

6. Service robots

A service robot is a robot that performs useful tasks for humans. The market differentiates between service robots for private use and service robots for industrial use. In households, the primary target group, isolated types, such as swimming pool robots, have already been in use for years, and you will also find robotic vacuum cleaners, hard floor cleaners, and lawn mowers. In the private and industrial sector, flying robots (drones) assist humans in monitoring and inspection activities from the air.

Service robots are increasingly being used, e.g. for cleaning photovoltaic roof panels, or flying robots for the inspection or monitoring of construction sites, of listed buildings, etc. Service robots transport goods in production plants and logistics centres, or distribute medication in hospitals. In the development of new service robot applications, safe implementation always needs to be addressed as well. In particular where robots work in the immediate vicinity of humans and, at the same time, have a high degree of automation or high autonomy, it must be ensured that no hazards arise from the interaction with humans.



7. Important technology rules in robotics

- EN ISO 10218-1:2011 Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots (ISO 10218-1:2011)
- EN ISO 10218-2:2011 Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration (ISO 10218-2:2011)
- EN ISO 13482:2014 Robots and robotic devices - Safety requirements for personal care robots (ISO 13482:2014)
- ISO/TS 15066:2016 Robots and robotic devices — Collaborative robots
- ISO 18646-1:2016 Robots and robotic devices — Performance criteria and related test methods for service robots – Part 1: Locomotion for wheeled robots

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Robotics – Key Aspects in Brief

Overview of the contents of the EN ISO standards

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CERTIFICATION

The use of robots has steadily increased in recent years. In the past, robots have been used almost exclusively in the automotive sector and in mass production. However, they have now also been introduced into many other industries due to the consistent further development of the robots and the related control technology. Some of the tasks are performed by versatile industrial robots, others by humans. In the future, man and robot will work hand in hand and complement each other perfectly.

Use this publication to find out what you need to take into account when placing a robot system on the market.

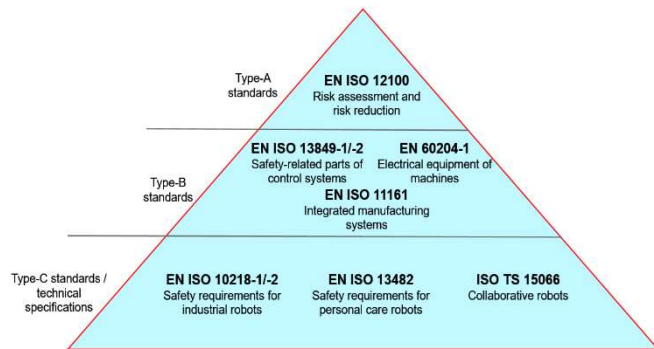
1. Introduction and relevant provisions

Anyone placing a robot or a robot system on the market must be able to give evidence of the compliance of the robot or robot system with the provisions in the Machinery Directive 2006/42/EC and, where applicable, with other provisions (e.g. Electromagnetic Compatibility (EMC) Directive).

One of the fundamental prerequisites is risk assessment and the implementation of necessary safety measures.

Within this context, questions related to the applicable standards or other technology rules may frequently arise.

For a robot or a robot system, reference may be made to the following technology rules:



2. Industrial robots

Within the meaning of the Machinery Directive, industrial robots are so-called «partly completed machinery» and are not given a CE marking; they must be placed on the market with a «declaration of incorporation». The installed application with robot, tools, and devices must, however, meet all requirements of the Machinery Directive, and must also be provided with the CE marking.



The standard EN ISO 10218-1 specifies 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.

The standard EN ISO 10218-2 specifies safety requirements for the integration of industrial robots and industrial robot systems as defined in EN ISO 10218-1, and industrial robot cell(s).

The integration includes the following:

- a) design, manufacturing, installation, operation, maintenance and de-commissioning of the industrial robot system or cell;
- b) necessary information for the design, manufacturing, installation, operation, maintenance and decommissioning of the industrial robot system or cell;
- c) component devices of the industrial robot system or cell.

The standard describes the basic hazards and hazardous situations identified with these systems, and provides requirements to eliminate or adequately reduce the risks associated with these hazards.

EN ISO 10218-2 also specifies requirements for the industrial robot system as part of an integrated manufacturing system.

3. Collaborative robots

The possibility of cooperation between man and robot at a joint workplace without guards offers new possibilities and concepts in industry and production.

In robotics, the term «collaboration» means cooperation between man and robot. This cooperation is limited to a precisely defined joint workplace, and is called man-robot collaboration (MRC).

The four different, fundamental protection principles of MRC are listed below:

1. Safety-rated monitored stop

The robot stops when the employee steps into the joint working space and continues its movement after the employee has left the joint working space.

2. Hand guiding

The robot's movement is controlled actively by the employee with suitable equipment.

3. Speed and separation monitoring

Any contact between employee and robot in motion is avoided.

4. Power and force limiting

The contact forces between employee and robot are limited to such a degree that they are harmless.

These four fundamental protection principles of MRC are described in detail in the standards EN ISO 10218 «Robots and robotic devices - Safety requirements for industrial robots» Part 1 and 2, as well as in ISO/TS 15066 «Robots and robotic devices – Collaborative robots».

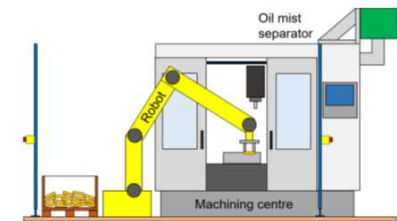
In all cases of MRC, any hazards to humans must be excluded by taking safety measures with the technology in use being obliged to comply with certain safety requirements. The applicable health and safety requirements are determined in accordance with the risk assessment, and appropriate measures are taken.



4. Integration of robots into plants and systems

The integration of a robot system into the plant is described in EN ISO 10218-2. As the robot by itself does not constitute a completed machine but is always expanded with application-specific tools and operated together with other machinery, a risk assessment and risk reduction must always be performed. The causes of accidents with robots are often an impermissible linking of safety components, ineffective safety functions, or missing or defective barriers around the source of the hazard.

With respect to the general safety of robot systems, the safety requirements as laid down in EN ISO 13849-1 Performance Level «d» (category 3) must be met in most cases. An emergency stop and a safety stop shall be provided as stopping devices. A safety stop must then take place when the safety doors are opened, or when the robot and the operator are in the same area at the same time. Another important aspect is the tool handled by the robot. In the case of materials handling tasks, it is necessary to ensure that a failure of the mostly pneumatic gripper device does not lead to the workpiece falling off.



5. Personal care robots

The standard EN ISO 13482 specifies requirements and guidelines for the inherently safe design, protective measures, and information for use of personal care robots, in particular with regard to personal care robots such as mobile servant robot, physical assistant robot and person carrier robot. These robots typically perform tasks to improve the quality of life of the intended users, irrespective of age or capability. The standard describes hazards associated with the use of these robots, and provides requirements to eliminate, or reduce, the risks associated with these hazards to an acceptable level. The standard covers human-robot physical contact applications. The scope excludes «flying robots» and «medical robots», which are covered by the «DETEC Ordinance on Special Category Aircraft (748.941)» respectively by Regulation (EU) 2017/745 on medical devices.