

Spectrographic Operating Supplies

 **Jarrell
—Ash**
DIVISION OF FISHER SCIENTIFIC CO.



Nation's Most Complete Stockpile of:

Kodak Plates and Films

National Electrodes, Powders

Corning Filters

Wig-L-Bug® Sample Preparator

Miscellaneous Supplies

Bulletin No. 5C



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Nation's Most Complete Source of Spectrographic Operating Supplies

Few laboratory supply houses can boast of the unique fund of experience that the Jarrell-Ash Spectrographic Supplies Section can:

1. Jarrell-Ash operates several of its own commercial testing and customer service laboratories, so that in a sense, "our needs are your needs".

2. Jarrell-Ash has installed thousands of spectrographic instruments in laboratories throughout the world.

This thorough familiarity with the needs of laboratories (. . . the degree of purity required in materials, knowing what to stock and how much, and the importance of

overnight delivery) uniquely qualifies the Jarrell-Ash Supplies Section to service spectrographic labs. It is perhaps the major factor that has allowed this section of Jarrell-Ash to grow to what is generally recognized as the nation's most complete source of spectrographic supplies.

Rapid Delivery

Jarrell-Ash maintains a stock of virtually all of the items listed in this catalog. Frequently, the Jarrell-Ash stock is larger than the manufacturer's. It is usually possible to fill orders the same day received . . . the customer's specifying Air and Special Delivery makes Jarrell-Ash service as fast as if it were in the customer's own city.

Spectrographic Standards

Jarrell-Ash is the exclusive representative for the Johnson Matthey Chemicals Limited line of Spectrographically Certified Specpure® Materials. Johnson Matthey is the recognized leader in the production of highest purity standards covering over 70 elements. Each standard has been "spectrographically certified" and is shipped with an accompanying report. For complete listing and prices write:

*Spectrographic Supplies Section
Jarrell-Ash Division,
Fisher Scientific Company
590 Lincoln Street
Waltham, Mass. 02154*

Prices subject to change
without notice.

F.O.B.: Domestic Destination

Note:

For overseas delivery, all prices indicated above, are ex-factory Waltham, Massachusetts U.S.A. (Packing not included)

Kodak Spectrographic Material

Jarrell-Ash supplies a wide range of Eastman Kodak sensitized materials to meet the specialized needs of astronomy, spectroscopy, photo instrumentation, and similar technical fields. The Kodak family of spectroscopic plates and films, offers:

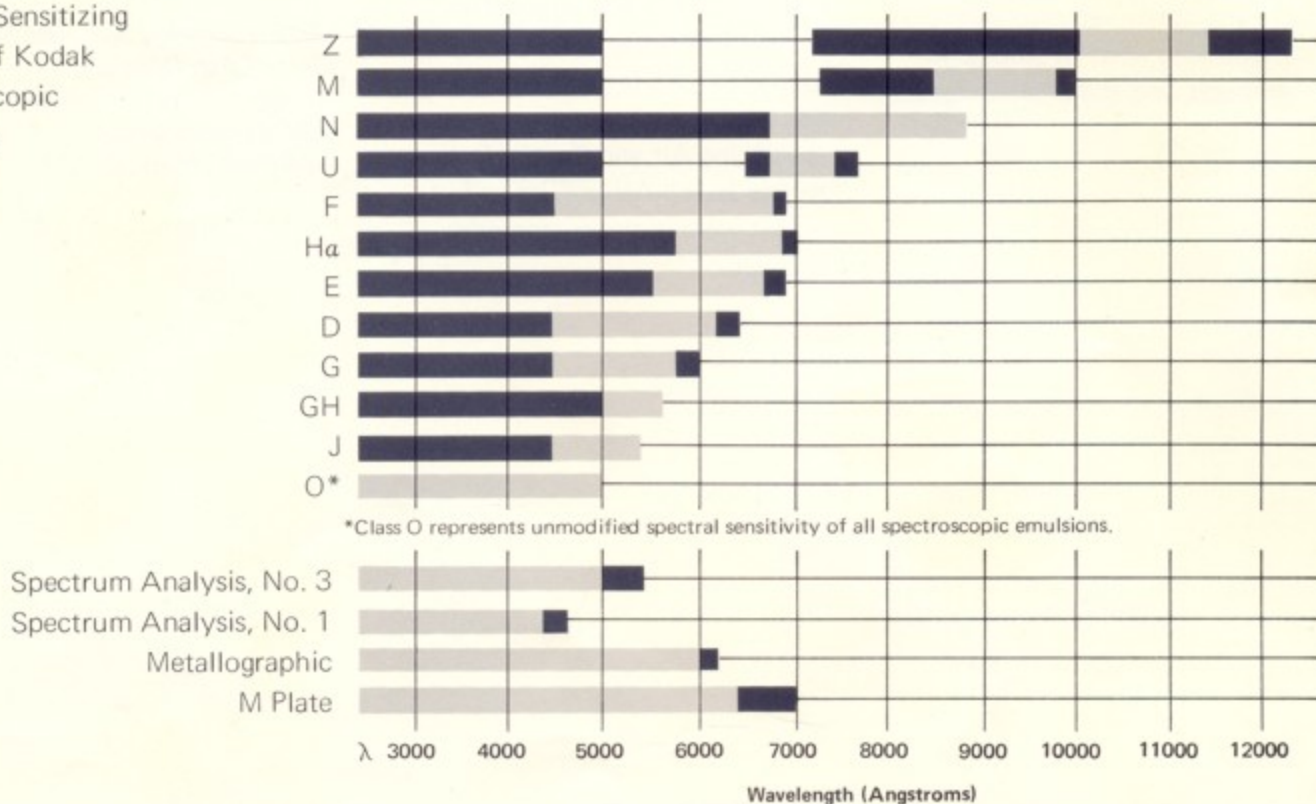
- A number of photographic plates and films whose spectral sensitivity can be extended into the vacuum ultraviolet by means of an ultra-violet-fluorescing overcoating.
- A choice of 11 emulsions and 12 different spectral sensitizings, for a total of 34 plate products and 25 film products. These are in addition to the more widely used Kodak Spectrum Analysis Plates and Films, No. 1 and No. 3.
- Photographic plates and films (Type Z) sensitive in the infrared to about 11,500Å.



- Emulsions with the finest grain and highest resolving power commercially available anywhere.
- Four basic emulsion types (Ia, IIa, IIIa, 103a) designed for long exposure to low-intensity illumination.

Note:

When ordering supplies listed in this catalog please use the IBM numbers listed in the rear of this catalog.

Spectral Sensitizing Classes of Kodak Spectroscopic Materials



 Spectral region for which material is especially valuable
 Spectral Region of useful sensitivity

Spectrum Analysis

Kodak Spectrum Analysis Plates and Films, No. 1 and No. 3, are designed specifically for use in emission spectrography. Spectrum Analysis Plates and Films, No. 1, are characterized by moderate sensitivity, very fine granularity, extremely high resolving power, and high contrast. The latter two characteristics, plus low background, make these materials especially suitable for trace-element work in the spectral region from 2500A to 4400A, where the instrument speed and light source are such that a weak spectral line must be distinguished from a heavy continuum of background radiation. These

products are usually preferred for semiquantitative analysis involving visual estimations of the concentrations of unknowns from standard spectra, as well as for precise quantitative work.

Spectrum Analysis Plates and Films, No. 3, have a moderately high-speed, medium-contrast emulsion and ample sensitivity for most spectrographic work from 2500 to 5000A. These products are especially recommended for trace-element work (where low densities and relatively low background radiation are encountered); for general qualitative spectrographic analysis; and for semiquantitative and quantitative spectrographic analysis when a coverage of a relatively wide concentration range is more important than the extra degree of precision obtainable with the higher-contrast

Spectrum Analysis, No. 1, materials. The emulsion for Spectrum Analysis Plates and Films, No. 3, has about twice the speed of the emulsion for the Spectrum Analysis, No. 1, products at 3000A and at a density of 0.1 above gross fog.

Spectroscopic Plates and Films, Type 103-0, have an emulsion speed about 4 times greater than that of Spectrum Analysis, No. 1, products when measured under the same conditions noted previously. This emulsion is recommended for recording low-intensity or short-duration light sources and weak spectral lines relatively free from background radiation in the spectral region from 2500A to 5000A.

Spectrum Analysis Films and SWR* Films

	Identification No.	Description	Price per Roll
SA1	SA 421-1	35mm x 100 ft darkroom loading, perforated	\$12.15
	SA 413	35mm x 100 ft daylight loading, perforated	12.90
SA3	SP 421-1	35mm x 100 ft darkroom loading, perforated	13.25
	SP 413	35mm x 100 ft daylight loading, perforated	14.00
SWR*	SP 764	35mm x 25 1/4 ft (on Type-U Tenite Core) Darkroom loading, not perforated	11.15

*Short Wave Radiation

Spectrum Analysis Plates and SWR* Plates

	Size	Price/ Pkg. of 12	Price/ Pkg. of 36	Case Prices Quan.	Price
SA1	2" x 10"	5.40	16.20	15 pkg.**	\$236.00
	4" x 10"	8.40	25.20	8 pkg.**	195.55
SA3	2" x 10"	---	20.60	15 pkg.**	268.50
	4" x 10"	9.00	27.00	8 pkg.**	209.50
SWR*	2" x 10"	---	54.00		
	4" x 5"	---	54.00		
	4" x 10"	---	86.40		

** Each package contains 36 plates. All listed plates have glass thickness of 0.04"

Classification of Kodak Spectroscopic Films and Plates

In this line of products, there are several types of emulsions available, and each of these can be sensitized

to various parts of the spectrum. For identification, each of the possible emulsion-sensitizing combinations is designated by a number and a letter. The number indicates the basic emulsion type and the properties related to it — such as relative sensitivity, contrast, and granularity. The letter, on the other hand, indicates the spectral

sensitization. For example, in the designation "Spectroscopic Plate, Type I-F," "I" indicates a Type 1 emulsion (high sensitivity, medium contrast, etc.); "F" indicates a panchromatic sensitization.

Spectroscopic Film

Note:

Each order must specify:

(1) Identification

(2) Emulsion, and

(3) Class.

Example: SP 421-103-F listed in that order.

Identification:

SP 421

35mm x 100 ft roll (Type AA, Plastic Core, Darkroom Load, Perforated).

\$22.55/roll

SP 449

16mm x 100 ft roll (On Camera Spool, Perforated) Minimum Order, 6 rolls.

\$14.30/roll

Class

Emulsion Type

D	103a	103	I						
E	103a					IV	V		
F	103a	103	I		III	IV	V	649	
G	103a								
GH									649
H ALPHA		103							
M			I						
N			I	IIa		IV			
O	103a	103	I		III			649	
Z			I						

Note:

Above designations are available in all emulsion types listed at right:

Spectroscopic Plates

Note:

Each order must specify:

(1) Emulsion Type,

(2) Class, and

(3) Size.

Example, 4" x 10" -103-F, listed in that order.

Sizes:

1" x 3"	\$20.70, pkg of 36
2" x 10"	42.50, pkg of 36
3 1/4" x 4 1/4"	33.20, pkg of 36
4" x 5"	41.35, pkg of 36
4" x 10"	64.50, pkg of 36
5" x 7"	19.60, pkg of 12
8" x 10"	35.70, pkg of 12
6.5 x 9 cm	30.60, pkg of 36
9 x 12 cm	36.75, pkg of 36
16 x 16 cm	23.45, pkg of 12

Class

Emulsion Types

D	103a		I		IIa				
E	103a		Ia		IIa		IV		
F	103a	103	I	II	IIa	III	IV	V	649
G	103a			II		III			
J	103a					IIIa			
M			I						
N			I				IV		
O	103a	103	I Ia	II	IIa	III			649
U	103a								
Z			I						

Note:

(1) All 10 listed sizes are available in all emulsion types listed at right:

(2) Spectroscopic plates are normally supplied unbacked, but can be supplied backed at an additional charge of 10%.

All listed plates have a glass thickness of 0.04".

**Kodak
Plates and
Film
Normally
In Stock at
Jarrell-Ash**

**35 mm
Film**

Emulsion	Size"	Emulsion	Size"	Emulsion	Size"	Emulsion
I-N	2 x 10	103-F	5 x 7	I-M	2 x 10	SA-1 Darkroom and Daylight Loading
I-N	4 x 10	103-F	4 x 5	I-M	4 x 10	SA-3 Darkroom and Daylight Loading
I-N	4 x 10			I-M	5 x 7	I-N
I-N	5 x 7	I-O	2 x 10			103-F
I-N	4 x 5	I-O	4 x 10	IV-N	2 x 10	IV-F
		I-O	5 x 7	IV-N	4 x 10	IV-N
103-O	2 x 10	II-O	2 x 10			
103-O	4 x 10			I-F	4 x 10	103a-O
103-O	5 x 7	I-Z	2 x 10			III-O
103-O	4 x 5	I-Z	4 x 10	IV-F	5 x 7	103a-D
		I-Z	5 x 7			I-Z
103a-F	2 x 10	I-Z	4 x 5	IIa-O	4 x 10	I-O
103a-F	4 x 10					SWR
103a-F	5 x 7	III-O	2 x 10	649-F	2 x 10	103-O
103a-F	4 x 5	III-O	4 x 10	649-F	4 x 10	649-F
103a-F	3 1/4 x 4 1/4			649-F	5 x 7	I-M
		III-F	2 x 10	649-F	4 x 5	103a-F
103a-O	2 x 10	III-F	4 x 10	649-F	3 1/4 x 4 1/4	III-F
103a-O	4 x 10	III-F	5 x 7			I-F
103a-O	5 x 7			SA-1	4 x 10	IIa-O
103a-O	4 x 5			SA-1	2 x 10	
103-F	2 x 10			SA-3	4 x 10	
103-F	4 x 10			SA-3	2 x 10	

**33 Positive
Plates**

Sizes	Plates Per Pkg.	Pkg. Per Case	Thickness of Glass	Price Per Pkg.
2" x 10"	36	15	.040"	\$16.20
3 1/4" x 4 1/4"	36	12	.050"	12.60
4" x 5"	36	12	.050"	16.20
4" x 10"	36	8	.040"	25.20
5" x 7"	12	20	.060"	7.20
8" x 10"	12	10	.060"	14.40
10" x 12"	6	12	.090"	12.30
11" x 14"	6	10	.090"	15.00
6.5 x 9 cm	36	12	.040"	10.80
9 x 12 cm	36	12	.050"	14.40

**"M" Plates
Metallographic Plates**

Sizes	Plates Per Pkg.	Pkg. Per Case	Thickness of Glass	Price Per Pkg.
2" x 10"	36	15	.040"	\$18.70
3 1/4" x 4 1/4"	36	12	.050"	14.05
4" x 5"	36	12	.050"	18.70
4" x 10"	36	8	.040"	30.40
5" x 7"	12	20	.060"	8.60
8" x 10"	12	10	.060"	17.15
6.5 x 9 cm	36	12	.040"	11.70
9 x 12 cm	36	12	.050"	16.40

†Available only in minimum quantities of a case lot.

Film and Plate Developers

Description	Price/ Unit	Price/ Case	Qty./ Case
D-8, Kodak Developer to make 1 gallon	\$3.55	\$36.20	12
D-11, Kodak Developer to make 1 gallon	1.10	23.75	24
D-11, Kodak Developer to make 5 gallons	4.40	23.75	6
D-16, Kodak Developer to make 10 gallons	4.85	28.25	6
D-19, Kodak Developer to make 1 gallon	1.30	30.25	24
D-19, Kodak Developer to make 3½ gallons	4.10	23.75	6
D-19, Kodak Developer to make 5 gallons	5.40	31.45	6
DK-50, Kodak Developer to make 1 gallon	.85	18.40	24
DK-50, Kodak Developer to make 3½ gallons	1.80	38.90	24
DK-50, Kodak Developer to make 10 gallons	4.80	51.80	12
DK-50, Kodak Replenisher (for DK-50) to make 1 gallon	1.30	28.10	24
DK-60a, Kodak Developer to make 1 gallon	1.05	22.70	24
DK-60a, Kodak Developer to make 3½ gallons	2.40	25.90	12
DK-60aTR, Kodak Replenisher to make 1 gallon (Replenisher for DK-60a tank development)	1.30	28.10	24
D-76, Kodak Developer to make 1 quart	.65	14.05	24
D-76, Kodak Developer to make ½ gallon	.80	17.30	24
D-76, Kodak Developer to make 1 gallon	1.20	25.95	24
D-76, Kodak Developer to make 10 gallons	6.90	24.85	4
D-76R, Kodak Replenisher to make 1 gallon (Replenisher for D-76)	1.20	25.90	24
Microdol-X, Kodak Developer to make 1 quart	1.05	22.70	24
Microdol-X, Kodak Developer to make 1 gallon	1.95	42.10	24
Microdol-X, Kodak Developer to make 5 gallons	6.35	34.30	6
Microdol-X, Kodak Liquid Developer, Kodak 1 quart bottle	1.85	20.00	12
Microdol-X, Kodak Replenisher to make 1 quart	1.05	22.70	24
Microdol-X, Kodak Replenisher to make 1 gallon	1.95	42.10	24

Kodak Nuclear Track Plates

Four types available:

Type NTB2	10, 25, 50 microns
NTB	10, 25, 50 microns
NTA	10, 25, 50 microns
NTB3	25, 50 microns

All types are available in size 2" x 10", 36/package, .060" glass thickness.

Price per package, \$138.60

**Stop Baths,
Fixing Baths,
Hardeners,
Storage Envelopes
And Accessories**

Description	Price/ Unit	Price/ Case	Qty./ Case
Indicator Stop Bath, Kodak (concentrated solution) 16 ounce bottle	\$ 1.30	\$16.10	12
Indicator Stop Bath, Kodak (concentrated solution) 1 gallon bottle	8.00	46.55	6
Fixer, Kodak Powder to make 1 quart	.40	9.30	24
Fixer, Kodak Powder to make ½ gallon	.55	12.80	24
Fixer, Kodak Powder to make 1 gallon	.85	19.80	24
Fixer, Kodak Powder to make 5 gallons	3.60	20.95	6
Fixer, Kodak Powder to make 25 gallons	12.40	—	—
Fixer, Kodak Rapid Liquid to make 1 gallon	1.75	20.40	12
Fixer, Kodak Rapid Liquid to make 5 gallons	6.20	24.05	4
Fixer, Kodak Rapid Liquid to make 30 gallons	29.70	—	—
Kodafix Solution to make 1 gallon	1.45	15.90	12
Hardener, Kodak Liquid — 1 gallon jug	5.95	—	—
Photo-Flo, Kodak (Concentrate) 16 ounce bottle	1.00	11.50	12
Fine Pore Cellulose Sponges	—	8.50	12
Envelopes for Storing 4" x 10" plates	—	20.50	500
Envelopes for Storing 4" x 10" plates	—	35.00	1000
Envelopes for Storing 2" x 10" plates	—	36.00	500
Envelopes for Storing 2" x 10" plates	—	62.50	1000
Envelopes for Storing 35 mm Film 2" x 23½"	—	38.50	500
Envelopes for Storing 35 mm Film 2" x 23½"	—	72.00	1000
Microphotometer Work Sheet Pads	1.50	33.00	24
Kodak Adjustable Safelight with OA filter	20.00	—	—

Electron Microscopy and Electron Diffraction

Workers in these fields have a choice of several Kodak products. Electron Image Plates have an

emulsion of extremely fine grain and high detective quantum efficiency, designed to work in the medium electron-energy range. Another feature of these plates is that speed and grain characteristics can be varied by changes in processing conditions. (In plate form, Nuclear Track Plates, types NTB and NTB2, are also available for electron-imagery applications).

The Projector Slide Plates are available in Medium and Contrast. These are extremely fine grain, blue sensitive, anti-halation Plates for making transparency for projection. The two contrast grades provide a range of contrast to suit most negatives and will give good prints on any of the various grades of paper.

Kodak Electron Image And Projector Slide Plates

Sizes	Plates Per Pkg.	Pkg. Per Case	Thickness of Glass	Price Per Pkg.
2" x 2"*	36	20	.040"	\$ 7.55
2" x 10"	36	15	.040"	16.55
3 1/4" x 4"	36	12	.050"	11.50
6.5 x 9 cm	36	12	.040"	10.10

*Available in Projector Slide type only and only this size.

National Spectroscopic Products

Electrodes
Powders
Preforms



Electrodes

National High Purity Graphite Electrodes

National Electrodes of the highest purity available: guaranteed 1 ppm maximum total ash content; 2 ppm per element spot impurity; 6 ppm maximum total spot impurities. For convenience in ordering, stock

items in National High Purity Graphite Electrodes, are listed below by Catalog Number.

If ASTM numbers are used in ordering, Grade AGKSP will be furnished.

Custom made spectroscopic electrodes can be supplied upon request. For quotation and delivery information contact the Jarrell-Ash Division Supplies

Section, 590 Lincoln Street, Waltham, Massachusetts. Please submit drawings and complete specifications with inquiry.

When ordering National electrodes, specify the quantity and the Catalog or ASTM Number.

ASTM No.	AGKSP Cat. No. (See Note 1)	SPK Cat. No. (See Note 2)	Price 100 Elec.
S-8	L3900	L3700	\$20.00
	L3902	L3702	19.00
S-13	L3903	L3703	22.00
	L3905	L3705	19.00
S-15	L3906	L3706	19.00
S-14	L3909	L3709	19.00
S-12	L3912	L3712	22.00
	L3915	L3715	26.00
	L3916	L3716	26.00
S-3	L3918	L3718	16.00
S-1	L3919	L3719	16.00
C-3	L3921	L3721	18.00
C-6	L3922	L3722	14.00
C-9	L3923	L3723	14.50
	L3924		18.00
	L3925		19.00
	L3927		24.00
	L3928		24.00
PC-1	L3933		23.00
	L3936		30.50

ASTM No.	AGKSP Cat. No. (See Note 1)	SPK Cat. No. (See Note 2)	Price 100 Elec.
P-1	L3939	L3739	\$21.00
	L3945	L3745	24.00
P-2	L3948	L3748	28.00
	L3951	L3751	17.00
	L3954	L3754	18.00
	L3955	L3755	24.00
C-5	L3957	L3757	20.00
C-5a	L3958	L3758	20.00
C-8	L3960	L3760	20.00
C-7	L3963	L3763	22.00
C-2	L3966	L3766	20.00
D-4	L3969	L3769	18.00
	L3970	L3770	22.00
	L3975	L3775	16.00
	L3977	L3777	16.00
	L3979	L3779	16.00

Note:

Electrodes are packed 100 to the unit box except items marked with an asterisk (*) which are packed 50 to the unit tube. All items are sold in unit box quantities or multiple thereof.

Catalog No. L3791 "TEFLON" Cup is used with electrodes L3789 & L3790. Price \$30.00/pkg of 24 cups.

Note:

A 2% price discount will be allowed when any one item is ordered in the following quantities:

All Electrodes — 10,000 or more
 Rods (12 inch lengths) — 2,000 or more
 Rods (6 inch lengths) — 4,000 or more
 Rods (4 inch lengths) — 6,000 or more

ASTM No.	AGKSP Cat. No. (See Note 1)	SPK Cat. No. (See Note 2)	Price 100 Elec.
S-5	L3982	L3782	\$20.00
		L3789#	35.00
		L3790#	35.00
	L4000	L4200	19.00
	L4006	L4206	19.00
S-4	L4012	L4212	22.00
	L4018	L4218	22.00
S-2	L4024	L4224	16.00
	L4025	L4225	16.00
	L4030	L4230	16.00
	L4031	L4231	16.00
C-1	L4036	L4236	16.00
	L4037	L4237	17.00
	L4042	L4242	12.00
	L4048		24.00
	L4054	L4254	21.00
		L4258	22.00
		L4259	22.00
		L4260	22.00
		L4261	22.00
		L4262	22.00
D-2	L4072*	L4272*	16.00
D-1	L4075*	L4275*	14.00
D-3	L4078		18.00
	L4081		18.00
	SP7508*	SP9045*	14.00

Powders

National High Purity Spectroscopic Powders

High purity powders are available in graphite grades SP-1 Series and SP-2 — also in carbon grade SP-3 (See Note 3).

Grade	Catalog Number	Price/ 1 Ounce	Price/Container		Price/ 1 Pound	Mesh Specifications
			4 Ounce	8 Ounce		
SP-1	L4100	\$6.00	\$20.00	\$35.00	\$60.00	65-75% through 200 Mesh
SP-1C	L4118	6.00	20.00	35.00	60.00	90-95% through 200 Mesh
SP-2	L4160	6.00	20.00	35.00	60.00	90-95% through 200 Mesh
SP-3	L4165	7.00	25.00	45.00	80.00	55-65% through 200 Mesh

Rods

Six-Inch High Purity Graphite Rods

Direct Reader Electrodes

Diameter (Inches)	Length (Inches)	Quantity Per Box	Grade AGKSP Catalog No. (See Note 1)	Grade SPK Catalog No. (See Note 2)	Price Per 100 Rods
.180	6	95	L3805	L3825	\$60.00
.242	6	50	L3808	L3828	71.00

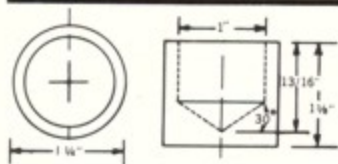
Twelve Inch Regular Graphite Rods

Diameter (Inches)	Length (Inches)	Quantity Per Unit Carton	Grade AGKS Catalog No. (See Note 5)	Price Per 100 Rods
.120	12	100	L4303	\$22.00
.180	12	25	L4306	23.00
.242	12	25	L4309	24.00
.305	12	25	L4312	28.00
.492	12	25	L4321	50.00

High-Purity Graphite and Carbon Rods

Diameter (Inches)	Length (Inches)	Quan. Per Carton	Graphite Grades		Price Per 100 Rods	Carbon Grade	
			AGKSP Catalog No. (See Note 1)	SPK Catalog No. (See Note 2)		L113SP Catalog No. (See Note 4)	Price Per 100 Rods
.120	12	1000	L3803	L3823	\$ 98.00	L3863	\$115.00
.180	4	200	L3804	L3824	40.00		
.180	12	100	L3806	L3826	120.00	L3866	150.00
.242	4	100	L3807	L3827	44.00		
.242	12	50	L3809	L3829	142.00	L3869	170.00
.305	12	50	L3812	L3832	185.00		
.120	2	100	L3952	L3752	16.50		
.180	2	100	L3953	L3753	18.00		
.242	2	100	L3956	L3756	22.00		

Graphite Fusion Crucibles



Catalog No. (See Note 6)	Price/100	Quantity/carton
L4400	\$15.00	100

Explanation of Graphite and Carbon Grades

Note 1: Grade AGKSP

Grade AGKSP is manufactured graphite with the highest crystallinity obtainable. Produced and controlled within close limits, it offers the optimum graphite properties for spectroscopic applications. Grade AGKSP has the highest thermal conductivity of all the grades and its recommended conductance is a principal requirement. Also uniform porosity and structure recommend this grade for porous cup and disc applications in solution techniques.

Note 2: Grade SPK

Union Carbide introduced the first high density, extruded graphite, spectroscopic electrode material, Grade SPK in 1959. Its density and structure give exceptionally high oxidation resistance and smooth burning characteristics. Because Grade SPK has lower thermal conductivity than Grade AGKSP, it maintains a higher heat concentration in the sample zone. In spark applications, Grade SPK maintains the very uniform and concentrated spark needed in homogeneity studies. It is best suited for the analysis of heavier base materials such as iron, zirconium, and titanium.

Note 3: Powder Grades

SP-1 SERIES graphite is designed especially for pelletizing.

SP-2 graphite is designed for use in powder form only and is not suitable for forming pellets.

SP-3 carbon is also designed for use in powder form only and can not be successfully pelletized.

Note 4: Grade L113SP

Grade L113SP is a carbon grade and therefore shows a very low crystallinity. High electrical resistivity and low thermal conductivity make it especially suitable in direct-current arc techniques where very high heat concentra-

tions in the sample zone and extremely high sensitivity are required but where reproducibility is of secondary importance. Because of its machining characteristics, Grade L113SP is stocked only in rod form but special forms can be supplied on request.

Note 5: Grade AGKS

This is a manufactured graphite having a uniform and highly crystalline structure. The grade has moderate purity and is recommended specifically for spark applications where the influence of the electrode impurities and high reproducibility are not critical. Grade AGKS is available in rod form only.

Note 6: Grade SRR

SRR Description
General purpose graphite for applications in which minor defects such as internal void and lamination are not objectionable.

Specifications of Graphite and Carbon Electrodes

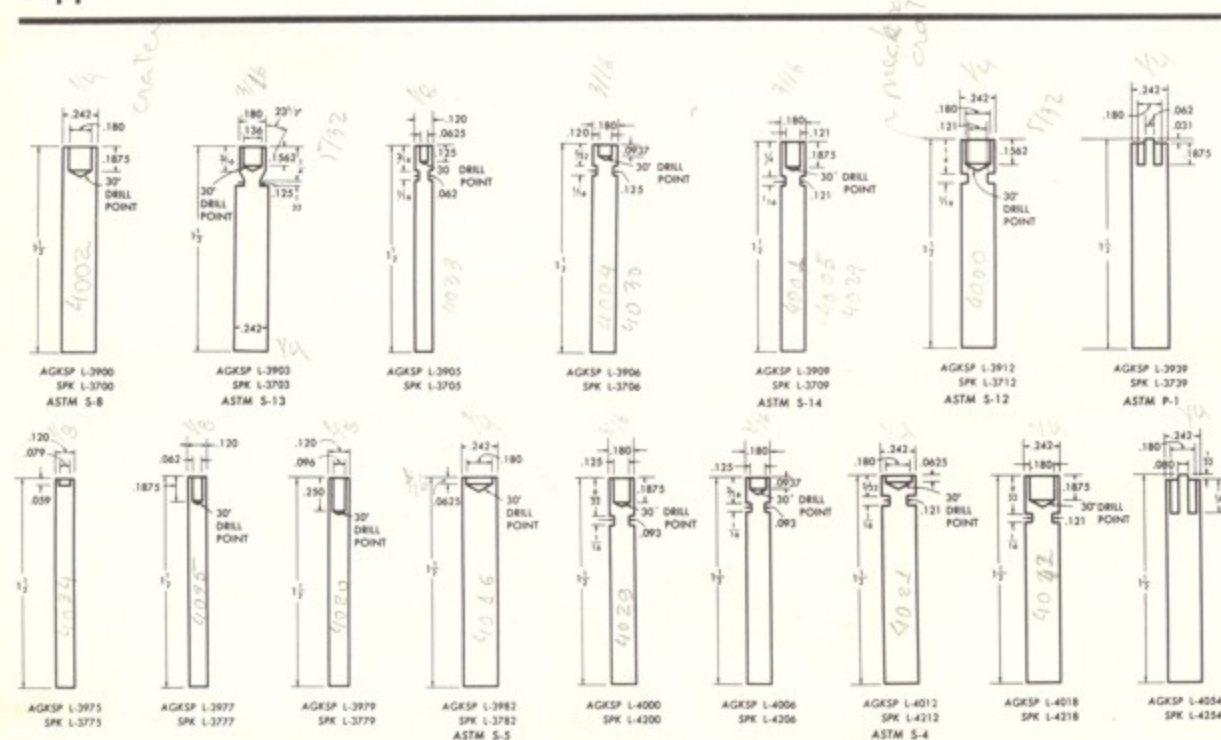
Powder-Type Electrodes:

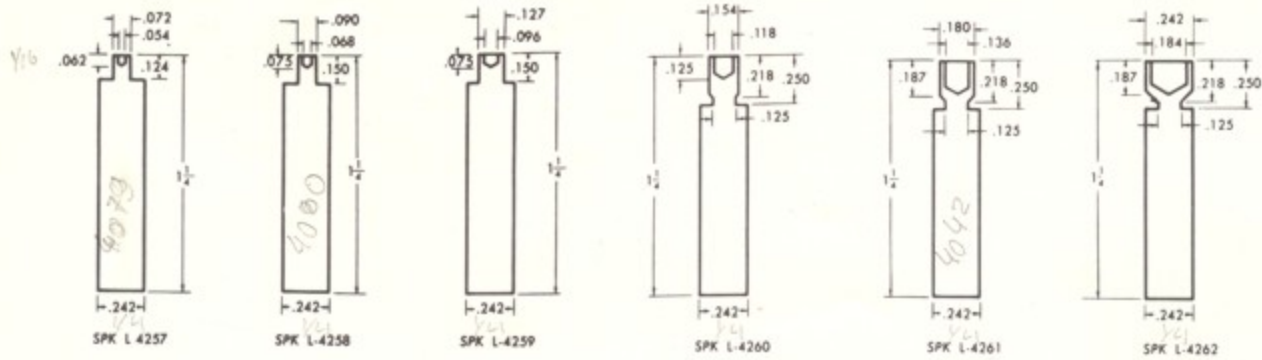
These electrodes are designed for powder-type samples, although they may be used in solution

applications and with small metal chips. Thinner wall cups permit quicker carbon burn-off and faster sample consumption; undercuts permit heat concentration in the sample zone. Powder-type electrodes are subclassified into

Cupped Types, Harvey's Series, Scribner-Mullins Types, Platform Types and Boiler Caps. These electrodes are available in Grades AGKSP and SPK.

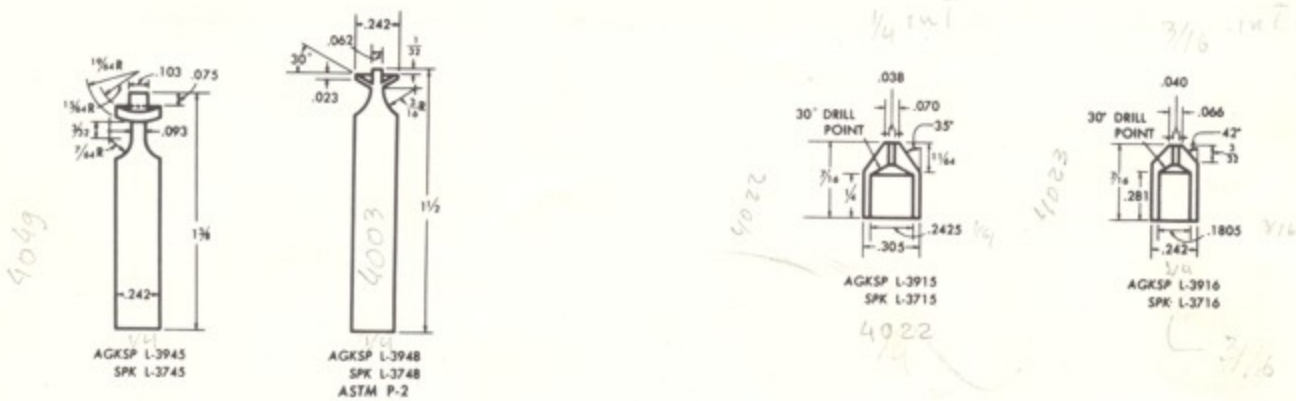
Cupped





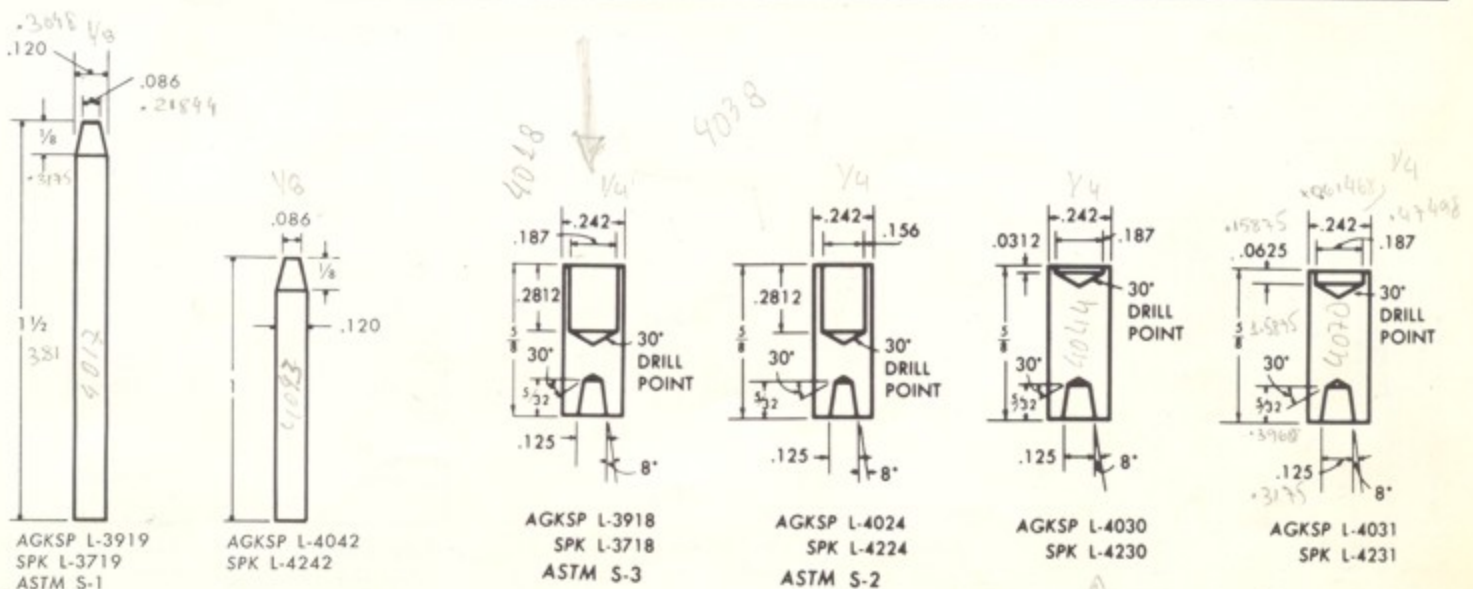
Platforms

Boiler
Caps



Pedestals for
Scribner-Mullins

Scribner-
Mullins



Solution Type Electrodes

These electrodes are subdivided into the following types: Rotating Disc, Porous Cup, Vacuum Cup and other types.

Rotating disc electrodes are available in Grades AGKSP and SPK. (See Notes 1 and 2). For aqueous, low-viscosity solutions, Grade AGKSP is recommended because its high porosity assures a uniform sample transport into the spark gap. Grade SPK is pre-

ferable for viscous solutions. Because of this grade's low surface porosity, a uniformly thin film is continuously exposed to the analytical gap.

Porous cup electrodes are available in Grade AGKSP only. The uniformity and porosity and resistance to solution absorption, allows a desirable uniform flow of solution to the analytical gap.

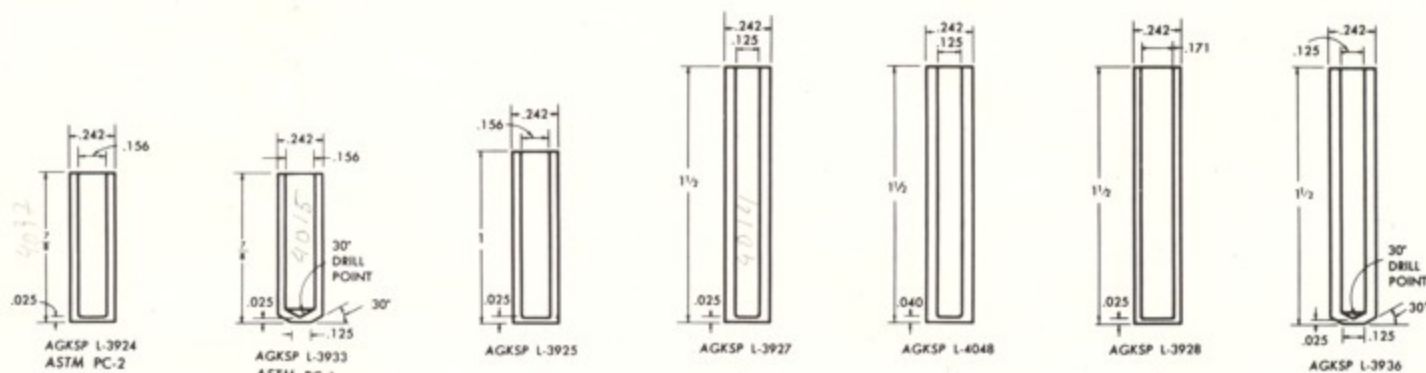
Plain electrodes and other shapes suggested for solution applications are available in both Grades AGKSP and SPK. If absorption

of the solution by the electrodes is desired to enhance the elements, Grade AGKSP is recommended. If a minimum of solution absorption is desired, Grade SPK is recommended.

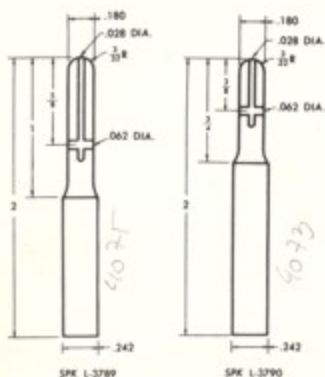
Note:

Information for this section provided through the courtesy of Union Carbide Corporation — Carbon Products Division.

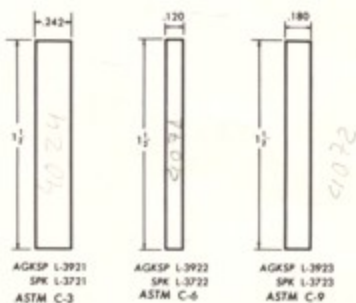
Porous Cups



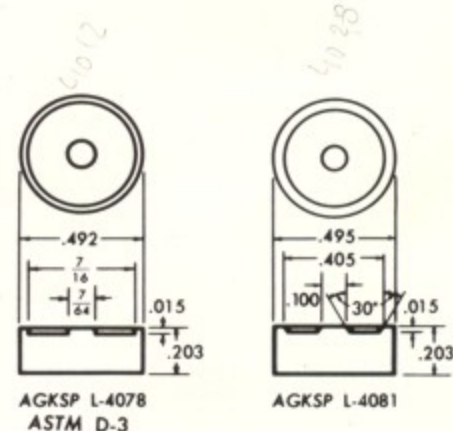
Vacuum Cups



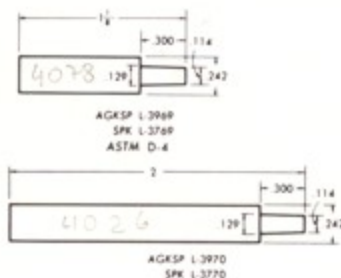
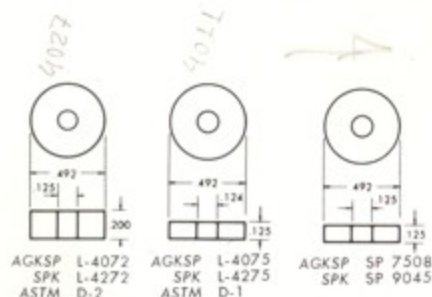
Plain



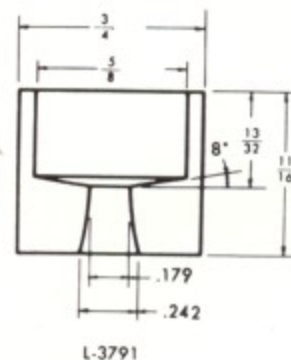
Rotating Disc (Platodes)



Rotating Disc (Rotrodes) With Tapered Mandrels

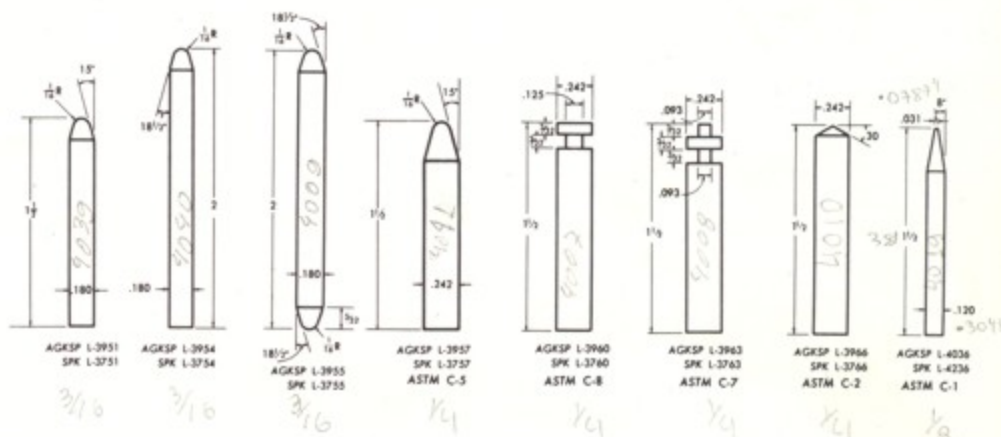


"Teflon" Cups for Vacuum Cup Electrodes



Counter-Type Electrodes

The counter electrodes below represent the various shapes used in arc or spark applications and are available in Grades AGKSP and SPK. (See Notes 1 and 2 page 7). For spark applications on light base materials such as aluminum and magnesium, Grade AGKSP is recommended; on heavy base materials such as iron and refractory metals, Grade SPK is recommended.



Spectrographic Standards

Jarrell-Ash SQ (Semi-Quantitative) Powder Standards for Spectrographic Analysis

In keeping with our policy to supply a complete line of spectrographic supplies, we are pleased to offer our line of spectrographic standards. This material is prepared in our laboratory under rigid controls to assure highest quality.

Master SQ Powder Standard:

This powder is useful for dilution with materials to be analyzed and pure materials for preparation of semi-quantitative standards of various matrices, or can be used for producing reference spectra.

The Master Standard 367-40

is a homogeneous powder, ground to 200-300 mesh and contains

1.30% of the following elements: Al, Sb, As, B, Ba, Be, Bi, Ca, Cd, Ce, Cs, Cr, Co, Cb, Cu, Ga, Ge, Hf, In, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Rb, Si, Ag, Na, Sr, Ta, Ti, Th, Sn, Ti, W, U, V, Zn, Zr, Te.

\$42.00 Per 2 grams

367-50 Master Standard

is a homogeneous powder, ground to 200-300 mesh and contains 1.20% of each of the following elements:

Al, Sb, As, B, Ba, Be, Bi, Ca, Cd, Ce, Cs, Cr, Co, Cb, Cu, Ga, Ge, Hf, In, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Rb, Si, Ag, Na, Sr, Ta, Ti, Th, Sn, Ti, W, U, V, Zn, Zr, Te, Au, Pd, Pt.

\$60.00 Per 2 grams

Graphite Series:

367-60 a set of 4 standards containing .1%, .01%, .001% and .0001% of each of the 367-50

Master Standard and elements above in a base of spectrographically pure graphite.

\$50.00 2 grams ea., per set of 4

Standards in other matrices:

consisting of a set of 3 standards, containing 45 elements in concentrations of .1%, .01% and .001% respectively, supplied in lots of 2 grams each. Included also is a 5 gram quantity of the matrix material, spectrographically pure, which can be used as a blank to dilute unknown samples or to make further dilutions of the standards.

Each set includes 3 standards (2 g ea.) and 5 g blank.

367-70 Zinc Oxide Base

\$46.00/set

367-71 Cupric Oxide Base

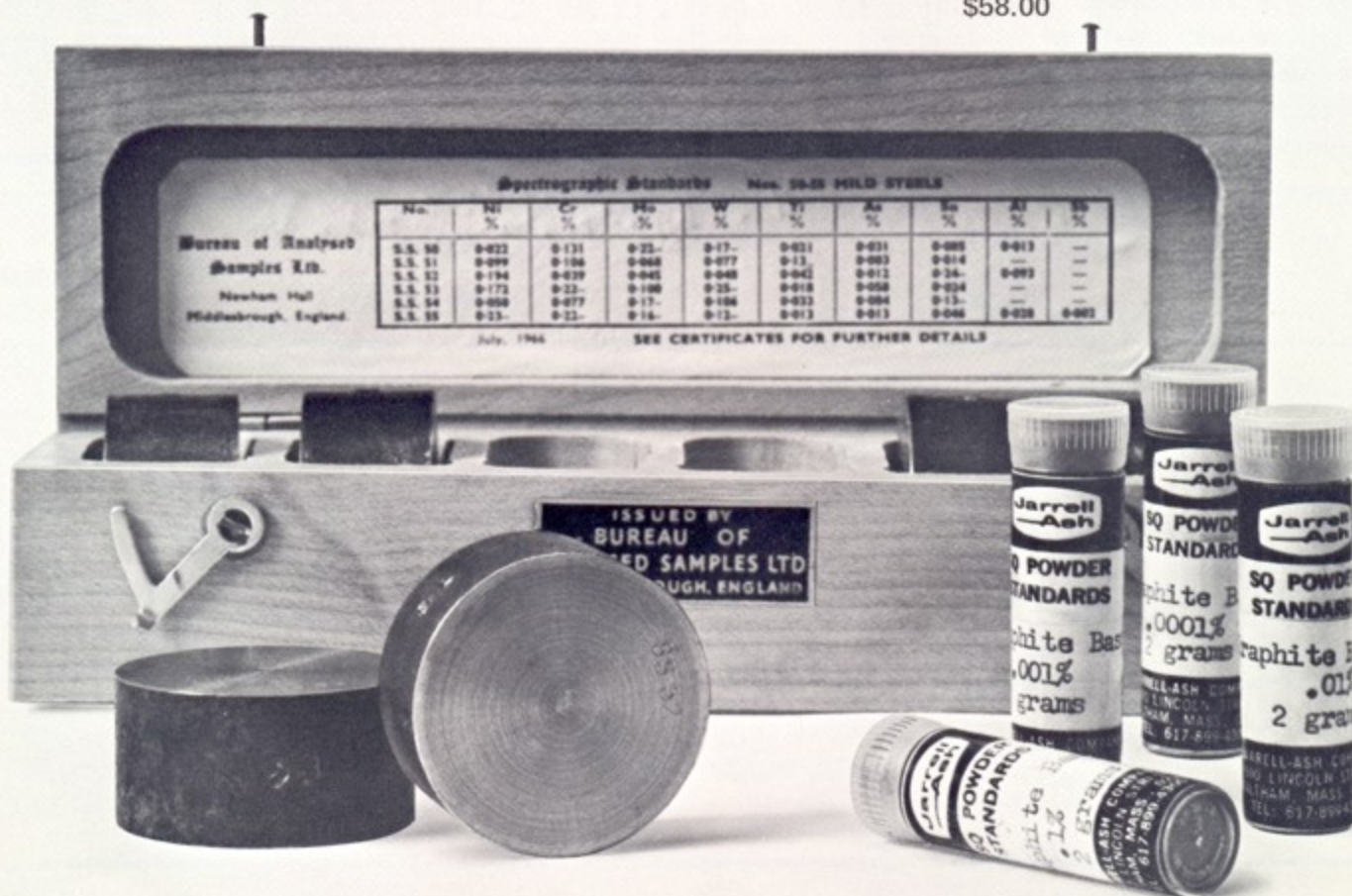
\$51.00/set

367-72 Lithium Carbonate Base

\$70.00/set

367-73 Stannic Oxide Base

\$58.00



367-74 Germanium Dioxide Base

\$63.00/set

367-75 Silicon Dioxide Base

\$51.00/set

367-76 Indium Oxide Base

\$70.00/set

367-77 Bismuth Oxide Base

\$46.00/set

367-78 Gallium Oxide Base

\$85.00/set

367-79 Aluminum Oxide Base

\$85.00/set

367-80 Titanium Oxide Base

\$110.00/set

367-81 Iron Oxide Base

\$51.00/set

Similar standards in other matrices can be supplied on request.

We are also prepared to supply special powder standards for quantitative analysis which would be made to your specific requirements of matrix elements to be added, and concentration ranges.

Low Tungsten Steel

Low Steel

Mild Steel

Carbon Steel

The Jarrell-Ash Division stocks and supplies Bureau of Analyzed Samples, Limited's line of steel standards. These samples, produced under rigorous laboratory control, are internationally recognized as the finest steel standards available.

Low Tungsten Steel Standards

Each of the standard samples is checked by at least eight analysts; a certificate of analysis is supplied with each set of standards. The certificate includes the names of the various analysts, as well as the method used and their individual results.

Low Tungsten Steel Standards:

Set includes 4 rods (SS Nos. 21-24). Each rod 3/4" diameter by 3" long.
\$60.00/set

Mild Steel Residual Standards:

Group A:

Set includes 6 discs (SS Nos. 50-55). Each disc is 1-1/2" diameter.
\$96.00/set

Group B:

Set includes 5 discs (SS Nos. 56-60). Each disc is 1-1/2" diameter.
\$96.00/set

High Speed Steel Standards:

Set includes 6 discs approximately 1-3/4" diameter x 1/2" thick. (SS Nos. 481-486).
\$114.75/set

Plain Carbon Steel Standards (containing Niobium)

Set includes 5 discs approximately 1-1/2" diameter x 3/4" thick. (SS Nos. 431-435).
\$76.50/set

Note:

Figure in shaded columns are standardized, other figures only approximate. Also, in some cases a dash is placed after second or third significant figure, indicating the limit of accuracy, and has no mathematical significance.

Austenitic Stainless Steel Standards:

BCS-331-338 chips; 8 chips per set.
\$150.00/set

Austenitic Stainless Steel Standards:

SS 61-68; 8 discs per set.
\$155.00/set

8% Aluminum Magnesium Alloy (BCS No. 316)

Conforming to B.S. 2970: 1959, Mag-1, Mag-7.

\$ 7.65/50 gram

\$12.75/100 gram

No. 316 is the second magnesium alloy to be added to the list of British Chemical Standards in recent years. It has been standardized for Al, Zn, Mn, Cu, Si, Fe, and Ni and is extended for use in the light alloy industry. It is also complementary to the Ce-Zn-Zi Magnesium Alloy (BCS 307) issued a few years ago.

Low Carbon High Silicon Steel (BCS No. 317)

No. 317 has been accurately standardized for carbon by modern techniques and is designed to meet the need for a carbon steel standard at the 0.03% level.

\$ 6.00/50 gram

\$ 9.75/100 gram

\$36.40/500 gram

Nodular Iron Series:

(SS 41/1-46/1). Set includes 6 bars, 1-3/16" diameter.

\$127.00/set

S.S. No.	W %	C %	Si %	P %	Mn %	Mo %	V %	S %
21	0.70	0.02	0.13	0.014	0.07	0.01	<0.01	0.036
22	1.29	0.02	0.13	0.014	0.05	0.02	0.02	0.038
23	2.16	0.18	0.21	0.018	0.07	0.04	<0.01	0.036
24	3.41	0.18	0.22	0.018	0.07	0.02	0.03	0.036

High Speed Steel

Average Analyses

S.S. No.	W %	Cr %	V %	Mo %	Co %	C %	Si %	S %	P %	Mn %
481	14.2-	3.56	0.52	0.22	0.21	0.69	0.14	0.027	0.021	0.29
482	18.1-	4.09	0.98	0.27	0.24	0.70	0.13	0.025	0.021	0.28
483	10.8-	3.21	0.54	0.17	1.94	0.67	0.11	0.025	0.019	0.29
484	22.4-	5.17	0.94	1.07	10.2-	0.85	0.20	0.024	0.030	0.21
485	18.2-	4.15	1.05	0.67	5.06	0.89	0.42	0.043	0.046	0.50
486	6.48	4.53	1.92	5.23	0.13	0.74	0.14	0.029	0.021	0.12

Mild Steel Residual Standards

Group A

S.S. No. (1½" Dia.)	Ni %	Cr %	Mo %	W %	Ti %	As %	Sn %
50	0.022	0.131	0.22-	0.17-	0.022	0.031	0.085
51	0.099	0.106	0.068	0.077	0.13-	0.003	0.014
52	0.194	0.039	0.045	0.048	0.043	0.012	0.24-
53	0.172	0.22-	0.100	0.25-	0.018	0.058	0.024
54	0.050	0.077	0.17-	0.106	0.034	0.084	0.13-
55	0.23-	0.22-	0.16-	0.12-	0.013	0.013	0.046

Group B

S.S. No. (1½" Dia.)	Mn %	Cu %	V %	Co %	Al %	Pb %	B %	Sb %
56	0.32	0.36	0.060	0.023	0.006	0.014	0.001	0.006
57	0.16	0.16	0.13-	0.006	0.020	0.011	0.003	0.033
58	0.43	0.08	0.18-	0.17-	0.050	0.016	0.004	0.025
59	0.12	0.07	0.08-	0.070	0.058	0.051	0.008	0.019
60	0.45	0.05	0.026	0.020	0.020	0.003	0.007	0.018

Plain Carbon Steels Containing Niobium

S.S. No.	C %	Si %	S %	P %	Mn %	Nb %
431	0.019	0.03	0.014	0.009	0.95	0.023
432	0.094	0.04	0.054	0.016	1.10	0.029
433	0.195	0.20	0.073	0.070	0.59	0.031
434	0.37-	0.51	0.010	0.056	1.54	0.10-
435	0.49-	0.57	0.036	0.024	0.37	0.019

Nodular Iron Series

S.S. No. (1-3/16" Dia.)	Mg %	Ni %	C %	Si %	Mn %	S %	P %
41/1	0.013	0.28	3.40	2.38	0.32	0.010	0.017
42/1	0.024	0.38	3.30	1.93	0.31	0.010	0.016
43/1	0.038	0.51	3.06	2.39	0.36	0.006	0.010
44/1	0.051	0.63	3.08	2.40	0.36	0.007	0.013
45/1	0.079	0.92	3.02	2.30	0.37	0.006	0.011
46/1	0.105	1.27	3.24	2.29	0.30	0.006	0.016

Austenitic Stainless Steel Standards

B.C.S. No. (Chips)	S.S. No. (Disc)	C %	Si %	S %	P %	Mn %	Cr %
331	61	0.062	0.42	0.016	0.016	0.78	15.2
332	62	0.063	0.44	0.020	0.015	0.80	12.8
333	63	0.066	0.45	0.020	0.016	0.79	18.7
334	64	0.079	0.45	0.022	0.012	0.85	25.6
335	65	0.093	0.67	0.023	0.018	0.94	18.4
336	66	0.083	0.51	0.023	0.020	0.81	17.6
337	67	0.081	0.50	0.018	0.016	0.87	17.6
338	68	0.163	1.42	0.028	0.027	1.59	18.5
		Ni %	Mo %	Ti %	Nb %	Ta %	Co %
331	61	6.26	---	---	---	---	0.040
332	62	12.4	---	---	---	---	---
333	63	9.49	---	---	---	---	---
334	64	20.6	---	---	---	---	---
335	65	9.47	---	0.46	---	---	---
336	66	9.48	2.43	---	---	---	---
337	67	9.52	---	---	1.02	0.048	---
338	68	9.33	---	---	---	---	---

ESCO Stainless Steel Standards

Standards for the analyses of AISI 300 series stainless steels are supplied as a set of six. They

are chill cast, 1-7/16" diameter and 1" high. Each standard is supplied with a certified analysis by the ESCO Corporation of Portland, Oregon, for the 14 elements listed below. In addition, each set will include curves ob-

tained by means of spectrographic analysis with information indicating spectral lines used and conditions.

Elements and Analysis Range*

	Fe	Cr	Ni	Mo	Mn	W	Si	C	Nb	Ti	Cu	P	S	Al
1.	64.61	16.00	14.00	5.00	.02	.20	.10	.01	.01	.01	.01	.01	.01	.01
2.	65.20	17.00	12.00	3.00	.05	1.20	.16	.025	.025	.025	.60	.11	.11	.50
3.	65.89	18.50	10.00	2.00	.15	.70	.25	.06	1.00	1.00	.10	.25	.05	.05
4.	66.55	20.00	8.50	1.30	.40	.40	.40	.15	.40	.40	.25	.50	.50	.25
5.	65.95	21.50	7.00	.80	1.00	2.00	.60	.40	.15	.15	.04	.05	.25	.11
6.	65.18	23.00	5.90	.50	3.00	.10	1.04	1.00	.06	.06	.02	.025	.025	.025

Stainless Steel Standards (Set includes 6 standards) \$240.00

*Ranges are approximate and may vary from standard to standard.

Pure Zinc And Zamak Zinc Alloys Standards

Now available are the pure Zinc and Zamak Zinc Alloys Standards in disc form. These standards measure 2.5" (6.5 cm) diameter by 5/16" (7 mm) thick. These stand-

ards, from Zinc et Alliages, have been verified by various laboratories, all members of France's Groupement pour l'Avancement des Methods Spectrographique, which guarantees them and are recognized by Groupement Analytique du Comite Technique European des Producteurs de Zinc as being equally valid.

Pure Zinc Standards:

Set of 5.

\$125.00

Zamak 3 Zinc Alloys:

Group A-4, Set of 4.

\$100.00

Group A-5, Set of 5.

\$125.00

Zamak 5 Standards:

Set of 3.

\$75.00

Pure Zinc Standards

No.	Pb	Cd	Fe	Sn	Cu
1	0.0014	0.0002	0.0006	0.000	0.0002
2	0.0026	0.001	0.002	0.0011	0.001
3	0.0057	0.003	0.0035	0.0030	0.0030
4	0.012	0.0064	0.0071	0.0064	0.0060
5	0.029	0.0105	0.0185	0.011	0.011

**Zamak 3
Zinc Alloys
Group A-4**

No.	Al	Cu	Mg	Pb	Cd	Sn
1	4.71	0.010	0.013	0.0010	0.0004	0.0003
2	4.30	0.030	0.023	0.0032	0.0032	0.0027
3	3.94	0.110	0.047	0.0052	0.0050	0.0049
4	3.61	0.30	0.066	0.010	0.0098	0.0097

Group A-5

No.	Al	Cu	Mg	Pb	Cd	Sn
1	4.71	0.010	0.013	0.0010	0.0004	0.0003
2	4.30	0.030	0.023	0.0032	0.0032	0.0027
3	3.94	0.110	0.047	0.0052	0.0050	0.0049
4	3.61	0.30	0.066	0.010	0.0098	0.0097
5	4.59	0.011	0.013	0.0011	0.0011	0.0014

**Zamak 5
Standards**

No.	Al	Cu	Mg	Pb	Cd	Sn
1	4.56	0.59	0.014	0.0012	0.001	0.0014
2	4.02	1.00	0.048	0.0029	0.0029	0.0027
3	3.40	1.44	0.087	0.009	0.01	0.0086

Jarrell-Ash Calibrating Oil Standards

367-10

Oil Standards (FSN9150-936-9987)

complete set of one bottle each of 367-00 through 367-09 Oil Standards.

Per set/\$145.00

367-00

Oil Standard (FSN9150-936-9988)

blank, containing 12 oz. of oil #L9150-L850-766-2009, in a dark amber plastic 16 oz. bottle.

\$10.00

367-01

Oil Standard (FSN9150-943-3134)

containing 1 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, Ag, & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

367-02

Oil Standard (FSN9150-943-3146)

containing 2 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, Ag & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

367-03

Oil Standard (FSN9150-943-3149)

containing 3 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, Ag & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

367-04

Oil Standard (FSN9150-943-3152)

containing 5 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, Ag & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

367-05

Oil Standard (FSN9150-926-2047)

containing 10 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, Ag & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

367-06

Oil Standard (FSN9150-943-3156)

containing 15 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, Ag & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

367-07

Oil Standard (FSN9150-943-3159)

containing 20 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, Ag, & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

367-08

Oil Standard (FSN9150-903-9737)

containing 50 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$35.00

367-09

Oil Standard (FSN9150-943-3161)

containing 100 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$45.00

367-20

Oil Standards for Si only,

complete set of one bottle of 367-00 plus one bottle each of 367-11 through 367-19 Oil Standards.

Per set/\$110.00

367-11

Oil Standard for Si only,

containing 1 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-12**Oil Standard for Si only,**

containing 2 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-13**Oil Standard for Si only,**

containing 3 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-14**Oil Standard for Si only,**

containing 5 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-15**Oil Standard for Si only,**

containing 10 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-16**Oil Standard for Si only,**

containing 15 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-17**Oil Standard for Si only,**

containing 20 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-18**Oil Standard for Si only,**

containing 50 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-19**Oil Standard for Si only,**

containing 100 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-26**Oil Stand for Si only,**

containing 200 PPM Si in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-21**Oil Standard**

containing 200 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, & Sn in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$75.00

367-22**Oil Standard**

containing 500 PPM each of Al, Cr, Cu, Fe, Pb, Mg, Ni, & Sn (Provided in two dark amber plastic bottles with four elements in each bottle)

\$175.00

367-31**Oil Standard for Ag only,**

containing 50 PPM Ag in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-32**Oil Standard for Ag only,**

containing 100 PPM Ag in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-33**Oil Standard for Ag only,**

containing 200 PPM Ag in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$18.00

367-34**Oil Standard for Ag only,**

containing 500 PPM Ag in 12 oz. of oil in 16 oz. dark amber plastic bottle.

\$25.00

Fisher Certified Atomic Absorption Standards

- Standardized Solutions of 15 Elements
- 1000 ppm
- 10,000 ppm

The many analysts who use atomic absorption techniques to determine trace quantities of metals can save time and trouble by using the carefully standardized solutions of 15 commonly determined metals, now available from Jarrell-Ash Company. These Fisher Atomic Absorption Standards are listed with compositions, catalog numbers and current prices in the table below.

Fisher's atomic absorption standards were originally developed for use in the analytical laboratories of the Fisher Chemical Manufacturing Division, which uses atomic absorption to check the purity of many of its reagents. They are now available in two standard concentrations — 1000 parts per million (1 ml of standard contains 1 mg of metal), and 10,000 parts per million (1 ml = 10 mg).

Experience has shown that concentrations lower than 1000 ppm will not remain stable, even in the

polyethylene bottles which Fisher uses for these standards. The 1000 ppm and 10,000 ppm solutions should not show any noticeable deterioration for at least 24 months. They may be diluted to whatever concentrations are needed to standardize or check the calibration of such equipment as the Jarrell-Ash Atomic Absorption instrumentation, Evans Model 140 Atomic Absorption Spectrophotometer, the Perkin-Elmer Models 290 and 303, and other atomic absorption instruments.

Fisher Atomic Absorption Standards carry Fisher's own guarantee of purity and reliability — the "Fisher *Certified*" label. Each standard is checked against microchemical standards obtained from the National Bureau of Standards and against spectrographically pure metals, using both standard analytical procedure for the detection of trace metals and the atomic absorption technique.

Since the solute and solvent used in making up each standard are specified, analysts can tell immediately whether it is compatible with a given sample and can be used in the method of additions to eliminate errors due to viscosity differences, and to increase the

accuracy of analyses. The strontium standard may also be useful as a diluent used to depress the concentration of interfering anions in determinations of calcium and magnesium.

The present series of standards covers the 15 metals that are most commonly determined by atomic absorption in clinical, agricultural, pharmaceutical, food processing, metallurgical, textile and industrial materials laboratories. Others will be added from time to time.

Arrangements can be made to prepare standards for other metals on special order.

Fisher's Atomic Absorption Standards are packaged in quarts because of the problem of maintaining the stability of larger volumes of very dilute solutions after the bottle has been opened. As shown in the table, orders for a 6-pack (6 one-quart bottles) bring a substantial price reduction.



Fisher Certified Atomic Absorption Standards

Metal	Composition Solute	Solvent	Concentrations and Prices					
			1000 ppm	Per Qt.	6 x 1 Qt. Per Qt.	10,000 ppm	Per Qt.	6 x 1 Qt. Per Qt.
Calcium	Calcium Carbonate	Dilute Nitric Acid	So-C-191	\$5.00	\$4.50	So-C-182	\$5.00	\$4.50
Copper	Cupric Oxide	Dilute Nitric Acid	So-C-194	5.00	4.50	So-C-183	5.00	4.50
Chromium	Potassium Dichromate	Distilled Water	So-C-192	5.00	4.50	So-C-184	5.00	4.50
Cobalt	Cobalt Metal	Dilute Nitric Acid	So-C-193	5.00	4.50	So-C-185	5.00	4.50
Iron	Ferric Chloride	Dilute Hydrochloric Acid	So-I-124	5.00	4.50	So-I-123	5.00	4.50
Lead	Lead Metal	Dilute Nitric Acid	So-L-21	5.00	4.50	So-L-15	5.00	4.50
Lithium	Lithium Carbonate	Dilute Hydrochloric Acid	So-L-45	5.00	4.50	So-L-44	5.50	5.00
Magnesium	Magnesium Metal	Dilute Nitric Acid	So-M-51	5.00	4.50	So-M-45	5.00	4.50
Manganese	Manganese Metal	Dilute Nitric Acid	So-M-81	5.00	4.50	So-M-72	5.00	4.50
Nickel	Nickel Metal	Dilute Nitric Acid	So-N-70	5.00	4.50	So-N-69	5.00	4.50
Potassium	Potassium Chloride	Distilled Water	So-P-351	5.00	4.50	So-P-350	5.00	4.50
Silver	Silver Nitrate	Distilled Water	So-S-457	5.00	4.50	So-S-456	5.50	5.00
Sodium	Sodium Bicarbonate	Dilute Nitric Acid	So-S-139	5.00	4.50	So-S-140	5.00	4.50
Strontium	Strontium Carbonate	Dilute Hydrochloric Acid	So-S-459	5.00	4.50	So-S-458	5.50	5.00
Zinc	Zinc Oxide	Dilute Nitric Acid	So-Z-13	5.00	4.50	So-Z-12	5.00	4.50

Accessories

Wig-L-Bug®

Sample Preparation Mixer

The fastest, cheapest and simplest way for you to prepare samples. Wig-L-Bug is the ideal sample prep mixer for applications in spectroscopy, geology, oil research and mineralogy. In a matter of seconds your samples are ground and

mixed. You will notice a great improvement in reproducibility from sample to sample. The economic plastic vials supplied with Wig-L-Bug enable you to weigh, mix and store your samples in the same container. The per sample cost is 4.2¢ less than the cost of an ordinary container alone.



Two Models Available

Model 5A

Operates continuously for up to 5 minutes; does not include a fan cooler.

Two types are available:

52-050 Wig-L-Bug

115v, 50-60 Hz; provided with 52-062 adapter (see listing below)

\$77.00

52-051 Wig-L-Bug

220v, 50 Hz*; provided with 52-062 vial adapter (see listing below)

\$84.00

* All 220 volt units can be supplied with 60 Hz on special order.

Model 3A

Operates continuously for up to 60 minutes; includes a fan-cooled motor.

Two types are available:

52-060 Wig-L-Bug

115v, 50 Hz, with half-hour timer.

**Provided with vial adapter.

\$98.50

52-061 Wig-L-Bug

220v, 50 Hz* with half-hour timer.

**Provided with a 52-062 vial adapter.

\$105.50

**On request, one-hour timer will be substituted for the half-hour, without additional charge.

Wig-L-Bug Accessories

Plastic Accessories

52-052 Vial Adapter:

Plastic; adapts any listed Wig-L-Bug for vials 1/2" diameter x 1" long.

\$4.00

52-053 Vial:

Polystyrene with polyethylene slip-on cap; size 1/2" diameter x 1" long.

\$4.10 per 100

\$32.00 per 1000

52-054 Ball-Pestle:

Clear Plexiglas; 3/8" diameter.

\$2.00 per 100

\$14.00 per 1000

52-055 Vial Adapter:

Plastic; adapts any type Wig-L-Bug for vial 1/2" diameter x 2" long.

\$11.00

52-056 Vial:

Polystyrene with polyethylene slip-on cap; size 1/2" diameter x 2" long.

\$5.25 per 100

\$42.00 per 1000

52-057 Ball-Pestle:

Clear Plexiglas; 1/8" diameter.

\$2.00 per 100

\$12.00 per 1000

Metal Accessories

52-062 Vial Adapter:

Adapts any type Wig-L-Bug for vials 1/2" diameter x 1" long.

\$4.50

52-063 Vial:

Stainless steel; size 1/2" diameter x 1" long with stainless steel ball-pestle 1/4" diameter.

\$8.00

52-064 Vial:

Hardened tool steel; size 1/2" diameter x 1" long with hardened steel ball-pestle 1/4" diameter.

\$8.00

52-065 Vial:

Agate; size 9/16" x 1-5/16" long; 2 ml capacity with agate ball-pestle 1/4" diameter. Requires a 52-052 adapter.

\$41.50

52-066 Technique Pen:

\$7.75

52-067 Refill, Technique Pen:

\$.85

52-068 Spare Arms:

Set of 2.

\$3.50

Note:

The 1/2" diameter x 1" long vials can handle a maximum of 1.0 ml.

The 1/2" diameter x 2" long vials can handle a maximum of 2.5 ml.

Spacing Dividers

Varying dispersions and non-linearity make measuring of spectral lines a difficult process. The SPACING DIVIDER will solve this problem for you. With it, measurements may be made by either interpolation or extrapolation using the distance between two known lines as reference. For example, if you want to measure a line in the 2500 Å range, set your microphotometer on silicon 2506.9 and 2516.1 lines; then read off the distance in angstroms from the known line to the unknown. Accuracy to 0.2 Å is generally possible.

Two Models Available:

52-080 6" , (Stainless Steel)

max. spread 23 mm; min. 3 mm.

\$35.00

52-081 12" , (Stainless Steel)

max. spread 46 mm; min. 6 mm.

\$50.00



Static Master

The Staticmaster Brush instantly removes dust, lint, and other particles held to a surface by static electricity. The three-inch brush, passed over the surface, neutralizes the static electricity, while removing the unwanted particles. The particles will not be re-attracted until the surface is recharged by handling. Connectors are available that enable you to attach two or three brush units to cover a wider surface area.

The powerful neutralizing source Polonium, incorporated as a silver and gold seal, is an alpha emitter that immediately neutralizes any surface in close proximity.

Two models are offered: the standard and the industrial models. The industrial Polonium source is

four times stronger than the standard model, and is equipped to cope with heavy duty industrial problems.

52-085 3" Standard Staticmaster Brush:
\$10.95

52-086 3" Industrial Staticmaster Brush:
\$14.95

52-088 Replacement Cartridge for 52-085:
\$5.95

52-089 Replacement Cartridge for 52-086:
\$9.95

52-087 Connector:
\$1.75



Abbeon Relative Humidity and Temperature Indicator

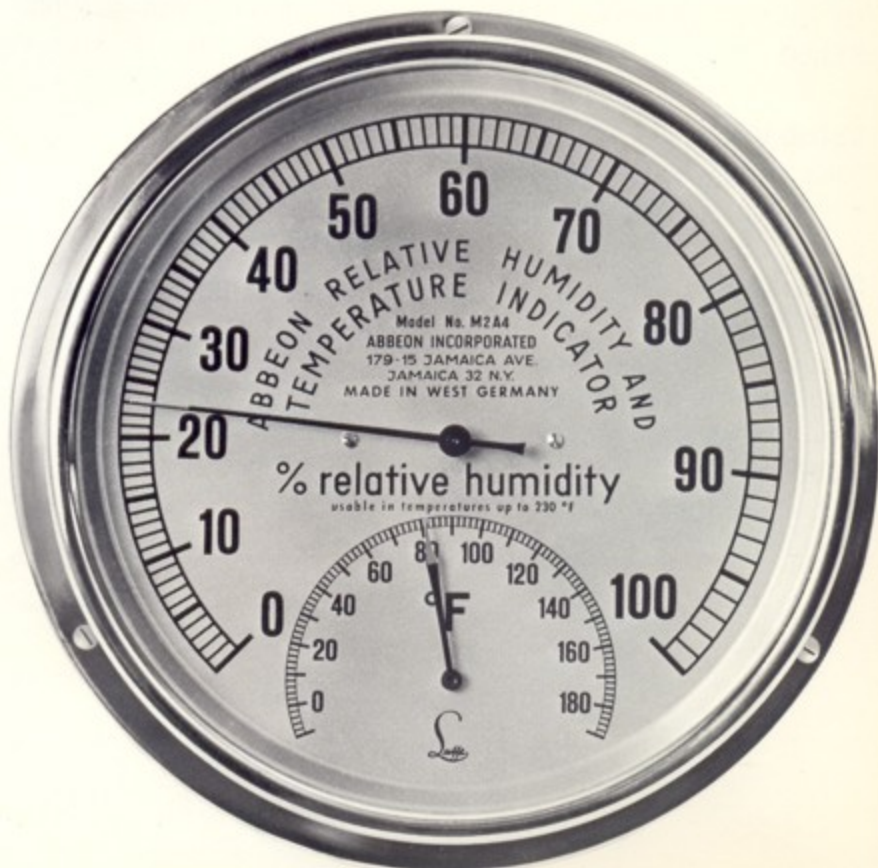
The accurate operation of your spectrograph or spectrometer may depend upon the moisture content and temperature of the air, and a knowledge of each. Accurate measurement of both is now possible with a Abbeon model #M2A4 Relative Humidity and Temperature Indicator.

Temp. Range: -10°F to +190°F.

R.H. Range: 0 to 100%

Instrument Accuracy: ±2%

52-082 Relative Humidity and Temperature Indicator:
\$24.95



Corning Filters

Cat. No.	Type of Filters	Transmittance	Use	Thickness Range (mm)	Sizes (Square) And Price
18-952	Ultraviolet transmitting clear filter	50% above 3100A	Eliminates higher orders when using 0 and SA-3 emulsions above 3000A	1.9 - 2.1	2"- \$5.00
18-953	Ultraviolet transmitting visible absorbing filters	40% from 2500A to 3900A; 85% at 3200 A	Eliminates first order 4800 to 7800A when using emulsions such as SA-3 and I-N	2.9 - 3.1	2"- \$9.50
18-954	Sharp - Cut Filters	40% above 4500 A	Eliminates second and higher orders when analyzing for alkalis (Na, Ni, K, Rb, Cs)	1.4 - 4.6	2"- \$6.50

Also available in 3-1/8" and 6-1/2" (square). Prices upon request.

Ordering Information

Spectrographic Films and SWR Film

Emul- sion	Type	Identification Number	Amount (35mm)	Cat. No.
SA-1	Darkroom	SP421-1	100 ft. roll	19200001
SA-1	Daylight	SA413	100 ft. roll	19200002
SA-3	Darkroom	SP421	100 ft. roll	19200003
SA-3	Daylight	SP413	100 ft. roll	19200004
SWR	Darkroom	SP764	25¼ ft. roll	19200005

Spectroscopic Films

Emul- sion	Type	Identification Number	Amount (35mm)	Cat. No.
103-F	Darkroom	SP421	100 ft. roll	19200006
103a-F	Darkroom	SP421	100 ft. roll	19200007
103-O	Darkroom	SP421	100 ft. roll	19200008
103a-O	Darkroom	SP421	100 ft. roll	19200009
103a-D	Darkroom	SP421	100 ft. roll	19200010
I-N	Darkroom	SP421	100 ft. roll	19200011
I-O	Darkroom	SP421	100 ft. roll	19200012
III-F	Darkroom	SP421	100 ft. roll	19200013
III-O	Darkroom	SP421	100 ft. roll	19200014
IV-F	Darkroom	SP421	100 ft. roll	19200015
I-F	Darkroom	SP421	100 ft. roll	19200016
IV-N	Darkroom	SP421	100 ft. roll	19200017
649-F	Darkroom	SP421	100 ft. roll	19200018
Ila-O	Darkroom	SP421	100 ft. roll	19200084
I-Z	Darkroom	SP421	100 ft. roll	19200085
I-M	Darkroom	SP421	100 ft. roll	19200093

Spectrographic Plates

Emulsion	Type	Amount	Cat. No.
SA-1	Plates 4" x 10"	12/pkg	19200019
SA-1	Plates 4" x 10"	36/pkg	19200020
SA-1	Plates 2" x 10"	12/pkg	19200021
SA-1	Plates 2" x 10"	36/pkg	19200022
SA-3	Plates 4" x 10"	36/pkg	19200023
SA-3	Plates 4" x 10"	12/pkg	19200024
SA-3	Plates 2" x 10"	36/pkg	19200025
I-N	Plates 2" x 10"	36/pkg	19200026
I-N	Plates 4" x 10"	36/pkg	19200027
I-N	Plates 4" x 5"	36/pkg	19200028
I-N	Plates 5" x 7"	12/pkg	19200029
103-O	Plates 2" x 10"	36/pkg	19200030
103-O	Plates 4" x 10"	36/pkg	19200031
103-O	Plates 4" x 5"	36/pkg	19200032
103-O	Plates 5" x 7"	12/pkg	19200033
103a-F	Plates 2" x 10"	36/pkg	19200034
103a-F	Plates 4" x 10"	36/pkg	19200035
103a-F	Plates 4" x 5"	36/pkg	19200036
103a-F	Plates 3 3/4" x 4 1/4"	36/pkg	19200037
103A-F	Plates 5" x 7"	12/pkg	19200038
103-F	Plates 2" x 10"	36/pkg	19200039
103-F	Plates 4" x 10"	36/pkg	19200040
103-F	Plates 4" x 5"	36/pkg	19200041
103-F	Plates 5" x 7"	12/pkg	19200042
I-O	Plates 2" x 10"	36/pkg	19200043
I-O	Plates 4" x 10"	36/pkg	19200044
I-O	Plates 5" x 7"	12/pkg	19200045
I-Z	Plates 2" x 10"	36/pkg	19200046
I-Z	Plates 4" x 10"	36/pkg	19200047
I-Z	Plates 4" x 5"	36/pkg	19200048
I-Z	Plates 5" x 7"	12/pkg	19200049
III-O	Plates 2" x 10"	36/pkg	19200050
III-O	Plates 4" x 10"	36/pkg	19200051
III-F	Plates 2" x 10"	36/pkg	19200052
III-F	Plates 4" x 10"	36/pkg	19200053
III-F	Plates 5" x 7"	12/pkg	19200054
I-M	Plates 2" x 10"	36/pkg	19200055
I-M	Plates 4" x 10"	36/pkg	19200056
I-M	Plates 5" x 7"	12/pkg	19200057
IV-N	Plates 2" x 10"	36/pkg	19200058
IV-N	Plates 4" x 10"	36/pkg	19200059

Emulsion	Type	Amount	Cat. No.
Ila-D	Plates 4" x 10"	36/pkg	19200060
SWR	Plates 4" x 5"	36/pkg	19200061
I-N	Backed Plates 4" x 10"	36/pkg	19200062
649-F	Plates 2" x 10"	36/pkg	19200063
649-F	Plates 4" x 10"	36/pkg	19200064
649-F	Plates 4" x 5"	36/pkg	19200065
649-F	Plates 3 3/4" x 4 1/4"	36/pkg	19200066
649-F	Plates 5" x 7"	12/pkg	19200067
103a-O	Plates 2" x 10"	36/pkg	19200087
103a-O	Plates 4" x 10"	36/pkg	19200088
103a-O	Plates 4" x 5"	36/pkg	19200091
103a-O	Plates 5" x 7"	12/pkg	19200092
Ila-O	Plates 4" x 10"	36/pkg	19200089
I-F	Plates 4" x 10"	36/pkg	19200090

Kodak Chemicals

Description	Amount	Cat. No.
D-19 Developer	To make 1 gallon	19200068
D-19 Developer	To make 3 1/2 gallons	19200069
D-19 Developer	To make 5 gallons	19200070
Indicator Stop Bath	16 oz. bottle	19200071
Kodak Fixer Powder	To make 1 gallon	19200072
Kodak Fixer Powder	To make 5 gallons	19200073
Kodak Rapid Fixer	To make 1 gallon	19200074
Kodak Rapid Fixer	To make 5 gallons	19200075
Kodafix Solution	To make 1 gallon	19200076
Kodak Photo-Flo	16 oz. bottle	19200077
Photo Sponge	12/pkg	19200078
Envelopes for Plates 4" x 10"	Box of 500	19200079
Envelopes for Plates 2" x 10"	Box of 500	19200080
Envelopes for Film 2" x 23 1/2"	Box of 500	19200081
Microphotometer Work Sheet Pads	ea.	19200082
Kodak Adjustable Safe Light with OA Filter	ea.	19200083

Preformed Electrodes AGKSP

Identification No.	Amount	Cat. No.	Identification No.	Amount	Cat. No.
L3900	Box of 100	19200501	L3960	Box of 100	19200531
L3903	Box of 100	19200503	L3963	Box of 100	19200532
L3905	Box of 100	19200504	L3966	Box of 100	19200534
L3906	Box of 100	19200505	L3969	Box of 100	19200535
L3909	Box of 100	19200506	L3970	Box of 100	19200536
L3912	Box of 100	19200507	L3975	Box of 100	19200537
L3915	Box of 100	19200508	L3977	Box of 100	19200538
L3916	Box of 100	19200509	L3979	Box of 100	19200539
L3918	Box of 100	19200510	L3982	Box of 100	19200540
L3919	Box of 100	19200511	L4000	Box of 100	19200542
L3921	Box of 100	19200512	L4006	Box of 100	19200543
L3922	Box of 100	19200513	L4012	Box of 100	19200544
L3923	Box of 100	19200514	L4018	Box of 100	19200545
L3924	Box of 100	19200515	L4024	Box of 100	19200546
L3925	Box of 100	19200516	L4030	Box of 100	19200547
L3927	Box of 100	19200517	L4031	Box of 100	19200548
L3928	Box of 100	19200518	L4036	Box of 100	19200549
L3933	Box of 100	19200519	L4042	Box of 100	19200550
L3936	Box of 100	19200521	L4048	Box of 100	19200551
L3939	Box of 100	19200522	L4054	Box of 100	19200552
L3945	Box of 100	19200524	L4072	Tube of 50	19200553
L3948	Box of 100	19200525	L4075	Tube of 50	19200554
L3951	Box of 100	19200526	L4078	Box of 100	19200555
L3954	Box of 100	19200527	L4081	Box of 100	19200556
L3955	Box of 100	19200528	SP1031	Box of 100	19200557
L3957	Box of 100	19200529	SP7508	Tube of 50	19200558
L3958	Box of 100	19200530			

Preformed Electrodes SPK

Identification No.	Amount	Cat. No.
L3700	Box of 100	19200559
L3703	Box of 100	19200561
L3705	Box of 100	19200562
L3706	Box of 100	19200563
L3709	Box of 100	19200564
L3712	Box of 100	19200565
L3715	Box of 100	19200566
L3716	Box of 100	19200567
L3718	Box of 100	19200568
L3719	Box of 100	19200569
L3721	Box of 100	19200570
L3722	Box of 100	19200571
L3723	Box of 100	19200572
L3739	Box of 100	19200573
L3745	Box of 100	19200575
L3748	Box of 100	19200576
L3751	Box of 100	19200577
L3754	Box of 100	19200578
L3755	Box of 100	19200579
L3757	Box of 100	19200580
L3758	Box of 100	19200581
L3760	Box of 100	19200582
L3763	Box of 100	19200583
L3766	Box of 100	19200585
L3769	Box of 100	19200586

Identification No.	Amount	Cat. No.
L3770	Box of 100	19200587
L3775	Box of 100	19200588
L3777	Box of 100	19200589
L3782	Box of 100	19200591
L3789	Box of 100	19200593
L3790	Box of 100	19200594
L4200	Box of 100	19200595
L4206	Box of 100	19200596
L4212	Box of 100	19200597
L4218	Box of 100	19200598
L4224	Box of 100	19200599
L4230	Box of 100	19200600
L4231	Box of 100	19200601
L4236	Box of 100	19200602
L4242	Box of 100	19200603
L4254	Box of 100	19200604
L4257	Box of 100	19200605
L4258	Box of 100	19200606
L4259	Box of 100	19200607
L4260	Box of 100	19200608
L4261	Box of 100	19200609
L4262	Box of 100	19200610
L4272	Tube of 50	19200611
L4275	Tube of 50	19200612
SP9045	Tube of 50	19200613

National Carbon Rods Graphite SPK

Identification No.	Amount	Cat. No.
L3823	Box of 100	19200614
L3825	Box of 95	19200615
L3826	Box of 100	19200616
L3829	Box of 50	19200617
L3832	Box of 50	19200618
L3928	Box of 50	19200619

Rods Graphite AGKSP

Identification No.	Amount	Cat. No.
L3803	Box of 100	19200622
L3805	Box of 95	19200623
L3806	Box of 100	19200624
L3808	Box of 50	19200625
L3809	Box of 50	19200626
L3812	Box of 50	19200627

Rods Graphite AGKS

Identification No.	Amount	Cat. No.
L4303	Box of 100	19200630
L4306	Box of 100	19200631
L4309	Box of 100	19200632
L4312	Box of 100	19200633
L4315	Box of 100	19200634
L4321	Box of 100	19200635

Rods Carbon Grade L113SP

Identification No.	Amount	Cat. No.
L3863	Box of 100	19200636
L3866	Box of 100	19200637
L3869	Box of 50	19200638

National Graphite Powders

Identification No.	Type	Amount	Cat. No.
L4110	SP-1	1 oz.	19200642
L4110	SP-1	4 oz.	19200643
L4110	SP-1	8 oz.	19200644
L4118	SP-1C	1 oz.	19200645
L4118	SP-1C	4 oz.	19200646
L4118	SP-1C	8 oz.	19200647
L4160	SP-2	1 oz.	19200648
L4160	SP-2	4 oz.	19200649
L4160	SP-2	8 oz.	19200650

National Carbon Grade Powder

Identification No.	Type	Amount	Cat. No.
L4165	SP-3	1 oz.	19200651
L4165	SP-3	4 oz.	19200652
L4165	SP-3	8 oz.	19200653



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