



BSI Standards Publication

Non-destructive testing — Ultrasonic testing — Vocabulary

National foreword

This British Standard is the UK implementation of EN ISO 5577:2025. It is identical to ISO 5577:2025. It supersedes BS EN ISO 5577:2017, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/46/3, Ultrasonic Testing.

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European foreword

This document (EN ISO 5577:2025) has been prepared by Technical Committee ISO/TC 135 "Non-destructive testing " in collaboration with Technical Committee CEN/TC 138 "Non-destructive testing" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2026, and conflicting national standards shall be withdrawn at the latest by April 2026.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 5577:2017.

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Endorsement notice

The text of ISO 5577:2025 has been approved by CEN as EN ISO 5577:2025 without any modification.

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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.

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 document 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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This document was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 3, *Ultrasonic testing*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 138, *Non-destructive testing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 5577:2017), which has been technically revised.

The main changes are as follows:

- terms pulse overshoot, main lobe, main beam, side lobe, diffraction, contact surface, echo amplitude, signal amplitude, and full screen height have been added;
- the term "plate wave" was replaced by "Lamb wave";
- some definitions and figures have been revised.

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.

Non-destructive testing — Ultrasonic testing — Vocabulary

1 Scope

This document defines the terms used in ultrasonic non-destructive testing and forms a common basis for standards and general use.

This document does not cover specific terms used in ultrasonic testing with arrays.

NOTE Terms used in ultrasonic testing with arrays are defined in ISO 23243.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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/>

4 Terms related to frequencies, waves and pulses

4.1 Frequencies

4.1.1

frequency

number of cycles per second

Note 1 to entry: Expressed in Hertz (Hz).

4.1.2

nominal frequency

probe frequency

frequency (4.1.1) of the *probe* (6.2.1) as stated by the manufacturer

4.1.3

test frequency

effective ultrasonic frequency of a system used to test a material or object

4.1.4

amplitude spectrum

distribution of *amplitude* (4.2.2) in relation to *frequency* (4.1.1)

Note 1 to entry: See [Figure 1](#).

4.1.5

centre frequency

arithmetic mean of the upper and lower *cut-off frequencies* (4.1.7)

Note 1 to entry: See [Figure 1](#).

4.1.6
peak frequency

frequency (4.1.1) at which the maximum amplitude is observed

Note 1 to entry: See [Figure 1](#).

4.1.7
cut-off frequency

frequency (4.1.1) at which the amplitude (4.2.2) of the transmitted signal has dropped by a specified amount from the amplitude at peak frequency (4.1.6)

Note 1 to entry: See [Figure 1](#).

Note 2 to entry: The transmitted signal can drop e. g. by 3 dB.

4.1.8
bandwidth

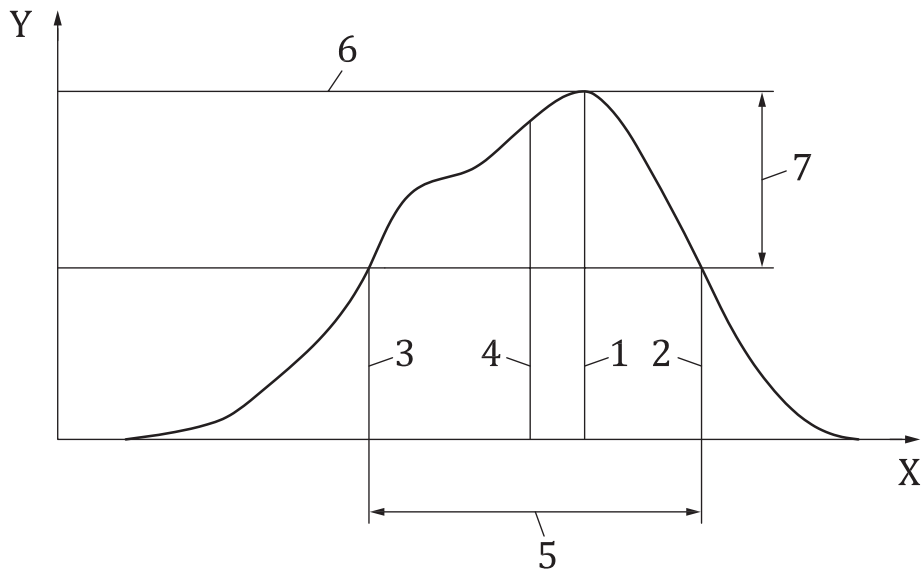
width of the amplitude spectrum (4.1.4) between the upper and lower cut-off frequency (4.1.7)

Note 1 to entry: See [Figure 1](#).

4.1.9
relative bandwidth

ratio of the bandwidth (4.1.8) to the centre frequency (4.1.5)

Note 1 to entry: The relative bandwidth is expressed in per cent.



Key

X	frequency
Y	amplitude
1	peak frequency
2	upper cut-off frequency
3	lower cut-off frequency
4	centre frequency
5	bandwidth at specified amplitude drop
6	peak amplitude
7	specified amplitude drop

Figure 1 — Amplitude spectrum and related terms

4.2 Waves and pulses

4.2.1

ultrasonic wave

any acoustic wave having a *frequency* ([4.1.1](#)) higher than the audible range of the human ear, generally taken as higher than 20 kHz

4.2.2

amplitude

absolute or relative measure of a sound wave's momentary magnitude

Note 1 to entry: The amplitude is not necessarily the maximum value, see *echo amplitude* ([7.5.6](#)).

4.2.3

phase

momentary condition of a vibration expressed as an arc measurement or an angle

4.2.4

wavelength

distance along the propagating direction between consecutive corresponding points of the same *phase* ([4.2.3](#))

Note 1 to entry: See [Figure 3](#).

4.2.5

wavefront

continuous surface joining all the most forward points of an *ultrasonic wave* ([4.2.1](#)) that have the same *phase* ([4.2.3](#))

4.2.6

time of flight

TOF

time it takes an ultrasonic pulse to travel from the transmitting transducer through the *test object* ([7.2.1](#)) to the receiving transducer, including the *delay path(s)* ([6.2.9](#))

4.2.7

pulse

electrical or ultrasonic signal of short duration

4.2.8

pulse amplitude

maximum amplitude of a *pulse* ([4.2.7](#))

Note 1 to entry: For rectified pulses (e. g. in an A-scan presentation), baseline-to-peak.

Note 2 to entry: For unrectified pulses, peak-to-peak.

4.2.9

pulse rise time

time taken for the amplitude of a *pulse* ([4.2.7](#)) to change from a specified lower level to a specified upper level

4.2.10

pulse duration

time interval between the leading and trailing edges of a *pulse* ([4.2.7](#)) measured at a specified level below the peak amplitude

4.2.11

pulse shape

diagramatic representation of the *amplitude* ([4.2.2](#)) of a *pulse* ([4.2.7](#)) as a function of time

4.2.12

pulse envelope

contour of a *pulse shape* ([4.2.11](#)) including all the peaks in terms of *amplitude* ([4.2.2](#)) and time

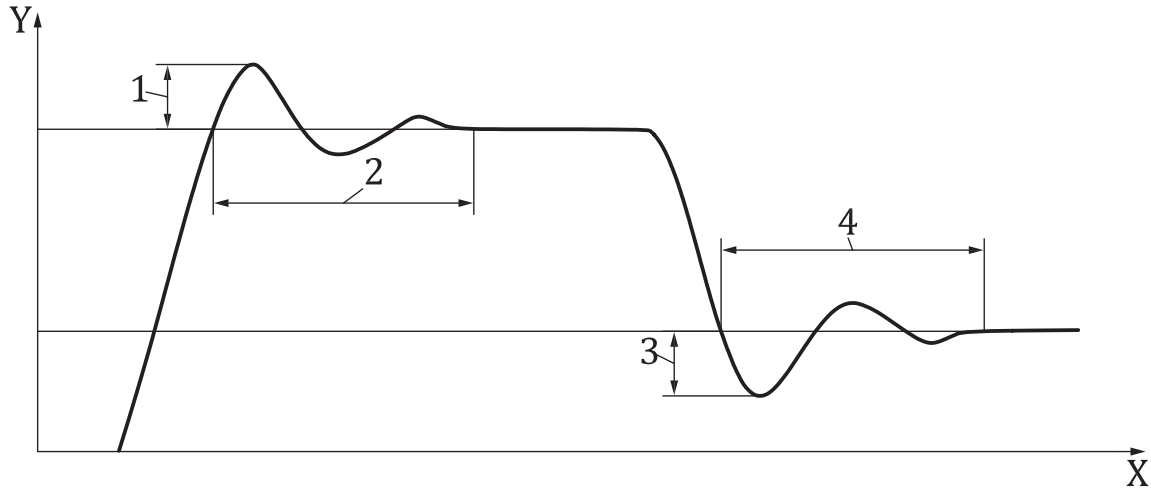
4.2.13**pulse energy**

total energy within a *pulse* (4.2.7)

4.2.14**pulse overshoot**

voltage peak at the rising or falling edge of a *pulse* (4.2.7)

Note 1 to entry: See [Figure 2](#).

**Key**

X	time
Y	amplitude
1	pulse overshoot at rising edge
2	pulse reverberation at rising edge
3	pulse overshoot at falling edge
4	pulse reverberation at falling edge

Figure 2 — Pulse overshoot and pulse reverberation

4.2.15**pulse reverberation**

vibration time after the rising or the falling edge of a *pulse* (4.2.7)

Note 1 to entry: See [Figure 2](#).

4.2.16**broad-band pulse**

pulse (4.2.7) in which the *relative bandwidth* (4.1.9) is ≥ 65 %

4.2.17**medium-band pulse**

pulse (4.2.7) in which the *relative bandwidth* (4.1.9) is > 35 % and < 65 %

4.2.18**narrow-band pulse**

pulse (4.2.7) in which the *relative bandwidth* (4.1.9) is ≤ 35 %

4.2.19**pulse repetition frequency****PRF**

number of *transmitter pulses* (6.1.3) generated per second

Note 1 to entry: The number of transmitter pulses is expressed in Hertz (Hz).

4.3 Types of ultrasonic waves

4.3.1

longitudinal wave

compression wave

wave in which the direction of displacement of particles is in the same direction as the propagation of the wave

Note 1 to entry: See [Figure 3 a\)](#).

4.3.2

transverse wave

shear wave

wave in which the direction of displacement of particles is perpendicular to the direction of the propagation of the wave

Note 1 to entry: See [Figure 3 b\)](#).

4.3.3

Rayleigh wave

surface wave

wave which propagates on the surface of a test object with an effective penetration depth of less than one *wavelength* ([4.2.4](#))

4.3.4

creeping wave

wave generated around the first *critical angle* ([5.4.12](#)) and propagating along the surface like a longitudinal wave, interacting with the surface and partially transforming into a transverse wave going into the volume of the test object

Note 1 to entry: It is neither influenced by the test object's surface conditions, nor does the wave follow undulations on the surface.

Note 2 to entry: The velocity of the creeping wave can be slightly slower than the velocity of the longitudinal wave.

4.3.5

Lamb wave

wave which propagates within the whole thickness of a plate and which can only be generated at particular values of *angle of incidence* ([5.4.2](#)), *frequency* ([4.1.1](#)) and plate thickness

4.3.6

plane wave

wave with a planar *wavefront* ([4.2.5](#))

4.3.7

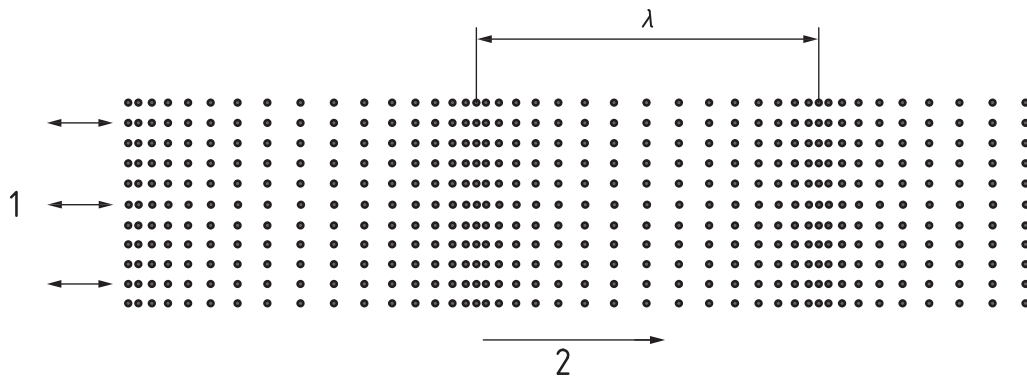
cylindrical wave

wave with a cylindrical *wavefront* ([4.2.5](#))

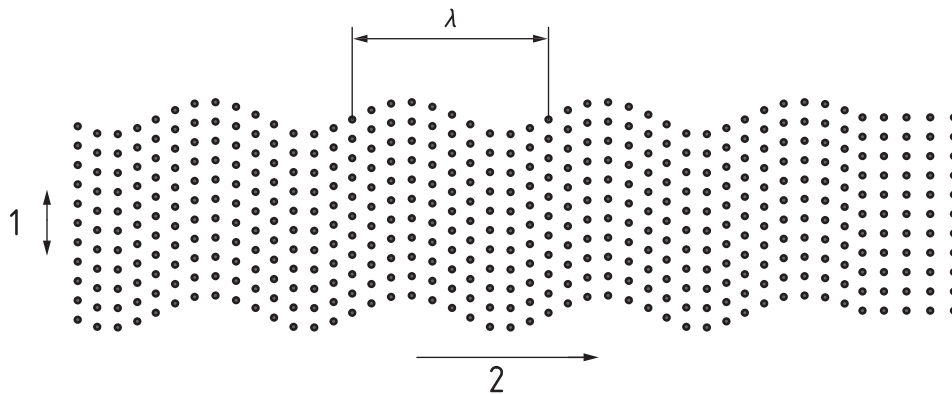
4.3.8

spherical wave

wave with a spherical *wavefront* ([4.2.5](#))



a) Longitudinal wave; compression wave



b) Transverse wave; shear wave

Key

1	direction of oscillation
2	direction of propagation
λ	wavelength

Figure 3 — Types of waves**5 Terms related to sound****5.1 Sound generation and reception****5.1.1****transducer**

active element of a *probe* (6.2.1) which converts electrical energy into sound energy and vice versa

5.1.2**piezoelectric transducer**

transducer (5.1.1) made from piezoelectric material

Note 1 to entry: Because the first piezoelectric transducers were cut from a quartz crystal, transducers sometimes misleadingly are called crystals.

5.1.3**piezo composite transducer**

composite transducer consisting of piezoelectric ceramic rods embedded in a polymer matrix

5.1.4

focusing transducer curved transducer

transducer (5.1.1) which is curved for focusing a *sound beam* (5.2.2)

Note 1 to entry: See *focusing probe* (6.2.25) for other ways for focusing a sound beam.

5.1.5

electro-magnetic acoustic transducer EMAT

transducer (5.1.1) which uses magnetostriction in paramagnetic materials or Lorentz force in conductive materials to generate ultrasound

5.2 Sound propagation

5.2.1

sound field

three-dimensional pressure distribution produced by transmitted sound waves

5.2.2

sound beam

ultrasonic beam

part of the *sound field* (5.2.1) within which the major part of the ultrasonic energy is transmitted

5.2.3

beam axis

line through the points of maximum sound pressure at different distances

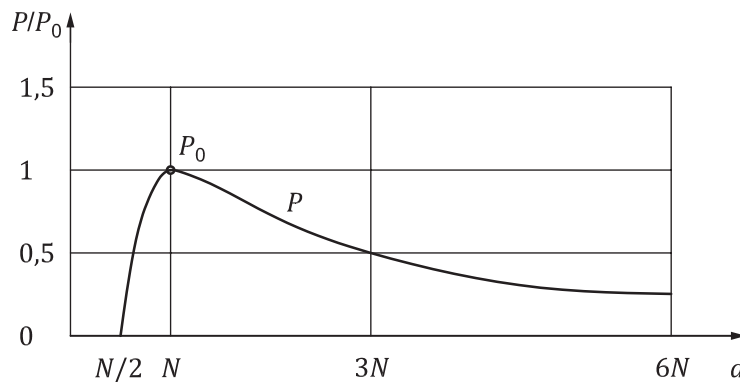
Note 1 to entry: See [Figures 4 b\)](#), [9](#), [10](#) and [11](#).

5.2.4

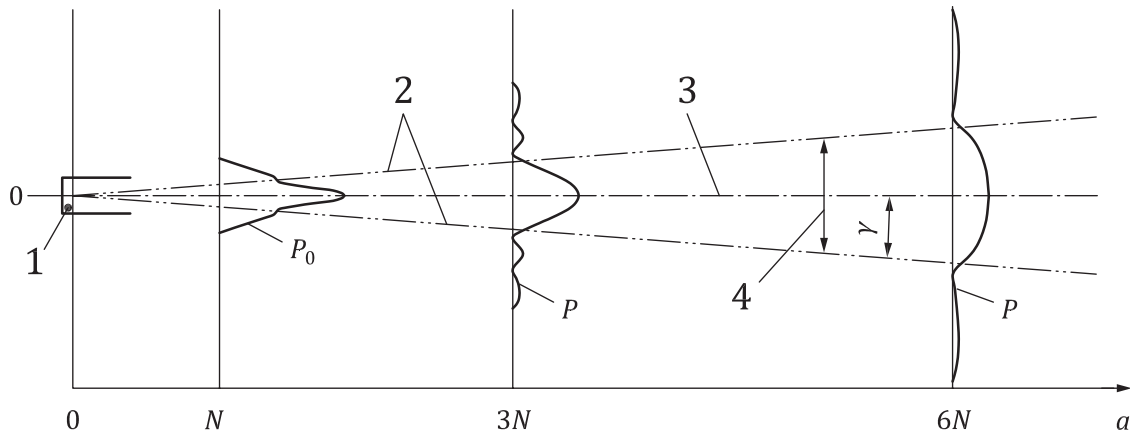
beam profile

curve which represents the sound pressure amplitude along the *beam axis* (5.2.3) or perpendicular to the beam axis at a specified distance from the *probe* (6.2.1)

Note 1 to entry: See [Figure 4](#).



a) Profile along the beam axis



b) Profiles perpendicular to the beam axis

Key

1	transducer
2	beam boundary
3	beam axis
4	beam width at a given distance
γ	angle of divergence
a	distance
N	near-field length
P	sound pressure
P_0	maximum sound pressure at near-field point

Figure 4 — Beam profiles

5.2.5

beam boundary

boundary of the *sound beam* (5.2.2) where the sound pressure has fallen to a given fraction of the value on the *beam axis* (5.2.3), measured at the same distance from the *probe* (6.2.1)

Note 1 to entry: See [Figures 4 b\)](#) and [9](#).

5.2.6

beam width

dimension of the beam perpendicular to the *beam axis* (5.2.3) measured between the beam boundaries at a specified distance from the *probe* (6.2.1)

Note 1 to entry: See [Figure 4 b\)](#).

5.2.7

angle of divergence

angle within the *far field* (5.2.11) between the *beam axis* (5.2.3) and the *beam boundary* (5.2.5)

Note 1 to entry: See [Figures 4 b\)](#) and [9](#).

5.2.8

near field

Fresnel zone

zone of the *sound beam* (5.2.2) where sound pressure does not change monotonically with distance because of interference

Note 1 to entry: See [Figure 9](#).

5.2.9

near-field point

position on the *beam axis* (5.2.3) where the sound pressure reaches its final maximum

Note 1 to entry: The term near-field point is only used for *single transducer probes* (6.2.2) which are not *focusing probes* (6.2.25). In any other case, use the term *focal point* (5.2.12).

5.2.10

near-field length

distance between the *transducer* (5.1.1) and the *near-field point* (5.2.9)

Note 1 to entry: See [Figure 4](#).

Note 2 to entry: The term near-field length is only used for *single transducer probes* (6.2.2) which are not *focusing probes* (6.2.25). In any other case use the term *focal distance* (5.2.13).

5.2.11

far field

Fraunhofer zone

zone of the *sound beam* (5.2.2) that extends beyond the *near-field point* (5.2.9) where sound pressure decreases monotonically with distance and the beam diverges

Note 1 to entry: See [Figure 9](#).

Note 2 to entry: The term far field is only used for *single transducer probes* (6.2.2) which are not *focusing probes* (6.2.25).

5.2.12

focal point

focus

point where the sound pressure on the *beam axis* (5.2.3) is at its maximum

5.2.13

focal distance

focal length

distance from the *probe* (6.2.1) to the *focal point* (5.2.12)

Note 1 to entry: See [Figures 9](#) and [12](#).

5.2.14

focal zone

focal range

zone in a *sound beam* (5.2.2) of a *probe* (6.2.1) in which the sound pressure remains above a specified level related to its maximum

5.2.15

length of the focal zone

distance along the *beam axis* (5.2.3) from the start to the end of the *focal zone* (5.2.14)

5.2.16

width of the focal zone

dimension of the *focal zone* (5.2.14) at *focal distance* (5.2.13) perpendicular to the *beam axis* (5.2.3)

5.2.17

acoustical properties

characteristic parameters of a material which control the propagation of sound in the material

5.2.18

acoustically anisotropic material

material which has differing sound velocities in differing directions of propagation

5.2.19

sound velocity

velocity of propagation

phase velocity ([5.2.20](#)) or *group velocity* ([5.2.21](#)) of a sound wave in a material in the direction of propagation

Note 1 to entry: In a non-dispersive material, there is no difference between phase velocity and group velocity.

Note 2 to entry: In an acoustically *anisotropic material* ([5.2.18](#)), the velocities can depend on the direction of propagation.

5.2.20

phase velocity

velocity of propagation ([5.2.19](#)) of a point of a constant phase of an *ultrasonic wave* ([4.2.1](#))

5.2.21

group velocity

velocity of propagation ([5.2.19](#)) of the acoustic energy

5.2.22

main lobe

main beam

sound beam ([5.2.2](#)) in the intended direction, typically with the highest pressure within the *sound field* ([5.2.1](#))

5.2.23

side lobe

part of the *sound field* ([5.2.1](#)) which corresponds to a local maximum in the far field, deviating from the direction of the *main lobe* ([5.2.22](#)) and typically lower in amplitude than the main lobe

5.3 Loss of sound pressure

5.3.1

attenuation

sound attenuation

decrease of pressure when a sound wave travels through a material, arising from *absorption* ([5.3.4](#)) and *scattering* ([5.3.3](#))

5.3.2

attenuation coefficient

coefficient used to express *attenuation* ([5.3.1](#)) per unit of distance travelled, dependent on material properties, *wavelength* ([4.2.4](#)) and type of wave

Note 1 to entry: The attenuation coefficient is usually expressed in dB/m.

5.3.3

scattering

random reflections caused by grain structure and/or by small *reflectors* ([7.4.1](#)) in the beam path when a wave travels through a material

5.3.4

absorption

part of the *attenuation* ([5.3.1](#)) resulting from transformation of ultrasonic energy into other types of energy

Note 1 to entry: Thermal energy is an example for another type of energy.

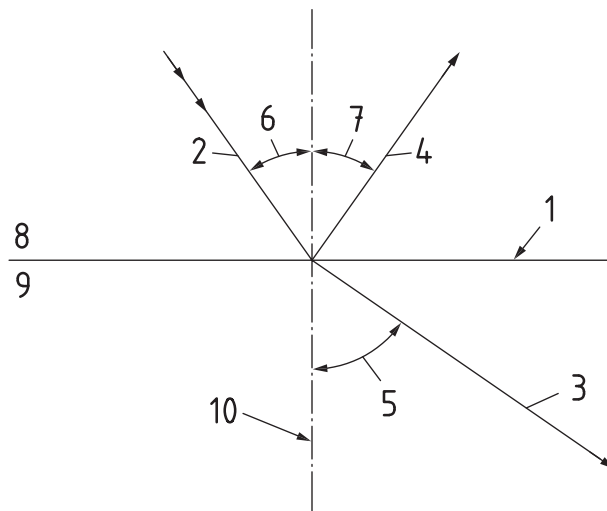
5.4 Ultrasonic waves at interfaces

5.4.1

interface

boundary between two materials, in acoustic contact, having different *acoustical properties* ([5.2.17](#))

Note 1 to entry: See [Figure 5](#).

**Key**

1	interface
2	direction of incident wave
3	direction of refracted wave
4	direction of reflected wave
5	angle of refraction
6	angle of incidence
7	angle of reflection
8	medium 1
9	medium 2
10	normal to the interface

Figure 5 — Refraction and reflection of ultrasonic waves**5.4.2****angle of incidence**

angle between the direction of the incident *ultrasonic wave* (4.2.1) and the normal to the *interface* (5.4.1)

Note 1 to entry: See [Figure 5](#).

5.4.3**reflection**

change of the direction of sound propagation within the same material when impinging on an *interface* (5.4.1)

Note 1 to entry: See [Figure 5](#).

5.4.4**refraction**

change of the direction of sound propagation when passing obliquely through the *interface* (5.4.1) between two materials of differing sound velocities

Note 1 to entry: See [Figure 5](#).

5.4.5**diffraction**

change of the direction of sound propagation within the same material when impinging on the edge(s) of a discontinuity

Note 1 to entry: Diffraction typically results in (almost) omnidirectional waves which are, as a result, weaker than reflected waves.