International Standard 4254/2

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Tractors and machinery for agriculture and forestry — Technical means for providing safety — Part 2 : Anhydrous ammonia applicators

Tracteurs et matériels agricoles et forestiers — Dispositifs techniques permettant d'assurer la sécurité — Partie 2 : Applicateurs d'ammoniac anhydre

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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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4254/2 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Tractors and machinery for agriculture and forestry — Technical means for providing safety — Part 2 : Anhydrous ammonia applicators

1 Scope and field of application

This part of ISO 4254 provides special guidelines to be followed when designing applicators for liquid ammonia for use with tractors and machinery for agriculture and forestry.

It should be read in conjunction with ISO 4254/1.

NOTE — The type of equipment, especially the pressure tank, hoses, connections and safety valves, is subject to legal provisions and periodic inspection by authorized supervisors in many countries. Attention is therefore drawn to the need to check for possible regulations and national standards. In addition, for safety valves, attention is drawn to ISO 4126, *Safety valves — General requirements*.

2 References

ISO/R 508, *Identification colours for pipes conveying fluids in liquid or gaseous condition in land installations and on board ships.*

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

ISO 4254/1, *Agricultural tractors and machinery — Technical means for providing safety — Part 1 : General.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 service pressure : Permissible pressure with which the equipment can operate satisfactorily.

3.2 test pressure : Pressure, in excess of maximum rated pressure, which causes no permanent deformation, damage or malfunction during testing.

4 Technical requirements

General technical requirements are covered by ISO 4254/1.

4.1 Tanks

4.1.1 Mounting of portable tanks

Mounting the tank on a tractor shall have minimal effect on the tractor's manoeuvrability. Neither the normal access doorway(s) nor any emergency exit from a protective cab shall be restricted.

The stability of the tractor shall be influenced as little as possible by the mounting of the tank, and the mass of the tank and contents shall not cause the permissible axle loads or permissible maximum mass of the tractor to be exceeded.

In systems containing tractor-mounted tanks, pipe and hose connections to the applicator shall be mounted, secured or protected in such a way that the connection is not subjected to either mechanical stress or thermal extremes.

Hoses shall be mounted such that movement does not strain the hoses and connections.

When in motion, filling hoses on truck nurse tanks and field nurse tanks shall be placed so as to prevent them from coming loose or falling off.

The tank(s) or vehicle shall have the necessary ladders and working platform so that the tank(s) may be filled and refilled safely.

If filling takes place during darkness, adjustable lamps shall be mounted on trucks and tractors equipped with tanks.

4.1.2 Labels

The ammonia tank shall be coated externally with a corrosion-resistant paint, preferably in light colours.

The tank shall be labelled AMMONIA in lettering at least 10 cm high. The tank shall be equipped with a sign in the language of the country, written in a legible and durable print, the wording of which shall be as follows :

WHEN FILLING
Use protective glasses and gloves.
Keep gas-mask and clean wash water at hand.

TRANSPORTATION AND PARKING
Shut-off valves shall be closed.

FILLING AND APPLICATION
Fire, open lights and smoking prohibited.

NOTE — National authorities may demand further wording and restricted label colours.

4.2 Fittings and accessories

4.2.1 General

Fittings and accessories shall be suitable for use with liquid ammonia and the construction material chosen to withstand the pressures and temperatures to which the equipment is exposed under normal operating conditions. On the high-pressure side, fittings and accessories shall have a design pressure of at least 2,5 MPa.

NOTE — Materials with suitable corrosion resistance against ammonia shall be used. Copper and zinc corrode in ammonia. Hence, these metals and their alloys should not be used.

Fittings shall be protected against damage deriving from jolts, accidents or similar unintentional treatment. Protective hoods and frames shall be designed so that the state (liquid/gaseous phase) of the ammonia appears clearly from the label.

If colours are preferred, colours according to ISO/R 508 shall be used, as follows :

— liquid phase : violet

— gaseous phase : yellow

4.2.2 Pressure relief valves

4.2.2.1 General

The tank shall be secured against inadmissible pressure increases by mounting one or more pressure relief valves, suitable for discharge of ammonia, on the upper part of the tank.

Pressure relief valves shall be equipped with a suitable drainage if liquid can accumulate on the outlet side.

4.2.2.2 Pressure relief capability

Pressure relief through pressure relief valves shall not be obstructed by shut-off valves.

4.2.2.3 Opening pressure

Pressure relief valves shall have a set pressure not higher than the design pressure of the tank. The set pressure shall be adjusted by the manufacturer of the valve.

Later adjustments shall be carried out by the manufacturer or an authorized expert.

4.2.2.4 Discharge capacity

The pressure relief valves of a tank shall have a discharge capacity which is determined in proportion to the external surface area of the tank. The minimum discharge capacity is given by the equation

$$V = 4{,}463 \times A^{0{,}82}$$

where

V is the normal volume of air, in cubic metres per minute at standard conditions (101 kPa* and 0 °C) which can be discharged at a pressure not higher than 120 % of the set pressure;

A is the external surface area of the tank, in square metres.

Discharge shall not cause any danger. Pressure relief valves and pipes for the discharge shall be provided with suitable protection against weather conditions (rainhood).

4.2.2.5 Marking of the pressure relief valve

Pressure relief valves shall be marked to show the following information :

— manufacturer;

— type;

— design pressure;

— discharge capacity;

— set pressure.

Pressure relief valves shall be sealed after testing and adjusting the set pressure. The year of adjustment and the mark of the expert shall be stamped on the seal.

* 101 kPa ≈ 760 mmHg

4.2.3 Shut-off valves

4.2.3.1 Manual shut-off valves

All connections to the tank — except connections to safety relief valves — shall be capable of being shut off by means of manually operated shut-off valves, placed as close as possible to the tank. The direction of operation may be marked.

4.2.3.2 Non-return valves

Pipe connections, which are used exclusively for filling purposes, shall be provided with a non-return valve, preferably mounted in the tank.

4.2.3.3 Maximum flow valves

Except where the provisions of 4.2.3.4 apply, all pipe connections shall be provided with maximum flow valves, preferably mounted in the tank. Excluded are stubs for pressure relief valves, pipes for filling purposes which are equipped with non-return valves, all pipes with an opening not exceeding 1,5 mm, and pipes in which a restrictor with opening 1,5 mm max. has been inserted immediately next to the tank.

4.2.3.4 Remote-controlled, quick shut-off valves

Full flow control valves may be replaced by suitable remote-controlled quick shut-off valves, designed in such a way that control failures will automatically cause a complete shut-off of the valve.

4.2.4 Fluid level indicator

The tank shall be equipped with at least one permanently mounted fluid level indicator. Furthermore, the tank shall be equipped with a device which ensures that a fill level of 85 % cannot be exceeded.

4.2.5 Pressure gauge (manometer)

The tank shall be connected to a pressure gauge. The scale of the gauge shall extend from a minimum not greater than the design pressure, to a maximum of 2,5 MPa.

4.3 Pipes

4.3.1 Quality

Pipe connections on the high-pressure side (before the pressure reduction valve) shall be made of easy-to-weld, standardized steel pipe with a design pressure of at least 2,5 MPa.

4.3.2 Pipe couplings

Pipes on the high-pressure side shall be coupled by welding carried out by a qualified person. Pipes up to 40 mm may be used with fittings made of malleable iron.

Welding materials shall be tested and the results found satisfactory according to national standards. By radiographic examination, welded couplings shall obtain at least the mark "3", when using the IIW[1] marking scale for radiographic examination.

Where necessary, pipes may be assembled by means of flanges, provided that the coupling is carried out in accordance with valid national standards. The packing material shall be resistant to ammonia.

4.3.3 Pressure testing

After assembly, the pipe shall be pressure-tested with water at a test pressure of 3,25 MPa.

4.3.4 Pressure relief valves on pipes

Pipes which can be shut off and which may contain ammonia in the liquid phase shall have a pressure relief valve, suitable for discharge of liquid ammonia.

Pressure relief valves shall be adjusted to open (blow) at a pressure not exceeding 2,5 MPa. The discharge shall not cause any danger.

4.4 Hoses and hose connections

4.4.1 Design and calculation

High-pressure hoses and their connections shall be designed and calculated for a service pressure of at least 2,5 MPa with a safety factor of 5 to burst. The manufacturer shall certify that the type of hose in question is suitable for application of liquid ammonia, and that the hose is randomly submitted to pressure testing at 5,0 MPa and burst pressure testing at 12,5 MPa.

Low-pressure hoses and their connections shall be designed and calculated for a service pressure of at least 0,5 MPa.

4.4.2 High-pressure hoses

Hose connections on the high-pressure side shall be designed as couplings with clips or similar fittings. Hoses up to 14 mm may be fitted with double clips.

4.4.3 Low-pressure hoses

On the low-pressure side (after the pressure-reduction valve), the hose shall be fastened to the stub with a clip or similar dependable type of connection.

1) International Institute of Welding.

4.4.4 Marking the hose

High-pressure hoses with an opening of 13 mm or larger shall be clearly and durably marked at intervals not exceeding 2 m, as follows :

LIQUID AMMONIA
Max. service pressure : . . . . . MPa
Name of manufacturer or seal of authorized expert : . . . . . .
Production year : . . . . . .

4.4.5 Hose valves

Hoses for filling purposes at the high-pressure side which carry ammonia in liquid phase shall be equipped with a shut-off valve, constructed in such a way that it cannot be opened through any unintentional action or movement.

4.4.6 Safety relief valves on hose connections

High-pressure hoses which can be shut off and which supply or may supply liquid phase ammonia shall be secured against dangerous pressure increases.

The pressure relief valves shall be suited for discharge of liquid ammonia and shall be adjusted to open (blow) at a pressure not exceeding 2,5 MPa. The discharge shall not cause any danger.

4.5 Device for application into the soil

The applicating device shall be equipped with a quick shut-off valve, which can be operated from the place of the operator. The valve shall be able to shut off the connection to the applicating elements.

Furthermore the applicator shall be equipped with a suitable pressure-reduction valve and a filter.

5 Operator's manual

Suppliers of truck nurse tanks, field nurse tanks and devices for ammonia application shall supply the user with the necessary number of operator's manuals in the user's own language.

These publications shall be generally prepared in accordance with ISO 3600 and shall contain full operating instructions with clear coupling diagrams and detailed information about the filling procedure. Furthermore, they shall specify the dangers involved in connection with ammonia and instructions about first aid to persons who have suffered injury caused by liquid or gaseous ammonia.

NOTE — National authorities may further require inspection books.

6 Operator's protection

A box containing the following items shall be at hand immediately next to the operator's seat on the vehicle with the ammonia tank :

— filter mask with ammonia filter;

— tight-fitting protective glasses;

— gloves made of rubber or a suitable plastic;

— emergency eye washer.

Furthermore, the vehicle shall carry a plastic bottle containing at least 10 l of water.

A label with the following text shall be fixed near the filling device :

"When filling the tank with ammonia, always use protective gloves and glasses. Make sure that the filter mask and eye bottle are ready at hand."

7 Certification

According to national legislation in certain countries, it is the responsibility of the supplier and the retailer to register new or used tanks for liquid ammonia with the authorities.

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