	2,388	0,002	0,6	XRF (fusion)	no accredition	
29	2,303	2,310	2,306	0,005	-0,8	XRF (fusion)	ISO 17025	
30	2,112	2,142	2,127	0,021	-3,8	XRF (fusion)	no accredition	Info only
31	2,337	2,339	2,338	0,001	-0,3	XRF (fusion)	no accredition	
32	2,407	2,426	2,417	0,013	1,1	XRF (fusion)	ISO 17025	
33	1,901	1,879	1,890	0,016	-7,8	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,054 %**
Measurand:	**MgO**	**Repeat. s.d:**	**0,006 %**
Mean ± U(Mean):	**1,276 ± 0,030 %**	**Range of tolerance:**	**1,169 - 1,384 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



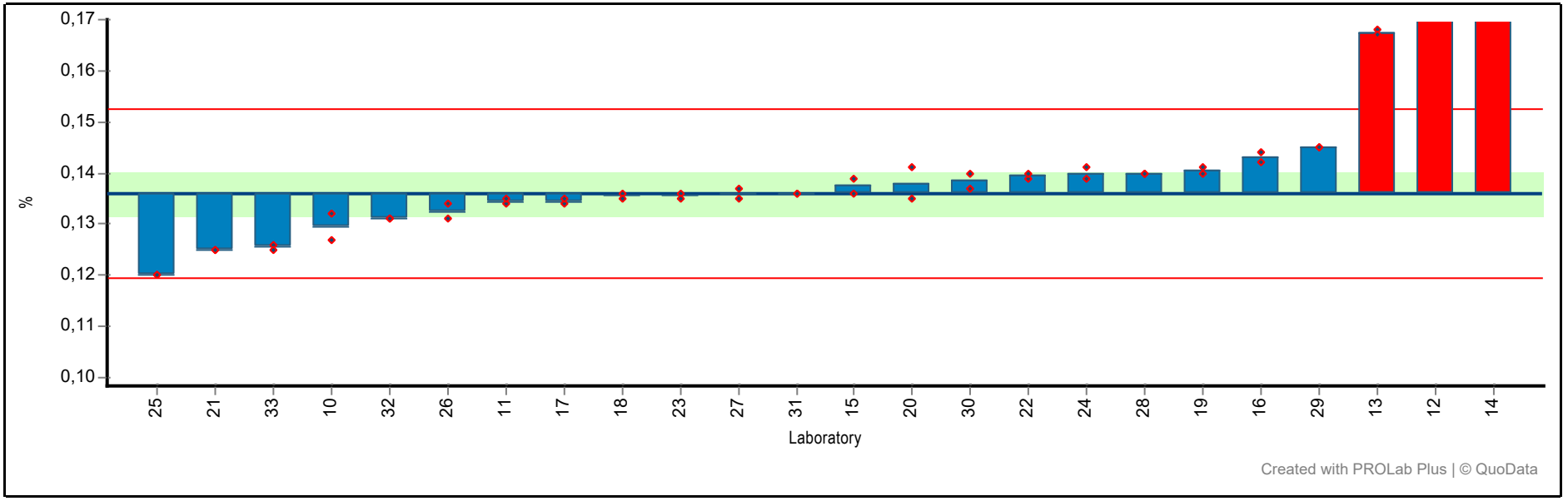
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	1,359	1,372	1,365	0,009	1,7	XRF (fusion)	no accredition	
11	1,315	1,320	1,317	0,004	0,8	XRF (fusion)	no accredition	
12	1,100	1,230	1,165	0,092	-2,1	XRF (fusion)	ISO 17025	
13	1,245	1,248	1,247	0,002	-0,6	XRF (fusion)	no accredition	
14	1,298	1,301	1,300	0,002	0,4	XRF (fusion)	no accredition	
15	1,255	1,254	1,254	0,001	-0,4	XRF (fusion)	no accredition	
16	1,256	1,234	1,245	0,016	-0,6	XRF (fusion)	no accredition	
17	1,327	1,331	1,329	0,003	1,0	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	1,308	1,314	1,311	0,004	0,6	XRF (fusion)	ISO 17025	
19	1,270	1,285	1,277	0,011	0,0	XRF (fusion)	no accredition	
20	1,270	1,272	1,271	0,001	-0,1	XRF (fusion)	no accredition	ISO 12677
21	0,582	0,571	0,577	0,008	-13,1	Other Method	no accredition	DIN EN 196-2
22	1,248	1,255	1,252	0,005	-0,5	Other Method	no accredition	DIN EN ISO 16976
23	1,229	1,225	1,227	0,003	-0,9	XRF (fusion)	ISO 17025	
24	1,279	1,282	1,280	0,002	0,1	XRF (fusion)	no accredition	
25	1,270	1,270	1,270	0,000	-0,1	XRF (fusion)	no accredition	
26	1,318	1,311	1,315	0,005	0,7	XRF (fusion)	no accredition	
27	1,223	1,227	1,225	0,003	-1,0	XRF (fusion)	no accredition	
28	1,278	1,299	1,288	0,015	0,2	XRF (fusion)	no accredition	
29	1,300	1,307	1,304	0,005	0,5	XRF (fusion)	ISO 17025	
30	1,106	1,102	1,104	0,003	-3,2	XRF (fusion)	no accredition	Info only
31	1,005	1,006	1,006	0,001	-5,1	XRF (fusion)	no accredition	
32	1,280	1,248	1,264	0,023	-0,2	XRF (fusion)	ISO 17025	
33	1,468	1,478	1,473	0,007	3,7	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,008 %**
Measurand:	**Mn2O3**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,136 ± 0,004 %**	**Range of tolerance:**	**0,119 - 0,153 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



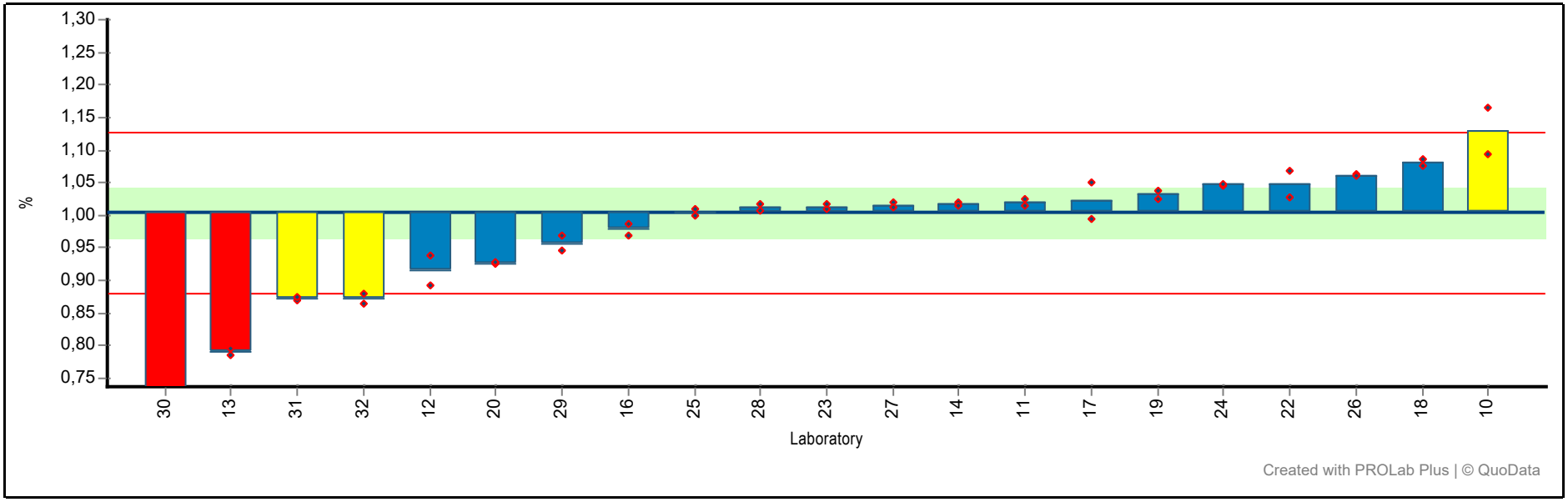
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,127	0,132	0,130	0,004	-0,8	XRF (fusion)	no accredition	
11	0,134	0,135	0,135	0,001	-0,2	XRF (fusion)	no accredition	
12	0,175	0,188	0,181	0,009	5,5	XRF (fusion)	ISO 17025	
13	0,168	0,167	0,168	0,001	3,8	XRF (fusion)	no accredition	
14	0,193	0,190	0,192	0,002	6,7	XRF (fusion)	no accredition	
15	0,139	0,136	0,138	0,002	0,2	XRF (fusion)	no accredition	
16	0,142	0,144	0,143	0,001	0,9	XRF (fusion)	no accredition	
17	0,134	0,135	0,135	0,001	-0,2	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,136	0,135	0,136	0,001	-0,1	XRF (fusion)	ISO 17025	
19	0,140	0,141	0,141	0,001	0,5	XRF (fusion)	no accredition	
20	0,141	0,135	0,138	0,004	0,2	XRF (fusion)	no accredition	ISO 12677
21	0,125	0,125	0,125	0,000	-1,3	Other Method	no accredition	DIN EN 196-2
22	0,139	0,140	0,140	0,001	0,4	Other Method	no accredition	DIN EN ISO 16976
23	0,136	0,135	0,136	0,001	-0,1	XRF (fusion)	ISO 17025	
24	0,141	0,139	0,140	0,001	0,5	XRF (fusion)	no accredition	
25	0,120	0,120	0,120	0,000	-1,9	XRF (fusion)	no accredition	
26	0,131	0,134	0,133	0,002	-0,4	XRF (fusion)	no accredition	
27	0,137	0,135	0,136	0,001	0,0	XRF (fusion)	no accredition	
28	0,140	0,140	0,140	0,000	0,5	XRF (fusion)	no accredition	
29	0,145	0,145	0,145	0,000	1,1	XRF (fusion)	ISO 17025	
30	0,137	0,140	0,139	0,002	0,3	XRF (fusion)	no accredition	Info only
31	0,136	0,136	0,136	0,000	0,0	XRF (fusion)	no accredition	
32	0,131	0,131	0,131	0,000	-0,6	XRF (fusion)	ISO 17025	
33	0,126	0,125	0,126	0,001	-1,3	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,062 %**
Measurand:	**Na2O**	**Repeat. s.d:**	**0,012 %**
Mean ± U(Mean):	**1,004 ± 0,038 %**	**Range of tolerance:**	**0,881 - 1,127 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**19**	**Statistical method:**	**Q/Hampel**



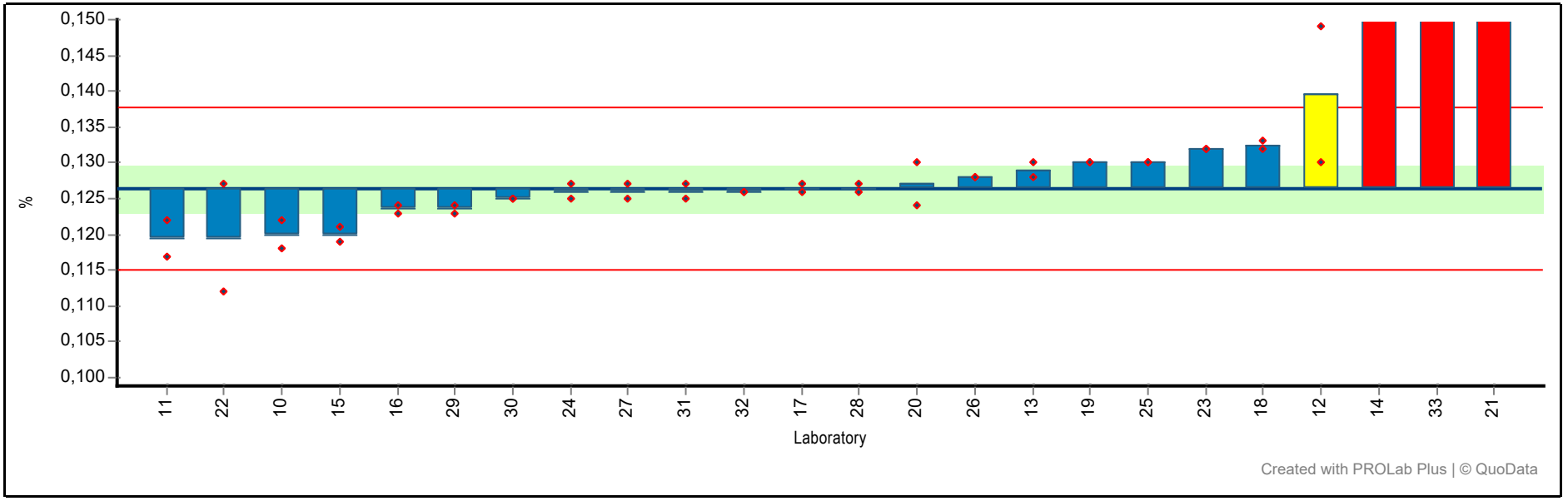
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	1,094	1,165	1,130	0,050	2,0	XRF (fusion)	no accredition	
11	1,025	1,015	1,020	0,007	0,3	XRF (fusion)	no accredition	
12	0,892	0,939	0,915	0,033	-1,4	XRF (fusion)	ISO 17025	
13	0,795	0,786	0,790	0,006	-3,5	XRF (pressed pellet)	no accredition	Info only
14	1,019	1,014	1,016	0,004	0,2	XRF (fusion)	no accredition	
16	0,968	0,988	0,978	0,014	-0,4	XRF (fusion)	no accredition	
17	1,051	0,995	1,023	0,040	0,3	XRF (fusion)	no accredition	
18	1,075	1,087	1,081	0,008	1,3	XRF (fusion)	ISO 17025	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	1,025	1,038	1,031	0,009	0,4	XRF (fusion)	no accredition	
20	0,926	0,927	0,927	0,001	-1,3	XRF (fusion)	no accredition	ISO 12677
22	1,028	1,069	1,048	0,029	0,7	Other Method	no accredition	DIN EN ISO 16976
23	1,010	1,017	1,014	0,005	0,2	XRF (fusion)	ISO 17025	
24	1,046	1,048	1,047	0,001	0,7	XRF (fusion)	no accredition	
25	1,000	1,010	1,005	0,007	0,0	XRF (fusion)	no accredition	
26	1,063	1,060	1,062	0,002	0,9	XRF (fusion)	no accredition	
27	1,020	1,012	1,016	0,006	0,2	XRF (fusion)	no accredition	
28	1,008	1,018	1,013	0,007	0,1	XRF (fusion)	no accredition	
29	0,970	0,945	0,958	0,018	-0,8	XRF (fusion)	ISO 17025	
30	0,675	0,645	0,660	0,021	-5,6	XRF (fusion)	no accredition	Info only
31	0,869	0,875	0,872	0,004	-2,1	XRF (fusion)	no accredition	
32	0,880	0,865	0,873	0,011	-2,1	XRF (fusion)	ISO 17025	

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,006 %**
Measurand:	**P2O5**	**Repeat. s.d:**	**0,002 %**
Mean ± U(Mean):	**0,126 ± 0,003 %**	**Range of tolerance:**	**0,115 - 0,138 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



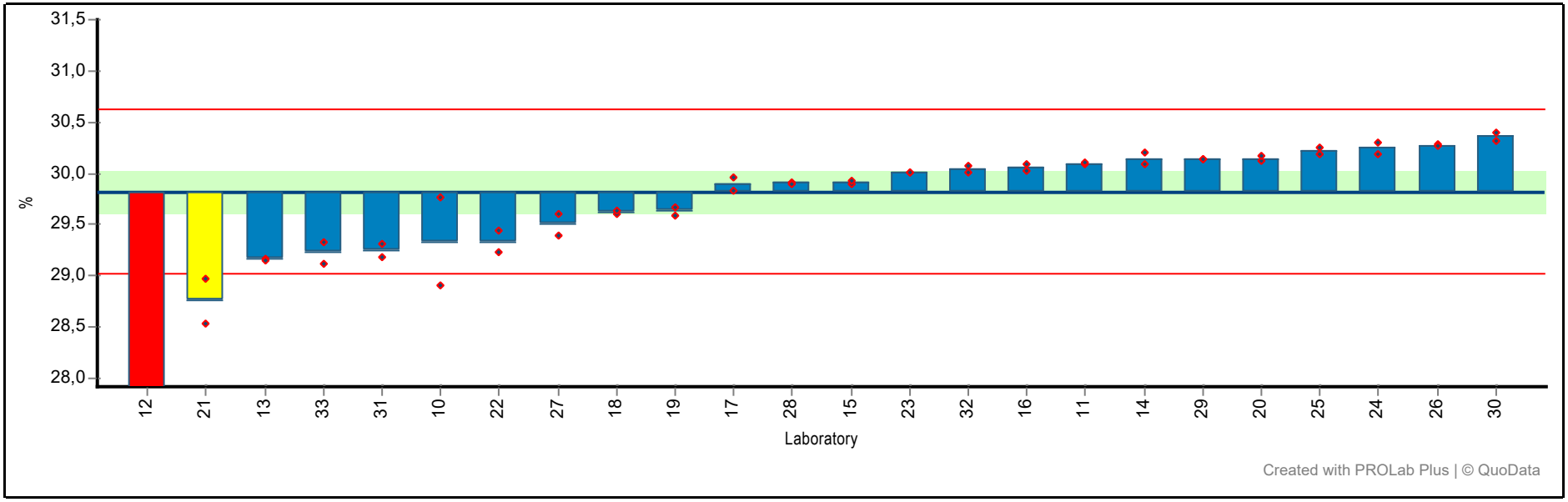
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,122	0,118	0,120	0,003	-1,1	XRF (fusion)	no accredition	
11	0,122	0,117	0,119	0,004	-1,2	XRF (fusion)	no accredition	
12	0,149	0,130	0,140	0,013	2,3	XRF (fusion)	ISO 17025	
13	0,128	0,130	0,129	0,001	0,5	XRF (fusion)	no accredition	
14	0,174	0,170	0,172	0,003	8,0	XRF (fusion)	no accredition	
15	0,121	0,119	0,120	0,001	-1,1	XRF (fusion)	no accredition	
16	0,123	0,124	0,123	0,001	-0,5	XRF (fusion)	no accredition	
17	0,126	0,127	0,127	0,001	0,0	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,133	0,132	0,133	0,001	1,1	XRF (fusion)	ISO 17025	
19	0,130	0,130	0,130	0,000	0,6	XRF (fusion)	no accredition	
20	0,124	0,130	0,127	0,004	0,1	XRF (fusion)	no accredition	ISO 12677
21	0,270	0,260	0,265	0,007	24,4	Other Method	no accredition	DIN EN 196-2
22	0,112	0,127	0,119	0,011	-1,2	Other Method	no accredition	DIN EN ISO 16976
23	0,132	0,132	0,132	0,000	1,0	XRF (fusion)	ISO 17025	
24	0,127	0,125	0,126	0,001	-0,1	XRF (fusion)	no accredition	
25	0,130	0,130	0,130	0,000	0,6	XRF (fusion)	no accredition	
26	0,128	0,128	0,128	0,000	0,3	XRF (fusion)	no accredition	
27	0,125	0,127	0,126	0,001	-0,1	XRF (fusion)	no accredition	
28	0,127	0,126	0,127	0,001	0,0	XRF (fusion)	no accredition	
29	0,124	0,123	0,123	0,001	-0,5	XRF (fusion)	ISO 17025	
30	0,125	0,125	0,125	0,000	-0,2	XRF (fusion)	no accredition	Info only
31	0,125	0,127	0,126	0,001	-0,1	XRF (fusion)	no accredition	
32	0,126	0,126	0,126	0,000	-0,1	XRF (fusion)	ISO 17025	
33	0,202	0,202	0,202	0,000	13,3	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,401 %**
Measurand:	**SiO2**	**Repeat. s.d:**	**0,076 %**
Mean ± U(Mean):	**29,820 ± 0,207 %**	**Range of tolerance:**	**29,018 - 30,621 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



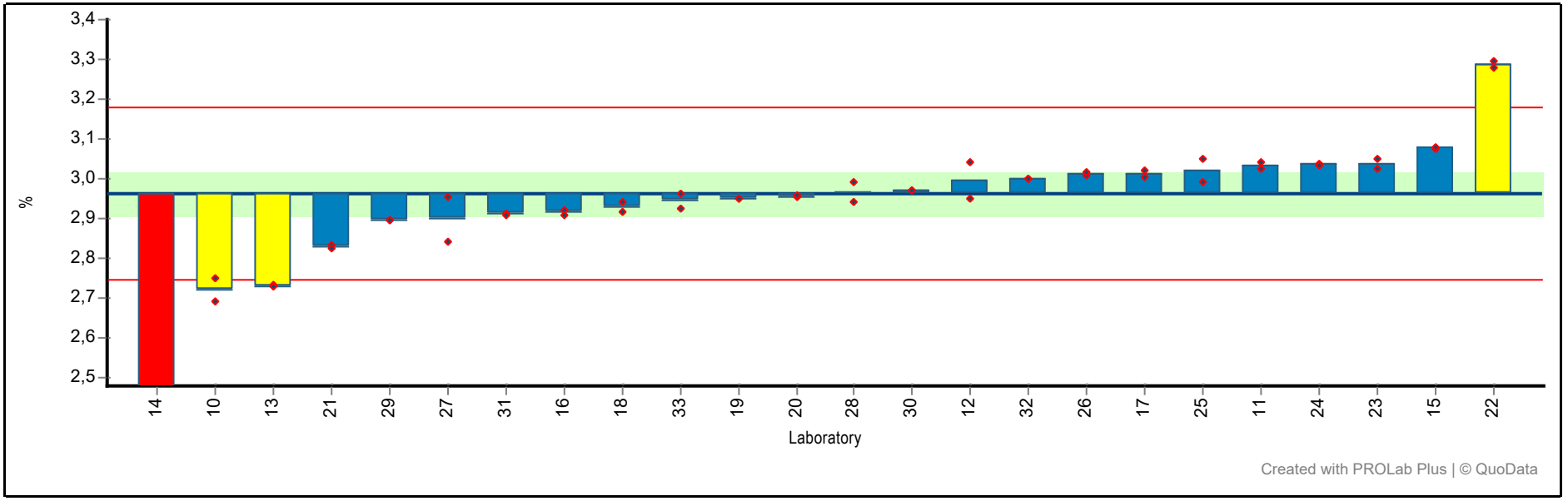
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	29,769	28,900	29,334	0,614	-1,2	XRF (fusion)	no accredition	
11	30,085	30,105	30,095	0,014	0,7	XRF (fusion)	no accredition	
12	27,500	27,340	27,420	0,113	-6,0	XRF (fusion)	ISO 17025	
13	29,166	29,154	29,160	0,008	-1,6	XRF (fusion)	no accredition	
14	30,085	30,197	30,141	0,079	0,8	XRF (fusion)	no accredition	
15	29,899	29,936	29,918	0,026	0,2	XRF (fusion)	no accredition	
16	30,086	30,022	30,054	0,045	0,6	XRF (fusion)	no accredition	
17	29,831	29,963	29,897	0,093	0,2	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	29,601	29,630	29,615	0,021	-0,5	XRF (fusion)	ISO 17025	
19	29,675	29,593	29,634	0,058	-0,5	XRF (fusion)	no accredition	
20	30,116	30,177	30,146	0,043	0,8	XRF (fusion)	no accredition	ISO 12677
21	28,975	28,537	28,756	0,310	-2,7	Other Method	no accredition	DIN EN 196-2
22	29,447	29,225	29,336	0,157	-1,2	Other Method	no accredition	DIN EN ISO 16976
23	30,012	30,013	30,013	0,001	0,5	XRF (fusion)	ISO 17025	
24	30,299	30,194	30,246	0,074	1,1	XRF (fusion)	no accredition	
25	30,190	30,260	30,225	0,049	1,0	XRF (fusion)	no accredition	
26	30,285	30,268	30,276	0,012	1,1	XRF (fusion)	no accredition	
27	29,611	29,397	29,504	0,151	-0,8	XRF (fusion)	no accredition	
28	29,919	29,898	29,909	0,015	0,2	XRF (fusion)	no accredition	
29	30,146	30,141	30,143	0,004	0,8	XRF (fusion)	ISO 17025	
30	30,318	30,400	30,359	0,058	1,3	XRF (fusion)	no accredition	Info only
31	29,319	29,175	29,247	0,102	-1,4	XRF (fusion)	no accredition	
32	30,003	30,078	30,041	0,053	0,6	XRF (fusion)	ISO 17025	
33	29,326	29,126	29,226	0,141	-1,5	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,108 %**
Measurand:	**SO3**	**Repeat. s.d:**	**0,012 %**
Mean ± U(Mean):	**2,962 ± 0,055 %**	**Range of tolerance:**	**2,745 - 3,178 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



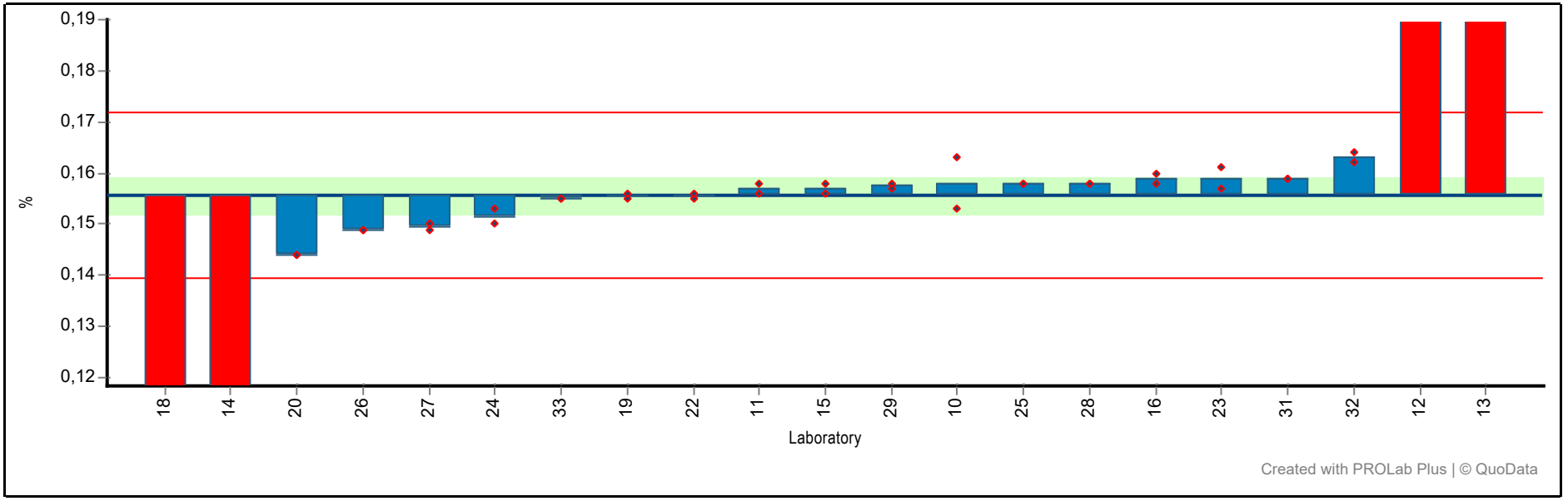
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	2,752	2,692	2,722	0,042	-2,2	XRF (fusion)	no accredition	
11	3,025	3,040	3,032	0,011	0,7	XRF (fusion)	no accredition	
12	2,950	3,040	2,995	0,064	0,3	XRF (fusion)	ISO 17025	
13	2,733	2,729	2,731	0,003	-2,1	XRF (fusion)	no accredition	
14	2,414	2,413	2,413	0,001	-5,1	XRF (fusion)	no accredition	
15	3,075	3,081	3,078	0,004	1,1	XRF (fusion)	no accredition	
16	2,921	2,910	2,915	0,008	-0,4	XRF (fusion)	no accredition	
17	3,004	3,021	3,013	0,012	0,5	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	2,917	2,941	2,929	0,017	-0,3	Other Method	ISO 17025	Combustion
19	2,950	2,949	2,950	0,001	-0,1	XRF (fusion)	no accredition	
20	2,953	2,957	2,955	0,003	-0,1	XRF (fusion)	no accredition	ISO 12677
21	2,835	2,826	2,830	0,006	-1,2	Other Method	no accredition	DIN EN 196-2
22	3,279	3,294	3,287	0,011	3,0	Other Method	no accredition	DIN EN ISO 16976
23	3,027	3,048	3,038	0,015	0,7	XRF (fusion)	ISO 17025	
24	3,039	3,035	3,037	0,003	0,7	XRF (fusion)	no accredition	
25	2,990	3,050	3,020	0,042	0,5	XRF (fusion)	no accredition	
26	3,007	3,016	3,011	0,006	0,5	XRF (fusion)	no accredition	
27	2,842	2,956	2,899	0,081	-0,6	XRF (fusion)	no accredition	
28	2,940	2,992	2,966	0,037	0,0	XRF (fusion)	no accredition	
29	2,895	2,895	2,895	0,000	-0,6	XRF (fusion)	ISO 17025	
30	2,972	2,972	2,972	0,000	0,1	Other Method	no accredition	Info only
31	2,913	2,908	2,910	0,004	-0,5	XRF (fusion)	no accredition	
32	3,000	3,000	3,000	0,000	0,4	XRF (fusion)	no accredition	
33	2,924	2,964	2,944	0,028	-0,2	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,008 %**
Measurand:	**SrO**	**Repeat. s.d:**	**0,002 %**
Mean ± U(Mean):	**0,156 ± 0,004 %**	**Range of tolerance:**	**0,140 - 0,172 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**



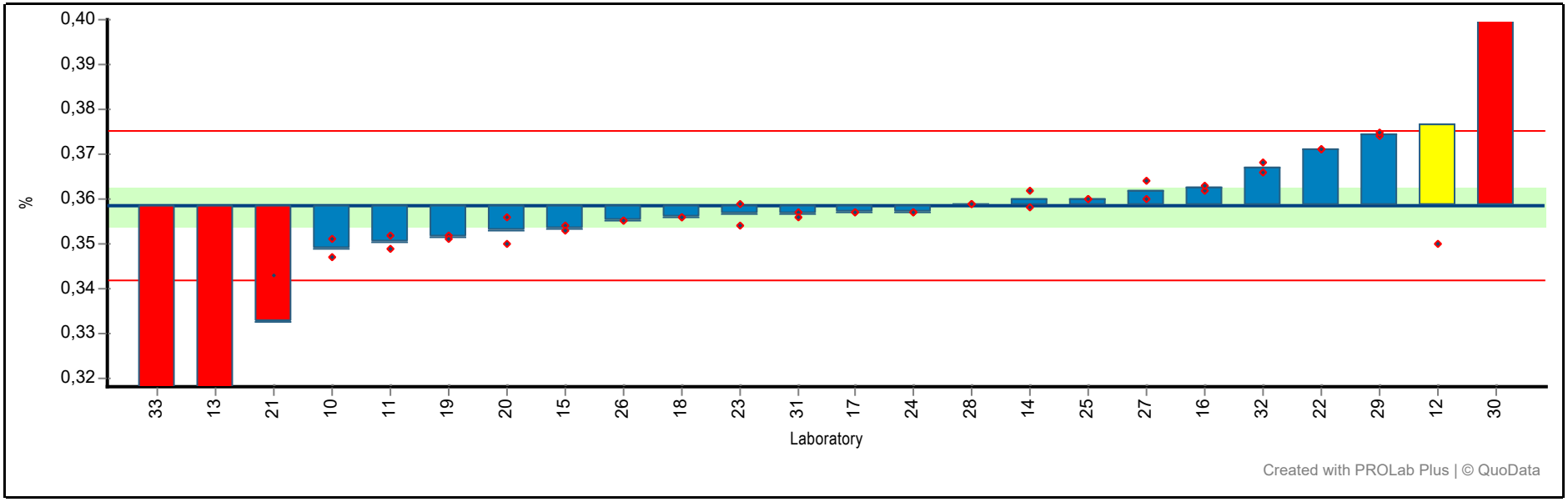
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,153	0,163	0,158	0,007	0,3	XRF (fusion)	no accredition	
11	0,156	0,158	0,157	0,001	0,2	XRF (fusion)	no accredition	
12	0,289	0,292	0,290	0,002	16,7	XRF (fusion)	ISO 17025	
13	0,350	0,353	0,351	0,002	24,3	XRF (fusion)	no accredition	
14	0,100	0,096	0,098	0,003	-7,1	XRF (fusion)	no accredition	
15	0,156	0,158	0,157	0,001	0,2	XRF (fusion)	no accredition	
16	0,160	0,158	0,159	0,001	0,4	XRF (fusion)	no accredition	
18	0,017	0,017	0,017	0,000	-17,2	XRF (fusion)	ISO 17025	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,156	0,155	0,155	0,001	0,0	XRF (fusion)	no accredition	
20	0,144	0,144	0,144	0,000	-1,4	XRF (fusion)	no accredition	ISO 12677
22	0,155	0,156	0,155	0,001	0,0	Other Method	no accredition	DIN EN ISO 16976
23	0,157	0,161	0,159	0,003	0,4	XRF (fusion)	ISO 17025	
24	0,153	0,150	0,151	0,002	-0,5	XRF (fusion)	no accredition	
25	0,158	0,158	0,158	0,000	0,3	XRF (fusion)	no accredition	
26	0,149	0,149	0,149	0,000	-0,8	XRF (fusion)	no accredition	
27	0,150	0,149	0,149	0,001	-0,8	XRF (fusion)	no accredition	
28	0,158	0,158	0,158	0,000	0,3	XRF (fusion)	no accredition	
29	0,158	0,157	0,158	0,001	0,2	XRF (fusion)	ISO 17025	
31	0,159	0,159	0,159	0,000	0,4	XRF (fusion)	no accredition	
32	0,162	0,164	0,163	0,001	0,9	XRF (fusion)	ISO 17025	
33	0,155	0,155	0,155	0,000	-0,1	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,008 %**
Measurand:	**TiO2**	**Repeat. s.d:**	**0,003 %**
Mean ± U(Mean):	**0,358 ± 0,004 %**	**Range of tolerance:**	**0,342 - 0,375 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**



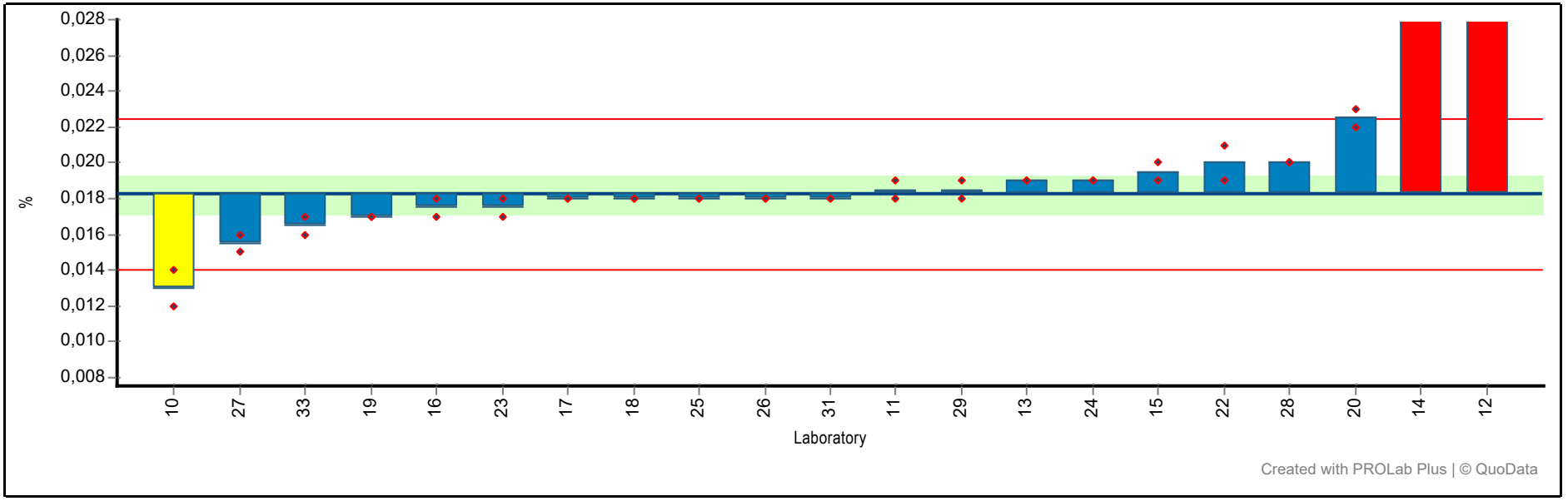
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,351	0,347	0,349	0,003	-1,1	XRF (fusion)	no accredition	
11	0,352	0,349	0,350	0,002	-0,9	XRF (fusion)	no accredition	
12	0,403	0,350	0,377	0,037	2,2	XRF (fusion)	ISO 17025	
13	0,317	0,313	0,315	0,003	-5,2	XRF (fusion)	no accredition	
14	0,358	0,362	0,360	0,003	0,2	XRF (fusion)	no accredition	
15	0,354	0,353	0,353	0,001	-0,6	XRF (fusion)	no accredition	
16	0,362	0,363	0,362	0,001	0,5	XRF (fusion)	no accredition	
17	0,357	0,357	0,357	0,000	-0,2	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,356	0,356	0,356	0,000	-0,3	XRF (fusion)	ISO 17025	
19	0,352	0,351	0,351	0,001	-0,8	XRF (fusion)	no accredition	
20	0,350	0,356	0,353	0,004	-0,6	XRF (fusion)	no accredition	ISO 12677
21	0,343	0,322	0,333	0,015	-3,1	Other Method	no accredition	DIN EN 196-2
22	0,371	0,371	0,371	0,000	1,5	Other Method	no accredition	DIN EN ISO 16976
23	0,354	0,359	0,356	0,004	-0,2	XRF (fusion)	ISO 17025	
24	0,357	0,357	0,357	0,000	-0,2	XRF (fusion)	no accredition	
25	0,360	0,360	0,360	0,000	0,2	XRF (fusion)	no accredition	
26	0,355	0,355	0,355	0,000	-0,4	XRF (fusion)	no accredition	
27	0,364	0,360	0,362	0,003	0,4	XRF (fusion)	no accredition	
28	0,359	0,359	0,359	0,000	0,1	XRF (fusion)	no accredition	
29	0,374	0,375	0,375	0,001	1,9	XRF (fusion)	ISO 17025	
30	0,409	0,409	0,409	0,000	6,1	XRF (fusion)	no accredition	Info only
31	0,357	0,356	0,356	0,001	-0,2	XRF (fusion)	no accredition	
32	0,366	0,368	0,367	0,001	1,0	XRF (fusion)	ISO 17025	
33	0,303	0,311	0,307	0,006	-6,2	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,002 %**
Measurand:	**ZnO**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,018 ± 0,001 %**	**Range of tolerance:**	**0,014 - 0,022 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**



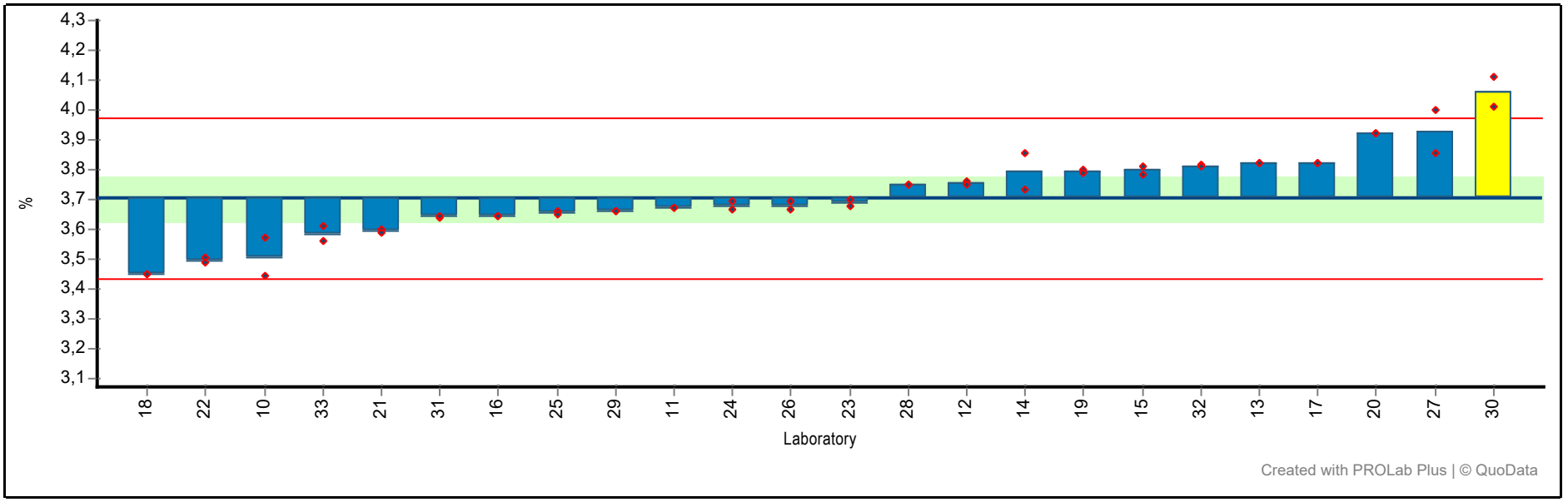
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,012	0,014	0,013	0,001	-2,5	XRF (fusion)	no accredition	
11	0,019	0,018	0,018	0,001	0,1	XRF (fusion)	no accredition	
12	0,038	0,042	0,040	0,003	10,4	XRF (fusion)	ISO 17025	
13	0,019	0,019	0,019	0,000	0,4	XRF (fusion)	no accredition	
14	0,034	0,035	0,035	0,001	7,8	XRF (fusion)	no accredition	
15	0,019	0,020	0,020	0,001	0,6	XRF (fusion)	no accredition	
16	0,018	0,017	0,018	0,001	-0,4	XRF (fusion)	no accredition	
17	0,018	0,018	0,018	0,000	-0,1	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,018	0,018	0,018	0,000	-0,1	XRF (fusion)	ISO 17025	
19	0,017	0,017	0,017	0,000	-0,6	XRF (fusion)	no accredition	
20	0,023	0,022	0,022	0,001	2,0	XRF (fusion)	no accredition	ISO 12677
22	0,019	0,021	0,020	0,001	0,8	Other Method	no accredition	DIN EN ISO 16976
23	0,017	0,018	0,018	0,001	-0,4	XRF (fusion)	ISO 17025	
24	0,019	0,019	0,019	0,000	0,4	XRF (fusion)	no accredition	
25	0,018	0,018	0,018	0,000	-0,1	XRF (fusion)	no accredition	
26	0,018	0,018	0,018	0,000	-0,1	XRF (fusion)	no accredition	
27	0,015	0,016	0,015	0,001	-1,3	XRF (fusion)	no accredition	
28	0,020	0,020	0,020	0,000	0,8	XRF (fusion)	no accredition	
29	0,019	0,018	0,018	0,001	0,1	XRF (fusion)	ISO 17025	
31	0,018	0,018	0,018	0,000	-0,1	XRF (fusion)	no accredition	
33	0,016	0,017	0,017	0,001	-0,8	XRF (pressed pellet)	no accredition	Info only

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,134 %**
Measurand:	**Loss on Ignition**	**Repeat. s.d:**	**0,012 %**
Mean ± U(Mean):	**3,703 ± 0,074 %**	**Range of tolerance:**	**3,436 - 3,970 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



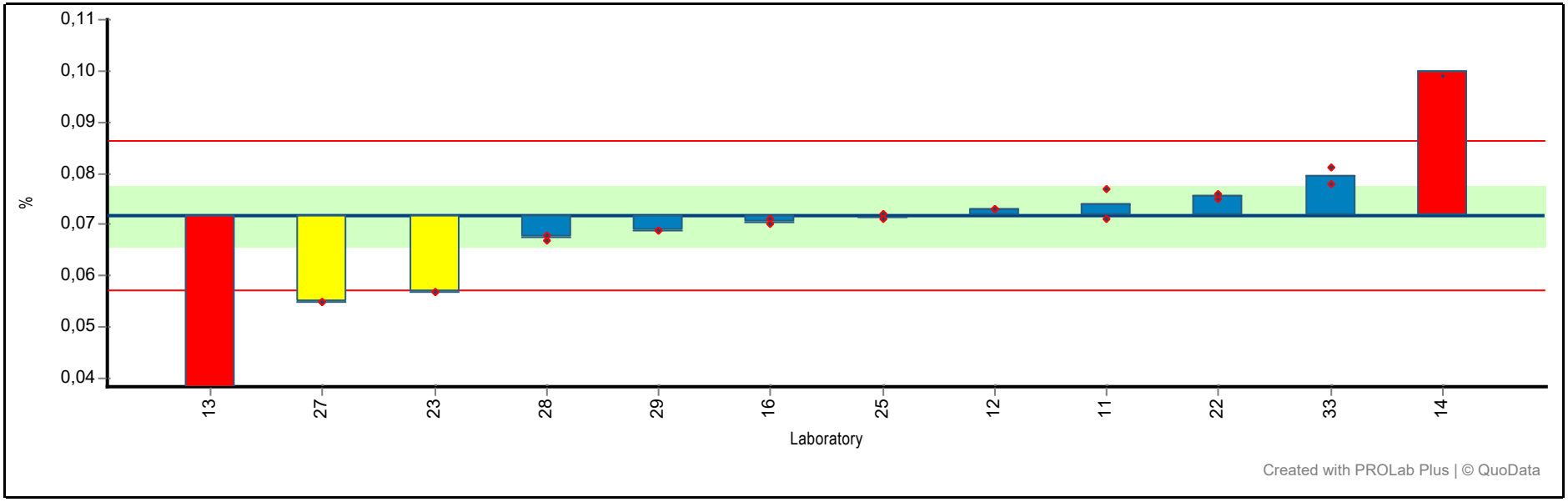
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	3,572	3,442	3,507	0,092	-1,5	Other Method	no accredition	LOI @ 950°C
11	3,671	3,671	3,671	0,000	-0,2	Other Method	no accredition	LOI @ 950°C
12	3,760	3,750	3,755	0,007	0,4	Other Method	ISO 17025	LOI @ 950°C
13	3,820	3,820	3,820	0,000	0,9	XRF (fusion)	no accredition	LOI @ 950°C
14	3,856	3,731	3,793	0,088	0,7	Other Method	no accredition	ISO 29581-2 2010
15	3,786	3,810	3,798	0,017	0,7	Other Method	no accredition	LOI @ 950°C
16	3,645	3,645	3,645	0,000	-0,4	Other Method	no accredition	LOI @ 950°C
17	3,820	3,822	3,821	0,001	0,9	Other Method	no accredition	LOI @ 950°C

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	3,450	3,450	3,450	0,000	-1,9	Other Method	ISO 17025	LOI @ 950°C
19	3,800	3,790	3,795	0,007	0,7	Other Method	no accredition	LOI @ 950°C
20	3,920	3,920	3,920	0,000	1,6	Other Method	no accredition	LOI @ 950°C
21	3,600	3,590	3,595	0,007	-0,8	Other Method	no accredition	LOI @ 950°C
22	3,503	3,490	3,497	0,009	-1,5	Other Method	no accredition	LOI @ 950°C
23	3,680	3,700	3,690	0,014	-0,1	Other Method	ISO 17025	gravimetric
24	3,667	3,693	3,680	0,018	-0,2	Other Method	no accredition	LOI @ 950°C
25	3,660	3,650	3,655	0,007	-0,4	Other Method	no accredition	LOI @ 950°C
26	3,667	3,693	3,680	0,018	-0,2	Other Method	no accredition	LOI @ 950°C
27	3,998	3,856	3,927	0,100	1,7	Other Method	no accredition	LOI @ 950°C
28	3,750	3,750	3,750	0,000	0,4	Other Method	no accredition	LOI @ 950°C
29	3,660	3,660	3,660	0,000	-0,3	Other Method	ISO 17025	LOI @ 950°C
30	4,010	4,110	4,060	0,071	2,7	Other Method	no accredition	Info only
31	3,638	3,647	3,643	0,006	-0,5	Other Method	no accredition	LOI @ 950°C
32	3,816	3,809	3,813	0,005	0,8	Other Method	ISO 17025	LOI @ 950°C
33	3,563	3,609	3,586	0,033	-0,9	Other Method	no accredition	LOI @ 950°C

RV_2024_02 Cement

Sample:	**FLX-1005**	**Reprod. s.d.:**	**0,007 %**
Measurand:	**Cl**	**Repeat. s.d:**	**0,001 %**
Mean ± U(Mean):	**0,072 ± 0,006 %**	**Range of tolerance:**	**0,057 - 0,086 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**10**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
11	0,071	0,077	0,074	0,004	0,3	XRF (fusion)	no accredition	
12	0,073	0,073	0,073	0,000	0,2	Other Method	ISO 17025	DIN EN 196-2
13	0,038	0,038	0,038	0,000	-4,6	XRF (pressed pellet)	no accredition	Info only
14	0,101	0,099	0,100	0,001	3,9	XRF (fusion)	no accredition	By calculation
16	0,071	0,070	0,071	0,001	-0,2	Other Method	no accredition	DIN EN 196-2
22	0,075	0,076	0,075	0,001	0,5	Other Method	no accredition	DIN EN 196-2
23	0,057	0,057	0,057	0,000	-2,0	XRF (fusion)	ISO 17025	
25	0,072	0,071	0,071	0,001	0,0	XRF (fusion)	no accredition	

RV_2024_02 Cement

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
27	0,055	0,055	0,055	0,000	-2,3	XRF (pressed pellet)	no accredition	Info only
28	0,067	0,068	0,068	0,001	-0,6	Other Method	no accredition	DIN EN 196-2
29	0,069	0,069	0,069	0,000	-0,4	Other Method	no accredition	EN 196-2, ASTM C114
33	0,081	0,078	0,080	0,002	1,1	Other Method	no accredition	DIN EN 196-2, w et

RV_2024_02 Cement

z-scores (per sample)

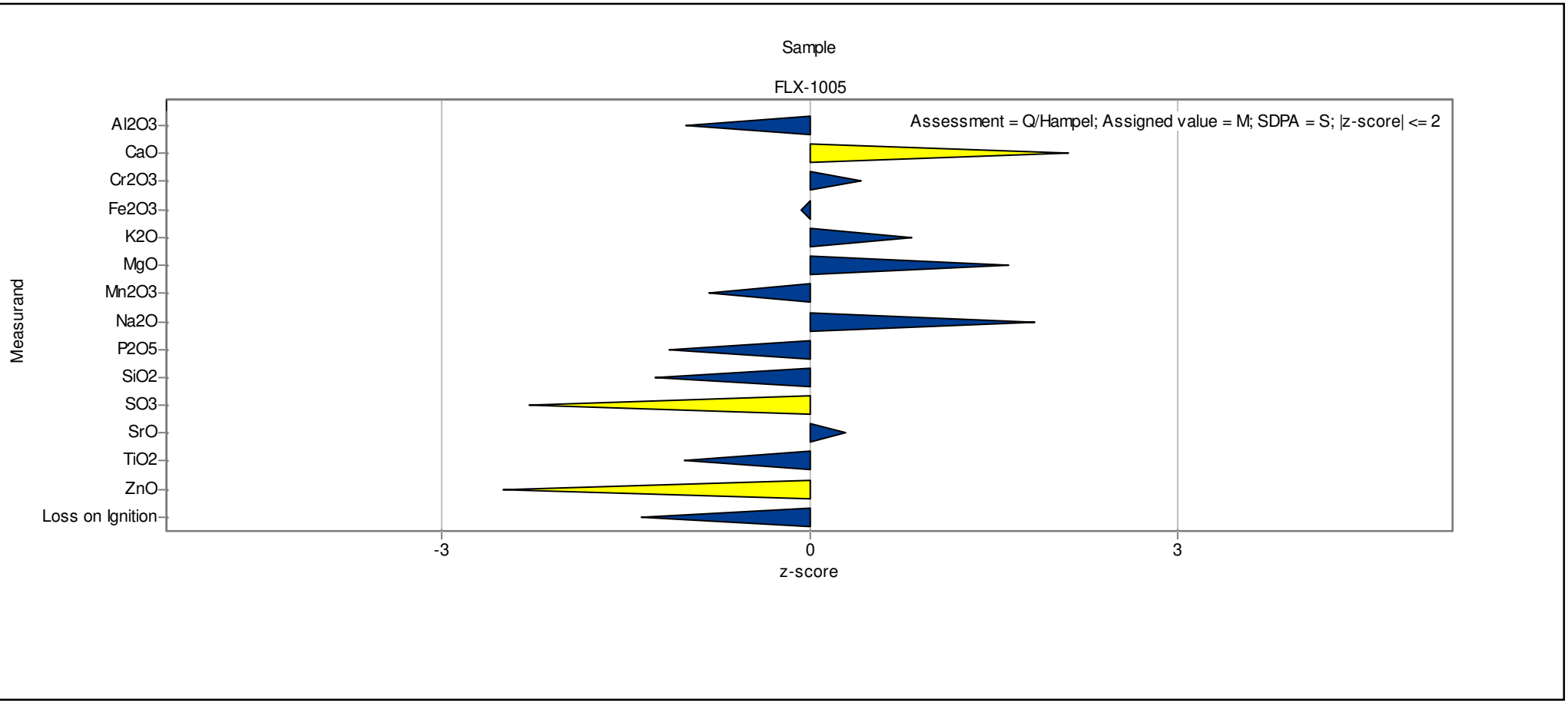
Sample: FLX-1005

Lab code	Al2O3	CaO	Cr2O3	Fe2O3	K2O	MgO	Mn2O3	Na2O	P2O5	SiO2	SO3	SrO	TiO2	ZnO	Loss on Ignition	Cl
10	-1,0	2,1	0,4	-0,1	0,8	1,6	-0,8	1,8	-1,2	-1,3	-2,3	0,3	-1,0	-2,5	-1,4	
11	-0,3	-1,0		-1,3	0,4	0,8	-0,2	0,2	-1,2	0,6	0,7	0,2	-0,9	0,1	-0,3	0,3
12	-3,4	1,0	1,3	32,8	0,9	-1,8	5,7	-1,3	2,5	-6,0	0,3	16,7	2,0	10,4	0,3	0,2
13	-2,3	1,9	121,4	8,9	1,0	-0,4	4,0	-3,1	0,5	-1,7	-2,2	24,3	-4,7	0,4	0,7	-4,6
14	2,3	-2,9		-0,3	1,1	0,5	7,0	0,2	8,5	0,7	-5,2	-7,1	0,2	7,8	0,5	3,9
15	0,1	0,1	-1,0	0,7	-0,7	-0,3	0,2		-1,2	0,2	1,1	0,2	-0,5	0,6	0,6	
16	0,4	-0,8	-0,2	-0,8	-0,3	-0,5	0,9	-0,4	-0,5	0,5	-0,4	0,4	0,4	-0,4	-0,5	-0,2
17	-0,3	-0,4	-0,3	-0,3	-0,1	1,0	-0,2	0,3	0,0	0,1	0,5		-0,1	-0,1	0,7	
18	0,3	-0,5		-0,5	-0,8	0,7	-0,1	1,1	1,2	-0,6	-0,3	-17,2	-0,3	-0,1	-1,8	
19	0,0	0,9	-1,6	-0,4	-1,1	0,1	0,6	0,4	0,7	-0,5	-0,1	0,0	-0,7	-0,6	0,5	
20	0,2	-0,4	1,4	-0,1	0,3	0,0	0,2	-1,1	0,1	0,7	-0,1	-1,4	-0,6	2,0	1,4	
21	-2,1	-0,8		-0,1	4,3	-12,0	-1,4		25,6	-2,7	-1,3		-2,8		-0,8	
22	-0,9	0,3	0,0	-0,3	-1,7	-0,3	0,4	0,7	-1,2	-1,3	3,1	0,0	1,4	0,8	-1,4	0,5
23	0,9	0,0	0,0	-0,3	0,2	-0,8	-0,1	0,1	1,1	0,4	0,7	0,4	-0,2	-0,4	-0,2	-2,0
24	0,6	0,3	-0,7	-0,8	0,3	0,2	0,5	0,6	0,0	1,0	0,7	-0,5	-0,1	0,4	-0,2	
25	0,3	-0,2	0,3	0,5	-0,3	0,0	-2,0	0,0	0,7	0,9	0,6	0,3	0,2	-0,1	-0,4	0,0
26	0,9	0,1	-0,2	0,6	0,2	0,7	-0,4	0,8	0,3	1,1	0,5	-0,8	-0,4	-0,1	-0,2	
27	-0,6	-0,7	-0,2	-0,3	-0,2	-0,8	0,0	0,2	0,0	-0,8	-0,6	-0,8	0,4	-1,3	1,4	-2,3
28	0,3	-0,1	0,4	0,9	0,6	0,3	0,5	0,1	0,0	0,2	0,0	0,3	0,1	0,8	0,2	-0,6
29	0,6	-0,5	0,3	3,2	-0,7	0,5	1,1	-0,7	-0,5	0,7	-0,6	0,2	1,7	0,1	-0,4	-0,4
30	1,6	5,7		1,9	-3,5	-2,9	0,3	-5,0	-0,2	1,3	0,1		5,5		2,3	
31	-0,7	1,0		0,1	-0,2	-4,6	0,0	-1,9	0,0	-1,5	-0,5	0,4	-0,2	-0,1	-0,5	
32	0,2	0,2		0,1	1,0	-0,1	-0,6	-1,9	0,0	0,5	0,4	0,9	0,9		0,7	
33	-0,6	6,5	-1,2	-2,3	-7,1	3,5	-1,3		14,0	-1,5	-0,2	-0,1	-5,6	-0,8	-0,9	1,1

RV_2024_02 Cement

Laboratory chart of z-scores

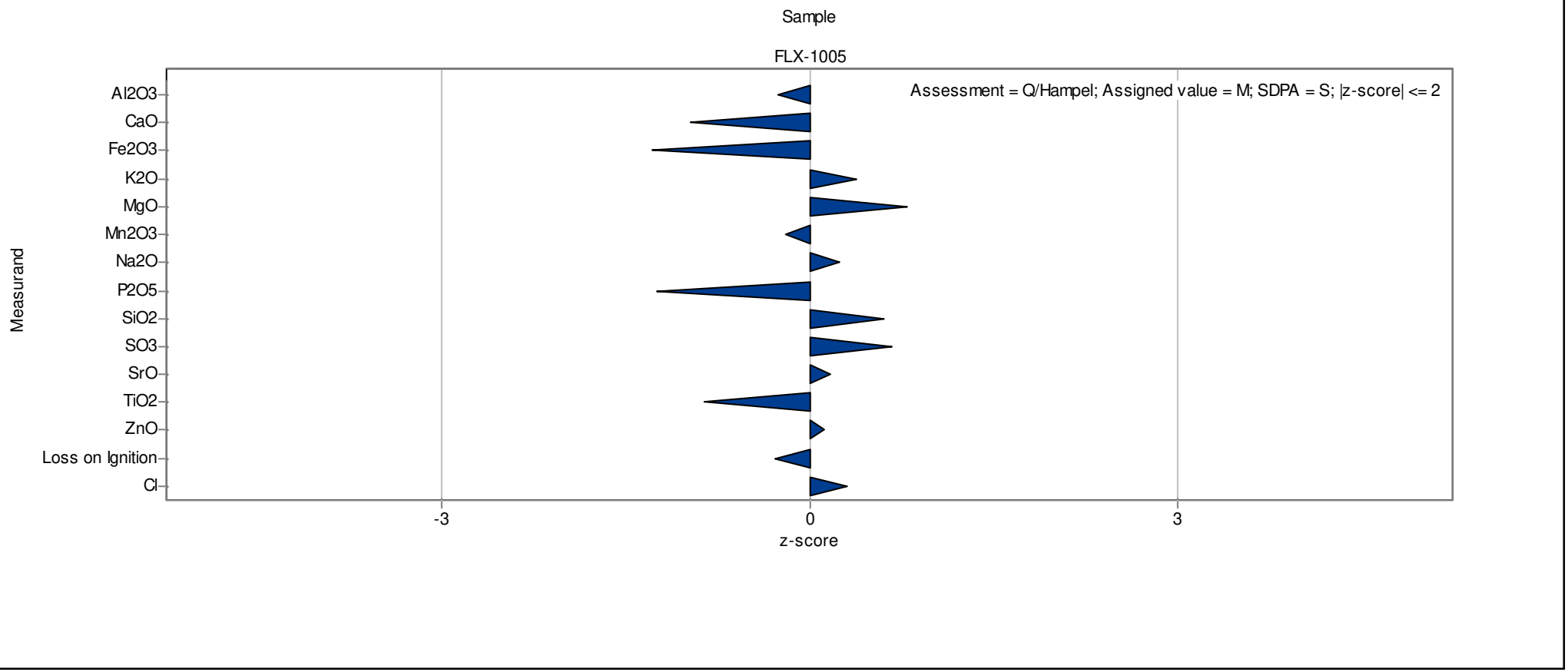
Laboratory: 10



RV_2024_02 Cement

Laboratory chart of z-scores

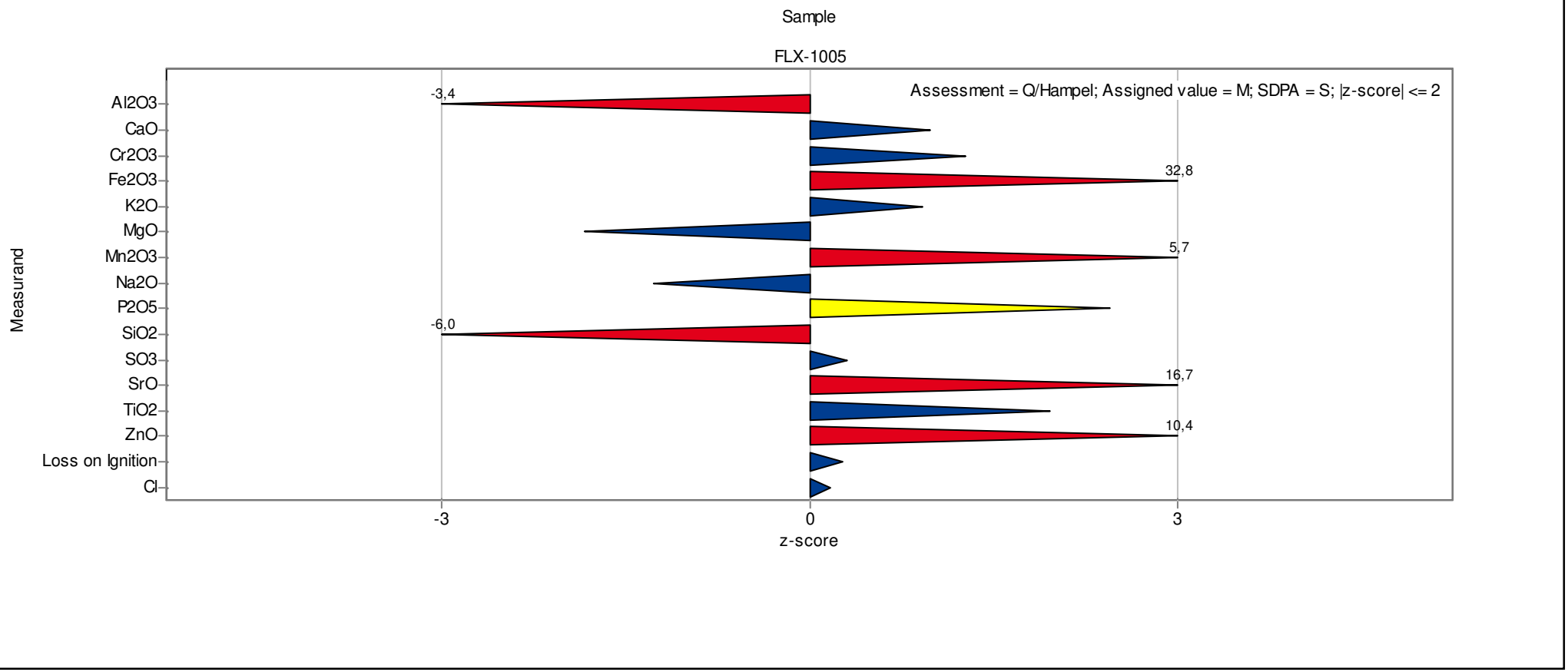
Laboratory: 11



RV_2024_02 Cement

Laboratory chart of z-scores

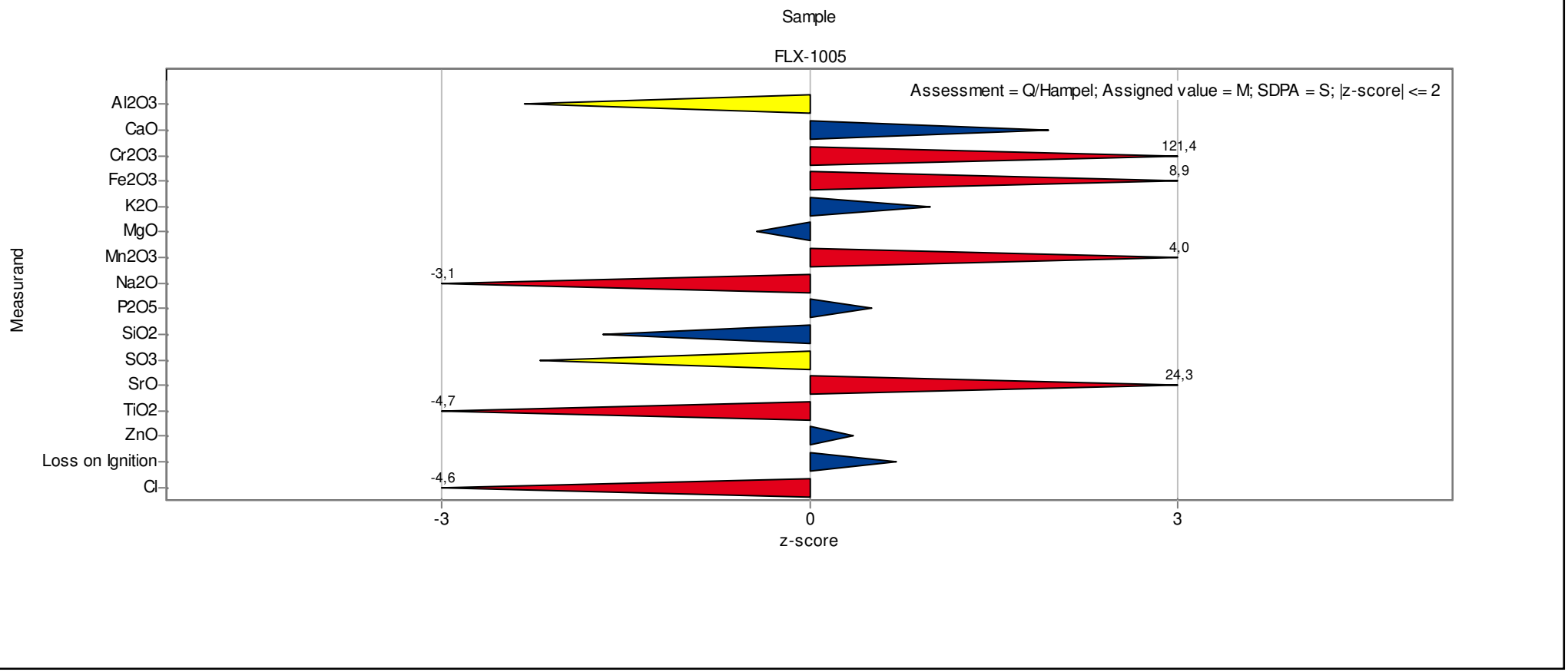
Laboratory: 12



RV_2024_02 Cement

Laboratory chart of z-scores

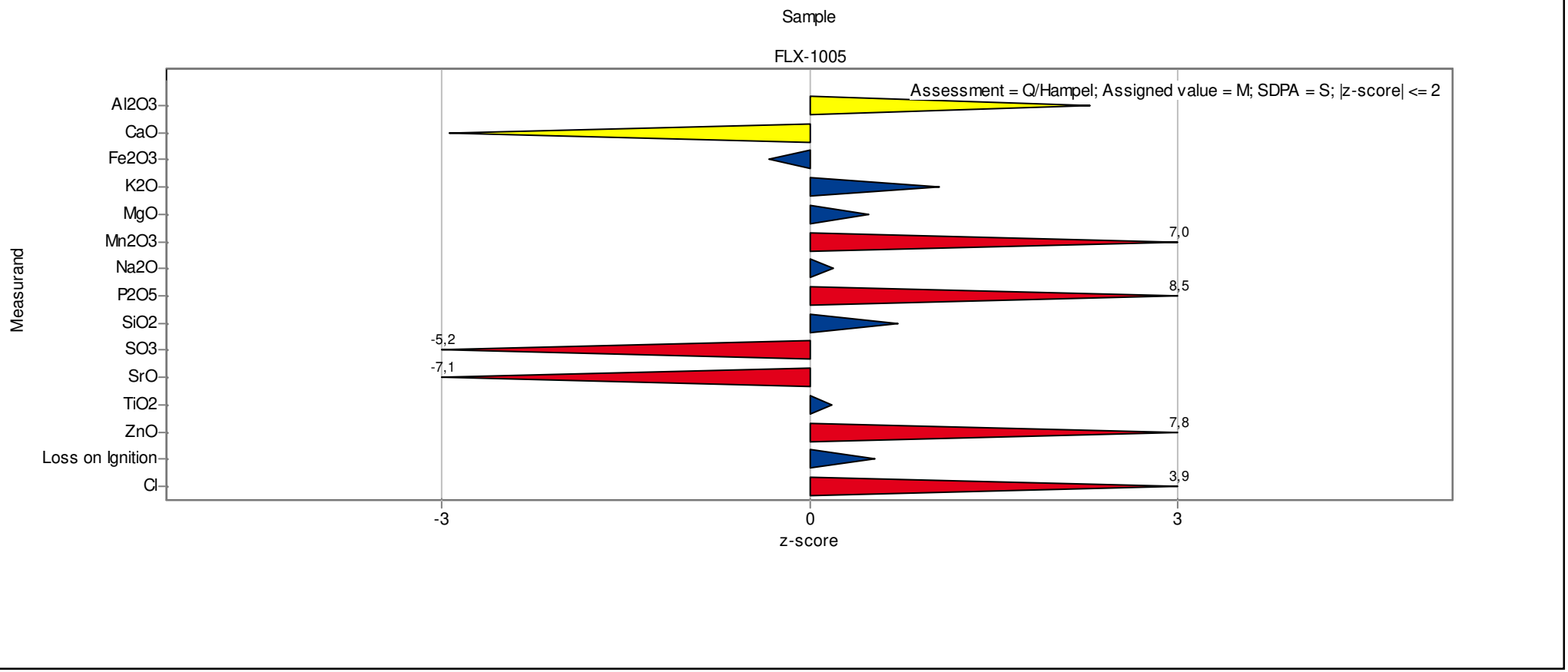
Laboratory: 13



RV_2024_02 Cement

Laboratory chart of z-scores

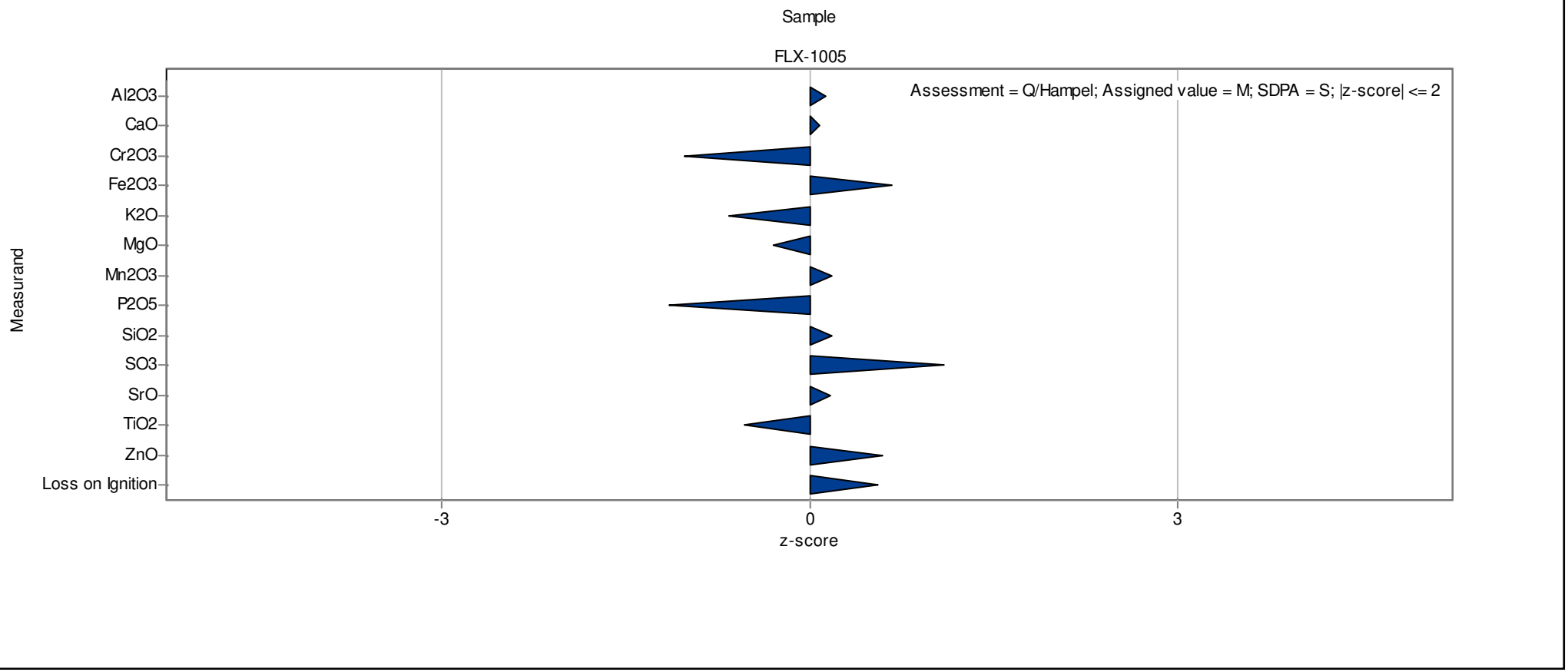
Laboratory: 14



RV_2024_02 Cement

Laboratory chart of z-scores

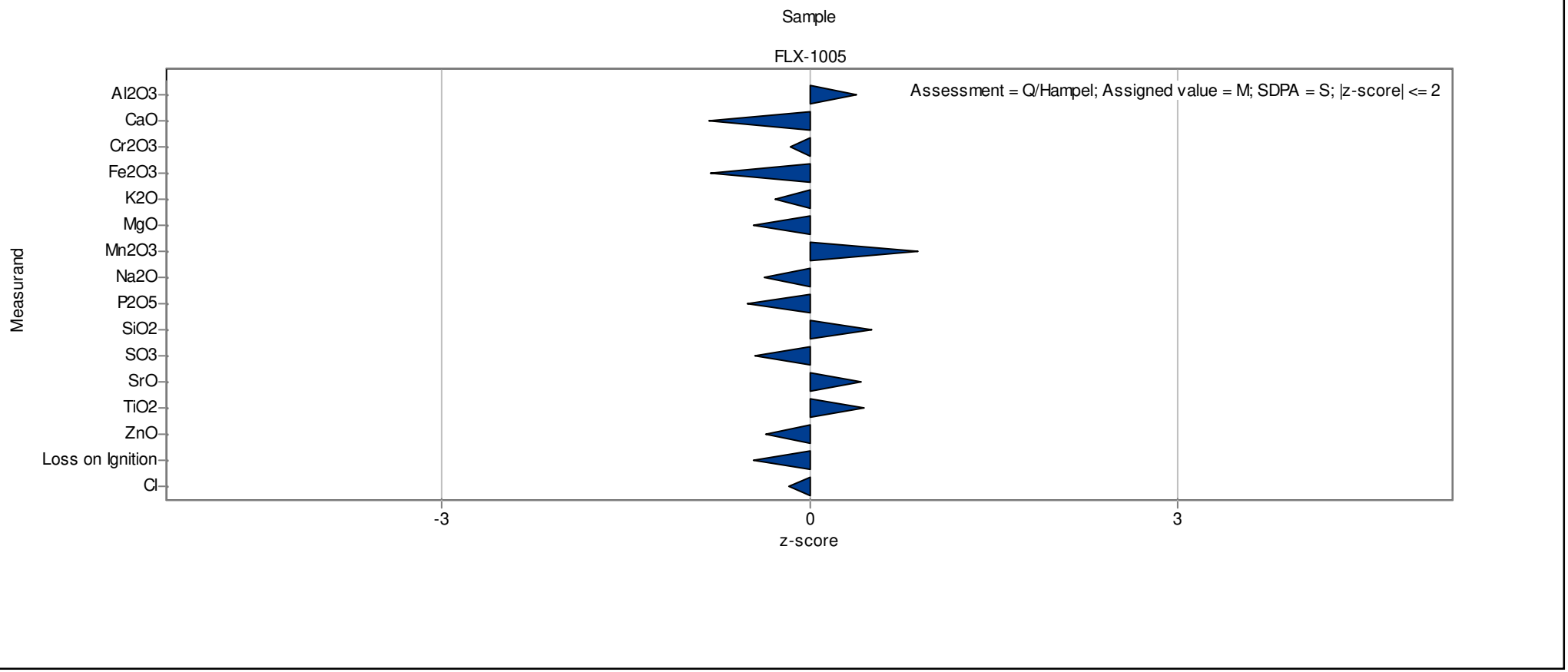
Laboratory: 15



RV_2024_02 Cement

Laboratory chart of z-scores

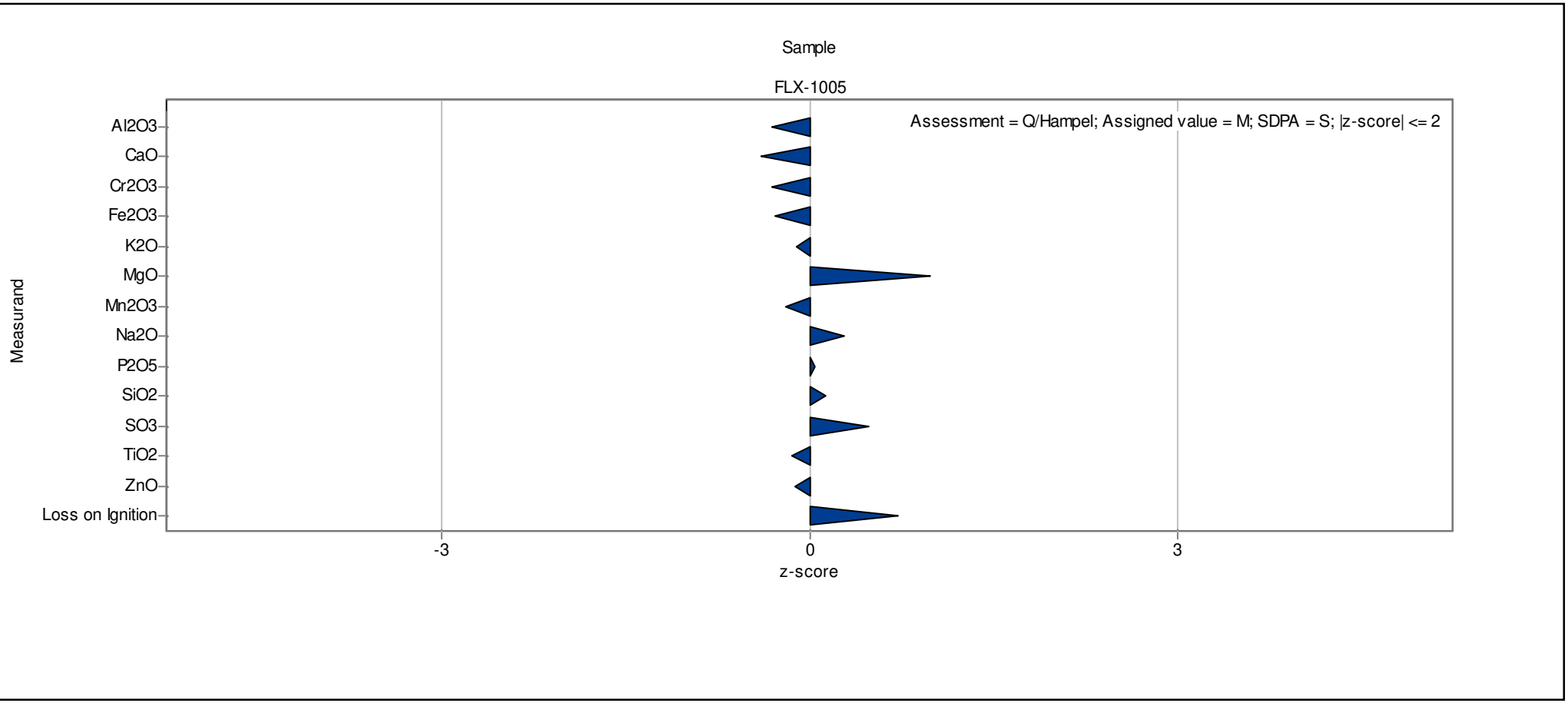
Laboratory: 16



RV_2024_02 Cement

Laboratory chart of z-scores

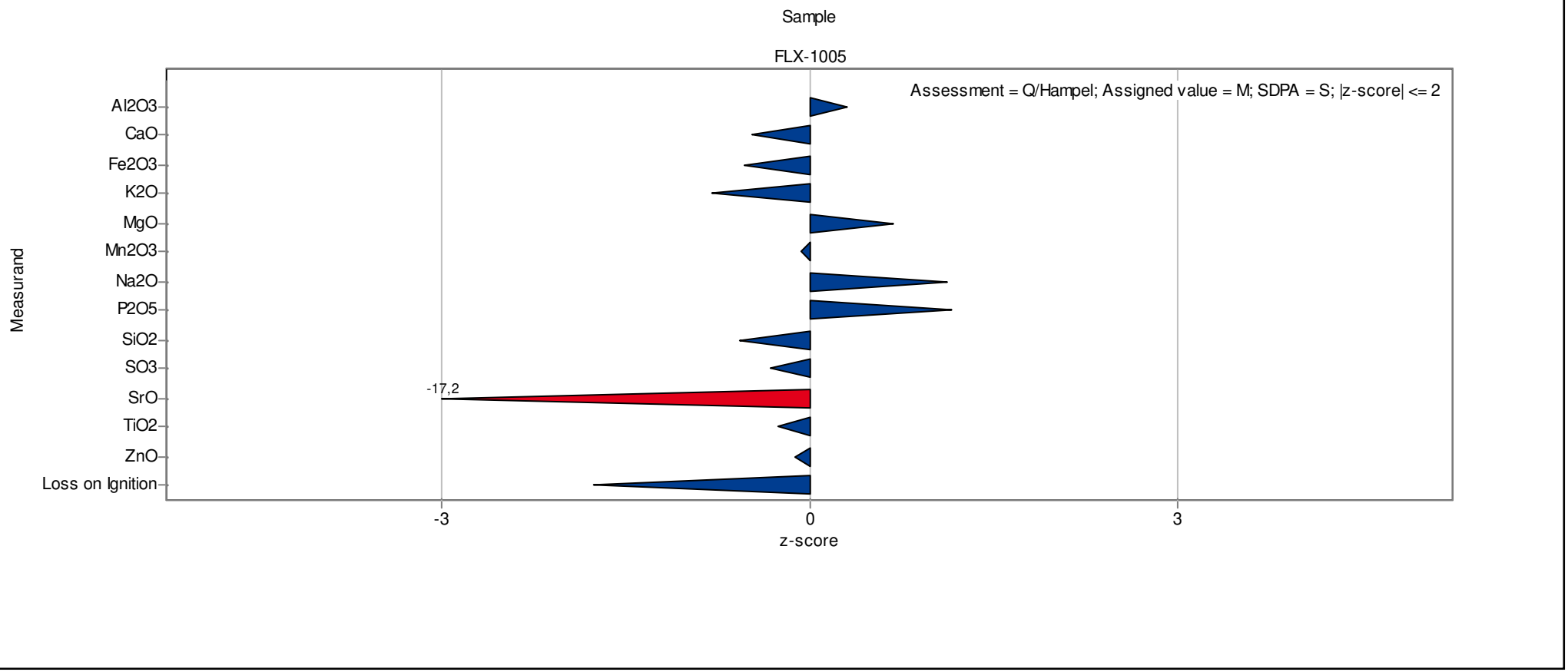
Laboratory: 17



RV_2024_02 Cement

Laboratory chart of z-scores

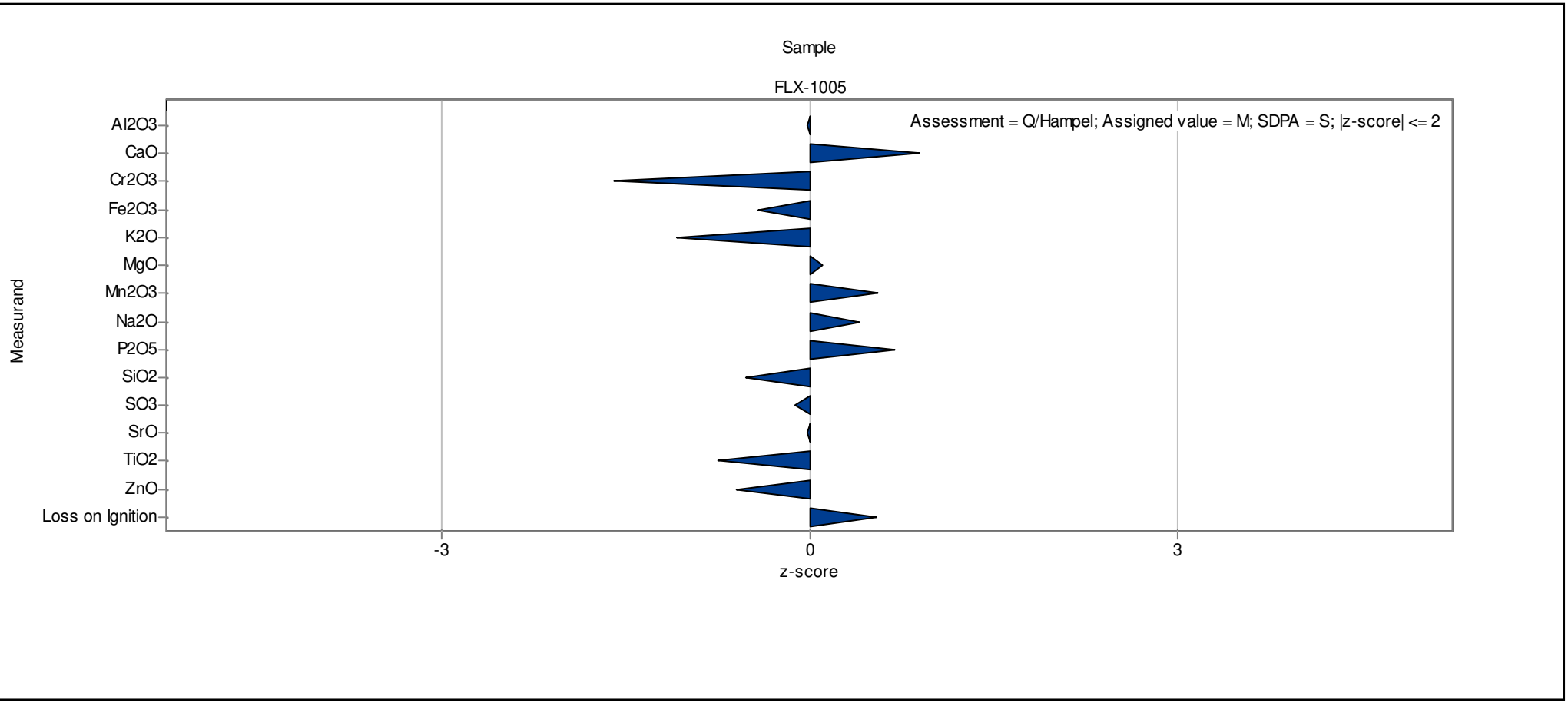
Laboratory: 18



RV_2024_02 Cement

Laboratory chart of z-scores

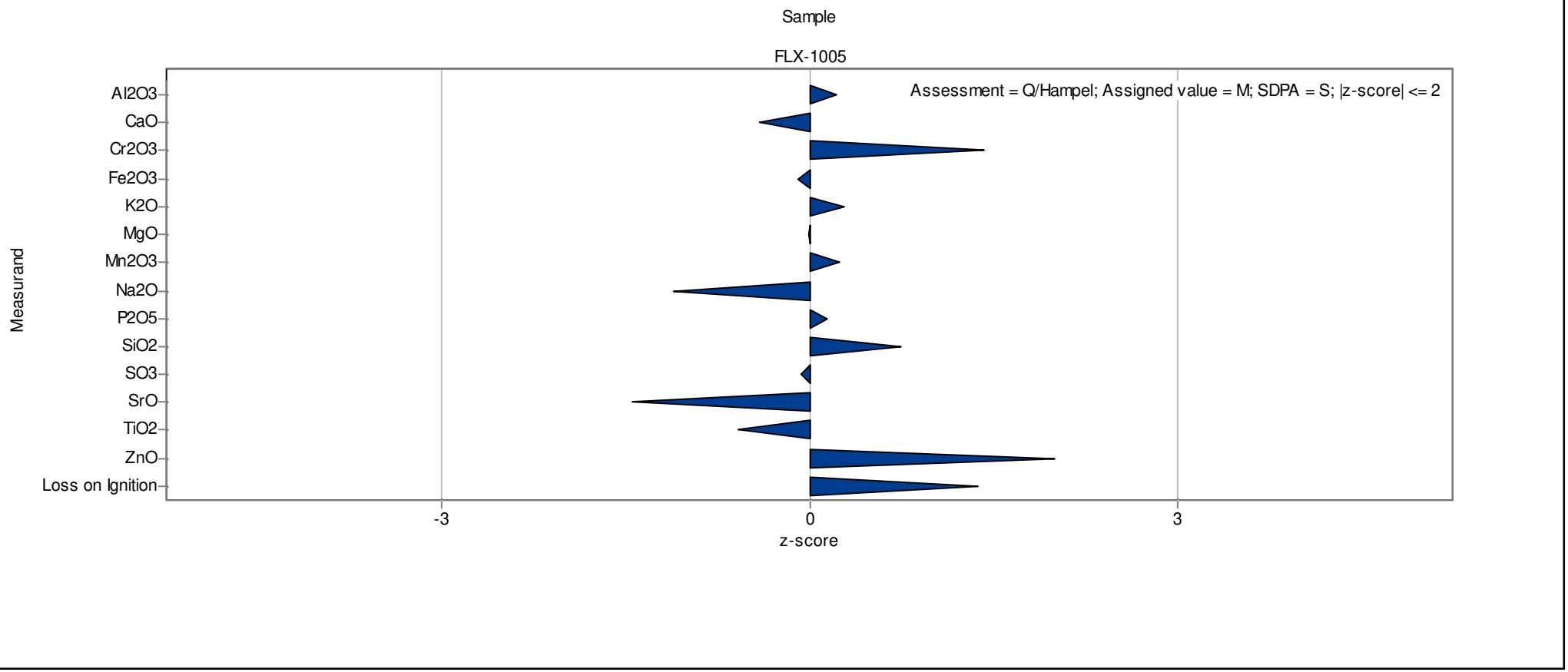
Laboratory: 19



RV_2024_02 Cement

Laboratory chart of z-scores

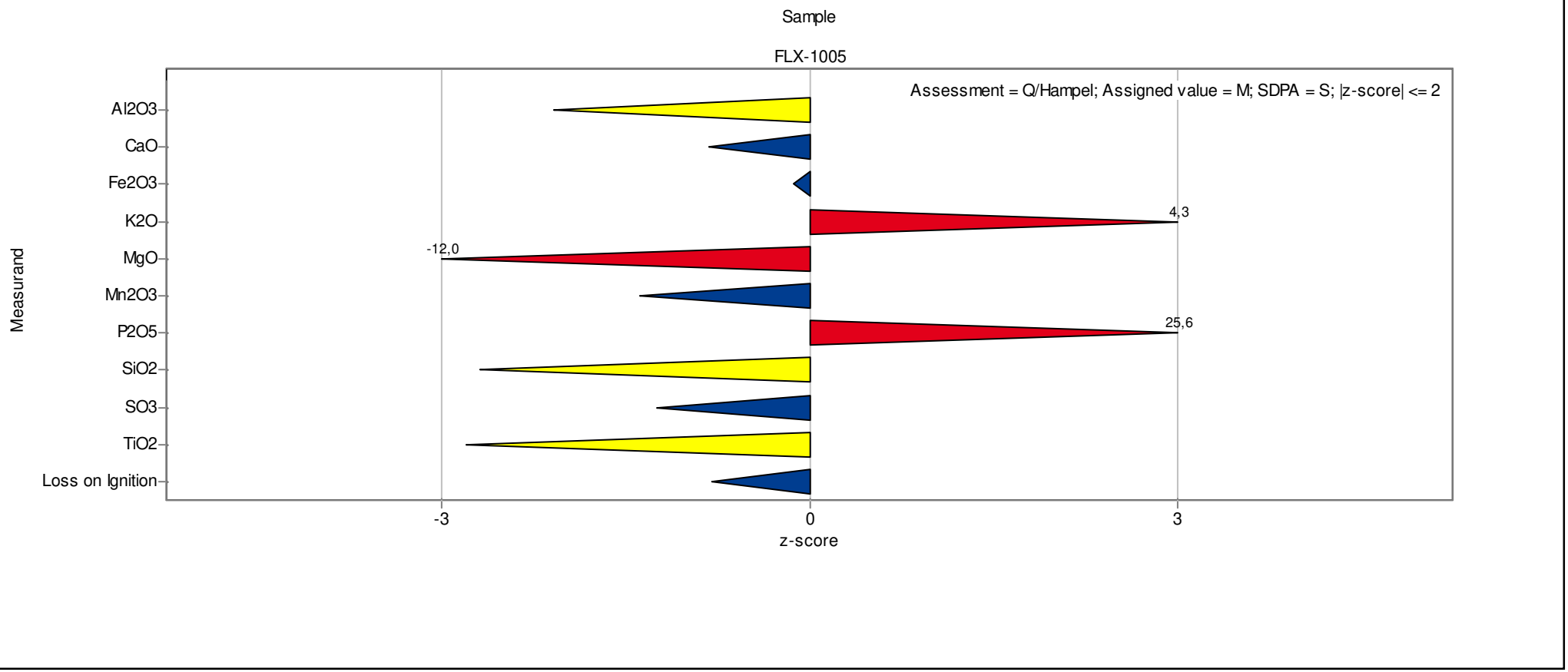
Laboratory: 20



RV_2024_02 Cement

Laboratory chart of z-scores

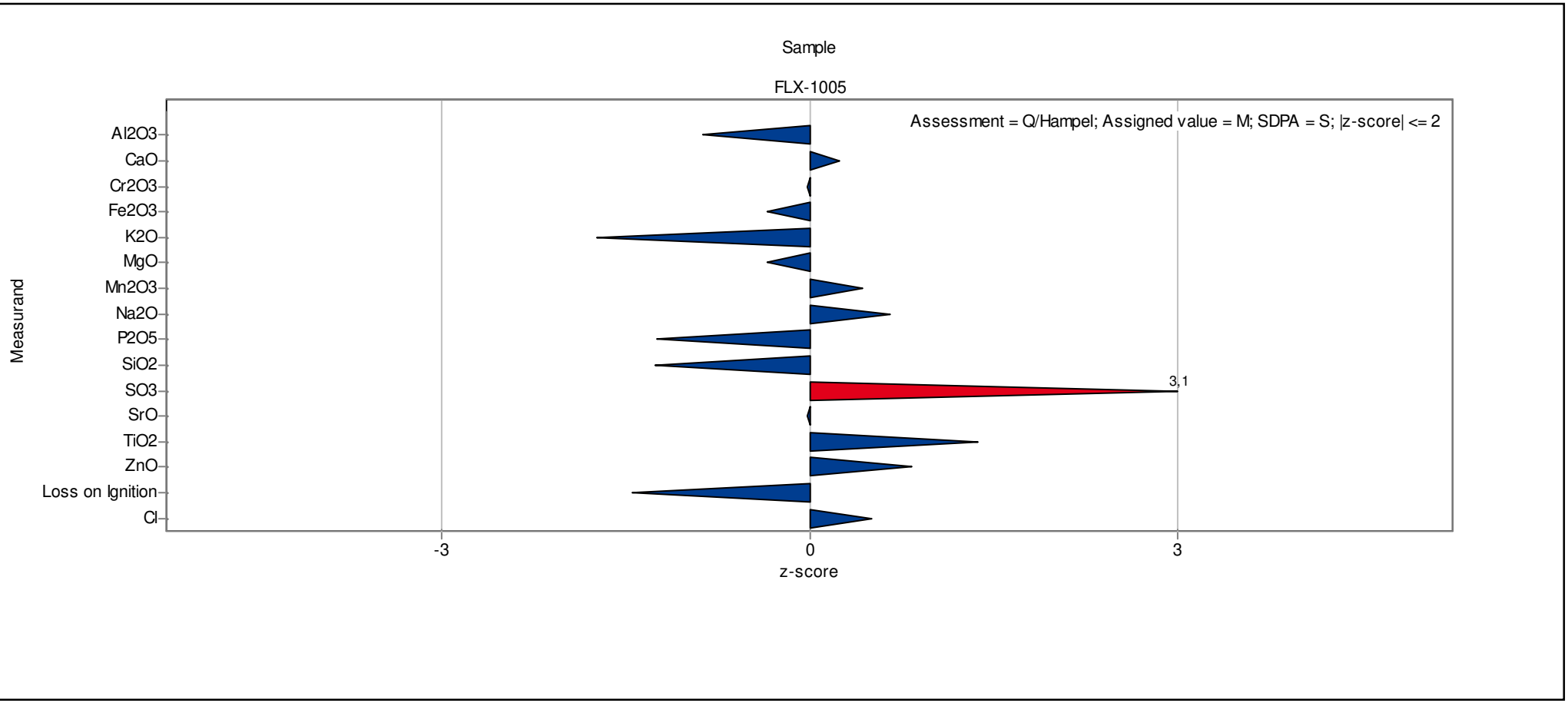
Laboratory: 21



RV_2024_02 Cement

Laboratory chart of z-scores

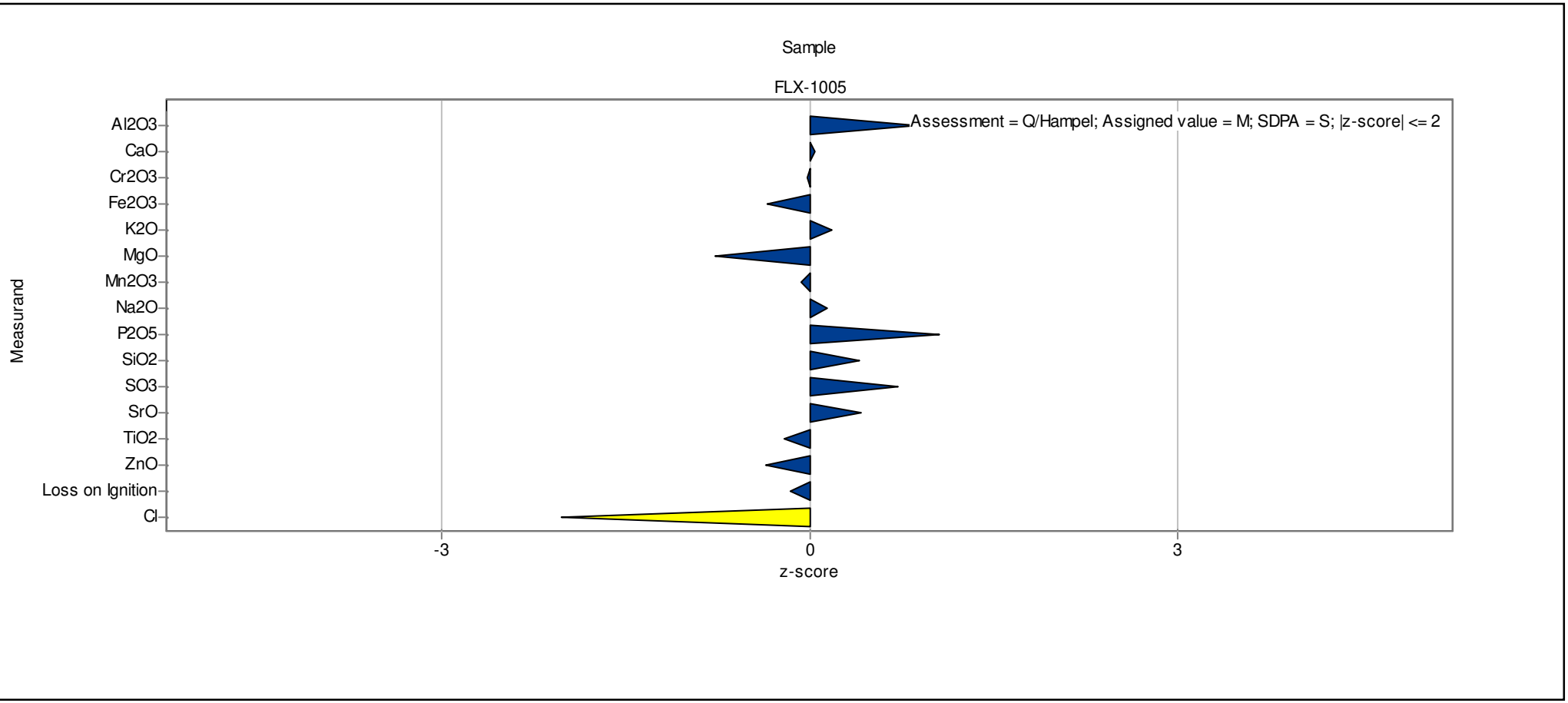
Laboratory: 22



RV_2024_02 Cement

Laboratory chart of z-scores

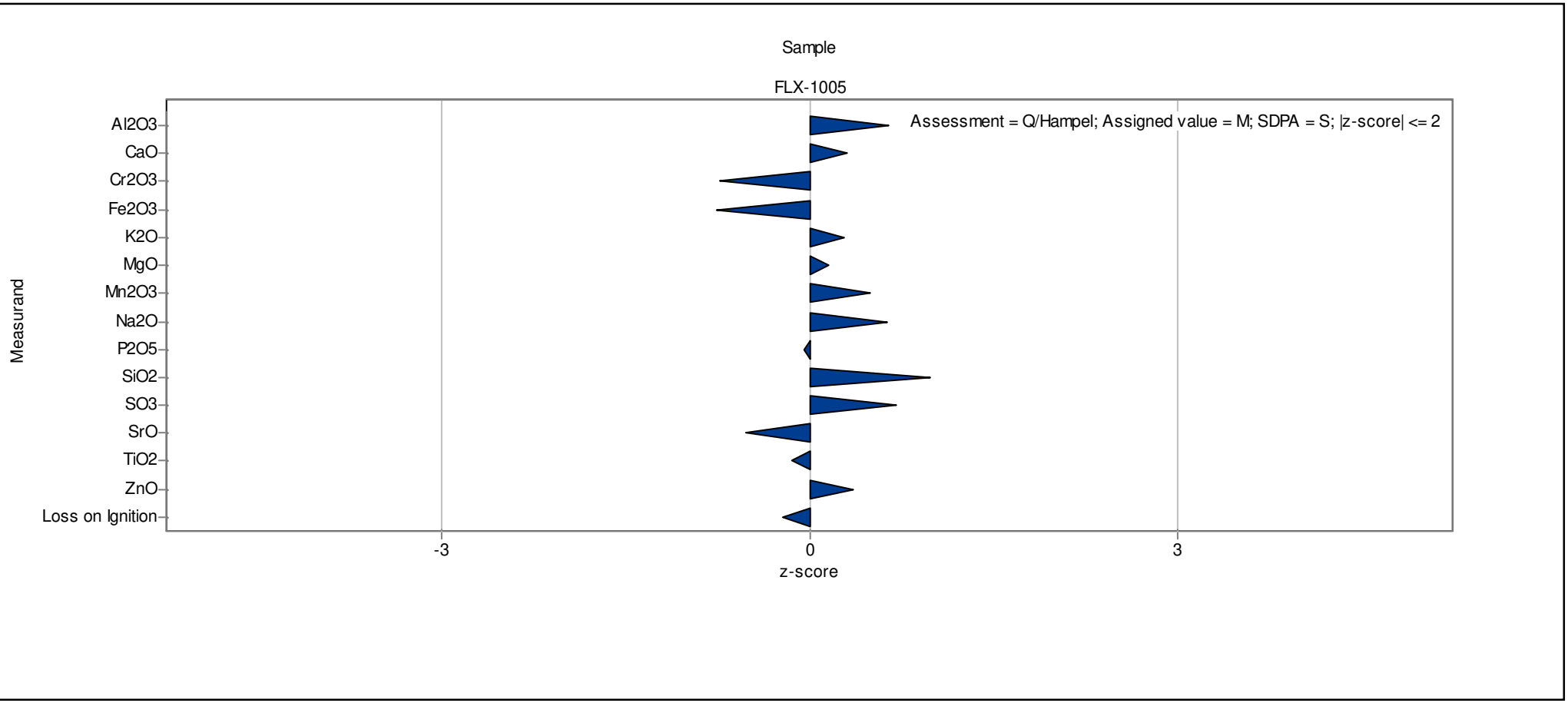
Laboratory: 23



RV_2024_02 Cement

Laboratory chart of z-scores

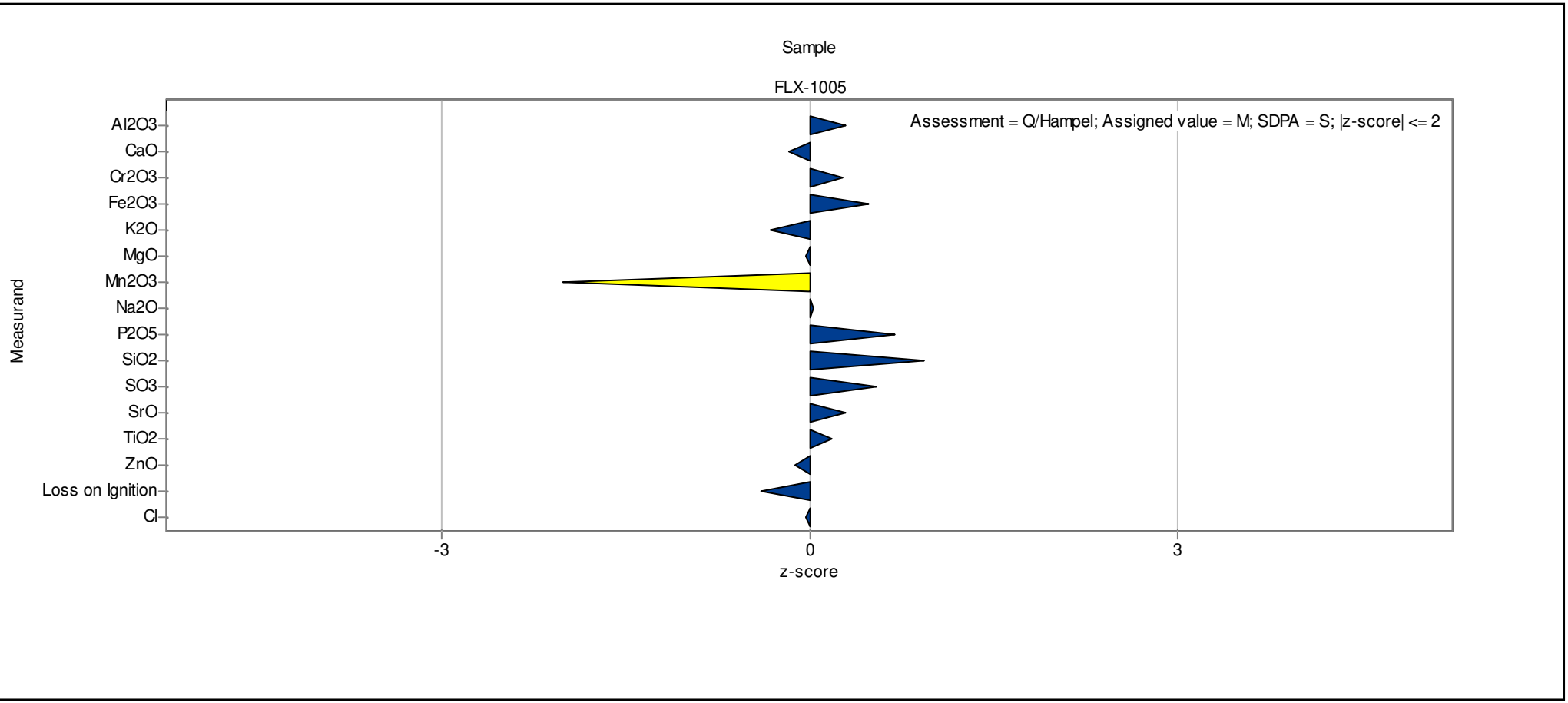
Laboratory: 24



RV_2024_02 Cement

Laboratory chart of z-scores

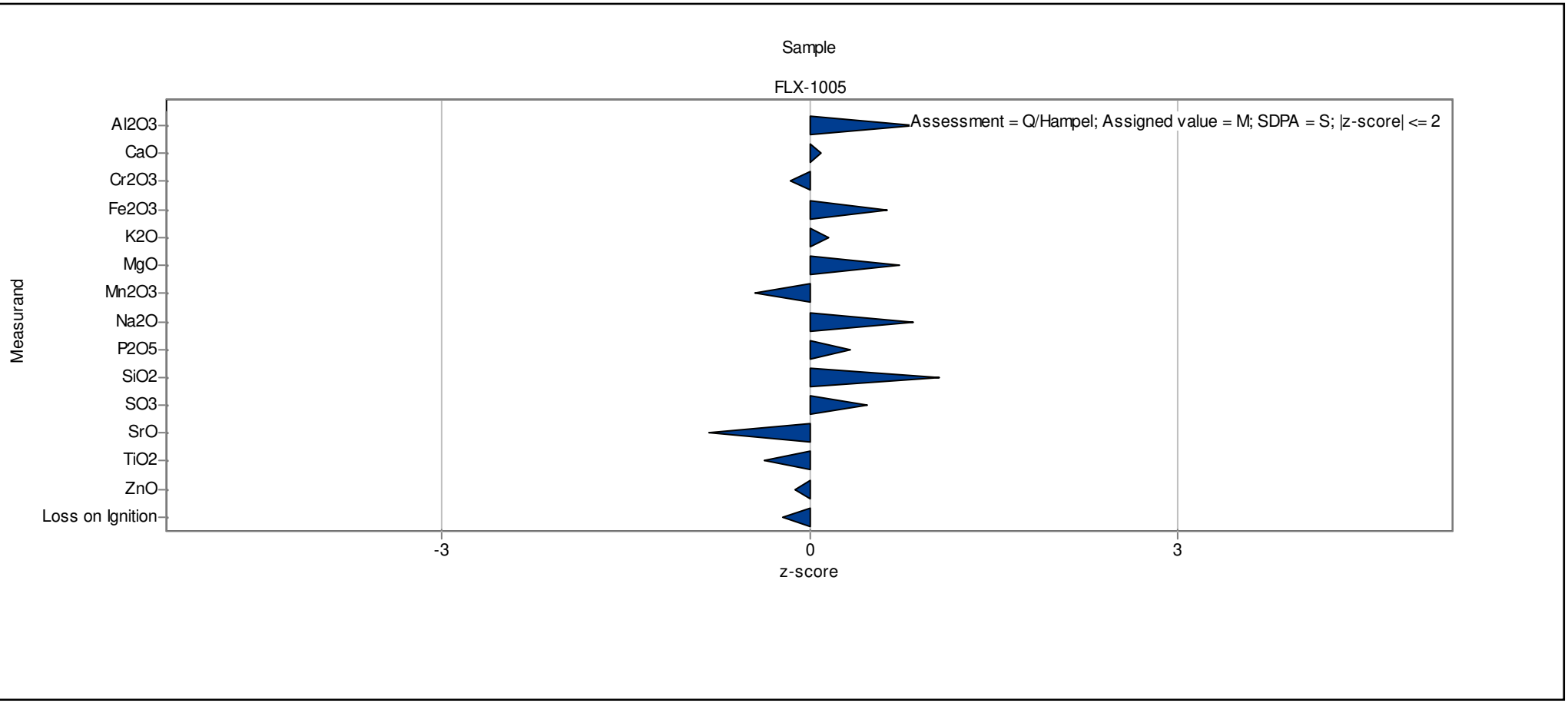
Laboratory: 25



RV_2024_02 Cement

Laboratory chart of z-scores

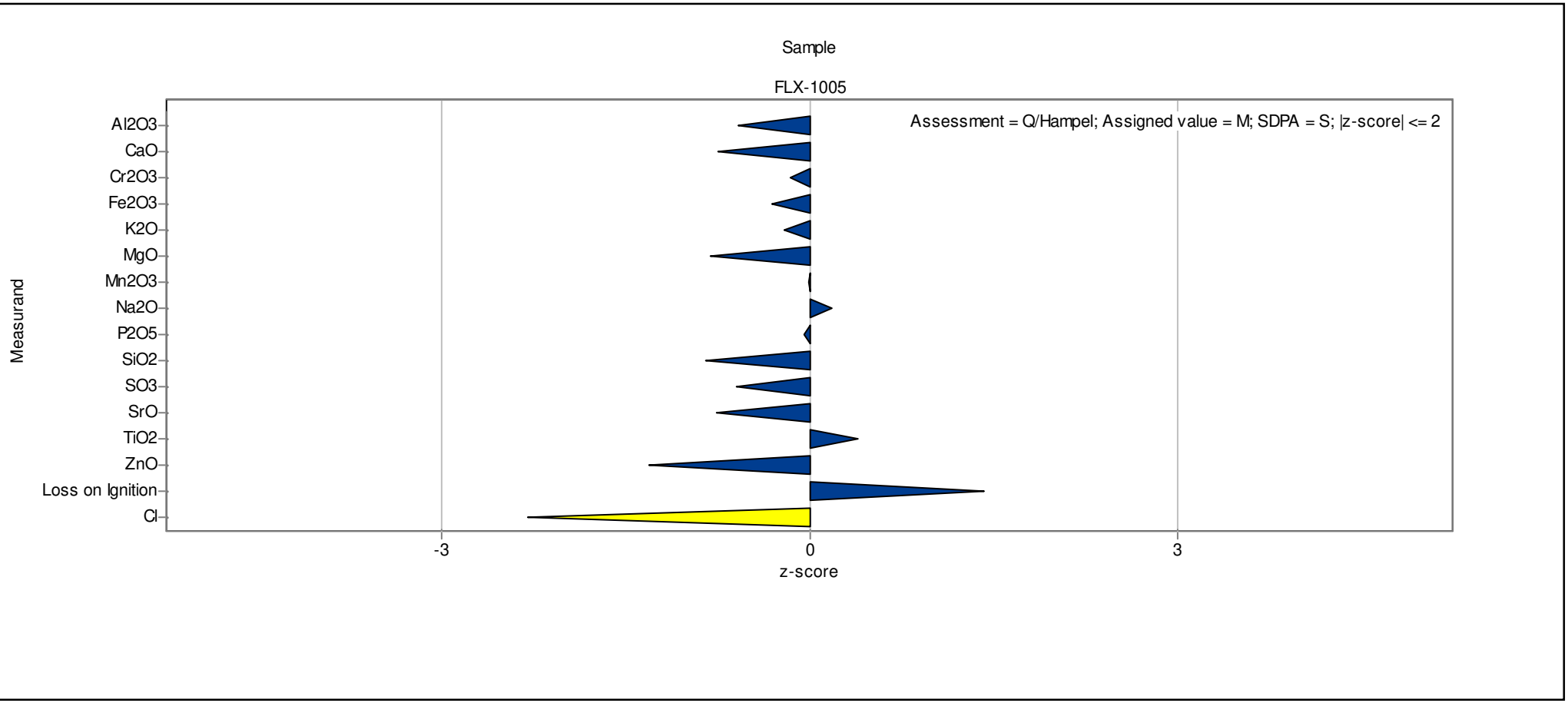
Laboratory: 26



RV_2024_02 Cement

Laboratory chart of z-scores

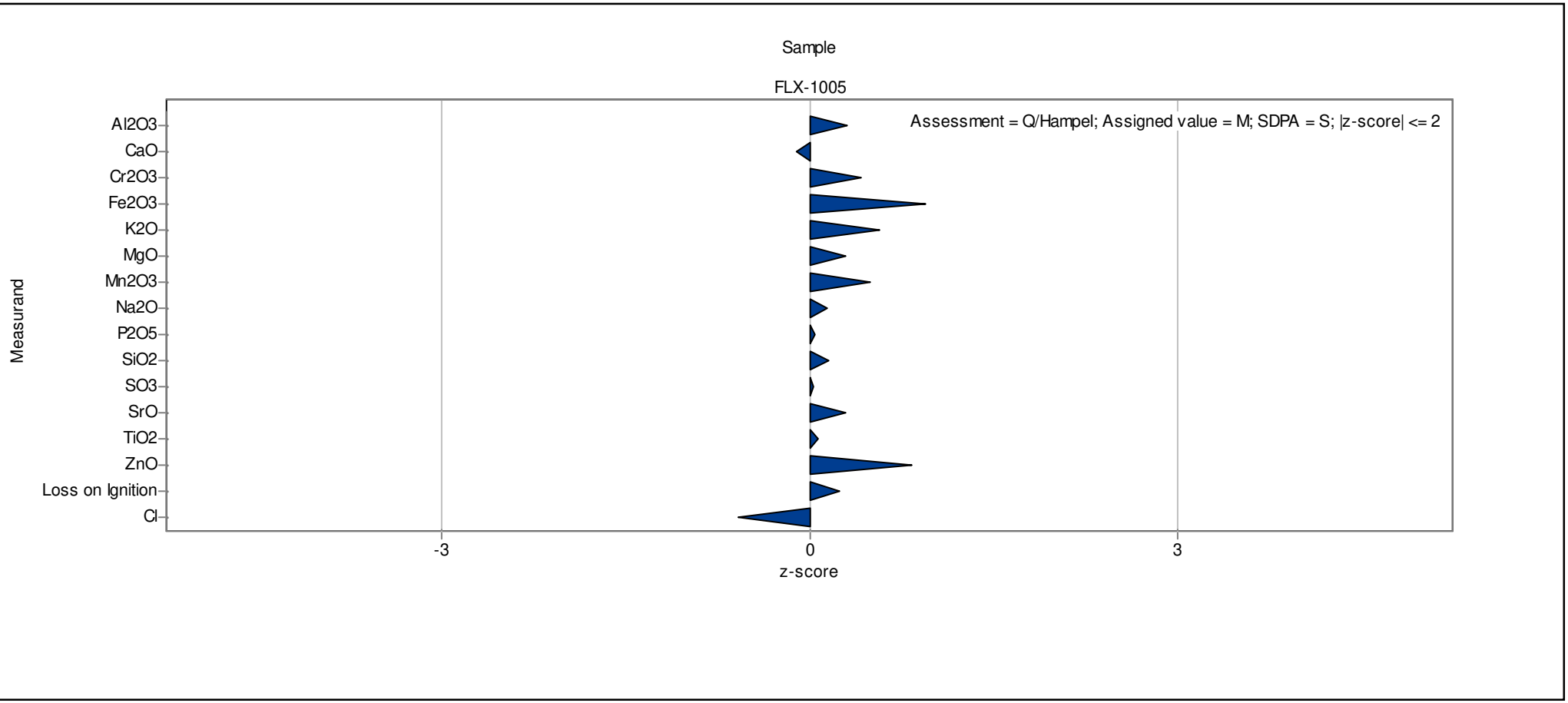
Laboratory: 27



RV_2024_02 Cement

Laboratory chart of z-scores

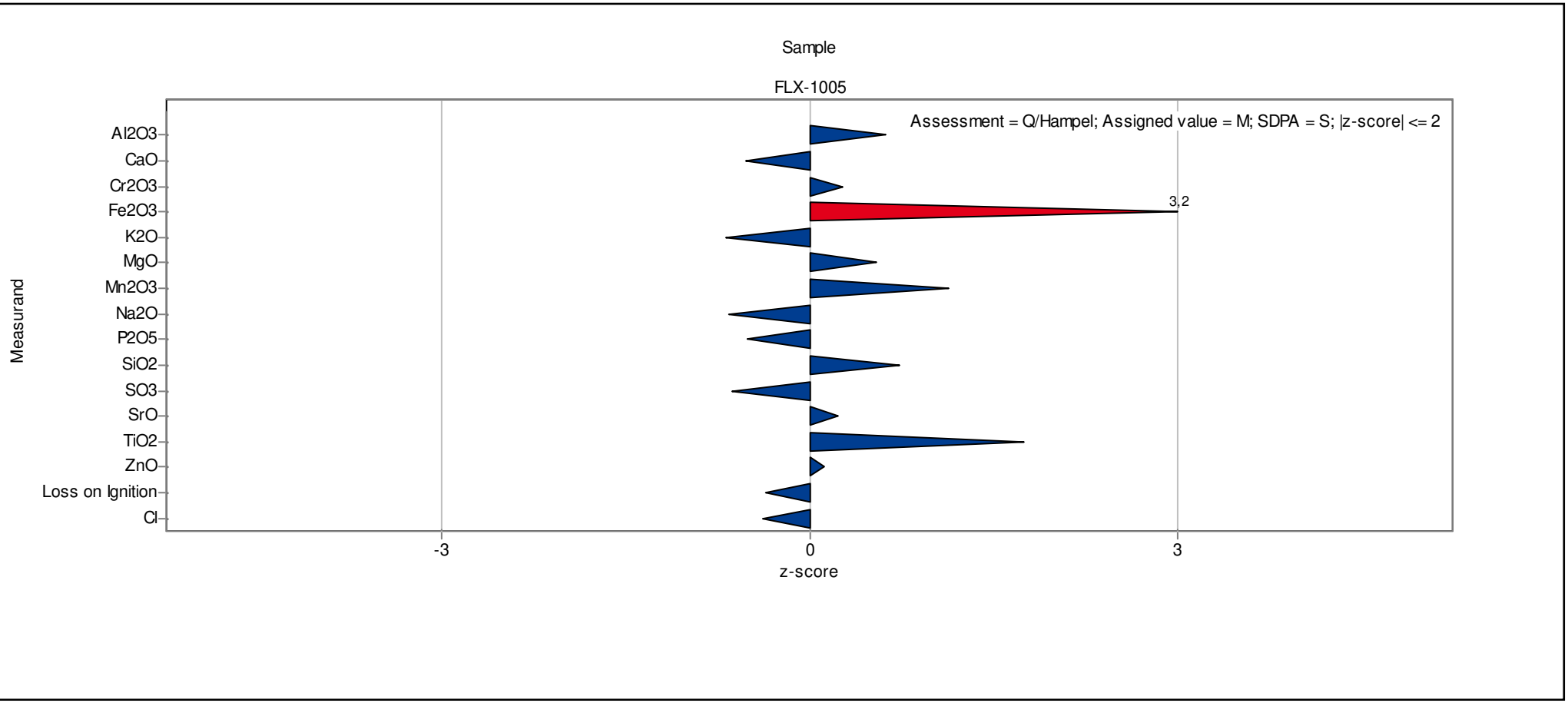
Laboratory: 28



RV_2024_02 Cement

Laboratory chart of z-scores

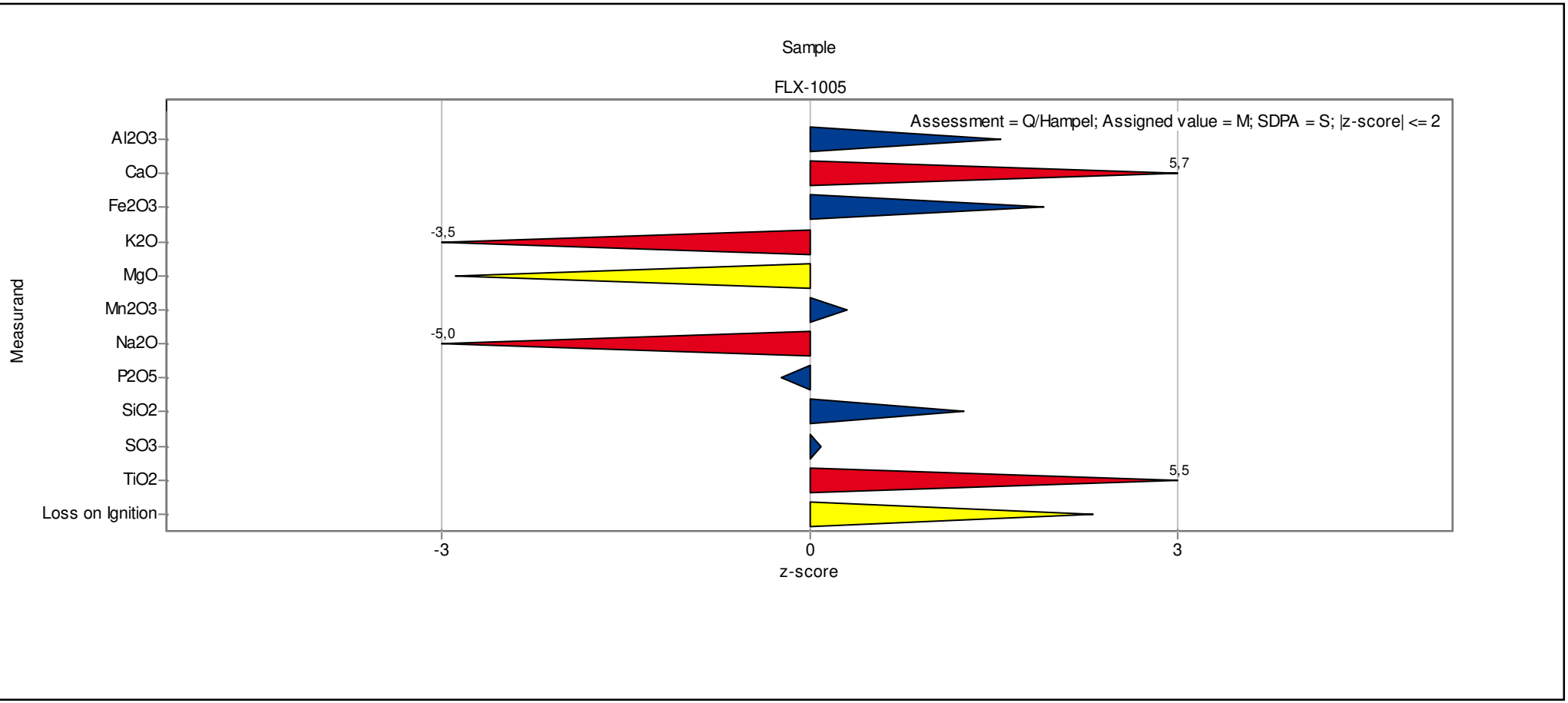
Laboratory: 29



RV_2024_02 Cement

Laboratory chart of z-scores

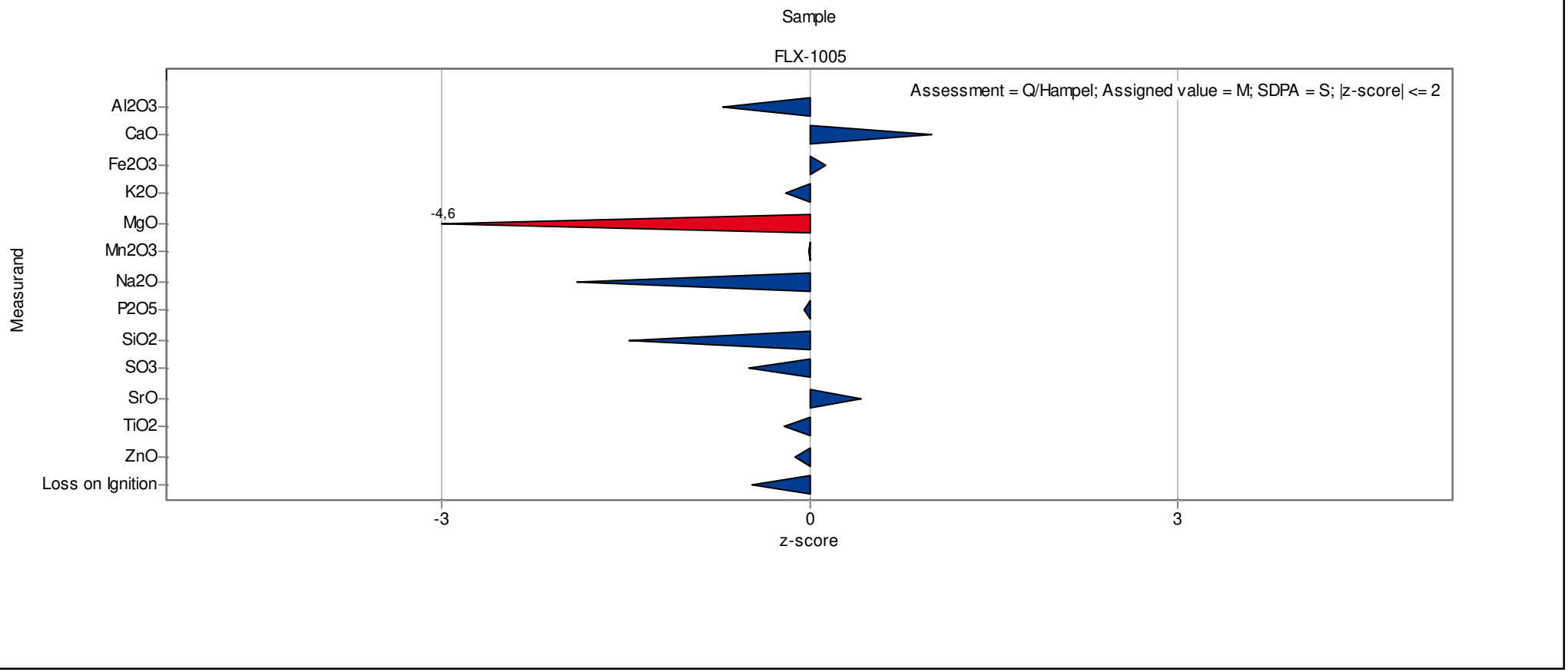
Laboratory: 30



RV_2024_02 Cement

Laboratory chart of z-scores

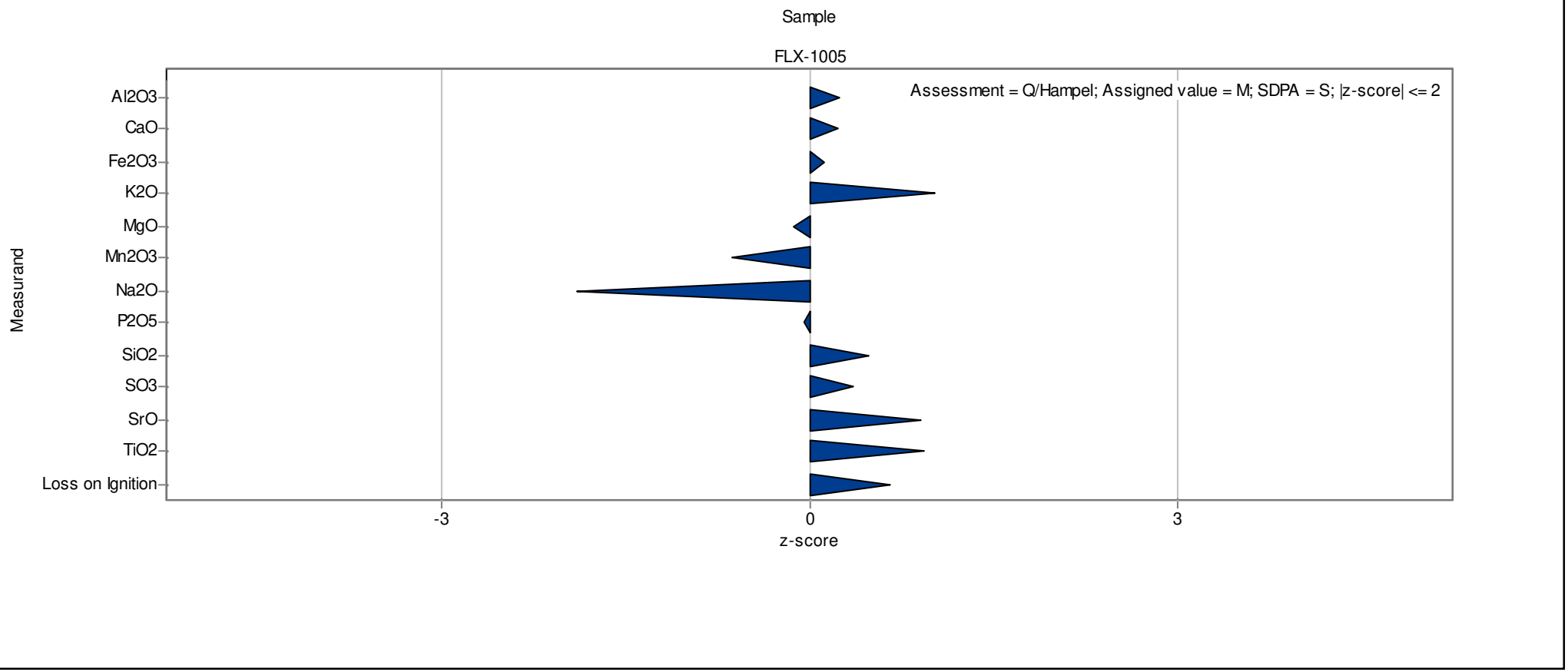
Laboratory: 31



RV_2024_02 Cement

Laboratory chart of z-scores

Laboratory: 32



RV_2024_02 Cement

Laboratory chart of z-scores

Laboratory: 33