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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

The committee responsible for this document is Technical committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 7, *Equipment for harvesting and conservation*.

ISO 4254 consists of the following parts, under the general title *Agricultural machinery — Safety*:

— *Part 1: General requirements*

— *Part 5: Power-driven soil-working machines*

— *Part 6: Sprayers and liquid fertilizer distributors*

— *Part 7: Combine harvesters, forage harvesters and cotton harvesters*

— *Part 8: Solid fertilizer distributors*

— *Part 9: Seed drills*

— *Part 10: Rotary tedders and rakes*

— *Part 11: Pick-up balers*

— *Part 12: Rotary disc and drum mowers and flail mowers*

— *Part 13: Large rotary mowers*

— *Part 14: Bale wrappers*

Introduction

The structure of safety standards in the field of machinery is as follows:

a) type-A standards (basic standards) giving basic concepts, principles for design, and general aspects that can be applied to machinery;

b) type-B standards (generic safety standards) dealing with one or more safety aspects or one or more types of safeguards that can be used across a wide range of machinery;

   — type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);

   — type-B2 standards on safeguards (e.g. two-hand controls, interlocking devices, pressure-sensitive devices, guards);

c) type-C standards (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This part of ISO 4254 is a type-C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations, or hazardous events are covered are indicated in the scope of this part of ISO 4254. These hazards are specific to mounted, semi-mounted, and trailed bale wrappers for bales of agricultural harvesting products including wrappers which are combined or integrated with pick-up balers.

Significant hazards that are common to all the agricultural machines (self-propelled ride-on, mounted, semi-mounted, and trailed) are dealt with in ISO 4254-1.

When the requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the provisions of this type-C standard.

Agricultural machinery — Safety —

Part 14: Bale wrappers

1 Scope

This part of ISO 4254, intended to be used together with ISO 4254-1, specifies the safety requirements and their verification for the design and construction of mounted, semi-mounted, trailed, and stationary bale wrapper for bales of agricultural harvesting products including wrappers which are combined or integrated with pick-up balers.

It describes methods for the elimination or reduction of hazards arising from the intended use and reasonably foreseeable misuse of these machines by one person (the operator) in the course of normal operation and service.

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

NOTE 1 Requirements for self-propelled bale wrappers may be added during the next revision of this part of ISO 4254.

NOTE 2 Examples of these machines are given in Annex A.

NOTE 3 Requirements for pick-up balers are specified in ISO 4254-11.

When requirements of this part of ISO 4254 are different from those which are stated in ISO 4254-1, the requirements of this part of ISO 4254 take precedence over the requirements of ISO 4254-1 for machines that have been designed and built according to the requirements of this part of ISO 4254.

This part of ISO 4254, taken together with ISO 4254-1, deals with all the significant hazards (as listed in Table 1), hazardous situations, and events relevant to mounted, semi-mounted, and trailed bale wrappers including wrappers which are combined with pick-up balers when they are used as intended and under the conditions of misuse that are reasonably foreseeable by the manufacturer (see Clause 4).

This part of ISO 4254 is not applicable to the following:

— non-mobile fixed bale wrappers;

— tube/inline wrappers;

— wrapping process that concerns only the circumferential part of the bale and that occurs in the bale chamber;

— the integrity of safety related parts of control systems with regard to the specification of performance levels;

— environmental hazards (except noise), road safety, and hazards related to moving parts for power transmission;

— hazards related to maintenance or repairs carried out by professional service personnel.

NOTE 4 Specific requirements related to road traffic regulations are not taken into account in this part of ISO 4254.

This part of ISO 4254 is not applicable to machines manufactured before the date of its publication.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3600, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Operator's manuals — Content and format*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 4254-1:2013, *Agricultural machinery — Safety — Part 1: General requirements*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14982, *Agricultural and forestry machinery — Electromagnetic compatibility — Test methods and acceptance criteria*

ISO 25119-1, *Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 1: General principles for design and development*

ISO 25119-2, *Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 2: Concept phase*

ISO 25119-3, *Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 3: Series development, hardware and software*

ISO 25119-4, *Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 4: Production, operation, modification and supporting processes*

ISO/TR 11688-1, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*

IEC 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, ISO 4254-1, and the following apply.

3.1
bale wrapper
machine to wrap preformed bales of agricultural harvesting products with plastic wrap/film

3.2
stationary bale wrapper
bale wrapper (3.1), generally with its own power source, to be used in a static position, but can be readily moved from one place to another to wrap individual bales or to form tubes of multiple bales to be loaded by external means

Note 1 to entry: Tube/inline wrappers are not covered by this part of ISO 4254.

Note 2 to entry: See Figure A.4 as an example.

3.3
non-mobile fixed bale wrappers
bale wrapper (3.1) designed to be used at a fixed location and is not meant to be moved from one place to another

3.4
fixed platform
part of the machine on which the bale to be wrapped is placed and which imparts rotative motion to the bale with rolls or belts usually around an axis parallel to the ground

Note 1 to entry: See Figure 1 as an example.

3.5
rotating platform
platform which, in addition to the rotation around an axis parallel to the ground, imparts another rotative motion to the bale around an axis generally perpendicular to the ground

Note 1 to entry: See Figure 2 as an example.

3.6
self-loading platform
platform able to pick the bale directly from the ground and to put it directly on the ground

3.7
stretching system
system made by a number of rolls including the plastic wrap/film roll(s) that, because of different peripheral speed, stretches the plastic wrap/film

3.8
wrapping arm
part of the machine including the *stretching system* (3.7) which makes the stretching system rotate around the bale to wrap it

3.9
loading arm/system
powered activated device to pick the bale from the ground and load it on the platform

3.10
unloading system
device to unload the wrapped bale on the ground

3.11
automatic mode
machine function that consists of either repetitive work cycles or a single work cycle that, once initiated by the intentional actuation of a control by the operator or by the machine itself, either repeats a cycle or comes to stop at the completion of a cycle without operator intervention as a part of normal machine operation

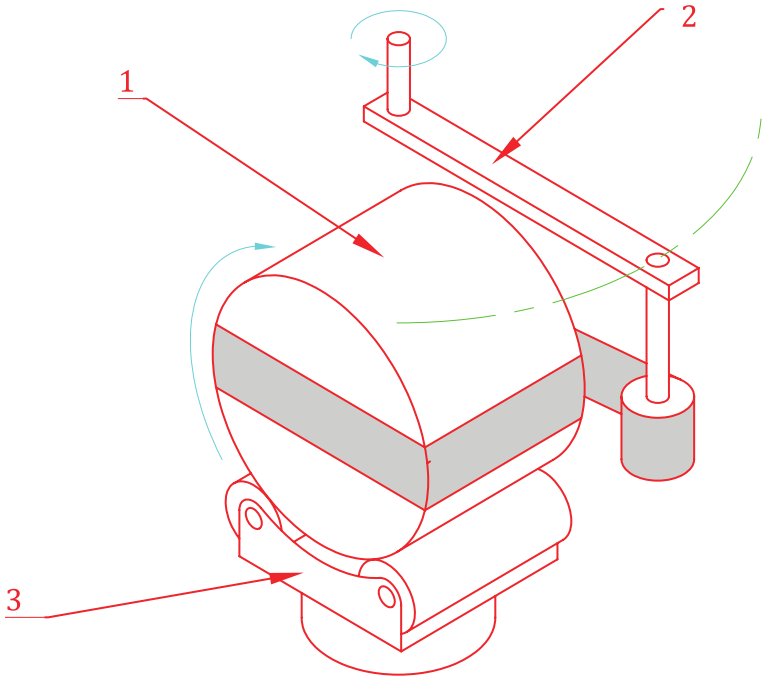
[SOURCE: ISO 4254-1:2013, 3.7]

3.12
work cycle
series of machine functional events that recur in succession and that either lead back to the starting point or come to a predetermined stopping point

[SOURCE: ISO 4254-1:2013, 3.8, modified]

3.13
wireless or cable-less remote control
wireless handpiece with usually a “start” and “stop” function for an automatic cycle and a possible further two switches for loading or unloading functions

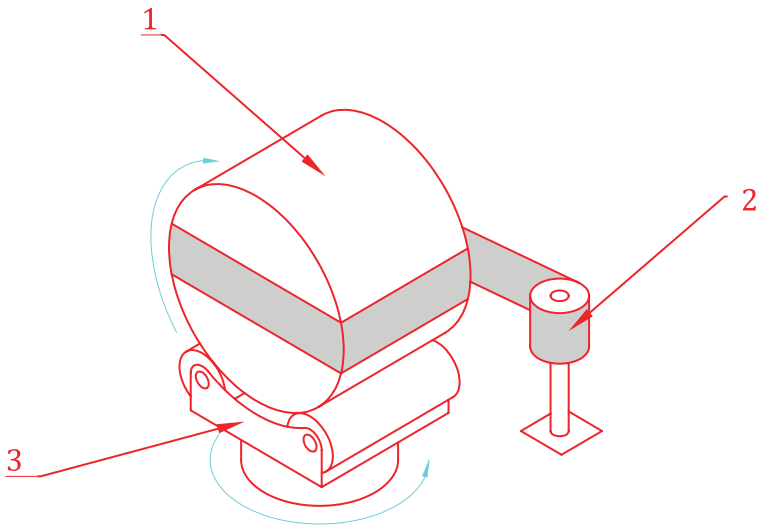
3.14
wired or cabled remote control
remote control which could be cables or an electrical control unit that has a manual switch to operate each machine function



Key

1 bale
2 wrapping arm
3 fixed platform

Figure 1 — Fixed platform and rotation of the bale and of the wrapping arm



Key

1 bale
2 plastic wrap film roll
3 rotating platform

Figure 2 — Rotating platform and rotations of the bale

4 List of significant hazards

Table 1 specifies the significant hazards, the significant hazardous situations, and significant hazardous events that have been identified by risk assessment as being significant for this type of machine, covered by this part of ISO 4254, and which may require specific action by the designer or manufacturer to eliminate or reduce the risk.

Attention is drawn to the necessity to verify that the safety requirements specified in this part of ISO 4254 apply to each significant hazard presented by a given machine and to validate that the risk assessment is complete.

Table 1 — List of significant hazards associated with bale wrappers including wrappers which are combined with pick-up balers

N[a]	Hazard	Hazardous situation/event	Clause/subclause of ISO 4254-1:2013	Clause/subclause of this part of ISO 4254
A.1	**Mechanical hazards**			
A.1.1	Crushing hazard	— Controls	4.5.3; 5.1.3.2; 5.1.8; 6.1	—
		— Power transmission	6.4	—
		— Working tools	4.10	5.2; 5.3; 5.4; 5.5; 5.6;
		— Service/maintenance	4.11; 4.17.1; 4.17. 3; 4.9.2; 4.9.3	5.5.1; 5.4.2
		— Shearing/pinching points	5.1.4	—
		— Moving the machine	5.2	5.4.3
		— Stability	6.2	5.4.3; 5.4.4
		— Mounting of machines	6.2.2; 6.2.3; 6.3	—
A.1.2	Shearing hazard	— Controls	4.5.3; 5.1.3.2; 5.1.8; 6.1	—
		— Power transmission	6.4	—
		— Working tools	4.10	5.2; 5.3; 5.4.2; 5.6;
		— Service/maintenance	4.11; 4.17.1; 4.17. 3; 4.9.2; 4.9.3	5.5
		— Shearing/pinching points	5.1.4	—
		— Moving the machine	5.2	—
		— Stability	6.2	—
		— Mounting of machines	6.2.2; 6.2.3; 6.3	—
A.1.3	Cutting or severing hazard	— Working tools	4.9.2; 4.9.3	5.7
A.1.4	Entanglement hazard	— Power transmission	6.4	—
		— Working tools	4.9.2; 4.9.3	5.2; 5.3; 5.5; 5.6.3
A.1.5	Drawing-in or trapping hazard	— Power transmission	6.4	—
		— Working tools	4.9.2; 4.9.3	5.2; 5.3; 5.6
		— Service/maintenance	—	5.5
A.1.6	Impact hazard	— Working tools	—	5.2; 5.3; 5.6
A.1.9	High-pressure fluid injection or ejection hazard	— Hydraulic components	4.13; 6.5	—
A.2	**Electrical hazards**			
A.2.1	Contact of persons with live parts (direct contact)	— Electrical equipment	4.12; 5.3; 6.5	—
A.2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	— Electrical equipment	4.12.1	—

[a] With reference to ISO 4254-1:2013, Table A.1.

Table 1 *(continued)*

N[a]	Hazard	Hazardous situation/event	Clause/subclause of ISO 4254-1:2013	Clause/subclause of this part of ISO 4254
A.2.4	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads, etc.	— Electrical equipment	4.12.2; 5.3.1	—
A.2.5	Electromagnetic phenomena	— Electrical equipment	4.18	5.1.3
A.3	**Thermal hazards**			
	Burns, scalds and other injuries by possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	— Operating fluids — Hot surfaces	4.15 5.5	— —
A.4	**Hazards generated by noise**			
	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness) Accidents due to interference with speech communication and acoustic warning signals	— Noise	4.3	5.8
A.7	**Hazards generated by neglecting ergonomic principles in machinery design**			
A.7.3	Neglected use of personal protective equipment	— Operator's manual	8.2.3	—
A.7.4	Inadequate local lighting	— Visibility	5.1.7. 3	5.4.1
A.7.5	Mental overload and under load, stress	— Controls	4.5	—

[a] With reference to ISO 4254-1:2013, Table A.1.

Table 1 *(continued)*

N[a]	Hazard	Hazardous situation/event	Clause/subclause of ISO 4254-1:2013	Clause/subclause of this part of ISO 4254
A.7.6	Human error, human behaviour	— Controls	4.5	5.2
		— Operator's manual	8.2	7.1
		— Signs	8.3	—
A.7.7	Inadequate design, location or identification manual controls	— Controls	4.5; 5.1.3; 6.1	5.2
A.8	Combination of hazards	— Individual assemblies	4.16	—
		— Operator's manual	8.1; 8.2	7.1
A.9	**Unexpected start-up, unexpected overrun/overspeed**			
A.9.1	Failure/disorder of the control system	— Service and maintenance	4.11	—
		— Electrical equipment	4.12	—
		— Connections	6.5	—
		— Control system	-	5.2; 5.3
A.9.2	Restoration of energy supply after an interruption	— Controls	4.5; 6.1	5.3
A.9.3	External influences on electrical equipment	— Cables	4.12.1	—
A.9.4	Other external influences (gravity, wind, etc.)	— Control System	—	5.3
A.9.5	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities	— Controls	4.5; 6.1.2	—
		— Boarding means	4.7; 4.8	—
		— Operator station	5.1	—
		— Moving the machine	5.2	—
		— Mounting of machines	6.2; 6.3	—
		— Service and maintenance	4.17	—
		— Operator's manual	8.2.3	—
A.10	Impossibility of stopping the machine in the best possible conditions	— Controls	4.5; 4.19; 6.1	5.2.3; 5.4.2
A.11	Variations in the rotational speed of tools	— PTO drive shaft	6.4; 8.1; 8.2	—
		— working tools	—	5.6.1.4; 5.6.3
A.12	Failure of power supply	— Supports	4.11	—
		— Electrical equipment	4.12	—
		— Connections	6.5	—
		— Hydraulic circuit	—	5.4.2

[a] With reference to ISO 4254-1:2013, Table A.1.

Table 1 *(continued)*

N[a]	Hazard	Hazardous situation/event	Clause/subclause of ISO 4254-1:2013	Clause/subclause of this part of ISO 4254
A.13	Failure of the control circuit	— Electrical equipment	4.12; 4.20	5.2
A.14	Errors of fitting	— Mounting of machines	6.2; 6.3	—
		— Operator's manual	8.1; 8.2	7.1
A.15	Break-up during operation	— Guards and barriers	4.10	—
		— Supports	4.11	—
		— Hydraulic components	4.13	—
		— Pneumatic components	4.14	—
A.16	Falling or ejected objects or fluids	— Supports	4.11	5.4
		— Hydraulic components	4.13	—
		— Folding elements	4.9.2; 4.9.3	—
A.17	Loss of stability/ overturning of machinery	— Stability	6.2	5.4.3; 5.4.4

[a] With reference to ISO 4254-1:2013, Table A.1.

5 Safety requirements and/or measures

5.1 General

5.1.1 Machinery shall comply with the safety requirements and/or protective measures of this subclause. In addition, the machine shall be designed in accordance with the principles of ISO 12100:2010, Clause 4 for hazards relevant, but not significant which are not dealt with by this part of ISO 4254.

5.1.2 Except where otherwise specified in this part of ISO 4254, the machine shall comply with the requirements of ISO 4254-1 and with ISO 13857:2008, Tables 1, 3, 4, and 6 as appropriate.

5.1.3 Machinery shall comply with ISO 14982 for evaluating the electromagnetic compatibility.

5.2 Controls

5.2.1 General

Controls shall be hold-to-run except for automatic mode (see 5.2.3).

Controls shall be designed or protected against unintended activation. Furthermore, controls shall be in accordance with ISO 4254-1:2013, 4.5.1 and shall be consistent with the related movements of the machine.

Controls shall be located outside the hazardous zones.

The control shall be designed in such a way that it shall not be possible for the operator to reach unguarded moving elements while the movements are activated. This requirement is considered fulfilled if

— the distance between manual controls and every active unguarded moving element exceeds 850 mm,

— every control can be activated only from the driver's seat of the tractor, or

— every control station shall have a machine stop control. The stop control shall be as described in 5.2.3 for machines with automatic mode. For machines without any automatic mode, the release of the hold-to-run controls is considered as a stop control.

When manual controls require activation from the driver's seat of the tractor, they shall be designed in such a way that the operator can reach them. They shall

— have an adjustable position while maintaining a distance in excess of 850 mm between manual controls and every active unguarded moving element when in the working position, or

— be situated inside the cabin.

5.2.2 Remote controls (with cables or cableless)

Remote controlled wrappers shall be designed to automatically stop if the controls are not in the run position or if either the power supply or communication between the controls and the wrapper is interrupted.

Remote controls and their electrical components shall comply with the provisions of IEC 60204-1.

The remote control shall

— in case of wireless or cableless, have a clear assignment of remote control and the receiver in order to prevent operation by other than the designated remote controls, and

— be constructed so that an unintentional operation of controls that could cause dangerous movements is prevented (e.g. protective collar, recessed button).

5.2.3 Machine stop control

The machine stop control shall be in clear contrast colour with its surrounding colour. When the machine stop is activated, the whole machine shall stop.

This requirement does not apply to wrappers that do not have own controls, but are activated by the tractor's controls inside the cabin.

5.2.4 Safety and reliability of the controls

Safety-related systems and programmable control systems shall be in accordance with ISO 25119-1, ISO 25119-2, ISO 25119-3, and ISO 25119-4 or ISO 13849-1 and ISO 13849-2.

NOTE Performance levels (or categories) in accordance with ISO 25119 or ISO 13849 will be specified at the next revision of ISO 4254-14.

5.3 Machines with automatic mode of operation

For machines with automatic mode of operation, ISO 4254-1:2013, 4.6 applies.

For machines with remote control which are operated stationary with automatic mode of operation, an acoustic and optical warning on the machine shall indicate the start of the movement initiated by the automatic mode at least 3 s in advance of that movement. When the automatic mode starts, the acoustic signal shall stop. The optical signal shall last until the automatic mode ends.

Each phase of the work cycle or an automatic operation not performed within the allowed time for that sequence shall be considered as a failure and result in bringing automatically the work cycle or the automatic operation to a safe state. The restart of the work cycle or the automatic operation shall be possible only after an intentional actuation of a control located outside the hazard zone.

On machines with activated automatic mode in an operating condition with no visible moving parts and no malfunction and in a stationary situation, the unintended activation of sensors for controlling of the automatic mode shall be prevented.

5.4 Loading and unloading of bales

5.4.1 Visibility during loading and unloading of bales

The operator shall have sufficient visibility (direct or indirect) of the loading and unloading operations from the operator position.

NOTE An ISO standard regarding the assessment of field of vision of the combination tractor–machinery is under development.

5.4.2 Bale loading and unloading system

To avoid the hazard of inadvertent lowering of the loading device during maintenance, a device in accordance with ISO 4254-1:2013, 4.11 shall be present on the machine. If the device is a mechanical support, this shall be not detachable.

In case of failure of the hydraulic circuit, means shall be provided to avoid unintended unloading of the bale.

5.4.3 Unloading of bales

Unloading of the bale towards the operator shall be prevented.

In order to avoid uncontrolled movement of the bale due to an uneven ground, information shall be provided in the operator's manual on the need to take into account the direction of the slope when discharging round bales and to warn operators to be aware of the risks from bales rolling downhill when working on slopes (see 7.1.4).

When the unloading of the bale is performed automatically (e.g. without additional activation of a control for engaging of the unloading of the bale),

— the operator shall be informed by optical and/or acoustical warning signal that the unloading of the bale will start in a minimum of 3 s following the initiation of the warning, and

— it shall be possible for the operator to prevent the automatic unloading of bales during an automatic mode of operation.

Stationary operated bale wrappers shall not allow unloading of bales in course of automatic mode unless technical measures are taken to ensure that the unloading process can only be initiated when there are no persons in the hazardous area.

For stability during unloading, see 5.4.4.

5.4.4 Stability

To minimize risk of roll over or tip over during loading or unloading of the bale, bale wrappers with lateral or rear loading shall be designed to be stable with maximum rated bale weight on a slope of 5° with the loading device in its most unfavourable position. When stability of the tractor-wrapper combination is dependent on the characteristics of the tractor, the manufacturer of the wrapper shall provide the information necessary for the stability of the connected machinery to be established.

Conformity with this requirement shall be verified using the test methods described in Annex C.

When the stability of the tractor-wrapper combination requires action by the user (e.g. longitudinal loading of a tractor with a mounted wrapper), a means of providing adequate stability shall be provided in the information for use in the operator's manual [see 7.1.4 d) and Annex B].

5.5 Maintenance and adjustments

It shall be possible to carry out maintenance and adjustments with the power source stopped.

If this is not possible for functional reasons and the power source has to be active to carry out specific maintenance and adjustments, this shall only be possible from outside the hazardous area and shall not lead to a hazardous situation. Information on safety precautions shall be provided in the operator's manual.

5.5.1 Replacement of the plastic wrap/film

A lifting device shall be provided

— if the machine is able to be operated with wrap/film rolls having a mass of more than 30 kg, or

— if the height to which it is necessary to raise the wrap/film roll so that it can just be moved onto the wrap/film roll carrier measured as the vertical distance between the ground or platform and the lower edge at the lower end of the wrap/film roll is equal or greater than 1,25 m.

5.5.2 Collection of residue wrap/film

Provisions (e.g. container) shall be provided on the machine for collection of residue wrap/film.

5.6 Stretching system

5.6.1 General

5.6.1.1 Contact with rotating machinery by access into the zone of movement of the stretching system shall be prevented by the following:

— fixed parts of the machine in accordance with 5.6.1.2;

— barriers in accordance with 5.6.1.2;

— a combination of barriers and fixed parts of the machine;

— a safety stopping device complying with the requirements specified in 5.6.2.

5.6.1.2 Barriers and fixed parts of the machine providing the protection of a barrier shall be located such that their outer surface is at a minimum horizontal distance of 300 mm from the zone of movement and a vertical distance of between 1 000 mm and 1 400 mm from the ground. In a horizontal plane, the protection shall be continuous around the machine.

5.6.1.3 All actions required for normal operation (e.g. change of wrap/film) shall be possible without the operator having to enter into the zone of motion of the stretching system. If due to functional reasons (e.g. clearing of wrap/film disorder) the operator has to gain access into the zone of motion of the stretching system for performing actions required in the course of normal operation, a stopping device according to 5.6.2 shall be provided.

5.6.1.4 The risk of the stretching system wrapping a person during start-up shall be minimized. This can be achieved by

— slow start of the stretching system with a starting speed $\leq 10^{-1}$ min (r/min) for one complete rotation for single arm stretching systems or for half rotation for multi-arm stretching systems, or

— a manually operated control when there is sufficient visibility on the zone of motion of the stretching system. This control shall have hold-to-run functionality for a least one complete rotation of wrapping. After one complete rotation of the stretching system, the hold-to-run-functionality is no longer necessary.

5.6.1.5 The manual force necessary for adjusting the stretching system in height and centring it in respect to the bale shall not exceed 300 N.

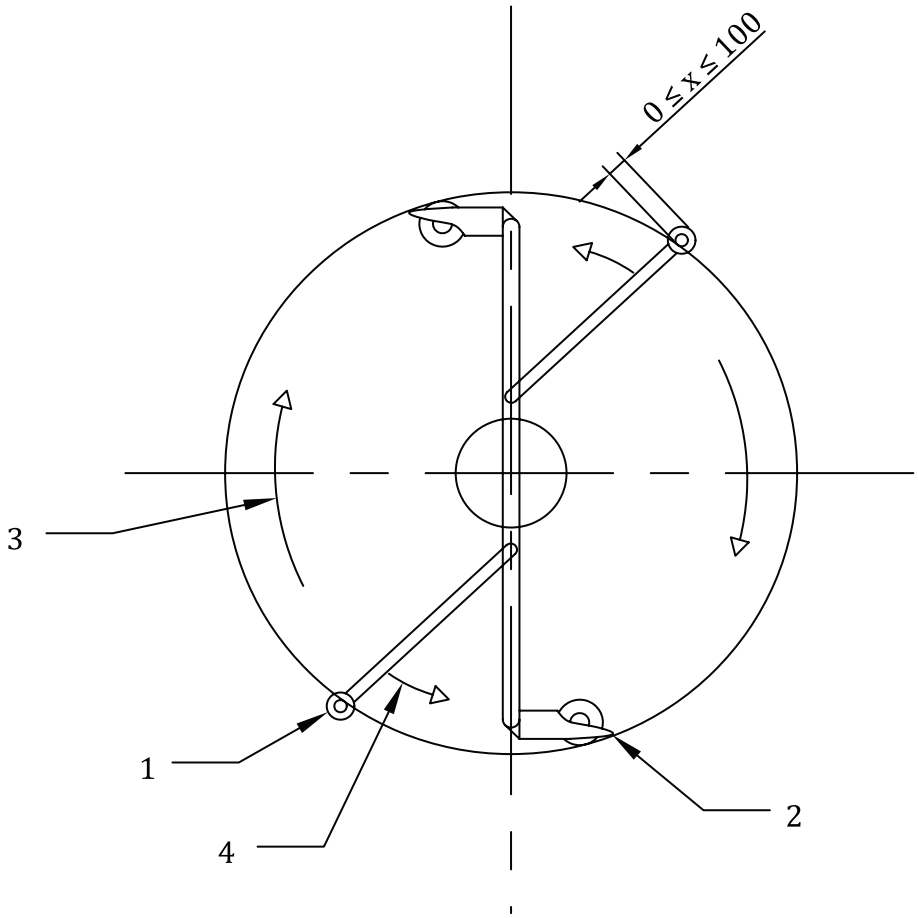
The device for the adjustment of the height shall have a locking device to maintain the set position.

5.6.2 Stopping device

5.6.2.1 If a stopping device is provided, it shall stop or prevent the movement of the stretching system. When the stretching system is moving, activation of the stopping device, if needed, shall not be a consequence of a voluntary action. If the stopping device is triggered, the movement of the stretching system shall stop before the stretching system can cause harm.

5.6.2.2 If the stopping device is a sensor arm (see Figure 3), it shall fulfil the following requirements.

5.6.2.3 The sensor arm shall be positioned such that in top view, the outer side of the contact head of the sensor arm is located at a position between the tip circle of the stretching system and 100 mm beyond the tip circle of the stretching system (see dimension "x" in Figure 3).

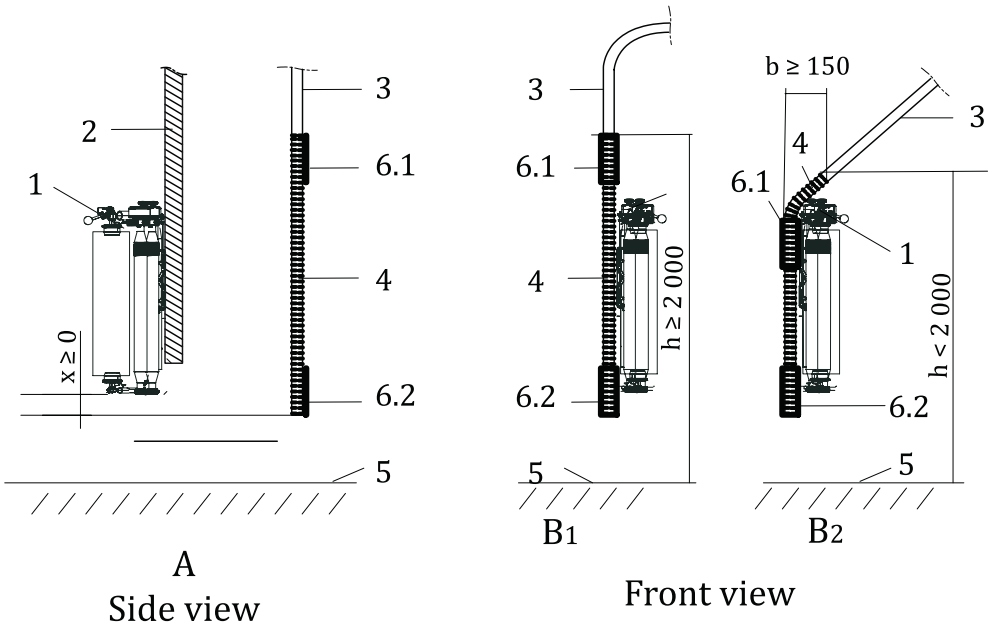


Key

1 outer side of the sensor arm
2 wrapping arm
3 direction of travelling
4 fallback of the sensor arm

Figure 3 — Location of the sensor arm

5.6.2.4 The end of the sensor arm shall extend below the end of the stretching system (see Figure 4).



Key

1 stretching system
2 wrapping arm
3 sensor arm
4 cushioned and marked area on sensor arm
5 ground/platform
6.1 possible position for upper impact and stop test
6.2 possible position for lower impact and stop test

Figure 4 — Length of sensor arm

5.6.2.5 The design of the sensor arm shall be such that a person coming into contact with the sensor arm is not endangered. For this purpose, the energy transferred when triggering the sensor arm shall not exceed 20 J determined by calculation or according to the test procedure given in Annex D. The sensor arm shall have a cushioned rounded profile of sufficient size to limit the pressure at any point of contact to a safe level. It shall be in clear contrast with the machine through use of a safety colour associated with a contrast colour, yellow–black, or red–white according to ISO 3864-1.

NOTE 1 The value of 20 J is under further consideration.

NOTE 2 Specifications for the cushioned rounded profile are under further consideration.

5.6.2.6 The wrapping arm and the stretching device shall stop before it makes contact with the obstruction causing the stop. This shall be verified using the test method described in Annex D.

5.6.2.7 The cushioned and marked area shall extend at least up to a height of 2 000 mm from the ground/platform (see Figure 4). This requirement does not apply if the wrapping arm bends inward at a height below 2 000 mm. In this case, the cushioned and marked area shall extend at least 150 mm inwards from the outer contour of the sensor arm (see Figure 4, B.2).

5.6.2.8 If the horizontal distance between the stretching system and the sensor arm is more than 500 mm, a guard shall be provided between stretching system and sensor arm in order to prevent a person inadvertently gaining access between stretching system and sensor arm. This guard shall

not prevent the correct operation of the stopping device (e.g. skirt, net). It shall be located at a height between 1 200 mm and 1 700 mm above the ground with a minimum height of 300 mm and shall be in clear contrast with the machine through use of a safety colour associated with a contrast colour, yellow–black, or red–white according to ISO 3864-1.

5.6.3 Additional requirements for wrappers with rotating platform

The design of the rotating platform shall be such that the unintentional fall of the bale is avoided (e.g. by limitation of the rotating speed of the platform).

The rotation of the platform at the start of the wrapping process shall comply with the requirements for slow start for single arm stretching systems specified in 5.6.1.4.

The rotating platform shall comply with the requirements given in 5.6.1.1 or the design of the rotating platform shall be such that there are no points which can cause entanglement when the rotating platform is rotating and the maximum rotating speed measured at the outer path is not more than 4,5 m/s.

5.7 Device to cut the wrap/film

The device to cut the wrap/film shall be guarded in order to minimize cutting hazard when not in use.

5.8 Noise

5.8.1 Noise reduction

5.8.1.1 Noise reduction at design stage

The machine shall be designed such that the level of noise emissions is minimized as much as possible taking into account the available information and technical measures to control noise at source as described in ISO/TR 11688-1.

NOTE ISO/TR 11688-2 gives useful information on noise generation mechanisms in machinery.

The main source causing noise is the stretching system.

5.8.1.2 Noise reduction information

If after taking all possible technical measures for reducing noise at the design stage a manufacturer considers that further protection of the operator is necessary, then adequate information shall be given in the operator's manual (see Clause 7).

5.8.2 Verification of requirements on noise based on noise emission values

For the determination of the sound power level and of the emission sound pressure level at the operator's position, the noise test code given in ISO 4254-1:2013, Annex B shall be used with the machine in wrapping phase.

6 Verification of the safety requirements and/or protective measures

Unless specified elsewhere, verification of the requirements specified in Clause 5 shall be made by means of inspection, calculation testing, or a combination of these as appropriate. In particular,

— dimensions, where given, shall be verified by measurement,

— controls shall be verified by a function test and positional measurements, and

— the construction and positioning of guards shall be verified by inspection, measurement, and function test.

7 Information for use

7.1 Operator's manual

7.1.1 The content and presentation shall be in accordance with ISO 3600.

7.1.2 Comprehensive instructions and information on all aspects of the safe use of the machine including suitable clothing and personal protective equipment requirements and the need for training, if necessary, shall be provided by the manufacturer in the operator's manual.

7.1.3 The operator's manual shall be in accordance with ISO 4254-1:2013, 8.2.3 (see also ISO 12100:2010, 6.4).

7.1.4 In particular, the following information shall be provided:

a) necessity to keep bystanders away from the wrapper;

b) necessity to use a power take-off drive shaft with undamaged guards;

c) means of avoidance of hazards arising when wrapping arm and loading arm change from transport to working position and vice versa;

d) for stability;

   — a warning that the wrapper may influence manoeuvrability and stability of the tractor-wrapper combination;

   — when necessary to ensure stability, the means to achieve adequate stability shall also be provided. Annex B gives an example for the longitudinal loading of a tractor with a mounted wrapper;

   — the information obtained from the tests required by Annex C when appropriate;

e) warning to turn off the engine of the tractor before any intervention on the machine;

f) it is forbidden to climb on the machine especially during working phases;

g) correct way to store the wrapper in order to ensure its stability;

h) use of devices (i.e. wheel chocks, etc.) to ensure stability when stored;

i) foreseen use of the machine;

j) use of adequate personal protective equipment (PPE);

k) maximum mass and dimension admissible for the bale;

l) linking points and correct procedure to mount the machine on the tractor;

m) prohibition to transport the bale on the machine on the road;

n) information regarding the safe procedure(s) for loading and unloading of the bale on slopes including the need to take into account the direction of the slope when unloading wrapped round bales and to warn operator's to be aware of the hazards associated with bales rolling downhill;

o) for pick-up balers combined with a bale wrapper, the procedure to follow to eject and pick-up the forage if the bale has failed and unwrapped;

p) instructions related to residual risks for safe access inside the area between the baler (under the door) and the wrapper;

q) warning systems and hazardous zones for bystanders;

r) value of the hydraulic pressure necessary for normal operation of the machine and maximum pressure allowed;

s) indication of hazardous zones;

t) information on functional adjustments of the machine and on maintenance operations;

u) the risk of possible overhead power line contact, if necessary;

v) necessity to replace the guard of the cutting device when the cutting device is not in use;

w) the safe procedure to check that safety devices, such as sensor arms, function correctly;

x) information about hazards related to unintentional unloading for rotating platforms;

y) precautions to be taken when using remote control.

7.2 Marking

7.2.1 General

All machines shall be marked in accordance with ISO 4254-1:2013, 8.4.

NOTE Legal requirements can require additional information.

7.2.2 Instructional signs

Instructional signs relating to equipment operation, servicing, and care shall have an appearance, especially colour, different from the safety signs on the equipment.

Nominal rotation frequency (in min–1) and direction of rotation of the power input connection (marked by an arrow) shall be provided on the machine.

7.2.3 Safety signs

Safety signs shall be provided on the machine in all appropriate places drawing attention to the following:

— hazards related to rotation of the wrapping arm during wrapping phase (e.g. residual hazards such as impact, winding, and crushing);

— the fact that it is forbidden to climb on the machine especially during working phases.

Annex A
(informative)

Wrappers — Examples

The following examples are illustrations of the functional characteristics of the machines and are not intended to illustrate the safety measures described in this part of ISO 4254.

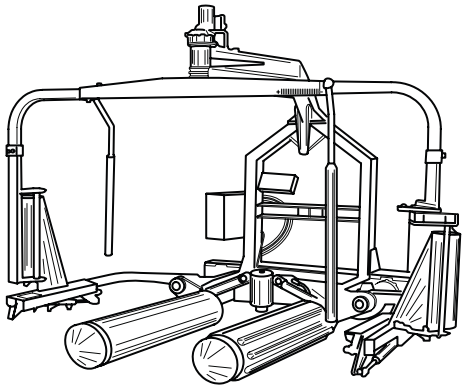


Figure A.1 — Mounted wrapper with rotating wrapping arm

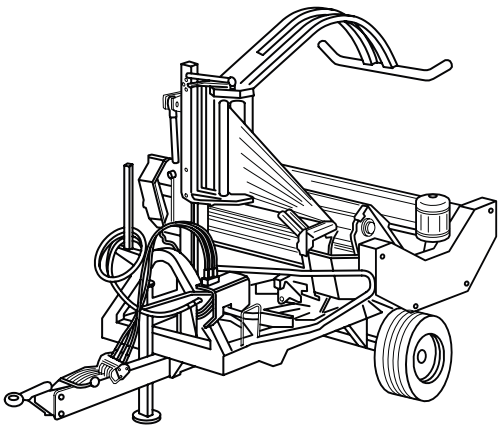


Figure A.2 — Trailed wrapper with rotating platform and rear loading device

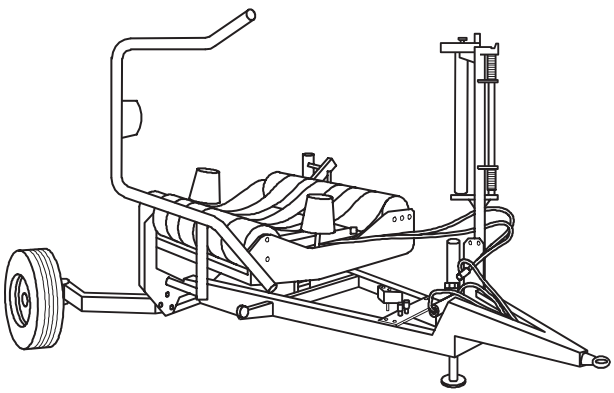


Figure A.3 — Trailed wrapper with rotating platform and lateral loading device

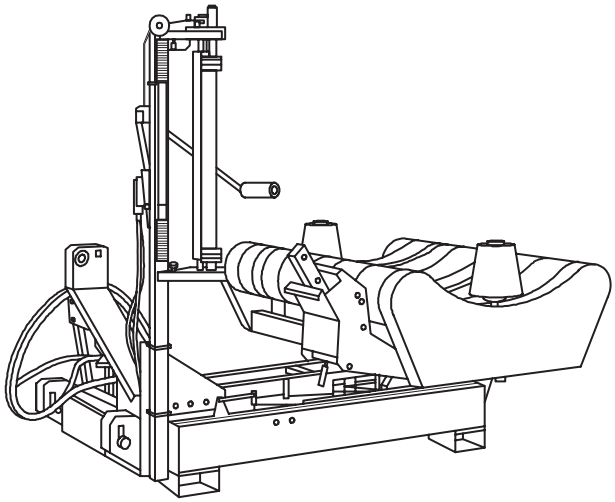


Figure A.4 — Mounted wrapper with rotating platform

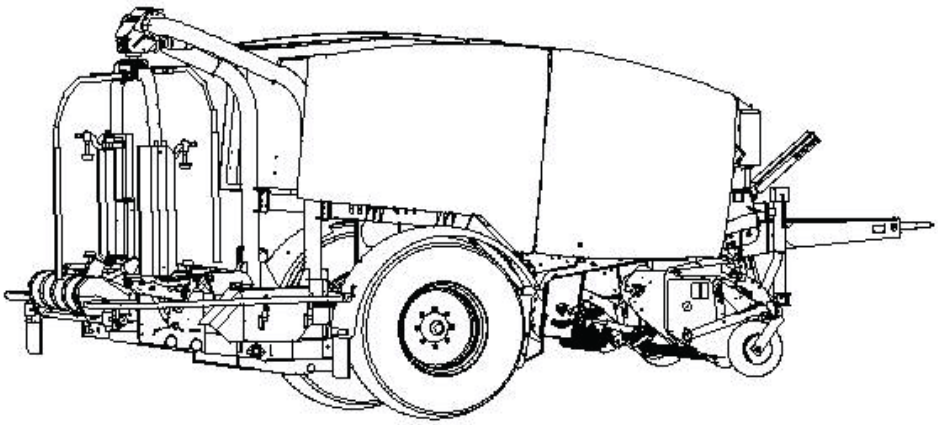


Figure A.5 — Baler-wrapper combination

Annex B
(informative)

Stability of the tractor-wrapper combination

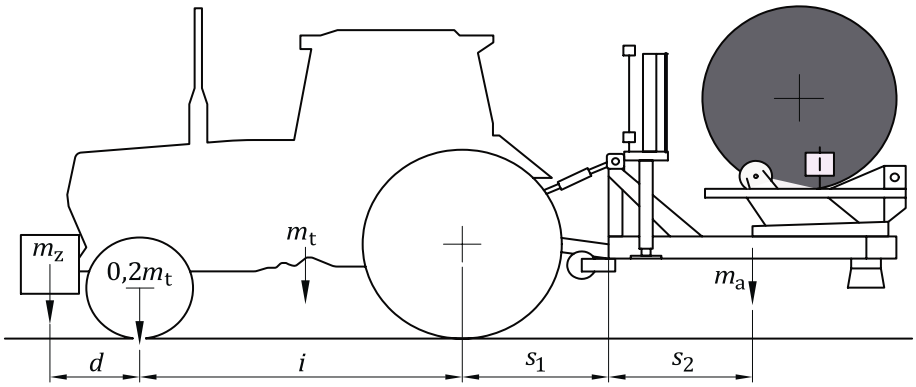
This Annex is related to 7.1.4 d) which includes the requirement to give information about possible loss of stability of the tractor when connected to the wrapper.

The following text is a guide for the manufacturer to allow adequate and complete information to be given to the user for the determination of the ballast required.

The following examples refer to a mounted wrapper.

The tractor-wrapper combination may become unstable if there is insufficient mass on the front axle of the tractor. Ballast requirement (m_z) for the front of the tractor in order to have at least 20 % of the unladen mass of the tractor on the front axle can be calculated using Formula (B.1).

$$m_z \times (d+i) \geq m_a \times (s_1 + s_2) - 0{,}2 \times m_t \times i \qquad \text{(B.1)}$$



Key

m_t unladen mass of the tractor (kg)

m_a mass of the mounted machine including the maximum mass for the bale as specified by the manufacturer (kg)

m_z mass of the ballast (kg)

d distance from the centre of gravity of the ballast and centre of the front axle (m)

i tractor wheel base (m)

s_1 distance between the centre of the rear axle and the centre of the lowest points of the three point linkage (m)

s_2 distance between the centre of the lowest points of the three point linkage and the centre of gravity of the mounted machine including the bale (m)

Figure B.1 — Calculation of ballast requirement for stability of the tractor-wrapper combination

Annex C
(normative)

Loading stability

C.1 General

This Annex applies to trailed wrappers and mounted wrappers with bale loading device.

C.2 Test devices

Testing platform which can be inclined rotating around at least one of its borders or firm ground having a slope of 5°.

Device to measure the vertical load at the drawbar.

Safety device to avoid overturning of the machine during testing.

C.3 Test procedure

The machine shall be tested in its every possible configuration and with all the possible attachments.

It shall be tested also with every possible tyre as specified by the manufacturer.

C.3.1 Machines with rear loading

Verification of the machine, when attached to the tractor and in loading phase, shall be performed with the following procedure:

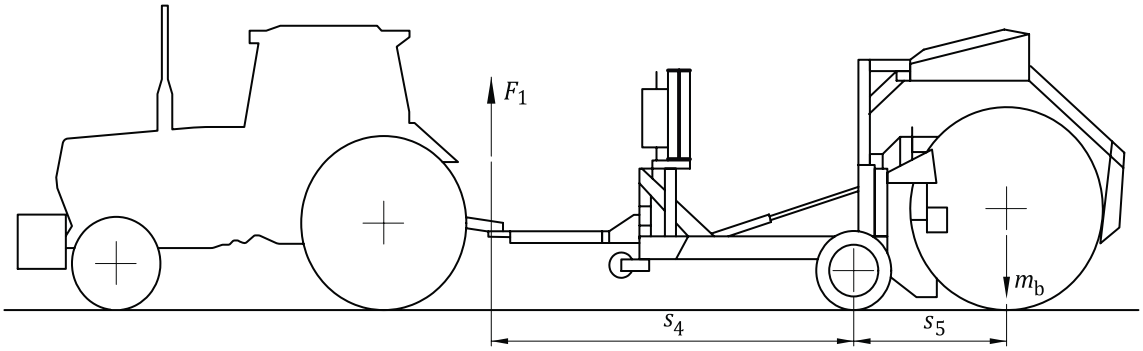
— horizontal firm ground;

— loading system locked in the most unfavourable position;

— r/min of the engine of the tractor to the max value as specified by the manufacturer;

— 10 min waiting in order to stabilize oil flow;

— activate loading device measuring the biggest load on the towing bar.



Key

F_1 load on the drawbar (N)

m_b maximum allowed mass of the bale (kg)

s_4 distance between centre of the wheels of the wrapper and centre of the drawbar (m)

s_5 distance between centre of the wheels and centre of gravity of the bale (m)

Figure C.1 — Verification of machines with rear load

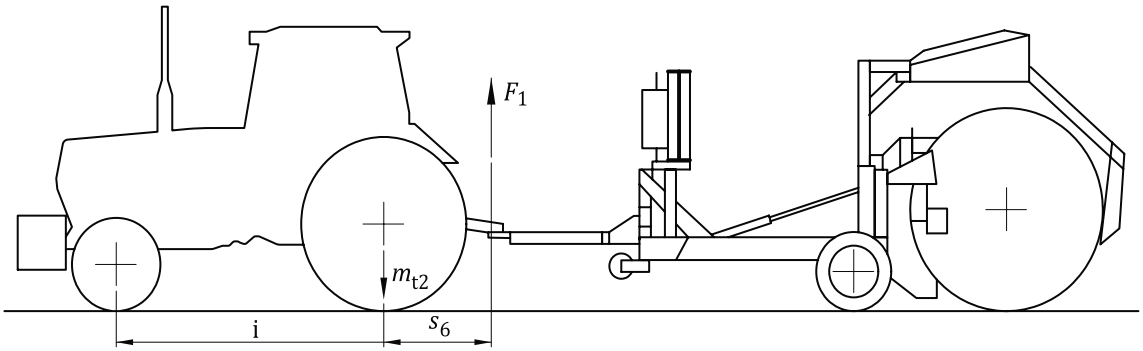
C.3.1.1 Test acceptance

If in the described position the direction of the load on the drawbar is directed downwards, the test is fulfilled.

If the direction of the load is directed upwards, it is necessary to add ballasts on the front part of the wrapper or information shall be given in the instruction handbook about the necessity to use a tractor having a load on the rear axle that satisfies the following formulae, where g is the gravity acceleration (see Figure C.2):

$$0{,}5 \times m_{t2} \times g \times i \geq F_1 \times (i + s_6) \quad \text{(C.1)}$$

$$m_{t2} \geq \frac{2 \times F_1 \times (i + s_6)}{g \times i} \quad \text{(C.2)}$$



Key

F_1 load on the drawbar (N)

m_{t2} unladen mass on the rear axle of the tractor (kg)

s_6 distance between the rear wheels centre and the centre of the drawbar (m)

i tractor wheel base (m)

Figure C.2 — Calculation of minimum load on the rear axle of the tractor

C.3.2 Machines with lateral loading

Verification of the machine, when attached to the tractor and in loading phase, shall be performed with the following procedure:

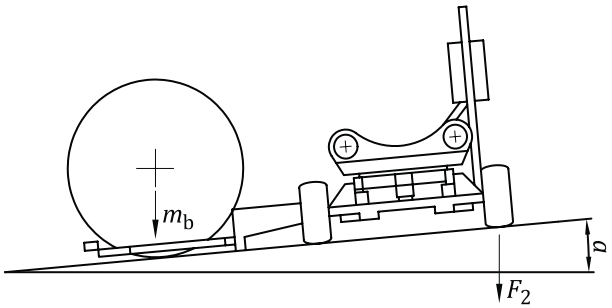
— the machine shall be on a slope of 5° with the side on which is installed the lateral loading system directed downhill;

— loading system locked in the most unfavourable position;

— r/min of the engine of the tractor to the max value as specified by the manufacturer;

— 10 min waiting in order to stabilize oil flow;

— the loading system shall be activated and the load, F_2, on the uphill wheel shall be measured.



Key

F_2 load on the uphill wheel of the wrapper (N)

m_b maximum allowed mass of the bale (kg)

α inclination of the slope

Figure C.3 — Verification of machines with lateral loading

C.3.2.1 Test acceptance

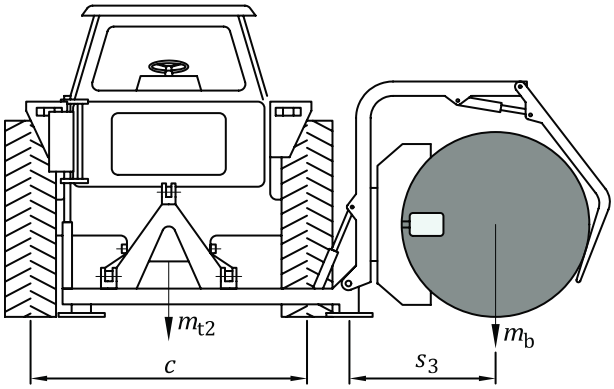
The load , F_2, on the uphill wheel of the wrapper shall be at least 500 N.

C.3.3 Mounted machines with lateral loading

For mounted wrappers with lateral loading system, the tractor-mounted machine combination is subjected to an overturning lateral moment deriving from the mass of the bale. To avoid overturning risks, it is necessary to verify the lateral stability of the tractor-mounted machine combination and consequently, to use a suitable tractor applying Formula (C.3).

$$0{,}6 \times m_{t2} \times \frac{c}{2} \geq m_b \times s_3 \quad \text{(C.3)}$$

$$m_{t2} \geq 3{,}33 \times \frac{m_b \times s_3}{c} \quad \text{(C.4)}$$



Key

m_{t2} unladen mass of the tractor on the rear axle (kg)

m_b maximum allowed mass of the bale as specified by the manufacturer (kg)

c rear track width (m)

s_3 distance of the centre of gravity of the bale from the fixing point of the loading system to the machine (m)

Figure C.4 — Example of calculation for lateral stability of the tractor-mounted machine combination

Annex D
(normative)

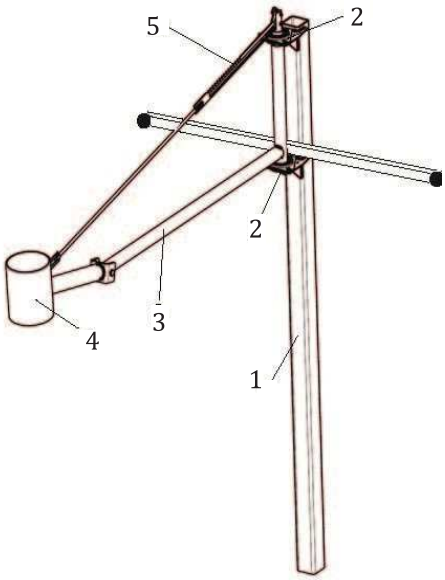
Test methods and acceptance criteria for sensor arm (pressure sensitive device)

D.1 General

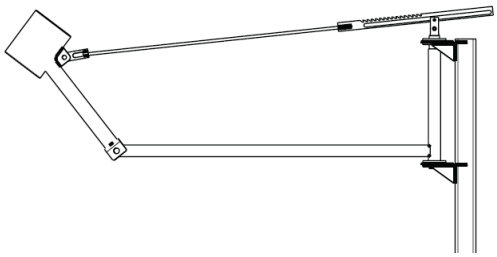
This Annex is related to 5.6.2.5 and describes a method for measuring the impulse energy of the sensor arm (pressure sensitive device) and for verification of whether the wrapping arm and the stretching device stop before the point of impact with the sensor arm.

D.2 Test apparatus

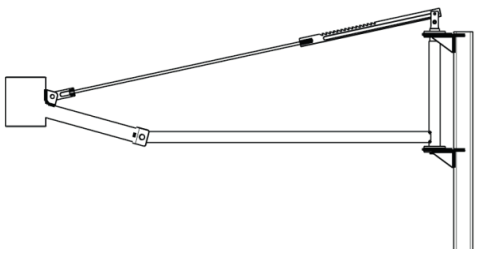
See Figure D.1.



a) Perspective view



b) Test arm in lifted position



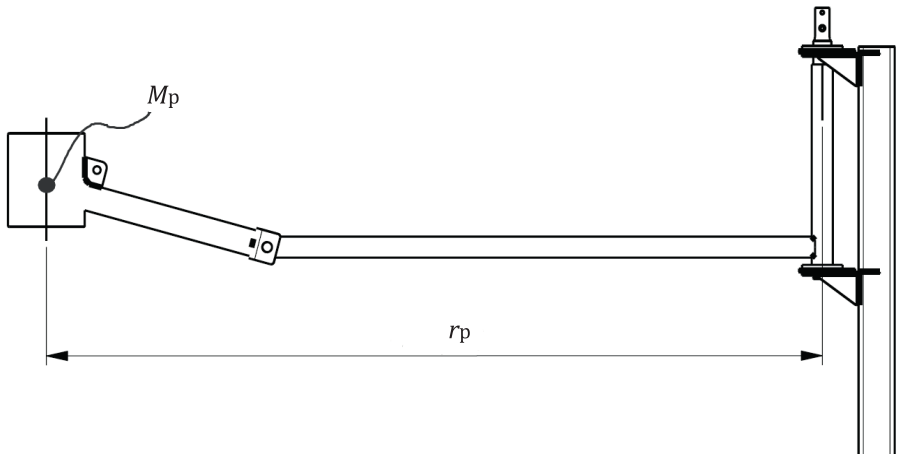
c) Test arm in impact position

Key

1 stationary support
2 pivoting point
3 rotatable arm
4 impact head made of metal not cushioned
5 release arm with release mechanism

Figure D.1 — Test apparatus

The pivot point (see Figure D.1, Key 2) consists of roller bearings to inforce minimum rotation resistance in this pivot point. The rotation resistance shall not exceed 0,4 N measured at M_p (see Figure D.2) perpendicular to the rotating arm.



Key

M_p virtual point mass originating in the centre of the impact head

r_p radius from the centre of the impact head to the pivot point

Figure D.2 — Test apparatus in the impact position — Point mass, M_p, and radius, r_p

The reduced moment of inertia, J_{red}, of the rotatable parts in the pivot point (see Figure D.1, Key 2), which are the rotatable arm (see Figure D.1, Key 3), the impact head (see Figure D.1, Key 4), and the release arm and release mechanism (see Figure D.1, Key 5), shall be equal to 7,42 kg*m^2 as a virtual point mass, M_p, at a radius, r_p, of between 1,25 m and 1,30 m from the pivot point. The virtual point mass, M_p, shall coincide with the centre of the impact head (see Figure D.1, Key 3).

The reduced moment of inertia, J_{red}, is calculated by Formula (D.1).

$$J_{red} = M_p \times r_p^2 = 7{,}42 \text{ kg*m}^2 \quad \text{(D.1)}$$

where

J_{red} is the reduced moment of inertia of all rotating parts in kg*m^2;

M_p is the virtual point mass of 4,5 kg originating in the center of the impact head;

r_p is the radius from the center of the impact head to the pivot point of between 1,25 m and 1,30 m.

D.3 Test conditions

The rigidity and stability of the sensor arm support shall not affect the result of the test. It shall be positioned such that the pivot point of the test apparatus, the impact point of the impact head, and the pivot point of the stretching system are all in line. The sensor arm shall be adjusted such that the centre of the intended contact area of the wrapping system will contact the centre of the impact head. The vertical pivot of the sensor arm support shall be perpendicular to the horizontal plane. The swinging sensor arm shall be able to rotate freely. The temperature of the hydraulic oil shall be at normal operating temperature. The wrapping arm shall be fitted with the maximum allowed mass wrap/film roll.

The test shall be performed two times and consists of two parts which are the following:

— impact test;

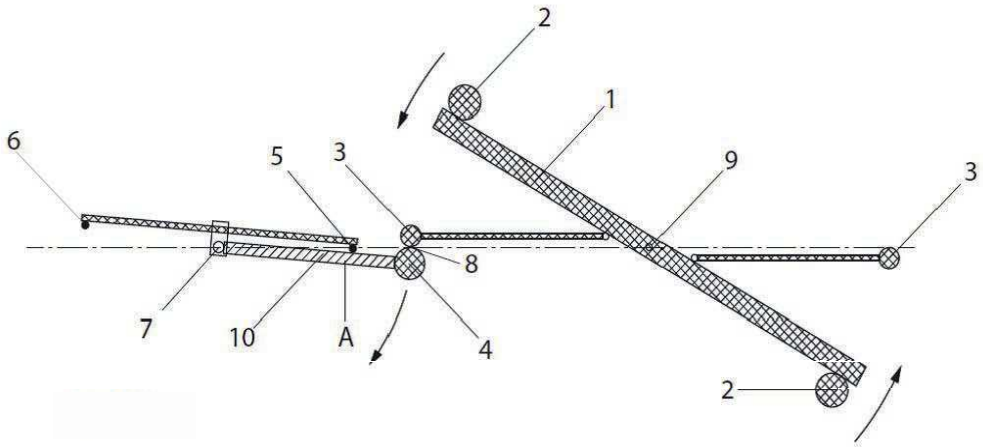
— stop test.

The stop test shall be performed after completion of the impact test.

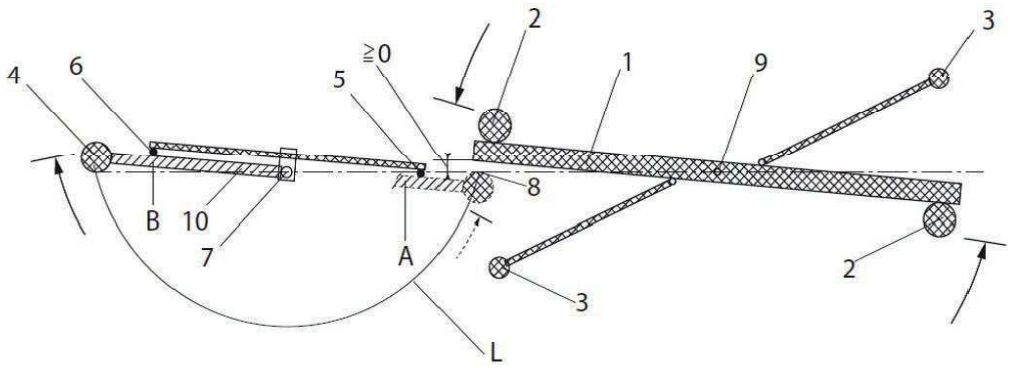
D.4 Test procedure

D.4.1 Impact test

Place the rotatable arm in start position with the impact head raised such that it is clear of contact with the wrapping mechanism. Start the stretching system. When the stretching system is at its maximum rotational speed, release the impact head such that it falls to the impact position before it is hit by the wrapping system (see Figure D.3). The movement of the impact head to the impact position shall not cause a rotational movement of the sensor arm that could change the impact position A.



a)



b)

Key

1	wrapping arm	8	impact point of impact head with sensor arm
2	stretching system	9	pivot point of stretching system
3	sensor arm	10	swinging arm (for impact head)
4	impact head	A	start impact position of the impact head
5	start position support	B	end impact position of the impact head
6	end position support	L	movement path of impact head
7	pivot point of test apparatus		

Figure D.3 — Test procedure (top view)

Determine the time between impact of impact head with sensor arm [see Figure D.3 a)] and hit on the end impact position [see Figure D.3 b)].

D.4.2 Stop test

In order to verify the stop position of the stretching device/wrapping arm, rotate the swinging arm with impact head back to its impact start position [see Figure D.3 a)].

D.5 Test results

D.5.1 Impact test

Calculate the radial speed, ω_t, of the impact head by Formula (D.2).

$$\omega_t = \pi/(t_1 - t_0) \quad \text{(D.2)}$$

where

ω_t is the radial speed of the impact head when moving from start impact position [see Figure D.3 a)] to end impact position [see Figure D.3 b)] of the impact head in s^{-1};

π is Pi (constant) = 3,141 5 corresponding to a 180° (π rad) movement of the impact head;

t_0 is the time at impact of the impact head with sensor arm [see Figure D.3 a)];

t_1 is the time the impact head reaches the end impact position [see Figure D.3 b)].

The impulse energy, E_i, is calculated by Formula (D.3).

$$E_i = 0{,}5 \times J_{red} \times \omega^2 \quad \text{(D.3)}$$

where

E_i is the impulse energy in Joule;

J_{red} is the inertia torque in in $kg*m^2$;

ω_t is the radial speed of the impact head when moving from start impact position [see Figure D.3 a)] to end impact position [see Figure D.3 b)] of the impact head in s^{-1}.

D.6 Acceptance criteria

D.6.1 General

When the results of the two tests (impact tests and stop tests) are positive, the requirements are considered to be fulfilled. If the result of one of the two tests is not positive, an additional test shall be carried out. If the result of this additional test is positive, the requirements are considered to be fulfilled.

D.6.2 Impact test

The impulse energy, E_i, shall be less or equal to 20 J. The acceptance criteria shall be met for each impact point in the shaded area shown in Figure 4.

D.6.3 Stop test

The wrapping arm and the stretching device shall stop before the point of impact of the impact head with the sensor arm. When rotating back to its start impact position [see Figure D.3 a)], the impact head shall not contact the stretching device/wrapping arm.

Bibliography

[1] ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

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