Multiplelabs
Turnkey Laboratories Solutions

Analytical®
Technologies Limited

SOES - 3101

Spark Optical Emission Spectrometer

EPCC / PRODUCTS / APPLICATION / SOFTWARE / ACCESSORIES / CONSUMABLES / SERVICES

Analytical Technologies Limited

An ISO 9001 Certified Company

www.analyticalgroup.net

Product Introduction

Metal producing and fabricating plants require truly advanced elemental analysis at every step — from incoming materials to in-process testing to final inspection for outgoing quality. One analytical instrument measures up every time.With outstanding repeatability, reproducibility, and reliability, SOES 3101 is perhaps the industry's best-selling arc/spark optical emission spectrometry (OES) analyzer. Its fast, accurate, cost-effective measurements add certainty to critical supply chains.

Users get ultrafast information on changing process conditions. Also drastically reduced cost of ownership — with lower consumables, plus advanced diagnostics and easy maintenance to prevent expensive downtime. And this tenth-generation SOES 3101 responds to evolving plant requirements with a host of new improvements, as shown below.

FAST, SIMPLE STANDARDIZATION WITH ICAL 2.0

Using conventional analyzers, standardization can take 30+ minutes, demand multiple samples, and require reruns whenever site conditions change. By contrast, in most cases ATL's proprietary iCAL 2.0 calibration logic needs only 5 minutes and a single sample per day. Plus it automatically compensates for most changes in environmental temperature or pressure. So SOES 3101 delivers outstanding stability, productivity, and savings, time after time.

NEW ANALYTICAL PERFORMANCE

SOES 3101 features completely new factory calibrations, with extended calibration ranges and element selections; optimized source excitation parameters; and improved limits of detection (LODs). Example: for iron (Fe), aluminum (Al), and copper (Cu) matrices, the analyzer surpasses its already impressive performance with 30% to 40% better LODs.

NEW ARGON COST SAVINGS

SOES 3101 models significantly decreased their consumption of expensive argon (Ar) gas. A brand-new feature now allows total shutdown of argon flow during standby, for periods configurable by the operator. Users save more consumables costs than ever!

NEW EASE OF USE

SOES 3101 now provides routine, trouble-free analysis of 10 matrices, 65 methods, and 59 elements — via convenient controls for operation; easy access for use and maintenance; and enhanced software features such as quickcheck programs, virtual type standards, and spectrum scans.

EASY-TO-USE SOFTWARE

Even for less experienced personnel, ATL's SPARK ANALYZER Pro software provides effortless operation. Favorites include application profiles tailored to preset user requirements; automatic program selection of sub-methods for given materials; spectra storage for later recalculations; multiple data export formats; and software-only upgrades for new lines, methods, or matrices.

Newest software highlights:

- Backup tool — for easy backups to network, other drives, etc.
- Virtual type standards — to improve accuracy by combining optimal element samples for type correction
- Extended grade library — for iron, aluminum, copper
- Quick-check programs — to identify & analyze main elements in under 12 seconds: for iron & aluminum materials, & now including analysis of copper
- Spectrum scan (optional) — to compare spectral lines of multiple samples in the same view
- Shift change protocol (optional) — to summarize all activities in a given shift: for handover to next operator, or QA optimization

HARDWARE NOTE

The latest SOES 3101 eliminates a magnesium fluoride (MgF_2) window at the spark stand — saving costs and maintenance replacement efforts.

Instrumentation Features

Optical Systems Optic I:

- Wavelength range 120 nm – 235 nm
- Focal length 300 mm, Holographic grating with 3600 gr. / mm
- CMOS detectors

Optic II:

- Wavelength range 233 nm – 670 nm (optional -766 nm)
- Focal length 400 mm, Holographic grating 2400 gr. / mm
- CMOS detectors

The applicable and configured wavelength range is based on the customer's application requirements. Both optics are temperature stabilized and pressure compensated.

Plasma Generator:

The benefit of this full digitalization with high fidelity is the guarantee that the spark pulse created is the spark pulse desired, every time.

Precision is improved and so is the similarity of the generated spark signals (unit uniformity). With our off-line digital control, we ensure that each plasma generator delivers identical spark signals, with a negligible deviation between any two plasma generators.

Every plasma generator has a programmable output power waveform for application specific optimization.

Online drift correction and background correction:

- Permanent control of the peak position of each line and readjustment if needed (iCAL 2.0)
- Recalculation of the background signal wherever it is possible

Optimized Measurement Times:

- Dynamic pre-burn time, reflecting the sample quality
- Minimized delay between measurement sequences
- Optimized number of excitation parameters including frequencies of up to 1000 Hz

Intelligent Calibration Logic (iCAL 2.0):

- Profile position control and standardization with only one sample

Accuracy of Analysis

It is the aim of modern OES spectrometers to greatly reduce the influence of the structure and composition (matrix) effects. The SOES 3101 combines traditional technologies like HEPS-High Energy Pre Spark to reach the stationary phase by “remelting” a small portion of the sample, resulting in a reduced structure effect.

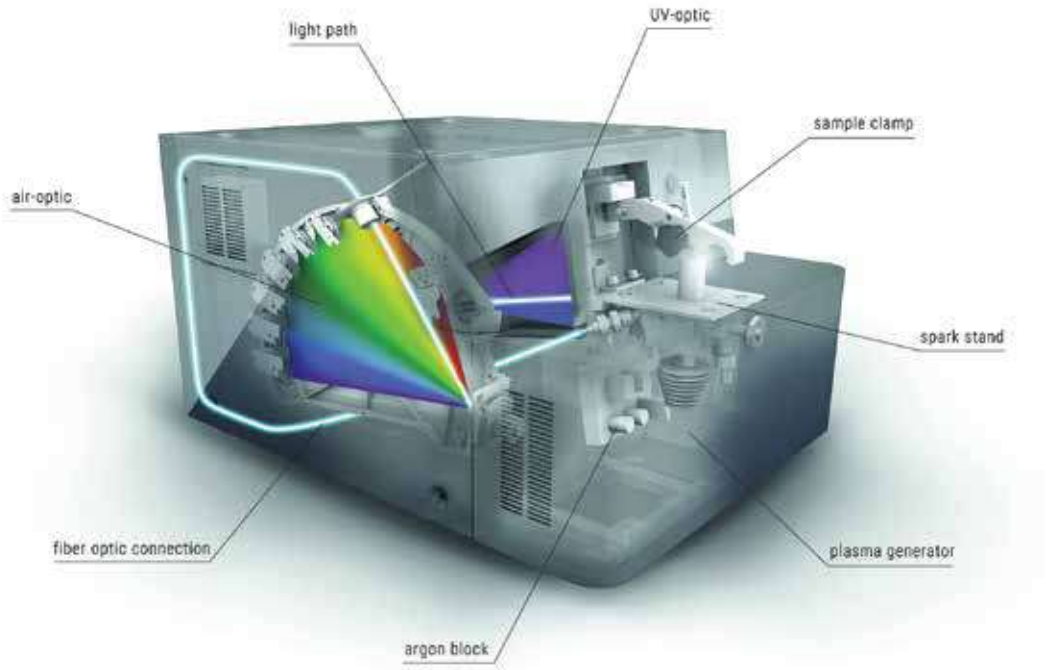


Table 1: Calculation of detection limit (DL) according to DIN 32645:2008-11 with a confidence limit of 99.7% (3 sigma), recorded on a production series device

Element	C	Si	Mn	P	S	Cr	Mo	Ni
Calibration range (%)	0.0008 - 4.7	0.0005 - 20	0.0005 - 29	0.0005 - 2.4	0.0005 - 0.43	0.0003 - 33	0.0004 - 9.5	0.0005 - 46
Detection Limit (ppm)	8	5	5	5	5	3	4	5

Element	Al	Co	Cu	Nb	Ti	V	W	Pb
Calibration range (%)	0.0005 - 8.7	0.0006 - 18	0.0002 - 8.1	0.0005 - 3	0.0002 - 3	0.0005 - 10	0.005 - 21	0.0008 - 0.38
Detection Limit (ppm)	5	6	2	5	2	5	50	8

Element	Sn	Mg	As	Zr	Bi	Ca	Ce	Sb
Calibration range (%)	0.0002 - 0.24	0.001 - 0.26	0.001 - 0.2	0.001 - 0.35	0.001 - 0.067	0.0001 - 0.013	0.001 - 0.17	0.001 - 0.24
Detection Limit (ppm)	2	10	10	10	10	1	10	10

Element	Se	Te	Ta	B	Zn	La	Ag	N
Calibration range (%)	0.0010 - 0.31	0.001 - 0.08	0.007 -0.76	0.0001 - 2	0.0005 - 0.045	0.0003 - 0.42	0.00005- 0.005	0.001 - 1.1
Detection Limit (ppm)	10	10	70	1	5	3	0.5	10

Element	Nd
Calibration range (%)	0.001 - 0.02
Detection Limit (ppm)	10

Table 2: RN19/... Low-Alloy Steel

Element	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	Nb
1	0.916	1.08	1.57	0.109	0.123	3.11	1.03	3.17	0.577	1.79	0.458	0.467
2	0.905	1.07	1.58	0.108	0.114	3.12	1.02	3.17	0.579	1.79	0.462	0.462
3	0.905	1.08	1.57	0.108	0.121	3.11	1.02	3.17	0.579	1.78	0.461	0.459
4	0.918	1.07	1.57	0.108	0.113	3.12	1.03	3.17	0.580	1.79	0.463	0.459
5	0.901	1.07	1.57	0.109	0.119	3.12	1.03	3.17	0.575	1.79	0.462	0.458
6	0.907	1.07	1.57	0.108	0.112	3.11	1.02	3.17	0.576	1.79	0.462	0.455
7	0.917	1.08	1.57	0.108	0.118	3.11	1.02	3.17	0.575	1.78	0.46	0.461
<x>	0.91	1.07	1.57	0.108	0.117	3.11	1.02	3.17	0.577	1.79	0.461	0.460
SD	0.0067	0.0026	0.0026	0.00057	0.0041	0.0043	0.0032	0.001	0.0019	0.003	0.0015	0.004
RSD (%rel.)	0.741	0.24	0.167	0.53	3.52	0.14	0.311	0.0318	0.338	0.169	0.315	0.86

Element	Ti	V	W	Pb	Sn	As	Zr	Bi	Ca	Ce	Sb	Se
1	0.123	0.505	0.528	0.0207	0.102	0.0781	0.0997	0.0076	<0.00010	0.0013	0.0662	<0.0010
2	0.122	0.500	0.524	0.0215	0.102	0.0767	0.0987	0.0080	<0.00010	0.0013	0.0663	<0.0010
3	0.121	0.504	0.530	0.0197	0.102	0.0767	0.0974	0.0070	<0.00010	0.0014	0.0663	<0.0010
4	0.121	0.503	0.526	0.0235	0.103	0.0771	0.0996	0.0088	<0.00010	0.0013	0.0668	<0.0010
5	0.122	0.501	0.526	0.0213	0.102	0.0776	0.0971	0.0077	<0.00010	0.0014	0.0666	<0.0010
6	0.121	0.502	0.530	0.0206	0.102	0.0768	0.0977	0.0075	<0.00010	0.0013	0.0670	<0.0010
7	0.122	0.503	0.533	0.0204	0.102	0.0772	0.0970	0.0074	<0.00010	0.0013	0.0667	<0.0010
<x>	0.122	0.503	0.528	0.0211	0.102	0.0772	0.0982	0.0077	<0.00010	0.0013	0.0666	<0.0010
SD	0.00053	0.0017	0.0031	0.0012	0.00042	0.00053	0.0011	0.00057		0.00006	0.00031	
RSD (%rel.)	0.432	0.34	0.586	5.78	0.414	0.692	1.17				0.473	

Element	Te	Ta	B	Zn	La	Ag	N	Fe
1	0.0240	>0.210	0.0032	>0.0260	<0.00030	0.00095	0.0276	83.8
2	0.0246	>0.210	0.0032	>0.0260	<0.00030	0.00097	0.0261	83.8
3	0.0232	>0.210	0.0032	>0.0260	<0.00030	0.00095	0.0250	83.8
4	0.0235	>0.210	0.0032	>0.0260	<0.00030	0.00096	0.0252	83.8
5	0.0241	>0.210	0.0030	>0.0260	<0.00030	0.00096	0.0256	83.8
6	0.0237	>0.210	0.0031	>0.0260	<0.00030	0.00096	0.0257	83.8
7	0.0236	>0.210	0.0030	>0.0260	<0.00030	0.00094	0.0262	83.8
<x>	0.0238	>0.210	0.0031	>0.0260	<0.00030	0.00096	0.0259	83.8
SD	0.00046		0.00009			0.000009	0.00086	0.0169
RSD (%rel.)	1.94						3.31	0.0201

Table 3: SUS5/... Cast Iron

Element	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	Nb
1	3.78	2.04	0.618	0.0445	0.0131	0.0173	0.0017	1.05	0.0354	0.0023	0.0032	<0.0005
2	3.79	2.04	0.621	0.0447	0.0164	0.0173	0.0017	1.05	0.0360	0.0031	0.0032	<0.0005
3	3.78	2.03	0.619	0.0447	0.0169	0.0172	0.0016	1.05	0.0356	0.0032	0.0032	<0.0005
4	3.82	2.04	0.621	0.0448	0.0157	0.0173	0.0017	1.05	0.0358	0.0032	0.0032	<0.0005
5	3.78	2.03	0.620	0.0458	0.0180	0.0172	0.0016	1.05	0.0360	0.0030	0.0032	<0.0005
6	3.76	2.03	0.619	0.0438	0.0141	0.0174	0.0016	1.05	0.0355	0.0023	0.0031	<0.0005
7	3.79	2.03	0.620	0.0451	0.0148	0.0173	0.0016	1.05	0.0354	0.0028	0.0032	<0.0005
<x>	3.79	2.03	0.620	0.0448	0.0156	0.0173	0.0016	1.05	0.0357	0.0028	0.0032	<0.0005
SD	0.0156	0.0039	0.0012	0.00063	0.0017	0.00006	0.00006	0.00059	0.00025	0.00038	0.00004	
RSD (%rel.)	0.411	0.194	0.191	1.41	10.79	0.322		0.056	0.697			

Element	Ti	V	W	Pb	Sn	Mg	As	Zr	Bi	Ca	Ce	Sb
1	0.0093	0.50	<0.0050	<0.0008	0.0752	0.0993	0.0035	<0.00100	0.0031	0.00013	0.0211	0.0158
2	0.0091	0.499	<0.0050	<0.0008	0.0744	0.1010	0.0036	<0.00100	0.0034	0.00016	0.0226	0.0174
3	0.0091	0.499	<0.0050	<0.0008	0.0748	0.0994	0.0037	<0.00100	0.0033	0.00014	0.0219	0.0175
4	0.0091	0.498	<0.0050	<0.0008	0.0741	0.0973	0.0034	<0.00100	0.0033	0.00013	0.0218	0.0168
5	0.0091	0.492	<0.0050	<0.0008	0.0751	0.1010	0.0035	<0.00100	0.0034	0.00015	0.0216	0.0178
6	0.0090	0.490	<0.0050	<0.0008	0.0749	0.0959	0.0030	<0.00100	0.0034	0.00014	0.0215	0.0172
7	0.0090	0.491	<0.0050	<0.0008	0.0749	0.0990	0.0038	<0.00100	0.0034	0.00016	0.0221	0.0184
<x>	0.0091	0.496	<0.0050	<0.0008	0.0748	0.0990	0.0035	<0.00100	0.0033	0.00014	0.0218	0.0172
SD	0.0001	0.0043			0.00038	0.0019	0.00025		0.00009	0.00001	0.00047	0.00082
RSD (%rel.)	1.1	0.86			0.503	1.9					2.16	4.74

Element	Se	Te	B	Zn	La	N	Nd	Fe
1	<0.0015	0.0041	<0.0001	0.0043	0.0067	0.0083	<0.00100	91.6
2	<0.0015	0.0043	<0.0001	0.0044	0.0071	0.0076	<0.00100	91.6
3	<0.0015	0.0041	<0.0001	0.0043	0.0066	0.0076	<0.00100	91.6
4	<0.0015	0.0047	<0.0001	0.0044	0.0070	0.0096	<0.00100	91.6
5	<0.0015	0.0035	<0.0001	0.0044	0.0064	0.0084	<0.00100	91.6
6	<0.0015	0.0040	<0.0001	0.0045	0.0066	0.0088	<0.00100	91.7
7	<0.0015	0.0041	<0.0001	0.0045	0.0065	0.0071	<0.00100	91.6
<x>	<0.0015	0.0041	<0.0001	0.0044	0.0067	0.0082	<0.00100	91.6
SD		0.00037		0.00006	0.00028	0.00084		0.0227
RSD (%rel.)				1.47	4.11	10.21		0.0248

Table 4: E/... Cr-Cr/Ni Steel

Element	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	Nb
1	0.0675	0.636	1.52	0.0026	<0.0005	14.80	1.23	25.67	0.222	0.0648	0.0174	0.0782
2	0.0698	0.643	1.52	0.0029	<0.0005	14.79	1.24	25.67	0.224	0.0648	0.0174	0.0785
3	0.0689	0.635	1.52	0.0029	<0.0005	14.82	1.24	25.62	0.222	0.0651	0.0176	0.0778
4	0.0638	0.637	1.52	0.0031	<0.0005	14.82	1.24	25.59	0.221	0.0652	0.0173	0.0779
5	0.0666	0.638	1.53	0.0030	<0.0005	14.79	1.23	25.63	0.222	0.0644	0.0174	0.0784
6	0.0651	0.637	1.52	0.0030	<0.0005	14.78	1.23	25.68	0.221	0.0648	0.0181	0.0770
7	0.0679	0.638	1.52	0.0033	<0.0005	14.81	1.24	25.62	0.222	0.0649	0.0175	0.0792
<x>	0.0671	0.638	1.52	0.0030	<0.0005	14.80	1.24	25.64	0.222	0.0649	0.0175	0.0781
SD	0.0021	0.0023	0.0031	0.0002		0.016	0.0039	0.0322	0.0011	0.00024	0.00027	0.00069
RSD (%rel.)	3.15	0.368	0.206			0.108	0.317	0.126	0.487	0.375	1.53	0.886

Element	Ti	V	W	Pb	Sn	As	Zr	Bi	Ca	Ce	Sb	Se
1	2.04	0.262	<0.0070	0.0057	0.0012	<0.0010	0.0023	0.0049	0.00028	<0.00100	<0.0010	<0.0015
2	2.03	0.261	<0.0070	0.0056	0.0012	<0.0010	0.0024	0.0050	0.00060	<0.00100	<0.0010	<0.0015
3	2.03	0.259	<0.0070	0.0057	0.0012	<0.0010	0.0024	0.0050	0.00026	<0.00100	<0.0010	<0.0015
4	2.03	0.260	<0.0070	0.0057	0.0012	<0.0010	0.0024	0.0049	0.00026	<0.00100	<0.0010	<0.0015
5	2.05	0.261	<0.0070	0.0057	0.0012	<0.0010	0.0024	0.0050	0.00011	<0.00100	<0.0010	<0.0015
6	2.06	0.263	<0.0070	0.0056	0.0012	<0.0010	0.0024	0.0049	0.00012	<0.00100	<0.0010	<0.0015
7	2.05	0.259	<0.0070	0.0056	0.0013	<0.0010	0.0024	0.0049	0.00011	<0.00100	<0.0010	<0.0015
<x>	2.04	0.261	<0.0070	0.0057	0.0012	<0.0010	0.0024	0.0049	0.00023	<0.00100	<0.0010	<0.0015
SD	0.0114	0.0014		0.00005	0.00003		0.00003	0.00004	0.00018			
RSD (%rel.)	0.561	0.539		0.956								

Element	Ta	B	La	N	Fe
1	<0.0070	0.0066	0.0011	<0.00100	53.3
2	<0.0070	0.0067	0.0011	<0.00100	53.3
3	<0.0070	0.0066	0.0011	<0.00100	53.3
4	<0.0070	0.0066	0.0011	<0.00100	53.4
5	<0.0070	0.0067	0.0011	<0.00100	53.3
6	<0.0070	0.0067	0.0012	<0.00100	53.3
7	<0.0070	0.0068	0.0011	<0.00100	53.3
<x>	<0.0070	0.0067	0.0011	<0.00100	53.3
SD		0.00006	0.00003		0.0274
RSD (%rel.)		0.892			0.0513

Table 5: RH18/... Highspeed Steel

Element	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	Ti
1	1.27	0.348	0.259	0.0136	0.0011	3.98	3.85	0.261	0.0138	10.02	0.0839	0.0113
2	1.27	0.349	0.259	0.0138	0.0012	3.99	3.88	0.261	0.0139	10.02	0.0835	0.0115
3	1.30	0.350	0.259	0.0147	0.0012	3.99	3.88	0.260	0.0139	9.99	0.0835	0.0116
4	1.27	0.349	0.259	0.0139	0.0010	4.00	3.86	0.261	0.0141	10.00	0.0837	0.0107
5	1.29	0.350	0.260	0.0140	0.0011	4.00	3.87	0.263	0.0141	9.97	0.0836	0.0116
6	1.29	0.353	0.261	0.0141	0.0013	4.00	3.89	0.264	0.0136	9.95	0.0836	0.0110
7	1.27	0.352	0.260	0.0138	0.0014	3.98	3.86	0.264	0.0136	9.97	0.0840	0.0108
<x>	1.28	0.350	0.259	0.0140	0.0012	3.99	3.87	0.262	0.0139	9.99	0.0837	0.0112
SD	0.0118	0.0019	0.00075	0.00035	0.00014	0.0092	0.015	0.0016	0.00022	0.0266	0.0002	0.00037
RSD (%rel.)	0.923	0.541	0.29	2.47	11.58	0.231	0.388	0.621	1.57	0.266	0.236	3.26

Element	V	W	Sn	As	N	Fe
1	2.92	9.27	0.0060	<0.00100	0.0247	67.7
2	2.94	9.43	0.0060	<0.00100	0.0231	67.5
3	2.97	9.41	0.0060	<0.00100	0.0248	67.4
4	2.91	9.39	0.0060	<0.00100	0.0241	67.5
5	2.97	9.37	0.0059	<0.00100	0.0259	67.5
6	2.95	9.39	0.0060	<0.00100	0.0268	67.5
7	2.91	9.28	0.0061	<0.00100	0.0268	67.7
<x>	2.94	9.36	0.0060	<0.00100	0.0252	67.5
SD	0.0273	0.0626	0.00005		0.0014	0.102
RSD (%rel.)	0.93	0.668	0.813		5.44	0.151

Table 6: BAS493/... Manganese Steel

Element	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	Nb
1	0.846	0.840	11.14	0.121	0.0102	0.273	0.959	3.08	0.0365	0.0099	0.0149	0.0040
2	0.848	0.849	11.12	0.123	0.0104	0.273	0.962	3.06	0.0371	0.0095	0.0149	0.0041
3	0.858	0.848	11.14	0.122	0.0103	0.272	0.964	3.08	0.0375	0.0090	0.0148	0.0041
4	0.855	0.849	11.19	0.124	0.0104	0.274	0.971	3.07	0.0363	0.0095	0.0149	0.0041
5	0.858	0.855	11.21	0.125	0.0105	0.275	0.975	3.06	0.0368	0.0099	0.0150	0.0039
6	0.847	0.846	11.18	0.122	0.0100	0.274	0.966	3.07	0.0370	0.0094	0.0149	0.0041
7	0.853	0.854	11.20	0.125	0.0105	0.276	0.976	3.06	0.0368	0.0100	0.0150	0.0040
<x>	0.852	0.849	11.17	0.123	0.0103	0.274	0.968	3.07	0.0369	0.0096	0.0149	0.0041
SD	0.0052	0.005	0.0323	0.0016	0.00018	0.0011	0.0067	0.0084	0.00041	0.00034	0.00005	0.00007
RSD (%rel.)	0.606	0.585	0.289	1.26	1.79	0.405	0.696	0.275	1.11	3.57	0.348	

Element	Ti	V	Sn	N	Fe
1	0.0026	0.0243	0.0023	0.0251	82.6
2	0.0027	0.0244	0.0021	0.0260	82.6
3	0.0027	0.0243	0.0022	0.0263	82.6
4	0.0026	0.0246	0.0022	0.0270	82.5
5	0.0026	0.0248	0.0022	0.0270	82.5
6	0.0027	0.0246	0.0021	0.0263	82.6
7	0.0026	0.0249	0.0023	0.0273	82.5
<x>	0.0026	0.0246	0.0022	0.0264	82.6
SD	0.00003	0.00024	0.00007	0.00074	0.0456
RSD (%rel.)		0.989		2.8	0.0553

Table 7: CRRM5/... Cr-Hard Cast

Element	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Ti	V	Fe
1	3.50	0.195	0.314	0.0305	0.0177	30.21	0.634	0.362	0.126	0.212	0.011	0.104	64.3
2	3.49	0.197	0.314	0.0305	0.0183	30.19	0.628	0.363	0.126	0.212	0.011	0.103	64.3
3	3.51	0.192	0.315	0.0304	0.0180	30.27	0.626	0.363	0.129	0.213	0.011	0.103	64.2
4	3.51	0.192	0.315	0.0302	0.0185	30.20	0.629	0.365	0.126	0.210	0.011	0.103	64.3
5	3.49	0.195	0.314	0.0305	0.0187	30.28	0.625	0.363	0.126	0.210	0.011	0.103	64.2
6	3.51	0.196	0.314	0.0304	0.0172	30.28	0.625	0.361	0.127	0.213	0.011	0.102	64.2
7	3.50	0.195	0.314	0.0300	0.0177	30.34	0.622	0.361	0.127	0.211	0.011	0.103	64.2
<x>	3.50	0.195	0.314	0.0303	0.0180	30.25	0.627	0.363	0.127	0.212	0.011	0.103	64.2
SD	0.0068	0.002	0.00051	0.0002	0.00052	0.0526	0.0038	0.0015	0.00091	0.0013	0.00005	0.00046	0.0501
RSD (%rel.)	0.194	1.03	0.164	0.666	2.89	0.174	0.61	0.4	0.715	0.607	0.459	0.442	0.078

Table 8: NIRM8/... Ni Resist

Element	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	Nb	Mg	Ce	Fe
1	1.44	5.36	1.62	0.0868	0.0124	2.78	0.765	34.99	0.229	0.0157	0.0392	0.0126	52.6
2	1.43	5.35	1.63	0.0861	0.0111	2.77	0.766	35.00	0.229	0.0155	0.0358	0.0131	52.7
3	1.44	5.39	1.63	0.0867	0.0114	2.79	0.769	34.96	0.229	0.0157	0.0362	0.0131	52.6
4	1.43	5.32	1.64	0.0862	0.0106	2.78	0.765	35.00	0.230	0.0155	0.0368	0.0139	52.7
5	1.44	5.35	1.64	0.0880	0.0124	2.79	0.768	34.90	0.230	0.0155	0.0367	0.0140	52.7
6	1.44	5.37	1.64	0.0873	0.0112	2.78	0.762	34.96	0.229	0.0159	0.0374	0.0136	52.7
7	1.43	5.35	1.64	0.0871	0.0109	2.79	0.765	34.93	0.229	0.0156	0.0370	0.0132	52.7
<x>	1.44	5.36	1.64	0.0869	0.0114	2.78	0.766	34.96	0.229	0.0156	0.0370	0.0133	52.7
SD	0.0062	0.0201	0.0061	0.00064	0.00073	0.0068	0.0021	0.0381	0.00033	0.00012	0.0011	0.00048	0.0277
RSD (%rel.)	0.429	0.375	0.373	0.741	6.34	0.245	0.28	0.109	0.142	0.78	2.95	3.58	0.0526

The Analysis of Aluminum and its Alloys

Table 1: Calculation of detection limit (DL) according to DIN 32645:2008-11 with a confidence limit of 99.7% (3 sigma), recorded on a production series device.

Element	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn
Calibrationrange (%)	0.0005 - 36	0.0005 - 12	0.0001 - 53	0.0002 - 30	0.00005 - 11	0.0002 - 0.46	0.0003 - 4	0.0008 - 20
Detection Limit (ppm)	5	5	1	2	0.5	2	3	8

Element	Ti	Ag	As	B	Ba	Be	Bi	Ca
Calibration range (%)	0.0003 - 5.4	0.0001 - 1	0.001 - 0.011	0.0001 - 1.5	0.0001 - 0.006	0.00005- 0.021	0.0005 - 0.71	0.0001 - 0.04
Detection Limit(ppm)	3	1	10	1	1	0.5	5	1

Element	Cd	Ce	Co	Ga	Hg	In	La	Li
Calibration range (%)	0.0001 - 0.33	0.001 - 0.046	0.0004 - 1.6	0.0001 - 0.11	0.0003 - 0.01	0.0003 - 0.1	0.0003 - 11	0.0001 - 8.2
Detection Limit(ppm)	1	10	4	1	3	3	3	1

Element	Mo	Na	P	Pb	Sb	Sn	Sr	Tl
Calibratio nrange (%)	0.0003 - 0.12	0.0001 - 0.021	0.0008 - 0.017	0.0005 - 1.5	0.0015 - 0.55	0.0002 - 21	0.00005 - 11	0.0005 - 0.015
Detection Limit (ppm)	3	1	8	5	15	2	0.5	5

Element	V	Zr	Sc
Calibrationrange (%)	0.0005 - 0.11	0.0002 - 1.3	0.0002 - 0.4
Detection Limit(ppm)	5	2	2

Table 2: 122/... Pure Aluminum

Element	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	As	B
1	0.0518	0.0591	0.0205	0.0204	0.0157	0.0201	0.0208	0.0212	0.0192	0.0203	0.0068	0.00018
2	0.0514	0.0603	0.0205	0.0205	0.0158	0.0208	0.0206	0.0214	0.0193	0.0202	0.0067	0.00019
3	0.0512	0.0595	0.0202	0.0205	0.0157	0.0203	0.0204	0.0211	0.0188	0.0200	0.0065	0.00019
4	0.0512	0.0586	0.0203	0.0205	0.0158	0.0201	0.0205	0.0212	0.0190	0.0201	0.0065	0.00018
5	0.0513	0.0595	0.0203	0.0206	0.0158	0.0202	0.0206	0.0213	0.0191	0.0201	0.0065	0.00021
6	0.0513	0.0588	0.0202	0.0205	0.0158	0.0201	0.0204	0.0211	0.0187	0.0200	0.0066	0.00018
7	0.0516	0.0591	0.0204	0.0204	0.0157	0.0201	0.0207	0.0213	0.0204	0.0202	0.0074	0.00020
8	0.0512	0.0610	0.0202	0.0204	0.0157	0.0202	0.0203	0.0210	0.0191	0.0201	0.0068	0.00019
<x>	0.0514	0.0595	0.0203	0.0205	0.0157	0.0202	0.0205	0.0212	0.0192	0.0201	0.0067	0.00019
SD	0.00021	0.00079	0.00013	0.00006	0.00006	0.00024	0.0002	0.00012	0.00053	0.00008	0.0003	
RSD (%rel.)	0.411	1.33	0.655	0.301	0.385	1.18	0.77	0.567	2.74	0.401	4.42	

Element	Ba	Be	Bi	Ca	Cd	Ce	Co	Ga	Hg	In	La	Li
1	0.0035	0.00049	0.0075	0.00023	0.0052	0.0119	0.0154	0.0256	0.0076	0.0144	0.0211	0.00038
2	0.0035	0.00049	0.0076	0.00020	0.0050	0.0122	0.0156	0.0255	0.0077	0.0145	0.0211	0.00036
3	0.0035	0.00049	0.0075	0.00022	0.0050	0.0118	0.0152	0.0252	0.0076	0.0141	0.0208	0.00039
4	0.0035	0.00049	0.0075	0.00023	0.0050	0.0118	0.0153	0.0254	0.0076	0.0143	0.0209	0.00040
5	0.0035	0.00049	0.0075	0.00023	0.0050	0.0119	0.0153	0.0254	0.0075	0.0143	0.0209	0.00038
6	0.0034	0.00049	0.0074	0.00021	0.0051	0.0117	0.0152	0.0252	0.0078	0.0142	0.0207	0.00037
7	0.0035	0.00049	0.0075	0.00023	0.0051	0.0120	0.0154	0.0255	0.0076	0.0143	0.0211	0.00037
8	0.0035	0.00048	0.0075	0.00019	0.0051	0.0115	0.0151	0.0254	0.0076	0.0140	0.0207	0.00037
<x>	0.0035	0.00049	0.0075	0.00022	0.0051	0.0119	0.0153	0.0254	0.0076	0.0143	0.0209	0.00038
SD	0.00003		0.00005		0.00006	0.00021	0.00014	0.00012	0.00007	0.00016	0.00018	0.00001
RSD (%rel.)			0.679		1.1	1.75	0.942	0.474	0.902	1.14	0.882	

Element	Mo	Na	P	Pb	Sb	Sn	Sr	Tl	V	Zr	Al
1	0.0098	0.0016	0.0040	0.0058	0.0090	0.0105	0.00033	0.0141	0.0187	0.0157	99.5
2	0.0100	0.0015	0.0040	0.0060	0.0089	0.0102	0.00034	0.0143	0.0190	0.0157	99.5
3	0.0096	0.0017	0.0039	0.0057	0.0087	0.0107	0.00033	0.0137	0.0183	0.0156	99.5
4	0.0097	0.0017	0.0039	0.0059	0.0086	0.0104	0.00033	0.0140	0.0185	0.0156	99.5
5	0.0097	0.0016	0.0040	0.0058	0.0088	0.0102	0.00034	0.0140	0.0186	0.0156	99.5
6	0.0096	0.0016	0.0041	0.0057	0.0090	0.0105	0.00031	0.0138	0.0183	0.0156	99.5
7	0.0098	0.0016	0.0041	0.0058	0.0081	0.0105	0.00032	0.0141	0.0186	0.0156	99.5
8	0.0097	0.0016	0.0040	0.0056	0.0086	0.0102	0.00033	0.0137	0.0185	0.0157	99.5
<x>	0.0097	0.0016	0.0040	0.0058	0.0087	0.0104	0.00033	0.0140	0.0186	0.0156	99.5
SD	0.00015	0.00004	0.00008	0.00013	0.00028	0.00018	0.000009	0.00021	0.00022	0.00006	0.003
RSD (%rel.)	1.51		2.06		3.24	1.78		1.49	1.17	0.381	0.003

Table 3: 434/... Al/Si - Alloy

Element	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	Be	Bi
1	12.98	0.328	1.73	0.197	1.41	0.0997	1.49	0.123	0.119	<0.00010	<0.00005	0.0014
2	13.01	0.326	1.75	0.197	1.41	0.1000	1.50	0.122	0.118	<0.00010	<0.00005	0.0015
3	13.02	0.328	1.73	0.197	1.41	0.0999	1.50	0.122	0.119	<0.00010	<0.00005	0.0014
4	13.03	0.33	1.72	0.197	1.40	0.1000	1.49	0.122	0.120	<0.00010	<0.00005	0.0015
5	13.00	0.331	1.72	0.196	1.40	0.0999	1.49	0.121	0.119	<0.00010	<0.00005	0.0014
6	13.01	0.327	1.74	0.197	1.41	0.0997	1.49	0.122	0.120	<0.00010	<0.00005	0.0015
7	13.06	0.327	1.74	0.197	1.41	0.1000	1.50	0.122	0.119	<0.00010	<0.00005	0.0015
8	13.07	0.327	1.75	0.197	1.41	0.0999	1.50	0.122	0.119	<0.00010	<0.00005	0.0015
<x>	13.02	0.328	1.73	0.197	1.41	0.0999	1.49	0.122	0.119	<0.00010	<0.00005	0.0015
SD	0.0279	0.0017	0.011	0.00025	0.0047	0.00018	0.0065	0.00049	0.00063			0.00002
RSD (%rel.)	0.214	0.514	0.634	0.128	0.331	0.184	0.433	0.401	0.529			

Element	Ca	Cd	Co	Ga	Hg	Li	Na	P	Pb	Sb	Sn	Sr
1	0.0139	<0.00010	0.0019	0.0072	<0.0003	<0.00010	0.0075	<0.0008	0.0074	<0.0015	0.0063	0.0277
2	0.0140	<0.00010	0.0020	0.0072	<0.0003	<0.00010	0.0076	<0.0008	0.0072	<0.0015	0.0066	0.0270
3	0.0140	<0.00010	0.0019	0.0072	<0.0003	<0.00010	0.0074	<0.0008	0.0072	<0.0015	0.0063	0.0271
4	0.0138	<0.00010	0.0019	0.0072	<0.0003	<0.00010	0.0075	<0.0008	0.0072	<0.0015	0.0063	0.0278
5	0.0138	<0.00010	0.0019	0.0072	<0.0003	<0.00010	0.0074	<0.0008	0.0073	<0.0015	0.0065	0.0277
6	0.0140	<0.00010	0.0020	0.0073	<0.0003	<0.00010	0.0073	<0.0008	0.0072	<0.0015	0.0065	0.0277
7	0.0140	<0.00010	0.0019	0.0072	<0.0003	<0.00010	0.0076	<0.0008	0.0073	<0.0015	0.0064	0.0274
8	0.0139	<0.00010	0.0019	0.0073	<0.0003	<0.00010	0.0076	<0.0008	0.0073	<0.0015	0.0063	0.0277
<x>	0.0139	<0.00010	0.0019	0.0072	<0.0003	<0.00010	0.0075	<0.0008	0.0073	<0.0015	0.0064	0.0275
SD	0.0001		0.00003	0.00003			0.00009		0.00005		0.00011	0.00031
RSD (%rel.)	0.684											1.12

Element	V	Zr	Al
1	0.0135	0.0103	81.4
2	0.0133	0.0103	81.4
3	0.0134	0.0102	81.4
4	0.0133	0.0103	81.4
5	0.0133	0.0103	81.4
6	0.0132	0.0102	81.4
7	0.0133	0.0103	81.3
8	0.0134	0.0102	81.3
<x>	0.0133	0.0103	81.4
SD	0.00008	0.00004	0.0404
RSD (%rel.)	0.621	0.363	0.0497

Table 4: 271/... Al/Cu - Alloy

Element	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	Be	Bi
1	0.192	0.307	4.50	0.204	0.0896	0.0123	2.07	0.0130	0.153	<0.0001	<0.00005	<0.005
2	0.191	0.306	4.45	0.204	0.0935	0.0123	2.06	0.0131	0.154	<0.0001	<0.00005	<0.005
3	0.190	0.304	4.45	0.204	0.0916	0.0124	2.04	0.0132	0.162	<0.0001	<0.00005	<0.005
4	0.192	0.311	4.50	0.205	0.0928	0.0123	2.08	0.0129	0.150	<0.0001	<0.00005	<0.005
5	0.190	0.305	4.44	0.204	0.0873	0.0123	2.04	0.0129	0.164	<0.0001	<0.00005	<0.005
6	0.190	0.306	4.44	0.204	0.0938	0.0122	2.06	0.0127	0.160	<0.0001	<0.00005	<0.005
7	0.191	0.307	4.47	0.205	0.0926	0.0122	2.09	0.0128	0.158	<0.0001	<0.00005	<0.005
8	0.192	0.310	4.50	0.204	0.0938	0.0122	2.09	0.0128	0.152	<0.0001	<0.00005	<0.005
<x>	0.191	0.307	4.47	0.204	0.0919	0.0123	2.07	0.0129	0.156	<0.0001	<0.00005	<0.005
SD	0.00097	0.0024	0.0261	0.00044	0.0023	0.00005	0.0188	0.00016	0.005			
RSD (%rel.)	0.509	0.77	0.585	0.217	2.51	0.435	0.912	1.23	3.17			

Element	Ca	Cd	Co	Ga	Li	P	Pb	Sb	Sn	V	Zr	Al
1	<0.00010	<0.00010	0.209	0.0106	<0.0001	<0.0008	0.0021	0.389	0.0017	0.0145	0.104	91.7
2	<0.00010	<0.00010	0.207	0.0106	<0.0001	<0.0008	0.0020	0.391	0.0018	0.0145	0.104	91.7
3	<0.00010	<0.00010	0.205	0.0107	<0.0001	<0.0008	0.0020	0.384	0.0018	0.0147	0.105	91.8
4	<0.00010	<0.00010	0.209	0.0105	<0.0001	<0.0008	0.0021	0.384	0.0017	0.0143	0.103	91.7
5	<0.00010	<0.00010	0.207	0.0107	<0.0001	<0.0008	0.0021	0.377	0.0017	0.0149	0.105	91.8
6	<0.00010	<0.00010	0.208	0.0107	<0.0001	<0.0008	0.0020	0.394	0.0018	0.0147	0.104	91.8
7	<0.00010	<0.00010	0.210	0.0106	<0.0001	<0.0008	0.0021	0.386	0.0018	0.0146	0.104	91.7
8	<0.00010	<0.00010	0.208	0.0105	<0.0001	<0.0008	0.0021	0.386	0.0018	0.0145	0.104	91.7
<x>	<0.00010	<0.00010	0.208	0.0106	<0.0001	<0.0008	0.002	0.386	0.0018	0.0146	0.104	91.7
SD			0.0016	0.0001	<0.0001		0.00004	0.0053	0.00004	0.00019	0.00058	0.0439
RSD (%rel.)			0.786	0.926	<0.0001		1.79	1.36	2.04	1.3	0.558	0.0478

Table 5: 5182/... Al/Mg - Alloy

Element	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Be	Bi	Ca
1	0.158	0.194	0.0490	0.352	4.54	0.0311	0.0193	0.0429	0.0282	<0.00005	0.0023	<0.00010
2	0.156	0.196	0.0487	0.352	4.54	0.0312	0.0190	0.0425	0.0290	<0.00005	0.0024	<0.00010
3	0.155	0.193	0.0483	0.351	4.53	0.0310	0.0192	0.0425	0.0288	<0.00005	0.0024	<0.00010
4	0.158	0.193	0.0493	0.350	4.52	0.0310	0.0191	0.0431	0.0288	<0.00005	0.0024	<0.00010
5	0.155	0.192	0.0484	0.352	4.51	0.0311	0.0190	0.0425	0.0293	<0.00005	0.0024	<0.00010
6	0.154	0.196	0.0484	0.352	4.51	0.0312	0.0189	0.0423	0.0291	<0.00005	0.0024	<0.00010
7	0.154	0.197	0.0483	0.352	4.52	0.0312	0.0190	0.0424	0.0290	<0.00005	0.0023	<0.00010
8	0.153	0.193	0.0484	0.351	4.54	0.0309	0.0188	0.0425	0.0288	<0.00005	0.0024	<0.00010
<x>	0.155	0.194	0.0486	0.352	4.53	0.0311	0.019	0.0426	0.0289	<0.00005	0.0024	<0.00010
SD	0.00017	0.0017	0.00037	0.00056	0.0125	0.0001	0.00014	0.00028	0.00032		0.00002	
RSD (%rel.)	1.1	0.869	0.753	0.16	0.277	0.322	0.757	0.654	1.1			

Table 6: 3432/... Al/Zn - Alloy

Element	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Be	Ca	Ga
1	1.82	0.793	4.20	0.419	0.256	0.0066	0.309	5.01	0.0595	<0.00005	0.00038	0.0117
2	1.83	0.783	4.25	0.415	0.254	0.0059	0.308	5.01	0.0601	<0.00005	0.00040	0.0118
3	1.82	0.772	4.22	0.414	0.254	0.0058	0.307	5.01	0.0603	<0.00005	0.00037	0.0119
4	1.82	0.782	4.22	0.417	0.256	0.0059	0.306	5.02	0.0603	<0.00005	0.00036	0.0118
5	1.83	0.777	4.26	0.414	0.256	0.0058	0.308	5.02	0.0605	<0.00005	0.00035	0.0119
6	1.83	0.784	4.24	0.418	0.258	0.0059	0.309	5.02	0.0605	<0.00005	0.00036	0.0119
7	1.82	0.786	4.24	0.415	0.256	0.0059	0.308	5.03	0.0606	<0.00005	0.00036	0.0118
8	1.83	0.771	4.24	0.414	0.258	0.0059	0.310	5.06	0.0607	<0.00005	0.00035	0.0119
<x>	1.82	0.781	4.23	0.416	0.256	0.0060	0.308	5.02	0.0603	<0.00005	0.00037	0.0118
SD	0.0039	0.0073	0.0194	0.0019	0.0015	0.00027	0.0012	0.0163	0.00038			0.00006
RSD (%rel.)	0.216	0.94	0.458	0.451	0.598		0.395	0.324	0.629			0.506

Element	Li	P	Pb	Sn	Sr	V	Zr	Al
1	<0.00010	<0.0008	0.198	0.0983	<0.00005	<0.00050	0.0017	86.8
2	<0.00010	<0.0008	0.200	0.0961	<0.00005	<0.00050	0.0017	86.8
3	<0.00010	<0.0008	0.202	0.0962	<0.00005	<0.00050	0.0017	86.8
4	<0.00010	<0.0008	0.199	0.0950	<0.00005	<0.00050	0.0016	86.8
5	<0.00010	<0.0008	0.201	0.0960	<0.00005	<0.00050	0.0017	86.8
6	<0.00010	<0.0008	0.202	0.0966	<0.00005	<0.00050	0.0017	86.8
7	<0.00010	<0.0008	0.199	0.0969	<0.00005	<0.00050	0.0017	86.8
8	<0.00010	<0.0008	0.201	0.0965	<0.00005	<0.00050	0.0017	86.7
<x>	<0.00010	<0.0008	0.200	0.0965	<0.00005	<0.00050	0.0017	86.8
SD			0.0016	0.00092				0.0293
RSD (%rel.)			0.824	0.953				0.0338

Analytical®
Technologies Limited

HPLC Servicing, Validation, Trainings and Preventive Maintenance :

HPLC Servicing :HPLC Servicing : We have team of service engineers who can attend to any make of HPLC promptly @the most affordable cost.

Trainings :We also take up preventive Maintenace to reduce downtime of HPLC's Trainings.

AMC's/CMC :AMC's/CMC :We offer user training both in-House and at customer sites on HPLC principles, operations, trouble-shooting.

Validations :Validations :We have protocols for carrying out periodic Validations as per GLP/GMP/USFDA norms.

Instruments :Instruments :We offer instruments/Renting Services Modules like pumps,detector etc. on Rent.

About Analytical Technologies

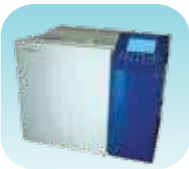
Analytical Technologies is synonymous for offering technologies for doing analysis and is the Fastest Growing Global Brand having presence in at least 96 countries across the global. Analytical Technologies Limited is an ISO:9001 Certified Company engaged in Designing, Manufaturing, Marketing & providing Services for the Analytical, Chromatography, Spectroscopy, Bio Technology, Bio Medical, Clinical Diagnostics, Material Science & General Laboratory Instrumentation. Analytical Technologies, India has across the Country operations with at least 4 Regional Offices, 6 Branch Offices & Service Centers. Distributors & Channel partners worldwide.

Our Products & Technologies

UV/VIS Spectro 2080+ Double Beam

Infra FTIR

Optima Gas Chromatograph 3007



Optima Gas Chromatograph 2979 Plus

Flash Chromatograph

Atomic Absorption Spectrophotometer

Liquid Partical Counter

Optical Emission Spectrophotometer

DSC/TGA

Semi Auto Bio Chemistry Analyzer

HEMA 2062 Hematology Analyzer

Micro Plate Reader/Washer

URINOVA 2800 Urine Analyzer

Total Organic Carbon 3800

Fully Automated CLIA

NOVA-2100 Chemistry Analyzer

PCR/Gradient PCR/ RTPCR

TOC Analyzer

Laser Particle Size Analyzer

Ion Chromatograph

Water purification system

Regulatory compliances

Corporate Social Responsibility

Analytical Foundation is a nonprofit organization (NGO) found for the purpose of:

1.Research & Innovation Scientist's awards/QC Professional Award : Quality life is possible by innovation only and the innovation is possible by research only, hence ANALYTICAL FOUNDATION is committed to identify such personallities for their contributions across various field of Science and Technology and awarding them yearly. To participate for award, send us your details of research / testing / publication at Info@analyticalfoundation.org

2. Improving quality of life by offering YOGA Training courses, Work shops/Seminars etc.

3. ANALYTICAL FOUNDATION aims to DETOXIFY human minds,souls and body by means of yoga, Meditation, Ayurveda, Health Care, Awards, Media, Events, Camps etc.

Analytical® Technologies Limited

HPLC Solutions MultipleLabs Analytical Bio-Med Analytical Distributors Analytical Foundation (Trust)

Corporate & Regd. Office:
Analytical House, # E67 & E68,
Ravi Park, Vasna Road, Baroda,
Gujarat 390 015. INDIA

T: +91 265 2253620
+91 265 2252839
+91 265 2252370
F: +91 265 2254395

E: info@hplctechnologies.com
info@multiplelabs.com
info@analyticalgroup.net
info@analyticalbiomed.com

W. www.analycalgroup.net
www.hplctechnologies.com
www.multiplelabs.com
www.ais-india.com

Sales & Support Offices:
across the country :
Distributors & Channel
partners World Wide

 Ver. 22.09 *T&C