

FLUXANA®

XRF Application Solutions

RV-2018-01

Final Proficiency Test Report for Cement

FLX-RV-Sample01, FLX-RV-Sample02



Bedburg-Hau, January 31, 2019

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Statistics and Report
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FLX-RV-Sample01	Al ₂ O ₃	CaO	Cr ₂ O ₃	Fe ₂ O ₃	K ₂ O	LOI	MgO	Mn ₂ O ₃
Unit	%	%	%	%	%	%	%	%
No. of laboratories	11	11	7	11	11	12	11	10
Mean m	4,670	64,987	0,006	2,987	0,754	3,410	2,190	0,231
Reproducibility standard deviation s _R	0,083	0,634	0,004	0,051	0,086	0,169	0,043	0,010
Repeatability standard deviation s _r	0,015	0,030	0,003	0,011	0,012	0,042	0,017	0,002
Robust standard deviation s*	0,081	0,583	0,004	0,040	0,099	0,178	0,035	0,009
Uncertainty U (s*)	0,061	0,440	0,004	0,030	0,074	0,128	0,026	0,007
Uncertainty U (s _R)	0,063	0,478	0,004	0,038	0,065	0,122	0,032	0,008
Mean - 2*s _R	4,504	63,720	-0,002	2,885	0,582	3,073	2,104	0,211
Mean + 2*s _R	4,835	66,254	0,013	3,089	0,926	3,748	2,276	0,251
	Na ₂ O	P ₂ O ₅	SiO ₂	SO ₃	SrO	TiO ₂	ZnO	
Unit	%	%	%	%	%	%	%	
No. of laboratories	11	10	11	11	9	10	7	
Mean m	0,088	0,172	20,153	3,423	0,085	0,190	0,040	
Reproducibility standard deviation s _R	0,031	0,009	0,147	0,080	0,006	0,014	0,005	
Repeatability standard deviation s _r	0,010	0,001	0,020	0,016	0,001	0,003	0,001	
Robust standard deviation s*	0,026	0,009	0,120	0,068	0,005	0,012	0,005	
Uncertainty U (s*)	0,020	0,007	0,090	0,051	0,005	0,009	0,005	
Uncertainty U (s _R)	0,023	0,007	0,111	0,060	0,005	0,011	0,005	
Mean - 2*s _R	0,026	0,154	19,859	3,263	0,074	0,163	0,031	
Mean + 2*s _R	0,150	0,189	20,446	3,582	0,097	0,218	0,049	

All values are in mass % and are based on annealed 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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RV-2018-01

FLX-RV-Sample02	Al ₂ O ₃	CaO	Cr ₂ O ₃	Fe ₂ O ₃	K ₂ O	LOI	MgO	Mn ₂ O ₃
Unit	%	%	%	%	%	%	%	%
No. of laboratories	11	11	6	11	11	12	11	10
Mean m	4,285	66,226	0,005	2,317	1,092	6,625	1,624	0,048
Reproducibility standard deviation s _R	0,090	0,490	0,002	0,069	0,062	0,239	0,034	0,007
Repeatability standard deviation s _r	0,015	0,090	0,001	0,005	0,013	0,027	0,007	0,001
Robust standard deviation s*	0,091	0,532	0,002	0,062	0,065	0,244	0,032	0,006
Uncertainty U (s*)	0,069	0,401	0,002	0,047	0,049	0,176	0,024	0,004
Uncertainty U (s _R)	0,068	0,369	0,002	0,052	0,047	0,172	0,026	0,006
Mean - 2*s _R	4,105	65,245	0,001	2,179	0,968	6,147	1,557	0,034
Mean + 2*s _R	4,465	67,207	0,009	2,454	1,216	7,102	1,691	0,063
	Na ₂ O	P ₂ O ₅	SiO ₂	SO ₃	SrO	TiO ₂	ZnO	
Unit	%	%	%	%	%	%	%	
No. of laboratories	11	10	11	11	9	10	8	
Mean m	0,214	0,054	20,510	3,195	0,148	0,208	0,047	
Reproducibility standard deviation s _R	0,022	0,008	0,158	0,039	0,008	0,015	0,007	
Repeatability standard deviation s _r	0,005	0,002	0,057	0,010	0,002	0,002	0,001	
Robust standard deviation s*	0,026	0,008	0,172	0,038	0,008	0,016	0,007	
Uncertainty U (s*)	0,019	0,006	0,129	0,028	0,007	0,013	0,006	
Uncertainty U (s _R)	0,017	0,006	0,119	0,029	0,007	0,012	0,006	
Mean - 2*s _R	0,171	0,038	20,194	3,117	0,132	0,177	0,034	
Mean + 2*s _R	0,258	0,071	20,825	3,273	0,164	0,238	0,060	

All values are in mass % and are based on annealed 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



RV-2018-01

Introduction

X-ray fluorescence analysis is a frequently used technique for the analysis of oxidic materials.

However, for the calibration of XRF instruments, dedicated standard material is needed. As a worldwide supplier for XRF laboratories, FLUXANA has developed a number of services to support XRF users. One of these services is the production of new reference materials and the organization of proficiency tests (PT).

In 2011, FLUXANA introduced its own quality management.

In February 2014, FLUXANA received accreditation from the German DAKKS according to DIN EN ISO/IEC 17025 for the test laboratory in Bedburg-Hau.

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

All evaluations are performed in agreement with DIN EN ISO/IEC 17043:2010-05, ISO Guide 34:2009, ISO Guide 31:2000 and ISO Guide 35:2006.

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). Outliers shown in the evaluation are only based on z-scores and marked with yellow or red colours.

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.

The laboratory performance is shown based on z-scores. The diagrams show the laboratory data in comparison with the calculated mean values.

**RV-2018-01****Participants**

Bernegger GmbH	Austria
Chemische Fabrik Budenheim KG	Germany
Zentrum für Glas- und Umweltanalytik GmbH	Germany
Wessling GmbH	Germany
BWZ Bildungs- und Wissenschaftszentrum	Germany
DEA Deutsche Erdöl AG	Germany
Fugro Technical Services Ltd.	Hong Kong
Sharrcem Sh. P. K. - Titan Group	Kosovë/Albania
CMS Cement Industries Sdn Bhd	Malaysia
CRL Energy Ltd	New Zealand
PPC Cement Group Lab Services	South Africa
Holcim (Schweiz) AG, Zentral-Labor	Switzerland
X-ray Minerals Services Ltd	United Kingdom



RV-2018-01

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 13528:2015)

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 :

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



RV-2018-01

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:

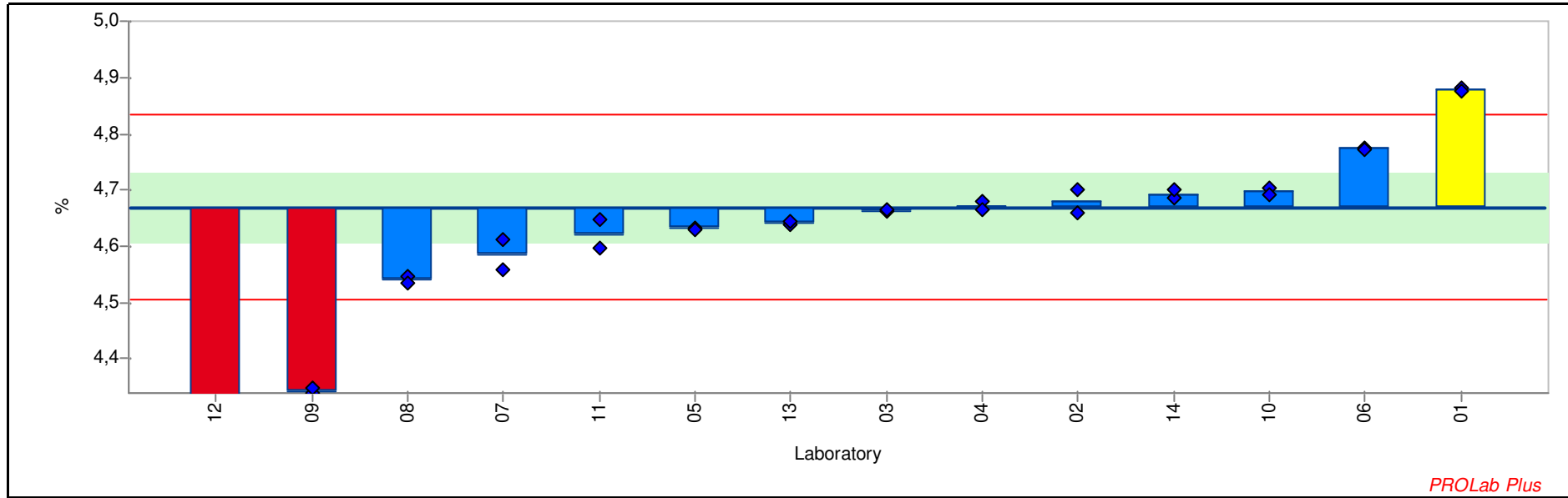
$ z \leq 2.0$	indicates "satisfactory" performance = generates no signal
$2.0 < z < 3.0$	indicates "questionable" performance = generates a warning signal
$ z \geq 3.0$	indicates "unsatisfactory" performance = generates an action signal

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

RV-2018-01 Zement

Summary results

Sample: FLX-RV-Sample01 **Reprod. s.d.:** 0,083 %
Measurand: Al₂O₃ **Repeat. s.d:** 0,015 %
Mean ± U(Mean): 4,670 ± 0,061 % **Range of tolerance:** 4,504 - 4,835 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method:** Q/Hampel



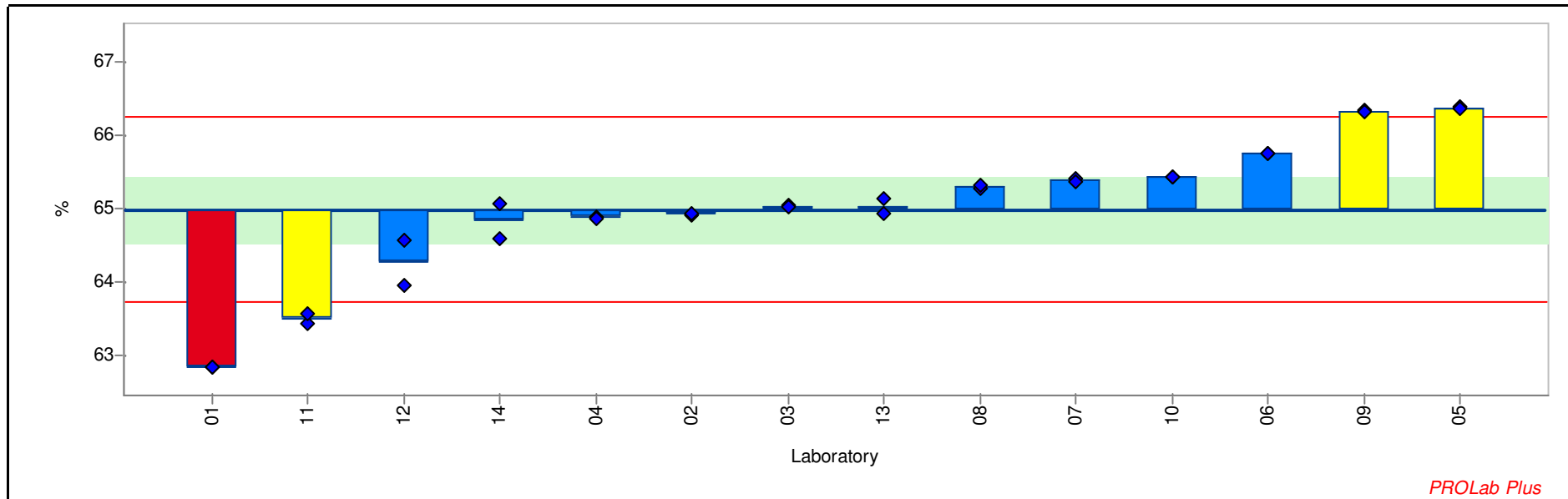
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	4,879	0,004	2,529	4,882	4,876	no accreditation	XRF (fusion)	
02	4,680	0,028	0,123	4,700	4,660	ISO 17025	XRF (fusion)	
03	4,662	0,002	-0,089	4,661	4,664	ISO 17025	XRF (fusion)	
04	4,671	0,011	0,020	4,679	4,664	ISO 17025	XRF (fusion)	
05	4,632	0,001	-0,458	4,633	4,631	ISO 17025	XRF (pressed pellet)	Info only
06	4,774	0,003	1,260	4,776	4,772	ISO 17025	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
07	4,585	0,037	-1,020	4,559	4,612	no accreditation	XRF (fusion)	
08	4,541	0,010	-1,558	4,548	4,534	no accreditation	XRF (fusion)	
09	4,344	0,005	-3,947	4,340	4,347	no accreditation	XRF (pressed pellet)	Info only
10	4,699	0,009	0,347	4,705	4,692	no accreditation	XRF (fusion)	
11	4,621	0,036	-0,587	4,596	4,647	ISO 17025	XRF (fusion)	
12	2,966	0,305	-20,599	3,182	2,751	no accreditation	XRF (pressed pellet)	Info only
13	4,643	0,004	-0,327	4,640	4,646	ISO 17025	XRF (fusion)	
14	4,692	0,011	0,274	4,685	4,700	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,634 %
Measurand: CaO **Repeat. s.d** 0,030 %
Mean ± U(Mean): 64,987 ± 0,440 % **Range of tolerance:** 63,720 - 66,254 % (|z-score| <= 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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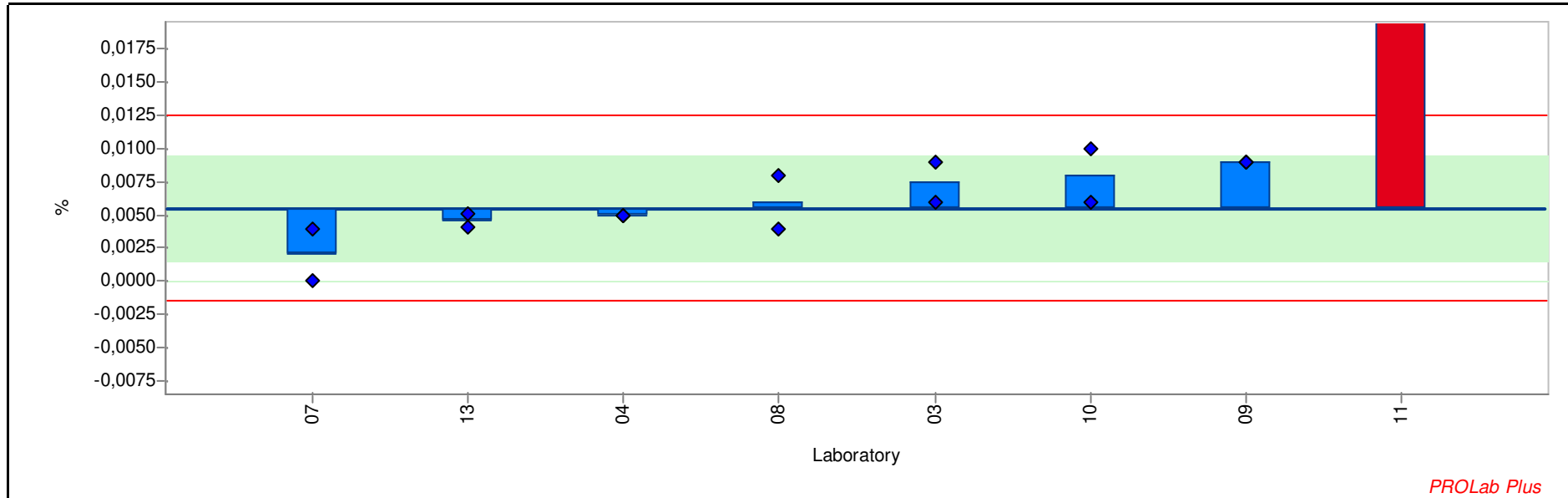
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	62,849	0,000	-3,375	62,849	62,849	no accreditation	XRF (fusion)	
02	64,920	0,014	-0,106	64,910	64,930	ISO 17025	XRF (fusion)	
03	65,032	0,007	0,071	65,037	65,027	ISO 17025	XRF (fusion)	
04	64,874	0,004	-0,178	64,877	64,872	ISO 17025	XRF (fusion)	
05	66,373	0,013	2,187	66,382	66,363	ISO 17025	XRF (pressed pellet)	Info only
06	65,751	0,006	1,206	65,747	65,755	ISO 17025	XRF (fusion)	
07	65,381	0,031	0,622	65,403	65,359	no accreditation	XRF (fusion)	
08	65,295	0,045	0,486	65,263	65,327	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	66,322	0,014	2,107	66,332	66,312	no accreditation	XRF (pressed pellet)	Info only
10	65,429	0,013	0,697	65,438	65,420	no accreditation	XRF (fusion)	
11	63,499	0,099	-2,348	63,429	63,569	ISO 17025	XRF (fusion)	
12	64,264	0,435	-1,141	64,572	63,957	no accreditation	XRF (pressed pellet)	Info only
13	65,032	0,153	0,071	65,141	64,924	ISO 17025	XRF (fusion)	
14	64,832	0,336	-0,244	64,595	65,070	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,004 %
Measurand: Cr2O3 **Repeat. s.d** 0,003 %
Mean ± U(Mean): 0,006 ± 0,004 % **Range of tolerance:** -0,002 - 0,013 % (|z-score| <= 2,000)
No. of laboratories: 7 **Statistical method** Q/Hampel



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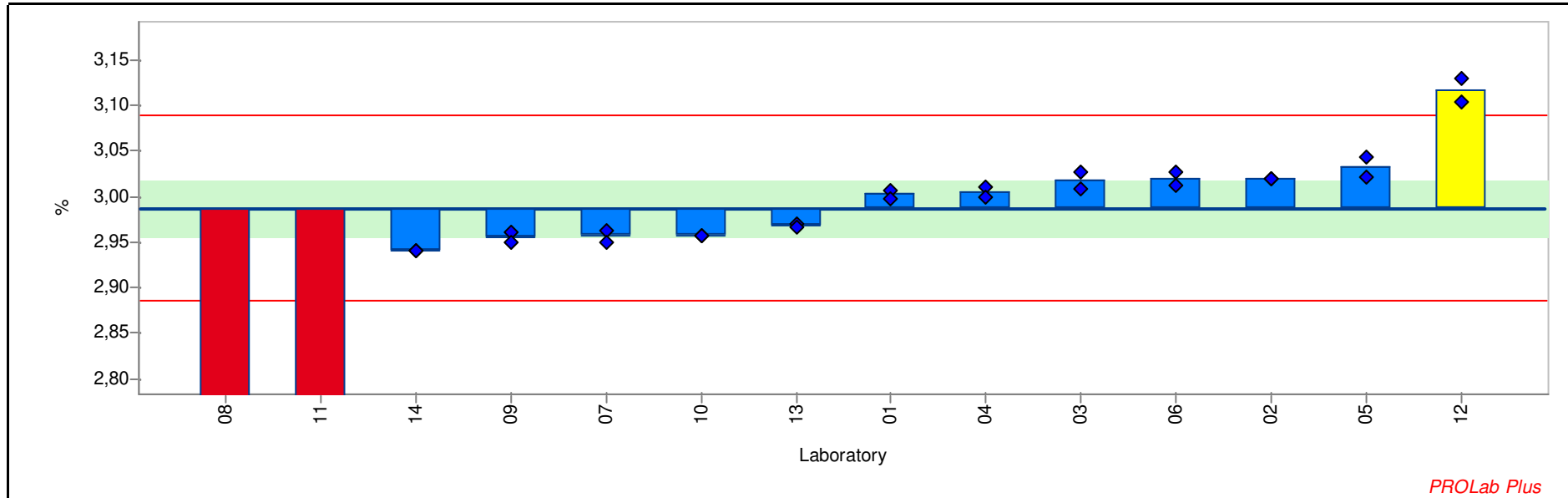
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
03	0,007	0,002	0,565	0,006	0,009	ISO 17025	XRF (fusion)	
04	0,005	0,000	-0,147	0,005	0,005	ISO 17025	XRF (fusion)	
06	<0,009			<0,009	<0,009	ISO 17025	XRF (fusion)	
07	0,002	0,003	-1,001	0,004	0,000	no accreditation	XRF (fusion)	
08	0,006	0,003	0,138	0,004	0,008	no accreditation	XRF (fusion)	
09	0,009	0,000	0,992	0,009	0,009	no accreditation	XRF (pressed pellet)	Info only
10	0,008	0,003	0,707	0,010	0,006	no accreditation	XRF (fusion)	
11	0,042	0,000	10,382	0,042	0,042	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
13	0,005	0,001	-0,261	0,005	0,004	ISO 17025	XRF (fusion)	
14	<0,002			<0,002	<0,002	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.:** 0,051 %
Measurand: Fe2O3 **Repeat. s.d.:** 0,011 %
Mean ± U(Mean): 2,987 ± 0,030 % **Range of tolerance:** 2,885 - 3,089 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method:** Q/Hampel



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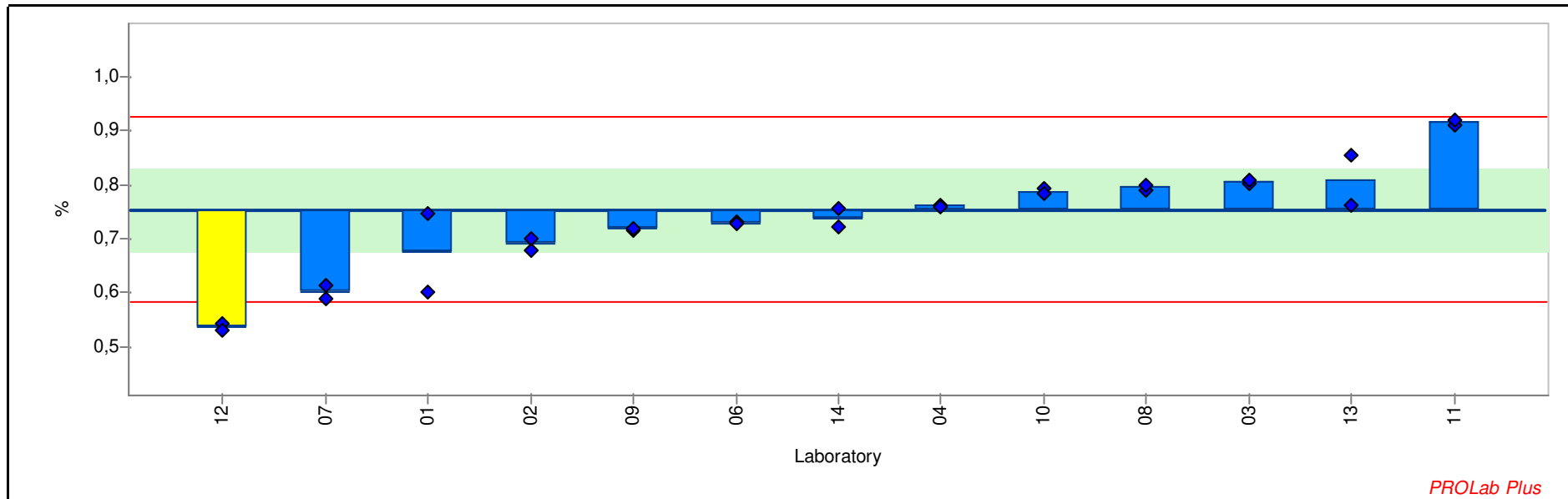
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	3,002	0,006	0,287	3,006	2,998	no accreditation	XRF (fusion)	
02	3,020	0,000	0,640	3,020	3,020	ISO 17025	XRF (fusion)	
03	3,018	0,013	0,601	3,009	3,027	ISO 17025	XRF (fusion)	
04	3,005	0,008	0,346	3,011	2,999	ISO 17025	XRF (fusion)	
05	3,032	0,016	0,875	3,043	3,021	ISO 17025	XRF (pressed pellet)	Info only
06	3,019	0,010	0,621	3,026	3,012	ISO 17025	XRF (fusion)	
07	2,957	0,009	-0,604	2,963	2,950	no accreditation	XRF (fusion)	
08	2,671	0,011	-6,188	2,679	2,664	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	2,955	0,007	-0,633	2,960	2,950	no accreditation	XRF (pressed pellet)	Info only
10	2,958	0,000	-0,575	2,958	2,958	no accreditation	XRF (fusion)	
11	2,713	0,013	-5,367	2,704	2,723	ISO 17025	XRF (fusion)	
12	3,117	0,018	2,541	3,130	3,104	no accreditation	XRF (pressed pellet)	Info only
13	2,967	0,002	-0,389	2,969	2,966	ISO 17025	XRF (fusion)	
14	2,940	0,000	-0,927	2,940	2,940	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,086 %
Measurand: K2O **Repeat. s.d** 0,012 %
Mean ± U(Mean): 0,754 ± 0,074 % **Range of tolerance:** 0,582 - 0,926 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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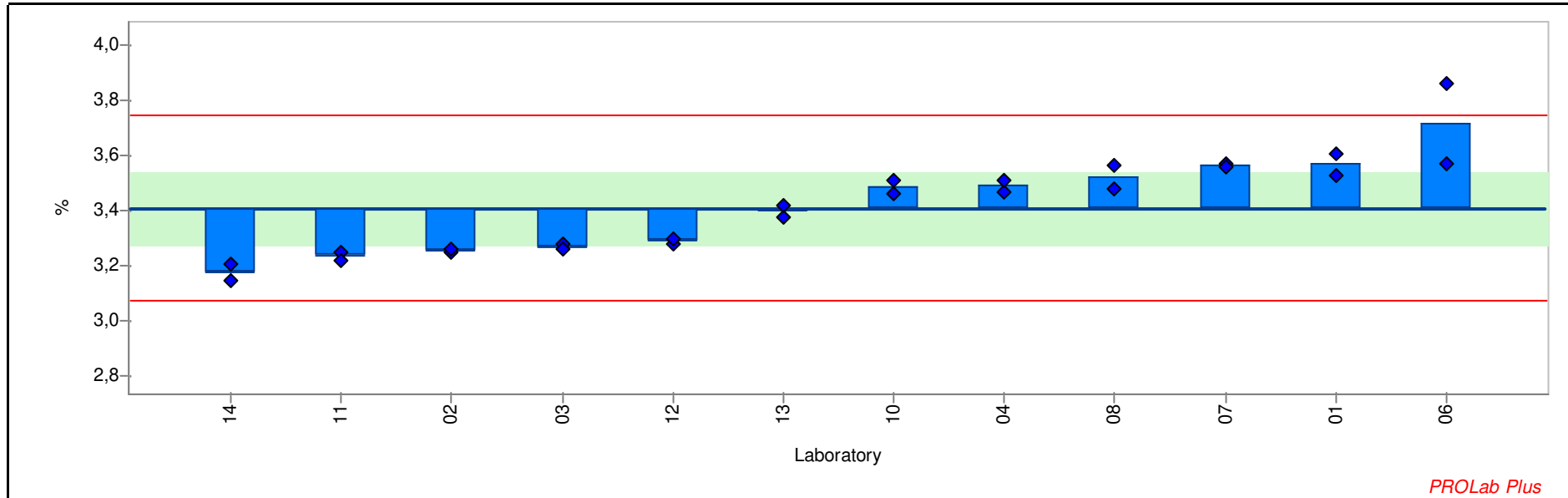
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,674	0,103	-0,932	0,601	0,747	no accreditation	XRF (fusion)	
02	0,690	0,014	-0,746	0,680	0,700	ISO 17025	XRF (fusion)	
03	0,804	0,005	0,586	0,801	0,808	ISO 17025	XRF (fusion)	
04	0,761	0,001	0,080	0,762	0,760	ISO 17025	XRF (fusion)	
06	0,728	0,002	-0,298	0,730	0,727	ISO 17025	XRF (fusion)	
07	0,601	0,016	-1,776	0,590	0,613	no accreditation	XRF (fusion)	
08	0,796	0,006	0,481	0,791	0,800	no accreditation	XRF (fusion)	
09	0,718	0,001	-0,420	0,717	0,719	no accreditation	XRF (pressed pellet)	Info only

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,787	0,007	0,383	0,792	0,782	no accreditation	XRF (fusion)	
11	0,915	0,008	1,869	0,909	0,920	no accreditation	Other Method	Total Alkalis in house method AAS1
12	0,538	0,008	-2,520	0,543	0,532	no accreditation	XRF (pressed pellet)	Info only
13	0,808	0,065	0,627	0,762	0,854	ISO 17025	XRF (fusion)	
14	0,738	0,025	-0,182	0,756	0,721	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,169 %
Measurand: Loss on Ignition **Repeat. s.d** 0,042 %
Mean ± U(Mean): 3,410 ± 0,128 % **Range of tolerance:** 3,073 - 3,748 % (|z-score| <= 2,000)
No. of laboratories: 12 **Statistical method** Q/Hampel



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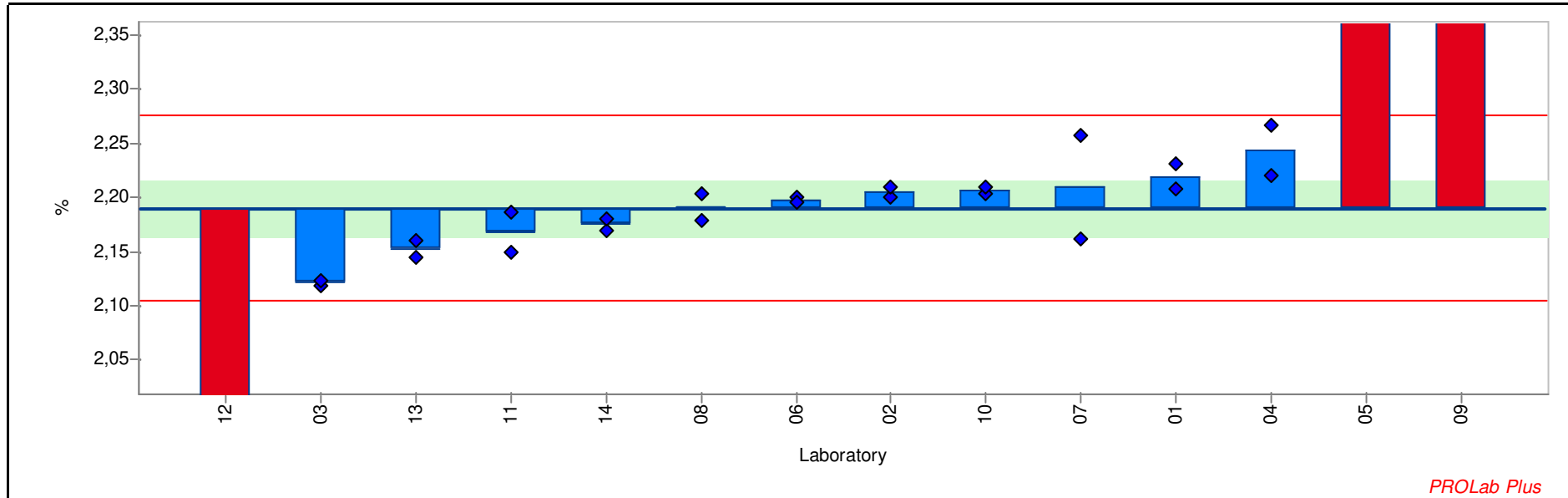
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	3,570	0,057	0,946	3,530	3,610	no accreditation	Other Method	LOI @ 950°C
02	3,255	0,007	-0,921	3,250	3,260	ISO 17025	Other Method	LOI @ 950°C
03	3,270	0,014	-0,832	3,280	3,260	ISO 17025	Other Method	LOI @ 950°C
04	3,490	0,028	0,472	3,470	3,510	ISO 17025	Other Method	LOI @ 950°C
06	3,715	0,205	1,806	3,860	3,570	ISO 17025	Other Method	LOI @ 950°C
07	3,564	0,008	0,911	3,570	3,558	no accreditation	Other Method	LOI @ 950°C
08	3,520	0,059	0,650	3,562	3,478	no accreditation	Other Method	LOI @ 950°C
10	3,487	0,033	0,454	3,510	3,464	no accreditation	Other Method	LOI @ 950°C

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	3,235	0,021	-1,040	3,250	3,220	ISO 17025	Other Method	SANS 50196-2
12	3,290	0,014	-0,714	3,280	3,300	ISO 17025	Other Method	LOI @ 950°C
13	3,400	0,028	-0,061	3,380	3,420	ISO 17025	Other Method	LOI @ 950°C
14	3,180	0,042	-1,366	3,210	3,150	no accreditation	Other Method	LOI @ 950°C

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,043 %
Measurand: MgO **Repeat. s.d** 0,017 %
Mean ± U(Mean): 2,190 ± 0,026 % **Range of tolerance:** 2,104 - 2,276 % (|z-score| <= 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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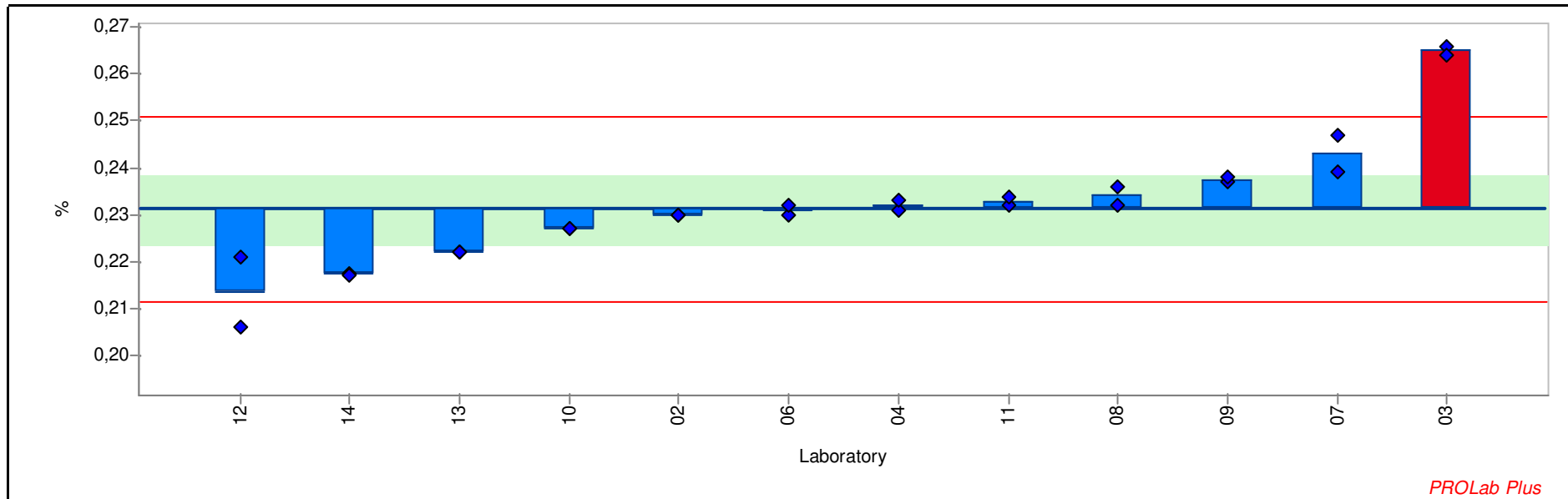
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	2,220	0,016	0,680	2,208	2,231	no accreditation	XRF (fusion)	
02	2,205	0,007	0,343	2,200	2,210	ISO 17025	XRF (fusion)	
03	2,121	0,003	-1,611	2,119	2,123	ISO 17025	XRF (fusion)	
04	2,243	0,033	1,226	2,266	2,220	ISO 17025	XRF (fusion)	
05	2,538	0,032	8,099	2,561	2,516	ISO 17025	XRF (pressed pellet)	Info only
06	2,197	0,004	0,168	2,200	2,195	ISO 17025	XRF (fusion)	
07	2,210	0,067	0,447	2,257	2,162	no accreditation	XRF (fusion)	
08	2,192	0,018	0,029	2,179	2,204	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	2,646	0,003	10,599	2,648	2,644	no accreditation	XRF (pressed pellet)	Info only
10	2,206	0,004	0,366	2,203	2,209	no accreditation	XRF (fusion)	
11	2,168	0,026	-0,524	2,150	2,186	ISO 17025	XRF (fusion)	
12	1,613	0,197	-13,425	1,752	1,474	no accreditation	XRF (pressed pellet)	Info only
13	2,152	0,012	-0,881	2,161	2,144	ISO 17025	XRF (fusion)	
14	2,175	0,007	-0,355	2,170	2,180	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.:** 0,010 %
Measurand: Mn2O3 **Repeat. s.d.:** 0,002 %
Mean ± U(Mean): 0,231 ± 0,007 % **Range of tolerance:** 0,211 - 0,251 % (|z-score| ≤ 2,000)
No. of laboratories: 10 **Statistical method:** Q/Hampel



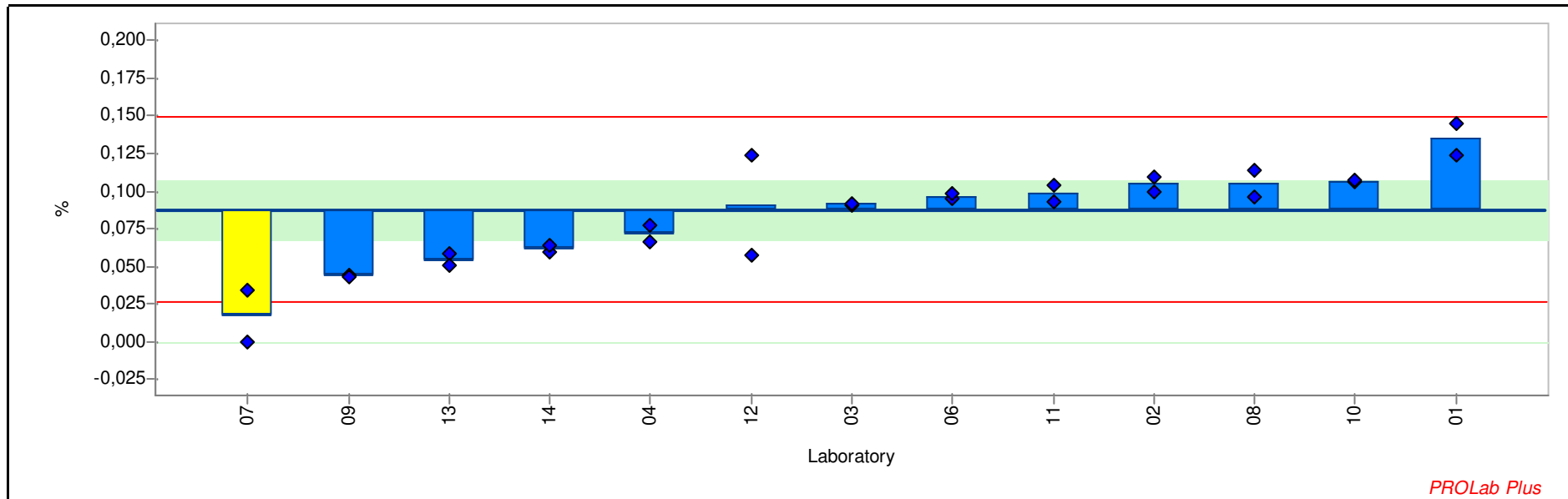
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
02	0,230	0,000	-0,111	0,230	0,230	ISO 17025	XRF (fusion)	
03	0,265	0,001	3,415	0,266	0,264	ISO 17025	XRF (fusion)	
04	0,232	0,001	0,091	0,231	0,233	ISO 17025	XRF (fusion)	
06	0,231	0,001	-0,010	0,230	0,232	ISO 17025	XRF (fusion)	
07	0,243	0,006	1,199	0,239	0,247	no accreditation	XRF (fusion)	
08	0,234	0,003	0,292	0,232	0,236	no accreditation	XRF (fusion)	
09	0,237	0,001	0,645	0,237	0,238	no accreditation	XRF (pressed pellet)	Info only
10	0,227	0,000	-0,413	0,227	0,227	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,233	0,001	0,178	0,232	0,234	ISO 17025	XRF (fusion)	
12	0,213	0,011	-1,773	0,206	0,221	no accreditation	XRF (pressed pellet)	Info only
13	0,222	0,000	-0,917	0,222	0,222	ISO 17025	XRF (fusion)	
14	0,217	0,000	-1,394	0,218	0,217	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,031 %
Measurand: Na2O **Repeat. s.d** 0,010 %
Mean ± U(Mean): 0,088 ± 0,020 % **Range of tolerance:** 0,026 - 0,150 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



PROLab Plus

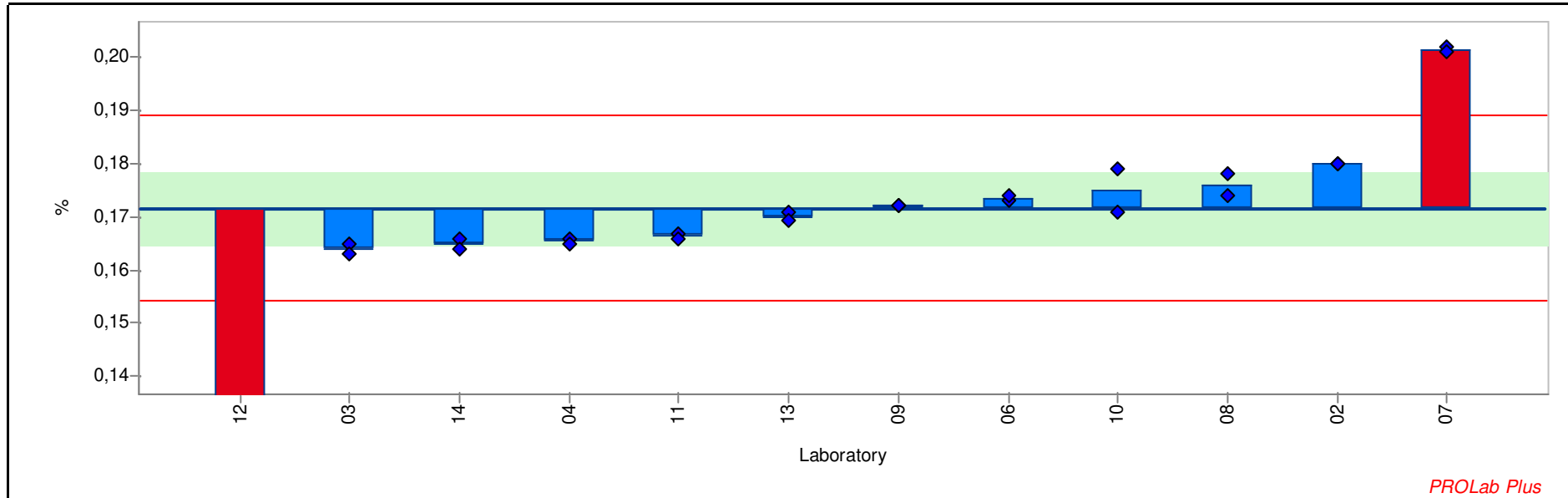
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,135	0,015	1,508	0,145	0,124	no accreditation	XRF (fusion)	
02	0,105	0,007	0,554	0,110	0,100	ISO 17025	XRF (fusion)	
03	0,091	0,001	0,118	0,091	0,092	ISO 17025	XRF (fusion)	
04	0,072	0,008	-0,529	0,077	0,066	ISO 17025	XRF (fusion)	
06	0,097	0,002	0,279	0,095	0,098	ISO 17025	XRF (fusion)	
07	0,017	0,024	-2,292	0,000	0,034	no accreditation	XRF (fusion)	
08	0,105	0,013	0,554	0,114	0,096	no accreditation	XRF (fusion)	
09	0,043	0,001	-1,435	0,044	0,043	no accreditation	XRF (pressed pellet)	Info only

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,106	0,001	0,603	0,106	0,107	no accreditation	XRF (fusion)	
11	0,099	0,008	0,345	0,093	0,104	no accreditation	Other Method	Total Alkalis in house method AAS1
12	0,090	0,047	0,085	0,124	0,057	no accreditation	XRF (pressed pellet)	Info only
13	0,054	0,005	-1,087	0,058	0,050	ISO 17025	XRF (fusion)	
14	0,062	0,003	-0,837	0,060	0,064	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,009 %
Measurand: P2O5 **Repeat. s.d** 0,001 %
Mean ± U(Mean): 0,172 ± 0,007 % **Range of tolerance:** 0,154 - 0,189 % (|z-score| <= 2,000)
No. of laboratories: 10 **Statistical method** Q/Hampel



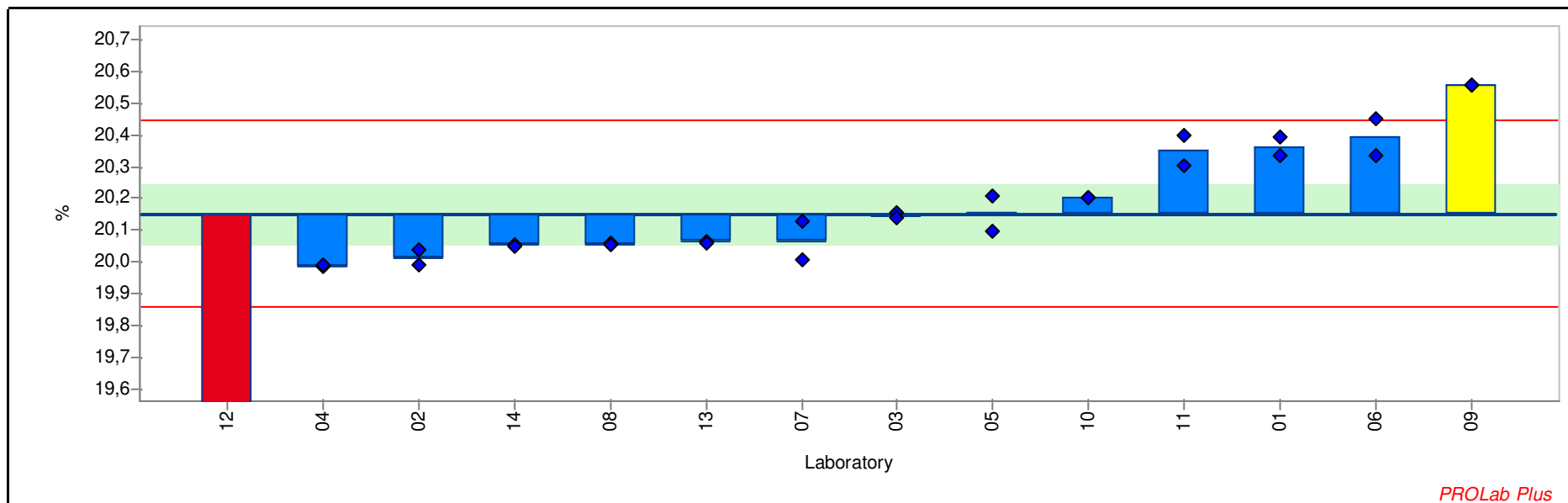
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
02	0,180	0,000	0,950	0,180	0,180	ISO 17025	XRF (fusion)	
03	0,164	0,001	-0,875	0,165	0,163	ISO 17025	XRF (fusion)	
04	0,166	0,001	-0,704	0,166	0,165	ISO 17025	XRF (fusion)	
06	0,173	0,001	0,209	0,173	0,174	ISO 17025	XRF (fusion)	
07	0,202	0,001	3,402	0,202	0,201	no accreditation	XRF (fusion)	
08	0,176	0,003	0,494	0,178	0,174	no accreditation	XRF (fusion)	
09	0,172	0,000	0,038	0,172	0,172	no accreditation	XRF (pressed pellet)	Info only
10	0,175	0,006	0,380	0,171	0,179	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,166	0,001	-0,601	0,167	0,166	no accreditation	XRF (fusion)	
12	0,113	0,024	-6,691	0,130	0,096	no accreditation	XRF (pressed pellet)	Info only
13	0,170	0,001	-0,190	0,171	0,169	ISO 17025	XRF (fusion)	
14	0,165	0,001	-0,761	0,166	0,164	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,147 %
Measurand: SiO2 **Repeat. s.d** 0,020 %
Mean ± U(Mean): 20,153 ± 0,090 % **Range of tolerance:** 19,859 - 20,446 % (|z-score| <= 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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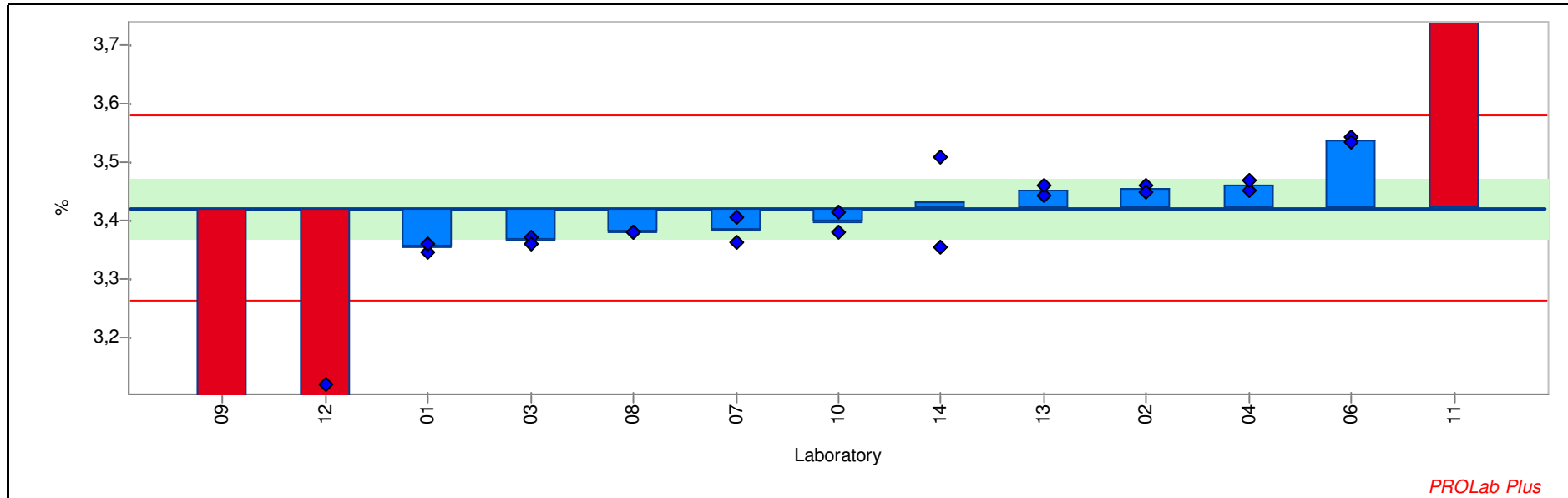
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	20,362	0,040	1,426	20,390	20,334	no accreditation	XRF (fusion)	
02	20,015	0,035	-0,937	19,990	20,040	ISO 17025	XRF (fusion)	
03	20,146	0,013	-0,041	20,156	20,137	ISO 17025	XRF (fusion)	
04	19,988	0,002	-1,117	19,987	19,990	ISO 17025	XRF (fusion)	
05	20,153	0,081	0,003	20,210	20,096	ISO 17025	XRF (pressed pellet)	Info only
06	20,390	0,081	1,621	20,448	20,333	ISO 17025	XRF (fusion)	
07	20,068	0,086	-0,576	20,007	20,129	no accreditation	XRF (fusion)	
08	20,056	0,003	-0,658	20,058	20,054	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	20,555	0,000	2,741	20,555	20,555	no accreditation	XRF (pressed pellet)	Info only
10	20,203	0,003	0,344	20,205	20,201	no accreditation	XRF (fusion)	
11	20,349	0,069	1,338	20,300	20,398	ISO 17025	XRF (fusion)	
12	15,197	1,375	-33,753	16,169	14,224	no accreditation	XRF (pressed pellet)	Info only
13	20,065	0,003	-0,598	20,067	20,063	ISO 17025	XRF (fusion)	
14	20,053	0,004	-0,681	20,055	20,050	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,080 %
Measurand: SO3 **Repeat. s.d** 0,016 %
Mean ± U(Mean): 3,423 ± 0,051 % **Range of tolerance:** 3,263 - 3,582 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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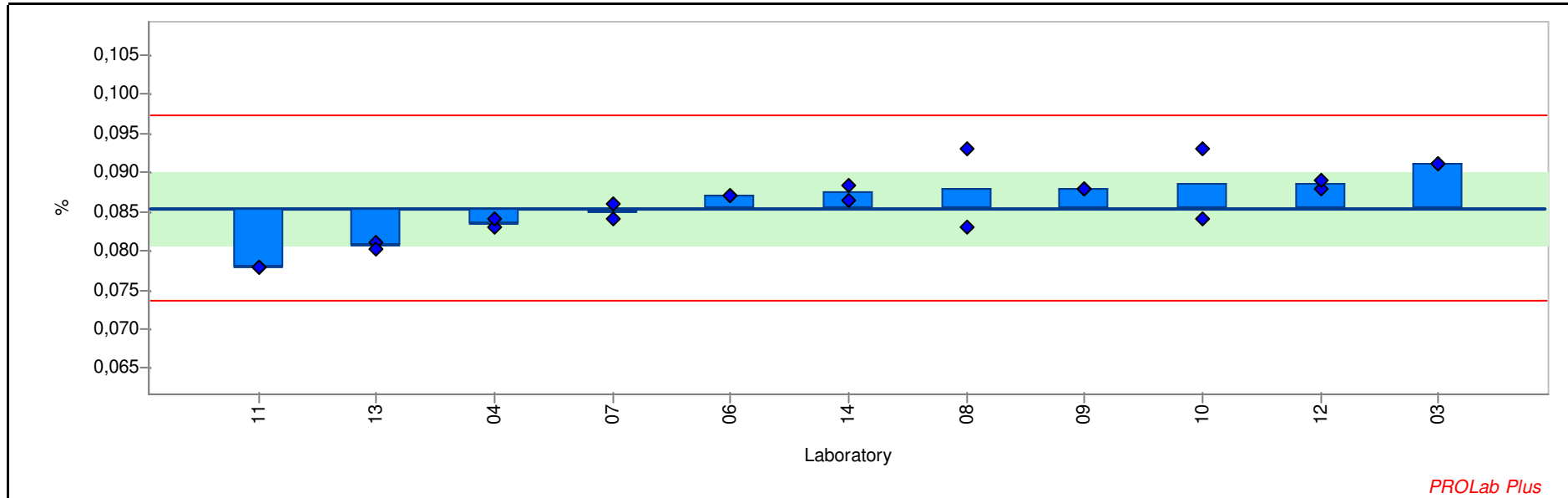
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	3,354	0,009	-0,857	3,348	3,361	no accreditation	XRF (fusion)	
02	3,455	0,007	0,405	3,460	3,450	ISO 17025	XRF (fusion)	
03	3,368	0,008	-0,693	3,373	3,362	ISO 17025	XRF (fusion)	
04	3,463	0,012	0,500	3,454	3,471	ISO 17025	XRF (fusion)	
06	3,540	0,006	1,467	3,544	3,535	ISO 17025	XRF (fusion)	
07	3,385	0,030	-0,467	3,364	3,407	no accreditation	XRF (fusion)	
08	3,380	0,000	-0,536	3,380	3,380	no accreditation	XRF (fusion)	
09	2,887	0,010	-6,727	2,880	2,894	no accreditation	XRF (pressed pellet)	Info only

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	3,398	0,025	-0,310	3,416	3,380	no accreditation	XRF (fusion)	
11	3,865	0,014	5,554	3,855	3,875	no accreditation	Other Method	Total SO3 SR3T in house method
12	2,982	0,194	-5,528	3,120	2,845	no accreditation	XRF (pressed pellet)	Info only
13	3,452	0,012	0,369	3,444	3,460	ISO 17025	XRF (fusion)	
14	3,433	0,110	0,123	3,355	3,510	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.:** 0,006 %
Measurand: SrO **Repeat. s.d.:** 0,001 %
Mean ± U(Mean): 0,085 ± 0,005 % **Range of tolerance:** 0,074 - 0,097 % (|z-score| ≤ 2,000)
No. of laboratories: 9 **Statistical method:** Q/Hampel



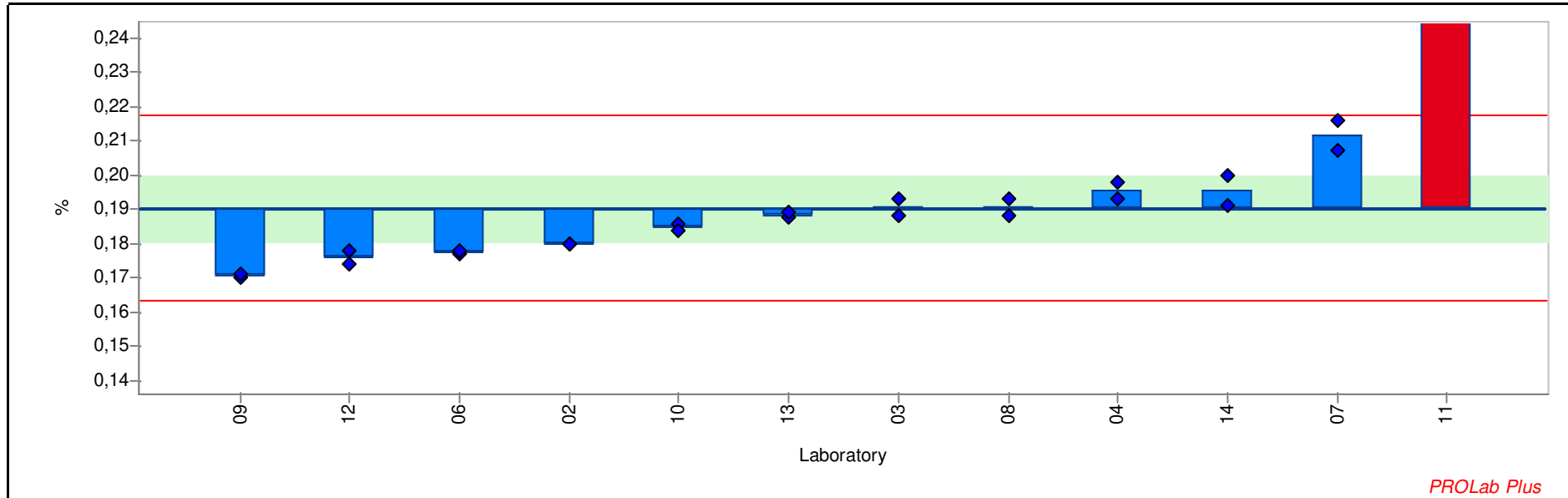
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
03	0,091	0,000	0,936	0,091	0,091	ISO 17025	XRF (fusion)	
04	0,084	0,001	-0,328	0,083	0,084	ISO 17025	XRF (fusion)	
06	0,087	0,000	0,262	0,087	0,087	ISO 17025	XRF (fusion)	
07	0,085	0,001	-0,075	0,084	0,086	no accreditation	XRF (fusion)	
08	0,088	0,007	0,430	0,083	0,093	no accreditation	XRF (fusion)	
09	0,088	0,000	0,430	0,088	0,088	no accreditation	XRF (pressed pellet)	Info only
10	0,088	0,006	0,514	0,084	0,093	no accreditation	XRF (fusion)	
11	0,078	0,000	-1,261	0,078	0,078	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
12	0,088	0,001	0,514	0,088	0,089	no accreditation	XRF (pressed pellet)	Info only
13	0,081	0,000	-0,808	0,081	0,080	ISO 17025	XRF (fusion)	
14	0,087	0,001	0,329	0,088	0,086	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.** 0,014 %
Measurand: TiO2 **Repeat. s.d** 0,003 %
Mean ± U(Mean): 0,190 ± 0,009 % **Range of tolerance:** 0,163 - 0,218 % (|z-score| <= 2,000)
No. of laboratories: 10 **Statistical method** Q/Hampel



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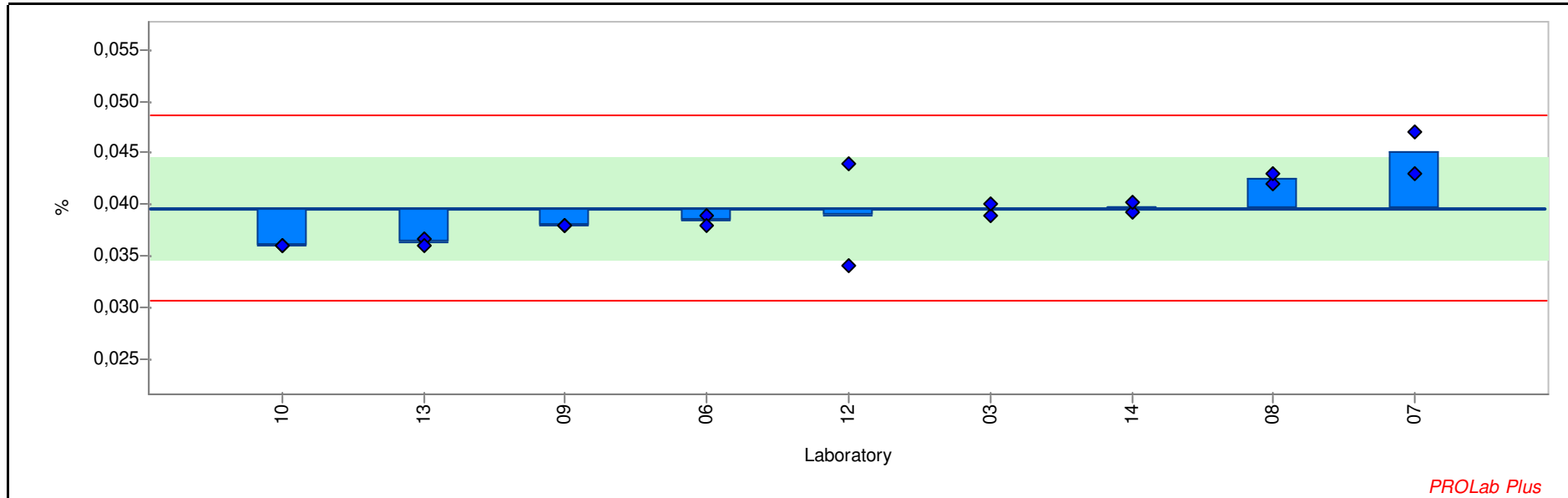
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
02	0,180	0,000	-0,766	0,180	0,180	ISO 17025	XRF (fusion)	
03	0,191	0,004	0,007	0,188	0,193	ISO 17025	XRF (fusion)	
04	0,196	0,004	0,376	0,193	0,198	ISO 17025	XRF (fusion)	
06	0,177	0,001	-0,951	0,177	0,178	ISO 17025	XRF (fusion)	
07	0,211	0,006	1,555	0,207	0,216	no accreditation	XRF (fusion)	
08	0,191	0,004	0,007	0,193	0,188	no accreditation	XRF (fusion)	
09	0,171	0,001	-1,466	0,170	0,171	no accreditation	XRF (pressed pellet)	Info only
10	0,185	0,001	-0,398	0,186	0,184	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,276	0,000	6,296	0,276	0,276	ISO 17025	XRF (fusion)	
12	0,176	0,003	-1,061	0,174	0,178	no accreditation	XRF (pressed pellet)	Info only
13	0,188	0,001	-0,151	0,188	0,189	ISO 17025	XRF (fusion)	
14	0,196	0,006	0,376	0,191	0,200	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample01 **Reprod. s.d.:** 0,005 %
Measurand: ZnO **Repeat. s.d.:** 0,001 %
Mean ± U(Mean): 0,040 ± 0,005 % **Range of tolerance:** 0,031 - 0,049 % (|z-score| ≤ 2,000)
No. of laboratories: 7 **Statistical method:** Q/Hampel



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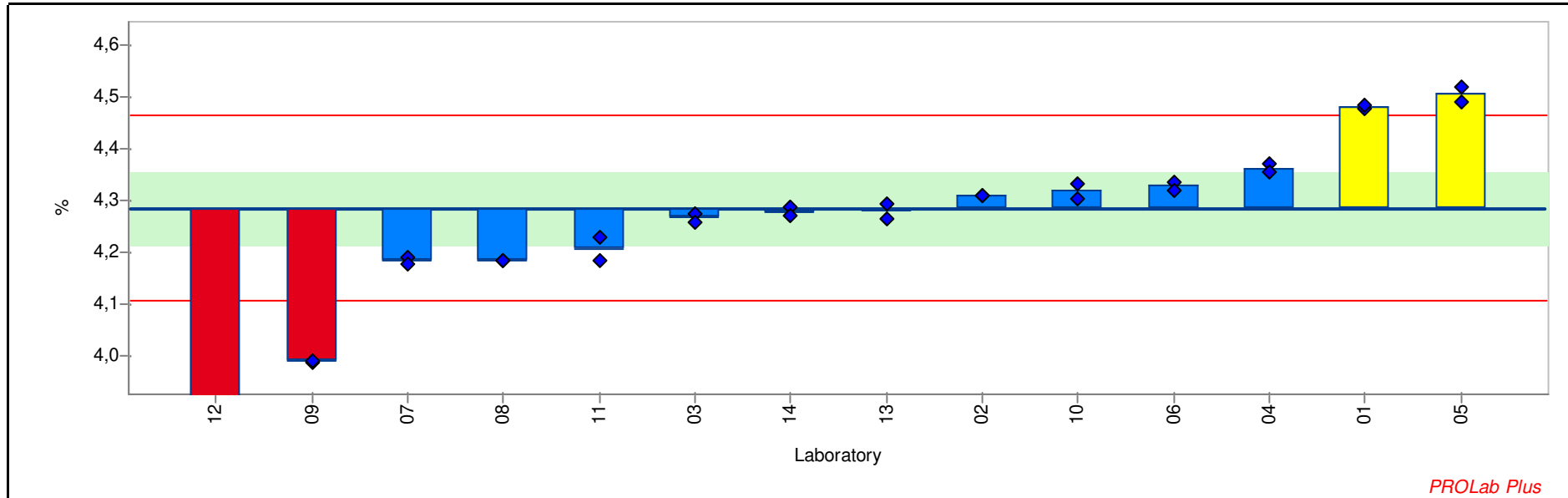
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
03	0,040	0,001	-0,034	0,039	0,040	ISO 17025	XRF (fusion)	
06	0,038	0,001	-0,256	0,039	0,038	ISO 17025	XRF (fusion)	
07	0,045	0,003	1,186	0,043	0,047	no accreditation	XRF (fusion)	
08	0,042	0,001	0,632	0,042	0,043	no accreditation	XRF (fusion)	
09	0,038	0,000	-0,367	0,038	0,038	no accreditation	XRF (pressed pellet)	Info only
10	0,036	0,000	-0,811	0,036	0,036	no accreditation	XRF (fusion)	
12	0,039	0,007	-0,145	0,044	0,034	no accreditation	XRF (pressed pellet)	Info only
13	0,036	0,000	-0,744	0,037	0,036	ISO 17025	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
14	0,040	0,001	0,027	0,039	0,040	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,090 %
Measurand: Al₂O₃ **Repeat. s.d** 0,015 %
Mean ± U(Mean): 4,285 ± 0,069 % **Range of tolerance:** 4,105 - 4,465 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



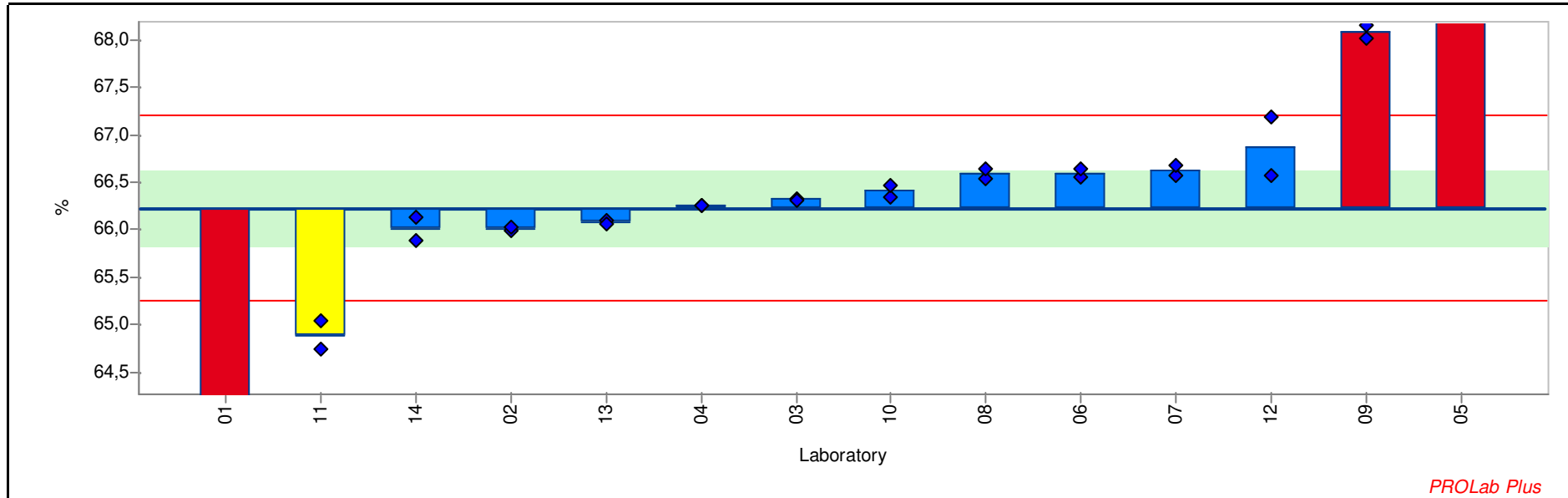
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	4,480	0,004	2,171	4,477	4,483	no accreditation	XRF (fusion)	
02	4,310	0,000	0,281	4,310	4,310	ISO 17025	XRF (fusion)	
03	4,266	0,011	-0,208	4,274	4,258	ISO 17025	XRF (fusion)	
04	4,362	0,013	0,859	4,371	4,353	ISO 17025	XRF (fusion)	
05	4,505	0,022	2,443	4,520	4,489	ISO 17025	XRF (pressed pellet)	Info only
06	4,328	0,011	0,481	4,336	4,320	ISO 17025	XRF (fusion)	
07	4,184	0,009	-1,125	4,190	4,177	no accreditation	XRF (fusion)	
08	4,184	0,001	-1,125	4,184	4,183	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	3,989	0,003	-3,288	3,987	3,991	no accreditation	XRF (pressed pellet)	Info only
10	4,319	0,021	0,376	4,304	4,333	no accreditation	XRF (fusion)	
11	4,205	0,033	-0,889	4,182	4,228	ISO 17025	XRF (fusion)	
12	2,728	0,188	-17,307	2,861	2,595	no accreditation	XRF (pressed pellet)	Info only
13	4,278	0,019	-0,070	4,265	4,292	ISO 17025	XRF (fusion)	
14	4,277	0,011	-0,080	4,285	4,270	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,490 %
Measurand: CaO **Repeat. s.d** 0,090 %
Mean ± U(Mean): 66,226 ± 0,401 % **Range of tolerance:** 65,245 - 67,207 % (|z-score| <= 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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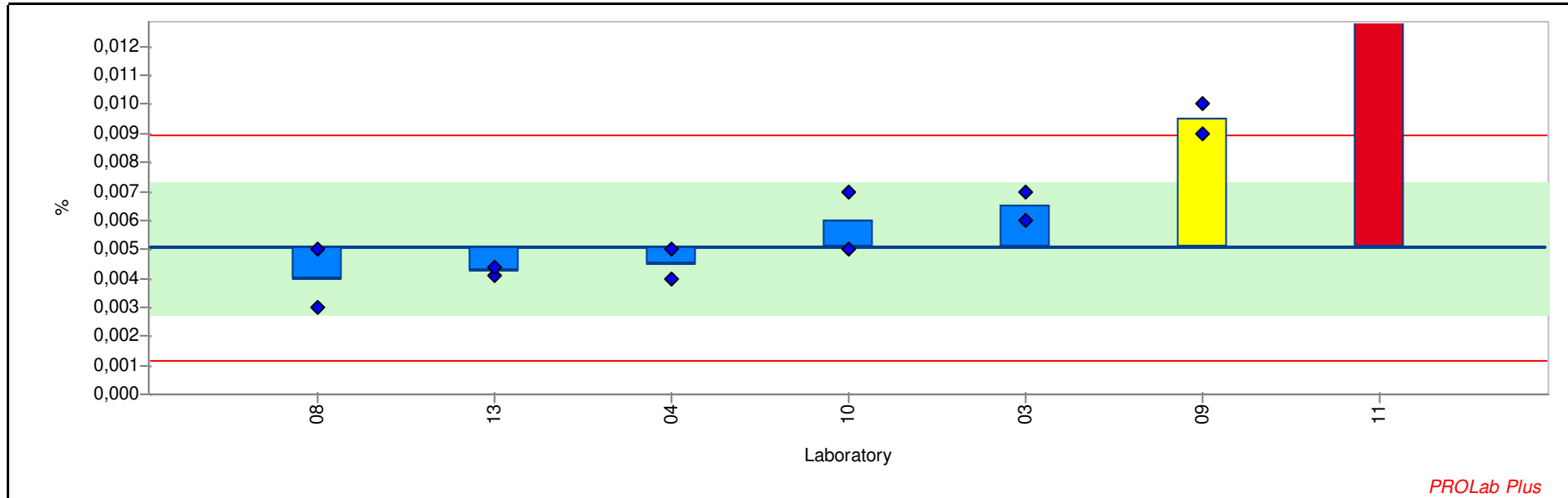
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	64,132	0,055	-4,270	64,171	64,093	no accreditation	XRF (fusion)	
02	66,010	0,028	-0,441	65,990	66,030	ISO 17025	XRF (fusion)	
03	66,316	0,011	0,184	66,324	66,309	ISO 17025	XRF (fusion)	
04	66,255	0,001	0,059	66,254	66,256	ISO 17025	XRF (fusion)	
05	69,901	0,062	7,494	69,858	69,945	ISO 17025	XRF (pressed pellet)	Info only
06	66,593	0,061	0,748	66,550	66,636	ISO 17025	XRF (fusion)	
07	66,627	0,076	0,818	66,574	66,681	no accreditation	XRF (fusion)	
08	66,590	0,077	0,741	66,535	66,644	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	68,078	0,099	3,776	68,148	68,008	no accreditation	XRF (pressed pellet)	Info only
10	66,406	0,082	0,367	66,348	66,464	no accreditation	XRF (fusion)	
11	64,889	0,215	-2,727	64,737	65,040	ISO 17025	XRF (fusion)	
12	66,874	0,439	1,320	67,184	66,563	no accreditation	XRF (pressed pellet)	Info only
13	66,078	0,025	-0,301	66,096	66,061	ISO 17025	XRF (fusion)	
14	66,007	0,173	-0,446	65,885	66,130	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.:** 0,002 %
Measurand: Cr2O3 **Repeat. s.d.:** 0,001 %
Mean ± U(Mean): 0,005 ± 0,002 % **Range of tolerance:** 0,001 - 0,009 % (|z-score| ≤ 2,000)
No. of laboratories: 6 **Statistical method:** Q/Hampel



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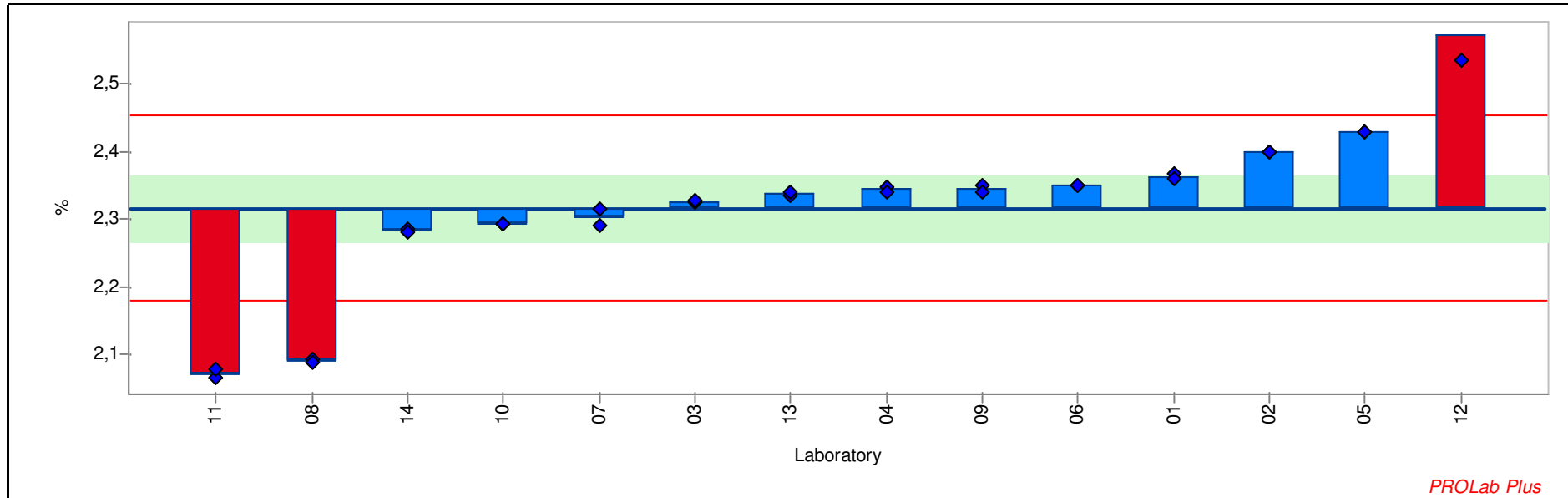
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
03	0,007	0,001	0,744	0,007	0,006	ISO 17025	XRF (fusion)	
04	0,005	0,001	-0,282	0,004	0,005	ISO 17025	XRF (fusion)	
06	<0,009			<0,009	<0,009	ISO 17025	XRF (fusion)	
08	0,004	0,001	-0,539	0,003	0,005	no accreditation	XRF (fusion)	
09	0,009	0,001	2,282	0,009	0,010	no accreditation	XRF (pressed pellet)	Info only
10	0,006	0,001	0,487	0,007	0,005	no accreditation	XRF (fusion)	
11	0,041	0,000	18,419	0,041	0,041	no accreditation	XRF (fusion)	
13	0,004	0,000	-0,410	0,004	0,004	ISO 17025	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
14	<0,002			<0,002	<0,002	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.:** 0,069 %
Measurand: Fe2O3 **Repeat. s.d.:** 0,005 %
Mean ± U(Mean): 2,317 ± 0,047 % **Range of tolerance:** 2,179 - 2,454 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method:** Q/Hampel



PROLab Plus

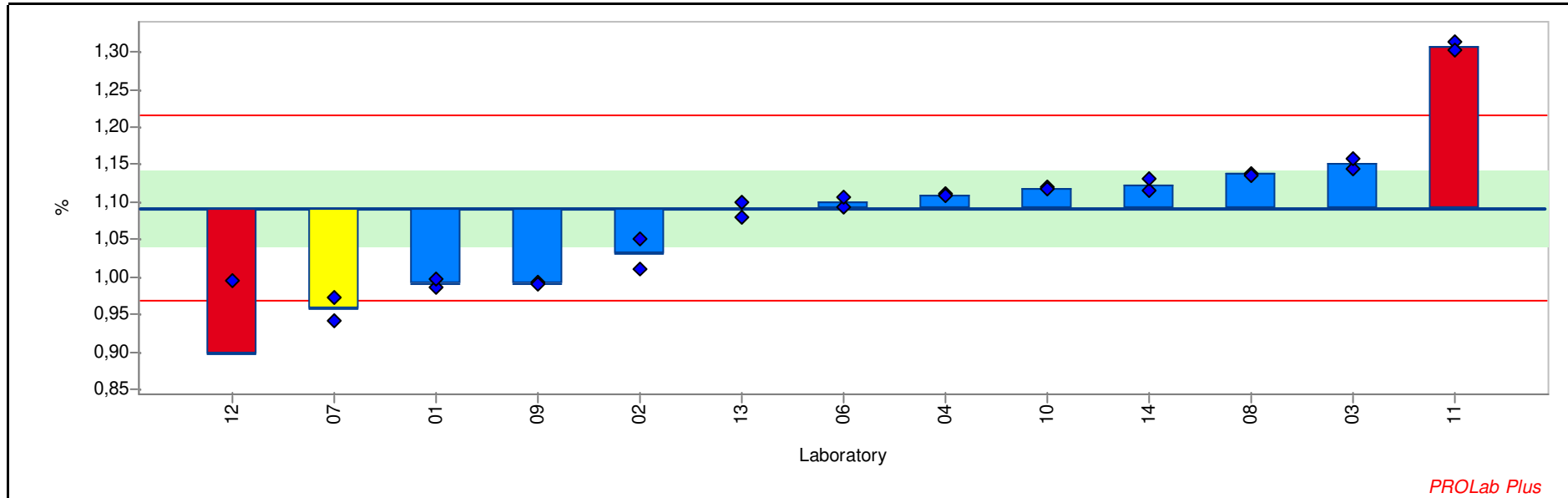
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	2,364	0,005	0,680	2,367	2,360	no accreditation	XRF (fusion)	
02	2,400	0,000	1,212	2,400	2,400	ISO 17025	XRF (fusion)	
03	2,327	0,002	0,141	2,325	2,328	ISO 17025	XRF (fusion)	
04	2,344	0,006	0,396	2,348	2,340	ISO 17025	XRF (fusion)	
05	2,429	0,001	1,641	2,430	2,429	ISO 17025	XRF (pressed pellet)	Info only
06	2,349	0,000	0,469	2,349	2,349	ISO 17025	XRF (fusion)	
07	2,303	0,016	-0,193	2,315	2,292	no accreditation	XRF (fusion)	
08	2,091	0,004	-3,287	2,094	2,088	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	2,345	0,007	0,411	2,350	2,340	no accreditation	XRF (pressed pellet)	Info only
10	2,293	0,000	-0,346	2,293	2,293	no accreditation	XRF (fusion)	
11	2,073	0,009	-3,554	2,066	2,079	ISO 17025	XRF (fusion)	
12	2,571	0,049	3,701	2,536	2,606	no accreditation	XRF (pressed pellet)	Info only
13	2,337	0,003	0,299	2,335	2,340	ISO 17025	XRF (fusion)	
14	2,282	0,004	-0,499	2,285	2,280	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,062 %
Measurand: K2O **Repeat. s.d** 0,013 %
Mean ± U(Mean): 1,092 ± 0,049 % **Range of tolerance:** 0,968 - 1,216 % (|z-score| <= 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



PROLab Plus

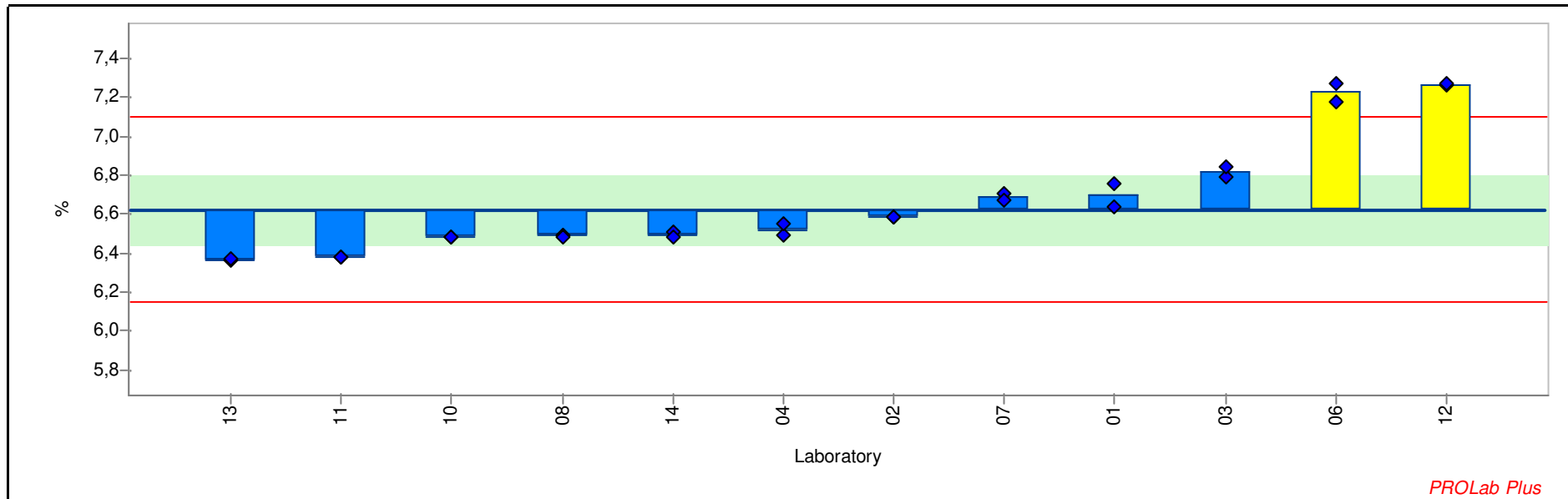
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,991	0,008	-1,623	0,985	0,997	no accreditation	XRF (fusion)	
02	1,030	0,028	-0,996	1,050	1,010	ISO 17025	XRF (fusion)	
03	1,151	0,010	0,952	1,144	1,158	ISO 17025	XRF (fusion)	
04	1,109	0,001	0,276	1,110	1,108	ISO 17025	XRF (fusion)	
06	1,100	0,008	0,131	1,094	1,106	ISO 17025	XRF (fusion)	
07	0,957	0,023	-2,170	0,941	0,973	no accreditation	XRF (fusion)	
08	1,136	0,001	0,718	1,137	1,136	no accreditation	XRF (fusion)	
09	0,992	0,002	-1,615	0,993	0,990	no accreditation	XRF (pressed pellet)	Info only

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	1,119	0,001	0,429	1,119	1,118	no accreditation	XRF (fusion)	
11	1,308	0,008	3,477	1,314	1,302	no accreditation	Other Method	Total Alkalis in house method AAS1
12	0,897	0,139	-3,128	0,996	0,799	no accreditation	XRF (pressed pellet)	Info only
13	1,090	0,013	-0,027	1,100	1,081	ISO 17025	XRF (fusion)	
14	1,123	0,011	0,493	1,115	1,130	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.:** 0,239 %
Measurand: Loss on Ignition **Repeat. s.d.:** 0,027 %
Mean ± U(Mean): 6,625 ± 0,176 % **Range of tolerance:** 6,147 - 7,102 % (|z-score| ≤ 2,000)
No. of laboratories: 12 **Statistical method:** Q/Hampel



PROLab Plus

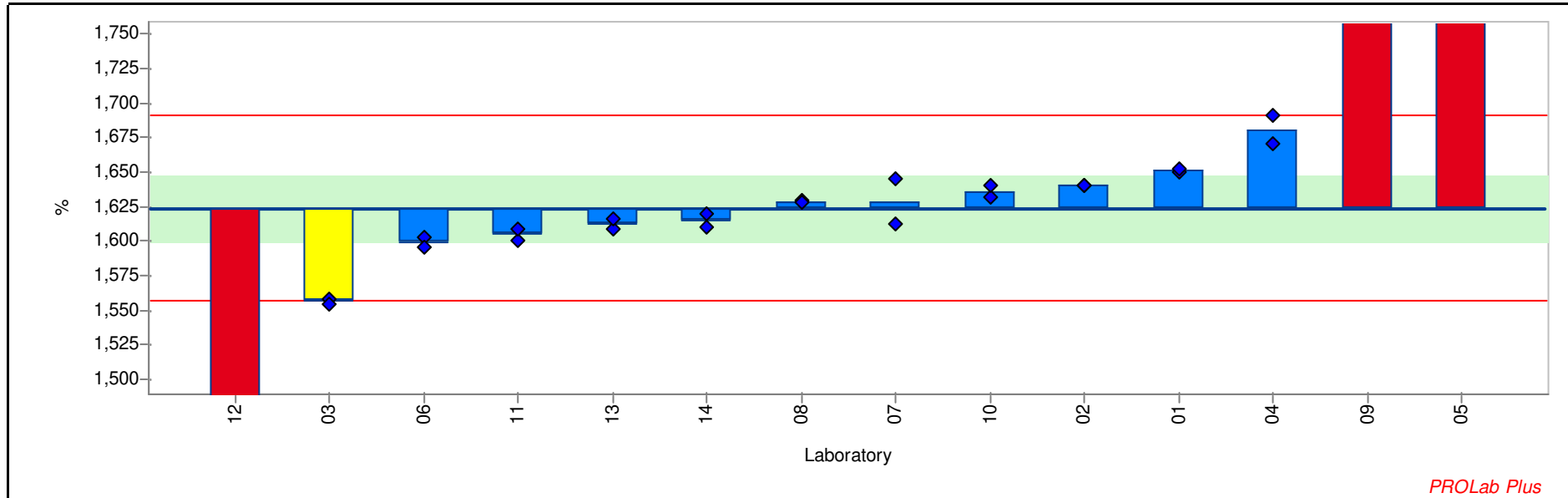
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	6,700	0,085	0,316	6,640	6,760	no accreditation	Other Method	LOI @ 950°C
02	6,590	0,000	-0,145	6,590	6,590	ISO 17025	Other Method	LOI @ 950°C
03	6,815	0,035	0,799	6,790	6,840	ISO 17025	Other Method	LOI @ 950°C
04	6,520	0,042	-0,438	6,490	6,550	ISO 17025	Other Method	LOI @ 950°C
06	7,225	0,064	2,518	7,180	7,270	ISO 17025	Other Method	LOI @ 950°C
07	6,691	0,023	0,279	6,707	6,675	no accreditation	Other Method	LOI @ 950°C
08	6,488	0,001	-0,572	6,489	6,487	no accreditation	Other Method	LOI @ 950°C
10	6,486	0,001	-0,583	6,486	6,485	no accreditation	Other Method	LOI @ 950°C

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	6,380	0,000	-1,025	6,380	6,380	ISO 17025	Other Method	SANS 50196-2
12	7,265	0,007	2,685	7,260	7,270	ISO 17025	Other Method	LOI @ 950°C
13	6,365	0,007	-1,088	6,360	6,370	ISO 17025	Other Method	LOI @ 950°C
14	6,495	0,021	-0,543	6,510	6,480	no accreditation	Other Method	LOI @ 950°C

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,034 %
Measurand: MgO **Repeat. s.d** 0,007 %
Mean ± U(Mean): 1,624 ± 0,024 % **Range of tolerance:** 1,557 - 1,691 % (|z-score| <= 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



PROLab Plus

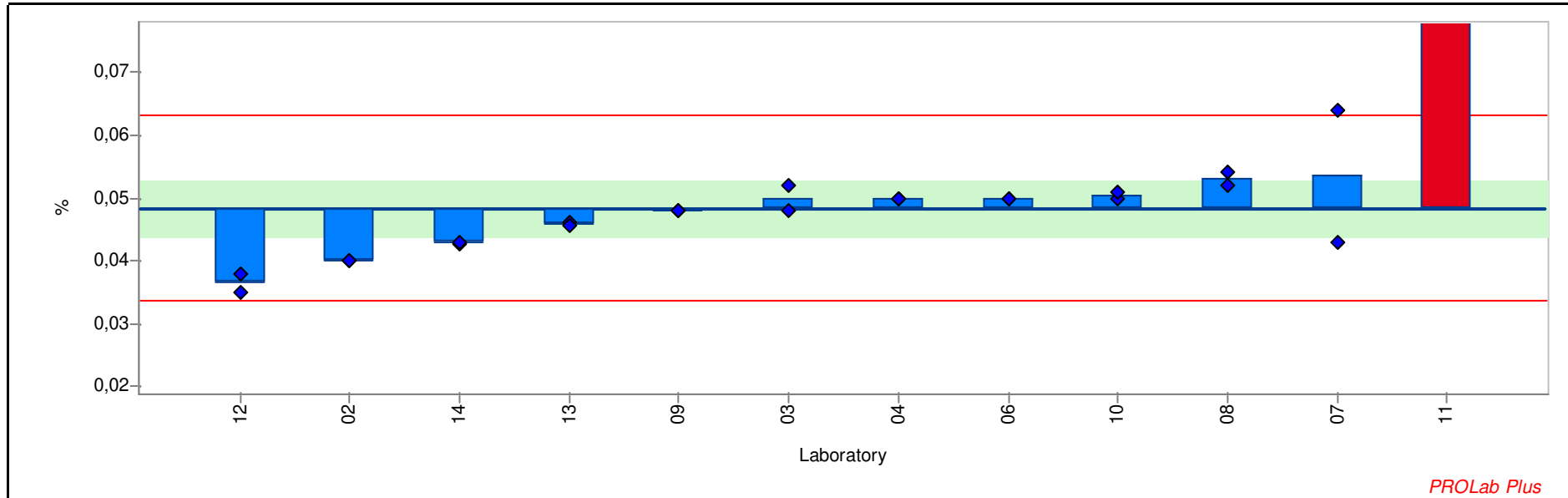
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	1,651	0,001	0,803	1,650	1,652	no accreditation	XRF (fusion)	
02	1,640	0,000	0,476	1,640	1,640	ISO 17025	XRF (fusion)	
03	1,556	0,002	-2,004	1,558	1,555	ISO 17025	XRF (fusion)	
04	1,680	0,015	1,679	1,691	1,670	ISO 17025	XRF (fusion)	
05	1,922	0,004	8,852	1,925	1,919	ISO 17025	XRF (pressed pellet)	Info only
06	1,599	0,005	-0,727	1,603	1,596	ISO 17025	XRF (fusion)	
07	1,629	0,023	0,134	1,645	1,612	no accreditation	XRF (fusion)	
08	1,628	0,001	0,134	1,629	1,628	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	1,865	0,005	7,144	1,868	1,861	no accreditation	XRF (pressed pellet)	Info only
10	1,636	0,006	0,357	1,632	1,640	no accreditation	XRF (fusion)	
11	1,605	0,005	-0,573	1,601	1,608	ISO 17025	XRF (fusion)	
12	1,313	0,013	-9,252	1,322	1,303	no accreditation	XRF (pressed pellet)	Info only
13	1,613	0,005	-0,338	1,609	1,616	ISO 17025	XRF (fusion)	
14	1,615	0,007	-0,267	1,610	1,620	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,007 %
Measurand: Mn2O3 **Repeat. s.d** 0,001 %
Mean ± U(Mean): 0,048 ± 0,004 % **Range of tolerance:** 0,034 - 0,063 % (|z-score| ≤ 2,000)
No. of laboratories: 10 **Statistical method** Q/Hampel



PROLab Plus

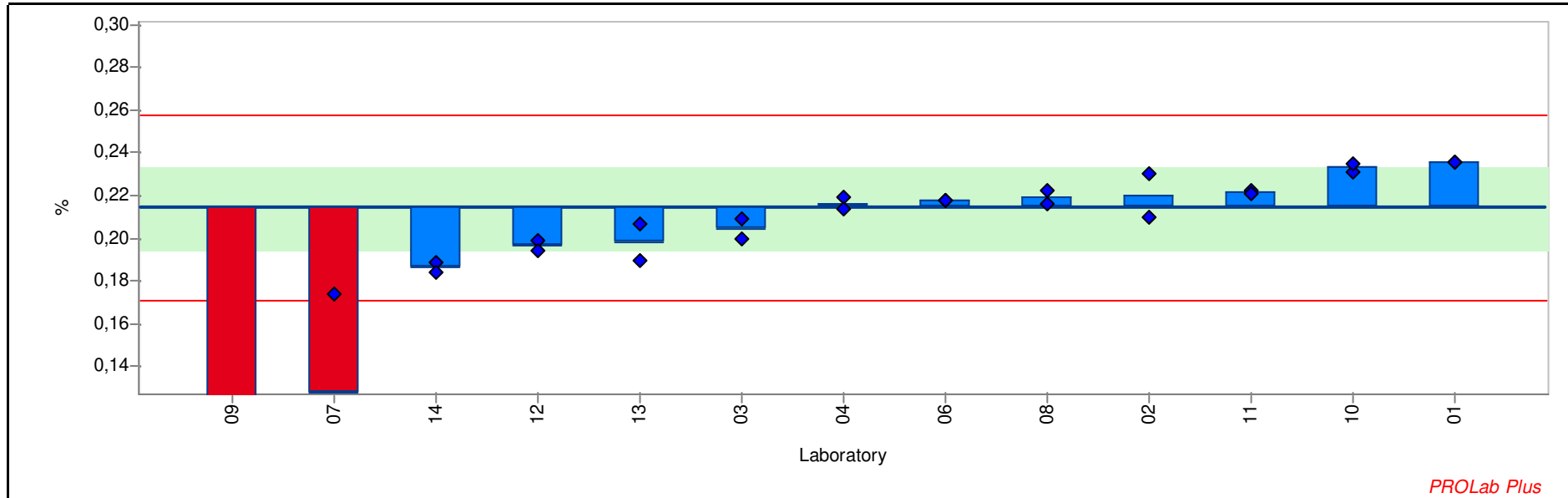
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
02	0,040	0,000	-1,137	0,040	0,040	ISO 17025	XRF (fusion)	
03	0,050	0,003	0,214	0,052	0,048	ISO 17025	XRF (fusion)	
04	0,050	0,000	0,214	0,050	0,050	ISO 17025	XRF (fusion)	
06	0,050	0,000	0,214	0,050	0,050	ISO 17025	XRF (fusion)	
07	0,053	0,015	0,686	0,043	0,064	no accreditation	XRF (fusion)	
08	0,053	0,001	0,619	0,054	0,052	no accreditation	XRF (fusion)	
09	0,048	0,000	-0,056	0,048	0,048	no accreditation	XRF (pressed pellet)	Info only
10	0,051	0,001	0,281	0,050	0,051	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,104	0,001	7,557	0,104	0,105	ISO 17025	XRF (fusion)	
12	0,037	0,002	-1,609	0,038	0,035	no accreditation	XRF (pressed pellet)	Info only
13	0,046	0,000	-0,340	0,046	0,046	ISO 17025	XRF (fusion)	
14	0,043	0,000	-0,750	0,043	0,043	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,022 %
Measurand: Na2O **Repeat. s.d** 0,005 %
Mean ± U(Mean): 0,214 ± 0,019 % **Range of tolerance:** 0,171 - 0,258 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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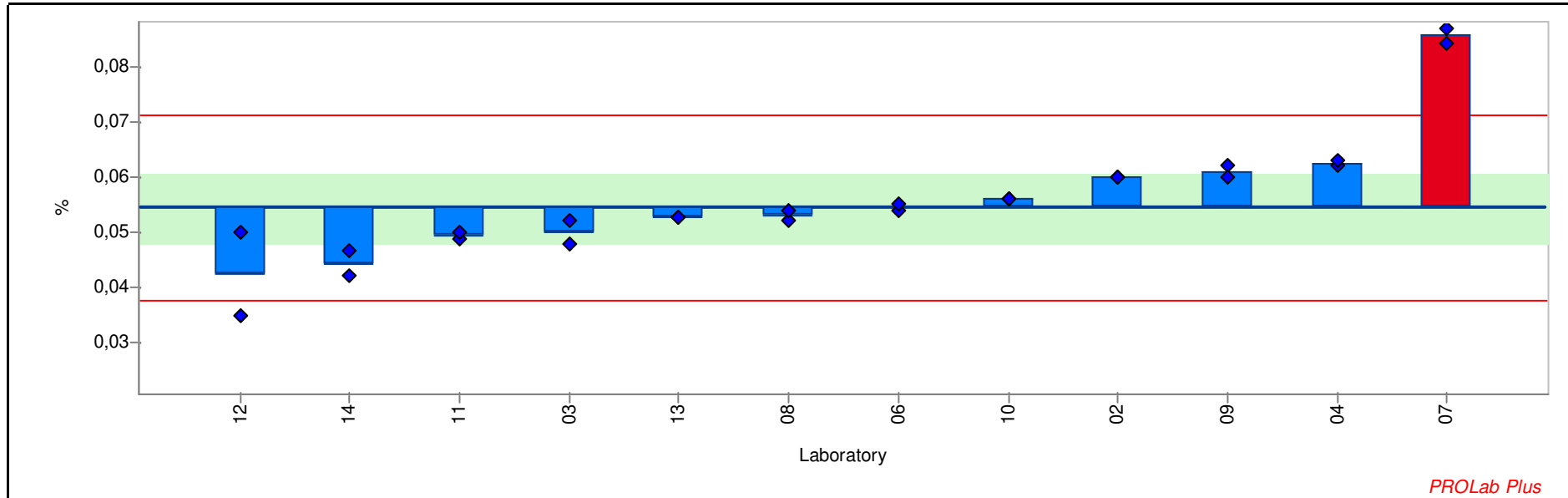
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,236	0,000	1,001	0,236	0,236	no accreditation	XRF (fusion)	
02	0,220	0,014	0,267	0,230	0,210	ISO 17025	XRF (fusion)	
03	0,205	0,006	-0,444	0,200	0,209	ISO 17025	XRF (fusion)	
04	0,216	0,004	0,107	0,219	0,214	ISO 17025	XRF (fusion)	
06	0,218	0,000	0,175	0,218	0,218	ISO 17025	XRF (fusion)	
07	0,128	0,066	-3,975	0,174	0,081	no accreditation	XRF (fusion)	
08	0,219	0,004	0,221	0,216	0,222	no accreditation	XRF (fusion)	
09	0,094	0,000	-5,512	0,094	0,094	no accreditation	XRF (pressed pellet)	Info only

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,233	0,003	0,863	0,231	0,235	no accreditation	XRF (fusion)	
11	0,222	0,001	0,345	0,223	0,221	no accreditation	Other Method	Total Alkalis in house method AAS1
12	0,197	0,004	-0,811	0,199	0,194	no accreditation	XRF (pressed pellet)	Info only
13	0,198	0,012	-0,742	0,189	0,207	ISO 17025	XRF (fusion)	
14	0,186	0,004	-1,269	0,189	0,184	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.:** 0,008 %
Measurand: P205 **Repeat. s.d.:** 0,002 %
Mean ± U(Mean): 0,054 ± 0,006 % **Range of tolerance:** 0,038 - 0,071 % (|z-score| ≤ 2,000)
No. of laboratories: 10 **Statistical method:** Q/Hampel



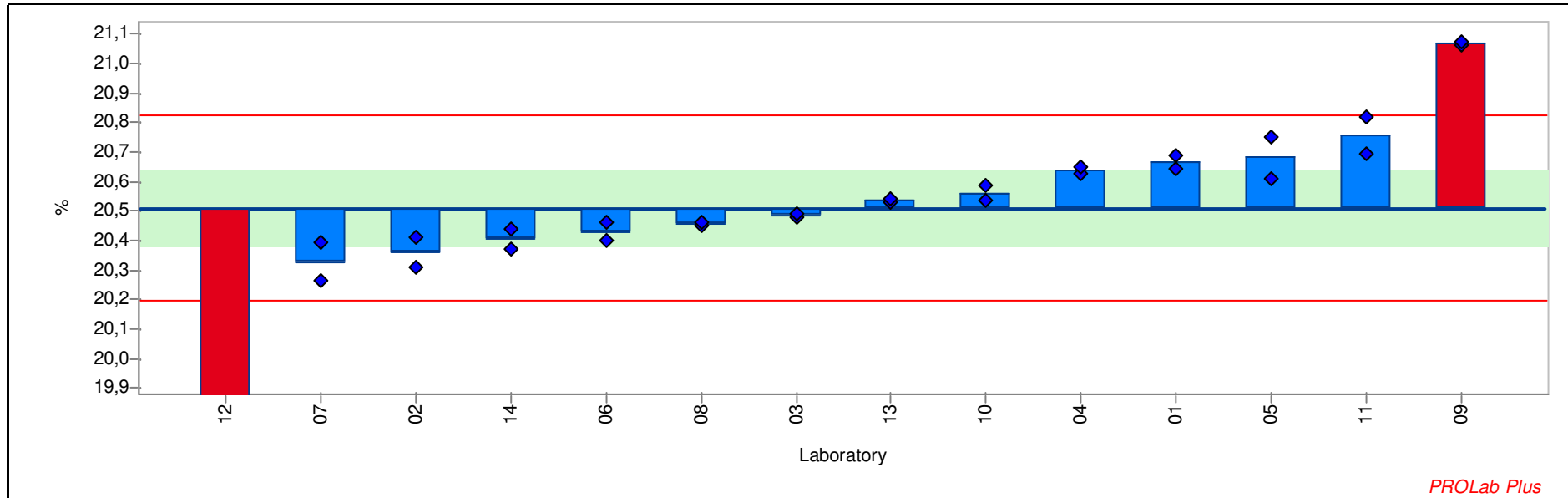
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
02	0,060	0,000	0,668	0,060	0,060	ISO 17025	XRF (fusion)	
03	0,050	0,003	-0,520	0,048	0,052	ISO 17025	XRF (fusion)	
04	0,063	0,001	0,965	0,062	0,063	ISO 17025	XRF (fusion)	
06	0,054	0,001	0,015	0,054	0,055	ISO 17025	XRF (fusion)	
07	0,085	0,002	3,696	0,087	0,084	no accreditation	XRF (fusion)	
08	0,053	0,001	-0,164	0,052	0,054	no accreditation	XRF (fusion)	
09	0,061	0,001	0,786	0,062	0,060	no accreditation	XRF (pressed pellet)	Info only
10	0,056	0,000	0,193	0,056	0,056	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,049	0,001	-0,586	0,049	0,050	no accreditation	XRF (fusion)	
12	0,043	0,011	-1,410	0,050	0,035	no accreditation	XRF (pressed pellet)	Info only
13	0,053	0,000	-0,187	0,053	0,053	ISO 17025	XRF (fusion)	
14	0,044	0,003	-1,188	0,047	0,042	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,158 %
Measurand: SiO2 **Repeat. s.d** 0,057 %
Mean ± U(Mean): 20,510 ± 0,129 % **Range of tolerance:** 20,194 - 20,825 % (|z-score| <= 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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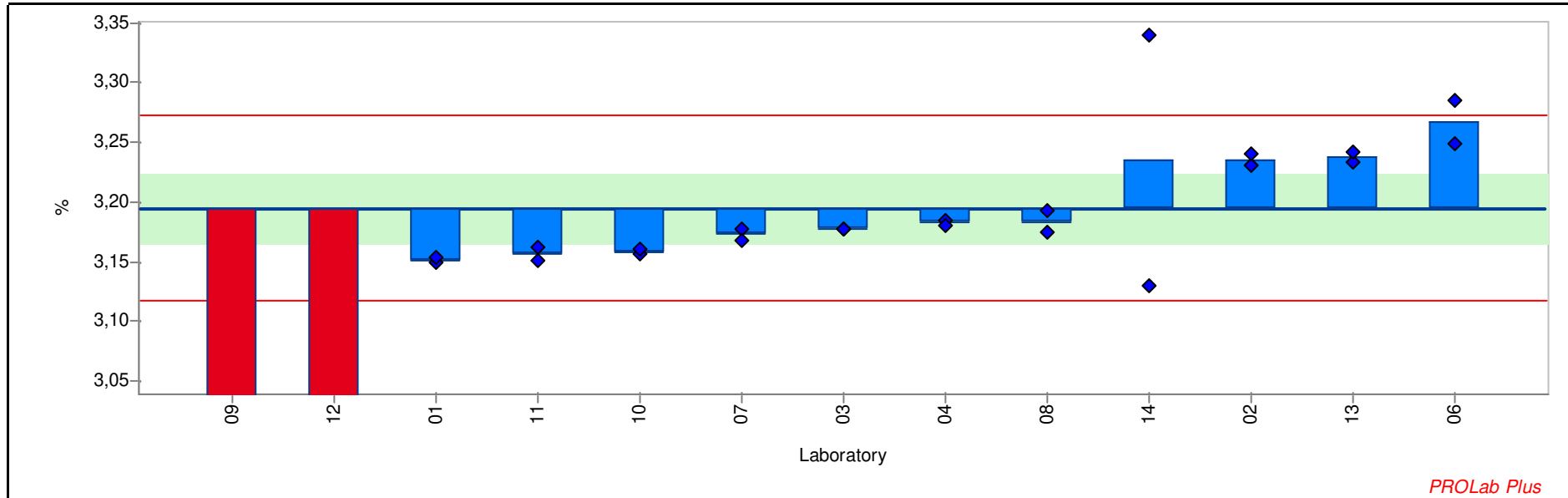
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	20,665	0,034	0,984	20,641	20,689	no accreditation	XRF (fusion)	
02	20,360	0,071	-0,949	20,310	20,410	ISO 17025	XRF (fusion)	
03	20,485	0,008	-0,157	20,479	20,491	ISO 17025	XRF (fusion)	
04	20,635	0,017	0,794	20,623	20,647	ISO 17025	XRF (fusion)	
05	20,680	0,099	1,079	20,610	20,750	ISO 17025	XRF (pressed pellet)	Info only
06	20,429	0,044	-0,512	20,398	20,460	ISO 17025	XRF (fusion)	
07	20,328	0,093	-1,149	20,394	20,263	no accreditation	XRF (fusion)	
08	20,456	0,007	-0,341	20,451	20,461	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	21,069	0,007	3,544	21,064	21,074	no accreditation	XRF (pressed pellet)	Info only
10	20,560	0,038	0,318	20,533	20,587	no accreditation	XRF (fusion)	
11	20,755	0,087	1,551	20,693	20,816	ISO 17025	XRF (fusion)	
12	15,240	0,515	-33,399	15,604	14,876	no accreditation	XRF (pressed pellet)	Info only
13	20,538	0,008	0,176	20,532	20,544	ISO 17025	XRF (fusion)	
14	20,405	0,049	-0,664	20,370	20,440	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.** 0,039 %
Measurand: SO3 **Repeat. s.d** 0,010 %
Mean ± U(Mean): 3,195 ± 0,028 % **Range of tolerance:** 3,117 - 3,273 % (|z-score| ≤ 2,000)
No. of laboratories: 11 **Statistical method** Q/Hampel



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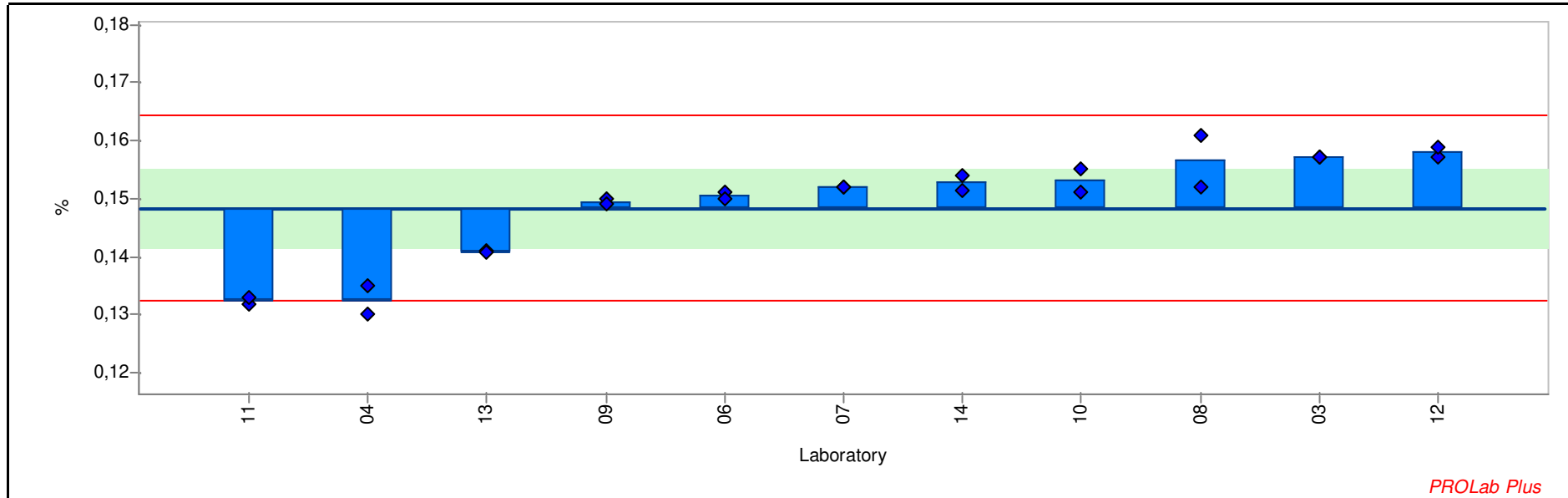
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	3,151	0,003	-1,125	3,149	3,153	no accreditation	XRF (fusion)	
02	3,235	0,007	1,030	3,230	3,240	ISO 17025	XRF (fusion)	
03	3,178	0,000	-0,432	3,178	3,178	ISO 17025	XRF (fusion)	
04	3,183	0,004	-0,317	3,185	3,180	ISO 17025	XRF (fusion)	
06	3,267	0,026	1,839	3,248	3,285	ISO 17025	XRF (fusion)	
07	3,172	0,008	-0,574	3,178	3,167	no accreditation	XRF (fusion)	
08	3,184	0,013	-0,291	3,174	3,193	no accreditation	XRF (fusion)	
09	2,508	0,005	-17,613	2,505	2,512	no accreditation	XRF (pressed pellet)	Info only

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	3,159	0,004	-0,933	3,156	3,161	no accreditation	XRF (fusion)	
11	3,156	0,008	-0,987	3,151	3,162	no accreditation	Other Method	Total SO3 SR3T in house method
12	2,739	0,249	-11,698	2,915	2,563	no accreditation	XRF (pressed pellet)	Info only
13	3,238	0,006	1,100	3,233	3,242	ISO 17025	XRF (fusion)	
14	3,235	0,148	1,030	3,130	3,340	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.:** 0,008 %
Measurand: SrO **Repeat. s.d.:** 0,002 %
Mean ± U(Mean): 0,148 ± 0,007 % **Range of tolerance:** 0,132 - 0,164 % (|z-score| ≤ 2,000)
No. of laboratories: 9 **Statistical method:** Q/Hampel



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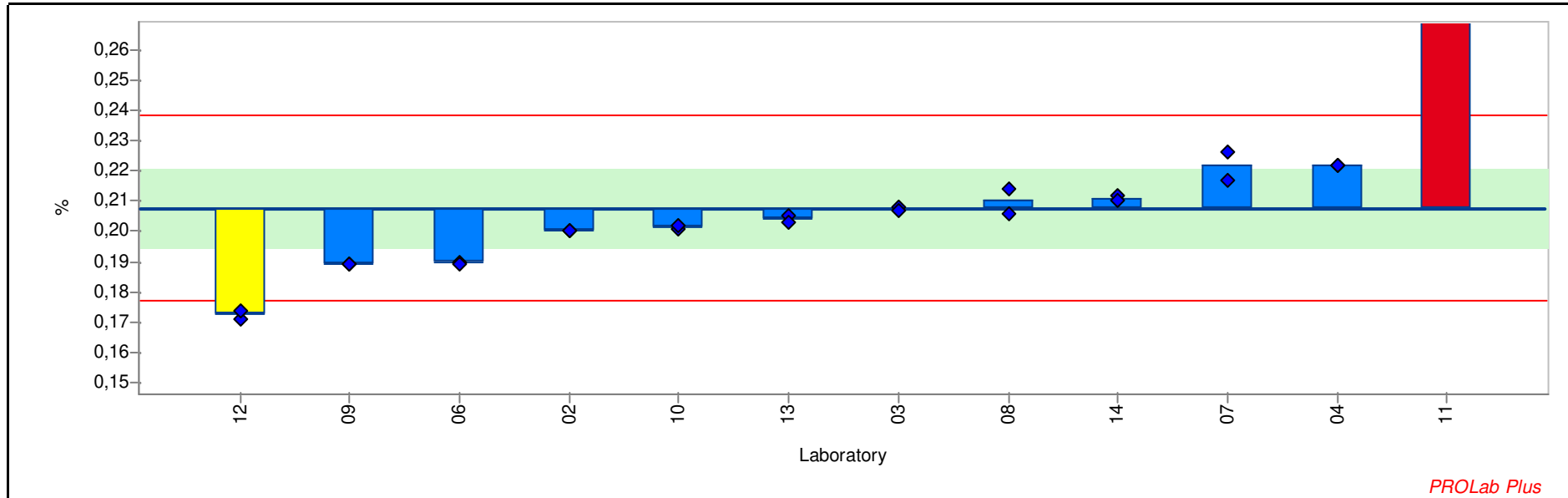
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
03	0,157	0,000	1,078	0,157	0,157	ISO 17025	XRF (fusion)	
04	0,133	0,004	-1,976	0,135	0,130	ISO 17025	XRF (fusion)	
06	0,150	0,001	0,267	0,151	0,150	ISO 17025	XRF (fusion)	
07	0,152	0,000	0,454	0,152	0,152	no accreditation	XRF (fusion)	
08	0,157	0,006	1,015	0,161	0,152	no accreditation	XRF (fusion)	
09	0,149	0,001	0,143	0,150	0,149	no accreditation	XRF (pressed pellet)	Info only
10	0,153	0,003	0,579	0,155	0,151	no accreditation	XRF (fusion)	
11	0,132	0,001	-1,991	0,132	0,133	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
12	0,158	0,001	1,202	0,157	0,159	no accreditation	XRF (pressed pellet)	Info only
13	0,141	0,000	-0,942	0,141	0,141	ISO 17025	XRF (fusion)	
14	0,153	0,002	0,548	0,151	0,154	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.:** 0,015 %
Measurand: TiO2 **Repeat. s.d.:** 0,002 %
Mean ± U(Mean): 0,208 ± 0,013 % **Range of tolerance:** 0,177 - 0,238 % (|z-score| ≤ 2,000)
No. of laboratories: 10 **Statistical method:** Q/Hampel



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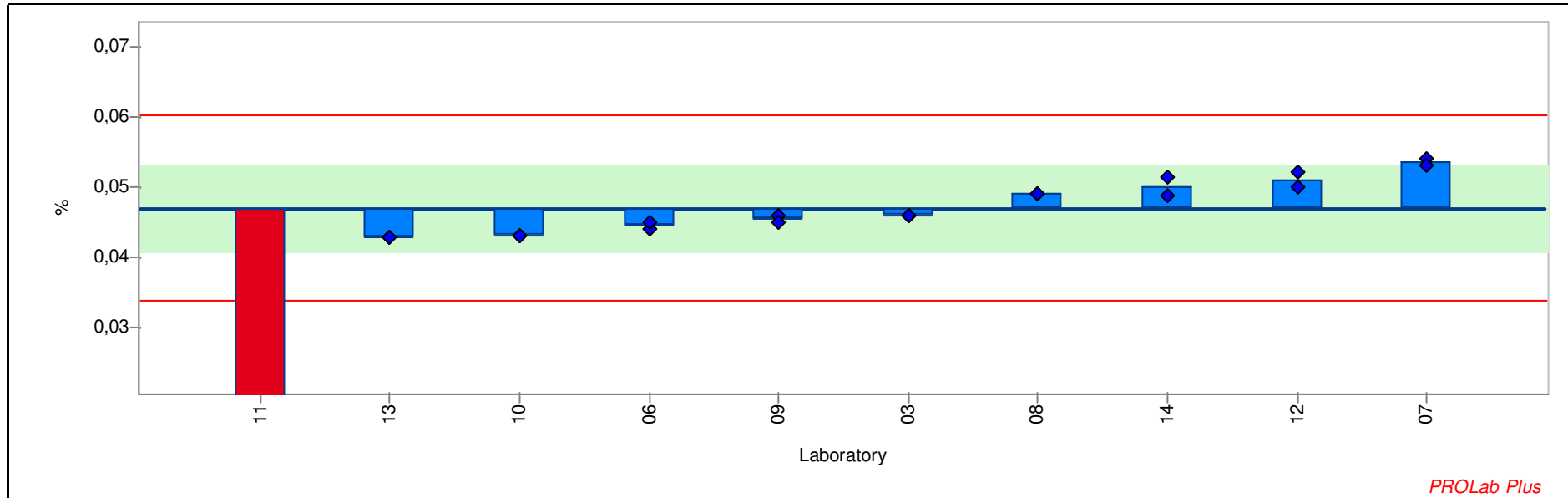
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
02	0,200	0,000	-0,501	0,200	0,200	ISO 17025	XRF (fusion)	
03	0,207	0,001	-0,013	0,208	0,207	ISO 17025	XRF (fusion)	
04	0,222	0,000	0,930	0,222	0,222	ISO 17025	XRF (fusion)	
06	0,190	0,001	-1,184	0,190	0,189	ISO 17025	XRF (fusion)	
07	0,222	0,006	0,898	0,217	0,226	no accreditation	XRF (fusion)	
08	0,210	0,006	0,150	0,206	0,214	no accreditation	XRF (fusion)	
09	0,189	0,000	-1,216	0,189	0,189	no accreditation	XRF (pressed pellet)	Info only
10	0,202	0,001	-0,403	0,201	0,202	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,275	0,001	4,357	0,276	0,274	ISO 17025	XRF (fusion)	
12	0,172	0,002	-2,289	0,171	0,174	no accreditation	XRF (pressed pellet)	Info only
13	0,204	0,001	-0,234	0,205	0,203	ISO 17025	XRF (fusion)	
14	0,211	0,001	0,215	0,212	0,210	no accreditation	XRF (fusion)	

RV-2018-01 Zement

Sample: FLX-RV-Sample02 **Reprod. s.d.:** 0,007 %
Measurand: ZnO **Repeat. s.d.:** 0,001 %
Mean ± U(Mean): 0,047 ± 0,006 % **Range of tolerance:** 0,034 - 0,060 % (|z-score| ≤ 2,000)
No. of laboratories: 8 **Statistical method:** Q/Hampel



Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
03	0,046	0,000	-0,147	0,046	0,046	ISO 17025	XRF (fusion)	
06	0,044	0,001	-0,372	0,044	0,045	ISO 17025	XRF (fusion)	
07	0,053	0,001	0,980	0,054	0,053	no accreditation	XRF (fusion)	
08	0,049	0,000	0,304	0,049	0,049	no accreditation	XRF (fusion)	
09	0,045	0,001	-0,222	0,046	0,045	no accreditation	XRF (pressed pellet)	Info only
10	0,043	0,000	-0,598	0,043	0,043	no accreditation	XRF (fusion)	
11	0,013	0,001	-5,106	0,014	0,012	no accreditation	XRF (fusion)	
12	0,051	0,001	0,604	0,050	0,052	no accreditation	XRF (pressed pellet)	Info only

RV-2018-01 Zement

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
13	0,043	0,000	-0,628	0,043	0,043	ISO 17025	XRF (fusion)	
14	0,050	0,002	0,461	0,049	0,051	no accreditation	XRF (fusion)	

Ring test RV-2018-01 Zement

Sample01

Survey of scores

Lab code	Al2O3	CaO	Cr2O3	Fe2O3	K2O	Loss on Ignition	MgO	Mn2O3	Na2O	P2O5	SiO2	SO3	SrO	TiO2	ZnO
01	2,529	-3,375		0,287	-0,932	0,946	0,680		1,508		1,426	-0,857			
02	0,123	-0,106		0,640	-0,746	-0,921	0,343	-0,111	0,554	0,950	-0,937	0,405		-0,766	
03	-0,089	0,071	0,565	0,601	0,586	-0,832	-1,611	3,415	0,118	-0,875	-0,041	-0,693	0,936	0,007	-0,034
04	0,020	-0,178	-0,147	0,346	0,080	0,472	1,226	0,091	-0,529	-0,704	-1,117	0,500	-0,328	0,376	
05	-0,458	2,187		0,875			8,099				0,003				
06	1,260	1,206		0,621	-0,298	1,806	0,168	-0,010	0,279	0,209	1,621	1,467	0,262	-0,951	-0,256
07	-1,020	0,622	-1,001	-0,604	-1,776	0,911	0,447	1,199	-2,292	3,402	-0,576	-0,467	-0,075	1,555	1,186
08	-1,558	0,486	0,138	-6,188	0,481	0,650	0,029	0,292	0,554	0,494	-0,658	-0,536	0,430	0,007	0,632
09	-3,947	2,107	0,992	-0,633	-0,420		10,599	0,645	-1,435	0,038	2,741	-6,727	0,430	-1,466	-0,367
10	0,347	0,697	0,707	-0,575	0,383	0,454	0,366	-0,413	0,603	0,380	0,344	-0,310	0,514	-0,398	-0,811
11	-0,587	-2,348	10,382	-5,367	1,869	-1,040	-0,524	0,178	0,345	-0,601	1,338	5,554	-1,261	6,296	
12	-20,599	-1,141		2,541	-2,520	-0,714	-13,425	-1,773	0,085	-6,691	-33,753	-5,528	0,514	-1,061	-0,145
13	-0,327	0,071	-0,261	-0,389	0,627	-0,061	-0,881	-0,917	-1,087	-0,190	-0,598	0,369	-0,808	-0,151	-0,744
14	0,274	-0,244		-0,927	-0,182	-1,366	-0,355	-1,394	-0,837	-0,761	-0,681	0,123	0,329	0,376	0,027

Ring test RV-2018-01 Zement

Sample02

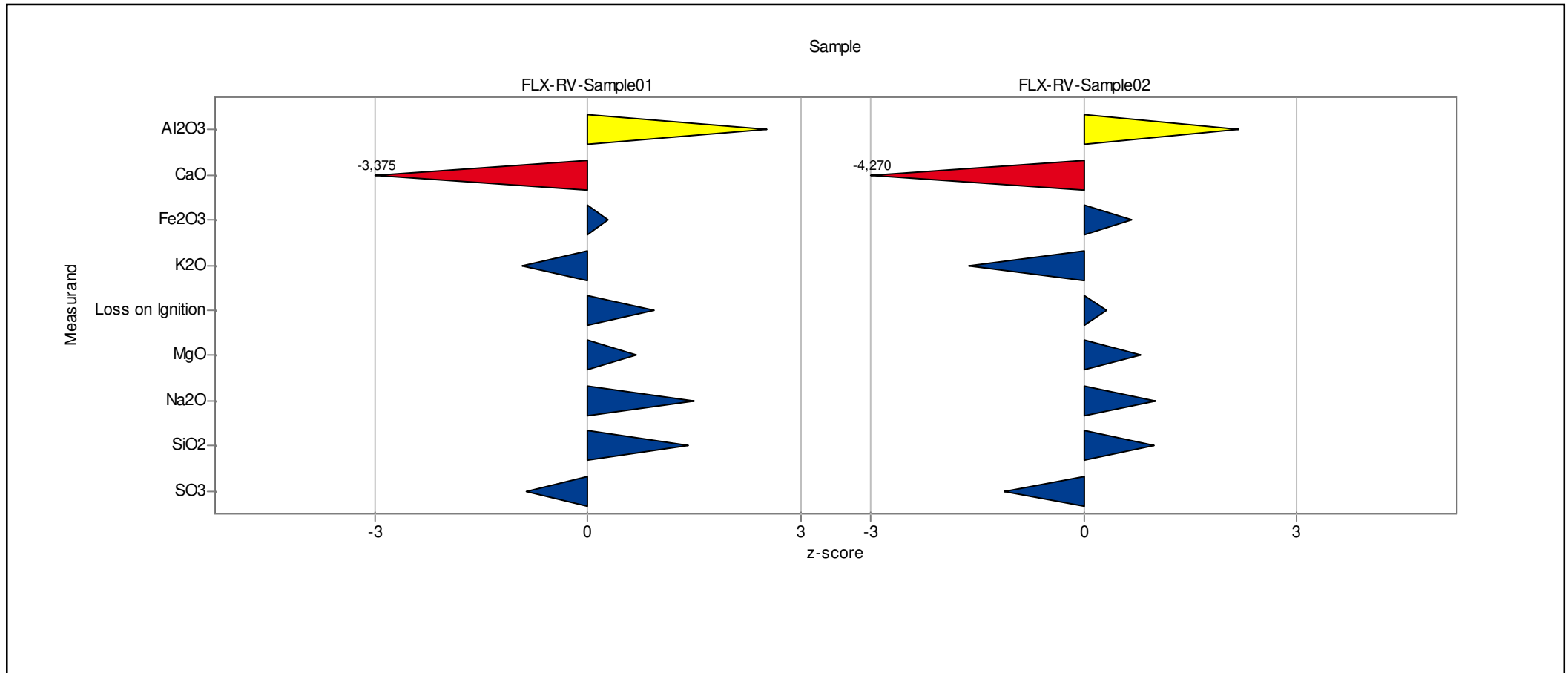
Survey of scores

Lab code	Al2O3	CaO	Cr2O3	Fe2O3	K2O	Loss on Ignition	MgO	Mn2O3	Na2O	P2O5	SiO2	SO3	SrO	TiO2	ZnO
01	2,171	-4,270		0,680	-1,623	0,316	0,803		1,001		0,984	-1,125			
02	0,281	-0,441		1,212	-0,996	-0,145	0,476	-1,137	0,267	0,668	-0,949	1,030		-0,501	
03	-0,208	0,184	0,744	0,141	0,952	0,799	-2,004	0,214	-0,444	-0,520	-0,157	-0,432	1,078	-0,013	-0,147
04	0,859	0,059	-0,282	0,396	0,276	-0,438	1,679	0,214	0,107	0,965	0,794	-0,317	-1,976	0,930	
05	2,443	7,494		1,641			8,852				1,079				
06	0,481	0,748		0,469	0,131	2,518	-0,727	0,214	0,175	0,015	-0,512	1,839	0,267	-1,184	-0,372
07	-1,125	0,818		-0,193	-2,170	0,279	0,134	0,686	-3,975	3,696	-1,149	-0,574	0,454	0,898	0,980
08	-1,125	0,741	-0,539	-3,287	0,718	-0,572	0,134	0,619	0,221	-0,164	-0,341	-0,291	1,015	0,150	0,304
09	-3,288	3,776	2,282	0,411	-1,615		7,144	-0,056	-5,512	0,786	3,544	-17,613	0,143	-1,216	-0,222
10	0,376	0,367	0,487	-0,346	0,429	-0,583	0,357	0,281	0,863	0,193	0,318	-0,933	0,579	-0,403	-0,598
11	-0,889	-2,727	18,419	-3,554	3,477	-1,025	-0,573	7,557	0,345	-0,586	1,551	-0,987	-1,991	4,357	-5,106
12	-17,307	1,320		3,701	-3,128	2,685	-9,252	-1,609	-0,811	-1,410	-33,399	-11,698	1,202	-2,289	0,604
13	-0,070	-0,301	-0,410	0,299	-0,027	-1,088	-0,338	-0,340	-0,742	-0,187	0,176	1,100	-0,942	-0,234	-0,628
14	-0,080	-0,446		-0,499	0,493	-0,543	-0,267	-0,750	-1,269	-1,188	-0,664	1,030	0,548	0,215	0,461

RV-2018-01 Zement

Laboratory chart of z-scores

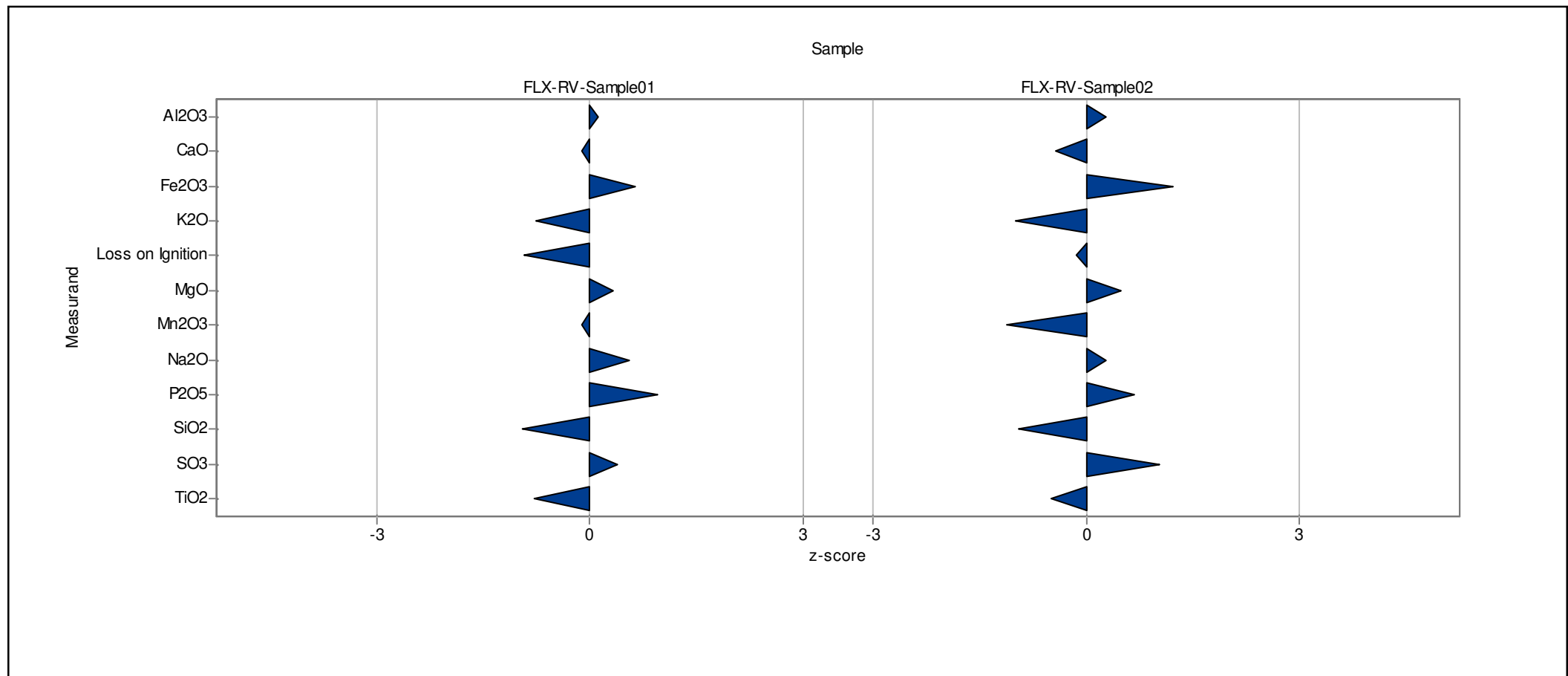
Laboratory: 01



RV-2018-01 Zement

Laboratory chart of z-scores

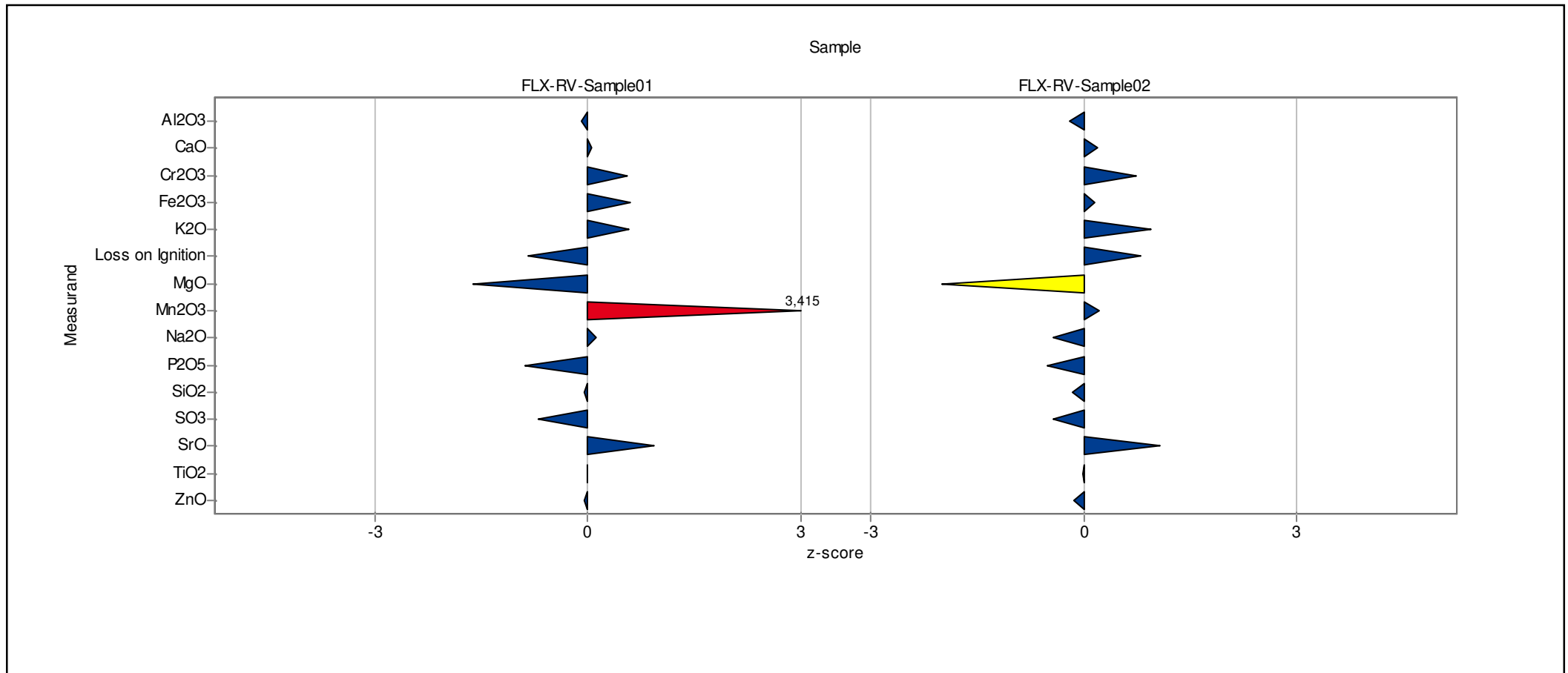
Laboratory: 02



RV-2018-01 Zement

Laboratory chart of z-scores

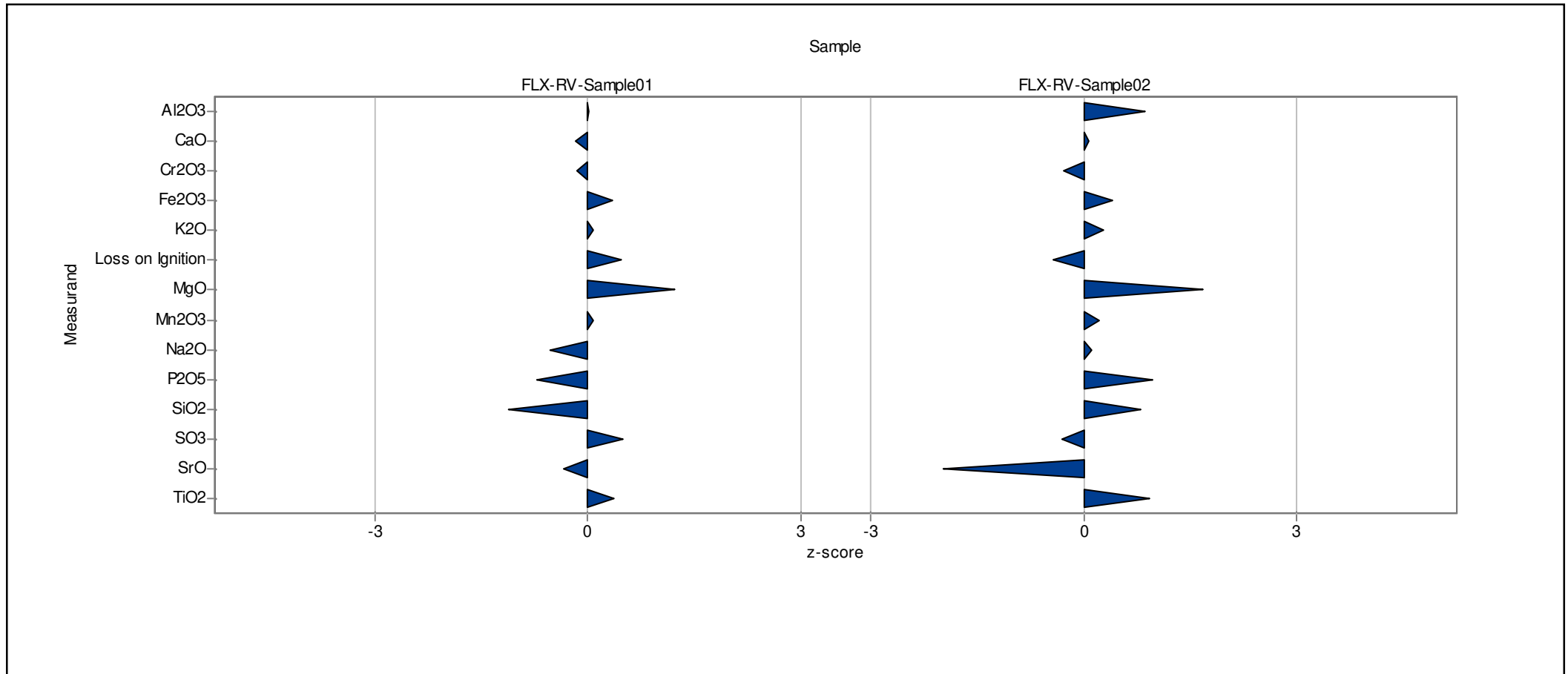
Laboratory: 03



RV-2018-01 Zement

Laboratory chart of z-scores

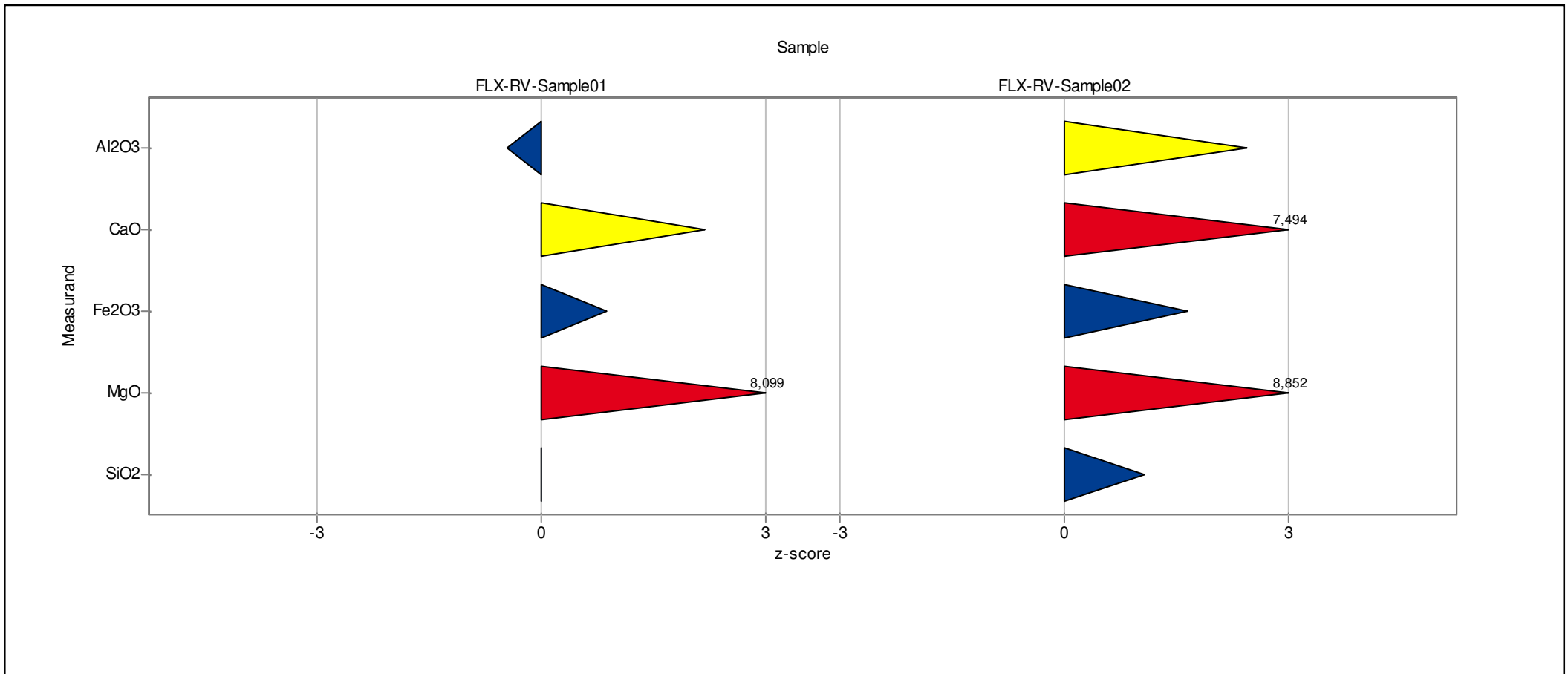
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RV-2018-01 Zement

Laboratory chart of z-scores

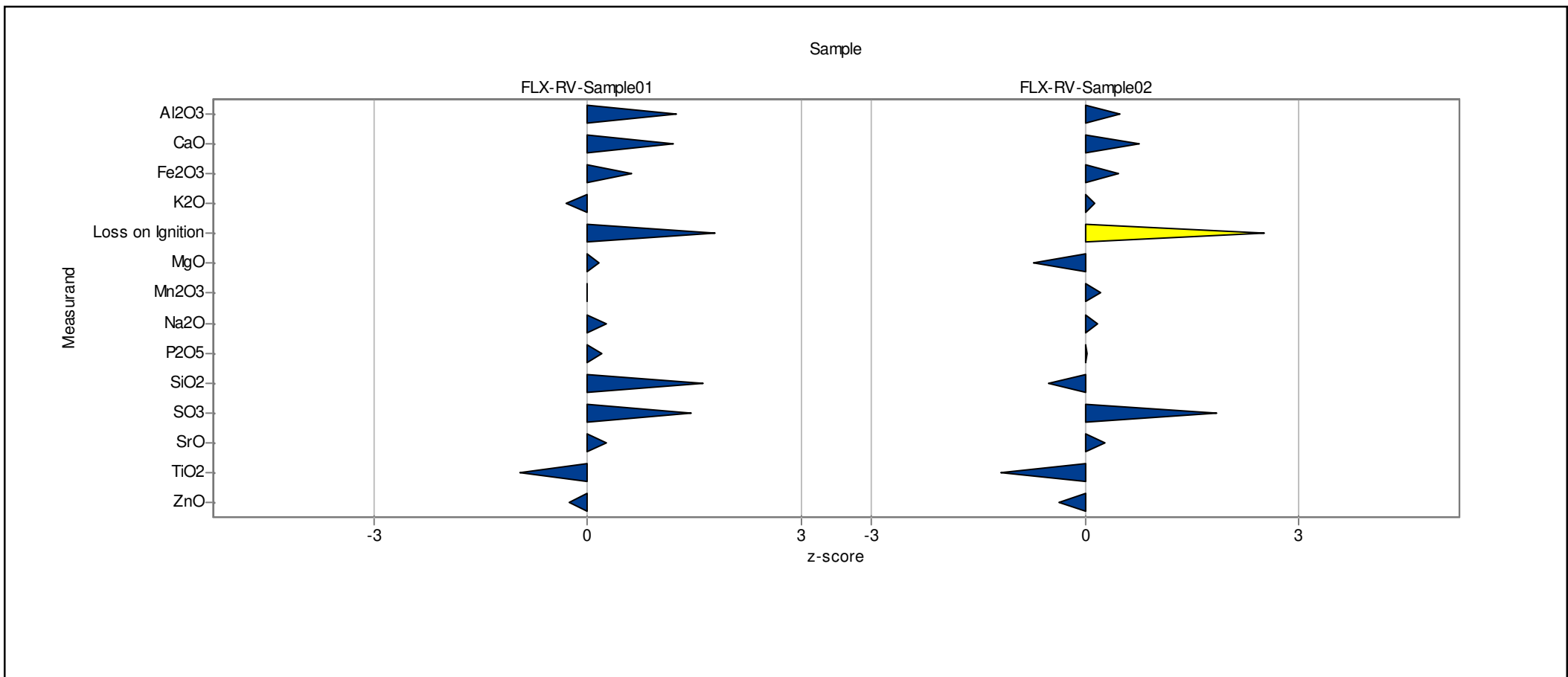
Laboratory: 05



RV-2018-01 Zement

Laboratory chart of z-scores

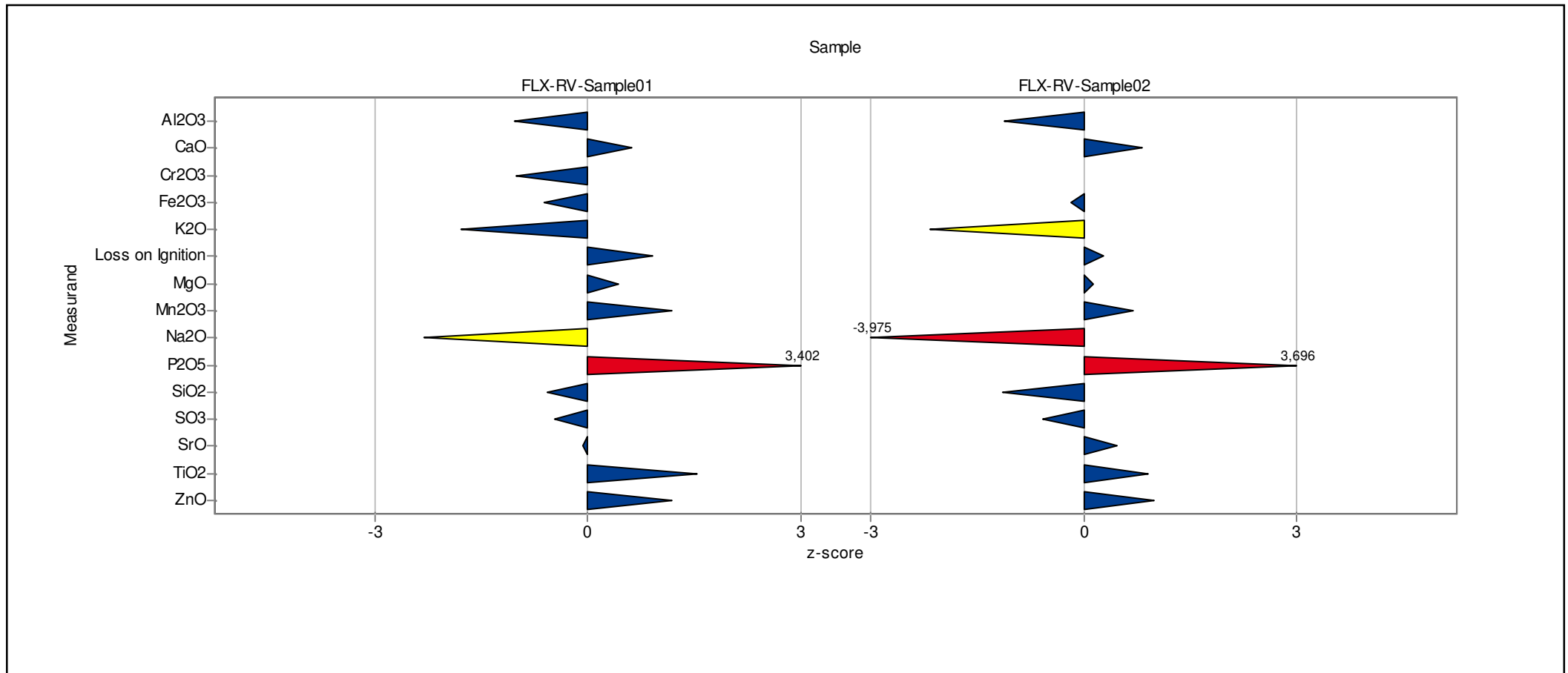
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RV-2018-01 Zement

Laboratory chart of z-scores

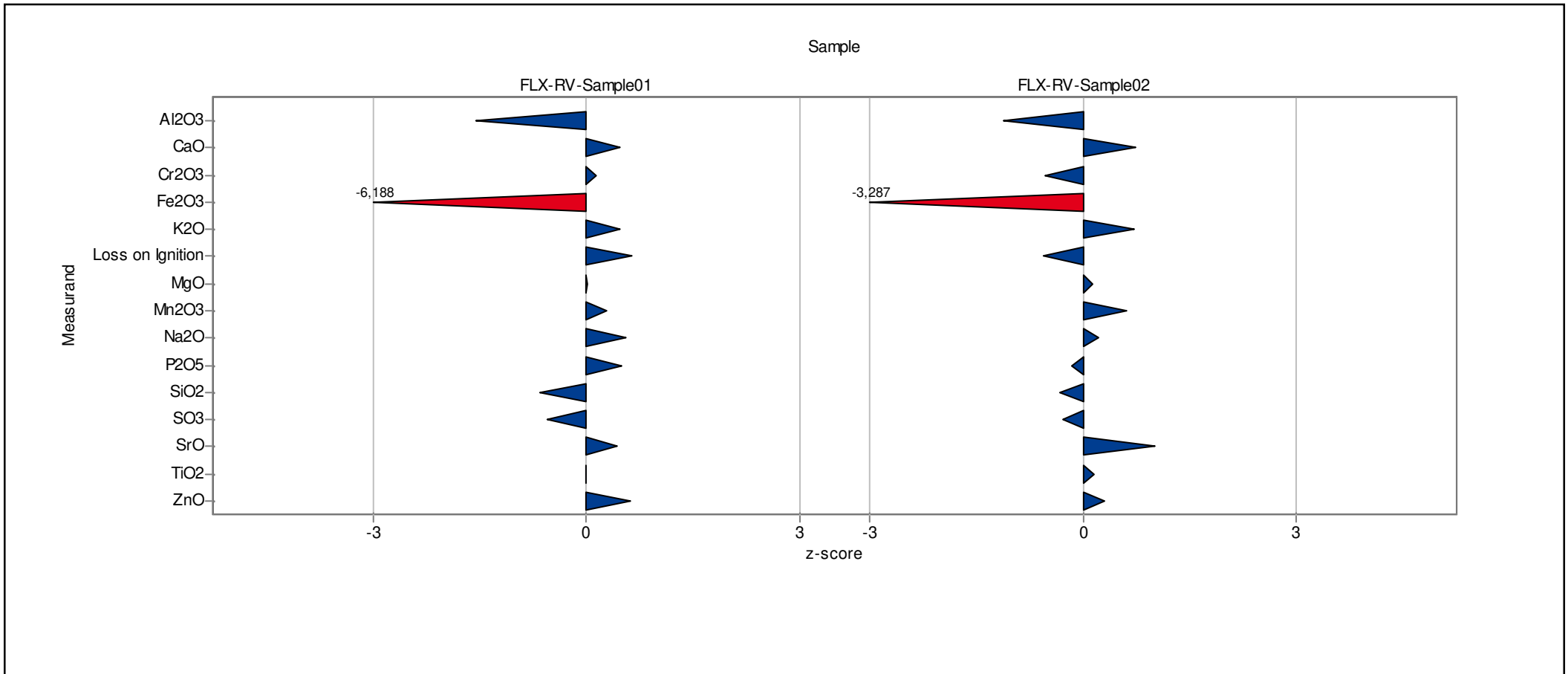
Laboratory: 07



RV-2018-01 Zement

Laboratory chart of z-scores

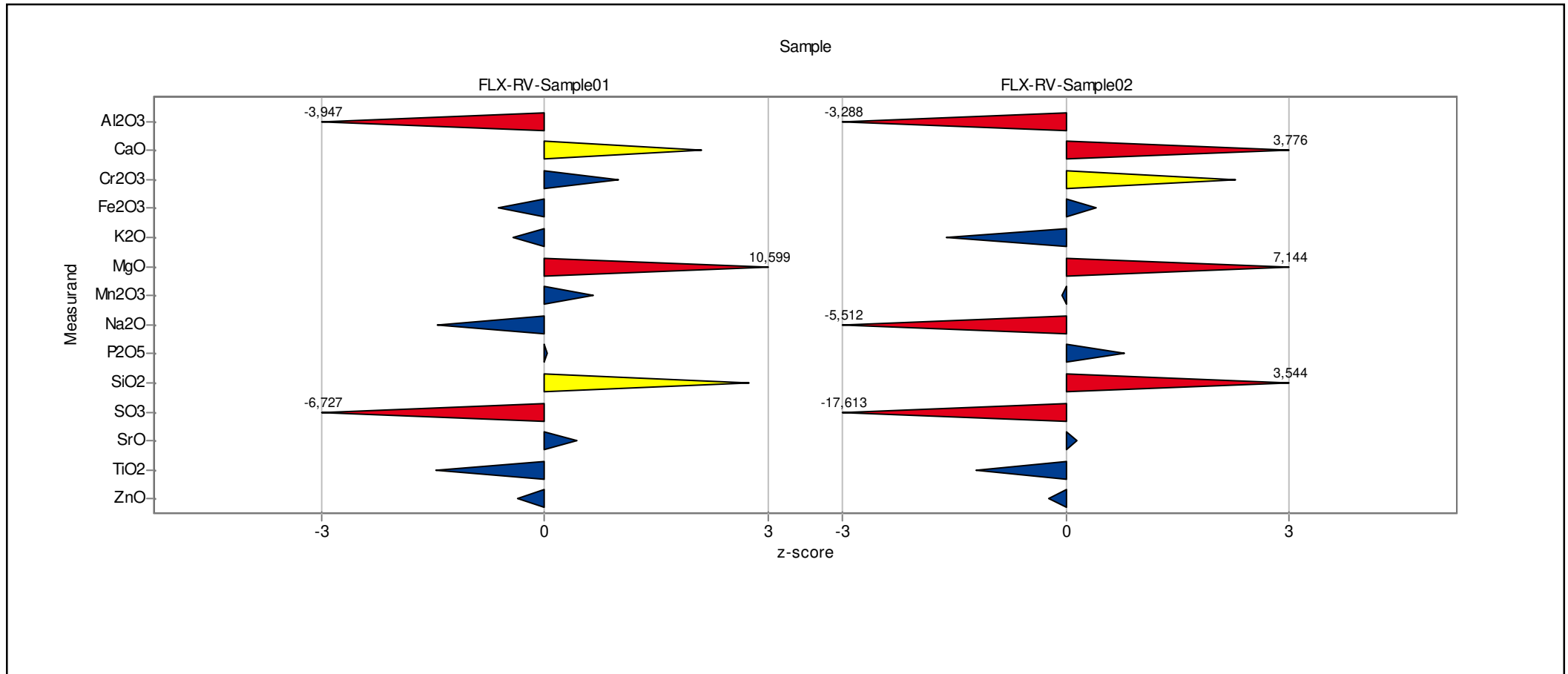
Laboratory: 08



RV-2018-01 Zement

Laboratory chart of z-scores

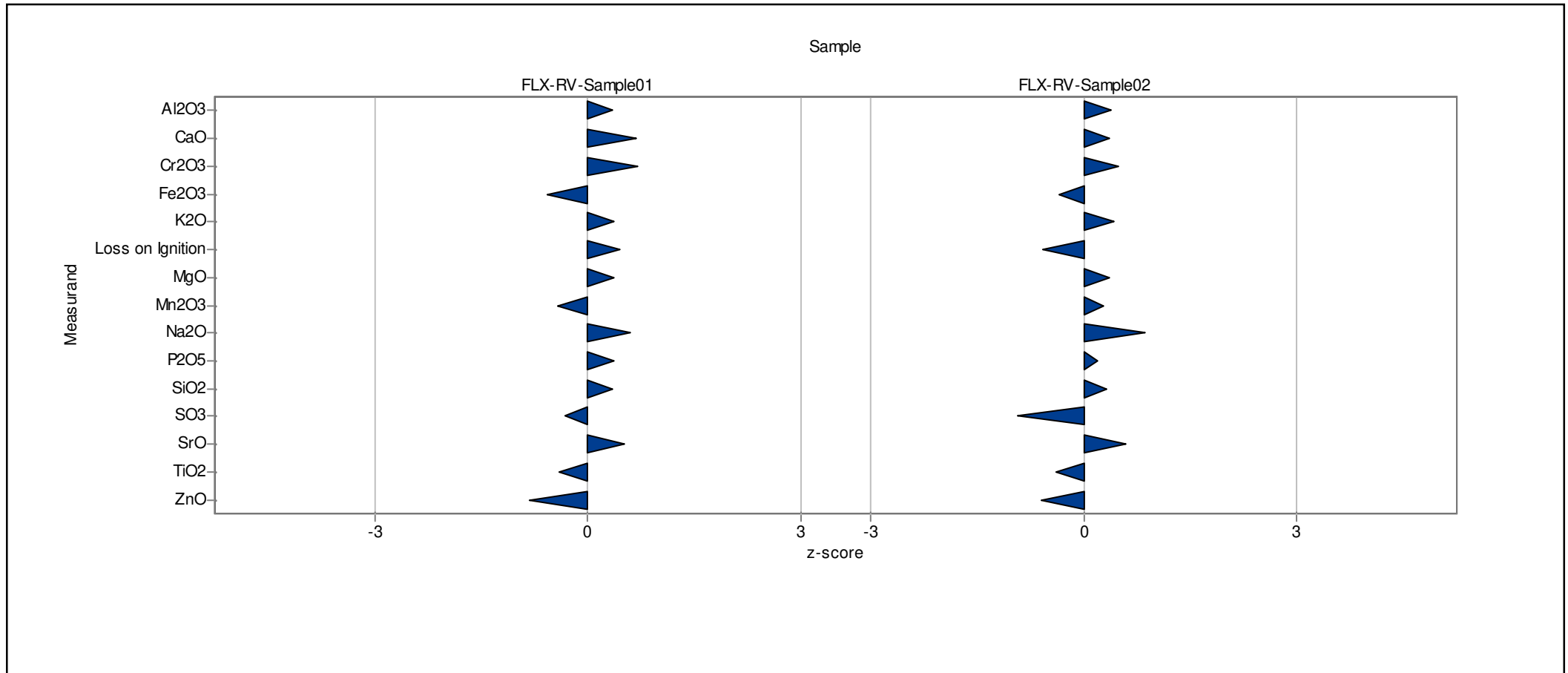
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RV-2018-01 Zement

Laboratory chart of z-scores

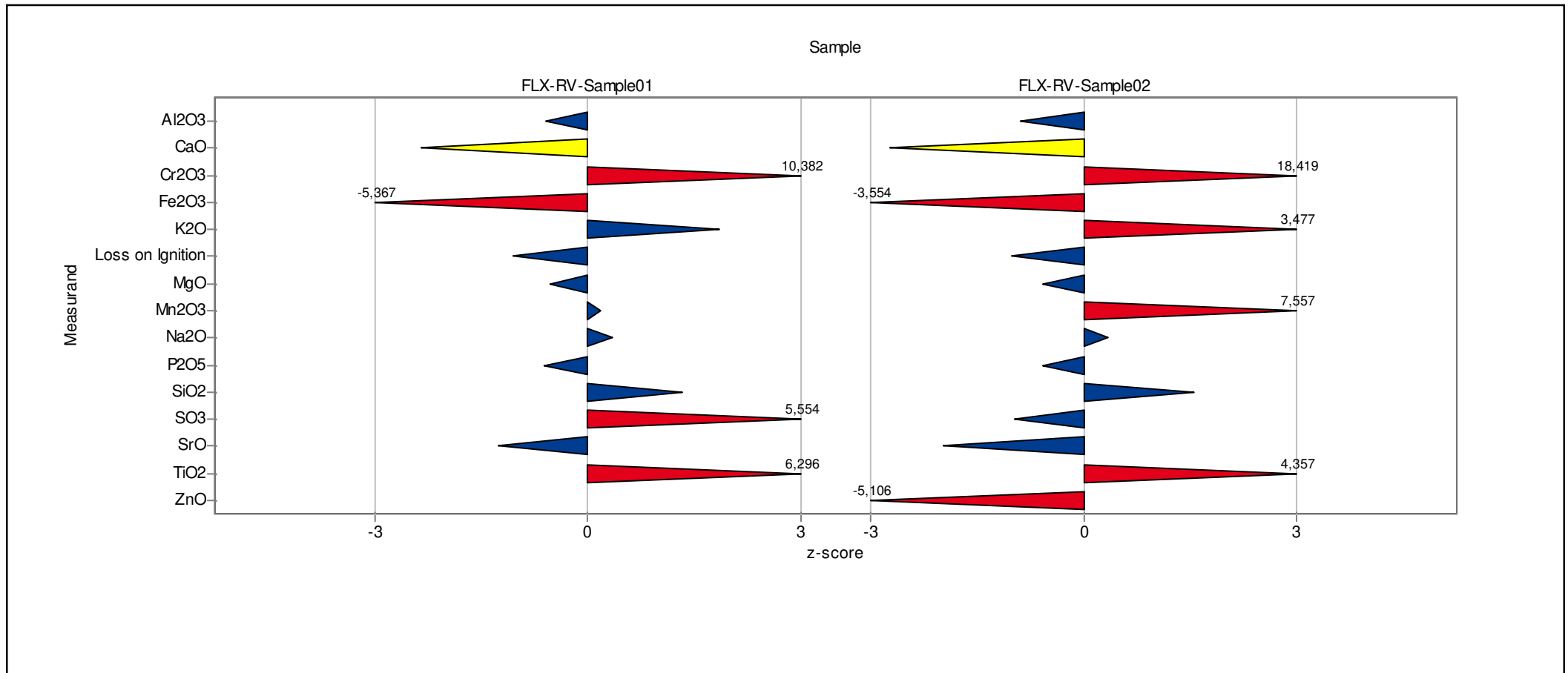
Laboratory: 10



RV-2018-01 Zement

Laboratory chart of z-scores

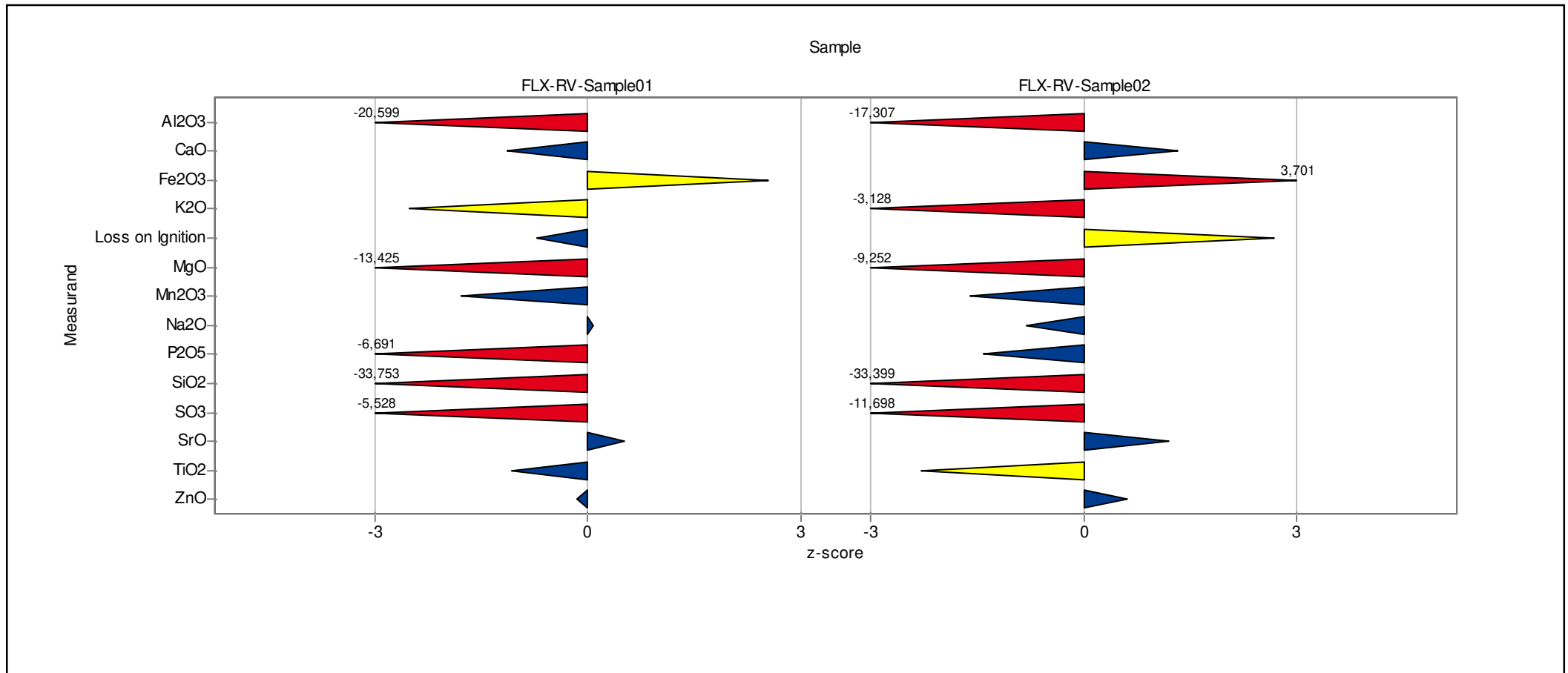
Laboratory: 11



RV-2018-01 Zement

Laboratory chart of z-scores

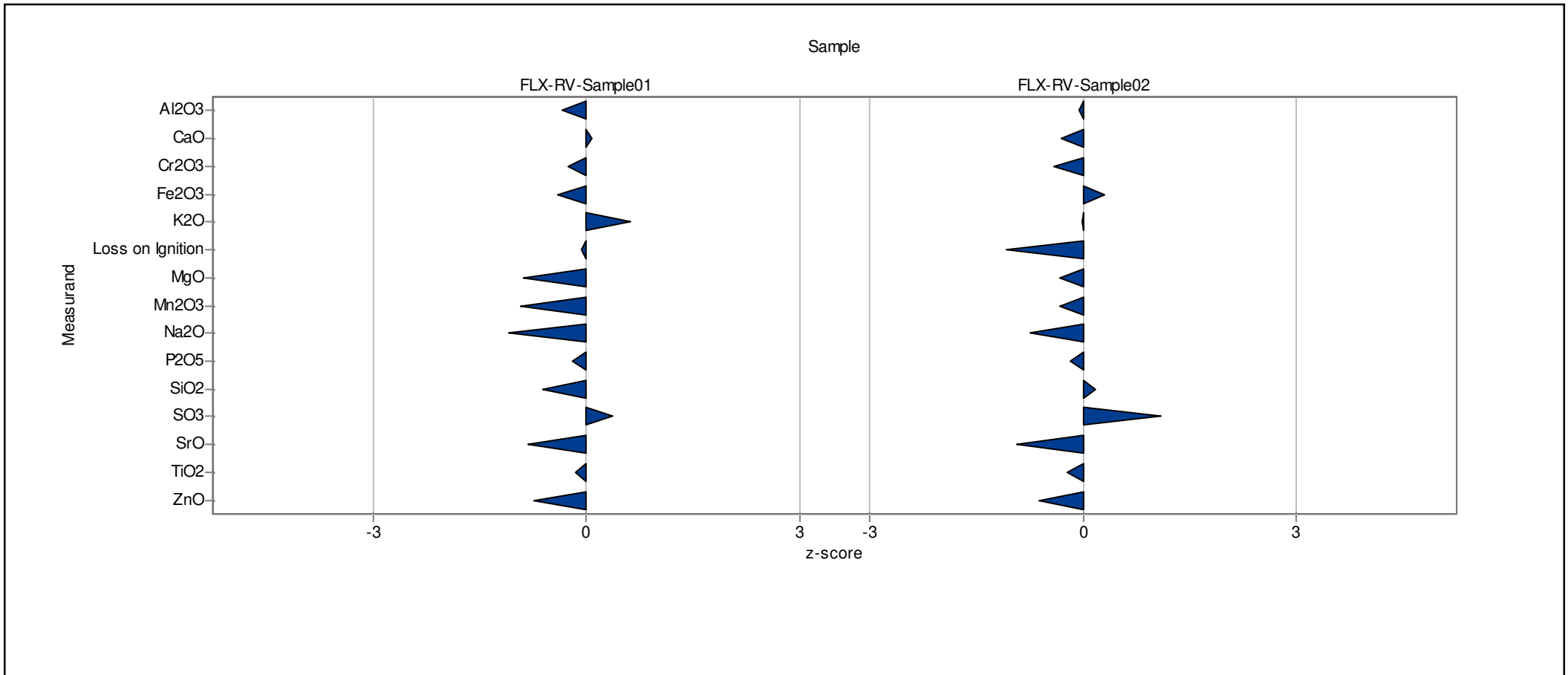
Laboratory: 12



RV-2018-01 Zement

Laboratory chart of z-scores

Laboratory: 13



RV-2018-01 Zement

Laboratory chart of z-scores

Laboratory: 14

