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**Earth-moving machinery —  
Hydraulic excavator and backhoe  
loader lowering control device —  
Requirements and tests**

*Engins de terrassement — Dispositif de contrôle d'abaissement de la  
flèche des pelles et chargeuses-pelleteuses hydrauliques — Exigences  
et méthodes d'essai*

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Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
[copyright@iso.org](mailto:copyright@iso.org)  
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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](http://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](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 1, *Test methods relating to safety and machine performance*.

This third edition cancels and replaces the second edition (ISO 8643:1997), which has been technically revised and contains the following changes:

- requirements and test provisions have been extended to support a wider range of lowering control device configurations.

## Introduction

Where excavators or backhoe loaders are used for object handling, a failure or rupture in the hydraulic circuit can endanger persons under raised loads.

This risk can be reduced by applying a lowering control device, which ensures controlled lowering of the load in the case of a hydraulic line failure or rupture.

Test procedures are based on the design characteristics of the hydraulic systems of hydraulic excavators and the backhoe part of backhoe loaders, and conditions of use.

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# Earth-moving machinery — Hydraulic excavator and backhoe loader lowering control device — Requirements and tests

## 1 Scope

This document establishes uniform requirements and test procedures for lowering control devices fitted on the boom, intermediate boom and arm cylinders of hydraulic excavators and backhoe loaders to control the rate of drop in the case of a hydraulic line failure or rupture.

It is applicable to the lowering control devices of hydraulic excavators and the backhoe equipment of backhoe loaders used for object handling which are equipped with the standard linkage as defined by the manufacturer. On machines where alternative linkage combinations are offered, only the standard length defined by the manufacturer is subject to testing.

## 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 6165, *Earth-moving machinery — Basic types — Identification and terms and definitions*

ISO 9248:1992, *Earth-moving machinery — Units for dimensions, performance and capacities, and their measurement accuracies*  
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## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6165 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### **linkage control system**

hydraulic control components (including pilot and slave valves) used for raising and lowering the lift point in object handling applications

### 3.2

#### **lifting linkage**

assembly of parts that can be a combination of booms and arms used for raising and lowering the lift point in the object handling process

### 3.3

#### **lowering control device**

hydraulic control valves used for controlled linkage lowering in the case of a hydraulic line failure or rupture

### 3.4

#### **failure-simulation device**

hydraulic valves used for simulating a failure or rupture in a hydraulic line in the linkage control system

### 3.5

#### **signal line**

hydraulic circuit that is used to sense a pressure

EXAMPLE Diagnostic test port, stability limit system.

### 3.6

#### **rated lift capacity**

smaller of either the rated tipping capacity or the rated hydraulic lift capacity

[SOURCE: ISO 10567:2007, 3.13]

### 3.7

#### **lift point**

##### **LP**

location on the attachment (e.g. bucket) or the quick coupler, as specified by the manufacturer, to which a load can be attached

[SOURCE: ISO 10567:2007, 3.2, modified]

### 3.8

#### **lift point radius**

##### **LPR**

horizontal distance from the axis of rotation to the vertical hoist line or tackle

[SOURCE: ISO 10567:2007, 3.5]

### 3.9

#### **object handling**

application of earth-moving machinery comprising lifting, lowering and transporting of a load by use of lifting accessories, whereby the assistance of a person or the operator of the machine is required for hooking, unhooking or stabilizing (whilst transporting) the load

Note 1 to entry: If the load is picked-up by a self-acting device and no assistance of a person is required for hooking, unhooking or stabilizing the load, this work is considered as a usual earth-moving application.

Note 2 to entry: Lifting accessories are, e.g. wire ropes, chains or textile straps; loads in object handling application are, e.g. pipes, vessels; self-acting devices are, e.g. grabs, clamshell buckets, log clamps, vacuum lifting device, magnetic plate or fork.

## **4 Lowering control device requirements**

**4.1** Lowering control devices shall comply with the requirements given in [4.1.1](#) to [4.1.8](#).

**4.1.1** The lowering control device shall operate automatically while the cylinders in the linkage control system that keep the load in a lifted position are pressurized, even if the machine/ignition is switched off.

**4.1.2** The operation of the lowering control device shall not detract from the normal response of the machine during use and shall not at any time endanger the stability of the machine.

**4.1.3** A relief valve to protect the cylinder may be fitted between the cylinder and the lowering control device.

**4.1.4** In the case of a failure in the linkage control system, lowering the load shall be possible without endangering persons or the stability of the machine.



**4.1.5** Each cylinder in the linkage control system that keeps the load in a lifted position shall have the following secured to it:

- a) the lowering control device as well as related tubes and fittings between the lowering control device and the cylinder (hoses are not acceptable);
- b) when provided, a separate relief valve (see [4.1.3](#)) as well as related tubes and fittings to connect it in parallel with the lowering control device.

Tubes and fittings related to connecting the control valve, and the relief valve when provided in parallel to the cylinder, shall have a minimum burst pressure of four times the working circuit pressure for that part of the system.

**4.1.6** If signal lines are present, then rupture of one of these lines shall result in an oil leakage of not more than 10 L/min for each cylinder at an oil temperature of approximately 40 °C to 50 °C at the specified working circuit pressure.

**4.1.7** If equalizing lines between cylinders are present, then rupture of one of these lines shall result:

- for machines with an operating mass (according to ISO 6016) of up to 40 t — in an oil leakage lower than 10 L/min for each cylinder at an oil temperature of 40 °C to 50 °C at the specified working circuit pressure;
- for machines with an operating mass (according to ISO 6016) equal to or greater than 40 t — in a cylinder stroke speed lower than 3 % per second of the total stroke for each cylinder at an oil temperature of 40 °C to 50 °C at the specified working circuit pressure.

NOTE Further investigation concerning the application of the requirement to arm cylinder equalizing line is needed; in the meantime, the requirement can be applied to the arm cylinder as well.

[ISO 8643:2017](#)

**4.1.8 Performance requirements** <https://standards.iteh.ai/catalog/standards/sist/92e20e87-5473-4d8e-b028-f25da4edfbf3/iso-8643-2017>

Lowering control devices (and equalizing or signal lines, if present) shall be tested in accordance with the test conditions and acceptance criteria given in [Table 1](#).