



RV-2019-01

Final Proficiency Report for Refractories

FLX-139, FLX-140



Bedburg-Hau, 16.12.2019

Coordinator of PT

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Statistics and Report

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FLX-139	Al ₂ O ₃	CaO	Cr ₂ O ₃	Fe ₂ O ₃	HfO ₂	K ₂ O	La ₂ O ₃	LOI
Unit	%	%	%	%	%	%	%	%
No. of laboratories	18	18	14	18	11	15	10	18
Mean m	96,799	0,479	0,359	0,112	0,011	0,255	0,323	2,217
Reproducibility standard deviation s _R	0,671	0,043	0,043	0,019	0,009	0,046	0,038	0,478
Repeatability standard deviation s _r	0,129	0,005	0,004	0,007	0,002	0,003	0,004	0,030
Robust standard deviation s*	0,641	0,045	0,041	0,017	0,009	0,050	0,036	0,441
Uncertainty U (s*)	0,378	0,026	0,028	0,010	0,007	0,032	0,029	0,260
Uncertainty U (s _R)	0,395	0,025	0,029	0,011	0,007	0,030	0,030	0,282
Mean - 2*s _R	95,456	0,392	0,273	0,074	-0,006	0,164	0,248	1,261
Mean + 2*s _R	98,142	0,566	0,445	0,151	0,029	0,346	0,399	3,173
	MgO	Na ₂ O	SiO ₂	SrO	TiO ₂	Y ₂ O ₃	ZrO ₂	
Unit	%	%	%	%	%	%	%	
No. of laboratories	16	13	18	12	15	9	14	
Mean m	0,244	0,129	0,576	0,181	0,038	0,081	0,592	
Reproducibility standard deviation s _R	0,074	0,049	0,049	0,016	0,013	0,010	0,028	
Repeatability standard deviation s _r	0,014	0,005	0,010	0,002	0,002	0,002	0,008	
Robust standard deviation s*	0,074	0,050	0,052	0,016	0,012	0,009	0,027	
Uncertainty U (s*)	0,046	0,035	0,031	0,012	0,008	0,007	0,018	
Uncertainty U (s _R)	0,046	0,034	0,029	0,012	0,008	0,008	0,019	
Mean - 2*s _R	0,096	0,032	0,545	0,150	0,013	0,060	0,535	
Mean + 2*s _R	0,392	0,226	0,607	0,213	0,063	0,102	0,649	

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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FLX-140	Al ₂ O ₃	CaO	Cr ₂ O ₃	Fe ₂ O ₃	HfO ₂	K ₂ O	La ₂ O ₃	LOI
Unit	%	%	%	%	%	%	%	%
No. of laboratories	15	15	16	16	16	16	10	16
Mean m	1,489	0,059	0,125	0,302	1,833	0,085	0,272	2,481
Reproducibility standard deviation s _R	0,093	0,024	0,017	0,039	0,145	0,026	0,057	0,414
Repeatability standard deviation s _r	0,010	0,003	0,003	0,002	0,005	0,003	0,007	0,025
Robust standard deviation s*	0,088	0,020	0,019	0,037	0,136	0,027	0,058	0,384
Uncertainty U (s*)	0,057	0,013	0,012	0,023	0,085	0,017	0,046	0,240
Uncertainty U (s _R)	0,060	0,015	0,011	0,024	0,091	0,016	0,045	0,259
Mean - 2*s _R	1,432	0,010	0,091	0,225	1,542	0,033	0,158	1,653
Mean + 2*s _R	1,546	0,108	0,159	0,380	2,124	0,137	0,386	3,308

	MgO	Na ₂ O	SiO ₂	SrO	TiO ₂	Y ₂ O ₃	ZrO ₂
Unit	%	%	%	%	%	%	%
No. of laboratories	12	13	14	13	15	14	16
Mean m	0,251	0,246	0,437	0,142	0,155	4,630	90,271
Reproducibility standard deviation s _R	0,060	0,061	0,053	0,041	0,018	0,364	1,604
Repeatability standard deviation s _r	0,011	0,005	0,007	0,002	0,003	0,007	0,061
Robust standard deviation s*	0,057	0,051	0,053	0,041	0,020	0,328	1,586
Uncertainty U (s*)	0,041	0,037	0,035	0,028	0,013	0,219	0,991
Uncertainty U (s _R)	0,043	0,042	0,035	0,028	0,012	0,243	1,003
Mean - 2*s _R	0,131	0,125	0,331	0,060	0,119	3,903	87,062
Mean + 2*s _R	0,371	0,367	0,543	0,224	0,192	5,358	93,480

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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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 17025:2005 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, DIN EN ISO 17034:2017 and ISO Guide 35:2017.

Participants

Neste Oyj	Finland
BASF SE	Germany
Ceramtec	Germany
FLUXANA GmbH & Co.KG	Germany
Fraunhofer-Institut für Bauphysik IBP, Standort Holzkirchen	Germany
Georgsmarienhütte GmbH	Germany
Horn & Co. Analytics	Germany
Rigaku RESE	Germany
Saarstahl AG	Germany
terrachem GmbH AnalySELabor	Germany
Thyssen Krupp Steel Europe AG	Germany
Zentrum für Glas- und Umweltanalytik GmbH	Germany
UIS Analytical Services	South Africa
Fundación IDONIAL	Spain
Kümaş Manyezit Sanayi A.Ş	Turkey
X-ray Minerals Services Ltd	United Kingdom
CoorsTek	USA
Southern Ionics Minerals	USA



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Statistical Evaluation used for this PT

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 colors.

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 :

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



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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 :

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

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.

Further Information

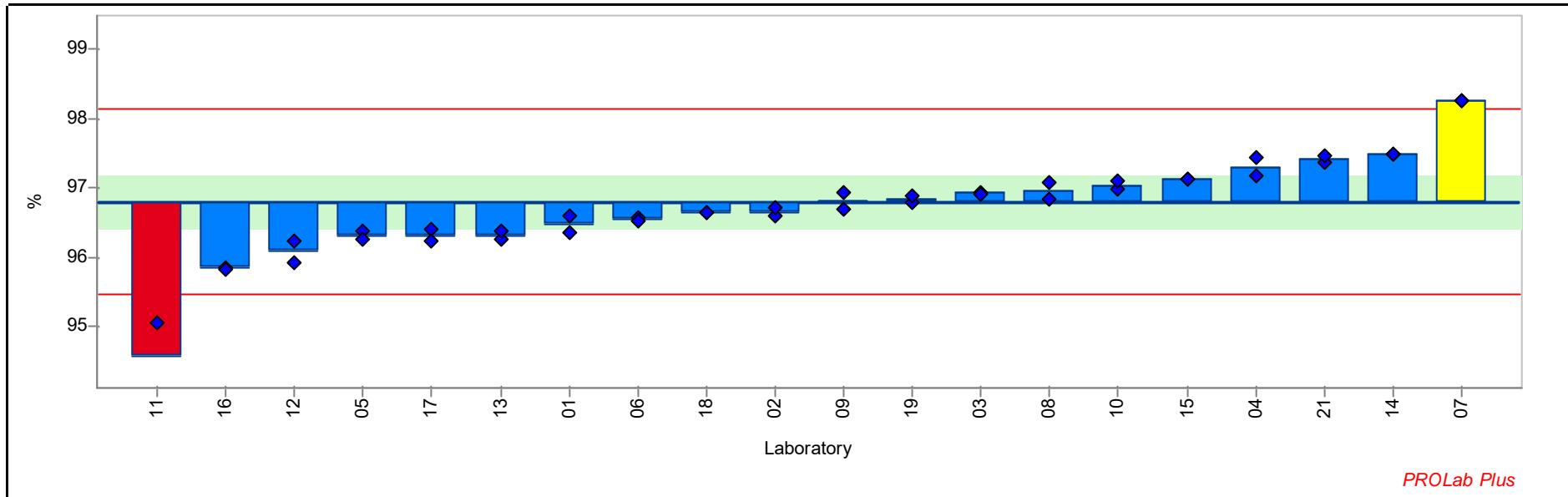
All laboratory data is listed in the following evaluation report. Additional information about laboratory accreditation and analytical methods used is also provided. Calculation was done only on traceable methods.

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

RV-2019_01 Refractories (Al2O3 and ZrO2)

Summary results

Sample:	FLX-139	Reprod. s.d.	0,671 %
Measurand:	Al2O3	Repeat. s.d	0,129 %
Mean ± U(Mean):	96,799 ± 0,378 %	Range of tolerance:	95,456 - 98,142 % (z-score <= 2,000)
No. of laboratories:	18	Statistical method	Q/Hampel



Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	96,480	0,170	-0,475	96,360	96,600	ISO 17025	XRF (fusion)	
02	96,647	0,089	-0,226	96,584	96,710	ISO 17025	XRF (fusion)	
03	96,919	0,001	0,180	96,920	96,919	ISO 17025	XRF (fusion)	
04	97,303	0,180	0,752	97,176	97,431	ISO 17025	XRF (fusion)	
05	96,311	0,092	-0,726	96,376	96,246	ISO 17025	XRF (fusion)	
06	96,548	0,021	-0,373	96,563	96,533	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
07	98,259	0,004	2,175	98,256	98,262	ISO 17025	XRF (fusion)	
08	96,957	0,172	0,237	97,079	96,836	no accreditation	XRF (fusion)	
09	96,800	0,170	0,002	96,680	96,920	ISO 17025	XRF (fusion)	
10	97,031	0,085	0,346	96,971	97,091	ISO 17025	Other Method	ICP-OES
11	94,575	0,686	-3,312	94,090	95,060	no accreditation	XRF (fusion)	
12	96,080	0,221	-1,070	95,924	96,236	ISO 17025	XRF (fusion)	
13	96,316	0,081	-0,719	96,259	96,373	ISO 17025	XRF (fusion)	
14	97,486	0,003	1,024	97,484	97,488	no accreditation	XRF (fusion)	By difference
15	97,125	0,007	0,486	97,130	97,120	no accreditation	XRF (fusion)	
16	95,844	0,015	-1,422	95,854	95,833	no accreditation	XRF (pressed pellet)	Info only
17	96,313	0,118	-0,724	96,396	96,229	no accreditation	XRF (fusion)	
18	96,644	0,001	-0,230	96,645	96,643	no accreditation	XRF (pressed pellet)	Info only
19	96,838	0,064	0,058	96,792	96,883	ISO 17025	XRF (fusion)	
21	97,415	0,064	0,918	97,370	97,460	no accreditation	Other Method	Wet chemical analysis

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,482	0,001	0,074	0,483	0,482	ISO 17025	XRF (fusion)	
10	0,463	0,002	-0,386	0,461	0,464	ISO 17025	Other Method	ICP-OES
11	0,488	0,007	0,201	0,493	0,483	no accreditation	XRF (fusion)	
12	0,532	0,008	1,201	0,537	0,526	ISO 17025	XRF (fusion)	
13	0,451	0,007	-0,650	0,456	0,446	ISO 17025	XRF (fusion)	
14	0,484	0,000	0,109	0,484	0,484	no accreditation	XRF (fusion)	
15	0,410	0,004	-1,581	0,408	0,413	no accreditation	XRF (fusion)	
16	0,501	0,007	0,500	0,496	0,506	no accreditation	XRF (pressed pellet)	Info only
17	0,500	0,000	0,477	0,500	0,500	no accreditation	XRF (fusion)	
18	0,451	0,001	-0,661	0,450	0,451	no accreditation	XRF (pressed pellet)	Info only
19	0,492	0,004	0,304	0,490	0,495	ISO 17025	XRF (fusion)	
21	0,545	0,021	1,511	0,560	0,530	no accreditation	Other Method	Wet chemical analysis

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,370	0,004	0,260	0,367	0,373	ISO 17025	Other Method	ICP-OES
11	0,365	0,003	0,143	0,363	0,367	no accreditation	XRF (fusion)	
12	0,338	0,000	-0,486	0,338	0,338	ISO 17025	XRF (fusion)	
13	0,197	0,004	-3,774	0,200	0,194	ISO 17025	XRF (fusion)	
16	0,398	0,010	0,913	0,391	0,405	no accreditation	XRF (pressed pellet)	Info only
17	0,330	0,003	-0,673	0,332	0,328	no accreditation	XRF (fusion)	
18	0,396	0,001	0,855	0,395	0,396	no accreditation	XRF (pressed pellet)	Info only
19	0,378	0,003	0,446	0,376	0,380	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,113	0,023	0,036	0,129	0,097	ISO 17025	XRF (fusion)	
10	0,129	0,006	0,844	0,133	0,124	ISO 17025	Other Method	ICP-OES
11	0,133	0,010	1,078	0,140	0,126	no accreditation	XRF (fusion)	
12	0,111	0,000	-0,068	0,111	0,111	ISO 17025	XRF (fusion)	
13	0,122	0,000	0,505	0,122	0,122	no accreditation	Other Method	ICP-OES
14	0,114	0,000	0,088	0,114	0,114	no accreditation	XRF (fusion)	
15	0,098	0,001	-0,771	0,097	0,098	no accreditation	XRF (fusion)	
16	0,129	0,002	0,844	0,130	0,127	no accreditation	XRF (pressed pellet)	Info only
17	0,110	0,002	-0,146	0,108	0,111	no accreditation	XRF (fusion)	
18	0,122	0,001	0,505	0,123	0,121	no accreditation	XRF (pressed pellet)	Info only
19	0,102	0,001	-0,511	0,103	0,102	ISO 17025	XRF (fusion)	
21	0,135	0,007	1,182	0,130	0,140	no accreditation	Other Method	Wet chemical analysis

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,057	0,004	5,264	0,055	0,060	no accreditation	XRF (fusion)	
16	0,013	0,001	0,120	0,012	0,013	no accreditation	XRF (pressed pellet)	Info only
17	0,007	0,002	-0,452	0,006	0,009	no accreditation	XRF (fusion)	
18	0,010	0,000	-0,166	0,010	0,010	no accreditation	XRF (pressed pellet)	Info only
19	0,011	0,000	-0,052	0,011	0,011	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,278	0,002	0,494	0,276	0,279	ISO 17025	XRF (fusion)	
10	0,314	0,006	1,294	0,310	0,318	ISO 17025	Other Method	ICP-OES
11	0,286	0,002	0,691	0,288	0,285	no accreditation	XRF (fusion)	
13	0,271	0,001	0,340	0,271	0,270	no accreditation	Other Method	ICP-OES
14	0,277	0,007	0,483	0,272	0,282	no accreditation	XRF (fusion)	
16	0,306	0,008	1,129	0,312	0,301	no accreditation	XRF (pressed pellet)	Info only
17	0,218	0,000	-0,810	0,218	0,218	no accreditation	XRF (fusion)	
18	0,337	0,001	1,787	0,337	0,336	no accreditation	XRF (pressed pellet)	Info only
19	0,271	0,001	0,340	0,270	0,271	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
13	0,331	0,004	0,190	0,333	0,328	ISO 17025	XRF (fusion)	
16	0,349	0,003	0,681	0,347	0,351	no accreditation	XRF (pressed pellet)	Info only
18	0,313	0,001	-0,287	0,313	0,312	no accreditation	XRF (pressed pellet)	Info only
19	0,338	0,010	0,389	0,345	0,331	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	2,583	0,095	0,766	2,516	2,651	ISO 17025	Other Method	LOI @ 1025°C
10	1,950	0,014	-0,559	1,940	1,960	ISO 17025	Other Method	LOI @ 1025°C
11	1,877	0,609	-0,713	2,308	1,446	no accreditation	Other Method	LOI @ 1025°C
12	2,820	0,085	1,261	2,760	2,880	ISO 17025	Other Method	LOI @ 1025°C
15	2,445	0,049	0,476	2,410	2,480	no accreditation	Other Method	LOI @ 1025°C
16	1,040	0,014	-2,463	1,030	1,050	no accreditation	Other Method	LOI @ 1025°C
17	2,409	0,001	0,402	2,410	2,409	no accreditation	Other Method	LOI @ 1025°C
18	7,380	0,002	10,800	7,381	7,378	no accreditation	Other Method	LOI @ 1025°C
19	1,752	0,016	-0,973	1,741	1,764	ISO 17025	Other Method	LOI @ 1025°C
21	2,445	0,049	0,476	2,410	2,480	no accreditation	Other Method	LOI @ 1025°C

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,237	0,001	-0,094	0,238	0,236	ISO 17025	XRF (fusion)	
10	0,253	0,001	0,121	0,252	0,254	ISO 17025	Other Method	ICP-OES
11	0,208	0,003	-0,486	0,210	0,206	no accreditation	XRF (fusion)	
12	0,438	0,014	2,617	0,428	0,448	ISO 17025	XRF (fusion)	
14	0,263	0,003	0,256	0,265	0,261	no accreditation	XRF (fusion)	
15	0,039	0,011	-2,765	0,047	0,031	no accreditation	XRF (fusion)	
16	0,325	0,001	1,086	0,325	0,324	no accreditation	XRF (pressed pellet)	Info only
17	0,215	0,012	-0,384	0,224	0,207	no accreditation	XRF (fusion)	
18	0,372	0,000	1,726	0,372	0,372	no accreditation	XRF (pressed pellet)	Info only
21	0,370	0,042	1,700	0,400	0,340	no accreditation	Other Method	Wet chemical analysis

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

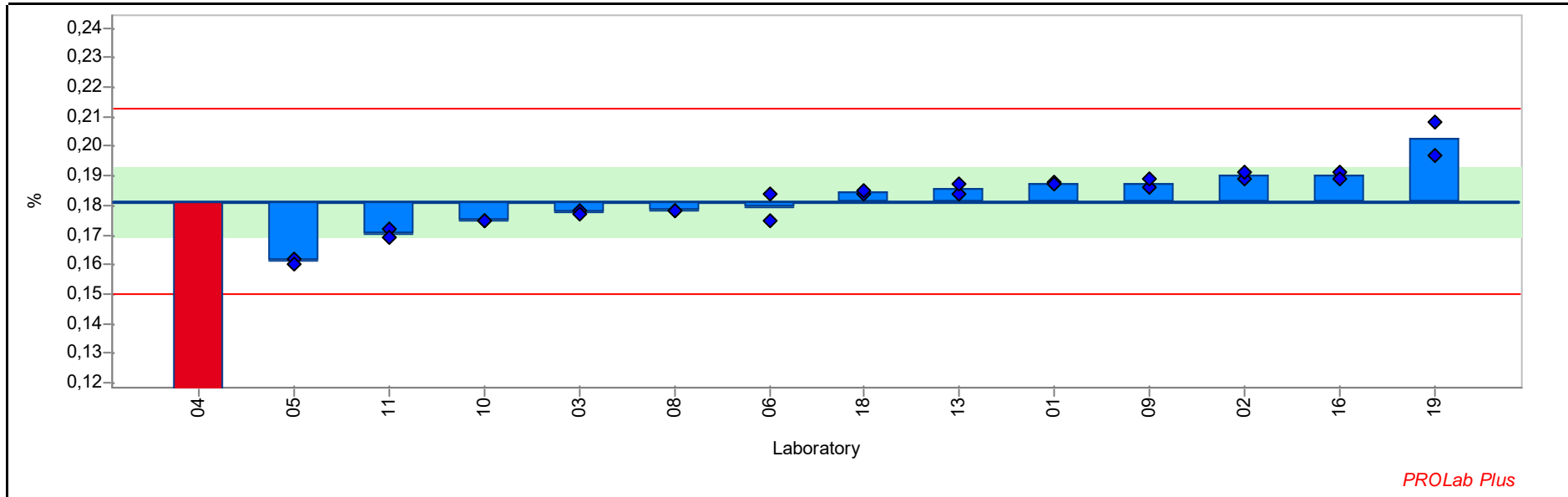
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,192	0,000	1,299	0,192	0,192	ISO 17025	Other Method	ICP-OES
11	0,269	0,048	2,885	0,303	0,235	no accreditation	XRF (fusion)	
13	0,143	0,000	0,290	0,143	0,143	no accreditation	Other Method	ICP-OES
14	0,139	0,005	0,197	0,142	0,135	no accreditation	XRF (fusion)	
16	0,149	0,006	0,413	0,145	0,153	no accreditation	XRF (pressed pellet)	Info only
17	0,163	0,004	0,692	0,160	0,165	no accreditation	XRF (fusion)	
18	0,204	0,001	1,536	0,204	0,203	no accreditation	XRF (pressed pellet)	Info only

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,585	0,001	0,178	0,584	0,585	ISO 17025	XRF (fusion)	
10	0,626	0,003	1,024	0,628	0,624	ISO 17025	Other Method	ICP-OES
11	0,560	0,014	-0,322	0,570	0,550	no accreditation	XRF (fusion)	
12	0,627	0,016	1,055	0,616	0,639	ISO 17025	XRF (fusion)	
13	0,575	0,005	-0,026	0,578	0,571	ISO 17025	XRF (fusion)	
14	0,603	0,003	0,555	0,601	0,605	no accreditation	XRF (fusion)	
15	0,560	0,003	-0,322	0,562	0,558	no accreditation	XRF (fusion)	
16	0,505	0,001	-1,444	0,506	0,504	no accreditation	XRF (pressed pellet)	Info only
17	0,581	0,004	0,106	0,584	0,578	no accreditation	XRF (fusion)	
18	0,516	0,001	-1,230	0,515	0,516	no accreditation	XRF (pressed pellet)	Info only
19	0,530	0,029	-0,924	0,551	0,510	ISO 17025	XRF (fusion)	
21	0,650	0,014	1,514	0,640	0,660	no accreditation	Other Method	Wet chemical analysis

RV-2019_01 Refractories (Al2O3 and ZrO2)

Sample: FLX-139 Reprod. s.d. 0,016 %
 Measurand: SrO Repeat. s.d 0,002 %
 Mean ± U(Mean): 0,181 ± 0,012 % Range of tolerance: 0,150 - 0,213 % (|z-score| <= 2,000)
 No. of laboratories: 12 Statistical method Q/Hampel



Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,188	0,001	0,393	0,188	0,187	ISO 17025	XRF (fusion)	
02	0,190	0,001	0,551	0,189	0,191	ISO 17025	XRF (fusion)	
03	0,177	0,001	-0,242	0,178	0,177	ISO 17025	XRF (fusion)	
04	0,099	0,008	-5,260	0,104	0,093	ISO 17025	XRF (fusion)	
05	0,161	0,001	-1,290	0,162	0,160	ISO 17025	XRF (fusion)	
06	0,179	0,006	-0,115	0,184	0,175	ISO 17025	XRF (fusion)	
08	0,178	0,000	-0,211	0,178	0,178	no accreditation	XRF (fusion)	
09	0,188	0,002	0,393	0,186	0,189	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,175	0,000	-0,401	0,175	0,175	ISO 17025	Other Method	ICP-OES
11	0,170	0,002	-0,687	0,172	0,169	no accreditation	XRF (fusion)	
13	0,185	0,002	0,266	0,184	0,187	no accreditation	Other Method	ICP-OES
16	0,190	0,001	0,551	0,191	0,189	no accreditation	XRF (pressed pellet)	Info only
18	0,184	0,001	0,202	0,184	0,185	no accreditation	XRF (pressed pellet)	Info only
19	0,203	0,008	1,345	0,197	0,208	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,037	0,001	-0,019	0,037	0,038	ISO 17025	Other Method	ICP-OES
11	0,055	0,007	1,381	0,050	0,060	no accreditation	XRF (fusion)	
12	0,042	0,003	0,341	0,044	0,040	ISO 17025	XRF (fusion)	
14	0,036	0,001	-0,099	0,037	0,036	no accreditation	XRF (fusion)	
15	0,048	0,018	0,781	0,060	0,035	no accreditation	XRF (fusion)	
16	0,039	0,004	0,101	0,042	0,036	no accreditation	XRF (pressed pellet)	Info only
17	0,044	0,000	0,501	0,044	0,044	no accreditation	XRF (fusion)	
18	0,032	0,000	-0,458	0,032	0,032	no accreditation	XRF (pressed pellet)	Info only
19	0,026	0,001	-0,978	0,026	0,025	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
16	0,089	0,001	0,757	0,090	0,088	no accreditation	XRF (pressed pellet)	Info only
18	0,085	0,001	0,371	0,086	0,084	no accreditation	XRF (pressed pellet)	Info only
19	0,074	0,004	-0,642	0,072	0,077	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,594	0,001	0,069	0,593	0,595	ISO 17025	Other Method	ICP-OES
11	0,575	0,007	-0,601	0,580	0,570	no accreditation	XRF (fusion)	
13	0,583	0,002	-0,301	0,585	0,582	ISO 17025	XRF (fusion)	
14	0,598	0,004	0,210	0,601	0,595	no accreditation	XRF (fusion)	
16	0,681	0,004	3,154	0,684	0,679	no accreditation	XRF (pressed pellet)	Info only
17	0,514	0,002	-2,734	0,516	0,513	no accreditation	XRF (fusion)	
18	0,591	0,001	-0,037	0,592	0,590	no accreditation	XRF (pressed pellet)	Info only
19	0,625	0,002	1,179	0,627	0,624	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

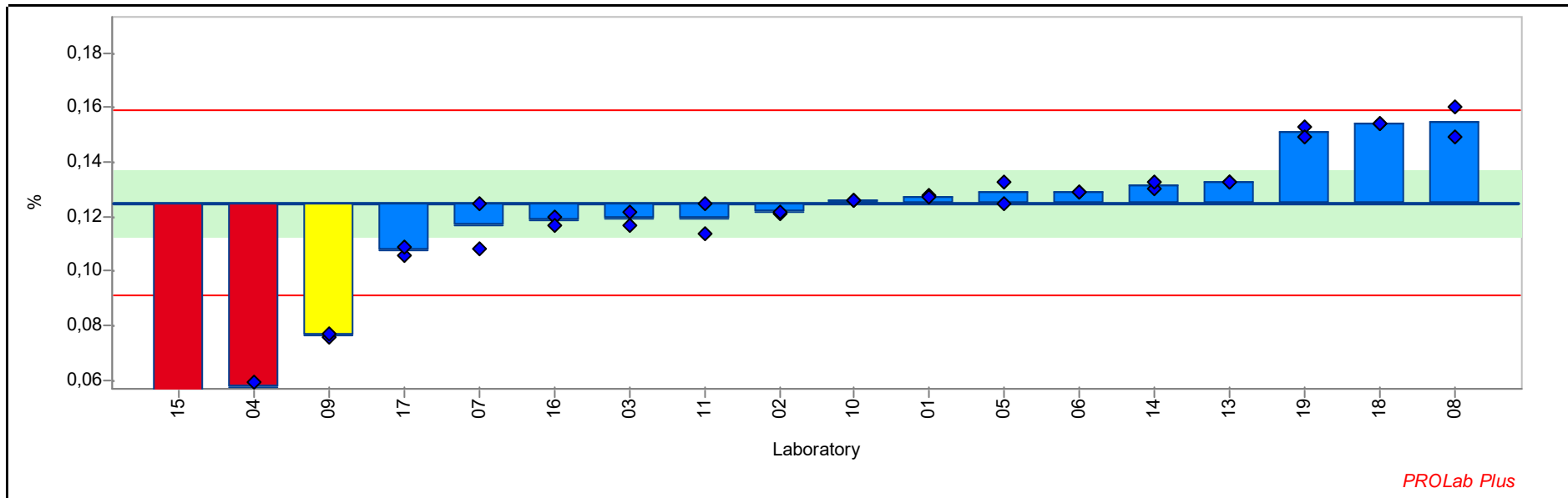
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	1,518	0,007	0,310	1,513	1,523	ISO 17025	XRF (fusion)	
10	1,412	0,001	-0,830	1,411	1,413	ISO 17025	Other Method	ICP-OES
11	1,421	0,041	-0,733	1,450	1,392	no accreditation	XRF (fusion)	
13	1,491	0,021	0,020	1,506	1,476	no accreditation	Other Method	ICP-OES
14	1,407	0,002	-0,878	1,406	1,409	no accreditation	XRF (fusion)	
16	0,869	0,017	-6,669	0,881	0,857	no accreditation	XRF (pressed pellet)	Info only
17	1,585	0,011	1,031	1,577	1,593	no accreditation	XRF (fusion)	
18	2,542	0,001	11,317	2,542	2,541	no accreditation	XRF (pressed pellet)	Info only
19	1,622	0,003	1,429	1,620	1,624	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,232	0,002	7,067	0,230	0,233	ISO 17025	Other Method	ICP-OES
11	0,064	0,003	0,212	0,066	0,062	no accreditation	XRF (fusion)	
13	0,071	0,000	0,498	0,071	0,071	no accreditation	Other Method	ICP-OES
14	0,067	0,001	0,314	0,067	0,066	no accreditation	XRF (fusion)	
15	0,019	0,002	-1,650	0,017	0,020	no accreditation	XRF (fusion)	
16	0,067	0,002	0,314	0,065	0,068	no accreditation	XRF (pressed pellet)	Info only
17	0,092	0,001	1,378	0,092	0,093	no accreditation	XRF (fusion)	
18	0,093	0,002	1,419	0,095	0,092	no accreditation	XRF (pressed pellet)	Info only
19	0,050	0,002	-0,381	0,051	0,048	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Sample: FLX-140 **Reprod. s.d.:** 0,017 %
Measurand: Cr2O3 **Repeat. s.d.:** 0,003 %
Mean ± U(Mean): 0,125 ± 0,012 % **Range of tolerance:** 0,091 - 0,159 % (|z-score| <= 2,000)
No. of laboratories: 16 **Statistical method:** Q/Hampel



PROLab Plus

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,128	0,001	0,143	0,128	0,127	ISO 17025	XRF (fusion)	
02	0,121	0,001	-0,209	0,121	0,122	ISO 17025	XRF (fusion)	
03	0,119	0,004	-0,326	0,122	0,117	ISO 17025	XRF (fusion)	
04	0,057	0,002	-3,961	0,056	0,059	ISO 17025	XRF (fusion)	
05	0,129	0,006	0,231	0,133	0,125	ISO 17025	XRF (fusion)	
06	0,129	0,000	0,231	0,129	0,129	ISO 17025	XRF (fusion)	
07	0,116	0,012	-0,502	0,108	0,125	no accreditation	Other Method	ICP-OES
08	0,154	0,008	1,726	0,160	0,149	no accreditation	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,076	0,001	-2,847	0,076	0,077	ISO 17025	XRF (fusion)	
10	0,126	0,000	0,055	0,126	0,126	ISO 17025	Other Method	ICP-OES
11	0,119	0,008	-0,326	0,125	0,114	no accreditation	XRF (fusion)	
13	0,133	0,000	0,465	0,133	0,133	no accreditation	Other Method	ICP-OES
14	0,132	0,002	0,377	0,130	0,133	no accreditation	XRF (fusion)	
15	0,050	0,001	-4,430	0,049	0,050	no accreditation	XRF (fusion)	
16	0,118	0,002	-0,385	0,120	0,117	no accreditation	XRF (pressed pellet)	Info only
17	0,107	0,002	-1,030	0,106	0,109	no accreditation	XRF (fusion)	
18	0,154	0,000	1,696	0,154	0,154	no accreditation	XRF (pressed pellet)	Info only
19	0,151	0,003	1,521	0,153	0,149	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,265	0,009	-0,979	0,258	0,271	ISO 17025	XRF (fusion)	
10	0,294	0,001	-0,215	0,293	0,295	ISO 17025	Other Method	ICP-OES
11	0,326	0,002	0,601	0,324	0,327	no accreditation	XRF (fusion)	
13	0,318	0,002	0,394	0,316	0,319	no accreditation	Other Method	ICP-OES
14	0,307	0,001	0,135	0,307	0,308	no accreditation	XRF (fusion)	
15	0,130	0,001	-4,462	0,129	0,131	no accreditation	XRF (fusion)	
16	0,321	0,001	0,485	0,320	0,322	no accreditation	XRF (pressed pellet)	Info only
17	0,284	0,003	-0,474	0,282	0,286	no accreditation	XRF (fusion)	
18	0,329	0,001	0,679	0,328	0,329	no accreditation	XRF (pressed pellet)	Info only
19	0,314	0,008	0,303	0,320	0,308	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

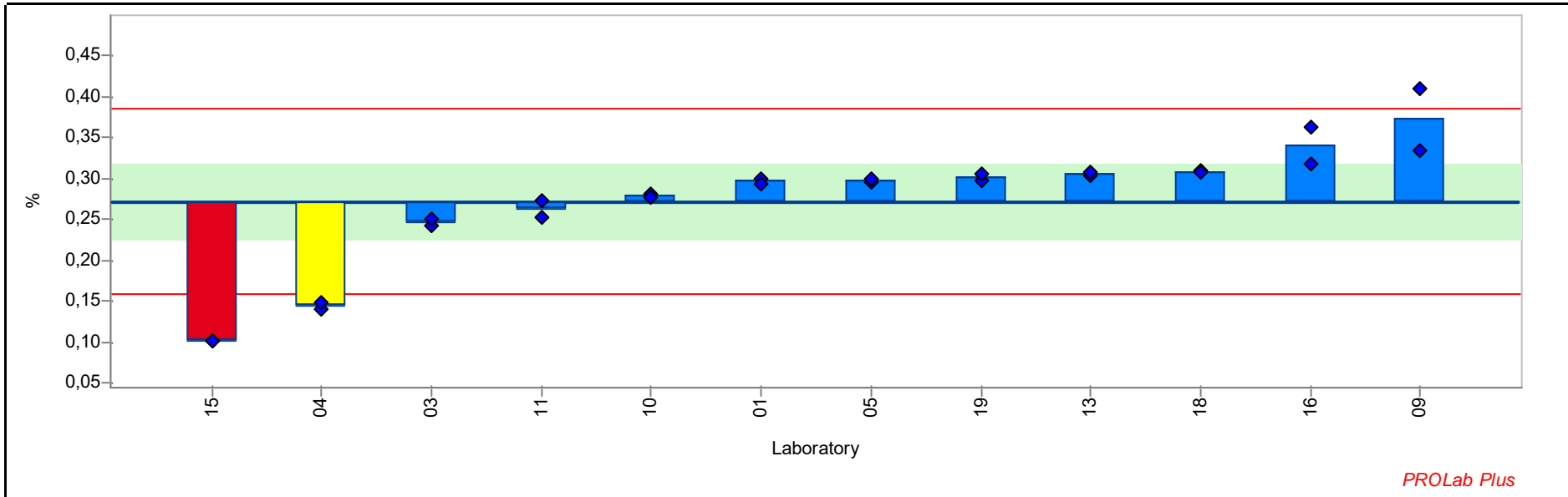
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	1,845	0,002	0,078	1,846	1,843	ISO 17025	XRF (fusion)	
10	1,806	0,006	-0,183	1,802	1,811	ISO 17025	Other Method	ICP-OES
11	1,808	0,190	-0,176	1,673	1,942	no accreditation	XRF (fusion)	
13	1,775	0,011	-0,400	1,767	1,783	ISO 17025	XRF (fusion)	
14	1,906	0,001	0,505	1,907	1,906	no accreditation	XRF (fusion)	
15	0,738	0,004	-7,534	0,741	0,735	no accreditation	XRF (fusion)	
16	1,820	0,009	-0,094	1,813	1,826	no accreditation	XRF (pressed pellet)	Info only
17	1,871	0,005	0,257	1,867	1,874	no accreditation	XRF (fusion)	
18	1,688	0,006	-0,999	1,684	1,692	no accreditation	XRF (pressed pellet)	Info only
19	1,739	0,004	-0,648	1,736	1,742	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	0,075	0,001	-0,387	0,076	0,074	ISO 17025	XRF (fusion)	
10	0,119	0,006	1,301	0,123	0,115	ISO 17025	Other Method	ICP-OES
11	0,112	0,004	1,013	0,114	0,109	no accreditation	XRF (fusion)	
13	0,103	0,001	0,687	0,104	0,102	no accreditation	Other Method	ICP-OES
14	0,093	0,003	0,303	0,091	0,095	no accreditation	XRF (fusion)	
15	0,073	0,007	-0,464	0,068	0,078	no accreditation	XRF (fusion)	
16	0,098	0,004	0,476	0,095	0,100	no accreditation	XRF (pressed pellet)	Info only
17	0,051	0,003	-1,308	0,053	0,049	no accreditation	XRF (fusion)	
18	0,185	0,002	3,851	0,187	0,184	no accreditation	XRF (pressed pellet)	Info only
19	0,087	0,001	0,092	0,088	0,087	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Sample: FLX-140 Reprod. s.d. 0,057 %
 Measurand: La₂O₃ Repeat. s.d 0,007 %
 Mean ± U(Mean): 0,272 ± 0,046 % Range of tolerance: 0,158 - 0,386 % (|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
01	0,296	0,004	0,434	0,299	0,294	ISO 17025	XRF (fusion)	
03	0,246	0,006	-0,454	0,242	0,250	ISO 17025	XRF (fusion)	
04	0,144	0,005	-2,238	0,141	0,148	ISO 17025	XRF (fusion)	
05	0,297	0,003	0,442	0,295	0,299	ISO 17025	XRF (fusion)	
09	0,372	0,052	1,761	0,335	0,409	ISO 17025	XRF (fusion)	
10	0,279	0,002	0,117	0,280	0,277	ISO 17025	Other Method	ICP-OES
11	0,263	0,015	-0,164	0,273	0,252	no accreditation	XRF (fusion)	
13	0,305	0,002	0,592	0,304	0,307	no accreditation	Other Method	ICP-OES

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
15	0,101	0,000	-3,002	0,101	0,101	no accreditation	XRF (fusion)	
16	0,340	0,032	1,189	0,362	0,317	no accreditation	XRF (pressed pellet)	Info only
18	0,308	0,002	0,645	0,310	0,307	no accreditation	XRF (pressed pellet)	Info only
19	0,302	0,006	0,530	0,298	0,306	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

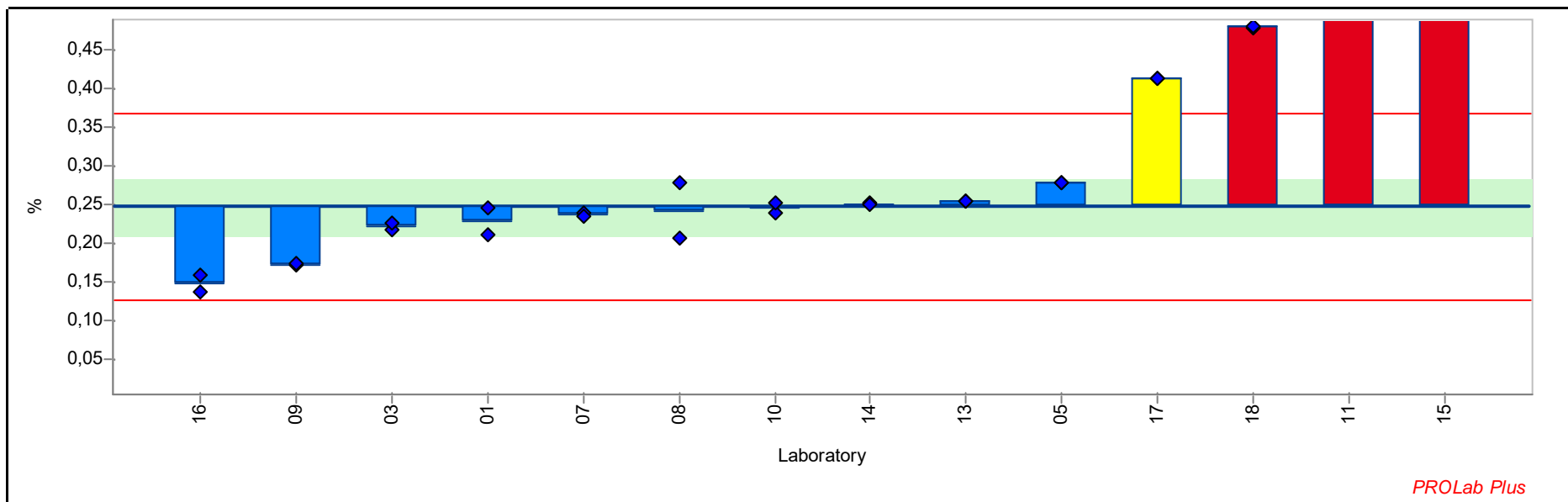
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	3,066	0,059	1,414	3,024	3,108	ISO 17025	Other Method	LOI @ 1025°C
10	2,210	0,014	-0,654	2,200	2,220	ISO 17025	Other Method	LOI @ 1025°C
11	2,212	1,001	-0,649	2,920	1,504	no accreditation	Other Method	LOI @ 1025°C
15	3,025	0,021	1,315	3,010	3,040	no accreditation	Other Method	LOI @ 1025°C
16	1,805	0,035	-1,633	1,830	1,780	no accreditation	Other Method	LOI @ 1025°C
17	2,595	0,018	0,275	2,582	2,607	no accreditation	Other Method	LOI @ 1025°C
18	2,404	0,008	-0,185	2,410	2,398	no accreditation	Other Method	LOI @ 1025°C
19	2,216	0,088	-0,640	2,278	2,154	ISO 17025	Other Method	LOI @ 1025°C

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,272	0,008	0,343	0,266	0,278	no accreditation	XRF (fusion)	
14	0,210	0,003	-0,690	0,212	0,208	no accreditation	XRF (fusion)	
15	2,345	0,066	34,911	2,299	2,392	no accreditation	XRF (fusion)	
16	0,185	0,006	-1,107	0,189	0,181	no accreditation	XRF (pressed pellet)	Info only
17	0,382	0,028	2,169	0,362	0,401	no accreditation	XRF (fusion)	
18	0,496	0,003	4,078	0,498	0,494	no accreditation	XRF (pressed pellet)	Info only

RV-2019_01 Refractories (Al2O3 and ZrO2)

Sample: FLX-140 **Reprod. s.d.:** 0,061 %
Measurand: Na2O **Repeat. s.d.:** 0,005 %
Mean ± U(Mean): 0,246 ± 0,037 % **Range of tolerance:** 0,125 - 0,367 % (|z-score| ≤ 2,000)
No. of laboratories: 12 **Statistical method:** Q/Hampel



Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,227	0,024	-0,313	0,210	0,244	ISO 17025	XRF (fusion)	
03	0,222	0,006	-0,404	0,217	0,226	ISO 17025	XRF (fusion)	
05	0,278	0,001	0,519	0,277	0,278	ISO 17025	XRF (fusion)	
06	<0,060			<0,060	<0,060	ISO 17025	XRF (fusion)	
07	0,236	0,003	-0,165	0,238	0,234	ISO 17025	Other Method	ICP-OES
08	0,241	0,050	-0,074	0,277	0,206	no accreditation	XRF (fusion)	
09	0,171	0,001	-1,227	0,171	0,172	ISO 17025	XRF (fusion)	
10	0,245	0,010	-0,017	0,238	0,252	ISO 17025	Other Method	ICP-OES

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

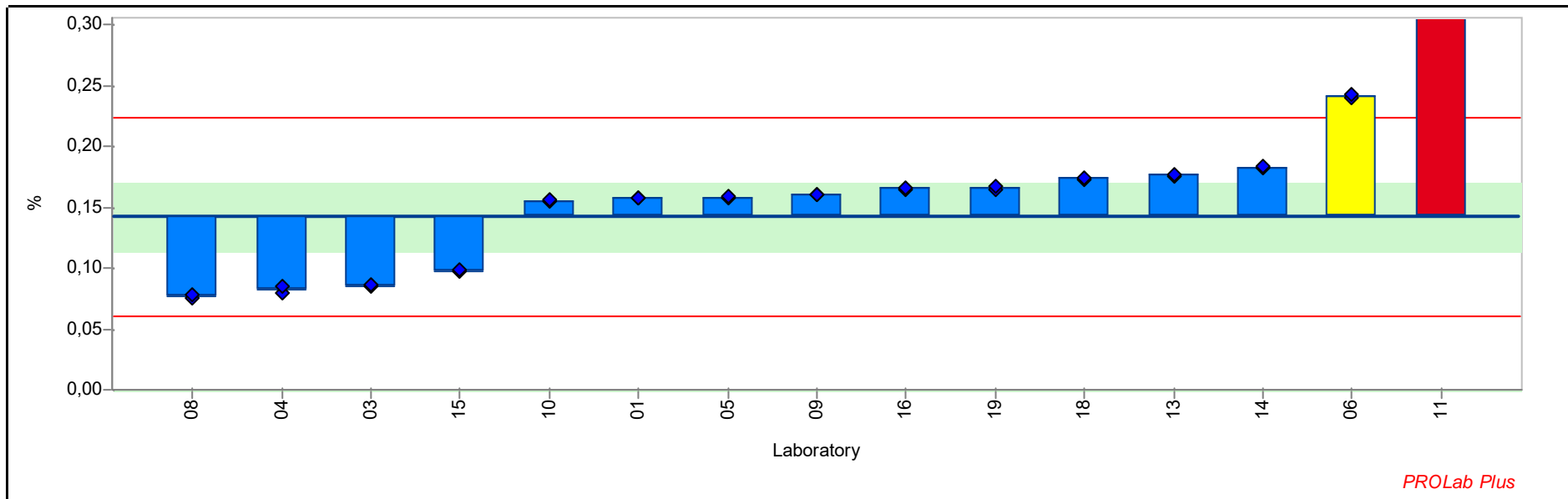
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	1,338	0,003	17,988	1,336	1,340	no accreditation	XRF (fusion)	
13	0,253	0,000	0,115	0,253	0,253	no accreditation	Other Method	ICP-OES
14	0,250	0,001	0,066	0,251	0,249	no accreditation	XRF (fusion)	
15	12,615	0,163	203,749	12,500	12,730	no accreditation	XRF (fusion)	
16	0,147	0,014	-1,631	0,137	0,157	no accreditation	XRF (pressed pellet)	Info only
17	0,412	0,001	2,743	0,412	0,413	no accreditation	XRF (fusion)	
18	0,479	0,001	3,846	0,479	0,480	no accreditation	XRF (pressed pellet)	Info only

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,453	0,006	0,284	0,457	0,448	ISO 17025	Other Method	ICP-OES
11	0,435	0,007	-0,046	0,430	0,440	no accreditation	XRF (fusion)	
13	0,514	0,005	1,453	0,518	0,511	no accreditation	Other Method	ICP-OES
14	0,458	0,001	0,378	0,457	0,458	no accreditation	XRF (fusion)	
16	0,266	0,004	-3,234	0,269	0,263	no accreditation	XRF (pressed pellet)	Info only
17	0,491	0,007	1,010	0,496	0,486	no accreditation	XRF (fusion)	
18	0,424	0,001	-0,244	0,424	0,425	no accreditation	XRF (pressed pellet)	Info only
19	0,347	0,004	-1,706	0,344	0,350	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Sample: FLX-140 **Reprod. s.d.** 0,041 %
Measurand: SrO **Repeat. s.d** 0,002 %
Mean ± U(Mean): 0,142 ± 0,028 % **Range of tolerance:** 0,060 - 0,224 % (|z-score| ≤ 2,000)
No. of laboratories: 13 **Statistical method** Q/Hampel



Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	0,158	0,001	0,377	0,157	0,158	ISO 17025	XRF (fusion)	
03	0,085	0,001	-1,385	0,085	0,086	ISO 17025	XRF (fusion)	
04	0,082	0,004	-1,471	0,079	0,085	ISO 17025	XRF (fusion)	
05	0,158	0,001	0,389	0,157	0,159	ISO 17025	XRF (fusion)	
06	0,241	0,002	2,433	0,240	0,243	ISO 17025	XRF (fusion)	
08	0,077	0,001	-1,593	0,076	0,078	no accreditation	XRF (fusion)	
09	0,160	0,000	0,438	0,160	0,160	ISO 17025	XRF (fusion)	
10	0,155	0,001	0,328	0,155	0,156	ISO 17025	Other Method	ICP-OES

RV-2019_01 Refractories (Al2O3 and ZrO2)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
11	0,479	0,015	8,258	0,490	0,469	no accreditation	XRF (fusion)	
13	0,176	0,001	0,842	0,176	0,177	no accreditation	Other Method	ICP-OES
14	0,182	0,001	0,989	0,182	0,183	no accreditation	XRF (fusion)	
15	0,098	0,001	-1,092	0,097	0,098	no accreditation	XRF (fusion)	
16	0,166	0,001	0,573	0,165	0,166	no accreditation	XRF (pressed pellet)	Info only
18	0,173	0,001	0,769	0,173	0,174	no accreditation	XRF (pressed pellet)	Info only
19	0,166	0,001	0,585	0,165	0,167	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

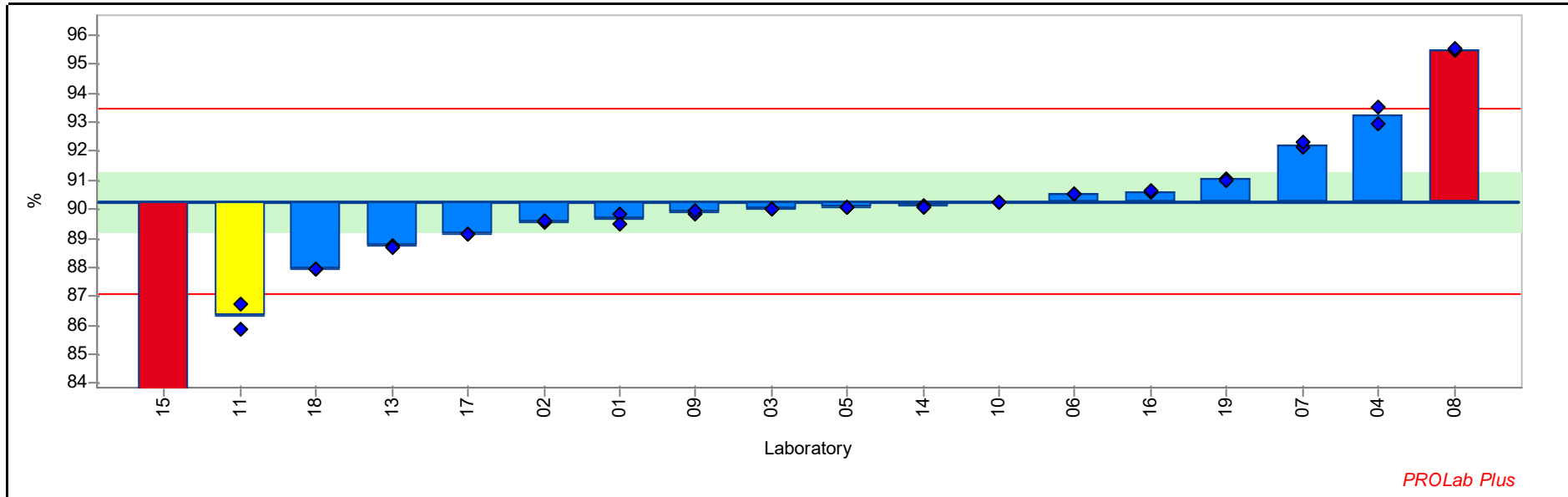
Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	0,162	0,001	0,335	0,161	0,162	ISO 17025	Other Method	ICP-OES
11	0,179	0,028	1,331	0,160	0,199	no accreditation	XRF (fusion)	
13	0,156	0,001	0,031	0,155	0,157	no accreditation	Other Method	ICP-OES
14	0,155	0,002	0,003	0,157	0,154	no accreditation	XRF (fusion)	
15	0,074	0,001	-4,506	0,075	0,073	no accreditation	XRF (fusion)	
16	0,398	0,008	13,420	0,392	0,404	no accreditation	XRF (pressed pellet)	Info only
17	0,162	0,001	0,363	0,161	0,163	no accreditation	XRF (fusion)	
18	0,266	0,001	6,089	0,265	0,266	no accreditation	XRF (pressed pellet)	Info only
19	0,189	0,004	1,829	0,186	0,191	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
10	4,066	0,005	-1,550	4,063	4,070	ISO 17025	Other Method	ICP-OES
11	4,663	0,215	0,089	4,511	4,815	no accreditation	XRF (fusion)	
13	4,324	0,051	-0,842	4,288	4,360	ISO 17025	XRF (fusion)	
14	4,710	0,039	0,217	4,682	4,737	no accreditation	XRF (fusion)	
15	1,918	0,004	-7,453	1,921	1,915	no accreditation	XRF (fusion)	
16	4,542	0,011	-0,244	4,549	4,534	no accreditation	XRF (pressed pellet)	Info only
18	4,864	0,000	0,642	4,864	4,864	no accreditation	XRF (pressed pellet)	Info only
19	4,707	0,004	0,212	4,705	4,710	ISO 17025	XRF (fusion)	

RV-2019_01 Refractories (Al2O3 and ZrO2)

Sample: FLX-140 **Reprod. s.d.:** 1,604 %
Measurand: ZrO2 **Repeat. s.d.:** 0,061 %
Mean ± U(Mean): 90,271 ± 0,991 % **Range of tolerance:** 87,062 - 93,480 % (|z-score| <= 2,000)
No. of laboratories: 16 **Statistical method:** Q/Hampel



Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
01	89,680	0,243	-0,368	89,852	89,508	ISO 17025	XRF (fusion)	
02	89,566	0,033	-0,439	89,543	89,589	ISO 17025	XRF (fusion)	
03	90,016	0,026	-0,159	90,034	89,997	ISO 17025	XRF (fusion)	
04	93,236	0,389	1,848	93,511	92,961	ISO 17025	XRF (fusion)	
05	90,082	0,016	-0,118	90,070	90,093	ISO 17025	XRF (fusion)	
06	90,549	0,005	0,173	90,545	90,552	ISO 17025	XRF (fusion)	
07	92,214	0,113	1,211	92,134	92,294	no accreditation	XRF (fusion)	
08	95,507	0,042	3,264	95,478	95,537	no accreditation	XRF (fusion)	

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Lab code	Lab mean	s.d.	z-score	Conc. 1	Conc. 2	Accreditation	Analytical method	Comment
09	89,885	0,088	-0,240	89,823	89,948	ISO 17025	XRF (fusion)	
10	90,258	0,013	-0,008	90,249	90,267	ISO 17025	Other Method	ICP-OES
11	86,309	0,634	-2,470	85,860	86,757	no accreditation	XRF (fusion)	
13	88,719	0,052	-0,968	88,755	88,682	no accreditation	Other Method	ICP-OES
14	90,123	0,040	-0,092	90,151	90,094	no accreditation	XRF (fusion)	By difference
15	81,680	0,255	-5,354	81,860	81,500	no accreditation	XRF (fusion)	
16	90,615	0,024	0,214	90,598	90,632	no accreditation	XRF (pressed pellet)	Info only
17	89,148	0,031	-0,700	89,170	89,126	no accreditation	XRF (fusion)	
18	87,918	0,007	-1,466	87,923	87,913	no accreditation	XRF (pressed pellet)	Info only
19	91,030	0,015	0,473	91,040	91,019	ISO 17025	XRF (fusion)	

Ring test RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Survey of scores

FLX-139

Lab code	Al ₂ O ₃	CaO	Cr ₂ O ₃	Fe ₂ O ₃	HfO ₂	K ₂ O	La ₂ O ₃	Loss on Ignition	MgO	Na ₂ O	SiO ₂	SrO	TiO ₂	Y ₂ O ₃	ZrO ₂
01	-0,475	0,660	0,470	-0,224	0,063	0,494	1,105	-0,716	0,040	0,012	0,300	0,393	-0,218	0,998	0,369
02	-0,226	-0,236	0,994	-0,224		-0,219	1,078	0,654	0,121	-1,708	0,208	0,551	0,501		-0,460
03	0,180	-0,891	-0,125	-1,319	-0,738	1,020	-1,095	0,194	-2,900	-2,450	2,687	-0,242	-0,338	-0,401	-0,054
04	0,752	-3,696	-3,623	-2,517	-0,509	-1,950	-2,832	0,104	1,605		-2,464	-5,260	-1,378	-3,246	-9,379
05	-0,726	0,258	0,283	-0,693	0,634	-0,273	0,323	0,910	-0,303	-0,256	-0,108	-1,290	1,101	0,708	0,263
06	-0,373	0,833	-1,104	-0,042		-2,268		-0,318	0,755	0,609	-3,045	-0,115	-0,258		0,139
07	2,175	0,350		0,713		0,264		-0,519	-0,027	-0,122	-2,801				
08	0,237	-1,811	1,076	1,052	2,235	-1,117		0,055	-2,435	-1,708	-0,271	-0,211	-2,178		-0,812
09	0,002	0,074	0,318	0,036	-0,566	0,494	0,376	0,766	-0,094	0,280	0,178	0,393	0,181	-0,112	2,502
10	0,346	-0,386	0,260	0,844	0,120	1,294	-0,048	-0,559	0,121	1,299	1,024	-0,401	-0,019	-0,835	0,069
11	-3,312	0,201	0,143	1,078	5,264	0,691	-0,817	-0,713	-0,486	2,885	-0,322	-0,687	1,381	0,684	-0,601
12	-1,070	1,201	-0,486	-0,068				1,261	2,617		1,055		0,341		
13	-0,719	-0,650	-3,774	0,505		0,340	0,190			0,290	-0,026	0,266		0,853	-0,301
14	1,024	0,109		0,088		0,483			0,256	0,197	0,555		-0,099		0,210
15	0,486	-1,581		-0,771				0,476	-2,765		-0,322		0,781		
16	-1,422	0,500	0,913	0,844	0,120	1,129	0,681	-2,463	1,086	0,413	-1,444	0,551	0,101	0,757	3,154
17	-0,724	0,477	-0,673	-0,146	-0,452	-0,810		0,402	-0,384	0,692	0,106		0,501		-2,734
18	-0,230	-0,661	0,855	0,505	-0,166	1,787	-0,287	10,800	1,726	1,536	-1,230	0,202	-0,458	0,371	-0,037
19	0,058	0,304	0,446	-0,511	-0,052	0,340	0,389	-0,973			-0,924	1,345	-0,978	-0,642	1,179
21	0,918	1,511		1,182				0,476	1,700		1,514				

Ring test RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Survey of scores

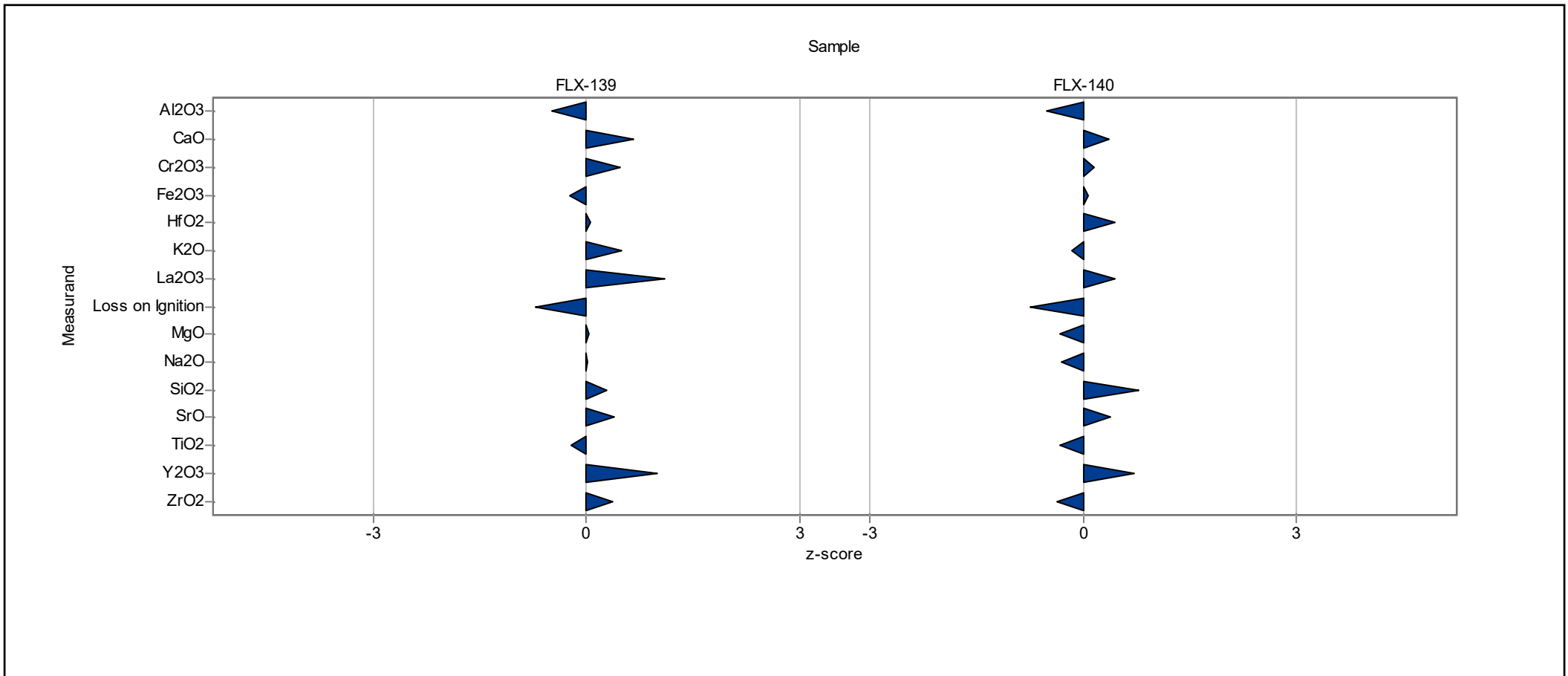
FLX-140

Lab code	Al ₂ O ₃	CaO	Cr ₂ O ₃	Fe ₂ O ₃	HfO ₂	K ₂ O	La ₂ O ₃	Loss on Ignition	MgO	Na ₂ O	SiO ₂	SrO	TiO ₂	Y ₂ O ₃	ZrO ₂
01	-0,518	0,355	0,143	0,070	0,439	-0,157	0,434	-0,751	-0,323	-0,313	0,774	0,377	-0,329	0,723	-0,368
02	0,520	0,458	-0,209	0,485	-0,115	-0,195		0,481			0,784		0,833	0,617	-0,439
03	-0,098	0,007	-0,326	-0,616	-0,039	1,051	-0,454	0,252	0,869	-0,404	0,756	-1,385	0,114	-0,060	-0,159
04	0,633	-0,688	-3,961	-5,473	-6,189	-1,710	-2,238	0,922	-1,057			-1,471	-1,740	-6,307	1,848
05	0,117	0,069	0,231	0,847	0,477	0,380	0,442	0,451	-0,332	0,519	-0,216	0,389	-0,771	0,208	-0,118
06	0,740	-1,016	0,231	-0,370	0,859	-0,521		-0,286	0,027		-1,951	2,433	-0,191	-4,907	0,173
07	-2,523	6,658	-0,502	0,834	-9,051	0,706		-0,560		-0,165	-2,131		-2,238	-0,185	1,211
08	-0,244		1,726	-0,979	-1,054	-1,001		0,114	0,385	-0,074	-1,442	-1,593			3,264
09	0,310	0,294	-2,847	-0,979	0,078	-0,387	1,761	1,414	-0,457	-1,227	0,765	0,438	-0,218	0,522	-0,240
10	-0,830	7,067	0,055	-0,215	-0,183	1,301	0,117	-0,654	-0,265	-0,017	0,284	0,328	0,335	-1,550	-0,008
11	-0,733	0,212	-0,326	0,601	-0,176	1,013	-0,164	-0,649	0,343	17,988	-0,046	8,258	1,331	0,089	-2,470
13	0,020	0,498	0,465	0,394	-0,400	0,687	0,592			0,115	1,453	0,842	0,031	-0,842	-0,968
14	-0,878	0,314	0,377	0,135	0,505	0,303			-0,690	0,066	0,378	0,989	0,003	0,217	-0,092
15		-1,650	-4,430	-4,462	-7,534	-0,464	-3,002	1,315	34,911	203,749		-1,092	-4,506	-7,453	-5,354
16	-6,669	0,314	-0,385	0,485	-0,094	0,476	1,189	-1,633	-1,107	-1,631	-3,234	0,573	13,420	-0,244	0,214
17	1,031	1,378	-1,030	-0,474	0,257	-1,308		0,275	2,169	2,743	1,010		0,363		-0,700
18	11,317	1,419	1,696	0,679	-0,999	3,851	0,645	-0,185	4,078	3,846	-0,244	0,769	6,089	0,642	-1,466
19	1,429	-0,381	1,521	0,303	-0,648	0,092	0,530	-0,640			-1,706	0,585	1,829	0,212	0,473

RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

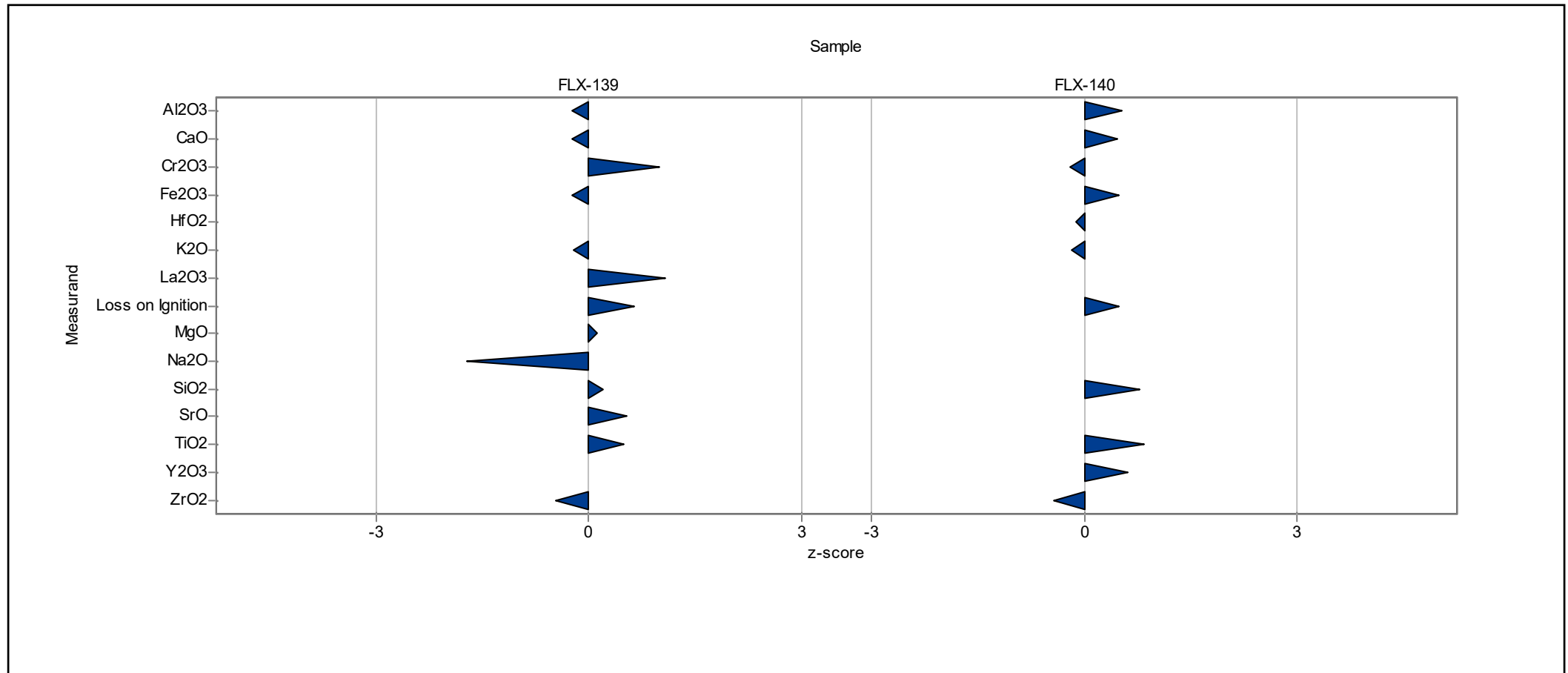
Laboratory: 01



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

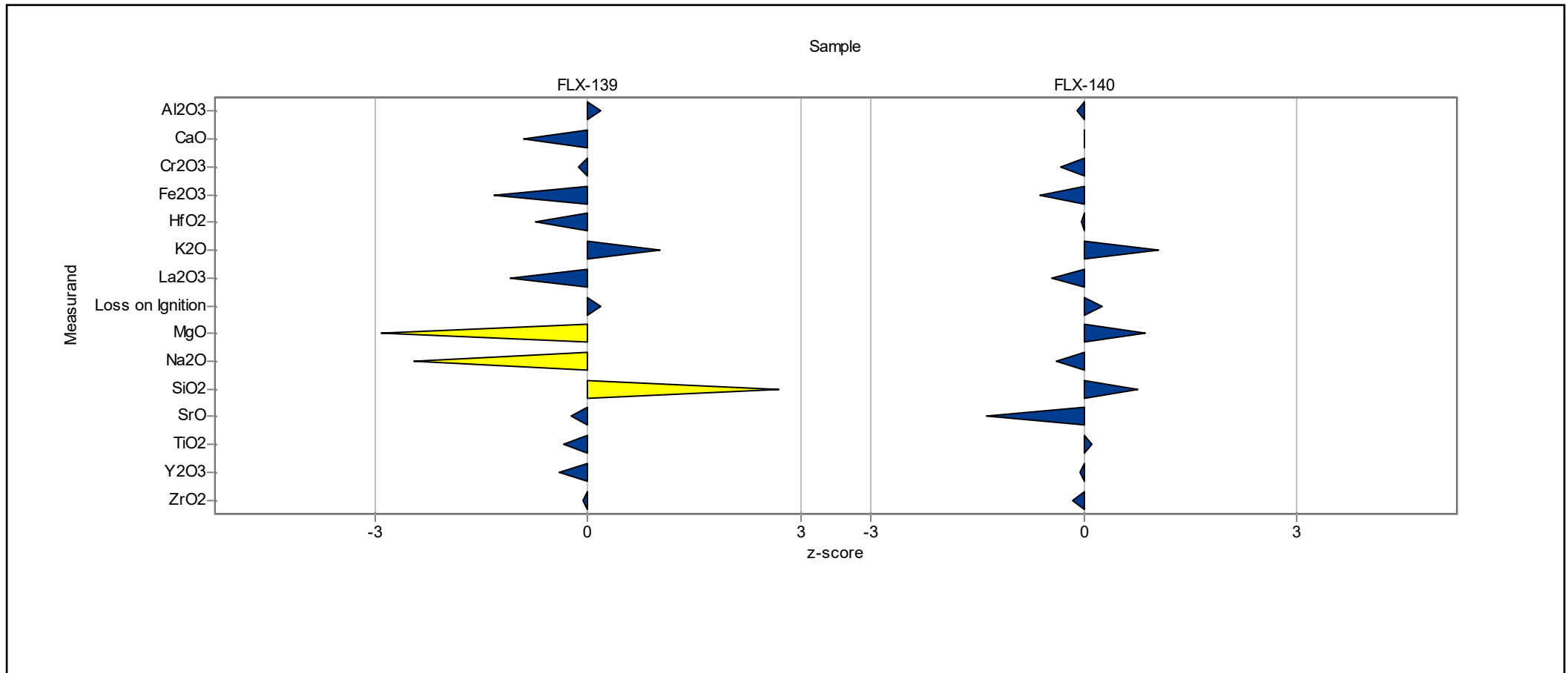
Laboratory: 02



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

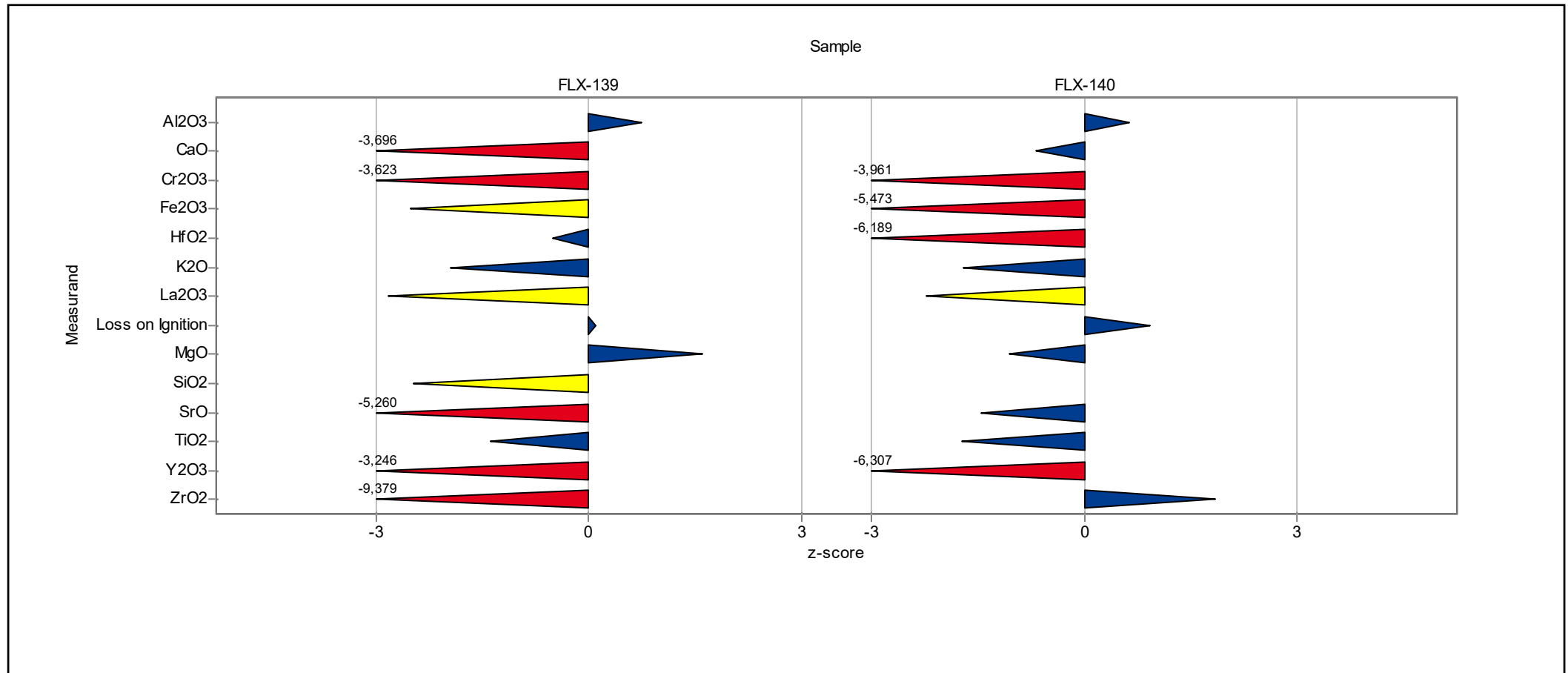
Laboratory: 03



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

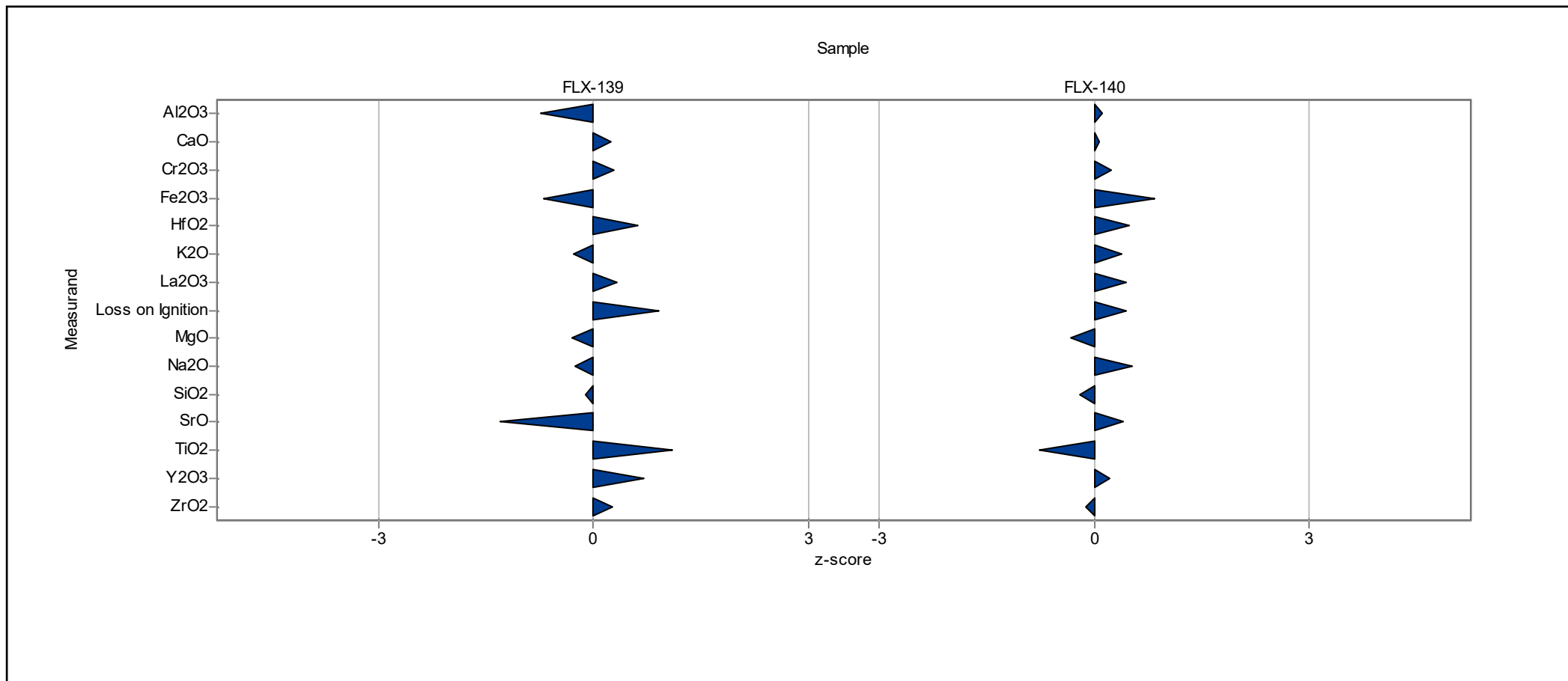
Laboratory: 04



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

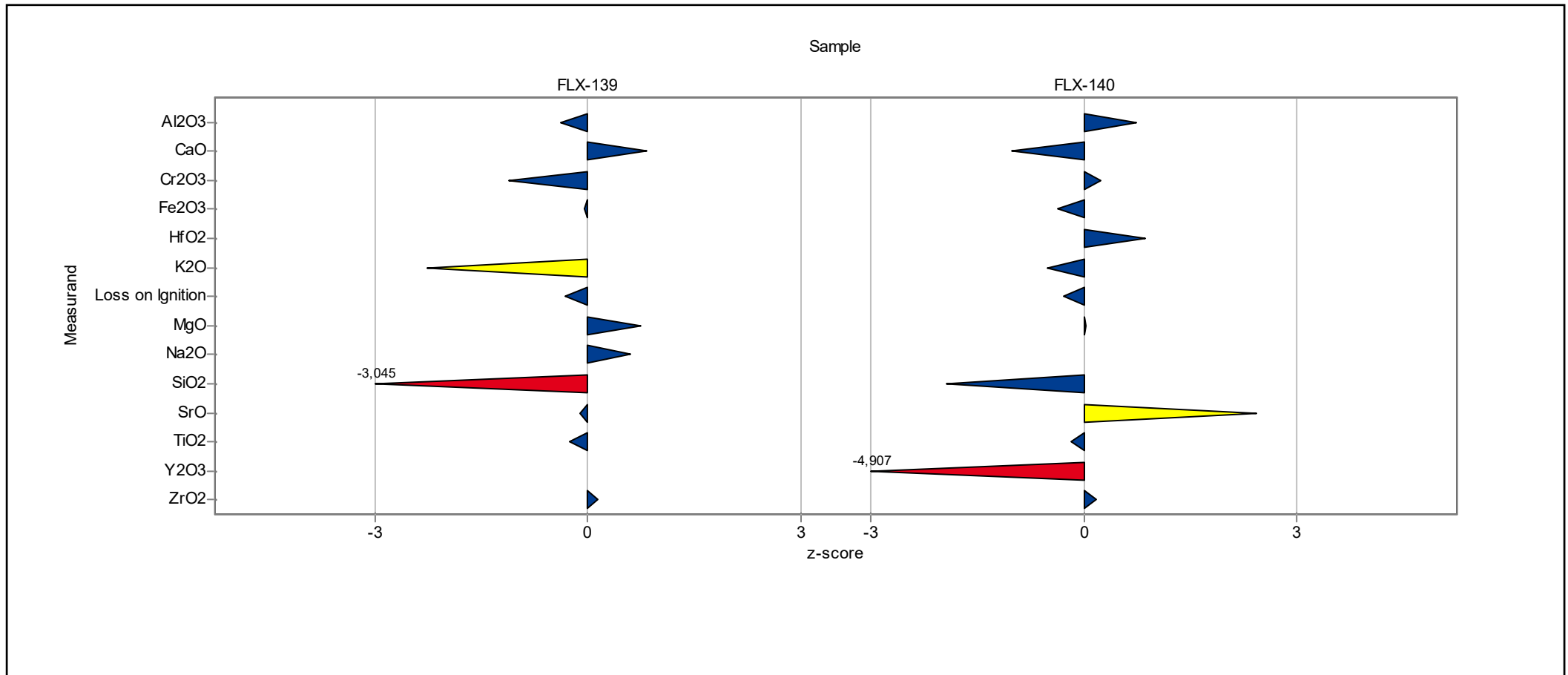
Laboratory: 05



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

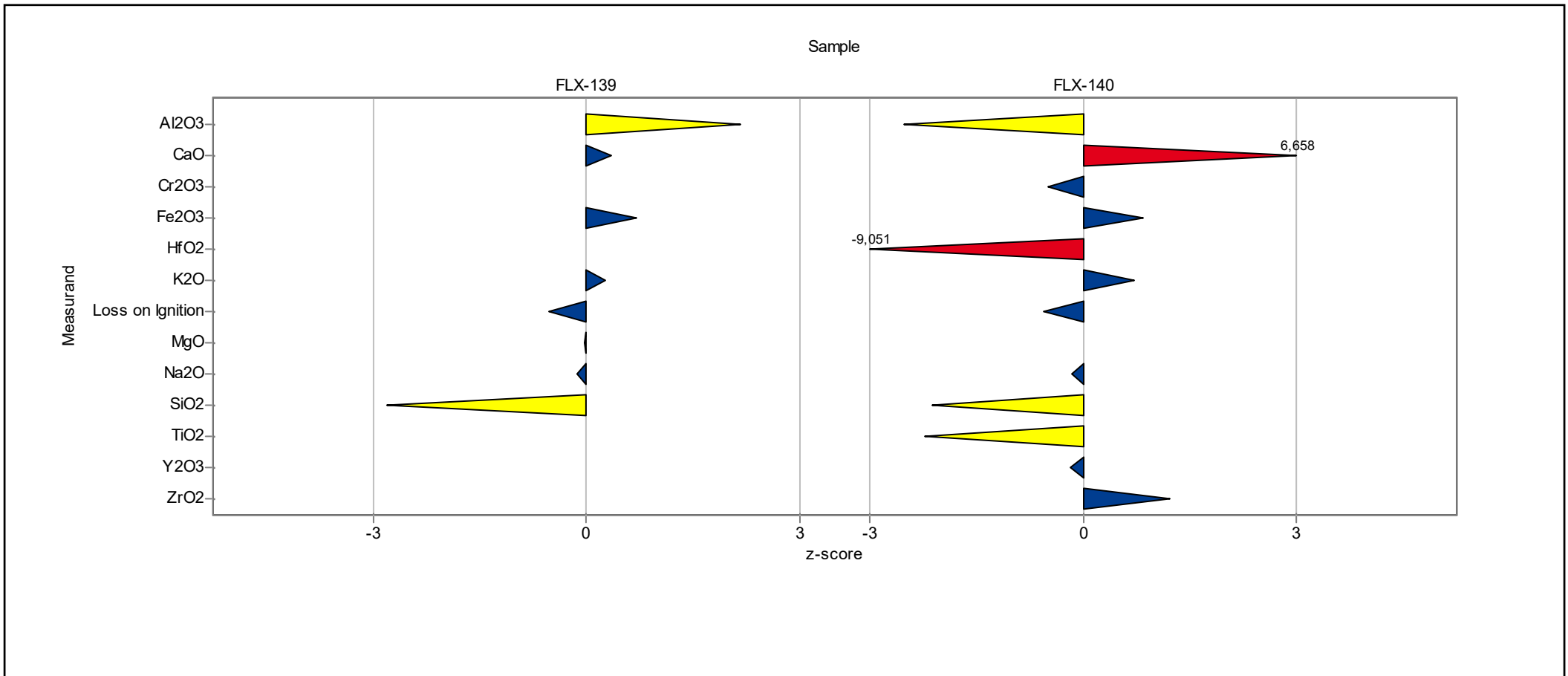
Laboratory: 06



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

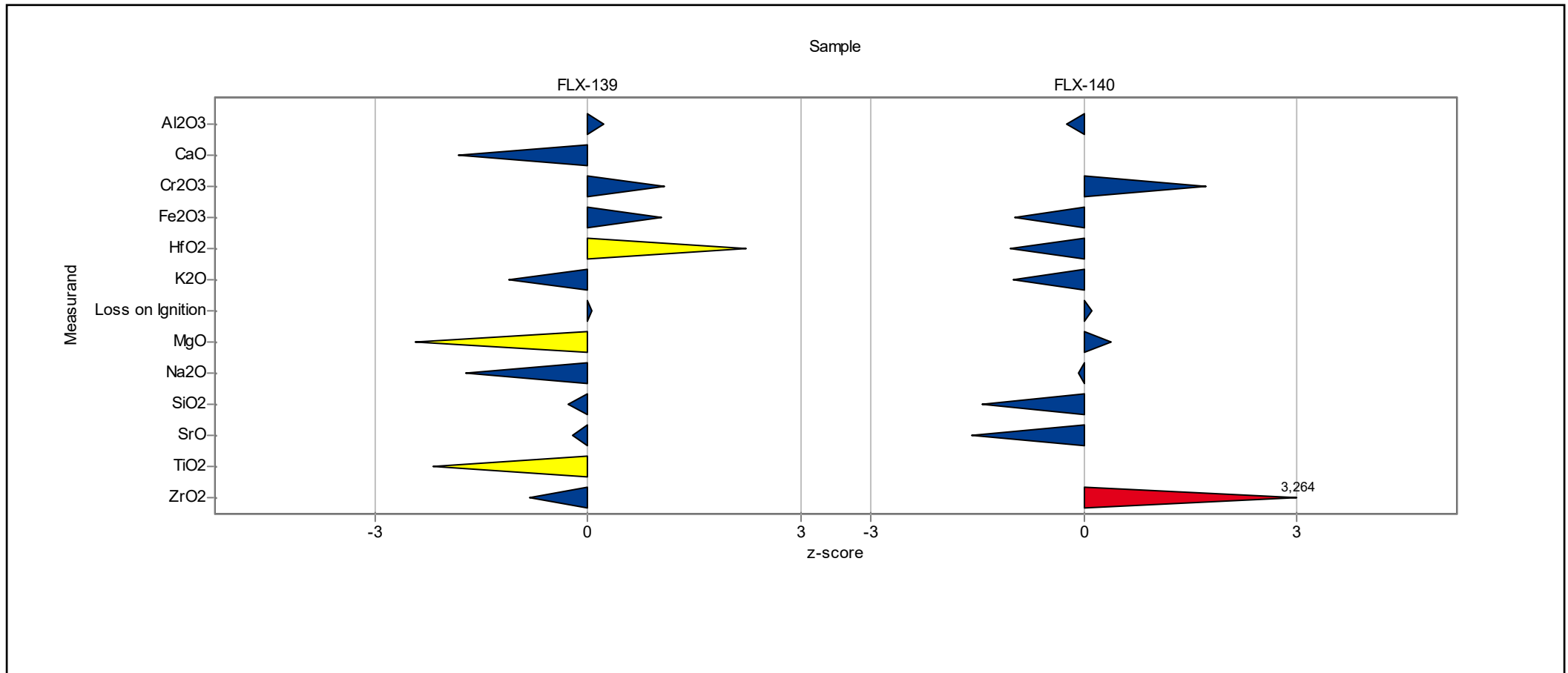
Laboratory: 07



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

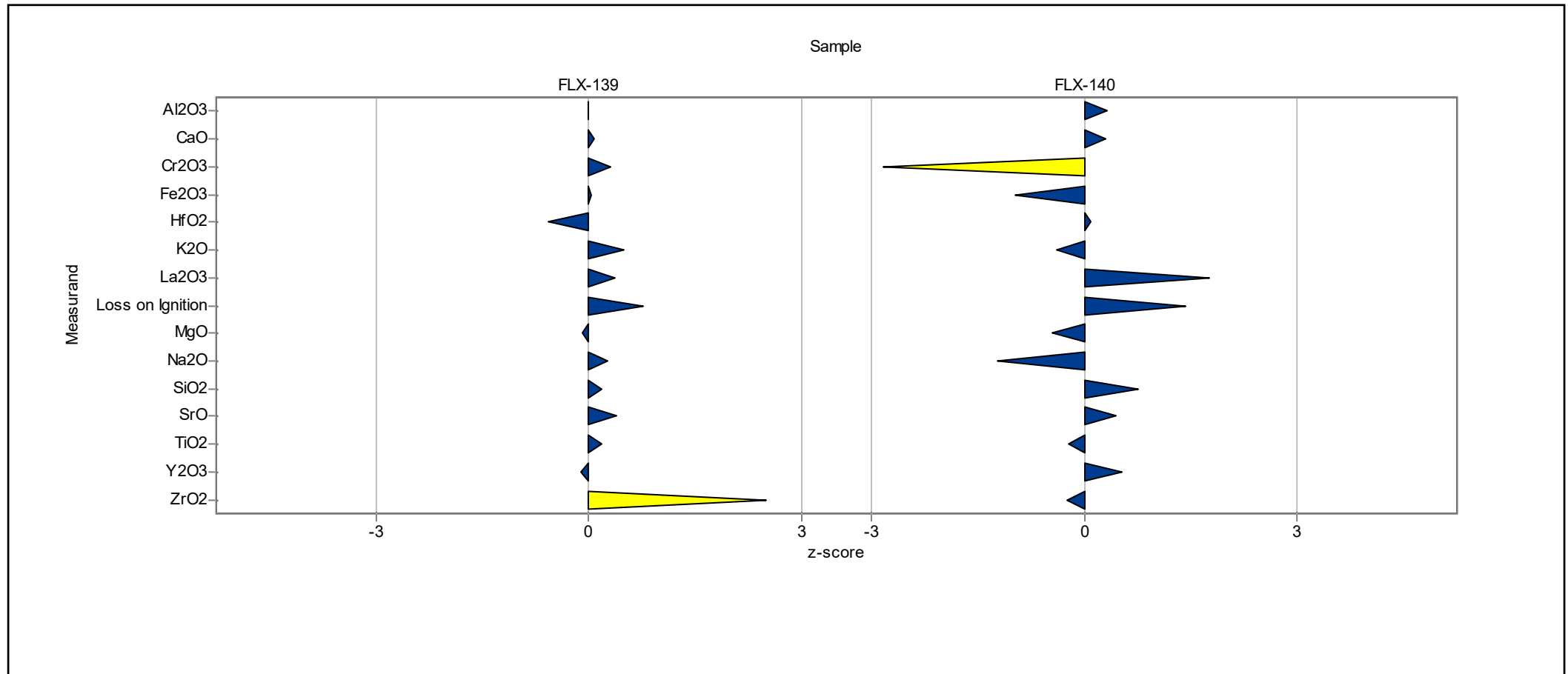
Laboratory: 08



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

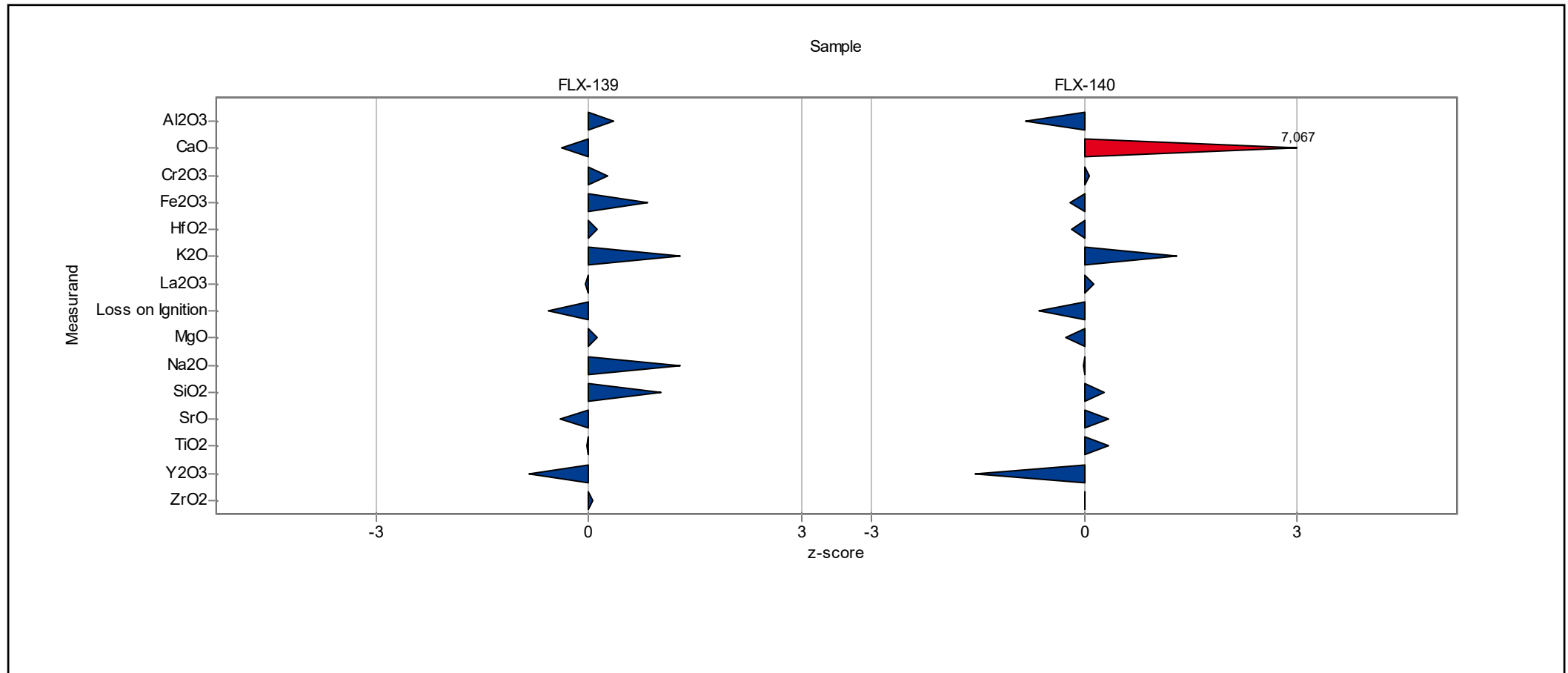
Laboratory: 09



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

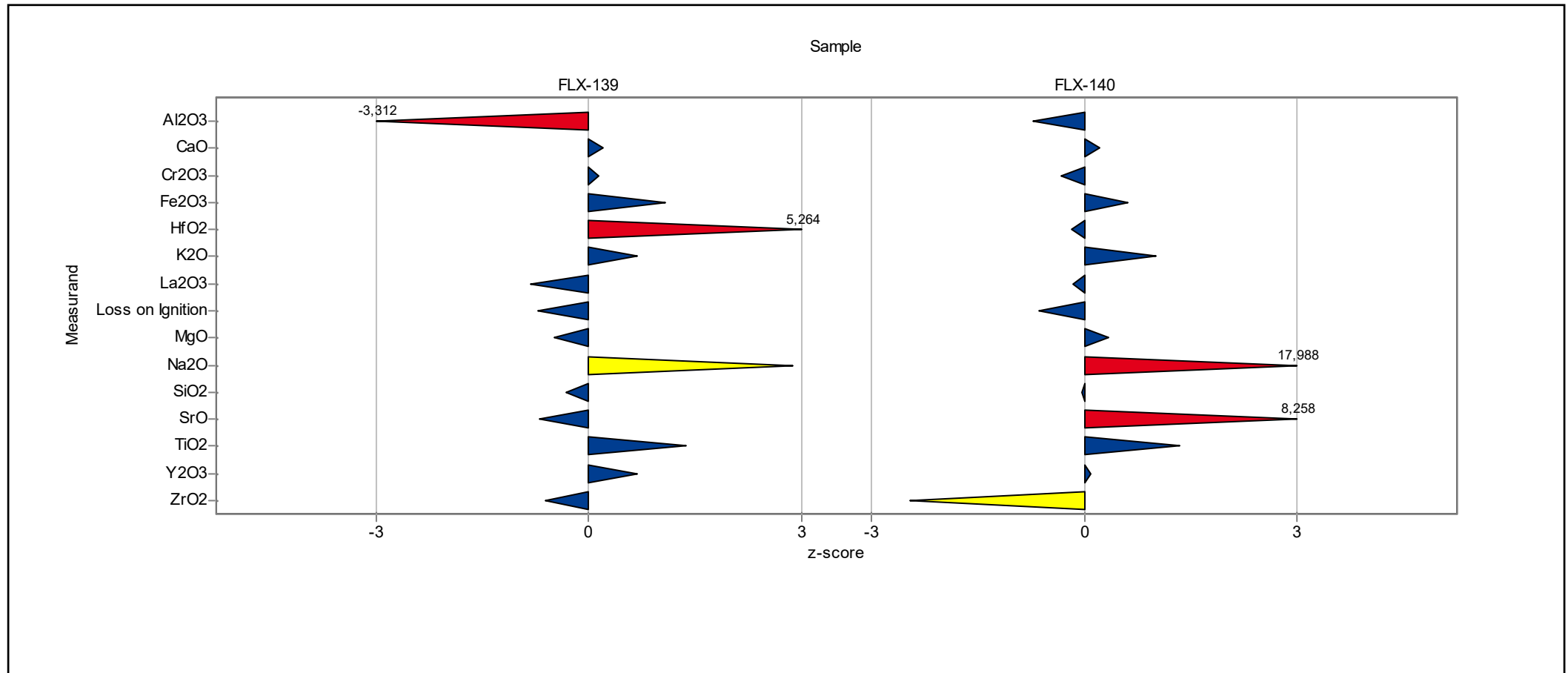
Laboratory: 10



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

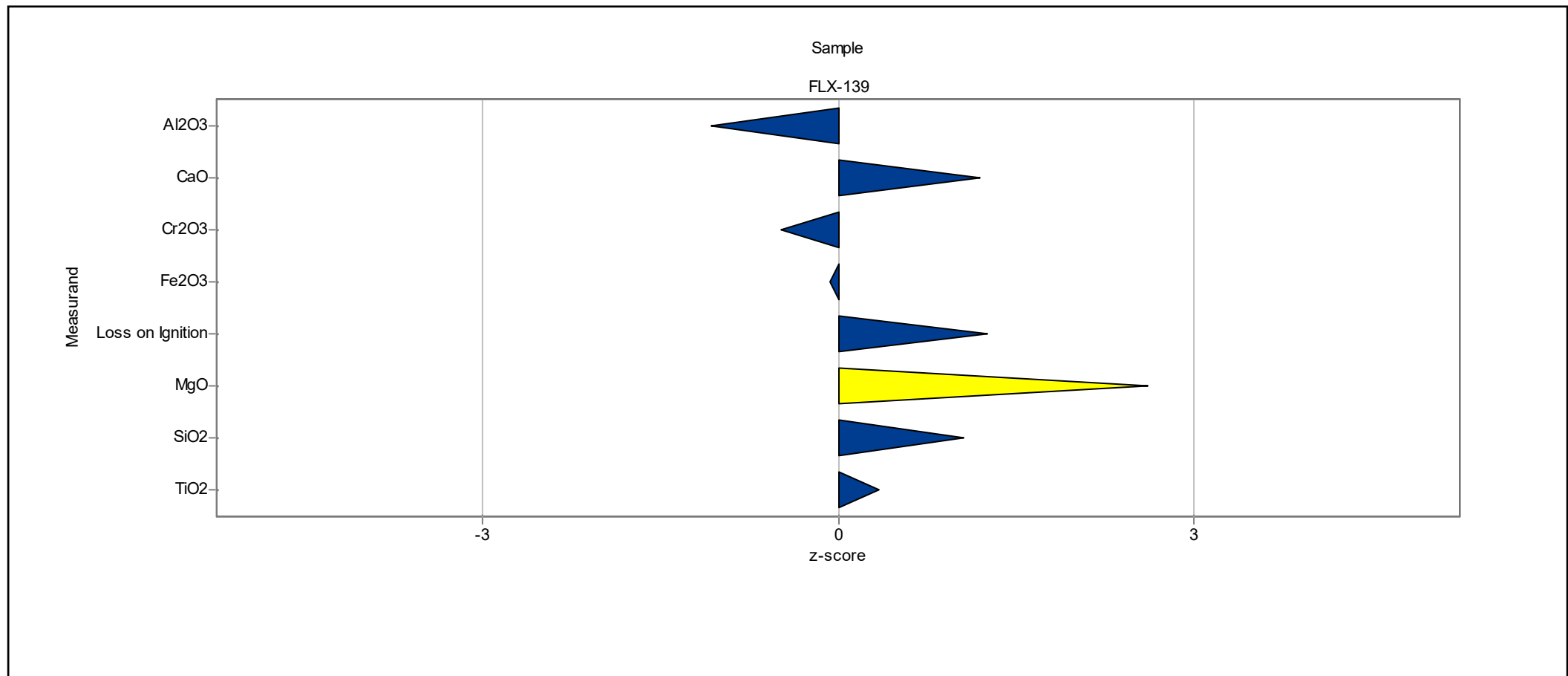
Laboratory: 11



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

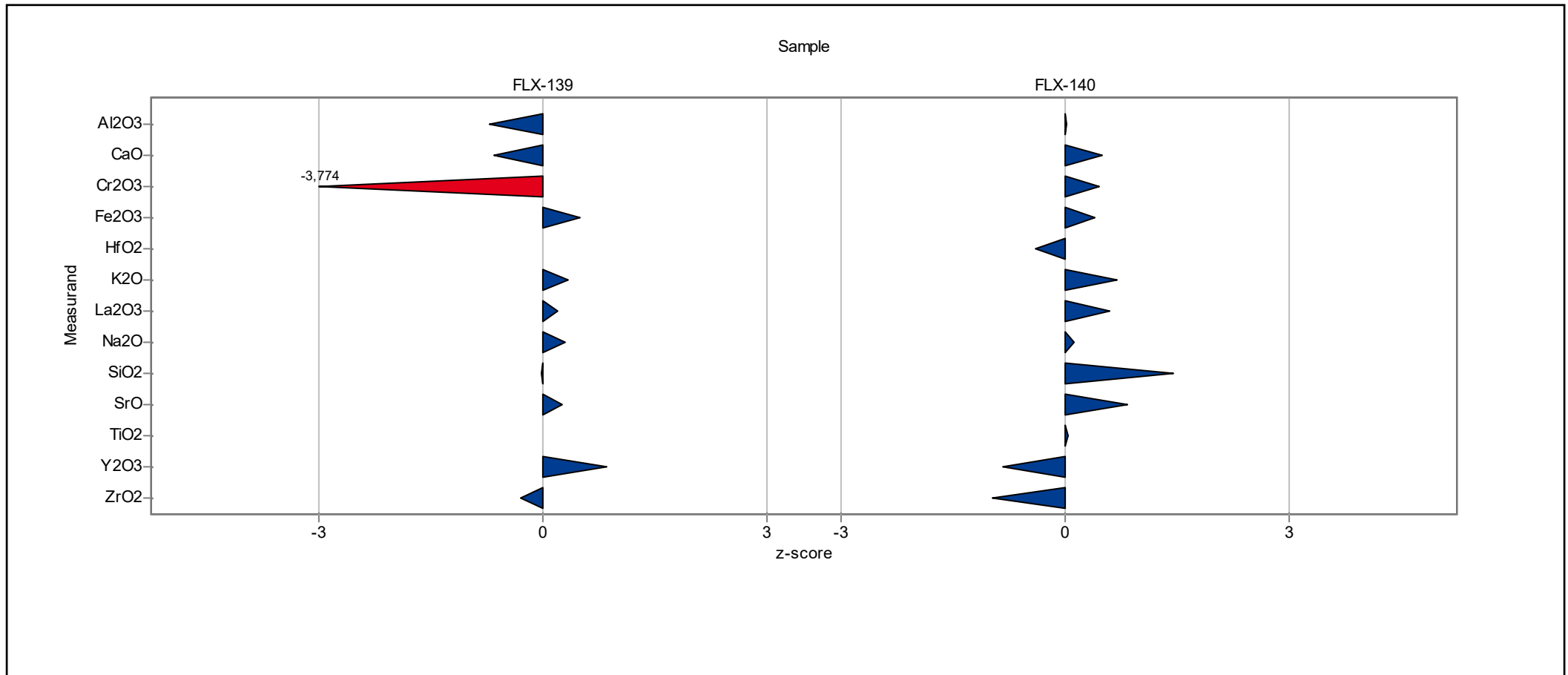
Laboratory: 12



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

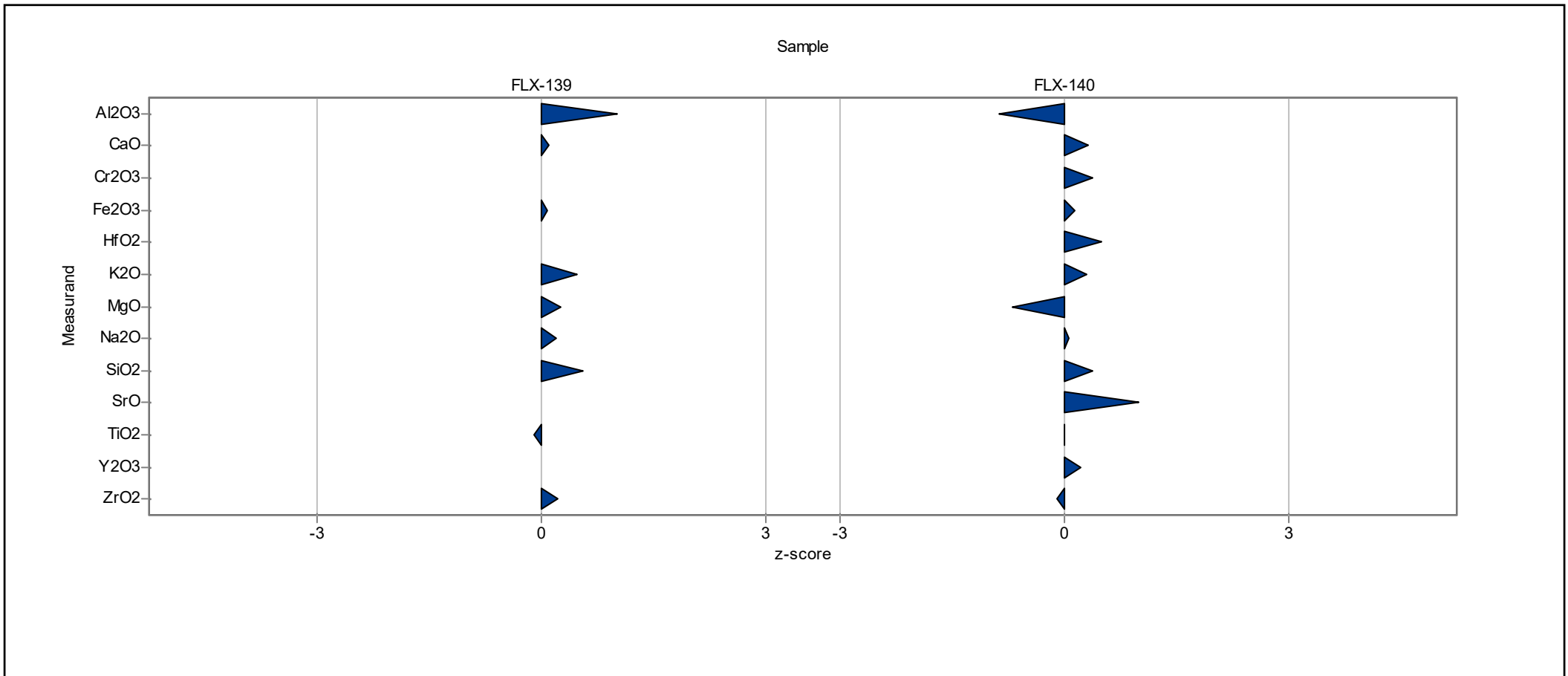
Laboratory: 13



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

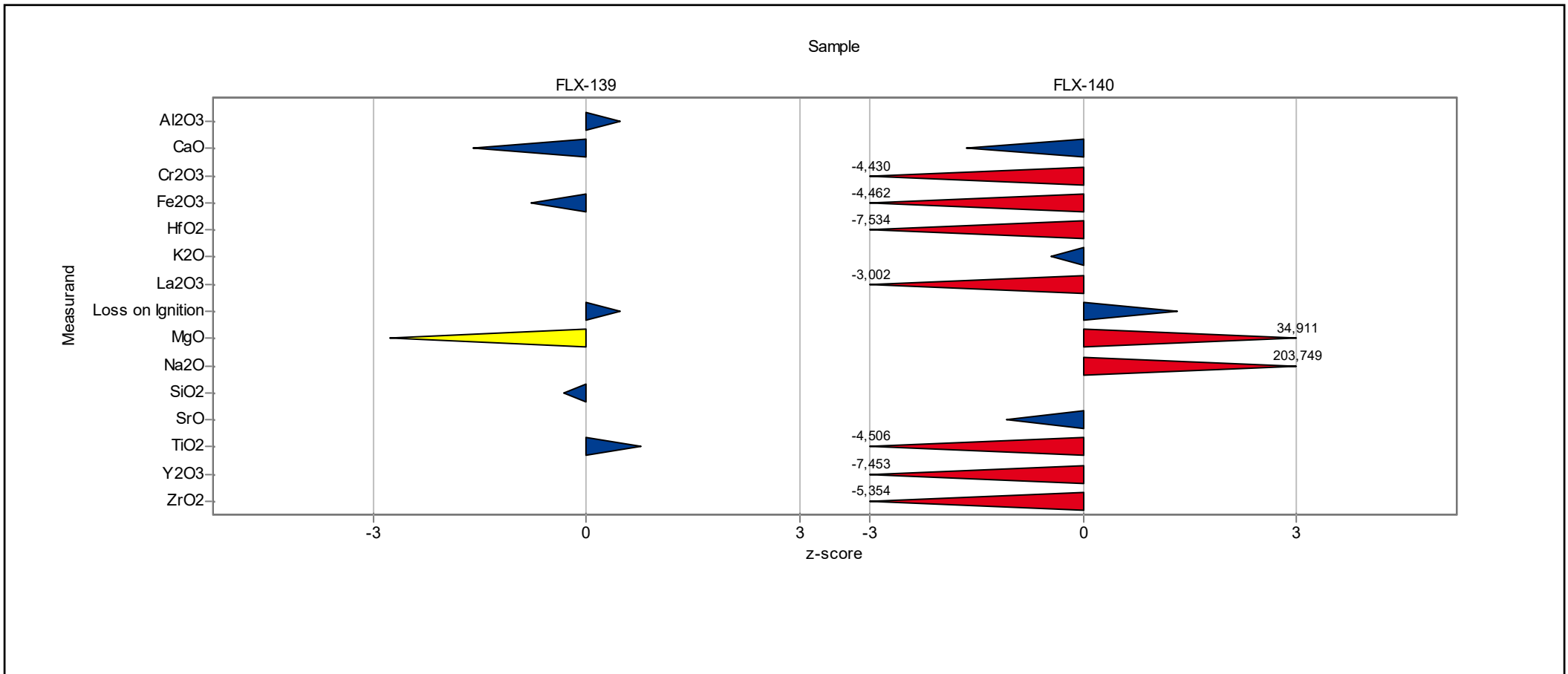
Laboratory: 14



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

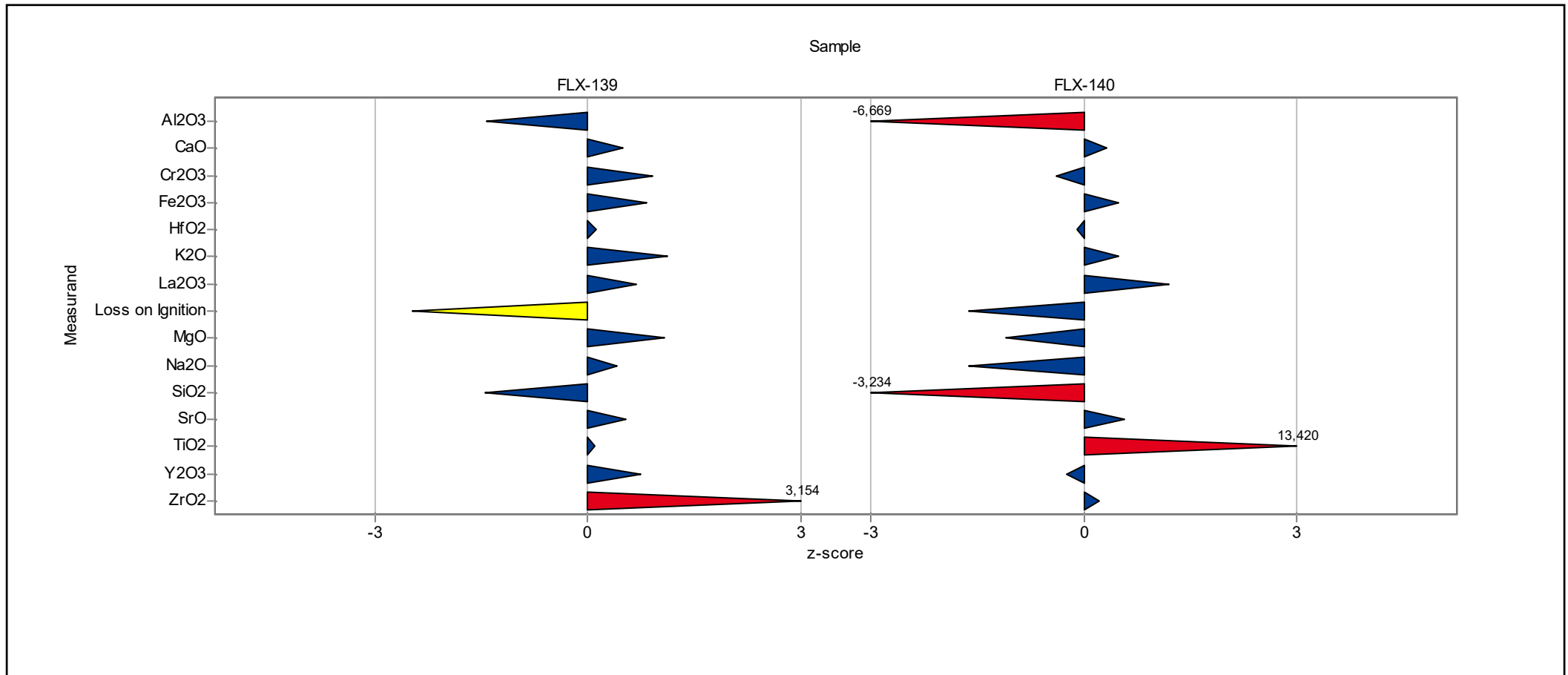
Laboratory: 15



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

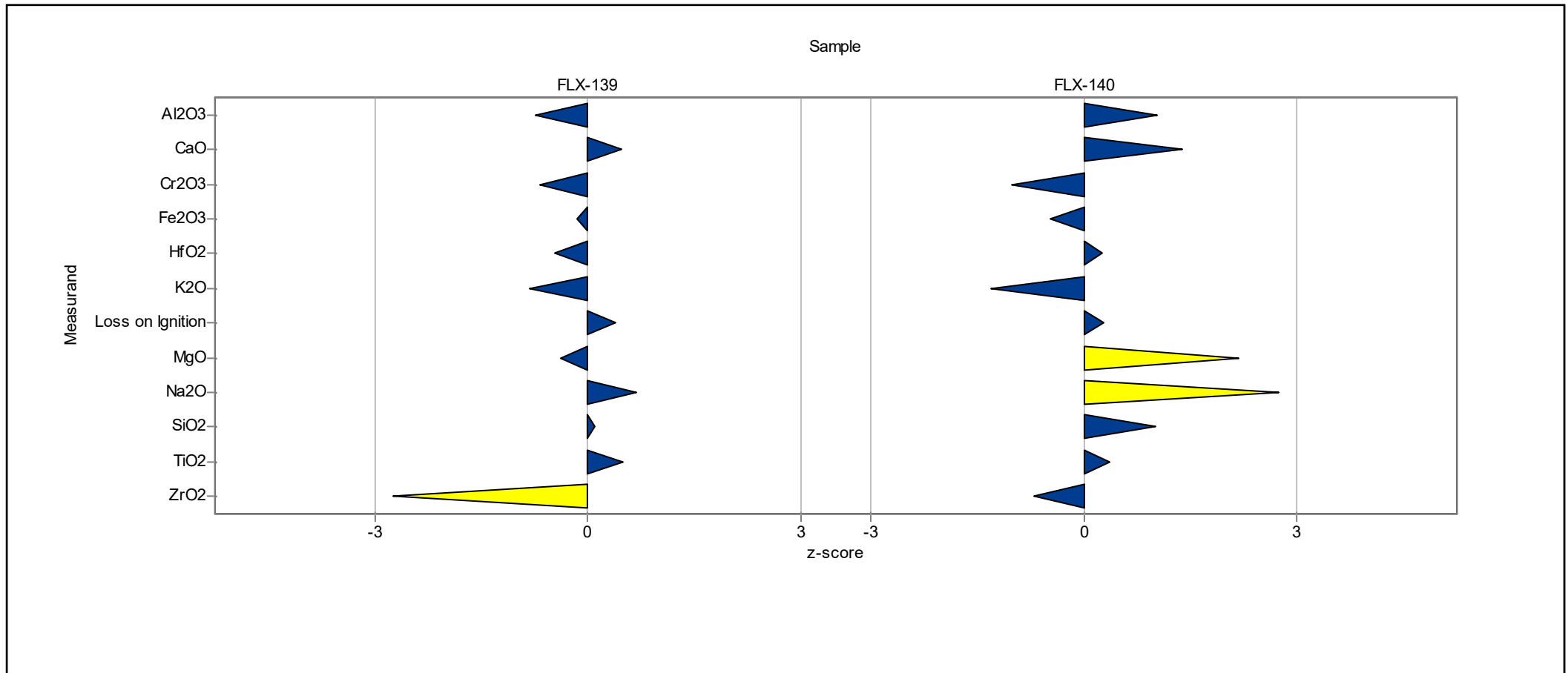
Laboratory: 16



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

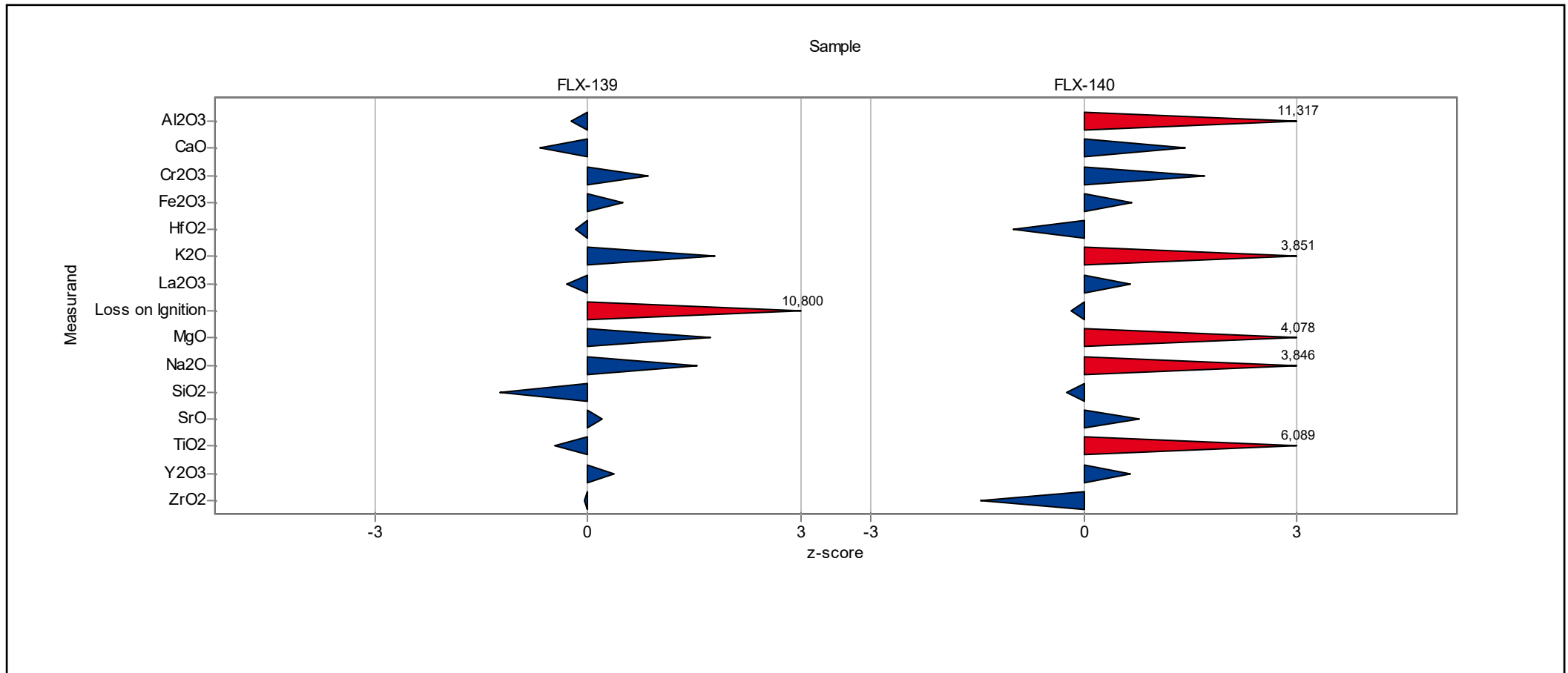
Laboratory: 17



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

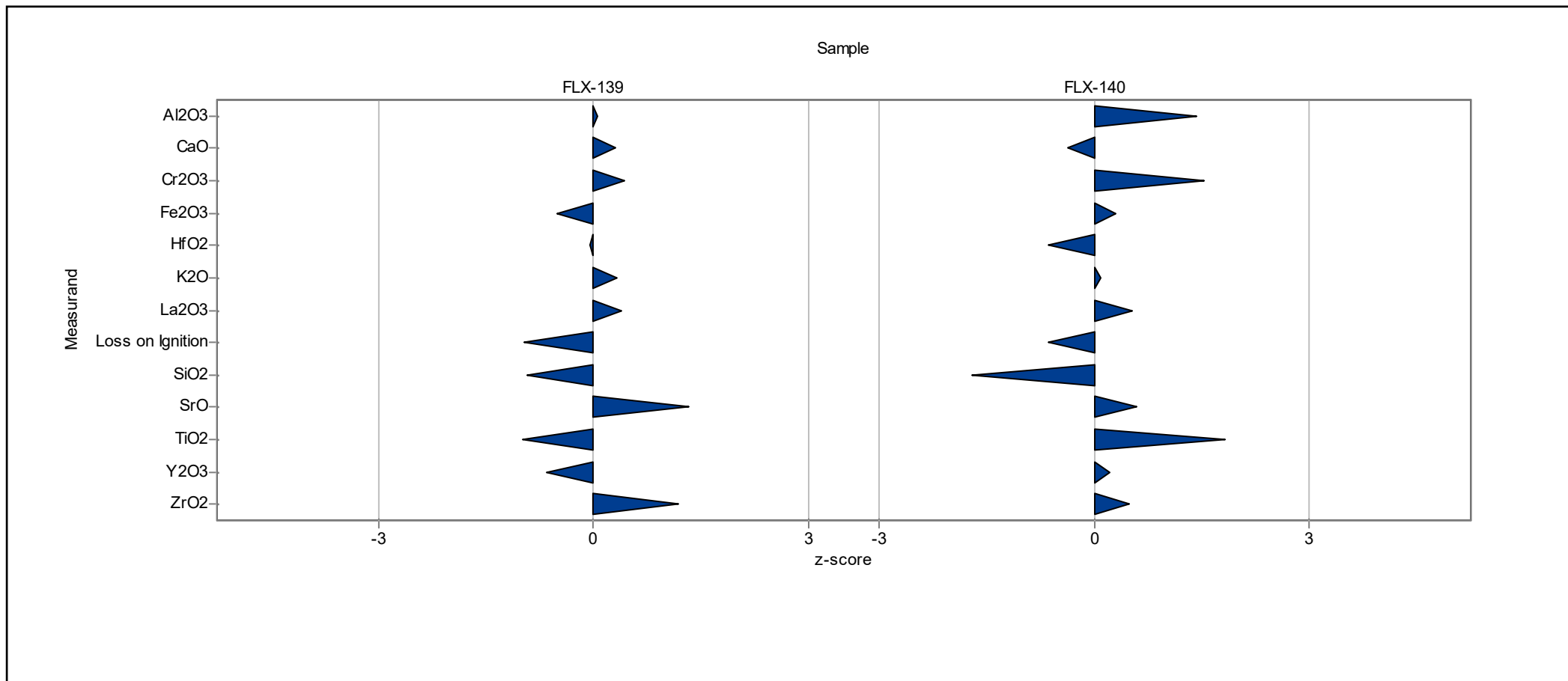
Laboratory: 18



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

Laboratory: 19



RV-2019_01 Refractories (Al₂O₃ and ZrO₂)

Laboratory chart of z-scores

Laboratory: 21

