
**Earth-moving machinery — Horizontal
directional drills — Terminology and
specifications**

*Engins de terrassement — Machines de forage à direction
horizontale — Terminologie et spécifications*

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Published in Switzerland

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Foreword

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ISO 21467 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 4, *Commercial nomenclature, classification and rating*.

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Earth-moving machinery — Horizontal directional drills — Terminology and specifications

1 Scope

This International Standard establishes terminology for horizontal directional drilling machines as defined in 3.1.1. It is applicable to non-riding, ride-on, pit-launched and attachment-mounted machines.

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*

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

3 Terms and definitions

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

3.1 General

3.1.1

horizontal directional drilling machine

machine that uses a steerable cutting head attached to the end of a drill string for creating a bore through the earth in a horizontal direction

See Figures 1 to 4.

NOTE 1 Drilling can include fluid injection through the drill string to the cutting head, tracking of the bore by use of sensors or a transponder near the cutting head and subsequent enlargement of the bore by backreaming.

NOTE 2 These machines typically apply force to the drill string using a drill frame parallel to, or inclined up to, 30° relative to the operating earth surface.

3.1.2

bore

hole produced underground used primarily for the installation of service utilities

3.1.3

drill string

one or more pieces of drill pipe joined together which transmit forces from the drill frame to the cutting head or backreamer that cuts the earth

NOTE It is also used to rotate the cutting head to position it for steering.

3.1.4

drill frame

structure on the horizontal drilling machine that transmits rotational and push/pull forces to the drill string

3.1.5

backreaming

process of enlarging the bore by pulling back a tool of larger diameter than that previously used to form the bore

3.2 Dimensions

3.2.1

overall machine length

L

longitudinal distance between the planes of the outer extremities in transport position

3.2.2

overall machine height

H

distance from the ground to the highest extremity in transport position

3.2.3

overall machine width

W

transverse distance between the planes of the outer extremities in transport position

3.2.4

entry angle

angle between the drill pipe and the ground plane with the machine in operating (work) position, expressed in degrees

3.2.5

drill pipe diameter

D1

minimum outside diameter of drill pipe excluding tool joint end

See Figure 5.

3.2.6

drill pipe tool joint end diameter

D2

maximum outside diameter of drill pipe tool joint end

See Figure 5.

3.2.7

drill pipe nominal length

L1

nominal (made-up) length of drill pipe

See Figure 5.

3.2.8

drill pipe overall length

L2

overall length of drill pipe

See Figure 5.

3.2.9**drill pipe wall thickness***T*

nominal wall thickness of drill pipe section, excluding tool joint end

See Figure 5.

3.2.10**fluid capacity of drill pipe**

Maximum measured volume of water the drill pipe can store internally per meter of length

3.2.11**drill pipe bore path bend radius***R*

calculated bend limit of a carbon steel pipe drill string during the drilling operation derived from the formula

$$R = \frac{E \times D1}{292 \times U}$$

where

R is the bend of radius, in metres

E is the modulus of elasticity of the pipe material, in megapascals

D1 is the outside diameter of the pipe, in millimetres

U is the published ultimate tensile strength of the pipe material, in megapascals

3.2.12**backreamer diameter**

maximum diameter of the circle that the reamer circumscribes

3.2.13**pit size**

minimum required pit width and length for a pit-launched machine (see Figure 3)

3.2.14**pit width***A*

minimum measured width at bottom of pit to the theoretical vertical ground planes for a given machine

3.2.15**pit length***B*

minimum measured length at the bottom of the pit to the theoretical vertical ground planes for a given machine

3.3 Masses**3.3.1****drilling machine operating mass**

mass of base machine with hydraulic tank full, fuel tank full, drilling fluid system full (if so equipped) and drill pipe storage rack on the machine full (if so equipped)

3.3.2**ground-bearing pressure**

drilling machine operating mass divided by ground contact area

3.3.3

drill pipe mass

measured mass of an empty drill pipe

3.4 Performance

NOTE Parameters that are measured, not calculated, are continuously achievable output levels at typical machine operating temperature.

3.4.1

engine net power

net power of the engine according to ISO 9249

3.4.2

ground travel speed

maximum ground travel speed of the drilling machine in both forward and reverse directions at operating mass

3.4.3

rotary spindle power

maximum rotational power measured at the spindle output

3.4.4

maximum spindle torque

maximum spindle torque measured to stall spindle rotation

3.4.5

maximum spindle speed

maximum measured revolutions per minute of the spindle

3.4.6

carriage thrust travel speed

maximum speed of movement of the carriage at no load in the advancing direction

3.4.7

carriage pullback travel speed

maximum speed of movement of the carriage at no load in the retracting direction

3.4.8

thrust force

maximum force measured to stall movement of the carriage in the advancing direction

3.4.9

pullback force

maximum force measured to stall movement of the carriage in the retracting direction

3.4.10

drilling fluid power

maximum drilling fluid power calculated from measured values of pressure and flow simultaneously available at the spindle while pumping water through the spindle

3.4.11

maximum drilling fluid pressure

maximum pressure measured at the spindle

3.4.12

maximum drilling fluid flow

maximum flow measured at the spindle

3.4.13 Drill pipe performance

3.4.13.1

column strength

maximum compressive, axially aligned, load the pipe can withstand without a buckling failure, when tested with the pipe in a horizontal position supported only at each end connection

See Figure 6.

3.4.13.2

torque capacity

maximum rotational moment the pipe can withstand without permanent deformation, when tested with the moment applied and resisted through the end connections

See Figure 7.

3.4.13.3

push/pull capacity

maximum compressive and tensile loads the pipe can withstand without permanent deformation, when tested with the pipe restrained at its quarter spans and with the loads applied through the end connections

See Figure 8.

3.4.13.4

rotational bending life rating

number of fully reversed rotational stress cycles (average of at least three tests) the pipe can withstand without failure at a test radius (R_1) of 0,67R

See Figure 9.

3.4.13.5

flow capacity

flow of water resulting in a 0,7 MPa (7 bar) pressure drop through 30 m of assembled drill pipe

3.4.13.6

make-up torque

manufacturer's recommended tightening torque when two joints of drill pipe are threaded together

4 Nomenclature

NOTE Some items shown may not be standard equipment.

4.1 Non-riding machine (see Figure 1)

4.1.1 Direct control

4.1.2 Control by wire

4.1.3 Remote (wireless) control

4.2 Ride-on machine

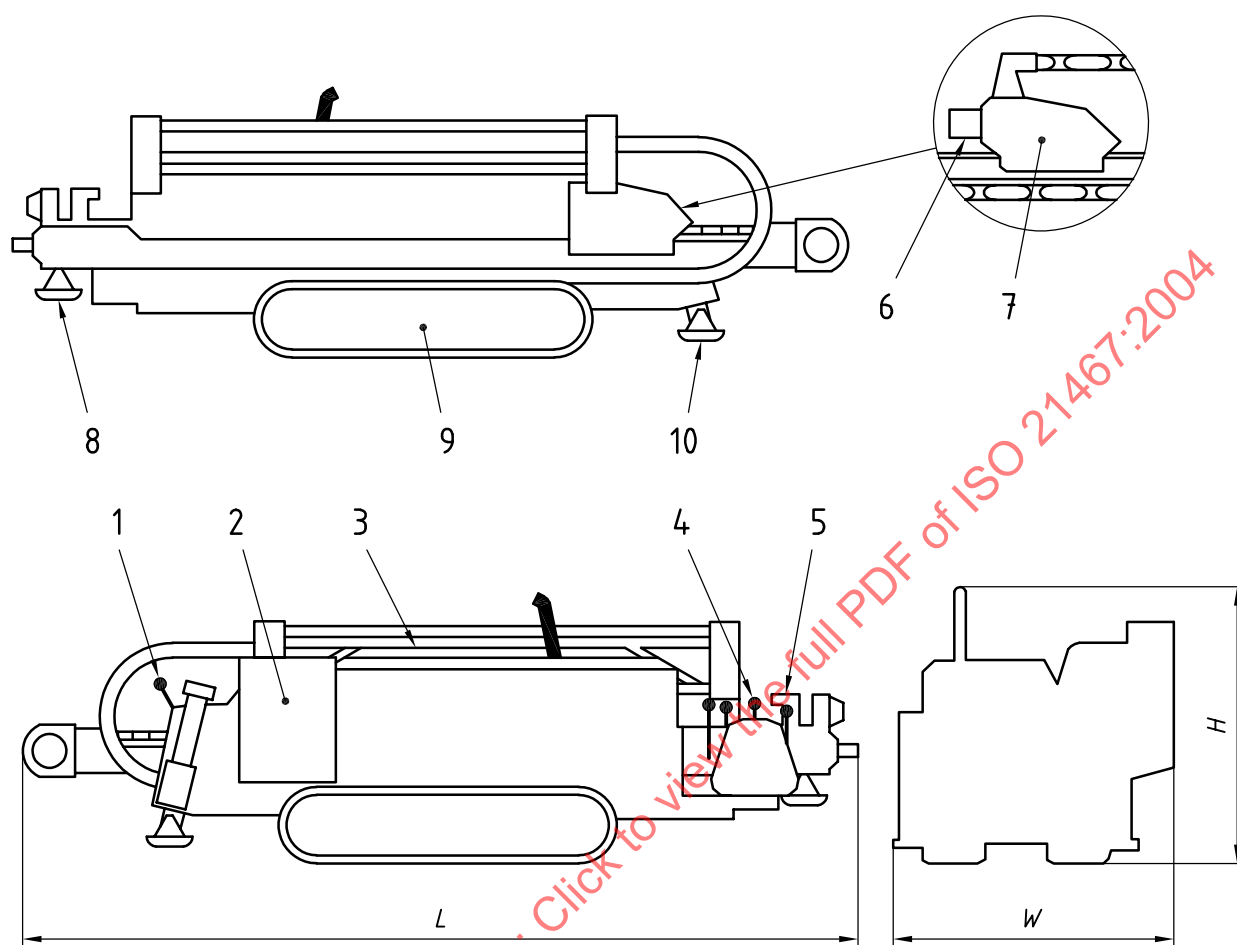
See Figure 2.

4.3 Pit-launched machine

See Figure 3.

4.4 Attachment-mounted machine

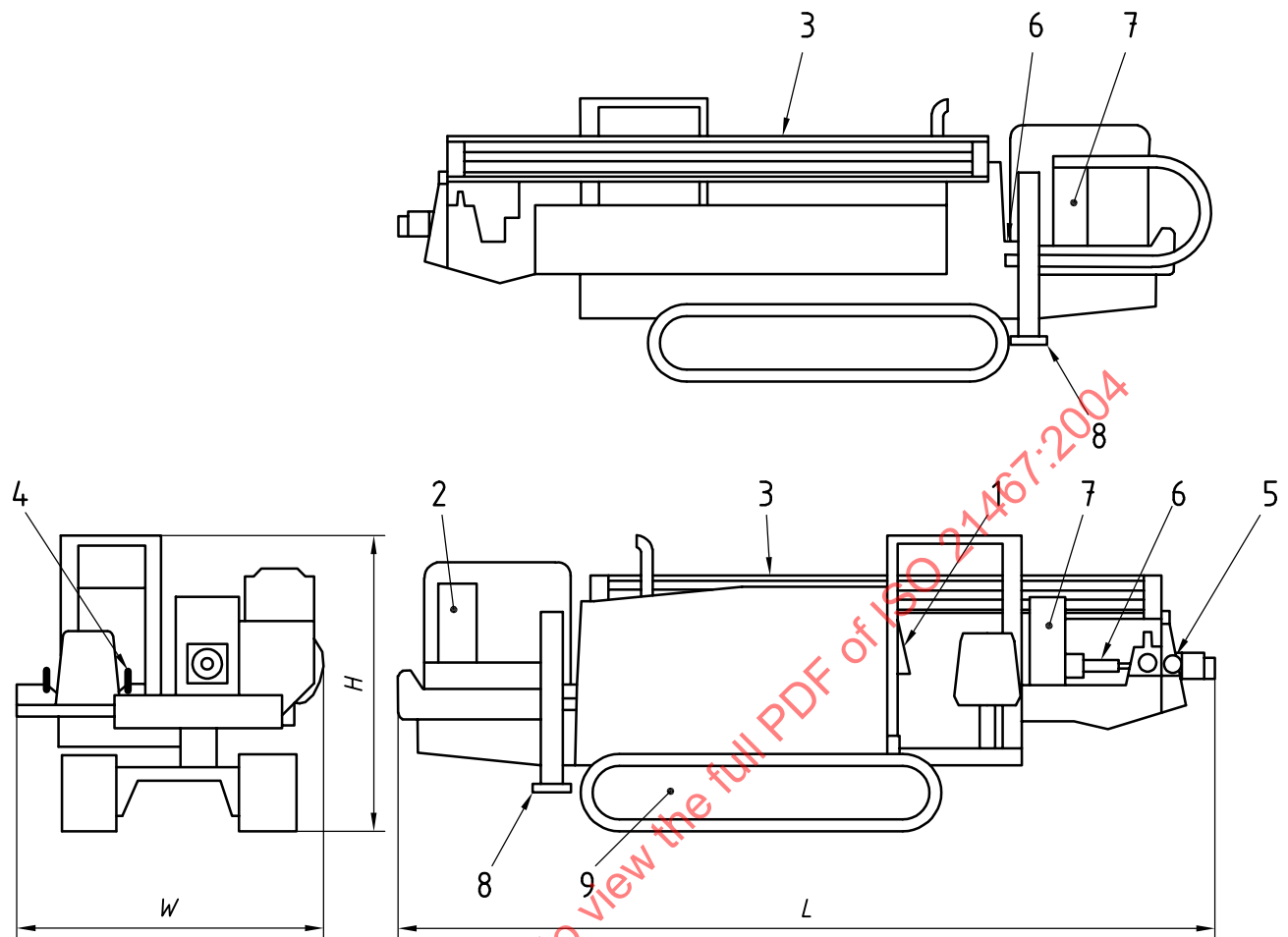
See Figure 4.



Key

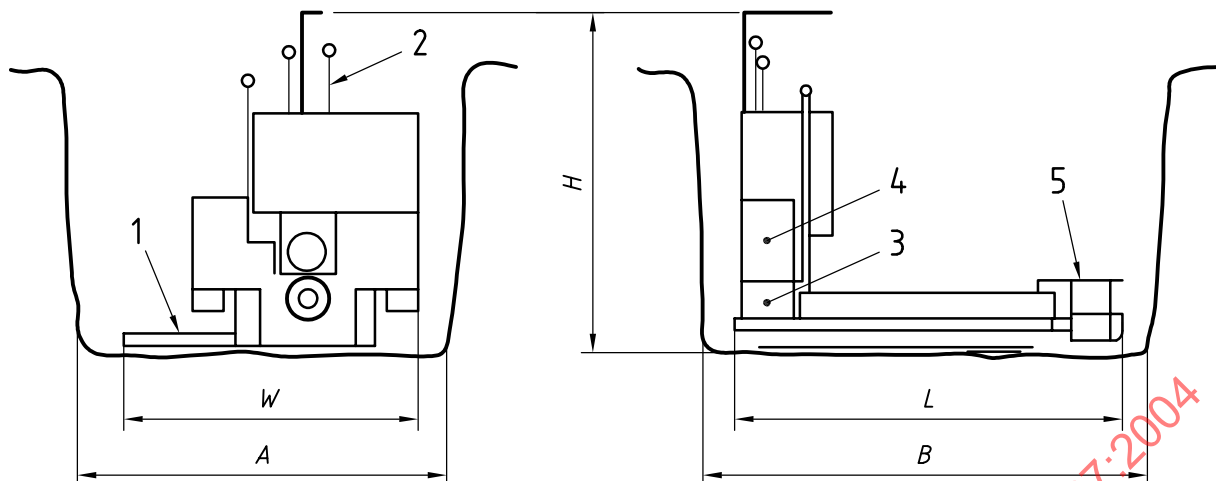
- H overall machine height
- L overall machine length
- W overall machine width
- 1 set-up controls
- 2 water tank
- 3 drill pipe rack
- 4 drill controls
- 5 clamp
- 6 spindle
- 7 carriage
- 8 front outrigger
- 9 undercarriage
- 10 rear outrigger

Figure 1 — Non-riding horizontal directional drilling machine

**Key**

- H overall machine height
- L overall machine length
- W overall machine width
- 1 set-up controls
- 2 water tank
- 3 drill pipe rack
- 4 drill controls — operator's station
- 5 clamp
- 6 spindle
- 7 carriage
- 8 rear outrigger
- 9 undercarriage

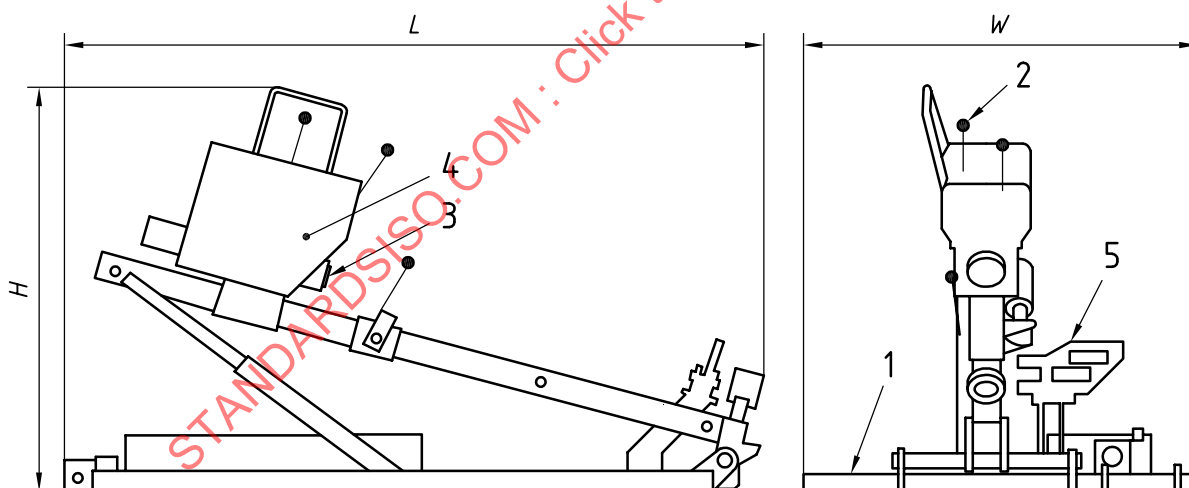
Figure 2 — Ride-on horizontal directional drilling machine



Key

- A pit width
- B pit length
- H overall machine height
- L overall machine length
- W overall machine width
- 1 operator station
- 2 drill controls
- 3 spindle
- 4 carriage
- 5 clamp

Figure 3 — Pit-launched horizontal directional drilling machine



Key

- H overall machine height
- L overall machine length
- W overall machine width
- 1 operator station
- 2 drill controls
- 3 spindle
- 4 carriage
- 5 clamp

Figure 4 — Attachment-mounted horizontal directional drilling machine