TC127

International Standard ISO 7131

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Earth-moving machinery — Loaders — Terminology and commercial specifications

Engins de terrassement — Chargeuses — Terminologie et spécifications commerciales

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Descriptors : earth handling equipment, loaders, vocabulary.

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7131 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*.

Contents

Earth-moving machinery — Loaders — Terminology and commercial specifications

1 Scope

This International Standard establishes terminology and the content of commercial literature specifications for self-propelled crawler and wheel loaders, and their equipment.

2 Field of application

This International Standard applies to loaders as defined in ISO 6165.

3 References

ISO 1585, *Road vehicles — Engine test code — Net power.*

ISO 3450, *Off-highway earth-moving machinery — Minimum performance criteria for brake systems.*

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

ISO 5998, *Earth-moving machinery — Rated operating load for crawler and wheel loaders.*

ISO 6014, *Earth-moving machinery — Determination of ground speed.*

ISO 6165, *Earth-moving machinery — Basic types — Vocabulary.*

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

ISO 6746/2, *Earth-moving machinery — Definitions of dimensions and symbols — Part 2 : Equipment.*

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

ISO 7546, *Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings.*

4 General definitions

4.1 loader : A self-propelled crawler or wheeled machine with an integral front-mounted bucket supporting structure and linkage which loads or excavates through forward motion of the machine, and lifts, transports and discharges material (see ISO 6165).

4.2 base machine : A loader as described by the manufacturer specifications. The machine should be provided with the necessary mountings and attachments to secure equipment as shown in clause 6.

4.3 equipment: A set of components mounted onto the base machine to fulfil the primary design function.

4.4 attachment: An optional assembly of components that can be mounted onto the base machine for a specific use.

4.5 component: A part or an assembly of parts of a base machine, equipment, or an attachment.

5 Base machine

5.1 Types of loaders

5.1.1 Undercarriage

5.1.1.1 Crawler loader (figure 1)

5.1.1.2 Wheel loader (figure 2)

5.1.2 Engine location

5.1.2.1 Front engine (figure 3)

5.1.2.2 Rear engine (figure 4)

5.1.3 Steering system

5.1.3.1 Front wheel steer (figure 5)

5.1.3.2 Rear wheel steer (figure 6)

5.1.3.3 All wheel steer (figure 7)

5.1.3.4 Articulated steer (figure 8)

5.1.3.5 Wheel skid steer [figure 9a)]

5.1.3.6 Wheel independent steer [figure 9b)]

5.1.3.7 Crawler skid steer (figure 10)

5.1.3.8 Crawler independent steer (figure 11)

5.1.4 Drive system

5.1.4.1 Front wheel drive (figure 12)

5.1.4.2 Rear wheel drive (figure 13)

5.1.4.3 All wheel drive (figure 14)

Undercarriage (see 5.1.1)

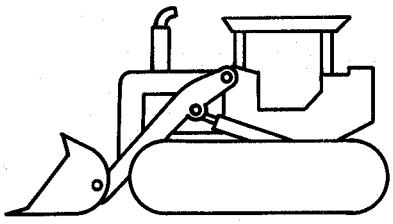


Figure 1 — Crawler loader

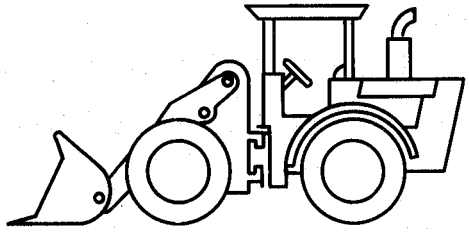


Figure 2 — Wheel loader

Engine location (see 5.1.2)

Figure 3 — Front engine

Figure 4 — Rear engine

Steering system (see 5.1.3)

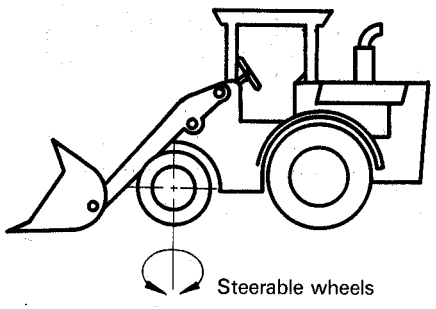


Figure 5 — Front wheel steer

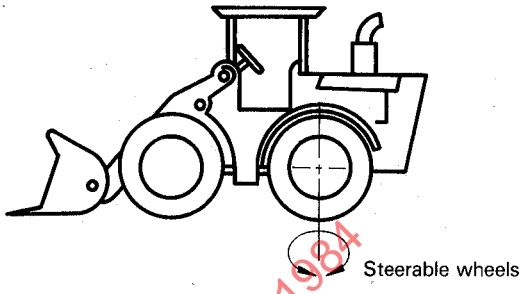


Figure 6 — Rear wheel steer

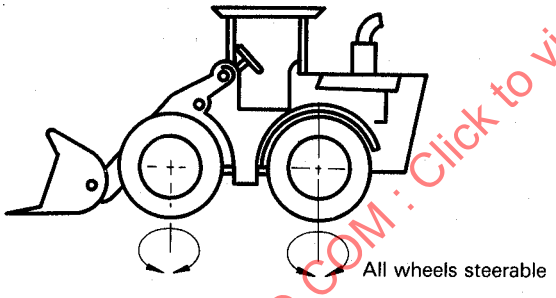


Figure 7 — All wheel steer

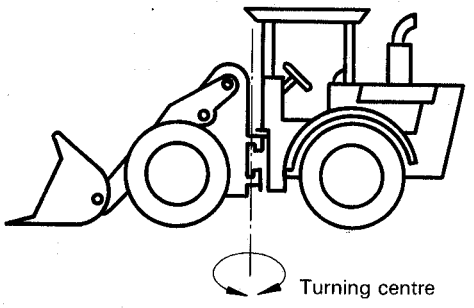


Figure 8 — Articulated steer

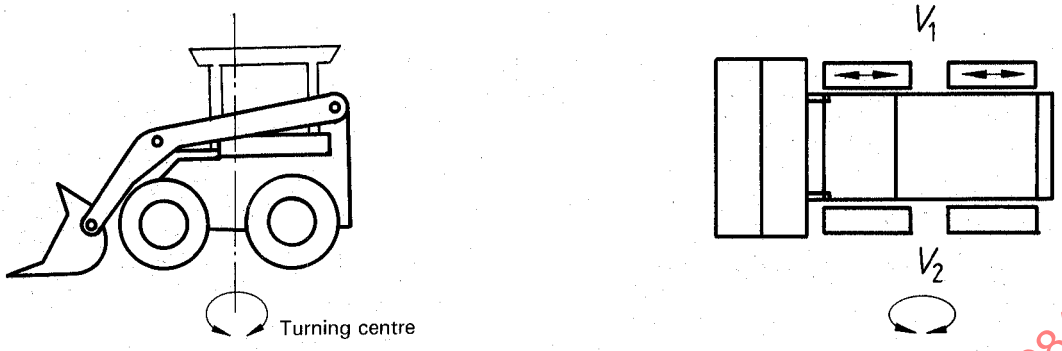


Figure 9a) — Wheel skid steer ($V_2 = 0$)

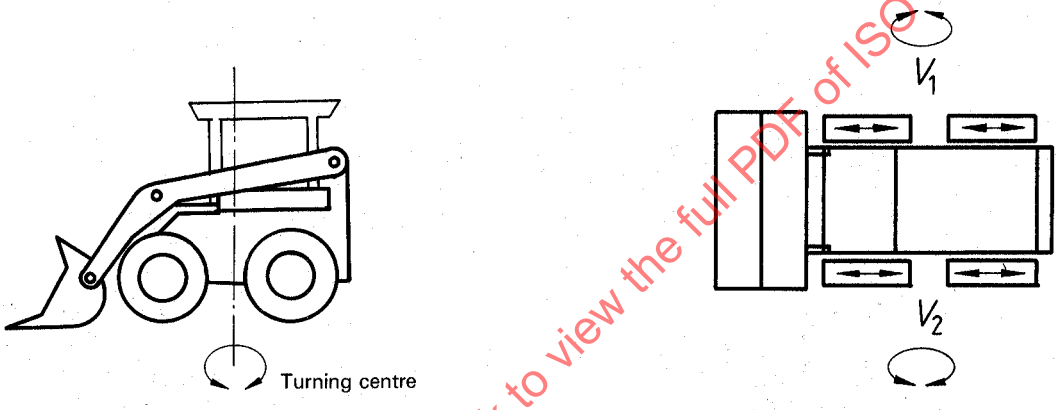


Figure 9b) — Wheel independent steer ($V_1 \neq V_2$)

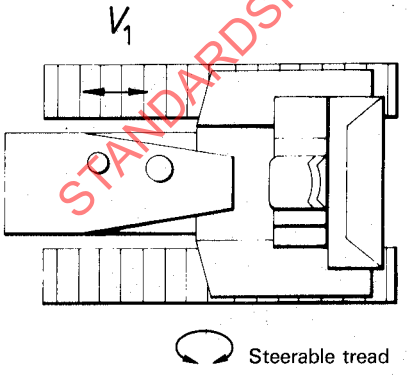


Figure 10 — Crawler skid steer

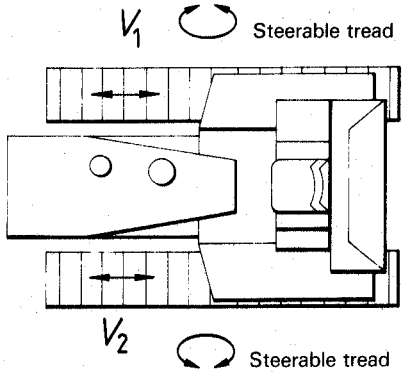


Figure 11 — Crawler independent steer ($V_1 \neq V_2$)

Drive system (see 5.1.4)

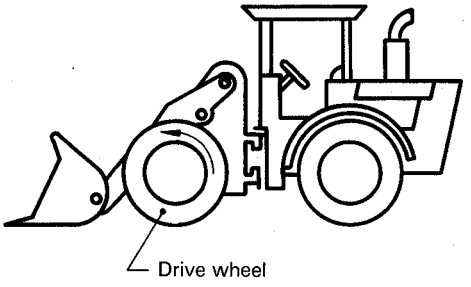


Figure 12 — Front wheel drive

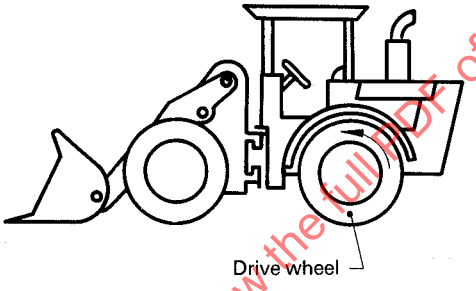


Figure 13 — Rear wheel drive

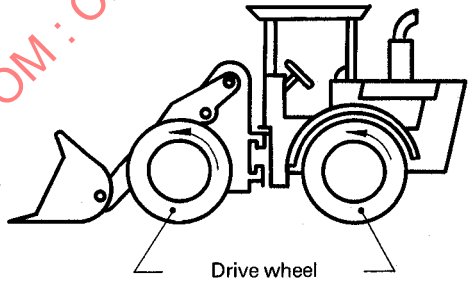


Figure 14 — All wheel drive

5.2 Dimensions (see figures 15 and 16)

For definitions of dimensions, see ISO 6746/1.

For definitions of dimensions strictly related to loaders, see annex A.

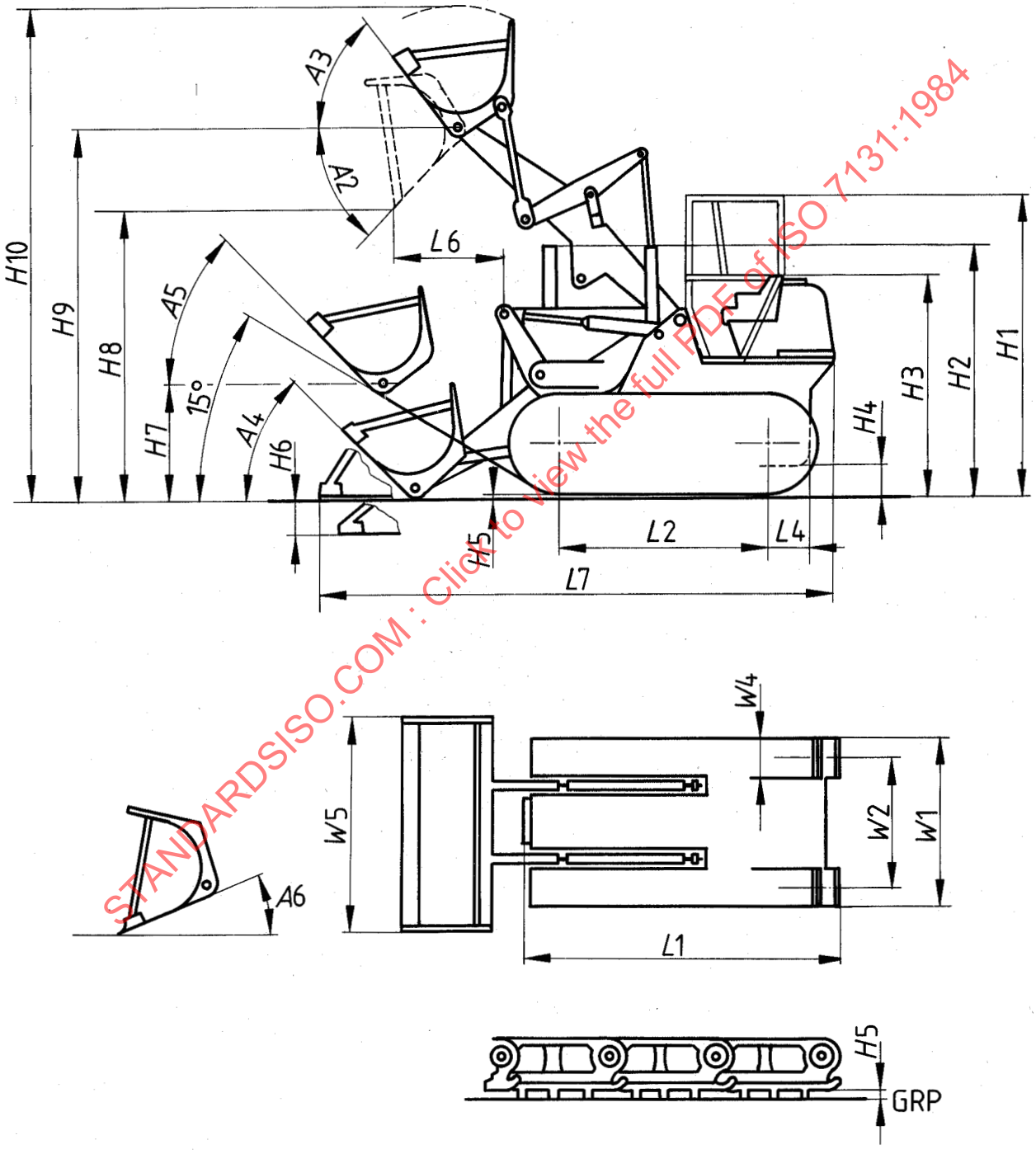


Figure 15 — Dimensions of base machine (crawler loader)

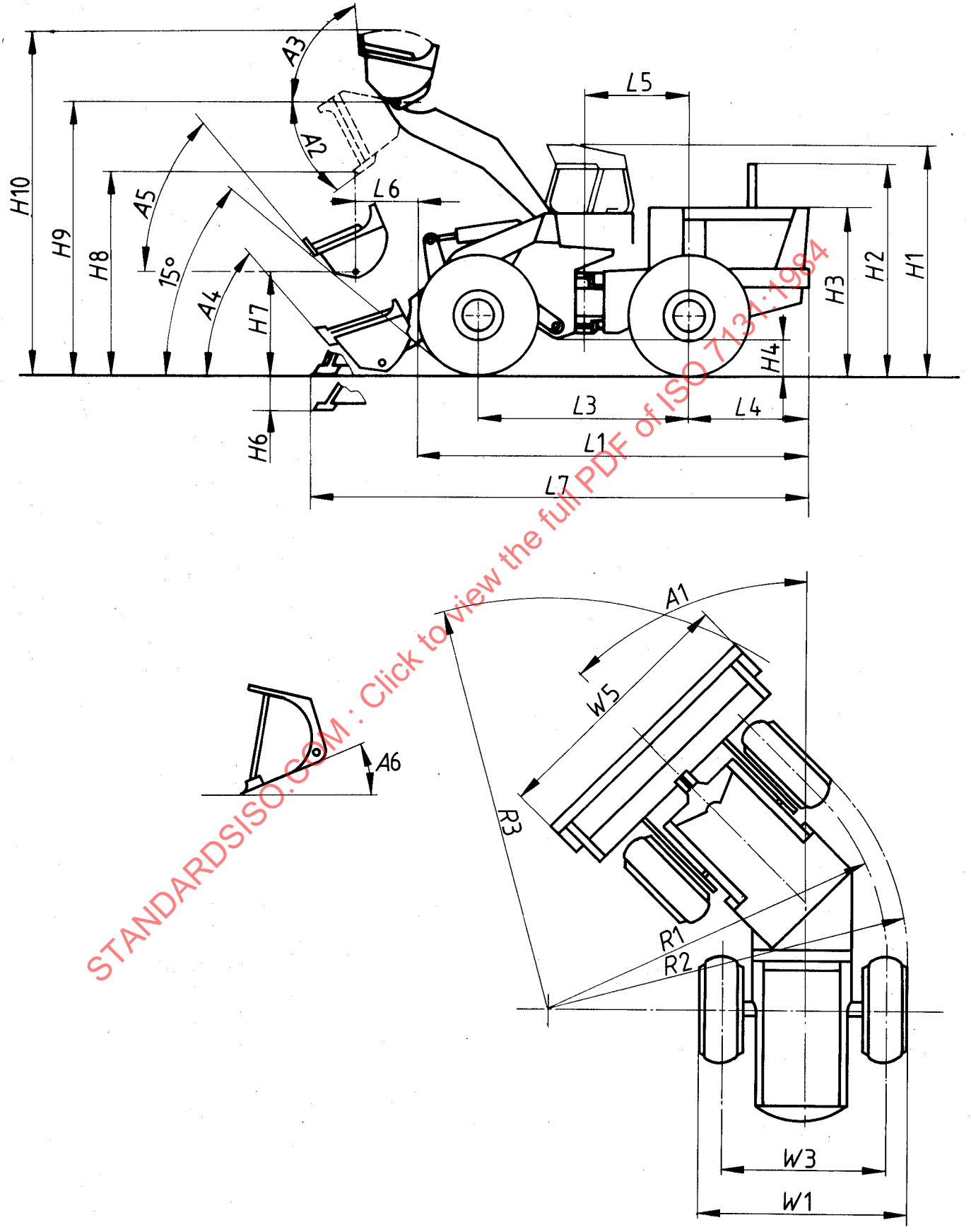


Figure 16 — Dimensions of base machine (wheel loader)

5.3 Masses

5.3.1 operating mass : The mass of the base machine with all standard equipment, operator (75 kg), full fuel tank, full lubricating, hydraulic and cooling systems and with stated bucket type and size (empty).

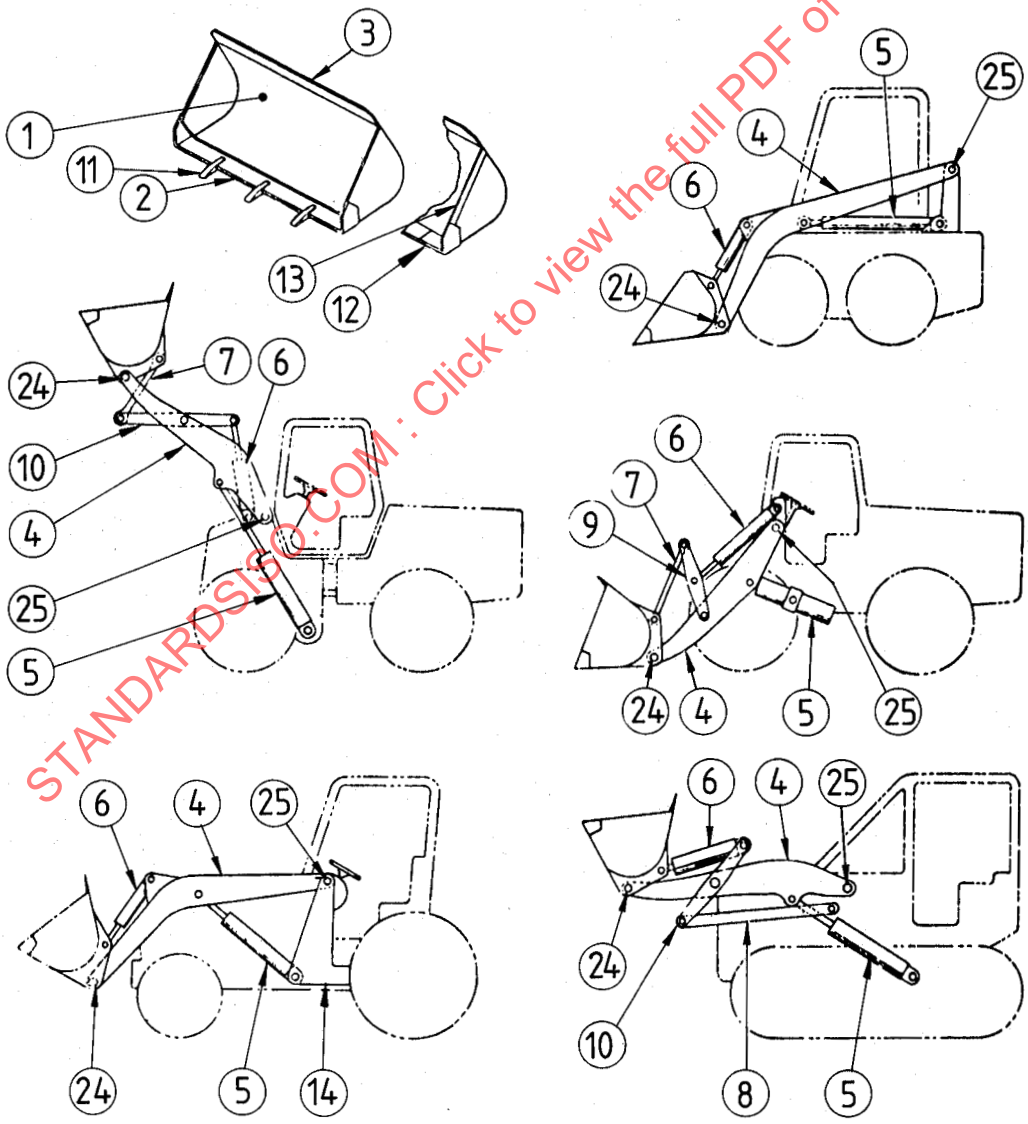
5.3.2 shipping mass : The mass of the machine without operator, with full lubricating, hydraulic and cooling systems, 10 % of fuel tank capacity and with or without equipment, cab, canopy, ROPS[1] or FOPS[2], as stated.

5.3.3 cab, canopy, ROPS or FOPS mass : The mass of cab, canopy, ROPS or FOPS with all their components and mountings required to secure these to the base machine.

5.4 Component nomenclature (see diagram numbers)

1 Bucket
2 Cutting edge
3 Spillguard
4 Lift arm
5 Cylinder, lift
6 Cylinder, bucket
7 Link, bucket
8 Link, guide
9 Lever, bucket
10 Bellcrank
11 Tooth, bucket
12 Cutter, corner
13 Cutter, side
14 Frame, loader (where separate from machine main frame)
24 Pin, bucket hinge
25 Pin, lift arm hinge

NOTE — "Front" or "rear" to be used when applicable to items 7, 8, 9 and 10.



1) ROPS — Roll-over protective structure.

2) FOPS — Falling object protective structure.

6 Equipment and attachments

6.1 Definitions

6.1.1 backhoe : A mechanism, attached to the back of the loader which excavates generally below ground level, elevates, swings and dumps material by action of a boom, arm, and bucket. The excavating motion is toward the machine. A backhoe has less than 360° swing (see figure 17).

6.1.2 scarifier : A mechanism having teeth for penetrating and loosening to shallow depths such materials as earth, asphaltic and gravel roads and similar surfaces. The scarifier is usually mounted on the back of the loader but may be mounted on the back of the bucket (see figure 18).

6.1.3 side dump bucket : A bucket which loads through forward motion of the machine and can dump to the side from an end of the bucket. It may also dump forward (see figure 19).

6.1.4 multi-purpose bucket : A bucket having a dozer-type mouldboard with hinges at the top to support a clam which can be opened to various positions providing for use as a dozer, scraper, clam, or bucket (see figure 20).

6.1.5 pallet fork : A structure having tines for lifting, transporting and discharging warehouse-type pallets (see figure 21).

6.1.6 log fork (log grapple) : A mechanism having tines and a top clamp for lifting, transporting, and discharging logs (see figure 22).

6.1.7 winch : A frame equipped with a drum and connected to the rear part of the base machine (see figure 23).

6.2 Dimensions

6.2.1 For definitions of dimensions, see ISO 6746/2.

6.2.2 For definitions of dimensions strictly related to loader equipment and attachments, see annex B.

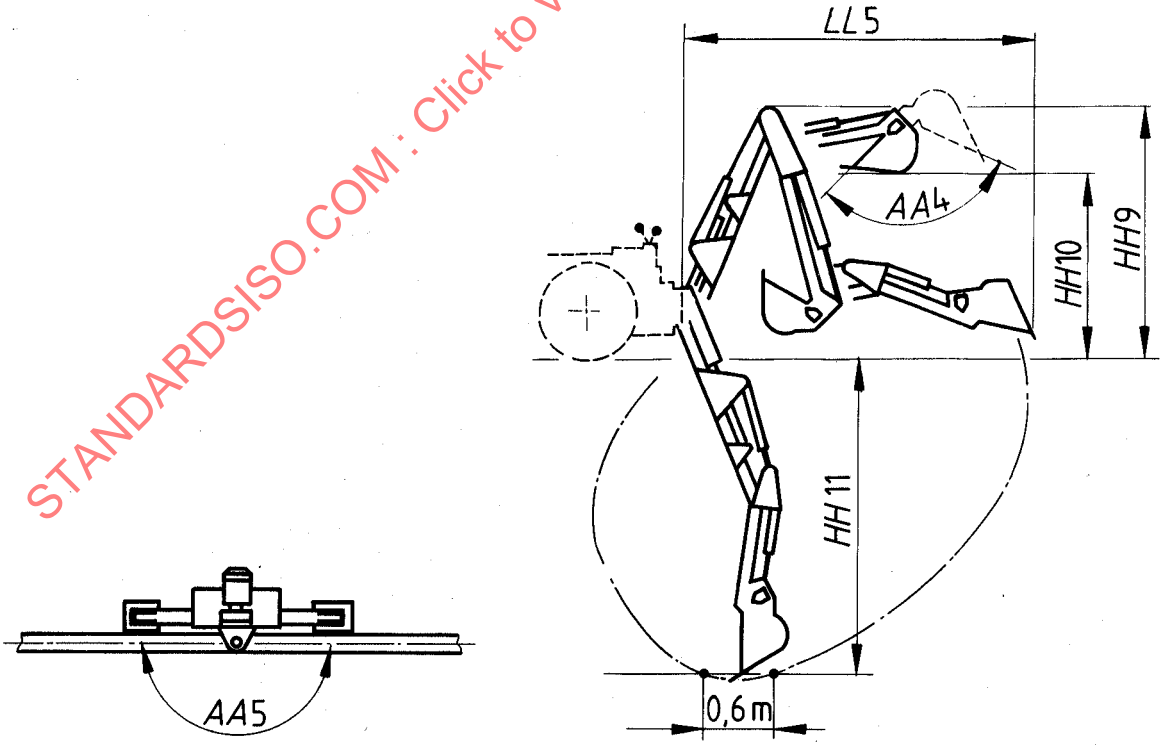


Figure 17 — Dimensions of backhoe

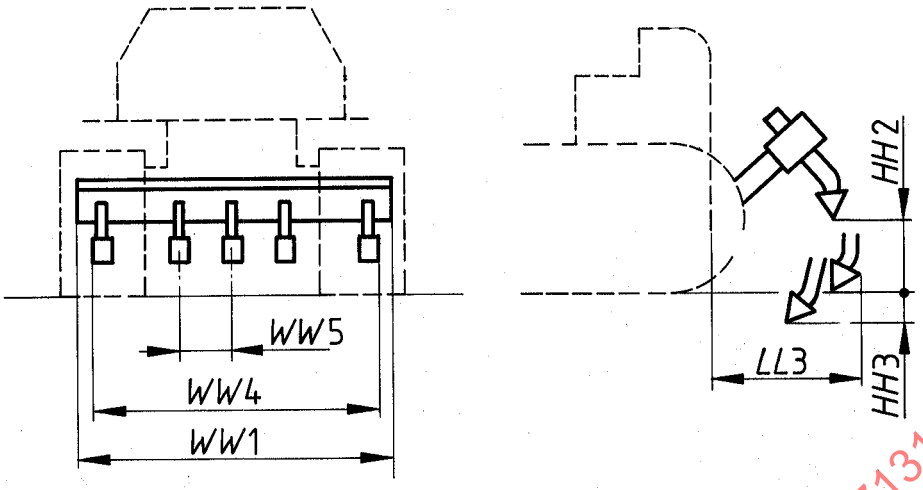


Figure 18 — Dimensions of scarifier

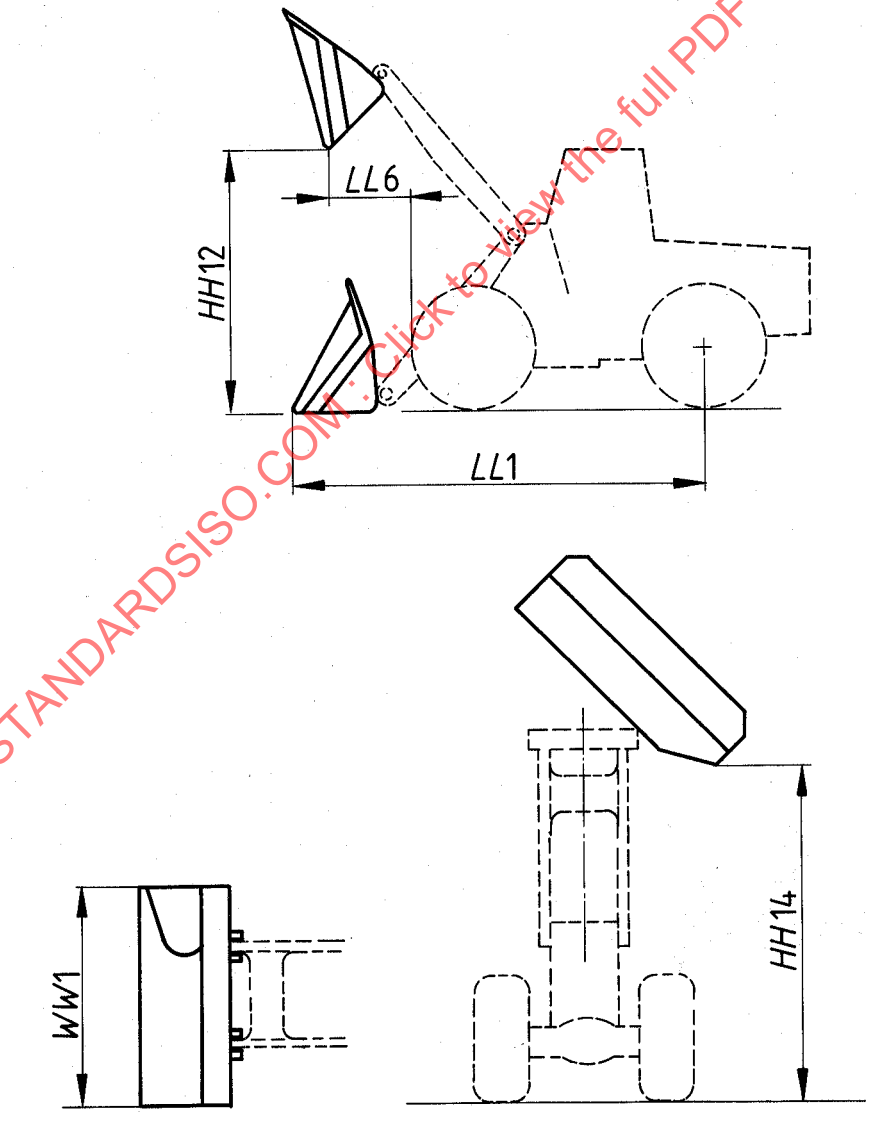


Figure 19 — Dimensions of side dump bucket

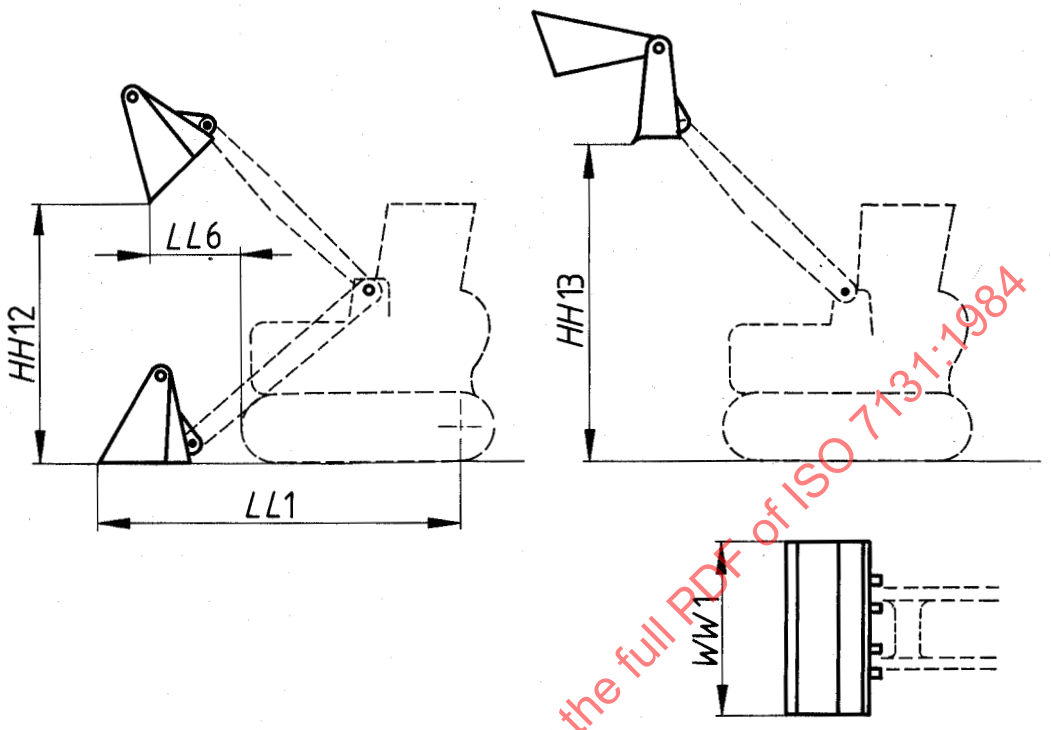


Figure 20 — Dimensions of multi-purpose bucket

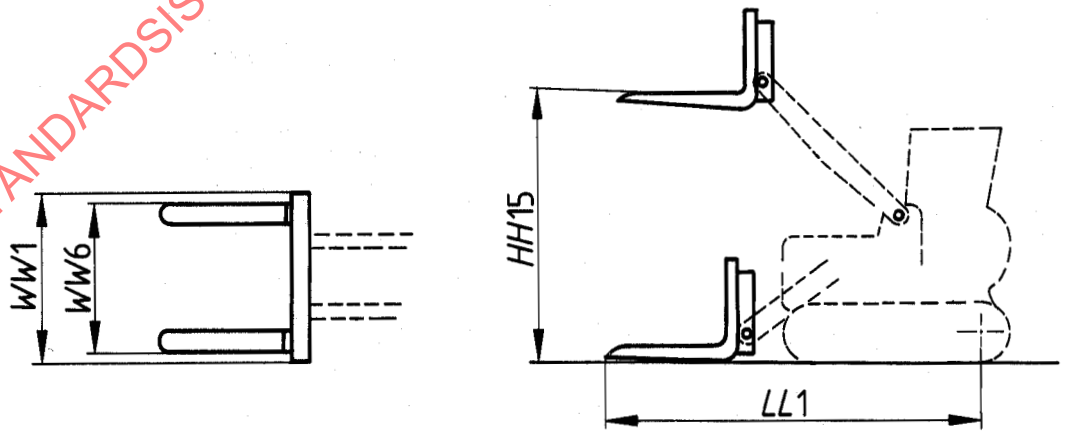


Figure 21 — Dimensions of pallet fork

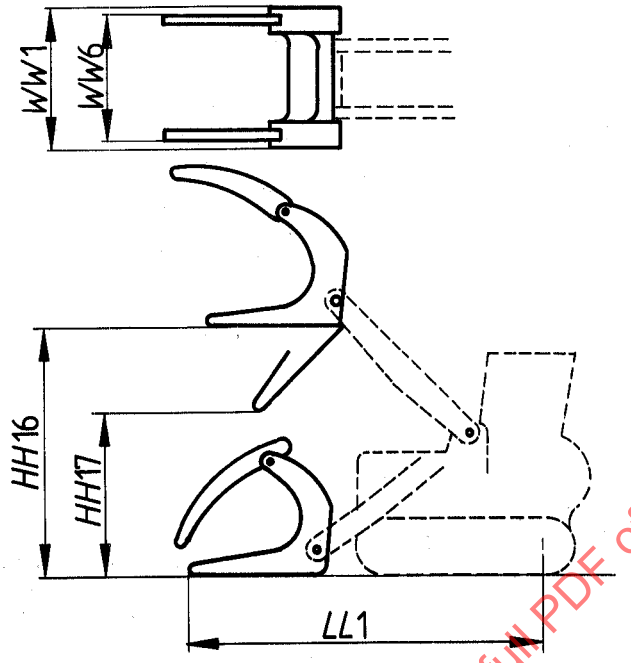


Figure 22 — Dimensions of log fork (log grapple)

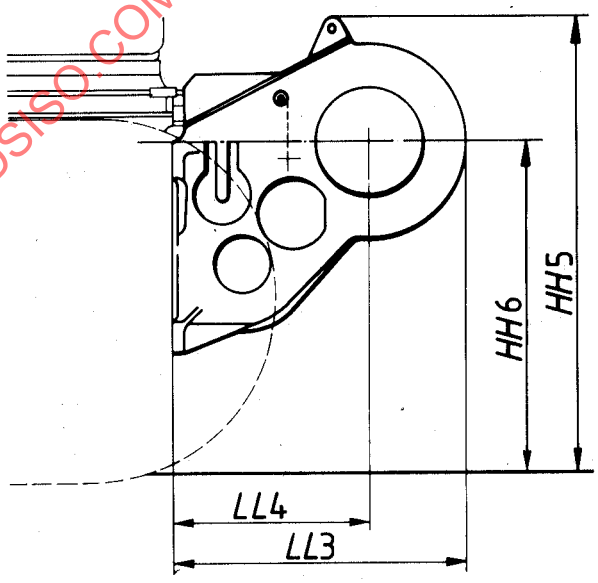


Figure 23 — Dimensions of winch

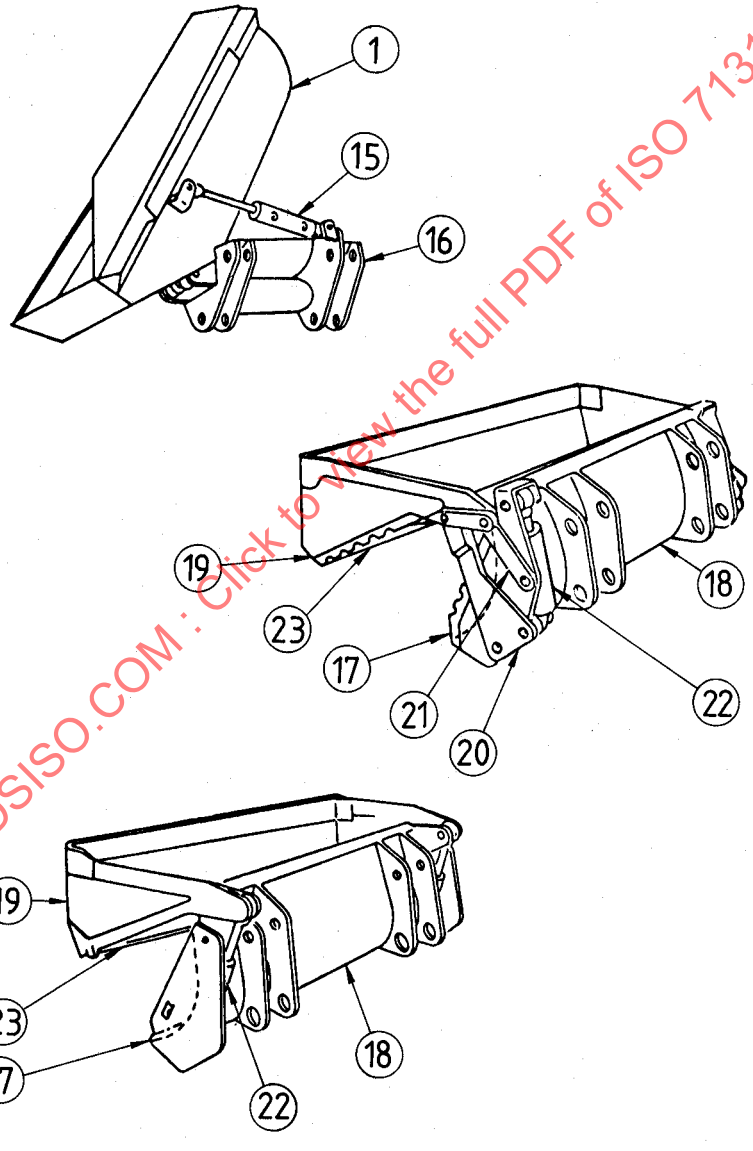
6.3 Nomenclature (see diagram numbers)

6.3.1 Side dump bucket

1 Bucket
15 Cylinder, side dump
16 Bucket support with carrier

6.3.2 Multi-purpose bucket

17 Cutting edge, mouldboard
18 Mouldboard
19 Clam section
20 Bellcrank
21 Link, clam guide
22 Cylinder, clam
23 Clam cutting edge



7 Performance terminology

7.1 ISO net power (engine) : See ISO 1585.[1)]

7.2 Tipping load

7.3 Tipping load at specified height

NOTE — Tipping loads will form the subject of a future International Standard.

7.4 Operating load : See ISO 5998.

7.5 Breakout force

7.6 raising time : Time required to raise the bucket with stated operating load from a position resting on the ground reference plane, fully rolled back, to full height.

7.7 lowering time : Time required to lower the empty bucket from full height to the position with bucket bottom lying on the ground reference plane.

7.8 dump time : Time required to rotate the bucket from the maximum rollback fully raised position to the full dump position while dumping an operating load.

7.9 maximum travel speeds : Maximum speeds that can be obtained on a hard level surface in each of the forward and reverse gear ratios, bucket empty (see ISO 6014).

7.10 braking performance (wheel loader) : See ISO 3450.

7.11 turning diameter: See ISO 7457.

8 Commercial literature specifications — SI units (examples)

8.1 Engine (specify characteristics)

Manufacturer and model.
Diesel or spark ignition.
Type of cycle (2 or 4 stroke).
Naturally aspirated, mechanically supercharged, or turbo-charged.
Number of cylinders.
Bore.
Stroke.
Displacement.
Cooling system (air or water cooled).
Type of fuel.
Power, flywheel net : ..... at ..... rpm.
Torque—maximum : ..... at ..... rpm (where applicable).
Starter type.
Electrical system, ... V.

8.2 Transmission (specify type)

Examples :

Manual shift with flywheel clutch.
Powershift with torque converter.
Hydrostatic.
Electric.
Number of speeds, forward and reverse.
Travel speeds (forward, reverse).

8.3 Hydraulic system

Cylinders (number, type and dimensions) :

— Lift
— Tilt

Pump flow : ..... at ..... pressure, at ..... rated engine rpm.
Main relief valve opening pressure .....

8.4 Filtration system (type)

Engine.
Transmission.
Steering and braking.
Hydraulic.

8.5 Crawler loader

8.5.1 Steering and braking

Examples :

Type (Drum, disc, wet or dry).
Actuating system (hydraulic, mechanical).

8.5.2 Final drives

Examples :

Type (Single or double reduction, planetary).
Ratio.
Lubrication.

8.5.3 Track

Dimensions.
Ground contact area.
Number of shoes (each side).
Number of rollers (each side).

8.6 Wheel loader

8.6.1 Driving axle (specify type)

Examples :

Fixed vs. oscillating.
Bevel gear and pinion.
Differential.
Two speed.
Hydrostatic.
Planetary final drive.

1) ISO/TC 127 is currently drawing up an engine test code.

8.6.2 Steering (specify type)

(See ISO 5010.)

Examples :

Articulated.
Front wheel steer.
Boosted, manual, hydrostatic.
Emergency steer method.

8.6.2.1 Performance

Turning radius, left and right : .....
Articulation angle : .....
Machine clearance diameter : .....

8.6.3 Brakes

8.6.3.1 Service brakes

Examples :

Type (Drum, disc, wet or dry).
Actuating system type (full air, full hydraulic, air over hydraulic, mechanical etc.).

8.6.3.2 Parking brake

Type.
Actuating system.

8.6.3.3 Secondary brakes

Type.
Actuating system.

8.6.3.4 Brake performance (specify).

(See ISO 3450.)

8.6.4 Tyres

Size and type.
Tread.
Ply rating.
Rim size.

8.7 System fluid capacities

Fuel tank.
Engine crankcase.
Cooling.
Transmission.
Transfer case.
Hydraulic system.
Axles.
Final drives.

8.8 Characteristics which may be affected by bucket selections (machine equipped with non-standard tyres)

Bucket capacity (nominal heaped).

Overall operating height.

Overall length.

Dump angle.

Dump height.

Reach, fully raised.

Rollback (specify height).

Maximum rollback at ground.

Carry position.

Maximum rollback at carry position.

Digging depth.

Bucket width.

Maximum grading angle.

Operating mass. [1)]

Operating load.

Tipping load. [1)]

Tipping load (at specified height). [1)]

Breakout force. [1)]

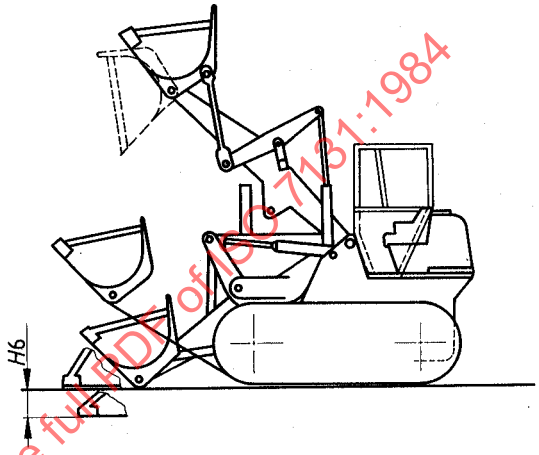
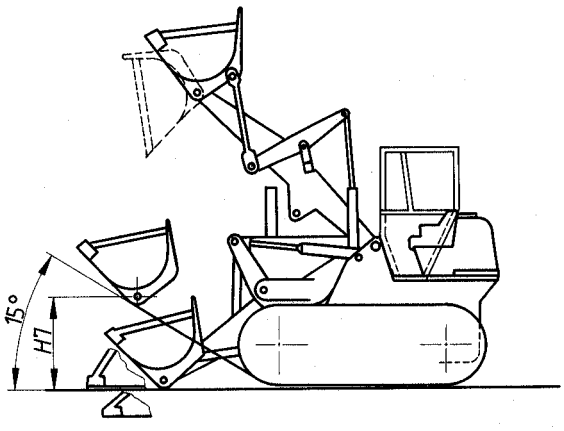
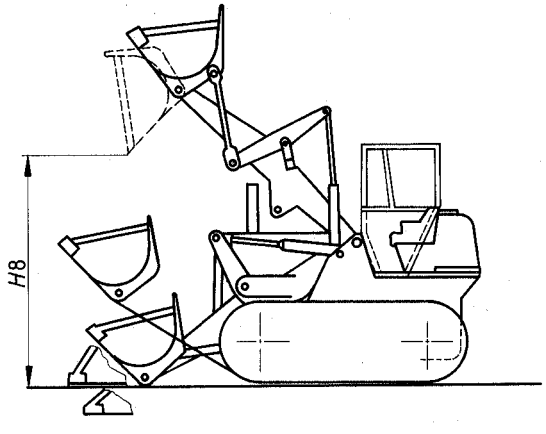
Machine clearance radius. [2)]

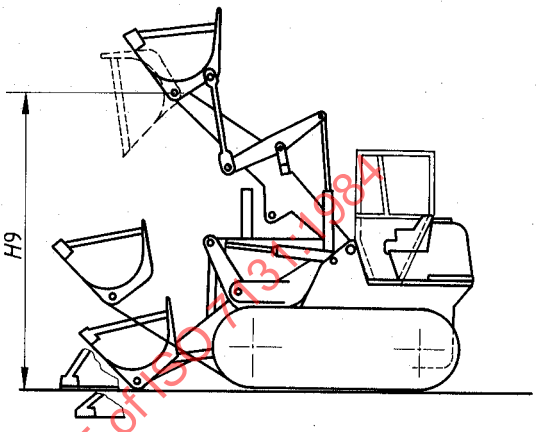
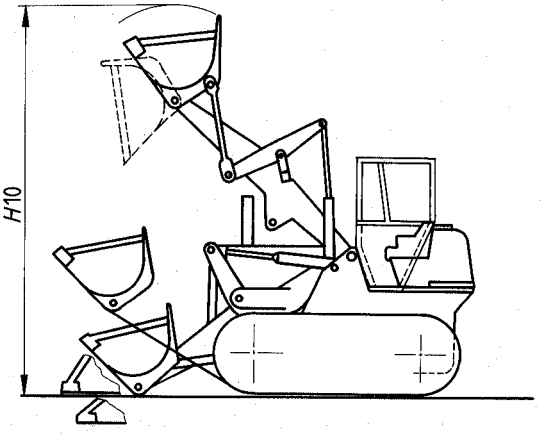
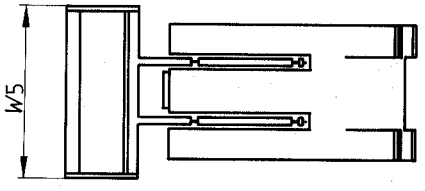
1) May be further affected by tyre selection, tyre ballast, counterweight, or attachments.

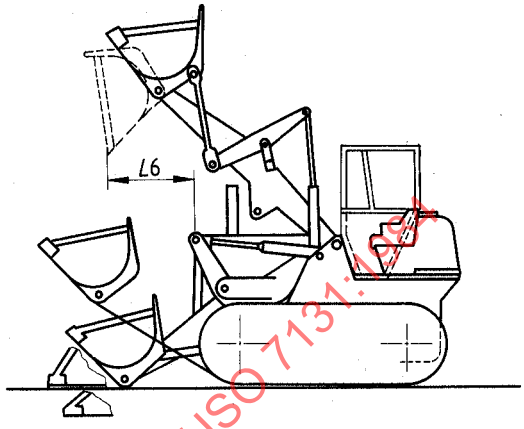
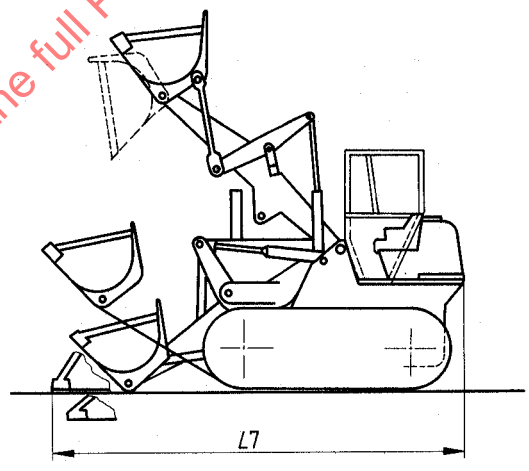
2) May be further affected by tyre selection.

Annex A

Base machine — Dimensions — Symbols, terms and definitions

Symbol	Term	Definition	Drawing
H6	Digging depth	Distance on "Z" coordinate between the ground reference plane (GRP) and the bottom of the bucket cutting edge at the lowest position with the bucket cutting edge horizontal.	
H7	Carry position (height)	Distance on "Z" coordinate between the GRP and the centreline of the bucket hinge pin, with the angle of approach at 15° to the lowest point of the bucket or lift arms, whichever is the lower, with the bucket at maximum rollback.	
H8	Dump height	Distance on "Z" coordinate between the GRP and the lowest point of the cutting edge, with the bucket hinge pin at maximum height and the bucket at a 45° dump angle. If the dump angle is less than 45°, specify the angle.	

Symbol	Term	Definition	Drawing
*H*9	Height to hinge pin, fully raised	Distance on "Z" coordinate between the GRP and the centreline of the bucket hinge pin with a fully raised bucket.	
*H*10	Overall operating height, fully raised	Distance on "Z" coordinate between the GRP and the highest point obtainable with a fully raised bucket.	
*W*5	Bucket width	Distance on "Y" coordinate between two "Y" planes passing through the farthest point on the sides of the bucket.	

Symbol	Term	Definition	Drawing
$L6$	Reach, fully raised	Distance on "X" coordinate between planes passing through the foremost point on the machine (including tyres, tracks or loader frame) and the foremost point on the cutting edge with the bucket hinge pin at maximum height and the bucket at a 45° dump angle. If the dump angle is less than 45° specify the angle.	
$L7$	Overall length (with bucket)	Distance on "X" coordinate between planes passing through the rearmost point of the machine and the foremost point of the cutting edge with the bucket bottom on the ground and level.	
$R3$	Minimum turning radius with bucket in carry position	Distance on "Z" plane between the turning centre and the farthest point on the side of the bucket when the machine is executing its smallest practicable turn.