



Hitachi High-Tech

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X-MET8000 Optimum Geo calibration datasheets

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The information in this document applies to the X-MET8000 Optimum Geo only.



Instrument limit of detection (IDL):

- The concentration that is required for an element to produce an x-ray signal (intensity) greater than three times the standard deviation of the noise (=background) level.

Method limit of detection (MDL):

- The minimum concentration of an element that can be measured and reported with 99% confidence that the element's concentration is greater than zero.
- It is calculated as per the procedure defined in Protocol 40 CFR Ch.1 Part 136 App B.

Note 1: The MDL is always larger than the IDL, as it takes into account errors due to the method/calibration itself (e.g. background subtraction, corrections for interfering elements...).

Note 2: All limits of detection are calculated for interference-free matrices. Limits of detection in a "real" sample will be higher.

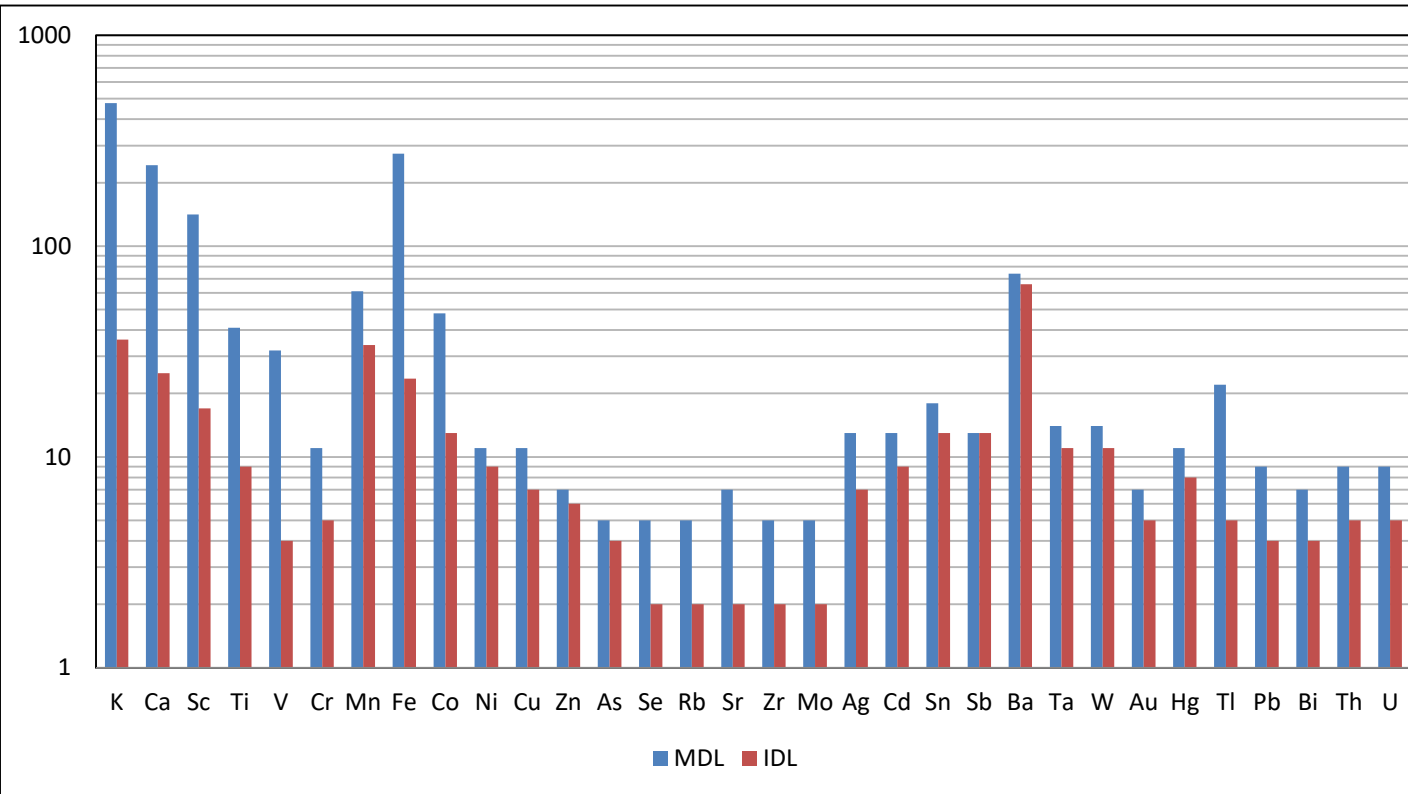
Soil application

- General FP method for the analysis of heavy metals in soil matrices.
- Suitable for samples with total heavy element content <10% and individual metal concentration < 1%.
- Does not include light elements.

Mining application

- Includes Mining FP and Mining LE FP.
- General method for analysing heavy elements in mining samples, where the total heavy element content is > 5% and individual metal concentration is > 1%.
- Mg, Al, Si, P and S are measured when the Light Elements are switched ON.
- CAUTION: light elements analysis is sensitive to sample form, i.e. samples need to be dried and ground for best accuracy.

Limits of detection (60s per condition), mg/kg

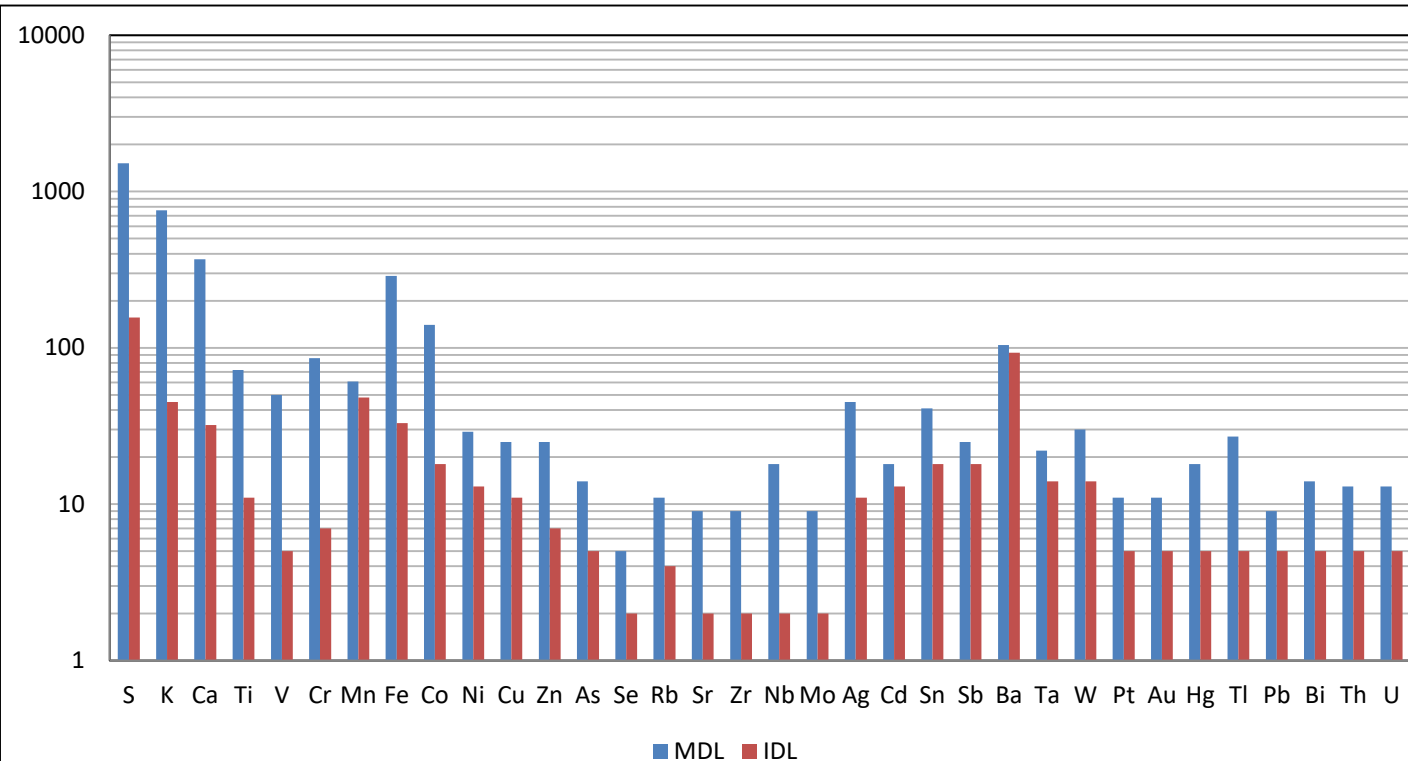


Typical accuracy and precision (60s total analysis time), wt%

NIST2711a	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Rb	Sr	Cd	Ba	Pb	Th
#1	2.50	2.62	0.357	0.0060	0.0043	0.0626	3.07	0.0023	0.017	0.0416	0.0090	0.013	0.0239	0.0070	0.069	0.14	0.0019
#2	2.49	2.66	0.359	0.0051	0.0037	0.0618	3.00	0.0035	0.016	0.0414	0.0071	0.013	0.0245	0.0065	0.064	0.14	0.0016
#3	2.55	2.60	0.363	0.0024	0.0032	0.0699	3.06	0.0032	0.015	0.0404	0.0101	0.014	0.0238	0.0069	0.072	0.14	0.0019
#4	2.49	2.64	0.362	0.0054	0.0039	0.0712	3.01	0.0032	0.016	0.0413	0.0064	0.013	0.0240	0.0066	0.064	0.14	0.0018
#5	2.46	2.60	0.348	0.0103	0.0044	0.0585	3.01	0.0030	0.014	0.0409	0.0082	0.013	0.0241	0.0074	0.073	0.14	0.0021
Average	2.50	2.62	0.358	0.0058	0.0039	0.0648	3.03	0.0030	0.016	0.0411	0.0082	0.013	0.0241	0.0069	0.068	0.14	0.0019
Certificate	2.53	2.42	0.317	0.0081	0.0052	0.0675	2.82	0.0022	0.014	0.0414	0.0107	0.012	0.0242	0.0054	0.073	0.14	0.0015

SRM2586	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	Sr	Ba	Pb
#1	1.019	2.096	0.673	0.0148	0.0284	0.113	5.60	0.0090	0.0086	0.0335	0.0087	0.0463	0.0460
#2	1.063	2.092	0.687	0.0135	0.0290	0.099	5.59	0.0083	0.0075	0.0337	0.0089	0.0389	0.0445
#3	1.022	2.120	0.686	0.0142	0.0281	0.110	5.58	0.0071	0.0083	0.0355	0.0087	0.0493	0.0446
#4	1.043	2.120	0.683	0.0130	0.0303	0.109	5.55	0.0097	0.0098	0.0370	0.0087	0.0553	0.0437
#5	1.000	2.114	0.683	0.0128	0.0286	0.090	5.60	0.0097	0.0085	0.0347	0.0086	0.0521	0.0459
Average	1.029	2.108	0.682	0.0137	0.0289	0.104	5.58	0.0088	0.0085	0.0349	0.0087	0.0484	0.0449
Certificate	0.976	2.218	0.605	0.0160	0.0301	0.100	5.16	0.0075	0.0081	0.0352	0.0084	0.0413	0.0432

Limits of detection (60s per condition), mg/kg

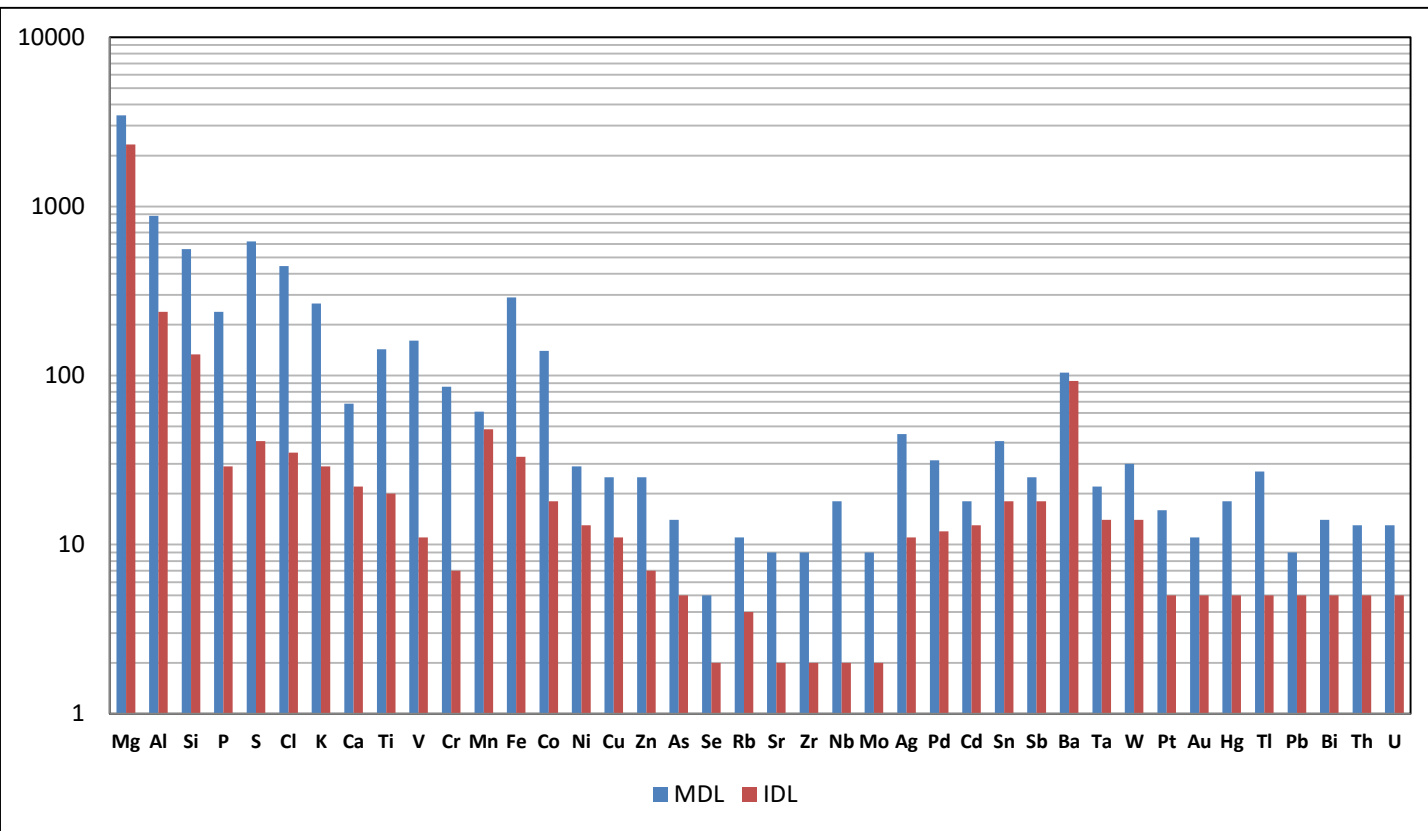


Typical accuracy and precision (30s total analysis time), wt%

CuConc2891	S	K	Ca	Ti	Mn	Fe	Cu	Zn	Ag	Cd	Pb
#1	15.31	0.504	0.984	0.200	0.037	5.85	41.5	2.96	0.076	0.029	2.33
#2	16.29	0.484	1.070	0.218	0.055	5.93	42.4	3.01	0.080	0.033	2.38
#3	14.91	0.503	1.035	0.200	0.046	5.85	41.2	2.92	0.075	0.031	2.30
#4	15.75	0.497	1.052	0.206	0.040	5.92	41.5	3.02	0.080	0.029	2.31
#5	15.92	0.523	1.055	0.219	0.045	6.00	42.0	2.97	0.075	0.030	2.36
Average	15.64	0.502	1.039	0.209	0.044	5.91	41.7	2.98	0.077	0.030	2.34
Certificate	15.98	0.417	0.614	0.168	0.037	5.78	40.4	2.89	0.071	0.029	2.25

OREAS 504	S	K	Ca	Ti	V	Mn	Fe	Cu	Zn	Se	Rb	Sr	Mo
#1	1.80	2.89	2.93	0.416	0.0120	0.0688	8.50	1.12	0.0092	0.0013	0.0065	0.0493	0.0675
#2	1.36	2.83	3.00	0.398	0.0153	0.0573	8.40	1.17	0.0077	0.0011	0.0057	0.0491	0.0656
#3	1.39	2.71	2.96	0.378	0.0201	0.0641	8.30	1.19	0.0081	0.0011	0.0074	0.0471	0.0662
#4	1.26	2.69	2.93	0.388	0.0160	0.0716	8.40	1.18	0.0085	0.0016	0.0061	0.0484	0.0688
#5	1.48	2.76	2.98	0.388	0.0102	0.0486	8.44	1.21	0.0091	0.0005	0.0063	0.0496	0.0683
Average	1.46	2.78	2.96	0.394	0.0147	0.0621	8.41	1.17	0.0085	0.0011	0.0064	0.0487	0.0673
Certificate	1.37	2.91	3.00	0.348	0.0186	0.0620	8.11	1.14	0.0113	0.0010	0.0069	0.0509	0.0624

Limits of detection (60s per condition), mg/kg



Typical accuracy and precision (60s total analysis time), wt%

GBM911-14	Mg	Al	Si	S	Cr	Mn	Fe	Ni	Cu	As
#1	8.116	1.53	14.43	10.61	0.090	0.104	18.13	3.07	0.3026	0.044
#2	8.437	1.64	14.52	10.59	0.087	0.115	17.95	3.08	0.2927	0.045
#3	8.485	1.49	14.31	10.44	0.096	0.104	18.21	3.05	0.295	0.047
#4	8.727	1.49	14.46	10.56	0.090	0.089	17.97	3.03	0.3076	0.044
#5	8.185	1.57	14.54	10.66	0.092	0.100	18.28	3.09	0.3016	0.045
Average	8.390	1.54	14.45	10.57	0.091	0.102	18.11	3.06	0.2999	0.045
Certificate	7.839	1.94	13.52	10.50	0.075	0.101	18.43	3.24	0.2856	0.044

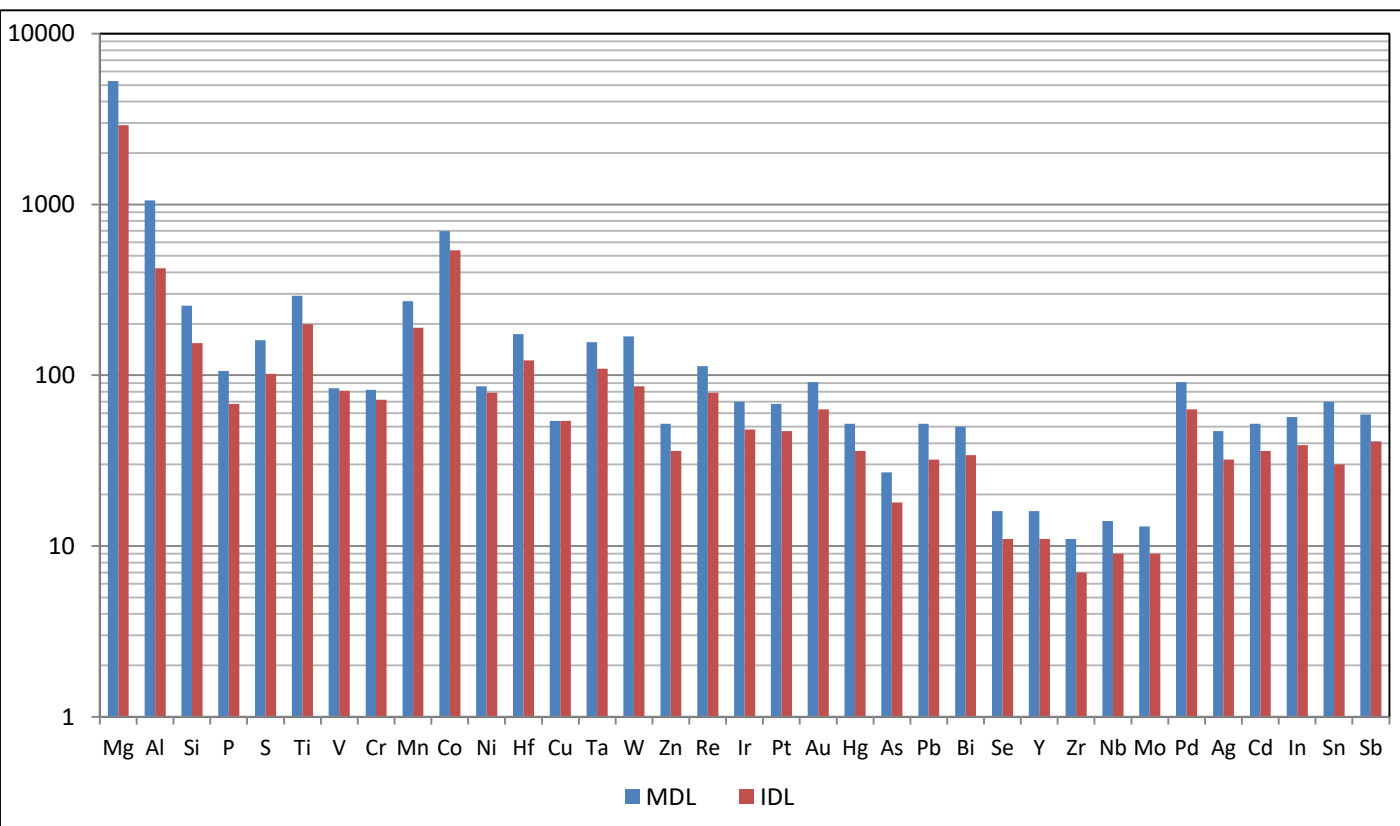
ECRM683-1	Mg	Al	Si	P	Ca	Mn	Fe
#1	0.00	1.01	4.81	0.183	4.71	0.402	56.79
#2	0.00	1.07	4.75	0.190	4.71	0.397	56.78
#3	0.75	1.06	4.71	0.180	4.68	0.421	55.90
#4	0.42	1.14	4.76	0.191	4.70	0.422	56.09
#5	0.52	1.01	4.77	0.201	4.69	0.413	56.13
Average	0.34	1.06	4.76	0.189	4.70	0.411	56.34
Certificate	1.04	1.30	3.38	0.148	5.70	0.462	56.06



Other calibrations available:

- Alloy LE FP
- Precious FP

Limits of detection in a steel matrix (60s per condition), mg/kg



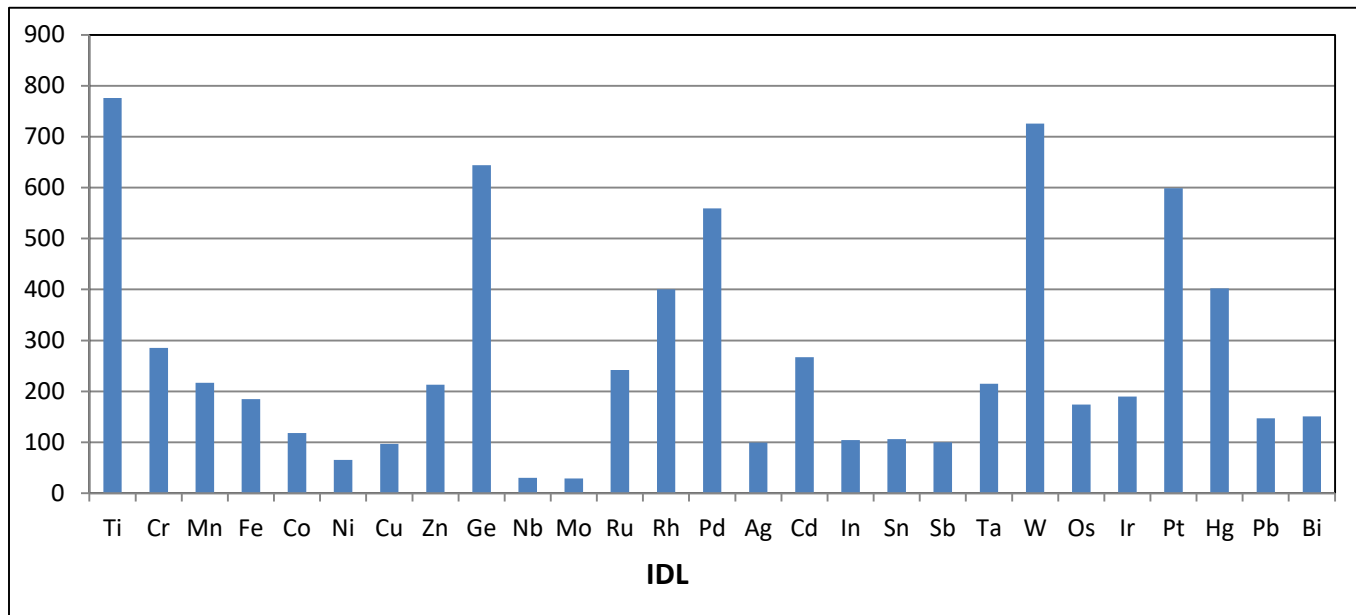
Typical accuracy and precision (30s total analysis time), wt%

MEASUREMENT RESULTS OF TWO CERTIFIED ALLOY STANDARDS

AISI416	Si	S	Cr	Mn	Fe	Co	Ni	Cu	Mo
#1	0.44	0.32	11.87	0.43	86.46	0	0.24	0.15	0.08
#2	0.37	0.33	11.88	0.53	86.25	0.1	0.24	0.15	0.08
#3	0.5	0.29	12.11	0.27	86.34	0	0.26	0.15	0.08
#4	0.42	0.31	11.99	0.43	86.2	0.08	0.23	0.14	0.08
#5	0.43	0.31	12.29	0.35	86.06	0.03	0.23	0.13	0.08
Average	0.43	0.31	12.03	0.40	86.26	0.042	0.24	0.14	0.08
Certificate	0.37	0.29	12.25	0.35	86.02	0.022	0.24	0.155	0.08

AA6063	Mg	Al	Si	Mn	Ni	Cu	Zn	Pb
#1	0.38	98.47	0.72	0.08	0.02	0.09	0.03	0.02
#2	0.26	98.62	0.66	0.09	0.03	0.08	0.03	0.02
#3	0.5	98.31	0.67	0.08	0.02	0.09	0.03	0.02
#4	0.38	98.56	0.64	0.06	0.03	0.08	0.03	0.02
#5	0.43	98.44	0.68	0.08	0.03	0.08	0.04	0.02
Average	0.39	98.48	0.67	0.08	0.03	0.08	0.03	0.02
Certificate	0.56	98.47	0.47	0.08	0.02	0.03	0.03	0.02

Limits of detection in a gold matrix (60s per condition), mg/kg



Typical accuracy and precision for gold (10s total analysis time), wt%

MEASUREMENT RESULTS OF GOLD STANDARDS

Au-6	Au	Pd	Cu	Ag
#1	49.17	25.88	12.69	12.26
#2	49.29	25.79	12.69	12.24
#3	49.26	25.68	12.73	12.33
#4	49.34	25.82	12.59	12.25
#5	49.37	25.88	12.62	12.12
Average	49.28	25.81	12.66	12.24
Certificate	49.99	24.96	12.53	12.54

Au-10	Au	Ni	Cu	Zn
a1	76.01	12.07	9.60	2.32
a2	76.17	11.95	9.54	2.34
a3	75.93	12.12	9.58	2.37
a4	76.02	12.10	9.57	2.30
a5	76.09	11.96	9.52	2.43
Average	76.05	12.04	9.56	2.35
Certificate	74.83	12.89	9.64	2.60