RV-2022-01

Final Proficiency Test Report for LD-slag

FLX-141

FLX-SAMPLE
1h 950 °C, LOT: 8163544
FLX-SAMPLE
1h 950 °C, LOT: 9846165
FLUXANA

Bedburg-Hau, June 01st, 2022

Coordinator of PT
Charlotte Winkels-Herding

Statistics and Report
Susan Aschenbrenner

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	Al2O3	CaO	Cr2O3	Fe2O3	K2O	Loss on ignition	MgO
Unit	%	%	%	%	%	%	%
No. of laboratories	31	31	29	32	25	30	33
Mean m	9,196	34,799	0,236	32,972	0,023	1,492	8,242
Reproducibility standard deviation s_R	0,209	0,402	0,016	0,712	0,007	0,168	0,273
Repeatability standard deviation s_r	0,022	0,073	0,002	0,090	0,002	0,014	0,025
Robust standard deviation s*	0,204	0,406	0,016	0,693	0,008	0,167	0,271
Uncertainty U (s*)	0,092	0,182	0,007	0,306	0,004	0,076	0,118
Uncertainty U (s_R)	0,094	0,181	0,007	0,315	0,004	0,077	0,119
Mean - 2*s_R	8,777	33,994	0,204	31,548	0,008	1,156	7,696
Mean + 2*s_R	9,615	35,604	0,267	34,396	0,038	1,829	8,788

	Mn2O3	P2O5	S	SiO2	TiO2	V2O5
Unit	%	%	%	%	%	%
No. of laboratories	32	30	25	30	32	21
Mean m	2,575	0,917	0,145	8,606	0,740	0,146
Reproducibility standard deviation s_R	0,146	0,024	0,013	0,135	0,031	0,014
Repeatability standard deviation s_r	0,010	0,004	0,002	0,032	0,004	0,001
Robust standard deviation s*	0,147	0,022	0,011	0,128	0,030	0,014
Uncertainty U (s*)	0,065	0,010	0,005	0,058	0,013	0,007
Uncertainty U (s_R)	0,065	0,011	0,007	0,062	0,014	0,008
Mean - 2*s_R	2,282	0,869	0,119	8,336	0,679	0,117
Mean + 2*s_R	2,868	0,964	0,171	8,876	0,802	0,174

All values are in mass % and are based on dried sample material.

Mean	**calculated from laboratory means using traceable methods only**
s_R	**Reproducibility standard deviation**
s_r	**Repeatability standard deviation**
s*	**Robust standard deviation**
U (s*)	**uncertainty calculated for a confidence interval of P= 95% (k=2)**
U (s_R)	**uncertainty calculated for a confidence interval of P= 95% (k=2)**
Range of tolerance	**Mean ± 2 x s_R ; all labs within this range show satisfactory performance**

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Introduction

FLUXANA GmbH & Co. KG is a company providing services in the field of X-ray fluorescence analysis (XRF).

In 2011, FLUXANA introduced its own quality management.

In 2020 the accreditation of the FLUXANA Laboratory in Bedburg-Hau, Germany, was updated to DIN EN ISO/IEC 17025:2018 and FLUXANA received accreditation as Producer of Reference materials according to DIN EN ISO 17034:2017, as well.

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

Outliers

Outliers in the statistical sense are typically not detected when using robust statistical methods because the robust A+S algorithms were found to work better than the classical approach (which is outlier detection plus arithmetic mean and classical s.d. formula). Obvious blunders are taken out before calculation and will be marked as 'information only'.

Further Information

All laboratory data is listed in the following evaluation report. Additional information about laboratory accreditation and analytical methods used is also provided. Calculation was done only on traceable methods.
Other methods, e.g., XRF using "pressed pellets" as the sample preparation method or XRF with the "standardless analysis" method, which are not traceable can also be used. These values will not be included in the evaluation. They will, however, be shown as 'information only' in the report and laboratory comparison.
The laboratory performance is shown based on z-scores. The diagrams show the laboratory data in comparison with the calculated mean values.

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Participants	**Country**
Bernegger GmbH	Austria
RHI Magnesita	Austria
Ministere des Transports du Quebec	Canada
Rio Tinto	Canada
VSB - Technical University of Ostrava	Czech Republic
Befesa Valera	France
AG der Dillinger Hüttenwerke	Germany
BASF Construction Additives	Germany
BASF SE	Germany
Dyckerhoff GmbH	Germany
Erlus AG	Germany
ESF Elbe-Stahlwerke Feralpi GmbH	Germany
FLUXANA GmbH & Co.KG	Germany
Fraunhofer IVV	Germany
Georgsmarienhütte GmbH	Germany
HeidelbergCement AG	Germany
IME Metallurgische Prozesstechnik und Metallrecycling	Germany
K-UTEC AG Salt Technologies	Germany
Landesamt für Geologie und Bergbau	Germany
Saarstahl AG	Germany
Salzgitter Flachstahl GmbH	Germany
Thyssen Krupp Steel Europe AG	Germany
TU Bergakademie Freiberg, Institut für Eisen- und Stahltechnologie	Germany
Dunaferr Labor Nonprofit Ltd.	Hungary
TiZir Titanium & Iron	Norwegen
Institute of Ceramic and Buildings Material	Poland
Ecodeal	Portugal
UIS-AS	South Africa
Atzerlan	Spain
LafargeHolcim España	Spain
LKAB	Sweden
Sandvik Materials Technology	Sweden
Holcim (Schweiz) AG	Switzerland
Jura-Cement-Fabriken	Switzerland
Çolakoglu Metalurji A.S.	Turkey
Isdemir (Iskenderun Iron & Steel Co.)	Turkey
X-ray Mineral Services Ltd	United Kingdom
American Cast Iron Pipe Company	United States

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Statistical Evaluation used for this PT

Calculation of Mean m

The mean m for all laboratories is calculated using the Hampel estimator (ISO/TS 20612:2007 9.2.3) based on the laboratory means µ using traceable methods only.

Calculation of reproducibility standard deviation s_R

The reproducibility standard deviation s_R is calculated using the Q-method (ISO/TS 20612:2007 9.2.3).

Calculation of repeatability standard deviation s_r

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

Calculation of robust standard deviation s*

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

Calculation of uncertainty $\boldsymbol{U_{s_R}}$ (according to Nordtest TR 537 ed 3.1.)

The **uncertainty** $\boldsymbol{U_{s_R}}$ 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:

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

Calculation of uncertainty $\boldsymbol{U_{s^*}}$ (according to ISO 13528:2020)

The **uncertainty** $\boldsymbol{U_{s^*}}$ 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:

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

The **uncertainty** $\boldsymbol{U_{s^*}}$ only takes the between laboratories uncertainty into account while the **uncertainty** $\boldsymbol{U_{s_R}}$ also includes the within laboratories uncertainty. Therefore $\boldsymbol{U_{s_R}}$ is recommended for use in accredited laboratories.

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Laboratory performance

Laboratory proficiency assessment is based on z-scores.
The **z-score** z is calculated from all laboratory means µ:

$$z = \frac{m - \mu}{s_R}$$

m	Mean value for all laboratories (assigned value)
µ	Mean value of individual laboratory
s_R	Reproducibility standard deviation

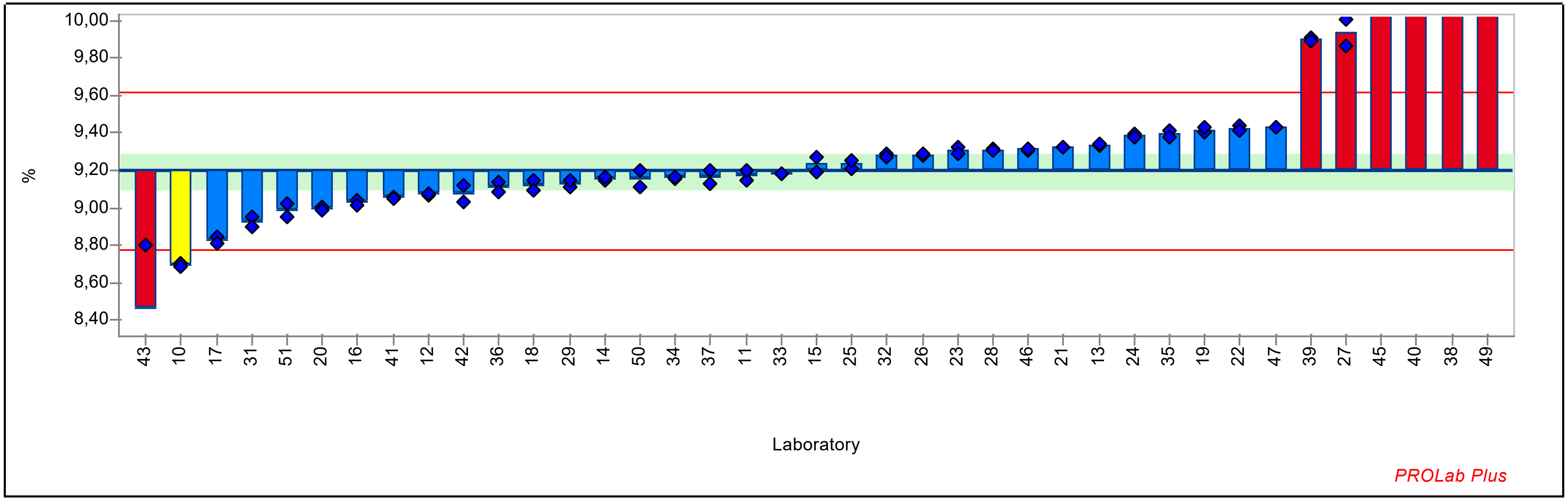
Assessment on z-scores:

$\lvert z \rvert <= 2.0$	indicates “satisfactory” performance = generates no signal
$2.0 < \lvert z \rvert < 3.0$	indicates “questionable” performance = generates a warning signal
$\lvert z \rvert >= 3.0$	indicates “unsatisfactory” performance = generates an action signal

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

Summary results

Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,209 %**
Measurand:	**Al2O3**	**Repeatability s.d.:**	**0,022 %**
Mean ± U(Mean):	**9,196 ± 0,092 %**	**Range of tolerance:**	**8,777 - 9,615 % (|z-score| <= 2,000)**
No. of laboratories:	**31**	**Statistical method:**	**Q/Hampel**



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	8,694	0,012	-2,400	Other Method	no accredition	8,702	8,685	ICP-OES
11	9,175	0,035	-0,100	XRF (fusion)	ISO 17025	9,150	9,200	
12	9,073	0,006	-0,585	XRF (fusion)	no accredition	9,069	9,078	DIN EN 196-2
13	9,337	0,007	0,674	XRF (fusion)	ISO 17025	9,332	9,342	DIN 51001-2003-08

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Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
14	9,159	0,013	-0,179	XRF (fusion)	ISO 17025	9,149	9,168	
15	9,232	0,052	0,170	XRF (fusion)	ISO 17025	9,195	9,268	PN-EN ISO 12677: 2011
16	9,028	0,018	-0,802	XRF (fusion)	ISO 17025	9,041	9,015	DIN 51418-2-2015-03
17	8,831	0,026	-1,746	Other Method	ISO 17025	8,849	8,812	ICP-OES - DIN EN 10351
18	9,121	0,034	-0,358	XRF (fusion)	no accredition	9,145	9,097	DIN 51001-2003-08
19	9,415	0,016	1,049	XRF (fusion)	no accredition	9,404	9,427	DIN 51001 Bbl 1 2010-05
20	8,994	0,013	-0,967	XRF (fusion)	no accredition	9,003	8,984	EN 196-2
21	9,322	0,001	0,600	XRF (fusion)	no accredition	9,321	9,322	DIN 51001-2003-08
22	9,425	0,016	1,095	XRF (fusion)	no accredition	9,436	9,414	
23	9,305	0,023	0,521	XRF (fusion)	no accredition	9,321	9,289	
24	9,387	0,013	0,911	XRF (fusion)	no accredition	9,396	9,377	
25	9,232	0,026	0,170	XRF (fusion)	no accredition	9,213	9,250	DIN 51001-2003-08
26	9,282	0,007	0,411	XRF (fusion)	no accredition	9,277	9,287	DIN 51418-2-2015-03
27	9,939	0,100	3,550	XRF (fusion)	no accredition	10,010	9,868	DIN 51418-2-2015-03; Information only
28	9,308	0,006	0,533	XRF (fusion)	no accredition	9,312	9,303	
29	9,130	0,028	-0,315	XRF (fusion)	no accredition	9,110	9,150	
31	8,927	0,035	-1,287	XRF (fusion)	no accredition	8,951	8,902	
32	9,277	0,014	0,388	XRF (fusion)	ISO 17025	9,287	9,267	DMI 31-305 (ASTM E1361, ASTM E1621)
33	9,184	0,002	-0,054	XRF (fusion)	no accredition	9,183	9,186	NF EN ISO 12677
34	9,162	0,003	-0,162	XRF (fusion)	no accredition	9,160	9,164	
35	9,396	0,023	0,956	XRF (fusion)	no accredition	9,412	9,380	
36	9,113	0,035	-0,396	XRF (fusion)	no accredition	9,138	9,088	DIN 51001-2003-08
37	9,166	0,049	-0,143	XRF (fusion)	no accredition	9,131	9,201	DIN EN ISO 12677
38	11,445	0,290	10,745	XRF (pressed pellet)	no accredition	11,240	11,650	information only
39	9,900	0,014	3,364	XRF (fusion)	no accredition	9,910	9,890	
40	10,915	0,004	8,211	XRF (pressed pellet)	no accredition	10,917	10,912	information only
41	9,055	0,007	-0,673	XRF (fusion)	ISO 17025	9,060	9,050	DIN 51418-2-2015-03
42	9,076	0,059	-0,573	XRF (fusion)	no accredition	9,118	9,034	
43	8,465	0,472	-3,494	XRF (pressed pellet)	no accredition	8,798	8,131	standardless analysis; information only
45	10,840	0,014	7,855	XRF (pressed pellet)	ISO 17025	10,850	10,830	CR 10299:1998; information only
46	9,312	0,006	0,552	XRF (fusion)	ISO 17025	9,307	9,316	DIN EN 196-2
47	9,430	0,000	1,118	XRF (fusion)	no accredition	9,430	9,430	
49	17,640	0,608	40,342	XRF (pressed pellet)	no accredition	18,070	17,210	information only

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Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
50	9,159	0,060	-0,179	XRF (pressed pellet)	no accredition	9,201	9,116	information only
51	8,985	0,049	-1,008	XRF (fusion)	no accredition	9,020	8,950	DIN 51418-2-2015-03

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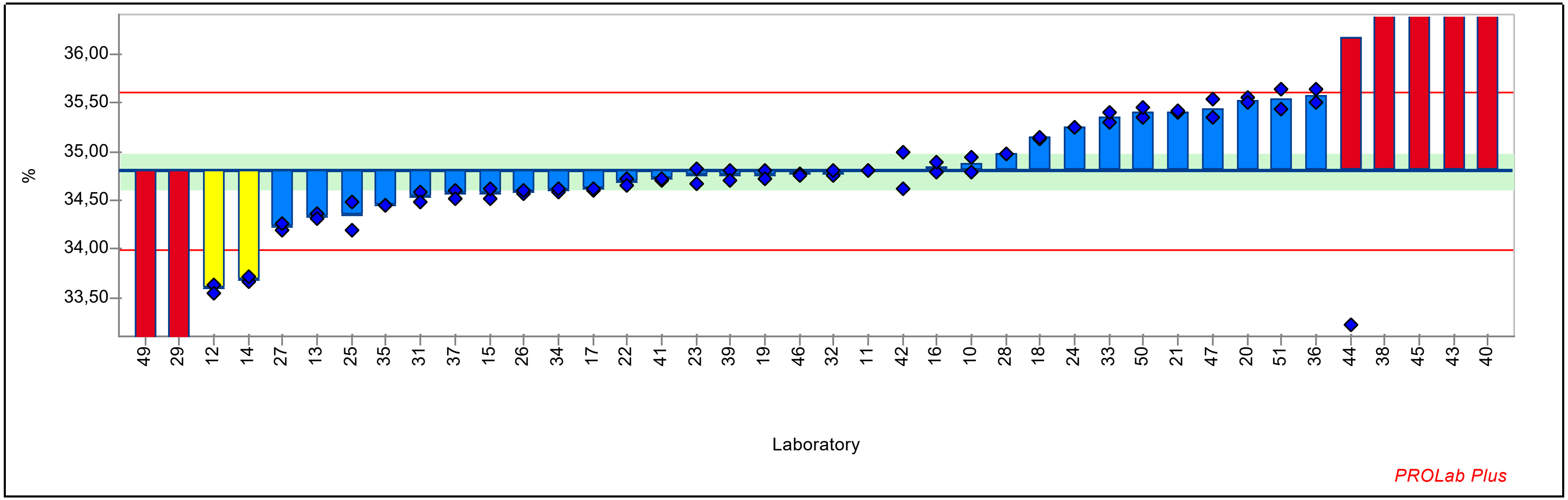
Sample: FLX-141
Measurand: CaO
Mean ± U(Mean): 34,799 ± 0,182 %
No. of laboratories: 31

Reproducibility s.d.: 0,402 %
Repeatability s.d.: 0,073 %
Range of tolerance: 33,994 - 35,604 % (|z-score| <= 2,000)
Statistical method: Q/Hampel



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	34,872	0,110	0,181	Other Method	no accredition	34,794	34,950	ICP-OES
11	34,805	0,007	0,015	XRF (fusion)	ISO 17025	34,800	34,810	
12	33,594	0,060	-2,993	XRF (fusion)	no accredition	33,637	33,552	DIN EN 196-2
13	34,338	0,042	-1,145	XRF (fusion)	ISO 17025	34,368	34,309	DIN 51001-2003-08
14	33,691	0,047	-2,754	XRF (fusion)	ISO 17025	33,658	33,724	
15	34,570	0,070	-0,568	XRF (fusion)	ISO 17025	34,521	34,620	PN-EN ISO 12677: 2012

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Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	34,847	0,074	0,119	XRF (fusion)	ISO 17025	34,795	34,899	DIN 51418-2-2015-03
17	34,614	0,016	-0,460	XRF (fusion)	ISO 17025	34,603	34,625	DIN EN ISO 12677
18	35,141	0,004	0,850	XRF (fusion)	no accredition	35,138	35,144	DIN 51001-2003-08
19	34,763	0,065	-0,090	XRF (fusion)	no accredition	34,809	34,717	DIN 51001 Bbl 1 2010-05
20	35,528	0,040	1,811	XRF (fusion)	no accredition	35,556	35,500	EN 196-2
21	35,410	0,004	1,518	XRF (fusion)	no accredition	35,407	35,413	DIN 51001-2003-08
22	34,688	0,054	-0,277	XRF (fusion)	no accredition	34,726	34,649	
23	34,748	0,119	-0,127	XRF (fusion)	no accredition	34,832	34,664	
24	35,254	0,004	1,129	XRF (fusion)	no accredition	35,251	35,256	
25	34,341	0,206	-1,138	XRF (fusion)	no accredition	34,195	34,487	DIN 51001-2003-08
26	34,592	0,021	-0,515	XRF (fusion)	no accredition	34,577	34,607	DIN 51418-2-2015-03
27	34,235	0,049	-1,402	XRF (fusion)	no accredition	34,200	34,270	DIN 51418-2-2015-03
28	34,974	0,006	0,436	XRF (fusion)	no accredition	34,979	34,970	
29	32,370	0,071	-6,036	XRF (fusion)	no accredition	32,320	32,420	information only
31	34,537	0,066	-0,653	XRF (fusion)	no accredition	34,583	34,490	
32	34,779	0,031	-0,050	XRF (fusion)	ISO 17025	34,757	34,801	DMI 31-305 (ASTM E1361, ASTM E1621)
33	35,352	0,063	1,373	XRF (fusion)	no accredition	35,307	35,396	NF EN ISO 12677
34	34,603	0,016	-0,487	XRF (fusion)	no accredition	34,592	34,614	
35	34,453	0,007	-0,860	XRF (fusion)	no accredition	34,448	34,458	
36	35,575	0,092	1,928	XRF (fusion)	no accredition	35,510	35,640	DIN 51001-2003-08
37	34,564	0,057	-0,585	XRF (fusion)	no accredition	34,604	34,523	DIN EN ISO 12677
38	37,155	0,346	5,855	XRF (pressed pellet)	no accredition	37,400	36,910	information only
39	34,750	0,071	-0,122	XRF (fusion)	no accredition	34,800	34,700	UniQuant; information only
40	41,543	0,036	16,758	XRF (pressed pellet)	no accredition	41,568	41,517	information only
41	34,719	0,015	-0,198	XRF (fusion)	ISO 17025	34,709	34,730	DIN 51418-2-2015-03
42	34,813	0,261	0,033	XRF (fusion)	no accredition	34,997	34,628	
43	38,420	0,450	8,999	XRF (pressed pellet)	no accredition	38,102	38,739	standardless analysis; information only
44	36,175	4,165	3,419	Other Method	no accredition	39,120	33,230	EN 16424:2014; information only
45	37,330	0,028	6,289	XRF (pressed pellet)	ISO 17025	37,350	37,310	CR 10299:1998; information only
46	34,766	0,022	-0,081	XRF (fusion)	ISO 17025	34,782	34,751	DIN EN 196-2
47	35,442	0,132	1,599	XRF (fusion)	no accredition	35,536	35,349	
49	30,955	2,143	-9,553	XRF (pressed pellet)	no accredition	32,470	29,440	information only
50	35,404	0,062	1,503	XRF (pressed pellet)	no accredition	35,360	35,448	information only

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Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
51	35,534	0,146	1,826	XRF (fusion)	no accredition	35,637	35,431	DIN 51418-2-2015-03

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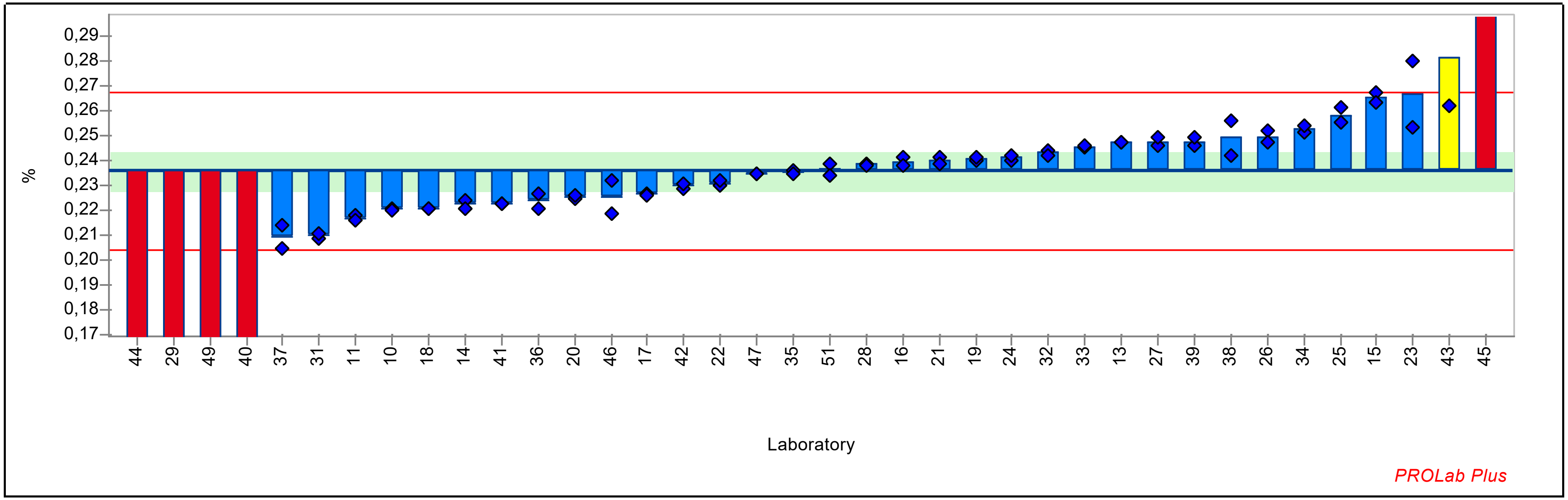
Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,016 %**
Measurand:	**Cr2O3**	**Repeatability s.d.:**	**0,002 %**
Mean ± U(Mean):	**0,236 ± 0,007 %**	**Range of tolerance:**	**0,204 - 0,267 % (|z-score| <= 2,000)**
No. of laboratories:	**29**	**Statistical method:**	**Q/Hampel**



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	0,221	0,001	-0,967	Other Method	no accredition	0,221	0,220	ICP-OES
11	0,217	0,001	-1,190	XRF (fusion)	ISO 17025	0,218	0,216	
13	0,247	0,000	0,721	XRF (fusion)	ISO 17025	0,247	0,247	DIN 51001-2003-08
14	0,223	0,002	-0,839	Other Method	ISO 17025	0,224	0,221	ICP-OES
15	0,265	0,003	1,867	XRF (fusion)	ISO 17025	0,267	0,263	PN-EN ISO 12677: 2013
16	0,239	0,002	0,243	XRF (fusion)	ISO 17025	0,241	0,238	DIN 51418-2-2015-03

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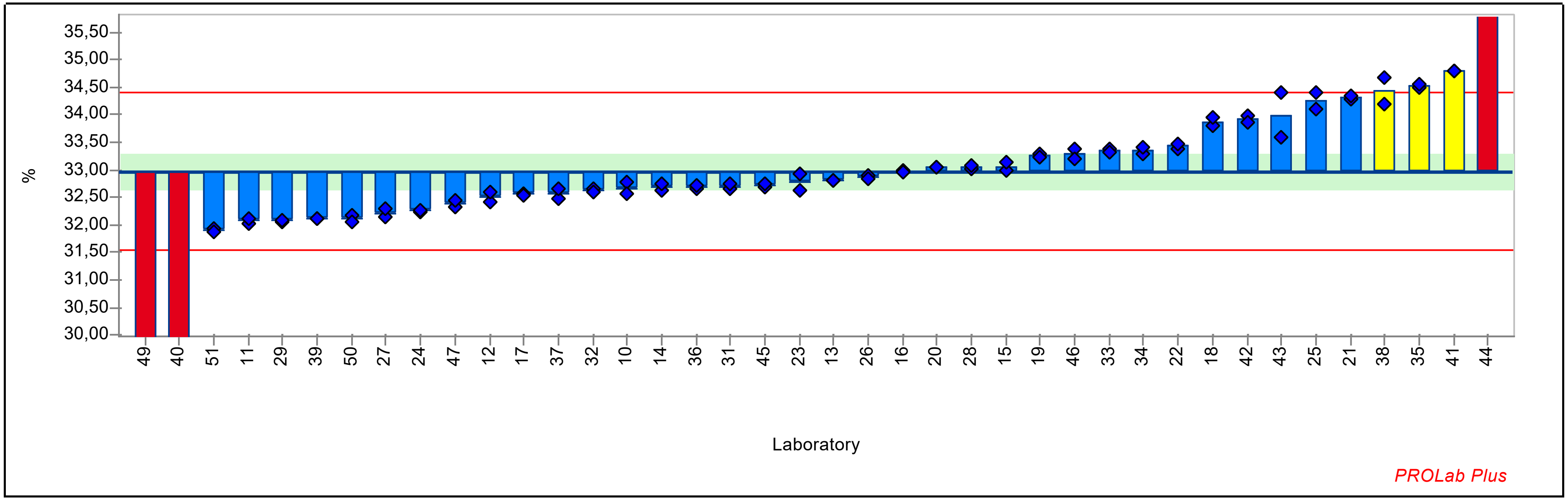
Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
17	0,227	0,001	-0,585	XRF (fusion)	ISO 17025	0,227	0,226	DIN EN ISO 12677
18	0,221	0,000	-0,935	XRF (fusion)	no accreditation	0,221	0,221	DIN 51001-2003-08
19	0,240	0,001	0,307	XRF (fusion)	no accreditation	0,240	0,241	DIN 51001 Bbl 1 2010-05
20	0,226	0,001	-0,648	XRF (fusion)	no accreditation	0,225	0,226	EN 196-2
21	0,240	0,001	0,275	XRF (fusion)	no accreditation	0,241	0,239	DIN 51001-2003-08
22	0,231	0,001	-0,298	XRF (fusion)	no accreditation	0,230	0,232	
23	0,267	0,019	1,963	XRF (fusion)	no accreditation	0,280	0,253	
24	0,241	0,001	0,339	XRF (fusion)	no accreditation	0,240	0,242	
25	0,258	0,004	1,421	XRF (fusion)	no accreditation	0,261	0,255	DIN 51001-2003-08
26	0,250	0,004	0,880	XRF (fusion)	no accreditation	0,252	0,247	DIN 51418-2-2015-03
27	0,247	0,002	0,753	XRF (fusion)	no accreditation	0,246	0,249	DIN 51418-2-2015-03
28	0,238	0,001	0,180	XRF (fusion)	no accreditation	0,239	0,238	
29	0,124	0,000	-7,112	XRF (fusion)	no accreditation	0,124	0,124	information only
31	0,210	0,001	-1,635	XRF (fusion)	no accreditation	0,209	0,211	
32	0,243	0,001	0,466	XRF (fusion)	ISO 17025	0,244	0,242	DMI 31-305 (ASTM E1361, ASTM E1621)
33	0,245	0,001	0,625	XRF (fusion)	no accreditation	0,245	0,246	NF EN ISO 12677
34	0,253	0,002	1,071	XRF (fusion)	no accreditation	0,251	0,254	
35	0,235	0,001	-0,011	XRF (fusion)	no accreditation	0,236	0,235	
36	0,224	0,004	-0,744	XRF (fusion)	no accreditation	0,221	0,227	standardless; information only
37	0,209	0,006	-1,667	XRF (fusion)	no accreditation	0,214	0,205	DIN EN ISO 12677
38	0,249	0,010	0,848	XRF (pressed pellet)	no accreditation	0,242	0,256	information only
39	0,247	0,002	0,753	XRF (pressed pellet)	no accreditation	0,246	0,249	UniQuant; information only
40	0,147	0,000	-5,647	XRF (pressed pellet)	no accreditation	0,147	0,147	information only
41	0,223	0,000	-0,807	XRF (fusion)	ISO 17025	0,223	0,223	DIN 51418-2-2015-03
42	0,230	0,001	-0,362	XRF (fusion)	no accreditation	0,229	0,231	
43	0,281	0,028	2,918	XRF (pressed pellet)	no accreditation	0,262	0,301	standardless analysis; information only
44	0,102	0,014	-8,513	Other Method	no accreditation	0,112	0,092	EN 16424:2014; information only
45	0,325	0,001	5,656	XRF (pressed pellet)	ISO 17025	0,325	0,324	CR 10299:1998; information only
46	0,226	0,009	-0,648	XRF (fusion)	ISO 17025	0,232	0,219	DIN EN 196-2
47	0,235	0,000	-0,043	XRF (fusion)	no accreditation	0,235	0,235	
49	0,138	0,010	-6,220	XRF (pressed pellet)	no accreditation	0,145	0,131	information only
51	0,236	0,004	0,052	XRF (fusion)	no accreditation	0,239	0,234	DIN 51418-2-2015-03

2022_01 Slag

Sample: **FLX-141**
Measurand: **Fe2O3**
Mean ± U(Mean): **32,972 ± 0,306 %**
No. of laboratories: **32**

Reproducibility s.d.: **0,712 %**
Repeatability s.d.: **0,090 %**
Range of tolerance: **31,548 - 34,396 % (|z-score| <= 2,000)**
Statistical method: **Q/Hampel**



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	32,669	0,148	-0,425	Other Method	no accredition	32,774	32,565	ICP-OES
11	32,070	0,071	-1,267	XRF (fusion)	ISO 17025	32,020	32,120	
12	32,510	0,118	-0,649	XRF (fusion)	no accredition	32,426	32,593	DIN EN 196-2
13	32,803	0,000	-0,237	XRF (fusion)	ISO 17025	32,803	32,803	DIN 51001-2003-08
14	32,684	0,101	-0,404	XRF (fusion)	ISO 17025	32,613	32,756	
15	33,059	0,092	0,122	XRF (fusion)	no accredition	32,994	33,124	PN-EN ISO 12677: 2014

2022_01 Slag

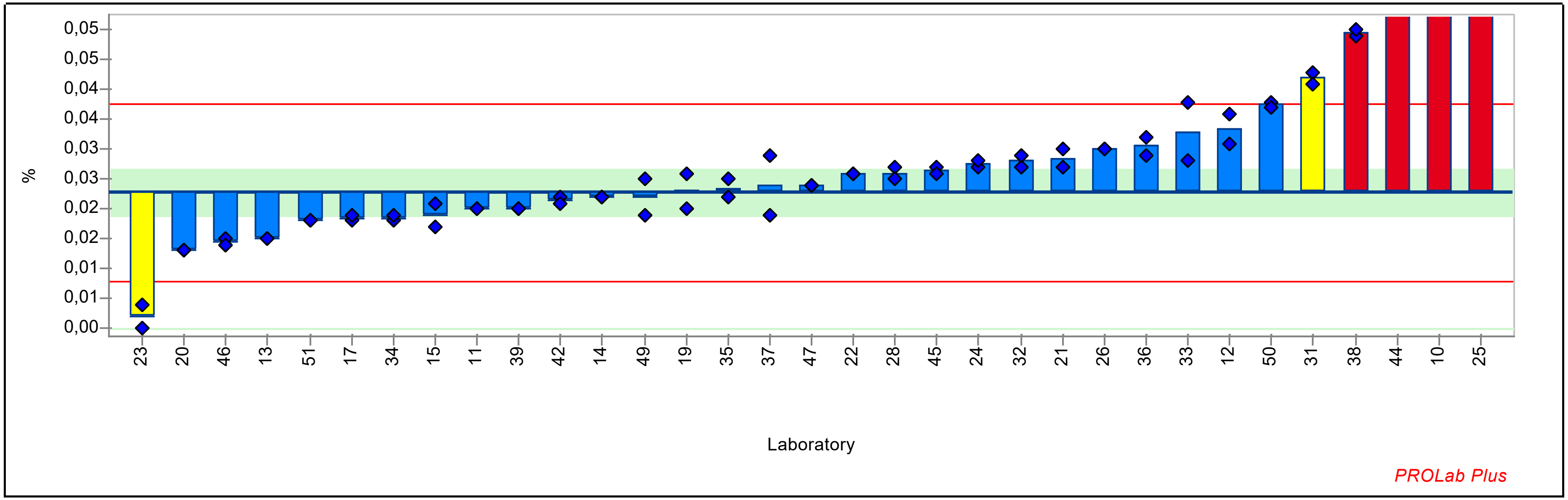
Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	32,962	0,024	-0,014	XRF (fusion)	ISO 17025	32,979	32,945	DIN 51418-2-2015-03
17	32,550	0,005	-0,592	XRF (fusion)	ISO 17025	32,554	32,547	DIN EN ISO 12677
18	33,868	0,103	1,260	XRF (fusion)	no accreditation	33,796	33,941	DIN 51001-2003-08
19	33,261	0,048	0,406	XRF (fusion)	no accreditation	33,295	33,227	DIN 51001 Bbl 1 2010-05
20	33,043	0,013	0,099	XRF (fusion)	no accreditation	33,033	33,052	EN 196-2
21	34,314	0,057	1,885	XRF (fusion)	no accreditation	34,274	34,354	DIN 51001-2003-08
22	33,435	0,065	0,651	XRF (fusion)	no accreditation	33,389	33,481	
23	32,769	0,203	-0,286	XRF (fusion)	no accreditation	32,625	32,912	
24	32,259	0,018	-1,001	XRF (fusion)	no accreditation	32,246	32,272	
25	34,257	0,209	1,805	XRF (fusion)	no accreditation	34,109	34,404	DIN 51001-2003-08
26	32,870	0,040	-0,143	XRF (fusion)	no accreditation	32,898	32,842	DIN 51418-2-2015-03
27	32,210	0,113	-1,070	XRF (fusion)	no accreditation	32,130	32,290	DIN 51418-2-2015-03
28	33,046	0,030	0,104	XRF (fusion)	no accreditation	33,024	33,067	
29	32,072	0,016	-1,264	XRF (fusion)	no accreditation	32,061	32,083	
31	32,697	0,063	-0,385	XRF (fusion)	no accreditation	32,653	32,742	
32	32,623	0,057	-0,490	XRF (fusion)	ISO 17025	32,663	32,583	DMI 31-305 (ASTM E1361, ASTM E1621)
33	33,351	0,033	0,533	XRF (fusion)	no accreditation	33,374	33,328	NF EN ISO 12677
34	33,355	0,097	0,538	XRF (fusion)	no accreditation	33,286	33,423	
35	34,535	0,046	2,195	XRF (fusion)	no accreditation	34,502	34,567	
36	32,695	0,035	-0,389	XRF (fusion)	no accreditation	32,670	32,720	DIN 51001-2003-08
37	32,570	0,128	-0,564	XRF (fusion)	no accreditation	32,480	32,661	DIN EN ISO 12677
38	34,440	0,339	2,062	XRF (pressed pellet)	no accreditation	34,200	34,680	information only
39	32,100	0,000	-1,225	XRF (fusion)	no accreditation	32,100	32,100	UniQuant; information only
40	27,907	0,006	-7,115	XRF (pressed pellet)	no accreditation	27,902	27,911	information only
41	34,805	0,005	2,574	XRF (fusion)	ISO 17025	34,808	34,801	DIN 51418-2-2015-03
42	33,925	0,088	1,340	XRF (fusion)	no accreditation	33,988	33,863	
43	33,989	0,566	1,428	XRF (pressed pellet)	no accreditation	33,588	34,389	standardless analysis; information only
44	42,401	0,719	13,244	Other Method	no accreditation	42,909	41,892	EN 16424:2014; information only
45	32,720	0,028	-0,354	XRF (pressed pellet)	ISO 17025	32,700	32,740	CR 10299:1998; information only
46	33,294	0,139	0,452	XRF (fusion)	ISO 17025	33,392	33,195	DIN EN 196-2
47	32,385	0,092	-0,824	XRF (fusion)	no accreditation	32,320	32,450	
49	18,195	1,506	-20,757	XRF (pressed pellet)	no accreditation	19,260	17,130	information only
50	32,103	0,093	-1,220	XRF (pressed pellet)	no accreditation	32,169	32,038	information only

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
51	31,894	0,049	-1,514	XRF (fusion)	no accredition	31,929	31,859	DIN 51418-2-2015-03

2022_01 Slag

Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,007 %**
Measurand:	**K2O**	**Repeatability s.d.:**	**0,002 %**
Mean ± U(Mean):	**0,023 ± 0,004 %**	**Range of tolerance:**	**0,008 - 0,038 % (|z-score| <= 2,000)**
No. of laboratories:	**25**	**Statistical method:**	**Q/Hampel**



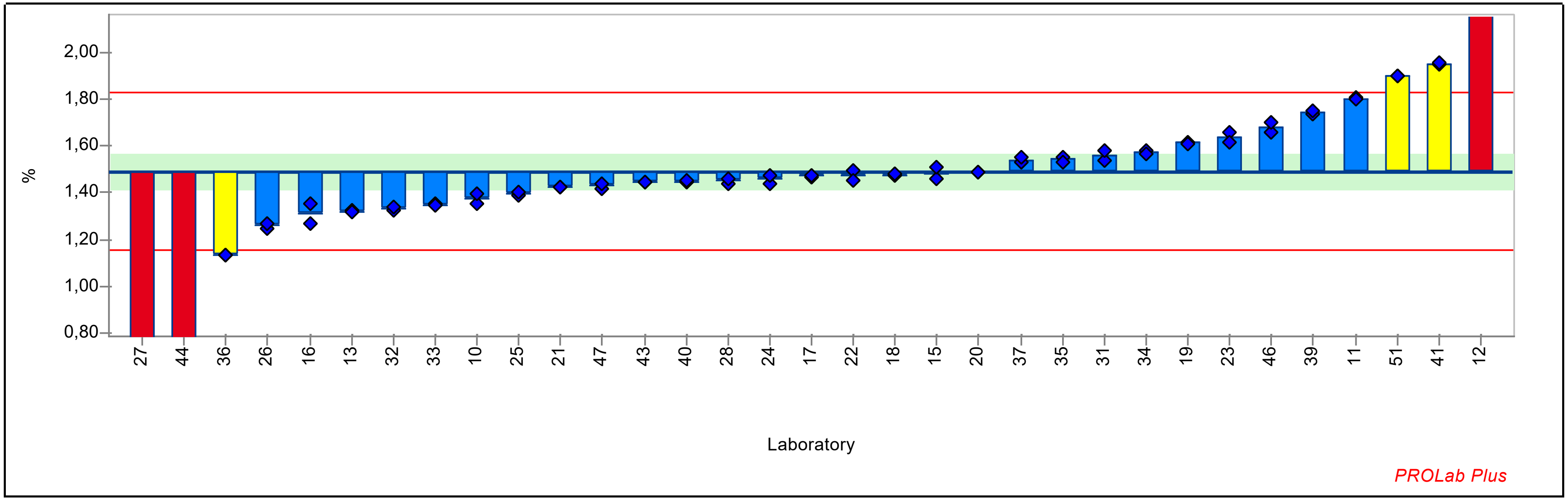
Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	0,091	0,008	9,143	Other Method	no accredition	0,097	0,085	ICP-OES, information only
11	0,020	0,000	-0,376	XRF (fusion)	ISO 17025	0,020	0,020	
12	0,034	0,004	1,434	XRF (fusion)	no accredition	0,036	0,031	DIN EN 196-2
13	0,015	0,000	-1,046	XRF (fusion)	ISO 17025	0,015	0,015	DIN 51001-2003-08
14	0,022	0,000	-0,108	Other Method	ISO 17025	0,022	0,022	ICP-OES
15	0,019	0,003	-0,510	XRF (fusion)	ISO 17025	0,021	0,017	PN-EN ISO 12677: 2015

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	<0,003					<0,003	<0,003	information only
17	0,018	0,001	-0,577	Other Method	ISO 17025	0,018	0,019	ICP-OES - DIN EN 10351
19	0,023	0,004	0,026	XRF (fusion)	no accreditation	0,020	0,026	DIN 51001 Bbl 1 2010-05
20	0,013	0,000	-1,314	XRF (fusion)	no accreditation	0,013	0,013	EN 196-2
21	0,028	0,002	0,764	XRF (fusion)	no accreditation	0,030	0,027	DIN 51001-2003-08
22	0,026	0,000	0,428	XRF (fusion)	no accreditation	0,026	0,026	
23	0,002	0,003	-2,789	XRF (fusion)	no accreditation	0,000	0,004	
24	0,028	0,001	0,630	XRF (fusion)	no accreditation	0,027	0,028	
25	0,100	0,002	10,282	XRF (fusion)	no accreditation	0,098	0,101	DIN 51001-2003-08; information only
26	0,030	0,000	0,965	Other Method	no accreditation	0,030	0,030	ICP
27	<0,007			XRF (fusion)	no accreditation	<0,007	<0,007	DIN 51418-2-2015-03; Information only
28	0,026	0,001	0,428	XRF (fusion)	no accreditation	0,027	0,025	
31	0,042	0,001	2,573	XRF (fusion)	no accreditation	0,043	0,041	
32	0,028	0,001	0,697	XRF (fusion)	ISO 17025	0,027	0,029	DMI 31-305 (ASTM E1361, ASTM E1621)
33	0,033	0,007	1,367	XRF (pressed pellet)	no accreditation	0,038	0,028	semi-quantitative; information only
34	0,018	0,001	-0,577	XRF (fusion)	no accreditation	0,018	0,019	
35	0,024	0,002	0,093	XRF (fusion)	no accreditation	0,025	0,022	
36	0,030	0,002	1,032	XRF (fusion)	no accreditation	0,032	0,029	DIN 51001-2003-08
37	0,024	0,007	0,160	XRF (fusion)	no accreditation	0,019	0,029	DIN EN ISO 12677
38	0,050	0,001	3,579	XRF (pressed pellet)	no accreditation	0,049	0,050	information only
39	0,020	0,000	-0,376	XRF (fusion)	no accreditation	0,020	0,020	
42	0,021	0,001	-0,175	XRF (fusion)	no accreditation	0,022	0,021	
44	0,058	0,003	4,719	Other Method	no accreditation	0,060	0,056	EN 16424:2014; information only
45	0,026	0,001	0,495	XRF (pressed pellet)	ISO 17025	0,027	0,026	CR 10299:1998; information only
46	0,014	0,001	-1,113	XRF (fusion)	ISO 17025	0,015	0,014	DIN EN 196-2
47	0,024	0,000	0,160	XRF (fusion)	no accreditation	0,024	0,024	
49	0,022	0,004	-0,108	XRF (pressed pellet)	no accreditation	0,025	0,019	information only
50	0,037	0,001	1,970	XRF (pressed pellet)	no accreditation	0,038	0,037	information only
51	0,018	0,000	-0,644	XRF (fusion)	no accreditation	0,018	0,018	DIN 51418-2-2015-03

2022_01 Slag

Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,168 %**
Measurand:	**Loss on Ignition**	**Repeatability s.d.:**	**0,014 %**
Mean ± U(Mean):	**1,492 ± 0,076 %**	**Range of tolerance:**	**1,156 - 1,829 % (|z-score| <= 2,000)**
No. of laboratories:	**30**	**Statistical method:**	**Q/Hampel**



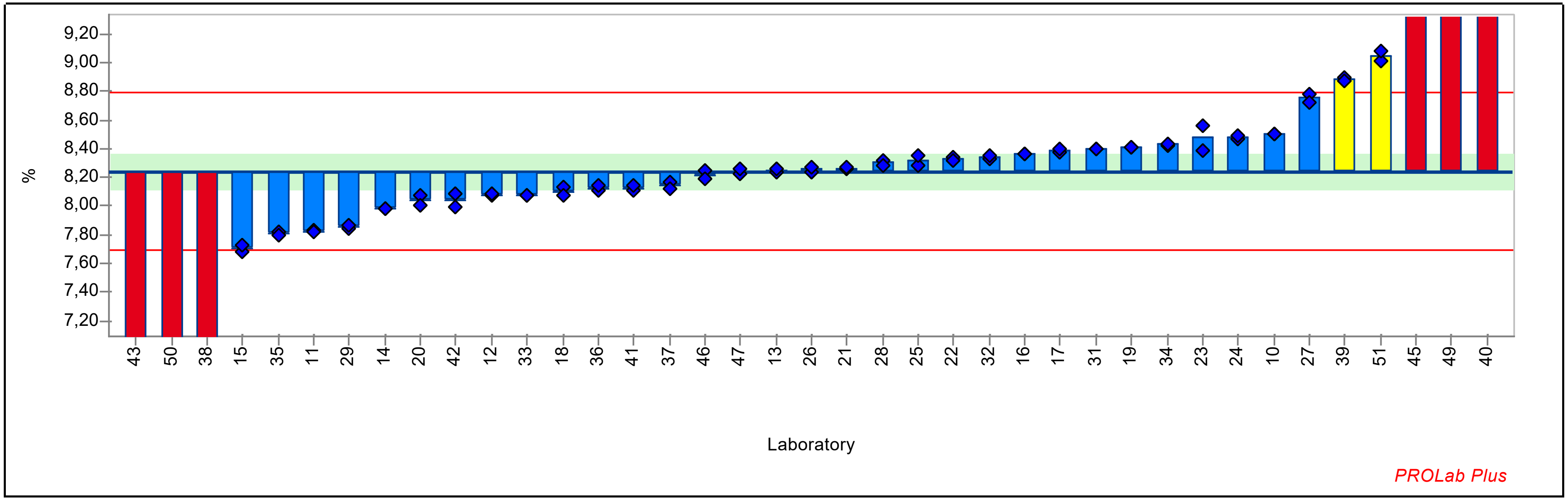
Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	1,374	0,030	-0,704	Other Method	no accredition	1,353	1,395	LOI @ 950°C
11	1,805	0,007	1,860	Other Method	ISO 17025	1,810	1,800	LOI @950°C
12	4,010	0,000	14,974	Other Method	no accredition	4,010	4,010	DIN EN 196-2; LOI @ 950°C, information only
13	1,321	0,006	-1,019	Other Method	ISO 17025	1,325	1,317	DIN EN 196-2; LOI @ 950°C
15	1,482	0,036	-0,058	Other Method	no accredition	1,457	1,508	DIN EN 196-2; LOI @ 950°C
16	1,310	0,057	-1,084	Other Method	ISO 17025	1,350	1,270	ISO 29581-2:2010; LOI @ 950°C

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
17	1,472	0,003	-0,121	Other Method	no accredition	1,470	1,474	LOI @ 950°C
18	1,478	0,007	-0,085	Other Method	no accredition	1,473	1,483	LOI @ 950°C
19	1,617	0,005	0,739	Other Method	no accredition	1,620	1,613	DIN EN 196-2; LOI @ 950°C
20	1,490	0,000	-0,014	Other Method	no accredition	1,490	1,490	LOI @ 950°C
21	1,425	0,001	-0,403	Other Method	no accredition	1,424	1,425	LOI @ 950°C
22	1,474	0,030	-0,106	Other Method	no accredition	1,496	1,453	LOI @ 950°C
23	1,635	0,030	0,852	Other Method	no accredition	1,657	1,614	LOI @ 950C
24	1,458	0,023	-0,204	XRF (fusion)	no accredition	1,442	1,474	LOI @ 950°C
25	1,398	0,010	-0,561	Other Method	no accredition	1,391	1,405	DIN EN 196-2; LOI @ 950°C
26	1,260	0,014	-1,382	Other Method	no accredition	1,250	1,270	LOI @ 950°C
27	0,015	0,000	-8,786	Other Method	no accredition	0,015	0,015	DIN EN 196-2; LOI @ 950°C, information only
28	1,450	0,013	-0,252	Other Method	no accredition	1,441	1,459	LOI @ 950°C
31	1,560	0,028	0,402	Other Method	no accredition	1,540	1,580	LOI @ 950°C
32	1,334	0,008	-0,942	Other Method	ISO 17025	1,328	1,340	ASTM C-114, LOI @ 950°C
33	1,349	0,006	-0,849	Other Method	no accredition	1,354	1,345	LOI @ 950°C
34	1,575	0,007	0,492	Other Method	no accredition	1,580	1,570	LOI @ 950°C
35	1,542	0,011	0,298	Other Method	no accredition	1,550	1,535	LOI @ 950°C
36	1,131	0,001	-2,152	Other Method	no accredition	1,130	1,131	LOI @ 950°C
37	1,540	0,014	0,284	Other Method	no accredition	1,530	1,550	DIN EN ISO 26845, LOI @ 950°C
39	1,745	0,014	1,503	Other Method	no accredition	1,735	1,755	LOI @ 950°C
40	1,450	0,002	-0,255	Other Method	no accredition	1,448	1,451	LOI @ 950°C
41	1,954	0,008	2,749	Other Method	ISO 17025	1,949	1,960	LOI @ 950°C
43	1,448	0,002	-0,267	Other Method	no accredition	1,446	1,449	LOI @ 950°C
44	0,605	0,004	-5,274	Other Method	no accredition	0,603	0,608	DIN EN 196-2; LOI @ 950°C; information only
46	1,679	0,030	1,110	Other Method	ISO 17025	1,658	1,700	DIN EN 196-2; LOI @ 950°C
47	1,430	0,014	-0,371	Other Method	no accredition	1,420	1,440	LOI @ 950°C
51	1,900	0,000	2,425	Other Method	no accredition	1,900	1,900	ISO 29581-2:2010; LOI @ 950°C

2022_01 Slag

Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,273 %**
Measurand:	**MgO**	**Repeatability s.d.:**	**0,025 %**
Mean ± U(Mean):	**8,242 ± 0,118 %**	**Range of tolerance:**	**7,696 - 8,788 % (|z-score| <= 2,000)**
No. of laboratories:	**33**	**Statistical method:**	**Q/Hampel**



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	8,506	0,001	0,969	Other Method	no accredition	8,507	8,506	ICP-OES
11	7,825	0,007	-1,528	XRF (fusion)	ISO 17025	7,830	7,820	
12	8,078	0,011	-0,603	XRF (fusion)	no accredition	8,070	8,085	DIN EN 196-2
13	8,248	0,015	0,023	XRF (fusion)	ISO 17025	8,238	8,259	DIN 51001-2003-08
14	7,984	0,001	-0,946	Other Method	ISO 17025	7,985	7,983	ICP-OES
15	7,704	0,040	-1,970	XRF (fusion)	ISO 17025	7,676	7,733	PN-EN ISO 12677: 2016

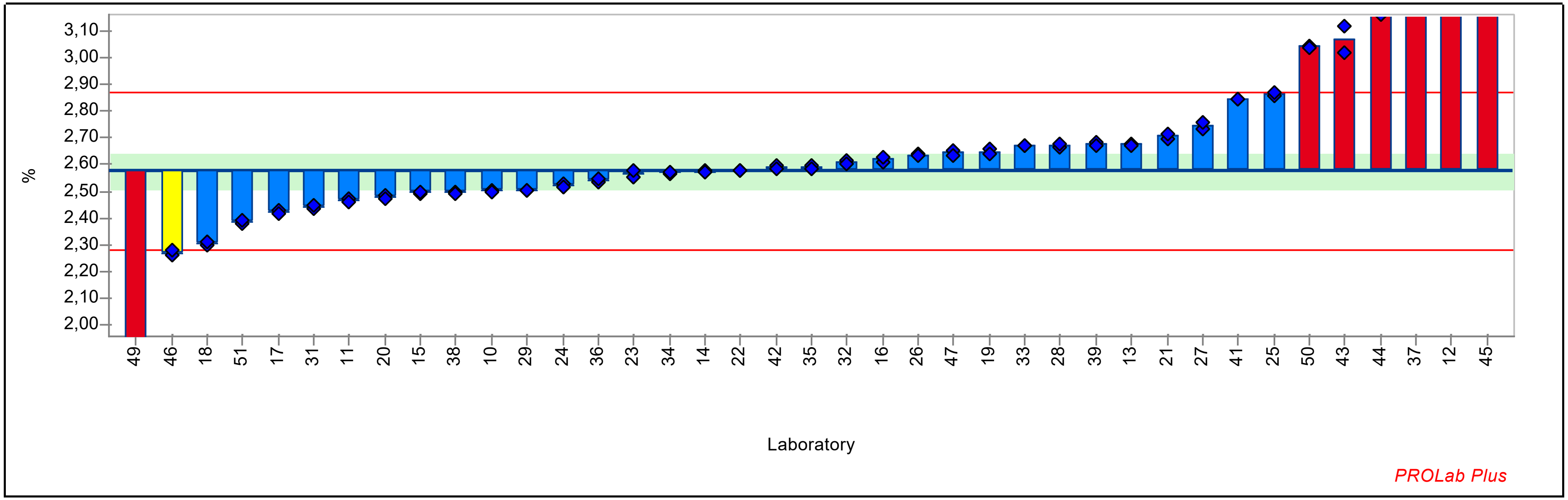
2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	8,367	0,001	0,459	XRF (fusion)	ISO 17025	8,367	8,368	DIN 51418-2-2015-03
17	8,384	0,016	0,522	XRF (fusion)	ISO 17025	8,373	8,396	DIN EN ISO 12677
18	8,102	0,046	-0,515	XRF (fusion)	no accredition	8,134	8,069	DIN 51001-2003-08
19	8,412	0,002	0,624	XRF (fusion)	no accredition	8,411	8,414	DIN 51001 Bbl 1 2010-05
20	8,038	0,048	-0,748	XRF (fusion)	no accredition	8,072	8,004	EN 196-2
21	8,265	0,003	0,084	XRF (fusion)	no accredition	8,263	8,267	DIN 51001-2003-08
22	8,329	0,021	0,320	XRF (fusion)	no accredition	8,344	8,315	
23	8,476	0,120	0,859	XRF (fusion)	no accredition	8,392	8,561	
24	8,478	0,016	0,864	XRF (fusion)	no accredition	8,467	8,489	
25	8,320	0,050	0,287	XRF (fusion)	no accredition	8,285	8,356	DIN 51001-2003-08
26	8,254	0,024	0,044	XRF (fusion)	no accredition	8,237	8,271	DIN 51418-2-2015-03
27	8,753	0,046	1,870	XRF (fusion)	no accredition	8,785	8,720	DIN 51418-2-2015-03
28	8,301	0,021	0,216	XRF (fusion)	no accredition	8,316	8,286	
29	7,859	0,016	-1,405	XRF (fusion)	no accredition	7,847	7,870	
31	8,401	0,003	0,582	XRF (fusion)	no accredition	8,403	8,399	
32	8,339	0,017	0,355	XRF (fusion)	ISO 17025	8,327	8,351	DMI 31-305 (ASTM E1361, ASTM E1621)
33	8,078	0,004	-0,603	XRF (fusion)	no accredition	8,075	8,080	NF EN ISO 12677
34	8,429	0,010	0,685	XRF (fusion)	no accredition	8,422	8,436	
35	7,812	0,014	-1,576	XRF (fusion)	no accredition	7,822	7,802	
36	8,123	0,027	-0,436	XRF (fusion)	no accredition	8,104	8,142	DIN 51001-2003-08
37	8,143	0,033	-0,365	XRF (fusion)	no accredition	8,166	8,119	DIN EN ISO 12677
38	6,356	0,176	-6,912	XRF (pressed pellet)	no accredition	6,231	6,480	information only
39	8,880	0,014	2,337	XRF (fusion)	no accredition	8,890	8,870	
40	14,133	0,029	21,580	XRF (pressed pellet)	no accredition	14,112	14,153	information only
41	8,125	0,028	-0,427	XRF (fusion)	ISO 17025	8,106	8,145	DIN 51418-2-2015-03
42	8,040	0,059	-0,739	XRF (fusion)	no accredition	8,082	7,999	
43	4,437	0,267	-13,940	XRF (pressed pellet)	no accredition	4,626	4,248	standardless analysis; information only
45	10,730	0,000	9,115	XRF (pressed pellet)	ISO 17025	10,730	10,730	CR 10299:1998; information only
46	8,215	0,042	-0,101	XRF (fusion)	ISO 17025	8,244	8,185	DIN EN 196-2
47	8,241	0,019	-0,006	XRF (fusion)	no accredition	8,227	8,254	
49	11,570	0,113	12,192	XRF (pressed pellet)	no accredition	11,650	11,490	information only
50	5,034	0,046	-11,755	XRF (pressed pellet)	no accredition	5,001	5,066	information only
51	9,047	0,050	2,951	XRF (fusion)	no accredition	9,012	9,083	DIN 51418-2-2015-03

2022_01 Slag

Sample: FLX-141
Measurand: Mn2O3
Mean ± U(Mean): 2,575 ± 0,065 %
No. of laboratories: 32

Reproducibility s.d.: 0,146 %
Repeatability s.d.: 0,010 %
Range of tolerance: 2,282 - 2,868 % (|z-score| <= 2,000)
Statistical method: Q/Hampel



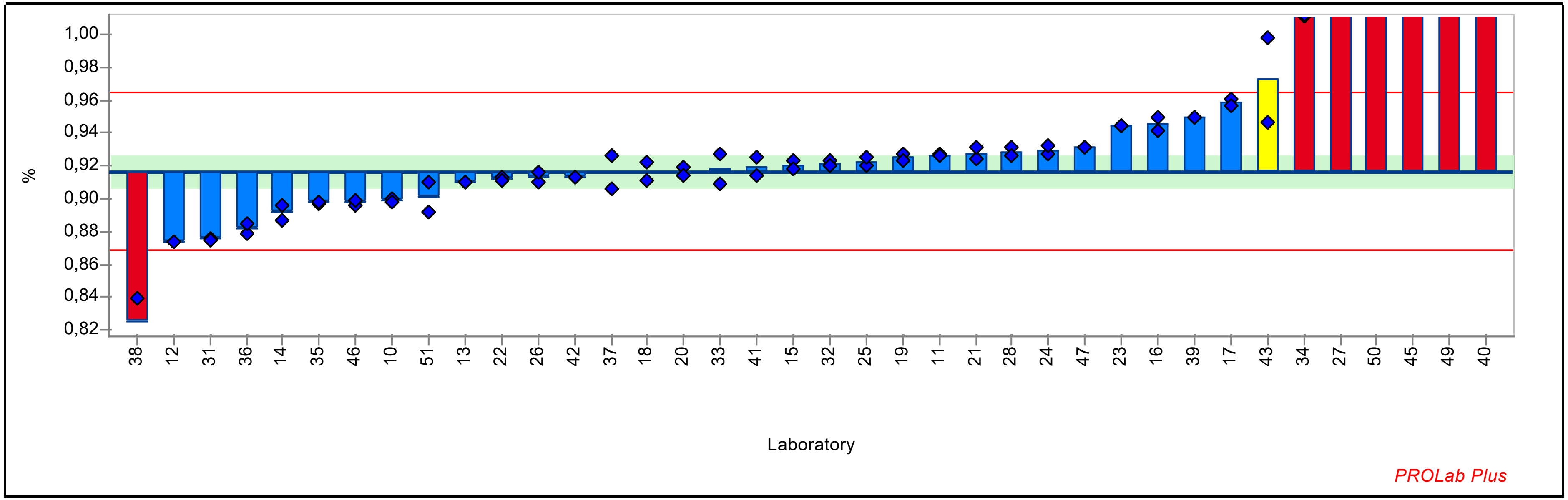
Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	2,503	0,004	-0,492	Other Method	no accredition	2,506	2,500	ICP-OES
11	2,465	0,007	-0,752	XRF (fusion)	ISO 17025	2,470	2,460	
12	5,219	0,004	18,069	XRF (fusion)	no accredition	5,216	5,222	DIN EN 196-2
13	2,677	0,004	0,697	XRF (fusion)	ISO 17025	2,680	2,674	DIN 51001-2003-08
14	2,572	0,005	-0,017	Other Method	ISO 17025	2,576	2,569	ICP-OES
15	2,495	0,003	-0,547	XRF (fusion)	no accredition	2,493	2,497	PN-EN ISO 12677: 2017

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	2,620	0,013	0,311	XRF (fusion)	ISO 17025	2,611	2,630	DIN 51418-2-2015-03
17	2,424	0,006	-1,032	Other Method	ISO 17025	2,428	2,420	ICP-OES - DIN EN 10351
18	2,306	0,012	-1,842	XRF (fusion)	no accredition	2,297	2,314	DIN 51001-2003-08
19	2,649	0,012	0,502	XRF (fusion)	no accredition	2,657	2,640	DIN 51001 Bbl 1 2010-05
20	2,478	0,008	-0,667	XRF (fusion)	no accredition	2,483	2,472	EN 196-2
21	2,707	0,013	0,902	XRF (fusion)	no accredition	2,698	2,716	DIN 51001-2003-08
22	2,580	0,001	0,037	XRF (fusion)	no accredition	2,581	2,580	
23	2,566	0,015	-0,065	XRF (fusion)	no accredition	2,555	2,576	
24	2,522	0,009	-0,366	XRF (fusion)	no accredition	2,528	2,515	
25	2,864	0,012	1,971	XRF (fusion)	no accredition	2,855	2,872	DIN 51001-2003-08
26	2,635	0,005	0,413	XRF (fusion)	no accredition	2,639	2,632	DIN 51418-2-2015-03
27	2,745	0,014	1,162	XRF (fusion)	no accredition	2,735	2,755	DIN 51418-2-2015-03
28	2,671	0,006	0,656	XRF (fusion)	no accredition	2,667	2,675	
29	2,504	0,000	-0,485	XRF (fusion)	no accredition	2,504	2,504	
31	2,440	0,010	-0,923	XRF (fusion)	no accredition	2,433	2,447	
32	2,607	0,009	0,222	XRF (fusion)	ISO 17025	2,614	2,601	DMI 31-305 (ASTM E1361, ASTM E1621)
33	2,670	0,002	0,646	XRF (fusion)	no accredition	2,671	2,668	NF EN ISO 12677
34	2,569	0,006	-0,038	XRF (fusion)	no accredition	2,565	2,574	
35	2,591	0,006	0,109	XRF (fusion)	no accredition	2,595	2,587	
36	2,542	0,007	-0,226	XRF (fusion)	no accredition	2,537	2,547	DIN 51001-2003-08
37	4,934	0,001	16,118	XRF (fusion)	no accredition	4,933	4,934	DIN EN ISO 12677
38	2,495	0,004	-0,544	XRF (pressed pellet)	no accredition	2,498	2,493	information only
39	2,676	0,008	0,693	XRF (fusion)	no accredition	2,682	2,671	
41	2,845	0,000	1,845	XRF (fusion)	ISO 17025	2,845	2,845	DIN 51418-2-2015-03
42	2,589	0,007	0,095	XRF (fusion)	no accredition	2,594	2,584	
43	3,069	0,072	3,376	XRF (pressed pellet)	no accredition	3,018	3,120	standardless analysis; information only
44	3,241	0,115	4,551	Other Method	no accredition	3,322	3,160	EN 16424:2014; information only
45	5,380	0,000	19,170	XRF (pressed pellet)	ISO 17025	5,380	5,380	CR 10299:1998; information only
46	2,271	0,011	-2,078	XRF (fusion)	ISO 17025	2,263	2,279	DIN EN 196-2
47	2,643	0,012	0,468	XRF (fusion)	no accredition	2,652	2,635	
49	1,538	0,112	-7,084	XRF (pressed pellet)	no accredition	1,618	1,459	information only
50	3,042	0,004	3,188	XRF (pressed pellet)	no accredition	3,044	3,039	information only
51	2,385	0,011	-1,302	XRF (fusion)	no accredition	2,377	2,392	DIN 51418-2-2015-03

2022_01 Slag

Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,024 %**
Measurand:	**P2O5**	**Repeatability s.d.:**	**0,004 %**
Mean ± U(Mean):	**0,917 ± 0,010 %**	**Range of tolerance:**	**0,869 - 0,964 % (|z-score| <= 2,000)**
No. of laboratories:	**30**	**Statistical method:**	**Q/Hampel**



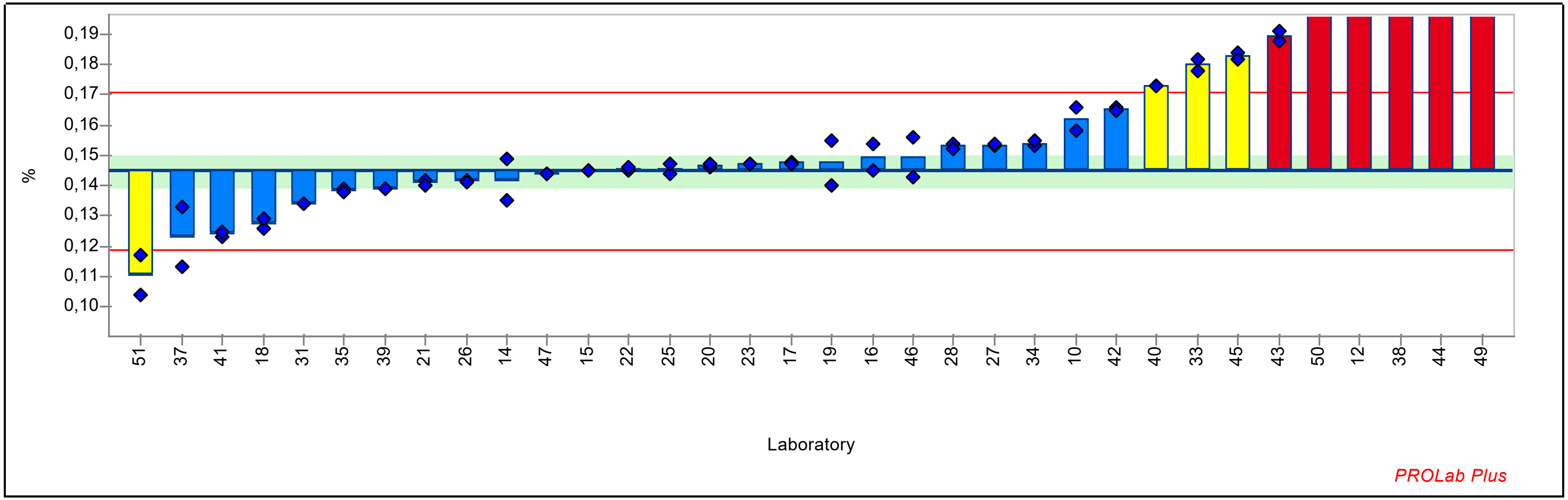
Lab code	**Lab mean**	**s.d.**	**z-score**	**Analytical method**	**Accreditation**	**Conc. 1**	**Conc. 2**	**Comment**
10	0,899	0,001	-0,740	Other Method	no accredition	0,900	0,898	ICP-OES
11	0,927	0,001	0,411	XRF (fusion)	ISO 17025	0,927	0,926	
12	0,874	0,000	-1,786	XRF (fusion)	no accredition	0,874	0,874	DIN EN 196-2
13	0,910	0,000	-0,280	XRF (fusion)	ISO 17025	0,910	0,910	DIN 51001-2003-08
14	0,891	0,006	-1,054	Other Method	ISO 17025	0,887	0,896	ICP-OES
15	0,921	0,004	0,160	XRF (fusion)	ISO 17025	0,923	0,918	PN-EN ISO 12677: 2018

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	0,946	0,006	1,206	XRF (fusion)	ISO 17025	0,941	0,950	DIN 51418-2-2015-03
17	0,959	0,003	1,771	XRF (fusion)	ISO 17025	0,961	0,957	DIN EN ISO 12677
18	0,917	0,008	-0,008	XRF (fusion)	no accreditation	0,922	0,911	DIN 51001-2003-08
19	0,925	0,003	0,348	XRF (fusion)	no accreditation	0,927	0,923	DIN 51001 Bbl 1 2010-05
20	0,917	0,004	-0,008	XRF (fusion)	no accreditation	0,919	0,914	EN 196-2
21	0,927	0,005	0,452	XRF (fusion)	no accreditation	0,924	0,931	DIN 51001-2003-08
22	0,912	0,001	-0,196	XRF (fusion)	no accreditation	0,913	0,911	
23	0,944	0,000	1,143	XRF (fusion)	no accreditation	0,944	0,944	
24	0,929	0,004	0,536	XRF (fusion)	no accreditation	0,927	0,932	
25	0,923	0,004	0,243	XRF (fusion)	no accreditation	0,920	0,925	DIN 51001-2003-08
26	0,913	0,004	-0,154	XRF (fusion)	no accreditation	0,910	0,916	DIN 51418-2-2015-03
27	1,028	0,004	4,679	XRF (fusion)	no accreditation	1,026	1,031	DIN 51418-2-2015-03; Information only
28	0,929	0,004	0,494	XRF (fusion)	no accreditation	0,931	0,926	
31	0,875	0,001	-1,724	XRF (fusion)	no accreditation	0,876	0,875	
32	0,921	0,002	0,201	XRF (fusion)	ISO 17025	0,923	0,920	DMI 31-305 (ASTM E1361, ASTM E1621)
33	0,918	0,013	0,055	XRF (pressed pellet)	no accreditation	0,909	0,927	semi-quantitative; information only
34	1,011	0,001	3,968	XRF (fusion)	no accreditation	1,011	1,012	
35	0,897	0,001	-0,803	XRF (fusion)	no accreditation	0,897	0,898	
36	0,882	0,004	-1,452	XRF (fusion)	no accreditation	0,879	0,885	DIN 51001-2003-08
37	0,916	0,014	-0,029	XRF (fusion)	no accreditation	0,926	0,906	DIN EN ISO 12677
38	0,825	0,020	-3,837	XRF (pressed pellet)	no accreditation	0,811	0,839	information only
39	0,950	0,000	1,394	XRF (fusion)	no accreditation	0,950	0,950	
40	2,296	0,002	57,741	XRF (pressed pellet)	no accreditation	2,295	2,298	information only
41	0,919	0,008	0,118	XRF (fusion)	ISO 17025	0,914	0,925	DIN 51418-2-2015-03
42	0,913	0,000	-0,154	XRF (fusion)	no accreditation	0,913	0,913	
43	0,972	0,036	2,336	XRF (pressed pellet)	no accreditation	0,947	0,998	standardless analysis; information only
45	1,123	0,005	8,613	XRF (pressed pellet)	ISO 17025	1,126	1,119	CR 10299:1998; information only
46	0,897	0,002	-0,803	XRF (fusion)	ISO 17025	0,896	0,899	DIN EN 196-2
47	0,931	0,000	0,599	XRF (fusion)	no accreditation	0,931	0,931	
49	1,368	0,081	18,886	XRF (pressed pellet)	no accreditation	1,425	1,311	information only
50	1,040	0,001	5,181	XRF (pressed pellet)	no accreditation	1,041	1,040	information only
51	0,901	0,013	-0,656	XRF (fusion)	no accreditation	0,910	0,892	DIN 51418-2-2015-03

2022_01 Slag

Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,013 %**
Measurand:	**S**	**Repeatability s.d.:**	**0,002 %**
Mean ± U(Mean):	**0,145 ± 0,005 %**	**Range of tolerance:**	**0,119 - 0,171 % (|z-score| <= 2,000)**
No. of laboratories:	**25**	**Statistical method:**	**Q/Hampel**



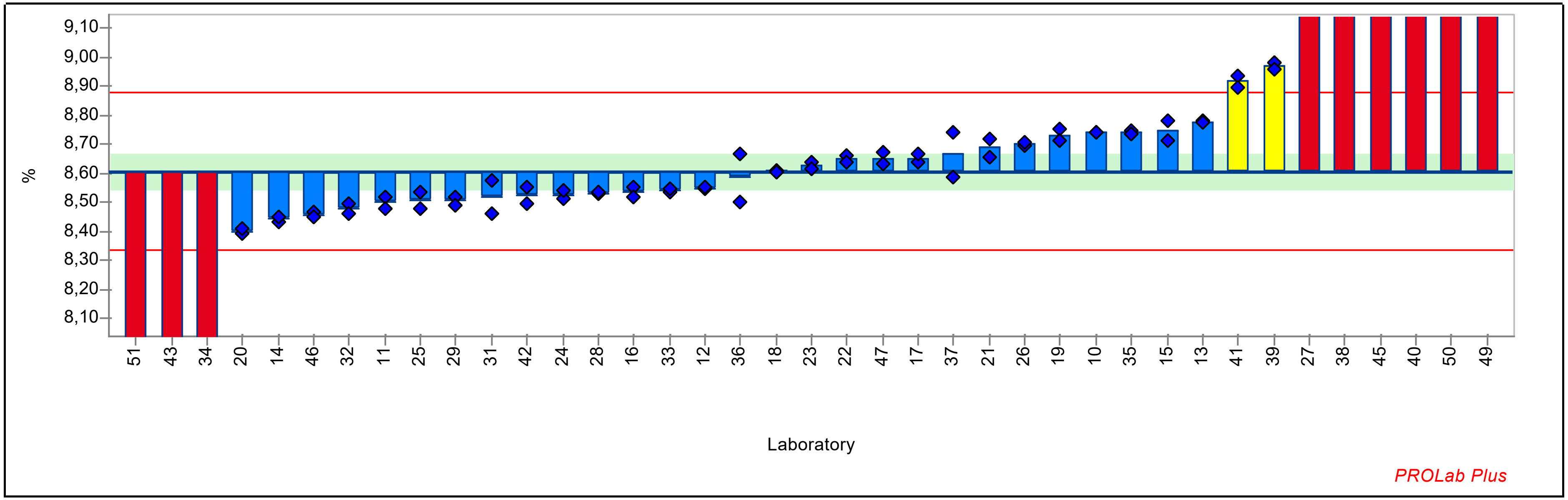
Lab code	**Lab mean**	**s.d.**	**z-score**	**Analytical method**	**Accreditation**	**Conc. 1**	**Conc. 2**	**Comment**
10	0,162	0,006	1,331	Other Method	no accredition	0,166	0,158	Elemental Analyzer
12	0,213	0,000	5,267	Other Method	no accredition	0,213	0,213	information only
14	0,142	0,010	-0,213	Other Method	no accredition	0,135	0,149	Combustion, IR
15	0,145	0,000	0,019	Other Method	ISO 17025	0,145	0,145	Combustion, IR
16	0,149	0,006	0,366	XRF (fusion)	no accredition	0,154	0,145	
17	0,147	0,001	0,212	Other Method	ISO 17025	0,148	0,147	IR

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
18	0,128	0,002	-1,332	Other Method	no accredition	0,126	0,129	DIN 51085:2015-01
19	0,148	0,011	0,212	Other Method	no accredition	0,155	0,140	Combustion, IR
20	0,146	0,001	0,135	Other Method	no accredition	0,146	0,147	Combustion, IR
21	0,141	0,001	-0,290	Other Method	no accredition	0,142	0,140	DIN EN ISO 15350
22	0,145	0,001	0,058	XRF (fusion)	no accredition	0,145	0,146	
23	0,147	0,000	0,173	XRF (fusion)	no accredition	0,147	0,147	
25	0,145	0,002	0,058	Other Method	no accredition	0,144	0,147	DIN 51085:2015-01
26	0,141	0,001	-0,251	Other Method	no accredition	0,142	0,141	Combustion, IR
27	0,153	0,001	0,675	Other Method	no accredition	0,153	0,154	DIN 51085:2015-01
28	0,153	0,001	0,637	XRF (fusion)	no accredition	0,154	0,152	
31	0,134	0,000	-0,830	Other Method	no accredition	0,134	0,134	Infrared detection
33	0,180	0,003	2,720	Other Method	no accredition	0,178	0,182	ISO 15350
34	0,154	0,001	0,714	Other Method	no accredition	0,153	0,155	Combustion
35	0,139	0,001	-0,483	XRF (fusion)	no accredition	0,139	0,138	
37	0,123	0,014	-1,679	XRF (fusion)	no accredition	0,113	0,133	DIN EN ISO 12677
38	0,213	0,004	5,306	XRF (pressed pellet)	no accredition	0,211	0,216	information only
39	0,139	0,000	-0,444	XRF (pressed pellet)	no accredition	0,139	0,139	UniQuant, information only
40	0,173	0,000	2,180	XRF (pressed pellet)	no accredition	0,173	0,173	information only
41	0,124	0,001	-1,602	XRF (fusion)	ISO 17025	0,123	0,125	DIN 51418-2-2015-03
42	0,166	0,001	1,601	Other Method	no accredition	0,166	0,165	Combustion, IR
43	0,190	0,002	3,454	XRF (pressed pellet)	no accredition	0,188	0,191	standardless analysis; information only
44	0,240	0,007	7,351	Other Method	no accredition	0,245	0,235	EN 16424:2014; information only
45	0,183	0,001	2,952	XRF (pressed pellet)	ISO 17025	0,184	0,182	CR 10299:1998; information only
46	0,149	0,009	0,366	Other Method	ISO 17025	0,143	0,156	Combustion, IR
47	0,144	0,000	-0,058	Other Method	no accredition	0,144	0,144	
49	0,377	0,015	17,887	XRF (pressed pellet)	no accredition	0,387	0,366	information only
50	0,207	0,000	4,804	XRF (pressed pellet)	no accredition	0,207	0,207	information only
51	0,111	0,009	-2,644	XRF (fusion)	no accredition	0,117	0,104	DIN 51085:2015-01

2022_01 Slag

Sample:	**FLX-141**	**Reproducibility s.d.:**	**0,135 %**
Measurand:	**SiO2**	**Repeatability s.d.:**	**0,032 %**
Mean ± U(Mean):	**8,606 ± 0,058 %**	**Range of tolerance:**	**8,336 - 8,876 % (|z-score| <= 2,000)**
No. of laboratories:	**30**	**Statistical method:**	**Q/Hampel**



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	8,740	0,003	0,994	Other Method	no accredition	8,738	8,742	ICP-OES
11	8,500	0,028	-0,784	XRF (fusion)	ISO 17025	8,520	8,480	
12	8,548	0,004	-0,428	XRF (fusion)	no accredition	8,545	8,551	DIN EN 196-2
13	8,777	0,006	1,265	XRF (fusion)	ISO 17025	8,781	8,772	DIN 51001-2003-08
14	8,441	0,012	-1,217	Other Method	ISO 17025	8,433	8,450	ICP-OES
15	8,745	0,050	1,035	XRF (fusion)	ISO 17025	8,710	8,781	PN-EN ISO 12677: 2020

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	8,535	0,026	-0,521	XRF (fusion)	ISO 17025	8,554	8,517	DIN 51418-2-2015-03
17	8,651	0,023	0,335	XRF (fusion)	ISO 17025	8,635	8,667	DIN EN ISO 12677
18	8,608	0,004	0,016	XRF (fusion)	no accredition	8,611	8,605	DIN 51001-2003-08
19	8,730	0,026	0,924	XRF (fusion)	no accredition	8,749	8,712	DIN 51001 Bbl 1 2010-05
20	8,399	0,011	-1,528	XRF (fusion)	no accredition	8,392	8,407	EN 196-2
21	8,686	0,045	0,598	XRF (fusion)	no accredition	8,655	8,718	DIN 51001-2003-08
22	8,649	0,018	0,324	XRF (fusion)	no accredition	8,662	8,637	
23	8,627	0,015	0,154	XRF (fusion)	no accredition	8,637	8,616	
24	8,525	0,023	-0,598	XRF (fusion)	no accredition	8,509	8,541	
25	8,505	0,042	-0,750	XRF (fusion)	no accredition	8,475	8,534	DIN 51001-2003-08
26	8,701	0,009	0,702	XRF (fusion)	no accredition	8,694	8,707	DIN 51418-2-2015-03
27	9,534	0,012	6,872	XRF (fusion)	no accredition	9,542	9,525	DIN 51418-2-2015-03
28	8,529	0,004	-0,569	XRF (fusion)	no accredition	8,526	8,532	
29	8,505	0,021	-0,747	XRF (fusion)	no accredition	8,520	8,490	
31	8,517	0,081	-0,661	XRF (fusion)	no accredition	8,574	8,459	
32	8,478	0,024	-0,947	XRF (fusion)	ISO 17025	8,495	8,461	DMI 31-305 (ASTM E1361, ASTM E1621)
33	8,541	0,005	-0,484	XRF (fusion)	no accredition	8,537	8,544	NF EN ISO 12677
34	7,997	0,010	-4,510	XRF (fusion)	no accredition	7,990	8,004	information only
35	8,742	0,006	1,005	XRF (fusion)	no accredition	8,746	8,737	
36	8,584	0,117	-0,165	XRF (fusion)	no accredition	8,666	8,501	DIN 51001-2003-08
37	8,664	0,109	0,431	XRF (fusion)	no accredition	8,741	8,587	DIN EN ISO 12677
38	9,535	0,308	6,887	XRF (pressed pellet)	no accredition	9,318	9,753	information only
39	8,970	0,014	2,698	XRF (fusion)	no accredition	8,980	8,960	
40	11,009	0,050	17,798	XRF (pressed pellet)	no accredition	11,044	10,973	information only
41	8,915	0,028	2,291	XRF (fusion)	ISO 17025	8,935	8,895	DIN 51418-2-2015-03
42	8,522	0,041	-0,621	XRF (fusion)	no accredition	8,551	8,493	
43	7,715	0,445	-6,599	XRF (pressed pellet)	no accredition	8,030	7,400	standardless analysis; information only
45	9,660	0,000	7,809	XRF (pressed pellet)	ISO 17025	9,660	9,660	CR 10299:1998; information only
46	8,454	0,012	-1,121	XRF (fusion)	ISO 17025	8,463	8,446	DIN EN 196-2
47	8,650	0,028	0,328	XRF (fusion)	no accredition	8,670	8,630	
49	17,720	0,368	67,515	XRF (pressed pellet)	no accredition	17,460	17,980	information only
50	12,167	0,091	26,380	XRF (pressed pellet)	no accredition	12,231	12,103	information only
51	7,348	0,071	-9,321	XRF (fusion)	no accredition	7,398	7,297	DIN 51418-2-2015-03; information only

2022_01 Slag

Sample: FLX-141

Measurand: TiO2

Mean ± U(Mean): 0,740 ± 0,013 %

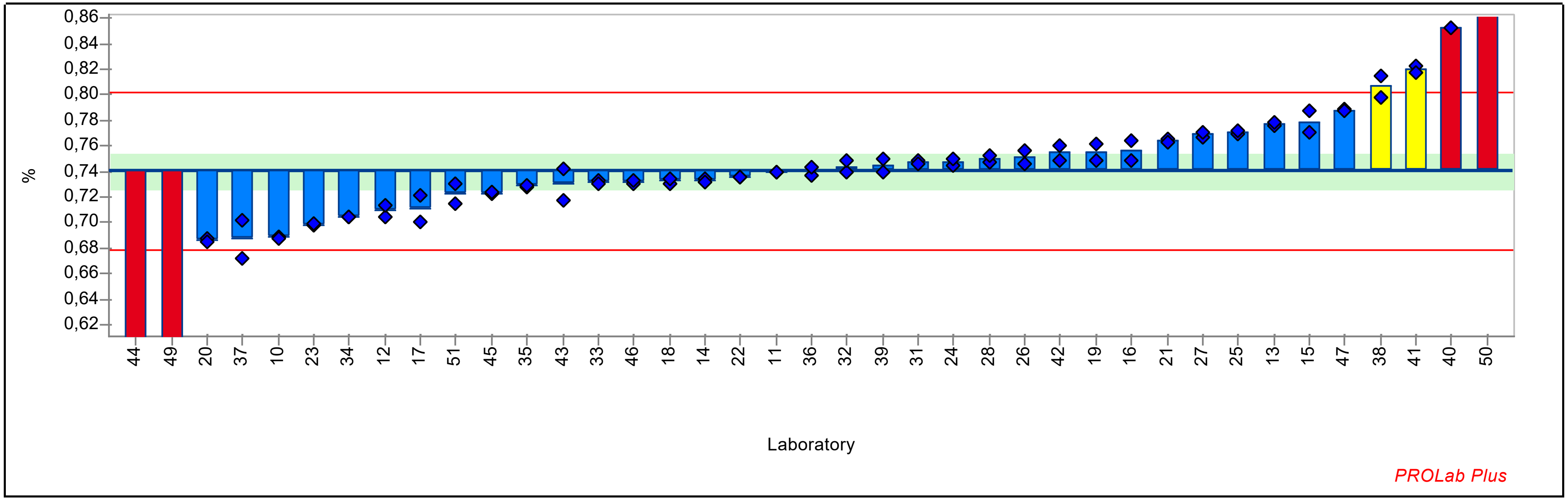
No. of laboratories: 32

Reproducibility s.d.: 0,031 %

Repeatability s.d.: 0,004 %

Range of tolerance: 0,679 - 0,802 % (|z-score| <= 2,000)

Statistical method: Q/Hampel



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	0,688	0,001	-1,684	Other Method	no accredition	0,689	0,688	ICP-OES
11	0,740	0,000	-0,005	XRF (fusion)	ISO 17025	0,740	0,740	
12	0,710	0,006	-1,000	XRF (fusion)	no accredition	0,705	0,714	DIN EN 196-2
13	0,777	0,001	1,201	XRF (fusion)	ISO 17025	0,776	0,778	DIN 51001-2003-08
14	0,733	0,001	-0,234	Other Method	ISO 17025	0,734	0,732	ICP-OES
15	0,779	0,011	1,266	XRF (fusion)	ISO 17025	0,787	0,771	PN-EN ISO 12677: 2021

2022_01 Slag

Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
16	0,756	0,011	0,532	XRF (fusion)	ISO 17025	0,764	0,749	DIN 51418-2-2015-03
17	0,711	0,014	-0,951	XRF (fusion)	ISO 17025	0,721	0,701	DIN EN ISO 12677
18	0,732	0,002	-0,250	XRF (fusion)	no accreditation	0,731	0,734	DIN 51001-2003-08
19	0,756	0,009	0,500	XRF (fusion)	no accreditation	0,762	0,749	DIN 51001 Bbl 1 2010-05
20	0,686	0,002	-1,749	XRF (fusion)	no accreditation	0,688	0,685	EN 196-2
21	0,764	0,001	0,777	XRF (fusion)	no accreditation	0,765	0,763	DIN 51001-2003-08
22	0,736	0,000	-0,136	XRF (fusion)	no accreditation	0,736	0,736	
23	0,698	0,001	-1,358	XRF (fusion)	no accreditation	0,698	0,699	
24	0,748	0,004	0,239	XRF (fusion)	no accreditation	0,745	0,750	
25	0,770	0,002	0,989	XRF (fusion)	no accreditation	0,769	0,772	DIN 51001-2003-08
26	0,752	0,008	0,369	XRF (fusion)	no accreditation	0,746	0,757	DIN 51418-2-2015-03
27	0,769	0,003	0,940	XRF (fusion)	no accreditation	0,767	0,771	DIN 51418-2-2015-03
28	0,750	0,004	0,304	XRF (fusion)	no accreditation	0,747	0,752	
31	0,747	0,001	0,223	XRF (fusion)	no accreditation	0,748	0,746	
32	0,744	0,006	0,125	XRF (fusion)	ISO 17025	0,740	0,748	DMI 31-305 (ASTM E1361, ASTM E1621)
33	0,732	0,001	-0,266	XRF (fusion)	no accreditation	0,733	0,731	NF EN ISO 12677
34	0,704	0,000	-1,179	XRF (fusion)	no accreditation	0,704	0,704	
35	0,728	0,001	-0,380	XRF (fusion)	no accreditation	0,728	0,729	
36	0,740	0,005	0,011	XRF (fusion)	no accreditation	0,737	0,744	DIN 51001-2003-08
37	0,687	0,021	-1,733	XRF (fusion)	no accreditation	0,672	0,702	DIN EN ISO 12677
38	0,806	0,012	2,162	XRF (pressed pellet)	no accreditation	0,815	0,798	information only
39	0,745	0,007	0,158	XRF (fusion)	no accreditation	0,750	0,740	
40	0,853	0,001	3,662	XRF (pressed pellet)	no accreditation	0,853	0,852	information only
41	0,821	0,004	2,618	XRF (fusion)	ISO 17025	0,823	0,818	DIN 51418-2-2015-03
42	0,754	0,008	0,467	XRF (fusion)	no accreditation	0,760	0,749	
43	0,730	0,017	-0,331	XRF (pressed pellet)	no accreditation	0,718	0,742	standardless analysis; information only
44	0,390	0,037	-11,414	Other Method	no accreditation	0,416	0,364	EN 16424:2014; information only
45	0,723	0,001	-0,560	XRF (pressed pellet)	ISO 17025	0,722	0,724	CR 10299:1998; information only
46	0,732	0,001	-0,266	XRF (fusion)	ISO 17025	0,731	0,733	DIN EN 196-2
47	0,788	0,001	1,559	XRF (fusion)	no accreditation	0,789	0,787	
49	0,480	0,036	-8,496	XRF (pressed pellet)	no accreditation	0,505	0,454	information only
50	1,125	0,018	12,560	XRF (pressed pellet)	no accreditation	1,113	1,138	information only
51	0,722	0,011	-0,576	XRF (fusion)	no accreditation	0,730	0,715	DIN 51418-2-2015-03

Sample: FLX-141

Measurand: V2O5

Mean ± U(Mean): 0,146 ± 0,007 %

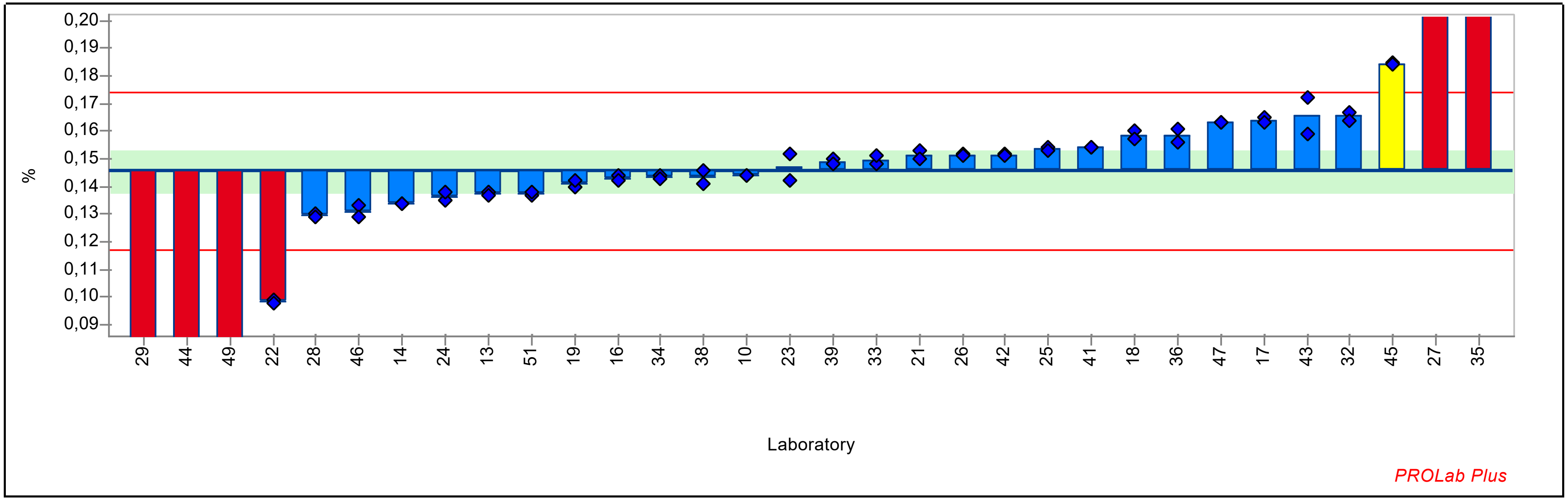
No. of laboratories: 21

Reproducibility s.d.: 0,014 %

Repeatability s.d.: 0,001 %

Range of tolerance: 0,117 - 0,174 % (|z-score| <= 2,000)

Statistical method: Q/Hampel



Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
10	0,144	0,000	-0,110	Other Method	no accredition	0,144	0,144	ICP-OES
13	0,138	0,001	-0,568	XRF (fusion)	ISO 17025	0,138	0,137	DIN 51001-2003-08
14	0,134	0,000	-0,815	Other Method	ISO 17025	0,134	0,134	ICP-OES
16	0,143	0,001	-0,181	XRF (fusion)	ISO 17025	0,144	0,142	DIN 51418-2-2015-03
17	0,164	0,001	1,300	XRF (fusion)	ISO 17025	0,165	0,163	DIN EN ISO 12677
18	0,159	0,002	0,912	XRF (fusion)	no accredition	0,160	0,157	standardless; information only

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Lab code	Lab mean	s.d.	z-score	Analytical method	Accreditation	Conc. 1	Conc. 2	Comment
19	0,141	0,001	-0,322	XRF (fusion)	no accredition	0,140	0,142	DIN 51001 Bbl 1 2010-05
21	0,151	0,002	0,419	XRF (fusion)	no accredition	0,153	0,150	DIN 51001-2003-08
22	0,099	0,001	-3,318	XRF (fusion)	no accredition	0,099	0,098	
23	0,147	0,007	0,101	XRF (fusion)	no accredition	0,142	0,152	
24	0,137	0,002	-0,639	XRF (fusion)	no accredition	0,135	0,138	
25	0,153	0,001	0,560	XRF (fusion)	no accredition	0,154	0,153	DIN 51001-2003-08
26	0,151	0,001	0,419	XRF (fusion)	no accredition	0,152	0,151	DIN 51418-2-2015-03
27	0,396	0,004	17,620	XRF (fusion)	no accredition	0,398	0,393	DIN 51418-2-2015-03; Information only
28	0,130	0,001	-1,132	XRF (fusion)	no accredition	0,130	0,129	
29	0,022	0,001	-8,676	XRF (fusion)	no accredition	0,022	0,023	information only
32	0,166	0,002	1,406	XRF (fusion)	ISO 17025	0,167	0,164	DMI 31-305 (ASTM E1361, ASTM E1621)
33	0,149	0,002	0,278	XRF (pressed pellet)	no accredition	0,148	0,151	semi-quantitative; information only
34	0,143	0,001	-0,145	XRF (fusion)	no accredition	0,144	0,143	
35	0,553	0,007	28,724	XRF (fusion)	no accredition	0,548	0,558	information only
36	0,159	0,004	0,912	XRF (fusion)	no accredition	0,156	0,161	standardless; information only
38	0,143	0,004	-0,145	XRF (pressed pellet)	no accredition	0,146	0,141	information only
39	0,149	0,001	0,242	XRF (fusion)	no accredition	0,150	0,148	
41	0,154	0,000	0,595	XRF (fusion)	ISO 17025	0,154	0,154	DIN 51418-2-2015-03
42	0,151	0,001	0,419	XRF (fusion)	no accredition	0,152	0,151	
43	0,165	0,009	1,406	XRF (pressed pellet)	no accredition	0,159	0,172	standardless analysis; information only
44	0,056	0,006	-6,314	Other Method	no accredition	0,060	0,052	EN 16424:2014; information only
45	0,184	0,001	2,745	XRF (pressed pellet)	ISO 17025	0,185	0,184	CR 10299:1998; information only
46	0,131	0,003	-1,027	XRF (fusion)	ISO 17025	0,133	0,129	DIN EN 196-2
47	0,163	0,000	1,229	XRF (fusion)	no accredition	0,163	0,163	
49	0,075	0,005	-4,939	XRF (pressed pellet)	no accredition	0,079	0,072	information only
51	0,138	0,001	-0,568	XRF (fusion)	no accredition	0,137	0,138	DIN 51418-2-2015-03

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z-scores (per sample)

Sample: FLX-141

Lab code	Al2O3	CaO	Cr2O3	Fe2O3	K2O	Loss on Ignition	MgO	Mn2O3	P2O5	S	SiO2	TiO2	V2O5
10	-2,400	0,181	-0,967	-0,425	9,143	-0,704	0,969	-0,492	-0,740	1,331	0,994	-1,684	-0,110
11	-0,100	0,015	-1,190	-1,267	-0,376	1,860	-1,528	-0,752	0,411		-0,784	-0,005	
12	-0,585	-2,993		-0,649	1,434	14,974	-0,603	18,069	-1,786	5,267	-0,428	-1,000	
13	0,674	-1,145	0,721	-0,237	-1,046	-1,019	0,023	0,697	-0,280		1,265	1,201	-0,568
14	-0,179	-2,754	-0,839	-0,404	-0,108		-0,946	-0,017	-1,054	-0,213	-1,217	-0,234	-0,815
15	0,170	-0,568	1,867	0,122	-0,510	-0,058	-1,970	-0,547	0,160	0,019	1,035	1,266	
16	-0,802	0,119	0,243	-0,014		-1,084	0,459	0,311	1,206	0,366	-0,521	0,532	-0,181
17	-1,746	-0,460	-0,585	-0,592	-0,577	-0,121	0,522	-1,032	1,771	0,212	0,335	-0,951	1,300
18	-0,358	0,850	-0,935	1,260		-0,085	-0,515	-1,842	-0,008	-1,332	0,016	-0,250	0,912
19	1,049	-0,090	0,307	0,406	0,026	0,739	0,624	0,502	0,348	0,212	0,924	0,500	-0,322
20	-0,967	1,811	-0,648	0,099	-1,314	-0,014	-0,748	-0,667	-0,008	0,135	-1,528	-1,749	
21	0,600	1,518	0,275	1,885	0,764	-0,403	0,084	0,902	0,452	-0,290	0,598	0,777	0,419
22	1,095	-0,277	-0,298	0,651	0,428	-0,106	0,320	0,037	-0,196	0,058	0,324	-0,136	-3,318
23	0,521	-0,127	1,963	-0,286	-2,789	0,852	0,859	-0,065	1,143	0,173	0,154	-1,358	0,101
24	0,911	1,129	0,339	-1,001	0,630	-0,204	0,864	-0,366	0,536		-0,598	0,239	-0,639
25	0,170	-1,138	1,421	1,805	10,282	-0,561	0,287	1,971	0,243	0,058	-0,750	0,989	0,560
26	0,411	-0,515	0,880	-0,143	0,965	-1,382	0,044	0,413	-0,154	-0,251	0,702	0,369	0,419
27	3,550	-1,402	0,753	-1,070		-8,786	1,870	1,162	4,679	0,675	6,872	0,940	17,620
28	0,533	0,436	0,180	0,104	0,428	-0,252	0,216	0,656	0,494	0,637	-0,569	0,304	-1,132
29	-0,315	-6,036	-7,112	-1,264			-1,405	-0,485			-0,747		-8,676
31	-1,287	-0,653	-1,635	-0,385	2,573	0,402	0,582	-0,923	-1,724	-0,830	-0,661	0,223	
32	0,388	-0,050	0,466	-0,490	0,697	-0,942	0,355	0,222	0,201		-0,947	0,125	1,406
33	-0,054	1,373	0,625	0,533	1,367	-0,849	-0,603	0,646	0,055	2,720	-0,484	-0,266	0,278
34	-0,162	-0,487	1,071	0,538	-0,577	0,492	0,685	-0,038	3,968	0,714	-4,510	-1,179	-0,145
35	0,956	-0,860	-0,011	2,195	0,093	0,298	-1,576	0,109	-0,803	-0,483	1,005	-0,380	28,724

2022_01 Slag

Lab code	Al2O3	CaO	Cr2O3	Fe2O3	K2O	Loss on Ignition	MgO	Mn2O3	P2O5	S	SiO2	TiO2	V2O5
36	-0,396	1,928	-0,744	-0,389	1,032	-2,152	-0,436	-0,226	-1,452		-0,165	0,011	0,912
37	-0,143	-0,585	-1,667	-0,564	0,160	0,284	-0,365	16,118	-0,029	-1,679	0,431	-1,733	
38	10,745	5,855	0,848	2,062	3,579		-6,912	-0,544	-3,837	5,306	6,887	2,162	-0,145
39	3,364	-0,122	0,753	-1,225	-0,376	1,503	2,337	0,693	1,394	-0,444	2,698	0,158	0,242
40	8,211	16,758	-5,647	-7,115		-0,255	21,580		57,741	2,180	17,798	3,662	
41	-0,673	-0,198	-0,807	2,574		2,749	-0,427	1,845	0,118	-1,602	2,291	2,618	0,595
42	-0,573	0,033	-0,362	1,340	-0,175		-0,739	0,095	-0,154	1,601	-0,621	0,467	0,419
43	-3,494	8,999	2,918	1,428		-0,267	-13,940	3,376	2,336	3,454	-6,599	-0,331	1,406
44		3,419	-8,513	13,244	4,719	-5,274		4,551		7,351		-11,414	-6,314
45	7,855	6,289	5,656	-0,354	0,495		9,115	19,170	8,613	2,952	7,809	-0,560	2,745
46	0,552	-0,081	-0,648	0,452	-1,113	1,110	-0,101	-2,078	-0,803	0,366	-1,121	-0,266	-1,027
47	1,118	1,599	-0,043	-0,824	0,160	-0,371	-0,006	0,468	0,599	-0,058	0,328	1,559	1,229
49	40,342	-9,553	-6,220	-20,757	-0,108		12,192	-7,084	18,886	17,887	67,515	-8,496	-4,939
50	-0,179	1,503		-1,220	1,970		-11,755	3,188	5,181	4,804	26,380	12,560	
51	-1,008	1,826	0,052	-1,514	-0,644	2,425	2,951	-1,302	-0,656	-2,644	-9,321	-0,576	-0,568

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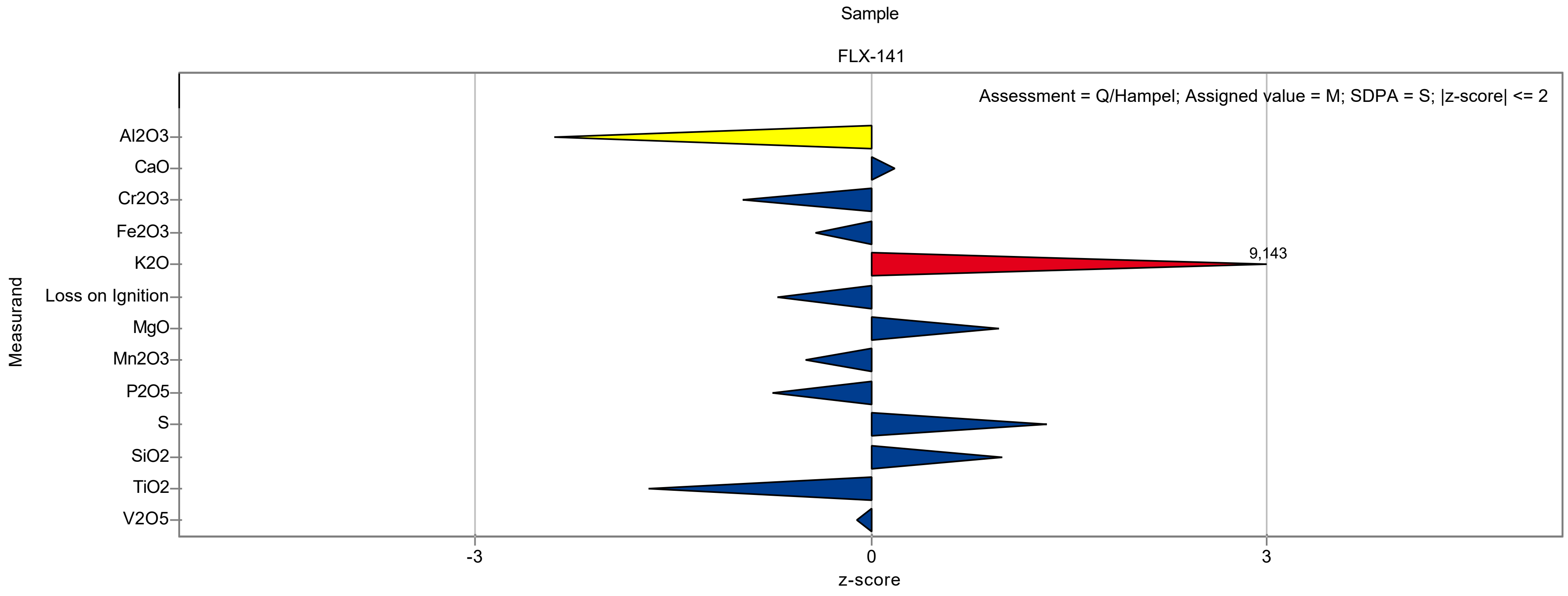
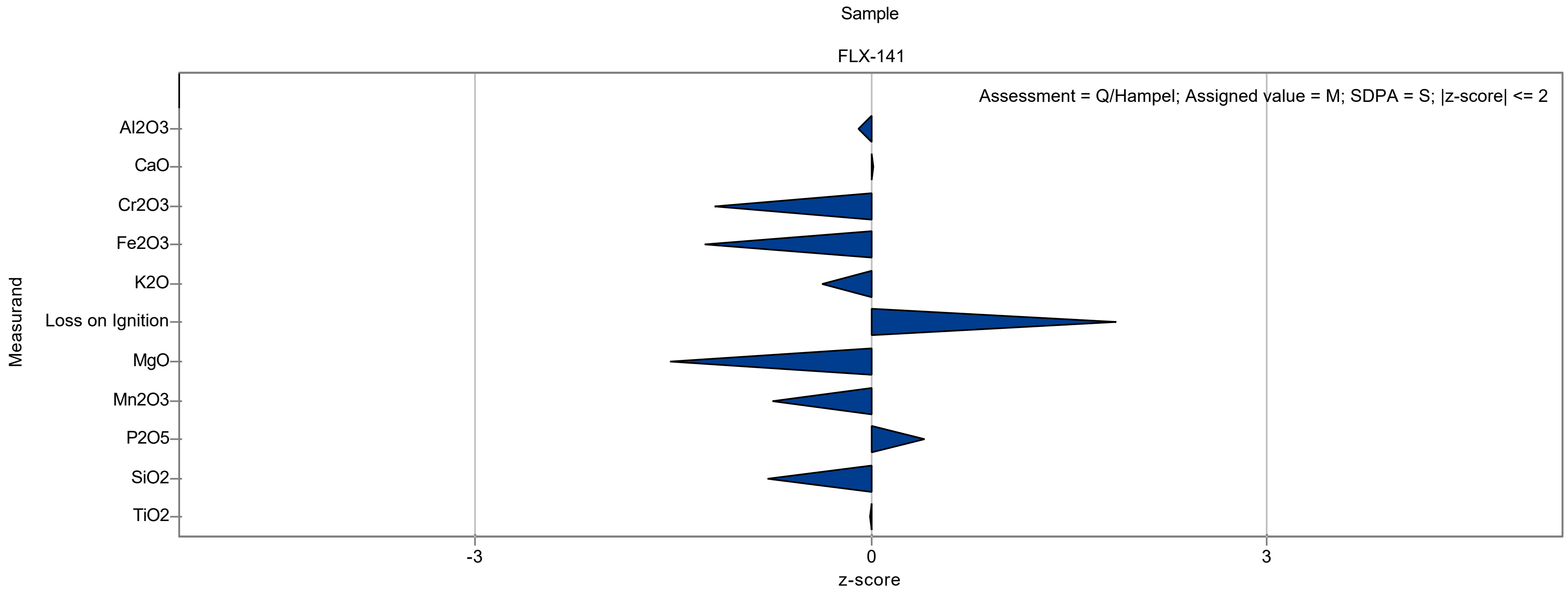
Laboratory chart of z-scores

Laboratory: 10



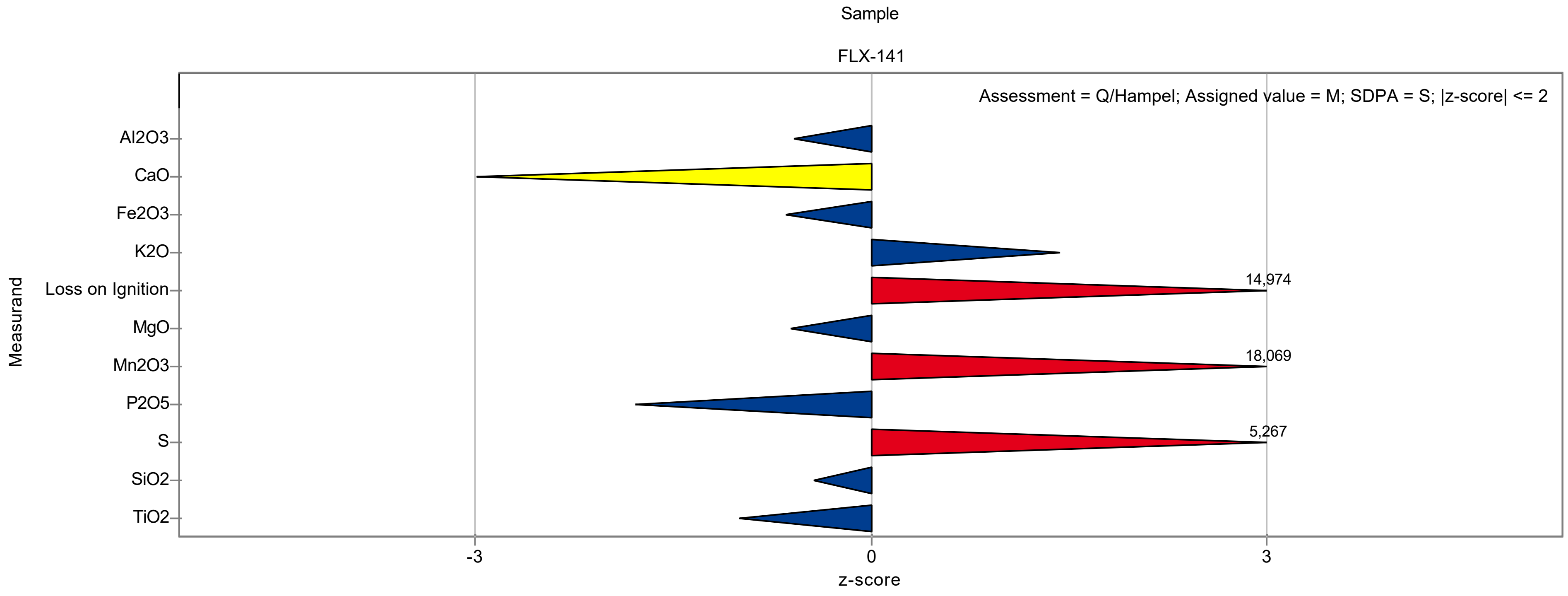
Laboratory chart of z-scores

Laboratory: 11



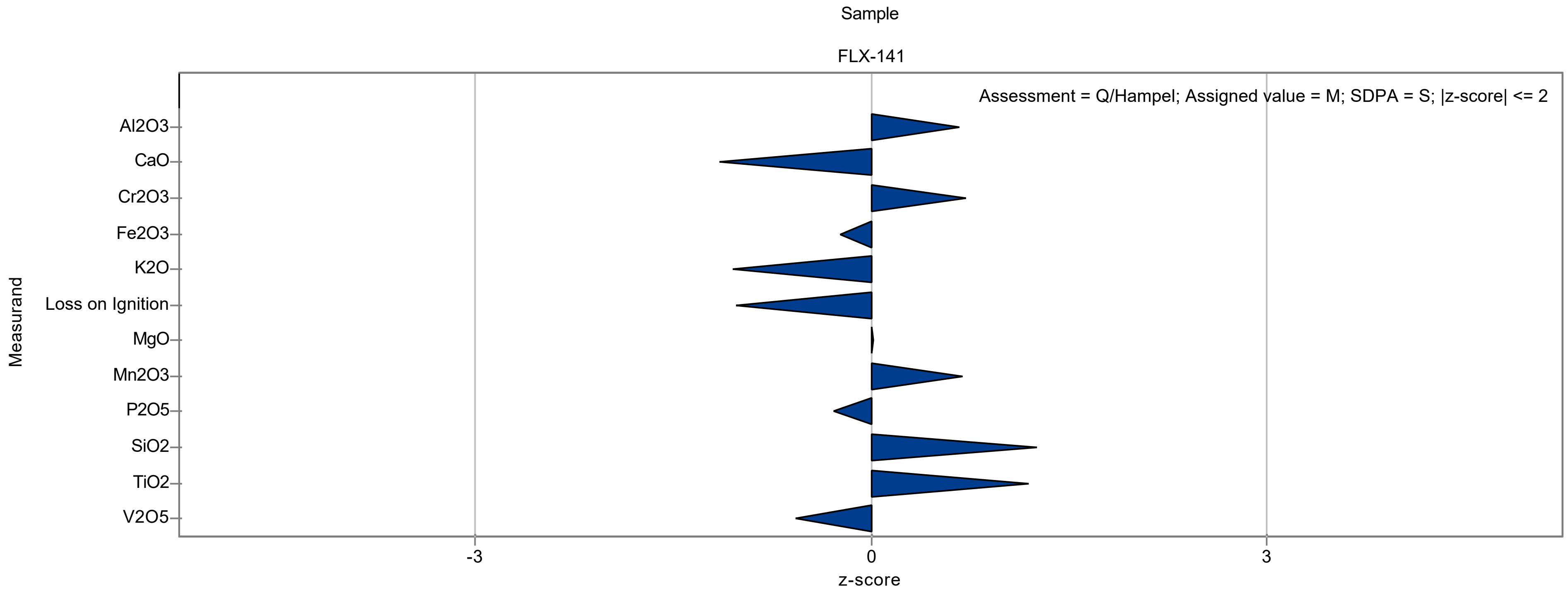
Laboratory chart of z-scores

Laboratory: 12



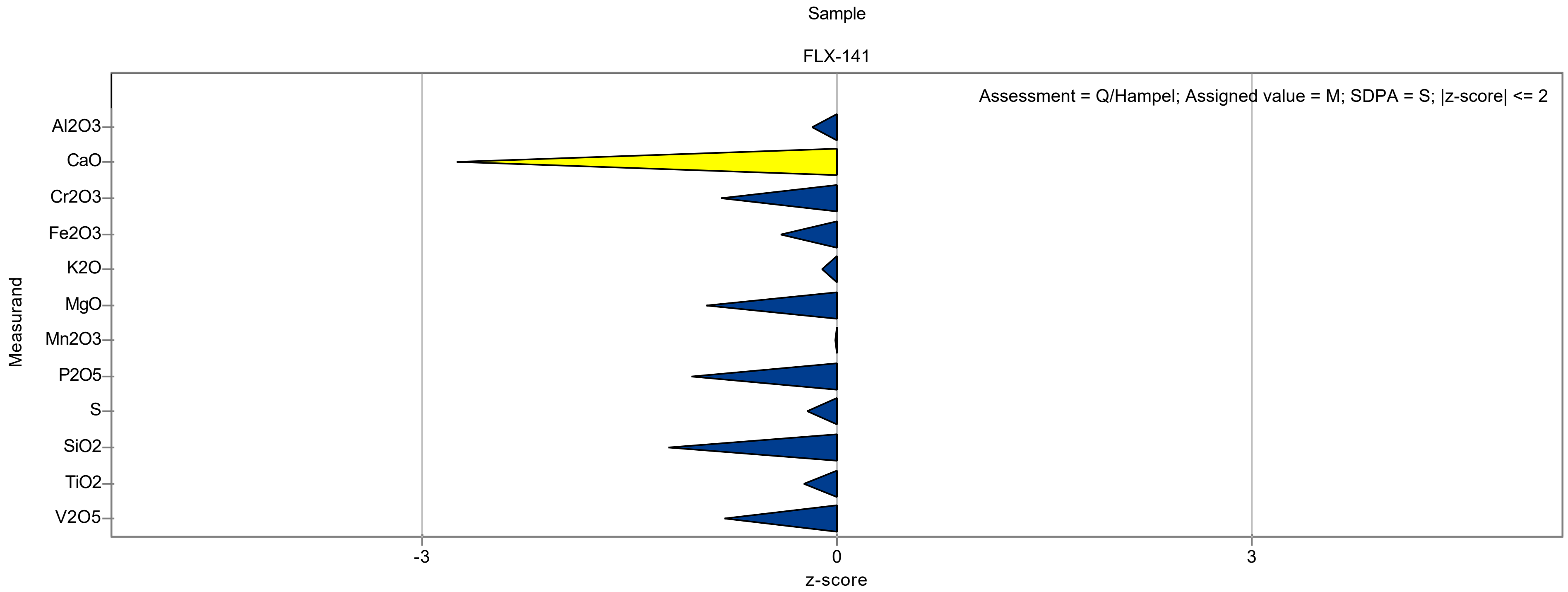
Laboratory chart of z-scores

Laboratory: 13



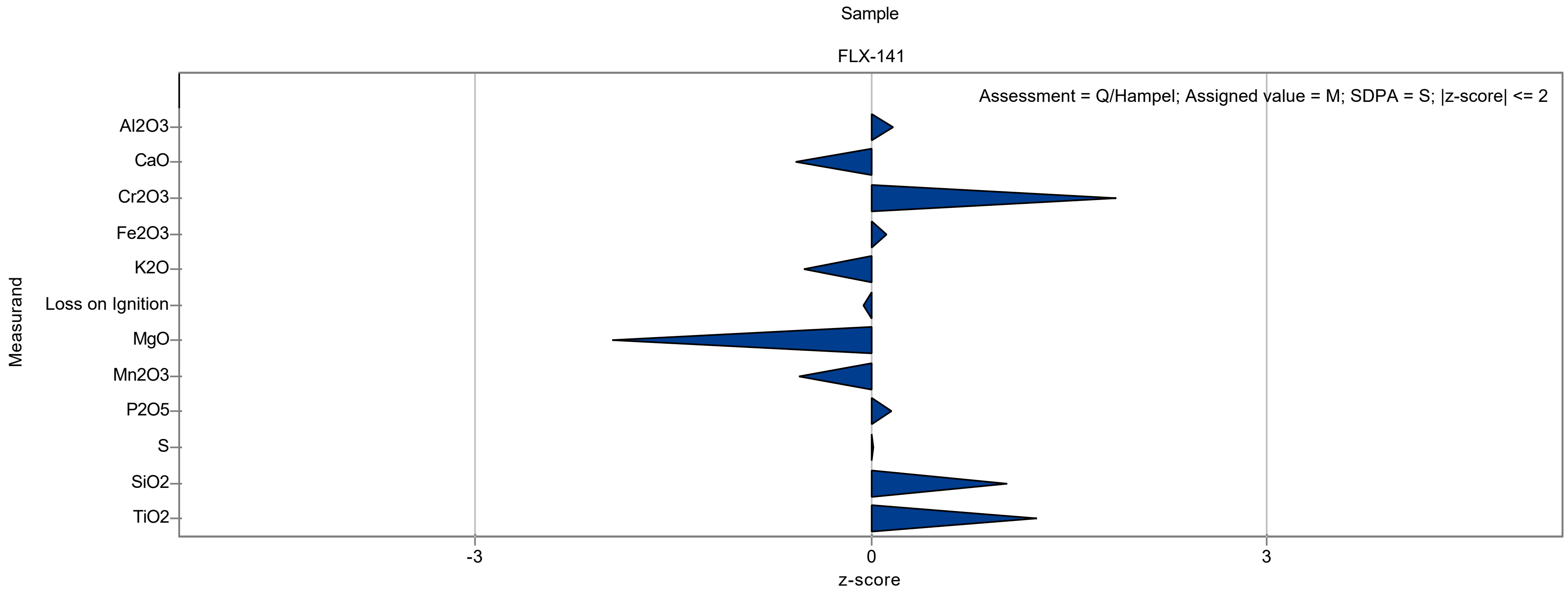
Laboratory chart of z-scores

Laboratory: 14



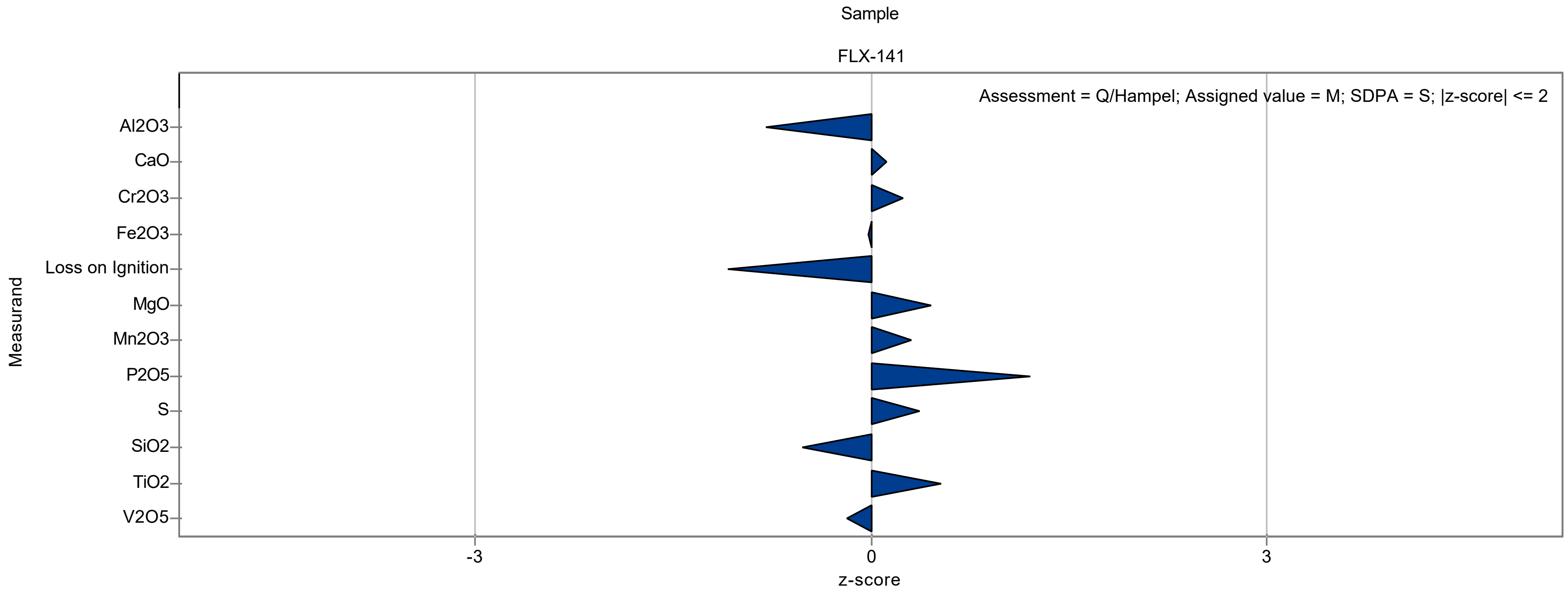
Laboratory chart of z-scores

Laboratory: 15



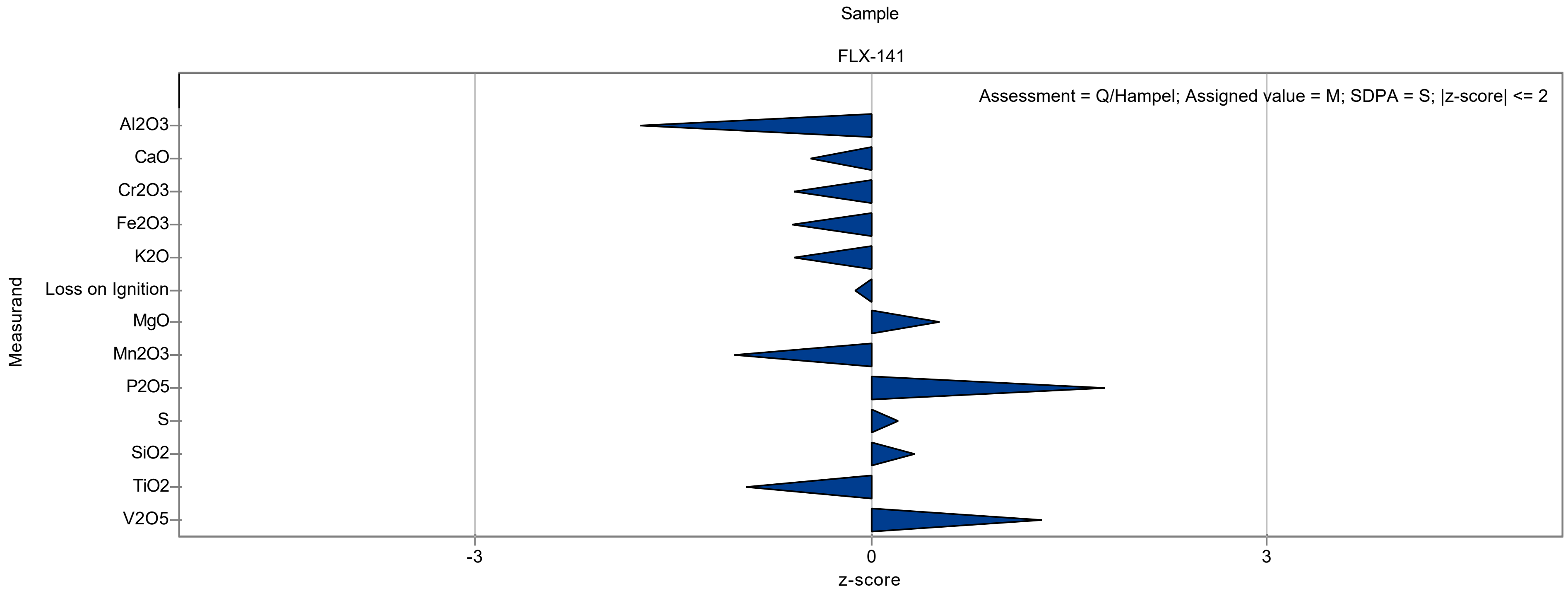
Laboratory chart of z-scores

Laboratory: 16



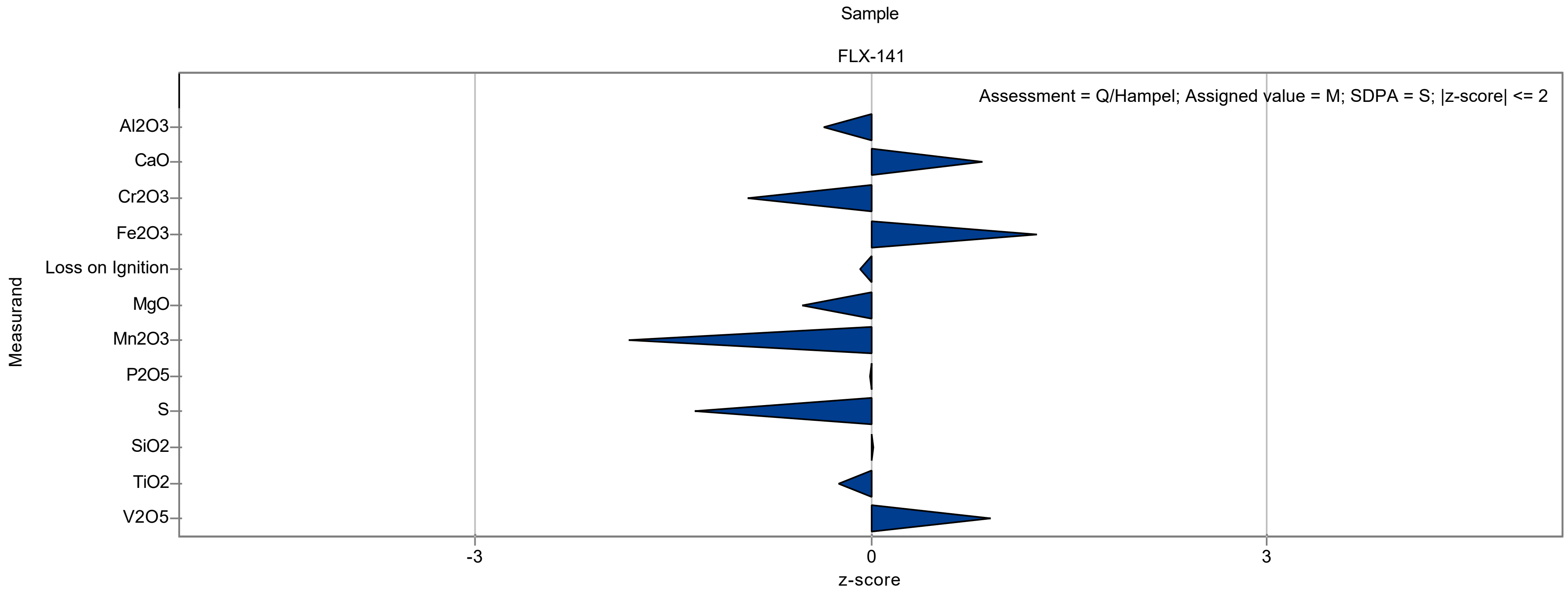
Laboratory chart of z-scores

Laboratory: 17



Laboratory chart of z-scores

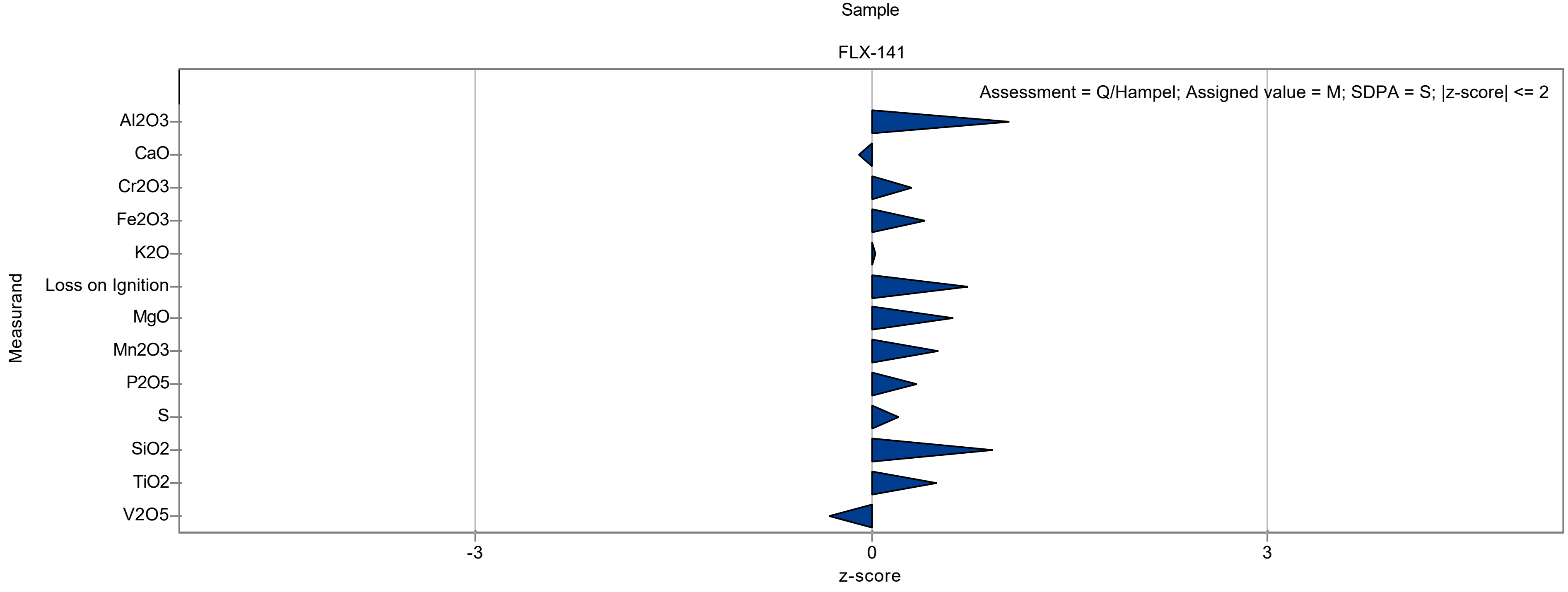
Laboratory: 18



2022_01 Slag

Laboratory chart of z-scores

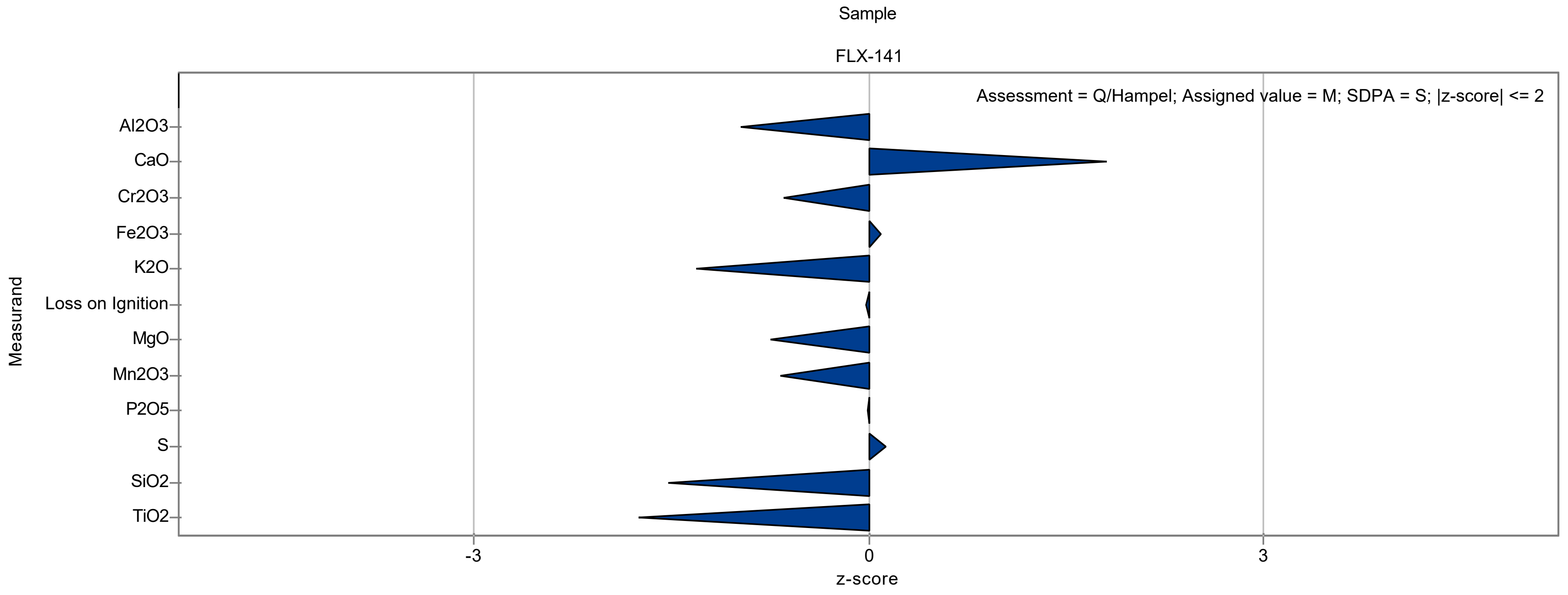
Laboratory: 19



2022_01 Slag

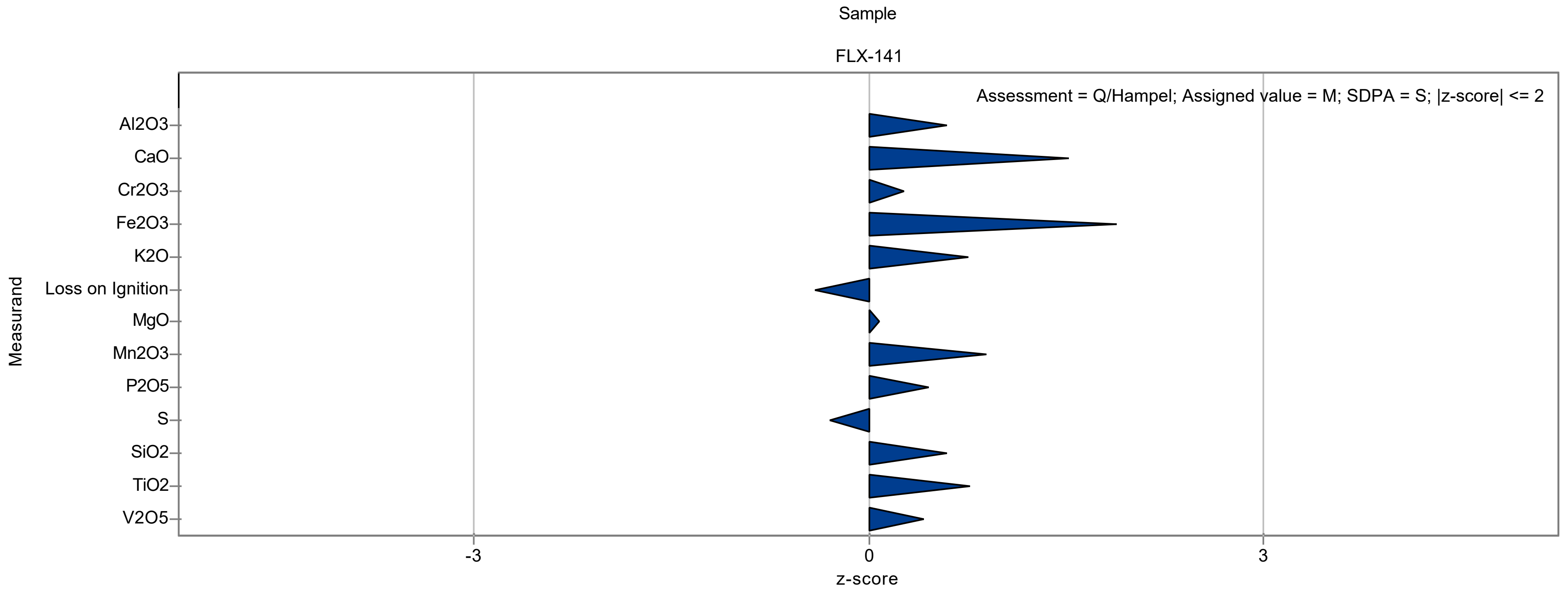
Laboratory chart of z-scores

Laboratory: 20



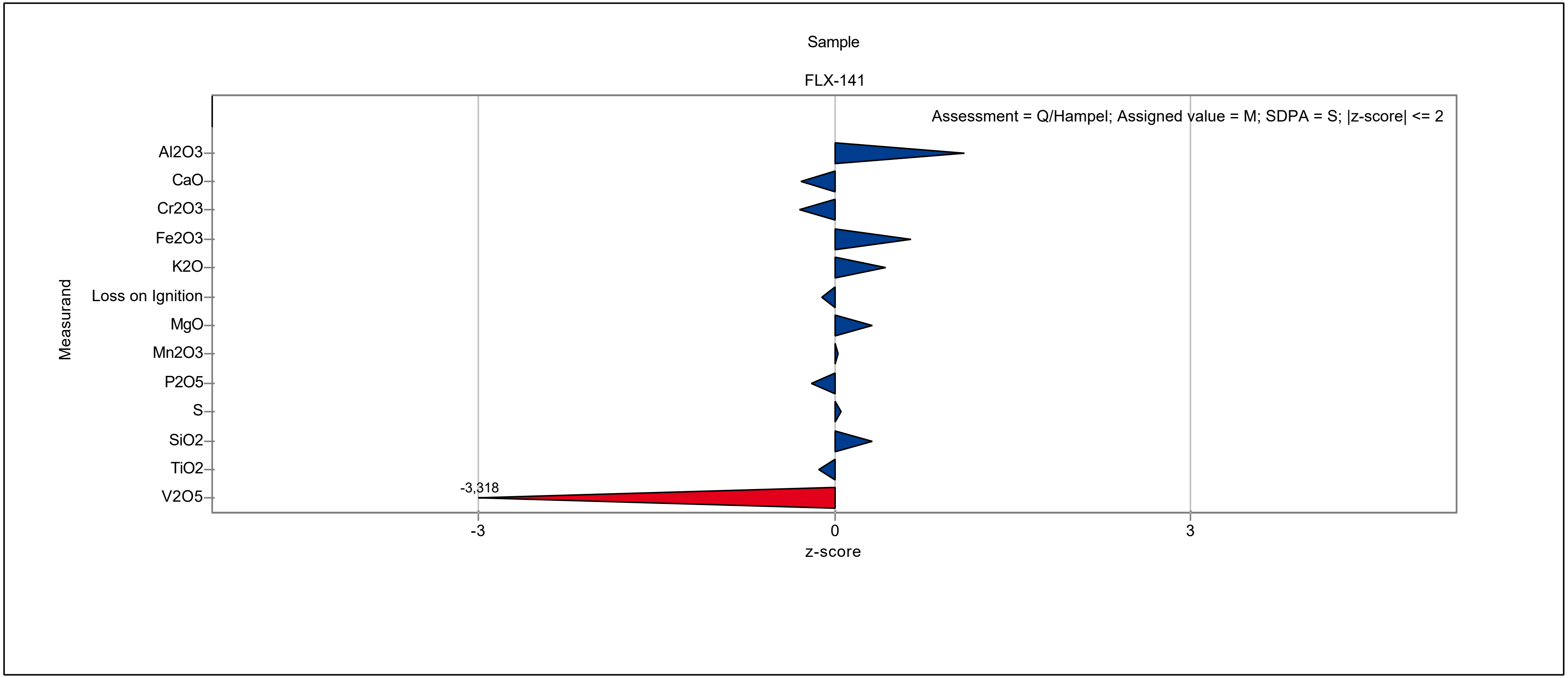
Laboratory chart of z-scores

Laboratory: 21



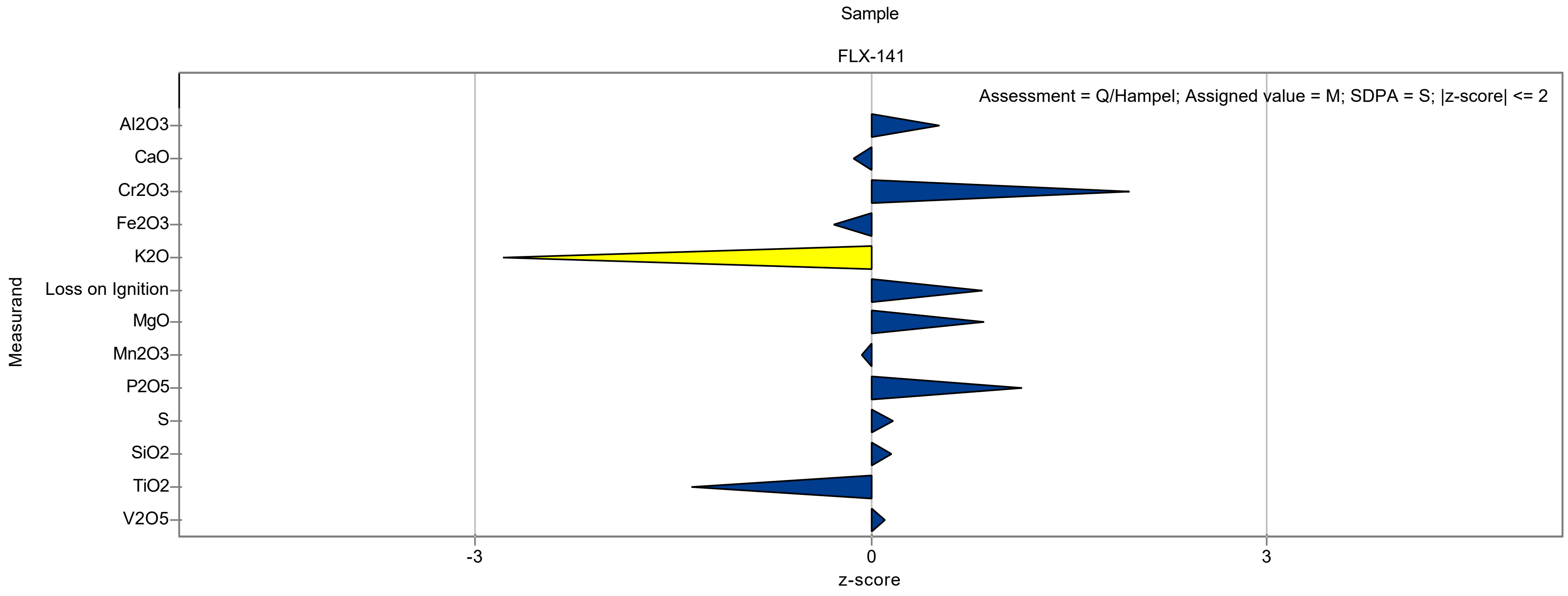
Laboratory chart of z-scores

Laboratory: 22



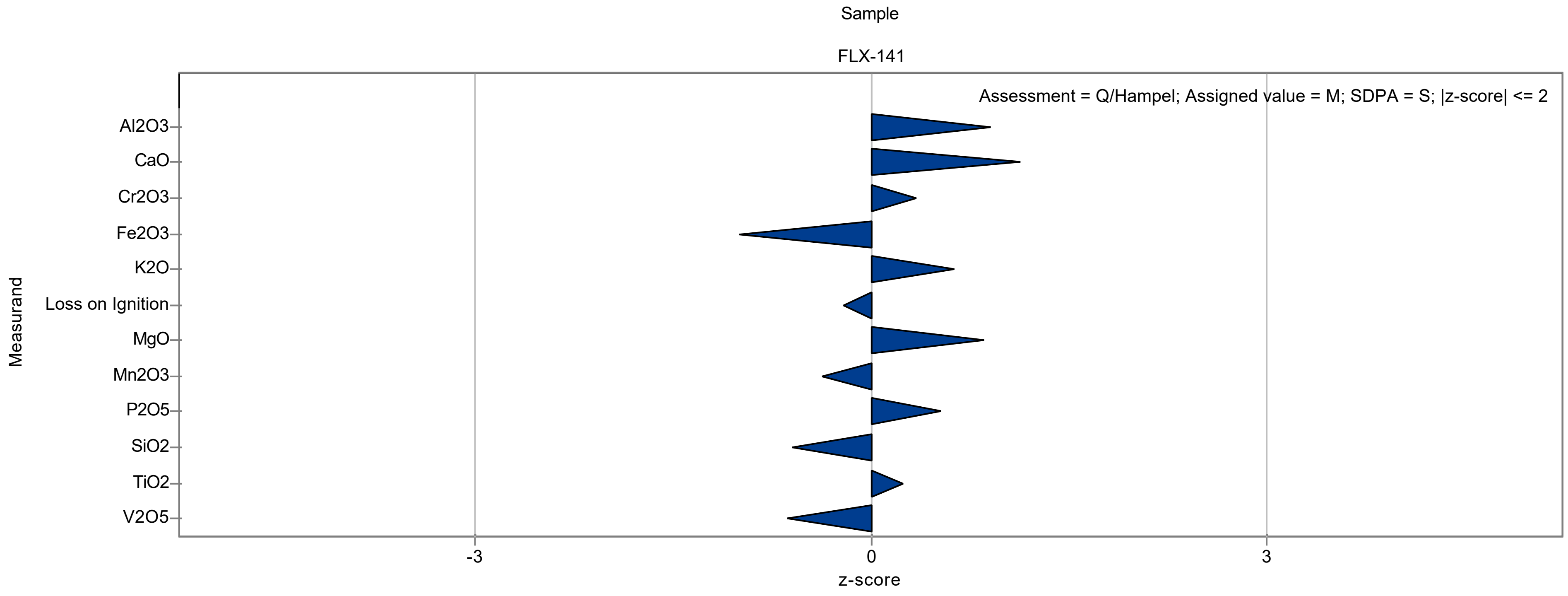
Laboratory chart of z-scores

Laboratory: 23



Laboratory chart of z-scores

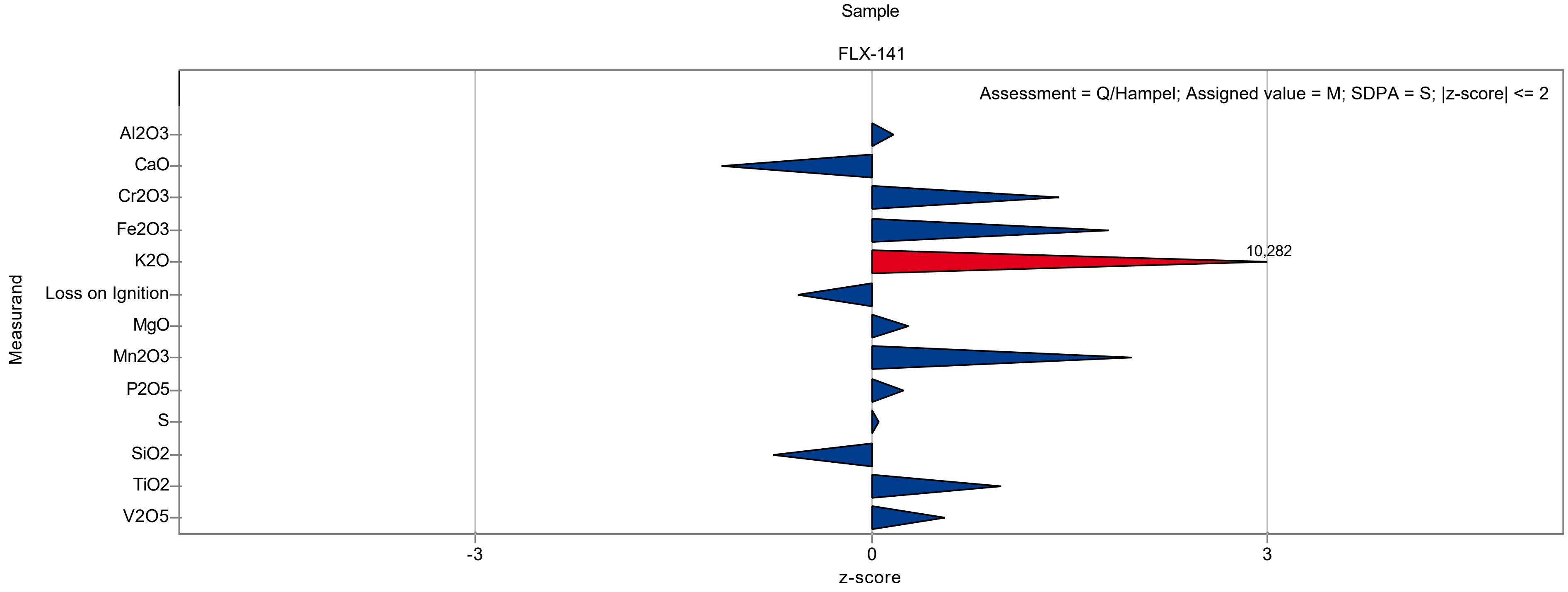
Laboratory: 24



2022_01 Slag

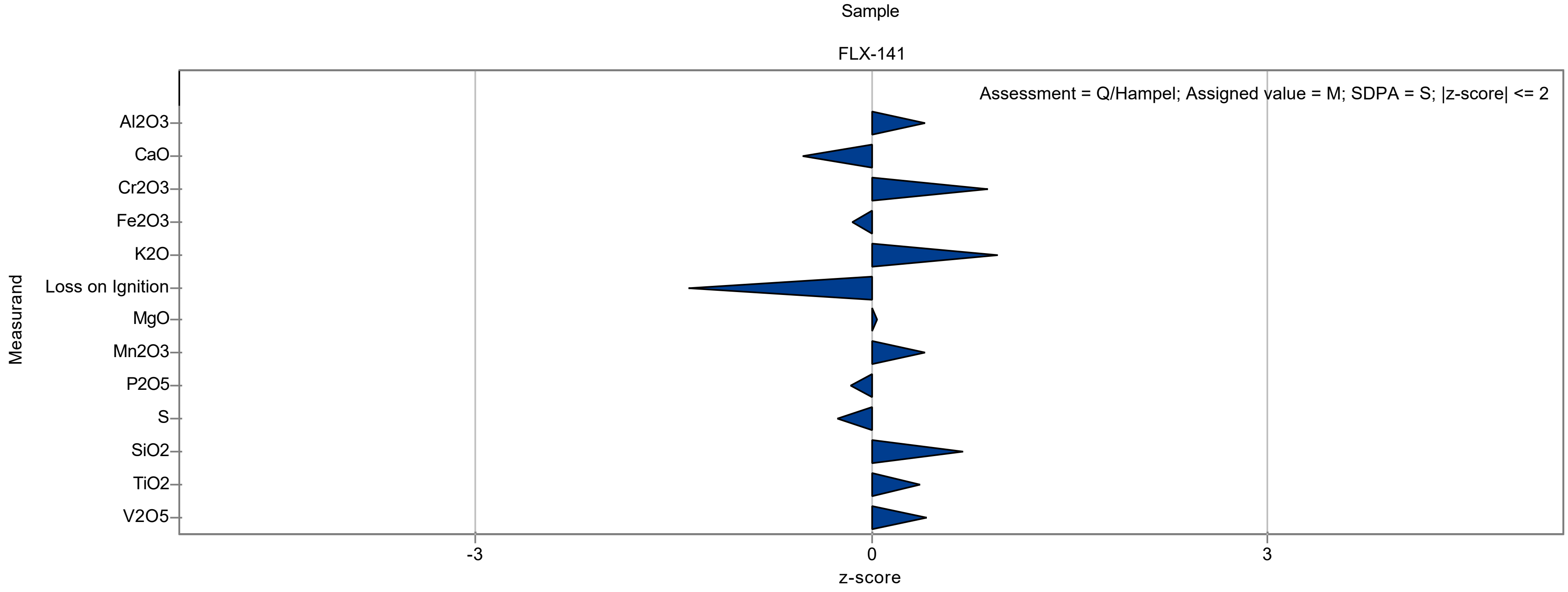
Laboratory chart of z-scores

Laboratory: 25



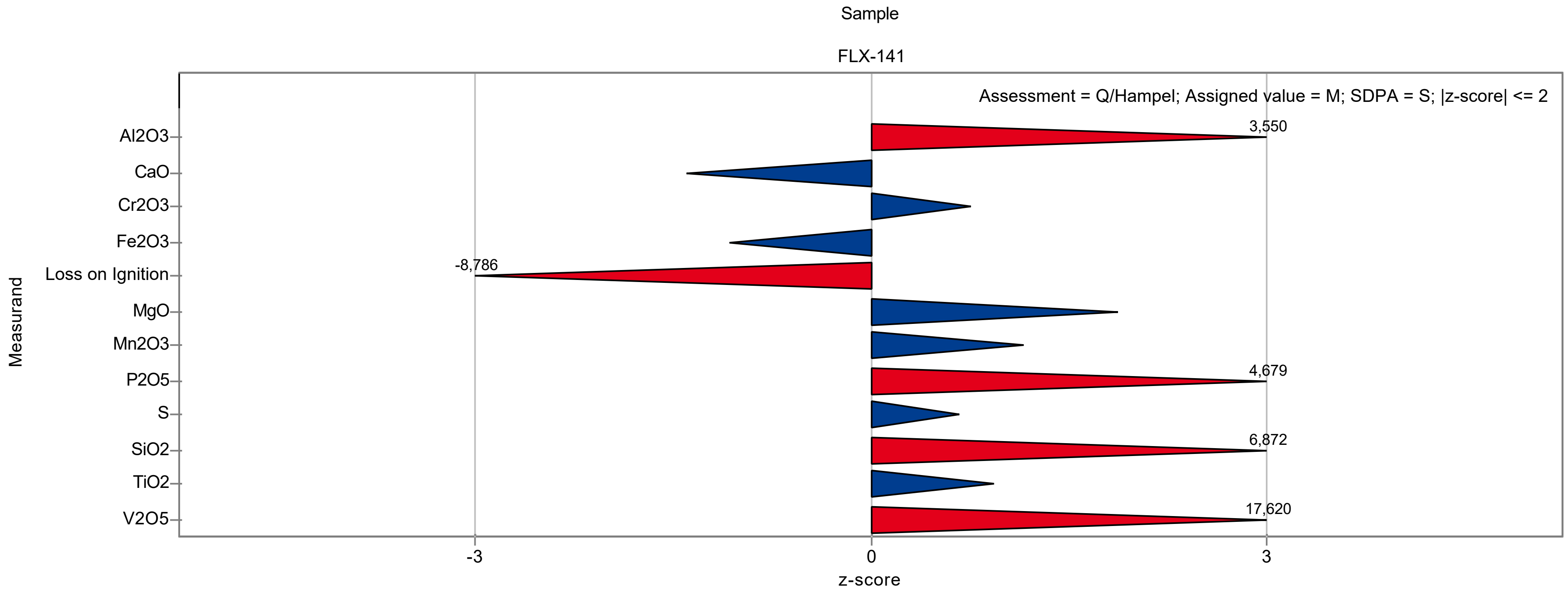
Laboratory chart of z-scores

Laboratory: 26



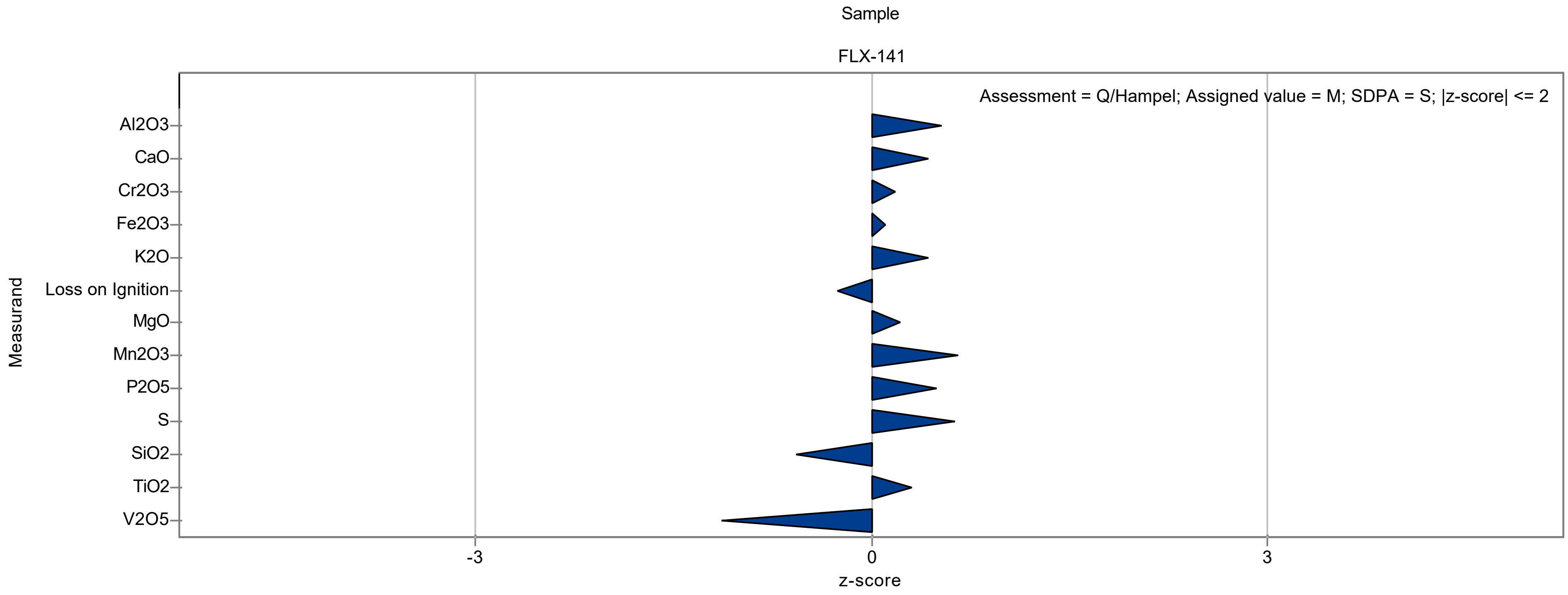
Laboratory chart of z-scores

Laboratory: 27



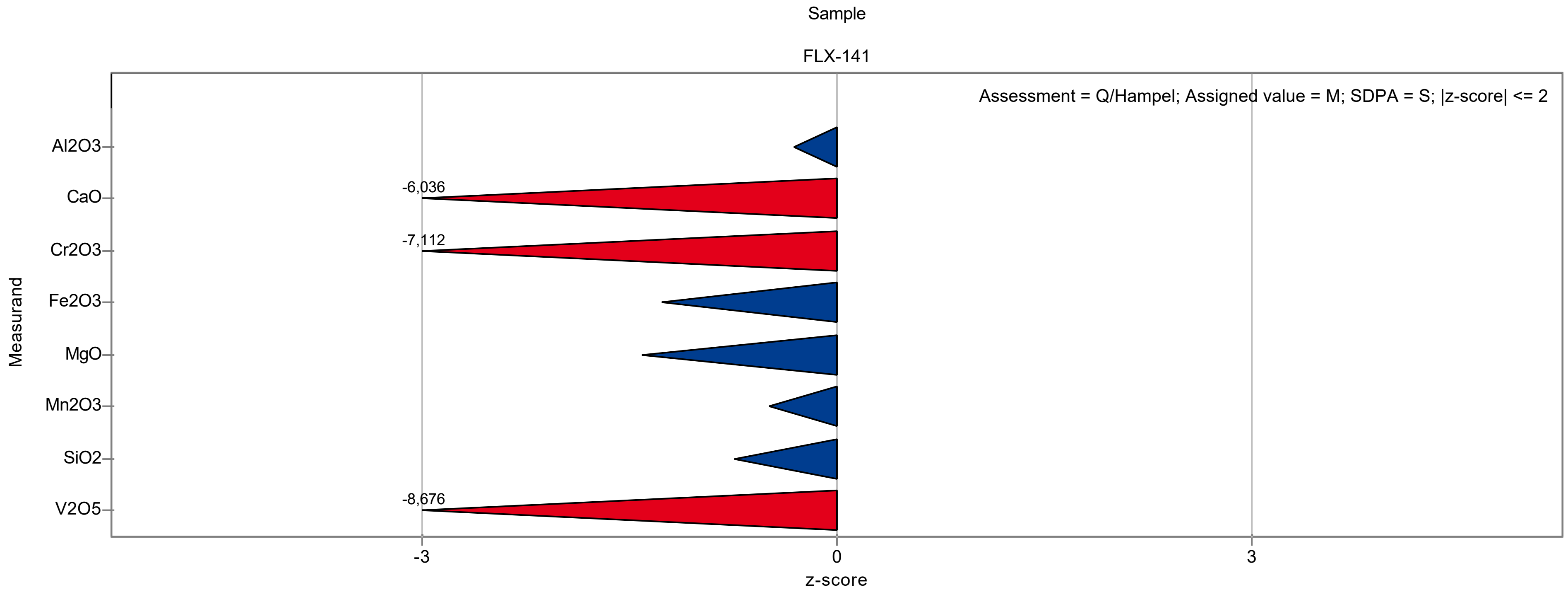
Laboratory chart of z-scores

Laboratory: 28



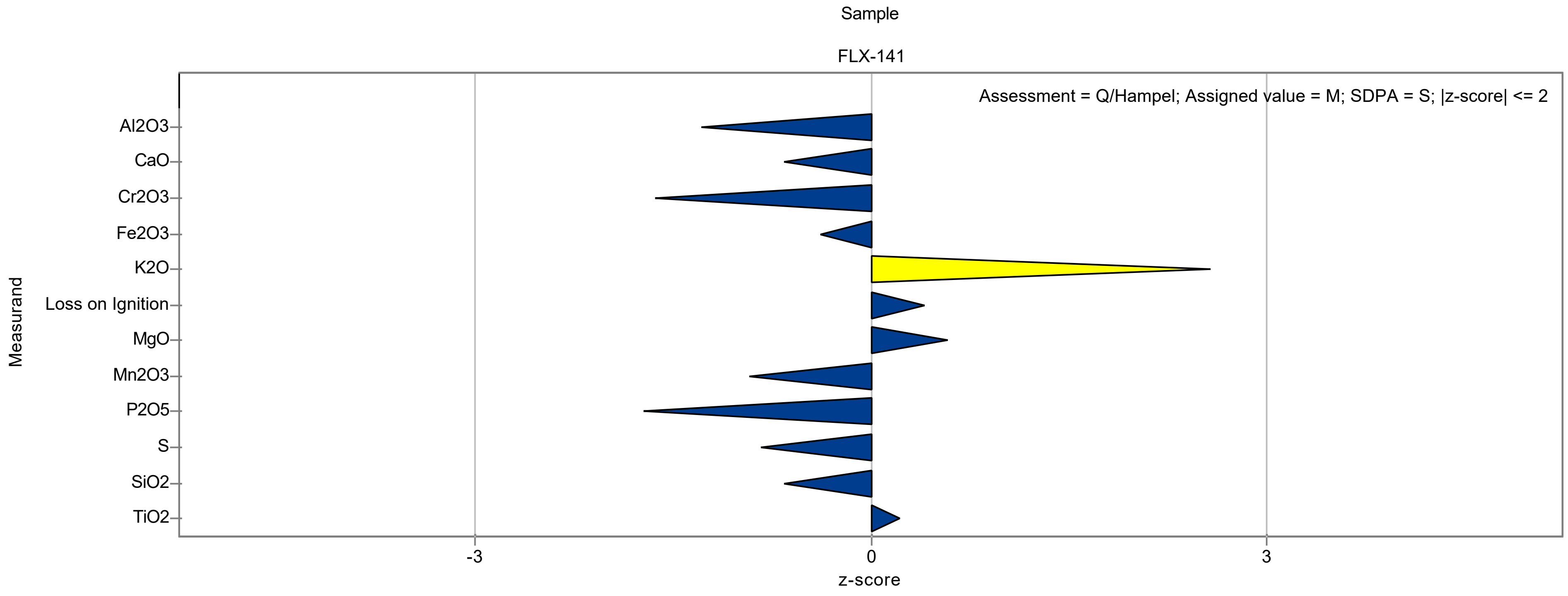
Laboratory chart of z-scores

Laboratory: 29



Laboratory chart of z-scores

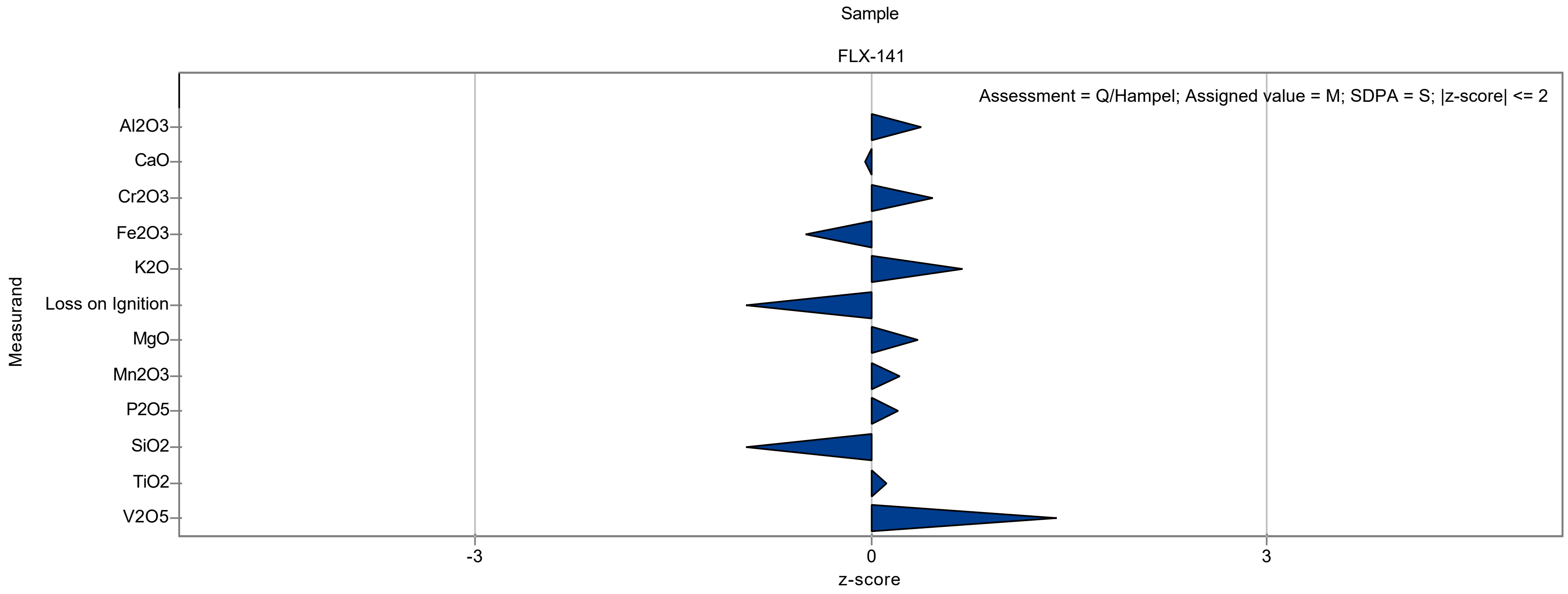
Laboratory: 31



2022_01 Slag

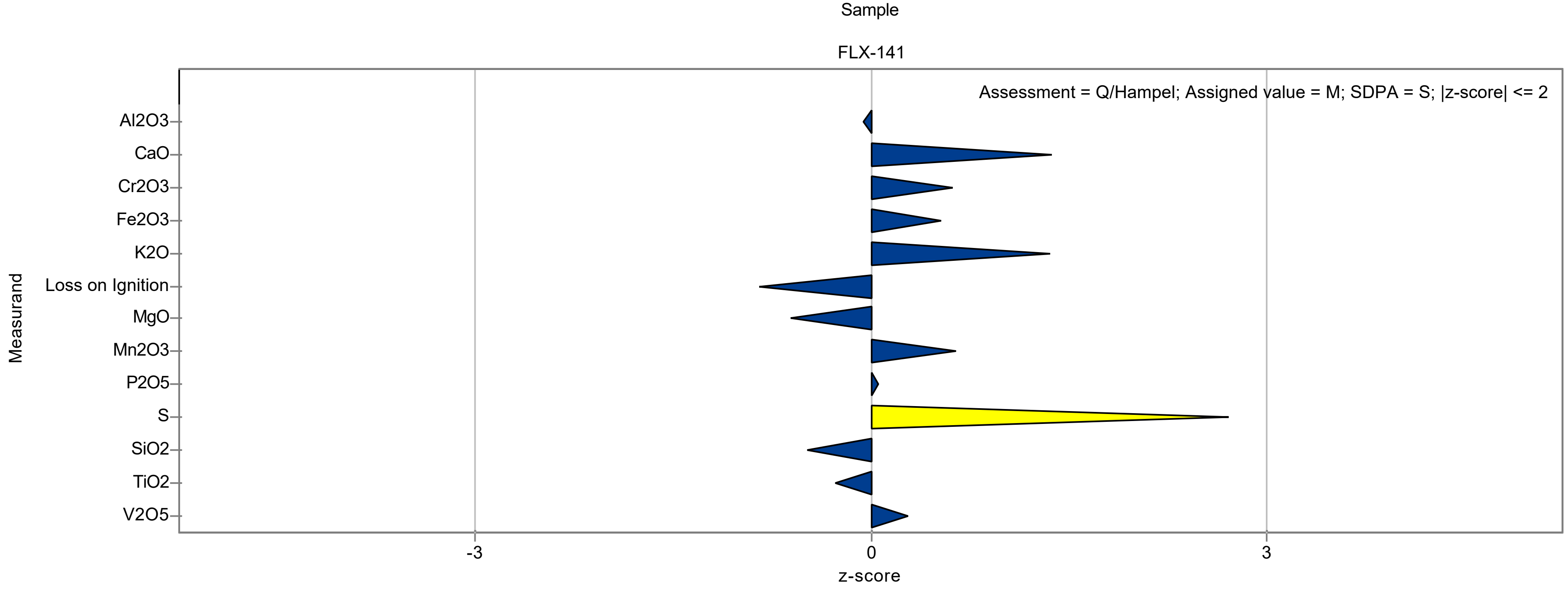
Laboratory chart of z-scores

Laboratory: 32



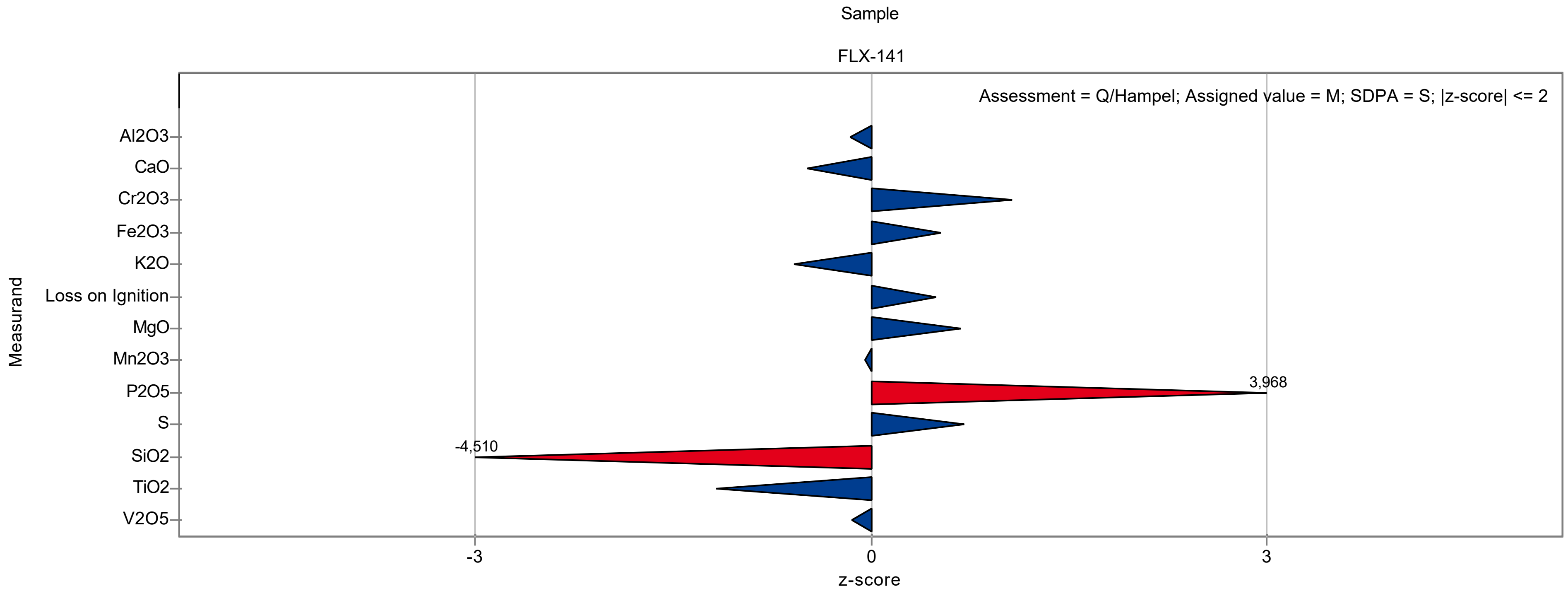
Laboratory chart of z-scores

Laboratory: 33



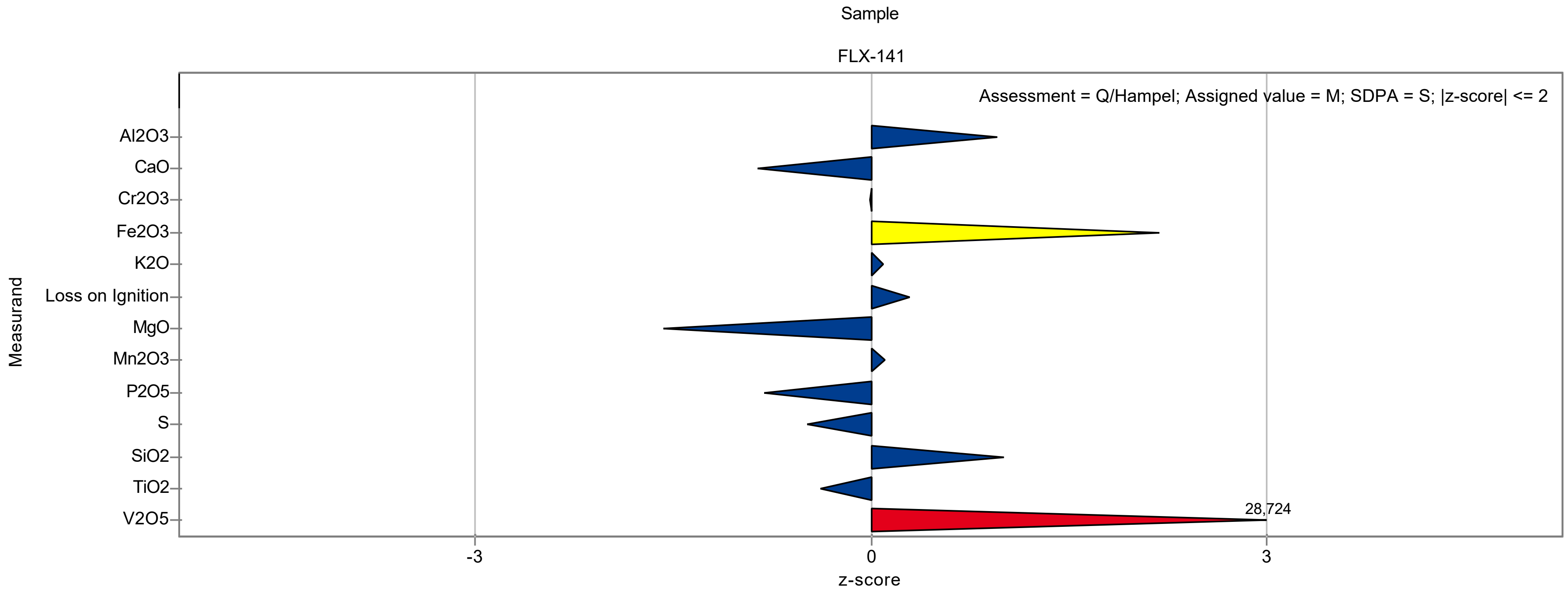
Laboratory chart of z-scores

Laboratory: 34



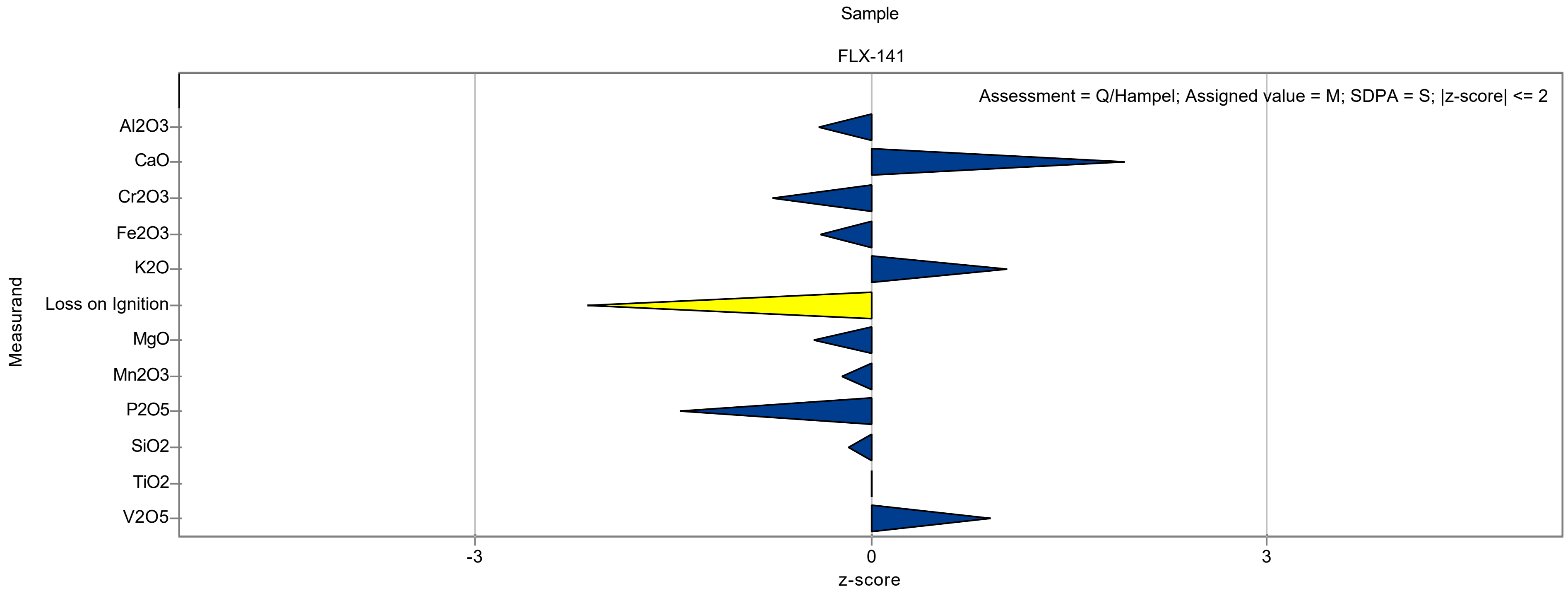
Laboratory chart of z-scores

Laboratory: 35



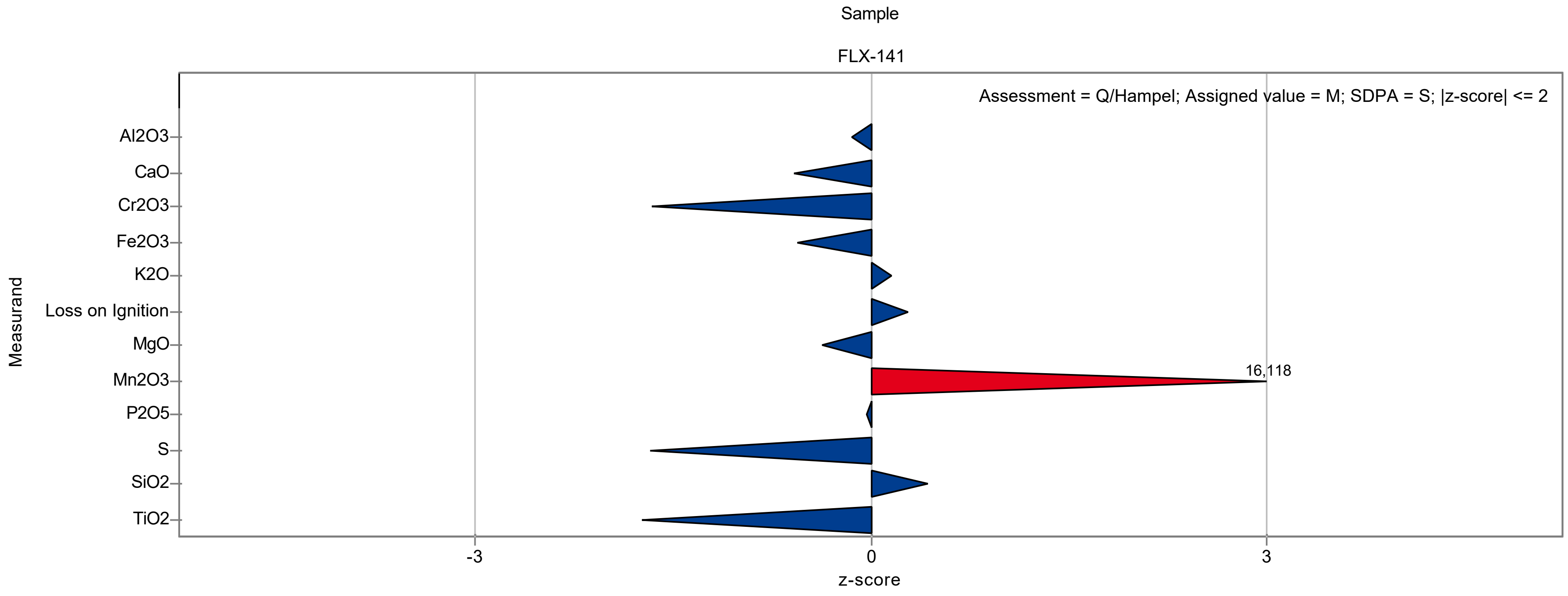
Laboratory chart of z-scores

Laboratory: 36



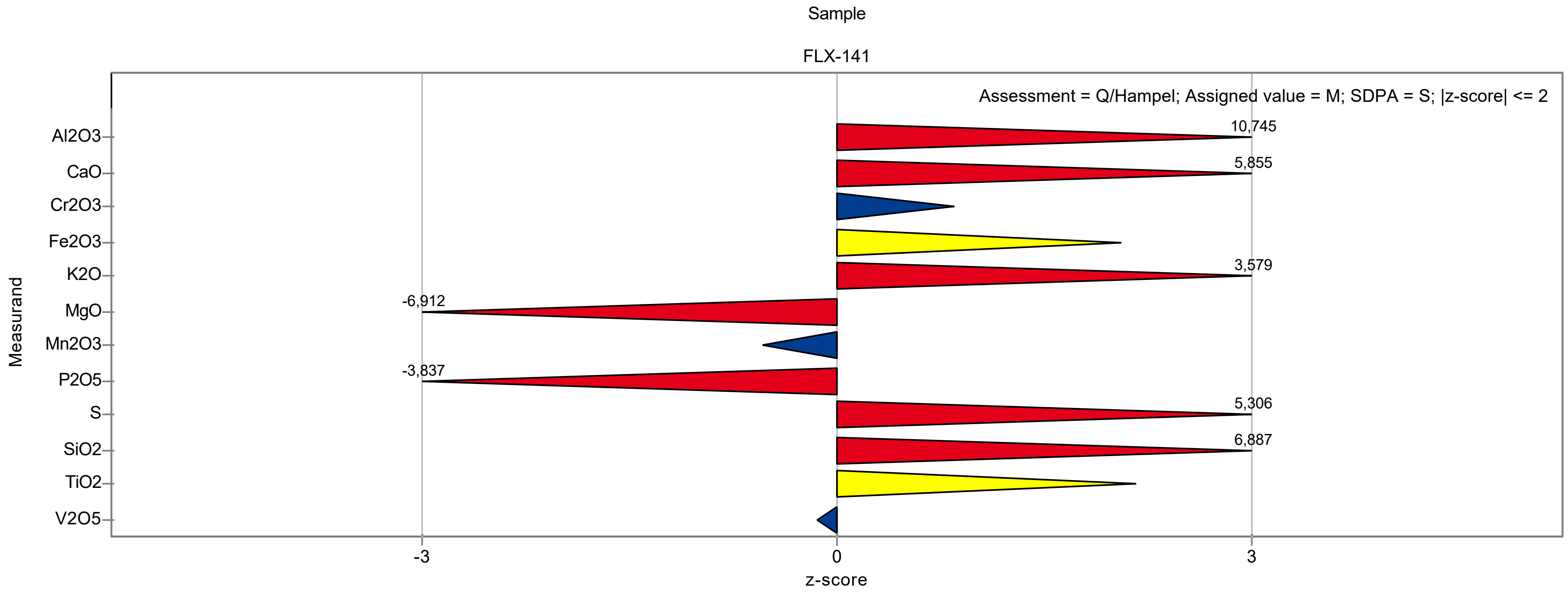
Laboratory chart of z-scores

Laboratory: 37



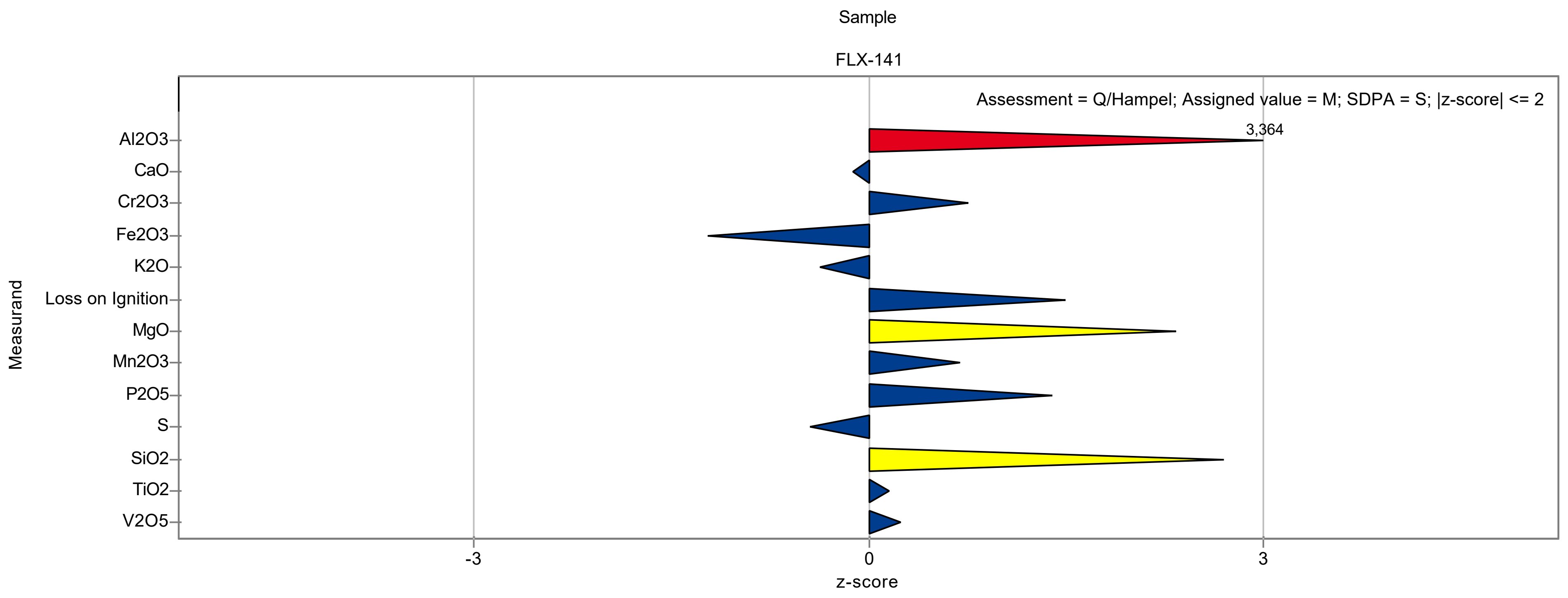
Laboratory chart of z-scores

Laboratory: 38



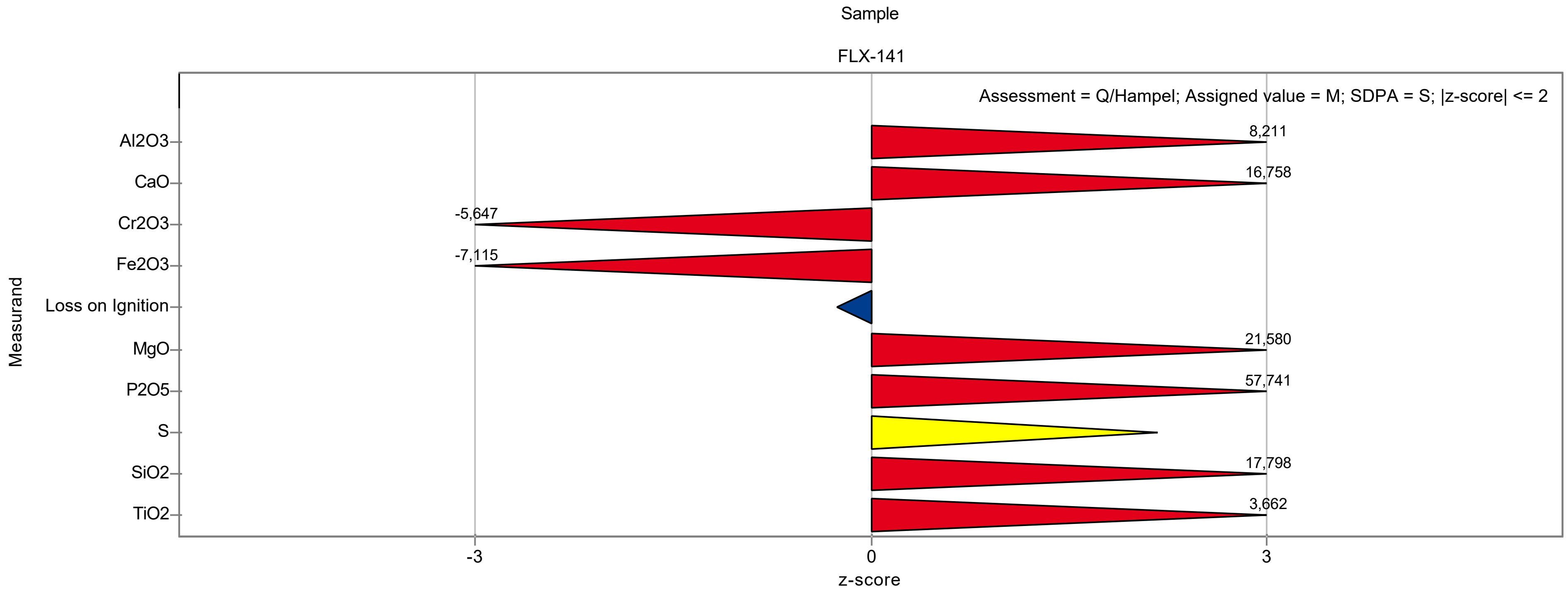
Laboratory chart of z-scores

Laboratory: 39



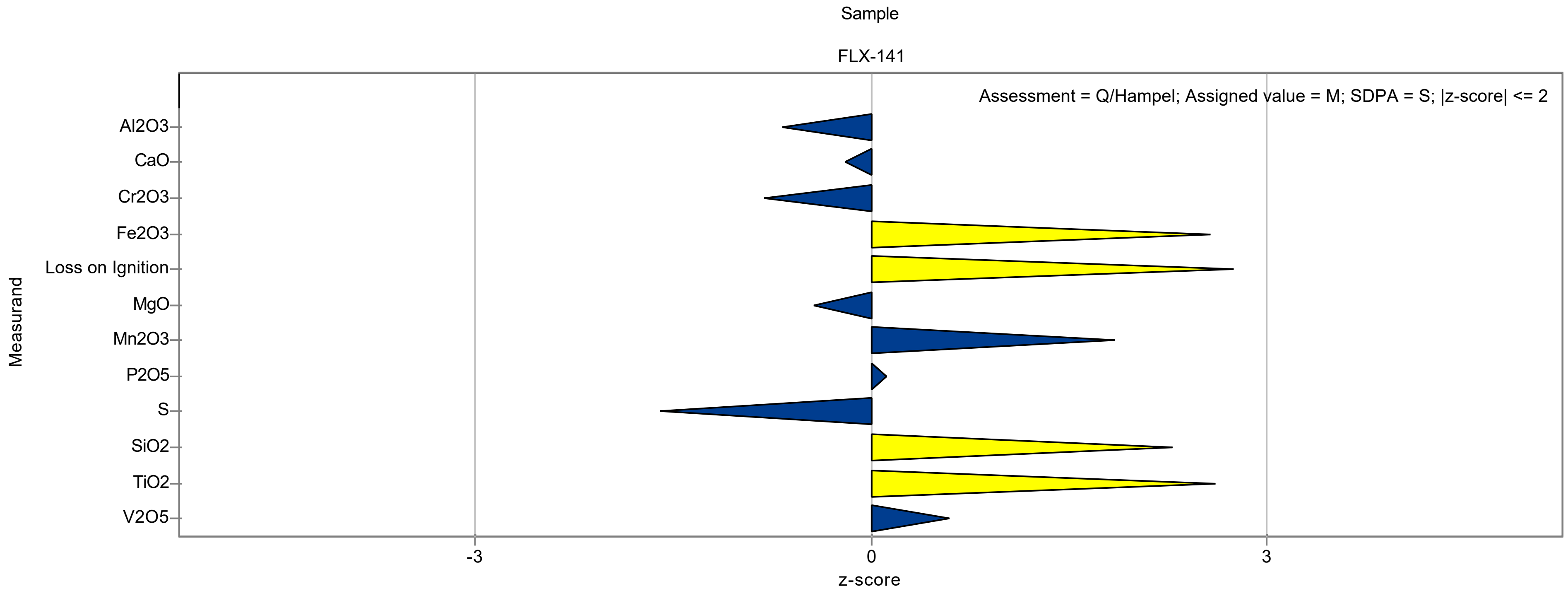
Laboratory chart of z-scores

Laboratory: 40



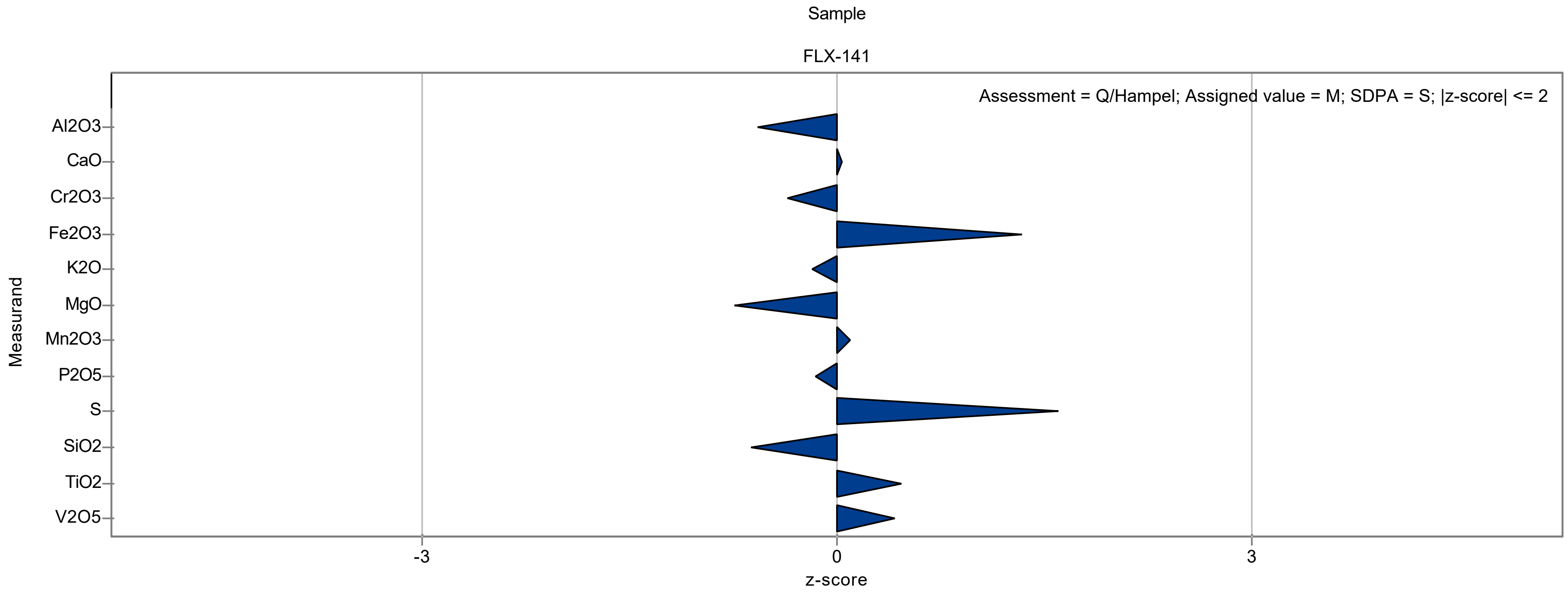
Laboratory chart of z-scores

Laboratory: 41



Laboratory chart of z-scores

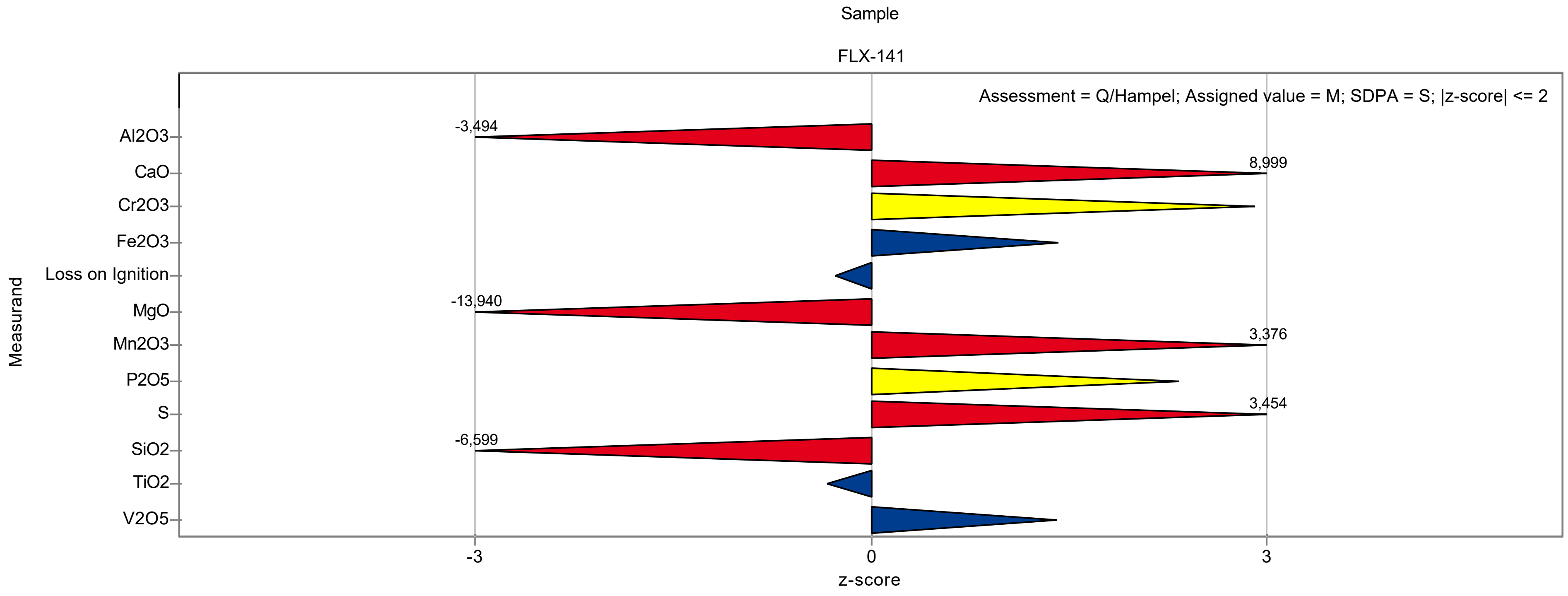
Laboratory: 42



2022_01 Slag

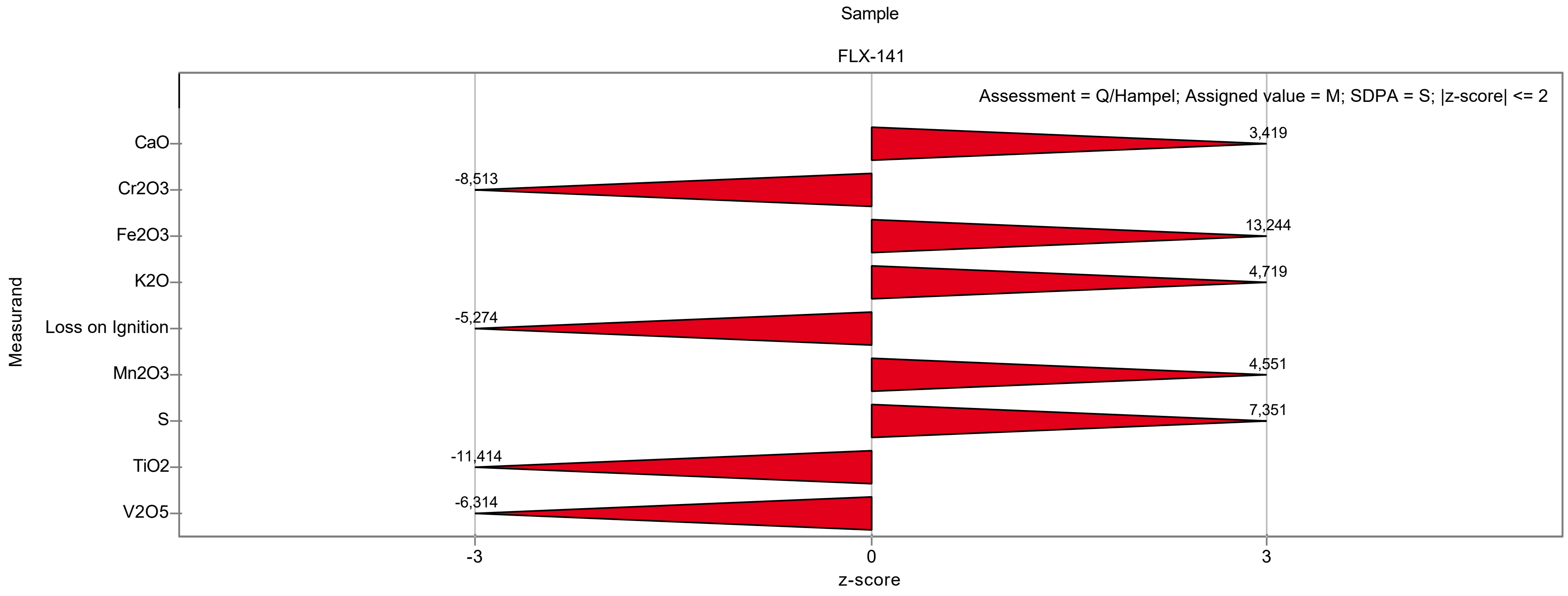
Laboratory chart of z-scores

Laboratory: 43



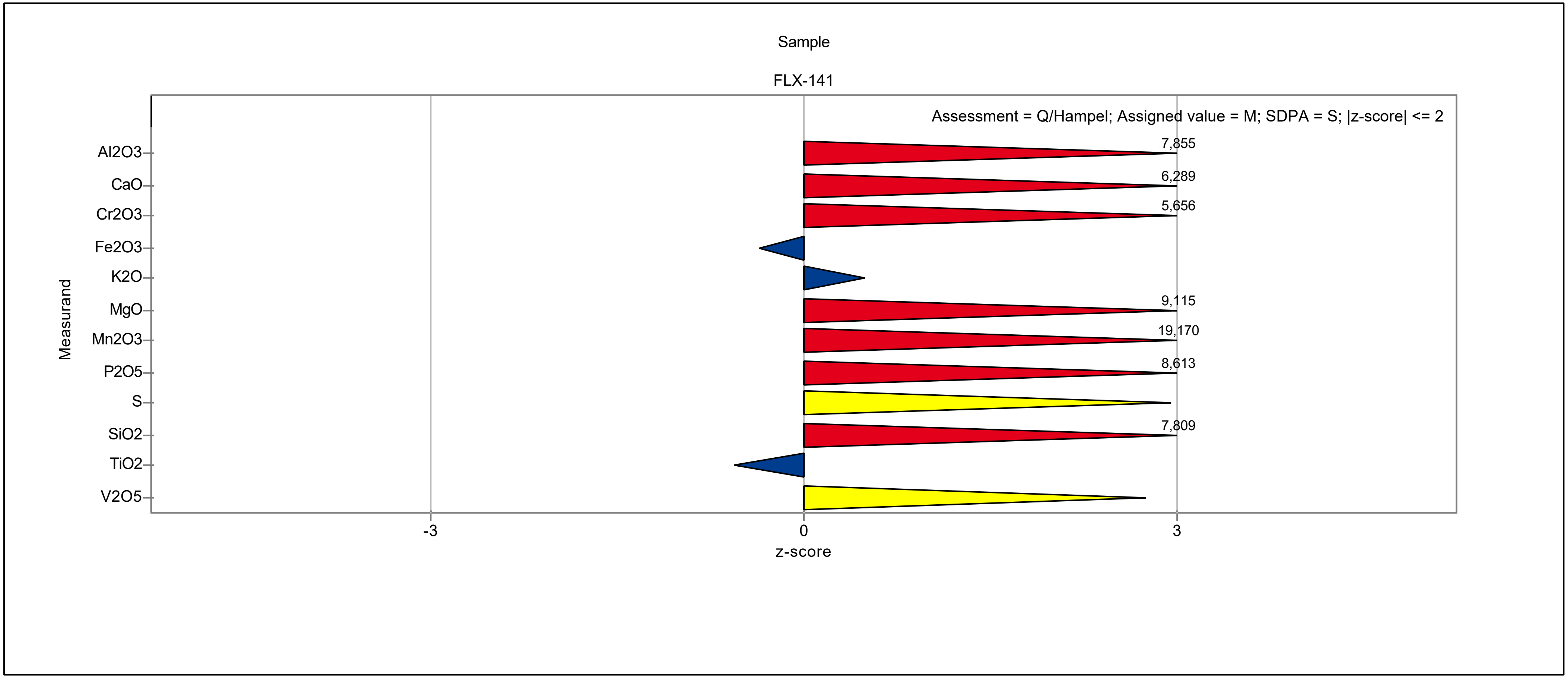
Laboratory chart of z-scores

Laboratory: 44



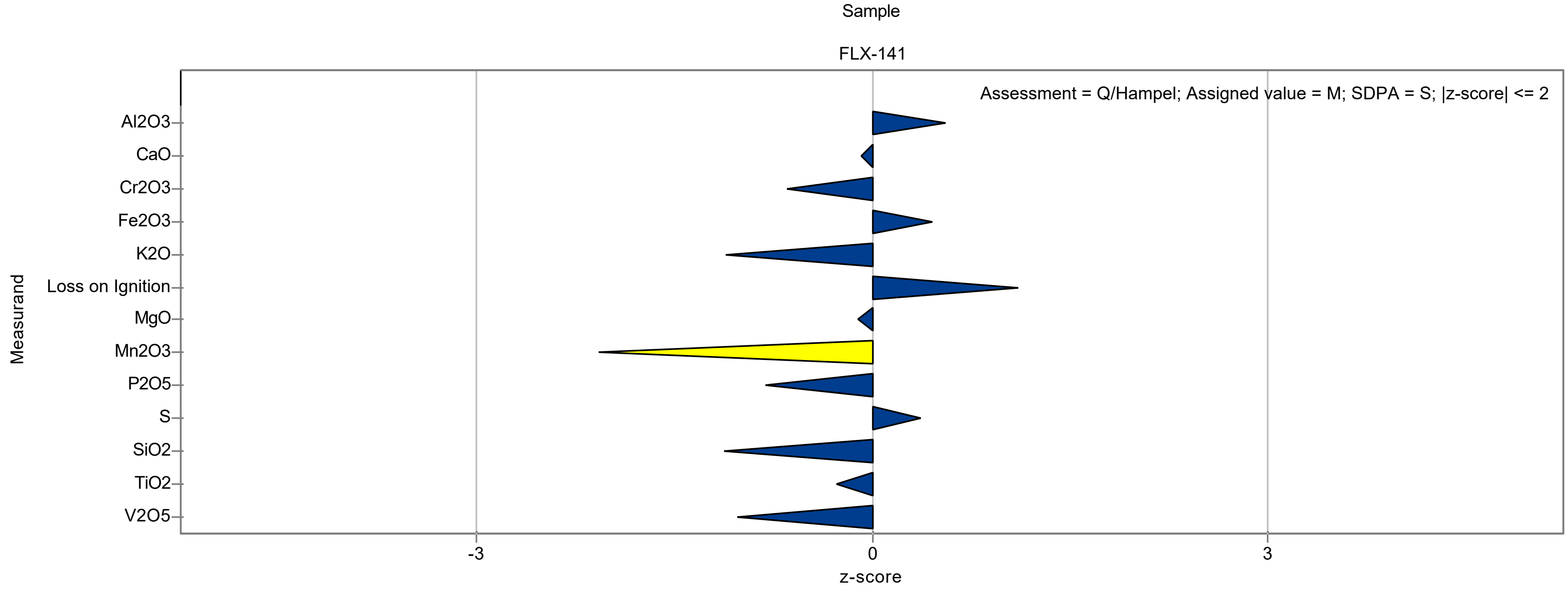
Laboratory chart of z-scores

Laboratory: 45



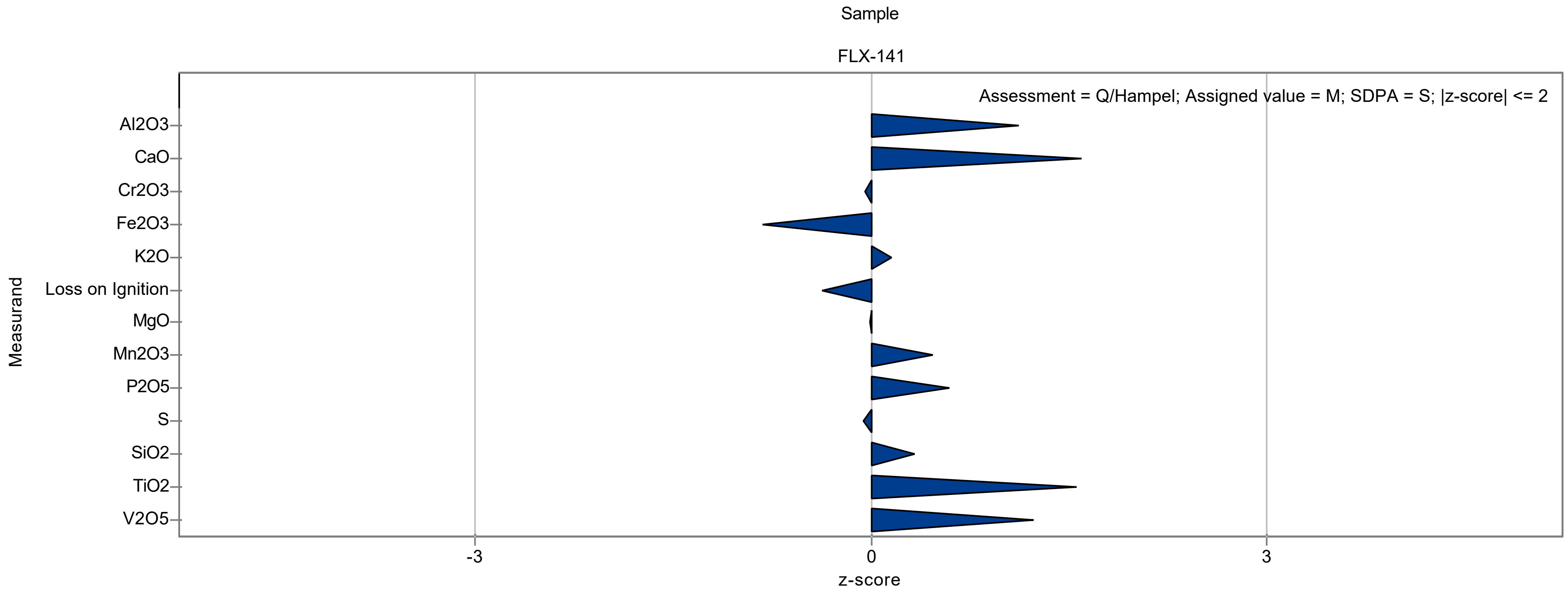
Laboratory chart of z-scores

Laboratory: 46



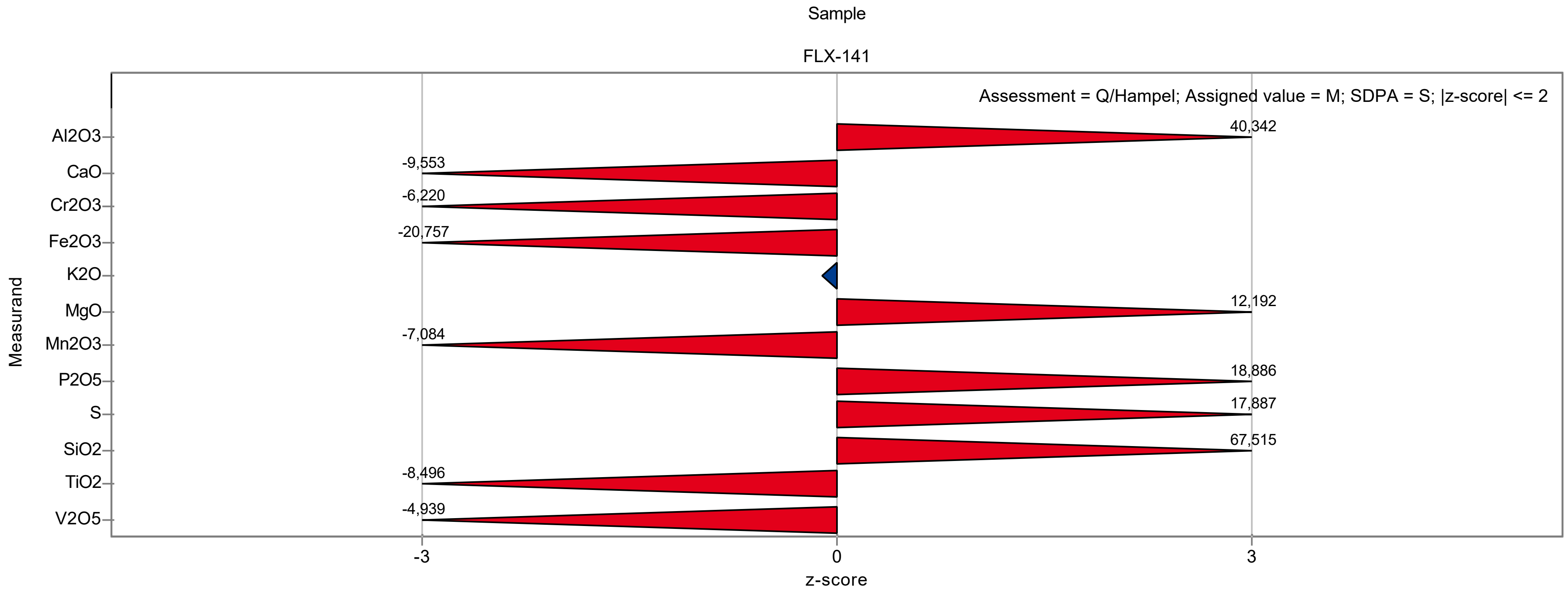
Laboratory chart of z-scores

Laboratory: 47



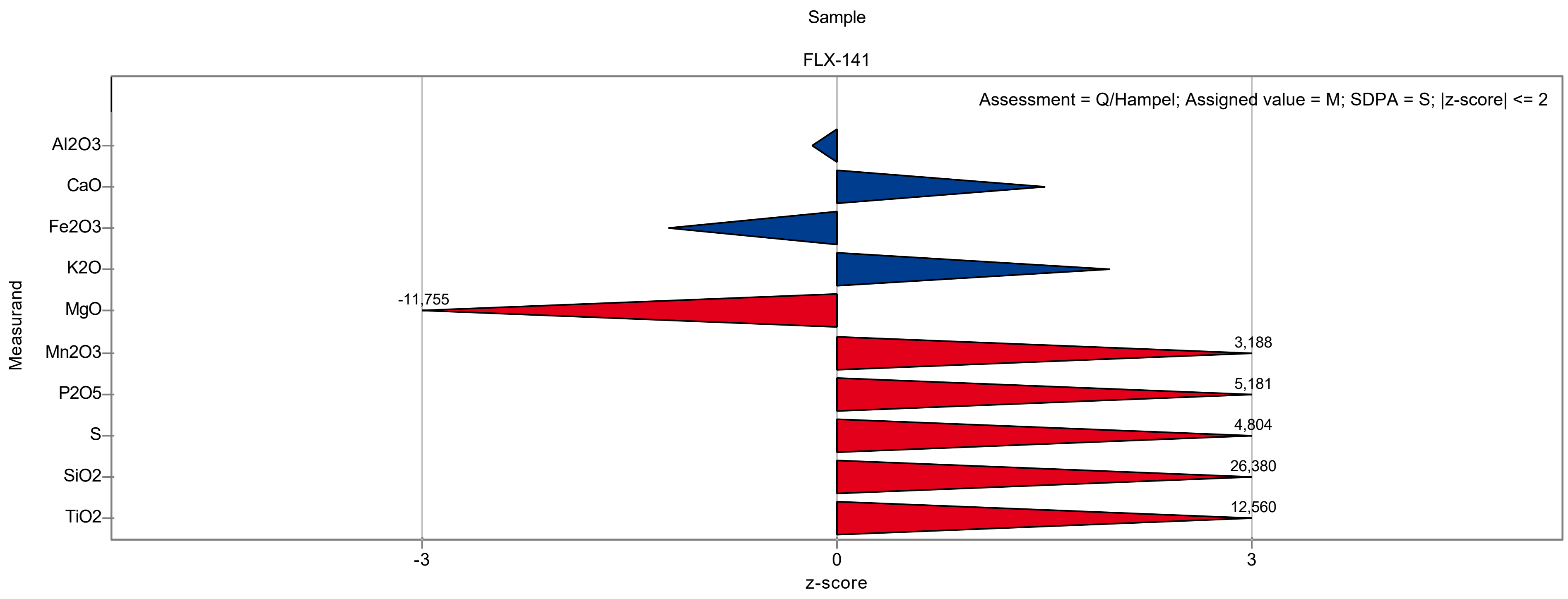
Laboratory chart of z-scores

Laboratory: 49



Laboratory chart of z-scores

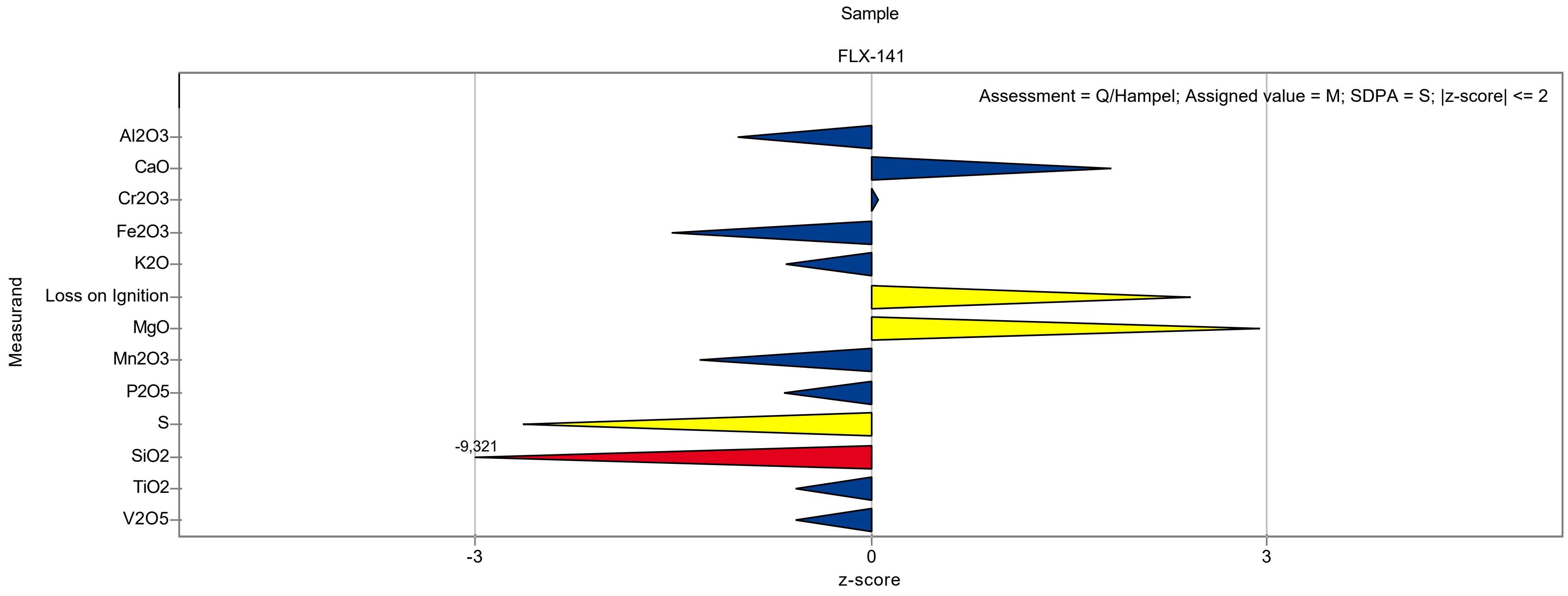
Laboratory: 50



2022_01 Slag

Laboratory chart of z-scores

Laboratory: 51



2022_01 Slag

z-scores (per sample)

Sample: FLX-141

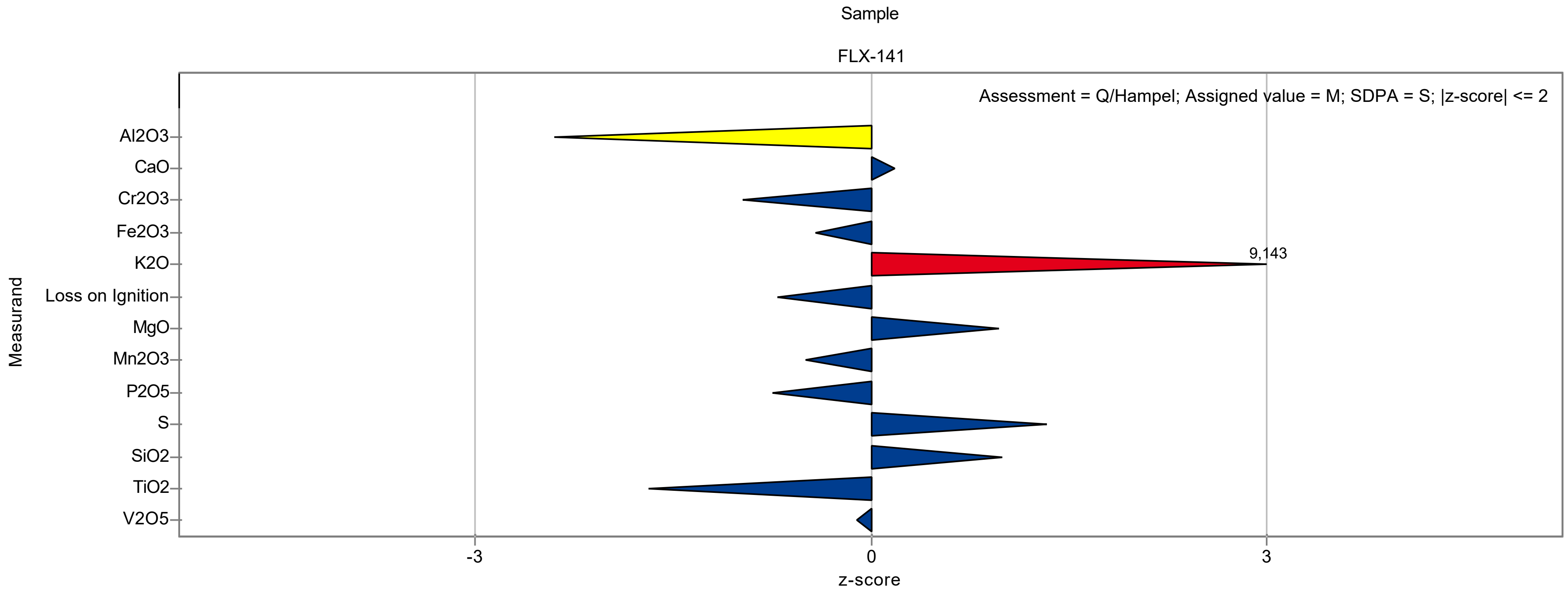
Lab code	Al2O3	CaO	Cr2O3	Fe2O3	K2O	Loss on Ignition	MgO	Mn2O3	P2O5	S	SiO2	TiO2	V2O5
10	-2,400	0,181	-0,967	-0,425	9,143	-0,704	0,969	-0,492	-0,740	1,331	0,994	-1,684	-0,110
11	-0,100	0,015	-1,190	-1,267	-0,376	1,860	-1,528	-0,752	0,411		-0,784	-0,005	
12	-0,585	-2,993		-0,649	1,434	14,974	-0,603	18,069	-1,786	5,267	-0,428	-1,000	
13	0,674	-1,145	0,721	-0,237	-1,046	-1,019	0,023	0,697	-0,280		1,265	1,201	-0,568
14	-0,179	-2,754	-0,839	-0,404	-0,108		-0,946	-0,017	-1,054	-0,213	-1,217	-0,234	-0,815
15	0,170	-0,568	1,867	0,122	-0,510	-0,058	-1,970	-0,547	0,160	0,019	1,035	1,266	
16	-0,802	0,119	0,243	-0,014		-1,084	0,459	0,311	1,206	0,366	-0,521	0,532	-0,181
17	-1,746	-0,460	-0,585	-0,592	-0,577	-0,121	0,522	-1,032	1,771	0,212	0,335	-0,951	1,300
18	-0,358	0,850	-0,935	1,260		-0,085	-0,515	-1,842	-0,008	-1,332	0,016	-0,250	0,912
19	1,049	-0,090	0,307	0,406	0,026	0,739	0,624	0,502	0,348	0,212	0,924	0,500	-0,322
20	-0,967	1,811	-0,648	0,099	-1,314	-0,014	-0,748	-0,667	-0,008	0,135	-1,528	-1,749	
21	0,600	1,518	0,275	1,885	0,764	-0,403	0,084	0,902	0,452	-0,290	0,598	0,777	0,419
22	1,095	-0,277	-0,298	0,651	0,428	-0,106	0,320	0,037	-0,196	0,058	0,324	-0,136	-3,318
23	0,521	-0,127	1,963	-0,286	-2,789	0,852	0,859	-0,065	1,143	0,173	0,154	-1,358	0,101
24	0,911	1,129	0,339	-1,001	0,630	-0,204	0,864	-0,366	0,536		-0,598	0,239	-0,639
25	0,170	-1,138	1,421	1,805	10,282	-0,561	0,287	1,971	0,243	0,058	-0,750	0,989	0,560
26	0,411	-0,515	0,880	-0,143	0,965	-1,382	0,044	0,413	-0,154	-0,251	0,702	0,369	0,419
27	3,550	-1,402	0,753	-1,070		-8,786	1,870	1,162	4,679	0,675	6,872	0,940	17,620
28	0,533	0,436	0,180	0,104	0,428	-0,252	0,216	0,656	0,494	0,637	-0,569	0,304	-1,132
29	-0,315	-6,036	-7,112	-1,264			-1,405	-0,485			-0,747		-8,676
31	-1,287	-0,653	-1,635	-0,385	2,573	0,402	0,582	-0,923	-1,724	-0,830	-0,661	0,223	
32	0,388	-0,050	0,466	-0,490	0,697	-0,942	0,355	0,222	0,201		-0,947	0,125	1,406
33	-0,054	1,373	0,625	0,533	1,367	-0,849	-0,603	0,646	0,055	2,720	-0,484	-0,266	0,278
34	-0,162	-0,487	1,071	0,538	-0,577	0,492	0,685	-0,038	3,968	0,714	-4,510	-1,179	-0,145
35	0,956	-0,860	-0,011	2,195	0,093	0,298	-1,576	0,109	-0,803	-0,483	1,005	-0,380	28,724

2022_01 Slag

Lab code	Al2O3	CaO	Cr2O3	Fe2O3	K2O	Loss on Ignition	MgO	Mn2O3	P2O5	S	SiO2	TiO2	V2O5
36	-0,396	1,928	-0,744	-0,389	1,032	-2,152	-0,436	-0,226	-1,452		-0,165	0,011	0,912
37	-0,143	-0,585	-1,667	-0,564	0,160	0,284	-0,365	16,118	-0,029	-1,679	0,431	-1,733	
38	10,745	5,855	0,848	2,062	3,579		-6,912	-0,544	-3,837	5,306	6,887	2,162	-0,145
39	3,364	-0,122	0,753	-1,225	-0,376	1,503	2,337	0,693	1,394	-0,444	2,698	0,158	0,242
40	8,211	16,758	-5,647	-7,115		-0,255	21,580		57,741	2,180	17,798	3,662	
41	-0,673	-0,198	-0,807	2,574		2,749	-0,427	1,845	0,118	-1,602	2,291	2,618	0,595
42	-0,573	0,033	-0,362	1,340	-0,175		-0,739	0,095	-0,154	1,601	-0,621	0,467	0,419
43	-3,494	8,999	2,918	1,428		-0,267	-13,940	3,376	2,336	3,454	-6,599	-0,331	1,406
44		3,419	-8,513	13,244	4,719	-5,274		4,551		7,351		-11,414	-6,314
45	7,855	6,289	5,656	-0,354	0,495		9,115	19,170	8,613	2,952	7,809	-0,560	2,745
46	0,552	-0,081	-0,648	0,452	-1,113	1,110	-0,101	-2,078	-0,803	0,366	-1,121	-0,266	-1,027
47	1,118	1,599	-0,043	-0,824	0,160	-0,371	-0,006	0,468	0,599	-0,058	0,328	1,559	1,229
49	40,342	-9,553	-6,220	-20,757	-0,108		12,192	-7,084	18,886	17,887	67,515	-8,496	-4,939
50	-0,179	1,503		-1,220	1,970		-11,755	3,188	5,181	4,804	26,380	12,560	
51	-1,008	1,826	0,052	-1,514	-0,644	2,425	2,951	-1,302	-0,656	-2,644	-9,321	-0,576	-0,568

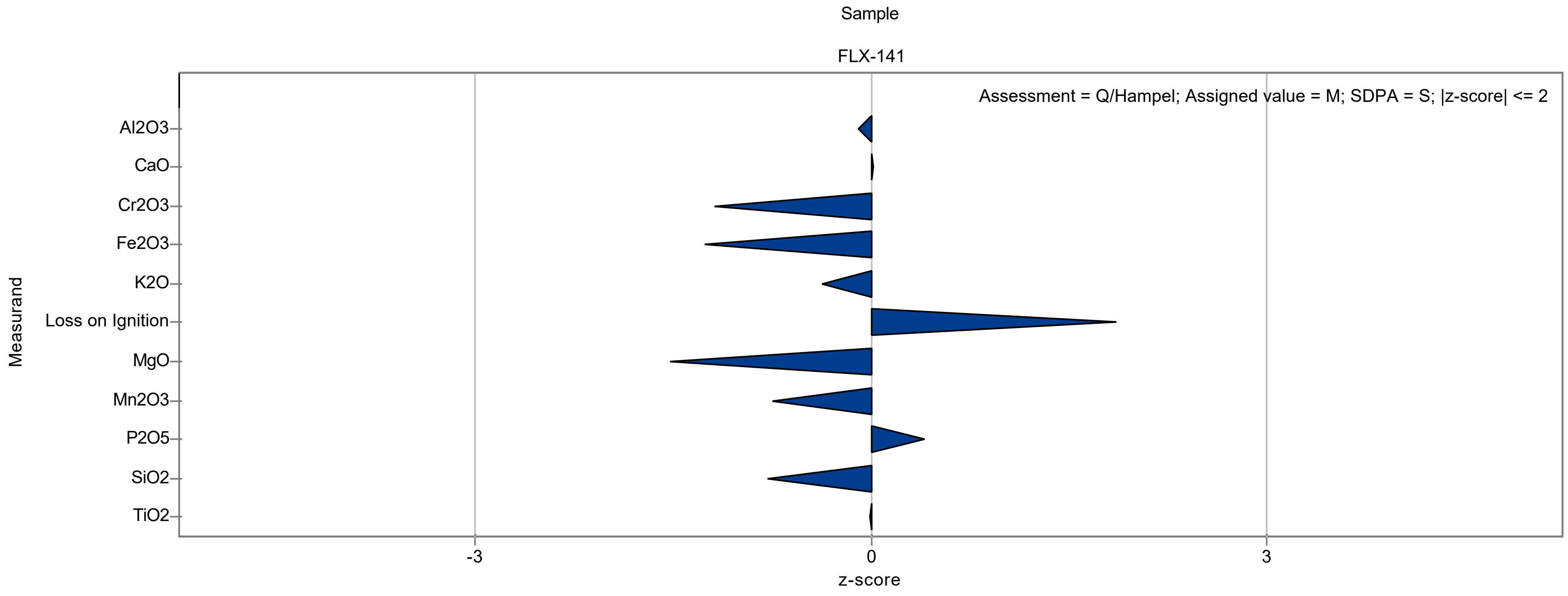
Laboratory chart of z-scores

Laboratory: 10



Laboratory chart of z-scores

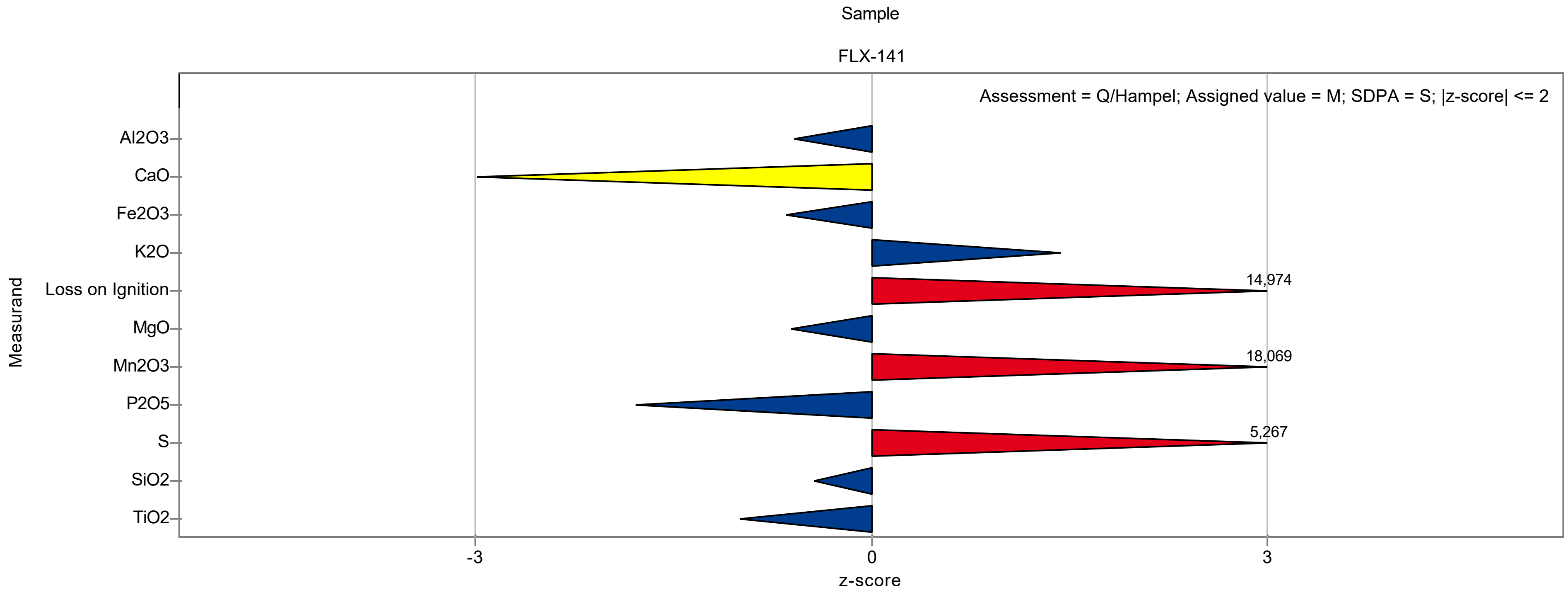
Laboratory: 11



2022_01 Slag

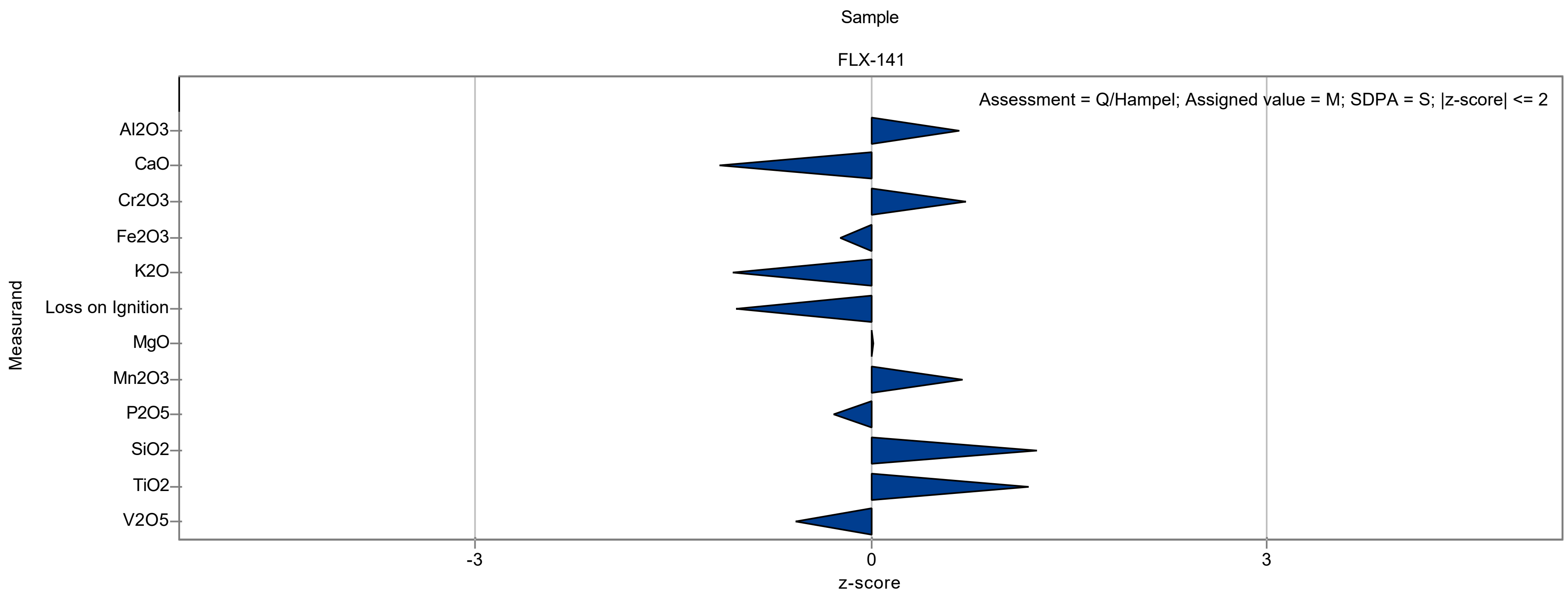
Laboratory chart of z-scores

Laboratory: 12



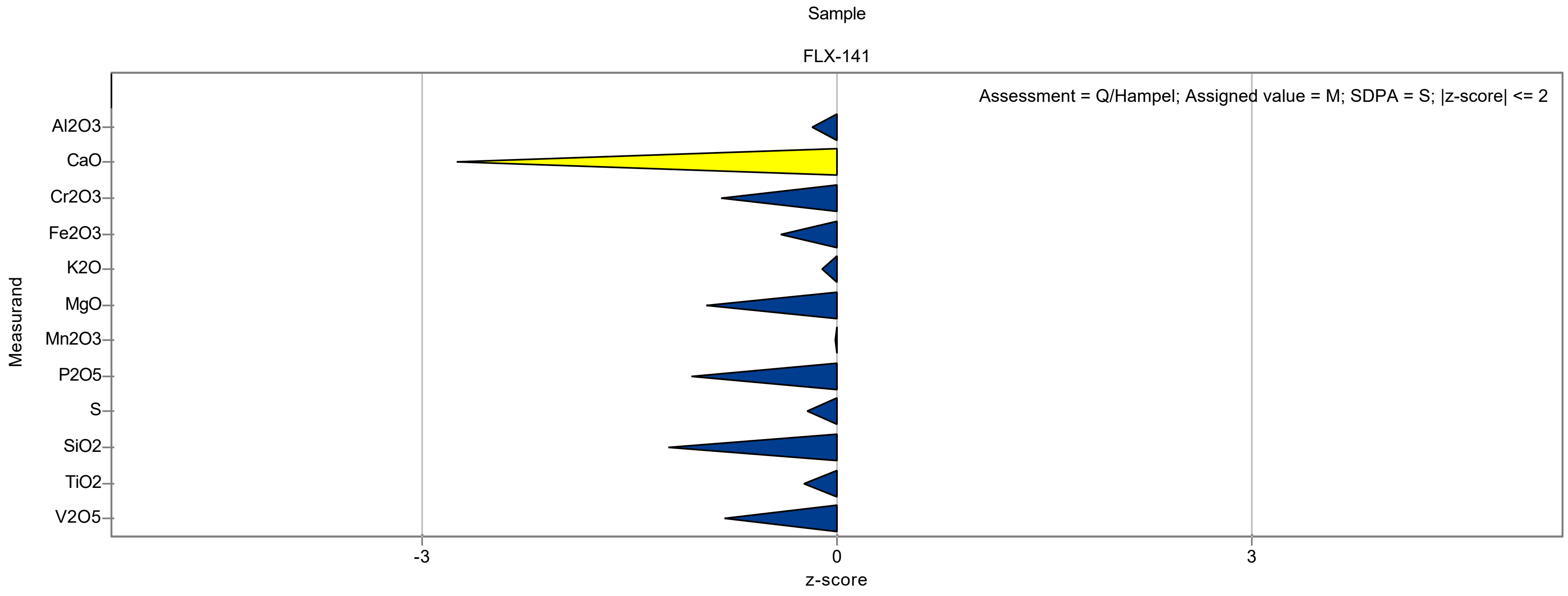
Laboratory chart of z-scores

Laboratory: 13



Laboratory chart of z-scores

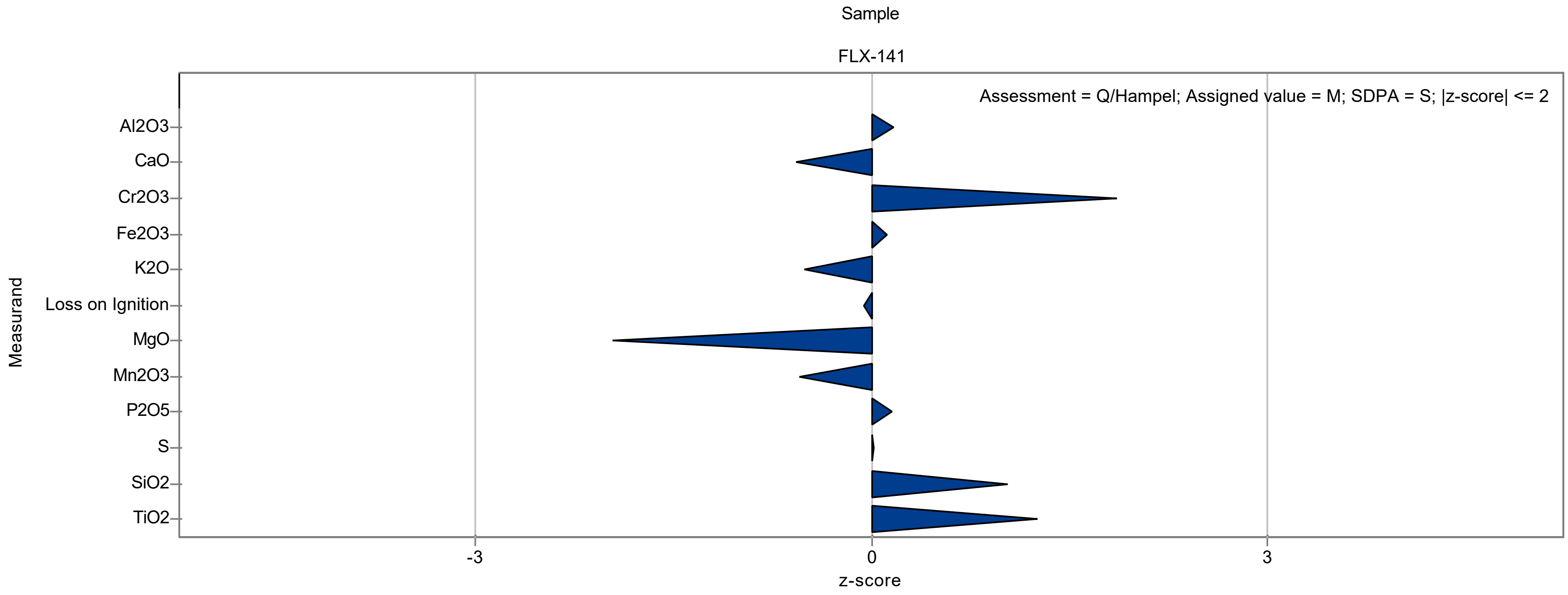
Laboratory: 14



2022_01 Slag

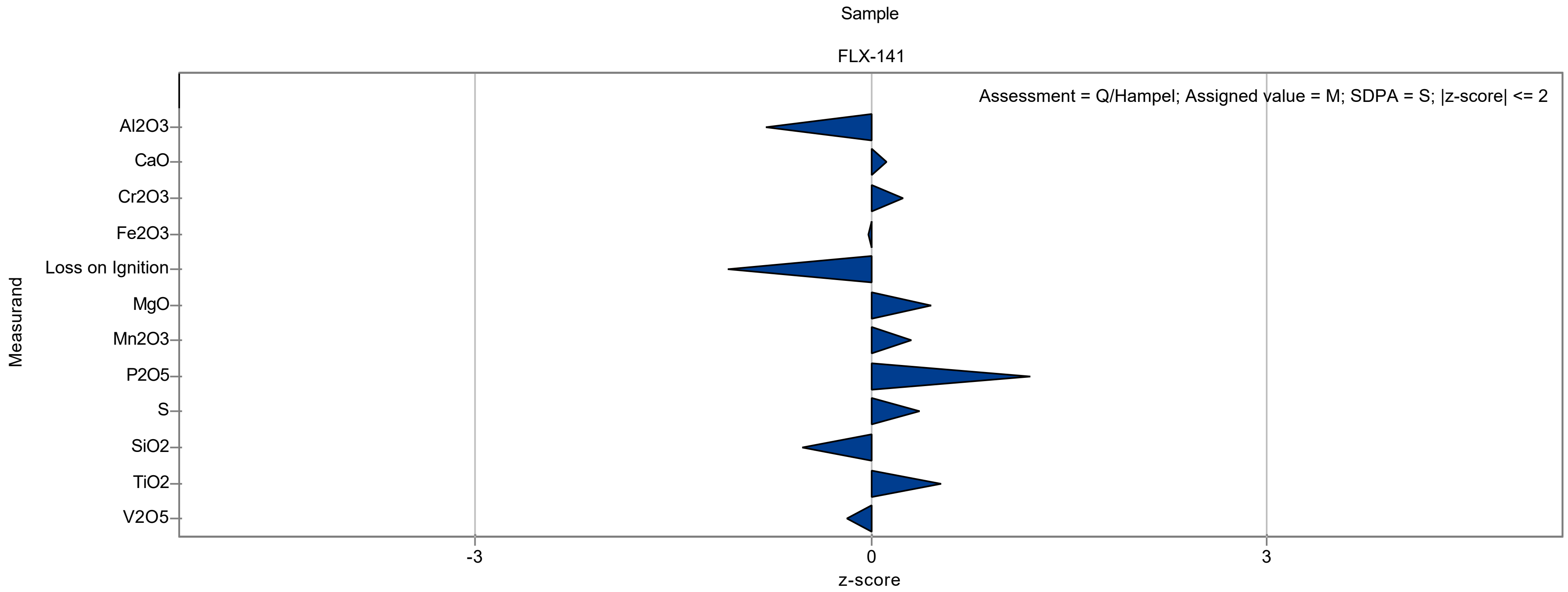
Laboratory chart of z-scores

Laboratory: 15



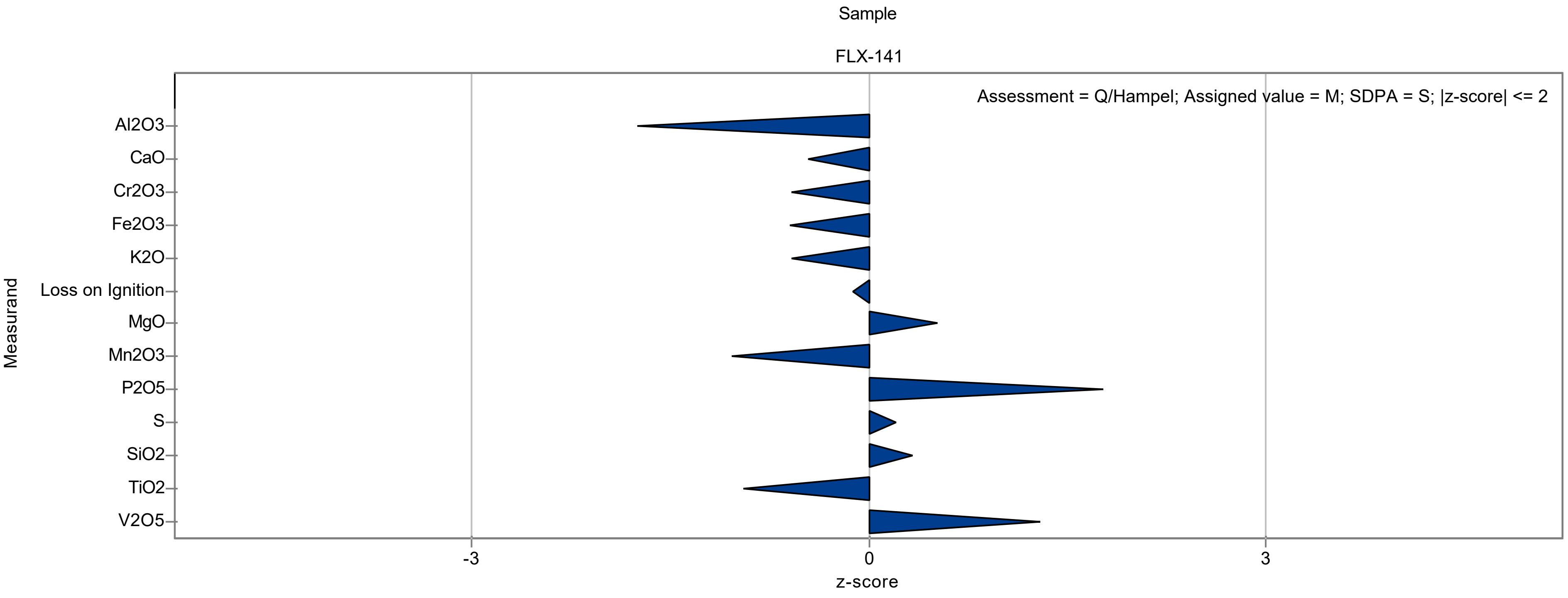
Laboratory chart of z-scores

Laboratory: 16



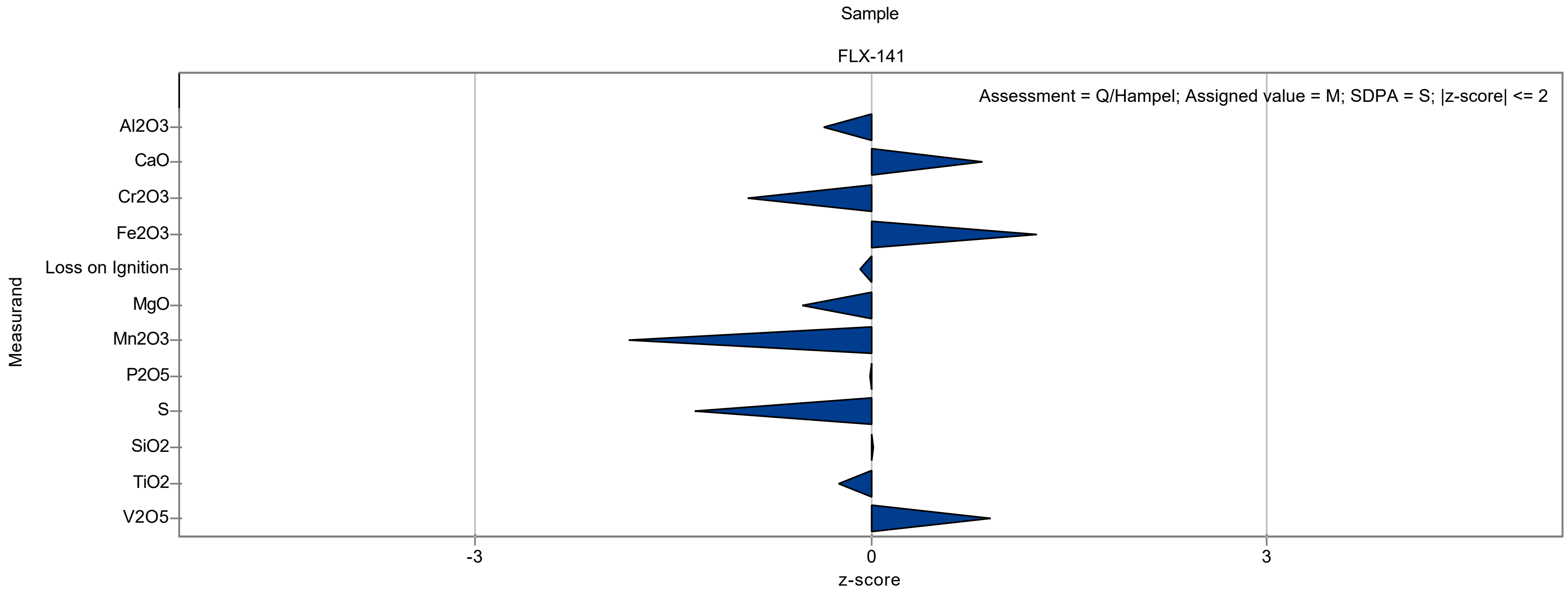
Laboratory chart of z-scores

Laboratory: 17



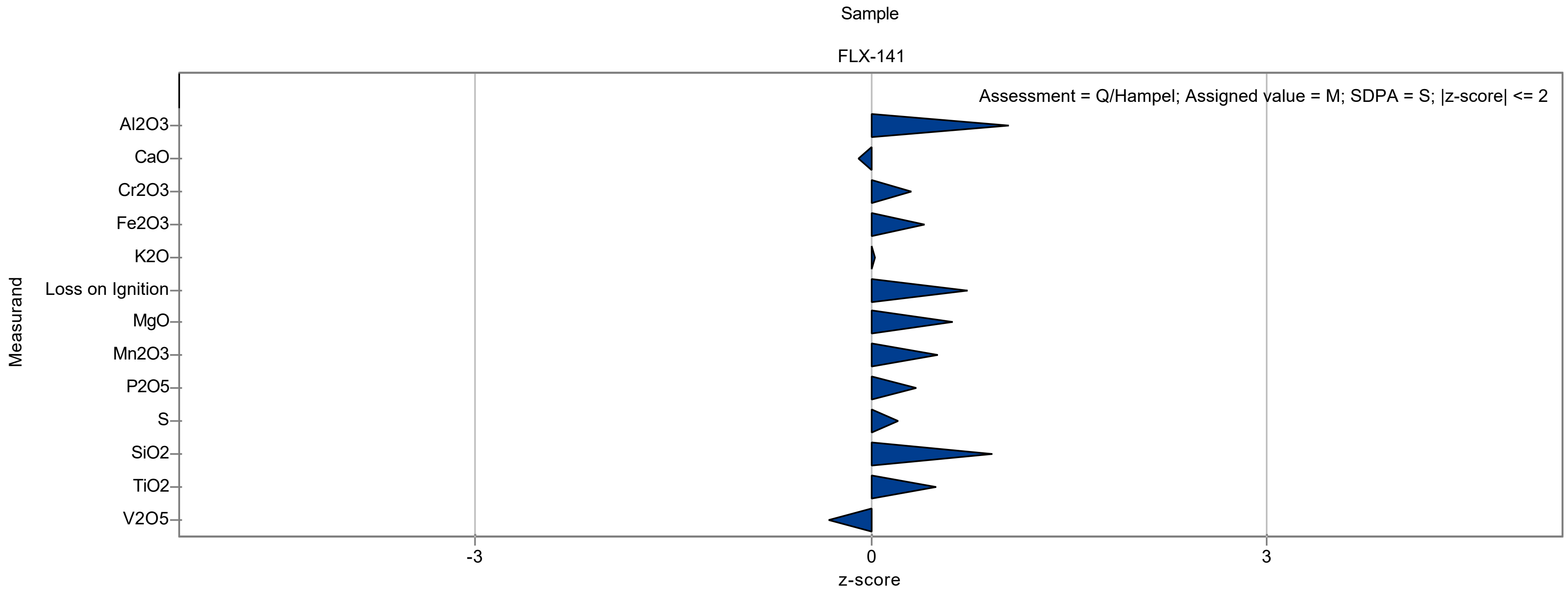
Laboratory chart of z-scores

Laboratory: 18



Laboratory chart of z-scores

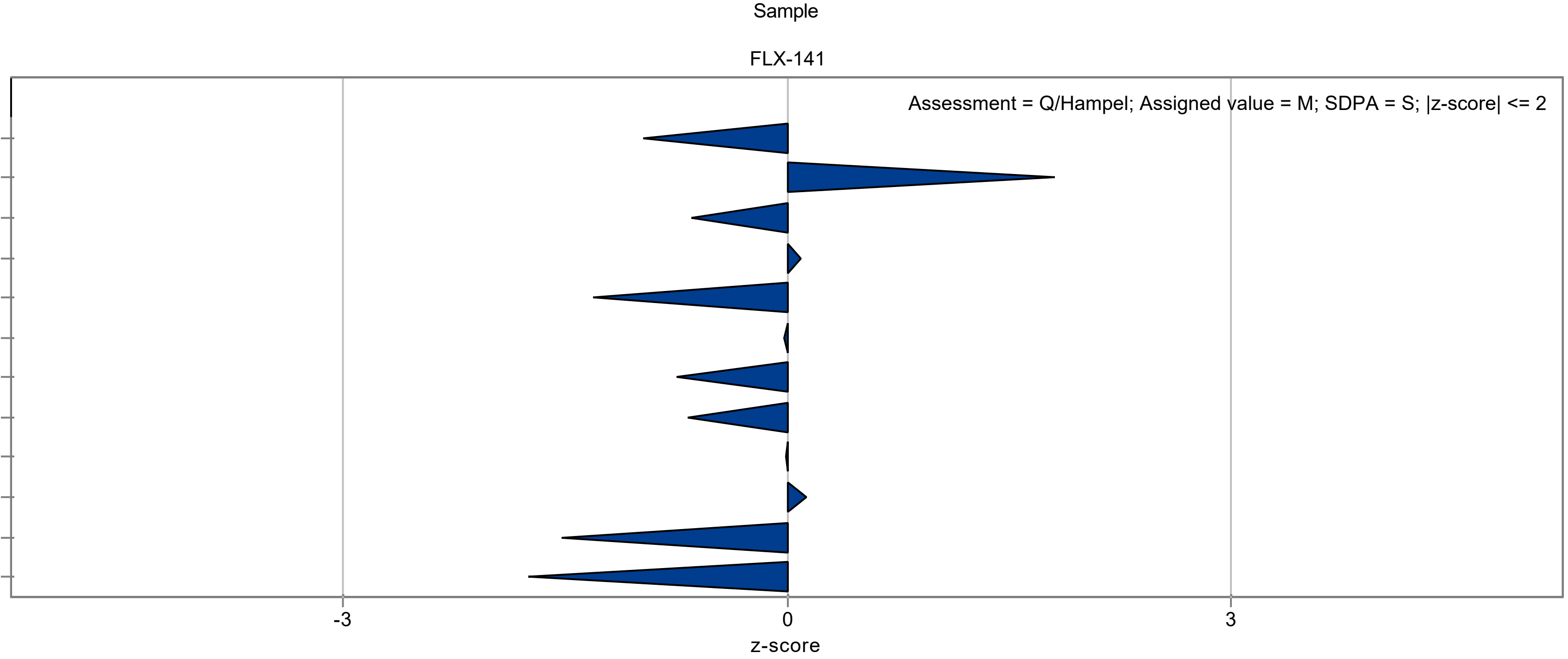
Laboratory: 19



2022_01 Slag

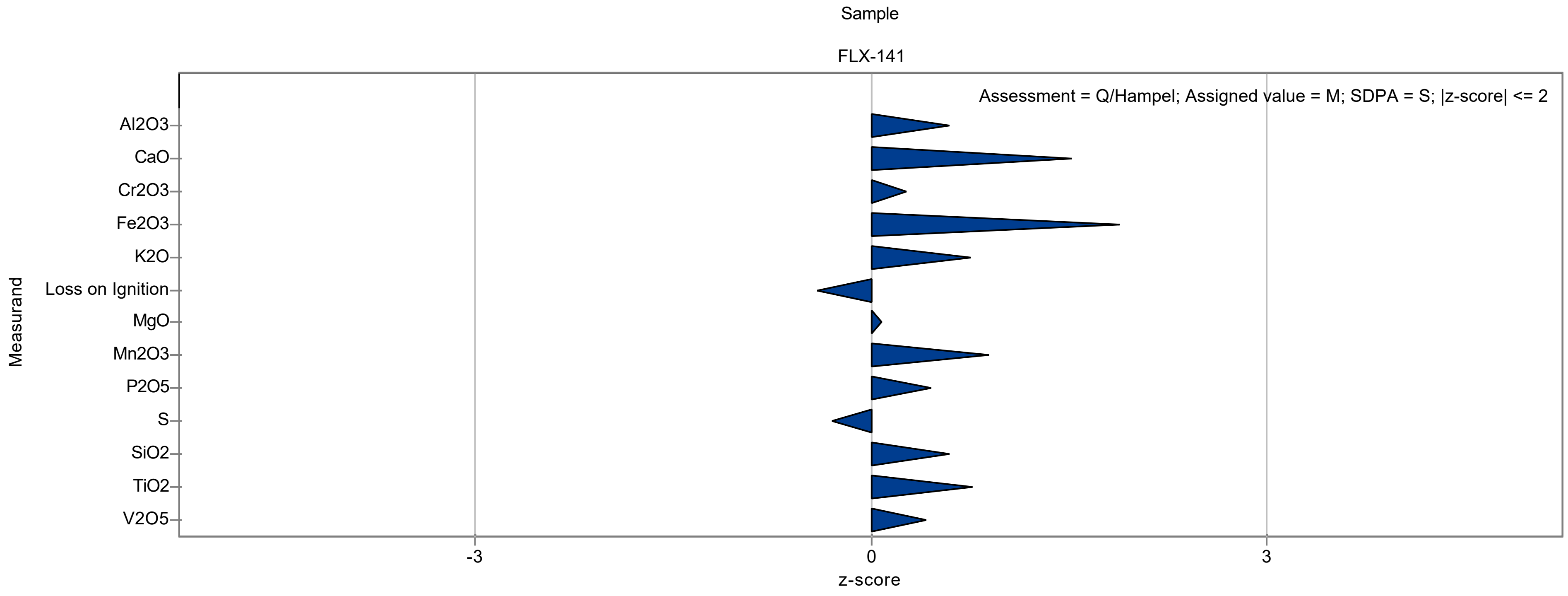
Laboratory chart of z-scores

Laboratory: 20



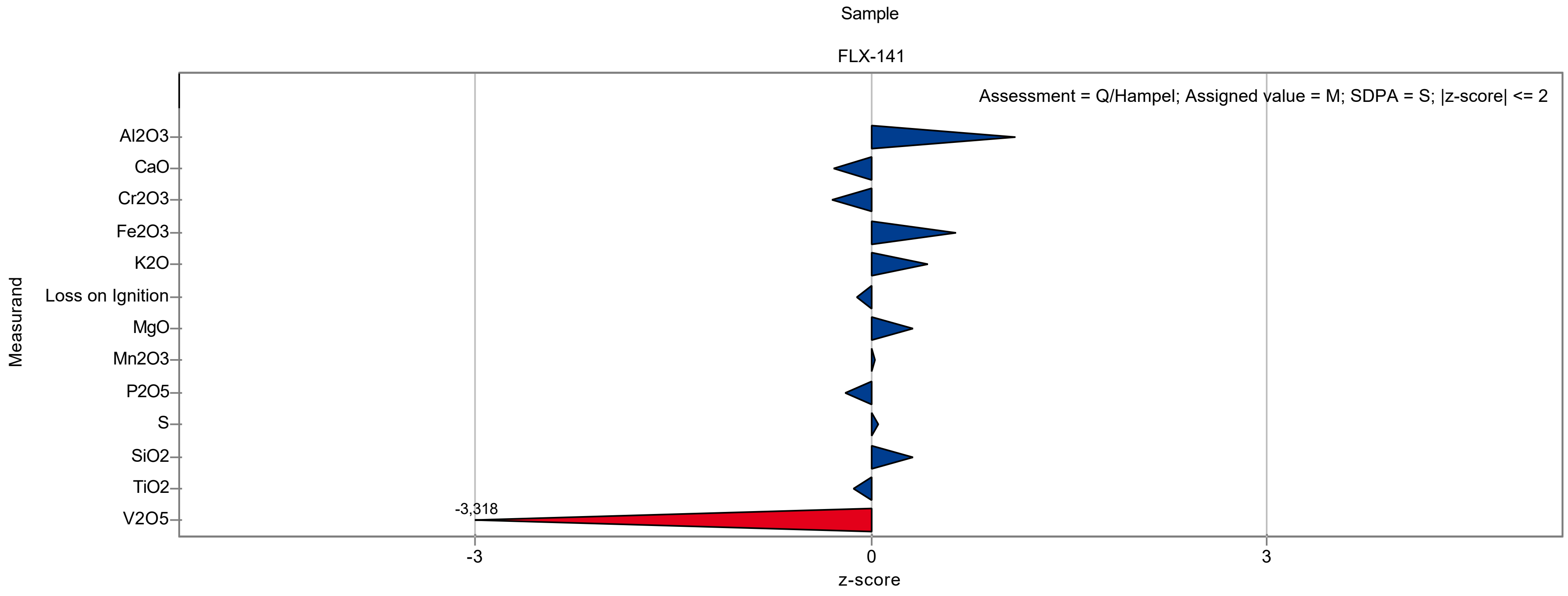
Laboratory chart of z-scores

Laboratory: 21



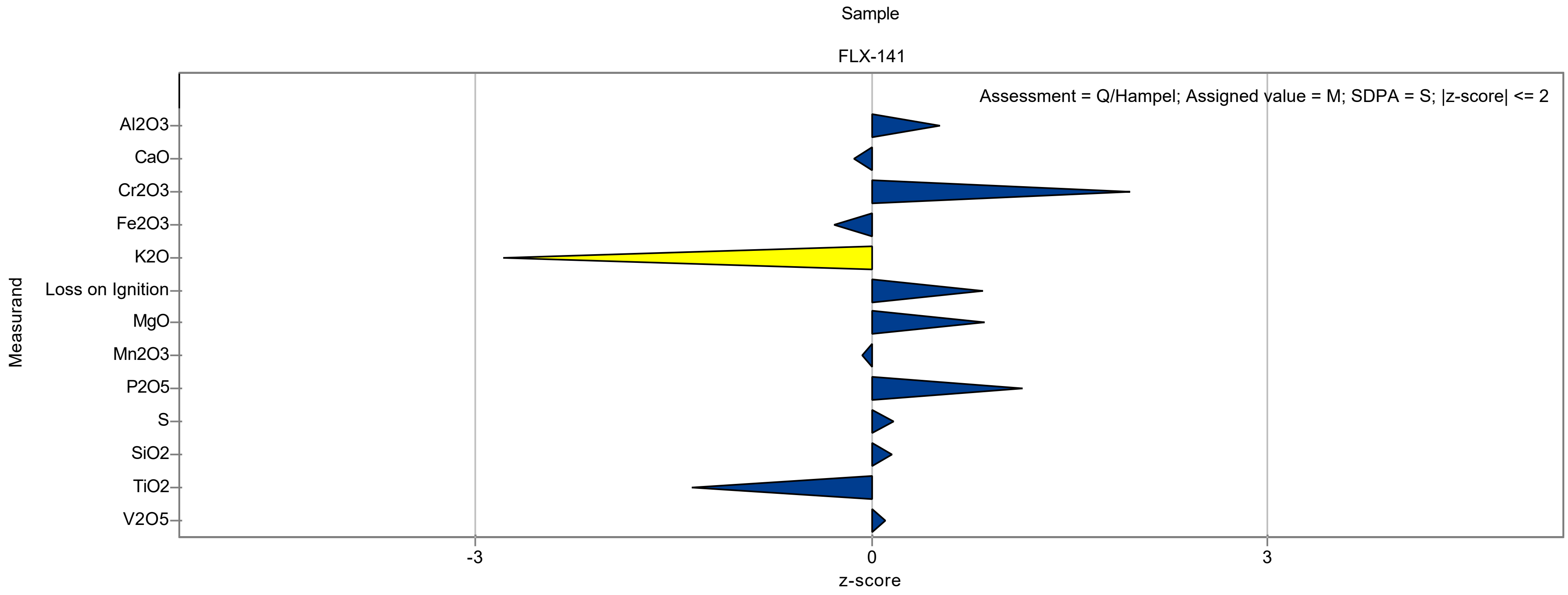
Laboratory chart of z-scores

Laboratory: 22



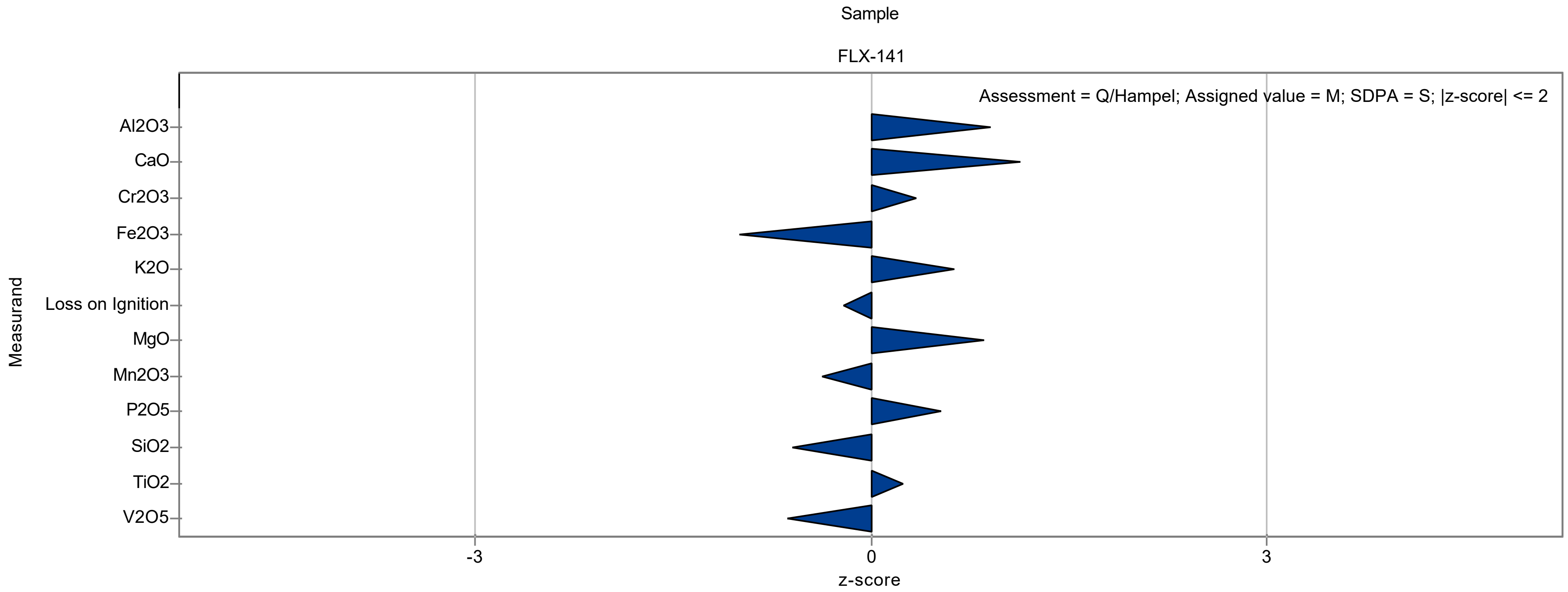
Laboratory chart of z-scores

Laboratory: 23



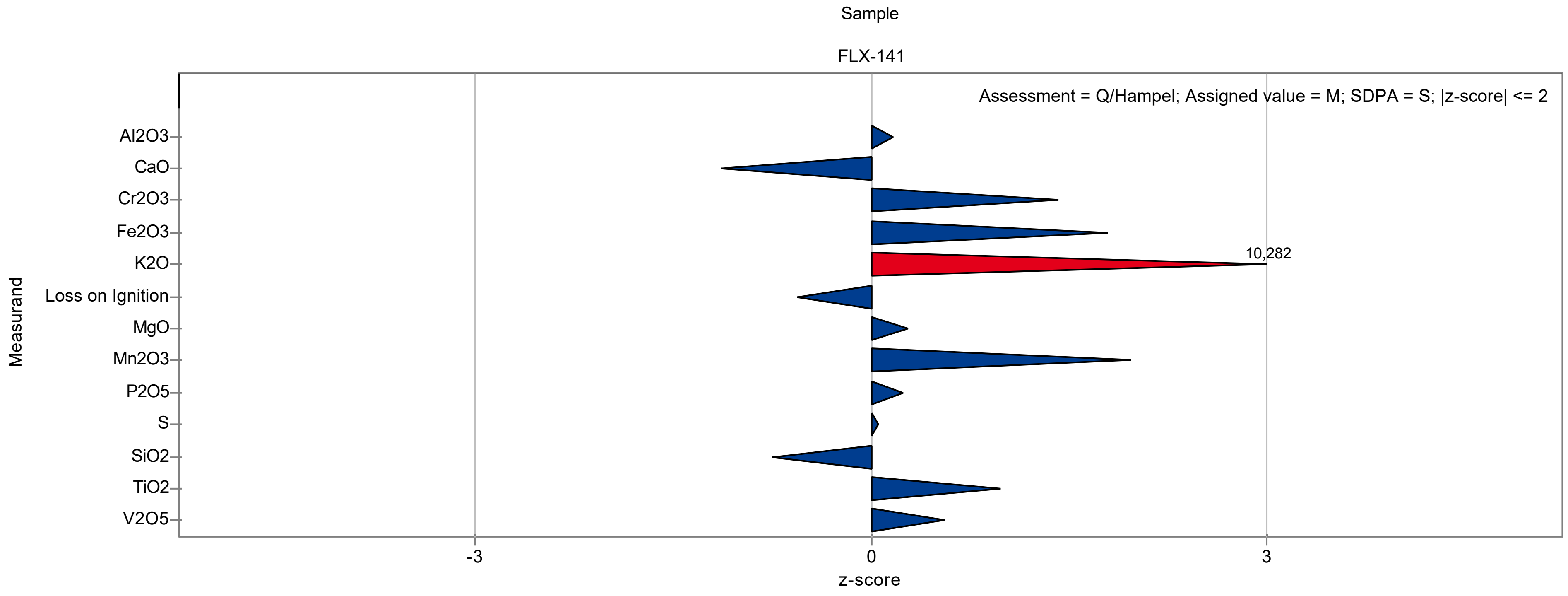
Laboratory chart of z-scores

Laboratory: 24



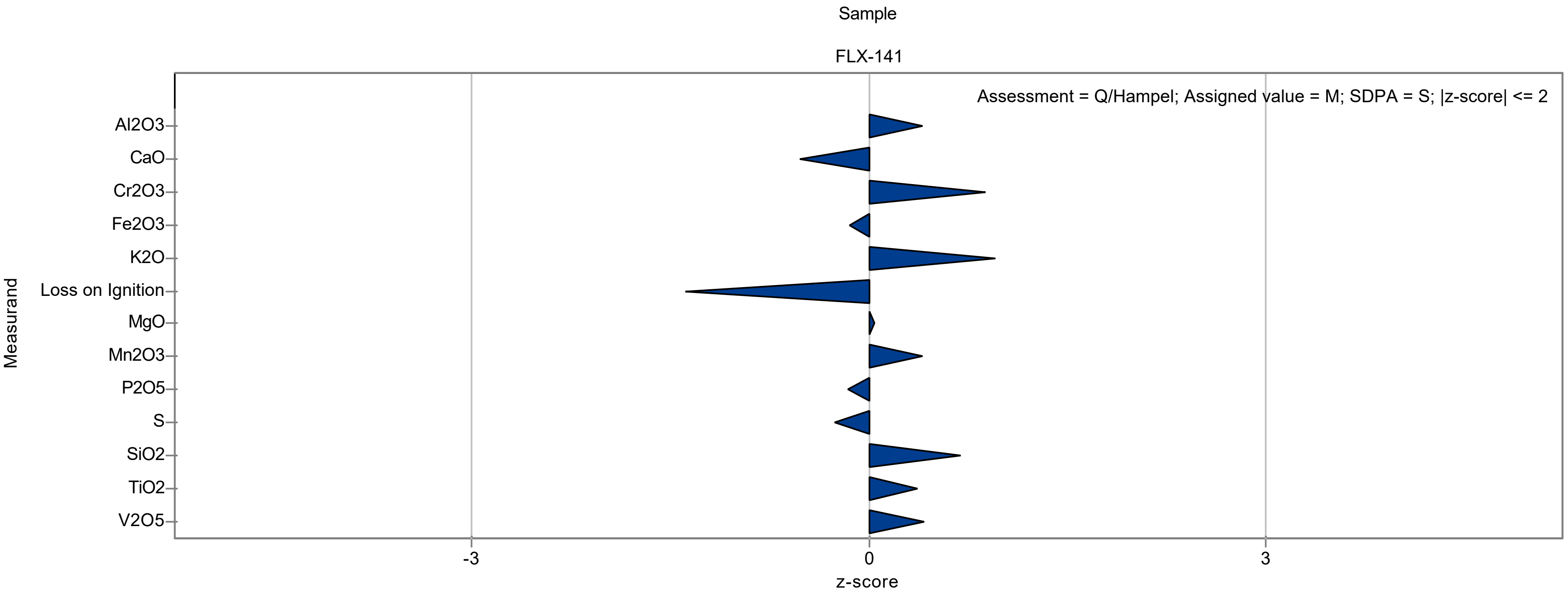
Laboratory chart of z-scores

Laboratory: 25



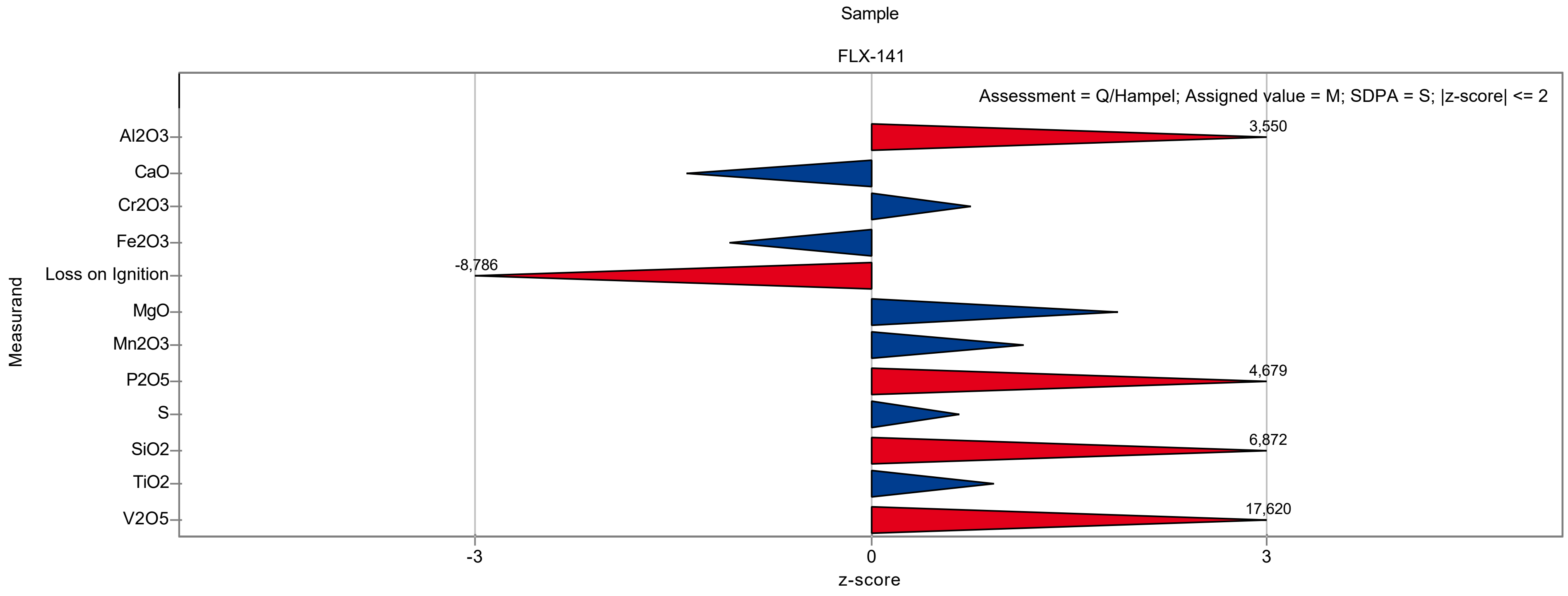
Laboratory chart of z-scores

Laboratory: 26



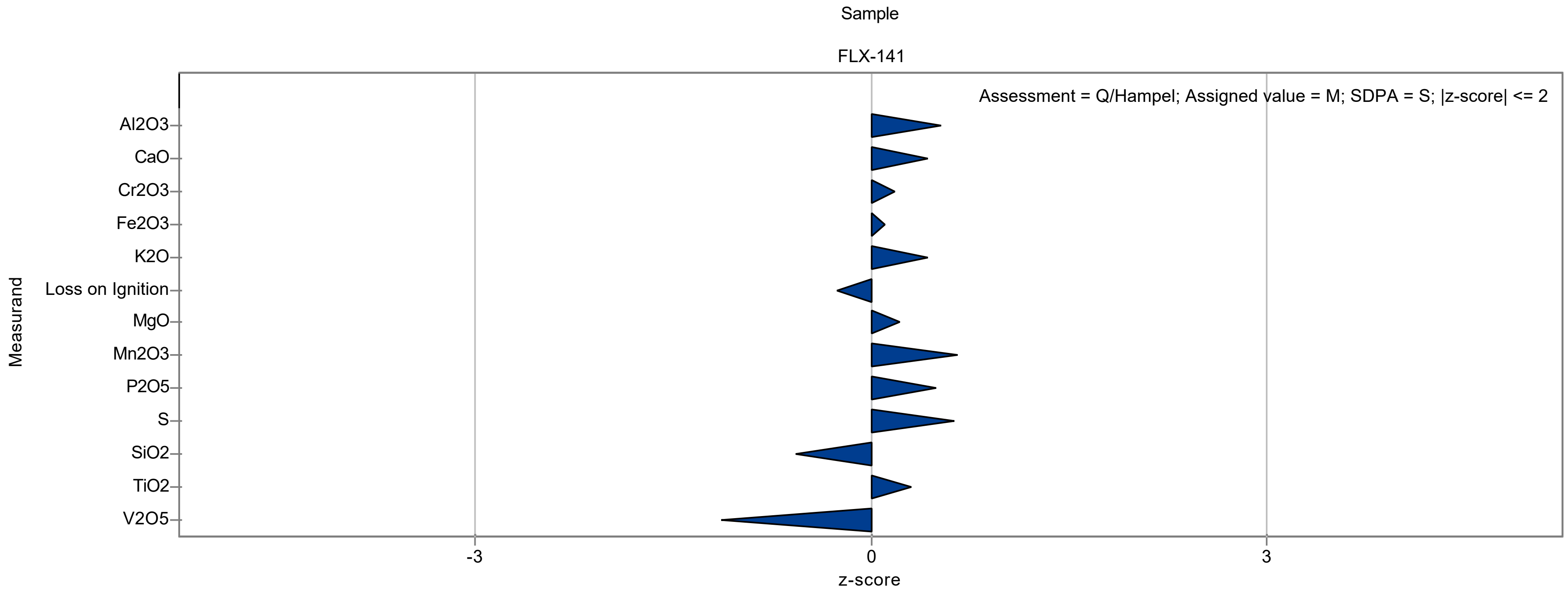
Laboratory chart of z-scores

Laboratory: 27



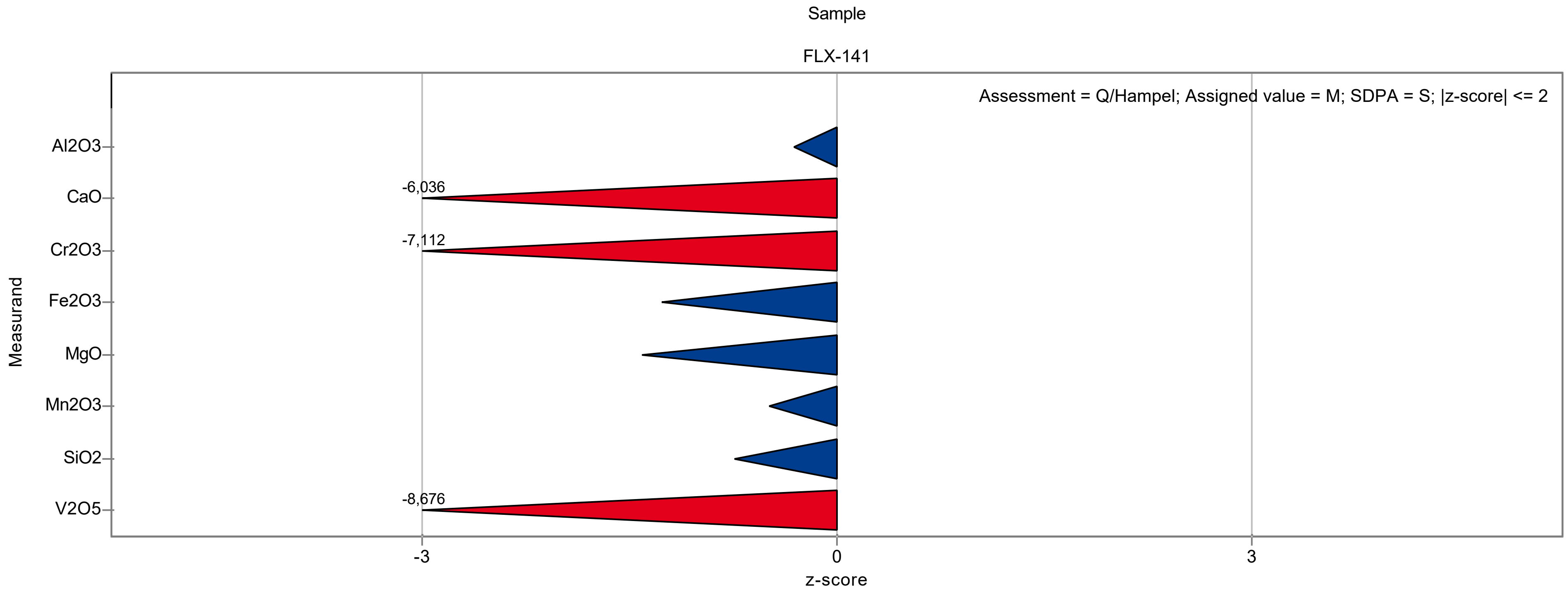
Laboratory chart of z-scores

Laboratory: 28



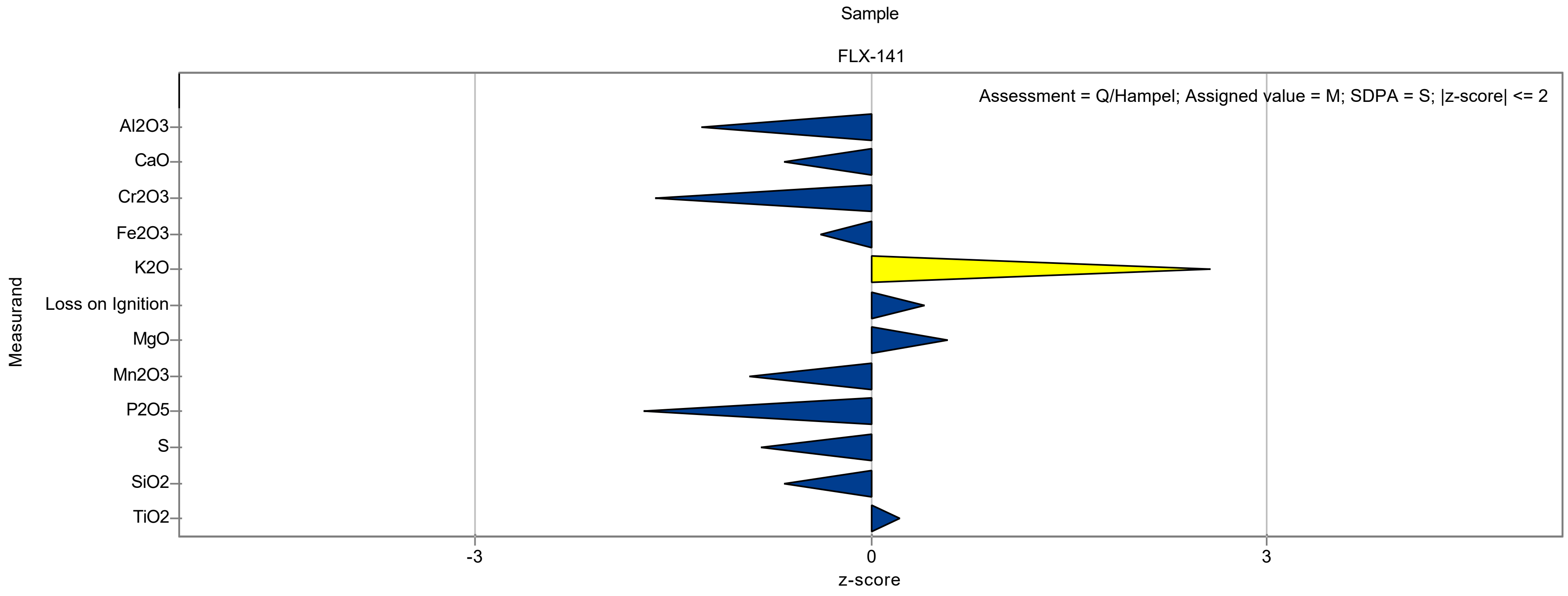
Laboratory chart of z-scores

Laboratory: 29



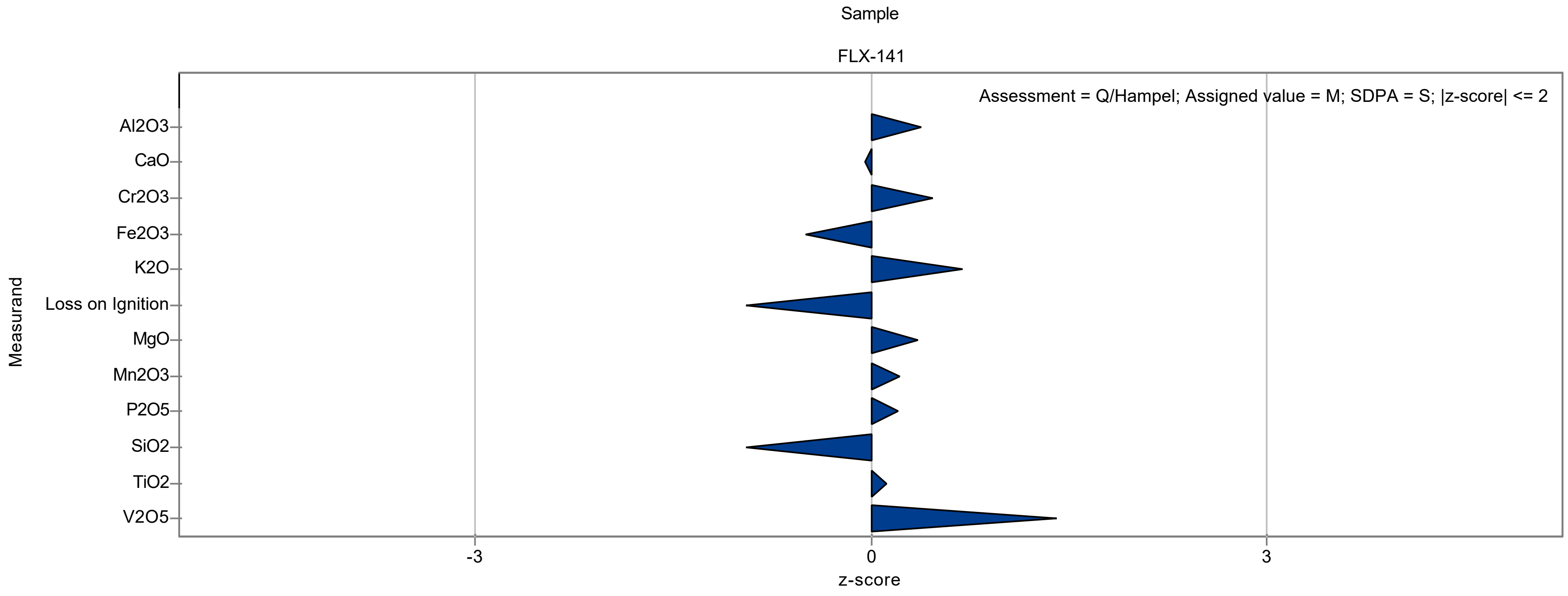
Laboratory chart of z-scores

Laboratory: 31



Laboratory chart of z-scores

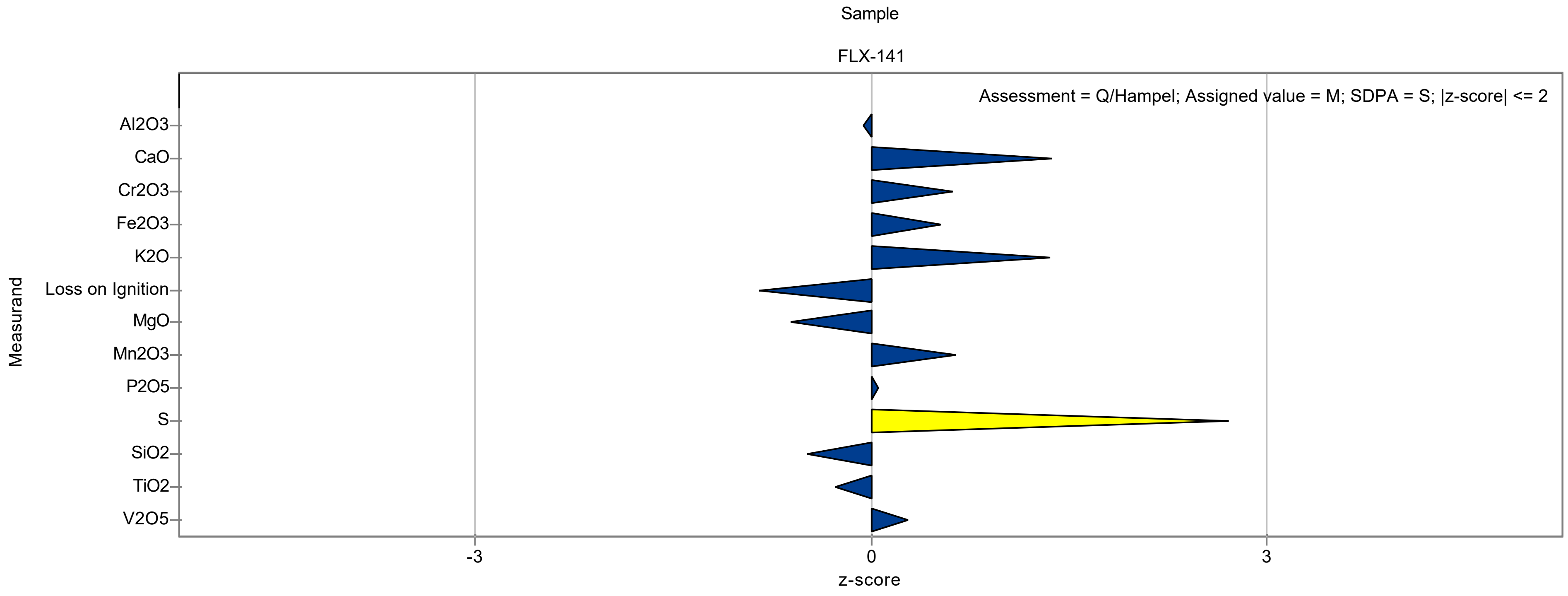
Laboratory: 32



2022_01 Slag

Laboratory chart of z-scores

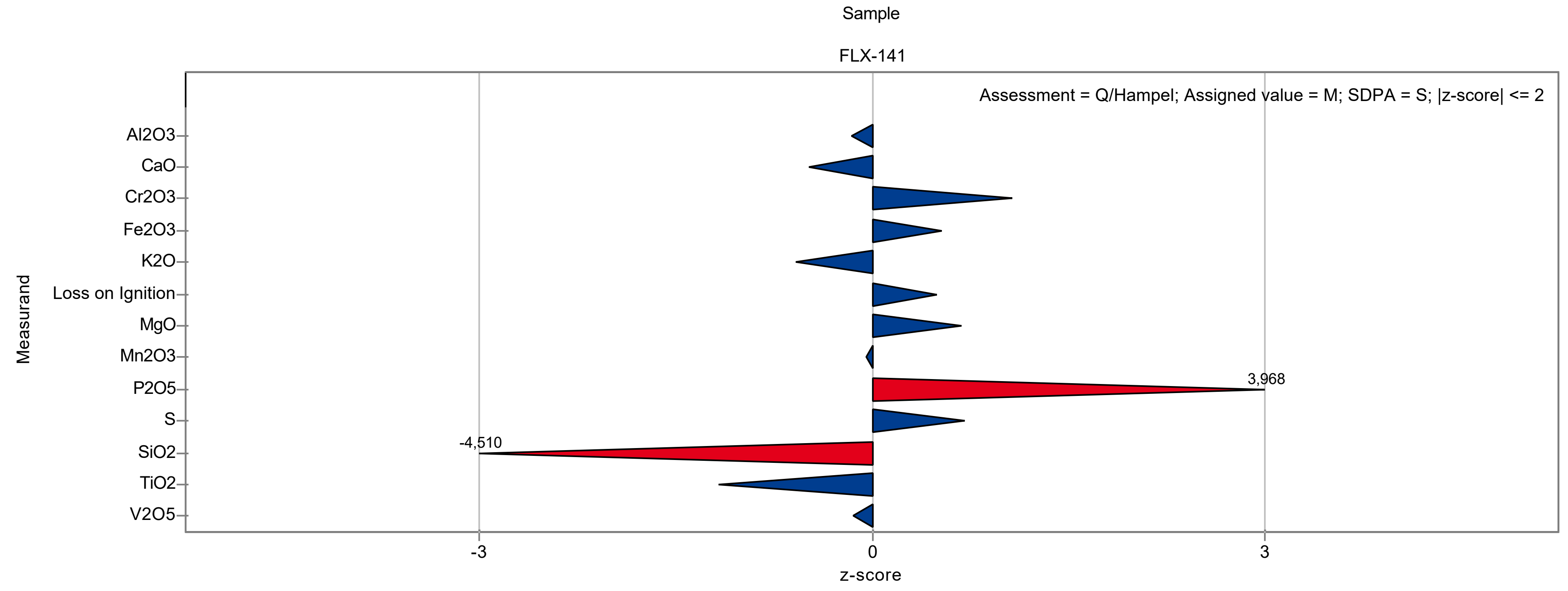
Laboratory: 33



2022_01 Slag

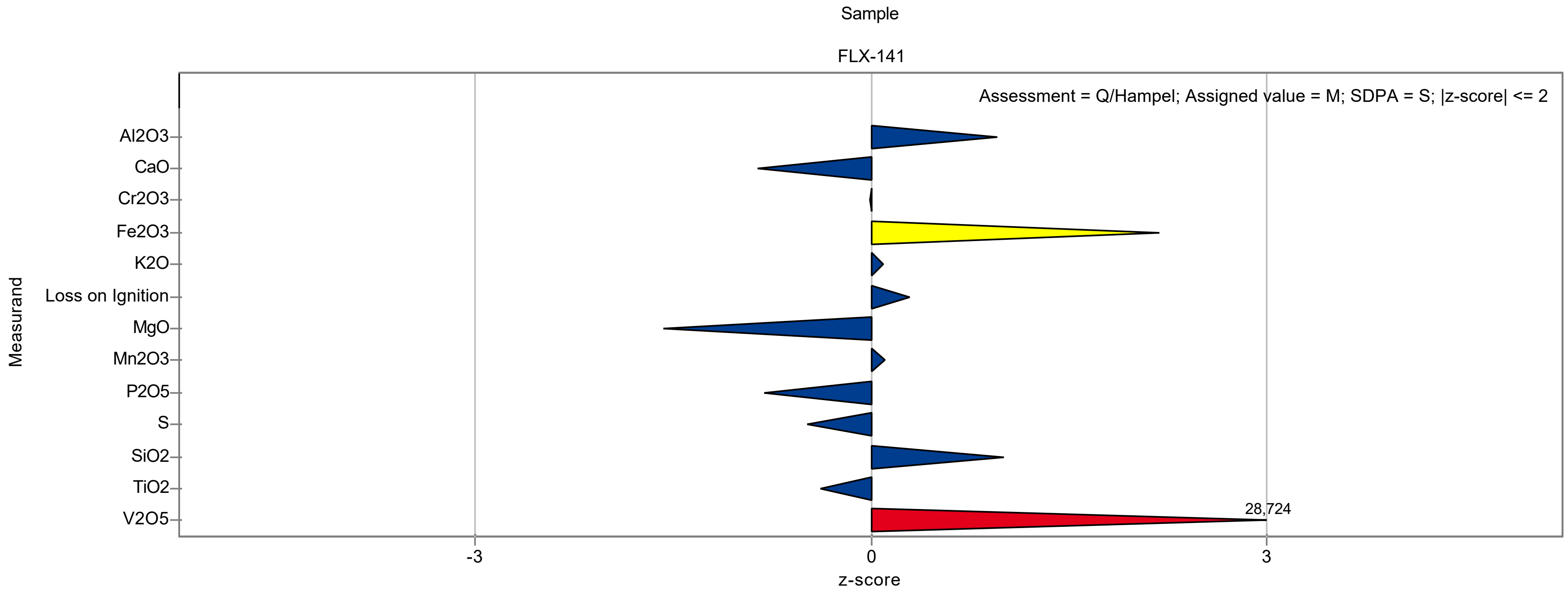
Laboratory chart of z-scores

Laboratory: 34



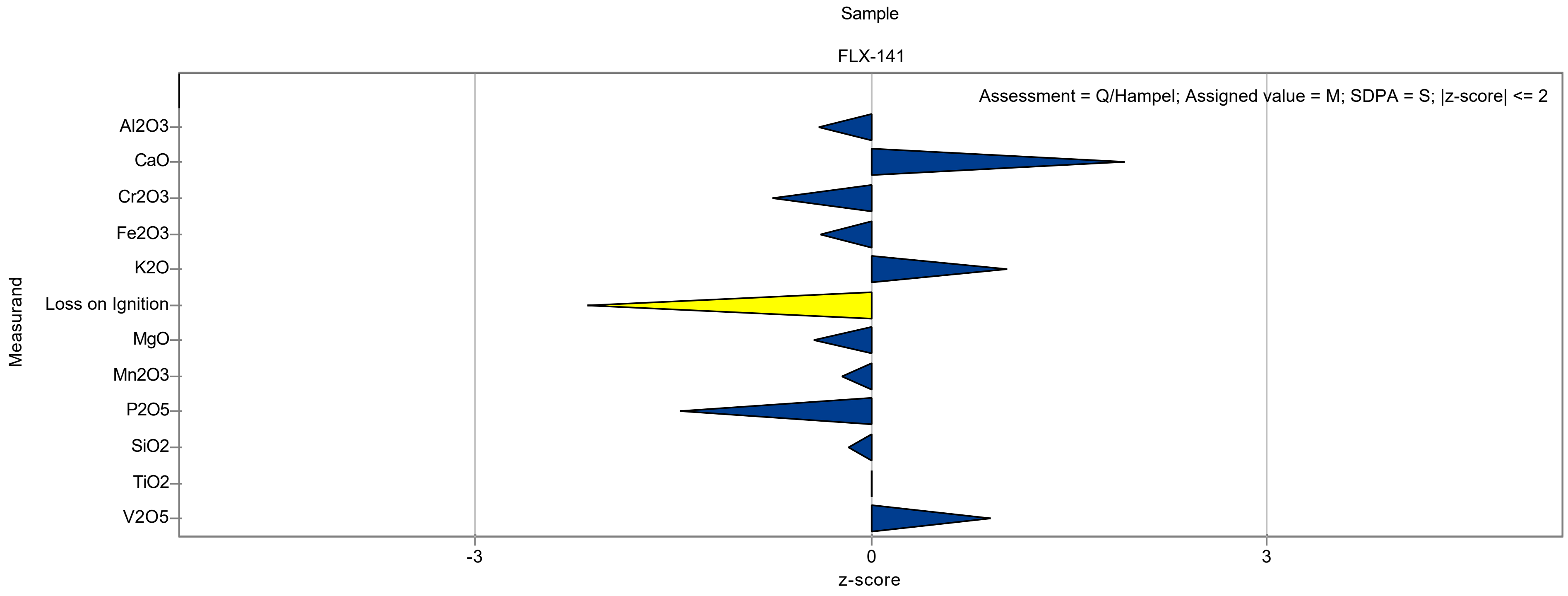
Laboratory chart of z-scores

Laboratory: 35



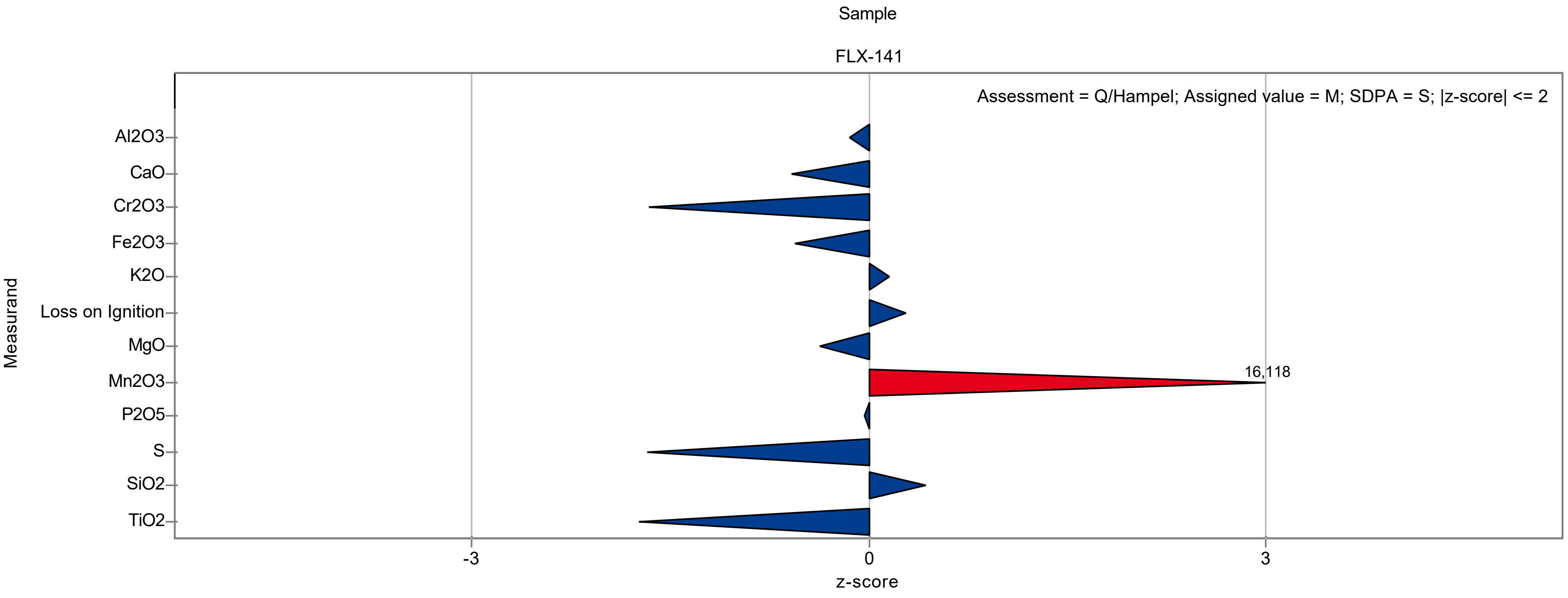
Laboratory chart of z-scores

Laboratory: 36



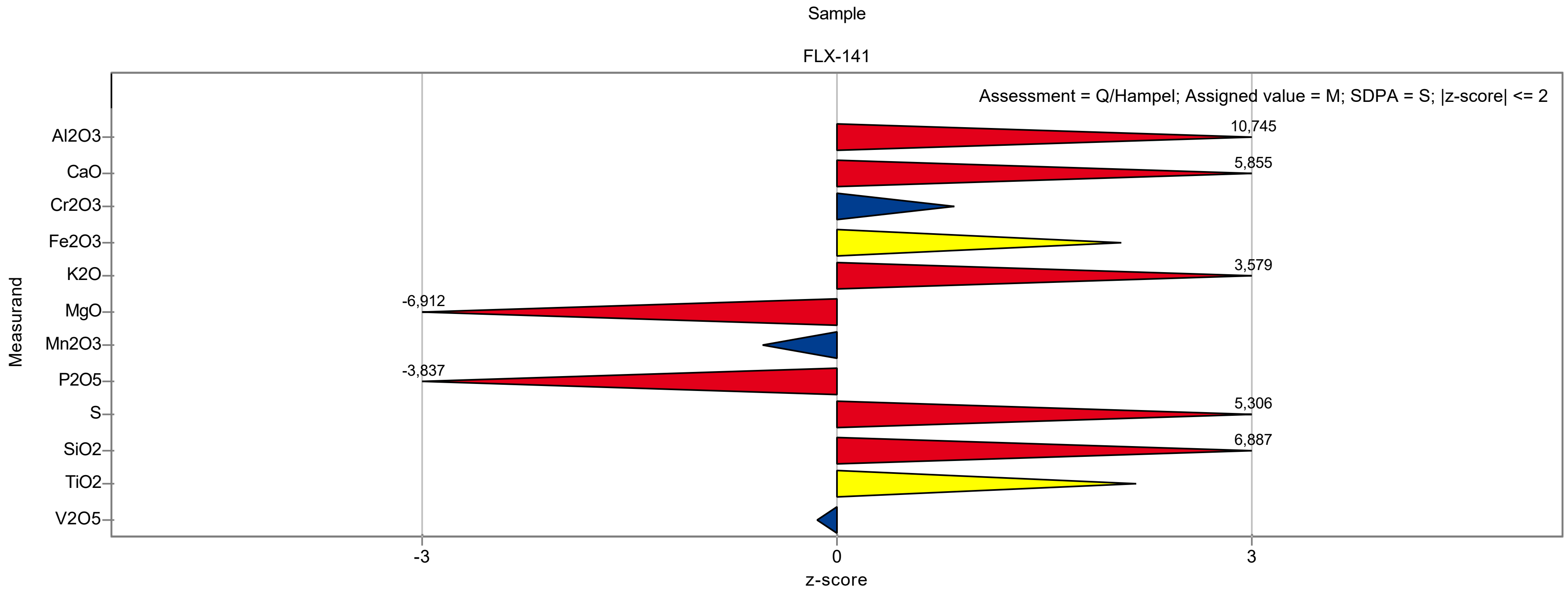
Laboratory chart of z-scores

Laboratory: 37



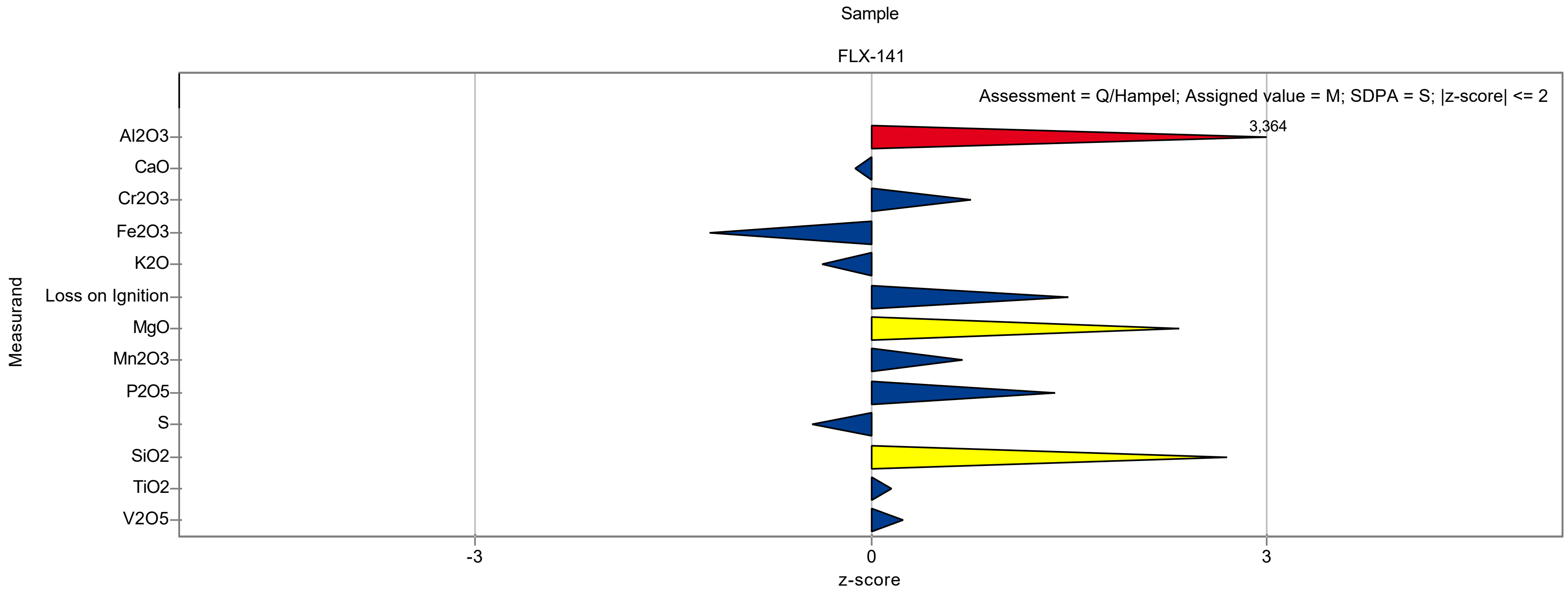
Laboratory chart of z-scores

Laboratory: 38



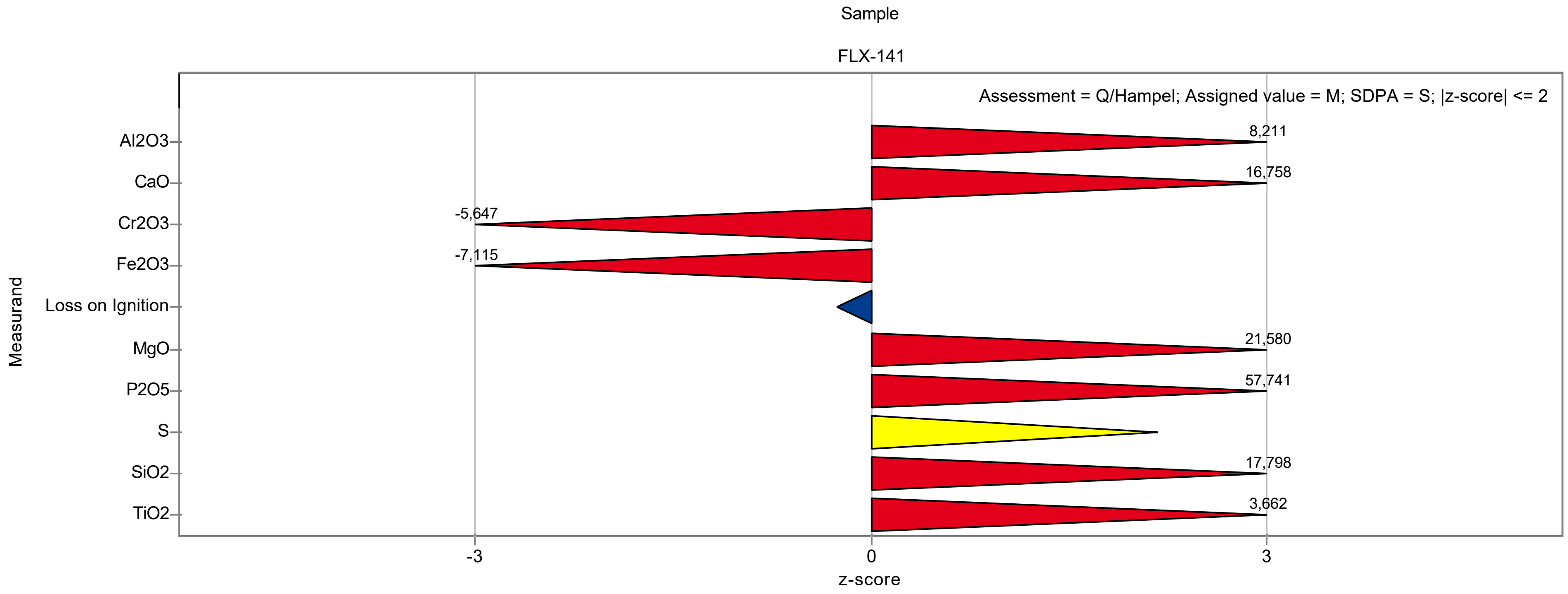
Laboratory chart of z-scores

Laboratory: 39



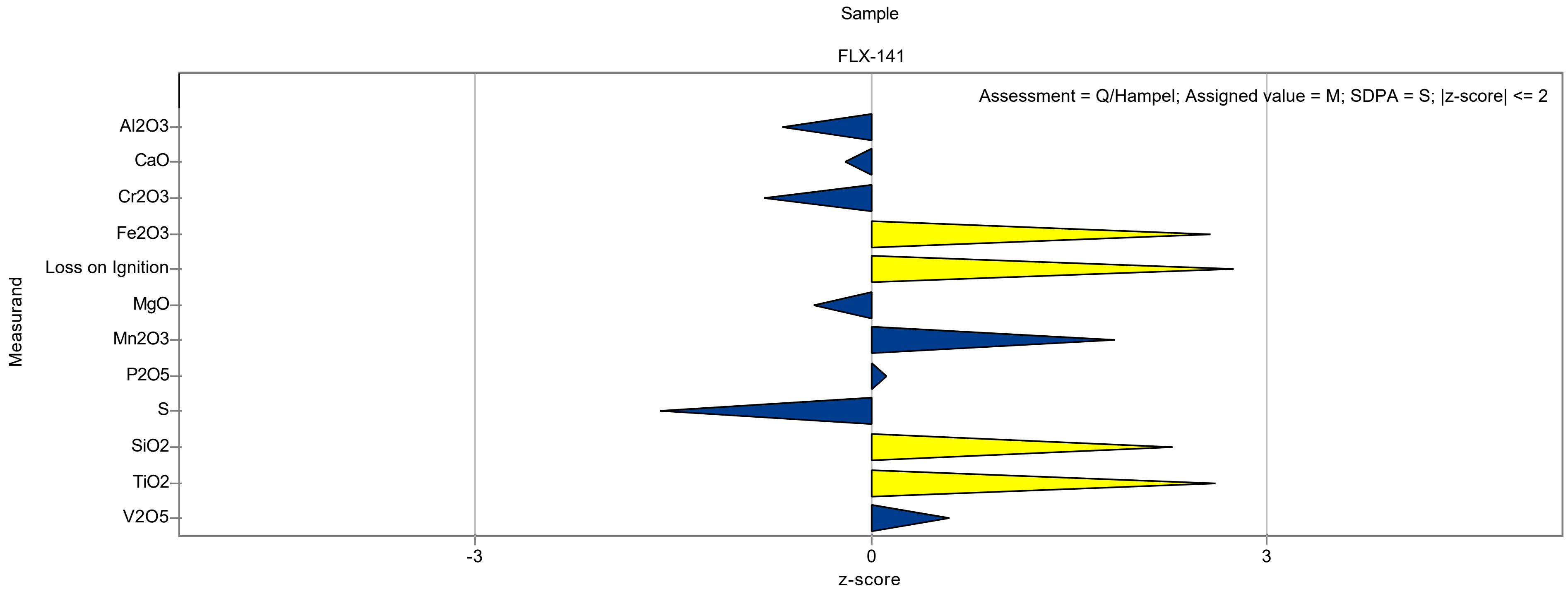
Laboratory chart of z-scores

Laboratory: 40



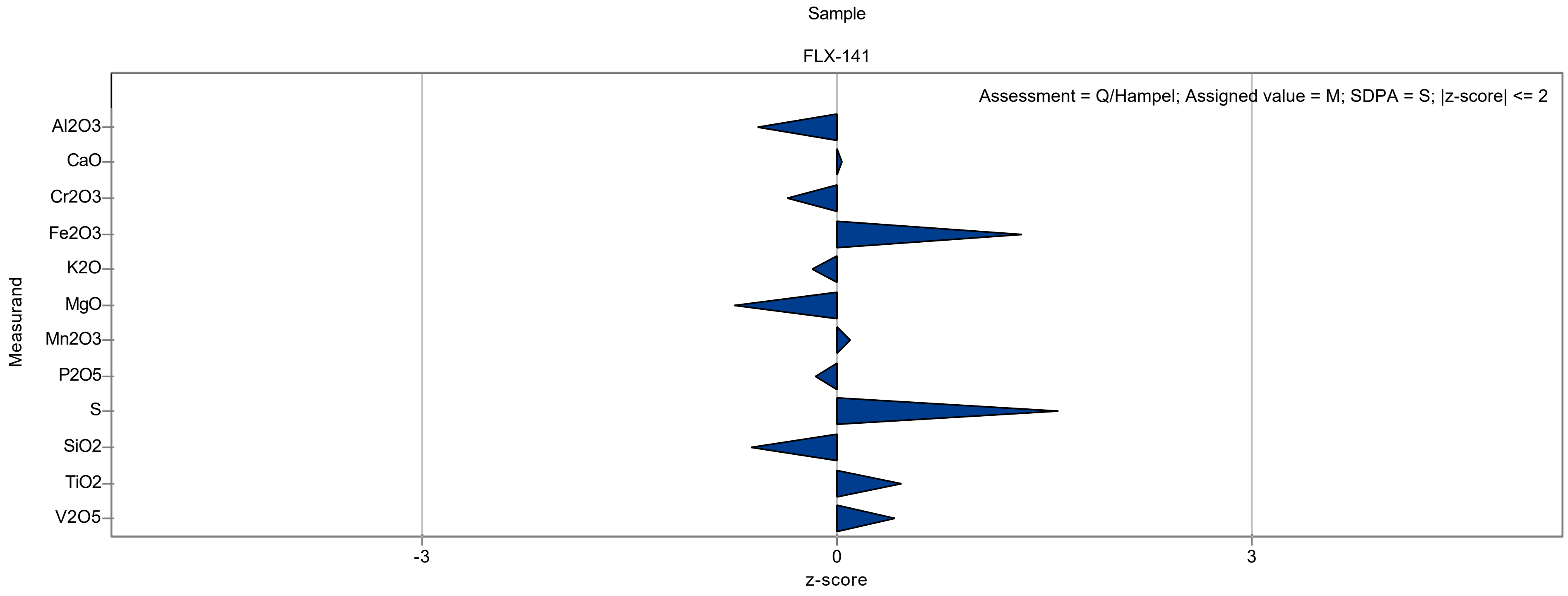
Laboratory chart of z-scores

Laboratory: 41



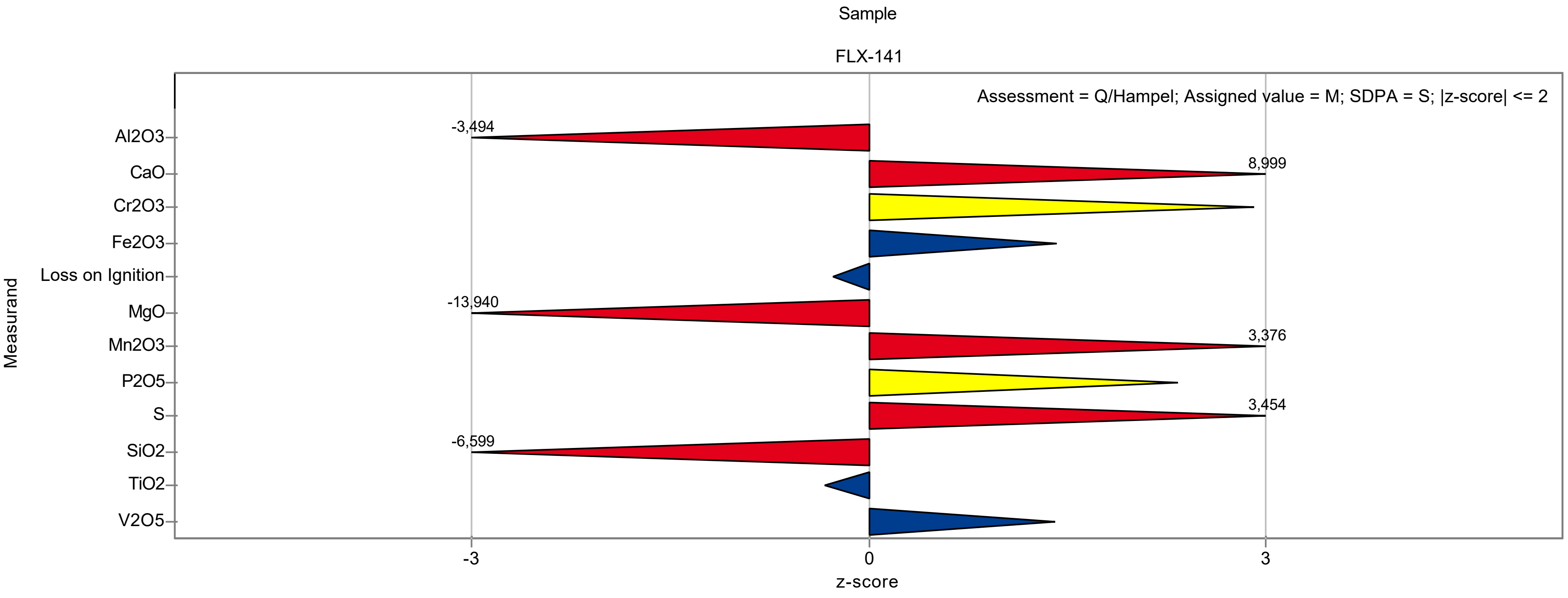
Laboratory chart of z-scores

Laboratory: 42



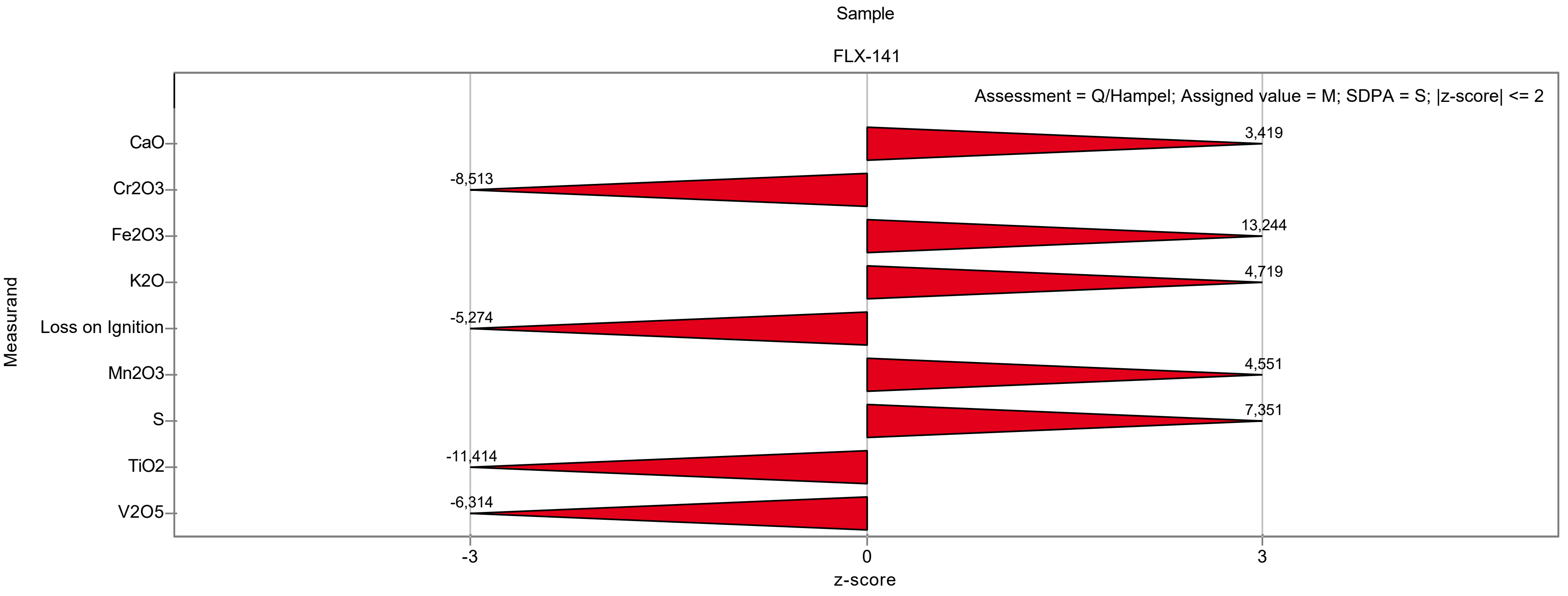
Laboratory chart of z-scores

Laboratory: 43



Laboratory chart of z-scores

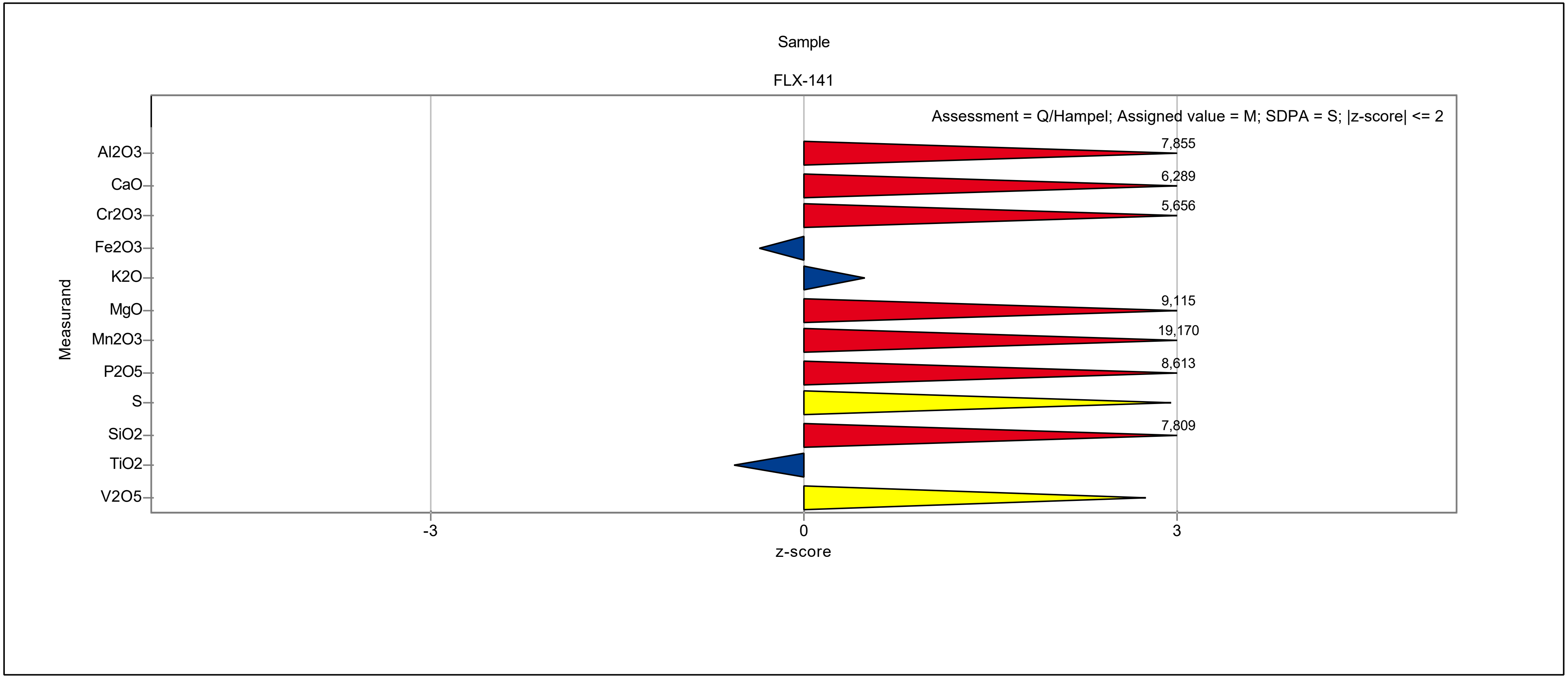
Laboratory: 44



2022_01 Slag

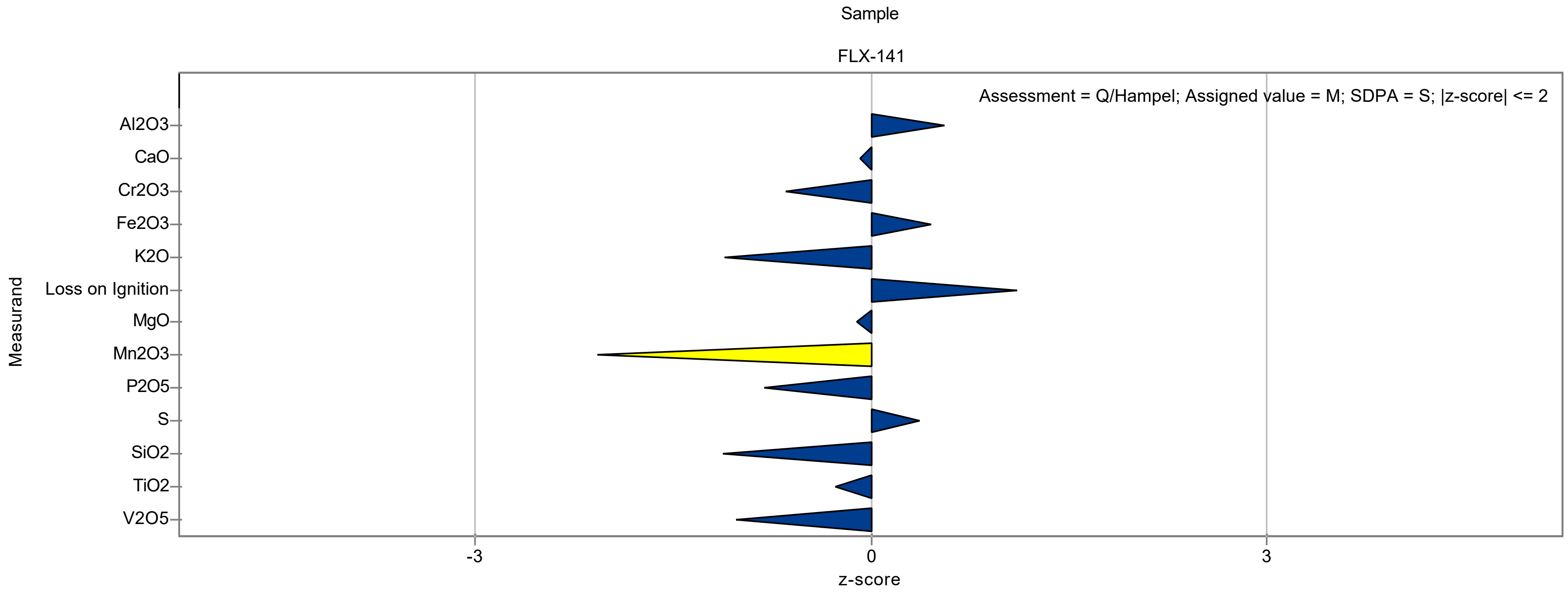
Laboratory chart of z-scores

Laboratory: 45



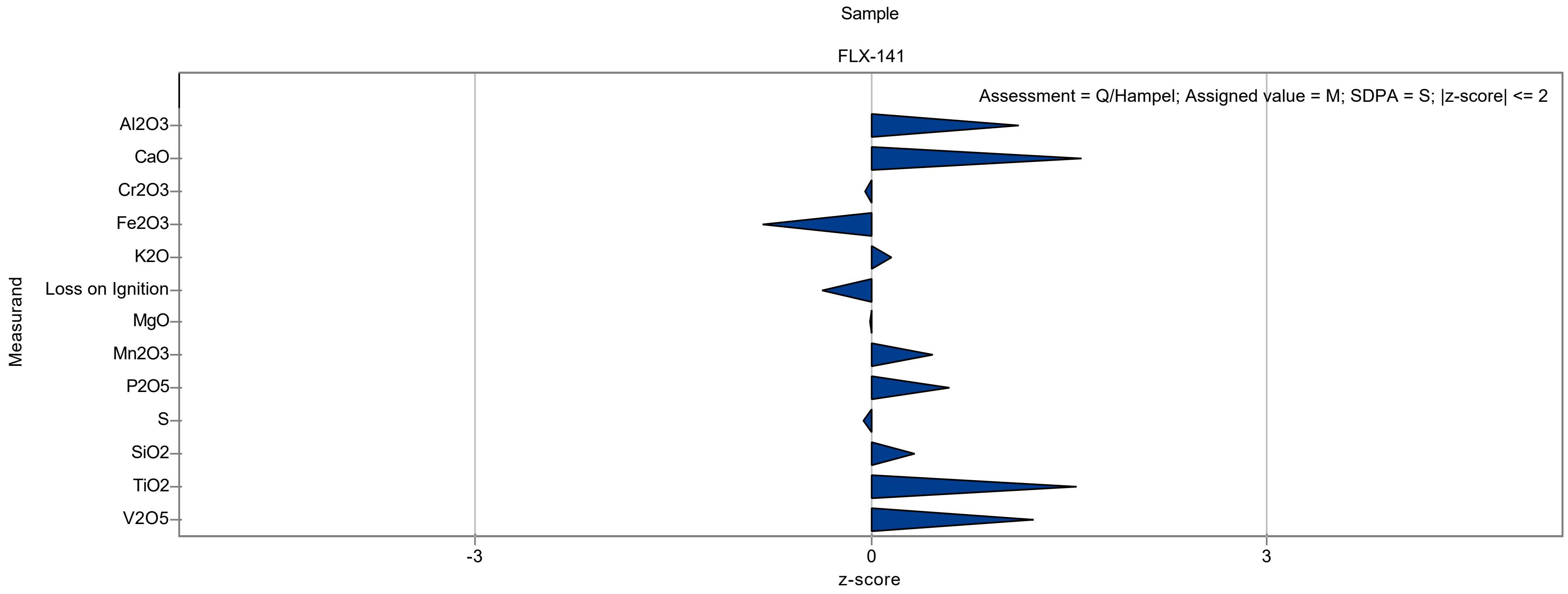
Laboratory chart of z-scores

Laboratory: 46



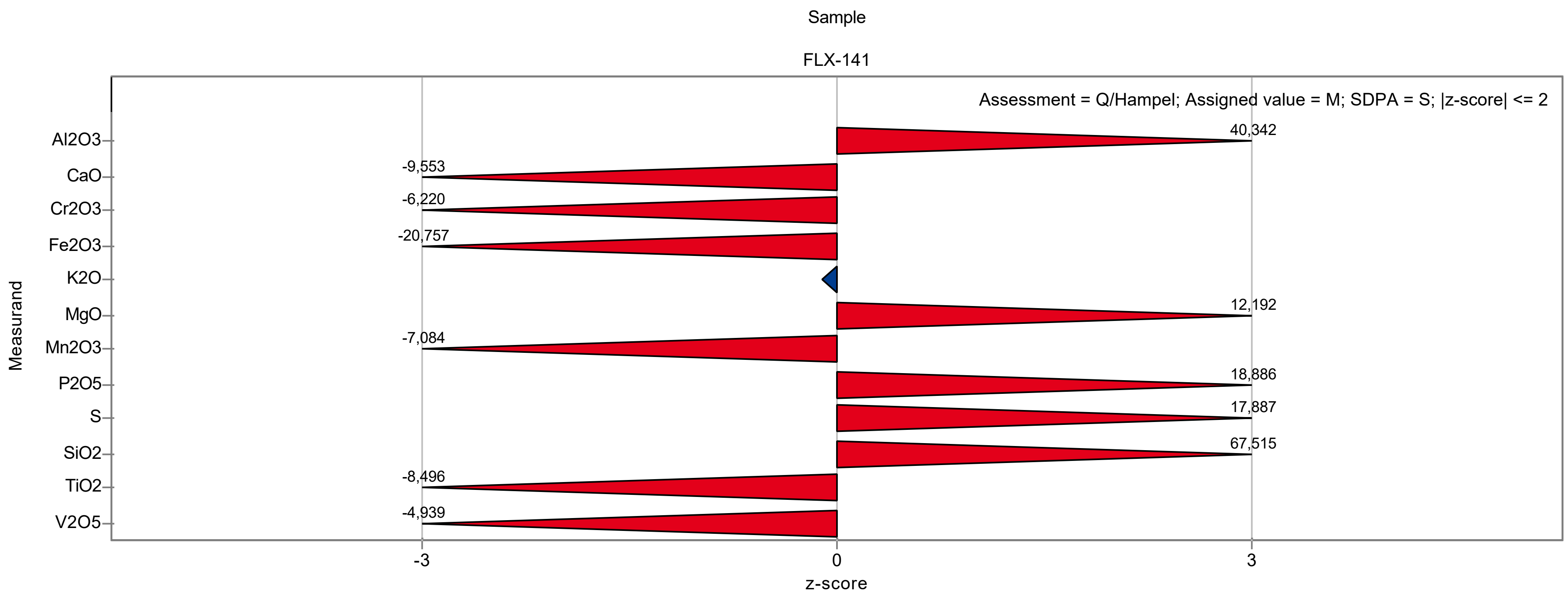
Laboratory chart of z-scores

Laboratory: 47



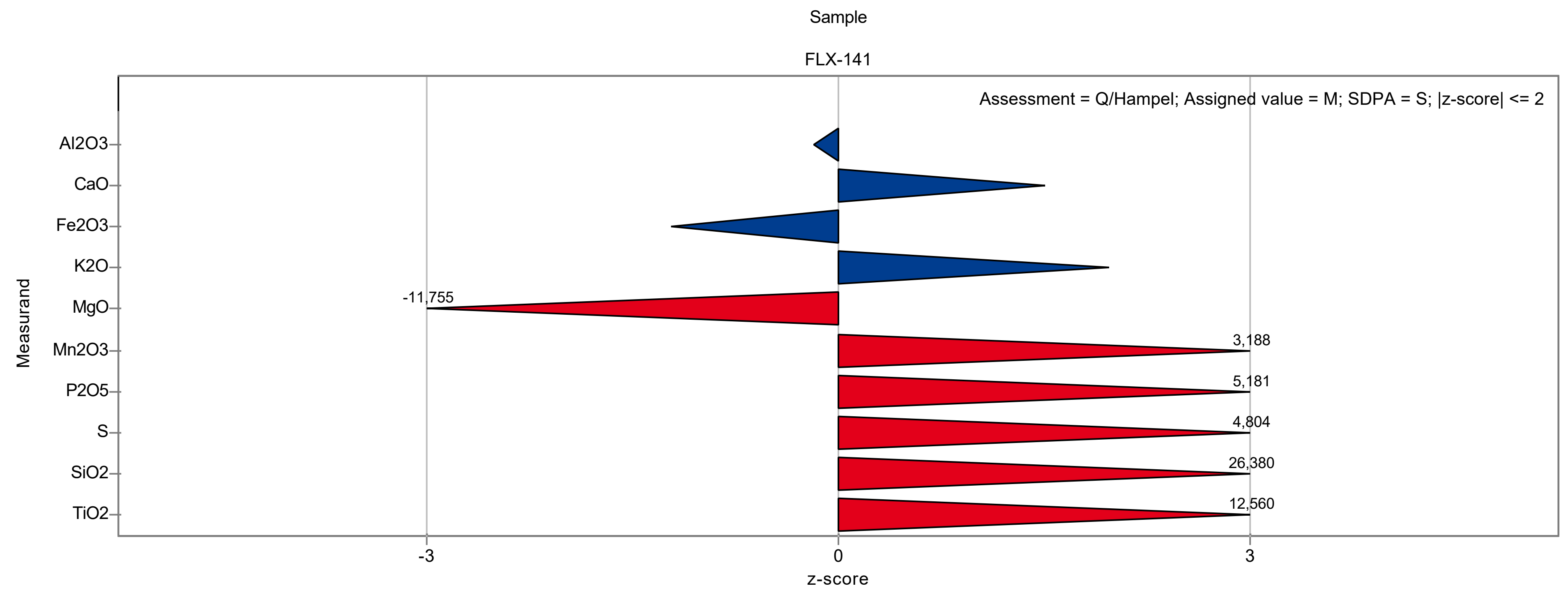
Laboratory chart of z-scores

Laboratory: 49



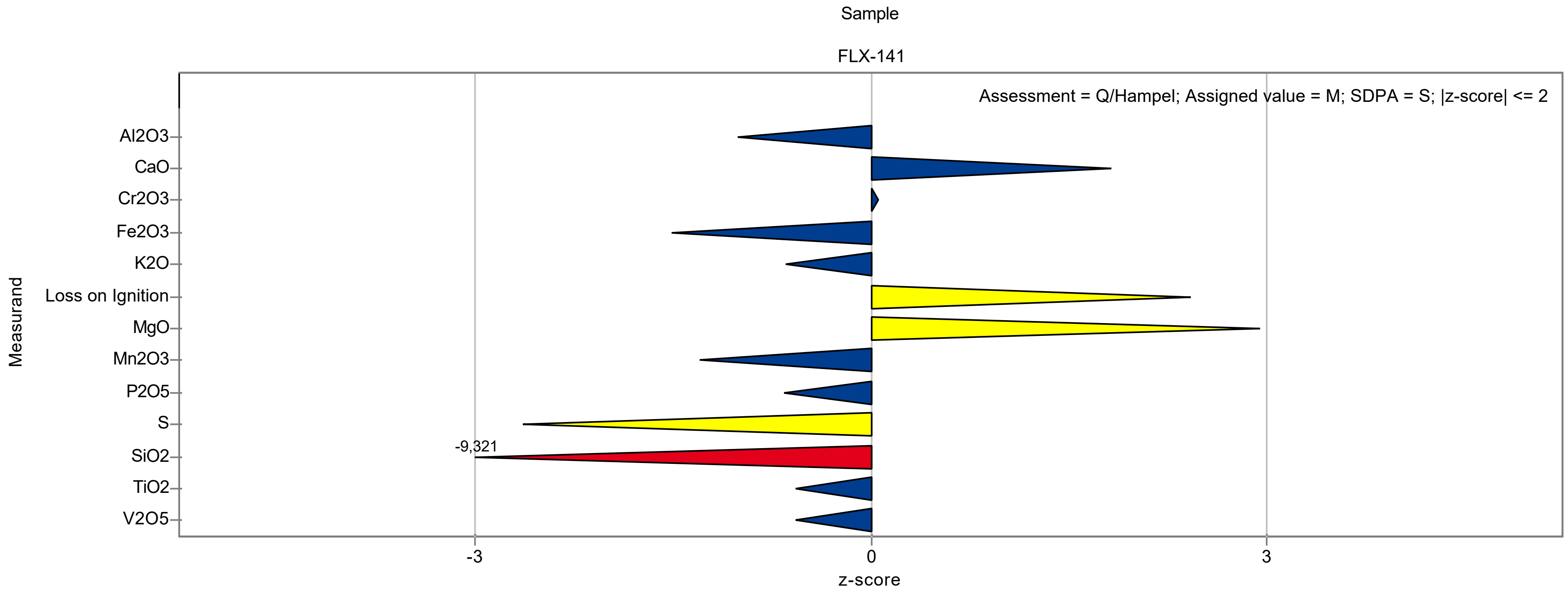
Laboratory chart of z-scores

Laboratory: 50



2022_01 Slag

Laboratory chart of z-scores

Laboratory: 51