

Broadband Balanced Mixers Receivers, Down convertors



Applications

- Low noise Receivers of mm-wave signal
- Down convertors
- Instruments and test equipment

Features

- 26.5-220 GHz operating frequency
- 6 - 12 dB conversion losses
- Good flatness
- up to 22 GHz IF
- Up to 40 dB balance
- required LO power 1...20 mW
- VSWR 2:1 (typ)

Description

Broadband balanced mixers are the key part of mm-wave receivers, down convertors numerous instruments and test equipment. Standard line of ELVA-1's balanced mixers **BM-XX/LO/IF/N** series provide low conversion losses and low noise figure of the devices within wide frequency band from 26,5GHz to 220 GHz.

The **BM-XX/LO/IF/N** mixers are based on Ga-As Schottky diodes of ELVA-1 own manufacturing. They provide their features within whole waveguide band of RF and LO frequencies. Using original design of the mixer allows reaching IF up to 22 GHz and LO/IF isolation up to 30...40 dB. Standard mixers demand about 10 mW LO power and work without external biasing.

There are Balanced Mixers producing on custom design together with standard product line. They can work with lower LO power levels at 1-2 mW and higher IF frequencies up to 22 GHz. Low LO power Balanced mixers are biased and have the fourth coaxial input.

Harmonic mixers are also available for producing. The harmonic mixers have a bit worse conversion losses then mixers working at fundamental harmonic. The advantage of the harmonic mixers is they can be used in the receivers which do not have a LO source with as high operating frequency as RF signal.

To provide lower noise figure and to have higher RF to IF gain there are balanced mixers **BMA-X/LO/IF** series with built-in IF pre-amplifier.

Two main designs of the balanced mixers: axed and angle ones, are shown in the pictures above. Typical specifications of **BM-XX/LO/IF/N** balanced mixers is given below.

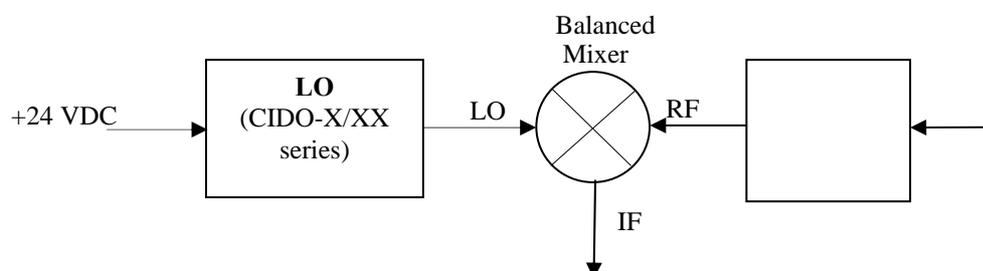
Specifications

MODEL NUMBER	BM-28/XX	BM-22/XX	BM-19/XX	BM-15/XX	BM-12/XX	BM-10/XX	BM-08/XX	BM-06/XX
Frequency Band and Range, GHz	Ka 26.5-40	Q 33-50	U 40-60	V 50-75	E 60-90	W 75-110	F 90-140	D 110-170
Input waveguide	WR28	WR22	WR19	WR15	WR12	WR10	WR8	WR6
Waveguide Flange	UG-599/U	UG-383/U	UG-383/U-M	UG-385/U	UG-387/U	UG-387/U-M	UG-387/U-M	UG-387/U-M
Conversion losses at RF LO over full waveguide band, IF: 0.01-8 GHz, dB (max)	8	8	8.5	9	9.5	10	---	---
Conversion losses at fixed LO, IF: 0.01-8 GHz, dB (max)	6.0	7	7	7.5	7.5	8	8	8.5
Conversion losses at fixed LO, IF: 8-18 GHz, dB (max)	7 IF <13.5GHz	7.5 IF <17GHz	7.5	8	8	8.5	9	9

- Notes:**
1. Maximum operating temperature is +60°C
 2. Incident max CW RF power: 20 mW (typ)
 3. RF power at 1 dB compression: 1 dBm (typ)
 4. IF, bias connectors: SMA female
 5. BM-05 mixers are available upon request

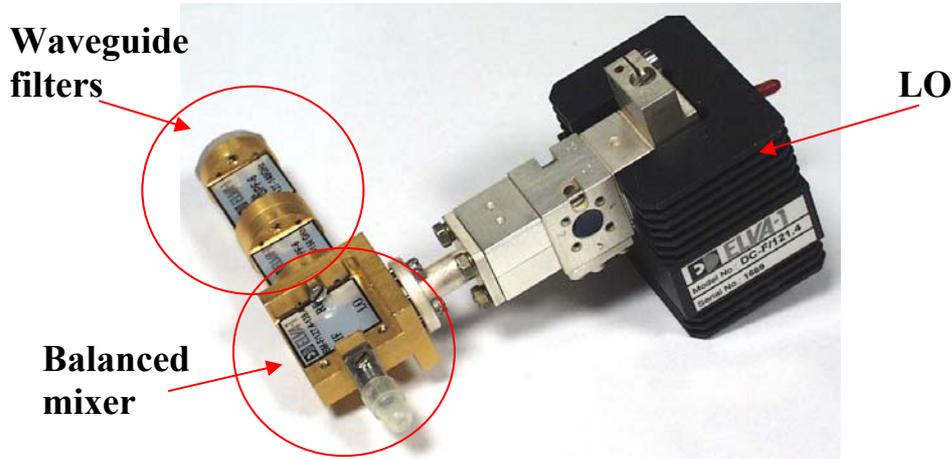
Typical Application: mm-wave receiver / down converter

The Balanced mixers are frequently used as a part of a mm-wave receivers / down converters. Also ELVA-1 offers the rest components of the down converters: High stable local oscillator to drive balanced mixer and waveguide filters. Due to the down converters have two received frequency bands lower and higher LO frequency some waveguide filters can be installed at RF port of the Balanced mixer to suppress needless signals.

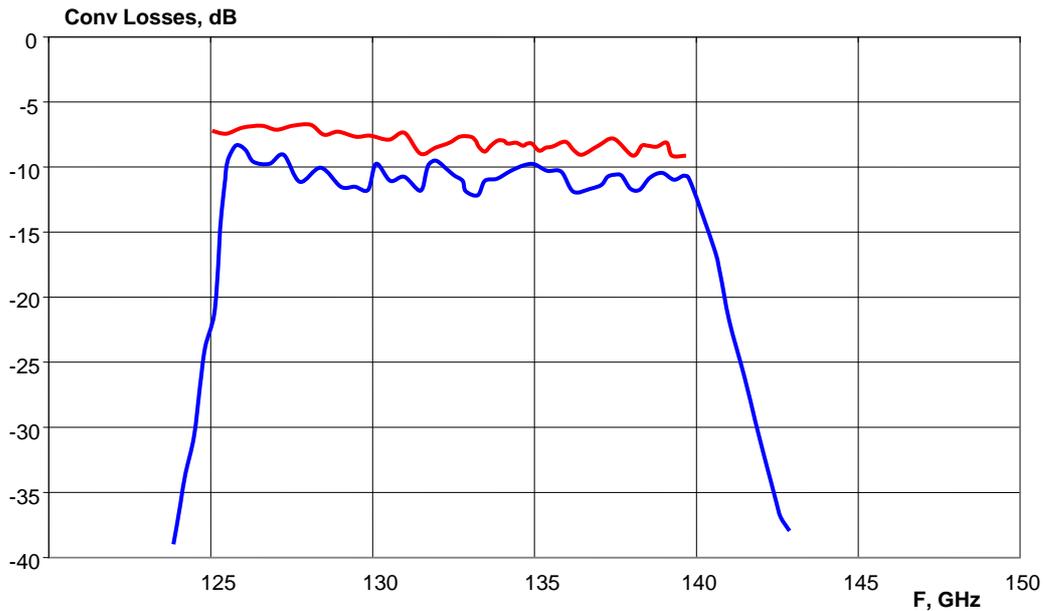


Typical outward view and measured data of a receiver / down converter are presented below:

F-band Downconverter
LO= 121.4GHz RF=127.4-139.4GHz
IF=6...18GHz (LPF and BPF used)



Conversion Losses of the Downconverter
Flo= 121.4GHz RF=127.4-139.4GHz



How to Order: Specify Model Number **BM-XX/LO/IF/N/A/B**, where

- **XX** – number of waveguide standard (Ex. 10 for WR-10 and 06 for WR-06)
- **LO** – LO frequency (or operating range), F- if full band
- **IF** – intermediate frequency range
- **N** – number of operating harmonic, nothing if N=1
- **A** – with built-in power amplifier at output, nothing if without output power amplifier
- **B** – requires bias, nothing if no bias

Example:

BM-10/F/4 (W-band mixer, LO= 75-110 GHz, IF= 4 GHz)

BM-06/142/6-18 (D-band mixer, LO= 142 GHz, IF= 6-18 GHz)

BM-10/12-18/1/6 (W-band mixer, LO= 12-18 GHz, IF= 1 GHz, harmonic number 6)

BM-10/94/0.5-1.5/A (W-band mixer, LO= 94 GHz, IF= 0.5-1.5 GHz, harmonic number 1, with built-in output power amplifier)

Delivery time 6-8 weeks for standard models. Custom designed mixers are delivered within 12 weeks ARO.

All ELVA-1 balanced mixers are warranted by the manufacturer for one year after receipt.