

# FleXbus System

## Specifications



**SPECIFICATION FOR  
“nVent ERIFLEX FleXbus” Insulated Flexible Busbar System  
or engineering approved equivalent per the specification below**

## **1. SUMMARY**

This specification covers the technical requirements of the nVent ERIFLEX FleXbus insulated flexible busbar System for use in low-voltage power applications where electrical connections between live parts are required.

## **2. CONDUCTOR**

### **2.1. COMPLIANCE REQUIREMENTS**

- a. IEC® 61439-1 “Low-voltage switchgear and controlgear assemblies” and temperature rise tested & certified
- b. IEC® 61439.1 Class II (reinforced insulation) – Chapter 8.6.4 and Table 4
- c. IEC® 60364-4-41 Class II (reinforced insulation) – Chapter 410.3.3 and 412
- d. IEC® 60695-2-12 (Glow Wire Test 960 °C)
- e. UL 94V-0 : Flame retardant
- f. UL® 2885 (Outline of Investigation for Acid Gas, Acidity and Conductivity of Combusted Materials)
- g. IEC® 60754-1 (Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content)
- h. Smoke, Toxicity and Acidity Rating: IEC® 60754-2
- i. IEC® 62821-1 (Electric cables - Halogen-free, low smoke, thermoplastic insulated and sheathed cables of rated voltages up to and including 450/750 V)
- j. IEC® 61034-2 (Measurement of smoke density of cables burning under defined conditions)
- k. EN 45545 European union standard fire testing to railway components obtaining an HL3 classification for chapters R22 and R23
- l. UV Rating: UL 2556 and UL 854. IEC® 60364-2-52 Chapter 522.11: Level AN3 and ISO 4892-2
- m. RoHS 2002/95/EC Compliant
- n. CE marked
- o. EU CPR Class: CPR does not apply to FleXbus
- p. Vibration test according IEC 60364-5-51, Table 51-A and annex C and according CEI60364-5-52, Chapter 552.7 level AH2/ Class 3M6 (High vibration)

## 2.2. PRODUCT COMPOSITION

### a. Braided conductor

The Conductor is made with 0.2mm wire diameter and stranded and braided together. Each wire is made with CCA material (Copper Clad Aluminum) with 90% Aluminum and 10% Copper Aluminum should be from A00 grade with 99.8% purity

Copper should be Cu-ETP according to EN13599 and with purity of minimum 99.9%.

The maximum resistivity at 20°C shall be <0.027 ohms.mm<sup>2</sup>/m.

Wire elongation shall be >10%

Final braid shall be rectangular section with 50 or 100 mm width and maximum thickness of 32mm.

Conductor shall be ready-to-use from one side or 2 sides with crimped tube made with tinned copper and pre-punched

Conductor length shall be up to 100 meter long

Conductor cross section should be able to carry from 500 to 2356A with one conductor per phase, up to 4712A with 2 conductors per phase and up to 6361A with 3 conductors per phase at Delta T 60K. Temperature rise test should be performed by a third party laboratory and test report shall be COFRAC certified. Temperature rise test should be performed According to IEC 61439-1 (Ed 3.0 2020/05) Low-voltage switchgear and controlgear assemblies Part 1: General rules – Chapter Temperature-rise §10.10.2.3.

No bending radius should restrict the usage of this conductor.

Manufacturer should provide current/Ampacities table under different Delta T (K) and with and without conductor arrangement (Symmetrical coefficient - magnetic field) according to IEC 60364 (Low Voltage Installations) - 523.7 Conductors in parallel

Manufacturer shall provide de-rating coefficient in function of the system frequency (Hz)

Manufacturer shall provide Thermal dissipation at Typical Downstream Circuit Breaker Current Rating (W/phase) @ 90°C

Manufacturer shall provide the Thermal short-circuit strength (I<sub>cw</sub>) resistance @ 0.2 / 0.5 / 0.8 and 1 second

Manufacturer shall provide the conductor Voltage drop data's in function of the conductor cross section and length.

Harmonics should be taken under consideration and manufacturer shall provide solution and de-rating data's according to the IEC 60364 – Table E.52.1

### b. Insulating sleeve

The insulating sleeve is made of extruded Thermoplastic Elastomer (TPE). The TPE have an elongation performance of 500% and a dielectric strength of 20kV for 1mm of insulation. The TPE is self-extinguishable and rated to class V0 according to UL94 and Glow Wire Test 960 °C, according to IEC® 60695-2-12.

The TPE is Halogen free according to UL 2885, IEC® 60754-1 and IEC® 62821-2.

The TPE is Low smoke classified according to UL 2885 and IEC® 61034-2.

It have a thickness of 3 mm minimum.

The sleeve is 100% dielectrically tested during extrusion

The insulating sleeve is compliant with Chapter 8.4.4 and table 4 – Protection by total insulation of the IEC 61439-1 standard (Class II: reinforced/double insulation) and Class II according to the IEC 60364-4-41 chapter 410.3.3 and 412.

The Mechanical impact resistance shall be IK09

Dielectric strength is 20kV:mm

Nominal voltage is 1000V AC and 1500V DC as per IEC

Nominal voltage is 6000V AC & DC according to EN 50264-3-1, Chapter 7.3, 7.5, 7.6 and 7.7.

Nominal voltage is 3600V AC according to IEC 62271-1, Chapter 7.2.7.2 and 7.2.7.3.

Working temperature is from -50°C to +115°C

Insulation should be EN 45545 certified and HL3 classified

Tested according to the AN3 UV radiation level - High UV exposure (IEC 60364-5-52 - Low voltage electric installation, Chapter 522.11: Solar radiation (AN)).

The insulating sleeve is marked with a traceability code, CE Mark and be of green or yellow color.

The insulating sleeve material is black or dark grey.

### **3. BRAIDED CONDUCTOR CONNECTION SYSTEM**

#### **3.1. COMPLIANCE REQUIREMENTS**

- a. IEC® 61439-1 “Low-voltage switchgear and controlgear assemblies” and temperature rise tested & certified
- b. IEC® 61914 “Cable cleats for electrical installations” and short-circuit tested & certified up to 67kA rms – 147kA Peak.
- c. Vibration test according IEC 60364-5-51, Table 51-A and annex C and according CEI60364-5-52, Chapter 552.7 level AH2/ Class 3M6 (High vibration)
- d. RoHS 2002/95/EC Compliant
- e. CE marked

#### **3.2. PRODUCT COMPOSITION**

Connection system is made with:

- High current busbar clamp made with nonmagnetic materials stainless steel (Stainless Steel 304 EN 1.4301) for high current connections to prevent the formation of magnetic fields. It allow to fix the conductor on the transformer/ Power supply palm, without drilling It contains a crimped Self-locking nut for vibration resistance and easy installation. Rigid design assures even contact pressure. Clamp should have different dimension according to power supply connection palm such as 63/80/100/120/160mm large. One Clamp per phase can carry up to 1984A and two clamp per phase can carry up to 4712A. Above, 3 clamp up to 6361A It contain a Voltage detection connecting point

- High Current plate made with Rigid Copper part CU-ETP 99.9% purity and tinned to provide a good electrical contact and to maintain braid expansion during compression. A specific version should contain a connection point for the PE conductor connected to the neutral phase.

## 4. SUPPORT / BRACING SYSTEM

### 1.1. COMPLIANCE REQUIREMENTS

- a. UL 94V-0 : Flame retardant
- b. IEC® 60695-2-12 (Glow Wire Test 960 °C)
- c. IEC® 60754-1 (Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content)
- d. IEC® 61439-1 “Low-voltage switchgear and controlgear assemblies”
- e. IEC® 61914 “Cable cleats for electrical installations” and short-circuit tested & certified up to 67kA rms – 147kA Peak.
- f. Vibration test according IEC 60364-5-51, Table 51-A and annex C and according CEI 60364-5-52, Chapter 552.7 level AH2/ Class 3M6 (High vibration)
- g. RoHS 2002/95/EC Compliant
- h. CE marked

### 4.2. PRODUCT COMPOSITION

Support should contain an adjustable Clip, to adapt the support with different conductor thickness (Open/Closed position)

Made with Glass Fiber Reinforced Polyamide, Halogen free, RoHS, Working Temperature: -40 to 130 °C, Flammability Rating: UL® 94V-0 and IEC® 60695-2-11 (Glow Wire Test 960 °C). Low smoke as per ISO 5659-2

Support can offer multiple configuration such as Flat, or on edge position. Configuration with 3P / 3P+N / 3P+N+PE... One or two conductor per phase. Conductors Side by side or on top. Adjustable distance between each conductor (12,5 mm pitch) through Punched holes Aluminum profile to fix the support directly on the wall, on the ceiling, or on cable tray (Wire / Perforated / Ladder cable tray). Optional brackets shall be available.

Mounting hardware shall be made with Electrogalvanized steel from class 8.8

Manufacturer shall provide solution and data's for phase inversion or neutral rotation configuration  
Support shall be short-circuit tested & certified up to 67kA rms – 147kA Peak according to IEC® 61914. Manufacturer shall provide maximum distance between support in function of Icc from 10 to 67 kA (rms)

## **5. FIRE BARRIER SYSTEM**

### **5.1. COMPLIANCE REQUIREMENTS**

- a. EN 1366-3 Fire resistance tests for service installations - Penetration seals
- b. EN 13501-1 Fire classification of construction products and building elements. Reaction to Fire
- i. CE marked & ETA (European Technical Assessment)

OR

- c. ASTM E 814 (UL 1479) Test method for Fire Tests of Through Penetrations Fire Stops
- d. ASTM E 84 (UL723) Test method for Surface Burning Characteristics of Building materials.

### **5.2. PRODUCT COMPOSITION**

Fire barrier system shall be a kit for conductors penetration seal based on the following components:

- Product in cartridges on the basis of polyurethane with intumescent fire protection additives. After application, it react and increase its volume.
- Block-shaped intumescent elastic product on the basis of polyurethane with intumescent fire protection additives
- Intumescent wrap on the basis of butyl rubber with intumescent fire protection additives and glass fabric reinforcement.

## **6. IP55 and IP66 CONDUCTOR ENTRY**

### **6.1. COMPLIANCE REQUIREMENTS**

- a. IEC® 60529 (Degrees Of Protection Provided By Enclosures - IP Code) – IP55 classified
- b. UL 94V-0 : Flame retardant
- c. RoHS 2002/95/EC Compliant

### **6.2. PRODUCT COMPOSITION**

IP55 Conductor entry can be used for Switchboard and/or Power supply cover to upgrade installation to IP55 level. It protect the conductor insulation against sharp edge from Power supply or Switchboard top cover

Conductor Entry is made with

- Soft PVC to follow any potential conductor bending radius
- The sealing around the conductor is made by a self-fusing tape with a strong adhesive
- Good resistance to solvent and hydrocarbon splashes
- Adaptable to any conductor cross section by cutting the top material with traditional cutter
- High acid resistance
- UV resistance
- RoHS compliant
- Flame retardant

Optional Heat shrink tubing to upgrade from IP55 to IP66. Thick wall polyolefin heat shrink tubing with coextruded hot melt adhesive. Shrink ratio is up to 4:1, min. shrink temperature is 135°C, operating temperature is –55°C to +130°C.

## 7. MANUFACTURER'S QUALIFICATION AND QUALITY CONTROL

- a. Manufacturer shall be ISO9001:2008 certified and manufacturing and quality control be done accordingly.

## 8. 3D/2D CONNECTION DESIGN

The system manufacturer must provide the user/installer with 3D/2D models of all system components, in a wide range of file extensions, depending on the CAD software used.

## 9. CALCULATION NOTE

The system manufacturer must supply a regulatory calculation note, or provide the user/installer with the option of formalizing the calculation note, e.g. by supplying appropriate software. The calculation note must include :

Project identification

- Customer name
- Project name/number
- Calculation note creation date
- Name and company of calculation note creator

Power supply/source level

- Source type
- Source name
- In (rated current) of source (A)
- Voltage between phases (V)
- Number of phases
- Cos  $\phi$
- Harmonic level
- Max altitude of installation
- Source Icc (kA rms) - IK3, IK2 and IK1

Conductor level

- Type
- Correction factor
- Symmetrical installation (yes/no)
- Max. insulation voltage
- Conductive part (description)
- Insulation (description) with max. operating temperature
- Rated short-time withstand current Icw (kA)
- Cross-section per phase
- I max / Phase (A)
- Ambient temperature taken into account
- Voltage drop (Cos  $\phi=0.8$ ) (%)
- Connection length
- PE conductor copper cross-section

Switchgear / protecting device level



- Type of protection
- In Max (A)
- Number of switchgear poles
- Tripping time
- Breaking capacity (kA)
- Icc at Switchgear level (kA rms) - IK3, IK2 and IK1

The calculation note must indicate the reference standard for the calculation (International - IEC) or (European - HD) or (National) :

- AS 3008
- ÔNORM
- RGIE - AREI
- NBR 5410
- CSN
- NFC 15-100
- DIN VDE 0100
- CEI 64-8
- NEN 1010
- NP
- REBT
- NIBT-NIN
- BS 7671