

How does an HMI become an EMC-safe industrial solution?

Industrial HMI systems must comply with strict EMC regulations and certifications to ensure safe and interference-free operation. SCHURTER combines comprehensive HMI development with deep EMC expertise – from early-stage analysis and material selection to housing concepts and pre-compliance testing.

Does your HMI design meet the EMC standards of demanding industrial environments?



Reliable control - smart automation: with certified components and HMI solutions from SCHURTER

From sensors and switches to digital control systems - industrial machines and devices today contain numerous electronic components. Avoiding interference from electromagnetic radiation is therefore an important prerequisite for reliable and trouble-free operation. To ensure safe use, machines must meet strict requirements in the area of electromagnetic compatibility (EMC). The control panels (also known as human-machine interfaces or HMIs for short) of industrial applications are particularly sensitive areas, as they are usually located on the outside of the machine. The HMI itself can generate electromagnetic radiation and emit it into the environment, but it can also absorb

external radiation, which then penetrates the device. A radiation-resistant HMI is therefore an important component for achieving electromagnetic compatibility.

International EMC regulations

Electrical and electronic products must comply with various electromagnetic compatibility (EMC) regulations worldwide in order to be approved for the respective markets. These regulations ensure that devices do not cause electromagnetic interference and are themselves protected from external electromagnetic influences.

• Europe: CE marking and EMC Directive

In Europe, the CE mark is mandatory for almost all electrical products and especially for industrial machines and systems. It certifies the conformity of the product with the applicable EU directives, in particular

- the Machinery Directive (2006/42/EC), which lays down essential health and safety requirements,
- and
- the EMC Directive (2014/30/EU), which ensures that devices have electromagnetic compatibility.

Products with CE marking must be tested and documented accordingly.

They must not interfere with the operation of other devices and must be resistant to external electromagnetic influences.

- **USA: FCC approval**

In the United States, the electromagnetic compatibility of electronic devices is regulated by the Federal Communications Commission (FCC). Devices that intentionally or unintentionally emit or receive electromagnetic energy must be tested and approved in accordance with FCC regulations.

There are two main procedures:

- Supplier's Declaration of Conformity (SDoC): The manufacturer or importer self-declares conformity based on internal or external test results.
- Certification by a Telecommunication Certification Body (TCB): For more highly regulated products, formal certification by an independent body is required.

The FCC sets specific emission limits to ensure freedom from interference with communications services and electronic devices.

- **China: CCC certification**

China Compulsory Certification (CCC) is required for the Chinese market. This mandatory government certification applies to a large number of product categories, including electronic devices. The CCC certification includes:

- Product safety tests and
- EMC tests based on Chinese standards, such as GB/T 9254.1-2021, which are largely based on international standards such as CISPR 32:2015.

Only products that pass these tests receive the CCC mark and can be sold or imported in China.

Compliance with the respective EMC requirements in Europe (CE), the USA (FCC) and China (CCC) is essential for the safe operation and international market access of industrial machines and electronic devices.



Compliance with EMC requirements and certification of electrical devices - a must for global distribution

HMI design for industrial use

The first step in developing an HMI for industrial use is to determine the requirements that the final application must meet. What legal regulations apply, and under what conditions will the device be used later? What radiation influences are present in the environment, and how can sufficient immunity be ensured in the design? The electronics within the HMI itself are also an important factor: the application must not generate any radiation (emission) that affects other devices in the environment. By analysing the expected conditions at an early stage, the product design can be adapted accordingly.

Power electronics

Industrial machines and devices often contain so-called power electronics - electrical components that operate at high power levels. These applications often use circuits that switch very quickly and generate specific radiation frequencies. This makes the industrial market a particularly challenging environment when it comes to minimising electromagnetic radiation. Due to the high power levels in use, interference can also have significant consequences.

Sophisticated choice of materials

Electronic components are connected to each other by cables and connection points. By selecting materials with high immunity, electromagnetic radiation can be largely reduced. Shielded cables and interference suppression components play a key role in achieving the desired EMC level. The positioning of the various components in relation to each other also influences the sensitivity to radiation. Interference sources can be fitted with filters or placed behind shields.

As early as the design phase, the engineers determine the optimum combination of radiation-reducing measures, taking into account the environmental conditions, the manufacturer's requirements and the costs of the various solutions.



Selection of interference suppression components

Housing of the HMI

In addition to adjustments to the internal circuits of a control panel, the housing can also be designed and integrated in various ways. A closed metal housing can act as a Faraday cage that protects against external radiation. Openings in the housing, for example, for connection cables, can be sealed as radiation-resistant as possible through specific adaptations to ensure maximum immunity.

Pre-Compliance-Tests

Tests can be carried out as early as the development phase to ensure that the desired EMC level is achieved.

If possible, special software is used in a test environment to measure how the application reacts to interference radiation. This allows weak points to be identified and various adjustments to be tested in order to achieve the best result.

Working together to create an EMC-safe HMI solution

EMC starts with the design and is perfected through close collaboration. As a developer of HMIs, SCHURTER works closely with manufacturers of machines and devices for industrial use. With specific expertise in this area, SCHURTER engineers provide support in the customised development and trouble-free integration of the HMI so that the final solution meets both the manufacturer's requirements and the applicable EMC regulations.



Co-Design of industrial HMI solutions

When developing applications in which EMC plays a central role, close cooperation between all parties involved is crucial. Customised development takes all relevant requirements into account right from the start - from industry-specific standards to CE conformity. As a specialist in customised control panels, SCHURTER is a leader in the field of EMC and has extensive expertise in the development, production and integration of industrial control panels. SCHURTER's HMI solutions have already proven themselves in automation, shipping, rail transportation and in potentially explosive environments with ATEX certification.



Customized HMI solutions for industrial applications

About SCHURTER

The SCHURTER Group is a globally successful Swiss technology business. With our components ensuring the clean and safe supply of power, input systems for ease of use, we impress our customers with agility and excellent product and service quality.