Efficient and cost effective method to reduce damaging motor bearing currents in big inverter drive systems

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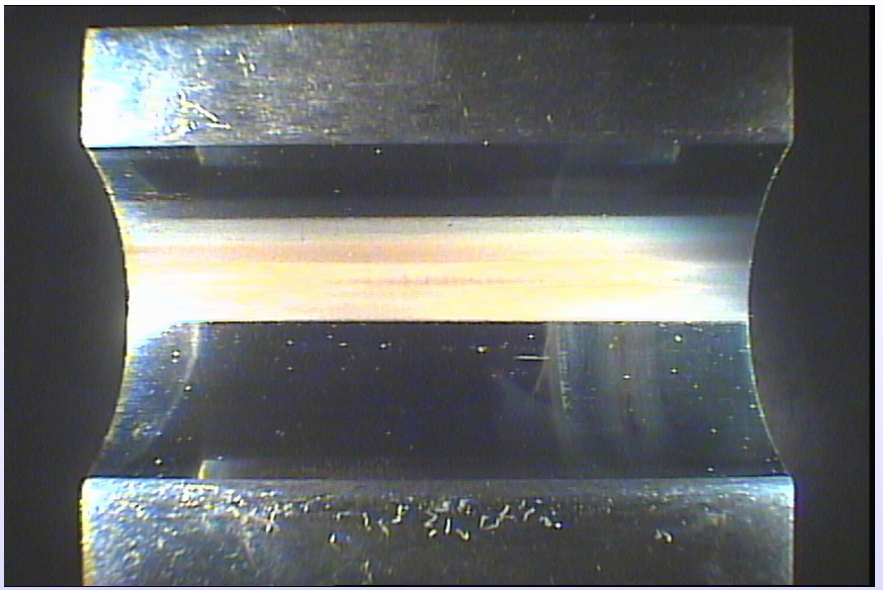
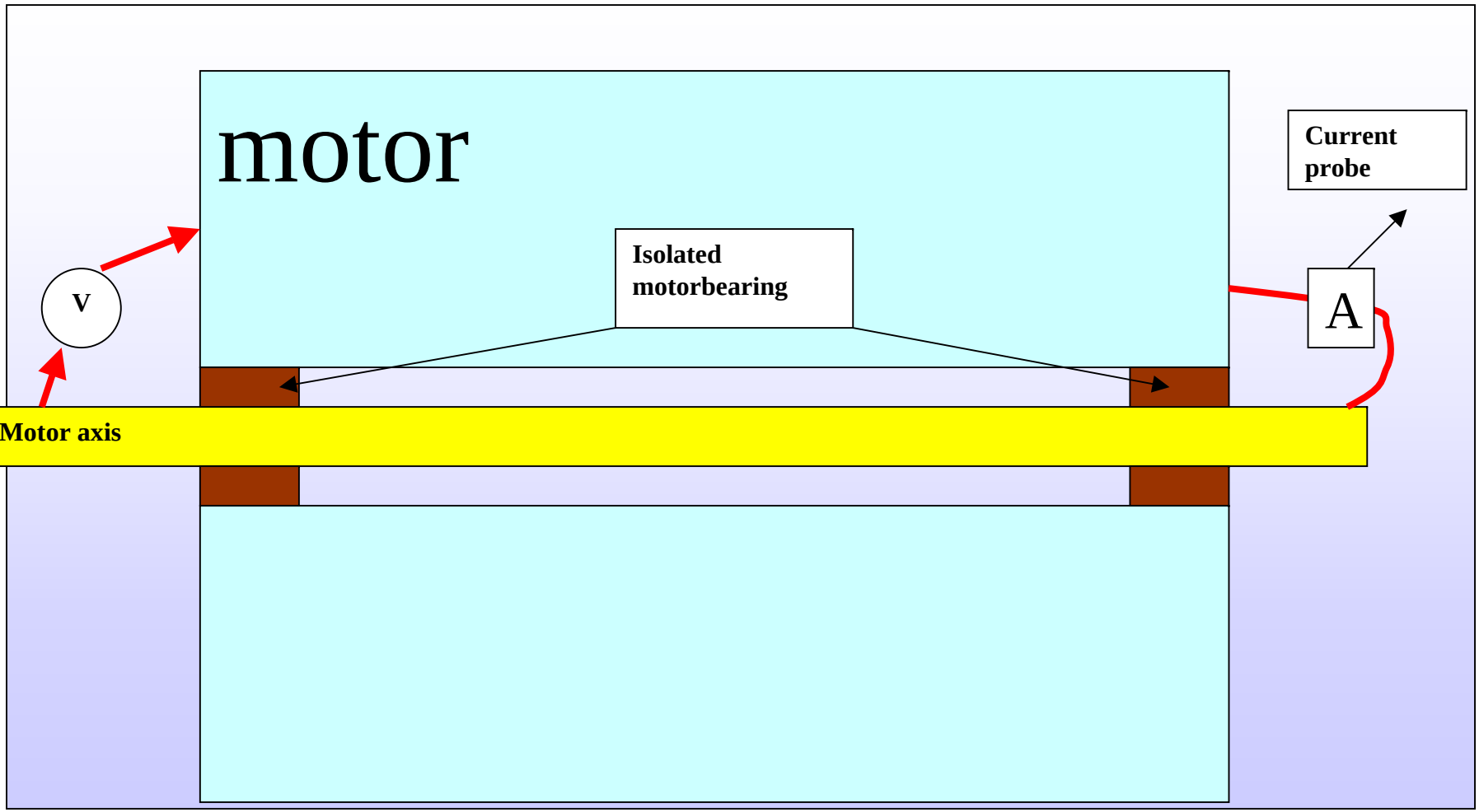
The phenomenon



Motor bearing damages

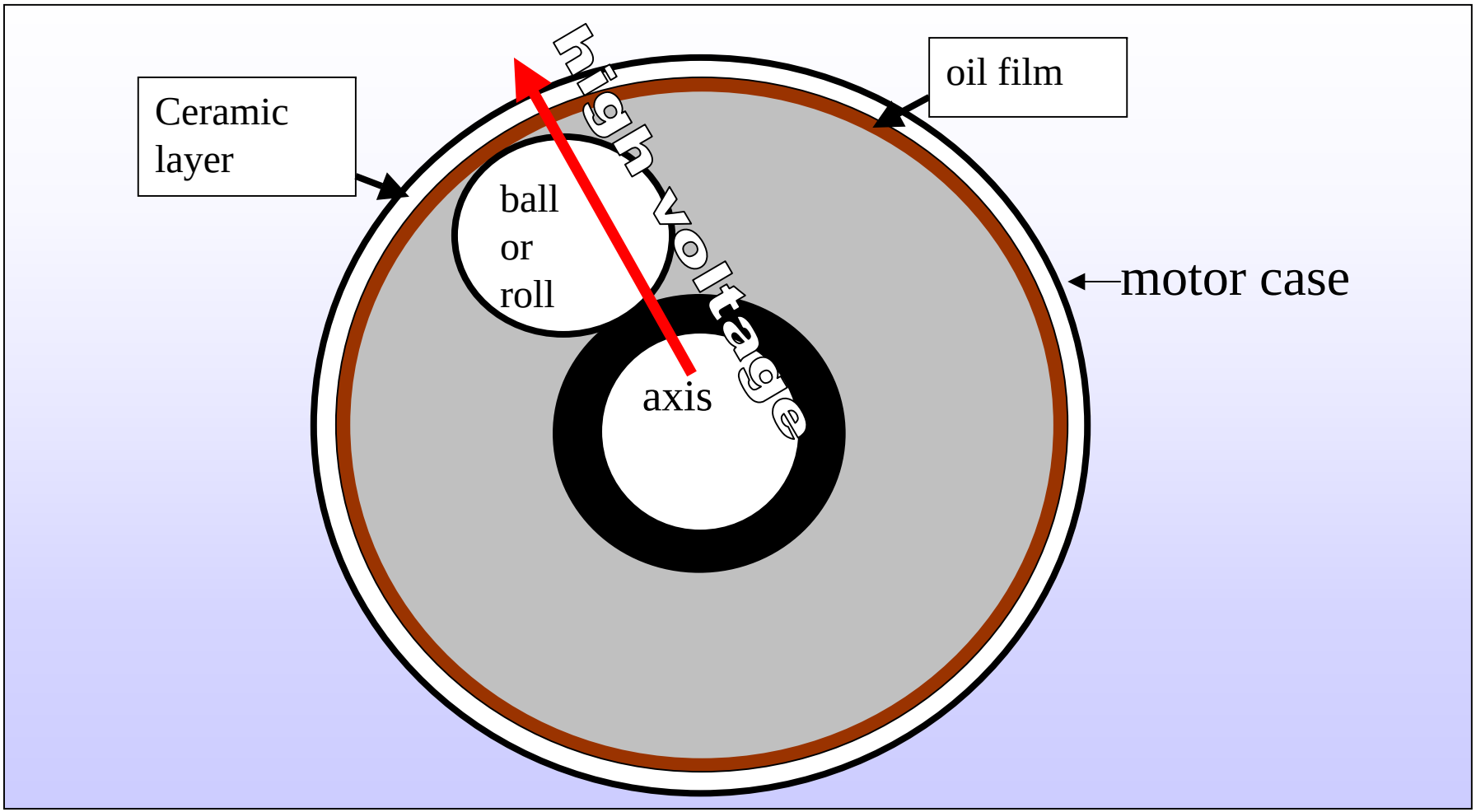
Cool Blue® cores to reduce motor bearing voltages and -currents

how can you measure the voltage across a bearing?



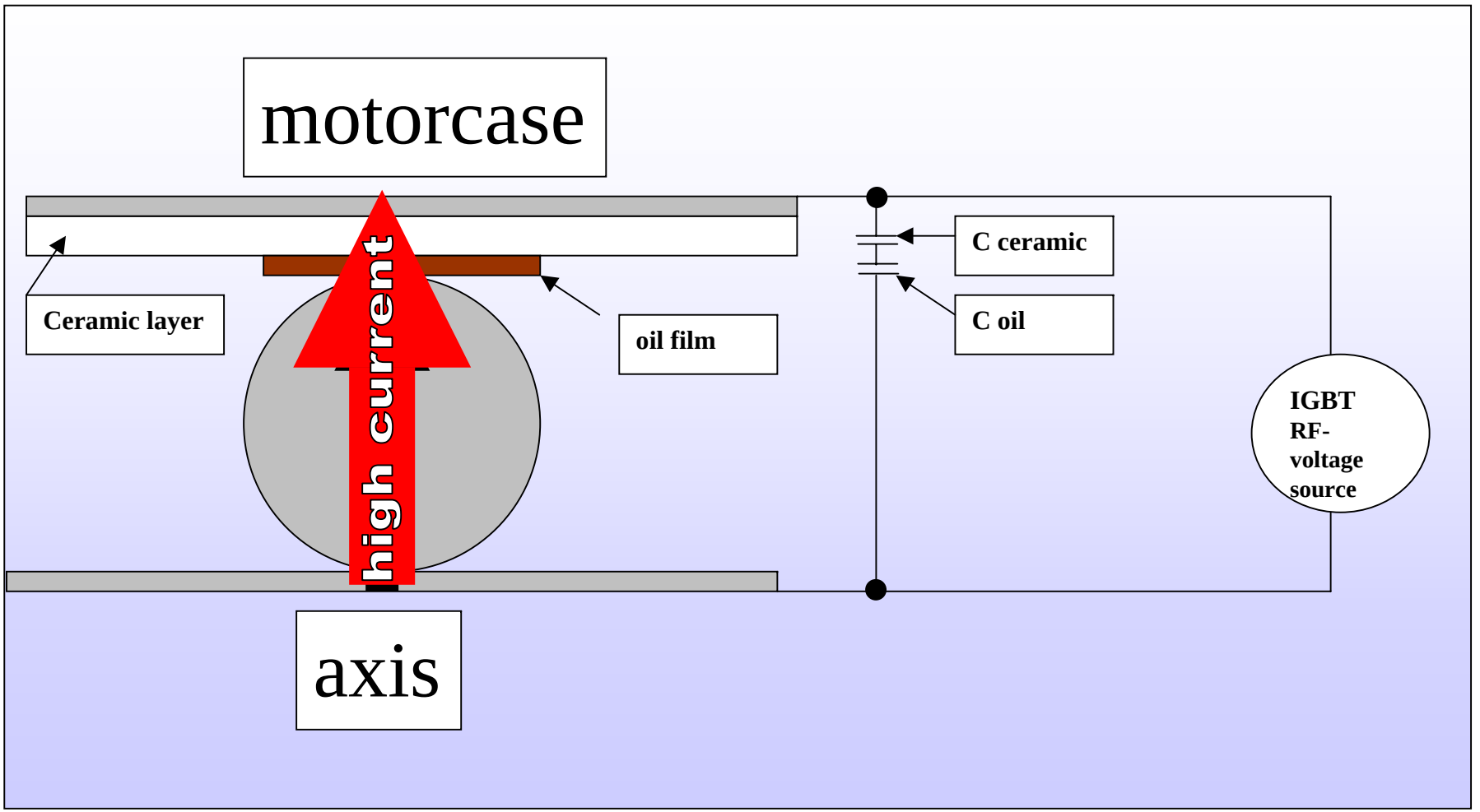
Cool Blue® cores to reduce motor bearing voltages and -currents

Effect even on Isolated bearings



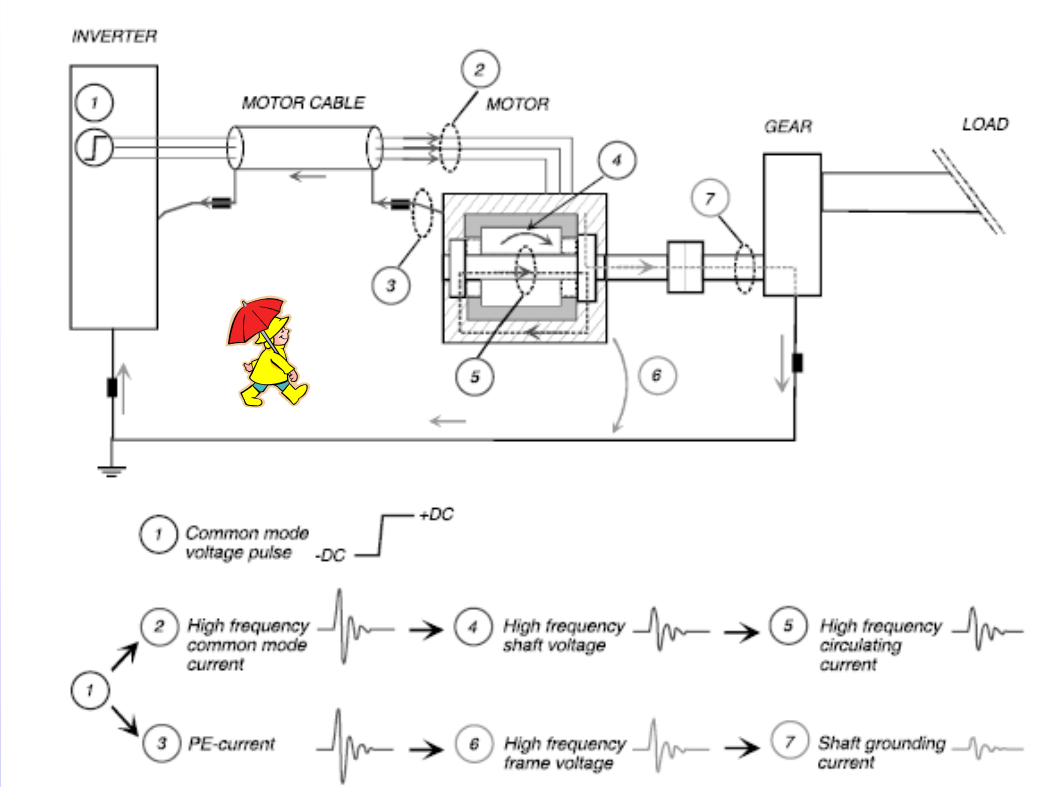
Cool Blue® cores to reduce motor bearing voltages and -currents

Ceramic bearing and oil film short cut



Cool Blue® cores to reduce motor bearing voltages and -currents

How can we avoid these damaging currents ?



Cool Blue® cores to reduce motor bearing voltages and -currents

A view inside the motor

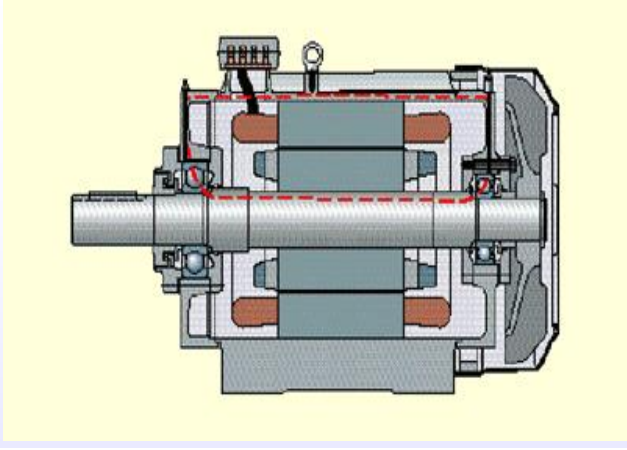
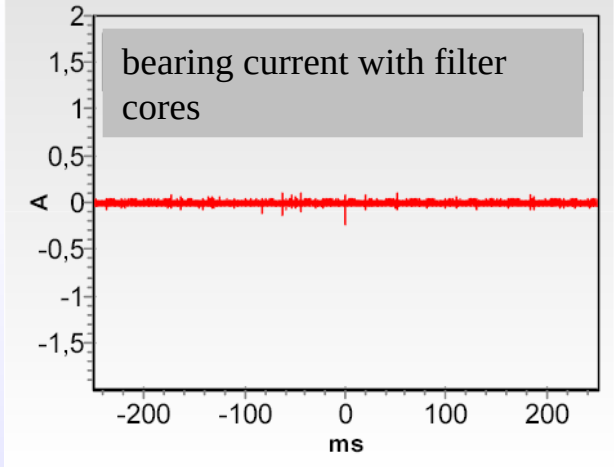
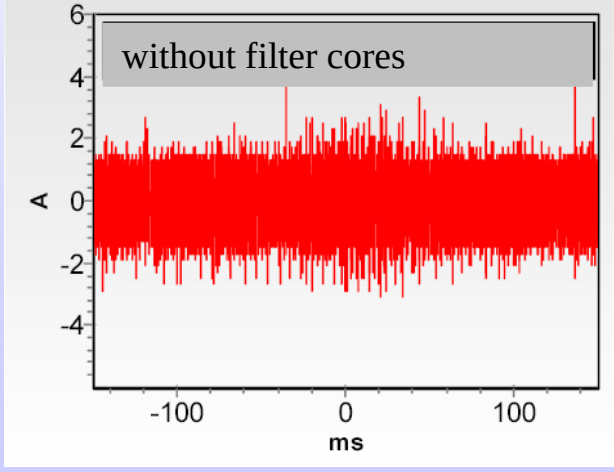


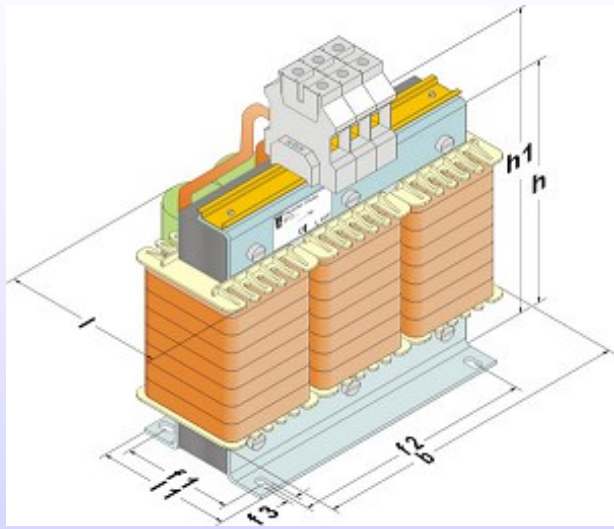
Figure 1: Bearing currents can cause "bearing fluting", a rhythmic pattern on the bearing's races.



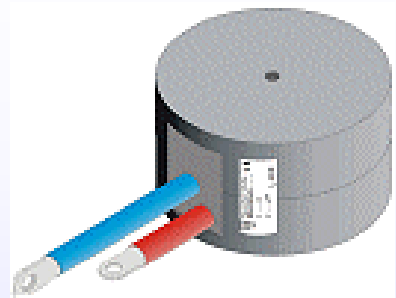


Cool Blue® cores to reduce motor bearing voltages and -currents

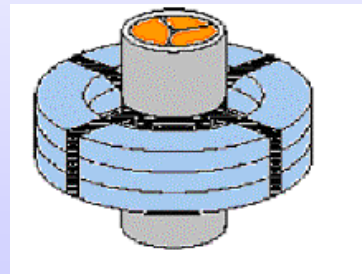
Different solutions are possible



3-phase motor filter



pot cores



Cool Blue® -cores

Cool Blue® cores to reduce motor bearing voltages and -currents

Why do Cool Blue® provide the best solution ?

- low to no noise operation
- low leakage field
- low loss / cool operation
- small volume
- easy to mount
- can easily be re-tooled
- very good value for the money

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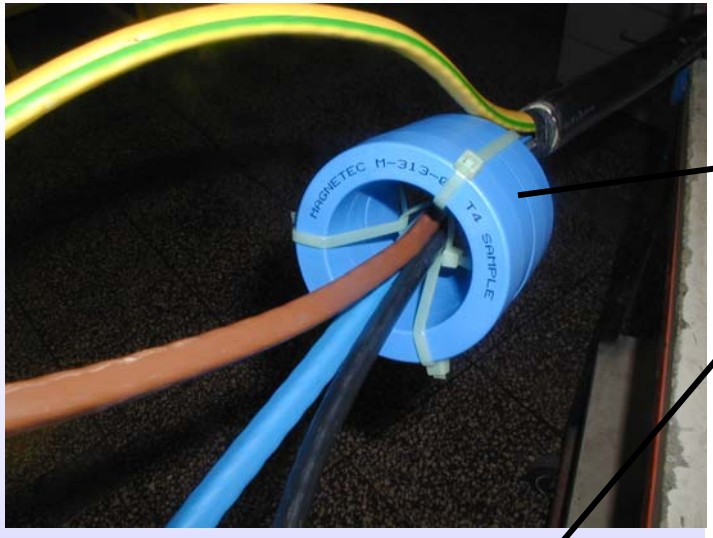
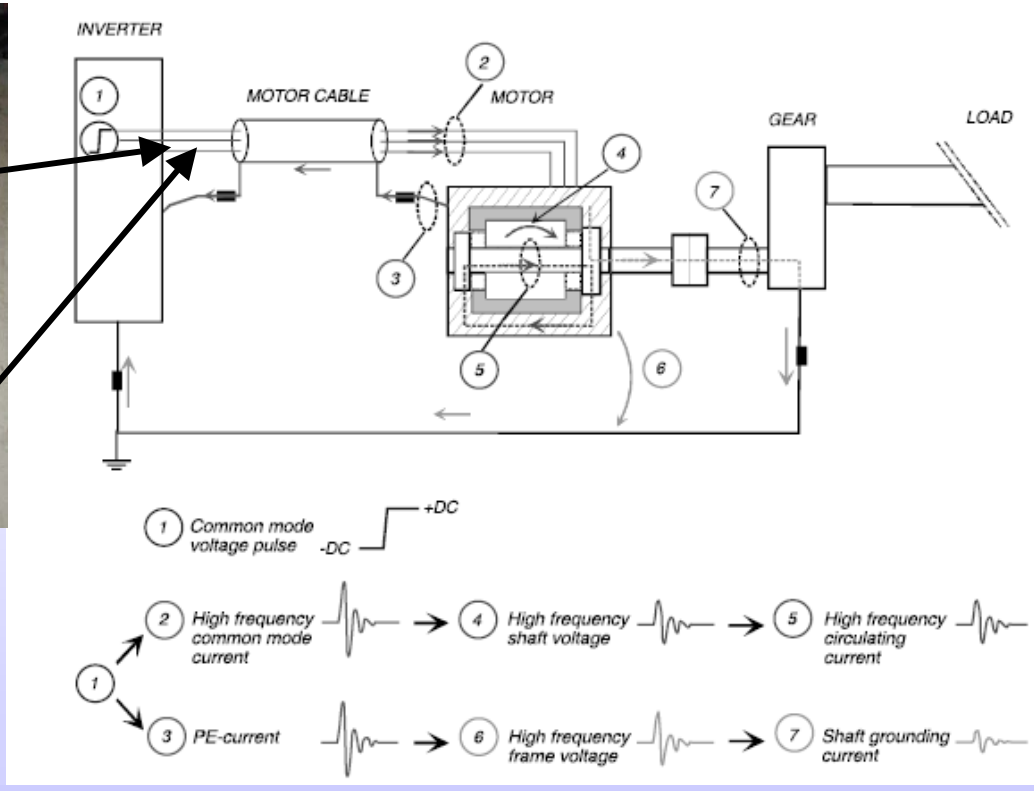
How to use Cool Blue® cores made of NANOPERM®

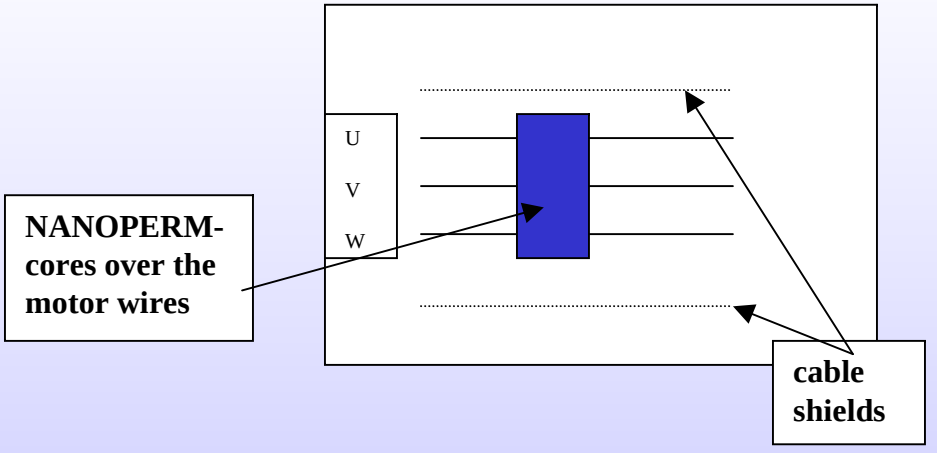


place core here, cover all wires but NOT the shielding (neural)



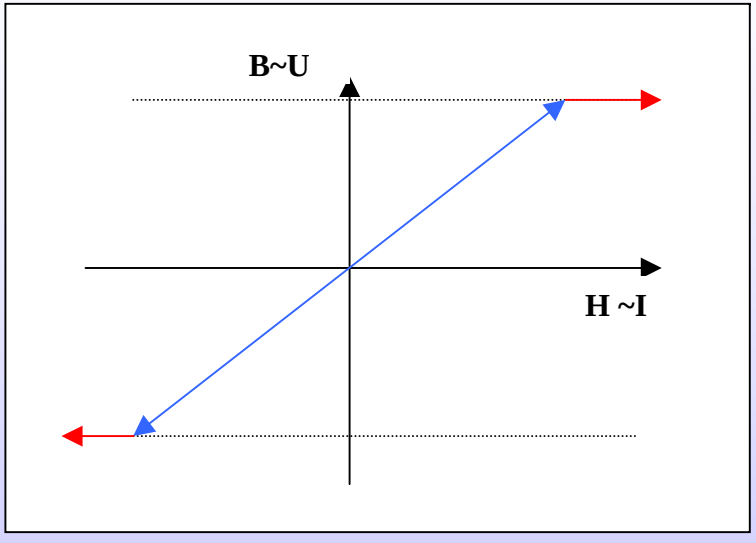
Cool Blue® cores to reduce motor bearing voltages and -currents

How to use Cool Blue® cores made of NANOPERM®



Cores operate as a common mode choke when being put over all motor cables

How to derive the right Setup of cores?



H ~ I
Relate to the sum current L1+L2+L3

B ~ U
Relate to the inducted voltage in the core

The amount of cores necessary depends on the sum-bearing current

Experimental approach

The inner diameter is defined by the cross section of the motor cables

3-4 cores should be mounted together

If the core temperature is > 120°C double the amount of cores

If the temperature is still > 120°C select next bigger core size

Available round core standard range

Outer diameter	Inner diameter	h	Order no. p/n	max. asymmetric current (sum-current Peak)
80 mm	**63**	**30**	**M-113**	**6 A**
100	**80**	**30**	**M-114**	**8 A**
130	**100**	**30**	**M-115**	**9 A**
160	**130**	**30**	**M-116**	**12 A**
200	**175**	**30**	**M-117**	**16 A**
300	**250**	**30**	**M-205**	**23 A**

- More core types are available on request
- 4 pieces are typically necessary

Cool Blue® cores to reduce motor bearing voltages and -currents

Available oval core standard range

Outer diameter	Inner diameter	h	Order no.	max. asymmetric current (sum-current Peak)
80 mm	**63**	**30**	**M-283**	**6 A**
100	**80**	**30**	**M-284**	**8 A**
130	**100**	**20**	**M-142**	**9 A**
160	**130**	**30**	**M-116**	**12 A**
240	**200**	**30**	**M-111**	**19 A**
300	**250**	**30**	**M-248**	**23 A**

- More core types are available on request
- 4 pieces are typically necessary

Cool Blue® cores to reduce motor bearing voltages and -currents

Motor bearing currents occur not only in Mega Watt – drives !

In MW-drives the switching frequencies are at around 1 kHz

In kW-drives the switiching frequencies are in the 10 kHz range !

This causes motor bearing problems, too!

Conclusion

Cool Blue® cores can increase motor bearing‘s lifetime up to factors compared to the actual standard**.**

Example:
A standstill in a paper factory for replacing the motor bearing costs about 10k€ per hour.

The investment of some 100 € is a worth while maintenance measure - it will double the bearing‘s lifetime!