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VOLTAGE LOSSES

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AVOIDING VOLTAGE LOSSES WHEN INSTALLING LED FLEX STRIPS

Ideally, the voltage loss in the supply of flex strips are less than 2%. In reality, this can oft en only be achieved with large cable cross sections. Some transformers, such as all grid transformers in the ISOLED® product range, offer the possibility of adjusting their output voltage by up to 10% in order to ensure 12 V or 24 V at the first power feeding point, even with long supply lines. The following table shows the expected voltage losses:

LENGTH OF SUPPLY CABLE	VOLTAGE DROP/LOSS ON THE COPPER SUPPLY CABLE SUSPENDED LOAD: 5 M ROLL OF A 24 V LED FLEX STRIP WITH 14.4 W/M							
	0,50 MM²		0,75 MM²		1,00 MM²		1,50 MM²	
	VOLTAGE	LOSS	VOLTAGE	LOSS	VOLTAGE	LOSS	VOLTAGE	LOSS
1,0 m	**23,79 V**	**0,21 V**	**23,86 V**	**0,14 V**	**23,89 V**	**0,11 V**	**23,93 V**	**0,07 V**
3,0 m	**23,36 V**	**0,64 V**	**23,57 V**	**0,43 V**	**23,68 V**	**0,32 V**	**23,79 V**	**0,21 V**
5,0 m	**22,93 V**	**1,07 V**	**23,29 V**	**0,71 V**	**23,46 V**	**0,54 V**	**23,64 V**	**0,36 V**
7,5 m	**22,39 V**	**1,61 V**	**22,93 V**	**1,07 V**	**23,20 V**	**0,80 V**	**23,46 V**	**0,54 V**
10,0 m	**21,86 V**	**2,14 V**	**22,57 V**	**1,43 V**	**22,93 V**	**1,07 V**	**23,29 V**	**0,71 V**
15,0 m	**20,79 V**	**3,21 V**	**21,86 V**	**2,14 V**	**22,39 V**	**1,61 V**	**22,93 V**	**1,07 V**
20,0 m	**19,71 V**	**4,29 V**	**21,14 V**	**2,86 V**	**21,86 V**	**2,14 V**	**22,57 V**	**1,43 V**
30,0 m	**17,57 V**	**6,43 V**	**19,71 V**	**4,29 V**	**20,79 V**	**3,21 V**	**21,86 V**	**2,14 V**

Formula for calculating the voltage loss with DC voltage

$$\text{Voltage (U)} = \frac{2 \cdot \text{Length (l)} \cdot \text{Current (I)}}{\text{Conductivity of copper (56)} \cdot \text{Cable cross section (A in mm2)}}$$

Conductivity of copper (σ in S/m): ^{56} · ^{106} (The value depends on the purity of the material)

In order to avoid overheating, we recommend staying below 3 amps for the power input of LED flex strips per feeding contact!

$$\text{Current per feeding contact in A (I)} = \frac{\text{Flex strip output in W/m (P)} \cdot \text{Circuit board length in m (which is operated by a feeding contact)}}{\text{Operating voltage in V (U)}}$$

Voltage at the end of a 5-meter long 24 V flex strip circuit board (for unilateral feed-in)

Flex strip output	AFTER LENGTH OF 5 M	
	VOLTAGE	LOSS
4,8 W/m	**Approx. 23.3 V**	**Approx. 0.7 V**
9,6 W/m	**Approx. 22.6 V**	**Approx. 1.4 V**
12,0 W/m	**Approx. 22.2 V**	**Approx. 1.8 V**
14,4 W/m	**Approx. 21.9 V**	**Approx. 2.1 V**
22,0 W/m	**Approx. 20.7 V**	**Approx. 3.3 V**
28,0 W/m	**Approx. 19.8 V**	**Approx. 4.2 V**

The voltage loss of the supply line as well as at the flex strip circuit board is halved or decreases

- When using a flex strip with 7.2 W/m instead of 14.2 W/m, i.e. for smaller LED power;
- when operating at higher voltage, i.e. using 24 V DC instead of 12 V DC LED flex strips.

The voltage loss of the supply line as well as at the flex strip circuit board is doubled or increases

- when using a flex strip with double or higher output in W/m;
- when operating at lower voltage, i.e. for example when using a 12 V LED flex strip.

USAGE TIP – ADDITIONAL FEED-IN

Even if the transformer has to be placed further away for complex installations such as escalators and not centrally as is ideal, the following sketches describe the possibilities for efficient current feed-in and therefore for avoiding different brightness light output over the entire light strip length:

Example:

24 V LED flex strip with 14.4 W/m (total 216 W on 15 m)

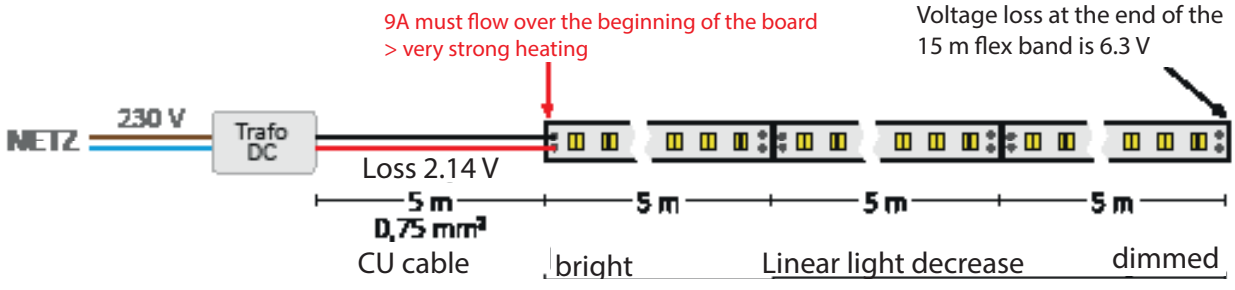
3 rolls each at 5 m length (light line thus totals 15 m)

Supply line: copper cable of 5 m in length

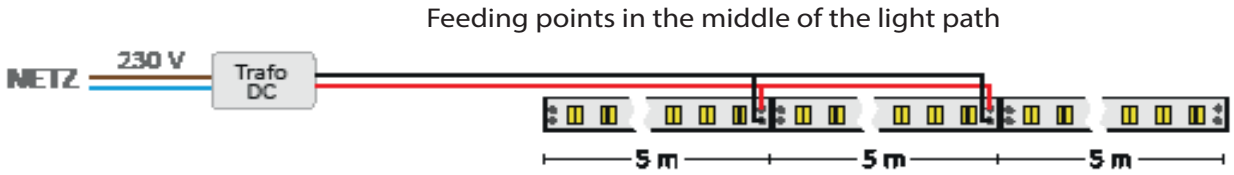
Using additional feed-in points that are realised through a sufficiently sized cable avoids

- voltage losses,
- light losses and
- the overheating of the LED circuit boards (preservation of the expected service life!).

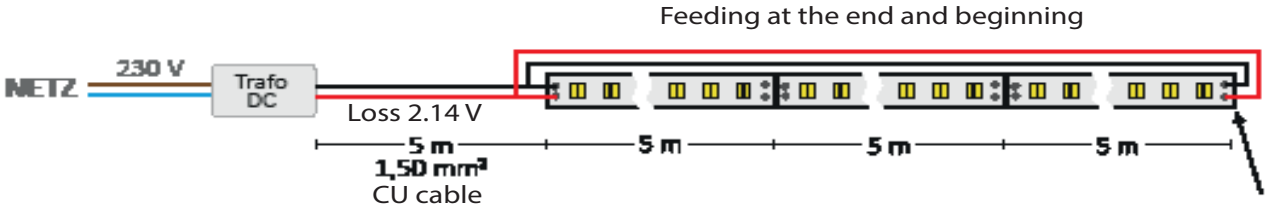
UNILATERAL FEED-IN – NOT RECOMMENDED!



Tip 1 Parallel feed-in points at 5 m and 10 m along the light line



Tip 2 Additional feed-in at the end of the light strip



Note

With an LED flex strip properly mounted on a heat-dissipating surface (e.g. aluminium profile), the surface temperature never rises above 50°C!

Increased temperatures mean a rapid reduction of service life.

The conductivity of various surfaces are to be noted: the heat absorption of, for example, stainless steel as well as coated sheet metal is far below that of aluminium.