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BSI Standards Publication

Gas-fired endothermic engine driven heat pumps

Part 1: Terms and definitions

bsi.

National foreword

This British Standard is the UK implementation of EN 16905-1:2017.

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Pompes à chaleur à moteur endothermique alimenté au gaz - Partie 1 : Termes et définitions

Gasbefeuerte endothermische Motor-Wärmepumpen - Teil 1: Begriffe

This European Standard was approved by CEN on 9 January 2017.

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European foreword

This document (EN 16905-1:2017) has been prepared by Technical Committee CEN/TC 299 “Gas-fired sorption appliances, indirect fired sorption appliances, gas-fired endothermic engine heat pumps and domestic gas-fired washing and drying appliances”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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 standard comprises the following parts under the general title, *Gas-fired endothermic engine driven heat pumps:*

— *Part 1: Terms and definitions*;

— *Part 2: Safety* (WI 00299025; currently in preparation);

— *Part 3: Test conditions*;

— *Part 4: Test methods*;

— *Part 5: Calculation of seasonal performances in heating and cooling mode*.

EN 16905-1, prEN 16905-2, EN 16905-3, EN 16905-4 and EN 16905-5 have been prepared to address the essential requirements of the European Directive 2009/142/EC relating to appliances burning gaseous fuels (see prEN 16905-2:201X, Annex ZA for safety aspects and EN 16905-5:2017, Annex ZA for rational use of energy aspects).

These documents are linked to the Energy Related Products Directive (2009/125/EC) in terms of tests conditions, tests methods and seasonal performances calculation methods under Mandate M/535; (see EN 16905-3:2017, Annex ZA, EN 16905-4:2017, Annex ZA, EN 16905-5:2017, Annex ZA and prEN 16905-2:201X, Annex ZB).

These documents will be reviewed whenever new mandates could apply.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

1.1 Scope of EN 16905 series

This European Standard specifies the requirements, test methods and test conditions for the rating and performance calculation of air conditioners and heat pumps using either air, water or brine as heat transfer media, with gas-fired endothermic engine driven compressors when used for space heating, cooling and refrigeration, hereafter referred to as "GEHP appliance".

This European Standard only applies to appliances with a maximum heat input (based on net calorific value) not exceeding 70 kW at standard rating conditions.

This European Standard only applies to appliances under categories I_{2H}, I_{2E}, I_{2Er}, I_{2R}, $I_{2E(S)B}$, I_{2L}, I_{2LL}, I_{2ELL}, $I_{2E(R)B}$, I_{2ESi}, $I_{2E(R)}$, I_{3P}, I_{3B}, $I_{3B/P}$, II_{2H3+}, II_{2Er3+}, $II_{2H3B/P}$, $II_{2L3B/P}$, $II_{2E3B/P}$, $II_{2ELL3B/P}$, II_{2L3P}, II_{2H3P}, II_{2E3P} and II_{2Er3P} according to EN 437.

This European Standard only applies to appliances having:

a) gas fired endothermic engines under the control of fully automatic control systems;

b) closed system refrigerant circuits in which the refrigerant does not come into direct contact with the fluid to be cooled or heated;

c) where the temperature of the heat transfer fluid of the heating system (heating water circuit) does not exceed 105 °C during normal operation;

d) where the maximum operating pressure in the:

   1) heating water circuit (if installed) does not exceed 6 bar

   2) domestic hot water circuit (if installed) does not exceed 10 bar.

This European Standard applies to appliances only when used for space heating or space cooling or for refrigeration, with or without heat recovery.

The appliances having their condenser cooled by air and by the evaporation of external additional water are not covered by this European Standard.

Packaged units, single split and multisplit systems are covered by this European Standard. Single duct and double duct units are covered by this European Standard.

The above appliances can have one or more primary or secondary functions.

This European Standard is applicable to appliances that are intended to be type tested. Requirements for appliances that are not type tested would need to be subject to further consideration.

In the case of packaged units (consisting of several parts), this European Standard applies only to those designed and supplied as a complete package.

NOTE All the symbols given in this text are used regardless of the language used.

1.2 Scope of EN 16905-1

This part of EN 16905 series specifies the terms and definitions of gas-fired endothermic engine driven heat pumps for heating and/or cooling mode including the engine heat recovery.

2 Normative references

Not applicable.

3 Terms and definitions

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

3.1 Appliance and its constituents:

3.1.1
air conditioner
encased assembly or assemblies designed as a unit to provide delivery of conditioned air to an enclosed space (room for instance) or zone

Note 1 to entry: It includes a refrigeration system for cooling and possibly dehumidifying the air.

Note 2 to entry: It can have means for heating, circulating, cleaning and humidifying the air. If the unit provides heating by reversing the refrigerating cycle, then it is a heat pump.

3.1.2
close control air conditioner
air conditioner to satisfy the requirements of the process carried out in the air conditioned room

3.1.3
control cabinet air conditioner
air conditioner to satisfy the requirements of the control cabinet

3.1.4
double-duct air conditioner
air conditioner in which, during cooling or heating, the condenser (or evaporator) intake air is introduced from the outdoor environment to the unit by a duct and rejected to the outdoor environment by a second duct, and which is placed wholly inside the place to be conditioned, near a wall

3.1.5
engine heat recovery
recovery of residual heat energy from the engine by means of a heat exchanger

3.1.6
engine heat recovery heat exchanger
heat exchanger assembly which is designed to transfer the residual heat energy to the engine heat recovery medium

3.1.7
exhaust air
air from the air conditioned space entering the outdoor heat exchanger

3.1.8
brine
heat transfer medium that has a freezing point lower than the freezing point of water

3.1.9
gas carrying circuit
assembly of parts of the GEHP appliance that carry or contain supplied gas or process gas

Note 1 to entry: This circuit includes the gas circuit.

3.1.10
gas circuit
assembly of parts of the GEHP appliance that carry or contain the supplied gas between the gas inlet connection and the outlet of the safety shut-off valves

3.1.11
gas inlet connection
part of the GEHP appliance intended to be connected to the gas supply

3.1.12
gas rate adjuster
component allowing the gas rate of a gas mixture equipment to be brought to a predetermined value according to the supply conditions

Note 1 to entry: The action of operating this device is called “adjustment of the gas rate”.

Note 2 to entry: E.g. gas mixer.

3.1.13
GEHP appliance
gas-fired endothermic engine driven heat pump

3.1.14
heat pump
encased assembly or assemblies designed as a unit to provide delivery of heat

Note 1 to entry: It includes a refrigeration system for heating.

Note 2 to entry: It can have means for cooling, circulating, cleaning and dehumidifying the air. The cooling is by means of reversing the refrigerating cycle.

3.1.15
heat recovery
recovery of heat rejected by the unit whose primary control is in the cooling mode by means of either an additional heat exchanger (e.g. a liquid chiller with an additional condenser) or by transferring the heat through the refrigerating system for use by units whose primary control remains in heating mode (e.g. variable refrigerant flow with simultaneous cooling and heating operation)

3.1.16
heat recovery heat exchanger
heat exchanger assembly which is designed to transfer heat to the heat recovery medium

3.1.17
heat transfer medium
medium (water, air …) used for the transfer of the heat without changing the state

3.1.18
ignition device
means (e.g. electrical, etc.) used to ignite the gas admitted to the internal combustion engine

3.1.19
indoor heat exchanger
heat exchanger which is designed to transfer heat between the refrigerant and the indoor heat transfer medium

Note 1 to entry: In the case of an air conditioner operating in the cooling mode, this is the evaporator. In the case of an air conditioner operating in heating mode, this is the condenser.

Note 2 to entry: In case the indoor heat transfer is water or brine, the indoor heat exchanger is also placeable at outdoor.

3.1.20
injector
component that admits gas into an internal combustion engine

3.1.21
internal combustion engine
mechanism delivering shaft power by the combustion of fuel in one or more cylinders in which working pistons reciprocate

3.1.22
outdoor heat exchanger
heat exchanger which is designed to transfer heat between any available heat source and the refrigerant

Note 1 to entry: In the case of an air conditioner operating in the cooling mode, this is the condenser. In the case of an air conditioner operating in heating mode, this is the evaporator.

3.1.23
primary function
main purpose for which the GEHP appliance is designed

Note 1 to entry: Both the heating and cooling functions of the GEHP appliance are classed as primary functions if they satisfy the rational use of energy requirements for those functions.

3.1.24
range-rating device
component on the GEHP appliance intended to be used by the installer to adjust the nominal heat input (value of the heat input at standard rating condition) of the GEHP appliance within the range of maximum and minimum heat inputs stated in the technical specifications/instructions, to suit the actual heat requirements of the installation

3.1.25
recycled air
air from the air conditioned space entering the indoor heat exchanger

3.1.26
sealing an adjuster or control device
arrangements made to make evident any attempt to change the set adjustment (e.g. breakage of the device or the sealing material)

Note 1 to entry: A sealed adjuster or control device is considered to be non-existent

3.1.27
secondary function
optional function of the GEHP appliance, such as heating or cooling, which is not expected to satisfy the rational use of energy requirements of a primary function

3.1.28
single-duct air conditioner
air conditioner in which, during cooling or heating, the condenser (or evaporator) intake air is introduced from the space containing the unit and discharged outside this space

3.1.29
water loop
closed circuit of water maintained with a temperature range on which the units in cooling mode reject heat and the units in heating mode take heat

3.2 Combustion products circuit:

3.2.1
air supply and combustion products evacuation ducts
means for transporting combustion air to the internal combustion engine and the combustion products to the terminal or fitting piece

Note 1 to entry: It is necessary to distinguish between:

— completely surrounded ducts: the combustion products evacuation duct is surrounded by combustion air throughout its length,

— separate ducts: the combustion products evacuation duct and the combustion air supply duct are neither concentric nor completely surrounded ducts.

3.2.2
backflow valve
valve to prevent flue gas backflow

3.2.3
combustion chamber
enclosure inside which combustion of the air-gas mixture takes place

3.2.4
combustion circuit
circuit including the air supply duct and the combustion products circuit

3.2.5
combustion products circuit
circuit including the combustion chamber, the heat exchanger, the combustion products evacuation duct and either the fitting piece or the connection to the terminal, if any

3.2.6
terminal
part of the combustion circuit fitted external to the building which has the function of the air supply inlet and/or combustion products outlet of the appliance

3.2.7
terminal guard
device that protects the terminal from physical damage from outside influences

3.3 Adjusting, monitoring, control and safety devices:

3.3.1
adjustable pressure regulator
pressure regulator fitted with a means of adjusting the downstream pressure

Note 1 to entry: This means is considered as an "adjusting device".

3.3.2
adjustable control thermostat
control thermostat that permits the user to obtain setting temperatures between a minimum and a maximum value

3.3.3
air proving device
device intended to cause safety shutdown in the event of abnormal conditions of air admission or of combustion products evacuation

3.3.4
automatic engine control system
system that comprises a programming unit and the combustion detection function

Note 1 to entry: All the functions of an automatic control system are assembled in one or more housings.

3.3.5
automatic shut-off valve
device that automatically opens, closes or varies a rate on a signal from the engine control system

Note 1 to entry: Automatic valves are classified in accordance with EN 161 into classes A, B, C, D and J.

3.3.6
breather hole
orifice that allows atmospheric pressure to be maintained in a compartment of variable volume

3.3.7
closure member
movable part of the valve or the thermoelectric device that opens, varies or shuts off the gas path

3.3.8
control knob
component intended to be moved by hand in order to act on an appliance control (e.g. tap, thermostat, etc.)

3.3.9
control thermostat
device enabling the water temperature to be kept automatically within a given range at a predetermined value

3.3.10
diaphragm
flexible component that operates a valve by means of a force resulting from a pressure difference

3.3.11
external soundness
soundness, with respect to the atmosphere, of an enclosure containing gas

3.3.12
fault tolerating time
time between the occurrence of a fault and the shut-down of the internal combustion engine which is tolerated by the application without creating a hazardous situation

3.3.13
gas/air ratio control
device that automatically adapts the combustion air rate to the gas rate or vice versa

3.3.14
frost protection system
system that actively protects the water in the GEHP appliance against freezing

Note 1 to entry: An anti-freeze solution is not considered as an active frost protective system.

3.3.15
internal soundness
soundness of a closure member in the closed position and isolating an enclosure containing gas from another enclosure or from the outlet of the valve

3.3.16
limit thermostat
device that causes a shut off of the gas supply when a limit value of the temperature is reached, and automatically enables a new start-up sequence when the temperature returns below the fixed limit

3.3.17
maximum allowable working temperature
temperature that the material can withstand over a long period of time under working condition

3.3.18
multifunctional control
device which has two or more controls and/or control function(s) whereby the functional parts cannot operate if separated

3.3.19
overheat cut-off device
device that causes safety shutdown and non-volatile lockout before the GEHP appliance is damaged and/or before safety is put in question

3.3.20
pressure regulator
device which maintains the downstream pressure constant to within fixed limits independent of variations within a given range of the upstream pressure and the gas rate

3.3.21
programme
sequence of control operations determined by the programming unit, involving switching on, supervising and switching off the internal combustion engine

3.3.22
programming unit
device that reacts to impulses from control and safety systems, gives control commands, controls the start-up programme, supervises the internal combustion engine operation and causes controlled shutdown, safety shutdown or lockout, if necessary and follows a predetermined sequence of actions operating in conjunction with a combustion detection device

3.3.23
remote control
device that performs the remote control function by wires or wireless connection, with or without line of sight of the GEHP appliance

3.3.24
remote control function
function that provides automatic and normal operation by means of a control intended to be actuated with or without line of sight of the GEHP appliance, e.g. through:

a) communication lines/protocols,

b) additional hardware and/or software,

c) ultra-sonic,

d) infrared (IR)/radio frequency (RF) transmission,

e) all kind of combinations of a) to c) via the internet, e.g. modems, portable telephones

3.3.25
remote reset
device that performs a specific remote control function, being reset from lock-out to allow a restart attempt

3.3.26
safety temperature limiter
device that causes safety shutdown and non-volatile lockout so as to prevent a gas or a water temperature exceeding a preset limit

3.4 Operation of the GEHP appliance:

3.4.1
complete combustion
combustion with no more than traces of combustible constituents (hydrogen, hydrocarbons, carbon monoxide, carbon etc.) in the combustion products

3.4.2
condensing operation mode of the flue system
operation mode where, under normal operation conditions, condensate is produced in the combustion products

3.4.3
controlled shutdown
process by which a control device (on the GEHP appliance or external to it) causes the gas supply to the internal combustion engine to be stopped immediately; the GEHP appliance returns to its start position

3.4.4
domestic hot water
DHW
water delivered by the GEHP appliance, raised to a certain temperature in order to use it for domestic needs, e.g. kitchen, bathroom, etc

3.4.5
extinction safety time
T_{Se}
time that elapses between extinction of the supervised flame and the order to shut off the gas supply to internal combustion engine

3.4.6
heat input
Q
quantity of energy used in unit time corresponding to the volumetric or mass flow rates, the calorific value used being either the net or gross calorific value

Note 1 to entry: The heat input is expressed in kilowatt (kW).

3.4.7
incomplete combustion
combustion at which at least one combustible constituent is present in significant proportions in the combustion products

3.4.8
internal cooling circuit
loop in which a fluid circulates intended to maintain the various elements of the GEHP appliance at their operating temperature

3.4.9
locking out
complete interruption of the gas supply with lockout

3.4.10
maximum water service pressure
maximum pressure permitted in the domestic water circuit of combinations GEHP appliance, as stated in the appliance instructions

3.4.11
nominal electrical frequency
frequency stated in the technical specifications/ instructions at which the GEHP appliance can operate normally

3.4.12
nominal voltage
voltage or range of voltages stated in the technical specifications/instructions at which the GEHP appliance can operate normally

3.4.13
non-volatile lockout
shutdown condition such that a restart can only be accomplished by a manual reset

3.4.14
pre-purge time
period during which pre-purge takes place

3.4.15
purge
mechanical introduction of air into the combustion circuit in order to displace any gas/air mixture, which could remain there

Note 1 to entry: A distinction is made between:

— pre-purge: the purge that takes place between the start command and the ignition device being energized,

— post-purge: the purge that is carried out after burner shutdown.

3.4.16
recycling
automatic process by which, after loss of combustion during operation, the gas supply is interrupted and the full start procedure is re-initiated automatically

3.4.17
safety shutdown
process which is effected immediately following the response of a protection device or the detection of a fault and puts the internal combustion engine out of operation such as to maintain a safe condition and avoid damage to the GEHP appliance, and through which the resulting state of the system is defined by deactivated terminals for the shut-off valves and the ignition device

3.4.18
start
action which causes the GEHP appliance to leave its prestart operation allowing the predetermined programme to commence

3.4.19
equivalent engine speed
$Erpm_{equivalent}$
weighted average of the engine speed used for the measurement of NOx

3.5 Gases:

3.5.1
calorific value
quantity of heat produced by the complete combustion, at a constant pressure equal to 1 013,25 mbar, of a unit volume or mass of gas, the constituents of the combustible mixture being taken at reference conditions and the products of combustion being brought back to the same conditions

Note 1 to entry: A distinction is made between:

— the gross calorific value *Hs*: the water produced by combustion is assumed to be condensed,

— the net calorific value *Hi*: the water produced by combustion is assumed to be in the vapour state.

Note 2 to entry: The calorific value is expressed:

— either in megajoules per cubic metre (MJ/m^3) of dry gas under the reference conditions,

— in megajoules per kilogram (MJ/kg) of dry gas.

3.5.2
gas pressure
static pressure of the moving gas, relative to the atmospheric pressure, measured at right angles to the direction of the flow of the gas

Note 1 to entry: Symbol: *p*. The gas pressures used are expressed in millibars (mbar) 1 mbar = 10^2 Pa.

3.5.3
limit gases
test gases representative of the extreme variations in the characteristics of the gases for which appliances have been designed

3.5.4
limit pressures
maximum pressure: p_{max}; minimum pressure: p_{min}
pressures representative of the extreme variations in the appliance supply conditions

3.5.5
normal pressure
p_n
pressure under which the appliances operate in nominal conditions (condition used to obtain the values of the rating plate) when they are supplied with the corresponding reference gas

3.5.6
pressure couple
combination of two distinct gas distribution pressures applied by reason of the significant difference existing between the Wobbe indices within a single gas family or group in which:

— the higher pressure corresponds only to gases of low Wobbe index,

— the lower pressure corresponds to gases of high Wobbe index

3.5.7
reference gases
test gases with which appliances operate under nominal conditions (condition used to obtain the values of the rating plate) when they are supplied at the corresponding normal pressure

3.5.8
relative density
d
ratio of the masses of equal volumes of dry gas and dry air under the same conditions of temperature and pressure: 15 °C or 0 °C and 1 013,25 mbar

3.5.9
test gases
gases which are intended for the verification of the operational characteristics of gas appliances and which consist of reference gases and limit gases

3.5.10
test pressure
gas pressures used to verify the operational characteristics of gas appliances, consisting of normal and limit pressures

3.5.11
Wobbe index
gross Wobbe index: Ws; net Wobbe index: Wi
ratio of the calorific value of a gas per unit volume to the square root of its relative density under the same reference conditions; it is said to be gross or net according to whether the calorific value used is the gross or net calorific value

Note 1 to entry: The Wobbe index is expressed:

— either in megajoules per cubic metre (MJ/m^3) of dry gas under reference conditions,

— or in megajoules per kilogram (MJ/kg) of dry gas.

3.6 Conditions of operation, measurement and calculations:

3.6.1
active mode
mode corresponding to the hours with a cooling or heating load of the building and whereby the cooling or heating function is switched on

3.6.2
application rating condition
rating condition which provides additional information on the performance of the appliance within its operation range when applicable

3.6.3
auxiliary energy factor in cooling mode
AEFc
cooling capacity to effective electrical power input ratio

Note 1 to entry: The auxiliary energy factor in cooling mode is expressed in kilowatt/ kilowatt (kW/kW).

3.6.4
auxiliary energy factor in heating mode
AEFh
heating capacity to effective electrical power input ratio

Note 1 to entry: The auxiliary energy factor in heating mode is expressed in kilowatt/ kilowatt (kW/kW).

3.6.5
bin hours
h_j
sum of all hours occurring at a given temperature for a specific location

Note 1 to entry: The number is rounded to a whole number and is derived from representative weather data over the 1982–1999 period.

Note 2 to entry: For the reference heating seasons the specific locations are Strasbourg (average), Helsinki (colder) and Athens (warmer).

3.6.6
bivalent temperature
$T_{bivalent}$
lowest outdoor temperature at which the heating load is equal to the appliance declared capacity

Note 1 to entry: The bivalent temperature is expressed in °C.

3.6.7
correction for engine heat recovery
C_{device_hr}
capacity or electric power input correction due to the device(s) (fan(s) or pump(s)) responsible for circulation the heat transfer medium through the engine heat recovery heat exchanger, in kilowatt

Note 1 to entry: The correction for engine heat recovery is expressed in kilowatt (kW).

3.6.8
correction for indoors units
C_{device_indoor}
capacity or electric power input correction due to the device(s) (fan(s) or pump(s)) responsible for circulation the heat transfer medium through the indoor heat exchanger, in kilowatt

Note 1 to entry: The correction for indoor units expressed in kilowatt (kW).

3.6.9
correction for outdoors units
$C_{device\_outdoor}$
capacity or electric power input correction due to the device(s) (fan(s) or pump(s)) responsible for circulation the heat transfer medium through the outdoor heat exchanger, in kilowatt

Note 1 to entry: The correction for outdoor units is expressed in kilowatt (kW).

3.6.10
cooling capacity
heat given off from the heat transfer medium to the refrigerant circuit of the GEHP appliance in cooling mode, integrated over and divided by a defined interval of time

Note 1 to entry: The cooling capacity is expressed in kilowatt (kW).

3.6.11
declared capacity
DC
heating or cooling capacity that the appliance can deliver at any given temperature condition declared, as declared by the installation manual

Note 1 to entry: The declared capacity is expressed in kilowatt (kW).

3.6.12
defrost mode
state of the appliance in the heating mode where the operation is modified or reversed to defrost the outdoor heat exchanger

3.6.13
defrost period
time on which the appliance is in the defrost mode

3.6.14
degradation coefficient
Cd
measure of efficiency loss due to the cycling of air-to-air, air to water, water/brine-to-air or water/brine-to-water units

Note 1 to entry: If the degradation coefficient is different for cooling and heating mode, then the degradation coefficient of cooling is used for both cooling and heating.

3.6.15
design load for cooling
$P_{designc}$
cooling load at the building $T_{designc}$ conditions

Note 1 to entry: The design load for cooling is expressed in kilowatt (kW).

3.6.16
design load for heating
$P_{designh}$
heating load at the building $T_{designh}$ conditions

Note 1 to entry: The design load for heating is expressed in kilowatt (kW).

3.6.17
effective cooling capacity
Q_{Ec}
measured cooling capacity corrected for the heat from the device (pump(s) or fan(s)) responsible for circulating the heat transfer medium through the indoor heat exchanger

Note 1 to entry: The effective cooling capacity is expressed in kilowatt (kW).

3.6.18
effective electrical power input
P_E
electrical power input of the appliance within the defined interval of time including share of electrical power input of the device (pump(s) or fan(s)) responsible for circulating the heat transfer medium through the appliance

Note 1 to entry: The effective electrical power input is expressed in kilowatt (kW).

3.6.19
effective engine heat recovery capacity
Q_{Ehr}
measured engine heat recovery capacity corrected for the heat from the device (pump(s) or fan(s)) responsible for circulating the engine heat recovery medium through the engine heat recovery heat exchanger

Note 1 to entry: The effective engine heat recovery capacity is expressed in kilowatt (kW).

3.6.20
effective heating capacity
Q_{Eh}
measured heating capacity corrected for the heat from the device (pump(s) or fan(s)) responsible for circulating the heat transfer medium through the indoor heat exchanger

Note 1 to entry: The effective heating capacity is expressed in kilowatt (kW).

3.6.21
engine heat recovery capacity
heat given off by the engine heat recovery heat exchanger to the engine heat recovery medium, integrated over and divided by a defined interval of time

Note 1 to entry: The engine heat recovery capacity is expressed in kilowatt (kW).

3.6.22
engine heat recovery efficiency for electricity in cooling mode
$EHREelec_C$
effective engine heat recovery capacity in cooling to effective electrical power input ratio

Note 1 to entry: The engine heat recovery efficiency for electricity in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.23
engine heat recovery efficiency for electricity in heating mode
$EHREelec_h$
effective engine heat recovery capacity in heating to effective electrical power input ratio

Note 1 to entry: The engine heat recovery efficiency for electricity in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.24
engine heat recovery efficiency for gas in cooling mode
$EHREgas_C$
effective engine heat recovery capacity in cooling to measured heat input ratio

Note 1 to entry: The engine heat recovery efficiency for gas in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.25
engine heat recovery efficiency for gas in heating mode
$EHREgas_h$
effective engine heat recovery capacity in heating to measured heat input ratio

Note 1 to entry: The engine heat recovery efficiency for gas in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.26
gas utilization efficiency ratio in cooling mode
GUE*c*
effective cooling capacity to measured heat input ratio

Note 1 to entry: The gas utilization efficiency ratio in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.27
gas utilization efficiency ratio in heating mode
GUE*h*
effective heating capacity to heat input ratio

Note 1 to entry: The gas utilization efficiency ratio in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.28
heating capacity
heat given off by the GEHP appliance to the heat transfer medium in heating mode, integrated over and divided by a defined interval of time

Note 1 to entry: If heat is removed from the indoor heat exchanger for defrosting, it is taken into account.

Note 2 to entry: The heating capacity is expressed in kilowatt (kW).

3.6.29
heat recovery capacity
heat removed by the heat transfer medium of the heat recovery heat exchanger, integrated over and divided by a defined interval of time

Note 1 to entry: The heat recovery capacity is expressed in kilowatt (kW).

3.6.30
off mode
mode wherein the unit is completely switched off and can be reactivated neither by control device nor by timer

Note 1 to entry: Off mode means a condition in which the GEHP appliance is connected to the main power source and is not providing function. The following will also be considered as off mode: conditions providing only an indication of off mode condition; conditions providing only functionalities to ensure electromagnetic compatibility.

3.6.31
operation limit temperature
TOL
lowest outdoor temperature at which the heat pump can still deliver heating capacity, as declared by the installation manual

Note 1 to entry: The operation limit temperature is expressed in °C.

3.6.32
part load ratio
part load (building load) divided by the design load (0 to 100 %)

3.6.33
part load
heating or cooling load of the building which is less than the design load

3.6.34
primary energy conversion factor for electricity
$Prim_{elec}$
primary energy factor for electricity, value based on ErP Directive (2009/125/EC) or by default equal to 2,5

3.6.35
primary energy conversion factor for gas
$Prim_{gas}$
primary energy factor for gas, value based on ErP Directive (2009/125/EC) or by default equal to 1 on GCV

3.6.36
primary energy ratio in cooling mode
PER_c
total efficiency of a GEHP appliance in cooling, calculated with GUEc, AEFc and EHREc

Note 1 to entry: The primary energy ratio in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.37
primary energy ratio in heating mode
PER_h
total efficiency of a GEHP appliance in heating, calculated with GUEh, AEFh and EHREh

Note 1 to entry: The primary energy ratio in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.38
rating condition
standardized conditions (standard and application rating condition) provided for the determination of data which are characteristic for the unit, especially:

— (rating) heating capacity: Q_{Rh}, effective heating capacity: Q_{Eh}, gas utilization efficiency in heating mode: GUE_h, auxiliary energy factor in heating mode: AEF_h, primary energy ratio for heating PER_h;

— (rating) cooling capacity: Q_{Rc}, effective cooling capacity: Q_{Ec}, gas utilization efficiency in cooling mode: GUE_c, auxiliary energy factor in cooling mode: AEF_c, primary energy ratio for cooling PER_c

3.6.39
reference annual cooling demand
Q_{refc}
representative annual cooling demand which is used for the calculation of reference seasonal performance in cooling mode

Note 1 to entry: The reference annual cooling demand is expressed in kilowatthour (kWh).

3.6.40
reference annual heating demand
Q_{refh}
representative annual heating demand which is used for the calculation of reference seasonal performance in heating mode

Note 1 to entry: There are three reference heating demands: “A” average, “C” colder and “W” warmer, corresponding to the three reference heating seasons.

Note 2 to entry: The reference annual heating demand is expressed in kilowatthour (kWh).

3.6.41
reference design conditions for cooling
$T_{designc}$
temperature conditions at 35 °C dry bulb (24 °C wet bulb) outdoor temperature and 27 °C dry bulb (19 °C wet bulb) indoor temperature

Note 1 to entry: The reference design conditions for cooling are expressed in °C.

3.6.42
reference design conditions for heating
$T_{designh}$
temperature conditions for average, colder and warmer climates

Note 1 to entry: Average = −10 °C, colder = −22 °C, warmer = 2 °C.

3.6.43
reference cooling season
representative climate profile(s) by temperature bins for cooling to the reference design conditions for cooling

Note 1 to entry: The climate profile for cooling is explained in EN 16905–5:2017, Table 23.

3.6.44
reference heating season
representative climate profile(s) by temperature bins for heating to the reference design conditions for heating

Note 1 to entry: There are three reference heating seasons “A” average, “C” colder and “W” warmer.

3.6.45
reference seasonal auxiliary energy factor in cooling mode
SAEF*c*
seasonal auxiliary energy factor of a GEHP appliance calculated for the reference annual cooling demand, including the energy consumption during active mode, thermostat off mode, standby mode and off mode

Note 1 to entry: The reference seasonal auxiliary energy factor in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.46
reference seasonal auxiliary energy factor in heating mode
SAEF*h*
seasonal auxiliary energy factor of a GEHP appliance calculated for the reference annual heating demand, including the energy consumption during active mode, thermostat off mode, standby mode and off mode

Note 1 to entry: The reference seasonal auxiliary energy factor in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.47
reference seasonal engine heat recovery efficiency for electricity in cooling mode
$SEHREelec_C$
seasonal engine heat recovery efficiency for electricity, of a GEHP appliance calculated for the reference annual cooling demand

Note 1 to entry: The reference seasonal engine heat recovery efficiency for electricity in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.48
reference seasonal engine heat recovery efficiency for electricity in heating mode
$SEHREelec_h$
seasonal engine heat recovery efficiency for electricity, of a GEHP appliance calculated for the reference annual heating demand

Note 1 to entry: The reference seasonal engine heat recovery efficiency for electricity in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.49
reference seasonal engine heat recovery efficiency for gas in cooling mode
$SEHREgas_C$
seasonal engine heat recovery efficiency for gas expressed in GCV, of a GEHP appliance calculated for the reference annual cooling demand

Note 1 to entry: The reference seasonal engine heat recovery efficiency for gas in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.50
reference seasonal engine heat recovery efficiency for gas in heating mode
$SEHREgas_h$
seasonal engine heat recovery efficiency for gas expressed in GCV, of a GEHP appliance calculated for the reference annual heating demand

Note 1 to entry: The reference seasonal engine heat recovery efficiency for gas in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.51
reference seasonal gas utilization efficiency ratio in cooling mode
$SGUE_c$
seasonal gas utilization efficiency ratio, expressed in GCV, of a GEHP appliance calculated for the reference annual cooling demand

Note 1 to entry: The reference seasonal gas utilization efficiency ratio in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.52
reference seasonal gas utilization efficiency ratio in heating mode
$SGUE_h$
seasonal gas utilization efficiency ratio, expressed in GCV, of a GEHP appliance calculated for the reference annual heating demand

Note 1 to entry: The reference seasonal gas utilization efficiency ratio in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.53
reference seasonal primary energy ratio in cooling mode
$SPER_c$
seasonal primary energy ratio of a GEHP appliance calculated for the reference annual cooling demands

Note 1 to entry: The reference seasonal primary energy ratio in cooling mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.54
reference seasonal primary energy ratio in heating mode
$SPER_h$
seasonal primary energy ratio of a GEHP appliance calculated for the reference annual heating demands

Note 1 to entry: The reference seasonal primary energy ratio in heating mode is expressed in kilowatt/kilowatt (kW/kW).

3.6.55
sound power level
ten times logarithm to the base 10 of the ratio of the given sound power to the reference sound power which is 1 pW (10 W −12 W), and expressed in decibels

3.6.56
stand by mode
mode wherein the unit is switched off partially and can be reactivated by a control device or timer

Note 1 to entry: The unit is connected to the mains power source, depends on signal input to work as intended and provides only the following functions, which persist for an indefinite time: reactivation function, or reactivation function and only an indication of enabled reactivation function, and/or information or status display.

3.6.57
standard rating condition
mandatory rating condition that is used for establishing the necessary values (effective capacity, GUE and PER) for the marking in the rating plate

Note 1 to entry: The values showed in the rating plate are measured at 100 % load.

3.6.58
thermostat off mode
mode corresponding to the hours with no cooling or heating load of the building, whereby the cooling or heating function of the unit is switched on, but is not operational, as there is no cooling or heating load

Note 1 to entry: For the reference cooling season, this situation occurs when the outdoor temperature reaches 16 °C or lower. For the reference heating seasons, this situation occurs when the outdoor temperature reaches 16 °C or higher.

Note 2 to entry: When a unit is cycling off during active mode, this is not considered as thermostat off mode.

4 Denomination

The units are denominated in such a way that the heat transfer medium for the outdoor heat exchanger is indicated first, followed by the heat transfer medium for the indoor heat exchanger (see Table 1).

Table 1 — Most common types of units

Heat transfer medium		Classification
Outdoor heat exchanger	**Indoor heat exchanger**	
Air	Air	Air/air heat pump or air cooled air conditioner
Water	Air	Water/air heat pump or water cooled air conditioner
Brine	Air	Brine/air heat pump or brine cooled air conditioner
Air	Water	Air/water heat pump or air cooled liquid chilling package
Water	Water	Water/water heat pump or water cooled liquid chilling package
Brine	Water	Brine/water heat pump or brine cooled chilling package

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1) Currently in preparation.

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