The iXblue MBC-DG-LAB is a family of automatic bias controllers specially designed to lock the operating point of LiNbO$_3$ Mach-Zehnder modulators and to ensure a stable operation over time and environmental conditions.

The MBC-DG-LAB controllers are continuously tunable bias controllers, meaning they allow operation of the modulator at any point of its transfer function and thus can be used for a large variety of applications. They are easy to implement, and are available as bench top instruments and OEM boards. iXblue MBC-DG series controllers are especially well suited for digital and pulse applications.

The iXblue MBC-DG-LAB shows a very low noise sensitivity yielding a significant reduction of the required dither voltage amplitude. This new version is characterized by an enhanced stability. The electronic board benefits of an AUTOSET operation for the QUAD/MIN/MAX modes resulting in a simplified use. The user parameters are stored and can be recovered after switched off. An USB communication and a Graphical User Interface (GUI) are introduced for ease of use.

Principle

The iXblue MBC-DG-LAB controllers are dither signal based: a low amplitude, low frequency tone signal is superimposed to the modulation signal. The resulting optical modulation is then detected and a digital signal processing based on a FFT analysis principle allows to lock the operating point at the desired position.

FEATURES

- MIN, MAX, QUAD+ & QUAD-
- Any other operating point
- Continuous tuning of the bias point
- USB remote control
- High stability and sensitivity
- Autoset

APPLICATIONS

- LiNbO$_3$, InP, GaAs modulators
- Digital NRZ, RZ, DPSK,...
- Pulse applications
- Analog applications

OPTIONS

- Internal photodiode and tap coupler
- Benchtop and board versions
- Ditherless version

Performance Highlights

Parameter	Min	Typ	Max	Unit
DC bias voltage	-10	-	+10	V
Autoset mode	MIN, MAX, QUAD-, QUAD+			-
Locking range	-	360	-	Degree
Locking accuracy at Quad$^\pm$	-	90 ± 0.5	-	Degree
Extinction ratio at MIN mode	-	$50^1 \pm 0.05$	-	dB

[1] 50 dB: from modulator nominal Extinction Ratio value

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
DC bias voltage	V_{bias}	-	-10	-	+10	V
Bias Voltage step	ΔV_{bias}	Manual mode	0.001	-	0.1	mV
Automatic locking point	-	Transfer level	MIN (0%), MAX (100%), QUAD-(-50%), QUAD+(+50%), and other transfer level value			-
Dither frequency	f_{dither}	by 40 Hz frequency step	400	-	1 400	Hz
Dither amplitude	V_{dither}	by 1 mV amplitude step	5	-	1 000	mV

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
		At Photodiode input port (MBC-DG-LAB version A0 & B0)				
Wavelength	λ	MBC-DG-LAB-A0	900	-	1 600	nm
		MBC-DG-LAB-B0	600	-	900	
Input optical power	OP	MBC-DG-LAB-A0[1] - Measured @1550 nm	-20	-10	-3	dBm
		MBC-DG-LAB-A0[2] - Measured @1310 nm	-19	-10	-2	dBm
		MBC-DG-LAB-A0[3] - Measured @1060 nm	-18	-8	-0.8	dBm
		MBC-DG-LAB-B0[4] - Measured @850 nm	-17	-7	0.5	dBm
		At Tap-Coupler input port (MBC-DG-LAB version A1, A2, A3, B1, B2)				
Wavelength	λ	-	760	-	1 600	nm
Input optical power	OP	MBC-DG-LAB-A1[1] - λ range 1550nm±20nm	0	10	17	dBm
		MBC-DG-LAB-A2[2] - λ range 1310nm±20nm	0.5	13	18	dBm
		MBC-DG-LAB-A3[3] - λ range 1060nm±20nm	2.5	11.5	19	dBm
		MBC-DG-LAB-B1[4] - λ range 850nm±10nm	2.8	12.5	20	dBm
		MBC-DG-LAB-B2[5] - λ range 780nm±20nm	2.8	12.5	20	dBm

[1] Measured @1550 nm - [2] Measured @1310 nm - [3] Measured at 1060 nm - [4] Measured at 850 nm - [5] Measured at 780 nm

Bias Control Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
		Timing				
Autoset (MIN, MAX, QUAD±)	Auto	Automatic scan	25	30	40	s
Initialisation	-	After an autoset	-	10	-	s
Start up	-	-	10	-	30	s
		QUAD+, QUAD-				
Locking accuracy	-	at Quad±	89.5	90	90.5	Degree
Locking Stability	-	Standard deviation, over 2 hours, and modulator temperature controlled	-0.1	-	+0.1	Degree
		MIN & MAX Bias performances				
Extinction Ratio	ER	Modulator with ER > 50 dB & tap coupler	-	-	50	dB
Locking stability	ΔER	-	-	±0.05	-	dB

MBC-DG-LAB

Different digital modulation formats (NRZ, RZ, DPSK) require specific operating points and bias control parameters. That is also true for pulse signals with different duty cycles. The MBC-LAB through its intuitive GUI offers pre-set (Autoset) bias setting for MIN, MAX, and QUAD for fast and easy modulator operation.

Dimensions	
Dimensions (W x H x D)	220 mm x 220 m x 52 mm
Power supply (rear panel)	100-120 V / 220-240 V automatic switch, 50-60 Hz
Interfaces	
Photodiode Input /coupler input	FC/APC connector
Bias Output	BNC Female connector
Communication	USB
Remote Control	
Minimum computer requirements	Windows XP SP3
Computer configuration	Recommended Windows XP-SP3, W7, W8

Ordering information

MBC-DG-LAB-A0: No coupler, 900nm to 1600nm
MBC-DG-LAB-B0: No coupler, 600nm to 900nm
MBC-DG-LAB-A1: Integrated coupler 1550nm ±20nm
MBC-DG-LAB-A2: Integrated coupler 1310nm ±20nm
MBC-DG-LAB-A3: Integrated coupler 1060nm ±20nm
MBC-DG-LAB-B1: Integrated coupler 850nm ±10nm
MBC-DG-LAB-B2: Integrated coupler 780nm ±20nm

About us

iXBlue Photonics includes iXBlue iXFiber brand that produces specialty optical fibers and Bragg gratings based fiber optics components and iXBlue Photline brand that provides optical modulation solutions based on the company lithium niobate ($LiNbO_3$) modulators and RF electronic modules.
iXBlue Photonics serves a wide range of industries: sensing and instruments, defense, telecommunications, space and fiber lasers as well as research laboratories all over the world.