WIRELESS POWER TRANSFER

Würth Elektronik eiSos GmbH

October, 2015

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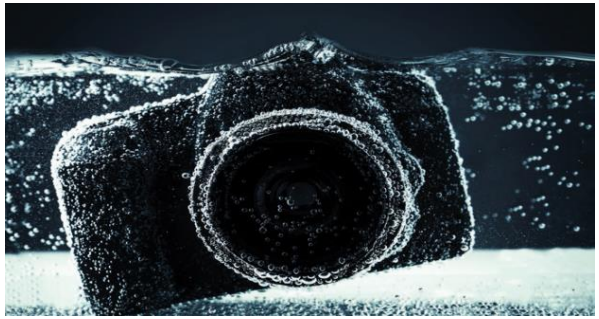
- Applications
- Technologies & Standards
- Coil Specific Considerations
- Würth Elektronik Products & Advantages

Applications

Application Areas besides Consumer Products



Industrial

Automotive

Medical Technology

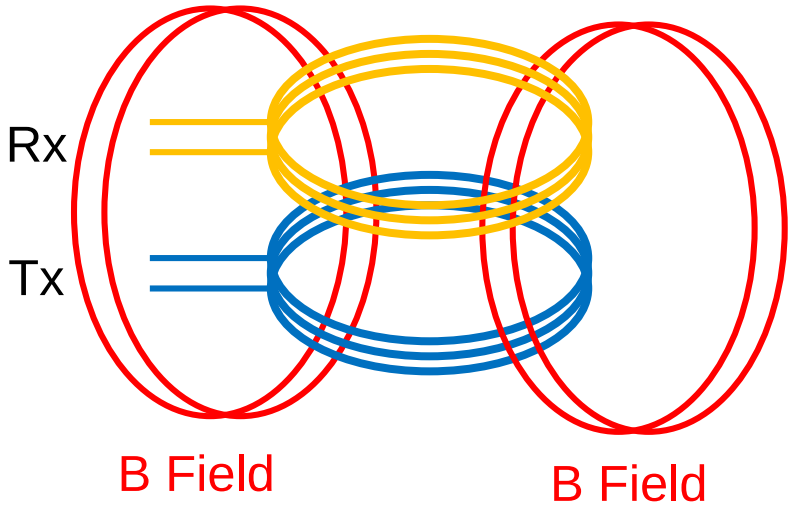
Furniture / Infrastructure

Cordless Kitchen

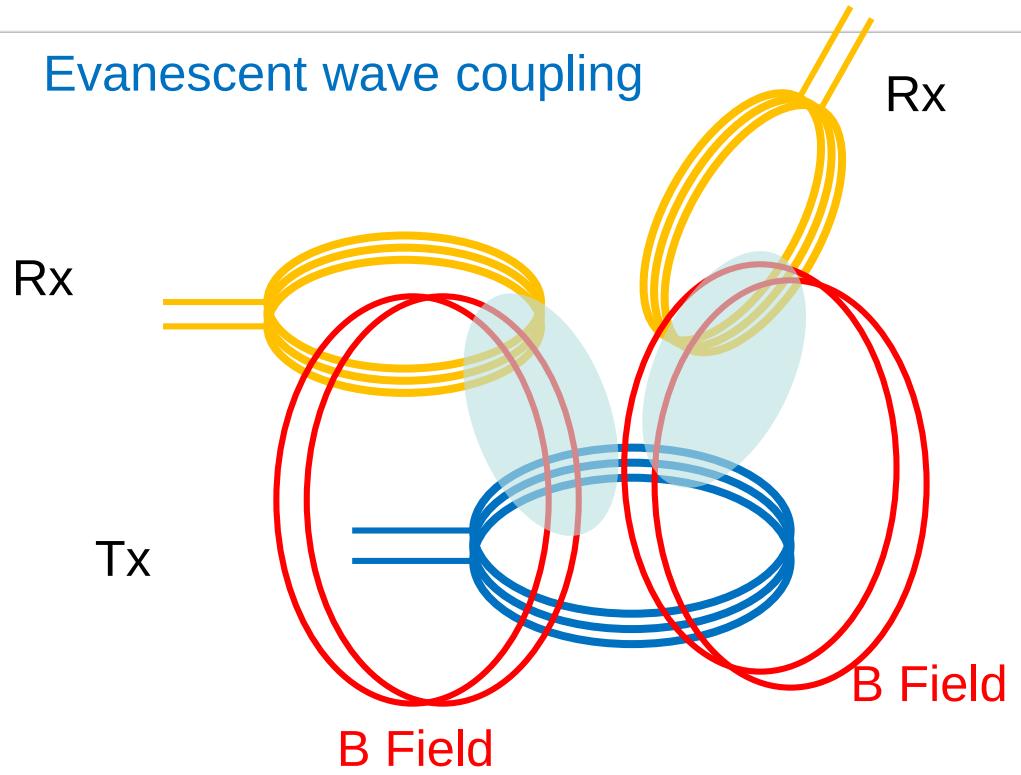
Power for appliances everywhere

Technologies and Standards

Inductive and Resonant Coupling



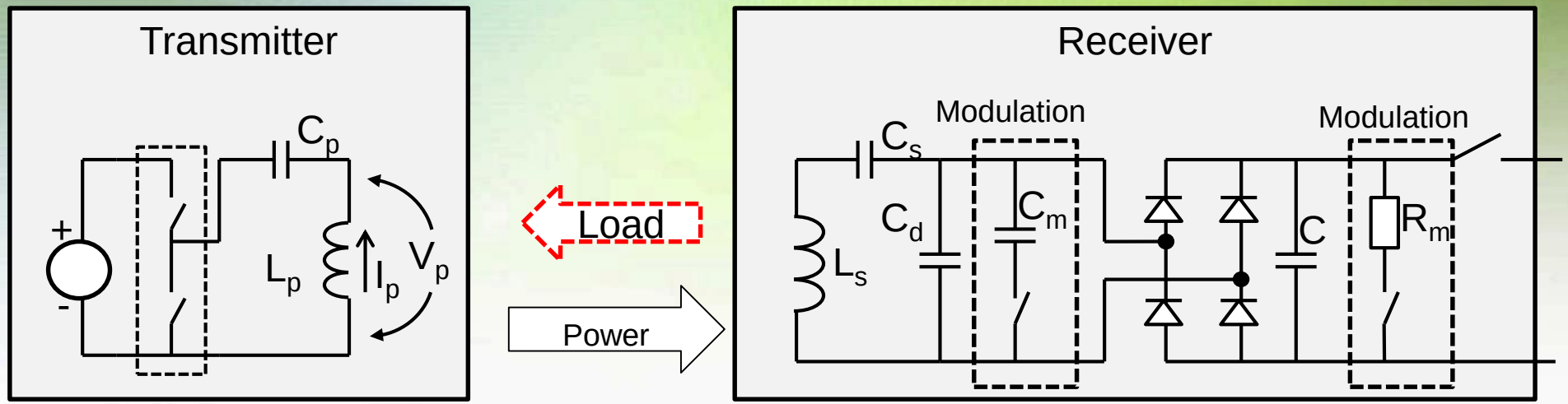
inductive power transfer



resonant power transfer

WIRELESS POWER
CONSORTIUM

Inductive Wireless Power Transfer



The Power of Qi

How to get a Qi-certified product?

Product must fulfill the requirements of Qi low power specification downloadable from
http://www.wirelesspowerconsortium.com

Part1: Interface definition (public)
Part2: Performance Requirements (for members only)
Part3: Compliance testing (for members only)

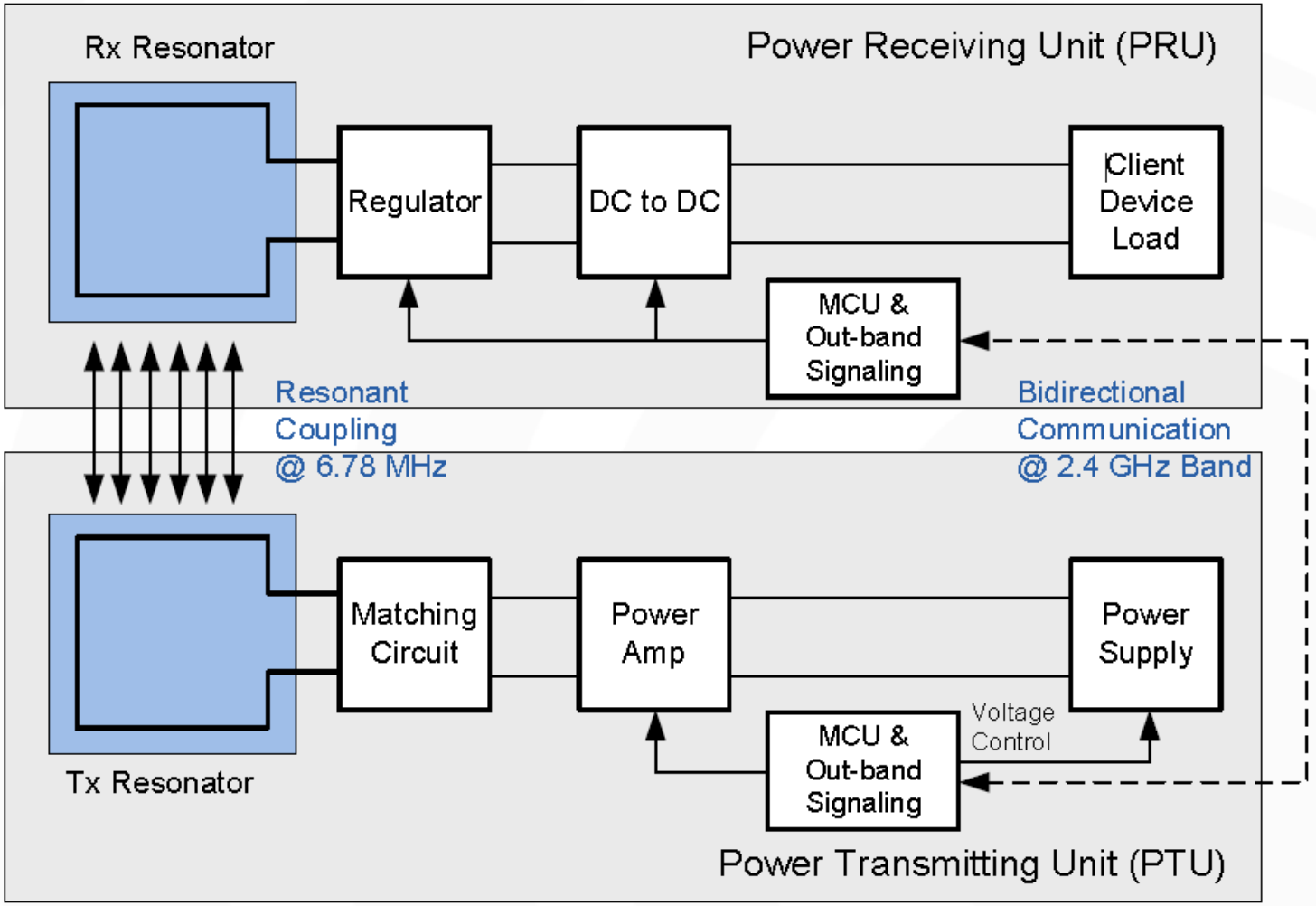
Product must be certified – Qi authorized test labs are:

- TÜV Rheinland, Korea
- TÜV Rheinland, Taiwan
- CETECOM, Germany
- DLS electronic systems, USA

Product certification is available only to members of the WPC.

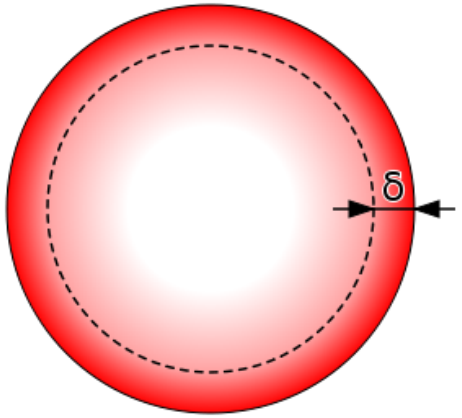
A4WP V1.0 Specification Highlights

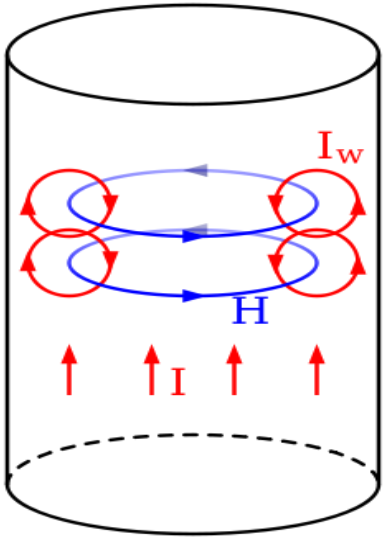
A4WP WPT System Reference Model



Coil specific considerations

Skin Effect





Source: en.wikipedia.org

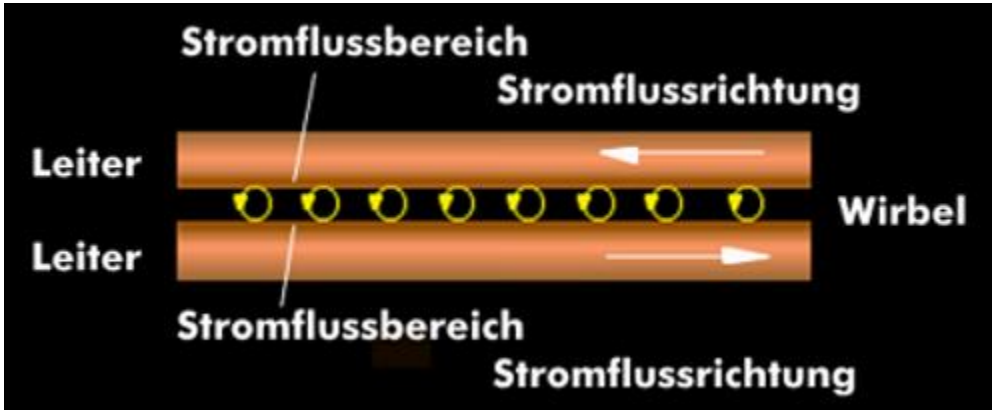
The penetration depth δ can be described with the following formula:

$$\delta = \sqrt{\frac{2\rho}{\omega\mu}}$$

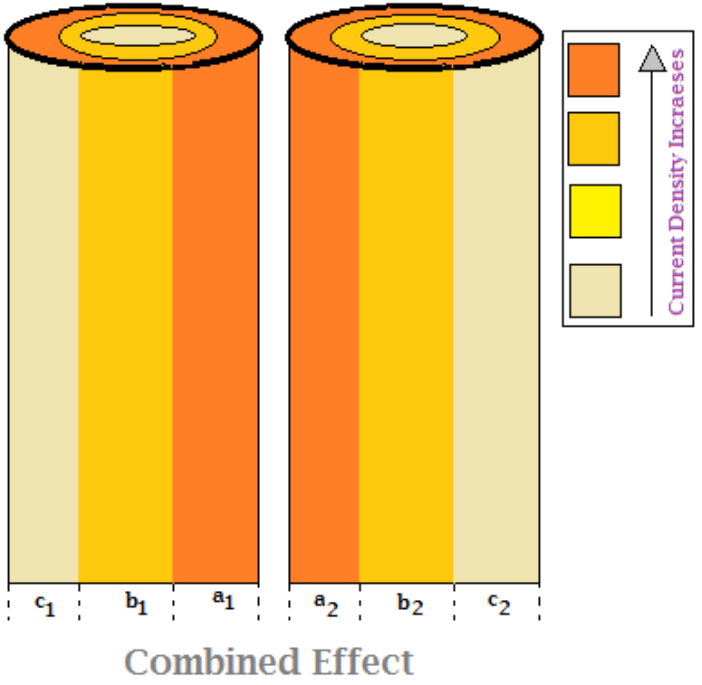
ρ	specific resistance
ω	angular frequency
μ	sheared effective permeability (e.g.: 100)

Proximity Effect

The proximity effect causes current constriction or current displacement in closely spaced conductors.

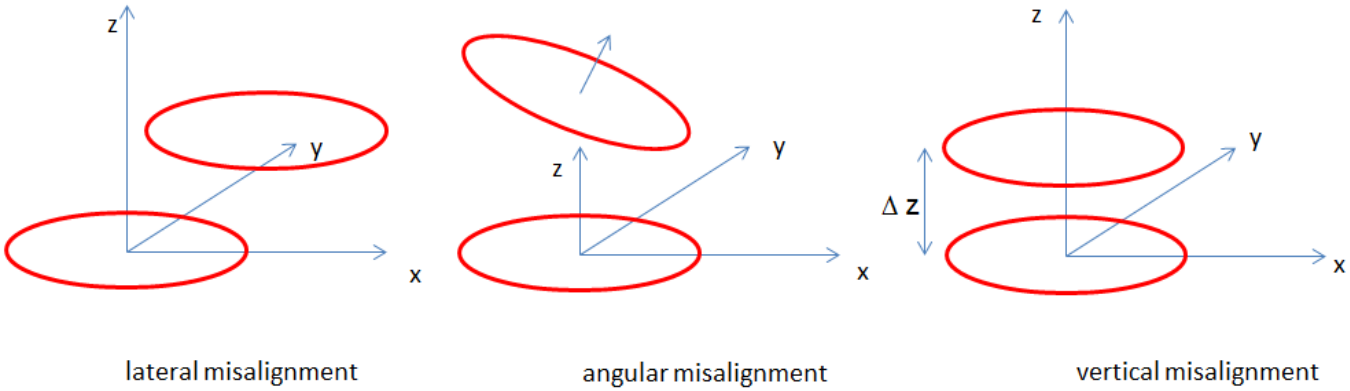


Source: itwissen.info



Source: electrical4us.com

Coupling factor / alignment tolerances

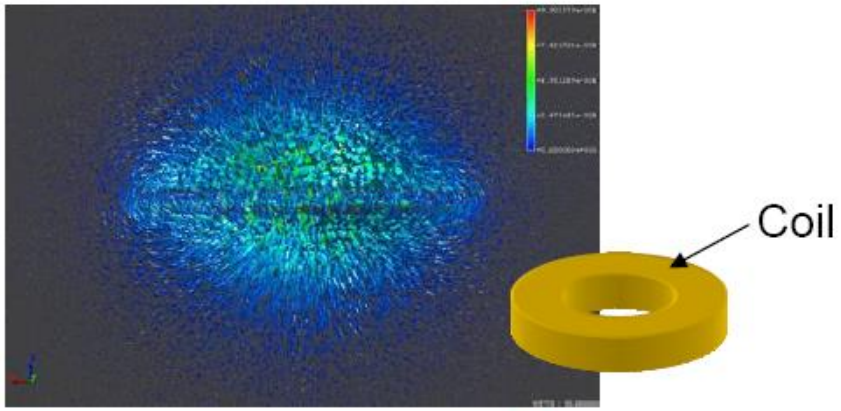


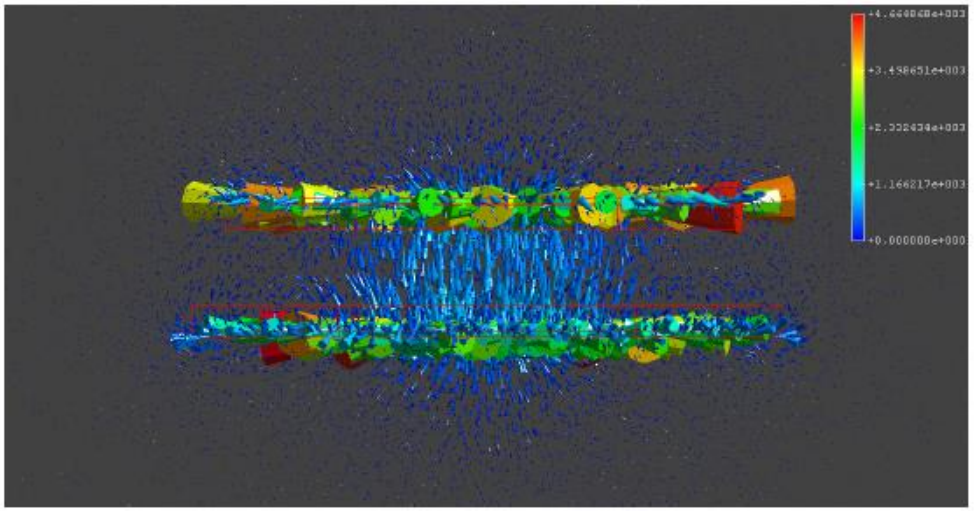
Good coupling and maximum energy transmission depends on

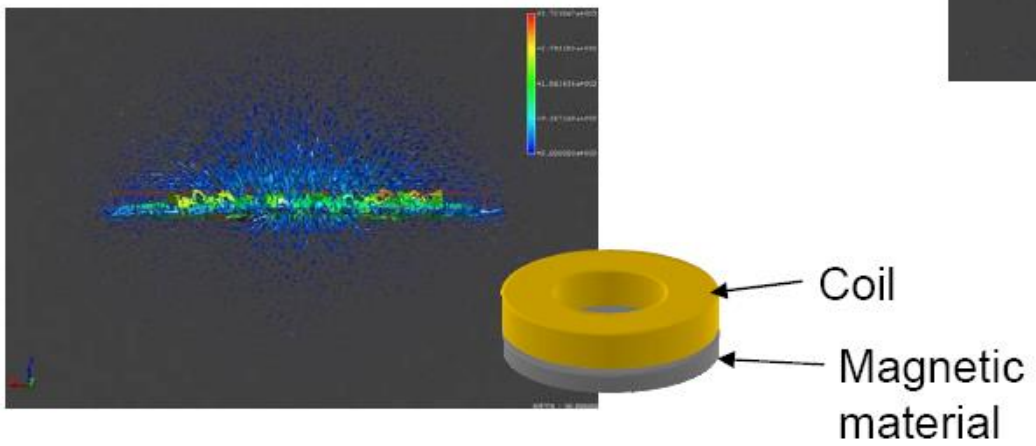
- size of the effective area of the receiver coil in the magnetic field
- the distance in the z direction

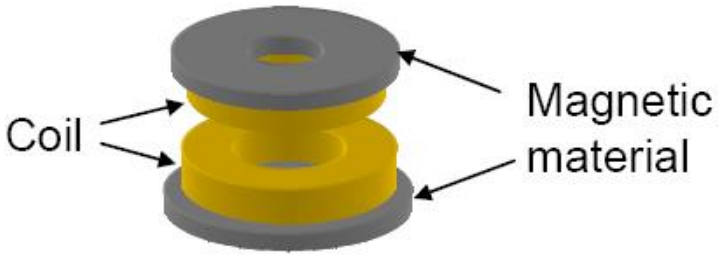
A coupling factor of 1 is ideal

Improvement using ferromagnetic shielding





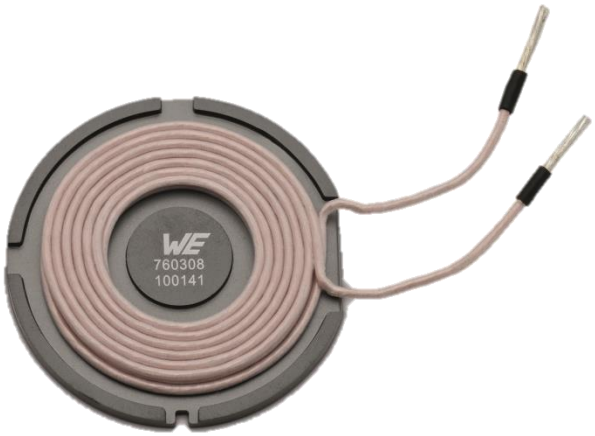


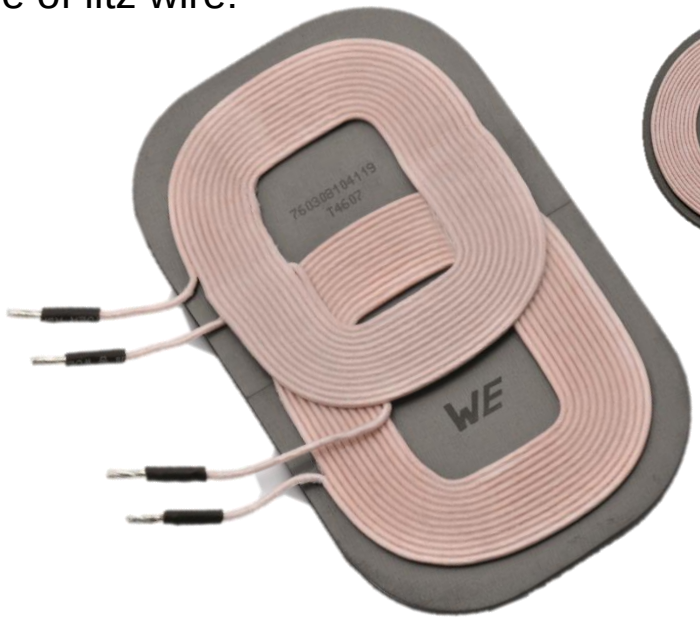


WE Products & Advantages

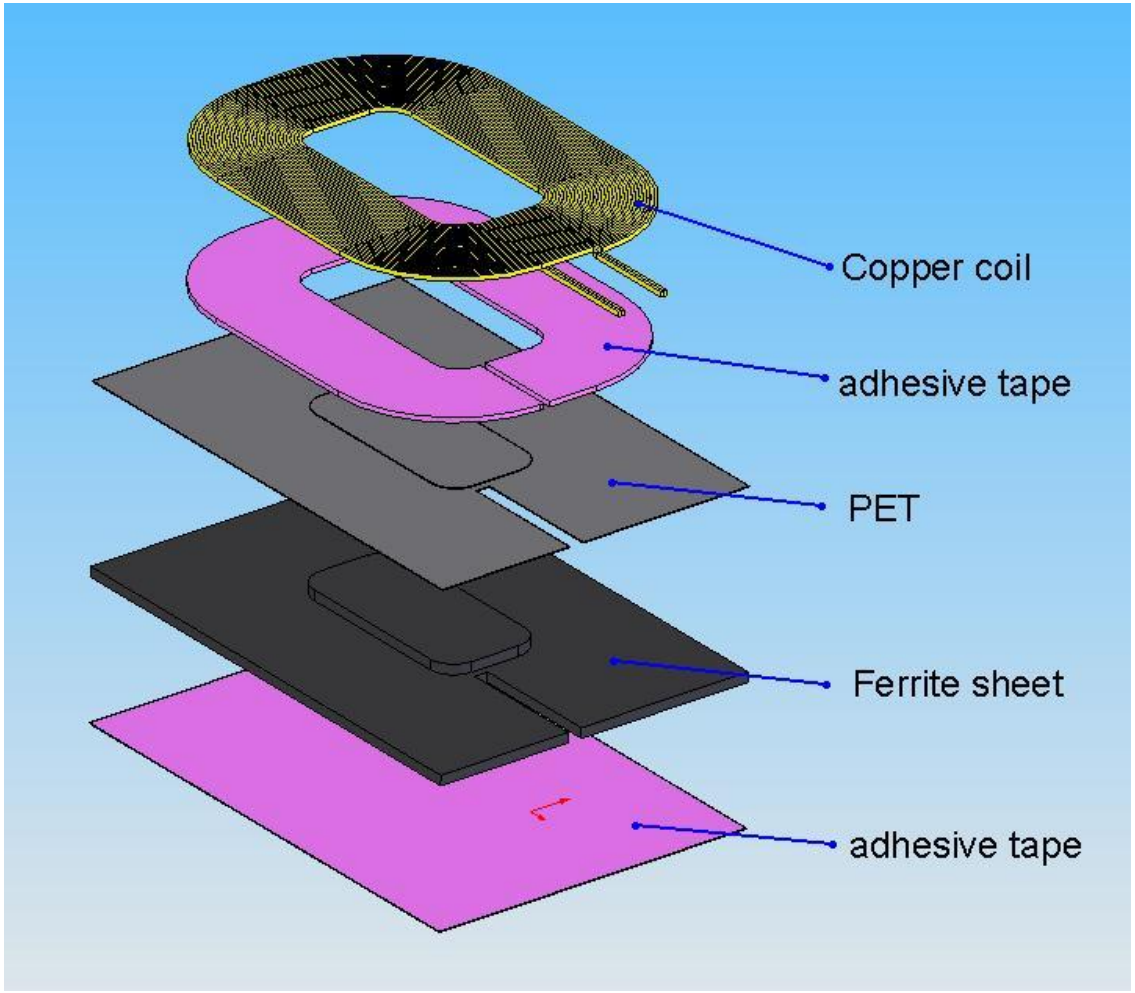
Würth Elektronik Wireless Power Coils WE-WPCC

- Fully compliant to WPC Qi standard
- Efficiency up to 93%
- Supreme shielding characteristics for low leakage inductance
- Outstanding performance due to usage of litz wire:
  - ✓ lowest R_{DC}
  - ✓ highest Q values





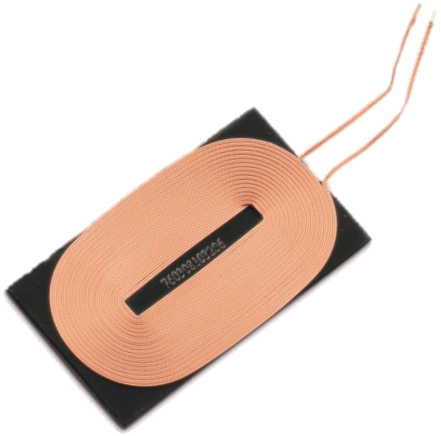
Structure of thin receiver coils



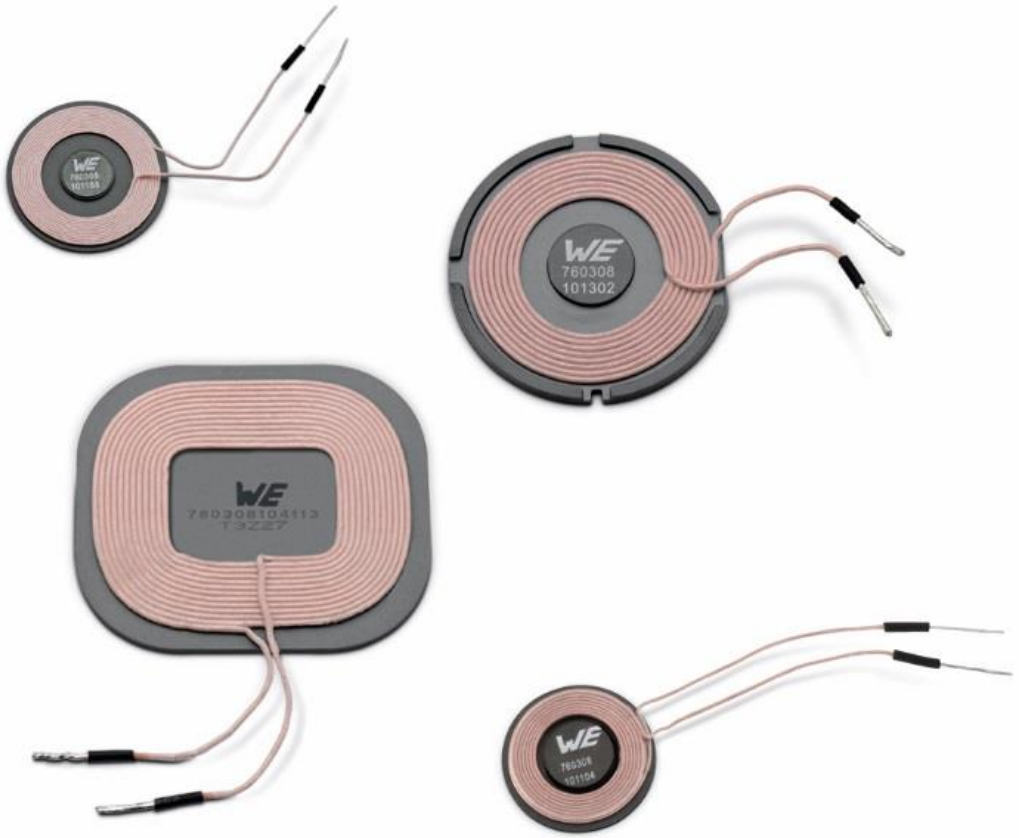
WE Wireless Power Coils – 9/2015

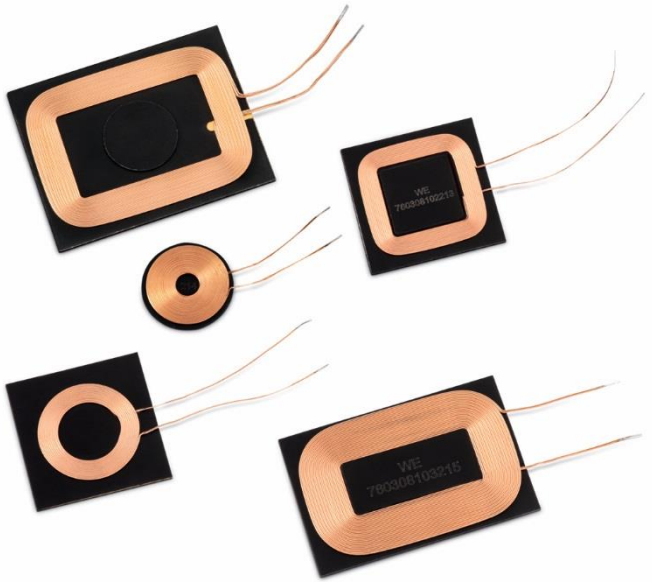
15 Transmitter Coils

15 Receiver Coils



http://katalog.we-online.de/en/pbs/browse/Power_Magnetics/Wireless_Power_Transmission





Thank you