

RMKA

15/23



West Germany

Carl Zeiss  
Oberkochen

Camera  
空中照像机

Carl Zeiss P.O. Box 1389/1380 D-7082 Oberkochen

Geschäftsbereich  
Meßtechnik/Optik

P.O. Box 1389/1380  
D-7082 Oberkochen  
Telephone (07384) 201  
Cable Address: Zeisswerk Oberkochen  
Telex 07 1376 155

Taiwan Instrument  
Attn. Mr. C. E. Lin

Taipei - Taiwan

Your Ref.	Yours of	Our Ref.	Phone	Telex	Date
		M-VVD/Ebg/Puhr	(07364) 20.....857	0713761.....55	06.03.81

Re.: Repair RMK A 15/23 - Serial-No. 119 035

Dear Mr. Lin,

enclosed please find the

Calibration Certificate

for the repaired Aerial Camera. The invoice and shipping documents will send by separate mail.

Yours sincerely

Carl Zeiss  
Geschäftsbereich Meßtechnik/Optik  
Verkaufsdienste  
Geodäsie und Photogrammetrie

R. Eilenberger

Encl.

Calibration Certificate  
材料  
移局  
4.14



Form 01 250 0880

Board of Management:  
Wolfgang Adolphs  
Prof. Dr.-Ing. Josef Herrmann  
Dr. Gert Utmann  
Dr. Horst Skokudek

Bank Accounts:  
Deutsche Bank AG, Heidenheim  
No. 2125367 (BLZ 613 700 88)  
Commerzbank Heidenheim  
No. 201112 (BLZ 632 400 16)

Dresdner Bank Aalen  
No. 5843200 (BLZ 614 800 01)  
Post Office Account:  
Stuttgart 2 015-705  
(BLZ 630 100 70)

CARL ZEISS  
 OBERKOSCHEN/WUERTT.

CALIBRATION CERTIFICATE  
 FOR PHOTOGRAMMETRIC CAMERAS

CAMERA TYPE: RMK A 15/23  
 LENS TYPE: PLEOGON A  
 MAX. APERTURE: F/4

SERIAL NO. 119035  
 SERIAL NO. 119004  
 NOM. FOCAL LENGTH: 153 MM

1) CALIBRATED FOCAL LENGTH = 153.049 MM

2) DISTORTION /0.001 MM, REFERRING TO P.P. OF SYMMETRY PPS

S/MM=	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
A	0	0	0	-1	-1	-1	-2	-2	-2	-1	-2	-1	1	1	7	8
B	0	-1	-2	-2	-3	-2	-3	-2	-2	-2	-1	0	2	3	7	6
C	0	1	-1	-1	-1	-1	-1	-1	-2	-1	-2	-2	-2	-1	0	1
D	0	0	-2	-3	-3	-4	-3	-4	-3	-5	-6	-4	-3	-3	3	7
AV.	0	0	-1	-2	-2	-2	-2	-2	-2	-2	-3	-2	0	0	4	6

3) P.P. OF AUTOCOLLIMATION AND FIDUCIAL CENTRE, REFERRING TO PPS

P.P. OF AUTOCOLLIMATION PPA X = -0.015 Y = -0.012 MM  
 FIDUCIAL CENTRE FC X = -0.020 Y = -0.014 MM

4) FIDUCIAL MARKS, REFERRING TO PPS

X1 = 112.981 X2 = -113.026 X3 = -0.025 X4 = -0.015 MM  
 Y1 = -0.018 Y2 = -0.009 Y3 = 112.990 Y4 = -113.012 MM  
 DISTANCES 1-2 = 226.007 3-4 = 226.002 MM

5) PHOTOGRAPHIC RESOLVING POWER, IN CYCLES PER MM

AREA WEIGHTED AVERAGE RESOLUTION 37

FIELD ANGLE /DEG = 0 7 14 21 28 35 42

RADIAL LINES 63 62 54 47 49 29 29  
 TANGENTIAL LINES 56 62 47 44 39 24 20

FILM: AVIPHOT PAN 30 SPEED 21 DIN  
 DEVELOPED IN ULTRAFIN 1+15

6) FILTERS

KL (CLEAR) NO.  
 B (YELLOW) NO.  
 O (ORANGE) NO.

7) MAGAZINE PLATEN  
 FK 24/120 NO.

127 646

ABTEILUNG FUER GEODESIE UND PHOTOGRAMMETRIE

I.-A.

*W. Lorch*

DATE 04.03.81

Dr.-Ing. W. Lorch

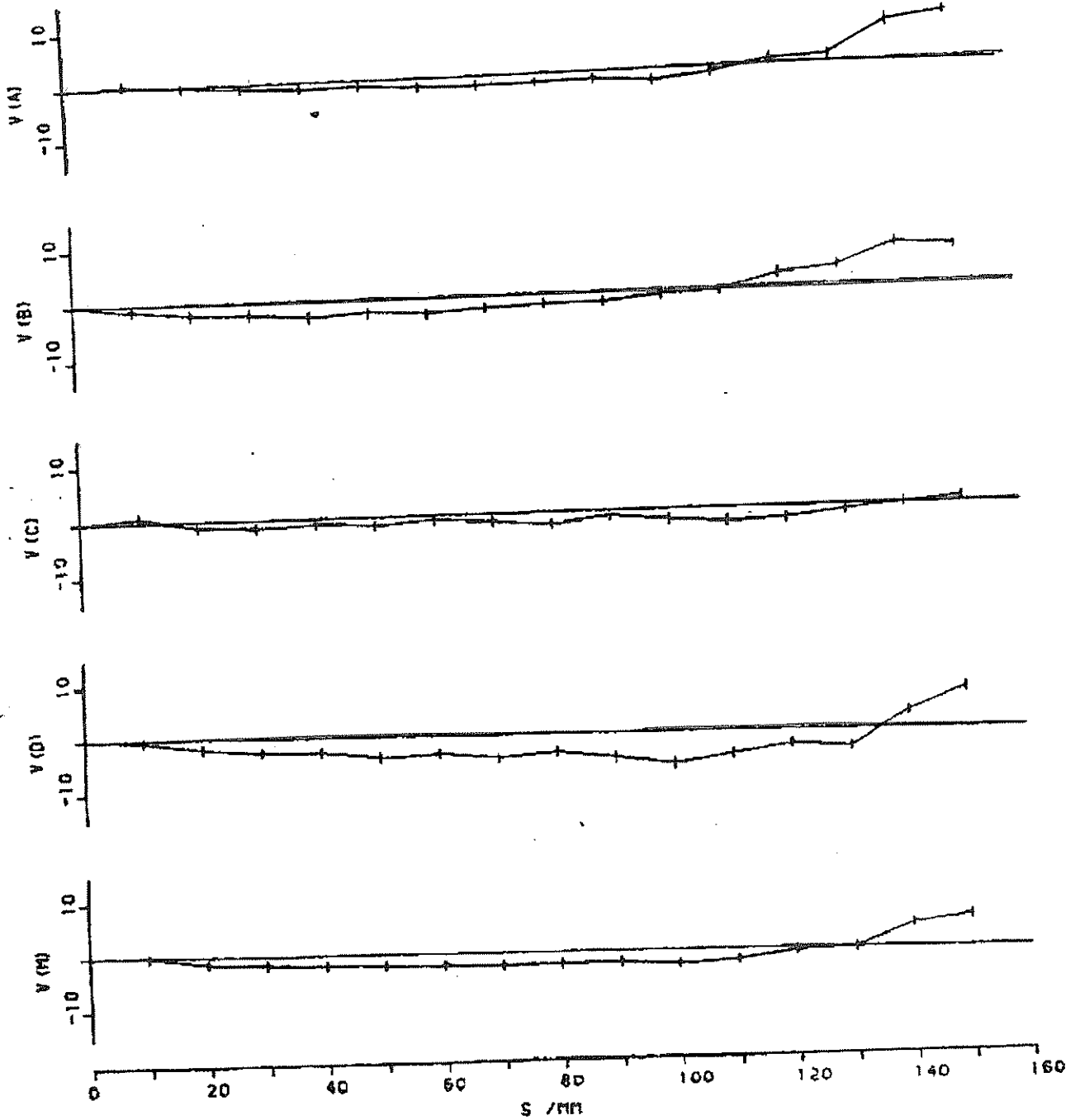
RMK A 15/23  
PLEOGON A

4/153

NO. 119035  
NO. 119004

CFL=153.049 MM

DISTORTION /0.001 MM. REFERRING TO PPS

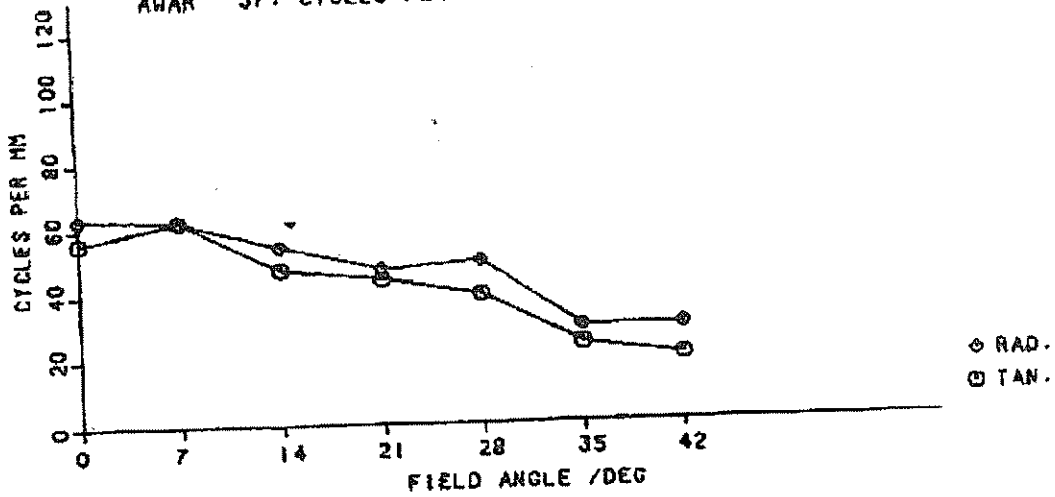


RMK A 15/23

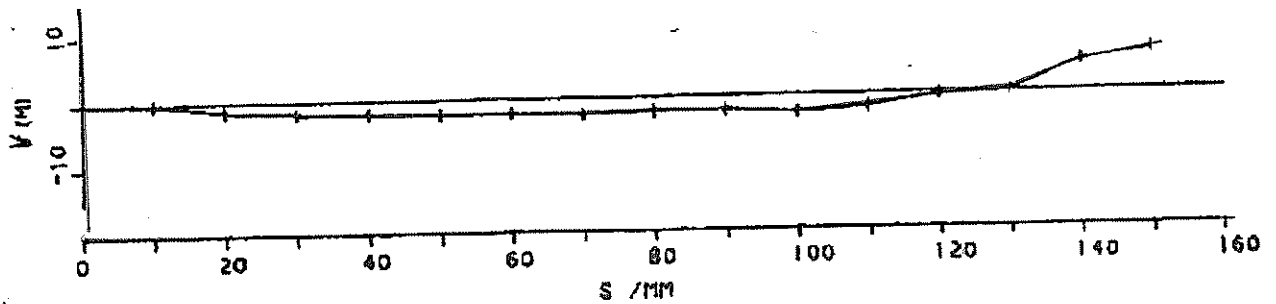
NO. 11.9035

PHOTOGRAPHIC RESOLVING POWER

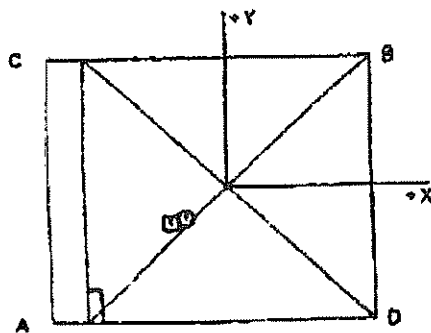
AWAR 37. CYCLES PER MM (230 MM X 230 MM NEGATIVE SIZE)



DEPARTURE OF AVERAGE DISTORTION FROM ZERO REFERENCE



PRINCIPAL POINT (PPA.PPS) AND FIDUCIAL CENTRE (FC)



COORDINATES. REFERRING TO PPS

	X / MM	Y / MM
○ PPA	-0.015	-0.012
□ FC	-0.020	-0.014

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0.01 X-AXIS AS DEFINED BY FIDUCIAL MARK COORDINATES  
 $\alpha(A) = 0.0^\circ$      $\alpha(D) = \alpha(A) + 90^\circ$

## A p p e n d i x

This camera has been tested in accordance with the existing regulations. The methods used are based on the Recommended Procedures for Calibrating Photogrammetric Cameras and for Related Optical Tests (International Society of Photogrammetry, 1960, reaffirmed 1964). The optical performance and the external construction are in accordance with our terms of delivery.

### 1. Calibrated Focal Length

The calibrated focal length is chosen so as to minimize the square sum of the radial measured distortion.

### 2. Distortion

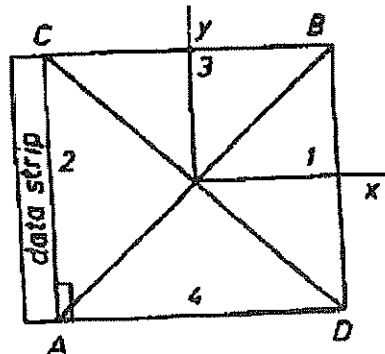
The values of radial distortion refer to the calibrated focal length and to the principal point of symmetry (Section 3). A positive value indicates that the image is further from the centre than its distortionfree position.

The radial distortion is measured for points of the focal plane separated by 10 mm from the axis for each of the four radii A, B, C, and D. AV is the average radial measured distortion at a given radial distance. Measurements are made at maximum aperture on the goniometer by attaching the filter D (cut-off wavelength 535 nm at transmittance 50 %). The standard deviation of the distortion values given can be assumed to be less than 0.002 mm.

The maximum tangential distortion, i.e. the displacement of the central image from a straight line connecting corresponding image points at equal but opposite angular separations from the axis, does not exceed 0.005 mm.

### 3. Principal Point and Fiducial Centre

The positions of the principal point of autocollimation and of the fiducial centre (Section 4) are given in a rectangular coordinate system as shown, with the principal point of symmetry as origin.



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Regarding the origin for distortion values it must be realized that in the photogrammetric process, the asymmetry due to a displacement of that point is eliminated together with the asymmetry introduced by camera tilt. The principal point of symmetry is chosen as origin for distortion, because only this residual asymmetry cannot be eliminated by simple compensation.

#### 4. Fiducial Marks

Coordinates of the fiducial marks are given in a rectangular system as shown above, with the principal point of symmetry as origin. Fiducial marks 1 and 2 lie in the line of flight. The lines joining opposite pairs of fiducial marks intersect at an angle within 30 seconds of  $90^\circ$ . The point of intersection (fiducial centre) is within 0.02 mm of the principal point of autocollimation. The location of the fiducial marks can be assumed to be accurate within 0.005 mm.

#### 5. Photographic Resolving Power

The resolving power is obtained by photographing a series of three line test figures. The difference of log luminance between the lines and the background is 1.6. The photographs are taken under the recommended standard illumination by using the filter B (cut-off wavelength 480 nm at transmittance 50 %) in parallel light. The camera is used at full aperture.

The resulting image is examined with a low power stereoscopic microscope to find the spatial frequency of the finest pattern resolved. The values of resolving power are reduced to the image plane and refer to the focus setting as used for determining the calibrated focal length.

#### 6. Filters

The two surfaces of the filters listed in the certificate are within 5 seconds of being parallel.

#### 7. Magazine Platen

The platen mounted in FK 24/120 film magazine, serial no. as indicated in the certificate, does not depart from a true plane by more than 0.010 mm.

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CAMERA CALIBRATION

CAMERA: RC10 LENS: 15 UAG II NO.: 3113 CALIBRATION DATE: 21.06.92  
 RC10 15 UAG II NO. 3113

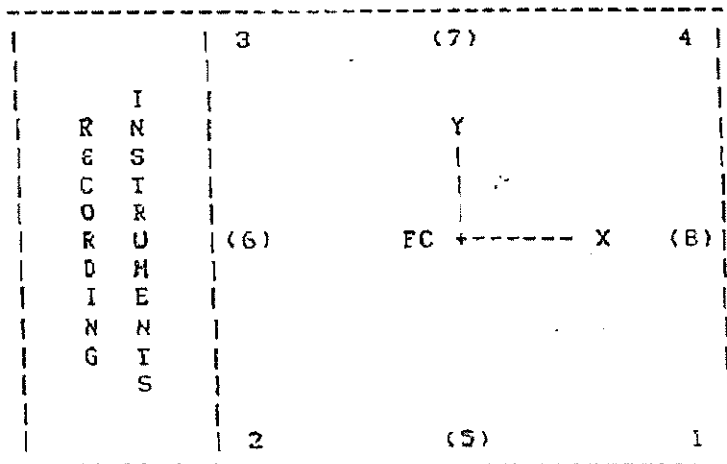
APERTURE: 11  
 PRINCIPAL POINT OF AUTOCOLLIMATION (PPA) AND  
 PRINCIPAL POINT OF SYMMETRY (PPS)

REFERRED TO FC, SEE DIAGRAM

	X (MM)	Y (MM)
PPA	-0.011	0.007
	-0.022	-0.002

REFIDUCIAL MARKS, REFERRED TO FC

	X (MM)	Y (MM)
1	105.999	-105.999
2	-105.998	-105.998
3	-106.008	106.008
4	106.001	106.001



AS SEEN ON FOCAL PLANE FRAME

APL