

## MODULATOR

# MPX2000 / MPZ2000 series

## 2 $\mu\text{m}$ band low frequencies to 20 GHz Phase Modulators

The MPX2000 and MPZ2000 are phase modulators especially designed for phase modulation in the 2.0  $\mu\text{m}$  wavelength band from low frequencies to 20 GHz and above. The MPX2000/MPZ2000 incorporate 2.0  $\mu\text{m}$  specific waveguides and are pigtailed with 2.0  $\mu\text{m}$  polarization maintaining fibers.



### Features

- Low insertion loss
- Low  $V_{\pi}$
- 2.0  $\mu\text{m}$  specific design

### Applications

- LIDAR
- Gas sensing
- Spectral broadening
- Beam combining
- Spectroscopy
- Seed source
- Research & development
- Pound-Drever-Hall locking (PDH)

### Options

- LVP, Very Low  $V_{\pi}$  value
- Low Residual Amplitude modulation
- High electrical input power capability
- Space grade version

### Related Equipements

- MX2000 Intensity modulator
- Matched RF amplifiers
- Spectral broadening ModBox
- Coherent Beam Combining ModBox CBC

### MPX2000-LN-0.1 - Performance Highlights <sup>(1)</sup>

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	2000	2200	nm
Usable electro-optical bandwidth	-	300	-	MHz
$V_{\pi}$ RF @50 kHz	-	4.5	-	V
Insertion loss	-	3	-	dB

(1) Specifications given at 25 °C, 2050 nm

### MPZ2000-LN-10 - Performance Highlights <sup>(1)</sup>

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	2000	2200	nm
Usable electro-optical bandwidth	-	16	-	GHz
$V_{\pi}$ RF @50 kHz	-	6.5	-	V
Insertion loss	-	3	-	dB

(1) Specifications given at 25 °C, 2050 nm

### MPZ2000-LN-10-LVP - Performance Highlights <sup>(1)</sup>

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	2050	2200	nm
Usable electro-optical bandwidth	-	20	-	GHz
$V_{\pi}$ RF @50 kHz	-	4	-	V
Insertion loss	-	3	-	dB

(1) Specifications given at 25 °C, 2050 nm

# MPX2000-LN-0.1

## 300 MHz Phase Modulator

### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	$S_{21}$	RF electrodes	100	150	-	MHz
Usable electro-optical bandwidth	$S_{21}$	RF electrodes	-	300	-	MHz
$V_{\pi}$ RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes	-	4.5	6	V
RF input impedance	$Z_{in-RF}$	-	-	10	-	k $\Omega$

### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	$\lambda$	-	1900	2000	2200	nm
Insertion loss	IL	Without optical connectors <sup>(1)</sup>	-	3	5	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 2050 nm, unless differently specified.

<sup>(1)</sup> Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

### Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Modulation voltage range	$EV_{in}$	-20	20	V
Optical input power	$OP_{in}$	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

# MPZ2000-LN-10

## 16 GHz Phase Modulator

### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	$S_{21}$	-	10	12	-	GHz
Usable electro-optical bandwidth	$S_{21}$	-	-	16	-	GHz
Ripple $S_{21}$	$\Delta S_{21}$	-	-	0.5	1	dB
Electrical return loss	$S_{11}$	-	-	-12	-10	dB
$V_{\pi}$ RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	6.5	7.5	V
Impedance matching	$Z_{in-RF}$	-	-	50	-	$\Omega$

### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	$\lambda$	-	1900	2000	2200	nm
Insertion loss	IL	Without optical connectors <sup>(1)</sup>	-	3	4	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 2050 nm, unless differently specified.

<sup>(1)</sup> Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

### Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
RF input power	$EP_{in}$	-	28	dBm
High electrical input power option	$HEP_{in}$	-	33	dBm
Optical input power	$OP_{in}$	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

# MPZ2000-LN-10-LVP

## 20 GHz Phase Modulator

### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	$S_{21}$	-	-	10	-	GHz
Usable electro-optical bandwidth	$S_{21}$	-	-	20	-	GHz
Ripple $S_{21}$	$\Delta S_{21}$	-	-	0.5	1	dB
Electrical return loss	$S_{11}$	-	-	-13	-10	dB
$V_{\pi}$ RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	4	5	V
$V_{\pi}$ RF @10 GHz	$V_{\pi_{RF\ 10\ GHz}}$	-	-	6	-	V
Impedance matching	$Z_{in-RF}$	-	-	50	-	$\Omega$

### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	$\lambda$	-	1900	2050	2200	nm
Insertion loss	IL	Without optical connectors <sup>(1)</sup>	-	3	4	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 2050 nm, unless differently specified.

<sup>(1)</sup> Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

### Absolute Maximum Ratings

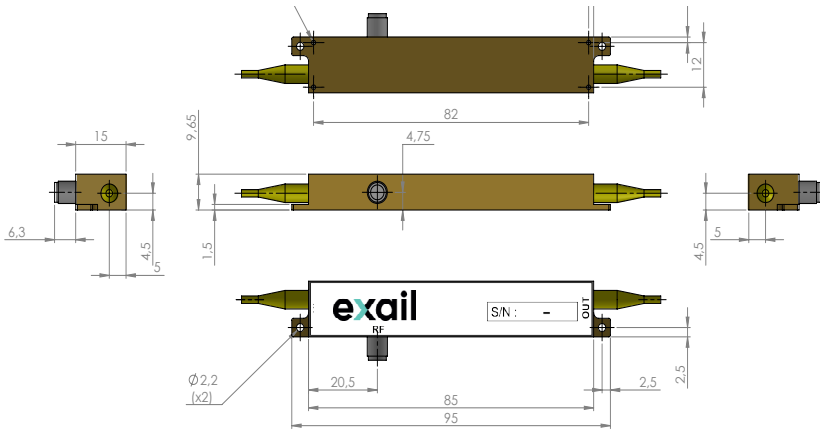
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
RF input power	$EP_{in}$	-	28	dBm
Optical input power	$OP_{in}$	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

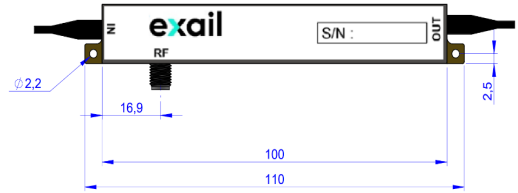
# MODULATOR | MPX2000 / MPZ2000 SERIES | 5/5

## Mechanical Diagram and Pinout

All measurements in mm



Housing #A: Standard Modulator housing



Housing #B: Modulator housing with LVP (MPZ2000-LN-10-LVP)

Port	Function	Note
IN	Optical input port	2000 nm Polarization maintaining fiber EXAIL IXF-PMF-1950-125-P-021
OUT	Optical output port	2000 nm Polarization maintaining fiber EXAIL IXF-PMF-1950-125-P-021
RF	RF input port	Female K (SMA compatible)

## Ordering Information

MPX2000/MPZ2000-LN -  -  -  -  -  -

- Bandwidth: **01** (300 MHz), **10** (16 GHz)
- Input fiber: **P** Polarization maintaining
- Output fiber: **P** Polarization maintaining
- Input connector: **00** (bare fiber), **FA** (FC/APC)
- Output connector: **00** (bare fiber), **FA** (FC/APC)
- High Electrical Power: **HEP** (for MPZ2000-LN-10 only)
- Low Vpi option: **LVP**

Exail reserves the right to change, at any time and without notice, the specifications, design, function or form of its products described herein.

contact.photonics@exail.com | www.exail.com

Europe +33 1 30 08 87 43 | Americas +1 508 745 3487 | APAC +65 6747 4912

