EUROPEAN
COMMISSION

Brussels, XXX
C(20..) yyy final

**COMMISSION DELEGATED REGULATION (EU) No …/..**

**of XXX**

**supplementing Regulation (EU) No 167/2013 of the European Parliament and of the Council with regard to vehicle functional safety requirements for the approval of agricultural and forestry vehicles**

**(Text with EEA relevance)**

**EXTRACT of chapter XXXIV coupling devices (version of 18.09.2013)**

**ANNEX XXXIV**
**Requirements on mechanical couplings**

**Definitions specific to this Annex**

'Mechanical coupling between tractor and towed vehicle' means the components installed on the tractor and on the towed vehicle in order to provide the mechanical coupling between those vehicles.

'Type of mechanical coupling between tractor and towed vehicle' means parts which do not differ from one another in such essential respects as:

— nature of mechanical coupling component,

— drawbar rings (40 mm and/or 50 mm diameter),

— external shape, dimensions or mode of operation (e.g. automatic or non-automatic),

— material,

— value of D as defined in Appendix 2 to Annex XXXIV for the test performed using the dynamic method or the trailer mass as defined in Appendix 3 to Annex XXXIV for tests performed using the static method, and also the vertical load on the coupling point S.

‘Reference centre of mechanical coupling’ means the point on the pin axis which is equidistant from the wings in the case of a fork and the point resulting from the intersection of the plane of symmetry of the hook with the generatrix of the concave part of the hook at the level of contact with the ring when this is in the traction position.

‘Height above ground of mechanical coupling’ means the distance between the horizontal plane through the reference centre of the mechanical coupling and the horizontal plane on which the wheels of the tractor are resting.

‘Vertical load on the coupling point’ means the load transmitted, under static conditions on the reference centre of the mechanical coupling.

‘Automatic mechanical coupling’ means a mechanical coupling component which closes and secures itself when the sliding mechanism for the drawbar rings is actuated, without further action.

‘Weight on the front axle of the unladen tractor’ means that part of the weight of the tractor which, under static conditions, is transmitted on the ground by the front axle of the tractor.

1. General requirements

1.1. The mechanical coupling components may be designed to function automatically or non-automatically.

1.2. The mechanical coupling components on the tractor must conform to the dimensional and strength requirements in point 2.1 and point 2.2 and the requirements for the vertical load on the coupling point in point 2.3.

1.3. The mechanical coupling components must be so designed and made that in normal use they will continue to function satisfactorily and retain the characteristics prescribed by this Annex.

1.4. All parts of mechanical coupling components must be made of materials of a quality sufficient to withstand the tests referred to in point 2.2. and must have durable strength characteristics.

1.5. All the couplings and their locks must be easy to engage and release and must be so designed that under normal operating conditions no accidental de-coupling is possible.

In automatic coupling components the locked position must be secured in a form-locking manner by two independently functioning safety devices. However, the latter may be released using the same control device.

1.6. The drawbar ring must be capable of tilting horizontally at least 60° on both sides of the longitudinal axis of a non-built-in coupling device. In addition, vertical mobility of 20° upwards and downwards is required at all times. (See also Appendix 1.)

The angles of articulation must not be attained at the same time.

1.7. The jaw must permit the drawbar rings to swivel axially at least 90° to the right or left around the longitudinal axis of the coupling with a fixed braking momentum of between 30 and 150 Nm.

The towing hook, no-swivel clevis coupling, ball type coupling and pin type coupling must allow the drawbar ring to swivel axially at least 20° to the right or left around the longitudinal axis of the coupling.

1.8. In order to prevent unintentional uncoupling from the hitch ring, the distance between the towing hook tip and the keeper (clamping device) shall not exceed 10 mm at the maximum design load.

2. Special requirements

2.1. Dimensions

The dimensions of the mechanical coupling components on the tractor must comply with Appendix 1, Figures 1 to 5 and Table 1.

2.2. Strength

2.2.1. For the purposes of checking their strength the mechanical coupling components must undergo a dynamic test under the conditions set out in Appendix 2 and a static test under the conditions set out in Appendix 3.

Alternatively, for fast (b-category) vehicles, that dynamic test may be performed according to the requirements of the UNECE Regulation 55 << revision 02 ?>>.

In addition, for fast (b-category) vehicles, that dynamic test must be performed with the coupling attached to the entire vehicle chassis, suitably restrained within a test bed.

**Kommentar [v1]:** Suggested by TRL study

**Kommentar [v2]:** This suggested text added to enhance assessment of vehicle structural integrity, in line with study report.

2.2.2. The test must not cause any permanent deformation, breaks or tears.

2.3. Vertical load on the coupling point (S)

2.3.1. The maximum static vertical load is laid down by the manufacturer. However, it must not exceed 3000 kg, except for the ball type coupling, where the maximum value shall not exceed 4000 kg.

2.3.2. Conditions of acceptance:

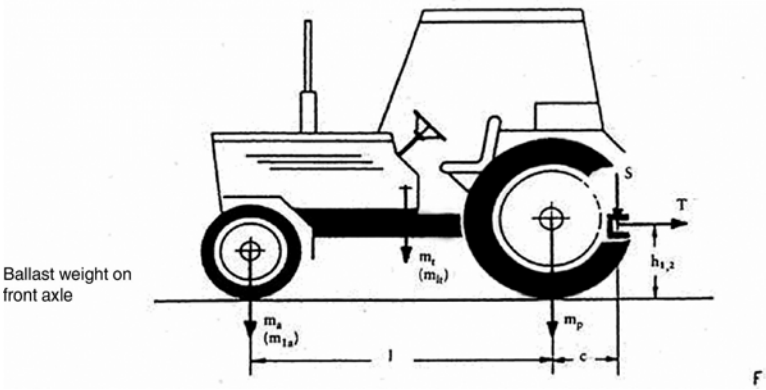
2.3.2.1. The permissible static vertical load must not exceed the technically permissible static vertical load recommended by the manufacturer of the tractor nor the static vertical load laid down for the towing device pursuant to EC component type-approval.

2.3.2.2. The requirements of point 2 of Annex I to Directive 2009/63/EC[1] must be complied with, but the maximum load on the rear axle must not be exceeded.

**Kommentar [v3]:** Transfer the mentioned text of Dir 2009/63 here.

2.4. Height above the ground of the coupling device (h)

[1] Directive 2009/63/EC of the European Parliament and of the Council of 13 July 2009 on certain parts and characteristics of wheeled agricultural or forestry tractors (Codified version) (OJ L 214, 19.8.2009, p. 23).




2.4.1. All tractors with a loaded mass exceeding 2,5 tonnes must be fitted with a trailer coupling having a ground clearance satisfying one of the following relations:

$h_1 \leq (((m_a - 0{,}2.m_t).l - (S.c))/(0{,}6.(0{,}8.m_t + S)))$or

$h_2 \leq (((m_{la} - 0{,}2.m_t).l - (S.c))/(0{,}6.(0{,}8.m_{lt} - 0{,}2.m_t + S)))$where:

| | | |
|---|---|---|
| $m_t$ | : | mass of the tractor, |
| $m_{lt}$ | : | mass of the tractor with ballast weight on the front axle, |
| $m_a$ | : | weight on the front axle of the unladen tractor, |
| $m_{la}$ | : | weight on the front axle of the tractor with ballast weight on the front axle, |
| l | : | tractor wheelbase, |
| S | : | vertical load on the coupling point, |
| c | : | distance between the reference centre of the mechanical coupling and the vertical plane passing through the axle of the rear wheels of the tractor. |

Masses $m_t$, $m_{lt}$, $m_a$ and $m_{la}$ are expressed in kg.

3. Conditions for granting EU type approval

**Kommentar [v4]:** This section contains the requirements of sections 4 and 6 of Annex IV to 2009/144 and Appendix 6 to Annex IV.

3.1. A tractor representative of the tractor type to be approved, on which a coupling device, duly approved, is mounted is submitted to the technical services responsible for conducting the type-approval tests.

3.2. The technical service responsible for conducting the type-approval tests checks whether the approved type of coupling device is suitable for mounting on the type of tractor for which type-approval is requested. In particular, it ascertains that the attachment of the coupling device corresponds to that which was tested when the EU component type-approval was granted.

3.3. For each type of mechanical coupling component the application must be

accompanied by the following documents and particulars:

- scale drawings of the coupling device (three copies). These drawings must in particular show the required dimensions in detail as well as the measurements for mounting the device,
- a short technical description of the coupling device specifying the type of construction and the material used,
- a statement of the value of D as referred to in Appendix 2 for the dynamic test or the value of T (towable mass in tonnes), corresponding to 1,5 times the technically permissible maximum laden trailer mass, as referred to in Appendix 3 for the static test, and also the vertical maximum load on the coupling point S (expressed in kg),
- one or more sample devices as required by the technical service.

3.4. The holder of the EU type-approval may ask for its extension for other types of coupling device.

3.5. The competent authorities grant such extension on the following conditions:

3.5.1. the new type of coupling device has received EU component type-approval;

3.5.2. it is suitable for mounting on the type of tractor for which the extension of the EU type-approval is requested;

3.5.3. the attachment of the coupling device on the tractor corresponds to that which was presented when EU component type-approval was granted.

3.6. A certificate, of which a model is shown in << RAR >>, is annexed to the EU type-approval certificate for each type-approval or type-approval extension which has been granted or refused.

3.7. If the application for EU type-approval for a type of tractor is made at the same time as the request for EU component type-approval for a type of coupling device on a tractor for which EU type-approval is requested, then points 3.1 and 3.2 are unnecessary.

3.8. All mechanical couplings must be accompanied by the manufacturer's instructions for use. These instructions must include the EU component type-approved number and also the values of D (kN) or T (tonnes) depending on which test was performed on the coupling.

4. Markings

4.1. Every mechanical coupling component conforming to the type for which EU component type-approval has been granted must bear a marking with the following inscriptions:

4.1.1. trade name or mark;

4.1.2. EU component type-approval mark conforming to the model in << RAR >>;

**Kommentar [v5]:** Model in RAR according to Appendix 4 to Annex IV of 2009/144

4.1.3. where the strength is checked in accordance with Appendix 2 (dynamic test):

permissible value of D (kN),
static vertical load value of S (kg);

4.1.4. where the strength is checked in accordance with Appendix 3 (static test):
towable mass T (tonnes), and vertical load on the coupling point S (kg).

4.1.5. The data must be clearly visible, easily legible and durable.

## Appendix 1

Mechanical coupling types
‘Clevis type mechanical coupling’: see Figures 1 and 2.
‘No-swivel clevis mechanical coupling’: see Figure 1d.
‘Towing hook’: see Figure 1 – “Hitch-hook dimensions” in ISO 6489-1:2001.
‘Tractor drawbar’: see Figure 3.
‘Ball type mechanical coupling’: see Figure 4.
‘Pin (piton) type mechanical coupling’: see Figure 5.

Drawings of mechanical couplings components

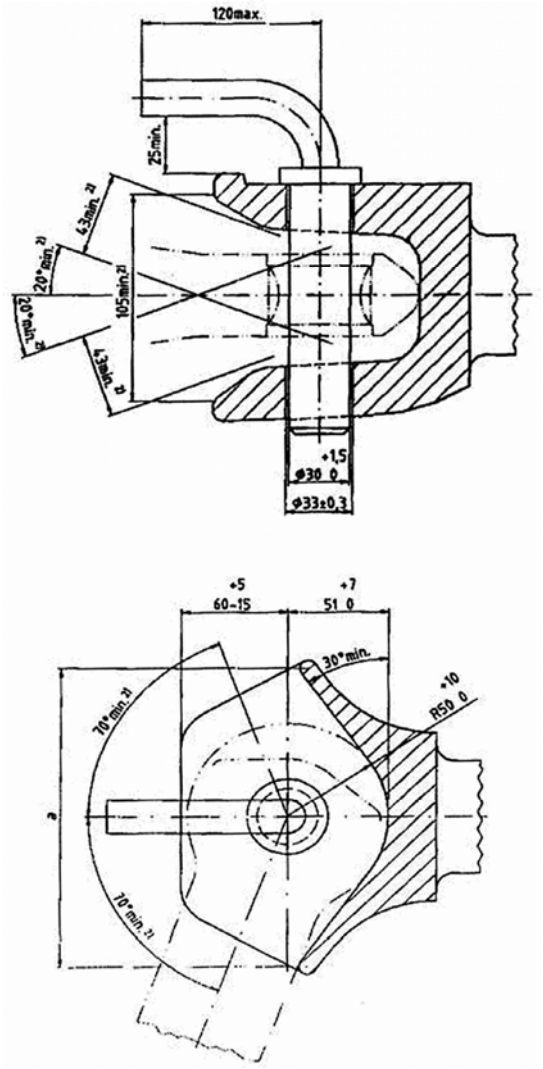



*Figure 1a — Non-automatic trailer coupling, with cylindrical locking pin*

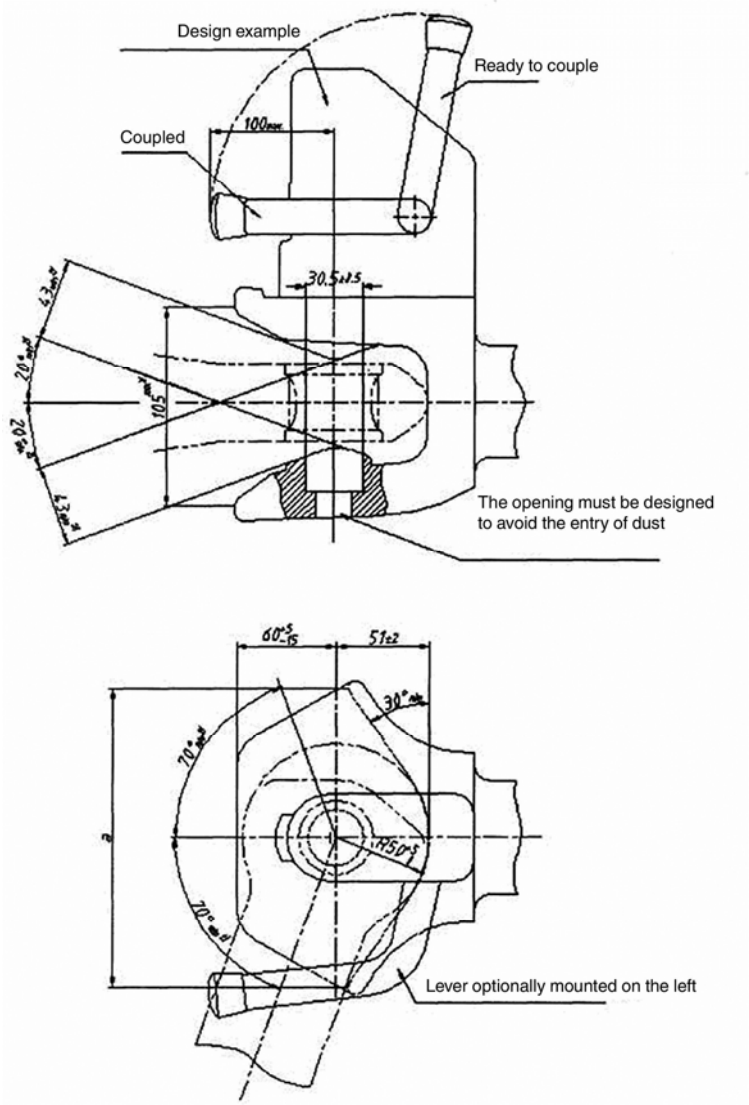



*Figure 1b — Automatic trailer coupling, with cylindrical locking pin*

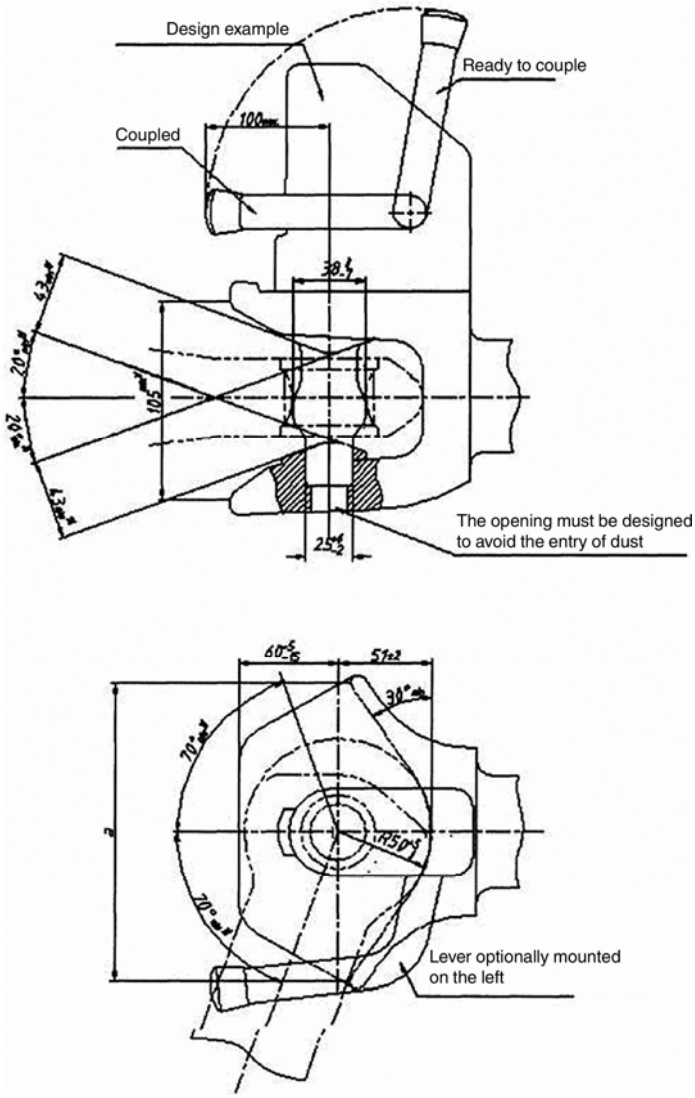
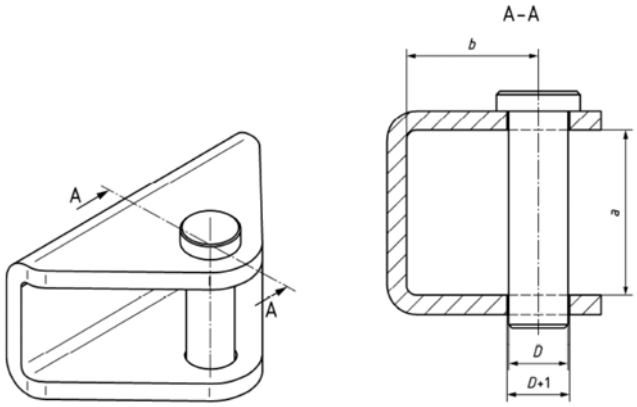



*Figure 1c — Automatic trailer coupling, with cambered locking pin*




| *Table 1* | | | | | |
|---|---|---|---|---|---|
| *Shapes and dimensions of trailer or implement clevis couplings* | | | | | |
| *Vertical load*<br>S<br>kg | *D value*<br>D<br>kN | *Shape* | *Dimension*<br>mm | | |
| | | | D<br>± 0,5 | a<br>min. | b<br>min. |
| ≤ 1000 | ≤ 35 | w | 18 | 50 | 40 |
| ≤ 2000 | ≤ 90 | x | 28 | 70 | 55 |
| ≤ 3000 | ≤ 120 | y | 43 | 100 | 80 |
| ≤ 3000 | ≤ 120 | z | 50 | 110 | 95 |

*Figure 1d – No-swivel clevis coupling (corresponding to ISO 6489-5:2011)*

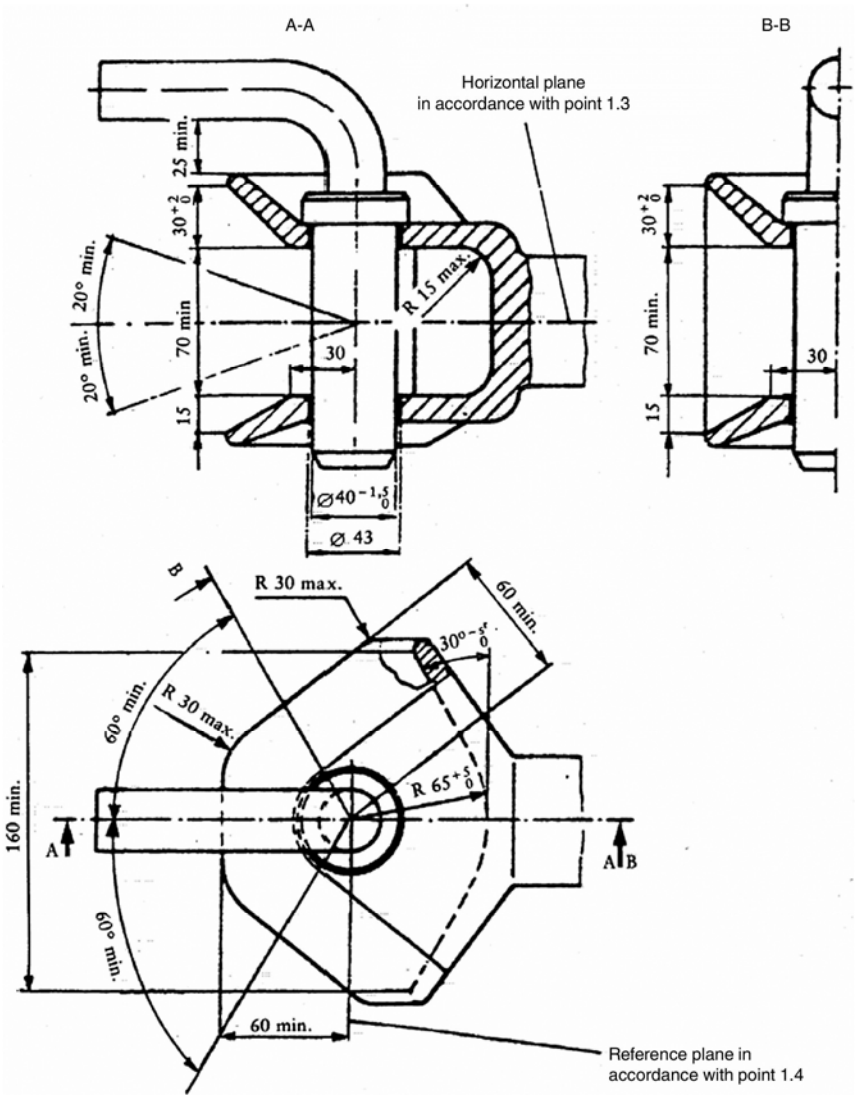



*Figure 2 — Non-automatic trailer coupling*

**corresponds to ISO 6489 Part 2 of July 2002**

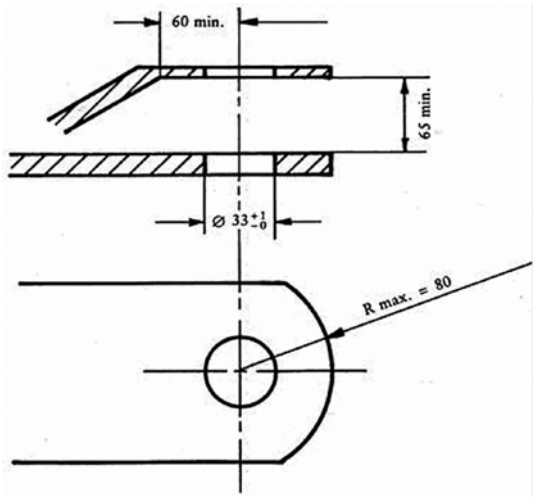
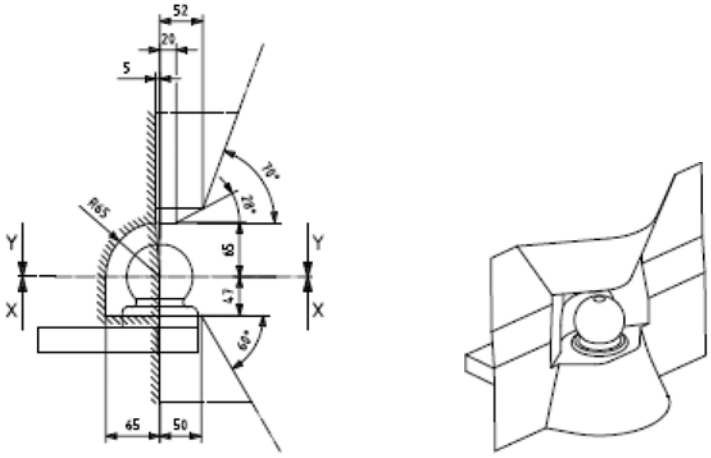



*Figure 3 — Tractor drawbar*
*corresponds ISO Standard 6489 Part 3 of June 2004*



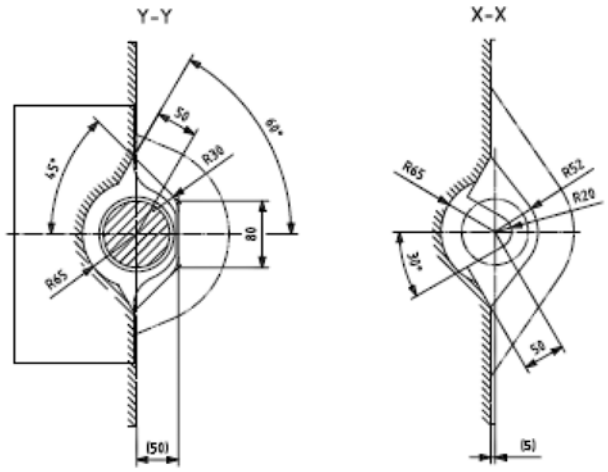
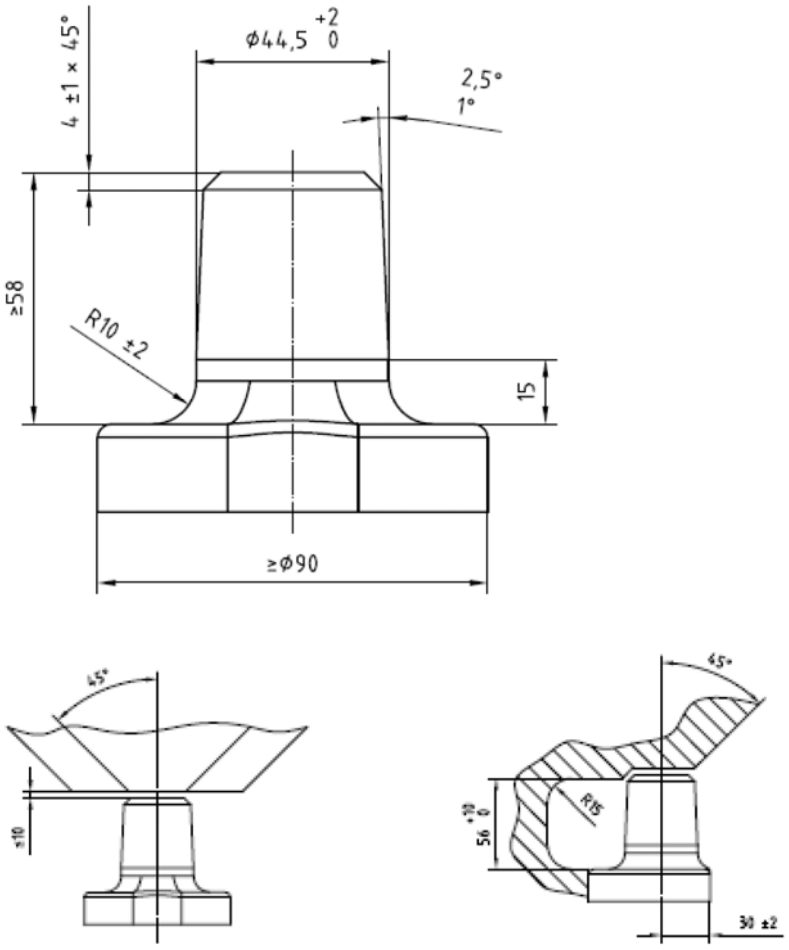



*Figure 4 – Ball type coupling (corresponding to ISO 24347:2005)*



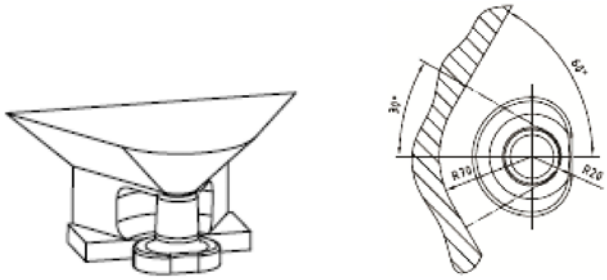



*Figure 5 – Pin type coupling (corresponding to ISO 6489-4:2004)*

## Appendix 2

## DYNAMIC TEST METHOD

1. TEST PROCEDURE

The strength of the mechanical coupling is to be established by alternating traction on a test bed.

This method describes the fatigue test to be used on the complete mechanical coupling device, i.e. when fitted with all the parts needed for its installation the mechanical coupling is mounted and tested on a test bed.

The alternating forces are applied as far as possible sinusoidally (alternating and/or rising) with a load cycle depending on the material involved. No tears or breaks may occur during the test.

2. TEST CRITERIA

The horizontal force components in the longitudinal axis of the vehicle together with the vertical force components form the basis of the test loads.

In so far as they are of secondary importance, horizontal force components at right angles to the longitudinal axis of the vehicle and also moments are not to be taken into consideration.

The horizontal force components in the longitudinal axis of the vehicle are represented by a mathematically established representative force, the value D.

The following equation is applied to the mechanical coupling:

$D = g \cdot (M_T \cdot M_R)/(M_T + M_R)$

Where:

| | | |
|---|---|---|
| $M_T$ | = | the technically permissible total mass of the tractor, |
| $M_R$ | = | the technically permissible total mass of the towed |

| | | |
|---|---|---|
| | | vehicles, |
| g | = | 9,81 $m/s^2$. |

The vertical force components at right angles to the track are expressed by the static vertical load S.

The technically permissible loads are given by the manufacturer.

3. TEST PROCEDURE

3.1. General requirements

The test force is applied to the mechanical coupling device being tested by means of an appropriate standard drawbar ring beneath an angle formed by the position of the vertical test load $F_v$ *vis-à-vis* the horizontal test load $F_h$ in the direction of the median longitudinal plane passing from top front to bottom rear.

The test force is applied at the usual point of contact between the mechanical coupling device and the drawbar ring.

The play between the coupling device and the ring must be kept to a minimum.

In principle the test force is applied in an alternating manner around the zero point. With an alternating test force the resulting load is equal to zero.

Should the design of the coupling device (e.g. excessive play, towing hook) make it impossible to carry out the test with an alternating test load, the test load may also be applied on a rising basis in the direction of traction or pressure, whichever is the greater.

Where the test is carried out with a rising force curve, the test load is equal to the upper (highest) load, and the lower (smallest) load should not exceed 5 % of the upper load.

Care should be taken in the alternating force test to ensure that by suitable mounting of the test apparatus and choice of power conduction system no additional moments or forces arising at right angles to the test force are introduced; the angular error for the direction of force in the alternating force test should not exceed ±1,5°; and for the rising force test the angle is set in the upper load position.

The test frequency must not exceed 30 Hz.

For components made of steel or steel casting the load cycle amounts to $2 \cdot 10^6$. The subsequent tear test is carried out using the colour penetration method or similar method.

If springs and/or dampers are incorporated into the coupling parts, they are not to be removed during the test but may be replaced if, during the test, they are subject to strain under conditions which would not obtain during normal operation (e.g. heat action) and become damaged. Their behaviour before, during and after the test must be described in the test report.

3.2. Test forces

The test force consists in geometrical terms of the horizontal and vertical test components as follows:

$F = \sqrt{(Fh2 + Fv2)}$ where:

$Fh = \pm 0{,}6 \cdot D$ (kN) in the case of alternating force,

or

$Fh = 1{,}0 \cdot D$ (kN) in the case of rising force (traction or pressure),

$Fv = g \cdot 1{,}5 \cdot S/1000$ (value expressed in kN)

| | | |
|---|---|---|
| S | = | static drawbar load (load on the track, expressed in kg).';» |

**Appendix 3**

## COUPLING DEVICE

## STATIC TEST METHOD

1. TEST SPECIFICATIONS

1.1. General

1.1.1. Subject to a check on its construction characteristics, the towing device must undergo static tests in accordance with the requirements of points 1.2, 1.3 and 1.4.

1.2. Test preparation

The tests must be carried out on a special machine, with the towing device and any structure coupling it to the body of the tractor attached to a rigid structure by means of the same components used to mount it on the tractor.

1.3. Test instruments

– The instruments used to record loads applied and movements must have the following degree of accuracy:

loads applied ±50 daN,

– movements ±0,01 mm.

1.4. Test procedure

1.4.1. The coupling device must first be subjected to a pre-traction load which does not exceed 15 % of the traction test load defined in point 1.4.2.

1.4.1.1. The operation described in point 1.4.1 must be repeated at least twice, starting with a zero load, which is gradually increased until the value prescribed in point 1.4.1 is reached, and then decreased to 500 daN; the settling load must be maintained for at least 60 seconds.

1.4.2. The data recorded for plotting the load/deformation curve under traction, or the graph of that curve provided by the printer linked to the traction machine, must be

based on the application of increasing loads only, starting from 500 daN, in relation to the reference centre of the coupling device.

There must be no breaks for values up to and including the traction test load which is established as 1,5 times the technically permissible trailer mass; in addition, the load/deformation curve must show a smooth progression, without irregularities, in the interval between 500 daN and 1/3 of the maximum traction load.

1.4.2.1. Permanent deformation is recorded on the load/deformation curve in relation to the load of 500 daN after the test load has been brought back to that value.

1.4.2.2. The permanent deformation value recorded must not exceed 25 % of the maximum elastic deformation occurring.

1.5. The test referred to in point 1.4.2 must be preceded by a test in which an initial load of three times the maximum permissible vertical force (in daN, equal to g · S/10) recommended by the manufacturer is applied in a gradually increasing manner, starting from an initial load of 500 daN, to the reference centre of the coupling device.

During the test, deformation of the coupling device must not exceed 10 % of the maximum elastic deformation occurring.

The check is carried out after removing the vertical force (in daN, equal to g · S/10) and returning to the initial load of 500 daN.