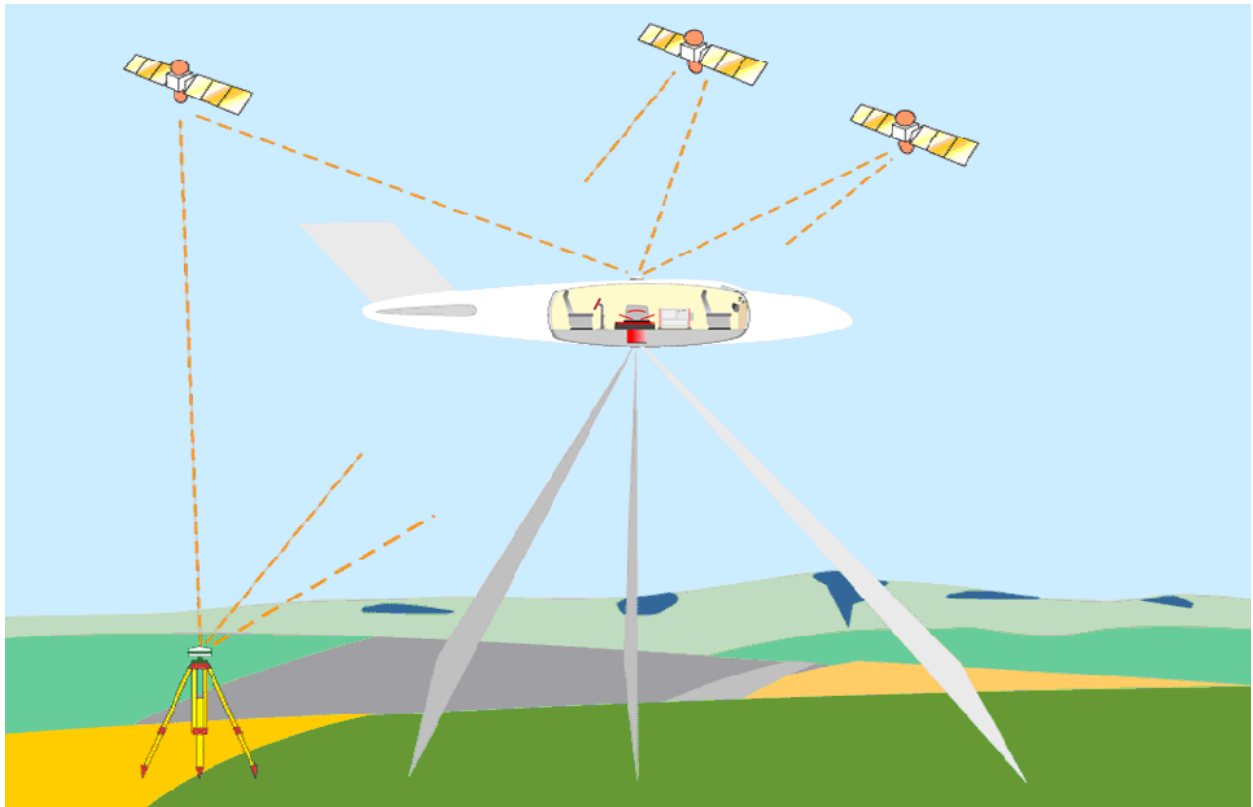


Leica ADS80 Calibration Certificate



This certificate is valid for

Sensor Head

SH82

IMU

CUS6

Serial Number

1314

Serial Number

56022244

Control
Unit

CU80

Serial Number

1129

Inspector

Calibration certificate issued on

08 August 2017

by

Robert Bosch

Certificate and calibration data ID **763806_1314_141118-1**

Document code 763806

**ADS
80**

Leica Geosystems AG
Heinrich-Wild-Strasse
9435 Heerbrugg
Switzerland

Leica
Geosystems

Components

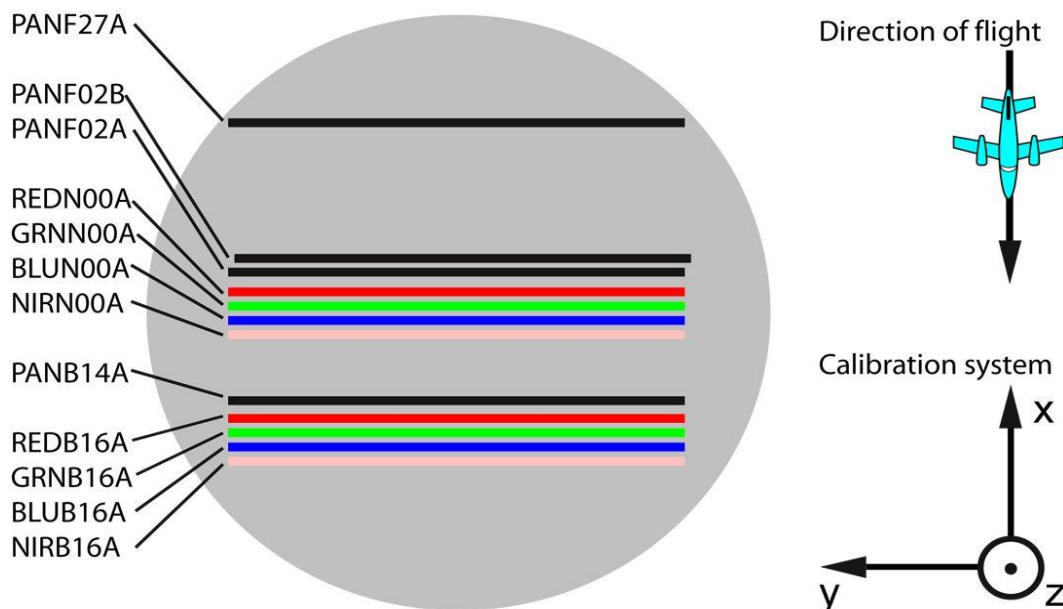
Component	Device	Type	Serial Number
<i>SH82 #1314</i>	Lens system	DO64-810000	21955 / 0032
	Focal Plate Module cover	FCO	67e
	Focal Plate Module (FPM)	FPM-A	67e
	Inertial Measurement Unit	uIRS	56022244
<i>CU80 #1129</i>	Positioning system incl. GPS/GLONASS	IPAS	1418

Nominal FPM layout of tested system

End pixel coordinates are center of pixel coordinates.
 Middle coordinates are between pixels 6000 and 6001.
 All values in [mm]

Line Name	X	Y, Pixel 1	Y, Center	Y, Pixel 12000
PANF27A	32.18400	-38.99675	0.00000	38.99675
PANF02B	02.21000	-38.99345	0.00330	39.00005
PANF02A	02.18400	-38.99675	0.00000	38.99675
REDN00A	00.01300	-38.99345	0.00330	39.00005
GRNN00A	-00.01300	-38.99675	0.00000	38.99675
BLUN00A	00.00000	-38.99345	0.00330	39.00005
NIRN00A	00.00000	-38.99675	0.00000	38.99675
PANB14A	-15.81600	-38.99675	0.00000	38.99675
REDB16A	-17.98700	-38.99345	0.00330	39.00005
GRNB16A	-18.01300	-38.99675	0.00000	38.99675
BLUB16A	-18.00000	-38.99345	0.00330	39.00005
NIRB16A	-18.00000	-38.99675	0.00000	38.99675

View from top of Sensor Head



Calibration process

Adjustment of optical systems in optical laboratory




	Passed	Date	Inspector
<i>DSNU (Dark Signal Non Uniformity)</i>	ok	22.04.2009	Bernhard Riedl
<i>PRNU (Photo Response Non Uniformity)</i>	ok	22.04.2009	Bernhard Riedl
<i>MTF</i>	ok	22.04.2009	Bernhard Riedl
<i>Best image plane</i>	ok	22.04.2009	Bernhard Riedl

Flight and data processing

	Passed	Date	Inspector
<i>Test flight</i>	ok	05.06.2017	Customer
<i>GNSS and IMU data processing</i>	ok	24.07.2017	Robert Bosch
<i>IMU accelerometer biases</i>	ok	24.07.2017	Robert Bosch
<i>Image data processing</i>	ok	24.07.2017	Robert Bosch
<i>Geometrical calibration</i>	ok	08.08.2017	Robert Bosch

Inspection

Inspectors

<i>Name</i>	Bernhard Riedl	08.08.2017	
<i>Position</i>	ADS Production Manager		
<i>Name</i>	Robert Bosch	08.08.2017	
<i>Position</i>	ADS Support Engineer		
<i>Name</i>	Udo Tempelmann	08.08.2017	
<i>Position</i>	ADS Software Manager		

Leica ADS80 calibration process specification

	Document code
<i>Inspection plan</i>	862100
<i>Leica ADS80 system calibration process</i>	870106

Maintenance

<i>Last date of service</i>	
<i>Recommendations</i>	

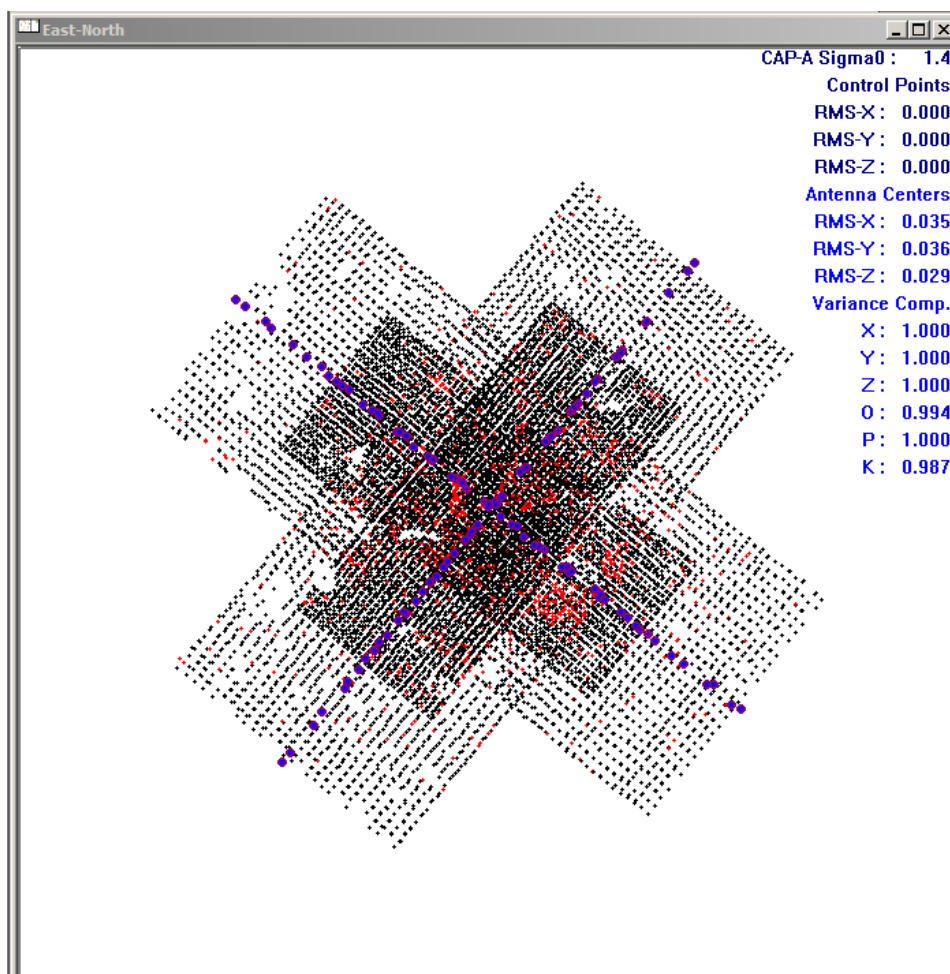
Results of geometrical calibration

Calibrated apparent pixel coordinates for all sensor lines are contained on the calibration file attached to this certificate. File: **1314-170808-1.zip**

Stereo lines

A-lines	PANF27A	PANF02A	PANB14A
Calibration method	Estimation of additional parameters in simultaneous bundle adjustment		
Sigma naught of bundle adjustment	1.4 micron		
Mean local redundancy	> 0.5		
Accuracy of calibrated apparent pixel coordinates	± 1.0 micron		

Final bundle adjustment result after elimination of tie point blunders and before introduction of ground control:



IMU misalignment

Misalignment results in [rad]:	$\omega =$	-0.0000448964	± 0.0000033014
	$\phi =$	-0.0001615988	± 0.0000033100
	$\kappa =$	-0.0000606193	± 0.0000038331

Color lines

Included lines	BLUN00A	REDN00A	GRNN00A	NIRN00A
	BLUB16A	REDB16A	GRNB16A	NIRB16A
Calibration method	Optimal robust polynomial fit of tie point residuals from bundle adjustment			
Mean accuracy of estimated fit for:				
Blue, Green, Red	± 1.5 micron			
NIR	± 1.5 micron			
Accuracy of apparent pixel-coordinates	± 1 micron			

Lines of staggered panchromatic line pair

B-lines	PANF02B
Calibration method	Transfer of A-lines results, using the known offset of the staggered lines
Accuracy of apparent pixel coordinates	Same as for A-lines
Relative accuracy between the lines of a staggered pair	± 0.5 micron