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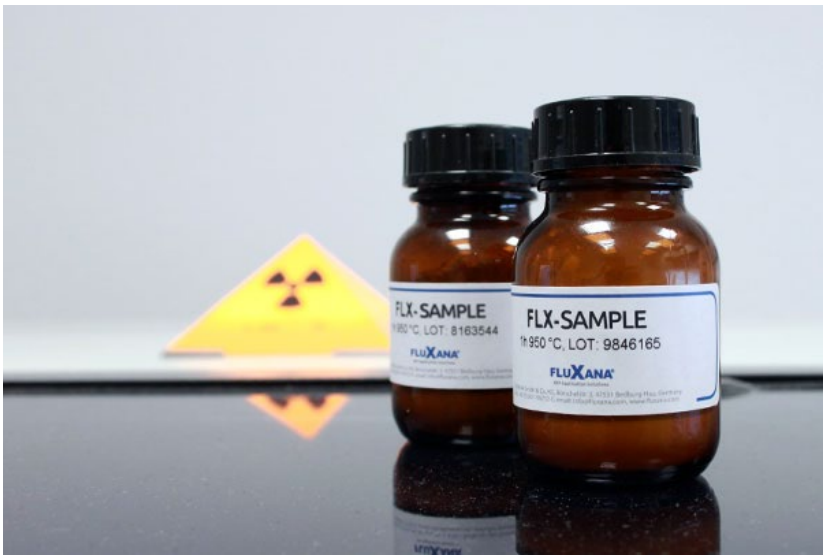
XRF Application Solutions

RV-2022-02

Final Proficiency Test Report for cement (Correction)

FLX-1003



Bedburg-Hau, September 26th, 2022

Coordinator of PT
Charlotte Winkels-Herding

Statistics and Report
Susan Aschenbrenner

An correction has been made to Lab.code 15.
Nothing has changed on the other values!

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	Al2O3	CaO	Fe2O3	K2O	MgO	Mn2O3	Na2O
Unit	%	%	%	%	%	%	%
No. of laboratories	21	20	22	21	22	20	21
Mean m	6,911	59,723	1,819	0,849	2,326	0,171	0,176
Reproducibility standard deviation s_R	0,096	0,209	0,044	0,049	0,042	0,008	0,033
Repeatability standard deviation s_r	0,019	0,085	0,007	0,010	0,009	0,002	0,007
Robust standard deviation s*	0,100	0,206	0,043	0,049	0,044	0,007	0,034
Uncertainty U (s*)	0,054	0,115	0,023	0,027	0,024	0,004	0,019
Uncertainty U (s_R)	0,052	0,117	0,023	0,027	0,022	0,004	0,018
Mean - 2*s_R	6,719	59,305	1,732	0,751	2,242	0,156	0,110
Mean + 2*s_R	7,103	60,141	1,906	0,946	2,410	0,187	0,243

	P2O5	SiO2	SO3*	TiO2	ZnO	LOI*	Cl
Unit	%	%	%	%	%	%	%
No. of laboratories	20	21	20	21	17	24	10
Mean m	0,101	23,695	3,726	0,434	0,012	7,831	0,087
Reproducibility standard deviation s_R	0,004	0,216	0,099	0,011	0,001	0,151	0,007
Repeatability standard deviation s_r	0,002	0,033	0,020	0,002	0,000	0,024	0,004
Robust standard deviation s*	0,004	0,207	0,103	0,012	0,001	0,132	0,005
Uncertainty U (s*)	0,002	0,113	0,058	0,006	0,001	0,067	0,004
Uncertainty U (s_R)	0,002	0,118	0,055	0,006	0,001	0,077	0,006
Mean - 2*s_R	0,093	23,264	3,527	0,411	0,009	7,529	0,074
Mean + 2*s_R	0,109	24,126	3,924	0,456	0,015	8,133	0,101

All values are in mass % and are based on ignited sample material, except for LOI and Cl.
*** SO3 and LOI are not corrected for possible sulfide concentrations.**

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

Institut für Erdwissenschaften	Austria
Rio Tinto Aluminium/ARDC	Canda
Lafarge Ciments / Martres-Tolosane	France
RHONE CIMENTS	France
BASF Construction Additives GmbH	Germany
Bernegger GmbH	Germany
BMI Deutschland GmbH	Germany
Bruker AXS GmbH	Germany
BWZ Frankfurt am Main; Generalzolldirektion	Germany
Chemische Fabrik Budenheim KG	Germany
Dyckerhoff GmbH	Germany
FLUXANA GmbH & Co. KG	Germany
IME Metallurgische Prozesstechnik und Metallrecycling	Germany
OPTERRA Wössingen GmbH	Germany
TU München - Centrum Baustoffe und MPA	Germany
Sharrcem shpk a Titan Cement Group	Kosovo
Franzefoss Minerals AS	Norway
NOAH Solutions AS	Norway
CRH Lab	Poland
Moravacem d.o.o.	Serbia
UIS Analytical Services	South Africa
Jura-Cement-Fabriken AG	Switzerland
Levy Technical Laboratories	United States
Zibo Refratechnik Refractories Co.,Ltd.	VR China

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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 13528:2020)

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.

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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

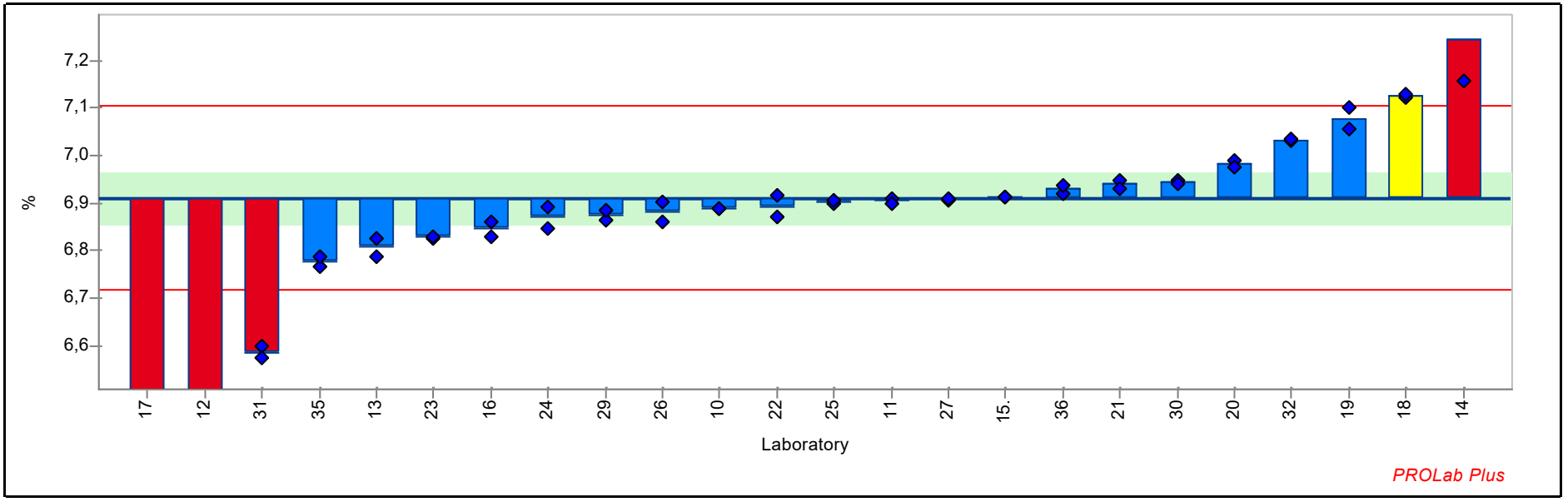
Assessment on z-scores:

$\|z\|$ <= 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.

Summary results

Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,096 %**
Measurand:	**Al2O3**	**Repeat. s.d:**	**0,019 %**
Mean ± U(Mean):	**6,911 ± 0,054 %**	**Range of tolerance:**	**6,719 - 7,103 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**21**	**Statistical method:**	**Q/Hampel**

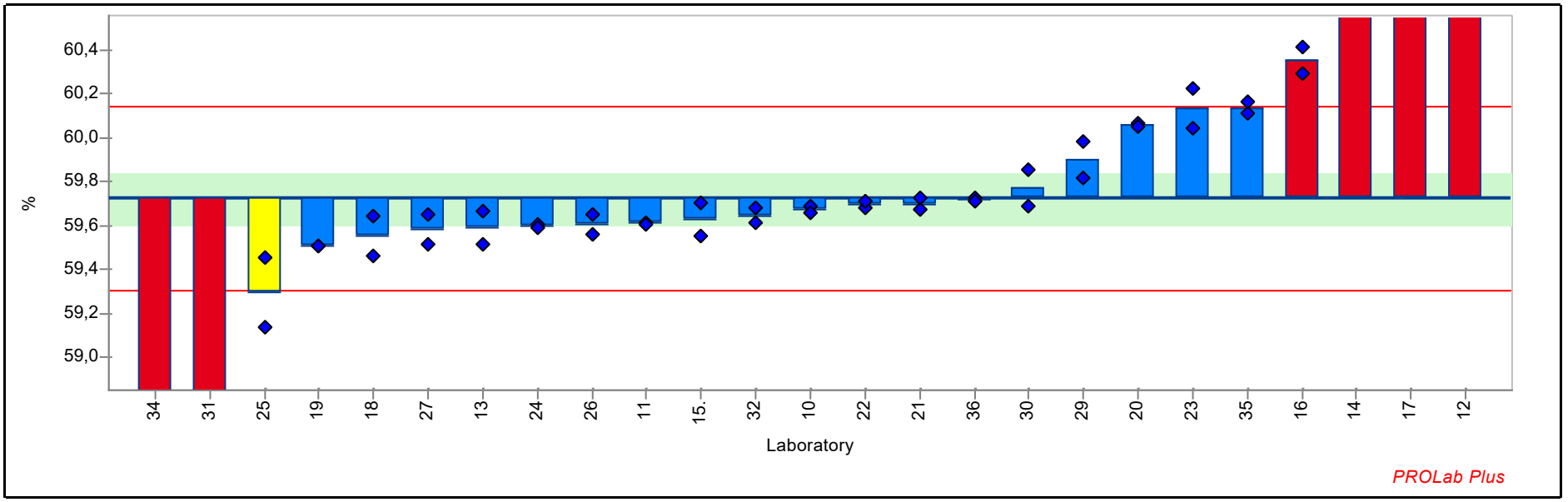


Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	6,890	6,890	6,890	0,000	-0,2	XRF (fusion)	no accredition	DIN EN 196-2
11	6,910	6,900	6,905	0,007	-0,1	XRF (fusion)	ISO 17025	DIN EN 196-2
12	6,077	6,452	6,264	0,265	-6,7	XRF (fusion)	no accredition	standardless Analysis, Info only
13	6,824	6,789	6,806	0,025	-1,1	XRF (fusion)	no accredition	ISO 29581-2 2010
14	7,330	7,156	7,243	0,123	3,5	XRF (fusion)	no accredition	ASTM E 1031
15.	6,914	6,913	6,913	0,001	0,0	XRF (fusion)	no accredition	DIN EN 196-2

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
16	6,860	6,830	6,845	0,021	-0,7	XRF (fusion)	no accredition	
17	6,148	5,608	5,878	0,382	-10,7	XRF (pressed pellet)	no accredition	Info only
18	7,120	7,130	7,125	0,007	2,2	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	7,054	7,102	7,078	0,034	1,7	XRF (fusion)	no accredition	
20	6,991	6,976	6,983	0,011	0,8	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	6,949	6,930	6,939	0,013	0,3	XRF (fusion)	no accredition	ISO 29581-2 2010
22	6,872	6,915	6,893	0,030	-0,2	XRF (fusion)	no accredition	DIN EN 196-2
23	6,825	6,830	6,828	0,004	-0,9	XRF (fusion)	no accredition	ISO 29581-2 2010
24	6,847	6,893	6,870	0,033	-0,4	XRF (fusion)	no accredition	
25	6,900	6,906	6,903	0,004	-0,1	XRF (fusion)	no accredition	DIN 51001-2003-08
26	6,902	6,862	6,882	0,028	-0,3	XRF (fusion)	no accredition	DIN EN 196-2
27	6,906	6,910	6,908	0,003	0,0	XRF (fusion)	no accredition	
29	6,865	6,884	6,875	0,013	-0,4	XRF (fusion)	no accredition	
30	6,946	6,939	6,942	0,005	0,3	XRF (fusion)	no accredition	ISO 29581-2
31	6,598	6,576	6,587	0,016	-3,4	XRF (fusion)	no accredition	ASTM-E1621-21
32	7,030	7,033	7,032	0,002	1,3	XRF (fusion)	no accredition	
35	6,765	6,786	6,775	0,015	-1,4	XRF (fusion)	no accredition	
36	6,920	6,937	6,928	0,012	0,2	XRF (fusion)	no accredition	ISO 29581-2 2010

2022_02 Cement

Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,209 %**
Measurand:	**CaO**	**Repeat. s.d:**	**0,085 %**
Mean ± U(Mean):	**59,723 ± 0,115 %**	**Range of tolerance:**	**59,305 - 60,141 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**

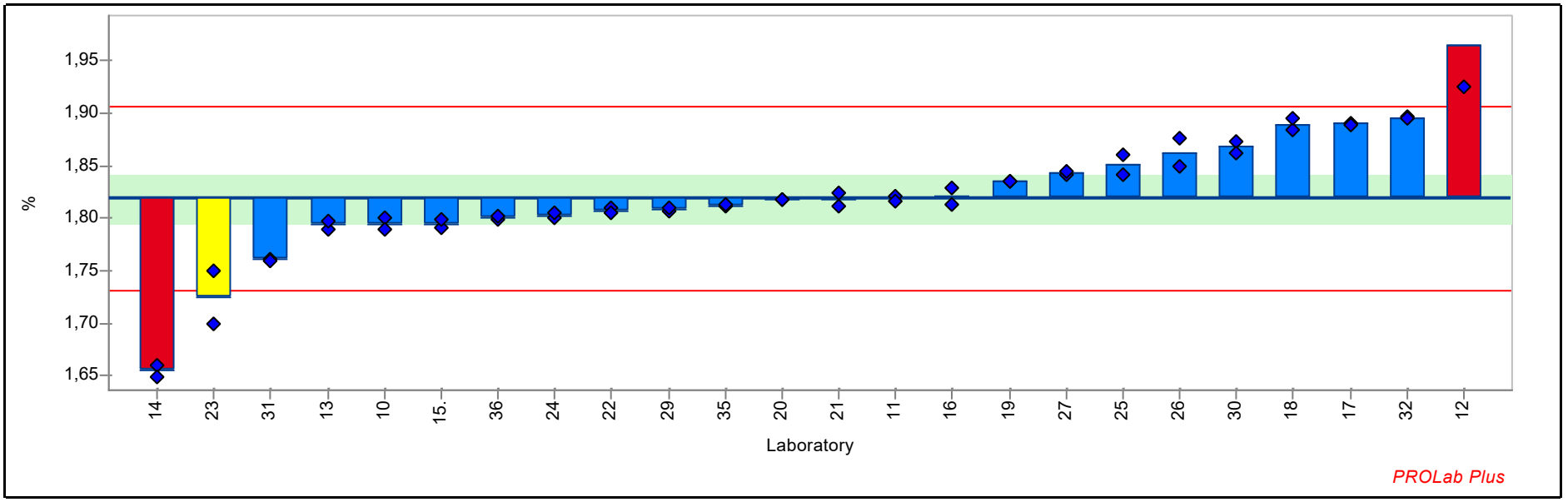


Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	59,690	59,660	59,675	0,021	-0,2	XRF (fusion)	no accredition	DIN EN 196-2
11	59,615	59,605	59,610	0,007	-0,5	XRF (fusion)	ISO 17025	DIN EN 196-2
12	61,800	62,060	61,930	0,184	10,6	XRF (fusion)	no accredition	standardless Analysis, Info only
13	59,513	59,663	59,588	0,106	-0,6	XRF (fusion)	no accredition	ISO 29581-2 2010
14	60,574	60,688	60,631	0,081	4,3	XRF (fusion)	no accredition	ASTM E 1031
15.	59,554	59,706	59,630	0,107	-0,4	XRF (fusion)	no accredition	DIN EN 196-2
16	60,416	60,291	60,353	0,088	3,0	XRF (fusion)	no accredition	
17	61,310	61,780	61,545	0,332	8,7	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	59,465	59,640	59,553	0,124	-0,8	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	59,508	59,507	59,508	0,001	-1,0	XRF (fusion)	no accredition	
20	60,068	60,049	60,058	0,013	1,6	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	59,674	59,725	59,700	0,036	-0,1	XRF (fusion)	no accredition	ISO 29581-2 2010
22	59,680	59,710	59,695	0,021	-0,1	XRF (fusion)	no accredition	DIN EN 196-2
23	60,045	60,225	60,135	0,127	2,0	XRF (fusion)	no accredition	ISO 29581-2 2010
24	59,602	59,590	59,596	0,008	-0,6	XRF (fusion)	no accredition	
25	59,453	59,137	59,295	0,223	-2,0	XRF (fusion)	no accredition	DIN 51001-2003-08
26	59,557	59,651	59,604	0,066	-0,6	XRF (fusion)	no accredition	DIN EN 196-2
27	59,515	59,649	59,582	0,095	-0,7	XRF (fusion)	no accredition	
29	59,817	59,985	59,901	0,119	0,9	XRF (fusion)	no accredition	
30	59,692	59,856	59,774	0,116	0,2	XRF (fusion)	no accredition	ISO 29581-2
31	56,040	55,910	55,975	0,092	-17,9	XRF (fusion)	no accredition	ASTM-E1621-21, Info only
32	59,681	59,612	59,647	0,049	-0,4	XRF (fusion)	no accredition	
34	55,582	56,016	55,799	0,307	-18,8	Other Method	no accredition	ICP-OES; ASU L00.00-144, Info only
35	60,113	60,163	60,138	0,035	2,0	XRF (fusion)	no accredition	
36	59,726	59,711	59,718	0,011	0,0	XRF (fusion)	no accredition	

2022_02 Cement

Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,044 %**
Measurand:	**Fe2O3**	**Repeat. s.d:**	**0,007 %**
Mean ± U(Mean):	**1,819 ± 0,023 %**	**Range of tolerance:**	**1,732 - 1,906 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**

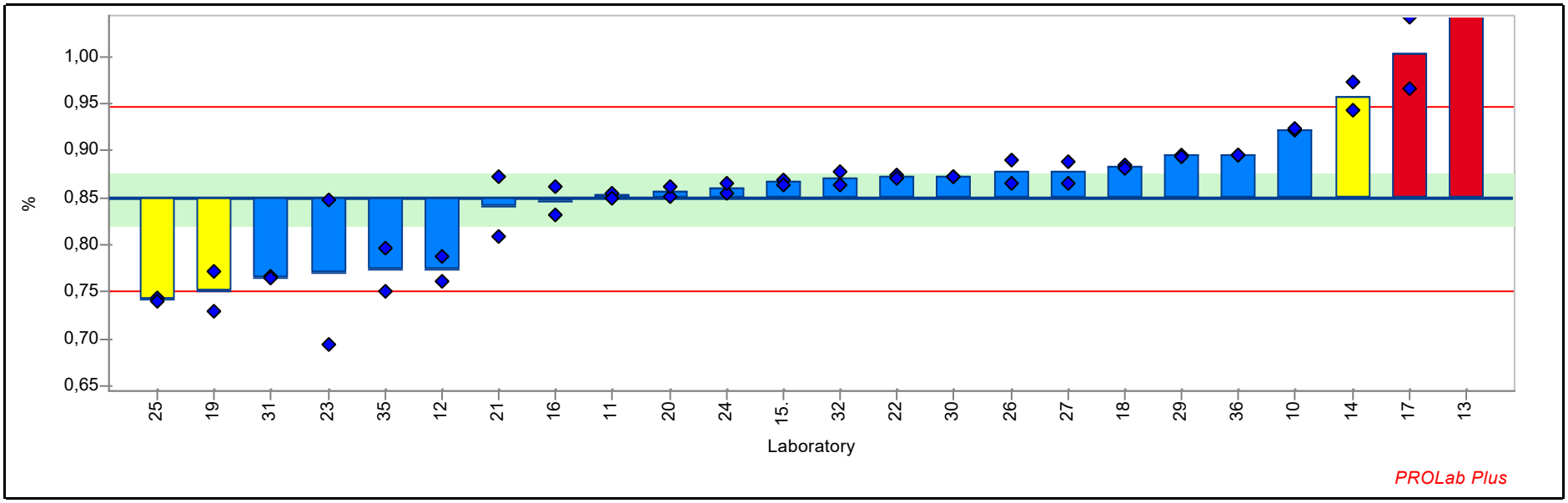


Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	1,800	1,790	1,795	0,007	-0,5	XRF (fusion)	no accredition	DIN EN 196-2
11	1,822	1,817	1,820	0,004	0,0	XRF (fusion)	ISO 17025	DIN EN 196-2
12	1,925	2,004	1,965	0,056	3,3	XRF (fusion)	no accredition	standardless Analysis, Info only
13	1,790	1,798	1,794	0,006	-0,6	XRF (fusion)	no accredition	ISO 29581-2 2010
14	1,661	1,649	1,655	0,008	-3,8	XRF (fusion)	no accredition	ASTM E 1031
15.	1,791	1,799	1,795	0,006	-0,5	XRF (fusion)	no accredition	DIN EN 196-2
16	1,829	1,813	1,821	0,011	0,0	XRF (fusion)	no accredition	
17	1,891	1,889	1,890	0,001	1,6	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	1,884	1,895	1,889	0,008	1,6	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	1,836	1,835	1,836	0,001	0,4	XRF (fusion)	no accredition	
20	1,818	1,818	1,818	0,000	0,0	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	1,812	1,824	1,818	0,008	0,0	XRF (fusion)	no accredition	ISO 29581-2 2010
22	1,810	1,805	1,808	0,004	-0,3	XRF (fusion)	no accredition	DIN EN 196-2
23	1,750	1,700	1,725	0,035	-2,2	XRF (fusion)	no accredition	ISO 29581-2 2010
24	1,801	1,805	1,803	0,003	-0,4	XRF (fusion)	no accredition	
25	1,861	1,841	1,851	0,014	0,7	XRF (fusion)	no accredition	DIN 51001-2003-08
26	1,876	1,850	1,863	0,018	1,0	XRF (fusion)	no accredition	DIN EN 196-2
27	1,841	1,845	1,843	0,003	0,6	XRF (fusion)	no accredition	
29	1,807	1,810	1,809	0,002	-0,2	XRF (fusion)	no accredition	
30	1,873	1,863	1,868	0,007	1,1	XRF (fusion)	no accredition	ISO 29581-2
31	1,762	1,760	1,761	0,001	-1,3	XRF (fusion)	no accredition	ASTM-E1621-21
32	1,897	1,895	1,896	0,001	1,8	XRF (fusion)	no accredition	
35	1,812	1,813	1,813	0,001	-0,1	XRF (fusion)	no accredition	
36	1,799	1,803	1,801	0,003	-0,4	XRF (fusion)	no accredition	

2022_02 Cement

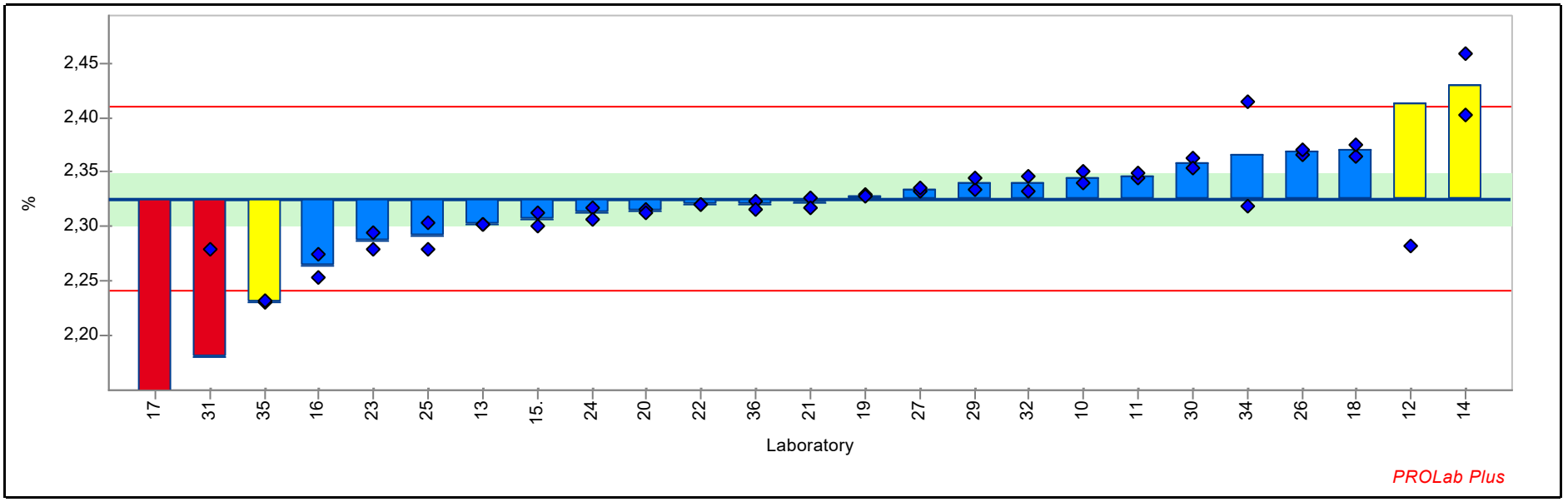
Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,049 %**
Measurand:	**K2O**	**Repeat. s.d:**	**0,010 %**
Mean ± U(Mean):	**0,849 ± 0,027 %**	**Range of tolerance:**	**0,751 - 0,946 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**21**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,921	0,923	0,922	0,001	1,5	XRF (fusion)	no accredition	DIN EN 196-2
11	0,855	0,850	0,853	0,004	0,1	XRF (fusion)	ISO 17025	DIN EN 196-2
12	0,788	0,761	0,774	0,019	-1,5	XRF (fusion)	no accredition	standardless Analysis, Info only
13	1,624	1,620	1,622	0,003	15,9	XRF (fusion)	no accredition	ISO 29581-2 2010, Info only
14	0,972	0,942	0,957	0,021	2,2	XRF (fusion)	no accredition	ASTM E 1031
15.	0,869	0,864	0,867	0,004	0,4	XRF (fusion)	no accredition	DIN EN 196-2
16	0,832	0,861	0,847	0,021	0,0	XRF (fusion)	no accredition	
17	1,041	0,965	1,003	0,054	3,2	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,885	0,881	0,883	0,003	0,7	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	0,772	0,730	0,751	0,030	-2,0	XRF (fusion)	no accredition	
20	0,852	0,861	0,857	0,006	0,2	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	0,873	0,809	0,841	0,045	-0,2	XRF (fusion)	no accredition	ISO 29581-2 2010
22	0,875	0,870	0,873	0,004	0,5	XRF (fusion)	no accredition	DIN EN 196-2
23	0,847	0,695	0,771	0,107	-1,6	XRF (fusion)	no accredition	ISO 29581-2 2010
24	0,854	0,866	0,860	0,008	0,2	XRF (fusion)	no accredition	
25	0,744	0,740	0,742	0,003	-2,2	XRF (fusion)	no accredition	DIN 51001-2003-08
26	0,865	0,890	0,877	0,018	0,6	XRF (fusion)	no accredition	DIN EN 196-2
27	0,866	0,889	0,877	0,016	0,6	XRF (fusion)	no accredition	
29	0,895	0,894	0,895	0,001	0,9	XRF (fusion)	no accredition	
30	0,873	0,873	0,873	0,000	0,5	XRF (fusion)	no accredition	ISO 29581-2
31	0,767	0,764	0,766	0,002	-1,7	XRF (fusion)	no accredition	ASTM-E1621-21
32	0,877	0,864	0,871	0,009	0,5	XRF (fusion)	no accredition	
35	0,751	0,796	0,774	0,032	-1,5	XRF (fusion)	no accredition	
36	0,896	0,895	0,895	0,001	1,0	XRF (fusion)	no accredition	

Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,042 %**
Measurand:	**MgO**	**Repeat. s.d:**	**0,009 %**
Mean ± U(Mean):	**2,326 ± 0,024 %**	**Range of tolerance:**	**2,242 - 2,410 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**22**	**Statistical method:**	**Q/Hampel**

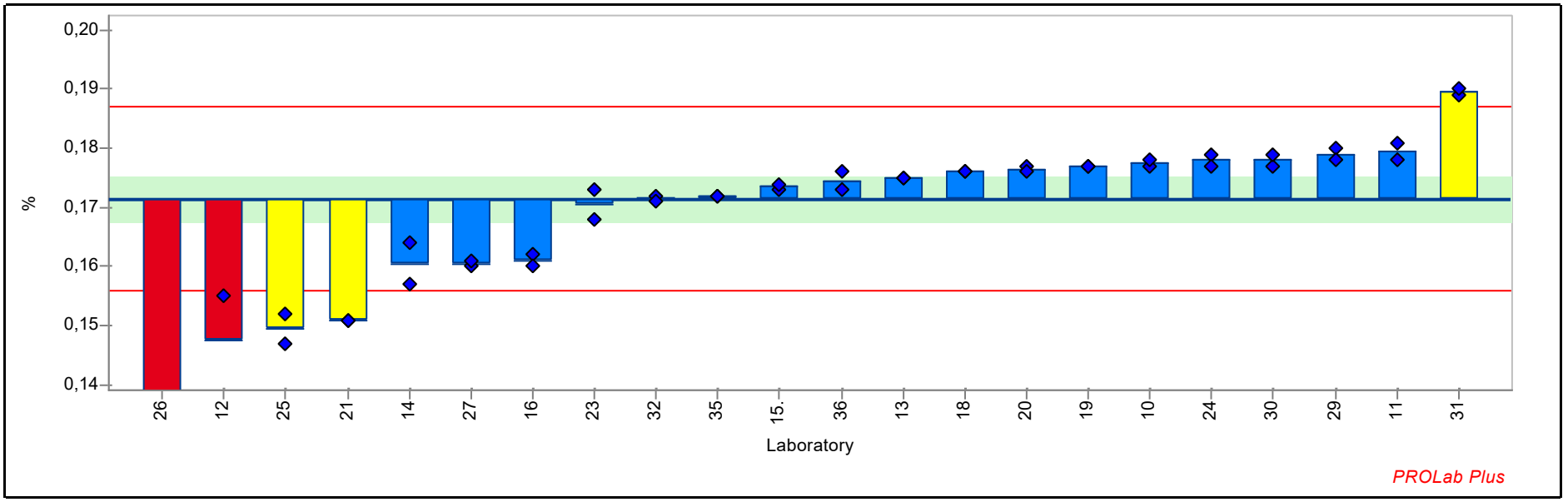


Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	2,350	2,340	2,345	0,007	0,5	XRF (fusion)	no accredition	DIN EN 196-2
11	2,344	2,349	2,346	0,004	0,5	XRF (fusion)	ISO 17025	DIN EN 196-2
12	2,542	2,283	2,412	0,183	2,1	XRF (fusion)	no accredition	standardless Analysis, Info only
13	2,302	2,302	2,302	0,000	-0,6	XRF (fusion)	no accredition	ISO 29581-2 2010
14	2,402	2,458	2,430	0,040	2,5	XRF (fusion)	no accredition	ASTM E 1031
15.	2,301	2,312	2,306	0,008	-0,5	XRF (fusion)	no accredition	DIN EN 196-2
16	2,275	2,253	2,264	0,016	-1,5	XRF (fusion)	no accredition	
17	2,041	1,984	2,013	0,040	-7,5	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	2,365	2,375	2,370	0,007	1,1	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	2,329	2,328	2,329	0,001	0,1	XRF (fusion)	no accredition	
20	2,316	2,313	2,314	0,002	-0,3	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	2,326	2,318	2,322	0,006	-0,1	XRF (fusion)	no accredition	ISO 29581-2 2010
22	2,320	2,320	2,320	0,000	-0,1	XRF (fusion)	no accredition	DIN EN 196-2
23	2,280	2,295	2,287	0,011	-0,9	XRF (fusion)	no accredition	ISO 29581-2 2010
24	2,318	2,306	2,312	0,008	-0,3	XRF (fusion)	no accredition	
25	2,304	2,279	2,292	0,018	-0,8	XRF (fusion)	no accredition	DIN 51001-2003-08
26	2,366	2,371	2,369	0,004	1,0	XRF (fusion)	no accredition	DIN EN 196-2
27	2,333	2,336	2,335	0,002	0,2	XRF (fusion)	no accredition	
29	2,334	2,345	2,340	0,008	0,3	XRF (fusion)	no accredition	
30	2,363	2,354	2,359	0,006	0,8	XRF (fusion)	no accredition	ISO 29581-2
31	2,280	2,080	2,180	0,141	-3,5	XRF (fusion)	no accredition	ASTM-E1621-21
32	2,346	2,333	2,340	0,009	0,3	XRF (fusion)	no accredition	
34	2,319	2,414	2,367	0,067	1,0	Other Method	no accredition	ICP-OES; ASU L00.00-144
35	2,230	2,232	2,231	0,001	-2,3	XRF (fusion)	no accredition	
36	2,324	2,316	2,320	0,006	-0,1	XRF (fusion)	no accredition	

2022_02 Cement

Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,008 %**
Measurand:	**Mn2O3**	**Repeat. s.d:**	**0,002 %**
Mean ± U(Mean):	**0,171 ± 0,004 %**	**Range of tolerance:**	**0,156 - 0,187 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**

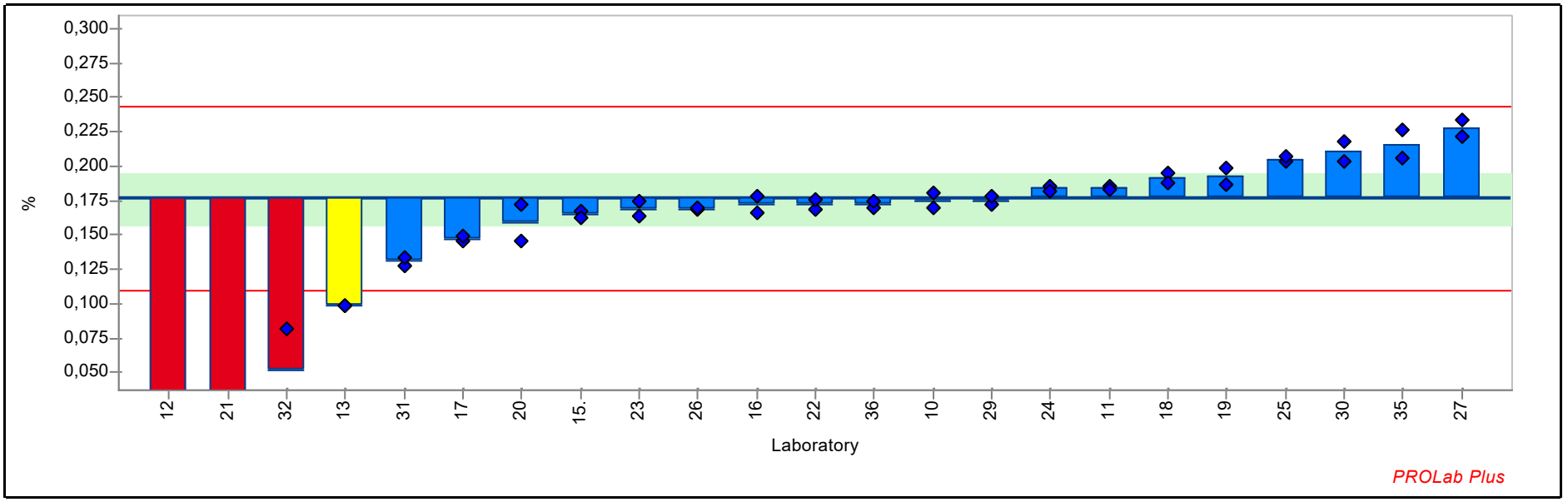


Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,177	0,178	0,177	0,001	0,8	XRF (fusion)	no accredition	DIN EN 196-2
11	0,178	0,181	0,179	0,002	1,0	XRF (fusion)	ISO 17025	DIN EN 196-2
12	0,155	0,140	0,148	0,011	-3,1	XRF (fusion)	no accredition	standardless Analysis, Info only
13	0,175	0,175	0,175	0,000	0,5	XRF (fusion)	no accredition	ISO 29581-2 2010
14	0,157	0,164	0,161	0,005	-1,4	XRF (fusion)	no accredition	ASTM E 1031
15.	0,173	0,174	0,173	0,001	0,3	XRF (fusion)	no accredition	DIN EN 196-2
16	0,162	0,160	0,161	0,001	-1,4	XRF (fusion)	no accredition	
18	0,176	0,176	0,176	0,000	0,6	Other Method	no accredition	ICP-OES: DIN EN ISO 11885

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,177	0,177	0,177	0,000	0,7	XRF (fusion)	no accredition	
20	0,177	0,176	0,176	0,001	0,6	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	0,151	0,151	0,151	0,000	-2,6	XRF (fusion)	no accredition	ISO 29581-2 2010
23	0,173	0,168	0,170	0,004	-0,1	XRF (fusion)	no accredition	ISO 29581-2 2010
24	0,179	0,177	0,178	0,001	0,8	XRF (fusion)	no accredition	
25	0,152	0,147	0,149	0,004	-2,8	XRF (fusion)	no accredition	DIN 51001-2003-08
26	0,120	0,111	0,115	0,006	-7,2	XRF (fusion)	no accredition	DIN EN 196-2, Info only
27	0,160	0,161	0,161	0,001	-1,4	XRF (fusion)	no accredition	
29	0,180	0,178	0,179	0,001	1,0	XRF (fusion)	no accredition	
30	0,177	0,179	0,178	0,001	0,8	XRF (fusion)	no accredition	ISO 29581-2
31	0,189	0,190	0,190	0,001	2,3	XRF (fusion)	no accredition	ASTM-E1621-21
32	0,172	0,171	0,171	0,001	0,0	XRF (fusion)	no accredition	
35	0,172	0,172	0,172	0,000	0,1	XRF (fusion)	no accredition	
36	0,173	0,176	0,174	0,002	0,4	XRF (fusion)	no accredition	

2022_02 Cement

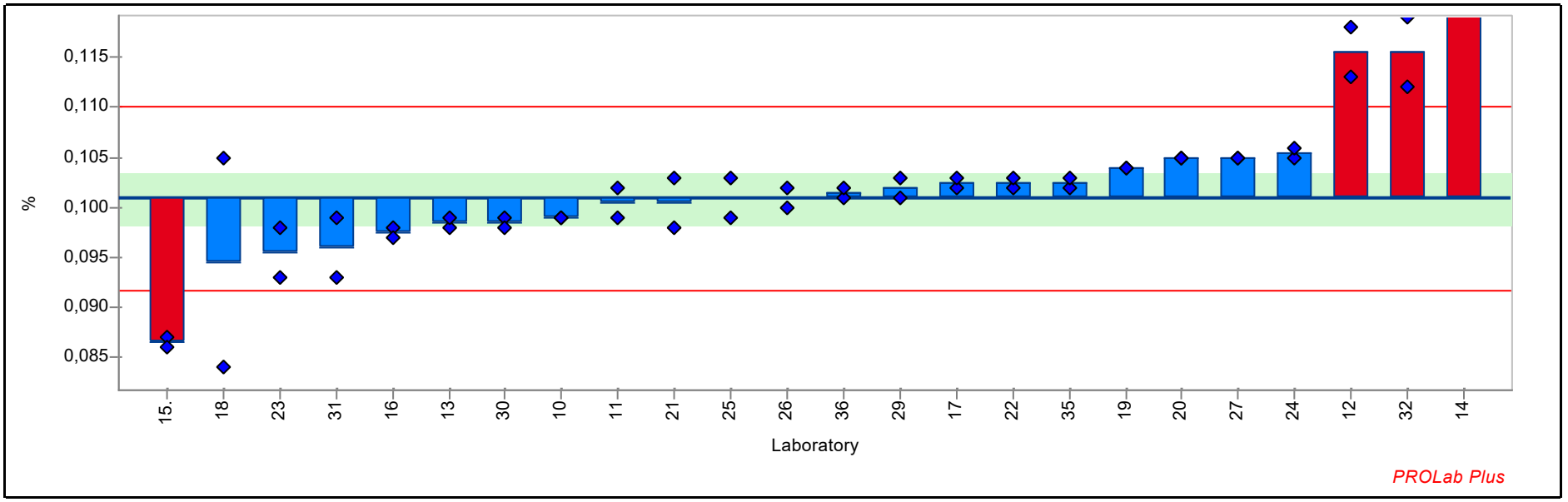
Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,033 %**
Measurand:	**Na2O**	**Repeat. s.d:**	**0,007 %**
Mean ± U(Mean):	**0,176 ± 0,019 %**	**Range of tolerance:**	**0,110 - 0,243 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**21**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,180	0,170	0,175	0,007	0,0	XRF (fusion)	no accredition	DIN EN 196-2
11	0,185	0,183	0,184	0,001	0,2	XRF (fusion)	ISO 17025	DIN EN 196-2
12	0,000	0,000	0,000	0,000	-5,3	XRF (fusion)	no accredition	standardless Analysis, Info only
13	0,098	0,099	0,099	0,001	-2,3	XRF (fusion)	no accredition	ISO 29581-2 2010
15.	0,167	0,162	0,165	0,004	-0,4	XRF (fusion)	no accredition	DIN EN 196-2
16	0,166	0,178	0,172	0,008	-0,1	XRF (fusion)	no accredition	
17	0,145	0,149	0,147	0,003	-0,9	XRF (pressed pellet)	no accredition	Info only
18	0,195	0,188	0,192	0,005	0,5	Other Method	no accredition	ICP-OES: DIN EN ISO 11885

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,186	0,198	0,192	0,008	0,5	XRF (fusion)	no accredition	
20	0,172	0,146	0,159	0,018	-0,5	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	0,037	0,030	0,034	0,005	-4,3	XRF (fusion)	no accredition	ISO 29581-2 2010
22	0,169	0,176	0,172	0,005	-0,1	XRF (fusion)	no accredition	DIN EN 196-2
23	0,164	0,174	0,169	0,007	-0,2	XRF (fusion)	no accredition	ISO 29581-2 2010
24	0,185	0,182	0,183	0,002	0,2	XRF (fusion)	no accredition	
25	0,203	0,207	0,205	0,003	0,9	XRF (fusion)	no accredition	DIN 51001-2003-08
26	0,168	0,170	0,169	0,001	-0,2	XRF (fusion)	no accredition	DIN EN 196-2
27	0,233	0,221	0,227	0,008	1,5	XRF (fusion)	no accredition	
29	0,172	0,178	0,175	0,004	0,0	XRF (fusion)	no accredition	
30	0,203	0,218	0,211	0,011	1,0	XRF (fusion)	no accredition	ISO 29581-2
31	0,128	0,133	0,131	0,004	-1,4	XRF (fusion)	no accredition	ASTM-E1621-21
32	0,082	0,021	0,052	0,043	-3,7	XRF (fusion)	no accredition	
35	0,226	0,206	0,216	0,014	1,2	XRF (fusion)	no accredition	
36	0,170	0,175	0,172	0,004	-0,1	XRF (fusion)	no accredition	

Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,005 %**
Measurand:	**P2O5**	**Repeat. s.d:**	**0,002 %**
Mean ± U(Mean):	**0,101 ± 0,003 %**	**Range of tolerance:**	**0,092 - 0,110 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**21**	**Statistical method:**	**Q/Hampel**

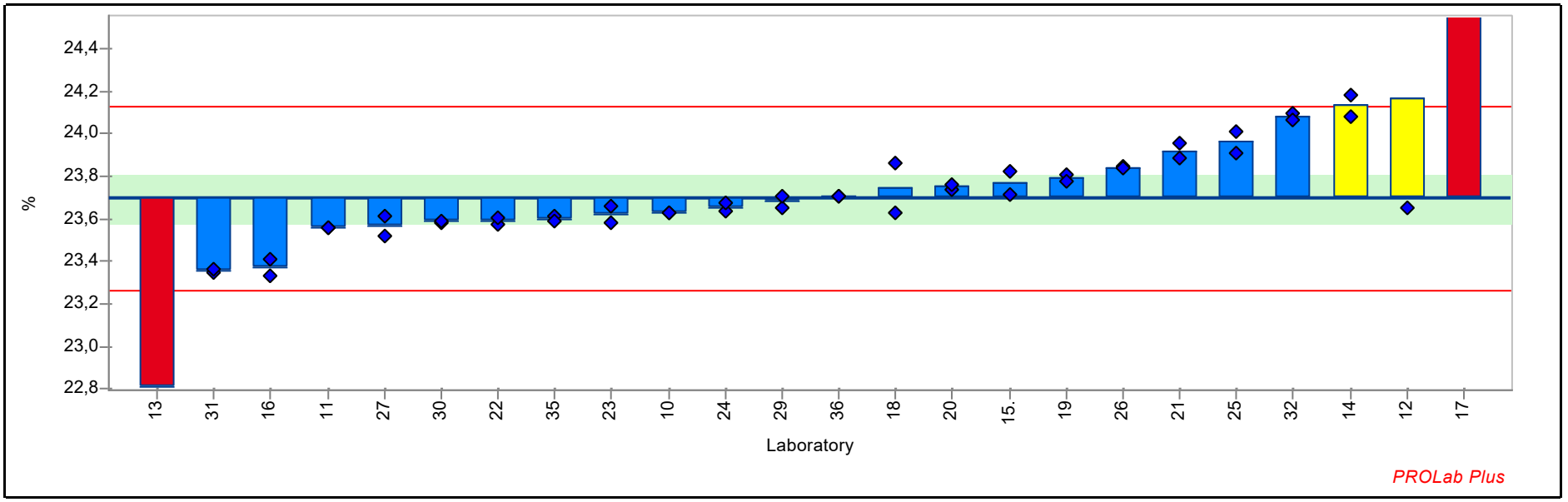


Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,099	0,099	0,099	0,000	-0,4	XRF (fusion)	no accredition	DIN EN 196-2
11	0,102	0,099	0,101	0,002	-0,1	XRF (fusion)	ISO 17025	DIN EN 196-2
12	0,113	0,118	0,115	0,004	3,2	XRF (fusion)	no accredition	standardless Analysis, Info only
13	0,098	0,099	0,099	0,001	-0,5	XRF (fusion)	no accredition	ISO 29581-2 2010
14	0,833	0,846	0,839	0,009	161,2	XRF (fusion)	no accredition	ASTM E 1031, Info only
15.	0,087	0,086	0,086	0,001	-3,1	XRF (fusion)	no accredition	DIN EN 196-2
16	0,098	0,097	0,098	0,001	-0,7	XRF (fusion)	no accredition	
17	0,102	0,103	0,102	0,001	0,4	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,105	0,084	0,095	0,015	-1,4	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	0,104	0,104	0,104	0,000	0,7	XRF (fusion)	no accredition	
20	0,105	0,105	0,105	0,000	0,9	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	0,098	0,103	0,101	0,004	-0,1	XRF (fusion)	no accredition	ISO 29581-2 2010
22	0,102	0,103	0,102	0,001	0,4	XRF (fusion)	no accredition	DIN EN 196-2
23	0,098	0,093	0,096	0,004	-1,2	XRF (fusion)	no accredition	ISO 29581-2 2010
24	0,105	0,106	0,105	0,001	1,0	XRF (fusion)	no accredition	
25	0,103	0,099	0,101	0,003	0,0	XRF (fusion)	no accredition	DIN 51001-2003-08
26	0,102	0,100	0,101	0,001	0,0	XRF (fusion)	no accredition	DIN EN 196-2
27	0,105	0,105	0,105	0,000	0,9	XRF (fusion)	no accredition	
29	0,101	0,103	0,102	0,001	0,2	XRF (fusion)	no accredition	
30	0,099	0,098	0,099	0,001	-0,5	XRF (fusion)	no accredition	ISO 29581-2
31	0,099	0,093	0,096	0,004	-1,1	XRF (fusion)	no accredition	ASTM-E1621-21
32	0,112	0,119	0,115	0,005	3,2	XRF (fusion)	no accredition	
35	0,102	0,103	0,102	0,001	0,4	XRF (fusion)	no accredition	
36	0,101	0,102	0,102	0,001	0,1	XRF (fusion)	no accredition	

2022_02 Cement

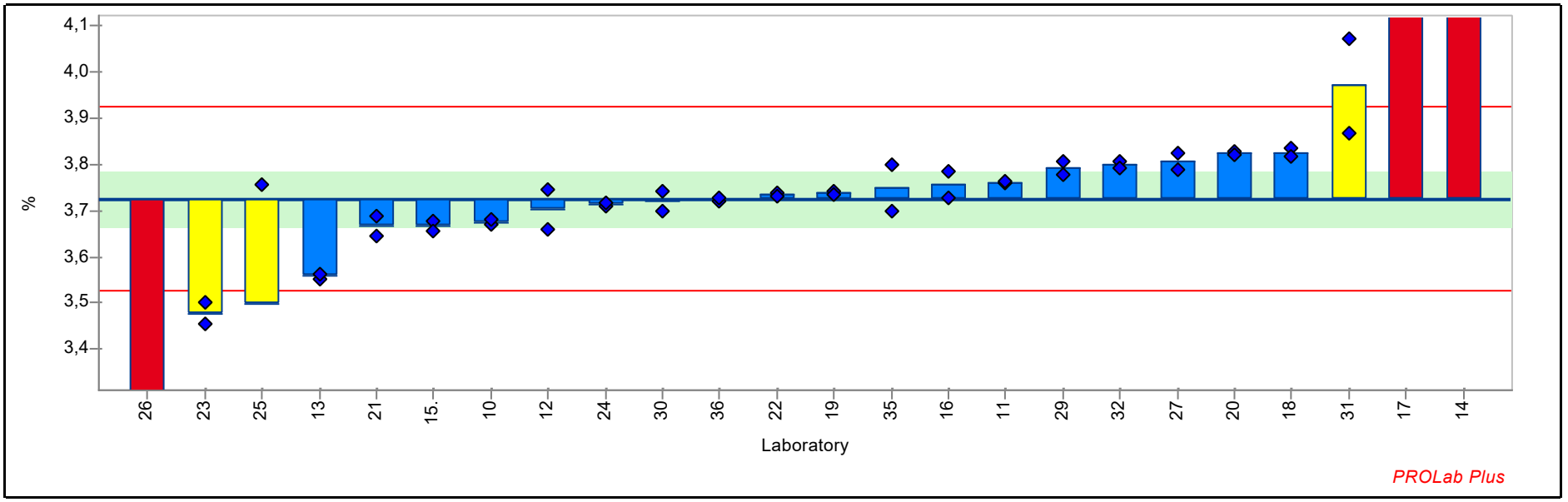
Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,216 %**
Measurand:	**SiO2**	**Repeat. s.d:**	**0,033 %**
Mean ± U(Mean):	**23,695 ± 0,113 %**	**Range of tolerance:**	**23,264 - 24,126 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**21**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	23,630	23,630	23,630	0,000	-0,3	XRF (fusion)	no accredition	DIN EN 196-2
11	23,562	23,559	23,561	0,002	-0,6	XRF (fusion)	ISO 17025	DIN EN 196-2
12	23,650	24,690	24,170	0,735	2,2	XRF (fusion)	no accredition	standardless Analysis, Info only
13	22,803	22,821	22,812	0,013	-4,1	XRF (fusion)	no accredition	ISO 29581-2 2010
14	24,081	24,186	24,133	0,074	2,0	XRF (fusion)	no accredition	ASTM E 1031
15.	23,824	23,712	23,768	0,079	0,3	XRF (fusion)	no accredition	DIN EN 196-2
16	23,413	23,330	23,371	0,059	-1,5	XRF (fusion)	no accredition	
17	29,690	30,030	29,860	0,240	28,6	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	23,859	23,632	23,745	0,161	0,2	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	23,805	23,773	23,789	0,023	0,4	XRF (fusion)	no accredition	
20	23,741	23,765	23,753	0,017	0,3	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	23,883	23,958	23,920	0,053	1,0	XRF (fusion)	no accredition	ISO 29581-2 2010
22	23,570	23,605	23,587	0,025	-0,5	XRF (fusion)	no accredition	DIN EN 196-2
23	23,580	23,660	23,620	0,057	-0,3	XRF (fusion)	no accredition	ISO 29581-2 2010
24	23,635	23,672	23,654	0,026	-0,2	XRF (fusion)	no accredition	
25	24,012	23,911	23,962	0,071	1,2	XRF (fusion)	no accredition	DIN 51001-2003-08
26	23,845	23,838	23,841	0,005	0,7	XRF (fusion)	no accredition	DIN EN 196-2
27	23,616	23,520	23,568	0,068	-0,6	XRF (fusion)	no accredition	
29	23,654	23,707	23,681	0,037	-0,1	XRF (fusion)	no accredition	
30	23,582	23,592	23,587	0,007	-0,5	XRF (fusion)	no accredition	ISO 29581-2
31	23,350	23,360	23,355	0,007	-1,6	XRF (fusion)	no accredition	ASTM-E1621-21
32	24,093	24,064	24,078	0,021	1,8	XRF (fusion)	no accredition	
35	23,610	23,592	23,601	0,013	-0,4	XRF (fusion)	no accredition	
36	23,703	23,707	23,705	0,003	0,0	XRF (fusion)	no accredition	

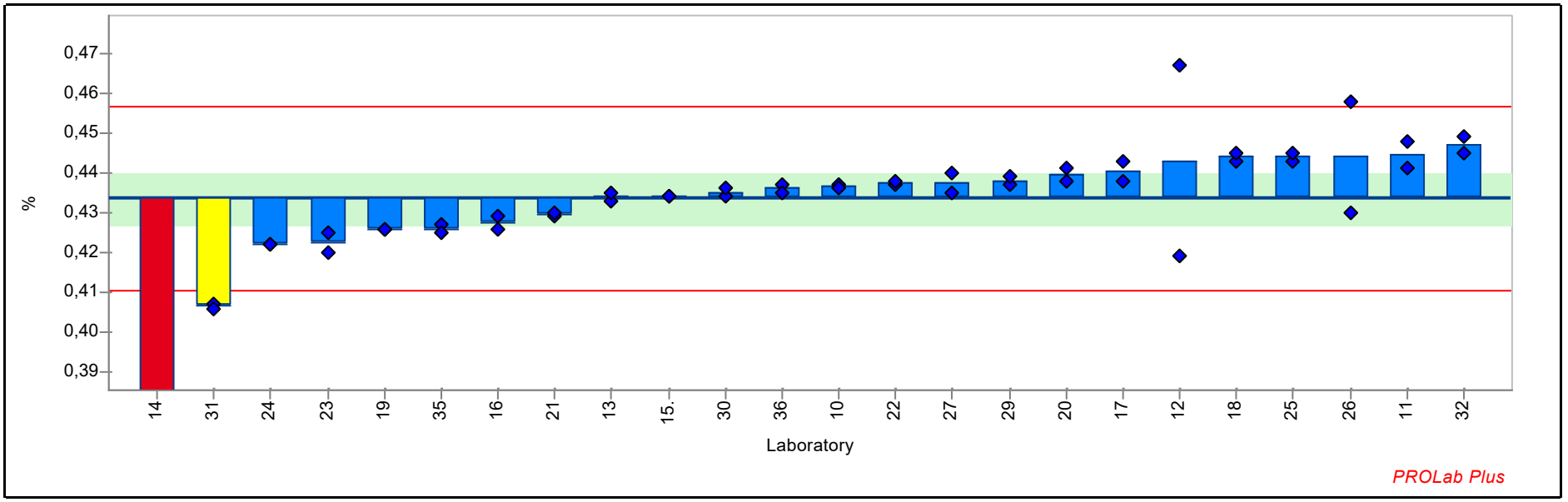
Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,099 %**
Measurand:	**SO3**	**Repeat. s.d:**	**0,020 %**
Mean ± U(Mean):	**3,726 ± 0,058 %**	**Range of tolerance:**	**3,527 - 3,924 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**20**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	3,670	3,680	3,675	0,007	-0,5	XRF (fusion)	no accredition	DIN EN 196-2
11	3,759	3,764	3,761	0,004	0,4	XRF (fusion)	ISO 17025	DIN EN 196-2
12	3,658	3,745	3,702	0,062	-0,2	XRF (fusion)	no accredition	standardless Analysis, Info only
13	3,553	3,563	3,558	0,007	-1,7	XRF (fusion)	no accredition	ISO 29581-2 2010
14	5,444	5,358	5,401	0,061	16,9	XRF (fusion)	no accredition	ASTM E 1031, Info only
15.	3,679	3,657	3,668	0,016	-0,6	XRF (fusion)	no accredition	DIN EN 196-2
16	3,784	3,729	3,756	0,039	0,3	XRF (fusion)	no accredition	
17	4,438	4,458	4,448	0,014	7,3	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	3,835	3,817	3,826	0,013	1,0	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	3,743	3,734	3,739	0,006	0,1	XRF (fusion)	no accredition	
20	3,829	3,821	3,825	0,006	1,0	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	3,687	3,644	3,665	0,030	-0,6	XRF (fusion)	no accredition	ISO 29581-2 2010
22	3,740	3,730	3,735	0,007	0,1	XRF (fusion)	no accredition	DIN EN 196-2
23	3,500	3,455	3,478	0,032	-2,5	XRF (fusion)	no accredition	ISO 29581-2 2010
24	3,709	3,715	3,712	0,004	-0,1	XRF (fusion)	no accredition	
25	3,238	3,758	3,498	0,368	-2,3	XRF (fusion)	no accredition	DIN 51001-2003-08
26	3,215	3,214	3,215	0,001	-5,2	XRF (pressed pellet)	no accredition	DIN EN 196-2, Info only
27	3,787	3,823	3,805	0,025	0,8	XRF (fusion)	no accredition	
29	3,778	3,807	3,792	0,021	0,7	XRF (fusion)	no accredition	
30	3,741	3,698	3,720	0,030	-0,1	XRF (fusion)	no accredition	ISO 29581-2
31	4,071	3,869	3,970	0,143	2,5	XRF (fusion)	no accredition	ASTM-E1621-21
32	3,805	3,793	3,799	0,008	0,7	XRF (fusion)	no accredition	
35	3,800	3,700	3,750	0,071	0,2	XRF (fusion)	no accredition	
36	3,719	3,726	3,723	0,005	0,0	XRF (fusion)	no accredition	

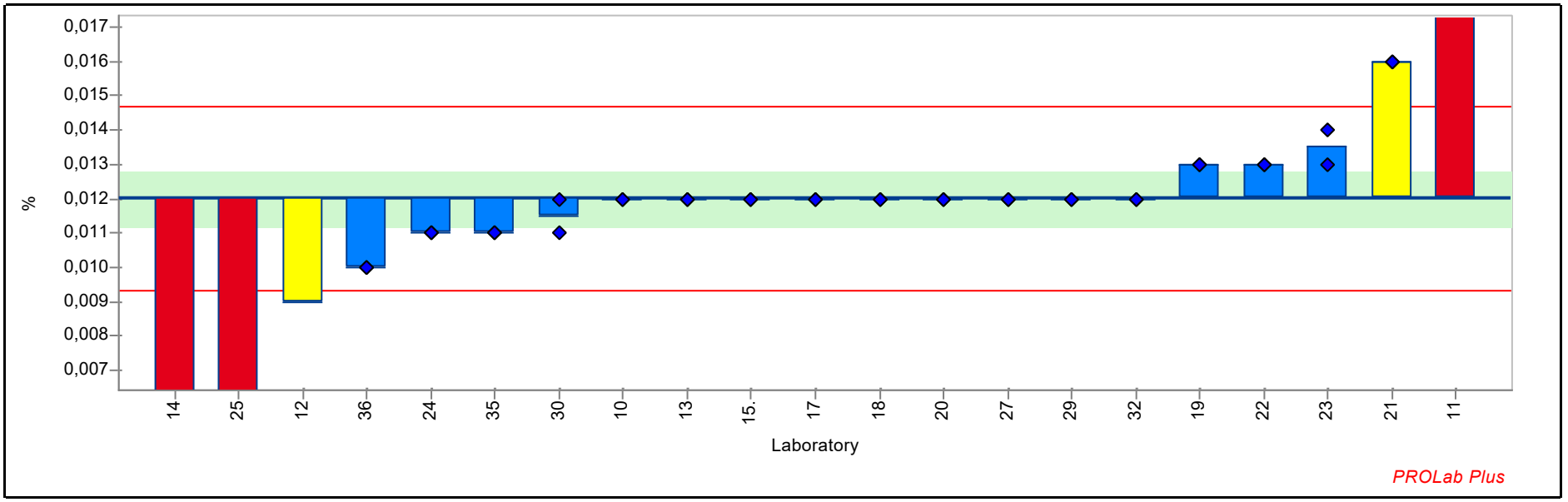
Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,011 %**
Measurand:	**TiO2**	**Repeat. s.d:**	**0,002 %**
Mean ± U(Mean):	**0,434 ± 0,006 %**	**Range of tolerance:**	**0,411 - 0,456 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**21**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,437	0,436	0,436	0,001	0,3	XRF (fusion)	no accredition	DIN EN 196-2
11	0,441	0,448	0,445	0,005	1,0	XRF (fusion)	ISO 17025	DIN EN 196-2
12	0,467	0,419	0,443	0,034	0,8	XRF (fusion)	no accredition	standardless Analysis, Info only
13	0,433	0,435	0,434	0,001	0,0	XRF (fusion)	no accredition	ISO 29581-2 2010
14	0,306	0,309	0,307	0,002	-11,0	XRF (fusion)	no accredition	ASTM E 1031, Info only
15.	0,434	0,434	0,434	0,000	0,0	XRF (fusion)	no accredition	DIN EN 196-2
16	0,426	0,429	0,427	0,002	-0,5	XRF (fusion)	no accredition	
17	0,443	0,438	0,441	0,004	0,6	XRF (pressed pellet)	no accredition	Info only

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	0,443	0,445	0,444	0,001	0,9	Other Method	no accredition	ICP-OES: DIN EN ISO 11885
19	0,426	0,426	0,426	0,000	-0,7	XRF (fusion)	no accredition	
20	0,438	0,441	0,440	0,002	0,5	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	0,429	0,430	0,429	0,001	-0,3	XRF (fusion)	no accredition	ISO 29581-2 2010
22	0,437	0,438	0,438	0,001	0,3	XRF (fusion)	no accredition	DIN EN 196-2
23	0,420	0,425	0,422	0,004	-1,0	XRF (fusion)	no accredition	ISO 29581-2 2010
24	0,422	0,422	0,422	0,000	-1,0	XRF (fusion)	no accredition	
25	0,443	0,445	0,444	0,001	0,9	XRF (fusion)	no accredition	DIN 51001-2003-08
26	0,458	0,430	0,444	0,020	0,9	XRF (fusion)	no accredition	DIN EN 196-2
27	0,435	0,440	0,438	0,004	0,3	XRF (fusion)	no accredition	
29	0,437	0,439	0,438	0,001	0,4	XRF (fusion)	no accredition	
30	0,434	0,436	0,435	0,001	0,1	XRF (fusion)	no accredition	ISO 29581-2
31	0,407	0,406	0,406	0,001	-2,4	XRF (fusion)	no accredition	ASTM-E1621-21
32	0,449	0,445	0,447	0,003	1,2	XRF (fusion)	no accredition	
35	0,427	0,425	0,426	0,001	-0,7	XRF (fusion)	no accredition	
36	0,437	0,435	0,436	0,001	0,2	XRF (fusion)	no accredition	

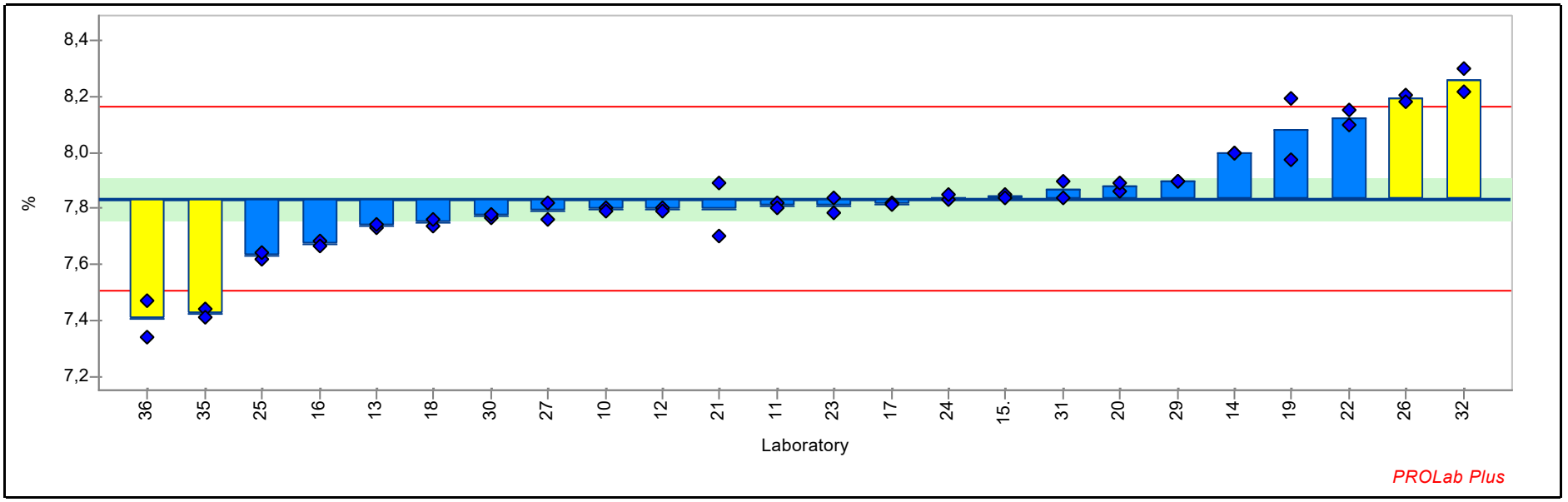
Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,001 %**
Measurand:	**ZnO**	**Repeat. s.d:**	**0,000 %**
Mean ± U(Mean):	**0,012 ± 0,001 %**	**Range of tolerance:**	**0,009 - 0,015 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**17**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	0,012	0,012	0,012	0,000	0,0	XRF (fusion)	no accredition	DIN EN 196-2
11	0,025	0,020	0,022	0,004	7,9	XRF (fusion)	ISO 17025	DIN EN 196-2, Info only
12	0,018	0,000	0,009	0,013	-2,2	XRF (fusion)	no accredition	standardless Analysis, Info only
13	0,012	0,012	0,012	0,000	0,0	XRF (fusion)	no accredition	ISO 29581-2 2010
14	0,000	0,000	0,000	0,000	-9,0	XRF (fusion)	no accredition	ASTM E 1031, Info only
15.	0,012	0,012	0,012	0,000	0,0	XRF (fusion)	no accredition	DIN EN 196-2
17	0,012	0,012	0,012	0,000	0,0	XRF (pressed pellet)	no accredition	Info only
18	0,012	0,012	0,012	0,000	0,0	Other Method	no accredition	ICP-OES: DIN EN ISO 11885

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
19	0,013	0,013	0,013	0,000	0,7	XRF (fusion)	no accredition	
20	0,012	0,012	0,012	0,000	0,0	XRF (fusion)	ISO 17025	ISO 29581-2 2010
21	0,016	0,016	0,016	0,000	3,0	XRF (fusion)	no accredition	ISO 29581-2 2010
22	0,013	0,013	0,013	0,000	0,7	XRF (fusion)	no accredition	DIN EN 196-2
23	0,014	0,013	0,013	0,001	1,1	XRF (fusion)	no accredition	ISO 29581-2 2010
24	0,011	0,011	0,011	0,000	-0,7	XRF (fusion)	no accredition	
25	0,006	0,005	0,005	0,001	-4,9	XRF (fusion)	no accredition	DIN 51001-2003-08
27	0,012	0,012	0,012	0,000	0,0	XRF (fusion)	no accredition	
29	0,012	0,012	0,012	0,000	0,0	XRF (fusion)	no accredition	
30	0,012	0,011	0,011	0,001	-0,4	XRF (fusion)	no accredition	ISO 29581-2
32	0,012	0,012	0,012	0,000	0,0	XRF (fusion)	no accredition	
35	0,011	0,011	0,011	0,000	-0,7	XRF (fusion)	no accredition	
36	0,010	0,010	0,010	0,000	-1,5	XRF (fusion)	no accredition	

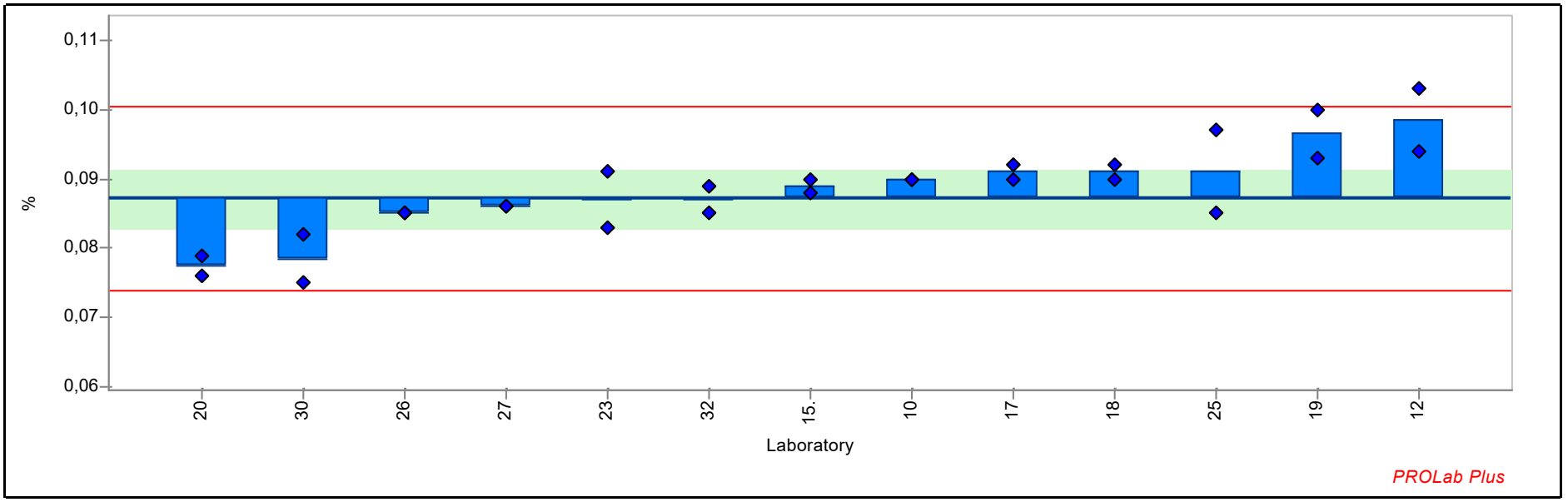
Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,164 %**
Measurand:	**Loss on Ignition**	**Repeat. s.d:**	**0,024 %**
Mean ± U(Mean):	**7,835 ± 0,076 %**	**Range of tolerance:**	**7,508 - 8,163 % (|z-score| <= 2,0)**
Number of laboratories in calculation:	**23**	**Statistical method:**	**Q/Hampel**



Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
10	7,800	7,790	7,795	0,007	-0,2	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
11	7,820	7,800	7,810	0,014	-0,2	XRF (fusion)	ISO 17025	DIN EN 196-2
12	7,800	7,790	7,795	0,007	-0,2	Other Method		LOI @ 950°C
13	7,731	7,741	7,736	0,007	-0,6	Other Method	no accredition	ISO 29581-2 2010, LOI @ 950°C
14	8,000	8,000	8,000	0,000	1,0	Other Method	no accredition	LOI @ 950°C
15.	7,850	7,840	7,845	0,007	0,1	Other Method	ISO 17025	DIN EN 196-2, LOI @ 950°C
16	7,684	7,666	7,675	0,013	-1,0	XRF (fusion)	no accredition	LOI @ 950°C
17	7,820	7,812	7,816	0,006	-0,1	Other Method	no accredition	LOI @ 950°C

Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
18	7,737	7,761	7,749	0,017	-0,5	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
19	7,973	8,192	8,082	0,155	1,5	Other Method	no accredition	LOI @ 1050°C
20	7,865	7,890	7,877	0,018	0,3	Other Method	ISO 17025	ISO 29581-2 2010, LOI @ 950°C
21	7,700	7,890	7,795	0,134	-0,2	Other Method	no accredition	ISO 29581-2 2010, LOI @ 950°C
22	8,100	8,150	8,125	0,035	1,8	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
23	7,785	7,836	7,811	0,036	-0,2	Other Method	no accredition	USP/NF, LOI @ 950°C
24	7,830	7,850	7,840	0,014	0,0	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
25	7,620	7,640	7,630	0,014	-1,3	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
26	8,206	8,181	8,194	0,018	2,2	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
27	7,820	7,760	7,790	0,042	-0,3	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
29	7,895	7,898	7,896	0,002	0,4	XRF (fusion)	no accredition	LOI @ 950°C
30	7,770	7,780	7,775	0,007	-0,4	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
31	7,900	7,840	7,870	0,042	0,2	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
32	8,300	8,220	8,260	0,057	2,6	Other Method	no accredition	DIN EN 196-2, LOI @ 950°C
35	7,442	7,410	7,426	0,023	-2,5	XRF (fusion)	no accredition	LOI @ 950°C
36	7,340	7,470	7,405	0,092	-2,6	Other Method	no accredition	ISO 29581-2 2010, LOI @ 950°C

Sample:	**FLX-1003**	**Reprod. s.d.:**	**0,007 %**
Measurand:	**Cl**	**Repeat. s.d:**	**0,004 %**
Mean ± U(Mean):	**0,087 ± 0,004 %**	**Range of tolerance:**	**0,074 - 0,100 % (|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	0,090	0,090	0,090	0,000	0,4	Other Method	no accredition	DIN EN 196-2
12	0,103	0,094	0,099	0,006	1,7	XRF (fusion)	no accredition	standardless Analysis, Info only
15.	0,088	0,090	0,089	0,001	0,3	Other Method	ISO 17025	DIN EN 196-2, w et chemistry
17	0,090	0,092	0,091	0,001	0,6	XRF (pressed pellet)	no accredition	Info only
18	0,092	0,090	0,091	0,001	0,6	Other Method	no accredition	DIN EN 196-2
19	0,100	0,093	0,097	0,005	1,4	XRF (fusion)	no accredition	
20	0,076	0,079	0,077	0,002	-1,5	XRF (fusion)	ISO 17025	DIN 51001-2003-08
23	0,091	0,083	0,087	0,006	0,0	XRF (fusion)	no accredition	ISO 29581-2 2010

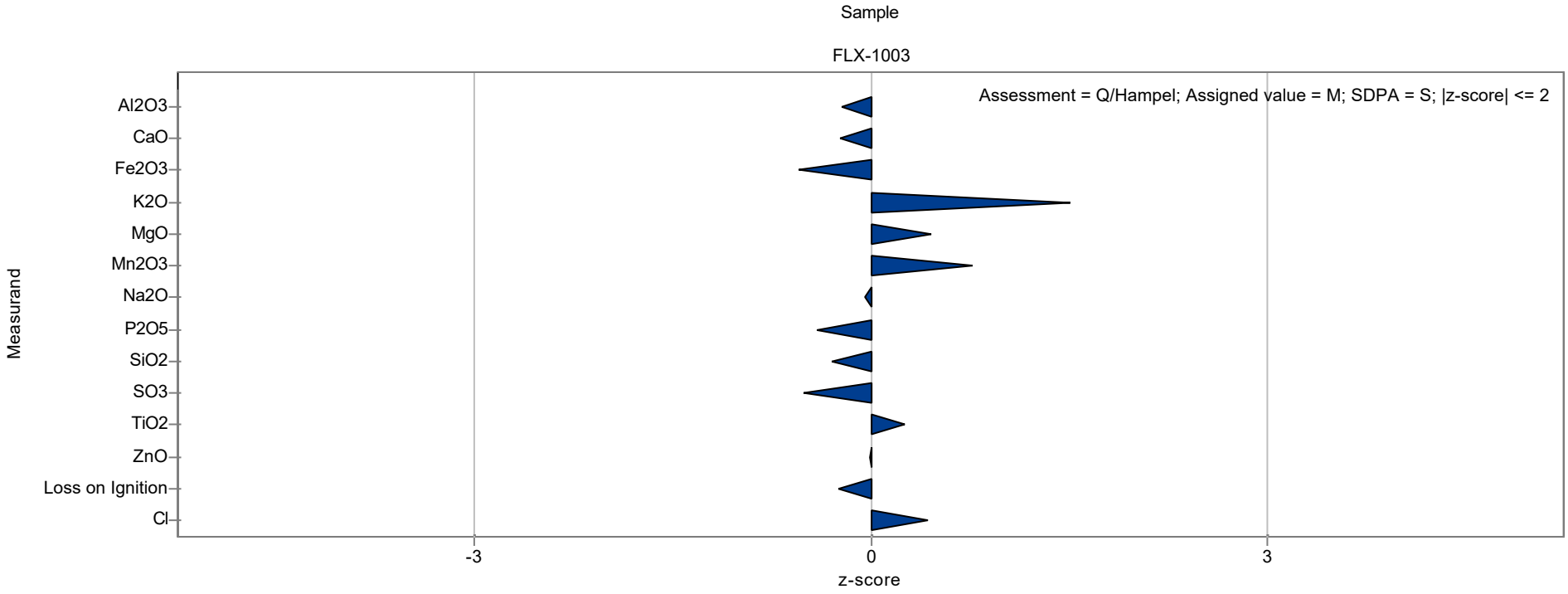
Lab code	Conc. 1	Conc. 2	Lab mean	s.d.	z-score	Analytical method	Accreditation	Comment
25	0,097	0,085	0,091	0,008	0,6	Other Method	no accredition	DIN EN 196-2/2013
26	0,085	0,085	0,085	0,000	-0,3	XRF (pressed pellet)	no accredition	DIN EN 196-2, Info only
27	0,086	0,086	0,086	0,000	-0,2	Other Method	no accredition	EN 196-2:2013
30	0,075	0,082	0,079	0,005	-1,3	Other Method	no accredition	EN196-2, ASTM C114
32	0,085	0,089	0,087	0,003	0,0	Other Method	no accredition	

Survey of scores

Lab code	Al2O3	CaO	Fe2O3	K2O	MgO	Mn2O3	Na2O	P2O5	SiO2	SO3	TiO2	ZnO	Loss on Ignition	Cl
10	-0,2	-0,2	-0,5	1,5	0,5	0,8	0,0	-0,4	-0,3	-0,5	0,3	0,0	-0,2	0,4
11	-0,1	-0,5	0,0	0,1	0,5	1,0	0,2	-0,1	-0,6	0,4	1,0	7,9	-0,2	
12	-6,7	10,6	3,3	-1,5	2,1	-3,1	-5,3	3,2	2,2	-0,2	0,8	-2,2	-0,2	1,7
13	-1,1	-0,6	-0,6	15,9	-0,6	0,5	-2,3	-0,5	-4,1	-1,7	0,0	0,0	-0,6	
14	3,5	4,3	-3,8	2,2	2,5	-1,4		161,2	2,0	16,9	-11,0	-9,0	1,0	
15.	0,0	-0,4	-0,5	0,4	-0,5	0,3	-0,4	-3,1	0,3	-0,6	0,0	0,0	0,1	0,3
16	-0,7	3,0	0,0	0,0	-1,5	-1,4	-0,1	-0,7	-1,5	0,3	-0,5		-1,0	
17	-10,7	8,7	1,6	3,2	-7,5		-0,9	0,4	28,6	7,3	0,6	0,0	-0,1	0,6
18	2,2	-0,8	1,6	0,7	1,1	0,6	0,5	-1,4	0,2	1,0	0,9	0,0	-0,5	0,6
19	1,7	-1,0	0,4	-2,0	0,1	0,7	0,5	0,7	0,4	0,1	-0,7	0,7	1,5	1,4
20	0,8	1,6	0,0	0,2	-0,3	0,6	-0,5	0,9	0,3	1,0	0,5	0,0	0,3	-1,5
21	0,3	-0,1	0,0	-0,2	-0,1	-2,6	-4,3	-0,1	1,0	-0,6	-0,3	3,0	-0,2	
22	-0,2	-0,1	-0,3	0,5	-0,1		-0,1	0,4	-0,5	0,1	0,3	0,7	1,8	
23	-0,9	2,0	-2,2	-1,6	-0,9	-0,1	-0,2	-1,2	-0,3	-2,5	-1,0	1,1	-0,2	0,0
24	-0,4	-0,6	-0,4	0,2	-0,3	0,8	0,2	1,0	-0,2	-0,1	-1,0	-0,7	0,0	
25	-0,1	-2,0	0,7	-2,2	-0,8	-2,8	0,9	0,0	1,2	-2,3	0,9	-4,9	-1,3	0,6
26	-0,3	-0,6	1,0	0,6	1,0	-7,2	-0,2	0,0	0,7	-5,2	0,9		2,2	-0,3
27	0,0	-0,7	0,6	0,6	0,2	-1,4	1,5	0,9	-0,6	0,8	0,3	0,0	-0,3	-0,2
29	-0,4	0,9	-0,2	0,9	0,3	1,0	0,0	0,2	-0,1	0,7	0,4	0,0	0,4	
30	0,3	0,2	1,1	0,5	0,8	0,8	1,0	-0,5	-0,5	-0,1	0,1	-0,4	-0,4	-1,3
31	-3,4	-17,9	-1,3	-1,7	-3,5	2,3	-1,4	-1,1	-1,6	2,5	-2,4		0,2	
32	1,3	-0,4	1,8	0,5	0,3	0,0	-3,7	3,2	1,8	0,7	1,2	0,0	2,6	0,0
34		-18,8			1,0									
35	-1,4	2,0	-0,1	-1,5	-2,3	0,1	1,2	0,4	-0,4	0,2	-0,7	-0,7	-2,5	
36	0,2	0,0	-0,4	1,0	-0,1	0,4	-0,1	0,1	0,0	0,0	0,2	-1,5	-2,6	

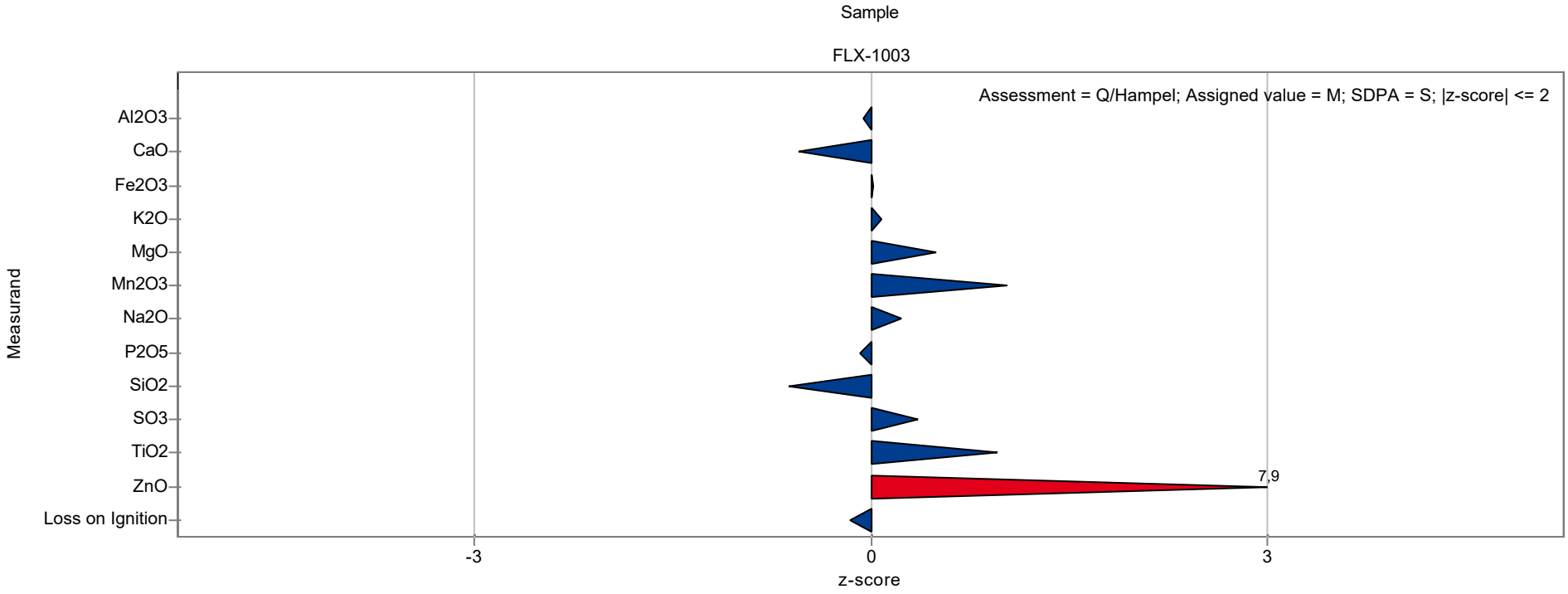
Laboratory chart of z-scores

Laboratory: 10



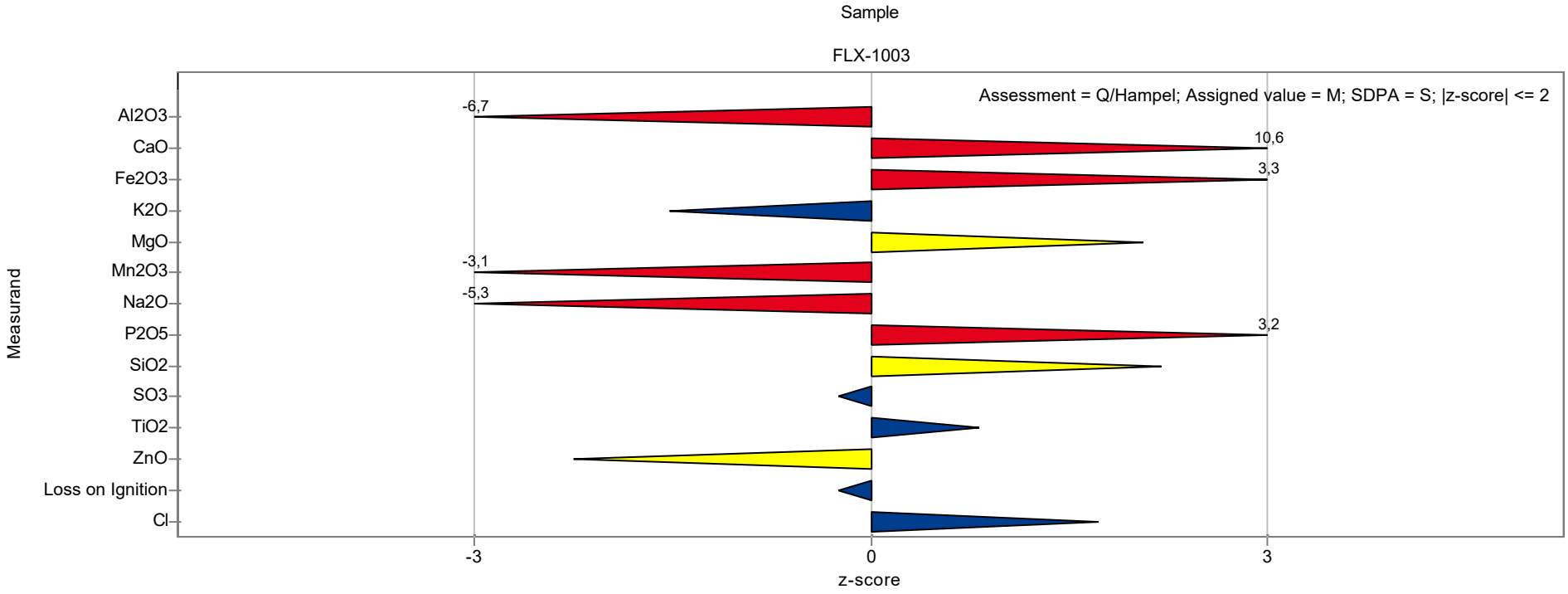
Laboratory chart of z-scores

Laboratory: 11



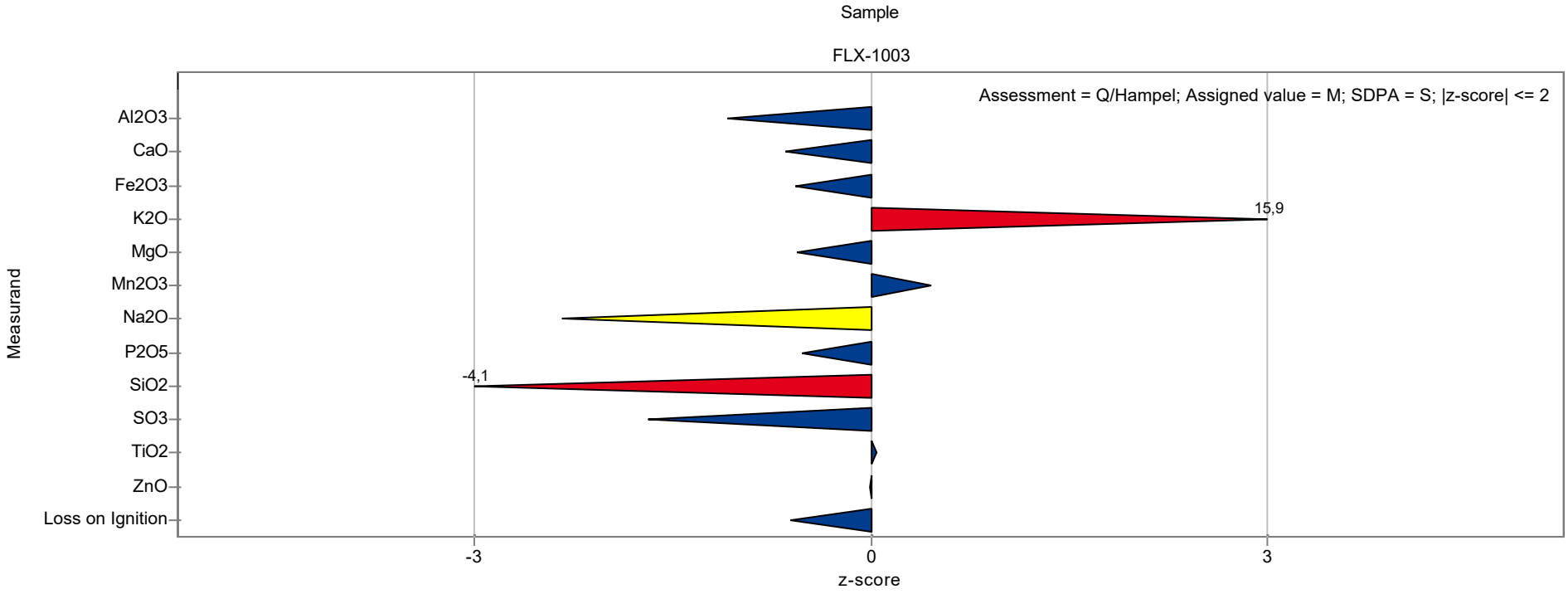
Laboratory chart of z-scores

Laboratory: 12



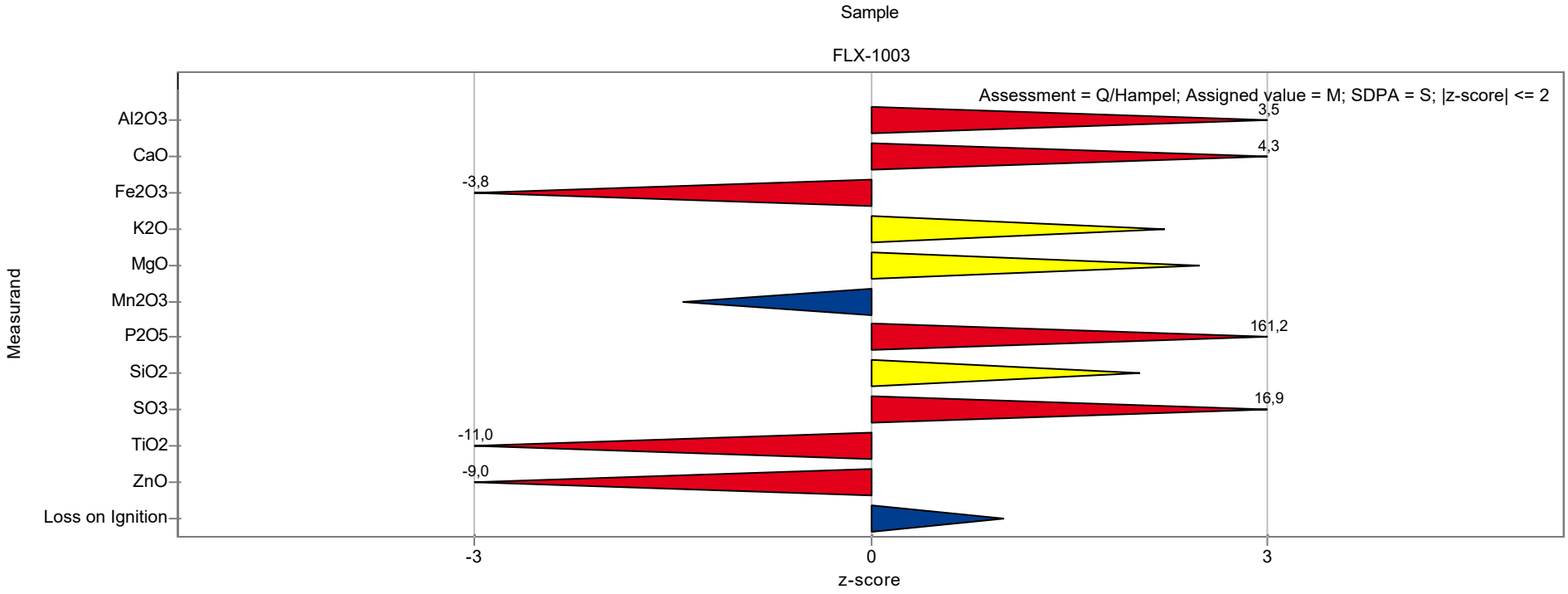
Laboratory chart of z-scores

Laboratory: 13



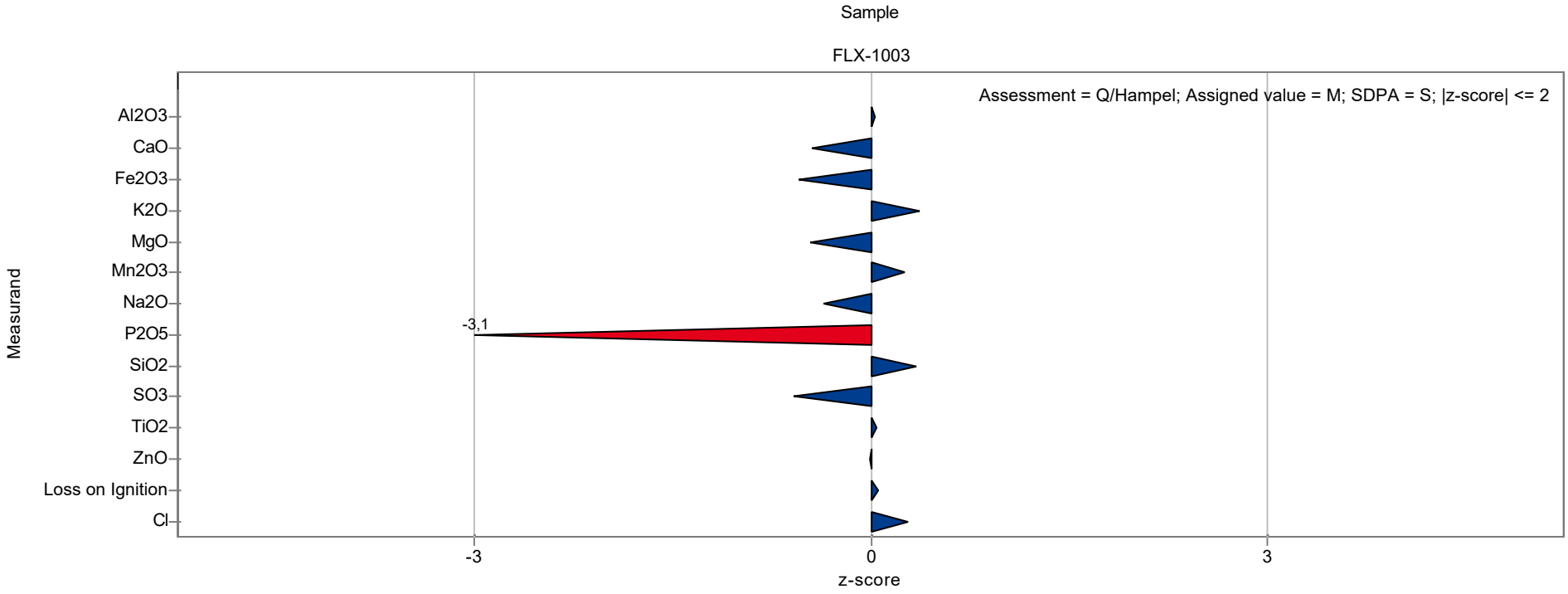
Laboratory chart of z-scores

Laboratory: 14



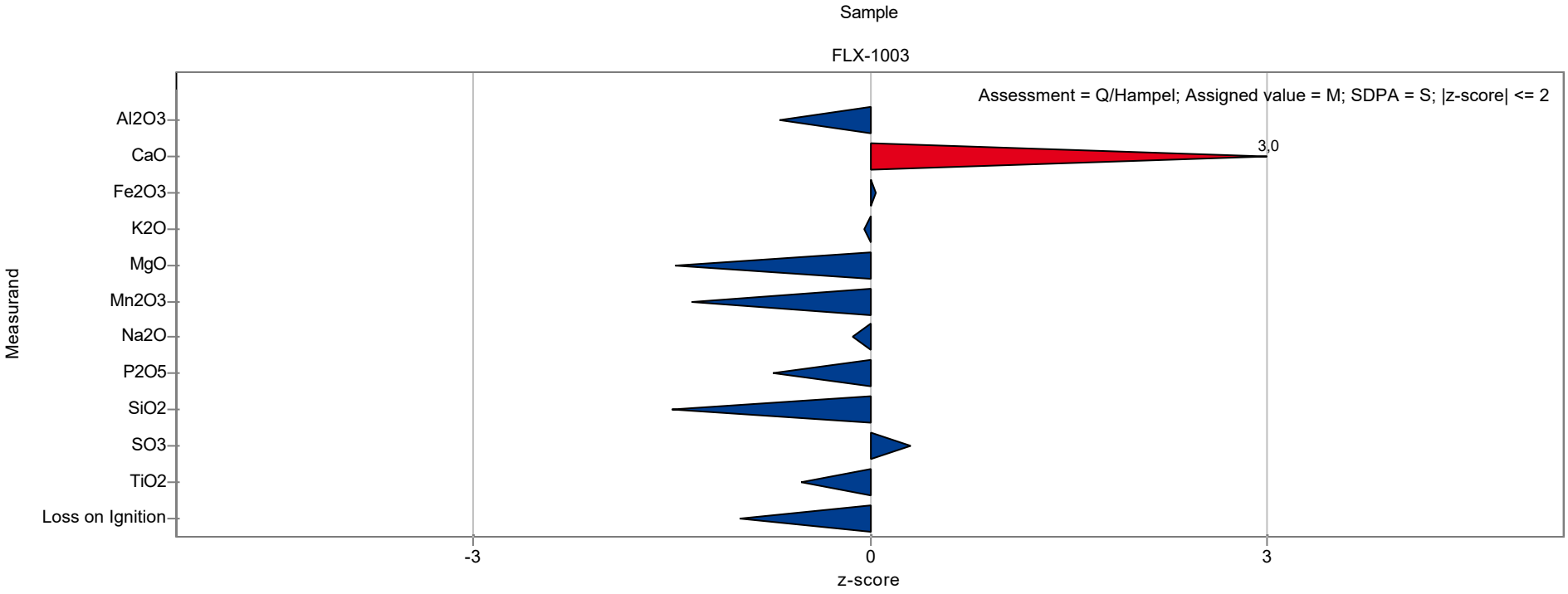
Laboratory chart of z-scores

Laboratory: 15.



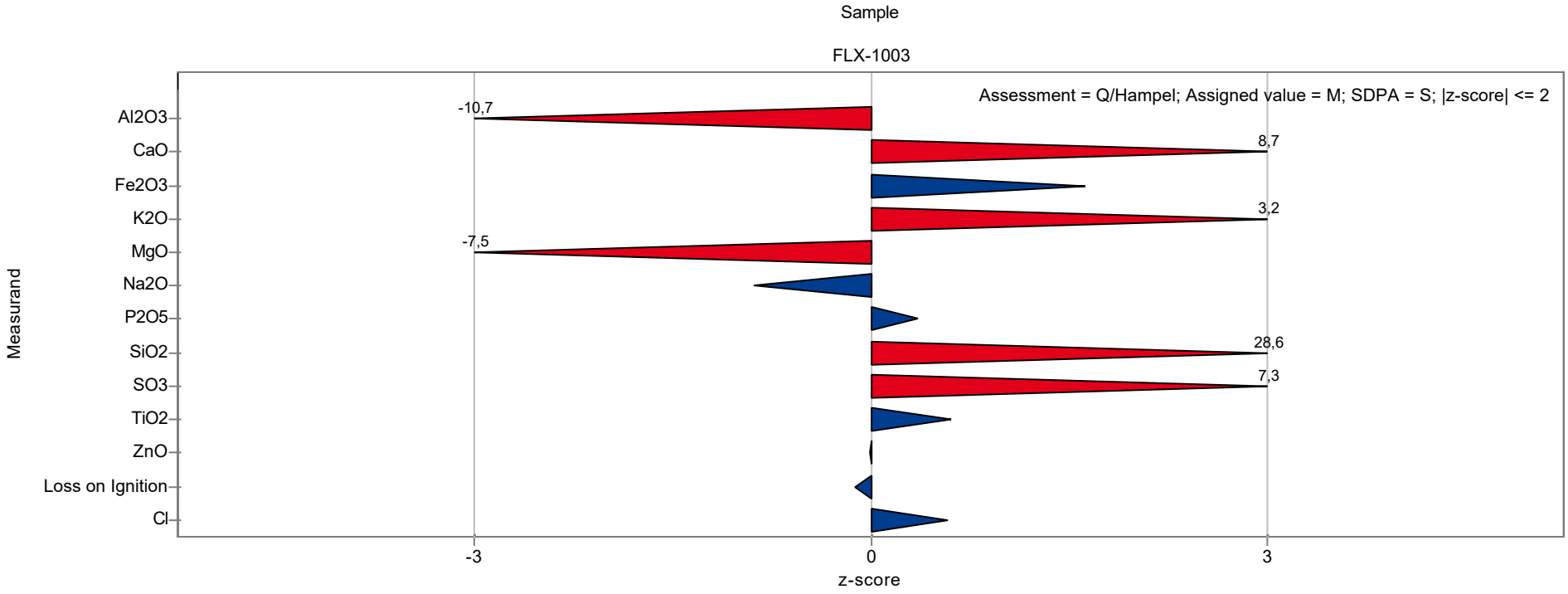
Laboratory chart of z-scores

Laboratory: 16



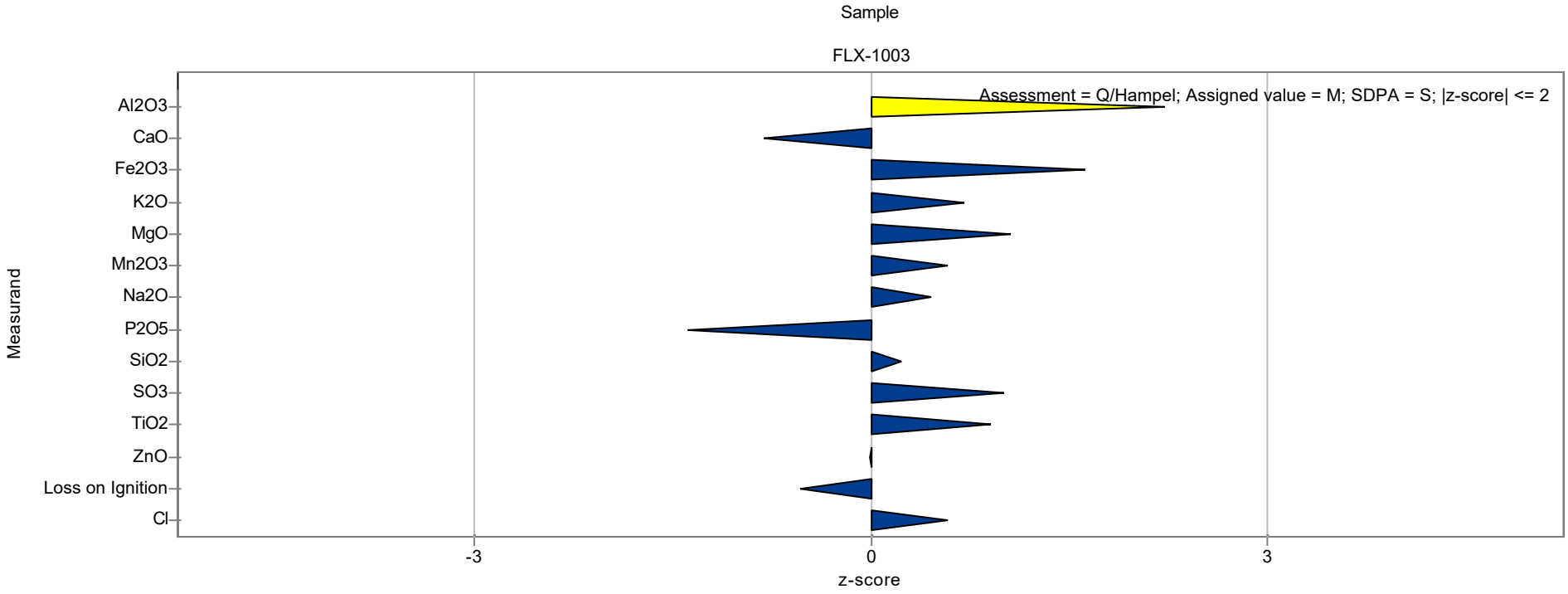
Laboratory chart of z-scores

Laboratory: 17



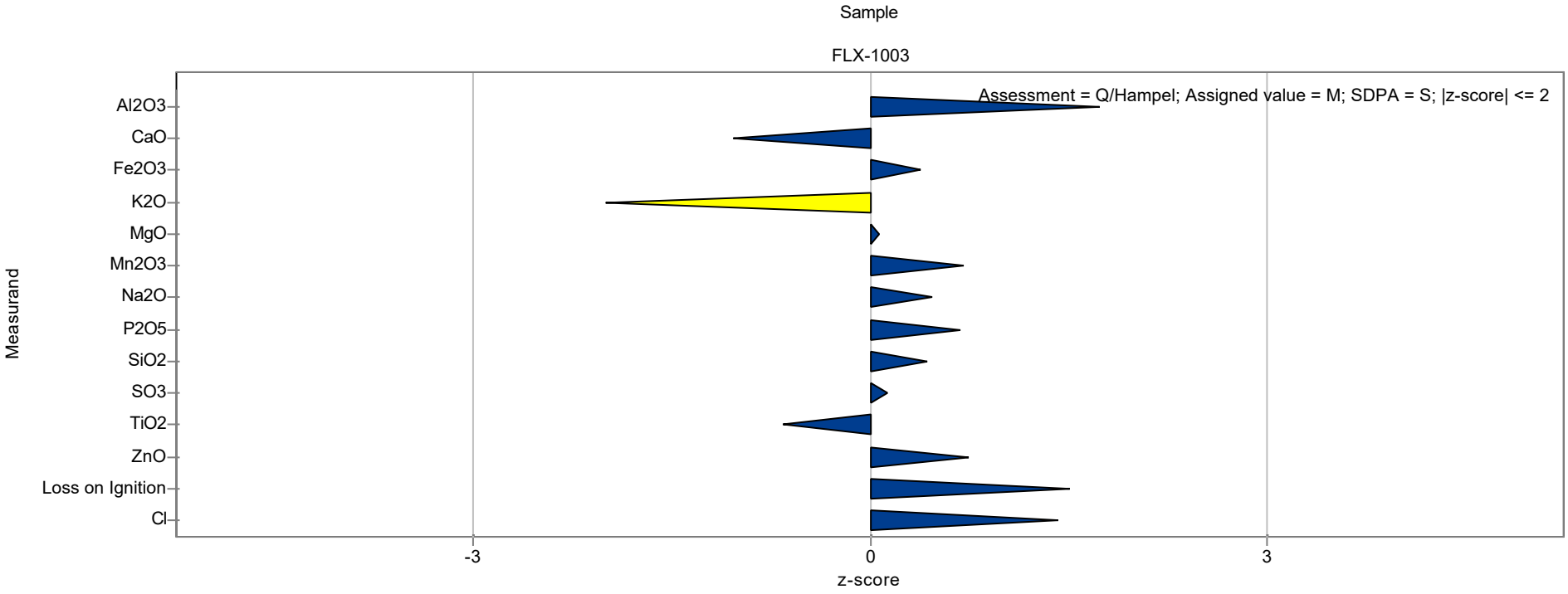
Laboratory chart of z-scores

Laboratory: 18



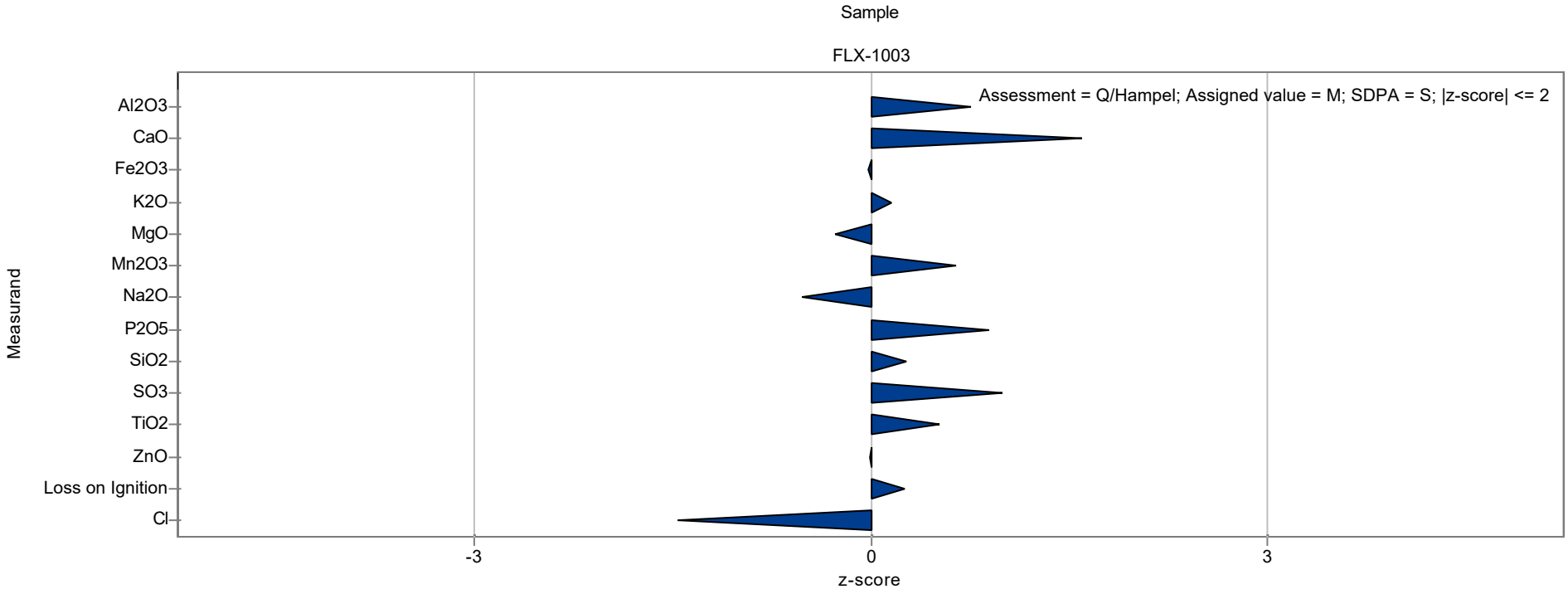
Laboratory chart of z-scores

Laboratory: 19



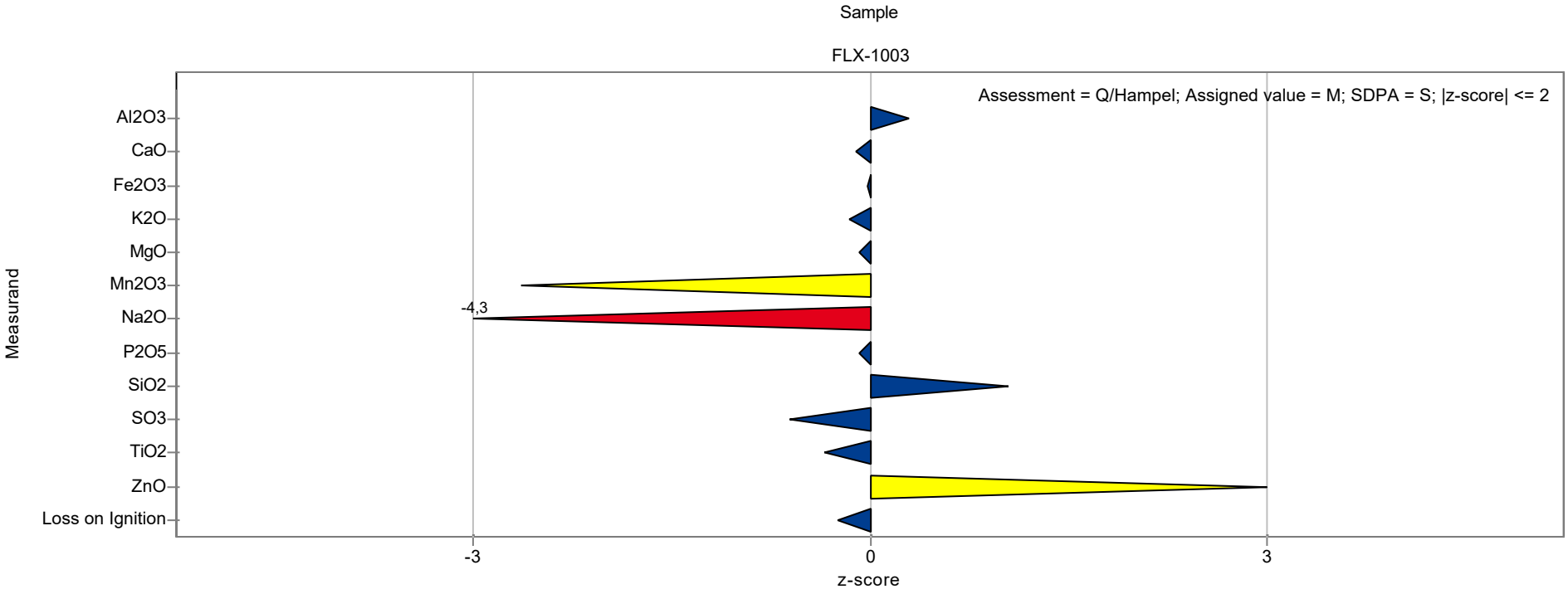
Laboratory chart of z-scores

Laboratory: 20



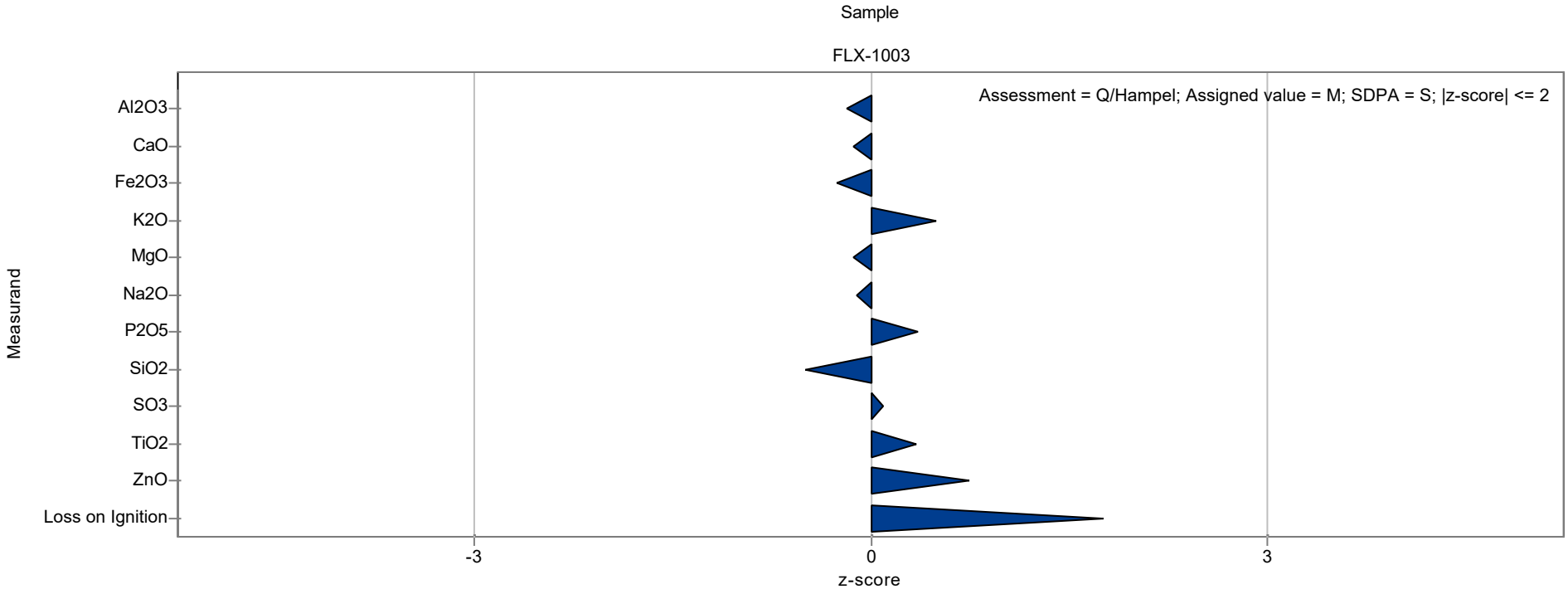
Laboratory chart of z-scores

Laboratory: 21



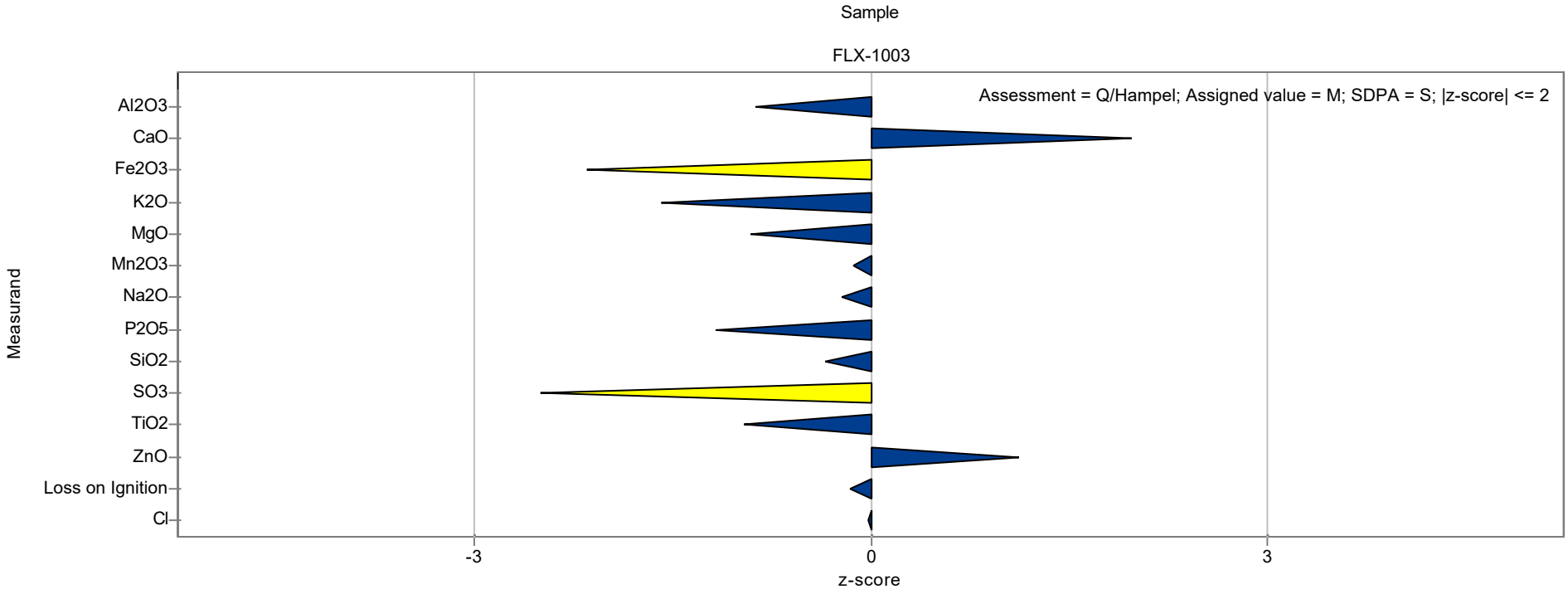
Laboratory chart of z-scores

Laboratory: 22



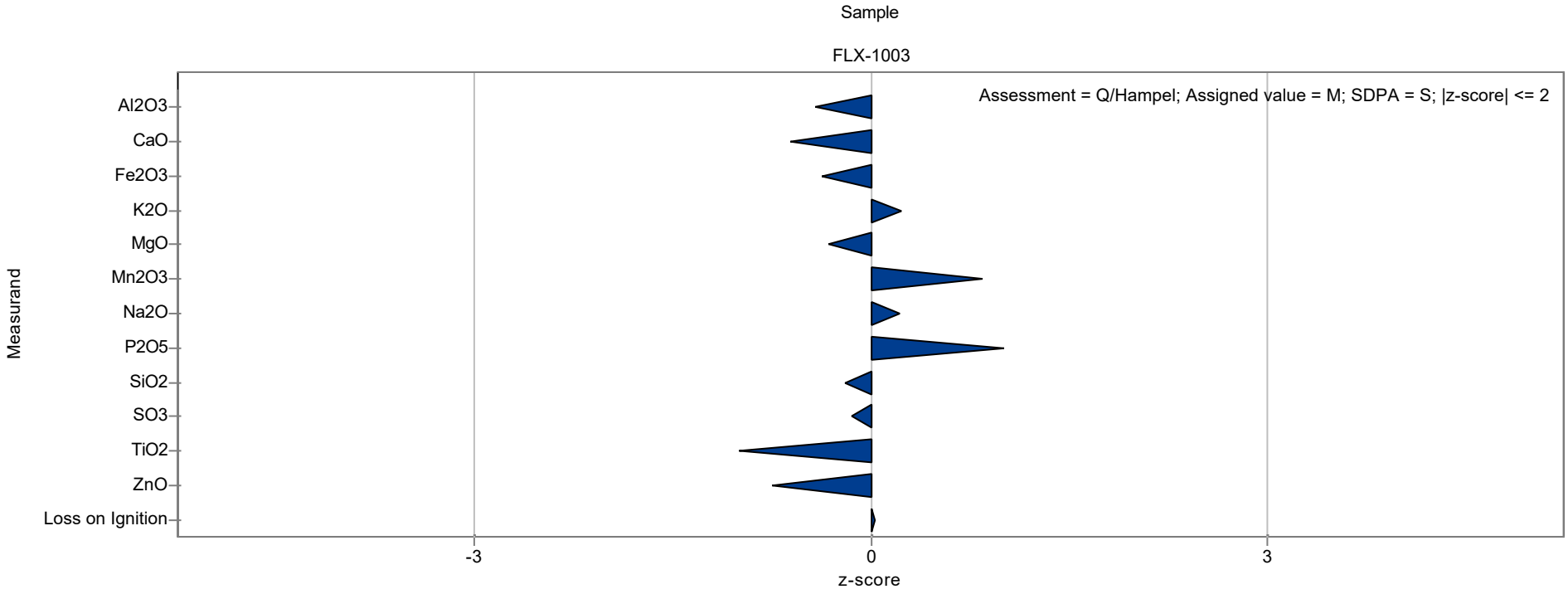
Laboratory chart of z-scores

Laboratory: 23



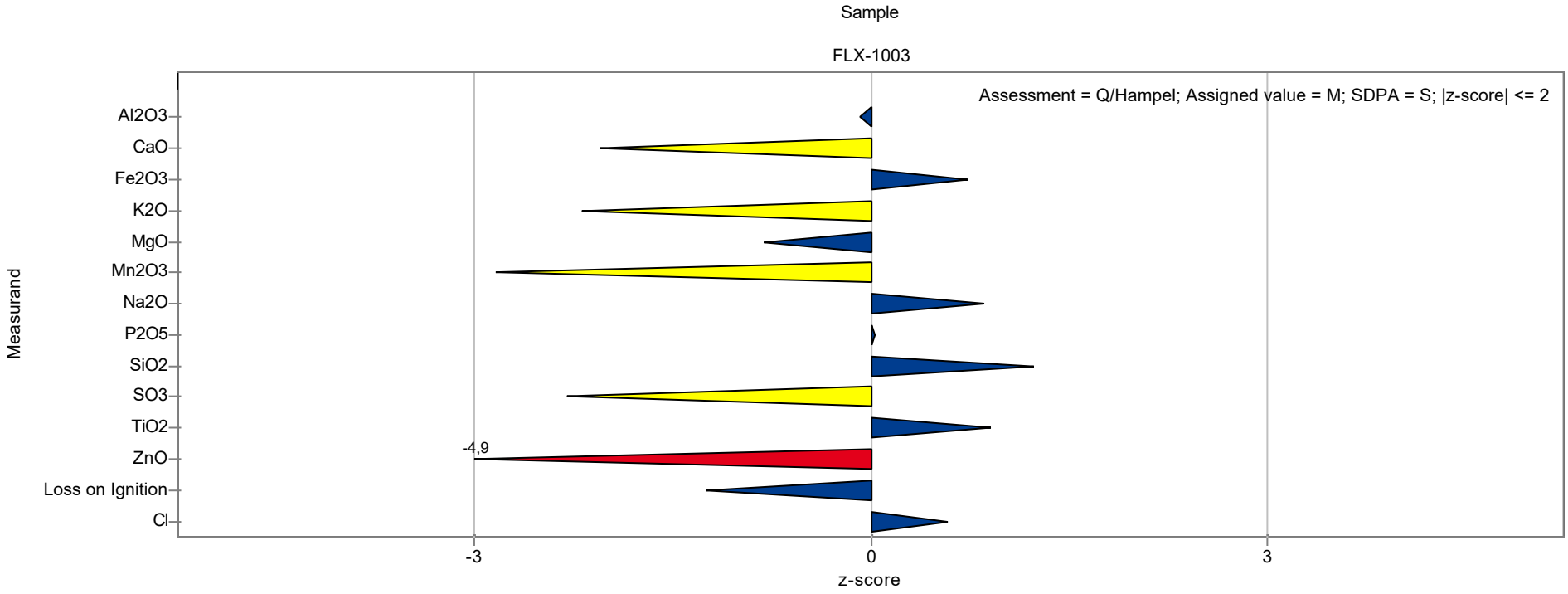
Laboratory chart of z-scores

Laboratory: 24



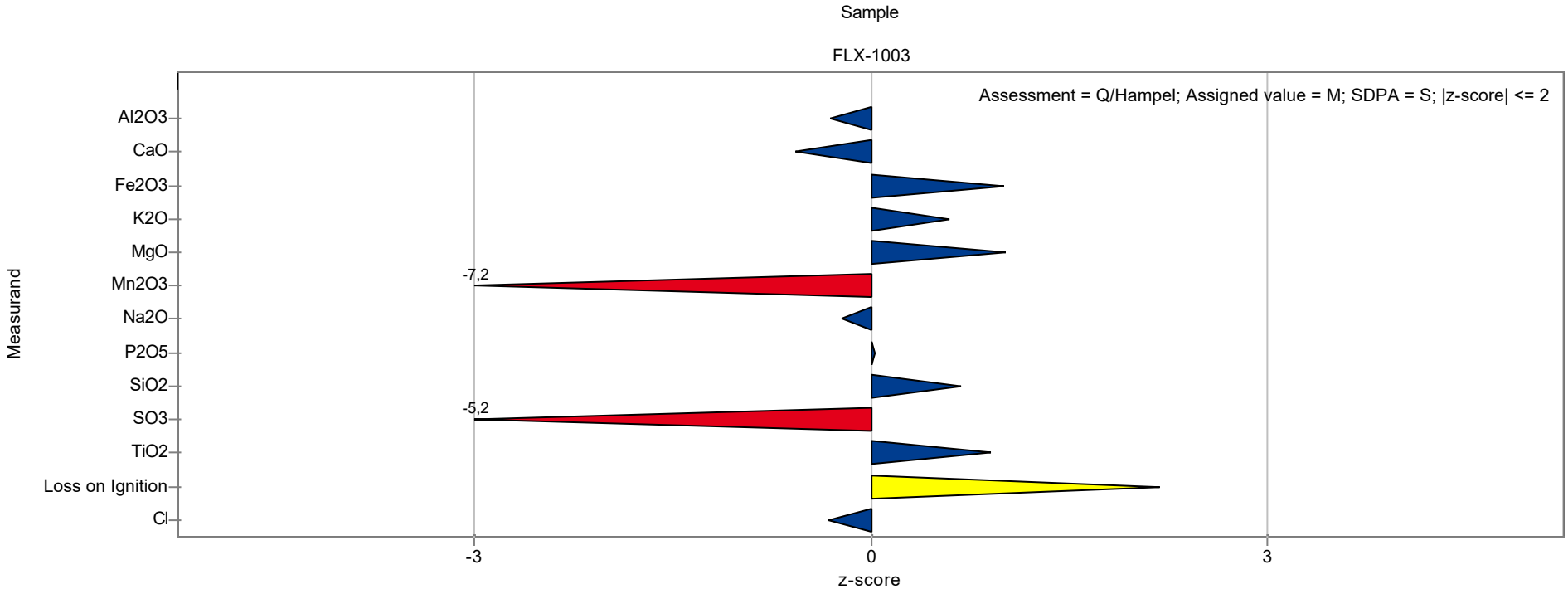
Laboratory chart of z-scores

Laboratory: 25



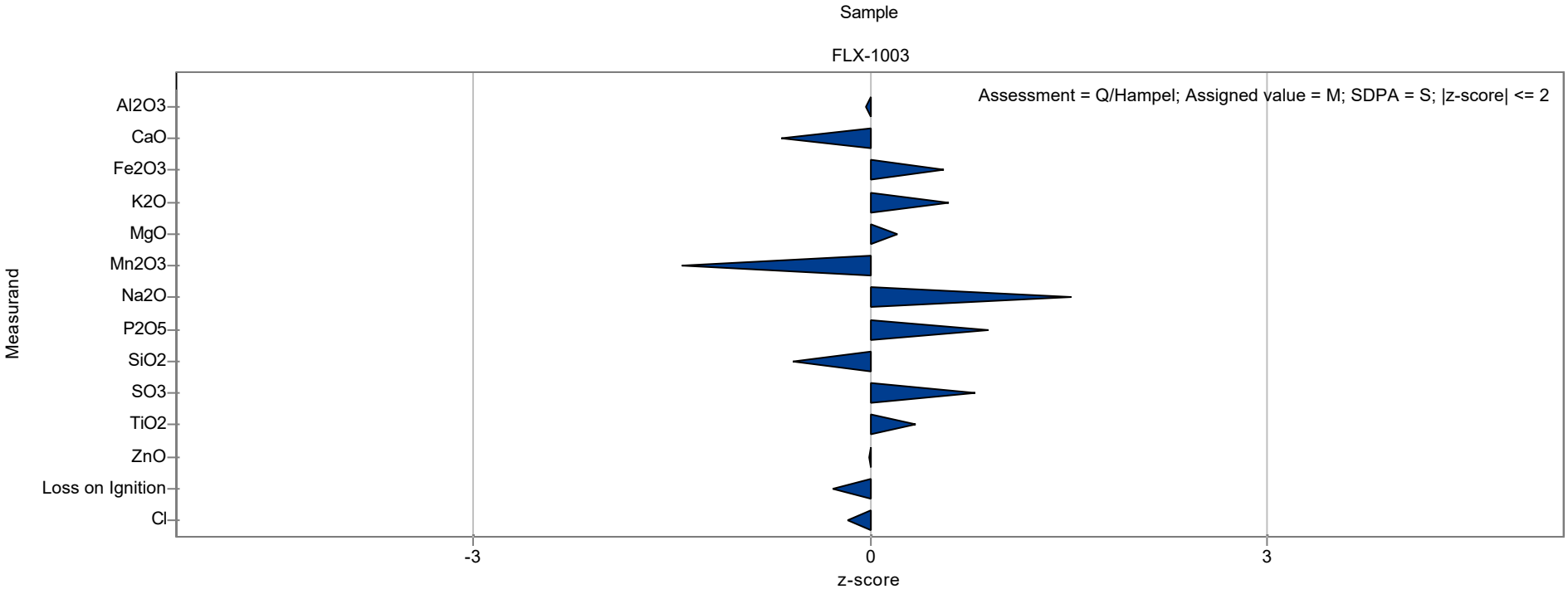
Laboratory chart of z-scores

Laboratory: 26



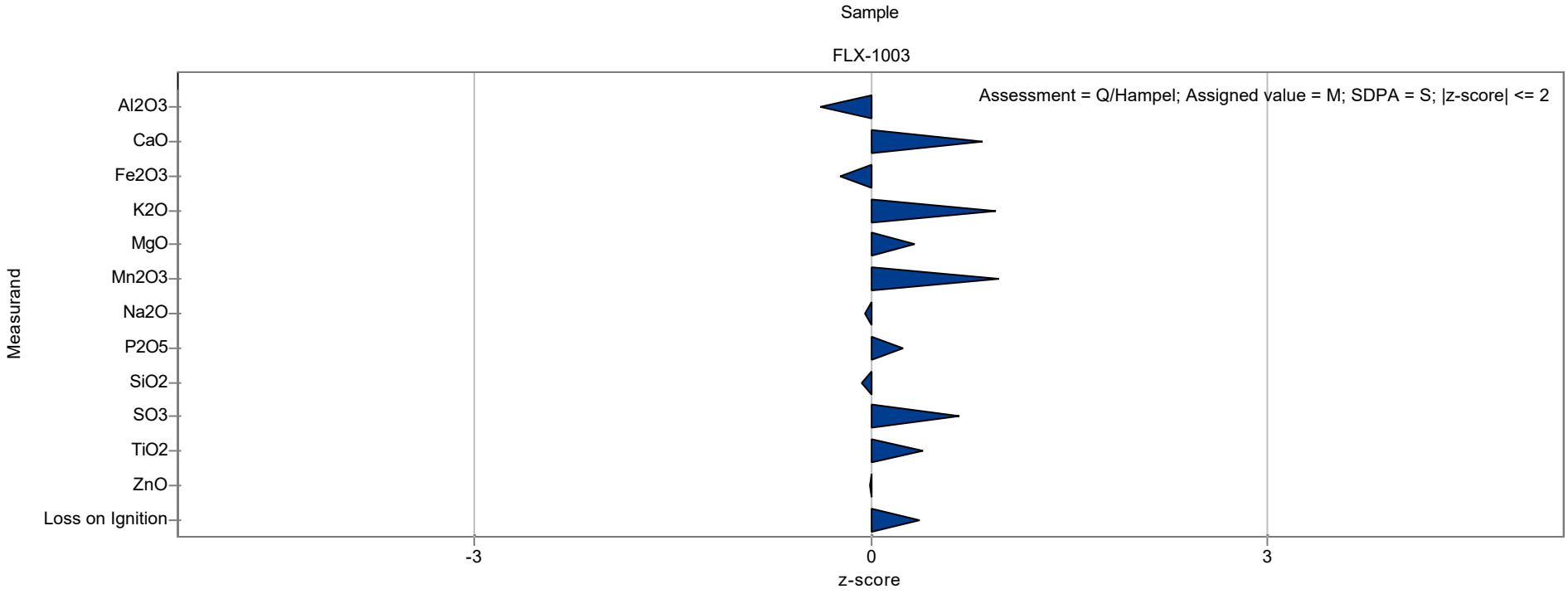
Laboratory chart of z-scores

Laboratory: 27



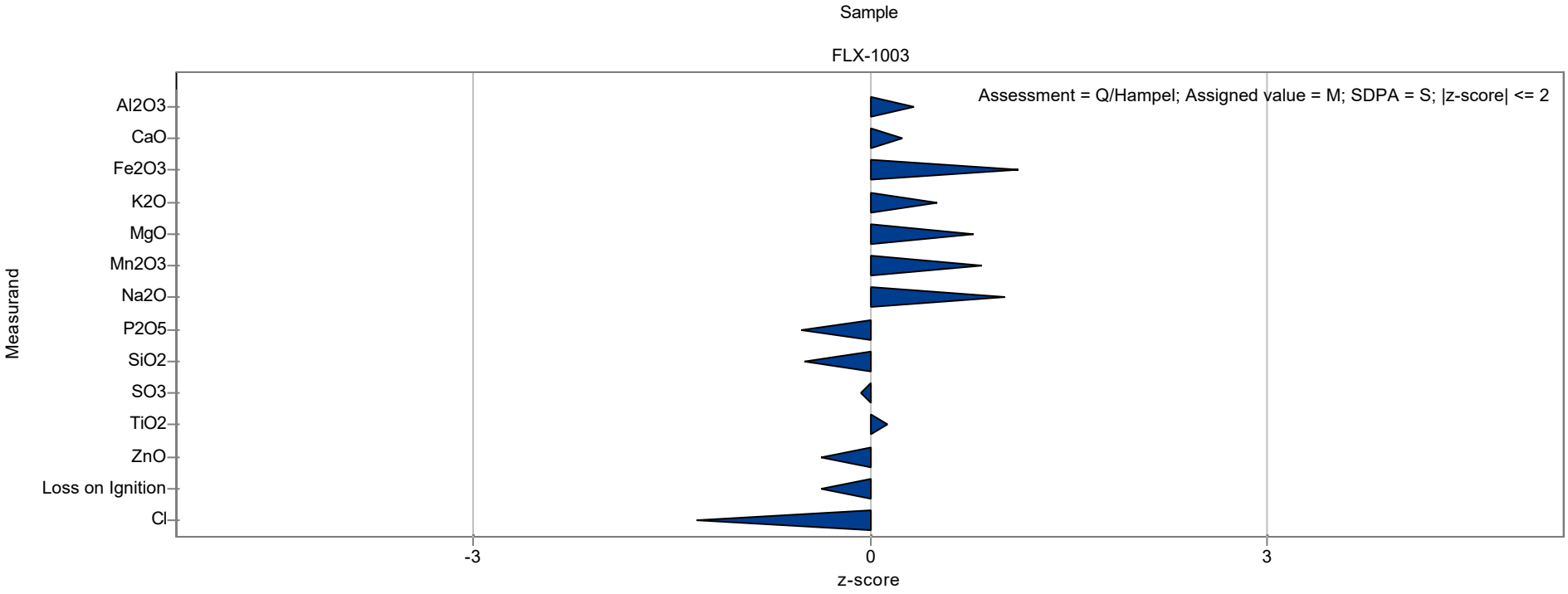
Laboratory chart of z-scores

Laboratory: 29



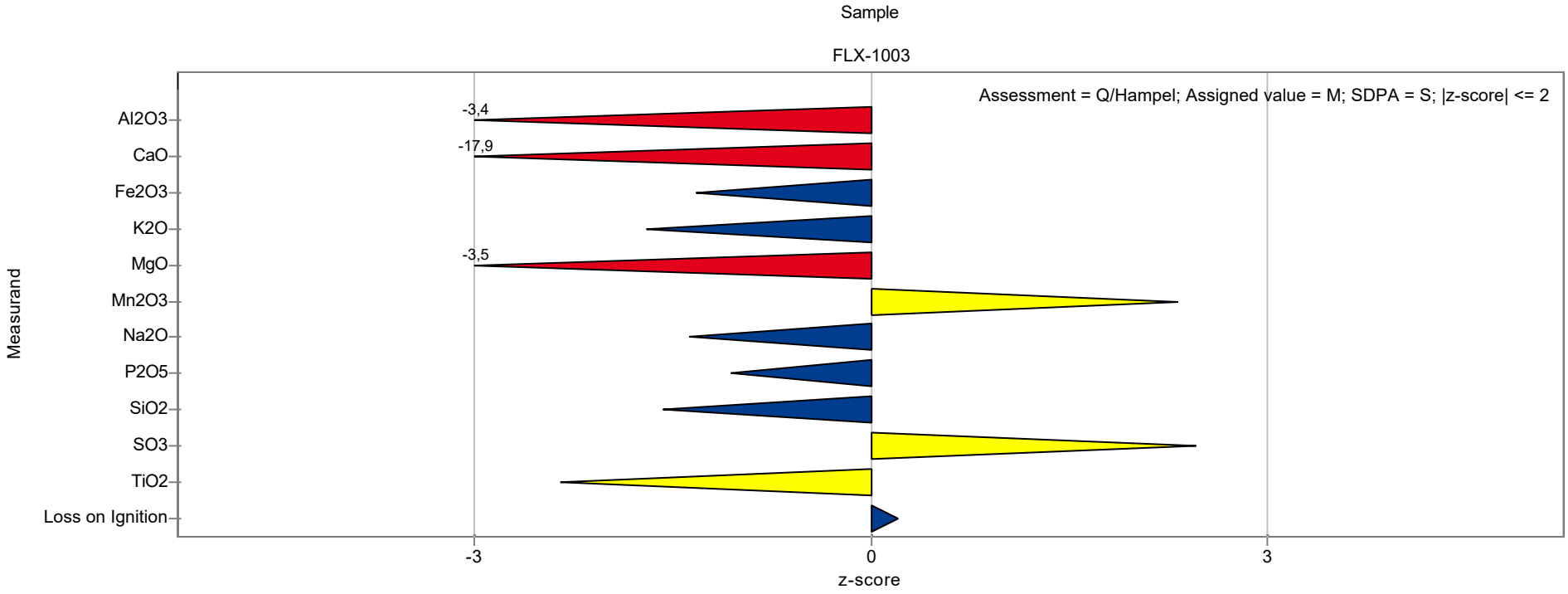
Laboratory chart of z-scores

Laboratory: 30



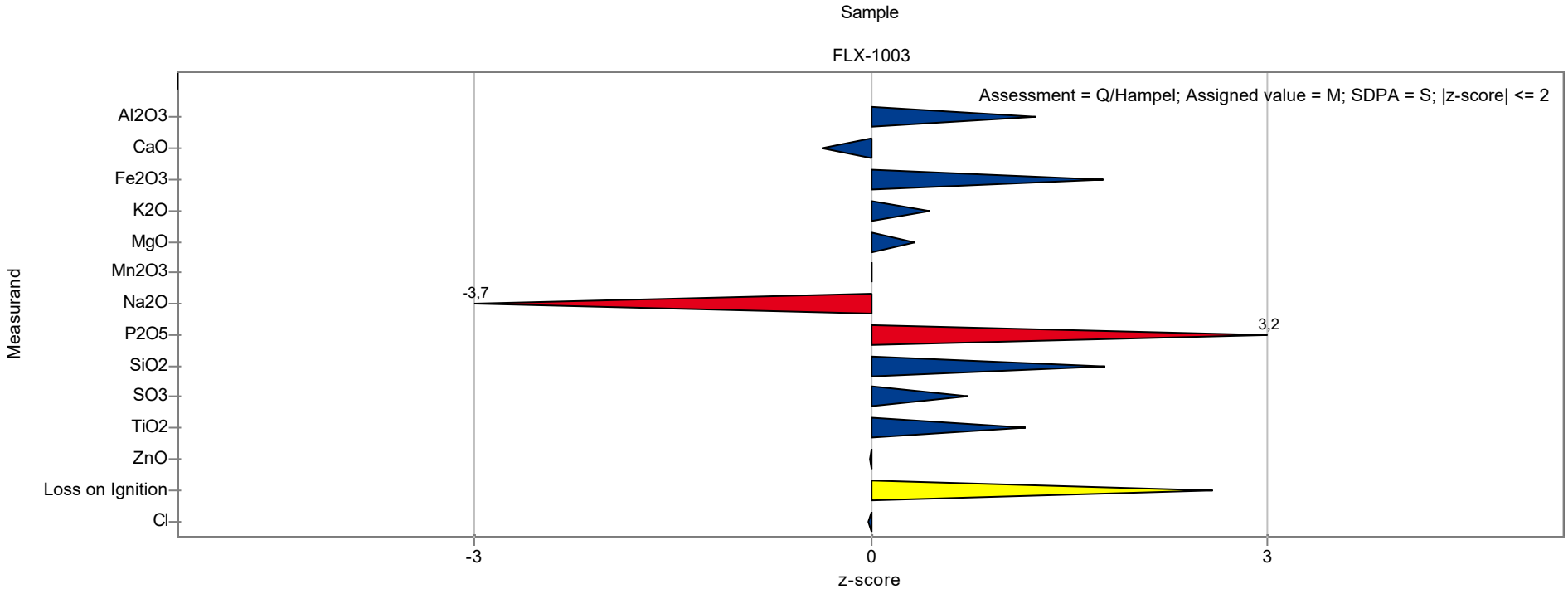
Laboratory chart of z-scores

Laboratory: 31



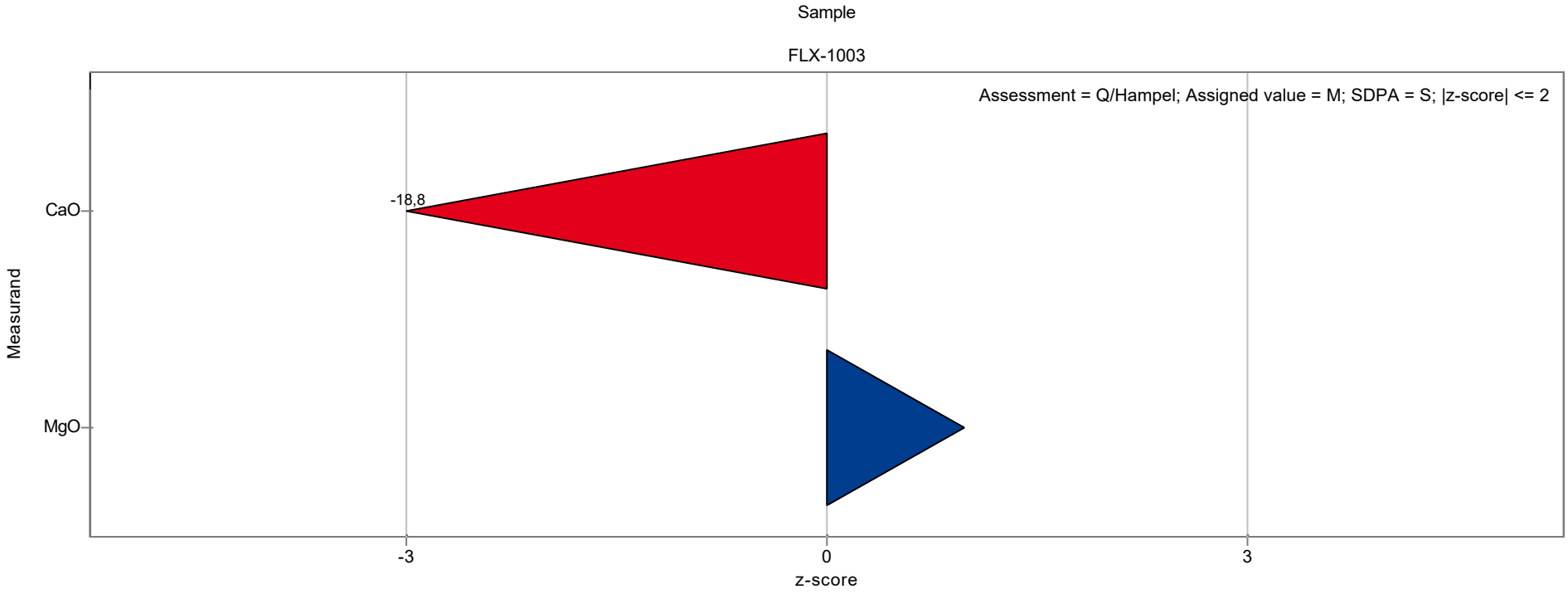
Laboratory chart of z-scores

Laboratory: 32



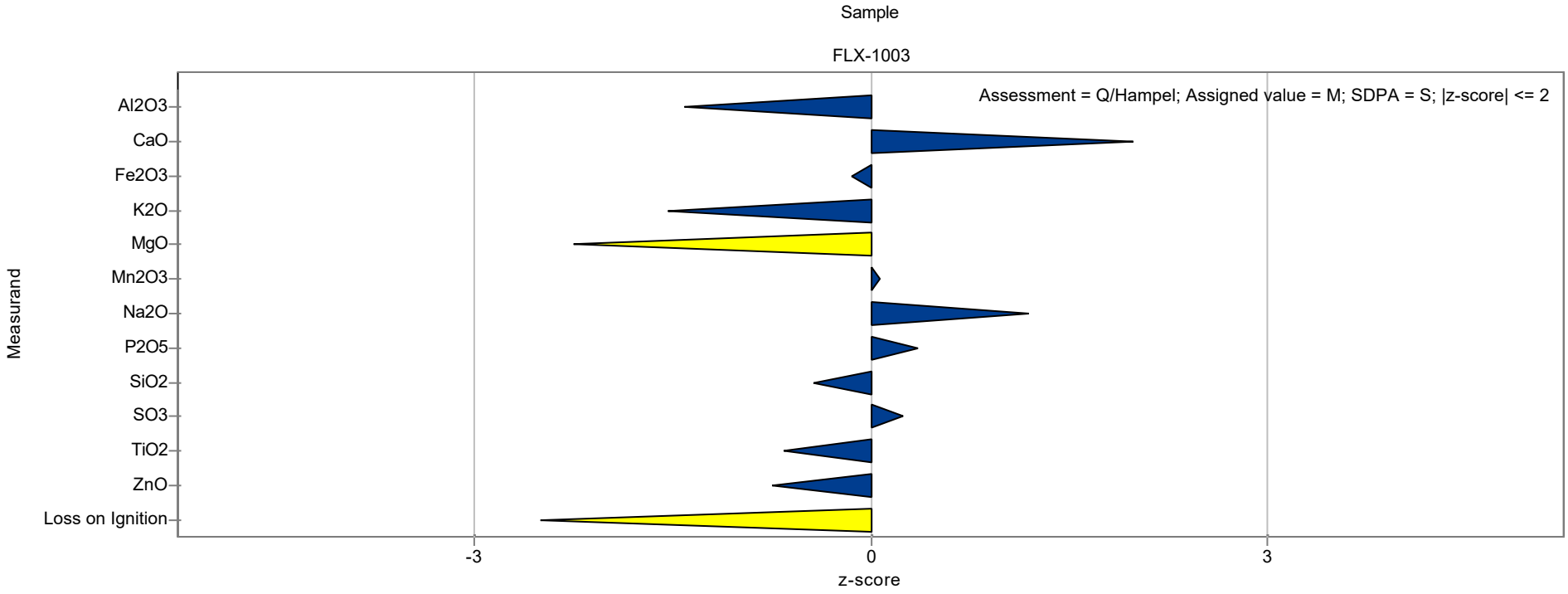
Laboratory chart of z-scores

Laboratory: 34



Laboratory chart of z-scores

Laboratory: 35



Laboratory chart of z-scores

Laboratory: 36