

# Guidelines for the application of the European Directives in electrohydraulics

The European Community issued a complex set of rules with the scope to improve and grant the workers' safety and health, as well as the correct operation of components and equipments. These general rules are:

**Machine Directive (98/37/CE)**

**Electromagnetic Compatibility Directive - EMC (89/336/CEE)**

**Low Voltage Directive - BT (72/23/CEE)**

**Explosive Atmosphere Directive - ATEX (94/9/CE)**

**Pressure Equipment Directive - PED (97/23/CE)**

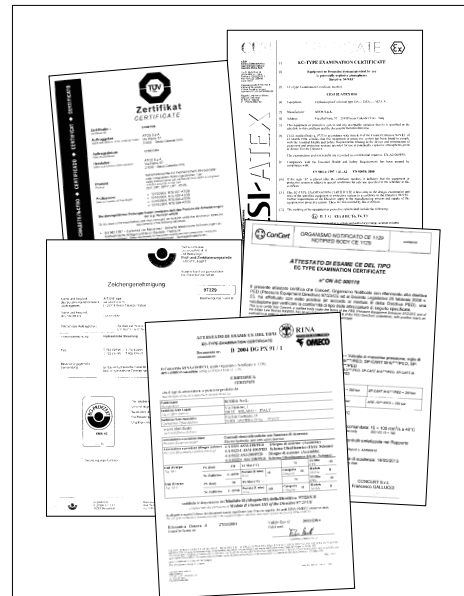
Atos applies the CE mark on its electrohydraulic components to certify their conformity to the above Directives when applicable to their constructive and functional characteristics.

However the Atos CE marking does not relieve the manufacturer of the machine from testing and marking the machine in accordance with the above mentioned Directives and the relevant Harmonized Norms. In practice the Directives define the general guidelines and they do not provide specific technical requirements; the relevant Harmonized Norms are technical specifications addressed to different application fields (as explosion proof environments) or components (as safety components). They provide the technical requirements and the test specifications which the components have to be submitted. The compatibility of the product characteristics with the Harmonized Norms have to be certified by an official Notified Body. The Notified Bodies are specific boards and agencies recognized by the European Community which perform the inspection, testing and the CE type certification of the components, machines and systems before their marketing. They can also perform the evaluation of the production quality assurance of the manufacturer.

- The **Machine Directive 98/37/CE** defines the main requirements and the general guidelines for the designing and the manufacturing criterias applicable to the machines and to the specific components used for safety functions, in order to ensure the health protection from the risks generated by the machines functioning. For these machines and components the Directive imposes the manufacturers to certify the conformity of their products to the relevant Harmonized Norms.
- The **EMC Directive 89/366/CEE** involves all the equipments which can cause electromagnetic disturbances and/or which can be influenced by them: it prescribes a sufficient immunity level to external disturbances and, at the same time, to generate limited electromagnetic disturbances (emission). The relevant Harmonized Norms are: EN 50081-2 (Emission) and EN 50082-2 (Immunity).
- The **BT Directive 72/23/CEE** involves all electric components used in a range of nominal voltage from 50 to 1000 V alternate current and from 75 to 1500 V direct current. The Harmonized Norms are: EN 60730-1 and EN 60730-2-8, equivalent to the German VDE 0580 norm.
- The **ATEX Directive 94/9/CE** defines the manufacturing criteria and the safety requirements of the equipments used in potential explosive environments for presence of gas or flammable dusts. The Directive provides the classification and marking of the explosion proof components depending to:
  - protection mode
  - group of gas present in the environment
  - surface temperature of the component
  - zone of application, classified according to the risk level
 The relevant Harmonized Norms are: EN50014 and EN50018.
- The **PED Directive 97/23/CE** defines the manufacturing criterias and the safety requirements relevant to the equipments and systems operating under pressure. For hydraulic equipments, the Directive imposes the certification and the CE marking for those components that, due to the operating pressure or to the product pressure per volume or nominal size, are within the limits classified by the Directive in 4 different classes.

Atos R&D dept is active since many years in the development of safety components and options for hydraulic systems in cooperation with the best Notified Bodies recognized by the European Community. The Atos products involved in the above Directives are provided with CE marking and conformity certificate annexed to the products, as detailed in the following sections.

In any case the correct functioning of the components and the respect of the norms are assured only if the components are used in accordance with the relevant specifications and if the user's instructions are duly followed. These instructions are shown on the technical tables (see [www.atos.com](http://www.atos.com) or KT Master Catalogue) and on the documentation annexed to the products (supply voltage tolerances, characteristics of the hydraulic fluids and the relevant class of contamination, working temperature, etc...).



Examples of Atos CE certificates provided by Notified Bodies:



## 1 ATOS COMPONENTS IN COMPLIANCE WITH MACHINE DIRECTIVE (98/37/CE)

The Atos hydraulic components involved in the Machine Directive and thus subjected to the CE marking are:

### 1.1 Lead sealing pressure relief valves (tab. C010 and C020) - fig. 1

Direct operated pressure relief cartridges, type SP-CART-\*/RS and valves type ARE-\*/RS, with factory set and lead sealing adjustment, are specifically designed for application on safety blocks for vertical presses, CE marked as per the Machine Directive. These valves are made in accordance with Harmonized Norms prEN 693 and prEN 12622. They are characterized by a special execution of the internal components and a protective cap locked on the adjustment screw by means of a metallic wire and a lead sealing to avoid unauthorized adjustment. For these valves, on request, Atos issues a CE Declaration of Conformity in accordance with the Machine Directive.

### 1.2 Safety solenoid valves and cartridges (tab. E110 and E115) - fig. 2

2, 3, 4-way directional solenoid and cartridge valves (direct and pilot operated) are available with mechanical microswitch (option /FC) or inductive proximity sensor (option /FI) that detects the spool/poppet position. Such components can be used on machines for safety functions.

They are CE marked and they are certified by the TÜV according to the safety requirements provided by the Machine Directive and by the relevant Harmonized Norms EN982, EN201, EN422, EN693, EN12612.

Atos provides a technical data sheet based upon annex I of the Machine Directive and issues a CE Declaration of Conformity, since they are not involved in annex IV of the aforesaid Directive. These components are also in compliance with the EMC and BT Directives, see section 2.

### 1.3 Safety manifolds for hydraulic presses - fig. 3

The Machine Directive impose to the machines' manufacturers to satisfy specific safety requirements. For machines listed in annex IV of this directive, e.g. vertical presses, these requirements are extremely severe. The manufacturers of hydraulic manifolds and hydraulic components are not requested to issue any declaration, since such manifolds are not considered as machines. Nevertheless Atos developed some standard manifolds (i.e. to be used on press brakes, shears or, in general, vertical presses) certified by the notified German agency "BG-Berufgenossenschaft". This agency issues the declarations that certify the conformity of such Atos manifolds to the Harmonized Norms: EN 693 and EN 12622.

### 1.4 Hydraulic power-units (section L) - fig. 4

The Machine Directive does not consider the hydraulic power-unit as safety component neither a machine and therefore the latter does not need to be CE-marked. However it can be considered as a simple component, i. e. as an element to be included within a machine. With reference to the latter the Scoda system division issues, upon request, the Manufacturer's Declaration as requested by the Directive. According to the Harmonized Norm EN 982, Scoda provides technical documentations indicating the working conditions and suitable instructions for a safe installation, commissioning and maintenance of the power units.

### 1.5 Filling and filtering unit type GL-15 (tab. L150) and test stand for hydraulic components type GT-90/EW (tab. L250)

GL-15 and GT-90/EW, manufactured in conformity to Harmonized Norm EN 982, are considered complete machines and consequently they are subjected to CE marking according to the Machine Directive.

Atos/Scoda issues a CE Declaration of Conformity in accordance with the Machine Directive and they provide technical documentations indicating the working conditions, and the instructions for safe installation, commissioning and maintenance.

SP-CART M-5/\*\*\*/RS  
Pressure relief cartridge

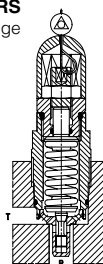


Fig. 1

DHI-06\*/FI

Directional solenoid safety valve

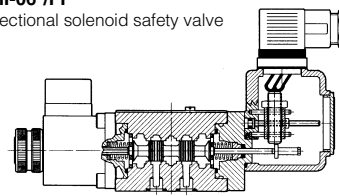


Fig. 2

Safety manifold

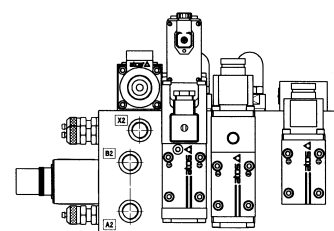


Fig. 3

Hydraulic power unit

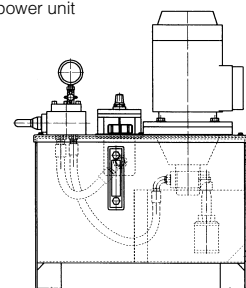


Fig. 4

## 2 ATOS COMPONENTS IN COMPLIANCE WITH EMC AND BT DIRECTIVE (89/336/CEE) AND (72/23/CEE)

### 2.1 Solenoid valves (tab. E010, E020, E041, E080)

The Atos solenoid valves, direct and pilot operated, are marked CE to certify their conformity to the EMC and to the BT Directives, this last is limited to the coil voltages 110 and 220 Vdc; 110 and 230 Vac. The conformity refers to the valve's electrical parts (coils).

On request, Atos supplies the CE conformity declaration.

The electric connectors are not part of the valve and the relevant certification, if required, can be provided from the manufacturer.

#### Atos recommends the following instructions:

- Always protect the coils with a suppressor diode, to avoid peaks and discharges of the inductor, when it is de-energized;
- Grant the earth connection (via grounded subplates or manifolds or via the earth pin on the valve's coil);
- Always disconnect the main supply lines before the start-up and/or maintenance on the solenoid valves.

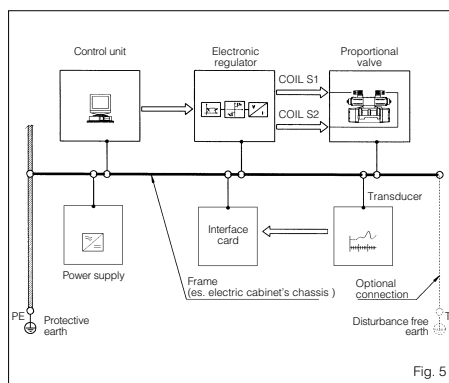


Fig. 5

### 2.2 Proportional valves and electronic drivers (sections F and G) - fig. 5

Atos proportional valves with or without transducer and the relevant integral or separated electronic driver are marked CE to certify their conformity to the EMC Directive. The respect of such Directive is granted only if the proportional valves are used in conjunction with Atos electronic drivers. On request, Atos supplies the CE conformity declaration.

#### Atos recommends the following instructions:

- For the valve, grant the earth connection (via grounded subplates or manifolds or via the earth pin available on the valve's coil);
- Shield all the connections to prevent the interference of electromagnetic disturbances; furthermore, provide the earth connections as shown in fig. 5;
- Use, if possible, an earth connection without disturbances (protected earth).

The electric signals of electronic regulators (e.g. reference, feedback and enabling signals) must not be used to perform the machine safety functions. This in accordance with the Harmonized Norm EN 982.

Always pay particular attention to the switch-on/off of the electronic regulators, since they could cause uncontrolled movements of the actuators driven by the relevant proportional valve. For further general information about installation and use of proportional valves and drivers, refer to tab. F003.

### 3 ATOS COMPONENTS FOR APPLICATIONS IN COMPLIANCE WITH ATEX DIRECTIVE 94/9/CE

The Atos components involved in the ATEX Directive and thus subjected to the CE marking are the valves associated to electric functioning and expressly designed for application in hazardous areas for presence of potentially explosive atmosphere. All the Atos components non associated to electrical functions (i.e. pumps, pressure control valves, etc) are exempted from the ATEX certification because their functioning does not generate dangerous conditions for the explosive environment. For detailed analysis see section 4.

#### 3.1 On-Off and proportional solenoid valves, tab. E120 and E130 - fig. 6 and 7)

These components are basically made by:

- electrical part for the valve actuation (solenoid) or for the spool position monitor (LVDT transducer), see section 3.2.
- mechanical part, comprehensive of external body and internal components for regulation, see section 3.3.

#### 3.2 Electrical parts

The solenoids and the LVDT transducers are certified by **CESI** for application in potential explosive environment, in particular:

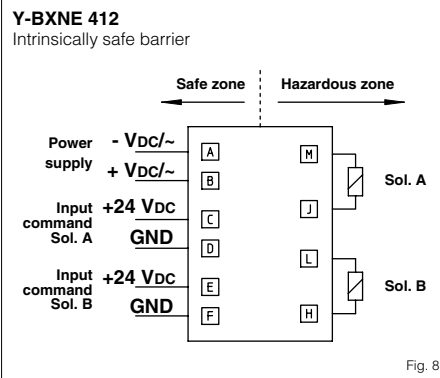
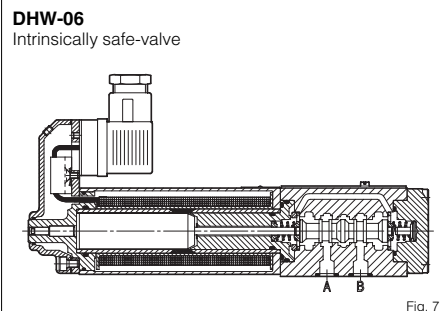
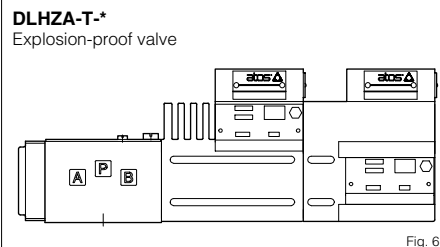
- The explosion proof solenoids, on-off (OA) and proportional (OZA and MZA), are certified with Notification n° **CESI 02 ATEX 014**, according to the protection mode: **Ex II 2 G EEx d IIC T6,T4,T3**, for surface plants with presence of gas or explosive mixture, category 2, zone 1 and 2.
- The explosion proof solenoids, on-off (OAM) and the proportional (OZAM and MZAM), are certified with Notification n° **CESI 03 ATEX 057X**, according to the protection mode: **Ex I M 2 EEx d I** for application in tunnels and mining plants with presence of grisou gas or flammable dust. The valve's power supply have to be switched off in case of explosive atmosphere.
- The position transducers (ETHTA), separated or assembled on the proportional valves, are certified with Notification n° **CESI 02 ATEX 015**, according to the protection mode: **Ex II 2 G EEx d IIC T6,T5,T4** for surface plants with presence of gas or explosive mixture, category 2, zone 1 and 2.
- The On-Off intrinsically safe solenoids (OW) are certified with Notification n° **CESI 02 ATEX 013** according to the protection mode: **Ex II 1 G EEx ia IIC T6 (IIB T6, IIA T5)**, for surface plants with presence of gas or explosive mixture, category 1, zone 0, 1 and 2. The intrinsically safe valves can respect the ATEX prescriptions only if connected to appropriate safety electronics barriers that limit the electrical power to the valve also in case of short circuit. For the correct installation of the intrinsically safety valves, Atos recommend to check that the characteristics and the ATEX certification of the barriers are in compliance with the requirements specified in the Atos catalogue, tab. E130 (minimum current limits). For the best functioning of the valves use the barriers Y-BXNE-4120\* shown in tab. E130, also see fig. 8.

#### 3.3 Mechanical parts

The mechanical part is consisting of the external valve body.

The safety of the mechanical parts in front of the application in the hazardous environment, is demonstrated by the following analysis:

- All the internal parts are separated and insulated from the external environment by means of pressure-proof seals. The mechanical part is connected to the hydraulic circuit. Inside the body the internal volumes are filled by the hydraulic fluid, thus there are no internal volumes which can be saturated by the external atmosphere.
- The mechanical part is not provided of any potential source which could cause the ignition of the explosive gas mixture because its functioning, also in case of failure, doesn't produce any sparks or overheating.
- The functioning of the mechanical part does not create conditions for generating the explosive atmosphere.



### 4 ATOS COMPONENTS FOR APPLICATIONS IN EXPLOSIVE ENVIRONMENT EXEMPTED FROM ATEX CERTIFICATION

#### 4.1 Components relevant to section A of Atos catalogue: pumps

Vane and piston pumps, fixed and variable displacement, hand pumps

These products, except the piston pumps provided of electric/electronic controls (tab. A170), are mechanical components, basically consisting of the external body containing the drive shaft, the pumping components and the hydraulic regulators.

These products, when correctly installed and operated according to the catalogue prescriptions, can be safe used in potential explosive environment on the basis of the considerations of the analysis of section 3.3.

#### 4.2 Components relevant to section B of Atos catalogue: cylinders

All the cylinders listed in the Atos catalogue are suitable for use in the potential explosive environment on the basis of the following considerations:

- the internal volumes are in connection with the hydraulic circuit and they are insulated from the external environment by means of suitable seals.
- their functioning do not create sparks or overheating that can be dangerous in presence of the explosive mixtures.

The servocylinders type **CKM** (with magnetosonic transducer) can be supplied with explosion proof position transducer, ATEX certified according to the protection mode **Ex II 2G EEx d II C T6, T5**.

For the application of servocylinders type **CKP** (with potentiometric transducer) and **CKV** (with inductive transducer) in explosion proof environment, please consult Atos technical dept.

#### 4.3 Components relevant to section C and D of Atos catalogue: pressure control valves, flow control valves, check valves, modular valves

For the valves with mechanical control the same considerations shown in the section 3.3 can be applied. For application in hazardous environment are excluded the fast/slow valves, type DHQ and DKQ valves described in tab. D170.

#### 4.4 Components relevant to section E of Atos catalogue: directional control valves

For the application in the potential explosive environment are excluded the safety valves provided of mechanical switch or inductive proximity switch (table E110 and E115).

The valves provided of electrical control are certified as described in section 3.1.

For the valves with mechanical, hydraulic and pneumatic controls the same considerations shown in the section 3.3 can be applied.

#### 4.5 Components relevant to section H of Atos catalogue: ISO cartridge valves

The solenoid operated cartridges are certified as described in section 3.1.

For the hydraulic operated cartridges, the same considerations shown in the section 3.3 can be applied.

## 5 ATOS COMPONENTS IN COMPLIANCE WITH PED DIRECTIVE (97/23/CE)

According to the requirements of the PED Directive the hydraulic components subjected to the CE marking are:

- Components to be used with fluids of group 2 whose operating pressure is greater than 1000 bar and/or components whose product pressure x volume is greater than 10000 bar x liter;
- Components designed for pressure safety applications;
- Power units with accumulators having a volume greater than 1 liter and only if connected to the actuators.

### 5.1 Components relevant sections A-C-D-E-F-H: pumps, valves and cartridges

These components, identified by the article 3, point 1.1 of the PED Directive, are designed to be used with fluids of group 2, they have a product pressure x volume under pressure always less than 10000 bar x liter and their max working pressure is always lower than 1000 bar. Thus they are exempted by the CE marking, according to the article 3, paragraph 3 of the PED Directive.

#### PED pressure relief safety valves, (tab. C010 and C020) - fig. 9.

These valves, identified by the article 3, point 1.4 of PED Directive, are CE marked and they are certified by **ConCert S.r.L.**

- Category: IV
- Procedure for the conformity evaluation: Module B (CE-type examination) + D (manufacturing quality assurance)

They are supplied with Atos conformity declaration and with the installation, commissioning and maintenance guidelines.

ARE-06-\*\*\*/PED  
Pressure relief valve



Fig. 9

### 5.2 Components relevant to section B: cylinders

Atos cylinders, identified by the article 3, point 1.1 of PED Directive, are designed to be used with fluids of group 2 and their working pressure is always less than 1000 bar.

The cylinders with long stroke can exceed the product pressure x volume under pressure of 10000 bar x liter, in this case they are CE marked and they are supplied with the Atos CE conformity declaration.

- Category: I
- Procedure for the conformity evaluation: Module A (factory manufacturing inspection).

### 5.3 Components relevant to the section K: hydraulic systems accessories

- pressure switches MAP-\*\*\*, technical table K070
- subplates series BA-\*\*\*, technical tables K280, K290 and K295
- filters series X-FUI; X-FER; X-FHP, technical table K020

The above components, identified by the article 3, point 1.1 of PED Directive, are designed to be used with fluids of group 2, they have a product pressure x volume under pressure less than 10000 bar x liter and their max working pressure is always lower than 1000 bar. Thus they are exempted by the CE marking, according to the article 3, paragraph 3 of the PED Directive.

#### Accumulators: Scoda tab. SK130

The accumulators with a volume  $\leq 1$ l and with a max working pressure less than 1000 bar, identified by the article 3, point 1.4 of the PED Directive, are exempted by the CE marking, according to the article 3, paragraph 3 of the PED Directive.

For these accumulators it is valid the declaration released by the manufacturer and available by Atos/Scoda Quality Assurance department.

It is declared that the accumulators having a volume  $> 1$ l, identified by the article 3, point 1.4 of the PED Directive, are designed to be used with fluids of group 2 and they are classified depending on the volume and on the max working pressure according to one of the four classes of the Directive listed in section 5.4.

The accumulators subjected to the CE marking are supplied with the CE conformity declaration plus the installation, commissioning and maintenance manual, directly provided by the accumulator manufacturer.

#### Manometers: Scoda tab. SK123

The manometers, identified by the annex 1, article 2.10 b of the PED Directive, having a max pressure  $\leq 200$  bar are exempted by the CE marking according to the article 3, paragraph 3 of the PED Directive

For these manometers it is valid the declaration released by the manufacturer and available by Scoda Quality Assurance department.

The manometers, identified by the annex 1, point 2.10 b of the PED Directive, having a max pressure  $> 200$  bar, are classified in the Class I of the Directive, therefore they are subjected to the CE marking. These manometers are supplied with the CE Conformity declaration directly released by the manufacturer.

#### Other accessories for power units: section K of the Scoda catalogue

All the components relevant to the above section, identified by the article 3, point 1.1 of the PED Directive, are designed to be used with fluids of group 2, they have a product pressure x volume under pressure always less than 10000 bar x liter and the max working pressure is always lower than 1000 bar. Thus they are exempted by the CE marking, according to the article 3, paragraph 3 of the PED Directive.

For these components are valid the declarations released by the manufacturers and available by Scoda Quality Assurance department.

### 5.4 Hydraulic power units, tab. L010, L020, SL030, L050 and L080

The hydraulic power units, if equipped with accumulators having a volume  $> 1$ l, identified by the article 3, point 2 of PED Directive, following the installation on the machine and the connection to the actuators, are considered hydraulic assemblies, as per article 1, point 1 which have to be evaluated, certified and CE marked according one of the following classes of the Directive:

- Class I: when  $50 < PS \times V \leq 200$ ; Machine manufacturer self conformity certification
- Class II: when  $PS \times V \leq 1000$ ; Conformity certified by Notified Body
- Class III: when  $PS \times V \leq 3000$ ; Conformity certified by Notified Body
- Class IV: when  $PS \times V > 3000$ ; Conformity certified by Notified Body

**PS** = Max design pressure    **V** = accumulator volume (of single accumulator)

The Atos/Scoda technical dept. on request can provide the support for the evaluation of the above hydraulic assembly's class.

On request Scoda can supply the power units certified and CE marked according the PED Directive, therefore comprehensive of components for pressure safety function.

The certification of the power unit represent an important advantage in front of the certification of the whole hydraulic assembly, that must be provided by the machine manufacturer. In fact in this case the customer certification is reduced only to the inspection of the compatibility of the max pressure of the equipments used in the machine with the max pressure provided by the power unit design.

Each single power unit is provided of installation, commissioning and maintenance manual, containing the relevant CE/PED certificate reporting the power unit series number and the relevant technical descriptions.

- Evaluation procedure of the conformity: Module B (CE-type examination) + D (manufacturing quality assurance)
- Notified body: **RINA-Omecco**

### 5.5 Filling and filtering groups GL-15: tab. L150

#### Test benches for hydraulic components GT-90: tab. L250

The above components are exempted by the CE marking, according to the article 1, point 3.6 of the PED Directive