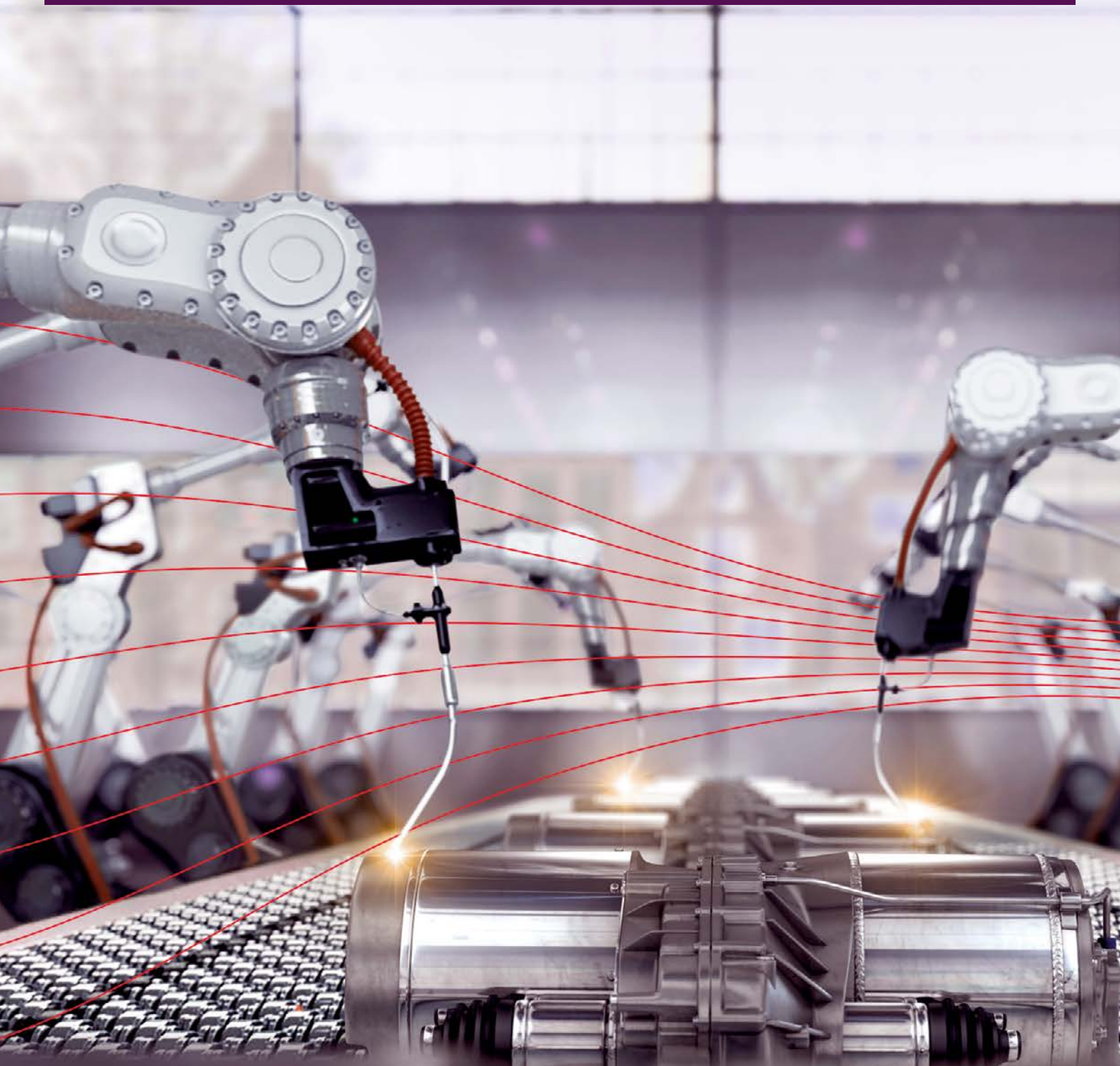


FACT SHEET

Delivering Electromagnetic Compatibility in Robotics



Increased Installation and Use of Robots



As Industry 4.0 is increasingly adopted to achieve productivity goals, growing numbers of robots are being employed to help workers carry out manufacturing tasks. The top three industries extensively using robots are Automotive, Electrical/Electronic and Metal/Machinery. Equipment designers must take care to meet applicable equipment directives that cover both electromagnetic compatibility and functional safety. Electromagnetic compatibility, or EMC, ensures a device will not be disturbed by electromagnetic interferences (EMI) and safely operate as intended. Nor will the device emit high EMI levels, also known as Radio Frequency Interference (RFI) to other devices in the vicinity that could cause incorrect operation.

Safety and Compliance

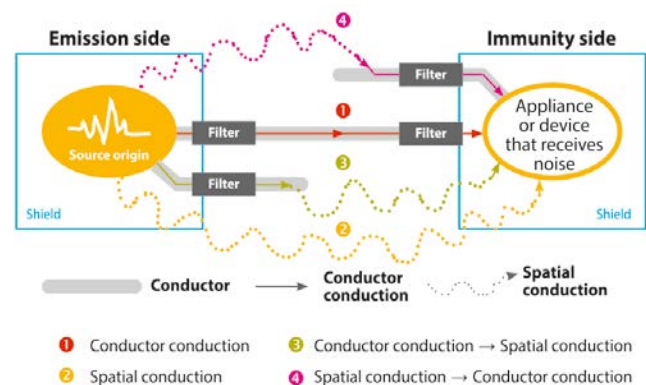
Future factories are likely to make use of more robots, if robot developers do not take steps to mitigate EMI, the resulting issues could cause robots to behave in unexpected ways, such as requiring frequent restarts or unprogrammed movements. In addition, it could cause interference with functional-safety systems, such as false triggering of a safety mechanism, leading to unnecessary equipment stoppages, or failure of the safety protection systems to operate when required. All these safety issues may be a concern to workers especially when working in close proximity to the robot.

Standards such as the EU Machinery Directive 2006/42/EC define safety requirements including the design of the machine and specific safety components. The procedures that must be used to ensure compliance with these requirements are also covered. ISO 10218 (part 1: Robots and part 2: Robot systems and integration) specifies the requirements and guidelines for the inherent safe design, protective measures, and information for use of industrial robots. It describes basic hazards associated with robots

and provides requirements to eliminate or adequately reduce, the risks associated with these hazards. Also relevant for robots, is IEC 60204-1 (Safety of machinery – Electrical equipment of machines). General rules regarding EMC topics were added in Edition 6.0

Due to the interdependence, functional safety cannot be guaranteed without reference to the applicable EMC standards. IEC 61000-1-2 presents a methodology for achieving the functional safety of electrical systems and expressly covers electromagnetic phenomena. It can be applied to robotics as electrical systems. Also, applicable, IEC 61000-6-2 and 61000-6-4 are EMC standards that define immunity and emission requirements, respectively, for electrical and electronic equipment used in industrial environments.

Recommendations for the Design Engineer



When approaching a product design regarding conducted emissions and immunity, an important consideration is the leads and wires into and out of a device, or within the device itself. Aside from ensuring that the leads are wired according to the EMC recommendations and that shielding is effectively connected, there are various methods to ensure that noise produced by the device won't be emitted from the leads and external noises will not be conducted into the device through the leads. EMI suppression filters are one of the most common and cost effective ways of attenuating noise and interference signals. If EMI filters are not used, the device may require much more extensive shielding and redesign. A benefit of proactively addressing EMI concerns is that an EMI filter can often be easily integrated into a devices design, without significantly impacting the overall dimensions, weight, and cost of a product. EMI filters provide high attenuation and are very compact in size, depending on power and EMC requirements.

The general design rule is to place an EMI filter as close to the noise source as possible. The more effective you are mitigating noise propagation within the unit itself, the

less likely it will escape. This also helps to reduce the chance that a unit's EMI noise will cause interference to its own internal circuitry.

However, there should always be a filter at the power exit/entry point. Any noise within a unit can and will couple onto any wire trying to find an escape path. A power line filter at the exit/entry point removes this chance and protects the unit from outside interference.

What Solutions can Schaffner offer?

Schaffner has a wide range of products, perfectly designed for many applications and approved with safety certifications. Below you can find some recommended products. If one of these doesn't seem to work, please contact us and we can discuss a customized solution. To review the many solutions Schaffner offers and for additional information, please visit us at [schaffner.com](https://www.schaffner.com)

FN2090 Series

Features and Benefits

- Optimized filter range for enhanced performance AC and DC applications, in same compact size (KK, LL, NN types).
- Provides an exceptional differential and common-mode attenuation performance.
- [Link to Data Sheet](#)



FN3287 & FN3288 Series

Features and Benefits

- Compact 3-phase filter from 10A–230A for worldwide robotics and machinery applications.
- State-of-the-art EMI attenuation based on an innovative filter topology.
- Ensures compliance with Class C2 or even C1 limits.
- Low leakage current filter versions help to fulfill tough requirements.
- [Link to Data Sheet](#)



FN2500 & FN2640 Series

Features and Benefits

- Excellent EMC filter for robotics, collaborative robots and autonomous machines.
- Multiple terminal combinations available: Faston, wire leads, studs, cage clamp and IEC inlets.
- Voltage rating up to 277 VAC for chassis mount types and 250V for IEC inlet connectors.
- Voltage rating up to 400 VDC for FN2500.
- FN2520 and FN2660 filters with higher performance available.
- [Link to Data Sheet](#)



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