SVENSK STANDARD
SS-ISO 14955-3:2020

Verktygsmaskiner – Miljöutvärdering av verktygsmaskiner – Del 4: Principer för mätning av metallbearbetande verktygsmaskiner och laserbearbetande verktygsmaskiner med avseende på energieffektivitet (ISO 14955-3:2020, IDT)

Machine tools – Environmental evaluation of machine tools – Part 3: Principles for testing metal-cutting machine tools with respect to energy efficiency (ISO 14955-3:2020, IDT)

Svenska Institutet för Standarder

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Standarden är framtagen av kommittén för Uppmätning av verktygsmaskiner, SIS/TK 491.

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Den internationella standarden ISO 14955-3:2020 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 14955-3:2020.

The International Standard ISO 14955-3:2020 has the status of a Swedish Standard. This document contains the official English version of ISO 14955-3:2020.

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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).

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).

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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.

This document was prepared by Technical Committee ISO/TC 39, *Machine tools*.

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.

A list of all parts in the ISO 14955 series can be found on the ISO website.

Introduction

Machine tools are complex products for industrial use to manufacture parts ready for use or semi-finished products. The performance of a machine tool as key data for investment is multi-dimensional regarding its economic value, its technical specification, and its operating requirements which are influenced by the specific application. Therefore, the same machine tool can show quite different energy supplied to the machine depending on the part which is manufactured and the conditions under which the machine is operated. Therefore, the environmental evaluation of a machine tool cannot be considered in isolation from these considerations.

ISO 14955-1 defines an analysis and evaluation procedure for machine tools based on functional units with the intention of a unified approach. ISO 14955-1 enables simplified and general evaluation methods in order to define and assess the energetic behaviour and the individual energetic and/or efficiency weaknesses of a machine tool.

ISO 14955-2 defines the required parameters and procedures for machine tool and machine tool component measurement, including required parameters which are relevant for the assessment of the energetic machine tool behaviour.

The reference scenario introduced in this part reflects the actual machine process in the field under best knowledge. The definition of the reference scenario and its measurement helps to indicate application-dependent improvement potential and the application of the methodology as defined in ISO 14955-1 and related improvement measures for given industrially driven applications.

The ISO 14955 series takes care of relevant environmental impacts during the use stage. Aside from the design and engineering of machine tools, the intended utilization of machine tools is addressed by this document.

Machine tools — Environmental evaluation of machine tools —

Part 3: Principles for testing metal-cutting machine tools with respect to energy efficiency

1 Scope

This document supports the energy-saving design methodology according to ISO 14955-1 and the methods for measuring energy supplied to machine tools and machine tool components defined in ISO 14955-2. This document addresses the environmental evaluation of machine tools during the use stage based on reference scenarios. It contains an example for metal cutting machine tools.

This document defines a methodological approach to assess relevant machine tool operating states based on an individual reference scenario for the energy assessment of machine tools and the integration of energy-efficiency aspects into machine tool design.

This document explains what needs to be measured in line with ISO 14955-1 and ISO 14955-2. Furthermore, it shows how a reference scenario for the measurement of the machine function "processing", according to ISO 14955-1, is evaluated.

An example of how to use this document is given in Annex A.

The results from applying this document are influenced by the effect of user behaviour and manufacturing strategies during the use phase. This document does not support the comparison of machine tools.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14955-1:2017, *Machine tools — Environmental evaluation of machine tools — Part 1: Design methodology for energy-efficient machine tools*

ISO 14955-2:2018, *Machine tools — Environmental evaluation of machine tools — Part 2: Methods for measuring energy supplied to machine tools and machine tool components*

DIN 8580:2003, *Manufacturing processes — Terms and definitions, division*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14955-1, ISO 14955-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
reference part
workpiece with defined specification of geometry, material, size, geometric tolerances, surface quality and defined related manufacturing procedure

Note 1 to entry: The reference part is a determined number of geometric elements in given composition and dimension which are manufactured under defined operating states (see [8]).

3.2
reference scenario
individually defined manufacturing process, containing the definition of part handling and the environmental conditions to achieve an individual *reference part* (3.1)

Note 1 to entry: The reference scenario covers machine based and task-based scenarios according to ISO 14955-2:2018.

3.3
discrete part manufacturing
production process in which its output is individually countable, or identifiable by serial numbers, and is measurable in distinct units rather than by weight or volume

Note 1 to entry: Term used in distinction to process manufacturing, e.g. of substances such as plastics, food, beverages or pharmaceuticals.

3.4
mass production
large-scale production
manufacturing of large quantities of standardized products, frequently utilizing assembly line technology

Note 1 to entry: Mass production refers to the process of creating large numbers of similar products efficiently. Mass production is typically characterized by some type of automation, as with an assembly line, to achieve high volume, the detailed organization of materials flow, careful control of quality standards and division of labour.

3.5
tool
device for imparting a desired shape, form, or finish to a material

Note 1 to entry: The desired shape can be achieved by different means, e.g. by material removal, forming, shaping.

3.6
shop floor production
job shop
fabrication-outfit specializing in small quantities of custom-made parts, produced according to customer specifications

Note 1 to entry: Usually, in shop floor production, there is no workpiece defined between machine tool builder/supplier and machine tool user at the time of machine tool acquisition.

Note 2 to entry: In shop floor production, time shares are strongly related to the specific production being executed. A typical utilization of a machine tool in a shop floor production is 8 h/day for 5 days/week.

3.7
energy performance indicator
EnPI
measure or unit of energy performance, as defined by the organization

Note 1 to entry: EnPI(s) can be expressed by using a simple metric, ratio or a model, depending on the nature of the activities being measured.

Note 2 to entry: See ISO 50006 for additional information on EnPI(s)[4].

Note 3 to entry: Examples for organizations are manufacturer, supplier and user.

[SOURCE: ISO 50001:2018, 3.4.4]

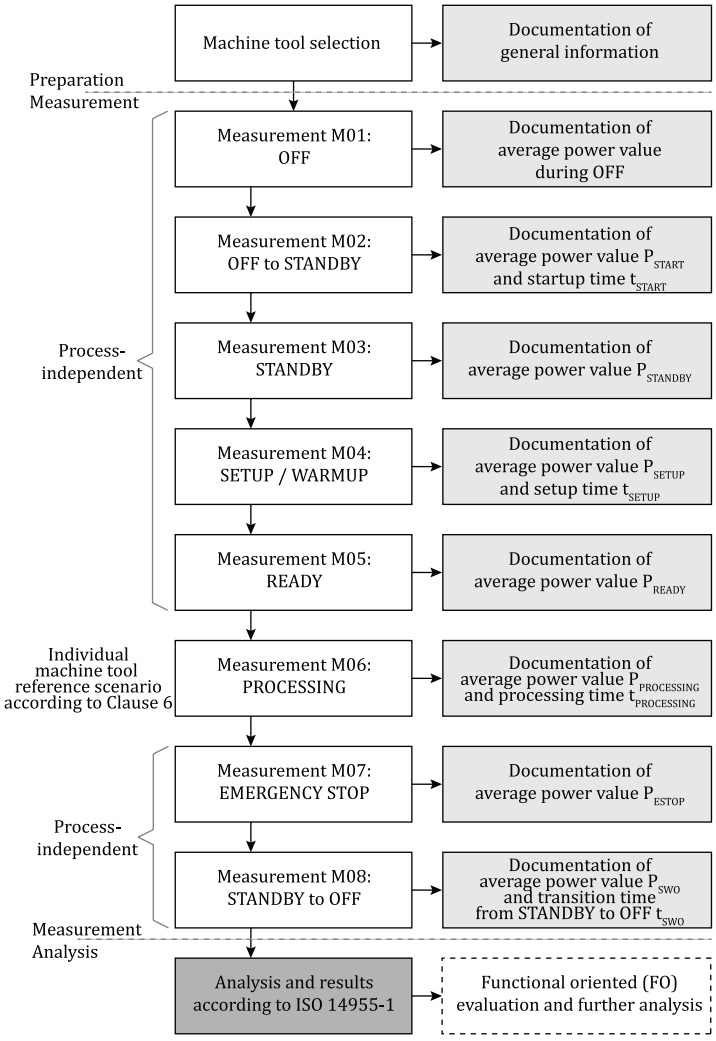
4 General approach for the environmental evaluation of machine tools

4.1 General

This clause describes the procedure for the environmental evaluation of machine tools according to ISO 14955-1. This approach requires the measurement of all possible operating states of the machine tool, including the reference scenario, as defined in Clause 6. Based on this assessment, relevant machine tool operating states can be indicated and assessed and the functional oriented analysis according to ISO 14955-1 can be performed.

Stable conditions are assumed if the difference of the average of the measured value over two measurement periods is not larger than 100 W or ±5 % of the connected load (nominal power).

Figure 1 shows the general approach for the environmental evaluation of machine tools. Detailed information is given in 4.2 to 4.10. Clause 5 shows the results and further assessments based on the performed machine tool measurement.



NOTE STANDBY is a stable state after machine tool is turned ON. This state can include heating on some machine tools.

Figure 1 — General approach for the environmental evaluation of machine tools