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Machine tools — Environmental evaluation of machine tools —

Part 5: Principles for testing woodworking machine tools with respect to energy supplied

Machines-outils — Évaluation environnementale des machines-outils —

Partie 5: Principes d'essai des machines-outils pour le travail du bois concernant l'énergie fournie

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Foreword

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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).

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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.*

This document is intended to be used in conjunction with ISO 14955-1 and ISO 14955-2.

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

As environmental impact is a common challenge for all products and natural resources become scarce, environmental performance criteria for machine tools need to be defined and the use of these criteria need to be specified.

Woodworking machine tools are complex products for industrial use to manufacture workpieces ready for use or semi-finished products. Their environmental impact includes waste raw material, use of auxiliary substances such as lubricants and other material flows as well as conversion of electrical energy into heat, dissipation of heat to the ambient or heat exchange by fluids and eventually the use of other resources such as compressed air.

Based on relevance considerations, the ISO 14955 series is focussed on environmental impacts during the use phase.

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. The energy supplied to the same machine tool can vary depending on the workpiece being manufactured and the conditions under which the machine tool is operated. Therefore, the environmental evaluation of a machine tool cannot be done without considering these aspects.

Machine tools — Environmental evaluation of machine tools —

Part 5: Principles for testing woodworking machine tools with respect to energy supplied

1 Scope

This document specifies technical requirements for testing procedures for evaluation of energy supplied during use phase for the design of machine tools to process wood and materials with similar physical characteristics to wood.

This document, along with ISO 14955-1 and ISO 14955-2, covers all significant energy requirements relevant to woodworking machine tools, when they are used as intended and under the conditions foreseen by the manufacturer/supplier.

This document defines relevant operating states, optional shift regimes and optional machine tool activities for several types of woodworking machine tools.

This document also applies to peripheral devices which are supplied as an integral part of the machine. This document also applies to machine tools which are part of an integrated manufacturing system where the energy required is comparable to those of machine tools working separately.

This document applies to the following woodworking machine tools:

— NC boring and routing machines;

— horizontal beam panel sawing machines;

— vertical panel sawing machines;

— edge banding machines fed by chains;

— wide belt calibrating and sanding machines;

— four-sided moulding machines;

— tenoning and/or profiling machines;

— foiling/laminating machines;

— dimension saws and circular saw benches;

— single spindle vertical moulding machines (toupie);

— surface planing, thickness planing, combined surface/thickness planing machines;

— band sawing machines;

— combined machines;

— multi-blade rip-sawing machines;

— presses and bending presses;

— mounting presses.

A list of energy efficiency improvements for woodworking machine tools is given in Annex A.

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, *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*

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
numerically controlled boring and routing machine
NC boring and routing machine
integrated fed machine designed for the machining of workpieces by the use of milling and/or boring tools having at least two orthogonal axes programmable by the user (e.g. X, Y) for positioning and/or machining, where the axes operate in accordance with a NC work programme

[SOURCE: ISO 19085-3:2017, 3.1, modified — Note 1 to entry and the examples have been deleted.]

3.2
horizontal beam panel sawing machine
machine, designed for cutting panels, fitted with one travelling saw carriage per cutting line incorporating one or more circular saw blades

[SOURCE: ISO 19085-2:2017, 3.1, modified — Note 1 to entry has been deleted.]

3.3
vertical panel sawing machine
machine designed for cutting panels where the workpiece is supported in a near vertical plane during cutting and where the saw unit is mounted in front of the workpiece support

[SOURCE: ISO 19085-4:2018, 3.1, modified — Note 1 to entry has been deleted.]

3.4
edge banding machine fed by chains
machine designed for banding in one pass the edge band on one end of the workpiece (single end edge banding machine) or on both ends of the workpiece (double end edge banding machine), consisting of an edge banding zone with various units (e. g. heating, bonding, and pressing for flexible or solid edges) and of a zone for additional operations such as snipping, trimming, milling, sanding, polishing, chamfering etc., in addition the edge banding zone, can be preceded by a sizing/profiling zone

[SOURCE: ISO 18217:2015, 3.1, modified — Note 1 to entry and Figure 1 have been deleted.]

3.5
wide belt calibrating and sanding machine
machine used to calibrate and/or to sand panels and/or linear workpieces, fitted with an integrated feed and sanding belts positioned above and/or below the workpiece level, with manual or automatic loading and/or unloading

[SOURCE: ISO 19085-8:2018, 3.1, modified — In the term, "wide belt" has been added; the Notes to entry, Figure 1 and Figure 2 have been deleted.]

3.6
four-sided moulding machine
machine for four-sided longitudinal processing with four or more working units with spindles, which can be equipped with planing and/or moulding tools, at least one unit on each side of the workpiece, and with integrated feed of the workpiece

3.7
tenoning and/or profiling machine
machine designed for production of a tenon and/or profile on one side of the workpiece (single end machines) or on opposing sides of the workpiece (double end machine) in one pass, where the tenons and/or profiles are cut by means of milling tools and/or saw blades mounted on one or more spindles (on each machine half), and where the workpiece is fed manually or mechanically

3.8
foiling/laminating machine
machine tool to foil/laminate flat surfaces with sheets or rolls of, for example, high gloss foils or foils of paper

Note 1 to entry: Example of a flat surface is a board.

3.9
dimension saw
hand-fed machine fitted with a single main circular saw blade, which is fixed in position during the cutting operation, and a sliding table adjacent to the saw blade

[SOURCE: ISO 19085-5:2017, 3.1, modified — The Notes to entry and Figure 1 have been deleted.]

3.10
circular saw bench
table saw
hand-fed machine fitted with a single main circular saw blade which is fixed in position during the cutting operation, and a horizontal table fixed during operation

[SOURCE: ISO 19085-9:2017, 3.1, modified — The Notes to entry and Figure 1 have been deleted.]

3.11
single spindle vertical moulding machine
toupie
hand-fed machine fitted with a single vertical spindle (interchangeable or not interchangeable), which is fixed in position during cutting operation and a horizontal table, which is fixed in total or in part during cutting operation

[SOURCE: ISO 19085-6:2017, 3.1, modified — "toupie" has been added as admitted term. In the definition, "arbor" has been replaced with "spindle". The Notes to entry and Figure 1 have been deleted.]

3.12
surface planing, thickness planing, combined surface/thickness planing machine
machine designed for cutting off layers of the upper or lower surface of a workpiece by a cutter-block rotating around a horizontal axis, mounted at right angles to the infeed direction between two tables or above a table designed to position and support the workpiece that is fed into the machine against the direction of the cut

[SOURCE: ISO 19085-7:2019, 3.2 to 3.4, modified — The 3 definitions have been merged.]

3.13
band sawing machine
sawing machine with one saw blade in the form of a continuous band mounted on and running between two or more band saw blade wheels

3.14
combined machine
machine incorporating two or more separately usable working units, i.e. a sawing unit, a moulding unit and/or a planning unit

[SOURCE: ISO/FDIS 19085-11:2019, 3.1, modified — The Notes to entry have been deleted.]

3.15
multi-blade rip-sawing machine
machine designed to be used with circular saw blades at different positions on the spindles which are fixed in position during cutting, where the workpiece is fed to the tools by an integrated power feed, i.e. rollers, or chain conveyor

[SOURCE: ISO/FDIS 19085-13:2019, 3.1, modified — The Notes to entry have been deleted.]

3.16
press
bending press

machine used to laminate and/or join together flat panels consisting of solid wood and wood-based materials such as chipboard, fibreboard, plywood, where pressing force is applied between two flat surfaces by actuators pushing top or bottom surface against each other, and loading and/or unloading is manual and gluing and/or shaping process is cold

[SOURCE: ISO/FDIS 19085-15:2019, 3.1 to 3.3, modified — The 3 definitions have been merged.]

3.17
mounting press
machine used to assemble cabinets, window frames, and similar products

3.18
chips and dust extraction system
CADES
system used for extraction, conveyance, separation and temporary storage of chips and dust from woodworking machine tools

4 Basics for measurement and calculation of energy supplied

4.1 General

Ambient conditions according to ISO 14955-2:2018, 4.2, shall be reported.

Stable conditions are assumed if the average power from two random measurements differ less than ±5 % of the nominal power of the connected load or not larger than 100 W.

Examples of machine tool components that are supplied with energy are listed in Table 1.

Table 1 — Examples of machine tool components that are supplied with energy

Machine tool component	Example
Machine CONTROLS	PC, CNC, auxiliary circuits
PERIPHERAL UNITS	Chiller, cabinet cooling Chip conveyor, vacuum pump, lighting, cleaning blow
PROCESSING UNITS	Glue or edge melting unit tool spindles, sanding belts unit
MOTION UNITS	Format change axis Process axes, including feeding

Descriptions of operating states are given in 4.2 to 4.6.

4.2 Operating state OFF

The main switches for electrical power supply shall be OFF.

The compressed air supply isolation valves shall be closed.

The air flow at each extraction connection outlet of the machine tool is assumed to be zero.

4.3 Operating state ON

The main switches for electrical power supply shall be ON.

The compressed air supply isolation valves shall be open.

The measurement shall be performed after more than 60 min of OFF state or when stable conditions are reached. The measurement shall last at least 5 min.

The electrical power measured is mainly the power applied to PC, CNC, control system, auxiliary circuits. Compressed air flow is mainly sealing air, if existent, or due to leakage.

In this state, manual operated tool change or manual operated tool magazine loading/unloading or die change can be done, when operating state STANDBY is not provided.

4.4 Operating state STANDBY

In this state, all available energy saving features of the machine tool shall be activated.

The measurement shall be performed 10 min after PROCESSING state has ended.

The average power shall be measured over a time of at least 5 min.

In this state, manual operated tool change or manual operated tool magazine loading/unloading or die change can be done.

4.5 Operating state WARM UP

WARM UP is the transition from STANDBY or ON, if STANDBY is not provided, to PROCESSING.

The measurement shall be performed after more than 30 min of STANDBY or ON, if STANDBY is not provided.

The average power shall be measured over the full time of the transition. The WARM UP time shall be reported.

4.6 Operating state PROCESSING

As this is the operating state the machine tool is made for, power measured at the system boundary shall be converted to energy.

The definition of this operating state is left to the agreement between manufacturer/supplier and user.

Workpiece loading/unloading are included in this operating state.

5 Evaluation of energy supplied to different types of woodworking machine tools

5.1 General

Measuring equipment installed shall not reduce the level of safety of the machine tool.

For each operating state, energy supplied shall be reported in terms of:

a) measured average electric active power in kW supplied to the machine and its peripherals;

b) measured average pneumatic air flow in Normal-litre/h (N.L./h) supplied to the machine and its peripherals;

c) calculated average air flow in m^3/h (anr) of contaminated airflow extracted from the machine and related pressure drop.

   This value shall be assumed as 0 m^3/h (anr) in operating state OFF.

   For all other operating states, it shall be conventionally calculated as the sum of average airflows through all extraction hoods of the machine tool. Each of these average airflows shall be calculated multiplying the theoretical maximum airflow through the extraction hood when the related gate valve is fully open, for the ratio of the time share during which the gate valve remains fully open and the total duration of the considered operating state.

NOTE 1 In all operating states other than OFF, it is assumed that CADES is activated.

NOTE 2 The user can truly benefit from machines with gate valves management only if the CADES is provided with the possibility to manage variable air flows with automatic reaction.

Measured values for compressed air and contaminated air flow shall be converted to electrical energy according to ISO 14955-2:2018, 7.9, in order to apply ISO 14955-1.

In particular, for operating state PROCESSING, the energy supplied shall be evaluated with reference to each machine tool activity.

The types of energy supplied to be considered at the system boundary are (see Figure 1):

— electrical energy inputs;

— compressed air supply inputs (if any);

— contaminated air flow outputs (if any).