International Standard ISO 5395/3

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Power lawn mowers, lawn tractors, and lawn and garden tractors with mowing attachments — Safety requirements and test procedures — Part 3 : Requirements for rotary mowers

Tondeuses à gazon à moteur, tracteurs de pelouse, tracteurs de jardin et de pelouse avec équipements de tonte adaptables — Règles de sécurité et méthodes d'essai — Partie 3 : Spécifications des tondeuses à axe vertical

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5395/3 was developed by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, and was circulated to the member bodies in July 1978.

It has been approved by the member bodies of the following countries :

Australia	India	Spain
Austria	Iran	Sweden
Belgium	Italy	Switzerland
Bulgaria	Korea, Dem. P. Rep. of	Turkey
Canada	Korea, Rep. of	United Kingdom
Chile	Portugal	USA
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Finland
France
Germany, F. R.
New Zealand

Printed in Switzerland

Power lawn mowers, lawn tractors, and lawn and garden tractors with mowing attachments — Safety requirements and test procedures — Part 3 : Requirements for rotary mowers

0 Introduction

This International Standard forms part of a series covering safety requirements and test procedures for power lawn mowers, lawn tractors, and lawn and garden tractors with mowing attachments. The complete list of parts will be as follows :

Part 1 : Definitions.[1)]

Part 2 : Basic requirements.

Part 3 : Requirements for rotary mowers.

Section one : General construction.

Section two : Test procedures.

Section three : Pedestrian controlled machines — Requirements.

Section four : Ride-on (riding) machines — Requirements.[2)]

Section five : Towed units — Requirements.[1)]

Part 4 : Requirements for cylinder (reel) mowers.[3)]

Section one : General construction.

Section two : Test procedures.

Section three : Pedestrian controlled machines — Requirements.

Section four : Ride-on (riding) machines — Requirements.

Section five : Towed units — Requirements.

Part 5 : Noise measurement.[1)]

1) In preparation.

2) At present at the stage of draft addendum.

3) At present at the stage of draft.

1 Scope and field of application

This International Standard specifies safety requirements and test procedures applicable to powered rotary mowers, including pedestrian controlled and ride-on (riding) types, ride-on (riding) lawn tractors, and lawn and garden tractors with mower attachments, designed primarily for use at and around the home, and having a width of cut greater than 300 mm.

NOTES

1 This International Standard does not apply to Sulky-type attachments, flail mowers, or sickle bar mowers, and the electrical aspects of electrically driven machines with voltages above 42 V are not covered.

2 Additional requirements for ride-on (riding) lawn tractors and lawn and garden tractors, having a drawbar pull up to 6 600 N, are specified in ISO 500.

3 Where applicable, the requirements of this International Standard could be applied to professional (commercial) power lawn mowers, lawn and garden tractors and lawn tractors.

2 References

ISO 560, *Plain end precision steel tubes, seamless and welded — Dimensions and masses per unit length.*

ISO 2759, *Board — Determination of bursting strength.*

ISO 3304, *Plain end seamless precision steel tubes — Technical conditions for delivery.*

ISO 3305, *Plain end welded precision steel tubes — Technical conditions for delivery.*

ISO 3306, *Plain end as-welded and sized precision steel tubes — Technical conditions for delivery.*

ISO 3600, *Agricultural tractors and machines — Operator manuals and technical publications — Presentation.*

ISO 3767/1, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator's controls and other displays — Part 1 : Common symbols.*[1)]

ISO 3789/3, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Location and method of operation of operator's controls — Part 3 : Controls for powered lawn and garden equipment.*[1)]

ISO 4254, *Agricultural tractors and machinery — Technical means for providing safety.*[1)]

IEC Publication 335-1, *Safety of household and similar electrical appliances — Part 1 : General requirements.*

IEC Publication 335-18, *Safety of household and similar electrical appliance — Part 2 : Guidelines for the safety of battery-powered, motor-driven and magnetically driven appliances for household and similar appliances and their charging and battery assemblies.*

Section one : Rotary mowers — General construction

3 Blade enclosure[2)]

The blade enclosure shall extend beyond the plane of the blade tip circle, except at the grass discharge opening. The blade enclosure shall be subjected to the foot probe test (see section two, clause 10) and the thrown object test (see section two, clause 12).

4 Discharge openings[2)]

When discharge openings are provided, the tangential extension of the discharge chute perimeters shall not intersect the operator zone when the mower is set at any height of cut; also no tangential line from the blade tip circle shall intersect the operator zone without first contacting the blade enclosure or guard.

5 Guards and grass catchers[2)]

The grass catcher and/or guards, when properly and completely installed, shall effectively prevent objects from being thrown out in a manner dangerous to the operator or bystander.[3)] Swinging guards or guards which have to be displaced in order to fit the grass catcher shall automatically return to the full guard position, or the mower shall become inoperable. Guards shall not be removable without the use of tools. The guards shall be considered as forming part of the blade enclosure for the purpose of clause 3 and 4.

6 Blades

6.1 Stopping devices — Pedestrian controlled or ride-on machines

(See ISO 5395/2, sub-clause 3.6.)

6.2 Blade stopping time

The blade(s) shall stop rotating from the manufacturer's specified maximum speed within 7 s after shutting off the power or declutching.

For mowers not stopping within this time, visual indication of blade rotation and a warning label shall be provided, with the label reading. "Blades continue to rotate after the machine is switched off or declutched".

1) At present at the stage of draft.

2) Under study.

3) A thrown object test and a structural integrity test are under study.

Section two : Rotary mowers — Test procedures

Section two specifies the tests for pedestrian controlled and ride-on mowers, and has the following clauses :

7 — General test conditions

8 — Impact test

9 — Unbalance test

10 — Foot probe test

11 — Blade security test

12 — Thrown object and structural integrity test

7 General test conditions

Where it is required that the mower blade be run during the tests specified in section two, it shall be operated at the maximum speed specified by the mower manufacturer.

8 Impact test

8.1 Test equipment

The test equipment shall be as illustrated in figure 1. The mower shall be completely encircled by a wall of 1 800 g/m^2 (350 lb/1 000 ft^2) double-wall fibreboard resting on the floor. The wall of fibreboard shall be 600 mm from the blade tip circle with a minimum height 600 mm above the floor or supporting surface.

NOTE — 50 mm × 200 mm boards or similar protection should be placed on the outside face of the wall of fibreboard to protect personnel.

8.2 Test method

The mower shall be positioned over a 30 mm × 3 mm (nominal) welded or seamless steel tube that has been placed in the test fixture (see figure 1). The blade of the test mower shall be adjusted to the cutting height closest to 50 mm and shall be so positioned that when the tube is inserted into the path of the rotating blade, the blade will strike the exposed portion of the tube within 10 to 15 mm of the blade tip (see figure 1). The tube shall be inserted once into the path of each blade assembly.

The mower shall be run for 15 s, or until the mower motor stops or the tube is severed.

Where it is not possible to insert the tube due to mower design, the mower shall be moved the minimum distance necessary to permit the tube to be inserted.

8.3 Test acceptance

No complete blade, arm or disc to which it is mounted shall become detached. Also, any breakage of the blade or blade retaining device shall be considered as failure of the test. Breakage of the shearing pin is not to be considered as failure.

In addition, no part of the mower shall penetrate all layers of the wall of fibreboard as specified in 8.1.

9 Unbalance test

9.1 Test equipment

The mower shall be completely encircled by a wall of 1 800 g/m^2 (350 lb/1 000 ft^2) double-wall fibreboard resting on the floor. The wall of fibreboard shall be 600 mm from the blade tip circle with a minimum height of 600 mm above the horizontal plane of the blade tip circle.

NOTE — 50 mm × 200 mm boards or similar protection should be placed on the outside face of the wall of fibreboard to protect personnel.

9.2 Test method

The blade unbalance, in kilogram metres, should first be determined by the formula

$$2{,}369\ (10^{-2})\ L^3$$

where L is the diameter of the blade tip circle, in metres.

The calculated unbalance shall be created by removing material from, or adding it to, the blade until the desired unbalance is obtained.

The test shall be run at the maximum speed specified by the mower manufacturer, for 1 h in the fibreboard enclosure for each blade assembly.

9.3 Test acceptance

The mower under test shall not lose any component necessary for compliance with the requirements of this International Standard, and no component or part shall penetrate the fibreboard enclosure.

10 Foot probe test

10.1 Test equipment

A test fixture as illustrated in figure 2 and a foot probe according to figure 2.

10.2 Test method

The mower shall be placed on a hard flat surface. The guards or deflectors, or both, shall be secured in the normal operating position on the blade enclosure and the mower support members shall be in contact with the supporting surface. Components of mowers or machines, or both, such as wheels and frames, may be considered as part of the blade enclosure for the purpose of this test. The test shall be conducted under static conditions.

The probe shall be held in a vertical plane and rotated in the vertical plane a maximum of 15° above and below the horizontal (see figure 2) and tested in all positions within those rotation limits. The probe shall be applied at any point of the discharge chute and to periphery of the blade enclosure, with a force of 20 N or until the blade enclosure lifts from the original position.

The tests shall be made with the blades in the highest and lowest cutting positions. If the blade path height is different at different blade speeds, the test shall be conducted so as to include the two extremes of blade height.

10.3 Test acceptance

The test probe shall not enter the path of the blade(s) assembly.

11 Blade security test

11.1 Test method

The blade, or blade drive retaining device, shall be tightened to the torque value specified by the manufacturer; if no torque value is specified, the test shall be conducted in an as received condition. The blade shaft shall be blocked against rotation during the test. The test shall be successively performed on any blade or blade support that can be made to rotate relative to the shaft. The torque shall be applied to the blade in the direction of normal rotation, until the component under test turns relative to the shaft or until a torque limit of 65 N·m is reached. If the blade or blade support turns relative to the shaft, it shall be turned in the same direction for 15 revolutions, or until the torque applied reaches the 65 N·m limit. The blade shall also be turned in the opposite direction for 15 revolutions or until the torque applied reaches the 65 N·m limit.

11.2 Test acceptance

There shall be no evidence of failure of any blade securing fixture, and the initial fastening torque shall not have changed by more than ± 10 % at the end of the test.

12 Thrown object and structural integrity test

[Under study.]

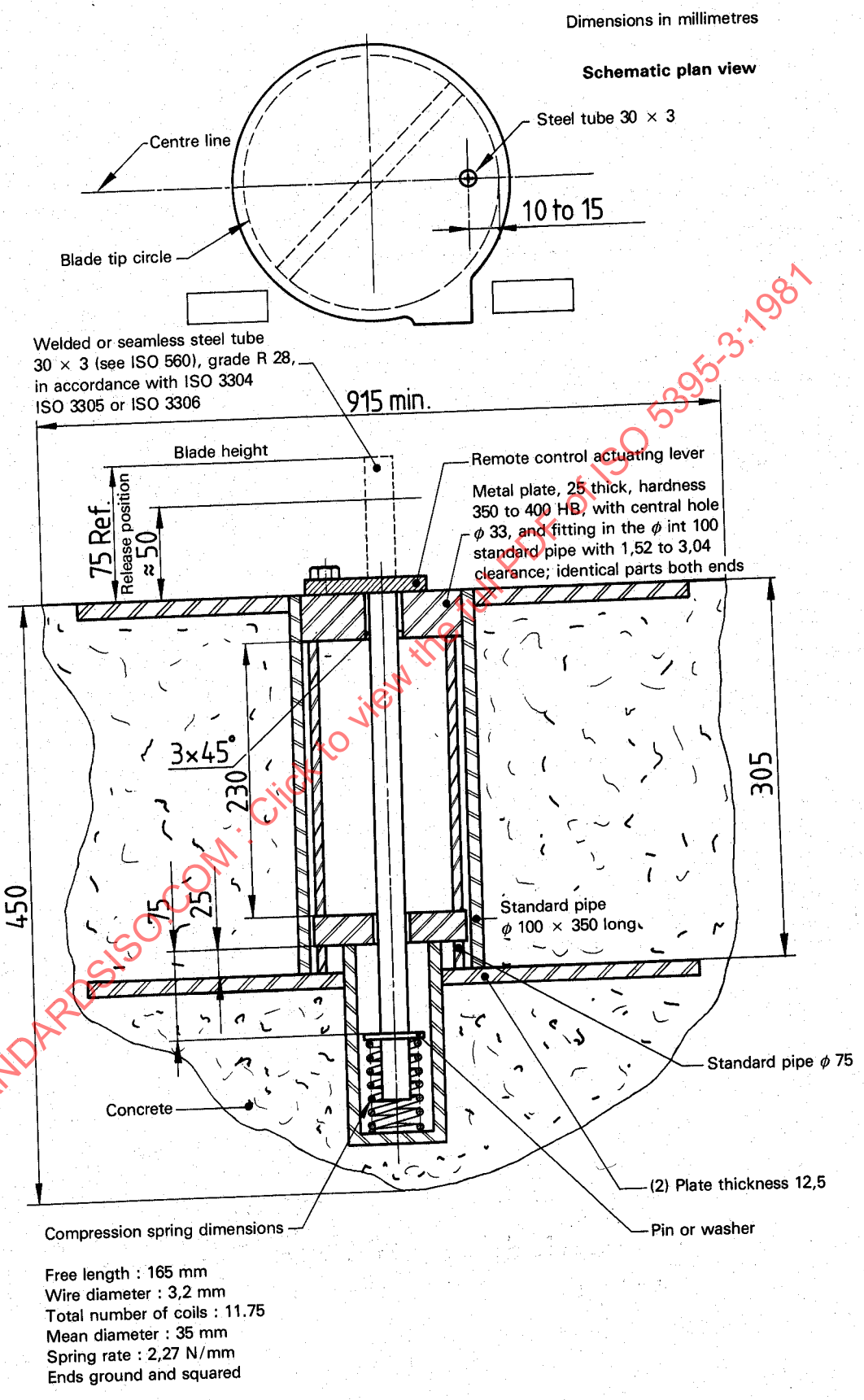
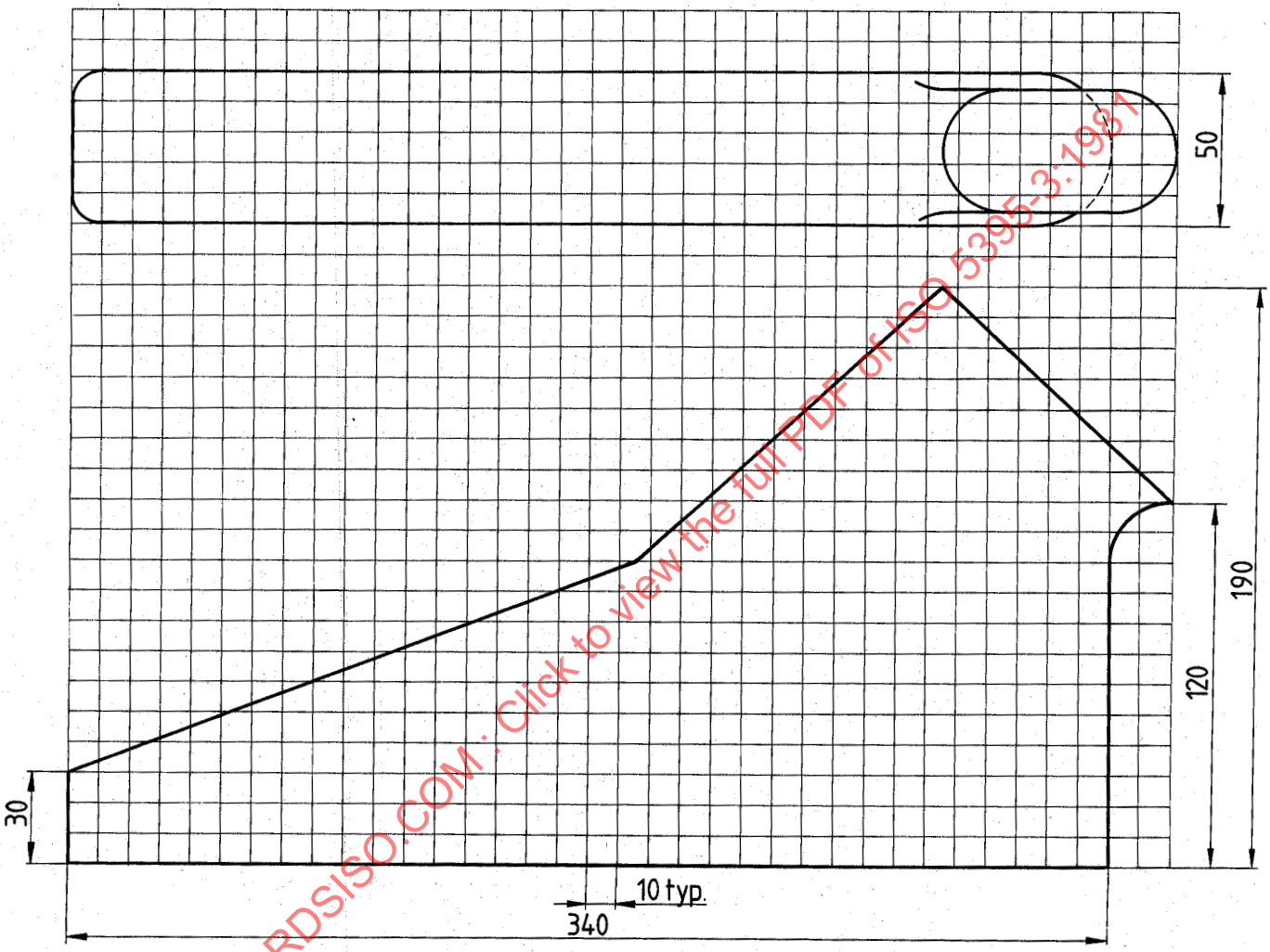


Figure 1 — Impact test fixture

Dimensions in millimetres



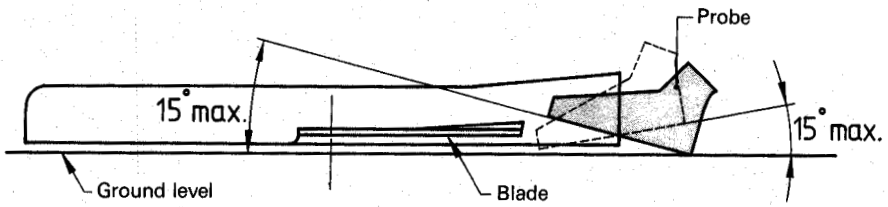


Figure 2 — Foot probe test

Section three : Rotary mowers — Pedestrian controlled machines — Requirements

13 Controls

(See ISO 3789/3.)

14 Handle construction

The mower handle shall be fastened to the mower so as to prevent loss of control by unintentional uncoupling while in operation.

14.1 Handle latches, handle length

A positive means (latch or upstop) shall be provided which shall not be subject to unintentional disengagement during normal operation of the mower, and shall not allow the end of the handle adjacent to the operator to come nearer than 450 mm horizontally behind the nearest path of the mower blade(s) during normal operation (see figure 3). The width of the grip of the handle shall be at least 3/4 of the cutting width or 500 mm for mowers having a cutting width greater than 670 mm.

Exceptions :

1) Swing-over handle

A swing-over handle shall be permitted if positive operating positions are provided. If, during normal operation, a disengaging mechanism is provided to by-pass the operating positions to swing the handle over the mower, the mechanism shall automatically lock back into the operating position(s). A mower with a swing-over handle shall meet the requirements of this clause for all operating positions of the handle.

2) Handle storage position

If a handle storage position is provided, the handle shall automatically or manually lock back into the operating position(s) when the handle is moved into this (these) position(s).

For handle construction relating to mowers weighing less than 10 kg, see the annex.

14.2 Extended handle

Where extended handles are provided, in place of a rear blade enclosure extension, the requirements of 14.1 shall be met with the exception that the end of the handle adjacent to the operator shall not come closer than 750 mm horizontally behind the nearest path of the mower blade.

Freely pivoted extended handles shall be of such a length that the centre of the handle grip is 1 200 mm horizontally behind the nearest path of the mower blade at a height of 1 000 mm, and a latch to locate the handle in a safe position for starting shall be provided.

15 Blade enclosure — Front and rear

[Under study.]

16 Safety instructions

[Under study.]

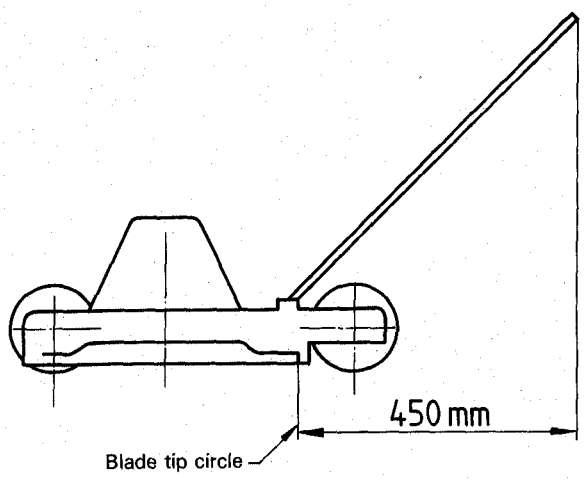


Figure 3 — Handle length