

CAMERA CALIBRATION CERTIFICATE

CAMERA TYPE : RC20
LENS TYPE : 21/4 NAGA-F
LENS NO. : 7176

Calibration date: 12.02.2003

LEICA AG, HEERBRUGG

 **SwissOptic**
SwissOptic AG
Heinrich-Wild-Strasse
CH-9435 Heerbrugg
Schweiz



Aperture: 4.0
 Filter on goniometer: 450 NM
 Filter on camera: --
 Principal distance for focussing distance 900 m : 214.75 mm

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

| Radius mm | Half - Sides | | | | Mean |
|--------------|--------------|------|------|------|------|
| | 1 | 3 | 2 | 4 | |
| 10 | 1.7 | 0.7 | 1.6 | 1.2 | 1.3 |
| 20 | 2.8 | 1.7 | 2.8 | 2.2 | 2.3 |
| 30 | 3.3 | 2.4 | 3.5 | 2.3 | 2.8 |
| 40 | 4.0 | 3.2 | 3.8 | 3.0 | 3.5 |
| 50 | 4.0 | 3.2 | 3.6 | 3.0 | 3.4 |
| 60 | 3.1 | 2.7 | 3.4 | 2.1 | 2.8 |
| 70 | 2.3 | 1.7 | 1.9 | 1.3 | 1.8 |
| 80 | 0.7 | 0.9 | 1.0 | 0.4 | 0.7 |
| 90 | -0.1 | 0.7 | -0.9 | -1.0 | -0.3 |
| 100 | -1.7 | -0.7 | -1.4 | -1.9 | -1.4 |
| 110 | -2.3 | -2.0 | -2.0 | -2.0 | -2.0 |
| 120 | -1.9 | -2.6 | -2.6 | -2.4 | -2.3 |
| 130 | -1.7 | -2.4 | -1.7 | -1.5 | -1.8 |
| 140 | -0.5 | -0.6 | -0.6 | -0.1 | -0.4 |
| 148 | -1.4 | -0.9 | -0.1 | 0.3 | -0.5 |

Photographic resolution (line pairs per millimeter)

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

Aperture: 4.0
 Filter: 450 NM
 Film: KODAK PANATOMIC X 2412
 Developer: KODAK HC110

| Angle (deg) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
|-------------|----|----|----|----|----|----|----|----|
| Radial: | 84 | 84 | 83 | 81 | 63 | 48 | 52 | 55 |
| Tangential: | 84 | 74 | 65 | 62 | 59 | 55 | 50 | 45 |

AWAR (Area weighted average resolution) in lp/mm: 59

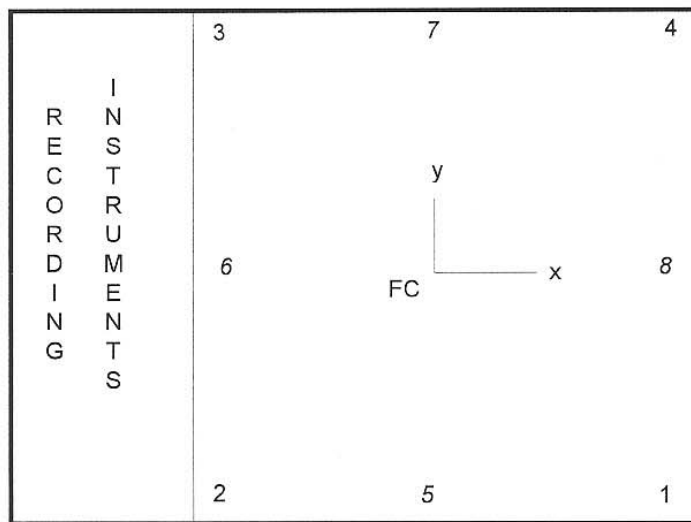


**Principal point of autocollimation (PPA) and
principal point of symmetry (PPS)**
referred to central cross (FC), see diagram

| | x (mm) | y (mm) |
|-----|--------|--------|
| PPA | -0.012 | -0.002 |
| PPS | -0.018 | -0.018 |

Fiducial marks, referred to central cross (FC)

| | x (mm) | y (mm) | | x (mm) | y (mm) |
|---|----------|----------|---|----------|----------|
| 1 | 106.000 | -106.001 | 5 | 0.004 | -110.003 |
| 2 | -106.002 | -106.001 | 6 | -110.004 | 0.002 |
| 3 | -105.998 | 105.999 | 7 | -0.003 | 110.005 |
| 4 | 106.006 | 106.005 | 8 | 110.001 | 0.003 |



as seen on focal plane frame



RC20

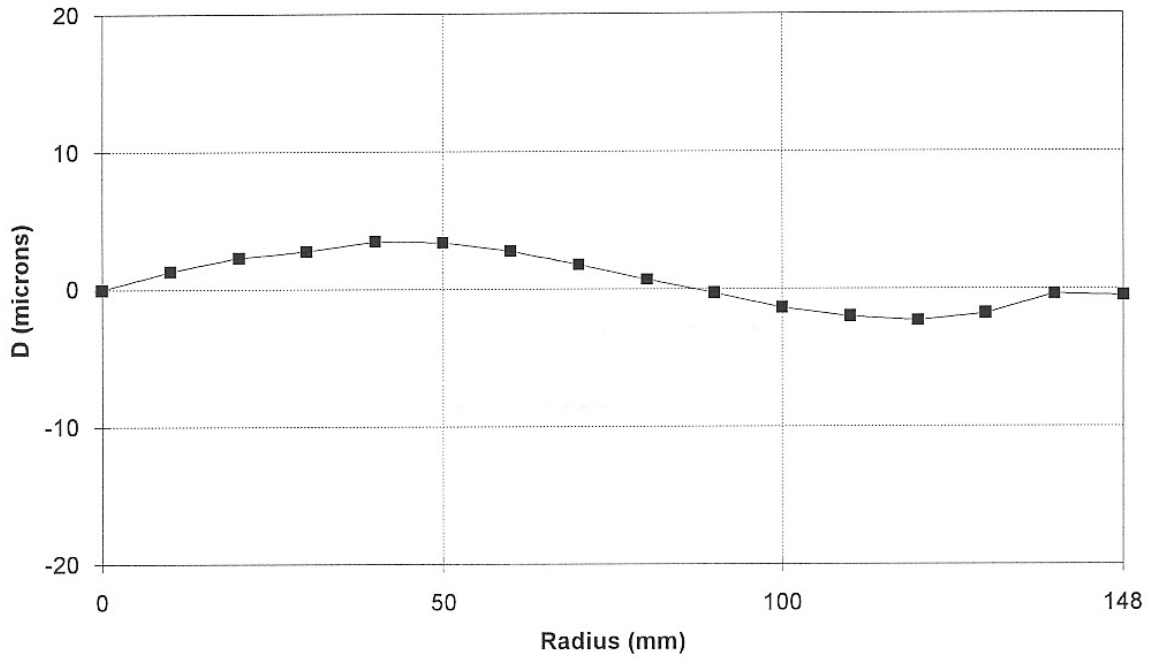
21/4 NAGA-F

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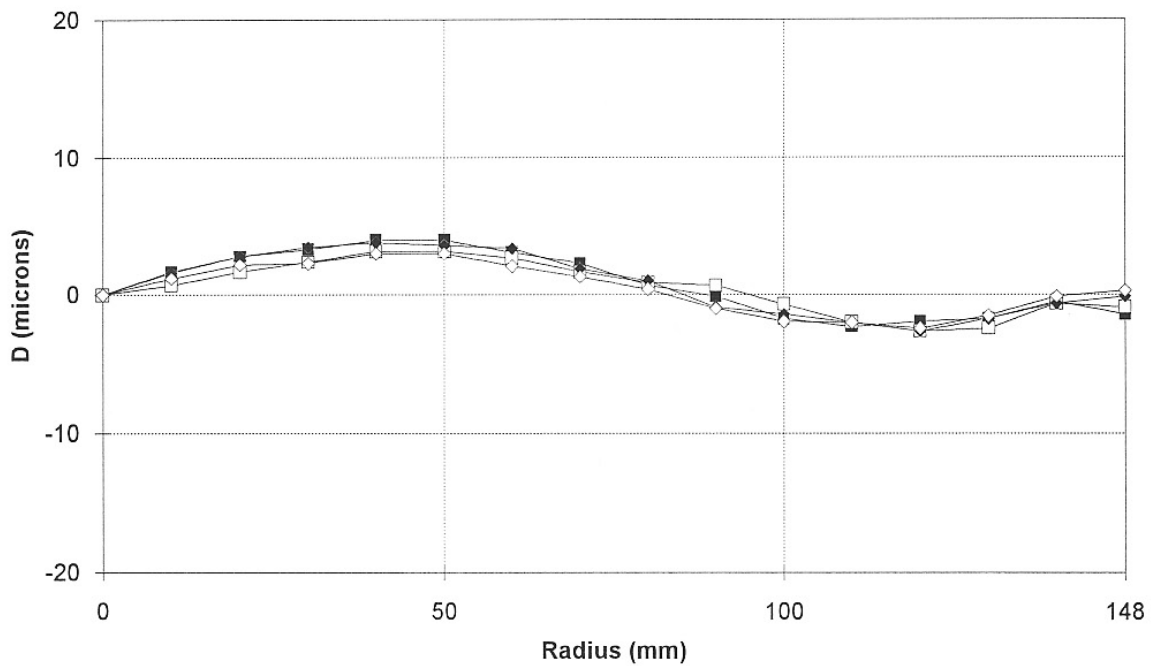
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Mean radial distortion



Radial distortion for semi-diagonals referred to PPS



—■— 1 —□— 3 —◆— 2 —◇— 4

