CARL ZEISS
JENA

ZEISS
Photo-Lenses

P 261

ZEISS

Photo Lenses

CARL ZEISS * JENA

Catalogue: *P 261*

Contents.

CARL ZEISS JENA

THE ZUGSPITZE

Two-colour print after an uvachrome-photo taken and reproduced with Zeiss Tessar

On the Choice of a Suitable Lens.

1. Universal Lenses.

In most cases the amateur, no less than the professional photographer, requires the lens which he is about to choose to answer a good deal more than one particular purpose. The desired lens should be available for a wide range of work. It should enable its owner to take instantaneous photographs of every kind, records of sporting events, scenes of familiar and rustic life, portraits, groups, landscapes of every description, both in summer and in winter, seascapes and mountain views; also, he may wish to be able to photograph from air craft, to take views of architectural interest as well as interiors, and he may contemplate the contingency of embarking upon photography in natural colours. He may also wish to use his lens, occasionally at least, for enlarging and projection. Finally, he may deem it desirable not to be debarred from adding, at some future date, a telephoto negative attachment to his primary outfit. The lenses described in the succeeding paragraphs answer these requirements and may accordingly be looked upon as universal lenses. Each of them has some special characteristics which render it adapted for one purpose more particularly than another. It is, therefore, always possible to select a lens which will meet the requirements of a given case in the most adequate manner.

Tessars F/4.5 and F/6.3. These are rapid lenses giving, over a large angle, exquisitely sharp and brilliant pictures, in consequence of which the negatives admit of being enlarged very considerably. — The back lens of the Tessar cannot be used by itself. The Tessar lens is of an entirely dissymmetrical type, and in consequence, no attempt was made to endow the front and back lenses as such separately with even the most modest qualities. The objective was computed with the sole aim of rendering its performance as an inseparable whole as perfect as possible. It will be readily appreciated that this restriction in the composition of the objective leaves the computer far greater freedom in the choice of the various elements, such as the curvatures of the lenses and the kinds of glass which he may employ, than is possible in the case of an objective the front and back components of which are required to be capable of independent use up to a certain point. In consequence of this greater number of available elements the objective embodies a higher degree of correction in a comparatively simple combination consisting of four lenses, two of which are cemented.

The Tessar is therefore the lens *par excellence* for hand cameras with single extension. Since the introduction of our *Distar Lenses,* it is, however, also largely used on cameras with double extension, since the Distar Lenses impart to the Tessar the quality of a long focus lens and even render it available as the principal element of **a very extensive range of combinations** suiting a great variety of purposes (see p. 18 and 19).

The choice between Tessar F/4.5 and Tessar F/6.3 is determined by the following considerations. Tessar F/4.5 is twice as rapid as Tessar F/6.3 when working at full aperture. The latter, however, embraces a wider angle than the Tessar F/4.5, stopped down to F/6.3 (see columns 3 and 4 on page 8). — It is however, a complete error to ascribe to one or the other type superiority in the matter of depth of focus. When stopped down to F/6.3, the Tessar F/4.5 has both the same rapidity and exactly the same depth of focus as the Tessar F/6.3 or any other lens of similar relative aperture and focal length.

Where rapidity is a matter of primary consideration, possessors of a sufficiently rigid camera, provided with a front or shutter admitting of the attachment of the somewhat heavier Tessar F/4.5, will do well to let their choice fall on Tessar F/4.5. Preference may, however, be given to Tessar F/6.3 where the primary requirement is that the camera should be as compact and light as possible and to this end fitted, say, with a lens of shorter focus and embracing

a larger field; and in some cases the choice may be finally decided by the somewhat lower price of the Tessar F/6.3.

The Double Protar has a greatest rapidity of F/6.3, F/7 or F/7.7, according as it is made up of like or unlike Protar Lenses. In the matter of greatest rapidity it is therefore comparable to the Tessar F/6.3. It has, however, the quality that its components may be used separately as long focus lenses, giving sharp images at their full aperture of F/12.5. In many cases they are therefore available for instantaneous work, and there is the further advantage that the components generally differ in their foci*. Those who desire to secure the best pictorial results under the most varied conditions as well as an excellent perspective, and also to be equipped for taking instantaneous photographs cannot do better than provide themselves with a good camera of their favourite plate size with double or triple extension, and furnish it with a Double Protar composed of two component lenses of different foci together with a Compur Shutter. By adding to the Double Protar a third Protar Lens of a slightly different focal length and supplementing the resulting **Convertible Protar Set** by a wide-angle lens proper, say a Protar Lens F/18, together with a tele attachment and suitable yellow screens, a *universal outfit* may be secured which provides a complete range of foci for a given plate size and which satisfies very exacting requirements as regards rapidity (see p. 10, lower half).

2. Special Lenses.

The all-round lenses named in the preceding paragraphs may be employed with good enough results for some of the special and more or less circumscribed purposes to which photography can be applied. It is, however, not difficult to realise that in photographic lenses, as in any other tool which is capable of highly developed specialisation, it is a decided advantage in all cases where the tool is required for a certain restricted purpose to specially develop *one* quality at the expense of others which do not enter into the given purpose. Thus according to circumstances, it may be important in one case to more especially increase the rapidity, in another the covering power, or to shorten the focal length by the development of the telephotographic system, and in yet another it may be deemed of primary importance, to simplify the formula of an objective in order to lessen its weight, size or price.

a) Special Lenses adapted for a wide range of uses.

In this group we include three series of lenses embracing a field which is not so extensive as is the case with the preceding universal lenses in a wider sense. On the other hand, some of the lenses of this group are considerably more rapid and others furnish a means of shortening the camera extension on the tele-photographic principle. At the same time the size of the field of view and the other properties of the lenses, as well as the focal lengths in which they are made, are still of a kind calculated to cover a comparatively wide range of uses. They occupy, in fact, an intermediate position between the universal lenses proper and the special lenses in a narrower sense. They include the following series.

The Tessar F/2.7, like other Tessars, is made up of four lenses with six surfaces only presented to air. At full aperture it is nearly three times as rapid as the universal Tessar F/4.5, while capable of embracing a field of 45 to 50°. Though its composition is simple, in view of its large aperture ratio and large field angle, the quality of the image which it yields meets all requirements which arise when extreme rapidity is a matter of primary consideration. The shorter focal lengths of these new lenses are primarily adapted for cinematographic work, while the intermediate and longer foci serve as extremely rapid snapshot lenses in a poor light on hand cameras, if operated by experienced amateurs, and, above all, meet the requirements of sports and press

* Column 1 on page 10.

photographers. The F/2.7 Tessar is likely to prove particularly successful for taking colour screen photographs of children and animals and snapshots in artificial light (For detailed information see our booklet P 258).

The Triotars F/3.5, that is to say, their shortest foci with a relative aperture of F/3, have a rapidity midway between the universal Tessar F/4.5 and the Tessar F/2.7. The size of the useful field of view of the lens is about the same as that of the Tessar F/2.7, and its range of uses is likewise comparable to that of the Tessar F/2.7, as indicated above, though naturally the rapidity is rather less in view of its smaller relative aperture. On the other hand, its price is less thanks to its simpler composition and the smaller diameter of the lenses. (For detailed information see our booklet P 258).

The Tessar F/6.3 has a quality peculiar to the so-called telephotographic lenses in that the focal length is considerably longer than the camera extension. Thus a half-plate folding camera with an extension of six inches can be fitted with a Tele Tessar of a focal length of 25 cm. (10 inches), whereas the focal length of a standard lens, such as the Tessar may not exceed 15 cm. (6 in). In consequence of this property the Tele Tessar working with the same camera extension and at the same distance from the object as the standard lens furnishes figures which are 60 per cent larger, whilst the width of the scene which it is able to include in the picture is 40 per cent less than in the case of the Tessar. Its covering power conforms to these conditions (see columns 2 and 3 on page 8). — Its greatest rapidity is the same as that of Tessar F/6.3 and one half that of Tessar F/4.5. It defines beautifully sharply and evenly up to the edge, and, its great length notwithstanding, the intensity of the marginal light is similarly uniform, thanks to the large diameter of the back lens. The Tele Tessar is therefore the *beau ideal* of those who wish to be able to take with a hand camera instantaneous photographs showing large figures. It serves accordingly the purposes of amateur photographers for taking pictures of wild animals, including insects and other small creatures, and for portraiture. Above all, its excellent qualities show themselves when used on reflex and other focal plane cameras in the hands of sport and press photographers, who are often enough compelled to operate from unpleasantly long distances, and it is highly valued by portrait photographers, as it provides them with a conveniently portable outfit with a sufficiently rapid long focus lens which they are able to use in the open, away from their studios. (A few further details respecting the Tele Tessar will be found on pages 12, 13 and 14 and in our separate publication P 239).

b) Special Lenses for a smaller range of uses.

The lenses coming within this category may be classfied in accordance with the special purposes for which they are intended. We recommend accordingly:

For **Cinematograph Cameras,** apart from the short focus lenses of the Tessars F/4.5 and, for occassional use when operating from a greatest distance, the Tele Tessar F/6.3, more especially the

Tessars F/2.7 of short focal length
Tessars F/3.5 of short focal length
Triotars F/3 or F/3.5 of short focal length

are being extensively used, notably the lenses of 4 cm. and 5 cm. focus (see page 8, below).

For **Portraiture,** apart from the long focus lenses of Tessars F/6.3 and F/4.5 and the Tele Tessar, the

Tessars F/3.5 with long foci,
Tessars F/5, f = 50 cm. and f = 70 cm.,
Triplets F/4.8, f = 50 cm. and F/5, f = 70 cm.

The latter four lenses, which are of more recent date, are lower in price than the corresponding Tessars F/4.5, this result being obtained in the case of the Tessar F/5 at the expense of rapidity, and in that of the Triplet also at that of the field of view (see columns 2 ond 3, on page 9). In the case

of the Triplet, which is made up of three lenses the field of view is smaller than in the Tessar of four lenses, but it suffices where the lens is mainly required to obtain large heads or single figures.

For Aerial Photography, apart from the long foci of Tessar F/4.5,

Tessar F/5, f = 50 cm. and f = 70 cm.

Triplets F/4.8, f = 50 cm. and F/5, f = 50 cm.

For **Wide-angle Views proper of Architecture and Interiors**, apart from the Double Protars, more especially the

Short focus lenses of the Protar F/18.

For **Process Work**, apart from the long focus lenses of the Protar F/18 and occasionally the Tessar F/6.3, primarily the

Apochromatic Planars and Apochromatic Tessars.

For **Telephotographic Work**, apart from the long focus lenses of the Protar series, the

Tele-Tessar F/6.3,

Magnars F/10, and

Tele-photo Combinations (see pages 12—15 of this catalogue).

Choice of a Suitable Focal Length.

The size of plate or film having been decided upon, there remains only a restricted range of foci from which a selection may be made. For all ordinary purposes it may be accepted as a useful rule that the focal length should be equal to the diagonal of the plate. Thus in the case of a ½-plate the diagonal is 5½ inches; and, by the given rule, the required lens should have a focal length of 5 to 6 inches. It will be seen that in this case the length of the plate is to the focus as 4:5, and a similar ratio will obtain between the width of the scene taken in by the lens and the distance of a central object therein. For example, at a distance of five yards, a scene four yards wide will appear on the plate; whilst at ten yards the plate will show a picture of objects occupying a space 8 yards wide, and at thousand yards the scene included in the picture is 800 yards wide.

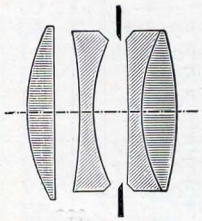
This rule, *"Focus equal to diagonal"*, requires frequent modification. Portraits, groups and scenes of daily life demand rather longer foci in order to secure a good pictorial effect, and the studio cameras as well as field and reflex cameras generally used for these purposes may be readily fitted with larger lenses. On the other hand, in many cases, for instance when photographing architectural objects, machinery and, above all, interiors, it is necessary to employ lenses embracing very wide angles; and in consequence, the focal length of the required lens is very much shorter than would follow from the rule.

The subjoined Tables of Lenses, giving the plate sizes for the various lens series and foci, have been arranged in accordance with the principles here outlined. The scheduled plate sizes must not be taken to exhaust the resources of the respective lenses. In the majority of cases the limits of uniform sharpness extend beyond the figures given, even when the lenses are used with large stops. In order to provide a measure of the extent to which the limits of the plates may be pushed, the diameter of the largest sharply defined picture which is obtainable with small stops is given in a separate column of the tables.

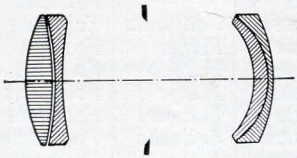
It may not be amiss to append here a word on the exact value of the focal lengths. — It is quite immaterial from the operator's point of view whether the stated focal length conforms exactly within a millimetre to the actual focal length of the lens, nor is it practicable, generally speaking, to maintain such a meticulous conformity. We have therefore for some years abstained from noting in our lists the focal length in terms of millimetres, as this would tend to suggest a greater degree of accuracy than actually obtains in the lenses, and the mounts themselves have the focal lengths inscribed thereon in terms of centimetres.

Types of Zeiss Lenses

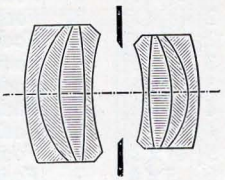
represented diagrammatically in actual size for a focal length of 10 cm. (4 in).



Tessar F/4.5
likewise F/2.7, F/3.5, F.6.3, F/10, F/12.5



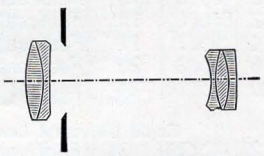
Tele Tessar F/6.3



Douple Protar F/7
likewise F/6.3 or F/7.7

Protar Lens F/12.5

Protar F/18

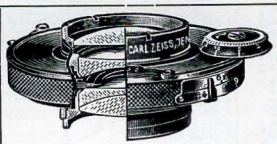


Magnar F/10

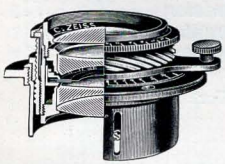
Zeiss Lens Mounts.

The Zeiss Lens Mounts are fitted with Iris Diaphragms, with the exception of the Apochromatic Tessars and the Apochromatic Planars, which are provided, as a rule, with a set of Waterhouse Diaphragms, and are fitted with an Iris Diaphragm to special order only.

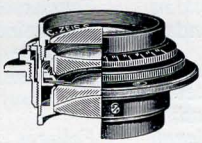
Standard **Mount N** for Travelling and large Stand Cameras with bellow extension.



"Compur" and **"Compound"** Lens Shutter Mount, adapted for the majority of extensible hand cameras, for time and instantaneous exposure.



Focussing **Mount A** for folding and other hand cameras with fixed extension. Mount A protrudes into the camera and has a focussing device for near and far.



Sunk **Mount B** for reflex and folding cameras with variable extension. Mount B protrudes into the camera, but has no focussing device for near and far.

Zeiss Lenses are supplied completely mounted only, i. e. either in one of the above mounts or in conjunction with a lens shutter, as it is only under these conditions that we can vouch for their good performance.

Focal length cm.	Focal length in	Plate size for which recommended in.	Diameter of Circle covered with small stops in.	in Standard "N" Mount	in sunk "B" Mount	in focussing "A" Mount	with "Compur" or "Compound" Shutter	Tube No.[1] for Mounts N B A	Tube No.[1] for Shutter Comp.
				Codewords					
Tessar F/4.5									
Extra Rapid Universal Lens for Amateur and Professional Photographers[2])									
4	1½	1¼×1⅛	2	*Fodicari*	—	—	—	00	—
5.5	2¼	1¾×1¾	2½	*Fodicas*	—	*Folicetur*	*Fondeado* *	00	Cooa
6.5	2½	2×1¾	3	*Fodicassem*	*Foliforme*	*Folleatos*	*Fogbank* *	I	Cooa
7.5	3	2⅜×1¾	3½	*Fodicate*	*Foliga*	*Fodico*	*Fogbell* *	I	Cooa
9	3½	3¼×2¼	4	*Fodicatior*	*Foligno*	*Fodiebat*	*Fogdog* *	I	Co
10.5	4	3¼×2½	5	*Fodicatis*	*Folilet*	*Fodiemus*	*Fogeler* *	II	Co*
12	4¾	3½×2½	5½	*Fodicato*	*Folimort*	*Fodienda*	*Foggage* *	II	Coa
13.5	5¼	4¼×3¼	6	*Fodicatum*	*Folinaha*	*Fodiendus*	*Foggetta* *	IV	III
15	6	5×4	7	*Fodicatura*	*Folio*	*Fodiens*	*Foggettino* *	IV	IV
16.5	6½	5½×3¼	8	*Fodicavere*	*Folioing*	*Fodientem*	*Foggia*	VI	VI
18	7	6½×4¾	8¾	*Fodicavi*	*Foliolado*	*Fodientia*	*Foggiammo*	VI	VI
21	8¼	7½×5	10¼	*Fodicem*	*Foliolas*	*Fodina*	*Foggiante*	VII	VII
25	10	8×5	12¼	*Fodicemur*	*Foliolate*	*Fodinarum*	*Foggiarono*	X	X
30	12	8½×6½	14½	*Fodicent*	*Foliole*	*Fodinis*	*Fondeara*	XII	XII
36	14	9×7	17	*Fodicentur*	—	—	—	XIV	—
40	16	10×8	20	*Fodicere*	—	—	—	XV	—
50	20	12×10	24	*Fodicet*	—	—	—	XVI	—
Tessar F/6.3									
Rapid Universal Lens for Amateur and Professional Photographers[2])									
5.5	2¼	1¾×1¾	3½	*Fodiremo*	—	—	*Fondirse* *	00	Cooa
6.5	2½	2×1¾	3¾	*Fodissemus*	—	*Fodrum*	*Foggiati* *	00	Cooa
7.5	3	2⅜×1¾	4½	*Fodissent*	*Foliolum*	*Foedabam*	*Foggiatore* *	I	Cooa
9	3½	3¼×2¼	5	*Fodit*	*Foliomer*	*Foedabant*	*Foggiava* *§	I	Cooa
10.5	4	3¼×2½	6	*Foltrisch*	*Foluz*	*Foluzes*	*Folyoca* *§	I	Cooa
12	4¾	3½×2½	6¾	*Foditis*	*Foliosa*	*Foedabis*	*Foggier* *§	I	Co
13.5	5¼	4¼×3¼	8	*Foditur*	*Foliosame*	*Foedabor*	[3])*Fogginess* *§	II	Co
15	6	5×4	8¼	*Fodivano*	*Folioses*	*Foedae*	*Foggiolla* *§	II	Co*
16.5	6½	5½×3¼	9	*Fodoli*	*Foliosim*	*Foedamus*	*Foggun* *§	III	C¹
18	7	6½×4¾	10½	*Fodorum*	*Foliosior*	*Foedandi*	*Fogless*	IV	IV
21	8¼	7½×5	12¼	*Fodrai*	*Foliosum*	*Foedandos*	*Foglia*	IV	IV
25	10	8×5	15	*Fodrammo*	—	—	*Fogliamo*	VI	VI
30	12	8½×6½	17¼	*Fodrando*	—	—	*Fogliasti*	X	X
36	14	9×7	21	*Fodrarium*	—	—	*Fogliatura*	X	X
50	20	10×8	28	*Fodrati*	—	—	—	XIV	—
60	24	12×10	33½	*Fodravano*	—	—	—	XV	—
Tele Tessar F/6.3									
Rapid Telephoto Lens giving a long focus with short camera extensions									
18	7	3¼×2½	5¼	*Fondait*	*Fondare*	*Fondatare*	*Fondation*	IIIT	IIIT
25	10	5×4	7¼	*Fondament*	*Fondarono*	*Fondateur*	*Fondator*	VIT	VIT
32	12½	5½×3¼	9½	*Fondan*	*Fondasses*	*Fondatie*	*Fondatore*	VIIT	VIIT
40	16	7½×5	12	*Fondante*	*Fondasim*	—	*Fondatoris*	XT	XT
Tessar F/3.5									
Very Rapid Short Focus Lens for Cinematographic Work									
3.5	1⅜	¾×½	1	*Folcemmo*	—	*Folcire*	—	00	—
4	1½	1×¾	1¼	*Fonditoi*	—	*Fongate*	—	00	—
5	2	1×¾	1⅜	*Folcenti*	*Follares*	*Folciremmo*	—	I	—
7.5	3	1¼×1⅛	2¼	*Folcette*	*Follaria*	*Folciuto*	—	I	—
10	4	1¾×1¾	3¾	*Folciranno*	*Follarlen*	*Fold*	—	III	—

[1]) Respecting the appropriate yellow glass screens, Ducar filters and Distar Lenses see pp. 16. 17 and 19. — [2]) Respecting Distar Lenses for supplementary attachment to Tessars on cameras with double extension see p. 19 of this catalogue. — [3]) In Compur shutter, likewise f=13 cm., *"Foggieremo"*. — *) These Tessars are likewise available for use as *paired lenses in Stereo shutters*. — §) These Tessars may also be supplied in Ibso shutters, which automatically rewind when released for exposure and which are a little lower in price than the Compur shutters.

For Prices see separate Leaflet.

Focal length cm.	Focal length in.	Plate size for which recommended in.	Diameter of Circle covered with small stops in	in Standard "N" Mount	in sunk "B" Mount	in focussing "A" Mount	with "Compur" or "Compound" Shutter	Tube No. [1] for Mounts N B A	Tube No. [1] for Comp. Shutter
				Codewords					
Tessar F/3.5									
Very Rapid Lens for Portrait and Special Work.									
21	$8\frac{1}{4}$	$3\frac{1}{2}\times2\frac{1}{2}$	6	*Foldage*	—	*Fongea*	—	X	—
25	10	5×4	7	*Folderols*	—	*Fongeant*	—	XII	—
30	12	$6\frac{1}{2}\times4\frac{3}{4}$	$8\frac{1}{4}$	*Folding*	—	—	—	XIV	—
Tessar F/2.7									
An extremely rapid lens.									
1.5		$\frac{1}{2}\times\frac{1}{4}$	—	*Fontanella*	—	*Fontanuse*	—	00	—
2.5		$\frac{1}{2}\times\frac{1}{4}$	—	*Fontanaria*	—	*Fontecica*	—	00	—
3.5		$1\times\frac{2}{4}$	—	*Fontaneros*	—	*Fonteio*	—	Coo	—
4		$1\times\frac{3}{4}$	—	*Fontanesia*	*Fontanol*	*Fonteiora*	*Foolsam*	I	—
5		$1\times\frac{3}{4}$	—	*Fontanetta*	*Fontanone*	*Fontema*	*Foolscap*	I	—
8		$2\frac{3}{8}\times1\frac{3}{4}$	—	*Fontaneus*	*Fontanorum*	*Fontenier*	*Fooltrap*	III	III
10		$2\frac{1}{2}\times2\frac{1}{2}$	—	*Fontange*	*Fontanosi*	*Fontezinha*	*Fontezuela*	IV	IV
12		$3\frac{1}{2}\times2\frac{1}{2}$	—	*Fotania*	*Fontanosol*	*Footballs*	*Footland*	VI	VI
14.5		$3\frac{1}{2}\times2\frac{1}{2}$	—	*Footman*	*Footmark*	*Footmuff*	*Footnote*	VIIT	VIIT
16.5		5×4	—	*Fontaniere*	*Fontanum*	*Fonthill*	*Footbase*	X	X
Triotar F/3 and F/3.5									
A very rapid lens for cinematograph and focal plane cameras.									
1.5		$\frac{1}{2}\times\frac{1}{4}$	—	*Fontibus* [2]	—	*Foodyl*	—	00	—
2.5		$\frac{1}{2}\times\frac{1}{4}$	—	*Fonticina* [2]	—	*Fool*	—	00	—
3.5		$1\times\frac{3}{4}$	—	*Fonticolis*	—	*Foolborn*	—	00	—
4		$1\times\frac{3}{4}$	—	*Fonticolor*	—	*Foolduck*	—	00	—
5		$1\times\frac{3}{4}$	—	*Fonticule*	*Fontyn*	*Fooled*	*Footbench*	I	—
7.5		$2\frac{3}{8}\times1\frac{3}{4}$	—	*Fonticulum*	*Fonvielle*	*Fooleries*	*Footblower*	II	II
10		$2\frac{1}{2}\times2\frac{1}{2}$	—	*Fontigena*	*Fooda*	*Foolhen*	*Footboard*	III	III
12		$3\frac{1}{4}\times2\frac{1}{2}$	—	*Fontigenel*	*Foodful*	*Foolified*	*Footbridge*	IV	IV
15		$3\frac{1}{2}\times2\frac{1}{2}$	—	*Fontigenis*	*Foodless*	*Fooling*	*Footcloth*	VI	VI
18		5×4	—	*Fontinal*	*Foodplant*	*Foolish*	*Footcope*	VII	VII
21		$5\frac{1}{2}\times3\frac{1}{4}$	—	*Fontinales*	*Foodstuff*	*Foolkiller*	*Footed*	X	X
Tessar F/5									
Rapid Lens for Portraiture, Groups and Aerial Work.									
50	20	24×30	$16\frac{1}{2}$	*Fongees*	—	—	—	XV	—
70	28	30×40	$21\frac{3}{4}$	*Fongeons*	—	—	—	XVII	—
Triplet F/4.8									
Rapid Lens for Portraiture and Aerial Work.									
50	20	$7\frac{1}{2}\times5$	10	*Fonger*	—	—	—	XV	—
70	28	9×7	$12\frac{3}{4}$	*Fongerai* [3]	—	—	—	XVII	—
Protar F/18									
Wide Angle Lens for Panoramic Views, Architecture, Interiors and Technical Photography.									
4	$1\frac{1}{2}$	$2\frac{1}{4}\times1\frac{1}{4}$	4	*Foedent*	—	—	—	Coo	—
6	$2\frac{1}{2}$	$3\frac{1}{4}\times2\frac{1}{4}$	6	*Foederabo*	—	—	—	Coo	—
8.5	$3\frac{1}{2}$	$4\frac{1}{4}\times3\frac{1}{4}$	$8\frac{1}{2}$	*Foederamus*	*Folkfree*	—	—	Co	—
11	$4\frac{1}{2}$	$6\frac{1}{2}\times4\frac{3}{4}$	11	*Foederans*	*Folking*	—	—	Co	—
14	$5\frac{1}{2}$	$7\frac{1}{2}\times5$	14	*Foederat*	*Folkland*	—	—	C1	—
18	7	$8\frac{1}{2}\times6\frac{1}{2}$	16	*Foederatio*	*Folklore*	—	—	C1	—
21	$8\frac{1}{4}$	10×8	$21\frac{1}{4}$	*Foederem*	*Folkloric*	—	—	C1	—
27	$10\frac{1}{2}$	12×10	$26\frac{3}{4}$	*Foederent*	*Folkmoot*	—	—	III	—
32	$12\frac{1}{2}$	14×10	$31\frac{1}{2}$	*Foedris*	—	—	—	III	—
39	$15\frac{1}{2}$	15×12	$33\frac{1}{2}$	*Foederor*	—	—	—	III	—
46	18	15×12	40	*Foederum*	—	—	—	III	—
63	25	20×16	46	*Foedi*	—	—	—	VI	—

1) Respecting the appropriate Yellow Glass Screens, Ducar Filters, and Distar Lenses see pp. 16, 17 and 19.
2) Relative aperture F/3.
3) Relative aperture F/5.

For Prices see separate Leaflet.

Protar Lens F/12.5

Single Lens with Front Stop for Landscapes and Portraits.

Focal length inches: Front Lens	Back Lens	whole System	Rel. Ap. F/	Plate size for which recommended in.	Diameter of Circle covered with small stops in.	in Standard "N" Mount	in sunk "B" Mount	with "Compur" or "Compound" Shutter	Tube No.[1] for Mounts N and B	Tube No.[1] for Comp. Shutter
						Codewords				
18 cm. = 7 in.			12.5	$6\frac{1}{2}\times4\frac{3}{4}$	9	*Foeneos*	*Foetal*	*Folle*	I	C°
22 „ = $8\frac{3}{4}$ „			„	7×5	11	*Foeniculi*	*Foeteam*	*Folleam*	II	C°
29 „ = $11\frac{1}{2}$ „			„	$8\frac{1}{2}\times6\frac{1}{2}$	15	*Foenile*	*Foetebas*	*Folleant*	III	III
35 „ = 14 „			„	10×8	18	*Foenilium*	*Foetebimus* *)	*Folleare*	IV	IV
41 „ = 16 „			„	12×10	21	*Foenisex*	*Foetebo*	*Folleata*	VIII	VIII
48 „ = 19 „			„	14×11	$24\frac{1}{2}$	*Foenoris*	*Foetebunt*	*Folleatir*	VIII	VIII
59 „ = 23 „			„	15×12	$30\frac{1}{2}$	*Foenus*	*Foetemus*	*Fonghi*	X	X
99 „ = 27 „			„	18×14	$35\frac{1}{2}$	*Foesne*	*Foetendos*	*Fongia*	XII	XII

*) Like the lenses of our other series, Protar Lenses are not supplied without tube-mounts. They require to be fitted by us to one of our mounts A, B, N or to a shutter, as it is only in this way that we can accept responsibility for the good performance of the lenses. The cost of adaptation varies according to circumstances.

Double Protar F/6.3 to F/7.7

Rapid Universal Lens consisting of two Protar Lenses.

Front Lens	Back Lens	whole System	Rel. Ap. F/	Plate size for which recommended in.	Diameter of Circle covered with small stops in.	in Standard "N" Mount	in sunk "B" Mount	with "Compur" or "Compound" Shutter	Tube No.[1] for Mounts N and B	Tube No.[1] for Comp. Shutter
		inches				Codewords				
7	7	4	6.3	$3\frac{1}{2}\times2\frac{1}{2}$	$6\frac{3}{4}$	*Foetens*	*Follage*	*Fogonero*	I	C°
$8\frac{3}{4}$	7	$4\frac{1}{2}$	7	$4\frac{1}{2}\times3\frac{1}{4}$	7	*Foetenti*	*Follageria*	*Fogones*	II	C°
$11\frac{1}{2}$	7	5	7.7	$4\frac{1}{4}\times3\frac{1}{4}$	8	*Foetere*	*Follagese*	*Fogonillo*	III	III
$8\frac{3}{4}$	$8\frac{3}{4}$	5	6.3	$4\frac{1}{2}\times3\frac{1}{4}$	8	*Foetescit*	*Follais*	*Fogos*	II	C°
$11\frac{1}{2}$	$8\frac{3}{4}$	$5\frac{3}{4}$	7	5×4	9	*Foetescunt*	*Follammo*	*Fogisidade*	III	III
14	$8\frac{3}{4}$	6	7.7	$5\frac{3}{4}\times4$	10	*Foetet*	*Follamos*	*Fogring*	IV	IV
$11\frac{1}{2}$	$11\frac{1}{2}$	$6\frac{3}{4}$	6.3	$6\frac{1}{2}\times4\frac{3}{4}$	$10\frac{1}{4}$	*Foetida*	*Follando*	*Fogsmoke*	III	III
14	$11\frac{1}{2}$	$7\frac{1}{4}$	7	$7\frac{1}{2}\times5$	$11\frac{1}{2}$	*Foetidabo*	*Follanse*	*Fogueado*	IV	IV
16	$11\frac{1}{2}$	8	7.7	$7\frac{1}{2}\times5$	$12\frac{1}{4}$	*Foetidans*	—	*Fogueamos*	VIII	VIII
14	14	8	6.3	$7\frac{1}{2}\times5$	$12\frac{3}{4}$	*Foetidem*	*Follar*	*Foguease*	IV	IV
16	14	$8\frac{3}{4}$	7	8×5	$13\frac{1}{2}$	*Foetidor*	—	*Fogueen*	VIII	VIII
19	14	$9\frac{1}{4}$	7.7	$8\frac{1}{2}\times6\frac{1}{2}$	$14\frac{1}{2}$	*Foetor*	—	*Foguero*	VIII	VIII
16	16	$9\frac{1}{2}$	6.3	$8\frac{1}{2}\times6\frac{1}{2}$	$14\frac{1}{2}$	*Foetoribus*	—	*Fohismus*	VIII	VIII
19	16	$10\frac{1}{4}$	7	9×7	16	*Foetosi*	—	*Foible*	VIII	VIII
23	16	11	7.7	9×7	$17\frac{1}{4}$	*Foetosorum*	—	*Fongiez*	X	X
19	19	11	6.3	9×7	$17\frac{1}{4}$	*Foetosos*	—	*Follebas*	VIII	VIII
23	19	$12\frac{1}{4}$	7	9×7	19	*Foetutina*	—	*Fongiform*	X	X
27	19	13	7.7	10×8	$20\frac{1}{2}$	*Fofinho*	—	*Fongipore*	XII	XII
23	23	13	6.3	10×8	$21\frac{1}{4}$	*Fofos*	—	*Fonica*	X	X
27	23	$14\frac{1}{2}$	7	12×10	23	*Fog*	—	*Fonicor*	XII	XII
27	27	16	6.3	12×10	25	*Fogaban*	—	*Fonil*	XII	XII

Selected Convertible Protar Sets.

Protar Set	Plate Size in.	Available Focal Lengths in cm. Components	Doublet	Standard Mount N	Compur or Compound Shutter	Tube Numb. for N Mount	Tube Numb. for Comp.
Bo	5×4	29 22 18	14.5 13 11.5	*Foliatim*	*Foliatume*	III	III
C	$7\frac{1}{2}\times5$	35 29 22	18.5 15.5 14.5	*Foliatiora*	*Folichom*	IV	IV
D	9×7	48 41 35 29	26 23.5 22 20 18.5	*Foliatorum*	*Folicula*	VIII	VIII

Usual Accessories to the Protar Sets.

Protar Set	Wide Angle Protar F/18 (see p. 9)	Telephoto Attachment (see pp. 14 and 15)	Yellow Glass Screens (see p. 16) Light [ab. 5×]	Dark [ab. 10×]
Bo	*Foederamus*	*Folaria*	*Folette*	*Folgaz*
C	*Foedeans*	*Folaro*	*Folga*	*Folgazano*
D	*Foederat*	*Folatre*	*Folgado*	*Folidandra*

*1) Respecting the appropriate Yellow Glass Screens, Ducar Filters, and Distar Lenses see pp. 16, 17 and 19.

For Prices see separate Leaflet.

Process Lenses and Appliances.

Detailed Particulars will be found in our Booklet P 228.

Process Lens in N Mount	Relative Aperture	Focal Length f cm.	Focal Length f in.	Sharply covered size of plate 1:1 cm.	Sharply covered size of plate 1:1 in.	Sharply covered size of plate 1:2 cm.	Sharply covered size of plate 1:2 in.	Codeword	Recommended for use with the specified lens: Prism No.	Mirr. No.	Trough No.	Revolv. Coll. No for Prism	Revolv. Coll. No for Mirr
Apo-Tessar	F/9	32	12½	24×30	12×10	18×24	9×7	*Focone*	3	—	1	4	—
	F/10	46	18	40×50	15×12	30×40	15×12	*Focorum*	4	5	2	5	6
	F/10	64	25	50×60	25×21	40×50	18×16	*Focosetta*	6	6	2 a	8	9
	F/10 5	84	33	70×80	30×28	50×60	25×21	*Focosino*	7	7	3 a	9	9 a
	F/12.5	117	46	80×90	35×32	60×70	28×25	*Focot*	8	8	4	10	—
	F/15	150	60	90×120	48×35	70×80	30×28	*Fonkelde*	8	8	4	10	—
	F/15	180	71	120×150	60×48	90×100	40×35	*Foculabam*	9	9	—	11	—
Apo-Planar	F/7.5	41	16½	35×45	18×16	26×35	15×12	*Foculabunt*	4	5	2	5	6
	F/9	59	23	45×55	25×21	35×45	18×16	*Foculamini*	6	6	2 a	8	9
	F/10	80	31½	65×75	30×25	45×60	25×21	*Foculamur*	7	7	3 a	9	9 a
	F/10	105	41½	75×85	35×30	65×70	28×25	*Foculans*	8	8	4	10	—
	F/12.5	130	51	90×100	40×35	70×80	30×28	*Foculantia*	8	8	4	10	—
	F/12.5	170	67	120×150	60×48	90×100	40×36	*Foculare*	9	9	—	11 a	—
Protar	F/18	32	12½	24×30	12×10	18×24	9×7	*Focinola*	2	—	1	3	—
	F/18	39	15½	26×35	15×12	20×25	10×8	*Foco*	3	—	1	4	—
	F/18	46	18	30×40	15×12	24×30	12×10	*Focolare*	3	—	1	4	—
	F/18	63	25	40×50	18×16	30×40	15×12	*Focolarone*	4	—	1	5	—

Reversing Prism	Small side cm.	Small side in.	Codeword
No. 2	3.5	1.4	*Fodanti*
„ 3	4.5	1.8	*Fodantium*
„ 4	6	2.4	*Fondarem*
„ 5	7.5	3.0	*Fodaremus*
„ 6	9	3.5	*Fodarere*
„ 7	10.5	4.1	*Fodarier*
„ 8	12.5	4.9	*Fodat*
„ 9	17.5	6.9	*Fodatior*

Reversing Mirror	Diameter of Oval Surface cm.	Diameter of Oval Surface in.	Codeword
No. 5	6× 8.5	3.3×2.4	*Fodatuiska*
„ 6	8×11.5	4.5×3.1	*Fodatorum*
„ 7	10×14	5.5×3.9	*Fodatum*
„ 8	12×17	6.7×4.7	*Fodatura*
„ 9	14×20	7.9×5.5	*Fodaturius*

Filter Trough	Diameter Clear cm.	Diameter Clear in.	Diameter Aperture cm.	Diameter Aperture in.	Codeword
No. 1	6	2.4	5	2.0	*Foculator*
„ 2	8	3.1	7	2.8	*Foculaturi*
„ 2 a	9.5	3.7	8.5	3.3	*Foculi*
„ 3	11	4.3	10	3.9	*Foculorum*
„ 3 a	12.5	4.9	11	4.3	*Foculos*
„ 4	14	5.5	12	5.0	*Foculum*

Revolving Collar	Codeword	Inside Screw Diameter		Outside Diameter	
No. 2	*Fodabam*	39 mm.	1.52 in.	74 mm.	2.91 in.
„ 2 a	*Fodabamur*	44 „	1.73 „	74 „	2.91 „
„ 3	*Fodabant*	56 „	2.20 „	94 „	3.60 „
„ 4	*Fodabare*	66 „	2.59 „	110 „	4.32 „
„ 5	*Fodabit*	76 „	2.98 „	122 „	4.79 „
„ 6	*Fodabo*	90 „	3 53 „	146 „	5.73 „
„ 8	*Fodamini*	112 „	4.40 „	170 „	6.68 „
„ 9	*Fodanda*	121 „	4.76 „	185 „	7.26 „
„ 9 a	*Fodandior*	133 „	5.22 „	200 „	7.85 „
„ 10	*Fodandos*	160 „	6.28 „	244 „	9.60 „
„ 11	*Fodans*	193 „	7.59 „	300 „	11.80 „
„ 11 a	*Fodaturos*	193 „	7.59 „	300 „	11.80 „

R-Yellow Filters	No.	Codeword	For use with Apotessar
Set of three, light, intermediate and dark, in case	X	*Fonkelen*	f = 46 cm
	XII	*Fonkeling*	f = 64 „
	XIV	*Fonneuse*	f = 84 „

R-Colour Filters	No.	Codeword	For use with Apotessar
Set of three, red, green, blue, in case	X	*Fonolite*	f = 46 cm.
	XII	*Fonologia*	f = 64 „
	XIV	*Fonomet*	f = 84 „

Focussing Microscope: Magnifying 28 for fine process work. Codeword: *Fodaturum*

Focussing Lens A mounted in sliding tube for amateurs, professional photographers, and process workers 6 or 10×

Magnificat.	Focal Length		Diameter		Codeword
6×	4 cm.	1½ in.	21 mm.	0.8 in.	*Fodaveras*
10×	2.5 „	1 „	11 „	0.4 „	*Fodavero*

Viewing Appliances for Stereo Photographs.

For particulars of Stereo Pictures on paper and glass, etc. see separate Leaflet P 236

Zeiss Stereoscope with simple pair of eyepieces	f = 15 cm., in wooden case		*Fondada*
„ „ „ achromatic pair of eyepieces	f = 10 cm., „ „ „		*Fondador*
„ „ „ pairs of eyepieces and	f = 15 cm., „ „ „		*Fontalem*
„ Verant Stereoscope with Verant Lenses	f = 9 cm., „ „ „		*Fontanalem*

For Prices see separate Leaflet.

Telephotographic Objectives.

The term "telephotographic lens" applies to that species of optical combinations in which the image formed by a converging front component is magnified by a diverging back component, situated at a considerable distance from the latter, before the rays forming it can reach the ground glass screen. When the ultimate image is formed under these conditions it is found that the required camera extension becomes shorter, and, indeed, under certain circumstances very much shorter, than the focal length of the image-forming combination. For this reason *telephotographic combinations furnish larger figures in the picture than lenses of the standard types,* such as the Tessars, *when operating with the same camera extension, other things being equal.* It will be readily realised that the further this special advantage of the telephotographic lens, viz. the shortening of the camera extension, is carried, the greater will be the concessions which have to be made in other respects, such as those affecting the rapidity, field of view, weight and mechanical length of the combination itself. So long as the front and back component are mutually adjusted and corrected, like the immovable components of a standard photographic objective, so as to furnish only one specified focal length, the required result is obtained by a moderate degree of sacrifice of other optical qualities, but the necessary compromise assumes a very different aspect where it is required that *the resulting focal length of the combination shall be variable within wide limits* by mere variation of the distance between the front and back components. In the "compound telephotographic lenses" this requirement has been fulfilled ever since their inception by correcting to the utmost degree the converging and diverging components independently, and by employing as a rule for the converging component a photographic doublet of the standard type, such as the Tessar or Double Protar.

We make three distinct classes of telephoto lenses. Stated in the order in which they came into being, they are: —

The **Telephoto Combinations,** which consist of a standard lens (viz. a Tessar, Double Protar, etc.) and *Tele Negative,* the latter being connected with the positive component by means of a *Tele Tube* of fixed length (Nos. I, Ia, Ib), or of variable length Nos. (II, III, IV).

The **Magnar F/10**, which is available for use as an inseparable whole only, and which reduces the camera extension in a very pronounced degree.

The **Tele Tessar F/6.3,** which likewise can only be used as an inseparable whole and which reduces the camera extension by a moderate amount.

The following table and sketches may serve to furnish a general comparison of the performances and optical particulars of the above types of telephoto lenses as contrasted with the Tessar F/4.5 as a repesentative of the class of standard doublet. It is assumed that all the lenses are used on a 12×9-cm. camera.

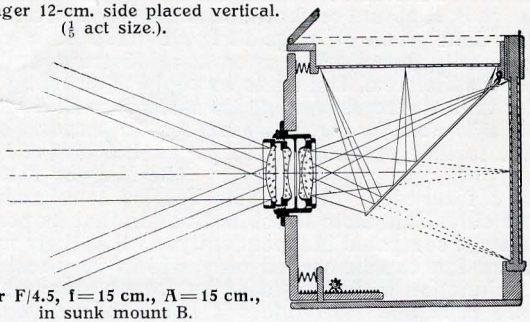
12×9-cm. camera lenses, as shown diagrammatically on page 13.		Tessar	Tele-Tessar	Magnar	Telephoto Combination Tube No. I	Tube No. II
Focal length	f =	15 cm.	25 cm.	45 cm.	50 cm.	90 cm. *
Extension (Camera front to focussing screen)	A =	15 „	15 „	15 „	15 „	30 „ *
Relative aperture		F/4.5	F/6.3	F/10	F/30	F/54 *
Comparative rapidities (F/4.5 being taken as 100)		100	50	20	2	0.7 *
Angular extent 2*w* of objects appearing on the 12×9-cm. plate	Diagonal 15 cm.	53°	33.5°	19°	17°	9.5° *
	Long side 12 cm.	43.5°	27°	15°	13.5°	7.5° *
Extent of objects shown on the long side of the plate	at 100 metres	80 m.	48 m.	26.5 m.	24 m.	13.5 m. *
	at 3 metres	2.3 „	1.3 „	0.7 „	0.6 „	0.3 „
Size in picture of a house 10 metres high, at 100 metres		1.5 cm.	2.5 cm.	4.5 cm.	5 cm.	9 cm. *
Size in picture of head 25 cm. high at 3 metres		1.3 „	2.3 „	4.4 „	5 „	10.7 „ *

*) Variable within wide limits.

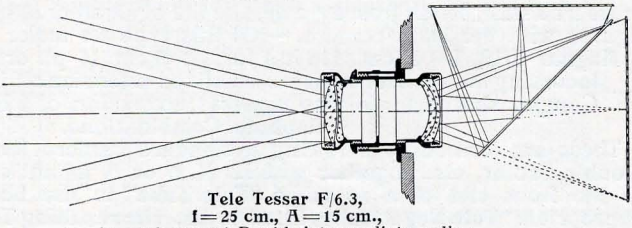
For Prices see separate Leaflet.

9×12 cm. / 4¾×3½ in. -Hand Camera focussed for distant objects.

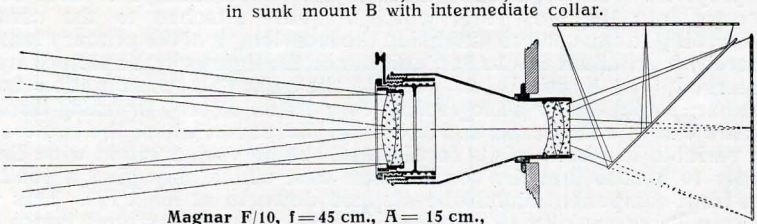
Longer 12-cm. side placed vertical.
(⅕ act size.).



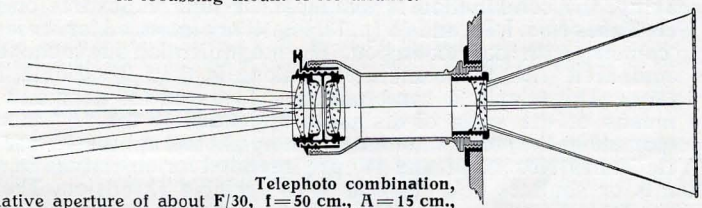
Tessar F/4.5, f=15 cm., A=15 cm.,
in sunk mount B.



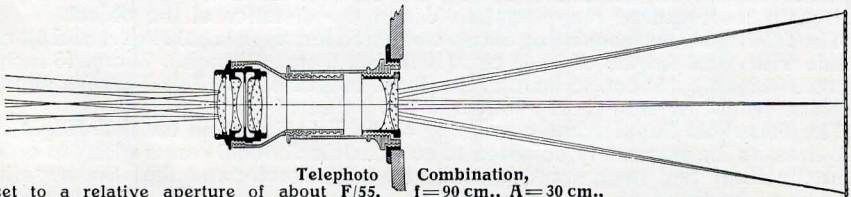
Tele Tessar F/6.3,
f=25 cm., A=15 cm.,
in sunk mount B with intermediate collar.



Magnar F/10, f=45 cm., A= 15 cm.,
in focussing mount A for disance.



Telephoto combination,
adjusted for a relative aperture of about **F/30, f=50 cm., A=15 cm.,**
made up of Tessar F/4.5, f=15 cm. in mount A and *Tele Negative* f=6 cm., combined by means of *Tele Tube No. I* (shown by shaded lines) of invariable lengths: Focussing for near and distant objects is effected by the 'A' Mount of the Tessar with the aid of the scale appended thereto.



Telephoto Combination,
set to a relative aperture of about **F/55, f=90 cm., A=30 cm.,**
made up of Tessar F/4.5, f=15 cm. in mount B and *Tele Negative* f=6 cm combined by means of *Tele Tube No. II* (shown by shaded lines), the length of which can be varied, by a trapezoid screw thread, for near and distant objects and for different magnifications and camera extensions (see p. 15).

For Prices see separate Leaflet.

The Tele Tessar F/6.3

does not differ in its management from a camera lens of the standard type in an N, B, A Mount or shutter, as will be seen from the diagrams on page 13. From the data given on page 12 it will have been seen that the Tele Tessar is not primarily to be looked upon as an instrument designed for taking photographs from a distance. Thanks to its rapidity and long focus it is particularly valuable for taking *records showing the habits of small creatures, for photographing animals in the wild state, for portraiture and for the purposes of sports and press photographers.* For further particulars see pages 4, 5 and 8.

The Magnar F/10

is a forerunner of the Tele Tessar. It resembles the latter and differs from the older Telephoto Combinations in that its positive and negative components are not corrected independently, so that their mutual position and the camera extension can be varied only within very restricted limits. Its fair rapidity in conjunction with the great focal length obtainable with short camera extension (see p. 12 and 13) renders it specially well adapted *for photographing animals in the wild state, details from air craft,* the life of small creatures and large portrait figures with the hand camera. — Of this type we make one size only, viz. —

Magnar F/10, f = 45 cm., (18 in.) for 12×9 cm. (¼ pl. or 5×9 in.), in
focussing mount A for cameras with fixed extension of 6 in. Codeword: *Foiselle*
Compur shutter for folding cameras, extension of 6 in. „ : *Fontanal*

Telephoto Combinations.

These are formed by screwing a standard camera lens, such as a Tessar, Double Protar, etc., together with its N, B or A mount or its Compur shutter to the front end of a so-called **"Tele Tube"** to the back end of which the appropriate **"Tele Negative"** is fitted by us. The resulting Telephoto Combination screws into the lens ring, which remains attached to the camera front. According to the camera extension the focal length of the primary lens increases thereby from about 3½× to 8×, and hence the figures in the picture are similarly enlarged (see Synopsis on page 15, below). This combination is therefore primarily adapted *for photographing very distant objects, for taking details of architecture and in a landscape,* and such like. Moreover, where the camera extension is variable it admits of its focal length being varied within wide limits. — In order to ensure that the combination as a whole may give a good definition the front component should be stopped down to at least F/9. This will cause the resulting rapidity to diminish to F/30 or even less, and hence, generally speaking, the combination is available for time exposures only.

Tele Tubes Nos. I, Ia, and Ib (p. 13, Fig. 4) are intended for lenses in "A" mounts and cameras with fixed extension. The magnification due to the tele-combination as compared with the camera lens alone is then invariable, being as a rule 3 to 4×. The telephoto combination is focussed for near and distant objects by means of the scale of distances appended to the "A" mount of the front component in the same manner as when photographing in the ordinary way.

Tele Tubes Nos. II, III and IV are intended for objectives in standard or "B" mounts or shutters and cameras with variable extension. They are provided with a focussing screw (p. 13, Fig. 5) having a scale which reads the value in millimeters of the interval Δ occuring in the annexed tables. This enables the operator to set the combination, with any camera extension which he may be using, to the required magnifigation V and the distance of the object.

The Telenegatives, consisting of two cemented lenses (see p. 13 figs. 4 and 5), are made with *focal lengths* of f = 4½ cm. (1¾ inch.), 6 cm. (2⅜ inch.), 7½ cm. (3 inch.), 10 cm. (4 inch.), 15½ cm. (5 inch.), The focal length of the *Tele Negative* should preferably not be less than about one third that of the camera lens.

The **Telephoto Supplement,** consisting of the Tele Tube and the Tele Negative, requires to be accurately adjusted to suit each individual camera lens in order that the front and back screw threads may fit exactly and that the negative lens may be fixed at a proper position within the tube. For this purpose it is advisable to send the lens to the works for adaptation. At the very least the whole of the inscription engraved on the objective should be quoted.

Tele Tubes.

Tube No.	Tube Length variable by mm.	Tube Length variable for ex. for Δ*	Suitable for: TeleNegative f₂ cm.	Camera Lens: in Tube of size No.) A Mount	Camera Lens: N, B Mount Comp.	Camera Lens: for example Tessar F/4.5 f₁ cm.	Camera Lens: for example Tessar F/6.3 f₁ cm.	Camera Lens: for example Double Prot. f₁ cm.
I	—	—	4½ a. 6	up to IV	—	up to 15	up to 18	—
Ia	—	—	6 „ 7½	„ „ VII	—	16.5 „ 21	—	—
Ib	—	—	7½ „ 10	„ „ XII	—	25 „ 30	—	—
II	12	5 to 17 or 10 to 22	4½ a. 6	—	up to VI	up to 18	up to 18	29/22
III	20	5 to 25 or 10 to 30	6 „ 7½	—	„ VIII	„ 21	„ 21	35/35
IV	32	10 to 42	10 „12½	—	„ XII	„ 30	„ 36	69/59

*) According to limits imposed by the camera extension and the Tele Negative (see two tables at the bottom of the page). **) See two last columns on pages 8 to 10).

Usual Supplements for Hand Cameras.

For Size of Camera	Focal Length of Lens cm	Fixed Camera Extension Lens in 'A' mount Tele Attachment Tube/Negative	Fixed Camera Extension Codeword	Variable Camera Extension Lens in 'N' or 'B' mount, or in Comp.* Tele Attachment Tube/Negative	Variable Camera Extension Codeword
6×9	10.5 and 12	I / 4½	*Foladina*	II / 4½	*Folaga*
9×12	13.5 „ 15	I / 6	*Foland*	II / 6	*Folaria*
10×15	16.5 „ 18	Ia / 6	*Folaro*	II / 6	*Folaria*
13×18	18 „ 21	Ia / 7½	*Folatrant*	III / 7½	*Folatre*

*) Assuming that the camera lens together with shutter in use may be screwed off or unlocked from the camera.

Optical Interval Δ*), Camera extension K**), Prolongation B of Exposure.

The magnification V being given: $\Delta = f_2 : V$; $K = (V-1)$; $f_2\ B = V^2$

Telenegative f →	4½ cm		6 cm		7½ cm		10 cm		12½ cm	
V	B	Δ mm	K cm	Δ mm	K cm	Δ mm	K cm	Δ mm	K cm	Δ mm	K cm
3	9	15	9	20	12	25	15	33.3	20	41.7	25
3½	12	13	11.5	17	15	21.5	19	28.6	25	35.7	31
4	16	11.3	13.5	15	18	19	22.5	25	30	31.3	37
4½	20	10	16	13.5	21	16.5	26	22.2	35	27.8	44
5	25	9	18	12	24	15	30	20	40	25	50
6	36	7.5	22.5	10	30	12.5	37	16.7	50	20.8	63
7	49	6.5	27	8.5	36	11	45	14.3	60	17.9	75
8	64	5.5	31.5	7.5	42	9.5	52	12.5	70	15.6	88

*) To be set by the scale on Tubes Nos. II, III and IV. **) The value of K is reckoned from the centre of the Tele Negative. In Tubes No. I, Ia, Ib and II the latter is situated approximately in the plane of the screw collar but in the case of Tubes Nos. III and IV it is placed towards the interior of the camera 4 to 10 cm. from the screw collar, so as to obtain a better balance of the weight. In the cases of Tubes Nos. III and IV the requisite camera extension will accordingly be greater by this amount than the values of K stated in the table.

Diameter in centimetres of the Image attainable in the Tele Combinations.

Set to Δ*)	Anastigmatic Front Component f₁ (e. g. Tessar, Double Protar) →	9	10.5	12	13.5	12	13.5	15	16.5	18	18	21	25	30	36 cm
	Telenegative f₂ →	4½ cm.				6 cm.					7½ cm.		10 cm.		12½ cm.
	K = 9 cm.	9.0	—	—	—	—	—	—	—	—	—	—	—	—	—
	K = 12 „	11.5	11.5	11	10.5	12.5	12	11.5	11	11	—	—	—	—	—
	K = 15 „	14	14	14	13	15	14.5	14	13	13	13	—	—	—	—
	K = 18 „	17	17	16	15	17	16.5	16	15	15	15.5	10.5	—	—	—
	K = 21 „	19.5	18.5	18.5	17	20	19.5	18	17.5	17	18	12	—	—	—
	K = 24 „	21.5	21	21	19.5	22.5	21.5	21	20	19	20	13.5	23	21	—
	K = 27 „	24	23.5	23	21.5	26	24.5	23	21.5	21	23	15	25.5	23	—
	K = 30 „	26.5	26.5	25.5	23.5	27.5	26.5	25.5	23.5	23	25.5	17	27.5	25.5	17.5
	K = 36 „	30	29	28	26	33	31.5	30	28	27	30.5	20	33	30.5	20.5
	K = 42 „	—	—	—	—	38	36	34.5	33.5	31.5	35.5	23	40	35.5	23.5
	K = 48 „	—	—	—	—	43	41	39	36.5	35	40	26	43.5	39	27
	K = 54 „	—	—	—	—	—	45.5	43	40.5	39	44	29.5	49.5	44	30
	K = 60 „	—	—	—	—	—	50	49.5	44.5	43.5	49	33	55	49.5	33.5

Diameter of Image Circle**)

*) See the preceding table. **) These image circles are attainable by stopping the front lens down to about F/25. When larger stops are employed (it is not advisable to exceed F/9) the diameter of the image circle increases, but the circle within which the definition is perfectly sharp diminishes.

For Prices see separate Leaflet.

Yellow Glass Screens.

Photographic plates and films do not render the intensity values of colours as they are perceived by the eye. Their excessive response to ultra-violet, violet and blue light is not sufficiently toned down for many purposes by the orthochromatic treatment of the sensitive layer. Our yellow glass screens serve to render the balance more perfect. They are made of a special Jena yellow glass which is impervious to ultra-violet light and which transmits violet and blue light to a greatly diminished extent, whilst it allows all the other colours of longer wave-lengths to pass with almost undiminished intensity. This material differs greatly from the common yellow glass screens frequently met with, which transmit a much larger proportion of the short-wave light and a smaller proportion of the long wave- light than the Jena yellow glass, so that in a double sense they are less suitable for their intended purpose than the Jena yellow glass. It goes without saying that our yellow glass screens are made with optical precision, as otherwise they could not fail to impair the optical qualities of our objectives.

These Yellow Glass Screens are supplied in two degrees of density, and are respectively listed as *"light"* and *"dark"*. The former prolong the time of exposure required for normal isochromatic plates and films about five times and suffice as a rule for landscapes without snow, especially for distant views and for making surveys from aircraft, whereas it will be found preferable to employ "dark" yellow glass filters when photographing on high mountains, or when taking snow landscapes in general or reproducing vividly coloured pictures and views.

Yellow Glass Filter to slip on

Our yellow glass filters are mounted in two ways to suit the mount of the lenses with which they are to be used, viz. either in such a manner that they may be pushed into the hood of the lens mount (with velvet lining, as shown in the figure on the top of page 17), or so that they may be slipped over the outer rim of the hood, the ring mount being slit and sprung for this purpose, as shown in the annexed figure.

To slip over				To slip in			
Lens Mount No.	adapted for outside diameter of the hood	'light' | 'dark' Retarding about 5 times Codeword	'light' | 'dark' Retarding about 10 times Codeword	Lens Mount No.	adapted for inside diameter of the hood	'light' | 'dark' Retarding about 5 times Codeword	'light' | 'dark' Retarding about 10 times Codeword
C^{00}	19.3 mm	*Follebise*	*Follegio*	oo	17.5 mm	*Foldnet*	*Folgaras*
$C^{00}a$	21 „	*Follebita*	*Folleiro*	P^{00}	18 „	*Folderaar*	*Fomenting*
$C^{00}*$	24 „	*Folta*	*Foment*	I	23.5 „	*Folego*	*Folgaria*
C^{0}	27 „	*Follebo*	*Folleme*	II	28.5 „	*Foleria*	*Folgaron*
$C^{0}*$	28.5 „	*Follebunt*	*Follemos*	III	33.5 „	*Follette*	*Folgaz*
$C^{0}a$	29.8 „	*Folleg*	*Follenda*	IV	38.5 „	*Folga*	*Folgazano*
B	31 „	*Fonomi*	*Fononu*	VI	47.1 „	*Folgabais*	*Folgazei*
P^{0}	31.5 „	*Foltamente*	*Fomentar*	VII| VIII	53.1 „	*Folgado*	*Folidandra*
C_1	32 „	*Fonda*	*Fondable*				
III_T	36.8 „	*Fonsa*	*Fonsadera*	X	65.1 „	*Follendir*	*Follendos*
VI_T	50.9 „	*Fonsado*	*Fonsario*	XII	70 „	*Fondaccio*	*Fondaco*
$VIII_T$	56.9 „	*Fonsoir*	*Fontab*				
X_T	69 „	*Fontaine*	*Fontala*				

When ordering Filters for Zeiss lenses purchased on a previous occasion the **manufacturing number engraved on the mount** should be stated in every instance since the diameters of the lens mounts frequently deviate from the standard gauges to suit the dimensions of shutters and cameras.

For Prices see separate Leaflet.

Slip-in Ducar Filters

Ducar Filters

for Autochrome and Agfa Colour Screen Plates.

In these filters the chromatic effect required to rectify the colour rendering is combined with the effect of a very feeble diverging lens. This effect is of such a magnitude that a Ducar Filter slipped upon the front of the lens displaces the plane of the sharp image exactly by the thickness of the photographic plate, that is, into the plane of the layer at the rear of the colour screen. This disposes of the necessity of appending special devices to the camera, the focussing scale, the dark slide, or the focussing screen when taking colour photographs. All that is required is to defer putting the Ducar Filter in position until the image has been focussed on the ordinary ground glass screen which faces the object with its greyed surface. This has the additional advantage that during the focussing the picture is seen in its natural colours. — The Ducar filters are mounted to slip over or into the lens hood (see page 16).

Ducar Filters to slip over
suitable for a lens of which the focal length is = f (cm), and of which the sun-shade has the outer diameter Do (mm)

Description Tube No. / f	Do mm	for Autochrome plates Ducar Filter Codeword	for Agfa Colour plates A-Ducar Filter Codeword
R/ 5.5	18.5	*Folhicos*	*Fondello*
H/ 5.5	25	*Foltering*	*Fondeor*
P/ 6.5	21	*Fondava*	*Fonder*
P/ 7.5	29.8	*Fondazi*	*Fonderom*
C_a/ 7.5	21	*Foliabo*	*Fondeur*
B/ 7.5	31	*Fondea*	*Fondeva*
P/ 9	31.5	*Foltezza*	*Fondia*
III/10	36.8	*Footfast*	*Foothill*
IV/10	41.8	*Footfight*	*Foothold*
P/10.5	31.5	*Foliacion*	*Fondig*
B/10.5	31	*Fondeen*	*Fondill*
C/10.5	28.5	*Foltissimo*	*Fondime*
C/12	29.8	*Foltado*	*Fondoir*
IV/12	31.8	*Footgear*	*Footing*
VI/12	50.9	*Footgeld*	*Footiron*
C/13.5	27	*Foliages*	*Fondria*
VII/14.5	56.9	*Footglove*	*Footkey*
C/15	28.5	*Foliaguda*	*Fonduk*
VI/15	50.9	*Footgnaw*	*Footless*
VII/18	56.9	*Footgrain*	*Footlevel*
X/16.5	69	*Footguard*	*Footliker*
T/18	36.8	*Footpace*	*Footplate*
X/21	69	*Foothald*	*Footline*
T/25	50.9	*Footpad*	*Footplow*
T/32	56.9	*Footpage*	*Footpost*
T/40	69	*Footpicker*	*Footpote*

Ducar Filters to slip in
suitable for a lens of which the focal length is = f (cm), and of which the sun-shade has the inner diameter Di (mm)

Description Tube No. / f	Di mm	for Autochrome plates Ducar Filter Codeword	for Agfa Colour plates A-Ducar Filter Codeword
I/ 6.5	23.5	*Folgorano*	*Fonderal*
C/ 6.5	18	*Folhoso*	*Fonderia*
I/ 7.5	23.5	*Folgorata*	*Fondest*
II/ 7.5	28.5	*Footrule*	*Footsore*
III/ 8	33.5	*Footfall*	*Fothanded*
I/ 9	23.5	*Folgorino*	*Fondevir*
C/ 9	18	*Foliabamos*	*Fondeza*
II/10.5	28.5	*Footstall*	*Footstep*
I/12	23.5	*Folguin*	*Fondire*
II/12	28.5	*Folgura*	*Fondle*
II/13.5	28.5	*Folhado*	*Fondon*
III/13.5	33.5	*Follastro*	*Fondose*
IV/13.5	38.5	*Folhame*	*Fondre*
II/15	28.5	*Folharia*	*Fondsa*
III/15	33.5	*Foliamos*	*Fondsen*
IV/15	38.5	*Folhea*	*Fondua*
II/16.5	28.5	*Foliance*	*Fondule*
III/16.5	33.5	*Folheador*	*Fondusi*
VI/16.5	47.1	*Folhearas*	*Fonebo*
IV/18	38.5	*Folhease*	*Fonet*
VI/18	47.1	*Folheatura*	*Fonetir*
IV/21	38.5	*Folheca*	*Fonfara*
VII/21	53.1	*Folhenda*	*Fonfone*

*) The Ducar Filters are suitable for use with other objectives, provided their focal lengths do not differ by more than 3 per cent from the focal lengths of the Tessar Lenses as here stated.

When ordering Ducar Filters for Zeiss lenses purchased on a previous occasion it is advisable to quote the factory number as well as all other inscriptions on the lens mount. Lenses not of our make should be sent for adaptation of the filter, and in their case there may be an additional charge for the adaptation.

For Prices see separate Leaflet.

Distar Lenses.

Distar Lenses are simple lenses of small diverging power. They have the property, when placed in front of the camera lens, of increasing its focal length and the corresponding camera extension. In this way they serve to supplement the resources of the camera lens, notably those of a dissymemtrical type, which from its nature is only intended for a camera with a fixed extension, since its components are not corrected individually for their independent use as long-focus lenses. In particular, they effect the following practical results:

They impart to the Tessars the manifold qualities of convertible sets of lenses.

Their lens curvatures are such that, when used in conjunction with an anastigmatic lens, in particular with a Tessar Lens, they furnish a uniformly good image within an extensive field. Moreover, a moderate reduction of the aperture suffices to ensure in the combined Tessar and Distar Lenses a degree of definition such as is desirable for such different purposes as portraiture, street scenes, landscapes, and architecture. Over the separate components of strictly symmetrical or hemi-symmetrical objectives the combination of a Tessar with a Distar Lens has *the following advantages:*

It affords greater freedom in the choice of focal lengths: In the case of symmetrical objectives either component affords *one* and the same long focal length, while in hemi-symmetrical objectives the front and back components furnish *two* long focal lengths differing in magnitude. The Distar Lenses specified in the annexed list provide a means of obtaining as many as *five* long-focus combinations with a given Tessar lens.

There is less distortion at the edge of the image field: As is well known, all component lenses of symmetrical or hemi-symmetrical objectives give rise to an appreciable amount of distortion, which may be very pronounced in the case of architectural pictures. This distortion is 'barrel-shaped' when the lenses are placed behind the stop, and it is 'cushion-shaped' when they are placed in front of the stop. On the other hand, when the long-focus lens is produced by attaching a Distar lens in front of the Tessar lens the barrel-shaped distortion is so slight that it remains quite tolerable even when buildings are taken within an extensive angle.

The Camera Extension is shorter: With the back lenses of symmetrical and hemi-symmetrical objectives the camera extension required for distance is at least 10 per cent longer than the focal length f, whereas in the combination "Tessar+Distar" it is only about equal to f. For example, for f=25.5 cm. the camera extension is 25.5 cm. in the latter case, in the former it is 29 cm. It will readily be seen that this renders the camera available for photographing nearer objects, other things being equal (see columns 9 and 10, page 19).

The changes are made with greater ease: In order to obtain the longer foci the Distar Lenses are simply slipped upon the front mount of the Tessar after the manner of yellow glass screens. Compare with this what has to be done when incidentally after other exposures the front lens component of a hemi-symmetrical objective is to be used behind the stop of the shutter, say, of a roll film camera with double extension.

Facilities for supplementing the available equipment: An existing Tessar Lens may at any subsequent time be supplemented by one or several Distar Lenses so as to form a set of convertible lenses.

Distar Lens	Codeword	Outside diameter of Objective receiving Distar Lens mm.	Primarily intended for use with: Objective	Zeiss Mount	Shutter	Effect of the lessar printed in heavy type + Distar Lens [1]: V	f_D cm.	K_∞ cm.	K 2 m cm.
2/C_0	*Fodiam*	27.0	**Tessar 4.5/9 cm**	I	0/I	1.4	19	18.5	21
3/C_0	*Fodiamus*		**Tessar 6.3/12 cm**	I	0/I	1.7	23	23	26
3.5/C_0	*Fodiatis*		**Tessar 6.3/13.5 „**	—	0	1.9	26	26	29.5
2/C_{0*}	*Fodica*	28.5	**Tessar 4.5/10.5 cm**	—	0/I	1.25	13	13	14
3/C_{0*}	*Fodicabam*		**Tessar 6.3/15 „**	—	0	1.4	15	15	16
3.5/C_{0*}	*Fodicabant*					1.5	16	16	17.5
2.5/C_{0a}	*Fodicantor*	29.8	**Tessar 4.5/12 cm**	—	0a	1.4	15.5	15.5	17
3.5/C_{0a}	*Fodicare*					1.55	18.0	18.5	20
4.5/C_{0a}	*Fodicarent*					1.9	21.5	22	25
1.5/II	*Fodicabare*	32.0	Tessar 4.5/10.5 cm	II	—	1.3	22.5	22	25
2.5/II	*Fodicabis*		Tessar 4.5/12 „	II	—	1.7	28.5	28.5	33
3/II	*Fodicabo*		Tessar 6.3/13.5 „	II	—	1.9	32.5	33	39.5
			Tessar 6.3/15 „	II	—				
			Tessar 6.3/16.5 „	—	1				
1.5/III	*Fommeling*	36.8	**Tessar 4.5/13.5 cm**	—	1/III	1.25	17.5	17	19
2/III	*Fodicabunt*		Tessar 6.3/16.5 „	III	—	1.3	18.5	18.5	20.5
3/III	*Fodicamini*					1.6	22.5	23	26
3.5/III	*Fodicamur*					1.8	25	25.5	29
1.5/IV	*Fomitale*	41.8	Tessar 4.5/13.5 cm	IV	—	1.25	19	19	21
2/IV	*Fodicanda*		**Tessar 4.5/15 „**	IV	2	1.4	20.5	20.5	23
2.5/IV	*Fomitibus*		Tessar 6.3/18 „ [2]	IV		1.5	23	23	26
3/IV	*Fodicandis*		Tessar 6.3/21 „ [3]	IV		1.7	25.5	26	29.5
3.5/IV	*Fodicandum*					1.9	28.5	29.5	34
1/VI	*Fomitum*	50.9	**Tessar 4.5/16.5 cm**	VI	2a	1.2	20	20	22
1.5/VI	*Fodicans*		**Tessar 4.5/18 „**	VI		1.3	22	22	24.5
2/VI	*Fonacion*					1.5	24.5	24.5	28
2.5/VI	*Fodicantem*					1.6	27.5	28	32.5
3/VI	*Fodicanti*					1.9	31.5	32	38
1/VII	*Fomiter*	56.9	**Tessar 4.5/21 cm**	VII	3	1.25	26	26	30
1.5/VII	*Fomitorus*					1.4	30	30	35.5
2/VII	*Fonasum*					1.6	33.5	35	41.5
2.5/VII	*Fonazione*					2	41	42	53

Further details respecting our Distar Lenses will be found in our Leaflet P 209, which we shall be pleased to send on request.

1) V is the resulting magnification:
f_D is the resulting focal length of the combination "Tessar+Distar Lens";
K_∞ is the requisite camera extension when focussing for infinity;
K 2 m is the same when focussing objects at a distance of 2 metres,
the objective printed in heavier type being supplemented by the Distar named. When used in combination with lenses of shorter foci, the same Distar lenses occasion a smaller increase in the size of the figures, the focal lengths and camera extensions, whilst when combined with lenses of longer foci the reverse takes place. We supply with each Distar lens a card containing all necessary data respecting magnification, focal lengths, camera extensions, stops, and the resulting lengthening of the exposure.

When ordering Distar Lenses for use with existing objectives the whole of the particulars engraved on the lens mount should be quoted, and the exact outside diameter of its hood should also be given as well as the greatest available camera extension measured from the Iris Diaphragm to the ground glass screen.

For Prices see separate Leaflet.

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