



## Summary of European Machinery Directive 2006/42/EC and Related Directives - Updated February 2013

---

### *And their Applicability to Sun Products*

The information below is intended to give readers a short, practical summary of some of the CE regulations that may be applicable to fluid power equipment when installed on a machine and destined for European Union countries, or countries requiring compliance to the European Machinery Directives. Sun Hydraulics, for the most part, supplies components [exceptions are noted in the paragraphs below], and these hydraulic components on their own do not have a complete function, are not CE Marked or subject to the requirements of the Machinery Directive. This document is not all inclusive; additional information relating to the Machinery Directive 2006/42/EC and applications utilizing hydraulic components is available at: [www.cetop.org](http://www.cetop.org) (Choose: Publications, then Position Papers PP07) and [Guide to application of the Machinery Directive 2006/42/EC](#).

### **Historic Perspective:**

In 1989 the European Union [EU] passed legislation to create harmonized standards (Directives) throughout member participating countries defining standards of safety and performance that various types of equipment must meet when being used in EU countries. The first Machinery Directive was 89/392/EEC. Over the next few years the directive was changed and/or modified to introduce a consistent approach to marking, documentation and enforcement; amended in 1991 [91/368/EEC], and twice in 1993 [93/44/EEC, 93/68/EEC]. Machinery Directive 93/68/EEC became effective 1 January 1993, and this is the Directive that had the most impact on hydraulic equipment. In 1998 the European Union introduced Machinery Directive 98/37/EC which is a consolidation of the previous directives into one document, but made no changes in the actual requirements. This was done to overcome existing technical trade barriers, simplify free trade, and try to create a genuine single market. Machinery Directive 2006/42/EC is the latest directive, which became effective 29 December 2009. The new Directive's philosophical thrust is about designing, manufacturing, building and safely using the machine, etc., as summed up in Paragraph 1.1.2 of the Directive: "Machinery must be designed and constructed so that it is fitted for its function; and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under conditions foreseen, but also taking into account any reasonably foreseeable misuse thereof. The aim of measures taken must be to eliminate any risk throughout the foreseeable lifetime of the machinery, including the phases of transport, assembly, dismantling, disabling, and scrapping." The new Machinery Directive also incorporates changes to include a broader applicability to more European countries, and continue towards a technically harmonized and uniform European market. This newest standard further **replaces the Manufacturer's Declaration Document with a Declaration of Incorporation**. The Conformity European Mark, CE, is the symbol adopted to signify compliance to the harmonized European standards.

Under the new Machinery Directive, 2006/42/EC, the definition of "machine" includes the original definition as "An assembly of linked parts or components, at least one of which moves through some type of actuator, with associated power and control circuits, joined together for a specific purpose in the processing, treatment, moving, or packaging of a material." But 2006/42/EC adds the following: "including: 1) machines, 2) interchangeable equipment, 3) safety components, 4) lifting accessories, 5) chains, 6) ropes and webbings, 7) removable mechanical transmission devices, and 8) partly completed machinery." A Declaration of Incorporation must be provided for "partly completed machinery" as defined in 2006/42/EC, if it is not already CE marked.



Paragraph 35 of the Machinery Working Group of the European Commission has determined "Fluid power components on their own that are not CE Marked are not considered partly completed machinery, and thus excluded from the scope of the Machinery Directive. The design, construction and performance of these fluid power components must enable the final machine into which they are incorporated to comply with the Machinery Directive for performance, health and safety." There are certain machinery situations where other Directives may need to be considered for fluid power components, such as; Simple Pressure Vessels (2009/105/EC), Electromagnetic Compatibility (2004/108/EC), Personal Protective Equipment (89/686/EEC), Low Voltage Equipment (2006/95/EC), Pressure Equipment (97/23/EC), and Hazardous Materials (2002/95/EC).

For the purposes of the Machinery Directive, a **Safety Component** is a component, sold separately, specifically designed, manufactured and marketed to perform a safety related function, and as such it is CE Marked (see Pressure Directive 93/23/EC below for additional information). **Standard** fluid power components used in a safety system would not be classified as safety components in their own right.

### **CE Marking**

CE Marking is not generally applied to the individual components as noted above, but only to the complete machines and systems as defined in the Machinery Directive. The overall machine must carry a CE Marking, indicating compliance with the appropriate Machinery Directive(s). Machine manufacturers, or their authorized representatives, normally indicate compliance by means of self-certification, although there are a few exceptions. The "machine" manufacturer will need to have a **Technical File** on the product and an overall **Machine Declaration of Conformity** to the Machinery Directive, which is available to market inspectors. Although it is not necessary for all documentation to be made permanently available in material form [e.g. in hard copy or electronic form], it must be provided when asked for by the notified governing body. Under the Machinery Directive, the CE Mark does not apply to individual fluid power components (some exceptions for fluid power safety related items and integrated electronic components), as these components cannot perform any function in the sense of the Machinery Directive without being fully installed into a "partially completed machine or complete machine" as defined by the Machinery Directive.

To create the **Technical File**, all individual components coming under the jurisdiction of the Machinery Directive being used to assemble the "machine" must be supported by either a CE Marked component or a **Declaration of Incorporation** which certifies that the component or "partially completed machine" is suited for assembly into a "machine" in the sense of the Machinery Directive. As stated above, it has been determined that most fluid power components such as individual valves, standard solenoid valves [not incorporating integral electronics] and manifold assemblies (consisting of multiple fluid power components) do not require a **Declaration of Incorporation**.

### **Pressure Equipment Directive 97/23/EC**

Certain pressure containing vessels and systems, where the pressure is above 7.0 psi or 0,5 bar, and the pressure-volume product exceeds a specified factor, must be protected from exceeding design pressure requirements to ensure safety. The Pressure Equipment Directive [sometimes referred to as PED] defines, based on fluid type and pressure-volume product, what protection must be implemented. The manufacturer of the complete machine is obligated to analyze the hazards that may evolve with the application of his machine, and ensure that it is safe for use under reasonably foreseeable conditions, and then declares that the machine conforms to the Directive(s).



Fluid power products that are specifically designated and tested to limit pressure or perform a specific safety function, are classified as "safety relevant," and may be CE Marked. Sun Hydraulics has available a limited offering of direct acting pressure relief valves meeting the requirements of "Safety Accessories" as classified under Category IV of the Directive. These valves are CE Marked and TUV approved as individual components. The model numbers for the CE marked valves are: RDDT-Q\*\* and RDFT-Q\*\*, with additional technical information available at [www.sunhydraulics.com](http://www.sunhydraulics.com).

### **Electromagnetic Compatibility Directive 2004/108/EC**

For general market electro-hydraulic products not having a direct machine function in the sense of the Machinery Directive, the product does **NOT** fall under the scope of the Electromagnetic Compatibility Directive [EMC] and need not be certified. An example of this type of product is solenoid operated switching valves (AC and DC).

If a product has potential electromagnetic compatibility issues, either conducted or radiated, and/or is susceptible to electromagnetic radiation or generation thereof, or performs a function on its own in the sense of the Machinery Directive, then appropriate measures must be taken to ensure compliance to the required EMC Directive protection levels. Typical electro-hydraulic products will need to comply with EN 61000-6-2, EN 61000-6-4, [heavy industrial] or EN 61000-6-1 and EN 61000-6-3 [light industrial]. If these protective measures are done within the component itself, then a CE Mark may be affixed to the component and/or the **Manufacturers Declaration of Conformity**, certifying it passes the requirements of the EMC Directive in isolation (example: proportional valve with integrated amplifier electronics). However, when the component is installed on the complete machine, the wiring and routing thereof may contribute to the electro-magnetic signature, and negate the individual component compliance. Testing can be done by suitable measures in the final installation on the "machine," and the overall machine then certified to meet the EMC Directive. The **EMC Directive does not permit self-certification of components**.

Sun's electro-hydraulic products incorporating electronic amplifiers integral with the coil are all CE Marked as per EMC Directive 2004/108/EC. They comply with the requirements of EN 61000-6-2 and EN 61000-6-4 for Industrial Heavy Duty environments [e.g. radiated electro-magnetic field immunity > 10V/m, etc.]. These products are [Sun base Model Code in brackets]: Embedded Electronic Proportional Valve Coils [790-\*\*\*\*].

Sun's hydraulic products with active element position monitoring incorporate an electronic position switch. Sun cartridge valves with a "Z" in the 5th position in the model code are supplied with an electronic position switch. The electronic switch in these products is CE Marked per the EMC Directive and complies with EN 61000-2 and EN61000-4 for Industrial Heavy Duty environments [e.g. radiated electro-magnetic field immunity > 10V/m, etc.]. Examples of these are: Logic Element Position-Monitored Valves [LO\*\*-Z\*\*and LK\*\*-Z\*\*] and Solenoid Operated Position-Monitored Directional Valves [DAAL-Z\*\*, DBAL-Z\*\*, DTCA-Z\*\*, DLDA-Z\*\*, DMDA-Z\*\*, and DNCA-Z\*\*]. Note, valves incorporating electrical position monitoring are **NOT CE Marked as a Safety Component**. See [www.sunhydraulics.com](http://www.sunhydraulics.com) for detailed information on the above products and CE Certification.

### **Low Voltage Directive (2006/95/EC)**

The Low Voltage Directive covers all products using electric voltages between 50 to 1000 VAC and 75 to 1000 VDC. The Directive requires protection from electrical shocks and high surface temperatures. Fluid power products fall under the scope of this Directive. Surface temperatures on solenoids may reach levels causing skin damage and protection may be required. The Directive requires "redundant protection" against electrical shocks; single insulation is not acceptable by itself. A protective ground is most commonly used. Products



using voltages in the specified range must have a third lead and/or connector, providing a direct path to ground. Sun solenoid coils rated for operation at or above the Directive low limit incorporate a protective third terminal directly connected to the metallic body of the coil for external grounding purposes via the ISO/DIN 43650 electrical plug interface.

Further, EN 60204-1:2006 Section 6.4.1. PELV [Protective Extra-Low Voltage] stipulates electrical devices rated below voltages of 25 VAC and 60 VDC must also comply with the requirements of a protective bonding circuit when the equipment is normally used in dry areas and when large area contact with live parts and the human body is not expected. Nominal voltage shall not exceed 6 VAC or 15 VDC in all other cases.

Sun coil models utilizing an ISO/DIN 43650 electrical plug with grounding third lead comply with 2006/95/EC and EN 60204-1:2006 and are: 12VDC: 770-212; 14VDC: 770-214; 24VDC: 770-224; 28VDC: 770-228; 36VDC: 770-236; 48VDC: 770-248; 24 VAC: 770-297; 115 VAC: 760-211, 770-211; 230 VAC: 760-223, 770-223; 127 VDC: 770-299; 220 VDC: 770-298. The following Sun coils are CE Marked: 770-212 [12VDC], 770-214 [14VDC], 770-224 [24VDC], 770-236 [36VDC], 770-248 [48VDC], 770-297 [24VAC], 770-211 [115VAC], 770-223 [230 VAC], 770-299 [127 VDC] and 770-298 [220 VDC].

### **Hazardous Substances Directive (2011/65/EU)**

This Directive covers the Restriction of Hazardous Substances (RoHS) compliance covering the use of certain hazardous materials in electrical equipment designed for use with a voltage rating not exceeding 1000 VAC and 1500 VDC. The intent of this Directive is to discourage electrical/electronic equipment use of heavy metals, to combat environmental pollution, and to protect human health. The original Directive took effect on 1 July 2006, and the latest change, 2011/65/EU, took effect 3 January 2013. It is focused at mercury, cadmium, lead, chromium VI (hexavalent), PBB (poly-brominated biphenyls), and PBDE (poly-brominated diphenyl ether), the last two classified as fire retardants. Decision 2005/618/EC allows a maximum concentration value of 0.1% by weight in homogeneous materials for lead, mercury, hexavalent chromium, poly-brominated biphenyls (PBB) and poly-brominated diphenyl ethers (PBDE), and 0.01% by weight in homogeneous materials for cadmium. Homogeneous material means a material that can not be mechanically disjointed into different materials. There are many specific exemptions to the Directive which are now listed in Annex III and IV; examples are: mercury in fluorescent and other discharge lamps to promote ignition, lead in solders for special applications, and cadmium in x-ray measurement filters and LED's. All products produced by Sun Hydraulics meet the Hazardous Substance Directive as of July 1, 2006.

Bill Zoller

Sun Hydraulics Corporation