COMPENDIUM OF INDIAN STANDARDS ON

SAFETY OF MACHINERY

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INTRODUCTION

The safety of machinery is a vital component of industrial operations. It ensures that machines are designed, operated, and maintained in a manner that minimizes the risk of accidents and injuries to operators, workers, and others nearby. Machinery safety standards provide a comprehensive framework to protect human health and safety in the workplace. These globally recognized standards address a wide range of risks associated with machinery, particularly in the field of mechanical engineering.

This compendium offers an overview of Indian Standards related to machinery safety and aims to support the reduction of risks associated with machinery use.

It serves as a single, consolidated source that summarizes all relevant standards pertaining to the safety of machinery.

Adherence to machinery safety standards is essential for minimizing workplace hazards, enhancing productivity, and safeguarding employees and operators. Manufacturers, operators, and regulatory authorities must work together to implement and uphold these standards, thereby fostering a culture of safety. By complying with established safety norms, organizations can prevent accidents, reduce operational risks, and promote a safer industrial environment.

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Safety of Machinery - Risk Assessment

Scope: Risk assessment is the main component of Safety of machinery. These standards give practical guidance on conducting risk assessment for machinery and describe various methods and tools for each step in the process. They underline the areas of assessment of risks. Risk evaluation and Reduction of risks to health resulting from hazardous substances emitted by machinery.

Key Provisions: These standards include design considerations, control measures, risk assessment processes that follow a structured approach of determination of risks, hazard identification risk estimation and risk evaluation and selection of tools for risk reduction measures. They give examples of different measures that can be used to reduce risk and are intended to be used for risk assessment on a wide variety of machinery in terms of complexity and potential for harm.

Its intended users are those involved in the design, installation or modification of machinery (for example, designers, technicians or safety specialists).

These standards that cover the risk assessment are in the Safety of machinery are -

1. Safety of Machinery — General Principles for Design — Risk Assessment and Risk Reduction (IS 16819 : 2018/ISO 12100 : 2010)
2. Safety of Machinery — Risk Assessment Part 2 Practical Guidance and Examples of Methods (IS/ISO/TR 14121-2 : 2012)
3. Safety of machinery - Reduction of risks to health resulting from hazardous substances emitted by machinery Part 1 principles and specifications for machinery manufacturers [IS 16834 (Part 1) : 2018 ISO 14123-1 : 2015]
4. Safety of Machinery — Reduction of Risks to Health Resulting from Hazardous Substances Emitted by Machinery Part 2 Methodology Leading to Verification Procedures [IS 16834 (Part 2) : 2018 ISO 14123-2 : 2015]

Safety of Machinery — Emission of Airborne Hazardous Substances

Scope: The specific parameters which can be used for the assessment of the emission of pollutants from machines or the performance of the pollutant control systems integrated in machines are covered under these standards. They give guidance on the selection of appropriate test methods and the particular test methods according to their various fields of application and types of machines including the effects of measures to reduce exposures to pollutants.

Key Provisions: These standards aim to ensure worker safety by enabling the assessment and control of airborne contaminants at the source and are applicable during the design, manufacture, and use of machinery and support exposure risk assessment and the development of exposure reduction measures.

Purpose: To help manufacturers and safety professionals choose suitable testing procedures to determine how much hazardous substance a machine releases during operation.

1. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 1 Selection of Test Methods (IS 16806 (Part 1) : 2018 ISO 29042-1 : 2008
2. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 2 Tracer Gas Method for the Measurement of the Emission Rate of a Given Pollutant (IS 16806 (Part 2) : 2018 ISO 29042-2 : 2009)
3. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 3 Test Bench Method for the Measurement of the Emission Rate of a Given Pollutant (IS 16806 (Part 3) : 2018 ISO 29042-3 : 2009)
4. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 4 Tracer Method for the Measurement of the Capture Efficiency of an Exhaust System [IS 16806 (Part 4) : 2018 ISO 29042-4 : 2009]
5. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 5 Test Bench Method for the Measurement of the Separation Efficiency by Mass of Air Cleaning Systems with Unducted Outlet [IS 16806 (Part 5) : 2018 ISO 29042-5 : 2010]
6. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 6 Test Bench Method for the Measurement of the Separation Efficiency by Mass of Air Cleaning Systems with Ducted Outlet [IS 16806 (Part 6) : 2018 ISO 29042-6 : 2010]

Safety of Machinery — Emission of Airborne Hazardous Substances

7. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 7 Test Bench Method for the Measurement of the Pollutant Concentration Parameter (IS 16806 (Part 7) : 2018 ISO 29042-7 : 2010)
8. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 8 Room Method for the Measurement of the Pollutant Concentration Parameter (IS 16806 (Part 8) : 2018 ISO 29042-8 : 2011)
9. Safety of Machinery — Evaluation of the Emission of Airborne Hazardous Substances Part 9 Decontamination Index (IS 16806 (Part 9) : 2018 ISO 29042-9 : 2011)

Safety of Machinery — Fire Prevention and Fire Protection

Scope: This standard on Safety of Machinery — Fire Prevention and Fire Protection(IS 16807 : 2020 ISO 19353 : 2019) specifies methods for identifying fire hazards resulting from machinery and for performing a risk assessment. It gives the basic concepts and methodology of protective measures for fire prevention and protection to be taken during the design and construction of machinery. The measures consider the intended use and reasonably foreseeable misuse of the machine. It provides guidelines for consideration in reducing the risk of machinery fires to acceptable levels through machine design, risk assessment and operator instructions.

Key Points:

- The standard introduces a three-step risk reduction strategy: inherently safe design, safeguarding, and complementary protective measures such as fire detection and suppression systems.
- Applicable to machinery manufacturers, users, and safety bodies, it mandates performance-based safety controls and compatibility with machine operations.
- The standard enhances operational safety, reduces potential damage and injury, and supports regulatory compliance, ultimately promoting a culture of proactive fire risk management in machinery environments.

Safety of Machinery — Hygiene Requirements

Scope: These Standards specify hygiene requirements of machines and provide information for the intended use to be provided by the manufacturer. They apply to all types of machines and associated equipment used in applications where hygiene risks to the consumer of the product can occur. They elaborate on hygiene requirements for the formulation, manufacture, use and handling of lubricants which, during manufacture and processing, can come into incidental contact with products and packaging used in the food, food-processing, cosmetics, pharmaceutical, tobacco or animal-feeding-stuffs industries.

IS 16808:2018 ensures that machinery intended for hygienic applications is designed, built, and maintained in a way that minimizes hygiene risks and supports cleanability and safety. The standard emphasizes thorough risk assessment, material choice, cleanable design, and proper documentation.

Key Provisions:

Identification of Hazards:

- Hygiene risks may arise from:
- Biological causes (for example, bacteria, viruses)
- Chemical causes (for example, cleaning agents, lubricants)
- Physical causes (for example, foreign materials)

Hygiene Strategy:

- Based on risk assessment and guided by ISO 12100.
- Involves evaluating use, product type, and cleaning needs.
- Machinery is categorized into 5 hygiene levels (from minimal to aseptic-ready).

Hygienic Design Requirements:

- Materials must be corrosion-resistant, non-toxic, and cleanable.
- Design principles include:
- Smooth, accessible surfaces
- Avoidance of crevices and dead spaces
- Clean-in-place or easy dismantling for cleaning
- Hygienic joints and fasteners

1. Safety of Machinery — Hygiene Requirements for the Design of Machinery (IS 16808 : 2018/ISO 14159 : 2002)
2. Safety of Machinery — Lubricants with Incidental Product Contact — Hygiene Requirements [IS 16912 : 2018/ISO 21469 : 2006]

Safety of Machinery — Permanent Means of Access to Machinery

Scope: These standards specify minimum requirements for permanent, non-powered means of access to stationary machines when access from ground or floor level is not possible. They apply to fixed and adjustable access components that are part of the machine or related civil structures. The safety requirements for the design, construction, and installation of working platforms and walkways, stairs, step ladders , guard rails and fixed ladders are elaborated in the standards.

It excludes powered access systems and machinery manufactured before its publication.

Key Provisions:

- The standard helps manufacturers and designers choose the most appropriate type of access based on factors like height, frequency of use, ergonomics, and risk of falls.
- It also defines basic safety requirements related to dimensions, stability, and protection against falling.
- The goal is to reduce accidents and improve worker safety by integrating safe access provisions into the overall machine design.
- These standards emphasize on ergonomics and user safety.

1. Safety of Machinery — Permanent Means of Access to Machinery Part 1 Choice of Fixed Means and General Requirements of Access [IS 16809 (Part 1) : 2018/ISO 14122-1 : 2016]
2. Safety of Machinery — Permanent Means of Access to Machinery Part 2 Working Platforms and Walkways [IS 16809 (Part 2) : 2018/ISO 14122-2 : 2016]
3. Safety of Machinery — Permanent Means of Access to Machinery Part 3 Stairs, Stepladders and Guard-Rails [IS 16809 (Part 3) : 2018/ISO 14122-3 : 2016]
4. Safety of Machinery — Permanent Means of Access to Machinery Part 4 Fixed Ladders [IS 16809 (Part 4) : 2018/ISO 14122-4 : 2016]

Safety of Machinery- Control Systems

Scope: These standards emphasize on safety related parts of control systems providing safety requirements and guidance on the principles for the design and integration of safety-related parts of control systems (SRP/CS), including the design of software. For these parts of SRP/CS, they specify characteristics that include the performance level required for carrying out safety functions procedures and conditions to be followed for the validation by analysis and testing of the specified safety functions and the category achieved the performance level achieved by SRP/CS.

They apply to SRP/CS for high demand and continuous mode, regardless of the type of technology and energy used (electrical, hydraulic, pneumatic, mechanical, etc.), for all kinds of machinery.

Key Elements:

- Performance Levels (PL a–e): Define the level of risk reduction.
- Risk Assessment: Based on severity, exposure, and avoidance.
- System Categories (B, 1–4): Define system architecture and fault tolerance.
- Reliability Metrics: Includes MTTFd, DC, and CCF.
- Design Requirements: Emphasizes redundancy, diagnostics, and safe software.
- Verification Methods:Includes both analysis and testing to check compliance with:
- Functional requirements
- Reliability parameters (for example, MTTFd, DC, CCF)
- System architecture (Categories B, 1–4)
- Validation: Required to confirm the system meets the intended PL.
- Software Validation: Addresses verification of safety-related software, including embedded and programmable logic.

Applications:

Used in machinery safety systems, including automation, robotics, and industrial equipment.

The standards covered are:

1. Safety of Machinery — Safety Related Parts of Control Systems Part 1 General Principles for Design (IS 16810 (Part 1) : 2018 ISO 13849-1 : 2015)
2. Safety of Machinery — Safety Related Parts of Control Systems Part 2 Validation (IS 16810 (Part 2) : 2018 ISO 13849-2 : 2012)

Safety of Machinery -Two-Hand Control Devices - Principles for Design and Selection (IS 16817:2020/ISO 13851:2019)

Scope: The primary objective of this standard is to specify safety requirements for THCDs, ensuring that hazardous machine functions can only be initiated and maintained through the simultaneous use of both hands. This design principle helps keep the operator's hands away from danger zones during machine operation. The standards apply to all THCDs, regardless of the energy used, including those fully assembled for installation and those assembled by the machine manufacturer or integrator. However, they do not apply to devices intended as enabling devices, hold-to-run devices, or special control devices.
They apply to SRP/CS for high demand and continuous mode, regardless of the type of technology and energy used (electrical, hydraulic, pneumatic, mechanical, etc.), for all kinds of machinery.

Key Features:

- ***Design Requirements:*** The standard outline requirements to prevent accidental operation, ensure synchronous actuation (both hands must activate controls within 0.5 seconds), and prevent defeat (e.g., using one hand and an elbow).
- ***Types of THCDs:*** Three types are defined based on functional characteristics and performance levels, with Type III requiring the highest safety performance level (PL d) as per ISO 13849-1.
- ***Safety Functions:*** THCDs must prevent unexpected start-up, require both actuators to be released before re-initiation, and ensure that hazardous functions cease upon release of any actuator.
- ***Positioning and Distance:*** While the standards provide guidance on the positioning of THCDs relative to danger zones, they do not specify exact distances, leaving this to be determined based on risk assessment and other relevant standards like ISO 13855.

Safety of Machinery — Safety Guards and Interlocking Devices

Scope: These standards specify general requirements for the design, construction, and selection of guards provided to protect persons from mechanical hazards. It indicates other hazards that can influence the design and construction of guards. They include the principles for the design and selection independent of the nature of the energy source of interlocking devices associated with guards.

This applies to guards for machinery which will be manufactured after it is published. The requirements are applicable if fixed and movable guards are used. They cover the parts of guards which actuate interlocking devices.

These standards also provide guidance for the design and integration of a safeguarding supportive system (SSS) which is intended to include a mode selection as part of an SRP/CS or to add a layer of personnel authentication and authorization to an IMS.

Key Features:

Design and Construction:

- Ensures that guards are designed and constructed to prevent access to hazard zones.
- Guards should be robust and resistant to environmental conditions.

Types of Interlocking Devices:

- Covers various interlocking device types, including mechanical, electrical, and non-contact systems, providing guidance on their appropriate application based on risk assessment.

Integration with Control Systems:

- Guides on integrating interlocking devices with machine control systems to ensure that hazardous functions are disabled when guards are not in place.

Fault Masking:

- Occurs when a fault in one part of the safety system is concealed by the operation of other parts, preventing its detection. This can result in the system failing to respond appropriately to hazardous conditions.

Calculation Methodology:

- Provides formulas and guidelines to determine the minimum distance between the hazard and the safeguard, considering the machine's stopping time and human approach speed.

Safety of Machinery — Safety Guards and Interlocking Devices

The Standards covered are:

1. Safety of Machinery — Guards — General Requirements for the Design and Construction of Fixed and Movable Guards (IS 16811 : 2018/ISO 14120 : 2015)
2. Safety of Machinery — Interlocking Devices Associated with Guards — Principles for Design and Selection (IS 16812 : 2018/ISO 14119 : 2013)
3. Safety of Machinery — Safeguarding Supportive System (IS 18990 : 2024 ISO/TR 22053 : 2021)
4. Safety of Machinery — Trapped Key Interlocking Devices — Principles for Design and Selection (IS/ISO TS 19837 : 2018)
5. Safety of Machinery — Evaluation of Fault Masking Serial Connection of Interlocking Devices Associated with Guards with Potential Free Contacts (IS 18982 : 2024 ISO/TR 24119 : 2015)
6. Safety of Machinery — Evaluation of Fault Masking Serial Connection of Interlocking Devices Associated with Guards with Potential Free Contacts [IS 18982 : 2024 ISO/TR 24119 : 2015]

Safety of Machinery — Prevention of Unexpected Start-Ups and Stop functions

Scope: The standards specify requirements for designed-in means aimed at preventing unexpected machine start-up to allow safe human interventions in danger zones and functional requirements and design principles for the emergency stop function on machinery, independent of the type of energy used. This document applies to unexpected start-up from all types of energy source, i.e. power supply, e.g. electrical, hydraulic, pneumatic; stored energy due to gravity, compressed springs; and external influences, e.g. from wind.

Key Provisions:

- ***Availability and Accessibility:*** Emergency stop devices must be available and operational at all times, easily accessible, and located at each operator control station and at other locations where initiation of the emergency stop function is required.
- ***Disengagement and Reset:*** The effect of an activated emergency stop device shall be sustained until the device has been manually reset. Resetting the emergency stop device shall not by itself restart the machinery but only permit restarting.
- **Applies** to all types of machinery to prevent hazardous unexpected start-up during installation, maintenance, or other non-operational phases. Used by machine designers, manufacturers, and employers to ensure compliance with safety standards.
- **Helps** prevent accidents due to unintentional machine activation. Enhances worker safety and legal compliance with occupational safety regulations.

The Standards covered are:

1. Safety of Machinery — Prevention of Unexpected Start-Up [IS 16813 : 2019/ ISO 14118 : 2017]
2. Safety of Machinery — Emergency Stop Function — Principles for Design (IS 16818 : 2018/ISO 13850 : 2015)

Safety of Machinery — Prevention of Accidents

Scope: These standards specify safety distances to prevent access to machinery hazard zones in industrial and non-industrial environments. The distances are designed to limit access through protective structures and apply where distance alone ensures adequate risk reduction. They enable the user (e.g. standard makers, designers of machinery) to avoid hazards from crushing zones. Minimum gaps relative to parts of the human body are specified and are applicable when adequate safety can be achieved by this method. It provides tested parameters for walking and upper limb movements, excluding other types of approach such as running or falling.

Key Provisions:

- Safety distances are determined based on anthropometric data to cover up to the 95th percentile of the population.
- Emphasizes that safety distances are effective when distance alone provides sufficient risk reduction.
- Acknowledges that individuals with extreme body dimensions may still reach hazard zones even when standards are met
- ***Minimum Gap Specifications:*** The standard provides detailed measurements for minimum gaps relative to different parts of the human body, such as fingers, hands, arms, and legs. These measurements are based on anthropometric data to ensure safety across a diverse workforce.
- ***Application Guidance:*** It offers guidance on how to apply these minimum gap values in the design and construction of machinery to eliminate or reduce the risk of crushing injuries.

The Standards covered are:

1. Safety of Machinery — Safety Distances to Prevent Hazard Zones Being Reached by Upper and Lower Limbs (IS 16814 : 2021/ISO 13857 : 2019)
2. Safety of Machinery — Minimum Gaps to Avoid Crushing of Parts of the Human Body (IS 16816 : 2019/ISO 13854 : 2017)
3. Safety of Machinery — Positioning of Safeguards with Respect to the Approach Speeds of Parts of the Human Body (IS 16815 : 2019/ISO 13855 : 2010)

Safety of Machinery — Pressure Sensitive Protective Devices

Scope: These standards specify general principles and safety requirements for the design and testing of pressure-sensitive mats and floors used to protect persons from hazardous machinery. They also include pressure-sensitive edges and bars, with or without an external reset facility, designed to detect the presence of persons or body parts exposed to potential hazards and encompass general principles and requirements for the design and testing of custom, application-specific pressure-sensitive protective devices like pressure-sensitive bumpers, pressure-sensitive plates and pressure-sensitive wires (trip wires).

Key Provisions:

- ***Applicability:*** The standards apply to pressure-sensitive mats and floors designed to detect persons weighing more than 35 kg, and children weighing more than 20 kg. It is not applicable for detecting individuals under 20 kg.
- D***esign and Testing Requirements:*** They outline minimum safety requirements for performance, marking, and documentation of these devices, ensuring they function reliably under specified conditions.
- ***User Guidance:*** It provides guidance to assist machinery manufacturers and users in implementing adequate arrangements for the effective use of pressure-sensitive mats and floors, edges and bars
- **Additional requirements** may apply in environments with elderly, disabled individuals, or children. Electromagnetic immunity requirements are also addressed.
- **Manufacturers and users** are responsible for selecting appropriate protective devices based on risk assessments.

The Standards covered are:

1. Safety of Machinery — Pressure Sensitive Protective Devices Part 1 General Principles for Design and Testing of Pressure-Sensitive Mats and Pressure-Sensitive Floors [IS 16835 (Part 1) : 2018/ISO 13856-1 : 2013]
2. Safety of Machinery — Pressure Sensitive Protective Devices Part 2 General Principles for Design and Testing of Pressure-Sensitive Edges and Pressure-Sensitive Bars [IS 16835 (Part 2) : 2018/ISO 13856-2 : 2013]
3. Safety of Machinery — Pressure Sensitive Protective Devices Part 3 General Principles for Design and Testing of Pressure-Sensitive Bumpers, Plates, Wires and Similar Devices [IS 16835 (Part 3) : 2018/ISO 13856-3 : 2013]

Safety of Machinery - General Guidelines

(1) Safety of Machinery — Rules for Drafting and Presentation of Safety Standards (IS 18966 : 2024/ISO GUIDE 78 : 2012)

Scope: This Guide presents rules for the drafting and presentation of International Standards dealing with machinery safety and their revisions, primarily to achieve consistency and acceptable quality of the various standards to be prepared. It also gives requirements on the criteria for the selection of new work items and for procedures to prepare, produce or revise standards in an efficient and effective way.

Key Provisions:

Standard Types:

- Type-A: Basic safety standards providing fundamental concepts and principles.
- Type-B: Generic safety standards dealing with specific safety aspects or safeguards.
- Type-C: Machine safety standards detailing safety requirements for particular machines or groups of machines.

Drafting Principles:

Emphasizes the use of clear, unambiguous language and consistent terminology. It mandates the inclusion of specific clauses such as scope, normative references, terms and definitions, and safety requirements.

Risk Reduction Measures:

Introduces the term “risk reduction measure” as a synonym for “protective measure,” aligning with contemporary safety terminology.

Safety of Machinery - General Guidelines

(2) Safety of Machinery — Relationship with ISO 12100 Part 1 How ISO 12100 Relates to Type-B and Type-C Standards [IS 18988 (Part 1) : 2024/ISO/TR 22100-1 : 2021]

Scope: This document provides assistance to the designer/manufacturer of machinery and related components as to how the system of existing type-A, type-B and type-C machinery safety standards should be applied in order to design a machine to achieve a level of tolerable risk by adequate risk reduction. This document explains the general principles of ISO 12100 and how this type-A standard is used for practical cases in conjunction with type-B and type-C machinery safety standards.

Key Provisions:

Risk Assessment Framework:

- Provides a methodology for identifying hazards, assessing risks, and implementing appropriate risk reduction measures.

Standard Integration:

- Explains how ISO 12100 serves as the foundation for machinery safety and how it relates to type-B and type-C standards.

Guidance for Standards Development:

- Offers assistance to standards-writing committees on harmonizing safety requirements across different machinery types.

Safety of Machinery - General Guidelines

(3) Safety of Machinery — Relationship with ISO 12100 Part 4 Guidance to Machinery Manufacturers for Consideration of Related IT-Security (Cyber Security) Aspects [IS 18988 (Part 4) : 2024 ISO/TR 22100-4 : 2018]

Scope: This document gives machine manufacturers guidance on potential security aspects in relation to safety of machinery when putting a machine into service or placing on the market for the first time. It provides essential information to identify and address IT-security threats which can influence safety of machinery.

This document gives guidance but does not provide detailed specifications on how to address IT-security aspects which can influence safety of machinery.
This document does not address the bypass or defeat of risk reduction measures through physical manipulation.

Key Provisions:

Legal Framework:

- Acknowledges that intentional misuse, such as cyberattacks, falls outside the traditional scope of safety standards like ISO 12100, but emphasizes the need for manufacturers to consider such threats due to their potential safety implications.

Risk Assessment Integration:

- Encourages the incorporation of IT-security considerations into the overall risk assessment and risk reduction processes for machinery.
- Guidance for Manufacturers: Provides recommendations for manufacturers to evaluate potential cybersecurity vulnerabilities and implement appropriate measures to mitigate associated risks.

Relevance to Industry 4.0:

- Highlights the increasing importance of cybersecurity in the context of interconnected and smart manufacturing systems, where cyber threats can have direct safety consequences.

Safety of Machinery - General Guidelines

(4) Safety of Machinery — Relationship with ISO 12100 Part 5 Implications of Artificial Intelligence Machine Learning [IS 18988 (Part 5) : 2024 ISO/TR 22100-5 : 2021]

Scope: This document addresses how artificial intelligence machine learning can impact the safety of machinery and machinery systems.

This document describes how hazards being associated with artificial intelligence (AI) applications, machine learning in machinery or machinery systems, and designed to act within specific limits, can be considered in the risk assessment process.

Key Provisions:

- ***Exclusions:*** The standard does not apply to machinery or systems with AI/ML applications designed to act beyond specified limits, which can result in unpredictable effects. It also does not address safety systems incorporating AI, such as safety-related sensors and other safety-related parts of control systems.

- ***Risk Assessment Integration:*** Encourages the incorporation of AI/ML considerations into the overall risk assessment and risk reduction processes for machinery, in line with ISO 12100.

- ***Guidance for Manufacturers:*** Provides recommendations for machinery designers and manufacturers to evaluate potential hazards introduced by AI/ML functionalities and implement appropriate measures to mitigate associated risks.

Safety of Machinery - General Guidelines

(5) Safety of Machinery — Instruction Handbook — General Drafting Principles (IS 18989 : 2024/ISO 20607 : 2019)

Scope: This document specifies requirements for the machine manufacturer for preparation of the safety relevant parts of an instruction handbook for machinery.

This document:
— provides further specifications to the general requirements on information for use given in ISO 12100:2010, 6.4.5; and
— deals with the safety-related content, the corresponding structure and presentation of the instruction handbook, taking into account all phases of the life cycle of the machine.

Key Provisions:

- ***Alignment with ISO 12100:*** Provides detailed specifications complementing the general requirements on information for use as outlined in ISO 12100:2010, particularly clause 6.4.5.
- ***Structured Content:*** Outlines a recommended structure for instruction handbooks, ensuring that safety-related information is organized logically and is easily accessible to users.
- ***Clarity and Comprehensibility:*** Emphasizes the importance of clear language and presentation to facilitate user understanding, thereby promoting safe usage of machinery.
- ***Consideration of User Profiles:*** Encourages tailoring the instruction handbook to the intended audience, taking into account the users' technical knowledge and experience levels.

Safety of Machinery - General Guidelines

(6) Safety of Machinery — Relationship with ISO 12100 Part 2 How ISO 12100 Relates to ISO 13849-1 (IS/ISO/TR 22100-2 : 2013)

Scope: This part of ISO/TR 22100 describes the general relationship between ISO 12100 and ISO 13849-1 used to reduce the risk of harm. It focuses on the use of safety-related parts of control systems in relation to risk assessment and the risk reduction process.

Key Provisions:

- ***Standards Hierarchy:*** It outlines the structure of machinery safety standards:
  Type-A: General principles (e.g., ISO 12100)
  Type-B: Generic safety aspects (e.g., ISO 13849-1)
  Type-C: Specific machine types

- ***Risk Assessment Integration:*** ISO 12100 provides a comprehensive process for identifying hazards and assessing risks. When risks cannot be eliminated through design, ISO 13849-1 offers methods to design and implement safety-related control systems to mitigate these risks.

Information Flow Between Standards

- **From ISO 12100 to ISO 13849-1:** Hazard identification and risk assessment results inform the requirements for safety-related control functions.

- **From ISO 13849-1 to ISO 12100:** The performance of implemented control systems feeds back into the overall risk assessment to verify if risk reduction is adequate.

Safety of Machinery - General Guidelines

(7) Safety of Machinery — Relationship with ISO 12100 Part 3 Implementation of Ergonomic Principles in Safety Standards (IS/ISO/TR 22100-3 : 2013)

Scope: This document describes the main ergonomic risk factors influencing the safety of machinery and gives a framework for incorporating them into the design of machines by the integration of important ergonomic principles relating to:
— avoiding stressful postures and movements during use of the machine;
— designing machines, and more especially hand-held and mobile machines, which can be operated easily;
— avoiding as far as possible noise, vibration, thermal effects.

Key Provisions:

Identifies key ergonomic risks such as:

- **Posture and Movement:** Designing for natural body positions to reduce strain.
- **Force Requirements:** Minimizing excessive force needed to operate machinery.
- **Repetitive Actions:** Reducing repetitive tasks that can lead to fatigue or injury.
- **Workplace Layout:** Ensuring adequate space and accessibility.
- **Environmental Conditions:** Considering lighting, noise, and temperature.

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