

# CAMERA CALIBRATION CERTIFICATE

CAMERA TYPE : RC 30  
LENS TYPE : 30/4 NAT-S  
LENS NO. : 17132

*act for*  
*8/11*  
*Heul*

Calibration date: 22.08.2006

LEICA AG, HEERBRUGG

 **SwissOptic**  
SwissOptic AG  
Heinrich-Wild-Strasse  
CH-8435 Heerbrugg  
Schweiz



# Camera Calibration Certificate

(Cover sheet)



## Object

| Camera Type | Lens Type  | Lens-No<br>(Serial-No) | Remarks |
|-------------|------------|------------------------|---------|
| RC 10       |            |                        |         |
| RC 10A      |            |                        |         |
| RC 20       |            |                        |         |
| RC 30       | 30/4 NAT-S | 17132                  |         |

## Acceptance

| Characteristics                                      | Acceptance | Remarks |
|------------------------------------------------------|------------|---------|
| Radial distortion                                    | yes        |         |
| Photographic resolution                              | yes        |         |
| Principal point of autocollimation [PPA]             | yes        |         |
| Principal point of symmetry [PPS]                    | yes        |         |
| Fiducial marks                                       | yes        |         |
| Mean radial distortion                               | yes        |         |
| Radial distortion for semi-diagonals referred to PPS | yes        |         |

*Handwritten signatures and initials:*  
 \*fer  
 OTH  
 V. L. D.

## Inspection

|                                             |                      | Signature / Remarks              |
|---------------------------------------------|----------------------|----------------------------------|
| Calibration Date                            | 22.08.2006           | Operating hours: h               |
| Inspector Name:                             | Paul Dietsche        | Signature: <i>P. Dietsche</i>    |
| Position:                                   | Supervisor           |                                  |
| Inspection stamp-No:                        | FO 187               |                                  |
| Inspection plan                             | 563450<br>14.04.1989 | (Identification-No)<br>(Version) |
| Lens cone calibration process specification | 870105<br>19.01.2000 | (Identification-No)<br>(Version) |

## Maintenance

|                                                                        |            | Remarks                |
|------------------------------------------------------------------------|------------|------------------------|
| The last date, when service/ overhaul of this lens cone was performed. | 01.03.2005 | Operating hours 0766 h |

Overhaul urgently required: no

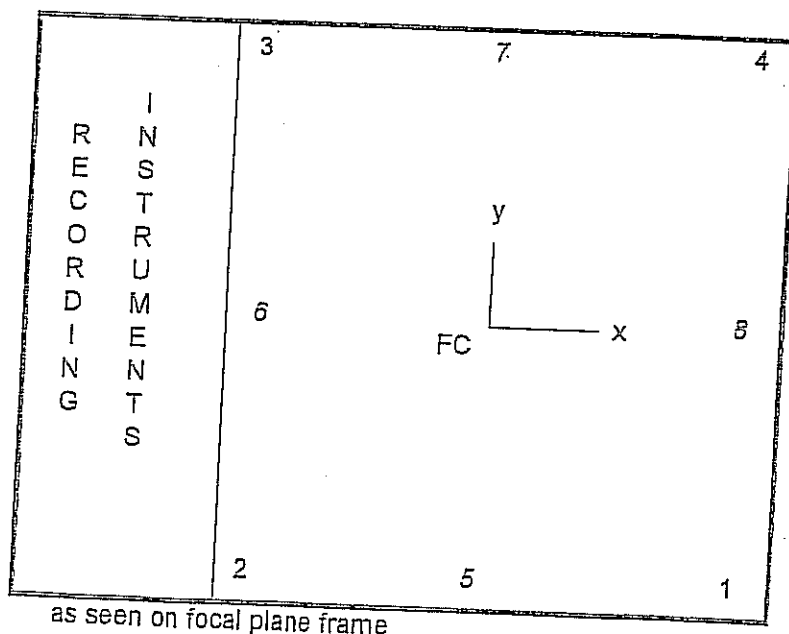
To avoid any malfunctions / damages, it is recommended to perform a complete service / overhaul as soon as possible.  
 See „Lens calibration process specification“ or „RC 30 Technical Reference Manual“

Principal point of autocollimation (PPA) and  
principal point of symmetry (PPS)  
referred to central cross (FC), see diagram

|     | x (mm) | y (mm) |
|-----|--------|--------|
| PPA | 0.001  | 0.003  |
| PPS | -0.021 | -0.001 |

Fiducial marks, referred to central cross (FC)

|   | x (mm)   | y (mm)   |   | x (mm)   | y (mm)   |
|---|----------|----------|---|----------|----------|
| 1 | 106.008  | -106.010 | 5 | 0.002    | -112.002 |
| 2 | -106.003 | -106.003 | 6 | -111.998 | 0.001    |
| 3 | -106.005 | 106.007  | 7 | 0.000    | 112.009  |
| 4 | 106.002  | 106.002  | 8 | 111.998  | 0.001    |



as seen on focal plane frame



*Handwritten signatures and initials.*

Aperture: 4.0  
 Filter on goniometer: VIS (400-700 NM)  
 Filter on camera: --  
 Principal distance for focussing distance 850 m : 303.56 mm

Radial distortion (micrometers) referred to principal point of symmetry (PPS)  
 (Positive values denote image displacement away from center)

| Radius<br>mm | Half - Sides |      |      |      | Mean |
|--------------|--------------|------|------|------|------|
|              | 1            | 3    | 2    | 4    |      |
| 10           | -0.7         | -1.1 | -0.2 | -0.8 | -0.7 |
| 20           | -1.5         | -2.1 | -1.3 | -1.5 | -1.6 |
| 30           | -1.7         | -2.8 | -1.2 | -2.2 | -1.9 |
| 40           | -1.8         | -2.2 | -1.7 | -1.6 | -1.8 |
| 50           | -1.5         | -2.2 | -1.3 | -1.0 | -1.5 |
| 60           | -1.5         | -1.6 | -0.6 | -0.9 | -1.1 |
| 70           | -0.9         | -1.1 | -0.1 | -0.2 | -0.5 |
| 80           | -1.4         | -0.5 | 0.2  | 0.1  | -0.4 |
| 90           | -1.0         | -0.4 | 0.0  | 0.1  | -0.3 |
| 100          | -1.5         | -0.9 | 0.4  | -0.2 | -0.5 |
| 110          | -1.3         | -0.2 | 1.9  | 1.0  | 0.3  |
| 120          | -1.5         | -0.5 | 1.9  | 0.7  | 0.1  |
| 130          | -2.1         | -1.3 | 2.1  | 0.4  | -0.2 |
| 140          | 1.1          | -0.6 | 1.2  | 1.3  | 0.7  |
| 148          | 4.1          | 3.0  | 2.3  | 5.4  | 3.7  |

#### Photographic resolution (line pairs per millimeter)

International 3-line test-chart, contrast (log) : 2.0

Aperture: 4.0  
 Filter: VIS (400-700 NM)  
 Film: KODAK PANATOMIC X 2412  
 Developer: KODAK HC110

| Angle (deg) | 0   | 5   | 10  | 15  | 20  | 25  |
|-------------|-----|-----|-----|-----|-----|-----|
| Radial:     | 118 | 117 | 116 | 114 | 111 | 107 |
| Tangential: | 118 | 105 | 103 | 110 | 94  | 97  |

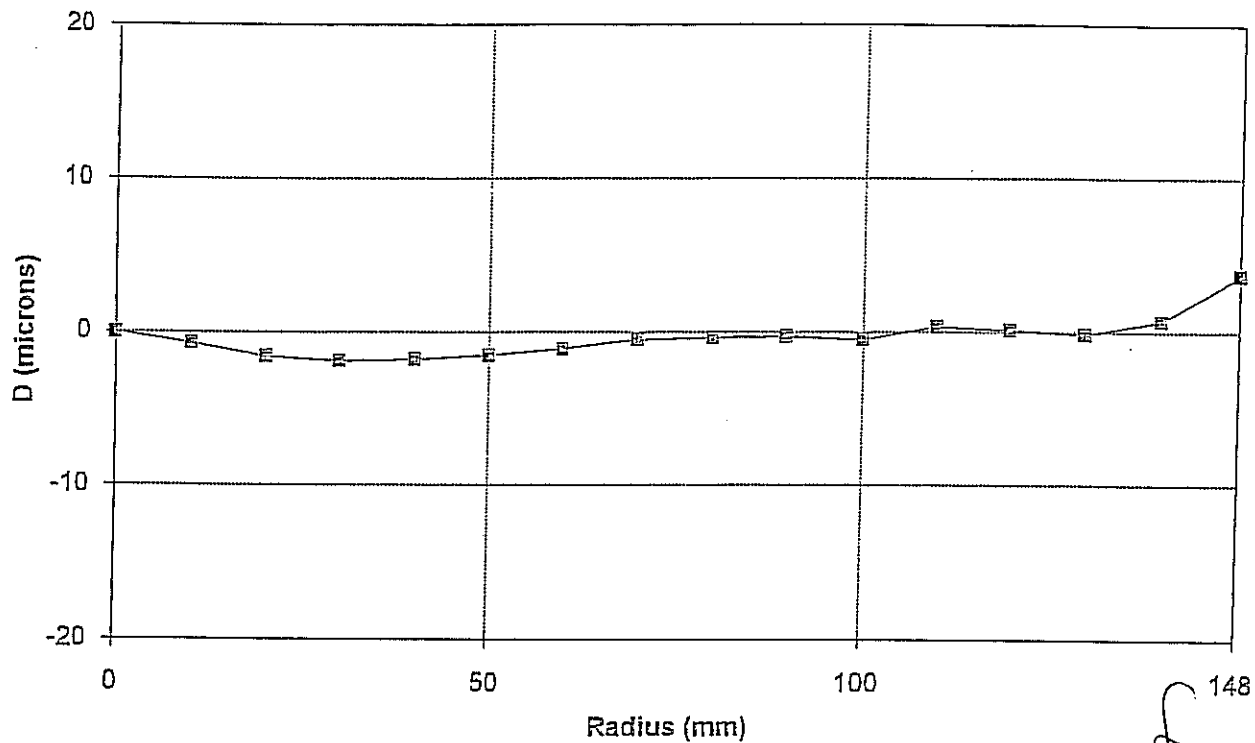
AWAR (Area weighted average resolution) in lp/mm: 107



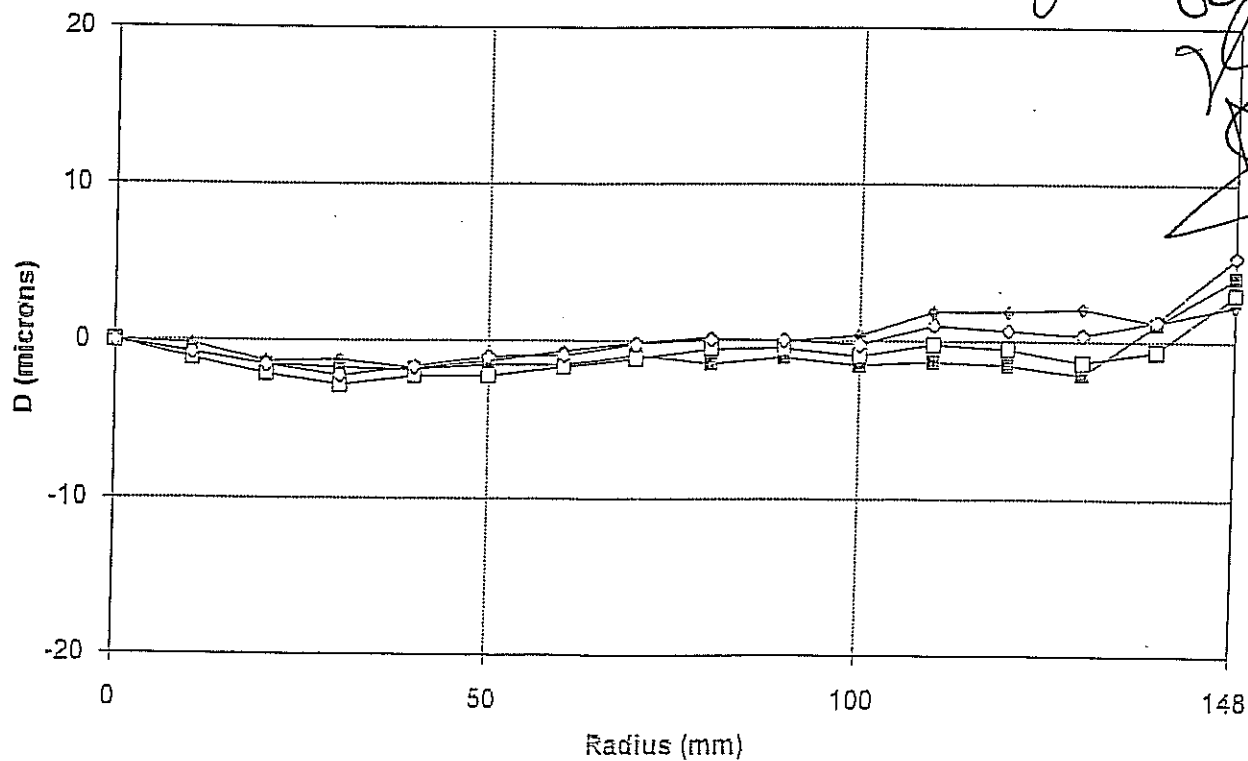
*Handwritten signatures and initials, including 'Jm', 'alt', and 'Hel'.*

Aperture: 4.0  
Filter on goniometer: VIS (400-700 NM)  
Filter on camera: --  
Principal distance for focussing distance 850 m : 303.56 mm

## Mean radial distortion



## Radial distortion for semi-diagonals referred to PPS



—■— 1 —□— 3 —◆— 2 —○— 4