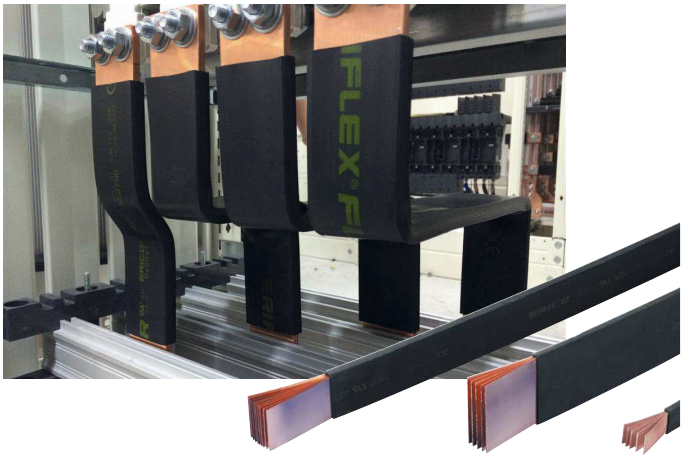
NVENT ERIFLEX AND SHORT CIRCUIT



Purpose: This document gives guidelines to panel builders on various issues including proper component selection, wiring methods and calculation of short-circuit current ratings.

GENERAL INTRODUCTION

nVent ERIFLEX Low Voltage Power Connections Software allows users to create a technical panel layout with all of the necessary components and easy to follow instructions. Users can determine the optimum size of nVent ERIFLEX Flexibar according to the nominal current (In), width of connections, temperatures with optimized air cooling and now the: short-circuit effect. The interactive software features the most up-to-date pricelists, technical and commercial datasheets and a project installation calculator.

WHAT IS A SHORT-CIRCUIT?

A short-circuit is an abnormal connection between two nodes of an electric circuit intended to be at different voltages. Whenever a short-circuit occurs on a power system, a series of devastating phenomenon take place. This is one of the reasons why electrical installations require back-up protection against short-circuit currents and requires users to properly select and install the right devices.

HOW IS A THERMAL PHENOMENON CREATED?

A thermal phenomenon is created by the ampacity carried in the conductive parts. The increase of conductor temperature is linked to the resistivity of the conductor material and cross section, ampacity and duration.

This phenomenon may destroy the device or the conductor insulation if the selection is not properly done. The device or conductor characteristics are quantified by a maximum admissible ampacity (Icw) with duration time by default at one second. nVent ERIFLEX Low Voltage Power Connections Software allows a user to calculate the needed minimum cross section for a requested Icw value and duration according to the IEC 61439.1, Annex B.

HOW ARE ELECTROMAGNETIC FORCES INDUCED?

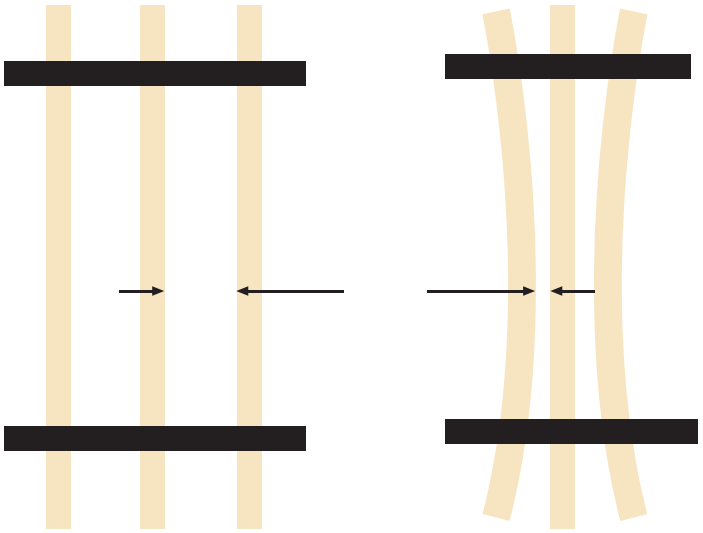
Electromagnetic forces are induced in conductors by the currents flowing through them. When parallel conductors are long compared to the distance between them, the force will be evenly distributed along the conductors. The force is attractive when the currents in the two conductors have the same direction resulting in a “pull” mechanical effect. When the directions of the currents are opposite, the forces are repulsive resulting into a “push” mechanical effect.

HOW IS AN ELECTROMAGNETIC FORCE CALCULATED?

An electromagnetic force is calculated with the peak ampacity value (Ipk). Icc rms is not used to calculate the electromagnetic force. However, the IEC 61439.1 standard gives by default the relation between Ipk and Icc rms, also called “factor n” (IEC 61439.1 §9.3.3, table 7).

The effect of this phenomena is very dangerous, because the creepage and clearance distances can be dramatically reduced due to movements of non-insulated conductors (mechanical deformation, oscillations) during the short-circuit. The result could be a flash over between two conductive parts.

Clearance Distances
Busbar supports with bare copper bars



Before short-circuit:
Normal Distance

During short-circuit:
Reduction of clearance distance

For plain bars, it requires the user to properly select the right product, using the nVent ERIFLEX Low Voltage Power Connections Software calculator, and then installing the right type and number of busbar supports to withstand a prospective fault current.

The reduction of distance during movement of Flexibar does not provide added risk because of its high quality insulation. The mutual contact or contact with conductive parts is permitted with Flexibar insulation.

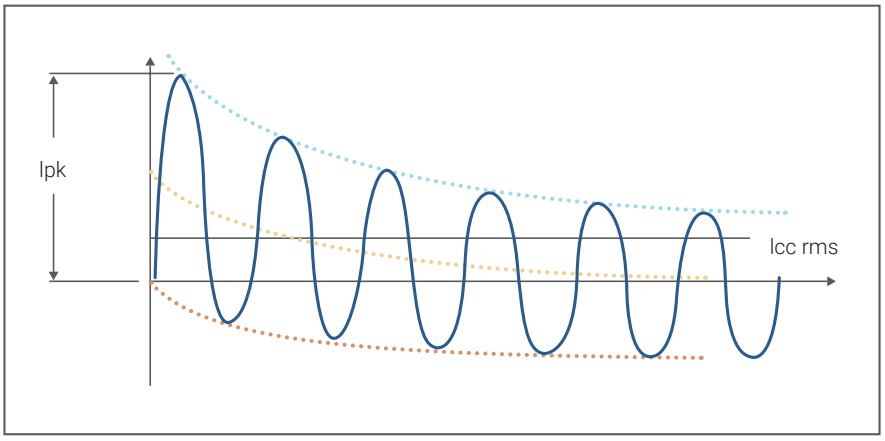
IEC 60865 indicates the following formula for the force calculations during short-circuit:

$F = 2*10^{-7} \times 0.87 \times Ipk^2 \times (l / d)$

KEY
F = Force (N)
Ipk : Ampacity (A)
l= length of conductor (m)
d= distance between axes of conductors (m)

There is no differentiation between a cable and Flexibar in the IEC 61439.1 standard, they are both insulated conductors. The Ipk endurance is not limited by Flexibar.

Electromagnetic Force



NVENT ERIFLEX RECOMMENDATIONS

- In cases where several Flexibar products are installed in parallel, a minimum distance of a few millimeters is recommended for air cooling. We advise installers to use ERIFLEX spacers (FS, RFS, UFS kit) which improve the aesthetics global feature.

NVENT ERIFLEX RECOMMENDATIONS (CONTINUED)

- Maximum admissible Flexibar Icw value must be in accordance with the Icw of the equipment.
- Thanks to the high quality of PVC insulation (reinforced insulation), mutual contact or contact with conductive parts is allowed and there should not be mechanical risk of damage. Consequently, it is not necessary to fix Flexibar or the cables.
- In case of proximity with sharp edges, and based on the variety of configurations, it is very difficult to give universal rules for Flexibar enduring short-circuit. Two possibilities can be implemented:

  1. The protection of the sharp edges can be done by rebate seals, rectangular glands, plastic screens, etc.

  2. Create a support to fix Flexibar. This could be designed and manufactured by nVent engineers who specialize in nVent ERIFLEX.
- The possibility to fix Flexibar together can reduce the distance (d) between Flexibar, which can increase the electromagnetic force. Keeping Flexibar free, without support, longer distances (d) can minimize the electromagnetic force. The optimized design is linked to each specific configuration.
- The installer should follow specific manufacturer recommendations of the device in instances where Flexibar is connected.

LOOKING FOR MORE INFORMATION?

Help make your project successful with worldwide customer service. Contact your local nVent ERIFLEX sales representative for more information, quotes, repair or maintenance, or to request your personal login information for nVent ERIFLEX Low Voltage Power Connections Software. For technical support and assistance, contact us at: technicalsupportEU@nVent.com.