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Drilling and foundation machinery — Horizontal directional drilling (HDD) machines — Commercial specifications

Machines de forage et de fondation — Machines de forage horizontal dirigé (HDD) — Spécifications commerciales

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 195, *Building construction machinery and equipment*, Subcommittee SC 3, *Drilling and foundation machinery and equipment*.

This second edition cancels and replaces the first edition (ISO 21467:2004), which has been technically revised.

The main changes are as follows:

— the title has been updated;

— the Scope has been updated, including machines that were previously excluded;

— the term "machine" has been replaced by "HDD machine" throughout the document;

— Clause 2 has been updated with the removal of ISO 6165;

— in Clause 3, several HDD machine type definitions have been added to align with Clause 4; additional definitions have been added to align with the figures in Annex A; definitions have been removed (for example, performance definitions) if not covered in the body text; Clause 3 has been divided into sub-sections for better flow and readability;

— in Clause 4, nomenclature has been removed because it was out of the scope; Clause 4 now covers machine types; figures that are still appropriate have been moved to Annex A;

— Clause 5 for commercial specifications has been added;

— Annex A has been added to include figures and key items previously in Clause 4;

— Annex B has been added to illustrate key drilling tool components;

— Annex C has been added to illustrate external structures used with large HDD machines;

— Bibliography has been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Drilling and foundation machinery — Horizontal directional drilling (HDD) machines — Commercial specifications

1 Scope

This document establishes content for commercial specifications for horizontal directional drilling (HDD) machines.

It is not applicable to:

— soil drilling machines (see ISO 11886);

— soil/rock drilling machines (see ISO 11886);

— foundation machines (see ISO 11886);

— pile driving machines (see ISO 11886);

— rock drill rigs (see ISO 18758-1).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 9249, *Earth-moving machinery — Engine test code — Net power*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 General

3.1.1
horizontal directional drilling machine
HDD machine
machine that uses a steerable *drill head* (3.3.1) attached to the end of a *drill string* (3.3.2) to drill through the earth in a mostly horizontal direction

Note 1 to entry: HDD machines typically apply force to the drill string using a *drill frame* (3.3.8) parallel to, or inclined up to 30° relative to, the operating earth surface.

Note 2 to entry: For examples, see Annex A.

3.2 HDD machine types

3.2.1
portable HDD machine
HDD machine (3.1.1) designed to be hand-carried or transported manually entirely or partly

Note 1 to entry: See Figure 1.

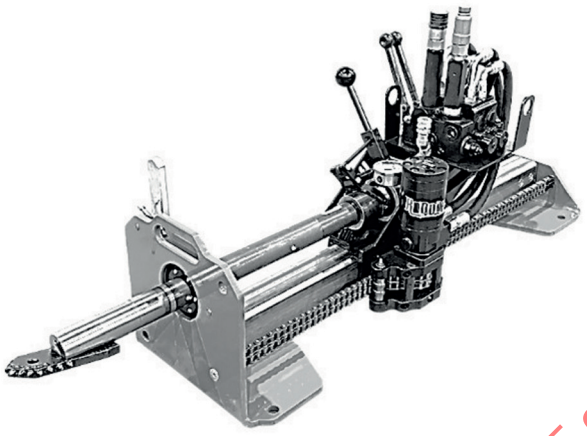


Figure 1 — Example of portable HDD machine

3.2.2
pedestrian-controlled HDD machine
self-propelled HDD machine (3.2.4) operated by a pedestrian operator with on-board or cabled controls

Note 1 to entry: See Figure 2.

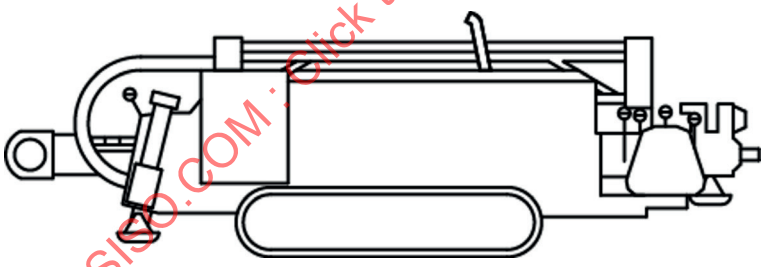


Figure 2 — Example of pedestrian-controlled HDD machine

3.2.3
towed HDD machine
HDD machine (3.1.1) with an integrated trailer chassis for transport

Note 1 to entry: See Figure 3.

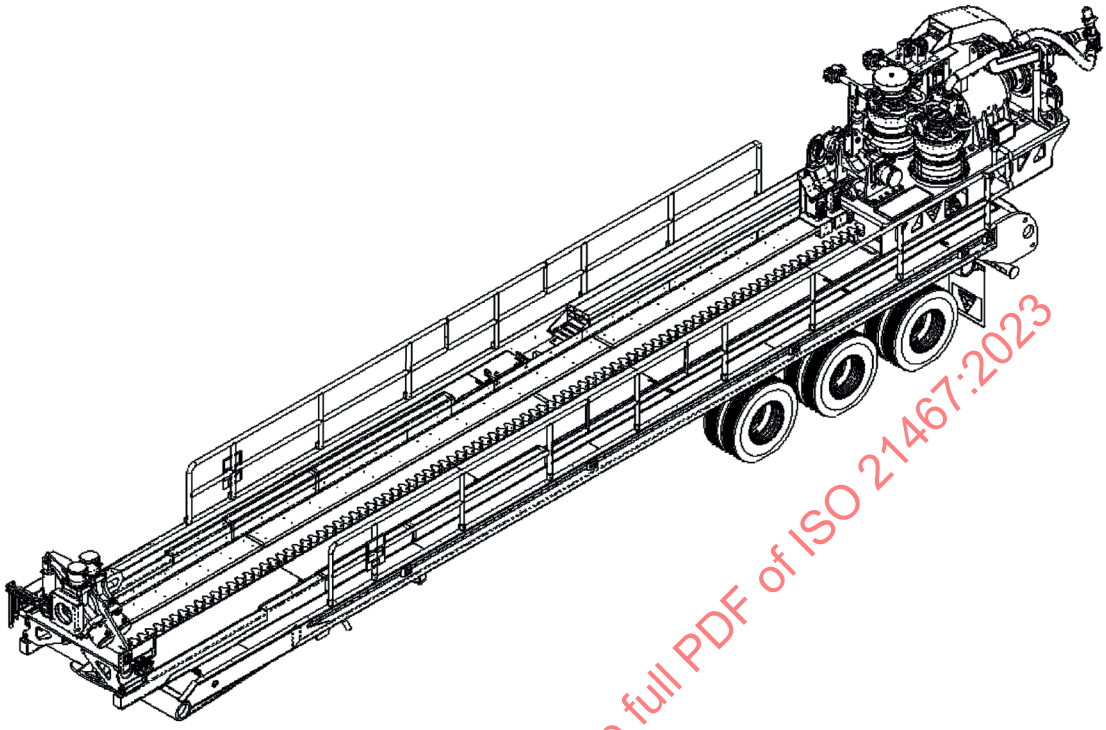


Figure 3 — Example of towed HDD machine

3.2.4
self-propelled HDD machine
HDD machine (3.1.1) that trams under its own power

Note 1 to entry: See Figure 4.

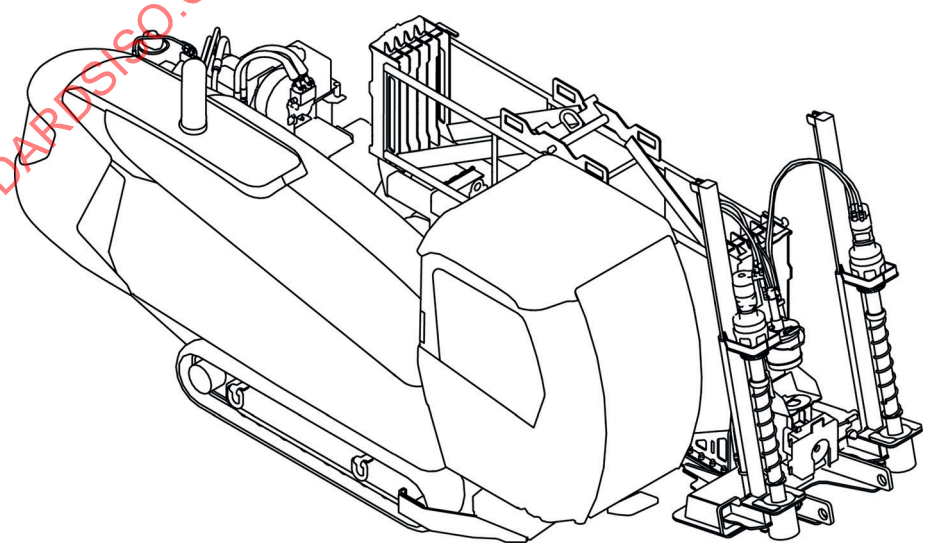


Figure 4 — Example of self-propelled HDD machine

3.2.5
ride-on HDD machine
self-propelled HDD machine (3.2.4) that is controlled by a seated or standing operator on the machine while tramming

Note 1 to entry: See Figure 5.

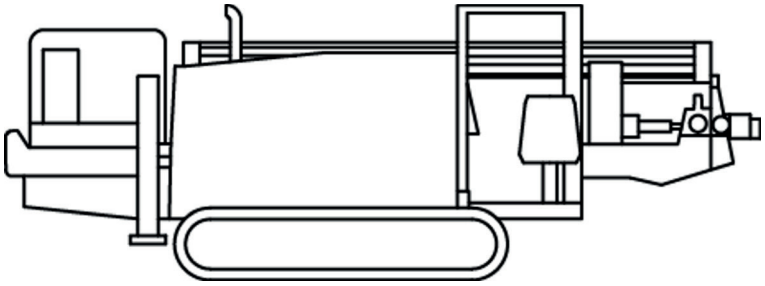


Figure 5 — Example of ride-on HDD machine

3.2.6
remote-controlled tramming HDD machine
self-propelled HDD machine (3.2.4) that is operated with a wireless remote control

Note 1 to entry: See Figure 6.

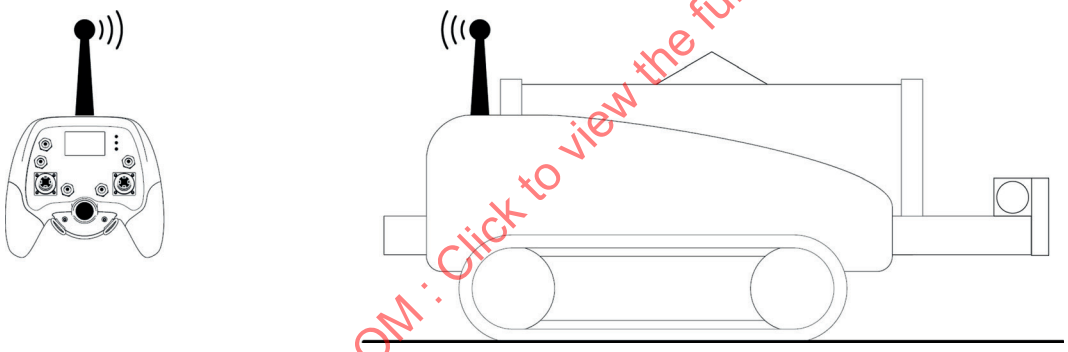


Figure 6 — Example of remote-controlled tramming HDD machine

3.2.7
skid-mounted HDD machine
stationary *HDD machine* (3.1.1) mounted on a frame with provisions for it to be transported

Note 1 to entry: See Figure 7.

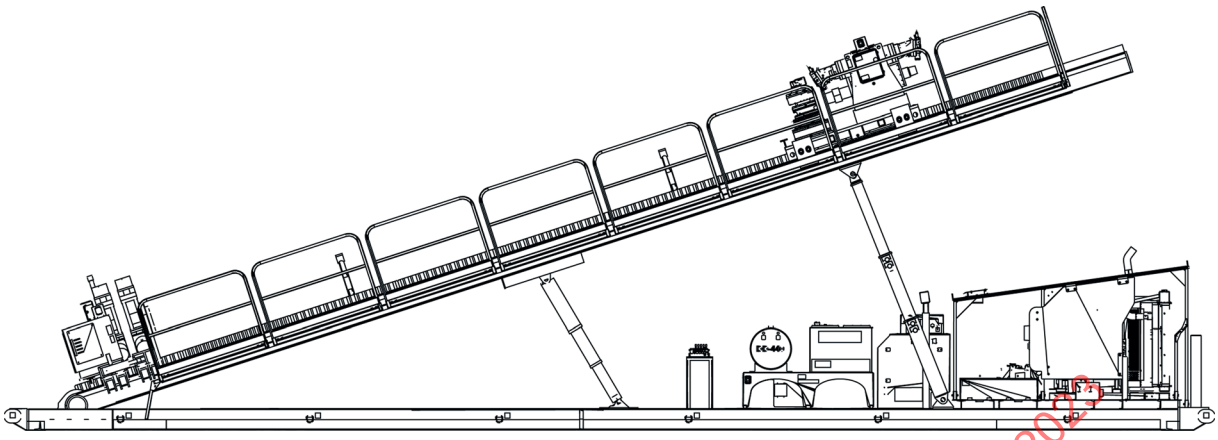


Figure 7 — Example of skid-mounted HDD machine

3.2.8
pit-launched HDD machine
portable HDD machine (3.2.1) that is set up in an excavated pit to perform the drilling operation

Note 1 to entry: See Figure 8.

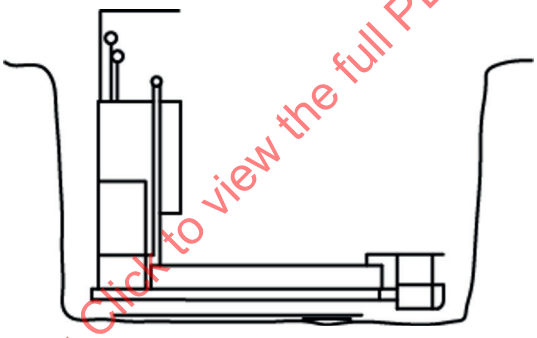


Figure 8 — Example of pit-launched HDD machine

3.2.9
surface-launched HDD machine
HDD machine (3.1.1) that is set up on the ground surface

Note 1 to entry: See Figure 9.

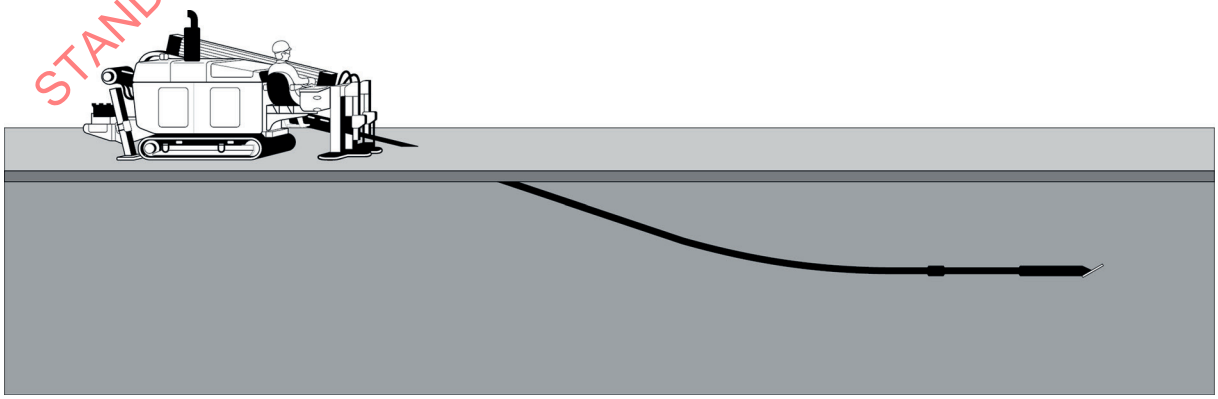


Figure 9 — Example of surface-launched HDD machine

3.3 Components

3.3.1
drill head
device at the leading end of the *drill string* (3.3.2) that holds the *drill bit* (3.3.4), injects flushing media into the *bore* (3.8.1), and holds the tracking device

Note 1 to entry: See Annex B for examples and further information.

3.3.2
drill string
piece or pieces of *drill pipe* (3.3.3) joined together that transmit forces from the *HDD machine* (3.1.1) to the *drill head* (3.3.1) or *reamer* (3.3.5)

Note 1 to entry: It is also used to rotate the drill head to position it for steering.

Note 2 to entry: See Annex B for examples and further information.

3.3.3
drill pipe
drill rod
length of tube designed to transfer flushing media and rotation energy from the *HDD machine* (3.1.1) to the *drill bit* (3.3.4)

Note 1 to entry: See Annex B for examples and further information.

3.3.4
drill bit
device designed as a tool to penetrate the formation being drilled by the drilling method employed

Note 1 to entry: The drill bit can be typically replaced or rebuilt.

Note 2 to entry: See Annex B for examples and further information.

[SOURCE: ISO 22475-1:2021, 3.2.2, modified — Removed "which is attached to, or an integral part of, the drill string that is used as a cutting tool" and added "designed as a tool"; added notes 1 and 2 to entry.]

3.3.5
reamer
cutting tool designed specifically to enlarge a bored hole

Note 1 to entry: See Annex B for examples and further information.

3.3.6
clamp
vise
wrench
device used to hold either the *drill pipe* (3.3.3) or the *drill head* (3.3.1), or both, securely to join or disconnect the joints

3.3.7
drill pipe rack
drill rod rack
structure that holds multiple *drill pipes* (3.3.3)

Note 1 to entry: The drill pipe rack can be loaded or uploaded manually or with the use of a *loader* (3.8.2).

3.3.8
drill frame
structure on the *HDD machine* (3.1.1) that carries the *drill frame carriage* (3.3.9)

3.3.9
drill frame carriage
structure that travels along the *drill frame* (3.3.8) that transmits rotational and push/pull forces to the *drill string* (3.3.2)

3.3.10
spindle
structure on the *drill frame carriage* (3.3.9) that provides the connection to the *drill string* (3.3.2) to transmit torque, thrust, and pull from the *drill frame* (3.3.8) to the drill string

3.3.11
stabilising device
device or structure used to stabilise the *HDD machine* (3.1.1) by supporting or levelling it

EXAMPLE Stabiliser, outrigger.

3.3.12
undercarriage
chassis providing mobility for and supporting the weight of the *HDD machine* (3.1.1)

3.3.13
on-board fluid tank
vessel mounted on the *HDD machine* (3.1.1) containing water or drilling fluid

3.4 Dimensional characteristics

3.4.1
overall machine length
L
longitudinal distance between the planes of the outer extremities in operating configuration

3.4.2
overall machine height
H
distance from the ground reference plane to the highest extremity in operating configuration

3.4.3
overall machine width
W
transverse distance between the planes of the outer extremities in operating configuration

3.4.4
bore entry angle
angle between the *drill pipe* (3.3.3) and the ground reference plane, with the *HDD machine* (3.1.1) in operating (work) position

3.4.5
setback
minimum required distance between the front of the *HDD machine* (3.1.1) and the entry point of the *drill string* (3.3.2) into the ground

3.4.6
angle of approach
angle between the ground reference plane and a plane, tangent to the front tyres or tracks of an *HDD machine* (3.1.1) and passing through the lowest point of any protruding structure or component ahead of the front tyres or tracks, which limits the magnitude of the angle

[SOURCE: ISO 13539:1998, 3.8.9, modified — Removed the symbol "A 1"; removed "(GRP)" after "ground reference plane"; changed "forward" to "front"; changed "a machine" to "an HDD machine"; changed "in front of" to "ahead of"; changed "tyres or tracks" to "front tyres or tracks"; removed references to figures.]

3.4.7
angle of departure
angle between the ground reference plane and a plane, tangent to the rear tyres or tracks of an *HDD machine* (3.1.1) and passing through the lowest point of any protruding structure or component behind the rear tyres or tracks, which limits the magnitude of the angle

[SOURCE: ISO 13539:1998, 3.8.10, modified — Removed the symbol "A 2"; removed "(GRP)" after "ground reference plane"; changed "a machine" to "an HDD machine"; removed references to figures.]

3.4.8
pit width
A
minimum measured width at bottom of pit to the theoretical vertical ground planes for a given machine

3.4.9
pit length
B
minimum measured length at the bottom of the pit to the theoretical vertical ground planes for a given machine

3.5 Masses

3.5.1
operating mass
mass of base machine with hydraulic tank full, fuel tank full, *on-board fluid tank* (3.3.13) full (if so equipped) and *drill pipe rack* (3.3.7) on the *HDD machine* (3.1.1) full with the heaviest pipe configuration (if so equipped)

3.5.2
drill pipe mass
drill rod mass
measured mass of an empty *drill pipe* (3.3.3)

3.6 Speeds, torques, and forces

3.6.1
maximum ground travel speed
ground travel speed of the *HDD machine* (3.1.1) in both forward and reverse directions at *operating mass* (3.5.1) at maximum engine rotational speed

3.6.2
maximum spindle speed
maximum measured revolutions per minute of the *spindle* (3.3.10) under no load

3.6.3
maximum spindle torque
maximum torque measured to stall *spindle* (3.3.10) rotation

3.6.4
carriage thrust travel speed
maximum speed of movement of the *drill frame carriage* (3.3.9) at no load in the advancing direction

3.6.5
maximum carriage thrust force
maximum force measured to stall movement of the *drill frame carriage* (3.3.9) in the advancing direction

3.6.6
carriage pullback travel speed
maximum speed of movement of the *drill frame carriage* (3.3.9) at no load in the retracting direction

3.6.7
maximum carriage pullback force
maximum force measured to stall movement of the *drill frame carriage* (3.3.9) in the retracting direction

3.7 Fluid pressure and flow

3.7.1
maximum drilling fluid pressure
maximum pressure measured at the *spindle* (3.3.10)

3.7.2
maximum drilling fluid flow
maximum flow measured at the *spindle* (3.3.10)

3.8 Other terms

3.8.1
bore
horizontal hole produced underground

3.8.2
loader
handling device
device used to handle and position items for the drilling operation

Note 1 to entry: These items are typically *drill pipes* (3.3.3), *drill pipe racks* (3.3.7) and drill tooling.

3.9 External structures

3.9.1
external power supply
energy source that is not part of the machine for supplying power to the *HDD machine* (3.1.1)

Note 1 to entry: See Annex C for examples.

3.9.2
external control room
free-standing structure with provisions for observing and controlling *HDD machine* (3.1.1) operation

Note 1 to entry: See Annex C for examples.

4 HDD machine types

HDD machine types are listed but not limited to the following:

a) portable HDD machines;
   — pit-launched HDD machines;
b) towed HDD machines;
c) self-propelled HDD machines;
   — pedestrian-controlled HDD machines;
   — ride-on HDD machines;
   — remote-controlled tramming HDD machines;
d) skid-mounted HDD machines;

e) surface-launched HDD machines.

NOTE See Annex A for examples.

5 Commercial specifications

5.1 General specifications

The following general characteristics shall be specified and expressed in:

a)	overall machine length	m
b)	overall machine height	m
c)	overall machine width	m
d)	operating mass	kg
e)	bore entry angle (maximum)	degrees
f)	setback	m
g)	angle of approach	degrees
h)	angle of departure	degrees
i)	bore diameter	mm
j)	maximum ground travel speed	km/h
k)	fuel tank capacity	l
l)	hydraulic tank capacity	l
m)	drilling fluid capacity (if equipped)	l
n)	water tank capacity (if equipped)	l

5.2 Engine specifications

The following engine specifications shall be specified:

a)	make and model	
b)	fuel type	
c)	maximum engine speed	r/min
d)	engine net power	kW in accordance with ISO 9249

5.3 Operating specifications

The following operating specifications shall be specified and expressed in:

a)	operating machine length	m
b)	operating machine height	m
c)	operating machine width	m

d)	maximum spindle torque	N·m
e)	maximum spindle speed	r/min
f)	carriage thrust travel speed	m/s
g)	carriage pullback travel speed	m/s
h)	maximum carriage thrust force	kN
i)	maximum carriage pullback force	kN
j)	maximum drilling fluid pump pressure	bar
k)	maximum drilling fluid pump flow	l/m

5.4 Drill pipe specifications

The following drill pipe specifications shall be specified and expressed in:

a)	minimum bend radius	m
b)	length	m
c)	joint diameter	mm
d)	drill pipe mass	kg

5.5 Drilling fluid specifications

The following drilling fluid specifications shall be specified and expressed in:

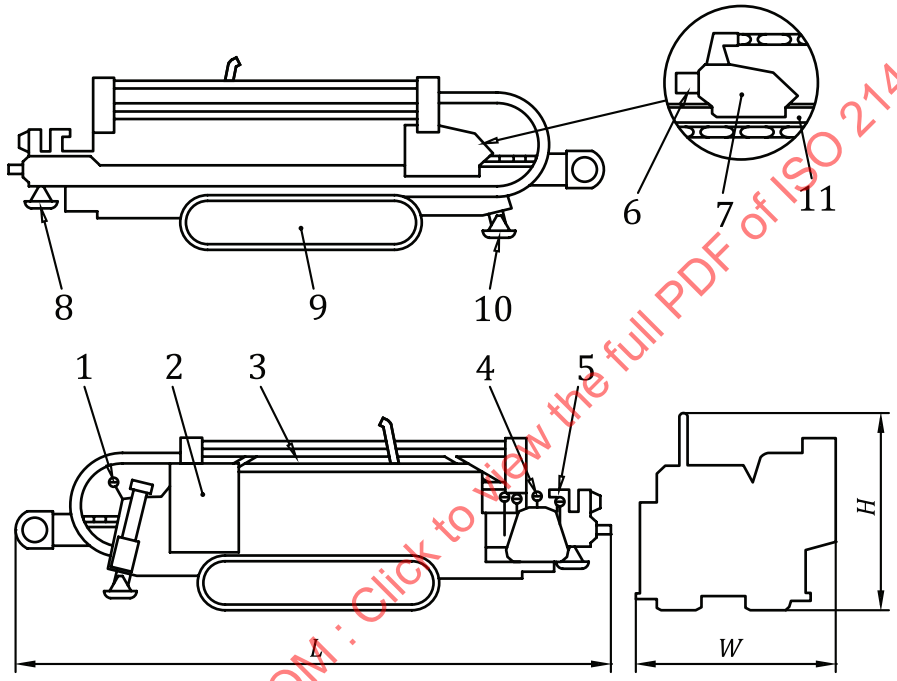
a)	maximum drilling fluid pressure	bar
b)	maximum drilling fluid flow	l/m

Annex A
(informative)

Examples of HDD machines

A.1 Example of pedestrian-controlled HDD machine

Figure A.1 illustrates an example of a pedestrian-controlled HDD machine.



Key

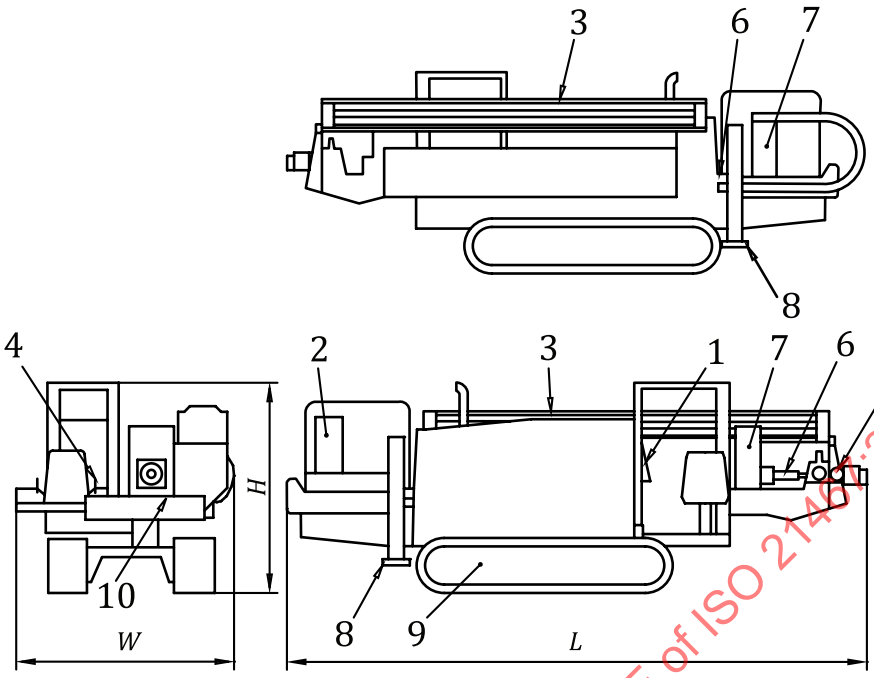
H	overall machine height	5	clamp
L	overall machine length	6	spindle
W	overall machine width	7	drill frame carriage
1	pedestrian controls	8	stabilising device (front)
2	on-board fluid tank	9	undercarriage
3	drill pipe rack	10	stabilising device (rear)
4	drilling controls	11	drill frame

NOTE The example is shown in transport configuration.

Figure A.1 — Example of pedestrian-controlled HDD machine

A.2 Example of ride-on HDD machine

Figure A.2 illustrates an example of a ride-on HDD machine.



Key

H	overall machine height	5	clamp
L	overall machine length	6	spindle
W	overall machine width	7	drill frame carriage
1	operator controls	8	stabilising device (rear)
2	on-board fluid tank	9	undercarriage
3	drill pipe rack	10	drill frame
4	drilling controls — operator's station		

NOTE The example is shown in transport configuration.

Figure A.2 — Example of ride-on HDD machine

A.3 Example of pit-launched HDD machine

Figure A.3 illustrates an example of a pit-launched HDD machine.