

INTERNATIONAL
STANDARD

ISO
13539

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**Earth-moving machinery — Trenchers —
Definitions and commercial specifications**

*Engins de terrassement — Trancheuses — Définitions et spécifications
commerciales*



Reference number
ISO 13539:1998(E)

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.

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.

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Earth-moving machinery — Trenchers — Definitions and commercial specifications

1 Scope

This International Standard defines terms and specifies the content of commercial literature specifications for self-propelled trenching machines, and their equipment, as defined in clause 3.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3450:1996, *Earth-moving machinery — Braking systems of rubber-tyred machines — Systems and performance requirements and test procedures.*

ISO 5010:1992, *Earth-moving machinery — Rubber-tyred machines — Steering requirements.*

ISO 6014:1986, *Earth-moving machinery — Determination of ground speed.*

ISO 6016:1998, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components.*

ISO 6165:1997, *Earth-moving machinery — Basic types — Vocabulary.*

ISO 6746-1:1987, *Earth-moving machinery — Definitions of dimensions and symbols — Part 1: Base machine.*

ISO 6746-2:1987, *Earth-moving machinery — Definitions of dimensions and symbols — Part 2: Equipment.*

ISO 7457:1997, *Earth-moving machinery — Determination of turning dimensions of wheeled machines.*

ISO 8812:—¹⁾, *Earth-moving machinery — Backhoe loaders — Definitions and commercial specifications.*

ISO 9249:1997, *Earth-moving machinery — Engine test code — Net power.*

ISO 10265:1998, *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems.*

¹⁾ To be published.

3 General definitions

3.1

trencher

self-propelled crawler or wheeled machine, having rear- and/or front-mounted **equipment** (3.6) [**attachment** (3.7)], primarily designed to produce a **trench** (3.2) in a continuous operation, through motion of the machine; the attachment can be a digging chain, wheel disc, plough blade, or a similar item [ISO 6165:1997]

3.1.1

pedestrian-operated trencher

trencher (3.1) controlled by an operator while walking either along side or in line with the machine

3.1.2

rider-operated trencher

trencher (3.1) controlled by an operator while riding on the machine

3.2

trench

narrow excavation for which, in general, the depth is greater than the width

3.3

spoil

earth, rock, and the like removed when making a **trench** (3.2)

3.4

base machine

trencher (3.1) with mountings necessary to secure **equipment** (3.6) as described by the manufacturer's specifications

3.5

component

part, or an assembly of parts, of a **base machine** (3.4), **equipment** (3.6) or an **attachment** (3.7)

NOTE — Adapted from ISO 6016:1998.

3.6

equipment

set of **components** (3.5) mounted onto the **base machine** (3.4) to fulfil the primary design function when an **attachment** (3.7) is fitted

NOTE — Adapted from ISO 6016:1998.

3.7

attachment

assembly of **components** (3.5) for a specific use and which can be mounted onto either the **base machine** (3.4) or its **equipment** (3.6)

NOTE — Adapted from ISO 6016:1998.

3.8 Base machine dimensions

See also ISO 6746-1 for definitions of dimensions.

3.8.1

maximum total height

H 1

vertical distance from the ground reference plane (GRP) to the highest point of the **base machine** (3.4)

See figures 1 to 3.

3.8.2
maximum equipment/attachment height*H* 2

vertical distance from the ground reference plane (GRP) to the highest point of the **equipment** (3.6) [**attachment** (3.7)] in their maximum raised position

See figures 1 to 3.

3.8.3
maximum width*W* 1

distance between the farthest points situated on each side of the machine, perpendicular to the direction of travel

See figures 1 to 3.

3.8.4
track gauge*W* 2

perpendicular distance between the longitudinal centrelines of the track sprockets

See figure 3.

3.8.5
tread width*W* 3

perpendicular distance between the tyre longitudinal centrelines

See figures 1 and 2.

3.8.6
maximum length*L* 1

longitudinal distance between the farthest points on the front and on the rear of the machine

See figures 1 to 3.

3.8.7
crawler base*L* 2

perpendicular distance between the centrelines of the driver sprocket axis and the idler sprocket axis

See figure 3.

3.8.8
wheel base*L* 3

perpendicular distance between the lateral centrelines of the front and rear wheels, with the wheels in the straight ahead position

See figures 1 and 2.

3.8.9
angle of approach*A* 1

angle between the ground reference plane (GRP) and a plane, tangent to the forward tyres or tracks and passing through the lowest point of any protruding structure or **component** (3.5) in front of the tyres or tracks, which limits the magnitude of the angle

See figures 2 and 3.

3.8.10
angle of departure

A 2
angle between the ground reference plane (GRP) and a plane, tangent to the rear tyres or tracks of a machine and passing through the lowest point of any protruding structure or **component** (3.5) behind the rear tyres or tracks, which limits the magnitude of the angle

See figures 1 to 3.

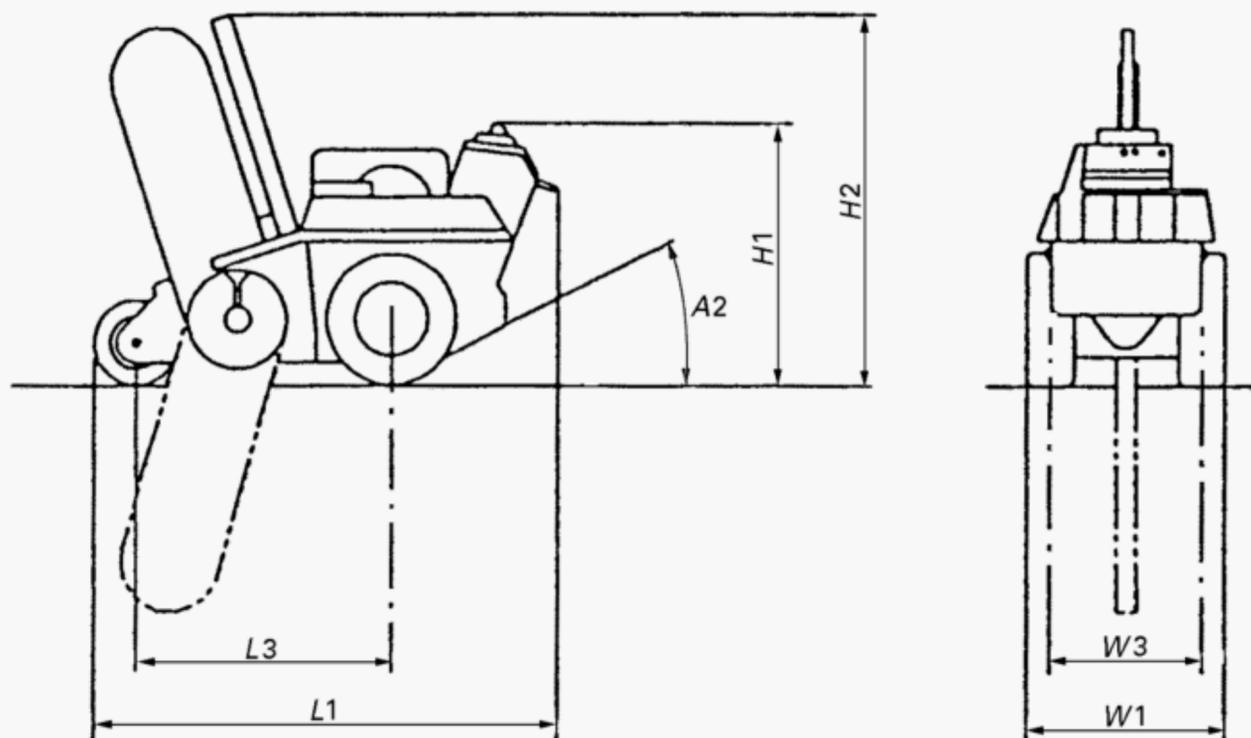


Figure 1 — Pedestrian-operated trencher

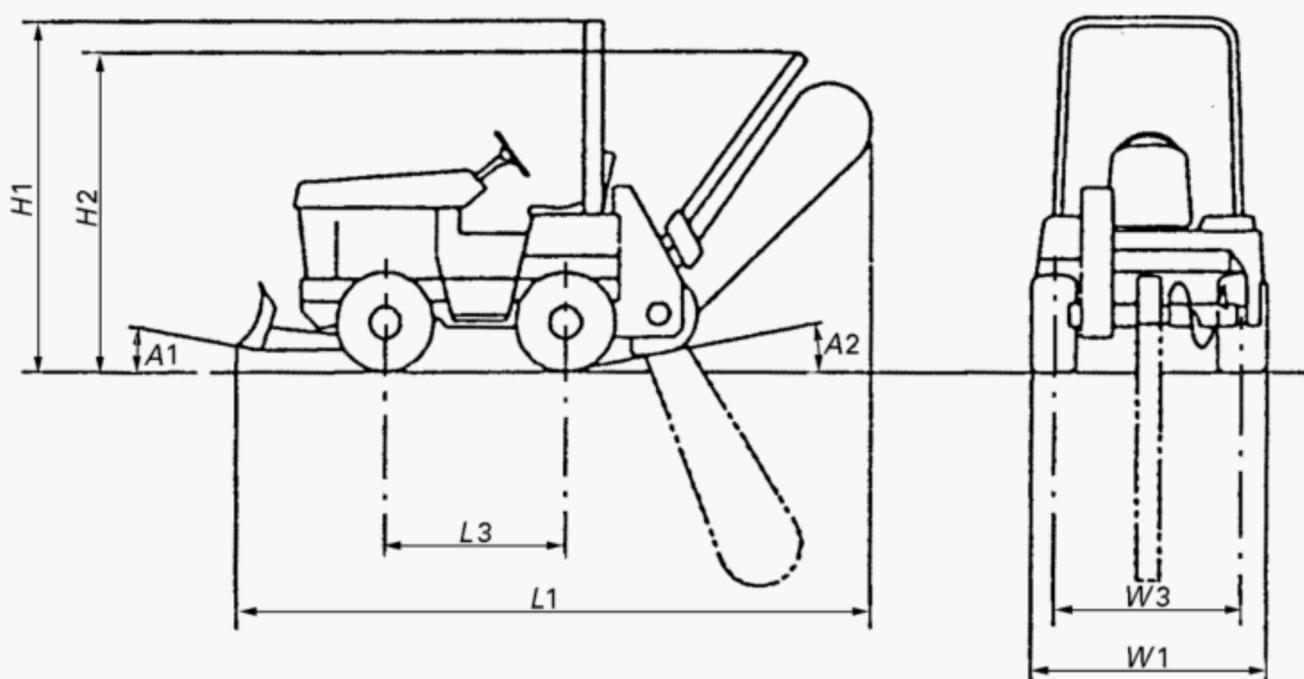


Figure 2 — Rider-operated wheeled trencher

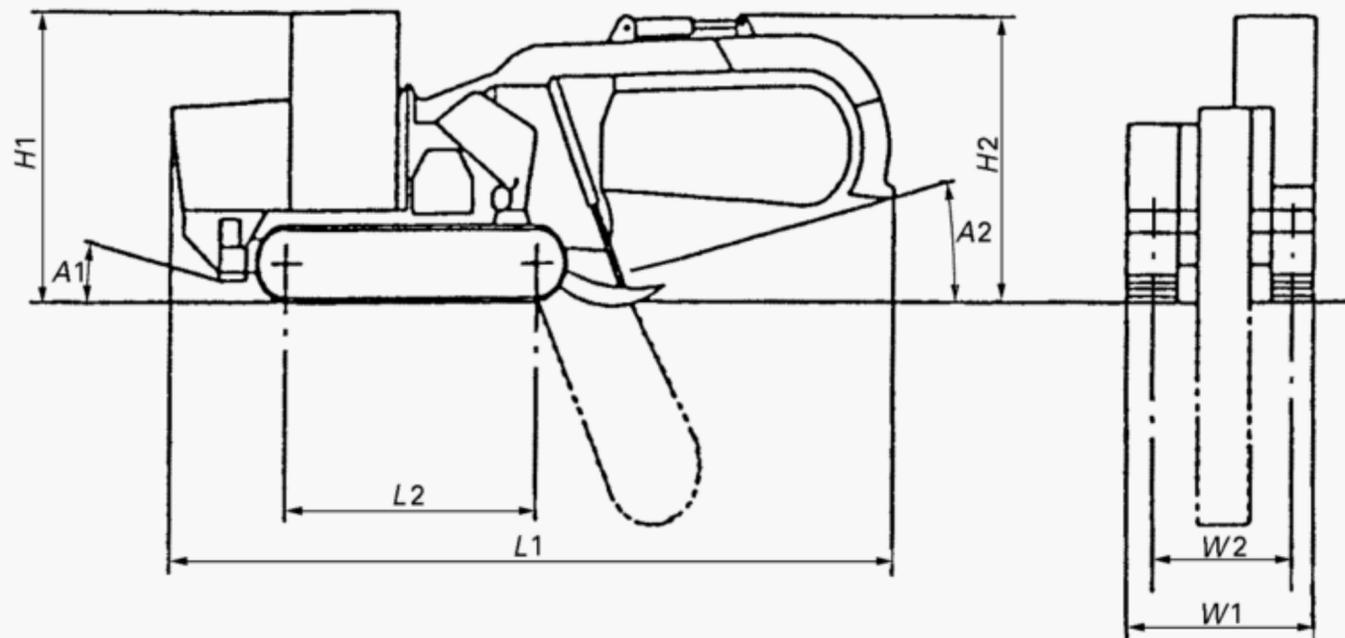


Figure 3 — Rider-operated crawler trencher

4 Types of trenchers

See also ISO 6746-1 for definitions of dimensions.

4.1

chain-line trencher

trencher (3.1) using one or more flexible digging chains having tools (teeth, bits, buckets, etc.) attached for cutting a **trench** (3.2) and conveying **spoil** (3.3) from it

See figures 4 and 5 for dimensions and nomenclature, respectively.

4.1.1

trench depth

H_{10}

vertical distance from the ground reference plane (GRP) to the bottom of the **trench** (3.2) free of **spoil** (3.3)

4.1.2

trench width

W_{10}

measured width of the **trench** (3.2) for specified digging **components** (3.5)

4.1.3

trench offset

W_{11}

perpendicular distance from the centreline of the **trench** (3.2) to a vertical plane passing through the farthest point at each side of the machine

4.1.4

spoil discharge reach

W_{12}

distance from the centreline of the **trench** (3.2) to a vertical plane passing through the farthest conveying element of the spoil-conveying system

4.1.5

boom angle

A_3

maximum full depth angle of the digging boom measured from the ground reference plane (GRP) to a line passing through the head shaft and the bottom-end idler centrelines

4.1.6
head-shaft height
*H*₁₁

vertical distance from the ground reference plane (GRP) to the centreline of the head shaft

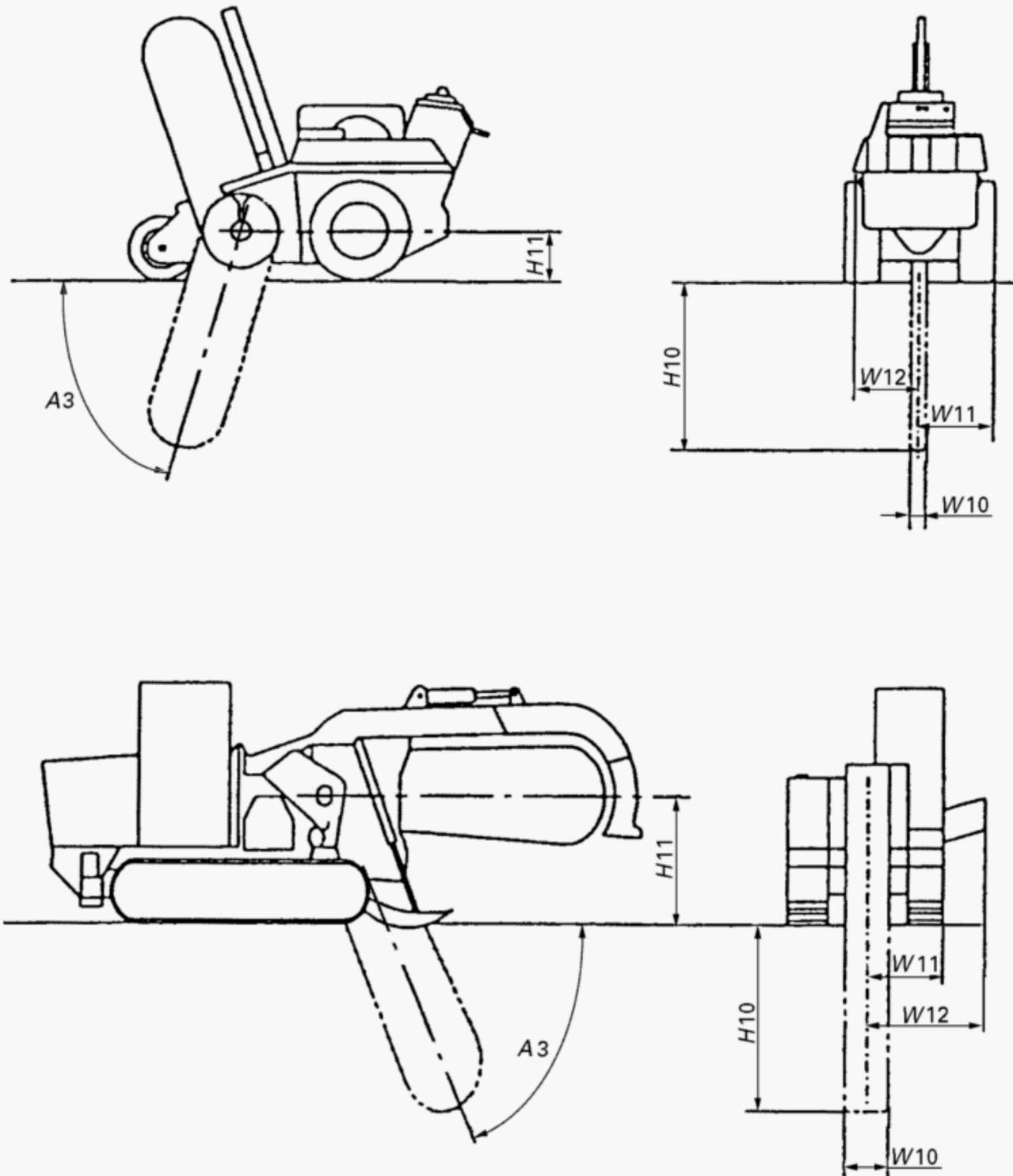
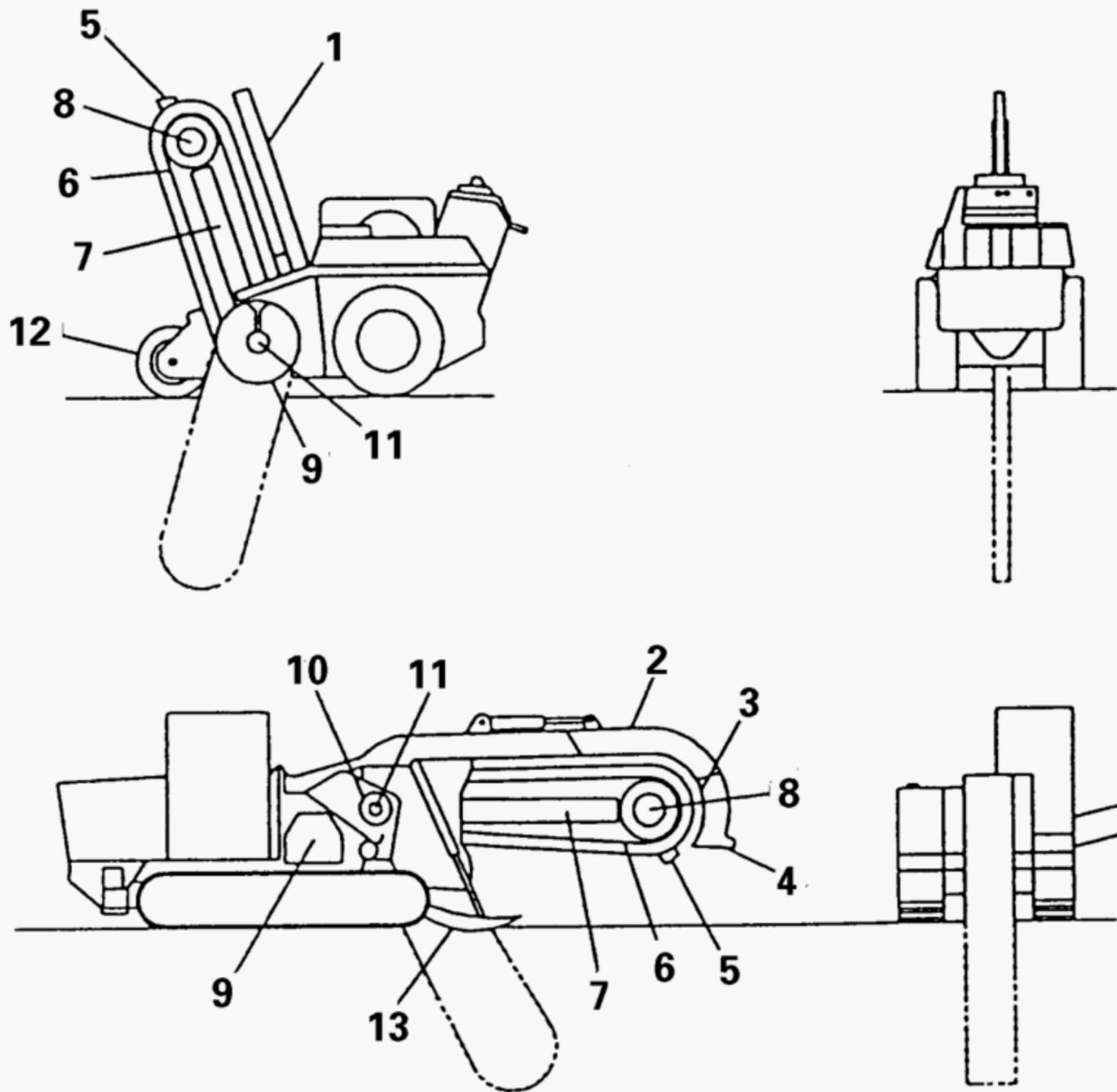


Figure 4 — Chain-line trencher dimensions



Key

- | | | | | | |
|---|-----------------------|---|------------------------------------|----|------------------------------|
| 1 | Restraint bar | 6 | Digging chain (single or multiple) | 10 | Digging chain drive sprocket |
| 2 | Trench cleaner bar | 7 | Digging boom | 11 | Head shaft |
| 3 | Trench cleaner facing | 8 | Boom-end idler | 12 | Trail wheel |
| 4 | Trench cleaner shoe | 9 | Spoil-conveying system | 13 | Stabilizer |
| 5 | Digging tool | | — head-shaft driven auger | | |
| | — cup tooth | | — idler driven auger(s) | | |
| | — chisel tooth | | — conveyor | | |
| | — bit | | — chute | | |
| | — other | | — other | | |

Figure 5 — Chain-line trencher nomenclature

4.2

disc-trencher

trencher (3.1) using a rotating disc edged with cutting tools generally used for cutting rock, hard plane, or road surfaces such as asphalt and concrete

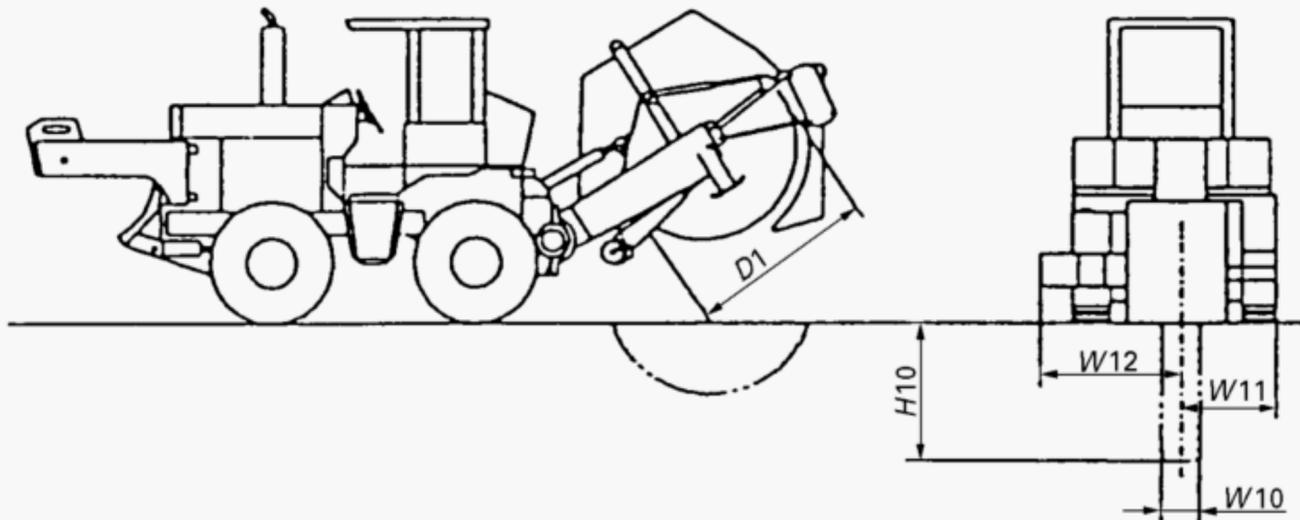
See figures 6 and 7 for dimensions and nomenclature, respectively.

4.2.1

disc diameter

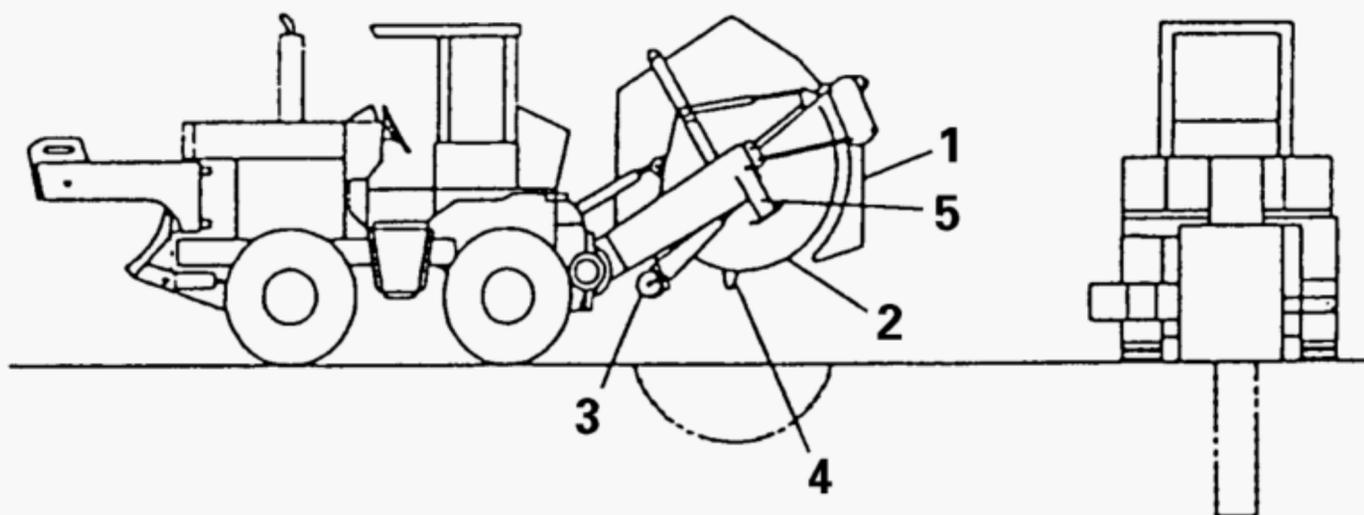
D_1

diametrical distance between the outer tips of the cutting tools on the disc



NOTE — For definitions of dimensions H_{10} , W_{10} , W_{11} , and W_{12} , see 4.1.1 to 4.1.4.

Figure 6 — Disc-trencher dimensions



Key

- | | | | |
|---|------------------------|---|------------|
| 1 | Trench cleaner | 4 | Cutter bit |
| 2 | Cutter disc | 5 | Stabilizer |
| 3 | Spoil-conveying system | | |
| | — auger | | |
| | — conveyor | | |
| | — other | | |

Figure 7 — Disc-trencher nomenclature

4.3

wheel trencher

trencher (3.1) using a rotating wheel typically employing a series of buckets with toothed cutting edges for cutting and conveying **spoil** (3.3) from the **trench** (3.2)

See figures 8 and 9 for dimensions and nomenclature, respectively.

4.3.1
trench depth

H 10

vertical distance from the ground reference plane (GRP) to the bottom of the **trench** (3.2) ignoring the effect on measurement of any **spoil** (3.3) which may be present

4.3.2
wheel diameter

D 2

diametrical distance between the outer tips of the cutting tools on the wheel

4.3.3
wheel clearance

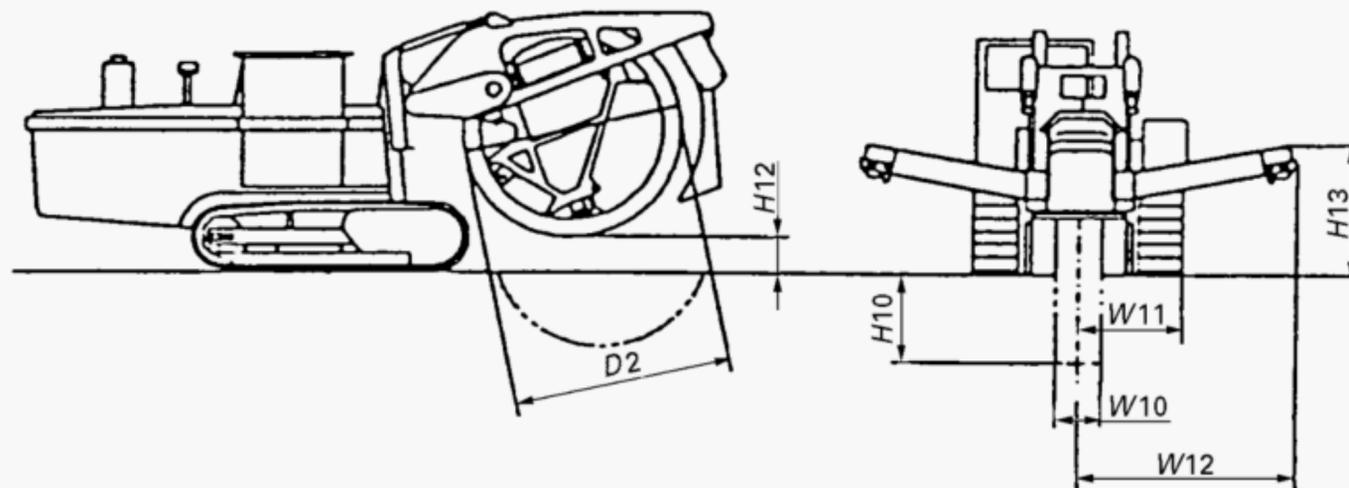
H 12

maximum vertical distance from the ground reference plane (GRP) to the tip of the tool at the bottom of the wheel in its raised position

4.3.4
spoil discharge height

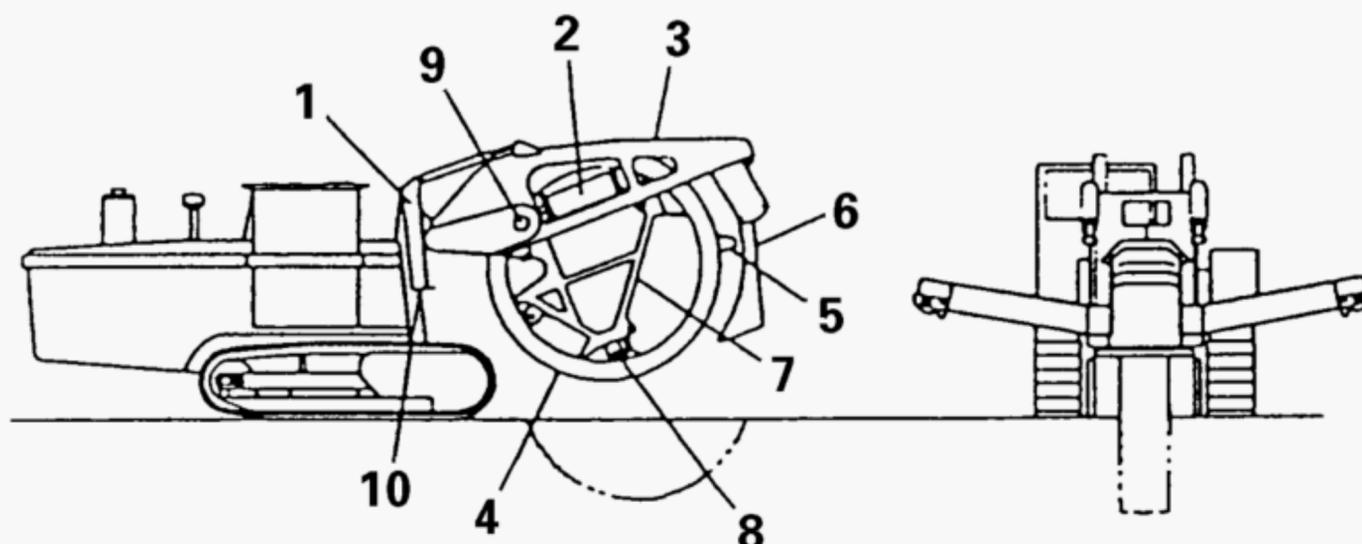
H 13

vertical distance from the ground reference plane (GRP) to the conveyor discharge when at full trenching depth



NOTE — For definitions of dimensions *W* 10, *W* 11, and *W* 12, see 4.1.2 to 4.1.4.

Figure 8 — Wheel-trencher dimensions

**Key**

1	Carriage	6	Trench cleaner
2	Side-discharge conveyor	7	Stay rods
3	Boom frame	8	Truck wheel assembly
4	Digging wheel	9	Head shaft and sprocket
5	Digging bucket	10	Mast

Figure 9 — Wheel-trencher nomenclature**4.4****direct-burial plough**

trencher (3.1) using drawbar pull to move a ripper-like plough blade through the soil while simultaneously burying underground services; its **equipment** (3.6) may be a static plough using only drawbar pull to move the blade through the soil or a vibratory plough using blade oscillation to reduce the drawbar pull required to move the blade through the soil

See figures 10 and 11 for dimensions and nomenclature, respectively.

4.4.1**feed blade cover depth***H* 20

vertical distance from the ground reference plane (GRP) to a horizontal line tangent to the top inside surface of the feed tube at the exit end, with the blade in the full depth position

4.4.2**feed blade width***W* 20

perpendicular distance between vertical planes tangent to internal portions of the feed tube at the narrowest cross section

4.4.3**feed blade bend radius***R* 20

smallest radius of curvature of the feed tube guide, measured from the surface internal to the feed tube

4.4.4**blade steer angle***A* 20

maximum angle that the plough blade may be pivoted, measured horizontally, from the plough arm centreline containing the midposition of the blade to its maximum pivoted position

4.4.5 blade angle adjustment
A 21

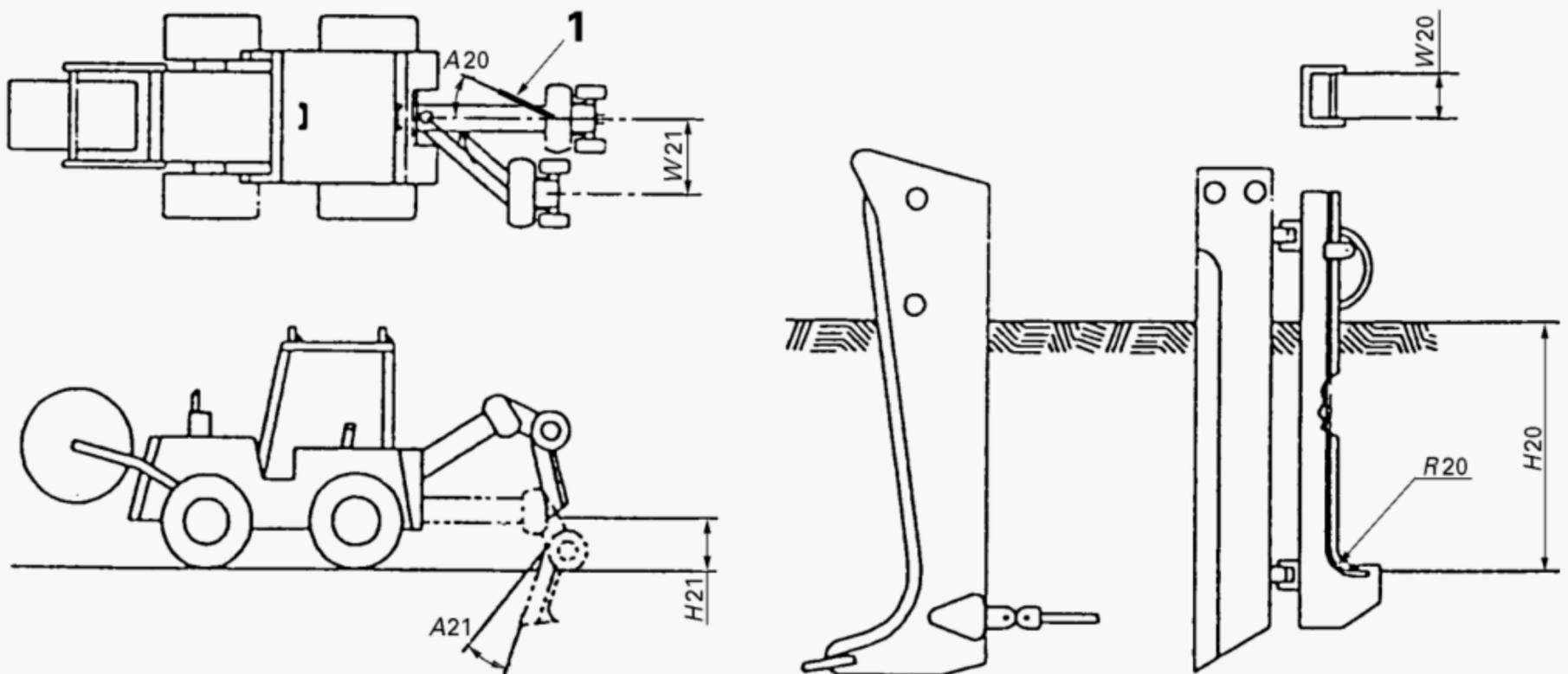
adjustable range in angle of the plough-blade leading edge measured vertically in the plane of the blade path

4.4.6 blade ground clearance
H 21

vertical distance from the ground reference plane (GRP) to the lowest point of the plough blade with the plough arm(s) fully raised and oriented parallel to a vertical plane passing through the machine longitudinal centreline with the specified blade

4.4.7 blade offset from centreline
W 21

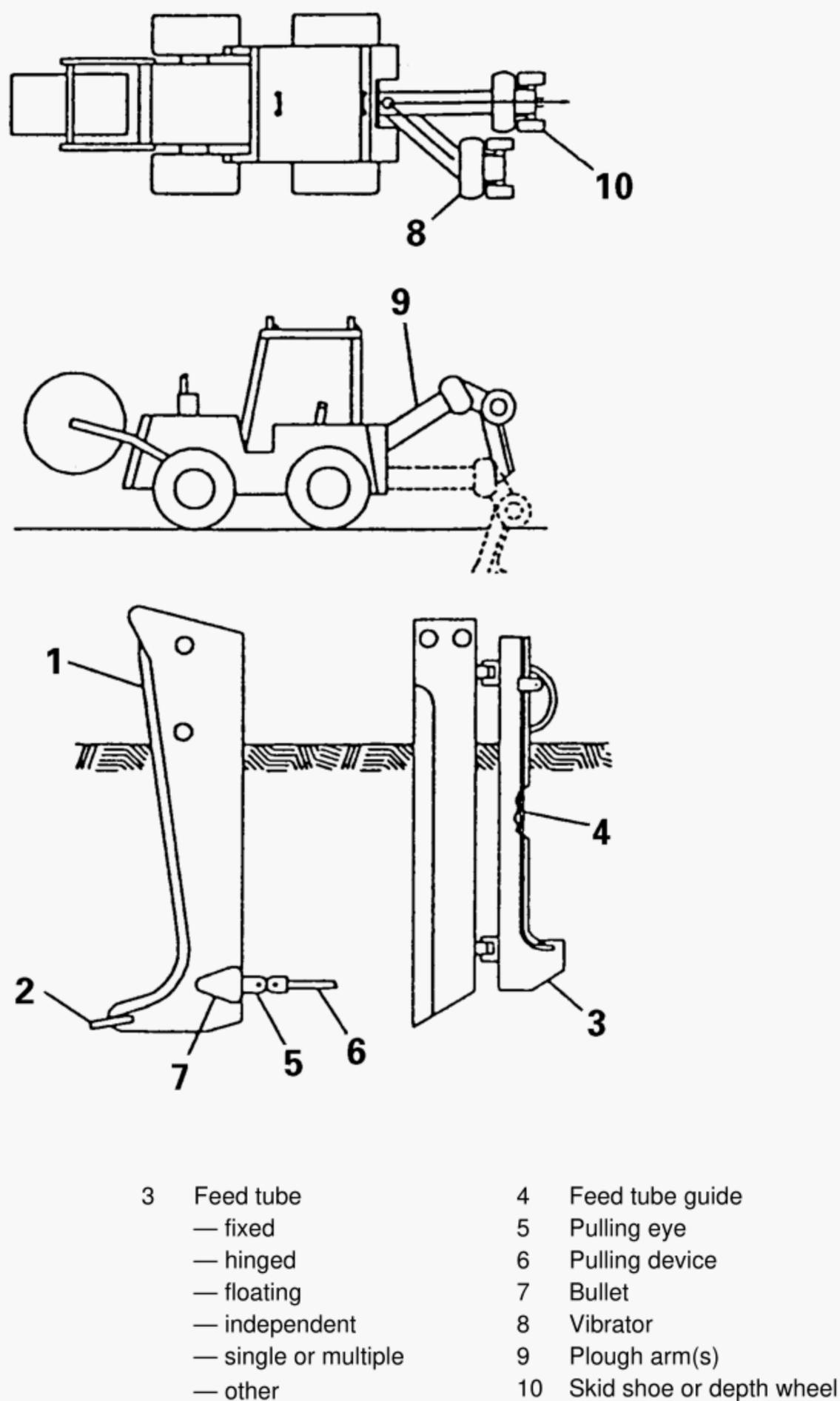
distance from a vertical plane passing through the machine longitudinal centreline to a maximum lateral position of the plough blade, with the blade parallel to the vertical plane and at full depth on the ground reference plane (GRP)



Key

1 Plough blade

Figure 10 — Direct-burial plough dimensions



Key

- | | | | | | |
|---|--------------|---|----------------------|----|--------------------------|
| 1 | Plough blade | 3 | Feed tube | 4 | Feed tube guide |
| — | — feed blade | — | — fixed | 5 | Pulling eye |
| — | — pull blade | — | — hinged | 6 | Pulling device |
| — | — other | — | — floating | 7 | Bullet |
| 2 | Blade toe | — | — independent | 8 | Vibrator |
| | | — | — single or multiple | 9 | Plough arm(s) |
| | | — | — other | 10 | Skid shoe or depth wheel |

Figure 11 — Direct-burial plough nomenclature

5 Attachments

See also ISO 6746-2 for definitions of dimensions.

5.1 reel carrier

integral structure transporting and dispensing a spool of cable or other material during the direct burial ploughing operation

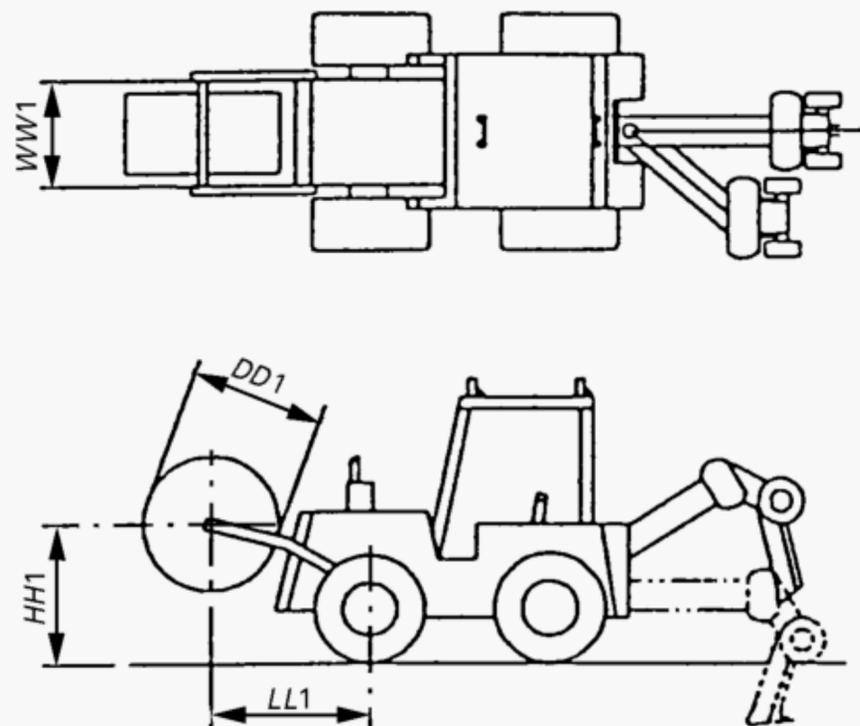
See figures 12 and 13 for dimensions and nomenclature, respectively.

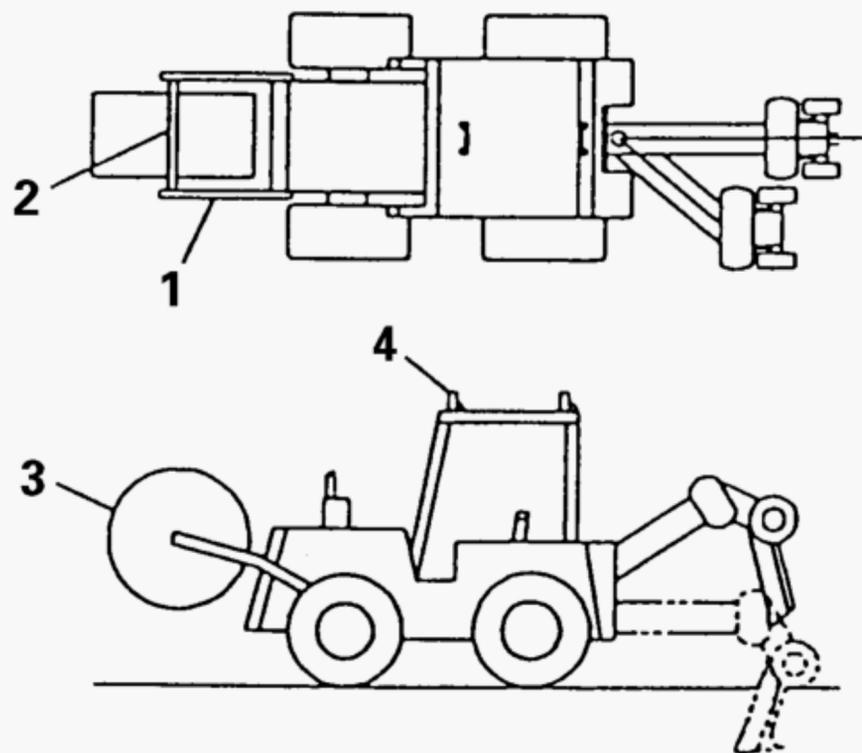
5.1.1**internal width***WW 1*minimum lateral distance between adjacent arms of the **reel carrier** (5.1)**5.1.2****maximum reel diameter***DD 1*two times the minimum radial clearance between the **reel carrier** (5.1) and spindle centreline**5.1.3****spindle height***HH 1*

vertical distance from the ground reference plane (GRP) to the centreline of the spindle when at its maximum raised position

5.1.4**spindle location***LL 1*

horizontal distance from the centreline of the nearest tyre or track sprocket, in contact with the ground, to the centreline of the spindle when at its maximum lift position

**Figure 12 — Reel carrier dimensions**



Key

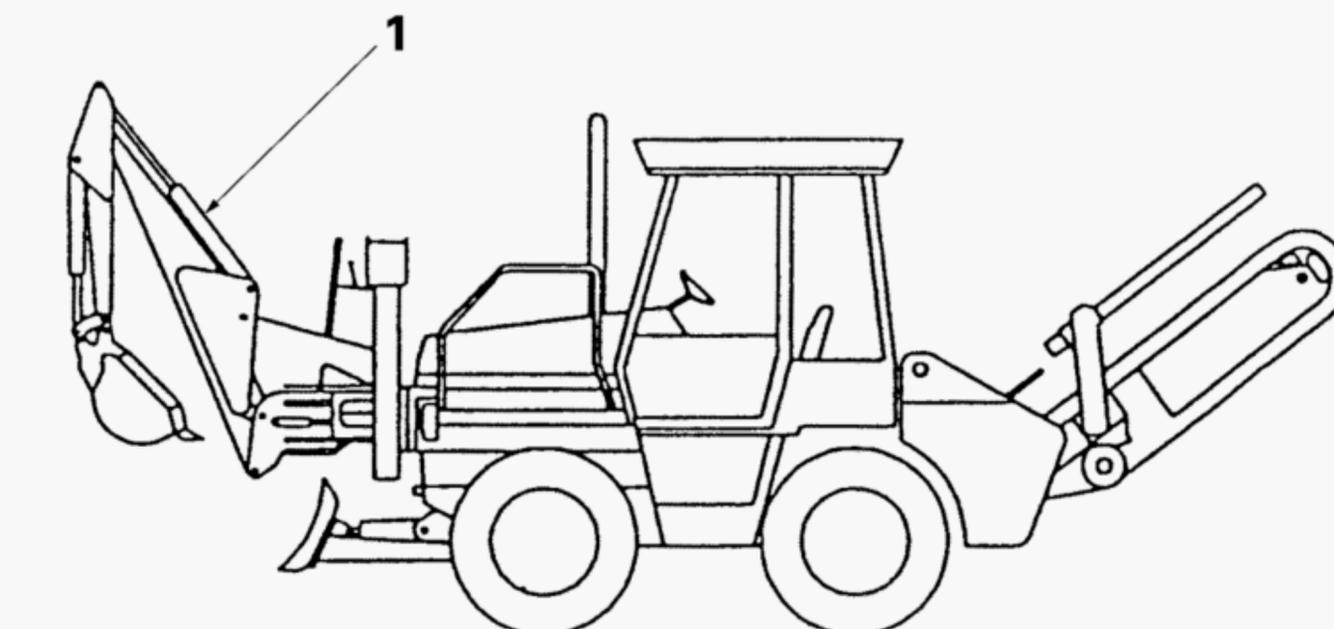
- | | | | |
|---|--------------|---|----------------|
| 1 | Reel carrier | 3 | Reel |
| 2 | Spindle | 4 | Material guide |

Figure 13 — Reel carrier nomenclature

5.2 backhoe attachment

(3.7) which may be mounted on the front or the rear of a **trencher** (3.1)

See figure 14 and ISO 8812 for dimensions and nomenclature.



Key

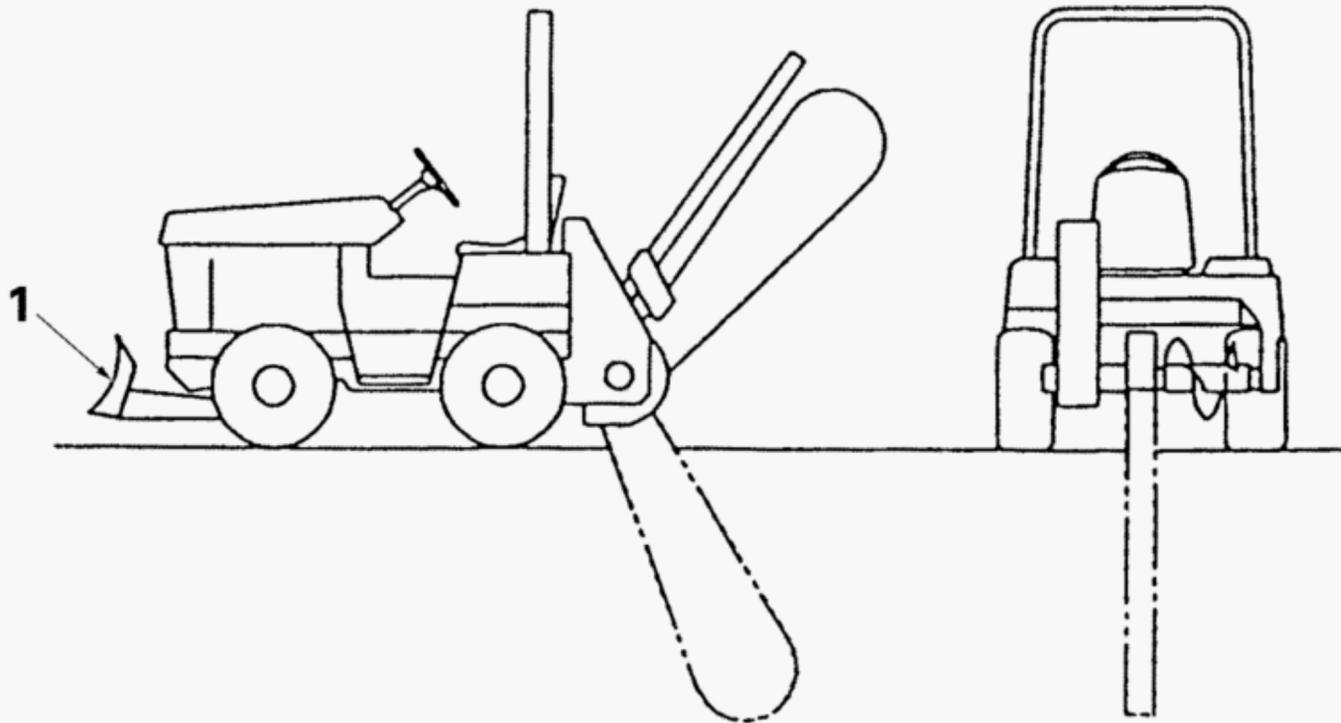
- 1 Backhoe

Figure 14 — Trencher with backhoe

5.3 backfill blade attachment

(3.7) which may be installed on the front or the rear of a **trencher** (3.1) for returning **spoil** (3.3) to the **trench** (3.2)

See figure 15 and ISO 6746-2 for dimensions and nomenclature.

**Key**

1 Backfill blade

Figure 15 — Trencher with backfill blade**6 Commercial literature specifications**

The following information shall be specified in commercial literature.

SI units shall be used.

6.1 Engine

The following information shall be specified for the engine:

- a) manufacturer and model;
- b) ignition type, i.e. compression or spark-ignition;
- c) number of cylinders;
- d) bore and stroke;
- e) displacement;
- f) cooling system;
- g) maximum gross power rating at specified speed;
- h) net flywheel power at installed engine speed in accordance with ISO 9249;
- i) electrical system voltage.

6.2 Ground-drive system

The following information shall be specified for the ground-drive system:

- a) type of drive system, i.e. mechanical or hydrostatic;
- b) maximum travel speed of each gear forward and reverse in accordance with ISO 6014.

6.3 Work-function drive system

The following information shall be specified for the work-function drive system:

- a) type of drive system, i.e. mechanical or hydrostatic;
- b) operating speeds for
 - chain-line trencher: chain speeds,
 - disc- and wheel-trencher: bit speeds,
 - burial plough: oscillating frequency and vibrator force.

6.4 Steering system

The following information shall be specified for the steering system:

- a) type of steering — see ISO 5010 for definitions;
- b) machine clearance diameter — in accordance with ISO 7457
 - front steering only,
 - co-ordinated steering.

6.5 Brake system

See ISO 3450 and ISO 10265.

The type of service and parking brake shall be specified.

6.6 Tyres

The following information shall be specified for tyres:

- a) size and type;
- b) load rating at specified pressure.

6.7 Track

The following information shall be specified for the track:

- a) shoe type;
- b) dimensions.

6.8 Hydraulic system

The pump flow at relief pressure shall be specified.

6.9 System fluid capacities

The following information shall be specified for system fluid capacities:

- a) fuel;
- b) hydraulic system.

6.10 Masses

The following information shall be specified for masses:

- a) operating weight in accordance with ISO 6016;
- b) shipping weight in accordance with ISO 6016.

