Heynen works for innovators

MXI-HV High Voltage & Low Losses Multi-Gap Toroidal Inductors

Features

- For resonant inductors and input/output chokes
- Nominal inductance from 35 μH to 96 μH
- Nominal current from 8 to 30 A
- Low loss design, suitable for high frequency ripple current applications (i.e. resonant converters and interleaved PFCs)
- Multigap ferrite core design, minimizing fringing losses
- Two inductors in same component (series/parallel connection alternative)
- High working voltage up to 2.0 kVpeak between each inductor
- Full potted component with silicone resin.
- High performance triple insulated litz wire windings
- Suitable for highest demanding environments
- Flat inductance vs current performance
- Design adaptability: Rac and core loss vs frequency definition
- Isolation between windings over 3.5kV.
- Plastic housing and potting resin UL94-V0 approved
- Typical frequency ranges from 75 to 300 kHz
- Operating temperature: -40ºC to 155ºC

PRAX Part Number	Nominal Inductance	Typical Working Frequency	RMS Current Rating (I_{rms})	Peak Current Rating (I_{peak})	Saturation Current (I_{peak})	R_{DC}
Horizontal	*[μH] ±10%*	*[kHz]*	*(A)*	*(A)*	*(A)*	*[mΩ] max*
MXI-03530-HV	**35,0**	**75-300**	**30,0**	**42,4**	**68**	**14**
MXI-05215-HV	**52,0**	**75-300**	**15,0**	**21,2**	**54**	**36**
MXI-07612-HV	**76,0**	**75-300**	**12,0**	**17,0**	**37**	**36**
MXI-09608-HV	**96,0**	**75-300**	**8,0**	**11,3**	**29**	**36**

Notes

1- Electrical specifications at 25ºC.
2- Inductance measured at 100 kHz/250 mVac.
3- All rated parameters considering W1+W2 in series.
4- Simulations using a pure sinusoidal waveform.
5- Self-resonant frequency over 2,5 MHz (W1+W2)
6- Saturation current defined as the max typical peak current keeping inductance value within specification
7- Operating temperature includes component self-heating.
8- Core losses calculated using core supplier simulation parameters at 100ºC.
9- Rac graph values considering W1+W2 at 25ºC
10- Temperature rise graph simulated based on natural convection at 25ºC ambient.
11- Losses calculated considering AC effects on wires as proximity and skin effect (based on Dowell's formula).
12- Design considering minimization of fringing effects but not included in losses definition.
13- Customized values are available under request. Contact PRAX (www.prax-power.com) for further information.

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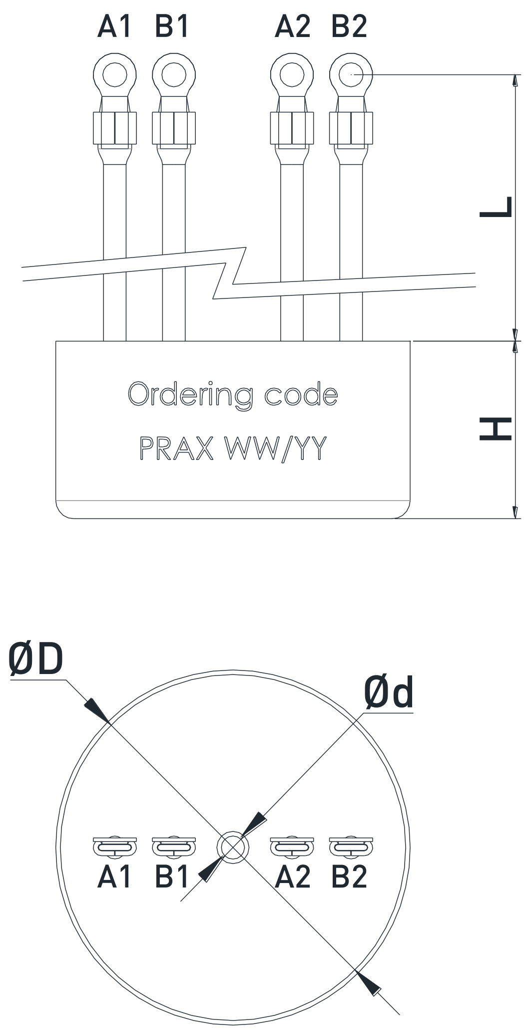
Dimensions

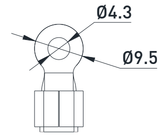
All dimensions in mm



PRAX Part Number	D (max)	d	H max	L	Weight [g]
MXI-03530-HV	80	5,1 ±0,2	68	100 ±10	700
MXI-05215-HV	80	5,1 ±0,2	40	100 ±10	450
MXI-07612-HV	80	5,1 ±0,2	40	100 ±10	450
MXI-09608-HV	80	5,1 ±0,2	40	100 ±10	450

Notes

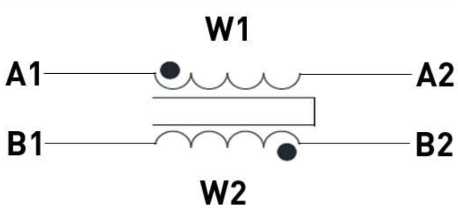
1- Flexible outputs.
2- Other terminals available under request.
3- All outputs are sleeved.
4- Ouputs with M4 ring terminals



Marking

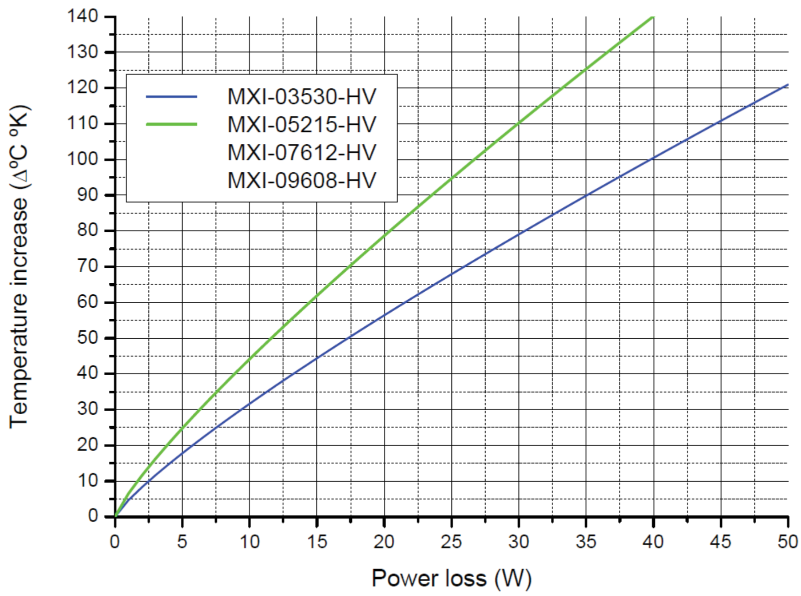
Part Number
PRAX / Lot number

Schematic

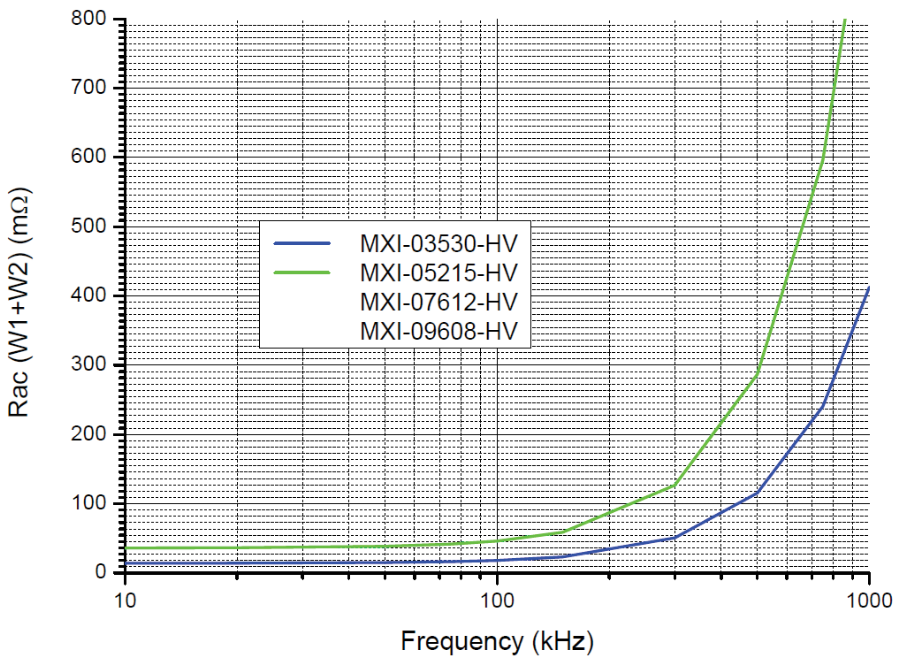


Revised: 26/04/2022

Temperature rise vs Power loss

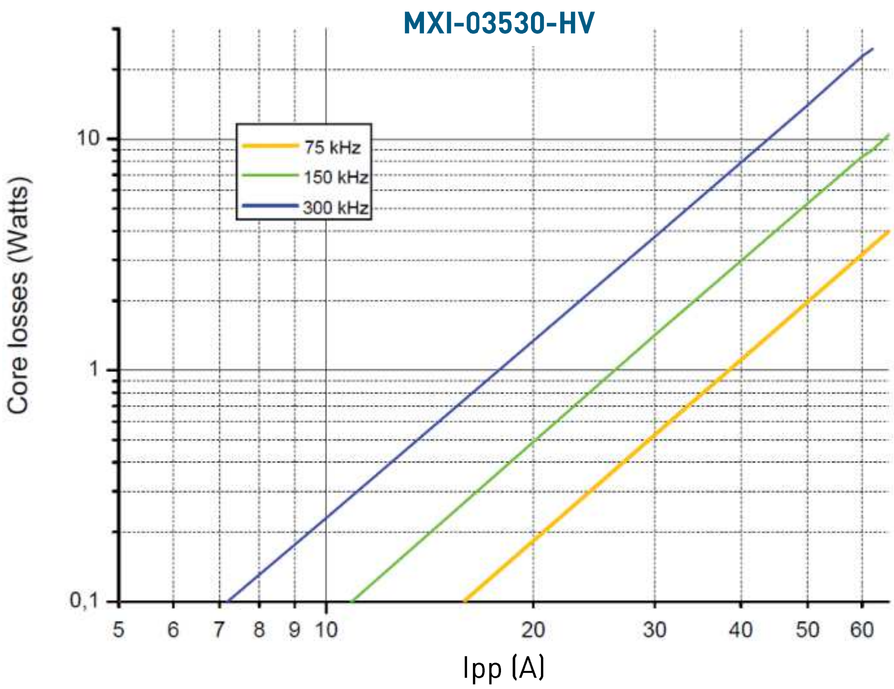


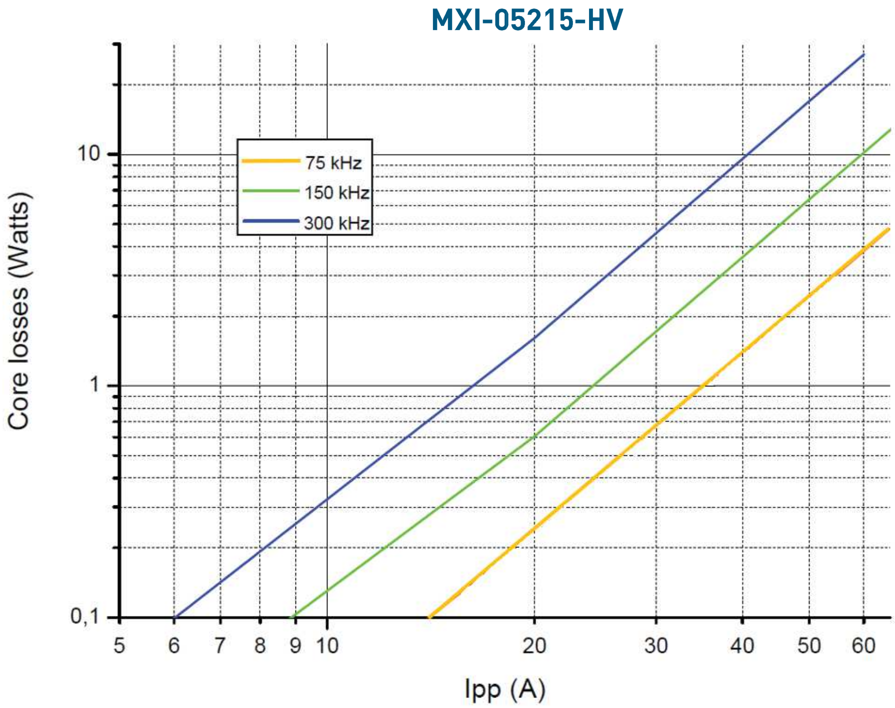
Winding Rac vs Frequency



Revised: 26/04/2022

Core loss vs Peak-Peak Current





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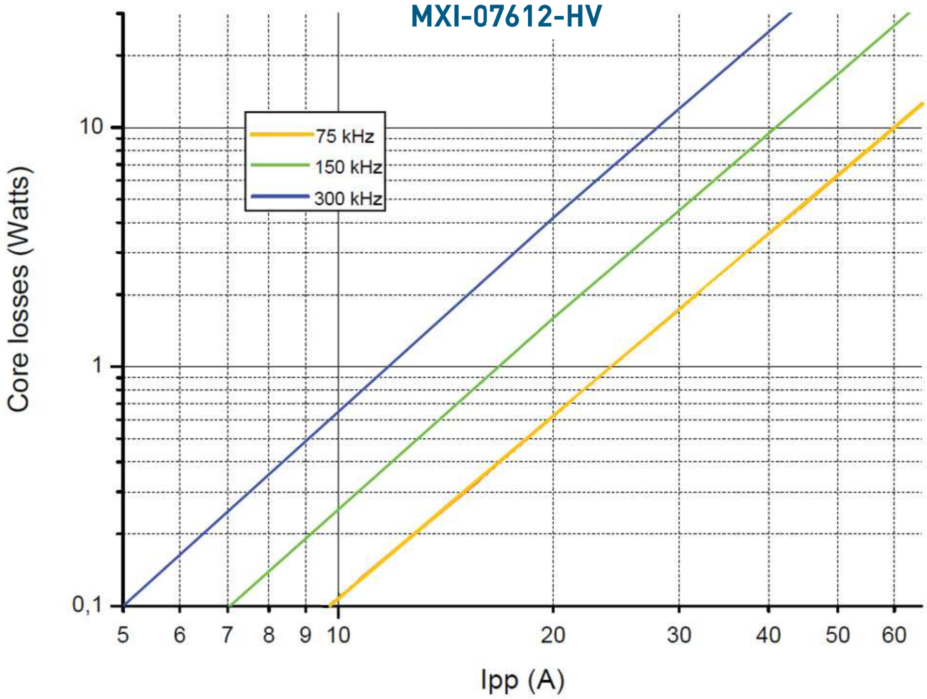
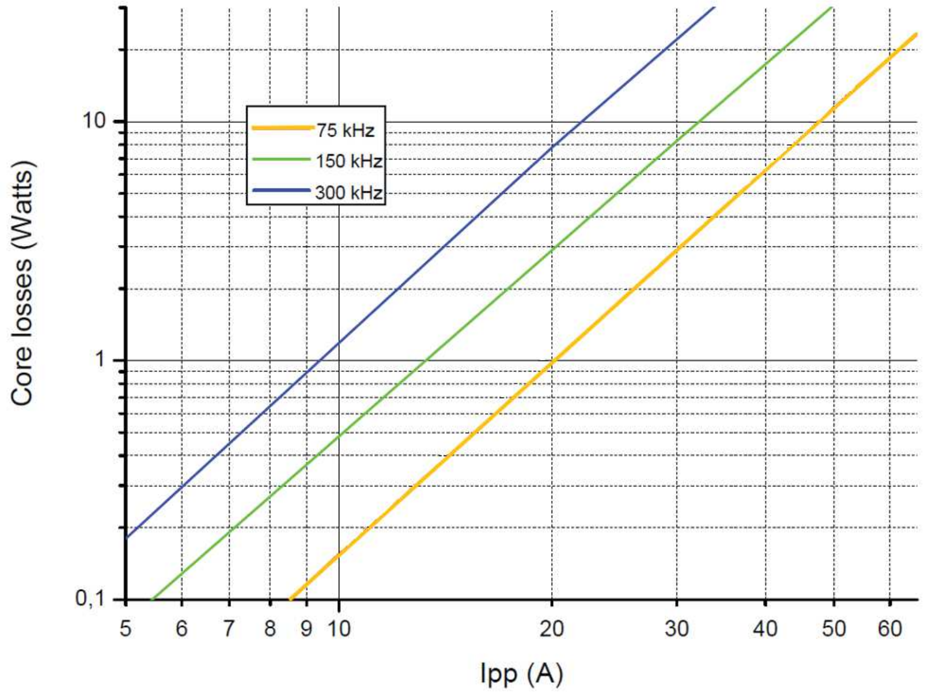
Core loss vs Peak-Peak Current (Cont.)

MXI-07612-HV



MXI-09608-HV



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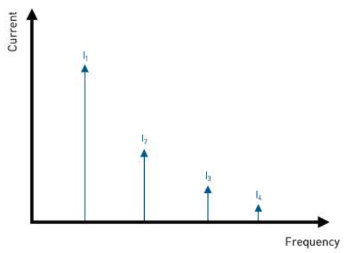
GUIDE FOR LOSSES AND TEMPERATURE RISE SIMULATION

This catalogue and its charts allow loss and temperature rise calculations based on the actual current waveform of the application.

<u>Copper Loss</u>

- Determine your current waveform and its harmonics



- Using Rac vs frequency chart, get corresponding Rac value for each harmonic
- Calculate Copper Loss using a summation of each loss at each harmonic. Accuracy depends on number of harmonics used.

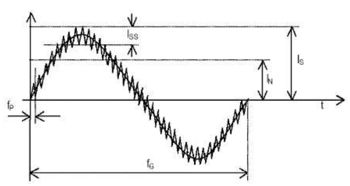
$$Cop_{Loss} = \sum I_n^{\,2} \cdot \mathrm{Rac_n}$$

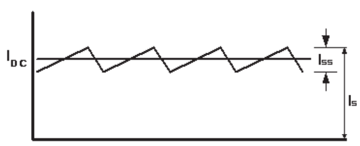
<u>Core Loss</u>

Core loss charts defined in this catalogue are based on general Steinmetz equation under sinusoidal excitation using constants provided by core manufacturer.

For non-sinusoidal excitation the improved General Steinmetz Equation (iGSE) should be used to get more accurate core loss calculations.

In waveforms containing DC or low frequency plus a superimposed high frequency ripple current, peak to peak (Ipp) current in core loss chart is selected considering the high frequency ripple only, I_{SS} in below charts.





For example, consider a DC current of 30Amps plus a superimposed ripple current of 20Amps peak-peak at 200kHz (I_{DC} = 30Amps; I_{SS} = 20App; I_S = 40Amps).

Ipp in core losses chart is equal to I_{SS} = 10Amps. Determine inductor core losses by selecting the 200kHz line with Ipp =10Amps.

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Temperature rise

Once Copper and Core loss are calculated, inductor total loss can be determined by the simple summation of both losses

$$\text{Total Losses} = Cop_{LOSS} + Core_{LOSS}$$

Using total losses vs temperature rise chart, inductor temperature in the application can be determined.

Chart is simulated based on natural convection at 25ºC ambient, therefore if the application provides sufficient cooling system (i.e. heatsink or fan) over the inductor, higher losses might be accepted without incurring in excessive inductor heat.

NOTE

All parameters and charts stated in this catalogue are based on accurate theoretical calculations. However, actual results might differ from those defined in this catalogue. PRAX strongly recommends to validate product in final application before production.

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