PHOTRON PTY.LTD.

LIGHTEN YOUR HORIZON

HOLLOW CATHODE LAMPS

PRODUCT BROCHURE

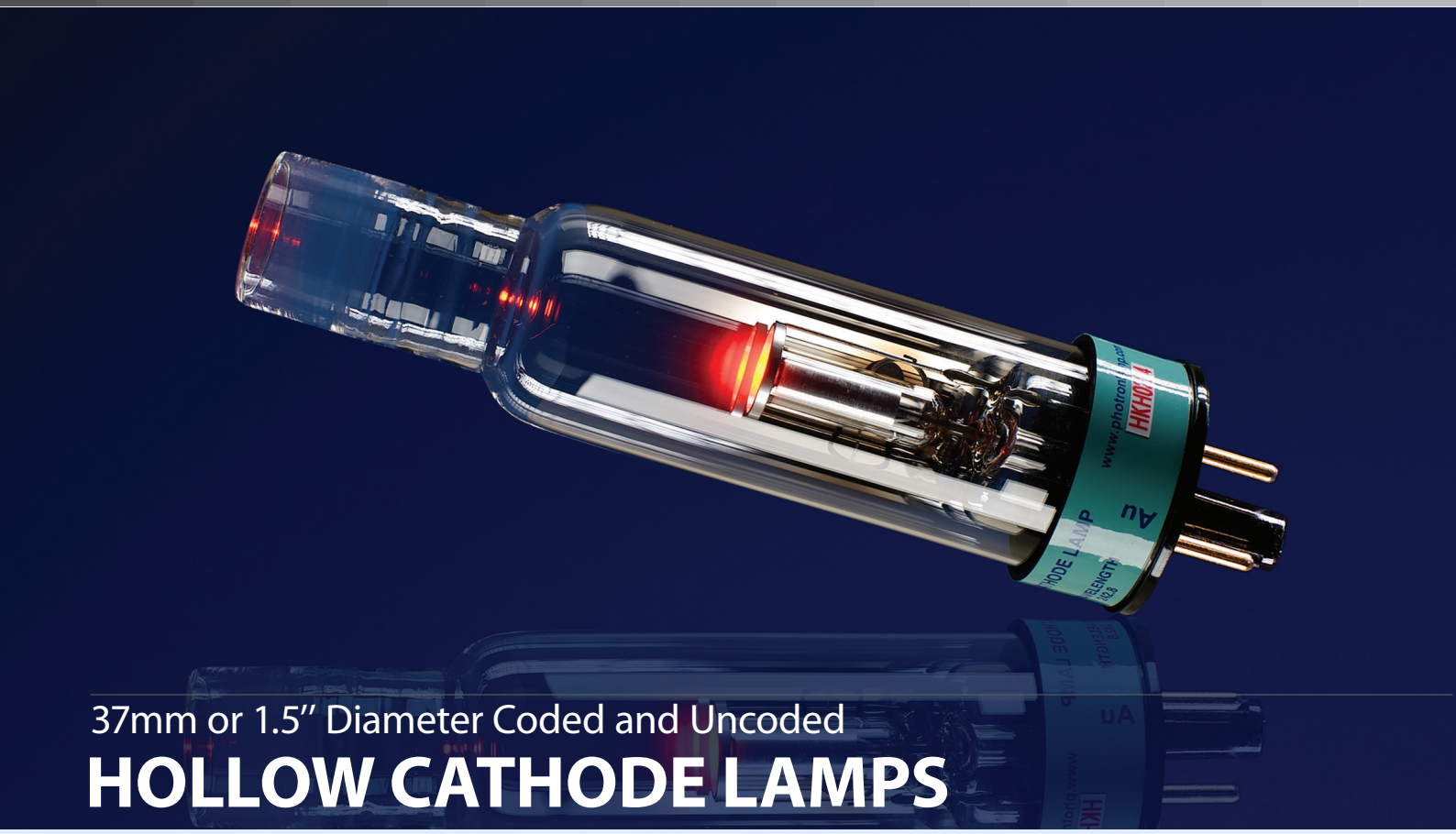
PHOTRON PTY.LTD. specialises in research, development and manufacture of high quality light sources for use in analytical spectography. The principals of Photron each have more than 50 years experience in both the design of spectographic instruments and light sources. The design for all lamps produced by Photron are based on actual use and experience with atomic absorbtion, UV-visible spectrophotometers and other spectroscopic instruments.

Constant development of alloys, intermetallic species and cathode surface technology ensures the analyst of the best possible line source for atomic absorbtion spectography (AAS). Stringent process conditions, modern and efficient high vacuum equipment coupled with an intelligent selection of internal components provide Photron's Hollow Cathode Lamps (HCL's) with fast warm-up times and an extended shelf life guaranteed for 5 years from the date of manufacture.

The successful development of the boosted discharge Hollow Cathode Lamp called the Super Lamp [see page 12] provides a simple and efficient equivalent to Electrodeless Discharge Lamps with a wider range of elements and a considerable reduction in cost.

Photron can customise and manufacture lamps for OEM customers required scecifications using the purest elements available Eg: Optogalvanic effect & Astronomical background correction.
Photron also manufacture a large range of Deuterium Lamps, Please refer to our **D2 Brochure**. We also supply OEM Quality Graphite tubes for most of the big instrument manufacturers and stock a supply of UV-Vis lamps.

We pride ourselves on highly competitive pricing, stock on hand ready for dispatch, efficient manufacturing time and one of the fastest delivery services worldwide for our customers.



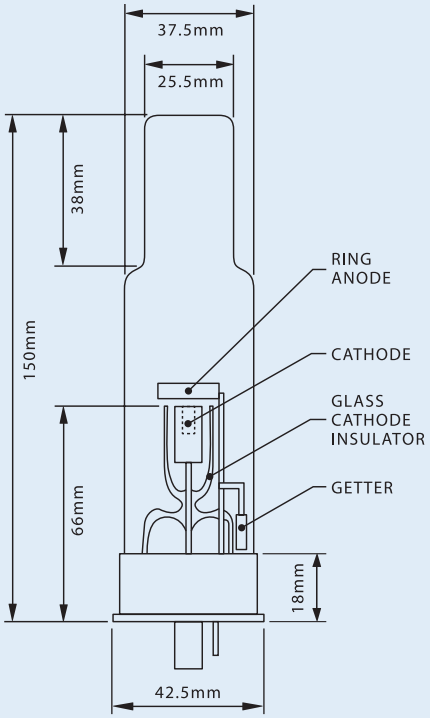
37mm or 1.5" Diameter Coded and Uncoded

HOLLOW CATHODE LAMPS

For Direct use in AAS systems manufactured by: **Agilent, Varian, Analytic Jena, Thermo Fisher, GBC, Unicam** and all other makes.
Use in Perkin Elmer instruments can be facilitated with the use of an adaptor kit (P204), however our 51mm (See page 6-7) HCL's are recommended.

Hollow cathode lamps produced by Photron are designed and manufactured to achieve all of the following fundamental requirements for a spectral line source.

- Intense emission of resonance (ground state derived) lines.
- Narrow line width, for maximum sensitivity and linearity.
- Minimal spectral interference from continuum emission, present in the cathode.
- Rapid warm up to produce stable long term light emission.
- Noise free operation.
- Long running life and a 5 year shelf life.
- Cathode materials and geometry achieve a combination of spectral purity and a suitable sputtering rate. (A high sputtering rate will give high intensity at the expense of lamp life, sensitivity and linearity).



SMITH-HIEFTJE BACKGROUND CORRECTION.

Photron lamps have been tested and found to work as well as lamps sold specifically for this technique, however due to the high energy pulse used, some elements will be consumed at a higher rate reducing lamp life.

CODED LAMPS

P800C Series - For GBC and Varian AAS with coded recognition - 4 pin.
P800UC Series - For Thermo Unicam AAS with coded recognition - 7 pin.

ELEMENT SELECTION TABLE

ELEMENT	PART No.	PRIMARY WAVE LENGTH	ALTERNATIVE WAVE LENGTH
Al	P801	396.2	308.2 - 309.
Sb	P802	217.6	206.8 - 217.9
As	P803	193.7	189.0 - 197.2
Ba	P804	553.5	455.4 - 493.4
Be	P805	234.9	–
Bi	P806	223.1	222.8 - 227.7
B	P807	249.8	208.9
Cd	P808	228.8	326.1
Ca	P809	422.7	239.9
Cs	P810	852.1	455.6
Ce	P811	520.0	569.7
Cr	P812	357.9	425.4 - 427.5
Co	P813	240.7	304.4
Cu	P814	324.8	217.9 - 218.2
Dy	P815	421.2	404.6
Er	P816	400.8	389.3
Eu	P817	459.4	462.7
Gd	P818	368.4	405.8 - 407.9
Ga	P819	294.4	403.3 - 417.2
Ge	P820	265.2	271.0
Au	P821	242.8	267.6
Hf	P822	307.8	268.2
Ho	P823	410.4	425.4 - 405.4
In	P824	303.9	325.6 - 410.2
Ir	P825	208.9	264.0 - 266.5
Fe	P826	248.3	248.8 - 372.0
La	P827	550.1	403.7
Pb	P828	217.0	283.3 - 261.4
Li	P829	670.8	323.3
Lu	P830	335.9	356.7 - 337.6
Mg	P831	285.2	202.5
Mn	P832	279.5	279.8 - 280.1
Hg	P833	253.7	–
Mo	P834	313.3	320.9
Nd	P835	492.5	463.4
Ni	P836	232.0	231.1 - 341.5
Nb	P837	334.9	405.9 - 408.0
Os	P838	290.9	305.9 - 426.0
P	P874	213.6	–
Pd	P839	247.6	244.8 - 340.5
Pt	P840	265.9	264.7 – 299.8
K	P841	766.5	404.4 - 769.9
Pr	P842	495.1	513.3
Re	P843	346.0	346.5
Rh	P844	343.5	328.1 - 369.2
Rb	P845	780.0	794.8
Ru	P846	349.9	392.6
Sm	P847	429.7	476.0
Sc	P848	391.2	390.8
Se	P849	196.0	204.0
Si	P850	251.6	250.7 - 251.4
Ag	P851	328.1	338.3
Na	P852	589.0	330.2 - 589.6
Sr	P853	460.7	407.8
Ta	P854	271.5	275.8
Te	P855	214.3	225.9
Tb	P856	432.7	431.9 - 433.8
Tl	P857	276.7	258.0
Th	P858	371.9	–
Tm	P859	371.8	436.0 - 410.6
Sn	P860	235.5	224.6 - 266.1
Ti	P861	364.3	365.4 - 399.0
W	P862	255.1	294.7 - 400.9
U	P863	358.5	356.6 - 351.4
V	P864	318.5	306.6 - 318.4
Yb	P865	398.8	346.4
Y	P866	410.2	414.2
Zn	P867	213.9	307.6
Zr	P868	360.1	468.7 - 354.8
H2	P869	170-380	–

All lamp windows upgraded to Quartz for maximum transmission of the spectral line.

CODED SERIES LAMPS

Photron offer a large range of coded lamps for use in the following insrtruments:

P800C Coded Series Lamps – 4 Pin Base

- Agilent / Varian Instuments
- GBC Instruments

P800UC Unicam Coded Lamps – 7 Pin Base

- Thermo Fisher / Unicam Instuments

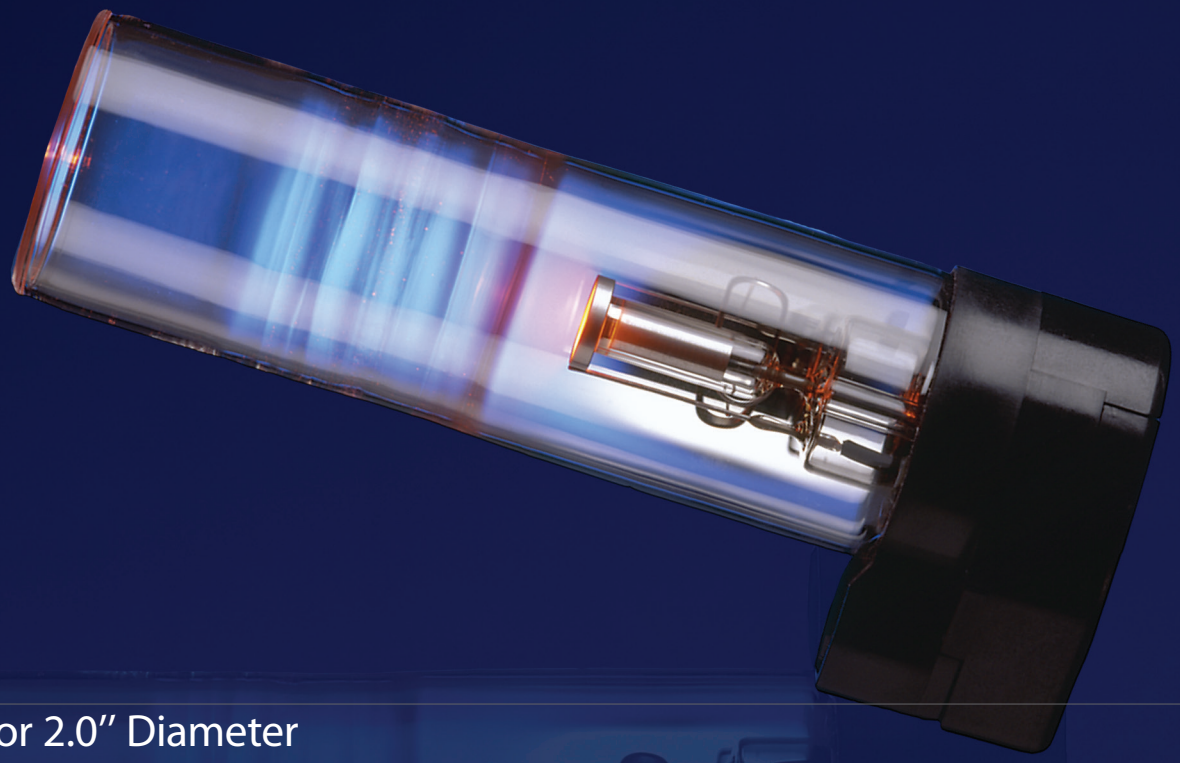
COMMON MULTI ELEMENT LAMPS

ELEMENT	PART No.	PRIMARY WAVE LENGTH	ALTERNATIVE WAVE LENGTH
Ca	P870	422.7	239.9
Mg		285.2	202.5
K	P871	766.5	404.4
Na		589.0	330.2
Cu	P872	324.8	217.9
Zn		213.9	307.6
Cr	P873	425.4	
Co		240.7	
Cu		324.8	
Fe		248.3	
Mn		279.5	
Ni		232.0	

The P873 was for exclusive use in foundries who only needed to measure concentration % in their melt if their emission spectrometer failed. It is of little use in detection limit applications.

Note: For better detection limits, a single element lamp is recommended.

Other combinations of elements can be ordred, please see page 8-9 or enquire.
Add suffix A=Argon fill gas, H=Helium fill gas, X=Xenon fill gas, K=Krypton fill gas.



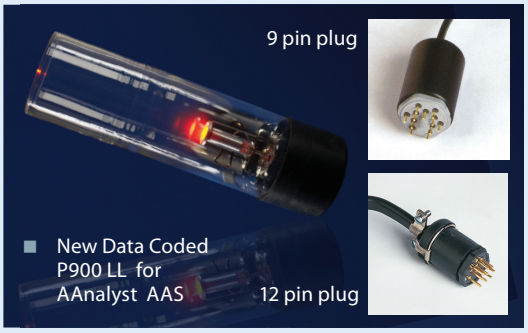
51mm or 2.0" Diameter

HOLLOW CATHODE LAMPS

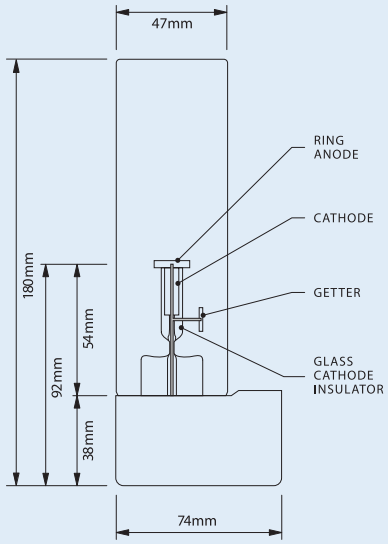
for use with Perkin-Elmer Instruments

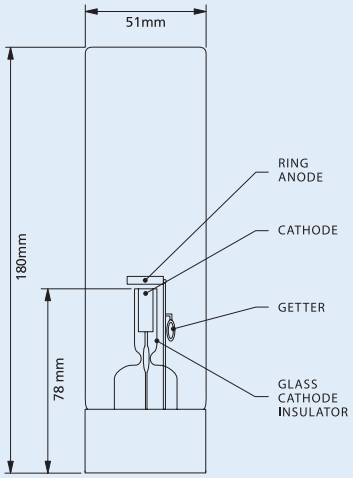
These hollow cathode lamps are produced to provide direct use without adapters in all Perkin-Elmer, AAnalyst & AAS instruments. All windows on these lamps are fully fused and contain no "gassy" adhesives which drastically reduce shelf life.

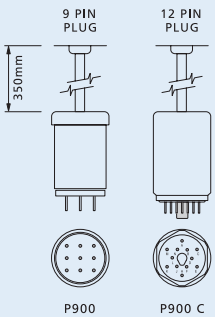
- Totally hermetic glass seals ensures a clean fill gas and cathode for the life of the lamp and most importantly a shelf life longer than 5 years.
- The application of the same glass cathode shielding technique used in all Photron hollow cathode lamps gives maximum stability and reliability throughout lamp life.
- Due to the elegantly simple design of the electrode geometry of Photron lamps, less mass is present within the lamp, reducing outgassing and making the lamp more resistant to breakage from lateral shock.



- Still available from Photron. Perkin Elmer style P900, 9 pin and P900C, 12 pin plug 2" Lamps







ELEMENT SELECTION TABLE

ELEMENT	PART No.	PRIMARY WAVE LENGTH	ALTERNATIVE WAVE LENGTH
Al	P901LL	396.2	308.2 - 309.3
Sb	P902LL	217.6	206.8 - 217.9
Ba	P904LL	553.5	455.4 - 493.4
Be	P905LL	234 9	>
Bi	P906LL	223:1	222.8 - 227.7
B	P907LL	249.8	208.9
Cd	P908LL	228.8	326.1
Ca	P909LL	422.7	239.9
Cr	P912LL	357.9	425.4 - 427.5
Co	P913LL	240.7	304.4
Cu	P914LL	324.8	217.9 - 218.2
Dy	P915LL	421.2	404.6
Er	P916LL	400.8	389.3
Eu	P917LL	459.4	462.7
Gd	P918LL	368.4	405.8 - 407.9
Ga	P919LL	294.4	403.3 - 417.2
Ge	P920LL	265.2	271.0
Au	P921LL	242 8	267.6
Hf	P922LL	307.8	268.2
Ho	P923LL	410.4	425.4 - 405.4
In	P924LL	303:9	325.6 - 410.2
Ir	P925LL	208.9	264.0 - 266.5
Fe	P926LL	248.3	248.8 - 372.0
La	P927LL	550.1	403.7
Pb	P928LL	283.3	217.0 - 261.4
Li	P929LL	670.8	323.3
Mg	P931LL	285.2	202.5
Mn	P932LL	279.5	279.8 - 280.1
Hg	P933LL	253.7	>
Mo	P934LL	313.3	320.9
Nd	P935LL	492.5	463.4
Ni	P936LL	232.0	231.1 - 341.5
Nb	P937LL	334.9	405.9 - 408.0
Os	P938LL	290.9	305.9 - 426.0
P	P974LL	213.6	>
Pd	P939LL	247.6	244.8 - 340.5
Pt	P940LL	265.9	264.7 – 299.8
K	P941LL	766.5	404.4 - 769.9
Pr	P942LL	495.1	513.3
Re	P943LL	346.0	346.5
Rh	P944LL	343.5	328.1 - 369.2
Rb	P945LL	780.0	794.8
Ru	P946LL	349.9	392.6
Sm	P947LL	429.7	476.0
Sc	P948LL	391.2	390.8
Se	P949LL	196.0	204.0
Si	P950LL	251.6	250.7 - 251.4
Ag	P951LL	328.1	338.3
Na	P952LL	589.0	330.2 - 589.6
Sr	P953LL	460.7	407.8
Ta	P954LL	271.5	275.8
Te	P955LL	214.3	225.9
Tb	P956LL	432.7	431.9 - 433.8
Tl	P957LL	276.7	258.0
Tm	P959LL	371.8	436.0 - 410.6
Sn	P960LL	235.5	224.6 - 266.1
Ti	P961LL	364.3	365.4 - 399.0
W	P962LL	255.1	294.7 - 400.9
V	P964LL	318.5	306.6 - 318.4
Yb	P965LL	398.8	346.4
Y	P966LL	410.2	414.2
Zn	P967LL	213.9	307.6
Zr	P968LL	360.1	468.7 - 354.8

Cabled 9 pin and 12 pin lamps Available.
The following Elements are available in Lumina bases but without Data Coding: Ce, Cs, Lu, Th, U.

All lamp windows upgraded to Quartz for maximum transmission of the spectral line.

COMMON MULTI ELEMENT LAMPS

ELEMENT	PART No.	PRIMARY WAVE LENGTH	ALTERNATIVE WAVE LENGTH
Ca	P970	422.7	239.9
Mg		285.2	202.5
K	P971	766.5	404.4
Na		589.0	330.2
Cu	P972	324.8	217.9
Zn		213.9	307.6
Cr	P973	425.4	
Co		240.7	
Cu		324.8	
Fe		248.3	
Mn		279.5	
Ni		232.0	

The P973 was for exclusive use in foundries who only needed to measure concentration % in their melt if their emission spectrometer failed. It is of little use in detection limit applications.

Note: For better detection limits, a single element lamp is recommended.

Other lamp combinations available. See page 8-9 or enquire.

CODE	DESCRIPTION
P204	Adaptor Kit, 37mm Lamps - PE AA (9 Pin)
P204C	Adaptor Kit, 37mm Lamps - PE Coded AA (12Pin)
P204L	Adaptor Kit, 37mm Lamps - PE AAnalyst (4 Pin)
P207	Adaptor, PE 12 Pin Lamp - PE AA (9 Pin)
P208	Adaptor, PE 9 Pin Lamp - PE AAnalyst (4 Pin)
P210	Adaptor, PE 12 Pin Lamp - PE AAnalyst (4 Pin)
P211	Adaptor, PE 9 Pin Lamp - PE Coded AA (12 Pin)
P215	Adaptor, PE AAnalyst (4 Pin) Lamp - PE Coded AA (12 Pin)
P216	Adaptor, PE AAnalyst (4 Pin) Lamp - PE AA (9 Pin)

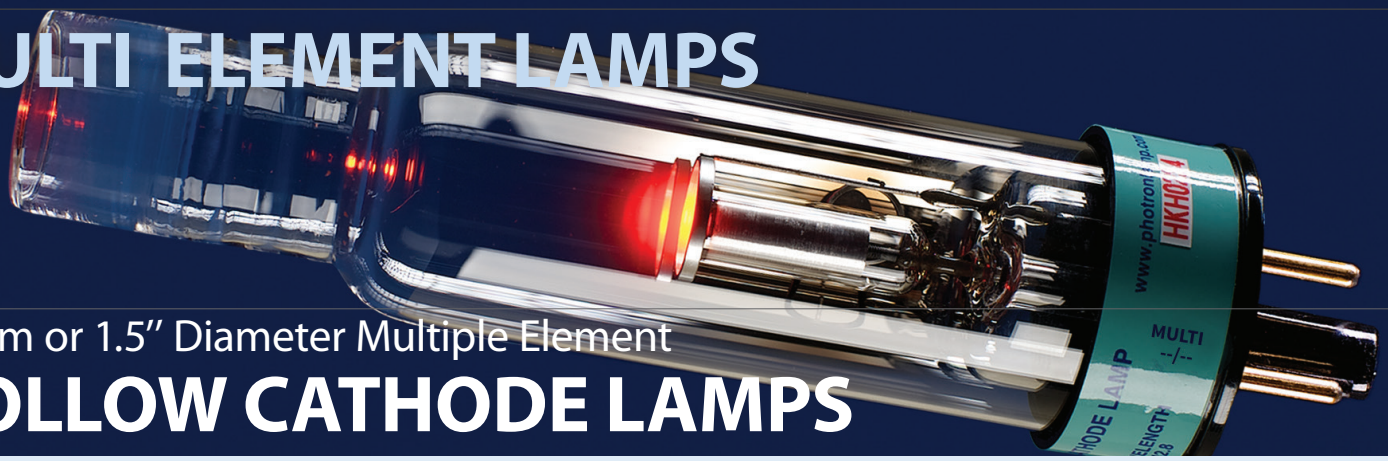

P211


P210


P204


P208

MULTI ELEMENT LAMPS



37mm or 1.5" Diameter Multiple Element
HOLLOW CATHODE LAMPS

Photron's Multi-Element Lamps are customized to suit customers needs. Benefits of Multi-Element Lamps include:

- Shorter warm up times.
- Multiple Element testing, reducing analysis times by eliminating the need to change lamps.

PART No.	ELEMENT SYMBOL
P501	Al/Mn
P502	Al/Sb
P503	Al/Si
P504	Ag/B
P505	Al/Fe/Si
P506	Al/Ca/Mg
P507	Ca/Cu/Mg/Zn
P508	Ca/Fe/Mg
P509	Ag/Cd
P510	Cd/Co/Cr/Mn
P511	Au/Cu
P512	Co/Mn
P513	Co/Cr/Fe/Mn/Mo
P514	Cr/Fe
P515	Cr/Fe/Mn
P516	Cr/Fe/Ni
P517	Cr/Ni/Mo
P518	Co/Cr/Fe
P519	Cd/Cu
P520	Cr/Cu/Ni
P521	Cu/Fe
P522	Cu/Fe/Mn/Ni
P523	Cr/Cu/Fe/Zn
P524	Cu/Fe/Mn/Zn
P525	Cu/Mn
P526	Cu/Mn/Zn
P527	Cu/Ni
P528	Ag/Cu/Ni
P529	Cu/Zn/Fe
P530	Fe/Mn
P531	Fe/Ni
P533	Ag/Hg
P535	K/Ni
P536	Mn/Ni
P537	K/Na/Ni
P538	Cr/Cu/Mn/Ni
P539	As/Pb
P540	Ag/Ru
P541	Co/Cu
P542	Se/Sn
P543	Ag/Si
P544	Mo/Si
P545	Ag/Sn
P547	Ag/Tl
P548	Ag/Zn
P549	Ag/Cd/Pb
P550	Ag/Cu/Fe
P551	Cr/Ni
P553	Cr/Fe/Mn/Mo

PART No.	ELEMENT SYMBOL
P554	Ag/W
P555	Ag/Ti
P556	Cd/Cu/Zn
P557	Al/Cr/Ni
P559	Au/Pd
P560	Cu/Fe/Ni
P561	Ca/Zn
P562	Cr/Se
P563	Ti/V
P565	Cd/Sn
P566	Ag/Pb
P567	Cr/Fe/Mn/Ni
P569	Al/Ca/Fe/Mg
P570	Ag/Cr/Cu/Fe/Ni
P571	Co/Cu/Fe/Ni
P572	Ca/Fe
P576	Ca/Mg/Si
P578	Cd/Zn
P579	Cd/Cu/Pd/Zn
P581	Co/Cu/Fe/Mg/Ni
P582	Cr/Cu/Zn
P583	Al/Ca/Fe/Si
P584	Co/Ni
P585	Cu/Fe/Mn
P586	Au/Ag
P587	Cr/Cu
P589	Ag/Cu/Zn
P590	Cu/Mo/Zn
P591	Co/Cu/Mo/Zn
P592	Co/Cu/Fe/Mn/Mo
P593	Ag/Cr/Cu/Ni
P594	Ag/Pb/Zn
P595	Au/Cu/Fe
P596	Al/Fe
P598	Sb/Se
P599	Ag/Cr/Ni
P5-0001	Co/Mo
P5-0003	Cr/Mn/Ni
P5-0004	Co/Cu/Fe
P5-0005	Ag/Cd/Pb/Zn
P5-0006	Fe/Ni/Zn
P5-0007	Co/Fe/Ni/Zn
P5-0008	Co/Fe
P5-0010	Cr/Co/Fe/Mg/Mn/Ni
P5-0011	Ag/Fe
P5-0012	Cd/Pb/Zn
P5-0014	Co/Cr/Cu/Fe/Ni
P5-0015	Co/Cr/Mn
P5-0017	Cr/Fe/Mn/Ti

PART No.	ELEMENT SYMBOL
P5-0019	Ag/Cr/Cu/Fe/Ni
P5-0020	Cr/Mn
P5-0021	Al/Mo/Si
P5-0022	Ag/Al/Cr/Cu/Fe/Mg
P5-0023	Co/Cu/Fe/Mn
P5-0024	Al/Ca
P5-0025	Ag/Cd/Zn
P5-0026	Al/Si/Ti
P5-0027	Cr/Mo
P5-0028	Co/Cu/Mn/Ni
P5-0029	Cd/Pb
P5-0030	Ag/Cu/Pb/Zn
P5-0031	Mo/V
P5-0033	Fe/Zn
P5-0034	Co/Cr/Cu/Mn/Ni
P5-0035	Ca/Mg/Ni
P5-0037	Ag/Cd/Zn
P5-0043	Al/Cu/Fe/Mn
P5-0045	Cr/Cu/Fe
P5-0046	Co/Cu/Ni/Zn
P5-0047	Mg/Ti
P5-0049	Cr/Ni/Zn
P5-0052	Cu/Fe/Mo
P5-0053	Cu/Fe/Sn/Zn
P5-0057	Fe/Si/Ti/V
P5-0059	Cu/Mg/Zn

MULTI-ELEMENTS – CODED

PART No.	ELEMENT SYMBOL

- Agilent / Varian Coded

P870C	Ca/Mg
P871C	Na/K
P872C	Cu/Zn
P873C	Co/Cr/Cu/Fe/Mn/Ni

- Thermo Fisher Coded

P532UC	Fe/Mn/Ni
P538UC	Cr/Ni/Cu/Mn
P551UC	Cr/Mn
P585UC	Cu/Fe/Mn
P587UC	Cr/Cu

Photrons's range of multi-element lamps are all designed to balance the spectral line of each element equally.

51mm or 2.0" Diameter Multiple Element

HOLLOW CATHODE LAMPS

- Limited amount of Coded available.

PART No.	ELEMENT SYMBOL
P601	Al/Mn
P602	Al/Sb
P603	Al/Si
P604	Ag/B
P605	Al/Fe/Si
P606	Al/Ca/Mg
P607	Ca/Cu/Mg/Zn
P608	Ca/Fe/Mg
P609	Ag/Cd
P610	Cd/Co/Cr/Mn
P612	Co/Mn
P613	Co/Cr/Fe/Mn/Mo
P614	Cr/Fe
P615	Cr/Fe/Mn
P616	Cr/Fe/Ni
P617	Cr/Ni/Mo
P619	Cd/Cu
P620	Cr/Cu/Ni
P621	Cu/Fe
P622	Cu/Fe/Mn/Ni
P623	Cr/Cu/Fe/Zn
P624	Cu/Fe/Mn/Zn
P625	Cu/Mn
P626	Cu/Mn/Zn
P627	Cu/Ni
P628	Ag/Cu/Ni
P629	Cu/Zn/Fe
P630	Fe/Mn
P631	Fe/Ni
P632	Fe/Mn/Ni
P633	Ag/Hg
P635	K/Ni
P636	Mn/Ni
P637	K/Na/Ni
P638	Cr/Cu/Mn/Ni
P640	Ag/Ru
P641	Co/Cu
P642	Se/Sn
P643	Ag/Si
P644	Mo/Si
P645	Ag/Sn
P647	Ag/Tl
P648	Ag/Zn
P649	Ag/Cd/Pb
P650	Ag/Cu/Fe
P651	Cr/Ni
P653	Cr/Fe/Mn/Mo

PART No.	ELEMENT SYMBOL
P654	Ag/W
P655	Ag/Ti
P656	Cd/Cu/Zn
P657	Al/Cr/Ni
P659	Au/Pd
P660	Cu/Fe/Ni
P661	Ca/Zn
P662	Cr/Se
P663	Ti/V
P665	Cd/Sn
P666	Ag/Pb
P667	Cr/Fe/Mn/Ni
P669	Al/Ca/Fe/Mg
P670	Ag/Cr/Cu/Fe/Ni
P671	Co/Cu/Fe/Ni
P672	Ca/Fe
P676	Ca/Mg/Si
P678	Cd/Zn
P679	Cd/Cu/Pd/Zn
P681	Co/Cu/Fe/Mg/Ni
P682	Cr/Cu/Zn
P683	Al/Ca/Fe/Si
P684	Co/Ni
P685	Cu/Fe/Mn
P686	Au/Ag
P687	Cr/Cu
P689	Ag/Cu/Zn
P690	Cu/Mo/Zn
P691	Co/Cu/Mo/Zn
P692	Co/Cu/Fe/Mn/Mo
P693	Ag/Cr/Cu/Ni
P694	Ag/Pb/Zn
P695	Au/Cu/Fe
P696	Al/Fe
P699	Ag/Cr/Ni
P6-0001	Co/Mo
P6-0003	Cr/Mn/Ni
P6-0004	Co/Cu/Fe
P6-0005	Ag/Cd/Pb/Zn
P6-0006	Fe/Ni/Zn
P6-0007	Co/Fe/Ni/Zn
P6-0008	Co/Fe
P6-0010	Cr/Co/Fe/Mg/Mn/Ni
P6-0011	Ag/Fe
P6-0012	Cd/Pb/Zn
P6-0014	Co/Cr/Cu/Fe/Ni
P6-0015	Co/Cr/Mn

PART No.	ELEMENT SYMBOL
P6-0017	Cr/Fe/Mn/Ti
P6-0018	Cr/Cu/Fe/Ni/Zn
P6-0019	Ag/Cr/Cu/Fe/Ni
P6-0020	Cr/Mn
P6-0021	Al/Mo/Si
P6-0022	Ag/Al/Cr/Cu/Fe/Mg
P6-0023	Co/Cu/Fe/Mn
P6-0024	Al/Ca
P6-0025	Ag/Cd/Zn
P6-0026	Al/Si/Ti
P6-0027	Cr/Mo
P6-0028	Co/Cu/Mn/Ni
P6-0029	Cd/Pb
P6-0030	Cu/Zn/Pb/Ag
P6-0031	Mo/V
P6-0032	Fe/Ag
P6-0033	Fe/Zn
P6-0034	Co/Cr/Cu/Mn/Ni
P6-0035	Ca/Mg/Ni
P6-0037	Ag/Cd/Zn
P6-0038	Ni/Si/Ti
P6-0039	Al/Cu/Fe/Mn
P6-0040	Pt/Ru
P6-0043	Al/Cu/Fe/Mn
P6-0045	Cr/Cu/Fe
P6-0046	Co/Cu/Ni/Zn

MULTI-ELEMENTS

PART No.	ELEMENT SYMBOL
P6-0002LL	Ca/Mg/Zn
P6-0002LL	Ag/Cr/Cu/Mg/Al/Fe
P6-0034LL	Co/Cr/Cu/Mn/Ni
P686LL	Au/Ag
P606LL	Ca/Mg/Al
P624LL	Cu/Fe/Mn/Zn
P660LL	Cu/Fe/Ni
P661LL	Ca/Zn
P670LL	Ag/Cr/Cu/Fe/Ni
P692LL	Fe/Co/Cu/Mn/Mo
P693LL	Cr/Cu/Ni/Ag

Note:
For better detection limits, a single element lamp is recommended

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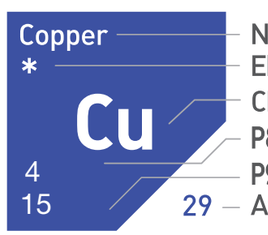
service@photron.com.au sales@photron.com.au

Hydrogen *** H 1																	Helium *** He 4 10 2
Lithium * Li 10 15 3	Beryllium * Be 10 30 4											Boron * B 18 30 5	Carbon * C 6	Nitrogen *** N 7	Oxygen *** O 8	Fluorine *** F 9	Neon *** Ne 10
Sodium * Na 5 8 11	Magnesium * Mg 4 6 12											Aluminium * Al 10 25 13	Silicon * Si 12 40 14	Phosphorus * P 20 35 15	Sulfur * S 16	Chlorine *** Cl 17	Argon *** Ar 18
Potassium * K 10 12 19	Calcium * Ca 4 10 20	Scandium * Sc 8 30 21	Titanium * Ti 18 40 22	Vanadium * V 18 40 23	Chromium * Cr 6 25 24	Manganese * Mn 5 20 25	Iron * Fe 5 30 26	Cobalt * Co 10 30 27	Nickel * Ni 5 25 28	Copper * Cu 4 15 29	Zinc * Zn 5 15 30	Gallium * Ga 4 20 31	Germanium * Ge 4 30 32	Arsenic * As 7 18 33	Selenium * Se 10 16 34	Bromine ** Br 35	Krypton *** Kr 36
Rubidium * Rb 10 20 37	Strontium * Sr 10 20 38	Yttrium * Y 8 30 39	Zirconium * Zr 18 40 40	Niobium * Nb 15 40 41	Molybdenum * Mo 7 30 42	Technetium * Tc 43	Ruthenium * Ru 8 30 44	Rhodium * Rh 6 30 45	Palladium * Pd 10 30 46	Silver * Ag 3 10 47	Cadmium * Cd 4 4 48	Indium * In 5 20 49	Tin * Sn 8 30 50	Antimony * Sb 8 20 51	Tellurium * Te 6 30 52	Iodine * I 53	Xenon *** Xe 54
Caesium * Cs 20 20 55	Barium * Ba 15 25 56	LANTHANIDES	Hafnium * Hf 10 30 72	Tantalum * Ta 18 40 73	Tungsten * W 18 40 74	Rhenium * Re 12 30 75	Osmium * Os 15 20 76	Iridium * Ir 18 30 77	Platinum * Pt 7 30 78	Gold * Au 4 10 79	Mercury ** Hg 3 6 80	Thallium * Tl 5 6 81	Lead * Pb 4 12 82	Bismuth * Bi 10 12 83	Polonium * Po 84	Astatine * At 85	Radon *** Rn 86
Francium * Fr 87	Radium * Ra 88	ACTINIDES	Rutherfordium **** Rf 104	Dubnium **** Db 105	Seaborgium **** Sg 106	Bohrium **** Bh 107	Hassium **** Hs 108	Meitnerium **** Mt 109	Darmstadtium **** Ds 110	Roentgenium **** Rg 111	Copernicium **** Cn 112	Ununtrium **** Uut 113	Flerovium **** Fl 114	Ununpentium **** Uup 115	Livermorium **** Lv 116	Ununseptium **** Uus 117	Ununoctium **** Uuo 118

Lanthanum * La 14 30 57	Cerium * Ce 10 20 58	Praseodymium * Pr 10 35 59	Neodymium * Nd 15 30 60	Promethium * Pm 61	Samarium * Sm 8 30 62	Europium * Eu 10 35 63	Gadolinium * Gd 15 35 64	Terbium * Tb 8 30 65	Dysprosium * Dy 18 30 66	Holmium * Ho 15 30 67	Erbium * Er 10 30 68	Thulium * Tm 10 30 69	Ytterbium * Yb 14 30 70	Lutetium * Lu 15 25 71
Actinium * Ac 89	Thorium * Th 8 20 90	Protactinium * Pa 91	Uranium * U 18 25 92	Neptunium * Np 93	Plutonium * Pu 94	Americium * Am 95	Curium * Cm 96	Berkelium * Bk 97	Californium * Cf 98	Einsteinium * Es 99	Fermium * Fm 100	Mendelevium * Md 101	Nobelium * No 102	Lawrencium * Lr 103



Name of element
Element state
Chemical symbol
P800 1.5" Std Hollow Cathode Lamp – Recommended Current (mA)
P900LL 2.0" Perkin Elmer style AAS – Recommended Current (mA)
Atomic number

Colour denotes elements that can be made into Hollow Cathode Lamps

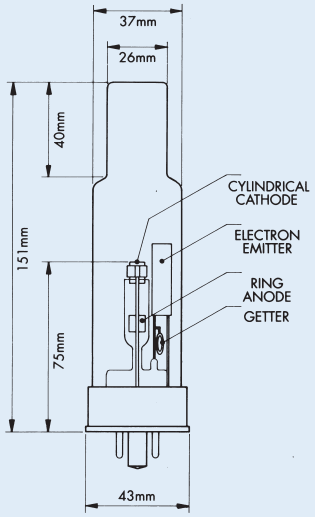
* Solid
** Liquid
*** Gas
**** Unknown

SUPER LAMP PAT.

High Intensity Sharp Line Source for AAS and AFS Spectroscopy

The Super Lamp is particularly recommended for the following determinations in Atomic Absorption Spectroscopy.

- Elements with resonance spectra in the far UV where instrumental efficiency is reduced e.g. Arsenic and Selenium.
- Elements with complex spectra, where the enhanced resonance line reduces the interference of background radiation, allowing the use of wider slit widths further reducing signal to noise. e.g. Nickel and Iron.
- For determinations at or near the detection limit, in some cases a 10 fold improvement in detection limit can be achieved.
- This lamp produces intense spectra with narrow line widths.
- 10 Volt Super Lamps are also used in Atomic Flourescence Spectography.



SUPER LAMP PAT.

High Intensity Sharp Line Source for Perkin Elmer Instruments

PHOTRON'S PERKIN ELMER SIZE SUPER LAMPS produce intense spectra with narrow line widths, have faster warm up times and are available for a wider range of elements than Electrodeless Discharge Lamps.

SINGLE OPERATION — The Super Lamp and power supply have been designed for ease of operation. Simply select the instrument lamp current as for a normal hollow cathode lamp then adjust the boost current to peak energy level or minimum noise condition.

COMPATIBILITY — The Super Lamp and power supply are compatible with most commercial atomic absorption instruments, either by direct connection or with adaptor kits available (see page 18). Once the power supply is installed normal hollow cathode lamps can be used in the same position without disconnecting the power supply.

LOW COST — The Super Lamp system provides a high intensity light source at much lower cost than Electrodeless Discharge Lamps, warm up is faster and generally more stable.

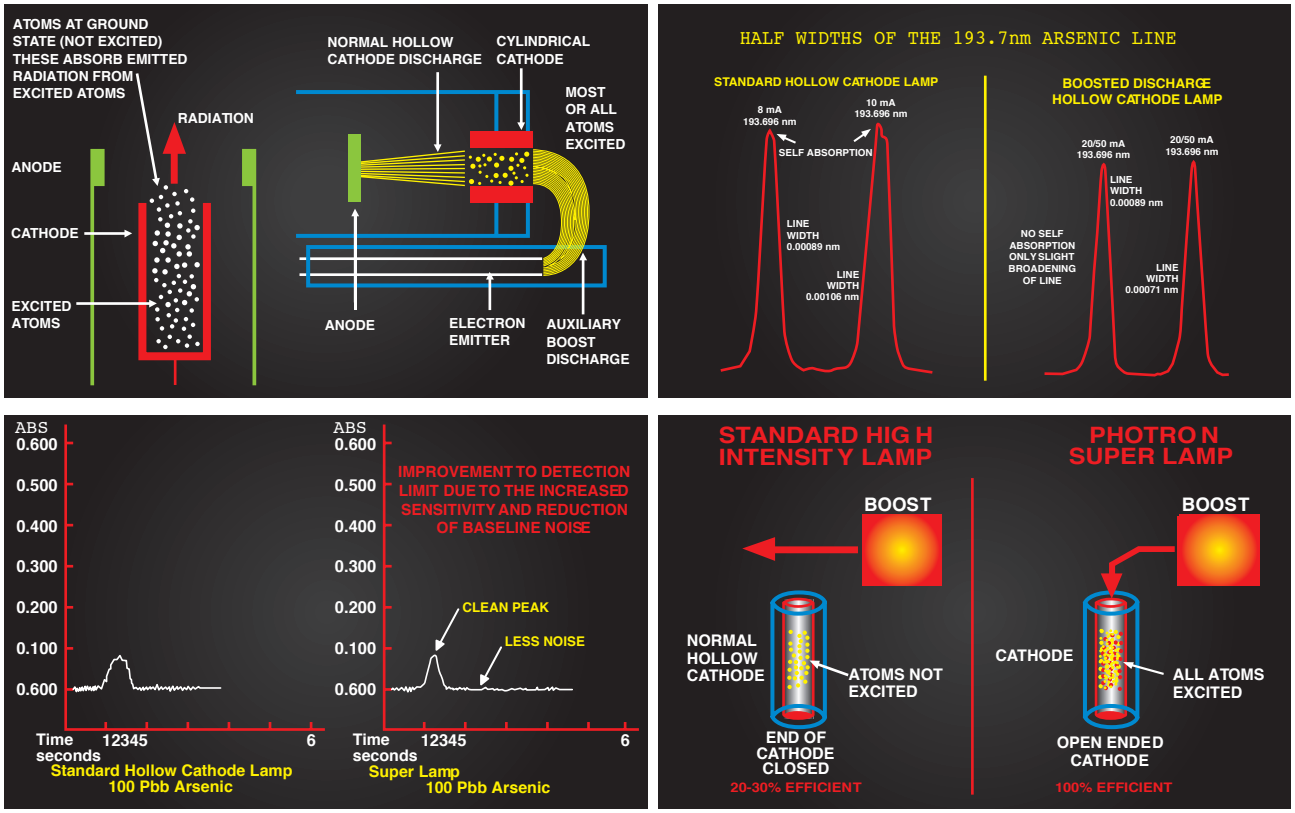
PRINCIPLE OF OPERATION — As illustrated the lamp consists of an anode situated behind an open ended cylindrical cathode. A second "hot" cathode is mounted externally and provides a secondary discharge through the primary cathode. The normal sputtering discharge operates between the cylindrical cathode and the anode and is obtained using the standard hollow cathode lamp supply from the AA spectrophotometer, an auxiliary power supply provides the heater current and current for the secondary discharge.

RESONANCE LINE WIDTH — This secondary discharge excites all atoms sputtered that are present in the discharge plasma allowing much higher currents to be used without any self-absorption broadening. *See data sheet for max current.*

BACKGROUND RADIATION — Fortunately this increase in excitation only affects the primary resonance lines of the sputtered atoms, all other emitted spectra such as ion and gas lines become a much smaller component of total lamp intensity. The result is an improvement in linearity and the ability to use wider bandpass for elements with lines close to the resonance line, e.g. Ni.

LINEARITY — The narrow line width and the large reduction in non resonance spectra provides the analyst with an almost linear calibration curve. This means that for most determinations only 1 standard is required for calibration.

THE RESULT — The comparison of a hollow cathode lamp and a Super Lamp for a furnace determination of Arsenic clearly illustrates the performance achieved.



Super Lamp[PAT.] Selection Table

P800 37mm, Super Lamps

ELEMENT SYMBOL	PART No.	WAVE LENGTH	INTENSITY GAIN OVER STD LAMP
Sb	P802S	217.6	25
As	P803S	193.7	5
Bi	P806S	223.1	15
Cd	P808S	228.8	35
Cr	P812S	357.9	2
Ir	P825S	208.9	7
Fe	P826S	248.3	13
Pb	P828S	217.0	23

ELEMENT SYMBOL	PART No.	WAVE LENGTH	INTENSITY GAIN OVER STD LAMP
Mn	P832S	279.5	13
Ni	P836S	232.0	16
Se	P849S	196.0	26
Te	P855S	214.3	10
Tl	P857S	276.8	10
Zn	P867S	213.9	24
P	P874S	213.7	3
6 Multi	⌄	⌄	⌄
Co	P873S	240.7	28
Cr	P873S	357.9	3
Cu	P873S	324.8	5
Fe	P873S	248.3	3
Mn	P873S	279.5	2
Ni	P873S	232.0	12

P800 37mm, 10 Volt Super Lamps

ELEMENT SYMBOL	PART No.	WAVE LENGTH	INTENSITY GAIN OVER STD LAMP
Sb	P802S-10V	217.6	25
As	P803S-10V	193.7	5
Bi	P806S-10V	223.1	15
Cd	P808S-10V	228.8	35
Cr	P812S-10V	357.9	2
Fe	P826S-10V	248.3	7
Pb	P828S-10V	217.0	13
Mn	P832S-10V	279.5	23

ELEMENT SYMBOL	PART No.	WAVE LENGTH	INTENSITY GAIN OVER STD LAMP
Ni	P836S-10V	232.0	13
Pt	P840S-10V	265.9	16
Se	P849S-10V	196.0	26
Te	P855S-10V	214.3	10
Tl	P857S-10V	276.8	10
Zn	P867S-10V	213.9	24
P	P874S-10V	213.7	3
6 Multi	⌄	⌄	⌄
Co	P873S	240.7	28
Cr	P873S	357.9	3
Cu	P873S	324.8	5
Fe	P873S	248.3	3
Mn	P873S	279.5	2
Ni	P873S	232.0	12

P900 51mm, Super Lamps

ELEMENT SYMBOL	PART No.	WAVE LENGTH	INTENSITY GAIN OVER STD LAMP
Sb	P902S	217.6	25
As	P903S	193.7	5
Bi	P906S	223.1	15
Cd	P908S	228.8	35
Cr	P912S	357.9	2
Fe	P926S	248.3	7
Pb	P928S	217.0	13
Mn	P932S	279.5	23

ELEMENT SYMBOL	PART No.	WAVE LENGTH	INTENSITY GAIN OVER STD LAMP
Ni	P936S	232.0	13
Pt	P940S	265.9	16
Se	P949S	196.0	26
Te	P955S	214.3	10
Tl	P957S	276.8	10
Zn	P967S	213.9	24
P	P974S	213.7	3
6 Multi	⌄	⌄	⌄
Co	P973S	240.7	28
Cr	P973S	357.9	3
Cu	P973S	324.8	5
Fe	P973S	248.3	3
Mn	P973S	279.5	2
Ni	P973S	232.0	12

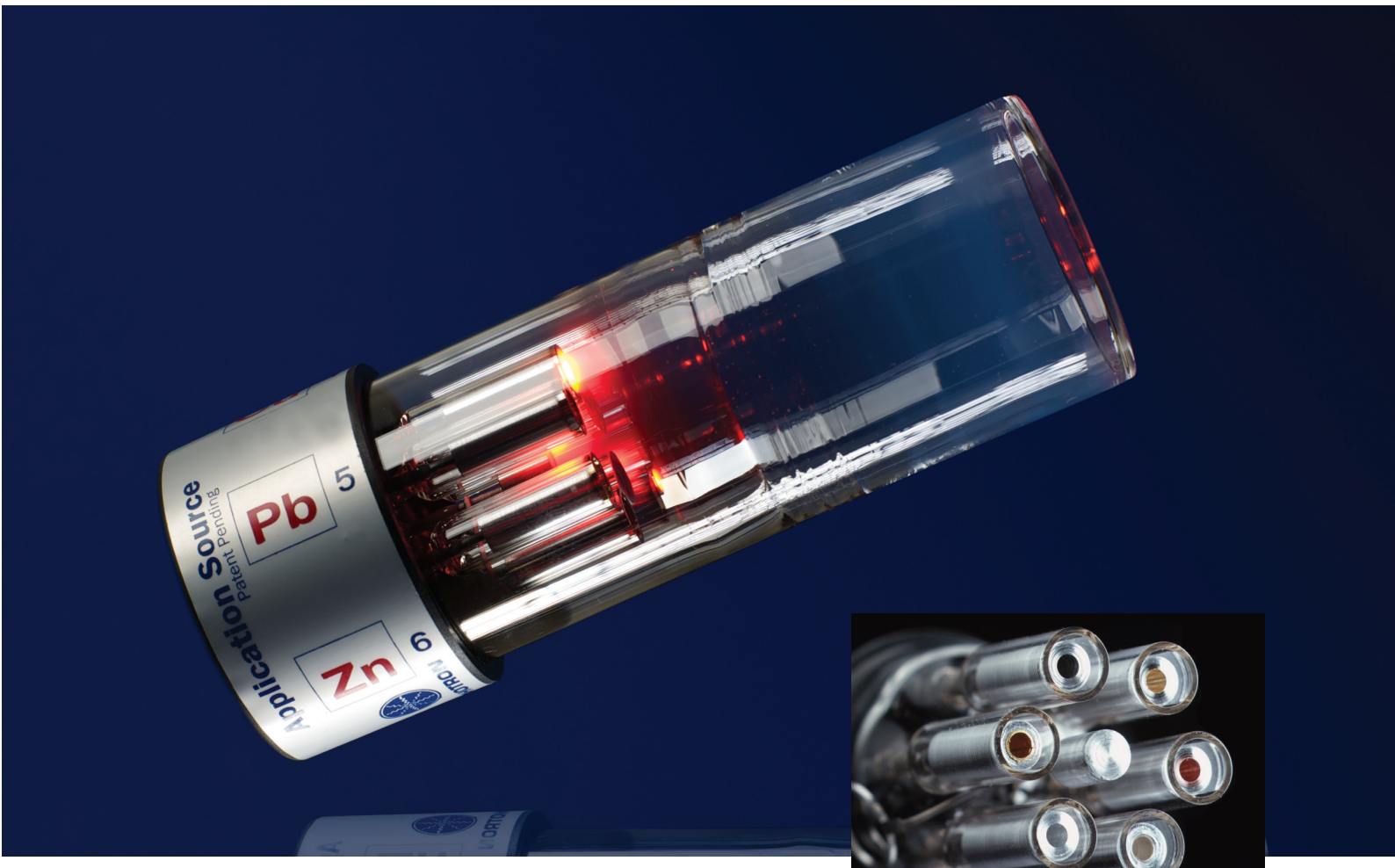
"Intensity gain over Std lamp" Denotes SuperLamp intensity gain over standard Hollow cathode lamp.

Other elements available upon request.

APPLICATION SOURCE LAMP

This new product has 6 individual cathodes in a single envelope. This provides either 6 single elements with the same spectral purity and intensity as a single element lamp or 2 or more elements per cathode allowing many analytical laboratories to have all their element range provided for in one longer life lamp. Choose from the following 11 standard Application Sources or contact us to design your own element combination.

P401	As Cd Hg Pb Se T l	Environmental, Toxicology
P402	Al Fe Ni Si Ti V	Petrochemical
P403	Ag As Au Cu Pb Zn	Mining
P404	Al Co Fe Mg Mn Ni	Base Metals
P405	Ca Cu K Mg Na Zn	Clinical alkali Earths Soil & plant
P406	Cr Cu Fe Ni Pb Zn	Base Metals #2
P407	Co Cr Cu Mn Mo Ni	Stainless Steel
P408	Al Bi Mn Na Si V	Steel
P409	Al Cu Mn Pb Sn Zn	Alloys
P411	AsPb-SeSN-TlAg-CdZn-Hg-CrCo Cu FeMnNi	Toxic & Trace Elements
P410	**Special** *[Customer designed Lamp]*	**Customised to clients requirement**



Currently this lamp is only directly usable in a GBC 932plus and a Sensor AA atomic absorbtion Spectrophotometer.

ASTRONOMICAL CALIBRATION LAMPS

Thorium / Argon (Th/Ar) Hollow Cathode Lamps

ASTRONOMICAL CALIBRATION LAMPS

Astronomical spectrographs are used for a variety of high-precision measurements, ranging from the discovery of low-mass exoplanets to the possible variation of fundamental constants, such as the fine structure constant or the proton-electron mass ratio. These works require excellent wavelength calibration sources and a detailed understanding of the associated uncertainties and systematics. In the era of extremely large telescopes, it is often the accuracy of the calibration source, not the intrinsic photon noise, that limits the achievable precision. Furthermore, the science goals of future extremely large telescopes will require very high precision calibration sources.

Below 900 nm, the well-established thorium-argon (Th/Ar) hollow cathode lamps have been a workhorse. Continual improvements in the line list have now enabled Th lamps to be used to calibrate almost the entire optical bandpass with high precision.

Hollow cathode lamps, being significantly less expensive and easier to use, are the preferred wavelength calibration solution for most astrophysical spectrographs. Thorium (232Th), an element often used as the cathode for such lamps, exhibits many of the desired characteristics of an atomic emission calibration source: it has many energy levels (leading to many lines), a heavy nucleus, a very long half-life, and occurs in nature as a single isotope.
Other elements such as Uranium can be used as a calibration source.

** Power supply required to run the lamp is P209. Also optional P217, 10m Extension lead cable*

OPTOGALVANIC LAMPS

See-Through Hollow Cathode Lamps

SEE THROUGH HOLLOW CATHODE LAMPS (LASER CALIBRATION)

Photron manufactures Optogalvanic (see-through) hollow cathode lamps, they are designed to act as a frequency stable reference for high intensity tuneable monochromatic light sources, particularly lasers.

Most of the cathode materials used in standard hollow cathode lamps may be used in the "see-through" design.
We can also offer a range of fill gases, such as: Neon, Argon, Xenon and Krypton.

Photron

POWER SUPPLY and ACCESSORIES

The Photron hollow cathode power supply (P209) provides a precision current source to correctly drive Photron hollow cathode lamps at a specific current. This allows use of a stand-alone hollow cathode lamp for purposes such as laser frequency tuning, Astronomy with P858A Thorium Lamps and Optogalvanic Lamps as well.

Current is adjusted by a ten turn current control on the front panel. The current is constantly displayed on the front panel meter for ease of adjustment.
Current range is 0 to 25mA and a 600V automatic starting voltage is provided to enable even ageing lamps to start correctly.

Photron

POWER SUPPLY and ACCESSORIES

The Photron Super lamp power supply adds a boost discharge for use with Super lamps, the lamp uses existing spectrophotometer lamp current, the power supply adds a boost discharge to increase excitation of atoms sputtered by the instrument lamp supply. This boost current is linked by circuitry inside the power supply and the boost discharge is transmitted at the same rate as the instrument.

The boost discharge when increased from zero will reach a peak light intensity and then cause the level to drop off.

This effect means that instruments with different electronic systems will require different boost currents to achieve the peak signal output. With the simple operation of setting the boost, makes the Superlamp a fast more sensitive and cost efficient than other systems.

Photron's Superlamp power supply can be fitted to many Atomic Absorbtion instruments including; Varian, Perkin Elmer, GBC Scientific, Unicam, Hitachi, Shimadzu, Analytic Jena and many others.

Photron also offers adaptors which may be required to fit the power supply to some instruments.

The Superlamp power supply has obtained the CE mark certification.

POWER SUPPLY SPECIFICATIONS

INPUT VOLTAGE: 100,110,220,240, 50/60Hz 150VA

DIMENSIONS: 360 x 310 x 135 mm, weight: 6kg.

CONTROLS: Mains switch, boost current control, 0-100mA meter.

CODE	DESCRIPTION
P200	Photron's Super Lamp Power Supply
P201	Adaptor Kit, Super Lamp Power Supply - Varian AA
P202	Adaptor Kit, Super Lamp Power Supply - Varian Spectra Series AA
P203	Adaptor Kit, Super Lamp Power Supply - Hitachi AA
P204	Adaptor Kit, 37mm Lamps - PE AA (9 Pin)
P204A	37mm Anti-heat Holder – 2" O/D
P204C	Adaptor Kit, 37mm Lamps - PE Coded AA (12 Pin)
P204L	Adaptor Kit, 37mm Lamps - PE AAnalyst (4 Pin)
P205	Adaptor Kit, Super Lamp Power Supply - GBC AA
P205-AvantAA	Adaptor Kit, Super Lamp Adaptor to suit AvantAA
P205-Sanvanta	Adaptor Kit for Super Lamp to GBC Savanta
P205-SensAA	Adaptor Kit for Super Lamp to SensAA
P205-XplorAA	Adaptor Kit for Super Lamp to XplorAA
P207	Adaptor, PE 12 Pin Lamp - PE AA (9 Pin)
P208	Adaptor, PE 9 Pin Lamp - PE AAnalyst (4 Pin)
P209	Hollow Cathode Lamp Power Supply
P210	Adaptor, PE 12 Pin Lamp - PE AAnalyst (4 Pin)
P211	Adaptor, PE 9 Pin Lamp - PE Coded AA (12 Pin)
P215	Adaptor, PE AAnalyst (4 Pin) Lamp - PE Coded AA (12 Pin)
P216	Adaptor, PE AAnalyst (4 Pin) Lamp - PE AA (9 Pin)
P217	HCL Power Supply - Lamp Extension Cable (10mtr)
P220	Adaptor, Super Lamp Power Supply - PE AA (9 Pin)
P220C	Adaptor, Super Lamp Power Supply - PE Coded AA (12 Pin)
P220L	Adaptor, Super Lamp Power Supply - PE AAnalyst (4 Pin)

PHOTRON'S QUALITY POLICY

PHOTRON PTY.LTD. is engaged in the design and production of highly specialised items of equipment for incorporation in atomic absorption spectrometers for use in chemical analysis. In particular, Photron Pty Ltd is highly skilled in the art of manufacturing atomic spectral lamps, which can emit ultra-violet and visible radiation characteristics of any selected element. Photron is one of the worlds leaders in the manufacture of such lamps which are sold world wide.

The motivation that drives Photron Pty Ltd is simple; we want to make a better product than our competitors. Photron Pty Ltd quality commitment is demonstrated by:

- Routine in-house and field testing and quality conformance checking.
- Attention to detail and committed to customer needs.
- Maintaining contact with our customers to ensure their satisfaction with the quality of our goods and services.
- Maintaining a quality management system which meets the requirements of Australian Standard AS/NZS ISO 9001:2000.

Improvement in the quality of our performance can only result from a total team effort. Our aim will only be achieved by properly motivated, trained and appreciated staff who are conscious of "doing it right the first time".

Every member of the Photron organisation has a responsibility for quality.

Jim Green
CEO
Photron Pty. Ltd.

PHOTRON WARRANTY

Hollow Cathode Lamps

All Photron hollow cathode lamps and the Super Lamp[PAT.] are warranted to be free of material and manufacturing defects when operated at the correct current for each instrument detailed on the lamp operating data sheet supplied for each element.

The operational lifetime of all of the above is rated at 5000mA Hrs based on the currents specified in the data sheet, e.g. lamp run at 10mA last 500Hrs.

The use of currents higher than specified particularly on instruments where high peak currents are used, will shorten the life for some elements. Those affected either have a high vapour pressure (Hg As Se) or high sputtering rate (Au Cd Zn).

Warranty claims regarding lamp failure will be considered up to 2 years from date of purchase. Warranty claims must accompany a completed warranty card. If a free replacement lamp is supplied the validity of guarantee shall date from shipment of the first lamp. The shelf life of unused lamps are warranted for 5 years from the original purchase, any hollow cathode lamp found faulty before any use will be replaced.

PHOTRON PTY.LTD.

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