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ELV System: its Applications & Future Prospects

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Abstract: *ELV stands for Extra Low Voltage Systems, Low Current Systems , Electronic Systems or as Telecommunication Systems. ICT components can also be known as ELV Systems. The myths over the use of A.C. or D.C. for power distribution are deep-rooted, perhaps dating back to Edison. With increasing D.C. powered loads in building services (for example, in LED lighting circuits, portable device charging, access and security systems, or environmental control) often extremely inefficient, transformer/rectifier units (contributing to localized heating of the working space through I^2R losses), people are looking to reduce power conversion losses without compromising performance or functionality while increasing the number of low voltage (LV) and extra low voltage (ELV) D.C. Powered systems. By definition, any electrical system which has circuit work <50 Vrms (in case of AC current) or <120 V (in case of DC current) is known as a Low Current/ELV System. The development of more efficient LED signals now allows extra low voltage to be used without imposing significant limitations on intersection cable runs or numbers of signals that can be driven, allowing all the potential benefits of ELV systems to be realized in the ST900 ELV system. As well as offering significantly improved electrical safety, the ST900 ELV system offers real environmental benefits. ELV systems reduces CO_2 emissions due to lower power requirements, and reductions in raw material usage, resulting from the need for fewer street cables. Currently the rapid growth of ST900 ELV systems around the world is being observed. SELV, PELV, FELV is being currently used for lowering the losses*

Keywords: *ELV systems, applications, SELV, PELV , FELV*

I. Introduction

Energy costs is rising day by day, the pressure is increasing on engineers to make use of new and innovative solutions and alternative energy sources to power buildings. To fulfill this demand engineers now need to take a more integrated approach to energy efficiency, looking to find opportunities to apply engineering solutions to existing innovation. Dedicated D.C. power distribution infrastructure is emerging as a popular solution to this challenge, one with both standardized and proprietary approaches that need to be appropriately managed. This concept is being adopted globally. As a result, there is a need to understand how to control provision of power over legacy cabling as well as the design of future installations. It is important as much of the growth in this area is based upon the attachment of remote internet-protocol (IP) enabled devices, providing separated extra-low voltage (SELV) circuits, which are compliant with IEEE 802.3 – generally termed power over Ethernet (POE) circuits – that are evolving to increase the power level delivered over each cable. It is critical to note that not all the implementations of ELV D.C. power distribution over telecommunications cabling infrastructures adopt the IEEE solutions.

Observations:

Extra-low voltage (ELV), in electricity supply, is one of several means to protect against electrical shock.[1] The International Electro technical Commission and its member organizations define an ELV circuit as one in which the electrical potential of any conductor against earth (ground) is not more than either 25 volts RMS (35 volts peak) for alternating current, or ripple-free 60 volts (contradicts the table) for direct current under dry conditions. Lower numbers apply in wet conditions, or when large contact areas are exposed to contact with the human body.

The IEC defines three types of extra-low-voltage systems (FELV, PELV, and SELV), which are distinguished by their successively more restrictive safety properties.[2.]

Separated or safety extra-low voltage (SELV)

SELV system is an electrical system in which the voltage cannot exceed ELV under normal conditions. SELV stands for separated extra-low voltage. A SELV circuit should have protective-separation i.e., double insulation, reinforced insulation or protective screening) from all circuits other than SELV and PELV (i.e., all circuits that might carry higher voltages) The safety of a SELV circuit is provided by the extra-low voltage, the low risk of accidental contact with a higher voltage; the lack of a return path through earth (ground) that electric current could take in case of contact with a human body.

Protected extra-low voltage (PELV)

PELV system is an electrical system in which the voltage cannot exceed ELV under normal conditions. A PELV circuit requires protective-separation from all circuits other than SELV and PELV (i.e., all circuits that might carry higher voltages), but it can have connections to other PELV systems and earth (ground).

In contrast to a SELV circuit, a PELV circuit can have a protective earth (ground) connection. A PELV circuit, just as with SELV, requires a design that guarantees a low risk of accidental contact with a higher voltage. For a transformer, this can mean that the primary and secondary windings must be separated by an extra insulation barrier, or by a conductive shield with a protective earth connection. A typical example for a PELV circuit is a computer with a Class I power supply.

Functional extra-low voltage (FELV)

The term functional extra-low voltage (FELV) describes any other extra-low-voltage circuit that does not fulfill the requirements for an SELV or PELV circuit. Although the FELV part of a circuit uses an extra-low voltage, it is not adequately protected from accidental contact with higher voltages in other parts of the circuit. The protection requirements for the higher voltage have to be applied to the entire circuit. Examples for FELV circuits include those that generate an extra low voltage through a semiconductor device or a potentiometer.

Benefits of ELV

These include significant reductions in CO_2 emissions due to lower power requirements, and reductions in raw material usage, resulting from the need for fewer street cables. The end result is significantly lower costs compared to traditional LED solutions, due to improved technology. It is these benefits that are currently driving the rapid growth of ST900 ELV systems around the world.

Looking ahead, the development of more efficient LED signals now allows extra low voltage to be used without imposing significant limitations on intersection cable runs or numbers of signals that can be driven, allowing all the potential benefits of ELV systems to be realized in the ST900 ELV system. As well as offering significantly improved electrical safety, the ST900 ELV system offers real environmental benefits.

ST900 ELV Intersection Controller

The ST900 ELV system is designed to reduce energy costs significantly, and emphasizes on safety. ELV reduces annual power consumption by 65% to 70% , saves over two tonnes of CO_2 per year , reduces precious raw materials, used for cables, by 30% , are cheaper to install than traditional LED based solutions ,offer realistic overall payback times even compared to initially lower cost HI solutions, are electrically much safer than non ELV installations.

More ELV products

A complete ELV system is required in order to maximize the benefits that ELV can bring. Siemens offers a full range of ELV equipment to complete the family.

- Helios ELV LED signal heads
- Helios ELV LED box signs
- ELV nearside signals
- ELV LED wait indicators
- ELV solar cell[4.]

II. Conclusion

The myths associated with the use of A.C. or D.C. for power distribution are deep-rooted, perhaps dating back to Edison, Tesla and Westinghouse. With increasing D.C. powered loads in building services , often extremely inefficient, transformer/rectifier units the clients are looking to reduce power conversion losses without compromising performance while increasing the number of low voltage (LV) and extra low voltage (ELV) D.C. powered systems. The trend towards D.C. power distribution has been based on the use of telecommunications cabling infrastructure, which was not initially designed or installed for the delivery of power. There is a need to understand how to control provision of power over legacy cabling as well as the design of future installations. In addition, some powering solutions use cabling infrastructures that are of proprietary design but that are installed explicitly for the delivery of power using D.C. within the ELV or LV bands (for example, provision of 380-400 V D.C. supplies to equipment within data centers), while certain solutions employ existing mains power supply cabling converted to D.C. distribution. ELV covers all the new modern technologies that are increasingly becoming important systems in every building such as data network, CCTV, fire alarm systems, public address systems, audio/video solutions, access control and detection systems .

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