CATALOG OF LENSES · PRISMS AND REFLECTORS

BAUSCH & LOMB

A CATALOG OF LENSES, PRISMS and REFLECTORS

with Other Special Optical Items

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INTRODUCTORY

The following lists of lenses, prisms, mirrors and other optical parts have been compiled for the convenience of our many friends who from time to time have need of such goods. A selection from these lists will enable us to render much more prompt service than has been possible heretofore and enable you in many cases to take advantage of the lower prices which result from production in reasonable quantities.

While many of these items are identified under a common name, or by reference to a familiar application, this should not be interpreted as a limiting statement of the extent of usefulness of any optical part. Tradition and usage have in a measure bestowed names and appellations, but modern ingenuity and inventiveness alone, limit the useful application of optics.

Some of the lens lists have been completed from material which we use in our own instruments and in such cases there is a conspicuous absence of system in the sequence of focal lengths and diameters. On the other hand, they include many more possibilities than would ordinarily be offered in such lists.

If your requirements cannot be satisfied with any of the material listed we are always ready to quote on material made to your specifications. Before asking us for quotations, however, please note carefully the following information and

instructions, since by following these instructions carefully you can not only secure the lowest possible price but you can also aid us in rendering you prompt and efficient service.

How to Order Special Optical Parts

The cost of optical goods varies over an exceedingly large range depending on two other factors aside from quantity production. The nature and quality of the material employed is one of these factors. Tell us, if you can, what degree of freedom from bubbles, striae and other defects is required for glass, and whether or not crystal material must be free from defects in polarized light.

The demand for precise workmanship is the most important factor influencing the cost of optical parts. One of two lenses which to the casual glance look alike may cost twenty five times as much as the other. This is due to the fact that one lens was ground much more closely to a certain curvature, i. e., has a closer tolerance, than the other.

Lens curvatures and also flat surfaces are, in precision work, checked by interference methods against standard test glasses. Tolerances are given in the number of light waves or fractions of a light wave which the surface may depart from the standard without destroying the usefulness of the lens.

Another respect in which lenses may differ within wide limits is in centering. Perfection requires that the optical axis

pass through its geometrical center. Three types of lenses in order of their accuracy of centering are pressed edge, edged and centered lenses. The last type is used only in precise work. Be sure to specify the type of centering desired.

The price of prisms of a given size depends also on the tolerance permitted in linear dimensions, the accuracy necessary in maintaining the prescribed angles, and in the quality of the surfaces, i. e., how flat they must be. Prism angles can be held to within a fraction of a second of arc when necessary. It is very rarely necessary and when it is the cost is astonishingly high. It is, of course, much less expensive if a tolerance of one or two minutes or arc can be permitted but still less expensive if a tolerance of about five minutes can be allowed. The latter degree of accuracy is probably sufficient for 95% of the prisms used. Higher accuracy is only exceptionally required.

Some purchasers of optical material, evidently acting on the impression that anything less than perfection is a proof of carelessness in manufacture, use such expressions as "perfectly flat", "exactly one inch long", etc. without realizing that not only would it be impossible to prove whether the specifications had been met or not but that the cost of such a product would be entirely prohibitive. There are, we suspect, some lens makers without experience in precision work who will cheerfully accept orders of this character and quote

prices which are appropriate for what we consider third class work. It may often happen that the job requires nothing better than third class work insofar as precision is concerned and the customer is completely satisfied with results. He would probably regard the prices of a precision lens maker on the same inquiry as outrageous simply because the latter comprehends what precise workmanship means while the former not only is unable to turn out such work but is unable even to comprehend what it involves.

In most cases in which simple lenses are employed precision is unnecessary. The inherent defects in the quality of the images formed by simple lenses make it useless to devote extreme care in their manufacture. Good glass and a good polish are essential but interference methods of testing surfaces and high precision in centering are unprofitable. On the other hand, it is foolish to waste the efforts of a lens designer by carrying out his laboriously calculated formula with manufacturing methods of insufficient precision so that complex constructions generally merit and require precise workmanship.

Be sure to include in your order for special prisms a drawing showing all the dimensions and tolerances; a free hand sketch suffices. If, however, you are not sure of the accuracy required send us complete information concerning the use you will make of the parts. Do not hesitate to go into detail. Often seemingly insignificant facts have a great bearing on

the required accuracy of parts, and complete information is necessary if we are to exercise judgment for you as to the accuracy required. In such a case, if our information is incomplete, much delay will be caused by the need for correspondence to put us in possession of the necessary facts.

To order.

Lenses

(a) Describe the use you wish to make of the lens.

(b) Give the focal length with tolerances.

(c) Give diameter and free aperture.

(d) If you have some special requirements as to correction and can state them, do so.

(e) If the lens is to be of quartz or other crystal material, state whether or not the material is to be free from defects in polarized light and give the location of the crystal of the crystal axis with tolerances.

(f) If the lens is to be achromatic be sure to indicate the position and size of the object and the position and size of the image you desire to form.

(g) State what quality of centering is required.

Prisms

(a) Describe the use you wish to make of the prism.

(b) Include a sketch of the prism with dimensions and tolerances and the angles.

(c) If you can state how accurately the angles must be made in terms of minutes or seconds of arc, do so.

(d) Indicate on your sketch which sides of the prism are to be polished and which may be left unpolished.

(e) If you can state the degree of planeness required on the polished surfaces in terms of wavelengths, do so.

(f) If you can do so, state the kind of glass required, i.e. crown, light flint, heavy flint, and state to what extent freedom from very small bubbles is necessary, bearing in mind that absolute freedom from them is almost impossible.

(g) If the prism is to be of quartz or other crystal material, state whether or not the material is to be free from defects in polarized light and give the location of the crystal axis with tolerances.

Mirrors

(a) Describe the use you wish to make of the mirror.

(b) If it is a curved mirror.

(1) State whether spherical, parabolic or other form is required, if you can.

(2) Give diameter, with tolerances.

(3) Give focal length with tolerance, radius of curvature, or object and image distances.

(4) State what kind of backing is required, i. e. heat resisting or other.

(c) If it is a plane mirror.

(1) State whether first or second surface mirror is required.

(2) State degree of planeness required in terms of wave lengths of light if you can.

(3) State degree of parallelism of surface required in terms of minutes or seconds of arc if it is a second surface mirror.

(4) Give dimensions of mirror with tolerances, bearing in mind that highly precise mirrors should not be less in thickness than 1/10 the diagonal or diameter. Mirrors of lower quality may be thinner.

(5) If first surface do you want the silver protected by a thin coat of transparent lacquer? For the most precise work, the lacquer coating should not be used for it will cause a slight deterioration of image quality.

LENSES

LENSES

In the following lists, containing tables of available plano convex and double convex lenses, the character of the centering is indicated by a code or otherwise as stated at the head of the list. The surface quality is in all cases about of the quality of good spectacle lenses. The glass is usually white but in some cases may be slightly green.

By focal length we mean the equivalent focal length. In plano convex lenses this is the distance from the convex surface to the image of a far distant object formed when the plano side is turned towards the object and the lens stopped down to a small central aperture. In the case of the double convex lenses it is the distance from the surface to the image plus one third of the thickness of the lens. Here, too, the lens is assumed to be stopped down to a small aperture.

Plano Convex Lenses

Catalog Number	Focal Length m.m.	Diameter m.m.	Price
NOTE: The following lenses are centered			
61-44-22-012	6.4	6.0	$2.00
61-44-25-012	9.5	3.5	2.00
61-44-22-013	12.8	10.0	1.50
61-44-30-012	19.0	10.5	1.50
71-12-60-012	35.2	12.5	1.50
61-44-30-013	38.2	21.0	1.50
42-47-08-012	51.2	24.5	1.50
61-44-36-013	76.5	25.7	1.50
42-47-07-012	84.5	34.5	1.50
42-63-54-012	85.1	40.0	1.00
41-53-11-012	93.3	40.5	1.00
61-44-38-013	95.6	25.7	1.00
41-53-13-012	109.5	40.5	1.00
41-53-14-012	124.7	40.5	1.00
41-53-20-012	150.2	61.5	1.00
41-53-15-012	156.6	40.5	1.00
41-53-22-012	187.0	61.5	1.00
41-53-25-012	233.2	61.5	1.00
41-53-28-012	279.5	61.5	1.00
NOTE: The following lenses are edge-ground			
31-63-07-012	70.7	19.8	1.00
31-61-85-012	84.1	20.0	1.00
81-34-75-012	155.8	45.0	.75
81-33-17-012	355.6	77.2	.75
NOTE: The following lenses are edge-pressed			
31-15-15-012	11.8	10.2	1.00
31-15-12-012	13.8	10.5	1.00
31-15-10-012	19.0	11.5	1.00
31-15-07-012	22.8	12.7	1.00
31-15-15-013	26.8	19.8	.75
31-15-12-013	35.2	19.8	.75
31-15-06-013	40.2	19.8	.50
31-15-10-013	45.4	19.8	.50
31-63-10-012	52.0	15.8	.50

See also Projection Condensers, page 16, and enlarging condensers, page 17.
For quantities of 10 or more of a particular lens write for special quotation .

Prices of lenses as given are net.

Double Convex Lenses

Catalog Number	Focal Length m.m.	Diameter m.m.	Price
NOTE: The following lenses are edge-ground			
81-23-99-012	25.4	12.8	.50
81-41-10-012	25.4	25.4	.50
81-23-99-013	38.2	15.9	.50
81-41-15-012	38.1	25.4	.50
81-23-99-014	50.8	19.1	.50
81-23-80-012	50.8	22.2	.50
81-41-20-012	50.8	25.4	.50
81-41-02-012	63.5	22.2	.50
81-41-25-012	63.5	25.4	.50
31-63-01-012	63.5	30.2	.50
81-41-30-012	76.2	30.2	.50
81-23-35-012	76.0	31.8	.50
81-68-68-012	78.6	31.8	.50
81-41-35-012	88.9	25.4	.50
81-23-30-012	88.9	38.9	.50
81-41-40-012	101.6	25.4	.50
81-41-45-012	114.3	25.4	.50
81-26-25-012	132.5	51.0	.75
81-33-07-012	177.8	77.2	.75
81-33-08-012	203.2	89.8	.75
81-33-10-012	254.0	102.7	1.50
81-33-12-012	304.8	115.7	1.50
81-33-13-012	330.2	128.1	1.50

For quantities of 10 or more of a particular lens write for special quotation.

Prices of lenses as given are net.

Additional double convex lenses are available in the following focal lengths. They are carried in stock in uncut forms but will be supplied at the prices quoted edged round or centered in any diameter from 25 mm to 40 mm. The finish and quality is that of high grade spectacle lenses.

	Edged		Centered	
Focal Length	Cat. No.	Price	Cat. No.	Price
8000 mm	DCX-5-001	$ .65	DCX-6-001	$1.15
4000	DCX-5-002		DCX-6-002	
2670	DCX-5-003		DCX-6-003	
2000	DCX-5-005		DCX-6-005	
1600	DCX-5-006		DCX-6-006	
1330	DCX-5-007		DCX-6-007	
1140	DCX-5-008		DCX-6-008	
1000	DCX-5-010		DCX-6-010	
888	DCX-5-011		DCX-6-011	
800	DCX-5-012		DCX-6-012	
727	DCX-5-013		DCX-6-013	
666	DCX-5-015		DCX-6-015	
615	DCX-5-016		DCX-6-016	
570	DCX-5-017		DCX-6-017	
500	DCX-5-020		DCX-6-020	
444	DCX-5-022	.70	DCX-6-022	1.20
400	DCX-5-025		DCX-6-025	
364	DCX-5-027		DCX-6-027	
333	DCX-5-030		DCX-6-030	
307	DCX-5-032		DCX-6-032	
285	DCX-5-035		DCX-6-035	
266	DCX-5-037		DCX-6-037	
250	DCX-5-040		DCX-6-040	
235	DCX-5-042	.80	DCX-6-042	1.30
222	DCX-5-045		DCX-6-045	
210	DCX-5-047		DCX-6-047	
200	DCX-5-050		DCX-6-050	
190	DCX-5-052		DCX-6-052	
182	DCX-5-055		DCX-6-055	
174	DCX-5-057		DCX-6-057	
167	DCX-5-060		DCX-6-060	
160	DCX-5-062		DCX-6-062	
154	DCX-5-065	.90	DCX-6-065	1.40
148	DCX-5-067		DCX-6-067	
143	DCX-5-070		DCX-6-070	
133	DCX-5-075		DCX-6-075	
125	DCX-5-080		DCX-6-080	
118	DCX-5-085	1.00	DCX-6-085	1.50
111	DCX-5-090		DCX-6-090	
105	DCX-5-095		DCX-6-095	
100	DCX-5-100		DCX-6-100	
95	DCX-5-105	1.25	DCX-6-105	1.75
91	DCX-5-110		DCX-6-110	
84	DCX-5-120		DCX-6-120	
77	DCX-5-130		DCX-6-130	
72	DCX-5-140	1.40	DCX-6-140	1.90
67	DCX-5-150		DCX-6-150	
63	DCX-5-160		DCX-6-160	
56	DCX-5-180		DCX-6-180	
50	DCX-5-200		DCX-6-200	

For quantities of 10 or more write for special quotation.
Prices quoted are net.

Double Concave Lenses

These lenses are carried in stock in uncut form. At the prices quoted they will be supplied edged round or centered in any diameter desired from 25 mm to 40 mm. The finish and quality is that of high grade spectacle lenses.

Specify catalog number and diameter.

Focal Length	Edged Cat. No.	Edged Price	Centered Cat. No.	Centered Price
8000 mm	DCC-5-001	$ .65	DCC-6-001	$1.15
4000	DCC-5-002		DCC-6-002	
2670	DCC-5-003		DCC-6-003	
2000	DCC-5-005		DCC-6-005	
1600	DCC-5-006		DCC-6-006	
1330	DCC-5-007		DCC-6-007	
1140	DCC-5-008		DCC-6-008	
1000	DCC-5-010		DCC-6-010	
888	DCC-5-011		DCC-6-011	
800	DCC-5-012		DCC-6-012	
727	DCC-5-013		DCC-6-013	
666	DCC-5-015		DCC-6-015	
615	DCC-5-016		DCC-6-016	
570	DCC-5-017		DCC-6-017	
500	DCC-5-020		DCC-6-020	
444	DCC-5-022	.70	DCC-6-022	1.20
400	DCC-5-025		DCC-6-025	
364	DCC-5-027		DCC-6-027	
333	DCC-5-030		DCC-6-030	
307	DCC-5-032		DCC-6-032	
285	DCC-5-035		DCC-6-035	
266	DCC-5-037		DCC-6-037	
250	DCC-5-040		DCC-6-040	
235	DCC-5-042	.80	DCC-6-042	1.30
222	DCC-5-045		DCC-6-045	
210	DCC-5-047		DCC-6-047	
200	DCC-5-050		DCC-6-050	
190	DCC-5-052		DCC-6-052	
182	DCC-5-055		DCC-6-055	
174	DCC-5-057		DCC-6-057	
167	DCC-5-060		DCC-6-060	
160	DCC-5-062		DCC-6-062	
154	DCC-5-065	.90	DCC-6-065	1.40
148	DCC-5-067		DCC-6-067	
143	DCC-5-070		DCC-6-070	
133	DCC-5-075		DCC-6-075	
125	DCC-5-080		DCC-6-080	
118	DCC-5-085	1.00	DCC-6-085	1.50
111	DCC-5-090		DCC-6-090	
105	DCC-5-095		DCC-6-095	
100	DCC-5-100		DCC-6-100	
95	DCC-5-105	1.25	DCC-6-105	1.75
91	DCC-5-110		DCC-6-110	
84	DCC-5-120		DCC-6-120	
77	DCC-5-130		DCC-6-130	
72	DCC-5-140	1.40	DCC-6-140	1.90
67	DCC-5-150		DCC-6-150	
63	DCC-5-160		DCC-6-160	
58	DCC-5-180		DCC-6-180	
50	DCC-5-200		DCC-6-200	

For quantities of 10 or more write for special quotation.
Prices quoted are net.

Plano Concave Lenses

We carry no lenses of this type in stock, but will be glad to quote prices upon receipt of inquiry or specifications.

Convexo-Concave Lenses

The convexo concave have in all focal lengths a concave surface of the same radius of curvature.
They are carried in stock in uncut form but will be supplied at the price quoted either edged round or centered in any diameter desired from 25 mm to 40 mm. Focal lengths are measured from the concave surfaces.

Specify catalog number and diameter.

Focal Length	Edged Cat. No.	Price	Centered Cat. No.	Price
8000 mm	MCX-5-001	$ .80	MCX-6-001	$1.30
4000	MCX-5-002		MCX-6-002	
2670	MCX-5-003		MCX-6-003	
2000	MCX-5-005		MCX-6-005	
1600	MCX-5-006		MCX-6-006	
1330	MCX-5-007		MCX-6-007	
1140	MCX-5-008		MCX-6-008	
1000	MCX-5-010		MCX-6-010	
888	MCX-5-011		MCX-6-011	
800	MCX-5-012		MCX-6-012	
727	MCX-5-013		MCX-6-013	
666	MCX-5-015		MCX-6-015	
615	MCX-5-016		MCX-6-016	
570	MCX-5-017		MCX-6-017	
500	MCX-5-020		MCX-6-020	
444	MCX-5-022	.90	MCX-6-022	1.40
400	MCX-5-025		MCX-6-025	
364	MCX-5-027		MCX-6-027	
333	MCX-5-030		MCX-6-030	
307	MCX-5-032		MCX-6-032	
285	MCX-5-035		MCX-6-035	
266	MCX-5-037		MCX-6-037	
250	MCX-5-040		MCX-6-040	
235	MCX-5-042	1.00	MCX-6-042	1.50
222	MCX-5-045		MCX-6-045	
210	MCX-5-047		MCX-6-047	
200	MCX-5-050		MCX-6-050	
190	MCX-5-052		MCX-6-052	
182	MCX-5-055		MCX-6-055	
174	MCX-5-057		MCX-6-057	
167	MCX-5-060		MCX-6-060	
160	MCX-5-062		MCX-6-062	
154	MCX-5-065	1.25	MCX-6-065	1.75
148	MCX-5-067		MCX-6-067	
143	MCX-5-070		MCX-6-070	
133	MCX-5-075		MCX-6-075	
125	MCX-5-080		MCX-6-080	

For quantities of 10 or more write for special quotation.
Prices quoted are net.

Concavo-Convex Lenses

The concavo-convex have in all focal lengths a convex surface of the same radius of curvature.
They are carried in stock in uncut form but will be supplied at the price quoted either edged round or centered in any diameter desired from 25 mm to 40 mm. Focal lengths are measured from the concave surfaces.

Specify Catalog number and diameter.

Focal Length	Edged		Centered	
	Catalog No.	Price	Catalog No.	Price
8000 mm	MCC-5-001	$ .80	MCC-6-001	$1.30
4000	MCC-5-002		MCC-6-002	
2670	MCC-5-003		MCC-6-003	
2000	MCC-5-005		MCC-6-005	
1600	MCC-5-006		MCC-6-006	
1330	MCC-5-007		MCC-6-007	
1140	MCC-5-008		MCC-6-008	
1000	MCC-5-010		MCC-6-010	
888	MCC-5-011		MCC-6-011	
800	MCC-5-012		MCC-6-012	
727	MCC-5-013		MCC-6-013	
666	MCC-5-015		MCC-6-015	
615	MCC-5-016		MCC-6-016	
570	MCC-5-017		MCC-6-017	
500	MCC-5-020		MCC-6-020	
444	MCC-5-022	.90	MCC-6-022	1.40
400	MCC-5-025		MCC-6-025	
364	MCC-5-027		MCC-6-027	
333	MCC-5-030		MCC-6-030	
307	MCC-5-032		MCC-6-032	
285	MCC-5-035		MCC-6-035	
266	MCC-5-037		MCC-6-037	
250	MCC-5-040		MCC-6-040	
235	MCC-5-042	1.00	MCC-6-042	1.50
222	MCC-5-045		MCC-6-045	
210	MCC-5-047		MCC-6-047	
200	MCC-5-050		MCC-6-050	
190	MCC-5-052		MCC-6-052	
182	MCC-5-055		MCC-6-055	
174	MCC-5-057		MCC-6-057	
167	MCC-5-060		MCC-6-060	
160	MCC-5-062		MCC-6-062	
154	MCC-5-065	1.25	MCC-6-065	1.75
148	MCC-5-067		MCC-6-067	
143	MCC-5-070		MCC-6-070	
133	MCC-5-075		MCC-6-075	
125	MCC-5-080		MCC-6-080	

For quantity of 10 or more write for special quotation
Prices quoted are net.
The above lenses are carried in stock : additional lenses will be furnished to a minimum focal length of 50 mm. These lenses are not carried in stock but made according to standard specifications upon receipt of order.
(Focal lengths 118,111,104,100,95,91,88,83,77,71,67,63,59,55,53,50.)
Available in both Convexo-concave and concavo-convex.

Cylindrical Lenses

These lenses have one surface flat in all powers. The other side is a convex or a concave cylinder. They are carried in stock in uncut form. They will be supplied at the prices quoted edged round to any specified diameter from 25 mm to 40 mm.
The focal length is measured from the curved surface in all cases.
Specify catalog number and diameter.

	Convex		Concave	
Focal Length	Cat. No.	Price	Cat. No.	Price
8000 mm	CCX-5-001	$ .80	CCC-5-001	$ .80
4000	CCX-5-002		CCC-5-002	
2670	CCX-5-003		CCC-5-003	
2000	CCX-5-005		CCC-5-005	
1600	CCX-5-006		CCC-5-006	
1330	CCX-5-007		CCC-5-007	
1140	CCX-5-008		CCC-5-008	
1000	CCX-5-010		CCC-5-010	
888	CCX-5-011		CCC-5-011	
800	CCX-5-012		CCC-5-012	
727	CCX-5-013		CCC-5-013	
666	CCX-5-015		CCC-5-015	
615	CCX-5-016		CCC-5-016	
570	CCX-5-017		CCC-5-017	
500	CCX-5-020		CCC-5-020	
444	CCX-5-022	.90	CCC-5-022	.90
400	CCX-5-025		CCC-5-025	
364	CCX-5-027		CCC-5-027	
333	CCX-5-030		CCC-5-030	
307	CCX-5-032		CCC-5-032	
285	CCX-5-035		CCC-5-035	
266	CCX-5-037		CCC-5-037	
250	CCX-5-040		CCC-5-040	
235	CCX-5-042	1.00	CCC-5-042	1.00
222	CCX-5-045		CCC-5-045	
210	CCX-5-047		CCC-5-047	
200	CCX-5-050		CCC-5-050	
190	CCX-5-052		CCC-5-052	
182	CCX-5-055		CCC-5-055	
174	CCX-5-057		CCC-5-057	
167	CCX-5-060		CCC-5-060	
160	CCX-5-062	1.25	CCC-5-062	1.25
154	CCX-5-065		CCC-5-065	
148	CCX-5-067		CCC-5-067	
143	CCX-5-070		CCC-5-070	
133	CCX-5-075		CCC-5-075	
125	CCX-5-080		CCC-5-080	

For quantities greater than 10 write for special quotation.
Lenses of focal length 250 mm or greater are carried in stock.
Other lenses are made according to standard specifications upon receipt of order.

Prices quoted are net.

Projection Condensers

(Plano - Convex)

These lenses are made of condenser glass of a very slight greenish tinge. They have pressed edges, are well annealed and are standard in every respect. Suitable for a great variety of optical work where condensers are necessary parts.

Cat. No.	Focus		Diameter		Thickness		Price
41-51-12	5-1/2"	139.7 mm	4"	101.5 mm	21.5 mm		$1.40
41-51-17	6-1/2"	165.1 mm	4"	101.5 mm	18.6 mm		1.40
41-51-47	11-1/2"	292.1 mm	4"	101.5 mm	12.5 mm		3.75
41-51-89	23"	584.2 mm	4-1/32"	102.4 mm	6.2 mm		1.50
41-51-13	5-1/2"	139.7 mm	4-5/16"	109.5 mm	26.2 mm		1.50
41-51-18	6-1/2"	165.1 mm	4-5/16"	109.5 mm	21.7 mm		1.50
41-51-23	7-1/2"	190.5 mm	4-5/16"	109.5 mm	18.8 mm		1.50
41-51-28	8-1/2"	215.9 mm	4-5/16"	109.5 mm	17.0 mm		1.50
41-51-23	9"	228.6 mm	4-5/16"	109.5 mm	16.1 mm		1.50
41-51-37	10"	254.0 mm	4-5/16"	109.5 mm	14.4 mm		1.50
41-51-52	12"	304.8 mm	4-5/16"	109.5 mm	12.0 mm		1.50
41-51-57	15"	381.0 mm	4-5/16"	109.5 mm	10.0 mm		1.50
41-51-14	5-1/2"	139.7 mm	4-15/32"	113.5 mm	27.7 mm		1.50
41-51-19	6-1/2"	165.1 mm	4-15/32"	113.5 mm	23.2 mm		1.50
41-51-24	7-1/2"	190.5 mm	4-15/32"	113.5 mm	20.0 mm		1.50
41-51-29	8-1/2"	215.9 mm	4-15/32"	113.5 mm	18.0 mm		1.50
41-51-34	9"	228.6 mm	4-15/32"	113.5 mm	17.1 mm		1.50
41-51-38	10"	254.0 mm	4-15/32"	113.5 mm	15.3 mm		1.50
41-51-53	12"	304.8 mm	4-15/32"	113.5 mm	12.7 mm		1.50
41-51-58	15"	381.0 mm	4-15/32"	113.5 mm	10.6 mm		1.50
41-51-62	18"	457.2 mm	4-15/32"	113.5 mm	9.4 mm		1.50
41-86-92	23"	584.2 mm	4-15/32"	113.5 mm	8.7 mm		1.50
41-51-48	11-1/2"	292.1 mm	5- 1/2"	139.7 mm	23.0 mm		9.00
41-51-39	10"	254.0 mm	6"	152.4 mm	26.6 mm		6.00
41-51-49	11-1/2"	292.1 mm	6"	152.4 mm	25.7 mm		10.50
41-51-54	12"	304.8 mm	6"	152.4 mm	21.9 mm		6.00
41-51-43	10-3/4"	273.0 mm	7-7/8"	200.0 mm	37.8 mm		15.00
41-86-91	17"	431.8 mm	8"	203.2 mm	28.0 mm		9.00
41-86-90	19"	482.6 mm	8"	203.2 mm	24.7 mm		9.00

Enlarging Condensers

These condensers are designed for photographic enlarging. They are edged round, and of high quality white crown glass well annealed and free from troublesome defects.

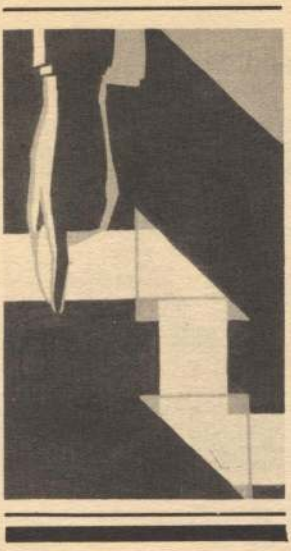
Cat. No.	Focus	Diameter	Thickness	Price
51-71-10	10" 254.0 mm	6-1/2" 165.1 mm	31.9 mm	$ 6.00
51-71-12	12" 304.8 mm	8" 203.2 mm	39.0 mm	9.00
51-71-14	14" 355.6 mm	9" 228.6 mm	41.1 mm	12.00
51-71-15	15" 381.0 mm	10" 254.0 mm	49.0 mm	15.00
51-71-18	18" 457.2 mm	12" 304.8 mm	60.8 mm	30.00
51-71-21	21" 533.4 mm	14" 355.6 mm	68.0 mm	45.00

Telescope Objectives

Our achromatic objectives are of the two-lens construction well corrected for spherical aberration and color, and better corrected for coma over a moderate field than is the average telescope objective. Prices quoted include mounting.

Cat. No.	Diameter	Focus	Price
61-45-15	1"	15"	$12.00
61-45-19	1-1/4"	19-3/4"	15.00
61-45-30	2"	30"	25.00
61-45-35	2-3/8"	35-1/2"	30.00
61-45-37	2-1/2"	37-1/2"	35.00
61-45-45	3"	45"	70.00
61-45-46	3-1/8"	47-1/4"	90.00
61-45-52	3-1/2"	52-1/2"	110.00
61-45-60	4"	60"	150.00

Achromatic objectives of other focal lengths and diameters will be made to the customer's specifications.



PRISMS

Crown Glass Wedge Type Prisms

These are dispersing or refracting prisms, 38 mm square with ground edges. Prisms up to and including 20 △ have the base ground perpendicular to one face. Above 20△ they are ground isoceles. They are made of crown glass, of refractive index 1.523 for sodium light.

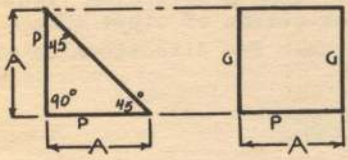
Deviation

Cat. No.	Prism Diopters	Angular Deviation	Price Each
PR-5-005	0.50△	0° 17'	$ .75
PR-5-007	0.75	0° 26'	
PR-5-010	1.00	0° 34'	
PR-5-015	1.50	0° 52'	
PR-5-020	2.00	1° 8'	
PR-5-025	2.50	1° 26'	
PR-5-030	3.00	1° 43'	
PR-5-035	3.50	2° 00'	
PR-5-040	4.00	2° 17'	
PR-5-050	5.00	2° 52'	
PR-5-060	6.00	3° 26'	
PR-5-070	7.00	4° 00'	
PR-5-080	8.00	4° 35'	1.00
PR-5-090	9.00	5° 8'	
PR-5-100	10.00	5° 43'	
PR-5-110	11.00	6° 17'	1.25
PR-5-120	12.00	6° 51'	
PR-5-130	13.00	7° 24'	
PR-5-140	14.00	7° 58'	2.00
PR-5-150	15.00	8° 32'	
PR-5-160	16.00	9° 5'	
PR-5-170	17.00	9° 39'	2.25
PR-5-180	18.00	10° 12'	
PR-5-190	19.00	10° 46'	
PR-5-200	20.00	11° 20'	
PR-5-250	25.00	14° 2'	2.50
PR-5-300	30.00	16° 42'	
PR-5-350	35.00	19° 17'	
PR-5-400	40.00	21° 48'	
PR-5-450	45.00	24° 14'	
PR-5-500	50.00	26° 34'	

Prices quoted are net.

Right Angle Prisms

These prisms are made of crown glass. They are free from strain and striae, but a few small bubbles may be present especially in the larger sizes. The angles are correct to within 5 minutes of arc and pyramidal error is reduced to 5 minutes or less. In sizes up to one inch the ground bases are perpendicular to the optical surfaces within 10 minutes of arc; sizes from 1 inch upward within 5 minutes. The surfaces are plane within 1/2 wave length of sodium light.
Prices will be quoted upon application, for prisms of other than listed dimensions or accuracy specifications. See directions on pp 2 for ordering special optical parts.



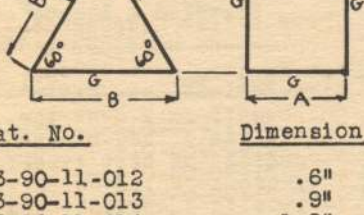
Surfaces marked "p" are polished.

Surfaces marked "g" are fine ground.

Size Dimension A	Unsilvered		Silvered & Lacquered on hypothenuse	
	Cat. No.	Price	Cat. No.	Price
1/4"	31-90-01-012	$2.00	31-90-02-012	$2.75
3/8"	31-90-01-013	2.25	31-90-02-013	3.00
1/2"	31-90-01-014	2.50	31-90-02-014	3.25
5/8"	31-90-01-015	2.75	31-90-02-015	3.75
3/4"	31-90-01-016	3.00	31-90-02-016	4.00
1"	31-90-01-017	3.25	31-90-02-017	4.50
1-1/4"	31-90-01-018	4.00	31-90-02-018	5.25
1-1/2"	31-90-01-019	6.00	31-90-02-019	7.50
2"	31-90-01-021	9.00	31-90-02-021	11.00
2-1/2"	51-73-25-012	32.00	51-73-25-013	35.00
3"	51-73-30-012	51.00	51-73-30-013	55.00
3-1/2"	51-73-35-012	65.00	51-73-35-013	70.00
4"	51-73-40-012	90.00	51-73-40-013	95.00

Equilateral 60° Prisms

These prisms are made of dense flint glass of refractive index 1.615, free from strain and striae. A few small bubbles may be present especially in the larger sizes. The 60° optical angle is correct within 5 minutes of arc. The ground bases are perpendicular to the polished optical faces within 10 minutes in the small sizes, up to 1 inch; one inch and larger, within 5 minutes. The polished surfaces are plane within 1/2 wave length of sodium light. Prices will be quoted upon application, for prisms of other than listed dimensions or accuracy specifications, See directions on pp 2 for ordering special optical parts.



Surfaces marked "p" are polished.

Surfaces marked "g" are fine ground.

Cat. No.	Dimension A	Dimension B	Price Each
33-90-11-012	.6"	1"	$ 6.50
33-90-11-013	.9"	1-1/2"	9.75
33-90-11-014	1.2"	2"	25.00
33-90-11-015	1.5"	2-1/2"	35.00
33-90-11-016	1.8"	3"	50.00
33-90-11-017	2.4"	4"	95.00

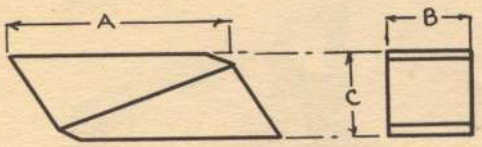
Prices quoted are net.

In addition to the common reflecting and dispersing prisms, we are prepared to make the following special types.

1. Pellin-Broca Constant Deviation.
2. Trapezoidal Erecting Prisms. (Dove)
3. Rhombohedral Prisms
4. Achromatic Prisms
5. Direct Vision Dispersing Prisms
6. Lummer Brodun - Photometer Cubes
7. Roof Prisms
8. Pentagonal Prisms

Prices on these and other types will be furnished on receipt of customer's specifications.

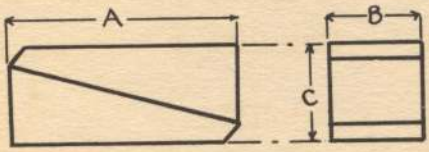
Halle Prisms



These prisms have oblique end surfaces and are practically square in cross section. The angular extent of the symmetrical field is about 18°. They are cemented with Canada Balsam.

Catalog Number	Aperture		Price
31-90-05-014	8 mm	11/32"	$14.00
31-90-05-016	10	13/32	18.00
31-90-05-017	11	7/16	21.00

Glan Thompson Prisms



These prisms have perpendicular end surfaces and are square in cross section. Since they extinguish uniformly over the entire field they are regarded as the best type. They are cemented carefully with a special hard cement of the proper index of refraction, thus removing the difficulties, inherent with cementing with linseed oil. The free aperture is about one-half the length. We follow the practice of making the plane of extinction parallel to the diagonals of the end surfaces. Prices for special sizes will be quoted on request.

Catalog Number	Aperture		A.	Price
31-90-06-013	7 mm	5/16"	32°	$13.00
31-90-06-014	8	11/32	10°	14.00
31-90-06-015	9	3/8	10°	18.00

NOTE: A is the Angular extent of symmetrical polarized field.

REFLECTORS

Reflectors

Our reflectors are listed in three classes, Regular, Commercial, and Studio, differing in the accuracy of the surfaces. Of these Regular quality is the highest class while Commercial quality represents a degree of surface accuracy ample for many applications but not equal to Regular quality. An intermediate grade called Studio quality is listed in certain sizes. In this quality the front surface is of Commercial quality while the silvered surface is of Regular quality.

The silvering is the same for all reflectors, consisting of a heavy chemical deposit of silver, covered and protected with electroplated copper.

Three types of backing are offered:

1. The black enamel backing, which protects the silvered surface from moisture and gases, and is satisfactory for ordinary use.

2. The heat resisting backing, which is made up of refractory materials and enables the reflectors to be used with high intensity arcs, without damage to the silvered surface.

3. The wire mesh backing, which protects the silvering, resists heat and gives the mirror maximum ability to withstand shock or breakage. A shattered reflector with this type of backing will remain reasonably serviceable, the form being maintained by the wire mesh embedded in the binding material.

We have been guided in offering this selection by present demands of customers. Reflectors of special size, shape and focal length will be made to order, the price depending upon specifications.

Parabolic Reflectors

Regular Quality - Black Enamel Backing

Cat. No.	Diameter	Focus	Price
43-10-12	12-1/2"	6"	$ 52.00
43-10-18	19-7/16"	7-7/8"	77.50
43-10-24	25-1/4"	10"	135.00
43-10-30	31-17/32"	12-1/4"	205.00
43-10-60	61-21/32"	25-19/32"	930.00

Regular Quality - Wire Mesh Backing

43-12-18	19-7/16"	7-7/8"	92.50
43-12-24	25-1/4"	10"	150.00
43-12-30	31-17/32"	12-1/4"	220.00
43-12-36	37-1/4"	14-3/4"	325.00
43-12-60	61-21/32"	25-19/32"	970.00

Commercial Quality - Black Enamel

43-14-06	6"	2-3/8"	7.00
43-14-46	6-3/8"	1-1/4"	7.00
43-14-87	7-1/4"	1-1/4"	7.50
43-14-57	7-5/8"	3-3/10"	8.00
43-14-08	8"	1-1/4"	8.00
43-14-89	8-1/2"	3-3/10"	8.50
43-14-10	10"	4"	9.00
43-14-11	11"	4"	10.00
43-14-12	12-1/2"	6"	11.00
43-14-14	14"	4-3/4"	15.00
43-14-16	16-3/4"	7-7/8"	21.00
43-14-18	19-7/16"	7-7/8"	25.00
43-14-24	25-1/4"	10"	45.00
43-14-86	16"	3-3/4"	21.00

Spherical Reflectors

Regular - Heat Resisting Enamel

43-31-02	2-11/16"	1-3/32"	3.00

Commercial - Heat Resisting Enamel

43-35-02	2-11/16"	1-3/32"	2.00

Studio - Heat Resisting Enamel

43-38-04	4-1/2"	1-3/8"	5.00
43-38-05	5-1/4"	1-3/4"	6.50
43-38-07	7"	2-17/32"	9.00

Mirrors

Good quality, second surface mirrors, suitable for laboratory use and instrument illumination.

Plano - Round

Catalog No.	Diameter	Price
43-60-85	5/8"	$ .20
43-60-86	3/4"	.20
43-60-87	7/8"	.20
43-60-55	15/16"	.20
43-60-88	1"	.25
43-61-12	1-1/4"	.30
43-61-15	1-1/2"	.40
43-61-25	2-1/2"	.60
43-61-30	3"	.70
43-61-35	3-1/2"	.80
43-61-45	4-1/2"	1.00
43-61-50	5"	1.25
43-61-60	6"	1.75

Plano - Rectangular

Catalog No.	Size in mm	Price
71-57-01-012	54 x 25.4	$2.00
33-21-81-012	44 x 35	2.00
33-21-80-012	80 x 44	2.50
41-27-40-012	171 x 111	3.00

Concave Mirrors

Catalog No.	Diameter	Focus	Price
43-62-85	5/8"	2-5/8"	$ .25
43-62-86	3/4"	2-5/8"	.25
43-62-87	7/8"	2-5/8"	.25
43-62-55	15/16"	2-5/8"	.25
43-62-88	1"	2-5/8"	.30
81-72-02-012	1-1/4"	1-3/4"	.35
43-63-12	1-1/4"	2-5/8"	.35
43-63-20	2"	15"	.60
43-63-25	2-1/2"	15"	.75
71-17-31	3"	7" with 1/2" hole	1.50
43-63-30	3"	15"	1.00
71-17-36	3-1/2"	7" with 1/2" hole	1.75
43-63-35	3-1/2"	15"	1.25
71-17-41	4"	7" with 1/2" hole	2.00
43-63-45	4-1/2"	15"	1.75
43-63-60	6"	15"	2.50

Other sizes and focal lengths will be made according to customer's specifications.

Convex Mirrors

We do not carry a stock of Convex Mirrors but will be glad to quote and supply Convex Mirrors, made according to customer's specifications.

First Surface Mirrors

These mirrors are of ordinary quality but are worked with special care and will give a clear undistorted image.
They are coated with a heavy chemical deposit of metallic silver, and are protected with a special coating of transparent lacquer. The surface is very sensitive to hard or abrasive materials and should be cleaned only with a camels hair brush. The mirrors should not be cleaned with any material having a solvent action upon this coating.

Cat. No.	Size in mm	Price
41-39-24-011	122.5 x 75.2 x 4	$2.50
41-23-75-011	232 x 162 x 5	8.00
41-30-50-011	304 x 252 x 5	12.00
71-35-20-011	304.8 x 304.8 x 5	17.00
71-37-40-011	381 x 381 x 5	20.00

Other sizes and shapes will be made according to the customer's specifications. Customer should include in the specifications whether he desires the silvered surface to be protected with a thin coat of transparent lacquer or not.

Black Glass Mirrors

This item is furnished in one thickness, made of Black Argentine Glass. The surface is equal to good plate glass, but is not optically worked. Suitable for polarizing mirrors.

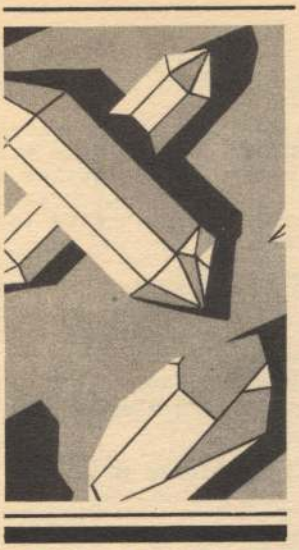
Catalog No.	Length	Width	Thickness	Price
33-19-02-012	170 mm	120 mm	10 mm	$3.50
33-65-95-012	240 mm	170 mm	10 mm	6.50

Other sizes and shapes will be made up according to the customer's specifications.

Prices quoted are net.

Stellite Stainless Steel Mirrors

We are equipped to make up Mirrors in this non-corroding material. Prices furnished upon submission of specifications.



SPECIAL ITEMS

QUARTZ OPTICAL PARTS

For the purpose of securing transmission of light in the ultra violet, crystal quartz is used. Any standard optical form which is made of glass may also be made of quartz. Quartz optics are more expensive than glass because of the rarity of good crystal quartz, its extreme hardness, and the necessity for taking into consideration the optic axes of the crystal.

In ordering quartz parts please specify quality as far as possible since this is a most important factor in price determination. General instructions for determining the needed quality are given on page 5 . Particular attention should also be given to the following manufacturing tolerances; surface accuracy, dimensional tolerances, parallelism in the case of plates and angular and pyramidal tolerances in prisms.

The following items are not carried in stock unless so stated but are listed for convenience of ordering.

Quartz Lenses

Precision Lenses

Prices are quoted for plano convex or double convex quartz lenses, cut perpendicularly to the optic axis, i.e., the lens axis and the crystal axis coincide. These prices are for plano convex or double convex lenses from 150.0 to 500.00 mm focal length. Lenses of shorter focal lengths will be priced according to specifications. Specify tolerance of parallelism of crystal axis, and geometrical axis of lens. The best quality lenses are held to within 3' of arc.

Prices are quoted on three qualities of quartz:

1. Quartz free from defects in polarized light.
2. Quartz free from visible defects.
3. Quartz with minor visible defects.

First Quality

Diameter		Catalog No. Plano-Convex	Catalog No. Double Convex	Price
25 mm	1"	33-90-01-012	33-90-21-012	$15.00
30	1-3/16"	33-90-01-013	33-90-21-013	18.00
35	1-3/8"	33-90-01-014	33-90-21-014	20.00
40	1-9/16"	33-90-01-015	33-90-21-015	30.00
45	1-13/16"	33-90-01-016	33-90-21-016	40.00
50	2"	33-90-01-017	33-90-21-017	50.00
55	2-3/16"	33-90-01-018	33-90-21-018	62.50
60	2-3/8"	33-90-01-019	33-90-21-019	75.00
65	2-9/16"	33-90-01-021	33-90-21-021	90.00
70	2-3/4"	33-90-01-022	33-90-21-022	105.00
75	3"	33-90-01-023	33-90-21-023	120.00
80	3-1/8"	33-90-01-024	33-90-21-024	135.00

Diameter		Catalog No. Plano-Convex	Catalog No. Double Convex	Price
85 mm	3-3/8"	33-90-01-025	33-90-21-025	$150.00
90	3-5/8"	33-90-01-026	33-90-21-026	180.00

Second Quality

Diameter		Catalog No. Plano-Convex	Catalog No. Double Convex	Price
25 mm	1"	33-90-02-012	33-90-22-012	$ 12.00
30	1-3/16"	33-90-02-013	33-90-22-013	15.00
35	1-3/8"	33-90-02-014	33-90-22-014	17.50
40	1-9/16"	33-90-02-015	33-90-22-015	25.00
45	1-13/16"	33-90-02-016	33-90-22-016	30.00
50	2"	33-90-02-017	33-90-22-017	40.00
55	2-3/16"	33-90-02-018	33-90-22-018	51.00
60	2-3/8"	33-90-02-019	33-90-22-019	62.50
65	2-9/16"	33-90-02-021	33-90-22-021	75.00
70	2-3/4"	33-90-02-022	33-90-22-022	85.00
75	3"	33-90-02-023	33-90-22-023	95.00
80	3-1/8"	33-90-02-024	33-90-22-024	105.00
85	3-3/8"	33-90-02-025	33-90-22-025	120.00
90	3-5/8"	33-90-02-026	33-90-22-026	145.00

Third Quality

Diameter		Catalog No. Plano-Convex	Catalog No. Double Convex	Price
25 mm	1"	33-90-03-012	33-90-23-012	$ 10.00
30	1-3/16"	33-90-03-013	33-90-23-013	12.00
35	1-3/8"	33-90-03-014	33-90-23-014	15.00
40	1-9/16"	33-90-03-015	33-90-23-015	18.00
45	1-13/16"	33-90-03-016	33-90-23-016	20.00
50	2"	33-90-03-017	33-90-23-017	25.00
55	2-3/16"	33-90-03-018	33-90-23-018	35.00
60	2-3/8"	33-90-03-019	33-90-23-019	40.00
65	2-9/16"	33-90-03-021	33-90-23-021	50.00
70	2-3/4"	33-90-03-022	33-90-23-022	60.00
75	3"	33-90-03-023	33-90-23-023	66.00
80	3-1/8"	33-90-03-024	33-90-23-024	75.80
85	3-3/8"	33-90-03-025	33-90-23-025	85.00
90	3-5/8"	33-90-03-026	33-90-23-026	105.00

Prices quoted are net.

Lenses or plates of fused quartz can be supplied, the quality of which depends upon the material. Large lenses of fused quartz have not been manufactured as yet without striae or bubbles. Prices upon application.

Quartz Condensers

These are made either plano convex or double convex cut without reference to the optic axis, from quartz having slight visible defects. They are well centered and entirely satisfactory for their purpose. The prices are for lenses from 150.0 mm to 500 focal length in plano-convex or double convex form. Estimates will be given on special sizes and focal lengths.

Cat. No.		Diameter		Price Each
Plano Convex	Double Convex			
33-90-06-013	33-90-26-013	30.0	1-3/16	$ 7.50
33-90-06-014	33-90-26-014	35.0	1-3/8	10.00
33-90-06-015	33-90-26-015	40.0	1-9/16	13.00
33-90-06-016	33-90-26-016	45.0	1-13/16	18.00
33-90-06-017	33-90-26-017	50.0	2	22.50
33-90-06-018	33-90-26-018	55.0	2-3/16	30.50
33-90-06-019	33-90-26-019	60.0	2-3/8	35.00
33-90-06-021	33-90-26-021	65.0	2-9/16	45.00
33-90-06-022	33-90-26-022	70.0	2-3/4	55.00

Prices quoted are net.

For other focal lengths prices are dependent upon specifications, especially thickness. Prices upon application.

Equilateral 60° Quartz Prisms

The quotations below are for quartz free from visible defects, axis within 3 minutes of arc tolerance from the condition specified below, angular and pyramidal tolerance 5 minutes of arc and surfaces plane within 1/2 wave length of sodium light. The crystal is so cut that the optical axis is perpendicular to the refracting edge, and at minimum deviation the light is parallel to the optical axis. Only the square faces adjacent to the refracting edge are polished, the third face being ground, so that the optic axis is located for the user. In this type of prism the ray traveling at minimum deviation suffers no doubling due to birefringence.

Cat. No.	Side Dimensions		Price Each
33-90-09-015	15.0	5/8	$15.00
33-90-09-016	20.0	3/4	20.00
33-90-09-017	25.0	1	30.00
33-90-09-018	30.0	1-3/16	50.00
33-90-09-019	35.0	1-3/8	65.00
33-90-09-021	40.0	1-9/16	85.00
33-90-09-022	45.0	1-3/4	110.00
33-90-09-023	50.0	2	135.00

Prices quoted are net.

If different quality is desired, special quotations will be made on request.

Cornu Prisms

The Cornu double quartz prism is made up of two 30° prisms, one of right rotating quartz and one of left rotating quartz. The prism elements are not cemented but are held together in optical contact. The optic axis is perpendicular to the refracting edge and at minimum deviation the image suffers no doubling. By the use of right and left quartz, rotation of the plane of polarization of the emergent ray is avoided.
Cornu prisms of the best quality right and left quartz with precise plane surfaces can be furnished at the following prices.

Cat. No.	Height A		Side B		Price Each
	mm	inches	mm	inches	
33-90-14-012	25.0	1	38.0	1-1/2	$115.00
33-90-14-013	30.0	1-3/16	45.0	1-3/4	150.00
33-90-14-014	35.0	1-3/8	48.0	1-7/8	200.00
33-90-14-015	40.0	1-9/16	60.0	2-3/8	235.00
33-90-14-016	45.0	1-3/4	68.0	2-22/32	275.00
33-90-14-017	50.0	2	75.0	3	300.00

Special Quartz Prisms

We are equipped also to manufacture special prisms of various types, among which are Rochon's double image prisms, Wollaston's double image prism, and Straubel's constant deviation prism. Prices will be furnished on request.

Calcite Optical Parts

Perfectly clear Calcite is very difficult to obtain in pieces of any considerable size and prices are based, to a very large extent, on the quality of the material. The prices of our polarization prisms are based on the clearest material obtainable. In the case of the larger Nicol prisms, some small inclusions in the calcite are unavoidable.

Special Calcite Prisms

We are equipped to manufacture special calcite prisms among which may be mentioned the following types; Ahrens, Jellet half-shade, Lippich half-shade, Wollaston, and Rochon double image. Prices are dependent on specifications and will be furnished on request.

Calcite Plates

Special calcite plates for physical research are manufactured according to specific requirements. These can be made for any particular position of the optic axis and for various degrees of plane parallelism. Prices will be given on request.

Retardation Plates

In passing through a selenitc plate, polarized light is refracted into two rays, one of which is so retarded as to give rise to interference colors, when viewed through an analyzer. If such a plate be plane parallel, only one color will be seen, the color being determined by the thickness of the plate and birefringence of the mineral from which it is cut. Such plates of selenite or other doubly refracting material are known as retardation plates

They are designed for use with the polarizing microscope and may also be used for producing interference colors in objects viewed with polariscopes, strain testing devices, or photo elasticity set-ups.

	Catalog No.	Price
In the Quarter Undulation Plate one vibration is retarded 1/4 wave length behind the other. The transmitted light is elliptically polarized. Unmounted	31-51-54-012	$3.50
The Sensitive Tint Plate is also called violet of the first order, or red of the first order. It has a retardation of 575 millimicrons, extinguishes the intense yellow rays, resulting in a violet color. It can be used to determine the vibration directions, extinction angles, slight double refraction and the optical character of minerals Unmounted	31-28-57-012	8.00
Selenite Plate producing red of the first order with a retardation of 550 millimicrons. It is not the same as the Sensitive Tint Plate which is called red of the first order, and is more violet in hue than this plate which is distinctly red Unmounted	31-51-60-012	4.50
Selenite Plate producing red between crossed nicols and green between parallel nicols. The retardation between crossed nicols is 1040 millimicrons. The red is of the 1 3/4 order. Unmounted	31-57-24-011	4.50
Mounted	31-57-24-021	6.00

		Catalog No.	Price
Selenite Plate producing purple between crossed nicols and green between parallel nicols. The retardation between crossed nicols is 575 millimicrons. The purple is of the first order	Unmounted	31-57-24-012	$4.50
	Mounted	31-57-24-022	6.00
Selenite Plate producing blue between crossed nicols and yellow between parallel nicols. The retardation between crossed nicols is 670 millimicrons. The blue is of the 1 1/8 order.	Unmounted	31-57-24-013	4.50
	Mounted	31-57-24-023	6.00

Prices quoted are net.

Halite (Rock Salt) Optics

We offer rock salt optics such as plates, spherical and cylindrical lenses and equilateral prisms made to specifications. Prices will be quoted on the basis of customer's specifications.

Heat Absorbing Glass

A specially developed glass with high heat absorbing characteristics. The color is a light green. It is used in projectors or other apparatus where it is desirable to protect against heat without the inconvenience of an absorption cell.

Cat. No.	Size in mm	Price
41-39-50	101.6 x 82.5 x 2	$5.00
41-39-52	108 x 108 x 2	5.00
41-26-99-012	40 mm round x 2	1.50

Other sizes and shapes will be furnished according to customer's specifications.

Optical Flats (Test Planes)

These flats are circular, made of quartz, polished on both sides and accurate to 1/4 wave length of sodium light on one side (.000144 mm).

Catalog No.	Diameter	Price
#33-14-60	2"	$ 27.50
#33-14-61	3-1/2"	100.00
#33-14-62	5"	250.00

These flats are packed each in a velvet lined case.

For industrial use, the following set is offered. Three optical flats 2" diameter accurate to 1/4 wave length complete in velvet lined case.

Catalog No.	Price
#33-14-63	$ 75.00

We will also make to the customer's specifications test glasses of other diameter or accurate to other fractions of wave length. These may be made in a choice of materials - glass - fused quartz - crystal quartz. They may be had in any reasonable diameter or accuracy. They may be either plane test glasses or test glasses for testing curved surfaces by interference methods. Prices will be based on customer's specifications.

Plane Parallel Glasses

Owing to the differing requirements for plane parallels prices are not listed, but will be furnished on recepit of specifications as to use, size, thickness and limits of accuracy. The parallelism of our planes are expressed in seconds of arc. A limit of 2" expresses a nigh degree of parallelism.

The thickness of flats and plane parallels should not be less than 1/10 diameter.

Engraving

We are equipped to do precise engraving of all varieties excepting only diffraction gratings. In giving specifications for engraving, mention materials, total length or diameter; interval between lines, width of line and tolerance of total run. Also, include a sketch showing what lines are to be extended.

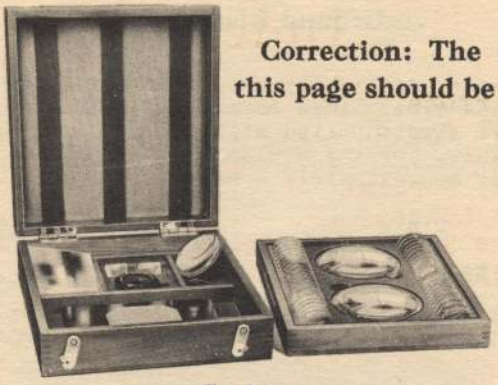
Ground Glasses

These ground glasses are lightly ground on one side, ruled with perpendicular black cross lines 38 mm long in the center of plate. Ground glasses are also supplied with a round cover glass cemented over the cross lines, forming a clear spot of 38 mm diameter. All ground glasses are approximately 2 mm thick.

Size	Plain		With Cover Glass	
	Cat. No.	Price	Cat. No.	Price
5" x 7"	42-14-95-012	$2.25	42-14-95-013	$4.00
8" x 10"	42-14-90-012	3.00	42-14-90-013	5.00

Cover Glasses and Slides

As described on pages 139 - 140 of the Micro Catalog.



Correction: The illustrations on this page should be transposed.

Set No. 1

Lenses Only

1 1/2" Double Convex
2 each - Focal Lengths;
4000, 2000, 1000, 500,
333, 250, 200, 100, 66.7,
50.

1 1/2" Plano Cylinders
2 - 200 mm

1 1/2" Double Concave
2 each - 4000, 2000,
1000, 333, 200, 100,
66.7

Projection Condensers
2 - 4" diameter,
5 1/2" focus

38 Lenses complete in case, #33-19-01-20 $30.00

Set No. 2

Set #2 includes all parts listed under Set #1 and the following Deviation Prisms (Wedge) 42 mm diameter :

2 each, Angle of Deviation
2°, 4°, 8°

2 - 1" face, Right Angle
Prisms

1 Spherical Reflector
2 11/16" diameter, 2 0/32"
focus

1 Plano Plate with cross
lines 1 1/2" diameter

1 Polarizing Mirror
(Black Glass)

1 Analyzer (Halle Prism
Mounted)

1 Ground Glass 4" x 4"

2 Second Surface mirrors
3" x 4"

1 Iris Diaphragm, 1"
opening.

54 Parts complete in case. #33-19-02-40 $70.00

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Bausch & Lomb Optical Products

Magnifiers
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Optical Machinery
Projection Lenses
Searchlight Reflectors
Ophthalmic Instruments
Metallurgical Equipment
Binoculars (Stereo-Prism)
Spectrophotometric Outfits
Spectacle and Eyeglass Frames
Photomicrographic Apparatus
Gun Sights for Army and Navy
Industrial Optical Instruments
Photographic Lenses and Shutters
Projection Apparatus (Balopticon, etc.)

D-10; 1-32.

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