



FEATURES

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

APPLICATIONS

- LiNbO₃, InP, GaAs modulators
- Digital NRZ, RZ, DPSK,...
- Pulse applications
- Analog applications

OPTIONS

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

The ixblue MBC-DG-LAB is a family of automatic bias controllers specially designed to lock the operating point of LiNbO₃ 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.

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 [±]	-	90 ± 0.5	-	Degree
Extinction ratio at MIN mode	-	50 ¹ ± 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	V
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
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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 \pm 20nm	0	10	17	dBm
		MBC-DG-LAB-A2 ² - λ range 1310nm \pm 20nm	0.5	13	18	dBm
		MBC-DG-LAB-A3 ³ - λ range 1060nm \pm 20nm	2.5	11.5	19	dBm
		MBC-DG-LAB-A4 ⁴ - λ range 950nm \pm 20nm	2.5	11.5	19	dBm
		MBC-DG-LAB-B1 ⁵ - λ range 850nm \pm 10nm	2.8	12.5	20	dBm
		MBC-DG-LAB-B2 ⁶ - λ range 780nm \pm 20nm	2.8	12.5	20	dBm

¹ Measured @1550 nm - ² Measured @1310 nm - ³ Measured at 1060 nm - ⁴ Measured at 950 nm - ⁵ Measured at 850 nm - ⁶ Measured at 780 nm

Bias Control Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
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Timing

Autoset (MIN, MAX, QUAD \pm)	Auto	Automatic scan	25	30	40	s
Initialisation	-	After an autoset	-	10	-	s
Start up	-	-	10	-	30	s

QUAD+, QUAD-

Locking accuracy	-	at Quad \pm	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 mm 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, 900 nm to 1600 nm
- MBC-DG-LAB-B0: No coupler, 600 nm to 900 nm
- MBC-DG-LAB-A1: Integrated coupler 1550 nm ± 20 nm
- MBC-DG-LAB-A2: Integrated coupler 1310 nm ± 20 nm
- MBC-DG-LAB-A3: Integrated coupler 1060 nm ± 20 nm
- MBC-DG-LAB-B1: Integrated coupler 850 nm ±10 nm
- MBC-DG-LAB-B2: Integrated coupler 780 nm ± 20 nm

About us

ixblue Photonics produces specialty optical fibers and Bragg gratings based fiber optics components and provides optical modulation solutions based on the company lithium niobate (LiNbO₃) 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.