



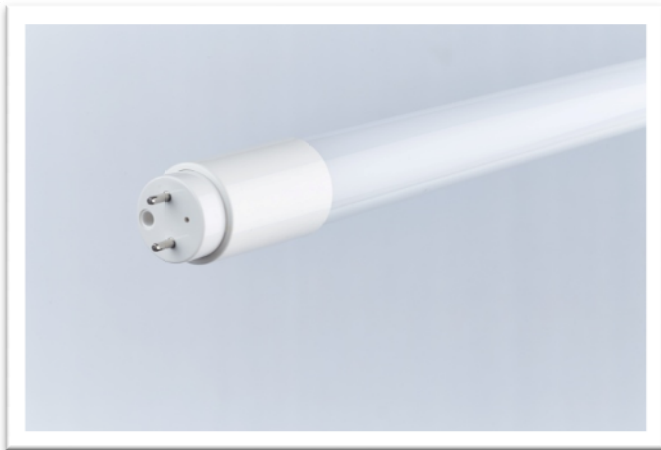
INDO T8RS

LED tube solution for on-train saloon lighting

KNOWN CHALLENGES:

- **Getting the right balance of colour temperature and light quality**
To create a warm, welcoming environment that helps passengers feel comfortable and safe as soon as they step onto the train and throughout their journey.
- **Maximising lighting reliability across the fleet**
To ensure saloon lighting is consistently robust and reliable; especially the ability to withstand constant, long term vibration. Minimising risk, disruption and costs caused by product failures.
- **Reducing maintenance and operating costs**
To realise the full operational, energy and cost saving benefits of upgrading to LED.
- **Preventing dips and surges in light output**
To deliver a seamless customer experience, that doesn't cause disruption or anxiety to passengers.
- **Managing different voltage requirements across different fleets**
To make refurbishment and maintenance, spares holding and stock management as simple as possible.

T8RS OVERVIEW:



INDO T8RS is a high quality retrofit LED tube solution designed specifically for on train saloon lighting.

The product uses INDO's pioneering **Direct Drive**[®] lighting technology to eliminate the need for an LED driver (the most common cause of unit failure) employing advanced control circuitry to carefully regulate and smooth out the current.

This innovation has enabled a host of unique product design opportunities over and above energy saving, from improved reliability through to better product form, which come together to offer train

operating companies the following benefits:

T8RS BENEFITS:

- **Getting the right balance of colour temperature and light quality:**
High quality of light has been prioritised within the T8RS product design; over lumens per watt (energy efficiency). This can be flexed in response to your requirements to balance out CRI and colour temperature against any required energy saving targets.



- **Maximising lighting reliability across the fleet:**

Regularly reporting fewer than 0.2% failures in the field, as a driverless unit without any wear-out components, product lifetime is limited only by the LEDs themselves giving at least 80,000 hours of maintenance-free operation. In addition, being Direct Drive meant the INDO T8RS could be designed more solidly to withstand vibration. All components are surface-mounted as a single part onto the LED/heatsink and further secured with a conformal coating to 'glue' everything in place. This differs from other products on the market, where a separate power supply (the driver) is connected to the heat sink by wires and is vulnerable to relative movement within the unit causing damage during vibration. The T8RS offers the most robust solution for saloon lighting.

- **Reducing maintenance work and operating costs:**

Having no driver in the T8RS means that, once installed, the lamp itself requires no maintenance. As well as its superior vibration stability, you eliminate all costs associated with the need for driver replacement such as customer disruption, cost of spares and stock holding, rail vehicle maintenance etc.

Energy savings of up to 60% or more can be achieved with the T8RS, depending on your product specification. These savings, in addition to the maintenance savings from using Direct Drive make an impressive business case.

- **Preventing dips and surges in light output:**

Improvement to the quality of light is made possible due to the unique circuitry design. These power supply issues, experienced often on trains are easily handled with the T8RS as the units work on a wide input voltage range anyway (DC supplies from 24V up to 110V). This means T8RS maintains brightness across the entire operating range.

- **Managing the different requirements across different fleets:**

Again, the ability to work on a wide input voltage range means that customers simply require one single product for T8 procurement across all fleets. You won't need to order 24V, 48V and 110V versions to suit different vehicle supply voltages as T8RS works with all of these, in one product.

As a fast-growing, pioneering technology company, INDO Lighting is used to working in collaboration with customers to create innovative solutions that are right for their specific needs. To this end, it's worth knowing the T8RS can also be easily adapted to suit special lighting projects, for example if customers require amendments to product shaping etc.