Secured production processes, increased product quality: How metal detection as a critical control point can specifically support producers in the plastics industry in achieving their production targets.
Metallic foreign bodies are possible contaminants in the production of plastic-based products. Starting with screws and nuts loosened by vibration or grinding of production equipment and tools, foreign bodies can also enter the production process "from the outside": Cable remnants, metal clips, springs, chips, fragments. If recycled raw materials are also used in production, the list is apparently endless. Foreign bodies clog nozzles, contaminate filters, destroy injection moulds, end up in the final product and are therefore a daily threat to more than the production process. If they become part of the product unnoticed, they impair the product quality and thus possibly also the reputation of the producer. If they end up unnoticed in safety-critical products such as voltage-securing charging sockets, they can become a hazard for the user. This white paper discusses different applications of metal detectors in plastics production. It also provides valuable information on the parameters of reliable, optimally used metal detection at the critical control point.

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1. What does metal detection detect?

Metal detectors for the plastics industry detect metal parts made of iron, steel, stainless steel but also non-ferrous metals such as aluminium. Sensors are able to detect not only magnetic, but also non-magnetic metals. This makes metal detection a more reliable inspection solution than using magnets.
The principle of metal detection

A metal detector is an electromagnetic sensor that reliably detects even the smallest metallic particles. In simple terms, the detector coil is based on three conductor loops. These are usually made of copper and are wound around the detector channel. The inductive coupling of these three loops is the basis of metal detection. The two receivers are electrically connected together so that the voltages induced by the transmitter cancel each other out.

Metal has the ability to conduct current (conductivity). If a metallic object is passed through the detection channel, it will influence the electromagnetic field of the detector coil. The changed voltage is processed via software - the device detects it.

Ferromagnetic, non-ferromagnetic or non-magnetic?

Irrespective of whether the product is made of polypropylene, polyethylene, polyamide or another material, the magnetic properties (permeability) and conductivity of metal parts in the product are decisive for their successful detection. Further parameters are described in chapter 4.

- **Ferromagnetic metals ("Fe")**
  All metals that are simply attracted by a magnet (e.g. steel). Iron is the easiest metal to detect.

- **Nonferromagnetic metals ("NonFe")**
  Non-magnetic metals with a high conductivity (e.g. aluminium). Due to their conductivity, these metals generate a signal similar to iron in some products.

- **Non Magnetic Stainless Steel (SS)**
  Stainless steels of higher quality from the AISI 300