DEFINITIONS and TESTS

Definition p2.10

For Agricultural Tractor Drawbar Couplings

D=g*(0,90Tf+0,85Tr) (kN) (Formulas from practice data see attached 1)

Tf, Tr=The technically permissible maximum mass of the towing vehicle in tonnes on Front axle and Rear axle.
g = 9,81 m/s^2

Alternatively :

D=g*0.8*T (kN) (Formulas from theoretic analisys coming also from the assumption that the Trailer mass can be 4 times the Tractor mass)

T = The technically permissible maximum mass of the towing vehicle in tonnes

For Agricultural Trailer Drawbar Eyes

D =g*R*0,6 (kN)

Dynamic vertical load on Drawbar Coupling, Eye and Drawbar

V= g*0,7*R* (h/l)

h= height in metres of the trailer's centre of gravity when loaded to the permissible maximum mass

l= distance in metres between the centre of the coupling ring and the centre of the axle assembly, in metres .

(h/l)= 0,4 Where the factor (h/l) is not known.

Annex 6 p1.6

-Any positive locking device, which is retained in position by spring force, shall remain in its secured position when subjected to a force applied in the least favourable direction and equivalent to **3 times** the mass of the locking mechanism.

Keep current UN R 55.

Annex 6 p2.2

The test frequency shall not exceed 35 Hz

Annex 6 p2.2

*****For coupling devices made from steel the number of stress **cycles is 2×10^6.**
*****For devices made from materials other than steel a higher number of cycles may be necessary.
*****The dye-penetration method of crack testing or an equivalent method shall be used to determine any cracking during test.

Annex 6 p3.1.3

-Dynamic pulsating endurance test with resultant test force.
-Alternatively,
a two-component synchronous dynamic endurance test is also permissible

Fres=$\sqrt{Fh^2 + Fs^2}$(kN)

Angle force appl.

(α) =Arctan Fs/Fh

Annex 6 p3.1.3

Horizontal load **(kN)**
Fh=1,0*D

Annex 6 p3.1.3

Vertical load
Fs= g*S+0,3V

Annex 6 p3.3.1.3

-clevis-type with non-cylindrical pins, it is also necessary to test the closure and any locking devices by means of a static force of **0.25 D** acting in the direction of opening.
-clevis-type with cylindrical pins A test force of **0.1D** is sufficient.
-This force shall be raised to the above value smoothly and quickly and be maintained for 10 seconds.
-The test shall not cause the closure to open and it shall not cause any damage.

Annex 6 p3.3.5

-For ball, hook and piton-type couplings and equivalent devices, the keeper plate shall be tested using a static force of
Fs stat = 0.6 · D (vertically upwards).
-The Drawbar eyes may not be released and no permanent deformation which would be detrimental to the satisfactory operation of the device is permitted

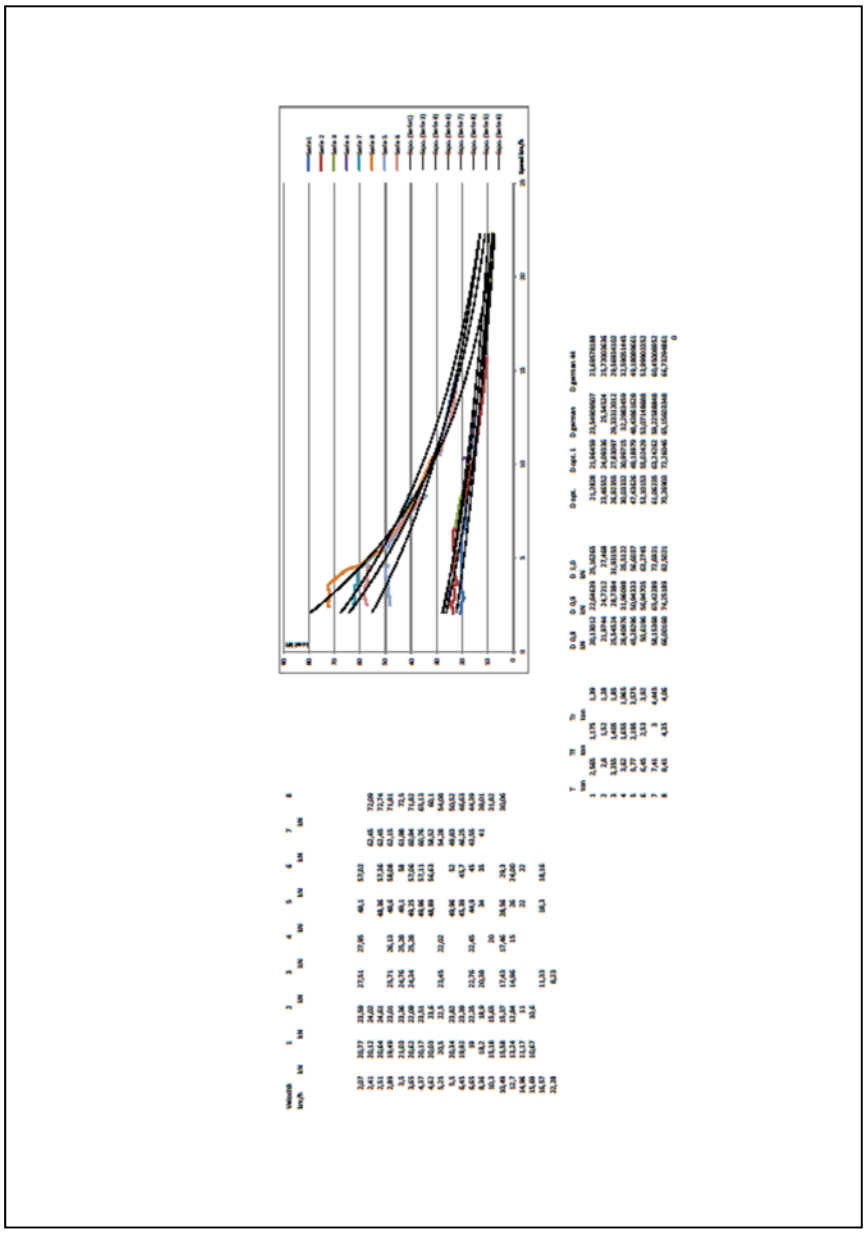
Annex 6 p3.6.1

Towing brackets shall be subjected to the same forces during testing as the coupling. The test load shall be applied at a horizontal and vertical distance corresponding to the position of the coupling device which exerts the least favourable load on the towing bracket

Annex 6 p3.6.2

Towing brackets with connections for a quick height-adjustable latching rail plate on the point of coupling side shall be subject to a static test in the transverse direction:
Force =0.6 * D
(kN)
-Angle of application **60°** to the longitudinal centre line.
-Point of force application to the coupling point see 3.6.1
Test preparation
The tests must be carried out on a special machine, with the towing bracket device and any structure connecting 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.
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.
Test procedure
The towing bracket device must first be subjected to a pre-traction load which does not exceed 15 % of the traction test load defined above.
The above operation described must be repeated at least twice, starting with a zero load, which is gradually increased until the value prescribed is reached, and then decreased to 500 daN; the settling load must be maintained for at least 60 seconds.
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 towing bracket device.
There must be no breaks for values up to and including the traction test load; in addition, the load/deformation curve must show a smooth progression, without irregularities, in the interval between 500 daN and 2/3 of the maximum traction load.
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.
During the test, permanent deformation of the towing bracket device must not exceed 10 % of the maximum elastic deformation occurring.
The check is carried out after removing the load and returning to the initial load of 500 daN.

Attachment 1



Attachment 2

Comparative example with the actual different proposed formulas:

Case	Combination	Proposal	D[kN]	Dc[kN] / V [kN]	Fh[kN]	Fs[kN]	Fres[kN]
1	T = 3 t R = 6 t S = 1 t	G	19.6	21.8	19.6	15.4	24.7
		I	23.5	16.5	23.5	14.7	27.8
2	T = 3 t R = 12 t S = 1 t	G	23.5	28.8	23.5	16.7	28.9
		I	23.5	32.9	23.5	19.7	30.7
3	T = 6 t R = 14 t S = 1.5 t	G	41.2	46	41.2	25.8	48.6
		I	47	38.5	47	26.2	53.8
4	T = 6 t R = 24 t S = 1.5 t	G	47	55.2	47	28	54.7
		I	47	65.9	47	34.5	58.3
5	T = 9 t R = 20 t S = 2 t	G	61	67	61	35.7	70.7
		I	70.6	55	70.6	36.1	79.3
6	T = 9 t R = 36 t S = 2 t	G	70.6	81.5	70.6	39.2	80.8
		I	70.6	98.9	70.6	49.3	86
7	T = 9 t R = 36 t S = 3 t	G	70.6	86.3	70.6	50.1	86.6
		I	70.6	98.9	70.6	59.1	92
8	T = 12 t R = 28 t S = 3 t	G	82.4	92	82.4	51.5	97.2
		I	94.2	76.9	94.2	52.5	107.8
9	T = 12 t R = 48 t S = 3 t	G	94.2	110.4	94.2	56	109.5
		I	94.2	131.8	94.2	69	116.7
10	T = 12 t R = 32 t S = 4 t	G	85.6	99.9	85.6	63.2	106.5
		I	94.2	87.9	94.2	65.6	114.8
11	T = 12 t R = 48 t S = 4 t	G	94.2	115.1	94.2	66.9	115.6
		I	94.2	131.8	94.2	78.7	122.8