TC 23

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Agricultural tractors — Test procedures — Part II : Hydraulic power and lifting capacity

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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 789/II was developed by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, and was circulated to the member bodies in November 1977.

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

Australia	Germany, F.R.	Romania
Austria	India	South Africa, Rep. of
Belgium	Iran	Spain
Brazil	Ireland	Sweden
Bulgaria	Italy	Switzerland
Canada	Korea, Dem. P. Rep. of	Turkey
Chile	Mexico	United Kingdom
Czechoslovakia	Netherlands	U.S.A.
Denmark	New Zealand	U.S.S.R.
Finland	Philippines	Yugoslavia
France	Poland	

No member body expressed disapproval of the document.

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Agricultural tractors — Test procedures — Part II : Hydraulic power and lifting capacity

0 INTRODUCTION

This International Standard forms part of a series covering test procedures for agricultural tractors. Other parts in the series will be as follows :

Part I : Power tests.[1)]

Part III : Turning space/turning circle.

Part IV : Exhaust smoke measurement.

Part V : Machine stability on slopes.

Part VI : Centre of gravity.

Part VII : Power and torque of the drive wheels.

Part VIII : Engine air cleaner.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies test procedures for determining the following hydraulic performance characteristics of agricultural tractors :

a) the maximum vertical force which can be exerted by the hydraulic lift at the lower hitch points throughout their full range of movement;

b) the maximum vertical force which can be exerted by the hydraulic lift, at a point 610 mm to the rear of the hitch points on a frame attached to the three-point linkage, throughout its full range of movement;

c) the maximum hydraulic power available at an external hydraulic tapping;

d) optionally, the ability of the lifting system to maintain the load in the lifted position without hydraulic power.

NOTE — To ensure that the lifting capacity and the hydraulic power are adequate for effective practical use and also to allow for variation in the performance of nominally identical tractors, the measured maximum performance is reported as that which would be obtained with the hydraulic fluid pressure maintained at 90 % of the pressure sustained by the relief valve (see 5.1.7 c).

2 REFERENCES

ISO 730/I, *Agricultural wheeled tractors — Three-point linkage — Part I : Categories 1, 2 and 3.*

ISO 730/II, *Agricultural wheeled tractors — Three-point linkage — Part II : Category 1 N (Narrow hitch).*[2)]

ISO 3339/I, *Tractors and machinery for agriculture and forestry — Classification and terminology — Part I : Power and tractive units.*[2)]

ISO 3448, *Industrial liquid lubricants — ISO viscosity classification.*

3 DEFINITIONS

3.1 agricultural tractor : (See ISO 3339/I.)

3.2 rated engine speed : The maximum rotational frequency, in reciprocal minutes (min^{-1}), specified by the tractor manufacturer for continuous operation at full load.

4 TEST CONDITIONS

4.1 The tractor tested shall conform to the specification in the test report and shall be used in accordance with the manufacturer's recommendations for normal operation.

4.2 The tractor shall be run-in prior to the test. For spark ignition engines fitted with a means for the operator to vary the ratio of the fuel/air mixture, the tests shall be carried out with the settings recommended for normal operation.

4.3 The hydraulic fluid shall be as recommended by the manufacturer and identified by type and viscosity (see ISO 3448).

4.4 The throttle or governor control lever shall be in the fully open position except where otherwise specified.

1) Revision of ISO/R 789.

2) At present at the stage of draft.

4.5 The temperature of the hydraulic fluid in the tank shall be 65 ± 5 °C. If this cannot be achieved, owing to the presence of an oil cooler for example, the temperature measured during the test shall be stated in the test report.

4.6 A pressure gauge shall be fitted immediately next to the external tapping of the tractor.

4.7 The accuracy of measurements shall be as follows :

Rotational frequency :	± 0,5 %
Distance :	± 0,5 %
Force :	± 1,0 %
Mass :	± 0,5 %
Pressure :	± 2 %
Temperature :	± 0,5 °C

5 TEST PROCEDURES

5.1 Hydraulic lifting test

5.1.1 The unballasted tractor shall be so secured in a horizontal position that the tyres are not deflected by the reactive force of the power lift.

5.1.2 A frame having the following characteristics shall be attached to the three-point linkage :

5.1.2.1 The mast height and the distance from the hitch to the centre line of the tractor shall be appropriate to the linkage category of the tractor, as specified in ISO 730/I or II. Where more than one category is specified, that chosen for the test shall be at the manufacturer's option.

5.1.2.2 The centre of gravity shall be at a point 610 mm to the rear of the hitch points, on a line at right angles to the mast and passing through the middle of the line joining the lower hitch points.

5.1.3 The frame shall be adjusted, as follows, to achieve a typical and repeatable arrangement :

a) lift rods adjusted to mean length, i.e. the length midway between the maximum and minimum lengths;

b) upper link adjusted to the length necessary to bring the mast of the frame vertical when the lower links are horizontal;

c) where more than one upper or lower link point is available on the tractor, the points used shall be those specified by the manufacturer and shall be included in the test report;

d) where there is more than one point attachment to connect the lift rods to the lower links, the connection points used shall be those specified by the manufacturer and shall be included in the test report.

5.1.4 In moving from the horizontal to the uppermost position, the mast shall tilt a minimum of 10° (see ISO 730/I and ISO 730/II).

5.1.5 The external force shall be applied to the frame at its centre of gravity and the weight of the frame shall be added to this force.

5.1.6 The lifting force available shall be measured and recorded at a minimum of six points approximately equally spaced throughout the range of movement of the lift. At each point the force shall be the maximum which can be exerted against a static load.

5.1.7 The following measurements shall be included in the test report :

a) the maximum forces at the hitch points and on the frame, measured in accordance with 5.1.6 and corrected to those values corresponding to the hydraulic pressure stated in 5.1.7 c) below;

b) the full range of vertical movement of the respective points of application of the force (see 5.1.6);

c) the pressure equivalent to 90 % of the minimum relief valve pressure setting as specified by the manufacturer;

d) the height of the lower hitch point above the ground in its lowermost position and without load;

e) the tilting angle of the mast over the full range of lift;

f) the main linkage dimensions as tested (on a drawing);

g) the temperature of the hydraulic fluid during the test;

h) the calculated moment around the rear axle, resulting from maximum external lift force at the frame which can be exerted through the full range of movement.

5.2 Hydraulic power test

The following measurements shall be reported :

a) the opening pressure of the relief valve or, if this is impossible to measure, the manufacturer's setting;

b) the pressure sustained by the open relief valve, with the pump stalled in the case of a closed-centre system with pressure-compensated variable delivery pump;

c) the opening and closing pressures of the unloading valve in the case of a closed-centre system having an accumulator;

d) the pump delivery rate at rated engine speed and minimum pressure;

e) the hydraulic power available at any hydraulic tapping and the corresponding flow rate, at 90 % of relief valve pressure setting or, for continuous operation of an external hydraulic motor, at whatever pressure is specified by the manufacturer;

f) the hydraulic tapping point used in e).

5.3 Maintenance of lift of load

NOTE – This test is optional at the request of the manufacturer.

5.3.1 The tractor shall be secured in accordance with 5.1.1.

5.3.2 A downward vertical force equal to 90 % of the maximum force which can be exerted throughout the full range of movement (see 5.1.6) shall be applied to the frame at its centre of gravity.

5.3.3 With the hydraulic lift in its uppermost position and the control lever in the "raise" position, the engine shall be stopped and the vertical height of the point of application of the force shall be measured.

5.3.4 At intervals of 5 min over a period of 30 min, the vertical height shall be remeasured.

5.3.5 The following measurements shall be reported :

a) the force applied to the frame;

b) the decrease in the height of the point of application of the force after each 5 min interval;

c) the ambient temperature at the start of measuring.

6 TEST REPORT

A suitable test report is shown in the annex.

ANNEX

SPECIMEN TEST REPORT

Tractor manufacturer's name and address : . . . . . .

Date and location of tests : . . . . . .

Specification of tractor

Tractor :

Model : . . . . . Serial No. : . . . . . .

Mass with tanks full but without ballast or driver : . . . . . kg

Engine :

Make : . . . . . Model : . . . . . .

Type : . . . . . Serial No. : . . . . . .

Rated speed : . . . . . (min^{-1})

Hydraulic fluid used in tests

Type : . . . . . Viscosity : . . . . . cst . . . . . .

Viscosity index : . . . . . .

Type of the hydraulic system : . . . . . .