0.6.1 PRESSURE EQUIPMENT DIRECTIVE

Pressure Equipment Directive is a directive (2014/68/EU) issued by the European Union and transposed in Italy by Legislative Decree No. 93/2000. Until May 30, 2002 it was possible to retain the existing Italian legislation and, from that date, the PED has become mandatory and replaced the previous provisions.
PED governing the design, construction, equipment and installation of pressure devices in safety.
In the field of application of the law are included, for example, pipes, hydraulic valves and vessels under a relative pressure greater than 0.5 bar.
Equipments under pressure with greater pressure of 0.5 bar must be subjected to a preliminary examination to assess whether they fall within the scope of PED and if they are subjected to the requirements of compliance, audit and attestation required by the Directive.
If the preliminary examination is successful, equipments under pressure must satisfy the essential requirements of Annex I of the Directive and then must recive the CE mark followed by the number of notification of the Notified Body.
The PED directive concerns exclusively the marketing of the pressure equipments, in the European Community, but gives no indication on the requirements relating to operation and maintenance of them, which are governed by national regulations.
In Italy all installations of pressure equipments subject to the PED directive must be communicated to the relevant offices of ISPESL or ASL (D.M. n. 329/04).
The Directive has introduced the concept of a Notified Body, which was absent in the field of pressure equipment, such as certifying body for the activities of construction of pressure equipments. The nomenclature has also been enriched by expressions such as "pressure equipment", meaning by this expression each part subject to an internal pressure (piping, pressure vessels, etc.), "pressure accessories" and "safety system", instruments that are aimed to limit the pressure in certain circumstances.
PED identifies the manufacturer as the solely responsible of the production process, assisted in some activities by the Notified Body. Last important innovation was the inclusion of a dedicated procedure for manufacturers operating in certified quality system ISO 9001/2008.
Fall within pressure equipments subjected to PED directive the following single equipment and their assemblies:

- containers: housing designed and built to contain fluids under pressure such as compressors, autoclaves, condensers, gas or steam vessels, reactors, heat exchangers, LPG spheres, etc.
- pipelines: understood as a pipe or system of pipes for the transport of pressurized fluids including any pressure-bearing components such as dismantling joints, expansion joints, flanges, fittings etc.. It does not include for example the water pipes for oil or gas (see paragraphs below);
- pressure accessories: hydraulic valves such as gate valves, butterfly valves, air valves, non-return valves, etc.
- safety controls: devices designed to protect pressure equipment against exceeding the allowable limits, and these include:
- devices for direct pressure limitation: safety valves, burst disk devices, folding bars, controlled safety devices used for the discharged pressure (CSPRS);
- limiting devices that activate control systems or that close and disable the equipment: switches, thermostats, fluid level sensors, security devices for measuring, control and regulation (SRMCR).
- sets: consisting of various pressure equipments assembled by a manufacturer to constitute an integrated and functional assembly.

The PED requires manufacturers to identify the level of dangerousness of the equipment built. They are required to recognize the risks due to pressure and then to design and build the equipment taking into account this analysis. The threat level is linked to the concept of energy stored in the equipment.
The stored energy is evaluated on the basis of the following parameters:

- size of equipment (volume V in liters in the case of vessels, diameter DN in millimeters in the case of pipes);
- maximum working pressure (PS): maximum pressure in bar, for which the equipment was designed, according to manufacturer's specifications.
- minimum/maximum working temperature (TS): minimum/maximum temperature for which the equipment was designed, according to manufacturer's specifications.
- fluid: pure gas, liquid, vapor or mixtures thereof. They are classified as
- fluids in Group 1: dangerous. Belong to this group the fluid
  explosive
  toxic
  flammable
  oxidizing
- fluids in Group 2: non-dangerous. Belong to this group all those who do not fall into Group 1.

Operating conditions and installation.
According to Annex II of the Directive, depending on the type of equipment under pressure (pipe, vessel, accessories), the parent group of the fluid (dangerous or not dangerous), the physical state of the fluid (gas, liquid) and result of the calculation of PS x V, in the case of containers, PS x DN in the case of vessels, there are nine tables through which you can define the risk category (I, II, III, IV) of the component, equipment or assembly.
Equipment or assembly acquire the most severe category of risk between the risk categories of pressure equipment of which they belong, while safety accessories are automatically classified in category IV, which corresponds to that of maximum risk.
For the vessels and piping results:

Fluids	Containers	Pipes
gas group 1	table 1	table 6
gas group 2	table 2	table 7
liquid group 1	table 3	table 8
liquid group 2	table 4	table 9

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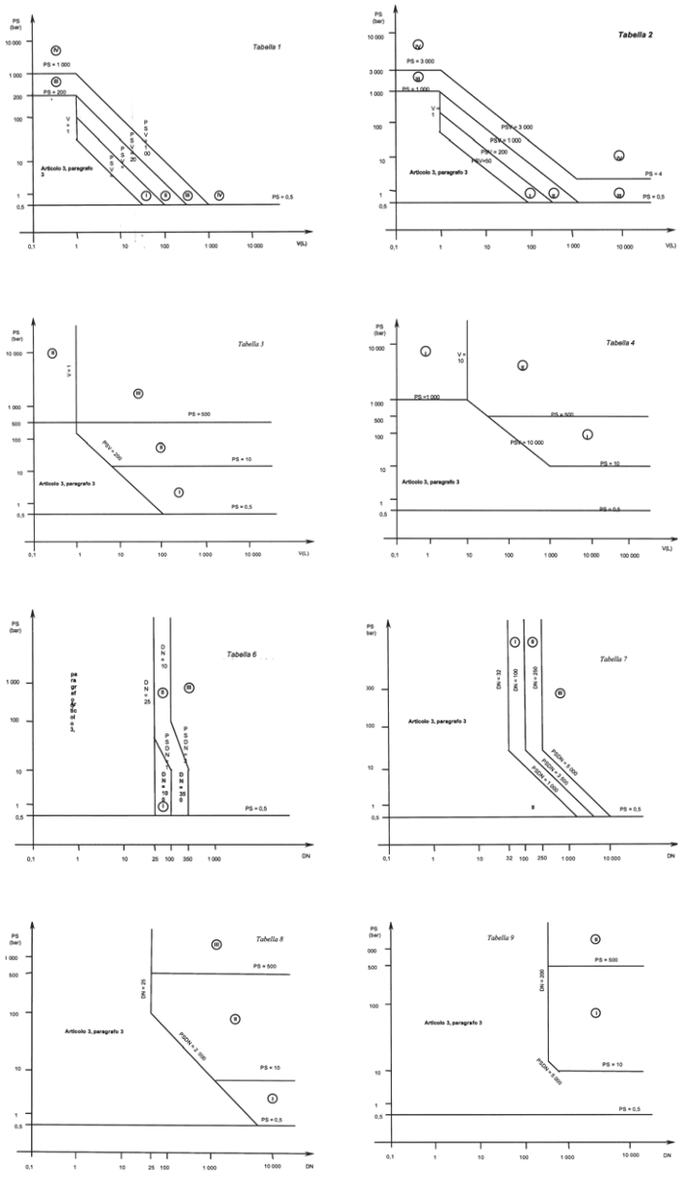
Depending on the risk category of pressure equipment, EC certification procedures vary according to the Pressure Equipment Directive.

- In the case of low limits of dangerous equipment (as provided in Article 3, paragraph 3 of the Directive), it will bear no EC marking, so you can place the product on the market accompanied by the necessary information to the purchaser for an appropriate use of the equipment. Up



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to 1,000 bar, the accumulators under a liter capacity are excluded (or better within article 3, par. 3).

- for classes I, II, III, IV is required to issue the Declaration of Conformity and stamp the EC mark, an operation that, for classes II, III and IV is authorized by the Notified Body. In order to stamp the mark, the manufacturer, in each construction phase, must follow the requirements more demanding with increasing risk class. These requirements vary according to the product supplied.

For class I, which covers less dangerous equipments, it is mandatory EC certification without the intervention of the Notified Body. In fact, the PED allows the "self-certification", that is EC marking of the equipment according to the preparation of a technical file able to demonstrate that are satisfied the essential requirements set out in Annex I of the Directive and also justifies the membership product to category I, accompanied by a declaration of conformity issued by the manufacturer and purchaser intended.

The requests are more heavy in higher classes, up to class IV, in fact:

- for Class II is mandatory EC certification issued by a Notified Body which, without considering the merits of the design, shall carry out the monitoring of production in the manner chosen by the manufacturer;
- for Class III is mandatory EC certification issued by a Notified Body. If the manufacturer has not certified its quality system including the design, there is also the execution of extensive tests on the prototype which will bear the EC mark;
- for the risk class IV is required the highest level of design and production control. We refer to the safety system (automatically) and sets consisting of vessels + pipelines that use dangerous fluids at high pressures. Class IV is never reached in the case of fluids in Group 2 with vapor pressure less than 0.5 bar (ie: water at temperatures below 110°) whatever the size of the equipment.

Directive 2014/68/EU applies only to the productive activities of the equipment under pressure and its sale. The use of the equipment does not fall directly into the European directive, but every State has adopted specific legislation for this purpose. In Italy the rule regarding the use of pressure equipment is the D.M. n° 329 of 01/12/2004.

The user of the component must still obtain the documents relating to the accumulator and should enclose them at the side of the machine.

0.6.2 RELEVANT LEGISLATION

- PED - Directive 2014/68/EU (published in Official Journal of the European Communities NL181 / 1 of 09.07.1997) certification of pressure equipment and assemblies placed on the European Community market.
- Legislative Decree No 02/25/2000 93 - Implementation of Directive 92/23/EEC concerning pressure equipment.
- Decree Law No. 329, 01/12/2004 (Published in the Official Journal of General Series No. 22, 28/01/2005) - Regulations for the commissioning and use of pressure equipment and assemblies referred to Article 19 Legislative Decree 25 February 2000, No 93. - certification of pressure equipment and assemblies placed on the European Community market
- T-PED Directive - Directive 99/36/EC (D. Lgs. No. 23 of February 2, 2000) - certification of transportable pressure equipment.

0.6.3 CERTIFIED PRESSURE EQUIPMENT

Gas Accumulators

The accumulators are to be regarded as vessels containing a liquid and a gas, according to Art. 8, paragraph 3, when a vessel is composed of several compartments, it must be classified according to the fluid results in the highest category, should then consider the case of a vessel with gas of group 2 (Nitrogen, gas not dangerous). The classification uses the diagram described in Table 2 of Annex II of the PED

Each accumulator, as it is a pressure vessel, must be provided with a safety valve.

The safety valve can be mounted on the nitrogen side or on the oil side. When the installation location of the accumulator is provided for the fire risk, you must also install a safety device on the gas side (safety valve type VS214/VS215 or burst disk type DR / ....) calibrated at a pressure equal to or less than the PS, and / or a fusible disk DF / ... calibrated at a temperature equal to or less than the maximum TS max.

On the pipe that connects the accumulator to the system, you must mount a shut-off device, accompanied by the corresponding discharge.

Pressure relief valves

The pressure relief valves (or security valves) are special accessories directly limiting the pressure in the system. They are therefore part of the "safety system" (art. 1 par. 2.1.3) and must meet the requirements of Annex I of the Directive and be CE marked.

0.6.4 DOCUMENTATION

Each product must be accompanied by:

- Declaration of CE Conformity
- operating and maintenance manual.

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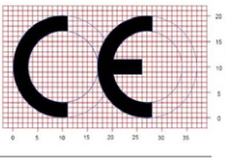

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