
Earth-moving machinery — Safety —
Part 3:
Requirements for loaders

Engins de terrassement — Sécurité —

Partie 3: Exigences applicables aux chargeuses

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 20474-3 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety, ergonomics and general requirements*.

ISO 20474 consists of the following parts, under the general title *Earth-moving machinery — Safety*:

- *Part 1: General requirements*
- *Part 2: Requirements for tractor-dozers*
- *Part 3: Requirements for loaders*
- *Part 4: Requirements for backhoe-loaders*
- *Part 5: Requirements for hydraulic excavators*
- *Part 6: Requirements for dumpers*
- *Part 7: Requirements for scrapers*
- *Part 8: Requirements for graders*
- *Part 9: Requirements for pipelayers*
- *Part 10: Requirements for trenchers*
- *Part 11: Requirements for earth and landfill compactors*
- *Part 12: Requirements for cable excavators*
- *Part 13: Requirements for rollers*
- *Part 14: Information on national and regional provisions [Technical Specification]*

Introduction

This document is a type-C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

Provisions that are applicable for Australia, EU, Japan or the USA, and which are mandatory for compliance with specific governmental laws, directives or regulations in force in the particular country or region, are given in ISO/TS 20474-14.

NOTE Other countries or regions may also have regional requirements.

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Earth-moving machinery — Safety —

Part 3: Requirements for loaders

1 Scope

This part of ISO 20474 gives the safety requirements specific to loaders as defined in ISO 6165. It is intended to be used in conjunction with ISO 20474-1, which specifies general safety requirements common to earth-moving machine families, and with ISO/TS 20474-14, which gives information on provisions that are mandatory in particular countries or regions. The specific requirements given in this part of ISO 20474 take precedence over the general requirements of ISO 20474-1.

This part of ISO 20474 deals with all significant hazards, hazardous situations and events relevant to the earth-moving machinery within its Scope when used as intended or under conditions of misuse reasonably foreseeable by the manufacturer (see also ISO/TS 20474-14). It specifies the appropriate technical measures for eliminating or reducing risks arising from significant hazards, hazardous situations or events during commissioning, operation and maintenance. It is not applicable to machines manufactured before the date of its publication.

2 Normative references

The following referenced documents are indispensable for the application 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 2867, *Earth-moving machinery — Access systems*

ISO 3457, *Earth-moving machinery — Guards — Definitions and requirements*

ISO 6016, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*

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

ISO 6682, *Earth-moving machinery — Zones of comfort and reach for controls*

ISO 7131, *Earth-moving machinery — Loaders — Terminology and commercial specifications*

ISO 14397-1:2007, *Earth-moving machinery — Loaders and backhoe loaders — Part 1: Calculation of rated operating capacity and test method for verifying calculated tipping load*

ISO 14397-2, *Earth-moving machinery — Loaders and backhoe loaders — Part 2: Test method for measuring breakout forces and lift capacity to maximum lift height*

ISO 20474-1:2008, *Earth-moving machinery — Safety — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20474-1 and ISO 7131, and the following apply.

3.1 loader
self-propelled crawler or wheeled machine having front-mounted equipment primarily designed for loading operation (bucket use), which loads or excavates through forward motion of the machine

NOTE 1 A loader work cycle normally comprises filling, elevating, transporting and discharging material.

NOTE 2 Derivated machinery: loaders can also be used for derivated applications (see ISO 20474-1:2008, 3.1.2).

3.2 compact loader
loader with an operating mass as defined in ISO 6016 of 4 500 kg or less, designed to work in confined spaces with the associated needs for greater manoeuvrability

3.3 skid steer loader
loader normally having an operator station between attachment-supporting structures and steered by using variation of speed and/or direction of rotation between traction drives on opposite sides of a machine with fixed axles or with tracks

3.4 swing loader
loader having a swing-type lift arm with a swinging angle to the left and right from a straight position

NOTE A swing loader work cycle is normally similar to a loader cycle except that, additionally, work can be done offset of the machine track.

3.5 hydraulic lift capacity
maximum mass that can be lifted in any arm position with the fork in horizontal position limited by the hydraulic circuit working pressure according to ISO 14397-2

4 Safety requirements and/or protective measures

4.1 General

Loaders shall comply with the safety requirements and/or protective measures of ISO 20474-1, in as far as those are not modified by the specific requirements of this clause.

4.2 Loaders with front access

The access system of loaders with front access shall be in accordance with ISO 2867.

4.3 Operator's seat

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.4 Rear windows

ISO 20474-1:2008, 4.3.2.7 and 4.3.2.9 for the rear window(s) shall apply, with the exception that no motorized wiper(s) and washers are required for loaders with a cab width ≤ 750 mm, measured outside of the cab to the height of the SIP (seat index point).

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.5 Protection

4.5.1 Roll-over protective structures (ROPS)

ISO 20474-1, 4.3.3, shall apply.

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.5.2 Falling object protective structures (FOPS)

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.5.3 Fenders

ISO 20474-1:2008, 4.14.7, is not applicable to compact loaders with front access.

4.5.4 Operator's controls and indicators

ISO 20474-1:2008, 4.5, shall apply, with the following addition for compact loaders with front access.

Controls for lifting and lowering the loader linkage, machine movement and hydraulically controlled attachments (e.g. multi-purpose bucket) shall be either automatically mechanically secured (e.g. by a safety bar) or automatically deactivated when the operator leaves/enters the operator's compartment.

4.5.5 Guarding for loaders with front access

Loaders shall be fitted with side protection that prevents the operator from reaching the trapping parts between the side arms and fixed parts of the machine when the operator is seated in the operator's position. Opening in the guards shall comply with ISO 3457. For the lower limbs, guards are required within the zone of reach as specified in ISO 6682 and shall have a minimum height of 200 mm from the floor plate.

4.5.6 Restraint systems for machines with front access

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.6 Stability

4.6.1 General requirements

For mandatory national and regional provisions, see ISO/TS 20474-14.

4.6.2 Bucket application

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.6.3 Fork application

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.6.4 Log handling application

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

4.6.5 Single heavy object (non-palletized, single heavy object) application

4.6.5.1 General

The rated operating capacity is based on the use of a single heavy object handling device (for a non-palletized load), determined using the criteria given in 4.6.5.2 to 4.6.5.4.

4.6.5.2 Rated load — Transport mode

The tipping load shall be determined in accordance with ISO 14397-1, except for the stability factor as stated in ISO 14397-1:2007, 5.1, with the block handling attachment (e.g. stone fork) in a fully roll-back-and-carry position:

- the rated load capacity as given in Table 1 is valid only for speeds ≤ 10 km/h;
- the rated load according to this mode, as a percentage of the tipping load, shall not exceed the applicable value specified in Table 1 when operating on a flat, hard surface.

Table 1 — Stability factors in single heavy object handling in transport mode

Ground condition	Rated load capacity as a percentage of tipping load	
	Wheeled loaders	Crawler loaders
Firm and level ground	80	60

4.6.5.3 Hydraulic lift capacity

It shall be possible to control the rated load in all positions foreseen by the manufacturer, considering all the relevant hydraulic circuits involved.

4.6.5.4 Rated operating capacity

The rated operating capacity shall be determined either by

- the rated load according to 4.6.5.2, or
- the hydraulic lift capacity as specified in 4.6.5.3,

whichever is the lesser of the two.

4.6.5.5 Handling attachment

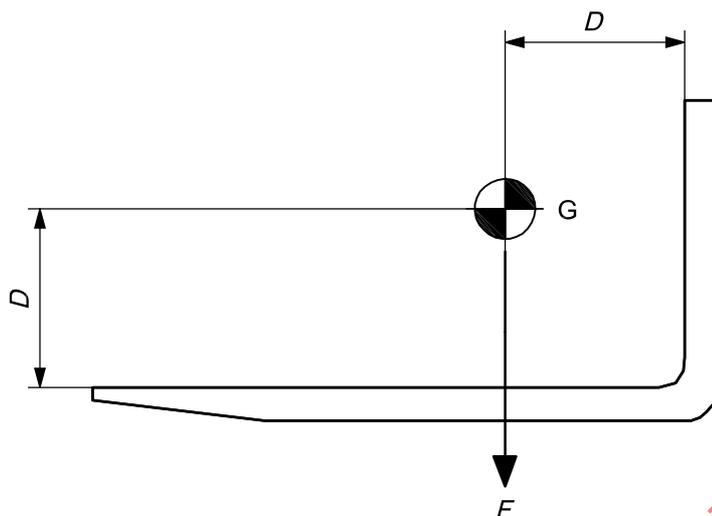
The centre of gravity distance, D , of the attachment is shown in Figure 1.

For indicating the rated operating load for a single heavy object handling attachment, a transversal square cross-section of the load should be considered.

The specifications in Table 2 should preferably be selected.

4.6.6 Object handling application

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

**Key**

D distance, mm (see Table 2)

F load, N

G centre of gravity

Figure 1 — Load centre distance with fork arms

Table 2 — Load centre distance

Load, F N	Distance, D mm
$F \leq 100\,000$	600
$100\,000 < F \leq 200\,000$	900
$F > 200\,000$	1 200

4.6.7 Other applications

The rated load of derived machinery shall be determined by the manufacturer according to the load specification given in 4.6.2 to 4.6.6, considering the comparable hazard.

5 Verification of safety requirements and/or protective measures

ISO 20474-1:2008, Clause 5, shall apply.

6 Information for use

ISO 20474-1:2008, Clause 6, shall apply with the following additions to the operator's manual (6.2):

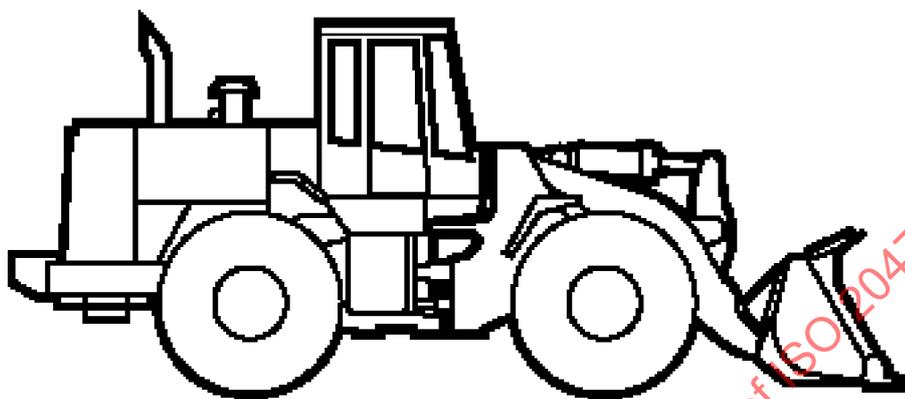
The manufacturer shall provide information on the rated operating capacity as well as the corresponding operating conditions:

- the bucket application according to 4.6.2;
- the fork application according to 4.6.3.

For mandatory national and/or regional provisions, see ISO/TS 20474-14.

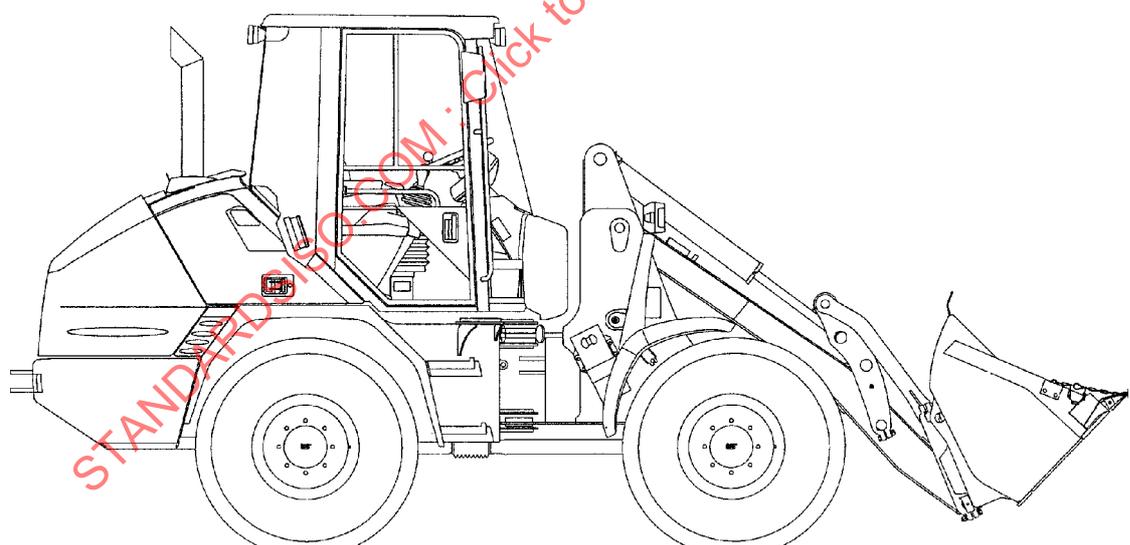
Annex A
(informative)

Illustrations



NOTE Wheeled loader with an operating mass greater than 4 500 kg.

Figure A.1 — Wheeled loader



NOTE Wheeled loader with an operating mass \leq 4 500 kg, designed to work in confined spaces and with a need for greater manoeuvrability.

Figure A.2 — Compact wheeled loader

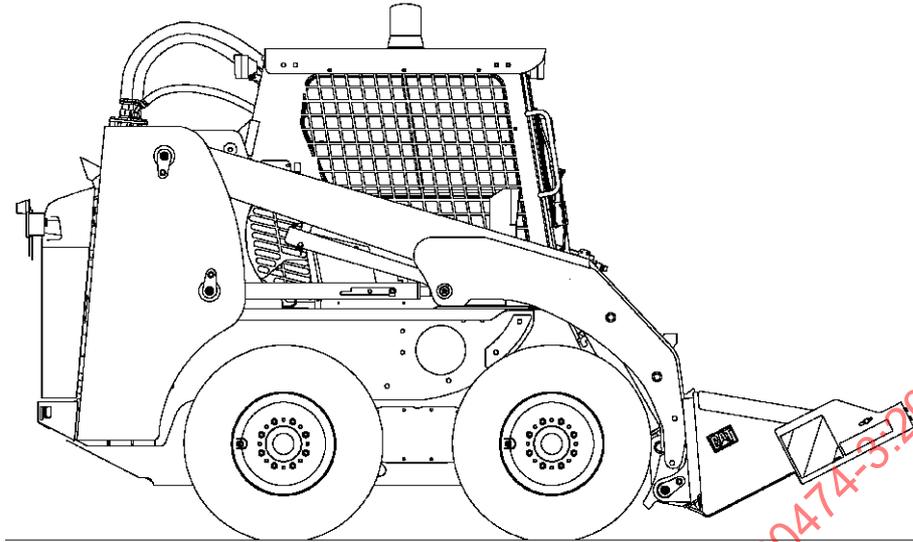


Figure A.3 — Skid steer loader

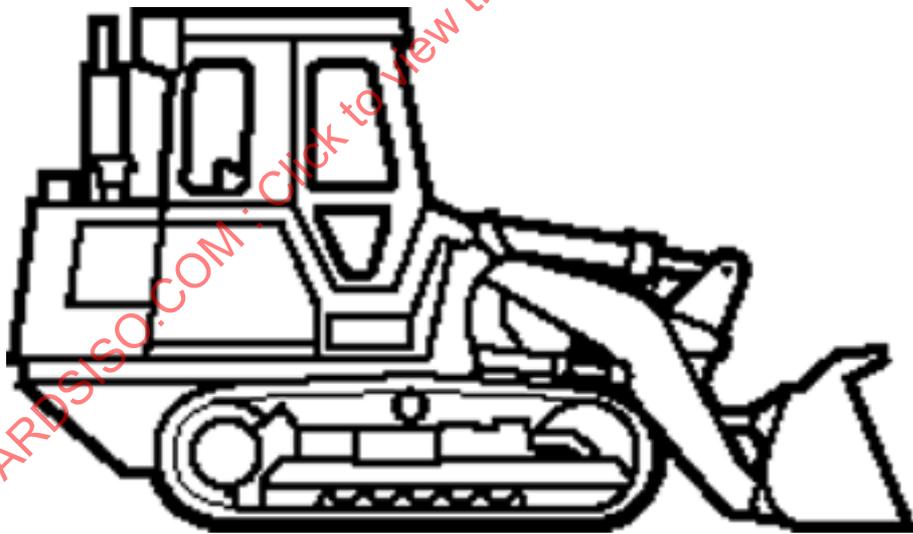


Figure A.4 — Crawler loader