MODULATOR

MPX1300 and MPZ1300 series

Low frequencies to 20 GHz Phase Modulators

The Exail MPX1300 and MPZ1300 series represent the largest lithium niobate ($LiNbO_3$) phase modulators selection specifically engineered for operation in the 1310 nm wavelength band.
With O-Band–optimized optical waveguides pigtailed to matching fibers, these devices are true, dedicated 1310 nm phase modulators.

- MPX1300-LN-0.1: Optimized for low-frequency applications, supporting modulation frequencies up to 300 MHz.
- MPZ1300-LN-10: A telecom-grade phase modulator delivering standard performance with an electro-optical bandwidth (EO-BW) of up to 20 GHz.
- MPZ1300-LN-10-LVP-POL: Enhanced optical and electro-optical performance, featuring lower Vπ, higher polarization extinction ratio (PER), increased optical input power (OPin), and EO-BW up to 20 GHz.



Exail's O-Band phase modulators are available with a wide range of options — including DC coupling, high electrical power handling, and low Vπ configurations — ensuring maximum performance across diverse applications, from advanced laboratory research to demanding ndustrial systems.

Features

- Low and wide EO bandwidth
- Full O-Band operation
- Low Vπ (LVP option)
- Low insertion loss (LVP option)
- High PER (LVP option)
- High optical power input (LVP option)
- High Electrical input power (LVP option)

Applications

- Side bands generation
- Laser Combining
- Interferometric sensing
- Frequency shifting / broadening
- Quantum Key Distribution (QKD)
- Pound-Drever-Hall locking (PDH)
- High data rate telecommunications

Options

- DC coupled
- Low residual intensity modulation
- High electrical input power capability
- High polarization extinctio ratio
- Optical E and S bands version

MPX1300-LN-0.1 Phase Modulators Highlights

Parameter	
Operating wavelength	1260 nm - 1360 nm
Usable Electro-optical bandwidth	300 MHz
Vπ RF @50 kHz	3 V
Insertion loss	3 dB

MPZ1300-LN-10 Phase Modulators Highlights

Parameter	
Operating wavelength	1260 nm - 1360 nm
Usable electro-optical bandwidth	16 GHz
Vπ RF @50 kHz	3.3 V
Insertion loss	2.5 dB

MPZ1300-LN-10-LVP-POL Phase Modulators Highlights

Parameter	
Operating wavelength	1260 nm - 1360 nm
Usable electro-optical bandwidth	20 GHz
Vπ RF @50 kHz	2.5 V
Insertion loss	2.5 dB

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MPX1300-LN-0.1

Up to 300 MHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	-3 dB	100	150	-	MHz
Usabe electro-optical bandwidth	S_{21}	-	-	300	-	MHz
Vπ RF @50 kHz	$V\pi_{RF\ 50\ kHz}$	-	-	3	3.5	V
RF Input Impedance	Z_{in-RF}	-	-	10	-	kΩ

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1260	1310	1360	nm
Insertion loss	IL	Without optical connectors[1]	-	3	4	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 1310 nm, unless differently specified.
[1] 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
Electrical Voltage range	EV_{in}	-20	+20	V
Optical Power input	OP_{in}	-	+20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MPZ1300-LN-10

Up to 16 GHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	-3 dB, from 2 GHz	10	12	-	GHz
Usable electro-optical bandwidth	S_{21}	-	-	16	-	GHz
Ripple S_{21}	ΔS_{21}	-	-	0.5	1	dB
Electrical return loss	S_{11}	-	-	-17	-13	dB
Vπ RF @50 kHz	$V\pi_{RF\ 50\ kHz}$	-	-	3.3	4	V
Vπ RF @10 GHz	$V\pi_{RF\ 10\ GHz}$	-	-	4.5	5.5	V
RF impedance matching	Z_{in-RF}	-	-	50	-	Ω
Vπ DC electrodes	$V\pi_{DC}$	DCC option, housing #B	-	3.3	6	V
DC port impedance matching	Z_{in-DC}	DCC option, housing #B	1	-	-	MΩ

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut X-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1260	1310	1360	nm
Insertion loss	IL	Without optical connectors [1]	-	2.5	3.5	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 1310 nm, unless differently specified.
[1] Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

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Parameter	Symbol	Condition	Min	Typ	Max	Unit
RF Electrical Power input	EP_{in}	-	-	-	+28	dBm
Optical Power input	OP_{in}	For optimal performance	-	-	+12	dBm
		Before failure	-	-	+20	dBm
Bias voltage range	V_{DCC}	DCC option, housing #B	-15	-	+15	V
Operating temperature	OT	-	0	-	+70	°C
Storage temperature	ST	-	-40	-	+85	°C

MPZ1300-LN-10-LVP-POL

Up to 20 GHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	-3 dB, from 2 GHz	10	12	-	GHz
Usable electro-optical bandwidth	S_{21}	-	-	20	-	GHz
Ripple S_{21}	ΔS_{21}	-	-	0.5	1	dB
Electrical return loss	S_{11}	-	-	-14	-10	dB
Vπ RF @50 kHz	$V\pi_{RF\ 50\ kHz}$	LVP design, housing #C	-	2.5	3.3	V
Vπ RF @10 GHz	$V\pi_{RF\ 10\ GHz}$	LVP design, housing #C	-	3.5	4.5	V
Vπ RF @20 GHz	$V\pi_{RF\ 20\ GHz}$	LVP design, housing #C	-	4.5	-	V
RF impedance matching	Z_{in-RF}	-	-	50	-	Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut X-Prop			
Waveguide process	-	-	Proton Exchange			
Operating wavelength	λ	-	1260	1310	1360	nm
Insertion loss	IL	Without optical connector [1]	-	2.5	3.5	dB
Polarization extinction ratio	PER	Without optical connector	25	30	-	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 1310 nm, unless differently specified.
[1] Consider an extra-loss up to 0.25 dB for each FC/APC optical connector.

Absolute Maximum Ratings

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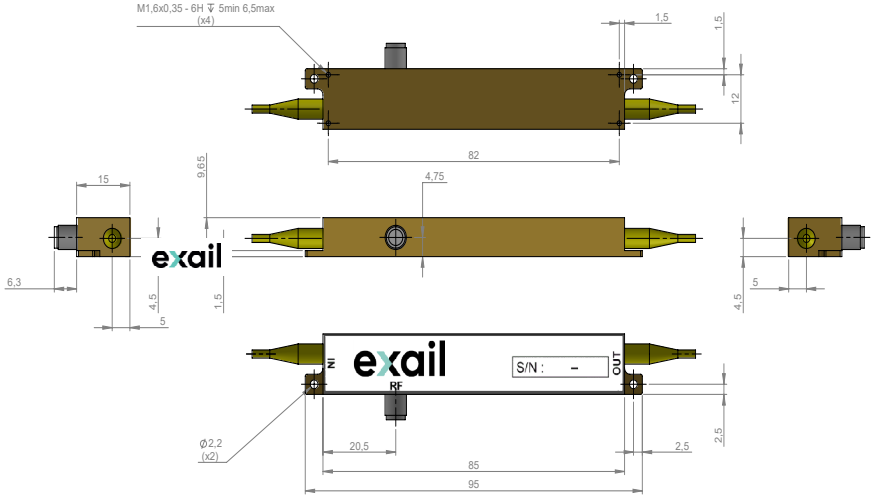
Parameter	Symbol	Min	Max	Unit
RF High Electrical Power input	HEP_{in}	-	33	dBm
High Optical Power input [1]	HOP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C
Vibration	Vib	MIL-STD-883K method 2007.3 - Test condition B		
Mechanical shock	Shock	MIL-STD-883K method 2002.5 - Test condition B		

[1] Optical power up to 20 dBm can be applied without causing optical degradation, while maintaining stable insertion loss and avoiding refractive index.

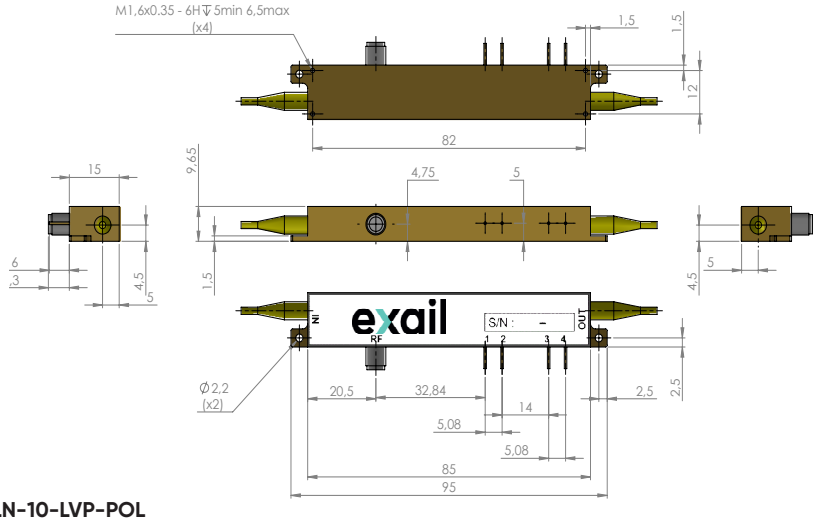
Mechanical Diagram and Pinout

All measurements in mm

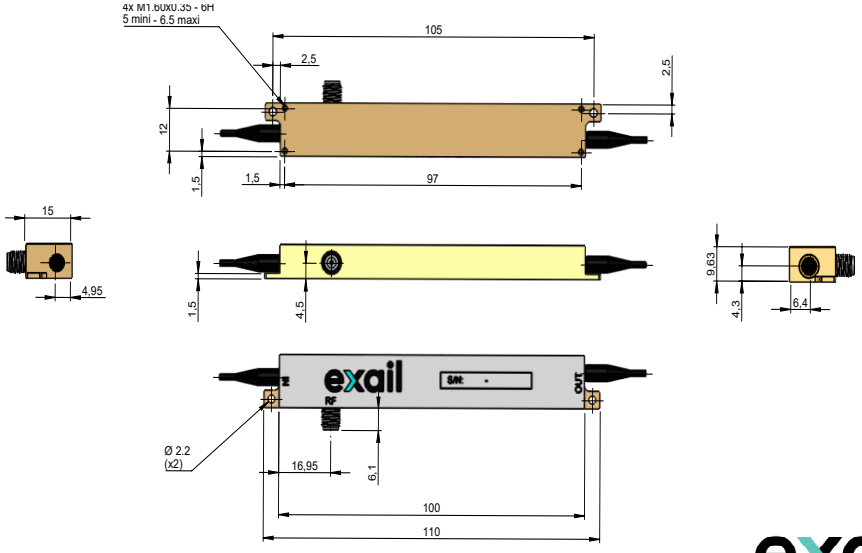
Housing #A: Standard Modulator housing



Housing #B: Modulator housing with DCC

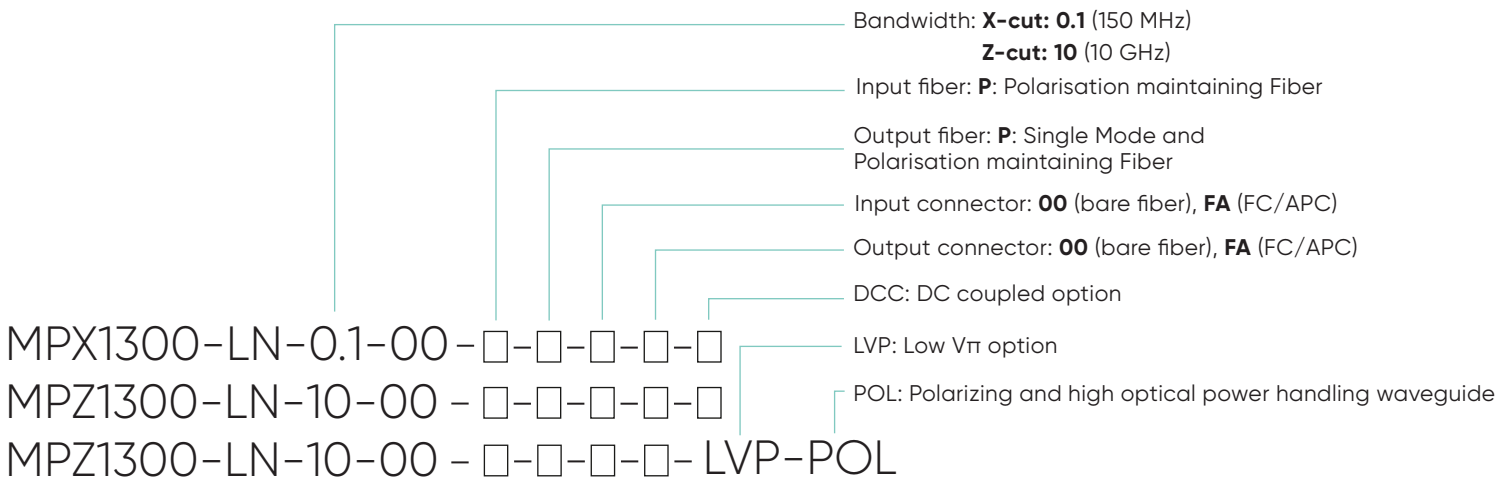


Housing #C: Modulator housing for the MPZ1300-LN-10-LVP-POL



Port	Function	Note
IN	Optical input port	Polarization maintaining fiber 1310 nm, Corning PM 13-U25D Length: 1.5 meter, buffer diameter: 900 µm
OUT	Optical output port	Polarization maintaining fiber 1310 nm, Corning PM 13-U25D Length: 1.5 meter, buffer diameter: 900 µm
RF	RF input port	Female K (SMA comptatible)
PINS 1 / 2	Ground / DC	Pin feed through diameter 1.0 mm - For DCC option with housing #B
PINS 3 / 4	Not connected / Not connected	Pin feed through diameter 1.0 mm - For DCC option with housing #B

Ordering Information



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