



Information Note on PTO Drive Shafts and their Guards

The correct guarding of PTO drive shafts plays a crucial role in the safe use of agricultural machinery.

This note sets out the legal and technical framework which applies to the manufacture and sale of these products when independently placed on the market i.e. the units are being made available as individual units rather than being provided as part of a machinery package.

It is not possible to tell from physical appearances alone whether a product satisfies all the requirements of the legislation so it is useful to do a cross-check on markings and documentation to get a better sense of the manufacturer's attention to detail.

In order to understand the documentation it is necessary to appreciate the legal context.

PTO drive shafts are sometimes referred to as removable mechanical transmission devices.

Legislation

The Machinery Directive 2006/42/EC sets out the requirements for placing machinery on the European single market. It defines machinery under a number of categories one of which is “removable mechanical transmission device” and it states that when such a device is placed on the market with a guard, it shall be regarded as one product.

The Directive in its Annex V includes “guards for removable mechanical transmission devices” in the list of safety components.

The effect of the above declarations means that when PTO guards or combined PTO drive-guard units are made available for sale on a stand-alone basis, they are subject to the Machinery Directive, require being CE-marked and accompanied by a Declaration of Conformity and Instructions for Use. Also section 3.4.7 of Annex 1 to the Directive sets out a number of design requirements to be met for the transmission of power between self-propelled machinery (or tractor) and recipient machinery. These relate to:

- a. Whole length protection in respect of moving parts,
- b. Protection at the PTO of the tractor/self-propelled machinery ,
- c. Ability to open the guard to access the shaft,
- d. Sufficient clearance between the drive shaft and its guard so that the shaft does not damage the guard,
- e. Provision of a protective casing on shaft end for the recipient machinery
- f. Torque limiters/freewheels may be fitted to universal joint transmissions only on the side adjoining the recipient machinery,
- g. Recipient machinery must have means to protect the drive unit from damage when it is uncoupled,

- h. Prevention of guard rotation,
- i. Guard must cover the transmission to the ends of the inner jaws in the case of simple universal joints and at least to the centre of the outer joint or joints in the case of wide-angle universal joints,
- j. Measures to prevent shaft guard being used as steps if the machinery is provided with a means of access close to the drive unit unless the guard is designed and built for that purpose.

The Machinery Directive also sets out the requirements for manufacturers to demonstrate the conformity of their equipment with the Directive and for certain equipment listed in its Annex IV, particular procedures must be applied. This annex lists “both removable mechanical transmission devices including their guards” and “guards for removable mechanical transmission devices”.

For Annex IV equipment the options are as follows:

1. If the product is manufactured in accordance with a harmonised standard and that standard covers all the relevant essential health and safety requirements, the manufacturer can use one of the following:
 - a. Procedure for assessment of conformity with internal checks as provided in Annex VIII;
 - b. EC Type Examination (Annex IX) plus internal checks as per Annex VIII, point 3;
 - c. Full quality assurance as per Annex X.
2. If the product has not been manufactured in accordance with harmonised standards, or only partly in accordance with such

standards or if the harmonised standards do not cover all the relevant essential health and safety requirements or no harmonised standard exists for the product, then one of the following procedures must be applied:

- a. EC Type Examination (Annex IX) plus internal checks as per Annex VIII, point 3;
- b. Full quality assurance as per Annex X.

General technical requirements are set out in the essential health and safety requirements in Annex 1 to the Directive but for many products, the manufacturer can presume conformity with the Directive if they follow a harmonised standard i.e. a standard which has been referenced in the Official Journal of the European Union.

The Machinery Directive has been transposed into Irish law by the 2008 European Communities (Machinery) Regulations [S.I.No.407 of 2008] for which the Health and Safety Authority (HSA) are the competent authority.

Under the Directive the manufacturer can provide to another party a written mandate to perform all or part of their duties connected to the Directive; this party is known as an "authorised representative" which should not be confused with the term "authorised dealer".

The design, manufacture, import or supply of these products is also addressed by section 16 of the 2005 Safety, Health and Welfare at Work Act which requires compliance with any national legislation implementing a European Directive.

Standards for PTO Drive Shafts and their Guards

There are two standards listed in the EU Official Journal:

EN 12965:2003+A2:2009 -Tractors and machinery for agriculture and forestry-Power take-off (PTO) drive shafts and their guards-Safety; and

EN ISO 5674:2009 - Tractors and machinery for agriculture and forestry-Guards for power take-off (PTO) drive-shafts-Strength and wear tests and acceptance criteria.

EN 12965:2003+A2:2009 in its Annex ZB lists a number of essential health and safety requirements for which the standard does not provide a presumption of conformity.

These are:

- 1.3.3 dealing with risks due to falling or ejected objects
- 1.7.3, first and second indent of first paragraph which deals with marking issues related to the name and address of the manufacturer and designation of the machinery,
- 1.7.4.2 (q) which deals with the content of the instruction manual concerning the method to be followed in the event of accident or breakdown,
- 1.7.4.2 (t) which deals with the content of the instruction manual concerning specification of spare parts,
- 1.7.4.2 (u) which deals with the content of the instruction manual concerning airborne noise emissions.

EN ISO 5674:2009 focuses on strength and wear tests and its Annex ZB identifies a number of essential health and safety requirements for which the standard provides a presumption of conformity.

Marking of PTO Guards

The minimum information that must, by law, be marked legibly and indelibly (i.e. not just a sticky label) on the guard for a PTO drive unit is:

- CE marking
- Name and full address of the manufacturer[and authorised representative if applicable]
- Designation of series or type
- Year of construction
- Indication as to which end of the drive shaft is to be linked to the tractor.

Declaration of Conformity

A declaration of conformity must be supplied as part of the documentation accompanying the equipment. It may exist as a separate document or form part of the instruction manual. This declaration should clearly identify

1. the business name and full address of the manufacturer and, where appropriate the authorised representative;
2. name and address of the person authorised to compile the technical file who must be established in the EU;
3. description of the type of equipment;
4. a sentence expressly declaring that the product fulfils all the relevant provisions of the Machinery Directive;
5. where appropriate, the name, address and identification number of the notified body who carried out the EC type examination and the number of the EC type examination certificate;

6. where appropriate, the name, address and identification number of the notified body who approved a full quality assurance system;
7. where appropriate, the harmonised and other standards used for the manufacture of the unit;
8. place and date of declaration;
9. identity and signature of the person empowered to draw up the declaration on behalf of the manufacturer/authorised representative.

Instruction Handbook

The product must be supplied with an instruction handbook that contains comprehensive information on the maintenance, transport, safe use, safe system of work and any relevant extra precautions and special equipment.

In particular the handbook should cover:

1. Explanation of any symbols;
2. Instructions for putting into service including where necessary how to cut the guard and shaft to the correct length;
3. Precise instructions on the maintenance and lubrication of the guard, the shaft , any overrun devices or torque limiters;
4. Foreseen uses of the guard and shaft including maximum allowable angles and the relationship between the size of the drive shaft and the type of master shield;
5. Warnings not to use the drive shaft either without a guard or with a damaged guard; also not to use the unit without using the restraining devices properly;
6. The need to support the shaft when it is not in use and not use the restraining devices for this purpose;

7. The necessity to replace damaged parts;
8. Warning not to use non-compatible parts;
9. Information about the attachment of the restraining system;
10. Checking the handbook of the recipient machinery if the use of accessories such as torque limiters or overrun devices is required;
11. Warning not to use the drive guard as a step;
12. Nominal power in kW to be transmitted by the drive shaft and nominal speed of rotation;
13. Nominal torque of the drive shaft;
14. Instructions for fitting of drive shaft onto the PTO of the tractor/self- propelled machine;
15. Prevention of damage to guard from draw bars and lower links;
16. Instructions for guard replacement.

Sources of further information

Irish legislation may be sourced on the HSA website at www.hsa.ie

Comprehensive information on the Machinery Directive may be found at http://ec.europa.eu/enterprise/sectors/mechanical/machinery/index_en.htm

Standards may be purchased through the National Standards Authority of Ireland at www.nsai.ie