



**Ente Nazionale
Meccanizzazione Agricola**

The logo for ENTAM (European Network for Testing of Agricultural Machines) consists of the word "ENTAM" in a bold, serif font, set against a yellow rectangular background.

**European Network for Testing
of Agricultural Machines**

**TESTING SERVICE OF FUNCTIONAL AND SAFETY
CHARACTERISTICS OF AGRICULTURAL MACHINES**

TEST REPORT No. 49 – 001



**AUTOMATIC LIMITER WITH VOLUNTARY DISENGAGEMENT:
H-TLD**

**MANUFACTURER: COMER GROUP S.P.A.
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TESTS CARRIED OUT IN CONFORMITY WITH ENAMA PROTOCOL N. 49, BY:

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FOR AN EASIER INTERPRETATION OF THE RESULTS, PLEASE NOTE THAT:

$$1 \text{ MPa} = 10 \text{ bar}$$

$$1 \text{ kW} = 1.36 \text{ CV}$$

$$1 \text{ m}^3/\text{s} = 3600 \text{ m}^3/\text{h}$$

$$1 \text{ m/s} = 3,6 \text{ km/h}$$

$$1 \text{ l} = 1 \text{ dm}^3$$

C.V. (coefficient of variation) = a parameter indicating the amount of deviation of data with respect to the mean value.

Moment of a force = product of the force times the distance between the direction of the force and the axis of rotation (arm). Unit of measurement = Nm

Technical data

- torque limiter	with automatic re-engagement adjustable from 1500 Nm to 4000 Nm
- disengagement of the drive	using oil under pressure introduced into the device
- power take-off	1"3/8 z6-1"3/8 z21- 1"3/4 z6-1"3/4 z20
- rotation speed	up to 1100 rpm

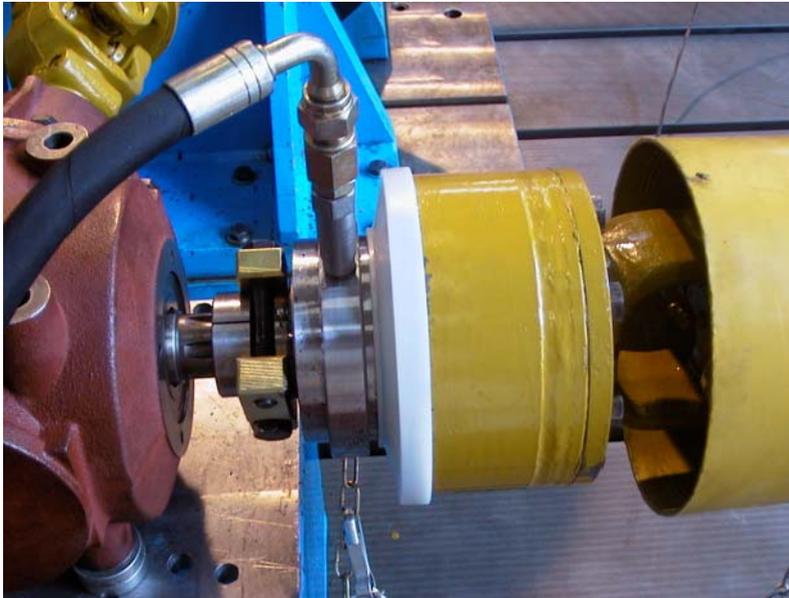


Fig.1 – Hydraulic device

Description

This is a device which is able to disengage the drive each time the operator has to access an area in which there are potential hazards, or in other dangerous situations, such as for example, where someone is in the direct vicinity of pick-up baler, mixer-feeder wagons or similar.

The device consists of an automatic limiter with voluntary disengagement fitted into the kinematic chain of the machine. Information withdrawn from potentially dangerous areas to safeguard, which are defined by the end manufacturer of the machine, is converted and used to actuate the hydraulically controlled axial movement of a disc located inside the device. This movement enables the tangs that transmit the drive to be released, thus

creating a neutral state.

Resetting the drive can only take place by voluntarily re-engaging the device when the p.t.o. of the tractor is stopped and only subsequently bringing it back to speed.

The H-TLD disengaging device has a maximum radial dimension of $\varnothing 176$ mm, an axial length of 182 mm and a weight of approx. 16 Kg .

It has a torque transmission capacity, which can be adjusted to requirement, of between 1500 and 4000 Nm, with rotation speeds that must not exceed 1100 rpm.

The voluntary disengagement of the drive is activated when oil is introduced into the rotating distributor (3) at a pressure of between 25 and 50 bar inclusive, based on the maximum torque it can transmit.

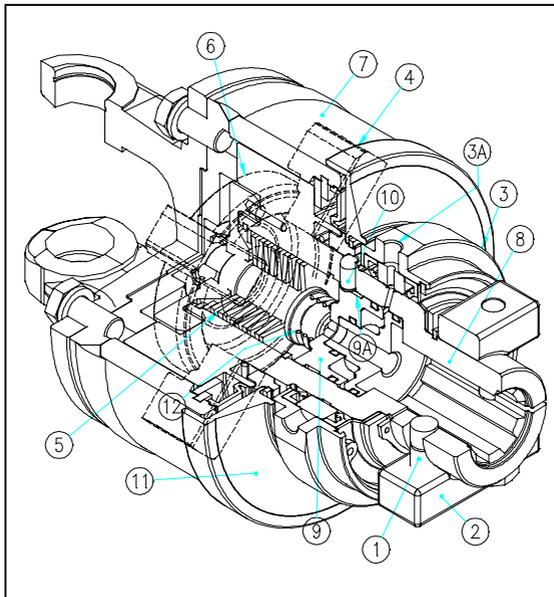


Fig. 2 – Drawing of the device and its components (see text for legend).

Figure 2 illustrates the various components of the disengaging device. The device transmits the drive from the body (7) to the hub (8) by means of the tangs (4) inserted into longitudinal slots in the body itself; these are kept in position by adjustable tension springs (5) via the disc (6). When the torque absorbed from the hub (8) exceeds the calibration value, radial centripetal force is generated on the tangs (4), winning the action that the springs (5) exert through the disc (6). The tangs are therefore radially withdrawn from the longitudinal slots in the body (7), disengaging the drive. For the tangs to be returned to the torque transmission position, the rotation speed must be reduced to below 250 rpm and then can be returned to working conditions.

To disengage the drive independently of the torque absorbed, oil is introduced under pressure to the rotary distributor (3) generating an axial shift on the piston (9) fitted inside the hub (8) and integral to the disc (6), which overcomes the tension of the springs (5) when it moves. At this point the tangs (4) are free to exit the longitudinal slots of the body (7). Contemporaneously the securing pins (10) descend in the neck (9A) in the piston itself (9) enabling the sleeve to be withdrawn (11); this re-covers externally the apertures where the securing pins are housed (10). In this way the pins are not able to release themselves from the neck (9A) any longer and therefore prevent the piston (9) and the disc (6) integral to it from

returning to their initial position, even in the absence of hydraulic pressure. To transmit torque again the drive must be arrested, then the sleeve (11) pushed towards the body (7) enabling the pins (10) to exit the neck (9A) and the piston (9) to return to its initial position under the action of the return spring (12).



Fig. 3 – The hydraulic device during the tests on the test bench.

Test results

The results of the tests reported in tables 1 and 2 were obtained using the device both as a torque limiter and as a voluntary disengaging device. The tests were carried out using a test bench composed by the following:

- transmission chain,
- brake,
- dynamometer,
- rev-counter

The tests were carried out at the following temperatures:

- ambient temperature: +20°C
- hydraulic oil temperature: +20°C

Speed (rpm)	Continuous moment transmitted (Nm)	Maximum moment transmitted (Nm)
300	0	1803
540	0	1849
1000	0	1831
300	700	1810
540	800	1784
1000	500	1819
300	1400	1780
540	1300	1775
1000	900	1836

Table 1 - Operating as a limiter

Speed (rpm)	Continuous moment transmitted (Nm)	Torque interruption time * (sec.)	Hydraulic pressure ** (bar)
350	0	Of no significance	33
540	0	Of no significance	40
1000	0	Of no significance	35
350	600	0.04	32
540	600	0.04	31
1000	500	0.04	32
350	1000	0.04	39
540	1000	0.04	37
1000	900	0.04	38

Table 2 - Operating as a voluntary disengagement device

(*) interruption time of the torque measured from the instant in which the control piston has completed its movement. The time taken by the piston to carry out its movement depends on the controlling hydraulic circuit.

(**) in this test the disengaging pressure remained constant and equal to the min. value necessary, without any reduction of the same being noted when increasing the torque transmitted.

Application Instructions

The H-TLD disengaging device can be fitted to any power take-off shaft with a splined profile according to standard DIN 9611 (and more generally with

splined shafts of a max diameter of 45 mm and smooth shafts with tang of a max diameter of 40 mm) independent of the device to which the shaft itself belongs. Therefore, it can be used in upgrading operations on existing used

machines equipped with any transmission unit.

The device must be locked onto the input shaft of the power transmission (PIC) of the operating machine by securing the locating bolts (1) on the contact bridges (2). The distributor (3) must be secured to an element that prevents it from rotating through the aperture M6 made in it. Finally the distributor (3) must be connected to the hydraulic circuit using one of its two G1/8" threaded apertures (3A). The maximum hydraulic oil pressure must be adjusted between a minimum of 25 and a maximum of 50 bar, based on the calibration setting as an automatic limiter.

When the disengaging device acts as a torque limiter it intervenes automatically disengaging the transmission whenever an increase in torque that exceeds the calibration value takes place, thus safeguarding the machine itself, the cardanic transmission and the reduction gear components. As with the mechanical version, it has the advantages of a reliable, repetitive system, with automatic re-engaging, even if the p.t.o. rotation speed must be reduced to a minimum until the device is reactivated before returning to normal working conditions.

When the device acts as a voluntary drive disengagement, it comes into operation when a valve is activated that allows oil to be introduced at the set pressure into the branch of the circuit that is connected via the aperture (3A) on the distributor (3), in case of emergency or because the operator

needs to access a potentially hazardous area. The voluntary action causes the disengagement of the drive which can be re-set only after stopping the rotation of the power take-off and manually re-engaging the sleeve (11). After the safety device has been re-set, the tractor p.t.o. can be re-activated, returning the rotation speed to the desired working speed.

Comments on the functionality

The results of the tests carried out formed the basis of the following considerations:

- As a torque limiter, the device presents a capacity of intervention to a maximum value which is more or less constant, independently of the load absorbed from the test bench (which represents the operating machine) and of the operating speed.
- As a voluntary disengaging device, the drive interruption time remains constant independently of the load absorbed from the test bench (which represents the operating machine) and of the operating speed.

THE PRESENT TEST REPORT, REGARDING THE AUTOMATIC LIMITER WITH VOLUNTARY DISENGAGEMENT, MODEL H-TLD, IS VALID FOR FIVE YEARS OR UNTIL THE REGULATIONS REFERRING TO IT ARE MODIFIED, AND IS OFFICIALLY RECOGNISED BY THE MEMBERS OF ENAMA:

**ASSOCAP (Associazione Nazionale dei Consorzi Agrari)
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UNIMA (Unione Nazionale Imprese Meccanizzazione Agricola)**

AS WELL AS BY THE BOARD OF GOVERNORS OF ENAMA IN WHICH THE FOLLOWING ARE ALSO REPRESENTED:

**MIPAF (Ministero per le Politiche Agricole e Forestali)
Regioni e Province Autonome
ISMA (Istituto Sperimentale per la Meccanizzazione Agricola)**

THE TEST RESULTS ARE RECOGNIZED BY THE FOLLOWING TESTING STATIONS BELONGING TO ENTAM, WITH THE FOLLOWING NUMBERS:



BLT - Bundesanstalt für Landtechnik n° I – 003/02
(Rottenhauserstraße 1, A-3250 Wieselburg,
AUSTRIA)



DLG - Deutsche Landwirtschafts-Gesellschaft e. V. n° I - 5006
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FAT – Eidgenössische Forschungsanstalt für n° I – 03.02
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