



APPLICATION EXAMPLE

**ECosine™ Active**  
**A contribution to safety**  
**in road tunnels**

**SCHAFFNER**  
energy efficiency and reliability

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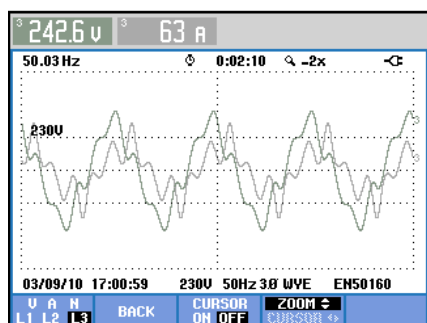
## Light – an indispensable safety feature

The lighting of road tunnels contributes to a fast traffic flow and road safety. Like the general street lighting, the tunnel lighting is also completely tailored to the motor vehicle driver. The requirements for the lighting are derived on the one hand from the adaptability and on the other hand from the permitted maximum speed. It must of course have the highest level at the tunnel entrance and can reduce for the tunnel interior in accordance with the adaptation gradient. The tunnel entrance has the appearance of a black hole and must therefore be particularly brightened. In recent years, the aspect of the energy efficiency of the installed lighting technology has gained importance in addition to traffic flow and road safety.

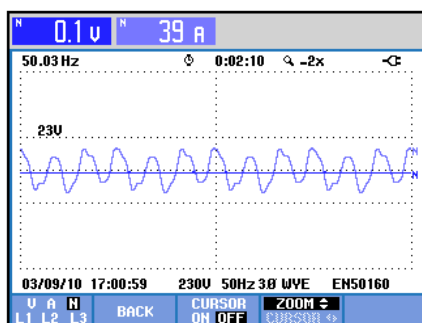
### Thermal problems in the low-voltage distribution

The light regulation in a road tunnel in France is performed via variable transformers to which fluorescent tubes with electronic ballasts are connected in groups. The ballasts draw non-linear (not sinusoidal) currents from the low-voltage distribution network which have high harmonic content. This situation has resulted in an increased thermal load of the variable transformers and the cabling, particularly the neutral conductors, and in strong distortion of the mains voltage. This impermissible additional heating, e.g. in the control room, is clearly noticeable, particularly during the summer.

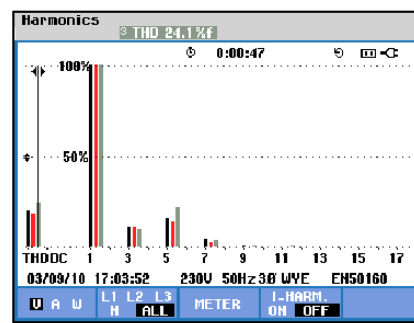
The following values can be measured:



Current and voltage in L3 without filtering



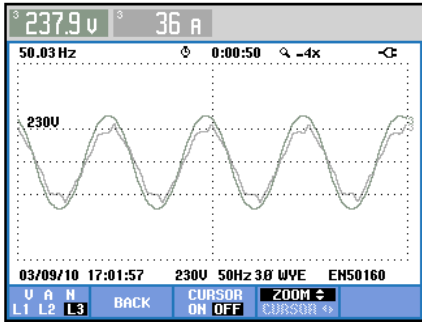
Current and voltage in the neutral conductor without filtering



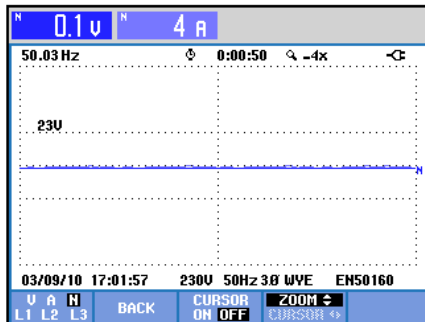
Voltage distortion THD-V of 24.1% without filtering

### ECOsine™ Active provides electrical and thermal unloading

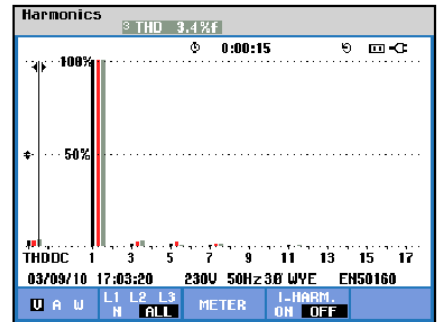
ECOsine™ Active harmonic filters can provide assistance here. One active filter of the type FN3430-60-400-4 per variable transformer takes over the compensation of the lamp currents, i.e. the harmonics, and the compensation of reactive power. This reduces the load for the complete electrical infrastructure, particularly variable transformers and neutral conductors. Thanks to ECOsine™ Active, the total current consumption (RMS) of the installation is significantly reduced. The filter also prevents the stimulation of resonances present in the low-frequency range.



Current and voltage in L3 using ECOSine™ Active



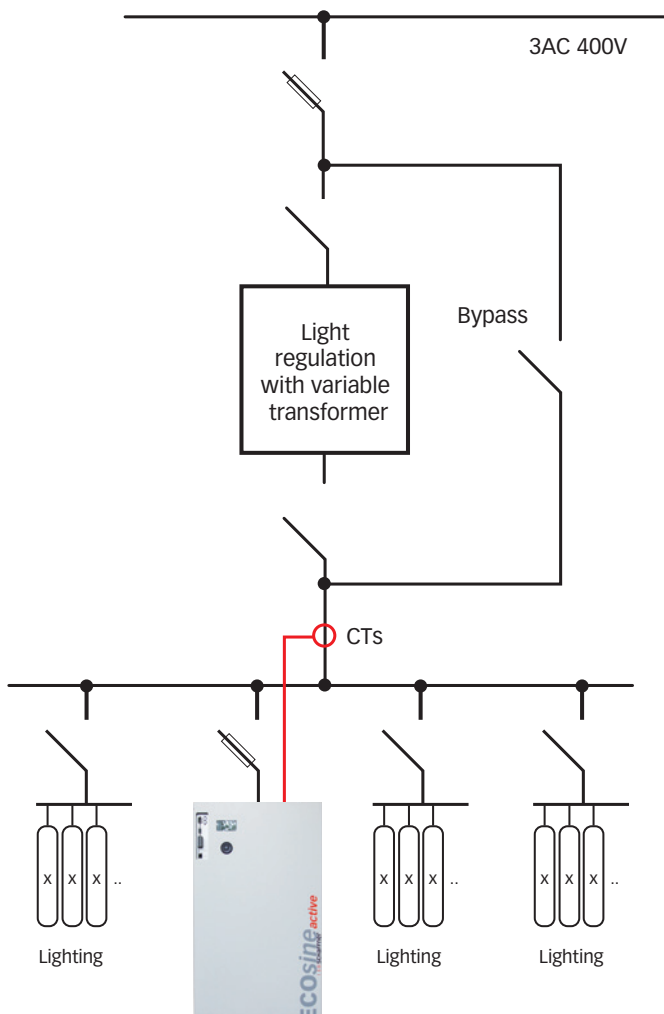
Current and voltage in the neutral conductor using ECOSine™ Active



Voltage distortion THD-V of 3.4% using ECOSine™ Active

The active compensation of the tunnel lighting using ECOSine™ Active makes an important contribution to the reliability of the system and thus to the road safety in the tunnel.

Basic circuit diagram of an installation section with ECOSine™ Active FN3430-60-400-4



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