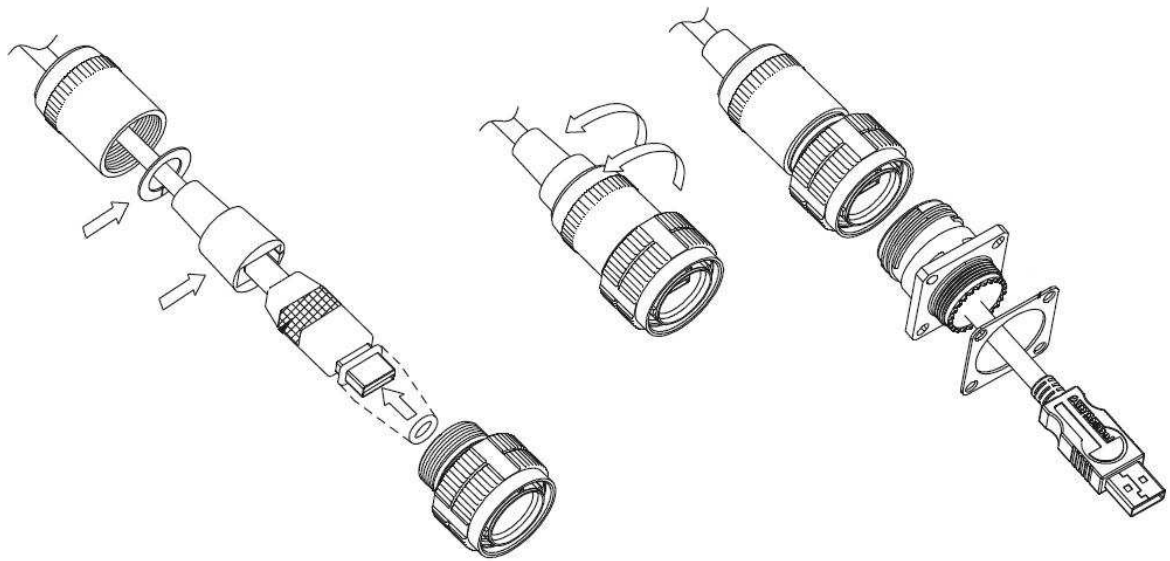




**Compliance with EN60079-15: 2006  
Electrical apparatus for explosive atmospheres  
Type of Protection « n » for Zone 2**

**USBFTVX series: rugged and sealed USB connectors**



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## Introduction

This report will demonstrate compliance of USBFTVX series with requirements of EN60079-15: 2006 Electrical apparatus for explosive atmospheres – type of protection “n”.

## Electrical Characteristics

Voltage : 60V<sub>eff</sub> max

USB jack contacts of USBFTVX series are rated for at least 1A.

As USBFTVX is low power non-sparking electrical material. Voltage and current have to be chosen to handle a max power of 20W.

Data transmission: USB specification 2.0. Data Rate : Up to 480 Mb/s for High Speed USB

## Review of Requirements (by section)

### 1. Scope

EN60079-15: 2006 describes requirements for construction, testing and marking of Group II electrical apparatus with type of protection “n” dedicated to be used in explosive atmospheres of gas.

It's applicable to non-sparking electrical apparatus as well as apparatus with parts or circuits producing arcs or sparks or having hot surfaces which, if not protected in one of the ways specified in this standard, could be capable of igniting a surrounding explosive atmosphere.

USBFTVX series is designed for device group II, category 3G. It may be operated within zone 2 as a low power non sparking connector under specified electrical characteristics. Following paragraphs will show compliance with a T6 temperature classification and an operating temperature range of – 40°C / + 70°C.

### 2. Normative references

Please consult EN60079-15: 2006 and EN60079-0: 2006

### 3. Definitions

Please consult EN60079-15: 2006 and EN60079-0: 2006

### 4. General : Group of material and surface temperature

USBFTVX series will be classified as Group II (no specific explosive gas atmosphere) with a T6 classification.

### 5. Temperatures

*Ambient temperature:*

The operating temperature range of USBFTVX series is – 40°C to + 70°C. As this range is special compared to standard one - 20°C / + 40°C, EN60079-15 rating code II3G ExnAIIIT6 will be followed by the symbol “X”.

*Surface temperature:*

USBFTVX series meets the requirement for a T6 classification.

To evaluate this T6 classification for an ambient temperature of -40°C / +70°C, representative samples were tested at an ambient temperature of 20°C. A derating curve gives us then the heating for an ambient of 70°C: at 72.1°C of ambient and with a current of 1.5A per contact the hottest point (inside the plug) is 80° (T6 – 5°C).



## 6. Requirements for electrical material

### *Mechanical resistance:*

Representative samples were tested following articles 26.4.2 mechanical resistance.

A mass of 1kg (diameter of 25mm) falls twice on each mated pair from a height of 0.7m.

No deterioration which could affect the IP protection level has been observed. Moreover no electrical discontinuity has been noticed during the test.

Then plugs of each mated pairs were submitted to drop tests described in article 26.4.3: 4 falls from 1m height on horizontal floor in concrete. As for mechanical resistance tests, no deterioration able to affect the IP protection has been observed. Then mated pairs were submitted successfully to IP67 tests following EN60529.

Furthermore, as USBFTVX shells are based on military specification MIL-DTL-38999 serie III, its mechanical resistance equals many of parameters established by this standard.

### *Protection degree:*

USBFTVX is IP67 and IP68.

### *Clearances, creepage distances and separations:*

USBFTVX is a low power non-sparking electrical material. The protection degree is IP67 and IP68. The maximum voltage of use is 60Veff and power should not exceed 20W.

So no special creepage and clearance are required.

As USBFTVX is a passive component which doesn't contain any power, this connector is not concerned by any transient.

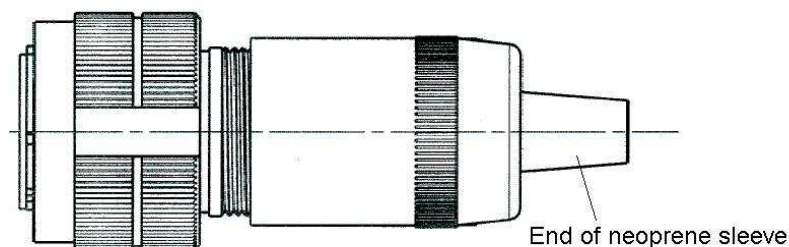
### *Dielectric Withstanding Voltage (DWV):*

USBFTVX has been successfully tested under a test voltage of 500V during 1 minute, according to 6.8.1.

Moreover, according to 6.8.2 and 34, each panel mount receptacle is controlled during production and has to support test voltage of 500V during 1 minute without any breakdown or flashover.

## 7. Non metallic shell or part of shell

For USBFTVX series the only part of the shell which is non metallic is the end of the polychloropren sleeve.



The functionality of this polychloropren sleeve is to insure the compression of the O ring on the plug body to reach the IP67 and IP68 sealing level. All the active parts of this sleeve are protected by the metallic shell. So USBFTVX is not concern by life time, luminar resistance, thermal shock and tap hole tests.

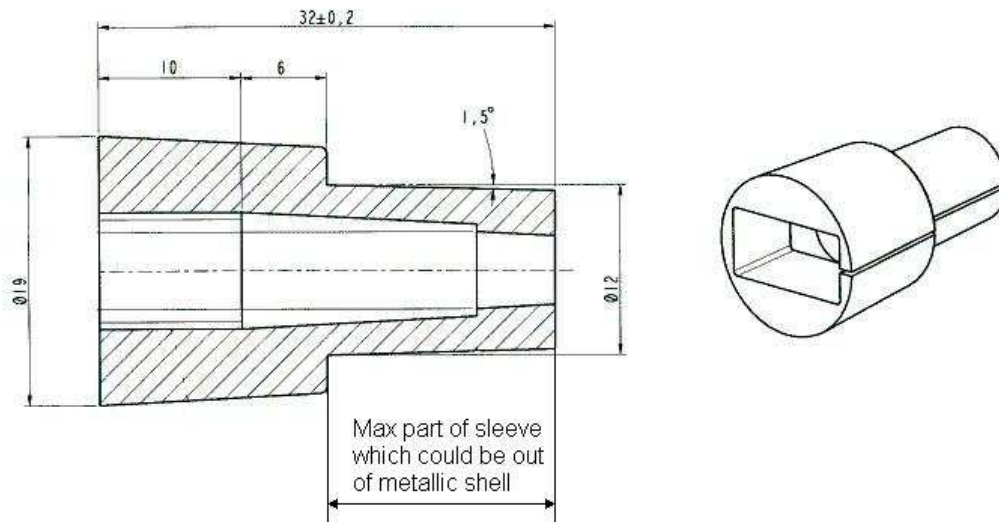


*Electrostatic discharge on non metallic exterior part of shell:*

The sleeve has a round shape and its maximal surface projection is  $19 \times 16 + 16 \times 12 = 496 \text{ mm}^2 < 2000 \text{ mm}^2$ .

**NB:**

This is the maximal surface projection of the complete sleeve, but only its termination can be out of the shell.



8. Metallic shell

As USBFTVX is designed for group II zone 2 applications, no constraint is specified.

9. Shell Closing

Not applicable: USBFTVX doesn't contain any closing to satisfy the IP67 and IP68 degree of protection.

10. Coupling system

Requirements of EN60079-0 are not applicable for EN60079-15.

11. Rotation of through bulkhead

Not applicable: there is no necessary rotation to insure the connection of cable on USBFTVX.

12. Material used for transversal sealing

Each panel mount receptacle of USBFTVX is compounded for transversal sealing (IP67 and IP68), even in unmated conditions.

The temperature range of used compounds is  $-50^\circ\text{C} / +180^\circ\text{C}$  so it's in accordance with our temperature range of use  $-40^\circ\text{C} / +70^\circ\text{C}$ .

13. Ex components

USBFTVX is an Ex component. He complies with ATEX European Union Directive 94/9/EC relating to GroupII category 3G locations (annex VIII) except of the CE marking: as passive components, connectors are not submitted to CE marking. So USBFTVX will have to be used



as an Ex component with systems, materials or enclosures on which the integration has been foreseen, for example by respecting recommended panel drillings.

#### 14. Wiring elements and wiring localisation

USBFTVX contains standard USB components which are suitable for use with USB cables and cordsets of the market and is a non-sparking electrical connection.

The following elements will show compliance of USB cable entry with Annex A of EN60079-0:

- sealing is insured by polychloropren sleeve and O ring in NBR
- as explained in above article 7., the polychloropren sleeve, which has a part out of the shell, is in accordance with the requirement for non apparition of electrostatic discharge.
- there isn't any composed of filling
- tensile strength test with mooring by the system polychloropren sleeve + metallic backshell: a traction of 100N has been applied on a mated pair using a USB cordset with a diameter of 5mm. Backshell of the plug has been tightened with a torque of 10Nm. After 6 hours, there was no slide of USB cordset. Moreover no electrical discontinuity has been noticed.
- to check mechanical resistance, after tensile strength, a torque of 15Nm has been applied and no damage of the packing box has been noticed
- cable is protected by the polychloropren sleeve.
- the backshell has to be tightened according to the torque of 10Nm. Then the dismounting will be possible only with a tool.
- mechanical mooring test and mechanical resistance were successfully performed on the cable entry mounted on USBFTVX mated pair.
- USBFTVX mated pairs equipped with its cable entry has been submitted successfully to mechanical resistance described in 26.4.2 At the end of those tests, USBFTVX was still IP67 and IP68. For more information, please see above article 6. Requirements for electrical material.

#### 15. Wiring elements of ground conductors

Not applicable.

#### 16. Shell entry

USBFTVX plug contains a cable entry whose compliance with EN60079-0 has been shown in above article 14.

The acceptable outside cable diameters are from 4mm to 6mm.

#### 17. Supplementary requirements for non-sparking rotating machine

Not applicable. USBFTVX does not have any rotating features.

#### 18. Supplementary requirements for connection apparatus

Not applicable. Description given for connection apparatus doesn't correspond to USBFTVX.

#### 19. Supplementary requirements for non-sparking fuses and fuse assemblies

Not applicable. The products covered by this document do not have any built-in fuses.

#### 20. Supplementary requirements for non-sparking plugs and sockets



In use USBFTVX will be connected on one material. It is mechanically immobilized by a thread coupling with anti decoupling device. This standard coupling system of military specification MIL-DTL-38999 serie III will avoid any involuntary separation.

USBFTVX will have the warning marking: WARNING – DO NOT SEPARATE WHEN ENERGIZED.

As USBFTVX receptacles are compounded, they are IP67 and IP68 even in unmated conditions.

Moreover sealing caps are available for plugs and receptacles and provide an IP67 and IP68 sealing.

21. Supplementary requirements for non-sparking luminaries

Not applicable. The product doesn't contain any luminaries.

22. Supplementary requirements for non-sparking battery elements

Not applicable. The product doesn't contain any battery elements.

23. Supplementary requirements for low power non-sparking material

USBFTVX series is a low power non-sparking rugged USB connector rated for a voltage of 60Veff max with a max power of 20W.

USBFTVX provides an IP67 and IP68 protection degree which is superior to IP54.

As USBFTVX is a passive component which doesn't contain any power, this connector is not concerned by any transient.

24. Supplementary requirements for non-sparking current transformers

Not applicable: USBFTVX doesn't contain any current transformer.

25. Other electrical material

Not concerned.

26. Supplementary general requirements for producing arcs, sparks or hot surfaces material

Not applicable, USBFTVX doesn't produce any arcs, sparks or hot surfaces.

27. Supplementary requirements for enclosed-break devices and non-incendive components which produce arcs, sparks or hot surfaces

Not applicable, USBFTVX doesn't produce any arcs, sparks or hot surfaces and doesn't utilize these devices or features.

28. Supplementary requirements for hermetically sealed devices which produce arcs, sparks or hot surfaces

Not applicable, USBFTVX doesn't produce any arcs, sparks or hot surfaces and doesn't utilize these devices or features.

29. Supplementary requirements for closed or encapsulated devices which produce arcs, sparks or hot surfaces

Not applicable, USBFTVX doesn't produce any arcs, sparks or hot surfaces and doesn't utilize these devices or features.



30. Supplementary requirements for energy-limited materials and circuits which produce arcs, sparks or hot surfaces

Not applicable, USBFTVX doesn't produce any arcs, sparks or hot surfaces and doesn't utilize these devices or features.

31. Supplementary requirements for materials protected by restricted-breathing enclosures and which produce arcs, sparks or hot surfaces

Not applicable, USBFTVX doesn't produce any arcs, sparks or hot surfaces and doesn't utilize these devices or features.

32. General information on verification and tests

The tests made on USBFTVX series follow endurance, mechanical resistance and IP protection degree.

All Amphenol Socapex interconnection system are designed and manufactured following the corporations ISO9001 approved product design and testing procedures.

33. Type tests

To certify USBFTVX series as a zone 2 reinforced & sealed USB connector, Amphenol Socapex has performed the tests required by standard EN60079-15 in his own laboratory. Test reports can be provided on request.

34. Verifications and individual tests

As explained above in article 33, Amphenol Socapex performs in its own laboratory the tests on USBFTVX required by standard EN60079-15. Please ask us to consult test reports.

*Specific individual testing: Dielectric Withstanding Voltage (DWV) test:*

Each panel mount receptacle is controlled during production and has to support test voltage of 500V during 1 minute without any breakdown or flashover.

35. Marking

USBFTVX is suitable for use in zone 2 hazardous locations and is marked according to clause 35. Description of marking:

Manufacturer's name : AMPHENOL

Manufacturer's type: [Amphenol Socapex commercial designation (example: USBFTVX2SA2N03A)]

Certification code: II3G ExnAIIIT6X, see note 1

Operating ambient temperature: - 40°C to + 70°C, see note 2

Certification org. and code: Not applicable

Batch identification code: Date code of production (example : 0822 for week 22 of year 2008)

As USBFTVX will be connected on one material, according to clause 20, the marking will contain the warning: WARNING – DO NOT SEPARATE WHEN ENERGIZED.

Note 1 :

X indicates special conditions. In our case it refers to extended ambient temperature range – 40°C to + 70°C compared to the standard one – 20°C to + 40°C.

Note 2 :

Ambient temperature range won't be listed on USBFTVX plugs and receptacles: they are small products and certification code is already followed by an "X".



USBFTVX complies with ATEX European Union Directive 94/9/EC relating to Group II category 3G locations (annex VIII) except of the CE marking : as passive components, connectors are not submitted to CE marking. So USBFTVX will have to be used as an Ex component with systems, materials or enclosures on which the integration has been foreseen, for example by respecting recommended panel drillings.

#### 36. Documentation & 37. Instructions

USBFTVX is delivered with a notice where information for proper installation, use and performance is precised.

### **Conclusion**

In conclusion, this document shows the compliance of USBFTVX series manufactured by Amphenol Socapex with EN60079-15: 2006.

All the verification tests have been performed by Amphenol Socapex on representative samples of all the products covered by this document.

All products covered by this document are also subject to Manufacturing Department Production Testing in accordance with the ISO9001 approved test procedures.