
**Agricultural and forestry machinery —
Knapsack combustion-engine-driven
mistblowers — Safety requirements**

*Matériel agricole et forestier — Nébulisateurs portés à dos à moteur à
combustion interne — Exigences de sécurité*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 28139 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 144, *Tractors and machinery for agriculture and forestry*, in collaboration with Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 6, *Equipment for crop protection*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Introduction

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

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 requirements of this type-C standard are different from those which are stated in type-A or B standards, the requirements 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.

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Agricultural and forestry machinery — Knapsack combustion-engine-driven mistblowers — Safety requirements

IMPORTANT — The electronic file of this document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

1 Scope

This International Standard specifies safety requirements and their verification for the design and construction of knapsack mistblowers incorporating a combustion engine where the air flow is generated by a fan.

It describes methods for the elimination or reduction of hazards arising from their use. In addition, it specifies the type of information on safe working practices to be provided by the manufacturer. It does not, however, give any technical requirement for reducing noise or vibration hazards. Indeed, the different means available to reduce these hazards are a matter for the technical aids to which the manufacturer may resort, through specialized books or specified bodies.

This International Standard deals with all significant hazards, hazardous situations and events, excepting those arising from

- electromagnetic compatibility, [ISO 28139:2009](https://standards.iteh.ai/catalog/standards/sist/3cb7ab33-b72a-4e4c-b25f-1dcc2771401c/iso-28139-2009)
- static electricity, <https://standards.iteh.ai/catalog/standards/sist/3cb7ab33-b72a-4e4c-b25f-1dcc2771401c/iso-28139-2009>
- explosion or fire from chemicals for spraying,
- insufficient structural integrity, and
- noise and vibration.

It is applicable to knapsack combustion-engine-driven mistblowers when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

It is not applicable to knapsack combustion-engine-driven mistblowers manufactured before the date of its publication.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3767-5:1992, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 5: Symbols for manual portable forestry machinery*

ISO 3864-1:2002, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

ISO 8893:1997, *Forestry machinery — Portable brush-cutters and grass-trimmers — Engine performance and fuel consumption*

ISO 9357:1990, *Equipment for crop protection — Agricultural sprayers — Tank nominal volume and filling hole diameter*

ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

ISO 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 19932-1:2006, *Equipment for crop protection — Knapsack sprayers — Part 1: Requirements and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1:2003 and the following apply.

3.1 knapsack mistblower
machine with a backpack power unit designed for applying chemicals to crops by means of a hand-held spraying device with the liquid being contacted, nebulized and transported by a high-speed air flow generated by a fan

NOTE An example of this machine is given in Annex C.

3.2 backpack power unit
power source which is designed to be carried on the operator's shoulders by means of a supporting device and harness

3.3 harness
adjustable strap(s) used to suspend the machine from the operator

3.4**silencer**

device for directing the exhaust gases

3.5**engine stopping device**

control fitted to the machine which stops the engine

3.6**suspension point**

device on the machine to which the harness can be attached

3.7**throttle trigger****throttle control**

device, usually a lever, activated by the operator's hand or finger, for controlling the engine speed

3.8**throttle lock**

device for temporarily setting the throttle in a partially open position

3.9**throttle trigger lockout**

device that prevents unintentional activation of the throttle trigger

3.10**chemical pump control device**

device, usually a lever, activated by the operator's hand or finger to engage or disengage the pump for filling the chemical tank

3.11**air tube**

tube for the air flow between the fan and the nozzle

3.12**normal operation**

use of the machine that is reasonably foreseeable and which is consistent with such activities as distribution of chemicals, starting, stopping, fuelling and filling with chemicals

3.13**normal use**

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

3.14**throttle limiting device**

manually activated device allowing different maximum positions of the throttle without preventing the return of the throttle to the idling position, designed to facilitate operation of the engine over a longer working period

4 List of significant hazards

For the purposes of this International Standard, Table 1 gives, for defined danger zones, the significant hazards, the significant hazardous situations and the significant hazardous events covered by this International Standard that have been identified by risk assessment as being significant for this type of machine, and which require specific action to eliminate or to reduce the risk.

Table 1 — List of significant hazards, hazardous situations and events associated with knapsack combustion-engine-driven mistblowers

Hazard		Subclause
1	Cutting or severing hazards related to the power-driven components	5.9
2	Entanglement hazard related to the power-driven components	5.9
3	Drawing-in or trapping hazards related to the power-driven components	5.9
4	Electrical hazards, created by contact with parts under high voltage (direct contact) or parts which have become under high voltage under faulty conditions (indirect contact)	5.13
5	Thermal hazards resulting in burns, scalds and other injuries, created by possible contact of persons with objects or materials with high temperature, including the radiation of heat sources	5.11, 7.3
6	Hazards resulting from contact with or inhalation of exhaust gases and sprayed products	5.3, 5.4, 5.5, 5.13, 7.3
7	Fire or explosion hazard related to fuel spillage	5.10, 7.3
8	Hazards from neglect of ergonomic principles in machine design, such as hazards from unhealthy postures or excessive efforts and inadequate consideration of human hand-arm anatomy related to handle design	5.1, 5.6, 5.7, 5.8
9	Hazards from failure of the control system related to handle strength, position of controls and marking	5.6, 7.4
10	Hazards from unexpected start-up, unexpected overrun/over-speed from failure/disorder of the control system related to failure in the position of the controls	5.6
11	Hazards from impossibility of stopping the machine in the best possible conditions related to the position of the engine stopping device	5.6
12	Hazards from ejection of fluids related to fuel spillage	5.10
13	Stability when in operation	5.2

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5 Safety requirements and/or protective measures

5.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this International Standard.

It is recommended that the overall mass of the knapsack mistblower at the maximum load, measured with full fuel and chemical tanks, as indicated by the manufacturer, not exceed 30 kg for men and 25 kg for women.

5.2 Stability when in operation

The centre of gravity of the upright sprayer shall not be located at a horizontal distance greater than 150 mm from the vertical plane passing through the fixation points of the harness at the full gross mass of the machine.

Compliance shall be checked by measurement.

5.3 Exhaust system

The exhaust outlet shall be located so as to direct exhaust emissions away from the operator in the normal operating position.

Compliance shall be checked by inspection and functional testing.

5.4 Chemical tank and strainer

5.4.1 General

The chemical tank shall be easy to clean both inside and outside. It shall be provided with a strainer having a mesh width not greater than 2 mm whose removal and mounting operations shall be easily carried out with the use of gloves.

The tank shall be equipped with a volumetric scale according to ISO 9357. The volumetric scale shall have a maximum error of $\pm 7,5\%$ up to a filling level of 20 % of nominal capacity and $\pm 5\%$ for greater filling levels.

During filling and emptying operations, the level of chemicals inside the tank shall be visible. The nominal volume shall be specified in whole litres. Additionally, filling levels and limits shall be visible during the filling operation.

If the mistblower is fitted with an auxiliary pump, the control of the pump shall be positioned so that it can be easily reached by the operator in the normal operating position.

Compliance shall be checked by inspection, functional testing and measurement.

5.4.2 Protection against chemical spillage and overflow

The actual overall volume of the tank shall exceed the nominal volume by at least 5 %.

To avoid chemical spillage during filling, the diameter of the filling opening shall be in accordance with ISO 9357.

However, it shall be possible to fill the tank to its nominal capacity within 60 s, without any liquid spillage, using the device described in ISO 19932-1:2006, Annex C.

The filling tank opening shall be fitted with a lid, which shall

- have a retainer,
- be able to be opened and closed without the use of a special tool, and
- be fitted with a holding device ensuring a closed position by means of a positive mechanical action (for example, lids fixed by screwing).

Compliance shall be checked by inspection, functional testing and measurement.

5.4.3 Protection against contact with chemicals when draining

It shall be possible to fully empty the chemical tank without overturning the machine.

The operator shall be prevented from coming into contact with the chemicals when emptying the tank. This requirement is met if

- the draining outlet can be opened without the use of a tool (for example, by means of a tap), and
- the flow is directed away from the operator.

Compliance shall be checked by inspection and functional testing.