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## **Safety of machinery — Relationship with ISO 12100 —**

Part 4:

### **Guidance to machinery manufacturers for consideration of related IT-security (cyber security) aspects**



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

A list of all parts in the ISO 22100 series can be found on the ISO website.

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## Introduction

Internet, digital services and technology are important enablers for smart manufacturing, which is one part of internet of things (IoT) (see ISO/IEC 20924). For the manufacturing environment, the foundations are vertical networking and horizontal integration across the entire value chain, convergence of design, ordering, delivery and manufacturing capabilities. This results in the transformation of conventional value chains and the emergence of new business models. Smart products based on smart manufacturing know many details on how they were made, their performance and how they are being used. The physical product is linked to its digital representation, and the digital content depends on lifecycle phase. Implementing smart manufacturing creates an efficient and highly responsive package by leveraging existing manufacturing systems, as well as technological and economic potential. Smart manufacturing increases the vulnerabilities of machinery to IT-security threats.

Smart manufacturing leads to the emergence of dynamic, real-time optimized, self-organizing value chains. An appropriate regulatory framework is therefore necessary, as well as standardized interfaces and harmonized business processes. Smart manufacturing is characterized by:

- a) increased product flexibility;
- b) new intrinsic built-in product properties;
- c) flexible work organization;
- d) changed scale (up to a lot size 1) and location of manufacturing.

For smart manufacturing, the description of the network infrastructure needs to be further expanded to enable privacy, self-configuration and ease of use. Therefore, there is a need for fast available, robust and secure communication networks.

The primary purpose of this document is to address aspects on safety of machinery that can be affected by IT-security attacks related to the direct or remote access to, and manipulation of, a safety-related control system(s) by persons for intentional abuse (unintended uses). IT-security attacks are increasingly becoming a potential threat to the safety of machinery. Although intentional abuse falls outside the scope of ISO 12100 and the (safety-related) risk assessment process, it is reasonable also for machinery manufacturers to consider such threats.

Current technologies enable machinery to be monitored and/or improved regarding their performance remotely by adjusting parameters without having to be on site at the machine. This ability provides considerable benefits as machinery can be kept operating without the downtime and associated costs of a field service person making a service call.

However, this same capability to adjust machine parameters to improve performance lends itself to the possibility for persons with nefarious or criminal intent to make adjustments that can put workers and others at risk of harm. For example, speeds or forces can be adjusted to dangerous levels, temperatures can be lowered below a kill step level resulting in food contamination, or error codes or messages can be erased or falsified.

Human error can have little relation to IT-security in its strict sense. Those unintentional influences (reasonably foreseeable human error when adjusting parameters of the machine or its control system) are already covered within the normal (safety-related) risk assessment and the resulting inherently safe design of the control system (see ISO 12100:2010, 6.2.11.1).