



European Machinery Directive 2006/42/EC & Related Directives

Applicability to Sun Hydraulics 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 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 <http://www.cetop.org/publications/position-papers/> and can be found in their PP07 reference document.

The Machinery Directive & Fluid Power Components

In short, the Machinery Directive does not include fluid power components. Paragraph 35 of the Machinery Working Group states the following:

“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.”



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.

There are certain machinery situations where other Directives may also need to be considered for fluid power components. The following Directives relate to various Sun products:

- Pressure Equipment (97/23/EC)
- Electromagnetic Compatibility (2004/108/EC)
- Electromagnetic Compatibility (2009/19/EC)
 - Radio Equipment Directive (ETSI 300-328 & 301-489-17)
- Low Voltage Equipment (2006/95/EC)
- Hazardous Materials (2002/95/EC).

Those applicable to Sun products are discussed in the summary below.



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 TÜV approved as individual components.

The model numbers for the Sun Hydraulics CE-marked valves are:

- RDDT-Q**
- RDFT-Q**

Additional technical information for these products is available on our website [here](#).



Electromagnetic Compatibility Directive 2009/19/EC

For general market electrohydraulic 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 our solenoid-operated switching valves (Vac and Vdc).

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 electrohydraulic 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 electromagnetic 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.

Model 790 Series Embedded Amplifiers

Sun's electrohydraulic 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 electromagnetic field immunity > 10V/m). These products include the Embedded Electronic Proportional Valve Coils [model series 790-****].



The newer addition to this family of Sun’s electrohydraulic products – the Bluetooth Embedded Amplifier (models 790-****B) – incorporate Bluetooth communications capabilities and embedded electronic amplifiers. These products are all CE marked as per the updated EMC Directive 2009/19/EC set forth on 12 March 2009. They pass the requirements for both radiated and conducted electromagnetic field immunity > 30V/m and therefore comply with the requirements of EN 61000-6-2 and EN 61000-6-4 as well.

In addition, these electrohydraulic products are tested to the Radio Equipment Directive (RED) ETSI 300-328 and 301-489-17 for electromagnetic compatibility of vehicles.

See [“CE Testing Results & Explanation”](#) documentation for 790-****B models on our website.

Sun’s Position-Monitored Valves

Sun's hydraulic products with active element position monitoring incorporate an electronic position switch. Sun cartridge valves with a “Z” in the fifth 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 electromagnetic field immunity > 10V/m).

Examples of these include the following:

- Logic Element Position-Monitored Valves
 - LO**-Z**
 - LK**-Z**
- Solenoid-Operated Position-Monitored Directional Valves
 - DAAL-Z** ○ DLDA-Z**
 - DBAL-Z** ○ DMDA-Z**
 - DTCA-Z** ○ DNCA-Z**
- Pilot-Operated, Position-Monitored Proportional Throttle Valves
 - FT**-Z**

Note, valves incorporating electrical position monitoring are not CE marked as a Safety Component. See our website for detailed information on the above products and our [“CE Testing Results & Explanation.”](#)



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 that provides 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 as follows:

- 12 Vdc: 770-212
- 14 Vdc: 770-214
- 24 Vdc: 770-224
- 28 Vdc: 770-228
- 36 Vdc: 770-236
- 48 Vdc: 770-248
- 24 Vac: 770-297
- 115 Vac: 770-211
- 230 Vac: 770-223
- 127 Vdc: 770-299
- 220 Vdc: 770-298



Hazardous Substances Directive 2011/65/EU

Currently, all products produced by Sun Hydraulics meet the Hazardous Substance Directive (2011/65/EU), with the exception of our model 790-**** coils.

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 (2002/95/EC) took effect on 1 July 2006, and the latest change, 2011/65/EU, took effect on 3 January 2013. It is focused on 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 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 cannot be mechanically disjointed into different materials. There are many exemptions to the Directive listed in Annex III and IV — e.g., mercury is allowed in fluorescent and other discharge lamps to promote ignition.