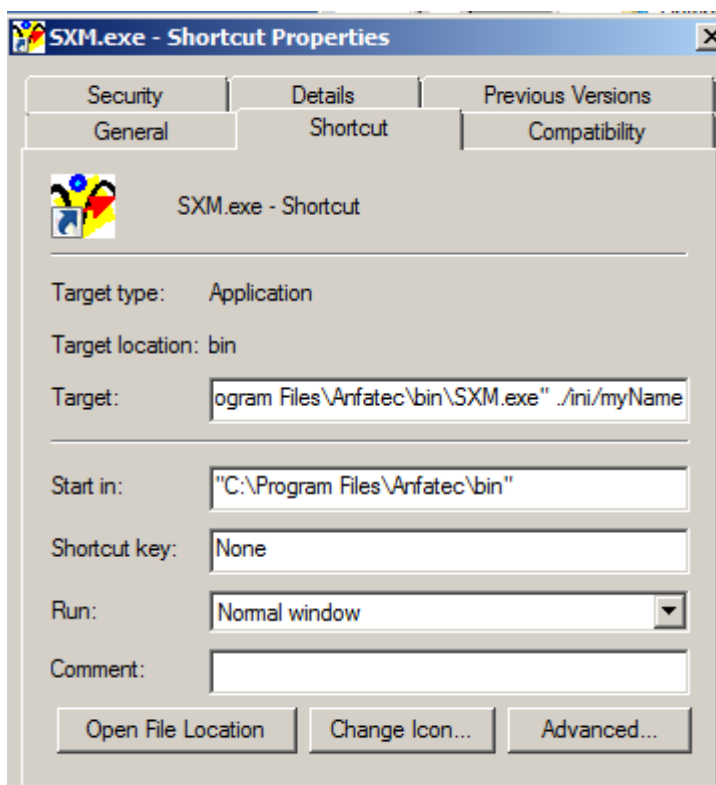


APPENDIX 1: INI-FILES

1 SXM.INI

The software “sxm.exe” requires a set of parameters, which are stored inside an ini-file. If this ini-file does not exist, it automatically generates a file named “sxm.ini” in the start directory of the sxm.exe.

In order to setup the software with specific parameters for a hardware, those ini-files can get different names and scan be located in different locations. The best way to start the sxm-exe with the correct parameter file is, to place a link to the sxm.exe on the desktop of the PC.



In order to connect the icon with a certain sxm.ini file, right-click on it and chose “Properties”.

Behind “Target”, add the relative path from the sxm.exe to the ini-file.with your name.

If a certain setting in the sxm-program should be kept for later use, one can simply create a copy of the ini-file and add another link to the desktop with reference to this ini.file, so that the program starts with these settings to be remembered.

The entries in the ini-file have the following meaning:

[scanpara]	parameters in ScanParameter window
Edit3=20	image range in the related x-y-unit **
Edit4=9	scan speed in lines/s **
Edit7=0	X-Center **
Edit8=0	Y-Center **
ComboBox1=128	number of Pixel/line **
Edit9=45	scan angle in degree **
** from version 21.3, these values are stored immediately after each entering (for LabView)	
Overscan = 3	percentage of overscan
SetPoint=1	set point
Voltage=10	tunneling voltage in physical units
Integral=1	controller parameter Ki

Proportional=100	controller parameter Kp
ComboBox1=128	number of Pixel/line
FormPosLeft=64	x-Position parameter windows
FormPosTop=51	y-Position of parameter windows
RetractItemCaption2=-	captions hidden under the Retract knob
RetractItemCaption3="10 µm"	
RetractItemSteps3=10	amount of stepper steps for the distance named "10 µm"
RetractItemCaption4="100 µm"	
RetractItemSteps4=100	
RetractItemCaption5="1 mm"	
RetractItemSteps5=1000	amount of stepper steps for the distance named "1000 µm"
RetractItemDefault=3	
ApproachItemCaption3=-	captions hidden under the Approach knob
ApproachItemCaption4="2 µm"	
ApproachItemSteps4=2	
ApproachItemCaption5="10 µm"	
ApproachItemSteps5=10	
ApproachItemCaption5="100 µm"	
ApproachItemSteps5=100	
Level=2	last plane level function
dxdz=0	stored values for plane tilt
dydz=0	
<i>// new in 2017 //</i>	
EnableFastApproach=0	disables the visibility of the "FastApproach" feature
<i>// new in 2018 //</i>	
EnableDriftCorr=0	enables the feature Drift-Correction in the parameter tab
[WindowName]	
window0=Height	every window can get useful names here
window1=AD1	
window2=AD2	in newer version, the number of windows here is much larger
window3=AD3	
window4=AD4	The numbers equal the channels.
[WindowSlope]	
window0=0	slope correction selection for the windows
window1=0	the number written here is the last setting for slope correction
window2=0	
window3=0	
window4=0	
[WindowInvisible]	
ADC15=1	Here, some windows (DMX or DMY) can be switched of manually
ADC16=1	These signals are always ON, if Hardlin is active, however, for the screen, it is sometimes nice not to have them on the screen.
[Oszi]	
Scale=2	Oscilloscope window
ScaleNumber=3000	type of scaling last scaling

FormPosLeft=176	x-Position of oscilloscope window
FormPosTop=204	y-Position of oscilloscope window
[Window]	
window0=1	"1" means, that this window is displayed
window1=1	all windows are saved
window2=0 ...	
....	
ADC1=1	channel ADC1 is installed/not installed.
DAC1=1	channel DAC1 is installed/not installed.
....	
[FeedPara]	Feedback parameter window
Edit1=-600.85	edit windows settings
Edit2=-10	
Edit5=1	
Edit6=0	
KelvinOffset=0	this option is for the compensated KPFM measurements. When "1", the user can set a value into an Offset window "Edit11".
	When "0", "Edit11" disappears
Edit11=0	value for the last set Offset in compensated KPFM
ApproachDeadTime=10	→ is a number in μs . Default is 2 μs .
FeedbackChannelAddr0=0	allows to set the input channel for each feedback mode
... Addr0 = 1 st	feedback mode in feedback list
... Addr1 = 2 nd	feedback mode in feedback list
... Addr2 = 3 rd	feedback mode in feedback list
= 0	the input channel is the 1 st channel in the ADC channel list
= 4	the input channel is the 5 th channel in the ADC channel list
// new in 2017 //	
PreAmpVer=1	enables the external I2C driven Bias-Switch (/1, /10, /100)
[Spekt]	
FormPosTop=88	spectroscopy window
FormPosLeft=102	y-position of window
ItemString=0	x-position of window
Edit1=-8.9369	selection of spectroscopy-Modus
Edit2=-1.495	X-Position
Edit3=10000	Y-Position
PreAmpVer=1	Delay 1
PreAmpSwitch=-1	-1 or not listed: no preamp. 1...FemtoPreAmp, 2...Omicron
PreAmpBiasSwitch=-1	last entry of the Omicron/Femto-PreAmpSwitch
	Bias Switch position for Sigma or Omicron type Bias Switches
// new in 2017 //	
Feenstra=1	enables Feenstra Spectroscopy. "1"=ON. "0"=Off (default)
[I_s]	
Edit4=1990.7	for distances spectroscopy
Edit5=0.10001	Delay 2
Edit8=0	retracted distance
[I_U]	
Edit4=509.26	for current- voltages-spectroscopy
	Delay 2

Edit5=0.33	step width
Edit6=0	start voltage
Edit7=99.999	End voltage
[feedback_test]	for den Feedback-Test
Edit4=46.296	Delay 2
Edit5=2	retract value
Edit8=0	
Channel=12	
Kind=23	
CountCh=3	
Channel0=0	
ViewY0=3	
ViewX=0	
Channel1=4	
Channel2=5	
Cycle=0,5	
Leadinout=On	
[Save]	window Options/Set-up
Path=C:/sxm/bilder	save path
AutoSaveSpekt=1	automatic save of spectroscopy-data
BasisName=a1	Basis for file names during save
number=2	number, which is added to the base name
AutoSaveScan= 0	automatic save of images
PathFormPosLeft=452	x-Position of window
PathFormPosTop=295	y-Position of window
[Scale]	window Options/Scale
DACxCheckBox1=1	channel x installed
DACxCheckBox2=0	channel x not inverted
ADCxCheckBox1=1	channel x installed
ADCxCheckBox2=1	channel x inverted
DACxEdit1=nm	physical unit of D/A-channel x
DACxEdit2=0.00043	scaling factor of D/A-channel x
DACxEdit3=-32760	minimum numerical value of D/A-channel x
DACxEdit4=32760	maximum numerical value of D/A-channel x
DACxEdit5=0	Offset of D/A-channel x
ADCxEdit1=mV	physical unit of A/D-channel x
ADCxEdit2=0.305	scaling factor of A/D-channel x
ADCxEdit3=-32760	minimum numerical value of A/D-channel x
ADCxEdit4=32760	maximum numerical value of A/D-channel x
ADCxEdit5=0	Offset of A/D-channel x
DACxLabel2=bias	name of D/A-channel x
ADCxLabel2=current	name of A/D- channel x
...	
[Stepper]	coarse positioning
StageControllMode=0	Z825 DC Motors operation mode
StageControllPosUp=0	..
StageControllPosDown=0	..

ComX=3	serial interface for Agilis tables
slSlow=120	long break between two steps for Slip-Sticks, or voltage for dc motor in standard mode
slFast=20	short wait time between two steps for Slip-Sticks or voltage for dc motor in high-speed mode
slSteps=1	number of steps at single click
AppSteps=10	number of steps during automated approach, which the motor is moved after each piezo move cycle
RetSteps=10	number of steps for retract in feedback.
Right=10	Function number, for the coarse move window buttons
Left=11	....links
Forward=12	....front (= + y-direction)
Backward=13	....back (= - y-direction)
Up=23	....retract
Down=22	....approach
Off=28	current through motors stopped
RULD=25	tilt of level station (right axis up, left axis down)
RDLU=24	tilt of level station (right axis down, left axis up)
BU=27	tilt of level station (back axis up)
BD=26	tilt of level station (back axis down)
zCoarsePos=82756	
slStepsVisible=0	
OnTime= 80000	time the voltage for dc motors is ON fr z-Approach in μ s
<i>// new in 2017 //</i>	
FastTempOff=125	additional stepper function that allows to stop SlipStick motion faster after Joystick is released
MultiRelayInstalled=1	.. for Update-Controllers for older Omicron-Hardware displays/allows to set the status of the Joystick backside buttons (more SlipStick directions)
[Coarse]	window ""Coarse Move""
xyTranslator=true	if false, the coarse move short cut is hidden
FormPosLeft=181	x-Position of Coarse-Move window
FormPosTop=250	y-Position of Coarse-Move window
SlowX=200	Advanced menu in the Coarse Move window
FastX=1	wait at slow movement (without Shift) in x
SlowY=200	wait at fast movement (with Shift) in x
FastY=1	....in y
SlowZ=200	....in y
FastZ=1	....in z
SlowLevel=200	....in z
FastLevel=1	wait time for slow movement of Level motors
level station=0	wait time for fast movement of Level motors
HighSpeed=1	if "1", then Level-Station is working
Sound=1	High-Speed button pressed or not
StepsZ=1	sound on step On or Off
StepsX=7	... how many steps are done with one single click on up/down
StepsY=7	... same for left/right
....	... same for forward/backward
	.... here can be very different entries for specific systems, that describe

specific functions ... please refer to your system.

[Crosshairs]	zu window "Crosshairs"
FormPosLeft=323	x-Position of cross hairs windows
FormPosTop=119	y-Position of cross hairs windows
ChannelX=1	A/D-channel for x-direction
ChannelY=4	A/D-channel for y-direction (here: FastTB)
ChannelZ=2	A/D-channel for z-direction
Gain=2	Gain
[Microscope]	
Feedback=3	number of selected Feedbacks
SlowFeedbackMaxBandwidth=39062	maximum pixel clock in normal feedback mode
LIAVersion=23	This is the Version of the sxm-board and used for the ac-coupling of the input. Default value is "22", which equals no ac-coupling. For hardware version "23", the line is obligatory. For hardware versions higher than 23, this line is not needed.
OffsAngle=-90	scan angle in hardware, if the user enters 0° in software
KelvinFeedback=0	1 = Kelvin Feedback active (or not = 0)
KelvinChannel=2	LIA channels whose LiaX is taken as KPFM-feedback input
FormPosLeft=98	
FormPosTop=422	
SpringConstant=0.2	
enableLockin=0	
CantileverScaleCMAFM=-4454634,31633802	
CantileverScaleNCAFM=0	
CorrectZ=0	
TimeToCallDriver=1	
CompensatorFB=0	
FeedbackBandWidthGain=1	
[dnc]	dynamic non-contact window DNC
channel=12	hardware channel for the amplitude (= feedback input for AFM amplitude ...)
channelPhi=13	hardware channel of the phase signal (needed for AutoPhase and PLL)
maxUac=1	limit for the maximum drive voltage in V. If not mentioned, then all drives are possible.
Start=370902	Start frequency
Stop=373239	Stop frequency
Use=372300	valid frequency
FormPosLeft=81	window position x
FormPosTop=537	window position Y
InputRadio1=0	last selection of the gain – here: not selected
Input1Scale=0.213	hardware scaling of the dnc-input for the gain 1
InputRadio10=1	last selection of the gain – here: selected
Input10Scale=0.0210	hardware scaling of the dnc-input for the gain 10
InputRadio100=0	last selection of the gain – here: not selected
Input100Scale=0.00189	hardware scaling of the dnc-input for the gain 100
Popup0=20k-400k	default frequency range

Popup1=352500-383672	entry 1 in the frequency range list with the last ranges
Popup2=369669-376244	entry 1 in the frequency range list with the last ranges
Popup3=370902-373239	entry 1 in the frequency range list with the last ranges
Popup4=136638-143892	entry 1 in the frequency range list with the last ranges
Ampl=0,1000	last set drive amplitude
Scale0=336	hardware scaling of the ref-output between switch0 and switch1
Scale1=3696	hardware scaling of the ref-output between switch1 and switch2
Scale2=3696	hardware scaling of the ref-output between switch2 and switch3
Scale3=36850	hardware scaling of the ref-output below switch3
Switch0=5.6	maximum rms output amplitude
Switch1=0.56	hardware switch ($< 2047/Scale1$)
Switch2=0.5395	hardware switch ($< 2047/Scale2$)
Switch3=0.056	hardware switch ($< 2047/Scale3$)
Tau=2	
RollOff=2	
RedBandwidth=0	

[dncopt]	Options for the dnc-window
history=2	number of shown spectra
vector=1	Pixel- or line plot (1... line plot)
average=100	number of averages
datapoints=256	number of data points
DelimiterSave=1	delimiter between data points
FormPosLeft=187	window position X
FormPosTop=216	window position Y
SaveNumbered=1	numbered save on / off
SaveComment=0	save with comments on / off
SaveExt=dat	File-Extension
SaveName=E:/Inbetriebnahme/test	valid path
NextNumber=2	next spectrum
ContAverage=-1	
Wobbel=0	Wobbel on / off
Comment=	last comments
harmonic=1	allows to set a different harmonic as feedback amplitude (for AMU2.4, only)
phase=150,249	offset phase for manual phase adjustment
AutoPhase=1	automated phase adjustment on/off
ShowWarning=1	
ScaleY=0	
ShowWarningOverload=1	
Beep on Overload=1	
BeepOnOverload=0	
ac=1	ac input coupling for the lockin amplifier enabled
SyncFilter=1	checkbox for synchronous filter = on/off, if enabled
ShowPhase=0	
ShowX=0	

QEnabled=0
 LastSaveName="I:\Data\150915_PCICard_Sigma\10nA_x10_1s_50Ohm.dat"
 activeTab=0
 AutoSave=0

// new in 2017 //

showwarning=0 Usually, the software checks that the shown data in a spectrum is taken from the input to the feedback. This entry disables that the feedback channel is checked for each spectrum acquisition.

[Main] for main window
DDEServerOn=1 allow to control the software via Python
 FormPosLeft=117 Position X
 FormPosTop=32 Position Y
 FormWidth=... Width of the main window
 FormHeight=... Height of the main window

ContOnRestart=1
RetractOnExitSXM=1 has to be entered manually. Default: 0 (no retract on exit).
UserIni="./ini/...." relative path to a specific user.ini file **with no extension**
example: UserIni="./ini/CMuser"

DeviceDriverIOCTLFreq=7922

[SpektOpt] options of spectroscopy
 FormPosLeft=463 Position X
 FormPosTop=188 Position Y
 SaveComment=1
 DelimiterSave=1
 SaveExt=dat
 xAxis=1
 SaveNumbered=1
 AutoSave=0
 SaveName=E:/Inbetriebnahme/ path for saving
 NextNumber=3
CountAverage=1
History=0
DataPoints=1
Vectors=1
Color0=0
Color1=255
Color2=16711680
Color3=65280
ShowLeadInOut=1
yAxisAll=1
LastSaveName=

[Oszi2] for window oscilloscope 2
 Channel1=1 which channel in 1 an
 Channel2=10 which channel in 2 an
 Channel3=0 which channel in 3 an
 Offs1=141 Offset of channel 1
 Offs2=217 Offset of channel 2
 Offs3=265 Offset of channel 3

[X_s]
Edit4=4864
Edit5=-8000
Channel=5
Edit8=1000
Channel0=0
ViewY0=3
Cycle=1
Leadinout=On
Kind=5
ViewX=0
LineWidth=3
CountCh=4
Channel1=2
Channel2=0
DataPoints=1023
Channel3=0
Edit6=2000
Edit7=-1000

[Tools]
camera =
LinScan =
CameraOption=1
Present=

additional programs
path for camera program
path for Linearisation file

[X_U]
Edit4=10010
Edit5=20
Edit6=-20
Edit7=-1000
Channel=9
Kind=9
Channel0=1
ViewY0=3
ViewX=0
Cycle=1
Leadinout=On
CountCh=4
Channel1=0
Channel2=4
Channel3=-1
DataPoints=256
BiasCycleName=""
Edit8=1000

all settings for the X_U-spectroscopy
Each spectroscopy type gets its own ini-entry region

[Sel]
FormPosLeft=54
FormPosTop=563

settings of the scripting window

[Setup]

FormPosLeft=135

FormPosTop=167

[Slid]

FormPosLeft=673

FormPosTop=306

FormPosHeight=526

DA1=3,1

DA2=-3

DA3=2

DA4=2

Radio1=1

...

Window to adjust auxiliary DAC-channel outputs

Position of the window

output value at DA AUX5

at AUX6

at AUX7

at AUX8

... which options are selected

[AutoOffset]

FormPosLeft=496

FormPosTop=142

this function is required for STM operation

[Software]

OsziButton=0

SpectButton=1

CoarseButton=0

Crosshairsbutton=0

dncButton=1

SelButton=0

Oszi2Button=1

ScanButton=0

CameraButton=0

SlidButton=0

LockinButton=1

FastSpeedButton=0

which button in the menu bar are visible

0 = off

1 = on

Switches the button for Fast Mode off

(not required, if AMU2.9 is not plugged)

ZControl Button visible or not

Tip Conditioning Button visible or not

1 ... enables that the entry [Options/LED] appears

starting from Vers. 26.38 ... required

for Interferometer Feedback, only

ZControlButton=0

TipFormButton=0

LEDButton=1

InterButton=0

[Misc]

FormPosLeft=35

FormPosTop=1

position of the Options/Misc-window

[osziopt]

SaveName="c:\temp\lin\3"

SaveExt="dat"

.....

Options for the 'Oscilloscope2-Window'

these settings are comparable with the other option windows

[trash]

Vectors=1

[MultiLockin]

Amplitude=0.2

only valid if the 4-channel lock-in board is implemented
→ hardware version: AMU2.6 and AMU2.9

FormPosLeft=191

FormPosTop=291

FilterIndex=0

RollOfIndex=-1

Freq1=2000.001

Channel0=5

Channel1=6

AmplScale3=960000

Scaling of the DAC-Output for RefB

AmplScale2=97400

AmplScale1=not used

AmplScale0=8770

InputRadio1=1

Scaling of the ADC-Input B (AMU2.9, only)

Input1Scale=0.087

InputRadio10=0

Input10Scale=0.00847

Freq2=200000

Phase1=341,9

last detected phase offset

Phase2=13,3

Phase3=-20,5

ACtoDCScale=1

sets the ratio in scaling between lockin channels and related DC inout channels "Amplitude vs. InA" and "Lia1R vs. InB" entry is generated automatically == 1 in sxm-versions > 26.28

[Force]

parts of a new force spectroscopy (not ready)

FormPosLeft=18

FormPosTop=18

ForceGain=0

[Joystick]

settings for the coarse control via external game controller

Use=1

1= use game controller, 0= game controller not visible(default)

JoyName="Logitech Cordless RumblePad 2" name of the last selected game controller

JoyItemX=0 function used for x-movement (0st entry = x-movement)

JoyItemY=1 function used for y-movement

JoyItemZ=3 function used for z-movement

Tolerance=5 minimum distance from "zero" to start with the movement

If the joystick does not stop to move, if it is released, then this value has to be increased.

JoyModeByte=6

JoyModeBit=3

FormPosLeft=76

position of the joystick window

FormPosTop=330

position of the joystick window

SelectPoint=5

[Scanner]

special settings for image acquisition

Name='S0921'

name of the scanner file in use

SoftLinOn=1 uses scanner file on/off
 HardLinOn=1 uses hardware linearisation
 SyncFilter=1 enables the entry “synchronous filter” for DNC

[HardLin] stores settings in “Options/Hardlin”
 LinXa2=0,858324386114955 coefficients ...
 LinYa2=0,172434526145788
 LinXa3=1,69035086122468
 LinYa3=-0,0399022017081163
 Ki=0 feedback speed
 InX=13 channel for x-direction linearisation
 InY=14 channel for y-direction linearisation
 FitPoly=1 fit on/off
 X2X3_0=0 set coefficients zero on/off
 FormPosLeft=58
 FormPosTop=162
 FrmPosLeft=1293
 KiPoly=0.02

[SXMSaver] settings for the energy saver in the system
 Coarseretract=1
 IdleTime=180 time to auto-standby
 LASEROff=1
 PiezoOff=1
 StepperIdleTime=10 TimeOut for the steppers in seconds

[CM X(U)]

[script]
 Path=C:\user\falk\sxm\SCAN\Scripts
 FileName=Stepper.scr

[LED]
 FormPosLeft=705
 FormPosTop=112
 UsePWM=1 switched a pulse width modulated output on for an external LED
 UseI2C=0 switches the appearance of the 1st two LED sliders off

[ZControl]
 MouseWheelSense= default value: $0.0125/3 = 0.004166$.
 Entry is generated automatically.
 defines

[Camera]

[X(t) // U-Step OL] these are all settings for different spectroscopy options
 [X(t) // s-step CL]
 [X(t) s-step CL]
 [X(t) U-Step]
 [X(t) s-Step]

[X(U) CL]
[X(s)]
[X(t) z-step CL]
[X(t) z-Step]
[X(t) U-Step CL]

[SmartFeedback]
[GenLockin]
[TipCond]
[A3D]

[TestMic]
Gain0=15 // HVA Gain für Z
Gain2=15 // HVA Gain für X
Gain3=15 // HVA Gain für Y
GainzFast=15 // HVA Gain für FastZ

[Scannerwin]
MaxRange=320 maximum voltage range that is used to display in units of nm/V for X and Y
FilterRevision=2 this entry is required in High-Speed Systems, only, and
0 .. no filter used at all
1 .. filters on PCI card used
2 .. enables that 4 filter/channels are accessible// inside controller unit
3 .. closed loop implementation with 6 generic filter stages for X and Y
PowerFkt=2 used for the HV Bus switch. Default: 0.

[PowerFkt2] entry appears only if [Scannerwin]-> PowerFkt=2
enableOff=0 Off-Knob in the tab "Power" in the scanner window visible or not
EnableLowBW=0 low bandwidth Knob in the tab "Power" visible or not
AutoHighBW=1 which bandwidth setting is used when software starts
AutoLowBW=0

// new in 2017 //

**the following two entries are generated only, if AutoHighBW=0 AND AutoLowBW=0:
AutoLowBWforPII=0**

**"1" = automatically Low Bandwidth for HV amplifiers in PLL mode
"0" = Bandwidth for HV amplifiers can be switched in PLL mode**

AutoHighBWforNotPII=0

**"1" = automatically Low Bandwidth for HV amplifiers in mixed mode
"0" = Bandwidth for HV amplifiers can be switched in mixed mode**

**EnableHighBW=0 "0" makes the power entry "Active" invisible
"1" entry is visible (default, if entry is missing)**

[SlowADC]
Getec=1 show only three HV channels through the HV-Relais board
Gain0=157.6E-9 Scaling of the 1st HV number (X)
Gain1=157.2E-9 Scaling of the 2nd HV number (Y)
Gain2=157.2E-9 Scaling of the 3rd HV number (Z)

2 SCANNER.INI

```
[Gains]           // piezo gains given in nm/V or μm/V
XGain=0.39        // example: 9 μm at 150 V voltage sweep with a hardware gain of 6.5
YGain=0.39        // in μm/V, because X and Y are scaled in μm
ZGain=60          // example: 9 μm at 150 V → 60 nm/V
ZFastGain=30      // shorter piezo actuator
```

3 USER.INI

Contains settings for window positions, selected channels, channels to be acquired. The connection between an ini-file (parameter called from the desktop) and this user.ini-file is done with an ini-entry in the sxm.ini: [Main] **UserIni="./ini/...."** .