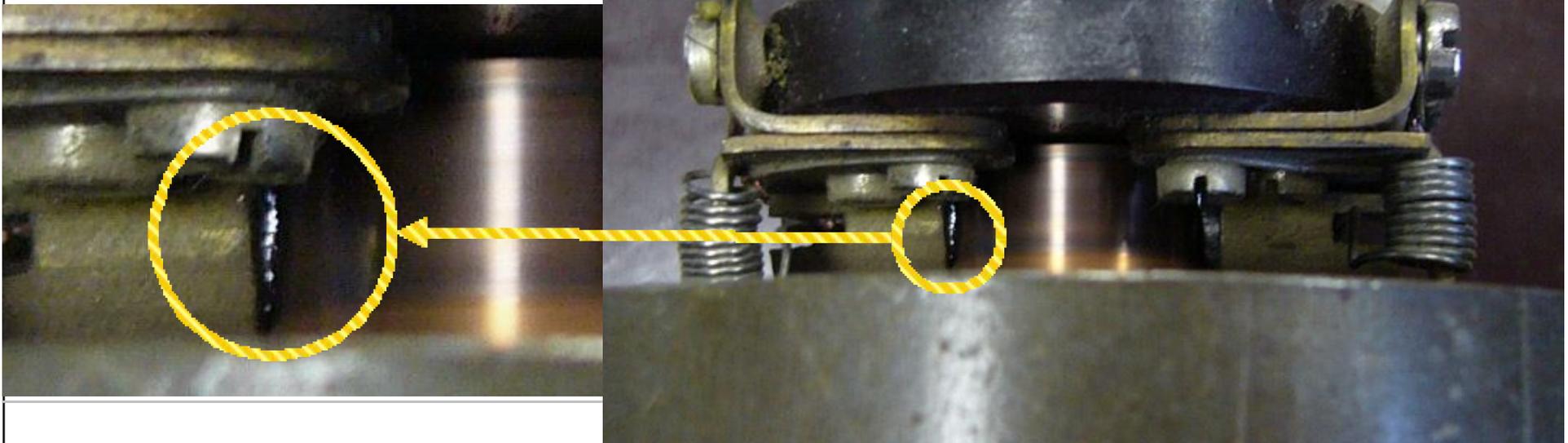


Brush motors with noise suppression

The root of all evil: brush sparking

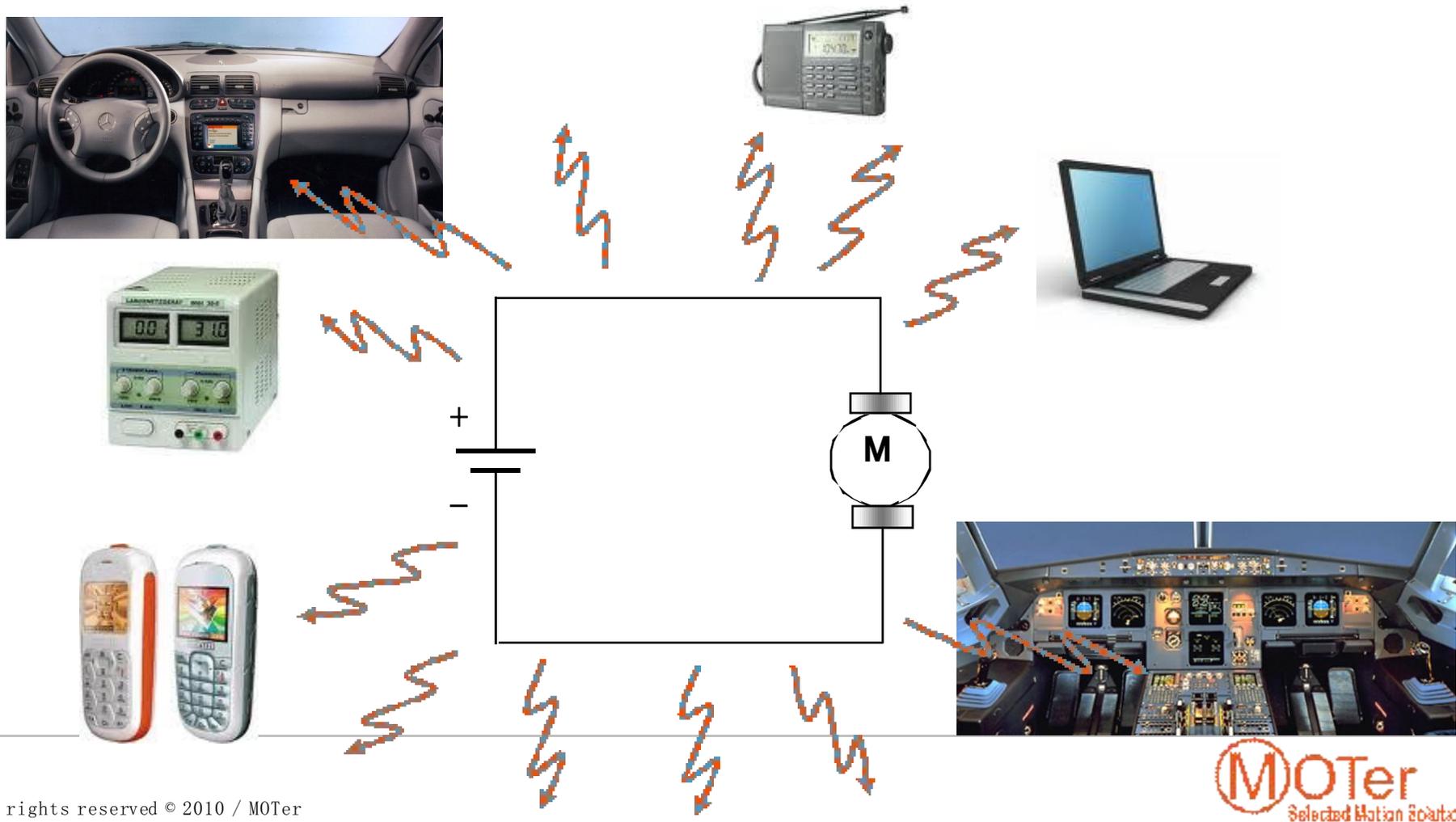
Brush sparking happens in the instant, the brush connects or separates two sectors of the commutator with different potentials. The spark that develops while connecting is usually not considerable. The spark that develops while two sectors are separated from each other is much stronger because the magnetic field inside the rotor lamination transforms into electrical energy (induction) and this energy is short-circuited in the spark.

These sparks generate electromagnetic radiation and may interfere neighbouring circuitries.



Brush motors with noise suppression

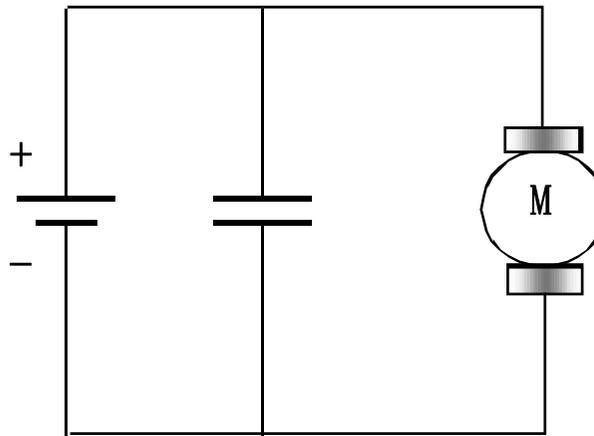
Interference of neighbouring circuitries due to radiated or conducted radiation



Brush motors with noise suppression

Noise suppression with capacitor

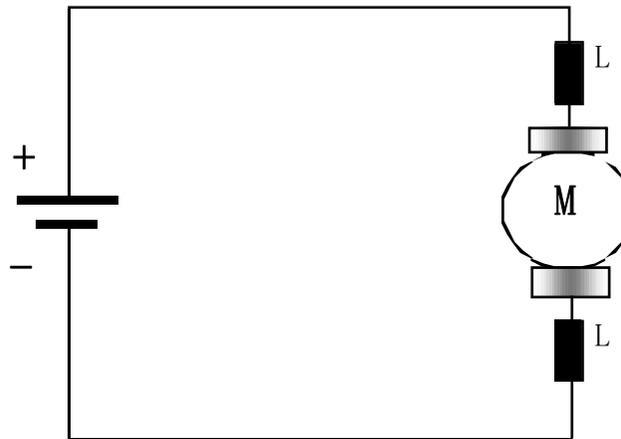
The most simple way to reduce noise is a capacitor parallel to the source of the noise emission. For high frequency interference, capacitors are like a short circuit.



Brush motors with noise suppression

Noise suppression with inductors

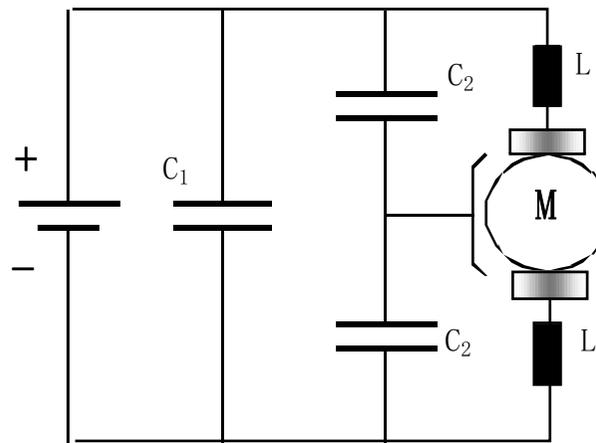
Inductors, connected in series to the supply voltage have a high resistance for high frequency signals because the inductive reactance increases with the frequency of the signal. Inductors have nearly no resistance for direct-current voltages.



Brush motors with noise suppression

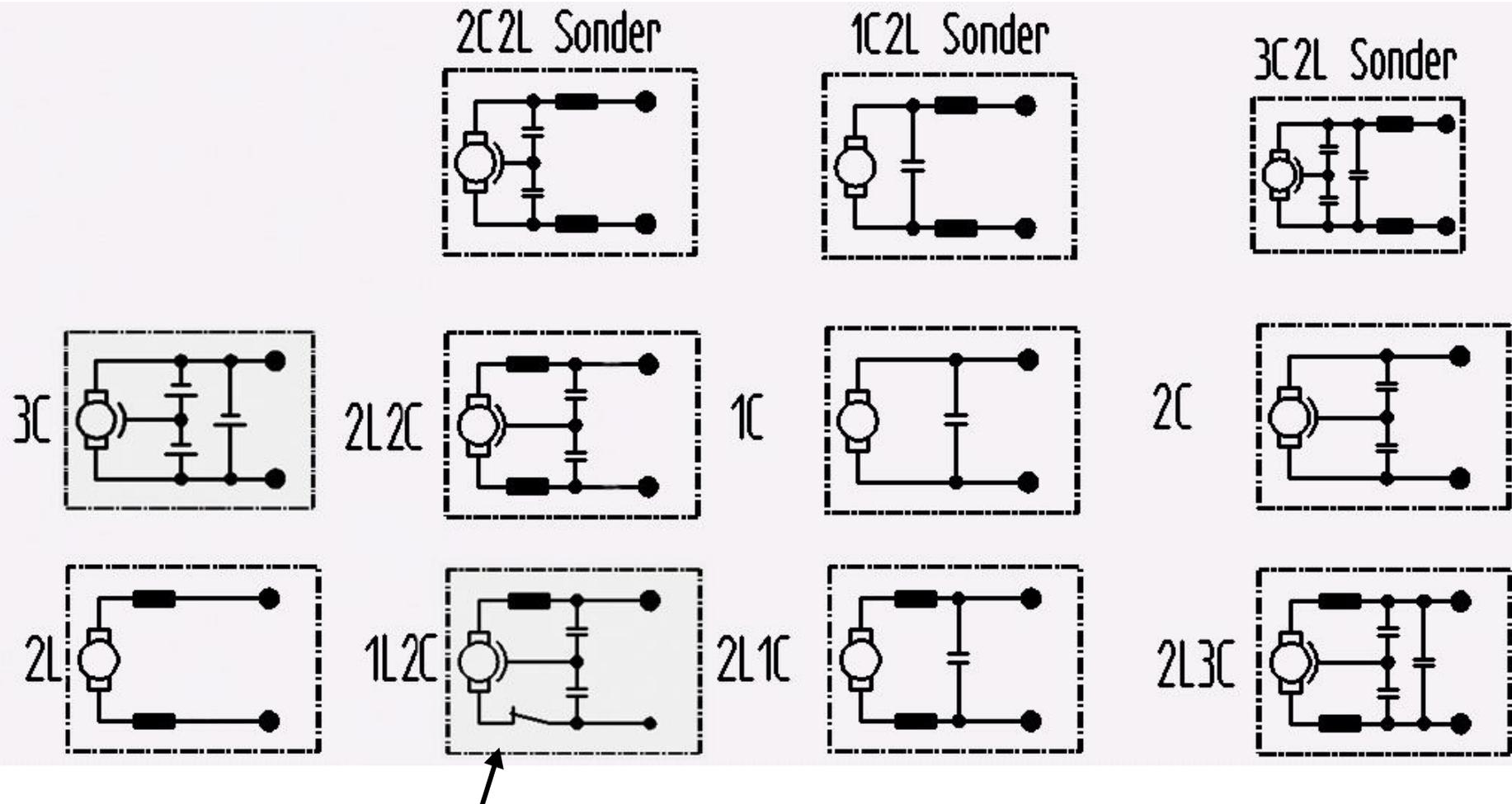
Noise suppression with combinations of inductors and capacitors

Depending on the noise suppression requirements, different components need to be combined.



Brush motors with noise suppression

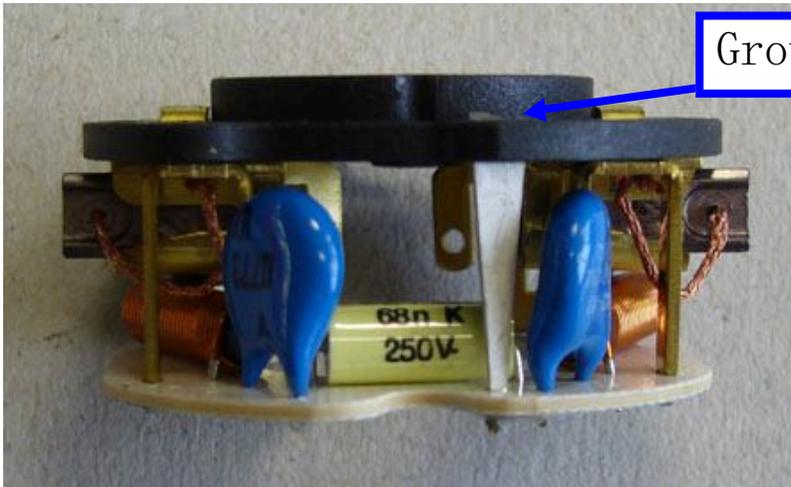
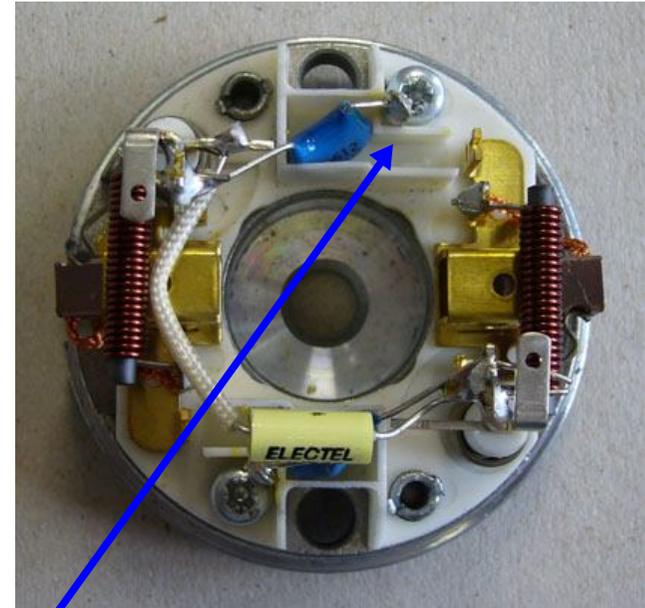
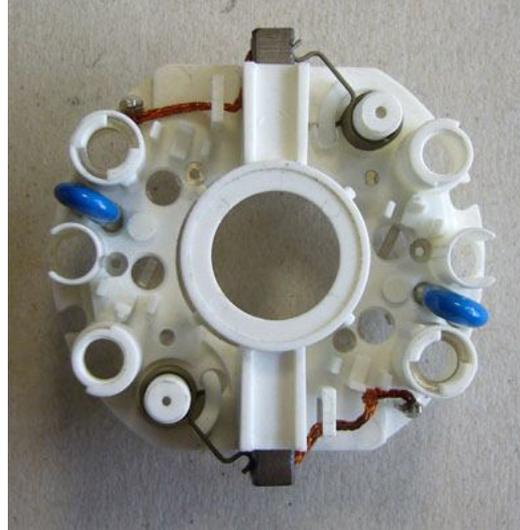
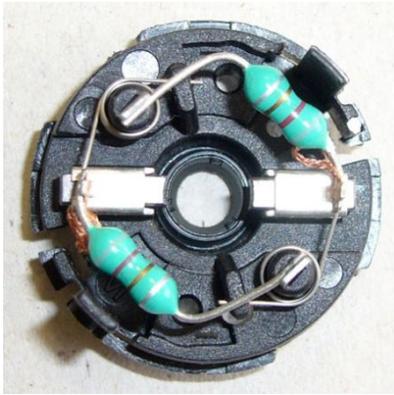
Overview over existing noise suppression circuitries:



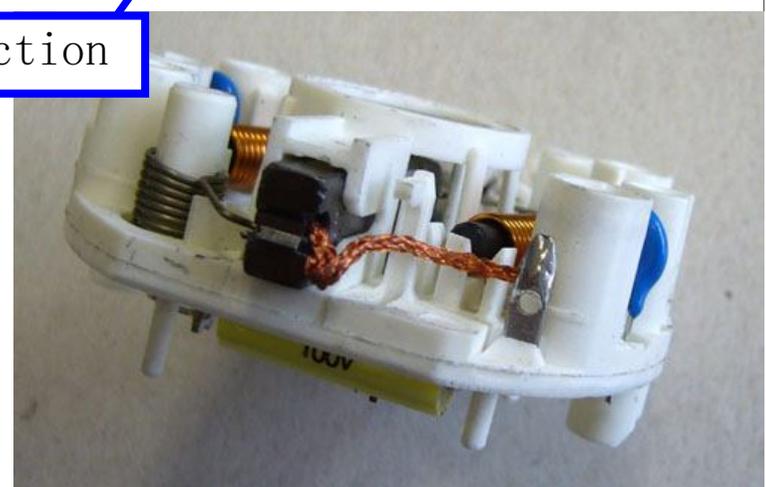
Note: In noise suppression 1L2C, an inductor of a 2L2C noise suppression circuitry was replaced by a thermal switch.

Brush motors with noise suppression

Selection of brush plates with noise suppression:

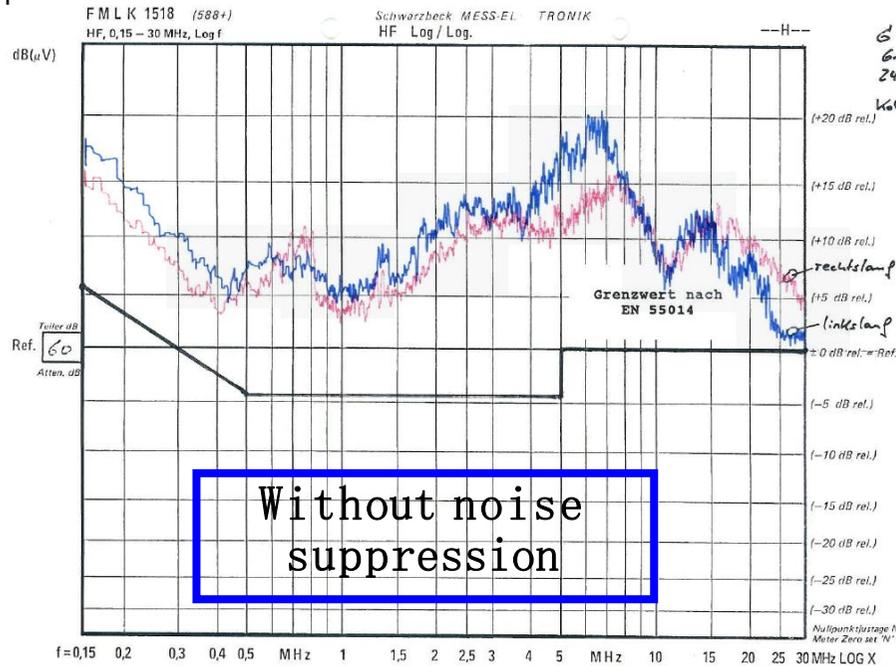


Ground connection

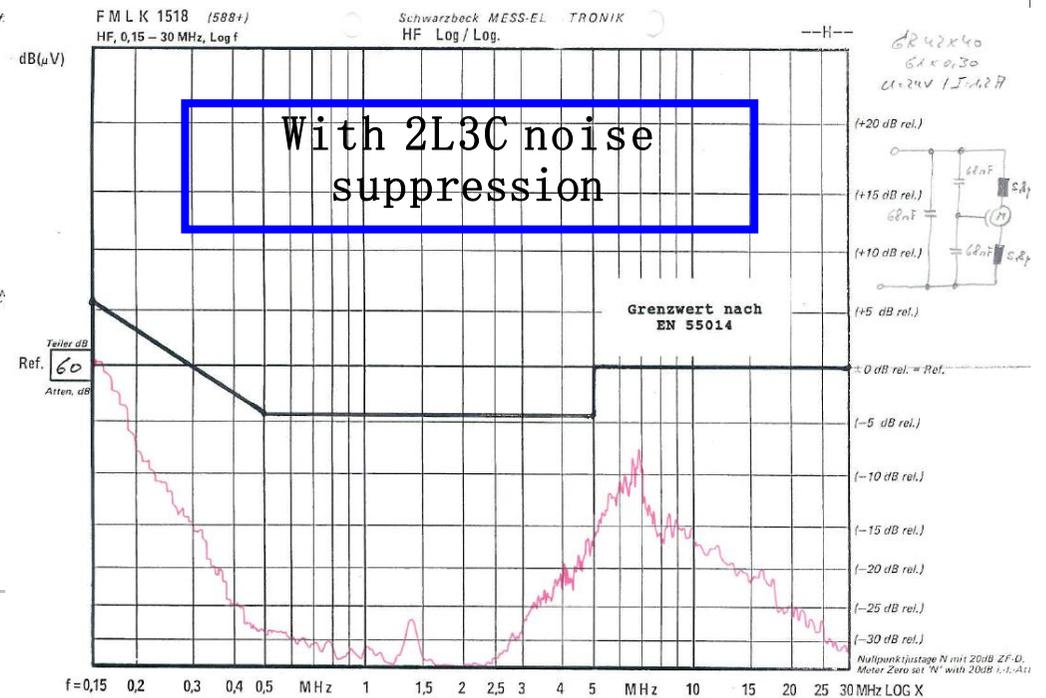
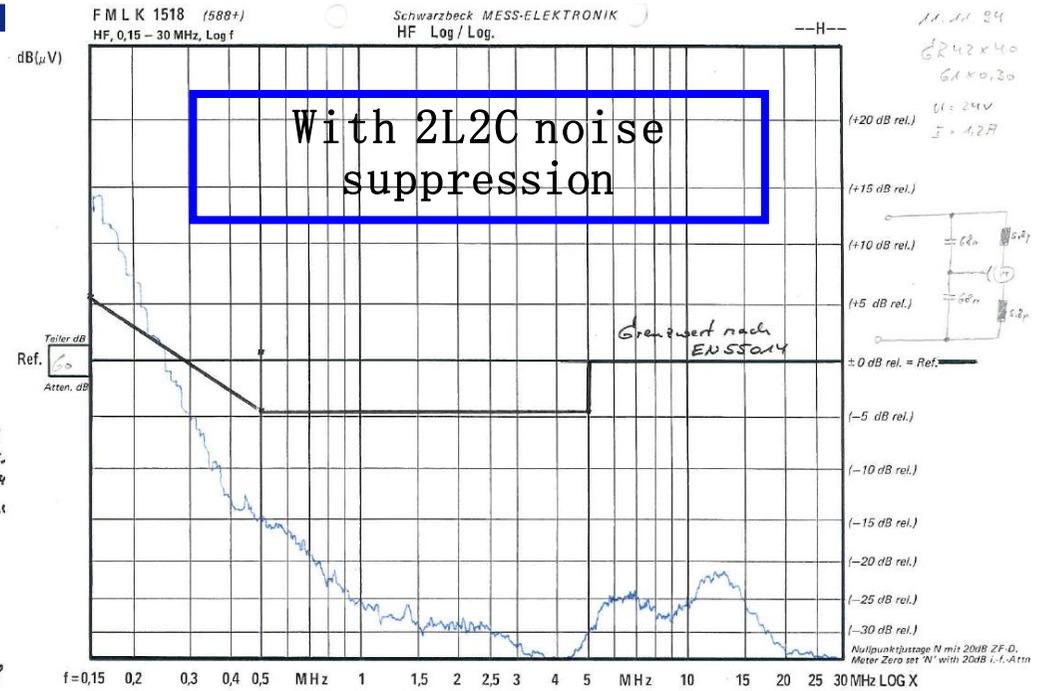


Brush motors with noise suppression

Example: BD42



Without noise suppression

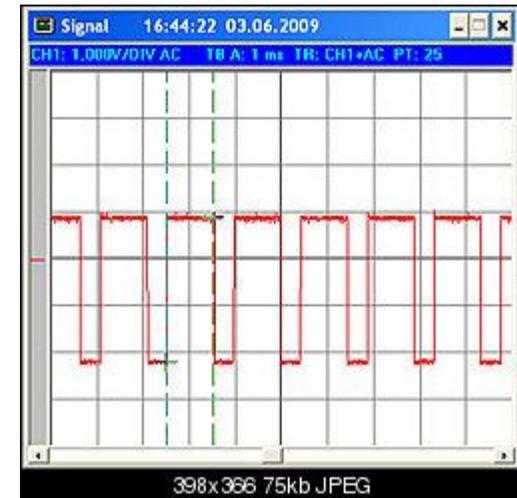


Brush motors with noise suppression

Technical notes

Operation with PWM voltage controller

Simple voltage controller do not provide a smooth direct current but a pulse-width modulated voltage (PWM). Depending on the frequency of the PWM voltage, a considerable part of the provided energy may be short-circuited by the transverse capacitor of the noise suppression circuitry. If a PWM voltage controller is used, it must be checked, if the selected noise suppression circuitry is suitable. Please contact your colleagues in Bonndorf in case of doubt.



Alternatives for noise suppression

Instead of using a noise suppression circuitry, the complete system motor-cable-voltage supply can be shielded to the environment, e.g. with a suitable housing. The shielding must be well enough to protect electromagnetic radiation from escaping more than allowed by the applicable standard. In addition, it must be made sure that the voltage supply is suitable for these interference voltages and does not lead the interferences outside the shielded area.