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Australian Standard®

AGRICULTURAL TRACTORS AND SELF-PROPELLED MACHINES—TEST PROCEDURE FOR PERFORMANCE OF AIR-CONDITIONING SYSTEM

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CSIRO, Agricultural Engineering Group
Department of Agriculture, New South Wales
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Department of Employment and Industrial Affairs, Queensland
Department of Employment and Industrial Affairs, Victoria
Department of Industrial Relations, New South Wales
Department of Primary Industries, Queensland
National Farmers Federation
National Safety Council of Australia (Victorian Division)
Queensland Agricultural College
Queensland Cane Growers Council
Safety Institute of Australia (Incorporated)
Tractor and Machinery Association of Australia

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PREFACE

This standard was prepared by the Association's Committee on Agricultural Tractors and Machinery.

The purpose of this standard is to establish, for agricultural tractors and self-propelled machines, a uniform test procedure which will provide a meaningful measurement of the contribution to operator environmental temperature and humidity provided by a complete air-conditioning system operating in a specified ambient environment.

The standard is based on, and is technically equivalent to, a Technical Report proposed by ISO Technical Committee ISO/TC 23 — Tractors and Machinery for Agriculture and Forestry, being document ISO/TC 23/SC 2 N 141, except for the consideration of the effect of solar radiation. The procedure given in the ISO Draft Proposal did not determine the complete climatic environment of the operator which is also affected by heat radiation from sources other than those on the machine, i.e. solar radiation. In this standard, the effect of solar heat radiation has been taken into consideration by simulating the solar load during testing.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

for

AGRICULTURAL TRACTORS AND SELF-PROPELLED MACHINES— TEST PROCEDURE FOR PERFORMANCE OF AIR-CONDITIONING SYSTEM

1 SCOPE. This standard sets out a method for evaluating the thermodynamic performance of air-conditioning systems on agricultural tractors and self-propelled machines.

NOTES:

1 The term 'vehicle' in the standard refers to agricultural tractors and self-propelled machines and is used for editorial clarity and conciseness.

2. Minimum recommended performance levels for acceptable comfort purposes are set out in Appendix B.

3. This standard covers performances for new air-conditioning systems only.

4. This standard does not cover assessment of the ability of the filtration system to deal with hazardous dust or chemicals.

2 APPLICATION. The test procedure can be used to evaluate any air-conditioning system but not ventilating systems using ambient temperature air.

3 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 2535	Glazed Flat-plate Solar Collectors with Water as the Heat-transfer Fluid—Method for Testing Thermal Performance
ISO 3737	Agricultural Tractors and Self-propelled Machines—Test Method for Enclosure Pressurization Systems
ISO 5353	Earth Moving Machinery—Seat Index Point
ASHRAE 55-74	Thermal Environmental Conditions for Human Occupancy

4 DEFINITIONS. For the purpose of this standard, the following definitions apply:

4.1 Air-conditioning system—any electromechanical refrigeration system intended to control the air temperature and humidity in the operator's enclosure of an agricultural tractor or self-propelled machine.

4.2 Compressor cycling—intermittent operation (cut out and cut in) caused by operation of the thermostat.

4.3 Compressor protective cycling—intermittent operation caused by operation of the high or low pressure protective devices.

5 GENERAL REQUIREMENTS FOR TESTING. The following general requirements shall apply:

(a) The air-conditioning system shall be completely powered by standard equipment on the test vehicle.

(b) All vehicle accessories pertinent to the operator's enclosure, enclosure components, filters and blowers shall be standard production parts or equivalent and shall be adjusted within the vehicle manufacturer's specification limits.

6 APPARATUS. The following apparatus is required:

(a) Ten temperature-measuring devices, having an accuracy of ±0.5°C, and provided with shielding from solar load as necessary. (Nine devices are for use within the cab of the vehicle, and the tenth is for measuring ambient dry-bulb temperature.)

(b) Devices, having an accuracy of ±0.5°C for measuring ambient and cab wet-bulb temperatures.

NOTE: A motor-driven psychrometer is recommended.

(c) Two pressure gauges or other pressure-measuring devices, having an accuracy of ±2 percent of the reading, to be used for measurement specified by Clause 10(c).

(d) Manometer, having an accuracy of ±10 percent of the reading.

(e) Ammeter, having an accuracy of ±2 percent of the reading.

(f) Voltmeter, having an accuracy of ±2 percent of the reading.

(g) Time-measuring device, having an accuracy of ±0.5 s over the period of the test.

(h) Tachometer, having an accuracy of ±20 r/min, for measuring engine speed.

(j) Equipment for loading the vehicle's engine.

(k) Anemometer, having an accuracy of ±0.3 m/s, for measuring air velocity outside the vehicle.

(l) Solar radiation simulator capable of maintaining a uniform radiation intensity on the test plane specified in Clause 7.3 (see AS 2535). The intensity shall be checked on a 150 mm grid.

(m) Test room large enough to contain the entire vehicle and having devices to provide and maintain the temperature, air velocity, solar load and relative humidity around the cab at the values stated in Clause 7.

7 AMBIENT CONDITIONS IN TEST ROOM—OUTSIDE OPERATOR ENCLOSURE.

7.1 Enthalpy of air. The condition of the air at the test room shall be maintained at a dry-bulb temperature of 40°C to 42°C and a wet-bulb temperature of 26°C to 27°C throughout the duration of the test.

7.2 Velocity of air. The air velocity passing front to rear of the vehicle shall be at least 1.0 m/s, but shall not exceed 3.0 m/s.