INTERNATIONAL STANDARD

ISO 7134

Third edition
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Earth-moving machinery — Graders — Terminology and commercial specifications

Engins de terrassement — Niveleuses — Terminologie et spécifications commerciales

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.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.

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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 7134 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 4, *Terminology, commercial nomenclature, classification and ratings*.

This third edition cancels and replaces the second edition (ISO 7134:1993), which has been technically revised. It also incorporates Technical Corrigendum ISO 7134:1993/Cor 1:1996.

Earth-moving machinery — Graders — Terminology and commercial specifications

1 Scope

This International Standard establishes terminology and the content of commercial literature specifications for graders and their equipment.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5010, *Earth-moving machinery — Rubber-tyred machines — Steering requirements*

ISO 6746-1, *Earth-moving machinery — Definitions of dimensions and codes — Part 1: Base machine*

ISO 6746-2, *Earth-moving machinery — Definitions of dimensions and codes — Part 2: Equipment and attachments*

ISO 7457, *Earth-moving machinery — Determination of turning dimensions of wheeled machines*

ISO 15550:2002, *Internal combustion engines — Determination and method for the measurement of engine power — General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6746-1 and ISO 6746-2, and the following apply.

3.1 General

3.1.1
grader
self-propelled wheeled machine with an adjustable blade positioned between the front and rear axles, which can be equipped with a front-mounted blade or scarifier that can also be located between the front and rear axles

[SOURCE: ISO 6165:2012, 4.8]

3.1.2
base machine
grader without equipment, as described by the manufacturer's specifications, but provided with the necessary mountings to secure the attachments

3.1.3
equipment
set of components mounted onto the base machine to fulfil the primary design function

3.1.4
attachment
optional assembly of components that can be mounted onto the base machine for a specific use

3.1.5
component
part or an assembly of parts of a base machine, equipment or an attachment

3.2 Masses

3.2.1
operating mass
mass of the base machine, equipment specified by the manufacturer, operator (75 kg), full fuel tank and full lubricating, hydraulic and cooling systems

3.2.2
shipping mass
mass of the base machine without operator, with full lubricating, hydraulic and cooling systems, 10 % of fuel tank capacity and with or without equipment, cab, canopy and/or operator protective structure, as stated by the manufacturer

3.2.3
cab [canopy] [ROPS] [FOPS] mass
mass of cab [canopy] [ROPS (roll-over operator protective structure)] [FOPS (falling-object operator protective structure)] with all components and mountings required to secure it to the base machine

3.3 Performance

3.3.1
net power
power obtained on a test bed at the end of the crankshaft or its equivalent, at the corresponding engine speed, with the equipment and auxiliaries listed in ISO 15550:2002, Table 1, column 2, and required in column 3 (fitted for engine net power test)

Note 1 to entry: If the power measurement can only be carried out with a mounted gearbox, the losses in the gearbox should be added to the measured power to give the net engine power.

[SOURCE: ISO 15550:2002, 3.3.3.1, modified.]

3.3.2
maximum travel speed
maximum speed that can be obtained on hard level surfaces in each of the forward and reverse gear ratios available

3.4 Attachments (for dimensions, see Annex B)

3.4.1
scarifier
mechanism having teeth for penetrating and loosening to shallow depths materials such as earth, asphalt and gravel roads, and similar surfaces

Note 1 to entry: The scarifier may be located on the grader ahead of the front wheels or between front and rear wheels.

3.4.2
ripper
attachment consisting of a frame connected to the rear part of the base machine by means of a mounting bracket

Note 1 to entry: It is equipped with one or more teeth.

3.4.3
snowplough
structure located ahead of the front wheels, designed to move snow laterally by the ploughing action of a mould-board

Note 1 to entry: The plough may be either one-way or V configuration.

3.4.4
front blade
blade usually curved as a mould-board located ahead of the front wheels, designed to scrape and push earth and similar materials generally forward

4 Base machine

4.1 Types of graders

Graders shall be classified according to the following attributes.

4.1.1 Undercarriage — Number of wheels

A grader may have

— four (see Figure 1), or

— six (see Figure 2)

wheels.

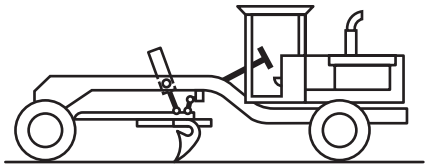


Figure 1 — Four-wheel grader

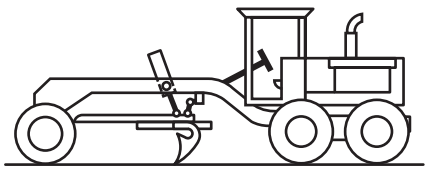


Figure 2 — Six-wheel grader

4.1.2 Number of engines

Graders have a single engine. See Figure 3.

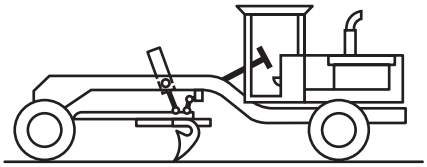


Figure 3 — Grader with single engine

4.1.3 Engine location

The grader's engine may be located

— at the front (see Figure 4), or

— the rear (see Figure 5).

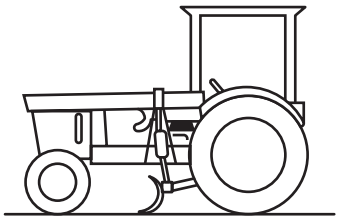


Figure 4 — Grader with front engine

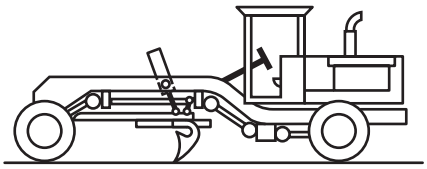


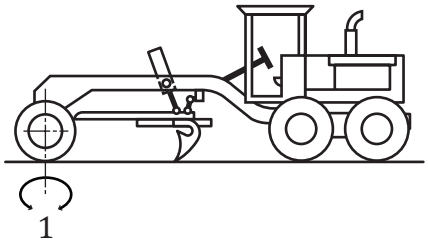
Figure 5 — Grader with rear engine

4.1.4 Steering system

The system may be

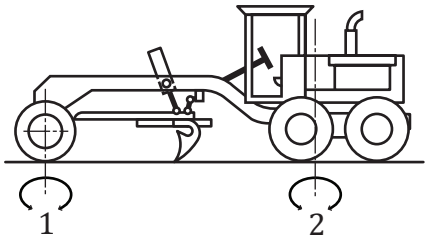
— front-wheel steer (see Figure 6), or

— front-wheel and articulated-frame steer (see Figure 7).



Key
1 steerable wheels

Figure 6 — Front-wheel-steer grader



Key
1 steerable wheels
2 turning centre

Figure 7 — Front-wheel- and articulated-frame–steer grader

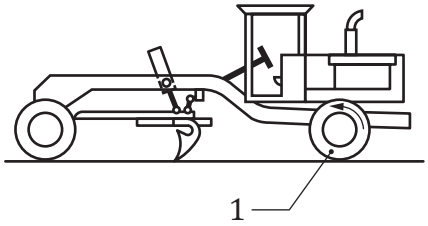
4.1.5 Drive system

The drive system may be

— two-wheel-drive (see Figure 8),

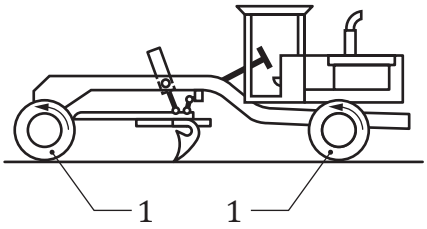
— four-wheel-drive (see Figure 9), or

— six-wheel-drive (see Figure 10).



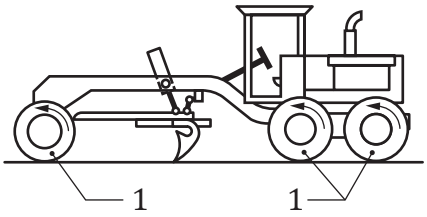
Key
1 drive wheels

Figure 8 — Two-wheel-drive grader



Key
1 drive wheels

Figure 9 — Four-wheel-drive grader



Key
1 drive wheels

Figure 10 — Six-wheel-drive grader

4.2 Dimensions

Dimensions of the base machine (grader) are shown in Figure 11.

For the definitions of the base machine dimensions, see ISO 6746-1. The X, Y and Z coordinates and the GRP (ground reference plane) shall be in accordance with ISO 6746-1.

For definitions of dimensions strictly related to graders, see Annex A and Annex B.

NOTE Wheel tread (*W*3) can be different for front and rear tyres.

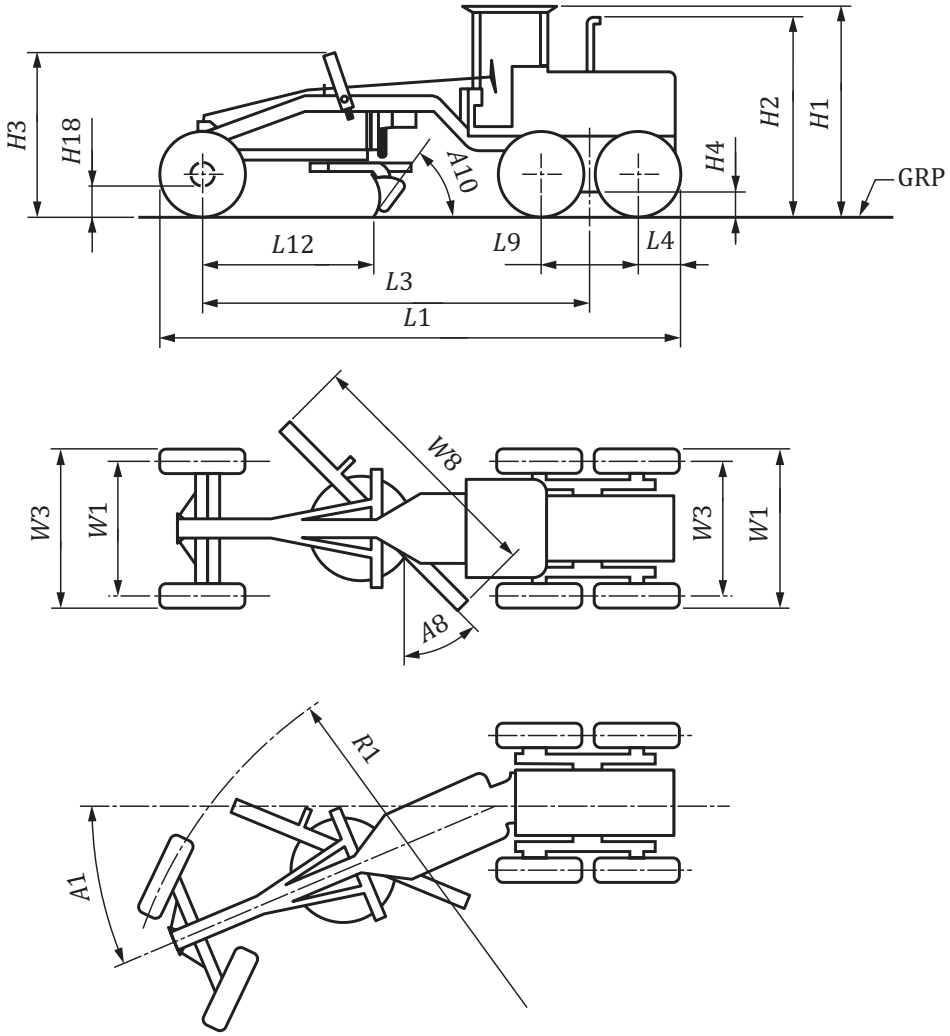
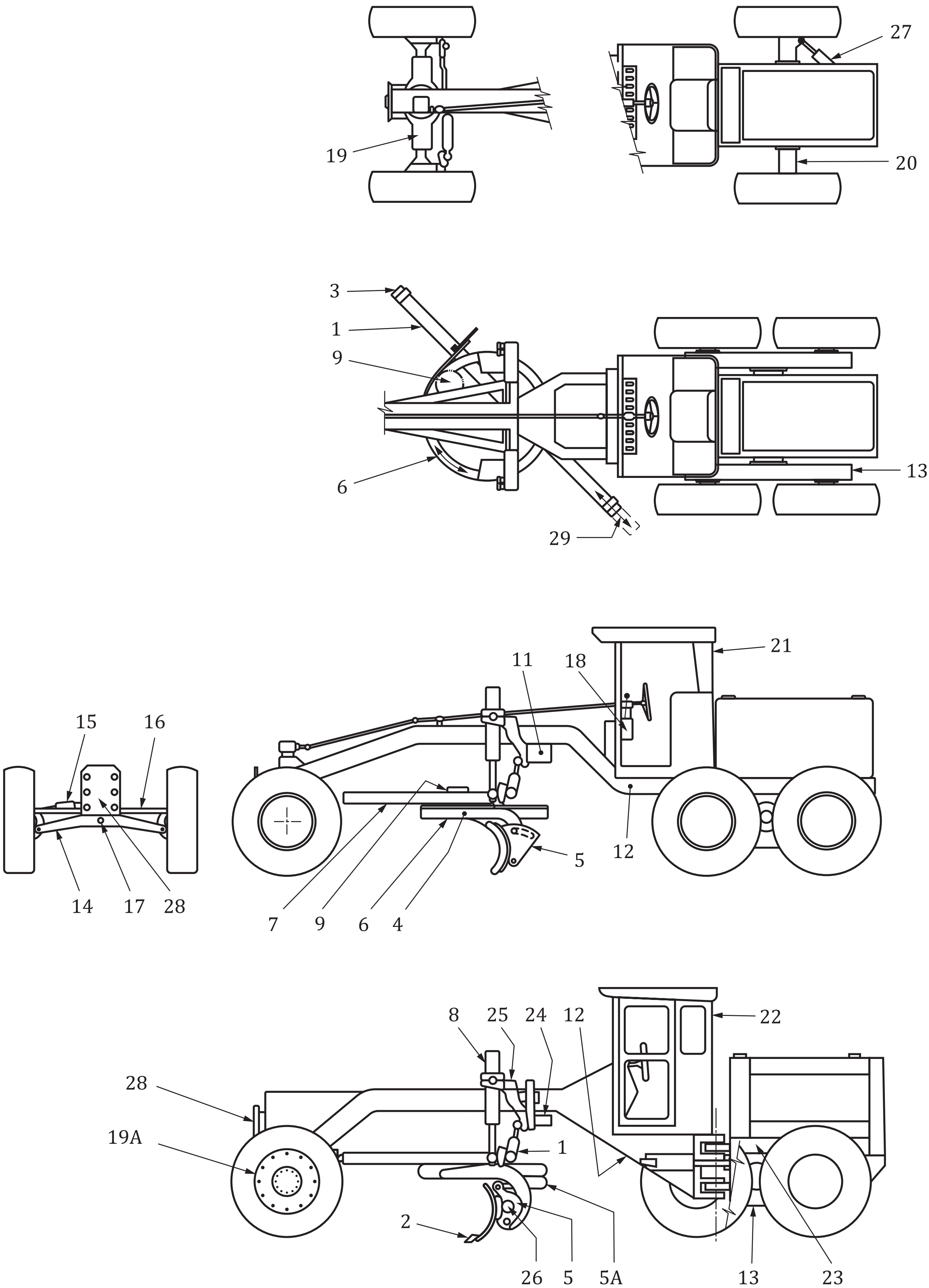


Figure 11 — Dimensions of base machine — Grader

4.3 Nomenclature

See Figure 12 for grader component nomenclature.



Key

1	blade
2	cutting edge
3	bit, end
4	arm, blade
5	bracket, blade pitch
5A	cylinder, blade pitch
6	circle
7	drawbar
8	cylinder, blade lift
9	drive, circle
10	cylinder, circle sideshift
11	circle sideshift
12	frame, main
13	drive, tandem
14	axle, front
15	cylinder, wheel lean
16	tie bar, wheel lean
17	pin, axle pivot
18	control, power
19	drive, front (mechanical)
19A	drive, front (hydraulic)
20	drive, rear
21	canopy, ROPS
22	cab, ROPS
23	frame, engine
24	lock, lift arm
25	arm, lift
26	cylinder, blade sideshift
27	cylinder, rear stear
28	plate, attachment
29	blade sideshift

Figure 12 — Grader component nomenclature

5 Attachments

5.1 Dimensions

For the definitions of dimensions related to grader attachments, see Annex B.

The dimensions of the scarifier, ripper, snowplough and front blade are shown in Figures 13 to 16 respectively.

For definitions of dimensions, see ISO 6746-2.

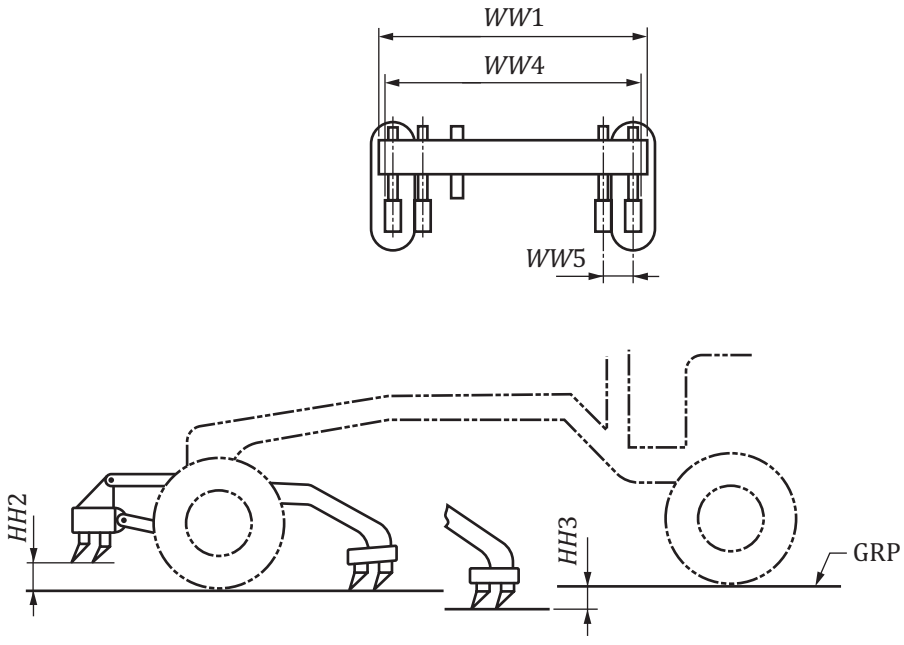


Figure 13 — Scarifier dimensions

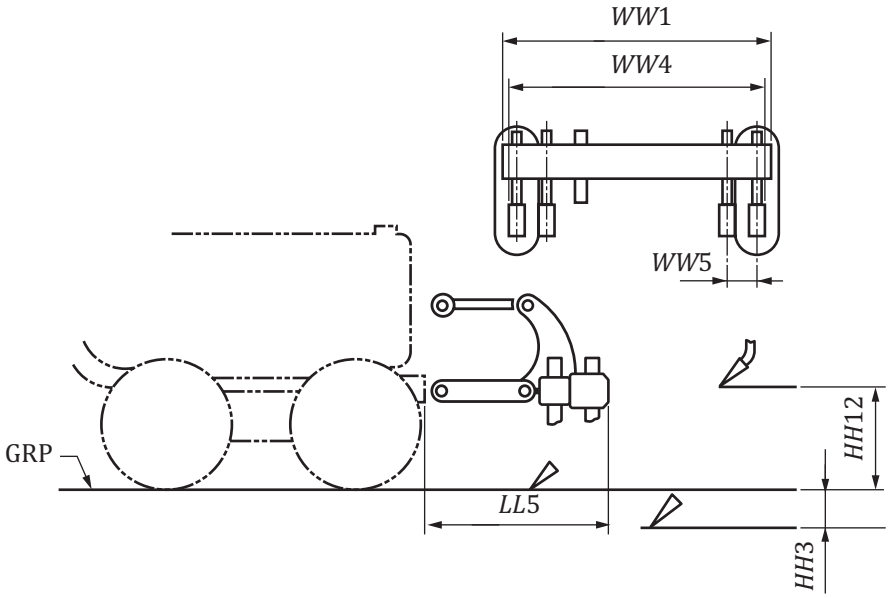


Figure 14 — Ripper dimensions

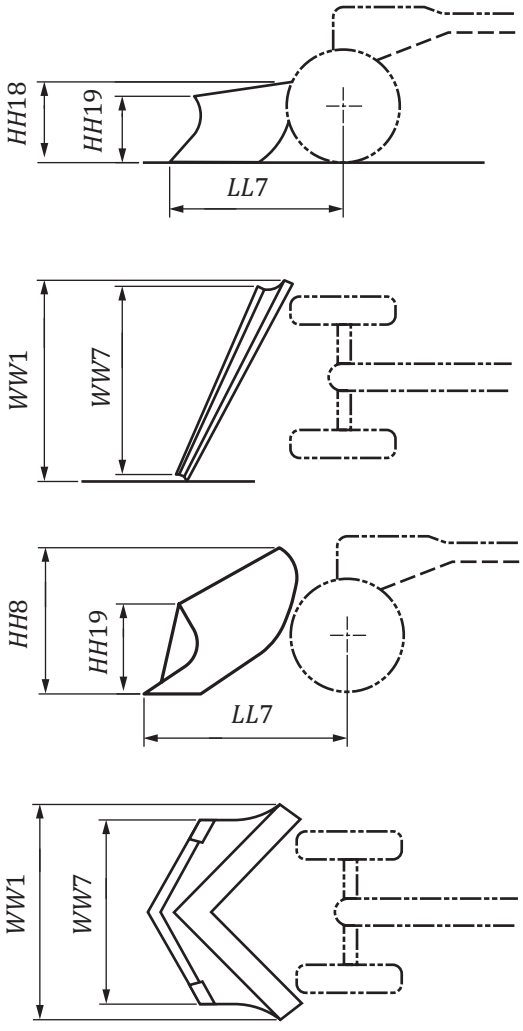


Figure 15 — Snowplough dimensions

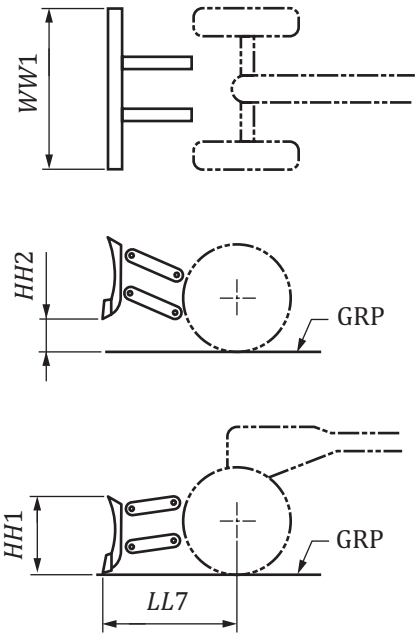
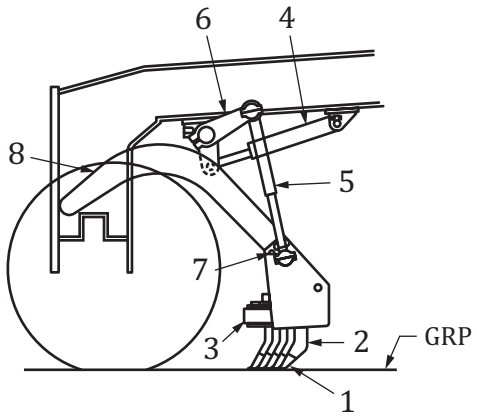


Figure 16 — Front-blade dimensions

5.2 Nomenclature

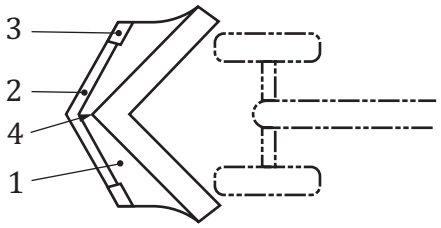
The nomenclature of parts of the scarifier, snowplough and front blade are given in Figure 17, 18 and 19 respectively. See ISO 6747 for nomenclature applicable to rippers.



Key

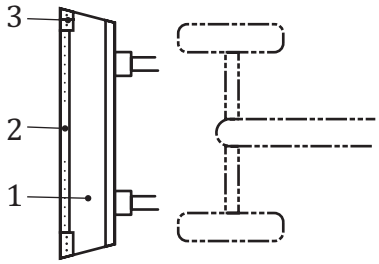
1	point	5	link, lift
2	shank	6	arm, lift
3	block, tool	7	pitch adjustment
4	cylinder	8	beam

Figure 17 — Scarifier nomenclature



Key
1 mould board
2 cutting edge
3 end bit
4 nose piece

Figure 18 — Snowplough nomenclature



Key
1 blade
2 cutting edge
3 end bit

Figure 19 — Front-blade nomenclature

6 Commercial literature specifications

The following is applicable for specification in commercial literature.

Units of measurement shall be expressed in SI (International System) units.

6.1 Engine

The following shall be specified:

a) manufacturer and model;

b) ignition type, i.e. compression or spark;

c) type of cycle, i.e. two- or four-stroke;

d) form of air aspiration, i.e. naturally aspirated, mechanically supercharged or turbocharged;

e) number of cylinders;

f) bore;

g) stroke;

h) displacement;

i) cooling system, i.e. air- or water-cooled;

j) type of fuel;

k) ISO net flywheel power at a given engine speed;

l) maximum torque at a given engine speed r/min;

m) starter type;

n) electrical system voltage.

6.2 Transmission

The front and rear transmission types may be specified, for example:

— manual shift with flywheel clutch;

— powershift with torque converter;

— hydrostatic;

— electric;

— number of speeds (forward and reverse);

— maximum travel speeds (forward and reverse).

6.3 Axles

6.3.1 Front

The front axle type may be specified, for example.

— powered, double reduction mechanical;

— powered, hydrostatic wheel;

— not powered;

— leaning wheel.

6.3.2 Rear

The rear axle type may be specified, for example:

— single;

— single with planetary reduction in wheel;

— tandem (specify type and ratio).

6.4 Steering

6.4.1 Type

The type of steering, in accordance with ISO 5010, shall be specified. For example:

— articulated;

— front-wheel steer;

— front-wheel and articulated frame steer;

— boosted, manual, hydrostatic.

6.4.2 Performance

The turning radius, as defined in ISO 7457, shall be specified:

a) without wheel lean;

b) with maximum articulation and maximum wheel lean.

6.5 Brakes

6.5.1 Service brakes

The type and actuating system of the service brakes may be specified, for example:

— drum, disc, wet or dry;

— mechanical, air, hydraulic, electrical, combination.

6.5.2 Secondary brake

The type of secondary brake may be specified.

6.5.3 Parking brake

The type of parking brake may be specified.

6.5.4 Brake performance

The brake performance for all applicable systems may be specified. See ISO 3450.

6.6 Tyres

6.6.1 The size and type of the tyres shall be specified.

6.6.2 The following may be specified:

— tread;

— ply rating;

— rim size.

6.7 Hydraulic system pumps

The following shall be specified:

a) type;

b) main relief valve opening pressure;

c) pump flow, at a given pressure, at rated engine speed.

6.8 System fluid refill capacities

6.8.1 The following shall be specified:

a) fuel tank;

b) hydraulic system.

6.8.2 The following may be specified:

— engine crankcase;

— cooling system;

— transmission;

— differential;

— tandems.

6.9 Mass

6.9.1 The following shall be specified:

a) operating mass;

b) shipping mass.

6.9.2 The distribution of operating mass between

— the front axle, and

— the centreline of the rear axle or the midpoint of the rear tandem drive

may be specified.

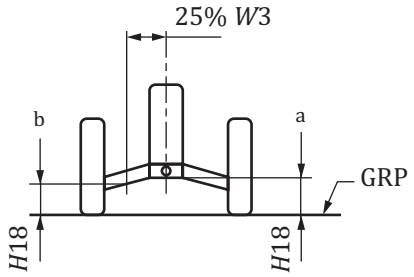
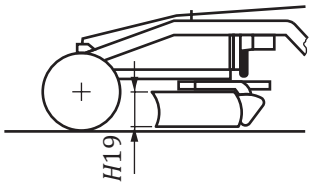
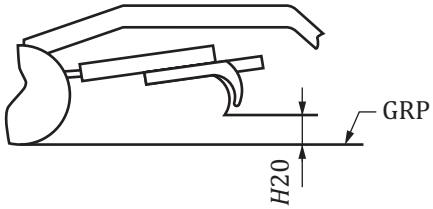
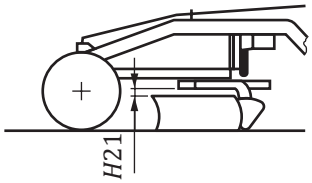
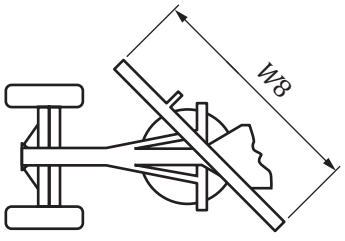
6.10 Overall grader dimensions

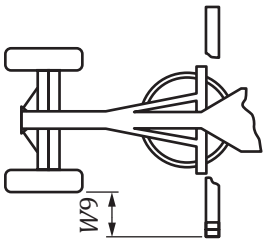
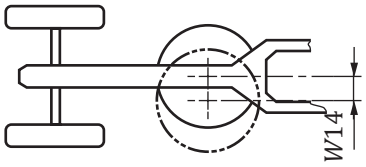
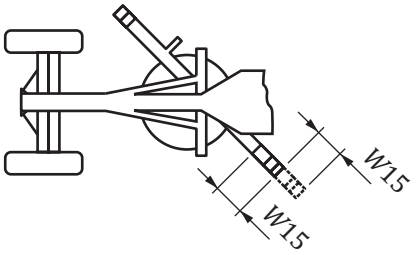
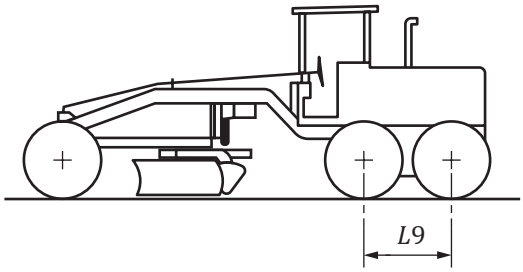
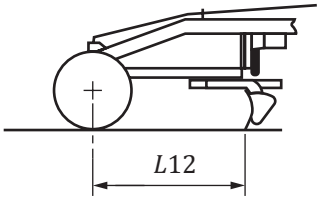
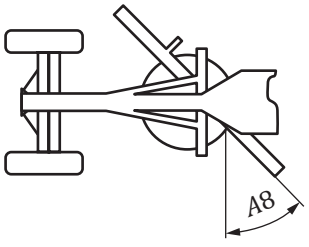
An outline drawing of the grader shall be supplied.

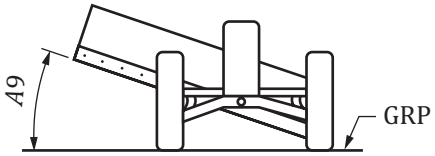
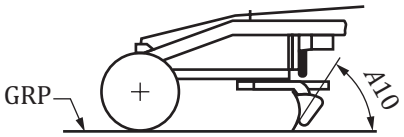
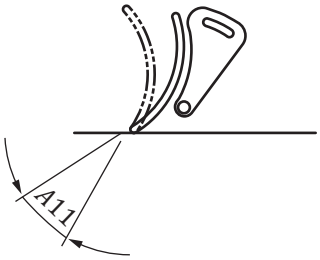
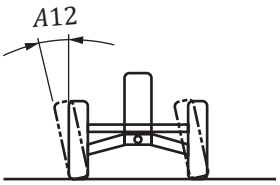
Annex A
(normative)

Equipment dimensions

Annex A defines grader equipment dimensions and specifies their codes.

Code	Term and definition	Illustration
*H*18	**front axle ground clearances** a lowest point of the front axle lying in the zero Y plane b lowest point of the axle at a distance of 25 % of the front tread width (*W*3) to either side of the zero Y plane	
*H*19	**blade height** dimension obtained by measuring the distance on the Z coordinate from the lower edge of the cutting edge to the top edge of the blade, measured at blade mid-length	
*H*20	**lift above ground** vertical height from the GRP to a Z plane containing the lower edge of the blade cutting edge when this edge is in an X plane If blade pitch is adjustable, blade pitch angle is adjusted for maximum lift above the ground.	
*H*21	**blade throat clearance** minimum dimension obtained by measuring the distance on the Z coordinate from the upper edge of the blade to the bottom of the circle measured at blade mid-length	
*W*8	**blade length** overall length measured between parallel vertical planes passing through the extreme ends of the blade or cutting edges or end bits, whichever is longer	

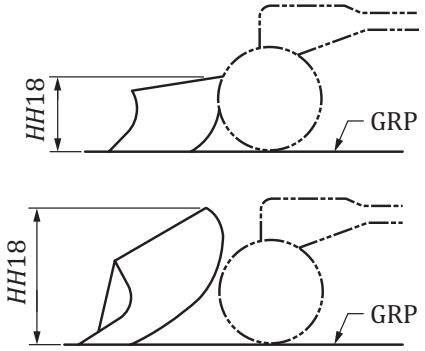
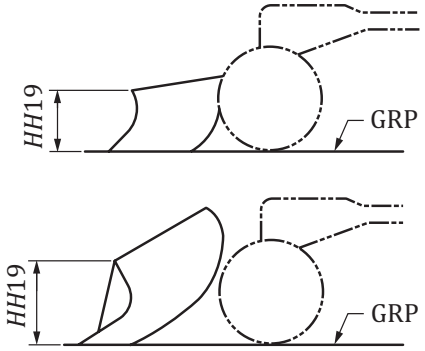
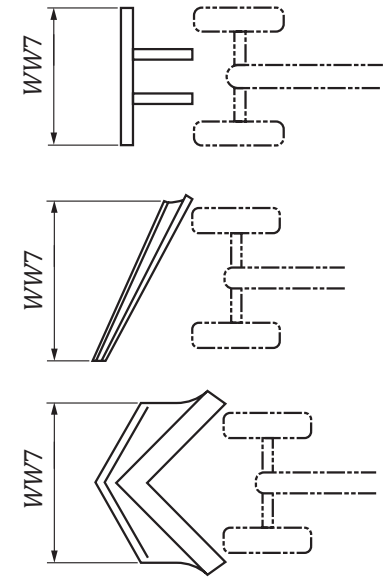
Code	Term and definition	Illustration
*W*9	**shoulder reach** distance from a Y plane through the outside surface of a front tyre to a Y plane through the outermost point on the end of the blade, cutting edge or end bit, with the lower edge of the cutting edge being maintained on the GRP and in an X plane, with no blade side shift and wheels not leaned For machines having crab steer capability, the manufacturer may specify an additional amount of reach available.	
*W*14	**circle sideshift** distance on Y coordinate between the zero Y plane and a Y plane through the centre point of the circle when the circle has been shifted to a position to the left or right of the zero Y plane	
*W*15	**blade sideshift** offset from the middle position of a blade which is movable, with respect to the circle, along a line parallel to an element lying along the length of the blade	
*L*9	**tandem centre distance** distance on X coordinate between X planes passing through the centres of front and rear wheels of the tandem	
*L*12	**blade position from front axle** distance on X coordinate between an X plane through the centreline of the front wheels and an X plane through the front edge of the cutting edge with the edge on the GRP If the blade pitch is adjustable, the blade pitch angle is to be at the middle point of the adjustment.	
*A*8	**blade angle** angle between a vertical plane through the lower edge of the cutting edge and an X plane	

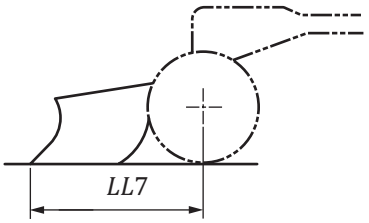
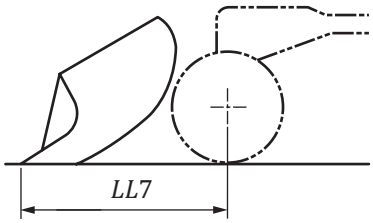
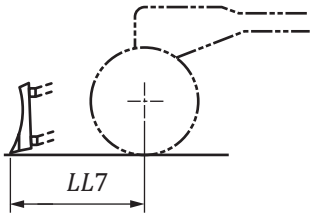
Code	Term and definition	Illustration
*A*9	**blade tilt angle** angle that the plane generated by the cutting edge, moving in the grader direction of travel, makes with relation to the GRP	
*A*10	**blade pitch angle** angle between the plane containing the forward surface of a flat cutting edge, or tangent to the forward surface at the bottom edge of the curved cutting edge, and the GRP when the lower edge of the cutting edge is on the GRP	
*A*11	**blade pitch angle adjustment range** angle obtained by rotating an adjustable blade from one extreme pitch angle to the other	
*A*12	**wheel lean angle** Angle between a vertical plane and a plane through a surface of the wheel rim when the wheel is in a lean position	

Annex B
(normative)

Attachment dimensions

Annex B defines grader attachment dimensions and specifies their codes.

Code	Term and definition	Illustration
*HH*18	**snowplough maximum height** distance on Z coordinate between the GRP and highest point on the snowplough at or near the rear (outer)	
*HH*19	**snowplough height at leading end** distance on Z coordinate between the GRP and highest point on the snowplough at the leading end of a single direction configuration plough or at the centre of the “V” in a “V” configuration plough	
*WW*7	**cutting edge width** distance on Y coordinate between two Y planes through the extreme ends of the cutting edges or end bits	

Code	Term and definition	Illustration
*WW*1	**attachment width** distance on Y coordinate between two Y planes through the extreme width of the attachment	See Figures 13, 14, 15 and 16 for examples.
LL7	**blade front overhang** distance on X coordinate between two X planes passing through the centres of the front wheels and the front extreme point of the attachment when the attachment is resting on the GRP	  

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