Large format lenses from VEB Carl Zeiss Jena 1945 - 1991

Many large format photographers own a few lenses they bought used, either to save money or because specific features are no longer available in new production lenses. Until 1989, most lenses came from West Germany, Japan, or the USA. Obviously, there were view cameras and large format (LF) lenses in the Eastern Bloc countries during the Cold War, but not much was known about them. This changed since the Berlin wall came down, and many of these lenses have now found their way into the global used market. The largest manufacturer behind the iron curtain was Carl Zeiss Jena in the German Democratic Republic (GDR) as the direct successor of the well-known prewar company of the same name. Other Eastern Bloc LF lens manufacturers included Meyer-Optik (formerly Hugo Meyer Görlitz, also in the GDR), Meopta in the Czech Republic, PZO in Poland, and several companies such as LOMO, KOMZ, and KMZ in the Soviet Union (see the other article on Eastern Bloc lenses: http://www.arnecroell.com/eastern-bloc-new.pdf).

VEB Carl Zeiss Jena

At the end of World War II the German state of Thuringia, where Jena is located, was under the control of British and American troops. However, the Yalta Conference agreement placed it under Soviet control shortly thereafter. Just before the US command handed the administration of Thuringia over to the Soviet Army, American troops moved a considerable part of the leading management and research staff of Carl Zeiss Jena and of the Schott glass company to Heidenheim near Stuttgart, 126 people in all. This led to the foundation of "Opton Optische Werke" in Oberkochen West Germany, initially as subsidiary of Carl Zeiss Jena. The latter, however, was nationalized in 1948 by the communist rulers of the GDR as "VEB Carl Zeiss Jena" and later became one of the big industrial "combines" of the GDR ("VEB" is a GDR acronym for a nationalized company, standing for "Volkseigener Betrieb"). The nationalization and the Cold War subsequently led to the separation of Zeiss into a new independent establishment in Oberkochen (changing its name from Opton to Zeiss-Opton back to Carl Zeiss over a few years), and the traditional company location in Jena in the GDR.

Operations at Carl Zeiss Jena were initially hampered by war damage, the removal of key personnel to the American sector, and later also to Russia, as well as the subsequent dismantling of equipment by the Soviet army, leaving only 6% of the production equipment. Nevertheless, Carl Zeiss Jena resumed production shortly after the war and became the major supplier of optical equipment in the Eastern Bloc countries during the cold war. Over the years, the GDR concentrated their optical, precision machining, and electronic industry under the roof of the VEB Carl Zeiss Jena. This also included the assimilation of the other well-known GDR manufacturer of photographic lenses, Meyer-Optik, through the integration of the camera manufacturer VEB Pentacon in 1985. In 1989, VEB Carl Zeiss Jena was one of the biggest GDR companies with 69,000 employees. A vast range of products in

the fields of optics and precision machinery was produced, from binoculars to planetariums to micro-electronics.

The postwar separation of Zeiss also lead to two distinctively different large format lens lines. Zeiss Oberkochen developed a completely new line of Biogon, Planar, Sonnar, and Tessar lenses for Linhof press and technical cameras, to be used at wide apertures for the 6x9cm and 4x5" formats. These were discontinued around 1972, and subsequently Zeiss Oberkochen left the large format field except for a few special orders. Carl Zeiss Jena initially continued some of the pre-war lens lines for large format and process cameras, and later phased in replacements and new developments.

Actually, most or all of the Carl Zeiss Jena lenses were not manufactured in Jena proper, but at another Zeiss plant in Saalfeld, Thuringia, about 30 miles from Jena. The Saalfeld plant has its own history. It was originally founded in 1910/1911 as Optische Anstalt Saalfeld (OAS) by Carl Zeiss Jena, the company Winkel from Göttingen, and Alfred Gruchot, a former manager of Hugo Meyer Görlitz. Initially, OAS produced optical parts and low- to medium-priced objectives for camera manufacturers like Contessa-Nettel and Franke & Heidecke (Rollei). After the famous merger of Contessa-Nettel, Ernemann, Goerz, and ICA in 1926 to form Zeiss-Ikon, that company became OAS' main customer. After WWII, OAS was integrated into the VEB Carl Zeiss Jena, where they made most photographic, movie, video, projection, and process lenses for Zeiss, as well as other components. In 1985, there were plans to move the GDR production of photographic lenses from Saalfeld to the Görlitz plant of VEB Pentacon/Meyer-Optik, but this was never realized.

Four years later, in 1989, the Berlin wall came down and in October 1990 Germany was reunited. Following the reunification, the nationalized companies of the GDR (about 8000) were taken over by a government trust agency called "Treuhand", to be turned over to new management through privatization or to be closed down. This included Carl Zeiss Jena and its Saalfeld plant. Carl Zeiss Oberkochen took back only a core part, including microscopy, astronomical, and geodetic instruments, but not photographic optics. Another part of Zeiss Jena formed the new company Jenoptik, now successfully working in clean room technology, photonics, and other fields. The Saalfeld plant continued operations under the Treuhand trustee management until they were sold to Docter Optic in August 1991. The last large format lenses produced before Docter Optic took over were a batch of 300mm f/4.5 Tessars made in June 1991. The Docter Optic era is the topic of a separate article and includes my experiences with some of their lenses (http://www.arnecroell.com/docter.pdf).

LF lenses from Carl Zeiss Jena

An important difference compared to Western production was that the majority of the Carl Zeiss Jena LF lenses came in barrel mounts. The GDR produced between the lens shutters, but mostly in the 00 size for 35mm or medium format folding cameras. Shutter names were "Tempor" (VEB Zeiss Ikon Dresden), "Junior" (Werner/Fotoverschlüsse Tharandt), "Priomat", and "Prestor" (VEB KKWD/VEB Pentacon Dresden), but not many were made for LF lenses. Prestors 1, 3, and 5 were produced only from 1964-1966; note that these Prestors were a different construction than the better known high-speed Prestor in 00 size made by VEB Zeiss Ikon since 1958. Zeiss Jena also used West-German Compound and Compur shutters for Tessars in the fifties, probably for selling them on Western markets. The production numbers of the shuttered Tessars are listed in table 2a. Many Zeiss LF lenses

were originally used with a shutter behind the lens in the cameras of the Pentacon "Mentor" lines, or in the "Globica", a traditional tailboard camera on a stand. For instance, between 1946 and 1991 Carl Zeiss Jena produced over 21,000 units of the f/4.5 210mm Tessar (their LF lens with the highest production number) in various barrel mounts, but only 1,737 lenses of the same type in a shutter. Note that the barrel lenses can usually not be put into a shutter without some machining. Some of them, like the Apo-Germinar W, actually have the individual lenses mounted directly into the barrel, not with assembled front and back lens cells that screw into a separate barrel mount with aperture. In others, like some of the Apo-Tessars, the lens cells unscrew easily from the mount. Nevertheless, lenses from Carl Zeiss Jena are usually of very high quality and therefore the cost for having them mounted in a shutter or in front of one can sometimes be justified. In addition, they can be used without major modifications on cameras with a shutter behind the lens, such as a Sinar or Packard shutter. Most barrel mounts have the classic nonlinear aperture scale with a nearly round diaphragm opening. Apo-Germinar models (at least after 1970) have a linearized scale.

The manufacturers name engraved on the lens might be "Carl Zeiss Jena", "Carl Zeiss Jena DDR", "CZJ", "Jenoptik", "Aus Jena", "Ernst Abbe Jena", or simply "Jena", depending on when and where the lens was sold. These differences result from the long and convoluted legal struggles on the use of the Zeiss name between Zeiss Oberkochen and Zeiss Jena during the Cold War. Conversely, Carl Zeiss Oberkochen had to use the name "Opton" in the Eastern Bloc countries. There was also a small series of lenses labeled "Meyer-Optik" that were Tessars made by CZJ for Meyer in 1991 for a mahogany version of the Globica – it has the serial number of the last lot under the Carl Zeiss Jena era and the mount is the same. There is no lens name (neither "Tessar" nor "Trioplan" - Meyers old triplet name) engraved. Whether this was an exception because of the turbulent economic situation after the reunification, or if there was previous production by Zeiss Jena for other companies as an OEM supplier is unknown.

Carl Zeiss Jena serial numbers followed the prewar numbering scheme until 1980, when they changed to a new system. The old system, with up to 8 digits (highest number 11,036,647), was only approximately chronological, and semicontinuous across lens types. Once an internal order for a lot of lenses was issued, a continuous block of numbers was assigned to this order, even though the production might have taken considerable time, sometimes years. Occasionally not all numbers assigned were used, in which case these numbers were reused and assigned to a different lot or some prototype production. Unless one has the numbers from the original production files, the number range given in table 1 allows only a rough estimate of production time, with an error of ±2 years, occasionally more. In 1980 the system changed completely. Each specific lens type had its own number series with 4 - 5 digits, always starting at 1001. Thus different lenses can have the same serial no. and will also duplicate very early Zeiss production numbers. Errors occurred occasionally with the new system and sometimes the same serial no. block was issued to the same lens type twice. Without the production files, no easy dating of lenses is possible within the new system, but it was only in effect for 12 years (1980-1991).

All post-war Carl Zeiss Jena LF lenses were coated, with the possible exception of early post-war lenses. Initially the red "T" designation was used for coated lenses, but dropped later when coating became standard procedure. Zeiss Jena introduced multicoating in 1976, 4 years after Zeiss Ober-

kochen, but mostly for 35mm and medium format lenses. To my knowledge, the only Zeiss Jena LF lenses with multicoating are the Apo-Germinar W lenses.

A note on the tables: The Zeiss production files indicate that lens design parameters were changed occasionally for a lens of a given name, as listed in tables 2b, 3b, and 4b, to adjust for different glasses available, or to improve the performance. The mounts and mount materials (brass vs. aluminum) also changed over 45 years, so weights and filter dimensions can vary. The mounts of the most recent lenses will most likely be identical to the Docter Optic counterparts described in the Docter article. Image circles were calculated from the coverage angle; for the Tessars (table 2a) and the specialty lenses (table 6), the image circle is given for infinity. For the process lenses (tables 3a, 4a, 5) it is given for 1:1. At infinity, the image circle is about half that value.

Tessar lenses

The standard LF lenses made by Carl Zeiss Jena were Tessars. These are direct descendants of Paul Rudolph's original Tessar from 1902, with 4 lens elements in 3 groups. Tables 2a and b lists only Tessars from 135mm up, since anything shorter won't cover 4x5", but there were of course shorter focal lengths available. Tessars were also used and sold as enlarging lenses. Initially, three series existed after WWII, with maximum openings of f/3.5, f/4.5, and f/6.3, respectively. The f/3.5 Tessars, a 2nd generation designed by Willy Merté and Ernst Wandersleb before WWII, were discontinued in the mid-1950's. The two f/6.3 Tessars were discontinued in the late 1960's; both were new designs (1947) and differed from Wandersleb's 1911 versions with the same specification. Only the f/4.5 series was continued to the very end in 1991. A variety of designs existed for the f/4.5 series; the shorter focal lengths used mostly postwar designs, but the longer ones used the late 1920's designs (probably also by Merté) to the very end.

The optimum aperture for the Tessars is f/22. The f/3.5 and f/4.5 versions can do double duty, as portrait lenses wide open, and stopped down to the optimum aperture for technical subjects, architecture etc. The f/3.5 version shows some visible focus shift, so for best results it is advisable to focus at the taking aperture from wide open down to f/5.6, whereas f/8 should be for focusing used when stopped down more. If this is taken into account, even the older Tessars can deliver high quality results.

Process lenses: Apo-Tessar

The other lenses used for large format are the process lenses made by Carl Zeiss Jena. They first produced Apo-Tessars, similar to what they had prior to WWII (tables 3a and b). As process lenses, they are optimized for a 1:1 reproduction ratio, but can be used at infinity. Apo-Tessars were originally built like regular Tessars (4 elements/3 groups), but used a special glass (a short flint, "KF" in the Schott nomenclature) with abnormal dispersion. They are optimized for high definition over a smaller field than regular Tessars. Thus they have less coverage (43°), and a maximum opening of f/9 or less. The coverage may be higher for less stringent requirements in pictorial use. Optimum aperture is again f/22. Initially, these were based on designs from the late 1920's, although the 140mm and 180mm versions got redesigned in 1939. Those lenses are still marked in cm instead of mm, despite post-war production dates and coating. In 1955, CZJ redesigned them again, introducing a small air gap in the back

cell instead of the cemented interface, so the latest design is a 4/4 construction. Most of those versions carry the focal length in mm.

Process lenses: Apo-Germinar

Subsequently, the Apo-Tessars were replaced with the newly developed Apo-Germinars (tables 4a and b), originally designed by Harry Zöllner, the head of the Zeiss Jena design office from 1946 to 1977. There was some overlap in production as the last Apo-Tessars where produced up to the late 1960's, and Apo-Germinars were introduced in the early 1960's. Later, Apo-Germinars went through one or two redesigns, depending on the type. The original design version from 1957 used 6 lenses in 6 groups for *all* focal lengths, but the redesign from 1962 switched to a classic process lens design of the Dialyte type, 4 elements in 4 groups for focal lengths up to 450mm. Only a few hundred lenses of the original 6-element design have been produced for each focal length. The longer focal lengths retained 6 elements in 6 groups, i.e. the 600, 750, 900, 1000mm, and 1200mm versions. The Apo-Germinars have 46° coverage, with a maximum opening of f/9, similar to Apo-Artars or Apo-Ronars. They are all optimized for a 1:1 reproduction ratio, but it is well known that this lens type holds up quite well when used at infinity. The optimum aperture of the Apo-Germinars is f/22. For the later 6/6 version a patent was granted in 1964 (in West-Germany; 1965 in Britain). Apo-Germinars are very high quality lenses and offer exceptional performance. They are at least as good as their Apo-Ronar, Apo-Artar, or Apo-Nikkor counterparts and were sold on Western markets at a premium price. For comparison, in the long focal lengths Rodenstock offered similar 6- or 8-element Apo-Ronars (in addition to their regular 4-element ones of the same focal lengths) as their ultimate process lenses for the most demanding applications.

Process lenses: Apo-Germinar W

The latest development was the introduction of the Apo-Germinar W series in 1981, symmetric wide-angle process lenses with 63-73° coverage (table 5). The design is rather unique and expensive to manufacture with 8 elements in 8 groups (- + - + I + - + -). Other process lenses with similar coverage either use a 6/4 Plasmat construction (Rodenstock Apo-Gerogon, Schneider G-Claron, Fujinon-A) or a 4/4 double Gauss meniscus construction of the Topogon type (Process Nikkors, Schneider G-Claron WA). The optimum aperture for the Apo-Germinar W is f/16, 1 stop faster than the lenses of most competitors. These lenses are multicoated, probably because of the 16 glass-air surfaces involved, but are not marked MC or otherwise. Zeiss Jena claimed a superior performance of the Apo-Germinar W compared to standard wide angle process lenses, and they indeed have a remarkably high and even modulation transfer function over the field. The price for the high performance is a rather large size and weight in relation to their focal length and coverage. Apo-Germinar W lenses were available with individual center filters to counter any illumination falloff. The 210mm and 240mm versions make great enlarging lenses for 8x10", and the 150mm for 4x5".

Other lenses

In addition to the lenses described above, Carl Zeiss Jena produced small prototype batches of LF lenses that never found their way into full production, like the ones for the "Grandina" camera

planned by Meopta (see http://www.arnecroell.com/grandina.pdf) and other longer focal lengths Biometars. They also made lenses for aerial reconnaissance and photogrammetry like the Lamegon, Superlamegon, Lametar, and Pinatar lenses, and lenses for other uses that may be used as large format optics. They are listed in table 6.

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*Table 1. Approximate VEB Carl Zeiss Jena serial number range for the old number system through 1980. See text for detai*ls.

Year	Serial Number
1947	3,000,000
1951	3,500,000
1954	4,000,000
1957	5,000,000
1960	6,000,000
1965	7,000,000
1968	8,000,000
1972	9,000,000
1976	10,000,000
1980	11,000,000

Table 2a. VEB Carl Zeiss Jena Tessars. Different weights for the same lens are from different sources and are caused by the change in mount materials over time. The 60° angle and the image circle numbers in {} for the f/4.5 Tessars are from a 1969 Zeiss brochure, the other values from later sources.

Focal Length [mm]	Max. Aperture	Angle of Coverage [°]	Image Circle (calculated) [mm]	Mount/ Shutter	Filter Size	Weight [g/oz.]	Remarks
150	3.5	57	163	Compur 2			50 produced
				barrel	M49x0.75	270/9.5	155 produced
165	3.5	57	179	Compound III			50 produced
				barrel			1375 produced
210	3.5	57	228	Compound IV			75 produced
				barrel	M67x0.75	660/23.3	2200 produced
250	3.5	57	271	Compound V	M84x1	1252/44.2	45 produced
				barrel	M84x1	920/32.5	665 produced
300	3.5	57	326	barrel			305 produced
135	4.5	57/60	147 {160}	Compur 1	M40.5x0.5	257/9.1	300 produced
				barrel	M40.5x0.5	105/3.7	11016 produced
150	4.5	55/60	156 {180}	Compur 1	M40.5x0.5	210/7.4	1750 produced
				barrel	M49x0.75	220/7.8	972 produced
165	4.5	55/60	172 {200}	barrel	M58x0.75	280/9.9	690 produced
180	4.5	55/60	187 {220}	Compur 2	M49x0.75	343/12.1	330 produced
				Compound III			25 produced
				barrel	M58x0.75	390/13.8 215/7.6	18512 produced
210	4.5	55/60	219 {250}	Compound III			1637 produced
				Prestor 3	M58x0.75	521/18.4	100 produced (in 1968)
				barrel	M67x0.75	490/17.3 335/11.8	21664 produced
250	4.5	55/60	260 {300}	Compound IV			325 produced
				barrel	M77x0.75	690/24.3 500/17.6	15696 produced
300	4.5	55/60	312 {360}	Compound V	M84?	1176/41.5	488 produced
				Prestor 5		1188/41.9	
				barrel	M95x1	1270/44.8 1005/35.5	11270 produced
360	4.5	55/60	375 {430}	barrel	M105x1	1870/66 1550/54.7	3525 produced
135	6.3	70	189	Compur 0			250 produced
				barrel	M35.5x0.5	110/3.9	811 produced
165	6.3			barrel			800 produced
210	6.3	70	294	Compur 1	M40.5x0.5	195/6.9	125 produced
				Prestor 1			25 produced (in 1965)
				barrel	M40.5x0.5	110/3.9	3272 produced

Table 2b. VEB Carl Zeiss Jena Tessar design dates and serial numbers.

Focal Length [mm]	Max. Aperture	Design Year	Serial Numbers
150	3.5	1926	3,605,301-3,605,400 4,009,801-4,009,900
		1952	3,746,023-3,746024 3,746029 – 3,746,030
165	3.5	1926	3,075,001 and higher
210	3.5	1929	3,072,101 and higher
250	3.5	1935	2,731,551 and higher
300	3.5	1937	2,770,035 and higher except
		1953	3,746,102-3,746,103
135	4.5	1927	2,850,601-2,850,700 2,868,901-2,869,900
		1948	Between 3,072,001 and 4,869,260 except
		1952	3,746,058-3,746,059
		1957	4,870,946 and higher 1001-1637 (1980-1986)
150	4.5	1947	Between 3,179,494 and 3,669,701 except
		1911	3,406,151 – 3,406,600 and
		1951	3,623,051-3,623,550
		1928	3,873,201 and higher except
		1926	3,893,951 – 3,894,000
165	4.5	1911	2,732,001-2,732100 2,743,501-2,743,600
		1959	1,001-1,145 (1980-1984) and 5,909,201 and higher except
		1926	8,272,129 - 8,272,228
180	4.5	1929	2,814,301-2,814,500 3,778,601-11,022,432 1,001-11,650 (1980-1991)
		1948	3,017,685-3,624,900
210	4.5	1929	2,814,501-10,833,987 1,001-7,417; 7,818-8,063 (1981-1991)
		1975	7,418-7,817 (1990)
250	4.5	1928	2,789,151 and higher
300	4.5	1928	2,773,566 - 3,181,297 3,791,601-10,832,987 1001-4100 (1981-1991)
		1948	3,408,501-3,606,700
360	4.5	1928	2,798,001 and higher; 1001-1800 (1981-1985)
135	6.3	1911	2,920,899
		1947	3,087,701 and higher
165	6.3	1911	2,731,601 - 2,938,550
210	6.3	1911	2,919,628-2,920,350
		1947	3,071,701 and higher

Table 3a. VEB Carl Zeiss Jena Apo-Tessars. Note that Apo-Tessar mounts often have no filter threads, or uncommon ones.

Focal Length [mm]	Max. Aperture	Angle of Coverage	Image Circle @ 1:1 and f/22 (calculated)	Mount/ Shutter	Weight [g/oz]	Remarks
140	9	43	221	barrel		1031 produced
180	9	43	284	barrel		1010 produced
180	15	30-35	193-227	barrel		560 produced
240	9	43	378	barrel		1073 produced
300	9	43	473	barrel	385/13.6	2395 produced
375	9	43	591	barrel		469 produced
450	9	43	709	barrel	460/16.2	2407 produced
600	9	43	945	barrel	1000/35.3	2296 produced
750	9	43	1182	barrel	1790/63.1	1261 produced
900	9	43	1418	barrel		Only 1 listed in manufacturing files, more exist
1200	11	43	1890	barrel		70 produced
1800	15	30-35	1929-2270	barrel		Not listed in post-WWII Zeiss Jena manufacturing files

Table 3b. VEB Carl Zeiss Jena Apo-Tessar design dates and serial numbers. The 1955 designs used a small air gap in the back cell instead of the cemented interface.

Focal Length [mm]	Max. Aperture	Design Year	Serial Numbers
140	9	1939	Between 2,907,501 and 3,622,200
		1955	3,622,201 and higher
180	9	1939	Between 2,799,101 and 4,435,700
		1955	4,676,016 and higher
180	15	1955	7,289,976 – 7,290,000
		1968	7,326,281 and higher
240	9	1929	Between 2,913,801 and 3,410,770; also 6,360,551-6,360,600; 7,047,601 - 7,047,650; 7,258,826 - 7258,850
		1955	6,223,701 and higher except the above range
300	9	1927	Between 3,008,101 and 3,411,040
		1955	3,411,041 and higher
375	9	1937	Between 3,181,693 and 4,498,834
		1955	4,678,126 and higher
450	9	1928	Between 3,016,691 and 4,870,945
		1955	4,951,631 and higher
600	9	1928	Between 2,801,161 and 3,608,350; also 4,498,951 - 4,499,050; 4,543,204
		1955	4,467,396 and higher except the above range
750	9	1927	Between 2,915,126 and 3,875,870
		1955	4,467,431 and higher
900	9	1928	3,608,571; 3,746,098;
1200	11	?	3,016,941 and higher

Table 4a. VEB Carl Zeiss Jena Apo-Germinars

Focal Length [mm]	Max. Aperture	Lens Elements/ Groups	Angle of Coverage	Image Circle @ 1:1 and f/22 (calculated)	Mount/ Shutter	Filter Size	Weight [g/oz]	Remarks
140	9.0	6/6	46	232	barrel	-	192/6.8	ca. 140 produced
180	9.0	6/6	46	298	barrel	-	452/15.9	ca. 1140 produced
240	9.0	6/6 and 4/4	46	398	barrel	M49x0.75	300/10.6	1943 produced
300	9.0	6/6 and 4/4	46	497	barrel	M49x0.75	330/11.6	454 produced
360	9.0	4/4	46	596	barrel	M67x0.75	780/27.5	1295 produced
375	9.0	6/6 and 4/4	46	621	barrel			1354 produced
450	9.0	6/6 and 4/4	46	746	barrel	M67x0.75	900/31.7	2108 produced
600	9.0	6/6	46	994	barrel	M86x1	1890/66.7	1709 produced
750	9.0	6/6	46	1243	barrel	M105x1	3480/122.8	633 produced
900	9.0	6/6	46	1491	barrel			96 produced
1000	12.0	6/6	46	1657	barrel	M105x1	3800/134	230 produced
1200	11.0	6/6	46	1988	barrel			65 produced

.

Table 4b. VEB Carl Zeiss Jena Apo-Germinar design dates and serial numbers

Focal Length [mm]	Max. Aperture	Design Year	Serial Numbers
140	9.0	1957	4,897,126 - 6,259,280
		1962	7,208,266 and higher
180	9.0	1957	5,634,668 - 6,259,310; 7,290,101 - 7,290,150
		1962	7,208,316 - 7,208,365; 7,333,689 - 7,334,688
240	9.0	1957	Between 4,897,128 and 6,389,424
		1962	Between 6,795,606 and 9,000,684
		1970	9,228,009 and higher 1;001-2;775 (1981-1989)
300	9.0	1957	Between 4,897,129 and 6,361,320
		1962	7,290,226 – 7,290,275
		1970	9,228,089 and higher 1,001-1,100 (1982)
360	9.0	1970	9,228,129 and higher 1,001-1,990 (1982-1988)
375	9.0	1957	Between 4,897,130 and 6,798,004
		1962	6,798,057 and higher
450	9.0	1955	8,787,771 - 8,787,790
		1957	Between 4,897,131 and 7,028,675
		1962	Between 8,826,425 and 9,000,764
		1964	Between 7,028,676 and 7,355,318
		1970	9,228,209 and higher 1,001 – 1,880 (1981-1988)
600	9.0	1956	Between 5,634,741 and 6,389,770
		1962	Between 6,504,841 and 9,000,780
		1970	9,228,249 and higher 1,001-1,600 (1982-1989)
750	9.0	1957	Between 4,897,132 and 6,621,130
		1962	Between 7,131,989 and 8,973,851
		1970	9,228,359 and higher (1,001-1,175) 1985-1988
900	9.0	1957	Between 4,897,133 and 10,405,585
1000	12.0	1970	9,469,721 and higher
1200	11.0	1957	Between 5,634,781 and 7,290,650

Table 5. VEB Carl Zeiss Jena Apo-Germinar W lenses. The design year was 1981 for all lenses, and the production dates were between 1982 and 1988.

Focal Length [mm]	Max. Aperture	Lens Elements/ Groups	Angle of Coverage	Image Circle @ 1:1 and f/16 (calculated)	Mount/ Shutter	Filter Size	Weight [g/oz]	Remarks
150	8.0	8/8	63	368	barrel	M67x0.75	1030/36.3	850 produced
210	8.0	8/8	68	567	barrel	M86x1	1490/52.5	850 produced
240	8.0	8/8	73	710	barrel	M110x1	3180/112.2	810 produced

Table 6. VEB Carl Zeiss Jena prototype, aerial, and photogrammetry lenses. "PI" stands for Pan-Infra, i.e. it is corrected for both the visible and the near IR spectrum.

Lens Name	Focal Length [mm]	Max. Aperture	Lens Elements/ Groups	Angle of Coverage [°]	Image Circle (calculated)	Mount/ Shutter	Remarks
Biometar	120	2.8	5/4	?	?	barrel	Prototype, around 1979/1980
Biometar	135	4.0	5/4	67	156@f/4 180@f/11	Prestor 1	For Meopta Grandina camera, 5 produced for test purposes*
Biometar	165	2.8	5/4	?	?	?	2 produced for test purposes (designed 1956)
Biometar	180	2.8	5/4	?	?	?	2 produced for test purposes (designed 1955)
Biometar	210	4.0	5/4	?	?	?	2 produced for test purposes (designed 1957)
Biometar	210	5.4	5/4	66	240@f/5.4 270@f/16	Prestor 1	For Meopta Grandina camera, 5 produced for test purposes*
Biometar	250	4.0	5/4	?	?	?	2 produced for test purposes (designed 1952)
Dagor	125	9.0	6/2	?	?	?	26 produced (some for planetarium use)
Dagor	180	6.8	6/2	?	?	?	88 produced in special mount, unknown use
Lamegon	55	5.6	?	?	?	Electric shutter/Compur	Aerial/Photogrammetry
Lamegon	65	4.5	8/4	105	156@f/4.5 170@f/22	Prestor 1	For Meopta Grandina camera, 5 produced for test purposes*
Lamegon	90	4.5	8/4	105	200@f/4.5 224@f/11	Prestor 1	For Meopta Grandina camera, 5 produced for test purposes*
Lamegon	100	8	8/4	?	?	Electric shutter	Photogrammetry, for UMK 1318
Lamegon	115	4	10/?	?	?	?	Aerial/Photogrammetry, designed 1962
Lamegon	150	4.5	10/6	?		?	Aerial for LMK 2323, designed 1968/74
Lamegon PI	150	4.5	10/6	91	305	?	Aerial/Photogrammetry, designed 1984
Lamegon PI-D	150	4.0	11/7	91	305	?	Aerial/Photogrammetry, designed 1984
Lamegoron	210	5.6	10/6	76	328	?	Aerial/Photogrammetry

Lamegor PI	300	5.6	10/6	56	306	?	Aerial, for MRB 30/2323, designed 1973
Lamegot	300	5.6	?	53		?	Aerial/Photogrammetry
Pinatar	115	4	10/6	?	?	?	For RMK
Pinatar	125	4	?	?	?	?	Photogrammetry, for MKF-6 (70mm film)
Pinatar	210	4	10/6	69	289	?	Photogrammetry
Super-Lamegon PI	64	5.6	12/8	121	230	Electric shutter	Photogrammetry/8m fixed focus
Super-Lamegon	70	5.6	10/6	?	?	?	Aerial, for MRB 1818
Super-Lamegon	90	5.6	11/?	121	318	Electric shutter	Aerial, for MRB2323
Super-Lamegon PI	90	5.6	12/8	121	318	?	?
Lametar	200	8	6/4	?	?	?	Aerial, designed 1972,for UMK1318
Lametar	300	11	4/3	?	?	?	Aerial, designed 1972/79, Tessar type, for UMK1318
Tessar	270	8	4/3	53	250@f/8 270@f/16	Prestor 1	For Meopta Grandina camera, 5 produced for test purposes*

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*Very few additional units were produced in the 1970's in Copal/Copal electric shutters and offered through a photo warehouse in the USA under the "Aus Jena" label.

Fig. 1 Tessar 250mm f/3.5 in barrel. Scale length is 10cm/4".

Fig. 2 Tessars 210mm and 360mm f/4.5 in barrel, late versions. The filter size of the 210mm is 67mm. Picture courtesy of Jörg Krusche.

Fig. 3 Two generations of Carl Zeiss Jena 300mm f/9 process lenses. Left: Apo-Tessar (1927 design, uncoated); Right: Apo-Germinar (1970 design). Scale length is 10cm/4".

Fig. 4 Two generations of 600mm f/9 process lenses. Left: Apo-Tessar (1955 design); Right: Apo-Germinar 600mm (1970 design). Filter size of the 600mm Apo-Germinar is 86mm. Picture courtesy of Jörg Krusche.

Fig. 5 Apo-Germinar W 210mm f/8 with center filter. Scale length is 10cm/4".