

The ZEISS SEG-6 Rectifier

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1. Introduction

For 25 years, the SEG-5 rectifier has been sold in large numbers. In 1952, a first prototype of this instrument (Fig. 1) was presented to the public, which at that time was a revolutionary innovation due to its automatic controls. Far over 300 units are by now in use all over the world, and the SEG-5 is frequently called nothing less than the rectifier.

Before the new SEG-6 model was introduced, many separate improvements were made, frequently following suggestions contributed by users. The working ranges and basic design of the instrument, however, remained unchanged. It was precisely the preservation of important design elements which, above all in the case of electrical assemblies, led to a situation where certain components became increasingly scarce. Together with the desire to make the instrument even better suited for automation, this situation prompted a fundamental revision of its design.

The result of this work is an impressive number of changes which justify the introduction of a new type designation, namely SEG-6 rectifier (Fig. 2). The design and the capabilities of this SEG-6 will be described in the following.

2. General improvements

The basic design features and thus also the general appearance of the instrument were left practically unchanged. The massive cast-metal base and column as well as the wide guideways for the lens, negative and lamp carriages were retained. The same applies to the time-tried cup-shaped mount of the easel. Changes are limited to subassemblies and separate components intended to simplify the instrument and thus allow more economical production and to obtain even greater stability in the mechanical controls. For example, it thus became possible to design the negative carriage for even higher load and the film troughs for the large spools and hence longer rolls of film.

An important new feature is the fact that the standard instrument now comes with a vacuum easel provided with suction holes, vacuum chamber and supports for connecting any pump of suitable characteristics. This makes allowance for the constantly growing interest in film flattening by means of vacuum. However, the wet process can be used now as before.

The electrical system of the rectifier has been completely redesigned. All electrical assemblies have been streamlined and accommodated in an easily accessible switchbox at the back of the instrument that is commonly called "knapsack". This design has resulted in a considerable reduction of the number and length of electrical cables as compared with the SEG-5. Furthermore, outdated components, such as tubes, etc., have been replaced by advanced and more reliable solid-state hardware. A slight additional advantage is the fact that even the standard instrument now allows switching the lamp voltage from monochrome to color (mercury vapor lamp - incandescent lamp).

The projection lens of the rectifier had been considerably improved as long as a few years ago. The TOPOGON V-2 180 mm f/6.3 was given an additional f-stop setting at f/9, whereas the maximum aperture for exposure had previously been f/12.5. In other words, the actual speed of the SEG-5 had been doubled - and image quality was improved at the same time. At any magnification, the new type of lens gives higher resolution at f/9 and f/12.5 than its predecessor at its optimum aperture of f/18. This applies both to the axis and the average weighted area resolution. The increase of AWAR values partly goes up to 50 %.

3. Illumination

Illumination has been considerably improved by the introduction of a rigorous lamp control ensuring that at any magnification the light source is now in its most favorable position in relation to the Fresnel condenser and the lens. This control also covers the range $v < 1.7x$, thus eliminating manual lens positioning in this region. As a result, the mechanical wedge-type adjustment previously used for this purpose has been dispensed with.

In addition to the time-tried type HQA-125 mercury vapor lamp with a specially matted bulb, a type HQL-125 (or HPL-125 or HRL-125, depending on the lamp manufacturer) will now be included among the accessories. This lamp has a fluorescent-coated bulb and will give even more uniform illumination, which may be an advantage with negatives of very even density. As a matter of fact, illuminance on the easel is about 4x less with this type of lamp so that considerably longer exposure times will result at higher magnifications. However, now as before, the standard HQA-125 lamp in conjunction with the Fresnel condenser, which was last improved around 1969, ensure excellent illumination, provided that the lamp is properly centered.

4. Vanishing-point control

The automatic vanishing-point control introduced in the SEG-5 had a tremendous impact on rectification because it simplified and accelerated orientation. Even today it is of decisive importance for empirical orientation. Up to now, negative-carriage displacement as a function of magnification, easel tilt and camera focal length, had been computed partly mechanically and partly electrically.

The vanishing-point control of the SEG-6 has been completely redesigned: magnification setting and easel tilt are picked up electrically, an electronic analog processor is contained in the "knapsack" for computing the shift values, and servo-circuits are provided for shifting the negative carriage. The camera focal length can still be set on a scale, but the setting range has been increased from a previous maximum of 320 mm to 610 mm so that the control now also covers narrow-angle photography taken with a ZEISS RMK 60/24 camera. In addition, the vanishing-point control of the SEG-6 has been conceived as an accessory, allowing it to be left out wherever it is not needed, for example, for rectification by orientation data where the negative shift values are precomputed, too.

5. Accessories

Like the SEG-5, the SEG-6 can be equipped with an optional power drive for the pedal disk as well as a grid-exposure frame (Fig. 3). Since the vacuum easel now is standard equipment, only a vacuum pump with a sound-proofing box and the necessary connecting hoses are offered as optional accessories. The use of a new pump has improved the suction characteristics.

Customers using primarily uncut roll film will place a very one-sided load on the negative carriage due to the full spool in one of the troughs. To overcome this difficulty, a device has been developed, which allows the film spools to be suspended from the condenser frame so as to relieve the negative carriage.

Another accessory is the OCS-1 Orientation System (Fig. 4) that was introduced already for the SEG-5. The OCS-1 has been described in detail elsewhere [1]. It allows checking of rectification by orientation data and performing numerical orientation. In either case, the actual projection to be measured is compared in an HP 9815 A desk calculator with the nominal position given by digitally stored control points in order to obtain corrections for easel tilt and magnification.

6. Conclusions

With the new ZEISS SEG-6 rectifier and its accessories, an instrument for rectifying individual photographs has thus become available, which makes full allowance for present-day requirements. Based on the time-tried SEG-5 concept and advanced components, it may be expected to be just as successful and long-lived as its predecessor.

References

- [1] Hobbie, D.: Numerische Einpassung am Entzerrungsgerät SEG 5 mit der Orientierungs-Einrichtung ZEISS OCS 1, Bildmessung und Luftbildwesen, page 164, 1976.
Numerical orientation in the SEG-5 with the aid of the ZEISS OCS-1 Orientation System, Bildmessung und Luftbildwesen No. 4/1976, pgs. 164-168 (S 51-597 e)

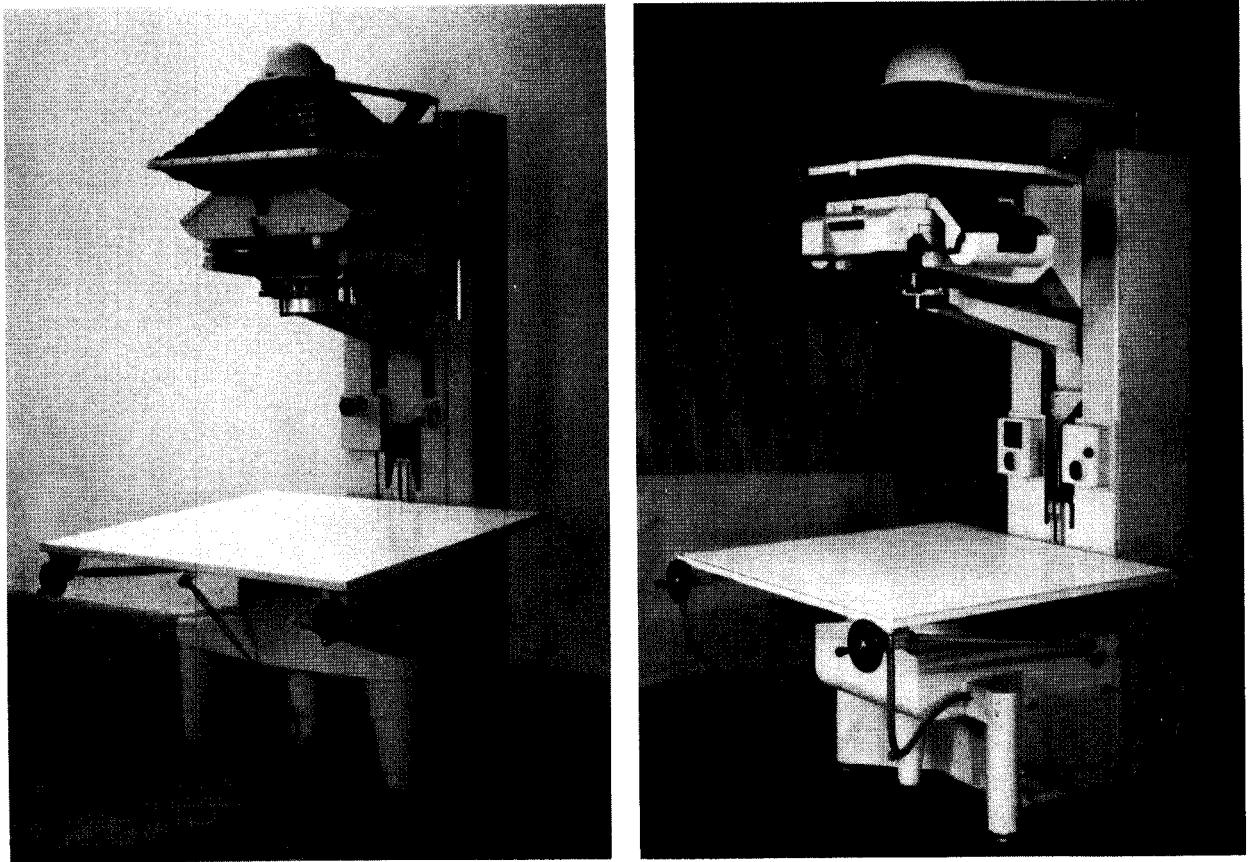


Fig. 1: Prototype (1952) and first production-line instrument (1954) of the ZEISS SEG-5 rectifier.

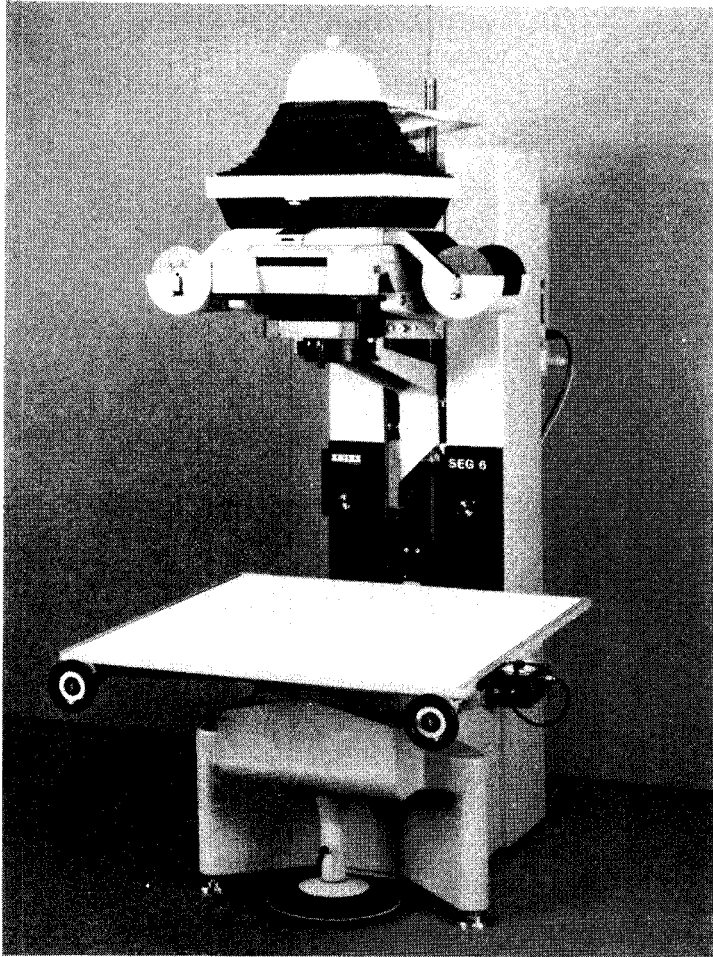


Fig. 2: ZEISS SEG-6 rectifier.

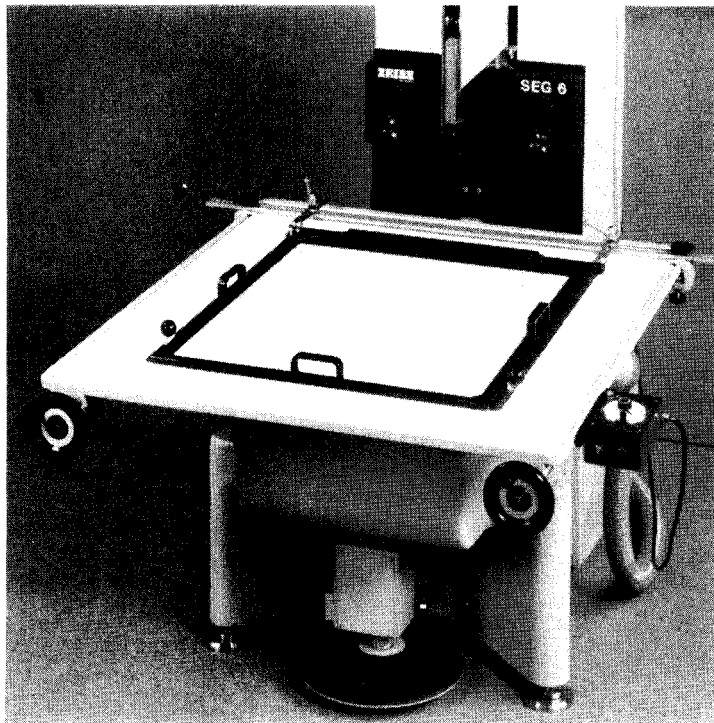


Fig. 3: Grid exposure frame and power pedal-disk drive, available as optional accessories to the SEG-6.

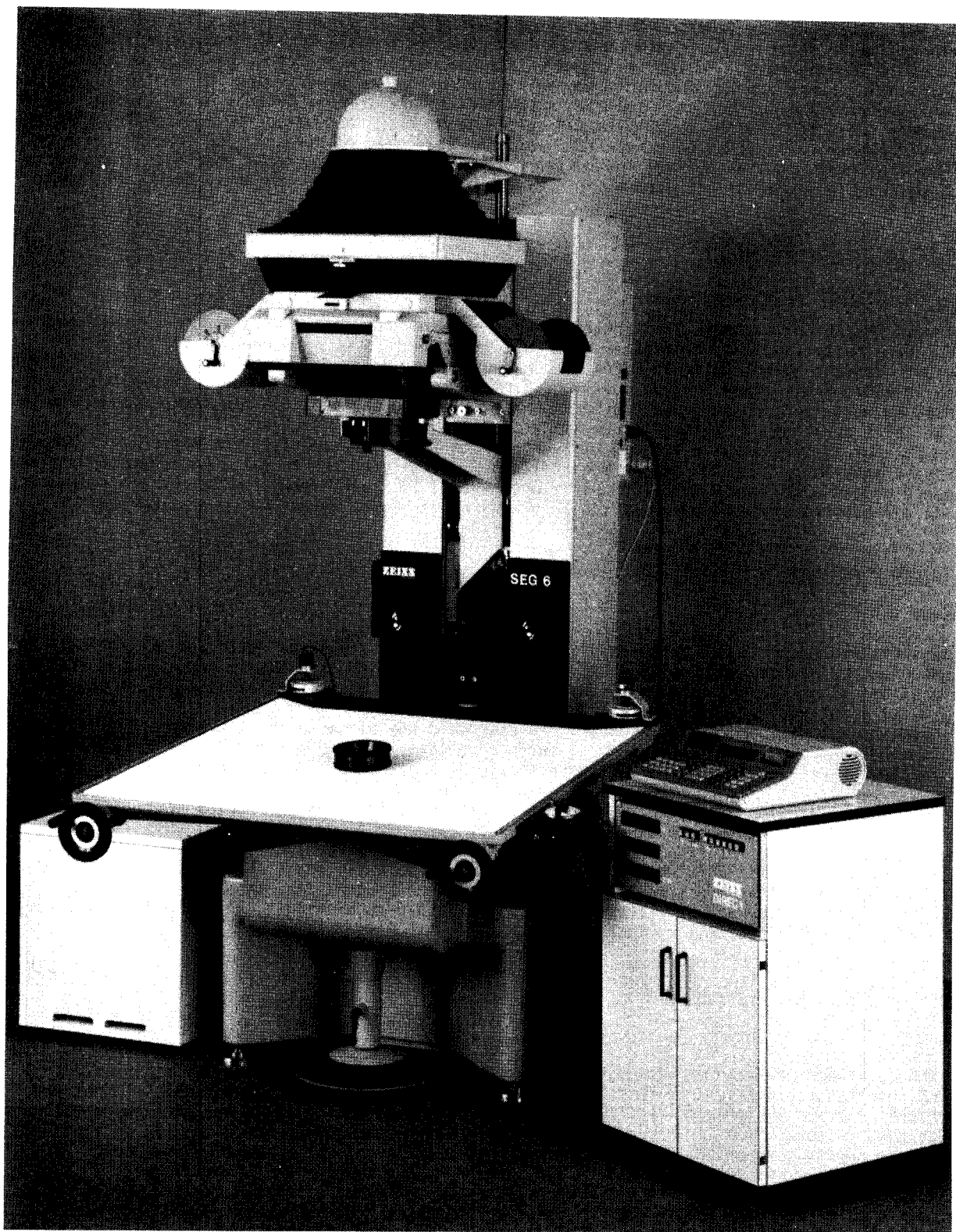


Fig. 4: The SEG-6 with vacuum pump and OCS-1 Orientation System.

Abstract

The SEG-5 rectifier, of which large numbers have been sold during the past 25 years, has been modified and brought up to date. The resulting SEG-6 model is already being supplied to customers. While the basic design and rectification ranges have remained practically unchanged, there are noticeable improvements in a few important points: automatic lamp control has been extended to a magnification range $< 1.7x$. The vanishing-point control is now governed by an electronic instead of an electromechanical computer and also accommodates camera focal lengths up to 610 mm. Standard equipment includes a vacuum easel with improved suction characteristics. In addition, the mechanical and electrical systems have been improved. The extremely high-resolution TOPOGON V-2 lens 180 mm f/6.3 has been part of the instrument ever since 1972. The overall result of these measures is a noticeable degree of improvement in a time-tried instrument of extremely high performance.

Das Entzerrungsgerät ZEISS SEG 6

Zusammenfassung

Das seit 25 Jahren in großen Stückzahlen verkaufte Entzerrungsgerät SEG 5 wurde konstruktiv gründlich überarbeitet und modernisiert. Das daraus entstandene SEG 6 wird bereits serienmäßig geliefert. Während grundsätzlicher Aufbau und Auswertebereiche nahezu unverändert bleiben, ergeben sich in einigen wichtigen Punkten deutliche Verbesserungen: Die Funktion der automatischen Lampensteuerung wurde auf den Vergrößerungsbereich $< 1,7$ -fach ausgedehnt; die Fluchtpunktsteuerung erfolgt jetzt durch einen elektronischen statt durch einen elektrisch-mechanischen Rechner sowie auch für Aufnahmebrennweiten bis 610 mm; serienmäßig ist ein Ansaugtisch mit besserer Saugcharakteristik enthalten. Außerdem wurden Mechanik und Elektrik verbessert, das außerordentlich hochauflösende Objektiv TOPOGON V 2 6,3/180 wird bereits seit 1972 serienmäßig geliefert. Insgesamt ist damit ein bewährtes und außerordentlich leistungsfähiges Gerät weiter verbessert worden.

L'appareil redresseur ZEISS SEG 6

Résumé

L'appareil redresseur SEG 5 vendu depuis vingt-cinq ans dans le monde entier, a été amélioré et modernisé. Le nouveau modèle SEG 6 est déjà produit en série. Bien que sa conception fondamentale et ses plages de restitution soient sensiblement identiques à celles de l'ancien modèle SEG 5, il a subi des perfectionnements remarquables:

La commande automatique de l'éclairage a été étendue à une plage de grossissement $< 1,7x$.

La commande du point de suite s'opère au moyen d'un calculateur électronique (et non plus d'un calculateur électromécanique), la distance focale de la chambre de prise de vue pouvant atteindre 610 mm.

La table de projection à production de vide automatique appartient à l'équipement standard du SEG 6 et possède un système de dépression plus efficace.

Les organes mécaniques et électriques ont une qualité supérieure.

Depuis 1972, l'objectif TOPOGON V 2 (f/6,3; distance focale 180 cm) à haut pouvoir de résolution est incorporé dans l'appareil redresseur SEG 5 et par conséquent dans le modèle SEG 6.

Comme son prédécesseur SEG 5, l'appareil redresseur SEG 6 se distingue par ses excellentes performances et sa technicité irréprochable.

El rectificador ZEISS SEG 6

Resumen

El SEG 5, vendido en grandes cantidades desde hace 25 años, ha sido repasado y modernizado. El SEG 6 resultante ya se suministra de serie. Mientras que quedaron casi invariables la construcción básica y los márgenes de rectificación, se han introducido mejoras considerables en algunos otros puntos importantes: se ha ampliado el funcionamiento del mando automático de la lámpara a un margen de aumentos menor que 1,7 veces; el mando perspectivo se basa ahora en una computadora electrónica en vez de una electromecánica y también se presta para distancias focales de toma hasta 610 mm. El equipo normal incluye una mesa de vacío mejorada. Además, se han perfeccionado los sistemas mecánicos y eléctricos. El objetivo TOPOGON V 2 de 180 mm f/6,3, de resolución extraordinariamente elevada, ya se suministra como equipo standard desde 1972. En total ha resultado un aparato acreditado de enorme rendimiento, muy mejorado.

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