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Australia



# Earth-moving machinery — Definitions of dimensions and codes

**Part 1: Base machine**



AS ISO 6746.1:2021

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- Department of Regional NSW
- Department of Resources, Qld
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- Institute of Instrumentation, Control & Automation Australia
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## Part 1: Base machine

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## Preface

This Standard was prepared by the Standards Australia Committee ME-063, Earthmoving Equipment.

The objective of this document is to define certain dimensions of earth-moving base-machines as well as the codes identifying those dimensions. At the same time, it specifies a reference system for defining, and a coding system for identifying, additional, similar dimensions in terminology standards and commercial specifications.

It applies to the basic types of earth-moving machinery as defined in ISO 6165.

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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 6746-1 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 4, *Commercial nomenclature, classification and rating*.

This third edition cancels and replaces the second edition (ISO 6746-1:1987), which has been technically revised.

ISO 6746 consists of the following parts, under the general title *Earth-moving machinery — Definitions of dimensions and codes*:

- *Part 1: Base machine*
- *Part 2: Equipment and attachments*

# Australian Standard®

## Earth-moving machinery — Definitions of dimensions and codes

### Part 1: Base machine

#### 1 Scope

This part of ISO 6746 defines certain dimensions of earth-moving base-machines as well as the codes identifying those dimensions. At the same time, it specifies a reference system for defining, and a coding system for identifying, additional, similar dimensions in terminology standards and commercial specifications.

It is applicable to the basic types of earth-moving machinery as defined in ISO 6165.

#### 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 6165, *Earth-moving machinery — Basic types — Vocabulary*

#### 3 Terms and definitions

For the purposes of this part of ISO 6746, the terms and definitions given in ISO 6165 and the following apply.

##### 3.1

##### **three-dimensional reference system**

system used to determine dimensions of earth-moving machines

SEE:

##### 3.1.1

##### **zero Y plane**

vertical plane which passes through the longitudinal centreline of the machine

##### 3.1.2

##### **X plane**

any vertical plane perpendicular to the Y plane

##### 3.1.3

##### **Z plane**

any horizontal plane perpendicular to the X and Y planes

##### 3.1.4

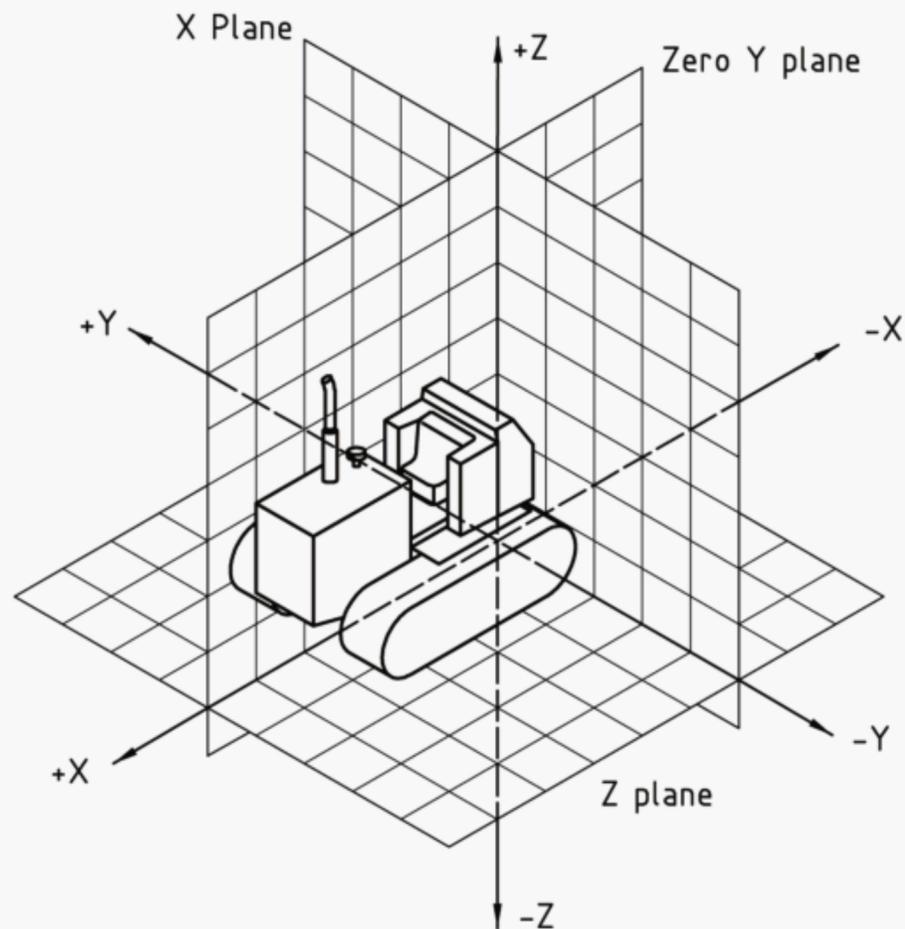
##### **positive coordinate**

positive direction, forward from the zero X plane, right from the zero Y plane and above the zero Z plane

Note 1 to entry: The intersection of the X, Y, Z axes (zero planes) is normally located at a well-defined base point: i.e. SIP for a seat as defined in ISO 5353; crankshaft centreline for an engine; sprocket or rear axle centreline for a tractor-dozzer; ground line for machine measurements.

Note 2 to entry: If only components (e.g. engine, seat) are shown, the location and positive direction of the axis from the intersection of the X, Y, Z axes (zero planes) assume the normally expected orientation of the component to a machine, i.e. number one cylinder of engine to the front of the machine, seat facing to the front.

Note 3 to entry: If the machine or its equipment or attachment or all these are illustrated, a machine driving from right to left is shown.



**Figure 1 — Three-dimensional reference system**

### 3.2

#### **ground reference plane** **GRP**

plane on which the machine is placed for measurements: in the case of the base machine, a hard, level surface; in the case of equipment and attachments, either a hard, level surface or compacted earth

Note 1 to entry: The surface used depends on the intended use of the machine and its equipment and attachments. This needs to be defined when developing specific ISO terminology standards or commercial specifications.

### 3.3

#### **base machine**

machine with a cab or canopy and operator-protective structures if required, without equipment or attachments but possessing the necessary mountings for such equipment and attachments

## 4 General

Dimensions and codes for base machines are given in [Annexes A to E](#), illustrating the use of the three-dimensional reference system (see [Figure 1](#)) and the coding system specified in [Clause 5](#) to define such dimensions and assign codes to them. Definitions of dimensions and codes for equipment and attachments are given in ISO 6746-2.

The list of examples given in the annexes is not exhaustive. The same general principles should be used when defining, and assigning identifying codes to, other earth-moving base-machine dimensions in specific terminology standards or commercial specifications.

The three-dimensional reference system shall be used to determine such dimensions.

## 5 Coding system

Each dimension is assigned a code composed of a capital letter and reference number.

A single capital letter shall be used to indicate the type of base-machine dimension, according to the following:

*H* = height (see [Annex A](#));

*W* = width (see [Annex B](#));

*L* = length (see [Annex C](#));

*R* = radius (see [Annex D](#));

*A* = angle (see [Annex E](#)).

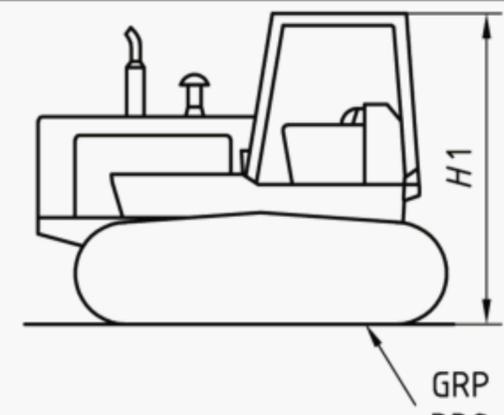
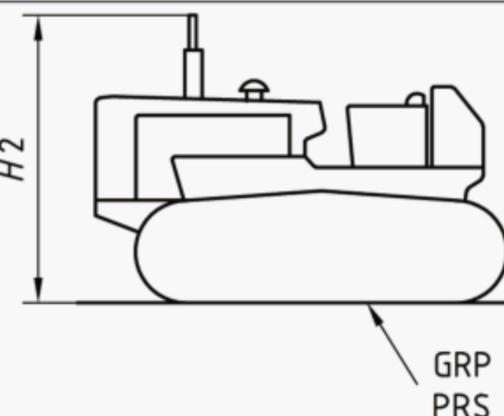
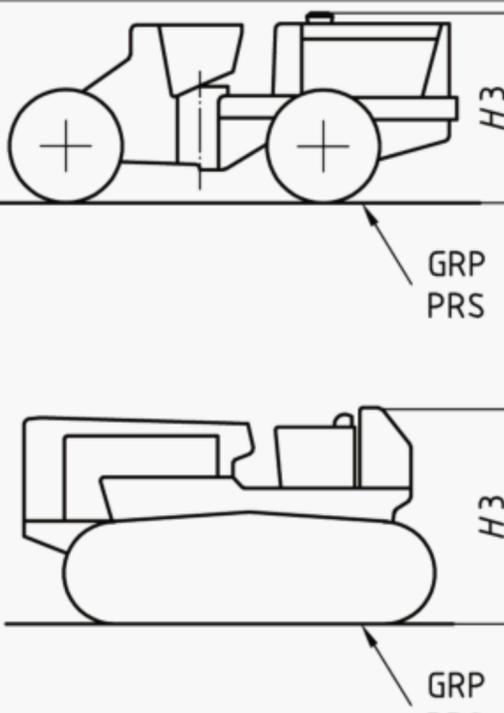
More than one reference number may be added to the appropriate capital letter, depending on the needs of the specific earth-moving base machine for which a standard or commercial specification is being developed.

## Annex A (normative)

### Heights

This annex defines base-machine heights and specifies their codes.

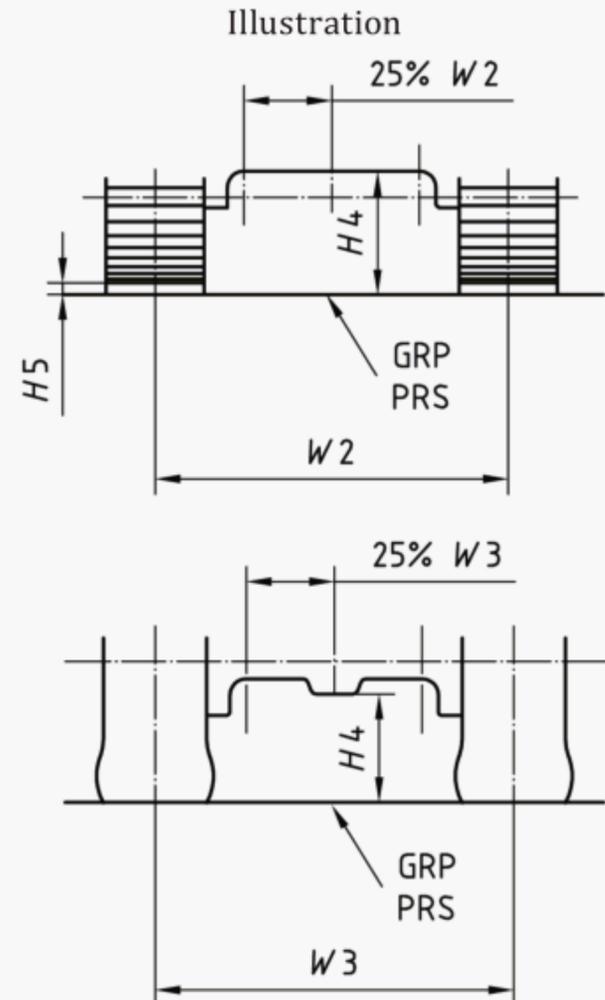
La présente annexe définit les hauteurs des engins de base et spécifie leurs codes.

Code	Term and definition	Illustration
<i>H1</i>	<p><b>maximum height</b></p> <p>distance on Z coordinate between the GRP and the highest point of the machine with cab or operator protective structures (e.g. ROPS), including track grousers resting on a hard surface with no penetration</p>	 <p>The diagram shows a side view of a tracked machine. A vertical dimension line on the right side indicates the height from the ground level to the top of the operator's cab. The ground level is marked with a horizontal line and labeled 'GRP PRS' with an arrow pointing to it. The height is labeled 'H1'.</p>
<i>H2</i>	<p><b>maximum height without cab or ROPS</b></p> <p>distance on Z coordinate between the GRP and the highest point of the machine without cab or operator protective structures (e.g. ROPS), including track grousers resting on a hard surface with no penetration</p>	 <p>The diagram shows a side view of a tracked machine with the cab removed. A vertical dimension line on the left side indicates the height from the ground level to the highest point of the machine's body. The ground level is marked with a horizontal line and labeled 'GRP PRS' with an arrow pointing to it. The height is labeled 'H2'.</p>
<i>H3</i>	<p><b>shipping height</b></p> <p>distance on Z coordinate between the GRP and the highest point on the machine after removal of parts normally removed for shipping</p>	 <p>The diagram consists of two parts. The top part shows a top-down view of a tracked machine with two wheels marked with a cross. A vertical dimension line on the right side indicates the height from the ground level to the highest point of the machine. The ground level is marked with a horizontal line and labeled 'GRP PRS' with an arrow pointing to it. The height is labeled 'H3'. The bottom part shows a side view of the same machine with the cab removed. A vertical dimension line on the right side indicates the height from the ground level to the highest point of the machine's body. The ground level is marked with a horizontal line and labeled 'GRP PRS' with an arrow pointing to it. The height is labeled 'H3'.</p>

Code **H4** Term and definition **ground clearance**

distance on Z coordinate between the GRP and the central part of the machine, minus dimension *H5*

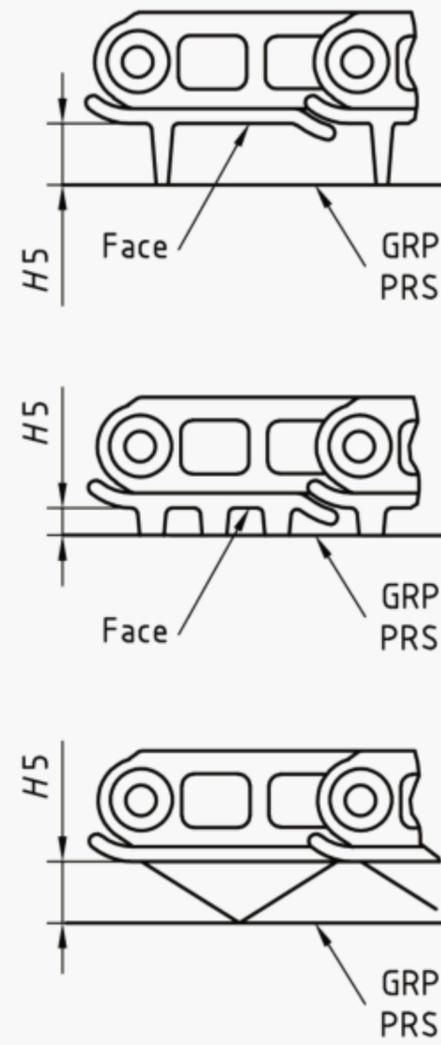
NOTE The central part of the machine is defined as 25 % of the track gauge (*W2*) or tread (wheel track) (*W3*) to either side of the zero Y plane.



Code **H5** Term and definition **grouser height**

distance on Z coordinate between two Z planes passing through the face of the shoe and the tip of the grouser

NOTE For a triangular section shoe, it is the distance between two Z planes passing through the track link bolting surface and the tip of the grouser.



## Annex B (normative)

### Widths

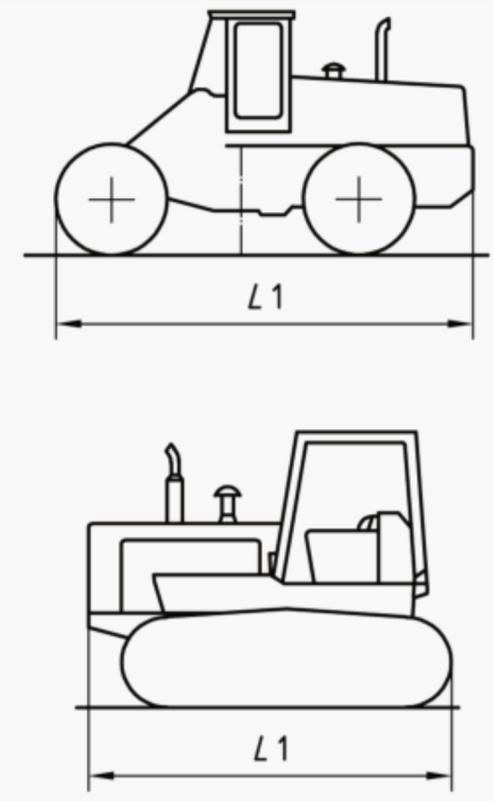
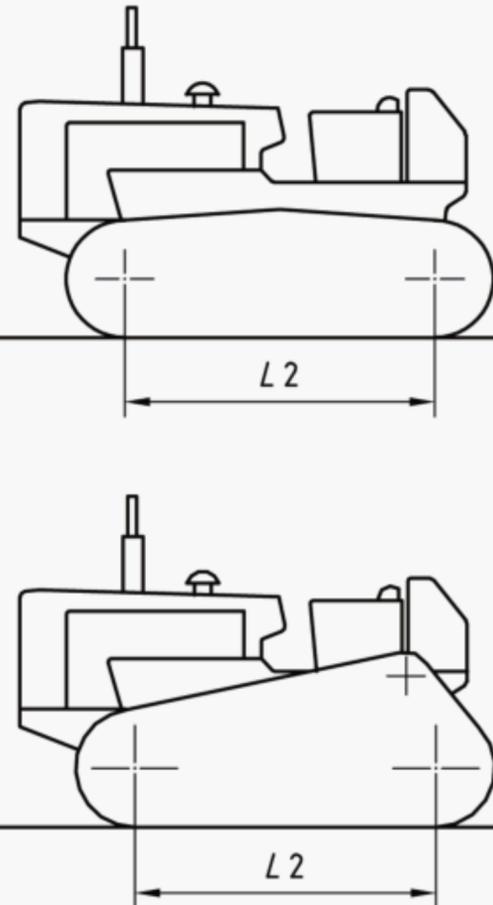
This annex defines base-machine widths and specifies their codes.

Code	Term and definition	Illustration
W1	<p><b>maximum width</b></p> <p>distance on Y coordinate between two Y planes passing through the farthest points of the machine on both sides of the zero Y plane</p>	
W2	<p><b>track gauge</b></p> <p>distance on Y coordinate between two Y planes passing through the mid-width of the sprocket teeth</p>	
W3	<p><b>tread (wheel type)</b></p> <p>distance on Y coordinate between two Y planes passing through the tyre centreline</p> <p>NOTE 1 In the case of dual wheels, it is the distance between two Y planes passing through the centreline of the dual wheels.</p> <p>NOTE 2 If the machine has more than one tread (wheel track) dimension, each is specified.</p>	
W4	<p><b>track shoe width</b></p> <p>distance on Y coordinate between two Y planes passing through the extreme lateral points of the same track shoe</p>	

## Annex C (normative)

### Lengths

This annex defines base-machine lengths and specifies their codes.

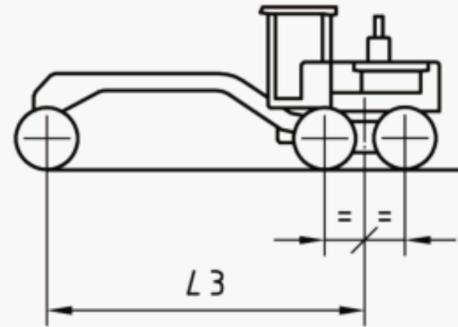
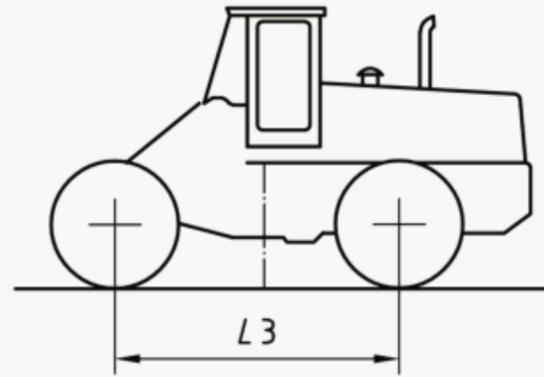
Code	Term and definition	Illustration
<i>L1</i>	<p><b>maximum length</b></p> <p>distance on X coordinate between two X planes passing through the farthest points on the front and rear of the machine</p>	 <p>The illustration for <i>L1</i> shows two types of machines. The top machine is a wheeled tractor with two large wheels. A horizontal dimension line labeled <i>L1</i> spans the distance between the centerlines of the front and rear wheels. The bottom machine is a crawler tractor with a continuous track. A horizontal dimension line labeled <i>L1</i> spans the distance between the farthest points on the front and rear of the machine's chassis.</p>
<i>L2</i>	<p><b>crawler base</b></p> <p>distance on X coordinate between two X planes passing through the front idler axis and the sprocket (or rear idler) axis</p>	 <p>The illustration for <i>L2</i> shows two configurations of a crawler tractor. The top configuration shows the machine from a side view with the front idler and sprocket axes marked with crosses. A horizontal dimension line labeled <i>L2</i> spans the distance between these two axes. The bottom configuration shows the machine from a different side view, also with the front idler and sprocket axes marked with crosses, and a horizontal dimension line labeled <i>L2</i> indicating the distance between them.</p>

Code Term and definition  
*L3* **wheel base**

distance on X coordinate between two X planes passing through the centres of the front wheels and the rear wheels with machine and wheels in the straight-ahead position

NOTE For machines equipped with rear tandem, the centre of the rear wheels is the line midway between the two axles of the tandem.

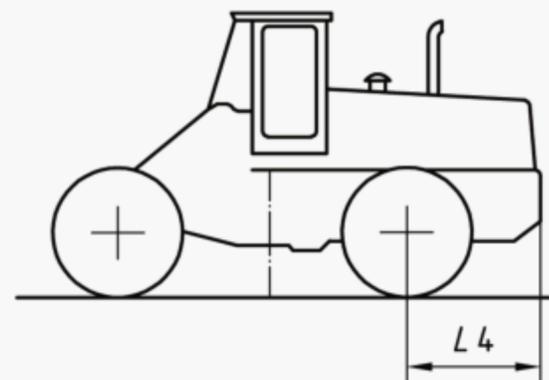
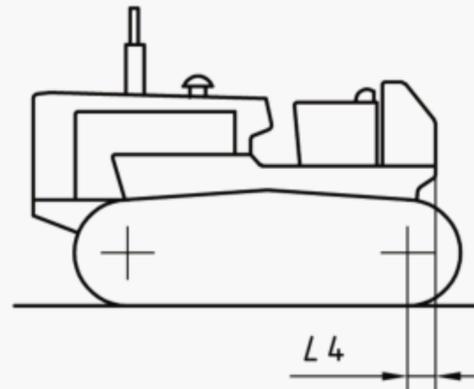
Illustration



*L4* **rear overhang**

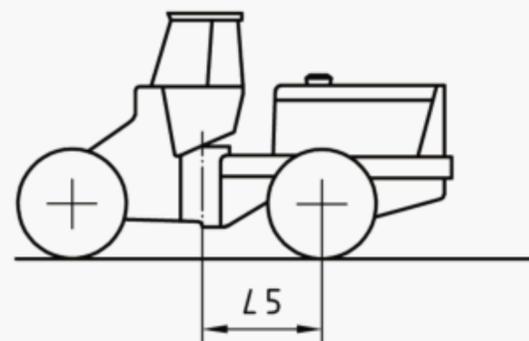
<crawler machines> distance on X coordinate between two X planes passing through the sprocket or rear idler axis and the rear mounting surface of the machine

<wheeled machines> distance on X coordinate between two X planes passing through the rear wheel centre and the rearmost feature



*L5* **rear axle to pivot of articulated steering**

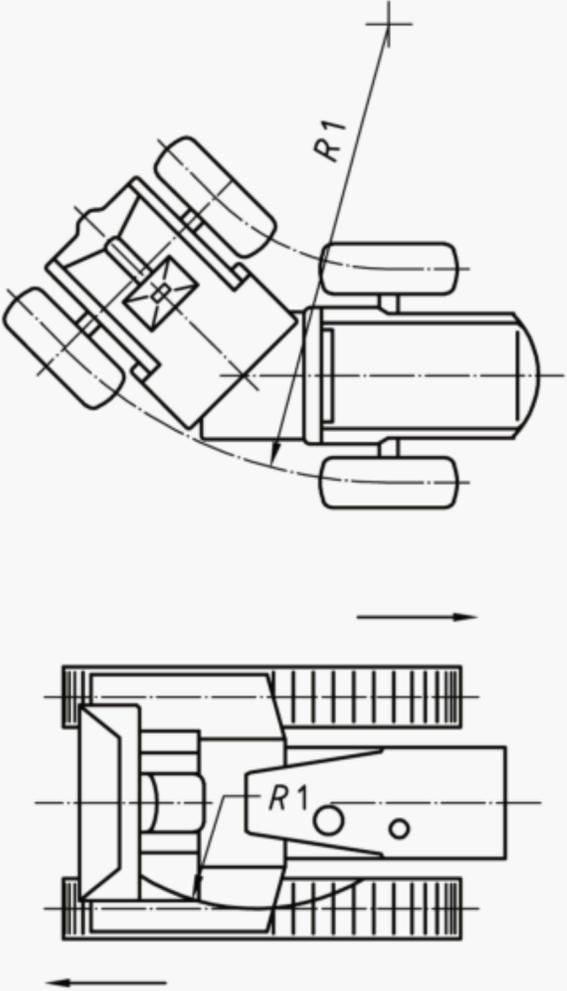
distance on X coordinate between two X planes passing through the rear axle and pivot centre



## Annex D (normative)

### Radial dimensions

This annex defines base-machine radii and specifies their codes.

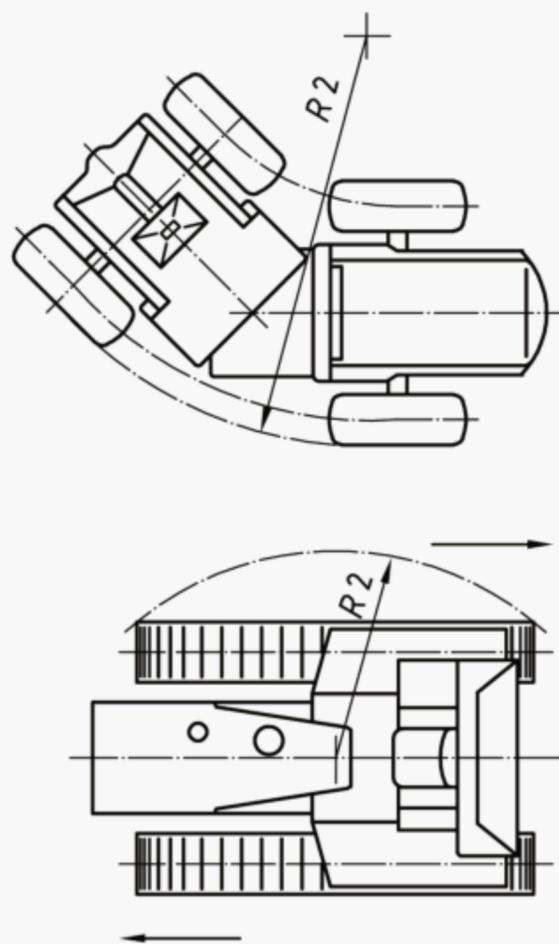
Code	Term and definition	Illustration
<p><i>R1</i></p>	<p><b>turning radius</b></p> <p>distance in Z plane between the turning centre and the track or tyre centreline describing the largest circle, while the machine is executing its smallest practicable turn</p> <p>NOTE For machines with independent steering, <i>R1</i> will be measured from the machine centreline.</p>	 <p>The illustration consists of two parts. The top part is a perspective view of a tracked machine with four tracks, shown in a sharp turn. A dashed line indicates the turning center, and a dimension line labeled 'R1' shows the distance from this center to the centerline of the outer track. The bottom part is a side-view cross-section of the machine's track system, showing the sprockets and the track. A dimension line labeled 'R1' is drawn from the machine's centerline to the centerline of the track, with arrows indicating the direction of travel.</p>

Code      Term and definition  
*R2*      **clearance radius**

distance in Z plane between the turning centre and the farthest point of the machine while it is executing its smallest practicable turn

NOTE For machines with independent steering, *R2* will be measured from the machine centreline.

Illustration



## Annex E (normative)

### Angular dimensions

This annex defines base-machine angles and specifies their codes.

Code	Term and definition	Illustration
A1	<p><b>articulation angle</b></p> <p>angle in Z plane described by the front portion of a machine when pivoting from the straight-ahead position to the maximum left or right position</p>	
A2	<p><b>Ackermann steering angle</b></p> <p>angle in Z plane described by the front or rear axle of the machine when the wheels are pivoting from the straight-ahead position to the maximum left or right position</p>	
A3	<p><b>angle of approach</b></p> <p>angle in Y plane between the GRP and a plane, tangent to the forward tyres or tracks and passing through the lowest point of any structure of the base machine forward to the tyres or tracks, which limits the magnitude of the angle</p>	
A4	<p><b>angle of departure</b></p> <p>angle in Y plane between the GRP and a plane tangent to the rear tyres or tracks and passing through the lowest point of any structure of the base machine behind the tyres or tracks, which limits the magnitude of the angle.</p>	

## **Bibliography**

- [1] ISO 5353, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point*

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