

Abstract of current stage

1st Part

The basic purpose for which the objective of the current stage has been iterated in the achievement plan is the identification and presentation of the requirements for the design of protection interfaces, so that the protection level to explosion meets the requirements stipulated by Directive ATEX 94/9/EEC. The current stage has also comprised the creation and simulation of a virtual model for a protection interface.

The introductory part shows briefly both the context of project and the criteria that should be considered during the design and production of protection interfaces so that the finished product meets the safety requirements and not only them.

The first chapter comprises a synthetic presentation of the safety requirements applicable to the protection interfaces intended to protect the low current equipment located in areas with explosive atmosphere hazard.

The second chapter deals with the main issue of the objective pre-determined for the current stage. Subsequently, the first part comprises the constructive requirements for the protection interfaces. The following sub-chapters address the identification and presentation of operating parameters that characterize the protection interfaces and its component parts.

The next subchapters include the mathematical model used to calculate the operating parameters in relation to the values of the safety parameters presented briefly in the applicable standards.

There have been drawn the following conclusions after the carrying out of the study:

- There has been established that the most important operating parameters during the design of protection interfaces are: rated voltage – U_n and rated current – I_n .
- There has been settled the difference between the no-charge maximum voltage – U_0 and the shortcircuit maximum current – I_0 .
- There has been developed the mathematical model that gives the value of the permissible maximum current - I_{adm} .
- There has been developed a software able to give the significant parameters for the protection interfaces (I_{adm} , U_0 , I_0 , R_{min}).

- There have been calculated the values of I_{adm} , U_0 , I_0 , R_{min} as a function of U_n and they have been presented under the form of a chart in the paper and under the form of tables in annexes.
- There has been established that the upper limit of 45V for the parameter U_0 shown as a table in SR EN 60079-11 shall trigger saturation effects for the values of parameters calculated starting with the value of 30V for the rated voltage - U_n .
- There have been identified and presented the constructive parameters that characterize the protection interfaces.
- There have been presented the conditions required for the parameters that characterize the protection interfaces. They are the grounds for the sizing of protection interfaces.

2nd Part

The basic purpose for which the objective of the current stage has been iterated in the achievement plan is the development and testing a virtual model for protection interfaces.

The introductory part shows briefly both the context of project and the criteria that should be considered during the design and production of protection interfaces so that the finished product meet the safety requirements and not only them.

The first chapter comprises a synthetic presentation of the general issues on the protection interfaces. It also includes a classification of the protection interfaces for the low currents equipment located in the areas with explosive atmosphere hazards. There follows a brief presentation of the technical requirements on the need to implement the serial and parallel limitation devices and of their protection devices.

This chapter ends with a theoretical approach on the correlation between the values of different parameters that characterize the protection interfaces of low current installations located in the areas with hazard of explosive atmospheres.

Chapter 2 covers a general presentation of the protection interfaces, of the normal operating status and of their failure status, subchapter 2.2 includes the virtual model for the protection interface and it has been developed the virtual testing environment by simulation means.

Subsequently, the following conclusions have been drawn:

- There have been developed different types of protection interfaces both for direct current and for alternating current.
- There has been developed a virtual model for the protection interface intended for low currents circuits with an alternating voltage of up to 12 V a.c.
- There has been developed a testing environment with the help of graphic design of LT spice IV electronic circuits.
- Testing by simulation means of the virtual model has shown a suitable operation of the protection interface for the values of rated voltages of up to 12 V a.c.
- The testing by simulation means of the virtual model for the protection interfaces has shown that they can be used in a suitable status for protection to explosion for Group I (firedamp mines), sub-group IIA, IIB, IIC (atmospheres of combustible gases at surface) and Group II (atmospheres of combustible dusts and surface).