

FiSens FBG-Interrogator

[Multi-Channel Software]

Quickstart Guide

Version 1.0

Software versions covered in this handbook:

- FiSens FBG-Interrogator 1.5 alpha 2

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1 System, Fiber and FBG Channel Setup

1.1 Connecting Devices and Fibers

Once you have successfully installed the LabView runtime and FiSens FBG-Interrogator software is copied to your hardware drive, please open the executable file: "*FiSens FBG-Interrogator*".

As soon as the window is opened, to start click on the top right button: "Connect Interrogators".

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Measurement	Conf	Figurat	ion			\emptyset	FiSe	ens	FE	3G In	nterr	ogat	or 1.	.5 alı	oha 2	2						Optimi	ze Laten	cy time		Conne	ct inter	rogators	Exit progra
	Settings	Zero		2 4 6	8 10	12 14 1	Vi 6 18 20	sualisatio	n Range (26 28	°C) 30 32 3	34 36 3	8 4 0 42	44 46	48 50	10 Hz 10,2 10,2	Targe Raw Ri Effect.	t Rate ate (Hz) Rate (Hz)	Au opti	to- mize	500 - 0 - - 500 -			Res Se De	et Grapi elect all select al	Me	l sec. Vit asured va	sualisation Span Ilue Ire (°C)	Save selected sensors to dis	k Save at refresh Refresh Spectra
10030021 FBG X100 100,00ms x1	s	z	-/-/* 22,3	-/-/2 22,1	-/-/3 22,4	-/-/4 22,1	-/-/5 22,7	-/-/6 22,5	-/-/7 21,9	-/-/8 22,7	-/-/9 22,8	-/-/10 22,6	-/-/11 22,6	-/-/12 22,3	-/-/13 22,5	-/-/14 22,7	-/-/15 22,4	-/-/16 22,4	-/-/17 22,8	-/-/18 22,4	-/-/19 21,8	-/-/20 22,5							
40030001 FBG X400 50,00ms x2	s	z	-/1/ 33,2	1 -/1/2 32,3	-/1/3 35,4	-/1/4 32,7	-/1/5 37,4	-/1/6 28,2	-/1/7 30,5	-/1/8 24,2	-/1/9 24,9	-/1/10 28,6	-/1/11 30,7	-/1/12 31,0	-/1/13 35,0	-/1/14 35,4	-/1/15 38,4	-/1/16 40,4	-/1/17 32,4	-/1/18 41,1	-/1/19 33,2	-/1/20 36,3	-/1/21 33,0	-/1/22 26,5	-/1/23 19,7	-/1/24 12,1	-/1/25 17,7		
	s	z	-/2/ -26,1	1 -/2/2 30,2	-/2/3 38,3	-/2/4 35,1	-/2/5 34,3	-/2/6 33,4	-/2/7 38,8	-/2/8 38,9	-/2/9 37,7	-/2/10 37,0	-/2/11 33,6	-/2/12 36,8	-/2/13 34,4	-/2/14 24,4	-/2/15 25,6	-/2/16 25,0	-/2/17 38,2	-/2/18 34,8	-/2/19 35,2	-/2/20 34,9	-/2/21 37,8	-/2/22 30,4	-/2/23 30,8	-/2/24 23,0	-/2/25 17,8		
	s	z	-/3/ -22,6	1 -/3/2 31,5	-/3/3 28,7	-/3/4 25,1	-/3/5 29,8	-/3/6 22,9	-/3/7 25,2	-/3/8 23,1	-/3/9 26,7	-/3/10 24,7	-/3/11 31,0	-/3/12 25,7	-/3/13 23,7	-/3/14 24,8	-/3/15 22,6	-/3/16 23,1	-/3/17 20,2	-/3/18 25,7	-/3/19 17,1	-/3/20 18,0	-/3/21 18,3	-/3/22 18,8	-/3/23 15,1	-/3/24 11,0	-/3/25		
	s	z	-/4/ 37,1	1 -/4/2 32,3	-/4/3 35,1	-/4/4 33,1	-/4/5 27,9	-/4/6 32,3	-/4/7 30,1	-/4/8 29,7	-/4/9 25,7	-/4/10 33,2	-/4/11 32,0	-/4/12 32,1	-/4/13 33,4	-/4/14 30,3	-/4/15 30,5	-/4/16 27,5	-/4/17 22,7	-/4/18	-/4/19 17,7	-/4/20 19,4	-/4/21 12,9	-/4/22 12,7	-/4/23 19,5	-/4/24 12,8	-/4/25 18,0		
	s																												

The software should then connect to the systems, their fibers and FBG sensors. If the software does not connect nor show the system and their FBG, please check under Windows Device Management, whether the system is detected and most likely the driver not automatically installed. You will find an FTDI driver installer in the installation folder, which after installation should allow Windows to detect the Interrogator properly under the COM-Ports.

Once connected, each fiber is displayed by a row and multiple fibers are framed by an orange line highlighting their correspondent Interrogator system shown on the left. Each FBG sensor is displayed by a block counted from left to right: 1 to maximal 32 FBG per fiber.

1.2 Setting FBG sensor channels

Since this is the first time you connect the fiber to the system, not all FBG sensor channels are properly adjusted (as you can see by the inhomogeneous color distribution over the FBG sensor blocks).

To start the setting and zeroing of all FBG sensors per fiber **click on the left button:** "*S*" (for Settings). A new window should then open, where you can set all kind of FBG wavelength channel interrogation parameters for each respective fiber. In the left chart you will also see the raw spectra of the different fibers connected. You can switch between the fibers by simply use the up-/down arrows on the right.

For now, **click on the button:** "Adaptive auto-set" in the middle right of the window. The software will then automatically detect all FBG sensors along the fiber and set a correspondent FBG sensor channel.



After closing the window by clicking on the middle right red button: "*Back to main program (ESC)*" you will come back to the main window of the application.

After you have "Adaptive Auto-Set" all connected fibers, the FBG sensor blocks should look homogenously colored and zeroed at one temperature or strain, like this:

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Measurement	Cont	figurat	ion			\emptyset	FiSe	ens	FE	3G Ir	nterro	ogat	or 1.	5 alp	oha 2	2						Optim	ize Laten	cy time		Conne	ct inter	rrogators	Exit progr	ram
	Settings	Zero all		4 6	8 10	12 14 1	Vi 6 18 20	sualisatio 22 24	n Range i 26 28	(°C) 30 32	34 36 3	8 40 42	44 46	48 50	9,4 10,3	Targe Raw Ra Effect.	t Rate ate (Hz) Rate (Hz]	Au opti	to- mize	500 - 0 - -500 -			Res Se De	set Grapi elect all select al	1 ∂ 30 Ame) sec. ^{Vie} asured va emperatu	sualisation Span slue ure (°C)	Save selected sensors to disk	Save at refresh Refresh Spectra	Signal level
10030021 FBG X100 100,00ms x1	s	z	-/-/1 21,4	-/-/2 20,6	-/-/3 20,5	-/-/4 20,9	-/-/5 21,0	-/-/6 21,7	-/-/7 20,9	-/-/8 21,1	-/-/9 20,8	-/-/10 20,9	-/-/11 21,1	-/-/12 21,3	-/-/13 20,9	-/-/14 20,9	-/-/15 20,8	-/-/16 21,1	-/-/17 20,7	-/-/18 21,0	-/-/19 20,9	-/-/20 21,1						^		1
40030001 FBG X400 50,00ms x2	s	z	-/1/1 21,5	-/1/2 21,3	-/1/3 21,1	-/1/4 20,6	-/1/5	-/1/6	-/1/7 21,3	-/1/8 21,0	-/1/9 21,1	-/1/10 21,7	-/1/11 21,0	-/1/12 20,8	-/1/13 21,2	-/1/14	-/1/15 21,3	-/1/16 21,3	-/1/17	-/1/18 21,4	-/1/19 21,3	-/1/20 20,8	-/1/21 21,4	-/1/22 21,0	-/1/23	-/1/24 21,2	-/1/25 21,0			ĩ 🚺
	s	z	-/2/1 21.1	-/2/2 21.1	-/2/3 20.8	-/2/4 20.8	-/2/5 21.2	-/2/6 20.3	-/2/7 21.1	-/2/8 21.3	-/2/9 21.3	-/2/10 20.9	-/2/11 21.7	-/2/12 21.1	-/2/13 21.1	-/2/14 21.3	-/2/15 21.1	-/2/16 21.0	-/2/17 21.2	-/2/18 21.3	-/2/19 21.1	-/2/20 21.3	-/2/21 21.1	-/2/22 20.9	-/2/23	-/2/24 21.2	-/2/25 20.5			Ĩ
	s	z	-/3/1 21,8	-/3/2 21,4	-/3/3 20,8	-/3/4 21,1	-/3/5 21.0	-/3/6 21,2	•/3/7 21,1	-/3/8 20,9	-/3/9 21,2	-/3/10 21,3	-/3/11 21,2	-/3/12 21.0	-/3/13 21,2	-/3/14 21,2	-/3/15 21,4	-/3/16 20,8	-/3/17 21,2	-/3/18 21,3	-/3/19 21,2	-/3/20 21.0	-/3/21 20,9	-/3/22 21,1	-/3/23 21,2	-/3/24 20,8	-/3/25 21,3			Ĩ
	s	z	-/4/1 21,1	-/4/2 20,7	-/4/3 20,9	-/4/4	-/4/5	-/4/6	-/4/7 20,7	-/4/8	-/4/9 21,0	-/4/10 21,0	-/4/11 21,1	-/4/12	-/4/13 21,1	-/4/14	-/4/15	-/4/16 21,1	-/4/17	-/4/18 20,8	-/4/19 21,0	-/4/20	-/4/21 21,0	-/4/22 20,7	-/4/23 21,3	-/4/24 20,9	-/4/25 21,5			Ĩ
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	s	z																												
																														1

Basically you are now ready to start your measurements.

2 Selection and Visualization of FBG Sensors

2.1 Selecting FBG sensor channels

Before you start visualizing or saving your measurement data you will have to select each FBG sensor you like to read out. This can be either done by clicking on the upper part of each FBG sensor block (the part will then light up yellow) or by **clicking on the button:** *"Select all"* on the top right.

🚿 FiSens FBG II	nterrog	ator																											- 0	i ×
Measurement	Conf	igurati	on			Ø	FiSe	ens	FE	3G Ir	terr	ogat	or 1.	.5 alp	bha 2	2						Optim	ize Laten	cy time		Conne	t inter:	rogators	Exit pro	ogram
	Settings	Zero all		4 6	8 10	12 14 1	Vi 6 18 20	sualisatio 22 24	n Range (26 28	(°C) 30 32 3	34 36 3	8 40 42	44 46	48 50	10 Hz 10,2 10,2	Targe Raw Ra Effect.	t Rate ate (Hz) Rate (Hz)	Auroptin	to- mize	24- 22- 20- 18-	Sec Sec 1 Providence	Marila di GM (Mari	Res Si De	set Graph elect all select all	30 Me	sec. Vie asured va	ualisation Span lue re (°C)	Save selected sensors to disk	Save refree Spect	at sh Signal level
10030021 FBG X100 100,00ms x1	s	z	-/-/1 21,4	-/-/2 20,6	-/-/3 20,9	-/-/4 20,9	-/-/5 21,1	-/-/6 21,1	-/-/7 20,9	-/-/8 21,0	-/-/9 20,8	-/-/10 20,9	-/-/11 21,1	-/-/12 21,2	-/-/13 21,2	-/-/14 21,0	-/-/15 21,1	-/-/16 21,1	-/-/17 20,7	-/-/18 21,0	-/-/19 21,2	-/-/20 21,1						^^		
40030001 FBG X400 50,00ms x2	s	z	-/1/1 21.6	-/1/2 21.4	-/1/3 21.2	-/1/4 21.0	-/1/5 20.9	-/1/6 21.0	-/1/7 20.8	-/1/8 20.6	-/1/9 20.7	-/1/10 20.4	-/1/11 20.3	-/1/12 20.8	-/1/13 20.2	-/1/14 20.9	-/1/15 20.4	-/1/16 20.8	-/1/17 20.3	-/1/18 20.6	-/1/19 20.7	-/1/20 20.4	-/1/21 21.1	-/1/22 19.9	-/1/23 20.6	-/1/24 20.4	-/1/25			
	s	z	-/2/1	-/2/2	-/2/3 21.0	-/2/4	-/2/5	-/2/6	-/2/7 20.8	-/2/8	-/2/9	-/2/10	-/2/11 20 5	-/2/12	-/2/13	-/2/14	-/2/15	-/2/16	-/2/17 20 5	-/2/18	-/2/19	-/2/20	-/2/21	-/2/22 20.2	-/2/23	-/2/24	-/2/25			
	s	z	-/3/1	-/3/2	-/3/3	-/3/4	-/3/5	-/3/6	-/3/7	-/3/8	-/3/9	-/3/10	-/3/11	-/3/12	-/3/13	-/3/14	-/3/15	-/3/16	-/3/17	-/3/18	-/3/19	-/3/20	-/3/21	-/3/22	-/3/23	-/3/24	-/3/25			
	s	z	-/4/1	-/4/2	-/4/3	-/4/4	-/4/5	-/4/6	-/4/7	-/4/8	-/4/9	-/4/10	-/4/11	-/4/12	-/4/13	-/4/14	-/4/15	-/4/16	-/4/17	-/4/18	-/4/19	-/4/20	-/4/21	-/4/22	-/4/23	-/4/24	-/4/25			<u></u>
	s	z	20,7	20,8	21,0	20,9	21,2	20,9	20,2	20,6	20,4	20,6	20,5	20,5	20,2	20,8	20,2	20,7	20,8	20,6	20,5	20,8	20,6	19,9	20,6	20,3	19,7			
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Besides all FBG sensor blocks lighting up yellow, you will see on the top, next to *"Select all"*, that the FBG measurements have started to plot within a small white window. You can enlarge this window by simply clicking on it.

2.2 Visualizing FBG sensor channels

With this additional window opened you can visualize all measured FBG values (temperature/strain) over time.



Next to this graph visualization of the FBG values, it is also possible to graphically show the information with a color spectrum level between blue and red, as can be seen in the following picture.

🗴 FiSens FBG I	nterroga	ator																										-	- 🗆 🛛
Measurement	Confi	iguratio	n			Ø	-iSe	ens	FE	3G In	terr	ogat	or 1.	.5 alp	oha 2	2						Optimi	ize Laten	cy time		Conne	t inter	rogators E	xit program
	Settings	Zero all	0 2	4 6	8 10	12 14 1	Vi 5 18 20	isualisatio 22 24	n Range 26 28	(°C) 30 32 3	4 36 3	8 40 42	44 46	48 50	10 Hz 10,2 10,2	Targe Raw R Effect.	t Rate ate (Hz) Rate (Hz)	Autoptin	to- mize	40 - 30 - 20 - 10 -			Res Si De	et Grapi elect all select al	h () 30	sec. Vis asured va	ualisation Span lue re (°C)	Save selected sensors to disk	Save at refresh Refresh Spectra
10030021 FBG X100 100,00ms x1	s	z	-/-/1 20,9	-/-/2 20,8	-/-/3 21,3	-/-/4 21,2	-/-/5 21,5	-/-/6 21,5	-/-/7 21,1	-/-/8 21,1	-/-/9 21,3	-/-/10 21,1	-/-/11 21,3	-/-/12 21,3	-/-/13 21,0	-/-/14 21,1	-/-/15 21,1	-/-/16 21,1	-/-/17 20,9	-/-/18 20,8	-/-/19 20,8	-/-/20 20,5						^	
40030001 FBG X400 50,00ms x2	s	z	-/1/1 22.8	-/1/2 22.6	-/1/3 22.4	-/1/4 21.4	-/1/5 21.8	-/1/6 21.9	-/1/7 22.4	-/1/8 21.6	-/1/9 21.7	-/1/10 21.9	-/1/11 22.0	-/1/12 22.3	-/1/13 23.9	-/1/14 25.3	-/1/15 30.1	-/1/16 30.4	-/1/17 30.8	-/1/18 29.3	-/1/19 25.8	-/1/20 23.6	-/1/21 23.3	-/1/22 22.1	-/1/23 22.4	-/1/24 22.3	-/1/25 22.1		
	s	z	-/2/1 22.8	-/2/2 22.6	-/2/3 21.4	-/2/4 21.0	-/2/5 21.4	-/2/6	-/2/7 21.8	-/2/8	-/2/9 23.0	-/2/10 21.8	-/2/11 21.9	-/2/12	-/2/13 23.4	-/2/14	-/2/15 28.8	-/2/16	-/2/17 30.2	-/2/18	-/2/19 26.0	-/2/20 24 1	-/2/21 22.6	-/2/22 22 1	-/2/23 22.8	-/2/24	-/2/25 21.6		
	s	z	-/3/1	-/3/2	-/3/3	-/3/4	-/3/5	-/3/6	-/3/7	-/3/8	-/3/9	-/3/10	-/3/11	-/3/12	-/3/13	-/3/14	-/3/15	-/3/16	-/3/17	-/3/18	-/3/19	-/3/20	-/3/21	-/3/22	-/3/23	-/3/24	-/3/25		
	s	z	-/4/1	-/4/2	-/4/3	-/4/4	-/4/5	-/4/6	-/4/7	-/4/8	-/4/9	-/4/10	-/4/11	-/4/12	-/4/13	-/4/14	-/4/15	-/4/16	-/4/17	-/4/18	-/4/19	-/4/20	-/4/21	-/4/22	-/4/23	-/4/24	-/4/25		
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To adjust the color level within a certain range, you can use the slider on the top left to fit your application dynamic range. For instance, the range was set here from 5° to 34° C and once the FBG sensors were touched in the middle of the fibers, the color shifted from green over yellow to red.

3 Sampling Rate and Measurement Recording

3.1 Adjusting Measurement Rate

To change the sampling rate from 1Hz, to 10Hz or even higher frequencies, you can click on the top middle and choose a target rate and then by confirming with a **click on the button**: *"Auto-optimize"*. The measurement frequency will be automatically adjusted.

Due to Windows USB limitations, it might be required to change the Windows latency time from 14ms to 1ms. To confirm this setting, you first have to restart the FiSens FBG-Interrogator application with Administrator Rights, then click on the top button: *"Optimize Latency time"* and then within the orange window: *"Adjust now!"*. After you have done this, you can restart the application in a standard mode, the settings will be remembered for all set devices.

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Measurement	Confi	iguratio	m			\emptyset	FiSe	ens	FE	BG In	terr	ogat	or 1.	5 alp	bha 2	2						Optimi	ize Laten	icy time		Conne	ct inter	rrogators	Exit progr	ram
	8	7	-				Vi	sualisatio	n Range (°C)				_) 100 H	z Targe	t Rate	Au	ito-	500-			Res	set Grapi	h 👌 30	0 sec. Vis	sualisation Span	Save selected	Save at refresh	level
	Settin	all	0 2	4 6	8 10 1	12 14 16	6 18 20	22 24	26 28	30 32 3	34 36 3	8 40 42	44 46	48 50	48,2 48,1	Effect.	rte (Hz) Rate (Hz)	opti	mize	-500-			De	select al	II A Te	easured va	ilue ire (°C)		Refresh Spectra	Signal
10030021 FBG X100 10.00ms x1	s	z	-/-/1 22,6	-/-/2 20,5	-/-/3 20,4	-/-/4 19,8	-/-/5 21,8	-/-/6	-/-/7 20,3	-/-/8 21,4	-/-/9 21,3	-/-/10	-/-/11 20,9	-/-/12 20,2	-/-/13 21,5	-/-/14 20,2	-/-/15 20,7	-/-/16 20,8	-/-/17	-/-/18	-/-/19 20,2	-/-/20						^		1
40030001 FBG X400	s	z	-/1/1	-/1/2	-/1/3	-/1/4	-/1/5	-/1/6	-/1/7	-/1/8	-/1/9	-/1/10	-/1/11	-/1/12	-/1/13	-/1/14	-/1/15	-/1/16	-/1/17	-/1/18	-/1/19	-/1/20	-/1/21	-/1/22	-/1/23	-/1/24	-/1/25			1
10,00115 x 1	5	7	-/2/1	-/2/2	-/2/3	-/2/4	-/2/5	-/2/6	-/2/7	-/2/8	-/2/9	-/2/10	-/2/11	-/2/12	-/2/13	-/2/14	-/2/15	-/2/16	-/2/17	-/2/18	-/2/19	-/2/20	-/2/21	-/2/22	-/2/23	-/2/24	-/2/25			
Image: Solution of the state of th													21,2 -/3/20	20,6 -/3/21	20,2 -/3/22	20,1 -/3/23	20,4 -/3/24	18,9 -/3/25												
	5	Z	19,0	19,4	19,4	20,9	20,2	19,3	20,5	20,5	20,1	19,7	19,7	19,1	19,4	19,2	20,4	19,9	21,3	21,4	20,1	19,9	19,7	20,7	19,4	19,0	19,2			
	s	z	-/4/1 18,9	-/4/2 20,4	-/4/3 20,1	-/4/4 20,4	-/4/5 20,4	-/4/6 20,2	-/4/7 20,1	-/4/8 19,9	-/4/9 18,8	-/4/10 20,3	-/4/11 20,2	-/4/12 19,7	-/4/13 20,0	-/4/14 20,7	-/4/15 19,5	-/4/16 20,8	-/4/17 20,4	-/4/18 20,3	-/4/19 19,9	-/4/20	-/4/21 19,8	-/4/22 18,9	-/4/23 20,8	-/4/24 19,7	-/4/25			1
	s	z																	-						-					1
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																				Auto	matica	lly adj	ust va	lue in	Winde	ows Re	gistry	now?		
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You will now be able to increase the target sampling rate to higher frequencies of up to 100Hz or 150Hz.

3.2 Recording Measurements

All selected and visualized FBG values can be also recorded within a txt-file (saved in your users FiSens folder). For doing so you will have to **click the button**: *"Save selected sensors to disk"*.

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Measurement	Conf	iguratio	on			\emptyset	FiSe	ens	FE	3G Ir	nterr	ogat	or 1	.5 al	pha i	2										Conn	ect int	errogato	rs E	xit prog	ram
	tings	Zero					v	isualisatio	n Range	(°C)					50 Hz	Target Raw Ra	t Rate ate (Hz)	Aut	to- mize	30- 25- 20-	yka in	41 991 1	Re	set Grap elect all	h di	l0 sec. leasured	Visualisati Span value	on Save : sensor	selected s to disk	Save at refresh	nal level
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20,00ms x1		_	23,0	20,7	21,4	21,1	23,0	22,0	21,7	22,0	21,1	20,9	21,4	21,2	21,7	21,0	21,8	21,6	21,6	21,0	20,8	21,4									
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As you can see in above screenshot all selected FBG sensors all recorded within a txt-file for each respective row with a time stamp. To adjust the time stamp format, go to the second tab: "Configuration" and then into the Sub-Tab: "Program settings".

These are the basic functionalities to setup, start and visualize or record your FBG sensor measurements. There are a lot of more possible configurations which are described in more detail within the FiSens Handbook.

We wish you enlighting measurements!