SPARK DIRECT READING SPECTROMETERS (VACUUM TYPE)



OES-G630

- Widely used in metallurgy, foundry, machinery, scientific research, electric power, aviation, nuclear power, processing and recycling industries
- Suitable for sample analysis of metals and their alloys such as Fe, Al, Cu, Ni, Co, Mg, Ti, Zn, Pb, Sn and Mn
- Equipped with automatic optical path calibration and automatic identification of specific spectral lines
- Integrated vacuum chamber design enables fast vacuum pumping and longer vacuum retention
- The vacuum optical system adopts a unique entrance window and vacuum isolation design, optical lenses adopt a single-plate lens structure
- Optional flexible sample clamps to accommodate sample analysis of various shapes and sizes

STANDARD DELIVERY

Main unit	1 pc
Computer	1 pc
Analysis software	1 pc
Vacuum pump	2 pcs
Electrode brush (OES-G630-BR)	2 pcs
Pressure valve	1 pc
Consumable and spare parts	1 set*

* Including wrenches, airway connection pipes and other common consumables

OPTIONAL ACCESSORY

Spectral standard sample	**MSS series**	based on the test material
Spectral sample grinder	**OES-MY100**	Ø350mm, 380V
Small sample fixture	**OES-G630-FIX1**	4mm boron nitride small hole fixture
	OES-G630-FIX2	4-15mm rod sample rotating fixture
	OES-G630-FIX3	7~10mm rod sample rotating fixture
	OES-G630-FIX4	15mm rod sample fixture
	OES-G630-FIX5	8.7mm spherical sample fixture
	OES-G630-FIX6	0.5~3mm wire sample fixture



spectral sample grinder **(optional)**



boron nitride small hole fixture



rod sample rotating fixture



rod sample rotating fixture



rod sample fixture



spherical sample fixture



wire sample fixture

small sample fixture **(optional)**

SPECIFICATION

Code		OES-G610	OES-G630
Optical system	wavelength range	165~580nm	130~580nm (N element detection supported)
	focal length	400mm	
	detector	high-performance CMOS detector	
	optical system construction	paschen-runge double optical chamber structure	
Excitation source	light source	DDD digital excitation light source	adjustable digital light source
	frequency	100~1000Hz	
	excitation voltage	400VA	
	excitation current	1~400A	
Test curve	standard curve	low alloy steel **(A1)**, Cr-Ni stainless steel **(A2)**	
	customized curve	curves can be added or customized for special base materials (Al, Cu, Ni, Mg, Zn, Ti, etc.)	
Excitation stand	gas supply	argon (purity≥99.999%, pressure: ≥0.5MPa)	
	flow rate	excitation: 3.5L/min, standby: 0.4L/min	
	electrode	tungsten electrode	
	analysis interval	3.4mm	
	excitation aperture	9mm	
Vacuum system		vacuum software automatic control and monitoring	
Analysis software		complete automatic system diagnosis function perfect database management function for convenient data query and summary complete spectral line information and intelligent interference deduction algorithm realize data acquisition and processing, generate data formats compatible with office software	
Power supply		220V AC, 50/60Hz	
Work environment		10~35°C, humidity: 20%~80%	
Dimension (L×W×H)		750×560×350mm	725×865×550mm
Net weight		40kg	80kg

TEST CURVES*

Fe base curves	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**
	Low alloy steel**	Cr-Ni stainless steel	High speed tool steel	High Mn steel	High Cr cast iron	High Ni cast iron	Cast iron
Al base curves	**B1**	**B2**	**B3**	**B4**	**B5**		
	Low-Al	Al-Si	Al-Zn	Al-Cu	Al-Mg-Si		
Cu base curves	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**
	Brass	Copper	Al-Cu	Beryllium Bronze	Sn-Pb-Cu	Pure copper	Si-Bronze
Ni base curves	**D1**	**D2**	**D3**	**D4**	**D5**		
	Pure Ni	Monel	Hastelloy	Inconel/Incoloy	Nimonic		
Co base curves	**E1**	**E2**	**E2**				
	Low-Co	Stellite 6, 25, 31	Stellite 8, WI-52				
Zn base curves	**F1**	**F2**	**F3**	**F4**	**F5**		
	Low-Zn	Zn-Al 2%	Zamak 2, 3, 5	Zamak 6, 8,12,15	Zamak 27		
Mg base curves	**G1**	**G2**					
	Pure Mg	Mg-Al-Mn-Zn					
Sn base curves	**H1**	**H2**	**H2**				
	Pure Sn	Sn-Sb-Cu-Ag	Sn-Pb				
Pb base curves	**K1**	**K2**	**K2**				
	Pure lead	Pb-Ca	Pb-Sb-Sn				
Ti base curves	**L1**	**L2**					
	Pure Ti	Low-Ti					

*Low alloy steel **(A1)** and Cr-Ni stainless steel **(A2)** are standard curves, and all others are optional
The specific range of curve elements is shown in the attached curve table
Low alloy steel **(A1) includes carbon and medium-low alloy steel

OES-G610 TEST CURVE TABLES

FE BASE CURVES

Curve number	A1	A2	A3	A4	A5	A6	A7
Elemental content (%)	Low alloy steel*	Cr-Ni stainless steel	High speed tool steel	High Mn steel	High Cr cast iron**	High Ni cast iron**	Cast iron**
C	0.006-1.6	0.0052-1.04	0.731-3.3	0.145-2.4	1.16-3.35	2.05-3.7	1.81-4.5
Si	0.0014-2.57	0.02-4.8	0.065-0.7	0.091-1.7	0.055-2.72	0.27-5.61	0.15-3.96
Mn	0.021-19.74	0.021-19.6	0.027-0.73	1.46-23.85	0.201-2.72	0.27-6.72	0.114-3.42
P	0.0032-0.135	0.0049-0.051	0.0042-0.045	0.007-0.188	0.024-0.367	0.0015-0.217	0.021-0.82
S	0.0013-0.111	0.0008-0.056	0.001-0.04	0.0006-0.11	0.0047-0.13	0.005-0.156	0.003-0.211
Cr	0.002-12.42	7.4-29.5	2.55-5.27	0.017-2.85	1.17-32.6	0.246-10.44	0.03-2.5
Ni	0.0107-4.0	0.063-23.11	0.05-0.383	0.0068-3.98	0.129-2.16	0.9-36.6	0.01-4.77
Mo	0.004-3.98	0.0058-4.91	0.076-9.47	0.0032-2.2	0.086-3.51	0.1-0.99	0.003-1.7
Al	0.003-1.29	0.0057-1.8	0.005-0.36	0.004-2.53	0.051-0.18	-	0.002-0.214
Cu	0.0032-0.7	0.016-4.13	0.046-0.348	0.012-0.47	0.193-1.64	0.1-2.17	0.06-1.73
Co	0.0088-0.5	0.0088-0.46	0.019-15	0.007-0.11	0.018-0.357	-	0.0046-0.14
Ti	0.001-0.297	0.0011-1.03	-	0.0007-0.3	0.008-0.19	-	0.004-0.5
Nb	0.0057-0.506	0.0057-2.42	-	0.0006-0.108	0.1-0.7	0.003-0.38	0.003-0.33
V	0.0082-1.26	0.014-0.558	0.154-11.95	0.0013-0.84	0.086-1.01	-	0.0014-1.13
W	0.05-1.97	0.0007-2.75	0.06-14.31	0.14-1.45	0.015-1.57	-	0.001-0.97
Mg	-	-	-	-	-	0.014-0.033	0.0001-0.1
B	0.0017-0.0083	0.0002-0.013	-	0.001-0.02	0.015-0.178	-	0.002-0.26
Zr	0.005-0.41	0.0005-0.41	-	-	-	-	-
La	-	-	-	-	-	-	-
Ce	0.0002-0.019	-	-	-	-	0.003-0.02	0.002-1.81
Fe	REF	REF	REF	REF	REF	REF	REF

*Low alloy steel **(A1)** includes carbon and medium-low alloy steel
**Cast iron samples are required to be whitening treated samples

AL BASE CURVES

Curve number	B1	B2	B3	B4	B5
Elemental content (%)	Low-Al	Al-Si	Al-Zn	Al-Cu	Al-Mg-Si
Si	0.01-1.63	0.02-20	0.02-9.4	0.02-7	0.02-2.3
Fe	0.01-2.54	0.02-4	0.03-1	0.05-1.9	0.07-0.80
Cu	0.002-1	0.005-6	0.01-4.3	0.01-5.82	0.0023-5.82
Mn	0.001-1	0.005-1	0.02-1	0.05-1	0.03-2.4
Mg	0.002-1	0.01-1.5	0.01-4	0.01-2.7	0.006-10.32
Cr	0.001-0.362	0.005-0.5	0.01-0.4	0.01-0.14	0.0013-0.362
Ni	0.001-0.16	0.02-2.5	0.01-0.2	0.01-2.3	0.005-0.25
Zn	0.002-0.5	0.005-3.5	0.01-8.36	0.05-3.5	0.01-1
Ti	0.001-0.587	0.005-0.4	0.005-0.3	0.001-0.2	0.007-0.3
Bi	0.0021-0.71	0.02-0.6	0.002-0.6	0.02-0.6	0.0021-0.701
Pb	0.02-0.5	0.005-0.5	0.005-0.5	0.01-0.5	0.001-0.5
Sb	0.0003-0.05	0.005-0.4	-	-	-
Sn	0.01-0.2	0.003-0.5	0.005-0.2	0.02-0.3	0.007-0.2
Sr	-	0.005-0.1	-	-	-
V	0.004-0.05	0.005-0.2	0.005-0.03	0.01-0.13	0.002-0.03
P	-	0.002-0.005	-	-	-
Al	REF	REF	REF	REF	REF

CU BASE CURVES

Curve number	C1	C2	C3	C4	C5	C6	C7
Elemental content (%)	Brass	Copper	Al-Cu	Beryllium Bronze	Sn-Pb-Cu	Pure copper	Si-Bronze
Zn	0.5-43.0	0.01-23.0	0.04-2.2	0.005-0.23	0.003-0.7	0.001-0.3	0.2-6.0
Pb	0.01-6.0	0.002-0.13	0.002-0.068	0.005-0.3	0.001-21	0.001-1.5	0.01-0.8
Sn	0.009-4.8	0.009-0.13	0.003-0.35	0.005-0.18	0.005-11.2	0.001-0.3	0.05-0.7
P	0.002-0.14	0.003-0.07	-	-	0.001-0.42	0.001-0.078	0.005-0.08
Mn	0.001-5.3	0.009-1.1	0.001-3.1	-	0.001-0.4	0.001-0.1	0.2-1.8
Fe	0.02-3.0	0.03-1.03	0.005-6.0	0.02-0.28	0.003-0.028	0.001-0.2	0.1-1.7
Ni	0.009-1.8	5.5-32.5	0.002-6.0	0.005-0.35	0.001-1.0	0.001-0.5	0.05-1.0
Si	0.001-4.6	0.009-0.46	0.004-0.3	0.02-0.3	0.002-0.009	0.001-0.055	1.5-5.0
Mg	0.001-0.01	0.003-0.14	-	0.003-0.7	-	0.001-0.01	-
Cr	0.001-0.2	-	-	-	-	0.001-0.081	-
Ag	-	-	-	-	0.001-0.14	0.006-0.13	-
Co	0.004-0.1	-	-	-	0.001-0.1	-	-
Al	0.001-6.7	-	3.0-12.9	0.02-0.2	0.01-0.1	-	-
S	0.001-0.15	0.004-0.06	-	-	0.001-0.14	0.001-0.05	-
Cu	REF	REF	REF	REF	REF	REF	REF

NI BASE CURVES

Curve number	D1	D2	D3	D4	D5
Elemental content (%)	Pure Ni	Monel	Hastelloy	Inconel/Incoloy	Nimonic
C	0.0022-0.05	0.0051-0.266	0.005-0.197	0.01-0.71	0.005-0.201
Si	0.0018-0.18	0.04-2.85	0.015-1.3	0.01-6.49	0.026-1.33
Mn	0.00018-0.31	0.31-2.35	0.099-1.19	0.001-1.53	0.0004-1.49
P	-	0.02-0.027	0.005-0.038	0.0033-0.022	0.003-0.054
S	0.00018-0.0068	0.001-0.041	0.001-0.055	0.001-0.0211	0.00096-0.0506
Cr	0.0001-0.132	0.006-0.513	0.123-22.8	2.96-25.3	0.123-24.94
Mo	0.0001-0.0013	0.001-0.059	8.32-32.44	0.007-10.8	0.122-33.04
Fe	0.0019-0.297	1.022-3.98	0.85-19.92	0.022-19.8	0.034-30.02
W	-	-	0.028-5.4	0.005-13.8	0.004-10.96
V	0.00005-0.0024	-	0.01-0.6	0.009-0.145	0.0005-0.607
Al	-	0.001-3.81	0.012-0.72	0.005-5.61	0.008-6
Co	0.00017-0.104	0.02-0.18	0.083-2.6	0.02-17.9	0.014-19.91
Cu	0.00018-0.108	20.76-32.41	0.024-1.54	0.03-3.52	0.006-0.66
Nb	-	0.001-2.65	0.01-0.7	0.016-6.21	0.025-7.43
Sn	-	0.001-0.075	-	0.003-0.68	-
Ti	0.0002-0.0235	0.003-1.5	0.003-0.35	0.003-3.4	0.003-2.86
B	-	-	0.01-0.0106	0.001-2.96	0.0001-0.022
Mg	0.0004-0.0368	0.01-0.07	-	0.001-0.022	-
Zr	-	-	-	0.001-0.032	0.0048-0.075
Pb	-	0.01-0.079	-	-	0.0004-0.0281
Ta	-	-	-	0.001-3.2	0.017-4.26
Ni	REF	REF	REF	REF	REF

CO BASE CURVES

Curve number	E1	E2	E3
Elemental content (%)	Low-Co	Stellite 6, 25, 31	Stellite 8, WI-52
C	0.001-0.085	0.001-2.8	0.046-1.18
Si	0.001-0.57	0.001-3.2	0.02-0.493
Mn	0.0005-0.071	0.0005-1.9	0.019-1.9
p	0.001-0.017	0.001-0.042	0.002-0.111
S	0.001-0.015	0.001-0.050	0.0005-0.0099
Cr	0.001-0.110	18.0-34.0	0.69-22.8
Ni	0.0035-0.63	0.0020-11.7	0.14-28
Mo	0.003-0.051	0.003-1.0	0.0503-19.13
Fe	0.003-2.1	0.003-2.4	0.19-25.54
W	-	2.3-16.2	0.01-11.99
V	-	0.001-0.35	0.005-0.3
Al	0.0010-0.025	0.001-0.22	0.014-5.26
Cu	0.0010-0.0040	0.001-0.030	0.005-0.0607
Nb	-	0.001-0.15	0.001-2.97
Sn	-	0.0006-0.01	-
Ti	-	0.001-0.05	0.001-0.183
Pb	-	-	0.0035-0.025
B	-	-	0.001-0.0042
Be	-	-	0.01-0.0481
Cd	-	-	0.005-0.021
Ga	-	-	0.00537-3.1
Co	REF	REF	REF

ZN BASE CURVES

Curve number	F1	F2	F3	F4	F5
Elemental content (%)	Low-Zn	Zn-Al 2%	Zamak 2,3,5	Zamak 6,8,12,15	Zamak 27
Al	0.023-0.912	1.5-4	2.92-8.89	4.04-23.9	8-33
Cd	0.00044-0.0183	0.001-0.003	0.00092-0.025	0.001-0.025	0.00044-0.025
Cu	0.00012-0.0371	0.001-0.036	0.717-5.92	0.0114-3.22	0.00012-5.92
Fe	0.00053-0.0443	0.001-0.036	0.0013-0.1	0.0037-0.072	0.00053-0.1
Mg	0.00034-0.0107	0.005-0.07	0.0009-0.159	0.0016-0.105	0.00034-0.159
Mn	0.0002-0.0257	0.005-0.032	0.0013-0.0274	0.0022-0.009	0.0002-0.032
Ni	0.0002-0.034	0.005-0.02	0.0005-0.0258	0.0021-0.0236	0.0002-0.034
Pb	0.0045-0.097	0.002-0.012	0.0017-0.028	0.0029-0.028	0.00015-0.097
Sb	0.0016-0.309	-	0.0006-0.065	-	0.0006-0.309
Sn	0.00037-0.0172	0.005-0.05	0.0004-0.011	0.0018-0.0115	0.00037-0.0172
Si	-	-	0.0011-0.015	0.011-0.077	0.0011-0.015
Cr	0.005-0.15	0.005-0.015	0.0001-0.0046	0.0007-0.0147	0.0001-0.15
In	0.00223-0.0228	-	-	-	0.00223-0.0228
Bi	-	-	0.0009-0.0148	-	0.0009-0.0148
La	-	-	0.0008-0.0026	-	0.0008-0.0026
Zn	REF	REF	REF	REF	REF

MG BASE CURVES

Curve number	G1	G2
Elemental content (%)	Pure Mg	Mg-Al-Mn-Zn
Al	0.005-3.38	0.0059-11.02
Zn	0.0012-0.711	0.0012-4.03
Mn	0.006-0.271	0.006-0.77
Si	0.0063-0.12	0.0063-0.8
Fe	0.0012-0.027	0.0012-0.027
Cu	0.00072-0.08	0.00063-0.3
Ni	0.00042-0.04	0.00026-0.04
Pb	0.0011-0.05	0.0011-0.05
Ti	0.00018-0.0025	0.0001-0.0025
Sn	0.0021-0.043	0.0017-0.08
Ca	0.0024-0.067	0.0024-0.067
Cd	0.0025-0.076	0.0025-0.076
Ag	0.0028-0.03	0.0028-0.03
Be	0.00015-0.01	0.00015-0.01
Ce	0.0009-0.0024	0.0009-0.0024
Hg	0.005-0.033	0.005-0.033
La	0.0007-0.0021	0.0007-0.0021
Sn	REF	REF

SN BASE CURVES

Curve number	H1	H2	H3
Elemental content (%)	Pure Sn	Sn-Sb-Cu-Ag	Sn-Pb
Ag	0.00023-0.305	0.0055-0.842	0.004-4.02
Al	0.0003-0.0262	0.0007-0.01	0.0003-0.0262
As	-	0.013-0.248	0.0028-0.248
Bi	0.0098-0.19	0.013-0.602	0.0098-3.03
Cd	0.00066-0.0282	0.0019-1.72	0.00045-1.72
Co	0.00013-0.0267	0.002-0.0267	0.001-0.0267
Cu	0.0037-1.028	0.222-11.51	0.0037-11.51
Fe	0.0004-0.024	0.0014-0.0053	0.0006-0.053
In	-	0.0059-0.036	-
Ni	0.00059-0.0336	0.0058-0.115	0.002-0.11
P	0.0016-0.025	0.005-0.025	0.001-0.025
Pb	0.0049-0.259	0.04-0.429	0.0238-43.086
Sb	0.01-1.064	3.05-13	0.01-12.98
Zn	0.00072-0.0501	0.0007-0.0212	0.0005-8.27
S	0.0007-0.0033	-	0.0007-0.004
Sn	REF	REF	REF

PB BASE CURVES

Curve number	K1	K2	K3
Elemental content (%)	Pure lead	Pb-Ca	Pb-Sb-Sn
Ca	-	0.068-0.13	-
Sn	0.0002-0.0038	0.082-1.45	0.0037-0.21
Al	-	0.024-0.039	-
Se	-	-	0.00012-0.0017
Sb	0.0002-0.0068	0.00016-0.0042	0.80-7.61
Bi	0.0005-0.027	0.0013-0.0072	0.0055-0.051
Cu	0.0001-0.006	0.0001-0.0043	0.0037-0.056
As	0.0002-0.0021	-	0.0035-0.12
Ag	0.0001-0.0071	0.00082-0.0037	0.001-0.0089
Zn	0.0001-0.0008	0.002-0.0052	-
Cd	0.0001-0.0023	0.00037-0.0013	0.0001-0.0029
Ni	0.0001-0.008	-	0.0001-0.0062
Fe	0.00015-0.00023	-	-
Te	-	-	0.00022-0.0029
La	-	0.0008-0.049	-
Ce	-	0.001-0.041	-
Pb	REF	REF	REF

TI BASE CURVES

Curve number	L1	L1
Elemental content (%)	Pure Ti	Low-Ti
Al	0.01-0.1	0.01-7.8
V	0.012-1.2	0.012-5.5
Fe	0.051-0.15	0.051-1.01
Si	0.006-0.03	0.006-0.446
C	0.005-0.16	0.005-0.124
Cr	0.003-0.22	0.003-0.997
Mn	0.002-0.015	0.002-0.027
Mo	0.004-0.99	0.004-4.74
Nb	0.005-0.98	0.005-3.94
Ni	0.002-0.01	0.002-0.018
Sn	0.006-0.75	0.006-2.5
Zr	0.002-1.0	0.002-3.8
Ti	REF	REF

OES-G630 TEST CURVE TABLES

FE BASE CURVES

Curve number	A1	A2	A3	A4	A5	A6	A7
Elemental content (%)	Low alloy steel*	Cr-Ni stainless steel	High speed tool steel	High Mn steel	High Cr cast iron**	High Ni cast iron**	Cast iron**
C	0.006-1.6	0.0052-1.04	0.731-3.3	0.145-2.4	1.16-3.35	2.05-3.7	1.81-4.5
Si	0.0014-2.57	0.02-4.8	0.065-0.7	0.091-1.7	0.055-2.72	0.29-5.61	0.15-3.96
Mn	0.021-19.74	0.021-19.6	0.027-0.73	1.46-23.85	0.201-2.09	0.27-6.72	0.114-3.42
P	0.0032-0.135	0.0049-0.051	0.0042-0.045	0.007-0.188	0.024-0.367	0.0015-0.217	0.021-0.82
S	0.0013-0.111	0.0008-0.056	0.001-0.04	0.0006-0.11	0.0047-0.13	0.005-0.156	0.003-0.211
Cr	0.002-12.42	7.4-29.5	2.55-5.27	0.017-2.85	1.17-32.6	0.246-10.44	0.03-2.5
Ni	0.0107-4.0	0.063-23.11	0.05-0.383	0.0068-3.98	0.129-2.16	0.9-36.6	0.01-4.77
Mo	0.004-3.98	0.0058-4.91	0.076-9.47	0.0032-2.2	0.086-3.51	0.1-0.99	0.003-1.7
Al	0.003-1.29	0.0057-1.8	0.005-0.36	0.004-2.53	0.051-0.18	-	0.002-0.214
Cu	0.0032-0.7	0.016-4.13	0.046-0.348	0.012-0.47	0.193-1.64	0.1-2.17	0.06-1.73
Co	0.0088-0.5	0.0088-0.46	0.019-15	0.007-0.11	0.018-0.357	-	0.0046-0.14
Ti	0.001-0.297	0.0011-1.03	-	0.0007-0.3	0.008-0.19	-	0.004-0.5
Nb	0.0057-0.506	0.0057-2.42	-	0.0006-0.108	0.1-0.7	0.003-0.38	0.003-0.33
V	0.0082-1.26	0.014-0.558	0.154-11.95	0.0013-0.84	0.086-1.01	-	0.0014-1.13
W	0.05-1.97	0.0007-2.75	0.06-14.31	0.14-1.45	0.015-1.57	-	0.001-0.97
Mg	-	-	-	-	-	0.014-0.033	0.0001-0.1
B	0.0017-0.0083	0.0002-0.013	-	0.001-0.02	0.015-0.178	-	0.002-0.26
Sn	0.0035-0.054	0.004-0.05	-	-	-	-	0.0007-0.563
Zn	0.002-0.04	0.0011-0.005	-	-	-	-	0.001-0.0055
As	0.0019-0.056	0.0019-0.038	-	-	-	-	0.002-0.26
Bi	0.0002-0.013	-	-	-	-	-	0.0017-0.05
Zr	0.005-0.41	0.0005-0.41	-	-	-	-	-
La	-	-	-	-	-	-	0.0002-0.023
Ca	0.0001-0.055	0.0001-0.001	-	-	-	-	-
Ce	0.0002-0.019	-	-	-	-	0.003-0.02	0.002-1.81
Sb	0.0004-0.01	0.004-0.01	-	-	-	-	0.004-0.2
N	0.005-0.063	0.0058-0.74	-	-	-	-	-
Fe	REF	REF	REF	REF	REF	REF	REF

*Low alloy steel **(A1)** includes carbon and medium-low alloy steel
**Cast iron samples are required to be whitening treated samples

CU BASE CURVES

Curve number	C1	C2	C3	C4	C5	C6	C7
Elemental content (%)	Brass	Copper	Al-Cu	Beryllium Bronze	Sn-Pb-Cu	Pure copper	Si-Bronze
Zn	4.63-41.76	0.102-22.94	0.227-1.92	-	0.11-6.52	0.00044-0.0331	0.2-6.0
Pb	0.0018-5.31	0.003-0.1	0.0097-0.058	0.0012-0.329	0.0206-18.78	0.00018-0.074	0.01-0.8
Sn	0.01-4.58	0.018-0.11	0.035-0.289	-	2.48-15.15	0.00004-0.331	0.05-0.7
P	0.0004-0.121	0.0038-0.03	-	-	0.0018-0.7	0.00018-0.0992	0.005-0.08
Mn	0.0048-3.4	0.153-0.98	0.182-2.8	-	0.0003-0.194	0.00008-0.0056	0.2-1.8
Fe	0.011-2.8	0.036-0.937	0.38-5.2	0.014-0.58	0.0025-0.31	0.00086-0.159	0.1-1.7
Ni	0.0019-2.94	11.11-31.08	0.21-4.37	0.0067-0.76	0.004-2.28	0.00012-0.228	0.05-1.0
Si	0.0005-4.91	0.0045-0.444	0.031-0.3	0.011-0.32	0.0007-0.17	-	1.5-5.0
Mg	-	0.0097-0.122	-	0.0035-0.17	-	-	-
Cr	0.0013-0.16	-	-	-	-	-	-
As	0.0002-0.142	0.0039-0.0182	-	-	0.0315-0.146	0.00017-0.0376	-
Sb	0.0002-0.432	0.0015-0.0106	-	-	0.001-0.557	0.00013-0.0182	0.005-0.7
Cd	-	-	-	-	-	0.00003-0.0622	-
Bi	0.005-3	0.0012-0.007	-	0.00058-0.0055	0.0015-0.72	0.00009-0.013	-
Ag	0.006-0.023	-	-	-	0.0016-0.12	0.001-0.388	-
Be	-	-	-	0.583-2.21	-	-	-
Co	0.0027-0.0558	-	-	0.01-2.36	0.0202-0.089	-	-
Al	0.0013-6.82	-	7.35-12.51	0.01-0.35	0.0006-0.13	-	-
S	0.001-0.041	0.0068-0.043	-	-	0.0011-0.115	0.0013-0.525	-
Cu	REF	REF	REF	REF	REF	REF	REF

AL BASE CURVES

Curve number	B1	B2	B3	B4	B5
Elemental content (%)	Low-Al	Al-Si	Al-Zn	Al-Cu	Al-Mg-Si
Si	0.01-1.63	0.02-20	0.02-9.4	0.02-7	0.02-2.3
Fe	0.01-2.54	0.02-4	0.03-1	0.05-1.9	0.07-0.80
Cu	0.002-1	0.005-6	0.01-4.3	0.01-5.82	0.0023-5.82
Mn	0.001-1	0.005-1	0.02-1	0.05-1	0.03-2.4
Mg	0.002-1	0.01-1.5	0.01-4	0.01-2.7	0.006-10.32
Cr	0.001-0.362	0.005-0.5	0.01-0.4	0.01-0.14	0.0013-0.362
Ni	0.001-0.16	0.02-2.5	0.01-0.2	0.01-2.3	0.005-0.25
Zn	0.002-0.5	0.005-3.5	0.01-8.36	0.05-3.5	0.01-1
Ti	0.001-0.587	0.005-0.4	0.005-0.3	0.001-0.2	0.007-0.3
Bi	0.0021-0.71	0.02-0.6	0.002-0.6	0.02-0.6	0.0021-0.701
In	0.01-0.5	-	0.01-0.5	-	-
Ca	0.0001-0.002	0.002-0.03	-	-	0.0005-0.00214
Cd	0.01-0.02	0.001-0.3	0.002-0.3	0.01-0.3	0.0003-0.02
Ga	0.002-0.055	0.005-0.2	-	-	0.009-0.02
Pb	0.02-0.5	0.005-0.5	0.005-0.5	0.01-0.5	0.001-0.5
Sb	0.0003-0.05	0.005-0.4	-	-	-
Sn	0.01-0.2	0.003-0.5	0.005-0.2	0.02-0.3	0.007-0.2
Sr	-	0.005-0.1	-	-	-
V	0.004-0.05	0.005-0.2	0.005-0.03	0.01-0.03	0.002-0.03
Zr	0.001-0.12	0.005-0.2	0.01-0.3	0.001-0.2	0.003-0.12
Be	0.00028-0.005	0.005-0.21	-	-	0.0003-0.013
B	0.0002-0.005	0.0006-0.002	-	-	0.0002-0.0013
Co	0.0014-0.0251	0.009-0.21	-	-	0.0014-0.0251
La	0.0019-0.1	-	-	-	-
Ce	0.0003-0.1	-	-	-	-
Mo	0.0031-0.03	-	-	-	-
As	0.002-0.0058	-	-	-	-
Ag	0.0005-0.0194	-	-	-	0.0005-0.0194
P	-	0.002-0.005	-	-	-
Na	-	0.0007-0.008	-	-	-
Al	REF	REF	REF	REF	REF

ZN BASE CURVES

Curve number	F1	F2	F3	F4	F5
Elemental content (%)	Low-Zn	Zn-Al 2%	Zamak 2,3,5	Zamak 6,8,12,15	Zamak 27
Al	0.023-0.912	1.5-4	2.92-8.89	4.04-23.9	8-33
Cd	0.00044-0.0183	0.001-0.003	0.00092-0.025	0.001-0.025	0.00044-0.025
Cu	0.00012-0.0371	0.001-0.036	0.717-5.92	0.0114-3.22	0.00012-5.92
Fe	0.00053-0.0443	0.001-0.036	0.0013-0.1	0.0037-0.072	0.00053-0.1
Mg	0.00034-0.0107	0.005-0.07	0.0009-0.159	0.0016-0.105	0.00034-0.159
Mn	0.0002-0.0257	0.005-0.032	0.0013-0.0274	0.0022-0.009	0.0002-0.032
Ni	0.0002-0.034	0.005-0.02	0.0005-0.0258	0.0021-0.0236	0.0002-0.034
Pb	0.0045-0.097	0.002-0.012	0.0017-0.028	0.0029-0.028	0.00015-0.097
Sb	0.0016-0.309	-	0.0006-0.065	-	0.0006-0.309
Sn	0.00037-0.0172	0.005-0.05	0.0004-0.011	0.0018-0.0115	0.00037-0.0172
Si	-	-	0.0011-0.015	0.011-0.077	0.0011-0.015
Cr	0.005-0.15	0.005-0.015	0.0001-0.0046	0.0007-0.0147	0.0001-0.15
In	0.00223-0.0228	-	-	-	0.00223-0.0228
Bi	-	-	0.0009-0.0148	-	0.0009-0.0148
La	-	-	0.0008-0.0026	-	0.0008-0.0026
Zn	REF	REF	REF	REF	REF

NI BASE CURVES

Curve number	D1	D2	D3	D4	D5
Elemental content (%)	Pure Ni	Monel	Hastelloy	Inconel/Incoloy	Nimonic
C	0.0022-0.05	0.0051-0.266	0.005-0.197	0.01-0.71	0.005-0.201
Si	0.0018-0.18	0.04-2.85	0.015-1.3	0.01-6.49	0.026-1.33
Mn	0.00018-0.31	0.31-2.35	0.099-1.19	0.001-1.53	0.0004-1.49
P	-	0.02-0.027	0.005-0.038	0.0033-0.022	0.003-0.054
S	0.00018-0.0068	0.001-0.041	0.001-0.055	0.001-0.0211	0.00096-0.0506
Cr	0.0001-0.132	0.006-0.513	0.123-22.8	2.96-25.3	0.123-24.94
Mo	0.0001-0.0013	0.001-0.059	8.32-32.44	0.007-10.8	0.122-33.04
Fe	0.0019-0.297	1.022-3.98	0.85-19.92	0.022-19.8	0.034-30.02
W	-	-	0.028-5.4	0.005-13.8	0.004-10.96
V	0.00005-0.0024	-	0.01-0.6	0.009-0.145	0.0005-0.607
Al	-	0.001-3.81	0.012-0.72	0.005-5.61	0.008-6
Co	0.00017-0.104	0.02-0.18	0.083-2.6	0.02-17.9	0.014-19.91
Cu	0.00018-0.108	20.76-32.41	0.024-1.54	0.03-3.52	0.006-0.66
Nb	-	0.001-2.65	0.01-0.7	0.016-6.21	0.025-7.43
Sn	-	0.001-0.075	-	0.003-0.68	-
Ti	0.0002-0.0235	0.003-1.5	0.003-0.35	0.003-3.4	0.003-2.86
B	-	-	0.01-0.0106	0.001-2.96	0.0001-0.022
Mg	0.0004-0.0368	0.01-0.07	-	0.001-0.022	-
Zr	-	-	-	0.001-0.032	0.0048-0.075
Pb	-	0.01-0.079	-	-	0.0004-0.0281
Ta	-	-	-	0.001-3.2	0.017-4.26
Ag	0.00011-0.0011	-	-	-	-
As	0.0001-0.0028	-	-	-	0.008-0.021
Be	0.0001-0.0005	-	-	-	-
Bi	0.0001-0.00111	-	-	-	-
Ca	0.00028-0.001	-	-	-	-
Sb	0.0001-0.0011	-	-	-	0.0005-0.008
Zn	0.00023-0.00081	-	-	-	-
N	-	-	-	0.0033-0.236	-
Ni	REF	REF	REF	REF	REF

SN BASE CURVES

Curve number	H1	H2	H3
Elemental content (%)	Pure Sn	Sn-Sb-Cu-Ag	Sn-Pb
Ag	0.00023-0.305	0.0055-0.842	0.004-4.02
Al	0.0003-0.0262	0.0007-0.01	0.0003-0.0262
As	-	0.013-0.248	0.0028-0.248
Bi	0.0098-0.19	0.013-0.602	0.0098-3.03
Cd	0.00066-0.0282	0.0019-1.72	0.00045-1.72
Co	0.00013-0.0267	0.002-0.0267	0.001-0.0267
Cu	0.0037-1.028	0.222-11.51	0.0037-11.51
Fe	0.0004-0.024	0.0014-0.0053	0.0006-0.053
In	-	0.0059-0.036	-
Ni	0.00059-0.0336	0.0058-0.115	0.002-0.11
P	0.0016-0.025	0.005-0.025	0.001-0.025
Pb	0.0049-0.259	0.04-0.429	0.0238-43.086
Sb	0.01-1.064	3.05-13	0.01-12.98
Zn	0.00072-0.0501	0.0007-0.0212	0.0005-8.27
S	0.0007-0.0033	-	0.0007-0.004
Sn	REF	REF	REF

CO BASE CURVES

Curve number	E1	E2	E3
Elemental content (%)	Low-Co	Stellite 6, 25, 31	Stellite 8, WI-52
C	0.001-0.085	0.001-2.8	0.046-1.18
Si	0.001-0.57	0.001-3.2	0.02-0.493
Mn	0.0005-0.071	0.0005-1.9	0.019-1.9
p	0.001-0.017	0.001-0.042	0.002-0.111
S	0.001-0.015	0.001-0.050	0.0005-0.0099
Cr	0.001-0.110	18.0-34.0	0.69-22.8
Ni	0.0035-0.63	0.0020-11.7	0.14-28
Mo	0.003-0.051	0.003-1.0	0.0503-19.13
Fe	0.003-2.1	0.003-2.4	0.19-25.54
W	-	2.3-16.2	0.01-11.99
V	-	0.001-0.35	0.005-0.3
Al	0.0010-0.025	0.001-0.22	0.014-5.26
Cu	0.0010-0.0040	0.001-0.030	0.005-0.0607
Nb	-	0.001-0.15	0.001-2.97
Sn	-	0.0006-0.01	-
Ti	-	0.001-0.05	0.001-0.183
Pb	-	-	0.0035-0.025
B	-	-	0.001-0.0042
Be	-	-	0.01-0.0481
Cd	-	-	0.005-0.021
Ga	-	-	0.00537-3.1
Co	REF	REF	REF

MG BASE CURVES

Curve number	G1	G2
Elemental content (%)	Pure Mg	Mg-Al-Mn-Zn
Al	0.005-3.38	0.0059-11.02
Zn	0.0012-0.711	0.0012-4.03
Mn	0.006-0.271	0.006-0.77
Si	0.0063-0.12	0.0063-0.8
Fe	0.0012-0.027	0.0012-0.027
Cu	0.00072-0.08	0.00063-0.3
Ni	0.00042-0.04	0.00026-0.04
Pb	0.0011-0.05	0.0011-0.05
Ti	0.00018-0.0025	0.0001-0.0025
Sn	0.0021-0.043	0.0017-0.08
Ca	0.0024-0.067	0.0024-0.067
Cd	0.0025-0.076	0.0025-0.076
Ag	0.0028-0.03	0.0028-0.03
Be	0.00015-0.01	0.00015-0.01
Ce	0.0009-0.0024	0.0009-0.0024
Hg	0.005-0.033	0.005-0.033
La	0.0007-0.0021	0.0007-0.0021
Sn	REF	REF

PB BASE CURVES

Curve number	K1	K2	K3
Elemental content (%)	Pure lead	Pb-Ca	Pb-Sb-Sn
Ca	-	0.068-0.13	-
Sn	0.0002-0.0038	0.082-1.45	0.0037-0.21
Al	-	0.024-0.039	-
Se	-	-	0.00012-0.0017
Sb	0.0002-0.0068	0.00016-0.0042	0.80-7.61
Bi	0.0005-0.027	0.0013-0.0072	0.0055-0.051
Cu	0.0001-0.006	0.0001-0.0043	0.0037-0.056
As	0.0002-0.0021	-	0.0035-0.12
Ag	0.0001-0.0071	0.00082-0.0037	0.001-0.0089
Zn	0.0001-0.0008	0.002-0.0052	-
Cd	0.0001-0.0023	0.00037-0.0013	0.0001-0.0029
Ni	0.0001-0.008	-	0.0001-0.0062
Fe	0.00015-0.00023	-	-
Te	-	-	0.00022-0.0029
La	-	0.0008-0.049	-
Ce	-	0.001-0.041	-
Pb	REF	REF	REF

TI BASE CURVES

Curve number	L1	L1
Elemental content (%)	Pure Ti	Low-Ti
Al	0.01-0.1	0.01-7.8
V	0.012-1.2	0.012-5.5
Fe	0.051-0.15	0.051-1.01
Si	0.006-0.03	0.006-0.446
C	0.005-0.16	0.005-0.124
Cr	0.003-0.22	0.003-0.997
Mn	0.002-0.015	0.002-0.027
Mo	0.004-0.99	0.004-4.74
Nb	0.005-0.98	0.005-3.94
Ni	0.002-0.01	0.002-0.018
Sn	0.006-0.75	0.006-2.5
Zr	0.002-1.0	0.002-3.8
Ti	REF	REF