

APPLICATION NOTE

Selecting the right ESB installation contactor for LED lamp loads



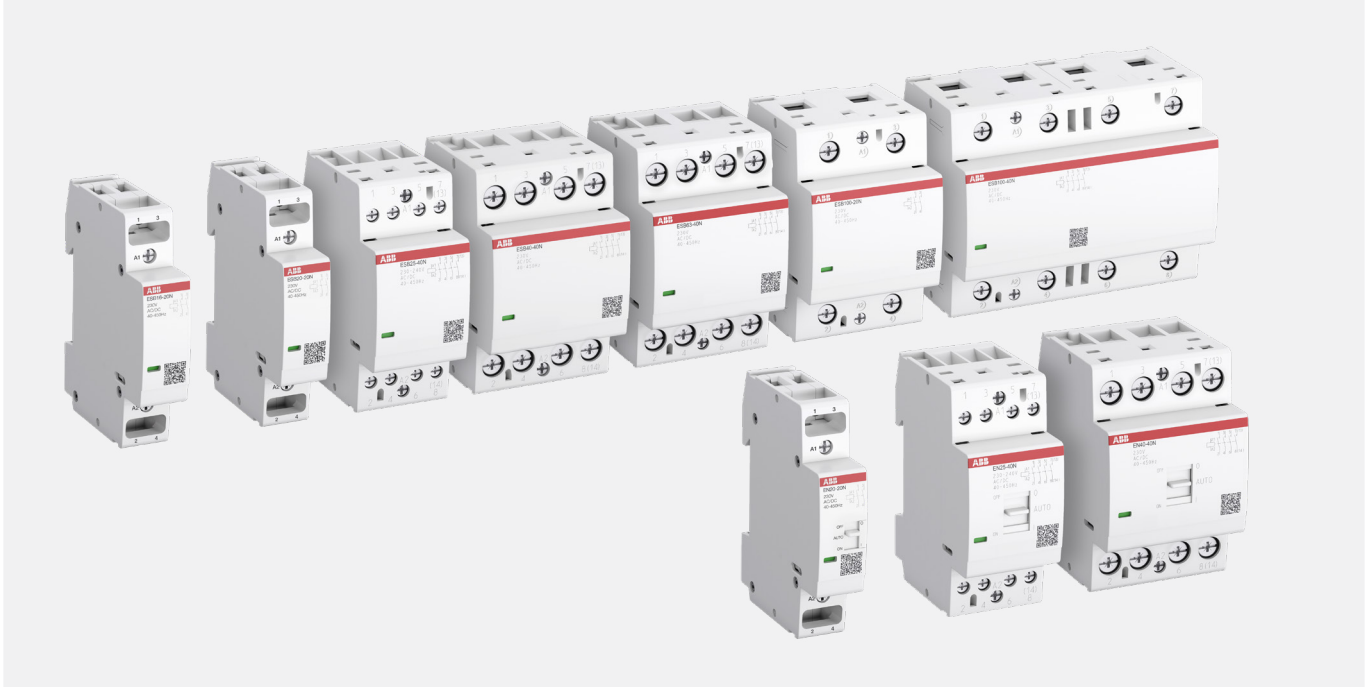
The use of LED lamps has increased a lot in recent years. LED lamps offer a variety of advantages over traditional incandescent bulbs and other lighting technologies. They are characterized by their energy efficiency, long service life and low heat generation.

With this increasing prevalence, it is important to select the right installation contactor for LED lamp loads to ensure reliable operation and maximum service life. This application note provides guidance on how to properly select ABB installation contactors for LED lamp loads.

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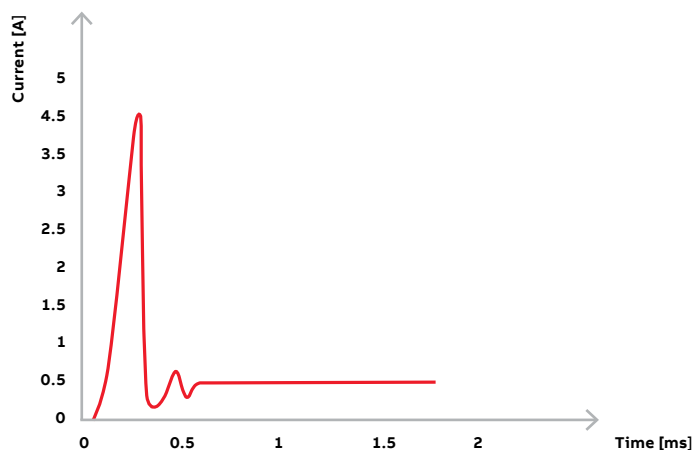
The challenge for switching contacts



Before choosing an installation contactor for LED lamps, it is important to understand the challenges of switching LED lamps. LED lamps often have a lower operating current and lower power consumption compared to traditional incandescent or fluorescent lamps. At the same time, they often have high and short inrush current spikes, which pose a challenge for the contactor.

The inrush current varies significantly and can range up to 300 times the operating current. Especially with several lamps, this can be very high. Thus, the inrush current and its duration in the microsecond range are the two decisive design factors that should be used to determine how many LED lamps with lamp drivers can be connected to a contactor per phase.

Figure 1:
Inrush current
over time



The current peak generated is determined by many factors such as the type of ballast, the cable length and the cable cross-section, the lamp specification or the phase angle of the AC voltage when switched on.

Choosing the right ESB installation contactors

If there is no value for an inrush current given in the technical data, the values in line 1 of table 1 can be used as a guide when selecting the right contactor. It specifies the maximum current value that the respective installation contactors can switch per phase if very high-quality lamp drivers are used, which cause only very small or no current peaks.

If the technical specifications of the driver are known, it is recommended to use the values of the secondary line as this helps prevent contact welding during closing of the contacts. The secondary line delineates the maximum switching capacity per phase for each contact of the installation contactor. This value is equivalent to ten times the current specified in the primary line and the contacts of the ESB/EN.. N installation contactor is capable to withstand this current for a duration of two milliseconds.

| | ESB16..N | ESB20..N EN20..N | ESB25..N EN25..N | ESB40..N EN40..N | ESB63..N | ESB100..N |
|--|----------|---------------------|---------------------|---------------------|----------|-----------|
| LED-Lamps [A] | 4 | 6 | 7 | 20 | 30 | 45 |
| Max. current peak [A] for 2 ms (2 ms = 2,000 μs) | 40 | 60 | 70 | 200 | 300 | 450 |

Table 1: Current values for LED lamp loads

Example

Selecting the right installation contactor to control 50 LED lamps with 85mA (Figure 2).

Case 1: Without specification of an inrush current

- 50 lamps
- I_e : 85 mA
- $85 \text{ mA} \times 50 = 4250 \text{ mA} = 4,25 \text{ A} < 6 \text{ A} \rightarrow \text{ESB20}$



Figure 2

Case 2: With specification of an inrush current

- 50 lamps
- I_e : 85 mA
- I_{peak} : 5 A for 100 μS
Please note that 100μS is equal to 0.1ms. This means that the contactors can carry the inrush peak 20 times longer. (2ms/0.1ms = 20)
- $50 \times 5 \text{ A} = 250 \text{ A} < 300 \text{ A} \rightarrow \text{ESB63}$

Distribution in case of supply via one or more poles

Setting 1

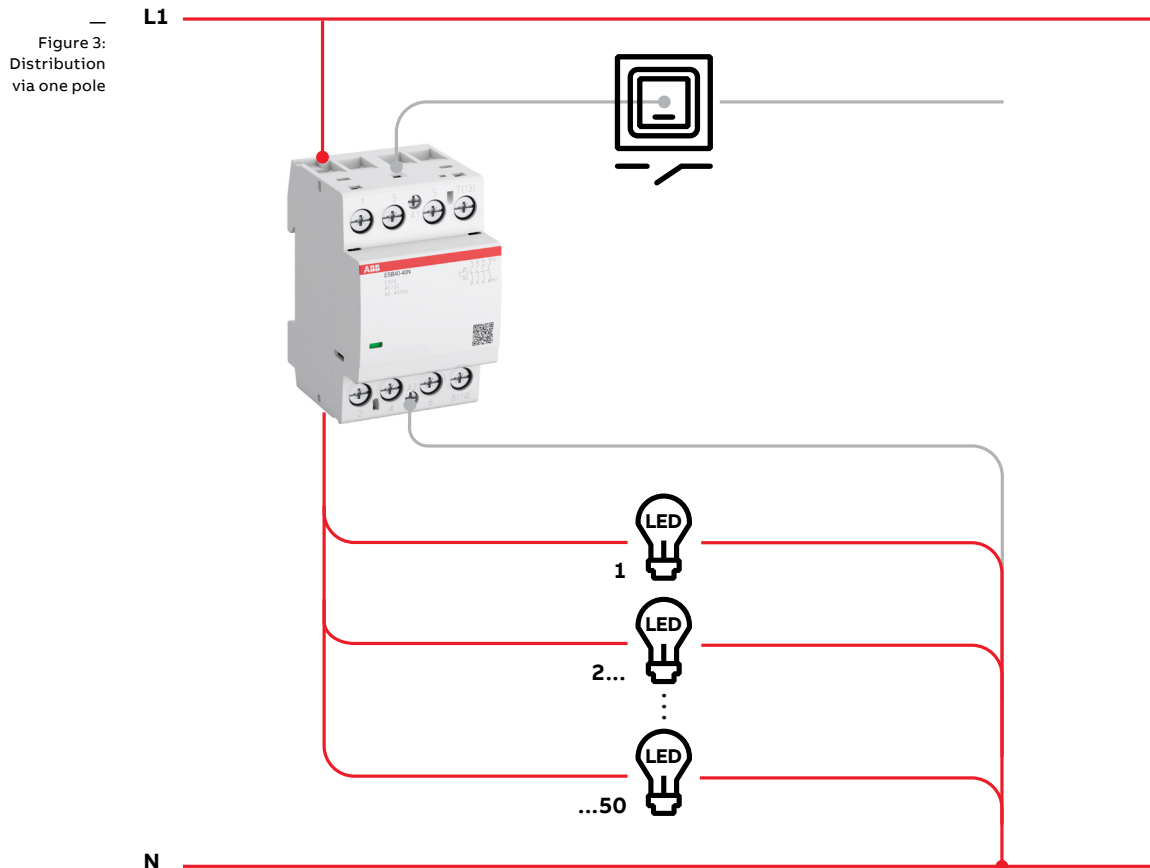
There is only one pole available

If only one pole is available on the contactor and all lamps/drivers are connected to this pole, the maximum current of all lamps must be summed up, and the contactor must be selected based on this value and the values in the table.

(Case 1 or Case 2).

For Case 1 the ESB20 is the right installation contactor.

For Case 2 the ESB63 is the right installation contactor since this contactor can withstand 250 A for 2 mS.

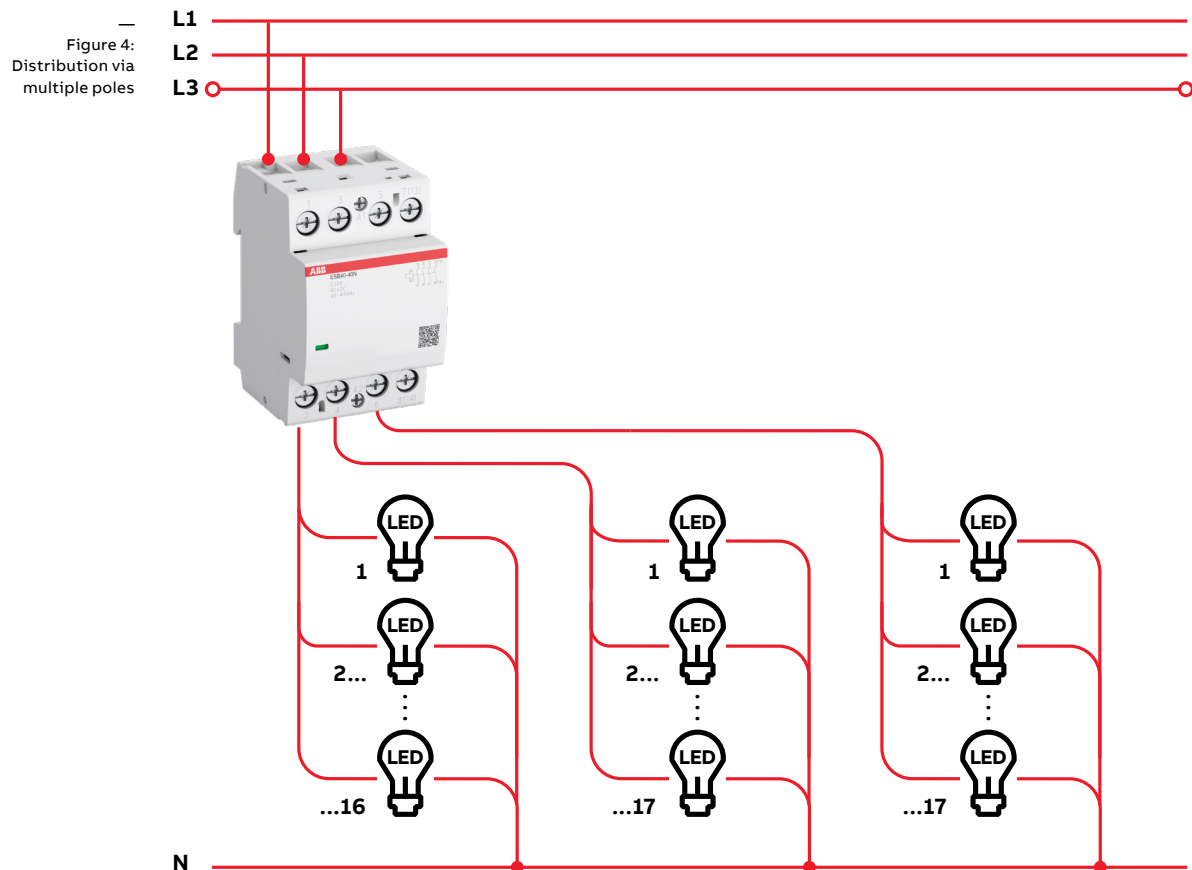


Setting 2

If three poles are available, it is advisable to divide the lamp drivers in a balanced way:

- Pole 1 → $16 \times 5 \text{ A} = 80 \text{ A}$
- Pole 2 → $17 \times 5 \text{ A} = 85 \text{ A}$
- Pole 3 → $17 \times 5 \text{ A} = 85 \text{ A}$

The highest inrush current peak is 85 A for 100 μs . In this case, an ESB40 is recommended for the corresponding contacts, for example: ESB40-30N, or if the neutral conductor should be connected an ESB40-40N.



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