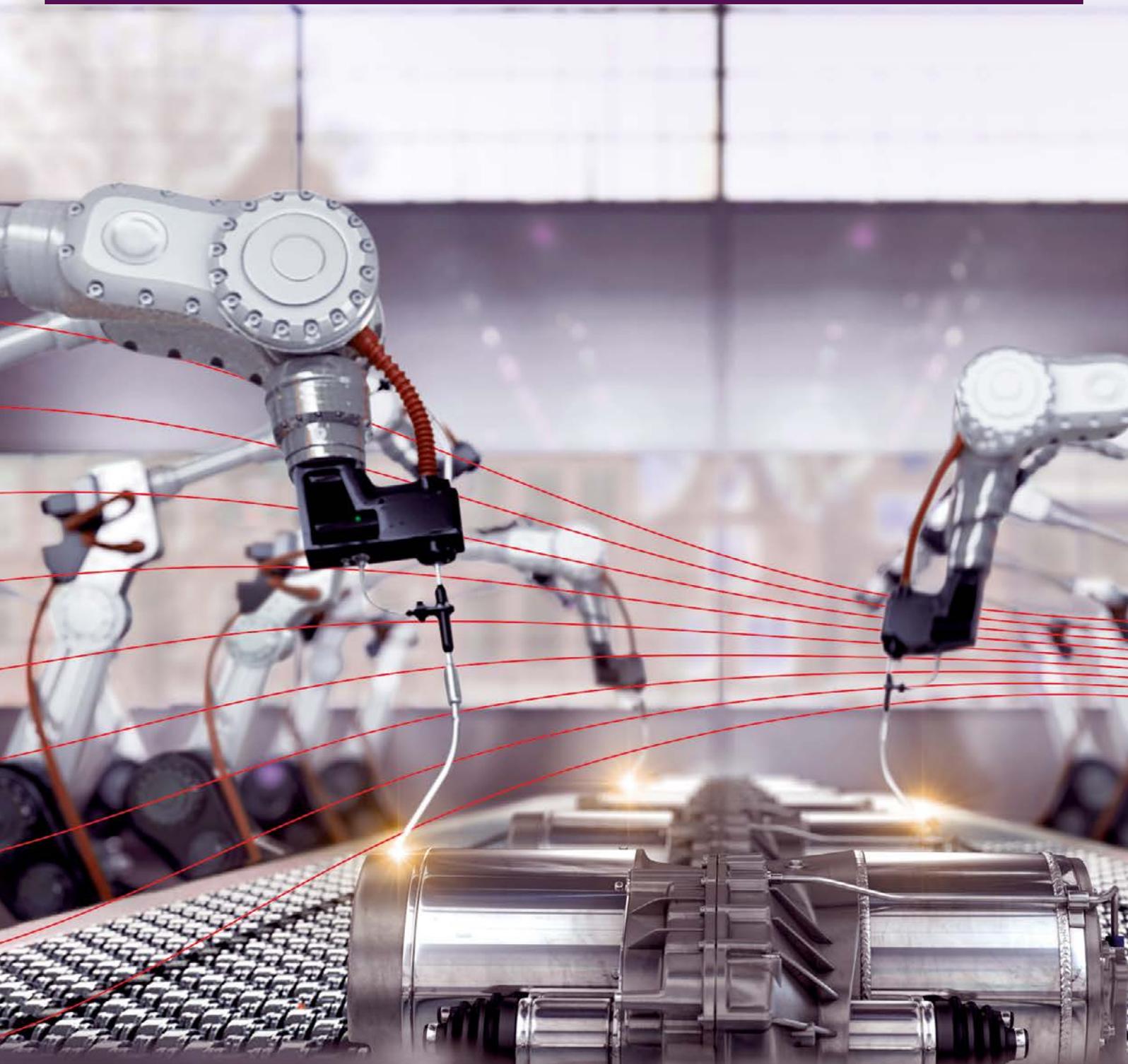


FACT SHEET

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

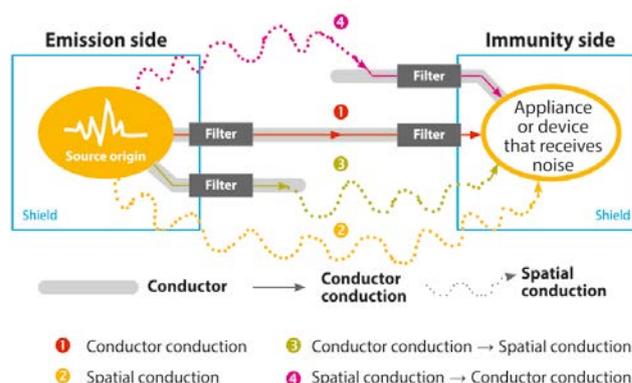
Future factories are likely to make use of more robots, if robot developers do not take steps to mitigate EMI, the resulting issues could cause robots to behave in unexpected ways, such as requiring frequent restarts or unprogrammed movements. In addition, it could cause interference with functional-safety 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](#)



Headquarters, Global Innovation and Development

Switzerland

Schaffner Group
Industrie Nord
Nordstrasse 11 e
4542 Luterbach
P + 41 32 681 66 26
info@schaffner.com

Sales and Application Centers

China

Schaffner EMC Ltd. Shanghai
T20 - 3 C No 565 Chuangye Road
Pudong district 201201
P + 86 21 38 139 500
cschina@schaffner.com

Finland

Schaffner Oy
Sauvonrinne 19 H
08500 Lohja
P + 358 50 468 72 84
finlandsales@schaffner.com

France

Schaffner EMC S.A.S.
16 - 20 Rue Louis Rameau
95875 Bezons
P + 33 1 34 34 30 60
francesales@schaffner.com

Germany

Schaffner Deutschland GmbH
Schoemperlenstrasse 12 B
76185 Karlsruhe
P + 49 721 56 910
germanysales@schaffner.com

India

Schaffner India Pvt. Ltd
Regus World Trade Centre
WtC 22nd Floor Unit No 2238
Brigade Gateway Campus 26 / 1
Dr. Rajkumar Road
Malleshwaram (W)
560055 Bangalore
P + 91 80 679 35 355
indiasales@schaffner.com

Italy

Schaffner EMC S.r.l.
Via Ticino 30
20900 Monza (MB)
P + 39 039 21 41 070
italysales@schaffner.com

Japan

Schaffner EMC K.K.
Taiju - Seimei Sangenjaya Bldg.
1 - 32 - 12 Kamiyama Setagaya-ku
154 - 0011 Tokyo
P + 81 3 57 12 36 50
japansales@schaffner.com

Singapore

Schaffner EMC Pte Ltd.
05 - 09 Kg Ubi
Ind. Estate 408705
P + 65 63 77 32 83
singapore@schaffner.com

Spain

Schaffner EMC España
Calle Caléndula 93 Miniparc III
Edificio El Soto de Moraleja
Alcobendas 28109 Madrid
P + 34 917 912 900
spainsales@schaffner.com

Sweden

Schaffner EMC AB
Östermalmstorg 1
114 42 Stockholm
P + 46 8 50 50 2425
swedensales@schaffner.com

Switzerland

Schaffner EMV AG
Industrie Nord
Nordstrasse 11 e
4542 Luterbach
P + 41 32 681 66 88
P + 41 32 681 66 26
switzerlandsales@schaffner.com

Taiwan

Schaffner EMV Ltd.
20 Floor - 2 No 97 Section 1
XinTai 5th Road
22175 XiZhi District
New Taipei City 22175
P + 886 2 2697 55 00
taiwansales@schaffner.com

Thailand

Schaffner EMC Co. Ltd.
Northern Region Industrial
Estate 67 Moo 4 Tambon
Ban Klang Amphur Muang
P.O. Box 14 51000 Lamphun
P + 66 53 58 11 04
thailandsales@schaffner.com

United Kingdom

Schaffner Ltd.
1 Oakmede Place Binfield
RG42 4JF Berkshire
P + 44 118 977 00 70
uksales@schaffner.com

USA

Schaffner EMC Inc.
52 Mayfield Avenue
Edison New Jersey
P + 1 732 225 95 33
usasales@schaffner.com

To find your local partner within
Schaffner's global network, please visit
[schaffner.com](https://www.schaffner.com)

The information contained within this document and the functions offered are solely intended to provide information about products available for purchase from Schaffner group companies ("Schaffner") and do not constitute an offer for purchase or sale or a recommendation or advice. The content of this document has been carefully prepared and reviewed and all reasonable efforts have been made to ensure the accuracy of the information. However, Schaffner does not warrant the accuracy and does not assume any liability whatsoever for any errors or inaccuracies of this document and the consequences thereof. Schaffner accepts no responsibility or liability for any losses or damages of any kind arising out of the use of this document or any of its related functions. Further, Schaffner cannot be held responsible for any errors or unexpected unfulfillment of shipments. Schaffner reserves the right to make changes to this document, the products, the published specifications and any other functions at any time without notice. Product suitability for any area of application must ultimately be determined by the customer. In all cases, products must never be operated outside their published specifications. Schaffner does not warrant, represent or guarantee the availability of any or all published products. The latest publications and product specification sheets as well as the current Schaffner general terms and conditions and data protection policy apply; these documents and the complete legal disclaimer can be downloaded from the Schaffner website. In order to improve readability, the masculine form is mainly used for people and personal nouns in this document. All references to persons apply equally to all genders. The abbreviated language form has only editorial reasons and does not imply any valuation.

All intellectual property rights, such as trademarks, tradenames, designs and copyrights, are reserved and are exclusively owned by Schaffner Holding AG.

This document may exist also in other languages. This version is valid and binding.

This disclaimer shall be governed by substantive Swiss law and resulting disputes shall be settled by the courts at the place of business of Schaffner Holding AG.

© 2023 Schaffner Holding AG

Schaffner Group

Nordstrasse 11e
4542 Luterbach
Switzerland
P + 41 32 681 66 26
info@schaffner.com

schaffner.com

schaffner
MORE POWER TO YOU