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Hydraulic fluid power — Design methodology for energy efficient systems

Transmissions hydrauliques — Méthodologie de conception de systèmes à haut rendement énergétique

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Foreword

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This document was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 9, *Installations and systems*.

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Introduction

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

Based on relevant considerations, ISO 18464 is focused on environmental impacts related to the energy consumed by hydraulic systems during operation and defines a design process for hydraulic systems including energy consumption as a key criterion.

Energy consumption of hydraulic systems is primarily defined by the type of machine, e.g. lathes, injection moulding machines and excavators, their duty cycles and the architecture of hydraulic systems.

Additionally, the level of energy consumption is a function of the requirements of the machine, duty cycle and frequency of use by the operator. It is only when the machines are adapted for specific applications (e.g. working cycle, control precision, level of automation) in an optimal manner, that energy efficient concepts can have the most positive impact.

Typical applications for hydraulics in machines are

— clamping applications with high force,

— press applications with high force,

— motion, acceleration and braking of heavy loads,

— hydraulic mass compensation, and

— hydrostatic transmission.

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Hydraulic fluid power — Design methodology for energy efficient systems

1 Scope

This document specifies a design methodology for hydraulic systems that can be operated with the lowest possible energy consumption while maintaining the intended functionality of the stationary or mobile machinery in which they are installed.

This document takes into account the duty cycles of the application. The definition of the duty cycles is not part of this document.

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 5598, *Fluid power systems and components — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and the following apply.

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

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

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

3.1
hydraulic system
arrangement of interconnected components including one or more prime movers, that generates, transmits, controls and converts hydraulic fluid power

4 Symbols and abbreviated terms

The symbols used throughout this document are shown in Table 1.

Table 1 — List of symbols

Symbol	Abbreviated term
d	inner diameter of piping
$E_{a,e}$	amount of energy stored in hydraulic accumulators or other energy storage devices at the end of the stabilised duty cycle, if energy storage devices are part of hydraulic systems
$E_{a,s}$	amount of energy stored in hydraulic accumulators or other energy storage devices at the beginning of the stabilised duty cycle, if energy storage devices are part of hydraulic systems
$E_{c,in}$	energy consumption of the hydraulic system over the considered duty cycle
$E_{c,in,i}$	energy consumption for a specific duty cycle, i

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