BRITISH STANDARD

BS EN
908:1999

Agricultural and forestry machinery — Reel machines for irrigation — Safety

The European Standard EN 908:1999 has the status of a British Standard

ICS 65.060.35; 65.060.80

National foreword

This British Standard is the English language version of EN 908:1999.

The UK participation in its preparation was entrusted to Technical Committee AGE/30, Irrigation and drainage equipment, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 9 and a back cover.

This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 April 1999

ISBN 0 580 32065 0

Amendments issued since publication

Amd. No.	Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 908

January 1999

ICS 65.060.35

Descriptors: agricultural machinery, mobile equipment, irrigation, safety of machines, dangerous machines, safety requirements, accident prevention, specifications, hazards, safety devices, utilization, information, marking, technical notices

English version

Agricultural and forestry machinery — Reel machines for irrigation — Safety

Matériel agricole et forestier — Enrouleurs d'irrigation — Sécurité

Land- und Forstmaschinen — Beregnungsmaschinen mit Schlauchtrommel — Sicherheit

This European Standard was approved by CEN on 14 December 1998.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 908:1999 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 144, Tractors and machinery for agriculture and forestry, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1999, and conflicting national standards shall be withdrawn at the latest by July 1999.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

Annex A is normative and contains the "List of hazards".

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

0 Introduction

The extent to which hazards are covered is indicated in the scope of this standard. These hazards are specific to reel machines for irrigation.

The hazards that are common to all the agricultural machines (self-propelled, mounted, semi-mounted and trailed) will be dealt with in a standard currently in preparation (prEN 1553).

1 Scope

This standard specifies safety requirements and their verification for the design and construction of reel machines for irrigation including self-propelled machines.

It describes methods for elimination or reduction of risks which need specific requirements for reel machines for irrigation.

In addition, it specifies the type of information on safe working practices to be provided by the manufacturer.

The list of significant hazards dealt with in this standard is given in annex A. Annex A also indicates the hazards which have not been dealt with.

Environmental aspects have not been considered in this standard.

This standard applies primarily to machines which are manufactured after the date of issue of the standard.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1:1991, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology.*

EN 292-2:1991, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*
(and amendment A1:1995)

EN 294:1992, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs.*

EN 953:1997, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards.*

prEN 1553:1998, *Agricultural machinery — Agricultural self-propelled, mounted, semi-mounted and trailed machines — Common safety requirements.*

3 Definitions

For the purpose of this standard, the definitions given in EN 292-1:1991 and EN 292-2:1991 apply together with the following.

3.1

reel machine

type of traveller irrigation machine featuring a stationary structure with a reel, coiling a hose which carries irrigation water to, and drags, a travelling cart, upon which is affixed the emitting system, which is most often an irrigation gun

3.2

irrigation gun

large sprinkler used on reel machines and other systems

NOTE The usual flow-rates from guns range from 10 m^3/h to 100 m^3/h, and their nozzle diameter from 10 mm to 40 mm.

3.3

coiling

one of the actions performed by the reel machine when irrigating: the reel machine is progressively coiling all the polyethylene hose on the drum, causing the irrigation gun to move regularly across the irrigation field. When the irrigation gun reaches the machine, the coiling is completed and the machine stops

3.4

guiding system

lateral guiding device of the hose that permits its steady coiling with joined spirals

3.5

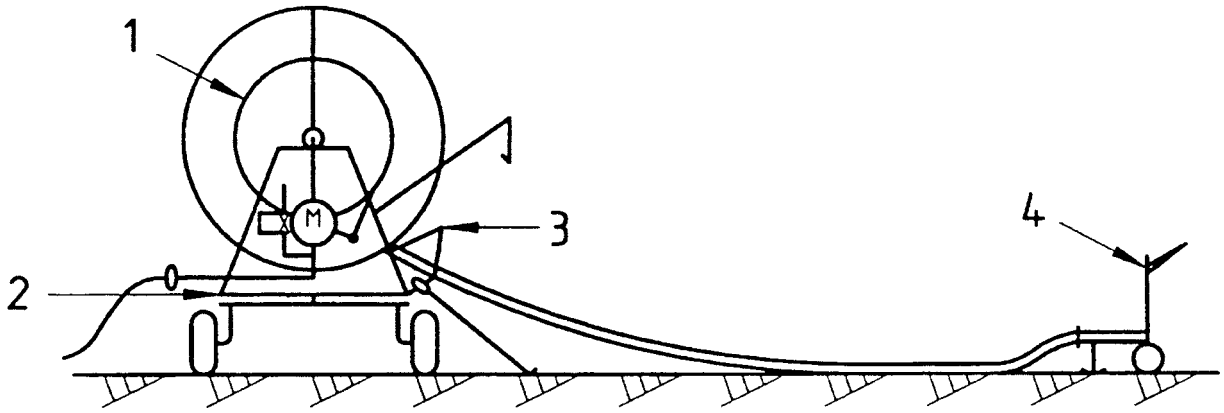
drive system of the guiding system

mechanism providing power to the guiding system that ensures the even layering of the hose

3.6

sweeping zone

envelope of the different positions of the turret corresponding to its different possible orientations



1 Drum of the spool
2 Turret
3 Hose guiding system
4 Irrigation gun

Figure 1

4 Safety requirements and/or measures

4.1 General

The reel machines for irrigation shall comply as appropriate with EN 292 for hazards which are not dealt with and especially with annex A of EN 292-2:1991/A1:1995 when EN 292 does not give precise requirements.

Unless otherwise specified in this standard, the machine shall comply with the requirements of prEN 1553:1998 and with Tables 1, 3, 4 and 6 of EN 294:1992.

4.2 Irrigation gun

The adjustment controls of the irrigation gun that have to be operated during the working (for example, adjustment of the sector angle and of the rotation speed of the irrigation gun) shall be located at a distance less than 1,80 m from the ground or from the access platform, whatever the speed of rotation of the irrigation gun.

Irrigation guns with a speed of rotation greater than $1\ rad{\cdot}s^{-1}$ shall be located at a height equal to or more than 2 m from the ground or from any platform (vertical distance between the ground or the platform and the lowest rotating part of the irrigation gun).

This requirement does not apply:

— when the swivelling range of the irrigation gun is restricted to a maximum of 300° provided that the adjustment platform be located outside the swivelling range;

— when the irrigation gun is fitted with a guard providing a safety distance in accordance with EN 294:1992.

4.3 Guiding system of hose

When the coiling speed of the hose is greater than $0{,}4\ m{\cdot}s^{-1}$, access to crushing and shearing points between the hose and the guiding system and between the guiding system and the frame of the machine shall be prevented by fixed guards according to EN 953 or by the framework of the machine using the safety distances according to Table 1 of EN 294:1992.

When the uncoiling speed of the hose can be greater than $0{,}4\ m{\cdot}s^{-1}$, access to crushing and shearing points between the guiding system and the frame of the machine shall be prevented by fixed guards according to EN 953 or by the framework of the machine using the safety distances of Table 1 of EN 294:1992.

Access to the drive system of the guiding system shall be prevented by fixed guards according to EN 953.

4.4 Spool

If the rotation of the drum generates crushing or shearing points between the spool and the machine frame, such points shall be guarded.

Satisfactory methods include, for example:

— a guard providing the safety distance according to Tables 3 and 4 of EN 294:1992;

or

— a full (without opening) side wall without any prominent feature, including the water delivery pipe between the axis of the drum and the hose.

Machines equipped with a hose speed selector shall be fitted with:

— a device which allows for the removal of tension from the hose before changing gear;

or

— a device which enables the operator to change gear under tension.

4.5 Stability

Any means needed to ensure stability when working (e.g. jacks, supporting wheels) shall be an integral part of the machine. They shall comply with **4.3.2.1.1** of prEN 1553:1998.

The machine shall be stable when resting on a slope of 8,5° in the following conditions:

— without using the additional means to ensure stability;

— hoses full of water and with irrigation gun hooked;

— in all the directions of the turret around its vertical axis (if applicable);

— with the axle positioned parallel, then perpendicular to the slope.

Any functional outlet of water, associated with the use of the machine, except the possible leakages, shall be at a minimum distance of 5 m away from the machine.

4.6 Orientation of the turret

If applicable, turrets shall be lockable in both working and transport positions.

The centre of gravity of the mobile part shall be located at less than 0,20 m from its rotational axis when the hoses are filled with water. Failing this, the rotation shall be ensured by a hold-to-run control device located outside the sweeping zone.

4.7 Hydraulic lifting

When hydraulic lifting systems are used, they shall be fitted with anti-fall devices to ensure a falling speed of less than 0,1 $m \cdot s^{-1}$ in the event of rupture of a hydraulic pipe.

4.8 Accessories

An appropriate housing shall be provided on the machine for the storage of specific tools.

4.9 Transport

The hose reel or machine shall be provided with means for attaching the hose to the machine during transportation.

5 Verification of safety requirements and/or measures

Dimensions, where given, shall be verified by measurements. Controls shall be verified by a functional test and positional measurements; guards by functional tests.

6 Information for use

6.1 Instruction handbook

Comprehensive instructions and information on all aspects of maintenance and the safe use of the machine shall be provided in the instruction handbook. It shall comply with **5.5** of EN 292-2:1991.

In particular, the following points shall be emphasized:

a) the hazards that may occur when adjusting the machine while it is operating;

b) the hazards due to any lack of stability caused by steep slopes or difficult working conditions;

c) the risk of touching overhead power lines with the machine or the water jets;

d) dangers due to the hazard of instability of the hose reel during operation and the use of jacks or supporting wheels where necessary;

e) the speed of rotation if it is more than 1 $rad \cdot s^{-1}$;

f) the hazards of unforeseeable rotation of the drum around its vertical axis;

g) the unrolling speed of the hose;

h) the maximum travelling speed of the machine not to be exceeded when hoses are filled;

i) the hazards for the face, in particular for the eyes, associated with water jets;

j) the need to place the water-flow device in such a way that the water flows out at least 5 m away from the machine;

k) the hazards associated with the tension of the hoses, in particular during any intervention on the reel.

6.2 Marking

The marking shall comply with **5.4** of EN 292-2:1991.

All machines shall be marked legibly and indelibly with at least the following information:

— name and address of the manufacturer;

— year of construction;

— designation of series or type;

— serial number, if any;

— nominal rotation frequency and direction of rotation of the power input connection (marked by an arrow);

— total weight of the apparatus empty of water;

— total weight of the apparatus full of water.

In addition,

— the controls for the adjustment of the angular range of the rotating part of the irrigation gun shall be clearly marked or identified;

— a warning shall draw attention to the risk of touching overhead power lines with the machine or water jets.

Annex A (normative)

List of hazards

Table A.1 gives the list of hazards based on EN 292-1:1991 and EN 292-2:1991 and annex A of EN 292-2:1991/A1:1995.

Table A.2 gives the list of hazards due to the mobility of the machine.

The meanings of the different statements given in the last column (solutions given by this standard) of these tables are:

— "not relevant": the hazard is not significant for the machine.

— "dealt with": the hazard is significant. The measures given in the indicated clauses provide guidance for dealing with the hazards in accordance with the principles of safety integration of EN 292; that means:

  — elimination or reduction of the risk by design, as far as possible;

  — protection measures;

  — information for the residual risks.

— "partly dealt with": the hazard is significant for several parts of the machine. The measures given in the indicated clauses deal with this hazard for some of these parts. In the other parts where the hazard is significant, other measures, not included in this standard, will have to be applied in order to deal with this hazard.

— "not dealt with": the hazard is significant for the machine but has not been taken into account during the preparation of this European Standard.

For a number of hazards which are indicated as "not dealt with" or "partly dealt with" requirements are given in prEN 1553. These are identified by an (*) in the last column of Tables A.1 and A.2.

Table A.1 — List of hazards

Hazards		Relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
1	*Mechanical hazards* (caused for example by: — shape, — relative location, — mass and stability (potential energy of elements), — mass and velocity (kinetic energy of elements), — inadequacy of the mechanical strength, — accumulation of potential energy by: • elastic elements (springs), or • liquids or gases under pressure, or • vacuum of the machine parts or workpieces).	**4.2**	—	—
1.1	crushing hazard	**4.2.1**, **4.2.2**	**3.2**	dealt with in **4.1**, **4.3**, **4.4**, **4.6**, **4.7**
1.2	shearing hazard	**4.2.1**, **4.2.2**	**3.2**, **4.1.1**	dealt with in **4.1**, **4.3**, **4.4**, **4.7**
1.3	cutting or severing hazard	**4.2.1**, **4.2.2**	**3.2**	not relevant
1.4	entanglement hazard	**4.2.1**, **4.2.2**	—	partly dealt with in **4.3**, **4.4**, **4.6**, **4.7***
1.5	drawing-in or trapping hazard	**4.2.1**	**3.11**, **4.1.1**, **6.1.2**	dealt with in **4.3**, **4.4**
1.6	impact hazard	**4.2.1**	—	dealt with in **4.2**, **4.5**, **4.6**, **4.9**
1.7	stabbing or puncture hazard	**4.2.1**	—	not relevant

Table A.1 — List of hazards *(continued)*

Hazards		Relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
1.8	friction or abrasion hazard	**4.2.1**	**3.3** b)	not relevant
1.9	high pressure fluid ejection hazard	**4.2.1**	—	not dealt with*
1.10	ejection of parts (of machinery and processed material/workpieces)	**4.2.2**	**3.8**	not relevant
1.11	loss of stability (of machinery and machine parts)	**4.2.2**	**6.2.5**, **3.3**	dealt with in **4.5**, **4.6**
1.12	slip, trip and fall hazards in relationship with machinery (because of their mechanical nature)	**4.2.3**	**6.2.4**	partly dealt with in **4.2***
2	*Electrical hazards*, caused for example by:	**4.3**	**3.9**	—
2.1	electrical contact (direct or indirect)	**4.3**	—	dealt with in **6.1** c), **6.2**
2.2	electrostatic phenomena	**4.3**	—	not relevant
2.3	thermal radiation or other phenomena such as ejection of molten particles, and chemical effects from short-circuits, overloads, etc.	**4.3**	—	not relevant
2.4	external influences on electrical equipment	**4.3**	**3.4**	not dealt with
3	*Thermal hazards*, resulting in:	**4.4**	**3.6.3**	—
3.1	burns and scalds, by possible contact of persons by flames or explosions and also by the radiation of heat sources	**4.4**	—	not dealt with (only relevant for self-propelled machine)
3.2	health-damaging effects by hot or cold work environment	**4.4**	—	not relevant
4	*Hazards generated by noise*, resulting in:	**4.5**	**3.6.3**	—
4.1	hearing losses (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	**4.5**	—	not dealt with (only relevant for self-propelled machine)
4.2	interferences with speech communication, acoustic signals, etc.	**4.5**	—	not dealt with (only relevant for self-propelled machine)
5	*Hazards generated by vibration* (resulting in a variety of neurological and vascular disorders)	**4.6**	**3.6.3**	not dealt with (only relevant for self-propelled machine)
6	*Hazards generated by radiation*, especially by:	**4.7**	—	—
6.1	electrical arcs	—	—	not relevant
6.2	lasers	—	—	not relevant
6.3	ionizing radiation sources	**4.7**	—	not relevant
6.4	machines making use of high frequency electromagnetic fields	—	—	not relevant
7	*Hazards generated by materials and substances processed, used or exhausted by machinery*	**4.8**	**3.3** b)	—
7.1	hazards resulting from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	**4.8**	—	not relevant
7.2	fire or explosion hazard	**4.8**	—	not relevant
7.3	biological and micro-biological (viral or bacterial) hazards	**4.8**	—	not relevant

Table A.1 — List of hazards *(continued)*

Hazards		Relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
8	*Hazards generated by neglecting ergonomic principles in machine design* (mismatch of machinery with human characteristics and abilities) caused for example by:	**4.9**	**3.6**	—
8.1	unhealthy postures or excessive efforts	**4.9**	**3.6.1**, **3.6.4**	partly dealt with in **4.2***
8.2	inadequate consideration of human hand-arm or foot-leg anatomy	**4.9**	**3.6.2**	not dealt with (only relevant for self-propelled machines)
8.3	neglected use of personal protection equipment	**5.5**	—	not relevant
8.4	inadequate area lighting	—	**3.6.5**	not relevant
8.5	mental overload or underload, stress, etc.	**4.9**	**3.6.4**	not relevant
8.6	human error	**4.9**	**3.6**	dealt with in **6.1**
9	*Hazard combinations*	**4.10**	—	not relevant
10	*Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders*, for example:	**5.2.2**	**3**	—
10.1	failure of energy supply (of energy and/or control circuits)	**3.16**	**3.7**	not dealt with (only relevant for self-propelled machines)
10.2	unexpected ejection of machine parts or fluids	—	**3.8**, **4**	not dealt with*
10.3	failure, malfunction of control system (unexpected start up, unexpected overrun)	**3.15**, **3.16**, **3.17**	**3.7**	not dealt with
10.4	errors of fitting	—	—	dealt with in **6.1**
10.5	overturn, unexpected loss of machine stability	**4.2.2**	**6.2.5**	partly dealt with in **4.5**, **4.6***
11	*Hazards caused by (temporary) missing and/or incorrectly positioned safety related measures/means*, for example:	—	**4**	—
11.1	all kinds of guards	**3.22**	**4.2**	dealt with in **6.1**
11.2	all kinds of safety related (protection) devices	**3.23**	**4.2**	dealt with in **6.1**
11.3	starting and stopping devices	—	**3.7**	not relevant
11.4	safety signs and signals	—	**3.6.7**, **5.2**, **5.3**, **5.4**	not relevant
11.5	all kinds of information or warning devices	—	**5.4**	not relevant
11.6	energy supply disconnecting devices	—	**6.2.2**	not dealt with (only relevant for self-propelled machines)
11.7	emergency devices	—	**6.1**	not relevant
11.8	feeding/removal means of workpieces	—	**3.11**	not relevant
11.9	essential equipment and accessories for safe adjusting and/or maintaining	**3.3**, **3.11**	**6.2.1**, **3.12**, **6.2.3**, **6.2.6**	dealt with in **4.8**
11.10	equipment evacuating gases, etc.	—	—	not relevant

Table A.2 — List of hazards due to mobility

Hazards		Solutions given by this standard
12	*Inadequate lighting of moving/working area*	not relevant
13	*Hazards due to sudden movement, instability, etc.*	dealt with in **4.5**, **4.6**
14	*Inadequate/unergonomic design of driving/operating position*	—
14.1	hazards due to dangerous environments (contact with moving parts, exhaust gases etc.)	not dealt with (only relevant for self-propelled machines)
14.2	inadequate visibility from driver's/operator's position	not dealt with (only relevant for self-propelled machines)
14.3	inadequate seat/seating (seat index point)	not dealt with (only relevant for self-propelled machines)
14.4	inadequate/unergonomic design/positioning of controls	not dealt with (only relevant for self-propelled machines)
14.5	starting/moving of machinery	not dealt with*
14.6	traffic of machinery	not dealt with
14.7	movement of pedestrian controlled machinery	not relevant
15	*Mechanical hazards*	—
15.1	hazards to exposed persons due to uncontrolled movement	dealt with in **4.6**, **4.9**
15.2	hazards due to break-up and/or ejection of parts	not relevant
15.3	hazards due to rolling over (deflection limiting volume: DLV)	not dealt with (only relevant for self-propelled machines)
15.4	hazards due to falling objects (DLV)	not relevant
15.5	inadequate means of access	not dealt with (only relevant for self-propelled machines)*
15.6	hazards caused due to towing, coupling, connecting, transmission, etc.	not dealt with*
15.7	hazards due to batteries, fire emissions etc.	not dealt with (only relevant for self-propelled machines)

Annex ZA (informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of "Machinery" Directive 89/392/EEC dated 89/06/14 modified by 91/368/EEC dated 91/06/20 and by 93/44/EEC dated 93/06/14.

WARNING. Other requirements and other EU Directives may be applicable to the product falling within the scope of this standard.

The clauses of this standard are likely to support requirements of "Machinery" Directive.

Compliance with these clauses of this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

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London
W4 4AL