



BSI Standards Publication

Garden equipment — Pedestrian controlled lawn aerators and scarifiers — Safety

National foreword

This British Standard is the UK implementation of EN 13684:2018+A1:2024. It supersedes BS EN 13684:2018, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

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English Version

Garden equipment - Pedestrian controlled lawn aerators and scarifiers - Safety

Matériel de jardinage - Aérateurs et scarificateurs à
conducteur à pied - Sécurité

Gartengeräte - Handgeführte Rasen-Bodenbelüfter und
Vertikutierer - Sicherheit

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European foreword

This document (EN 13684:2018+A1:2024) has been prepared by Technical Committee CEN/TC 144 “Tractors and machinery for agriculture and forestry”, 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of an identical text or by endorsement, at the latest by June 2025 and conflicting national standards shall be withdrawn at the latest by June 2025.

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 includes Amendment 1 approved by CEN on 6 October 2024.

This document supersedes A1 EN 13684:2018 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

In comparison with the previous edition [EN 13684:2004+A3:2009], the following modifications have been made:

- Addition of requirements for:
 - electromagnetic immunity;
 - engine starting;
 - guarding of power driven components;
 - machine stability, with a test method.
- Modification of the:
 - contents of the instructions;
 - machine markings and warnings with new safety signs;
 - noise test method;
 - vibration test method.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This document is a type-C standard as stated in EN ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document. The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type-A or type -B standards, the provisions of this type-C standard take precedence over the requirements of the other standards, for machines that have been designed and built according to the requirements of this type-C standard.

1 Scope

This European Standard specifies safety requirements and their verification for the design and construction. It is applicable to pedestrian controlled internal combustion engine powered lawn aerators and scarifiers which are designed for re-generating lawns by, for instance, combing out grass, thatch and moss or cutting vertically into the lawn face using tines which rotate about a horizontal axis.

This document deals with all significant hazards, hazardous situations or hazardous events relevant to pedestrian controlled internal combustion engine powered lawn aerators and scarifiers, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer. It describes methods of elimination or reduction of hazards arising from their use. In addition, it specifies the type of information to be provided by the manufacturer on safe working practices.

Throughout this document, the term “machine” applies to those machines known as aerators, scarifiers, corers, lawn rakes or grass rakes.

It does not apply to:

- aerators/scarifiers made from a machine falling within the scope of EN 709:1997+A4:2009 when fitted with an aerating/scarifying implement;
- non-powered aerators;
- vertical axis aerators; or
- those aerators which cut into the soil by means of a reciprocating motion or by water pressure.

Environmental hazards have not been considered in this document.

This document is not applicable to aerators/scarifiers which are manufactured before the date of its publication.

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.

EN ISO 354:2003, *Acoustics — Measurement of sound absorption in a reverberation room (ISO 354:2003)*

EN ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

Ⓐ EN ISO 4413:2010, *Hydraulic fluid power — General rules and safety requirements for systems and their components (ISO 4413:2010)* Ⓐ

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

Ⓐ EN ISO 7010:2020, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2019, Corrected version 2020-06)* Ⓐ

EN ISO 11201:2010, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11688-1:2009, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

▣^{A1} EN ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2023)* ▣^{A1}

▣^{A1} EN ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)* ▣^{A1}

EN ISO 14982:2009, *Agricultural and forestry machinery — Electromagnetic compatibility — Test methods and acceptance criteria (ISO 14982:1998)*

EN ISO 20643:2008, *Mechanical vibration — Hand-held and hand-guided machinery — Principles for evaluation of vibration emission (ISO 20643:2005)*

▣^{A1} ISO 3767-1:2016, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols* ▣^{A1}

▣^{A1} ISO 3767-3:2016, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 3: Symbols for powered lawn and garden equipment* ▣^{A1}

▣^{A1} ISO 3767-4:2016, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 4: Symbols for forestry machinery* ▣^{A1}

▣^{A1} ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings* ▣^{A1}

▣^{A1} ISO 7000:2019, *Graphical symbols for use on equipment — Registered symbols* ▣^{A1}

▣^{A1} ISO 11684:2023, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety labels — General principles* ▣^{A1}

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100:2010 and the following apply.

3.1

braking system

combination of one or more brakes and the related means of operation and control

3.2

catcher

part or combination of parts which provides a means for collecting grass, thatch, moss or other debris

3.3

control

means or device which will control the operation of the machine or any specific operating function thereof

3.4

working position

depth setting of the **tines** designated by the manufacturer

3.5

discharge chute

extension of the tine enclosure from the discharge opening, generally used to control the discharge of material from the tines

3.6

discharge opening

gap or opening in the tine enclosure through which grass, thatch, moss and other debris may be discharged

3.7

front discharge

action of throwing out grass, thatch and moss so that they will be collected in a catcher which is located in front of the **tines**

3.8

handle

part likely to be hand-held for guiding the machine in normal use

3.9

lawn aerator

corer

machine which uses the ground to determine the depth of cut, designed for penetrating the lawn surface

3.10

scarifier

lawn rake

machine designed to scratch the surface, or earth face thereby also combing the lawn

3.11

maximum operating engine speed

highest engine speed obtainable when adjusted in accordance with the machine manufacturer's specifications and/or instructions with the tines engaged

3.12

normal operation

use of the machine which is specified by the manufacturer and which is consistent with such activities as combing thatch, starting, stopping, fuelling, connecting to (or disconnecting from) a power source

3.13

normal use

normal operation, plus routine maintenance, servicing, cleaning, transporting, attaching or removing accessories, and making adjustments as determined by the manufacturer's instructions

3.14

operator control

control requiring operator actuation to perform specific functions

3.15

operator presence control

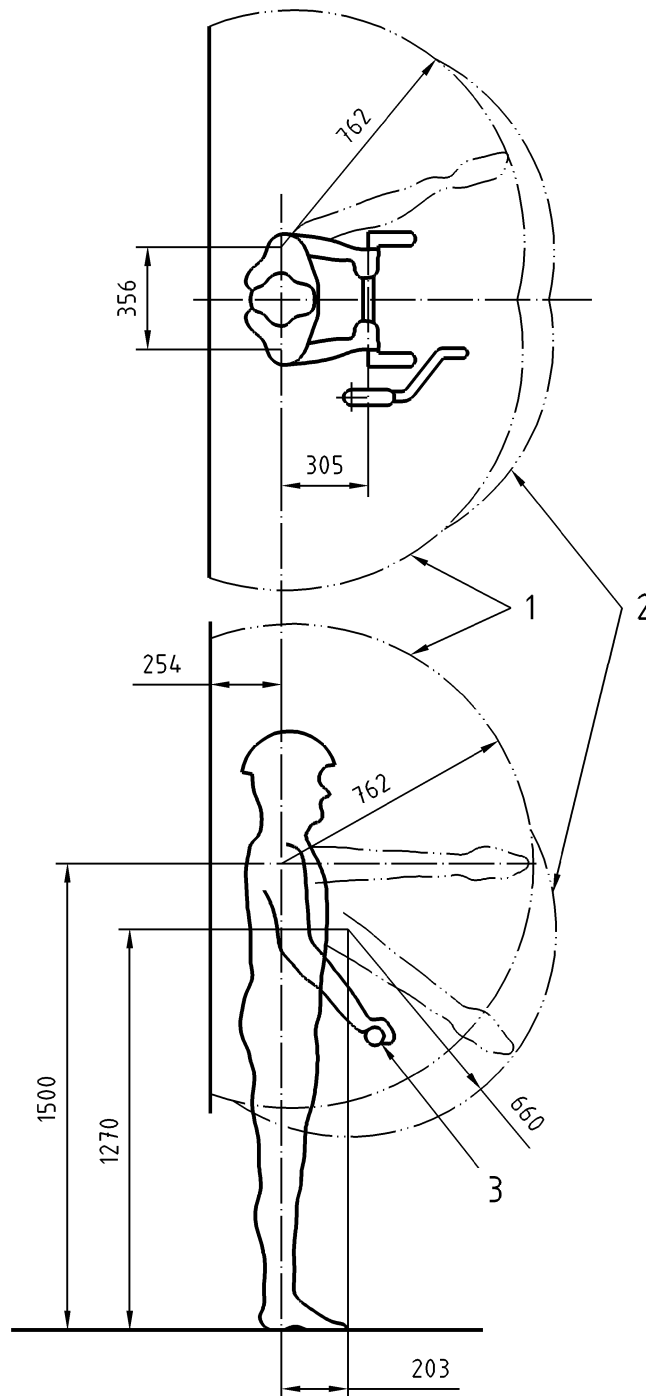
OPC

control designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed

3.16

operator zone

zone for persons operating a machine as presented in Figure 1



Key

- 1 operator zone
- 2 lower forward zone
- 3 handle

NOTE 1 The operator zone is the area into which the extremities of a 95th percentile male can reach from the normal operator position.

NOTE 2 The lower forward zone is the area into which a 5th percentile male or a 50th percentile female can reach when against the handle. This zone can also be reached by a 95th percentile leaning forward against the handle.

NOTE 3 All barriers (handles) within the operator zone will reduce the zone by the space occupies and protected by the barrier.

NOTE 4 The operator zone includes the maximum range of movement of all frequently used operator controls but is not intended to represent preferred operator control positions.

Figure 1 — Operator zone (see 3.16 and 5.8.1)

3.17

parking brake

device incorporated in the machine which, when operated, prevents the machine from moving from a stationary position and which will remain applied without the operator being present

3.18

power source

engine which provides mechanical energy for movement of the tines and traction drive

3.19

rear discharge

action of throwing out grass, thatch and moss so that they will be collected in a catcher which is located behind the tines

3.20

service brake

designated primary means for decelerating and stopping a machine from its ground travel speed

3.21

tine

mechanism used to provide the penetrating or scratching action of a machine

3.22

tine enclosure

part or assembly which provides the protective means around the tines

3.23

tine tip circle

path described by the outermost point of the tine as it rotates about its shaft axis

3.24

traction drive

means (system) used to transmit power from the power source to the ground drive means

3.25

width of cut

total width of scarification/aeration measured across the tines at right angles to the direction of travel

3.26

tine assembly

tines together with any supporting part(s), which together perform the aerating or scarifying action

4 List of significant hazards

This clause contains for defined danger zones all the significant hazards, hazardous situations and events covered by this document, identified by risk assessment as significant for this type of machines and which require specific action by the designer or manufacturer to eliminate or to reduce the risk (see Table 1).

It is the responsibility of the manufacturer to check whether or not the safety requirements specified in this document apply to each significant hazards presented by its specific machine and to validate that the risk assessment is complete with particular attention to:

- the intended use of the machine including maintenance, setting and cleaning and its reasonably foreseeable misuse;
- the identification of all significant hazards associated with the machine.

Table 1 — List of significant hazards associated with scarifiers and aerators

Ref. No.	Hazard	Location or event	Clause/subclause of this standard
Hazards, hazardous situations and hazardous events			
1	Mechanical hazards due to:		
	— machine parts or work pieces, e.g.:		
	e) inadequacy of mechanical strength;	Tine failure/strength	5.14
	— accumulation of energy inside the machinery e.g.:		
	g) liquids and gases under pressure;	Hydraulic fluid leakage/burst	5.6, 6.1
1.1	Shearing hazard	Contact with moving parts	5.2, 5.3, 5.10.2, 5.15, 6.1, 6.2 and Annex A
1.2	Cutting or severing hazard	Contact with moving parts	5.2, 5.3, 5.10.2, 5.15, 6.1, 6.2 and Annex A
1.3	Entanglement hazard	Contact with moving parts	5.2, 5.3, 5.10.2, 5.15, 6.1, 6.2 and Annex A
1.4	Drawing-in or trapping hazard	Contact with moving parts	5.2, 5.3, 5.10.2, 5.15, 6.1, 6.2 and Annex A
1.5	Impact hazard	Hit by thrown objects	5.3, 5.13
1.6	High pressure fluid injection or ejection hazard	Penetration by high pressure fluid	5.6, 6.1

Ref. No.	Hazard	Location or event	Clause/subclause of this standard
Hazards, hazardous situations and hazardous events			
2	Electrical hazards due to:		
2.1	Contact of persons with live parts (direct contact)	Contact with live parts	5.9.3
2.2	Approach to live parts under high voltage	Contact with HT ignition parts	5.9.3
2.3	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads, etc.	Protection against circuit overload	5.9.2.3
3	Thermal hazards, resulting in:		
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	Contact with hot parts	5.4
4	Hazards generated by noise, resulting in:		
4.1	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	Hearing damage	5.16, 6.1, 6.2 and Annex A, Annex C
5	Hazards generated by vibration		
5.1	Use of hand-held machines resulting in a variety of neurological and vascular disorders	Vibration white finger	5.17, 6.1, Annex E
6	Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery		
6.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes, and dusts	Breathing engine exhaust fumes	5.5, 6.1
		Contact with hazardous fluids	5.7, 6.1
6.2	Fire or explosion hazard	Abrasion of wire insulation etc	5.9.2.1

Ref. No.	Hazard	Location or event	Clause/subclause of this standard
Hazards, hazardous situations and hazardous events			
7	Hazards generated by neglecting ergonomic principles in machinery design as, e.g. hazards from:		
7.1	Unhealthy postures or excessive effort	Position of controls	5.8.1
7.2	Inadequate consideration of hand-arm or foot-leg anatomy	Position of controls	5.8.1
		Position of handle	5.12
7.3	Neglected use of personal protection equipment	Eye and ear protection	6.1, Annex A
7.4	Inadequate design, location or identification of manual controls	Position of controls	5.8.1, 5.8.2
8	Combination of hazards		
9	Unexpected start-up, unexpected over-run/over-speed (or any similar malfunction) from:		
9.1	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	Removal of guards before stopping machine	5.3
		Over-speed of engine	5.8.1
		Leaving unattended machine running	5.8.3
9.2	Break-up during operation	Broken tines	5.14
9.3	Falling or ejected objects or fluids	Thrown objects	5.3, 5.13
Additional hazards, hazardous situations and hazardous events due to mobility			
10	Relating to the travelling function		
10.1	Movement when starting the engine	Movement of the machine	5.8.1, 5.8.3, 5.8.4
10.2	Movement without a driver at the driving position	Operator presence control — tines	5.8.3
		Operator presence control — traction	5.8.4
10.3	Insufficient ability of machinery to be slowed down, stopped and immobilized	Stopping from travelling	5.11.1, 5.11.2
		Keeping stationary	5.11.3, 5.18

Ref. No.	Hazard	Location or event	Clause/subclause of this standard
Hazards, hazardous situations and hazardous events			
11	Linked to the work position (including driving station) on the machine		
11.1	Mechanical hazards at the work position: c) fall of objects, penetration by objects e) contact of persons with machine parts or tools (pedestrian controlled machines)	Thrown objects Feet in contact with tines	5.3, 5.13 5.12
11.2	Noise at the work position	Hearing damage	5.16, 6.1, 6.2 and Annex A, Annex C
11.3	Vibration at the work position	Vibration white finger	5.17, 6.1, Annex E
12	Due to the control system		
12.1	Inadequate location of manual controls	Position of controls	5.8.1
12.2	Inadequate design of manual controls and their mode of operation	Reverse only with rearward movement of control	5.8.4
13	Due to the power source and to the transmission of power		
13.1	Hazards from the engine and the batteries	Harm from battery vapour	5.9.2.2
14	From/to third persons		
14.1	Unauthorized start-up/use	Removable key	5.10.1
14.2	Drift of a part away from its stopping position	Positive stop control	5.10.1
15	Insufficient instructions for the driver/operator		
		Full instructions	6.1, 6.2 and Annex A

5 Safety requirements and/or protective measures

5.1 General

Machinery shall comply with the safety requirements and/or protective/risk reduction measures of this Clause.  In addition, the machine shall be designed according to the principles of EN ISO 12100:2010 for relevant but not significant hazards, which are not dealt with by this document (e.g. sharp edges on the outside of the machine). 

5.2 Power driven components and the tines

All power driven transmission components except the ground-contacting parts of the machine shall be guarded to prevent contact with these parts during normal operation. For guarding of the tines see 5.15.

Ⓐ Except where otherwise stated in this document all openings and safety distances shall conform to EN ISO 13857:2019, 4.2.4.1 or 4.2.4.3 together with Table 4, as appropriate. Ⓐ

Compliance shall be checked by inspection and measurement.

5.3 Guard attachment

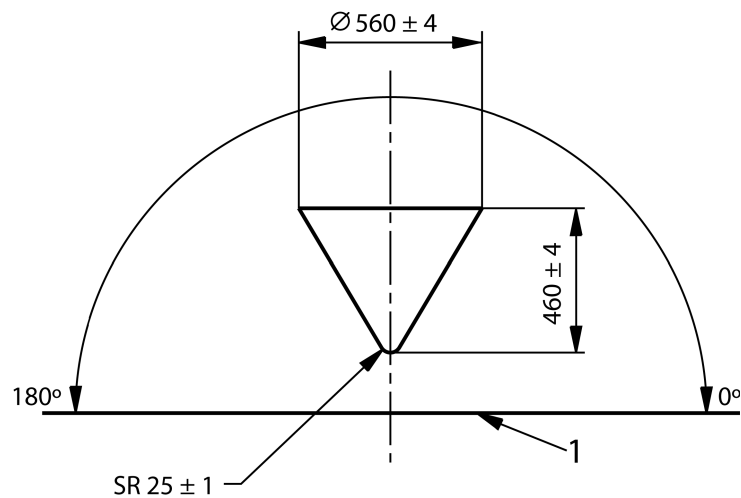
Guards allowing access to power driven components, other than the tines, shall be interlocked at least according to $PL_r = b$ of Ⓐ EN ISO 13849-1:2023 Ⓐ, to cause the moving parts to come to rest before access can be gained. While the power driven component is exposed it shall not be possible for it to be driven. Other guards shall be fixed guards and shall not be detachable without the use of tools, or the construction of the machine shall be such that it cannot be used without the guard in its guarding position. Guarding shall be designed to prevent hazardous thrown objects. This shall be tested according to 5.13.

5.4 Hot exhaust surfaces

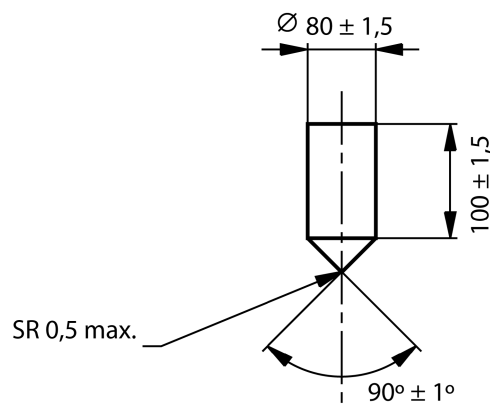
5.4.1 General

Engine exhaust components and their guards with a surface temperature greater than 90 °C for non-metallic materials or 80 °C for metallic materials, and that are accessible during normal operation shall be guarded from inadvertent contact so that the tip or conical surface of cone A or B (see Figure 2) shall not contact any area of 10 cm² or more of the hot surface.

Dimensions in millimetres



a) Cone A



b) Cone B

Key

1 horizontal plane

Figure 2 — Test cones (see 5.4.1 and 5.4.2.2)

It is not necessary to test the accessibility of hot parts while they are hot. Allow the hot parts to cool before using the cone(s).

5.4.2 Test equipment and method of test**5.4.2.1 Temperature measuring equipment**

The temperature measuring equipment for hot surfaces shall have an accuracy of $\pm 2^\circ\text{C}$.

5.4.2.2 Method of test

The test shall be conducted in the shade. The power source shall be operated at its maximum operating engine speed until the surface temperatures stabilize. Identify the hot surface area(s) on the power source exhaust system and guard. Temperatures shall be determined by correcting the observed temperature by the difference between the specified ambient and test ambient temperature.

Corrected temperature ($^\circ\text{C}$) = observed temperature ($^\circ\text{C}$) – ambient temperature ($^\circ\text{C}$) + 20 ($^\circ\text{C}$)