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Vacuum technology — Vocabulary —

Part 2:
Vacuum pumps and related terms

Technique du vide — Vocabulaire —
Partie 2: Pompes à vide et termes associés

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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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This document was prepared by Technical Committee ISO/TC 112, *Vacuum technology*.

This second edition cancels and replaces the first edition (ISO 3529-2:1981), which has been technically revised. The main changes compared to the previous edition are as follows:

— under positive displacement pumps are added diaphragm-, peristaltic-, scroll-, screw-, claw- and trochoid vacuum pumps;

— under kinetic vacuum pumps are added regenerative- and compound turbo vacuum pump;

— under gas entrapment or capture vacuum pumps different types of condensers are added;

— under parts, categories and characteristics of vacuum pumps are added some new actual used definitions.

A list of all parts in the ISO 3529 series can be found on the ISO website.

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.

Vacuum technology — Vocabulary —

Part 2:
Vacuum pumps and related terms

1 Scope

This document gives definitions of vacuum pumps and related terms. It is a continuation of ISO 3529-1 which defines general terms used in vacuum technology.

2 Normative references

ISO 3529-1:2019, *Vacuum technology — Vocabulary — Part 1: General terms*

ISO 21360-1:2012, *Vacuum technology — Standard methods for measuring vacuum-pump performance — Part 1: General description*

3 Terms and definitions

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

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

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

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

3.1 Vacuum pumps

3.1.1
vacuum pump
device for creating, improving and/or maintaining a vacuum

Note 1 to entry: Two basically distinct categories may be considered: *gas transfer pumps* (3.1.2) and *gas gathering vacuum pumps* (3.1.32)

Note 2 to entry: Some definitions given in ISO 3529-1 are repeated in this document in deferent terms to adapt to vacuum pumps.

Note 3 to entry: Vacuum is defined in ISO 3529-1.

Note 4 to entry: A classification table for vacuum pumps is described in Annex A.

3.1.2
gas transfer vacuum pumps
vacuum pump (3.1.1) that transports gas molecules from the inlet to the *outlet* (3.2.3) of the vacuum pump by means of positive displacement or transfer of kinetic momentum

3.1.3
positive displacement vacuum pump
vacuum pump (3.1.1) in which a volume filled with gas is cyclically isolated from the inlet, the gas being then transferred to an *outlet* (3.2.3)

Note 1 to entry: In most types of positive displacement vacuum pumps the gas is compressed before exhausted. Two categories can be considered: reciprocating or oscillating positive displacement vacuum pumps (3.1.4–3.1.6) and rotary positive displacement vacuum pumps with single (3.1.7–3.1.13) or double (3.1.14–3.1.16) rotor principle.

Note 2 to entry: Positive displacement vacuum pump are often equipped with a gas ballast system, to admit a controlled quantity of a suitable non-condensable gas during the compression part of the cycle so as to reduce or avoid the extent of condensation within the vacuum pump.

Note 3 to entry: An oil-sealed (liquid-sealed) vacuum pump is a rotary positive displacement vacuum pump in which oil (liquid) is used to seal the gap between parts which move with respect to one another and to reduce the residual free volume in the pump chamber at the end of the compression part of the cycle.

Note 4 to entry: A dry positive displacement vacuum pump is a device, where the pumping chambers are not oil-sealed (liquid-sealed).

Note 5 to entry: All types of positive displacement vacuum pumps can be combined as multi-stages of the same or differing.

3.1.4
diaphragm vacuum pump
dry *positive displacement vacuum pump* (3.1.3) in which the gas is compressed and expelled due to the movement of a reciprocating or oscillating action of a diaphragm by using suitable valves

3.1.5
piston vacuum pump
positive displacement vacuum pump (3.1.3) in which the gas is compressed and expelled due to the movement of a reciprocating piston moving in a cylinder by using suitable valves

3.1.6
linear peristaltic vacuum pump
vacuum pump (3.1.1) which uses linear placed actuators forcing or compress the gas through a flexible tube

3.1.7
scroll vacuum pump
vacuum pump (3.1.1) which uses two interleaving circular involute spirals to compress gases before exhausted

Note 1 to entry: Depending on the application scroll pump may or may not have an inlet valve, isolation valve for fault conditions or power losses.

3.1.8
rotary vane vacuum pump
rotary *positive displacement vacuum pump* (3.1.3) in which an eccentrically placed rotor is turning tangentially to the fixed surface of the stator

Note 1 to entry: The swept compressed gas is expelled to atmosphere via a discharge valve.

Note 2 to entry: Two or more vanes sliding in slots of the rotor (usually radial) and sliding along on the internal wall of the stator, divide the stator chamber into several parts of varying volume.

3.1.9
liquid ring vacuum pump

rotary *positive displacement vacuum pump* (3.1.3) in which an eccentric rotor with fixed blades throws a liquid against the stator wall

Note 1 to entry: The liquid takes the form of a ring concentric to the stator and combines with the rotor blades to define a varying volume.

3.1.10
external vane vacuum pump

rotary *positive displacement vacuum pump* (3.1.3) in which a rotor is turning eccentrically, in contact with the internal wall of the stator

Note 1 to entry: A device moving relative to the stator is pressed against the rotor and divides the stator chamber into parts of varying volume (external vane pump).

3.1.11
rotary piston vacuum pump

rotary *positive displacement vacuum pump* (3.1.3) in which a rotor is turning eccentrically to the internal wall of the stator

Note 1 to entry: The stator chamber is divided into two parts of varying volume by a bulkhead (piston or plunger) sealed in the stator (piston bearing) and rigidly fixed to the rotor.

Note 2 to entry: Rotary piston vacuum pump also called rotary plunger vacuum pump.

3.1.12
trochoid vacuum pump

rotary *positive displacement vacuum pump* (3.1.3) in which an elliptical piston moves around a shaft eccentrically

Note 1 to entry: The case is in continuous non-contact sealing with the piston. Oil is fed for sealing.

3.1.13
peristaltic vacuum pump

rotary *positive displacement vacuum pump* (3.1.3) in which a turning rotor compresses with a number of rollers or lobes a flexible tube and forcing the gas move through the tube

3.1.14
roots vacuum pump

rotary *positive displacement vacuum pump* (3.1.3) in which two or three lobed rotors, interlocked and synchronized, rotate in opposite directions moving past each other and the housing wall with a small clearance and without touching

Note 1 to entry: Roots vacuum pumps are used as primary — also referred to as mechanical booster vacuum pump — as well as secondary or main vacuum pump.

Note 2 to entry: Roots pumps have per stage no inner compression ratio.

3.1.15
screw vacuum pump

rotary *positive displacement vacuum pump* (3.1.3) comprises opposing synchronously rotating screws with various profile design like tapered or variable pitch for an inner compression ratio

Note 1 to entry: The screw vacuum pump could have profile design without inner compression ratio too.

3.1.16
claw vacuum pump
rotary *positive displacement vacuum pump* (3.1.3) in which two claw-shaped rotors, interlocked and synchronized, rotate in opposite directions moving past each other and the housing wall with a small clearance and without touching

Note 1 to entry: Claw vacuum pumps are designed with one or more compression stages.

3.1.17
kinetic vacuum pump
vacuum pump (3.1.1) in which a gas or gas molecules can be displaced from the pump inlet to the *outlet* (3.2.3) either mechanically (rotating it at high speed or by providing an impulse in the direction of flow) or by the use of another fluid (providing also an impulse in the direction of flow) or using an electrical potential to displace gas ions

Note 1 to entry: Three categories can be considered: mechanical kinetic pumps (3.1.18–3.1.22), fluid entrainment pumps (3.1.23–3.1.30) and *ion transfer pumps* (3.1.31).

3.1.18
turbine vacuum pump
rotary *kinetic vacuum pump* (3.1.17) in which the transfer of a large amount of gas is obtained by a rapidly rotating device

Note 1 to entry: The dynamic sealing is obtained without rubbing. The gas flow either may be directed parallel to the axis of rotation (axial flow vacuum turbine pump) or at right angles to the axis of rotation (radial flow vacuum turbine pump or centrifugal vacuum pump).

3.1.19
regenerative vacuum pump
rotary *kinetic vacuum pump* (3.1.17) in which the transfer of gas is obtained by a centrifugal rotor stage, utilizing the vortex behaviour of the gas in combination with a side channel parallel to the rotor

Note 1 to entry: Regenerative vacuum pumps are designed with one or more gas ring compression stages. Regenerative vacuum pumps are available with an axially located gas channel and/or radially located gas channel.

3.1.20
molecular drag vacuum pump
kinetic vacuum pump (3.1.17) in which a momentum is imparted to the gas molecules by contact between them and the surface of a high-speed rotor, causing them to move towards a channel to the *outlet* (3.2.3) of the vacuum pump.

Note 1 to entry: The technical design based on invention from Gaede, Holweck or Siegbahn.

3.1.21
turbo-molecular vacuum pump
molecular drag vacuum pump (3.1.20) in which the rotor is fitted with discs provided with slots or blades rotating between corresponding discs in the stator

Note 1 to entry: The linear velocity of a peripheral point of the rotor is of the same order of magnitude as the velocity of the gas molecules. A turbo-molecular vacuum pump operates normally when molecular flow conditions obtain.

Note 2 to entry: Compound turbo-molecular vacuum pump.

3.1.22
compound turbo-molecular vacuum pump
one shaft *high vacuum pump* (3.4.6) with compression-stages based on turbo-molecular vacuum pump design combined with drag stages based on molecular drag vacuum pump design and/or regenerative pump stages on the fore vacuum side of the vacuum pump

3.1.23
diffusion vacuum pump
kinetic vacuum pump (3.1.17) in which a low-pressure, high-speed vapour stream provides the entrainment fluid

Note 1 to entry: The gas molecules diffuse into this stream and are driven to the outlet. The number density of gas molecules is always low in the stream. A diffusion vacuum pump operates, when molecular flow conditions of pumped gas obtained, since vapour jets will not be formed unless the mean free path inside the pump is large enough.

3.1.24
self-purifying diffusion vacuum pump
oil vapour *diffusion vacuum pump* (3.1.23) in which the volatile impurities of the operating fluid are prevented from returning to the boiler but are transported towards the *outlet* (3.2.3) by a special design

3.1.25
fractionating diffusion vacuum pump
multi-stage oil vapour *diffusion vacuum pump* (3.1.23) in which the lowest pressure stage is supplied with the more dense, low vapour pressure constituents of the operating fluid, and where the higher-pressure stages are supplied with the less dense constituents of higher vapour pressure

3.1.26
diffusion-ejector vacuum pump
multi-stage *kinetic vacuum pump* (3.1.17) in which a stage or stages having the characteristics of a *diffusion vacuum pump* (3.1.23) are succeeded by a stage or stages having the characteristics of an *ejector vacuum pump* (3.1.27)

3.1.27
ejector vacuum pump
kinetic vacuum pump (3.1.17) based on the pressure decrease due to a Venturi-effect and in which the gas is entrained in a high-speed stream towards the *outlet* (3.2.3)

Note 1 to entry: An ejector vacuum pump operates when viscous and intermediate flow conditions of pumped gas are obtained.

3.1.28
liquid jet vacuum pump
ejector vacuum pump (3.1.27) in which the entrainment fluid is a liquid (usually water)

3.1.29
gas jet vacuum pump
ejector vacuum pump (3.1.27) in which the entrainment fluid is a non-condensable gas

3.1.30
vapour jet vacuum pump
ejector vacuum pump (3.1.27) based on an entrainment vapour (water, mercury or oil vapour)

Note 1 to entry: The entrainment vapour is subsequently condensed at the outlet of the pump.

3.1.31
ion transfer pump
kinetic vacuum pump (3.1.17) in which the gas molecules are ionized and then transferred towards an *outlet* (3.2.3) by means of electric fields combined or not with a magnetic field

3.1.32
gas gathering vacuum pump
vacuum pump (3.1.1) that captures gas in a solid or adsorbed state

3.1.33
gas entrapment vacuum pump
capture vacuum pump
vacuum pump ([3.1.1](#)) in which the gas or vapour molecules are retained by physical or chemical adsorption, condensation or deposition on internal surfaces

3.1.34
adsorption vacuum pump
entrapment vacuum pump ([3.1.33](#)) in which the gas is retained mainly by physical adsorption of a material of large real area (for example a porous substance) enhanced by low temperatures

3.1.35
getter vacuum pump
entrapment vacuum pump ([3.1.33](#)) based on gas binding mainly by chemical adsorption on a material usually a metal alloy either bulk material or a freshly deposited thin layer

3.1.36
non-evaporable getter vacuum pump
NEG-vacuum pump
entrapment vacuum pump ([3.1.33](#)) with a reactive porous alloy or powder mixtures getter material

Note 1 to entry: After the system is evacuated and sealed, the reactive getter material has to be heated (by radio frequency induction heating usually) before the material is binding the gas by a chemical reaction.

3.1.37
sublimation vacuum pump
evaporation vacuum pump
entrapment vacuum pump ([3.1.33](#)) in which a getter material is sublimed (evaporated) from a target and deposited on the inner surface of the vacuum chamber as the active pump getter

Note 1 to entry: In that context evaporation and sublimation are similar concepts.

3.1.38
sputter ion vacuum pump
getter ion *vacuum pump* ([3.1.1](#)) in which the ionized gas is transferred towards a getter which is dispersed in a continuous way by cathodic sputtering additional combined by implantation of ions in the cathode

Note 1 to entry: The getter effect is the dominated pump principle, but for noble gases the implantation effect is important.

3.1.39
standard diode ion vacuum pump
sputter ion vacuum pump ([3.1.38](#)) with only chemical active cathodes

3.1.40
differential ion vacuum pump
sputter ion pump ([3.1.38](#)) with a chemical reactive cathode and an additional active cathode based on Tantalum for better pumping effect of noble gases

3.1.41
triode Ion vacuum pump
sputter ion vacuum pump ([3.1.38](#)) with a cathode designed as a lattice, an anode in the middle and a surrounding collector for the highest pumping speed of noble gases

3.1.42
cryogenic vacuum pump
cryopump
entrapment vacuum pump (3.1.33) consisting of surfaces refrigerated to a low temperature sufficient to condense or deposed residual gases to distinguish them from gases with lower condensing temperature which are trapped on an adsorbing material

Note 1 to entry: The temperature chosen shall be in the range depending on the nature of the gases to be pumped.

Note 2 to entry: Cryopumps are often combined with adsorbing materials like active charcoal or zeolite as an additional cryosorption vacuum pump. The condensate is maintained at a temperature such that the equilibrium vapour pressure is equal to or less than the desired low pressure in the chamber.

Note 3 to entry: Three main effects are dominating the cryogenic vacuum pump performance so cryogenic-sorption as physical adsorption of a porous substance at low temperature, cryogenic-condensation (condensation of molecules on a cooled surface) and cryogenic-trapping (processes in which light molecules with very low condensation temperature are captured physically between layers of condensed/deposited material with higher condensation temperature).

3.1.43
condenser
device to condense vapour to a liquid or transform the vapour to a solid as *surface deposition* (3.1.46)

Note 1 to entry: vacuum condensers are used for pumping vapours in the low vacuum range particularly in drying processes.

3.1.44
surface condenser
<liquid condensation> condenser used for vapour condensation to liquid on a cooled tube or plate surface

3.1.45
spray condenser
direct contact condenser

Note 1 to entry: The vapour condensed in a direct contact with the injected coolant.

3.1.46
surface deposition (desublimation)
surface condenser for solid condensation (desublimation) of vapour below the triple point on appropriate cooled tubes or plates

3.2   Parts of vacuum pumps

3.2.1
pump case
external wall of a pump, which separates the low-pressure gas from the atmosphere

3.2.2
inlet
port by which gas to be pumped enters a vacuum pump

3.2.3
outlet
discharge port of a vacuum pump

3.2.4
vane
blade
sliding member which divides into compartments the working space between the rotor and stator in some positive displacement rotary vacuum pumps, usually used in rotary vane *vacuum pump* (3.1.1)

Note 1 to entry: The rotor of mechanical kinetic pumps are often equipped with contact free blades e.g. the turbine of a turbomolecular vacuum pump.

3.2.5
discharge valve
valve operating automatically for the discharge of gas from the compression chamber of some positive displacement pumps

3.2.6
expansion chamber
space within the stator chamber of positive displacement vacuum pumps, into which the pumped gas is expanded

3.2.7
compression chamber
space within the stator chamber of some positive displacement vacuum pumps, into which the gas is compressed before being discharged

3.2.8
vacuum pump oil
liquid used for sealing, cooling and lubrication, in oil-sealed *vacuum pumps* (3.1.1)

Note 1 to entry: The term pump oil is also commonly used to describe pump fluids used in oil vapour vacuum pumps. This note does not apply to the German expression.

3.2.9
gas ballast valve
valve predominantly used for positive displacement vacuum pumps to continuously feed a carefully controlled amount of fresh non-condensable gas in the suction chamber of the vacuum pump to allow pump condensable gases

3.2.10
pump fluid
operating fluid of an ejector or *diffusion vacuum pump* (3.1.23)

3.2.11
nozzle
part of an *ejector vacuum pump* (3.1.27) or *diffusion vacuum pump* (3.1.23) used to direct the flow of the pump fluid in order to produce the pumping action

3.2.12
nozzle throat
smallest cross-section of the *nozzle* (3.2.11)

3.2.13
nozzle clearance area
smallest cross-sectional area between the outer rim of a *nozzle* (3.2.11) and the wall of the pump casing

3.2.14
nozzle clearance
width of the annulus determining the *nozzle clearance area* (3.2.12)

3.2.15
jet
stream of pump fluid issuing from a *nozzle* (3.2.11), in an ejector or *diffusion vacuum pump* (3.1.23)

3.2.16
diffuser
composition of converging section, uniform section (i.e. diffuser throat) and diverging section of the wall of an *ejector vacuum pump* (3.1.27)

3.2.17
diffuser throat
part of a diffuser having the smallest cross-sectional area

3.2.18
vapour tube
vapour pipe
vapour chimney
tube through which the vapour passes from the boiler to the nozzle or nozzles of a *vapour jet vacuum pump* (3.1.30) or *diffusion vacuum pump* (3.1.23)

3.2.19
nozzle assembly
integral system of nozzles and vapour ducts (usually removable) in a *vapour jet* (3.1.30) or *diffusion vacuum pump* (3.1.23)

3.2.20
skirt
lower part of the *nozzle assembly* (3.2.15), usually enlarged, separating the returning condensed pump fluid and the vapour generated by the pump boiler

3.3 Accessories

3.3.1
trap
device in which the partial pressure of the constituents of a mixture of gases and vapours is reduced by physical or chemical means

3.3.1.1
cold trap
trap (3.3.1) which operates by condensation on cooled surfaces

3.3.1.2
sorption trap
trap (3.3.1) which operates by sorption

3.3.1.3
ion trap
trap (3.3.1) in which ionization processes are employed to remove certain undesirable constituents from the gas phase

3.3.2
baffle
system of screens, possibly cooled, placed near the inlet of *vapour jet vacuum pump* (3.1.30) or *diffusion vacuum pump* (3.1.23), to reduce back-streaming and back-migration

3.3.3
oil separator
device which reduces the loss of *vacuum pump oil* (3.2.8) by entrainment as droplets at the *outlet* (3.2.3) of a *vacuum pump* (3.1.1)

3.3.4
oil purifier
device for removing contaminants from *vacuum pump oil* (3.2.8)

3.4   Categories of vacuum pumps with reference to operation

3.4.1
dry vacuum pump
vacuum pump ([3.1.1](#)) which is not oil- or liquid-sealed and the pump principles not using fluids.

Note 1 to entry: Note to entry   The term dry vacuum pump is mainly used for dry displacement vacuum pumps.

3.4.2
rough (low) vacuum pump
vacuum pump ([3.1.1](#)) for reducing the pressure in a vessel, from atmospheric to min 10^2 Pa

3.4.3
roughing vacuum pump
vacuum pump ([3.1.1](#)) for reducing the pressure in a vessel or system from atmospheric to a value at which another pumping system can begin to operate

3.4.4
backing vacuum pump
vacuum pump ([3.1.1](#)) for maintaining the backing pressure of another pump below its critical value.

Note 1 to entry: A backing vacuum pump may be used as a roughing vacuum pump.

3.4.5
maintaining vacuum pump
auxiliary backing vacuum pump ([3.4.4](#)) for maintaining the backing pressure of certain types of vacuum pump when the low gas flow rate at that time does not warrant the use of the main backing vacuum pump

3.4.6
high vacuum pump
vacuum pump ([3.1.1](#)) which operates in the lowest pressure range

3.4.7
booster vacuum pump
vacuum pump ([3.1.1](#)) generally used between the backing pump and the *high vacuum pump* ([3.4.6](#))

Note 1 to entry: The booster vacuum pump is either used to increase the throughput of the pumping system in a medium range of pressure, or to improve the pressure stages within the system and so reduce the volume flow rate needed for the backing vacuum pump.

3.4.7.1
mechanical booster vacuum pump
vacuum pump ([3.1.1](#)) based on mechanical principle and used between the backing pump and the process chamber

Note 1 to entry: The mechanical booster vacuum pump could either used to increase the throughput of the pumping system in a medium vacuum or a rough vacuum application, or to improve the pressure stages within the system and so reduce the volume flow rate needed for the backing vacuum pump.

3.4.7.2
jet booster vacuum pump
vacuum pump ([3.1.1](#)) based on fluid entrainment *ejector vacuum pump* ([3.1.27](#)) and used between the backing vacuum pump and the process chamber

Note 1 to entry: The jet booster vacuum pump could either used to increase the throughput of the pumping System in a medium vacuum or a rough vacuum application, or to improve the pressure stages within the System and so reduce the volume flow rate needed for the backing vacuum pump.

3.5   Characteristics of vacuum pumps

3.5.1
volume flow rate
q_V

$$q_V = \frac{\mathrm{d}V}{\mathrm{d}t} \tag{1}$$

where

    V is the volume of gas at a specific temperature and pressure crossing the inlet of vacuum pump in a given interval of time t

Note 1 to entry: For practical reasons, the volume flow rate of a given vacuum pump and for a given gas is conventionally considered to be equal to the quotient of the throughput of this gas and of the equilibrium pressure at a given location. The volume flow rate is expressed in cubic metres per hour or litres per second.

Note 2 to entry: The term "pumping speed" with symbol "S" are often used instead of "volume flow rate".

Note 3 to entry: For general definition, see ISO 3529-1 and for measurement issues ISO 21360-1.

3.5.2
throughput
q_{pV}
quantity of gas (in a pressure-volume units) passing through the *vacuum pump* ([3.1.1](#)) inlet cross-section in a given interval of time, divided by that time

Note 1 to entry: It is also the mass flow rate divided by the unitary mass density expressed by Formula 2:

$$q_{pV} = p_1\, \frac{dV}{dt} = p_1 q_V \tag{2}$$

where

    p_1 is the vacuum pressure on the inlet;

    q_V is the volume flow rate of the vacuum pump;

    t is given interval of time;

    V is the volume of gas crossing the inlet of vacuum pump in a given interval of time.

[SOURCE: ISO 3529-1:2019, 3.3.17]

3.5.3
starting pressure
pressure at which a *vacuum pump* ([3.1.1](#)) can be started without damage and a pumping effect can be obtained

3.5.4
backing pressure
p_3
pressure at the *outlet* ([3.2.3](#)) of a *vacuum pump* ([3.1.1](#))

[SOURCE: ISO 21360-1:2012, 3.5]

3.5.5
critical backing pressure
p_c
maximum backing pressure p_3 on the *outlet* ([3.2.3](#)) that the *vacuum pump* ([3.1.1](#)) can withstand for continuous operation without being damaged or overloaded

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3.5.6
maximum backing pressure
backing pressure above which a *vacuum pump* ([3.1.1](#)) can be damaged

3.5.7
maximum working pressure

$p_{1\mathrm{max}}$
highest pressure on the inlet side that the *vacuum pump* ([3.1.1](#)) and the driving device can withstand for a prolonged period of operation time without being damaged

[SOURCE: ISO 21360-1:2012, 3.4]

3.5.8
ultimate pressure
value towards which the pressure on the *vacuum pump* ([3.1.1](#)) inlet — obtained in the test dome — approaches asymptotically

Note 1 to entry: This ultimate pressure is always lower than the base pressure.

Note 2 to entry: It is the lowest pressure obtainable with the vacuum pump.

Note 3 to entry: It is recommended not to give ultimate pressure values in the manufacturer's specification. Therefore, no procedure to measure the ultimate pressure is given in this document. However, if the manufacturer lists the ultimate pressure, the operating conditions and measurement time durations under which the measurement is made should be stated.

Note 4 to entry: The defined pressure value is only ascertainable with equipment installed on a measurement dome but interpreted as the pressure on the vacuum pump inlet.

3.5.9
base pressure

$p_{\mathrm{b}1}$
lowest *vacuum pump* ([3.1.1](#)) *inlet pressure* ([3.5.10](#)) at zero throughput — obtained in the test dome — after time limited conditioning of the vacuum pump and the test dome

Note 1 to entry: The defined pressure value is only ascertainable with equipment installed on a measurement dome but interpreted as the pressure on the pump inlet.

3.5.10
inlet pressure

p_1
pressure at the inlet of the *vacuum pump* ([3.1.1](#)), measured at a defined location in the test dome

[SOURCE: ISO 21360-1:2012, 3.2]

3.5.11
compression ratio
K_0
ratio of the backing pressure, p_3, to the inlet pressure, p_1, of the *vacuum pump* ([3.1.1](#)) without throughput, expressed by [Formula 3](#):

$$K_0 = \frac{p_3 - p_{b3}}{p_1 - p_{b1}}$$

(3)

[SOURCE: ISO 21360-1:2012, 3.7]

Note 1 to entry: At a given gas throughput the ratio of the backing pressure p_3, to the inlet pressure p_1 of the vacuum pump is expressed by the equation $K_{\mathrm{eff}} = p_3/p_1$. At zero gas throughput the max. value of the compression ratio is called K_0.

Note 2 to entry: p_{b3} is the base pressure of the (primary) vacuum pump connected to the exhaust of the test pump.