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Grafisk teknik – Riktlinjer om strömförbrukning för digitala tryckpressar (ISO 20690:2018, IDT)

Graphic technology – Determination of the operating power consumption of digital printing devices (ISO 20690:2018, IDT)

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Den internationella standarden ISO 20690:2018 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 20690:2018.

The International Standard ISO 20690:2018 has the status of a Swedish Standard. This document contains the official version of ISO 20690:2018.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Grafisk teknik, SIS/TK 434.

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Contents

Page

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 on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

Introduction

Estimates of operating costs for digital printing devices often include a calculation of energy consumption. However, energy efficiency comparisons are currently impossible to make, as there is no standard reference for their calculation.

It is common industry practice to estimate energy usage based solely on the connected load of a machine. This is not a very reliable method, however, as this means that, in many cases, the calculated values (e.g. 70 % of the power consumption) do not reflect the actual usage of the machine and its energy consumption[7]. Actual energy consumption often differs significantly from the estimated values[8]. Using these methods, power consumption data across devices can, therefore, not be compared, since the calculations have not followed a common framework that takes into account the influence of peripheral equipment such as IR or UV dryers and measurement cycles. This document provides requirements for the measurement of the parameters needed to estimate the energy efficiency (e.g. 1 000 A4 sheets/kWh) that correspond to the actual energy consumption for a defined machine combination.

This document specifies a method for the estimation of energy efficiency for digital production printing presses, also known as professional digital printing presses. It is up to the manufacturer of a digital printing system to declare whether it is suitable for use as a digital production printing press and, in such cases, this document is applicable.

Specifications to calculate the energy consumption of conventional sheet-fed and web-fed offset machines[5] and office equipment[6] exist and are widely used. This document is therefore, not applicable for the calculation of energy efficiency of conventional sheet-fed and web-fed offset printing machines, or for office equipment.

The universal availability of accurate and verifiable energy consumption data will enable printing machinery buyers, printers and their customers to assess the energy efficiency of digital production printing presses. However, the user of this document should understand that the effectiveness of power does not dictate quality acceptance levels of the expected output that a customer may require. Power consumption is an important part of all the output requirements and quality standards necessary for maintaining the quality and repeatability required by the print buyer. Energy efficiency can be reported in various ways, such as the number of prints printed per kWh, or as the amount of energy required in kWh to produce a specific number of prints. This information can be used to

— assess the power consumption and energy efficiency of machines including peripheral devices,

— estimate operating costs for investment planning,

— benchmark energy efficiency of digital production presses,

— measure energy efficiency improvements of digital printing devices over time or for dedicated process variations, and

— provide data to enable companies to claim environmental subsidies, when replacing equipment with more energy efficient equipment.

This document defines how to calculate the electrical energy requirements and thus the energy efficiency of digital printing devices.

When comparing the results obtained from this document, care should be taken that the devices being compared were set up to produce the same print quality using comparable types of printing technology, process and device configurations. This document may not be suitable for all devices, such as those resulting from continuous developments. It is intended to be revised as the technology evolves.

Graphic technology — Determination of the operating power consumption of digital printing devices

1 Scope

This document provides requirements and recommendations for measuring the electricity consumption of small-format and wide-format digital production presses printing in different modes of operation. It is intended for use on equipment that has been declared by the manufacturer to be suitable for use as a digital production printing press.

This document provides a means to compare the energy efficiency figures according to two or more characteristic machine combinations: Best Quality (BQ), Best Productivity (BP) or other combinations.

This document is not suitable for determining the power consumption of individual device components such as servos, fans, compressors, control boards and so on. It excludes digital presses designed to print textiles intended for clothing or machines, which similarly depend on additional processes to produce the printed product, such as ceramics.

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.

IEC 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
electrical energy
E
equivalent to electrical energy converted to other forms of energy (power, light, heat) for the operation of machines and devices

Note 1 to entry: Electricity generated in this way is calculated using the following formula:

$$E = \int_{t_1}^{t_2} u(t) \times i(t) dt$$

where $u(t)$ and $i(t)$ are the instantaneous values of voltage and current.

3.2
energy usage
power required for the operation of a given process over time

Note 1 to entry: Energy usage or electric energy consumption is typically measured in watt seconds, kilowatt-hours or watt-hours; Symbol Ws, kWh or Wh.

3.3
connected load
theoretically possible maximum power consumption of a machine, which can be expected when components of the printing machine are running at maximum load

Note 1 to entry: The connected load is the power specified by the manufacturer and used to rate the electrical power supply of the printing house (power rating, fuse rating, cable cross section). This ensures fail-safe operation of the machine under any possible operating condition. Determination of the connected load value has not been uniformly regulated so machine manufacturers handle it differently.

Note 2 to entry: The connected load should not be used to calculate a device's actual power consumption. This is always lower, and in most applications, it is significantly lower.

3.4
operational power consumption
power consumption of a machine in a defined operating condition (operational mode)

Note 1 to entry: Active power, reactive power and apparent power are distinct operational power consumptions. Typical operating modes are Sleep, Print Ready and Production (also known as active mode).

3.5
active power
P
power available for conversion into other types of power

Note 1 to entry: Mechanical, thermal or chemical power. In general, the active power of a consumer in a periodic AC voltage system can be determined with the formula

$$P = 1/T \int_0^T u(t) \times i(t) dt$$

where T is the desired period.

Note 2 to entry: standard unit: watt, kilowatt; symbol: W, kW.

3.6
reactive power
Q
power caused by inductive, capacitive and non-sinusoidal consumers placing additional burden on supply network

Note 1 to entry: Standard unit: volt ampere reactive; Symbol: var, kvar.

3.7
apparent power
S
geometric sum of *active power*, *P*, (3.5) and *reactive power*, *Q*, (3.6) and/or the product of the effective values of voltage and current

Note 1 to entry: It can be calculated as follows:

$$S = U_{\text{eff}} \times I_{\text{eff}}$$

Note 2 to entry: With non-ohmic consumers, the apparent power is always higher than the active power. The electrical connections ought to be sized analogously to the apparent power that can be transferred.

Note 3 to entry: Standard unit: volt ampere, kilovolt-ampere; Symbol: VA, kVA.

3.8
power meter
power analyser, which records voltages and currents as continuous values to determine power parameters

Note 1 to entry: For example, active, apparent and/or reactive power by numerical integration.

Note 2 to entry: These are high precision devices designed for industrial use.

3.9
Sleep mode
period when printing machine is switched on, not printing and operating with lower power than that of Print Ready mode

Note 1 to entry: A reduced power state that a printing device automatically enters after a set period of inactivity. Sleep mode permits operation of all product features (including maintenance of network connectivity), albeit with a possible delay to transition into Print Ready or production mode.

3.10
Print Ready mode
period when printing machine is switched on with all assembled components (pre and post processing units) ready to print immediately

3.11
production mode
period when printing machine is printing live jobs

Note 1 to entry: A production mode is characterized by a stable power consumption, when the printing machine is printing in a representative and typical fashion.

Note 2 to entry: The production mode is also known as the steady production mode.

3.12
Raster Image Processor
RIP
device or piece of software which converts coded character data and/or vector data into a raster bit stream (bitmap)

[SOURCE: ISO 12637-2:2008, 2.115, modified]

3.13
machine combination
software, hardware and print media having a direct influence on the resulting print image quality

EXAMPLE BQ combination = device configuration (hardware) + substrate (media) + print mode (software)

Note 1 to entry: *RIP* (3.12) and *print mode* (3.17) settings are examples of machine combination.

Note 2 to entry: When the settings depend heavily on the RIP and printing technology, the machine combination can also be referred to as the digital printing combination.

3.14
device configuration
physical hardware equipment included in a given production line

3.15
basic device configuration
standard hardware equipment configuration as defined by the manufacturer, owner or user of the device for the type of printed products or market that the press is being used

3.16
alternative device configuration
physical hardware configuration differing from the basic device configuration