





Another EMC resource
from EMC Standards

9 - Suppressing electro-mechanical devices

Helping you solve your EMC problems

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Module 9. Suppressing electromechanical devices



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Change Record: v2 to v2.2, March 2019

- **EMC Standards logo added**
- **Footnote added to all slides:** 'Cherry Clough Consultants confidential training material'
- **All URLs / hyperlinks now activated**
- **Contents list was 9.0.2, now renumbered as 9.0.3**
- **New slide added as 9.0.2** (Good EM Engineering; De-Risking projects)
- **Slide 9.2.2 slightly modified to enhance its safety warning**
- **Slide 9.2.4 improved**
- **Slide 9.3.3. 9.4.4 and 9.4.8 slightly improved**
- **Slides 9.6.2 and 9.6.3 slightly improved**
- **Slides 9.7.2 slightly improved**
- **Slide 9.0.3 renumbered as 9.0.4 and moved right to the end**
- **Slides 9.8.2 updated and improved**

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Good EM (electromagnetic) Engineering, and De-Risking new projects

- **Good EM engineering is cost-effective SI, PI, EMC design: well-proven to save time & money in all lifecycle stages, helping increase profits & reduce financial risks...**
 - for all products, equipment, vehicles, systems, installations; etc., of any size, in all applications...
see www.emcstandards.co.uk/testimonials and **Module 1**
(especially 1.15, which is also in Webinar 1c; and 1.16 which is also in Webinar 1d)
- **Our courses (of which this is one) provide a complete set of good EM Engineering guidelines, that should also be used as an initial design checklist to **De-Risk new projects:** *any that can't or won't be followed identify a project risk!***
also see Module 1, section 1.16 (also in Webinar 1d)
 - to adapt any λ -based design guidelines to different applications and/or different EMC test standards:
see Module 1, section 1.18 *(also in Webinar 1d)*

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- 9.1 Emissions caused by arcs and sparks
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- 9.5 Suppressing sliprings
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- 9.7 Suppressing electric bells and buzzers
- 9.8 Some useful references

Keep up to date with new versions of this course module!
Visit: www.emcstandards.co.uk/emc-for-products-equipment2

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9. Suppressing electromechanical devices

9.1 Emissions caused by arcs and sparks

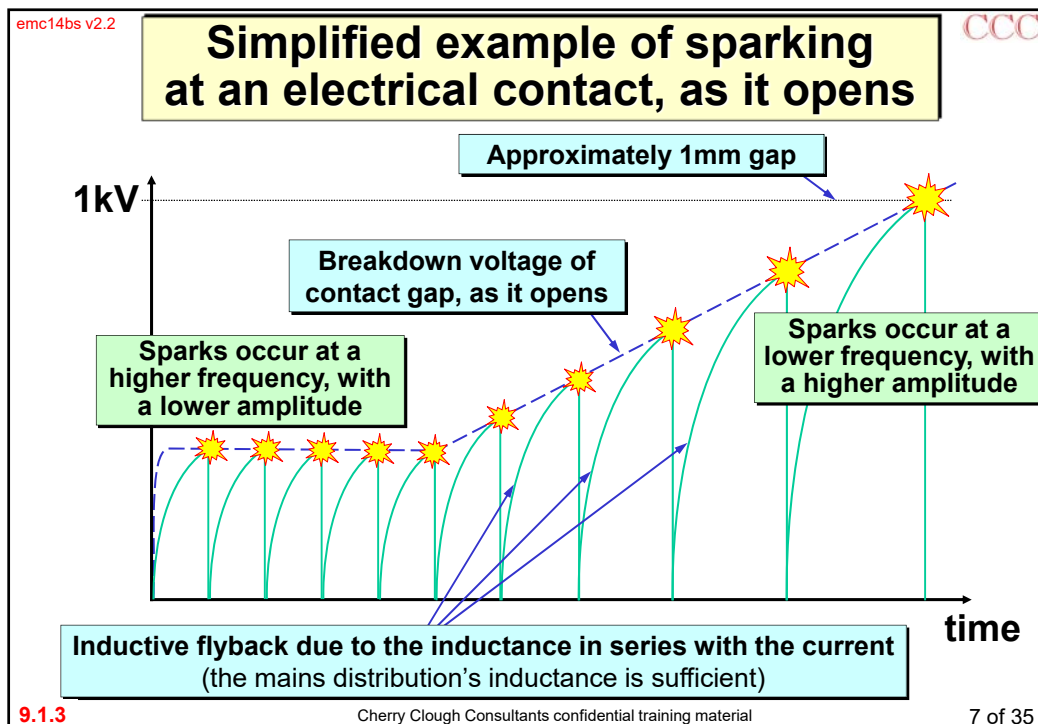
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Introduction to arcs and sparks

- **When a contact opens the current can't change instantly because of the inductance in the circuit...**
 - inductive energy is stored in any conductor (e.g. mains supply distribution and long DC cables)...
 - also stored in all coils and windings (solenoids, transformers, motor windings, etc.)
- **The resulting voltage flyback breaks down the contact's air gap while it tries to maintain the current flow**

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Introduction to arcs and sparks continued...

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- Frequency spectrum of arcs and sparks is truly 'DC - daylight'
- And this wide spectrum is radiated (or picked-up) by all conductors...
 - depending on their length and resonant frequencies
- It's best to avoid the creation of sparks altogether...
 - by using semiconductors which don't try to switch current instantaneously, such as: PowerFETs, IGBTs, zero-crossing triacs, etc.

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9. Suppressing electromechanical devices

9.2 Suppressing electromechanical contacts

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Snubbers for contact gaps

Popular style RC snubber typically $100\Omega + 100\text{nF}$ (don't use a wire-wound R !)

2 or more switched poles need a snubber for each

From supply Contacts To load

NOTE: At 50Hz 230V rms the leakage current of this snubber circuit is 7.5mA rms: a possible safety hazard

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