

EL6851 DMX terminal for lighting and stage equipment – seamlessly integrated into EtherCAT I/O system

Fast communication for the “DMX world”

Beckhoff has integrated an additional building automation subsystem in the EtherCAT Terminal system with the EL6851 DMX terminal. As a DMX master, the terminal allows the direct connection of up to 32 DMX devices and supports the transmission of the full DMX protocol width of 512 bytes in just one control cycle using EtherCAT.



Beckhoff has enhanced its building automation system offering with the EL6851 DMX terminal for the EtherCAT Terminal system.

DMX is the standard protocol for controlling professional stage and effect lighting equipment, which is used, for example, for the dynamic lighting of showrooms and salesrooms as well as for exclusive displays of light and color in high-profile buildings, such as hotels and event centers. For static DMX light sources color mixing and brightness values are transmitted, while moving DMX light sources receive additional spatial coordinates. The high data transfer rate of EtherCAT permits higher update rates of light settings, resulting in more harmonious changes of light and color as perceived by the human eye. The EL6851 can be used to control DMX devices with three axes, such as scanners, moving heads or spotlights; the implementation of the RDM protocol for DMX-internal diagnostics and parameterization is at the planning stage.

IEC 61131-3 compliant function blocks are available for TwinCAT automation software from Beckhoff. An Ethernet-capable digital light controller can function as a main level, but a Beckhoff controller such as Embedded PCs or Industrial PCs can also be used.

Special features of the EL6851 DMX terminal

Compact design in a conventional 12 mm terminal block

Galvanic isolation of the RS485 interface eliminates the coupling of remote devices via earth loops.

The required RS485 terminal resistor can be switched on in the terminal.

RDM, Remote Device Management, will be supported in the future.

RDM is an extension of the DMX protocol for central configuration and monitoring of DMX devices:

- | device addressing
- | selection of different device profiles
- | device parameterization
- | error diagnostics
- | monitoring of temperature, voltage, current and frequency

Technical details

The DMX master transmits new settings to the slaves cyclically at 250 kbaud in order to generate dynamic light changes and displays of color. In the DMX protocol, a maximum of 32 slaves are allowed in one strand without repeaters. The 512 byte long frame in the DMX protocol is termed a 'universe.' 512 channels are available in it, each of which represents a device setting with 8-bit resolution, i.e. in 256 steps, e.g. for dimming, color, focus, etc. In the case of moving light sources, additional settings such as inclination, swiveling and speed (with 8-bit or 16-bit resolution) occupy additional channels, so that the 512 channels are only indirectly sufficient for 32 devices. Furthermore, if the universe is fully utilized, a frame will require 22 ms for internal DMX circulation, which means a refresh rate of 44 Hz. The higher the refresh rate, the more harmonious the light changes are to the human eye. The circulation period can be shortened by reducing the amount of user data; the optimum level has proven to be a utilization of 64 bytes (frequency > 300 Hz), with which 64 channels are available per universe.

The integration of several universes in a controller becomes simple with the EL6851: EtherCAT can transfer large amounts of data quickly, the EtherCAT protocol is retained down to each terminal and the terminal supports various mapping sizes (64 to 512 bytes). If several master terminals are connected, each as its own universe, the time offset in transmitting from the controller to the master can be significantly reduced.

