

# Declaration of Compliance:

In Accordance with EU Regulations 2014/34/EU

Equipment for use in Potentially Explosive Atmospheres



<b>ISSUED BY:</b>	BFM® Global Limited PO Box 66-087 Beachaven 0749 Auckland New Zealand
<b>ISSUED ON:</b>	12 December 2019
<b>FOR THE FOLLOWING PRODUCT:</b>	BFM® fitting, comprising of BFM® spigot and BFM® connector. The BFM® connector materials are set out in the table on page 2.
<b>MANUFACTURED BY:</b>	BFM® Global Limited PO Box 66-087 Beachaven 0749 Auckland New Zealand
<b>CONFIRMATION:</b>	<p>BFM® Global has commissioned the IBExU Institute on eight occasions to test the BFM® fitting for conformance with Atex standard (Regulation 2014/34/EU) regulating product in potentially explosive environments.</p> <ol style="list-style-type: none"><li>1. Report 1B-10-8-058 August 2010 – Tested the BFM® concept and LM4 material</li><li>2. Report 1B-12-8-052 July 2012 – Tested Seeflex 040E</li><li>3. Report 1B-13-8-029 March 2013 – Tested Seeflex 020E and Longer Length Connectors</li><li>4. Report 1B-13-8-085 August 2013 – Tested Seeflex 040AS</li><li>5. Report 1B-15-8-038 May 2015 – Tested Seeflex 020E, with a lesser wall thickness</li><li>6. Report 1B-16-8-071 June 2016 - Tested modifications to BFM® Connectors</li><li>7. Report 1B-17-8-0027 June 2017 - Tested Flexi &amp; Flexi Earthed</li><li>8. Report 1B-18-8-0083/1 March 2019 - Tested Seeflex 060ES, LM3, Teflex, Teflex NP and updated assessments to current standard</li><li>9. Report 1B-18-8-0083/2 March 2019 - Tested Non-Standard BFM®s - SS and PE rings, Flexi &amp; Flexi Earthed, Kevlar Covers</li></ol> <p>Taking these reports and detailed communication with IBExU into consideration, we can advise on the BFM® fitting with standard diameters ranging from 100 to 1,650mm. We have summarised assessments in the table on page 2, with further explanation and greater detail on the following pages.</p>

## IMPORTANT NOTE:

This Declaration covers all explosible dusts as identified by the IFA in their “GESTIS-DUST-EX: Database of Combustion and Explosion Characteristics of Dusts” (Click on link to open database: <https://www.dguv.de/ifa/gestis/gestis-staub-ex/index-2.jsp>). It does not cover explosives i.e. those dusts that need no oxygen from the surrounding air for an explosion, such as gun powder, TNT etc.

## Product Summary Table:

**STRONGLY CHARGE GENERATING** processes are those with a total freefall of more than 3m or using pneumatic transport.

PROCESS TYPE	EXPLOSION ZONE:	MAXIMUM POSSIBLE TOTAL LENGTH* (of non-conductive, un-earthed pipework including BFM® Connectors <b>without rings</b> )									
		SEEFLEX			LM4	LM3	TEFLEX	TEFLEX NP	FLEXI EARTHED & FLEXI	KEVLAR COVER	
		040E, 020E	040AS	060ES							
NOT STRONGLY CHARGE-GENERATING	Dust Ex Zones Interior/ Exterior: 20-22	3m	3m	3m	3m	3m	3m	6m	Flexi Earthed: 3m Flexi: 1m+ to 3m (only permissible for dust with min. ignition energy of >30mj) ≤1m (permissible for dust with min. ignition energy >10mj)	No restrictions as long as metal rings are earthed	
	Gas Ex Zones Exterior 1 + 2 (Inner Zones 0-2 permissible for connector material 040AS ONLY!)	2a = 3m 2b = Zone 1/22 & 2/20,21 - 200cm <sup>2</sup> (area equivalent to Ø100*200L) Zone 2/22 - 3m 2c = Zone 2/22 - 3m	3m	Not recommended (contact us for more informaton)	3m	3m	Not recommended (contact us for more informaton)	6m			
STRONGLY CHARGE GENERATING	Dust Ex Zones Interior/ Exterior: 20-22	200mm Restrictions apply	200mm		200mm	200mm Restrictions apply		6m		No restrictions as long as metal rings are earthed	
	Gas Ex Zones Exterior 1+2 (Inner Gas Ex zones not permissible)		200mm		200mm			6m			

PROCESS TYPE	EXPLOSION ZONE:	MAXIMUM POSSIBLE TOTAL LENGTH* (of non-conductive, un-earthed pipework including BFM® Connectors <b>with rings</b> )									
		SEEFLEX 040E & 020E		SEEFLEX 040AS		LM4		LM3		TEFLEX	
		SS RINGS	PLASTIC RINGS	SS RINGS	PLASTIC RINGS	SS RINGS	PLASTIC RINGS	SS RINGS	PLASTIC RINGS	SS RINGS	PLASTIC RINGS
NOT STRONGLY CHARGE-GENERATING	Dust Ex zones Interior/ Exterior: 20-22	3m	3m	3m	3m		3m		3m		3m
	Gas-Ex Zones Exterior 1 + 2 (Inner Zones 0-2 permissible for connector material 040AS ONLY!)	Zone 2 only = 3m	2a = 3m 2b = Zone 1/22 & 2/20,21 - 200cm <sup>2</sup> (area equivalent to Ø100*200L) Zone 2/22 - 3m 2c = Zone 2/22 - 3m	Zone 2 only = 3m	3m		3m		3m		Not recommended (contact us for more informaton)
STRONGLY CHARGE GENERATING	Dust Ex Zones Interior/ Exterior: 20-22	200mm Restrictions apply	200mm Restrictions apply	200mm	200mm		200mm		200mm Restrictions apply		
	Gas-Ex Zones Exterior 1+2				200mm		200mm				

**Note:** 'SS Rings' means Stainless Steel Rings. These results are only valid for connectors that are undamaged. Connectors that are worn, deformed or have any rings exposed should be replaced.

<b>TABLE KEY:</b>		
	Restrictions apply - contact us for details	
	Not recommended due to restrictions - contact us for details	
	Not Suitable	

\*EG. if there was a section of unearthed, non-conductive pipe 2m long above the BFM® fitting, then the connector length would be restricted to 1m long.

## Product Compliance Detail:

### SEEFLEX 040E & 020E:

The BFM® fitting with Seeflex 040E connector can be used in all Dust Zones. Below is the key conclusion from Report 1B-18-8-0083/1.

The BFM® connectors tested here and in [1] to [6] can be used without restriction in not strongly charge-generating processes both in Zone 20 inside and in Zone 21 outside (Note: Zone 20 is not usual on the outside). From an electrostatic point of view, there is no restriction with regard to the minimum ignition energy of the dust or dust group, because no incendive charges / discharges are possible.

FIGURE 1: BFM CONNECTOR DUST ZONES

With regards to strongly charge-generating processes, the following conditions must be met:

- Max. length ≤ 200 mm
- No explosive gas atmosphere is present.
- Only transport of dusts with low ( $< 10^6 \Omega \cdot m$ ) or middle ( $< 10^{10} \Omega \cdot m$ ) resistivity
- Avoidance of very dry transport air with rel. humidity  $< 25 \%$

FIGURE 2: 020E, 040E AND LM3 STRONGLY CHARGE GENERATING PROCESS CONDITIONS

### CONNECTOR SIZES:

The IBExU Report IB-18-8-0083/1 concludes that the BFM® fitting with Seeflex 040E and 020E connectors of all diameters conform to ATEX regulations in all Dust Zones with a length of up to 3m for not strongly charge-generating processes and 200mm for strongly charge generating processes

### SEEFLEX 040AS:

The Seeflex 040AS can be used in all Dust Hazardous Zones. Refer to Figure 1 for details. With regards to strongly charge-generating processes, 040AS must meet certain conditions to be applicable:

The materials Seeflex 040AS and LM4 tested in [4] or [1] with surface resistances  $1.6 \cdot 10^9 \Omega$  or  $2.5 \cdot 10^{10} \Omega$  are dissipative. However, even with these BFM® connectors, an exceeding of the leakage resistance of  $< 10^8 \Omega$  permitted according to IEC/TS 60079-32-1 [10] can be expected after a relatively short length. For this reason, Seeflex 040AS and LM4 should only be used for pneumatic transport up to the (standard) length of the BFM® connectors of 200 mm. The simultaneous presence of flammable gases / vapours is only permitted if no dusts with a high ( $> 10^{10} \Omega \cdot m$ ) resistivity are transported and if very dry transport air with a relative humidity of  $< 25 \%$  is avoided.

FIGURE 3: 040AS AND LM4 STRONGLY CHARGE GENERATING PROCESS CONDITIONS

### CONNECTOR SIZES:

**For all Dust Zones:** The IBExU concludes that the BFM® fitting with Seeflex 040AS conforms to Atex regulations with diameters 100mm to 1650mm with a length of up to 3m long for strongly charge-generating processes and 200mm long for not strongly charge-generating processes.

**For Outer Gas Zones 1 & 2:** The IBExU concludes that the BFM® fitting conforms to Atex regulations with all standard diameters and a length of up to 3m long for not strongly charge-generating processes and 200mm for strongly charge-generating processes.

Sizes outside this range would need to be tested independently.

**LM4, LM3, TEFLEX NP:**

The BFM® fitting with LM4, LM3, and Teflex NP connectors can be used in all Dust Hazardous Zones. They are also suitable in Outer Gas Zones 1 and 2. Relevant section from report 1B-18-8-0083/1 is pasted below.

Gas zone inside and/or outside	Dust zone inside and/or outside	Permissible BFM surface <sup>1)</sup> for Explosion Group		
		II A (or I)	II B	II C
<b>Seeflex 040AS, LM3, LM4 and Teflex NP</b>				
0, 1, 2	20, 21, 22	No restrictions <sup>3)</sup>		

**FIGURE 4: LM3, LM4 AND TEFLEX NP NOT-STRONGLY CHARGE GENERATING PROCESSES**

The use of the term no restrictions in figure 4 refers to surface size restrictions for not strongly charge generating processes. The conditions for this are no pneumatic transport and an overall conductive, un-earthed free fall distance total of less than or equal to 3m.

**CONNECTOR SIZES:**

The IBEExU concludes that the BFM® fitting with LM4 and LM3 connectors conforms to ATEX regulations, as above, with all diameters and lengths of up to 3m long for not strongly charge-generating processes and 200mm for strongly charge-generating processes with the exception of Teflex NP which can be used for either not strongly or strongly charge-generating processes at lengths of up to 6m.

**FLEXI CONNECTORS:**

**STANDARD FLEXI CONNECTORS:**

The BFM® fitting with a Flexi connector can be used in all Dust Zones. Below is the assessment from Report IB-18-8-0083/2.

Dust explosion hazard at not strongly charge generating processes (free fall with total length up to 3m no pneumatic transport): Use is permitted with the following restrictions:

- Hose length up to 1m: Minimum Ignition Energy of the dust >10mJ
- Hose length >1m up to 3m: Minimum ignition Energy of the dust >30mJ

Minimum Ignition Energy values are valid for BFM® connectors with diameters up to 300 mm

**FIGURE 5: STANDARD FLEXI CONNECTOR LENGTHS**

IBExU report IB-18-8-0083/2 also concludes that flexi connectors should not in any circumstance be used for strongly charge-generating processes or in gas explosion zones.

**CONNECTOR SIZES:**

The IBEExU concludes that the BFM® fitting with a standard Flexi Connector is as per Seeflex 040E and 020E ie. connectors of all diameters conform to ATEX regulations in all Dust Zones with a length of up to 3m for not strongly charge-generating processes.

**FLEXI EARTHED CONNECTORS:**

The BFM® fitting with a Flexi connector can be used in all Dust Zones. Below is the assessment from Report IB-18-8-0083/2.

*Tube lengths up to 3m are permitted if the spiral wire is earthed*

**FIGURE 6: FLEXI EARTHED LENGTHS**

**Note:** Although connecting to earth (spigot) on one end of the BFM® Flexi Earth is sufficient, BFM® Global strongly recommends connecting both ends to earth. This acts as a safety measure should one end become disconnected or should the Flexi wire break for any reason. It also helps with equipotential bonding with upstream and downstream apparatus.

**RINGS:**

The Seeflex 040E, 020E and 040AS connectors with rings can be used in all Dust Hazardous Zones. The use of Plastic rings has no effect on the ATEX rating of the material, however Stainless Steel rings are not suitable for use in any Gas Zones.

Below is the key conclusion from Report IB-18-8-0083/2 relating to the use of Stainless Steel rings in Dust Zones:

**3.1.2 Use of the stainless steel rings in dust-explosion-hazardous areas**

As long as the stainless steel rings of the non breathable materials Seeflex 020E, Seeflex 040E and Seeflex 040AS are permanently completely embedded in the respective plastic materials, they do not pose any hazard in the case of explosive dusts. In practice, however, it must be made sure that the plastic layer around the stainless steel ring is not worn to such an extent that the stainless steel ring is completely or partially uncovered. If this cannot be made sure, the above-mentioned Seeflex-BFM® connectors should only be used for dusts with Minimum Ignition Energy > 10 mJ (valid for diameters up to 500 mm). For the breathable materials LM3, LM4 and Teflex, the stainless steel rings should only be used for dusts with Minimum Ignition Energy > 10 mJ, because the porosity of the materials allows electrostatic charging and spark discharge at the stainless steel rings. The criteria mentioned apply both to *not* strongly charge-generating processes and strongly charge-generating processes. In the case of strongly charge-generating processes (here especially: pneumatic transport and free fall > 3 m), the restrictions of use for the respective BFM® standard connectors mentioned in [1] must always be considered.

FIGURE 7: STAINLESS STEEL RINGS IN DUST EX ZONES

A check of the condition of ringed connectors to ensure the Stainless Steel rings are not exposed is recommended as part of regular health and safety maintenance procedures.

**KEVLAR COVERS:**

Kevlar Covers can be used for Interior Dust explosion areas without modification, subject to the ATEX rating of the inner connector (as per the Product Summary Table on page 2).

The use of Kevlar Covers in Exterior Dust Zones is not certified. However, the IBExU concludes that if the fastening ring at each end is earthed to the outside of the corresponding spigots, then the Kevlar Cover can be used for Exterior Dust Zones.

Kevlar Covers are not certified for use in any Gas Zones.

**SEEFLEX 060ES & TEFLEX:**

Report IB-18-8-0083/1 states that Seeflex 060ES and Teflex can be used with the same restrictions. For Dust Zones 20-22 there are no restrictions in the use of 060ES and Teflex connectors. Their use is however restricted for use in Gas Interior and Exterior Zones. Relevant section from report IB-18-8-0083/1 is pasted below.

Seeflex 060ES and Teflex				
0	20, 21, 22	100 cm <sup>2</sup>	50 cm <sup>2</sup> <sup>2)</sup>	8 cm <sup>2</sup> <sup>2)</sup>
1	20, 21	100 cm <sup>2</sup>	50 cm <sup>2</sup> <sup>2)</sup>	8 cm <sup>2</sup> <sup>2)</sup>
	22	200 cm <sup>2</sup>	200 cm <sup>2</sup>	40 cm <sup>2</sup> <sup>2)</sup>
2	20 oder 21	200 cm <sup>2</sup>	200 cm <sup>2</sup>	40 cm <sup>2</sup> <sup>2)</sup>
	22	No restrictions <sup>3)</sup>		

FIGURE 8: SEEFLEX 060ES & TEFLEX SURFACE AREA RESTRICTIONS

**CONNECTOR SIZES:**

The IBExU concludes that 060ES and TEFLEX connectors can be used for all Dust Hazardous Zones with no surface size restrictions in not strongly charge generating processes (free fall with total lengths up to 3m and no pneumatic conveyance). Their use in gas zones is restricted according to the table above with surface sizes restricted to the above values. They can be used in zone 2/22 unrestricted.

**IMPORTANT INFORMATION:**

It should be noted that the length of the BFM® connectors specified in this document refers to the maximum possible length of non-conductive or unearthed pipework. For example, if there was a section of unearthed non-conductive pipe 2m long above the BFM® fitting then the size would be restricted to 1m long.

SIGNED ON BEHALF OF  
BFM® GLOBAL LTD:



BLAIR MCPHEAT  
DIRECTOR