

EU Directive 94/20 on Towing Devices for Motor Vehicles and Trailers

Peter Bonacker, who prepared this paper, as you have heard is unfortunately unable to be here today, but he has worked for Ringfeder for nearly 20 years, mostly in the Engineering Department, and for the last three years in Technical Sales, with specific responsibilities for this market.

The subject this morning is EC Directive 94/20 relating to mechanical coupling devices for motor vehicles and their trailers **and their attachment to those vehicles**, so it doesn't only deal with the components themselves.

The Directive has been in force since 1994, but it is only now starting to take effect in the hardware that you or I will see in this country. It refers to all parts or devices on the frames or load-bearing parts of the vehicles by which the towing and towed vehicles are connect together. It also includes fixed or removable parts of the attachment, adjustment or operation of these coupling devices and also test parameters and methods. In scope it covers devices such as tow ball couplings, fifth wheels, kingpins, automatic bolt couplings (or Ringfeder) as we call them here regardless of brand, drawbar eyes and drawbeams. It also covers an item which we don't see much, if at all yet in New Zealand, and that is remote control mechanisms for couplings.

The Directive categorises all towing couplings into **standard** and non-standard couplings. Standard tow couplings have identical critical dimensions and ratings which are detailed in the Directive itself, which means that any coupling is interchangeable within its class, independent of the type/model and manufacturer. For Automatic Bolt couplings this covers such things as mounting bolt patterns, safety mechanisms, minimum angles of movement and specific dimensions for tow eyes.

It is perhaps of interest that this Directive is supposed to be adopted and introduced in International regulations during the second International Conference in London in September this year – this will probably finalise arrangements in 1997. The European market will therefore be unified, and I'm sure there'll be a flow-on effect in New Zealand, given the abundance of European product here.

To go through the 80 page document part by part would be too time-consuming and so I'd like to draw your attention to some parts that in my opinion are worth mentioning because of their importance.

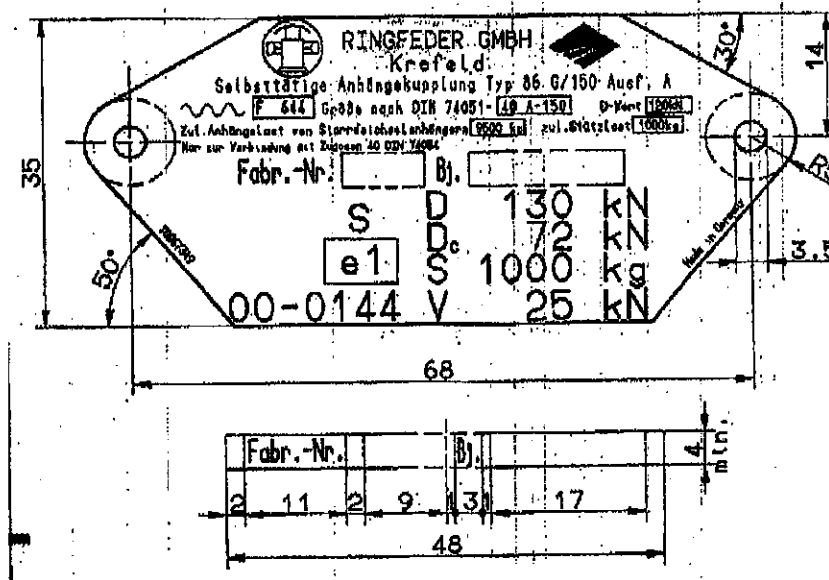


Figure 1

The first diagram (Figure 1) shows the new type of identification tag, which will not only show whether a coupling has been tested to the Directive, rather than the existing DIN standards, but the classification, rating and country of origin information for the unit.

We will briefly touch on the meaning of some of these ratings later, but the information shown on this plate is:

- Date Code Type and Serial Number
- Class of Coupling. S = non-standard 40mm

- D Valve
- Dc Valve
- S Valve
- V Valve
- Country of Origin
- Type approval number –00 Original form of Directive

Before explaining some of these a little further, it is important to note that the Directive exclusively refers to the 50mm bolt coupling as the size which has been standardised, and which should be interchangeable. As an aside, 50mm refers to the eye dimension and not the pin. 40mm couplings are not included in the standardised range, but still can be and are, rated to this new Directive.

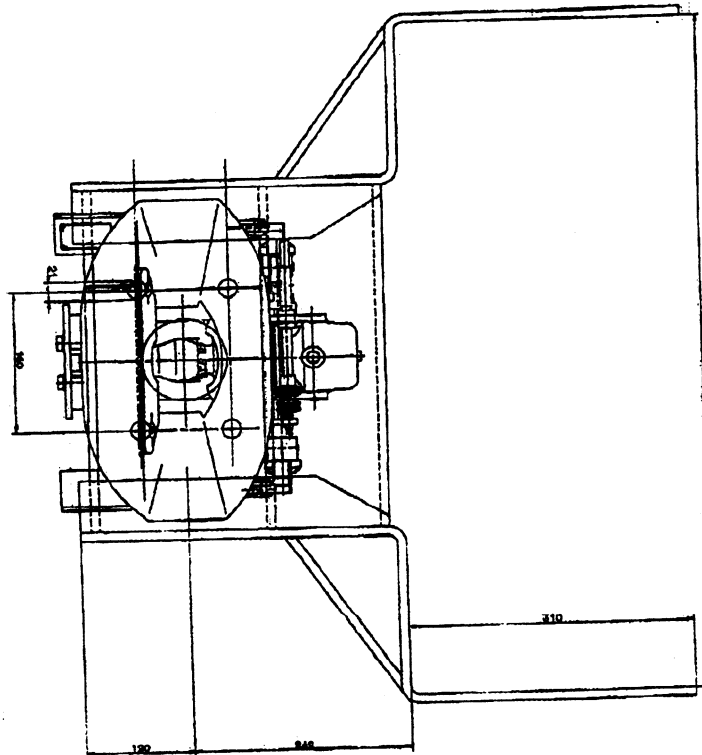


Figure 2: Drawbeam

Drawbeams (Figure 2) are already subject to specific licence in European countries and liable to the same criteria as the couplings themselves, a situation which will also most probably be adopted internationally.

This is being currently contested however as:

- (1) The interface between the vehicle frame and coupling is not clearly defined – cross-members can also be included,

and

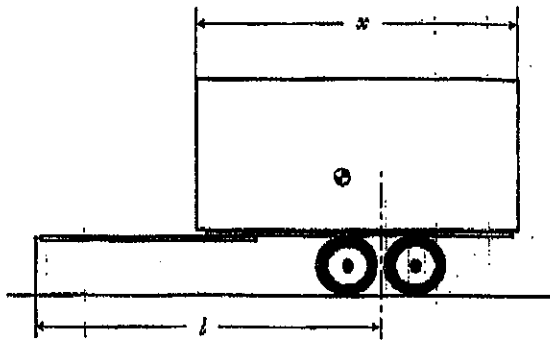
- (2) Many vehicle manufacturers want this to be part of their responsibility.

Probably the most interesting item for New Zealand, as compared to previous EC Directives such as ECE55, is the introduction of new test conditions that now apply. Specifically couplings are now tested to a new DC value and a V valve as well as the well-known but often misunderstood D valve. Both these valves and the S valve (S stands for Static support load) specifically refer to rigid drawbar, centre axle, or pig trailers (figure 3). For hinged drawbar full trailers the D value still applies to couplings and for centre axle rigid drawbar trailers, these new valves will apply.

These trailers are enjoying an increase in popularity in Europe for various reasons, in particular:

- ease of reversing in urban areas
- low cost of manufacture. A lot of these vehicles are now chassis-less in Europe.
- larger volume-capacity for similar axial and longitudinal control.

To explain a little further these terms, "S" is the maximum allowable static load on the coupling. The V valve is made up of a factor "A" which is related to suspension type resilience, "X" which is the load length in metres, "T" which is the drawbar length, and "C" which is the sum of the axle loads when carrying the maximum permissible load in tonnes. It should be noted for your mathematics that X^2/L^2 must be 1 or greater in this Directive, where it is less than 1 in real terms, 1 must be used in the equation.



$$V = a \cdot \frac{x^2}{l^2} \cdot C \text{ [kN]}$$

$a_1 = 1.8 \text{ m/s}^2$ for vehicles with air suspension

$a_2 = 2.4 \text{ m/s}^2$ for vehicles with other suspension

Figure 3

The Dc Valve is calculated in a manner similar to what we've known for D Valve.

$$Dc = g \times \frac{T \times C}{T + C} \text{ (kn)}$$

Note that "T" includes the vertical load of a centre axle trailer drawbar on the coupling. The Dc valve was specifically introduced because for these trailer types the trailer masses are always smaller than for other trailer configurations, and if the standard D valve was used the couplings would be over-dimensioned (larger than necessary).

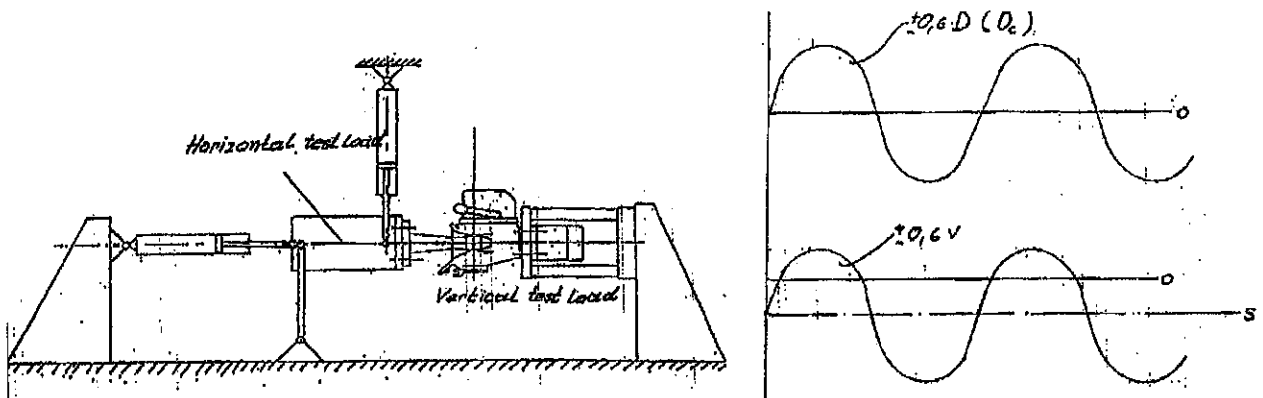


Figure 4

These new load values have been utilising Ringfeder in dual components tests (Slide 4) for their Couplings. That is, horizontally with 0.6D, and vertically with 0.6V. with the amplitude displaced by the S axis. It should be re-emphasised that there is significant difference between the "S" or static support load, which is a theoretical value, and the dynamic vertical load "V" value. This is often misinterpreted in the design applications for these trailer types, but up until now has been accounted for in the coupling specifications, if not on the unit itself.

Ringfeder have tested nearly all of their bolt couplings in accordance with EC94/20 and anticipate completing their testing and obtaining type approval to the new standard before the end of 1996.

This really is only a small portion of what has been a large and very comprehensive project, which in our opinion will have positive effects on safety and pave the way for ease of maintenance and compatibility of components and systems into the next millennium.